The Northumberland Line Order

APP-W5-3 Appendices to Proof of Evidence

CONTENTS

Appendix A

All Level Crossing Risk Model

ALCRM provides a combined estimate of both the individual and collective risks at a level crossing.

The individual and collective risk is expressed in Fatalities and Weighted Injuries (FWI). The following values help to explain this:

- **1** = 1 fatality per year or 10 major injuries or 200 minor RIDDOR events or 1000 minor non-RIDDOR events
- **0.1** = 20 minor RIDDOR events or 100 minor non-RIDDOR events
- **0.005** = 5 minor non-RIDDOR events

INDIVIDUAL RISK
This is the annualised probability of fatality to a 'regular user'. NOTE: A regular user is taken as a person making a daily return trip over the crossing; assumed 500 traverses per year. Individual risk:

- Applies only to crossing users. It is not used for train staff and passengers
- Does not increase with the number of users.
- Is presented as a simplified ranking:
    - Allocates individual risk into rankings A to M
      (A is highest, L is lowest, and M is 'zero risk' e.g. temporary closed, dormant or crossings on mothballed lines)
    - Allows comparison of individual risk to average users across any crossings on the network

Individual Risk Ranking	Upper Value (Probability)	Lower Value (Probability)	Upper Value (FWI)	Lower Value (FW)
A	1 in 1	Greater than 1 in 1,000	1	0.001000000
B	1 in 1,000	1 in 5,000	0.001000000	0.000200000
C	1 in 5,000	1 in 25,000	0.000200000	0.000040000
D	1 in 25,000	1 in 125,000	0.000040000	0.000008000
E	1 in 125,000	1 in 250,000	0.000008000	0.000004000
F	1 in 250,000	1 in 500,000	0.000004000	0.000002000
G	1 in 500,000	1 in 1,000,000	0.000002000	0.000001000
H	1 in 1,000,000	1 in 2,000,000	0.000001000	0.000000500
I	1 in 2,000,000	1 in 4,000,000	0.000000500	0.000000250
J	1 in 4,000,000	1 in 10,000,000	0.000000250	0.000000100
K	1 in 10,000,000	1 in 20,000,000	0.000000100	0.000000050
L	Less than 1 in 20,000,000	Greater than 0	0.000000050	Greater than 0
M	0	0	0	0

COLLECTIVE RISK

This is the total risk for the crossing and includes the risk to users (pedestrian and vehicle), train staff and passengers.

Collective risk:

- Is presented as a simplified ranking:
  - Allocates collective risk into rankings 1 to 13 (1 is highest, 12 is lowest, and 13 is 'zero risk' e.g. temporary closed, dormant or crossings on mothballed lines)
  - Can easily compare collective risk between any two crossings on the network

Collective Risk Ranking	Upper Value (FWI)	Lower Value (FW)
1	Theoretically infinite	Greater than 5.00E-02
2	0.050000000	0.010000000
3	0.010000000	0.005000000
4	0.005000000	0.001000000
5	0.001000000	0.000500000
6	0.000500000	0.000100000
7	0.000100000	0.000050000
8	0.000050000	0.000010000
9	0.000010000	0.000005000
10	0.000005000	0.000001000
11	0.000001000	0.000000500
12	0.0000005	0
13	0.00E+00	0.00E+00

Appendix B
ORR Guidance Document

OFFICE OF RAIL REGULATION

Level Crossings: A guide for managers, designers and operators

Railway Safety Publication 7

December 2011

Contents

Foreword

What is the purpose of this guide?

1. The Office of Rail Regulation (ORR) has issued this guidance after extensive consultation. It provides general guidance on the safe management, operation, modification and use of Britain's level crossings. It also provides detailed information on the level crossing order making process which is managed by ORR. It updates earlier guidance (RSPG2E), in particular to align it with developments in industry standards and with recommendations from the Rail Accident and Investigation Branch (RAIB).

2. Please note that it is intended to be used as **guidance.** Following the guidance is not compulsory and you are free to take other action. The guidance aims to help people involved in the management and operation of level crossings to understand the associated risks and responsibilities

3. We expect level crossing risks to be controlled to the appropriate degree. If innovative or alternative ways of doing things emerge as ways of properly controlling risk, then this guidance should not hinder their introduction.

4. ORR wants its advice on level crossing safety to be accessible to everyone who has a role to play in making level crossings safer and more efficient.

Who is this guide for?

5. This document is for people who design, install, maintain and operate level crossings. It may be of interest to others who use or are affected by the use of level crossings.

6. Interested parties may include any of the following:

(a) railway infrastructure managers;

(b) highway authorities;

(c) road authorities;

(d) planning authorities;

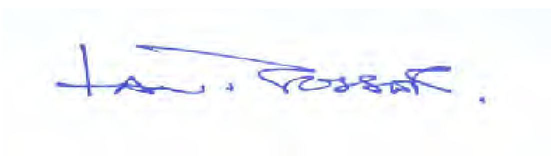
(e) train and station operators;

(f) landowners

(g) level crossing users, including groups representing motorists, cyclists, ramblers and persons with reduced mobility.

7. This guidance does **not** apply to tramways, as the characteristics of tramway crossings and the principles of tramway operation are different.

8. If in doubt, you should contact ORR for advice about how to interpret and apply this guidance to particular circumstances. The guidance will be regularly updated and the version on the ORR website shows the date of the latest update.



Ian Prosser

Director, Railway Safety

Introduction

Why is managing level crossing risk important?

1. Level crossings account for nearly half of the catastrophic train accident risk on Britain's railways. ORR believes that the safe design, management and operation of level crossings can reduce the risks, have a positive effect on user behaviour and so reduce the number of fatal and serious incidents.

What is ORR's policy on level crossings?

2. ORR seeks to influence duty holders and others to reduce risk at Britain's level crossings. It does this through a variety of means ranging from advice to formal enforcement action. ORR checks that preventive and protective measures are implemented in accordance with the principles of prevention set out in the Management of Health and Safety at Work Regulations 1999. Risk control should, where practicable, be achieved through the elimination of level crossings in favour of bridges, underpasses or diversions. Where elimination is not possible, ORR aims to ensure that duty holders reduce risk so far as is reasonably practicable and in accordance with the principles of protection.

3. As the safety regulator for Britain's railways, ORR's role is to provide clear advice and enforce relevant legislation – including that which relates to level crossings. We also exercise the powers of the Secretary of State in making level crossing orders under the Level Crossings Act 1983. The Agency Agreement made between the Secretary of State for Transport and the Office of Rail Regulation relates to functions which ORR has agreed to perform on behalf of the Secretary of State. The Agreement is on ORR's website at http://www.rail-reg.gov.uk/upload/pdf/mou_ORR_DfT.pdf

4. ORR believes that it is neither effective nor efficient for only rail companies to be responsible for managing safety at level crossings. Decisions about level crossings should involve rail companies, traffic authorities and other relevant organisations as early on as possible. Relevant authorities should recognise the wider benefits that safety improvements at level crossings (for example, replacing them with bridges) can bring about, particularly for road users. If wider benefits can be achieved, the appropriate funding bodies should agree on how the costs of making safety improvements will be met.

5. ORR is also committed to helping people understand the importance of the safe use of level crossings. The 'Using Level Crossings Safely' guidance is available on ORR's website.

1. The legal framework

Overview

1.1 The law relating to level crossings is not straightforward as there is a need to balance the interests of road and rail, and take account of the impact of local circumstances that affect the use of the crossing.

1.2 The law applying to level crossings has evolved over the past 160 years. No single government department controls all level crossing legislation. Currently, laws relating to the highways, railways and health and safety apply.

1.3 The Law Commission for England and Wales and the Scottish Law Commission are undertaking a joint review of the existing law governing level crossings. Check their website for the latest position at: http://www.lawcom.gov.uk/level_crossings.htm

1.4 Duties are placed on a number of bodies and individuals including:

(a) railway infrastructure managers;

(b) level crossing operators;

(c) highway, road and traffic authorities;

(d) employers and employees;

(e) train and freight operators;

(f) land owners;

(g) road users; and

(h) other crossing users

1.5 ORR is the enforcing authority for railway health and safety legislation.

1.6 The key pieces of legislation that operators and users of level crossings should be familiar with are:

- Health and Safety at Work etc. Act 1974 is the primary piece of legislation covering occupational health and safety in Great Britain. It requires undertakings to manage and control risks arising from their work activities in connection with level crossings, so far as is reasonably practicable. It also gives ORR inspectors the powers to inspect and enforce safety at level crossings.
- The Management of Health and Safety at Work Regulations 1999 require employers to carry out risk assessments, make arrangements to implement necessary measures, appoint competent people and arrange for appropriate information and training.
- Level Crossings Act 1983 enables the Secretary of State for Transport to make orders that take account of both safety and convenience aspects of crossings. The order can specify the protection arrangements required at certain types of crossing. Detailed advice on the level crossing order process can be found in Chapter 3.

- Transport and Works Act 1992 enables the Secretary of State for Transport to make orders that authorise the construction of a railway in England, including allowing it to cross the highway by means of a level crossing. The authorisation of railway schemes wholly in Wales is by way of an order made by Welsh Ministers. Cross-border rail schemes are authorised by orders made by the Secretary of State subject to the agreement of Welsh Ministers. For Scotland, the Transport and Works (Scotland) Act 2007 enables Scottish Ministers to make orders that authorise the construction of a railway in Scotland, including allowing it to cross the highway by means of a level crossing. Prior to these Acts being made, crossings would have been authorised either by orders made under the Light Railways Act 1896 or under Private Acts.

- Level Crossings Regulations 1997 make it an offence for a crossing operator to fail to comply with a level crossing order.

- Railways and Other Guided Transport Systems (Safety) Regulations 2006 (ROGS), as amended by The Railways and Other Guided Transport Systems (Safety) (Amendment) Regulations 2011, require all infrastructure managers to have a safety management system that enables them to control risk – including risk arising from level crossings. ORR's published guidance on ROGS is at: http://www.rail-reg.gov.uk/upload/pdf/rogs-guidance-may11.pdf

- The Traffic Signs Regulations and General Directions 2002 contain requirements for road signs, including carriageway markings. These are supported by the Traffic Signs Manual found on DfT's website at:http://www.dft.gov.uk/pgr/roads/tss/tsmanual/

- The Private Crossings (Signs and Barriers) Regulations 1996 prescribe the types of signs that may be used on or near private level crossings.

- The Equality Act 2010 places duties on designers and managers to ensure that facilities at crossings do not cause an unnecessary barrier to access across the railway for those with disabilities.

- The current Railway Group Standard relating to level crossings (GK/RT0192, Level Crossing Interface Requirements, Issue 1) defines the requirements for level crossings systems at the interface between the mainline infrastructure manager and railway undertakings. GK/RT0192 can be found at:
http://www.rgsonline.co.uk/Railway_Group_Standards/Control%20Command%20and%20Signalling/Railway%20Group%20Standards/GKRT0192%20Iss%201.pdf

Highways and planning law

1.7 A process for involving affected local authorities in level crossing protection arrangements is in place.

1.8 The modifications to the Level Crossings Act 1983, introduced by the Road Safety Act 2006, formalised existing good practice in securing consultation on changes to level crossings in advance of formal circulation of a draft level crossing order. The changes also permit the order to require both the operator of the crossing and the local traffic authority to provide, operate and maintain any protective equipment (including barriers and traffic signs) specified in the order.

1.9 Local traffic authorities and level crossing operators may agree a long term strategy for each crossing. Where appropriate, consideration should be given to what action may be required by each party, to permit the crossing to be closed in the long term.

1.10 Finally, there is a requirement in planning legislation for planning authorities to consult the Secretary of State and the operator of the network where a proposed development materially affects traffic over a level crossing. For example, a new housing development near a crossing may cause traffic levels over the crossing to increase greatly and mean that existing protection arrangements at the crossing are no longer adequate.

2. Managing risks at level crossings

Introduction

2.1 This part of the guidance provides advice for those involved in the design, supply, installation and maintenance, and continued assessment of level crossing suitability. It revises and updates the advice previously given in Railway Safety Principles and Guidance, part 2, section E, 'Guidance on Level Crossings'.

Applying the guidance

2.2 This document does not set mandatory standards, though it does describe certain essential principles and features, such as interlocking and prescribed road signs and markings. It gives examples of established good practice which, if followed, are likely to be in accordance with the law.

2.3 ORR encourages innovative solutions to level crossing problems. In all cases a risk assessment will need to show that due consideration has been given to safety and that risks have been reduced so far as reasonably practicable. Innovative proposals may be constrained, to some extent, by the need for consistency for example for road signs.

2.4 The guidance is produced to help those who are responsible for providing and maintaining the protection arrangements at level crossings. This includes highways and road authorities, who should find the guidance helpful in so far as it deals with the roadway aspects of the protection arrangements. We hope that others, such as planning authorities, who may be consulted on proposed modifications to level crossings, will also find this document helpful.

2.5 Level crossings take many forms depending on whether they are on a public or private road, or for vehicle, horse or pedestrian use. The protection arrangements which are appropriate at level crossings will vary, depending upon the crossing location, for example proximity to road junctions, the level of usage and the nature of railway traffic.

2.6 An important factor in assuring the safety of level crossings is providing, so far as circumstances permit, a consistent appearance for road and rail users of any crossing. To help achieve this, several level crossing types have been developed over the years. Detailed protection arrangements for each type are described later.

2.7 The guidance applies when the protection arrangements at existing crossings are reviewed. It will also apply when new crossings are created. Arrangements at a level crossing on a road to which the public has access may be subject to an order, made by the Secretary of State, to provide for the protection of those using the crossing. Level crossing orders, made under the Level Crossings Act 1983, usually specify the protection arrangements at public vehicular crossings.

2.8 Where level crossings cannot be eliminated but are being renewed or altered, every effort should be made to improve the crossing and reduce risk to both crossing and railway users. Certain types of crossing design, particularly automatic types, whilst fit for purpose when road and rail traffic densities were lower, have been found to be prone to misuse with potentially high consequences when collisions occur. Given the high cost when crossings are installed and their long service life, ORR expects that the safest suitable crossing for the site-specific risks will be selected when renewing a crossing.

Effects on existing level crossings

2.9 This guidance sets out examples of good practice appropriate for today's world. It is relevant to existing crossings where protection arrangements require improvement. Factors affecting the continued suitability of arrangements might include increased traffic levels and speeds (road and rail), new road lay-outs, and any history of misuse or near-misses. Where protection arrangements are specified in a level crossing order, the crossing operator is required to ensure that the order is complied with. In addition to this, however, crossing operators have general duties under the Health and Safety at Work etc. Act 1974 to ensure, so far as is reasonably practicable, the safety of all those using or affected by a level crossing. In effect, this means that crossing operators need to monitor regularly the suitability of arrangements and make changes when necessary. Where the crossing is subject to a level crossing order, such changes should prompt the crossing operator to request a new or amended order to reflect these changes. The level crossing order making process is described in detail in Chapter 3.

Operating conditions

2.10 Level crossing type and design will depend on the operational requirements of the railway and road usage.

2.11 To ensure that the level of protection at the crossing remains adequate and appropriate, assess the suitability of the type of crossing when circumstances at the crossing change. This includes railway factors (for example rolling stock, signalling, electrification, speed, etc) and those of the local environment (such as housing or industrial developments, changes to road traffic conditions etc).

2.12 It is important to take into account:

(a) normal railway operating conditions;

(b) degraded conditions where any component or part of the railway system has failed;

(c) foreseeable abnormal conditions to which the system may be subjected;

(d) usage, including consideration of altered or increased usage due to incident or regular occurrences and events; and

(e) emergency situations.

Design and installation

2.13 Clients, designers, suppliers, contractors and installers have responsibilities under the Construction (Design and Management) Regulations 2007 in relation to level crossings.

2.14 Similarly, equipment at level crossings may be subject to other specific regulations, for example, the Electricity at Work Regulations 1989 and the Provision and Use of Work Equipment Regulations 1998 (PUWER).

2.15 Where reference is made in this document to the Traffic Signs Regulations and General Directions 2002 or to the Private Crossings (Signs and Barriers) Regulations 1996 they will be quoted as the 2002 Regulations and the 1996 Regulations respectively. References to sign diagram numbers are to diagrams in those Regulations.

Structure of the guidance

2.16 This part of the guidance:

(a) suggests the crossing types appropriate to the prevailing conditions;

(b) provides general guidance applicable to all types of crossing;

(c) gives specific details of types of crossing; and

(d) provides guidance on carriageway aspects and crossing equipment.

Terminology

2.17 Throughout the document, verbs with specific meanings are used:

should - the primary verb for statements of guidance;

may - where the guidance suggests options;

must - only used where there is a legal/statutory requirement for the measures described to be employed. Reference to the Act or Regulations will be provided;

is (are) required - having decided upon a particular option or arrangements, some consequential choices stem from that first decision. This expression is used to indicate those consequential choices and where firmer guidance is considered appropriate.

2.18 Some terms that relate specifically to level crossings have a special meaning and where these terms are first mentioned in the text they are italicised and a cross reference to the definition in Appendix A is provided.

2.19 Throughout this document speeds are given in miles per hour as this is the convention for UK highway signage and the majority of UK railway signage. Conversions to kilometres per hour should use the metric equivalent specified in relation to the relevant imperial unit in the third column of the Schedule to the Units of Measurement Regulations 1995.

Level crossing types – basic protection and warning arrangements

Figure 1

Protection from train movements	Crossing confirmed clear	Warning arrangements	Full barriers/gates	Half barriers	No barriers	Telephone "protection"
Protected	By signaller or crossing keeper		MCG			
			MCB			
			MCB (CCTV)			
	By obstacle detector		CB-OD			
	By driver			ABCL		
					AOCL	
	By train crew/other		TMO			
Unprotected		Approaching Train		AHB		
					UWC (MSL)	
					FP (MSL)	
		Telephone				UWC (T)
		Line of Sight			OC	
					UWC	
					FP/BW	

MCG: manually controlled gated crossing
MCB: manually controlled barrier crossing
MCB (CCTV): manually controlled barrier crossing with closed circuit television
CB-OD: controlled barrier crossing with obstacle detection
ABCL: automatic barrier crossing locally monitored
AOCL: automatic open crossing locally monitored
TMO: train crew (or other peripatetic railway staff) operated crossing
AHB: automatic half barrier crossing
UWC (MSL): user worked crossing with miniature stop lights
FP (MSL): footpath crossing with miniature stop lights
UWC (T): user worked crossing with telephone
OC: open crossing
UWC: user worked crossing
FP/BW: footpath or bridleway crossing

Protection from train movements ensures that trains are not authorised to pass over the crossing until the crossing is closed and the crossing area has been checked to be clear.

Unprotected crossings depend on a warning being given to crossing users of an approaching train so that they can be clear before the train arrives. It is unlikely that the train can be stopped if the crossing is not clear.

Telephones are fitted to several crossing types for a range of purposes. At a UWC (T) the warning of an approaching train is achieved by contacting the signaller. For this to be effective the user must make the call and the signaller must be able to advise how close the nearest train is.

Assessing suitability

2.20 Selecting the most suitable type of level crossing depends on various factors, one of which may be traffic volume. Table 1 gives guidance on the factors to be considered for any given location. In deciding which type of level crossing to install, consider likely road traffic delays. Determine the protection provided at a level crossing by undertaking a suitable and sufficient risk assessment. The following table is a general summary of the different crossing types. For further details see relevant sections in this chapter.

Table 1

Section	Type of crossing	Key features
4	Gated crossings operated by railway staff	The *traffic moment* (see Appendix A) and *actual daily road vehicle usage* (see Appendix A) should be low. Railway signals interlocked with the gates are required so that it is not possible to clear the signals unless the road is fully closed by the gates, nor is it possible to open the road unless the signals are at Stop and free of *approach locking* (see Appendix A).
5	Barrier crossings operated by railway staff	Generally suitable for any situation. Railway signals interlocked with the barriers are required so that it is not possible to clear the signals unless the road is fully closed by the barriers, nor is it possible to open the road unless the signals are at Stop and free of approach locking.
5A	Barrier crossings with obstacle detection	This type of crossing is protected by road traffic light signals and lifting barriers on each side of the railway. An audible warning to pedestrians is also provided. The crossing is designed to operate automatically. Railway signals, which provide full protection to the crossing, are required on all railway approaches. These signals must be interlocked with the lifting barriers so that it is not possible to clear the signals unless the road is fully closed by the barriers, nor should it be possible to raise the barriers unless the signals are set at Stop and free of approach locking, or the train has passed the signal and traversed the crossing.

Section	Type of crossing	Key features
6	Automatic half barrier crossings (AHBC)	The speed of trains over the crossing should not exceed 100 mph. There should not be more than two running lines. Appropriate means to stop any train approaching the crossing in an emergency situation are required where reasonably practicable and before a train has passed the last protecting signal. Trains should not normally arrive at the crossing in less than 27 seconds after the amber lights of the road traffic light signals first show. At least 95% of trains should arrive within 75 seconds and 50% within 50 seconds. The carriageway on the approaches to the crossing should be sufficiently wide to enable vehicles to pass safely. There is no limit to the amount of road traffic, but the road layout, profile and traffic conditions should be such that road vehicles are not likely to become grounded or block back obstructing the railway. Good road profile is particularly important at this type of crossing. Not suitable where pedestrian usage is high.
7	Automatic barrier crossings, locally monitored (ABCL)	The speed of the trains over the crossings will be determined by the traffic moment but should not exceed 56 mph at any time. There should not be more than two running lines. The carriageway on the approaches to the crossing should be sufficiently wide to enable vehicles to pass safely. The road layout, profile and traffic conditions should be such that road vehicles are not likely to ground or regularly to block back obstructing the railway.
8	Automatic open crossings, locally monitored (AOCL)	The speed of the trains over the crossings will be determined by the traffic moment but should not exceed 56 mph at any time. There should not be more than two running lines. The limits on the road and rail traffic are defined in Appendix B. The carriageway on the approaches to the crossing should be sufficiently wide to enable vehicles to pass safely. The road layout, profile and traffic conditions should be such that road vehicles are not likely to ground or regularly to block back obstructing the railway.
9	Open crossings	The speed of trains over the crossing should not exceed 10 mph. There should not be more than one line over the crossing. The maximum daily traffic moment should not normally exceed 2000 or the peak hour traffic moment 30. The actual daily road vehicle usage should not exceed 200. The 85th percentile road speed at the crossing should be less than 35 mph. The road layout, profile and traffic conditions should be such that road vehicles are not likely to ground or regularly to block back obstructing the railway.

Section	Type of crossing	Key features
10	User worked crossings (UWCs) for vehicles	The speed of the trains over the crossing should not exceed 100 mph unless additional protection is provided. These crossings should only be used on private roads. There should not normally be more than two lines over the crossing. Where no additional protection is provided, such as miniature stop lights, the warning period (i.e. arrival time of the train from the first sighting) should be greater than the time required by users to traverse the *crossing length* (see Appendix A) by not less than 5 seconds.
11	Footpath and bridleway crossings	The speed of trains over the crossing should not exceed 100 mph unless additional protection is provided. There should not normally be more than two lines over the crossing. The *warning time* (see Appendix A) should be greater than the time required by users to traverse the crossing surface between the *decision points* (see Appendix A) at either end of a footpath crossing on foot, or on horseback at a bridleway crossing, unless additional protection is provided. Where miniature stop lights are provided, the warning period should be greater, by not less than 5 seconds, than the time required by users to traverse the crossing surface between the decision points at either end of a footpath crossing on foot, or on horseback at a bridleway crossing.
12	Foot crossings at stations	This type of crossing should only be considered for lightly used stations where line speed does not exceed 100 mph and no alternative arrangements are available.

General guidance

2.21 This section gives general guidance on positioning and equipment at all types of crossings.

Positioning signalling and other railway infrastructure relative to level crossings

2.22 During normal working, no part of a stationary train should obstruct a level crossing. Where a level crossing is near a station, special arrangements may be necessary.

2.23 Determine by risk assessment where any protecting signals will be sited relative to a level crossing. Assess the likelihood and consequences of trains passing the signals without authority. If it is not possible to optimise the positions of signals, take appropriate measures to reduce the risk so far as is reasonably practicable.

2.24 Provide additional measures to protect road users where a road crosses electrified railway lines. See Section 19 for further advice.

Equipment at level crossings

2.25 Consider the likely impact of future uses of both the land and the railway (for example changed line speeds) on sighting and safety before land adjacent to crossings is let or sold off by railway duty holders and apply appropriate restrictive terms.

2.26 Install all crossing equipment clear of the railway structure gauge and the edge of the carriageway. Ensure that it does not obstruct sighting.

2.27 Provide an alternative power supply at all automatic crossings, including those with miniature stop lights, to allow the crossing equipment to function normally in the event of a main power supply failure.

2.28 It may be necessary, where trains run after dark, to illuminate the crossing to enable its safe operation. If the roads to a crossing are lit, the crossing should be illuminated to at least the same standard. Any lighting should not cause glare to either road users or train drivers, interfere with the visibility of railway signals or cause avoidable annoyance to local householders.

2.29 Additional lighting may be necessary at crossings which are locally monitored by the driver of the approaching train. This is to enable the train driver to see that the crossing is unobstructed from the point at which they may have to brake the train.

2.30 Any failure or damage to the equipment at a level crossing, which may lead to incorrect or unsafe operation, should be evident to the *control point*, the driver of an approaching train, or the user of the level crossing within a reasonable time of the event occurring.

Gated crossings operated by railway staff

General description

2.31 This type of crossing is protected by gates, on both sides of the railway, which complete the fencing of the railway when closed across the road or the railway. The crossing is manually operated by railway staff who close the gates alternately across the road or the railway.

2.32 The normal position of the gates, either across the road or railway, may be specified in the legislation authorising construction of the line. Changes may be authorised by direction under the Road and Rail Traffic Act 1933. Directions may be issued by ORR on behalf of the Secretary of State. Where the gates do not completely fence in the railway when open to road traffic, cattle-cum-trespass guards may be required (described later in Section 14 ‘Additional measures to protect against trespass’).

2.33 Road traffic light signals may be provided to assist with the safe operation of the gates. Where they are not provided, red lamps and red retro-reflective targets mounted on the gates, which show towards approaching road traffic when the gates are across the road, should be provided.

Method of operation

2.34 The gates may be operated by either:

(a) infrastructure manager staff, who are permanently stationed at a control point, sufficiently close to have a clear view to enable safe operation of the crossing; or

(b) one of the crew of an approaching train (or other peripatetic staff) at a control point adjacent to the level crossing, after the train has been stopped short of the crossing.

2.35 The person operating the gates should have a good view of the whole crossing area and, unless road traffic light signals are provided, approaching road traffic.

2.36 Road traffic light signals, where provided, should be activated before any attempt is made to close the gates to road traffic. The lights should continue to show until the gates are fully closed across the railway.

2.37 The crossing operator should have an appropriate indication of the approach of trains and clear instructions as to when the gates should be closed to road traffic.

2.38 Where the crossing is operated by a member of train crew, the train must stop short of the crossing to allow the person to close the gates to road traffic. The train may then only proceed over the crossing when the train driver receives the authority from the person operating the gates. When the train has cleared the crossing the gates should be reopened to road traffic.

Railway signalling and control

2.39 Provide railway signals which afford full protection to the crossing on all railway approaches. These signals should be interlocked with the gates so that it is not possible to clear the signals unless the road is fully closed by the gates, nor should it be possible to open the gates unless the signals are set at Stop and free of approach locking, or the train has passed the signal and cleared the crossing.

2.40 Where road traffic light signals are provided, a train passing a protecting railway signal at Stop should immediately cause the intermittent road traffic light signals to flash red, omitting the steady amber phase. Where a protecting railway signal is very close to a level crossing, this emergency warning to road users may be very short. Additional measures may be necessary, therefore, to ensure that the crossing is closed to road traffic before the train reaches the immediate vicinity of the crossing. Such additional measures may be specified in a level crossing order.

2.41 Where trains are required to stop short of the crossing, interlocking between signalling and gates is not required. Instead, provide a warning board at full service braking distance to remind the train driver to stop short of the crossing and a Stop board at the stopping point. The Stop board should not normally be less than 50 m before the crossing.

Barrier crossings operated by railway staff

General description

2.42 This type of crossing is protected by road traffic light signals and lifting barriers on both sides of the railway. An audible warning to pedestrians is also provided. The barriers are normally kept in the raised position and, when lowered, extend across the whole width of the carriageway on each approach.

2.43 The crossing is operated by infrastructure manager staff who start the road traffic light signal sequence and then lower the barriers. The lowering and raising cycles may be initiated automatically.

2.44 Road traffic light signals may not be necessary where the barriers are normally in the lowered position and are clearly visible from an appropriate distance to approaching road traffic. Where no road traffic light signals are provided, the number of road vehicles during the peak hour should not exceed 20 and the permissible speed of the railway should not exceed 100 mph.

2.45 Telephones for public use are not normally required.

Method of operation

2.46 This type of crossing may be operated:

(a) by infrastructure manager staff stationed at a control point adjacent to the crossing when the line is open to rail traffic;

(b) by infrastructure manager staff stationed at a control point remote from the crossing using closed-circuit television (CCTV), whenever the line is open to rail traffic;

(c) by infrastructure manager staff at a control point adjacent to the crossing after an approaching train has been stopped short of the crossing.

2.47 For all methods of operation the person operating the crossing equipment should have a clear and full view of the crossing (including the barriers) from the control point, either directly or by CCTV.

2.48 Where the barriers are normally raised, the sequence of events to close the crossing to road traffic, once the lowering cycle has been initiated either manually or automatically, is:

(a) the amber light on each of the road traffic light signals immediately shows and the audible warning begins. The amber lights should show for approximately 3 seconds (up to 5 seconds to suit road conditions);

(b) immediately the amber lights are extinguished, the intermittent red lights should show;

(c) approximately 4 to 6 seconds later the barriers should start to descend. Where pairs of barriers are provided, the *right-hand side* (see Appendix A) barriers should not begin to descend until the *left-hand side* (see Appendix A) barriers are fully down. The time for each barrier to reach the lowered position should normally be 6 to 10 seconds. At skew crossings, where the crossing distance is greater, barrier timings may need to be lengthened accordingly. The closure sequence should be monitored by the operator, particularly if queuing vehicles or heavy usage by pedestrians is likely to increase risk;

(d) the audible warning for pedestrians should stop when all the barriers are fully lowered;

(e) the intermittent red lights should continue to show; and

(f) the crossing should be viewed carefully to ensure that there are no persons or obstructions present, before 'crossing clear' is confirmed and railway signals cleared for the passage of trains

2.49 The sequence of events to open the crossing to road traffic, once the raising cycle has been initiated either manually or automatically, is:

(a) all the barriers begin to rise simultaneously and should normally rise in 4 to 10 seconds; and

(b) the intermittent red lights should be extinguished as the barriers rise.

2.50 Where barriers lower automatically, they should not lower unless at least one red light in all the road traffic light signals is shown in each direction from which users may approach the crossing. If CCTV monitoring is provided, initiation of automatic lowering should switch on the CCTV monitor and give an audible indication at the control point.

2.51 Where automatic lowering is used, provide two barriers on each approach to avoid road users becoming trapped on the crossing.

2.52 Once the barriers have started to descend, the lowering cycle is completed in the normal sequence even if all the red road traffic light signals facing in one direction fail. The barriers may then be raised when it is safe to do so. Where, in these circumstances, the barriers have not started to descend, they should remain in the raised position.

2.53 Barriers should rise as soon as practicable after all trains for which the lower sequence has been initiated or maintained, have passed clear of the crossing.

Railway signalling and control

2.54 Provide railway signals, to fully protect the crossing, on all railway approaches. Interlock these signals with the lifting barriers so that it is not possible to clear the signals unless the road is fully closed by the barriers. It should not be possible to raise the barriers unless the signals are set at Stop and are free of approach locking, or the train has passed the signal and traversed the crossing.

2.55 Where the barriers are power operated, there should be controls at the control point to raise, stop, and lower the barriers. It should not be possible to clear any protecting signals until a further control to confirm ‘crossing clear’ has been operated with the barriers down.

2.56 If a train passes a protecting signal at Stop, the road traffic light signals should immediately show an intermittent red light (omitting the steady amber phase), and the audible warning should start. The barriers should not be lowered as this may strike or trap crossing users.

2.57 If the crossing is operated by one of the crew of an approaching train (or other peripatetic staff), after the train has been stopped short of the crossing, interlocking between the signalling and barriers is not required. Instead, a warning board is to be provided at full service braking distance from a stop board placed at a suitable point, not normally less than 50 m, before the crossing to remind the train driver to stop short of the crossing. The control point should be placed adjacent to the crossing..

2.58 To ensure that the crossing operates safely when the railway line is open to traffic, indicators at the control point should confirm that the equipment is powered and functioning correctly.

Barrier crossings with obstacle detection

General description

2.59 This type of crossing is protected by road traffic light signals and lifting barriers on each side of the railway. An audible warning to pedestrians is also provided. The barriers are normally kept in the raised position, and when lowered, extend across the whole width of the carriageway on each approach. (*Obstacle detection equipment* (see Appendix A) may be appropriate to reduce risk at other types of level crossing).

2.60 The crossing normally operates automatically. The closure sequence, described below, is initiated by approaching trains. Confirmation that the crossing is clear, and that railway signals may be cleared for the passage of trains, is provided automatically following a thorough scan for any significant obstruction, by obstacle detection equipment.

2.61 Telephones for emergency public use should be provided.

2.62 Equipment provided should enable the crossing to be operated manually, for example from a remote control point using CCTV. Manual operation may be necessary when a persistent obstruction is detected, when obstacle detection equipment is not in use, and for periodic monitoring of crossing usage and suitability.

2.63 This type of crossing may be suitable at sites where road traffic flows freely, road lay-out is simple and there is no significant history of misuse. Risk assessment should, in particular, consider how the risks from blocking-back of road traffic and high or problematic pedestrian usage will be controlled.

Method of operation

2.64 The sequence of events to close the crossing to road traffic, once the lowering cycle has been initiated, is:

(a) the amber light on each of the road traffic light signals immediately shows and the audible warning begins. The amber lights show for approximately 3 seconds (up to 5 seconds to suit road conditions);

(b) immediately the amber lights are extinguished, the intermittent red lights should show;

(c) approximately 4 to 6 seconds later the left-hand barriers should start to descend. Once the left-hand side barriers are lowered, a scan of the crossing area is performed by the obstacle detector. If the crossing is clear, the right-hand barriers will begin to descend immediately. If an obstacle is detected, and in order that it may clear the crossing, there will be an interval before the right-hand side barriers may begin to descend. The time for each barrier to reach the lowered position should normally be 6 to 10 seconds. At skew crossings, where the crossing distance can be greater, barrier timings may need to be lengthened accordingly;

(d) it should not be possible to lower the barriers unless at least one red light in each road traffic light signal facing approaching road traffic is working;

(e) once the barriers have started to descend, the lowering cycle should be completed in the normal sequence even if all the red lamps in any one of the road traffic light signals facing approaching road traffic fail. The barriers may then be raised when it is safe to do so. Where, in these circumstances, the barriers have not started to descend, they should remain in the raised position;

(f) the audible warning for pedestrians should stop when all the barriers are fully lowered;

(g) the intermittent red lights should continue to show; and

(h) the crossing is again scanned by the obstacle detector. A clear scan, confirming ‘crossing clear’, is required before railway signals can be cleared for the passage of trains.

2.65 Barriers should rise as soon as practicable after all trains for which the lower sequence has been initiated or maintained, have passed clear of the crossing.

2.66 The sequence of events to open the crossing to road traffic, once the raising cycle has been initiated or maintained is:

(a) all the barriers begin to rise simultaneously and should normally rise in 4 to 10 seconds; and

(b) the intermittent red lights should be extinguished as the barriers rise.

Railway signalling and control

2.67 Provide railway signals, to fully protect the crossing, on all railway approaches. Interlock these signals with the lifting barriers so that it is not possible to clear the signals unless the road is fully closed by the barriers, nor should it be possible to raise the barriers unless the signals are set at Stop and free of approach locking, or the train has passed the signal and traversed the crossings.

2.68 It should not be possible to clear any protecting signals until ‘crossing clear’ is confirmed either automatically by obstacle detection equipment, or manually when that equipment is not being used.

2.69 Provide discrete function controls at the control point for use when obstacle detection equipment is not being used.

2.70 If a train passes a protecting signal at Stop, the road traffic light signals should immediately show an intermittent red light (omitting the steady amber phase) and the audible warning should start. The barriers should not be lowered as this may strike or trap crossing users.

2.71 To ensure that the crossing operates safely when the railway line is open to traffic, indicators at the control point should confirm that the equipment is powered and functioning correctly.

Automatic half barrier crossings (AHBC)

General description

2.72 This type of crossing is protected by road traffic light signals and a lifting barrier on both sides of the railway. Audible warning to pedestrians is also provided. Lifting barriers are normally kept in the raised position and pivoted on the left-hand side of the road. When lowered, the barriers only extend across the entrances to the crossing leaving the exits clear.

2.73 The crossing equipment is activated automatically by an approaching train. The lowering of the barriers is preceded by the display of road traffic light signals. The period between the initial display of the road traffic light signals and the arrival of the fastest train should be sufficiently long to enable road vehicles and pedestrians to clear the crossing.

2.74 Telephones for public use, including those who are required to phone for permission to cross, are normally provided near each road traffic light signal on the right-hand side of the road. The telephones are connected to a *supervising point* (see Appendix A), which must always be open when the railway line is open.

2.75 The supervising point should have appropriate means to stop any train approaching the crossing, and means of communicating with railway staff operating the crossing equipment locally at the crossing in an emergency or abnormal situation.

Method of operation

2.76 Provide equipment to initiate crossing operation on each track and for each direction that trains may approach. The crossing equipment is activated automatically by a train as it approaches the crossing.

2.77 The time between the amber light on each of the road traffic light signals starting to show and the train arriving at the crossing should be at least 27 seconds. The train should pass as soon after 27 seconds as possible. At least 95% of trains should arrive within 75 seconds and 50% within 50 seconds, once the closing sequence has begun. Where the crossing length is longer than 15 m, the 27 seconds should be increased by 1 second for every additional 3 m of crossing length.

2.78 In certain circumstances at *predictor crossings* (see Appendix A) in abnormal circumstances an accelerating train could arrive at the crossing slightly sooner than 27 seconds after initiation of the amber road traffic light signal. This may be acceptable at crossings where it can be shown that the likelihood of an 'early arrival' is very low. No trains should arrive at a crossing in less than 22 seconds after initiation of the road traffic light signals. If 'early arrival' is foreseeable, for example for trains accelerating from a station, arrangements should be modified accordingly.

2.79 The sequence of events to close the crossing to road traffic is:

(a) the amber light on each of the road traffic light signals immediately shows and an audible warning for pedestrians begins. The lights should show for approximately 3 seconds (up to 5 seconds to suit road conditions, which will lengthen the time between amber light and train arrival);

(b) immediately the amber lights are extinguished the intermittent red lights should show; and

(c) approximately 4 to 6 seconds later the barriers should start to descend and take a further 6 to 10 seconds to reach the lowered position. At skew crossings, where the crossing distance can be increased greatly, barrier timings may need to be lengthened accordingly to enable slow-moving road users to clear the crossing.

2.80 Barriers should rise as soon as practicable after the train has passed unless another approaching train is so close that a minimum of 10 seconds *road open time* (see Appendix A) cannot be achieved. In this situation the barriers should remain lowered and the intermittent red lights should continue to flash. The audible warning should change in character after the first of the trains arrives at the crossing. The change in character should be timed so as to be detectable by pedestrians at the crossing.

2.81 Both barriers should begin to rise simultaneously. This should normally take 4 to 10 seconds to reach the raised position. The intermittent red traffic light signals should continue to show and the audible warning for pedestrians continue to sound, until the barriers begin to rise.

2.82 If both intermittent red lights in any of the road traffic light signals fail, the barrier should remain lowered. If there is a total power failure, the barriers should fall and remain lowered. If either barrier fails to reach the lowered position, neither barrier should rise until both have been fully lowered. If either barrier fails to rise from the lowered position, the intermittent red traffic light signals should continue to show.

Railway signalling and control

2.83 Appropriate means are required to stop trains approaching the crossing in an emergency situation.

2.84 Should a train pass a signal at Stop located between a *strike-in point* (see Appendix A) and the crossing, the road traffic light signals should immediately show an intermittent red light, omitting the steady amber phase. The audible warning for pedestrians should begin and the barriers start to lower.

2.85 Where trains may be required to stop because railway signals or stations lie within or close to the strike-in points, the sequence of events to close the crossing to road traffic may be initiated:

(a) automatically by an approaching train where stopping times of trains at a station can be predicted reasonably accurately and the time taken for trains to arrive at the crossing are within those indicated in paragraph 77;

(b) by a means that is only effective when the presence of a train is detected, for example a train crew-operated plunger linked with the train detection system. (This may be used where stopping times of trains cannot be reasonably predicted); or

(c) automatically by an approaching train where a Stop signal is provided between the strike-in point and the crossing, and is interlocked with the signalling system using a 'stopping/non-stopping' control.

2.86 Provide arrangements for local operation of the crossing equipment, with effective means to prevent unauthorised use.

2.87 To ensure that the crossing operates safely when the railway line is open to traffic, indicators at the control point should confirm that the equipment is powered and functioning correctly.

Automatic barrier crossings locally monitored (ABCL)

General description

2.88 This type of crossing appears, to the road user, to be similar to an automatic half barrier crossing. It is protected by road traffic light signals and a single lifting barrier on both sides of the railway. Audible warning to pedestrians is also provided. Lifting barriers are normally kept in the raised position and pivoted on the left-hand side of the road. When lowered, the barriers only extend across the entrances to the crossing leaving the exits clear. The period between the initial display of the road traffic light signals and the arrival of the fastest train should be sufficiently long to enable road vehicles and pedestrians to clear the crossing.

2.89 The crossing equipment is normally initiated automatically by an approaching train. The operation of the crossing equipment and the absence of obstruction on the crossing are monitored by the driver of an approaching train.

2.90 Train drivers are required to stop their trains short of the crossing unless they have received an indication that the crossing equipment is functioning correctly and have observed that the crossing is clear.

2.91 Consider providing telephones for public use. Where provided these should be connected to a supervising point which is always open when the railway line is open. Where no telephones are provided, provide signs on each side of the crossing, giving the name of the crossing and the public telephone number of a supervising point, which is always open when the railway line is open.

2.92 Staff at a supervising point should have:

(a) control of all train movements over the crossing;

(b) a means to communicate with railway staff operating the crossing equipment locally at the crossing:

- (i) in an emergency; or
- (ii) in an abnormal situation; and

(c) a means of communicating with the train driver approaching the crossing.

Method of operation

2.93 The crossing equipment is activated automatically by a train as it approaches the crossing. The sequence of events to close the crossing to road traffic is:

(a) the amber light on each of the road traffic light signals immediately shows and an audible warning for pedestrians begins. The lights should show for approximately 3 seconds (up to 5 seconds to suit road conditions);

(b) immediately the amber lights are extinguished the intermittent red lights should show; and

(c) approximately 4 to 6 seconds later the barriers should start to descend and take a further 6 to 10 seconds to reach the lowered position.

2.94 At least 95% of trains should arrive within 75 seconds and 50% within 50 seconds, once the sequence of events to close the crossing to road traffic has begun.

2.95 Train drivers must be able to bring their train to a stand short of the crossing from the point where they can observe the crossing to be clear and observe an indication that the crossing equipment is functioning correctly. Consider whether crossings longer than 15m might require an extended sequence to ensure that the crossing is clear before the train reaches the point where the driver has to start braking.

2.96 Barriers should rise, the road light signals should cease to show, and the audible warning should stop immediately, unless another approaching train is so close that a minimum of 10 seconds road open time cannot be achieved. In this situation the barriers should remain lowered and the intermittent red lights should continue to flash. The audible warning should change in character after the first of the trains arrives at the crossing. The change in character should be timed so as to be detectable by pedestrians at the crossing.

2.97 Both barriers should begin to rise simultaneously. This should normally take 4 to 10 seconds to reach the raised position. The intermittent red traffic light signals should continue to show and the audible warning for pedestrians continue to sound, until the barriers begin to rise.

2.98 Trains normally approach the crossing at a steady speed, known as the crossing speed, so that they can be halted short of the crossing from the point at which it clearly comes into the train driver's view. Preferably, trains should not stop before passing over a crossing unless it is not practicable to arrange otherwise, for example where a crossing lies immediately beyond a station platform.

2.99 If both intermittent red lights in any of the road traffic light signals fail, the barriers should continue to operate normally. If there is a total power failure, the barriers should remain in the raised position.

2.100 If the crossing remains closed for longer than could be caused by passing trains, it should automatically reopen to road traffic. The indication to the train driver that all the crossing equipment is functioning correctly should be extinguished at least 30 seconds before the road traffic light signals cease to flash and the barriers start to rise. An automatic reset function should be provided.

2.101 In the event of a failure of the main power supply (other than a momentary loss), the indication to the train driver that all the crossing equipment is functioning correctly should not be displayed. The road traffic light signals and the barriers should continue to operate normally.

Railway signalling and control

2.102 The indication that the crossing equipment is functioning correctly should only be displayed when the barriers have begun to descend, and at least one of the intermittent red lights of each road traffic light signal is lit, and the main power supply is functioning normally (other than a momentary loss).

2.103 The indication must be visible to approaching train drivers when they reach the decision point (marked by a special speed restriction board) where braking needs to commence, if it is necessary to stop short of the crossing.

2.104 Any railway signals which lie between the strike-in point and the crossing should not give information which conflicts with the indication given to the train driver that the crossing equipment is functioning correctly. On a double-track line, bi-directional control to initiate the crossing equipment is normally required.

2.105 Where trains are not required to stop before passing over the crossing, the sequence of events to close the crossing to road traffic should be initiated automatically by approaching trains.

2.106 A special speed restriction board is required at the point from which the crossing speed begins. This board may display different *crossing speeds* for different types of trains.

2.107 An advance warning board is required at a distance from the special speed restriction board which enables trains to slow down to the crossing speed. If the crossing speed is the same as the line speed, the advance warning board should normally be 100 m on the approach to the special speed restriction board.

2.108 Where all trains are required to stop at a station between the strike-in point and the crossing, a stop board should be located at least 50 m from the crossing and an advance warning board or fixed distant signal erected at the service braking distance from the stop board. The sequence of events to close the crossing to road traffic may be initiated either:

(a) automatically by an approaching train, where stopping times of trains at a station can be predicted reasonably accurately and the times taken for trains to arrive at the crossing are within those indicated in paragraph 2.94; or

(b) by a means that is only effective when the presence of a train is detected, for example a train crew-operated plunger linked with the train detection system.

2.109 Where not all trains are required to stop at a station between the strike-in point and the crossing, the sequence of events to close the crossing to road traffic may be initiated either:

(a) automatically by an approaching train where a Stop signal is provided between the strike-in point and the crossing, and is interlocked with the signalling system using a ‘stopping/non-stopping’ control; or

(b) automatically by an approaching train where stopping times of trains at a station can be predicted reasonably accurately and the times taken for trains to arrive at the crossing are within those indicated in paragraph 2.94.

2.110 Provide arrangements for local operation of the crossing equipment, with effective means to prevent unauthorised use.

Automatic open crossings locally monitored (AOCL)

General description

2.111 This type of crossing has no barriers but is protected by road traffic light signals and an audible warning for pedestrians. The period between the initial display of the road traffic light signals and the arrival of the fastest train should be sufficiently long to enable road vehicles and pedestrians to clear the crossing.

2.112 The crossing equipment is normally initiated automatically by an approaching train. The operation of the crossing equipment and the absence of obstruction on the crossing are monitored by the driver of an approaching train.

2.113 Train drivers are required to stop their trains short of the crossing unless they have received an indication that the crossing equipment is functioning correctly and have observed that the crossing is clear.

2.114 Provide signs on each side of the crossing, giving the name of the crossing and the public telephone number of a supervising point, which is always open when the railway line is open. Telephones for public use are not normally provided.

2.115 Staff at a supervising point should have:

(a) control of all train movements over the crossing;

(b) a means to communicate with railway staff operating the crossing equipment locally at the crossing.

(i) in an emergency; or

(ii) in an abnormal situation; and

(c) a means of communicating with the train driver approaching the crossing.

Method of operation

2.116 The crossing equipment is activated automatically by a train as it approaches the crossing. The sequence of events to close the crossing to road traffic is:

(a) the amber light on each of the road traffic light signals immediately shows and an audible warning for pedestrians begins. The lights should show for approximately 3 seconds (up to 5 seconds to suit road conditions); and

(b) immediately the amber lights are extinguished the intermittent red lights should show.

2.117 At least 95% of trains should arrive within 75 seconds and 50% within 50 seconds, once the sequence of events to close the crossing to road traffic has begun.

2.118 Train drivers must be able to bring their train to a stand short of the crossing from the point where they can observe the crossing to be clear and observe an indication that the crossing equipment is functioning correctly. Consider whether crossings longer than 15m might require an extended sequence to ensure that the crossing is clear before the train reaches the point where the driver has to start braking.

2.119 The road traffic light signals should cease to show and the audible warning should stop immediately, unless another approaching train is so close that a minimum of 10 seconds road open time cannot be achieved. In this situation the intermittent red lights should continue to flash. The audible warning should change in character after the first of the trains arrives at the crossing. The change in character should be timed so as to be detectable by pedestrians at the crossing. Consider whether other means of warning such as flashing signs showing the words 'Another train coming' might also be required.

2.120 Trains normally approach the crossing at a steady speed, known as the crossing speed, so that they can be halted short of the crossing from the point at which it clearly comes into the train driver's view. Preferably, trains should not have to stop before passing over a crossing unless it is not practicable to arrange otherwise, for example if a crossing lies immediately beyond a station platform.

2.121 If the crossing remains closed for longer than could be caused by passing trains, it should automatically reopen to road traffic. The indication to the train driver that all the crossing equipment is functioning correctly should be extinguished at least 30 seconds before the road traffic light signals cease to flash. An automatic reset function should be provided.

2.122 In the event of a failure of the main power supply (other than a momentary loss), the indication to the train driver that all the crossing equipment is functioning correctly should not be displayed. The road traffic light signals should continue to operate normally.

Railway signalling and control

2.123 The indication that the crossing equipment is functioning correctly should only be displayed when at least one of the intermittent red lights of each road traffic light signal is lit and the main power supply is functioning normally (other than a momentary loss).

2.124 The indication must be visible to approaching train drivers when they reach the decision point (marked by a special speed restriction board) where braking needs to commence if it is necessary to stop short of the crossing.

2.125 Any railway signals which lie between the strike-in point and the crossing should not give information which conflicts with the indication given to the train driver that all the crossing equipment is functioning correctly. On a double-track line, bi-directional control to initiate the crossing equipment is normally required.

2.126 Where trains are not required to stop before passing over the crossing, the sequence of events to close the crossing to road traffic should be initiated automatically by approaching trains. A special speed restriction board is required at the point from which the crossing speed begins. This board may display different crossing speeds for different types of trains.

2.127 An advance warning board is required at a distance from the special speed restriction board which enables trains to slow down to the crossing speed. If the crossing speed is the same as the line speed, the advance warning board should normally be 100 m on the approach to the special speed restriction board.

2.128 Where all trains are required to stop at a station between the strike-in point and the crossing, a stop board should be located at least 50 m from the crossing and an advance warning board or fixed distant signal erected at service braking distance from the stop board. The sequence of events to close the crossing to road traffic may be initiated either:

(a) automatically by an approaching train where stopping times of trains at a station can be predicted reasonably accurately and the time taken for trains to arrive at the crossing is within those indicated in paragraph 117; or

(b) by a means that is only effective when the presence of a train is detected, for example a train crew-operated plunger linked with the train detection system.

2.129 Where not all trains are required to stop at a station between the strike-in point and the crossing, the sequence of events to close the crossing to road traffic may be initiated either:

(a) automatically by an approaching train where a Stop signal is provided between the strike-in point and the crossing, and is interlocked with the signalling system using a ‘stopping/non-stopping’ control; or

(b) automatically by an approaching train, where stopping times of trains at a station can be predicted reasonably accurately and the time taken for trains to arrive at the crossing are within those indicated in paragraph 2.117.

2.130 Additionally, where the station is between the strike-in point and the crossing, and a Stop signal is not provided between the station and the crossing, the sequence of events to close the crossing to road traffic may be initiated automatically by an approaching train if:

(a) the railway is a single line;

(b) the actual daily road vehicle usage is less than about 2000;

(c) not more than 10% of trains stop at the station; and

(d) station stops are of short duration.

2.131 Provide arrangements for local operation of the crossing equipment, with effective means to prevent unauthorised use.

Open crossings

General description

2.132 This type of crossing does not have barriers or road traffic light signals. Only road traffic signs are provided. **Road users must give way to trains at the crossing.** Road users can see approaching trains in sufficient time for them to be able to cross the railway or stop safely. Train drivers are required to stop trains short of the crossing unless they have observed that the crossing is clear. Train drivers are also required to sound the train's horn as appropriate.

2.133 Telephones for public use are not necessary. Provide signs on each side of the crossing, giving the name of the crossing and the public telephone number of a supervising point, which is always open when the railway line is open.

Method of operation

2.134 Trains normally approach the crossing at a steady speed, known as the crossing speed, so that trains can be halted short of the crossing from the point at which it clearly comes into the train driver's view. Preferably, trains should not have to stop before passing over a crossing unless it is not practicable to arrange otherwise.

2.135 Trains are required to stop before proceeding over the crossing where:

(a) road users cannot see approaching trains across the viewing zones (defined in Appendix C); or

(b) the train driver cannot see the crossing from the point at which the brake should be applied to stop short of the crossing.

2.136 Trains are not required to stop again before proceeding over the crossing where:

(a) the train has stopped at a station platform on the approach to the crossing; or

(b) the train has already stopped for other reasons at a point from which the train driver can see the crossing.

Railway signalling and control

2.137 Where trains are not required to stop before passing over the crossing, a combined speed restriction and whistle board should be provided at a point from which the crossing speed begins. This board displays the crossing speed of 10 mph for all types of trains.

2.138 An advance warning board is required at the distance from the combined speed restriction and whistle board which enables trains to reduce their speed to the crossing speed. If the crossing speed is the same as the line speed, the advance warning board should normally be placed 100 m on the approach to the special speed restriction board.

2.139 Where all trains are required to stop before passing over the crossing, a stop board should be located at least 25 m from the crossing and an advance warning board or fixed distant signs erected at the service braking distance from the stop board.

User worked crossings (UWCs) for vehicles

General description

2.140 This type of crossing is normally protected by gates, or lifting barriers on both sides of the railway. The gates, normally closed across the road and hung so as to open away from the railway, are operated by the users. Barriers are normally closed across the road. Signs explaining how to use the crossing safely, including when to use any telephones, are displayed to road users on each side of the crossing.

2.141 When designing and operating any type of user worked crossing it is essential that the actual use of the crossing, the type of vehicles, equipment and activities and the frequency are properly understood. This will normally require effective dialogue with the crossing users during design and at appropriate intervals to ensure that the crossing remains suitable. Joint risk assessment with users may be appropriate.

2.142 Users should have sufficient time from first seeing an approaching train, or otherwise being made aware of the approach of a train with the aid of additional protective equipment, to cross safely. The decision point should be at least 3 m from the nearest running rail.

2.143 Additional protective equipment may not be required if the minimum warning time is available. The minimum warning period should be determined by risk assessment of crossing usage and be at least 5 seconds longer than the time required to cross. Assessments should involve the crossing users and be recorded.

2.144 In assessing the time required to cross, consider:

(a) the type and characteristics of vehicles, equipment or animals likely to go over the crossing;

(b) the surface of the crossing and its immediate approaches; and

(c) the position at which a vehicle, after going over the crossing, would be clear of the railway or gate on the far side.

‘Example:

Crossing distance (from decision point to decision point) 12 m

Longest/slowest vehicle likely to use the crossing 18 m at 1.5 m per second

Total distance = crossing distance + vehicle length (to ensure vehicle clear of crossing) In this case the total distance is 30 m

Crossing time at 1.5 m/s = 20 seconds

Add to this the 5 second safety margin and the minimum warning period for the crossing in this example is 25 seconds

2.145 Additional protective equipment that may be provided includes:

(a) miniature stop lights, as described in Section 18, on both sides of the crossing, especially where:

(i) the minimum warning time of trains cannot be obtained and the actual daily road vehicle usage exceeds 100; or

(ii) the provision of a telephone is impractical because it is difficult to provide reliable information concerning the whereabouts of trains, or the information supplied would be so restrictive that it would be likely to cause the user to become unduly impatient and to cross without permission; or

(iii) use of a telephone would cause excessive workload for the crossing operator; or

(iv) the line speed exceeds 100 mph.

(b) subject to the limitations noted above, telephones, on both sides of the crossing and connected to a supervising point, which is always open when the railway line is open, where:

(i) the minimum warning time of trains cannot be obtained;

(ii) there is known regular use by animals on the hoof;

(iii) fog is prevalent.

(c) audible warnings of the trains (preferably generated at the crossing itself). Where train speeds are low and the service infrequent, whistle boards positioned not more than 400 m from the crossing may help give warning of a train's approach.

2.146 To achieve the required warning time, it may be necessary to reduce the train speed over the crossing.

2.147 Telephones are not a preferred option. Where telephones are provided, vehicle drivers must follow instructions given. In some circumstances, it may also be necessary for other types of user, for example pedestrians, to telephone before crossing. Signs should make this clear.

2.148 Where miniature stop lights are provided, clear instructions should be provided for users. If lights are defective, users should be instructed to telephone the crossing operator and a contact number should be provided if there is no crossing telephone.

Footpath and bridleway crossings

General description

2.149 This type of crossing is found where the railway crosses a footpath or bridleway. Footpaths and bridleways are those which:

(a) are shown on definitive maps and statements maintained under Part III of the Wildlife and Countryside Act 1981; or

(b) have come into being following public path creation agreements or public path creation orders under Part III of the Highways Act 1980; or

(c) otherwise exist as either public or private rights of way.

2.150 Users are expected to use reasonable vigilance to satisfy themselves that no trains are approaching before they start to cross the line. They should cross quickly and remain alert whilst crossing. Users should have sufficient time from first seeing, or being warned of, an approaching train to cross safely.

2.151 Footpath crossings should be protected by a stile or self-closing wicket gate on both sides of the railway. They should not have a gate on one side and a stile on the other, nor different widths or types of gates. Stiles and kissing gates may not be appropriate at crossings where the use of bicycles, pushchairs, wheelchairs, etc. is foreseeable.

2.152 Bridleway crossings should be protected by a self-closing wicket gate on both sides of the railway. Unless required to dismount, it should be possible for a mounted horse rider to open the gates without dismounting.

2.153 Riders may be required to dismount because of the presence of overhead live conductors. Otherwise, assume that horse riders will remain mounted while crossing. Make allowances for young or inexperienced riders to lead their mounts. Consider whether cyclists use the crossing. Where appropriate, take measures to encourage cyclists to dismount.

2.154 At bridleway crossings, the gate should be at the decision point . Where this is not practicable, there should be sufficient space to allow a person on horseback to make a decision from a place of safety.

2.155 A sign explaining how to cross safely should be displayed at the decision point on each side of the crossing. For footpath crossings this should be not less than 2 m from the nearest running rails or 3 m where the line speeds are higher than 100 mph. For bridleway crossings this should not be less than 3m from the nearest running rail.

2.156 Where this type of crossing passes over multiple tracks and space between tracks exists so that a fenced, safe waiting place can be created for users, the crossing on each side of the safe waiting place should be treated as a separate crossing. A chicane may be provided on the crossing to make the position of the safe waiting place clear. Appropriate instructions to the users must be provided at appropriate points.

2.157 The minimum width between fences guiding users to the decision point or safe waiting area should be 1 m for footpath crossings. For bridleway crossings the minimum width should be 3m. These widths may need to be increased depending on user requirements.

2.158 Care should be taken not to provide misleading displays to crossing users. Where, for instance, miniature stop lights are provided on one part of a multiple track crossing, they should be provided on all parts of the crossing.

2.159 At a user worked crossing which is subject to additional footpath or bridleway crossing rights, stiles or separate gates for use by the pedestrians or riders should be provided. Vehicular gates may be locked shut and restricted to authorised private usage.

Method of operation

2.160 The warning time should be greater than the time required by users to cross between the decision points at either end of a crossing. In assessing how quickly users will cross, take account of the mobility of likely users and the type of crossing surface.

2.161 As a guide, a walking speed of 1.2 metres per second (m/s) may be used where the surface is level and close to rail level. In other cases 1 m/s may be more appropriate. Increase the calculated time to cross to take account of foreseeable circumstances such as impaired mobility of users, numbers of pushchairs and bicycles or where there is a slope or step up from the decision point.

2.162 Where the warning time is insufficient, additional protective equipment should be provided and may include:

(a) miniature stop lights as described in Section 18;

(b) telephones provided on both sides of the crossing and connected to a supervising point, which is always open when the railway line is open; or

(c) audible warnings of trains (preferably generated at the crossing itself). Where train speeds are low and the service infrequent, whistle boards positioned not more than 400 m from the crossing may help give warning of a train's approach.

2.163 Where whistle boards are considered, take account of:

(a) the speed of sound (330 m/s) and the speed of the train;

(b) the possibility that train drivers will not sound the horn, especially at certain times of the day or night;

(c) the possibility that train horns may be inaudible at the crossing because of background noise; and

(d) the possible impact of train horn noise on nearby residents.

2.164 Where whistle boards are provided, they are normally required on all railway approaches. The time between first hearing a horn and arrival of a train should be the same for trains travelling in either direction.

Foot crossings at stations

General description

2.165 This type of crossing is found between platforms at stations and may be the only route between platforms or the only practicable route for people who cannot use steps.

2.166 Only consider this type of crossing for lightly used stations where line speed does not exceed 100 mph and no alternative arrangements are available.

Method of operation

2.167 Where passengers are always escorted by railway staff, an established form of protection is a white light, extinguished 40 seconds before the arrival of trains. A sign reading "Caution – Cross only when light shows" is placed adjacent to the white light.

2.168 Where unescorted passengers may cross, miniature stop lights are the preferred protection method. The red light should show 40 seconds before the arrival of any train. An audible warning should be provided. Where the warning is for two or more trains approaching, the character or tone of the warning sound should change distinctively after the first train arrives at the crossing. Appropriate instructions should be provided.

Provision for pedestrians at public vehicular crossings

2.169 Appropriate provision should be made for pedestrians, taking account of the number and frequency of pedestrians and trains, at all public vehicular level crossings.

2.170 Where the approach roads are provided with a footway on either or both sides of the road, a footway or footways of adequate width should continue over the crossing. There should be sufficient space, taking into account the volume and nature of the users, for pedestrians to pass each other without the need to use part of the carriageway reserved for road vehicles. Allowance should be made for the needs of those with pushchairs and in wheelchairs.

2.171 Any footway should be made up to the level of the carriageway and maintained in a good and even condition.

Road markings
2.172 Provide longitudinal road markings along each edge of any footway, to delineate the required width and define the safe route for pedestrians walking over the crossing.

2.173 Clearly mark out a safe place for pedestrians to stand when crossings are closed to road traffic on any footways approaching an automatic or open crossing.

Audible warnings
2.174 Provide audible warning devices at all automatic crossings and barrier crossings operated by railway staff, so that pedestrians on or approaching the crossing are given adequate warning of the closure of the crossing. Devices should be capable of volume adjustment to suit local requirements.

2.175 Where road traffic light signals are provided, the warning sound should begin when the amber lights first show. At all automatic open or half barrier crossings, the warning sound continues until the intermittent red lights are extinguished. At barrier crossings operated by railway staff, the warning sound stops when the barriers are fully lowered.

2.176 At automatic open or half barrier crossings where two trains can arrive at the crossing without providing the minimum road open time, the character of the warning sound should change distinctively after the first of the trains arrives at the crossing.

2.177 At simple, un-automated, open crossings, the audible warning may be provided by horns from approaching trains.

Pedestrian signals
2.178 Traffic signals for pedestrians (Diagram 4006 in the 2002 Regulations) may be provided at crossings, particularly where the volume of pedestrians is high or vulnerable groups use the crossing regularly. The pedestrian traffic signal may be especially helpful at skewed automatic half barrier crossings, at full barrier crossings on one way streets and at auto-lower full barrier crossings.

2.179 Pedestrian signals should face outwards from the crossing towards approaching pedestrians. Pedestrian signals are not normally considered necessary at gated crossings operated by railway staff.

Tactile thresholds
2.180 Provide a suitable *tactile threshold* (see Appendix A) across each footway approaching a level crossing. Tactile thresholds are not required on roads where there is no footway.

2.181 Tactile thresholds should be placed before pedestrian stop markings across the footway on approach to the crossing. The purpose of the tactile threshold is to provide blind and partially-sighted people with an indication of the direction of the footway as well as the line behind which they should wait while the crossing is closed. See the Department for Transport's guidance on use of tactile paving surfaces.

Means to control the flow of pedestrians
2.182 Where vulnerable or large numbers of pedestrians regularly use a crossing, consider appropriate means to deter them from walking on the carriageway such as guard rails on approach. Guard rails should be provided only where the footway is sufficiently wide and does not create a bottleneck.

2.183 Where pedestrians in significantly large numbers cross from one side of the road to the other while the road is closed to allow a train to pass over the crossing, consider providing a double row of non-reflecting road studs to indicate the safe place to cross.

2.184 Where a crossing lies adjacent to a railway station and the entrance or exit to the station is via the platform ramp, pedestrians should be directed from the platform to the road and vice versa so that they are protected by the crossing after leaving or before joining the train.

Pedestrian categories

2.185 The volume of pedestrian and train flow may be determined by the train pedestrian value (TPV) which in turn defines the pedestrian categories. The TPV is the product of the maximum number of pedestrians and the number of trains passing over the crossing within a period of 15 minutes. A detailed method of calculation can be found in Appendix D. Pedestrian categories are given in Table 2.

Table 2 Pedestrian categories

Pedestrian category	Train pedestrian value (TPV)
A	**more than 450**
B	**151-450**
C	**150 or less**

Pedestrian provisions

2.186 As with all aspects of level crossing risk, the precautions for pedestrians should be determined by risk assessment. To guide that process, Table 3 suggests precautions which may be appropriate for these pedestrian categories.

Table 3 Pedestrian provisions

Pedestrian category	Width of footway (metres)	Road markings	Audible warnings*	Pedestrian signals	Tactile threshold*	Guard rails
A	**2 or more**	**YES**	**YES**	**YES**	**YES**	**ŧŧ**
B	**1.8 or more**	**YES**	**YES**	**ŧŧ**	**YES**	**ŧŧ**
C	**1.5 or more ŧ**	**YES**	**YES**	**ŧŧ**	**ŧŧ**	**ŧŧ**

Table 3 Pedestrian provisions
*** Not required at gated crossings operated by railway staff** **ŧ A reduced width of 1 m or lack of approach funnel is normally restricted to those crossings with a daily pedestrian usage of less than about 25** **ŧŧ Yes if necessary**

2.187 At any crossing where the number of pedestrians or the size of the vulnerable group is exceptionally large, automatic crossings may not be suitable and a barrier crossing operated by railway staff may have to be provided.

Additional measures to protect against trespass

2.188 Cattle-cum-trespass guards and fencing protection will normally be required to discourage trespass by pedestrians and, where relevant, animals straying onto the railway.

Cattle-cum-trespass guards

2.189 Guards should be provided where there is movement of animals over the crossing, or where there is a significant risk of trespass by pedestrians.

2.190 Guards should be provided at all types of crossings on third rail electrified railways, except at a gated crossing operated by railway staff, where the gates when across the railway completely fence off the road and any footway from the railway.

2.191 The guards should be adjacent to the footway at the edge of, and level with, the surface of the carriageway. They should extend the full length of the crossing between the boundary fences for a distance of at least 2.6 m in any direction from the edge of the carriageway.

2.192 The guards may consist of arris rails running parallel with the running rails or some other similarly effective system. Arris rails which are triangular in section with the vertical sides approximately 115 mm high, at approximately 150 mm pitch, and with a clear space between them not exceeding 35 mm are considered to be effective.

Fencing

2.193 Provide fencing:

(a) around barrier mechanisms unless protected in other ways; and

(b) to ensure the effectiveness of any cattle-cum-trespass guards.

2.194 At footpath crossings and bridleway crossings, consider whether additional fencing may be required between the boundary fence and the decision point. Where the gate or stile is at the decision point rather than in the boundary fence, provide additional fencing to connect the boundary fence to the decision point..

2.195 Where the road is unfenced and the adjacent land is used for grazing, and crossing gates are not provided, provide a standard highway-type cattle-grid in the roadway.

The crossing

Vertical profile

2.196 The profile over any vehicular crossing should have no sudden changes of vertical curvature. The profile over an automatic half barrier or user worked crossing is critical to safety. At other types of crossing it is less critical because these crossings are either manually operated by railway staff, or locally monitored by the drivers of trains travelling at restricted speeds such that they can stop short of the crossing.

2.197 The profile over automatic half barrier or user worked crossings should not cause a vehicle, such as a low-loader or a tractor and trailer, to become grounded and obstruct the railway. The likelihood of grounding depends on the characteristics of the road surface at the crossing and any potentially low-clearance vehicles that might use the crossing.

Measurement of safe profiles

2.198 Safe profile is determined by considering the wheelbase and ground clearance of road vehicles which might foreseeably use the crossing. The maximum permitted profile hump anywhere on the road surface, over the longest foreseeable wheelbase length, is 75mm.

2.199 At automatic half barrier (AHB) crossings, the safe profile may be defined by the vehicle category, which is in turn determined by the road and rail traffic density. It is defined in Table 4 below.

2.200 Traffic data should be established by census. Take into account the likely increase in road usage following automation of a crossing, as well as other factors, such as the proximity of heavy plant operator premises, which may necessitate a flatter profile. It is important to note that Table 4 below sets minimum requirements. Local information on actual usage may well mean that the profile at a particular crossing needs to be flatter than traffic data alone would suggest.

	Table 4 Measuring safe vertical profiles				
Actual daily road vehicle usage	or	Daily traffic moment	Vehicle category	Theoretical wheelbase length	
				(metres)	**(feet)**
More than 2000		**More than 80000**	**1**	**15.3**	**50**
2000 or less		**80000 or less**	**2**	**9.75**	**32**
600 or less		**25000 or less**	**3**	**8.5**	**28**

2.201 Provide “risk of grounding” signs as described in Section 19 for crossings with vehicle categories 2 and 3, where the profile does not meet the category 1 standard.

2.202 The profile should be maintained across the full width of the carriageway and the approaches. The approaches extend for a minimum of 20 m from the nearest rail for vehicle category 2 and 3 crossings, and up to 30 m for vehicle category 1 crossings.

2.203 Road approaches to crossings should be regularly inspected by the crossing operator (as well as the traffic authority or private road owners). The profile should be checked when road defects are noted or when track alterations are undertaken. Remedial works on approach roads should be undertaken as required.

2.204 At user worked crossings, determine with the users the types of vehicle or equipment likely to go over the crossing before designing the vertical profile. Once this is determined, use the maximum wheelbase length to design the safe profile based on the same maximum permitted hump of 75 mm. Determine the gradient of the approaches to the crossing in conjunction with the vertical profile required for the type of traffic using it.

2.205 Providing telephones at a user worked crossing does not reduce the need to maintain appropriate profile conditions.

Crossing surface

2.206 The surface of the carriageway over a crossing and on its immediate approaches should be properly maintained and have a skid resistance comparable to that of the road approaches. Consider a higher degree of skid resistance where road speeds are high, the visibility of a crossing is limited or the road slopes downhill towards the crossing. Appropriate measures should be discussed with the traffic authority. The surface should be free from pot-holes, running rails proud of the surface, depressed areas or major undulations. Any timbers or panels used in the surface should be firmly fixed. Flangeway gaps should be kept to a minimum, particularly at skew crossings, to reduce the risk of small or narrow wheels becoming trapped.

2.207 At vehicular crossings with gates which completely fence in the railway when closed to the road or where there is no footway adjacent to the carriageway, the ground at the edges of the carriageway over the crossing should be made up to the same level as the carriageway for at least 1 m.

2.208 At user worked crossings, a satisfactory road surface, appropriate for the type of traffic using them, and adequate approaches should be provided and maintained. Where timbers are used for the crossing surface, they should be securely fixed in position and provide a clear flangeway. Where the surface is predominantly made up of ballast, it should be contained to ensure that the surface is at, or almost at, rail level and the flangeway is maintained.

2.209 At footpath crossings and bridleway crossings, the surface provided between the decision points should be unobstructed. An appropriate level crossing surface should be provided in all but remote rural locations. There should be no movable signalling or track equipment (such as sets of points) on the surface or close by, that might create a hazard. The surface should be maintained in a good and even condition at rail level with suitable non-slip properties.

2.210 The type of surface should be in keeping with, but not necessarily the same as, the surface provided on the approaches to the crossing immediately outside the railway boundary.

2.211 Where the track ballast shoulder is high, either steps or ramps for footpath crossings and ramps for bridleway crossings should be maintained to give access to the surface. Ramps are preferable but where it is not reasonably practicable, provide steps. On steep slopes, consider whether hand-rails may be needed in addition to steps or ramps.

2.212 Where the surface is other than ballast or stone chippings, provide a non-slip surface. Where the surface is made up to rail level and stone is used as in-fill, provide a means to retain the stone.

2.213 At bridleway crossings, make the surface up to rail level.

2.214 At footpath crossings, make the surface up to rail level, where:

(a) the crossing is in a location where housing, factories, shops etc adjoin or are close to the railway, and the crossing provides an attractive or convenient link between them;

(b) any of the approaches on the path are metalled; or

(c) there is heavy regular use.

Crossing width

2.215 At all crossings, the width of the carriageway over the crossing and on the approaches should, where practicable, be constant. It should be possible for traffic to pass safely on the approaches and the crossing itself should not form an isolated passing place.

2.216 At automatic crossings, the carriageway width over the crossing should be maintained on each approach for the distances shown in Table 5. It may be necessary to increase these distances depending on the types of vehicle using the crossing.

Table 5 Crossing width

Actual daily road vehicle usage	or	Daily traffic moment	Distances measured from the stop line (metres)	
			AHBC and ABCL	AOCL
More than 2000		**More than 80000**	**21**	**21**
2000 or less		**80000 or less**	**14**	**14**
600 or less		**25000 or less**	**14**	**7**

2.217 The carriageway width over an automatic half barrier crossing should normally be at least 6.1 m. A narrower carriageway, to a minimum of 5 m, may be acceptable on less busy roads. As a guide in this instance, a less busy road may be considered to be one with a daily road vehicle usage of less than 4000.

2.218 The carriageway width over a locally-monitored automatic barrier crossing (ABCL) should not normally be less than 5 m. Existing level crossings being upgraded to ABCL may be less than 5 m in width.

2.219 The carriageway width over a locally-monitored automatic open crossing should not be less than 5 m where the actual daily road vehicle usage is greater than 600 or the peak hour traffic moment is greater than 120.

2.220 At user worked crossings, the road surface should be at least as wide as the distance between the gate posts. The width of the crossing should not exceed 5 m to allow the use of single-leaf gates.

2.221 At footpath crossings, the width of the surface should not be less than 1 m, and at bridleway crossings, the width of the surface should not be less than 3 m.

Provision of lay-bys

2.222 Consider whether lay-bys may be required at automatic half barrier crossings so that vehicles, whose drivers are required to telephone before using the crossing, can be parked clear of the carriageway.

Crossing alignment

2.223 At user worked crossings, the alignment of the crossing over the tracks should enable the time required to cross to be kept to a minimum.

2.224 Footpath crossings and bridleway crossings should, where possible, be at right angles to the railway line. Where necessary seek clarification from Rights of Way Officers when determining exact routes and opportunities for diversion. Where it is proposed to divert a public footpath or bridleway crossing, consult closely with the local Rights of Way Officer.

Crossing approaches

2.225 At user worked crossings, the alignment of the immediate approaches to the crossing should be in line with the alignment of the crossing itself. Light sources from road vehicles or equipment should not be allowed to cause confusion with railway signals.

Gates, wicket gates and barrier equipment

Gates

2.226 The gateway should be the full width of the carriageway plus at least 450 mm clearance on each side and the clearance between gate posts should be of equal width at both sides of the railway. Means should be provided to retain the gates in both open and closed positions.

2.227 When closed, the gates should extend over the full width of the carriageway. Unless legally specified otherwise, the normal position of the gates is across the road.

2.228 Consider installing power operated gates at user worked crossings . These avoid the need for multiple crossings in order to open and close gates.

2.229 At crossings on public roads, the gates should be painted white and carry red retro-reflective targets to face outwards when the gates are across the road. Additionally, consider mounting red lamps on the gates which show towards approaching road traffic when the gates are across the road.

2.230 At gated crossings operated by railway staff, the gates should be lockable when closed across the road or railway and should be conspicuous to the drivers of approaching trains when closed across the railway.

Wicket gates

2.231 Where wicket gates for pedestrians are provided, they should be on the same side of the carriageway and open away from the railway. Wicket gates for footpath crossings and gated crossings operated by railway staff should not be less than 1 m wide. Wider gates may be required in accordance with local user needs. Wicket gates for bridleway crossings should not be less than 1.5 m wide.

2.232 All wicket gates should be easy to open from either side and be self-closing. Latches are not normally provided on gates. Where it is appropriate to provide latches, however, they should be easy to operate and not prevent easy egress from the railway. Where wicket gates are provided across the footway at gated crossings operated by railway staff, they should be lockable.

Barriers

2.233 The tops of the barriers when lowered should be at least 900 mm above the road surface at the centre of the carriageway. The clearance between the bottom edge of the lowered barrier and the road surface at the centre of the carriageway should not exceed 1000 mm unless a skirt is fitted. Barriers that are designed to fall under gravity as part of their method of operation should be inclined towards the carriageway at an angle of between 5º and 10º from the vertical.

2.234 When raised no part of the barrier below 5 m should be within 450mm of the edge of the carriageway. Where the barriers cover a footway, no part of the raised barrier less than 2 m above the footway, should be within 150 mm horizontally from the outer edge of the footway.

2.235 The barriers should be as close as convenient to the railway, but no part of the equipment should be within the standard structure gauge.

2.236 Barriers should be at least 125 mm deep at their mid-points and at least 75 mm deep at their tips. Each barrier should display on both sides red and white bands about 600 mm long to the full depth of the barrier. A strip of retro-reflective material not less than 50 mm deep should be provided along the full length of each band.

2.237 Dangerous moving parts of the barrier mechanism, excluding the boom and any skirt, should be guarded effectively.

2.238 Two electric lamps (three on barriers longer than 6 m) of adequate luminous intensity should be fitted to each barrier which, when illuminated, show a red light in each direction along the carriageway. The lamps should be evenly spaced along the barriers with one lamp within 150 mm of the barrier tip. The lamps should show except when the barriers are fully raised. It may be appropriate at some user worked crossings to omit these lamps.

2.239 At barrier crossings operated by railway staff, each road approach should be protected by barriers which, when lowered, extend across the full width of the carriageway and any footway.

2.240 At barrier crossings operated by railway staff and user worked crossings, skirts should be fitted to the barriers where there is a significant risk of pedestrians deliberately passing under the lowered barriers. Where cattle or sheep are regularly walked over the crossing, skirts should be fitted. The skirts should be of a light colour, light construction and fence in the space between the lowered barriers and the road surface. Skirts are not required at automatic crossings with half barriers.

2.241 At user worked crossings, the barriers may be hand-operated and counter-weighted to fall when released. Such barriers should be linked so that they can be raised or lowered together from either side of the crossing.

Single barriers

2.242 Where single barriers are provided they should preferably be pivoted on the left-hand side of the road. On one-way roads or on two-way roads with central reservations where special provision can be made for pedestrians, barriers may be provided on the approach to the crossing only.

Half barriers

2.243 At automatic crossings with half barriers, the barriers should be pivoted on the left-hand side of the road on each approach.

2.244 On skew crossings with half barriers where the tip of the barrier points towards the railway, the point of intersection of the line extended through the barriers and the outer edge of the road, including any footway, should not be within 1000 mm of the nearest rail.

2.245 When lowered, the half barriers should extend to between 150 mm and 450 mm of the centre of the carriageway, but not over the centre line. On carriageways between 5 m and 5.7 m wide, the barriers should extend to within 800 mm of the centre line so as to leave a clear exit of at least 3 m in width. On carriageways narrower than 5 m, shorter barriers may be necessary in order to provide off-side clearance of at least 3 m.

Barriers on lines electrified on the overhead system

2.246 If the railway is electrified with overhead conductors and a barrier, if displaced, could come closer than 150 mm to the conductors, the barrier should either be made of metal or be provided with a continuous conducting strip. The metal barrier or conducting strip should be connected to earth in such a manner as to ensure that inadvertent contact with the overhead conductors causes any controlling circuit-breaker to interrupt the electric traction supply. Consider whether it may be appropriate to sheath the return conductor at any crossing.

Telephones and telephone signs

2.247 Telephones are not normally necessary at barrier crossings operated by railway staff, locally-monitored automatic open crossings or open crossings. At locally-monitored automatic barrier crossings consider providing telephones for public use so that equipment malfunctions can be reported.

2.248 At barrier crossings operated by a member of the train crew, or other railway staff, signs to Diagram 785 giving the telephone number of a supervising point which is always open when the railway line is open should be displayed at each side of the crossing. The name of the crossing should also be shown immediately below each sign.

2.249 Where telephones are provided as part of the safety arrangements, calls should always be routed to a suitable staffed railway location and a definite message as to whether or not it is safe to cross given.

At automatic crossings with half barriers

2.250 Telephones for public use at automatic crossings with half barriers should be suitably weatherproof or housed in cabinets and connected directly to the supervising point. A two-way calling facility should be provided.

2.251 The power supply to the telephones should be suitably backed up so that they remain available if the main power supply fails. Faults on individual telephones or the failure of a user to replace a handset should not prevent the correct operation of the remaining telephones.

2.252 The telephone symbol to Diagram 787 (2002 Regulations) should be displayed on or adjacent to each telephone/cabinet and on two other faces. The telephones should be clearly visible from the crossing. If the telephones are not clearly visible to a person at the location of the sign to Diagram 784.1, signs to Diagram 788 are required directing potential users to the telephones.

2.253 Clear and simple instructions, which are also legible at night, should be provided for users needing to contact the supervising point. The user should not have to dial a telephone number.

2.254 In case the telephone at the crossing is out of order, the name of the crossing, its grid reference and the public telephone number of a continuously staffed supervising point should be clearly displayed.

2.255 When calls are received in the supervising point, a distinctive warning should be sounded, accompanied by a visual indication. These calls should take priority over any other calls on the telephone system and the warning should sound even if the system is currently in use.

2.256 If the railway is not open for 24 hours a day, a means to notify users of the times between which trains do not travel over the crossing should be provided. This may be in the form of a notice which is legible at night or a recorded announcement. It is essential that information given is correct and fully up to date.

2.257 The telephone system should have a facility which records that calls have been made from the crossing during periods when the railway and supervising point are closed. When the supervising point reopens, a visual and audible indication should be given that calls from the crossing have been made during the period of closure.

At user worked crossings and bridleway crossings

2.258 Telephones, where provided, should be positioned adjacent to the gates or barriers on each side of the crossing, mounted in a suitable place, at heights appropriate to the users of the crossing. The telephones should be suitably weatherproof or housed in cabinets and connected directly to a supervising point. A two-way calling facility should be provided.

2.259 The telephone symbol to Diagram 787 should be displayed on or adjacent to the cabinet/telephone. Telephones should be seen readily from the crossing or signs to Diagram 788 provided.

2.260 Clear and simple instructions to direct users to contact the supervising point should be provided. These should also legible at night. The telephone user should not have to dial a telephone number.

2.261 The name of the crossing and its grid reference should be displayed followed by the telephone number of a continuously staffed supervising point in case the telephone at the crossing is out of order.

2.262 Evidence shows that many users fail to use telephones. Telephones create potential for human error during communications, and may distract the signaller from other tasks. Even where telephones are fitted, maintaining adequate *sighting distances* (see Appendix A) at the crossing can still reduce risk to users and the railway.

Miniature stop lights (MSL)

General description

2.263 Miniature stop lights (previously known as miniature warning lights) consist of red and green lights. They can be used at user worked crossings, footpath crossings and bridleway crossings. In some instances it may be appropriate for the warning system to be activated by the user on arrival before using the crossing. The green light normally shows, but an approaching train automatically changes the lights to red. Signs to Diagram 107 in the 1996 Regulations (see Figure 8) instructing users to cross only when the green light shows should be provided.

2.264 MSL alone may not be suitable where livestock or large or slow moving vehicles or equipment cross the railway. Additional arrangements may need to be made as determined in the risk assessment process.

Positioning of MSL

2.265 The MSL should be located so that they face towards an approaching user. They should be clearly visible to the crossing users when operating the gates or barriers. MSL may be mounted in the sign to Diagram 107 (1996 Regulations). At crossings not provided with a telephone, the public telephone number of a continuously staffed supervising point should be displayed, so that users may enquire about crossing safely (and report MSL failure). Use of signs to Diagram 108 should be avoided.

2.266 MSL should normally be placed on the near side of the railway, facing users approaching the crossing unless siting them at the far side is more effective at conveying the message.

MSL equipment

2.267 The red and green lights should be sufficiently bright to be clearly seen by users at the decision point. Light emitting diodes (LED) lamps are brighter and more reliable than traditional filament lamps. Low energy solutions such as flashing or on-call displays might be appropriate in certain locations. Lamps should be fitted with hoods (to aid viewing in bright sunlight) where necessary. Care should be taken to ensure that hoods do not restrict the visibility of MSL for users, including pedestrians operating gates or barriers.

Associated signs

2.268 Traffic signs associated with the use of MSL are shown in Figure 8 of Section 19. These signs are in addition to those required at user worked crossings, footpath crossings and bridleway crossings. These signs are in accordance with the 1996 Regulations.

2.269 At user worked crossings the signs to Diagrams 109 or 110 should be mounted with the MSL on the near side of the crossing facing approaching users.

2.270 At footpath or bridleway crossings the signs to Diagram 114 should be mounted with the MSL on the near side of the crossing facing approaching users. Where a footpath or bridleway is routed over a user worked crossing, care should be taken in the placement of signs (to Diagrams 109/110 and 114) so that instructions to drivers and instructions to pedestrians/riders are not confused.

Railway signalling and control equipment

2.271 MSL should be operated automatically by approaching trains, in accordance with the warning period required for the particular crossing.

2.272 The minimum warning period should be determined by risk assessment of crossing usage and be at least 5 seconds longer than the time required to cross.

2.273 The green light should show until the red light appears. As soon as the train is clear of the crossing, the red light should be extinguished and the green light should appear unless the red light is required to show for another train.

2.274 Bi-directional controls should be provided.

2.275 Consider whether special controls might be required, for example where signals or station platforms lie between the strike-in point and the crossing.

Traffic signals, traffic signs and road markings

2.276 The requirements for road signs, including carriageway markings, are contained in the 2002 Regulations. These are supported by guidance in the Traffic Signs Manual (chapters 4 and 5) and information available via the Department for Transport website. Signs for use at private crossings are described in the 1996 Regulations.

Road traffic light signals

2.277 The construction and specification of road traffic light signals used at level crossings are required to comply with Diagram 3014. The reverse of the backing board should be coloured grey. Lamps to the current European standard should be used.

2.278 A primary road traffic light signal should be located on the left-hand side of the carriageway, on each road approach, as close as possible to the crossing. At crossings where there are barriers, it should be located not more than 1 m before the barrier and adjacent to the barrier machine where this is on the left-hand side.

2.279 A duplicate primary road traffic light signal should be located on the right-hand side of the carriageway on each approach. Consider providing one or more additional road traffic light signals where neither the primary nor the duplicate primary signal can be seen from a side approach. Secondary road traffic light signals, located on the far side, should not be used at crossings.

2.280 No road traffic light signal should be located on the approach side of the vehicular stop line or an extension from it. Drivers stopped at the crossing need to see the road traffic light signals.

2.281 At *acute skew crossings* (see Appendix A and figure 9(b)), the duplicate primary signal may be placed in line with the vehicular stop line to shorten the length of the crossing.

2.282 At *obtuse skew automatic crossings* (see Appendix A), the duplicate primary signal may be placed closer to the railway than normal, provided that a vehicle stopped in line with the signal is not foul of the railway structure gauge. In the risk assessment consider whether special arrangements for pedestrians may be necessary (see Section 13 and Figure 9 (a) at the end of this section).

2.283 Where the normal post mounting of a road traffic light signal is impracticable, it may be mounted over the carriageway provided that no part of the horizontal structure or the signal is less than 5.5 m above the road surface.

2.284 Where a road traffic light signal is mounted over the carriageway and the railway is electrified with overhead conductors and the structure and signal, if displaced, could come closer than 150 mm to the overhead conductors, the structure and the signal should either be made of metal or be provided with a continuous conducting strip. The metal structure and signal or the conducting strip should be connected to earth in such a manner as to ensure that inadvertent contact with the overhead conductors causes controlling circuit-breaker(s) to interrupt the electric traction supply.

2.285 In exceptional cases, for example where the central reservation is narrow or where, at very acute skew crossings, the duplicate primary road traffic light signal would encroach on the overhang clearance above the carriageway, a special design of the restricted width signal in accordance with the relevant Department for Transport's drawing may be used. Using this restricted width signal requires special authorisation from the Department.

2.286 Where mounted at the side of the road, no part of the road traffic light signal below 5 m should be within 450mm of the edge of the carriageway. This is to minimise the likelihood of damage to the sign from passing vehicles, especially vehicles with large mirrors or overhanging loads. Where the road has a steep camber, the clearance may need to be increased to 600 mm. Offset traffic signal head mounting brackets (or cranked poles) may be needed to ensure that the horizontal clearance is maintained. The centre of the road traffic light signal lens nearest the carriageway should at least 810 mm, but not more than 1500 mm, measured horizontally from the carriageway edge.

2.287 Where the signals are above a footway, a minimum headroom from the lower edge of the signal backing board of 2100 mm should be maintained.

2.288 The distance from which it is desirable that the intermittent red lights and amber lights can be seen varies according to the speed value of the road. The speed is taken as the 85th percentile of the observed speeds of approaching vehicles. Recommended minimum visibility distances are shown in Table 6. If these minimum visibility distances cannot be achieved, consider further measures for example the provision of additional advance warning signs, countdown markers etc.

Table 6: Recommended minimum visibility distances

85th percentile speed of road vehicles		Minimum visibility distance (metres)
kilometres per hour (km/h)	miles per hour (mph)	
50	**30**	**70**
65	**40**	**90**
80	**50**	**150**
95	**60**	**220**
115	**70**	**300**

2.289 Where a crossing is close to a road junction controlled by traffic light signals, consider linking the two sets of road traffic light signals. The results of this consideration should be documented in the risk assessment. Where they are linked, seek special authorisation from the local traffic authority for the connection between them.

Pedestrian signals

2.290 Pedestrian light signals used at level crossings must comply with Diagram 4006 (2006 Regulations), appropriately positioned to maximise visibility.

2.291 The red figure on the pedestrian signal should be illuminated on commencement of the crossing closure sequence and should flash while the intermittent red lights of the road traffic light signals are lit. The rate of flashing should be the same as that of the intermittent red lights in the road traffic light signal.

Traffic signs

2.292 Appropriate traffic signs should be provided on each road approach. Examples of the layouts are given in Figures 2 to 7 and 9. Details of the signs for use with MSL are shown in Figure 8.

2.293 At automatic crossings with half barriers, signs to Diagram 784.1 should be appropriately positioned on approach to the crossing to suit the road speed (see Figure 4). A sign to Diagram 786 should be provided in association with 784.1 and on the nearside, facing vehicles leaving the crossing.

2.294 Where lay-bys are provided and a Traffic Regulation Order is in force limiting the parking at lay-bys to 'Large or slow vehicles only', the permitted variant to the sign to Diagram 660 should be provided and the road marked in accordance with Diagram 1028.3.

2.295 At automatic crossings and open crossings, signs to Diagram 775 reading 'Keep crossing clear' should be provided on each primary and duplicate primary road traffic light signal post to face traffic approaching the crossing. At open crossings they should be mounted on both sides of the road on or near the posts carrying the St Andrew's Cross signs (Diagram 774).

2.296 Signs to Diagram 775 may be provided at gated and barrier crossings operated by railway staff where standing traffic is a problem.

2.297 At automatic crossings on double-track lines, where two trains can arrive at the crossing without providing the minimum road open time, signs to Diagram 777 reading 'Another train coming if lights continue to show' should be provided on or near each duplicate primary road traffic light signal facing outwards from the crossing.

2.298 At locally-monitored automatic open crossings on double-track lines, where two trains can arrive at the crossing without providing the minimum road open time, signs to Diagram 776 reading 'Another train coming' should be provided on the left-hand side of the road, normally 2 m on the railway side of each primary road traffic light signal and directed towards drivers of vehicles halted at the stop lines. These signs should flash at the same rate as the road traffic light signals.

2.299 Where the width of the road is less than 4 m and the number of vehicles going over the crossing during the peak hour exceeds 120, a Priority Order should be considered and signs to Diagram 615 and 811 provided accordingly.

2.300 At automatic crossings and open crossings, where the road crosses the railway at a skew angle or there are bends on one or both approaches, bend and chevron signs and count-down markers may be required. Consider also whether additional reflecting road studs along the edges of the carriageway may be required to direct drivers along the road.

2.301 Wherever the form of protection at a crossing has been altered, a new educational sign to Diagram 790 reading ‘New level crossing control ahead’ is required to be displayed for a period of not more than 3 months (see Direction 37.1 in the 2002 Regulations).

2.302 At user worked crossings, footpath crossings and bridleway crossings, a sign explaining to the user how to cross safely for example ‘Stop, Look, Listen’ or ‘Cross only if green light shows’ or ‘Stop, always telephone before crossing’, should be provided facing the user at the decision point or at the telephone if provided. It is important that appropriately worded signs are provided whether or not they appear in the 1996 Regulations.

2.303 Information including the name of the crossing, location reference and contact number should also be provided at level crossings. A contact number for the railway operator should also be provided.

2.304 Signs specified in the 1996 Regulations may be placed by a crossing operator on or near a private road or path. It is an offence for a user to fail to comply with any requirement, restriction or prohibition conveyed by a crossing sign lawfully placed on or near a private road or path’ (Transport and Works Act 1992 and Transport and Works (Scotland) Act 2007). A public footpath or bridleway is clearly not a ‘private road or path’, but, where they convey an appropriate message, signs from the 1996 Regulations are commonly used. At footpath, bridleway and private crossings, other suitable signs may be used to inform users, clearly and simply, how to use the crossing safely.

Related to electrified lines

2.305 Where the railway is electrified with overhead conductors, signs to Diagram 779 should be provided with an appropriate plate (Diagram 780A). At user worked crossings, suitable signs warning of the danger from bare electrical conductors such as ‘Danger, overhead live wires’ should be provided and face towards the user approaching the decision point.

2.306 Overhead conductors at level crossings should be at the greatest height practicable. Signs to Diagram 780A should show a safe height which allows for suitable safe clearance under the overhead conductors.

2.307 Where currently overhead conductors at level crossings are not at maximum practicable height, steps should be taken to remedy this situation, so far as is reasonably practicable. In the interim, signs to Diagrams 779 and 780A should be provided at the last available alternative route before the crossing.

2.308 At any crossing where, currently, overhead conductors are not at the maximum practicable height, a height gauge to Diagram 781 should be erected at the ‘safe height’. Signs to Diagram 780.2A should show a safe height which allows for suitable safe clearance under the overhead conductors. At user worked crossings suitable warning signs should be displayed.

2.309 In calculating the ‘safe height’, allowance should be made for the effect of the vertical profile of the carriageway on a road vehicle and its load.

2.310 At crossings where the gradient of the approaches is such that vehicles with large overhangs or conveying a large overhanging load could touch or come dangerously close to the overhead line equipment, even though they are lower than the ‘safe height’ shown on the sign to Diagram 780A or 780.2A, an additional sign depicting the hazard, such as ‘Danger, overhanging load may foul live wires’ should also be provided.

2.311 At crossings where the railway is electrified with a conductor rail, warning notices depicting the hazard, such as ‘Do not touch the live rail’ should be provided.

Related to risk of grounding

2.312 Where there is a risk that vehicles may become grounded on the crossing, signs to Diagram 782 should be erected on the immediate approaches. Advance warning signs to Diagram 782 with distance information to Diagram 573 should be provided at the last available alternative route before the crossing.

2.313 Where telephones are provided at the crossing, signs to Diagram 783 should be mounted beneath signs to Diagram 782 on the approaches. Where telephones are not provided at the crossing, signs to Diagram 785.1 (large) should be provided on the approaches and signs to Diagram 785.1 (small) at the crossing itself.

Road markings

2.314 Road markings should be provided at level crossings in accordance with the 2002 Regulations taking into account guidance in the Traffic Signs Manual.

2.315 Road markings are not normally provided at gated crossings operated only by railway staff, unless the crossing is also signalled.

Transverse and associated road markings

2.316 Transverse road markings should extend across the left-hand half of each two-way carriageway, or across the full width of a carriageway which is either one-way or has no centre line marking.

2.317 Where road traffic light signals are installed, transverse Stop lines to Diagram 1001 should be provided at right angles to the carriageway on each approach approximately 1 m before the primary road traffic light signal. At locally-monitored automatic open crossings (AOCLs) increase this to 2 m. The 300 mm size variant is recommended.

2.318 At open crossings, Give Way lines to diagram 1003 should be provided at right angles to the carriageway on each approach to the crossing, but not less than 2 m from the running edge of the nearest rail. Give Way signs to diagram 602 should also be provided. The triangular road marking to diagram 1023 should be provided in advance of the Give Way lines.

2.319 At user worked crossings on private roads, carriageway markings are not normally used. However, where a STOP sign to diagram 601.1 is provided, a transverse Stop line to diagram 1002.1 and the word STOP to diagram 1022 should also be provided unless the road surface is unsuitable. If the private road is one to which the public has access, these markings must be used, utilising a short length of road surfacing if necessary.

2.320 At automatic crossings and open crossings, a pedestrian Give Way line to diagram 1003.2 should be provided across any footway. It should also be extended across the right-hand side of a carriageway marked with a centre line, unless there are guard rails between the carriageway and the footway. Do not use it at crossings where the full width is controlled by barriers.

2.321 The pedestrian Give Way line should be at right angles to the carriageway. It should be located approximately 1 m on the approach side of any road traffic light signal, except at open crossings where it should be in line with the Give Way markings on the left-hand side of the carriageway. No part of the line should be less than 2 m from the running edge of the nearest running rail.

2.322 At obtuse skew crossings, the pedestrian Give Way line should be provided in conjunction with a pedestrian signal. The end of this pedestrian line at the edge of the carriageway should be located not less than 2 m from the nearest running rail. In these cases the pedestrian Give Way line on the approach side of the road traffic light signal may then be omitted (see Figure 9).

Longitudinal road markings

2.323 The type of longitudinal road marking to use generally depends on the width of the carriageway.

2.324 Where the road passes over the crossing a continuous line to diagram 1012.1 should be provided along each edge of the carriageway. Line widths are detailed in table 4-5 in Chapter 5 of the Traffic Signs Manual. A 100 mm wide line should also be provided along the back edge of each footway and, if separated from the main carriageway, along the front edge. The markings should be continued as necessary on each approach to clearly define the footway.

2.325 Where the width of the carriageway over the crossing is less than 5 m, centre line markings will not normally be provided.

2.326 Where the width of the carriageway over the crossing is between 5 and 5.5 m, the centre of the carriageway between the Stop or Give Way lines should be marked with the appropriate longitudinal warning line to diagram 1004, 1004.1, 1008 or 1008.1. The warning line should extend back from each Stop line for at least the minimum number of marks indicated in table 4-3 of the Traffic Signs Manual Chapter 5, or for at least 6 m if beyond that distance the carriageway is less than 5 m wide.

2.327 Where the width of the carriageway on the immediate approaches is 5.5 m or more, the centre of the carriageway over the crossing should be marked with a double continuous white line to diagram 1013.1A. The lines should be continued along the approaches where justified by the normal visibility criteria for double white lines. At automatic half barrier crossings extend the double continuous white lines for at least 12 m back from the Stop line. Unless the double continuous line extends further back from each Stop line than the distance indicated in table 7, precede it by a double white line to diagram 1013.1D, with the continuous line nearer to drivers approaching the crossing.

2.328 The minimum length of double white lines depends on the 85th percentile speed of cars using the road, and on the general width of the carriageway, excluding any part of the crossing or approaches which may have been specially widened. Recommended overall lengths of the marking to diagram 1013.1A, or a combination of that marking and diagram 1013.1D, are shown in table 7. Where the carriageway is wider than 7.3 m the lengths in table 7 may be increased by up to 50%, but the double lines should not extend beyond the position of the sign to diagram 784.1, where this is used, unless a lay-by is provided.

Table 7: Lengths of double white lines	
85th percentile speed	Recommended length of double lines measured from the Stop line
Miles per hour (mph)	metres
up to 30	**up to 30**
31 to 40	**30 to 45**

Table 7: Lengths of double white lines	
over 40	**45 to 60**

2.329 At least one deflection arrow to Diagram 1014 must be provided on each approach to the double centre carriageway markings at crossings. It is normal for two such arrows to be used on each approach. Where a driver's forward view is limited, as at a crest, a third arrow may be necessary to give adequate forewarning. Arrows should be positioned in accordance with part 5 of the Traffic Signs Manual Chapter 5, summarised in Table 8 below.

Table 8: Location of deflection arrows				
Speed limit (mph)	Length of arrow (m)	Distance of tip of arrow from the start of the unbroken line		
		First arrow	Second arrow	Third arrow
30	**4.5**	**13.75**	**43.75**	**79.75**
40	**4.5**	**19.75**	**55.75**	**109.75**
50	**6**	**21**	**66**	**138**
60	**6**	**30**	**84**	**165**

Road studs

2.330 Double continuous white lines must be supplemented by a single row of white road studs. The studs should be white bi-directional reflecting and laid at intervals of between 3 and 4.5m. Any stud within 2 m of a running rail should be made of plastic.

Yellow box markings

2.331 Yellow box markings to diagram 1045 should be provided at automatic half barrier crossings where road traffic flow in any one direction exceeds the guideline figures in table 9 below. A yellow box marking might be appropriate at any type of crossing where blocking by queuing road traffic is foreseeable, regardless of the table 9 figures.

Table 9: Yellow box markings	
Overall width of carriageway (metres)	Yellow box to be provided if vehicle numbers in any one hour in either direction exceed
5.0 to 5.9	**500**
6.0 to 7.4	**600**

Table 9: Yellow box markings	
7.5 and over	**750**

2.332 Where a long yellow box is required the marking should be extended using additional diamond shaped units on the approach side and additional diagonal crosses on the trailing side of the crossing. The maximum permitted length of a yellow box is 30 m.

Figure 2: Typical layout of barrier crossing (with additional risks)

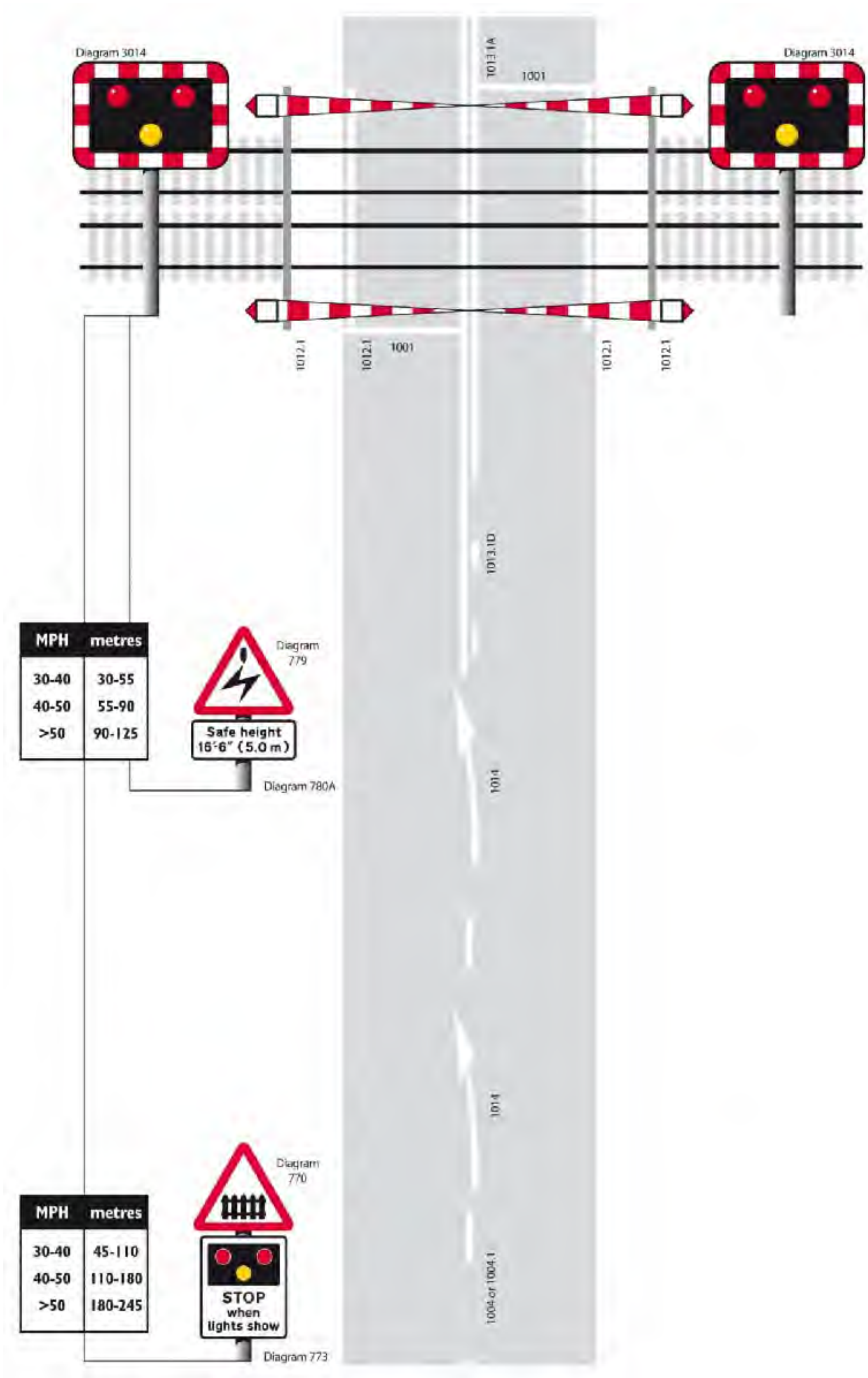
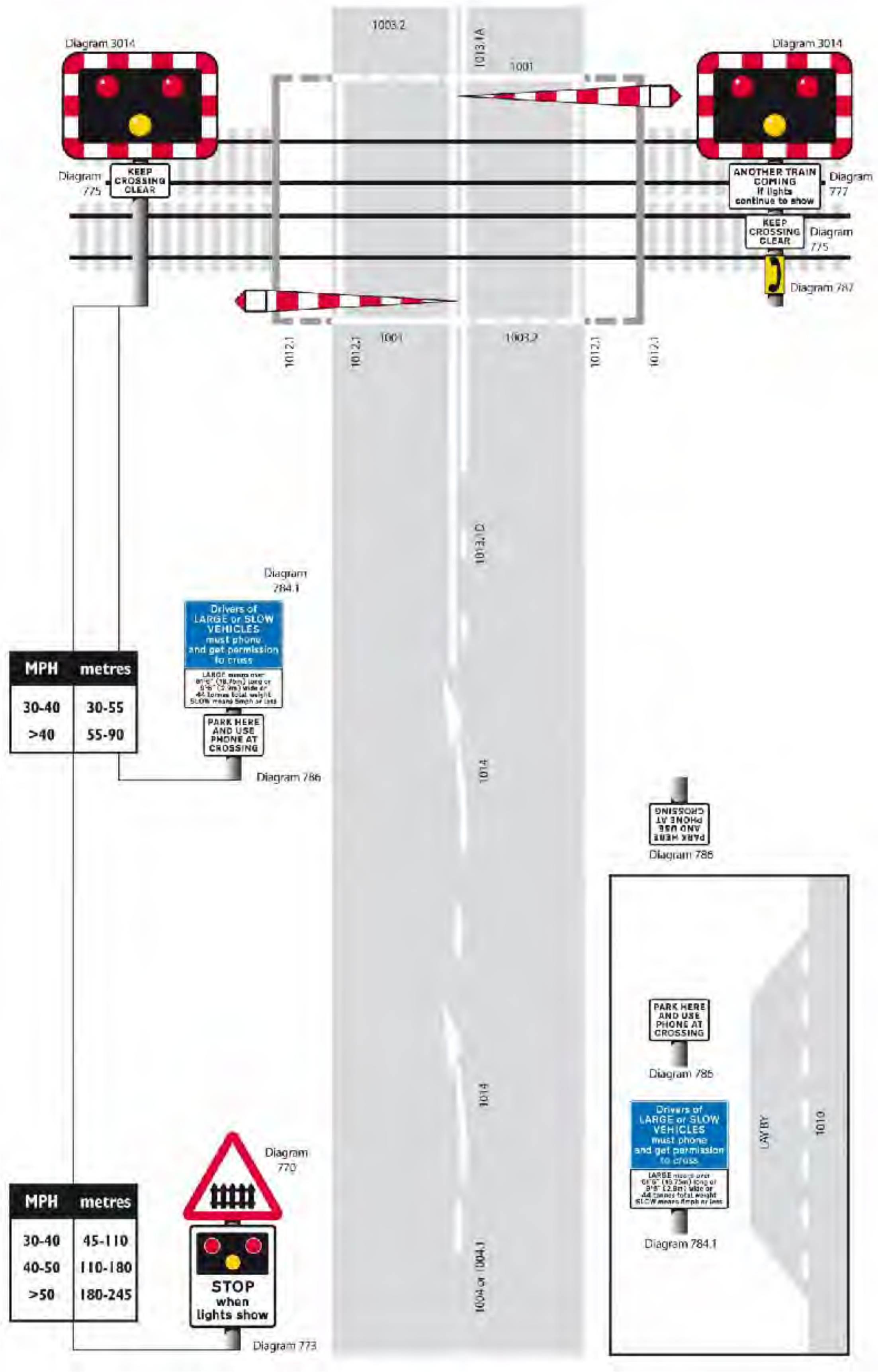


Figure 3: Typical layout of automatic half barrier crossing or automatic barrier crossing (locally monitored)



MPH	metres
30-40	30-55
>40	55-90

MPH	metres
30-40	45-110
40-50	110-180
>50	180-245

Figure 4: Typical layout of automatic half barrier crossing or automatic barrier crossing (locally monitored) (with additional risks)

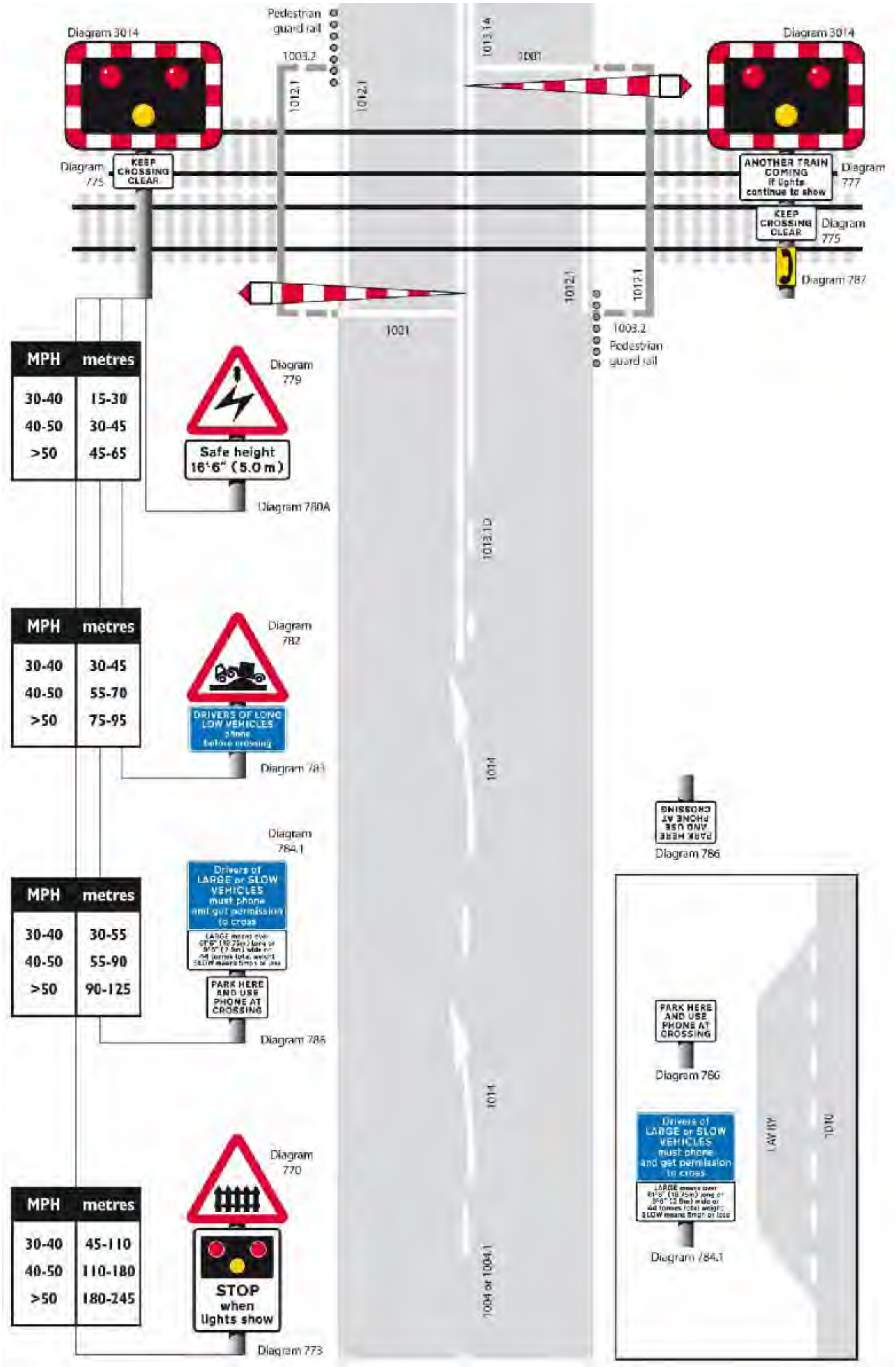


Figure 5: Typical layout of automatic open crossing (with additional risks)

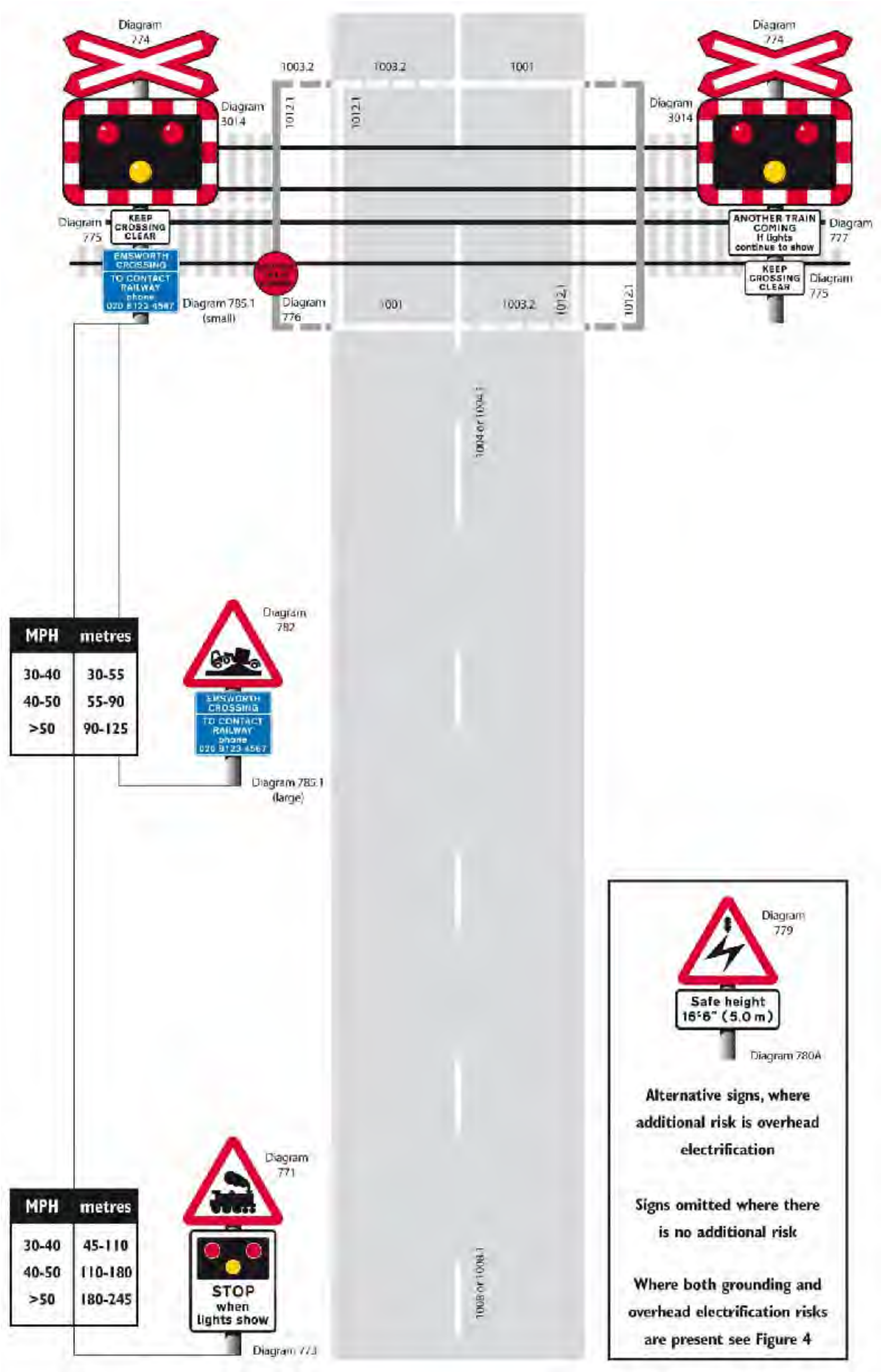


Figure 6: Typical layout of an open crossing

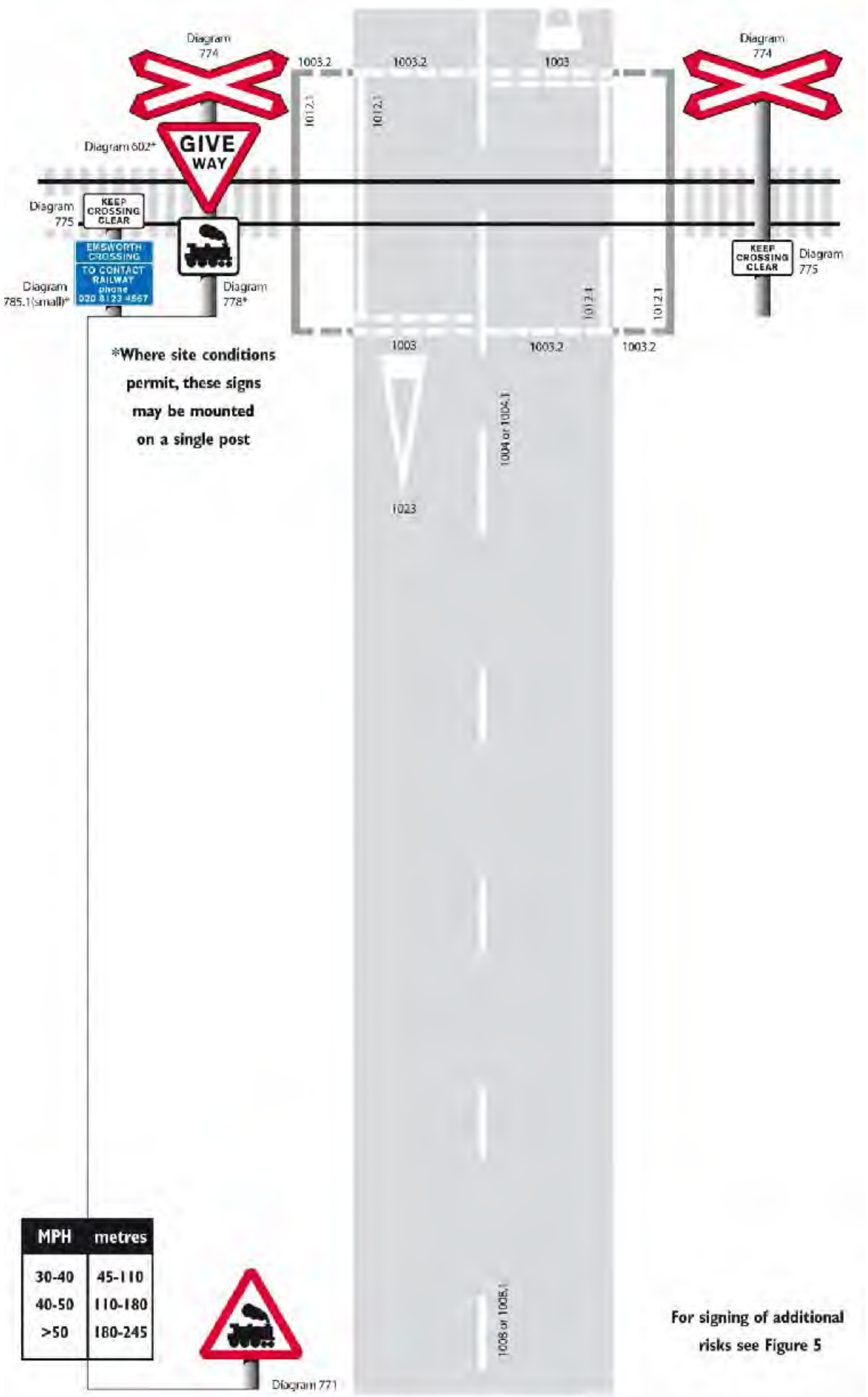


Figure 7: Typical layout of user worked crossing with adjacent footway or bridleway

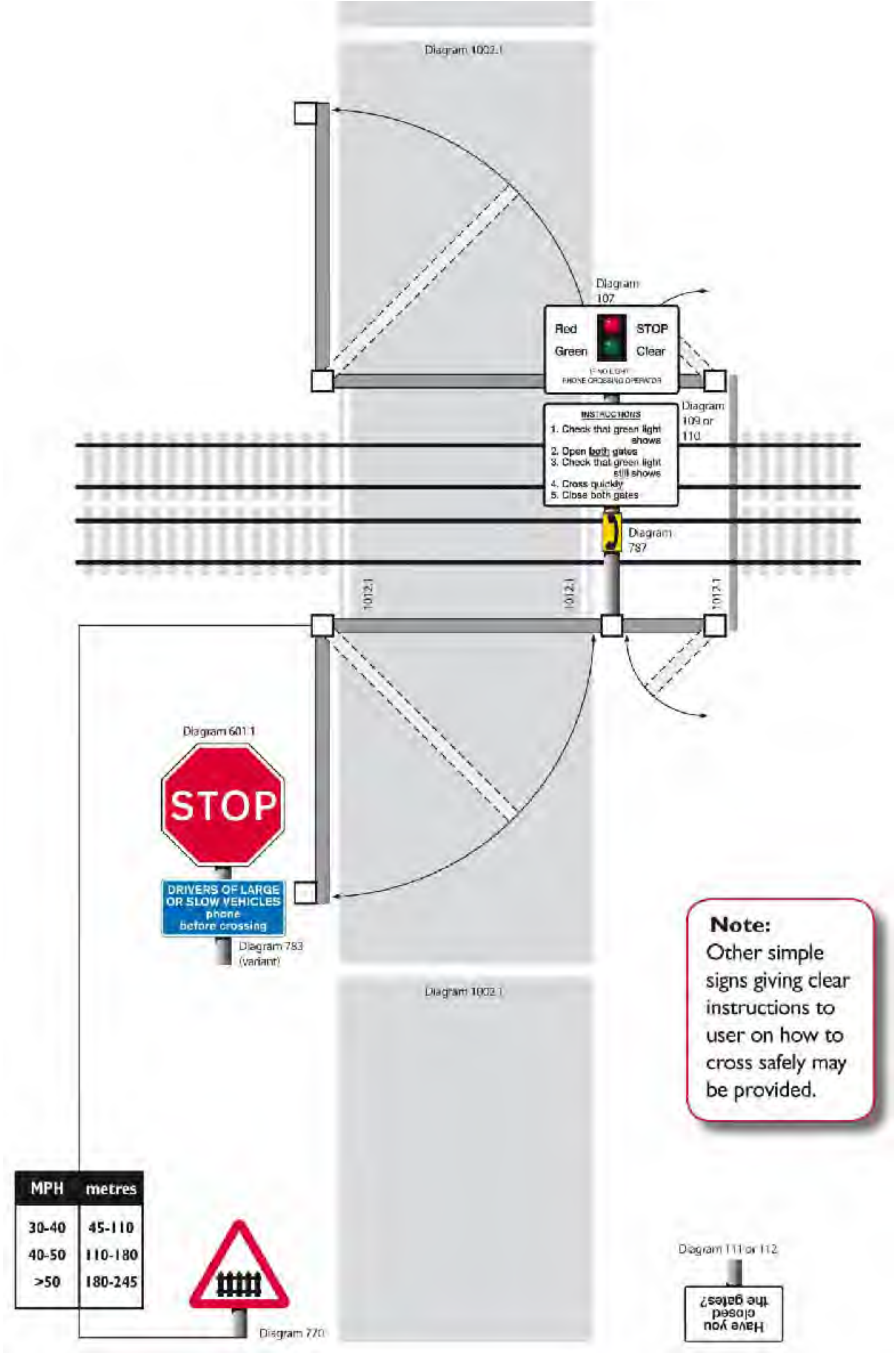


Figure 8: Special signs for use with MSL

Diagram 107

Preferred – provide telephone number if necessary

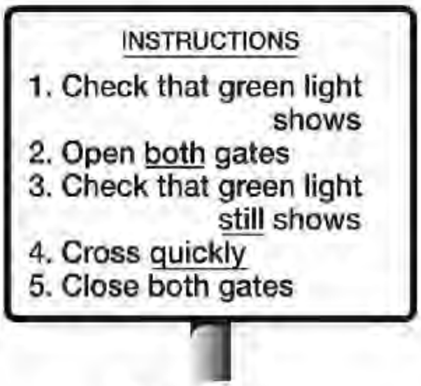


Diagram 109

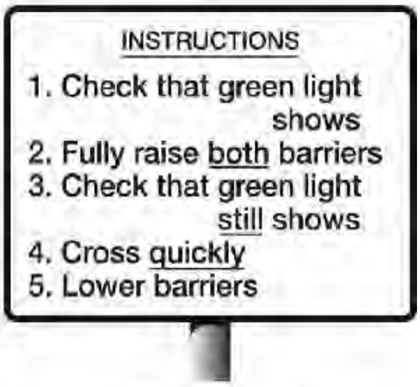


Diagram 110

Diagram 111

Diagram 112

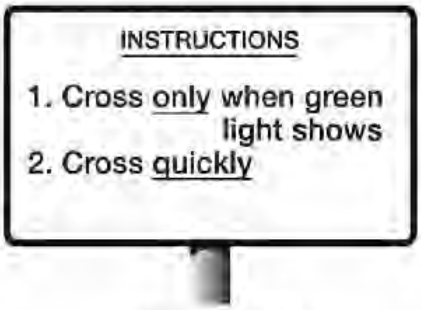
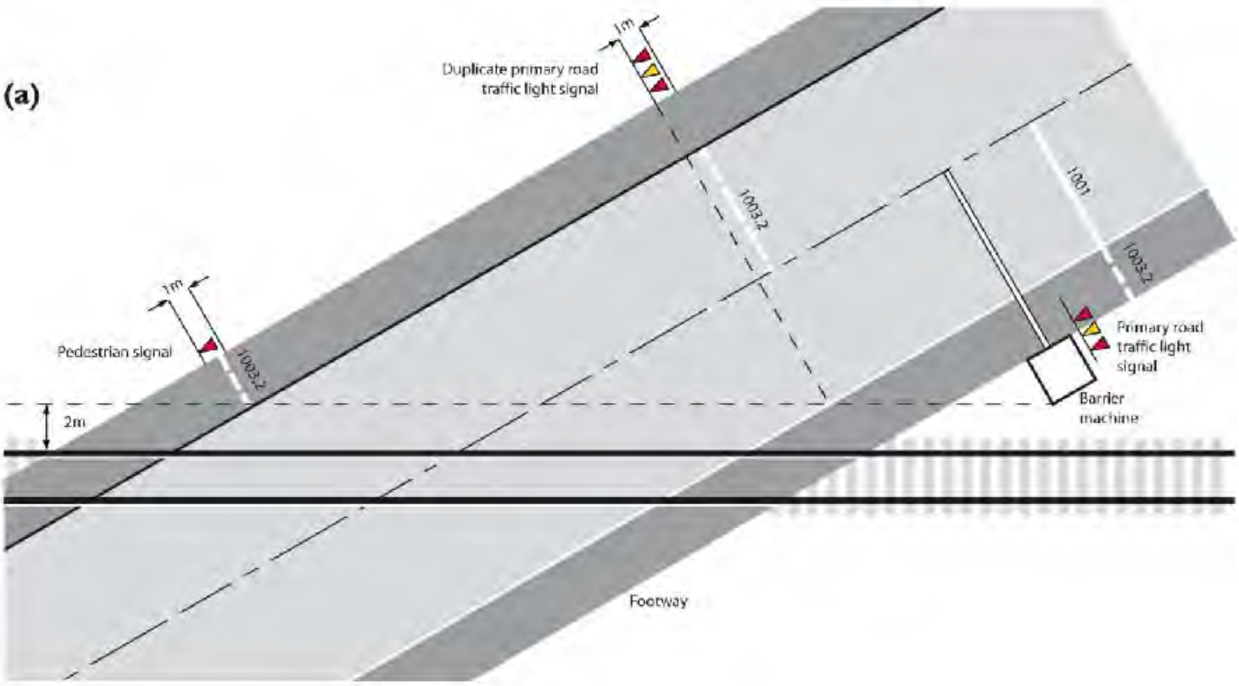
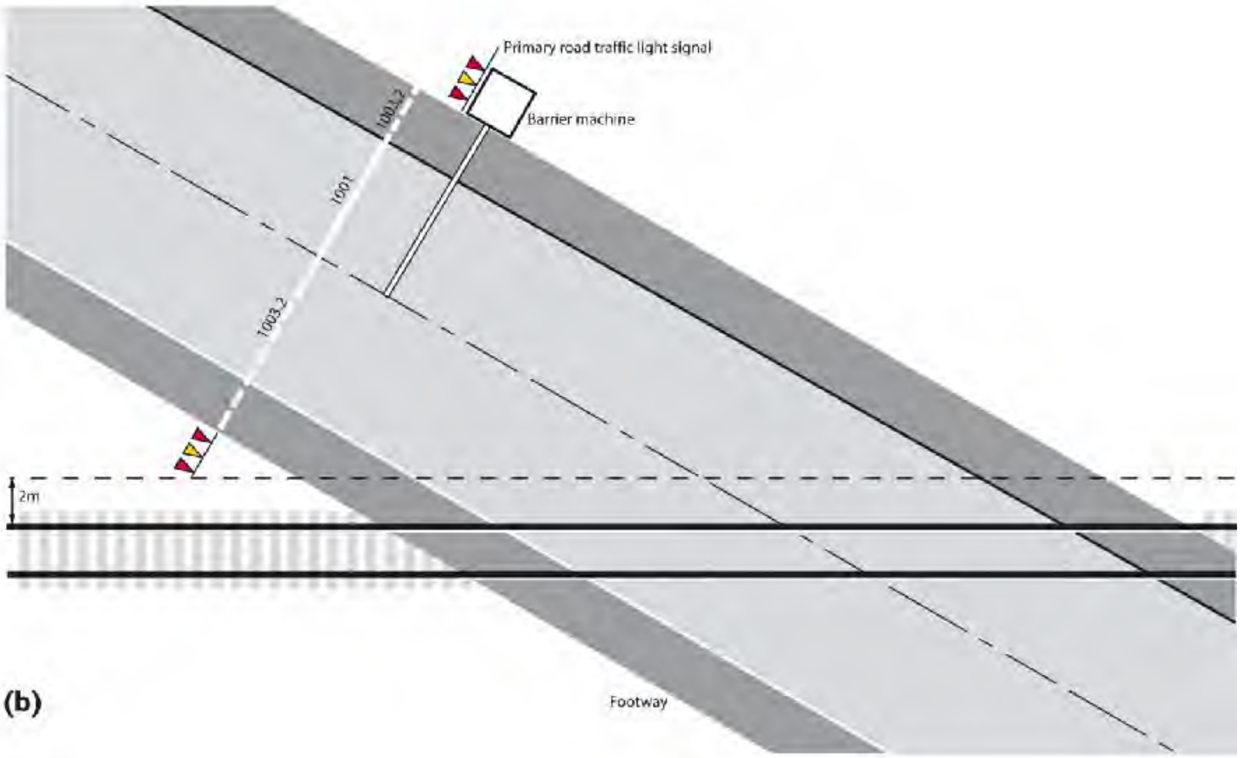


Diagram 114

Figure 9: typical layout of an obtuse skew crossing (a) and an acute skew crossing (b) indicating the arrangement of the transverse road markings and road traffic light signals (not to scale)





Notes to Figure 9

A pedestrian stop line is to be provided across the footway whenever a pedestrian signal is provided. The pedestrian stop line shall be approximately 1 m in advance of the pedestrian signal. This pedestrian stop line shall be positioned in such a manner that the end of the line at the edge of the carriageway is not less than 2 m from the nearest running rail.

The provision of a pedestrian signal may be appropriate at skew crossings with significant pedestrian usage.

In the case of an extremely obtuse skew crossing, like the one in Figure 9, the following arrangement may be considered as an alternative:

(a) the omission of the pedestrian stop line and the pedestrian signal on the right-hand side footway; and

(b) the duplicate primary road traffic light signal and the pedestrian stop line across the footway and across the right-hand side of the carriageway may be positioned closer than the minimum 2 m from the nearest running rail.

3. Level crossing order submissions

Overview and introduction

3.1 When the construction of railways was authorised, mainly in the 19th century, the individual enabling Act of Parliament specified how the railway was to cross other ways (for example roads and footpaths), either by bridge or on the level. Where the crossing was on the level, the arrangements for protecting the users, both railway and highway, were specified.

3.2 Since initial construction, use of the roads and railway has changed considerably, as has the cost of and delay caused by level crossings, and from the 1950s level crossings have been modernised to permit remote or automatic operation with lifting barriers and/or road traffic signals.

3.3 In order to permit the railway operator to change the protective arrangement specified in the original Act, a legal process was introduced which empowered the Secretary of State for Transport to make statutory orders specifying the new or updated arrangements at individual crossings to which the public has access. This process is currently authorised through provisions in the Level Crossings Act 1983.

3.4 This order making process is managed by ORR on behalf of the Secretary of State for Transport. The process is normally initiated by the operator of a level crossing, and requires consultation with the local traffic authority. An order provides for the protection of those using a level crossing and may place duties on both the crossing operator and local traffic authority. An order may make such provision as the Secretary of State considers necessary for the safety or convenience of crossing users.

3.5 This guide is intended to be an *aide-memoire* to assist railway level crossing operators in making level crossing order submissions to ORR for consideration. It also provides information for statutory consultees on the process, together with other background information. It takes account of the changes introduced in the Level Crossings Act 1983 by the Road Safety Act 2006.

The order making process in outline

3.6 The process is normally initiated by the crossing operator proposing a new or amended order. The local traffic authority and the ORR must be consulted. A request and draft order is then submitted and there is a statutory consultation period for the local traffic authority to make representations. On behalf of the Secretary of State, ORR considers any representations, and then decides whether to make the order, with or without amendments. The order is made to come into force when the relevant work is completed.

3.7 This Chapter includes advice on managing of level crossings, what an order should contain, and on the process for requesting, considering and making an order. It also includes contact details (Appendix E) and the wording of the Level Crossings Act 1983, as amended (Appendix F).

Background and other information on level crossing management

Modernisation of existing level crossings

3.8 The primary objective should be to close level crossings permanently, following the closure or diversion of a highway, road or by the provision of a bridge or under-pass. As a secondary objective, it may be practicable to reduce the status of the crossing, for example from vehicular to footpath or bridleway only. Simple renewal and retention of existing crossings should be seen as a last resort. Crossing renewals should not introduce new risks to the railway or users. In determining whether reasonably practicable solutions exist, other than renewing an existing crossing, the operator should take into account the whole-life costs of installing and maintaining level crossings.

Authorisation of level crossings

3.9 Level crossings on public highways normally need to be authorised by statutory means to establish the rights and obligations of road and rail users. An order under the Level Crossings Act 1983 does not authorise a crossing, but does provide the means for any changed protective arrangements at that crossing to be effectively placed, recorded and enforced.

New level crossings

3.10 Except in exceptional circumstances, ORR does not support the creation of any new level crossings, of any type. A new public highway level crossing in England and Wales may require a Transport and Works Act Order[11] or other appropriate statutory authorisation to create 'the right to cross the railway on the level'. In Scotland an order under the Transport and Works (Scotland) Act 2007 may be required. ORR is consulted on such proposals and may object during any relevant consultation exercise. Normally, any new road required to cross a railway should do so by a bridge or underpass.

3.11 Where a new level crossing is authorised under the Transport and Works Act 1992 or similar legislation, a level crossing order (obtained by the processes outlined in this document) may be needed to specify the necessary protective arrangements.

Temporary vehicular level crossings and temporary increased use

3.12 Bringing into use temporary level crossings, (excepting those for sole use by employees of the relevant transport undertaking) for instance to enable construction works to take place, must comply with the Railways and Other Guided Transport Systems (Safety) Regulations 2006 as amended. This also applies in the case of temporary increased use of private level crossings.

3.13 If the crossing is one to which the public has access, and the protection arrangements need to be altered from those specified in the authorising Act (for example manual gates to remotely operated full barrier CCTV), a level crossing order is the most appropriate mechanism for sanctioning the relevant changes.

Change in line speeds

3.14 Any project involving a change to line speeds over a length of route will require reassessment of risk and operational requirements at all crossings. Closure, where possible, should be pursued. Where a private user worked crossing is one to which the public has access, any significant changes may make it appropriate for all protection arrangements to be recorded in a level crossing order.

Level crossing orders: scope, content and format

3.15 A level crossing order details the protective arrangements at a level crossing. A new or amended order may bring about changes to those protective arrangements. Orders can revoke earlier orders, disapply requirements under other legislation (for example the authorising Act, a Light Railway Order or an order made under the Transport and Works Act 1992) and enable road traffic signs (including signals and road markings) to be placed (and have legal effect) upon a highway or other road to which the public has

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[1] See Section 1 & Schedule 1 of the Transport and Works Act 1992. Transport and Works Act Orders are dealt with by the Transport and Works Act Unit, Dept for Transport, Great Minster House, 76 Marsham Street, London, SW1P 4DR

access. It may place duties on both the level crossing operator and the local traffic authority, in relation to the safety or convenience of users of the crossing.

3.16 In England and Wales any level crossing on a "highway[2] or other road to which the public has access" may be subject to a level crossing order made under the Level Crossings Act 1983, though in many cases this will not be necessary. "Access" includes pedestrian, vehicular or on horseback, and is not restricted to a public right of way. It is a matter of fact, rather than right. Thus an order may be made for a "private" crossing if the public has access to it, even though there are no public rights of way over it or over the road up to the crossing. In Scotland the law, and in particular the definition of a 'road', is a little different. The effect is that in Scotland a level crossing order can only be made for a crossing if it is on a road to which the public has a *right* of access.

3.17 Level crossing orders may normally only be requested by the operator of the crossing (defined in relation to a level crossing as the person carrying on an undertaking which includes maintaining the permanent way at the crossing[3]). However, the Secretary of State may make an order without the request of an operator, and ORR may, by serving notice on an operator, require the operator to request an order.

3.18 The level crossing order specifies how the crossing shall be operated and the protective equipment (which includes barriers, traffic signs, signals and road markings) to be provided at the crossing by both the operator and local traffic authority.[4] The type of level crossing should normally conform with one of the types described in this guidance document. The level crossing order consideration process takes account of the safety and convenience of users, road and rail, and the status of the crossing. Where necessary and appropriate to particular circumstances at individual crossings, protective arrangements may be varied from the standard guidance.

3.19 Orders normally contain several parts. The order itself contains the citation, principal duties, revocation of earlier orders and other details. It records who applied for the order in its title, though this does not affect the validity of the order if the operator subsequently changes. It may also explicitly or implicitly disapply parts of earlier legislation applying to the crossing.

3.20 There are three supporting Schedules, which contain details of:

- The location of the crossing (in both road and railway terms), together with a record of the local traffic authority and, if appropriate, the status of the crossing for which the protection is provided (Schedule 1);
- What equipment the operator must provide (Schedule 2 part 1);
- How the operator must operate the crossing (Schedule 2 part 2);
- What the local traffic authority must provide (Schedule 3 part 1); and
- How the local traffic authority shall conduct its undertaking in relation to the level crossing (Schedule 3 Part 2).

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[2] See definition in the Level Crossings Act 1983, inserted by the Level Crossing Regulations 1997 and the Highways Act 1980

[3] See section 1(11) Level Crossings Act 1983

[4] See the amendments made to section 1(20(a) of the Level Crossings Act 1983 by section 50(2) of the Road Safety Act 2006

3.21 Orders for each type of crossing are made to a standard format, for which templates are available from ORR on application. However, where particular features, requirements or equipment need to be included, any proposed additional wording should be discussed with ORR at an early stage. Templates normally contain a number of options or alternative paragraphs (dealing with yellow box markings or centre of carriageway markings, for instance).

3.22 Any change that affects, or alters, the content of a level crossing order (including variation, amendment and revocation orders) requires statutory consultation (see timescales below). There is no mechanism for exemption from statutory consultation, nor can the minimum consultation and two-month period for representations be reduced. Level crossing orders can amend or vary earlier orders, and can revoke an earlier order completely.

3.23 Amendment or variation orders can be used to amend or vary individual words or paragraphs. Variation and amendment orders that affect an earlier order must explicitly provide for the earlier order to remain in force. ORR will not normally progress a variation or amendment order, and will require the submission of a new, complete draft order:

- where there are significant changes to any existing order;
- where a change of level crossing type is proposed;
- where there are already three or more existing amendments or variations to an original order;
- where the traffic sign numbering within an existing order relates to other than the current edition of the 2002 Regulations; or
- where significant time (more than two years) has elapsed since consultation, commissioning has been delayed, or circumstances have changed significantly since the original consultation.

3.24 New orders other than variation and amendment orders should explicitly revoke all earlier orders together with any amendment or variation orders that have not previously been revoked. Where an earlier order is revoked, the correct, full citation as quoted (This order may be cited as…) in the earlier order itself must be used.

Level crossing order request and consideration process

3.25 A “flow chart” outlining the order making process can be found at Figure 10. It is intended to be illustrative rather than prescriptive. In general, the earlier matters are discussed and resolved, the less scope there is for unforeseen timescale and resource problems to affect implementation of the proposed works.

Initial proposals

3.26 Level crossing modernisation project teams should make ORR aware of their proposals 12-24 months or more in advance of the proposed commissioning date so as to allow time to discuss the engineering aspects and the draft level crossing order with ORR. At this stage it is important to resolve issues of principle, such as the risk assessment to inform to what extent the crossing should meet current standards, or whether renewal as a different type of crossing will be appropriate. The proposed use of any novel equipment may require special consideration and should be discussed with ORR at this stage.

3.27 Consider whether a public consultation meeting will be needed (see public meetings below). Either at this stage or as part of the initial consultation with ORR and the local traffic authority, a site visit by interested parties should normally be arranged.

Consultation with local traffic authority and ORR

3.28 New consultation provisions were introduced by the Road Safety Act 2006[5]. Before submitting a request for an order to the Secretary of State, an operator must consult both ORR and the local traffic authority about the draft order he intends to submit to the Secretary of State, and must allow a reasonable period for them to make representations. The purpose is to permit any matters of concern to be raised and resolved in advance of the Secretary of State's formal consideration of the order. The 2006 Act also amended the Level Crossings Act 1983 to permit level crossing orders to place requirements on local traffic authorities[6].

3.29 Clearly, the proposed content of an order, in particular the schedules placing duties on the local traffic authority, needs to be discussed at as early a stage as possible, and particular attention should be given to the first consultation under the new arrangements with each local traffic authority. Attention should also be given at this stage to establishing an agreed status of the crossing, particularly where private vehicular rights are involved. Ideally, all matters should be resolved at this time, and the statutory consultation process should not raise any further issues or matters of comment.

3.30 As a minimum, the crossing operator must consult with the local traffic authority in the area the crossing is situated, and ORR. There is no longer a statutory duty to consult with the planning authority, but ORR considers that it is good practice to continue to do so. The crossing operator should consider consulting on as wide a basis as is felt necessary, for instance with planning authorities, parish and community councils. In the case of crossings with private rights, consider consulting the authorised users and the owner of the private road. Consider also consulting the authorised users, if the crossing is an accommodation or occupation crossing with public footpath or bridleway rights. Where operation of the crossing involves a train operator, such as for train crew operated crossings or automatic crossings initiated by station staff, the relevant train and station operators should be consulted. Responses to this consultation should be directed to and be considered by the crossing operator.

3.31 There is no statutory guidance on the process required or how far in advance of the draft order circulation date this consultation should be carried out. However, it will need to include a written summary of the proposal, a preliminary draft of the proposed order and an outline layout, and may, where appropriate and practicable, include a site visit. A record should be kept of issues raised and the considerations and decisions arising from them.

3.32 Evidence that consultation has been carried out, how it was done, what responses were received and what action has been taken should accompany the later draft order submission.

Public meetings

3.33 Although not a statutory requirement, "public" consultation meetings should also be considered and held with relevant local authorities and other relevant bodies as part of this consultation process where there are significant changes to the method of operation planned (for example conversion of manual gates to automatically controlled barriers). Such meetings within the local community, to describe the railway operator's proposals, will give advance warning of local concerns and allow time to consider any objections raised by the communities concerned.

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5 See the new sections 1(8) and 1(8A) to the Level Crossings Act 1983 introduced by section 50(7) of the Road Safety Act 2006

6 See the new section 1(2)(a) to the Level Crossings Act 1983 introduced by section 50(2) of the Road Safety Act 2006

3.34 The organisation and cost of such meetings are the railway operator's responsibility. ORR has, in the past, chaired such meetings in an independent capacity, and is prepared to continue doing so when requested, provided sufficient advance warning is given. Minutes should be kept and distributed to the communities concerned and ORR. Such meetings should be held as early as possible (12-24 months in advance). Local representatives such as the highway and planning authorities, town, parish and community councils, police (local as well as British Transport Police), other emergency services, National Farmers Union and any other significant local users should be invited as appropriate.

3.35 The railway operator should be prepared to give a brief presentation explaining the operation of the proposed level crossing and should be able to answer technical and any other questions. ORR will be pleased to explain the legislation and order making process to those present. A record should be kept of items raised at these meetings.

3.36 Any undertakings made to local communities should be carefully considered before being given, as failure to honour undertakings can lead to such issues being raised again during the formal consideration of the order, thus possibly delaying the making of the order.

Draft order submission and supporting information required

3.37 A list of supporting documents and information required to accompany order requests is provided in Appendix G. Here you will also find guidance on making and recording the results of a 'suitable and sufficient' risk assessment. Which documents need to be provided will depend on the particular circumstances of each level crossing; the list is for guidance and is neither exhaustive nor prescriptive. Where there are deviations from established guidance or practice, these should be justified. Evidence of the legal status of the crossing should be provided, if necessary.

3.38 If you have any doubts on what information is required, please contact ORR before making your submission. The information provided should come from one single point of contact in the relevant part of the organisation.

3.39 After consulting ORR and the local traffic authority about the draft order, the crossing operator must give them written notice of his intention to make a request for an order to the Secretary of State. That notice must specify a period (of at least two months) within which ORR and the local traffic authority can make representations to the Secretary of State, and must be accompanied by a copy of the draft order that is being requested.

3.40 The consultation letter to the local traffic authority and ORR should include an end date for consultation (at least two months), and a proposed or likely commissioning date for the new arrangements. Responses or objections from consultees at this stage should be directed to the Secretary of State for Transport c/o Level Crossing Team, ORR, One Kemble Street, London, WC2B 4AN.

3.41 The crossing operator should ensure that it can demonstrate delivery of these notification documents to the consultees. Copies of such letters should accompany the request to the Secretary of State. Details of any responses to the initial consultation process, and any action taken should also be included.

Draft order consideration and order making

3.42 Correspondence to the Secretary of State for Transport and the Office of Rail Regulation should be addressed to: The Secretary of State for Transport, c/o, Level Crossing Team, ORR, One Kemble Street, London, WC2B 4AN.

3.43 The draft order will be considered, taking into account guidance, relevant standards and the particular circumstances at the crossing. The primary considerations are whether the proposal is adequately safe and represents an appropriate balance between safety and convenience for all crossing users, road and rail.

3.44 Where relevant issues are raised concerning matters other than the safety or convenience of users, such as rights of way over a crossing, or the convenience of road users other than those using a crossing, these will be taken into account in ORR’s assessment of the draft order. However, the draft order may in these circumstances need to be referred to the Secretary of State for a decision.

3.45 It is at this stage that minor amendments to the proposed order, such as correcting dimensions in the original draft, are incorporated. More significant additions may be made, for instance where the assessment process has identified the need to better address particular risks at the crossing.

3.46 Consultation responses are also considered, and if appropriate the order may be modified to take account of these matters.

3.47 If there are public rights of way/convenience issues raised by the consultation, ORR may seek guidance from the Department for Transport. In some cases ORR is not empowered to make an order on behalf of the Secretary of State, and in such cases the draft order will be referred to the Secretary of State with a recommendation. ORR will inform the railway operator as soon as it becomes aware of any issues likely to delay the making of an order that might affect a proposed commissioning date.

Inspection of level crossings subject to orders

3.48 Implementing the arrangements specified in an order remains the responsibility of the crossing operator and local traffic authority. All level crossing works are subject to inspection at ORR's discretion. Variation or amendment orders, detailing minor changes only, may not necessitate inspection.

3.49 The inspection should normally be arranged shortly after the revised arrangements have been brought into use. Consultees, including a representative of the relevant traffic authority, should be invited by the railway operator to join the inspection. Any deficiencies identified should be corrected and the action taken confirmed in writing.

3.50 Failure to implement properly the arrangements specified in an order will be considered using ORR’s established enforcement decision making process. Formal enforcement, including notices and prosecution, may be used.

Traffic Signs Authorisations

3.51 Traffic Signs Authorisations are required if the railway operator wishes to place a sign on a public highway that is not shown within the 2002 Regulations, or wishes to place a sign from the 1996 Regulations on a public highway (including a public footpath) or road or other highway to which the public has access. Such requests should be made to ORR along with details of the size of the sign/signal, colour, size of lettering/numerals, etc. A detailed explanation of why the sign is required and copies of any supporting correspondence from local authorities (such as Police, Traffic authority) should be provided. Two copies of a map (minimum scale 1:2500) should be supplied, one showing the position of the proposed sign(s) marked with a cross, the other unmarked. ORR will progress the request on behalf of the railway operator.

Timescales

3.52 Where order requests are incomplete or inaccurate, the timescales indicated below will be extended. Where assessment of an application reveals that it is incomplete, then further assessment may be delayed until the relevant information is provided. Where a request is grossly deficient ORR may recommend the Secretary of State declines to make an order, and the consultation cycle will need to be restarted from the initial consultation phase. To avoid wasted effort by operators, local authorities and ORR's inspectors, the crossing operator should liaise with ORR at an early stage to ensure all necessary information will be available when required.

Consultation

3.53 Before submitting a request for an order, the crossing operator must formally advise and consult ORR and the local traffic authority of his intention to do so (section 1(8A) of the Level Crossings Act 1983). Consulting the local planning authority is also good practice, even though there is no longer a statutory requirement to do so. The timescales are not set down, but this should be undertaken at the earliest opportunity. Sufficient time should be allowed for a public meeting if necessary and, once the consultation is started, sufficient reasonable time should be allowed for responses to be made and considered. Two months may be considered as an absolute minimum for this to be done effectively. If adequate time is not allowed, or the consultation is otherwise ineffective, it may result in comments being made and needing to be considered after the statutory consultation. If consultation is not effectively carried out, the subsequent draft order submission might be legally challenged.

Circulation of draft order

3.54 The last date for comments should be included in the letter accompanying the draft order. Note that new level crossing orders, and variations or amendments to existing orders, however minor the changes, all have to go through a statutory consultation process in full. There is no power in the Level Crossings Act to shorten or waive the minimum consideration period.

Consideration of draft order together with any consultation responses

3.55 Considering draft orders and making a recommendation for signature cannot take place until the consultation period has ended. The recommendation can be that the order is made as submitted, that an order is not made, or that an amended order is made. In practice the majority of orders made fall into the last category.

3.56 Crossing operators are therefore advised to allow a minimum of four months between circulation of the draft order and the proposed commissioning date. The level crossing is required to comply with the level crossing order at all times and, therefore, the crossing operator must ensure that the new order is dated to 'come into force' on the commissioning date.

3.57 The earlier a crossing operator makes the application for an order, the less likely there will be timescale problems. While ORR will make every attempt to meet reasonable project timescales, it cannot deal with last-minute applications unless there are exceptional circumstances. Poor planning will not be considered as an exceptional circumstance.

3.58 The required "coming into force" date should normally be confirmed to ORR. Cancellation or postponement of a planned commissioning should be advised to ORR at the earliest opportunity. Once made, an order cannot easily be revoked.

Information for local traffic and planning authorities

3.59 A process for making orders in relation to level crossing protection has been in place since the late 1950s, and local authorities have, since that time, been part of that process. Even before level crossing modernisation began, local highway authorities had responsibility for traffic signs on the road approaches to level crossings, and this responsibility has not changed.

3.60 The modifications to the Level Crossings Act 1983 introduced by the Road Safety Act 2006 formalised good practice in consulting on changes to level crossings in advance of formal circulation of a draft order. The changes also permit the order to record and clarify the local traffic authority's responsibility for the approaches to the crossing. Where new traffic control measures are required (such as a centre-carriageway "median strip" to prevent "zig-zagging" around half barriers) the responsibility for provision and maintenance should be agreed through consultation and incorporated in the draft order. The final division of responsibilities will be made clear in the level crossing order. As a general principle, it may be considered appropriate for the party introducing any increased risk to bear the responsibility for controlling it. Where there is any failure to provide or maintain any traffic signs required by the order, ORR will consider whether formal enforcement is appropriate.

3.61 Where traffic signs on the approach to a crossing need to be changed, for example if a local traffic authority wishes to introduce one way traffic flow, proposals must be discussed and agreed with the railway operator in ample time for any necessary revision to the level crossing order to be made. This will determine when revised arrangements may be brought into force.

3.62 New orders may record the need for local traffic authorities and level crossing operators to agree a long term strategy for each crossing. Where appropriate, consideration should be given to what measures may be required, by each party, to permit the crossing to be closed in the long term.

3.63 New orders may also specifically require the local traffic authority and the crossing operator to co-operate in the joint management of risk at the crossing. This will require the local traffic authority to make the crossing operator aware of any significant temporary or permanent changes affecting the nature and characteristics of road traffic approaching the crossing. Such changes might include a revised road layout, traffic calming measures or a change in permissible road speed.

Planning decisions affecting level crossings

3.64 There is a requirement in planning legislation[7] for planning authorities to consult the Secretary of State for Transport and /or the railway operator where development materially affects traffic over any type of level crossing. In Scotland, the requirement is for the planning authority to consult Network Rail Infrastructure Limited or any other railway undertakers likely to be affected where the development is likely to result in a material increase in the volume or material change in the character of traffic using a level crossing over a railway. ORR acts on behalf of the Secretary of State in these matters, and can offer guidance at an early stage as to what might be material in the particular circumstances of individual crossings. Any impact on safety will depend on the type of level crossing involved. Existing protection may no longer be adequate.

3.65 Planning authorities should take careful note of comments from crossing operators. Consideration should be given to opportunities for closure of the level crossing concerned in favour of bridge underpass or diversionary routes. If a planning decision necessitates a change in level crossing protection, consideration should be given to the funding of the changes and to the timescales for implementation consistent with the requirements of the level crossing order making process. Changes in level crossing protection may well incur additional costs for local traffic authorities as well as the crossing operator.

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[7] Town and Country Planning (General Development Procedure) Order 1995 SI 1995 No 419; Regulation 25 and Schedule 5 of the Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2008 as amended

Requiring a request for a level crossing order

3.66 The Level Crossings Act 1983 section 1(6A) gives ORR, where it is of the opinion that an order is required, the power to issue a written notice to the operator of a crossing to require the operator to request a level crossing order. The notice will contain details of the reasons for the opinion, and places a statutory duty on the operator to request an order.

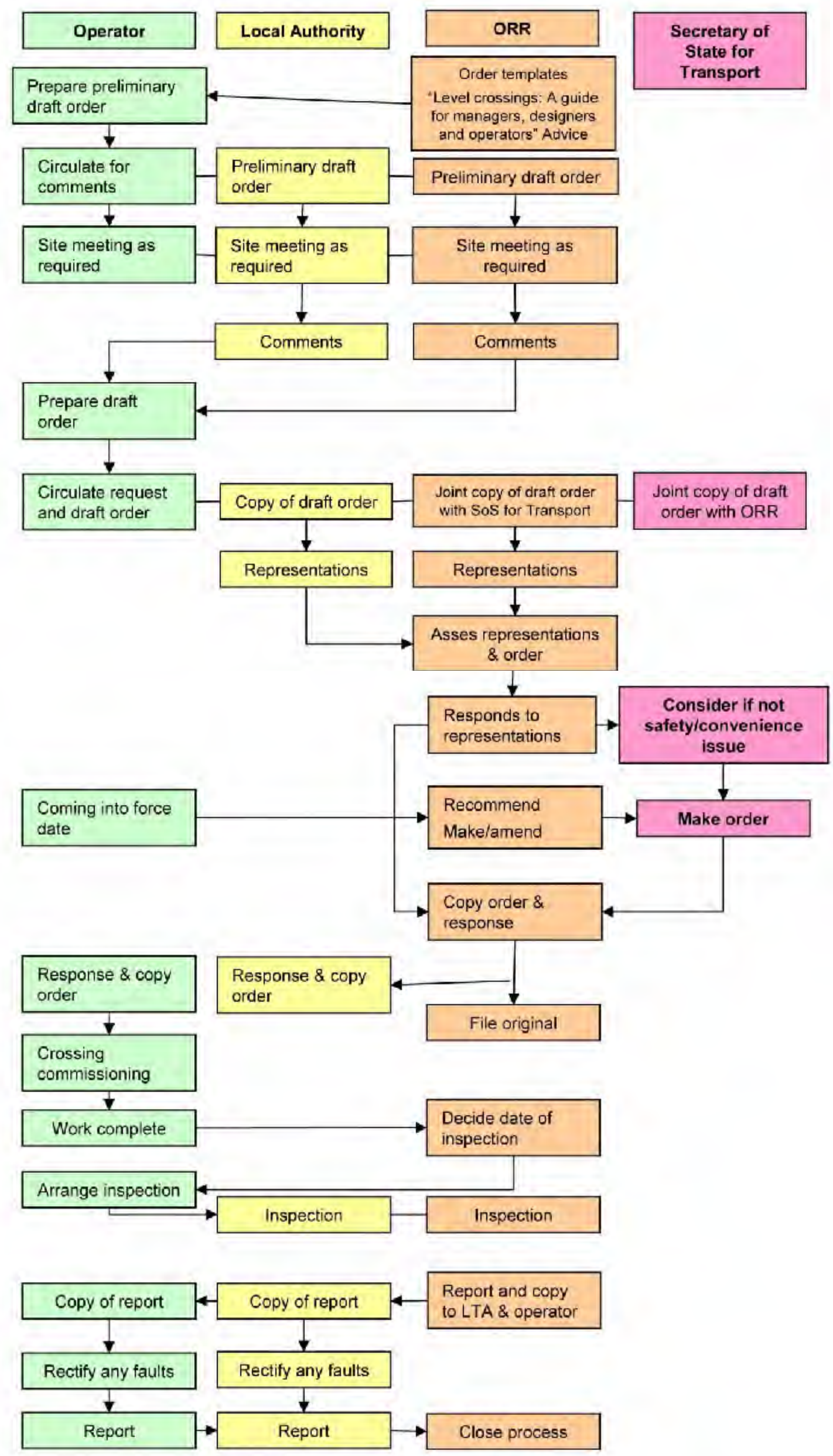
3.67 The subsequent request for an order will be considered by ORR as normal, but making the order is not delegated to ORR in these circumstances. In such cases the order is made by the Secretary of State, taking into account any recommendation from ORR.

3.68 If the operator declines to make a request for an order, the Secretary of State can be advised to make an order without a request. Alternatively, ORR may serve an improvement notice, under the Health and Safety at Work etc Act 1974, requiring an operator to request an order. Failure to comply with such a notice can lead to prosecution.

Relevant legislation and publications

3.69 The most relevant legislation is the Level Crossings Act 1983 (as amended by the Level Crossings Regulations 1997 and the Road Safety Act 2006). Operators should also be familiar with the Health and Safety at Work etc Act 1974, the Railways and Other Guided Transport Systems (Safety) Regulations 2006 as amended and the Traffic Signs Regulations and General Directions 2002. See Appendix H.

Figure 10: Level crossing order process



Appendix A - Common terms

Where possible the document has been written in plain English and the use of technical expressions or jargon has been avoided.

The following explains what is meant by certain terms used within the document that relate specifically to level crossings:

'Actual daily road vehicle usage' means the number of road vehicles passing between 06.00 and 24.00 averaged over a 9-day period.

'Acute (skew) crossing' is a crossing at which the angle measured in an anticlockwise direction from the road to the running rail is less than a right angle.

'Approach locking' is a feature of the signalling interlocking. In the context of a level crossing it should prevent the crossing opening to road traffic after protecting signals have been placed to danger if there is a risk of an approaching train not having received a complete warning sequence of signals.

'Control point' is a location from which the equipment at a crossing is controlled.

'Crossing length' applies to any vehicular crossing. At a crossing equipped with gates or full barriers it is the distance between the gates or barriers measured across the railway. At an open crossing or one equipped with half barriers it is the distance measured from the give way or stop line to a point at which a road vehicle would be clear of the railway or crossing equipment on the far side.

'Crossing speed' applies to locally-monitored crossings and open crossings. It is the maximum speed at which trains are allowed to travel from a point (indicated by the position of a special speed restriction board) on the approach to a crossing until the front of the train arrives at the crossing.

'Decision point' applies to user worked crossings, footpath crossings and bridleway crossings. It is a point where guidance on crossing safely is visible and at which a decision to cross or wait can be made in safety.

'Left-hand side' means the left-hand side of the road or carriageway as it would appear to a person approaching the crossing along that road or carriageway.

***'Obstacle detection'*:** An obstacle detector is a device or system for proving a level crossing is clear, as part of the closure sequence. An obstacle detector may comprise one detector or a system of obstacle detectors, for example a primary high-integrity obstacle detector to detect any obstruction capable of derailing a train, together with a lower-integrity Complementary obstacle detector to detect possibly low-lying, obstructions not capable of derailing a train.

'Obtuse (skew) crossing' is a crossing at which the angle measured in an anticlockwise direction between the road and the running rail is greater than a right angle.

'Predictor crossing' is a crossing at which the likely arrival time of trains is calculated automatically by the equipment at crossing. The timing of closure sequence is thus set according to the approach speed of trains

'Right-hand side' means the right-hand side of the road or carriageway as it would appear to a person approaching the crossing along that road or carriageway.

'Road open time' is the time after the road traffic light signals have ceased to show and any barriers are clear of the road, before the road traffic light show again for another train.

'Sighting distance' is the distance measured along the railway from a decision point to the point at which an approaching train becomes visible in any direction from which a train may approach.

'Strike-in point' is the position on the track at which the presence of a train is detected and the operating sequence of the crossing is initiated.

'Supervising point' is the location from where the crossing is supervised. Most commonly this is either a local or remote signal-box but can be another location.

'Tactile threshold' is an area of tactile paving slabs laid in a specific pattern for the guidance of visually-impaired pedestrians.

'Traffic moment' is the number of road vehicles using the crossing multiplied by the number of trains passing in a given period.

'Warning time' is the shortest possible time for trains to travel the sighting distance or, where whistle boards are provided, the shortest time between the sound being heard at the crossing and the train arriving at the crossing. In calculations of warning time the highest attainable train speed should be used.

Appendix B - Limitation on road and rail traffic at AOCL

1 Actual daily road vehicle usage is converted to effective daily road vehicle usage using Table 10 because the relationship between the accident probability and the actual road traffic volume is not linear. Converting the actual road traffic volume to the effective figure will give the same accident probability if the probability:traffic flow relationship is a straight line. (For a detailed explanation, see the report 'Automatic open level crossings - A review of safety' by Professor P F Stott, published in 1987 by HMSO, ISBN 0 11 5508317).

2 The effective daily road vehicle usage is then multiplied by the daily number of trains to give the effective traffic moment and hence the maximum permitted crossing speed which can be derived from Table 11.

Table 10	
Actual daily road vehicle usage	Effective daily road vehicle usage
250	**230**
500	**425**
750	**580**
1000	**705**
1250	**810**
1500	**890**
1750	**955**
2000	**1010**
2500	**1080**
3000	**1115**
3500	**1115**
4000	**1080**
4500	**1040**

Table 10	
5000	**990**
6000	**885**
7000	**765**
8000	**650**
9000	**540**
10000	**475**

Table 11	
Effective traffic moment	Maximum permitted crossing speed
	miles per hour (mph)
4000	**55**
4600	**50**
5400	**45**
6500	**40**
8200	**35**
10130	**30**
13100	**25**
15000	**less than 25**

Appendix C - Definition of viewing zone at open crossings

The viewing zone (the shaded region as shown in Figure 11) is defined by lines connecting points ‘X’ and ‘Y’ given in Table 12.

Figure 11: Definition of viewing zone at open crossings

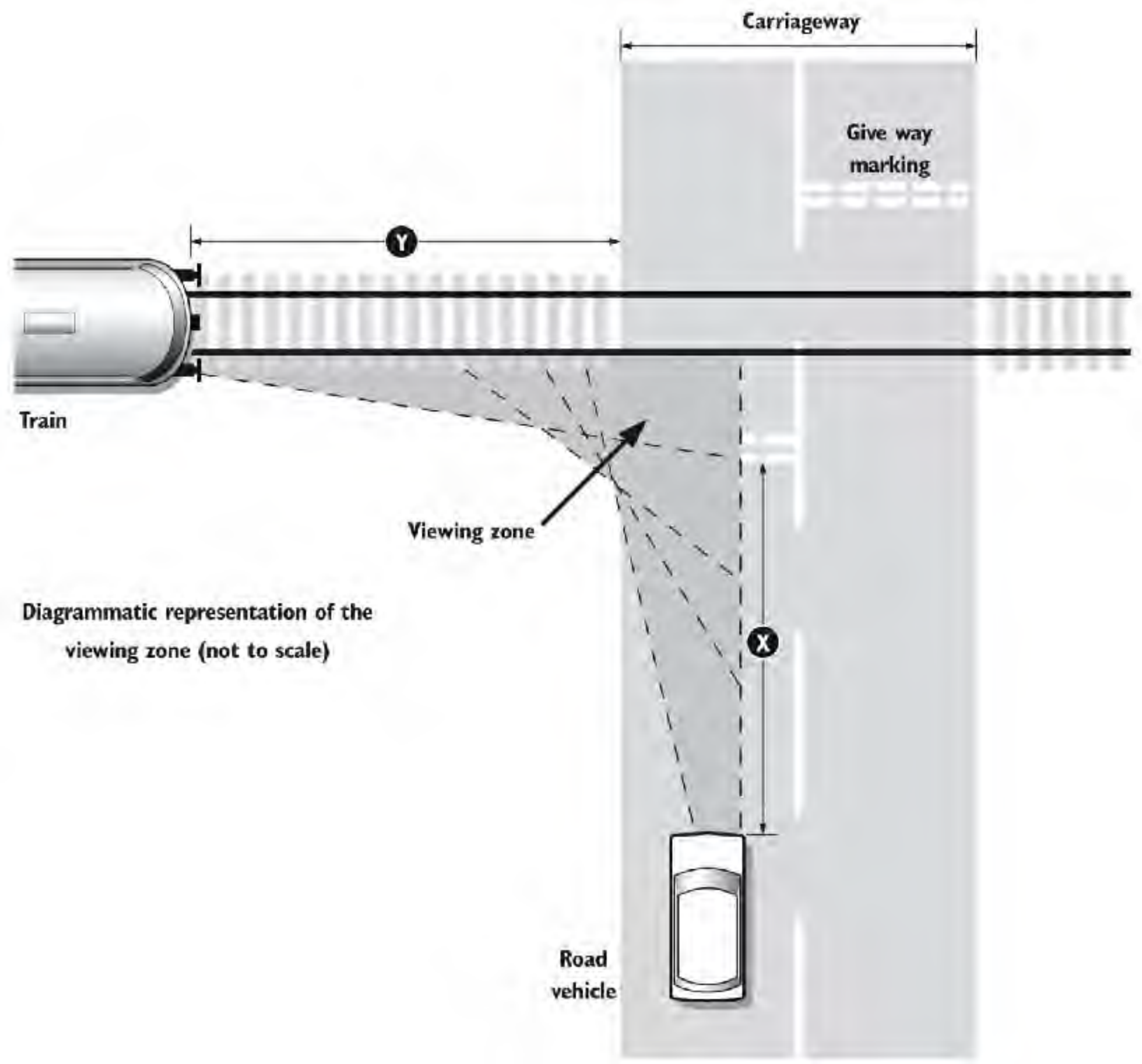


Table 12: Viewing zones			
Distances ‘x’ (metres)	Distances ‘y’ (metres) for crossing lengths of:		
	7 m	**14 m**	**21 m**
2	**140**	**170**	**200**
10	**40**	**45**	**55**
20	**25**	**30**	**35**
40	**20**	**25**	**30**

Distance ‘X’ is the distance of road vehicle users from the ‘give way’ line on the approach. Distance ‘Y’ is the distance of an approaching train from the crossing. A crossing which crosses the railway at right angles over a single line is normally considered to be 7 m long, but at longer crossings it should be possible to see trains earlier. Where road gradients are steep, distances ‘X’ should be varied accordingly. Where the 85th percentile road speed is less than 15 mph (25 km/h), the maximum value of ‘X’ may be 20 m.

Appendix D - Train pedestrian value (TPV) calculation

1 TPVs are calculated by multiplying the number of pedestrians who pass over the railway by any route at the crossing within any period of 15 minutes by the number of trains passing over the crossing in the same period.

2 Normally a census should be taken over a nine day period, between the hours 06.00 and 24.00, particularly where high volumes or vulnerable groups of pedestrians are involved. Where the number of pedestrians is low, the actual number may be determined by an estimate. Where there are regular events which boost pedestrian usage, these should be included in the census.

3 Where the data are obtained from a census, only the maximum number of pedestrians in any period of 15 minutes in the day needs to be established. Where an estimate is accepted, the number of pedestrians used in calculating TPV should be deemed to be 75% of the largest hourly value to obtain an equivalent maximum figure for a period of 15 minutes to cater for the non-uniform distribution of pedestrian flow.

4 The number of trains should be deemed to be 25% of those passing over the crossing in a period of one hour. This hour should be either:

(a) the same hour used to give the estimated hourly value of numbers of pedestrians; or

(b) the hour which includes the 15 minutes when the pedestrian number is established by census.

5 The number of trains should be rounded up to the next integer and should not normally be less than one

Appendix E - ORR level crossings team – Contact details

The ORR Level Crossings Team can be contacted at the Office of Rail Regulation, 3rd Floor, One Kemble Street, London, WC2B 4AN
Telephone: 0207 282 2000.

All submissions (both consultation and requests for orders) should be made to this address rather than direct to any out-based office or inspector. Core operating times are Monday to Friday, 09:00-17:00, though some staff may be available both before and after these times via ORR switchboard telephone number 020 7282 2000.

In addition, a number of local inspectors, working in the Network Rail routes or the heritage sector, take a significant role in the assessment of schemes. These inspectors may be used as the first point of contact for day-to-day enquiries.

Appendix F - Level Crossings Act 1983

Level Crossings Act 1983, as amended by the Transport and Works Act 1992, Level Crossings Regulations 1997, Railways Act 2005 and Road Safety Act 2006

1 -(1) Subject to the following provisions of this section, the Secretary of State may, in relation to any place where a railway crosses a road on a level (in this section referred to as a "level crossing"), by order provide for the protection of those using the level crossing.

(1A) Subsection (1) above applies whether or not the crossing is in use when the order is made; and if it is not in use when the order is made the order shall be made so as to come into force when it is in use.

(2) An order under this section may make such provision as the Secretary of State considers necessary or expedient for the safety or convenience of those using the crossing; and, in particular –

(a) may require the operator of the crossing or the local traffic authority (or both) to provide at or near the crossing any protective equipment specified in the order and to maintain and operate that equipment in accordance with the order; and
(b) may impose on the operator requirements as to the operation of the railway at or near that crossing.

(3) While an order is in force under this section in relation to a level crossing –

(a) (repealed)

(b) subject to any exceptions specified in the order, any provision made by or under any enactment as to the crossing (or level crossings including that crossing) and imposing requirements as to protective equipment at or near the crossing, the supervision of the crossing (including the provision of buildings for the purposes of supervision) or the operation of the railway at or near the crossing shall not apply in relation to the crossing.

(4) Nothing in subsection (3)(b) above affects any provision as to traffic signs made under the Road Traffic Regulation Act 1967; but a traffic sign placed on or near a road in pursuance of an order under this section shall be treated for the purposes of section 54(4) of that Act as having been placed as provided by that Act.

(4A) Nothing in subsection (3)(b) above affects any provision made by or under Part 1 of the Health and Safety at Work etc. Act 1974.

(5) An order under this section –

(a) may be varied or revoked by a subsequent order under this section; and

(b) may impose requirements as to protective equipment provided before the making of the order.

(6) The Secretary of State may make an order under this section in respect of a level crossing on being requested to do so by the operator of the crossing or without a request by the operator.

(6ZA) The Secretary of State may not make an order without a request by the operator unless:

(a) he has consulted the Office of Rail Regulation and the local traffic authority about the order he proposes to make; and

(b) having done so, he has sent to the operator, the Office of Rail Regulation, and the local traffic authority a copy of a draft order he proposes to make and a notice specifying the period (not being less than two months) within which they may make representations to him in respect of his proposal to make the order.

(6A) Where the Office of Rail Regulation gives written notice to an operator of a crossing that in its opinion a request should be made to the Secretary of State to make an order under this section in respect of that crossing and the notice states the reasons for that opinion, the operator shall be under a duty to make such a request.

(7) Where the operator of a crossing requests the Secretary of State to make an order under this section, the request shall be accompanied by a draft of the order which the operator is requesting the Secretary of State to make.

(8) Before making a request the operator–

(a) must consult the Office of Rail Regulation and the local traffic authority about the draft order he intends to submit to the Secretary of State; and

(b) having done so, must give written notice to the Office of Rail Regulation and the local traffic authority of his intention to make a request.

(8A) A notice given under subsection (8)-

(a) must be accompanied by a copy of the draft order which the operator intends to submit to the Secretary of State; and

(b) must specify the period (not being less than two months) within which the Office of Rail Regulation and the local traffic authority may make representations to the Secretary of State in respect of the request.

(9) The Secretary of State shall consider any representations made to him pursuant to subsection 6ZA or 8A above if they have been made within the period specified in the notice referred to in the subsection concerned and may then, if he decides to make the order, make it in accordance with the draft sent to persons pursuant to the subsection concerned or with such modifications as he thinks fit.

(10) This section applies where a Government department is operating a railway at a level crossing as it applies in other cases.

(10A) Any order made under section 124 of the Transport Act 1968 or section 66 of the British Transport Commission Act 1957 and in force immediately before 1st April 1997, including any requirements or conditions laid down under the order, shall have effect as if it had been made under this section.

(10B) In performing his functions under this Act the Secretary of State shall take account of any advice given to him with respect thereto by or on behalf of the Office of Rail Regulation.

(11) In this section –

"barrier" includes gate;

“local traffic authority”, in relation to a crossing, means the authority which for the purposes of the Road Traffic Regulation Act 1984 is the local traffic authority for the road crossed by the railway at the crossing;

"operator", in relation to a crossing, means any person carrying on an undertaking which includes maintaining the permanent way;

"protective equipment" includes barriers, lights, traffic signs, manual, mechanical, automatic, electrical, telephonic or television equipment or other devices;

"road" means any highway or other road to which the public has access; and

"traffic sign" has the same meaning as in the Road Traffic Regulation Act 1984.

2.- (1)This Act may be cited as the Level Crossings Act 1983.

(2) This Act shall come into force at the end of the period of three months beginning with the day on which it was passed.

(3) This Act does not extend to Northern Ireland.

Appendix G - Supporting documentation - level crossing order assessment checklist

Items on this list will normally be required, but you will need to consider the particular circumstances at each individual level crossing to determine whether all the items listed are required, or whether additional documentation may be needed to support your assessment.

Major works at existing level crossings, including change in protection method, complete renewal or major modernisation

1) An outline project description and risk assessment, together with justification that the type of protection proposed is suitable for current or foreseeable road and rail traffic levels. As a minimum, to be suitable and sufficient, the risk assessment process will need to:

- Identify all the hazards at the crossing for each type of user. Consider all possibilities including foreseeable misuse, seasonal variations and abnormal working. Design should eliminate risk where reasonably practicable.

- Evaluate the risks posed to all users, road and rail, by the identified hazards. Consider the likelihood of an accident and the probable results. Level crossing accidents are usually serious, and have the potential to be catastrophic.

- Consider how risks might arise or change over the expected life of the crossing.

- Identify how, and to what extent, the chosen measures control risk. Taking into account the important issue of road-user convenience, all reasonably practicable steps to reduce risk should be taken. Explain how the chosen risk control measures will maintain or, preferably, improve on previous safety arrangements.

- Identify any residual risks and be able to justify why no further action is warranted.

- Be recorded and clearly reflected in the design and installation of the Crossing.

Practical guidance on recording assessment findings

Regulation 3 of the Management of Health and Safety at Work Regulations 1999 requires the making of a ‘suitable and sufficient’ health and safety risk assessment for the purpose of identifying the measures that need to be taken to comply with the relevant law. The *significant findings* of the assessment should be recorded.

i. The simple purpose of all this is to help dutyholders make good decisions in compliance with the law. The record of assessment will set out the reasoning behind those decisions. A written record will also be a convenient means for showing others that a proper process has been followed. The selection of protection arrangements should be based on the findings of the risk assessment.

ii. In making decisions about risk reduction, regard must be given to the 'general principles of prevention' set out in schedule 1 of the above Regulations, whereby avoidance of risk is the first choice and issuing instructions is the last. A reference to the approved code of practice and guidance to the Management of Health and Safety at Work Regulations 1999 can be found in Appendix H – Publications.

iii. There is no single 'right way' of setting out assessment findings. There is no set style or length, though railway infrastructure managers may find it helpful to develop their own standardised formats. In most cases it should be possible to present the significant findings of assessment in a concise manner. There is much up to date information freely available on the topic of safety at level crossings. Railway infrastructure managers should be quite capable of undertaking, in-house, risk assessments and presenting their findings to a good standard. They will, of course, need to take into account the advice, and responsibilities, of other stakeholders, such as local traffic authorities.

iv. The record of assessment should be presented as a single, identifiable, document or bundle of information. Where necessary, and to avoid duplication, reference should be made to other documents such as ground plans, census results, published safety statistics, etc. In many cases a quantitative risk modelling process is used in support of the assessment. This is good, though care needs to be taken to ensure that the workings, sensitivities and limitations of any such process are understood by all concerned.

v. The record of assessment should:

- Describe when and how the assessment was undertaken and who was involved, i.e. the users of user worked crossings;
- Make clear what input data was used and confirm steps taken to ensure its accuracy;
- Explain how assessment findings have been interpreted and 'sense checked' by competent persons;
- Record the arrangements put in place to control risk, providing the reasoning for their selection or, in the case of measures not used, rejection. In determining the cost-effectiveness of new safety measures, pricing should be in line with the competitive market;
- Give proper consideration to the needs of crossing users whether in vehicles or not and whether at public or private.

2) Ground plans showing the level crossing at a scale of 1:50 or 1:100.

3) A plan, at a suitable scale, showing the highway approaches and positions of all proposed signs and road markings and a sketch showing the position of road traffic signals and barriers.

4) For all automatic crossings, half barrier crossings (not locally monitored) and relevant vehicular user worked crossings, a scale drawing detailing the category of road profile proposed, and showing the vertical road profile across the full width of carriageway over the crossing and on all approaches along the length of

the carriageway for a distance of 30 m from the nearest rail. The drawing should demonstrate that the claimed profile is achieved. (Items 3, 4 and 5 can be presented on one drawing).

5) As appropriate to the submission, signalling scheme plans (or relevant parts) showing:

a) for Automatic Half Barrier Crossings (AHBC)

'Strike-in points', control tables for protecting signals if there are station controls or similar within the scheme, distance of protecting signals from the crossing and line speeds and calculations relating to the acceleration of trains, where required.

b) for Automatic Half Barriers Locally Monitored (ABCL) and Automatic Open Crossings Locally Monitored (AOCL)

The position of stop boards, special speed restriction boards (SSRB), advance warning boards (AWB), 'strike-in points', details of the calculations and standards used to position the boards and strike-in points, gradients and line speeds (please contact ORR in advance of making any AOCL or ABCL submission if other signalling alterations are proposed in the vicinity of the level crossing).

c) for Automatic Open Crossings Locally Monitored (AOCL)

A robust, comprehensive, risk assessed justification for the continued provision of AOCL type crossing equipment (or Manually Operated Crossings Locally Monitored) rather than any form of barrier crossing will be required in all cases. Orders for new AOCL crossings will not normally be considered.

d) for Open Crossings (OC)

The position of stop boards, special speed restriction boards (SSRB), advance warning boards (AWB), calculations and standards used to position the boards, gradients, line speeds and details of the viewing zone proposed.

e) for Manually Controlled Barriers with CCTV (MCB CCTV) and for Manually Controlled Barriers (MCB)

The position of protecting signals and control tables, the position of 'strike-in points', if authority for auto-lowering is sought, gradients and line speeds.

f) for Miniature Stop Light crossings (MSL)

'Strike-in points', control tables for protecting signals if there are station controls or similar within the scheme, distance of protecting signals from the crossing, line speeds and details of authorised usage of the crossing.

6) A detailed road traffic census (covering all user types) covering a minimum of a representative 9-day period between 0600-2400 hours to accompany all automatic crossing submissions, particularly AOCL, and at MCB CCTV crossings, if authority for auto-lowering is sought. Seasonal variation in traffic levels should be addressed in any supporting census analysis. Permitted and normal road traffic approach speeds should be included. Rail traffic census details should also be supplied. Recent (less than 18 months old) traffic census information should be available if requested for other submissions. (A project may be delayed

if this information has not been taken into account.) Anticipated barrier down-time should be considered if significant changes are proposed, for example conversion from AHB to MCB.

7) Photographs of the existing level crossing from all road and rail approaches.

8) For new MCB CCTV level crossings or where the signaller's control arrangements are changed, an ergonomics/human factors report on the proposed signaller control functions, workload and furniture layout is required.

9) A statement of the status of the crossing, for example 'private road with public bridleway and footpath' and, if a public vehicular crossing, reference to the authority under which the railway is permitted to cross the road on the level - the original railway Act.

10) A draft level crossing order (or draft variation order) and a request addressed to the Secretary of State for Transport for consideration of the draft, along with copies of the covering letters sent to the statutory consultees.

11) Confirmation of the consultation with local authorities and ORR, with details of any matters raised and resultant changes.

Minor works at existing level crossings

12) A statement of compliance with standards and regulations signed by a competent person within the crossing operator's organisation.

13) An outline description and risk assessment of the proposed work.

14) A draft level crossing order (or draft variation order) and a request addressed to the Secretary of State for Transport for consideration of the draft, along with copies of the covering letters sent to the statutory consultees.

15) Confirmation of the consultation with local authorities and ORR, with details of any matters raised and resultant changes.

16) Items 3-9 above, as appropriate.

Appendix H - Legislation and publications

Legislation

The Railway Clauses Consolidation Act 1845 and the Railways Clauses Consolidation (Scotland) Act 1845

Road and Rail Traffic Act 1933

The Electricity at Work Regulations 1989 (Statutory Instrument No 1989/635)

New Roads and Street Works Act 1991

Transport and Works Act 1992

The Town and Country Planning and General Development Procedure Order 1995 (Statutory Instrument No. 1995/419)

The Private Crossings (Signs and Barriers) Regulations 1996 (Statutory Instrument No1996/1786)

Railway Safety (Miscellaneous Provisions) Regulations 1997
(ISBN 0-7176- 1262-7)

The Provision and Use of Work Equipment Regulations (PUWER) 1998 (Statutory Instrument No 1998/2306)

Railway Safety Regulations 1999 (ISBN 0-7176-2442-0)

The Management of Health and Safety at Work Regulations 1999 (Statutory Instrument No 1999 3242)

Level Crossings Act 1983 (as amended by the Level Crossings Regulations 1997 and the Road Safety Act 2006)

The Railways and Other Guided Transport Systems (Safety) Regulations (ROGS) 2006 (Statutory Instrument No. 2006/599) as amended by The Railways and Other Guided Transport Systems (Safety) (Amendment) Regulations 2011

The Construction (Design and Management) Regulations 2007 (Statutory Instrument No 2007/320)

The Traffic Signs Regulations and General Directions 2002 (as amended by the Traffic Signs (Amendment) Regulations and General Directions 2008 -Statutory Instrument No 2008/2177)

The Equality Act 2010

Publications

A guide to the Level Crossing Regulations 1997 L97 (ISBN 0 7176 1261 9)

Approved Code of Practice: Safe use of work equipment. Provision and use of work equipment regulations 1998 L22 HSE Books 2008 ISBN: 9780717662951

The Traffic Signs Manual, Chapters 4/5, (ISBN 978 0 11 552411 0 and ISBN 0 11 5524797), found on DfT's website at: http://www.dft.gov.uk/pgr/roads/tss/tsmanual/

Installation of Traffic Signals and Associated Equipment (ISBN 0 11 552008 2)

Safety at Street Works and Road Works, Code of Practice
(ISBN 0 11 551958 0)

Railway Group Standards and Network Rail Line Standards and Codes of Practice

Guidance on the use of Tactile Paving Surfaces (rev June 2007) found on DfT's website at:
http://www.dft.gov.uk/transportforyou/access/peti/guidanceontheuseoftactilepav6167

Prevention of Trespass and Vandalism on Railways - a good practice guide
(ISBN 0 7176 1661 4)

Appendix C
Definitions: Level Crossing Guidance Document: LCG 02

- **Vulnerable users:** at level crossings can be defined as people who when compared with typical users, are likely to take an extended time to traverse; due to disability or distraction; or might be at greater risk of harm due to their perception of risk.
- **Defining vulnerability:** there are a number of factors that can result in people being at greater risk when using level crossings. These can include (but are not limited to) limitation in mobility, visual or hearing impairment, cognitive ability, being encumbered and also inability to comprehend English i.e., to read signage and / or speak to signallers.
- **Types of Vulnerable users:** may include people with physical and / or mental disabilities or other impairments. Users with physical disability or elderly people aided by a walking stick, wheelchair or mobility scooter, young children – unaccompanied or in groups; distracted users who wear head-obscuring clothing and or earphones, or talking on a mobile phone, dog walkers; cyclists who are known not to dismount and considered at risk; Non-English language speakers.
- **Encumbered users:** Users who would otherwise not be considered vulnerable but who are crossing whilst carrying bags or other heavy items, pushing a pram, cycle, wheelbarrow or trolley, or leading a dog (either on or off a lead) or riding/leading a horse.

Appendix D

Signage referred to in the NRA and positioned at Newsham footpath crossing

Appendix C – Network Rail Standards

Ref:	**NR/L3/XNG/308**
Issue:	1
Date:	05 September 2020
Compliance date:	05 September 2020

Level 3

Work Instruction

Risk assessing level crossings

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Ref:	**NR/L3/XNG/308**
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User information

This Network Rail document contains colour-coding according to the following Red–Amber–Green classification.

Red requirements – *no variations permitted*

- Red requirements are to be complied with and achieved at all times.
- Red requirements are presented in a red box.
- Red requirements are monitored for compliance.
- Non-compliances will be investigated and corrective actions enforced.

Amber requirements – *variations permitted subject to approved risk analysis and mitigation*

- Amber requirements are to be complied with unless an approved variation is in place.
- Amber requirements are presented with an amber sidebar.
- Amber requirements are monitored for compliance.
- Variations can only be approved through the national variations process.
- Non-approved variations will be investigated and corrective actions enforced.

Green guidance – *to be used unless alternative solutions are followed*

- Guidance should be followed unless an alternative solution produces a better result.
- Guidance is presented with a dotted green sidebar.
- Guidance is not monitored for compliance.
- Alternative solutions should be documented to demonstrate effective control.

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Compliance

This Network Rail standard/control document is mandatory and shall be complied with by Network Rail Infrastructure Limited and its contractors if applicable from 5th September 2020.

Where it is considered not reasonably practicable[1] to comply with the requirements in this standard/control document, permission to comply with a specified alternative should be sought in accordance with the Network Rail standards and controls process, or with the Railway Group Standards Code if applicable.

If this standard/control document contains requirements that are designed to demonstrate compliance with legislation they shall be complied with irrespective of a project's Governance for Railway Investment Projects (GRIP) stage. In all other circumstances, projects that have formally completed GRIP Stage 3 (Option Selection) may continue to comply with any relevant Network Rail standards/control documents that were current when GRIP Stage 3 was completed.

NOTE 1: *Legislation includes Technical Specifications for Interoperability (TSIs).*

NOTE 2: *The relationship of this standard/control document with legislation and/or external standards is described in the purpose of this standard.*

Disclaimer

In issuing this standard/control document for its stated purpose, Network Rail Infrastructure Limited makes no warranties, expressed or implied, that compliance with all or any standards/control documents it issues is sufficient on its own to provide safety or compliance with legislation. Users are reminded of their own duties under legislation.

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[1] *This can include gross proportionate project costs with the agreement of the Network Rail Assurance Panel (NRAP).*

Issue record

Issue	Date	Comments
1	September 2020	Content transferred from NR/L3/OPS/045/3.08

Reference documentation

NR/L2/OCS/031	Assessing and assuring the impact of operational risks relating to changes to the train plan
NR/L2/OPS/100	Provision, Risk Assessment and Review of Level Crossings
NR/L2/SIG/30021	Alterations to Authorised Line Speeds
NR/L3/INF/02226	Corporate Records Retention Schedule
NR/L3/XNG/207	Level Crossing Manager Competence Framework

Legislation

This standard/control document has been reviewed to confirm it complies with the following legislation:

Health and Safety at Work etc. Act 1974

The Management of Health and Safety at Work Regulations 1999

Level Crossing Act 1983

The Railways and Other Guided Transport Systems (Safety) Regulations 2006 (as amended)

Road Traffic Act 1988 & 1991

The Traffic Signs Regulations and General Directions 2016

The Private Crossings (Signs and Barriers) Regulations 1996

Compliance with this standard/control document does not, on its own, provide compliance with the legislation listed.

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1 Purpose

This standard provides a process for risk assessing level crossing assets.

It contributes to the control of the following high-level risks:

a) Level Crossings: vehicle, person or animal on the line at risk of collision; and

b) Level Crossings – non-collision (with train) incident.

Level crossing risk assessments form part of a multi-disciplinary process that demonstrates that level crossings remain safe, reliable and legally compliant.

2 Scope

This standard describes a method of risk assessing operational level crossings on Network Rail's managed infrastructure. It includes:

a) the core level crossing risk assessment process;

b) frequency of risk assessments;

c) use of the All Level Crossing Risk Model (ALCRM) as the risk model;

d) monitoring and response to level crossing incidents and accidents; and

e) level crossing risk records.

It does not apply to authorised walking routes that cross the railway unless they are classified as a staff crossing with white lights. It does not apply to road rail access points or track access points.

A flowchart of the process is shown in Appendix A.

3 Roles and responsibilities

R – Responsible is the person or people who are responsible for performing a certain task or action. **A – An Accountable** person is one who has overall accountability to make sure that a task or action is completed. **C – Consulted** people have an input into the task or action, this can be providing information, reviewing documents or attending workshops etc. **I – Informed** people are those who receive the output of a task or process. * Denotes option for delegation		**Level Crossing Manager**	**Route Level Crossing Manager r**	**Risk Assessor**	**Operations Risk Advisor**
5	General	R	AC		

6	Competence	R	AC		
7	Risk Assessment Frequency	R	AC		
8	Risk Assessment Process – Collate Information	R	AC		
9	Risk Assessment Process – Identify Risk Controls Optioneering	CI	CI	AR	
10	Risk Assessment Process – Implement Risk Controls	CI	RCI	AR	R
11	Level Crossing Incidents and Accidents	I	I	AR	I
12	Level Crossing Risk Records	R	RA	RA	A

Table 1 – RACI chart

4 Definitions

Term	Definition
Optioneering	Optioneering is the opportunity to investigate potential safety improvements at a level crossing or its environment. Options that are modelled in ALCRM and selected for progression should be practicable and targeted toward the risks and hazards identified.
Risk Assessor	The Risk Assessor will almost always be the Level Crossing Manager. In certain cases, such as sickness, vacancies or annual leave, these duties may also be undertaken by the Route Level Crossing Manager or Operations Risk Advisor.
Operations Risk Advisor	Where a Route has appointed an Operations Risk Advisor to oversee line management responsibility for Level Crossing Managers, their RACI responsibilities conform to those of the Route Level Crossing Manager.

Table 2 – Terms and definitions

NOTE: *This is a generic RACI and Route specific responsibilities may be used – Routes are responsible for briefing such changes to their users.*

5 General

5.1 Operational level crossings on Network Rail managed infrastructure shall be risk assessed as required by NR/L2/OPS/100.

5.2 Risk assessment of level crossings shall include:

a) an ALCRM assessment of risk incorporating site visit, census and data collection;

b) demonstration of collaborative working with stakeholders;

c) optioneering; and

d) production of a Narrative Risk Assessment (NRA).

Level crossings shall be risk assessed at the required frequencies (see clause 8).

At hybrid level crossings where separate public and private rights exist, a separate risk assessment shall be conducted for each element of the asset.

***NOTE 1**: All elements of a level crossing risk assessment should normally be undertaken by the same person.*

***NOTE 2**: An example of a hybrid level crossing is one where a public footpath and private vehicle gates each provide separate means of access across the railway.*

6 Competence

6.1 Level crossing risk assessments shall be undertaken by risk assessors who:

a) have completed the level crossing risk assessment training; and

b) have demonstrated the capabilities necessary to undertake level crossing risk assessments; or

c) are under mentorship by someone who is competent to undertake level crossing risk assessments.

***NOTE:** The level crossing competence framework is shown in NR/L3/XNG/207.*

7 Risk assessment frequency

7.1 Calculated Frequency

The frequency of level crossing risk assessments shall be based on the calculated risk for each crossing.

The calculated frequency is the minimum frequency at which crossings shall be risk assessed.

***NOTE:** The minimum risk assessment frequencies are calculated by ALCRM using the live risk scores. Risk assessment frequencies may be increased, see clause 7.2.*

Crossings are placed into one of four categories. The categories, their associated risk assessment frequency and categorisation criteria are shown in Table 3.

The risk assessment frequency for hybrid level crossings shall be determined by the highest risk score.

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Category	Criteria	Assessment Frequency (Years)
Red	• Individual risk is A • Collective risk is 1 • Collective risk is 2 • Collision frequency (pedestrian + vehicle) is > 0.01	1.25
Yellow	• Individual risk is B • Individual risk is C • Collective risk is 3 • Collision frequency (pedestrian + vehicle) is > 0.001 • Sighting time is less than warning time by > 4 seconds ***NOTE:*** *This does not take mitigations such as whistle boards and telephones into account.*	2.25
Double Yellow	Risk score is not M13 and no red or yellow criteria apply	3.25
Green	Risk score is M13	Not assessed

Table 3 – Risk assessment frequency and risk categorisation criteria

NOTE: *Level crossing MSTs in Ellipse should align to ALCRM frequencies and be reviewed as part of an annual check of risk assessment frequencies.*

7.2 Calculated risk assessment frequency review

The risk assessor shall review the risk assessment frequencies calculated by ALCRM and record their decision when the frequency is increased.

The frequency may be increased where structured expert judgement or limitations in ALCRM's ability to model crossing specific risks are present.

7.3 Additional risk assessment triggers

A level crossing risk assessment shall be carried out:

a) at the evaluation stage for new crossings, proposed renewals, or alterations to the type of protection;

b) after commissioning of the renewal or safety enhancement of a level crossing;

c) within four weeks of a formal expression of concerns from internal or external stakeholders, e.g. TOCs (Train Operating Companies), ORR (The Office of Rail Regulation), highways authority, authorised user;

d) before significant timetable changes (as a minimum, optioneering of the impact of timetable change);

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NOTE 1: *See NR/L2/OCS/031 before alterations to permissible line speeds, see NR/L2/SIG/30021.*

e) within four weeks of an incident of misuse, near miss or accident which triggers the requirement for a risk assessment, see Table 4;

f) before Network Rail responds to planning proposal consultations that indicate a substantial change in traffic volumes, patterns or speeds (as a minimum, optioneering of the impact of traffic volume);

g) following a report of a significant change in the environment which has an impact on a level crossing;

h) within four weeks of receiving information of substantial increase in road traffic volume;

i) before infrastructure changes that affect a level crossing, e.g. new lines / sidings, line closures or the reopening of mothballed lines.

NOTE 2: *Risk assessments are also undertaken to support decision making for enhancements projects or stand-alone renewals.*

NOTE 3*:* *Apply structured expert judgement when deciding if changes are significant or substantial.*

NOTE 4: *In the case of very lightly used crossings a small increase in the number of road vehicles will have a greater impact on risk.*

8 Risk assessment process – collate information

8.1 Initial contact with authorised users of User Worked Crossings (UWC)

Risk assessors shall use the Level Crossing Sharepoint system to correspond with authorised users. Authorised users of user worked crossings shall be sent the templated authorised user initial letter which includes the authorised user questionnaire. Letters shall be sent between two and three months before the date of the next scheduled risk assessment.

NOTE: *Contact with authorised users of user worked crossings is important to support our understanding of risk. It enables us to work jointly with authorised users to improve level crossing safety.*

Letters shall be sent with a pre-paid envelope for authorised users to respond.

Authorised users might provide an email address as their preferred means of contact. In these circumstances, authorised user letters should be sent as email attachments.

8.2 Follow up contact with authorised users of User Worked Crossings

Where contact telephone numbers are available, risk assessors shall telephone authorised users to confirm their attendance at the site visit.

8.3 Prepare for site visit

Risk assessors shall prepare for the site visit. As a minimum this shall include:

a) completing the office based element of the risk assessment;

b) a review of previous census data;

c) deciding which type of census will be undertaken and which equipment shall be used;

NOTE 1: *Factors to take into account include time of day, duration and need for a second census due to seasonal variations.*

d) obtaining crossing usage information held by the controlling signal box e.g. records of requests to use the crossing entered in the occurrence book for user worked crossings, drivers of long or slow moving vehicles, herding animals; and

e) using appropriate 'smart' sources of information, e.g. local sources of information on crossing usage held in site logs by businesses or reports from residents, Google maps, local authority websites, SMIS (Safety Management Information System).

NOTE 2: *See Level Crossing Guidance documents LCG 01 and LCG 02 which are available on the Level Crossings Hub.*

8.4 Stakeholder involvement

Risk assessors shall decide if stakeholder representation is needed during the site visit. Arrange to meet stakeholders on site when their attendance is needed.

8.5 Carry out site visit

Risk assessors shall use a mobile device when undertaking the risk assessment site visit.

Risk assessors shall use the mobile device to record site visit inputs to risk assessments. The mobile device shall only be used in a position of safety.

NOTE: *The mobile device presents risk assessors with the relevant questions for the crossing being risk assessed. It provides risk assessors with the available fields and options to record the inputs to the risk assessment.*

If the mobile device fails, risk assessors can undertake risk assessment site visits using data collection forms.

8.6 Confirm usage – no users observed

At crossings where a quick census is undertaken, no users are observed and there is no visual or other supporting evidence of crossing use:

EITHER:

a) where possible carry out appropriate local investigations to substantiate usage, e.g. contact the authorised user, speak to nearby residents, check the internet for local walking groups etc…; and

b) deploy census equipment for a minimum of one month to verify if the crossing is being used.

If the collated information / evidence from investigations support that the crossing is not being used then:

a) where possible, establish and record if non-usage is temporary or permanent;

b) record no use as an estimated census in ALCRM and add supporting commentary.

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NOTE 1: *Where permanent non-use has been established, closure should be investigated and if practicable pursued.*

NOTE 2: *If agreement can be reached with the authorised user, lock crossing out of use until such time as it is needed again.*

OR:

a) if local investigations are not possible;

b) record no use as an estimated census in ALCRM and add supporting commentary.

Local investigations will generate one of two outcomes:

EITHER:

a) the crossing is being used and the risk assessment shall be updated with the revised census information and new risk assessment detail and the asset should continue to be risk assessed at the required frequency; or

b) the crossing is not being used and the M13 risk assessment remains valid. Confirm its M13 status in ALCRM with suitable commentary and continue to monitor for use during asset inspection visits.

If monitoring during asset inspection visits identifies that the crossing is being used, conduct a new risk assessment within four weeks.

If informed that a crossing with M13 status is being used, a new risk assessment shall be conducted within four weeks.

NOTE: *Interim measures might be needed before the new risk assessment is conducted.*

A flowchart of the action to take is shown in Figure 1.

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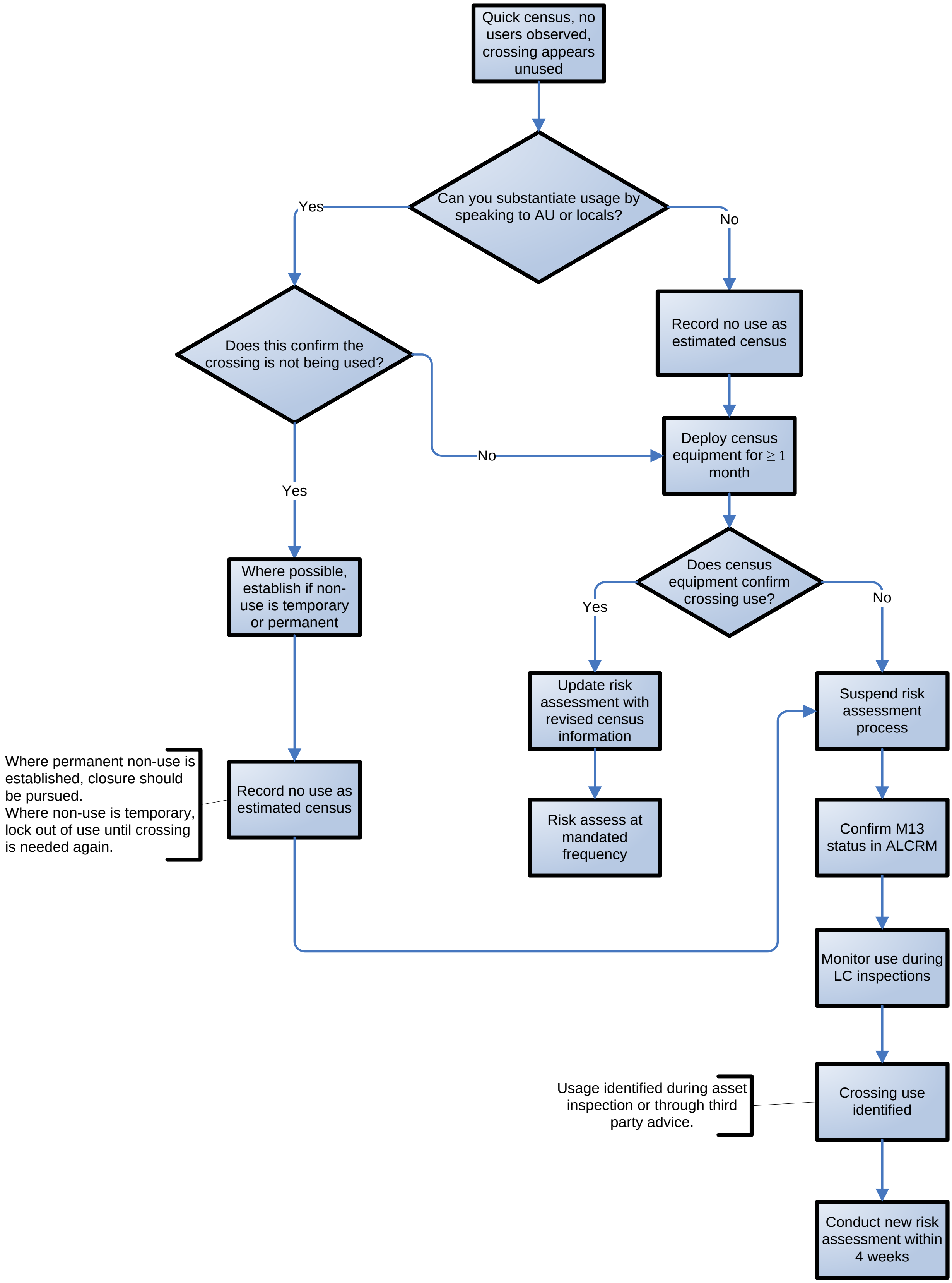

Figure 1 – Action to take when no users observed

8.7 Post site visit follow up

After completing the site visit, follow up checks might be needed. These can include:

a) checking the accuracy of data collected; or

b) speaking to an outside party, e.g. a local business; or

c) conducting an additional site visit.

8.8 Submit data into ALCRM

Risk assessors shall upload the data collected for the risk assessment into ALCRM from the mobile device.

NOTE: *To avoid loss of data, always upload the data collected where full Wi-Fi is available.*

Where risk assessment data is not recorded on the mobile device, e.g. device failure or paper copy used, risk assessors shall manually enter the data into ALCRM.

8.9 Check for existing safety benefits

Check the mitigations tab of the previous risk assessment in ALCRM to determine if any safety benefits have been applied, e.g. spoken alarm or red light safety equipment. Apply the safety benefits to the new risk assessment if still applicable.

8.10 Carry out ALCRM sign-off checks

A sign-off check shall be undertaken for each risk assessment. This shall be conducted by a person who meets the requirements of clause 7.

The person undertaking the check shall focus on key inputs and sense check all data for errors and anomalies. Any issues identified shall be discussed with the relevant risk assessor. Agreement shall be reached on any corrective action to be taken prior to sign off.

8.11 Sign-off ALCRM risk assessment

Risk assessments shall be signed off in ALCRM:

a) within six weeks of the site visit; and

b) by a person who meets the requirements of clause 7.

8.12 Changes to risk assessment frequency

ALCRM provides a warning of change in risk assessment frequency.

If the risk assessment frequency has changed, the risk assessor shall arrange for the relevant MST (Maintenance Schedule Task) in Ellipse to be updated.

NOTE 1: *Information on changes in risk assessment frequency is held on the Analyse Results page. The change in frequency management report (available on the Level Crossings Hub) can be run periodically to identify changes in risk assessment frequency.*

NOTE 2: *MSTs are updated by the Systems Support Manager. If the ALCRM score has changed to M13, the MST should be turned off.*

9 Risk assessment process – identify risk controls optioneering

9.1 Optioneering short and long term solutions

Optioneering shall be undertaken on all risk assessments. Optioneering shall be undertaken within 12 weeks of the site visit. Options to be progressed shall be identified and set to 'recommended' status within this timescale.

Potential risk controls shall be identified taking account of:

a) the ALCRM outputs;

b) key risk drivers;

c) structured expert judgement; and

d) other sources e.g. advice from other experts or key stakeholders.

Risk controls shall include short and long term solutions as appropriate.

New Level Crossing Orders place requirements on Network Rail and local authorities to agree long term strategies for public road level crossings.

Discussions and agreements shall be referenced in the NRA, see clause 9.10, and recorded in the level crossing file, see clause 12.

NOTE 1: *Risk assessors can create a first version of the NRA to assist with identifying risk controls during optioneering.*

NOTE 2: *The Level Crossing Risk Management Toolkit (LXRMTK) http://www.lxrmtk.com and the Level Crossing Risk Management Catalogue are good sources of risk control and human factors information.*

NOTE 3: *See clause 9.9.2 for action to be taken when risk is deemed to be adequately managed by existing controls and no further mitigations are reasonably practicable.*

NOTE 4: *It is good practice to agree long term strategies for all public road level crossings and footpath crossings with local authorities. All long term strategies should be developed in consultation with the Route Asset Manager.*

9.2 Optioneering interim risk controls

Interim risk controls might be needed in addition to short and long term solutions.

As a minimum, interim risk controls shall be evaluated and progressed in the following circumstances:

a) deficient sighting; or

b) where a significant risk would exist pending delivery of short or long term solution(s).

NOTE: *See guidance on Managing Interim Risk at Level Crossings. Interim risk controls should be modelled as short term options in ALCRM.*

9.3 Copy previous options

Relevant options from the previous risk assessment shall be copied onto the new live risk assessment.

Relevant options can include those that:

a) control risk and have not previously been recommended or approved;

b) have been previously recommended and are awaiting financial authority to progress to approved stage; or

c) are approved options awaiting delivery.

NOTE: *Previous options being copied should be checked and where needed amended for consistency with the new risk assessment, e.g. census numbers, sighting distances, train service data.*

9.4 Analyse results

Modelled options shall be analysed to determine which:

a) give the greatest safety benefit as measured in Fatalities and Weighted Injuries (FWI);

b) are effective at controlling and / or reducing risk conditions present at the crossing, e.g. address key risk drivers, known incidents of misuse or potential consequences of an incident or environmental risk; and

c) are achievable and practicable.

9.5 Carry out Cost Benefit Analysis (CBA)

CBA shall be carried out on options that meet the requirements of 9.4. The CBA shall be completed using the Network Rail CBA tool.

The CBA will give a benefit to cost ratio. CBA shall be used to support the decision when selecting options that will be progressed.

The following can be used to support decision making:

a) benefit to cost ratio is ≥ 1: positive safety and business benefit established;

b) benefit to cost ratio is between 0.99 and 0.5: reasonable safety and business benefit established; and

c) benefit to cost ratio is between 0.0 and 0.49: weak safety and business benefit established.

CBA might not be needed in all cases, e.g. low cost solutions or remedies for enforcement action. CBA gives an indication of overall business benefit. It should be used to support, not override, structured expert judgement when deciding which option(s) to progress. CBA does not always adequately reflect the safety benefit that can be achieved by implementing an option.

NOTE: *Where a business to cost ratio is < 1, supporting documentation will be needed to progress an option.*

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9.6 Final option selection

Decide which option(s) will be progressed for implementation.

NOTE 1: *This could include discussing with and obtaining the support of the wider Route team.*

NOTE 2: *More than one option can be progressed. Option(s) can include interim, short and long term risk controls.*

9.7 Recommend option(s)

All option(s) that are:

a) being progressed; or

b) are to be progressed in the future;

shall be set to 'recommended' status in ALCRM.

NOTE: *The ALCRM User Guide gives guidance on recommending options. Optioneering guidance is being developed.*

9.8 Seek option approval

Obtain approval for the selected option as appropriate.

Seek financial authority for the selected option(s) where needed.

NOTE: *This includes obtaining the support of an Investment Panel where appropriate. A sponsor might be appointed.*

For technical solutions, establish the high level feasibility of selected option(s).

9.9 Option(s) approved

9.9.1 Options to be progressed

When a feasible option has obtained approval, including financial authority where needed, it shall be set to 'approved' status in ALCRM.

Review the progress of recommended option(s) that have not gained financial authority or where feasibility has not been established within six months. Establish if the option remains viable.

Risk assessors shall revisit option selection if options are not approved or are not viable and evaluate if there are other controls which might be better suited to manage safety.

NOTE: *Further information is in 9.1 and 9.2.*

9.9.2 No options to be progressed

Risk assessors shall 'recommend', 'approve' and 'implement' a 'no further so far as is reasonably practicable (SFAIRP) mitigation identified' option where:

a) risk is deemed to be adequately managed by existing risk controls, e.g. at a CCTV level crossing; and

b) no further safety benefits are reasonably practicable.

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9.10 Complete a Narrative Risk Assessment (NRA)

The risk assessor shall complete a NRA for the level crossing being risk assessed.

As a minimum a NRA shall contain:

a) information automatically extracted from ALCRM;

b) enhanced qualitative narrative to greater articulate the risks present and support decision making;

c) conclusions relating to the management of risk in the interim, short and long term; and

d) evidence of risk control option(s) identified, those being progressed and those identified for future progression.

The NRA shall be completed within 12 weeks of the site visit.

NOTE 1: *The process for creating and guidance for completing NRAs are available on the Level Crossings Hub.*

NOTE 2: *The NRA is a risk assessment report for the level crossing. It should be written in report format.*

NOTE 3: *Review and update the joint long term strategy for all public road crossings when completing the NRA.*

9.11 NRA quality assurance process

All Level Crossing Managers (LCMs), Route Level Crossing Managers (RLCMs) and their nominated representatives shall undertake an assurance of the quality and consistency of level crossing risk assessments.

Checks should include:

a) accuracy of information collected as part of the core ALCRM data collection activity;

b) consistency of information; tracking for content which conflicts or is ambiguous;

c) detail of qualitative information; completeness, robustness, appropriateness;

d) identification of risks and hazards; relative to crossing users and crossing environment;

e) story board of NRA; content flows from beginning to end – e.g. there are no new hazards denoted in the conclusions section which do not feature earlier in the NRA;

f) the risk controls considered, recommended or rejected are appropriate to address the risks and hazards identified and are proportionate to these risks;

g) cost benefit analysis is completed, where this is required, and the BCR supports the recommended action(s) and/or legal, moral and economic considerations together with time, money and effort support proposals;

h) the language used is consistent with agreed protocols and terminology and would not be considered emotive or inappropriate; e.g. Deliberate misuse and user human error are applied correctly, and ‘misuse’ is avoided in narratives

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The NRA assurance process shall be completed within 12 weeks of the site visit.

A flowchart detailing the process overview is shown in Figure 2.

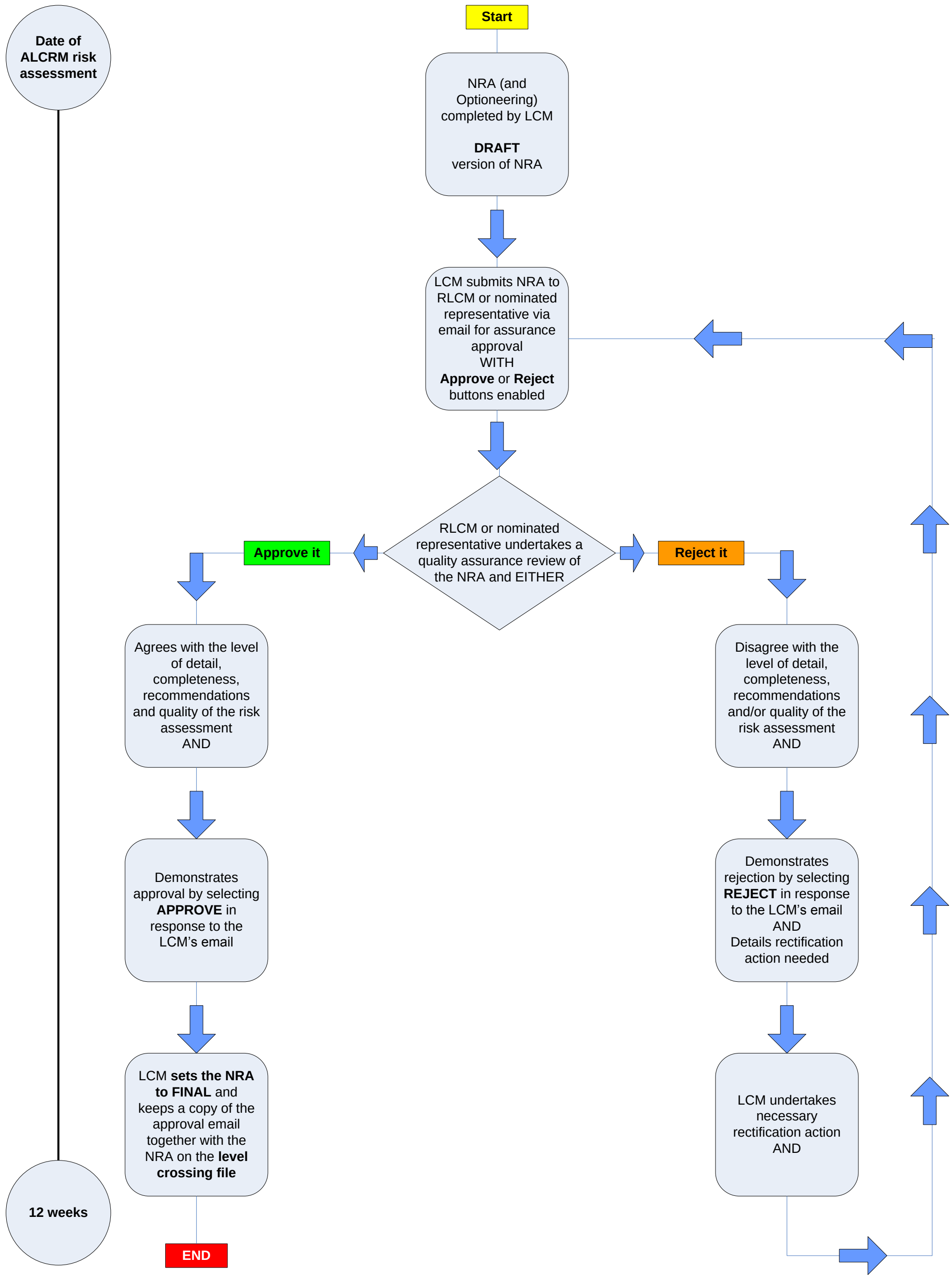

Figure 2 – NRS quality assurance process overview

9.12 Notify authorised users of risk assessment outcome

When the risk assessment is complete, the risk assessor shall send authorised users of user worked crossings the templated authorised user follow up letter and appropriate safe crossing usage information.

If the authorised user has provided alternative contact details, e.g. an email address, and confirmed they prefer to be contacted using these details, the letter shall be sent using the alternative contact details.

NOTE: *Authorised user letter templates are contained in the Level Crossing Sharepoint.*

10 Risk assessment process – implement risk controls

10.1 Stakeholder management

Risk assessors shall:

a) maintain contact with stakeholders to keep them updated on the progress of approved options;

b) inform stakeholders that work is due to take place before it commences.

10.2 Track option implementation

Risk assessors shall progress and track option(s) until they are implemented. Liaise with the sponsor and / or delivery agent as needed.

Work closely with teams implementing the works.

Recommended option(s) that have not been progressed within 12 months of the risk assessment date shall be reported six monthly. The report shall be run by the Route Level Crossing Manager (RLCM) / Operations Risk Advisor (ORA).

NOTE 1: *The suite of ALCRM management reports includes an optioneering report.*

NOTE 2*:* *Risk assessors should review the recommended options report to advise if options are still viable.*

10.3 Implement delivered option

Risk assessors shall establish that an option has been implemented and the expected safety benefits are achieved.

Evidence of implementation can include:

a) site visit;

b) photographs; and

c) documentary evidence, e.g. changes to ground plans, Level Crossing Orders etc.

When this has been established the option status shall be set to ‘implemented’ in ALCRM.

If the crossing is closed, update ALCRM to reflect temporary or permanent closure by implementing an M13 option and changing the core details to the respective status.

Follow the requirements of 8.12 to determine if the risk assessment frequency has changed.

NOTE 1: *This will generate a new live risk assessment. The risk assessment date will remain as the date of the site visit on which the implemented option is based.*

NOTE 2: *Guidance on closing and archiving crossings in ALCRM is given in AUG/CA, which is available on the Level Crossings Hub.*

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NOTE 3: *Implementing a risk control option can result in a change to the risk assessment frequency and reduce the FWI.*

10.4 Carry over ongoing options

Where more than one option is being progressed, carry over any other ongoing recommended or approved options to the new live risk assessment, see 9.3.

10.5 Notify stakeholders

Notify internal and external stakeholders of implemented options.

10.6 Decide if a new risk assessment is needed

Factors to take into account include:

a) the time elapsed between the date of site visit and delivery of implemented option; and

b) the requirements of 7.3.

Restart the process if a new risk assessment is needed.

11 Level crossing incidents and accidents

11.1 Identifying incidents and accidents

Risk assessors shall review daily Route Control logs and SMIS downloads to identify incidents and accidents affecting level crossings for which they are responsible.

Risk assessors shall also act proactively, taking account of other smart sources of intelligence such as red light safety equipment or census cameras, if such sources identify incidents which are not recorded through Route Operations Control.

This includes incidents of misuse, near misses and accidents.

11.2 Follow op to incidents and accidents

Risk assessors shall implement the actions described in Table 4.

When undertaking trigger risk assessments of user worked crossings, risk assessors shall document the method of contact and attempts to contact authorised users in the relevant level crossing file.

Involve other stakeholders in the review of risk assessments, findings and recommended actions arising from incidents and accidents.

Stakeholders include Highway Authorities, Environment Agency, the BTP (British Transport Police), Emergency Services and Road Rail Partnership Groups, etc.

NOTE 1: *Risk assessors should keep a record of incidents and accidents on the level crossings for which they are responsible to help identify when the triggers given in Table 2 are reached.*

NOTE 2: *Risk assessors should identify potential factors that might cause or increase misuse and the controls to address the risks. Risk assessors should maintain regular contact with Community Safety Managers so they are aware of route crime incidents at level crossings.*

11.3 Report reconciliation

Risk assessors shall reconcile data recorded in the Route Control log and SMIS for each period within one week of receipt of the report. Risk assessors shall inform the Safety Reporting Team) of any discrepancies. Risk assessors shall reach agreement with the Safety Reporting Team on any discrepancies identified and how they will be recorded in SMIS.

NOTE 1: *Report reconciliation can be undertaken by technical clerks or other nominated representatives should this better align with individual Routes operating structures.*

NOTE 2: *Risk assessors might receive other reports or information about incidents and accidents from local sources that can clarify the location or circumstances of incidents.*

12 Level crossing risk records

All records shall be retained as per the timescales defined in NR/L3/INF/02226.

Records shall include:

a) copies of all correspondence sent to the authorised users of user worked crossings;

b) copies of completed NRAs;

c) correspondence related to the consideration of and decisions about proposed risk controls;

d) correspondence relating to actual or potential closures;

e) long term strategy agreements and proposals;

f) actions taken as a result of monitoring and in response to incidents and accidents;

g) general correspondence relating to the risk management of level crossings.

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Crossing Type	Definition of Misuse	Trigger	Action Required	Definition of Near Miss	Trigger	Action Required	Definition of Accident	Trigger	Action Required
ABCL, AHB, AOCL(+B), AOCR	Crossing of the line during the warning sequence by vehicles or pedestrians Irregular use of the crossing by a long, low or slow moving vehicle	3 times in a period of 12 months	Undertake additional risk assessment unless within 6 months of last routine risk assessment or a risk assessment has already been undertaken in accordance with this table within the last 12 months	Crossing of the line during the warning sequence by vehicles or pedestrians necessitating emergency braking to be initiated by the train driver or too late for avoiding action to be taken	After each reported occurrence	Undertake additional risk assessment unless within 6 months of last routine risk assessment or a risk assessment has already been undertaken in accordance with this table within the last 12 months	Train has struck a vehicle or pedestrian or a vehicle has struck a train	After each reported occurrence (except pedestrian suicides)	Undertake additional risk assessment
MCB type, MG	Crossing of the line during the warning sequence by vehicles or pedestrians Barrier Strikes before the crossing clear button is pressed	3 times in a period of 12 months	Undertake additional risk assessment unless within 6 months of last routine risk assessment or a risk assessment has already been undertaken in accordance with this table within the last 12 months	Barrier Strikes after the crossing clear button is pressed	After each reported occurrence	Undertake additional risk assessment unless within 6 months of last routine risk assessment or a risk assessment has already been undertaken in accordance with this table within the last 12 months	Train has struck a vehicle or pedestrian or a vehicle has struck a train	After each reported occurrence (except pedestrian suicides)	Undertake additional risk assessment

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Crossing Type	Definition of Misuse	Trigger	Action Required	Definition of Near Miss	Trigger	Action Required	Definition of Accident	Trigger	Action Required
Open	Crossing of the line during the approach of a train (within the minimum required sighting distance)	3 times in a period of 12 months	Undertake additional risk assessment unless within 6 months of last routine risk assessment or a risk assessment has already been undertaken in accordance with this table within the last 12 months	Crossing of the line during the approach of a train by vehicles or pedestrians necessitating emergency braking to be initiated by the train driver or too late for avoiding action to be taken	After each reported occurrence	Undertake additional risk assessment unless within 6 months of last routine risk assessment or a risk assessment has already been undertaken in accordance with this table within the last 12 months	Train has struck a vehicle or pedestrian or a vehicle has struck a train	After each reported occurrence (except pedestrian suicides)	Undertake additional risk assessment
User worked crossing type	Crossing of the line during the approach of a train (within the minimum required sighting distance) Non use of telephone when provided (except incidents of the user failing to call back after use) Crossing when the MSLs are red Gates left open	3 times in a period of 12 months	Undertake additional risk assessment unless within 6 months of last routine risk assessment or a risk assessment has already been undertaken in accordance with this table within the last 12 months Make contact with authorised user to invite them to attend the risk assessment	Crossing of the line during the approach of a train by vehicles or pedestrians necessitating emergency braking to be initiated by the train driver or too late for avoiding action to be taken	After each reported occurrence	Undertake additional risk assessment unless within 6 months of last routine risk assessment or a risk assessment has already been undertaken in accordance with this table within the last 12 months Make contact with authorised user to invite them to attend the risk assessment	Train has struck a vehicle or pedestrian or a vehicle has struck a train	After each reported occurrence (except pedestrian suicides)	Undertake additional risk assessment If appropriate, make contact with authorised user to invite them to attend the risk assessment

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Crossing Type	Definition of Misuse	Trigger	Action Required	Definition of Near Miss	Trigger	Action Required	Definition of Accident	Trigger	Action Required
BW, FP, Station pedestrian crossings	Crossing of the line during the approach of a train (within the minimum required sighting distance) Crossing when the MSLs are red Crossing when the White Light Indicator is extinguished	3 times in a period of 12 months	Undertake additional risk assessment unless within 6 months of last routine risk assessment or a risk assessment has already been undertaken in accordance with this table within the last 12 months	In any of the following circumstances: • crossing of the line during the approach of a train • crossing when the MWLs are red • crossing when the White Light Indicator is extinguished necessitating emergency braking to be initiated by the train driver or too late for avoiding action to be taken	After each reported occurrence	Undertake additional risk assessment unless within 6 months of last routine risk assessment or a risk assessment has already been undertaken in accordance with this table within the last 12 months	Train has struck a pedestrian or horse	After each reported occurrence (except pedestrian suicides)	Undertake additional risk assessment

Table 4 – Responding to incidents and accidents

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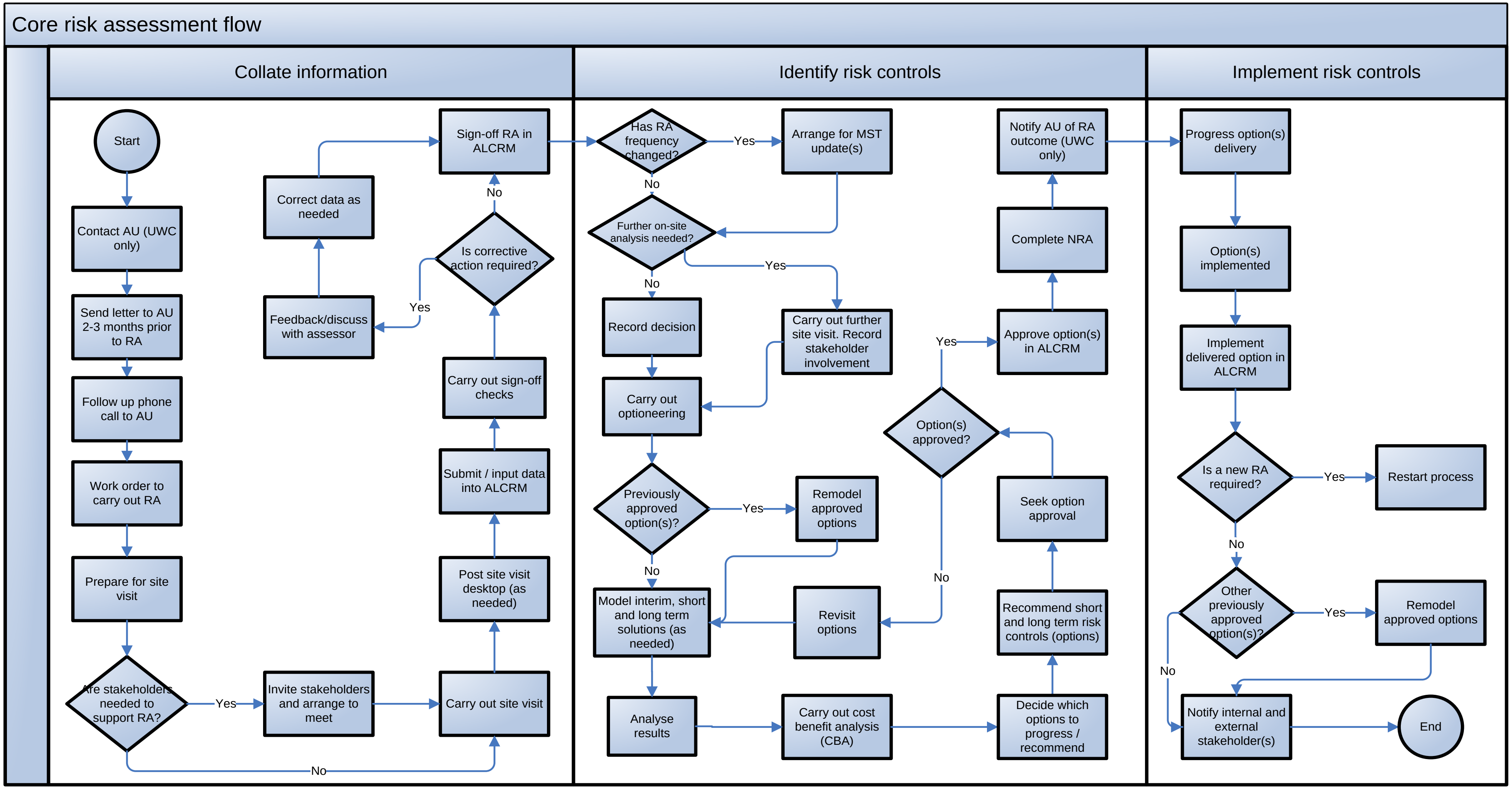
Appendix A - Risk assessment flowchart



Standard and control document briefing note

Ref: NR/L3/XNG/308	**Issue:** 1
Title: Risk assessing level crossings	
Publication date: 05 September 2020	**Compliance Date:** 05 September 2020
Standard/Control Document Owner: Head of Level Crossings	
Technical lead/contact for briefings: Darren Cottrell, Level Crossing Asset Strategy & Planning Manager	**Tel:** 07767 644687

Purpose:
This standard provides a process for risk assessing level crossing assets.

It contributes to the control of the following high-level risks:

a) Level Crossings: vehicle, person or animal on the line at risk of collision; and

b) Level Crossings – non-collision (with train) incident.

Level crossing risk assessments form part of a multi-disciplinary process that demonstrates that level crossings remain safe, reliable and legally compliant.

Scope:
This standard describes a method of risk assessing operational level crossings on Network Rail's managed infrastructure. It includes:

a) the core level crossing risk assessment process;

b) frequency of risk assessments;

c) use of the All Level Crossing Risk Model (ALCRM) as the risk model;

d) monitoring and response to level crossing incidents and accidents; and

e) level crossing risk records.

It does not apply to authorised walking routes that cross the railway unless they are classified as a staff crossing with white lights. It does not apply to road rail access points or track access points.

A flowchart of the process is shown in Appendix A.

Overview of change

All content of NR/L3/OPS/045/3.08 has been transferred to this standard. The technical content has not been amended.

Detail of change

Section(s)/clause(s)	Summary of changes
Throughout	Minor editorial changes. No change in technical content.
9.11	Removal of reference to LCG 18 NRA Route self-assurance process.

Reasons for change
The standard has been published to allow transfer of ownership of all content in NR/L3/OPS/045/3.08 from Operations SCSG to Signals and Level Crossings SCSG. The technical content has not been amended. This transfer has been undertaken to bring level crossing risk management and level crossing competence standards under one framework. This is in line with the level crossing system framework the Technical Authority is moving towards.

NR/L3/OPS/045/3.08 has been withdrawn and made historic.

Affected documents:

Reference	*Impact*
NR/L3/XNG/308 ISSUE 1	New
NR/L3/OPS/045/3.08 ISSUE 1	Withdrawn

Briefing requirements:

Will Briefing Management System be used to deliver the briefing to posts listed below? Yes

Technical briefings are given to those who have specific responsibilities within this standard/control document.

Awareness briefings are given to those who might be affected by the content but have no specific responsibilities within the standard/control document.

Details of the briefing arrangements are included in the associated briefing programme.

All posts identified for briefing must be as described in OrgPlus.

Roles are directly briefed and do not cascade briefings.

Briefing (A-Awareness/ T-Technical)	Post	Function	Responsible for cascade briefing? Y/N
A	Route Level Crossing Manager	Regions	Y
A	Level Crossing Manager	Regions	N
A	Route Asset Manager [Signalling]	Regions	N
A	Head of Liability Negotiation	Technical Authority	Y

A	Liability Negotiations Manager	Regions	Y
A	Liability Negotiations Adviser	Regions	N
A	Operations Risk Advisor	Regions	N
A	Programme Manager [Public & Passenger Safety]	Regions	N
A	Head of Corporate Passenger & Public Safety	Technical Authority	Y
A	Health Safety & Environment Director, North West & Central	Regions	N
A	Health Safety & Environment Director, Southern	Regions	N
A	Health Safety & Environment Director, Wales & Western	Regions	N
A	Head of Route Safety Health & Environment	Regions	N
A	Head of Route Safety Health & Environment [North West]	Regions	N

NOTE: *Contractors are responsible for arranging and undertaking their own Technical and Awareness Briefings in accordance with their own processes and procedures.*

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Level 3

Work Instruction

Level Crossing Manager competence framework

Approvals

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User information

This Network Rail document contains colour-coding according to the following Red–Amber–Green classification.

Red requirements – *no variations permitted*

- Red requirements are to be complied with and achieved at all times.
- Red requirements are presented in a red box.
- Red requirements are monitored for compliance.
- Non-compliances will be investigated and corrective actions enforced.

Amber requirements – *variations permitted subject to approved risk analysis and mitigation*

- Amber requirements are to be complied with unless an approved variation is in place.
- Amber requirements are presented with an amber sidebar.
- Amber requirements are monitored for compliance.
- Variations can only be approved through the national variations process.
- Non-approved variations will be investigated and corrective actions enforced.

Green guidance – *to be used unless alternative solutions are followed*

- Guidance should be followed unless an alternative solution produces a better result.
- Guidance is presented with a dotted green sidebar.
- Guidance is not monitored for compliance.
- Alternative solutions should be documented to demonstrate effective control.

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Compliance

This Network Rail standard/control document is mandatory and shall be complied with by Network Rail Infrastructure Limited and its contractors if applicable from 5th September 2020

Where it is considered not reasonably practicable[1] to comply with the requirements in this standard/control document, permission to comply with a specified alternative should be sought in accordance with the Network Rail standards and controls process, or with the Railway Group Standards Code if applicable.

If this standard/control document contains requirements that are designed to demonstrate compliance with legislation they shall be complied with irrespective of a project's Governance for Railway Investment Projects (GRIP) stage. In all other circumstances, projects that have formally completed GRIP Stage 3 (Option Selection) may continue to comply with any relevant Network Rail standards/control documents that were current when GRIP Stage 3 was completed.

NOTE 1: *Legislation includes Technical Specifications for Interoperability (TSIs).*

NOTE 2: *The relationship of this standard/control document with legislation and/or external standards is described in the purpose of this standard.*

Disclaimer

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[1] *This can include gross proportionate project costs with the agreement of the Network Rail Assurance Panel (NRAP).*

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Issue record

Issue	Date	Comments
1	September 2020	Content transferred from NR/L3/OPS/045/2.07

Reference documentation

NR/L3/OPS/045/2.14	Additional monitoring of employees and support procedure
NR/L3/OPS/045/2.16	Monitoring the quality of spoken of communications
NR/L3/OPS/045/F2.16A	Spoken Communication Monitoring Form

Managing Level Crossing Risk Management Competence Guidance LCG 07

Legislation

This standard/control document has been reviewed to confirm it complies with the following legislation:

Health and Safety at Work etc. Act 1974

The Management of Health and Safety at Work Regulations 1999

The Railways and Other Guided Transport Systems (Safety) Regulations 2006 (as amended)

Compliance with this standard/control document does not, on its own, provide compliance with the legislation listed.

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Contents

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1 Purpose

This standard details the competency assessment process used to assess the competencies required by Level Crossing Managers (LCMs) to undertake safety critical risk assessments of level crossings.

It helps assure that the competencies are understood and applied correctly and consistently. Application of this standard enables Network Rail to be confident that the safety of those who travel over our level crossings are assessed by those with the necessary skills to do so.

NOTE: *The level crossing competence Authority to Work together with relevant Assessment in The Line (AiTL) give LCM's their authority to undertake their role.*

2 Scope

This standard applies to any LCM, a person competent to carry out the role of an LCM and those involved in the management of these individuals.

3 Roles and responsibilities

R – Responsible is the person or people who are responsible for performing a certain task or action. **A – An Accountable** person is one who has overall accountability to make sure that a task or action is completed. **C – Consulted** people have an input into the task or action, this can be providing information, reviewing documents or attending workshops etc. **I – Informed** people are those who receive the output of a task or process. * Denotes option for delegation		**Level Crossing Manager**	**Line manager**	**Competent Person**	**Route Level Crossing Manager**	**Operations Risk Advisor**	**Assessor**
7	Competence Framework Overview	R	RA				
9	Simulation	CI	RA				
10	Assessment And Development Day	RA	RA				
11	Competent Person To Carry Out The Role		RA	R	C	C	
12	Visits To Level Crossing Managers	C	RA				
13	Monitoring Of Voice Communications	I	RA				

14	Non-Technical Skills Capability Assessment	CI	RA				
15	New LCMs	C	RA				R
16	Returning To Work From A Period Of Absence From Level Crossing Risk Management Duties	C	RA				RA
17	Addressing Development Needs	RC	RA				
18	Individual Competence Record	I	RA				
19	Line Manager / Assessor Competence		RA				R
20	Verification		RA				RA

Table 1 – RACI chart

NOTE: *This is a generic RACI and Route specific responsibilities may be used – Routes are responsible for briefing such changes to their users.*

4 Definitions

Term	Definition
Competence	A combination of practical, thinking and interpersonal skills along with experience and knowledge. It therefore includes both technical and non-technical elements. To be competent is the ability to perform activities to the standards expected.
Line manager	The manager with direct responsibility for making decisions about the competence of those they are managing. This person is required to act as an assessor in order to make decisions about competence.
Line manager – qualification	To carry out the requirements of this procedure line managers (or any nominated deputy) need to be a qualified assessor as set out in clause 20.
Non-technical skills	A set of behaviours, personal skills and attitudes that Network Rail expects an employee to demonstrate requiring an assessment, and if necessary, development.
Person competent to carry out the role	Anyone who is not permanently employed to undertake risk management of level crossings but may be required to under contingent arrangements.

Table 2 – Terms and definitions

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5 Level Crossing Manager (LCM)

5.1 LCMs are employed specifically to undertake the risk management of level crossings and do so as part of their core duties. Other persons competent to carry out the role are those staff within the function that should only undertake risk management of level crossings in emergency or during contingent situations. They need to maintain competency to do so.

5.2 All activities or tasks that an LCM undertakes have been risk assessed and graded as low, medium or high risk.

5.3 Activities or tasks that have been graded as low risk carry an assumed competency unless evidence is available to indicate non-compliance or poor performance.

5.4 Medium and high-risk activities or tasks are assessed through direct observation, the submission of supporting evidence and by simulation and knowledge tests.

5.5 All risk levels are supported by:

a) observation of the LCM;

b) professional discussion as part of the bands 1 to 4 performance management process;

c) naturally occurring performance indicators; and

d) simulation and knowledge tests.

5.6 An additional assessment of the non-technical skills of capabilities and behaviours demonstrated by an LCM supports line managers' decisions on competence

6 Guidance and clarification

6.1 Line managers and other staff who need further clarification on the contents of this document should contact the Level Crossing Safety Manager, National Level Crossing Team.

NOTE: *See Managing Level Crossing Risk Management Competence Guidance LCG 07 which is available on the Level Crossings Hub.*

6.2 The assessment and development day shall comprise of:

a) an observation of the LCM conducting a planned level crossing data collection;

b) input into ALCRM;

c) considered and recommended options;

d) review of the LCM's performance and supporting evidence of their risk management of their core crossing types.

6.3 There shall be simulation and knowledge testing for medium and high-risk activities that are not a normal part of the LCM's activity, or where there is insufficient naturally occurring evidence.

6.4 Line managers regularly and actively assess the competence and performance of LCMs by direct observation of level crossing risk management activities. These observations take place during visits to each LCM on their area. These visits, known as Observation visits, are detailed in clause 12.

6.5 Line managers agree action plans with LCMs where any gaps exist regarding an individual's competence. Where considerable knowledge gaps and lack of understanding are identified, line managers decide whether to remove an individual's Authority to Work (AtW) certification until competence has been reviewed, re-assessed and regained.

7 Competence framework overview

7.1 Each LCM shall be subject to a one yearly competency cycle.

7.2 Each cycle shall be sub divided into two cycles of 26 week duration.

NOTE 1: *Each level crossing risk management activity and task that an LCM is required to undertake have been risk assessed and graded as low, medium or high risk.*

7.3 Unless evidence is available to suggest non-compliance or poor performance, low risk activities shall be given an assumed competency.

7.4 Medium and high-risk activities or tasks shall be assessed through one to one discussion, direct observation and the submission of supporting evidence and by simulation and knowledge tests.

7.5 LCMs shall attend an assessment and development day with line managers once each 26 week cycle. They shall undertake those observations, knowledge tests and simulations detailed in the competency cycle. LCMs shall provide self-generated evidence of their level crossing risk management activity in support of their competence.

NOTE 2: *More frequent assessment and development days can be undertaken if needed.*

7.6 In support of the knowledge testing and simulation, line managers shall:

a) undertake observation visits,

b) monitor safety critical voice communications; and

c) undertake non-technical skills assessments with LCMs.

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7.7 AtW certificates for this competence shall be issued to LCMs at the commencement of each one year cycle.

8 Competence cycle

8.1 All tasks and activities in which LCMs are required to maintain competency have been defined and grouped unto units and elements. These units and elements have been graded as high or medium risk.

8.2 Within each cycle, the competency cycle dictates which high and medium risk elements shall be tested and assessed.

NOTE: *The competency cycle is published on the competence management system.*

9 Simulation

9.1 Line managers shall undertake simulations at each assessment and development day.

The topics to be tested are scheduled in the competency cycle.

NOTE 1: *All simulation scenarios are based on the medium and high risk elements within the competency cycle. The majority of simulations are generic and are applicable to all LCMs with some exceptions.*

NOTE 2: *Line managers are issued with an assessor pack for each simulation. It includes all materials needed to conduct the simulation and to record the actions and output from the LCM. This includes competence decisions and responses to 'what if' questions. 'What if' questions are provided to enhance the generic simulations to provide location based specifics that could not be replicated within the scenarios.*

9.2 Where a simulation is not provided that adequately matches a particular circumstance, utilise locally produced scenarios. These scenarios shall match the requirements of each simulation topic.

9.3 Line managers shall upload the output from the simulations and the resulting competence decisions to the Competency Management System (CMS).

9.4 Line managers shall indicate which 'what if' questions are used. They shall record LCM's responses to the questions.

9.5 Line managers shall use their judgement and technical knowledge to determine if the LCM is competent in the activities and tasks being assessed.

In making this determination line managers might need to carry out coaching.

NOTE 3: *The simulation supported by 'what if' questions allow line managers to assess LCMs' overall understanding and ability to apply their knowledge.*

9.6 Line managers are required to make a decision on an individual's competence status. An individual can be assigned as:

a) not yet competent with a Development Action Plan (DAP) and suitable mitigations in place;

b) competent with a DAP plan in place; or

c) competent and confident.

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NOTE: *To be assigned competent and confident an individual should demonstrate the technical knowledge and have clear self-belief in their level of understanding and its application.*

10 Assessment and development day

10.1 LCMs and their line manager's shall undertake an Assessment and Development Day during each 26 week cycle.

10.2 LCMs shall provide evidence of level crossing risk management activity to support their development day. LCMs shall undertake knowledge tests as required and simulations allowing line managers to:

a) identify an individual's strengths;

b) identify any areas for development;

c) provide coaching; and

d) address any minor knowledge deficiencies highlighted during area visits.

10.3 The observational element of assessment and development days shall consist of Line managers observing LCMs:

a) conducting a planned level crossing site visit; and

b) assessing the LCM's knowledge and understanding of the risks associated with the level crossing.

10.4 Following the observational element, LCMs shall discuss the following topics with their line managers:

a) options they would consider and recommend including their reasoning:

b) LCM's self-generated evidence of their risk management of their core crossing types; and

c) non-technical skills capability assessment record.

10.5 When line managers cannot reach a decision on an LCM's competence based on observation and submitted evidence, the LCM shall undertake the competence cycle determined knowledge tests and simulation. Knowledge tests of high risk activities shall be followed by simulations of the same activity.

See clause 17 for action to be taken if competency cannot be established.

11 Competent person to carry out the role

11.1 A competent person to carry out the role shall undergo the process set out in this procedure.

11.2 A competent person to carry out the role shall have a test menu set up by their line manager. It shall include a dated plan for the assessments to take place within the one year cycle. A minimum of one assessment day shall be completed within each one year competency cycle.

NOTE 1: *The test plan should be set up with the support of the relevant Route Level Crossing Manager (RLCM) / Operations Risk Advisor (ORA).*

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NOTE 2: *At least one assessment session should take place within the first six month period of this new procedure commencing.*

11.3 It is recognised that the line manager of the competent person to carry out the role might not have the required competence to conduct assessments. It is permitted for any competent person to carry out the role to be assessed by a manager who meets the requirements of clause 19.

12 Visits to Level Crossing Managers

12.1 Line managers shall visit each LCM they are responsible for a minimum of once in every alternate period.

NOTE 1: *This allows the line manger the chance to observe and discuss the LCM carrying out level crossing risk management activity in their normal working environment. This can include level crossing asset inspections.*

12.2 Each visit shall be of a duration that allows:

a) Line managers the opportunity to observe and discuss with the LCM any issues they may have; and

b) LCMs the opportunity to present any evidence they wish to be considered in support of their competence.

NOTE 2: *Line managers should allow sufficient time so that the individual's performance can be considered and assessed as being to an acceptable level.*

12.3 Line managers shall give consideration to undertaking visits to LCMs when LCM workload is at the maximum level.

NOTE 3: *Visits at these times might be of more value than visits to the LCM when workload is at a minimum.*

12.4 During each visit line managers shall as well as observing and discussing the individual's performance, check outputs from any activity outside normal business as usual issues.

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12.5 Where line managers become aware that the LCM is not performing at an acceptable level, they shall discuss the performance issues with the individual. A DAP shall be opened immediately.

NOTE 4: *This should include making the individual aware which areas of performance are not at the required standard.*

13 Monitoring of voice communications

13.1 Line managers shall make a decision about an individual's spoken communications competence twice per year. This shall be done as part of the Competence Conversation.

13.2 The decision about the individual's spoken communications competence shall, as a minimum, be based on a minimum of three spoken communications from communications monitoring.

This may be undertaken as a result of being involved in joint monitoring exercises or specifically undertaken to monitor that individual.

NR/L3/OPS/045/F2.16A shall be used to support the assessments.

13.3 Evidence of spoken communications competence may come from:

a) the standard of spoken communications observed / heard during observation visits that can be downloaded;

b) any spoken communications exchanges that are identified by the candidate using their personal log book that can be downloaded;

c) refresher training and any simulations of other operational activities that involve spoken communications.

13.4 The outcome of assessments shall be managed as shown in Table 3.

	CRITERIA	ACTION
Competent	All of the communications protocols have been followed. The communication content was delivered in a concise, and a clear manner applicable to the parties involved. A clear and positive understanding was reached.	NO ACTION REQUIRED – It is recommended that the candidate is given feedback during the next assessment & development day
Competent with Development	Some of the communications protocols have been followed; the likelihood was that a clear understanding was reached.	FEEDBACK REQUIRED – Area for development falls within the candidate's behaviours, feedback to be given as part of their capability assessment

Not Yet Competent	Some of the communications protocols have been followed, but with significant variations and with a possibility of a misunderstanding occurring.	DEVELOPMENT ACTION PLAN REQUIRED WITHIN SEVEN DAYS OF REVIEW – Area for development includes some safety criteria therefore remedial action required as soon as possible (no later than seven days)
High Risk	No attempt has been made to follow any of the communications protocols. A very high possibility of a misunderstanding occurring.	IMMEDIATE ACTION REQUIRED – The manager is required to speak to the candidate immediately, suspension of their authority to work may be considered, refresher training required

Table 3 – Assessment outcome and actions

13.5 NR/L3/OPS/045/F2.16A is provided on the competence management system. It shall be completed for each naturally occurring High Risk voice communication and for simulation output voice communications.

13.6 In determining if an LCM is competent in safety critical communication line managers shall use the process and guidance set out in NR/L3/OPS/045/2.16.

14 Non-technical skills capability assessment

14.1 Non-technical skills shall be observed at different times and from different sources. The assessment shall be made and during:

a) site visits;

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b) optioneering;

c) Narrative Risk Assessments etc.

14.2 At a minimum frequency of once every six months, line managers shall complete a Level Crossing Manager non-technical skills capability assessment for each LCM they manage. Any issues arising from this assessment shall be documented in a DAP.

14.3 Line managers shall decide if NR/L3/OPS/045/2.14 is required by the individual.

15 New LCMs

15.1 Where new LCMs are appointed, line managers shall open a DAP. Use the plan to document the gap between current knowledge and understanding and the knowledge and understanding the individual needs to obtain as part of the process for gaining an authority to work for their area.

16 Returning to work from a period of absence from level crossing risk management duties

16.1 At the end of any period of absence, and before LCMs return to level crossing risk management duties, line managers shall arrange to complete the actions shown in Table 4.

Length of Absence	Criteria	Action
1 to 6 months	No assessment and development days missed	Decide if following are required; location refresher training and Rule Book / Instruction changes briefing. Decide if the knowledge test and / or simulations shall be used to assist the LCM in returning to level crossing risk management duties. Agree a DAP with the LCM for this purpose.
1 to 6 months	Assessment and development day missed	Decide if following are required; location refresher training and Rule Book / Instruction changes briefing. The missed assessment and development day shall take place within I month of the individual returning to work. Agree a DAP with the LCM for this purpose.
Over 6 months	One or more assessment and development day(s) missed	Arrange for the AtW to be suspended. A period of location refresher training shall be undertaken before a new AtW can be issued Rule Book / Instruction changes briefing shall be given. Outstanding observations, knowledge tests and simulations shall be completed. Agree a DAP with the LCM.

Table 4 - Return to work following periods of absence

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NOTE: *In some cases it may be appropriate for the individual LCM to attend all or part of Initial Level Crossing Manager training course.*

17 Addressing development needs

17.1 Line manager supported development

Line managers shall create DAPs when development needs are identified.

NOTE: *During the Assessment and Development day the line manager has an opportunity to coach the LCM. Using the simulation, explaining the activity in a different way or relating the task to the LCM's normal working location may bring clarity to the individual's understanding.*

17.2 An LCM can fall below standard on simulation results and line managers may still return a 'competent' decision. Line managers shall provide evidence to support these decisions including simulation reports and other supporting evidence. This evidence shall be recorded in the individual's competence record.

17.3 If following coaching and open discussions, line managers cannot deem the individual competent, line managers shall put actions into place to mitigate any risks with the individual's lack of knowledge.

This can include the suspension of an individual's ATW until re-training and a successful re-assessment has taken place.

The details of action taken shall be recorded in a DAP.

17.4 Self-Development

Self-development is aimed at LCMs wishing to develop themselves e.g. by moving to a different location or broadening their knowledge of core crossing types and associated issues. Appropriate development needs to be judged on a case by case basis.

All development actions shall be recorded by line managers in the individual's competence record.

NOTE: *Types of development might include opening up further simulations beyond the location specific menu, time on other areas, cab rides, job shadowing, etc.*

18 Individual competence record

18.1 Line managers shall update an individual's competence record in the Competence Management System (CMS).

18.2 At the beginning of a new competence cycle, a new individual competence record shall be started. The previous completed record shall be closed. Records shall be retained in accordance with Network Rail's records retention requirements.

18.3 When LCMs move location within the cycle, the existing line manager shall transfer the individual's competence record to the new line manager. The new line manager shall update the record as appropriate.

19 Line manager/assessor competence

19.1 The requirements in Table 5 shall be used:

a) to assure the line manager / assessor competence;

b) to verify line manager / assessor occupational and vocational competence;

c) to enable the line managers' manager to check that the line manager / assessor competence is maintained.

20 Verification

20.1 Verification shall be carried out in accordance with Table 5.

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	Occupational	Vocational	New assessors/verifiers	Existing assessors/verifiers without qualifications	Verification
Line manager/ assessor	Line managers shall; a) have undertaken the activity in relation to their location; or b) have performed the activity in the past and currently supervise or train people in the activity; or c) be regarded as technical experts because they directly manage the quality of the activity to be assessed; or d) demonstrate knowledge and understanding in the subject matter to make them a credible assessor.	Line managers shall hold; a) D32/D33; or b) A1; or c) L20; or d) Network Rail Operations Assessor Qualification	New line managers shall successfully complete the Network Rail Operations Assessor training programme and pass the associated knowledge and understanding test.	The Lead Verifier for the scheme involved shall provide guidance on what combination of the above process shall apply to existing assessors without qualifications. ***NOTE:*** *This should account for the length of time an individual has been assessing and the quality of their assessing.*	Shall be observed conducting an assessment and development day at a minimum of once a year. ***NOTE:*** *This shall normally be by their line manager.*
Verifier	Verifiers shall have; a) undertaken the activity in the preceding five years, or; b) performed the activity in the past and are currently supervising or training people in the activity, or c) be regarded as technical experts because they currently directly manage the quality of the activity to be assessed or they can demonstrate sufficient technical expertise to make them a credible assessor, or; d) written agreement from the Lead Verifier for the scheme in question that they have appropriate occupational competence.	Verifiers shall hold; a) D34; or b) V1; or c) Network Rail Operations Verifier qualification; or d) other qualification deemed appropriate by the Lead Verifier for the scheme involved.	New Verifiers shall successfully complete the Network Rail Operations Verifier training programme and pass the associated knowledge and understanding test. They shall also be subject to additional monitoring by the Lead Verifier for a period of three months. At the end of this period the Lead Verifier shall deem them competent or shall initiate further development and further monitoring.	The Lead Verifier for the scheme involved shall provide guidance on what combination of the above process shall apply to existing Verifiers without qualifications. ***NOTE:*** *This should account for the length of time an individual has been verifying and the quality of their verification.*	The Route Business England & Wales and Route Business Scotland Competence Manager assumes the role of Lead Verifier. Verifiers shall observe the line manager / assessor conducting an assessment and development day at a minimum of once a year. The person carrying out this observation shall normally be line managers' Manager and shall meet the criteria of a verifier set out in this table.

Table 5 – Line manager/assessor competence and verification

Standard and control document briefing note

Ref: NR/L3/XNG/207	**Issue:** 1
Title: Level Crossing Manager competence framework	
Publication date: 05 September 2020	**Compliance Date:** 05 September 2020
Standard/Control Document Owner: Head of Level Crossings	
Technical lead/contact for briefings: Darren Cottrell, Level Crossing Asset Strategy & Planning Manager	**Tel:** 07767 644687

Purpose:
This standard details the competency assessment process used to assess the competencies required by Level Crossing Managers (LCMs) to undertake safety critical risk assessments of level crossings.

It helps assure that the competencies are understood and applied correctly and consistently. Application of this standard enables Network Rail to be confident that the safety of those who travel over our level crossings are assessed by those with the necessary skills to do so.

NOTE: *The level crossing competence Authority to Work together with relevant Assessment in The Line (AiTL) give LCM's their authority to undertake their role.*

Scope:

This standard applies to any LCM, a person competent to carry out the role of a LCM and those involved in the management of these individuals.

Overview of change

All content of NR/L3/OPS/045/2.07 has been transferred to this standard. The technical content has not been amended.

Detail of change

Section(s)/clause(s)	Summary of changes
Throughout	Minor editorial changes. No change in technical content.

Reasons for change
The standard has been published to allow transfer of ownership of all content in NR/L3/OPS/045/2.07 from Operations SCSG to Signals and Level Crossings SCSG. The technical content has not been amended. This transfer has been undertaken to bring level crossing risk management and level crossing competence standards under one framework. This is in line with the level crossing system framework the Technical Authority is moving towards.

NR/L3/OPS/045/2.07 has been withdrawn and made historic.

Affected documents:

Reference	*Impact*
NR/L3/XNG/207 ISSUE 1	New
NR/L3/OPS/045/2.07 ISSUE 1	Withdrawn

Briefing requirements:

Will Briefing Management System be used to deliver the briefing to posts listed below? Yes

Technical briefings are given to those who have specific responsibilities within this standard/control document.

Awareness briefings are given to those who might be affected by the content but have no specific responsibilities within the standard/control document.

Details of the briefing arrangements are included in the associated briefing programme.

All posts identified for briefing must be as described in OrgPlus.

Roles are directly briefed and do not cascade briefings.

Briefing *(A-Awareness/ T-Technical)*	**Post**	**Function**	**Responsible for cascade briefing? Y/N**
A	Route Level Crossing Manager	Regions	Y
A	Level Crossing Manager	Regions	N
A	Route Asset Manager [Signalling]	Regions	N
A	Head of Liability Negotiation	Technical Authority	Y
A	Liability Negotiations Manager	Regions	Y
A	Liability Negotiations Adviser	Regions	N
A	Operations Risk Advisor	Regions	N
A	Programme Manager [Public & Passenger Safety]	Regions	N
A	Head of Corporate Passenger & Public Safety	Technical Authority	Y

A	Health Safety & Environment Director, North West & Central	Regions	N
A	Health Safety & Environment Director, Southern	Regions	N
A	Health Safety & Environment Director, Wales & Western	Regions	N
A	Head of Route Safety Health & Environment	Regions	N
A	Head of Route Safety Health & Environment [North West]	Regions	N

NOTE: *Contractors are responsible for arranging and undertaking their own Technical and Awareness Briefings in accordance with their own processes and procedures.*

Ref:	NR/L3/TRK/4041
Issue:	1
Date:	02/06/2012
Compliance date:	01/09/2012

Level 3

Maintaining Track Assets at Level Crossings

Endorsement and Authorisation

Endorsed by:

Shingai Mutukwa, Working Group Chair

Authorised by:

Andy Jones, Steering Group Chair

Accepted for issue by:

Mick McManus, National Standards Manager

Published and Issued by Network Rail, Kings Place, 90 York Way, London. N1 9AG.

User information

This Network Rail standard contains colour-coding according to the following Red–Amber–Green classification.

Red requirements – *No deviations, could stop the railway*

- **Red requirements shall** always be complied with and achieved.
- Red requirements shall be presented in a red box with the word "shall" or expressed as a direct instruction.
- Accountability for the efficacy of red requirements lies with the Professional Head/Standard Owner.
- Red requirements are monitored for compliance.
- Corrective actions shall be enforced if deviations are discovered through functional checks (e.g. engineering verification visits, audit or Operations Self-Assurance).

Amber requirements – *Controlled deviations, approved risk analysis and mitigation*

- **Amber requirements shall** be complied with unless deviation has been approved in advance.
- Amber requirements shall be presented with an amber sidebar and with the word "shall" or expressed as a direct instruction.
- Accountability for the efficacy of these requirements lies with the Professional Head/Standard Owner, or their nominated Delegated Authority.
- Amber requirements are monitored for compliance.
- Deviations **may** be permitted. Deviations are approved by the Standard Owner or through existing Delegated Authority arrangements.
- Corrective actions shall be enforced if **non-approved** deviations are discovered through functional checks (e.g. engineering verification visits, audit or Operations Self-Assurance).

Green – *Guidance*

- Guidance is based on good practice. Guidance represents supporting information to help achieve Red and Amber requirements.
- Guidance shall be presented with a dotted green sidebar and with the word "should" (usually in notes) or as a direct instruction.
- Guidance is **not mandatory** and is not monitored for compliance.
- Alternative solutions may be used. Alternative solutions do not need to be formally approved.
- Decisions made by a competent person to use alternative solutions should be backed up by appropriate evidence or documentation.

Issue record

Issue	Date	Comments
1	June 2012	New Standard

Compliance

This Network Rail standard is mandatory and shall be complied with by Network Rail and its contractors if applicable from 01 September 2012.

When this standard is implemented, it is permissible for all projects that have formally completed GRIP Stage 3 (Option Selection) to continue to comply with the issue of any relevant Network Rail standards current when GRIP Stage 3 was completed and not to comply with requirements contained herein, unless stipulated otherwise in the scope of this standard.

Reference documentation

NR/L2/TRK/001 – Inspection and Maintenance of Permanent Way

NR/L3/TRK/1011 – Management of Permanent Way

NR/L2/TRK/2102 – Design and Construction of Track

NR/L2/TRK/2049 – Track Design Handbook

NR/L2/TRK/4040 – Level Crossing Surface Systems

NR/L2/TRK/5100 – Management of Fencing and Other Boundary Measures

NR/L2/TRK5201 – Management of Lineside Vegetation

NR/L2/SIG/19608 – Level Crossing Infrastructure: Inspection and Maintenance

NR/L2/SIG/30017 – Requirements for Level Crossings

NR/L2/SIG/30015 – Specification for Station, Footpath, Bridleway and User Worked Crossings

NR/L3/SIG/MG0081 – Inspection of Level Crossings Including Work Identification and Prioritisation

NR/L2/OPS/100 – Provision, Risk Assessment and Review of Level Crossings

NR/L3/MTC/PL0175 – Infrastructure Maintenance Planning Handbook

NR/L2/RVE/0007 – Specification for on and Off Tracking of Road Rail Vehicles

NR/SP/ELP/27021 – Electric Track Equipment Layout Design for D.C. Electrified Lines

NR/GN/ELP/27088 – Layout of Overhead Line Equipment

Disclaimer

In issuing this document for its stated purpose, Network Rail makes no warranties, express or implied, that compliance with all or any documents it issues is sufficient on its own to ensure safe systems of work or operation. Users are reminded of their own duties under health and safety legislation.

Supply

Copies of documents are available electronically, within Network Rail's organisation. Hard copies of this document may be available to Network Rail people on request to the relevant controlled publication distributor. Other organisations may obtain copies of this document from IHS. Tel: 01344 328039.

Contents

1 Purpose

This standard specifies the requirements for managing the installation, inspection, maintenance of track assets at operational level crossing infrastructure. It demonstrates that level crossing systems are compliant with legislation, reliable and safe.

2 Scope

This Network Rail standard is applicable to level crossings of the following types, including those that are subject to temporary closure:

- Automatic Half Barrier Crossings
- Automatic Full Barrier Crossing with Obstacle Detection
- Automatic Half Barrier Crossings Locally Monitored
- Automatic Open Crossings Locally Monitored (including OCFLs)
- Automatic Open Crossings Remotely Monitored
- Miniature Stop/ Warning Lights
- Manually Controlled Barriers (including CCTV and OCB)
- Traincrew Operated Crossings
- Manned Gated Level Crossings
- Manually Controlled Barrier – Obstacle Detection
- Open Crossings
- Power Operated Gate Opening Crossings
- User Worked Crossings
- Footpath and Bridleway Crossings
- Station Barrow Crossings
- Station Foot Crossings
- Sleeping Dog Crossings
- Mothballed Crossings.

NOTE This document is NOT applicable to Inspection and Maintenance of Road Rail Access Points (RRAPs), and Track Access Points (TAPs) as they are not level crossings.

3 Roles and responsibilities

RACI DETAILS	KEY CONTROL ACTIVITY	Resources										
		Infrastructure Maintenance Engineer	Track Maintenance Engineer	Section Manager (Off Track)	Off Track Inspector	Operations Risk Control Coordinator	Infrastructure Fault Control	Signaller	Maintenance Protection Coordinator	Section Planner	Infrastructure Maintenance Services Manager	Route Asset Manager (Track)
Process Task												
6.1	-	-	R	R	R	-	-	-	-	-	-	-
6.2	-	-	-	C	C	-	-	-	-	A,R	-	-
6.4.1	X	-	R	I	-	A,R	-	-	-	-	-	-
6.4.2	-	-	I	A,R	-	-	-	-	-	-	-	-
6.4.3	-	-	A,R	C	-	-	-	-	-	-	R	-
6.4.4	-	-	I	C	-	-	-	-	-	A,R	-	-
6.4.5	-	-	I	I	-	-	-	-	-	A,R	-	-
6.4.6	-	-	R	A	-	-	-	-	-	-	-	-
6.4.7	-	-	A,R	C	-	R	-	-	-	-	-	-
6.4.8	-	-	I	A,R	-	R	-	-	-	-	-	-
6.4.9	X	I	R	A,R	-	-	-	-	-	-	-	-
6.4.10	-	-	C	A,R	-	-	-	-	-	-	-	-
6.4.11	-	-	-	A,R	-	-	-	-	-	R	-	-
6.4.12	X	-	-	A,R	R	-	-	-	-	-	-	-
6.4.13	-	-	-	C	A,R	-	-	-	-	-	-	-
6.4.14	-	-	I	C	A,R	-	C	C	-	-	-	-
6.4.15	-	-	-	-	A,R	-	-	-	-	-	-	-
6.4.16	-	-	I	A	R	-	C	C	-	-	-	-
6.4.17	-	-	I	A	R	-	-	-	-	-	-	-
6.4.18	-	-	I	A	R	-	-	-	-	-	-	-
6.4.19	-	-	I	A,C	R	-	-	-	-	-	-	-
6.4.20	X	-	A,R	R	-	-	-	-	-	C	-	-
6.4.21	-	-	A,R	R	-	-	-	-	-	-	-	-
6.4.22	-	-	A,R	-	-	C	-	-	-	-	-	-
6.4.23	-	I	I	I	-	A,R	-	-	-	-	-	-
6.4.24	-	-	-	A,R	-	-	-	-	-	-	-	-
6.4.25	-	-	-	A,R	-	-	-	-	C	-	-	-
6.4.26	-	-	I	A,R	R	-	-	-	-	C	-	-
6.4.27	-	-	-	A,R	-	-	-	-	-	R	-	-
6.4.28	-	-	-	A,R	-	-	-	-	-	-	-	-
6.5	-	-	I	R	A,R	-	-	-	-	-	-	-
6.6.1	-	-	-	I	A,R	-	-	-	-	-	-	-
6.6.2	-	-	-	I	A,R	-	-	-	-	-	-	-
6.6.3	-	-	-	I	A,R	-	-	-	-	-	-	-
6.7	-	-	-	A,R	R	-	C	C	-	-	-	-
6.7.1	-	-	A,R	R	-	-	-	-	-	-	-	-
6.8	-	-	A,R	C	-	-	-	-	-	-	-	-
6.9	-	-	A,R	R	-	-	-	-	-	-	-	-
6.9.1	-	-	A,R	C	-	-	-	-	-	-	-	-
6.9.2	-	-	A,R	C	-	-	-	-	-	-	-	C
6.9.3	-	-	A,R	R	-	-	-	-	-	-	-	-
6.9.4	-	-	-	-	-	A,R	-	-	-	-	-	-

6.9.6	-	-	C	C	-	-	-	-	-	R	-	-
6.9.7.1	-	-	-	A,R	R	-	-	-	-	-	-	-
6.9.7.2	-	-	R	C	-	-	-	-	-	-	-	-
6.9.8	-	-	A,R	R	-	C	-	-	-	-	-	I
6.9.8.1	-	-	A,R	C	-	R	-	-	-	-	-	-
6.9.8.2	-	-	A,R	C	-	R	-	-	-	-	-	-
end RACI												

Table 1 – RACI

4 Definitions

For the purpose of this standard, the following terms and definitions apply.

ABCL	Automatic Barrier Crossing, Locally Monitored
AFBC-OD with TPWS	Automatic Full Barrier Crossing with Obstacle Detection and Train Protection Warning System
AHBC	Automatic Half-Barrier Crossing
ALCRM	Operations All Level Crossing Risk Model
AOCL	Automatic Open Crossing, Locally Monitored
AOCR	Automatic Open Crossing, Remotely Monitored
BW	Bridleway Crossing
CCTV	Closed Circuit Television
DCI	Driver's Crossing Indicator
ELLIPSE	Maintenance Scheduling System (formerly MIMS)
FP	Footpath Crossing
HAE	Highway Authority Engineer, this includes Local authority engineer
IFC	Infrastructure Fault Control
IMDM	Infrastructure Maintenance Delivery Manager
IMSM	Infrastructure Maintenance Services Manager
IME	Infrastructure Maintenance Engineer
MCB	Manually Controlled Barriers
MCB-CCTV	Manually Controlled Barriers with Closed Circuit Television
MCB-OD	Manually Controlled Barriers with Obstacle Detection
MCB-R	Remote Manually Controlled Barriers in excess of 50M from the Control Point
MG	Manned Crossing with Gates
MOM	Mobile Operations Manager
MPC	Maintenance Protection Coordinator
MSTs	Maintenance Scheduled Tasks

NR	Network Rail
OC	Open Crossing without road warning lights
OTI	Off Track Inspector
ORCC	Operations Risk Control Coordinator
RAM(T)	Route Asset Manager (Track)
RotR	Rules of the Route
SM	Section Manager
SM(OT)	Section Manager Off Track
SP	Section Planner
STME	Signal and Telecoms Maintenance Engineer
TME	Track Maintenance Engineer
UWC	User Worked Crossing
WAIF	Work Arising Inspection Form
Acceptable condition	An asset in acceptable condition is fit for purpose and is unlikely to become a defect prior to the next inspection.
Accommodation crossing	A field to field crossing essentially for use of a farmer.
Active (visible or audible) warning	A device which warns users of the imminent arrival of a train. Such devices can be either visible or audible and can be used in combination.
Actual daily road vehicle user	The number of road vehicles passing between 06.00 and 24.00 averaged over a 9-day period. The value recorded in ALCRM is acceptable if a full 9 day census is not available.
Approaches (to a crossing)	The road, bridleway or path leading up to a crossing. For the purposes of this document, the approaches, measured from the nearest running rail, extend for 30 m on heavily used vehicular crossings and 20 m on other crossings.
Authorised user	A person having the legal or contractual right to use a particular level crossing.
Automatic control system	A system which automatically activates the protective equipment at a level crossing on the approach of a train.
Automatic crossing	A level crossing where the protective equipment, for example, barriers and active warnings, is automatically activated by the approaching train. The term excludes a manually controlled crossing where automatic lowering and/or automatic raising of the barriers is provided.
Automatic lowering	The lowering of the barriers at a crossing initiated by a train.
Automatic raising	The raising of the barriers at a crossing initiated by the

	passage of a train clear of the crossing
Basic test	A simple check with a basic test gauge to determine compliance to vertical profiles within this document.
Bridleway crossing	A level crossing for pedestrians, cyclists and horses.
Cattle-cum-trespass guard	A device provided adjacent to the level crossing surface designed to deter animals from straying, and pedestrians from trespassing, onto the railway.
Check	Visually inspect for alignment, obstructions, breakages, decay and obvious damage.
Competence	Endorsement by line manager of a person's authority to work on a specific asset.
Control point	The location from which one or more controlled crossings are operated.
Crossing	Used in level crossing documentation to mean 'level crossing', where the continued use of 'level crossing' becomes repetitive and laboured.
Crossing length	The distance along the road or path between the barriers, decision points and stop lines on either side of the railway.
Crossing speed	The permissible train speed applying between a speed restriction sign and a locally monitored level crossing.
Crossing surface	An installation providing a continuation of the road surface to enable it to be carried across the railway at the same elevation. This term includes all associated support and fixing systems.
Crossing width	The width of the road or path crossing the railway.
Decision point	The point at which a level crossing user makes a decision to cross or wait.
Footpath crossing	A public or private pedestrian level crossing.
Grounding	The effect of any part of the road vehicle coming into contact with the crossing surface.
Hog	A measure of the crossing surface vertical profile over specified wheel base lengths.
Inspect	Visual examination of level crossing to detect hidden failures and deterioration of the assets. Includes non-intrusive "first aid" repairs (e.g. cleaning signs).
Left-hand side (of the road)	The left-hand side of the road or carriageway as it would appear to a person approaching the crossing along that road or carriageway.
Level crossing	An intersection at the same elevation of a road, footpath or bridleway and one or more rail tracks.

Level Crossing Ground Plan	Scaled and dimensioned drawing(s) showing the position of all equipment and associated features at a level crossing that should represent the details indicated in the Level Crossing Order. In case of omission / error / confusion, the Level Crossing Order is the overriding document.
Level Crossing Order	A legal document made by, or on behalf of, the Secretary of State for Transport under the Level Crossings Act 1983 which references the operation of the crossing. It also defines the position and size of certain component parts, including road markings and signage, and the responsibilities of Network Rail and the appropriate Highways Authority. For the purposes of this Specification, this includes Letters of Consent authorising level crossings. This may also include 'Direction Orders' which have been issued to mandate certain positions for level crossing gates.
Level survey	A detailed level survey using approved surveying techniques.
Maintenance	Technical activities defined in engineering standards to check that level crossings continue to operate safely and reliably.
Mothballed	This type of crossing is one that is on a line that is 'out of use' but not legally closed, (i.e. no network change applied for). Such an arrangement does not absolve Network Rail, from liability for maintaining level crossings, on all mothballed lines in particular those used by members of the public in a condition fit for purpose. Crossings on mothballed lines should be capable of being brought back into use with minimal change and shall meet all of their original legal requirements as if they were still open and should be inspected and tested as such. Gates, crossing fencing and surface systems will be required to be inspected at the frequency mandated for active crossings whereas other component parts such as signage, warning lights, telephones and lifting barriers shall only be inspected at a reduced frequency.
Off Track Inspector	Specialised inspectors, who check level crossings in accordance with this standard and undertake certain repairs. Shall be referred to as the 'Inspector' throughout this standard.
Near Side (N)	The left hand side of the carriageway when viewed in the direction of road traffic.
Non running lines	Lines without a through route e.g. sidings, freight yards and depots.
Occupational crossing	Where a private road crosses the railway for example leading to a house or farm.
Off Side (O)	The right hand side of the carriageway when viewed in the direction of road traffic.

Open crossing	A level crossing that has no barriers, gates or road traffic light signals and which is protected only by road traffic signs.
Outside party	Any asset owner other than Network Rail.
Repairs	The Inspector may carry out minor vegetation clearance, timber/ballast deck repairs, and sign changing. NOT repairs to electrical devices such as warning lights, barrier machines, audible alarms etc.
SC Defect	An immediate rectification defect, which if not immediately repaired has the potential to cause a serious incident to road, rail or pedestrian users.
Skew crossings	Acute skew crossings - the crossing angle measured in an anticlockwise direction from the road to the running rail (when facing direction of normal road traffic) is less than a 90degrees. Obtuse skew crossings - the crossing angle measured in an anticlockwise direction from the road to the running rail is greater than 90degrees.
Sleeping Dog crossing	A crossing generally of the UWC, FP, or Bridleway type which is still legally open and the right to cross the railway still legally exists but where no evidence exists that this right to cross is being exercised, or there is little or no trace of the crossing infrastructure.
Temporarily closed	Any crossing that has been temporarily closed for crossing the railway because of extended engineering work, adjacent developments etc., but where we intend to re-open the crossing.
Traffic moment	The number of road vehicles using the crossing multiplied by the number of trains passing in a given period.
User	A person who uses a level crossing. For the purposes of this document the term includes the authorised user and invitees of the authorised user.
User Worked crossing	A level crossing, where the user operates the crossing gates or barriers themselves.
Vegetation growing period	When growth on bushes, trees, hedgerows, grasses, reeds etc is likely to begin to thicken and affect visibility if not controlled.
Y Side	Normally, the side of the crossing adjacent to the UP line.
Z Side	Normally, the side of the crossing adjacent to the DOWN line.

5 General Statutory Requirements

5.1 Level Crossing Order

A Level Crossing Order is a legal document made by, or on behalf of, the Secretary of State for Transport under the Level Crossings Act 1983, as amended by the Level Crossings Regulations 1997 and The Road Safety Act 2006.

The Level Crossing Order specifies how the crossing is to be operated and the protective equipment, which includes barriers, traffic signs, signals and road marking, and the responsibilities of Network Rail and the appropriate Highways Authority.

Non-compliance with the requirements of the Level Crossing Order is a criminal offence.

The location of the public right of way, that is Footpaths and Bridleways, is held on a 'Definitive Map' owned by the local Highway Authority. A Title Deed is the legal document in use for User Worked Level Crossing (Non Public).

5.2 Ground Plan

A Level Crossing Ground Plan drawing shows the position of all equipment and associated features at a Level Crossing and complies with the requirements of the Level Crossing Order.

Level Crossing Ground Plans and Level Crossing Orders generally apply to crossings on roads where the public has access.

Where a Ground Plan does NOT exist for a crossing collate photographs, 360degrees – approaches and either side, at least four in total, or create a controlled sketch, which is then endorsed as correct for the installation by the ORCCs.

Clause 6 NR/L2/SIG/19608 TABLE 2, Level Crossing Features and References, provides guidance on which features are to be included on the Ground Plan and/or Level Crossing Order.

In cases of omission or error the Level Crossing Order takes precedence over the Level Crossing Ground Plan.

5.3 Walkway Requirements

Make appropriate provision for pedestrians, taking account of the number and frequency of pedestrians and trains, at all public vehicular level crossings.

Where a footway is provided on either or both sides of the approach road, a footway or footways of adequate width shall continue over the crossing. There shall be space, taking into account the volume and nature of the users, for pedestrians to pass each other without the need to use part of the carriageway reserved for road vehicles. Allowance shall be made for the needs of those with pushchairs and in wheelchairs.

Any footway shall be made up to the level of the carriageway and maintained in an even condition. Provide longitudinal road markings along each edge of any footway, to delineate the required width and define the safe route for pedestrians walking over the crossing. Also provide a safe place for pedestrians to stand when crossings are closed to road traffic on any footways approaching an automatic or open crossing.

All walkways are to be compliant with NR/L2/SIG/30015.

5.4 Vegetation

Sighting of trains from the decision point shall not be compromised by vegetation. When installing equipment, take note of any vegetation that could affect the safe operation of the crossing or compromise sighting in the future, remove or report any such vegetation.

Scratching, stinging or rash making plants are not allowed to grow within one metre either side of a stile or footpath gate. This area shall be surrounded with an appropriate method of fencing.

Where the hedges either side are overgrown from an adjoining land owner, consult the land owner prior to removal.

Vegetation is to comply with NR/L2/TRK/5201.

5.5 Fencing

Position fencing at the crossing as per the level crossing ground plan or controlled sketches / photographic record.

Fencing shall be compliant with NR/L2/TRK/5100.

5.6 Cattle-cum-trespass Guards

Provide cattle-cum-trespass guards where indicated on ground plans or controlled sketches / photographic record that have been endorsed as correct by the ORCC.

Cattle-cum-trespass guards shall:

- Be adjacent to the footway at the edge of and level with the surface of the decking system
- Extend the full length of the crossing between the boundary fences with a fence extended from the boundary down the full length of each guard
- Be a minimum of 2.6 metres step over distance from any edge of the crossing surface
- If constructed of wood be of triangular rails base and vertical sides115mm, with a Maximum of 35mm clear spacing between each rail
- If installed in DC conductor rail areas are to be constructed of a non-conductive material and adhere to NR/SP/ELP/27021.

5.7 Road Closures

For guidance on Network Rail procedure refer to ‘New Roads and Street Works Act Procedure’, available from the National Signalling and Level Crossings Programme Team.

6 Inspection

6.1 Inspection – Holistic View

Inspect the general arrangement of the crossing and check it is still to basic design as well as compliant to the Ground Plan or controlled sketches. Check if anything is missing with respect to the Ground Plan and surface system design.

Consider the relationship between the road and railway and the effects the location will have on the surface system. Have a diagram or cross section of the crossing location.

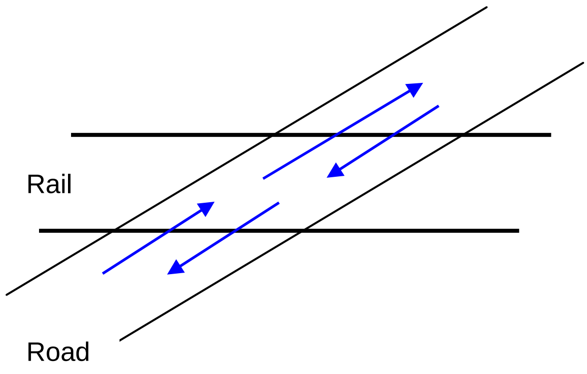


Figure 1 – Highly skewed crossing

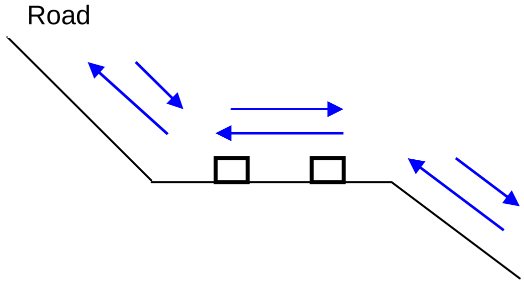


Figure 2 – Road/Rail Profile

Is the track providing a stable support?

Consider the effects of the road/railway profile:

- Highly skewed crossings experience increased dynamic loading, both vertical and lateral, which leads to panel fatigue and failure
- Look for signs of the crossing moving apart or shifting laterally
- Cumulative effects of panels affecting joint location on sleepers, panels likely to be staggered at skew crossings resulting in weakening of the system.
- Crossing on a tight radius, i.e. less than 400m - affects the profile of the level crossing as a result of the cant of the track.
- Topography/geology, e.g. hillside, valley, cutting, embankment, stable formation, water effects, effects on track stability
- Grounding (Nairn’s) - risk of train striking road vehicle
- Look for signs of grounding on approaches and over crossing surface.

Consider change in use of the crossing:

- Increased traffic patterns or loading.

Confirm the design of the crossing is correct:

- Performance history
- Surface system suitable for traffic type, volume and location.

Key issues are:

- The relationship between the road and railway, and the respective geometry
- Any effects due to the crossings location/environment
- Stability of the track system
- The surface systems ability to withstand the above given its design and condition.

6.2 Safe System of Work

Set up a safe system of work to comply with the Rule Book (GE/RT8000).

The safe system of work should extend to addressing the hazards associated with road traffic.

As a minimum this safe system of work should consider:

- Protection when working in the highway.
- The parking of any road vehicles, making sure that they are clear of the crossing; not parked in any lay by provided for large or slow vehicles; not parked in a position where it will obstruct the view of the Road Traffic Lights to oncoming users; not parked where it will constitute an offence i.e. in areas where there are double white lines in the centre of the carriageway.
- The method by which the highway is crossed. Where possible use pedestrian crossings (refer to the Highway Code).
- The method of walking along the highway; where possible, walk on the right hand side of a two-way highway facing oncoming traffic or use the safest alternative verge or footpath on a one-way highway.
- If part of a group, walk in single file.

6.3 Inspection Interval

Description	**Maximum Inspection Interval**
Automatic Half Barrier Crossings	7 weeks
Automatic Half Barrier Crossings Locally Monitored	7 weeks
Automatic Full Barrier Crossings	7 weeks
Automatic Open Crossings Locally Monitored	7 weeks
Automatic Open Crossings Remotely Monitored	7 weeks
Miniature Stop/Warning Lights	7 weeks
Manually Controlled Barriers (inc CCTV and OCB)	3 months
Traincrew Operated Crossings	3 months
Manned Gated Level Crossings	3 months
Station, Barrow or foot crossings with White Lights	6 months
Open crossings	6 months
User Worked Crossings	6 months
Footpath and Bridleway Crossings	6 months
Station, Barrow or foot crossings without White Lights	6 months
Sleeping Dog Crossing	6 months
Crossings on Mothballed lines	In accordance with specific crossing type
Vertical Profiles on Level Crossings	Annually

Table 2 – Maximum Inspection Interval from NR/L2/SIG/19608

6.4 Inspection Process

NOTE Refer to Appendix A for Inspection Flowchart.

6.4.1 Create Inspection Register

The Operations Risk Control Coordinator, (ORCC), provides the Track Maintenance Engineer, (TME), with the list of level crossings to be entered into Ellipse. The frequency of inspection is determined by the ORCC to comply with Table 2 Clause 6.3.

6.4.2 Produce Draft Inspection Plan

The Section Manager Off Track, (SM(OT)), produces the draft inspection plan using Ellipse data taking into account the required inspection intervals for inspection of level crossings.

6.4.3 Is Possession Access Required

The SM(OT), and the TME, shall determine the track access requirements for the inspection activities described within the plan, such that all tasks can be completed within their prescribed inspection frequencies.

The Infrastructure Maintenance Services Manager (IMSM) team, arrange where appropriate, all access requirements that fall within the Rules of the Route (RotR), and process such requests to conclusion.

The IMSM provides details of which possessions include elements of inspection activity, informing the SM(OT) and TME of any access requirements that cannot be fulfilled.

6.4.4 Review Access Granted

The Section Planner, (SP), in consultation with the SM(OT) and TME, periodically reviews the progress of requests for access requirements as well as any outcomes of the RotR planning process.

The SP confirms to the SM(OT) and TME that the possessions granted match the requirements of the inspection plan.

6.4.5 Has Suitable Access been Granted?

The SP shall inform the SM(OT) and TME of any access requirements that cannot be fulfilled.

6.4.6 Can Inspection be Rescheduled?

The SM(OT), TME and SP, shall explore alternative access that can be used in order to carry out the required inspections within the allowed timescale tolerance of NR/L2/SIG/19608 Clause 7.4.2, 7 days.

6.4.7 Need for Risk Mitigation Measures?

In the event of there being either no alternative access or inspection strategy, the SM(OT) and the TME, shall consider alternative inspection options and due dates in order to resolve the problem.

The TME and the ORCC will determine any risk mitigation measures necessary until the next schedule date shown in Ellipse.

6.4.8 Implement Risk Mitigation

The SM(OT) is responsible for the implementation of any risk mitigation agreed with the ORCC. Where these may require changes to Ellipse MSTs, the SM(OT) shall arrange that such changes are identified, communicated and realised.

6.4.9 Finalise Inspection Plan

The SM(OT) produces an inspection plan from Ellipse annually and submits it to the TME for endorsement.

The TME reviews the proposed annual plan inspection intervals for agreement with those defined in Table 2 Clause 6.3.

The TME is to review and action any instances where compliance cannot be met.

6.4.10 Resource Availability

The SM(OT):

- Arranges for sufficient resources to be available to deliver the inspection plan
- Checks that all staff are sufficiently trained and competent
- Provides adequate equipment and resources to enable the effective inspection and repair of the equipment.

The TME and SM(OT), at a period of no more than 12 months, shall review the resourcing requirements against the maintenance plan so that resources are utilised effectively and efficiently.

6.4.11 Update Ellipse

The SM(OT) shall, on a continual basis, pass sufficient information to the SP for Ellipse to be updated with all relevant information including planned start and planned end dates.

6.4.12 Inspect and Maintain

The SM(OT) shall confirm that the Off Track Inspector (OTI) undertakes the asset inspection and addresses any minor repair work to comply with the Ellipse Work Orders.

6.4.13 Defect(s) Identified?

The OTI, as part of the inspection process, shall identify any defects requiring repair and prioritise these to comply with this standard.

All defects to be recorded on the Level Crossing Inspection Record Form, TEF3243.

6.4.14 Is it an SC defect?

All SC (previously referred to as Priority 1) defects are a high risk to the safe operation of the level crossing and are to be immediately actioned. Where they cannot be rectified whilst on site, they shall be immediately reported to the Signaller and to Infrastructure Fault Control (IFC) for immediate action response. In addition, the OTI shall report the defect to their SM(OT).

For all other defects Clause 6.4.17 applies.

6.4.15 Can SC Defect be Repaired?

The OTI shall assess the SC defect for immediate repair and if able to shall undertake suitable repair work otherwise arrange for immediate rectification through IFC (Refer to Clause 6.4.16).

6.4.16 Instigate Immediate Action Response

If the nature of the repair is beyond the immediate capabilities of the OTI, then the OTI shall immediately, in consultation with the Signaller and IFC, instigate rapid response attendance to comply with the agreed process.

6.4.17 Can Defect(s) be repaired at time of inspection?

For defects other than SC, the OTI shall assess whether a repair within the context of availability of materials, plant and individual competence; can take place safely.

Defects which cannot be addressed as part of the inspection visit shall be recorded as per Clause 6.4.19.

6.4.18 Undertake Repair

The OTI having assessed the nature of the identified defect(s), shall determine those that are repairable and where they are competent undertake such work.

6.4.19 Inspection Completed

The OTI shall complete the Level Crossing Inspection Record Form, TEF3243, the relevant level Crossing Inspection Checklists listed in Table 3 and any supporting Ellipse Works Order, returning these to the SM(OT).

TEF no.	Inspection Checklist	Title
3241	LXi01	Road Arrangements
	LXi02	Road Signals
	LXi03	Booms or Barriers
	LXi04	Manned Gates
	LXi05	Telephone Systems
	LXi06	Road Signals & Signs, MSL/MWL
	LXi07	Road Signs, AHBC/ABCL
	LXi08	Road Signs, AOCL/AOCR
	LXi09	Road Signs, MCB/AFBC
	LXi10	Road Signs, Manned Gates
	LXi11	Road Signs, Open Crossings
	LXi12	Road Signs, UWC
	LXi13	Road Signs, Footpath and Bridleway
	LXi14	Road Signs, Station Barrow
	LXi15	Rail Signs, AHBC/MSL/MWL/AOCR
	LXi16	Rail Signs, Traincrew Operated
	LXi17	Rail Signs, AOCL/ABCL/OC
	LXi18	Whistleboards
	LXi19	AHBC/ABCL Operation
	LXi20	AOCL/AOCR Operation
	LXi21	MCB Operation
	LXi22	Manned Gates Operation
	LXi23	Gates/Barriers Operation
	LXi24	Train Man Operated Operation
	LXi25	Station Barrow Operation
	LXi26	Sleeping Dog
	LXi27	Crossings on Mothballed Lines
	LXi28	Surface Systems (Crossing Decks)
3242	LXi29	Level Crossing Vertical Profile Inspection Sheet

Table 3 – List of Level Crossing Inspection Checklists from NR/L2/SIG/19608

The details to be recorded:

- The date of the inspection, the location details and the inspector
- Repairs identified and immediately actioned
- Repairs identified and partially actioned
- Any repairs outstanding
- Any remarks.

6.4.20 Review Inspection Paperwork

The SM(OT) shall:

- Review all paperwork for completeness and for correct identification of work arising and file accordingly
- Review the defects for ownership, i.e. those for which Network Rail is responsible and those that are the responsibility of an outside party, refer to Clause 6.4.25
- Sign all work orders, Level Crossing Inspection report form

- Escalate any queries to the TME
- Send all completed work orders to the SP for input into Ellipse.

6.4.21 Any Outstanding Defects?

The SM(OT), as part of the paperwork review, shall identify any outstanding defects which may require action. Where such action is identified Clause 6.4.25 applies, otherwise go to Clause 6.4.24.

6.4.22 Need for Feedback to ORCC?

The TME shall, as part of the paperwork review, identify factors that may require further consideration by the ORCC to comply with NR/L2/SIG/19608.

6.4.23 ORCC Review

The ORCC shall review any feedback from the TME and consider any requirement for action.

If the outcome of this review requires a change of inspection interval or other mitigations then the ORCC shall inform the SM(OT), TME and IME.

6.4.24 Continue Cyclic Inspection

The cyclic inspection process shall continue regardless of whether there are defects requiring action identified.

6.4.25 Outside Party Responsibility?

Where defects are identified the SM(OT) shall determine the responsibility for the ownership of the repair.

For those deemed the responsibility of an outside party, the Maintenance Protection Coordinator (MPC), shall manage the rectification of the defect.

6.4.26 Prioritise Outstanding Defects

The OTI prioritises defects identified to comply with this standard. Produce supporting Ellipse Work Arising Inspection Forms (WAIF).

The SM(OT) shall:

- Check all defects are prioritised correctly
- Identify further access requirements necessary for their repair
- Provide this information to the SP for input to Ellipse
- Undertake a risk assessment prior to any outstanding defects being re-prioritised.

6.4.27 Update Ellipse

Following receipt of the completed paperwork from the SM(OT) the SP shall:

- Update the task in Ellipse with details from the completed paperwork
- Re-plan any work not done as soon as practicable
- Add the WAIFs to the system as applicable
- File work sheets for inspection and audit purposes.

6.4.28 Repair Defect(s)

The SM(OT) is responsible for planning and delivering the defect repair to comply with Table 13 Clause 6.7.1.

6.5 Inspection - General

Inspection procedure with crossing installed:

Item	Check / Action
Surface system	Appropriate for the local environment
	Level with top of the railhead
	Free from defects, deficiencies and deterioration
	Fit for use (including edge beams and approaches)
	Signs of grounding
	Condition of road surface/crossing interface
	Road markings present and clear
	Skid resistance over level crossings equal to that of the road approaches
Flangeway	Clear of debris and water ponding
	Rubber panels for splitting in the flangeway
	Nominal width of 60mm. Where the flangeway is less than 60mm an entry and exit flare shall be provided.
	Minimum depth of 55mm with the exception of rubberised surface systems where a minimum depth of 50mm is permitted
Panels	Secure and stable
	Free from cracks and/or splits
	Tight against each other, i.e. no gaps
	Sitting level with each other with little variation in height, i.e. no steps
	Panel restraint is fitted, Polysafe and older STRAIL systems, and functioning. Especially key for configurations with high skew angles and/or tight radius.
	Watch road vehicles over the crossing to see if any panels rock or have excessive movement.
	All of the correct type
Trespass Guards	Fitted where required by Level Crossing Order and defect free
Drainage	Adequate
Chain deflectors	In position
End restraints	Correctly fitted where integral to proprietary system type
	Tightness

Table 4 – General surface system inspection with crossing installed

Inspection procedure with crossing removed:

Item	Check / Action
Panels	For wear/splitting on underside
	Edges for cracking/splitting
	Have been correctly sitting on the sleepers.
	Correct panels have been used. (Note panels with continuous relief over the fastenings are not suitable for public road crossings).
Ballast	Level is correct for surface system type
Sleeper	Spacing is correct; 600mm for road crossings
Rail fastenings	Correctly installed
	Shall be checked for corrosion as specified in NR/L2/TRK/001/mod/09. Adequate drainage is key to preventing excessive rail corrosion.
Rail	Shall be checked for corrosion as specified in NR/L2/TRK/001/mod/09. Adequate drainage is key to preventing excessive rail corrosion.

Table 5 – General surface system inspection with crossing removed

All repairs shall be carried out using a method approved by the surface system manufacturer.

6.6 Inspection by Proprietary System Type

6.6.1 STRAIL

When inspecting a STRAIL system in addition to Table 4 and Table 5 Clause 6.5, consider the following specific items:

Item	Check / Action
Panels	Tight against each other
	Correct type for application
End brackets (pre-1998 STRAIL systems ONLY)	Tight
End deflectors	In position

Table 6 – STRAIL Inspection – Panels in Place

Item	Check / Action
Panels	Wear particularly the tongue and groove fixings and underside for splitting/wear
	Have been sitting on sleepers correctly
Movement stoppers	Present and correctly located on the centre sleeper
Sleepers	Correct spacing, road crossings - 600mm centres
	Not worn/ broken
Ballast	Level with the top of the sleepers
Filler blocks	Wear especially the older plastic type which may wear on the sleeper area

Table 7 – STRAIL Inspection – Panels Removed

6.6.2 Holdfast

When inspecting a Holdfast system in addition to Table 4 and Table 5 Clause 6.5, consider the following specific items:

Item	Check/ Action
Panels	Correct type for application
	Four foot panels - in line and not staggered
	Ends sitting squarely and supported on the sleepers

Table 8 – Holdfast Inspection – Panels in Place

Item	Check/ Action
Panels	Underside for wear and splitting in flangeway
	Correct type - panels with continuous relief over the fastenings are not suitable for public road crossings
	Sitting on sleepers correctly
Sleepers	Spacing correct, i.e. 600mm centres
Winged turret plates	Located at the centre of the crossing with additional sets located as per the design of crossing
Turret plates	Correctly located on sleepers and between each panel
Ballast levels	Slightly lower than the top of the sleeper

Table 9 – Holdfast Inspection – Panels Removed

6.6.3 Polysafe

When inspecting a Polysafe system in addition to Table 4 and Table 5 Clause 6.5, consider the following specific items:

Item	Check/ Action
Panels	Tight against each other, up to 10mm gap tolerance is permissible, appropriate to crossing users
Securing Guards/ End restraints	Installed and secure
Panels	Surface cracks and break out
	Correct type for application
Wedges	In place

Table 10 – Polysafe Inspection – Panels in Place

Item	Check/ Action
Sleepers	600mm spacing for all panel types
Panels	Wear and condition
Rubber Wedges	Condition
Ballast levels	Level with the top of the sleepers

Table 11 – Polysafe Inspection – Panels Removed

6.7 Defect identification

6.7.1 Defect identification and reporting

The identification of defects at level crossings shall be achieved through a process of planned inspections using standardised inspection checklists, refer to Appendix B Table B1.

SC defects require immediate action as they are high risk to the safe operation of the level crossing, i.e. immediate danger or risk to pedestrians, road and/or rail traffic. Where they cannot be rectified whilst on site, they shall be immediately reported to the Signaller and to the Infrastructure Fault Control (IFC) for immediate action response. The OTI shall report the defect to their SM(OT) and remain on site till the rapid response team arrives.

SI defects are high risk to the safe operation of the level crossing, danger or risk to pedestrians, road and/or rail traffic. They shall be immediately reported to Infrastructure Fault Control (IFC) for rectification within 7days. The OTI shall report the defect to their SM(OT).

6.7.2 Defect Rectification Timescales

Defects shall be rectified in a timescale according to their assigned priority based on safety risk. Table 12 details the timescales to be applied.

SC and SI defects cannot be re-prioritised as they are high risk to the safe operation of the level crossing.

Defects with priorities of M1, M2, M3, M6, M12 and M24 may be re-prioritised by the TME after completing a risk assessment either via a site visit or site photographs.

Minimum Action	Rectification Timescale
SC	Within 36 hours
SI	Within 7 days
M1	Within 4 weeks
M2	Within 7 weeks
M3	Within 13 weeks
M6	Within 26 weeks
M12	Within 52 weeks
M24	Within 104 weeks

Table 12 – Defect Rectification Timescales

6.8 Rail Corrosion

The Level Crossing surface system shall be removed at intervals set out in NR/L2/TRK/001/mod09 to enable inspection of track for rail corrosion (foot, web and head).

Ultrasonic inspection of rail through level crossings shall be carried out as set out in NR/L2/TRK/001/mod06. Consequence of corroded rail is increased derailment risk due to loss of material and therefore loss of anchoring. Action shall be taken on rail corrosion, particularly to the rail foot, to comply with NR/L2/TRK/001/mod09.

The TME shall review and sign NR/L3/TRK/003/TEF3043.

6.9 Road Profile

The profile over any vehicular crossing shall have no sudden changes of vertical curvature.

The profile over a level crossing shall not cause a vehicle, such as a low loader or a tractor and trailer, to become grounded and obstruct the railway.

The likelihood of grounding depends on the characteristics of the road surface and the crossing and any potentially low clearance vehicles that might use the crossing.

The safe profile is determined by considering the theoretical wheelbase and ground clearance of road vehicles which might use the crossing. The maximum permissible profile hog anywhere on the road surface over the longest foreseeable wheelbase length is 150mm. The maximum design hump for all new, renewed and substantially disturbed level crossing surface systems is 75mm.

NOTE Some Level Crossing Orders stipulate for the longest wheelbase of vehicles which may forseeably use the crossing, any hump shall not exceed the 75mm design maximum by be more than 40mm; i.e. maximum hump of 115mm. Maintain the profile at these level crossings to this level.

The safe profile is defined by the vehicle category, which is in turn determined by the road and rail traffic density.

Crossing Type	Categorisation	Specified Wheelbase	For Distance From Rail	Maximum Permissible Hog	Comments
Cat 1	Crossings used by all types of vehicles including cars, vans, lorries or tractors or farm vehicles	11.5m	30m	150mm	Crossing Inspectors to use their local knowledge of the crossing usage to determine the categorisation, but where there is any doubt they shall default to Category 1. It is IMPORTANT that the category determined and measured is recorded on the form
Cat 2	Crossings used by 4 x 4 vehicles, Vans, Lorries or tractors or farm vehicles ONLY (not used by cars)	9.75m	20m	150mm	
Cat 3	Crossings ONLY used by Tractors or farm vehicles (not normal road vehicles)	8.5m	20m	150mm	

Table 13 – Vehicle Categorisation for Measuring Safe Vertical Profiles (Public and Private Roads)

NOTE Vehicles with a theoretical wheelbase of 15.3m are considered to be 'Abnormal Vehicles' and require permission from the Highways Authority Abnormal Loads Team before they can access the road network. It is therefore not necessary to check vehicular level crossings for clearance with the 15.3m theoretical wheelbase.

Crossing Type	Categorisation	Specified Wheelbase	Distance From Rail	Maximum Permissible Hog	Comments
UWC Cat A	Crossings used by all types of vehicles including cars, vans, lorries or tractors or farm vehicles	8.5m	12m	150mm	Crossing Inspectors to use their local knowledge of the crossing usage to determine the categorisation , but where there is any doubt they shall default to category A It is IMPORTANT that the category determined and measured is recorded on the form
UWC Cat B	Crossings used by 4 x 4 vehicles, vans, lorries or tractors or farm vehicles ONLY (not used by cars)	6.5m	9m	150mm	
UWC Cat C	Crossings ONLY used by Tractors or farm vehicles (not normal road vehicles)	4m	6m	150mm	

Table 14 – Vehicle Categorisation for Measuring Safe Vertical Profiles (UWC)

6.9.1 Basic Test

The TME plans the basic tests required by NR/L2/SIG/19608, which can be carried out separately or in conjunction with the normal inspection regime for level crossings.

6.9.2 Level and Gradient Surveys

The TME plans level surveys and gradient surveys that are required due to the results of basic tests. When determining the timescale for this work, the TME shall take into consideration the usage of the crossing and the degree of measured non-compliance from the basic test. The plan shall be agreed with the Route Asset Manager (Track), (RAM(T)).

6.9.3 Section Manager Off Track

The SM(OT) assists as necessary in the planning and implementation of the inspections, review the inspection outputs prioritise work arising, and delivery of subsequent works as appropriate.

6.9.4 Operation Risk Control Coordinator

The ORCC verifies the list of assets to be inspected and provide the level crossing category that applies to each crossing and the level crossings to be inspected.

6.9.5 Tools and Equipment

6.9.5.1 Basic Inspection

a) Non-conducting measuring rods and chord (as described in Appendix C)

b) Measuring Tapes

c) Approved optical inclinometer (Suunto PM-5/360 or similar)

6.9.5.2 Level Surveys and Gradient Surveys

Use approved level surveying equipment.

NOTE Vehicle borne survey systems can be used instead of Clause 6.9.5.1 and/ or Clause 6.9.5.2.

6.9.6 Planning

Using Infrastructure Maintenance Planning Handbook, plan inspections using the Ellipse Standard Job 9534 - Basic Test. The inspections are covered by existing Task Risk Control Sheet NR/L3/MTC/RCS0216/OT04 Inspect/ Maintain/ Repair Level Crossing. Detailed surveys are carried out by the Track Technical Team.

6.9.7 Method

6.9.7.1 Basic Inspection

i. Inspect the crossing surface for evenness and absence of pot-holes. Examine the roadway surface condition for significant potholes or other similar surface defects that cause a potential risk of grounding.

ii. Using the basic test, as described in Appendix D, measure the actual hog against the maximum permissible hog of 150mm for the specified wheelbase for the crossing type as detailed in Table 15 below. If the maximum permissible hog is exceeded for the specified wheelbase for the crossing category, re-measure using the specified wheelbase for the next lower crossing category. Continue re-measuring until the maximum permissible hog is no longer exceeded and record the associated specified wheelbase, or that the level crossing fails all specified wheelbases.

iii.

Crossing Type and Category	Specified Wheelbase	Approach Slope Assessment Distance From Outer Rail	Maximum Permissible Hog
Cat 1	11.5m	30m	150mm
Cat 2	9.75m	20m	150mm
Cat 3	8.5m	20m	150mm
UWC Cat A	8.5m	12m	150mm
UWC Cat B	6.5m	9m	150mm
UWC Cat C	4m	6m	150mm

Table 15 – Vertical Profile Survey and Limits Data

iv. For UWC only - visually assess the approach slopes for:-

- hollows/concave changes of gradient, particularly at the crossing/approach interface
- a steep gradient either side of the crossing (steeper than 1 in 8).

6.9.7.2 Level Survey and Gradient Survey

Where either of these surveys is required as a result of the basic inspection, they shall comply with Appendix D.

Crossing Profile	Surface Condition	Survey Result
< Maximum permissible hog	Pass	Pass
< Maximum permissible hog	Fail	Failed due to surface condition
> Maximum permissible hog	-	Fail
Approach slopes at UWCs have visible hollows/concave gradient changes or the gradient is steeper than 1 in 8	Fail	Gradient Survey Required

Table 16 – Level and Gradient Survey Results

6.9.8 Subsequent Actions

Prioritise crossings reported as "Failed due to surface condition" to comply with Table B1 Appendix B, so that action to correct the defects and/or to mitigate any risk may be taken.

Immediately report crossings reported as "Failed maximum permissible hog" to the responsible TME who will implement the following actions:

If serious risks are identified by the basic test, review existing on-site mitigation measures and arrange further actions to reduce the risk to road and rail traffic. Seek advice from the ORCC.

Mitigation includes but is not limited to:

- Emergency Speed Restriction for trains
- Temporary closure of the crossing with openings controlled by Mobile Operations Manager or other competent staff.
- Man the crossing.

Plan and carry out detailed level survey within 7 weeks using approved techniques to confirm the results of the basic test. Determine the extent of the corrective action required to remove or mitigate the risks of grounding. Details of the level survey fixed points are given in Appendix D.

Crossings reported as "Gradient survey required" shall have the approach gradients measured using approved survey equipment as detailed in Appendix D.

Crossings without any of the above issues reported as "Passed maximum permissible hog" require no further action other than reporting.

The level crossings are to be inspected and details recorded on TEF3242 (LXi29) form. Completed forms are to be returned to the SM(OT) and reviewed by the TME.

6.9.8.1 Corrective Actions

Corrective action may include re-grading of the road or rail vertical profiles; mitigating actions include review and subsequent provision of mitigating systems on site. Contact ORCC to agree risk mitigation measures to be put in place.

Mitigation includes, but is not limited to:

- Knowledge of how to contact Signaller (sign saying who to call)
- Risk of grounding signs (advice of grounding risk to user)
- Provision of direct phone to Signaller (ease of contact)
- Improve sighting distances (reducing effect of risk)
- Re-profiling of road surface which may include regrading of the track level.

The risk is increased ONE level if crossing has history of misuse.

6.9.8.2 Risk Levels

Crossings are allocated a risk level depending on existing mitigation on site:

Risk Level		Existing Mitigation	Sighting	Misuse
High	1	None	Inadequate	-
Medium	2	One level	-	-
Low	3	Two levels	-	No history

Table 17 – Failed Profile Risk Levels

The risk levels are determined by the TME and ORCC. Once a risk level has been assigned the following actions can be taken:

Risk Level		Mitigation
High	1	Install telephone and signage / Re-profile
Medium	2	Install telephone and/or signage
Low	3	No work required

Table 18 – Mitigation for failed crossings

7 Installation and Maintenance

7.1 Introduction

A Level Crossing is a fixed point in the profile of the track and shall not change with engineering work; although a decking system is designed to take minor re-alignments of up to 10mm without having to be renewed.

7.2 Generic types of surface system for level crossings

7.2.1 Direct Loading Systems

These systems are dependant on sleeper spacing as they are supported by the sleeper. As the load is transferred from the crossing panel to the sleeper match the bottom of the panel to the top profile of the sleeper. Examples of this system include timber decks, Strail, Holdfast and older Omni systems (no longer manufactured).

7.2.2 Bridging Systems

The panels bridge the space between the supports, i.e. the rails or rail and kerb. Loads from road traffic are transferred from the panel to the rail and into the track system. Examples of this system include Polysafe and older Bomac Types (no longer manufactured).

7.2.3 Slab

This system consists of embedded rails where the load is spread throughout the pre-cast concrete units. The rails are moulded in situ. This design is considered to address most of the failure types associated with high loading. An example of this system is Harmelen.

7.2.4 Wooden Construction

This system is a direct loading system which distributes load directly onto sleepers and is constructed on site to suit track configuration. Construct to comply with REPW/450 - REPW/451.

Use wooden construction systems only where timber sleeper track exists, Track Categories 4 – 6. They are not suitable for public vehicular crossings. If any wooden systems exist in the highway they shall be renewed and replaced with a modern proprietary system.

7.2.5 Ballast Boxes

Do not use this crossing type in running lines, i.e. use in sidings and depots only.

Provide retaining boxes up to the rail head for all boxed ballast crossing surfaces. The boxes stop the surface degrading or sliding away underfoot, and maintain flange way clearance.

They shall be:

- Easily removed and replaced for maintenance
- Secured against vertical and lateral movement
- Constructed in accordance to diagram RT/CED/600/11.

7.3 Proprietary System by Type

7.3.1 STRAIL

STRAIL is a direct loading rubber panel system which consists of end restraints and tie rods, locking the system together as a monolithic unit. Earlier STRAIL systems did not have tie rods, and are therefore not monolithic. End restraints are integral to the earlier system type.

In older panel designs, if there are difficulties in matching the sleeper and panel profiles approved rubber matting may be used as specified by the manufacturer.

For STRAIL systems in road level crossings space sleepers at 600mm centres and ballast to be just below or flush with the top of the sleepers.

STRAIL have produced compensation panels which vary in width up to 100mm from the standard panels. These maybe used at high skew level crossings. When a panel joint is supported by less than 50mm of the sleeper, a reduced or enlarged compensation panel which brings the joint back to the sleeper centre should be installed to correct the panel seating.

Failure to install correctly can manifest as deflections of the rubber panels where they are insufficiently supported by sleepers.

Figure 3 – STRAIL System (Reproduced with permission from STRAIL/ Kraiburg Elastik GmbH)

Figure 4 – STRAIL System

7.3.2 Holdfast

Holdfast is a direct loading system based on the original Omni rubber panel design that is no longer manufactured.

In older panels only, if there are difficulties in matching the sleeper profile to panel profile approved rubber matting may be used as specified by the manufacturer.

For Holdfast systems in road level crossings space sleepers at 600mm centres and ballast to be just below or flush with the top of the sleepers.

'Winged' turret plates are located at the centre of the crossing with additional sets located as per the design to fix the position and prevent lateral movement of the system. 'Plain' turret plates are located on the sleepers in between each panel to fix position of adjacent panels.

Failure to correctly install the turret plates will lead to increased risk of movement or displacement of the panels, which can be indicated by gaps in the system.

Figure 5 – Holdfast System

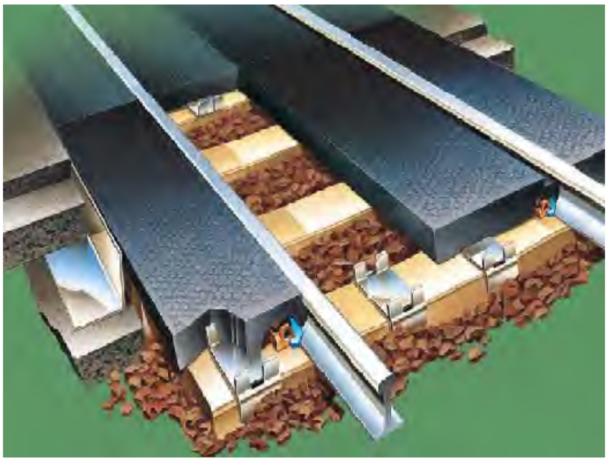


Figure 6 – Holdfast System with panel removed (Reproduced with permission from Holdfast Level Crossings Limited)

7.3.3 Omni

Omni is a direct loading panel system that is no longer manufactured.

Figure 7 – Omni concrete panel system

Figure 8 – Omni rubber panel system

7.3.4 Polysafe

The Polysafe design is a bridging system based on the Tarmac Bomac concrete panel system which is no longer manufactured. The 'Bridging' design accommodates road profile on canted track.

Space sleepers in road level crossings at 600mm centres and ballast to be level with the top of sleepers.

Polysafe panels are held in place by friction between rubber wedges secured against panel nib and rail web. These wedges are both internal and external and are 600mm in length.

Track fastenings are visible with the crossing panels installed.

Figure 9 – Polysafe System

Figure 10 – Polysafe System

7.3.5 Bomac

Bomac is a bridging system consisting of both framed and unframed concrete panels. The system is held in place by friction between rubber wedges, of length 200mm and 400mm, and the panels.

Polysafe concrete panels are compatible with Bomac panels, and can be mixed with these for maintenance. Support the panels with their respective rubber wedges.

Figure 11 below shows the correct installation of Bomac 113A wedge sets.

Figure 11 – Bomac 113A wedges installation

7.3.6 Harmelen

Harmelen is a slab track system consisting of embedded rails, the load spreads throughout the pre-cast concrete system.

Slab track crossings are only for use at crossings where Exceptional Operating Conditions (as defined in NR/L2/TRK/4040) have lead to repeated failure of other proprietary systems.

Figure 12 – Harmelen system

Figure 13 – Harmelen system

7.4 Manufacturer Installation Guidance

Manufacturers are to provide copies of operating and maintenance manuals to users of the product as necessary.

7.4.1 STRAIL Installation Guide

http://www.strail.de/index.php?id=915&L=1

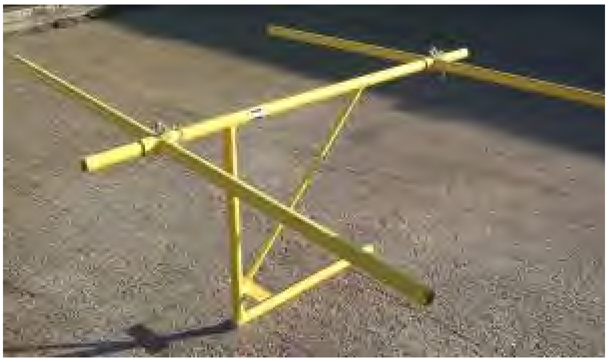


Figure 14 – STRAIL Manual Lifting Device

Figure 15 – STRAIL Manual Lifting Frame

Figure 16 – Mechanical Lifting Device

STRAIL removal procedure:

- Remove the tie rods (or end brackets on older design).
- Remove internal panels by inserting two crowbars into the recesses on the bottom of the panel where it rests on the sleeper and levering up.
- As the panel is moved by rolling forward two persons grasp the leading edge and continue the rolling action freeing the panel.
- The external panels are removed with one person using a crowbar but two are needed to continue the rolling action.

7.4.2 Holdfast Installation Guide

http://www.railcrossings.co.uk/downloads.php

Figure 17 – Holdfast Lifting Pins

Figure 18 – Rosehill Lifting Pins

The new Holdfast vertically split lifting pins have been developed to safely lift Holdfast panels.

Rosehill lifting pins have also been developed for lifting Holdfast crossing panels. The lifting pins are designed to lock in position to enable safe lifting.

Holdfast removal procedure:

- Use bars inserted into the two holes to lift the panels from their seated positions. If panels do not have holes work from the ends towards the centre.

7.4.3 Polysafe Installation Guide

http://www.polysafe.co.uk/cgi-bin/ps_page.pl?ref=5.3

Figure 19 – Polysafe Lifting Devices

Removal procedure:

- Unbolt and remove securing devices-leave clips in position.
- Remove top internal wedges using large screwdriver. Ease panel to one side using crowbars, use angle iron strip to protect panel.
- Remove internal panels using lifting device.
- Remove external panels by barring each panel sideways until sufficient room is obtained to insert lifting device, then lift and rotate the rear of the panel upwards and clear.

Removal procedure for single unit:

Inner panels

- Remove the top wedges up to and including the panel to be removed, lever panel sideways and install lifting devices.

Outer panels

- Raise the rear of the panel with two crowbars in the concrete kerb slots until it is possible to position the lifting device and raise the panel clear.

NOTE Before re-installing make sure that the rail, all panel bearing surfaces and kerbs are brushed clean, the rubber wedges washed and any damaged components replaced.

7.5 General Maintenance

For the purposes of surface systems, maintenance generally refers to the replacement of individual panels and components as opposed to repair in situ.

For failure of major components, e.g. edge beams, road closures, possession access and machinery will be required to enable works.

For guidance on road closures for planned and emergency works, refer to “New Roads and Street Works Act Procedure” available from the National Signalling and Level Crossings Programme Team.

Mitigation in the form of Emergency Speed Restrictions (ESR); manning of the crossing to protect users and closure of the crossing to road vehicles and pedestrians, can be applied.

Level crossings are a fixed point in the profile of the track. The track shall not be lifted or recanted through level crossings when track tamping is undertaken.

7.5.1 Temporary Repairs

Temporary repair of surface systems may be required where timescales to obtain a road closure or possession is outside the defect rectification timescales.

The following temporary repairs can be considered for a panel system:

Item	Action
Gaps	Wedge gaps Fill with epoxy resins Fill with approved foam spray Use approved fillers
Surface damage	Epoxy resins
Restraints	Tighten
Four Foot Deflector/ Chain guards	Tighten

Potholes within the railway boundary can be temporarily repaired using tarmac.

NOTE Only use fillers, epoxies, etc with Product Acceptance.

8 Renewals

8.1 General

Level crossing surface systems are designed to have a minimum service life of 15 years under normal operating conditions provided that the manufacturers' maintenance schedule has been followed.

NR/L2/SIG/30015 details the preferred layouts for renewal of footpaths, bridleways and User Worked crossings. NR/L2/SIG/30015 is applicable to new crossings or assets to be renewed during maintenance works.

For road crossings with high skew (acute angle between road and railway centre lines > 60°) /tight radius (radius of curvature of the railway < 400m) the proprietary system type shall be a full depth interlocking modular system.

When installing surface systems at crossings which are subjected to high loading a direct loading system shall be used.

Different proprietary system panels shall not be installed within the same level crossing.

The track shall not be lifted through level crossings when track renewal is undertaken, unless road profiling work is carried out at the same time. To meet the maximum design hump of 75mm; limit lifting or The new specification shall be achieved before the crossing is reopened to road and rail traffic.

8.2 Application of Proprietary Systems

Level crossing surface system supplier/ manufacturer's produce different panel systems for various crossing applications. Refer to NR/L3/TRK/2049/Clause D.8.1: Level Crossing Surface Systems - 1 and NR/L3/TRK/2049/Clause D.8.2: Level Crossing Surface Systems - 2.

8.3 Level Crossing Renewal/ Refurbishment Priority Assessment

TEF 3214 details a scoring system designed to assist with the prioritisation of renewals / refurbishment works. It covers both Maintenance Opex works e.g. replacement of Timber Decks at User Worked Crossings, and renewal / enhancement works.

Scoring prioritises crossing renewals / refurbishment works as a whole either by depot, route and/or nationally but does not specify set timescales.

The system consists of two sections – Usage and Condition. Each section has a sub total, which are multiplied together to give the overall score; this is then compared to scores from other crossings.

The crossing usage score is based upon:

- Crossing Type: Public Road / UWC / Bridleway / Footpath
- Road Classification - higher score for HGVs

- Actual road speed across the crossing. This is estimated and is not necessarily the prescribed legal speed limit as some speeds over the crossings are actually higher or lower than the legal limits
- Track Category
- Whether there is a high skew angle.

The condition score is based upon:

- Percentage of damaged, worn or rocking panels
- Condition of the cill beams
- Condition of the tarmac / road approaches
- Wet beds or track drainage ineffective
- Uncoated rail present and/or potential for water run off for salt contamination.

8.4 Level Crossing Renewal/ Refurbishment

TEF 3215 provides a standardised template for Level Crossing renewal or refurbishment proposal and shall be followed.

The following information shall be specified:

- Proposal number
- Location, including - route, delivery unit, ELR, mileage, Track ID(s)
- Ellipse Equipment Number
- Sleeper Type
- Rail Type / fastenings
- Renewal or a refurbishment proposal.

The sleeper, rail type and fastening information, is crucial to allow the appropriate proprietary system to be scoped for the existing and/or proposed track components.

Detail the justification for the renewal/refurbishment, e.g. life expired components, ORR enforcement or track realignment; supporting evidence may also be included e.g. inspection reports, Network Operations All Level Crossing Risk Model (ALCRM). Include a detailed description of existing infrastructure with the preferred renewal / refurbishment system selected.

The TEF shall be signed by the TME, although it might be completed by their SM(OT). It is then submitted to the RAM(T) and a signed copy returned to the TME when approved or declined.

8.5 Road Re-profiling

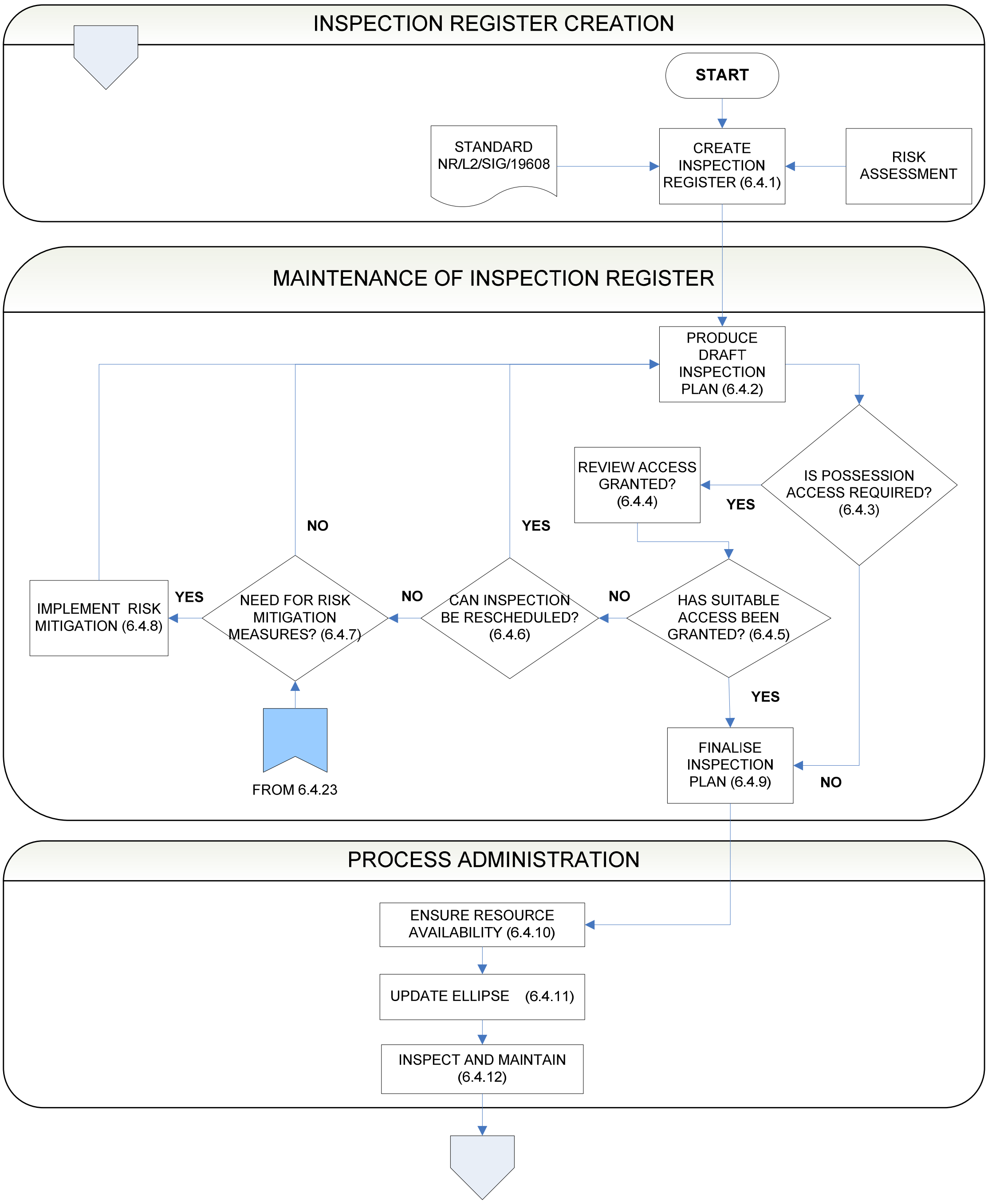
Major track renewal which affects the interface between the road and the crossing will require associated road reprofiling to meet maximum design hog requirements of

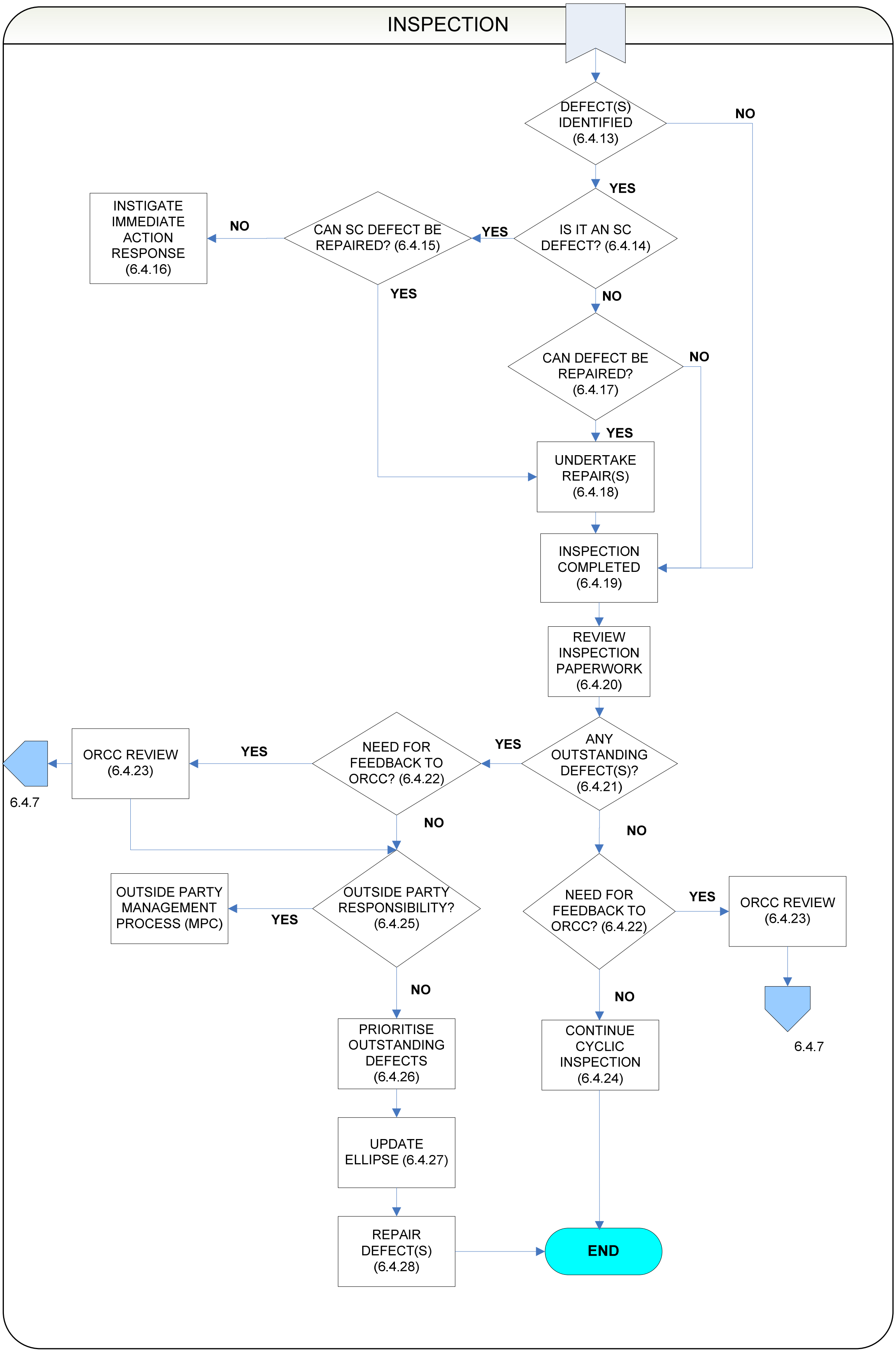
75mm. Additionally crossings which have failed maximum permissible hog will also require re-profiling.

The Local Authority will need to be consulted for reprofiling outside Network Rail boundaries.

Refer to NR/L3/TRK/2049/Clause D.8.3: Level Crossing Road Profiles - 1 and NR/L3/TRK/2049/Clause D.8.4: Level Crossing Road Profiles - 2.

Appendix A
Inspection Flowchart





INSPECTION
DEFECT(S) IDENTIFIED (6.4.13)
NO
YES
IS IT AN SC DEFECT? (6.4.14)
YES
CAN SC DEFECT BE REPAIRED? (6.4.15)
NO
INSTIGATE IMMEDIATE ACTION RESPONSE (6.4.16)
YES
NO
CAN DEFECT BE REPAIRED? (6.4.17)
NO
YES
UNDERTAKE REPAIR(S) (6.4.18)
INSPECTION COMPLETED (6.4.19)
REVIEW INSPECTION PAPERWORK (6.4.20)
ANY OUTSTANDING DEFECT(S)? (6.4.21)
YES
NEED FOR FEEDBACK TO ORCC? (6.4.22)
YES
ORCC REVIEW (6.4.23)
6.4.7
NO
NO
OUTSIDE PARTY RESPONSIBILITY? (6.4.25)
YES
OUTSIDE PARTY MANAGEMENT PROCESS (MPC)
NEED FOR FEEDBACK TO ORCC? (6.4.22)
YES
ORCC REVIEW (6.4.23)
6.4.7
NO
PRIORITISE OUTSTANDING DEFECTS (6.4.26)
NO
CONTINUE CYCLIC INSPECTION (6.4.24)
UPDATE ELLIPSE (6.4.27)
REPAIR DEFECT(S) (6.4.28)
END

Appendix B
Defect Minimum Actions (Table B.1)

Condition	Action Inspector/ Patroller	Action Section Manager (Off Track/ Track)	Initial Track Priority	Permanent Rectification Timescale
1.1 Trespass Guards on Public Road Vehicular Crossings (if required & shown on Legal Order / Ground Plan)				
One or more guards missing or one or more guards damaged and ineffective.	Notify Infrastructure Fault Control (IFC) and SM(OT). Temporary repair - lift adjacent guard(s) and re-fix at angle so effective measure in place. If temporary repair not possible consider closing crossing to pedestrian traffic at high risk locations.	Notify IFC. Notify SM(OT). Temporary repair - lift adjacent guard(s) and re-fix at angle so effective measure in place. If temporary repair not possible consider closing crossing to pedestrian traffic at high risk locations. Permanent repair - install missing / new guard within 24 weeks.	SC	M6
Any number of guards damaged but effective.	Record on inspection record sheet, raise WAIF with rectification timescale of 24 weeks.	Record on inspection record sheet, raise WAIF with rectification timescale of 24 weeks.		M6
Less than 2600mm but >1000mm 'step over' distance between adjacent sets of guards.	Record on inspection record sheet, raise WAIF with rectification timescale of 24 weeks.	Record on inspection record sheet, raise WAIF with rectification timescale of 24 weeks.		M6
Less than 1000mm 'step over' distance between adjacent sets of guards at manned crossing.	Notify IFC and SM(OT). Consider mitigation of placing watchman or closing crossing to pedestrian traffic. Temporary rectification - install additional length guards to achieve minimum 1000mm step over.	Notify IFC and ORCC/ORA. Consider mitigation of placing watchman or closing crossing to pedestrian traffic. Temporary rectification - install additional length guards to achieve minimum 1000mm step over. Permanent repair - install full length step over for guards within 24 weeks.	SC	M6
Guards installed incorrectly length <2.6m but >2.3m.	Record on inspection record sheet, raise WAIF with rectification timescale of 52 weeks.	Record on inspection record sheet. Permanent repair - install correct length as standard detail within 52 weeks.		M12
Guards installed incorrectly e.g. >35mm between timbers but effective.	Record on inspection record sheet, raise WAIF with rectification timescale of 52 weeks.	Record on inspection record sheet. Permanent repair - install correctly as standard detail within 52 weeks.		M12

Less than 1000mm step over at unmanned or remote crossing / guards incorrectly installed but not effective / installed less than 2.3m in length.	Notify IFC and SM(OT). Consider mitigation of placing watchman or closing crossing to pedestrian traffic. Temporary rectification - install minimum 1000mm of guards to create effective measure.	Notify IFC and ORCC/ORA. Consider mitigation of placing watchman or closing crossing to pedestrian traffic. Temporary rectification - install minimum 1000mm of guards to create effective measure. Permanent rectification - install fully compliant trespass guards within 24 weeks.	SC	M6
1.2 Trespass Guards on Footpath Crossings (all types) and where part of a UWC (if required & shown on endorsed record plan)				
One or more guards missing or one or more guards damaged and ineffective.	Notify Infrastructure Fault Control (IFC) and SM(OT). Temporary repair - lift adjacent guard(s) and re-fix at angle so effective measure in place. If temporary repair not possible consider closing crossing to pedestrian traffic at high risk locations.	Notify IFC. Notify SM(OT). Temporary repair - lift adjacent guard(s) and re-fix at angle so effective measure in place. If temporary repair not possible consider closing crossing to pedestrian traffic at high risk locations. Permanent repair - install missing / new guard within 24 weeks.	SC	M6
Any number of guards damaged but effective.	Record on inspection record sheet, raise WAIF with rectification timescale of 24 weeks.	Record on inspection record sheet, raise WAIF with rectification timescale of 24 weeks.		M6
Less than 2600mm but >1000mm 'step over' distance between adjacent sets of guards.	Record on inspection record sheet, raise WAIF with rectification timescale of 24 weeks.	Record on inspection record sheet, raise WAIF with rectification timescale of 24 weeks.		M6
Less than 1000mm 'step over' distance between adjacent sets of guards.	Notify IFC and SM(OT). Consider mitigation of placing watchman or closing crossing to pedestrian traffic. Temporary rectification - install additional length guards to achieve minimum 1000mm step over.	Notify IFC and ORCC/ORA. Consider mitigation of placing watchman or closing crossing to pedestrian traffic. Temporary rectification - install additional length guards to achieve minimum 1000mm step over. Permanent repair - install full length step over for guards within 24 weeks.	SC	M6
Guards installed incorrectly length <2.6m but >2.3m.	Record on inspection record sheet, raise WAIF with rectification timescale of 52 weeks.	Record on inspection record sheet. Permanent repair - install correct length as standard detail within 52 weeks.		M12
Guards installed incorrectly (e.g. >35mm between timbers) but effective.	Record on inspection record sheet, raise WAIF with rectification timescale of 52 weeks.	Record on inspection record sheet. Permanent repair - install correctly as standard detail within 52 weeks.		M12
Less than 1000mm step over at unmanned or	Notify IFC and SM(OT). Consider mitigation of placing watchman or closing crossing to	Notify IFC and ORCC/ORA. Consider mitigation of placing watchman or closing crossing to	SC	M6

remote crossing / guards incorrectly installed and not effective / installed less than 2.3m in length.	pedestrian traffic. Temporary rectification - install minimum 1000mm of guards to create effective measure.	pedestrian traffic. Temporary rectification - install minimum 1000mm of guards to create effective measure. Permanent rectification - install fully compliant trespass guards within 24 weeks.		
1.3 Cattle cum Trespass Guards on UWC (if required & shown on endorsed record plan) (including for crossing of livestock)				
One guard missing or one guard damaged and ineffective.	Record on inspection record sheet, raise WAIF with permanent rectification timescale of 24 weeks. Temporary repair - lift adjacent guard and re-fix at angle so effective guard in place within 36 hours	Record on inspection record sheet, raise WAIF with permanent rectification timescale of 24 weeks. Temporary repair - lift adjacent guard and re-fix at angle so effective guard in place within 36 hours	SC	M6
Two or more guards missing or two or more guards damaged and ineffective.	Notify Infrastructure Fault Control (IFC), close crossing to passage of livestock. Notify SM(OT). The ORCC/ORA shall consider continued or alternative mitigation e.g. placing watchman or closing crossing to passage of livestock. Temporary repair if three or less guards missing, lift and re-fix at angle so effective barrier in place.	Notify IFC, close crossing to passage of livestock. Notify ORCC/ORA. The ORCC/ORA shall consider continued or alternative mitigation of placing watchman or closing crossing to passage of livestock. Temporary repair if three or less guards missing, lift and re-fix at angle so effective barrier in place. Permanent repair - install missing / new guards within 24 wks.	SC	M6
Any number of guards damaged but effective.	Record on inspection record sheet, raise WAIF with rectification timescale of 24 weeks.	Record on inspection record sheet, raise WAIF with rectification timescale of 24 weeks.		M6
Less than 2600mm but >1000mm 'step over' distance between adjacent sets of guards.	Record on inspection record sheet, raise WAIF with rectification timescale of 24 weeks.	Record on inspection record sheet, raise WAIF with rectification timescale of 24 weeks.		M6
Less than 1000mm 'step over' distance between adjacent sets of guards.	Notify IFC, close crossing to passage of livestock. Notify SM(OT). The ORCC/ORA shall consider continued or alternative mitigation e.g. placing watchman or closing crossing to passage of livestock. Temporary rectification - install additional length guards to achieve minimum 1000mm step over.	Notify IFC, close crossing to passage of livestock. Notify ORCC or ORA. The ORCC/ORA shall consider continued or alternative mitigation e.g. placing watchman or closing crossing to passage of livestock. Temporary rectification - install additional length guards to achieve minimum 1000mm step over. Permanent repair - install full length step over for guards within 24 weeks.	SC	M6
Guards installed incorrectly length <2.6m but >1000mm*.	Record on inspection record sheet, raise WAIF with rectification timescale of 52 weeks.	Record on inspection record sheet. Permanent repair - install correct length as standard detail within 52 weeks.		M12
Guards installed	Record on inspection record sheet, raise WAIF	Record on inspection record sheet. Permanent		M12

incorrectly e.g. >35mm between timbers but effective.	with rectification timescale of 52 weeks.	repair - install correctly as standard detail within 52 weeks.		
Guards incorrectly installed and not effective to prevent animal incursion / installed less than 1000mm in length.	Notify IFC, close crossing to passage of livestock. Notify SM(OT). The ORCC/ORA shall consider continued or alternative mitigation e.g. placing watchman or closing crossing to passage of livestock. Temporary rectification - install additional length guards to achieve minimum 1000mm step over.	Notify IFC, close crossing to passage of livestock. Notify ORCC/ORA. The ORCC/ORA shall consider continued or alternative mitigation e.g. placing watchman or closing crossing to passage of livestock. Temporary rectification - install additional length guards to achieve minimum 1000mm step over. Permanent rectification - install fully compliant trespass guards within 24 weeks.	SC	M12
2.0 Surface Units - Bridging Systems (e.g. Bomac, Polysafe)				
Panel(s) rocking on public highway crossings (including broken nibs even if no panel movement).	Notify Signaller, Infrastructure Fault Control (IFC) and SM(OT).Consider closure of crossing to vehicular traffic. Immediate action - lift panel(s), investigate and rectify (normally failed nibs or missing rubbers). If immediate rectification not possible, place watchman and ORCC to instruct on any further mitigation (e.g. remove panel & close crossing to public, impose ESR with full time watchman etc).	Notify Signaller, IFC and ORCC/ORA. Consider closure of crossing to vehicular traffic. Immediate action - lift panel(s), investigate and rectify (normally failed nibs or missing rubbers). If immediate rectification not possible, place watchman and ORCC to instruct on any further mitigation (e.g. remove panel & close crossing to public, impose ESR with full time watchman etc).	SC	SC
Panel(s) rocking on UWC - all types (including broken nibs even if no panel movement).	Notify Signaller, IFC and SM(OT). Consider closure of crossing to vehicular traffic. Immediate action - lift panel(s), investigate and rectify (normally failed nibs or missing rubbers) If immediate rectification not possible, place watchman and ORCC/ORA to instruct on any further mitigation (e.g. remove panel & close crossing to public, impose ESR with full time watchman etc).	Notify Signaller, IFC, and ORCC/ORA. Consider closure of crossing to vehicular traffic. Immediate action - lift panel(s), investigate and rectify (normally failed nibs or missing rubbers) If immediate rectification not possible, place watchman and ORCC/ORA to instruct on any further mitigation (e.g. remove panel & close crossing to public, impose ESR with full time watchman etc).	SC	SC
Panel(s) rocking on pedestrian crossing - all types (including broken nibs even if no panel movement).	Notify IFC and SM(OT) . If trip hazard consider closing crossing to pedestrian traffic. Immediate action - lift panel(s), investigate and rectify (normally failed nibs or missing rubbers) If immediate rectification not possible, place watchman and ORCC/ORA to instruct on any	Notify IFC and ORCC/ORA. If trip hazard consider closing crossing to pedestrian traffic. Immediate action - lift panel(s), investigate and rectify (normally failed nibs or missing rubbers) If immediate rectification not possible, place watchman and ORCC/ORA to instruct on any	SC	SC

	further mitigation (e.g. remove panel & close crossing to public, impose ESR with full time watchman etc).	further mitigation (e.g. remove panel & close crossing to public, impose ESR with full time watchman etc).		
Not gapped correctly on public highway crossings.	If gap in area likely to be used by cyclists, notify IFC, Notify SM(OT), rectify within 36 hours. Temporary repair - install timber wedge rubber wedge, foam filler or similar OR consider taking line blockage and lever up panels to close gaps and install wedge at end restraint.	If gap in area likely to be used by cyclists, notify IFC and ORCC/ORA, rectify within 36 hours. Temporary repair - install timber wedge rubber wedge, foam filler or similar OR consider taking line blockage and lever up panels to close gaps and install wedge at end restraint. Permanent repair, close up gaps and reset end restraints within 7 days.	SC	SI
Not gapped correctly on public highway crossings.	If gap in area not likely to be used by cyclists, rectify within 7 days. Temporary repair (not mandatory) - install timber wedge, rubber wedge, foam filler or similar OR consider taking line blockage and lever up panels to close gaps and install wedge at end restraint.	If gap in area not likely to be used by cyclists, rectify within 7 days. Temporary repair (not mandatory) - install timber wedge rubber wedge, foam filler or similar OR consider taking line blockage and lever up panels to close gaps and install wedge at end restraint. Permanent repair, close up gaps and reset end restraints within 7 days.	SI	SI
Not gapped correctly on UWC and Footpath Crossings - all types.	Record on inspection record sheet, raise WAIF with permanent rectification within 4 weeks. Temporary repair (not mandatory) - install timber wedge, rubber wedge, foam filler or similar OR consider taking line blockage and lever up panels to close gaps and install wedge at end restraint.	Record on inspection record sheet, raise WAIF with permanent rectification within 4 weeks. Temporary repair (not mandatory) - install timber wedge rubber wedge, foam filler or similar OR consider taking line blockage and lever up panels to close gaps and install wedge at end restraint. Permanent repair, close up gaps and reset end restraints within 7 days.	M1	M1
Missing rubbers - all crossing types.	Notify Signaller, IFC and SM(OT). Consider closing crossing to vehicular traffic. Immediate action - lift panel(s), investigate and rectify. If immediate rectification not possible, place watchman and ORCC to instruct on any further mitigation (e.g. remove panel & close crossing to public, impose ESR with full time watchman etc).	Notify Signaller, IFC and ORCC/ORA. Consider closing crossing to vehicular traffic. Immediate action - lift panel(s), investigate and rectify. If immediate rectification not possible, place watchman and ORCC to instruct on any further mitigation (e.g. remove panel & close crossing to public, impose ESR with full time watchman etc).	SC	SC
Displaced rubbers - all crossing types.	Record on inspection record sheet, raise WAIF re-inspect within 7 days if no worse rectify	Record on inspection record sheet, raise WAIF re-inspect within 7 days if no worse rectify within	SI	M1

	within 4 weeks, if worse action as 'missing rubbers'.	4 weeks, if worse action as 'missing rubbers'.		
Surface condition - all types.	Note cracks, chips, holes, loose infill, small areas where surface has come out. Use inspector judgement as to location and scale of defect, the traffic, usage and any deterioration. If defect likely to cause panel failure within 36 hours or defect already a risk to users, notify Signaller, IFC and SM(OT). Consider closing crossing to vehicular traffic and / or pedestrian traffic (dependent on location of defect). Temporary repair to panel if possible - infill with tarmac, epoxy resin, grout etc; if no repair possible place watchman and ORCC to instruct on any further mitigation (e.g. remove panel & close crossing to public, impose ESR with full time watchman etc). For all other defects - record on inspection forms, take photograph, arrange re-inspection if considered appropriate to check for deterioration and record on WAIF with rectification timescale using best judgement. Range of timescales for rectification is 36hours to 52 weeks.	Note cracks, chips, holes, loose infill, small areas where surface has come out. Use inspector judgement as to location and scale of defect, the traffic, usage and any deterioration. If defect likely to cause panel failure within 36 hours or defect already a risk to users, notify Signaller, IFC and ORCC/ORA. Consider closing crossing to vehicular traffic and / or pedestrian traffic (dependent on location of defect).Temporary repair to panel if possible - infill with tarmac, epoxy resin, grout etc; if no repair possible place watchman and ORCC to instruct on any further mitigation (e.g. remove panel & close crossing to public, impose ESR with full time watchman etc). For all other defects - record on inspection forms, take photograph, arrange re-inspection if considered appropriate to check for deterioration and record on WAIF with rectification timescale using best judgement. Range of timescales for rectification is 36hours to 52 weeks.	SC	M12
Bomac / Polysafe panels mixed - incorrect rubbers.	Treat as displaced rubbers.	Treat as displaced rubbers.	SI	M1
Panels sitting proud of sill beams - where pedestrians cross, all crossing types.	Record on inspection record sheet, raise WAIF with permanent rectification within 52 weeks. Temporary repair - install tarmac or concrete ramp within 36hours.	Record on inspection record sheet, raise WAIF with permanent rectification within 52 weeks. Temporary repair - install tarmac or concrete ramp within 36hours.	SC	M12
Panels sitting proud of sill beams - other locations.	Record on inspection record sheet, raise WAIF with permanent rectification within 52 weeks.	Record on inspection record sheet, raise WAIF with permanent rectification within 52 weeks.	M12	M12
2.1 Surface Units - Load Bearing Systems 1 (e.g. Strail, Holdfast)				
Panel(s) rocking - all crossing types.	Load bearing systems should not rock. If they do, panel(s) either damaged or units not being properly supported by sills or sleepers. Notify Signaller and Infrastructure Fault Control (IFC), and SM(OT). Consider closing crossing to	Load bearing systems should not rock. If they do, panel(s) either damaged or units not being properly supported by sills or sleepers. Notify Signaller, IFC and ORCC/ORA. Consider closing crossing to vehicular traffic. Immediate action - lift	SC	SC

	vehicular traffic. Immediate action - lift panel(s), investigate and rectify. If immediate rectification not possible, place watchman and ORCC to instruct on any further mitigation (e.g. close crossing to public, impose ESR, ESR with full time watchman etc).	panel(s), investigate and rectify. If immediate rectification not possible, place watchman and ORCC to instruct on any further mitigation (e.g. close crossing to public, impose ESR, ESR with full time watchman etc).		
Not gapped correctly - all crossing types.	Load bearing systems are joined together with ether tie rods or turret plates. If gaps appear, likely that rod or turret plate broken or missing. Notify Signaller IFC and SM(OT). Immediate temporary rectification such as install timber wedge rubber wedge, foam filler or similar and place steel pin / timber post or similar as temporary end restraint if none present.	Load bearing systems are joined together with ether tie rods or turret plates. If gaps appear, likely that rod or turret plate broken or missing. Notify Signaller, IFC and ORCC/ORA. Immediate temporary rectification such as install timber wedge rubber wedge, foam filler or similar and place steel pin / timber post or similar as temporary end restraint if none present. Permanent rectification within 4 weeks.	SC	M1
Surface condition - all types.	Note cracks, tears, damage, holes. Use inspector judgement as to location and scale of defect, the traffic, usage and any deterioration. If defect likely to cause panel failure within 36 hours or defect already a risk to users, notify Signaller, IFC and SM(OT). Consider closing crossing to vehicular traffic and / or pedestrian traffic (dependent on location of defect). ORCC to instruct on any further mitigation (e.g. remove panel & close crossing to public, impose ESR, impose ESR with full time watchman etc) - rectification is to install new panel(s) or swap around such that defective panel is placed outside of trafficked area. For all other defects - record on inspection forms, take photograph, arrange re-inspection if considered appropriate to check for deterioration and record on WAIF with rectification timescale using best judgement. Range of timescales for rectification is 36hours to 52 weeks.	Note cracks, tears, damage, holes. Use inspector judgement as to location and scale of defect, the traffic, usage and any deterioration. If defect likely to cause panel failure within 36 hours or defect already a risk to users, notify Signaller, IFC and ORCC/ORA. Consider closing crossing to vehicular traffic and / or pedestrian traffic (dependent on location of defect).ORCC/ORA to instruct on any further mitigation (e.g. remove panel & close crossing to public, impose ESR, impose ESR with full time watchman etc) - rectification is to install new panel(s) or swap around such that defective panel is placed outside of trafficked area. For all other defects - record on inspection forms, take photograph, arrange re-inspection if considered appropriate to check for deterioration and record on WAIF with rectification timescale using best judgement. Range of timescales for rectification is 36hours to 52 weeks.	SC	M12
Panels sitting proud of sill	Record on inspection record sheet, raise WAIF	Record on inspection record sheet, raise WAIF	SC	M12

beams - where pedestrians cross, all crossing types.	with permanent rectification within 52 weeks. Temporary repair - install tarmac or concrete ramp within 36hours.	with permanent rectification within 52 weeks. Temporary repair - install tarmac or concrete ramp within 36hours.		
Panels sitting proud of sill beams - other locations.	Record on inspection record sheet, raise WAIF with permanent rectification within 52 weeks.	Record on inspection record sheet, raise WAIF with permanent rectification within 52 weeks.	M12	M12
2.2 Surface Units - Load Bearing Systems 2 (e.g. Omni)				
Panel(s) rocking - all crossing types.	Omni load bearing system should not rock. If it does, panel(s) either damaged or units not being properly supported by sills or sleepers. Notify Signaller, Infrastructure Fault Control (IFC) and SM(OT). Consider closing crossing to vehicular traffic. Immediate action - lift panel(s), investigate and rectify. If immediate rectification not possible, place watchman and ORCC/ORA to instruct on any further mitigation (e.g. close crossing to public, impose ESR, ESR with full time watchman etc).	Omni load bearing system should not rock. If it does, panel(s) either damaged or units not being properly supported by sills or sleepers. Notify Signaller, IFC and ORCC/ORA Consider closing crossing to vehicular traffic. Immediate action - lift panel(s), investigate and rectify. If immediate rectification not possible, place watchman and ORCC/ORA to instruct on any further mitigation (e.g. close crossing to public, impose ESR, ESR with full time watchman etc).	SC	SC
Not gapped correctly - all crossing types.	Omni load bearing systems are normally fixed down to a base plate. If gaps appear, likely that fixings have failed. Notify Signaller, Infrastructure Fault Control (IFC) and SM(OT). Immediate temporary rectification such as install timber wedge rubber wedge, foam filler or similar and place steel pin / timber post or similar as temporary end restraint if none present.	Omni load bearing systems are normally fixed down to a base plate system. If gaps appear, likely that fixings have failed. Notify Signaller, IFC and ORCC/ORA. Immediate temporary rectification such as install timber wedge rubber wedge, foam filler or similar and place steel pin / timber post or similar as temporary end restraint if none present. Omni system now obsolete so spares unlikely, permanent rectification will probably need to be full renewal. Notify RAM[T]. Minimum partial replacement of the affected cess, 4ft or 6ft panels with proprietary system within 24 weeks, full deck renewal within 2 years.	SC	M6 / M24
Surface condition - all types.	Note cracks, tears, damage, holes. Use inspector judgement as to location and scale of defect, the traffic, usage and any deterioration. If defect likely to cause panel failure within 36 hours or defect already a risk to users. Notify Signaller, Infrastructure Fault Control (IFC) and SM(OT). Consider closing crossing to vehicular	Note cracks, tears, damage, holes. Use inspector judgement as to location and scale of defect, the traffic, usage and any deterioration. If defect likely to cause panel failure within 36 hours or defect already a risk to users. Notify Signaller, IFC and ORCC/ORA. Consider closing crossing to vehicular traffic and / or pedestrian traffic	SC	M12

	traffic and / or pedestrian traffic (dependent on location of defect). ORCC to instruct on any further mitigation (e.g. remove panel & close crossing to public, impose ESR, impose ESR with full time watchman etc) - rectification is to install new panel(s) or swap around such that defective panel is placed outside of trafficked area. For all other defects - record on inspection forms, take photograph, arrange re-inspection if considered appropriate to check for deterioration and record on WAIF with rectification timescale using best judgement. Range of timescales for rectification is 36hours to 52 weeks.	(dependent on location of defect). ORCC/ORA to instruct on any further mitigation (e.g. remove panel & close crossing to public, impose ESR, impose ESR with full time watchman etc) - rectification is to install new panel(s) or swap around such that defective panel is placed outside of trafficked area. For all other defects - record on inspection forms, take photograph, arrange re-inspection if considered appropriate to check for deterioration and record on WAIF with rectification timescale using best judgement. Range of timescales for rectification is 36hours to 52 weeks. Consider renewal as system is obsolete.		
Panels sitting proud of sill beams - where pedestrians cross, all crossing types.	Record on inspection record sheet, raise WAIF with permanent rectification within 52 weeks. Temporary repair - install tarmac or concrete ramp within 36hours.	Record on inspection record sheet, raise WAIF with permanent rectification within 52 weeks. Temporary repair - install tarmac or concrete ramp within 36hours.	SC	M12
Panels sitting proud of sill beams - other locations.	Record on inspection record sheet, raise WAIF with permanent rectification within 52 weeks.	Record on inspection record sheet, raise WAIF with permanent rectification within 52 weeks.	M12	M12
2.3 Surface Units - Timbers (mainly UWC & Pedestrian)				
Timbers rocking / moving / damaged - all crossing types.	Crossing may not be in use at time of inspection. If seen, inspectors judgement to be used depending on location, usage and condition. If defect likely to cause panel failure within 36 hours or defect already a risk to users, notify Infrastructure Fault Control, (IFC) and SM(OT). Consider closing crossing to vehicular traffic and / or pedestrian traffic (dependent on location of defect). ORCC to instruct on any further mitigation (e.g. remove timber & close crossing to public, impose ESR, impose ESR with full time watchman etc) - rectification is to install new timber(s). For all other defects - record on inspection forms, take photograph, arrange re-inspection if considered appropriate to check for deterioration and	Crossing may not be in use at time of inspection. If seen, inspectors judgement to be used depending on location, usage and condition. If defect likely to cause panel failure within 36 hours or defect already a risk to users. Notify IFC and ORCC/ORA. Consider closing crossing to vehicular traffic and / or pedestrian traffic (dependent on location of defect). ORCC/ORA to instruct on any further mitigation (e.g. remove timber & close crossing to public, impose ESR, impose ESR with full time watchman etc) - rectification is to install new timber(s). For all other defects - record on inspection forms, take photograph, arrange re-inspection if considered appropriate to check for deterioration and record on WAIF with rectification timescale using best	SC	M12

	record on WAIF with rectification timescale using best judgement. Range of timescales for rectification is 36hours to 52 weeks.	judgement. Range of timescales for rectification is 36hours to 52 weeks.		
Anti-slip surface damaged / worn / ineffective.	Record on inspection record sheet, raise WAIF, take photos, with permanent rectification within 4 weeks.	Record on inspection record sheet, raise WAIF, take photos, with permanent rectification within 4 weeks.	M1	M1
3.0 End Restraints (normally fitted only to Bomac & Polysafe systems but some Strail systems as secondary restraint)				
End restraint missing, loose or gapped.	If gaps in panels, treat as gapped panels and rectify at time of gapping defect - if missing, install temp steel pin or timber posts, if loose - tighten, if gapped - install wedge. Permanent rectification within 7 days.	If gaps in panels, treat as gapped panels and rectify at time of gapping defect. If missing, install temp steel pin or timber posts, if loose - tighten, if gapped - install wedge. Permanent rectification within 7 days.	SC	SI
End restraint missing, loose or gapped.	If no gaps in panels, record on inspection record sheet, raise WAIF & permanent rectification within 7 days.	If no gaps in panels, record on inspection record sheet, raise WAIF & permanent rectification within 7 days.	SI	SI
4.0 Four foot deflector plates / chain guards				
Loose - installed as combined end restraint.	Treat as end restraint.	Treat as end restraint.	as 3.0 above	as 3.0 above
Loose - stand alone deflector plate.	Immediate rectification required. Either remove or tighten. Record on inspection record sheet, raise WAIF with timescale for replacement within 52 weeks.	Immediate rectification required. Either remove or tighten. Record on inspection record sheet, raise WAIF. Replace within 52 weeks.	SC	M12
Missing or damaged.	Record on inspection record sheet, raise WAIF.	Record on inspection record sheet, raise WAIF. Replace within 52 weeks.	M12	M12
5.0 Road surface condition - including approaches				
Potholes > 150mm diameter AND > 40mm deep within Stop Line to Stop Line.	Immediate rectification required using 'bagged' tarmac or similar.	Immediate rectification required using 'bagged' tarmac or similar with permanent rectification within 24 weeks.	SC	M6
Potholes < 150mm diameter and < or > 40mm deep within Stop Line to Stop Line.	Record on inspection record sheet, raise WAIF.	Record on inspection record sheet, raise WAIF. Rectify within 26 weeks.	M6	M6
Potholes - all sizes - outside stop lines.	Record on inspection record sheet, inform MPC within 7 days for onward rectification by the responsible 3rd party in line with their	Record on inspection record sheet, inform MPC within 7 days for onward rectification by the responsible 3rd party in line with their timescales	SI	M6

	timescales (most Local Authorities have a 'pothole' policy).	(most Local Authorities have a 'pot hole' policy).		
Surface wear.	Inspector's judgement depending on location, usage and condition. Record on inspection record sheet, take photos should further deterioration occur / not occur by next inspection. Raise WAIF with timescale for rectification to suit from 7days to 52 weeks.	Inspector's judgement depending on location, usage and condition. Record on inspection record sheet, take photos should further deterioration occur / not occur by next inspection. Raise WAIF with timescale for rectification to suit from 7days to 52 weeks.	SI	M12
5.1 Surface condition - including approaches - UWC and Footpaths				
Potholes > 150mm diameter AND > 40mm deep within decision points.	Immediate rectification required using 'bagged' tarmac or similar with permanent rectification within 24 weeks.	Immediate rectification required using 'bagged' tarmac or similar with permanent rectification within 24 weeks.	SC	M6
Potholes < 150mm diameter and < or > 40mm deep within decision points.	Record on inspection record sheet, raise WAIF. Rectify within 26 weeks.	Record on inspection record sheet, raise WAIF. Rectify within 26 weeks.	M6	M6
Potholes - all sizes outside decision points.	Inspector's judgement depending on type of crossing, location, usage and condition. Record on inspection record sheet, take photos to allow comparison should further deterioration occur / not occur by next inspection. Raise WAIF with timescale for rectification to suit from 7days to 52 weeks.	Inspector's judgement depending on type of crossing, location, usage and condition. Record on inspection record sheet, take photos to allow comparison should further deterioration occur / not occur by next inspection. Raise WAIF with timescale for rectification to suit from 7days to 52 weeks.	SI	M6
Surface wear.	Inspector's judgement depending on type of crossing, location, usage and condition. Record on inspection record sheet, take photos to allow comparison should further deterioration occur / not occur by next inspection. Raise WAIF with timescale for rectification to suit from 7days to 52 weeks.	Inspector's judgement depending on type of crossing, location, usage and condition. Record on inspection record sheet, take photos to allow comparison should further deterioration occur / not occur by next inspection. Raise WAIF with timescale for rectification to suit from 7days to 52 weeks.	SI	M12
6.0 Edge Beams / Sill Beams				
Rocking - all crossing types - where an immediate risk to rail, road or pedestrian users exists or likely to exist by	Notify Signaller, Infrastructure Fault Control (IFC) and SM(OT). Consider closing crossing to vehicular and/or pedestrian traffic. Immediate action - investigate and temporary rectification if possible (use of wedges / packers etc). If	Notify Signaller, IFC and ORCC/ORA. Consider closing crossing to vehicular and/or pedestrian traffic. Immediate action - investigate and temporary rectification if possible (use of wedges / packers etc) If immediate temporary (or	SC	M6

time of next inspection.	immediate temporary (or permanent) rectification not possible, place watchman and ORCC to instruct on any further mitigation (e.g. block train traffic, close crossing to public, impose ESR, impose ESR with full time watchman, enhanced inspection until rectification completed etc).	permanent) rectification not possible, place watchman and ORCC/ORA to instruct on any further mitigation (e.g. block train traffic, close crossing to public, impose ESR, impose ESR with full time watchman etc). Permanent rectification within 26 weeks with enhanced 4 weekly inspection frequency.		
Damaged / Degrading (wear & tear).	Record on inspection record sheet, raise WAIF, take photos to allow comparison should further deterioration occur / not occur by time of next inspection. Timescales for rectification to be within 26 weeks although reprioritisation is allowed subject to confirmation of no deterioration.	Record on inspection record sheet, raise WAIF, take photos to allow comparison should further deterioration occur / not occur by time of next inspection. Timescales for rectification to be within 26 weeks although reprioritisation is allowed subject to confirmation of no deterioration.	M6	M6
More than 2 sill beams damaged in any row.	N/A	Consider refurbishment request to RAM[T].		
7.0 Fencing				
Incomplete or damaged such that access to railway is easily accessible.	Immediate temporary or permanent rectification required by inspector. If not possible, notify Infrastructure Fault Control (IFC) and Signaller to caution trains until temporary repair made. Notify SM(OT).	Immediate temporary or permanent rectification required by inspector. If not possible, notify IFC and Signaller to caution trains until temporary repair made. Notify ORCC/ORA. Permanent rectification within 7 days unless adjacent land use allows extended timescale as Table 5 NR/L2/TRK/5100.	SC	SI
Incomplete or damaged such that access to railway is not easily accessible.	Notify SM(OT), immediate temporary (or permanent) repair required.	Inspector to stay on site, notify SM(OT), immediate temporary (or permanent) repair required. Permanent rectification within 7 days unless adjacent land use allows extended timescale as Table 5 NR/L2/TRK/5100.	SC	SI
8.0 Gates, Stiles & the like				
Wicket gates not locked (if required) or gate catch missing / ineffective (at UWC).	Notify Signaller, Infrastructure Fault Control (IFC) and SM(OT). Consider closing crossing to pedestrian traffic. Temporary (or permanent) rectification immediately.	Notify Signaller, IFC and ORCC/ORA. Consider closing crossing to pedestrian traffic. Temporary (or permanent) rectification immediately. Permanent rectification within 7 days.	SC	SI
Wicket gates / stiles / gates - other defects that impact upon their	Record on inspection record sheet, raise WAIF with timescale for rectification to be within 26 weeks.	Record on inspection record sheet, raise WAIF. Rectify within 26 weeks.	M6	M6

operation.				
9.0 Sighting distances - where required as primary mitigation at crossings (minimum sighting distance not achievable)				
Sighting not achievable due to encroachment by vegetation - all crossing types.	Notify Signaller, Infrastructure Fault Control (IFC) and SM(OT). Immediate rectification required. If not achievable, the ORCC/ORA shall instruct mitigation of imposing ESR to suit available sighting, placing watchman or closing crossing to pedestrian traffic.	Notify Signaller, IFC and ORCC/ORA. Immediate rectification required. If not achievable, the ORCC/ORA shall instruct mitigation of imposing ESR to suit available sighting, placing watchman or closing crossing to pedestrian traffic.	SC	SC
Sighting not achievable due to other obstruction either within or outside NR boundary.	Notify SM(OT). If immediate rectification not achievable, the ORCC/ORA shall instruct mitigation of imposing ESR to suit available sighting, placing watchman (max 24 hours), crossing closure to pedestrians or other.	Notify ORCC/ORA. If immediate rectification not achievable, the ORCC/ORA shall instruct mitigation of imposing ESR to suit available sighting, placing watchman (max 24 hours), crossing closure to pedestrians or other. ORCC/ORA to advise on further mitigation within 24 hours to allow watchman to stand down e.g. if necessary, ESR to remain. Permanent rectification to be advised by ORCC/ORA within 8 weeks.	SC	M2
10.0 Road Markings and Studs				
Road markings or studs missing.	Record on inspection record sheet, raise WAIF with timescale for rectification to be within 8 weeks.	Record on inspection record sheet, raise WAIF with timescale for rectification to be within 8 weeks.	M2	M2
Road markings erased or indistinct.	Record on inspection record sheet, raise WAIF with timescale for rectification to be within 8 weeks.	Record on inspection record sheet, raise WAIF with timescale for rectification to be within 8 weeks.	M2	M2
11.0 Roadway or Pedestrian Walkways				
Incorrect width on highway crossing (dimensioned on Ground Plan).	Notify SM(OT), raise WAIF for rectification within 13 weeks.	Notify ORCC/ORA, raise WAIF for rectification within 13 weeks. Rectification will involve placing additional panels or correcting road markings.	M3	M3
Incorrect width on pedestrian crossing - all types.	Notify SM(OT), raise WAIF for rectification within 13 weeks.	Notify ORCC/ORA, raise WAIF for rectification within 13 weeks. Rectification will involve placing additional panels or timbers to achieve correct width.	M3	M3
NOTE All SC and SI defects should be reported to Infrastructure Fault Control for immediate attention and to the ORCC if the defect is a sighting deficiency. Defects discovered on road profiles including approaches, at vehicular crossings shall be assessed for priority of rectification by the TME.				

Appendix C
Basic Test Equipment

C.1 Materials and Fabrication Method

The poles are fabricated using 40mm or greater diameter round hardwood of at least 1.4m in length having cup hooks screwed into them at 150mm from the flat end.

Measuring chords for each discrete wheelbase are fabricated from 6mm diameter non stretch rope. Allowance must be made for fitting to the cup hooks attached to the handles so that the correct wheelbase lengths are maintained.

Label or colour code each chord length so that the correct chord is used for each application.

C.2 Instructions:

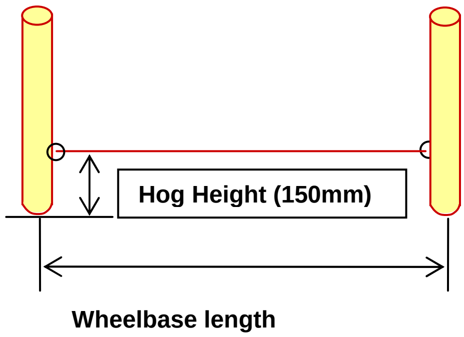


Figure C.1 – Pole and Chord Arrangement

STAGE 1 **STAGE 2** **STAGE 3**

Figure C.2 – Pole and Chord

- STAGE 1 - Using a ruler, score or mark notches at the required height (150mm) from the bottom of the wooden poles and screw in strong cup hooks at the marked points on each pole.
- STAGE 2 - Using yachting halyard, of differing colours for each specified wheelbase length, fabricate chords to lengths detailed in Table C1.
- STAGE 3 - Attach the required length of yachting halyard to the wooden poles, testing the strength and rigidity of the equipment.

Crossing Type and Category	Specified Wheelbase	Approach Slope Assessment Distance From Outer Rail	Maximum Permissible Hog
Cat 1	11.5m	30m	150mm
Cat 2	9.75m	20m	150mm
Cat 3	8.5m	20m	150mm
UWC Cat A	8.5m	12m	150mm
UWC Cat B	6.5m	9m	150mm
UWC Cat C	4m	6m	150mm

Table C.1 – Vertical Profile Survey and Limits Data

NOTE all material must be non-conducting.

Appendix D
Basic Test Survey and Level Survey Methods

D.1 Basic Test

The basic test is to simply establish compliance with the absolute limits applicable to convex (hog) profiles. The test will be carried out using the equipment described in Appendix C.

D.2 Basic Test Methodology

- Set up the wheelbase chord length for crossing to be surveyed.
- Checking the chord is tight and the poles upright, walk across the crossing checking the hog using the basic test.
- Check the profile over the distance specified for the type and category of crossing.

Profiles should be checked along the centre line of road, and either 1.8m each side of the centre line, or 150mm from each carriageway edge if 1.8m is beyond the crossing surface. If vehicles follow another path across the crossing (if turning on to crossing from side road for example), also survey these paths.

If the chord clears or just touches the crossing surface at any point and is not deflected from straight line it shall be deemed as passed.

If the chord is deflected by the crossing surface, the profile must be scored as having exceeded the maximum permissible hog and actioned according to Clause 6.9.8.

See Figure D1 below. Results to be recorded on LXi29

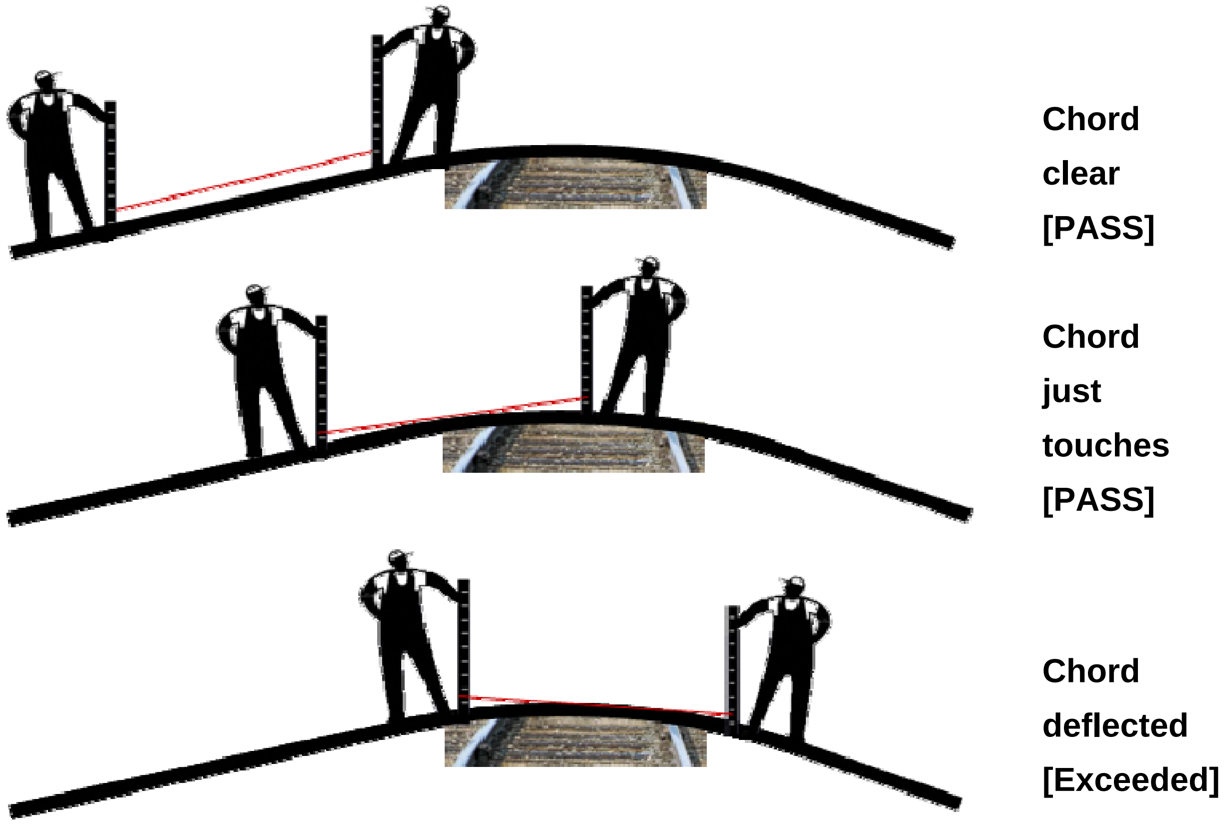


Figure D.1 – Basic Test Vertical Profile Survey

D.3 Level Survey and Gradient Survey

The level survey, using approved surveying equipment, should be detailed enough to accurately record the vertical profile, including local pot holes or sharp changes of gradient.

Levels should be taken to comply with Table D.1 below.

Area	Distance between Level Survey Points	Specific Points
20 – 50m from running rail	5m	
16 – 20m from running rail	2m	
0 – 16m from running rail	1m	
Level Crossing	Varies	Cill beams, All Panel Edges adjacent to rails, Rails, Four Foot Panel Centre Lines, Six/Ten Foot Centre Lines, and any other noticeable gradient changes

Table D.1 – Minimum Vertical Level Survey Points

D.4 Vehicle Borne Survey

Using approved vehicle mounted survey system, levels taken continuously over the crossing and approaches.

Table D.1 details the minimum points to be extracted for processing with the ‘Hump Calculator’ or ‘Excel’ plot.

Standards Briefing Note

Ref: NR/L3/TRK/4041	**Issue:** 1
Title: Maintaining Track Assets at Level Crossings	
Publication Date: 02/06/2012	**Compliance Date:** 01/09/2012
Standard Owner: Professional Head (Track)	
Non-Compliance rep (NRNC): Professional Head (Track)	
Further information contact: Shingai Mutukwa	**Tel:** 08578372

Purpose:
This standard specifies the requirements for managing the installation, inspection, maintenance of track assets at operational level crossing infrastructure. It demonstrates that level crossing systems are compliant with legislation, reliable and safe.

Scope:
This Network Rail standard is applicable to level crossings of the following types, including those that are subject to temporary closure.

NOTE This document is NOT applicable to Inspection and Maintenance of Road Rail Access Points (RRAPs), and Track Access Points (TAPs) as they are not level crossings.

What's New/ What's Changed and Why:
Post title Level Crossing Inspector Maintainer (LCIM) amended to Off Track Inspector (OTI)

Clause 5.7 Road Closures - guidance on Network Rail procedure, CCMS2 Document Number 62472748.
Clause 6.7 Defect Identification
Clause 6.7.1 Defect Rectification Timescales
Clause 6.9.5.2 Automated vehicle survey alternative to detailed and/or basic survey
Clause 6.9.8.1 Corrective actions that can be implemented at crossings that fail vertical profile checks
Clause 6.9.82 Process for assigning risk to crossings that fail vertical profile checks
Appendix B - Defect Minimum Actions
Clause 7.64 and Appendix A of NR/L2/SIG/19608 are superseded.
NR/BS/LI/236 has been Incorporated in Clause 6.9

NEW TEF numbers:
TEF3241 Level Crossing Infrastructure: Inspection & Maintenance Checklists (LXi Checklists)
TEF3242 Level Crossing Vertical Profile Inspection Sheet (LXi29)
TEF3243 Level Crossing Inspection Record Form

NEW Standard Track Drawings
REPW/450 Timber Level Crossing
REPW/451 Timber Pedestrian Level Crossing

Affected documents:

Reference	*Impact*
NR/BS/LI/236	*Withdrawn*

Briefing requirements: *Where Technical briefing (T) is required, the specific Post title is indicated. These posts have specific responsibilities within this standard and receive briefing as part of the Implementation Programme. For Awareness briefing (A) the Post title is not mandatory.*

Please see http://ccms2.hiav.networkrail.co.uk/webtop/drl/objectId/09013b5b804504da for guidance.

Briefing *(A-Awareness/ T-Technical)*	**Post**	**Team**	**Function**
T	Off Track Inspector		Infrastructure Maintenance
T	Section Manager (Off Track)		Infrastructure Maintenance
T	Track Maintenance Engineer		Infrastructure Maintenance
A	Infrastructure Maintenance Engineer		Infrastructure Maintenance
A	Infrastructure Maintenance Delivery Manager		Infrastructure Maintenance
A	Route Asset Manager (Track)		Infrastructure Maintenance
A	Operations Risk Advisor		Network Operations
T	Operations Risk Control Coordinator		Network Operations
A	Fault Control		Network Operations

**NOTE: Contractors are responsible for arranging and undertaking their own Technical and Awareness Briefings in accordance with their own processes and procedure*

Ref:	**NR/L2/TRK/4040**
Issue:	2
Date:	4th December 2010
Compliance date:	4th June 2011

Level 2

Level crossing surface systems

Endorsement and Authorisation

Endorsed by:

....

pp Roger Griffiths, Working Group Chair

Authorised by:

....

pp Colin Newsome, Steering Group Chair

Accepted for issue by:

....

Mick McManus, National Standards Manager

Published and Issued by Network Rail, Kings Place, 90 York Way, London. N1 9AG.

NetworkRail

Issue record

Issue	Date	Comments
1	December 1997	First issue
2	December 2010	Supersedes RT/CE/S/040, Issue 1

Compliance

This Network Rail standard is mandatory and shall be complied with by Network Rail and its contractors if applicable from 4 June 2011.

When this standard is implemented, it is permissible for all projects that have formally completed GRIP Stage 4 to continue to comply with the Issue of any relevant Network Rail Standards current when GRIP Stage 4 was reached and not to comply with requirements contained herein, unless the designated Standard Owner has stipulated otherwise in the accompanying Briefing Note.

Reference documentation

BS 5400-2:2006, *Steel, concrete and composite bridges – Part 2: Specification for Loads.*

NR/L2/TRK/001, *Inspection and maintenance of permanent way.*

NR/L2/TRK/2049, *Track Design Handbook.*

NR/L2/TRK/2102, *Design and Construction of Track.*

Road Note 27*. Instructions for using the portable skid resistance tester*. 2nd edition. ISBN No. 11 55 00 60X. Transport Research Laboratory Ltd: 1969.

Manual of Contract Documents for Highway Works. Volume 2: Notes for Guidance on the Specification for Highway Works. Department of Transport: August 1994.

Statutory Instrument 1994 No. 157. The Railways and Other Transport Systems (Approval of Works, Plant and Equipment) Regulations 1994. HMSO.

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Contents

1 Purpose

This standard specifies the performance of manufactured proprietary level crossing surface systems so that they are fit for purpose and have an adequate life expectancy.

2 Scope

This Network Rail standard specifies the performance of manufactured proprietary level crossing surface systems to be installed on Network Rail controlled infrastructure.

It specifies that these systems are type approved.

This standard applies to all manufactured level crossing surface systems installed in new vehicular level crossings, or for the replacement of the entire level crossing surface system on an existing vehicular level crossing.

NOTE Product acceptance issued under previous issues of this standard remain valid.

It applies to the maintenance or partial replacement of manufactured vehicular level crossing surface systems only where the existing level crossing surface system consists of components granted type approval against this standard.

Level crossing surface systems conforming to this standard may also be installed on footpath or bridleway crossings.

The requirements of this standard are applicable to all manufactured level crossing surface systems to be installed on new vehicular level crossings, or when an existing vehicular level crossing is renewed.

3 Definitions

For the purposes of this standard, the following terms and definitions apply.

panel
main component of a panel system that forms the part of the highway surface that carries traffic

panel system
type of level crossing surface system that utilises removable four-foot, six-foot, and cess panels

level crossing surface system
the complete installation, including the associated support system; providing a continuation of the road surface to enable road vehicles to cross the railway on the level

NOTE The term does not include cattle-cum-trespass guards, signalling devices, signs, barriers or ballasted track systems.

operating conditions
criteria that define whether the crossing is under Normal or Exceptional Operating Conditions

4 Operating Conditions

4.1 Normal Operating Conditions

A crossing shall be deemed to be within Normal Operating Conditions if:

a) the road is available for vehicular use;

b) the railway speed limit does not exceed 125 mph;

c) the road speed limit does not exceed 70 mph;

d) the maximum axle weight of rail traffic does not exceed 25.5 tonnes;

e) the vertical road profile is within the design limits specified in NR/L2/TRK/2049;

f) the radius of curvature of the railway is greater than 400 m;

g) the acute angle between the road and railway centre lines is between 60° and 90°;

h) the maximum axle load of road traffic does not exceed 44 tonnes.

4.2 Exceptional Operating Conditions

A level crossing shall be deemed to be operating under exceptional conditions when any of the Normal Operating Conditions are exceeded.

NOTE Level Crossings operating under exceptional conditions may have a shorter service life. Additionally, Level Crossings require a bespoke design if the condition exceeds any stated design capability of the manufacturer's standard design.

Bespoke designs shall be approved by the Professional Head (Track).

Consideration as to whether a bespoke design is necessary shall include but not be limited to the following:

- panel geometry (curvature, cumulative effects of tolerance, sleeper spacing);
- lateral restraint;
- effects of road traffic loading;
- the radius of curvature of the railway is 400 m or less;
- the acute angle between the road and railway centre lines is less than 60°;
- the maximum axle load of road traffic exceeds 44 tonnes.

The need for increases in inspection frequency due to exceptional operating conditions shall be considered.

5 Design criteria

The level crossing surface system shall be designed to carry a roadway across the railway on the level by providing 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, measured from the outside of the head of the rail.

Internal panels shall be symmetrical in plan view. Larger external panels (or a combination of smaller 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 by the sleepers and ballast or by the rail.

The edge of external panels parallel to and remote from the rails may be supported either by the substrate or an independent edge beam. Where an edge beam is not used, the road surfacing 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 panels without damage to the abutting road surfacing.

The panels shall provide a road surface which is free from any pedestrian tripping hazards or gaps that present a hazard to cyclists, wheelchairs or prams.

NOTE flangeways are exempt from this.

The level crossing surface system shall be secured to the track or substrate in such a way so that the completed crossing, under the influence of either turning road vehicles or rail traffic, cannot move along the track from its initial position or permit the development of gaps between individual crossing panels.

The level crossing surface system shall include devices placed centrally between the rails over a width of 300 mm and angled down at 45° to deflect anything hanging from a train which could otherwise damage or displace an end internal panel. The device may be integral with, or capable of being securely attached to, the outer edge of the end internal panel.

Panel systems shall be capable of accommodating horizontal realignments of the track up to ±10 mm, or changes in level of one or both rails, up to ±25 mm, or minor alterations to the road approaches, without the need to renew the complete crossing (horizontal and/or vertical re-alignment may require resetting of edge beams or substrate retention).

Panel systems shall be designed so that the panels can be removed and reinstalled either for replacement purposes or to gain access to the track for maintenance or inspection without damage to the track or component parts of the surface system.

NOTE Consideration should be given, where practicable, to allow the installation and removal of components by mechanical means.

There shall be no appreciable degradation of performance of surface systems under weather conditions to be expected in Great Britain.

6 Materials

Level crossing panels and their supports may be manufactured out of any material, provided that the finished product conforms to the requirements of this standard.

The materials used shall conform to an appropriate British or European Standard. The manufacturing process shall be subject to a Quality Assurance mechanism accredited in accordance with a current National or International Standard.

7 Design loading

Level crossing systems shall be designed in accordance with BS 5400-2 to carry 45 units of HB loading. The maximum permissible differential deflection between any type of panel and the rails alongside that panel under the design loading specified above, taking into account both panel deformation under load and deformation within the supports, shall be 10 mm.

The effects of deformation under loading shall not reduce the rail vehicle flange clearances specified in clause **8**.

8 Track compatibility

The level crossing surface system shall be designed to be installed in track with a track gauge of 1432 mm or 1435 mm, depending on sleeper type, where the track gauge is measured at right angles to and between the heads of the rails in a plane 14 mm below their top surface.

The track system to be accommodated at an individual crossing shall be specified by the purchaser.

Product acceptance of each propriety level crossing surface system shall specify the combinations of rail and sleeper for which it has been designed.

NOTE The suitability of the level crossing system must be confirmed for the track configurations into which it is to be installed.

The level crossing surface system shall be designed to permit the location any individual sleeper to vary by ±10 mm from the nominated spacing but cumulative variation to be no greater than ±10 mm through the entire crossing length as specified in NR/L2/TRK/2102. The level crossing surface system shall be capable of tolerating a track gauge variation of ±6 mm as specified in NR/L2/TRK/001.

The internal panels shall be located and profiled to provide a flangeway of at least 60 mm wide and at least 55 mm deep.

NOTE This is to permit the free passage of a rail vehicle wheel flange.

The width of the level part of the top surface of an internal panel (i.e. that on which road traffic will run), measured at right angles to the rails, shall be 1300 mm ± 3 mm. The external panels shall be designed to sit as closely as practicable to the outer edge of the running rail.

The level crossing surface system shall be installed to provide a road surface level with the plane between heads of the rails and extending for a distance of 100 mm from the outer edge of a rail to a tolerance measured from the plane of the rails of +5 mm, and –0 mm.

The level crossing surface system shall be able to accommodate a difference in rail levels across the gauge in one track (cant) of minimum 75 mm. The maximum cant that the system can accommodate shall be documented.

9 Inspection regime

The level crossing surface system shall be designed to be compatible with the inspections regimes specified in current Network Rail Standards.

10 Service life

Unless otherwise stated by the manufacturer, the level crossing surface system shall have a minimum service life of 15 years under normal operating conditions, provided that the manufacturer's maintenance schedule has been followed.

Routine replacement of components shall not be required within two years of installation, and subsequently at intervals of less than two years under normal operating conditions.

11 Road markings

The level crossing system shall have a means of fixing both retro-reflective road markings and road studs (cats eyes) to the upper surface of the system. The road markings and road studs shall remain in place and be visible under normal operating conditions. The fixing method shall permit removal or obliteration of both road markings and road studs if required.

12 Skid resistance

The level crossing system shall be supplied with an anti-skid surface that, when measured using the Portable Skid Resistance Tester as described in Department of Transport Road Note 27, provides a Skid Resistance Value of not less than 58. The Skid Resistance Value of the panel shall not reduce to below 52 during the 15 year service life of the level crossing surface system.

The average texture depth on a new panel shall be not less than 0.75 mm (not including any tread pattern inherent to the design of the panel) when measured using the sand patch method detailed in Department of Transport Manual of Contract Documents for Highway Works, Volume 2, *Notes for Guidance on the Specification for Highway Works*.

13 Electrical performance

The components of the level crossing shall be electrically insulated such that, under all conditions, each running rail within the level crossing is insulated from any exposed metallic component of the level crossing by an impedance of at least 2000 Ω. No component of the crossing shall cause the impedance between rails to be less than 2000 Ω.

The insulation shall not fall below this specified value during the 15 year design life of the crossing surface system. The insulating material shall allow for the effects of degradation due to such factors as ageing, surface oxidation, chemical contamination, ultraviolet light, heat and dampness.

The surface of the insulation shall be designed such that the salt and other chemicals applied to the road surface cannot accumulate so as to cause an electrical path of less than 2000 Ω impedence between rail and any exposed metallic level crossing component. Where practicable, to reduce contamination of the ballast by salt, flangeway sealing shall be provided.

The level crossing surface system shall be designed so that any metallic objects including the tracks of tracked vehicles are not able to short between a rail and any exposed metallic level crossing component.

Impedance shall be measured with a 10 volt d.c. source and a 10 volt a.c. source at 3000 Hz.

The insulating material shall be such that, in wet conditions with an installation of at least 8 metres of level crossing surfacing, the residual voltage between rails produced by the crossing is within the following specified limit. After application of a d.c. voltage across the rails of 10 volts for one week, the residual voltage across the rails shall fall to 0.5 volts or less within 15 seconds on removal of the feed.

14 Chemical resistance

The level crossing surface system shall be resistant to chemicals commonly spilt on the road way such as salt and de-icing compounds, petrol, diesel and lubricating oils.

15 Installation and maintenance manuals

The level crossing system shall be provided with manuals that provide the manufacturer's recommendations for the installation, removal, maintenance and eventual disposal of the level crossing surface system. The manuals shall also include a list of recommended spares to be held by the maintainer of the level crossing surface system.

16 Type approval

Level crossing surface systems shall be type approved by Network Rail.

To facilitate the issue of a Network Rail type approval certificate for their product, a level crossing surface system shall be provided with independently verified evidence of compliance with the requirements of this standard and the designed weight of the principal components of the proposed level crossing surface system.

Each proprietary level crossing system shall be documented with the stated design capability that it can tolerate for operating condition f) to h) in clause 4.1.

17 Private vehicular, footpath and bridleway crossings

NOTE Manufacturers may propose surface systems designed to lower highway loading standards for use on private vehicular and footpath/bridleway crossings.

Surface systems surface systems designed to lower highway loading standards for use on private vehicular and footpath/bridleway crossings shall only be used after they have been granted type approval by Network Rail, subject to any limitations specified in those type approvals.

Standards Briefing Note

Ref: NR/L2/TRK/4040	**Issue:** 2
Title: Level Crossing Surface Systems	
Publication Date: 04/12/2010	**Compliance Date:** 04/06/2011
Standard Owner: Professional Head [Track]	
Non-Compliance rep (NRNC): Professional Head [Track]	
Further information contact: Roger Griffiths	**Tel:** 07900 578619
Purpose: This standard specifies the performance of manufactured proprietary level crossing surface systems so that they are fit for purpose and have an adequate life expectancy.	**Scope:** This Network Rail standard specifies the performance of manufactured proprietary level crossing surface systems to be installed on Network Rail controlled infrastructure. It specifies that these systems are type approved. This standard applies to all manufactured level crossing surface systems installed in new vehicular level crossings, or for the replacement of the entire level crossing surface system on an existing vehicular level crossing. NOTE Product acceptance issued under previous issues of this standard remain valid. It applies to the maintenance or partial replacement of manufactured vehicular level crossing surface systems only where the existing level crossing surface system consists of components granted type approval against this standard. Level crossing surface systems conforming to this standard may also be installed on footpath or bridleway crossings. The requirements of this standard are applicable to all manufactured level crossing surface systems to be installed on new vehicular level crossings, or when an existing vehicular level crossing is renewed.

What's New/ What's Changed and Why:

Re-evaluated and revised with consideration to RAIB recommendations post derailment on Croxton Level Crossing

Re-Evaluated 'Normal Operating Conditions' and defined 'Exceptional Operating Conditions'.

Enquiring revealed that a significant percentage of Vehicular Level Crossings were operating outside 'Normal Operating Conditions'. The largely due to the number with traffic flows above 2500 vehicles per day. After consideration by the working group, this term has been removed from 'Standard Service State':-

1) Other parameters within the specification ensure that systems have adequate strength to cope with all traffic situations

2) Design life is specified as 15 years.

3) Traffic condition is variable and will affect deterioration trends, rather than failure and this is best managed through maintenance and inspection procedures.

Additionally, the term relating to gradient has also been removed as the term offered no benefit to design.

Revised numbering in line Track Document Policy.

Summary of what has to be done differently;-

1) Compliance with this specification applies to all new/entire replacement crossings.

2) Existing product approvals apply although where the condition of a crossing falls within the parameters of 'Exceptional Operating Conditions', the specification requires consideration to undertaking a bespoke design that requires approval on an individual crossing basis by an independent person nominated by the Professional Head [Track].

3) Clarification that Level crossing approvals should state relating track configurations and design capability to terms within 'Normal Operating Conditions'.

4) Defined the terms 'Panel System' and 'Level Crossing Surface System'.

5) Consideration to maintenance and inspection processes strengthened.

Affected documents:

Reference	*Impact*
RT/CE/S/040 ISSUE 1	Withdrawn

Briefing requirements: *Where Technical briefing (T) is required, the specific Post title is indicated. These posts have specific responsibilities within this standard and receive briefing as part of the Implementation Programme. For Awareness briefing (A) the Post title is not mandatory.*

Please see http://ccms2.hiav.networkrail.co.uk/webtop/drl/objectId/09013b5b804504da for guidance.

Briefing *(A-Awareness/ T-Technical)*	**Post**	**Team**	**Function**
A	Professional Head [T]	Engineering	Asset Management
A	Head of Asset Management [T]	Asset Management	Asset Management
A	NDS	NDS	Asset Management
A	Head of Track Design	Asset Management	Asset Management
T	Route Asset Manager [Track]	Asset Management	Asset Management
T	Senior Renewal & Enhancement Engineer	Asset Management	Asset Management
T	Renewal & Enhancement Engineer	Asset Management	Asset Management
T	Track Maintenance Engineer	Maintenance	Asset Management
T	Offttrack Manager	Maintenance	Asset Management
A	Infrastructure Maintenance Engineer	Maintenance	Asset Management
A	Infrastructure Maintenance Delivery Manager	Maintenance	Asset Management
A	Track Survey and Specification Engineer	Asset Management	Asset Management

**NOTE: Contractors are responsible for arranging and undertaking their own Technical and Awareness Briefings in accordance with their own processes and procedure*

Ref:	NR/L2/SIG/19608
Issue:	7
Date:	27 May 2014
Compliance date:	6 September 2014

Level 2

Level crossing asset inspection and implementation of minimum action codes

Endorsement and Authorisation

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Accepted for issue by:

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User information

This Network Rail standard contains colour-coding according to the following Red–Amber–Green classification.

Red requirements – *No variations, could stop the railway*

- **Red requirements shall** always be complied with and achieved.
- Red requirements shall be presented in a red box with the word “shall” or expressed as a direct instruction.
- Accountability for the efficacy of red requirements lies with the Professional Head/Standard Owner.
- Red requirements are monitored for compliance.
- Corrective actions shall be enforced if variations are discovered through functional checks (e.g. engineering verification visits, audit or Operations Self-Assurance).

Amber requirements – *Controlled variations, approved risk analysis and mitigation*

- **Amber requirements shall** be complied with unless variation has been approved in advance.
- Amber requirements shall be presented with an amber sidebar and with the word “shall” or expressed as a direct instruction.
- Accountability for the efficacy of these requirements lies with the Professional Head/Standard Owner, or their nominated Delegated Authority.
- Amber requirements are monitored for compliance.
- Variations **may** be permitted. Variations are approved by the Standard Owner or through existing Delegated Authority arrangements.
- Corrective actions shall be enforced if **non-approved** variations are discovered through functional checks (e.g. engineering verification visits, audit or Operations Self-Assurance).

Green – *Guidance*

- Guidance is based on good practice. Guidance represents supporting information to help achieve Red and Amber requirements.
- Guidance shall be presented with a dotted green sidebar and with the word “should” (usually in notes) or as a direct instruction.
- Guidance is **not mandatory** and is not monitored for compliance.
- Alternative solutions may be used. Alternative solutions do not need to be formally approved.
- Decisions made by a competent person to use alternative solutions should be backed up by appropriate evidence or documentation.

Issue record

Issue	**Date**	**Comments**
1	April 2004	First Issue
2	Feb 2006	Revised to reflect use of dedicated Level Crossing Inspectors
3	26/08/2008	Revised to reflect new posts in organisational change
4	01/12/2008	Revised after review to correct inconsistencies and to include reference to Sleeping Dogs and Mothballed Crossings plus a dedicated check sheet for Surface Systems (Level Crossing Decks)[Later withdrawn due to anomalies].
5	04/12/2010	Revision of document to be up issued to Issue 5 and also to include recommendations from RAIB reports, detail from TI 142, revised LXi28 Surface Systems (Level Crossing Decks) and new decking profile checksheet.
6	04/06/2011	Standard reissued as import and export from DOORs corrupted issue 5.
7	27/05/2014	Revised to clarify process, change responsibilities for inspections to Level Crossing Managers and introduce assurance appendices.

Compliance

This Network Rail standard is mandatory and shall be complied with by Network Rail and its contractors if applicable from 6 September 2014.

When this standard is implemented, it is permissible for all projects that have formally completed GRIP Stage 3 (Option Selection) to continue to comply with the issue of any relevant Network Rail standards current when GRIP Stage 3 was completed and not to comply with requirements contained herein, unless stipulated otherwise in the scope of this standard.

Disclaimer

Supply

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Contents

1 Purpose

This document provides Level Crossing Managers (LCMs) and Delivery Unit staff, see RACI in clause 4, with acceptable means of compliance for the inspection of level crossing assets.

This document assists in the mitigation of the following high level risk:

- Level Crossings: vehicle, person or animal on the line at risk of collision.

The inspections form part of a multi-disciplinary process that demonstrate that level crossings remain safe, reliable and legally compliant.

2 Scope

This process describes a method of inspecting level crossings on Network Rail Managed Infrastructure. It includes:

a) preparing for inspections;

b) undertaking inspections, identifying defects and the minimum actions to be taken on site;

c) recording inspections and defects identified; and

d) managing defect repairs.

It does not apply to authorised walking routes that cross the railway unless they are classified as a staff crossing with white lights. It does not apply to road rail access points or track access points.

Assurance requirements are given in Appendices:

- A – Annual check that the inspection frequencies in Ellipse are correct
- B – Checking the quality of repairs to level crossing defects
- C – Monitoring the timescales for rectifying level crossing defects
- D – Checking the quality of level crossing inspections

3 Level crossing inspection and defect rectification process

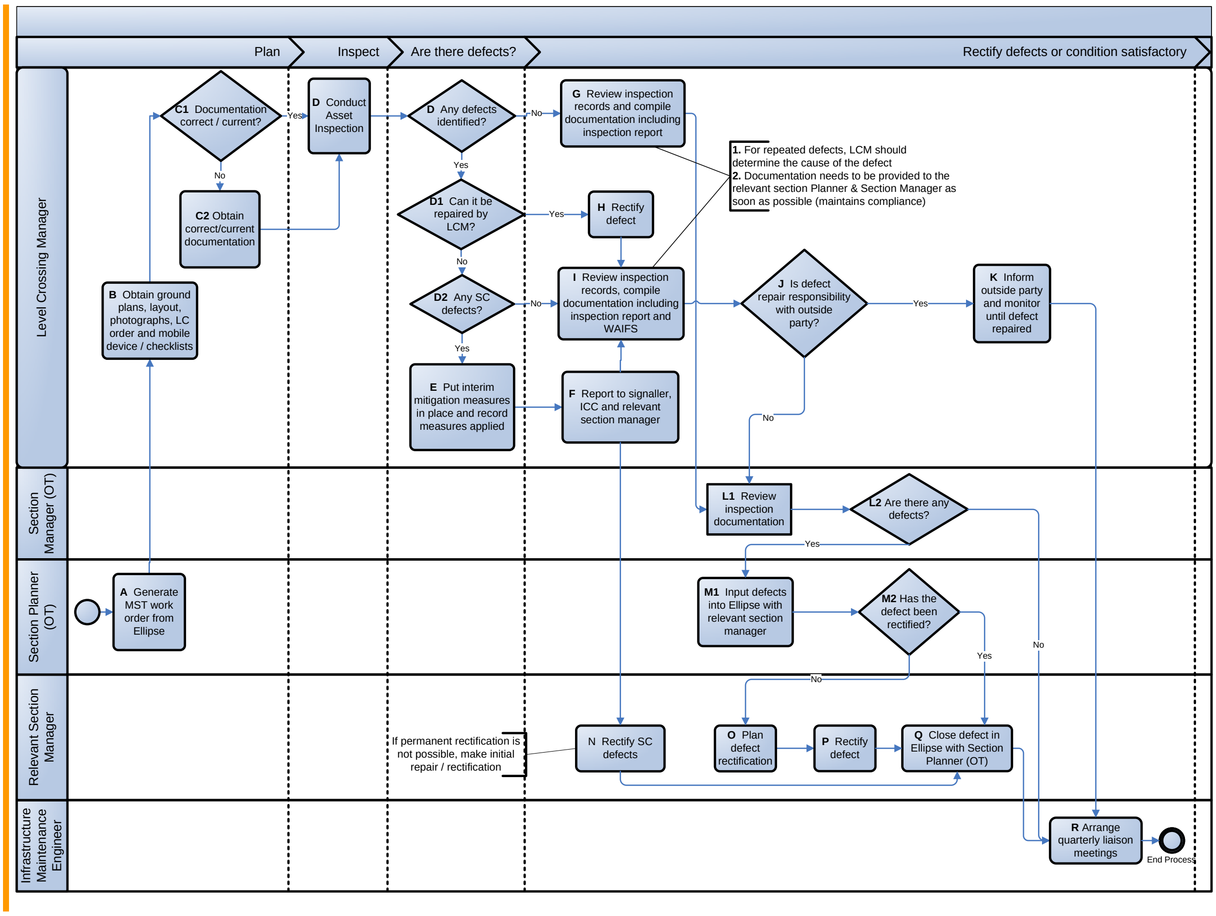


Figure 1 – Process flow chart

Sub-task	Responsible	Information
A	*Section Planner (Off-track)*	*Work orders shall be generated using MSTs in Ellipse.* *NOTE Wherever possible, any crossing that uses sighting distance as the main risk mitigation measure should be scheduled for inspection during the vegetation growing period.* *<u>Frequency of inspections</u>:* *The maximum intervals for level crossing inspections are given in Table 7.* *A seven-day tolerance is permitted for re-scheduling in cases of sickness and emergency.* *No other extension to the inspection intervals is permitted.* *Non-standard inspection frequencies are allocated to the relevant inspection MSTs in Ellipse.*

Sub-task	Responsible	Information
B, C (C1 and C2)	Level Crossing Manager (LCM)	LCMs shall prepare for inspections by gathering the relevant documentation and equipment. This shall include: a) ground plan or crossing sketch and layout photographs; b) Level Crossing Order where relevant; c) signalling plan; and d) mobile device. The LCM may include previous inspection records as a reminder of previously identified defects. *NOTE Inspection records are currently kept on TEF 3243.*
D (D1 and D2)	LCM	Conduct asset inspection. LCMs shall use a mobile device when undertaking inspections. LCMs shall use the mobile device to record the results of inspections. *NOTE The mobile device will present LCMs with the relevant questions for the crossing being inspected. Dropdown menus will provide LCMs with the available options to record the results of the inspection.* If the mobile device fails, LCMs shall undertake the inspections using the level crossing inspection checklists selected. The checklists contain a check box for each item on the checklist. The check boxes shall be completed in accordance with Table 3. In case of mobile device failure, LCMs shall take copies of the level crossing checklists to site. If the checklists need to be used, LCMs shall select the appropriate checklists using the guidance given in the *Level crossing inspection checklists and* Table 2. The checklists selected shall cover all the functionality and infrastructure elements of the level crossing to be inspected.
D, E	LCM	LCMs, as part of the inspection process, shall identify any defects needing repair. Defects identified shall be prioritised in accordance with Table 7. Actions taken on site shall comply with Table 7. It gives the minimum actions to be taken on site. It includes mitigation measures that can be applied and temporary repairs to be made when full repair is not possible.
D2, E, H	LCM	Repair defects: Where possible, defects shall be repaired as they are identified. This includes those that are not the responsibility of Network Rail and which can be safely, easily and quickly rectified providing the activity does not require a change to the Highways Interface process. These repairs shall be included on the defect forms. Factors to take into account when assessing if a repair is possible at the time of inspection include having a safe system of work, the availability of materials and individual competence. Examples of defects that are not the responsibility of Network Rail include loose/skewed road signs, cleaning dirt and graffiti on road signs. Check local arrangements.

Sub-task	Responsible	Information
G, I (I1 and I2)	LCM	Complete inspection records. After every inspection, LCMs shall: a) complete a Level Crossing Inspection Record; b) record all defects identified, including any rectified during the inspection; c) record interim mitigation measures implemented and temporary repairs made; d) where necessary, complete the level crossing inspection checklists; e) prioritise all defects using Table 7; f) produce the supporting Ellipse Work Arising Inspection Forms (WAIFs); and g) pass the completed documentation to the SM(OT). *NOTE 1 Inspection records are currently kept on TEF 3243.* *NOTE 2 Produce WAIFs for defects that are the responsibility of outside parties. The WAIF should be input into Ellipse against the LCM's workgroup with a monitor code.* LCMs shall retain copies of inspection documentation. *NOTE 3 This is to assist with monitoring repeated defects and monitoring defect repair.* LCMs shall lead the investigation of repeated defects to determine the cause of the defect.
L (L1 and L2)	Section Manager (OT)	The SM(OT) shall: a) review all inspection documentation for completeness; b) review defects identified for ownership; c) approve or reject the inspection record; d) escalate any queries to the TME; and e) send all completed WAIFs to the Off track Section Planner for input into Ellipse. The SM(OT) shall retain copies of inspection documentation in accordance with record keeping requirements.
M1 and M2	Section Planner (OT)	Input defects into Ellipse with relevant Section Manager. Close defects that have been rectified already.
O, P, Q	Section Manager	Defects shall be rectified in a timescale according to their assigned priority based on safety risk. Table 5 gives the timescales to be applied. The relevant SM shall plan the delivery of defect repairs to comply with Table 7. This includes temporary repairs which shall be made before the defect can be permanently rectified.
R	Infrastructure Maintenance Engineer	The IME shall arrange regular review meetings between themselves, their functional engineers and relevant LCMs to monitor the progress of defect rectification. The meetings shall take place at least four times a year. Invite external bodies if necessary. Records of the meetings shall be kept.

Table 1 – Key to process flow chart

Checklist	Title	AHBC	ABCL	AOCL+B	AOCL	AOCR	MCB all types	MG	UWC	OC	TMO	FP & BW	Barrow	SD
LXi01	Road Arrangements	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	-
LXi02	Road Signals	✓	✓	✓	✓	✓	✓	✓	-	-	✓	-	-	-
LXi03	Booms / Barriers	✓	✓	✓	-	-	✓	-	✓	-	✓	-	-	-
LXi04	Manned Gates	-	-	-	-	-	-	✓	-	-	✓	-	-	-
LXi05	Telephone Systems	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	-
LXi06	Road Signals & Signs, MSL /MWL	-	-	-	-	-	-	-	✓	-	-	✓	✓	-
LXi07	Road Signs AHBC, ABCL & AOCL+B	✓	✓	✓	-	-	-	-	-	-	-	-	-	-
LXi08	Road Signs AOCL / AOCR	-	-	-	✓	✓	-	-	-	-	-	-	-	-
LXi09	Road Signs MCB all types	-	-	-	-	-	✓	-	-	-	✓	-	-	-
LXi10	Road Signs Manned Gates	-	-	-	-	-	-	✓	-	-	-	-	-	-
LXi11	Road Signs Open Crossings	-	-	-	-	-	-	-	-	✓	-	-	-	-
LXi12	Road Signs UWC	-	-	-	-	-	-	-	✓	-	-	-	-	-
LXi13	Road Signs Footpath & Bridleway	-	-	-	-	-	-	-	-	-	-	✓	-	-
LXi14	Road Signs Station Barrow	-	-	-	-	-	-	-	-	-	-	-	✓	-
LXi15	Rail Signs AHBC / MSL / MWL / AOCR	✓	-	-	-	✓	-	-	✓	-	-	✓	-	-
LXi16	Rail Signs Traincrew Operated	-	-	-	-	-	-	-	-	-	✓	-	-	-
LXi17	Rail Signs AOCL / AOCL+B / ABCL / OC	-	✓	✓	✓	-	-	-	-	✓	-	-	-	-
LXi18	Whistle Boards	✓	-	-	-	-	-	-	✓	-	-	✓	✓	-
LXi19	Barrier crossings operation including AHBC, ABCL & AOCL+B	✓	✓	✓	-	-	-	-	-	-	-	-	-	-
LXi20	Open crossings operation including AOCL & AOCR	-	-	-	✓	✓	-	-	-	-	-	-	-	-
LXi21	MCB Operation all types	-	-	-	-	-	✓	-	-	-	-	-	-	-
LXi22	Manned Gates Operation	-	-	-	-	-	-	✓	-	-	-	-	-	-
LXi23	Gates / Barriers Operation	-	-	-	-	-	-	-	✓	-	-	✓	✓	-

Checklist	Title	AHBC	ABCL	AOCL+B	AOCL	AOCR	MCB all types	MG	UWC	OC	TMO	FP & BW	Barrow	SD
LXi24	Traincrew Operated Operation	-	-	-	-	-	-	-	-	-	✓	-	-	-
LXi25	Station Barrow Operation	-	-	-	-	-	-	-	-	-	-	-	✓	-
LXi26	Sleeping Dog	-	-	-	-	-	-	-	-	-	-	-	-	✓
LXi27	Crossings on Mothballed Lines	✓	✓	✓	✓	✓	✓	✓	✓	✓	-	✓	✓	-
LXi28	Surface Systems (Crossing Decks)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 2 – Level crossing inspection checklists and checklist selection

Mark	Status
X	Unacceptable
R	Acceptable – defect repaired
C	Acceptable
T	Unacceptable – temporary repair made
N/A	Not applicable

Table 3 – Marks for completing inspection checklists

Description	Maximum Inspection Interval
Automatic Half Barrier Crossings	7 weeks
Automatic Half Barrier Crossings Locally Monitored	7 weeks
Automatic Full Barrier Crossings	7 weeks
Automatic Open Crossings Locally Monitored	7 weeks
Automatic Open Crossings Remotely Monitored	7 weeks
Miniature Stop / Warning Lights	7 weeks
Manually Controlled Barriers all types	3 months
Traincrew Operated Crossings	3 months
Manned Gated Level Crossings	3 months
Station, Barrow or foot Crossings with White Lights	3 months
Open Crossings	6 months
User Worked Crossings	6 months
Footpath and Bridleway Crossings	6 months
Station, Barrow or Foot Crossings without White Lights	6 months
Sleeping Dog Crossing	6 Months
Crossings on Mothballed lines	In accord with specific crossing type

Table 4 – Maximum inspection intervals

Defect code	Timescale
SC	Within 36 hours
SI	Within 7 days
M1	Within 4 weeks
M2	Within 7 weeks
M3	Within 13 weeks
M6	Within 26 weeks
M12	Within 52 weeks
M24	Within 104 weeks

Table 5 – Defect codes, timescales and limits

4 RACI

Sub-Task	**Route Level Crossing Manager / ORA**	**Level Crossing Manager**	**Infrastructure Maintenance Engineer**	**Functional Maintenance Engineer(s)**	**Section Manager [Off track]**	**Section Planner**	**System Support Manager**	**Signaller**	**Operations Manager / LOM**	**Integrated Control Centre**	**Section Manager [other]**	**Infrastructure Maintenance Services Manager**	**Maintenance Protection Coordinator**	**Outside Party**
A					A	R								
B	A	R												
C1	A	R												
C2	A	R												
D, D1 & D2	A	R												
E	A, C	R		C	C			I	C	C				
F	A	R		I	I			I		I	I			
G & I	A	R		I	I	I								
H	A	R			I									
J & K	A	R			I	I					I		I	I
L1 & L2		C		A	R	I								
M1 & M2	I	C			A	R					C			
N		I	A	R										
O				A	R						R			
Q				A	R	R								
R	C	C	A	C	C						C			C

5 Process assurance

Responsible	Question	Frequency	Control effective?		
			Yes	No	
LCM **Plan**	Are all level crossings entered in Ellipse and are their inspection frequencies correct?	Annual			Inspect level crossings, check that all level crossing assets are in Ellipse and have the correct inspection frequencies. Keep records of this check. See supporting material, ***Assurance module 2: How to check that the level crossing inspection frequencies in Ellipse are correct*** If not following this assurance module, document alternative arrangements that can be evidenced. Obtain approval of these arrangements from the person accountable for this means of control.
IME **Check**	Are inspections conducted on time?	Weekly			Work outstanding report identifies overdue inspections. Escalate to RLCM / ORA. This check is made at the weekly Section Manager review meeting.
RLCM / ORA / IME **Check**	Are inspections of acceptable quality?	Annual			Monitor the quality of asset inspections. Keep records of this check. See supporting material, ***Assurance module 1: How to check the quality of level crossing asset inspections***. If not following this assurance module, document alternative arrangements that can be evidenced. Obtain approval of these arrangements from the person accountable for this means of control.
SM / LCM **Check**	Are defects repaired and closed in Ellipse to timescale?	Weekly / Ongoing			Repair defects: the SM shall monitor that defects are rectified as planned. LCMs Monitor level crossing defect rectification timescales. Keep records of this check. See supporting material, ***Assurance module 4: Guidance on how to monitor level crossing defect rectification timescales*** If not following this assurance module, document alternative arrangements that can be evidenced. Obtain approval of these arrangements from the person accountable for this means of control.
Functional	Are defect repairs of an	Annual			Repair defects: Functional Delivery

Delivery Unit Engineers / LCM **Check**	acceptable quality?				Unit Engineers monitor the quality of repairs. Keep records of this check. See supporting material, ***Assurance module 3: How to check the quality of level crossing defect repair***. If not following this assurance module, document alternative arrangements that can be evidenced. Obtain approval of these arrangements from the person accountable for this means of control**.**
IME **Act**	Are Liaison meetings taking place and defects being repaired to timescales?	Quarterly			Level crossing inspection liaison meetings: The IME arranges regular review meetings between themselves, their functional engineers and the relevant LCMs to monitor the progress of defect rectification. The meetings take place at least four times a year. External bodies are invited if necessary. Keep records of meetings.

Table 6 – Process assurance questions

Appendix A
How to check the quality of level crossing asset inspections

A.1 Introduction

This supporting material document provides Route Level Crossing Managers (RLCMs) where appointed, Operations Risk Advisors (ORAs) and Infrastructure Maintenance Engineers (IMEs) with a means of assurance for checking the quality of level crossing asset inspections. It includes providing feedback on the quality of inspections to Level Crossing Managers (LCMs).

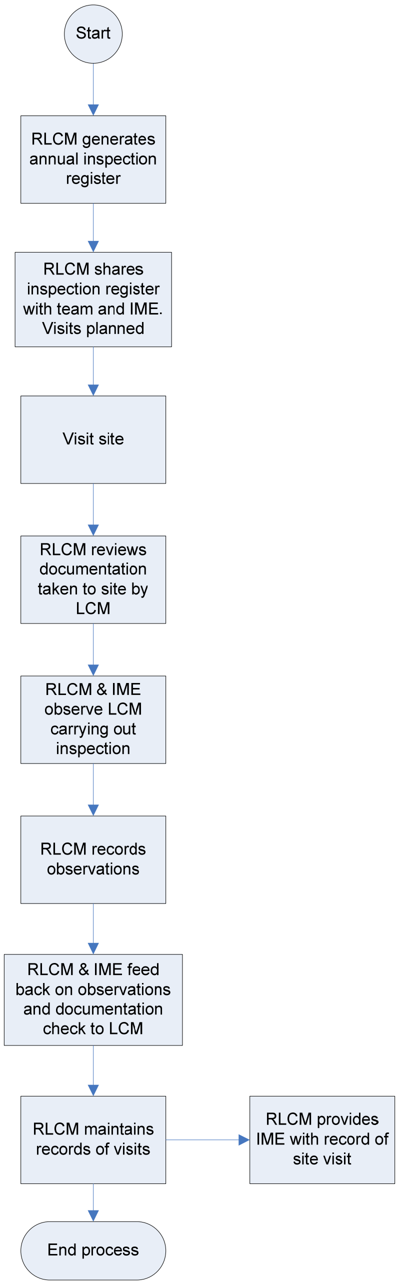
It describes a process for RLCMs, ORAs and IMEs to check the quality of level crossing asset inspections.

This document assists in the mitigation of the following high level risk:

- Vehicle, person or animal on the line at risk of collision

This document supports the process for the inspection and maintenance of level crossing assets.

If not following this assurance module, document alternative arrangements that can be evidenced. Obtain approval of these arrangements from the person accountable for this means of control.



A.2 Process

A.2.1

Each RLCM should carry out an annual physical check of the quality of level crossing asset inspections. This should be a 5% check of all crossings in a Route. It should:

a) cover all crossing types where possible; and

b) include crossings that are the responsibility of each LCM.

NOTE 1 It is good practice to visit the same number of crossings with each LCM.

Where Routes have not appointed RLCMs, the checks should be carried out by ORAs.

NOTE 2 Where appointed, checks should be carried out by RLCMs.

A.2.2

The RLCM should generate an annual inspection register for the crossings to be visited.

NOTE The crossings to be visited should be rotated each year so that a broad range of crossings are visited over several years.

A.2.3

The RLCM should share the inspections register with their LCMs and IMEs. Visits should be planned so that they align with LCMs' existing workbanks.

IMEs should be invited to attend inspection visits.

NOTE 1 Do not plan additional visits as part of this process.

NOTE 2 IMEs may delegate responsibility to attend visits to functional engineers.

A.2.4

During the visit the RLCM and IME / functional engineer should observe the LCM carry out the inspection. Activities to check, observe and record include:

a) check if the documentation mandated in table 1 is available and used;

NOTE It is good practice for LCMs to include other relevant documentation .e.g. AU details, previous inspection record forms and details of future work planned.

b) record if all defects have been identified;

c) record if all questions were answered on site;

d) record if a mobile device is used;

e) record if appropriate tools are used, e.g. measuring wheel;

f) observe if defect rectification is of acceptable quality where applicable; and

g) record if all defects that could have been rectified on site were rectified.

The RLCM should use Form NR/L2/SIG/19608 /F1 to record the results of the check.

A.2.5

The RLCM and IME / functional engineer should provide feedback to the LCM on the quality of the inspection.

NOTE This should be done on the day of the site visit and at the crossing where possible.

A.2.6

The RLCM should maintain records of the checks undertaken using form NR/L2/SIG/19608 /F1. The RLCM should provide the IME with a copy of NR/L2/SIG/19608 /F1.

NOTE Records can be kept in electronic or paper format.

Appendix B
How to check that the level crossing asset inspection frequencies in Ellipse are correct

B.1 Introduction

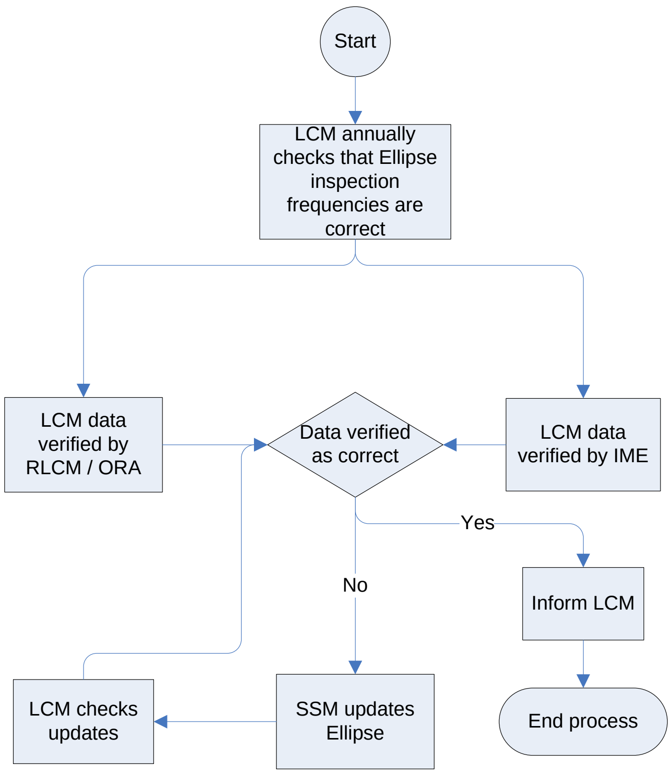
This supporting material provides Level Crossing Managers, Route Level Crossing Managers and Infrastructure Maintenance Engineers with a means of assurance to check that the asset inspection frequencies for level crossings held in Ellipse are correct.

This document describes an annual check of level crossing asset inspection frequencies held in Ellipse.

This document assists in the mitigation of the following high level risk:

- Vehicle, person or animal on the line at risk of collision

If not following this assurance module, document alternative arrangements that can be evidenced. Obtain approval of these arrangements from the person accountable for this means of control**.**



B.2 Process

B.2.1

The Level Crossing Manager (LCM) should obtain a report of the asset inspection frequencies contained in Ellipse for the level crossings within their responsibility. The LCM should use the report to make the following checks:

a) that all level crossings within their responsibility are included in Ellipse;

b) that the asset inspection frequencies in Ellipse comply with the requirements of table 4; and

c) that the asset inspection frequencies in Ellipse take account of any level crossings that require different inspection intervals as a result of risk assessment.

B.2.2

The LCM should send the report, including any changes identified, to the relevant Infrastructure Maintenance Engineer (IME) and Route Level Crossing Manager /Operations Risk Advisor (RLCM/ORA) for their approval.

The IME and RLCM/ORA should check the report and inform the LCM of any further changes identified. If no further changes are needed, the IME and RLCM/ORA should each inform the LCM that they approve the report.

B.2.3

The LCM should inform the Systems Support Manager (SSM) of any changes that need to be made to Ellipse.

B.2.4

The SSM should update Ellipse as requested by the LCM. The SSM should inform the LCM when the updates have been completed.

B.2.5

The LCM should check that any changes to Ellipse have been made correctly.

The LCM should inform the SSM if any further changes are needed.

Appendix C
How to check the quality of level crossing defect repair

C.1
Introduction

This supporting material provides Track Maintenance Engineers (TMEs) with a means of assurance for the checking of the quality of repairs made to level crossing defects. It includes providing feedback on the quality of repairs to Section Managers, Route Level Crossing Managers / Operations Risk Advisors and Level Crossing Managers.

This document describes a process for Delivery Unit engineers to check the quality of repairs that are made to level crossings.

This document assists in the mitigation of the following high level risk:

- Vehicle, person or animal on the line at risk of collision

If not following this assurance module, document alternative arrangements that can be evidenced. Obtain approval of these arrangements from the person accountable for this means of control.

C.2 Process

C.2.1

TMEs should carry out a physical 5% inspection of all crossings annually.

NOTE The crossings to be visited should be rotated each year so that a broad range of crossings are visited over several years.

The previous inspection records for the crossings should be reviewed. The check should include an assessment of the repair of defects identified as part of level crossing inspections undertaken during the previous 12 months.

The check should determine if:

a) defects identified during level crossing inspections have been repaired; and

b) repairs made are of an acceptable quality.

C.2.2

The TME should provide feedback to the relevant Section Manager, Level Crossing Manager and Route Level Crossing Manager / Operations Risk Advisor. The feedback should include an assessment of the quality of repairs made.

NOTE Feedback can include an assessment:

a) of the suitability of repairs made; and

b) if repairs could have been made by the LCM during inspection visits.

C.2.3

The TME should decide if further defect repair is needed.

C.2.4

The TME should inform the relevant Section Manager of any further defect repairs needed.

C.2.5

The Section Manager [off track] and the Section Planner should input the defects into Ellipse. The defects should be prioritised using Table 7*.*

C.2.6

The relevant SM should manage defect repairs.

Appendix D
Guidance on how to monitor level crossing defect rectification timescales

D.1 Guidance

This supporting material provides Level Crossing Managers (LCMs) with guidance on checking the timescales for level crossing defects to be rectified.

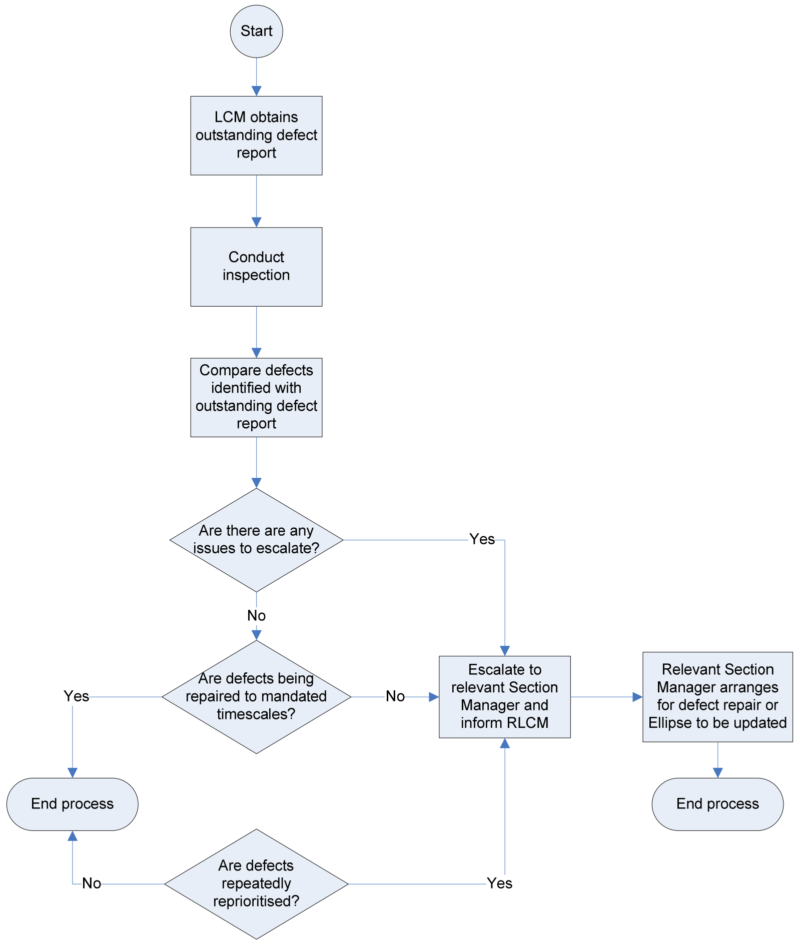
This document describes a process for LCMs to monitor the timescales for the rectification of level crossing defects.

This document assists in the mitigation of the following high level risk:

- Vehicle, person or animal on the line at risk of collision

This document supports the process for the inspection and maintenance of level crossing assets.

If not following this assurance module, document alternative arrangements that can be evidenced. Obtain approval of these arrangements from the person accountable for this means of control.



D.2 Process

D.2.1

After conducting an asset inspection, the LCM should check the status of defects they have previously reported. This can help to check that:

a) defects are being repaired to the appropriate timescales;

b) all previously reported defects have been entered into Ellipse; and

c) defects are not being repeatedly reprioritised.

D.2.2

The LCM should obtain a report of any outstanding defects for the crossing that has been inspected. Reports can be obtained from Business Objects.

NOTE The 'Work order data download' report provides relevant information.

The report should include all outstanding defects and defects rectified since the last visit.

D.2.3

The LCM should compare any defects they identified during the inspection with the outstanding defect report. Anomalies to check for include:

a) defects that have exceeded their rectification timescale;

b) defects which appear on the report and have already been rectified;

c) defects shown as rectified which are still an issue, e.g. LCM thinks the defect has not been adequately repaired;

d) defects previously identified that do not appear on the report; and

e) defects that are being repeatedly reprioritised.

D.2.4

The LCM should decide if there are any issues that need to be escalated. Where there are issues, the LCM should provide the relevant Section Manager with appropriate details.

The LCM should inform their RLCM of any items they have escalated.

D.2.5

The relevant Section Manager should take the appropriate action.

Table 7 – Defect Minimum Actions table

Condition	Action Level Crossing Manager / Delivery Unit	Initial priority	Permanent Rectification Timescale
1.1 Trespass Guards on Public Road Vehicular Crossings (if required & shown on Legal Order / Ground Plan)			
One or more guards missing or one or more guards damaged and ineffective.	Temporary repair – lift adjacent guard(s) and re-fix at angle so effective measure in place. Permanent repair – install missing / new guard within 26 weeks.	SI	M6
Any number of guards damaged but effective.	Raise WAIF with rectification timescale of 26 weeks.	-	M6
Less than 2.6m but >1.0m 'step over' distance between adjacent sets of guards.	Raise WAIF with rectification timescale of 26 weeks.	-	M6
Less than 1.0m 'step over' distance between adjacent sets of guards at manned crossing. **Note Not including CCTV crossings**	Decide if mitigation of placing watchman or closing crossing to pedestrian traffic is needed. Temporary rectification – install additional length guards to achieve minimum 1.0m step over. Permanent repair – install full length step over for guards within 26 weeks.	M1	M6
Guards installed incorrect length <2.6m but >2.3m.	Permanent rectification – install fully compliant trespass guards within 104 weeks.	-	M24
Guards installed incorrectly e.g. >35mm between timbers but effective.	Raise WAIF with rectification timescale of 104 weeks. Permanent repair – install correctly as standard detail within 104 weeks.	-	M24
Less than 1.0m 'step over' at unmanned or remotely monitored crossing / guards incorrectly installed and not effective / installed less than 2.3m in length.	Notify Integrated Control Centre (ICC) and SM(OT). Decide if mitigation of placing watchman or closing crossing to pedestrian traffic is needed. Temporary rectification – install minimum 1.0m of guards to create effective measure. Permanent rectification – install fully compliant trespass guards within 26 weeks.	SC	M6
Trespass guards do not extend to fence line	Notify Integrated Control Centre (ICC) and SM(OT). Decide if mitigation of placing watchman or closing crossing to pedestrian traffic is needed. Temporary rectification – install minimum 1.0m of guards to create effective measure. Permanent rectification – install fully compliant trespass guards within 26 weeks.	SC	M6
Trespass guards do not extend to fence line on DC lines	Notify Integrated Control Centre (ICC) and SM(OT). Decide if mitigation of placing watchman or closing crossing to pedestrian traffic is needed. Temporary rectification – install minimum 2.0m of guards to create effective measure. Permanent rectification – install fully compliant trespass guards within 26 weeks.	SC	M6

Condition	Action Level Crossing Manager / Delivery Unit	Initial priority	Permanent Rectification Timescale
1.2 Trespass Guards on Footpath Crossings (all types) and where part of a UWC (if required & shown on endorsed record plan)			
One or more guards missing or one or more guards damaged and ineffective.	Notify ICC and SM(OT). Temporary repair - lift adjacent guard(s) and re-fix at angle so effective measure in place. If temporary repair not possible decide if crossing needs to be closed to pedestrian traffic at high risk locations. Permanent repair - install missing / new guard within 26 weeks.	SC	M6
Any number of guards damaged but effective.	Raise WAIF with rectification timescale of 26 weeks.	-	M6
Less than 2.6m but >1.0m 'step over' distance between adjacent sets of guards.	Raise WAIF with rectification timescale of 26 weeks.	-	M6
Less than 1.0m 'step over' distance between adjacent sets of guards.	Notify ICC and SM(OT). Decide if mitigation of placing watchman or closing crossing to pedestrian traffic is needed. Temporary rectification - install additional length guards to achieve minimum 1.0m step over. Permanent repair - install full length step over for guards within 26 weeks.	SC	M6
Guards installed incorrect length <2.6m but >2.3m.	Permanent rectification – install fully compliant trespass guards within 104 weeks.	-	M24
Guards installed incorrectly (e.g. >35mm between timbers) but effective.	Raise WAIF with rectification timescale of 104 weeks. Permanent repair - install correctly as standard detail within 104 weeks.	-	M24
Less than 1.0m 'step over' at unmanned or remote crossing / guards incorrectly installed and not effective / installed less than 2.3m in length.	Notify ICC and SM(OT). Decide if mitigation of placing watchman or closing crossing to pedestrian traffic is needed. Temporary rectification - install minimum 1.0m of guards to create effective measure. Permanent rectification - install fully compliant trespass guards within 26 weeks.	SC	M6
Trespass guards do not extend to fence line	Notify ICC and SM(OT). Decide if mitigation of placing watchman or closing crossing to pedestrian traffic is needed. Temporary rectification - install minimum 1.0m of guards to create effective measure. Permanent rectification - install fully compliant trespass guards within 26 weeks.	SC	M6
Trespass guards do not extend to fence line on DC lines	Notify ICC and SM(OT). Decide if mitigation of placing watchman or closing crossing to pedestrian traffic is needed. Temporary rectification - install minimum 2.0m of guards to create effective measure. Permanent rectification - install fully compliant trespass guards within 26 weeks.	SC	M6

Condition	Action Level Crossing Manager / Delivery Unit	Initial priority	Permanent Rectification Timescale
1.3 Cattle cum Trespass Guards on UWC (if required & shown on endorsed record plan) (including for crossing of livestock)			
One guard missing or one guard damaged and ineffective.	Raise WAIF with permanent rectification timescale of 26 weeks. Temporary repair - lift adjacent guard and re-fix at angle so effective guard in place within 36 hours	SC	M6
Two or more guards missing or two or more guards damaged and ineffective.	Notify ICC, close crossing to passage of livestock. LCM to decide if continued or alternative mitigation is needed e.g. placing watchman. Temporary repair if three or less guards missing, lift and re-fix at angle so effective barrier in place. Permanent repair - install missing / new guards within 26 weeks.	SC	M6
Any number of guards damaged but effective.	Raise WAIF with rectification timescale of 26 weeks.	-	M6
Less than 2.6m but >1.0m 'step over' distance between adjacent sets of guards.	Raise WAIF with rectification timescale of 26 weeks.	-	M6
Guards installed incorrect length <2.6m but >1.0m.	Raise WAIF with rectification timescale of 104 weeks. Permanent repair - install correct length as standard detail within 104 weeks.	-	M24
Guards installed incorrect length <2.6m but >2.3m.	Permanent rectification – install fully compliant trespass guards within 104 weeks.	-	M24
Guards installed incorrectly e.g. >35mm between timbers but effective.	Raise WAIF with rectification timescale of 104 weeks. Permanent repair - install correctly as standard detail within 104 weeks.	-	M24
Guards incorrectly installed and not effective to prevent animal incursion / installed less than 1.0m in length.	Notify ICC, close crossing to passage of livestock. Notify SM(OT). LCM to decide if continued or alternative mitigation is needed e.g. placing watchman. Temporary rectification - install additional length guards to achieve minimum 1.0m step over. Permanent rectification - install fully compliant trespass guards within 26 weeks.	SC	M6
Trespass guards do not extend to fence line	Notify ICC, close crossing to passage of livestock. Notify SM(OT). LCM to decide if continued or alternative mitigation is needed e.g. placing watchman. Temporary rectification - install additional length guards to achieve minimum 2.0m step over. Permanent rectification - install fully compliant trespass guards within 26 weeks.	SC	M6

Condition	Action Level Crossing Manager / Delivery Unit	Initial priority	Permanent Rectification Timescale
Trespass guards do not extend to fence line on DC lines	Notify ICC, close crossing to passage of livestock. Notify SM(OT). LCM to decide if continued or alternative mitigation is needed e.g. placing watchman. Temporary rectification - install additional length guards to achieve minimum 1.0m step over. Permanent rectification - install fully compliant trespass guards within 26 weeks.	SC	M6
2.0 Surface Units -– Bridging Systems (e.g. Bomac, Polysafe)			
Panel(s) rocking on public highway crossings (including broken nibs even if no panel movement).	Notify Signaller, ICC and SM(OT). Decide if the crossing needs to be closed to vehicular traffic. Immediate action - lift panel(s), investigate and rectify (normally failed nibs or missing rubbers). If rectification not possible, place watchman. LCM to decide on further mitigation (e.g. remove panel and close crossing to public, impose ESR with full time watchman, etc).	SC	SI
Panel(s) rocking on UWC - all types (including broken nibs even if no panel movement).	Notify Signaller, ICC and SM(OT). Lift panel(s), investigate and rectify (normally failed nibs or missing rubbers). If immediate rectification not possible, place watchman. LCM to decide on any further mitigation (e.g. remove panel & close crossing to public, impose ESR with full time watchman, etc).	SC	SI
Panel(s) rocking on pedestrian crossing - all types (including broken nibs even if no panel movement).	Notify ICC and SM(OT). If trip hazard decide if the crossing needs to be closed to pedestrian traffic. Immediate action - lift panel(s), investigate and rectify (normally failed nibs or missing rubbers). If immediate rectification not possible, place watchman. LCM to decide on any further mitigation (e.g. remove panel and close crossing to public, impose ESR with full time watchman, etc).	SC	SI
Not gapped correctly on public highway crossings.	If gap in area **likely** to be used by cyclists, notify IFC and SM(OT), rectify within 36hours. Temporary repair - install timber wedge, rubber wedge, foam filler or similar OR take line blockage and lever up panels to close gaps and install wedge at end restraint. Permanent repair, close up gaps and reset end restraints within 7 days.	SC	SI
Not gapped correctly on public highway crossings.	If gap in area **not** likely to be used by cyclists, rectify within 7 days. Temporary repair (not mandatory) - install timber wedge, rubber wedge, foam filler or similar OR take line blockage and lever up panels to close gaps and install wedge at end restraint. Permanent repair, close up gaps and reset end restraints within 7 days.	SI	SI

Condition	Action Level Crossing Manager / Delivery Unit	Initial priority	Permanent Rectification Timescale
Not gapped correctly on UWC and Footpath Crossings - all types.	Raise WAIF with permanent rectification within 4 weeks. Temporary repair (not mandatory) - install timber wedge, rubber wedge, foam filler or similar OR take line blockage and lever up panels to close gaps and install wedge at end restraint. Permanent repair, close up gaps and reset end restraints within 4 weeks.	M1	M1
Missing rubbers - all crossing types.	Notify Signaller, ICC and SM(OT). Decide if the crossing needs to be closed to vehicular traffic. Immediate action - lift panel(s), investigate and rectify. If immediate rectification not possible, place watchman. LCM to decide on any further mitigation (e.g. remove panel & close crossing to public, impose ESR with full time watchman etc).	SC	SI
Displaced rubbers - all crossing types.	Raise WAIF. Re-inspect within 7 days, if no worse rectify within 4 weeks, if worse action as 'Missing rubbers'.	SI	M1
Surface condition - all types **– defect is likely to cause panel failure within 36 hours or defect already a risk to users**	Record cracks, chips, holes, loose infill, small areas where surface has come out. LCM to use judgement as to location and scale of defect, the traffic, usage and any deterioration., Notify Signaller, ICC and SM(OT). Decide if the crossing needs to be closed to vehicular traffic and/or pedestrian traffic (dependent on location of defect). Temporary repair to panel if possible - infill with tarmac, epoxy resin, grout etc; if no repair possible place watchman and LCM to **decide on any further mitigation** (e.g. remove panel & close crossing to public, impose ESR with full time watchman etc). For all other defects - record, take photograph, arrange re-inspection if appropriate to check for deterioration and record on WAIF with rectification timescale using best judgement. Range of timescales for rectification is 36hours to 104 weeks.	SC	M24
Surface condition - all types **– defect is not likely to cause panel failure within 36 hours or defect not a risk to users**	Record cracks, chips, holes, loose infill, small areas where surface has come out. LCM to use judgement as to location and scale of defect, the traffic, usage and any deterioration. Record, take photograph, arrange re-inspection if appropriate to check for deterioration and record on WAIF with rectification timescale using best judgement. Range of timescales for rectification is up to 104 weeks.	-	M24
Bomac / Polysafe panels mixed - incorrect rubbers.	Treat as 'Displaced rubbers'.	SI	M1
Panels sitting proud of cill beams - all crossing types.	Raise WAIF with permanent rectification within 52 weeks. Temporary repair - install tarmac or concrete ramp within 7 days.	SI	M12
At MCB-OD crossings vegetation is growing at or is likely to grow to 150mm within the detection area	Remove vegetation growing within the detection area.	SC	SC

Condition	Action Level Crossing Manager / Delivery Unit	Initial priority	Permanent Rectification Timescale
At MCB-OD crossings obstructions are present within the detection area	Remove obstruction(s) within the detection area.	SC	SC
2.1 Surface Units - Load Bearing Systems 1 (e.g. Strail, Holdfast, Rosehill)			
Panel(s) rocking - all crossing types.	Load bearing systems should not rock. If they do, panel(s) either damaged or units not being properly supported by cills or sleepers. Notify Signaller and ICC, and SM(OT). Decide if the crossing needs to be closed to vehicular traffic. Immediate action - lift panel(s), investigate and rectify. If immediate rectification not possible, place watchman. LCM to decide on any further mitigation (e.g. close crossing to public, impose ESR, ESR with full time watchman etc). Permanent repair, close up gaps and reset end restraints within 7 days.	SC	SI
Not gapped correctly - all crossing types.	Load bearing systems are joined together with ether tie rods or turret plates. If gaps appear, likely that rod or turret plate broken or missing. Notify Signaller ICC and SM(OT). Immediate temporary rectification such as install timber wedge, rubber wedge, foam filler or similar and place steel pin / timber post or similar as temporary end restraint if none present. Permanent rectification within 4 weeks.	SC	M1
Surface condition - all types **– defect is likely to cause panel failure within 36 hours or defect already a risk to users**	Record cracks, tears, damage, holes. LCM to use judgement as to location and scale of defect, the traffic, usage and any deterioration. Notify Signaller, ICC and SM(OT). Decide if the crossing needs to be closed to vehicular and/or pedestrian traffic (dependent on location of defect). **LCM to decide on any further mitigation** (e.g. remove panel & close crossing to public, impose ESR, impose ESR with full time watchman etc) - rectification is to install new panel(s) or swap around such that defective panel is placed outside of trafficked area. For all other defects - record, take photographs, arrange re-inspection if appropriate to check for deterioration and record on WAIF with rectification timescale using best judgement. Range of timescales for rectification is 36hours to 104 weeks.	SC	M24
Surface condition - all types **– defect is not likely to cause panel failure within 36 hours or defect not a risk to users**	Record cracks, chips, holes, loose infill, small areas where surface has come out. LCM to use judgement as to location and scale of defect, the traffic, usage and any deterioration. Record, take photograph, arrange re-inspection if appropriate to check for deterioration and record on WAIF with rectification timescale using best judgement. Range of timescales for rectification is up to 104 weeks.	-	M24

Condition	Action Level Crossing Manager / Delivery Unit	Initial priority	Permanent Rectification Timescale
Panels sitting proud of cill beams - all crossing types.	Raise WAIF with permanent rectification within 52 weeks. Temporary repair - install tarmac or concrete ramp within 7 days.	SI	M12
At MCB-OD crossings vegetation is growing at or is likely to grow to 150mm within the detection area	Remove vegetation growing within the detection area.	SC	SC
At MCB-OD crossings obstructions are present within the detection area	Remove obstruction(s) within the detection area.	SC	SC
2.2 Surface Units – Load Bearing Systems 2 (e.g. Omni)			
Panel(s) rocking - all crossing types.	Omni load bearing system should not rock. If it does, panel(s) either damaged or units not being properly supported by cills or sleepers. Notify Signaller, Infrastructure Fault Control (ICC) and SM(OT). Decide if the crossing needs to be closed to vehicular traffic. Immediate action - lift panel(s), investigate and rectify. If immediate rectification not possible, place watchman and LCM to decide on any further mitigation (e.g. close crossing to public, impose ESR, ESR with full time watchman etc).	SC	SI
Not gapped correctly - all crossing types.	Omni load bearing systems are normally fixed down to a base plate. If gaps appear, likely that fixings have failed. Notify Signaller, Infrastructure Fault Control (ICC) and SM(OT). Immediate temporary rectification such as install timber wedge, rubber wedge, foam filler or similar and place steel pin / timber post or similar as temporary end restraint if none present. Omni system now obsolete so spares unlikely, permanent rectification will probably need to be full renewal. Notify RAM[T]. Minimum partial replacement of the affected cess, 4ft or 6ft panels with proprietary system within 26 weeks, full deck renewal within 104 weeks.	SC	M6 / M24
Surface condition - all types **– defect is likely to cause panel failure within 36 hours or defect already a risk to users.**	Record cracks, tears, damage, holes. LCM to use judgement as to location and scale of defect, the traffic, usage and any deterioration. Notify Signaller, ICC and SM(OT). Decide if the crossing needs to be closed to vehicular and/or pedestrian traffic (dependent on location of defect). **LCM to decide on any further mitigation** (e.g. remove panel & close crossing to public, impose ESR, impose ESR with full time watchman etc). Rectification is to install new panel(s) or swap around such that defective panel is placed outside of trafficked area. For all other defects - record, take photographs, arrange re-inspection if appropriate to check for deterioration and record on WAIF with rectification timescale using best judgement. Range of timescales for rectification is 36hours to 104 weeks. Consider renewal as system is obsolete.	SC	M24

Condition	Action Level Crossing Manager / Delivery Unit	Initial priority	Permanent Rectification Timescale
Surface condition - all types **– defect is not likely to cause panel failure within 36 hours or defect not a risk to users**	Record cracks, chips, holes, loose infill, small areas where surface has come out. LCM to use judgement as to location and scale of defect, the traffic, usage and any deterioration. Record, take photograph, arrange re-inspection if appropriate to check for deterioration and record on WAIF with rectification timescale using best judgement. Range of timescales for rectification is up to 104 weeks.	-	M24
Panels sitting proud of cill beams - all crossing types.	Raise WAIF with permanent rectification within 52 weeks. Temporary repair - install tarmac or concrete ramp within 7 days.	SI	M12
At MCB-OD crossings vegetation is growing at or is likely to grow to 150mm within the detection area	Remove vegetation growing within the detection area.	SC	SC
At MCB-OD crossings obstructions are present within the detection area	Remove obstruction(s) within the detection area.	SC	SC
2.3 Surface Units - Timbers (mainly UWC & Pedestrian)			
Timbers rocking / moving / damaged - all crossing types **– defect is likely to cause panel failure within 36 hours or defect already a risk to users.**	Crossing may not be in use at time of inspection. If seen, judgement to be used depending on location, usage and condition. Notify ICC and SM(OT). Decide if the crossing needs to be closed to vehicular traffic and/or pedestrian traffic (dependent on location of defect). **LCM to decide on any further mitigation** (e.g. remove timber & close crossing to public, impose ESR, impose ESR with full time watchman etc) - rectification is to install new timber(s). For all other defects - record, take photographs, arrange re-inspection if appropriate to check for deterioration and record on WAIF with rectification timescale using best judgement. Range of timescales for rectification is 36hours to 104 weeks.	SC	M24
Surface condition - all types – **defect is not likely to cause panel failure within 36 hours or defect not a risk to users**	Record cracks, chips, holes, loose infill, small areas where surface has come out. LCM to use judgement as to location and scale of defect, the traffic, usage and any deterioration. Record, take photograph, arrange re-inspection if appropriate to check for deterioration and record on WAIF with rectification timescale using best judgement. Range of timescales for rectification is up to 104 weeks.	-	M24
Anti-slip surface damaged / worn / ineffective.	Raise WAIF, and take photographs, with permanent rectification within 4 weeks.	-	M1
Anti-slip surface damaged / worn / and still effective.	Raise WAIF and take photographs. Range of timescales for rectification is 4 to 52 weeks.	-	M1 - 12
3.0 End Restraints (normally fitted only to Bomac & Polysafe systems but some Strail systems as secondary restraint)			

Condition	Action Level Crossing Manager / Delivery Unit	Initial priority	Permanent Rectification Timescale
End restraint missing, loose or gapped.	If gaps in panels, treat as gapped panels and rectify at time of gapping defect. Temporary repair - if missing, install temp steel pin or timber posts, if loose - tighten, if gapped - install wedge. Permanent rectification within 7 days.	SC	SI
End restraint missing, loose or gapped.	If no gaps in panels, record, raise WAIF & permanent rectification within 7 days	SI	SI
4.0 Four foot deflector plates / chain guards			
Loose - stand alone deflector plate.	Immediate rectification required - retighten. Record, raise WAIF with timescale for replacement within 52 weeks. **Tighten or remove (temp) ramp required.**	SC	M12
Missing or damaged.	Raise WAIF. Install temporary deflector plate within 7 days. Replace within 52 weeks.	SI	M12
5.0 Surface condition - including approaches on all crossings			
Potholes > 150mm diameter AND > 40mm deep within Stop Line to Stop Line.	Immediate rectification required using 'bagged' tarmac or similar material type to existing surface. Permanent rectification within 26 weeks. Consider refurbishment request to RAM[T].	SC	M6
Potholes < 150mm diameter and < or > 40mm deep within Stop Line to Stop Line.	Raise WAIF. Rectify within 26 weeks.	M6	M6
Potholes - all sizes - outside stop lines.	Notify responsible third party within 7 days for onward rectification by the responsible 3rd party in line with their timescales (most Local Authorities have a 'pot hole' policy).	SI	M6
Surface wear.	LCM to make judgement depending on location, usage and condition. Record, take photographs should further deterioration occur / not occur by next inspection. Raise WAIF with timescale for rectification to suit from 7days to 52 weeks. Consider refurbishment request to RAM[T].	SI	M12
6.0 Edge Beams / Cill Beams			
Rocking - all crossing types - where an immediate risk to rail, road or pedestrian users exists or likely to exist by time of next inspection.	Notify Signaller, ICC and SM(OT). Decide if the crossing needs to be closed to vehicular and/or pedestrian traffic. Immediate action - investigate and temporary rectification if possible (use of wedges / packers etc). If immediate temporary (or permanent) rectification not possible, place watchman and LCM to decide on any further mitigation (e.g. block train traffic, close crossing to public, impose ESR, impose ESR with full time watchman, enhanced inspection until rectification completed etc). Permanent rectification within 26 weeks with enhanced 4-weekly inspection frequency.	SC	M6

Condition	Action Level Crossing Manager / Delivery Unit	Initial priority	Permanent Rectification Timescale
Damaged / Degrading (wear & tear).	Raise WAIF, take photographs to allow comparison should further deterioration occur / not occur by time of next inspection. Timescales for rectification to be within 26 weeks although reprioritisation is allowed subject to confirmation of no deterioration. Consider refurbishment request to RAM[T].	M6	M6
More than 2 cill beams damaged in any row.	Consider refurbishment request to RAM[T].	-	-
7.0 Fencing			
Incomplete or damaged such that access to railway is easily accessible.	Immediate temporary or permanent rectification required by LCM. If not possible, notify ICC and Signaller to caution trains until temporary repair made. Notify SM(OT). Permanent rectification within 13 weeks unless adjacent land use allows extended timescale as Table 5 NR/L2/TRK/5100.	SC	M3
Incomplete or damaged such that access to railway is not easily accessible.	Notify SM(OT), immediate temporary (or permanent) repair required. Permanent rectification within 13 weeks unless adjacent land use allows extended timescale as Table 5 NR/L2/TRK/5100	SC	M3
8.0 Gates & Stiles			
Wicket gates not locked (if required) or gate catch missing / ineffective (at UWC).	Notify Signaller, ICC and SM(OT). Decide if the crossing needs to be closed to pedestrian traffic. Temporary (or permanent) rectification immediately. Permanent rectification within 7 days.	SC	SI
Wicket gates / stiles / gates - other defects that impact upon their operation.	Raise WAIF with timescale for rectification to be within 26 weeks.	M6	M6
9.0 Sighting distances - where required as primary mitigation at crossings (minimum sighting distance not achievable)			
Sighting not achievable due to encroachment by vegetation - all crossing types.	Notify Signaller, ICC and SM(OT). Immediate rectification required. If not achievable, LCM to decide on mitigation method e.g. imposing ESR/ TSR to suit available sighting, placing watchman or closing crossing to pedestrian traffic.	SC	SC
Sighting distance might become obscured by vegetation and can become less than the required sighting distance before the next inspection.	LCM to remove vegetation if possible. NOTE SC priority for LCM rectification. Notify SM(OT) for permanent rectification within 13 weeks	SC	M3

Condition	Action Level Crossing Manager / Delivery Unit	Initial priority	Permanent Rectification Timescale
Sighting not achievable due to other obstruction either within or outside NR boundary.	Notify SM(OT). If immediate rectification not achievable, the LCM to decide mitigation of imposing ESR/ TSR to suit available sighting, placing watchman (max 24 hours), crossing closure to pedestrians or other. LCM to advise on further mitigation within 24 hours to allow watchman to stand down e.g. if necessary, ESR to remain. Permanent rectification to be advised by LCM within 13 weeks.	SC	M3
10.0 Road Markings and Studs			
Road markings, studs, reflectors or LEDs missing	LCM to make judgement depending on location, usage and condition. Take photographs raise WAIF with timescale for rectification to be within 36 hours – 26 weeks.	SC	M6
Road markings erased or indistinct (at least 70% of material for each individual road marking remains)	Raise WAIF with timescale for rectification to be within 8-26 weeks.	M2	M6
11.0 Roadway, Pedestrian Walkways or Bridleways			
Incorrect width on highway crossing (dimensioned on Ground Plan).	Notify SM(OT), raise WAIF for rectification within 13 weeks. Rectification will involve placing additional panels or correcting road markings.	M3	M3
Incorrect width on pedestrian crossing – all types and bridleways.	Notify SM(OT), raise WAIF for rectification within 13 weeks. Rectification will involve placing additional panels or timbers to achieve correct width.	M6	M6
Flangeway gaps <60mm wide and signs of flange contact present	Notify ICC for immediate response and Signaller to caution trains until rectification is complete.	SC	SC
Flangeway gaps <60mm wide and signs of flange contact not present	Notify SM(OT), raise WAIF for permanent rectification within 13 weeks	M3	M3
Flangeway depths <50mm deep on direct loading systems and <55mm deep on bridging systems and signs of flange contact present	Notify ICC for immediate response and Signaller to caution trains until rectification is complete.	SC	SC
Flangeway depths <50mm deep on direct loading systems and <55mm deep on bridging systems and signs of flange contact not present	Notify SM(OT), raise WAIF for permanent rectification within 13 weeks	M3	M3
12.0 Audible warning not functioning correctly			

Condition	Action Level Crossing Manager / Delivery Unit	Initial priority	Permanent Rectification Timescale
Single audible warning device not working	Notify ICC for immediate rectification.	SC	SC
All audible warning devices not working MCB	Notify ICC for immediate rectification and notify Signaller.	SC	SC
All audible warning devices not working Automatic Crossing inc MSL.	Place watchman at crossing, notify ICC for immediate rectification.	SC	SC
Another Train Coming Warning not working	Notify ICC for immediate rectification and notify Signaller. LCM to make judgement if mitigation is needed depending on location e.g. proximity to station and usage. Mitigations can include remaining on site, placing a watchman or requesting Signaller to caution trains.	SC	SC
Sound muted / timings incorrect	Notify ICC for immediate rectification and notify Signaller. LCM to make judgement if mitigation is needed depending on crossing type and location e.g. proximity to station and usage. Mitigations can include remaining on site, placing a watchman or requesting Signaller to caution trains.	SC	SC
Incorrect sound	Notify ICC for immediate rectification and notify Signaller. LCM to make judgement if mitigation is needed depending on crossing type and location e.g. proximity to station and usage. Mitigations can include remaining on site, placing a watchman or requesting Signaller to caution trains.	SC	SC
13.1 Barrier operation			
Any barrier not lowering	LCM to remove any single obvious defect obstructing the mechanism. If immediate rectification is not possible, notify ICC for immediate rectification and Signaller to caution trains until rectification is complete.	SC	SC
Automatic crossing lowering sequence too short	Notify ICC for immediate rectification and Signaller to caution trains until rectification is complete at automatic crossings.	SC	SC
Excessive lowering time Automatic crossing	Within 2 seconds of prescribed lowering time notify ICC for immediate rectification, in excess of 2 seconds from prescribed lowering time action as above and notify Signaller to caution trains.	SC	SC
Excessive lowering time MCB crossing	Notify ICC for immediate rectification and notify Signaller.	SC	SC
Short lowering time MCB crossing	Notify ICC for immediate rectification and notify Signaller.	SC	SC
No damping of barrier	Raise WAIF with timescale for rectification within 4 weeks.	-	M1
Barrier not raising at all	Notify ICC for immediate rectification and notify Signaller to take appropriate action as necessary, e.g. caution trains.	SC	SC

Condition	Action Level Crossing Manager / Delivery Unit	Initial priority	Permanent Rectification Timescale
Barrier slow in raising	Notify ICC for immediate rectification and notify Signaller.	SC	SC
Barrier hunting	Raise WAIF with timescale for rectification within 4 weeks.	SC	M1
13.2 Barrier boom			
Obvious severe structural damage	Notify ICC for immediate rectification and notify Signaller. LCM to decide if mitigation is needed e.g. remain on site, place a watchman or request Signaller to caution trains.	SC	SC
Stay wire snapped / missing / snagging	Notify ICC for immediate rectification and notify Signaller.	SC	SC
Stay wire sagging	Raise WAIF with timescale for rectification within 4 weeks.	-	M1
Minor structural damage	Raise WAIF with timescale for rectification within 4 weeks.	-	M1
Boom light out / missing / incorrectly aligned	LCM to rectify obvious defect to boom light mounting bracket where possible, if not possible notify ICC. Notify other defects to ICC for immediate rectification.	SC	SC
Barrier boom marking incorrect	Raise WAIF with timescale for rectification within 13 weeks.	-	M3
Barrier length incorrect	Raise WAIF with timescale for rectification within 13 weeks.	-	M3
13.3 Barrier skirt			
Skirts hitting the road	Raise WAIF with timescale for rectification within 4 weeks.	-	M1
Strut / dropper missing non consecutive in skirt	LCM to rectify defect or make temporary repair where possible. If not possible, raise WAIF with timescale for rectification within 13 weeks.	-	M3
2-4 Consecutive Struts / droppers missing in skirt	LCM to rectify defect or make temporary repair where possible. If not possible, raise WAIF with timescale for rectification within 7 days.	-	SI
>5 Consecutive Struts / droppers missing in skirt	LCM to rectify defect or make temporary repair where possible. If not possible notify ICC for immediate rectification.	SC	SC
Significant damage to skirt e.g. vehicle damage, bottom rail ineffective or incomplete,	LCM to rectify defect or make temporary repair where possible. If not possible notify ICC for immediate rectification.	SC	SC
Skirt where fitted not folding	LCM to remove any single obvious defect obstructing the mechanism where possible. If unable to be rectified, raise WAIF with timescale for rectification within 7 days.	-	SI
14.0 Telephone not functional / missing / line poor quality			
Level Crossing user phone	Notify ICC for immediate rectification and notify Signaller to take appropriate action as necessary, e.g. caution trains.	SC	SC

Condition	Action Level Crossing Manager / Delivery Unit	Initial priority	Permanent Rectification Timescale
Public Phones at any crossing other than MCB	Notify ICC for immediate rectification. Decide on mitigation needed until rectification. Either place watchman or notify Signaller to caution trains.	SC	SC
Public where fitted to an MCB	Raise WAIF with timescale for rectification within 7 days.	-	SI
Telephone incorrectly labelled inside	LCM to rectify defect where possible. If not possible raise WAIF with timescale for rectification within 13 weeks.	-	M3
Telephone incorrectly labelled outside	LCM to rectify defect where possible. If not possible raise WAIF with timescale for rectification within 13 weeks.	-	M3
15.0 Road traffic light signals			
Road traffic light signals incorrectly aligned and the majority of the road aspect signal is visible at the required sighting point	Raise WAIF with timescale for rectification within 13 weeks.	-	M3
Road traffic light signals incorrectly aligned and the alignment ineffective	Notify ICC for immediate rectification and notify Signaller. LCM to decide if mitigation is needed e.g. remain on site, place watchman or request Signaller to caution trains.	SC	SC
Road traffic light signals not functioning correctly	Fault Control for immediate rectification. Any more than one light out on either approach to the crossing trains to be cautioned.	SC	SC
Road traffic light signal reflectorised border is incomplete, or not clearly visible	Raise WAIF with timescale for rectification within 13 weeks.	-	M3
Road light assembly is damaged or backboard is faded	Raise WAIF with timescale for rectification within 13 weeks.	-	M3
Road light assembly is inadequately secured	Raise WAIF with timescale for rectification within 7 days.	-	SI
Road traffic light signal hood is obscuring the aspect	LCM to rectify / temporarily repair defect where possible. If not possible notify ICC for immediate rectification	SC	SC
Road traffic light signal incorrect hood, damaged or missing hood and is not obscuring the aspect	Raise WAIF with timescale for rectification within 7 days.	-	SC
16.0 Various			

Condition	Action Level Crossing Manager / Delivery Unit	Initial priority	Permanent Rectification Timescale
MSL stop light not working	Notify ICC for immediate rectification and notify Signaller to take appropriate action, e.g. caution trains. LCM to decide if additional mitigation is needed e.g. remain on site or place watchman.	SC	SC
Wicket gates not locked (if signaller controlled locking fitted)	Notify ICC for immediate rectification and notify Signaller to caution trains unless LCM remains on site or watchman is placed.	SC	SC
Crossing equipment encroaching on the footpath / carriageway	LCM to rectify obvious defect where possible. If not possible Notify ICC. Example – Barrier pedestal front door	SC	SC
Crossing equipment encroaching on the railway structure gauge	LCM to rectify obvious defect where possible. If not possible notify ICC. Example – Pedestal cage	SC	SC
Damaged or ineffective power operated gate opener where fitted	LCM to rectify defect or make temporary repair where possible. If not possible raise WAIF with timescale for rectification within 7 days.	-	SI
17.0 Signs			
Whistle board (where fitted) missing, obscured, dirty, vandalised or incorrectly aligned	LCM to rectify defect or make temporary repair where possible. If not possible raise WAIF with timescale for rectification within 7 days. LCM to decide on mitigation method, e.g. notify the signaller to caution trains, remain on site or provide a crossing attendant and / or arrange for an ESR as needed if immediate rectification is not possible.	SC	SI
Signs missing, obscured, dirty, vandalised or incorrectly aligned on public road crossings	LCM to rectify defect or make temporary repair where possible. Notify local / highways authority.	SC	-
Signs missing, obscured, dirty, vandalised or incorrectly aligned on public and private user worked, footpath and bridleway crossings,	LCM to rectify defect or make temporary repair where possible. If not possible raise WAIF with timescale for rectification within 7 days. LCM to decide on mitigation method, e.g. notify the signaller to caution trains, remain on site or provide a crossing attendant and / or arrange for an ESR as needed if immediate rectification is not possible.	SC	SI

Standards Briefing Note

Ref: NR/L2/SIG/19608	**Issue:** 7
Title: Level crossing asset inspection and implementation of minimum action codes	
Publication Date: 27/05/2014	**Compliance Date:** 06/09/2014
Standard Owner: Professional Head [Signalling and Controls]	
Non-Compliance rep (NRNC): Kevin Boyd	
Further information contact: Rachel Shannon	**Tel:** Rachel.shannon@networkrail.co.uk

Purpose: This document provides Level Crossing Managers (LCMs) and Delivery Unit staff, see RACI in clause 4, with acceptable means of compliance for the inspection of level crossing assets.

This document assists in the mitigation of the following high level risk:

•Level Crossings: vehicle, person or animal on the line at risk of collision.

The inspections form part of a multi-disciplinary process that demonstrate that level crossings remain safe, reliable and legally compliant.

Scope: This process describes a method of inspecting level crossings on Network Rail Managed Infrastructure. It includes:

a) preparing for inspections;

b) undertaking inspections, identifying defects and the minimum actions to be taken on site;

c) recording inspections and defects identified; and

d) managing defect repairs.

It does not apply to authorised walking routes that cross the railway unless they are classified as a staff crossing with white lights. It does not apply to road rail access points or track access points.

Assurance requirements are given in Appendices:

- A – Annual check that the inspection frequencies in Ellipse are correct
- B – Checking the quality of repairs to level crossing defects
- C – Monitoring the timescales for rectifying level crossing defects
- D – Checking the quality of level crossing inspections

What's New/ What's Changed and Why:

The standard takes into account the introduction of the Level Crossing Manager post and sets out:

1. Maximum inspection intervals.
2. Defect rectification timescales.
3. Defect minimum actions.
4. Means of assurance for the checking of level crossing asset inspections.

Business process 5400 did not reach its compliance date and will be withdrawn on publication of NR/L2/SIG/19608.

Affected documents:

Reference	*Impact*
NR/L2/SIG/19608 ISSUE 6	Superseded
BUSINESS PROCESS 5400	Withdrawn
NR/BS/LI/268	Withdrawn on compliance

Briefing requirements: *Where Technical briefing (T) is required, the specific Post title is indicated. These posts have specific responsibilities within this standard and receive briefing as part of the Implementation Programme. For Awareness briefing (A) the Post title is not mandatory.*

Please see http://ccms2.hiav.networkrail.co.uk/webtop/drl/objectId/09013b5b804504da for guidance.

Briefing *(A-Awareness/ T-Technical)*	**Post**	**Team**	**Function**
T	Level Crossing Manager	Route	Network Operations
T	Route Level Crossing Manager	Route	Network Operations
T	Operations Risk Advisor	Route	Network Operations
T	Route Asset Manager [Track]	Route	Network Operations
T	Route Asset Manager [Signalling]	Route	Network Operations
T	Section Manager [Off-track]	Route	Network Operations
T	Track Maintenance Engineer	Route	Network Operations
T	Signal and Telecoms Maintenance Engineer	Route	Network Operations

T	Section Manager [Track]	Route	Network Operations
T	Section Manager [Signalling]	Route	Network Operations
T	Section Planner [Off-track, Track, Signalling]	Route	Network Operations
T	Infrastructure Maintenance Engineer	Route	Network Operations
A	Area Director	Route	Network Operations
A	General Manager	Route	Network Operations
A	Route Infrastructure Maintenance Director	Route	Network Operations
A	Infrastructure Maintenance Delivery Manager	Route	Network Operations
A	Operations Manager	Route	Network Operations
A	Infrastructure Maintenance Services Manager	Route	Network Operations
A	Route Legal teams	Route	Network Operations
A	Infrastructure Maintenance Protection Co-ordinator	Route	Network Operations
A	Route Safety Improvement Manager	Route	Network Operations
A	Section Administrator [Off-track, Track and signalling]	Route	Network Operations
A	Community Relations Manager	Route	Government and Corporate Affairs
A	Route Control Manager	Route	Network Operations
A	Local Operations Manager	Route	Network Operations
A	Mobile Operations Manager	Route	Network Operations
A	Current Operations Manager	Route	Network Operations

**NOTE: Contractors are responsible for arranging and undertaking their own Technical and Awareness Briefings in accordance with their own processes and procedure*

Ref:	NR/L2/XNG/001
Issue:	3
Date:	05 December 2020
Compliance date:	06 March 2021

Level 2

Business Process

Provision and risk management of level crossings

Approvals

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Ref:	NR/L2/XNG/001
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User information

This Network Rail document contains colour-coding according to the following Red–Amber–Green classification.

Red requirements – *no variations permitted*

- Red requirements are to be complied with and achieved at all times.
- Red requirements are presented in a red box.
- Red requirements are monitored for compliance.
- Non-compliances will be investigated and corrective actions enforced.

Amber requirements – *variations permitted subject to approved risk analysis and mitigation*

- Amber requirements are to be complied with unless an approved variation is in place.
- Amber requirements are presented with an amber sidebar.
- Amber requirements are monitored for compliance.
- Variations can only be approved through the national variations process.
- Non-approved variations will be investigated and corrective actions enforced.

Green guidance – *to be used unless alternative solutions are followed*

- Guidance should be followed unless an alternative solution produces a better result.
- Guidance is presented with a dotted green sidebar.
- Guidance is not monitored for compliance.
- Alternative solutions should be documented to demonstrate effective control.

Compliance

This Network Rail standard/control document is mandatory and shall be complied with by Network Rail Infrastructure Limited and its contractors if applicable from 6th March 2021.

Where it is considered not reasonably practicable[1] to comply with the requirements in this standard/control document, permission to comply with a specified alternative should be sought in accordance with the Network Rail standards and controls process, or with the Railway Group Standards Code if applicable.

If this standard/control document contains requirements that are designed to demonstrate compliance with legislation they shall be complied with irrespective of a project's Governance for Railway Investment Projects (GRIP) stage. In all other circumstances, projects that have formally completed GRIP Stage 3 (Option Selection) may continue to comply with any relevant Network Rail standards/control documents that were current when GRIP Stage 3 was completed.

NOTE 1: *Legislation includes Technical Specifications for Interoperability (TSIs).*

NOTE 2: *The relationship of this standard/control document with legislation and/or external standards is described in the purpose of this standard.*

Disclaimer

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[1] *This can include gross proportionate project costs with the agreement of the Network Rail Assurance Panel (NRAP).*

Issue record

Issue	**Date**	**Comments**
1	December 2006	New standard
2	June 2008	Phase 2A / Engineering reorganisation responsibility change
3	December 2020	Replaces NR/L2/OPS/100 and revised based on current way of working

Reference documentation

NR/L2/OPS/031	Risk assessment and briefing of timetable change
NR/L2/XNG/101	Temporary Vehicular Level Crossings and Temporary Increased Use of Existing Level Crossings
NR/L2/SIG/19608	Level Crossing Infrastructure: Inspection and Maintenance
NR/L2/SIG/30021	Alterations to Authorised Line Speeds
NR/L2/XNG/30012/L110	Protection Choice, Layout Configuration and Overrun Risk
NR/L3/XNG/207	Level Crossing Manager: Competence Framework
NR/L3/XNG/308	Risk Assessing Level Crossings
NR/L3/XNG/309	Level Crossing Administration

Contents

1 Purpose

This procedure sets out the process requirements that enable Network Rail to manage the safety and convenience of its level crossings and fulfil its legal duties under health & safety legislation.

It provides a robust and consistent risk management and option selection process for new and existing level crossings and helps determine the over-arching safety requirements for them.

2 Scope

This process shall be applied to both new and existing level crossings on Network Rail Managed Infrastructure.

This process does not apply to:

- authorised walking routes that cross the railway unless they are classified as a staff crossing with active warning equipment (such as white lights); and
- road rail access points or track access points.

Ref:	**NR/L2/XNG/001**
Issue:	3
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3 Roles and responsibilities

R – Responsible is the person or people who are responsible for performing a certain task or action.

A – An Accountable person is one who has overall accountability to make sure that a task or action is completed.

C – Consulted people have an input into the task or action, this can be providing information, reviewing documents or attending workshops etc.

I – Informed people are those who receive the output of a task or process.

* Denotes option for delegation

		Level Crossing Manager	Route Level Crossing Manager	Operations Risk Advisor	Operations Risk Control Coordinator	Head of Operations Delivery	Route Director	S&T RAM	Off Track Section Manager	Local Operations Manager	Regional Director, Engineering & Asset Management	Liability Negotiations Manager	Head of Liability Negotiations	Property Director (Regions)	Director, HSQE (Regions)	Head of Maintenance Delivery
5	LC Risk Management Principles	R	R	R	R	C	A*	C	I	I	C	C	C		C	C
6	Competence	I	R	R*		R	A*								R*	
7	Renewals & Enhancements	RC	RC	R*	R	R*	A*	R	C	C	R*	R	R	R*	R* C	
7	Risk Assessment and Risk Management	R	R	R	R		A*	C	C	C		C	C		I	
8	Authorised Users	R	A													
9	Level Crossing Orders	R	A	A											A	A
10	Records	R	RA												A	

Table 1 – RACI chart

4 Definitions

For the purpose of this document, the following terms and definitions apply.

Term	Definition
All Level Crossing Risk Model (ALCRM)	Network Rail's quantitative safety risk modelling system which is used to assess the safety of individual level crossings as part of the risk assessment process.
Authorised walking route	A designated route providing access to places of work for railway staff (including booking-on points and stabling points) and which is suitable for use by people not certificated as competent in personal track safety.
Automatic crossing	A level crossing where the protective equipment is automatically activated by an approaching train and where no interlocked signal protection is provided.
Blocking back	The formation of a stationary or slow-moving queue of road traffic over a level crossing.
Crossing time	Time taken for a user to traverse the crossing from the decision point to a position of safety on the other side of the railway. Crossing time includes time taken for the user to make a decision to cross.
Decision point	The point at which a level crossing user makes a decision to cross or wait for an approaching train to pass.
Level crossing	An intersection where a road, footpath or bridleway crosses the railway over one or more railway tracks on the same level. For the purposes of this standard, this also includes roads within depots and yards and authorised walking routes fitted with active warning equipment.
Level crossing type	A recognised combination of control measures used at level crossings which form asset types, for example ABCL (automatic barrier crossing, locally monitored); CCTV monitored barrier crossing; staffed gated crossing.
Level crossing user ("user")	A person who uses a level crossing to cross the railway.
Narrative risk assessment (NRA)	The documented risk assessment for each level crossing on Network Rail managed infrastructure. It includes the quantitative risk calculations of ALCRM

Term	Definition
	and the qualitative expert judgement of level crossing managers to generate a balanced assessment of risk.
New level crossing	A level crossing, permanent or temporary, provided at a location where previously there was no means of crossing the railway at the same level; or A level crossing altered to provide vehicular access where previously there was no vehicular access; or A level crossing altered to provide access for equestrians and cyclists where previously there was only access for pedestrians
Railway staff	A person employed in the railway industry, acting in accordance with their duties.
SFAIRP	So Far as is Reasonably Practicable – the term used to describe the legal requirement for managing risk. This involves evaluating the magnitude of risk and comparing it against the effort, time and money to control it.
Signaller	A person responsible for the operation of the signalling system, to safely control the passage and regulation of trains, usually located in a signal box.
WARA	Work Activity Risk Assessment
Whistle board	A sign to instruct the train driver to sound the train horn. Normally provided where there is inadequate sighting to warn users of approaching trains.

Table 2 – Terms and definitions

Ref:	NR/L2/XNG/001
Issue:	3
Date:	05 December 2020
Compliance date:	06 March 2021

5 Level crossing risk management and option selection principles

5.1 Principles overview

Level crossings shall be subject to risk assessment in accordance with NR/L3/XNG/308.

In compliance with the Network Rail investment requirements, cost benefit analysis shall be used to support decision making.

Safety risks at level crossings shall always be managed so far as is reasonably practicable (SFAIRP), this involves evaluating the magnitude of risk and comparing it against the effort, time and money needed to control it.

Recognising that the safest level crossing is a closed one, closure shall always be investigated as part of option selection, taking account of public safety, cost, performance and societal needs.

Where it not possible to close a level crossing, downgrading the rights of way (for example removing vehicular rights) shall be investigated.

Where closure cannot be achieved, protection levels shall be informed by the narrative risk assessment and taking account of:

- the risk of harm;
- the impact on convenience of level crossing users;
- the impact on the workload of the operator;
- the impact on the train performance; and
- whole-life cost.

The Level Crossings Act 1983 requires that the level crossing user's convenience, as well as safety, is considered.

Where renewal of level crossing equipment or signalling renewals provides reasonable opportunity, the protection method of level crossings shall be reviewed, and crossings upgraded where reasonably practicable. The narrative risk assessment shall be updated as necessary.

NOTE 1: *by incorporating level crossing upgrades into re-signalling or re-control projects, this should reduce overall costs to Network Rail and introduce efficiencies in how we manage safety of the railway.*

NOTE 2: *Also refer to NR/L2/SIG/30009/E810*

Options which affect the safety, performance or convenience of level crossings, shall be agreed by key stakeholders within Route businesses as part of Steering Group meetings.

NOTE 3: *see Section 7.2 on Steering Group meetings.*

5.2 New level crossings

A new level crossing, permanent or temporary, shall be provided only if it is grossly disproportionate to provide some other means of crossing the railway.

A new level crossing shall provide the minimum rights of way needed to accommodate the required access over the railway.

A new level crossing may also be provided to replace one or more existing level crossings when it enhances the safety of level crossing users and the railway network.

New level crossings shall not be introduced onto Network Rail managed infrastructure in the following circumstances:

1. where the permissible speed is greater than 125mph (200 km/h); or
2. for footpath, bridleway or user worked crossings, where there are more than two running lines.

Proposals for new level crossings shall be reviewed by the Technical Authority. The Regional Managing Director shall authorise new level crossings in accordance with the above conditions.

NOTE 1: *anyone proposing a new level crossing is encouraged to approach the Technical Authority as early as possible in the option selection process and make appropriate provision in the project plan.*

5.3 Existing level crossings

Where level crossings exist, no permissible line speed greater than 125mph (200 km/h) shall be introduced unless the affected level crossings are legally closed.

When a risk assessment has been undertaken, reasonably practicable options to mitigate risk shall be identified in accordance with the following hierarchy of controls:

1. Eliminate the risk through closure;

NOTE 1: *where this is a level crossing with public status, this will require a legal temporary stopping up order (TTRO) until the crossing can be permanently closed.*

2. Introduce new or improved technology to upgrade the current crossing protection;
3. Upgrade the crossing with additional levels of protection e.g. AHB to MCB-OD, FPW to FPWMSL;
4. Improve the crossing layout;

NOTE 2: *e.g. reduce skew, provide guide fencing*.

5. Install new clearer instructional signage, ergonomic design to improve user comprehension

NOTE 3: *where this is a level crossing with public status, this may require a legal temporary stopping up order (TTRO) to enable the modified work to improve safety to conclude.*

6. Introduce new or improved operational procedures
7. Educate users, use stakeholder engagement and safety awareness events to improve user comprehension on safe crossing protocols
8. Enforce behavioural change, e.g. red-light safety cameras, mobile safety vehicles, BTP presence and engagement with stakeholders

The reasonably practicable option(s) shall be progressed for implementation based on a combination of cost benefit analysis and structured expert judgement.

Investment in level crossing safety shall be balanced against other safety risks.

Competing priorities may, for example, occur with embankments, structures, track, signalling, through trespass and at stations. Thus, it may not be possible and within funding to immediately implement long-term safety improvements at all level crossings.

Where such prioritisation is needed, interim controls shall be applied to mitigate risk where reasonably practicable to do so.

Where it has been determined that closure or additional control measures are not reasonably practicable, no further action other than routine inspection and monitoring is required until the next risk assessment is due or reasonable opportunity arises.

6 Competence for undertaking level crossing risk assessments

Level Crossing Managers shall complete all training modules applicable to the role in accordance with the competency requirements needed to undertake their duties.

Route Level Crossing Managers shall have in place a mentorship programme to contextualise the content of the training modules and then assess their competency prior to permitting them to work alone.

Level Crossing Manager competence shall be continuously assessed in accordance with NR/L3/XNG/207.

7 Risk assessment and risk management

7.1 General

An assessment of level crossing safety, performance and convenience shall consist of a signed off NRA, that is compliant with NR/L3/XNG/308, with supporting ALCRM calculations to generate a balanced assessment of risk for each level crossing.

NOTE 1: *NR/L3/XNG/308 details the NRA process*

The narrative risk assessment shall contain evidence of the following:

a) The level crossing environment and local factors;

b) Level crossing usage [train service and user census];

c) Stakeholder consultation;

NOTE 2: *Including but not limited to, engagement with authorised users, operations, ergonomics, asset management, liabilities negotiations*

d) Incident history;

e) ALCRM calculations and risk evaluation;

f) Residual risks and hazards;

NOTE 3: *including but not limited to, infrastructure, rail operations, environmental conditions, user behaviour and third-party interface*

g) Future developments;

NOTE 4: *including but not limited to, third party developments, timetable change, line speed enhancements, re-signalling schemes & local authority transport plans.*

h) Option evaluation and cost benefit analysis;

NOTE 5: *by using the CBA tool available from the Technical Authority.*

i) Summary and recommendations;

j) Steering group decision regarding recommended option(s);

k) Conclusion and sign-off.

NOTE 6: *see Appendix B guidance an NRA content*

The minimum frequency of level crossing risk assessments shall be based on the calculated risk for each crossing as defined in NR/L3/XNG/308.

7.2 Steering group

Each Route (or Region) shall have in place a suitable framework to assess the recommended options within narrative risk assessments (steady or future state), providing assurance that the appropriate form of protection has been selected and documented accordingly.

NOTE 1: *recommended options include interim and long-term plans to manage risk.*

NOTE 2: *to de-risk options taken forward for implementation, the steering group should take place as early as possible following risk assessment and option selection.*

Steering group meetings, or an equivalent, shall:

1. Contain a quorum of stakeholders with the necessary expertise to represent key business areas;

NOTE 3: *includes, Route Level Crossing Managers, Level Crossing Manager(s), Operations Managers/Local Operations Managers, Signalling & other Asset Management representatives, Liability Negotiations Managers – or nominated representatives*

2. Use professional judgement to reach agreement as to whether to approve or reject options, taking account of the qualitative and quantitative rationale contained within the narrative risk assessments;
3. Where options are approved, agree responsible owner to progress funding and agree prioritisation within work-banks;
4. Meet with a periodicity that enables decisions relating to option selection to form part of conclusions within narrative risk assessments and be signed off in accordance with the timescales contained within NR/L3/XNG/308.

The outcome from the steering group shall be recorded and where required provide assurance into the Preliminary Approval stage of the Signalling and Level Crossing Scheme Technical Approval Process, NR/L2/SIG/30035, that the appropriate form of level crossing protection is being implemented.

Where selected options change later in the project lifecycle, for example due to engineering factors identified during the design stage or in later technical approvals, then the changed options shall be resubmitted for reconsidered by the steering group.

7.3 Trigger risk assessments

In addition to the scheduled frequencies, risk assessments shall also be reviewed, and updated as necessary, in the following circumstances:

1. When the volume of vehicular traffic, pedestrians or animals using a level crossing has changed significantly;
2. When the volume of rail traffic has changed significantly;
3. When rail-infrastructure changes have occurred;

4. Following a report of significant change in the environment on the approach to a level crossing;
5. Upon identification of possible change in land use that could affect the level crossing; and
6. Following an expression of concern that changes the risk profile significantly.

NOTE 1: *an expression of concern might come from within Network Rail, a Train Operator, the safety regulator (ORR), an authorised user, or the relevant Highway Authority for example.*

7.4 Risk Modelling

ALCRM modelling shall be undertaken in the following circumstances:

1. As part of timetable change risk assessment as outlined in NR/L2/OPS/031;
2. Prior to responding to planning proposal consultations;
3. As part of proposals to change the rail infrastructure;
4. As part of franchise specification proposals
5. As part of a significant change in level of land use by authorised users.
6. As part of ALCRM modelling, NRAs shall be reviewed and updated as necessary.

Accidents and incidents at level crossings shall be monitored as part of daily checks of the Route Control Log. Where the incident involves a vehicle being struck or results in an accidental fatality involving a pedestrian, a full risk assessment shall be undertaken. For all other incidents, see NR/L3/XNG/308, a risk-based decision shall be taken as to whether a new risk assessment is required. A record of this decision shall be held on the level crossing file.

8 Level crossing renewals, upgrades and wider enhancements

When a level crossing is due for renewal the conclusions and recommendations of the NRA shall be used to determine the appropriate level crossing type and protection required.

Where an enhancement whether to road or rail is being considered the NRA shall continue to be the sole assessment for the level crossing and options held within it will be progressed through the wider enhancement scheme where reasonably practicable.

Where an enhancement whether to road or rail changes the proposed option, the NRA shall be updated accordingly.

This includes the use of cost benefit analysis.

The reviewed/bolstered NRA shall be then be taken to the Route Steering Group [see section 7.2] to seek acceptance of any revisions to conclusions and recommendations.

9 Third party changes

Changes in land use, including planning applications, shall be evaluated to determine if they have an adverse effect on the safety, performance and operation of level crossings.

Responses to planning applications shall be given in accordance with the required timescales.

NOTE: *refer to section 7.3 regarding risk modelling and risk assessment requirements*

10 Pursuing closure and/or reduction in status

When the opportunity arises, and there is a viable business case, the relevant Liability Negotiations Manager shall pursue closure or reduction in status of all types of level crossings. The Head of Liability Negotiation shall be accountable to instruct solicitors for the legal release of private rights.

11 Stakeholder engagement

11.1 Operations

Operations shall work collaboratively with Level Crossing Managers as part of assessing the safety of level crossings (as appropriate).

Narrative risk assessments shall include content relating to:

1. Signaller workload and the risks of human error;
2. Signal box ergonomics, incorporating displays and long signal sections;
3. Cross-referenced checks with occurrence books;
4. Notes on voice communication checks undertaken with or by the Local Operations Manager (or nominated deputy);
5. Notes on operational irregularities relating to the level crossing.

NOTE: *further details are contained within Appendix B, section 4.2*

11.2 Authorised users

The NRA process shall confirm the authorised user database is up to date.

Level crossing managers shall make use of suitable opportunities to verify that authorised user details remain correct, and where changes are identified, they shall update the liability negotiations teams with this information.

NOTE: *suitable opportunities includes, as part of asset inspection, during the risk assessment, or when undertaking calls, correspondence or site visits not related to the risk assessment*

Liability negotiations teams shall verify details through land registry checks as appropriate.

Authorised users of each user worked crossing shall be written to as part of each risk assessment.

The letter shall be used to:

1. Invite them to participate in the risk assessment;
2. Remind them of the safe crossing protocols that they need to follow;
3. Remind them of their legal obligations to brief invitees, employees and tenants on safe crossing protocols;
4. Request information about their use of the crossing, patterns of use and the vehicle types used;

5. Request an understanding of any changes in land use, tenancy details and other matters relating to safe operation; and
6. Ask if they are willing to consider closure of the crossing or lock it when not in use.

11.3 Others

Stakeholder engagement is integral to the risk assessment of level crossings.

So far as is reasonably practicable, Level Crossing Managers shall work collaboratively with internal and external stakeholders to manage the safety of level crossings. Those internal to Network Rail shall provide the necessary support as part of this process.

Intelligence received and other discussions that help inform risk-based decisions shall be recorded within the narrative risk assessment.

12 Level crossing orders

Level crossing orders for public road level crossings shall be maintained in compliance with the Level Crossing Act 1983 and the Level Crossing Regulations 1997.

Level crossing orders shall be required when:

1. amending the arrangements at a level crossing already subject to an order;
2. changing the level of control at a public road level crossing that does not have a current order;
3. requested to submit an order by the Secretary of State.

***NOTE 1**: General Counsel provides legal guidance to those preparing orders*

13 Level crossing files

A file shall be maintained for each level crossing in accordance with NR/L3/XNG/309.

It shall contain as minimum:

1. Level crossing order, if applicable
2. Ground plan, if applicable;
3. Narrative risk assessment (current and historical);
4. Correspondence regarding risk reduction and other works;
5. General correspondence’

Level crossing files shall be maintained for the lifetime of a level crossing and for 7 years thereafter.

Ref:	NR/L2/XNG/001
Issue:	3
Date:	05 December 2020
Compliance date:	06 March 2021

Appendix A - Minimum combinations of control measures for renewals, upgrades and new level crossings

The requirements in the table in this appendix shall be followed where risk assessment has identified improvements in protection arrangements are required so far as is reasonably practicable.

	Controlled by:	Monitored by:	Type of barrier required	Fixed signs required?	Phone to signaller required for user?	Active visible warning required?	Active audible warning required?	Limit on train speed	Additional requirements	Current crossing type meeting these requirements
A	Railway passenger at a station to gain access to a platform (pedestrian only)	Not monitored	None	Yes	No	Sometimes - see additional requirements	Sometimes – see additional requirements	Not to be provided where permissible train speed > 100 mph	An active visible warning is required where direct observation of trains does not give sufficient warning time e.g., white light indicators. Audible warning of the approach of a second train shall be considered where the level of risk justifies it.	Station footpath crossing
B	Railway staff supervised at a station to gain access to a platform (pedestrian only, or with barrows and trolleys)	Not monitored	None	Yes	Sometimes - see additional requirements	Sometimes - see additional requirements	No	Not to be provided where permissible train speed > 100 mph	**Either** an active visible warning (e.g., white light indicators) or a phone to signaller is required where direct observation of trains does not give sufficient warning time	Barrow crossing

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	Controlled by:	Monitored by:	Type of barrier required	Fixed signs required?	Phone to signaller required for user?	Active visible warning required?	Active audible warning required?	Limit on train speed	Additional requirements	Current crossing type meeting these requirements
C	User (pedestrian only)	Not monitored	Gate or stile	Yes	No	Sometimes - see additional requirements	Sometimes - see additional requirements	Not to be provided where permissible train speed > 125 mph	Active visible and audible warnings are required where direct observation of trains does not give sufficient warning time or where permissible train speed > 100 mph.	Footpath crossing
D	User (including vehicle driver, horse rider, cyclist, person moving farm animals on the hoof and pedestrian)	Not monitored	Gate or lifting full barrier	Yes	Sometimes - see additional requirements	Sometimes - see additional requirements	Sometimes - see additional requirements	Not to be provided where permissible train speed > 125 mph	**Either** a phone to signaller **or** an active visible warning is required where direct observation of trains does not give sufficient warning time or permissible train speed > 100 mph. An active audible warning is also required where an active visible warning is provided at a crossing over which there is a public right of way. Not to be provided on public roads.	Bridleway crossing. User worked crossing.
E	User (including vehicle driver, horse rider, cyclist, and pedestrian)	Not monitored	None	Yes	No	No	No	The speed of trains over the crossing should not exceed 10 mph	There should not be more than one line over the crossing. Only to be provided in depots or on sidings. The maximum daily traffic moment not normally to exceed 2000 or the peak hour traffic moment 30 or the maximum actual daily road vehicle user 200. The 85%ile road speed at the crossing to be less than 35 mph.	OC (Open Crossing)

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	Controlled by:	Monitored by:	Type of barrier required	Fixed signs required?	Phone to signaller required for user?	Active visible warning required?	Active audible warning required?	Limit on train speed	Additional requirements	Current crossing type meeting these requirements
F	Automatic control system	Train driver	None	Yes	Yes	Yes	Yes	Speed of trains to be limited so that drivers can stop short of the crossing from the point at which the crossing comes fully into view. The crossing speed shall not exceed 55 mph	Only to be provided in a depot/siding and not to be provided where there is more than two running lines.	AOCL (Automatic Open Crossing, locally monitored)
G	Automatic control system	Train driver	Lifting half barrier	Yes	Yes	Yes	Yes	Speed of trains to be limited so that drivers can stop short of the crossing from the point at which the crossing comes fully into view. The crossing speed shall not exceed 55 mph	Not to be provided where there are more than two running lines. Barriers are to close only the entrances to the crossing, leaving the exits clear.	ABCL (Automatic Barrier Crossing, locally monitored)

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	Controlled by:	Monitored by:	Type of barrier required	Fixed signs required?	Phone to signaller required for user?	Active visible warning required?	Active audible warning required?	Limit on train speed	Additional requirements	Current crossing type meeting these requirements
H	Automatic control system	Signaller	Lifting half barrier	Yes	Yes	Yes	Yes	Not to be provided where permissible speed > 100 mph	Not to be provided where there are more than two running lines. Not to be provided where grounding or blocking back of traffic is considered likely. Not to be renewed if adjacent to stations or near schools. Barriers are to close only the entrances to the crossing, leaving the exits clear.	AHBC (Automatic Half Barrier Crossing)
I	Automatic control system	Train driver	Lifting full barrier	Yes	Yes	Yes	Yes	Speed of trains to be limited so that drivers can stop short of the crossing from the point at which the crossing comes fully into view. The crossing speed shall not exceed 55 mph	Not to be provided where there are more than two running lines.	AFBCL (Automatic Full Barrier Crossing, locally monitored)

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	Controlled by:	Monitored by:	Type of barrier required	Fixed signs required?	Phone to signaller required for user?	Active visible warning required?	Active audible warning required?	Limit on train speed	Additional requirements	Current crossing type meeting these requirements
J	Train crew, locally	Train crew (integral with working of crossing)	Gate or lifting full barrier	Yes	No	Sometimes - see additional requirements	Sometimes - see additional requirements	Not applicable - train comes to a halt at the crossing	Active visible and audible warnings are required, except where existing crossings are fitted with gates and road usage is minimal.	Train crew operated gated crossing. Train crew operated barrier crossing.
K	Signaller or crossing keeper, remotely (by CCTV)	Signaller or crossing keeper (integral with working of crossing)	Lifting full barrier	Yes	No	Yes	Yes	Not to be provided where permissible train speed > 125 mph		CCTV monitored barrier crossing.
L	Obstacle detection	LIDAR/RADAR	Lifting full barrier	Yes	No	Yes	Yes	Not to be provided where permissible train speed > 125 mph		Obstacle detection monitored barrier crossing.
M	Signaller or crossing keeper, locally	Signaller or crossing keeper (integral with working of crossing)	Gate or lifting full barrier	Yes	No	Sometimes - see additional requirements	Sometimes - see additional requirements	Not to be provided where permissible train speed > 125 mph	Active visible and audible warnings are required, except where existing crossings are fitted with gates and road usage is minimal.	Staffed gated crossing. Staffed barrier crossing.

Ref:	NR/L2/XNG/001
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Appendix B – Core requirements for a narrative risk assessment template

The details shown below set out the core elements that shall be included within relevant narrative risk assessments to confirm a robust assessment of safety is undertaken.

NOTE: *the elements below do not mandate an order in which information should be written*

Photographs should be used to support observations within narrative risk assessments wherever practicable.

1 Title page

Crossing name, date of risk assessment and a photograph of the level crossing.

The photograph should contextualise the crossing within its environment i.e. a crossing approach picture should be used.

2 Reason for risk assessment

A reason why the risk assessment has been undertaken should be identified within the NRA, for example as part of a scheduled risk assessment frequency, following an accident or a series of safety events, following local environment changes, or following infrastructure/operational changes.

3 Level crossing overview

3.1 Summary

The level crossing overview familiarises readers with the location, crossing type and ALCRM calculated risk.

Summary details includes:

1. Level crossing name
2. Level crossing type
3. ELR, miles and chains
4. Route and/or Region
5. Number of running lines
6. Maximum permissible line speed over the level crossing
7. Electrification and type
8. Supervising signal box / control centre
9. Road name and type or footpath number
10. OS grid reference.
11. Postcode
12. Local / highway authority
13. Title & date of the level crossing order (if applicable)

14. Level crossing layout plan – number, version and date (if applicable)
15. ALCRM calculations – total FWI, risk per traverse letter and collective risk number

Orientation of the crossing or the railway as appropriate

3.2 Description of the crossing and its environment

A satellite image and map provides a visual representation of the topography of the crossing, including nearby roads and the crossing approaches

NOTE: *a minimum 1:25,000 scale should be used*

Extract from the sectional appendix contextualises the railway environment

Asset description including a summary of the protection provided and/or layout characteristics such as guide fencing

3.3 The geographical nature of the area

Describe the surrounding area and land use.

1. Rural, urban or coastal location
2. Residential, industrial, town or village environment
3. Local properties, businesses and amenities that could affect safety of the crossing, for example shops, supermarkets, schools, sheltered housing, rail/bus station, religious centres, cinemas, pubs, seasonal events

NOTE*: local amenities or attractions that can affect the level crossing might not always be adjacent to it*

4. Highways information, for example the route over the crossing might be classified as a designated diversionary route, it might be subject to flooding and might have specific gritting arrangements in place
5. Notable changes in land use and/or changes in authorised users
6. Whether it is a heritage, conservation or SSSI area
7. Whether adverse weather is known to occur such as fog and sea mist
8. If the crossing is on a flood plain

3.4 Approaches

Name, classification and road number as appropriate:

1. Whether roads and footpaths are public or private and if bridleway rights exist;
2. Highway layout including the number of lanes, reference to junctions and side roads, whether a pavement is provided, surface characteristics which might cause reflections or poor adhesion for vehicles and whether tactile paving is present;
3. Impact of any gradients, this includes both approaches and the area within the confines of the crossing which might result in risk of grounding;

NOTE 1: *Nairn's risk assessments should support this*

4. Legal speed limit on the approaches and over the level crossing, qualitative notes on compliance to the speed limits;
5. Whether the crossing is on a skew and if it causes a safety risk for users;

NOTE 2*: see guidance documents, LCG06 Deviating from the marked carriageway and LCG19 Skewed crossings, assessing the effects on pedestrian users.*

6. If sun glare is a known risk when viewing the crossing equipment or approaching trains;

NOTE 3: *also see guidance document, LCG13 Risk assessing for sun glare at public road level crossings.*

7. Condition of the approaches such as vegetation that could obscure signs or road traffic signals;
8. Distraction risks such as parked cars, low flying aircraft, ambient noise;

NOTE 4: *include notes on audibility of train horns especially where whistle boards are fitted.*

9. Lighting in the vicinity of the crossing that might result in glare or necessitate eyes to adjust, including going from light approaches to a darker crossing environment.

4 Rail operations

Rail operations and Signaller interface is a key component of the risk assessment.

4.1 Rail approach and usage

Train count for passenger and freight. For station level crossings, and those in close proximity to stations, include the mix of stopping and non-stopping services

Details relating to line speed(s):

1. Speed over the crossing;
2. Permissible speed changes on the approach to the crossing, including speed differentials for different classifications of trains;
3. Attainable speeds/variations in speed due to junctions, stations, including the impact of stopping and non-stopping services
4. Likelihood of trains passing on the crossing and whether there a risk to sighting from trains passing each other in the vicinity of the crossing

Operational risks such as:

1. Trains that may stop on the crossing or on the approach to the crossing due to location of signals for train regulation purposes, stabling of rolling stock, looping of freight trains etc. This can have an impact on access and sighting
2. Shunting movements that may impact on sighting or crossing activation
3. Bi-directional train movements that may also impact on sighting or crossing activation

Whether the railway line over the crossing is on a potential diversionary route

Details of the risk of overrun at protecting signals as detailed within NR/L2/SIG/14201 Signalling Risk Assessment Handbook (where applicable)

***NOTE:** details of NR/L2/SIG/14201 assessments will be available from the Route Operations Risk Control Coordinator who can also help interpret the results and advise on any mitigation needed*

4.2 Signaller interface

It is important to evaluate the interface with Signallers within the narrative risk assessment. Areas of focus should include:

1. Signaller workload, incorporating risk of human error, workload issues, repetition of tasks, number of crossings the Signaller has to interface with, signal box special instructions relating to level crossings, local methods of working when granting permission to cross or application of stopping/non-stopping controls, considering long signal sections – include reference to WARA and other assessments if known
2. Signal box ergonomics, incorporating long signal sections risks, reference to crossings recorded on diagrams/panels/VDUs, crossings ordered chronologically on diagrams/panels/VDUs and telephone concentrators, CCTV monitor blind spots/bleaching (B&W or colour) – include reference to ergonomic risk assessments if known
3. Cross-reference checks with occurrence books to gain intelligence on use, patterns of use and time requested, and given, to cross
4. Notes on voice communication checks with LOM
5. Notes on operational irregularities, e.g. trapping of pedestrians and vehicles, permission to cross with a train in section, failure to caution, incidents involving hand signallers and/or during engineering work (including un-signalled movements)

4.3 Train operator interface

Notes on:

1. Intelligence of incidents, local practices observed, and other risks and hazards identified by train crew including sighting of the crossing, interface with whistle boards and multi-tasking/distraction risks
2. Details of any cab rides undertaken, and sighting observations made

5 Level crossing design, operation and condition

Asset condition, design, performance and future plans inform risk-based decision-making.

Include information on:

1. Renewal date from SICA report (if applicable)

2. Derogations to current standards e.g. equipment type, layout, operational compliance.
3. Faults and failures including trends and impact on performance:
    - Asset inspection
    - SICA report
    - FMS
    - DST
4. Warning times of level crossing equipment incorporating design and onsite observations
5. Impact of crossing closure on society, user convenience and willingness to wait:
    - Barrier down time within the hour – peak time and average throughout the day
    - Train arrival times and compliance to relevant standards

NOTE: *proximity to stations, train frequency and likelihood of trains passing will influence this*

6. Notes on additional mitigation such as red standing man, red light safety cameras, barrier protection, surveillance cameras
7. Notes from any discussions with the RAM team relating to future plans for the crossing, including incorporation within re-signalling projects if known

6 Census

6.1 General

User census incorporating frequencies, patterns of use and user demographics (including vehicle types) is a critical element of the risk assessment process.

NOTE: *guidance on census can be found in level crossing guidance document LCG02 Census good practice.*

Reference should be made to type of census, date and duration and other intelligence such as engagement with authorised users, operations, local residents and businesses etc.

The following information should also be supplied:

1. The weather conditions at the time
2. General observations relating to user behaviour, deliberate misuse, user error or unusual occurrences, user distractions, ambient noise, parked cars, road traffic diversions, road works etc.
3. Commentary on peak and off-peak census, including patterns of use (where known)

Where seasonal variation is identified, a second census should also be referred to within the narrative risk assessment and detailed in the same way.

6.2 Road traffic census

A vehicular census should include information on:

1. Number of cars
2. Number of light goods vehicles
3. Number of motorcycles
4. Number of heavy goods vehicles
5. Number of agricultural vehicles (tractors and vehicles with trailers)
6. Number of buses
7. Number of pedal cyclists
8. Number of equestrians
9. Occurrences of herded animals

Include a narrative of any occurrences of large and slow-moving vehicles, including those with abnormal loads (if applicable)

Include narrative on average speeds – are they in keeping with environment, speed limits

Also include information on blocking back (if applicable)

NOTE: *blocking back information should consider the impact on safety and also crossing operation and performance*

6.3 Pedestrian Census

A pedestrian census should include information on:

1. Number of adult pedestrians
2. Number of accompanied children
3. Number of unaccompanied children
4. Number of cyclists
5. Number of equestrians
6. Number and types of vulnerable and encumbered users, which might include:
    - the elderly;
    - mobility impaired or in mobility scooters/wheelchairs;
    - dog walkers (dogs both on, and off the lead);
    - pedestrians wearing head covering clothing (i.e. hoodies);
    - pedestrians using a mobile device or wearing headphones;
    - pedestrians riding or pushing a cycle (behavioural);
    - pedestrians carrying heavy bags or equipment affecting ability to cross safely

NOTE: *guidance on vulnerable users can be found in level crossing guidance document LCG02 Census good practice.*

7 Sighting and traverse time requirements

Sighting and traverse requirements inform us as to whether we are meeting legal compliance, in addition to determining if further risk controls are required.

Should include:

1. Description of decision points and actual distance (metres) from the nearest running rail
2. Distance from decision point to 2m clear of the furthest running rail
3. Whether decking is provided, if it is skewed, type and provision of non-slip surface
4. Traverse time (seconds) for pedestrians and vehicles (as detailed in LCG01), accounting for:
    - Vulnerable users
    - Slowest vehicles type
5. Minimum sighting requirements taking account of:
    - highest line speeds,
    - temporary or emergency speed restrictions
    - attainable speeds (where this can be justified and is recorded within the NRA)
6. Actual sighting distances available
7. Include impact of signalled bi-directional movements

8 Impact of sun glare

The risk of sun glare should be noted for both passive and protected crossings.

Depending on the crossing type, notes should refer to either the orientation of the crossing or the orientation of the railway and highlight the risks of sun obscuring crossing equipment or approaching trains respectively.

For level crossings on public roads, where LCG13 - Risk assessing for sun glare at public road level crossings, has identified level crossings shown within Annex D, the risk assessment form in Annex C shall be completed and appended to the NRA.

This process shall also be applied to public road level crossings where sun glare risk is identified as a concern and that do not already feature in Annex D.

9 Incident history

Provide details of safety events at the level crossing that are relevant to the risk assessment. This should include:

1. Accidental fatalities
2. Deliberate acts (suicides/attempted suicides)
3. Collisions

4. Near misses
5. Road vehicle violations including collisions with equipment
6. Other user errors or deliberate acts including gates left open or incorrect methods of crossing operation etc.

In addition to summary details and volume of events, also include:

1. Where the data has been obtained from, e.g. SMIS, DST, RLSE, MSVs, Signaller misuse reporting tool, including third-party advice/stakeholder engagement
2. A narrative relating to the frequency of incidents, incorporating whether there are regular types of events, patterns of events or other trends identified

10 Risks and hazards

Identified risks and hazards, including precursor events are critical to the risk assessment and deciding if risk is tolerable or intolerable.

Refer to ALCRM calculations, key risk drivers and assessors structured expert judgement within the narrative.

10.1 Vehicular risks

List the vehicular risks, the list provided is not exhaustive:

1. Weaving around lowered barriers
2. Red light violations
3. Risk of grounding
4. Sunlight issues including sun glare, bleaching out of crossing equipment, reflections from the road surface following rain
5. Late braking exacerbated by fast straight roads and/or steep gradients
6. Blocking-back or other issues caused by nearby road junctions
7. High and frequent vehicle moment, high proportion of HGVs, those which are large and slow moving or carrying hazardous goods
8. Insufficient carriageway width for large vehicles to pass easily on the crossing
9. Overhead line equipment which might impact high-sided vehicles
10. Ice, mud, flooded or pot-holed roads which effect traction and ability to stop

Risks associated with crossing design incorporating levels of protection, audible, visual warnings, signage, positioning of equipment and layout

Parallel roads that are in close proximity to the crossing and which might exacerbate the risk of vehicles turning onto the railway in error

Conspicuity of crossing equipment taking account of road approaches, road speeds and risks of distraction

Provision or absence of street lighting which may introduce human factor risks when transitioning from light approaches to a darkened level or crossing or vice versa i.e. sensitivities associated with eyes

UWCTs which are in long signal sections

Decision points and visibility of approaching trains from within seating positions of vehicles likely to use the level crossing, taking account of height and length of vehicles which might also foul gauge

10.2 Pedestrian, cyclists and horse riders' risks

List the risks, the list provided is not exhaustive:

1. Sighting compliance and calculated crossing times
2. Audibility and suitability of whistle boards (where provided)
3. Regular bouts of adverse weather conditions which might affect sighting of approaching trains, e.g. fog and sea mist
4. Risk of sun glare, bleaching of MSLs or masking approaching trains
5. Sighting obscuration issues
6. Risks of another train coming including sighting obscuration risks, e.g., hidden trains.
7. Variances in approach speeds due to stopping and non-stopping services, line speed differentials and variances due to junctions, speed restrictions etc.
8. Vulnerable users and associated risks to them
9. Frequency of use and reasons for use, e.g. high-volume, community link, provides access to leisure attraction such as a beach or caravan park, station proximity etc.
10. Access issues (where identified), taking all demographics into account including those on mobility scooters or in wheelchairs, mobility impaired or encumbered e.g. with pushchairs
11. Crossing layout, ergonomic positioning of signs, telephone equipment, gates, chicane fencing etc and risks of poor designs
12. Signage information, optimal with key safety messages prioritised, duplicate information, poorly ordered, signage clutter etc.
13. Where technology is provided, if equipment is ergonomically and optimally positioned, accounting for all user groups including equestrians, if audible warnings are set at the appropriate volume etc.
14. Where technology is provided, if warning time is optimal for pedestrian users, considering the risks associated with willingness to wait
15. Suitability and width of crossing surface accounting for user demographic, including risks of skewed alignment, condition, construction type
16. Observed issues with decision points

17. Risks of distraction, including sources of ambient noise from adjacent buildings or low flying aircraft, locations where only one ticket machine is provided at station crossings, people crossing in groups or with animals etc.
18. Risks associated with darkness or transitioning from dark to light or light to dark environments, including slip, trips and falls, ability to read and follow instructional signage, ability to see approaching trains whilst eyes adjust etc.
19. Deliberate misuse intelligence, including trespass, loitering on or around the level crossing, climbing over lowered barriers or other equipment, deliberately running in front of trains etc.

11 Future developments

1. Record details about any planned future developments that could affect risk at the crossing; e.g. significant infrastructure changes, housing developments, superstores, schools etc. Details are to be provided of the applicable planning authority and the date contact was made. Refer to any correspondence or discussions held within Road Rail Partnership Groups or with authorised users regarding changes in land use. Also include details of any risk modelling undertaken.
2. Provide information regarding any potential line speed changes, service strengthening, planned changes to rolling stock and any associated risks. Include details of the source material; e.g. contact with the RAM, Network Rail planning team, scheme sponsor etc (as applicable).
3. Refer to long-term strategies and Include line of route information such as:
    - nearby level crossings that could be subject to change and which could affect the risk at the level crossing being assessed. Examples include closure of another level crossing which creates a diversion over the assessed crossing or the upgrade of a nearby AHB where the increased barrier down time might lead to an increase in road traffic over the assessed crossing;
    - any proposed upgrade to nearby lines which could lead to increased train paths, either permanently or as a diversionary route. This includes line speed enhancements, re-signalling schemes, electrification projects and the impact of any re-controls. Refer to any correspondence or discussions held and also include details of any risk modelling undertaken; and
    - include any analysis that has been undertaken on the social and economic costs of crossing upgrades through use of the AXIAT.

12. ALCRM output and option evaluation

The corporate CBA tool relating to level crossing safety shall be used to support decision making.

It is important to include both interim and long-term risk mitigation within narratives, risk modelling and CBA (as applicable).

Evidence should be provided summarising:

1. Interpretation of current risk levels;
2. Evidence of optioneering and safety benefits for evaluated risk mitigation;
3. Cost benefit analysis incorporating whole life cost of risk mitigation;
4. Qualitative judgement supporting recommended risk mitigation; and
5. Recommended options to improve safety or decisions supporting tolerable risk, i.e. risk is managed SFAIRP (as appropriate).

13. Conclusion and recommendations

1. Summary of the risk assessment, incorporating risks and hazards identified, reference to calculated risk (where the asset resides in terms of priority based on type, Route, national data), qualitative structured judgement, observations and stakeholder input
2. Proposed risk mitigation to improve safety and the decisions made by the Steering Group relating to acceptance or rejection of recommendations
3. Anticipated timescale for implementation of agreed recommendation(s) (if known)

Standard and control document briefing note

Ref: NR/L2/XNG/001	**Issue:** 3
Title: Provision and risk management of level crossings	
Publication date: 05 December 2020	**Compliance Date:** 06 March 2021
Standard/Control Document Owner: Head of Level Crossings Safety	
Technical lead/contact for briefings: Tim Clark, Level Crossing Safety Manager	**Tel:** 07799 336978

Purpose:

This procedure sets out the process requirements that enable Network Rail to manage the safety and convenience of its level crossings and fulfil its legal duties under health & safety legislation.

It provides a robust and consistent risk management and option selection process for new and existing level crossings and helps determine the over-arching safety requirements for them.

Scope:

This process shall be applied to both new and existing level crossings on Network Rail Managed Infrastructure.

This process does not apply to:

- authorised walking routes that cross the railway unless they are classified as a staff crossing with active warning equipment (such as white lights); and
- road rail access points or track access points.

Overview of change

NR/L2/OPS/100 has not been updated since June 2008 and does not reflect the implementation of the Level Crossing Manager organisation in 2013. This review will update the standard to reflect the business as usual working of the LCM organisation together with defining the minimum requirements for a Narrative LC Risk Assessment.

The reference number has been amended to reflect transfer of ownership to Head of Level Crossings Safety.

Detail of change

Section(s)/clause(s)	Summary of changes
Section 5	Updated to include principles overview and processes updated for new and existing level crossings
Section 6	Competence given its own section and bolstered to reflect current processes
Section 7	Risk assessment section updated to reflect current best practise and to mandate Route Steering Groups
New Section 8	LC renewals, upgrades mandated to use the Narrative Risk Assessment as the sole LCRA
New Section 9	To define processes with third party changes, planning applications etc
New Section 10	Making closure/reduction in status process clear
New Section 11	Stakeholder engagement section to encourage/promote collaboration with Operations. Crossing users etc
Appendix A	Updated and now includes AFBCL & MCBOD
New Appendix B	Setting out the core requirements for the narrative risk assessment and the inclusion of reference to NR/L2/SIG/14201 to include details of LX/SORAT in the NRA.

Reasons for change

The revised standard reflects the changes to level crossing risk management and the implementation of the LCM organisation in 2013. It also introduces the addition of the Narrative Risk Assessment process and defines the minimum requirements for version 2 of that process. Recommendations closed out:.RAIB Moreton-on-Lugg Rec.2, F.I.,Hockham Road A9.1, F.I.,Routs A9.5.

Affected documents:

Reference	*Impact*
NR/L2/OPS/100 ISSUE 2	Superseded

Briefing requirements:

Will Briefing Management System be used to deliver the briefing to posts listed below? No

Technical briefings are given to those who have specific responsibilities within this standard/control document.

Awareness briefings are given to those who might be affected by the content but have no specific responsibilities within the standard/control document.

Details of the briefing arrangements are included in the associated briefing programme.

All posts identified for briefing must be as described in OrgPlus.

Roles are directly briefed and do not cascade briefings.

Briefing *(A-Awareness/ T-Technical)*	Post	Function	Responsible for cascade briefing? Y/N
T	Route Level Crossing Manager	Regions	Y
T	Route Asset Manager [Signalling]	Regions	Y
T	Regional Head of Engineering [Signalling & Telecoms]	Regions	Y
T	Regional Engineer [Signalling & Telecoms]	Regions	Y
T	Principal Route Engineer [Signalling]	Regions	Y

T	Regional Asset Manager [Signalling]	Regions	Y
A	Health Safety & Environment Director, Southern	Regions	Y
A	Health Safety & Environment Director, Wales & Western	Regions	Y
A	Health Safety & Environment Director, North West & Central	Regions	Y
A	Health Safety & Environment Director, Scotland	Regions	Y
A	Head of Health, Safety & Environment [Anglia]	Regions	Y
A	Head of Health, Safety & Environment [East Midlands]	Regions	Y
A	Head of Health, Safety & Environment [East Coast]	Regions	Y
A	Head of Health, Safety & Environment [North East]	Regions	Y
A	Section Manager [Off Track]	Regions	Y
A	Director Engineering & Asset Management, Eastern	Regions	Y
A	Director Engineering & Asset Management, NW&C	Regions	Y
A	Director Engineering & Asset Management, Scotland	Regions	Y
A	Director Engineering & Asset Management, Southern	Regions	Y
A	Director Engineering & Asset Management, Wales & Western	Regions	Y
A	Head of Maintenance Delivery	Regions	Y
A	Infrastructure Director	Regions	Y
A	Local Operations Manager	Regions	Y

Briefing *(A-Awareness/ T-Technical)*	**Role**	**Function**
T	Programme Manager [LXPMO, York]	Capital Delivery

NOTE: *Contractors are responsible for arranging and undertaking their own Technical and Awareness Briefings in accordance with their own processes and procedures.*

CENSUS GOOD PRACTICE

KNOW YOUR CROSSING, ITS USERS AND ITS ENVIRONMENT

CONTENTS

National Level Crossing Team

If we can't close a level crossing, let's make it safer.

1 Purpose

This document provides guidance in the undertaking of census data collection as part of the risk assessment of level crossing safety.

2 Scope

It is intended for Level Crossing Managers and any other competent person responsible for the safe management and risk assessment of level crossings. It may also be used by other Network Rail personnel undertaking census data collection in support of level crossing risk assessments.

It should be applied to all risk assessments of level crossings and used to support decision making regarding the best means to obtain accurate census data, so far as is reasonably practicable.

3 The importance of accurate census

Census is one of the underpinning elements of a level crossing risk assessment. It is one of the most important influences on the level of risk. Therefore it is vital that a robust census is undertaken to achieve a meaningful and accurate risk assessment.

In general, the window of opportunity for an accident at a level crossing increases with a high level of crossing usage and a high number of train movements. Therefore, the number of level crossing users and the equivalent train moment, or trains per day, is a key influence of risk.

Census is also a key input of the All Level Crossing Risk Model [ALCRM] and forms a critical component in the calculated levels of risk. Underestimating or overestimating census can have a varying effect on the modelled output, which could influence decisions taken by the assessor or the business to manage safety. For example, crossings with a high individual risk and a low collective risk can be sensitive to changes in census data. In this circumstance, ALCRM might evaluate a crossing with weak census data to represent a slightly lower risk than that of the true risk profile. This could result in a lack of intelligence about the level of risk at an asset, leading to inaccuracies in strategic planning to manage safety.

In addition to the volume of use, it is also vital to understand the user demographic; i.e. the types of users who make up the census number, so as to identify hazards which may be prevalent to one or more user segments and to better target risk mitigation in these areas. Accurate census will therefore help us to better identify, and encapsulate within risk assessments, the types and vulnerabilities of users of our assets.

4 Census types, selection criteria and enhancing census accuracy

4.1 General

In general it may be considered that the greater the duration of census data collection activity, the greater the opportunity to improve the accuracy of the census.

This is an especially pertinent point in relation to determining pedestrian usage and in the undertaking of all census at footpath, bridleway and private user worked crossings.

In some cases due to seasonal fluctuations or peaks and troughs in use, it might be necessary to undertake more than one census data collection activity so as to broaden understanding regarding daily/annual usage. ALCRM can accommodate two censuses for this purpose.

In addition to physical on-site data collection techniques, an array of smart-sources of intelligence should also be used to support understanding; see 8. In determining robust knowledge of crossing usage, it might be necessary to use multiple combinations of on-site activities and other research based intelligence to accrue the complete picture.

4.2 Types of census and the preferred approach

Non-estimated census

The quick census is the least favoured of the non-estimate types due to its limited capacity to accurately reflect usage levels or identify all segments of users. A quick census can be susceptible to the time and date of the visit, omitting or overly including, peaks, troughs, seasonal activity and omitting weekend, evening and variances in use. It has, however, been independently endorsed as a broadly capable method for counting vehicles at public road crossings.

Where-ever possible, nine day census or greater (extended census) should be the census of choice for assessors. It offers strength in accuracy and endorses the company’s approach to continuous improvement by enhancing the accuracy of risk assessments and improving level crossing safety.

Estimated census

Estimated census should ideally be a last resort unless using forecast figures to determine the impact of a proposed housing development for example.

If it is to be used as the primary source, every effort should be made to determine usage levels using actual census data collection activity and prior to adopting it as the chosen census gathering technique. As with all census gathering activity, but especially so when using estimated structured judgement, all available intelligent sources should be used to aid decision making; see 5.7 and 8.

Table 1 details the types of census which can be used within the risk assessment process. It also highlights some of the benefits and dis-benefits associated with each census type.

Type	When to use	When not to use	Strengths and weaknesses	Census owner
Nine day or extended duration	**In all cases where a census is required**. Applicable to all asset types and all assessments from steady-state to project work where it is a prerequisite; e.g. re-signalling schemes and level crossing (LC) renewals. Serves to enhance understanding of LC usage and user behaviour, e.g. identifying night time usage, confirming vulnerable or irregular users, identifying peaks and troughs etc.		**Strengths:** High level of accuracy leading to improved modelling of risk in ALCRM and informed decision making for the assessor and the business. **Weaknesses:** Internal resources needed to deploy equipment and analyse footage. Availability of mobile or fixed camera technology within the Route. Cost to employ external supplier to undertake census. Availability of external supplier to meet business timescales/deadlines. ***TIP:*** *Camera equipment should be directed away from train movements to prevent spurious activations and to improve analysis time and resource.*	Level Crossing Manager or External Supplier
24 hours	To support understanding of LC usage and where time-constraints prevent use of nine day or extended duration census. *NOTE: At lesser used crossings a longer census will be more appropriate to identify consistent usage and afford greater accuracy*.	Not appropriate for understanding weekend, consistent night time usage or where there are known or suspected peaks and troughs in usage which are likely to extend beyond 24 hours.	**Strengths:** A better level of accuracy than a quick census and might otherwise improve the accuracy of the risk assessment. Could be undertaken as a physical count by Network Rail staff in the absence of technology, for expediency or to facilitate engagement with users. **Weaknesses:** Does not provide the same level of accuracy as a nine day census. Resource implications for Network Rail staff to deploy technology or undertake a physical count. Cost and availability of external supplier to meet business timescales/deadlines.	Level Crossing Manager, Operations Staff or External Supplier

<table>
<tr><th>Type</th><th colspan="2">When to use</th><th>When not to use</th><th>Strengths and weaknesses</th><th>Census owner</th></tr>
<tr><td>Quick
30 to 60 minutes, Mon to Fri between 9:30 - 16:30</td><td colspan="2">Weakest of all non-estimated census types. Primarily best suited for vehicle count at public roads.</td><td>Not appropriate where pedestrian usage is inconsistent throughout the day or unlikely to be witnessed during the census, but is known or suspected, or where vehicle use at private crossings is subject to variation.
Where an assessor is seeking to identify weekend use, night time usage or where there are known or suspected peaks and troughs in usage, including seasonal variations.</td><td>Strengths: Speed of data collection and assessor can observe and interact with users of the crossing.
Weaknesses: Less accurate than a nine day, extended census or a 24 hour census. Only provides a snapshot of use observed during the site visit. Provides poor understanding of crossing user demographic.</td><td>Level Crossing Manager</td></tr>
<tr><td rowspan="3">Estimate at passive crossings
including 24 hour usage</td><td rowspan="3">No crossing usage witnessed</td><td>Authorised user data available where:
a). Authorised user provides written daily usage information; or
b). Interview conducted with authorised user(s).</td><td>Not advisable if an authorised user is known or suspected to provide inaccurate information, e.g. over estimates usage due to fear of asset closure.</td><td>Strengths: Reasonable expectation of accuracy.
Weaknesses: Reliability of data provided by user. Behavioural patterns not observed.</td><td rowspan="3">Level Crossing Manager</td></tr>
<tr><td>Interview conducted with crossing user.</td><td>Not advisable if it is established or suspected that the user is unfamiliar with the crossing.</td><td>Strengths: Data potentially more accurate than relying on visual appearance of crossing.
Weaknesses: Individual’s opinion might not reflect accurate usage. User demographic might be misinformed.</td></tr>
<tr><td>Based on appearance of crossing.</td><td>Not advisable when trying to establish sleeping dog status, or where suspected or known high usage exists. Census needs to be supported with further evidence and is better suited to a nine day count.</td><td>Strengths: Allows use of structured expert judgement.
Weaknesses: Relies on structured expert judgement being accurate. Unsupported by factual information. Behavioural patterns not observed.</td></tr>
</table>

Type	When to use	When not to use	Strengths and weaknesses	Census owner
Estimate at protected crossings	For modelling the effect of changes in predicted traffic flows, e.g. impact of new developments on LC usage.	Not advisable where real time data is available.	**Strengths:** Allows forecast changes to be modelled in ALCRM enabling the impact to safety to be understood. This intelligence enables, for example, informed decision making in regard to planning application approvals or objections. **Weaknesses:** Relies on projected data to be accurate, as far as is reasonably practicable.	Level Crossing Manager

Table 1 Types of census

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4.3 Selecting an appropriate census type

Although a nine day or extended census offers the greater opportunity for accuracy and is therefore the preferred choice, as detailed in 4.2, there are many factors that might ultimately influence the type of census chosen by an assessor.

Decisions that influence census selection might include matters such as the availability of source material; such as mobile camera technology, the readiness of resources required to undertake the census or deploy equipment, the confidence in existing intelligence or the financial outlay if using third party suppliers or procuring technology. In addition there are other considerations which can vary between assets and which will influence the requirement. For example:

- Reason for census – e.g. the census is required to support a risk assessment at which intelligence is already rich and relatively current, to verify and quantify vulnerable usage or to support a re-signalling or renewal project.
- Peaks and troughs – where usage can vary significantly during the hours of the day and days of the week, a nine day census or longer is more likely to provide a much better picture of crossing use than a quick 30-60 minute census.
- Seasonal variations – where usage varies significantly at different times of the year, e.g. due to holiday periods, leisure attractions or agricultural use, a second census is advised as this will provide better quality data relating to annual usage.
- Weekend peaks – where high weekend usage is suspected e.g. crossing is on a route to a tourist attraction or is used as a leisure walkway, a nine day census or longer will offer a much better picture of crossing use than a quick mid-week or 24 hour census.
- Logistics, practicalities and costs – e.g. an extended census might be needed for a duration of between nine days to several months to substantiate usage or the crossing might be in a remote location.

To illustrate this further, the table below offers examples of how factors may shape decision making. The content of Table 2 is not exhaustive.

Factor	**Requirement**	**Census suitability**
Uncertainty over night-time quiet period usage	Need to establish the level of use during the hours when whistle board protection is removed.	Quick census is unsuitable for this purpose as it will not offer a consistent picture or pattern. A nine day census or extended census is needed. Deployment of mobile camera technology or third party supplier required.
School in close proximity to level crossing	Need to better understand behavioural patterns and the volume of crossing usage by vulnerable users. *NOTE: Whilst it is essential to understand the effect the school has on crossing usage, it is also important that a quick census does not focus solely on school arrival and departure times or during a lull in activity during the day.*	A nine day census or extended census offers to the best opportunity to identify trending patterns of use. Deployment of mobile camera technology or third party supplier required. A 24 hour census is better suited for this purpose than a quick census, but is not as robust as a nine day or extended census.
24 hour operational business resides in close proximity to level crossing	Need to understand the impact that shift change or deliveries might have on level crossing safety, e.g. night time quiet period, darkness risk and peaks in usage.	Quick census is unsuitable for this purpose as it will not offer a consistent picture or pattern. A nine day census or extended census offers to the best opportunity to identify trending patterns of use. Deployment of mobile camera technology or third party supplier required. *NOTE: Speaking to local businesses for information on working hours can enhance understanding of business impact on level crossing safety.*

Table 2 Additional census selection factors

5 Good practice regarding census data collection activity

5.1 General

This section contains good practice guidance for assessors when undertaking quick or 24 hour census in-house, in addition it details items to consider when actively recruiting an external supplier to undertake a 24 hour, nine day or extended census.

Section 5 also features guidance on vulnerable users.

5.2 Quick and 24 hour 'manual count' census undertaken by Network Rail staff

If a nine day or extended census cannot be undertaken, it is important that assessors are confident that either a 24 hour or quick census is appropriate to reflect reasoned accuracy for the asset being assessed. Census selection is discussed in 4.

Preparation	**Quick & 24 hour census** ✓ Always review previous censuses to re-familiarise yourself with the user demographic recorded and take cognisance of observations relating to vulnerable users, irregular users, peaks, troughs and seasonal fluctuation. ✓ Also use this information to determine the appropriateness of using a 24 hour or quick census. **Quick census** ✓ Previous census might also offer intelligence to inform decision making when deciding on the best time of day or day of the week to undertake census data collection activity. ✓ Make sure that you source equipment, tools and other items in a timely manner. Such items might include: downloading of electronic forms, iPad (charged), paper collection forms (contingency), pens, compass, range finder, measuring wheel, camera (charged/memory card with capacity) and appropriate clothing aside of corporate PPE; e.g. taking forecast weather conditions into account, the crossing location and the need for personal comfort. ✓ Prepare and obtain necessary SSOWPs to assure your site safety during the visit. **24 hour census** ✓ Agreement with relevant operations staff will be needed if a 24 hour 'manual count' census is considered appropriate. Consideration will need to be given to staff welfare; the ability for this method to provide a robust count and take cognisance of resource implications, so as to justify why this approach is better suited than deploying technology or employing outside parties. ✓ If a 24 hour 'manual count' census is considered appropriate, a template for this purpose should be provided to staff undertaking the task.

On site behaviour	**Site safety and staff welfare is the first priority** ✓ Take the census from a position of safety where the crossing is fully visible. ✓ Do not obstruct user access or distract users during the traverse/within the confines of the crossing. ✓ Park road vehicles appropriately, e.g. do not obstruct signage, crossing equipment or impair safe use of the crossing. ✓ Do not stand where you might obstruct crossing signage or equipment. ✓ If engaging with users to determine a broader understanding of the risk profile: – be approachable, professional and prepared to listen; – be cognisant of the environment and the positions of safety; and – only engage in conversation when it is safe and appropriate to do so
Data collection	✓ Note the start time, date and duration of the activity. ✓ Take cognisance of the type of crossing you are at and the level of concentration that is needed to conduct an accurate census, e.g. are you at a public highway crossing with high traffic moment or are you at a rural passive crossing that is lightly used? ✓ Observe usage: – is it in keeping with the calculated traverse time? – are users operating the crossing safely? – are there a high number of vulnerable and irregular users and how does this translate into applying the 50% safeguard? ✓ It is always useful to engage with users to obtain census information. It might lead to intelligence on risks and hazards that you might be unsighted to. It is often good practice to ask them about user demographics, if they have observed deliberate misuse or safety events and if they have any issues of concern with the asset, e.g. slippery surface, confusion with instructions on safe crossing protocol etc. ✓ Be aware of extreme weather conditions; this might influence the level of use witnessed during the census gathering activity. This can be particularly relevant at footpath or bridleway crossings. For example, very bad weather (gale-force winds, sleet, snow and very cold conditions) might lead to a reduction in the number of crossing users seen and conversely very good weather (heatwave) might result in slightly more users being out-and-about. Whilst both extremes are valid user moment experiences, in terms of quick census they could distort accuracy levels if significant. It is important therefore to consider if the weather conditions might have distorted the accuracy of the census. If appropriate, evaluate the need to revisit the crossing at another time.

Table 3 Quick and 24 hour ‘manual count’ census data gathering

5.3 Identifying vulnerable users

5.3.1 Vulnerable user definition

Vulnerable level crossing users can be defined as people who, when compared with typical users:

- are likely to take an extended time to traverse due to disability or distraction; and/or
- might be at greater risk of harm due to their perception of risk.

5.3.2 Defining vulnerability

There are a number of factors that can result in people being at greater risk when using level crossings. These can include but are not limited to:

- Limitations in mobility (take into account not only the ability to walk, but also the ability to turn their bodies or heads and look for oncoming trains)
- Visual or hearing impairment
- Cognitive ability, e.g. making safety related decisions (very young and elderly people are more likely to make poor decisions on the distance and speed of large moving objects such as trains)
- Being encumbered, e.g. crossing with bags, pushchairs, cycles or dogs (consider if dogs are on or off a lead (including the use of extendable versions), and if owners are in charge of more than one dog; it becomes increasingly harder to control multiple animals)
- Inability to comprehend English, i.e. to read signage and / or speak to Signallers

5.3.3 Types of vulnerable users

Vulnerable users can include, but are not limited to:

- People with physical and/or mental disabilities or other impairments; incl. those using mobility scooters
- Young children; unaccompanied or in groups
- Elderly people
- Dog walkers
- Cyclists, e.g. where known not to dismount and considered ‘at risk’
- People carrying heavy bags or large objects, with pushchairs etc.
- Non-English language speakers, e.g. migrant workers

5.3.4 Identifying vulnerable users by location

The likelihood of a level crossing being used by vulnerable users can be influenced by its proximity to:

- Sheltered housing or care homes; residential and nursing
- Schools
- Stations
- Residential thoroughfares
- Busy high streets
- Parks, play areas, known walking areas
- Fixed local attractions, e.g. beaches, caravan sites

5.3.5 Means of identifying vulnerable users

Crossings that might have vulnerable users can be identified by:

- Observation; census
- Research into the crossing environment using intelligent sources of information
- Interviewing users in nearby businesses, residential dwellings etc.
- Near miss or other reporting of precursor events

Other influencing factors can include:

- Location and/or crossing type, e.g. field to field crossings with stiles are less likely to have a high proportion of vulnerable users than a gated footpath crossing in an urban area
- Condition of the asset which might influence user traverse speed further, e.g. skewed crossing, stepped approaches etc.

5.3.6 Higher than average

5.3.6.1 What is higher than average?

NOTE: The below illustrative example does not offer a ratio of application, nor does it take precedence over structured expert judgement where for example, an assessor considers it an essential requirement to protect a minority user group or single person.

If there is ambiguity or uncertainty then, additional research and/or extended census might be necessary to inform decision making.

Deciding on whether higher than average vulnerable usage is prevalent should always be based on structured expert judgement and assessor’s acquired knowledge. Decisions should be supported by all available evidence gathered as part of the risk assessment; taking cognisance of physical on-site observation and intelligent sources of information. As an illustrative means only, it might be appropriate to consider, if for every five users:

- only one in five is made by a vulnerable user, the 50% safeguard might not typically be applied
- two in five is made by a vulnerable user, it is especially important that a risk based decision is made
- three to five are made by vulnerable users, the 50% safeguard would always be applied

The table below can be used to help decide which groups are considered vulnerable; however, it remains the LCMs final decision to add the 50% safeguard

	Vulnerabilities	When users are not normally considered vulnerable
Physical or mental disability	Users with known or suspected disabilities should always be considered as vulnerable; records should support this	N/A
Children	Easily distracted	Observed to be using the crossing correctly and safely as an individual user
	Subject to peer group pressures	Observed to be using the crossing correctly and safely as part of a group of users
	Low cognitive ability to interpret risk	Older children who may not be considered to be vulnerable users
	Observed to be unaware of or ignoring safe crossing protocols	Observed using the crossing correctly and safely whilst dismounted from a bicycle, scooter or similar
	Very young children most susceptible to all of the above vulnerabilities	
	Unaccompanied	
	Mounted or pushing a bicycle, scooter or similar	

	Vulnerabilities	When users are not normally considered vulnerable
Elderly *Judgement is needed as not all elderly people are slow or less able to use a crossing safely. The elderly are often in less of a hurry and can equally take greater time and care when crossing.*	Observed using walking aids or other obvious signs of mobility impairment	Observed to be using the crossing correctly and safely as an individual user
	Encumbered with shopping trolleys or large heavy bags	Observed to be using the crossing correctly and safely as part of a group of users
	Slower cognitive ability and/or reaction times	Observed to be compensating for sensory loss by checking carefully and moving as quickly as possible
	Using a mobility scooter; risks associated with negotiating decked surface (including width considerations) or getting stuck on the flange-way at skewed crossings	Persons who display physical fitness such as ramblers and leisure walkers
	Mounted or pushing a bicycle	
	Have become complacent and overly familiar with the train timetable and safe crossing protocol	
Dog walkers	Distracted due to: • dogs off leads • multiple dogs on leads • dogs on extendable leads	Observed to be using the crossing correctly and safely whilst keeping dogs on leads and under control
	Users who put themselves in danger to recover dogs off leads who are lineside	
	Type of access, stile/gate, and relative position of safety which may import risk to users who are unduly focusing on their dogs rather than making a safe crossing	
Cyclists	Failing to dismount and cycling across the crossing	Individuals observed dismounted and using the crossing correctly and safely
	Groups observed riding over the crossing together	Observed negotiating the crossing from a position of safety when manoeuvring their bicycle through the access and egress points
	Families on outings with small, young children on bicycles	
	Cyclists with trailers	
	Cycling event routes which attract and encourage crossing use by mounted riders	
	Type of access, stile/gate, and relative position of safety which may import risk to users who are unduly focusing on their bicycles	

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5.4 Pedestrian usage at public highway crossings

If undertaking a quick census at public highway crossings, in the absence of the availability of a nine day or extended traffic census, it is good practice to sense-check pedestrian count. Whilst vehicular traffic flow remains 'broadly' consistent, pedestrian moment can be much more volatile and subject to environmental influences. These same environmental factors will also dictate the 'typical' volume of pedestrian use of level crossings; generating peaks and troughs which could be missed by a quick census. For example, if an asset is located in close proximity to residential dwellings and/or community links such as shops or schools, the chances are that the pedestrian footfall is notable; i.e. you would expect to see pedestrian users. If a 30 minute quick census was undertaken mid-morning and resulted in very nominal numbers observed or no pedestrian users witnessed, this might not represent 'typical' pedestrian moment, but could be a rare lull in use. In addition, where users are witnessed, this might not represent the complete user demographic; schoolchildren, students etc. If uncertainty exists, a nine day or extended census might be needed. Utilisation of other intelligent sources, see 7, would be advisable and might also serve to substantiate concerns.

5.5 Nine day, extended or 24 hour census undertaken by external suppliers

There are companies that can be appointed to undertake 24 hour, nine day or extended census gathering activities. Research might be necessary to identify local companies with the capability to do this type of work or if appropriate and economical, national organisations might also be available for this purpose.

Funding for census data collection activity undertaken by external suppliers will need to be considered. Sources of funding for such work might incorporate use of the Route Safety Fund or additionally project funding, for example if census relates to a renewal or enhancement activity, might be available for this purpose.

It might also be necessary to undertake a formal tender process if the cost of work necessitates this. If in doubt, please confirm business protocol requirements.

Instructions to companies undertaking census data collection activities should include requirements for:

a) when the census is to be undertaken and its duration;

b) data to be recorded, e.g. types of users (vulnerability of users: persons encumbered, disabled, unaccompanied children, elderly, dog walkers, headphone wearing, texting etc…), vehicle types (HGV, tractors, buses, cars, vans etc…), and the date/time they are observed;

c) how the data is to be presented, e.g. hourly, daily, mean average per user type and/or hazardous event (e.g. children, elderly, texting, using mobile phone, hood up); and

d) when the data is required by

GRD007 Level Crossing Census Requirements contains further details on this.

5.6 Modelling of nine day or extended census activity

It is recommended that daily usage is recorded by respective user groups so as to enable an average to be taken per group for the census duration. In this way, the 24 hour entry in ALCRM represents the average daily moment per user group as opposed to overestimating or underestimating usage patterns by taking the highest or lowest daily figure witnessed during the census data collection activity.

5.7 Estimated census

As discussed in 4.1, estimated census is likely to be the least accurate of all census types and is the non-preferred approach. In all cases, actual census activity should be undertaken whenever practicable.

Where estimate census is used, it should only be applied to very lightly used crossings, such as field to field crossings in rural areas or private vehicular crossings with evidence of limited usage e.g. rusty padlock, overgrown approaches.

To estimate the usage of the crossing:

a) use information supplied by the authorised user(s) if applicable/available;

b) If applicable, interview the landowner or neighbouring landowners and ask how often the crossing is used, by whom and if applicable, by what type of vehicles. Ask whether or not there are particular periods which might generate use or greater use e.g. harvesting, holidays etc;

c) speak to owners of nearby dwellings or facilities that might use or witness use of the crossing;

d) look for evidence of use such as tracks or trodden paths, litter or other signs, analyse the extent of vegetation growth around the access points, take account of rust on padlocks (where fitted); and

e) utilise intelligent sources of information to help in the application of structured judgement; see 7.

6 Influencing factors affecting crossing usage

There are many factors that can influence usage patterns over level crossings. These factors might impact census flow daily, weekly, monthly or even annually.

It is important that such intense changes are evaluated when undertaking census gathering activity so as to avoid over or under inflating calculated risk. Where such usage patterns are identified, steps should be taken to provide a balanced census count. This might involve re-commissioning census or an extended census to better reflect accuracy and/or involve adding a second census in addition to the first so as to afford a more accurate representation of user moment.

Intelligent sources of information in addition to on-site observations can help assessors identify influencing factors; see 7.

The table below details a selection of factors that might influence user moment. The content is non-exhaustive.

	Asset Type		
Influencing factor	Public road	Footpath or bridleway	User worked crossing
Road network: full or partial closures, minor road works, diversionary routes in utilisation, road traffic accidents, road layout alterations under construction	✓		
Asset located near to attractions: funfairs, leisure retreats, historical or tourist matters of interest, beaches, race courses, motor racing circuits, theatres, concert halls, proximity to 'night-life' – e.g. clubs, bars, restaurants etc…	✓	✓	
Proximity of schools, hospitals, health clinics, community centres, shops etc…	✓	✓	
Proximity of businesses, types of businesses and hours of operation	✓	✓	
Type of private asset: field to field access for tending to crops or cattle, residential access, entrance to private facility or business use			✓
Harvest: types of crops, seasonal variance, hours of crop management			✓

Table 4 Influencing factors affecting user moment

NOTE: *For further information on census at private vehicle crossings, please also see guidance document LCG12 – Intensive use at UWCs.*

7 Using in-house technology to collect census information

In-house technology is widely used by assessors to help gather census intelligence. Available technologies adopted include use of mobile cameras, gate counters, pressure pads and SmartCam fixed equipment.

Camera equipment offers the best intelligence gathering capability as it can be used not only to count users, but to identify user demographics, including the presence of vulnerable users, and capture the behavioural attitude of users of level crossings. Naturally cameras are suited to 24 hour, nine day and extended censuses.

Gate counters and pressure pads, although suited to similar census conditions, have weaknesses which limit their successful deployment and effectiveness. The primary shortcomings with these census solutions is their inability to differentiate between user groups, provide capability for assessors to interrogate behaviour and the uncertainty of activation; e.g. a counter could be triggered by wind moving a gate or an animal standing on a pressure pad.

7.1 Use of fixed or mobile camera solutions

7.1.1 General and pre-planning activity

Deploying camera technology for nine days or more or using fixed equipment (where available) offers the greatest opportunity for accurate census.

It is important to pre-plan this activity well in advance so as to maximise the accuracy of the census gathering opportunity. You should take account of the date of the planned risk assessment and the duration of the census needed to provide a robust census, so that sufficient time is allocated to deploy camera technology. This applies where a single census is proposed to portray annual usage or where a second census is needed to support a more balanced annual picture.

When using camera equipment for the purpose of census gathering data collection, there are other important things to consider and procedures to follow. These are discussed below.

7.1.2 Knowing the law and complying with our legal obligations

Network Rail is subject to various acts of legislation and codes of practice. In particular, information security and data protection acts apply to the use of camera technology where it is used for the purpose of gathering census information at level crossings.

It is important that these instructions are adhered to so as to prevent legal or reputational risks to the company or individuals within the company. This includes regulatory or other operational threats and financial penalties which might ensue.

7.1.2.1 Notifying the general public/private land owners

Before camera equipment is switched on and during its operational use, it is essential that a conspicuous notice is provided on each side of the crossing informing users of its operational status and purpose.

The wording of notices shall be:

"A CCTV recording system is operated at this level crossing for the purposes of safety and the prevention of crime. The organisation responsible for the management of the system is Network Rail, which can be contacted on 03457 114141".

These legal notices demonstrate that Network Rail is complying with the requirements of the Data Protection Act 1998. Specifically we must demonstrate that we are conforming to the following principles:

- Personal data shall be processed fairly and lawfully – *Organisations must be transparent about how they intend to use the data and give individuals appropriate privacy notices when collecting their personal data.*
- Personal data shall be obtained only for one or more specified and lawful purposes – *Organisations must be clear from the outset about why they are collecting personal data and what they intend to do with it.*

7.1.2.2 Data security

Data security is an important aspect of our company compliance with legislation and codes of practice. It is important that camera equipment is secured against vandalism or theft, and where equipment is mobile, that all practical steps are taken to reduce the temptation or likelihood of such acts.

The essential requirements that must be undertaken when deploying any camera technology are:

- Placing the camera equipment in a security box which is securely located and padlocked; and/or
- Encrypting the SD card prior to use.

In addition, locating equipment which will reduce attention, conspicuity or the likelihood of tampering is strongly advised.

7.1.2.3 Data retention/storage

Census data cannot be held indefinitely without good reason. A reason for retention of footage or an image might be necessary because it highlights a risk or bad practice that can be used to promote awareness and educate others. Before images are shared, whether externally or internally, it is essential that they are redacted so as to preserve a user's identity. Retention shall be by exception and a record should exist of any pictures held including where they are located.

In normal operation, data must be deleted once the census has been completed and intelligence analysed.

When making decisions about retention, consider the implications of the following principle of the Data Protection Act 1998:

- Personal data processed for any purpose or purposes shall not be kept longer than is necessary for that purpose or those purposes – *Organisations need to:*
  - *Review the length of time personal data is kept for;*
  - *Consider the purpose or purposes the information is held in deciding whether (and for how long) to retain it;*
  - *Securely delete information that is no longer needed for this purpose or these purposes; and*
  - *Update, archive or securely delete information if it goes out of date.*

7.1.2.4 Subject access requests (SARs)

So as to comply with SARs, a log of camera deployment, a record of data deletion and the location of any retained images or footage (as above 6.1.2.3) must be kept.

7.1.3 Positioning of mobile solutions

NOTE: *When deploying camera solutions always remember that your personal safety is essential – make sure you have arranged a safe system of work before you begin.*

It is important to position camera equipment so that it can record the very best footage and afford the very finest intelligence. In deciding on the location of equipment there are many things that need to be taken into consideration. These include, but are not limited to:

- The quality and capability of the technology; e.g. will the image quality be sufficiently robust to depict the user demographic and age profile if positioned remote from the asset.
- Optimal positioning so as to facilitate the identity of the user demographic, identify vulnerable, encumbered or obviously impaired users, whilst contextualising the user and the asset and helping to identify behaviours, hazards and risks.
- The likelihood that equipment may suffer from theft or vandalism.
- The possibility that the environment may trigger spurious activations where motion detection is in use due to vegetation, wildlife or passing trains.
- Battery life and data capacity; the greater the number of users/motion activated triggers, the greater the impact on battery drain and memory card capacity.
- The need to understand greater second train coming frequency.

There are a number of good practice indicators which have been identified within the Level Crossing Manager community in regard to camera deployment. Excerpts of these are shown below:

- When mounting census equipment within the railway boundary, ensure that it does not interfere with the safe operation of trains, crossing equipment or positioned so as to result in user distraction.
- Try to avoid installing equipment on the direct route a user will travel to minimise the likelihood that the camera might be subject to theft or tampering.
- Take cognisance of the trespass history of the crossing in determining the positioning or appropriateness of deploying camera technology.
- It is advisable to mount camera equipment at a height of between 2ft and 6ft from the ground to reduce the likelihood of spurious activations from vegetation or animals.
- Where camera equipment is located in close proximity to trees or other shrubbery, make sure that branches will not foul the field of vision during bouts of wind or rain.

- Be aware of positioning equipment in such a way that activity from roads or paths parallel to the railway might cause spurious activations and result in unanticipated battery drain and/or quickly fill capacity of memory cards.

7.2 Use of gate counters and pressure pads

Due to the limited capabilities of gate counters and pressure pads in comparison with camera technology, as discussed in 6, the value added ability of this equipment is to support census intelligence by validating user numbers. For example, the use of quick census combined with multiple intelligent sources might, in isolated cases, provide enough information on which to make a judgement regarding user demographic, vulnerable usage and user behaviour. Gate counter or pressure pad technologies, could therefore help assessors to determine usage numbers over a sustained period of time and in doing so validate the quantitative output of the quick census.

In addition and where equipment can record date and time of activations, gate counters or pressure pads might be used to provide intelligence relating to peaks and troughs and night-time quiet period usage for example.

In summary and as illustrative examples, these technologies can be used for confirming:

a) sleeping dog status;

b) night-time quiet period use or usage during darkness;

c) peaks and troughs: daily or weekly;

d) provide a numerical count to check the accuracy of a quick census or validate other intelligent sources of information; and

e) to gather generic data, i.e. not user type intelligence, in support of level crossing closures.

8 Identifying crossing use through intelligent sources of information

8.1 General

As discussed in 4.1, it is important in addition to on-site census activity, to make full use of all available intelligent sources when determining usage of level crossings.

The fatality at Frampton level crossing on 11th May 2014, involving unknown unauthorised use of the bridleway element of the crossing by trail bike riders, highlights the type of activity that takes place across our network. It is acknowledged even with extended census and the use of intelligent sources, that this type of event might still go undetected, but the broader the research and active data collection, the greater the opportunity to identify such practices.

It is therefore advocated that the combined use of census which is nine day or greater, with the proactive use of intelligent sources (internet searches, researching social media and local club sites), in addition to seeking visual cues when on-site (tyre tread patterns or other clues); betters the opportunity for identifying the risk of unsafe or unauthorised activity than a quick, 24 hour or nine day census in isolation.

This is especially important so as to identify usage or patterns of use that might not be apparent even where nine day or extended census is undertaken. For example, organised groups promoting monthly or annual events which impact on the use of a level crossing could be missed from census activity alone, even where extended census is applied.

Utilisation of intelligent sources might also serve to identify vulnerable users or unauthorised use of level crossings. In this regard it can help assessors to identify organised groups so as to engage with them proactively and/or target risk mitigation appropriately.

8.2 Use of intelligent sources

Intelligent or smart-sources of information can take many forms. The information sources detailed below are not exhaustive, but they are a good source from which to build a portfolio of research material. Their sequence is also not representative of any hierarchical order of importance.

8.2.1 The internet

The world-wide web offers an abundance of opportunities to identify information to support census gathering intelligence. This rich smart-source may hold the key to significantly increasing assessor knowledge about the use of a level crossing and/or its users.

Detailed internet searches may yield information about the immediate environment, identify the promotion of rights of access or events and highlight use of level crossings by organisations or societies. When using the internet, consider:

- Local authority websites – might contain information on redevelopment proposals, road diversions, public attractions such as funfairs or other risk influencing intelligence.
- Rights of way maps and other mapping services – will highlight risk influencing factors within the immediate environment such as schools, businesses, public attractions, road layouts and afford understanding of how an asset serves the local community; e.g. provides a thoroughfare link, commuter route etc. The Definitive Map will help to identify if the route over a level crossing is publically promoted.
- Social media sites – intelligence relating to the use of level crossing might be available from social media channels such as: Facebook, YouTube, Twitter and Instagram. Individuals and organisations often promote activities via these network channels. Intelligence might include *posts* on forthcoming organised events within the locality, video footage or images of actual crossing use (including unauthorised or risk taking activity) and/or highlight

trends in use or frequencies of use including use by an unknown user demographic.

- Dedicated websites or chatroom forums – National groups such as the Ramblers or more localised groups such as off-road trail bike, 4x4 vehicle communities or regional scout groups often share or discuss experiences, social activity and promote events on their dedicated websites. A search for such communities and groups within the area of a level crossing may yield unknown intelligence about level crossing activity.

8.2.2 Highways authority traffic surveys

It is prudent to discuss with local authorities their programme of traffic surveys; both planned works and available footage or census data from completed activities. It might be possible to utilise this intelligence within risk assessments wholly or partially with agreement. Direct liaison with local authority contacts or through Road Rail Partnership Groups is advised.

8.2.3 Discuss the level crossing with the local experts

It might be that the best intelligence is accrued from the local community or those who interface with the asset directly. Often information may come to light through engaging with persons or groups that would otherwise reside unknown from census activity alone. Such intelligence might be obtained through discussion with people or groups such as:

- Local authority rights of way officers or community leads
- Council or Highways Agency officials
- Level crossing users
- Authorised users of private level crossings
- Local residents or businesses, schools or colleges
- Local user groups or clubs
- Signalling staff (Signallers or Crossing Keepers)
- Off-track, S&T, patrolling or other operational staff; e.g. MOMs
- Train operating companies (Drivers, Guards, station staff)
- British Transport Police

8.2.4 Operational records of crossing use

For private vehicle crossings equipped with telephones or automatic half barrier crossings (AHBs), record keeping in the form of occurrence books should exist to supplement intelligence for vehicle movements; albeit only for large or slow movements in the case of AHBs. In addition, in cases where the crossing provides access to business premises, there might be separate registers or site visitor logs which could support intelligence regarding vehicle use.

Accuracy of records is unlikely to be such that numbers or intelligence can be considered to be 100% assured, but if information is combined with additional research, it might contribute toward a broader understanding of actual crossing usage.

8.2.5 Tagging

At very lightly used or perceived dormant crossings, tagging a gate can be a useful way to determine if the asset is actually used, by whom and at what frequency. There is no guarantee that a user will make contact if they break the tag to cross, but its presence might:

a) Promote contact, resulting in useful intelligence that would not otherwise be forthcoming; or

b) If removed to cross, but no contact is made, it will be apparent to the assessor during the next risk assessment or asset inspection; an obvious sign that the crossing has been used and that greater intelligence is needed.

If tagging a gate, the user instruction should be stored in a waterproof container with the tag in a conspicuous place. As a minimum its contents should include:

- Level crossing details; name, type, UID (ELR, miles, chains)
- Date tag was placed at the crossing and the reason for the tag
- Telephone number and/or email address of contact point (typically this might be a Control Centre to ensure a 24 hour response)

9 Intelligence driven response to census

9.1 General

The undertaking of active census in conjunction with the use of intelligent sources of information will often confirm ‘known’ or suspected patterns of use, substantiate risks or hazards and endorse the user demographic; including the presence of vulnerable users. In other cases it may highlight unknown threats, unauthorised use or unsafe practices which require immediate interim actions, in addition to long-term plans, to control.

As a prerequisite of risk management protocol, it is important that intelligence is acted upon to mitigate threats or hazards and manage safety. In no hierarchical order, actions or parallel actions might include:

- Redeploy camera equipment (if appropriate) to better identify usage, patterns of use, user groups or collate additional evidence to support intelligence.
- Work collaboratively with operations staff (OM, LOM, and MOM), BTP, train operators and other stakeholder partners. If regular patterns of use are identified and as appropriate, arrange for evening or weekend visits to the

crossing, so as to talk directly with users to re-educate them regarding unauthorised use and unsafe acts. A BTP presence might also serve to enforce key messages. Operations staff working on a shift basis, such as MOMs, may be best placed to support this approach, unless by agreement, a Level Crossing Manager volunteers to work 'out-of-hours'.

- Revisit the internet and make specific use of targeted user group searches; specifically this should include using social media and local community or club websites to identify groups or clubs that observed users may belong to.
- Make direct contact with relevant local organisations, such as trail bike, 4x4, equestrian or walking societies, so as to promote safe crossing protocols, highlighting the risks and hazards associated with level crossings and unauthorised use. Work collaboratively to address safety concerns.
- Make contact with any county or national organisations if it is possible that the group or organisation is broader than the immediacy of the parish. Contact the central level crossing team if there are national implications and transferrable risks. It is important and advantageous to engage with and promote safety within larger institutions.
- Work collaboratively with local authorities, highways agencies and rights of way officers to:
  - determine if public and private status is accurately represented in documentation such as the Definitive Map;
  - identify whether restrictions and prohibitions by vehicles or other groups is suitably recorded and visible in public documentation; and
  - understand what additional actions can be taken by local authority colleagues to support Network Rail in managing asset safety.
- Take practicable steps to improve safety through delivery of physical improvements and provision of mitigation:
  - Re-evaluate closure opportunities, diversionary access and downgrades in status (where applicable).
  - Evaluate the requirements to provide risk reducing mitigation such as MSL, POGO for example.
  - Signage: review optimal positioning and order of signs, clarity of instructions; are there too many leading to signage cluttering and ambiguity or confused information, is there unnecessary signage or duplication, if appropriate and safe to do so without resulting in distraction or dilution of safety critical information – is there scope to provide an additional safety information or trespass sign etc…
  - Take steps to improve the crossing layout and undertake general infrastructure improvements: channelling, user segregation, improving traverse, sighting etc…

10 Census protocol

10.1 General

Every effort should be made to undertake a new census when undertaking a new risk assessment. In this way data is kept current with latest intelligence and:

- recorded census is reflective of the most current position, taking account of environmental or other external influences and the user demographic;
- calculated risk is representative of the current threat; and
- it facilitates analysis of the trending risk profile of the asset.

Where a quick census is used, see 4.2, this should be undertaken at the time of the site visit. In exceptional circumstances, it might be necessary to undertake the census on a different day, for example, if weather conditions adversely affect the accuracy of census data on the planned day of collection. If the census needs to be taken on another day, it should be undertaken as close to the date of the original site visit as possible.

Where a 24 hour, nine day or extended census is used, pre-planning activity should facilitate a structured timeline to deploy census gathering equipment or arrange external support, so as to tie-in with the date of the risk assessment site visit.

Where additional census is needed, this should be undertaken during the most appropriate parameter; taking account of intelligence, the reason for the second census and all other pertinent factors.

10.2 Applying new census data to an existing risk assessment

10.2.1 Acceptable use

Sometimes, more recent census data than that used in the current risk assessment becomes available or a need for new census data is identified. For example:

- a Network Rail project might commission a nine day census as part of an asset renewal or re-signalling scheme;
- a developer might submit a current nine day census for comparison against projected usage;
- an authorised user might provide unsolicited census data;
- an additional census might have been undertaken to capture seasonal variations in use;
- a Highways Authority might undertake a traffic survey and share it directly with the Level Crossing Manager or through Road Rail Partnership Groups; or
- a third party report might be received which generates a requirement for a more recent census, for example, usage is identified during the night-time quiet period at a whistle board protected crossing.

The new census information can be applied to the existing risk assessment provided there is confidence that all other cumulative data remains fit for purpose. If there is any doubt or ambiguity over this or if an extended period has lapsed since this data was accrued, a complete new risk assessment might be necessary.

If there is a significant change in the ALCRM score as a result of using new census data:

a) evaluate the need to undertake a new risk assessment;

b) re-evaluate the need for new or additional risk control measures or the need to expedite planned mitigations or implement interim controls; and

c) review the impact of the change on the risk assessment frequency.

10.2.2 How to record this in ALCRM

When it has been established that it is appropriate to use new census data in an existing risk assessment (in place of existing data), this should be recorded in ALCRM as follows:

a) Create a new option below the current (LIVE) risk assessment and in the census tab enter the new census date;

b) Enter the name or source of the census taker/provider, duration and type for the census being used and the census data itself;

c) Add any pertinent information about the new census within the notes section and explain why the decision to use it has been made; and

d) Set the option to recommend, approved and implemented so that it becomes the LIVE risk assessment.

10.3 Using old census data in new risk assessments

10.3.1 Acceptable use

In exceptional circumstances it might be appropriate to use census data that pre-dates the risk assessment being undertaken. This is only appropriate where the census is believed to give greater accuracy than that completed during the site visit. Examples are shown in table 4.

Wherever possible, the old census data should be compared to the census completed during the site visit. This is important to establish if the old census continues to provide accurate data on crossing usage.

Old census	New census	Validation	Comments
Nine day or extended census or 24 hour census	Quick census	Compare the daily usage from the new quick census with the daily usage from the previous nine day, extended or 24 hour census.	If the data is broadly comparable, use the nine day, extended or 24 hour census. If there is significant variation, decide which census offers the greater accuracy using structured judgement and accounting for intelligent sources of information. If needed, undertake a new nine day, extended or 24 hour census.
Estimate provided by an authorised user	Quick or estimate census	Compare the daily usage from the new quick or estimate census with the data provided previously by the authorised user. *NOTE: A quick census might over or under estimate usage. The AU estimate might identify different patterns of use not identified by a quick or visual estimate.*	If the data is broadly comparable, use the estimate provided by the authorised user. If there is significant variation, decide which census offers the greater accuracy using structured judgement and accounting for intelligent sources of information.
Quick census, users witnessed	Quick census, no users witnessed and estimate made	Apply structured expert judgement to decide if either census is appropriate or if a new census is needed.	Use the old census data if it is believed to more closely reflect usage than the estimate made, making use of structured judgement and accounting for intelligent sources of information within decision making. If not satisfied that either census reflects crossing usage accurately, a new nine day or extended census should be undertaken.

Table 5 Examples of using old census data

10.3.2 How to record this in ALCRM

When it has been established that it is appropriate to use old census data in a new risk assessment, this should be recorded in ALCRM. The date of the old census should be recorded appropriately and any pertinent information about the old census, including the decisions taken to use it and any comparison or validation with new census data, should be documented within the notes section.

10.4 Comparing new census with historic census

10.4.1 General

It is good practice to compare new census information with historic census so as to:

a) identify when significant changes have taken place such as:
   - changes in user numbers;
   - changes in user demographic, e.g. increase in vulnerable and/or irregular users
   - changes in vehicle use or type, e.g. increase in or introduction of HGVs; and

b) take account of historic census activity so as to utilise all intelligence and remain consistent in the identification of vulnerable and irregular users or types of vehicles and patterns of use, SFAIRP;

c) consistently apply an appropriate traverse time applicable to the user demographic or vehicle moment;

d) apply the correct minimum sighting requirements appropriate to the user demographic or vehicle moment; and

e) reduce the likelihood of errors within census counts so as to increase the accuracy of modelled risk and the application of structured judgement within risk assessment.

A comparison of data between new and historic censuses can help to identify trends, highlight any potentially significant changes in risk or signpost errors in census data. It is good practice to make this comparison using more than the last census taken so as to comprehensively take account of all available information.

Changes to look for should include:

- significant movement in usage figures;
- alterations in use by vulnerable and irregular users; taking account of any broader demographic change; and
- peaks and troughs and seasonal variation.

Such transitions in use or by users can significantly impact on the risk controls in place, or those proposed. It might also serve to provide assessors with a true holistic understanding of the assets history and an insight into future risks.

10.4.2 Analysis and actions

Where significant changes are identified, it might be necessary to undertake further detailed analysis to validate new intelligence. This will enable assessors to determine the full impact on risk.

Examples of changes that might trigger further investigation include:

a) the new census does not identify vulnerable users when they have been identified previously;

b) previous census(es) indicate night-time quiet period use and the new census does not;

c) previous census(es) include vehicle types which import risk, e.g. tractors and trailers or HGVs, the new census does not;

d) there are significant changes in user numbers (vehicle and pedestrian);

e) previously identified irregular use is not recorded in the new census, e.g. irregular usage previously recorded due to: leisure attractions, seasonal variation (beach access, fruit farms) etc.

Where conflicting information between assessments exists, it is important to utilise intelligent sources of information, in addition to further census activity or site-visits, to determine the accurate position.

Daily Vehicle usage change (compared to census) a consequence of the project			
Crossing	**Direction**	**Peak Hour**	**Daily Total**
North Seaton	EB	-33.6	**-61**
	WB	-27.3	
Green Lane	EB	47.5	**107**
	WB	59	
Seghill North	EB	102.9	**-164**
	WB	-266.5	
Hartley	EB	0	**0**
	WB	0	
Newsham	EB	-20.4	**126**
	WB	145.9	
Plessey Rd	EB	30.6	**139**
	WB	108.8	
Bebside	EB	-82.8	**75**
	WB	158.1	
Bedlington South	EB	0	**0**
	WB	0	
Bedlington North	EB	167.4	**186**
	WB	19	
Marcheys House	EB	0	**0**
	WB	0	
Holywell	EB	0	**0**
	WB	0	

Daily pedestrian usage change (compared to census) a consequence of the project		
Crossing	**Peak Hour**	**Daily Total**
Bebside	43	**430**
Newsham	31	**310**
Plessey	3	**30**
Bedlington South	54	**540**
Bedlington North WG	14	**140**
Bedlington North MCB	14	**140**
Green Lane	26	**260**
Hospital	26	**260**
North Seaton	1	**10**
Holywell	1	**10**
Earsdon	1	**10**

Note, a footbridge is likely to be built and this is likely to take all of these extra users away from the level crossing. This is yet to be conformed so it is best to keep with these numbers

APPENDIX E

PEDESTRIAN WILLINGNESS TO WAIT AT MSL CROSSINGS

Assessor Guidance

CONTENTS

National Level Crossing Team

If we can't close a level crossing, let's make it safer.

1 Purpose

This document provides guidance in assessing and managing the risks of pedestrian willingness to wait at miniature stop light [MSL] crossings.

2 Scope

This guidance is intended for Level Crossing Managers and any other competent person responsible for the safe management and risk assessment of level crossings.

The document is designed to improve awareness about the factors which influence pedestrian willingness to wait at MSL crossings and considers the impact of long waiting times on their behaviour. Its contents should be used to:

- help assessors identify willingness to wait risks during risk assessment or asset inspection;
- support decision making about the options available to help manage the risks;
- inform decision making during option selection about the appropriateness and effectiveness of MSLs as a risk control measure; and
- increase human factors awareness amongst the level crossing risk management community about risks which effect level crossing safety.

The contents of this guidance should be applied:

- during risk assessment and asset inspection at all MSL fitted crossings;
- as part of option selection when determining the appropriateness of MSLs as a proposed risk control measure; and/or
- following intelligence which indicates that pedestrian willingness to wait is a concern; for example, a trending picture of near miss events is observed in control logs or 3rd party advice from local users, neighbours or train Drivers is received.

3 Background

On the 24th January 2013 a cyclist using the footpath and bridleway crossing at Motts Lane, near Witham, Essex, was struck and killed by a train. The cyclist rode onto the crossing into the path of the train when the red lights were showing and the audible alarm was sounding. The cyclist was familiar with the crossing as he regularly used it to commute between home and work.

The RAIB investigation into the accident revealed that the MSLs at the crossing could show a red aspect for a long time before a train arrived. This was due to deficiencies in the signalling design in the area and the fact that the crossing was not being used as it was designed to be. At times, if a stopping train was in the station, the MSLs at the crossing could be at red for almost 5 minutes. Although it is not known for certain why the cyclist crossed, the investigation team concluded that it was possible that because he was used to seeing lights at red for long periods, he decided for himself that it was safe to cross.

The investigation into the incident also identified that users habitually ignored the red lights at this crossing and suggested that the cyclist may have become used to looking for trains instead of checking the lights. The RAIB made the following recommendation:

'Network Rail should establish, by carrying out research or otherwise, appropriate maximum time(s) for red lights to be designed to be shown at MSL crossings, and acceptable levels of variability for this time (taking into account factors such as the types of train, and stopping patterns), in view of the risk that users may become intolerant of extended waiting times. Taking account of the results of this work, it should modify its risk management processes for MSL crossings to include consideration of the length of time that the red lights show (paragraph 116c).'

In response to this recommendation, Network Rail commissioned human factors research into pedestrian willingness to wait at MSL crossings. The research was undertaken by a team of human factors experts employed by Environmental Resources Management (ERM).

The research involved a review of video footage at MSL crossings, analysis of data and literature reviews and a survey of crossing users. The research set out to deliver 3 objectives:

1. Identify an evidence-base that will inform suitable maximum waiting time limits for MSL level crossings for non-vehicular users.
2. Identify and prioritise the range of factors that influence the willingness to wait at MSL red lights and assess individual differences in willingness to wait.
3. Identify, evaluate and prioritise options for the mitigation of willingness to wait violations at MSL crossings, providing practical guidance for Route and Level Crossing Managers.

The findings of the research are summarised in this guidance and are intended to help Level Crossing Managers, and others who oversee level crossing safety, to assess and manage willingness to wait at MSL crossings.

4 Research findings

4.1 High level summary

The video footage used in the human factors study at MSL equipped crossings, found that:

- 80% of red light traverses (RLTs) are conducted by familiar users who initiate the traverse within 5 seconds of arriving at the crossing
- No red light traverses were initiated more than 30 seconds after reaching the crossing

This suggests that previous experience of the crossing is an important factor in reaching a decision to initiate a red light traverse.

When asked, crossing users suggested that a waiting time of between 3 and 6 minutes would lead to a greater likelihood of red light traverses, although this was influenced by the expected wait time at the crossing they were familiar with. This suggests that there are two types of red light traverses:

- where the user initiates it very soon after arriving at the crossing (video evidenced); and
- where the user waits an unusually long time for a train at the crossing, becomes frustrated, and initiates a red light traverse between 3 and 6 minutes after arrival (user response to questionnaire).

The former type of red light traverse is much more common than the latter, as evidenced by the video footage, with over 80% of red light traverses being of this type.

4.2 Influencing factors of red light traverses

The research also identified a set of influencing factors that increase the likelihood of a red light traverse. It is likely that these factors work in conjunction with each other, not in isolation.

These factors include:

- Familiarity with the crossing – users familiar with the crossing are more likely to conduct a red light traverse
- Proximity to stations – crossings that are closer to a station have a higher risk from red light traverses
- Sighting of trains – where users feel that they have adequate sighting of trains they are more likely to commit a red light traverse
- Anticipated red light durations – users perception that the waiting time would be 'too long' tended to increase the likelihood of them committing a red light traverse
- Time pressure – users who feel they are in a rush are more likely to commit a red light traverse
- Prior history of red light traverses – users who have committed red light traverses in the past are more likely to commit them in the future

Annex 'A' provides full details of the red light traverse influencing factors identified within the research, together with tangible descriptions associated with their human factor risks and, where appropriate, the evidential basis for them is also referenced.

4.3 Profiling red light traverses

The research recognised that whilst it is possible to identify a range of influencing factors which can trigger red light traverses, the factors themselves interact in unique combinations specific to each individual traverse made at each crossing location. For example, at one crossing, time pressure, the behaviour of others and proximity to a station may dominate the decision to conduct a red light traverse, while on other traverses at that location, it may be peer pressure and familiarity with the crossing that dominate the decision.

Red light traverse profiles were also categorised, in addition to the identified influencing factors, to help determine an overall pattern of behaviour. The profiles are summarised below:

- Evidential – *relies on past experience of using the crossing*
- Rushing – *time constraints drive behaviour*
- Imprudent – *intentional disregard*
- Distracted – *focused on other tasks*
- Rising frustration – *waiting causes progressive frustration*
- Distrust – *believes that the system is pointless and irrelevant to them*
- Lost trust – *past experience of faults with the lights/audible warning drive loss of confidence*
- Unaware – *lack of comprehension about the meaning of the lights/audible warning*

Annex ‘B’ incorporates the list of profiles shown above and also includes their evidential relationship within the research.

4.4 Combining influencing factors and profiles

In determining behavioural patterns at level crossings equipped with MSLs, the research team took the commonly co-occurring sets of influencing factors and aligned them against commonly occurring patterns of behaviour and user types. This enabled the creation of a simple means of understanding the particular types of red light traverse behaviour present. It also supports and facilitates the selection of targeted risk control measures.

Diagram 1 below (also Annex ‘C’) shows how the influencing factors and profiles align to demonstrate common themes in behaviour.

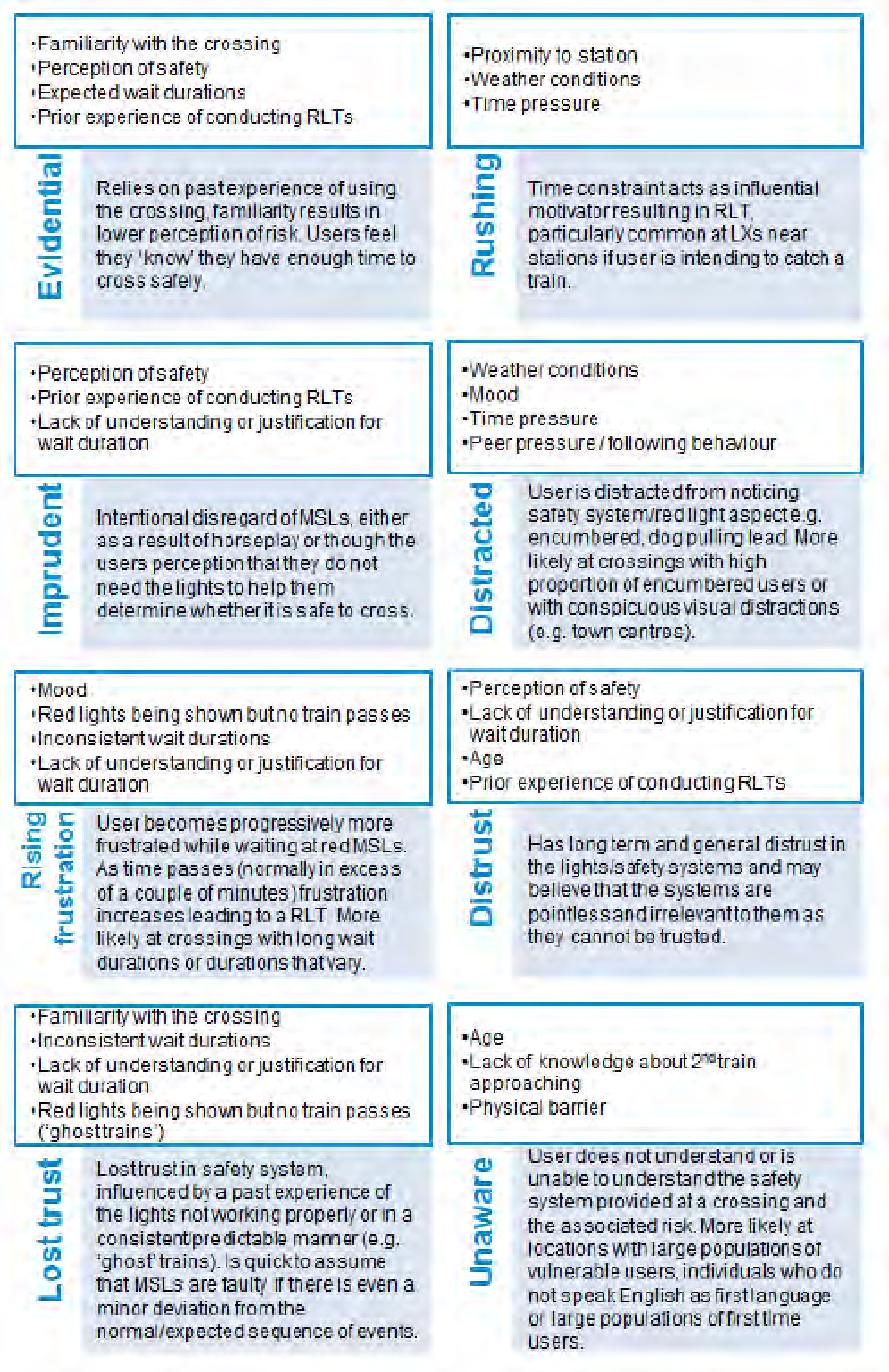


Diagram 1 - Influencing factors which define each red light traverse profile

5 Assessing the risk of red light traverses

5.1 General

It is important that the risk of red light traverses by pedestrian users of level crossings equipped with MSLs is an integral part of the risk assessment and risk management process.

The risk of red light traverses can differ significantly from level crossing to level crossing. Crossings are unlikely to have identical red light traverse profiles. The reasons are covered in 4.2 to 4.4 and centre on the different characteristics found at each asset. These include elements such as:

- available sighting;
- length of time before a train arrives at the crossing;
- second train coming frequency;
- logistics, such as proximity to stations;
- user profiles of the crossing;
  - types of user;
  - their previous experiences at the crossing;
  - whether the crossing is predominantly used for leisure or commuting purposes; and
  - the influence of other users.

It is therefore important that the assessment takes account of local factors:

- to determine the likelihood or frequency of red light traverses (if known to occur)
- identify factors at the crossing that either <u>could</u> or <u>do</u> make red light traverses more likely
- informs decision making about necessary and appropriate risk control measures
- supports decision making about MSL proposals

5.2 Gathering evidenced based intelligence

Evidence of red light traverses can be derived from various sources. These can include:

- Observing user behaviour during risk assessments, asset inspections and other site visits
- Deploying covert cameras to gather evidence of red light traverses
- Obtaining witness accounts by speaking to crossing users or local residents/businesses
- Speaking to train crew to understand if red light traverses are a known occurrence (might help to identify under-reporting)
- Undertake analysis of SMIS reports of near miss events

In gathering factual based evidence, it might be necessary to use more than one method in order to establish an accurate picture of red light traverses. Where evidence suggests this may be high, and if not already undertaken, covert cameras should be deployed to help inform the frequency and type of event.

5.3 Undertaking qualitative assessment using this guidance document

Key elements of the research relating to pedestrian willingness to wait are included within this guidance document. Assessors should also familiarise themselves with the contents of the ERM report to maximise knowledge and understanding.

Where red light traverses are not known, are suspected or where intelligence confirms that willingness to wait is a problem; LCG 15 should be used to help inform decision making about the likelihood of event or understand what might be influencing this behaviour, so that mitigations can be put into place to control the risks.

In formulating structured judgement about the risks associated with red light traverses, assessors should use the content and advice found within:

- Annex 'A' – Red light traverse influencing factors
- Annex 'B' – Red light traverse profiles
- Annex 'C' – Influencing factors which define each red light traverse profile

The collective information shown within Annex A-C should be used to inform/aid the investigation and identification of willingness to wait risk. For example, it might help an assessor identify:

- Inconsistent waiting times; where some trains take significantly longer than others to arrive at the crossing. *This could lead to a higher risk of red light traverses as users might use their previous experience to assume the lights will be red for longer and therefore erroneously consider they have more time to traverse safely.*
- High failure rates at the crossing; which might lead to users assuming that the lights are unreliable and trust in the system is lost.
- The impact at a crossing which is at or within sight of a station; there might be a higher probability of red light traverses. *This might be due to users rushing to catch trains or due to users being able to see a train stopped in the station and assuming that they are safe to cross; e.g. risk of second train coming.*

If red light traverses are suspected or foreseeable, in addition to applying appropriate risk reduction mitigation, it is good practice to deploy covert cameras or take other practicable steps to substantiate decision making; see section 5.2.

6 Mitigating the risk of red light traverses

6.1 General

When deciding on the appropriate risk control measures to manage the risk of red light traverses, it is important to consider:

- Engineering solutions
- Physical infrastructure improvements
- Educational opportunities

It is possible that more than one risk control measure might be needed. The best combination of controls should be evaluated so that maximum risk reduction/safety benefit is achieved.

The requirement for interim solutions should also be factored into decision making in anticipation of the delivery of longer term plans.

6.2 Engineered design

Where MSLs are evaluated to be an appropriate and necessary risk control measure, the design of the equipment, whilst conforming to relevant standards, should address local specific red light traverse risks. For example, users questioned indicated that both consistent and occasional long waiting times are likely to influence red light traverse behaviour.

It is important during the MSL design stage to consider the appropriateness of the following measures to reduce the risk of red light traverses:

- Minimising the waiting time, so far as it is safely practicable to do so
- Making the waiting times as consistent as possible for all classes of trains
- Removing the potential for 'ghost trains' (a red light showing when no train passes)
- Providing second train coming audible spoken alarms
- Alerting users if the sequence has been changed to encourage a change in their crossing behaviour

The mitigations listed above should also be considered retrospectively as part of enhanced risk management, if it has been identified that the waiting time at MSL equipped crossings is unacceptably long, and changes to the sequence are proposed.

6.3 Risk reducing options

In addition to 6.2, where MSLs are provided and red light traverses have been identified or where MSLs are proposed, the contents of the table in Annex 'D' should also be used to assist in the identification of appropriate risk reduction measures to manage safety.

The table provides a list of possible measures that might help to reduce the effects of red light traverses and encompasses high level costs and benefits and highlights some disadvantages of each.

Some risk control measures shown require extreme care, design and/or human factors support to implement. The Central Level Crossing Team should be consulted to offer advice and counsel as appropriate or if there is doubt about the correctness of approach proposed.

***Remember** – more than one risk control measure might be needed to manage red light traverse safety.*

6.4 Recording the output

Details of the willingness to wait assessment should be incorporated within the narrative risk assessment. The documented output should contain:

- assessor observations and reference to structured judgement decision making;
- sources of intelligence/evidence base (where applicable);
- identified risks and hazards; and/or
- action taken or proposals for, additional risk control measures.

Annex 'A' Red light traverse influencing factors

Influencing Factor	Description	Evidence
Familiarity with crossing	Users who use crossings with regularity come to an understanding of the 'usual' wait time for a train. If this time is short or long, this may impact how long drivers wait. If they rarely see trains and are never forced to wait extended times, this may reduce their willingness when this time becomes protracted for some reason.	More frequent users of the crossing tended have a history of red light traverses. 30% of users that used crossings a few times a week, or more than once a day, had previously crossed on a red light, compared to 20% for those that use it rarely or every few weeks.
Proximity to stations	Seeing trains in the station that have activated crossing lead to frustration and perception it is safe to cross.	40% of users at crossings in sight of a station had committed a RLT. RLTs were less common elsewhere, 25% of users at other crossings had conducted RLTs..
Perception of safety (sighting distance/time of trains)	Good track visibility of a clear track can give the impression there are no trains nearby, and users have little experience of the true speed of trains. Long sighting distances are likely to give the impression that trains are further away than in actuality; this may give people the impression that they have sufficient time to make a crossing when they do not, and that waiting is not necessary.	Of those who said they could judge if it was safe to cross on a red light, 66% said they would rely on good sighing of trains.
Physical Barrier	Physical barriers add an obstacle that must be factored into a decision to cross prematurely. Physical barriers can prevent crossing and force users to wait an appropriate amount of time. They provide a n obstacle the users must actively engage with which can draw the attention of distracted or unaware users to the crossing traverse	No evidence

Influencing Factor	Description	Evidence
Expected wait durations	The amount of perceived time a person has waited already and anticipates waiting. The user's interpretation of wait duration and future expectations are a key determinant of behaviour.	Approximately, 75% of users that described waiting times as 'too long' had previous history of crossing on a red light. 30% of those who described waiting times as 'acceptable' (or shorter) had a history of RLTs.
Peer pressure/ following behaviour	Being with companions can remove attention from the passing of time and increase willingness to wait. It can also result in distraction and reliance on the other individual to check for trains/MSLs. Others crossing unsafely reduces willingness to wait. The presence of children significantly increases willingness to wait.	Approximately 10% of users would be likely or very likely to cross on a red light because they saw other people doing so.
Weather conditions	Bad weather such as rain or cold can reduce willingness to wait.	10% (approx.) of users would be likely or very likely to cross on a red if the weather was poor.
Age	The impact of age upon the willingness to wait is varied. It is generally assumed that teenager and young adults are more likely to RLT. However, there is also evidence that older adults are equally likely to RLT.	25% of users aged between 18 and 60 (age categories 18-29 and 30-59) had previously cross on a red light. This figure is approximately 35% for both the under 18 age group and over 60 age group.
Time pressure	Rushing will reduce willing waiting times because it places emphasis on the passing of time and the goals (e.g. catch train) that drive the decision to rush dominate the decision to traverse and emphasise the cost of waiting (e.g. miss train)	Users who are always in a rush had a greater history of regular red light violations (15%), compared to those that were sometime (10%), rarely (2%) or never (10%) in a rush. 20% users stated they would be very likely or likely to cross on red if they were running late.
Prior experience of conducting RLTs	Remembering instances of previous successful RLT can inform decisions to perform another one and reduce waiting time.	60% of users that had previously crossed on a red light would be likely or very likely to do so if they looked up and down the track and could see no train. Only 15% for people who had not crossed on red before would take the same course of action.
Mood	Being in a good mood can increase willingness, but bad moods can decrease it.	No evidence

Influencing Factor	Description	Evidence
Inconsistent wait durations	This would suggest that users will become dissatisfied (frustrated) when they are made to wait longer than they expect. Making waiting times more consistent at crossings may avoid this problem,	No evidence
Lack of understanding or justification for wait duration	If users understand why they are waiting and can see that the reasons for waiting are justified this validates their action. If they do not see a train or are not validated this will lead to frustration and growing distrust.	No seeing a train (22%) and seeing a train waiting at a station (26%) are the primary reasons for frustration.
Red lights being shown but no train passes ('ghost trains').	Users loose trust in the system and may be more likely to cross on a red light because they know they may be waiting for no train.	No evidence
Lack of knowledge about 2nd train approaching	Users may assume it is safe to cross after a train has passed.	No evidence

Annex 'B' Red light traverse profiles

Profile ID	Description of common behaviour/beliefs/influencing factors	Error class	Prevalence
Evidential	Relies on past experience of using the crossing, familiarity results in lower perception of risk. Users feel they 'know' they have enough time to cross safely.	Routine non-compliance	**23/45** – The majority of RLTs displayed behaviour consistent with this type and numerous users surveyed reported past RLTs under similar circumstances
Rushing	Time constraint acts as influential motivator resulting in RLT, particularly common at LXs near stations if user is intending to catch a train.	Situational non-compliance	**14/45** – Displayed obvious traits associated with rushing while committing RLTs (running or fast paced approach, head down etc).
Imprudent	Intentional disregard of MSLs, either as a result of horseplay or through the users perception that they do not need the lights to help them determine whether it is safe to cross	Routine or situational non-compliance	**5/45** - Multiple traverses by a single fisherman moving equipment. User was interviewed and indicated a disregard for the MSLs lights and reliance on visual check for trains.
Distracted	User is distracted from noticing safety system/red light aspect e.g. encumbered, dog pulling lead. More likely at crossings with high proportion of encumbered users or with conspicuous visual distractions (e.g. town centres).	Action error (lapse)	**3/45** – Few obvious cases of distraction recorded, two users were encumbered by fishing equipment, 1 dog walker reported being preoccupied when interviewed.
Rising frustration	User becomes progressively more frustrated while waiting at red MSLs. As time passes (normally in excess of a couple of minutes) frustration increases leading to a RLT. More likely at crossings with long wait durations or durations that vary.	Situational non-compliance	No recorded cases of this type. However, 40% of users surveyed said they would be 'very likely' or 'likely' to consider crossing on red aspect if they had been waiting a long time and no train passed.
Distrust	Has a long term and general distrust in the lights/safety systems and may believe that the systems are pointless and irrelevant to them as they cannot be trusted.	Rule-based mistake	None observed during site visits but a number of comments in the interviews highlight this as an issue.
Lost trust	Lost trust in safety system, influenced by a past experience of the lights not working properly or in a consistent/predictable manner (e.g. 'ghost' trains). Is quick to assume that MSLs are faulty if there is even a minor deviation from the normal/expected sequence of events.	Rule-based mistake	Unable to determine through video footage analysis, however a number of people surveyed described past faults and not trusting system.
Unaware	User does not understand or is unable to understand the safety system provided at a crossing and the associated risk. More likely at locations with large populations of vulnerable users, individuals who do not speak English as first language or large populations of first time users.	Knowledge-based mistake	None observed during site visits but a number of comments in the interviews highlight this as an issue.

Annex 'C' Influencing factors which define each red light traverse profile

Evidential

- Familiarity with the crossing
- Perception of safety
- Expected wait durations
- Prior experience of conducting RLTs

Relies on past experience of using the crossing, familiarity results in lower perception of risk. Users feel they 'know' they have enough time to cross safely.

Rushing

- Proximity to station
- Weather conditions
- Time pressure

Time constraint acts as influential motivator resulting in RLT, particularly common at LXs near stations if user is intending to catch a train.

Imprudent

- Perception of safety
- Prior experience of conducting RLTs
- Lack of understanding or justification for wait duration

Intentional disregard of MSLs, either as a result of horseplay or though the users perception that they do not need the lights to help them determine whether it is safe to cross.

Distracted

- Weather conditions
- Mood
- Time pressure
- Peer pressure / following behaviour

User is distracted from noticing safety system/red light aspect e.g. encumbered, dog pulling lead. More likely at crossings with high proportion of encumbered users or with conspicuous visual distractions (e.g. town centres).

Rising frustration

- Mood
- Red lights being shown but no train passes
- Inconsistent wait durations
- Lack of understanding or justification for wait duration

User becomes progressively more frustrated while waiting at red MSLs. As time passes (normally in excess of a couple of minutes) frustration increases leading to a RLT. More likely at crossings with long wait durations or durations that vary.

Distrust

- Perception of safety
- Lack of understanding or justification for wait duration
- Age
- Prior experience of conducting RLTs

Has long term and general distrust in the lights/safety systems and may believe that the systems are pointless and irrelevant to them as they cannot be trusted.

Lost trust

- Familiarity with the crossing
- Inconsistent wait durations
- Lack of understanding or justification for wait duration
- Red lights being shown but no train passes ('ghost trains')

Lost trust in safety system, influenced by a past experience of the lights not working properly or in a consistent/predictable manner (e.g. 'ghost' trains). Is quick to assume that MSLs are faulty if there is even a minor deviation from the normal/expected sequence of events.

Unaware

- Age
- Lack of knowledge about 2nd train approaching
- Physical barrier

User does not understand or is unable to understand the safety system provided at a crossing and the associated risk. More likely at locations with large populations of vulnerable users, individuals who do not speak English as first language or large populations of first time users.

Annex 'D' Risk mitigation

Mitigation	Practicalities	Costs	Benefits	Disadvantages	Application
MSL strike-in/out calibration	At some locations it may not be possible to amend MSL sequences significantly. Local branch lines, junctions, stations for example may limit the changes possible.	£100k+ Campaign style activity, likely to be only necessary on some of the ~200 MSL crossings on the network.	Minimising red light durations reduces the opportunity for red light traverses. Ensuring consistent red light durations removes uncertainty and doubt, especially where waiting times are over 1 minute. Consistent and predictable waiting times can be easily understood by regular users and result in compliant traverse behaviours.	Cost associated with adjusting or providing new infrastructure for strike-ins is significant. Some crossings rely on interlocking controls and track circuit joints, so adjusting these will mean the addition of new timers or moving track circuit joints.	Should be undertaken either where there is evidence that red light traverses are taking place, or where it is suspected that waiting times are long. Should also feature in the design for new installations.
Multiple gate system	Assigning responsibility for maintenance and inspection may be problematic. Would require sufficient space for installation at the crossing. Careful consideration of gate and fencing design required to ensure all users (including vulnerable and encumbered) can access the crossing.	£0-£100k Assuming the option is not feasible if a land purchase is required, the option should be relatively low cost - price of materials, installation and maintenance.	This type of design slows down the user, encourages them to engage with the infrastructure and concentrate on using the crossing. It also can force cyclists to dismount (to use gates) and limit the number of people using a crossing at any one time.	May result in users waiting on the crossing while others are using the gates. Not suitable for locations with large pedestrian usage or hybrids with vehicle access required.	Could be helpful in certain situations, where users are rushing or unaware of the crossing. Careful consideration will be needed to not unduly restrict or compromise sighting. Design should be ergonomic and positively influence user behaviour e.g. • direct users toward MSL equipment and signage • face the direction of approaching trains.

Mitigation	Practicalities	Costs	Benefits	Disadvantages	Application
Interlocked gates *Trackside gate release mechanism or other safe system required*	Similar solutions implemented at some locations. Practicalities surround managing the exit of users on the crossing.	£10k-£100k Dependent upon the method of interlocking used (local, or interlocked to signalling).	Physical barrier preventing users from entering the crossing on red light. Has the potential to prevent full range of red light traverse behaviours. Overlay MSL product specification allows a simple interface with interlocked gates.	Potential for users to become trapped on crossing if a simple exit system or significant refuge area is not provided. Interlocked gates may require regular maintenance and frequent repair.	Method of allowing users trapped on the crossing to reach a safe position is a prerequisite. Precedent from good practice implementations of this design should be considered.
Planned obscuration *Full documented risk assessment required; incorporating human factors expertise*	Applicable to crossings where obvious and predictable cues are provided by local infrastructure. For example, crossings where stationary trains can be observed or locations where other level crossing can be seen. Ownership of fencing and boundary lines needs to be considered. Also how far through the traverse the obscuration needs to be applied, i.e., 5m, 10m, 20m back from the crossing.	Low, obscuration could be achieved using vegetation or relatively low cost fencing materials.	Encourages reliance on the MSL to determine whether it is safe to traverse. Prevents/deters users from using other (inaccurate/less consistent) cues to determine traverses.	Obscuration may block view of vehicle drivers at hybrid crossings.	Due to the potential to import risk by obscuring sighting, a detailed risk assessment involving human factors expertise <u>must</u> be conducted to support and inform decision making, <u>before</u> and <u>post</u> implementation. The sighting should generally not be restricted to less than the minimum required sighting at the crossing. Worth considering for specific locations, requires careful risk assessment of impact upon pedestrian and vehicle users where deployed at hybrid crossings.

Mitigation	Practicalities	Costs	Benefits	Disadvantages	Application
'MSLs are not working properly' sign	Would require a reporting hotline/point of contact to be established, roll-out of sign to all MSL crossings which could be achieved as part of other campaigns. Implementation of this on a static sign may not be effective. Provision of this information on a dynamic sign, which is able to provide other information may prove most effective. One option would be to combine the sign content with the incident data sign. LCMs assess MSL crossings every 7 weeks and this would provide an opportunity for updating content and showing users that NR staff regularly visit the crossing.	Low cost installation of signs: £0-£10k. Medium-High cost if dynamic signage employed: £10k-£100k+. Hotline setup and management would require further consideration.	Reporting and acting on MSL sequencing issues reported by the public will help build confidence in lights, reassure crossing users they are working properly. Any action taken needs to be publicised and conveyed to crossing users. Additional method of obtaining feedback on the asset.	Additional workload on LCMs, potential for false alarms. Potential for vandalism of sign or sign not being noticed.	Distrust in the lights can turn users who would normally always comply with safe crossing procedures into people who have decided it is appropriate to traverse on red lights. Providing information to help give them confidence that the lights are working correctly and to report faults will help build trust.

Mitigation	Practicalities	Costs	Benefits	Disadvantages	Application
Incident data signs *Careful consideration of accident history essential – sensitive application*	Obtaining hard-hitting statistics for individual locations may be difficult due to low frequencies of events. Keeping signs up to date would require periodic review/replacement. Could be implemented as a general notice board for the crossing, where other information is provided – for example, dynamic MSL not working sign.	Low cost to setup and install as part of other campaigns: £0-£10k. Higher cost if incorporated as part of dynamic signage.	Highlighting risk and drawing awareness to risk at locations using facts should help engage an intellectual discussion with users. This will engage those who are immune or fatigued with other types of message (emotion, social).	Increase in visual complexity of the crossing environment. Could prove a short term/novelty benefit to only a subset of crossing users at locations. Potential for vandalism and maintenance overheads.	Worth consideration if sufficiently impactful statistics can be produced. Particularly useful for targeting specific demographics perceived as higher risk at specific crossings. Careful and sensitive consideration must be given to the accident history at the crossing, and care taken to avoid emotive content that could cause distress or appear insensitive. Legal services should be engaged to counsel decision.
Waiting time justification	Accuracy of information.	Low cost installation of permanent signs: £0-£10k. Temporary signs would need to be deployed and removed at appropriate times to ensure accuracy of information (i.e. at beginning and end of works).	Providing an explanation for wait times, especially when there is a deviation from normal patterns, can help users justify waiting and prevents assumptions of MSL failure.	Increase in visual complexity of the crossing environment. Could prove a short term/novelty benefit. For short term option would need to ensure the signs were removed and deployed at the correct times otherwise users will lose trust in the information.	Potential short term solution, but low cost and worth consideration at crossings with significant variation in wait times.

Mitigation	Practicalities	Costs	Benefits	Disadvantages	Application
ATC audible alarms	ATC alarm campaign already underway; would require focusing of this campaign on MSL crossings to upgrade auditory alarms to the spoken alarms. A visual indication could also be provided on a dynamic sign to supplement the audible warning and provide an indication for those with hearing impairment.	Medium, opportunity to accommodate costs within existing campaign budget. High if a visual indication of ATC also required.	The alarms provide an alert to users who are not looking at/unable to see the MSLs. Also can orient the attention of users who are distracted to the crossing safety systems.	Noise pollution.	Likely to provide significant benefit in safeguarding against second train coming risk.
Education campaign: Challenging misconceptions	Messages have to be carefully chosen to address the specific behaviours of demographics using the crossing and those likely to red light traverse.	£10k-£100k Preparation of materials and production for dissemination to LCMs to manage locally – part of NR segmented media campaign structure.	Means of addressing behaviour that has proven so far resistant to national campaigns or other local safety interventions. Means of addressing behaviour that cannot be prevented through engineered solutions or is not cost effective.	Benefits won't be realised by all crossing users. Messages will have to be carefully selected to suit the red light behaviours at specific locations. Impact on behaviour may be long term, but this cannot be guaranteed.	Engineered solutions should be pursued before educational solutions. This approach should be deployed constructively - challenge assumptions/inform what the user should do. Messages should be carefully designed and consider the full range of reasons that may lead to a red light traverse.

APPENDIX F

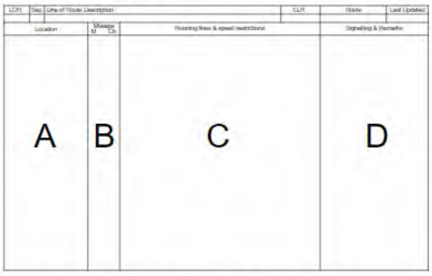
Last Updated: 02/06/2018

Explanation of Table A terms and symbols

Overview

Each 'Table A' diagram shows all running lines and connections, with their maximum permissible speed shown. Where appropriate, tunnels, stations, level crossings and other infrastructure is also shown. Location names, mileages and other details are additionally shown.

Each diagram has the following format:



The "Running lines & speed restrictions" column (C) shows a NOT TO SCALE map of part of the national rail network. Station platforms, signal boxes, tunnels, level crossings and other infrastructure will be shown. Line names and their maximum permissible speeds will be shown.

Unless indicated otherwise, all information is shown with the **Down**direction being down the page, and the **Up**direction being up the page.

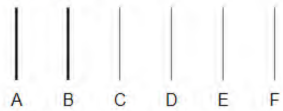
The "Location" column will provide the name of locations such as stations, tunnels, etc, which will be shown in line with their associated symbol in (C). The "Mileage" column (B), will provide the mileage of locations in miles and chains. Note: 1 chain = 22 yards = 20.11 metres. Where a railway line is measured in kilometres only, then this will be made clear on the relevant diagrams.

The "Signalling & Remarks" column (D) will provide further details such as the type of signalling present on the lines shown, where signalling is controlled from, an explanation of any abbreviations used in (C), and other details relevant to the area shown.

Across the top of the diagram, reading from left to right, are:
- the Line of Route (LOR) code
- the number of the diagram within that LOR
- the LOR description
- the Engineers' Line Reference (ELR) applicable to that part of the railway (more than one ELR may be shown)
- the Network Rail Route that manages that part of the railway shown
- date when the diagram was last updated.

Running lines, loops, sidings and other tracks

Lines are displayed as follows:



A: Line authorised to carry all types of train, including passenger trains.
B: Line authorised to carry goods trains or empty coaching stock trains only.
C: Line authorised to carry all types of train, including passenger trains, but part of another Line of Route. Details of which Table A diagram to refer to will be given.
D: Line authorised to carry goods trains or empty coaching stock trains only, but part of another Line of Route. Details of which Table A diagram to refer to will be given.
E: Track classed as a siding.
F: Other running line not controlled or managed by Network Rail (e.g. an adjacent London Underground Line, or adjacent metro tram line).