The Network Rail (Cambridge South Infrastructure Enhancements) Order

Proof of Evidence

NRE 6.3

Appendices to Proof of Evidence – Level Crossings (Mr John Prest)

(Inquiries Procedure (England & Wales) Rules 2004

January 2022

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Appendix JP1 – Principles for Railway Health and Safety published January 2017

Goal-setting Principles for Railway Health and Safety

January 2017

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Introduction

This introduction explains why ORR has decided to publish a set of goal-setting railway health and safety principles.

Status of the document

This document sets out ORR's expectations for the high-level health and safety outcomes that should be achieved by the railway (the "principles") when complying with the health and safety legislation related to the railway. It does not place additional burdens on dutyholders but highlights the factors which should be addressed by those designing and putting into use new railways or rail vehicles, including major upgrades and renewals from the earliest stage of such projects.

The document is not intended to address *operational* safety, but addresses how the *design* of railway vehicles, works, plant and equipment should take account of how it will be operated and maintained, including any reasonably foreseeable misuse, and any sustainability, resilience and whole life factors.

This document replaces and updates Part 1 ("the Principles") of HMRI's Railway Safety Principles and Guidance, which was discontinued in 2005.

Why have we issued these goal-setting railway health and safety principles now?

Her Majesty's Railway Inspectorate (HMRI) was historically responsible for giving statutory "approval" to new or altered works, plant and equipment. To enable the industry to be clear about the expectations of the inspectors and engineers responsible for considering applications for approval, HMRI published guidance on the most important safety principles and how they might be achieved. HMRI last fully updated its "railway safety principles and guidance" in 2005, shortly before its functions transferred to the Office of Rail Regulation (now the Office of Rail and Road).

Since 2005, there have been a number of changes to the safety and technical legislation relevant to the railway, driven primarily by the development of European railway legislation. These changes form part of a general move from 'rules' based safety management to a 'goal-setting' approach. The most significant recent legislation is:

- the Railways (Interoperability) Regulations 2011 (RIR) and the associated European Technical Specifications for Interoperability (TSIs)
- Common safety method on risk evaluation and assessment – EU Regulation 402/2013/EU (CSM RA)
- Construction (Design and Management) Regulations 2015 (CDM)

- Railways and Other Guided Transport Systems (Safety) Regulations 2006 (ROGS)

An important change introduced by ROGS was revocation of the Railways and Other Transport Systems (Approval of Works, Plant and Equipment) Regulations 1994, ending HMRI's responsibility for approving new or altered works, plant and equipment. The obligation to ensure that a safe railway was designed and built passed to the duty holder by way of 'Safety Verification'. Since 2013 on the mainline railway this has been overtaken by the common safety method on risk evaluation and assessment.

However, ORR regained a role in technical authorisations on parts of the mainline network as a consequence of interoperability legislation, and in 2011 the scope of such legislation was extended to the whole of the mainline railway, supported by a revised suite of Technical Standards for Interoperability (TSIs) completed in 2015.

This extension of the legislation, and ORR's authorisation role, has led to ORR's decision to update and re-publish our high-level expectations for new or altered works, railway vehicles, plant and equipment. While our authorisation role only extends to the mainline, we believe many of these expectations are likely to be equally applicable to all the railways and guided transport systems for which we are the health and safety regulator.

Where new railway infrastructure is commissioned, it is a statutory requirement (under CDM) that these projects achieve the aims of health and safety by design throughout the process from planning, through to construction, maintenance and decommissioning and the integration of human factors to each stage of this process. Health and safety by design is the key and ultimate principle for dutyholders. The industry has made progress in achieving health and safety by design, and we expect that following these principles will help and encourage the industry to develop a more consistent approach leading to health and safety benefits and cost savings.

Who is this document for?

The principles contained in this document apply to the design and placing into service of new or altered works, railway vehicles, plant and equipment capable of affecting health and safety on:

- Mainline railways
- Non-mainline railways (e.g. metro systems)
- Heritage railways

Certain elements of the principles may not apply to all the types of railway listed above and where this is the case, it is set out in subsequent chapters in the principles.

This document has been prepared with the following groups of people in mind;

- Health and safety managers in the rail industry;
- Those designing or putting into use new or altered works, railway vehicles, plant or equipment;
- Other managers in roles which affect health and safety, particularly in the development and implementation of standards;
- Staff working on the railway and their representatives;
- ORR railway inspectors and engineers

This document will allow you to:

- identify the high level health and safety principles relevant to you or your organisation or project;
- understand your responsibilities and help make sure you meet your duties; and
- find more detailed information if you need to.

General principles of prevention

When applying the principles in this document to activity on the railway, duty holders should consider the general principles of prevention starting with elimination before moving down the hierarchy of hazard control to the provision of personal protective equipment as set out in the Management of Health and Safety at Work Regulations 1999 (Available at http://www.legislation.gov.uk/uksi/1999/3242/made). We expect dutyholders to take a proactive approach in considering the principles of prevention.

Relationship to interoperability and standards on the mainline railway

Much of the UK domestic legislation arises from EU directives on railways and has been drafted to achieve compatibility with them. This document does not set out detailed or mandatory requirements for how to achieve compliance with the principles. Nor does it replace or duplicate more detailed requirements contained in technical specifications for interoperability or domestic health and safety regulations. Where the high level principles are dealt with in detailed guidance elsewhere, we have provided links to the relevant websites. The references and links provided in this document are correct at the time of publication, however you should always check that you are using the latest version when using any of the principles in the design of structures and systems covered by the document.

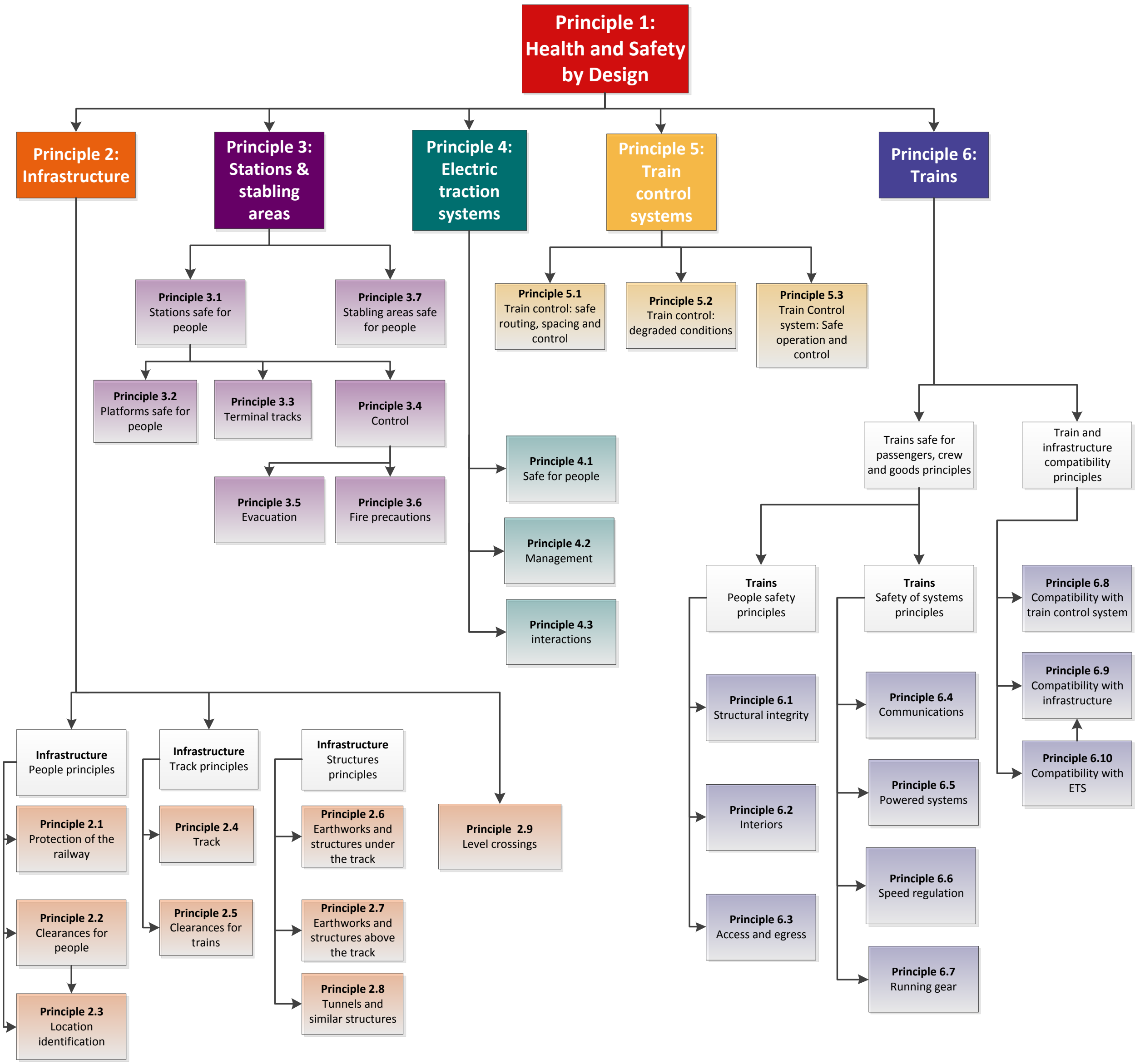
We continue to believe that responsibility for agreeing and producing detailed technical standards and guidance is best delivered by the industry itself. End users should be actively and effectively involved in the drawing up of industry standards to ensure their development is informed by feedback from operating experience. At a European level, this is delivered through strong industry participation in the development of TSIs and other standards. In the UK, the mainline industry collaborates on the development of complementary technical and operating standards through RSSB, and the heritage and tramways sectors have taken responsibility for their own technical guidance and standards. These principles are not intended to supersede, duplicate or conflict with these documents, but to complement them. Where European or domestic industry standards and guidance support compliance with the principles, they are sign-posted in the document.

Structure and content of the principles

This document sets out principles relating to:

- Health and safety by design
- Infrastructure
- Stations and stabling areas (sidings and depots)
- Electric traction systems
- Train control systems
- Trains

The flowchart sets out how the principles are arranged.



The principles describe the health and safety benchmark required by an item of works, plant or equipment and its interaction with people and other items of work, plant or equipment.

Each of the principles comprises a number of factors which should be taken into account in order to achieve the outcome described in the principle. The lists of factors are not exhaustive, nor are they listed in any fixed order of priority.

1. Health and Safety by design

Summary

This chapter explains the overarching principle of health and safety by design which is the ultimate goal of all the other railway safety principles set out in this document.

Principle 1

The railway shall ensure the elimination, or reduction and control, of health and safety risks in infrastructure, railway vehicles, products or processes.

The railway shall achieve this by considering and addressing early at the planning and design stage any potential risks from the construction of infrastructure and railway vehicles and manufacture of equipment, so that it is safe to use on the railway during installation, commissioning, operation, maintenance, de-commissioning and dismantling or demolition.

Factors

1.1 To help you achieve this principle, which underpins all the others, you must:

a) assess the impact of introducing new or altered works, plant or equipment on the whole railway system throughout the project's lifecycle (i.e. specification, design, construction, manufacture, installation, commissioning, operation, maintenance, de-commissioning and dismantling or demolition);

b) eliminate the risks and impacts so far as is reasonably practicable;

c) Ensure any risks remaining after elimination ("residual risks") can be effectively managed. Where elimination is not reasonably practicable, you must consider who is responsible for managing any residual risk and for any training necessary to manage the risk;

d) regularly evaluate the impact of planning and design decisions on all aspects of the lifecycle of the works, plant or equipment, beginning at the earliest stages of a project and continuing as options are selected and changes are made; and

e) integrate human factors processes which define how human factors will be managed throughout the lifecycle of the project(see human factors principles box)

1.2 To achieve the outcome expected by the principle, you should at least consider:

a) how the particular works, plant and equipment will interact with other new, altered or existing works, plant or equipment on the railway;

b) how the particular works, plant and equipment will interact with those of other railways and other guided transport systems;

c) what the works, plant and equipment will be used for, how it will be operated and how this affects the safety management system related to it;

d) New approaches used by the industry arising from information available following an investigation into an incident;

e) management of occupational health issues for workers such as manual handling, hand/arm vibration, hazardous substances and noise;

f) integration of human factors principles (see box below):

g) trespass, vandalism and wilful acts;

h) how the railway interacts with its adjacent environment including physical interfaces, noise, vibration, and electrical and magnetic interference;

i) the reliability and durability of the works, plant and equipment, and the level of maintenance required;

j) how the works, plant and equipment will be inspected and maintained throughout their life, including their decommissioning and disposal;

k) the control of risk posed when degradation occurs;

l) the integrity of safety critical works, plant and equipment;

m) the foreseeable climatic conditions in which the works, plant and equipment will be used and where relevant, including risks arising from climate change;

n) environmental legislation on pollution, such as noise, fumes etc where this may affect worker safety;

o) limiting fire load, ignition sources and fire spread; and

p) the impacts on passengers, including persons covered by the Persons of Restricted Mobility TSI.

Human factors principles

- A system is fit for purpose (from a human factors point of view) if it enables trained operators to carry out their designated tasks safely and reliably under normal, abnormal and emergency conditions;
- The system should not place undue demands on error-free and/or rapid human actions in response to emergency situations;
- Operators should be able to perform their tasks in a sustained manner without excessive workload, exceptional time pressure, significantly reduced levels of alertness or the need to use novel actions or procedures;
- Any equipment (hardware and/or software) provided for operators should support their needs and be tolerant of human error. It should be designed to avoid any loss of confidence in, or frustration with, the equipment by users;
- Equipment should be designed to minimise the need for trained operators to have frequent recourse to user instructions or to other forms of help or written procedures;
- The terminology used on any equipment should match that in normal use by operators, to avoid confusion;
- Priority operator responses to ensure the safety of passengers and staff should be clearly distinguished by suitable design means. Such responses should be quick and easy to make;
- Different items of equipment (including equipment from different suppliers) used by an operator should present information in a consistent format with compatible means of navigation and control;
- Any long-term health effects which may arise from the ergonomics of the workplace should be identified and suitable controls implemented; and
- Wherever possible there should be compliance with current human factors design standards and good practice guidelines.

Where can I find the legal requirements for health and safety by design?

The concept of health and safety by design is covered in a number of different areas of health and safety legislation including.

Council Directive 89/391/EEC on the introduction of measures to encourage improvements in the safety and health of workers at work

European Commission Regulation 2013/402/EU on a common safety method for risk evaluation and assessment (CSM Risk evaluation and assessment)

Technical Specifications for Interoperability (TSI's)

Control of Noise at Work Regulations 2005

Construction (Design and Management) Regulations 2015

Fire Precautions (Sub-surface Railway Stations) (England) Regulations 2009

Health and Safety at Work etc. Act 1974

Health and Safety (Safety, Signs and Signals) Regulations 1996

Management of Health and Safety at Work Regulations 1999

Railways and Other Guided Transport Systems (Safety) Regulations 2006

Railways Interoperability Regulations 2011

Regulatory Reform (Fire Safety) Order 2005

Supply of Machinery (Safety) Regulations 2008

Workplace (Health, Safety and Welfare) Regulations 1992

Where can I find further guidance on health and safety by design?

Guidance on health and safety by design can be found in:

- Chapter 12 of ORR's strategic risk document available at http://orr.gov.uk/__data/assets/pdf_file/0009/21402/2016-03-18-New-Strategic-Chapter-12-Health-and-Safety-by-Design.pdf
- ORR's guidance on CSM risk evaluation and assessment
- ORR's website page on Health and Safety by Design
- Human factors integration - http://orr.gov.uk/__data/assets/pdf_file/0011/22160/human-factors-integration-orr-evidence-principles.pdf
- A list of the applicable TSI's is available through RSSB.

2. Infrastructure principles

Summary

This chapter explains the principles related to infrastructure safety and is divided into four sections:

- People principles;
- Track principles;
- Structures principles; and
- Level crossings

People

The section sets out the principles related to people on or around railway infrastructure. The principles are:

- Protection of the railway;
- Separation from the operational railway for people; and
- Location identification.

Principle 2.1: Protection of the railway

The railway should be protected against unwanted intrusion and unauthorised access.

Factors

2.1 To help you achieve this outcome, you should at least consider:

a) the risk of unauthorised access and the provision of suitable barriers, signs and arrangements;

b) the need for authorised access by people (workers, emergency services etc) while deterring access to others;

c) the particular risks of access to any electric traction system and how they will be controlled;

d) the presence of earthworks and supporting structures above or adjacent to the railway;

e) the prevention of trespass at any level crossings;

f) the impact of activities adjacent to the railway;

g) the provision of crash barriers where roads are adjacent to the railway; and

h) visual distractions such as lasers or beams of light (including those from road vehicles adjacent to the railway).

Principle 2.2: Separation of people from the operational railway

People carrying out duties on the operational railway should be separated from it so that they are able to carry out their duties in safety. Where operational procedures permit people onto the infrastructure while trains are operating, adequate clearances should be provided to enable them to carry out their duties in safety.

Factors

2.2 To help you achieve this outcome, you should at least consider:

a) the range of people permitted onto the infrastructure including the different needs of people who routinely and frequently go out on the infrastructure compared to those who do so only occasionally;

b) the safety clearances on the track side taking into account the aerodynamic effect of passing trains;

c) the provision of a place of safety or refuge and the time required to reach it by workers on or about the track;

d) the appropriate marking of structures where clearances do not include allowances for personnel safety;

e) the safety clearances for all walkways including those to signal posts and in sidings and depots;

f) how emergency disembarkation of people on the train will be managed;

g) the positioning and securing of any electric traction system equipment; and

h) Positioning of equipment, such that safe access is easily achieved.

Principle 2.3: Location identification

Appropriate means to identify defined locations on the infrastructure should be provided for the safe operation and maintenance of the railway.

Factors

2.3 To help you achieve this outcome, you should at least consider:

a) the need to identify uniquely a particular location:

b) the need to identify uniquely any structures;

c) the method of operating the railway in both normal, degraded and emergency conditions; and

d) the need to respond to foreseeable incidents and attendance by emergency services; the need for the identifying mark to be observed from both on and off the railway

Track

The section sets out the principles related to track on railway infrastructure. They are:

- Track; and
- Clearances for trains.

Principle 2.4: Track

The track should provide for the safe guidance and support of trains.

Factors

2.4 To help you achieve this outcome, you should at least consider:

a) The static and dynamic forces imposed by trains on the range of track geometry;

b) Maintenance procedures to ensure that the track remains within normal condition tolerances;

c) the transfer of loads to the supporting structures;

d) the arrangements for the transfer of trains from one track to another;

e) the effect of temperature on the safe performance of the track;

f) the requirements of any signalling, train control or electric traction systems;

g) the provision of adequate containment arrangements where the effects of derailment would be severe;

h) measures to reduce and manage contamination to the rails ;

i) drainage;

j) the arrangements at any level crossing;

k) the means of preventing and detecting track failure, including alignment and geometry;

l) the noise and vibration that may be generated and their effects; and

m) risks, where relevant, arising from climate change.

Principle 2.5: Clearances for trains

There should be adequate and sufficient clearances between trains on adjacent tracks and between trains and structures and fixed equipment to ensure safe passage.

Factors

2.5 To help you achieve this outcome, you should at least consider:

a) The static and dynamic forces imposed by trains on the range of track geometry;

b) the static vehicle profile of trains taking account of the range of track geometry;

c) the dynamic vehicle profile and behaviour of the trains at all permitted speeds taking account of the range of track geometry;

d) the aerodynamic effects generated by trains passing through restricted spaces;

e) the need to place equipment within the confines of the structures without affecting clearances;

f) the maximum and minimum clearances required at platforms;

g) special arrangements to locate and position the track in relation to structures;

h) the means of maintaining clearances.

Structures principles

The section sets out the principles related to structures on railway infrastructure. They are:

- Earthworks and structures under the track;
- Earthworks and structures above the track; and
- Tunnels and similar structures.

Principle 2.6: Earthworks and structures under the track

Any earthworks and structures supporting the track must be capable of carrying and transferring the forces exerted by the trains.

Factors

2.6 To help you achieve this outcome, you should at least consider:

a) the ground conditions in the locality, (including historic ground conditions);

b) the static and dynamic track loading;

c) the risk of collision from road, rail or water traffic and the likely impact damage;

d) the risk of flooding and scour, and their effects including risks from climate change in accordance with parameters set out in current rail industry guidance;

e) the risk of derailment and the need to provide for derailment containment;

f) the positioning and securing of any electric traction system equipment;

g) the activities adjacent to the railway;

h) the risk to earthworks and structures from the failure of pipes or other services under or running alongside the railway; and

i) the risk to earthworks from the effects of burrowing animals or invasive vegetation.

Principle 2.7: Earthworks and structures above the track

Earthworks and structures above or adjacent to the railway must be capable of supporting the loads imposed upon them and afford protection to the railway.

Factors

2.7 To help you achieve this outcome, you should at least consider:

a) the ground conditions in the locality (including historic ground conditions);

b) the loading on the structures over or adjacent to the railway;

c) the risk of collision from road, rail or water traffic and the likely impact damage;

d) the risk of flooding and scour, and their effects including risks from climate change;

e) the risk of derailment and the need to provide for derailment containment;

f) the positioning and securing of any electric traction system equipment;

g) the activities adjacent to the railway;

h) the risk to the railway from failure of pipes or other services crossing above or running alongside the railway; and

i) The risk to structures from the effects of invasive vegetation and burrowing animals.

Principle 2.8: Tunnels and similar structures

Tunnels and other enclosed spaces should provide a safe environment for people and for safe evacuation.

Similar structures
Tunnels are not necessarily sub-surface. Developments over the railway, deep cuttings or other structures may give rise to situations with similar characteristics to tunnels with respect to limited means of access and egress, means and time to escape to a place of safety, and lack of natural ventilation

Factors

2.8 To help you achieve this outcome, you should at least consider:

a) the ground conditions in the locality (including historic ground conditions);

b) the length of tunnel, single or double track, cross-passages and intervention or escape shafts;

c) the type and frequency of traffic, and type and length of trains relative to the length of the tunnel;

d) the location of stop signals and position of the whole train when stopped at them.

e) the clearances within the tunnel;

f) the fire load of the tunnel and equipment or rolling stock within it;

g) any smoke and fire detection, and fire-fighting and suppression arrangements;

h) the provision of fresh air and the arrangements to control smoke and other emissions;

i) the aerodynamic effects generated by trains passing through restricted spaces;

j) compatibility with rolling stock for emergency evacuation;

k) a safe means of escape to a place of safety for all users in an acceptable time;

l) the provision of emergency lighting, communications and route signing;

m) the provision of safe access for emergency services;

n) the risks of flooding;

o) positioning and security of electric traction equipment, including the means of de-energising any electric traction system;

p) risks and hazards to people working on the railway from maintenance activity; and;

q) the fencing and security arrangements at tunnel portals and any ventilation and evacuation shafts.

Principle 2.9: Level Crossings

The removal of a crossing or the use of an alternative means of crossing the railway is always the first option to be considered in a risk control strategy by the duty holder. Where there is no reasonably practicable alternative to people crossing the railway at track level, a risk assessment should identify the appropriate arrangements which should be provided to protect and warn the users of the level crossing, and safeguard the railway

Factors

2.9 To help you achieve this outcome, your risk assessment should at least consider:

a) alternatives to a level crossing, such as overbridges and underpasses;

b) protective features that are appropriate for;

i) the volume of use, characteristics and behaviours (including perception of risk) exhibited by users ; and

ii) the frequency and speed of trains;

c) the desire, especially for level crossings on public roads, for them to present a consistent visual appearance for vehicle users;

d) the possibility of slow or abnormal road traffic using the level crossing;

e) the type of road or path on either side of the level crossing;

f) the need to deter trespass and straying onto the railway;

g) the protection of the level crossing by the signalling system;

h) the effect of equipment failure on the safety of trains and level crossing users;

i) the arrangements to avoid danger if a level crossing user is trapped;

j) the need for local operation; and

k) the interface with any electric traction system.

Where can I find the specific legal requirements for infrastructure safety?

Specific requirements for safety of railway infrastructure is covered in a number of different areas of health and safety legislation including:

- Infrastructure TSI (Commission Regulation 2014/1299/EU)
- Noise TSI (Commission Regulation 2014/1304/EU)
- Persons with Reduced Mobility TSI (Commission Regulation 2014/1300/EU)
- Safety in Railway Tunnels TSI (Commission Regulation 2014/1303/EU)
- Fire Precautions (Sub-surface Railway Stations) (England) Regulations 2009
- Fire Precautions (Sub-surface Railway Stations) Regulations 1989 [Scotland only]
- Fire (Scotland) Act 2005 [in Scotland only].
- Level Crossings Act 1983
- Regulatory Reform (Fire Safety) Order 2005
- Railway Safety (Miscellaneous Provisions) Regulations 1997

Where can I find further guidance information on infrastructure safety?

Guidance on infrastructure safety can be found in.

- ERA application guidance on TSI's available at http://www.era.europa.eu/Core-Activities/Interoperability/Pages/TSI-Application-Guide.aspx
- Railway Group Standards issued by RSSB
- Guidance on the road/rail interface http://orr.gov.uk/what-and-how-we-regulate/health-and-safety/guidance-and-research/infrastructure-safety/roadrail-interface-sites
- ORR's strategy for regulation of health and safety risks - Chapter 4: Level crossings
- Level crossings: A guide for managers, designers and operators
- The level crossings risk management human factors toolkit
- Rail guidance document on new/re-instated level crossings
- Railway Group Standards and guidance issued by RSSB
- Level Crossing management toolkit - http://www.lxrmtk.com/

3. Station and stabling areas principles and guidance

Summary

This chapter explains the different principles that relate to station and stabling areas. There are two principles which relate to:

- Stations safe for people; and
- Stabling areas safe for people.

Principle 3.1: stations safe for people

Stations should provide for the free and safe movement of people and should not give rise to risk to health to people in the station or working on the railway at the station.

Factors

3.1 To help you achieve this outcome, you should at least consider:

a) the movement and flow of people in and out of the station and to and from the platforms (including removing obstacles and the position of travel information screens);

b) providing safe access for maintenance of the structure and equipment;

c) waiting within a station in normal or abnormal operating conditions;

d) the arrangements to control overcrowding; the behaviour of people in enclosed areas; the sizing, materials and treatment of surfaces of concourses, passageways, ramps, stairs, escalators and platforms;

e) the suitability of escalators, lifts and passenger conveyors for the number of people they are to carry;

f) the number, size and spacing of exits;

g) the positioning of booking offices, ticket machines and retail outlets;

h) the provision of adequate and usable communication equipment and signs;

i) the provision of adequate lighting throughout the station;

j) the provision of adequate emergency lighting in the event of loss of power supplies (including the monitoring and testing of such lighting);

k) the adequacy of ventilation arrangements;

l) the integrity of the station structure and its ability to survive emergency situations;

m) the security of people;

n) providing a healthy environment for people working in stations;

o) risks and hazards to people using the station or working on the railway at the station from maintenance activity

p) the arrangements for the emergency evacuation of a station, including the special arrangements necessary for sub-surface stations including the additional risks caused by fire and the need to segregate evacuation routes and provide ventilation control systems; and

q) impact on people covered by the Persons of Restricted Mobility (PRM) TSI.

Principle 3.2: platforms safe for people

Platforms should allow for the safe waiting of people and for their safe boarding and alighting from trains.

Factors

3.2 To help you achieve this outcome, you should at least consider:

a) the protection arrangements for structural supports against derailment;

b) the compatibility of the platforms with the trains;

c) stepping distances and heights between platforms and trains including for persons covered by PRM.

d) the arrangements to control access to the platforms;

e) the facilities for train crew and platform staff to observe boarding and alighting passengers and to safely manage train despatch;

f) provision for people waiting on the platform and the movement of people on and between platforms;

g) the need to avoid 'pinch points' at platform entrances and exits;

h) the effect of platform edge screen doors on the station and other systems of the railway;

i) the positioning of information boards and vending facilities where they may impact on passenger movement and create crowds.;

j) the arrangements to deter trespass from the platform onto unauthorised parts of the railway;

k) the surface material, treatment and drainage of platforms to avoid tripping and slipping;

l) the need for platforms to be easily cleaned and the avoidance of places where debris can collect;

m) the aerodynamic effects generated by trains passing through restricted spaces;

n) ventilation arrangements;

o) the effect of any "train on fire" at the platform;

p) the means of escape in case of fire; and

q) emergency escape lighting.

Principle 3.3: Terminal tracks

Where stations have terminal tracks, arrangements should be provided to stop a train and protect people and the station from the effects of an overrun.

Factors

3.3 To help you achieve this outcome, you should at least consider:

a) the protection arrangements for structural supports against derailment;

b) the positioning of structural and other critical supports;

c) the positioning of booking offices and retail outlets;

d) the areas where people are likely to congregate;

e) the overrun provisions and type of arresting device(s) provided;

f) the protection that can be gained from automatic train protection or train stop systems;

g) the effect on braking performance caused by the weather, or contaminants;

h) the balance of risk between damaging the train and injury to its passengers, and damaging the station and the people using the station

i) the effect of any train on fire in the platform;

j) the means of escape in case of fire; and

k) emergency escape lighting.

Principle 3.4: control

Arrangements should be made and facilities provided to enable effective operational control of the station in co-ordination with the railway and with activities adjacent to the railway.

Factors

3.4 To help you achieve this outcome, you should at least consider:

a) the means of co-ordinating activities on the railway with those within the station so they do not cause additional risks to each other;

b) relationships and liaison arrangements with adjacent or connecting railway systems and with activities adjacent to the railway;

c) the level and diversity of surveillance, communication and information required to control the activities within the station complex;

d) the means of communication and the provision of information and instructions to workers and other people;

e) the liaison arrangements at the station for the emergency services; and

f) the availability of control facilities during emergency situations.

Principle 3.5: evacuation

The station and its control arrangements should allow for safe evacuation in an emergency.

Factors

3.5 To help you achieve this outcome, you should at least consider:

a) the time taken to complete evacuation of the station;

b) the protection of evacuation routes;

c) where people will gather after evacuation;

d) clearly designated roles and responsibilities of those managing the evacuation;

e) access for emergency services, especially in sub-surface stations;

f) information systems for evacuation of the station;

g) the zoning of public address systems;

h) the management of any ventilation system;

i) how people covered by the Persons with Restricted Mobility TSI can be evacuated safely

j) the means of escape in case of fire; and

k) emergency escape lighting.

Principle 3.6: fire precautions

Stations should have fire and fume prevention and control measures commensurate with the fire risk and evacuation arrangements.

Factors

3.6 To help you achieve this outcome, you should at least consider:

a) minimising the fire load;

b) the segregation of public areas of stations from non-public areas and high fire risk areas;

c) the provision of fire detection and warning systems and fire suppression systems;

d) ventilation and zoning for fume extraction systems to limit smoke from a fire spreading to other parts of the station;

e) the aerodynamic effects generated by trains passing through restricted spaces;

f) the provision and identification of initial fire-fighting equipment;

g) facilities and systems for fire-fighters;

h) the location of a suitable ‘rendezvous’ point where station staff will meet emergency services;

i) the means of escape in case of fire;

j) emergency escape lighting;

k) access and water supplies for the fire and rescue service; and

l) the additional risks caused by fire in a sub-surface station and the need to segregate evacuation routes and provide ventilation control systems

Principle 3.7: stabling areas safe for people

The railway system should provide for the safe marshalling, stabling, servicing and maintenance of trains.

Factors

3.7 To help you achieve this outcome, you should at least consider:

a) the segregation of the marshalling, stabling, servicing and maintenance areas from the running lines;

b) the protection of people in these areas from danger from moving trains;

c) any incline in relation to runaway trains;

d) the type of any electric traction system as overhead traction is generally safer. The position of any electric traction system, its sectioning and its means of isolation to facilitate train cleaning, servicing, maintenance or any other activities;

e) protection of the area from activities adjacent to the railway;

f) the need for adequate clearances and walkways;

g) the need for identifiable crossing places;

h) secure stabling of trains;

i) segregation of road vehicles in the area from trains and people;

j) the arrangements for the control of train movements within, into and from the area;

k) the provision of lighting for operational activities

l) risks and hazards to people working in the stabling area;

m) human factors arising from activities in the stabling area;

n) the security of the site from trespass;

o) contact with any electric traction system;

p) Safe access to trains when working at height;

q) means of escape in event of fire;

r) means of raising the alarm in the event of fire;

s) external and internal fire spread;

t) emergency escape lighting; and

u) access and water supplies for the fire and rescue services;

Where can I find the specific legal requirements for stations and stabling areas safety?

Specific requirements for safety of railway stations and stabling areas is covered in a number of different areas of health and safety legislation including.

- Infrastructure TSI (Commission Regulation 2014/1304/EU)
- Persons with Reduced Mobility TSI
- Building Regulations 2010
- Construction (Design and Management) Regulations 2015
- Fire (Scotland) Act 2005 [*in Scotland only*]
- Fire Precautions (Sub-surface Railway Stations) (England) Regulations 2009
- Regulatory Reform (Fire Safety) Order 2005
- Workplace (Health, Safety and Welfare) Regulations 1992

Where can I find further guidance on stations and stabling areas safety?

Guidance on railway stations and stabling areas safety can be found in:

- ERA application guidance on TSI's available at http://www.era.europa.eu/Core-Activities/Interoperability/Pages/TSI-Application-Guide.aspx
- Railway Group Standards issued by RSSB
- BS 7974:2001 - Application of fire safety engineering principles to the design of buildings.
- Building Regulations 2010: approved document B, volume 2
- Fire Safety Risk Assessment for transport premises issued by the Home Office
- Practical fire safety guidance for transport facilities [Scotland]

4. Electric traction system principles and guidance

This chapter explains the different principles and guidance that relate to electric traction systems. There are three principles which relate to:

- electric traction that is safe for people;
- management of electric traction ; and
- interactions.

Principle 4.1: electric traction safe for people

An electric traction system should be designed not to present health and safety risks to people.

Factors

4.1 To achieve this outcome you should ensure that:

a) The nominal wire height for a newly electrified railway should be maximised to create so far as is practicable an environment where clearances are not compromised, eg, in station areas;

b) Clearances to live non-insulated parts should be sufficient to provide safety for people working on or using the railway. Where clearances are compromised, effective protective measures (e.g. electrically protective barriers, obstacles etc.) should be considered;

c) Where ever possible live conductors should be effectively insulated to prevent danger;

d) Any live exposed conductors other than the contact wire should wherever possible be eliminated at the design stage. Any that cannot be eliminated including legacy items should be marked on drawings and recorded as residual hazards to be appropriately managed;

e) dangerous touch potentials on structures within and adjacent to the railway are avoided;

f) the arrangements at level crossings maximise the wire height and take account of the vehicle types likely to use that crossing, eg agricultural machinery;

g) the sectioning and isolation arrangements for normal operations or for maintenance should reflect and facilitate the time required for all maintenance work to be carried out in safe conditions;

h) any work being carried beneath conductors to be carried out safely and in accordance with the Electricity at Work Regulations 1989;

i) the arrangements to ensure that anyone who may foreseeably access the infrastructure are not exposed to danger; including management of parapet heights over electrified railways (bridge parapets of 1.8m represent the legal minimum for overhead electrified railways where the parapets are used to provide the protective measure); and

j) the routing and positioning of the electric traction system should enable people to avoid exceeding the relevant limits for exposure to electromagnetic fields.

Principle 4.2: electric traction systems management

An electric traction system should provide for its safe management and operation.

Factors

4.2 To help you achieve this outcome, you should at least consider:

a) the provision of adequate, reliable and useable means of communications between the electrical control centre, the electricity supplier, the railway control centre, the emergency services and trackside locations;

b) coordination of sectioning, isolation and possession arrangements for normal operations, including for maintenance and in emergencies;

c) the means for achieving isolations that are secure including access arrangements and the prevention of trains bridging between sections;

d) the continuity of power supply and the effect of its loss; for instance the separation of depot supply from the main running line;

e) the power supply and return configuration and its management;

f) earth fault and short-circuit protection;

g) the monitoring of the status of the electric traction system equipment;

h) the marking of electric traction system equipment and structures for location purposes; and

i) special circumstances for sub-surface railways.

Principle 4.3: electric traction systems interactions

An electric traction system should not give rise to or be subject to dangerous interactions within the railway or with other systems.

Factors

4.3 To help you achieve this outcome, you should at least consider:

a) the traction system and the characteristics of other trains which operate over the electrified lines;

b) the compatibility and separation of different electric traction systems;

c) the interfaces with trains or other plant and equipment;

d) the structures, rail-mounted plant and trains on the railway and the electrical clearances;

e) the siting of both conductor rails and overhead line equipment to allow sufficient clearance so as not to foul the trains or interfere with other structures on the railway;

f) the transfer of electro-magnetic fields which may be generated and their likely effects on other plant and equipment on the railway or adjacent to it; and

g) the transfer of electrical effects and their likely impact on other plant and equipment in use on the railway or adjacent to it.

Where can I find the specific legal requirements for electric traction systems safety?

Specific requirements for safety of electric traction systems is covered in a number of different areas of health and safety legislation including:

- Energy TSI
- Infrastructure TSI
- Persons of Reduced Mobility TSI
- Electrical Equipment (Safety) Regulations 1994
- Electricity at work Regulations 1989
- Electromagnetic Compatibility Regulations 2006

Where can I find further guidance on electric traction systems safety?

Guidance on electric traction safety can be found in:

- ERA application guidance on TSI's available at http://www.era.europa.eu/Core-Activities/Interoperability/Pages/TSI-Application-Guide.aspx
- Railway Group Standards and guidance issued by RSSB
- Guidance on the Electricity at Work Regulations issued by HSE http://www.hse.gov.uk/pubns/books/hsr25.htm

5. Train control system principles and guidance

Summary

This chapter explains the different principles that relate to train control systems.

Principle 5.1: safe routing, spacing and control

The train control system shall provide for the safe routing, spacing and control of trains.

Factors

5.1 To help you achieve this outcome, you should at least consider:

a) the prevention of collisions and derailments;

b) protection against precursors that could lead people making errors or mistakes during operational activity;

c) the type of trains permitted to operate on or likely to operate on the railway;

d) the effects of the electric traction system;

e) the type of track and track condition;

f) the interface with communication and other systems;

g) the protection of the railway from the train control system failing in an unsafe mode;

h) the avoidance of the degradation of the train control system from the use of secondary or other interfacing systems;

i) the capability of the train control system to be maintained without endangering the railway;

j) the marking of train control equipment for location purposes and identification of lineside signals;

k) the means of cancelling proceed indications in an emergency;

l) the effects of possible modifications to the train control system, including any upgrades (e.g software) and their validation;

m) the compatibility with level crossing arrangements;

n) interference from electrical sources;

o) protection of the train control system from malicious interference;

p) impact from any new type of train control system being installed. This includes train control systems being overlaid on an existing train control system as well as replacement; and

q) the presentation of information to the driver to ensure that driveability issues are taken into consideration for all types of train operating over the system.

Principle 5.2: degraded conditions

The train control system should continue to provide for safe passage of trains permitted to run under degraded conditions.

Factors

5.2 To help you achieve this outcome, you should at least consider:

a) design for levels of degraded conditions so that correctly working parts of the train control system may continue to be used safely;

b) protection from failure modes creating unsafe situations;

c) the loss or restoration of power supplies creating unsafe situations;

d) the identification of and communication with specific trains or signals;

e) the making of general broadcasts to trains and signallers;

f) alternative means of communication between the signaller and the driver of the train and between signallers;

g) the controlled restoration of the whole train control system; and

h) protection against precursors liable to lead to people making errors or mistakes during degraded operation.

Principle 5.3: safe operation and control in an emergency

Sufficient arrangements and facilities should be provided for the safe operation of the railway and for coordinated control between the railway and external organisations in the event of an emergency.

Factors

5.3 To help you achieve this outcome, you should at least consider:

a) the interfaces between the controls of the infrastructure, trains, stations and the emergency services;

b) the communication with the controls of the infrastructure, trains, stations, the emergency services and people using the railway;

c) the effective facilities for normal, abnormal and degraded conditions, and emergency situations; and

d) the inter-relationships between control systems.

Where can I find the specific legal requirements for train control system safety?

Specific requirements for safety of train control systems are covered in a number of different areas of health and safety legislation including:

- Control Command and Signalling TSI
- Electricity at Work Regulations 1989
- Electromagnetic Compatibility Regulations 2006
- Railway Safety Regulations 1999

Where can I find further guidance on train control systems safety?

Guidance on train control systems safety can be found in:

- ERA application guidance on TSI's available at http://www.era.europa.eu/Document-Register/Pages/TSI-Application-Guide.-CCS-TSI.aspx
- Railway Group Standards and guidance issued by RSSB
- Cyber Security Informed Safety Cases for the Rail Industry: Code of Practice issued by DfT.

6. Train principles

Summary

This chapter explains the different principles that relate to trains. There are two principles which relate to:

- Trains safe for passengers, crew and goods; and
- Train and infrastructure compatibility.

Trains safe for passengers, crew and goods

This section sets out the principles for safe trains for passengers, crew and goods. They are:

- People and goods safety
    - Structural integrity
    - Interiors
    - Access and egress
- Safety of systems
    - Communications
    - Powered systems
    - Speed regulation
    - Running gear

Principle 6.1: structural integrity

The structural integrity of trains should be maintained during normal operations and afford effective protection to people and goods carried in the event of an accident.

Factors

6.1 To help you achieve this outcome, you should at least consider:

a) the maximum loads foreseeably arising in normal operations;

b) the effects of a collision and the crashworthiness of a vehicle;

c) the structural compatibility of all trains using the route unless there are arrangements to reduce further the risk of collision;

d) effects of structural fatigue on the trains;

e) the level of containment and containment arrangements of any goods carried and any foreseeable movement of the goods that may occur;

f) the protection from and containment of fire;

g) the integrity of attachment of equipment;

h) the range and compatibility of coupling devices and other inter-train connections;

i) compatibility with buffer stops or similar train arrestor devices;

j) the arrangements for lifting the vehicle for both normal maintenance and emergency situations; and

k) the ability of glazing to resist impact damage and withstand aerodynamic effects.

Principle 6.2: interiors

The interiors of trains should provide a healthy and safe environment for people and any goods carried.

Factors

6.2 To help you achieve this outcome, you should at least consider:

a) compatibility with the body shell of the vehicle and the access and egress arrangements;

b) intended passengers (including persons covered by the PRM TSI) and their foreseeable behaviour which can include sitting, standing, sleeping, moving about the train, and the taking of meals or refreshments;

c) foreseeable events which may lead to injury and the interior passive safety features which may be taken to mitigate against injury;

d) foreseeable actions by people which may lead to injury to others;

e) the stowage of luggage, goods and equipment, including bicycles and wheelchairs, and their retention in normal operation and during an incident or collision;

f) the integrity of fixtures and fittings and their crashworthiness;

g) the limitation of fire load, ignition sources and fire spread;

h) the conditions and ergonomics to enable the train crew to operate the train safely;

i) the heating, ventilation and lighting of the vehicle in both normal and degraded operation of the train or railway;

j) train-borne noise;

k) the retention of toilet and other waste;

l) the interaction of security arrangements with safety arrangements; and

m) the provision and marking of emergency or safety equipment to deal with incidents

Principle 6.3: access and egress

Trains should have a safe means of access, egress and retention of people and goods carried.

Factors

6.3 To help you achieve this outcome, you should at least consider:

a) acceptable stepping distances to and from the platform including arrangements for persons covered by the PRM TSI;

b) the size, number and arrangement of doors;

c) the arrangements for the control of the doors;

d) the arrangements to prevent the doors being opened when the train is moving;

e) the arrangements to avoid trains departing with doors open;

f) the hazards created by the doors moving including the arrangements to avoid trapping people or clothing in doors prior to departure from a station to prevent people being dragged by a train setting off;

g) the arrangements for emergency evacuation of the train;

h) provision of equipment and arrangements for the escape of persons in an emergency; and

i) the arrangements for gaining access into the train in emergency situations.

Principle 6.4: communications

There should be effective means of communicating safety messages to passengers on the train or boarding and alighting from it; and between passengers and staff on the train both on board the train and to external controllers in event of an emergency.

Factors

6.4 To help you achieve this outcome, you should at least consider:

a) communications between the train, train crew and control or signalling centres;

b) communications between the members of the train crew on-board the train;

c) communications between the train crew and passengers;

d) passenger emergency alarm facilities;

e) provision of information for passengers with either visual or auditory impairments;

f) maintenance and monitoring of communication equipment;

g) availability of communication systems in degraded operations or emergency situations, including fire; and

h) Prevention of malicious interference of any such communication equipment including any software.

Principle 6.5: powered systems

The electrical and other powered systems and equipment on-board trains should not endanger other systems or people.

The systems covered by this principle include on-board electrical, mechanical, air or hydraulic systems or equipment including electric traction current collection, main and auxiliary power systems and all electrical control systems including software.

Factors

6.5 To help you achieve this outcome, you should at least consider:

a) interference with other powered control systems;

b) the positioning and protection of equipment and electrical conductors to avoid accidental contact by people;

c) the effect of the loss of power supply and their effects;

d) the effect of the loss of safety critical systems;

e) retention of and protection from failed mechanical components

f) the limitation of fire load and its protection, ignition sources, fire spread and smoke and fumes;

g) unauthorised access to, or use of, equipment (including software systems) and the prevention of malicious interference;

h) the availability of powered systems in degraded operations or emergency situations;

i) bonding and short-circuit protection including RCD protection of sockets available for use by passengers;

j) avoidance or control of electro-magnetic fields which are known to be harmful to people;

k) the safe management of any stored energy devices on the train in normal and emergency situations;

l) the arrangements for safe maintenance of powered systems, including de-energisation during maintenance;

m) the control of emissions; and

n) the control of noise.

Principle 6.6: speed control and braking

The speed control and braking system of the train should meet the operational requirements of the railway without endangering people and goods carried.

The speed regulation system may include systems other than the braking system.

Factors

6.6 To help you achieve this outcome, you should at least consider:

a) the requirement for the braking system to be continuous, capable of stopping and holding a divided train, and holding a stabled train;

b) the acceleration and deceleration rates and the rate of change of those rates to avoid endangering the people and goods carried or damaging the vehicles and their couplings;

c) the performance of the braking system under all foreseeable conditions of adhesion;

d) the incapacity of the train driver;

e) redundancy in the service braking;

f) the availability of the braking system on demand;

g) the overall braking performance provided by one or more braking systems;

h) the transition between different types and combinations of braking systems;

i) the gradients of the railway;

j) the compatibility with the track and, in particular, the forces imposed on the track;

k) the compatibility of the service braking performance with the train control system;

l) the compatibility with the electric traction system, including the compatibility of any regenerative braking systems and the effects of the receptivity of the traction system on braking performance;

m) minimising the risk of ‘dragging’ brakes;

n) minimising the release of toxic or other harmful substances from brake pads or blocks;

o) the provision of a reliable indication of speed; and

p) the compatibility with train control or driver advisory systems as they develop.

Principle 6.7: running gear (including wheels, axles and bogies)

The running gear should guide the train safely along the track.

Factors

6.7 To help you achieve this outcome, you should at least consider:

a) the compatibility of the wheel and rail interface;

b) the range of train operating speeds;

c) the compatibility with the track geometry;

d) maintenance procedures to ensure the wheel profile remains within normal condition tolerances;

e) the arrangements for transfer between tracks;

f) the effects of traction and braking forces;

g) the effects of permitted forces imparted to the track or train body and within the components of the running gear;

h) the risk and effects of component failure, particularly of wheel-sets and bearings;

i) the effects of collisions with obstacles and the provision of effective obstacle deflection;

j) the risk of derailment due to wheel unloading including from the influence of offset loads and locked suspensions;

k) transfer of noise or vibration to the track or the train body;

l) the integrity of attachment of equipment to the running gear; and

m) effective electrical bonding of the vehicle to ensure safe operation on the railway.

Train and infrastructure compatibility

The section sets out the principles related to train and infrastructure compatibility. The principles are:

- Compatibility with train control systems
- Compatibility with infrastructure
- Compatibility with electric traction system

Principle 6.8: Compatibility with train control system

The train should be compatible with the train control system.

Factors

6.8 To help you achieve this outcome, you should at least consider:

a) the service braking performance allowed for by the train control system;

b) the acceleration and deceleration rates allowed for by the train control system;

c) the effects of electro-magnetic interference and the arrangements to be employed to guard against interfering with the train control system;

d) the compatibility with train position detection arrangements;

e) the data transfer arrangements between the train and the train control system;

f) the presentation and availability of train control information at the driving position;

g) the implications of transitions between different signalling and train protection systems; and

h) whole lifecycle management of on-board signalling and train protection systems.

Principle 6.9: Compatibility with infrastructure

The train should be dimensionally compatible with the infrastructure and be capable of operating within the clearance envelope at all times

Factors

6.9 To help you achieve this outcome, you should at least consider:

a) the allowances for safety clearances under static and dynamic conditions;

b) the influence of the track geometry on the dynamic performance of the train;

c) the centre and end throws of the train on curved track;

d) the clearances between structures and trains;

e) the clearances between trains on adjacent tracks;

f) the length of platforms;

g) the stepping distances at platforms; and

h) operation in degraded mode with failure of suspension, door or other systems.

Principle 6.10: Compatibility with electric traction systems

Trains should be compatible with the electric traction system.

These factors also need to be taken into consideration for non-electric trains which operate on electric lines.

Factors

6.10 To help you achieve this outcome, you should at least consider:

a) the electrical clearances between vehicles and electrical conductors;

b) the position and geometry of electrical collector systems;

c) the arrangements for return currents;

d) the arrangements for regenerative braking;

e) the effects of electric traction system short-circuits;

f) the effects of electro-magnetic interference and the arrangements to be employed to guard against them; and

g) effective electrical bonding of the vehicle to ensure safe operation on the railway.

Where can I find the specific legal requirements for train safety?

Specific requirements for safety of trains are set out in the following legislation.

- Command Control and Signalling TSI
- Freight Wagons TSI
- Locomotive and Passenger Vehicles TSI
- Noise TSI
- Operations and Traffic Management TSI
- Persons of Reduced Mobility TSI
- Railway Safety Regulations 1999
- Rail Vehicle Accessibility Regulations 2010
- Simple Pressure Vessels (Safety) Regulations 1991
- Workplace (Health, Safety and Welfare) Regulations 1992

Where can I find further guidance on train safety?

Guidance on train safety can be found in:

- Railway Group Standards and guidance issued by RSSB
- ERA application guidance on TSI's available at http://www.era.europa.eu/Core-Activities/Interoperability/Pages/TSI-Application-Guide.aspx
- ORR's guidance on CSM risk assessment

This publication is available at orr.gov.uk

Any enquiries regarding this publication should be sent to us at orr.gov.uk

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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 85^{th} 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)

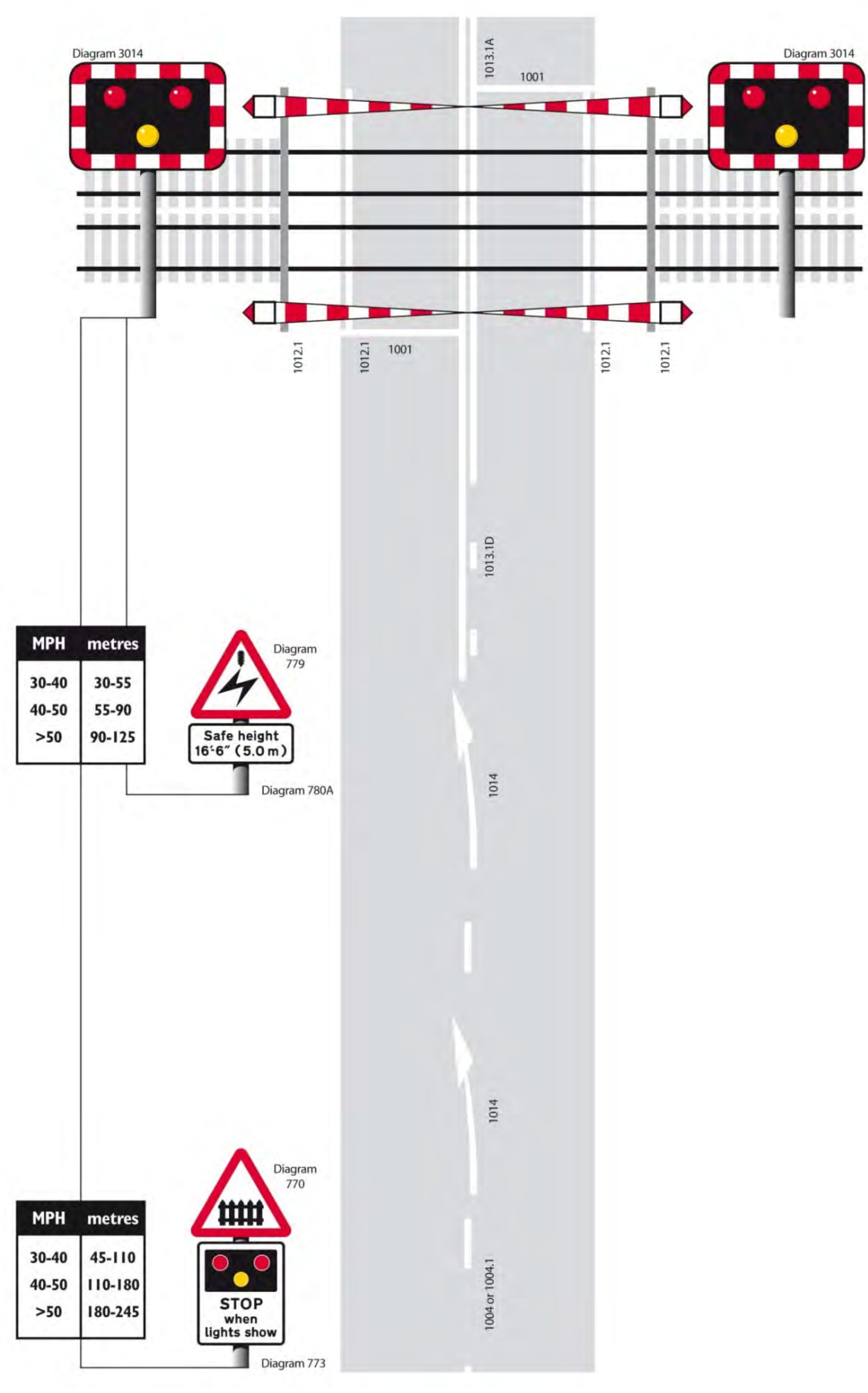


Figure 3: Typical layout of automatic half barrier crossing or automatic barrier crossing (locally monitored)

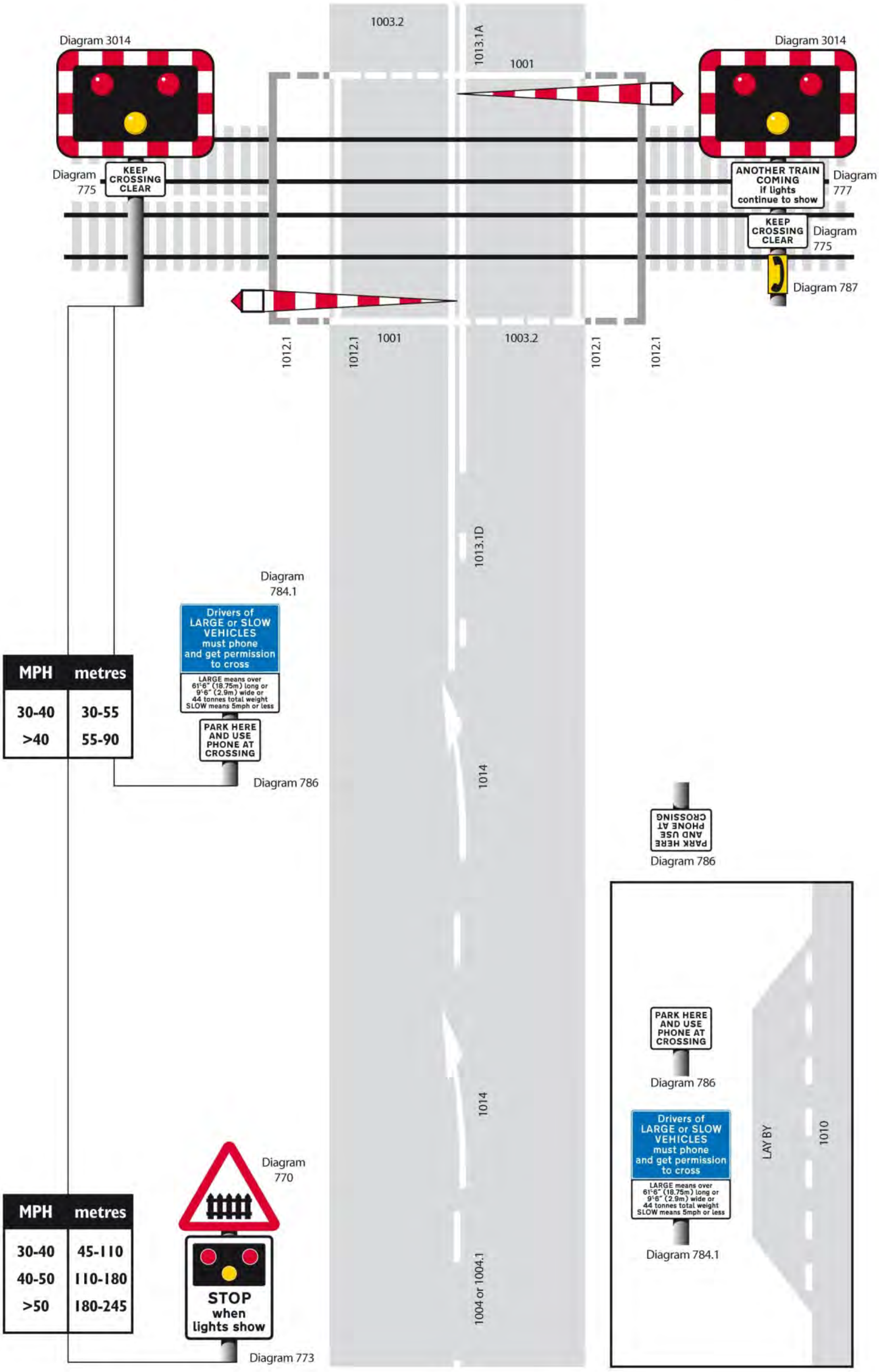


Figure 4: Typical layout of automatic half barrier crossing or automatic barrier crossing (locally monitored) (with additional risks)

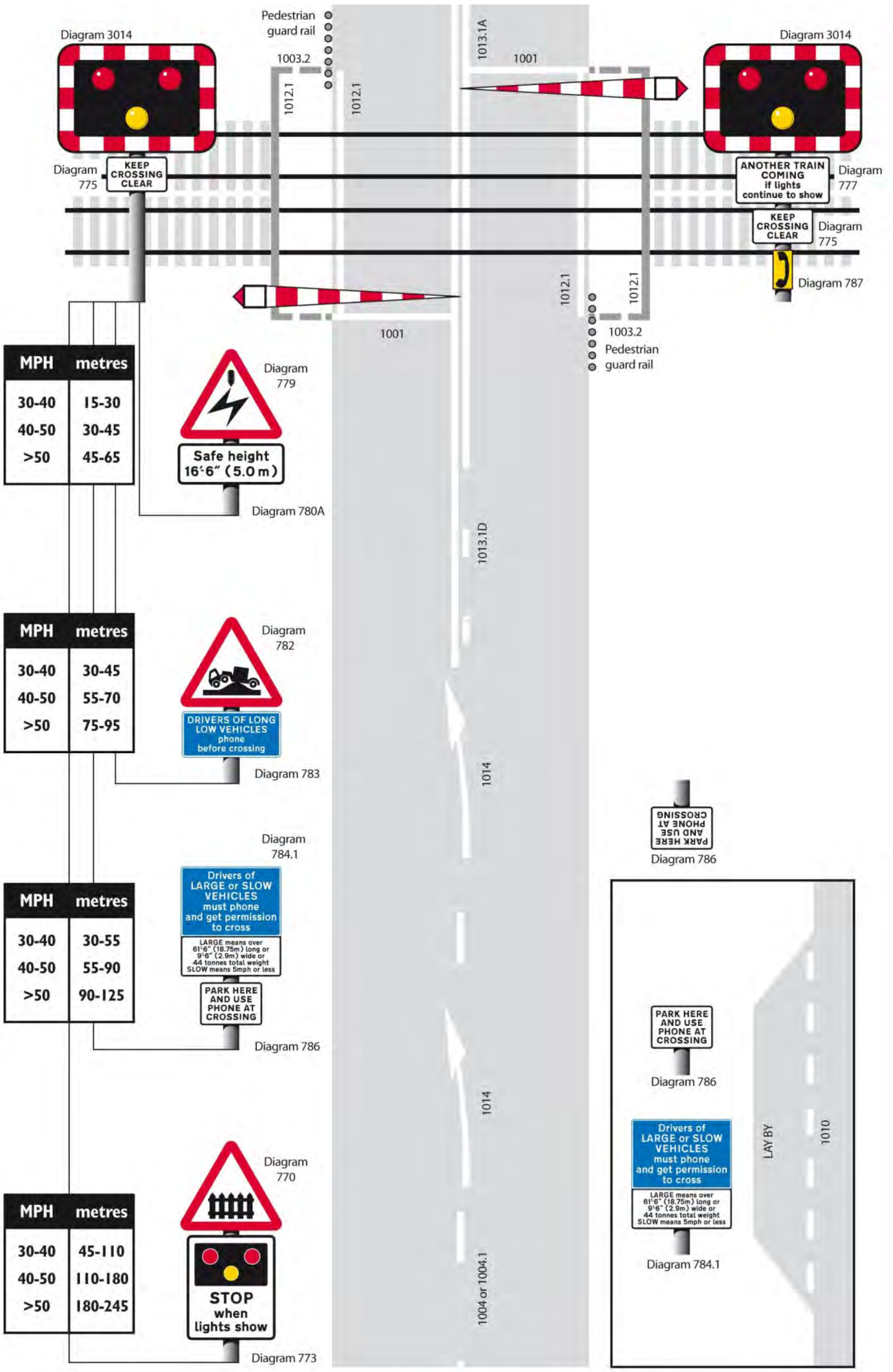


Figure 5: Typical layout of automatic open crossing (with additional risks)

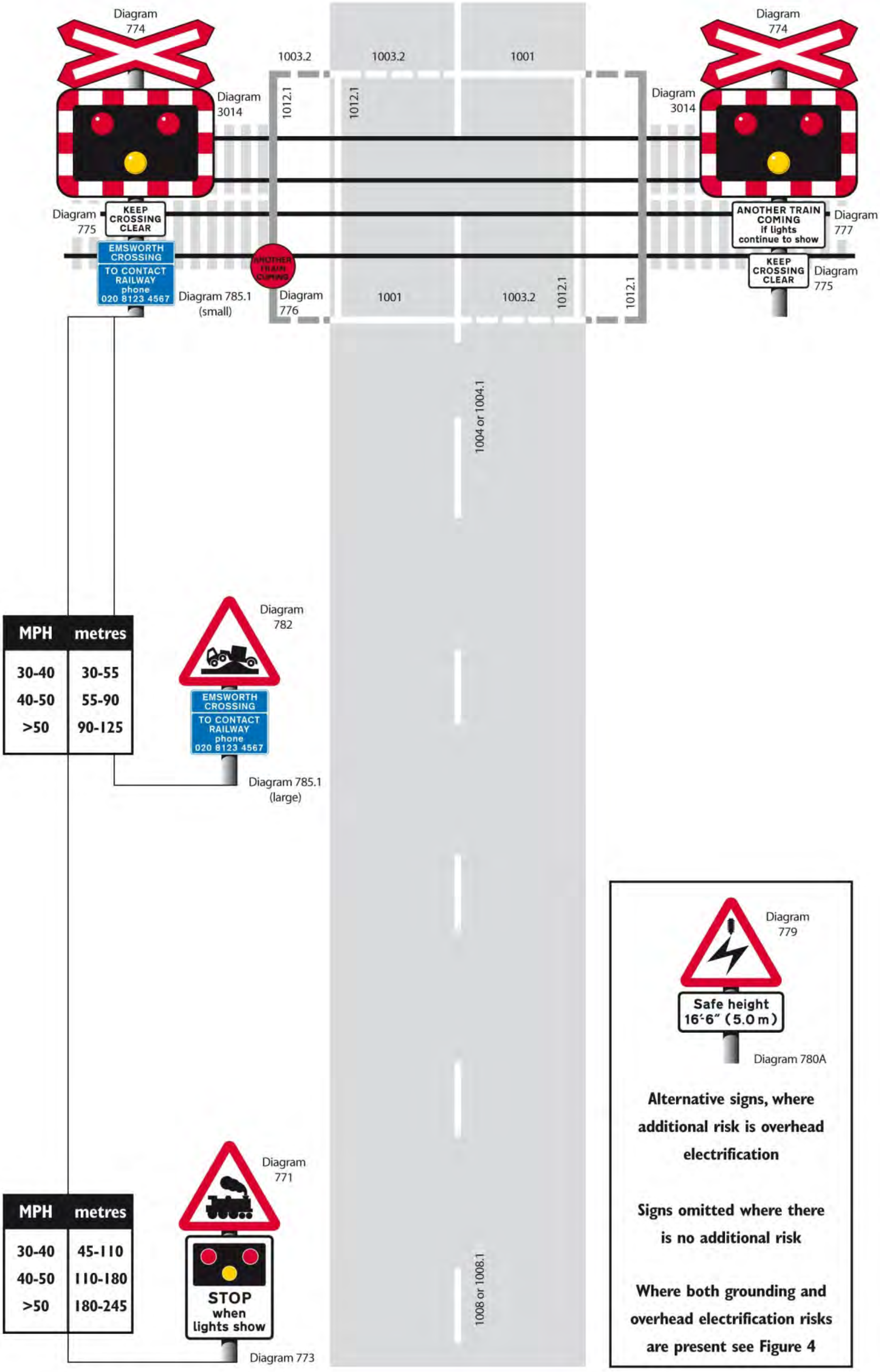


Figure 6: Typical layout of an open crossing

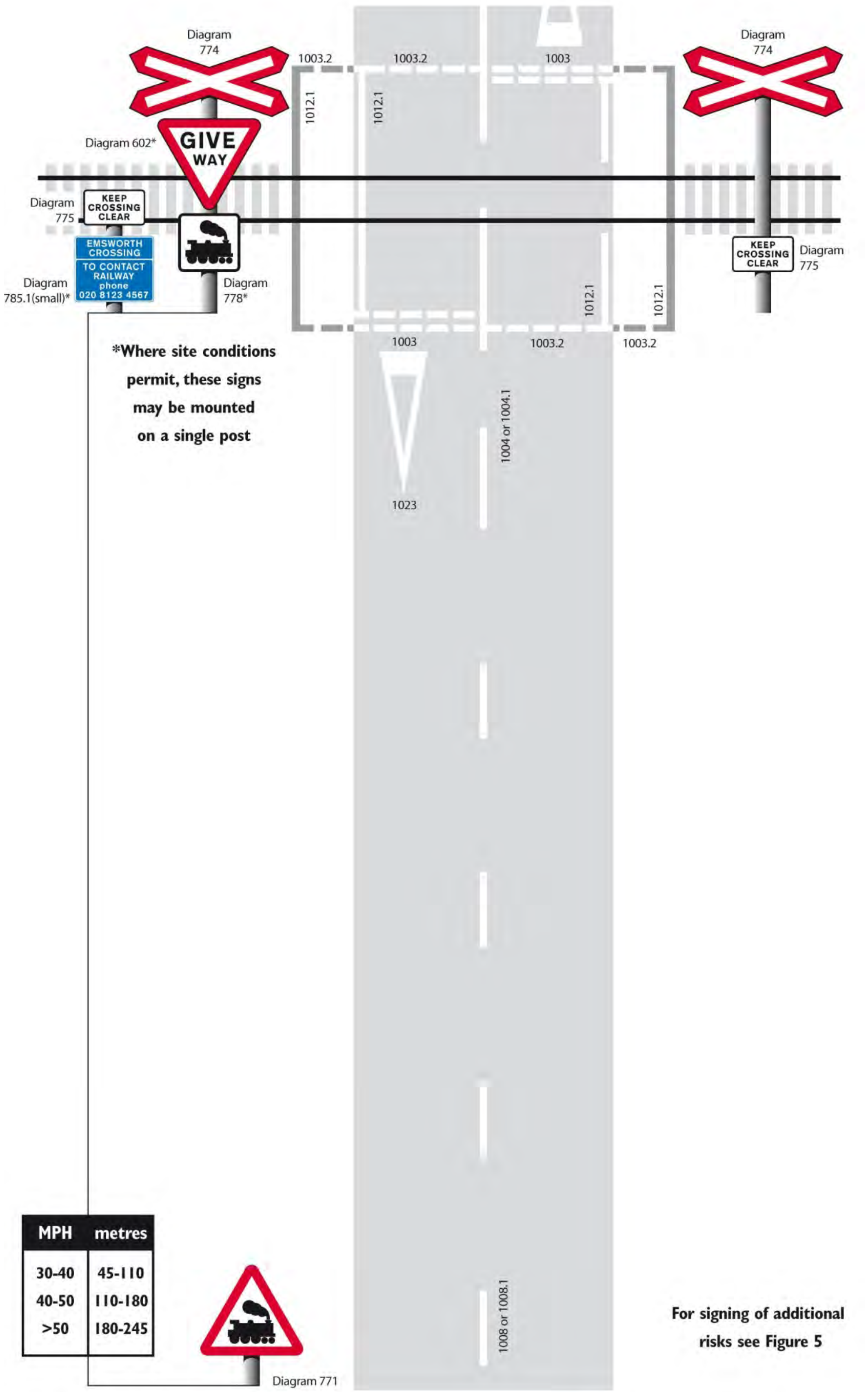


Figure 7: Typical layout of user worked crossing with adjacent footway or bridleway

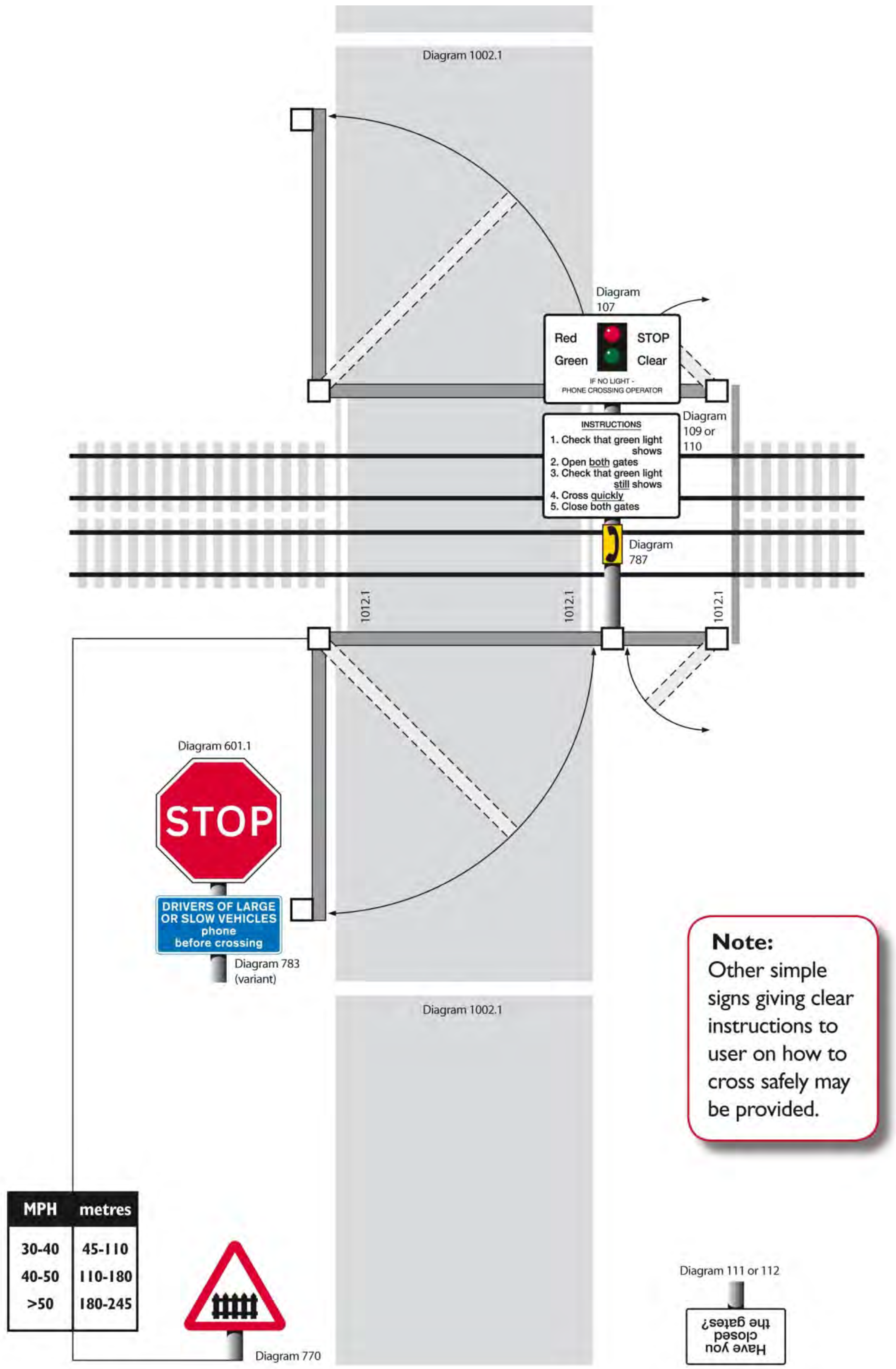


Figure 8: Special signs for use with MSL

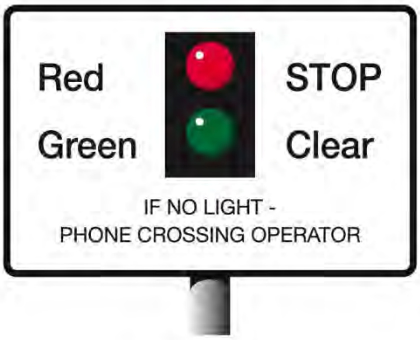


Diagram 107

Preferred – provide telephone number if necessary

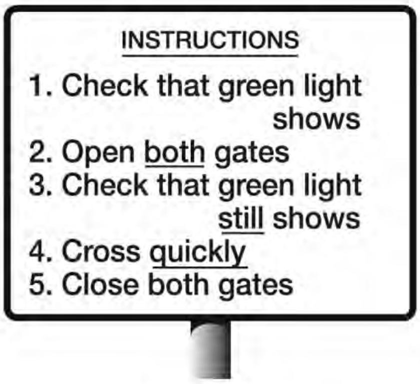


Diagram 109

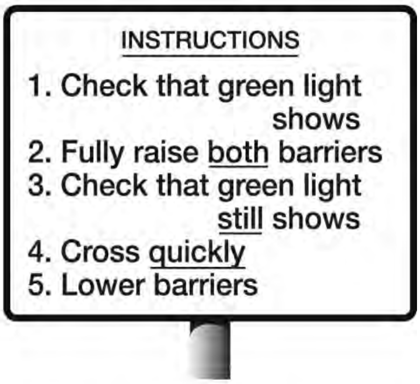


Diagram 110

Diagram 111

Diagram 112

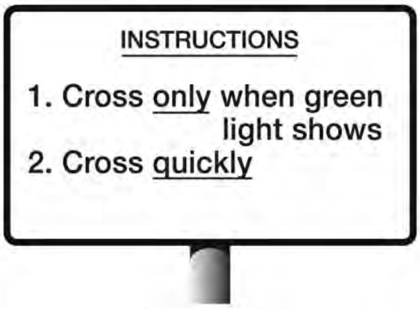
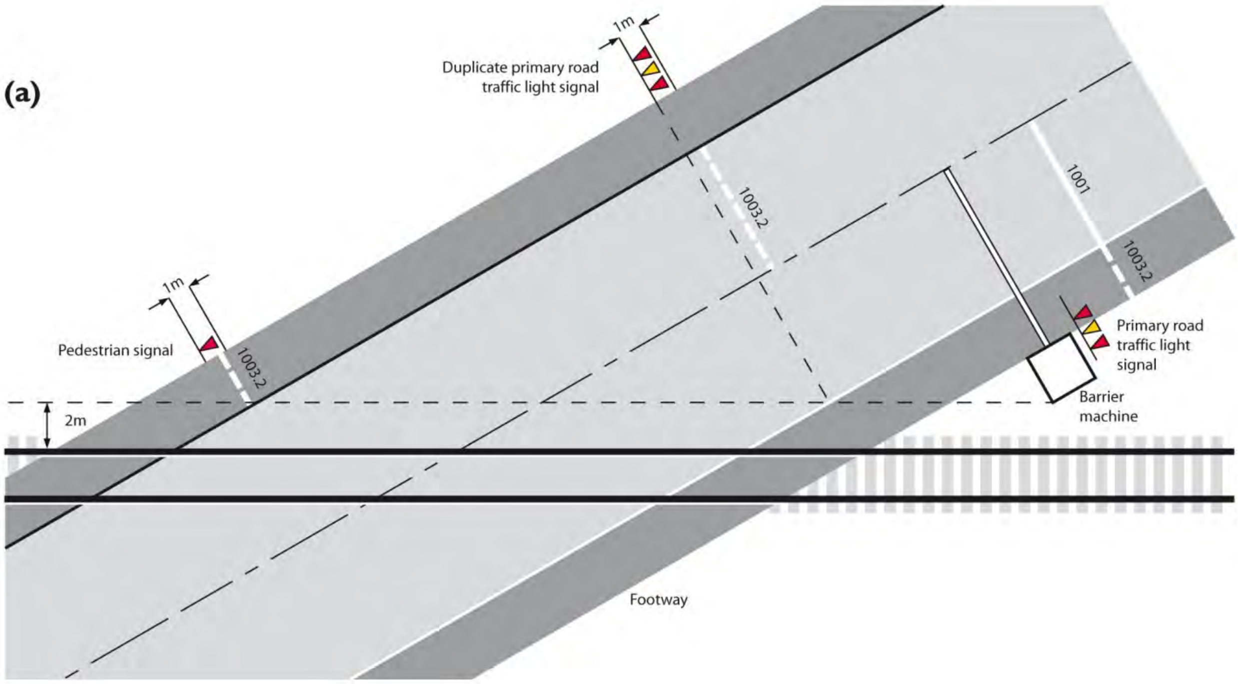
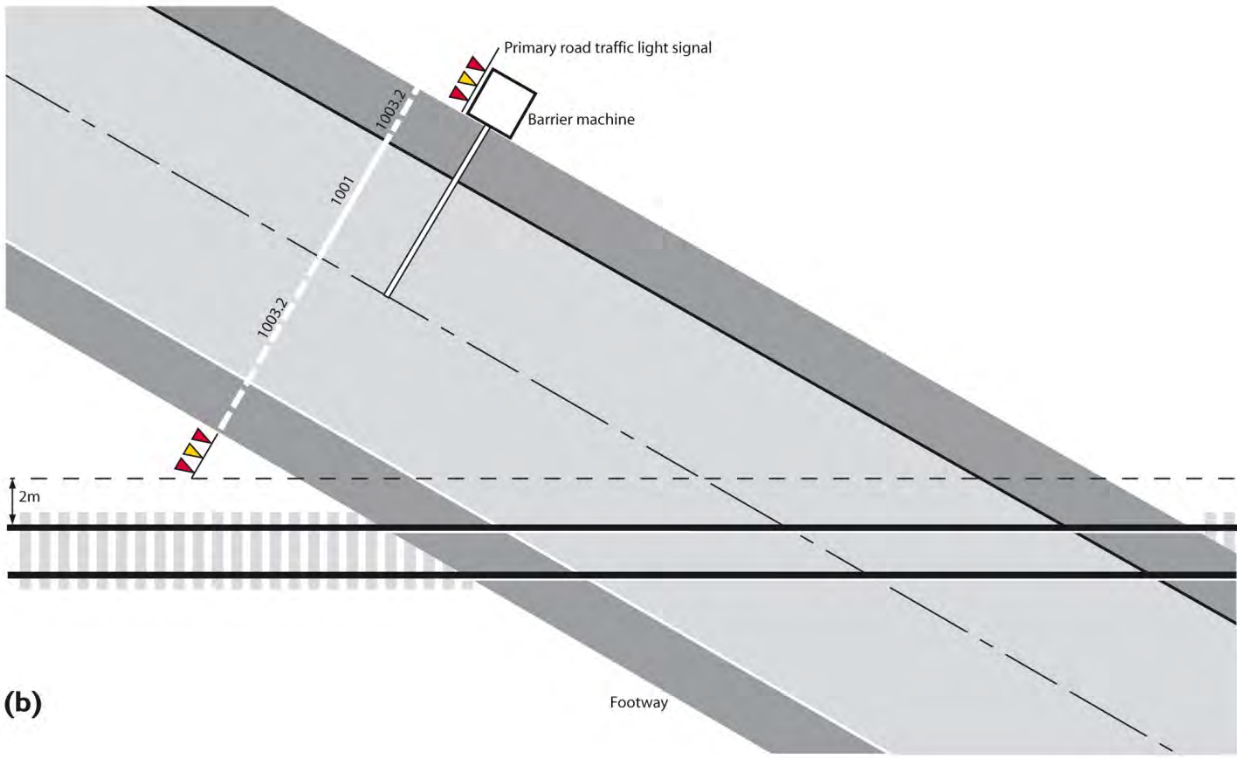


Diagram 114

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.

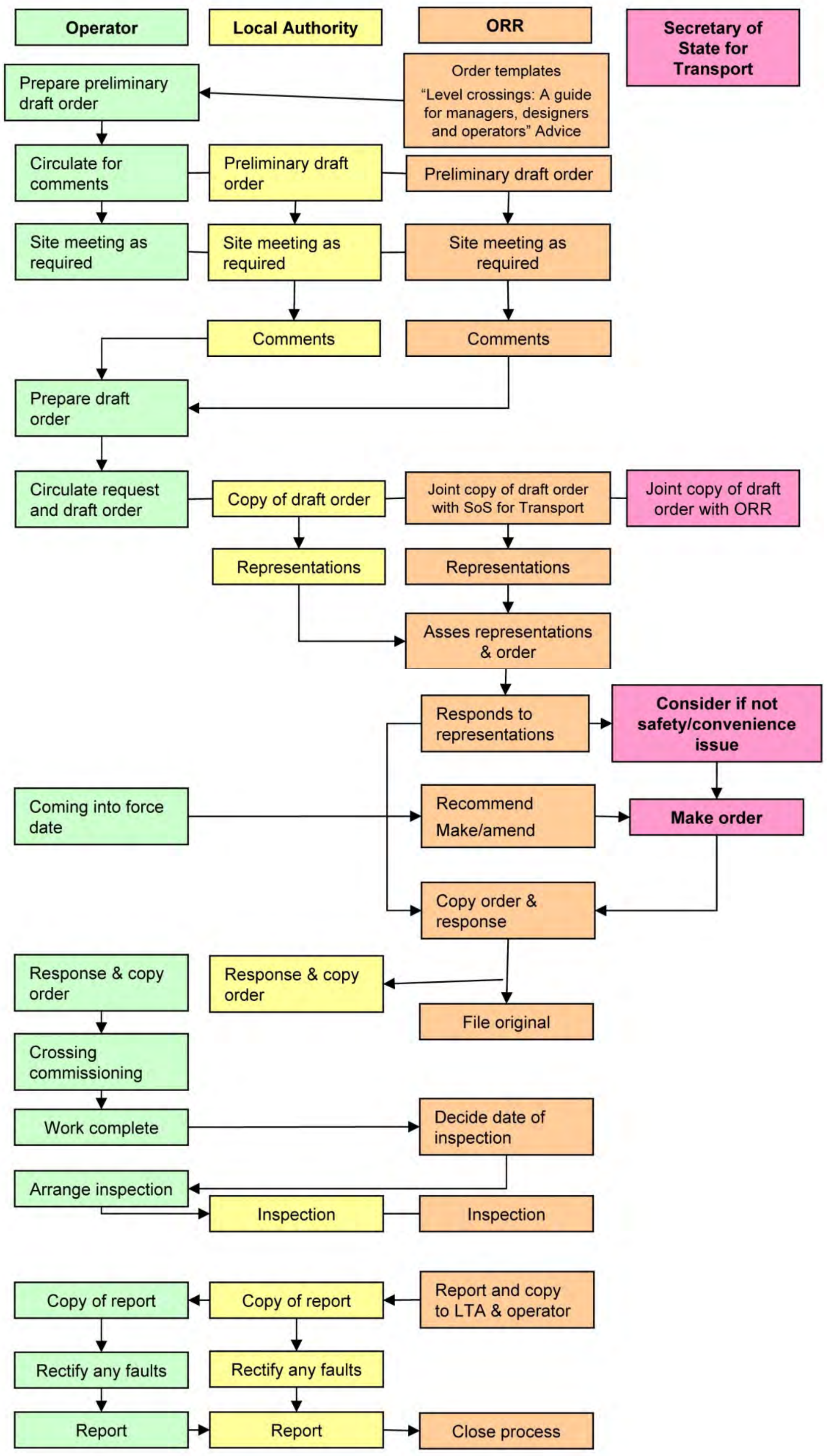
3.67 The subsequent request for an order will be considered by ORR as normal, but making the order is not delegated to ORR in these circumstances. In such cases the order is made by the Secretary of State, taking into account any recommendation from ORR.

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

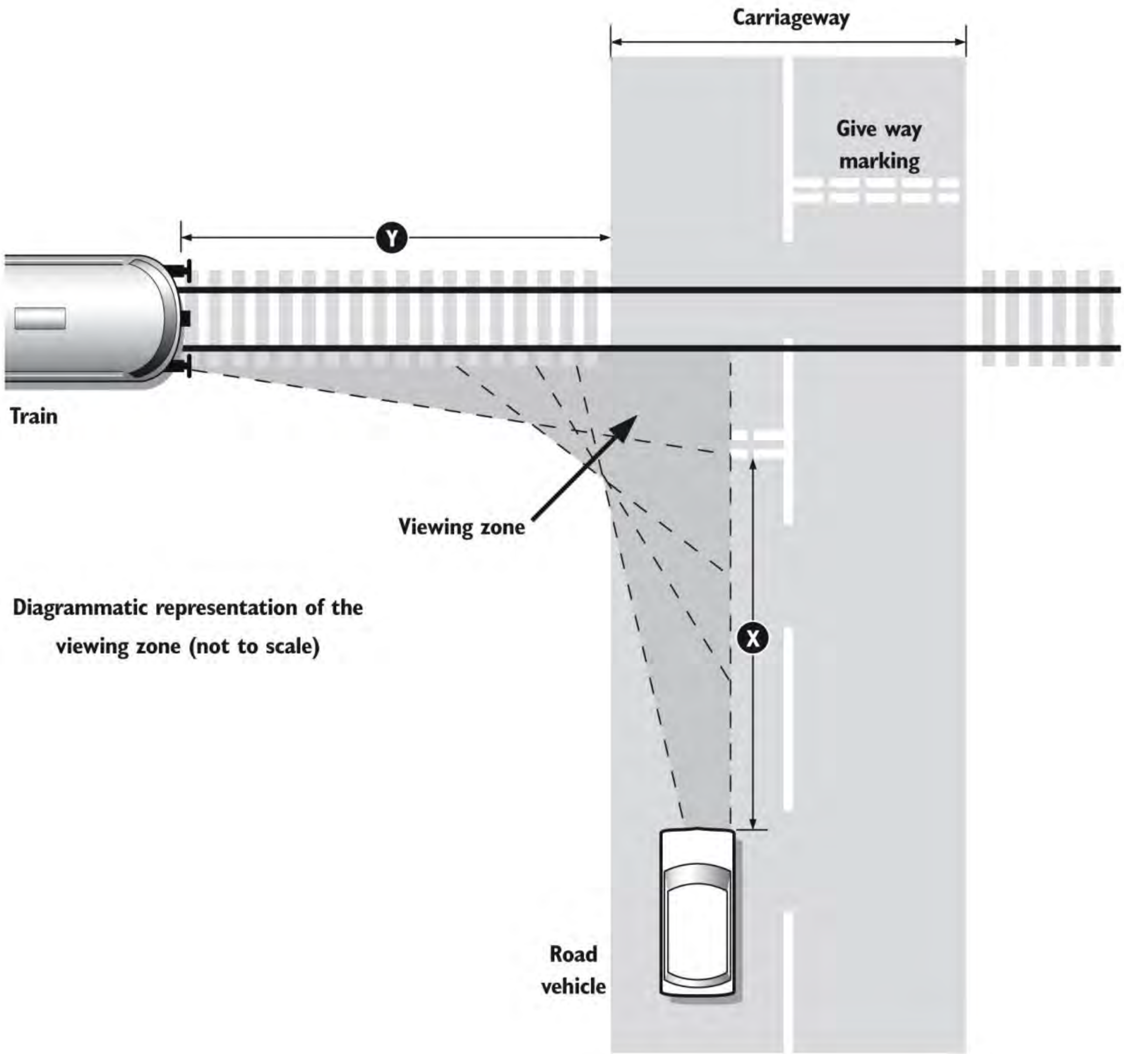


Table 12: Viewing zones			
Distances 'x' (metres)	Distances 'y' (metres) for crossing lengths of:		
	7 m	**14 m**	**21 m**
2	**140**	**170**	**200**
10	**40**	**45**	**55**
20	**25**	**30**	**35**
40	**20**	**25**	**30**

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
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Appendix JP3 – ORR publication Principles for Managing Level Crossing Safety – June 2021

Principles for managing level crossing safety

15 June 2021

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Foreword

Level crossings provide access routes across our railways for the public and for private landowners, but they present a particular safety challenge which has increased as our railways and highways have become busier. Level crossings are a priority topic for the Office of Rail and Road (ORR) because of the potential for harm and injury to members of the public.

There are currently just under 5,800 level crossings on the mainline railway with another estimated 1,500 on heritage and minor railways. They range from rural footpath crossings where the user checks for themselves that it is safe to cross, to high-tech public road crossings with obstacle detection systems and automatic barriers. This guidance is for all types of level crossing and is aimed at a wide audience including level crossing operators and managers, users, landowners and local traffic authorities.

This guidance marks a change from our level crossing guidance published in 2011 - *Level Crossings: Guidance for Managers, Designers and Operators*, and known as RSP7. While RSP7 does not set mandatory standards, it does describe particular layouts and methods of operation, and as such is perceived as setting requirements for level crossing design. *Principles for Managing Level Crossing Safety* takes a risk based approach, in line with other ORR health and safety guidance, and sets out principles and factors which should be considered in a level crossing risk assessment. It emphasises that risk should be reduced through the design of a level crossing or through an alternative way of crossing the railway where this is reasonably practicable, and the importance of considering how level crossings are actually used. Overall, this guidance supports our strategy for regulating level crossings, which is focussed on continued improvement in risk management.

This guidance has been developed with the help of a stakeholder steering group who were invited by ORR to engage from early in the project. We would like to thank the members of the stakeholder steering group: Association of Directors of Environment, Economy, Planning and Transport (ADEPT), British Transport Police, Department for Transport, Heritage Railway Association, Hertfordshire County Council, Institute of Public Rights of Way, Network Rail, Rail Delivery Group and RSSB.

Ian Prosser CBE - Director, railway safety

1. Introduction

1. This guidance is intended to inform the assessment and control of risks at all types of level crossings, through a thorough understanding of the user. A number of principles are set out, describing ORR's expectations for identifying and controlling the risks, and a list of key factors to consider accompany each principle.

2. This guidance does not place additional burdens on duty holders, introduce new duties, or prescribe how a level crossing should be designed, operated or maintained. Further information about level crossings is available on our website.

ORR's role

3. ORR is the independent safety and economic regulator for Britain's railways. We strive for a railway that operates safely, reliably and provides value for taxpayers and customers. We protect the health and safety of people who work in the rail industry or those affected by its activities, by ensuring railway businesses have effective health and safety management systems in place. This includes identifying, assessing and controlling risks properly.

Who is this document for?

4. The principles contained in this guidance apply to the design, management and operation of level crossings on:

   - mainline railways (National Rail);
   - non-mainline railways (e.g. heritage railways, metro systems, rail freight sites);

5. This guidance is a resource for anyone involved in level crossing safety, those whose activities impact on level crossing safety, and users of level crossings. Specifically, for those in the railway industry, traffic authorities, local authorities and others associated with the railway, such as landowners who have rights over the railway.

6. This guidance is likely to be relevant to people in the following roles in these organisations:

   - designers, planners and engineers;
   - those dealing with planning applications, access and public rights of way matters;

- managers, staff and volunteers with responsibilities which affect safety at, or near, level crossings.

7. This guidance is not specifically aimed at tramways but may be useful reference material when designing tramway crossings. More information on tramways is available on ORR's website.

How to use this document

8. The main purpose of this guidance is to inform the assessment and control of risks at a level crossing, recognising that every level crossing is different and its individual circumstances need to be taken into account.

9. We encourage consideration of the 'whole-system' in which a level crossing operates, by this we mean understanding how people, processes and technology work together to deliver a safe level crossing. A level crossing is an interface between the highway and the railway and involves a wide range of users and different parties who each have an impact on safety. The principles reflect this by focusing on users, the railway and the highway. We also emphasise the importance of collaboration between the various parties who contribute to level crossing safety.

10. For the purpose of this guidance, when we use the term 'highway' we also include private roads. A highway is usually defined as any road (including byways), footpath or bridleway to which the public have access.

11. Each of the principles in this guidance describes an ORR expectation for identifying or controlling the risks at a level crossing. A list of factors for consideration accompany each principle. We encourage you to consider all the principles and factors in this guidance. Not all principles and factors will be relevant for all level crossings; you may also need to identify other factors for level crossings where there are unusual circumstances. This is because each level crossing should have its own site specific risk assessment.

12. We have case studies to illustrate how the principles may be applied available on our website. A glossary of key terms is provided at **Annex A**.

13. You will also need to take account of other health and safety guidance, legislation and standards relevant to the railways and public highways. Equally, you will need to comply with relevant equality legislation and consider other relevant standards and guidance. Further information is available on our website.

Collaboration

14. It is particularly important that all those involved in the process of level crossing risk assessment work together so that opportunities can be taken to eliminate and reduce risk. Early engagement and consideration of solutions from different perspectives will provide better opportunities for innovation in managing risk. For example, a local housing development scheme which could increase use of a footpath crossing may provide an opportunity to replace the level crossing with a bridge as part of the development scheme.

15. There should be a joined up, collaborative approach to managing and improving level crossing safety between the infrastructure manager, traffic authority, local authority, train operating companies (including freight), users (particularly for private user-worked crossings) and other organisations such as the British Transport Police.

16. Where level crossings on public highways are under review, it is vital that the relevant local traffic authority is engaged in early discussions. This allows local traffic factors to be taken into account when designing level crossing controls. This is increasingly important given the greater volumes of road and rail traffic, and the impact the length of time that a level crossing is closed can have on road traffic. Equally, when there are temporary or permanent changes to highways that affect a level crossing, the traffic authority needs to discuss these with the crossing operator.

17. We support the use of joint plans which help to provide a structured and long-term approach to collaboration. These can be used to identify relevant organisations and user groups, gather relevant information and data (such as traffic volumes), local knowledge and incident history and document the necessary policies and processes.

2. Level crossing risk assessment

Human factors in level crossing design

18. Good level crossing design should understand the needs and limitations of the user, taking into account normal use, reasonably foreseeable human error and unintended methods of use. It should also consider the needs of those operating and maintaining the level crossing.

19. Level crossing users are individuals and differ, for example, in their mode of transport, age, sensory and mobility capabilities, familiarity with using level crossings and perception of risk. They may use the crossing for one part of a journey and have other demands or distractions on their mind, particularly in relation to the rush and pressures of daily life.

20. Every user will develop their own understanding of how to use a level crossing from the information available to them and their experience of similar situations. This understanding may have to be built up very quickly if they are unfamiliar with a level crossing and using it for the first time. Or they may be very familiar with a level crossing and have already developed and refined their understanding of how to use it. The user's understanding may not match how the level crossing is intended to be used. This means it is preferable to adopt a level crossing design that minimises cognitive demands and places as little onus as possible on the user to take decisions about when it is safe to cross the railway. Designers should also be aware that because of their level of expertise and familiarity, they may overestimate the intuitiveness of their design and therefore likelihood of users behaving as expected.

21. The points below set out some considerations for level crossing design:

    - understand natural human tendencies, such as people's willingness to wait. People will look for a quicker and easier way of doing something, especially if they are regular users. They may build up assumptions about the timing of trains and when they consider it is safe to cross, however trains do not always run to time or freight trains may be time tabled when not expected.

    - take account of how people can react when required to make quick decisions that affect safety.

- recognise people's expectations from the world around them on how something should work can be utilised to develop effective control measures e.g. people know that a green light means go and a red light means stop. Equally, where control measures do not meet with people's expectations for how something should work, risk can be introduced e.g. if there is inconsistency between the two sides of the crossing.

- use engineering controls to remove the risk of human error e.g. ensuring that once a railway signal has been cleared to allow a train to proceed towards a crossing, there can be no change to the equipment protecting the crossing. Where there is the potential for errors when people are expected to communicate with the crossing controller, consider other more reliable technological means to let users know when it is safe to cross. For all crossings, think about how to simplify and reduce the number of tasks that people are expected to perform and the instructions they are expected to follow in order to minimise their cognitive load.

- make it clear to people what they are expected to do. Where user action is required, such as closing gates, it is beneficial to make this easy, reinforce the need for the action to be completed, and confirm that it has been completed by giving feedback to the user. This is particularly important where there is a known problem e.g. where gates are being left open, electronic signs can remind users to close the gate.

- consider use of natural and/or artificial constraints, e.g. fencing on the approach to a crossing, to guide the user to the next appropriate decision or action.

What a risk assessment involves

22. Health and safety law requires railway duty holders to reduce the level of risk from their operations so far as is reasonably practicable. Level crossings present a particular challenge because they are at the interface between the railway and the highway, so require a collaborative approach between those involved, particularly as level crossing risks are not all under the direct control of the railway duty holders.

23. It is essential that decisions and options for level crossing control measures are informed by a suitable and sufficient assessment of the risks. This should be site specific and completed by competent people with thorough knowledge of the risks and the application of controls associated with level crossings, as well as a good

understanding of user behaviour and their perception of risk. The key elements of a suitable and sufficient risk assessment are:

Identify the hazards - An essential part of this will be to understand how the level crossing is used, both in normal and abnormal operating conditions, and who the users are. The safe user principles and factors set out in this document will help you to do this.

Assess the risks - This is about deciding how likely it is that someone could be harmed by each of the hazards identified and how serious it could be. The consequence and likelihood of harm should be considered in combination when assessing the significance of risks.

Control the risks - First consider whether the risk can be eliminated and if this is not reasonably practicable to achieve then consider how the risk can be controlled to reduce the likelihood of harm, following the principles of prevention described later. The safe railway and safe highway principles and factors set out in this publication will help you do this.

Record your findings - This should include documenting the hazards you have identified and the controls you have put in place.

Review the controls - The controls should be reviewed to ensure that they are working as intended and risk assessments should be kept up to date so that any changes at the crossing are assessed and managed.

24. When a risk assessment is reviewed because the level of risk has changed at a level crossing, e.g. because the speed and/or frequency of rail services has increased on a route, you must ensure you continue to meet the legal duty to reduce risk so far as is reasonably practicable. There may be situations where an increase in risk is acceptable because it is not reasonably practicable to reduce that risk.

Principles of prevention

25. Arrangements for managing risk at level crossings should follow the principles of prevention which are found in The Management of Health and Safety at Work Regulations 1999[1]. The following paragraphs set out an ideal order to follow when deciding how to manage risk at a level crossing.

1.

[1] The Management of Health and Safety at Work Regulations 1999, schedule 1.

Elimination

26. The first consideration for all level crossings should be whether there are reasonably practicable alternatives to a level crossing, this is best considered at the design stage of a level crossing as part of a whole system approach.

27. Proposals for new level crossings are rare, but projects to reinstate old railways may include proposals to reinstate a level crossing which previously existed on the route. During the design of a new railway or reinstatement scheme, there are likely to be fewer constraints and greater flexibility for identifying alternatives. In principle, ORR does not support the creation of new level crossings where there is a reasonably practicable alternative, and we encourage alternatives such as diversions, bridges or tunnels to be fully explored and delivered where reasonably practicable. Each situation should be considered on a case-by-case basis, taking account of the nature of the railway operations, surrounding environment and foreseeable users

28. For an existing level crossing, the risk assessment should always consider whether closure is a reasonably practicable option. However, we recognise that there are many factors to be considered, including the legal arrangements for closing rights of way. The cost of alternatives has to be taken into account but also the feasibility of alternatives e.g. level crossings are often located in built up areas where it is simply not possible to construct a bridge without causing significant detriment to local people. There may be local opinions either for or against a level crossing and good communication between the railway, the local authority, and other affected parties such as users and landowners is vital in these situations.

29. Using a risk assessment approach enables the costs and benefits of level crossings to be compared with the costs and benefits of alternatives to a level crossing, such as a bridge. This should also take into account the wider implications, such as the possibility that risk may be transferred to another level crossing.

Engineering controls

30. Where it is not reasonably practicable to close a level crossing, engineering controls should be considered. There is now a range of technologies available for level crossings. In addition, the cost has been decreasing over time, as the technologies are refined and the efficiency with which they can be installed increases. This has increased the options available for installing engineering controls e.g. by providing an active warning system in preference to relying on the user to look out for trains and determine whether it is safe to cross the railway. Another example is the use of obstacle detection systems at road level crossings, which check that a level crossing is clear for trains to proceed and can reduce human error and signaller workload.

Administrative controls

31. Administrative controls such as signage and instructions should be used in conjunction with other control measures where this is reasonably practicable, as they place a heavy reliance on the user and do not actively manage the risks.

32. Administrative controls also include the safe system of work for operating the level crossing under normal and abnormal operating conditions. Engineering controls should be used where reasonably practicable, however administrative procedures and processes will be required at most level crossings.

Reasonable practicability and decision making

33. Reducing risk so far as is reasonably practicable involves a judgement as to whether the risk can be controlled if the duty holder takes certain measures. The level crossing operator has a duty to manage risks to those who use a level crossing, including rail employees, rail passengers and members of the public.

34. The Courts have decided that risk control measures should be deemed reasonable unless the cost of the measure is grossly disproportionate when compared to the risk. There is no authoritative guidance on what factors should be taken into account when deciding whether cost is grossly disproportionate and no single algorithm which can be used to determine gross disproportion; it is a case-by-case, site-by-site judgement. Although there is no authoritative case law on what constitutes gross disproportion, ORR supports the view of the Health and Safety Executive that where the risk is greater a more significant degree of disproportion is justified.

Applying the gross disproportion judgement

35. Duty holders have to judge the risks at a level crossing. The risks to individuals and the likelihood and severity of the consequences of an incident at a level crossing, should be taken into account along with the specific characteristics of each crossing. This should be weighed against the cost in money, time and trouble or effort of options to eliminate, reduce, or mitigate risk.

36. Gross disproportion is a matter of informed judgement on a case-by-case basis for the duty holder. ORR does not set out what an appropriate gross disproportion factor would be for a level crossing. This is for two key reasons. Firstly, a single factor cannot be used for such a variety of circumstances as those found at level crossings. Secondly, the choice of factor should take account of the degree of risk involved, the uncertainty of any analysis and the potential for significant harm, which can only be determined on a case-by-case basis.

37. Use of cost benefit analysis (CBA) and applying the gross disproportion test are useful ways of deciding whether you have reduced risk so far as is reasonably practicable, but they are only part of the overall decision making process. The judgement should not be based on numerical calculations alone and should take account of your knowledge about the particular location, including information on past incidents and near misses. RSSB provide a useful guide to decision making – *Taking Safe Decisions* – which sums up the key test of a good decision as whether you are confident that it is rational, equitable and defensible.

38. In many situations CBA may not be required and relevant established good practice can be used as a baseline for risk reduction measures. In more complex situations CBA can be used to aid decision making by giving a monetary value to costs and benefits and enabling a comparison between them. The CBA should consider the costs to the duty holder of implementing the safety measure. This would include, for example, installation, training, maintenance and operational costs for the whole life of the level crossing. The benefits to be included in the CBA are the benefits in terms of the reduction in risk to passengers, workers and members of the public. To enable a comparison between costs and benefits, the health and safety benefits need to be given a monetary value and this is done using the value of preventing a statistical fatality (VPF). RSSB recommend a VPF figure based on that published by the Department for Transport. At the time of publication it is £2.017million.

3. Safe for the user

This section is for the identification of hazards at a level crossing. It follows the user's journey, from approaching the crossing to travelling over it and exiting it. It also asks you to consider the different types and characteristics of users at a crossing, which will identify some as being more vulnerable than others. The overall aim being to ensure that all foreseeable hazards are identified.

There should be comprehensive identification and understanding of all foreseeable users *before* considering the railway and public highway principles.

User Principle 1: Understand all foreseeable level crossing users.

To help you achieve this outcome, you should consider, at least, these factors:

(a) use a variety of quantitative and qualitative methods to gather evidence in order to get a good understanding of who uses the level crossing, how they use it and the frequency and pattern of use e.g. daily, weekly, seasonal variations and times of peak usage;

(b) nearby local facilities, e.g. stations, schools, care homes, national leisure routes, seasonal attractions or event venues and their foreseeable users e.g. people with luggage, children and elderly people;

(c) users with protected characteristics under the Equality Act 2010. You should ensure the specific risks these users encounter are identified and have due regard to eliminating or reducing these risks to promote equality of opportunity for these users;

(d) users with particular characteristics that impact on their safe use of the level crossing, e.g. dog-walkers, users crossing in groups, horse-riders, cyclists, motorcyclists;

(e) users who may be unfamiliar with a level crossing or who may have difficulties understanding instructions, e.g. delivery or commercial vehicle drivers and seasonal agricultural workers;

(f) livestock driven on foot over the level crossing, when this is likely, and who is in charge of the livestock;

(g) types of vehicles using the level crossing and how their particular characteristics might impact on the safe use of the level crossing e.g. long slow vehicles or farm machinery;

(h) users of private crossings who operate crossing controls, including those who need to brief others on how to do so safely, to understand how and when they use the level crossing and review/identify safe systems of work.

User Principle 2: Understand foreseeable user behaviours or actions at, or near, the level crossing.

To help you achieve this outcome, you should consider, at least, these factors:

(a) gather data on how users behave at the level crossing, including when there are known problems, e.g. through the use of incident data and technology such as cameras;

(b) why some users may not follow the expected route over a level crossing, e.g. local factors including layouts, the proximity of structures such as signal boxes, nearby footpaths, behaviour when there is a station nearby, or pubs/clubs are nearby;

(c) people deliberately taking risks at a level crossing e.g. going onto a level crossing that has been closed for an approaching train;

(d) clothing and equipment e.g. hoods and headphones which may affect awareness and/or concentration;

(e) animals accompanying users over the level crossing e.g. dogs and horses and their potential impact on behaviour;

(f) how passengers access any nearby platforms, information notices, ticket sales points or car park machines and the effect of this on the number of times a user needs to cross the railway and their willingness to wait;

(g) routine users who may develop assumptions and practices that can underestimate risks, especially when the system is not operating as it should;

(h) foreseeable user behaviour when level crossing equipment does not operate as expected by the user e.g. if the barriers have malfunctioned.

User Principle 3: Understand how users become aware of the level crossing.

To help you achieve this, you should consider, at least, these factors:

(a) information and cues provided to warn users they are reaching a level crossing so they can modify their actions, e.g. signage, highway markings, fencing, changes in the approach surface;

(b) highway approach angles, gradients and approach speed and how this affects awareness of the level crossing, particularly where the highway approach offers limited visibility.

User Principle 4: Provide a safe and convenient waiting place for users at the level crossing and where necessary on the approaches to the level crossing.

To help you achieve this, you should consider, at least, these factors:

(a) drivers of long, large or slow vehicles, farmers with livestock, or horse riders who may need a place to wait on the approach to the level crossing so they can communicate with the crossing controller;

(b) a safe place at the level crossing where the user can wait whilst a train passes or identify when it is safe to use the level crossing;

(c) depending on the crossing controls, users will need to undertake different actions at the waiting place, and their needs should be accommodated. Some level crossings require users to have good visibility of the track, which can be affected by the height of the user e.g. those in tractors and wheelchairs, and their distance from the track;

(d) physical controls, e.g. gates, fencing, chicanes, vegetation, structures and their positive (but also negative) impact on the effectiveness of the waiting place.

User Principle 5: Provide information to enable users to safely cross at the level crossing.

To help you achieve this, you should consider, at least, these factors:

(a) how, when and where users need to receive information to make decisions about when it is safe to cross or whether they should wait;

(b) communicate information and cues in the correct sequence, so the user clearly understands what they need to do. The surrounding environment, mode of transport and the importance of physical controls such as barriers and gates should be taken into account;

(c) impact of time of day, seasons and weather conditions on the effectiveness of the control measures provided for the user, e.g. artificial lighting may be necessary and any seasonal or daytime variations in sun glare may need to be mitigated;

(d) make users aware of specific hazards such as the height of overhead line equipment (OLE).

User Principle 6: Provide a suitable warning for users that a train is approaching to enable them to be in a safe place before a train passes.

To help you achieve this, you should consider, at least, these factors:

(a) an active warning system in preference to relying on the user to determine whether or not a train is approaching the level crossing;

(b) user behaviours and actions in relation to the operation of the level crossing, e.g. to prevent them from being trapped within a closed crossing or starting to cross when it is unsafe to do so;

(c) foreseeable actions of different users in a ‘another train coming’ scenario, these trains may be coming in the same or different directions; one may be inaudible and hidden from view;

(d) adequate visibility along the railway where sighting distances are part of the intended control measures e.g. vegetation management, the identification of lineside equipment that limits visibility and the impact of curved track;

(e) number of users and their characteristics, traffic volumes and time it takes to cross the railway in determining the closure sequence in relation to the likelihood of a descending barrier, or moving gate, striking a user or a train arriving when a user is on the crossing;

(f) impact of long and/or variable waiting times on user behaviour, e.g. impatience and risk taking behaviour such as attempting to beat/weave-around a closing level crossing barrier, or disregarding miniature stop lights and audible warnings;

(g) where users require permission from a crossing controller to cross, the information required and how this is conveyed.

User Principle 7: Users should be able to cross safely without stopping.

To help you achieve this, you should consider, at least, these factors:

(a) actual user routes and the time taken to cross the railway, including eliminating/reducing the impact of any level crossing skew;

(b) risk of traffic building up and blocking back over the level crossing and how this can be managed;

(c) how to keep users a sufficient distance away from OLE or conductor rails;

(d) segregating users at a level crossing e.g. pedestrians or horse-riders from vehicles. This could include physical separation, or suitable footways or highway markings;

(e) hazards created by the level crossing surface, e.g. from the rails, surface edges or flangeway gaps. The level crossing surface, including construction material, grip, colour and surface profile should be suitable for all foreseeable users.

User Principle 8: The level crossing should be left in a safe state for other users.

To help you achieve this, you should consider, at least, these factors:

(a) minimising reliance on the user to return to the level crossing to a safe state through the use of technology;

(b) encourage the desired behaviour after users have crossed, especially in relation to any further actions that are required, e.g. returning gates to a closed position;

(c) crossing equipment and method of operation should be consistent on both sides e.g. any barriers or gates;

(d) provision of information on how to report defects and misuse of level crossing equipment;

(e) users who have crossed the railway should be able to continue their journey without blocking the exit for other users.

User Principle 9: Understand how the level crossing is managed and operated by railway staff.

To help you achieve this, you should consider, at least, these factors:

(a) how the operating arrangements may create risks to those operating the level crossing, including in foreseeable abnormal conditions;

(b) the impact of any infrastructure or level crossing maintenance activity on the level crossing;

(c) foreseeable workload and fatigue issues and their potential impact on managing or operating level crossings, including when level crossing controls are changed;

(d) the design and operation of the level crossing should mitigate the likelihood and severity of errors by placing the least reliance on human intervention or responses.

4. Safe railway

This set of principles guides your risk control measures for a level crossing from the perspective of the railway. The primary safety consideration is to prevent a collision between a train and crossing user. Where this involves a large obstruction there is also the potential for a train to be derailed.

Railway Principle 1: A level crossing should be designed with protective measures so it is safe for users.

To help you achieve this, you should consider, at least, these factors:

(a) placing the least reliance on human intervention or responses from railway staff or users as possible. Risk control measures include:

- prevention of access to the railway by provision of barriers or gates activated or locked by the approach of a train;
- alerting users to an approaching train by visual and/or audible active warnings;
- gates or barriers, a suitable distance from the railway.

(b) appropriate monitoring of the level crossing asset to ensure it is functioning as intended, e.g. lights, barriers and emergency telephones. This needs to take into account how failures and other issues, such as a gate being left open, will be detected;

(c) minimise the likelihood of equipment failures that result in unsafe situations;

(d) displays, controls and mechanical components which provide the user with clear information on level crossing status, the approach of trains, and whether it is safe to cross;

(e) user behaviour if level crossing equipment fails, including the impact of frequent failure and how this can lead to unsafe assumptions;

(f) minimise the risk of a user being delayed or becoming trapped on a level crossing when a train is approaching, including consideration of the:

- width and surface profile of the highway throughout the level crossing;
- width and design of the gates/barriers on each side of the railway and their impact on entering and exiting the level crossing;
- crossing closure sequence, so it provides sufficient warning of an approaching train but also allows safe exit if a user is already on the level crossing. These elements need to be balanced because extended waiting times can encourage risk taking behaviour;
- height and position of any load gauges above the levelled highway surface;
- methods to prevent barriers or gates from unintentionally closing while the level crossing is being used;

(g) prevent users being injured as a result of being struck by descending barriers or moving gates;

(h) users should not be able to access any dangerous parts of machinery which are part of the level crossing equipment.

Railway Principle 2: Signalling controls at a level crossing should result in it being clear of users or obstructions before a train arrives.

To help you achieve this, you should consider, at least, these factors:

(a) an automatic system, of sufficient safety integrity, that detects people or obstructions on the level crossing before closing it and allowing a train to enter;

(b) prevent a train that has passed a protecting signal at danger or exceeded its movement authority from reaching the level crossing by providing a safety overlap (to the signal) reinforced by engineering controls (train protection systems that will bring the train to a stand);

(c) where it is not possible to provide an effective safety overlap or train protection system at a protecting signal, alternative protective measures should be provided. E.g. initiating the closure sequence before the protecting signal is reached, or providing an appropriate warning to users so that if a train passes a protecting signal at danger, they know to leave the level crossing if they are on it, or not to enter it.

Railway Principle 3: Take all foreseeable rail movements into account.

To help you achieve this, you should consider, at least, these factors:

(a) all foreseeable directions that trains and other rail vehicles, including road rail vehicles, might approach from, and their operating characteristics, including the frequency of trains and their speed;

(b) avoid train movements which would require a train to wait on a level crossing;

(c) specify any circumstances when a level crossing attendant will be required to operate the level crossing.

Railway Principle 4: It should not be possible to re-open railway controlled barriers or gates until the train has fully passed over the level crossing, or stopped in advance of the level crossing.

To help you achieve this, you should consider, at least, these factors:

(a) all foreseeable operating circumstances, including the speed, braking distance of trains and another train coming;

(b) the level crossing and signalling controls should place the least reliance on procedures and correct actions by the crossing controller;

(c) avoid trains stopping on a level crossing. It should not be possible to open the level crossing to pedestrian or road traffic if a train has stopped on it.

Railway Principle 5: People working on the level crossing should be able to do so safely.

To help you achieve this, you should consider, at least, these factors:

(a) facilitate safe access to the level crossing and its equipment for maintenance, e.g. minimising working at height or availability of parking areas for maintenance vehicles;

(b) how the level crossing will be safely operated by railway staff during normal and abnormal conditions e.g. manual operation of gates creating risks from road traffic;

(c) processes and procedures to manage the risk of injury from machinery and other equipment;

(d) lighting conditions, including light from nearby sources, which may impact on the visibility of the level crossing;

(e) avoid lighting that impairs the crossing controller being able to see approaching train headlights.

Railway Principle 6: Avoid road vehicles becoming stranded or grounded.

To help you achieve this, you should consider, at least, these factors:

(a) a suitable surface profile, which takes into account:

- foreseeable vehicle characteristics, e.g. vehicle length, wheel base or ground clearance;
- entry and exit gradients and their impact on any vehicle clearance from OLE.

(b) a means of communication with the level crossing controller where required;

(c) contingency plans for dealing with a stranded vehicle.

Railway Principle 7: Prevent livestock and other large animals such as horses straying onto the railway.

To help you achieve this, you should consider, at least, these factors:

(a) foreseeable use of the level crossing and the likelihood of livestock or other large animals being in the vicinity;

(b) measures to prevent access to the level crossing, e.g. gates, lick guards, cattle grids, holding pens and fencing;

(c) measures to prevent straying onto the line from the level crossing, such as cattle-cum-trespass guards.

Railway Principle 8: Discourage trespass onto the railway and vandalism.

To help you achieve this, you should consider, at least, these factors:

(a) provide the shortest route possible across the railway, with a defined route from entry to exit;

(b) the route over the level crossing should be obvious to the user, e.g. through the provision of well-maintained fenced approaches, distinct crossing surfaces and edge markings;

(c) anti-trespass guards to deter access onto the railway;

(d) design features for level crossing equipment to improve resilience against vandalism e.g. blocking public access to equipment and the use of protective meshes;

(e) monitoring equipment e.g. to act as a deterrent, provide information on activity at the level crossing;

(f) gates that are normally kept closed across the railway, where it is feasible and necessary to do so.

Railway Principle 9: Take account of foreseeable environmental conditions.

To help you achieve this, you should consider, at least, these factors:

(a) foreseeable weather conditions, e.g. fog, ice or wind noise;

(b) local environment e.g. ambient noise levels, geographical features;

(c) natural light conditions, e.g. sun glare (direct and reflected);

(d) where identified as necessary, sufficient lighting should be provided. This should not impair the ability of users to see approaching trains where the safe use of the level crossing relies on this.

5. Safe highway

This set of principles guides risk considerations for a level crossing from the perspective of the highway and is concerned with the approaches to the level crossing. The primary safety consideration is to prevent a collision between a level crossing user and a train. These principles also cover preventing road traffic incidents at, or near, the crossing.

Highway Principle 1: Warn users that they are nearing the level crossing by providing information.

To help you achieve this, you should consider, at least, these factors:

(a) signage and other measures should be provided at appropriate locations on the approaches to the crossing;

(b) maintain clear information by avoiding signage clutter;

(c) minimise demands and distractions on a user's attention as they approach a level crossing e.g. changes to the speed limit on the approach;

(d) signage and other measures should be maintained so they are visible, this may include vegetation management;

(e) warnings for specific hazards so users can take evasive action where necessary, e.g. the presence of OLE.

Highway Principle 2: Highway approach surfaces should enable users to cross safely.

To help you achieve this, you should consider, at least, these factors:

(a) approaches and profiles should be consistent with those at the level crossing, e.g. minimising slopes and acute angles to achieve an even passage over the level crossing;

(b) approach surfaces and profiles should be maintained so they continue to be suitable e.g. profile, colour, construction material and grip.

Highway Principle 3: Minimise the risk of road traffic blocking back over the level crossing.

To help you achieve this, you should consider, at least, these factors:

(a) road markings and/or signage, e.g. to prohibit overtaking, turning across the opposite carriageway or parking or waiting on the carriageway;

(b) linking road traffic light signals with the level crossing closure sequence;

(c) changes to road layout and features to improve traffic flows, e.g. providing waiting areas or addressing restrictive road layouts and gradients.

Highway Principle 4: Design highway approaches to avoid vehicles grounding on the level crossing.

To help you achieve this, you should consider, at least, these factors:

(a) the surface profile or other elements of the road layout;

(b) different road layouts e.g. provision of dedicated laybys for large, slow moving vehicles;

(c) advanced information signage to warn vehicles at risk of grounding.

Highway Principle 5: Take account of foreseeable environmental conditions on the level crossing approaches.

To help you achieve this, you should consider, at least, these factors:

(a) foreseeable weather conditions, e.g. fog or ice;

(b) natural light conditions, e.g. sun glare (direct and reflected);

(c) where identified as necessary, sufficient lighting should be provided;

(d) maintain visibility of the level crossing and its equipment e.g. by vegetation management and maintenance of signage and road markings so that they remain visible and legible.

Annex A: Glossary

For the purpose of this document, the following definitions are used.

another train coming	Also known as 'second train coming' and 'hidden trains', this is when a train passes over a level crossing with another train approaching. The second train may be obscured by the first train.
blocking back	A situation where road vehicles enter a level crossing when they are unable to leave because the exit is blocked by other vehicles, so vehicles are stationary on the level crossing.
conductor rail	Also known as 'third rail', a conductor rail provides trains with up to 750 volts DC. The live rail is raised and mounted on insulators at the sleeper end.
crossing controller	A person who controls the operation of a level crossing either at the crossing or remotely from a control centre.
flangeway gap	The gap between rails and highway which allows rail vehicle wheels to pass through.
highway	A highway is any road (including byways), footpath or bridleway to which the public have access. For the purpose of this guidance the meaning of highway should be interpreted as including private roads.
level crossing	A level crossing is where a railway crosses a road on the level (i.e. without the use of a tunnel/underpass or bridge). NB A road would include footpaths, bridleways and cycle ways.
overhead line equipment (OLE)	Overhead line equipment refers to the overhead wires and supporting infrastructure that carry electricity at 25,000 volts (AC) or 750 to 1500 volts (DC) to power electric trains.
protected characteristics	There are nine groups of people with protected characteristics defined in the Equality Act 2010: age, disability (a physical or a mental condition which has a substantial and long-term impact on the ability to do normal day to day activities), gender reassignment, marriage and civil partnership, pregnancy and maternity, race (colour, or nationality, or ethnic or national origins), religion or belief, sex and sexual orientation.
skewed crossing/skew	A level crossing at which the angle measured from the public highway to the running rail is not at a right angle

whole system	A 'whole-system' approach of level crossing safety by setting out the needs of crossing users as well as risk assessment considerations from the railway, and highway perspectives.

This publication is available at orr.gov.uk

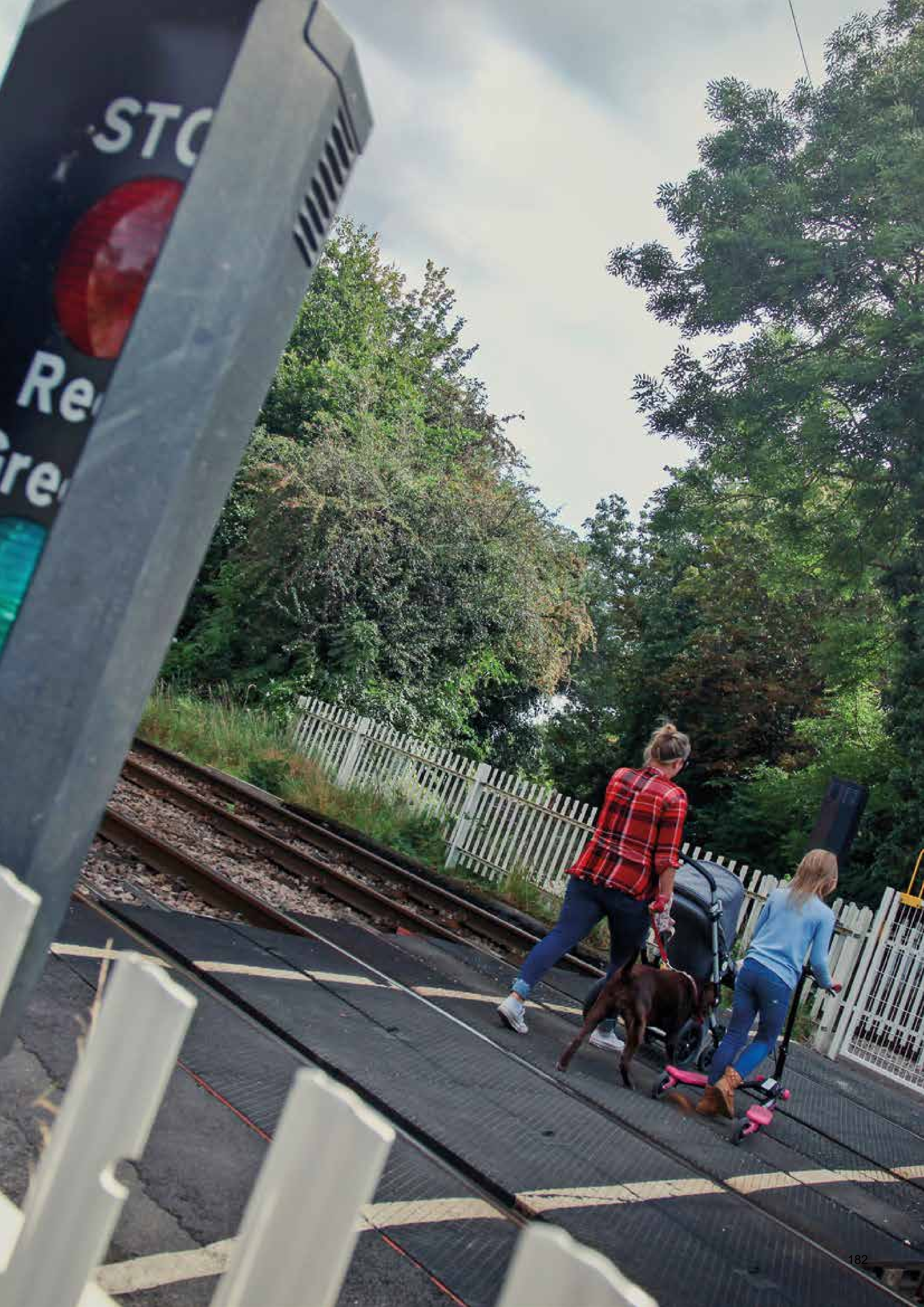
Any enquiries regarding this publication should be sent to us at orr.gov.uk

Appendix JP4 – Network Rail publication "Enhancing Level Crossing Safety 2019-2029"

Enhancing Level Crossing Safety

2019 – 2029

A long-term strategy targeting improved safety on Great Britain's railway



CONTENTS

FOREWORD

Andrew Haines
chief executive

Level crossings were built when the railway was first constructed in the Victorian times. They are used to connect communities across the UK, from residential and industrial areas, to high streets and farmland.

If we were to build the railway from scratch today, we wouldn't include level crossings. They pose a risk to our passengers and members of the public, who can also be delayed if there is a fault or incident at a level crossing. Drivers, cyclists and pedestrians can also find themselves delayed in their journeys by waiting for trains to pass through crossings. However, we know what an important part of day-to-day life these crossings play for the communities around them.

That's why we have worked really hard to make sure the level crossings on our railway are as safe as they can be, and as a result we have one of the best safety records in Europe. This is a commendable achievement considering our railway is one of the most intensively used in the world. But for me, this is still not good enough. There are far too many near misses and there are still, sadly, fatalities on level crossings.

Simply put, the safest level crossing is a closed one. We know that closing our level crossings isn't always a realistic option for the communities they serve. That's why since 2009, we have invested over £200million in improving safety at thousands of crossings, which includes closures, building bridges, identifying new safer rights of way, installing new barriers and warning systems, new signage and educating the people that use them how to be safe around them. Furthermore, we have introduced over 100 level crossing managers to gain a greater understanding of not only the level crossing itself, but the people who use them and the surrounding communities.

We've closed over 1,100 level crossings since 2009. With this, the hope would be that the number of incidents would have reduced, however, with more road journeys and an increasing population, coupled with growing public demand for train travel in and out of our economic hubs, more services are being introduced and sadly incidents continue. Overall, we see the same number of incidents despite having considerably less level crossings. That means there are more incidents per crossing now than there was five years ago.

Level crossing safety remains one of our key priorities. Further improvements to manage the safety of public and passengers are still required, this strategy sets out our objectives to make the railway a safer place for the people who use it and cross it. Our challenge, in collaboration with road and rail industry colleagues, remains the continued management of risk to be as low as reasonably practicable at level crossings while keeping the communities we work in safe and connected.

EXECUTIVE SUMMARY

Our approach to managing level crossing safety

Since 2009, we have made significant improvements in our management of level crossings, greatly improving safety and reducing opportunities for injuries and accidents across the network. We have a legal duty in health and safety legislation to, so far as reasonably practicable, not expose our passengers, the public or our workforce to risk at our level crossings.

Britain's level crossing safety record, which is one of the best across the world, reflects our efforts. But despite our investment and focus, level crossings continue to present a risk to the public. With accidents still occurring each year, we recognise the need to improve further and target continuous improvement in key areas.

Enhancing Level Crossing Safety is our strategy to manage the safety and reliability of level crossings in Great Britain for the next 10 years. It is aligned to the rail industry strategy *Leading Health and Safety on Britain's Railway* which targets improved safety at level crossings as one of its 12 key priorities.

Our long-term level crossing safety vision is:

- No accidents at level crossings on Britain's main line rail network

Our strategic long-term goals for level crossings are clear:

- Reduce safety risk to the public, passengers and our workforce
- Increase rail capacity and performance across the network
- Reduce operational and financial risk

We will reach these goals by meeting the following level crossing strategic objectives:

- Maximise risk reduction
- Fewer fatalities, injuries and near misses
- Reduce the likelihood of human error
- Change user behaviour
- Improve reliability at our level crossings

To meet these objectives Enhancing Level Crossing Safety clearly identifies four areas of targeted focus:

- Risk Management
- Technology and Innovation
- Competence Management
- Education and Enforcement

All of which are underpinned by the need for effective collaboration.

Enhancing Level Crossing Safety is designed around ALARP (as far as reasonably practicable) principles. It is an iterative strategy that will evolve over time to take account of emerging risks and trends which take precedence or require equal focus.

01

INTRODUCTION

Enhancing level crossing safety

Closing level crossings is the only way to fully eradicate the risk and sometimes we need to do that even if that means adversely affecting the community they serve. However, it is not possible or practicable to immediately close all level crossings. Aside from the financial and practical constraints, user convenience still needs to be a key consideration. A broad range of targeted interventions and initiatives are therefore needed to manage safety at crossings which remain open.

As part of our licence to operate and manage Britain's railway infrastructure, we have the legal duty to protect our passengers, the public and our workforce, and to reduce risk at our level crossings so far as is reasonably practicable.

Enhancing Level Crossing Safety provides the necessary overarching strategy to manage risk at level crossings. Its objective is to improve the safety of passive[1] and protected[2] crossings through effective collaboration and the delivery of targeted improvements.

The strategy provides:

A clearly defined vision that maximises risk reduction from investment

- The strategy underpins the company's policy on level crossing safety
- A common set of risk management objectives, priorities and processes that are shared across the business are consistently applied
- Efficiencies and opportunities that are shared through the procurement and delivery of solutions

A reference point for all Network Rail employees as to how level crossing safety is managed

- The strategy is visible and recognised across the business
- Corporate goals are understood by everyone, with safety at the forefront of all activities which interface directly or indirectly with level crossings
- The strategy sets direction and focus and helps to prioritise areas of greatest risk
- A holistic approach to risk management is applied, negating duplicated effort, waste and sub-optimal decision making

A reference point for rail industry colleagues, local authority stakeholders, the Office of Rail and Road (ORR) and the public as to how level crossing safety is managed

- The strategy is transparent with clearly articulated goals which target improved safety and enhanced reputation
- The strategy identifies how we will continue to meet our health and safety obligations in this area of risk management
- Collaboration and cross-industry working is understood and endorsed across all disciplines
- Good practice is adopted by all parties in Great Britain and is shared internationally with rail industry colleagues

[1] Footpath, bridleway, open, public and private vehicle crossings which require users to make safe decisions to traverse based on sighting alone or interface with Signallers using telephones (where provided).

[2] Crossings equipped with stop lights, alarms and/or barriers which warn users of approaching trains.

02

OUR SAFETY RECORD

There are around 6,000 level crossings across the network. They range from the most basic passive crossings, which rely on users making informed decisions to cross safely, through to public road crossings equipped with active risk controls.

Great Britain can demonstrate a very good safety record at level crossings in comparison to any major rail network in the world. Our good record is assisted by factors such as:

i. relatively few level crossings compared to other major rail networks;
ii. public awareness of rail/level crossing safety is generally good; and
iii. a sustained investment and focus in successive years since 2009.

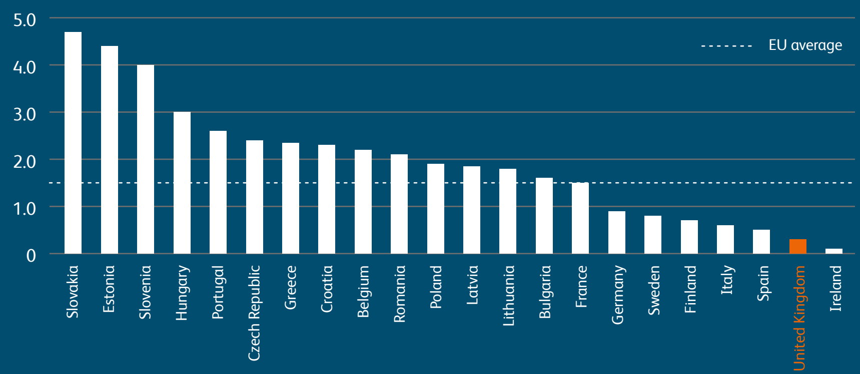


Figure 1: Level crossing incident rate across Europe per thousand track kilometres 2013 – 2017[3]

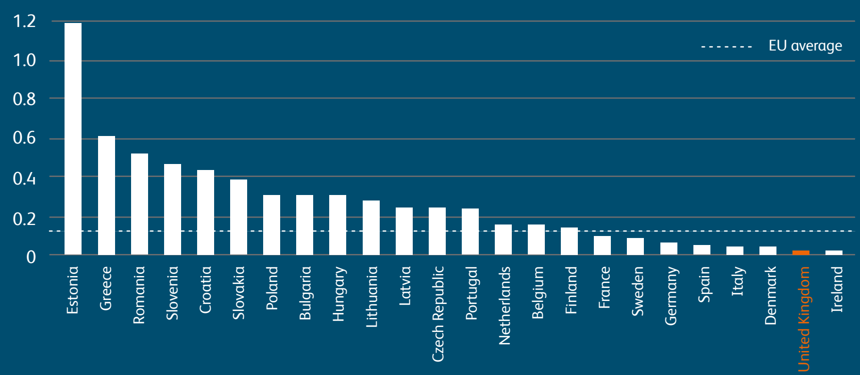


Figure 2: Level crossing incident rate across Europe per million train kilometres 2013 – 2017[3]

Despite our very good record, there is more we can do to prevent accidents at level crossings as there remains opportunity for human error to occur, for users to be distracted and for deliberate misuse to take place. Level crossings therefore not only present a risk to individual users, but where they facilitate vehicular access over the railway, they also increase the likelihood of potentially high risk train accidents.

Due to the nature of the road and rail networks in Great Britain, both types of infrastructure are extremely congested in parts of the country. These pockets of activity further increase the challenge of managing level crossing safety and intensify the opportunity for accidents to happen.

It is therefore to be expected that **level crossings represent one of the principal public safety risks on the railway**. Even though risk has been significantly reduced over successive years they still account for 6 %[4] of the total railway system risk.

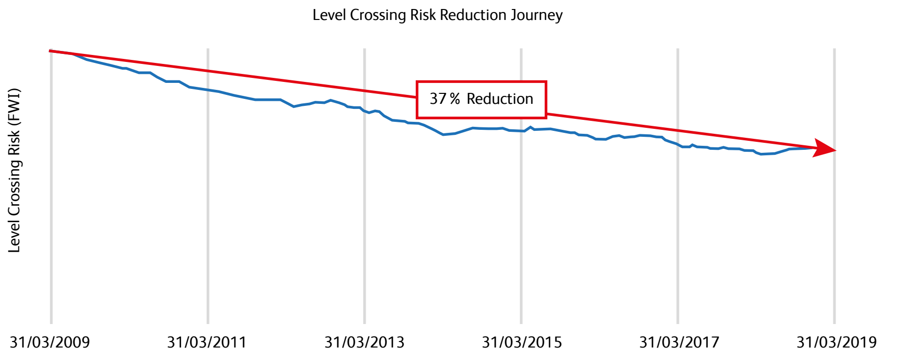


Figure 3: LCRIM calculated risk, March 2019

The All Level Crossing Risk Model (ALCRM) identifies, as shown in figure 4 below, that while Automatic Half Barrier Crossings (AHBs) account for just 6 % of the total estate they hold 32 % of total modelled risk and 75 % of our level crossings require the user to make the decision on whether it is safe to cross.

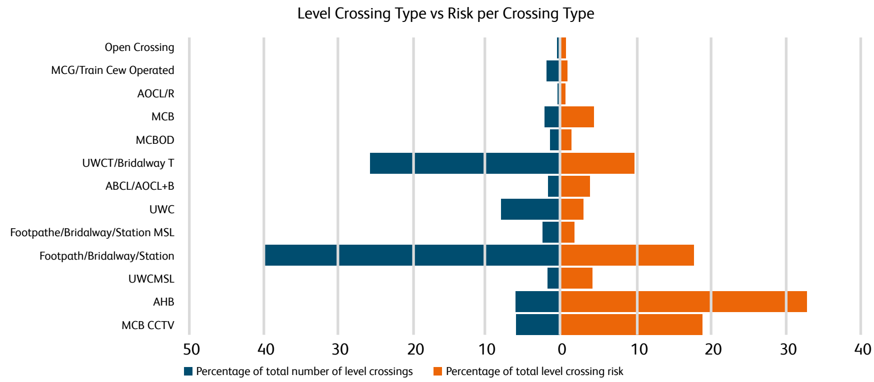


Figure 4: Level Crossing Type vs Risk per Crossing Type

Level crossing risk is driven by a number of external factors. If we were to do nothing more than maintain and renew level crossings like-for-like, it would be expected that **risk increases** would outpace efforts to manage safety as low as reasonably practicable. This is due to factors such as:

- Increased road/rail traffic
- Changing population (e.g. increased diversity, access by more vulnerable people)
- Congested pockets of road/rail/footpath networks
- Changes in public attitudes and expectations that risks are designed out, increasing the likelihood of errors

Our focus, through delivery of this level crossing safety strategy, is to prevent injuries and loss of life, so far as is reasonably practicable, by working to address legacy issues and to design out foreseeable risks of the future.

[3] Source: Eurostat Data – extracted 2019.

[4] As measured by Rail Safety & Standards Board (RSSB); source Safety Risk Model (SRM) v8.5, March 2018.


KEEP
CROSSING
CLEAR
SIGNAL BOX

03

OUR PURPOSE, VISION AND APPROACH

We exist to get people and goods where they need to be and to support economic growth and productivity in an environmentally sustainable way. The railway connects homes with schools and workplaces, businesses with markets and can help unlock new land for house building. It is also part of the social fabric of our nation, connecting people with friends, family and loved ones. We are…

“A company that is on the side of passengers and freight users; that is easy to engage with and a dependable partner; a company people are proud to work for; instinctively recognised as an industry leader.”

Our role is to run a safe, reliable and efficient railway, servicing passengers and freight users and the communities we work in.

Ideally, we would not have any level crossings. However, we recognise roads and walking routes are public rights of way and therefore running a safe and reliable railway must be delicately balanced with the number of level crossings in operation, and the people who use them.

We estimate that over 3.5 million vehicles and over 600,000 pedestrians or cyclists use our level crossings every day and given that trains can travel over those same crossings approximately 400,000 times per day, it is unfortunately inevitable that incidents will happen.

For members of public that experience near misses, or even direct contact with a train, whether that is in a car, on a bike, by foot or any other means, it can be very scary. With two accidental fatalities in 2018/19 and six the year before, we must never forget how dangerous level crossings can be. Not only do these incidents alter lives, they also result in delays for passengers who are trying to get home, to their hospital appointments or to pick their children up from school. In the past few decades, passenger numbers have soared, the number of train services has increased, and our network is now congested. Our Victorian rail network was never designed to accommodate so many trains. The sheer amount of traffic on the network means that even the smallest incident can have a significant knock-on impact.

To help reduce this impact we look at every level crossing in detail. Deciding how to manage each single level crossing is done through risk assessment and expert judgement. We work closely with the level crossing’s authorised users and liaise with communities around them. Often, the solution to improve safety at one crossing is different to the next.

04

OUR SAFETY VISION, GOALS AND OBJECTIVES

everyone home safe every day

Network Rail's core safety vision is *'Everyone home safe every day'*.
Of the 12 key commitments within our safety vision, two are particularly relevant to how we manage level crossing safety. These are:

- **We will relentlessly strive to find new ways to keep ourselves, colleagues, passengers and the public safe.**
- **We will design, construct, inspect, operate and maintain the railway to keep everyone safe.**

Underpinning our company safety vision is our Home Safe Plan which comprises of a series of projects that target risk reduction in key safety areas. Building on our home safe commitments, our long-term safety vision for level crossings targets **'no accidents at level crossings'.**

Our vision for no accidents is shared with our vision for collaboration, a critical factor in successful risk management. We must work together as rail infrastructure owners, train operators, transport police, local authorities and highways agencies to effectively tackle safety at our rail, road and footpath intersections. This applies at all levels, from a strategic tier to frontline operations.

This vision successfully encompasses the overarching principles of the rail industry safety strategy Leading Health and Safety on Britain's Railway and its challenge to improve level crossing safety.

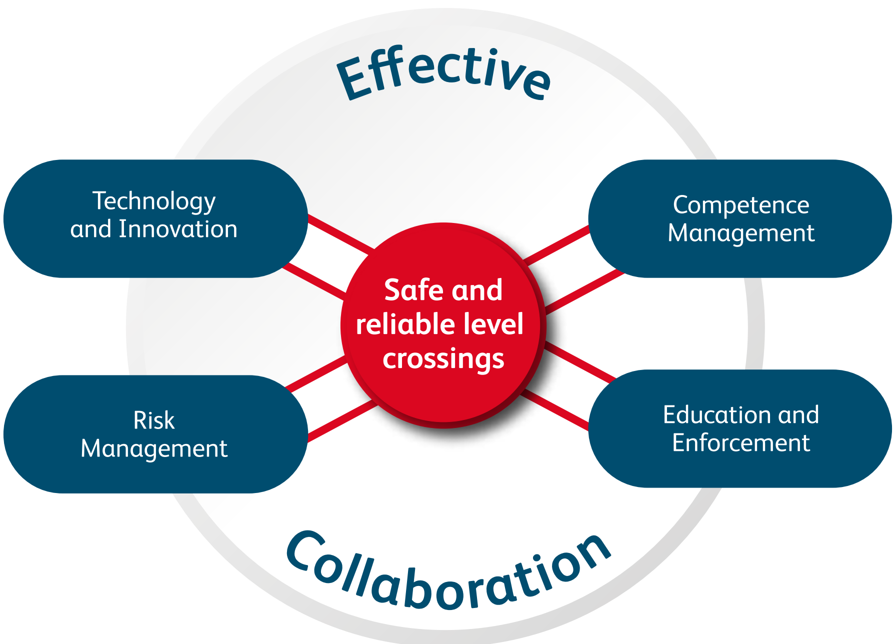
We are committed to improving level crossing safety and will do all that is reasonably practicable to close crossings and improve safety at those which remain open.

Our long term strategic goals for level crossings are:

- **Reduce safety risk to the public, passengers and the workforce**
- **Increase rail capacity and performance across the network**
- **Reduce operational and financial risk**

To reach these goals we will work towards the below objectives:

To meet these objectives we have identified four key areas of focus which are underpinned by the need for effective collaboration:



05

ROLES AND INTERFACES

This document provides a clear strategic framework for enhancing level crossing safety, endorsed and to be delivered by a devolved business. To effectively tackle level crossing safety requires effective collaboration. Through the industry's Level Crossing Strategy Group and System Safety Risk Group meeting structures, Network Rail will lead the industry in promoting collaborative practice. We will also champion collaboration across all other sectors, from engagement within parliamentary channels through to discussions with land owners, authorised users of private level crossings and the general public.

With shared objectives and co-operation across all sectors, there will be greater opportunities to improve public safety at level crossings. Crucial to this is funding, which is an essential enabler in delivering high volume risk reduction activity. We will work closely with ORR and Department for Transport (DfT) colleagues to demonstrate that plans for risk reduction activities are effectively targeted and offer appropriate levels of safety benefits and value for money. The case for dedicated investment will always be made with demonstrable returns evidenced within strategic plans.

Collaboration and shared goals within our own organisation are as critical as the relationships with external partners. *Enhancing Level Crossing Safety* will be used within Network Rail to promote the message of closing level crossings where possible and making those that remain open safer. We will also make use of safety education campaigns and channels such as the Network Rail intranet to broaden communication and awareness.

The general public must also contribute toward improved level crossing safety, eradicating risk taking behaviours and safely using level crossings. Our continued use of safety awareness campaigns, promotion of safety through social media networks, in addition to local activity and engagement will be used to educate and reinforce the safety messages.

Figure 5: Everyone: external stakeholders to Network Rail

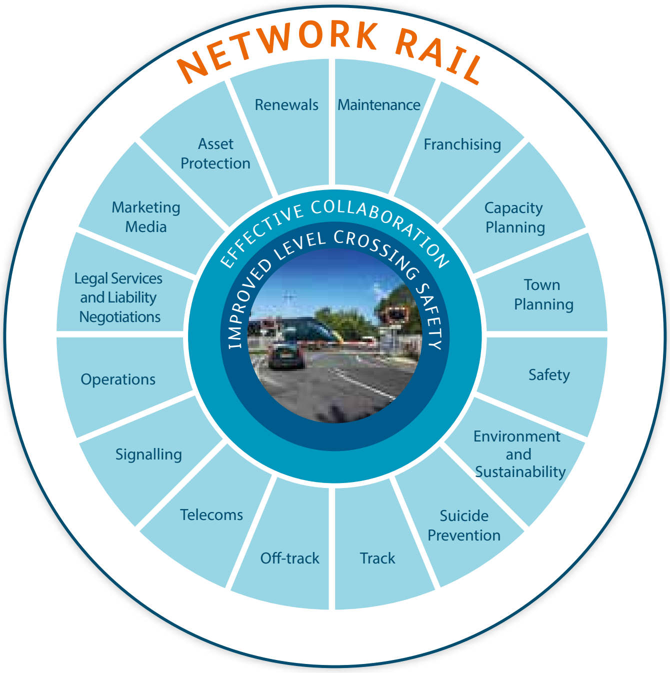


Figure 6: Network Rail's internal stakeholders

Legislative change that will allow us to work more closely with local authorities, highways agencies and private landowners in our efforts to reduce level crossing risk is welcomed. We will continue to press for change as parliamentary time allows and work closely, forging good working relations, with public authorities and local communities.

Our train operator colleagues continue to provide vital reporting, helping us better understand risk hotspots and real-time activities. We welcome this continued support and our future opportunities to work jointly, for example in the promotion of safety awareness messages, to improve level crossing safety and increase performance on the network.

Our partnerships mean that we have the necessary support network to continue our journey as world leaders in level crossing safety. Using platforms such as the industry's safety groups to progress our strategy and provide the necessary collaborative leadership to improve, we aspire to push the boundaries further still and to be united in our long-term vision of no accidents at level crossings.

Figures 5 and 6 illustrate the types of effective collaboration needed, both internally and externally, to enhance level crossing safety.

Managing safety within our own organisation

Within our own organisation, the principles of this safety strategy will be applied when work interfaces directly or indirectly with level crossings.

Enhancing Level Crossing Safety extends across our business, to many roles and functional areas and applies not only to those who manage safety on a daily basis, but to those whose actions may introduce risks and hazards at level crossings. For example; train planning, possession management, maintenance, renewals and enhancements, they all play a role in level crossing safety.

A joined-up way of working must be applied if we are to manage the safety of level crossings holistically, negate duplication and waste, and optimise risk management solutions and investment.

Doing more to continue to reduce procurement and installation costs is essential if we are to bring about efficiencies and opportunities to do more for less.

Transparent asset management plans visible across all sectors of the business will also help to drive such collaborative efficiencies.

'A joined-up way of working must be applied if we are to manage the safety of level crossings holistically, negate duplication and waste, and optimise risk management solutions and investment.'

06

TAKING SAFE DECISIONS

Network Rail has provisions in place that govern safety-based decision making. The company's Health and Safety Management System details this more fully in section 3.8 Safety Decision Criteria.

The industry's Taking Safe Decisions framework, which sets out a structure for taking decisions and helps meet the reasonably practicable legal standard, has been adopted by Network Rail. Risk assessment appraisal methods and professional judgement are applied to safety investments in determining reasonable practicability.

The industry's Taking Safe Decisions risk management framework is illustrated below.

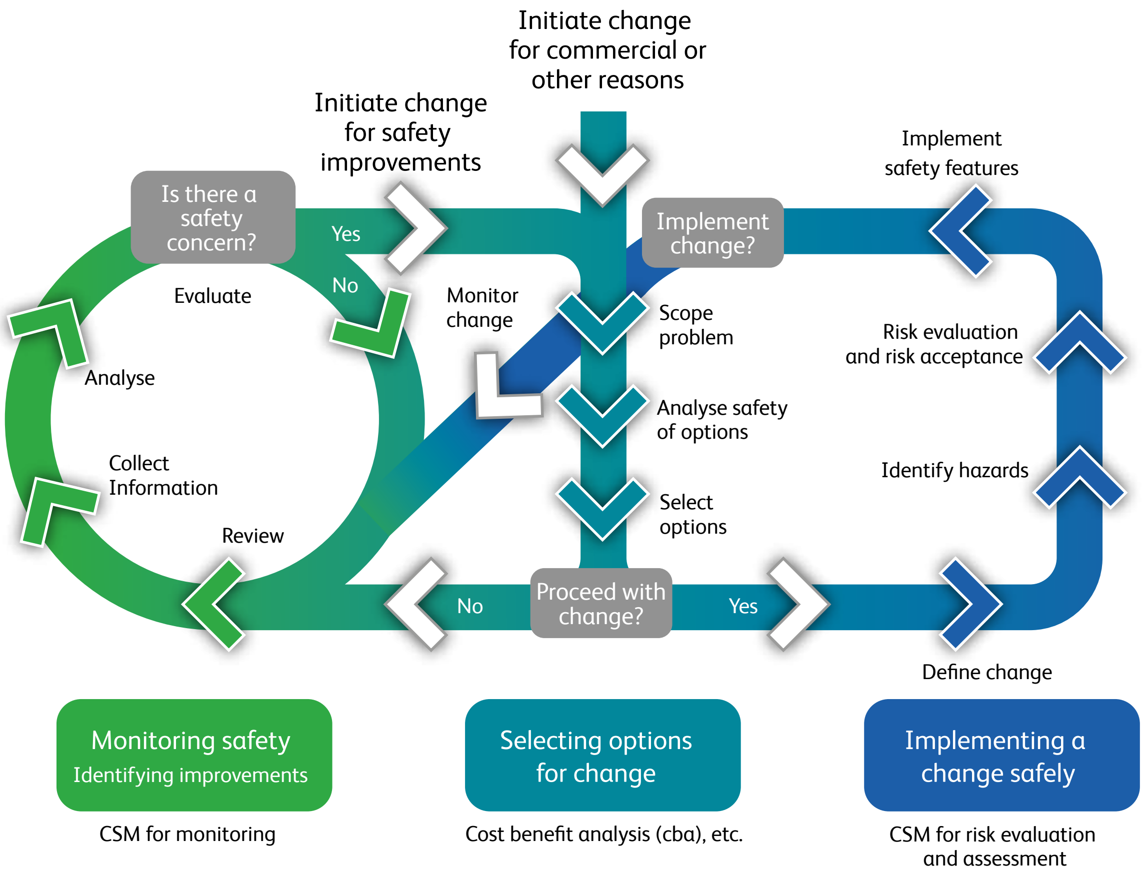


Figure 7: Taking safe decisions

ALARP

A recognised challenge that extends beyond the rail sector is economic constraint. We must adopt a responsible position in how we spend public money.

While we have a vision to eliminate accidents at level crossings, the question of what is reasonably practicable to do, must to be considered. This applies at every individual location.

We always seek to comply with the law and cost benefit analysis is used to determine how best to achieve this. Where increased investment is required to manage safety, risk-based decisions are made using the test of ‘as low as reasonably practicable’. (ALARP)

In making decisions about safety expenditure, reasonable practicability needs to be evaluated. In so doing, we will consider the collective risk (aggregated over all exposed groups, which will include members of the public, passengers and staff) that is present, against the sacrifice (money, time and effort) involved in the measures necessary to avert the risk. If it is shown that there is a gross disproportion between them and the risk is inconsequential in relation to the sacrifice, then a case may be made that the investment, or measure, is not considered to be reasonably practicable to progress.

In reaching such a judgement, a quantifiable risk-based cost benefit analysis (CBA), which also accounts for whole-life cost, will be undertaken to aid decision making.

In making ALARP decisions, we will not accept a decrease in risk at one location as offsetting risk increases in other locations, unless risk is also managed to ALARP.

Investment in level crossing safety must also 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 will be applied to mitigate risk.

Through a safety management framework of re-assessment and monitoring, we can continuously evaluate safety risks and prioritise expenditure appropriately, making sure risks are managed ALARP and public money is invested wisely.

As well as always complying with the legal duties placed upon us, there may be occasions when, for good business reasons, we decide to make changes to level crossings that provide further improvements for both passengers and public which go above and beyond what would otherwise be deemed 'reasonably practicable'.

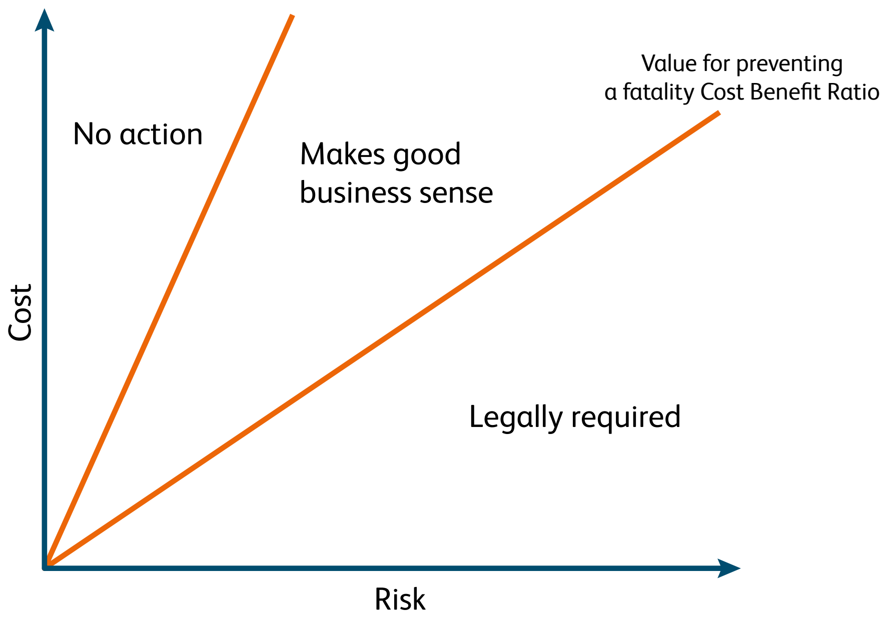


Figure 8: Our appetite for investment in level crossings

OUR FOCUS

‘We will continue to work with communities, private landowners and local authorities to find safer ways to cross the railway.’

Enhancing level crossing safety sets out our strategic direction, providing the vehicle for effective collaboration across the industry to reduce level crossing risk to as low as reasonably practicable. It is delivered through activities which are both internal and external to Network Rail and centres on four focal areas which affect both our passive and automatic level crossings targeting user mistakes or errors (including slips and lapses), deliberate misuse, asset failures and defects, and operator errors. This section looks at each of the four areas and considers how we will work over the next 10 years to improve the safety of level crossings.

Risk to the users of a level crossing is greatest where we ask the user to take more decisions for themselves. Therefore, risk reduction at passive level crossings is the first priority. Second, the automatic level crossing estate where opportunity for error and misuse continues.

Managing level crossing safety in a time of growth

A growth in rail traffic is required to accommodate a forecasted 40 % increase in passenger numbers by 2050 and to support the government’s Rail Freight Transport Strategy. Our level crossings are an important part of the operational

railway system and we need to ensure that level crossing safety is included in the discussions when we look for opportunities to increase rail traffic on our network.

To support those discussions, we will work to better understand the impact rail traffic increases will have on the safe operation of our level crossings and how it may affect the communities we serve.

As such, we will collaborate with the DfT and our train and freight operator colleagues to identify and manage the risk from proposed franchise requirements, freight and open access requirements and any subsequent timetable changes.

We will develop and embed processes that allow for full and proper understanding of risk changes to our level crossings at the earliest opportunity. By affording us enough time we will be able to determine, implement and/or install solutions to mitigate the risk increases, created by higher numbers of traffic moments at our level crossings, where required, thus allowing us to maintain a well performing railway.

Closures

The closure of a level crossing is the only true way to guarantee that risk has been eradicated and accidents cannot occur. Closures of passive footpath, bridleway and user worked crossings have been a focus of strategic investment since 2009.

However, we must recognise the importance of community, and how our level crossings do, in some circumstances, allow communities to remain connected. We will continue to work with communities, private landowners and local authorities to find safer ways to cross the railway. Opportunities will be taken, in accordance with ALARP principles, to close level crossings by using legislation including, where appropriate, the Transport and Works Act 1992. The risks of traversing the railway will be balanced against the risks of diversionary proposals. We will take account of demographic needs and user convenience within option selection. Public safety will always be at the forefront of decision making.

Wherever practicable and safe to do so, any diversions will seek to utilise conveniently located over-bridges or underpasses to assure public money is efficiently managed.

The support and partnerships of train operating company colleagues is welcomed in closing station crossings used by rail staff, where alternative/lift access is provided.

07

TECHNOLOGY AND INNOVATION

Technology will be used to make level crossings which remain open safer and generate improved performance and capacity on the network. We will seek out innovative technology, working with suppliers and other partners to reduce costs and generate financial efficiencies. Whole-life costs will be taken into consideration in tandem with the safety benefits of solutions.

To reduce the likelihood of human error and improve safety, we will continue to use available technology and look to future innovation opportunities to develop new solutions.

The use of technology at our level crossings is a central element of the level crossing safety strategy. It is a crucial measure in improving the safety of sighting-only crossings and protecting users of our highest risk footpath, bridleway and user worked level crossings.

Through appropriate deployment of technology, we are able to reduce risk and generate safety benefits, and maintain convenience to the users which reflect the importance of these solutions and support the investment made.

In targeting technology at passive crossings, we will prioritise in equal measure:

- Locations of high risk, high line speeds and high traffic volumes
- Footpath and bridleway crossings with sighting deficiencies protected by whistle boards; targeting those with known usage during the night-time quiet period[5] and working to eradicate whistle boards from the network
- Footpath and bridleway crossings providing access to schools and local amenities which are used by cross-sections of the community, notably by those who may be considered most at risk
- User worked crossings equipped with telephones in long signal sections
- User worked crossings equipped with telephones where Signaller workload and call volumes are assessed to be demanding
- User worked crossings which rely on sighting alone and which are assessed to present greatest risk of train accidents

In targeting technology at automatic crossings, we will prioritise:

- Unprotected automatic crossings - the automatic half barrier crossing
- Automatic crossings that rely on people, whether the signaller or train driver to confirm whether it is clear before allowing a train to pass over the level crossing
- Improvement and installation of both visual and audible warnings

Train detection warning systems

Audible warning devices (AWDs), overlay miniature stop lights (OMSLs) and integrated miniature stop lights (MSLs) will continue to be used to improve user awareness of approaching trains, reduce the likelihood of errors and lapses and safeguard vulnerable members of society from greater harm. At crossings which provide vehicular access over the railway, technology can significantly reduce the chance of high-risk train accidents. We will continue to innovate and develop new solutions that will allow us to place train detection warning systems at a greater number of level crossings and those solutions will be targeted at the user worked crossings which present greatest risk.

[5] Night-time quiet period or NTQP: The hours between 23:59 to 06:00 when train drivers do not sound train horns at whistle board protected level crossings except in emergencies.

Automatic half barrier level crossings

Whilst generating a proportionally high level of risk, automatic half barrier crossings do offer user convenience through minimised barrier down times. This has the potential to reduce road delays and congestion. In contrast, however, the opportunity for user error or deliberate red light violations and barrier weaving is always present and offsets much of this benefit. Consequently, the location of half barrier crossings is critically selected.

To improve levels of protection, but maintain convenience levels, we will continue to develop a variant to half barriers by using obstacle detection technology to design an AHB+ crossing type. This solution will retain the convenience of limited road closure times, but users will be protected by full barriers.

AHB+ technology, when available, will be deployed as part of risk-based improvements, upgrades and enhancements. Prioritised locations will be driven through risk assessment and will include those at stations, where there is high pedestrian use e.g. on the route to schools, stations or holiday parks and on high-speed lines. Specifically, AHB crossing types will not be renewed as equivalent like-for-like assets where they are adjacent to stations or regularly used by school children.

Other types of automatic half barrier or open crossings will be enhanced with automatic full barrier technology as identified through risk assessment.

Improved visual and audible warnings

There are a number of miniature stop light (MSL) equipped level crossings on the network which only provide users with a visual warning of approaching trains. We will identify these crossings and, based on risk, develop plans to install audible warning devices or make provisions, as part of renewals, to replace equipment with more modern solutions. Decisions to prioritise these locations will be balanced against other passive crossings where there are currently no train detection warning systems installed and where risk may be greater.

Some AHB level crossings conform to a previous design standard meaning that the audible warnings cease to sound when the half barriers reach the lowered position. These locations will be brought up to current design standards whereby the audible warnings continue until the end of the completed sequence, i.e. after the train has passed clear and the barriers have raised.

In accordance with risk assessment output, we will further introduce 'another train coming' spoken alarms at locations throughout the country, targeting automatic crossings where there is regular pedestrian footfall and a high likelihood of more than one train passing another within a single crossing sequence.

As enhancements with audible warnings are progressed, environmental noise impact on lineside neighbours will be taken into account and volumes adjusted within available tolerances so far as is practicable.
We will continue to upgrade our 50W halogen bulb road traffic light signals (RTLS) to light emitting diode (LED) lamps to improve the visibility of stop lights at level crossings. Locations identified as not currently being fitted with LEDs will be upgraded as part of renewal and enhancement schemes.

Work with suppliers to utilise new technologies that may provide even better visual warnings than the current LED RTLS will continue, and such technology will be used at locations where sun glare is a known concern.

Signage

Signs which convey safety messages must be clearly articulated such that they can be easily and expediently understood. The signs found at passive level crossings, which are mandated by legislation, have not evolved in many years and are not necessarily optimised for modern society or ergonomically designed around human factors studies.

Network Rail is therefore working in partnership with the ORR to review and update all mandatory signage at footpath, bridleway and user worked crossings. This work is building on the human factors studies and recommendations within RSSB commissioned research projects T983 Signs at private level crossings, and T984 Research into the causes of pedestrian accidents at level crossings and possible solutions. Improvements to signage at public road level crossings will follow once the prioritised work at passive crossings is concluded.

New signage will be deployed in a targeted and controlled way. We will work with the DfT and ORR to progress changes in legislation to formalise new signs in law.

Improved layout

In parallel with improving signs, we will work to enhance the ergonomics of passive crossings as a long-term objective, using our good practice guidance to remove signage clutter.

The findings of RSSB research paper T984 will form the basis of demarcating the danger zone, or area within the confines of the level crossing.

Guide-fencing and chicanes will be used to help direct users along safe paths to improve awareness and behaviours. We will use these measures at skewed crossings which are upgraded to right-angled surfaces and where original access points are retained.

Locations will be prioritised based on risk and qualitative judgement, making use of opportunities to make incremental improvements during risk assessment and asset inspection site visits.

The next generation of obstacle detection

First generation obstacle detection uses both RADAR (radio detection and ranging) and LIDAR (light imaging detection and ranging) to detect the entire crossing surface for obstructions. Whilst the combined system has been successfully deployed at almost 100 locations nationally, the lower LIDAR necessitates expensive profiling work and introduces potential failure modes which cause disruption and secondary risk.

A second generation of obstacle detection technology that will exceed current capability and avoid the need for a supplementary LIDAR (or equivalent) system is being explored. Such technology may prove suitable for use at different crossing types as part of a range of risk reduction solutions and safety enhancements.

Innovation

In addition to managing our known legacy issues, we will pool our expertise, taking opportunities to innovate such as those within a Digital Railway, to design level crossing improvements which target user mistakes or errors (including slips and lapses), deliberate misuse, asset failures and defects and operator errors.

We will tailor technology specifications according to risk, enabling wider deployment of safer but affordable designs. In designing for safety, areas of focused activity will include:

- Predictor technology to enable consistent and optimised train detection warnings, leading to minimised waiting times, enhanced user convenience, improved safety and increased rail performance

- Development of remote condition monitoring to:
  - Prevent failures (so far as is reasonably practicable)
  - Improve notification of faults and failures to enhance safety and reduce maintenance costs
  - Facilitate better data collection leading to improved analytics and improved safety
  - Provide robust intelligence post incident or as a result of allegations of faults and failures

- Use of video analytics to assist monitoring of CCTV controlled crossings

Locations will be prioritised based on risk and qualitative judgement, making use of opportunities to make incremental improvements during risk assessment and asset inspection site visits.

08

RISK MANAGEMENT

Effective risk management of our level crossings requires us to not only look at level crossings as a physical asset, but as a system of systems, and we must remember that our level crossings connect the railway to other public rights of way.

As part of condition-led renewals, we will take opportunities to look holistically at current and future road, rail and environmental proposals to efficiently manage risk.

We also need to continue improving our risk management capabilities.

Risk assessment process improvements

We will continue to build on the good work undertaken by level crossing managers, seeking ways to continually improve our risk assessment processes so that emerging human factors risks, and other hazards are fully incorporated within core risk management activity.

Further improvements in the number of extended censuses undertaken within risk assessments will be made to provide the best intelligence possible to determine when level crossings are used, at what frequency and by whom (user demographics, vulnerable and encumbered usage etc.).

Other transport systems, such as the roads network, will be explored to determine if alternative good practice measures exist to best represent vulnerable users within traverse time calculations. If it is established that well-founded procedures exist, we will explore how we might adjust our processes to align with these.

We will work with local authorities to understand the impact that our level crossings have on the wider local road network. Determining how our level crossings interact with the road network will give better information for our system risk understanding.

Improvements to the process of undertaking a narrative risk assessment (NRA) will be made in conjunction to enhancing the content and appearance of the document. It will evolve to support steady-state, renewals and enhancement project risk assessments. This will take account of lessons we have learnt and improve consistent risk assessment across the business.

The next generation of the All Level Crossing Risk Model (ALCRM)

Network Rail has used ALCRM since 2007 to quantitatively support its qualitative risk assessment of level crossing safety. In 2017, RSSB led the completion of research project T936 to update the algorithms such that they are further enhanced and aligned with the industry's Safety Risk Model (SRM).

These changes will be incorporated into the risk model to optimise calculated risk and enhance decision making, elevating the accuracy of risk assessments further still. A new Level Crossing Decision Support Tool will bring risk, asset and safety incident data into one place to help prioritise action.

09

COMPETENCE MANAGEMENT

Employee competence is a critical area of importance for Network Rail. Effective training and high levels of competence are conducive to effective risk management and tangible safety improvements at level crossings.

Accordingly, we will continue to invest in the training and competence of our level crossing managers, making sure that it is continuously adapted to account for change. Training and competence will be a particular area of focus in the development and deployment of the next generation of ALCRM, enhanced NRAs and/or as human factors intelligence or incident analysis modernises current thinking.

Training, competence, and assurance frameworks will continue to evolve to improve levels of consistency, quality and capability within the organisation. Where practicable this will be extended to others who interface with level crossings, such as those who undertake level crossing designs, produce ground plans or level crossing orders.

10

EDUCATION AND ENFORCEMENT

Influencing user behaviour

Getting people to behave safely around level crossings relies on them knowing how to behave safely and choosing to do so. This needs to be done before, during and in some cases after someone has used the crossing.

The 'before' requires education of safety risks and good habits around level crossings, the 'during' reinforces expected behaviour and 'after' re-educates on safety risks, good habits and expected behaviour where required.

Promoting safety awareness has been a critical part of improving level crossing safety, and indeed, rail safety for many years. We will continue to teach communities how to behave safely at level crossings giving them all the information they need. We will, in collaboration with the British Transport Police and other partners such as the National Farmers Union (NFU), trade groups and our train operator colleagues, deliver key safety messages to coincide with trending risks, seasonal trends and partner led campaigns – keeping information fresh and engaging.

We will target known ‘at risk’ groups such as those most vulnerable or prone to errors, lapses or deliberate acts and the communities where our level crossings are situated or nearby. We will do this by engaging in local community outreach activities such as visits to schools, clubs, societies as well as with level crossing users directly.

Those people who choose to behave unsafely will be addressed both through education and enforcement. We will undertake national campaigns aimed at changing the factors that drive unsafe behaviour e.g. mental health issues, anti-authority attitudes, inattention and intoxication. This activity will tackle, at a mass scale, the factors that lead to unsafe behaviours around level crossings. Increased awareness will also be promoted within our own organisation, helping our employees to become ambassadors for level crossing safety inside and outside of work.

Red light safety equipment (RLSE)

Over the past five years, Network Rail has worked with suppliers to develop Home Office Type Approved (HOTA) digital red light enforcement cameras, known as RLSE. This safety initiative has been successfully installed at 33 automatic level crossings around the country.

RLSE has been quantitatively established to significantly improve situational awareness and user behaviour, with safety related incidents reduced by as much as 90 % at certain locations.

We will continue to rollout RLSE as a means of improving safety at automatic level crossings, targeting our high-risk locations. RLSE will also be used to bolster safety at full barrier signal protected crossings which are subject to significant road vehicle violations in an aid to improve performance, train running and reduce the likelihood of perturbed working and imported secondary risks.

Mobile Safety Enforcement

A fleet of 15 British Transport Police (BTP) staffed mobile safety vehicles, equipped with automatic number plate recognition cameras, have operated throughout the country for the past five years. They have been deployed proactively and reactively at public road level crossings which are high risk or prone to regular bouts of deliberate misuse.

The BTP led driver education course has been successful in raising awareness and reducing the likelihood of repeat offences for drivers caught behaving in an unsafe manner. Prosecution is also used for more serious offences and repeat offenders.

The current fleet of MSVs continue to provide a valuable service as they draw toward life-expiry. In exploring a new mobile solution, evaluation of the safety benefits and cost of new mobile enforcement equipment will be undertaken. We will take account of lessons learnt and seek cost-effective technology to optimise investment and improve efficiency.

Any future investment in mobile enforcement equipment will be supported by a safety, performance, financial and reputational cost benefit analysis and underpinned by ALARP principles.

11

DELIVERY

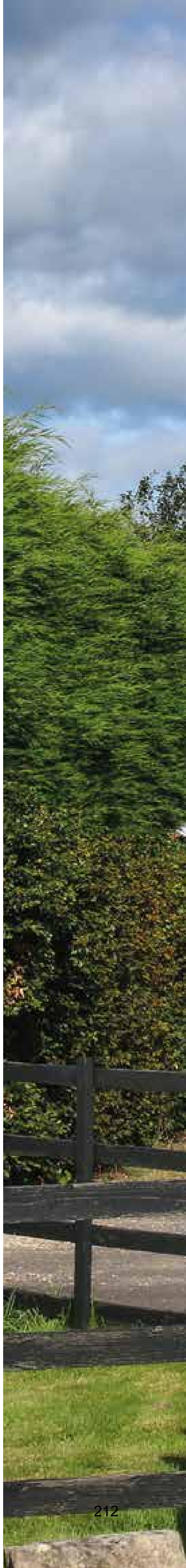
Embedding and delivering our Enhancing Level Crossing Safety Strategy

Delivering the objectives laid out within the strategy will require us to treat level crossings as a system of systems requiring an increased level of collaboration.

Effective collaboration starts with a common understanding of the goals and objectives. Industry experts were consulted in the development of this strategy and there is agreement what needs to be done. We will continue to, through the Industry Level Crossing Strategy Group, to develop a wider industry understanding of level crossing risk and establish the best collaborative delivery models across all our external stakeholders.

Our Level Crossing Integrated Review Group will drive through the delivery of this strategy within our organisation.

Supported and guided by this strategy, our Strategic Business Plans show how we intend to deliver safe and reliable level crossings for public and passengers, now and in the future.




ANOTHER TRAIN
COMING
if lights
continue to show
KEEP
CROSSING
CLEAR
KEEP

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KEY INFORMATION

Understanding our level crossings

Our Level crossing safety site provides a one-stop shop understanding of our level crossings, providing information on crossing locations and risk and information on how to use crossings safely.
https://www.networkrail.co.uk/communities/safety-in-the-community/level-crossing-safety/

Level crossing safety education

Having worked closely with teachers and students to develop resources that will help run fun, engaging and interactive activities that match different curriculum areas and deliver OFSTED requirements of PHSE teaching.

Our Safety education site provides teachers with resources aimed at Key Stages 1 to 4 (Scotland P1 to S4) providing safety awareness to young people in their early years and providing those at secondary school with the information and skills to stay safe as they enjoy greater independence.

Key Stages 1 and 2 (Scotland P1 to P6)
https://www.networkrail.co.uk/communities/safety-in-the-community/safety-education/primary-school-resources/

Key Stages 3 and 4 (Scotland P7 to S4)
https://www.networkrail.co.uk/communities/safety-in-the-community/safety-education/secondary-school-resources/

Welsh Baccalaureate
We have also worked to develop resources that support the Rail Safety Community Challenge which forms part of the WJEC Welsh Baccalaureate Framework
https://www.networkrail.co.uk/communities/safety-in-the-community/safety-education/welsh-baccalaureate/

Company Strategy

Enhancing level crossing safety 2019-2029

Endorsement and authorisation

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Appendix JP5 – Network Rail Standard NR/L2/XNG/001

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

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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.

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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
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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

Ref:	NR/L2/XNG/001
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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.

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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;

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***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.*

Appendix JP6 – Network Rail Standard NR/L3/XNG/308

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

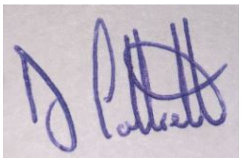
Level 3

Work Instruction

Risk assessing level crossings

Approvals

Content Approved by:



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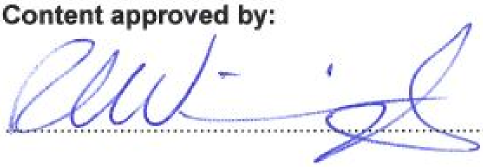
Darren Cottrell,
Technical Lead

Content approved by:



Rob Wainwright,
Standard and Control Document Owner

Approved for publication by:

....

John Winnifrith,
Standards and Controls Management Team

Published and Issued by Network Rail, 2nd Floor, One Eversholt Street, London, NW1 2DN.

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Issue:	1
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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 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

Supply

Copies of standards/control documents are available electronically, within Network Rail's organisation. Hard copies of this document might be available to Network Rail people on request to the relevant controlled publication distributor. Other organisations can obtain copies of this standard/control document from an approved distributor.

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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);

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;

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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.

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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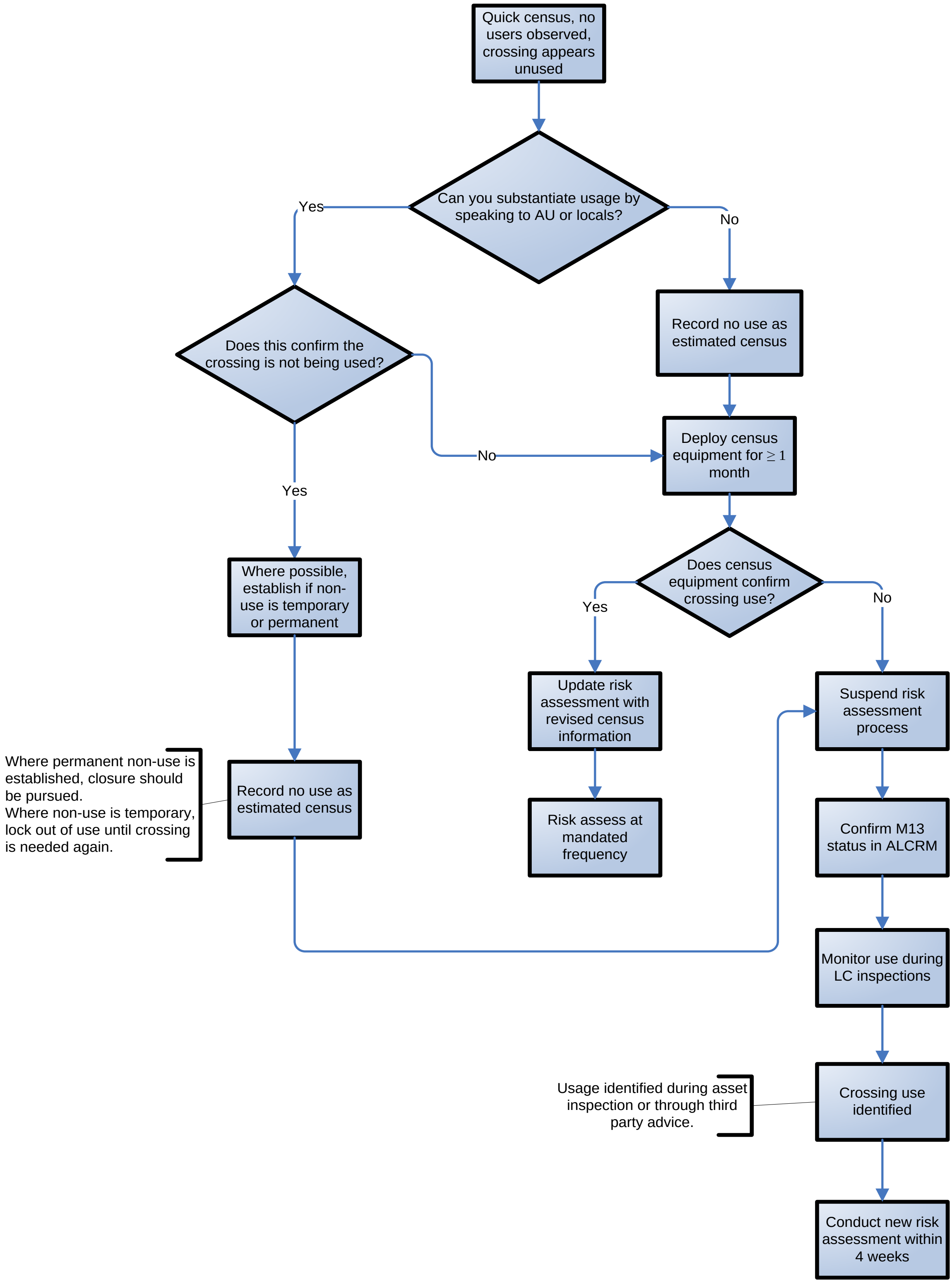

Figure 1 – Action to take when no users observed

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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.*

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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.*

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.

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.

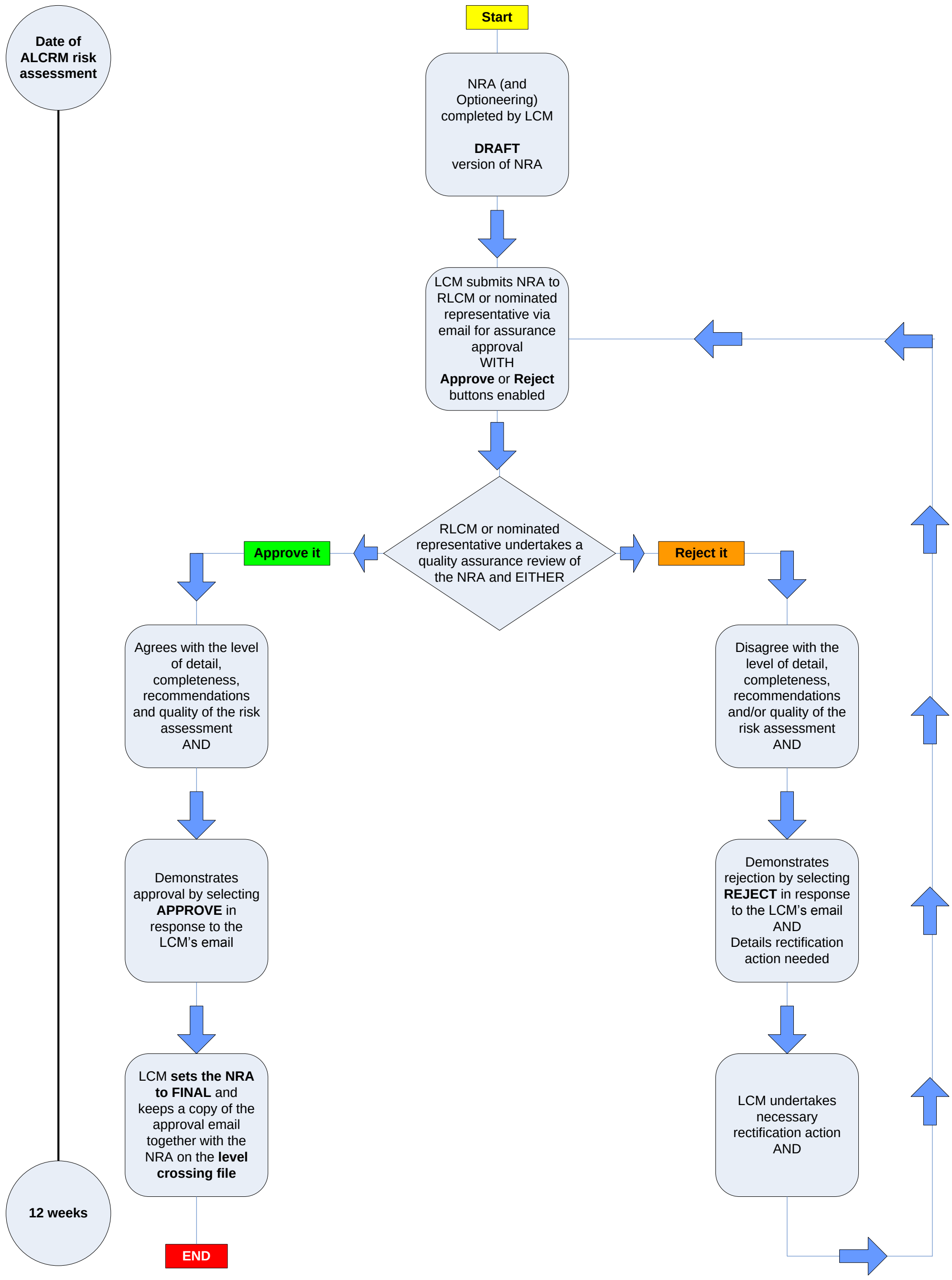

Figure 2 – NRS quality assurance process overview

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.*

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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Issue:	1
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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

Ref:	**NR/L3/XNG/308**
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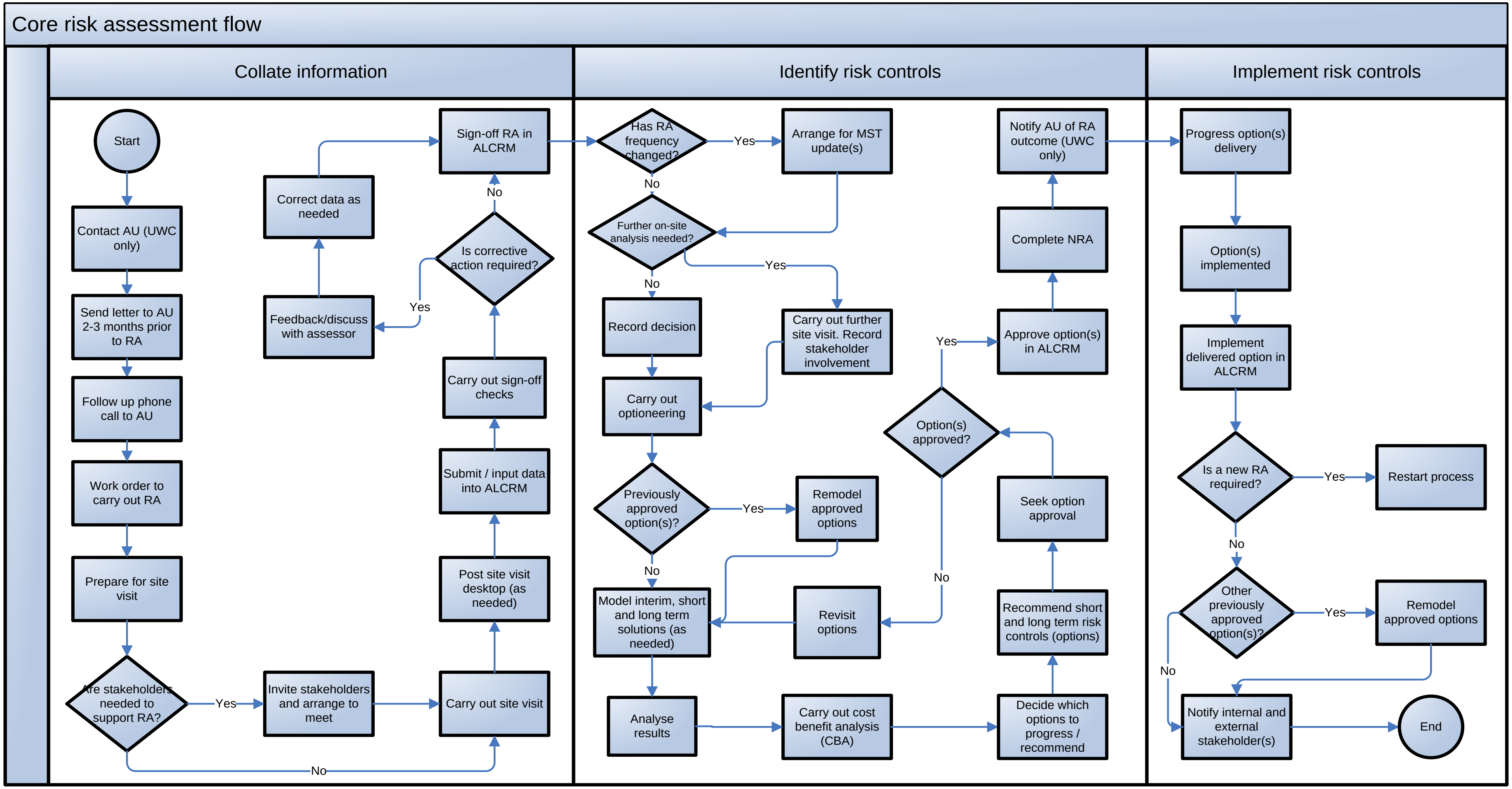
Appendix A - Risk assessment flowchart



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.*

Appendix JP7 – Network Rail Standard NR/L2/XNG/19608

Ref:	**NR/L2/XNG/19608**
Issue:	8
Date:	04 September 2021
Compliance date:	04 September 2022

Level 2

Business Process

Inspection of Level Crossing Systems

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Issue:	8
Date:	04 September 2021
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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 permitted*

- Red requirements are always to be complied with and achieved.
- 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 Limited and its contractors if applicable from 4th September 2022.

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 or Project Acceleration in a Controlled Environment (PACE) phase. In all other circumstances, projects that have formally completed GRIP Stage 3 (Option Selection) or PACE strategic development & project selection phase may continue to comply with any relevant Network Rail standards/control documents that were current when GRIP Stage 3 or PACE phase 1 was completed.

NOTE 1: *Legislation includes National Technical Specification Notices (NTSNs).*

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

Disclaimer

Supply

Copies of standards/control documents are available electronically, within Network Rail's organisation. Hard copies of this document might be available to Network Rail people on request to the relevant controlled publication distributor. Other organisations can obtain copies of this standard/control document from an approved distributor.

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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	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 check sheet.
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.
8	04/09/2021	Revised to provide a risk based approach to level crossing inspection and defect management

Reference documentation

NR/L3/XNG/308	Risk Assessing Level Crossings
NR/L2/XNG/202	Prioritisation of Level Crossing Defects
NR/L2/OHS/019	Safety of people at work on or near the line
NR/L2/CSG/STP001/04	Managing Variations to Network Rail Standards and Control Documents and Railway Group Standards

Legislation

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

Health and Safety at Work Act 1974 (HASAWA)
Level Crossings Act 1983
Level Crossings Regulations 1997
Management of Health and Safety at Work Regulations 1999

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

Contents

Ref:	**NR/L2/XNG/19608**
Issue:	8
Date:	04 September 2021
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1 A Purpose

This business process forms part of the Level Crossing Inspection and Maintenance Control for managing the high-level risks:

a) vehicle, person or animal on the line at risk of collision;

b) incident on or near Level Crossing not involving a railway vehicle.

Failure to adhere with this document could lead to a loss of safety around the level crossing system.

2 Scope

This business process defines the requirements on Route Level Crossing teams and Infrastructure Maintenance Delivery teams for inspection of all level crossing assets on Network Rail managed infrastructure. It includes:

a) defining the level crossing inspection intervals and programming inspections;

b) planning and preparing for level crossing inspections;

c) undertaking level crossing inspections; and

d) completing level crossing inspections and recording defects.

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

3 Terms and Abbreviations

Terms and abbreviations used in this document are described in Table 1 and Table 2 respectively.

Term	Definition
Barrow	A level crossing at the end of a station platform for use by (or under the supervision of) rail staff.
Frequency	The time between applications of a maintenance task.
Maximum Frequency	The maximum frequency between inspections that can be justified.
Mothballed crossings	A level crossing on a line which is no longer used by rail traffic but has not been subject to permanent network change. The crossing however may still be used by the public and still requires inspection and maintenance.
Normal Inspection Frequency	The normal inspection Frequency to be applied to each crossing type as defined in Appendix A.
Prioritisation	Identifying the severity of a defect in accordance with Network Rail standards and therefore how quickly re-inspection, mitigating action or resolution is required.
Sleeping Dog	A level crossing generally of the UWC, FP, or Bridleway type where the right to cross still legally exists, but there is no evidence of use. There may be little, or no trace of the level

	crossing infrastructure and maintenance has been withdrawn. These level crossings are reinstated and brought back into use when the right is later exercised.
Temporarily Closed Crossings	A level crossing of any type that has been temporarily legally closed for traversing the railway due to circumstances such as extended engineering work, adjacent developments etc., but where the intention remains to re-open the level crossing. The infrastructure remains in place and the crossing still requires inspection.
Watchman	Individual appointed to manage immediate risk associated with a defect. They do not need specific competency but should understand the consequence of the defect they are protecting (e.g., LCM, Pway, Signalling technician or level crossing attendant, MOM).
Work Arising Identification Form (WAIF)	Electronic or paper record for recording work arising from an inspection.

Table 1 Terms

Abbreviation	**Description**
ABCL	Automatic Barrier Locally Controlled
AFBCL	Automatic Full Barrier Crossing Locally Monitored
AHBC	Automatic Half Barrier Crossing
ALCRM	All Level Crossings Risk Model
ABCL	Automatic Barrier Crossing Locally Monitored
AOCL	Automatic Open Crossing Locally Monitored
AOCL+B	Automatic Open Crossing Locally Monitored with Barriers
AOCR	Automatic Open Crossing Remotely Monitored
BW	Bridleway
FDM	Field Data Manager
FP	Footpath
ICC	Integrated Control Centre
IME	Infrastructure Maintenance Engineer
LCM	Level Crossing Manager
MCB	Manually Controlled Barriers
MCB-OD	Manually Controlled Barriers with Obstacle Detector
MG	Manned Gates
MPC	Maintenance Protection Co-Ordinator

Abbreviation	Description
MSL	Miniature Stop Lights
OC	Open Crossing
ORA	Operations Risk Advisor
RLCM	Route Level Crossing Manager (or equivalent role)
SM(OT)	Section Manager Off Track
SP(OT)	Section Planner Off Track
SSM	System Support Manager
TMO	Traincrew Manually Operated
TME	Track Maintenance Engineer
UWC	User Worked Crossing
WAIF	Work arising identification form

Table 2 Abbreviations

Ref:	**NR/L2/XNG/19608**
Issue:	8
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4 Level Crossing Inspection Process

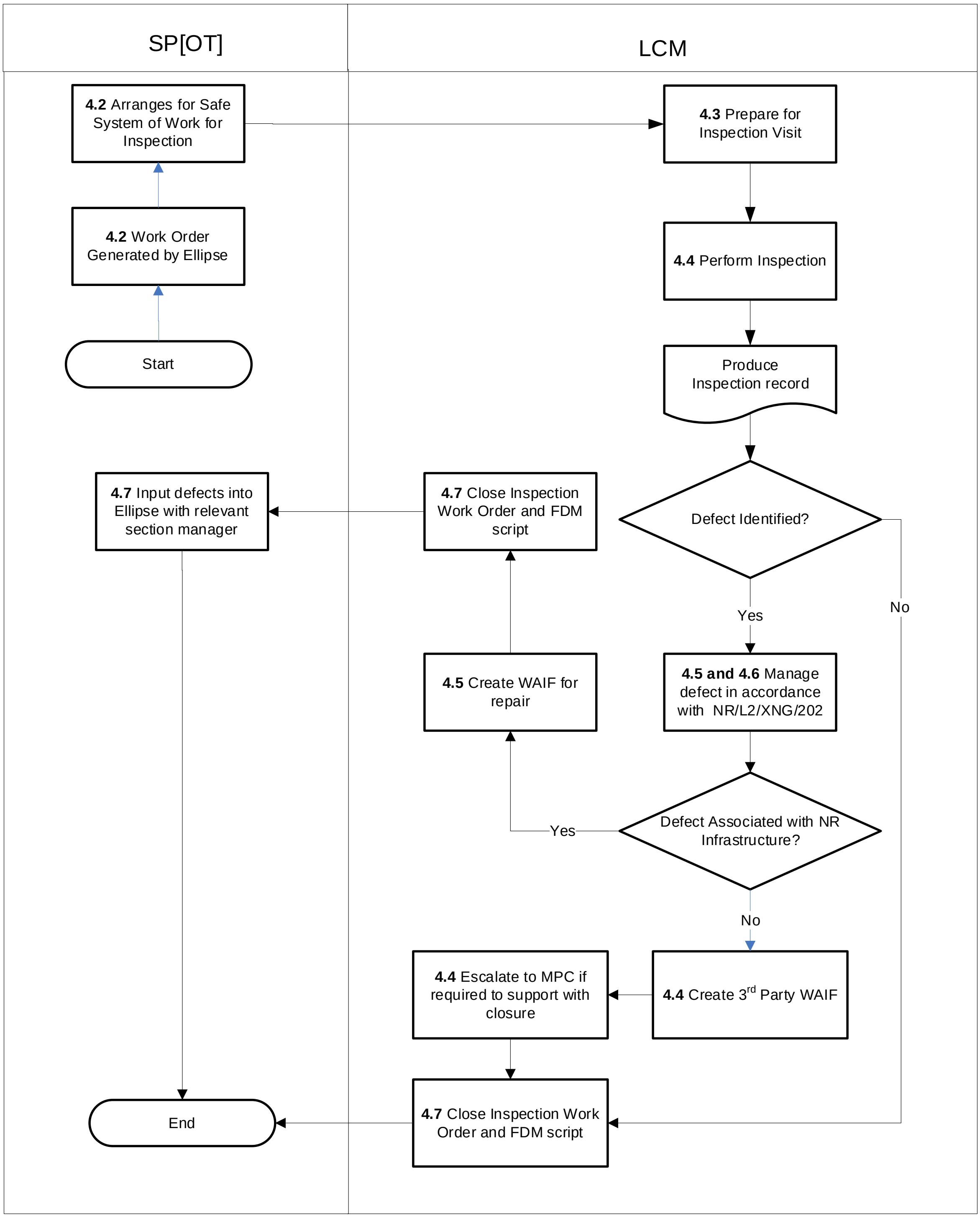

Figure 1 Process flow chart

4.1 Inspection Frequencies

All LCM's inspections shall be scheduled in Ellipse.

The IME shall be accountable for confirming the correct frequencies are applied to LCM's inspections.

The inspection frequencies defined in Appendix A shall be applied at each level crossing.

The inspection frequencies shall be dependent on the ALCRM risk category of the level crossing and level crossing type.

All crossings shall be subject to inspection at the normal frequency defined in Appendix A unless the inspection frequency has been extended to the maximum frequency defined in Appendix A.

If the inspection frequency is extended to the maximum, a site-specific risk assessment shall be approved which includes an assessment of crossing risk and asset condition.

NOTE 1: *The template in NR/L2/XNG/19608/F02 can be used to assess level crossing risk when applying to change the level crossing inspection frequency.*

The inspection frequency shall not exceed the maximum frequency defined in Appendix A.

When changes to the ALCRM risk model results in a change to the risk category, the LCM shall review the inspection frequency. Should the change result in a higher risk score which means an increased inspection frequency is required, they shall instigate a change to the inspection frequency with the SSM and IME in the relevant Infrastructure Maintenance Delivery Unit.

Any crossing that uses sighting distance as the main risk mitigation measure shall be scheduled for inspection in the vegetation growing period.

NOTE 2: *The period between April and September inclusive is deemed to be the vegetation growing period.*

The tolerance applied to level crossing inspection is 7 days, following which the inspection is deemed non-compliant.

4.2 Preparing for the Inspection

Figure 1 shows the process flow for the level crossing asset inspection.

This shall be followed for all inspections.

The LCM shall liaise with the SP[OT] to arrange for a safe system of work to be created for the inspection visit in accordance with NR/L2/OHS/019.

The LCM shall assemble the information, equipment and documentation required to conduct the inspection including:

a) the level crossing ground plan for all public road level crossings or in the absence of a level crossing ground plan, a site sketch of the level crossing arrangements;

b) the level crossing order for all public road level crossings where available;

c) an extract of a signalling plan showing any lineside signage on the approach to the level crossing;

d) a list of the outstanding defects (WAIFs) and faults associated with the crossing, including any issues related to 3rd parties on approach to the level crossing;

e) site safety documentation;

f) tools and equipment to perform minor repairs to level crossing systems identified on site.

NOTE: *Where no level crossing ground plan or site sketch exists for the level crossing, the LCM should produce a site sketch containing the level crossing arrangements.*

4.3 Conducting the Inspection

The LCM shall conduct the inspection using the scripts provided on Network Rail's approved mobile application.

The inspection script shall be completed on site at the level crossing.

The checklists selected shall cover all the level crossing functionality and infrastructure elements as part of the level crossing to be inspected.

The LCM shall work through the pre-loaded question set checklist in order.

NOTE: *The inspection checklist matrix applicable to each crossing type is detailed in Appendix B and is mirrored in the mobile solution.*

Where faults or defects are discovered, the asset condition shall be described as 'unacceptable' or 'acceptable – defect rectified'. Unless a work order is in place following a previous inspection, a defect shall be raised using a WAIF. In this case, the existing work order number shall be recorded in the notes section of the electronic script for audit purposes.

The signaller shall be informed immediately for all defects which could affect the safety of the line, or where defects might impact on level crossing users' safety.

4.4 Raising Defects

Defects identified shall be prioritised in accordance with NR/L2/XNG/202.

NR/L2/XNG/202 gives the minimum actions to be taken on site, the mitigation measures that can be applied, and the temporary repairs to be made.

When conducting the inspection, the LCM shall check all existing defects and act as follows:

a) escalate any defect that has deteriorated and requires more urgent attention to the responsible section manager and/or fault control, and arrange for further action in accordance with NR/L2/XNG/202;

b) where the degradation of the asset has not led to increased risk at the crossing, consider recommending to the appropriate Section Manager that the date on the Work Order is reprioritised;

NOTE: *The Section Manager may use the LCM recommendation as justification to re-prioritise the work order.*

c) where the defect is no longer present notify the appropriate Section Manager and arrange for the Work Order to be closed or cancelled.

No action is required for defects which are not in the categories listed in points a-c above.

All defects shall be recorded by creating a WAIF and reported as a fault with the ICC as per the requirements of NR/L2/XNG/202.

4.5 3rd Party Defects

The LCM shall take ownership of all 3rd party defects identified as part of level crossing inspection activities and raise a WAIF against the level crossing asset in Ellipse.

The LCM shall liaise with the MPC where escalation is required.

The LCM shall then advise the appropriate Section Manager that the work has been completed satisfactorily. The Section Manager shall arrange for the Work Order to be closed.

4.6 Repairing Defects

Where possible the LCM shall repair minor defects which are identified as part of the level crossing inspection provided:

a) it is safe to do so;

b) they are competent; and

c) it does not contravene Street Works Act (1991) legislation.

The LCM shall report defects identified as part of the level crossing inspection which require the appointment of a watchman to infrastructure control. Infrastructure control shall arrange for resources to be supplied from the local Infrastructure Maintenance Delivery Unit.

The LCM shall perform the watchman duties until either:

a) relieved by rapid response resource;

b) relieved by the Infrastructure Maintenance Delivery Unit staff; or

c) further mitigations are employed to manage risk.

4.7 Completing the Inspection

The LCM shall submit the completed inspection script and close the work order.

The LCM shall submit WAIFs for all new infrastructure defects identified with priorities in accordance with NR/L2/XNG/202.

The SP[OT] shall review the submitted WAIFs including any notes and arrange for Ellipse to be updated.

The SP[OT] shall arrange for work associated with WAIFs that are the accountability of other engineering disciplines to be transferred to the appropriate work group.

The LCM shall provide detail to the appropriate Section Manager where any reprioritisations are recommended in accordance with clause 5.

5 Review Process

The IME shall organise a meeting on their area to review the level crossing inspection process, defect management and rectification.

This meeting shall take place quarterly and include as a minimum the IME, SM[OT] and LCMs. The MPC shall attend as required.

The meeting shall include:

1. a review of the inspection frequencies:
    a. extended from baseline and changes in ALCRM;
    b. opportunities to change inspection frequencies.
2. a review of the defect rectification including:
    a. prioritisation of defects;
    b. reprioritisation of defects.
3. a review of any Level Crossings where renewal may be more beneficial than continued repair;
4. any issues around scheduling of inspections;
5. any issues around level crossing asset condition or safety.

The meeting shall review any approved variations to level crossing inspection frequency for adequacy annually.

A record of attendees and meeting minutes shall be retained as a record of the meeting.

An assurance process shall be applied to check:

1. the quality of level crossing asset inspections;
2. that the level crossing asset inspection frequencies in Ellipse are correct;
3. the quality of level crossing defect repair; and
4. level crossing defect rectification timescales.

The assurance process described in NR/L2/XNG/19608/Mod01 may be used.

Ref:	**NR/L2/XNG/19608**
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Appendix A - Level Crossing Inspection Intervals

Level Crossing Type	ALCRM risk category	Normal Frequency	Maximum Frequency
Public Road Crossing – Non Interlocked (e.g., AHBC / AOCL / ABCL / OC)	Red	7 Weeks (49 days)	3 Months (91 days)
	Amber / Double Amber	4 Months (119 days)	6 Months (182 days)
Public Road Crossings - Interlocked (e.g., MCB, MCB – OD, TMO, MG)	All	4 Months (119 days)	6 Months (182 days)
User Worked Crossings – all variants, including MSL	All	4 Months (119 days)	6 Months (182 days)
Footpath / Bridleways – all variants, including MSL	All	4 Months (119 days)	6 Months (182 days)
Sleeping Dog	All (Green)	12 Months (364 days)	
Mothballed, Temporarily Closed Crossings	As per crossing type		

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Appendix B – Level Crossing inspection checklist and type selection

	Crossing Type	AHBC	ABCL	AOCL+B	AOCL	AOCR	MCB – All Types	MG	UWC	OC	TMO	FP & BW	Barrow	Sleeping Dog	AFBCL
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**										✓				
LXi17	**Rail Signs – AOCL/AOCL+B/ ABCL/OC**		✓	✓	✓					✓					✓
LXi18	**Whistle Boards**	✓							✓			✓	✓		
LXi19	**Barrier Crossings operation inc. AHBC, ABCL & AOCL+B**	✓	✓	✓											✓
LXi20	**Open Crossings - Operation inc. AOCL & AOCR**				✓	✓									

	Crossing Type	AHBC	ABCL	AOCL+B	AOCL	AOCR	MCB – All Types	MG	UWC	OC	TMO	FP & BW	Barrow	Sleeping Dog	AFBCL
LXi21	**MCB Operation – All**						✓								
LXi22	**Manned Gates Operation**							✓							
LXi23	**Gates / Barriers Operation (inc. POGO)**								✓			✓	✓		
LXi24	**Traincrew Operated**										✓				
LXi25	**Station Barrow Operation**												✓		
LXi26	**Sleeping Dog**													✓	
LXi27	**Crossings on Mothballed Lines**	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓
LXi28	**Surface Systems**	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Standard and control document briefing note

Ref: NR/L2/XNG/19608	**Issue:** 8
Title: Inspection of Level Crossing Systems	
Publication date: 04 September 2021	**Compliance Date:** 04 September 2022
Standard/Control Document Owner: Head of Level Crossings Safety	
Technical lead/contact for briefings: Susie Walker, Engineer (Level Crossings)	**Tel:** 07515 625370

Purpose: This business process forms part of the Level Crossing Inspection and Maintenance Control for managing the high-level risks:

a) vehicle, person or animal on the line at risk of collision;

b) incident on or near Level Crossing not involving a railway vehicle.

Failure to adhere with this document could lead to a loss of safety around the level crossing system.

Scope: This business process defines the requirements on Route Level Crossing teams and Infrastructure Maintenance Delivery teams for inspection of all level crossing assets on Network Rail managed infrastructure. It includes:

a) defining the level crossing inspection intervals and programming inspections;

b) planning and preparing for level crossing inspections;

c) undertaking level crossing inspections; and

d) completing level crossing inspections and recording defects.

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

Overview of change

The key changes are:

- Amendment of inspection frequencies which are either increased or decreased depending on crossing type and ALCRM rating;
- The introduction of a risk assessment which can be used to extend the inspection frequency to a specified maximum; and
- Transfer of requirements relating to defect management and prioritisation to the newly created NR/L2/XNG/202.

The purpose of the standard has been amended so the focus is on managing risk at Level Crossings.

The standard has been completely reformatted with changes to layout and terminology to reflect current practices. There have been minor amendments to the process and a number of amendments to other requirements, including requirements which have been removed or included.

Detail of change

Section (NR/L2/SIG/19608 issue 7)	**Section (NR/L2/XNG/19608 issue 8)**	**Summary of changes**
All	All	There have been significant changes to the layout, formatting and terminology used in the standard to reflect current expectations and practices.
1 Purpose	1 Purpose	The purpose has been revised to reflect that the standard provides a method of managing risk instead of a process for achieving compliance.
2 Scope	2 Scope	Reference to managing defect repairs has been removed, this is part of the new NR/L2/XNG/202.
2 Scope	2 Scope	Reference to assurance requirements has been removed, reference is now made in section 5.
Figure 1	4 Figure Process flowchart	The flowchart has been reformatted, reference to defect management has been moved to NR/L2/XNG/202 and roles have been removed from this process flowchart for clarity.
Table 1 Key to process flow chart	n/a	This table has been removed, process sub-tasks A-R are now presented as clauses 4.1- 4.7.
Table 1 sub task 1	4.1 Inspection frequencies	Previously no extension to inspection frequencies has been permitted. New issue permits inspection frequencies to be extended if a site specific risk assessment is carried out (this is included as form NR/L2/XNG/19608/F02).
Table 1 sub-task A	4.1 Inspection frequencies	Inspection of crossings which use sighting distance as the main risk mitigation measure during the vegetation growing season is

		now a red requirement (previously amber). The growing season is now specified.
Table 1 sub-task A	n/a	Requirement relating to non-standard inspection frequencies has been removed.
Table 1 sub task B,C (C1 and C2)	4.2 Preparing for the inspection	Requirement to have a safe system of work has been added.
Table 1 sub task B,C (C1 and C2)	4.2 Preparing for the inspection	Amber requirement introduced to state the LCM shall take a list of outstanding defects, site safety documentation and tools. The requirement to take a mobile device has been removed.
Table 1 sub task D (D1 and D2)	4.3 Conducting the inspection	Reference to taking 'level crossing inspection checklists' removed.
Table 1 sub task D, E	n/a	All references to defect management and repair have been moved to NR/L2/XNG/202.
n/a	4.4 Raising defects	Requirements have been added with regard to inspecting existing defects.
n/a	4.5 3rd Party defects	Requirements for managing 3rd party defects have been added including reference to the MPC.
n/a	4.6 Repairing defects	Requirement for appointing a watchman has been added.
Table 1 sub ask G, I (I1 and I2)	4.7 Completing the inspection	Completion of inspection records has been simplified. Removed ref to TEF 3243. Reference to repeated defects removed.
Table 1 sub task L (L1 and L2)	4.7 Completing the inspection	Requirement to retain copies of inspection documentation removed and the process has been simplified.
Table 1 sub task O,P, Q	n/a	Requirement relating to defect prioritisation and management moved to NR/L2/XNG/202.
Table 1 sub task R	5	Further guidance is given as to what the review meeting should include.
Table 4	Appendix A	Inspection intervals amended.
Table 2	Appendix B	AFBCL has been added to the LXi matrix.
Table 3	n/a	Table 3 - Marks for completing inspection checklists has been removed.
4 RACI	n/a	The RACI matrix has been removed.
Table 6	n/a	Process assurance questions have been removed.
Appendix A, B, C and D	n/a	All assurance appendices have been removed. The process assurance documents have been moved to NR/L2/19608/Mod01.
Table 7	n/a	This table has been removed and included in NR/L2/XNG/202.

Reasons for change
The inspection frequencies have been amended according to level crossing type and ACLRM rating and a risk assessment to extend inspection frequencies has been added. This will result in inspection frequencies which are better aligned to the risk and degradation of the level crossing. It also means that RLCMs and LCMs will be able to use their knowledge and experience of individual level crossings to adapt the inspection regime accordingly.

The requirements relating to defect prioritisation and management have been moved to the new NR/L2/XNG/202 in order to separate the process of inspection from the engineering requirements associated with defects.

The standard has been reformatted and updated to increase ease of use and ensure the terminology used is up to date.

Affected documents:

Reference	*Impact*
NR/L2/SIG/19608 ISSUE 7	Superseded
NR/L2/XNG/19608/MOD01 ISSUE 1	New
NR/L2/SIG/19608/F01 ISSUE 1	Superseded
NR/L2/XNG/19608/F02 ISSUE 1	New

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	Level Crossing Manager	Regions	N
T	Operations Risk Advisor	Regions	Y
T	Infrastructure Maintenance Engineer	Regions	Y
A	Infrastructure Maintenance Protection Co-ordinator	Regions	N
T	Track Maintenance Engineer	Regions	Y
T	Section Manager [Off Track]	Regions	N
T	Section Planner [Off Track]	Regions	N
T	Signal & Telecoms Maintenance Engineer	Regions	Y
T	Section Manager [Track]	Regions	N
T	Section Manager [Signalling]	Regions	N
A	Section Planner [Signalling]	Regions	N

Briefing *(A-Awareness/ T-Technical)*	Role	Function
T	Regional Engineer (Signalling) or equivalent	Regions
T	Regional Engineer (Track) or equivalent	Regions

NOTE: *Contractors are responsible for arranging and undertaking their own Technical and Awareness Briefings in accordance with their own processes and procedures.*

Appendix JP8 – Network Rail Standard NR/L2/XNG/202

Ref:	**NR/L2/XNG/202**
Issue:	1
Date:	04 September 2021
Compliance date:	04 September 2022

Level 2

Business Process

Prioritisation of Level Crossing Defects

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Ref:	**NR/L2/XNG/202**
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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 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 Limited and its contractors if applicable from 4th September 2022.

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 or Project Acceleration in a Controlled Environment (PACE) phase. In all other circumstances, projects that have formally completed GRIP Stage 3 (Option Selection) or PACE strategic development & project selection phase may continue to comply with any relevant Network Rail standards/control documents that were current when GRIP Stage 3 or PACE phase 1 was completed.

NOTE 1: *Legislation includes National Technical Specification Notices (NTSNs)*

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

Disclaimer

Supply

Copies of standards/control documents are available electronically, within Network Rail's organisation. Hard copies of this document might be available to Network Rail people on request to the relevant controlled publication distributor. Other organisations can obtain copies of this standard/control document from an approved distributor.

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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	4th September 2021	First Issue

Reference documentation

NR/L2/XNG/19608	Inspection of Level Crossing Systems
NR/L2/OTK/5100	Boundary measure manual
NR/SP/ELP/27021	Electric track equipment layout for DC electrified lines

Legislation

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

Health and Safety at Work Act 1974 (HASAWA)
Level Crossings Act 1983
Level Crossings Regulations 1997
Management of Health and Safety at Work Regulations 1999

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

Contents

Ref:	**NR/L2/XNG/202**
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1 Purpose

This business process enables consistent defect prioritisation which is aligned to the risk of the defect.

2 Scope

This business process sets requirements for prioritising level crossing defects that are identified during the inspection process specified in NR/L2/XNG/19608.

It applies to all engineering maintenance personnel and level crossing managers.

Defects which are within the level crossing boundary but are not part of the level crossing system are out of scope.

3 Terms and abbreviations

Terms and abbreviations used in this document are described in Table 1 and Table 2 respectively.

Term	Definition
3rd Party Defect	Defect which is not the responsibility of Network Rail to resolve. Third parties could include the local council or neighbouring landowners.
Cill and Edge Beams	These are kerbs or edgings used to support the cess, 6 foot or outer panels.
Defect	An unacceptable asset condition which may lead to a degradation of safety or reliability.
Gapped	A gap considered a hazard (e.g. cycles, pram wheels, etc.). This is a 10mm gap anywhere on the crossing deck, excluding the flangeway gaps.
Integrated Control Centre (ICC)	The organisation delegated with monitoring of infrastructure faults and allocation of fault teams.
Prioritisation	Identifying the severity of a defect in accordance with Network Rail standards and therefore how quickly re-inspection, mitigating action or resolution is required.
Watchman	Individual appointed to manage immediate risk associated with a defect. They do not need specific competency but should understand the consequence of the defect they are protecting (e.g. rapid response, LCM, Track, Signalling technician or level crossing attendant).

Table 1 Terms

Abbreviation	Description
ESR	Emergency Speed Restriction
FP	Footpath
ICC	Integrated Control Centre
LCM	Level Crossing Manager
MCB	Manually Controlled Barriers
MCB-OD	Manually Controlled Barriers with Obstacle Detector
MPC	Maintenance Protection Co-ordinator
MSL	Miniature Stop Light
RLCM	Route Level Crossing Manager (or equivalent role)
RAM	Route Asset Manager (or equivalent role)
TME	Track Maintenance Engineer
TSR	Temporary Speed Restriction
UWC	User Worked Crossing
WAIF	Work Arising Identification Form

Table 2 Abbreviations

4 Defect Management

The signaller shall be informed immediately for all defects which could affect the safety of the line, or where defects may impact on level crossing users' safety and appropriate action taken.

Defects with priority defect codes SC, SI and M0 shall be reported as a fault to the Integrated Control Centre (ICC).

For each defect identified, the action tables in clause 6 shall be used to:

- assign a priority defect code for rectification which reflects the risk detailed within the tables; and
- mandate the action required to be taken by the LCM/delivery unit to rectify the defect.

NOTE: *For defects that pose a hazard to trains, vehicles or pedestrians and where both a temporary and permanent priority defect code is given the highest defect priority codes.*

A higher priority than those specified in clause 6 should be used if there are good safety or performance reasons identified by the LCM.

Table 3 provides the rectification timescales associated with each defect priority code.

Where possible the LCM shall repair minor defects, which are identified as part of the level crossing inspection provided:

a) it is safe to do so;

b) they are competent; and

c) it does not contravene Street Works Act (1991) legislation.

If a defect is not listed in the action tables in clause 6, the LCM shall assign a defect priority code and rectification action by taking into account the risk associated to the safety of the line and the level crossing user.

All defects identified shall be entered into Ellipse as per the requirements of NR/L2/XNG/19608.

The LCM shall take ownership of all 3rd party defects identified as part of level crossing inspection activities and raise a WAIF against the level crossing asset in Ellipse.

The LCM shall liaise with the MPC where escalation is required.

It is important that clear information is captured when recording defects either in Ellipse or in fault reports. Wherever practical, photographs should be taken of defects and attached to fault reports or forwarded to the manager responsible for the defect.

Priority Defect Code	Timescale
SC	Within 36 hours
SI	Within 7 days
M0	Within 14 days
M1	Within 4 weeks
M2	Within 8 weeks

Priority Defect Code	Timescale
M3	Within 13 weeks
M6	Within 26 weeks
M12	Within 52 weeks
M24	Within 104 weeks
MX	Non-actionable defect

Table 3 Priority defect codes and timescales

5 Reprioritisation of Defects

Defects with a red RAG category shall be completed in accordance with the actions table and shall not be reprioritised.

Amber defects may only be re-prioritised with agreement from the LCM.

The LCM shall review outstanding defects on their inspection and recommend reprioritisation where appropriate.

Green defects should be completed in accordance with the actions table unless the appropriate Section Manager agrees a reprioritisation. In this case they shall perform suitable assessment of the defect and document any risk and mitigations associated.

NOTE: *Where a defect is reprioritised for a sixth time in a row, the appropriate maintenance engineer should provide authorisation in accordance with Ellipse management standards.*

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6 Defect Actions Table

6.1 Cattle cum trespass guards

Condition	Action Level Crossing Manager / Delivery Unit	Priority defect code	
		Temporary repair	**Permanent repair**
One or more sections of the guards are missing or one or more guards damaged and ineffective.	Where users of the crossing pose a trespass or animal incursion risk, arrange for or apply a temporary repair. Consider closing crossing to passage of livestock or placing Watchman until temporary repair completed.	SC	M6
Any number of guards damaged but effective.	Permanent repair.	-	M6
Less than 1m 'step over' distance between adjacent sets of guards, including where trespass guards do not extend to fence line.	Where users of the crossing pose a trespass risk, arrange for a temporary repair. Consider additional risk when DC lines are present. Consider closing crossing to passage of livestock or placing Watchman until repair completed.	-	SI
Trespass guards installed incorrectly, e.g. less than 2.6m long, less than 35mm apart.	Arrange for trespass guards to be installed to standard.	-	M24
DC Rail too close to crossing surface as per NR/SP/ELP/27021 Conductor rail guard not present, in an unacceptable condition or less than 300mm from trespass guard.	Permanent Repair.	-	M24

Table 4 Cattle cum trespass guards

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6.2 Defect associated with crossing surface

Condition	Action Level Crossing Manager / Delivery Unit	Priority Defect Code	
		Temporary repair	Permanent repair
All Crossing Types			
Panel(s) rocking – all crossing types. OR broken nibs even if no panel movement.	If the defect poses a hazard to trains, vehicles or pedestrians, decide if an emergency crossing closure is required or if a Watchman needs to be appointed to monitor the degradation. Where defect cannot be repaired immediately LCM to decide on any further mitigation (e.g. ESR).	SC	SI
Panels not gapped correctly (all crossing types).	If the hazard poses a risk to vehicles or pedestrians, arrange for temporary (or permanent) repair. *Note: Arrange for Watchman if temporary repair cannot be completed. Re-check monthly for effectiveness of temporary repair until permanent repair has been completed.*	SC	M12
Surface condition degraded.	Where the defect poses risk to users or is likely to cause panel failure before next scheduled inspection. LCM to decide on mitigation as appropriate (e.g. close crossing to public, impose ESR etc). Perform or arrange for temporary repair. *Note: Arrange for Watchman if temporary repair cannot be completed. Re-check monthly for effectiveness of temporary repair until permanent repair has been completed.*	SC	M12
	Where the defects pose no risk to users and is not likely to cause panel failure before next scheduled inspection.	-	MX
Evidence of grounding (e.g. evidence of scoring to the crossing deck or on approach).	LCM to arrange level and gradient survey with TME.	-	M12
Panels sitting proud (10mm+) of cill beams - all crossing types.	Where the defect poses a risk to users arrange for temporary repair.	SC	M12
At MCB-OD crossings fitted with lower lidar vegetation is growing at or is likely to grow to 150mm within the detection area. OR Obstructions present within the detection area.	Remove or arrange for removal of vegetation / obstruction within the detection area.	-	SI

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Condition	Action Level Crossing Manager / Delivery Unit	Priority Defect Code	
		Temporary repair	Permanent repair
Bowmac / Polysafe Bridging Systems			
Missing or displaced rubbers - all crossing types.	LCM to decide on mitigation (e.g. close crossing to public, impose ESR with full time Watchman etc).	-	SC
Damaged, mixed - incorrect rubbers.	Re-check monthly. If degradation worsens action as 'Missing or displaced rubbers'.	M1	M4
Timber Decks – see all crossing types			
Anti-slip surface damaged, missing or worn.	Where surface is ineffective and there is a skid / slip risk. LCM to decide on mitigation (e.g. appoint watchman to warn crossing users or close crossing to public).	SC	M3
Becoming defective surface, showing signs of degradation.	Permanent repair.	-	M24
Rotted, broken, Deck or bearers.	Permanent repair.	-	SC

Table 5 Defect associated with crossing surface

6.3 Defect associated with end restraints

Condition	Action Level Crossing Manager / Delivery Unit	Priority Defect Code	
		Temporary repair	Permanent repair
End restraint missing or loose.	If there are gaps in panels or gap between end restraint and panel, treat as a gapped panel defect.	SC	SI

Table 6 Defect associated with end restraints

6.4 Four foot deflector plates/chain guards/tie bars

Condition	Action Level Crossing Manager / Delivery Unit	Priority Defect Code	
		Temporary repair	Permanent repair
Loose - standalone deflector plate.	Apply temporary or permanent repair if there is potential for the plate to make contact with train (eg, re-tighten or remove ramp).	SC	M12
Missing or damaged deflector plate.	Install temporary deflector plate or apply temporary repair.	M3	M12
Tie bars loose or broken.	Report defective tie bar.	-	SC

Table 7 Four foot deflector plates / chain guards / tie bars

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6.5 Surface condition including public road approach

Condition	Action Level Crossing Manager / Delivery Unit	Priority Defect Code	
		Temporary repair	Permanent repair
Potholes > 150mm diameter AND > 40mm deep within Stop Line to Stop Line.	Temporary repair required.	SC	M6
Potholes < 150mm diameter and < or > 40mm deep within Stop Line to Stop Line.	Permanent repair.	-	M6
Potholes - all sizes – between stop line and 50m on approach.	Permanent repair (by third party) in line with their policy *Note: Notify responsible third party within 7 days.*	-	MX
Surface Wear, cracks in tarmac or anti-skid/glare.	Within Stop Lines.	-	M12
	Outside Stop Lines – Permanent repair (by third party) in line with their policy. *Note: Notify responsible third party within 7 days.*	-	MX

Table 8 Surface condition including public road approach

6.6 Edge beams/cill beams

Condition	Action Level Crossing Manager / Delivery Unit	Priority Defect Code	
		Temporary repair	Permanent repair
Moving - all crossing types.	Where an immediate risk to rail, road or pedestrian users exists or likely to exist by time of next inspection, decide if an emergency crossing closure or if a Watchman is needed.	SC	M6
Damaged / Degrading (wear & tear).	Permanent repair.	-	M12

Table 9 Edge beams / cill beams

Ref:	NR/L2/XNG/202
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6.7 Fencing

Condition	Action Level Crossing Manager / Delivery Unit	Priority Defect Code	
		Temporary repair	Permanent repair
Incomplete or damaged fencing within immediate level crossing area.	If railway is accessible, temporary or permanent rectification required. If a temporary repair cannot be carried out LCM to decide on mitigation method e.g. signaller to caution trains or appoint Watchman. Permanent repair rectification within 13 weeks unless adjacent land use allows extended timescale as NR/L2/OTK/5100.	SC	M3
	If railway is not accessible permanent repair rectification within 13 weeks unless adjacent land use allows extended timescale as NR/L2/OTK/5100.	-	M3

Table 10 Fencing

6.8 Gates & Stiles all types

Condition	Action Level Crossing Manager / Delivery Unit	Priority Defect Code	
		Temporary repair	Permanent repair
Gates not secured/locked (if required) or gate catch missing / ineffective (at UWC).	Where an immediate risk to rail, road or pedestrian users exists LCM to decide on mitigation methods e.g. emergency crossing closure or Watchman.	SC	SI
Wicket gates / stiles / gates - other defects that impact upon their operation.	Where an immediate risk to users exists or is likely to exist by time of next inspection temporary (or permanent) rectification required.	SC	M6

Table 11 Gates & Stiles all types

6.9 Sighting distances

Where required as primary mitigation at crossings

Condition	Action Level Crossing Manager / Delivery Unit	Priority Defect Code	
		Temporary repair	Permanent repair
Sighting not achievable due to encroachment by vegetation.	Until rectification carried out, LCM to decide on mitigation method e.g. imposing ESR/ TSR to suit available sighting or emergency crossing closure.	-	SC
Sighting distance likely to become obscured by vegetation by next inspection.	Rectification required before sighting is likely to become obscured.	-	M3
Sighting not achievable due to other obstruction either within or outside NR boundary.	If immediate rectification not achievable, the LCM to decide mitigation (e.g. imposing ESR/ TSR to improve sighting time, emergency crossing closure).	SC	M3

Table 12 Sighting distances

Ref:	**NR/L2/XNG/202**
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6.10 Road markings and studs

Condition	Action Level Crossing Manager / Delivery Unit	Priority Defect Code	
		Temporary repair	Permanent repair
Studs, reflectors or LEDs missing or defective.	Temporary or permanent repair.	M3	M3
Stop Line Missing.	Temporary or permanent repair.	SC	M6
Road markings erased or indistinct (at least 70% of material for each individual road marking remains).	Permanent repair.	-	M6

Table 13 Road marking and studs

6.11 Roadway, pedestrian walkways or bridleways

Condition	Action Level Crossing Manager / Delivery Unit	Priority Defect Code	
		Temporary repair	Permanent repair
Incorrect width on level crossing (all types).	RLCM and RAM[T] to agree an action plan to manage the defect.	M3	M24
Flangeway gaps <60mm wide and signs of flange contact present.	Inform signaller to caution trains until rectification is complete.	-	SC
Flangeway gaps <60mm wide and signs of flange contact not present.	Permanent repair.	-	M3
Flangeway depths <50mm deep on direct loading systems and <55mm deep on bridging systems and signs of flange contact present.	Inform signaller to caution trains until rectification is complete.	-	SC
	If flangeway is blocked with mud and it is clear that the risk to trains is negligible, then the rectification timescales may be extended to 7 days and trains may continue to be signalled normally.	-	SI
Flangeway depths <50mm deep on direct loading systems and <55mm deep on bridging systems and signs of flange contact not present.	Permanent repair.	-	M3

Table 14 Roadway, pedestrian walkways or bridleways

Ref:	NR/L2/XNG/202
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Date:	04 September 2021
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6.12 Audible warning not functioning correctly

Condition	Action Level Crossing Manager / Delivery Unit	Priority Defect Code	
		Temporary repair	Permanent repair
Single audible warning device not working.	Arrange for S&T technicians to implement permanent repair.	-	SI
All audible warning devices not working.	Permanent repair. LCM to make judgement if mitigation is needed depending on crossing type and location e.g. proximity to station and usage.	-	SC
Another Train Coming Warning not working.	Arrange for S&T technicians to implement permanent repair. LCM to make judgement if mitigation is needed depending on location e.g. proximity to station and likelihood of trains crossing. *Note: Mitigations could include asking the signaller to regulate trains to prevent 2 trains approaching the crossing at the same time.*	-	SC
Sound muffled / Incorrect Sound.	Arrange for S&T technicians to implement permanent repair. LCM to make judgement if mitigation is needed depending on crossing type and location e.g. proximity to station and usage.	-	SI

Table 15 Audible warning not functioning correctly

6.13 Level crossing barriers

Condition	Action Level Crossing Manager/Delivery Unit	Priority Defect Code	
		Temporary repair	Permanent repair
Barrier operation			
Any barrier not lowering.	Look for any single obvious defect or Obstruction affecting the mechanism. Inform the Signaller to treat the level crossing as defective. Arrange for S&T technicians to attend and implement permanent repair.	-	SC
Excessive lowering time on automatic crossing.	Inform the Signaller who will take action to maintain the safety of the line. Arrange for S&T technicians to attend and implement permanent repair.	-	SC
Excessive lowering time on controlled crossing (eg MCB).	Arrange for S&T technicians to attend and implement permanent repair.	-	SI
Barrier not raising at all.	Arrange for S&T technicians to attend and implement permanent repair.	-	SC
Any barrier lowering too fast (all crossing types).	Arrange for S&T technicians to attend and implement permanent repair.	-	SI
No damping of barrier.	Arrange for S&T technicians to attend and implement permanent repair.	-	M3

Ref:	NR/L2/XNG/202
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Date:	04 September 2021
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Condition	Action Level Crossing Manager/Delivery Unit	Priority Defect Code	
		Temporary repair	Permanent repair
Level crossing pedestal shock absorber worn.	Arrange for S&T technicians to attend and implement permanent repair.	-	M3
Barrier slow in raising.	Arrange for S&T technicians to attend and implement permanent repair.	-	SI
Barrier hunting.	Arrange for S&T technicians to attend and implement permanent repair.	-	M3
Barrier Boom			
Obvious severe structural damage.	Arrange for S&T technicians to attend immediately. LCM to decide if mitigation is needed e.g. remain on site, place a Watchman or request Signaller to caution trains.	-	SC
Stay wire snapped / missing / snagging.	Arrange for S&T technicians to attend and implement permanent repair.	-	SI
Stay wire sagging.	Arrange for S&T technicians to attend and implement permanent repair.	-	M3
Minor structural damage.	Arrange for S&T technicians to attend and implement temporary or permanent repair.	-	M3
Barrier Boom light out, missing or incorrectly aligned.	Arrange for S&T technicians to attend and implement permanent repair.	-	SC
Boom light loose.	Arrange for S&T technicians to attend and implement permanent repair.	-	M3
Boom retro reflective marking defective.	Arrange for S&T technicians to attend and implement permanent repair.	-	M3
Barrier length incorrect.	Arrange for S&T technicians to attend and implement permanent repair.	-	M3
Barrier boom proving ineffective or strapped out.	Arrange for S&T technicians to attend and implement permanent repair.	-	M3
Gap between barrier tip >65mm.	Arrange for S&T technicians to attend site. LCM to decide if mitigation is needed to reduce risk of persons or animals entering the level crossing whilst the barriers are lowered (e.g. remain on site, place a Watchman or request Signaller to caution trains).	-	SI
Barrier Skirt			
Skirts hitting the road.	Arrange for S&T technicians to attend and implement permanent repair.	-	M3
Strut / dropper missing non-consecutive in skirt.	Arrange for S&T technicians to attend and implement permanent repair.	-	M3
2-3 Consecutive Struts / droppers missing in skirt.	Where not in the walkway, arrange for S&T technicians to attend and implement permanent repair.	-	SI
	Where in the walkway, arrange for S&T technicians to attend and implement permanent repair.	-	SC

Condition	**Action Level Crossing Manager/Delivery Unit**	**Priority Defect Code**	
		Temporary repair	**Permanent repair**
>3 Consecutive Struts / droppers missing in skirt.	Arrange for S&T technicians to attend and implement permanent repair.	-	SC
Significant damage to skirt e.g. vehicle damage, bottom rail ineffective or incomplete.	Arrange for S&T technicians to attend and implement permanent repair.	SC	M3
Skirt where fitted not folding.	Arrange for S&T technicians to attend and implement permanent repair.	-	SI
Skirt to Pedestal coupling damaged or ineffective.	Arrange for S&T technicians to attend and implement permanent repair.	-	M3

Table 16 Level crossing barriers

6.14 Level crossing telephones

Condition	**Action Level Crossing Manager/Delivery Unit**	**Priority Defect Code**	
		Temporary repair	**Permanent repair**
UWC phone not functional / missing / line poor quality.	Notify Signaller to take appropriate action as necessary, e.g. caution trains.	-	SC
Public phones at any crossing other than MCB not functional / missing / line poor quality.	LCM to decide on mitigation needed until rectification. Either place Watchman or notify Signaller to caution trains.	-	SC
Public where fitted to an MCB not functional / missing / line poor quality.	Arrange for S&T technicians to attend and implement permanent repair.	-	SI
Telephone incorrectly labelled.	Arrange for S&T technicians to attend and implement permanent repair.	SC	M3

Table 17 Level crossing telephones

6.15 Road traffic light signals

Condition	**Action Level Crossing Manager/Delivery Unit**	**Priority Defect Code**	
		Temporary repair	**Permanent repair**
Road traffic light signals incorrectly aligned however still visible at the required sighting point.	Arrange for S&T technicians to attend and implement permanent repair.	-	M3
Road traffic light signals incorrectly aligned and the alignment ineffective.	Notify Signaller. LCM to decide if mitigation is needed e.g. request Signaller to caution trains, block the line, emergency road closure.	-	SC

Road traffic light signals not functioning correctly.	Notify Signaller. Any more than one light out on either approach to the crossing trains to be cautioned.	-	SC
Road traffic light signal reflectorised border is incomplete, or not clearly visible.	Arrange for S&T technicians to attend and implement permanent repair.	-	M3
Road light assembly is damaged, or backboard is faded.	Arrange for S&T technicians to attend and implement permanent repair.	-	M3
Road light assembly is inadequately secured.	Arrange for S&T technicians to attend and implement permanent repair.	-	SI
Road traffic light signal hood is obscuring the aspect.	Arrange for S&T technicians to attend and implement permanent repair.	-	SC
Road traffic light signal incorrect hood, damaged or missing hood and is not obscuring the aspect.	Arrange for S&T technicians to attend and implement permanent repair.	-	SI

Table 18 Road traffic light signals

6.16 Signs

Condition	Action Level Crossing Manager/Delivery Unit	Priority Defect Code	
		Temporary repair	Permanent repair
Whistle board missing, obscured, dirty, vandalised or incorrectly aligned.	Where Whistle board may not be clearly visible to drivers, inform signaller to caution trains.	SC	SI
Signage which is Network Rails responsibility to maintain is missing, obscured, dirty, vandalised or incorrectly aligned.	LCM to decide on any mitigation needed (e.g. imposing ESR/ TSR to improve sighting time, emergency crossing closure).	SC	SI
Road Traffic signage which is <u>not</u> Network Rails responsibility to maintain is missing, obscured, dirty, vandalised or incorrectly aligned i.e. Highways Signage.	Where Lineside sign or 784.1 sign is found to be missing or obscured, trains shall be cautioned as per the rule book until the defect is rectified.	-	SC
	Inform the local authority / highways agency and arrange for the issue with the signage to be resolved. *Note LCM to escalate with local authority / highways agency where issues with signage are not being dealt with promptly.*	-	SI

Table 19 Signs

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6.17 Various

Condition	Action Level Crossing Manager/Delivery Unit	Priority Defect Code	
		Temporary repair	**Permanent repair**
Automatic Crossing Sequence too short leading to reduced warning.	Inform the Signaller who will take action to maintain the safety of the line. Arrange for S&T technicians to attend and implement permanent repair.	-	SC
Any MSL light units not working.	Notify Signaller to take appropriate action.	-	SC
Wicket gates not locked (if signaller controlled locking fitted).	Notify Signaller to caution trains unless LCM remains on site or Watchman is placed.	-	SC
Crossing equipment encroaching on the footpath / carriageway.	Arrange for S&T technicians to attend and implement permanent repair.	-	SC
Crossing equipment encroaching on the railway structure gauge.	Notify Signaller to take appropriate action.	-	SC
Damaged or ineffective power operated gate opener where fitted.	Arrange for S&T technicians to attend and implement permanent repair.	-	SI

Table 20 Various

Standard and control document briefing note

Ref: NR/L2/XNG/202	**Issue:** 1
Title: Prioritisation of Level Crossing Defects	
Publication date: 04 September 2021	**Compliance Date:** 04 September 2022
Standard/Control Document Owner: Head of Level Crossings Safety	
Technical lead/contact for briefings: Susie Walker, Engineer [Level Crossings]	**Tel:**
Purpose: This business process enables consistent defect prioritisation which is aligned to the risk of the defect.	**Scope:** This business process sets requirements for prioritising level crossing defects that are identified during the inspection process specified in NR/L2/XNG/19608. It applies to all engineering maintenance personnel and level crossing managers. Defects which are within the level crossing boundary but are not part of the level crossing system are out of scope.

Overview of change

Requirements relating to defect management and prioritisation have been transferred from NR/L2/SIG/19608 version 7 to this newly created standard.

There have also been amendments to the requirements, including requirements around reprioritisation of defects, management of 3rd party defects, updating of defect priority codes and amendments to the defect actions.

Detail of change

Section (NR/L2/SIG/19608 issue 7)	Section (NR/L2/XNG/202 issue 1)	Summary of changes
n/a	Scope	Guidance is given to state that defects are limited to those in the level crossing boundary.
Table 7	4 Defect management	A new red requirement is provided that the signaller shall be informed immediately for all defects which could affect the safety of the line.
Table 1 sub-task D, E	4 Defect management	• A requirement has been added about management of 3rd party defects • A requirement has been added with regard to action to take if the defect is not listed • A requirement has been added which permits the use of a higher priority if required • A guidance note has been added with regard to capturing data about defects.
Table 5	4 Defect management Table 3	New priorities defect codes have been added and there has been a minor amendment to an existing priority code
n/a	5 Reprioritisation of Defects	Provides guidance on reprioritising defects
Table 7	6 Defect Actions Table	• The table has been split into individual tables categorised by defect category • A RAG status has been applied to all defects depending on their criticality • Duplicated defects have been removed by removing reference to specific crossing types where possible • There have been some minor changes to wording around condition and action descriptions • New defects have been added • The risk priority for some defects has been amended • The layout of the table has been updated

Reasons for change

The requirements relating to defect prioritisation and management have been moved to this standard in order to separate the process of inspection from the engineering requirements associated with defects.

The defect priorities have been updated as previously they were considered to be too prescriptive and not risk based. This has led to too many defects in the work bank which could not possibly be actioned in time.

The standard has been reformatted and updated to increase ease of use and ensure the terminology used is up to date.

Affected documents:

Reference	*Impact*
NR/L2/XNG/202 ISSUE 1	New

<u>Briefing requirements:</u>

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	Operations Risk Advisor	Regions	Y
T	Level Crossing Manager	Regions	N
T	Section Manager [Off Track]	Regions	N
T	Section Planner [Off Track]	Regions	N
A	Route Control Manager	Regions	Y

NOTE: *Contractors are responsible for arranging and undertaking their own Technical and Awareness Briefings in accordance with their own processes and procedures.*