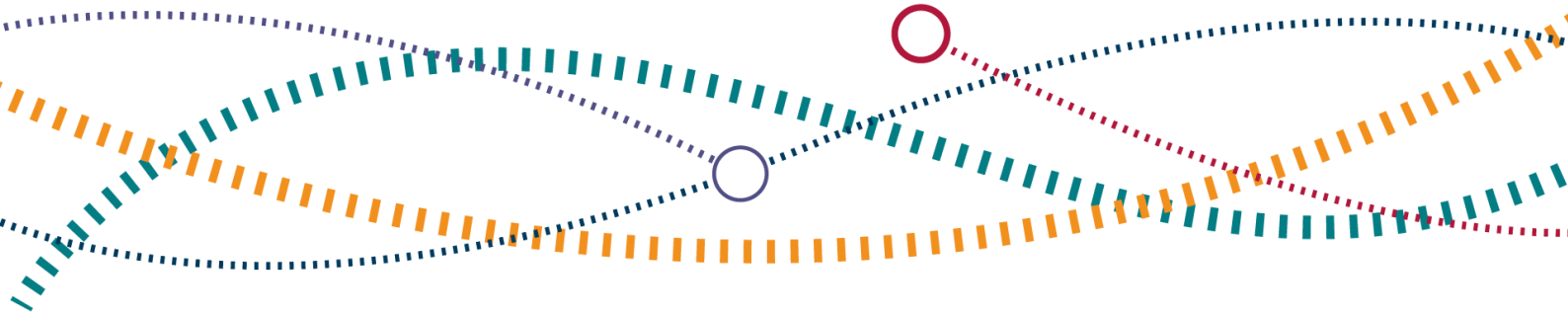
OFFICE OF RAIL AND ROAD

Principles for managing level crossing safety



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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. They 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 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, land owners and local traffic authorities.

This document 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 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, it supports our strategy for regulating level crossings, which is focussed on continued improvement in risk management.

We intend to supplement this document with case studies to illustrate how the principles can be applied to different types of crossings. We aim to withdraw RSP7 once this document and case studies are available on our updated web-pages.

1. Introduction

1. This document is intended to inform the assessment and control of risks at level crossings, following a user-centred approach. A number of principles are set out, describing ORR's expectation for identifying and controlling the risks, and a list of key factors to consider accompany each principle.

2. It does not place additional burdens on duty holders or prescribe how a level crossing should be designed, operated or maintained. Further details about level crossings are available on our website. [*NB Our level crossing web-pages are under review and will be updated when this guidance is published in its final form]*

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 document apply to the design, management and operation of level crossings on:

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

5. The document 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 rail industry, traffic authorities and local authorities, such as:

    - designers, planners and engineers;
    - those dealing with access and public rights of way matters;
    - managers, staff and volunteers in roles and with responsibilities which affect safety at, or near, level crossings;

- other duty holders associated with the railway, such as private landowners who have rights over the railway, train operating companies and freight operating companies.

6. Tramways are not included. More information on tramways is available on ORR's website.

How to use this document

7. The main purpose of this document is to inform the assessment and control of risks at a level crossing. Every level crossing is different and risk assessments should take account of the circumstances of each one.

8. We encourage consideration of the 'whole-system' in which a level crossing operates. By this we mean that 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 focussing on users, the railway and the highway. We also emphasise the importance of collaboration between the various parties who contribute to level crossing safety.

9. A highway is any road, footpath or bridleway to which the public have access. However, for the purposes of this document the meaning of highway should be interpreted as including private roads, because many of the principles will also be relevant to level crossings on private roads.

10. Each of the principles in this document describes an ORR expectation for identifying or controlling the risks at a level crossing. A list of factors accompany each principle, these set out how the associated principle can be achieved.

11. We encourage you to consider all the principles in this document. Not all principles will be relevant for all level crossings, equally, you may also need to take account of other factors for level crossings where there are unusual circumstances. We are developing case studies to illustrate how the principles may be applied and these will be available on our website. An illustration of the principles is shown at **Annex A**.

12. You will also need to take account of other health and safety guidance and legislation 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

13. It is particularly important that parties work together in the process of level crossing risk assessment so that opportunities can be taken to eliminate risk where possible. 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.

14. Where level crossings on public highways are under review, it is vital that the relevant local traffic authority is engaged in early discussions so that local traffic considerations can be fully considered and taken into account when designing level crossing controls. This is increasingly important given the greater volumes of road and rail traffic, and the significant impact from the length of time that a level crossing is closed to road traffic.

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 user-worked crossings) and other organisations such as the British Transport Police.

16. 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

17. Good level crossing design understands the needs and limitations of the user, taking into account normal use, reasonably foreseeable human error and unintended methods of use.

18. Level crossing users are individuals and differ, for example, in their mode of transport, familiarity with using the level crossing, age, sensory and mobility capabilities and perception of risk etc. 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.

19. This means that 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 use the crossing is preferable. In designing a level crossing to meet these aims, it is useful to be aware that a user's mental model of a situation (i.e. their explanation of how something works) helps them understand and put structure on the world around them. However, such a mental model may not contain the correct information, for example, due to a user's lack of familiarity with a level crossing's mode of operation. Because of their level of expertise and familiarity, a level crossing designer may overestimate the intuitiveness of their design and the ability of some users.

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

    - understand natural human tendencies, such as taking the path of least resistance and the reluctance to wait for too long, also how people can react when required to make quick decisions that affect their safety;
    - utilise users' expectations from their knowledge of how the world around them works to develop effective control measures at a level crossing;
    - simplify the number of tasks that a user is expected to perform and the instructions they are expected to follow in order to minimise their cognitive load;
    - make sure that what the user is expected to do is clear, so that they know what needs to be done and how it should be done. Where possible, this

should be reinforced by providing feedback to the user on the effect of their actions or that an action has been completed; and

- whether natural and/or artificial constraints, e.g. fencing on the approach to a crossing, can be used to guide the user to the next appropriate decision or action.

What a risk assessment involves

21. The 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 risk is not all under the direct control of the railway duty holders.

22. It is essential that decisions and options for level crossing control measures are informed by a suitable and sufficient risk assessment. This should be completed by competent people who have a proper knowledge of the risks and of 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.

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.

23. If the level of risk changes at a level crossing, you must ensure that you continue to meet the legal duty to reduce risk so far as is reasonably practicable. For example, risk at a level crossing might change because the speed and/or frequency of rail services has increased on a route. The increase in risk needs to be assessed and reduced so far as reasonably practicable, but there may be situations where an increase in risk is acceptable, because it is not reasonably practicable to reduce that risk.

Principles of prevention

24. 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.

Elimination

25. The first consideration should always be whether there are reasonably practicable alternatives to a level crossing. This is best considered at the design stage of a new railway or reinstatement scheme when there are likely to be fewer constraints and greater flexibility for identifying alternatives.

26. 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. 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.

27. For an existing level crossing the risk assessment should always consider whether closure is a reasonably practicable option, but 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

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

people. There may also be strong local opinions either for or against a level crossing and good communication between the railway, the local authority, and other affected parties such as landowners is vital in these situations.

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

Engineering controls

29. The range of technologies available for level crossings has improved considerably over recent years. 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 significantly increased the options available for installing engineering controls. For example, 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. Another example is the use of obstacle detection systems, which check that a level crossing is clear for trains to proceed and can reduce human error and signaller workload.

Administrative controls

30. Administrative controls such as signage and instructions for level crossing users are the last to be considered, they should be used in conjunction with other control measures where this is reasonably practicable.

Reasonable practicability and decision making

31. 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 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 single algorithm which can be used to determine gross disproportion; it is a case-by-case, site-by-site judgement.

32. Applying the gross disproportion judgement

    - Duty-holders have to judge the risk at a level crossing. The risk 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.
- 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. That is for two key reasons. Firstly, a single factor cannot be used for such a variety of circumstances as those found at level crossings and secondly, the choice of factor should take account of the degree of risk involved, and the potential for significant harm, which can only be determined on a case-by-case basis.

33. The Health and Safety Executive (HSE) established a rule of thumb as to how gross disproportion factors should be used. This suggests that a factor of up to 3 (i.e. costs three times larger than benefits) is appropriate where there is risk to workers, a factor of 2 is appropriate for low risk to members of the public, and a factor of up to 10 for high risk to members of the public.

34. 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. Ultimately 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. The Rail Safety and Standards Board (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.

35. In many situations CBA may not be required and relevant established good practice may 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 costs to be included in the CBA should be the net costs to the duty holder of implementing the safety measure. This would include, for example, installation, training and maintenance 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 £2million.

3. Safe for the user

A level crossing should be safe for the user. 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, and the frequency and pattern of use e.g. daily, weekly, seasonal variations and times of peak usage;

(b) nearby local facilities and their foreseeable user groups, e.g. stations, schools, care homes, seasonal attractions or event venues;

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

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

(e) livestock driven on foot over the level crossing, when this is likely, who is in charge of the livestock and whether slow vehicles will also be present;

(f) users with protected characteristics under the Equality Act 2010, e.g. age, disability, pregnancy and maternity, and race. 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;

(g) users of private crossings who operate crossing controls and 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: Identify foreseeable user behaviours or actions at, or near, a level crossing.

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

(a) 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 or nearby footpaths, fare evasion behaviour when there is a station nearby or the effect of alcohol on behaviour where pubs/clubs are nearby;

(b) the distraction of mobile phones or headphones, which may affect users' awareness or concentration;

(c) the likelihood and frequency of people deliberately going onto a closed level crossing (trespass), and how this can be reduced/eliminated;

(d) 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;

(e) the foreseeable actions of different user groups in a 'second train coming' scenario;

(f) the foreseeable actions of users when level crossing equipment does not operate as intended e.g. appreciating that most users will cross when the road traffic lights and barriers/gates indicate that it is safe to cross, regardless of what is on the railway.

User Principle 3: Understand how users become aware that they are approaching a level crossing.

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

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

(b) the approach angles, heights and speeds of foreseeable users and how this affects their awareness of the level crossing, particularly where the approach routes offer limited visibility;

(c) how, and when, a user makes a decision on whether the level crossing is safe to use and how this impacts on crossing controls.

User Principle 4: Provide a safe and convenient waiting place for users on level crossing approaches.

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

(a) farmers with livestock or drivers of long, large or slow vehicles who will need to communicate with the crossing controller;

(b) the needs of different users in relation to the location and size of a safe place (including the position of barriers/gates) where they can wait whilst a train passes or identify when it is safe to use the crossing. The tasks performed at the waiting place by the different users will vary and their needs should be accommodated, e.g. some users may need good visibility of the track to identify whether a train is approaching;

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

User Principle 5: identify the information users require to safely use a level crossing.

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

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

(b) how the information and cues are communicated, taking into account the user needs, the surrounding environment and having an awareness of the importance of physical controls, noting that signage is an administrative control (see Principles of Prevention);

(c) the impact of day/night times, the 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 sunlight glare may need to be mitigated;

(d) how users are made aware of specific hazards, such as the height of overhead line equipment (OLE).

User Principle 6: Provide a sufficient 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) the foreseeable actions of different users in a 'second train coming' scenario; ensuring 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;

(d) the number of users, traffic volumes and time it takes to cross the railway in relation to the likelihood of a descending barrier, or moving gate, striking a user;

(e) the impact of long waiting times on user behaviour, e.g. impatience and risk taking behaviour such as attempting to beat/weave-around a closing level crossing barrier.

User Principle 7: Ensure that users can cross quickly and safely.

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

(a) actual user routes and times 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) user proximity to OLE and conductor rails in third rail areas, and how to keep users a sufficient distance away;

(d) segregating users at a level crossing e.g. pedestrians from vehicles or horse-riders from motor vehicles. This could include physical separation, or by using 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 and colour and profile should be suitable for all foreseeable user groups.

User Principle 8: Ensure a level crossing is left in a safe state for future users.

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

(a) user behaviour after they have crossed, and how the desired behaviour can be encouraged, especially in relation to any further actions that are required, e.g. returning gates to a closed position;

(b) user understanding of how to operate any barriers or gates, which should be consistent on both sides;

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

(d) 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 a 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;

(b) the impact of any maintenance activity, e.g. when operated in manual mode;

(c) foreseeable workload and fatigue issues from managing or operating level crossings;

ensuring a level crossing's design supports the operator by mitigating the likelihood and severity of errors.

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 vehicle there is also the potential for a train to be derailed.

Railway Principle 1: Ensure the entry and exit to a level crossing and any closure sequence does not create a risk of injury to 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) minimise the risk of a user being trapped on a crossing when a train is approaching, including consideration of:

- the width of the public highway throughout the level crossing;
- the width and design of the gates/barriers on each side of the railway and their impact on users ability to enter/exit the level crossing;
- the 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;
- the height of load gauges, where present, above the levelled highway surface;
- methods to prevent barriers or gates from unintentionally closing while the level crossing is being used;

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

(d) ensure that users are not able to access any dangerous parts of machinery which are part of the level crossing equipment.

Railway Principle 2: Ensure a level crossing is clear of users or obstructions before a train arrives.

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

(a) a high-integrity, automatic system, 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 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 a suitable safety overlap or train protection system at a protecting signal, an appropriate warning should be provided 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: Ensure all foreseeable rail movements are taken 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 over a level crossing;

(b) eliminate any normal, or foreseeable train movements which would require a train to wait on a level crossing;

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

Railway Principle 4: Ensure barriers or railway-controlled gates cannot be re-opened until any train has fully passed over a level crossing, or sufficient time has elapsed to allow any approaching train to come to a stand.

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

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

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

(c) avoid trains waiting on a level crossing. But, when a train is waiting it should not be possible to open the crossing to pedestrian or road traffic.

Railway Principle 5: Ensure people working on the level crossing are safe.

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

(a) how the level crossing may be operated during normal and abnormal conditions by railway staff and the resulting risks to their safety;

(b) road traffic control systems which may place the crossing controller at risk when they are operating the level crossing;

(c) adequate protection from any dangerous parts of machinery at a level crossing;

(d) lighting conditions, including light from nearby sources, which may impact on a crossing controller or approaching train drivers visibility of the 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;
- the entry and exit gradients, and their impact on any vehicle clearance from OLE.

(b) advanced information signage to drivers and a means of communication with the level crossing operator;

(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) the 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, cattle grids, holding pens and fencing;

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

(d) ensure the crossing surface is suitable for the animals using the level crossing.

Railway Principle 8: Discourage trespass onto the railway.

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

(a) the level crossing should be the shortest route possible across the railway, with a defined route from entry to exit;

(b) the route over the level crossing should be clear 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) 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, and the impact these may have on use of the level crossing;

(b) the natural light conditions, e.g. sunlight glare, and the impact these may have on the safe use of the level crossing;

(c) where necessary, ensure that a level crossing is sufficiently lit. However, artificial lighting provided 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. The primary safety consideration is to prevent a collision between a level crossing user and train. The principles also cover preventing road traffic incidents at, or near, a crossing.

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

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

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

(b) signage should be maintained to ensure it is visible, which may include vegetation management;

(c) how users are made aware of specific hazards and given the option to take evasive action where necessary, e.g. the height of OLE.

Highway Principle 2: Ensure that highway approach surfaces enable users to cross the level crossing safely.

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

(a) approach surfaces and profiles should be consistent with those at the level crossing, to achieve an even passage of users over the level crossing;

(b) the approach surfaces and profiles should be suitable for all foreseeable user groups, vehicle types and vehicle approach speeds, e.g. profile, colour, construction material and grip.

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

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

(a) the effective use of road markings and/ or signs, for example, 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 sequence;

(c) ways to change the road features at, or near, a level crossing to improve traffic flows, e.g. providing waiting areas or addressing restrictive road layouts and gradients;

Highway Principle 4: Avoid vehicles grounding on the level crossing through the design of highway approaches.

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

(a) adjusting the camber or other elements of the road layout;

(b) introducing different road layouts on level crossing approach roads;

(c) signage to identify and warn at risk vehicles;

(d) how a grounded vehicle will be managed to prevent an accident.

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

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

(a) identify and mitigate foreseeable weather conditions that will affect safe approaches to the level crossing, e.g. fog or ice;

(b) identify natural light conditions that will affect approaches to the level crossing, for example sun glare;

(c) where necessary, ensure that the approaches to a crossing and any warning signage are suitably lit;

(d) maintain visibility of the crossing, e.g. by vegetation management and the legibility of signage and road markings which may degrade over time or in some locations.

Annex A

User Principle 1	Understand all foreseeable level crossing users.
User Principle 2	Identify foreseeable user behaviours or actions at, or near, a level crossing.
User Principle 3	Understand how users become aware that they are approaching a level crossing.
User Principle 4	Provide a safe and convenient waiting place for users on level crossing approaches.
User Principle 5	Identify the information users require to safely use a level crossing.
User Principle 6	Provide a sufficient warning for users that a train is approaching to enable them to be in a safe place before a train passes.
User Principle 7	Ensure that users can cross quickly and safely.
User Principle 8	Ensure a level crossing is left in a safe state for future users.
User Principle 9	Understand how a level crossing is managed and operated by railway staff.

Railway Principle 1	Ensure the entry and exit to a level crossing and any closure sequence does not create a risk of injury to users.
Railway Principle 2	Ensure a level crossing is clear of users or obstructions before a train arrives.
Railway Principle 3	Ensure all foreseeable rail movements are taken into account.
Railway Principle 4	Ensure barriers or railway controlled gates cannot be re-opened until any train has fully passed over a level crossing, or sufficient time has elapsed to allow any approaching train to come to a stand.
Railway Principle 5	Ensure people working on the level crossing are safe.
Railway Principle 6	Avoid road vehicles becoming stranded or grounded.
Railway Principle 7	Prevent livestock and other large animals, such as horses, straying onto the railway.
Railway Principle 8	Discourage trespass onto the railway.
Railway Principle 9	Take account of the foreseeable environmental conditions.

Highway Principle 1	Warn users that they are nearing a level crossing by providing information on highway approaches.
Highway Principle 2	Ensure that highway approach surfaces enable users to cross the level crossing safely.
Highway Principle 3	Minimise the risk of road traffic ‘blocking back’ over a level crossing.
Highway Principle 4	Avoid vehicles grounding on the level crossing through the design of highway approaches.

Highway Principle 5	Take account of the foreseeable environmental conditions on the highway approaches to a level crossing.

Annex B: Glossary

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

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 adjacent panels which allow rail vehicle wheels to pass through.
level crossing	A level crossing is where a railway crosses a road on a level (i.e. without the use of a tunnel/underpass or bridge). NB A road would include footpaths, bridleways and cycle ways.
highway	A highway is any road, footpath or bridleway to which the public have access. NB many of the principles in this document will also be relevant to level crossings on private roads so for the purpose of this document the meaning of highway should be interpreted as including private roads.
overhead line equipment (OLE)	Overhead line equipment refers to the overhead wires and supporting infrastructure that carry electricity at 25,000 volts to power electric trains.
protected characteristics	There are nine groups of people with protected characteristics defined in the Equality Act 2010: age, disability, gender reassignment, marriage and civil partnership, pregnancy and maternity, race, religion or belief, sex and sexual orientation.
second train coming	also known as ‘another train coming’, the scenario when a train passes over a level crossing, but the crossing remains closed because another train is approaching.
skewed crossing/skew	A crossing at which the angle measured from the public highway to the running rail is not at a right angle
vulnerable crossing users	Users of a level crossing who might be more vulnerable because they have less protection that other users, e.g. cyclists, motorcyclists or horse riders, or have reduced capabilities, e.g. people with disabilities, children or older people. In some

	crossing contexts, it may also be appropriate to consider all pedestrians as vulnerable crossing users.
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.

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