Guidance on Provision, Risk Assessment and Review of Level Crossings

Synopsis
This document provides guidance on meeting the requirements contained in GI/RT7011 Provision, Risk Assessment and Review of Level Crossings.

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Part A

A1 Issue record

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This document will be updated when necessary by distribution of a complete replacement.

A2 Implementation of this document

The publication date of this document is October 2002.

This document does not supersede any other Railway Group Guidance Notes.

A3 Responsibilities

Railway Group Guidance Notes are non-mandatory documents providing helpful information relating to the control of hazards and often set out a suggested approach, which may be appropriate for Railway Group* members to follow.

* The Railway Group comprises Railtrack PLC, Railway Safety, and the train and station operators who hold Railway Safety Cases for operation on or related to infrastructure controlled by Railtrack PLC.

Railtrack PLC is known as Railtrack.

A4 Health and safety responsibilities

In issuing this document, Railway Safety makes no warranties, express or implied, that compliance with all or any document published by Railway Safety is sufficient on its own to ensure safe systems of work or operation. Each user is reminded of its own responsibilities to ensure health and safety at work and its individual duties under health and safety legislation.

A5 Technical content

The technical content of this document has been approved by:

Jeff Allan, Principal Signalling and Telecommunications Engineer, Railway Safety
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A6 Supply

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Part B

B1 Purpose
This document provides guidance on meeting the requirements contained in GI/RT7011 Provision, Risk Assessment and Review of Level Crossings.

B2 Application of this document
B2.1 To whom the guidance applies
This document contains guidance that is applicable to duty holders of the infrastructure controller category of Railway Safety Case.

B2.2 Documents supported by this Guidance Note
This guidance note supports Railway Group Standard GI/RT7011. It quotes, verbatim and boxed, part C of GI/RT7011 and provides guidance on how its requirements may be met.

B3 Definitions
ALARP
As low as reasonably practicable.

Active warning
A device which warns users of the imminent arrival of a train. Such devices may be either visible or audible.

Authorised walking route
A designated route providing pedestrian 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 (for example, barriers and active warnings) is automatically activated by the approaching train.

Blocking back
The formation of a stationary or slow-moving queue of road traffic over a level crossing, due to road traffic conditions in the vicinity of the level crossing causing obstruction of the line. (This usage is not to be confused with the signalling term ‘blocking back’.)

Cattle-cum-trespass guard
A device provided adjacent to the road, bridleway or path at a level crossing designed to deter animals from straying and pedestrians from trespassing on to the railway.

Crossing
Used in level crossing documentation to mean ‘level crossing’, where the continued use of ‘level crossing’ becomes repetitive and laboured.

Crossing abuse
Any deliberate activity by a user at a level crossing which differs from the correct procedure for using the crossing.

Crossing keeper
A person appointed at a permanent gate box to carry out the normal operating procedure of a level crossing.

Crossing speed
The permissible speed applying between a special speed restriction board and a locally monitored level crossing.
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**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.

**Individual risk**
The probability of fatality per year to which an individual is exposed from the operation of the railway.

**Level crossing**
An intersection at the same level of a road, footpath or bridleway and one or more railway tracks.

**New level crossing**
For the purposes of this document, a new level crossing is:

a) a level crossing provided at a location where previously there was no means of crossing the railway at the same level

b) a level crossing altered to provide vehicular access where previously there was no vehicular access

c) a level crossing altered to provide access for horse riders and cyclists where previously there was only access for pedestrians.

**Permissible speed**
The maximum permitted speed of trains over a section of line, as detailed in the Sectional Appendix. For the purposes of this document, the term 'permissible speed' includes enhanced permissible speeds applicable to tilting trains.

**Railway staff**
A person employed in the railway industry, acting in accordance with their duties.

**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.

**SPAD**
Signal Passed At Danger.

**Train accident**
For the purpose of this document, a train accident is an incident involving the collision of a train and a level crossing user (vehicle, pedestrian or animal).

**Train crew**
A driver or guard who is authorised to operate level crossings.

**Type (of level crossing)**
A recognised combination of control measures used at level crossings, appropriate to particular circumstances, for example ABCL (automatic barrier crossing, locally monitored); CCTV monitored barrier crossing; staffed gated crossing.

**Unacceptable risk**
Individual risk above the upper limits of tolerability defined in ‘Reducing Risks, Protecting People’, published by the Heath and Safety Executive.

**User**
A person who uses a level crossing.

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**Unacceptable risk**
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**User**
A person who uses a level crossing.
User-worked crossing
A level crossing, where authorised users operate the crossing gates or barriers themselves.

Warning time
1. Applied to a footpath, bridleway or user-worked crossing, the shortest time for a train to travel from the point where it is first visible to its arrival at the crossing, on any of the lines over the crossing.

2. Applied to an automatic crossing, the shortest time from the commencement of the warning activated by an approaching train, to the arrival of the train at the crossing.

Whistle board
A sign to instruct the train driver to sound the horn.
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Part C
Providing new and reviewing existing crossings of the railway

C0 Introduction
Risk at level crossings is, as elsewhere, required to be ALARP. One step towards achieving this is to undertake a risk assessment, taking into account all factors which affect the risk to members of the public, passengers, and the workforce.

Risk assessments are required for new and existing level crossings to assist in the determination of appropriate protection. Subsequent reviews of the risk assessment (referred to as ‘risk reviews’ in this document) assist in the identification of additional protection where the risk is not sufficiently controlled.

C1 Providing new crossings of the railway

GI/RT7011 section C1.1
Providing alternatives to new level crossings
If a new crossing of the railway is necessary, a level crossing shall be provided only if it is not practicable to provide some other means of crossing the railway, for example, an overbridge, underbridge or subway.

It is, however, permissible to provide a new level crossing to replace an existing level crossing if this increases the safety of the railway and crossing users (for example, by closing two level crossings in exchange for one new level crossing).

New user-worked crossings (including footpath and bridleway crossings) shall not be installed where there are more than two running lines, unless the new crossing replaces one or more existing crossings and provides an overall reduction in risk.

New level crossings shall not be provided where the permissible speed exceeds 125 mph.

It should be noted that in addition to the above requirement, new level crossings are subject to legal requirements for approval. Guidance should be sought from HMRI on how best to achieve this approval.

GI/RT7011 section C1.2
Assessing the requirements for a new level crossing
If, exceptionally, providing a new level crossing is necessary because it is not practicable to provide another means of crossing the railway, the types of crossing that could be provided shall be established by means of a risk assessment. The risk assessment shall consider the following as a minimum, taking into account foreseeable future changes:

a) the characteristics of the railway operations over the proposed level crossing, including the frequency, speed and timetable of trains, the track layout, and the traction system and signalling arrangements

b) the characteristics of the expected level crossing users, including identification of those users that, if involved in a train accident, could cause the accident to have:

i) the potential for a catastrophic outcome, such as a train derailment (for example, due to trains striking vehicles or large animals)

ii) the potential to result in a single fatality outcome (for example, due to trains striking pedestrians)

b) the expected level of use of the crossing by those users
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d) the relationship between crossing time and warning time

e) other local conditions that may affect the safety of the crossing.

C1.1 Risk assessments for new level crossings
The purpose of a risk assessment for a new level crossing is to gauge the local conditions at the crossing site objectively so that the combination of level crossing control measures, and any additional safeguards selected, are appropriate and reduce the risk to ALARP.

The risk assessment requires consideration of many of the same factors as for existing crossings described further in section C2. However, for a new level crossing, estimates will take the place of some measurements. Information relating to similar level crossings and other nearby crossings may, where appropriate, be used as input to this assessment to provide credibility to the estimates.

It is important to consider the factors both at the time the level crossing is to be installed, and after foreseeable changes in, for example, the frequency of trains. This will provide a margin to ensure that the risk is controlled over a longer time period without the need for upgrade or additional safeguards.

The risk assessment is required to demonstrate that the risk at the new level crossing is below an upper limit of tolerability, and reduced to ALARP. Further guidance on these criteria is given below.

C1.2 Individual risk should be below an upper limit of tolerability
The total risk to which individuals are exposed by the railway is required to be below upper limits of tolerability.

A level crossing is one of many sources of railway risk to passengers and workers, and hence should contribute only a small percentage to their risk exposure. The upper limit of tolerability for the level crossing contribution to their risk is therefore a small proportion of their overall limit. On the basis of current levels of risk, it may be assumed that this is met unless there are particular characteristics of the crossing which indicate otherwise.

Risk from the railway to regular level crossing users, assumed to make 500 crossings of the railway per year, may be almost entirely due to the level crossing. It cannot be assumed that this will be below the upper limit of tolerability.

For new level crossings, the upper limit of tolerability should be more stringent than for existing crossings. The suggested upper limit is a probability of fatality per annum of $10^{-6}$, in line with the 2009 targets set out in the Railway Group Safety Plan.

If these limits cannot be met by a new level crossing, the level crossing should not be installed.

C1.3 Collective risk should be as low as reasonably practicable
Once it is established that the individual risk is below an upper limit of tolerability, there is a legal requirement for the risk to be ALARP. To ensure this, different combinations of level crossing control measures and additional safeguards need to be considered. The solution which results in the lowest residual risk whilst being reasonably practicable, should be selected for implementation.

Gi/RT7011 section C1.3
Determining the appropriate type of level crossing
The outcome of the risk assessment shall be used to determine the appropriate type of level crossing, together with:

a) the requirements set out in section C5
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b) technical and operational constraints.

The outcome of the risk assessment shall also be used to determine whether it is reasonably practicable to provide any additional safeguards.

The guidance given in HMRI Railway Safety Principles and Guidance - part 2 section E (and, in the case of barrow crossings at stations, the guidance given in HMRI Railway Safety Principles and Guidance - part 2 section B) should also be taken into account when determining the appropriate crossing type.

C1.4 Determining the appropriate type of level crossing

The risk assessment or review is one of several inputs to the decision on the type of level crossing. The outcome of the assessment should be considered alongside technical and practical considerations, and current legislation. Several iterations of the risk assessment and control measures included in the design will usually be required.

Operational constraints for consideration include the effect of the proposed level crossing type on signaller workload.

C2 Reviewing the suitability of existing level crossings

GI/RT7011 section C2.1

Requirements for risk assessments

There shall be a valid risk assessment in place for each level crossing.

There shall be documented procedures in place for carrying out risk assessments appropriate to each level crossing type.

If a level crossing is used by both vehicles and pedestrians, the risk to both types of user shall be considered. Where necessary, separate risk assessments for the vehicular and pedestrian elements of the crossing shall be conducted.

The risk assessment shall consider as a minimum:

a) the characteristics of the railway operations over the level crossing, including the frequency, speed and timetable of trains, the track layout, and the traction system and signalling arrangements

b) the characteristics of the expected level crossing users, including identification of those users that, if involved in a train accident, could cause the accident to have:

i) the potential for a catastrophic outcome, such as a train derailment (for example, due to trains striking vehicles or large animals)

ii) the potential to result in a single fatality outcome (for example, due to trains striking pedestrians)

c) the level of use of the crossing by those users

d) the characteristics and effectiveness of the measures provided to ensure the safety of level crossing users and the railway. The measures to be considered include, but are not limited to, fixed signs, active warnings, fences, gates and barriers, and any interaction with the signaller

e) for crossings without an active warning, the relationship between crossing time and warning time

f) the history of the level crossing in respect of frequency and nature of crossing abuse, trespass, accidents (including train accidents) and ‘near-miss’ incidents
g) other local conditions that may affect the safety of the crossing.

GI/RT7006 contains requirements for assessment and mitigation of the risk arising from SPADs at signals protecting level crossings.

There are special compliance requirements for this section. See section B2.2 for details.

C2.1   Procedures for conducting the risk assessment

The purpose of having documented procedures is to ensure that a consistent approach is applied at all level crossings. The procedure should include:

a) who should carry out the risk assessment
b) the factors taken into account
c) how the factors are to be measured
d) the effect which each of the factors has on the outcome
e) how the outcome of the risk assessment is used to determine the subsequent action.

Models and tools should be regarded and used as an aid to the assessment of risk, and not a substitute for professional expertise and judgement. The risk assessment procedures should reflect this.

The procedure should enable risk assessments to be carried out with a rigour commensurate with the circumstances at the level crossing, taking into account the broad level of risk indicated by the history of accidents, near misses and crossing abuse, and the opportunities for improvements in the protection.

Where it is considered obvious that the risk is unacceptably high, a detailed assessment may not be required to justify closure or upgrade. Equally, where it is obvious that the risk is low, there may be little benefit in a detailed risk assessment. In more borderline cases, the review will need to be more detailed, in order to determine the actions required.

The risk assessment should consider all scenarios which could lead to injury, including users being struck by trains, injury on barriers, slips, trips and falls on the crossing, and pedestrians being struck by road vehicles.

C2.2   Risk to different types of user

In all risk assessments, the risk to each user type should be considered. In many cases they can all be considered within a single assessment. However, at certain level crossings the nature of the risk and control measures will be very different for pedestrians compared to vehicles, for example, where there are separate gates for pedestrians. In these cases it is important to consider the user types separately.

It is also important to consider the needs of different users when selecting control measures to reduce risk.

C2.3   Risk assessment methodology

The methodology used for assessing the residual risk at a level crossing is the responsibility of the infrastructure controller. Appendix 4 outlines the factors that as a minimum this review should take into account for each group of level crossing types.
These factors should be used to evaluate the frequency and consequences of accident scenarios at the crossing. This does not necessarily require a numerate result; it may be adequate to use a qualitative approach which places the scenarios into frequency and consequence bands. The Engineering Safety Management ‘Yellow Book’ gives guidance on this. Appendix 3 describes generic qualitative and quantitative approaches.

C2.4 Automatic level crossing model
The Railtrack automatic level crossing model is a specific tool that has been developed for the assessment of risk at all automatic crossings. Version 2.2, which is the version available at the time of publication of this guidance note, uses data concerning the crossing type, traffic moment, train parameters, crossing parameters and user parameters. It outputs numerical values for the collective risk in equivalent fatalities per year, and the individual risk to vehicle users, pedestrians, passengers and staff in terms of fatalities per year.

The model provides a useful numerical input into decisions relating to the control measures at the level crossing. However, care should be taken where it does not explicitly address local factors which at a particular crossing can have a significant impact on the risk, for example, blocking back. Additional qualitative account of these needs to be taken.

C2.5 Other risk assessment models
There are not currently any recognised risk assessment models available for other level crossing types. This does not preclude the use of new tools, provided they address the appropriate factors identified in Appendix 4.

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Gi/RT7011 section C2.2
Requirement for risk reviews
All level crossings shall be subject to periodic risk reviews to revalidate and, when necessary, update the risk assessment.

There shall be documented procedures in place for carrying out risk reviews appropriate to each level crossing type. The risk review shall consider as a minimum the items listed in section C2.1.

The procedures shall specify the interval between risk reviews appropriate to each level crossing type. The specified intervals shall not be longer than five years.

A risk review shall be undertaken additionally when:

a) there is a train accident at the level crossing
b) there is an increase in the frequency of crossing abuse, trespass, accidents (other than train accidents) or ‘near-miss’ incidents
c) there is any significant change, or planned significant change, in the nature of railway operations over the crossing. ‘Change’ shall include any changes in permissible speeds, actual train speed, frequency and timetable, infrastructure or signalling arrangements
d) there is any significant change, or expected significant change, in the nature or extent of use of the level crossing by road vehicles, pedestrians or animals. Consideration shall be given to the effects of planning applications and other changes in land use
e) there is any significant change, or expected significant change, in the environment on the users’ approaches to the level crossing
f) a change is planned in the measures provided to ensure the safety of level crossing users and the railway
g) renewal of gates, barriers or control equipment is planned
h) there is any other significant change which has increased, or is expected to increase, the risk.

For the purpose of this section, a ‘significant change’ is one which is judged to be sufficient to make the current risk assessment invalid, and could lead to a decision to implement additional risk controls at the crossing.

Further requirements applicable when altering permissible speeds are given in GK/RT0007.

There are special compliance requirements for this section. See section B2.2 for details.

C2.6 Purpose of risk reviews
The purpose of reviewing the risk assessment on a regular basis is to ensure that any gradual changes which increase the risk at the crossing are detected and appropriate changes made to the crossing to reduce the risk.

The purpose of the intermediate risk review is to respond to a change or planned change in the circumstances at the level crossing which is considered sufficient to invalidate the existing risk assessment, and is likely to lead to the requirement for additional control measures at the crossing.

C2.7 Procedures for determining when to initiate a risk review
The procedure should provide clear guidance on when a regular or intermediate risk review will be initiated for each type of level crossing. The distinction between inspections and risk reviews should be clear within procedures, although it is permitted to combine them in site visits. Inspections are primarily to identify required maintenance of the level crossing, and to identify the need for a risk review. Risk reviews are primarily to identify whether changes to the control measures are required.

The frequency of the regular risk reviews should be determined such that in the interval between reviews, any gradual changes to the circumstances at the crossing are unlikely to accumulate sufficiently to require additional control measures.

C2.8 Identification of initiators of risk reviews
The control measures in place at a level crossing may become inadequate for many reasons. It is the responsibility of the infrastructure controller to monitor their adequacy and to initiate a risk review if it becomes apparent that either the risk has increased, the effectiveness of control measures has decreased, or if there are developments in the available level crossing control measures or additional safeguards which could be implemented to reduce the risk further. The thresholds described in section C2.15 are intended to aid this process.

It is intended that the changes which initiate an intermediate risk review are those considered sufficiently significant to justify additional control measures. Where the changes are small, their cumulative effects will be picked up in the regular risk review. The nature and scale of initiators will depend on the type of level crossing and are expanded further in Appendix 2, though this is not exhaustive.

Where an increase in near miss incidents or crossing abuse is detected, this may have arisen from a problem with the crossing condition which can be rectified by maintenance. A risk review need not be initiated where it is demonstrated that the source of the increased risk has been rectified.

Changes some distance away can increase the risk at a level crossing. It is therefore important that those managing the risk at level crossings have access to an appropriate and sufficient level of local knowledge to be aware of changes both within and beyond the immediate surroundings of the level crossing.
Where the initiator is a planned change to the level crossing, intended to improve safety, this does not obviate the need for risk review since there remains an obligation to ensure the residual risk is ALARP, not simply that it is lower than it was before. Equally, when a renewal of all or part of the level crossing is planned, consideration should be given to a risk review to identify whether any changes to improve the crossing at the same time can be justified.

C2.9 Procedures for conducting a risk review
Where the risk review has been initiated by a change or planned change, the review can focus on the effects of the change. In some cases an initial investigation may reveal that the effects of the change are not significant enough to justify changes, and a detailed risk review will not be required.

The cumulative effect of small changes to the operational use, traffic movement or local environment can, over a number of years, lead to a situation where there is no longer adequate protection of level crossing users or trains. The persons carrying out the review should be aware of this cumulative effect and take the gradual changes into account.

C2.10 Line of route risk reviews
Where the initiator of the risk review is a change to operations along a route, a line of route level crossing risk review should be considered as an initial risk evaluation of the level crossings affected.

This review is not a substitute for individual level crossing reviews, but where the change has the same effect along a route, it will provide a rapid indication of the actions required in response to the change.

The types of change to which this would apply are:

a) re-opening of a route that has been closed to rail traffic (for example mothballed lines)

b) increase in the permissible speed

c) changes in the frequency or regularity of trains

d) increase in the variation in train speed between train types, for example if freight trains are introduced on a passenger only route

e) electrification of the route

f) change to the signalling arrangements on the whole route, including closure of signal boxes

The purpose of such a review would be to categorise the level crossings along the route as follows:

a) crossing types which should be closed or upgraded

b) crossing types which should be subjected to rigorous individual risk review

c) crossing types which should be subject to individual risk review, but are unlikely to require significant changes.

A line of route risk review is a simplified version of the individual risk review, and should be primarily concerned with the following two factors:

a) the characteristics of the railway operations over the crossing. This includes frequency, speed and timetable of trains, track layout, traction and signalling arrangements
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b) the characteristics and effectiveness of the level crossing protection provided. This includes visual and audible warnings, fences, gates and barriers, and interaction with the signaller.

It will not take account of user volumes or other local factors, as these cannot be generalised across the route.

Where this approach is adopted, a documented procedure should be available.

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<td>Outcome of risk assessments and risk reviews</td>
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<tr>
<td>Following completion of the risk assessment, one of the following courses of action shall be determined, documented and carried out:</td>
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<td>a) Where the risk is unacceptable, the level crossing shall be closed, or upgraded to a more protective type (see section C2.4), or additional safeguards provided to reduce the risk (see section C2.5).</td>
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<td>b) Where the risk is sufficiently high for it to be reasonably practicable to provide another means of crossing the railway, consider closing the level crossing.</td>
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<tr>
<td>c) Where the risk is sufficiently high for it to be reasonably practicable to do so, the crossing shall be upgraded to a more protective type (see section C2.4) or additional safeguards provided (see section C2.5).</td>
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<tr>
<td>d) Where the risk is sufficiently low for it to be not reasonably practicable to provide additional safeguards, no further action is required until the next risk review.</td>
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C2.11 Immediate actions

Where the risk assessment indicates the need for new control measures to reduce the risk, interim actions should be considered to control the risk until permanent changes are implemented. This is particularly important where the assessment has indicated that the individual risk is unacceptable. Example of interim control measures to be considered are temporary speed restrictions or provision of an attendant.

The risk should be considered unacceptable if the user’s individual probably of fatality is above 10^-4, in line with the HSE definition of unacceptable risk to members of the public.

C2.12 Consideration of level crossing closure

The only means of eliminating the risk at a level crossing is to close it; the potential for this outcome should always be considered.

If the risk assessment indicates that the risk has increased to a level which is unacceptable, that is above the maximum individual risk levels for existing/replacement crossings given in section C1.2, actions are required to reduce the risk irrespective of cost. Crossing closure should be considered as a way of achieving this.

If the risk assessment indicates that the risk has increased significantly, although not to an unacceptable level, reasonably practicable actions are required to reduce the risk. Crossing closure should be assessed against this criterion.

Where a decision is made not to close the level crossing, the justification for the decision should be documented and further actions considered as indicated for outcome c) in GI/RT7011 section C2.3, as shown above.
C2.13 Consideration of level crossing upgrade and additional safeguards

The determination that the risk is not as low as reasonably practicable can only be made by consideration of options for improvement of the crossing and their impact on the risk. Whilst it is important to evaluate risk reduction options, the time and resources expended on this assessment should be in proportion to the need to reduce risk at a given crossing.

Where no previous risk assessment exists, all potential upgrade and additional safeguard options should be evaluated. However, where a previous risk assessment exists, the focus can be placed on the changes, as follows:

a) Where risk has increased since previous risk assessment, potential improvements should be re-evaluated in the light of those changes.

b) Where the risk is unchanged but new risk reduction options are available, evaluate reasonable practicability of these.

Where consideration is being given to upgrade, reference should be made to section C2.18.

Appendix 3 outlines qualitative and quantitative approaches to the evaluation of reasonable practicability. Judgement is required to re-evaluate the risk assessment with the anticipated effect of the upgrade or additional safeguards taken into account. Experience of the risk reviewer and reference to the effectiveness of the same control measures elsewhere are therefore important.

It is important to consider upgrades and additional safeguards in combinations, in order to achieve the largest risk reduction possible with reasonably practicable changes. This does not preclude a change that goes beyond reasonable practicability.

C2.14 Alternative risk control options

Where the risk is increased as a result of a change in the number or type of users, this new usage should be compared with the legal status of the level crossing. Enforcement of prohibition on use outside that for which the crossing is provided should be considered as a risk control option. This is particularly an issue for user-worked and footpath level crossings.

Where there is evidence of public use of a user-worked crossing, for example where it provides signed access to a location selling produce, the authorised user should be contacted to either prevent this public use or make arrangements for all users to be instructed in the safe use of the crossing. Alternatively, an agreement may be reached to upgrade the crossing for public use.

Where risk is increased as a consequence of circumstances outside the direct control of the infrastructure controller, for example, foliage within the boundary of a neighbouring property that obstructs sight lines, the infrastructure controller should endeavour to secure the assistance of those third parties necessary to control the risk.

C2.15 Sensitivity analysis

In both quantitative and qualitative assessments, it is beneficial to test the sensitivity of the outcome to the factors considered. In particular, where the risk assessment has been used as input to a decision not to upgrade a crossing or apply additional safeguards, if the decision would be overturned by relatively minor changes to (or uncertainties in) the assessment, then the decision not to make changes should be reconsidered.

The outcome of a sensitivity analysis should also be used to determine threshold levels of the risk factors, at which a future risk review would be initiated. This is likely to be useful for a small number of the factors, perhaps those considered most likely to change, or those which would have to change only slightly to significantly increase the risk. These thresholds should be taken as a guideline
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against which the level crossing can be monitored, rather than being considered as immovable triggers of a risk review.

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<tr>
<th>GI/RT7011 section C2.3 (part)</th>
<th>Outcome of risk assessments and risk reviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>Where the decision is taken to make changes to the level crossing, a plan shall be put in place for the implementation of the changes, with completion dates. (GO/RT3270 requires the route acceptance processes set out in that standard to be used whenever infrastructure is modified in a way which has a potential material effect on the operating safety of any vehicles currently authorised to operate on a route, or those in the process of acceptance.)</td>
<td></td>
</tr>
</tbody>
</table>

The train operators and other Railway Group members that will be affected by changes to level crossings arising from a risk assessment or review, should be consulted about the changes before they are implemented.

C2.16  Timescale for implementation of changes
The timescale for implementation will depend on the type of change being made, the location and any legal or regulatory procedures which must be followed. It should also take account of the level of risk to which people at the crossing are being exposed until the changes are made. The plan should recognise these priorities and constraints and set a realistic timescale in which the change will be made.

<table>
<thead>
<tr>
<th>GI/RT7011 section C2.3 (part)</th>
<th>Outcome of risk assessments and risk reviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>There shall be documented procedures in place to ensure that, if a level crossing is upgraded or additional safeguards are provided, there is no additional reasonably practicable action that can be taken to reduce the risk further.</td>
<td></td>
</tr>
</tbody>
</table>

All assessments of reasonable practicability shall be made over the whole life of the proposed changes.

C2.17  Check that there are no further reasonably practicable control measures or safeguards
The full consideration of options as described above will in most cases ensure that the additional control measures implemented at the crossing reduce the risk ALARP. However it is good practice to cross check that there would be no further reasonably practicable changes.

When assessing the reasonable practicability of the proposed change, it is important that this takes into account the safety benefits achieved, and the costs incurred, over the whole lifetime of the control measure.

<table>
<thead>
<tr>
<th>GI/RT7011 section C2.4</th>
<th>Upgrading the level crossing to a more protective type</th>
</tr>
</thead>
<tbody>
<tr>
<td>If the risk assessment or review outcome indicates the need to upgrade the crossing to a more protective type, the outcome shall be used to determine the appropriate type of level crossing, together with:</td>
<td></td>
</tr>
<tr>
<td>a) the requirements set out in section C5</td>
<td></td>
</tr>
<tr>
<td>b) technical and operational constraints.</td>
<td></td>
</tr>
</tbody>
</table>

The guidance given in HMRI Railway Safety Principles and Guidance - part 2 section E (and, in the case of barrow crossings at stations, the guidance given in HMRI Railway Safety Principles and Guidance - part 2 section B) should also be taken into account when upgrading a crossing.

C2.18  Determining the appropriate type of level crossing
The risk assessment is one of several inputs to the decision on the type of level crossing to which an upgrade is made. The outcome of the assessment should be considered alongside legal, technical and practical considerations.
Operational constraints for consideration include the effect of the proposed level crossing type on signaller workload.

**GI/RT7011 section C2.5
Provision of additional safeguards**

If the risk assessment or review outcome indicates the need for additional safeguards, consideration shall be given to options in the following areas to improve the level crossing control measures without upgrading the crossing to a more protective type:

- a) signage
- b) active warnings
- c) road surface and markings
- d) other forms of gate or barrier
- e) educating the crossing users
- f) enforcing traffic signal discipline and gate discipline
- g) communication between users and the signaller
- h) inspection
- i) monitoring by the signaller or by automatic systems
- j) operational constraint
- k) means for facilitating safe use by disabled people, including those with mobility, visual or hearing impairment
- l) user approach speeds.

**C2.19 Choice of safeguard, or combination of safeguards**

A non-exhaustive list of the additional safeguards which might be considered is given in Appendix 5. These should be considered for both existing and new level crossings. The choice of safeguard, or combination of safeguards will be dependent on the reasons for the risk not being considered to be ALARP.

**C2.20 Need to engage other agencies**

In order to implement some of these additional safeguards, it will be necessary for the infrastructure controller to engage other agencies such as local councils and the highway authority. These agencies can make significant contributions towards improved level crossing safety by making changes beyond the boundaries of the railway infrastructure.

**C3 Records of risk assessments and risk reviews**

**GI/RT7011 section C3
Records of risk assessments and risk reviews**

The risk assessments and reviews shall be documented and retained with the records relating to that level crossing. The documentation shall include:

- a) findings of the risk assessment or review, with the decisions made and the identity of the people making the decisions.
- b) actions taken as a result of the findings of the risk assessment or review
- c) reasons for not pursuing closure where the crossing remains open
- d) the date of the next scheduled risk review.
Guidance on Provision, Risk Assessment and Review of Level Crossings

Records of risk assessments and reviews, and the resulting decisions, should be retained for as long as they continue to be applicable to the current protection in place at the level crossing. Consideration should be given to retaining the records for longer periods to maintain an audit trail. The records should include details of the following:

a) the date of the risk assessment or review  
b) name(s) of risk assessor(s)  
c) the procedure to which the risk assessment or review was conducted  
d) the methodology applied, including the use of any models or tools and their version (where applicable)  
e) findings/outputs from the risk assessment or review  
f) risk reduction options considered  
g) decisions regarding options and risk reduction measures, and their justification  
h) any data, benchmarks or targets used, and the justification for their use  
i) constraints and assumptions underpinning the review  
j) any thresholds identified for initiation of a future intermediate risk review.

The keeping of records is essential in order to provide:  

a) evidence that the risk reduction measures implemented provide a level of risk which is ALARP  
b) evidence supporting the justification not to close a crossing, or not to implement a risk reduction measure where this is the conclusion reached  
c) the basis for any future risk review.

C4 Competence requirements

<table>
<thead>
<tr>
<th>GI/RT7011 section C4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competence requirements</td>
</tr>
</tbody>
</table>

Personnel, either as individuals or as a team, who perform level crossing risk assessments and reviews should possess:  

a) the necessary competencies in respect of the risk assessment processes and procedures  
b) the knowledge/experience necessary to consider technical aspects of the infrastructure, operations and level crossing equipment  
c) the ability to gain and make use of local knowledge regarding the use and surroundings of the level crossing  
d) an appreciation of the human factors that affect the safety of a level crossing.

The competencies and knowledge need to be sufficient to identify and evaluate all the factors required for the risk assessment as detailed in Appendix 4.
C5 Minimum combinations of level crossing control measures

GI/RT7011 section C5
Minimum combinations of level crossing control measures
All level crossings shall meet the requirements for minimum combinations of level crossing control measures set out in Appendix 1.

Detailed requirements for the control measures set out in Appendix 1 (types of barrier, fixed signs, telephones, active visible and audible warnings) are set out in GI/RT7012.

Level crossings not meeting the requirements for minimum combinations of level crossing control measures, for example open crossings and automatic open crossings, locally monitored (AOCL), shall be upgraded to a type that meets the requirements.

There are special compliance requirements for this section. See section B2.2 for details.

Appendix 1 of GI/RT7011 is reproduced as Appendix 1 of this Guidance Note.

C5.1 Types of user-worked level crossing
There are two distinct types of user-worked level crossing, which differ in terms of permitted use rather than the protection provided. Descriptions are provided here for information only.

An accommodation crossing normally provides access across the railway line between two parts of a property. There are exceptions to this where land on one side of the railway has been sold and the level crossing provides the only access. The crossing is for use only by authorised users.

An occupation crossing provides private access to a property, for use only by the authorised users and their invitees.

C5.2 Use of active visible warnings where there are more than two running lines
Where existing user-worked crossings provide access across more than two running lines, and there is a need to reduce the risk, closure, diversion and other risk management strategies are recommended over active warning devices. Active warning devices are not considered to offer sufficient protection at such crossings.

C6 New level crossing types

GI/RT7011 section C6
New level crossing types
The requirements of section C5 do not preclude the introduction of new types of level crossing. However, any trials of such level crossings could require a Certificate of Temporary Non-Compliance in accordance with GA/RT6004. Permanent installation of such level crossings could require a Certificate of Non-Compliance Pending RGS Revision in accordance with GA/RT6001.

There is no guidance associated with this section of GI/RT7011.
C7  Crossings to be closed

<table>
<thead>
<tr>
<th>GI/RT7011 section C7.1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lines where speeds exceed 125 mph</strong></td>
</tr>
<tr>
<td>Level crossings are not permitted where the permissible speed exceeds 125 mph. Where it is planned to increase the permissible speed to greater than 125 mph, all level crossings shall be closed before the speed is increased.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GI/RT7011 section C7.2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Closure of level crossings when the opportunity arises</strong></td>
</tr>
<tr>
<td>Consideration shall be given to complete closure of a level crossing whenever the opportunity arises, for example if the crossing has ceased to be used.</td>
</tr>
<tr>
<td>Where complete closure of a level crossing on a public road is not possible, but the level crossing has ceased to be used by vehicular traffic, consideration shall be given to reducing the crossing in status to a footpath or bridleway crossing.</td>
</tr>
<tr>
<td>Where there is no evidence of use by horse riders or cyclists at bridleway crossings, consideration shall be given to reducing the crossing in status from bridleway crossing to a footpath crossing.</td>
</tr>
</tbody>
</table>

Closure, or restriction on the permitted user types at a level crossing is an effective risk reduction strategy and should be sought wherever possible.

There are legal constraints on the circumstances in which a crossing can be closed, for example:

a) Permanent closure of a level crossing with public rights cannot be undertaken without legal powers and the agreement of the highway authority.

b) Permanent closure of a level crossing with private rights cannot be undertaken without the agreement of the authorised users, except where closure is pursued under the Transport and Works Act 1992, or private rights have been proven to have been lost through severance.

Severance occurs when the land ownership changes on one side of an accommodation crossing, removing the original purpose of the crossing, which was to connect two parcels of land in one ownership, separated by the construction of the railway. Such crossings are usually field-to-field crossings.

Requirements relating to how crossings are closed and the physical works undertaken are contained in GI/RT7012.
### Appendix 1

Minimum combinations of level crossing control measures

This appendix is mandatory. It sets out minimum permitted combinations of level crossing control measures (see section C5 in GI/RT7011). Additional control measures are to be provided where appropriate (see section C2.5 in GI/RT7011).

<table>
<thead>
<tr>
<th>Controlled by:</th>
<th>Monitored by:</th>
<th>Type of barrier required</th>
<th>Fixed signs required?</th>
<th>Phone to signaller required for user?</th>
<th>Active visible warning required?</th>
<th>Active audible warning required?</th>
<th>Limit on train speed</th>
<th>Additional requirements</th>
<th>Current crossing type meeting these requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Railway passenger at a station to gain access to a platform (pedestrian only)</td>
<td>Not monitored</td>
<td>None</td>
<td>Yes</td>
<td>No</td>
<td>Sometimes - see additional requirements</td>
<td>No</td>
<td>Not to be provided where permissible train speed &gt; 100 mph.</td>
<td>An active visible warning is required where direct observation of trains does not give sufficient warning time (that is, the warning time is less than the crossing time).</td>
</tr>
<tr>
<td>B</td>
<td>Railway staff at a station to gain access to a platform (pedestrian only, or with barrows and trolleys)</td>
<td>Not monitored</td>
<td>None</td>
<td>Yes</td>
<td>No</td>
<td>Sometimes - see additional requirements</td>
<td>No</td>
<td>Not to be provided where permissible train speed &gt; 100 mph.</td>
<td>An active visible warning is required where direct observation of trains does not give sufficient warning time (that is, the warning time is less than the crossing time).</td>
</tr>
<tr>
<td>C</td>
<td>Railway staff on authorised walking route (pedestrian only)</td>
<td>Not monitored</td>
<td>None</td>
<td>Yes</td>
<td>Sometimes - see additional requirements</td>
<td>Sometimes - see additional requirements</td>
<td>No</td>
<td>Not to be provided where permissible train speed &gt; 125 mph.</td>
<td>Either a phone to signaller or an active visible warning is required where direct observation of trains does not give sufficient warning time (that is, the warning time is less than the crossing time) or permissible train speed &gt; 100 mph.</td>
</tr>
<tr>
<td>D</td>
<td>User (pedestrian only)</td>
<td>Not monitored</td>
<td>Gate or stile</td>
<td>Yes</td>
<td>No</td>
<td>Sometimes - see additional requirements</td>
<td>Sometimes - see additional requirements</td>
<td>Not to be provided where permissible train speed &gt; 125 mph.</td>
<td>Active visible and audible warnings are required where direct observation of trains does not give sufficient warning time (that is, the warning time is less than the crossing time) or where permissible train speed &gt; 100 mph, except where whistle boards are currently provided as a means of extending the warning time.</td>
</tr>
</tbody>
</table>

Table 1: Minimum combinations of level crossing control measures (continued on next page)
<table>
<thead>
<tr>
<th>Controlled by:</th>
<th>Monitored by:</th>
<th>Type of barrier required</th>
<th>Fixed signs required?</th>
<th>Phone to signaller required for user?</th>
<th>Active visible warning required?</th>
<th>Active audible warning required?</th>
<th>Limit on train speed</th>
<th>Additional requirements</th>
<th>Current crossing type meeting these requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>User (including vehicle driver, horse rider, cyclist, person moving farm animals on the hoof and pedestrian)</td>
<td>Not monitored</td>
<td>Gate or lifting full barrier</td>
<td>Yes</td>
<td>Sometimes - see additional requirements</td>
<td>Sometimes - see additional requirements</td>
<td>Sometimes - see additional requirements</td>
<td>Not to be provided where permissible train speed &gt; 125 mph.</td>
<td>Either a phone to signaller or an active visible warning is required where direct observation of trains does not give sufficient warning time (that is, the warning time is less than the crossing time) or permissible train speed &gt; 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.</td>
</tr>
<tr>
<td>F</td>
<td>Automatic control system</td>
<td>Train crew</td>
<td>Lifting half barrier</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>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.</td>
<td>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.</td>
</tr>
<tr>
<td>G</td>
<td>Automatic control system</td>
<td>Signaller</td>
<td>Lifting half barrier</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Not to be provided where permissible speed &gt; 100 mph.</td>
<td>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. Barriers are to close only the entrances to the crossing, leaving the exits clear.</td>
</tr>
<tr>
<td>H</td>
<td>Train crew, locally</td>
<td>Train crew (integral with working of crossing)</td>
<td>Gate or lifting full barrier</td>
<td>Yes</td>
<td>No</td>
<td>Sometimes - see additional requirements</td>
<td>Sometimes - see additional requirements</td>
<td>Not applicable - train comes to a halt at the crossing.</td>
<td>Active visible and audible warnings are required, except where existing crossings are fitted with gates.</td>
</tr>
</tbody>
</table>

Table 1: Minimum combinations of level crossing control measures (continued on next page)
## Guidance on Provision, Risk Assessment and Review of Level Crossings

### Table 1: Minimum combinations of level crossing control measures

<table>
<thead>
<tr>
<th>Controlled by:</th>
<th>Monitored by:</th>
<th>Type of barrier required</th>
<th>Fixed signs required?</th>
<th>Phone to signaller required for user?</th>
<th>Active visible warning required?</th>
<th>Active audible warning required?</th>
<th>Limit on train speed</th>
<th>Additional requirements</th>
<th>Current crossing type meeting these requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>J</strong></td>
<td>Signaller or crossing keeper, remotely (by CCTV)</td>
<td>Lifting full barrier</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Not to be provided where permissible train speed &gt; 125 mph.</td>
<td>CCTV monitored barrier crossing</td>
<td></td>
</tr>
<tr>
<td><strong>K</strong></td>
<td>Signaller or crossing keeper, locally</td>
<td>Gate or lifting full barrier</td>
<td>Yes</td>
<td>No</td>
<td>Sometimes - see additional requirements</td>
<td>Sometimes - see additional requirements</td>
<td>Not to be provided where permissible train speed &gt; 125 mph.</td>
<td>Active visible and audible warnings are required, except where existing crossings are fitted with gates.</td>
<td>Staffed gated crossing</td>
</tr>
</tbody>
</table>

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Uncontrolled When Printed
### Appendix 2

Initiators of a risk review

<table>
<thead>
<tr>
<th>No.</th>
<th>Initiator</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1.1</td>
<td>A train accident at the level crossing.</td>
<td>Any collision between a train and a level crossing user (person, vehicle or large animal) or other object at the level crossing, whether or not it results in injury, should initiate a risk review. In these cases the findings of any investigation or inquiry should be taken into account in the review.</td>
</tr>
</tbody>
</table>
| 2.1.2 | An increase in the frequency of crossing abuse, trespass, accidents (other than train accidents), or 'near-miss' incidents. | An increasing trend (in terms of numbers and/or severity) in these incidents is indicative of an insufficiency of the protection in place. The trend must be sufficient to cause concern about the control measures in place at the crossing in order to initiate a risk review. A mechanism for monitoring these trends should be in place, both for an individual crossing and for groups of nearby crossings. This should facilitate reporting by train drivers, other railway staff and members of the public. Crossing abuse includes:  
   a) driving through red lights at road traffic signals, including zig-zagging around barriers  
   b) traffic blocking back across the railway  
   c) vandalism of level crossing equipment or warning signs (for example, vandals operating treadles at automatic level crossings)  
   d) trespass onto the line.  
Near-miss incidents include:  
   e) users damaging gates or barriers  
   f) vehicles obstructing the line as the train approaches, but clear before train arrives.  
Non-train accidents include:  
   g) users injured by gates or barriers  
   h) road traffic accidents on the crossing (not involving a train)  
   i) pedestrian/cyclist slips, trips and falls on the crossing. |
No. | Initiator | Comments |
--- | --- | --- |
2.1.3 | Any significant change, or planned significant change, to the nature of railway operations over the crossing. | A significant change is defined as one which is judged to make the current risk assessment invalid, and is likely to result in changes in the control measures at the level crossing; this may differ according to the type of level crossing. The effect of these factors on the risk is expanded further in Appendix 4. Examples of the types of change to be considered are listed below. 

Train speed:  
- a) increase in maximum train speed (even if the maximum permissible speed remains unchanged)  
- b) increase in the variability in speed between different trains.  

Train frequency/timetable:  
- (Note that either a major timetable change, or the cumulative effects of several six-monthly changes may be ‘significant’)  
- c) reopening of a line which has been closed to rail traffic  
- d) change in train frequency (at all or limited times of day)  
- e) change in the irregularity of trains  
- f) change in the frequency at which the crossing closes for the passage of more than one train  
- g) addition of passenger trains to a previously freight only route, or freight trains to a passenger only route  
- h) increase in length of trains, particularly where long freight trains are introduced  
- i) change in the stopping pattern of trains at an adjacent station.  

Infrastructure changes/signalling arrangements:  
- j) change in track layout on the approaches to the crossing  
- k) electrification of the route  
- l) change in the type of signalling or location of signals, where this affects the operation of the level crossing  
- m) changes in line opening times.
## Guidance on Provision, Risk Assessment and Review of Level Crossings

<table>
<thead>
<tr>
<th>No.</th>
<th>Initiator</th>
<th>Comments</th>
</tr>
</thead>
</table>
| 2.1.4 | Any significant change, or expected significant change, to the nature or extent of use of the level crossing by road vehicles, pedestrians or animals. | A change in the number or type of users may result from many different causes. As a minimum the following should be considered:  
   a) changes in the immediate and more remote surroundings of the **level** crossing:  
   b) new housing, workplaces, shops or services such as schools and hospitals  
   c) change in land use, for example conversion of a warehouse to a call centre, or opening of a park and ride facility  
   d) changes in road layouts, for example one way systems which direct more traffic over the **level** crossing, or changes which increase traffic approach speeds  
   e) inclusion of the **level** crossing on a signed tourist route.  
Both permanent and seasonal use should be considered, including the use of the **level** crossing as access for occasional events.  
Where possible, the potential for a change in use should be identified, rather than relying on measures of actual use to determine changes after they have happened.  
A knowledge of planning applications, and an awareness of other changes in the area will be necessary in order to monitor the potential for changes in use of the **level** crossing. |
| 2.1.5 | Any significant change, or expected significant change to the environment on the approaches to the **level** crossing. | Any changes on the approach to the **level** crossing which change the behaviour of crossing users, or make it more difficult to identify the warnings should be considered. These may include:  
   a) construction of buildings, billboards or other signs which in any way obstruct the **level** crossing or its warnings signs and signals, or would serve to distract **level** crossing users  
   b) change in the road layout, such as a new junctions, roundabouts, traffic calming, or one-way system  
   c) change in the traffic controls such as speed limits and the addition or change in sequence of road traffic light signals  
   d) the opening of dedicated cycle or bus lanes or tramways  
   e) change in parking restrictions. |
## Guidance on Provision, Risk Assessment and Review of Level Crossings

### 2.1 Initiator Comments

<table>
<thead>
<tr>
<th>No.</th>
<th>Initiator</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1.6</td>
<td>A planned change to the level crossing control measures.</td>
<td>A change to the control measures at a level crossing may be proposed for reasons other than the result of a risk review, for example to meet changed operational requirements. A risk review should be undertaken in these cases to ensure that the risk after the change will be ALARP.</td>
</tr>
<tr>
<td>2.1.7</td>
<td>Renewal of gates, barriers or control equipment is planned.</td>
<td>A planned renewal provides an opportunity to review the control measures at the crossing. Improvements to the crossing may be easier to make as part of the renewal than as a separate project. This does not apply to emergency repairs.</td>
</tr>
<tr>
<td>2.1.8</td>
<td>Any other significant change which has increased, or is expected to increase, the risk.</td>
<td>The above list is not exhaustive and the infrastructure controller is responsible for monitoring and identifying any other changes which increase the risk and therefore should initiate a risk review.</td>
</tr>
</tbody>
</table>

### 2.2 Other level crossings

<table>
<thead>
<tr>
<th>No.</th>
<th>Initiator</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2.1</td>
<td>A train accident at the level crossing.</td>
<td>Any collision between a train and a level crossing user (person, vehicle or large animal) or other object at the level crossing, whether or not it results in injury, should initiate a risk review. In these cases the findings of any investigation or inquiry should be taken into account in the review.</td>
</tr>
</tbody>
</table>
### Guidance on Provision, Risk Assessment and Review of Level Crossings

<table>
<thead>
<tr>
<th>No.</th>
<th>Initiator</th>
<th>Comments</th>
</tr>
</thead>
</table>
| 2.2.2 | An increase in the frequency of crossing abuse, trespass, accidents (other than train accidents) or near-miss incidents. | An increasing trend (in terms of numbers and/or severity) in these incidents is indicative of an insufficiency of the protection in place. The trend must be sufficient to cause concern about the control measures in place at the crossing in order to initiate a risk review. The infrastructure controller should have in place a mechanism for monitoring these trends, both for an individual crossing and for groups of nearby crossings. This should facilitate reporting by train drivers, other railway staff and members of the public. Crossing abuse includes:  
   a) failing to contact the signaller before crossing, or once crossing is complete (when required to do so)  
   b) any shortcut of the correct crossing procedure  
   c) leaving gates open  
   d) failing to secure gates open while crossing with a vehicle  
   e) vehicles becoming grounded on the crossing  
   f) vandalism of level crossing gates, signs or warnings  
   g) trespass onto the line. Near-miss incidents include:  
   h) users damaging gates or barriers  
   i) users on the line as the train approaches, but clear before train arrives. Non-train accidents include:  
   j) users injured by gates or barriers  
   k) road traffic accidents on the crossing (not involving a train)  
   l) pedestrian/cyclist slips, trips and falls. |
### Guidance on Provision, Risk Assessment and Review of Level Crossings

<table>
<thead>
<tr>
<th>No.</th>
<th>Initiator</th>
<th>Comments</th>
</tr>
</thead>
</table>
| 2.2.3 | Any significant change, or planned significant change, to the nature of railway operations over the crossing. | This shall include changes in permissible speeds, actual train speed, frequency and timetable, infrastructure or signalling arrangements. A significant change is defined as one which is judged to make the current risk assessment invalid, and is likely to result in changes in the control measures at the level crossing, this may differ according to the type of level crossing. The effect of these factors on the risk is expanded further in Appendix 4. Examples of the types of change to be considered are listed below. Train speed:  
  a) increase in maximum train speed (even if the maximum permissible speed remains unchanged)  
  b) increase in the variability in speed between different trains. Train frequency/timetable:  
  (Note that either a major timetable change or the cumulative effects of several six-monthly changes may be 'significant')  
  c) reopening of a line that has been closed to rail traffic  
  d) change in train frequency (at all or limited times of day)  
  e) change in the irregularity of trains  
  f) change in the frequency at which two trains pass at or near the level crossing  
  g) addition of passenger trains to a previously freight only route  
  h) increase in length of trains, particularly where long freight trains are introduced  
  i) change in the stopping pattern of trains at an adjacent station. Infrastructure changes/signalling arrangements:  
  j) change in track layout on the approaches to the crossing  
  k) electrification of the route  
  l) change to bi-directional working  
  m) change in line opening times. |
## Guidance on Provision, Risk Assessment and Review of Level Crossings

<table>
<thead>
<tr>
<th>No.</th>
<th>Initiator</th>
<th>Comments</th>
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</thead>
</table>
| 2.2.4 | Any significant change, or expected significant change, to the nature or extent of use of the level crossing by road vehicles, pedestrians or animals. | A change in the number or type of users may result from many different causes. As a minimum the following should be considered:  
   a) construction of housing, shops, leisure facilities or services for which the level crossing provides access  
   b) change in land use, for example, the type of agriculture, or a change from farming to leisure or other use  
   c) change in the nature of the business or residency to which a crossing provides access, for example leading to more invitees or use by disabled people  
   d) inclusion of the level crossing on a waymarked route or cycleway  
   e) evidence of public use of a user-worked crossing.  
Both permanent and seasonal use should be considered, including the use of the level crossing as access for occasional events. Where possible, the potential for a change in use should be identified, rather than relying on measures of actual use to determine changes after they have happened. A knowledge of planning applications, and an awareness of other changes in the area will be necessary, in order to monitor the potential for changes in use of the level crossing. |
| 2.2.5 | Any significant change, or expected significant change to the environment on the approaches to the level crossing. | Any changes on the approach to the level crossing which change the behaviour of crossing users, or make it more difficult to identify the warnings should be considered. These include:  
   a) construction of buildings, billboards or other signs which in any way obstruct the level crossing or its warnings signs and signals, or would serve to distract level crossing users  
   b) deterioration in the surface on the approaches to the crossing, or a change in their level which increases any step up or down to the level crossing surface  
   c) significant change in the angle of approach to the level crossing. |
<p>| 2.2.6 | A planned change to the level crossing control measures. | A change to the protection at a level crossing may be proposed for reasons other than the result of a risk review, for example to meet changed operational requirements. A risk review should be undertaken in these cases to ensure that the risk after the change will be ALARP. |</p>
<table>
<thead>
<tr>
<th>No.</th>
<th>Initiator</th>
<th>Comments</th>
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<tbody>
<tr>
<td>2.2.7</td>
<td>Renewal of gates, barriers or control equipment is planned.</td>
<td>A planned renewal provides an opportunity to review the control measures at the crossing. Improvements to the crossing may be easier to make as part of the renewal than as a separate project. This does not apply to emergency repairs.</td>
</tr>
<tr>
<td>2.2.8</td>
<td>Any other significant change which has increased, or is expected to increase, the risk.</td>
<td>The above list is not exhaustive and the infrastructure controller is responsible for monitoring and identifying any other changes which increase the risk and therefore should initiate a risk review.</td>
</tr>
</tbody>
</table>
Appendix 3
Detailed assessment of level crossing risk and risk reduction measures

3.1 Qualitative assessment of level crossing risk

3.1.1 Carrying out a qualitative risk assessment
Where a detailed risk assessment of level crossing risk is required to be carried out in accordance with sections C1 and C2 of GI/RT7011, a qualitative approach may suffice. Such an assessment should be carried out systematically, and is best conducted in the form of a structured professional judgement process.

3.1.2 Process for qualitative risk assessment
The process should entail:

a) provision of sufficient information, such as diagrams and completed site visit forms to ensure that all relevant characteristics of the crossing are taken into account

b) use of checklists or similar means, to ensure that all relevant issues are considered (the lists of factors in Appendix 4 may help)

c) an agreed means of classifying the factors affecting the risk (for instance, low/medium/high probability)

d) identification, evaluation and selection of risk reduction measures necessary to ensure that the risk is ALARP

e) recording the process, debate and decisions about the levels of risk and the risk reduction measures. See section C3 for specific guidance in this respect. Supporting information such as annotated checklists, and the reasons for rejecting risk reduction measures should also be kept.

3.1.3 Categorisation of risk reduction measures
Possible risk reduction measures, or combinations of risk reduction measures should be categorised as one of:

a) not required — costs are clearly grossly disproportionate to the risk benefits over the service life of the infrastructure

b) required — the cost is clearly not disproportionate to the benefits over the service life of the infrastructure

c) unable to determine whether required or not.

Where the risk reduction measure is categorised as c), then it may be necessary to apply quantitative analysis to resolve the uncertainty (see section 3.2 of this Appendix).

3.2 Quantitative assessment of level crossing risk

Where a qualitative assessment provides insufficient information to decision makers, or where it is a standard procedure for a particular crossing type, a quantitative assessment should be applied. By definition this is a numerate approach, but will generally involve an element of structured engineering judgement. This approach, in outline form, is as follows:
a) Estimate the current level of risk at the level crossing. The key factors which influence the level of risk are defined in Appendix 4. The effect of each of the factors on the risk for the crossing being assessed can be combined to obtain an estimate for the risk to passengers, workers and members of the public, for instance in the form of equivalent fatalities per annum. Best estimates for the factors should be used to estimate the risk, together with some assessment of the uncertainty and sensitivity to assumptions.

b) Assess the risk benefit from implementing the risk reduction measures. The risk benefit can be assessed by considering the impact of the proposed risk reduction option on each of the factors, then re-evaluating the overall risk estimate. The whole life risk reduction then needs to be converted into a monetary value using the value of preventing a fatality (VPF) figures published in the current Railway Group Safety Plan.

c) Consider the cost of implementing the risk reduction measure(s). This should take into account both the initial cost of the change and also the whole life operational and maintenance costs.

d) Determine whether the risk reduction measure needs to be implemented. The decision should take account of the risk if the option were not implemented and a comparison between the implementation costs (as estimated in c) above) and the expenditure justified by the risk benefit (as estimated in b) above).

Tools such as the Railtrack Automatic Level Crossing Model provide some assistance with carrying out the risk assessment.

Further information on both qualitative and quantitative assessment can be found in the Engineering Safety Management ‘Yellow Book’.

3.3 Implementation of risk reduction measures

The selection of the set of risk reduction measures to implement should take a holistic view of the possible combinations available, in order to select the combination which results in the lowest residual risk. Records containing robust arguments for the rejection of other risk reduction measures should be retained.
### Appendix 4
Factors to be included in the risk assessment

#### 4.1 Public road level crossings

<table>
<thead>
<tr>
<th>No.</th>
<th>Factor</th>
<th>Comments</th>
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<tbody>
<tr>
<td></td>
<td>Frequency and regularity of trains.</td>
<td>The frequency of trains approaching the crossing needs to be determined. This should take into account seasonal and daily variations. The regularity of trains impacts on users’ expectation of there being a train, particularly if a usually regular service is disrupted rather than where irregularity is timetabled. A low frequency train service can pose a high risk to users, due to the rarity of them encountering a train and the reduced vigilance that they may therefore demonstrate in crossing.</td>
</tr>
<tr>
<td>4.1.1</td>
<td>Variation in crossing closure times.</td>
<td>Highly variable closure times can increase accident frequency through encouraging crossing abuse. Variability arises from, for example: a) variation in train speeds b) multiple trains passing within one closure cycle c) stopping trains in nearby stations.</td>
</tr>
<tr>
<td>4.1.2</td>
<td>Variation in time from first warning to the arrival of the train.</td>
<td>Variability can increase accident frequency through encouraging crossing abuse. It arises through, for example: a) variation in train speeds b) stopping trains in nearby stations.</td>
</tr>
<tr>
<td>4.1.3</td>
<td>Maximum train speed.</td>
<td>The maximum train speed affects the potential consequences of an accident at the crossing. This is not necessarily the same as the permissible speed. Note that the same increase in speed may have a more significant effect on accident consequences where the initial speed was lower.</td>
</tr>
<tr>
<td>4.1.4</td>
<td>Adequacy of SPAD protection.</td>
<td>Where there is a signal protecting the crossing, consideration should be given to the potential for a SPAD to result in a train entering the crossing unprotected. Reference should be made to GI/GN7606 Guidance Note: Prevention and Mitigation of Overruns – Risk Assessment to determine the level of risk.</td>
</tr>
</tbody>
</table>
### Guidance on Provision, Risk Assessment and Review of Level Crossings

<table>
<thead>
<tr>
<th>No.</th>
<th>Factor</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1.6</td>
<td>Type of trains</td>
<td>The proportions of passenger and freight trains using the route will affect the potential consequences of a train accident.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The characteristics of the level crossing users.</td>
</tr>
<tr>
<td>4.1.7</td>
<td>Nature of users.</td>
<td>The main types of user, and their characteristics should be identified, and account taken of variations through the day and through the year. This should include consideration of their approach and crossing speeds.</td>
</tr>
<tr>
<td>4.1.8</td>
<td>Users particularly at risk.</td>
<td>The frequency of use of the crossing by high-risk traffic should be estimated. It can be ascertained from observation, knowledge of the surrounding area, or third-party reports. Abnormal traffic includes:</td>
</tr>
<tr>
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<td>a) large, low or slow-moving vehicles</td>
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<td></td>
<td>b) vehicles carrying hazardous goods</td>
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<tr>
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<td></td>
<td>c) mobility impaired pedestrians (for example, wheelchair users, people with small children, the elderly)</td>
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<td></td>
<td>d) people with impaired sight or hearing</td>
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<td></td>
<td></td>
<td>e) groups of children</td>
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<td></td>
<td>f) animals</td>
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<td></td>
<td></td>
<td>g) people under the influence of alcohol (drivers or pedestrians).</td>
</tr>
<tr>
<td>4.1.9</td>
<td>Potential for grounding.</td>
<td>The potential for grounding should be explicitly assessed, taking into account the crossing surface and the nature of the vehicles using the crossing. Where the potential is present, the ease of contacting the signaller or crossing keeper to report the grounding, and the signaller’s ability to stop an approaching train should be assessed, particularly where there is no telephone provided. The ability of a driver to see and stop short of an obstruction should also be considered.</td>
</tr>
<tr>
<td>4.1.10</td>
<td>Potential for blocking back.</td>
<td>The potential for blocking back should be ascertained from observation, from consideration of the road layout, or from third-party reports. It leads to an increase in the frequency of accidents because vehicles become trapped on the crossing. AHBC are not permitted where blocking back occurs.</td>
</tr>
</tbody>
</table>
### Guidance on Provision, Risk Assessment and Review of Level Crossings

<table>
<thead>
<tr>
<th>No.</th>
<th>Factor</th>
<th>Comments</th>
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<tbody>
<tr>
<td></td>
<td>The extent of use of the crossing</td>
<td>The frequency of use of the crossing by different users needs to be estimated. This should include counts of different vehicle types and pedestrians. The variations in traffic through the day, and on a seasonal basis should be considered, survey times and durations should reflect this. However where temporary arrangements such as manning the crossing are used during peaks of use, this should be taken into account. In addition, the potential for significant increases in traffic on a temporary basis should be considered, for example if the level crossing is on a diversionary route or is an access route to special events.</td>
</tr>
<tr>
<td>4.1.11</td>
<td>Traffic levels.</td>
<td>The frequency of use of the crossing by different users needs to be estimated. This should include counts of different vehicle types and pedestrians. The variations in traffic through the day, and on a seasonal basis should be considered, survey times and durations should reflect this. However where temporary arrangements such as manning the crossing are used during peaks of use, this should be taken into account. In addition, the potential for significant increases in traffic on a temporary basis should be considered, for example if the level crossing is on a diversionary route or is an access route to special events.</td>
</tr>
<tr>
<td></td>
<td>The characteristics and effectiveness of the level crossing protection provided</td>
<td>All additional safeguards provided at the crossing should be noted, and their impact on the risk evaluated. This includes features of the crossing itself, and the approach roads.</td>
</tr>
<tr>
<td>4.1.12</td>
<td>Type of level crossing.</td>
<td>The crossing should be classified as each type provides a different degree of risk control.</td>
</tr>
<tr>
<td>4.1.13</td>
<td>Additional safeguards provided.</td>
<td>All additional safeguards provided at the crossing should be noted, and their impact on the risk evaluated. This includes features of the crossing itself, and the approach roads.</td>
</tr>
<tr>
<td>4.1.14</td>
<td>Clarity of signs and warnings.</td>
<td>The location, visibility and clarity of the signs and warnings, including road traffic signals, should be assessed. Consideration should be given to vegetation and other obstructions, and the relative positioning of warning and information signs. The potential for sun-glare to obscure warning lights needs to be assessed, particularly where the crossing is east-west oriented.</td>
</tr>
<tr>
<td>4.1.15</td>
<td>Road surface and markings.</td>
<td>The nature and state of repair of the road surface should be assessed for hazards such as skidding, potholes and the clarity of the road markings. The hazard to cyclists from flangeways should be considered.</td>
</tr>
<tr>
<td>4.1.16</td>
<td>Workload of signaller/crossing keeper.</td>
<td>The overall workload of the crossing keeper/signaller should be taken into account, particularly where several crossings are controlled from the same location. The potential for confusing different crossings, or of failing to observe that the crossing is clear should be considered.</td>
</tr>
<tr>
<td>4.1.17</td>
<td>Interlocking.</td>
<td>If a manually controlled crossing is not interlocked with the signalling, the risk is increased, as the crossing is more vulnerable to mistakes by the crossing keeper.</td>
</tr>
</tbody>
</table>
The relationship between crossing time and warning time.

<table>
<thead>
<tr>
<th>No</th>
<th>Factor</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>4.1.18</td>
<td>Minimum opening time of the crossing. (Automatic crossings only.)</td>
<td>An estimate of the frequency with which the crossing has a short opening time should be made, as in these circumstances crossing abuse may increase.</td>
</tr>
</tbody>
</table>

The history of the level crossing in respect of levels of crossing abuse, trespass, near misses and accidents

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<th>No</th>
<th>Factor</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>4.1.19</td>
<td>History of accidents and near misses.</td>
<td>If there have been accidents or near misses at the crossing, these should be noted. The circumstances of the incidents and any findings of subsequent inquiries should inform a judgement on the risk which is indicated by these.</td>
</tr>
<tr>
<td>4.1.20</td>
<td>Level of reported crossing abuse.</td>
<td>Crossing abuse by vehicle drivers or pedestrians provide opportunities for accidents. The frequency and nature of these incidents should be included in the assessment, being indicative of the willingness of users to conform to the instructions for safe use of the crossing. Reports may be made by train drivers, other railway staff and members of the public. Any follow-up to the reports should also be accounted for.</td>
</tr>
<tr>
<td>4.1.21</td>
<td>Access point for trespassers.</td>
<td>Any reports of trespass, whether confirmed or anecdotal, should be taken into account. Of particular concern are trespassers who vandalise railway property, for example operating treadles when there is no train approaching.</td>
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Other local conditions which affect the safety of the crossing.

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<tr>
<th>No</th>
<th>Factor</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td>4.1.22</td>
<td>User distractions.</td>
<td>Anything which distracts a vehicle driver or pedestrian from the level crossing warnings should be taken into account. This includes other road signs, billboards, junctions, noise, and may vary seasonally.</td>
</tr>
<tr>
<td>4.1.23</td>
<td>Nature of approach.</td>
<td>Characteristics of the approach may increase the frequency of road vehicle driver error. These may include corners, junctions, a falling gradient, and other obstructions.</td>
</tr>
<tr>
<td>4.1.24</td>
<td>Other factors.</td>
<td>There may be features of the local environment which make the crossing more hazardous for all, or some users. These should be identified and taken into account on a case-by-case basis.</td>
</tr>
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</table>
4.2 Other vehicular level crossings

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<tr>
<th>No</th>
<th>Factor</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.2.1</td>
<td>Frequency and regularity of trains.</td>
<td>The frequency of trains approaching the crossing needs to be determined. This should taken into account seasonal and daily variations.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The regularity of trains impacts on users’ expectation of there being a train, particularly if a usually regular service is disrupted rather than where irregularity is timetabled.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A low frequency train service can pose a high risk to users, due to the rarity of them encountering a train and the reduced vigilance that they may therefore demonstrate in crossing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Where train frequency and speed are high, consideration should be given to whether the intervals remaining are sufficient to allow safe use of the crossing, or whether there is a need for closure or upgrade to a crossing controlled by signal or crossing keeper.</td>
</tr>
<tr>
<td>4.2.2</td>
<td>Time the user is expected to wait.</td>
<td>This is indicated by the duration of the warning of an approaching train given by an active warning system, or the maximum time a user will be asked to wait by the signal. Long waiting times encourage users to disregard the crossing instructions.</td>
</tr>
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<td></td>
<td></td>
<td>If the waiting time can be highly variable, the effect of this on the user should also be taken into account.</td>
</tr>
<tr>
<td>4.2.3</td>
<td>Frequency of simultaneous trains.</td>
<td>Where trains are timetabled to pass or follow in close succession at or near the level crossing, or disruption could easily lead to this situation, the impact on risk should be considered, as users may be tempted to think it is safe to cross, once they have seen one train pass.</td>
</tr>
<tr>
<td>4.2.4</td>
<td>Variability in train speed.</td>
<td>Variability can increase accident frequency, as the user will be less able to judge the time available between first sighting the train and arrival of the train at the crossing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The stopping patterns of the trains at a station visible from the crossing should also be taken into account, in terms of the obstruction to visibility caused by a stopped train, and the difficulty of judging the available crossing time.</td>
</tr>
<tr>
<td>4.2.5</td>
<td>Maximum train speed.</td>
<td>The maximum train speed (which may differ from the permissible speed) affects the potential consequences of an accident at the crossing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A given change in train speed has a more significant effect on accident consequences where the original speed was low.</td>
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</tbody>
</table>
Guidance on Provision, Risk Assessment and Review of Level Crossings

No | Factor | Comments |
---|---|---|
4.2.6 | Type of train | The proportions of passenger and freight trains using the route will affect the potential consequences of a train accident. |

The characteristics of the level crossing users

4.2.7 | Nature of users. | The main types of user should be identified, and account taken of variations through the year. Users include:
a) road vehicles, for example cars 
b) farm vehicles, for example tractors 
c) heavy or long farm vehicles, for example tractors with trailers 
d) pedestrians 
e) cyclists 
f) animals (individually or in groups). |

4.2.8 | Familiarity of users. | Where there is a high turnover of users, for example if a farm uses casual labour or the crossing is an access route to a holiday park, the potential unfamiliarity of the users with the crossing instructions should be taken into account. Equally, where users are very familiar with the crossing, the potential for complacency to increase the risk should be considered. |

4.2.9 | Potential for grounding. | The potential for grounding should be explicitly assessed, taking into account the crossing surface and the nature of the vehicles using the crossing. Where the potential is present, the ease of contacting the signaller or crossing keeper to report the grounding, and the signaller’s ability to stop an approaching train should be assessed, particularly where there is no telephone provided. The ability of a driver to see and stop short of an obstruction should also be considered. |

4.2.10 | Potential for blocking back or tailing. | Where the crossing use is high, or is used by groups, account should be taken of the potential for blocking back, and for tailing where users follow the person in front without as much attention to the railway as if they were alone. This is applicable to vehicular and pedestrian users, though to different degrees. |
### Guidance on Provision, Risk Assessment and Review of Level Crossings

<table>
<thead>
<tr>
<th>No</th>
<th>Factor</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>The extent of use of the crossing</td>
<td>by vehicles, pedestrians and animals.</td>
</tr>
<tr>
<td>4.2.11</td>
<td>Traffic levels.</td>
<td>The frequency of use of the crossing by different users needs to be estimated. This should include counts of different vehicle types and pedestrians. The variations in traffic through the day, and on a seasonal basis should be considered, survey times and durations should reflect this. However, where temporary arrangements such as manning the crossing are used during peaks of use, this should be taken into account. In addition, the potential for significant increases in traffic on a temporary basis should be considered, for example if the level crossing is used as an access route to special events.</td>
</tr>
<tr>
<td></td>
<td>Type of level crossing.</td>
<td>The crossing should be classified in terms of the following, as they provide a different degree of risk control:</td>
</tr>
<tr>
<td>4.2.12</td>
<td>Additional safeguards provided.</td>
<td>All additional safeguards provided at the crossing should be noted, and their impact on the risk evaluated. This includes features of the crossing itself, and the approach routes.</td>
</tr>
<tr>
<td>4.2.13</td>
<td>Ease of use of gates and barriers.</td>
<td>The ease of opening, closing and fastening back the gates or barriers should be considered. If they are difficult or the fastenings are not secure, the risk will be higher, as users may be reluctant to use gates/barriers correctly, or they may be left loose as a hazard to trains and other users.</td>
</tr>
<tr>
<td>4.2.14</td>
<td>Clarity of signs and warnings.</td>
<td>The location, visibility and clarity of the signs and warnings should be assessed. Consideration should be given to vegetation and other obstructions, and the relative positioning of warning and information signs. The potential for sun-glare to obscure warnings or visibility of the approaching train needs to be assessed.</td>
</tr>
<tr>
<td>4.2.15</td>
<td>Level crossing surface and profile.</td>
<td>The nature and state of repair of the surface should be assessed in terms of the potential for grounding or as a hazard for pedestrians or animals.</td>
</tr>
<tr>
<td>4.2.16</td>
<td>Workload of signaller.</td>
<td>The overall workload of the signaller should be taken into account, particularly where several crossings are monitored from the same location. The potential for confusing different crossings, or of providing incorrect information to users should be considered.</td>
</tr>
</tbody>
</table>
### Guidance on Provision, Risk Assessment and Review of Level Crossings

**No** | **Factor** | **Comments**
--- | --- | ---
4.2.18 | Nature and condition of fencing. | An assessment of the fencing of the railway near the crossing is required to determine the frequency of users crossing the railway other than at the level crossing itself. Where the fencing is poor or the location of the level crossing unclear, users are more likely to be exposed to a higher risk by crossing at the wrong point.

4.2.19 | Identification of level crossing. | The clarity of the identification of the level crossing to train drivers and signallers, to prevent confusion between level crossings, should be assessed. This is particularly important where there are several crossings along a line of route under the control of one signaller.

The relationship between crossing time and warning time.

4.2.20 | Minimum warning time. | The minimum warning time in each direction should be measured from an identified decision point, which should take into account where different types of user might take their crossing decisions. For example, drivers of high or long-fronted vehicles will make decisions from a different vantage point than pedestrians. The warning may be provided by sighting of the train or an active warning device.

The minimum warning time should take into account the fastest trains and all possible approach directions, particularly where there is a junction near the crossing.

Other factors to be taken into account are:
- a) growth of vegetation, particularly if the risk review is undertaken during the winter
- b) different weather conditions
- c) ease of sighting where the crossing is not at right angles to the railway
- d) ease of hearing audible warnings, by pedestrian users.

4.2.21 | Crossing time. | The crossing time required for the slowest user, who is not expected to telephone, needs to be estimated, taking into account the nature of the surface and the distance which must be covered.

Where the crossing time is longer than the warning time, the risk is considerably higher than otherwise.

The history of the level crossing in respect of levels of crossing abuse, trespass, near misses and accidents.

4.2.22 | History of accidents and near misses. | If there have been accidents or near misses at the crossing, these should be noted. The circumstances of the incidents and any findings of subsequent inquiries should inform a judgement on the risk which is indicated by these.
### Guidance on Provision, Risk Assessment and Review of Level Crossings

#### No | Factor | Comments
--- | --- | ---
4.2.23 | Level of reported crossing abuse. | Crossing abuse by vehicle drivers or pedestrians provide opportunities for accidents. The frequency and nature of these incidents should be included in the assessment, being indicative of the willingness of users to conform to the instructions for safe use of the crossing. Reports may be made by train drivers, other railway staff and members of the public. Any follow-up to the reports should also be accounted for. Crossing abuse may include:
- a) leaving gates open
- b) not following the instructions of the signaller
- c) failing to contact the signaller when required
- d) failure to follow the correct procedure when taking vehicles across the railway.

4.2.24 | Access point for trespassers. | Any reports of trespass, whether confirmed or anecdotal, should be taken into account. Of particular concern are trespassers who commit railway crime.

Other local conditions which affect the safety of the crossing.

4.2.25 | User distractions. | Anything which distracts a vehicle driver or pedestrian from the level crossing warnings should be taken into account, for example high levels of ambient noise.

4.2.26 | Nature of approach. | Characteristics of the approach may increase the frequency of road vehicle driver error. These may include the angle of incidence of crossing approaches with the railway line and problematical surfaces on approaches.

4.2.27 | Other factors. | There may be features of the local environment which make the crossing more hazardous for all, or some users. These should be identified and taken into account on a case-by-case basis.
### 4.3 Non-vehicular level crossings

<table>
<thead>
<tr>
<th>No</th>
<th>Factor</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The characteristics of the railway operations over the crossing.</td>
<td></td>
</tr>
<tr>
<td>4.3.1</td>
<td>Frequency and regularity of trains.</td>
<td>The frequency of trains approaching the crossing needs to be determined. This should take into account seasonal and daily variations. The regularity of trains impacts on users’ expectation of there being a train, particularly if a usually regular service is disrupted rather than where irregularity is timetabled. A low frequency train service can pose a high risk to users, due to the rarity of them encountering a train and the reduced vigilance that they may therefore demonstrate in crossing. Where train frequency and speed are high, consideration should be given to whether the intervals remaining are sufficient to allow safe use of the crossing, or whether there is a need for closure or upgrade to a crossing controlled by signaller or crossing keeper.</td>
</tr>
<tr>
<td>4.3.2</td>
<td>Time the user is expected to wait.</td>
<td>This is indicated by the duration of the warning of an approaching train given by an active warning system, or the maximum time a user will be asked to wait by the signaller. Long waiting times may encourage users to disregard the crossing instructions. If the waiting time can be highly variable, the effect of this on the user should also be taken into account.</td>
</tr>
<tr>
<td>4.3.3</td>
<td>Frequency of simultaneous trains.</td>
<td>Where trains are timetabled to pass or follow in close succession at or near the level crossing, or disruption could easily lead to this situation, the impact on risk should be considered, as users may be tempted to think it is safe to cross, once they have seen one train pass.</td>
</tr>
<tr>
<td>4.3.4</td>
<td>Variability in train speed.</td>
<td>Variability can increase accident frequency, as the user will be less able to judge the time available between first sighting the train and arrival of the train at the crossing. The stopping patterns of the trains at a station visible from the crossing should also be taken into account, in terms of the obstruction to visibility caused by a stopped train, and the difficulty of judging the available crossing time.</td>
</tr>
<tr>
<td>4.3.5</td>
<td>Maximum train speed.</td>
<td>The maximum train speed affects the potential consequences of an accident at the crossing. This is not necessarily the same as the permissible speed.</td>
</tr>
<tr>
<td>4.3.6</td>
<td>Type of trains</td>
<td>The proportions of passenger and freight trains using the route will affect the potential consequences of a train accident.</td>
</tr>
</tbody>
</table>
## Guidance on Provision, Risk Assessment and Review of Level Crossings

### The characteristics of the level crossing users

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</thead>
<tbody>
<tr>
<td>4.3.7</td>
<td><strong>Nature of users.</strong></td>
<td>The main types of user should be identified, and account taken of variations through the year. Users include:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a) pedestrians</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) cyclists</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c) animals. Use of the crossing by mobility impaired or distracted users should also be ascertained by observation, knowledge of the local area or anecdotal evidence. Such users include:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a) the elderly or disabled</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) people with small children</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c) people with dogs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>d) unaccompanied children.</td>
</tr>
</tbody>
</table>

### Familiarity of users

Where there is a high turnover of users, for example if a crossing is used by ramblers rather than locals, the potential unfamiliarity of the users with the crossing instructions should be taken into account. Equally, where users are very familiar with the crossing, the potential for complacency to increase the risk should be considered.

### Traffic levels

The frequency of use of the crossing by different users needs to be estimated. This should include counts of pedestrians, cyclists and horse-riders. The variations in traffic through the day, and on a seasonal basis should be considered. However, where temporary arrangements such as manning the crossing are used during peaks of use, this should be taken into account.

In addition, the potential for significant increases in traffic on a temporary basis should be considered, for example if the level crossing is used as an access route to special events.

### Type of level crossing

The crossing should be classified in terms of the following, as they provide a different degree of risk control:

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<tbody>
<tr>
<td>4.3.10</td>
<td><strong>Type of level crossing.</strong></td>
<td>The crossing should be classified in terms of the following, as they provide a different degree of risk control:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a) gates or stiles</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) whether a telephone is provided</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c) whether there are active warnings.</td>
</tr>
</tbody>
</table>

| 4.3.11 | **Additional safeguards provided.** | All additional safeguards provided at the crossing should be noted, and their impact on the risk evaluated. This includes features of the crossing itself, and the approach routes. |
### Guidance on Provision, Risk Assessment and Review of Level Crossings

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#### No  | Factor                              | Comments                                                                                                                                                                                                 |
---    |-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4.3.12| Ease of use of gates and stiles.    | The ease of opening and closing the gates should be considered. If they are difficult, this will increase the time taken to cross if there is no safe waiting space inside the gates. Also, if wicket gates are left open, other users following behind are less protected.  
Similarly, if stiles are difficult to traverse, this will again increase the risk.  
At all crossings, consideration should be given to whether dogs can go through gates/stiles whilst on leads. At bridleway crossings, consideration should be given to ease of use by cyclists and those on horseback. |
| 4.3.13| Clarity of signs and warnings.      | The location, visibility and clarity of the signs and warnings should be assessed. Consideration should be given to vegetation and other obstructions, and the relative positioning of warning and information signs.  
The potential for sun-glare to obscure warnings or visibility of the approaching train needs to be assessed.  
Train whistles are not always a reliable warning, so where whistle boards are provided, consideration should be given to their local effectiveness. |
| 4.3.14| Safe waiting space.                 | Where there is no safe waiting space inside the gates or stile on one or both sides of the railway, risk will be higher as users are at risk for longer.                                                   |
| 4.3.15| **Level crossing surface and profile.** | The nature and state of repair of the surface should be assessed in terms of the potential for tripping or becoming stuck, and for the effect on crossing time. |  
**Level crossing surface and profile.** | The nature and state of repair of the surface should be assessed in terms of the potential for tripping or becoming stuck, and for the effect on crossing time. |
| 4.3.16| Workload of signaller.              | Where a telephone is provided, the overall workload of the signaller should be taken into account, particularly where several crossings are monitored from the same location. The potential for confusing different crossings, or of providing incorrect information to users should be considered. |
| 4.3.17| Nature and condition of fencing.    | An assessment of the fencing of the railway near the crossing is required to determine the frequency of users crossing the railway other than at the level crossing itself. Where the fencing is poor or the location of the level crossing unclear, users are more likely to be exposed to a higher risk by crossing at the wrong point. |
| 4.3.18| Identification of level crossing.   | The clarity of the identification of the level crossing to train drivers and signalers, to prevent confusion between level crossings, should be assessed. This is particularly important where there are several crossings along a line of route under the control of one signaller. |
The relationship between crossing time and warning time

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<tbody>
<tr>
<td>4.3.19</td>
<td>Minimum warning time.</td>
<td>The minimum warning time in each direction should be measured from an identified decision point, which should take into account where different types of user might take their crossing decisions. The warning may be provided by sighting of the train, or an active warning device (or, for certain footpath crossings, the train whistle). The minimum warning time should take into account the fastest trains and all possible approach directions, particularly where there is a junction near the crossing. Other factors to be taken into account are: a) growth of vegetation, particularly if the risk review is undertaken during the winter b) different weather conditions c) ease of sighting where the crossing is not at right angles to the railway d) ease of hearing audible warnings e) masking of trains by other trains.</td>
</tr>
<tr>
<td>4.3.20</td>
<td>Crossing time.</td>
<td>The crossing time required for the slowest user, who is not expected to telephone, needs to be estimated, taking into account the nature of the surface and the distance which must be covered. Where the crossing time is longer than the warning time, the risk is considerably higher than otherwise.</td>
</tr>
</tbody>
</table>

The history of the level crossing in respect of levels of crossing abuse, trespass, near misses and accidents

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<thead>
<tr>
<th>No</th>
<th>Factor</th>
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<tbody>
<tr>
<td>4.3.21</td>
<td>History of accidents and near misses.</td>
<td>If there have been accidents or near-misses at the crossing, these should be noted. The circumstances of the incidents and any findings of subsequent inquiries, should inform a judgement on the risk which is indicated by these.</td>
</tr>
</tbody>
</table>
### Guidance on Provision, Risk Assessment and Review of Level Crossings

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<tr>
<th>No</th>
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<tbody>
<tr>
<td>4.3.22</td>
<td>Level of reported crossing abuse.</td>
<td>Crossing abuse provides opportunities for accidents. The frequency and nature of these incidents should be included in the assessment. Reports may be made by train drivers, other railway staff and members of the public. Any follow-up to the reports should also be accounted for. Crossing abuse includes: a) leaving gates open b) not following the instructions of the signaller c) failing to contact the signaller when required d) failure to follow the correct procedure for crossing the railway.</td>
</tr>
<tr>
<td>4.3.23</td>
<td>Access point for trespassers.</td>
<td>Any reports of trespass, whether confirmed or anecdotal should be taken into account. Trespassers who commit railway crime are of particular concern.</td>
</tr>
</tbody>
</table>

### Other local conditions which affect the safety of the crossing

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<tr>
<th>No</th>
<th>Factor</th>
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<tbody>
<tr>
<td>4.3.24</td>
<td>User distractions.</td>
<td>Anything which distracts a user from the process of crossing the railway safely should be taken into account, for example high levels of ambient noise or awkward crossing surface. If the crossing is near a station, the masking of approaching trains by trains waiting at platforms should be considered.</td>
</tr>
<tr>
<td>4.3.25</td>
<td>Nature of approaches.</td>
<td>Characteristics of the approach may increase the frequency with which level crossing users cross without due caution. These may include corners and other obstructions.</td>
</tr>
<tr>
<td>4.3.26</td>
<td>Other factors.</td>
<td>Certain features of the local environment make the crossing more hazardous for all, or some users. These should be identified and taken into account on a case-by-case basis.</td>
</tr>
</tbody>
</table>
Appendix 5
Additional safeguards to be considered

This Appendix provides a list of possible additional safeguards which could be applied where the risk is found not to be as low as reasonably practicable, but where the risk is not sufficient to justify upgrading the crossing to a more protective type. Any modifications may require the Level Crossing Order to be amended. This list is not exhaustive.

<table>
<thead>
<tr>
<th>No</th>
<th>Additional Safeguard</th>
<th>Comments</th>
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</thead>
<tbody>
<tr>
<td><strong>Signage</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.1</td>
<td>Additional signs.</td>
<td>Repeats of existing signs where this would reinforce the warning message to level crossing users.</td>
</tr>
<tr>
<td>5.2</td>
<td>Rearrangement of signs.</td>
<td>It may be possible to rearrange signs to improve their impact and clarity, particularly at user-worked, footpath and bridleway level crossings. Consideration should be given to the relative positioning of warning and information signs.</td>
</tr>
<tr>
<td><strong>Active warnings</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.3</td>
<td>New types of warning device.</td>
<td>New, relatively inexpensive, warning devices may be appropriate for installation at level crossings where established warning mechanisms are not reasonably practicable.</td>
</tr>
<tr>
<td><strong>Road surface and markings</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.4</td>
<td>Anti-skid surfaces on approaches to crossing.</td>
<td>Where there is evidence of road vehicle drivers failing to stop in time for the level crossing, for example collisions with barriers, an anti-skid surface may be appropriate, particularly on high-speed roads.</td>
</tr>
<tr>
<td>5.5</td>
<td>Yellow box markings.</td>
<td>Where there is evidence of blocking back occurring at the level crossing (other than at AHBC which are not permitted where blocking back is an issue), yellow box markings may be provided to deter road vehicle drivers from waiting on the crossing.</td>
</tr>
<tr>
<td>5.6</td>
<td>Coloured surfaces on approaches to crossing.</td>
<td>Coloured surfaces serve as an additional warning of the level crossing as a hazard, and may be appropriate where there is evidence of vehicle drivers disregarding other warnings, or reacting too late.</td>
</tr>
<tr>
<td>5.7</td>
<td>Rumble strips on approaches to crossing.</td>
<td>Rumble strips serve as an additional warning of the level crossing as a hazard, and may be appropriate where there is evidence of vehicle drivers disregarding other warnings, or reacting too late.</td>
</tr>
</tbody>
</table>
### Guidance on Provision, Risk Assessment and Review of Level Crossings

<table>
<thead>
<tr>
<th>No</th>
<th>Additional Safeguard</th>
<th>Comments</th>
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</thead>
</table>
| 5.8 | Additional parking restrictions. | Parking restrictions on either side of the level crossing may contribute to risk reduction where there is evidence that:  
a) visibility of the crossing or its warning signs is obstructed by parked vehicles  
b) parked vehicles restrict the approach to, or egress from, the level crossing. |
| 5.9 | Demarcation of a pedestrian walkway. | At level crossings used by both pedestrians and vehicles, separation of the two will reduce the risk of pedestrians being struck by road vehicles. The appropriate means of separation will depend on the nature of the level crossing and may include road markings, differentiated surfaces, fences on the approaches to the level crossing, and provision of separate gates or barriers. |
| 5.10 | Tactile threshold across each footway. | At level crossings used by a large number of pedestrians, or where there is known use by blind or partially sighted people, tactile thresholds should be considered. The tactile threshold should be of an appropriate design, and be located before the transverse road markings across the footway on the approach to the crossing. |

### Other forms of gate barriers

| No | | |
|----|----|
| 5.11 | Gates or barriers which can both be operated from both sides of the railway. | At some user-worked crossings it may be appropriate to provide a means for users to open both gates from both sides of the railway. This reduces the number of traverses of the railway from five to one, and may also encourage users to shut the gates where there is a problem with the gates often being left open. |

### Educating the crossing users

| No | | |
|----|----|
| 5.12 | Campaign to educate users. | Where there is evidence of crossing abuse, deliberate or otherwise, there may be benefit in a campaign to raise awareness of users to the dangers and correct usage of the level crossing. This may include visits to schools, distribution of information leaflets, letters to known users and advertising. Note that preference should be given to solutions which make the crossing easier to use, rather than to educating users. |
## Guidance on Provision, Risk Assessment and Review of Level Crossings

<table>
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<tbody>
<tr>
<td></td>
<td><strong>Enforcing traffic signal discipline and gate discipline</strong></td>
<td></td>
</tr>
<tr>
<td>5.13</td>
<td>Red light enforcement cameras.</td>
<td>Where there is evidence of vehicle drivers running through red lights at road traffic signals, enforcement cameras may reduce the number of offences. It needs to be combined with effective follow-up actions and prosecutions where offences are recorded.</td>
</tr>
<tr>
<td>5.14</td>
<td>Gate discipline enforcement.</td>
<td>Where gates of user-worked crossings are frequently left open, action should be taken to change the behaviour of the crossing users.</td>
</tr>
<tr>
<td></td>
<td><strong>Communication between users and the signaller</strong></td>
<td></td>
</tr>
<tr>
<td>5.15</td>
<td>Recording of telephone calls to allow monitoring.</td>
<td>Where there have been accidents or near misses caused by miscommunication between users and signallers, or where there is accusation of misinformation, recording of calls may help to change behaviours.</td>
</tr>
<tr>
<td>5.16</td>
<td>Signallers to be provided with clear information regarding names and locations of all level crossings.</td>
<td>Where a signaller controls several level crossings, the availability of clear information indicating the locations and names of all the level crossings, not just those with telephones, should be considered.</td>
</tr>
<tr>
<td>5.17</td>
<td>Display of a telephone number on which users can contact railway staff.</td>
<td>At level crossings where no telephone is provided, users would be able to contact railway staff if they carry a mobile phone, either to confirm that it is safe to cross, or to report an incident. The sign should clearly state the telephone number of a continuously manned point. Consideration should be given to who would make phone calls, whether the phone should route to the signaller or other control office, and the potential workload of those receiving calls.</td>
</tr>
<tr>
<td></td>
<td><strong>Inspection</strong></td>
<td></td>
</tr>
<tr>
<td>5.18</td>
<td>Increased frequency of inspection.</td>
<td>Where the risk is high but it is not appropriate or reasonably practicable to install further physical safeguards, more active monitoring of the condition and use of the level crossing may contribute to reducing the risk.</td>
</tr>
<tr>
<td>5.19</td>
<td>Additional British Transport Police patrols.</td>
<td>Where crossing abuse is a particular issue, an increase in British Transport Police patrols may be appropriate to reduce the risk.</td>
</tr>
<tr>
<td></td>
<td><strong>Monitoring by signaller or automatic systems</strong></td>
<td></td>
</tr>
<tr>
<td>5.20</td>
<td>Install event recording device.</td>
<td>Where evidence of crossing function or user behaviour would enable changes to be better focussed, event recording should be considered.</td>
</tr>
<tr>
<td></td>
<td><strong>Operational constraint</strong></td>
<td></td>
</tr>
<tr>
<td>5.21</td>
<td>Limiting speed and/or frequency of trains over crossing.</td>
<td>Changes to the operational use of a level crossing, either as a temporary or permanent measure, may in some cases be required to reduce the risk.</td>
</tr>
</tbody>
</table>
### Guidance on Provision, Risk Assessment and Review of Level Crossings

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<th>No</th>
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<th>Comments</th>
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<tbody>
<tr>
<td></td>
<td>Means for facilitating safe use by disabled people, including those with mobility, visual or hearing impairment</td>
<td></td>
</tr>
<tr>
<td>5.22</td>
<td>Power-operated barriers at UWC.</td>
<td>Where authorised users have difficulty operating gates and are therefore likely to leave them open, consideration should be given to providing powered barriers.</td>
</tr>
<tr>
<td>5.23</td>
<td>Tactile threshold across each footway.</td>
<td>At level crossings used by a large number of pedestrians, or where there is known use by people with visual impairment, tactile thresholds should be considered. The tactile threshold should be of an appropriate design, and be located before the transverse road markings across the footway on the approach to the crossing.</td>
</tr>
</tbody>
</table>

#### User approach speeds

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<th>No</th>
<th>Additional Safeguard</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.24</td>
<td>Reducing speed limit on public road approaches.</td>
<td>Reduction of speed limits may be possible in liaison with the highway authority.</td>
</tr>
</tbody>
</table>
Guidance on Provision, Risk Assessment and Review of Level Crossings

References

Railway Group Standards and other Railway Group Documents

GA/RT6001  Railway Group Standards Change Procedures
GA/RT6004  Temporary Non-Compliance with Railway Group Standards
GA/RT6006  Derogations from Railway Group Standards
GI/GN7606  Guidance Note: Prevention and Mitigation of Overruns – Risk Assessment
GI/RT7006  Prevention and Mitigation of Overruns - Risk Assessment
GI/RT7012  Design, Construction and Maintenance of Level Crossings (Due for publication in Spring 2003)
GK/RT0007  Alterations to Permissible Speeds

The Catalogue of Railway Group Standards and the Railway Group Standards CD-ROM give the current issue number and status of documents published by Railway Safety

Other References

ISBN 0 9537595 0 4  Engineering Safety Management Issue 3 (Yellow Book 3)
HS(G)153/1  HMRI Railway Safety Principles and Guidance - part 1
HS(G)153/2  HMRI Railway Safety Principles and Guidance - part 2 section A: Guidance on the infrastructure
HS(G)153/3  HMRI Railway Safety Principles and Guidance – part 2 section B: Guidance on stations
HS(G)153/6  HMRI Railway Safety Principles and Guidance - part 2 section E: Guidance on level crossings

Railway Group Safety Plan