The Network Rail (Tackley Level Crossing) Order

Appendices to Proof of Evidence

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IA1 - NR/L2/XNG/30020/R03

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IA3 - Impact Assessment Report

IA4 - Narrative Risk Assessment from 2019

IA5 - NR/L2/SIG/11201/ModX40

IA6 – ORR - "Principles for managing level crossing safety"

IA7 – Enhancing Level Crossing Safety 2019-2029

IA8 – Temporary Traffic Regulation Order

IA9 – Management of Health and Safety at Work Regulations 1999

IA10 – Census carried out by Barwood Development Securities Limited

IA11 - NR/L3/XNG/308 – Risk Assessing Level Crossings

IA12 – NR/L2/XNG/001 – Provision and risk management of level crossings

IA13 – Office of Rail and Road - Railway Safety Publication 7 December 2011 (RSP7) Level Crossings: A guide for managers, designers and operators

IA14 – NR/L2/XNG/30020/A28 – Signage for level crossings

IA15 – LCG 05 – Level Crossing Guidance Document

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IA1

Ref:	NR/L2/XNG/30020/R03
Issue:	1
Date:	04 June 2022
Compliance date:	03 September 2022

NR/L2/XNG/30020

Module R03

Requirements for station, footpath, bridleway and user-worked level crossings

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

Red requirements – *no variations permitted*

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

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

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

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

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NOTE 1: *Legislation includes National Technical Specification Notices (NTSNs)*

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

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

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Issue record

Issue	Date	Comments
1	June 2022	First issue

Reference documentation

NR/L2/XNG/30020	Level Crossing Design Handbook
NR/L2/30020/R01	General requirements for level crossings
NR/L2/XNG/30020/A27	Requirements for gates and stiles at level crossings
NR/L2/XNG/30020/A28	Signage for level crossings
NR/L2/SIG/11201/ModX41	Signalling Design: Module X41 – Level Crossings: Power User Worked Barriers.
The British Horse Society publication	Advice on Equestrian use of level crossings (08/2015)
The British Horse Society publication	Advice on Gates on routes used by riders (Jul 20)
The British Horse Society publication	Advice on Width, area and height (Jul 20)
The British Horse Society publication	Advice on Mounting Blocks (Dec 20)
RSSB Research Project T984	Research into the causes of pedestrian accidents at level crossings and potential solutions final report [T984]
BS 8300-1:2018	Design of an accessible and inclusive built environment - External environment. Code of practice
Legislation	Traffic Signs Regulations and General Directions 2016 [TSRGD]
Legislation	The Private Crossings (Signs and Barriers) Regulations 1996 [PC(S+B)s Regs]
Legislation	Rights of Way Act 1990
Legislation	Highways Act 1980

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Legislation

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

- The Traffic Signs Regulations and General Directions 2016
- The Private Crossings (Signs and Barriers) Regulations 1996
- Highways Act 1980

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

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1 Scope

This module specifies Network Rail's requirements that are applicable to the design of station, footpath, bridleway and user-worked level crossings.

The requirements in this module apply in addition to general requirements specified in NR/L2/XNG/30020/R01.

Other modules specify the requirements that are specific to different types, or particular configurations, of level crossing equipment.

This module applies to new level crossings and to existing level crossings where reasonable opportunity to comply with this module is identified.

This module applies to those scoping and designing level crossing works.

2 Definitions

Refer to NR/L2/XNG/30020 index for definitions.

3 Footpath level crossings (including station footpath and barrow crossings)

3.1 Surface system requirements for footpath level crossings

3.1.1

Requirements for the surface system are specified in the general requirements, NR/L2/XNG/30020/R01.

3.1.2

The surface shall be made up to rail level.

Rationale: in accordance with asset policy for accessibility. To reduce traverse times and to reduce the risk of slips, trips and falls to users within the danger area.

3.1.3

Where the track ballast shoulder is high and presents an increased hazard to movement over the crossing and it is not reasonably practicable to lower it, steps or ramps shall be provided to give access to the crossing surface.

3.1.4

Where the user is required to stop, look and listen (whether that be the primary procedure for using the crossing or the fallback procedure when active warnings fail) then the danger area shall be coloured yellow if the type of crossing surface makes it reasonably practicable.

Rationale: follows findings from research project T984 by assisting the user in understanding the area in which they are at risk from trains and by which all necessary safety checks should have been completed before traversing. BS8300-1 also states that a visual contrast between different surfaces can be helpful to signal a

change of surface purpose and assist partially sighted people to delineate between where it is safe to walk and where it is not.

NOTE 1: *The yellow surface may be particularly useful where the danger is not made clear by the signage, fencing and gate arrangement (see clauses 3.6.4, 4.6.5 and 5.7.7). For example, where fencing runs closer to the track than the edge of the danger area as shown in Figure 2, or where there is a long distance between the access point and the danger area, or where the decision point is not at the edge of the danger area.*

NOTE 2: *The purpose is to highlight the area in which users are considered to be at risk from trains and therefore there may be an area of uncoloured surface between the decision point or gate and the start of the danger area. But where the distance is short then the surface colour may be extended to the decision point or gate.*

3.1.5

Where it is not practicable to colour the surface, as per 3.1.4, all the way up to the edges of the danger area, then no colour shall be applied.

Rationale: to avoid providing potentially misleading information on the extent of the danger area.

3.1.6

Where the decision point is not at or before a gate, and where the surface system allows, then the decision point shall be marked with a stop line.

The stop line should be a 100 mm wide white line where the surface system allows.

Tactile paving may also provide a suitable stop line where the surface system does not allow for painting.

Where the surface does not allow for marking then considering should be given to upgrading it.

There should not be multiple stop lines, or markings of similar appearance, in different positions.

Rationale: to make the location of the decision point clearer to users.

NOTE: *It is not necessary to provide the stop line beneath a gate, where the gate itself acts as a clear demarcation.*

3.1.7

Consideration should be given to providing illuminated studs to demark the edges of the danger area, especially where there is regular use during the hours of darkness.

Rationale: illuminated studs help users see the edges of the crossing surface at night and where ambient lighting is poor.

NOTE: *Illuminated studs might also assist to delineate and highlight the danger area where it is not practicable to colour the surface yellow*

3.1.8

Ramps on approach to a footpath level crossing should have the lowest practicable gradient within the range 1:20 to 1:12. The gradient should be constant.

The gradient shall be no more than 1:8.

Rationale: 1:20 to 1:12 is in accordance with BS 8300-1. 1:8 is the maximum given in previous company standards and is retained as a maximum where it is not reasonably practicable to improve.

3.2 Fencing requirements for footpath level crossings

3.2.1

Requirements for fencing are specified in the general requirements, NR/L2/XNG/30020/R01.

3.2.2

Where the gate or stile is not in line with the boundary fence then fencing shall be provided running from the boundary fence to the gate or stile.

Rationale: to complete the boundary fence and guide users to the crossing.

NOTE: *Figure 1 and Figure 2 show examples.*

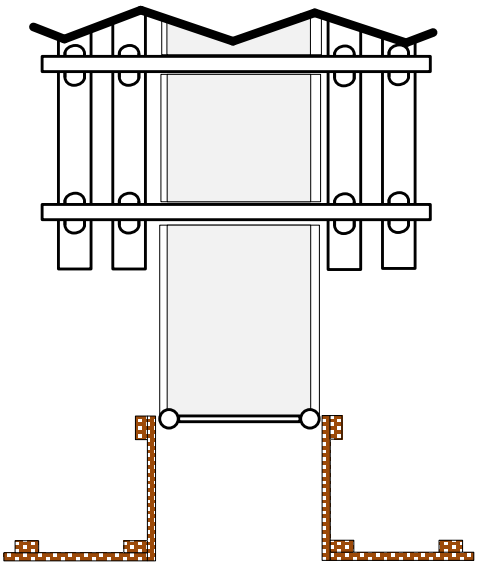


Figure 1 – fencing

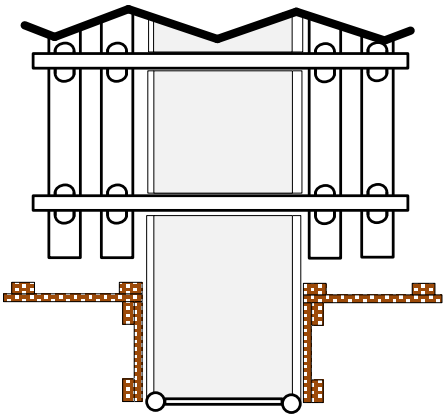


Figure 2 – fencing

3.2.3

Where the boundary fence is not in line with the edge of the danger area then fencing shall be provided to as close as reasonably practicable to the danger area.

Rationale: to complete the boundary fence and guide users to the crossing. Ending the fencing at the danger area helps to demark the danger area beyond, which is especially relevant where the user is required to stop, look and listen.

NOTE 1: *Where the boundary fence is very close to the danger area then the benefits of providing fencing to the edge of the danger area may not be reasonably practicable, particularly where cattle-cum-trespass guards are also provided.*

NOTE 2: *This will always apply for stiles given other requirements for a stile to be positioned before the decision point.*

NOTE 3: *Figure 3 shows an example.*

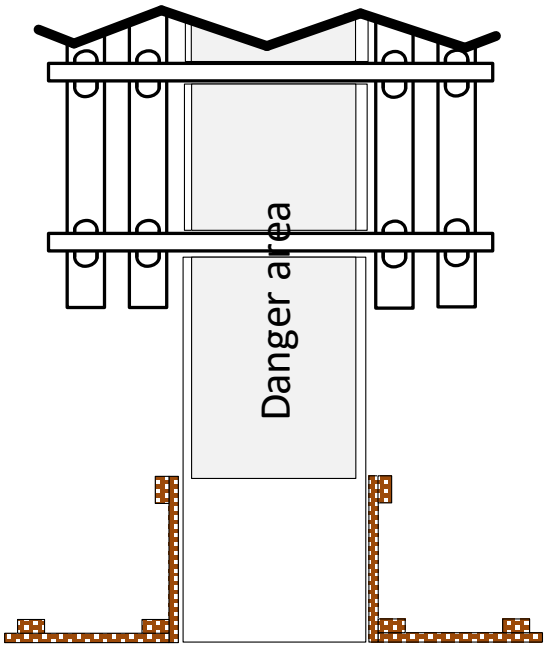


Figure 3 – fencing up to the danger area

3.3 Gate and Stile requirements for footpath level crossings

3.3.1

Footpath crossings (other than station footpath crossings) shall be protected by a stile or self-closing gate in accordance with NR/L2/XNG/30020/A27.

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NOTE 1: *Kissing gates may be appropriate where it is desirable to prevent livestock or mounted cyclists from passing. Stiles and kissing gates might not be appropriate at crossings where the use of bicycles, pushchairs, wheelchairs, etc. is foreseeable, although mobility friendly kissing gates can be provided.*

NOTE 2: *Stiles are a non-preferred method. They should only be provided where they are unlikely to cause undue inconvenience to users, such as when located before or after another restrictive feature such as previous stiles or un-surfaced approaches. In identifying whether to provide a stile, consideration should be given to asset policy, the NRA and DIA.*

3.3.2

Station footpath crossings should be protected by a self-closing gate in accordance with NR/L2/XNG/30020/A27.

NOTE: *A station footpath crossing should be protected by a gate as with any other footpath crossing, but this requirement recognises the constrained layout of many station crossings.*

3.4 Signage requirements for footpath level crossings

3.4.1

Signage requirements are specified in NR/L2/XNG/30020/R01 and NR/L2/XNG/30020/A28.

3.5 Telephone requirements for footpath level crossings

3.5.1

Telephone requirements are specified in NR/L2/XNG/30020/R01.

3.6 Layout requirements for footpath crossings

3.6.1

The minimum width of a footpath level crossing shall be 1 m.

Rationale: 1 m is in keeping with the Highways Act 1980 (as amended by the Rights of Way Act 1990).

NOTE 1: *This applies to the surface system and any approaches within Network Rail's boundary, including the width between fences, gate openings or bollards. Other requirements specify that the surface system be wider than gates, so in practice the minimum surface width is wider than this.*

NOTE 2: *Wider crossings may be required in accordance with local user needs where identified by the NRA or DIA. This should be a minimum of 1.5 m if used by pushchairs, cyclists or persons with reduced mobility.*

3.6.2

The danger area at a footpath level crossing shall extend to:

1. 2 m from the nearest running rail where the line speeds are up to 100 mph; or

2. 3 m from the nearest running rail where there the line speeds are over 100 mph.

3.6.3

The decision point should be as close as practicable to the edge of the danger area.

The decision point shall not be within the danger area.

Rationale: so that users are in a position of safety when making the decision to cross and spend the minimum time necessary on the railway. The closer a decision point can be to the danger area, the shorter the traverse times will be and more feasible active solutions with simpler strike-in arrangements become.

***NOTE:** This means that detailed instruction signs, and MSLs where provided, should be positioned as close as practicable to the edge of the danger area.*

3.6.4

Where the user is required to stop, look and listen then the intention should be to provide the user with a clear indication of the extent of the danger area and the location of the decision point by considering how the surface markings, fencing, signage and gates convey those positions.

***NOTE:** This needs to be considered whether stop, look and listen is the primary procedure of using the crossing, or the fallback procedure when active warnings fail.*

3.6.5

Where the user is required to stop, look and listen then the decision point should be as close as practicable to the associated detailed instruction signage.

The decision point shall be no closer to the danger area than the associated detailed instruction signage.

Rationale: allows the user to interpret the signage as the decision point.

***NOTE 1:** It is not required that the decision point in this case is at a point before the user loses sight of the signage because the user is expected to have read the signage on approach.*

***NOTE 2:** This applies whether the requirement to stop, look and listen is the primary procedure of using the crossing or a fallback procedure when active warnings fail. There are no approved signs available that can indicate a different decision point (e.g., closer to the track) in fallback circumstances.*

3.6.6

Where the user is required to stop, look and listen then the decision point shall be at a position from where the required sighting distance is available.

The required sighting should continue to be available between the decision point and the nearest running rail.

***NOTE 1:** This includes the need to consider any vegetation that is present or could compromise sighting in future.*

***NOTE 2:** This applies whether stop, look and listen is the primary procedure of using the crossing, or the fallback procedure when active warnings fail.*

3.6.7

Where MSLs are provided on the approach side then the decision point associated with the MSL shall be at a position from which the MSL is visible to users before they decide to pass it.

This should be as close as practicable to the MSL.

Rationale: to enable the user to make their decision to cross when the lights are still visible to them.

NOTE: *This might normally be about 0.5 m to 1 m in front of the MSL position, but may vary depending on the alignment of the MSL or if the MSL is fitted with anti-vandal mesh guard, diffuser, louvre or sidescreens.*

3.6.8

Where detailed instruction signs or MSLs are positioned at a gate then they should be placed on the opening side of the gate.

Rationale: to provide better visibility of the signage while approaching the gate and opening it.

NOTE: *Figure 4, Figure 5, Figure 6 and Figure 7 show some examples. The telephone may be on the sign post, or a separate post, depending on site arrangements but care should be taken that the telephone is not obstructed by the opening gate.*

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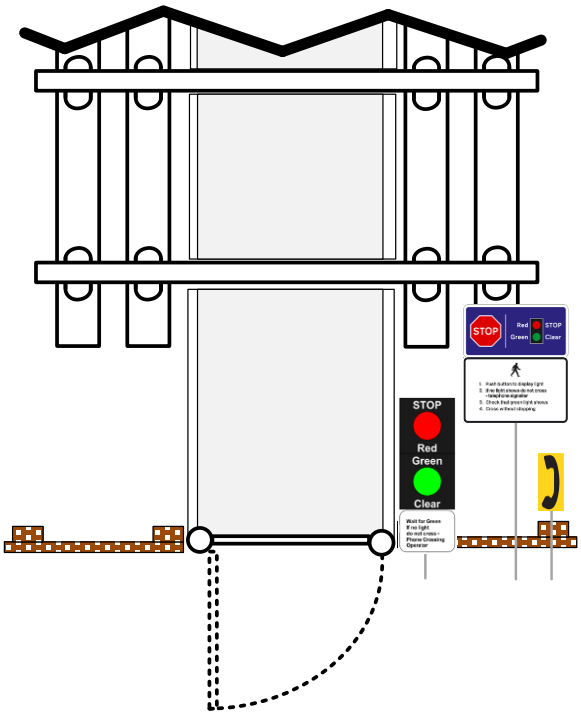


Figure 4 – footpath sign position

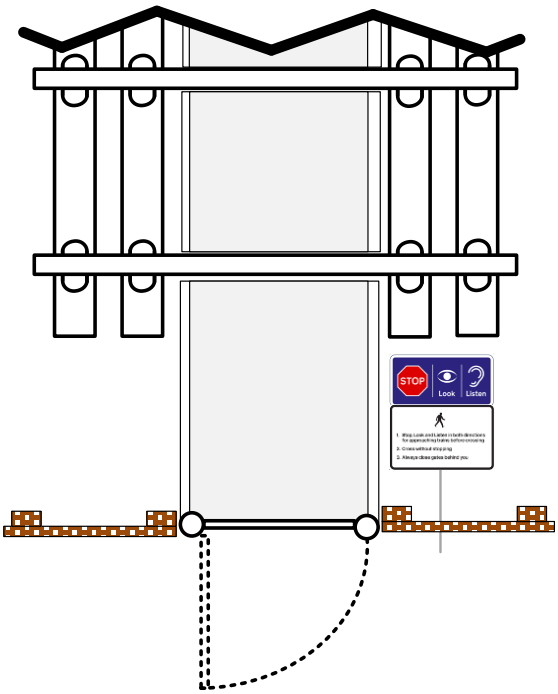


Figure 5 – footpath sign position

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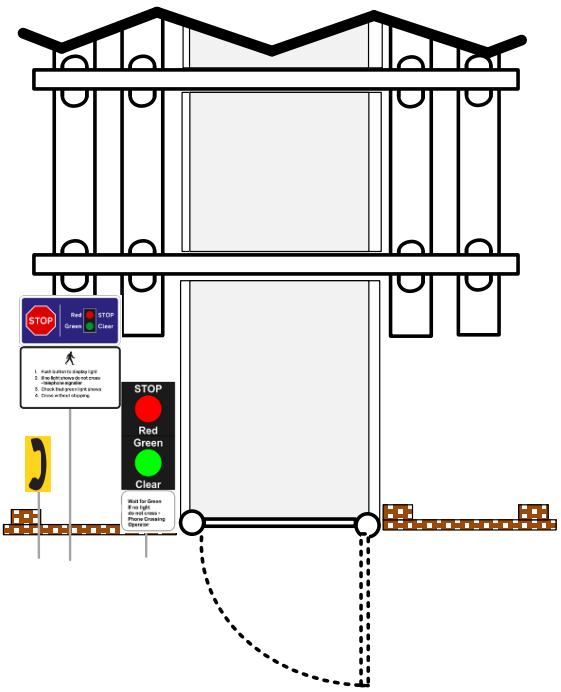


Figure 6 – footpath sign position

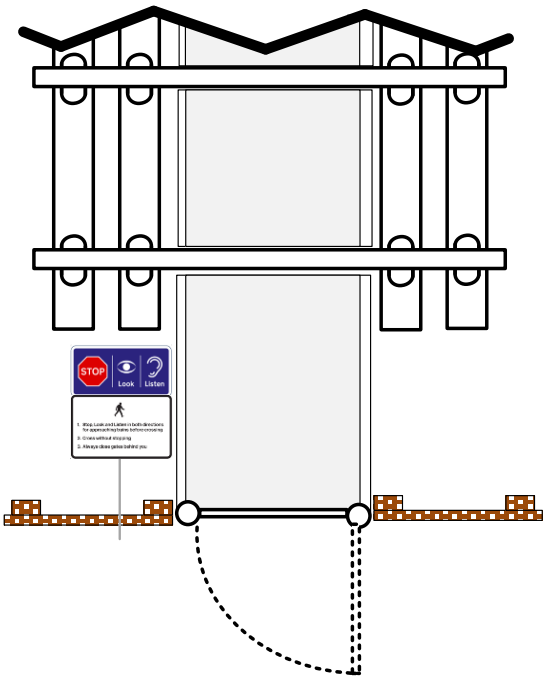


Figure 7 – footpath sign position

3.6.9

Gates should ideally be placed at the edge of the danger area.

Gates shall not be positioned inside the danger area.

Rationale: placing at the edge of the danger area means that users spend the minimum time necessary on the railway but remain in a position of safety before entering the crossing.

3.6.10

Pedestrian gates should be hung to provide the best access and avoid, for example, creating a pinch point between an open gate and a fence.

Where a pedestrian gate is adjacent to a vehicle gate at a user-worked crossing then the pedestrian gate should be hung with the opening side towards the vehicle gate such as shown in Figure 11.

Hanging the gate on its left-hand side as shown in Figure 4 and Figure 5 can be beneficial on double track railways with a normal left-hand running arrangement, where the user's attention is drawn towards the normal direction of traffic on the nearest line. However, this can mean that the signage positioned on the opening side obstructs sighting.

Hanging the gate on its right-hand side as shown in Figure 6 and Figure 7 may also be beneficial on double track railways with a normal left-hand running arrangement,

where users who open the gate only to the extent necessary to pass through, and therefore pass through at an angle, are facing towards the normal direction of traffic on the nearest line.

3.6.11

Stiles shall be positioned before the decision point to allow users to descend the stile into a position of safety before the decision point.

Rationale: it is difficult to predict how long a user might take to climb and descend a stile and there is a greater risk of falling.

3.6.12

Signage on posts should be positioned to protect users, or those otherwise passing by, from exposed edges.

NOTE: *Options include, but are not limited to, ensuring adequate clearance, positioning behind a fence if the fence does not obstruct visibility of the signage, or by returning fencing around the sign to create an alcove. Refer to NR/L2/XNG/30020/A28 for mounting height and clearance requirements.*

4 Bridleway level crossings

4.1 Surface system requirements for bridleway level crossings

4.1.1

Requirements for the surface system are specified in the general requirements, NR/L2/XNG/30020/R01.

4.1.2

The surface shall be made up to rail level.

Rationale: in accordance with asset policy for accessibility. To reduce traverse times and to reduce the risk of slips, trips and falls to users within the danger area.

4.1.3

Where the track ballast shoulder presents an increased hazard to movement over the crossing and it is not reasonably practicable to lower it then ramps shall be provided to give access to the crossing surface.

4.1.4

Where the user is required to stop, look and listen (whether that be the primary procedure for using the crossing or the fallback procedure when active warnings fail) then the danger area shall be coloured yellow if the type of crossing surface makes it reasonably practicable.

Rationale: Follows findings from research project T984 by assisting the user in understanding the area in which they are at risk from trains and by which all necessary safety checks should have been completed before traversing. BS8300-1 also states that a visual contrast between different surfaces can be helpful to signal a

change of surface purpose and assist partially sighted people to delineate between where it is safe to walk and where it is not.

***NOTE:** The yellow surface may be particularly useful where the danger is not made clear by the signage, fencing and gate arrangement (see clauses 3.6.4, 4.6.5 and 5.7.7). For example, where fencing runs closer to the track than the edge of the danger area as shown in Figure 2, or where there is a long distance between the access point and the danger area, or where the decision point is not at the edge of the danger area.*

4.1.5

Where it is not practicable to colour the surface (as per 4.1.4) all the way up to the edges of the danger area then no colour shall be applied.

Rationale: to avoid providing potentially misleading information on the extent of the danger area.

4.1.6

Where the decision point is not at or before a gate, and where the surface system allows, then the decision point shall be marked with a stop line.

The stop line should be a 100 mm wide white line where the surface system allows.

Tactile paving may also provide a suitable stop line where the surface system does not allow for painting.

Where the surface does not allow for marking then considering should be given to upgrading it.

There should not be multiple stop lines, or markings of similar appearance, in different positions.

Rationale: to make the location of the decision point clearer to users.

***NOTE:** It is not necessary to provide the stop line beneath a gate, where the gate itself acts as a clear demarcation.*

4.1.7

Consideration should be given to providing illuminated studs to demark the edges of the danger area, especially where there is regular use during the hours of darkness.

Rationale: illuminated studs help users see the edges of the crossing surface at night and where ambient lighting is poor.

***NOTE:** Illuminated studs might also assist to delineate to highlight the danger area where it is not practicable to colour the surface yellow*

4.1.8

Ramps on approach to a bridleway level crossing should have the lowest practicable gradient within the range 1:20 to 1:12. The gradient should be constant.

The gradient shall be no more than 1:8.

Rationale: 1:20 to 1:12 is in accordance with BS 8300-1 and maximum 1:12 is in accordance with The British Horse Society 'Advice on Bridges, gradients and steps'.

1:8 is the maximum given in previous company standards and is retained as a maximum where it is not reasonably practicable to improve.

***NOTE:** The gradient should be supported by the DIA or NRA.*

4.2 Fencing requirements for bridleway level crossings

4.2.1

Requirements for fencing are specified in the general requirements, NR/L2/XNG/30020/R01

4.2.2

Where the gate is not in line with the boundary fence then fencing shall be provided running from boundary fence to the gate.

Rationale: to complete the boundary fence and guide users to the crossing.

***NOTE:** Figure **1** and Figure **2** in the footpath section show examples.*

4.2.3

Where the boundary fence is not in line with the edge of the danger area then fencing shall be provided running from the gate to as close as practicable to the danger area.

Rationale: to complete the boundary fence and guide users to the crossing. Ending the fencing at the danger area helps to demark the danger area beyond which is especially relevant where the user is required to stop, look and listen.

***NOTE 1:** Where the boundary fence is very close to the danger area then the benefits of providing fencing to the edge of the danger area may not be reasonably practicable, particularly where cattle-cum-trespass guards are also provided.*

***NOTE 2:** Figure 3 in the footpath section shows an example.*

4.3 Gate requirements for bridleway level crossings

4.3.1

Bridleway crossings shall be protected by a gate in accordance with NR/L2/XNG/30020/A27.

***NOTE:** Lifting barriers are not permitted at bridleway crossings.*

4.4 Signage requirements for bridleway level crossings

4.4.1

Signage requirements are specified in NR/L2/XNG/30020/R01 and NR/L2/XNG/30020/A28.

4.5 Telephone requirements for bridleway level crossings

Telephone requirements are specified in NR/L2/XNG/30020/R01.

4.6 Layout requirements for bridleway crossings

4.6.1

The latest advice from The British Horse Society should be considered when designing a bridleway level crossing and The British Horse Society consulted as necessary.

4.6.2

The minimum width of a bridleway level crossing shall be 3 m.

Rationale: 3 m is in keeping with the Highways Act 1980 (as amended by the Rights of Way Act 1990). The British Horse Society 'Advice on Gates on routes used by riders' (Jul 20) also advises a minimum of 3 m width where gates are provided.

***NOTE 1:** This applies to the surface system and any approaches within Network Rail's boundary, including the width between fences and bollards. It does not apply to gate openings which are covered in NR/L2/XNG/30020/A27.*

***NOTE 2:** Wider crossings may be required in accordance with local user needs. Consideration should be given as to whether users are likely to pass in opposite directions (e.g., more than one horse, more than one cyclist, a horse and cyclist).*

4.6.3

The danger area at a bridleway level crossing shall extend to 3 m from the nearest running rail.

4.6.4

The decision point should be as close as practicable to the edge of the danger area.

The decision point shall not be within the danger area.

Rationale: so that users are in a position of safety when making the decision to cross and spend the minimum time necessary on the railway. The closer a decision point can be to the danger area, the shorter the traverse times will be and more feasible active solutions with simpler strike-in arrangements become.

***NOTE:** This means that detailed instruction signs, and MSLs where provided, should be positioned as close as practicable to the edge of the danger area.*

4.6.5

Where the user is required to stop, look and listen then the intention should be to provide the user with a clear indication of the extent of the danger area and the location of the decision point by considering how the surface markings, fencing, signage and gates convey those positions.

***NOTE:** This needs to be considered whether stop, look and listen is the primary procedure of using the crossing, or the fallback procedure when active warnings fail.*

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4.6.6

Where the user is required to stop, look and listen then the decision point should be as close as practicable to the associated detailed instruction signage.

The decision point shall be no closer to the danger area than the associated detailed instruction signage.

Rationale: allows the user to interpret the signage as the decision point.

NOTE 1: *It is not required that the decision point in this case is at a point before the user loses sight of the signage because the user is expected to have read the signage on approach.*

NOTE 2: *This applies whether the requirement to stop, look and listen is the primary procedure of using the crossing or a fallback procedure when active warnings fail. There are no approved signs available that can indicate a different decision point (e.g., closer to the track) in fallback circumstances.*

4.6.7

Where the user is required to stop, look and listen then the decision point shall be at a position from where the required sighting distance is available.

The required sighting should continue to be available between the decision point and the nearest running rail.

NOTE 1: *This includes the need to consider any vegetation that is present or could compromise sighting in future.*

NOTE 2: *This applies whether stop, look and listen is the primary procedure of using the crossing, or the fallback procedure when active warnings fail.*

4.6.8

Where MSLs are provided on the approach side then the decision point associated with the MSL shall be at a position from which the MSL is visible to users before they decide to pass it.

This should be as close as practicable to the MSL.

Rationale: to enable the user to make their decision to cross when the lights are still visible to them.

NOTE: *This might normally be about 0.5 m to 1 m in front of the MSL position but may vary depending on the alignment of the MSL or if the MSL is fitted with anti-vandal mesh guard, diffuser, louvre or sidescreens.*

4.6.9

Where MSLs are fitted with aspect hoods then they shall be positioned so as not to shield the aspects from users.

NOTE: *This will particularly be a consideration for mounted horse riders.*

4.6.10

Signage, and MSLs where provided, shall be positioned where they do not impede users, including mounted horse riders, from operating the gate.

4.6.11

Adequate clear space shall be provided beyond the clapper post, above the gate line, for a horse's head and neck to swing and not be impeded whilst the gate is operated.

Rationale: a horse's head and neck may need to overhang the gate and fence line when the gate is operated.

NOTE 1: *The British Horse Society 'Advice on Equestrian use of level crossings' (08/2015) advises that there be at least 1.8 m of clear space beyond the clapper post, above the gate line.*

NOTE 2: *This may mean placing the MSL on the hinged (hanging) side of gates (opposite to that shown in Figure 5 and Figure 6) to enable a horse's head and neck to pass over the fence line whilst the rider operates the gate, but care should be taken not to obscure the MSL when the gate is open.*

4.6.12

Gates should ideally be placed at the edge of the danger area.

Gates shall not be positioned inside the danger area.

4.6.13

Bridleway gates should be hung to provide the best access and avoid, for example, creating a pinch point between an open gate and a fence.

Where a bridleway gate is adjacent to a vehicle gate at a user-worked crossing then the pedestrian gate should be hung with the opening side towards the vehicle gate such as shown in Figure 11.

Hanging the gate on its left-hand side as shown in Figure 4 and Figure 5 can be beneficial on double track railways with a normal left-hand running arrangement, where the user's attention is drawn towards the normal direction of traffic on the nearest line. However, this can mean that the signage positioned on the opening side obstructs sighting.

Hanging the gate on its right-hand side as shown in Figure 6 and Figure 7 might also be beneficial on double track railways with a normal left-hand running arrangement, where users who open the gate only to the extent necessary to pass through, and therefore pass through at an angle, are facing towards the normal direction of traffic on the nearest line.

4.6.14

Signage on posts should be positioned to protect users, or those otherwise passing by, from exposed edges.

NOTE: *Options include, but are not limited to, ensuring adequate clearance, positioning behind a fence if the fence does not obstruct visibility of the signage, or by returning fencing around the sign to create an alcove. Refer to NR/L2/XNG/30020/A28 for mounting height and clearance requirements.*

4.6.15

A safe waiting area / manoeuvring space shall be provided immediately before the decision point.

The size of the area should consider local user needs and be at least 4 m x 4 m.

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Where it is not reasonably practicable to provide 4 m x 4 m or more, then the minimum shall be at least 3 m x 3 m.

Rationale: The British Horse Society 'Advice on Width, area and height' (Jul 20) and 'Advice on Installation of gates on bridleways' (Apr 19) state that the minimum needed to turn a horse (to operate a gate for example) is ideally 4 m x 4m an absolute minimum of 3 m x 3 m.

NOTE 1: *In accordance with other requirements, the decision point is ideally located at the gate and therefore the safe waiting area is ideally located just outside of the gate as shown in the Figure 8 example. However, where the decision point is located inside the gate then the safe waiting area needs to be provided inside the gate immediately before the decision point as shown in the Figure 9 example.*

NOTE 2: *The example shown in Figure 9 should also be provided where the gate is latched so that users are in a position of safety whilst manoeuvring a horse to unlatch the gate when exiting (see 4.6.17).*

NOTE 3: *The example shown in Figure 9 might also be more appropriate where there is an expectation of multiple users following each other over the crossing at the same time, although this behaviour should be discouraged.*

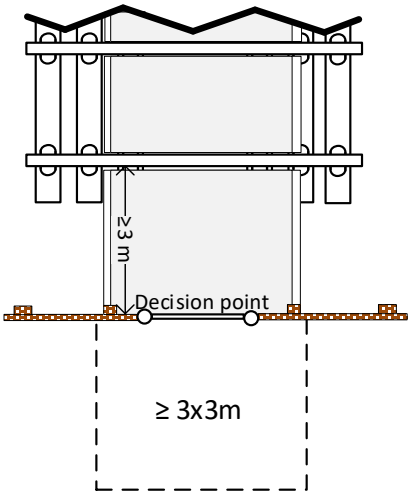


Figure 8 – Bridleway waiting area before gate

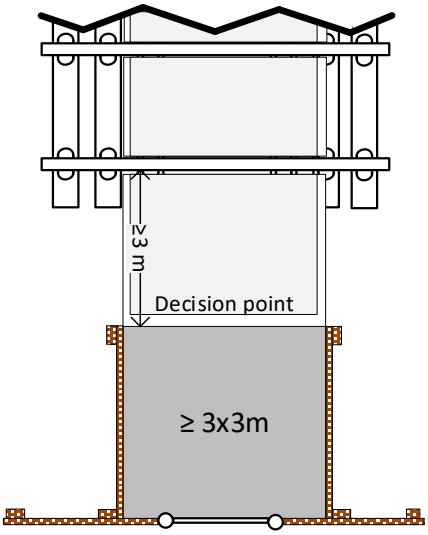


Figure 9 – Bridleway waiting area after gate

4.6.16

The safe waiting area should consist of firm, level (not sloping) ground with no protrusions to avoid injury to horses.

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Rationale: in accordance with advice from The British Horse Society 'Advice on Width, area and height' (Jul 20).

4.6.17

Where the gate is latched then there shall be a manoeuvring space in accordance with clause 4.6.15 (Figure 9) between the gate and the danger area.

Rationale: enables a user to be outside of the danger area whilst manoeuvring their horse to unlatch the gate upon exit. The British Horse Society 'Advice on Equestrian use of level crossings' (08/2015) advises that catchless/unlatched gates can be opened in a straight line without the turning on the line side that would be needed to operate a catch/latch.

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5 User-worked level crossings

5.1 Surface system requirements for user-worked level crossings

5.1.1

Requirements for the surface system are specified in the general requirements, NR/L2/XNG/30020/R01.

5.1.2

Where the surface system allows then a stop line shall be provided in a position where the front of a vehicle is expected to stop.

A suitable surface system may be extended to allow this, especially for public road approaches.

Rationale: for the convenience of users to stop their vehicles clear of the gate swing.

NOTE 1: *The stop line is defined in TSRGD and permitted by references in PC(S+B) Regs.*

5.1.3

Consideration should be given to providing illuminated studs to demark the edges of the danger area.

Rationale: illuminated studs help users see the edges of the crossing surface at night and where ambient lighting is poor.

5.2 Fencing requirements for user-worked level crossings

5.2.1

Requirements for fencing are specified in the general requirements, NR/L2/XNG/30020/R01.

5.3 Gate requirements for user-worked level crossings

5.3.1

Gates shall comply with NR/L2/XNG/30020/A27.

5.4 Lifting barrier requirements for user-worked level crossings

5.4.1

Requirements for user-worked barriers are specified in NR/L2/SIG/11201/ Mod X41.

5.4.2

The user controls should be positioned as close to the MSL head as practicable.

5.5 Signage requirements for user-worked level crossings

5.5.1

Signage shall be provided in accordance with NR/L2/XNG/30020/R01 and NR/L2/XNG/30020/A28.

5.6 Telephone requirements for user-worked level crossings

5.6.1

Telephone requirements are specified in NR/L2/XNG/30020/R01.

5.6.2

It should be noted that all approved signs for UWCs with MSLs require the user to telephone when no light shows. Therefore, in accordance with the requirements of NR/L2/XNG/30020/R01 for a telephone to be provided where users are instructed to telephone, a telephone will need to be provided at a UWC with MSL.

5.7 Layout requirements for user-worked level crossings

5.7.1

The minimum width of a UWC shall be 3 m.

Rationale: 3 m is in keeping with the Highways Act 1980 (as amended by the Rights of Way Act 1990) for 'any other highway'.

NOTE 1: *This applies to the surface system and any approaches within Network Rail's boundary, including the width between fences and gate openings. Other requirements require gates to be provided and for the surface system to be wider than each gate post, so in practice the crossing will be wider than this minimum.*

NOTE 2: *Wider crossings may be required in accordance with local user needs.*

5.7.2

A UWC shall be protected by gates or lifting barriers.

NOTE: *Manually operated gates require five traverses to bring one vehicle across. Power operated gates or barriers reduce this to a single traverse and might reduce instances of gates being left open.*

5.7.3

Vehicular gates at user worked crossings shall be no closer than 2 m to the track and close enough to stop a vehicle sitting between the gate and track.

5.7.4

Where a UWC adjoins a footpath or bridleway, there shall be separate access and egress facilities provided for each.

Rationale: for the safety and convenience of all categories of user and to enable the consistent application of signage.

5.7.5

Where a UWC adjoins a footpath or bridleway, users should be instructed to use the same fallback procedure when active warnings fail.

Rationale: for consistency and to mitigate the risk of misinterpretation where, for example, a user that is required to telephone follows signage intended for other users to stop, look and listen.

5.7.6

The danger area at a UWC shall extend to 3 m from the nearest running rail.

5.7.7

Where users are required to stop, look and listen then the intention should be to provide users with a clear indication of the extent of the danger area and the location of the decision point by considering how the surface markings, fencing, signage and gates convey those positions.

5.7.8

Where a vehicle driver at a UWC is required to stop, look and listen then the decision point shall be at a position from where the required sighting distance is available from a driver's eye position and where the vehicle is wholly within a position of safety, outside of the danger area.

The required sighting should be available from that point onwards.

Rationale: the whole vehicle needs to be in a position of safety when the driver is making the decision to cross.

NOTE 1: *The driver's eye position applies for all vehicle types expected to stop, look and listen.*

NOTE 2: *This applies whether the requirement to stop, look and listen is the primary procedure of using the crossing or a fallback procedure when active warnings fail.*

NOTE 3: *This means taking into account the front of any vehicle expected to use the crossing.*

5.7.9

Where MSLs are provided, the decision point shall be at the vehicle stop line, stop sign or stopping position before the gate swing and from where the MSL is visible to users.

Rationale: to enable the user to make their decision to cross when the lights are still visible to them.

5.7.10

Where manually operated vehicle gates are provided then the detailed instruction signs, and MSLs where provided, should be placed on the opening side of the vehicle gate.

Rationale: to provide better visibility of the signage while approaching the gate and opening it.

NOTE: *Figure 10 shows an example.*

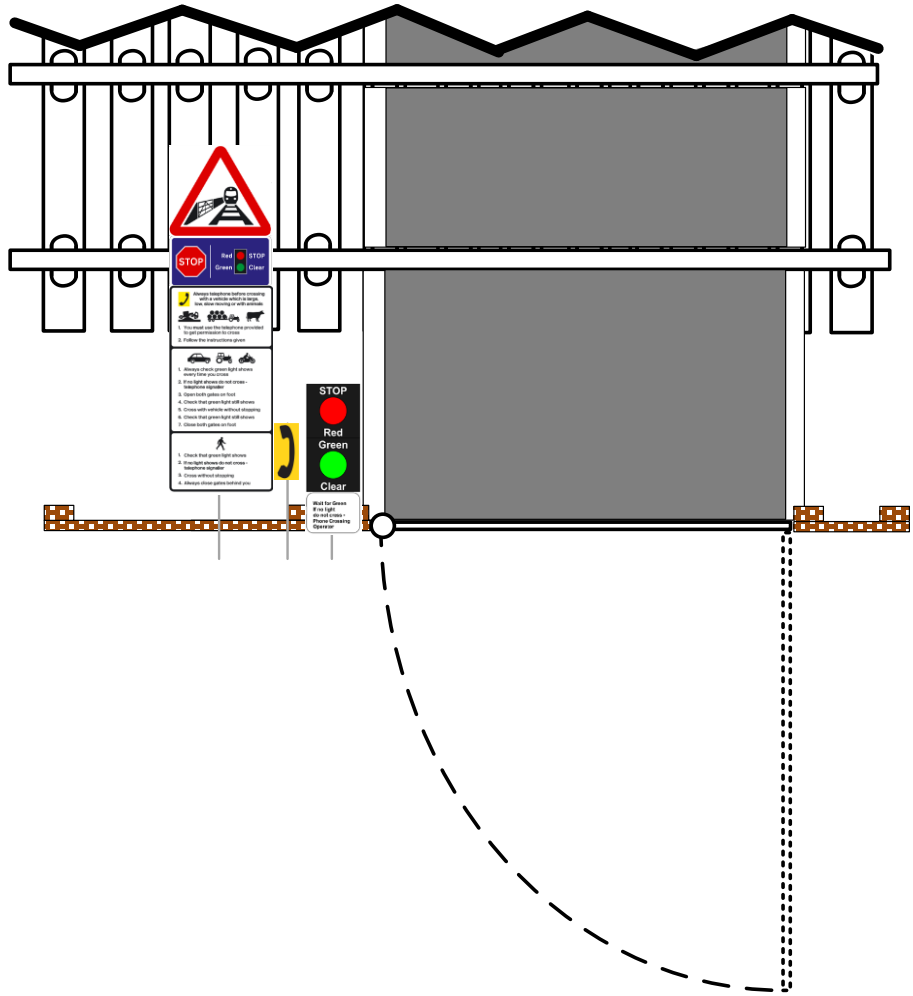


Figure 10 – Example UWC with MSL

5.7.11

Where separate access is provided for non-vehicle users then the access should normally be positioned opposite each other on the same side of any adjacent road.

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Rationale: this will normally provide the shortest, straightest route for the user and therefore enables them to spend the minimum time necessary on the railway. It also avoids users having to enter the road and come into conflict with vehicles.

***NOTE:** This also applies at skew crossings, where it might not result in the shortest traverse, unless the risk of pedestrians coming into conflict with vehicles and the absence of pedestrian surface markings between gates, have both been assessed as tolerable in the NRA and DIA.*

5.7.12

Where separate access is provided for non-vehicle users and an MSL is provided then the MSL should be the method of warning for users of both means of access.

5.7.13

Where separate access is provided for non-vehicle users and an MSL is provided then, where practicable, the MSLs, vehicle detailed instruction sign and telephone should be positioned between the vehicle access and the separate access, as shown in Figure 11.

Where this is not practicable then priority should be given to locating the MSL between the vehicle access and the adjacent access with the vehicle sign, and where necessary the telephone, relocated. Figure 12 shows an example. Care should be taken that the signs and telephone are not obscured or obstructed by open gates.

Rationale: to provide the best visibility of the MSL and signage for both types of user.

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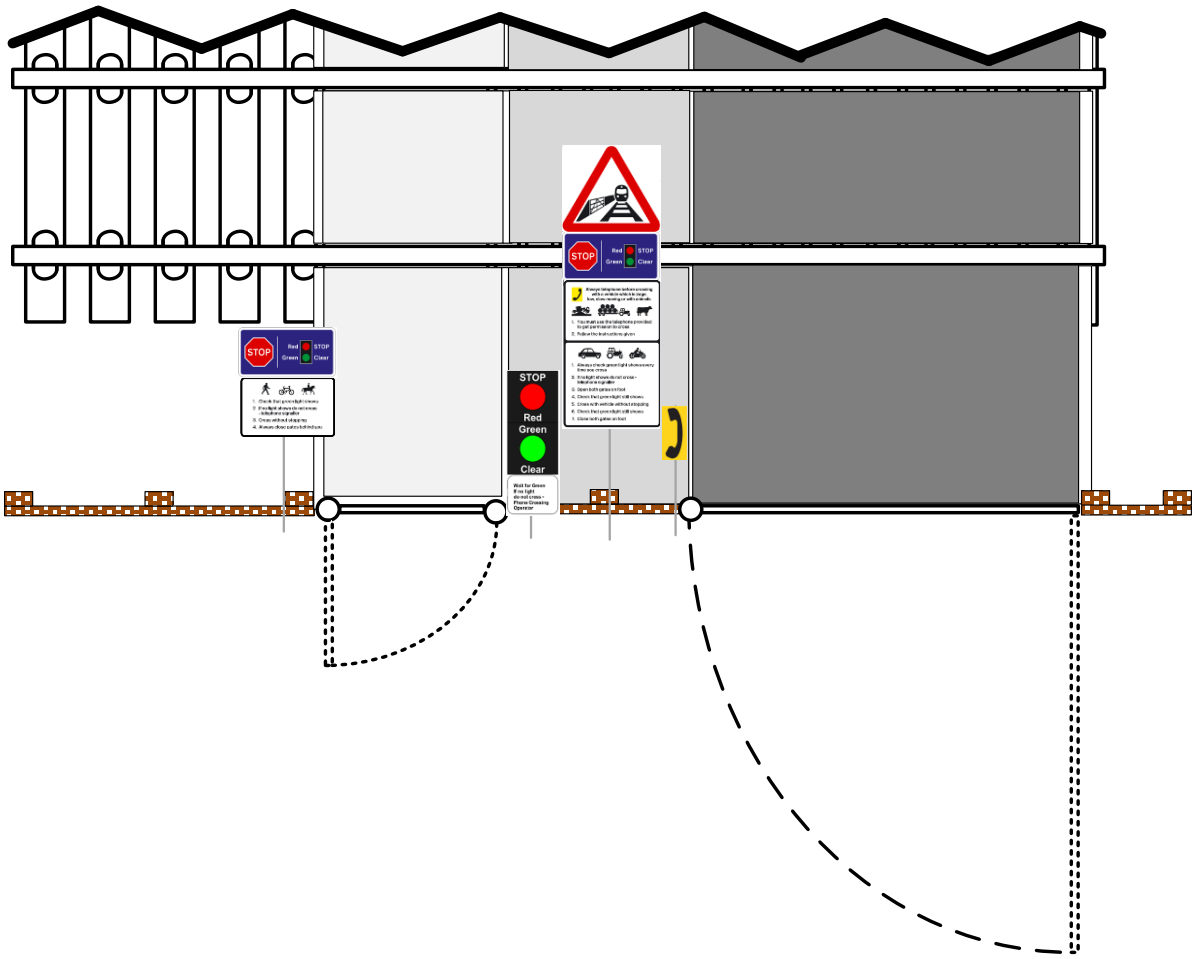


Figure 11 – Example hybrid UWC with MSL

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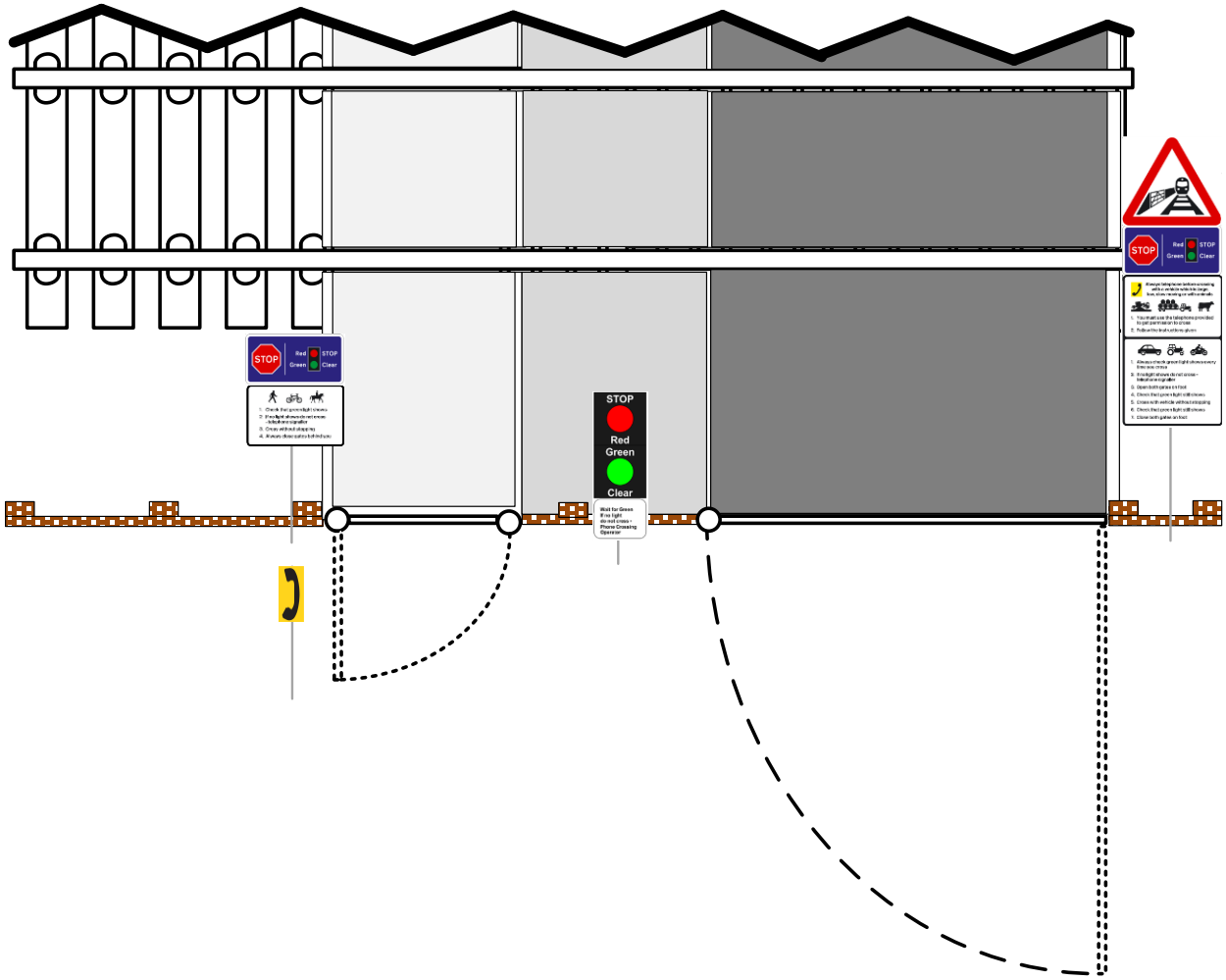


Figure 12 – Example hybrid UWC with MSL

5.7.14

Where Power Operated Gate Openers (POGO) are provided then NR/L2/SIG/11201/ModX42 requires that the normal operating buttons are located in a position:

- from where the detailed instruction sign is readable; and
- where the buttons are clearly associated with the detailed instruction sign; and

- from where the crossing surface is visible; and
- where drivers will need to exit their vehicle to operate them; and
- not where pedestrians might mistake the buttons as applying to the adjacent access.

Figure 13 and Figure 14 show examples.

Where the vehicle detailed instruction sign cannot be positioned between gates at a hybrid crossing then the buttons should also move to continue to be associated with the sign. Care should be taken that the buttons are not obstructed by open gates. Figure 15 shows an example.

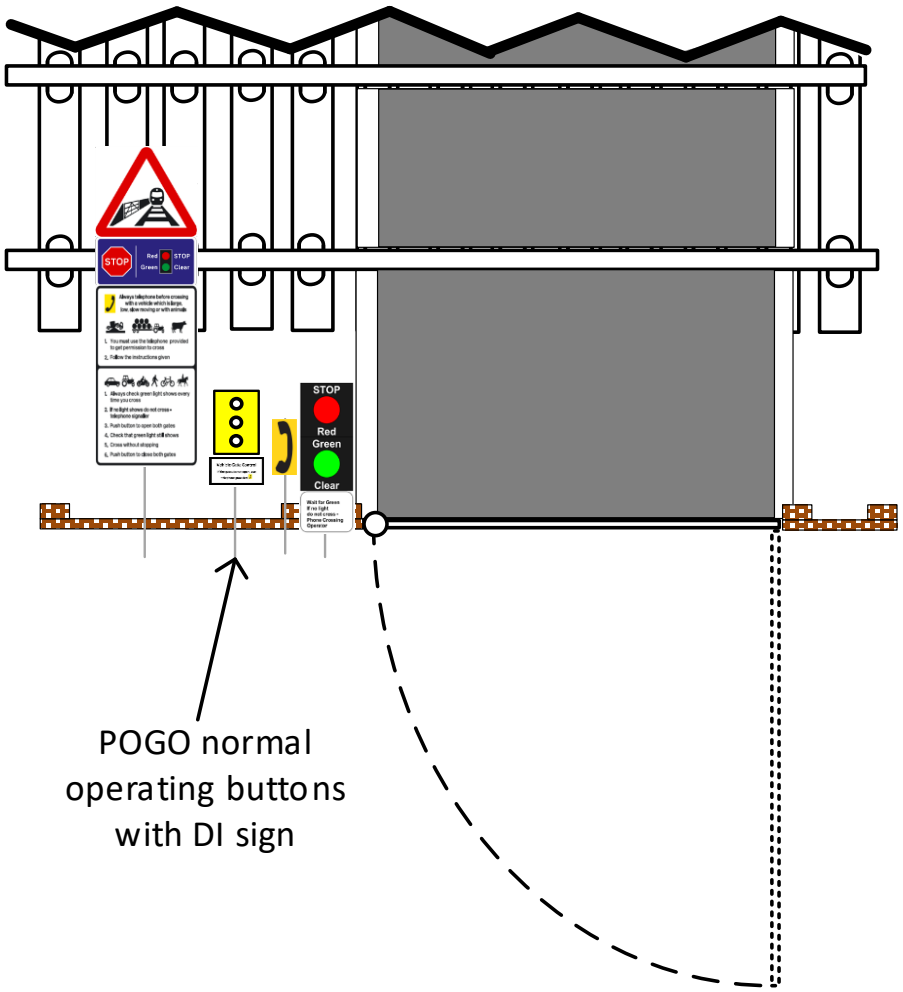


Figure 13 – Example UWC with MSL and POGO

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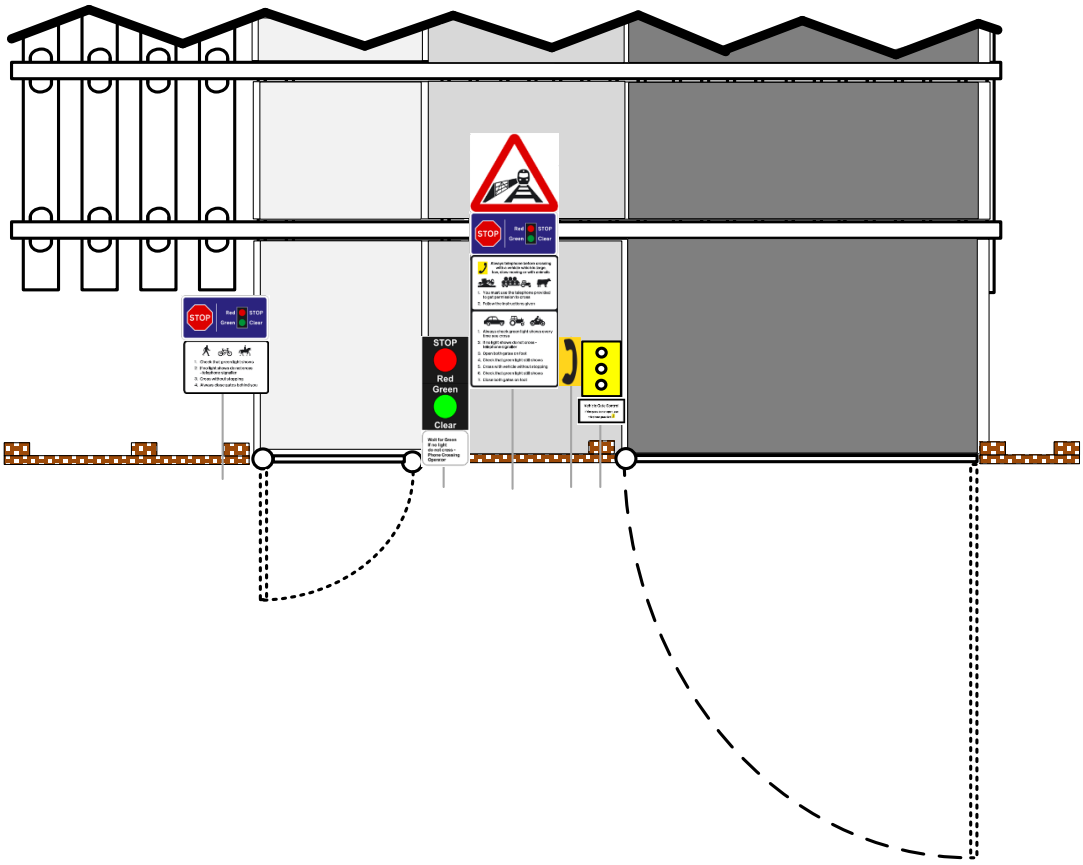


Figure 14 – Example hybrid UWC with MSL and POGO

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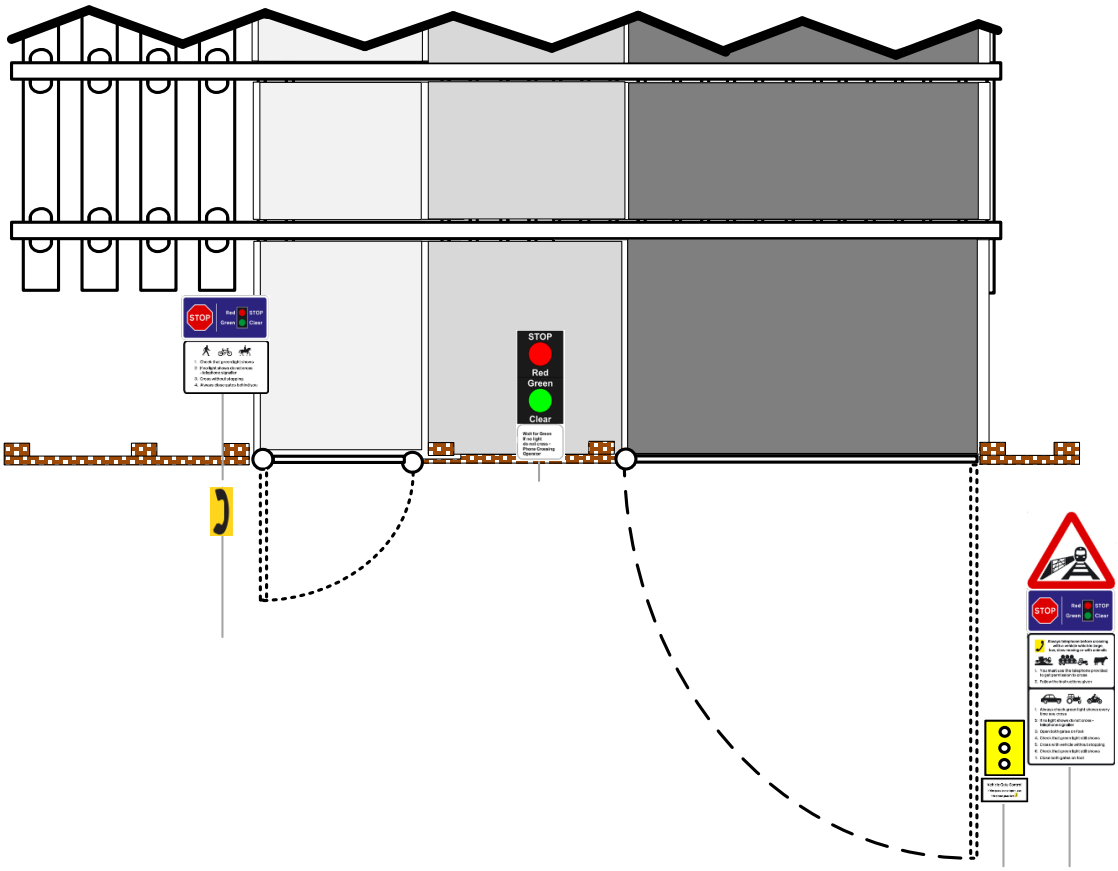


Figure 15 – Example hybrid UWC with MSL and POGO

6 Mounting block requirements

6.1.1

At bridleway and user-worked level crossings where horse riders are required to dismount, mounting blocks and hitching posts shall be provided on exiting the crossing.

Rationale: provided for the convenience of riders and to encourage correct usage of the crossing.

NOTE 1: *The British Horse Society 'Advice on Mounting Blocks' publication should be referred to for details of mounting block construction.*

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6.1.2

The mounting bock should be positioned 10m after the level crossing or as otherwise agreed during consultation with users.

Rationale: to allow for more than one horse to come through the gate unobstructed.

6.1.3

Where mounting blocks are provided they should be positioned on the left-hand side on exiting the crossing.

Rationale: The British Horse Society 'Advice on Mounting Blocks' (Dec 20) advises that riders most commonly mount from the left side of a horse.

6.1.4

Horse riders shall be instructed to dismount where overhead live conductors are present.

***NOTE:** It should be assumed that horse riders will remain mounted while using the level crossing, unless they are required to dismount by the instruction signs provided.*

IA2

RAIL SAFETY AND STANDARDS BOARD

Rule Book Module TW1
GERT8000-TW1
Issue 19 | December 2023

Preparation and movement of trains

Published by
Rail Safety and Standards Board Ltd



Conventions used in the Rule Book

	Example
A black line in the margin indicates a change to that rule when published for the first time, and will then appear until the module is reissued.	
Green text in the margin indicates who is responsible for carrying out the rule.	driver
A white **i** in a blue box indicates that there is information provided at the bottom of the page.	
A rule printed inside a red box is considered to be critical and is therefore emphasised in this way.	

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You will need this module if you carry out the duties of a:

- driver
- guard
- shunter
- signaller
- train preparer
- competent person.

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Uncontrolled when printed
Supersedes GERT8000-TW1 Iss 18.1 with effect from 02/12.2023

1 Abnormal brake applications

The person responsible: ***driver***

driver

If your train has been brought to a stand by a brake application which you did not make, you must immediately check the in-cab equipment indications, such as automatic warning system (AWS), ERTMS or train protection and warning system (TPWS), to see if this was the reason for the brake application.

If AWS, ERTMS or TPWS equipment was the reason the train was brought to a stand, you must immediately contact the signaller, unless TPWS caused the brake application when the train was approaching buffer stops.

If AWS, ERTMS or TPWS did not cause the brake application, you must find out if the brake was applied by the guard or by the passenger communication apparatus.

If none of these caused the brake application, you must check if the train is complete.

You must agree with the signaller what actions will be taken to find out whether the train has become divided and whether any other line is affected.

You must assume that your train has become divided if:

- the tail lamp is missing
- the brake pipe is open at the rear.

2 Assisting failed locomotive-hauled trains in the rear

The person responsible: ***driver***

2.1 General

driver failed train

If your train has failed, it may be assisted in the rear if you can apply the automatic brake in an emergency.

You must only allow the movement to proceed to the next place where the train can be moved clear of the running line, or a locomotive can be attached to the front.

You must make sure that you can fully control the train throughout the movement.

You must reach a clear understanding with the driver of the assisting locomotive about how the movement is to be started, stopped and controlled.

You can use GSM-R radio for this purpose at any time during the movement.

driver assisting train

Before the movement begins, you must temporarily isolate the TPWS.

Immediately after your train is detached from the failed train, you must reinstate the TPWS.

If you are the driver of an assisting train on which ERTMS is in operation, you must make sure that ERTMS is in the correct mode both before the movement starts, and immediately after your train is detached from the failed train.

You must not make any further movement without the signaller's authority.

2.2 Failed air-braked train

driver failed train

An air-braked train can only be assisted in the rear by:

- a light locomotive
- an air-braked train
- a vacuum-braked train hauled by a dual-braked locomotive.

You must not exceed 25 mph (40 km/h).

However, if the brake pipe is operative throughout the train, a light locomotive may assist:

- a passenger train (loaded or empty)
- a postal or parcels train
- any other train running with passenger brake timings.

You must not exceed 40 mph (65 km/h).

A single-piped air-braked train can be assisted in the rear if the failed locomotive is:

- capable of maintaining its own main reservoir pressure, or
- fitted with an assistance to failed train (AFT) cock.

A two-pipe air-braked train can be assisted in the rear if the main reservoir pipe is:

- coupled and operative throughout the failed train
- coupled to the assisting locomotive.

3 Attending for and leaving duty

The people responsible: ***driver, guard***

When attending for duty, you must read the notices that apply to you. **driver, guard**

Before leaving duty, you must hand in a full written report of the circumstances of any irregularity or exceptional incident.

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4 Brake system requirements

The people responsible: ***driver, guard, train preparer***

4.1 Making sure brakes are working correctly

driver, guard, train preparer

The automatic brake must normally be in use on every vehicle in a passenger, parcels or postal train. You must make sure that the brakes are working correctly before allowing a train to start a journey.

4.2 Carrying out a brake continuity test on locomotive-hauled trains or HSTs

driver, guard, train preparer

You must carry out a brake continuity test:

- when a locomotive is coupled to the train
- after a brake defect has been repaired
- after a train has been left unattended and the traction unit shut down (except where authorised in local instructions)
- when a vehicle is uncoupled from the train, unless it is uncoupled from the extreme rear
- when a vehicle is coupled to the train
- when any jumper cables have been disconnected and then re-connected during the journey.

You must carry out a brake continuity test only after all coupling, including brake and electrical connections, has been completed.

driver

If the train is assisted by a locomotive coupled in the rear, you must ask the driver of the assisting locomotive to carry out the brake continuity test. including brake and electrical connections.

4.3 Carrying out a brake continuity test on multiple-unit passenger trains

driver, guard, train preparer

You must make sure a brake continuity test is carried out as shown in train operating company instructions.

4.4 Coaching stock vehicles with isolated brakes

driver, guard, train preparer

You must carry out these instructions before a train formed of any type of coaching stock vehicles, whether locomotive-hauled, or multiple unit is allowed to:

- start a journey from other than a maintenance depot
- continue a journey after the brakes have been isolated during a journey.

Some types of multiple-unit train have braking equipment which provides the full brake power even though the brakes are isolated on a vehicle. When this is the case, you do not have to reduce speed as shown in this section. Your train operating company instructions will show which classes of train this applies to.

driver, guard, train preparer

You can allow a train to start or continue a journey with the automatic brake isolated on one vehicle as long as the following conditions are met.

- The train is formed of at least five coaching stock vehicles.
- If the brake has been isolated on the leading vehicle of a train, the requirements in section 5.4 of module TW5 *Preparation and movement of trains: Defective or isolated vehicles and on-train equipment* are carried out.
- If the brake has been isolated on the last vehicle of a train, the requirements in section 5.5 of module TW5 *Preparation and movement of trains: Defective or isolated vehicles and on-train equipment* are carried out.
- The speed of the train is restricted to 10 mph (15 km/h) below the permissible speed for that train over each portion of line concerned. However, the speed need not be reduced below 35 mph (55 km/h).

You can allow more vehicles on which the automatic brake has been isolated to be conveyed in the train as shown below, providing the same conditions can be met.

Total number of coaching stock vehicles in the train	**Number of vehicles with brakes isolated**
10 to 14	2
15 to 19	3
20 to 24	4
25 or more	5

driver

If the brakes have been isolated on a greater number of vehicles, you can only continue the journey, as long as you travel at a speed which will allow you to keep full control of the train, as shown in section 5.3 of module TW5 *Preparation and movement of trains: Defective or isolated vehicles and on-train equipment.*

4.5 Isolated vehicle brakes

driver, guard, train preparer

You must treat a vehicle with two air-brake distributors, one of which is isolated, as having isolated brakes.

If it is necessary to isolate the automatic brake on any vehicle, you must:

- carry out any necessary instructions for the type of vehicles concerned
- tell the driver
- make sure the train document is amended
- make sure the train meets the requirements of section 4.4.

4.6 Carrying out a running brake test

driver

You must test that the automatic brake is working properly by carrying out a running brake test.

When you carry out a running brake test, you must do so from a speed that is high enough for you to be sure that:

- the brake is operating effectively
- the speed of the train is being reduced.

Locomotive-hauled trains and HSTs

You must carry out the running brake test at the first opportunity after beginning the journey.

You must, if possible, also carry out a running brake test in good time before approaching:

- the first stopping place
- a crossing place on a single line
- a steep falling gradient
- a terminus or dead-end platform line.

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driver

Multiple-unit trains

When working multiple-unit trains you must carry out the running brake test as shown in your train operating company instructions.

5 Broken rails, bridge strikes and track defects

The people responsible: ***driver, signaller***

5.1 Broken, distorted or damaged rails and broken fishplates

driver

If there is a broken or defective rail or broken fishplates on the line on which your train is to travel, the signaller will tell you what is happening and the location of the rail defect.

When you are told to proceed, you must do so at no more than the speed the signaller tells you.

5.2 Bridge strikes

driver

If a bridge is reported as having been struck by a road vehicle on the line on which your train is to travel, the signaller will tell you what has happened and the location of the bridge.

When you are told to proceed, you must do so at no greater speed than the signaller tells you. You must not increase speed until the whole of your train has passed beyond the bridge concerned.

If it is an overline bridge that has been struck, the signaller may ask you to check the bridge before passing under it. In this case you must:

- stop your train before passing under the bridge
- check for any obvious damage, including debris on the line
- tell the signaller whether the line appears to be safe for the passage of trains.

If there is no obvious damage or debris, you may pass under the bridge at a speed not exceeding 5 mph (10 km/h).

5.3 Track defects

driver

If you believe there is a track defect, you must tell the signaller, as soon as possible:

- the location of the defect
- the type of defect, using terms in the table below
- whether there is a bridge or viaduct at or close to the location of the defect
- as much information as you can about the defect.

signaller

If a driver tells you about a possible track defect, you must:

- get the location of the defect from the driver
- get as much information as possible from the driver, using the terms in the table below
- carry out the actions shown in the table below
- tell Operations Control.

driver, signaller

Type of defect	Driver's report	Signaller's actions
A track defect that is seen	You can definitely see that there is: • a broken rail • a defective rail • broken fishplates.	You must stop trains from passing over the affected line as shown in module TS1 General signalling regulations regulation 17.1.1.

driver, signaller

Type of defect	Driver's report	Signaller's actions
A track defect that is felt	There is unusual movement of the train - either sideways or vertical - which may be because of a track defect. This may be: • a lurch or dip • shaking or vibrating • pitch.	You must arrange for the line to be examined, as shown in module TS1 General signalling regulations regulations 20.1, 20.3 and 20.5.
A track defect that is heard	You hear an unusual noise that may be because of a track defect. This may be: • a bang • a rattle • grinding.	You must arrange for the line to be examined, as shown in module TS1 General signalling regulations regulations 20.1, 20.3 and 20.5.
Deterioration of ride quality	You consider that the ride quality has deteriorated from that experienced previously at a particular location. In this case. • You do not need to tell the signaller about this. • You must report this to your Train Operator's Control at the earliest opportunity.	If a driver reports this type of defect, you must tell Operations Control.

6 Classification of trains

The people responsible: ***driver, train preparer***

The following table shows the classification used to identify the types of train.

driver, train preparer

You must tell the signaller if the classification of the train is different, or has been changed, from that published.

Description	Class
Express passenger train Nominated postal or parcels train Breakdown or overhead line equipment train going to clear the line (1Z99) Traction unit going to assist a failed train (1Z99) Snow plough going to clear the line (1Z99)	**1**
Ordinary passenger train Officers' special train (2Z01)	**2**
Freight train if specially authorised A parcels train Autumn-railhead treatment train Empty coaching stock train if specially authorised	**3**
Freight train which can run up to 75 mph (120 km/h)	**4**
Empty coaching stock train	**5**
Freight train which can run up to 60 mph (95 km/h)	**6**
Freight train which can run up to 45 mph (70 km/h)	**7**
Freight train which can run up to 35 mph (55 km/h)	**8**
Class 373 train Other passenger train if specially authorised	**9**
Light locomotive or locomotives	**0**

7 Dead locomotives

The people responsible: ***driver, train preparer***

7.1 General

driver, train preparer

You can allow dead locomotives to be worked as part of a formation of light locomotives, or conveyed in a train.

If a dead locomotive has an operational automatic brake, you must make sure that it is used even when it is partially defective. This means the number of brakes isolated reduces the brake force by no more than 25%.

You must make sure that the brake timings are compatible throughout the train, including the locomotives.

7.2 As a formation of light locomotives

driver, train preparer

Unless authorised otherwise, you must not allow more than a total of five hauling and dead locomotives to be worked as a formation of light locomotives.

You must not haul a locomotive on which the automatic brake is totally inoperative.

If any locomotive has a partially defective automatic brake, you must not allow the speed to exceed 50 mph (80 km/h).

7.3 In a passenger train (loaded or empty), postal or parcels train

driver, train preparer

Unless authorised otherwise, you can only convey one hauling and one dead locomotive, except that you can allow two dead class 20 or class 73 locomotives to be formed at the rear of the train.

You can convey more locomotives when an electric locomotive in service is being hauled over a non-electrified line, or an electrified line on which the traction current has been isolated.

driver, train preparer

When preparing the train, you must make sure that a dead locomotive is formed:

- immediately behind the hauling locomotive, or
- immediately inside the powering locomotive on a push-pull train, or
- at the rear of the train.

You must make sure that the automatic brake is fully operative on a dead locomotive.

7.4 In a freight train

driver, train preparer

Unless authorised otherwise, you must not convey more than a total of five hauling and dead locomotives.

If the dead locomotives have only a through pipe available, you must make sure that:

- not more than three locomotives are hauled
- the locomotives are formed immediately behind the hauling locomotive
- the automatic brake is operating on the three vehicles behind the dead locomotives.

You can only allow one locomotive (or two class 20 or class 73 locomotives) to be formed at the rear of the train.

You must not convey a dead locomotive at the rear of a train, or within the train, unless the automatic brake is operating fully.

You must only convey a dead locomotive formed anywhere in the train except immediately behind the hauling locomotive or at the extreme rear, as long as:

- your train operating company instructions allow this
- you carry out any additional instructions in the train operating company instructions.

driver, train preparer

If a dead locomotive is formed anywhere in a single-piped air-braked train except immediately behind the hauling locomotive, you must make sure that it is fitted with an AFT cock or equivalent. If not fitted with an AFT cock, a locomotive cannot be hauled dead, but can be conveyed with the engine under power but not supplying traction power.

8 Doors on passenger, postal and parcels trains

The people responsible: ***driver, guard, signaller***

8.1 Door open or not completely closed

guard

If a door comes open or is not completely closed while the train is moving, you must not try to close or secure the door, but immediately stop the train before doing so.

8.2 Treating and reporting doors as defective

driver of a DO train, guard

You must treat a door as defective and carry out the instructions in module TW5 *Preparation and movement of trains: Defective or isolated vehicles and on-train equipment* if any of the following applies.

- A power-operated door closes other than through normal operation.
- The train starts with someone or something trapped in a door.
- A power-operated door remains open when it should be shut.
- A door comes open during the journey.
- Someone is injured when opening or closing the door and it is possible that the condition of the door may have contributed to the accident.
- Someone falls from the door during the journey.
- The power-operated door controls become inoperative.
- The central door locking becomes defective.
- The internal passenger ‘door open’ buttons become lit when the train is moving.

driver of a DO train, guard

You must also treat a door as defective and carry out the instructions in module TW5 *Preparation and movement of trains: Defective or isolated vehicles and on-train equipment* if any of the following applies.

- A slam door is found on the safety catch, unless it is known that the door was not properly closed before the train started.
- A door handle does not return to the horizontal position when closed.
- A door is stiff in its frame.

guard

You must tell the driver what has happened.

driver

If it is necessary to stop the train, you must do so immediately.

You must tell the signaller what has happened and give details of:

- the vehicle number
- the location of the door
- the position of all door controls
- the position of the traction interlock switch at the time of the incident.

You must not move your train until instructed to do so by the signaller.

signaller

You must instruct the driver not to make any further movement until you have been given specific instructions from Operations Control.

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8.3 Passenger falling from the train during the journey

guard

If you know or suspect that someone has fallen from the train, you must tell the driver.

driver

You must tell the signaller if:

- someone has fallen from the train
- you cannot be certain whether anyone has fallen from the train.

You must also tell the signaller if it is known or suspected that someone has fallen from the train, but it is not known which door was involved.

driver of a DO train, guard

You must, if possible, transfer passengers to another vehicle and place the vehicle out of use.

driver

You must not move your train until instructed to do so by the signaller.

signaller

You must instruct the driver not to make any further movement until you have been given specific instructions from Operations Control.

9 Driver-guard communication

The people responsible: ***driver, guard***

When using the bell or buzzer to communicate, you must use the following codes. **driver, guard**

Code	Meaning
1	Stop
1-2	Close power-operated doors
2	Ready to start
2-2	Do not open doors (driver and guard to speak to one another)
3	Set back
3-1	Lock central door locking
3-2-1	Testing doors
3-3	Guard required by driver, or guard or driver to speak on the telephone
3-3-1	Release central door locking
4	Slow down
6	Draw forward
9	Police assistance required

You must make sure that all codes are made carefully, clearly and distinctly, with pauses clearly marked and acknowledged by repetition (except for code '3-2-1').

If you receive a code '9', you must get police assistance at the next suitable stopping point. You must arrange this by telling the signaller in the quickest way possible.

You must use the cab-to-cab telephone only for essential conversations about the working of the train.

You must not use the cab-to-cab telephone instead of the bell or buzzer codes to control movements of trains, unless your train operating company instructions allow you to do so when the bell or buzzer is defective.

10 Driver's reminder appliance (DRA)

The person responsible: ***driver***

Note: On a train on which ERTMS is in operation, the use of the DRA will only be necessary if a DRA is provided.

10.1 When entering or leaving the driving cab

driver

When you enter a driving cab before starting a journey, or when taking over the train from another driver, you must make sure that the DRA is set.

If there is a platform starting signal, you must reset the DRA only when one of the following applies.

- The platform starting signal has been cleared.
- You have been given authority to pass the signal at danger, or pass an end of authority (EoA) without a movement authority (MA).
- You are allowed to pass the signal at danger on your own authority.

You must set the DRA when you leave the driving cab at the end of a journey or when another driver is to take over the train.

10.2 When stopping at a station platform or at a signal at danger

driver

You must set the DRA when your train:

- stops at a station platform where the starting signal is at danger, or you do not have an MA beyond the station
- is stopped at any signal at danger, or at a block marker when you do not have an MA beyond it.

You must only reset the DRA when: **driver**

- the signal has cleared, or an MA has been received
- you have been given authority to pass the signal at danger, or an EoA without an MA
- you are allowed to pass the signal at danger on your own authority.

You may set the DRA before your train stops at the platform.

10.3 When stopping at a station platform where no signal is provided

You must set the DRA when your train stops at a station platform after having: **driver**

- passed a signal displaying a single yellow aspect or a semaphore distant signal at caution
- been authorised to pass at danger the signal, or an EoA without an MA, on the approach to the platform
- entered the platform under the authority of a position-light signal or subsidiary signal.

You may set the DRA before your train stops at the platform.

You must only reset the DRA when you receive the **'ready-to-start'** signal.

If you are at an unstaffed platform, you must only reset the DRA when you have made sure it is safe to start the train. **driver of a DO train**

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11 Driving-cab equipment

The people responsible: ***driver, train preparer***

driver, train preparer

When preparing a train for service, you must check that the following equipment is available in any cab that the train will be driven from, or in another location on the train as shown in your train operating company instructions for the type of rolling stock concerned.

- At least 10 detonators.
- Two track-circuit operating clips.
- Two red flags.
- A spare tail lamp or hand lamp when working locomotive-hauled DO trains.
- Any other equipment shown in the instructions for the type of train concerned.

On a multiple-unit train, one red flag must be available in each cab.

If any of the equipment shown above is not available in any cab that the train will be driven from, or in another location as shown in your train operating company instructions, you must not allow the train to start a journey.

12 Examining the line

The person responsible: ***driver***

12.1 How to carry out an examination of the line

If instructed by the signaller to examine the line, you must: **driver**

- reach a clear understanding with the signaller as to which portion of line is to be examined
- proceed over the affected portion of the line at caution
- carry out any other instructions.

If the affected portion of line is within a tunnel, you must not exceed 10 mph (15 km/h) through the tunnel.

If the signaller has told you that the examination of the line is because of a suspected track defect, you must not exceed 20 mph (30 km/h) over the affected portion of line.

You must report the state of the affected line from an agreed location beyond the affected portion of line.

12.2 If the headlight has failed

During darkness, poor visibility, or if there is a tunnel in the section, you must not use a train to examine the line if the headlight has failed completely, unless a portable headlight is fitted. **driver**

12.3 Being accompanied by a competent person

During darkness, poor visibility, or if the affected portion of line is within a tunnel, while examining the line, you must be accompanied by the guard or other competent person (if one is immediately available). **driver**

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13 Exploding detonators

The person responsible: ***driver***

13.1 At a signal box or when a hand danger signal is shown

driver

If your train explodes one or more detonators at a signal box or when a hand danger signal is being shown, you must:

- stop your train immediately
- not proceed until given permission to do so.

13.2 Other situations

driver

If your train explodes one or more detonators in any other situation, you must:

- stop your train immediately
- proceed at caution towards the obstruction, or any signal, end of authority (EoA) or handsignal.

14 Lights on trains

The people responsible: ***driver, guard, train preparer***

14.1 Headlights and marker lights

driver

You must make sure that any marker lights at the front of your train are switched on when the train is:

- on a running line
- moving on any line or in a depot, yard or siding
- being propelled in the right direction.

You must make sure that the headlight (fixed or portable) at the front of your train is:

- switched on when the train is moving on a running line
- displaying the correct day or night beam.

You must make sure that the headlight (fixed or portable) is switched off:

- in a depot, yard or siding
- when stabled on a running line.

14.2 Tail lamps

driver, guard, train preparer

You must make sure there is a tail lamp that is lit at the rear of the train when it is:

- on a running line
- on a through or reception siding
- being propelled in the right direction.

When two built-in electric tail lights are provided, you must make sure both are lit, where possible.

You must make sure that no other tail lamp is displayed at any other position.

14.3 Lights on shunting locomotives

driver

You must make sure there is at least one red and one white light displayed at each end of a shunting locomotive (where these are fitted) when it is being used for shunting purposes.

14.4 Lights when making a wrong-direction movement

driver

When making a wrong-direction movement of less than 400 metres (440 yards), you need not change the normal head or marker lights or the tail lamp.

When making a wrong-direction movement of more than 400 metres (440 yards), you must make sure that the headlights and marker lights are lit on the leading end of the movement and a tail lamp is lit at the rear end of the movement.

When making a wrong-direction movement as an assisting train towards a failed train, you must make sure you display normal headlights at both ends of your train and have switched off the tail lamp.

You can use a portable headlight or a handlamp if the above lights or lamps are not available.

15 Locomotive assisting in the rear of a train

The person responsible: ***driver***

15.1 Before the movement begins

driver

You must reach a clear understanding with the driver of the assisting locomotive about how the movement is to be started, stopped and controlled.

You can use GSM-R radio for this purpose at any time during the movement.

driver assisting locomotive.

You must only assist a train in the rear where authorised in the *Sectional Appendix.*

You must make sure that the assisting locomotive is always coupled to the train except where authorised in the *Sectional Appendix.*

Whenever an assisting locomotive is attached to the rear of the train, you must tell the signaller.

Before the movement begins, you must temporarily isolate the TPWS or make sure that ERTMS is in the correct mode.

15.2 Assisting locomotive leaving the train

driver assisting locomotive

Immediately after the locomotive is detached from the train, you must reinstate the TPWS, or make sure that ERTMS is in the correct mode.

You must only detach the assisting locomotive at a location authorised in the *Sectional Appendix.*

You must not pass a signal which has been cleared for the train that was assisted, until the signal has been returned to danger and then cleared again.

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driver assisting locomotive

If ERTMS is operative on the assisting locomotive, you must not make any further movement without the signaller's authority.

16 Locomotives at both ends of the train or in tandem

The person responsible: ***driver***

16.1 Trains with locomotives at both ends of the train

driver

You can operate a train with powered locomotives at both ends of the train in the following circumstances.

- When the rear locomotives are providing traction power.
- When the rear locomotives are providing an electrical train supply only.

You must make sure that the automatic brake is connected and operative throughout the train.

driver
locomotive on rear

You must reach a clear understanding with the driver of the leading locomotive as to what is required before the journey or movement begins.

You can use GSM-R radio to speak to the other driver at any time during the journey about how the movement is to be started, stopped and controlled.

During the journey, you may disregard any signal which reverts to danger or caution before your locomotive passes it.

16.2 Trains hauled by locomotives in tandem

driver

If ERTMS is in operation on the leading locomotive, you must make sure that suitable communication is available between each of the drivers.

If you are the driver of the leading locomotive, you are responsible for observing signals or in-cab indications and operating the brake.

If you are the driver of the second locomotive, you must:

- observe all signals affecting the working of the train, where possible
- observe any signals or follow other communication given by the driver of the leading locomotive
- apply the brake if it becomes necessary.

You can use GSM-R radio to speak to the other driver at any time during the journey about how the movement is to be started, stopped and controlled.

16.3 If a locomotive is not the leading one

driver

If you are the driver of any locomotive that is not the leading one, you must:

- temporarily isolate TPWS before the movement starts, if it is required to be in operation during any part of the journey
- reinstate the TPWS after the movement has been completed, or before the train reverses, if it will then be required to be in operation
- make sure that ERTMS is in the correct mode throughout any part of the journey when it is required to be in operation.

17 Locking doors on passenger trains

The people responsible: ***guard, train preparer***

guard, train preparer

You must carry out these instructions:

- before a train starts its first journey of the day
- after any vehicle has been attached or detached from a train
- when a door is locked out of use for any operational reason.

You must make sure that the following doors are locked.

- Gangway doors at each end of the train.
- Gangway doors at each side of any gangway connection which cannot be made.
- A door leading to any accommodation or vehicle which is not for public use, unless your train operating company instructions allow another means of preventing public access.

You must make sure that all other doors (internal and external) are kept unlocked at all times.

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18 Looking out along a train

The people responsible: ***driver, guard***

driver, guard

When starting away, if it is safe and possible to do so, you must look out to make sure everything is in order.

When working a freight train, if it is safe and possible to do so, you must look out from time to time to make sure the train is following in a safe and correct way.

19 Passenger communication apparatus (PCA)

The people responsible: ***driver, guard***

driver

If the PCA is operated, you must, if possible, avoid stopping the train:

- in a tunnel
- on a viaduct
- in any other unsuitable location.

If an emergency brake application is not automatically made when the warning alarm sounds on a train fitted with a PCA, you must:

- if possible, contact the person who has operated the apparatus
- ask the person why the PCA has been used
- take the necessary action
- if necessary, bring the train to a stand as soon as possible at a suitable location.

However, you must stop the train immediately if:

- you have reason to believe that the train may be in danger, or
- the apparatus is operated as the train is leaving a station.

driver of a DO train, guard

You must reset the PCA before the train restarts.

20 Permissive working

The person responsible: ***driver***

20.1 Definition

Permissive working allows a second train to be signalled onto a running line that is already occupied so that more than one train at a time can be on the same line in a:

- block section
- signal section
- dead-end platform line.

20.2 Authority for permissive working

driver

You must only make a permissive movement where authorised in the *Sectional Appendix*.

However, you can make a shunting movement to a portion of line that is already occupied, even though permissive working is not authorised, as long as this is for the purpose of attaching, detaching or removing vehicles.

20.3 Proceeding towards the rear of another train on permissive-worked lines

driver

When proceeding towards another train which is at a stand, you must:

- approach at caution
- stop your train at least 2 metres (6 feet 6 inches) short of the train in front.

20.4 Following another train which is moving on a permissive-worked line

driver

When it is permitted to drive a train towards the rear of another train which is moving forward, you must:

- proceed at caution
- keep sufficient distance from the train in front to prevent your train colliding with that train in case it stops
- not pass a signal which has been cleared for the train in front until the signal has been returned to danger and then cleared again.

20.5 Setting-back movements where permissive working is authorised

driver

You must not make any movement, other than for coupling or uncoupling, once the train has come to a stand unless one of the following applies.

- A signal is cleared for the movement.
- The movement is authorised by the signalling system.
- The movement is authorised by the signaller.

If the movement was made on the authority of the signaller, you must tell the signaller when the movement has been completed.

If making a setting-back movement when coupling or uncoupling, you must make sure that the movement is not greater than a distance of 600 mm (2 feet).

If it is necessary for the movement to be greater than this distance, you must get the authority of the signaller.

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20.6 Emergency permissive working

driver

You can also make a permissive movement when the signaller tells you that in an emergency situation on a TCB or ERTMS line your train is authorised to enter an occupied section to use a station platform.

21 Personal equipment

The people responsible: ***driver, guard***

When on duty, you must have with you: **driver, guard**

- a handlamp
- high-visibility clothing
- a means of telling the accurate time
- up-to-date notices for all lines over which you are required to work
- any other equipment as shown in your train operating company instructions.

You must also have with you a supply of Form RT3185 Reporting a Signal/AWS/TPWS/ERTMS/ATP/TVM failure or irregularity. **driver**

You must also have a supply of form NR3190 Emergency Special Working Tickets.

You must also have a green flag with you. **guard**

When you are working a locomotive-hauled passenger train that is not a push-pull train, you must also have:

- a red flag
- 10 detonators.

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22 Poor visibility

The person responsible: ***driver***

driver

If you cannot see signals, block markers or lineside indicators soon enough to react to them during poor visibility, you must reduce the speed of your train as you consider necessary.

You must not exceed 40 mph (65 km/h) during poor visibility on a line where AWS is not provided as shown in Table A of the *Sectional Appendix*.

23 Preparing a train

The people responsible: ***driver, guard, train preparer***

guard, train preparer

Before a train starts a journey, you must check all of the following.

- All vehicles are properly coupled, including the brake-pipe and electrical connections.
- The necessary lamps are provided on the trains.
- The load and formation of the train meet the relevant rules and instructions.
- Before moving any locomotive or vehicle in the train that is not registered with Network Rail, that special authorisation has been received from Network Rail.
- All vehicles appear safe to travel.
- All handbrakes are released (unless it is the driver's responsibility on multiple units).
- All the doors are properly closed on a passenger or empty coaching stock train.
- Two track-circuit operating clips are available for use in or next to each brake compartment on a train of coaching stock.

You must make sure the driver is aware of any items of defective or isolated on-train equipment.

You must give the driver any necessary instructions to do with the safe working of the train.

You must test power-operated doors as shown in your train operating company instructions. You must carry out this test before a train starts a journey, unless your train operating company instructions allow the test to be carried out before starting a journey that passengers will be carried on.

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driver

If you are working a train on which ERTMS is in operation, you must:

- make sure you enter the correct data and validate it (where necessary) or check the data already entered by the previous driver
- not enter data into the DMI when a train or vehicle is standing between your train and the signal or block marker at the EoA ahead.

24 Proceeding after being stopped because of an accident or other exceptional cause

The people responsible: ***driver, guard***

When your train has been stopped because of an accident or other exceptional cause, you must not restart until: **driver**

- you have received a **'ready-to-start'** signal from the guard, if the train is worked by a guard
- you have made sure it is safe to do so, if you are working a driver only (DO) train.

You must only give a **'ready-to-start'** signal to the driver after you have made sure it is safe to do so when the train has been stopped by an accident or other exceptional cause. **guard**

If your train has stopped over unworked points, you must: **driver**

- only restart when it is safe to do so
- if necessary, arrange for the points to be secured before restarting.

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25 Proceeding at caution

The person responsible: ***driver***

driver

If instructed to proceed at caution, you must, as well as not exceeding any specified speed, proceed at a speed which takes account of conditions (such as the distance you can see to be clear), that will allow you to stop the train short of any train, vehicle or other obstruction, or the end of your movement authority.

26 Propelling movements

The people responsible: ***driver, shunter, signaller,***

26.1 Authority for propelling

driver, shunter, signaller

You may allow a propelling movement to take place as follows.

- At locations shown in the *Sectional Appendix.*
- Within the station limits of the same signal box.
- A shunting movement on a track circuit block line that is not required to proceed beyond more than one main aspect signal.
- A shunting movement on an ERTMS line that is not required to proceed beyond more than one main aspect signal or block marker.
- Through points worked from a ground frame.
- An officers' special train in the right direction.
- A wrong-direction movement that has been authorised after taking a wrong route at a junction.
- When a wrong-direction movement has been authorised after overrunning a station.
- A movement that is in connection with single line working.
- A movement that is in connection with working to or from the point of obstruction.
- A movement of a breakdown train.
- A movement in connection with clearing a disabled train or portion of it from the section.
- A wrong-direction movement with the front portion of a divided train to the rear portion.

26.2 Controlling the movement

driver

You must not make a propelling movement unless it is controlled by a person acting as a shunter as shown in Rule Book module SS2 *Shunting*.

26.3 Before the movement starts

driver, shunter

Before the movement starts, you must both reach a clear understanding about:

- the movement
- the limits of the movement
- how it will be controlled.

You can use GSM-R radio to speak at any time during the journey about how the movement is to be started, stopped and controlled.

shunter

If the movement is to be made along a running line, you must:

- make sure the automatic brake is in use
- tell the signaller that the movement will be propelled, except when the movement is being made through points worked by a ground frame.

driver

You must:

- temporarily isolate the TPWS before the propelling movement starts
- reinstate the TPWS when the movement has been completed
- make sure that ERTMS is in the correct mode before the propelling movement starts.

26.4 During the movement

driver

If you are making a propelling movement, you must drive from the leading cab unless either of the following applies.

- You have to look out for signals or handsignals and you will have a better view from another cab.
- A shunter is controlling the movement by radio and you do not have to look out for signals or handsignals during the movement.

Throughout the movement you must:

- observe all signals
- not pass any block marker, signal or stop board without authority
- not exceed 20 mph (30 km/h), except for an officers' special train
- sound the warning horn when approaching a level crossing.

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27 Public address system

The person responsible: ***driver***

driver

If your train operating company's instructions tell you to make announcements using the public address system, you must not do so when the train is moving if you may become distracted and put the safe operation of the train in danger.

28 Rail adhesion

The people responsible: ***driver, signaller***

28.1 Levels of rail adhesion

There are three levels of rail adhesion conditions:

Level	Definition
Good	Rail adhesion conditions are good.
Expected	Rail adhesion is no worse than would be expected for the location and environmental conditions.
Reportable	Rail adhesion is worse than would be expected for the location and environmental conditions.

28.2 When to report rail adhesion levels

driver

You must follow your train operator's driving policy for low rail adhesion at locations where you expect to experience 'expected' adhesion levels. You do not need to report 'expected' adhesion levels to the signaller.

You must tell the signaller immediately if you experience 'reportable' rail adhesion levels.

signaller

If you are told about 'reportable' rail adhesion levels, you must tell Operations Control and take the following action.

Location where conditions apply	Action to be taken
Approach to a stop signal or an End of Authority (EoA)	Arrange for the driver of each train to be told about the circumstances unless the signal is showing a proceed aspect or an MA has been issued beyond the EoA
Controlled level crossing within the overlap of a signal or EoA	Close the crossing to road traffic before each train approaches
AHBC level crossing	Select the non-stopping mode (where provided)
Approach to a platform	Arrange for the driver of each train booked to call to be told about the circumstances
Dead-end platform	Arrange, if possible, for the platform to be taken out of use

signaller

When it is necessary for you to tell a driver about 'reportable' rail adhesion levels, you can do this by using the 'Acknowledged (safety) broadcast calls' arrangement.

driver

If you have been told about 'reportable' rail adhesion levels, you must approach the location using the method shown in your train operator's driving policy.

28.3 Arranging a controlled test stop

signaller

You must arrange for a train to make a controlled test stop at the location concerned, if one of the following applies.

- Operations Control tell you that the rail head has been inspected and nothing unusual has been found.
- Operations Control tell you that the rail head has been inspected, and improvement treatment carried out.
- At least 30 minutes have passed since you were told about the 'reportable' rail adhesion level.

signaller

In the case of a dead-end platform, you must not arrange for a test stop to be made unless you have been told that the rail head has been treated.

If possible, you must arrange for the test stop to be performed by a similar type of train to that which reported the conditions.

Before a controlled test stop is made, you must:

- arrange for the signal, where provided, to be cleared
- arrange for an MA to be issued beyond the EoA, if there is one
- where permissive working is authorised, make sure the platform line is clear.

driver

When the signaller tells you to make a controlled test stop, you must brake the train in the way that you would normally use for the environmental and rail adhesion conditions at the location, rather than the way that you would for 'reportable' rail adhesion levels.

Immediately after the controlled test stop, you must tell the signaller:

- the results of the test
- whether the rail adhesion level should still be considered as 'reportable'.

signaller

If the driver who made the controlled test stop reports that the rail adhesion level is still 'reportable', you must tell Operations Control, who will tell you when to arrange a further controlled test stop.

28.4 Resuming normal working

signaller

Until you are told that drivers are being notified by other means, you must continue to advise drivers.

You must continue to take any other action shown in section 28.2.

You must not resume normal working until a controlled test stop has been carried out and the rail adhesion level is no longer considered as 'reportable'.

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28.5 Serious wheel slip

driver

You must tell the signaller the location where serious or prolonged wheel slip is experienced. However, if you suspect the rail to be damaged, you must stop the train specially and tell the signaller immediately.

signaller

You must arrange for the affected portion of line to be inspected.

29 Route and traction knowledge requirements

The people responsible: ***driver, guard***

29.1 Driver's responsibilities

driver

When working a train, you must have the necessary knowledge for the entire route over which you are to work, or be accompanied by a competent conductor driver.

If the conductor driver is not familiar with the type of traction concerned, you must explain before starting the journey:

- how to stop the train in an emergency
- where the emergency equipment is kept
- how to shut down the traction unit in an emergency.

If you are being conducted over a portion of line you are not familiar with, you must take note of signals, speed restrictions, ERTMS lineside signs and other features about the line.

conductor driver

If you are the conductor driver, you must:

- take responsibility for the safe working of the train
- observe all signals and speed restrictions
- drive the train if authorised and competent to do so
- be competent in ERTMS on a train on which ERTMS is in operation.

conductor driver

If you are not driving the train, you must give the driver the necessary instructions concerning:

- signals
- speed restrictions
- gradients
- curves
- ERTMS driver machine interface (DMI) indications on a train on which ERTMS is on operation
- other features of the line the driver needs to know.

29.2 Guard's responsibilities

guard

When working a train, you must have the necessary knowledge for the entire route over which you are to work, or be accompanied by a person who has.

30 Sanding equipment

The person responsible: ***driver***

driver

If your train is equipped with manual sanding equipment, you must use this as necessary to assist with traction or braking.

You must, if possible, avoid using the sanding equipment:

- near to points and crossings
- during braking at speeds less than 12 mph (20 km/h)
- when at a standstill.

However you can use the sanding equipment in these situations if:

- it will avoid passing a signal at danger, an end of authority (EoA) without a movement authority (MA) or any other serious incident
- you are starting a train away
- it is necessary to test the sanding equipment.

You can also apply these instructions if your train is equipped with automatic sanding equipment, as long as your train operating company instructions state that you can.

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31 | Sidings and goods lines

The person responsible: ***driver***

driver

You must not allow a passenger train to enter a siding, a goods line or a goods loop unless:

- the arrangements have been published, or
- in an emergency, when authorised by the signaller.

32 Single line working

The people responsible: ***driver, guard***

32.1 In the wrong direction

If your train is to travel over the single line in the wrong direction, you must tell the guard. **driver**

You must consider the effect on: **driver, guard**

- station working, releasing doors and passenger safety
- protection arrangements if you have to carry out the requirements of Rule Book module M1 *Dealing with a train accident or train evacuation.*

32.2 Single line working where more than one running line is available

If your train is to travel over the single line in the wrong direction and the single line working arrangements have not been published in the *Weekly Operating Notice*, you must tell the guard. **driver**

If protection needs to be carried out as shown in Rule Book module M1 *Dealing with a train accident or train evacuation*, you must take into account the altered direction of train working under single line working arrangements. **driver, guard**

33 Single lines worked with a token, or with or without a train staff

The person responsible: ***driver***

33.1 Principle

Only one train at a time is allowed in a single-line section.

33.2 Entering or fouling a single line worked with a token or train staff

driver

You must always stop your train when you need to get, deliver or exchange a token or train staff.

Before you take a train onto the single line, you must make sure you get the correct token or train staff for the section you are about to enter from the signaller or person authorised in the *Sectional Appendix.*

Where a no-signaller token instrument is provided, you must ask the signaller or authorised person to release the token.

If you are the driver at the leading end of the train, you must show the token or train staff to the driver of any other locomotive at the leading end of the train before you enter the single line section.

You do not need to have the token or train staff, if any of the following apply.

- The line is under possession.
- Working by pilot is in operation.
- Modified working arrangements are in operation.
- You are authorised to pass the section signal on an electric token line at danger for shunting purposes.
- Your train is to enter the single-line section as an assisting train.

33.3 Handling the token or train staff

driver

You must keep the token or train staff with you in the cab from which the train is being driven until it is needed by a shunter.

If the token or train staff has been given to the shunter for shunting purposes, you must not continue with the journey until:

- shunting is completed
- the points have been locked in the correct position for trains to pass on the single line
- the shunter has returned the token or train staff to you.

When the train has reached the end of the section, you must:

- give the token or train staff to the signaller or the person authorised in the *Sectional Appendix*, or
- where a no-signaller token instrument is provided, place the token in the instrument or give the token to the authorised person to do this.

If your train has failed and an assisting train is to enter the section from a ground frame which is released by the token, the signaller will instruct you to take the token to the ground frame.

When you arrive at the ground frame, you must:

- contact the signaller
- not place the token in the instrument
- come to a clear understanding with the signaller about what is to be done
- hand the token to the driver of the assisting train.

If any portion of the train is left in the single-line section, you must tell the signaller before you leave the single-line section. You must keep the token or train staff until the whole train is clear of the single-line section.

If the signaller tells you that the front portion of the train is to continue on its journey, leaving the rear portion in the single-line section, you must then give up the token or train staff.

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driver

If the signaller has told you that, because of a failure of token instruments, trains will be run as if on a one-train working line where a train staff is provided, you must:

- handle the token as if it is a train staff
- not place the token in any instrument.

On a no-signaller token line, you must not transfer the token from one train to another unless it has been passed through a token instrument, except when:

- a train is to enter the section to assist, from the front, a portion of a train which has been left in the section
- you are told that due to a failure of token instruments, the single-line section will be worked as a one-train working line with train staff.

33.4 One-train working without a train staff

driver

You must not enter or foul the single-line section until the controlling signal is cleared unless one of the following applies.

- The line is under possession.
- Working by pilot is in operation.
- Modified working arrangements are in operation.
- Your train is to enter the single-line section as an assisting train.

If any portion of the train is left in the single-line section, you must tell the signaller. You must not leave the single-line section until you have told the signaller.

34 Snow conditions

The person responsible: ***driver***

driver

When snow is falling, or fallen snow is being disturbed by the passage of trains, you must carry out running brake tests as frequently as necessary to make sure that the automatic brake is operating effectively.

You must also carry out any other train operating company instructions.

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35 Starting a train

The people responsible: ***driver, person in charge***

35.1 Starting a train from a siding, depot or yard

person in charge

Before you give permission to the driver of a train leaving a siding, depot or yard to start the train, you must make sure it is safe to do so.

driver

Before you start a train from a siding, depot or yard, you must make sure it is safe to do so, and get permission from the person in charge, if there is one.

35.2 Starting a train assisted in the rear

person in charge

If a train is assisted in the rear, you must also give permission to the driver of the assisting locomotive for the train to start.

Person in charge in this section means the person in charge of movements at the location concerned.

36 Stopping a train at a station where the train is booked to stop

The people responsible: ***driver, guard***

You must stop your train at the platform as indicated by the car stop markers, where provided. — **driver**

Unless you are authorised to do otherwise, you must stop your train so that all doors used by passengers are at the platform.

If your train is to stop at a station where it is longer than the platform, you must, if possible, tell passengers leaving the train at that station to move along the train before reaching the station, or wait for the train to be drawn forward. — **driver of a DO train, guard**

You must make sure you do not release the doors until the train has stopped and is at the correct position at the platform. — **driver, guard**

You must make sure that you release the doors at the correct side of the train.

If the whole of the train will not be at a platform, you must make sure that you only release those doors that will be alongside the platform.

37 Stopping or stabling a train

The person responsible: ***driver***

37.1 Train shunted clear of the line or entering loop lines on other than track circuit block (TCB) or ERTMS lines

driver

If your train has not already passed the controlling signal box, you must tell the signaller immediately that your train has arrived complete with tail lamp and is clear of the running line when your train has:

- entered a loop or siding, or
- been shunted clear of the line on which it arrived.

37.2 Traction unit left unattended

driver

You must only leave your traction unit unattended when you are:

- handing it over to another competent person who is to take charge of it
- stabling the traction unit in either a depot, siding or other authorised place
- required to leave your traction unit unattended as instructed in the rules.

Each time you leave your traction unit unattended, you must make sure it is properly secured.

When you leave a traction unit on a dead-end platform line which has a red light on the buffer stops, you must make sure a red light is displayed on the end of the traction unit which faces approaching movements.

You do not have to display a red light if your train operating company instructions say that this is not necessary at that location because the traction unit will be sufficiently visible to an approaching movement.

37.3 Standing foul of any other line

driver

When stopping your train on a reception line or siding, you must make sure that the train does not stand foul of any other line.

38 Stopping short of, or overrunning a platform

The people responsible: ***driver, guard***

38.1 If the train is stopped incorrectly at a station platform

driver

When the guard is responsible for releasing the doors and you have stopped your train incorrectly at a station so that the whole of the train is not at the platform, you must tell the guard immediately using the bell or buzzer communication.

driver of a DO train, guard

You must immediately tell passengers not to get out of the train until it has been moved to the correct stopping position.

If the doors have been released by mistake, you must check that no one has fallen from the train before moving the train.

guard

If someone has fallen from the train or you are not sure whether someone has fallen from the train, you must tell the driver.

driver

You must tell the signaller if someone has fallen from the train, or you cannot be certain whether anyone has fallen from the train.

driver, guard

You must make arrangements, including where necessary with the person in charge of the platform, for the train to be moved so that those passengers who want to get off can do so safely.

driver

If the train is to draw forward or return in the wrong direction, you must only do this when all doors are closed and are no longer released.

You must get the signaller's permission before you make any of the following:

- a wrong-direction movement
- a movement towards a signal at danger
- any movement on a permissive platform line.

Before you make the movement, you must make sure you can do this without endangering anyone who has got off the train. **driver**

38.2 Returning to the platform after an overrun

If your train overruns a platform, it can only return to the platform if both of the following apply. **driver**

- The overrun is no more than 400 metres (440 yards) beyond the platform.
- You have received permission from the signaller.

You must tell the guard when permission has been given for the train to return to the platform.

If the train has to pass over a level crossing, you must make sure that the crossing is clear.

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39 Train in distress

The people responsible: ***driver, guard***

driver

If you cannot control the speed of your train or you need to alert anyone about some other emergency, you must:

- sound the 'train in distress' warning (a continuous series of long blasts on the high/loud tone of the horn)
- switch on the hazard warning indication if provided
- display a red light.

guard

If you become aware that the 'train in distress' warning is being sounded, you must:

- try to stop the train immediately
- contact the driver.

40 Train radio equipment

The people responsible: ***driver, guard, signaller, competent person***

40.1 Using the train radio safely

driver

Except in an emergency, you must only use the train radio when a train is moving if one of the following applies:

- You need to pass a message relating to the immediate movement of the train and it is necessary to do so before your next stopping point.
- You are responding to a 'contact signaller' or a 'contact train operator's control' message.
- You are allowed to elsewhere in the Rule Book.

Before you use the train radio when a train is moving, you must decide whether it is necessary and whether it can be done safely, taking into consideration:

- whether your train is running under cautionary signal aspects or you can see cautionary signal aspects ahead
- whether your train is approaching a location where it is necessary to reduce speed or you are running over a speed restriction
- whether you have reduced the speed of your train sufficiently before making the call to keep full control of the train throughout the call
- the movement authority and mode your train is operating in on an ERTMS line.

If a conversation cannot be completed quickly, you must end the call or stop the train.

If you need clarification, advice or information from a signaller, you must bring the train to a standstill before making a call.

driver If you receive a text message, you must only read that message when it is safe to do so.

signaller Except in an emergency, you must not use the train radio to speak to the driver unless you are sure that the train concerned is at a standstill.

signaller You can use the train radio at any time to send a ‘contact signaller’ message to get the driver to call you.

40.2 Communicating with the signaller

driver You must use the train radio (if available) as the normal method of communicating with the signaller.

You must only use a signal-post telephone if it is not possible to communicate using the train radio.

guard In an emergency, you can use the train radio (if available) to communicate with the signaller.

40.3 Signaller unable to contact the driver

signaller If you cannot contact the driver on the train radio, you must not send messages to the driver through anyone else. Instead, you must arrange for the driver to contact you direct.

40.4 Radio area boundaries

driver When your train passes a sign indicating the start of a GSM-R radio section, you must check that the GSM-R radio is operating and connected to the GSM-R network.

When your train passes a sign indicating the end of a GSM-R radio section, you must check that the alternative radio system is operational.

40.5 Making an emergency call

driver

You must only use the emergency call facility when it is necessary to give immediate advice for trains to be stopped or cautioned, or to call the emergency services, in connection with an accident, obstruction or other exceptional incident.

signaller

You must only use the emergency call facility when it is necessary to do so to stop the movement of trains, as shown in the train signalling regulations.

40.6 Railway emergency group call (REC)

a) Receiving a REC

driver

If you receive a REC, you must:

- bring your train to a stand immediately
- listen to the message.

b) During the REC

signaller

During the REC, you must:

- identify all trains that must remain at a stand
- instruct the drivers of those trains to remain at a stand
- get confirmation from the driver or competent person of each train that must remain at a stand that the message has been received and understood.

c) Ending the REC

When you are sure the emergency has been protected, you must end the REC with the phrase ‘End of railway emergency group call’.

driver

You must not consider the REC to be ended until the signaller has said this.

driver

d) Restarting trains

After the REC has been ended, you may restart your train as long as:

- you are sure your train is not affected by the emergency
- the signaller has not instructed you to remain at a stand.

You must proceed at caution as far as the next stop signal or proceed as indicated by the movement authority displayed.

In all other situations you must get authority from the signaller before you restart your train.

40.7 Duties of the competent person

driver

If the train radio in the leading cab has failed, a competent person may be provided in an alternative cab with an operative train radio as long as a direct means of communication is available between you and the competent person.

competent person

You must only use the train radio in an emergency to make a REC or respond to one.

You must only use the emergency call facility when the driver tells you or if you cannot contact the driver after you suspect an emergency.

If you receive a REC, you must:

- stop the train immediately
- listen to the message.

You must not consider the REC to be ended until the signaller has said 'End of railway emergency group call'.

If you have been instructed to remain at a stand you must confirm this with the signaller.

After the call has finished, you must tell the driver the content of the REC, including instructions regarding the movement.

41 Train requiring to stop in section

The person responsible: ***driver***

41.1 General

driver

You must tell the signaller, if necessary stopping the train at a signal or the signal box, before reaching the section of line in which the train has to work, if you are working:

- an engineering train that is required to work on a running line which is not under possession
- an engineering train that is to stop at a flexible train arrival point (FTAP) before working in a possession or protection zone (PZ)
- a freight train that is required to make an unscheduled call at an intermediate siding
- an officers' special train that is required to stop at a location that is not shown in the published notice.

You must:

- agree with the signaller a time when the section must be clear
- make sure your train has left the section by the agreed time.

41.2 Level crossings

driver

You must not stop the train within the controls of:

- an AHBC, unless it is under local control
- an automatic barrier crossing locally monitored (ABCL) or an automatic open crossing locally monitored (AOCL) level crossing.

41.3 Changing direction

driver

If the train is returning to the same end of the section at which it entered on a single or bi-directional line, you must ask the signaller for permission before the returning movement starts.

42 Train stopped out of course or unable to make normal progress

The people responsible: ***driver, signaller***

42.1 Driver's instructions

driver

If your train stops out of course for any reason, you must tell the signaller as soon as possible, including the reason for your train stopping.

If your train is only making slow progress and may be brought to a standstill, if you can, you must tell the signaller what is happening as soon as possible.

Examples of reasons a train cannot make normal progress would include:

- conductor rail icing
- rail-head adhesion
- insufficient traction power.

Whether you told the signaller because your train had stopped or was only making slow progress, you must carry out any instructions you are given by the signaller.

42.2 Signaller's instructions

signaller

If a driver tells you that a train has stopped out of course for any reason, or is only making slow progress and may be brought to a standstill, you must take any action that will prevent other trains being stopped as a result, and tell any other signaller who may be able to take similar action.

You must tell Operations Control.

43 Traincrew being relieved

The people responsible: ***driver, guard***

driver, guard

You must give the new driver or guard all necessary instructions and information about the safe operation of the train.

This must include:

- any operational requirements affecting the safe working of the train
- any defects with the train which the new driver or guard needs to know about
- any instructions given by the signaller.

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44 Trains put in danger

The people responsible: ***driver, guard***

44.1 When other trains are put in danger

driver

You must carry out the instructions in this section if you see:

- an obstruction on the line which could cause danger to other trains
- damage to structures or earthworks which could cause a danger to other trains
- a cow, bull or other large animal within the boundary fence, even if it is not an immediate danger to trains
- any other animal on or near the line which might be a danger to trains
- something wrong with another train.

You must tell the signaller by making a railway emergency group call (REC) on the train radio equipment.

You must warn the driver of any approaching train, if possible, by:

- sounding the horn
- switching on the hazard warning indication where provided.

If you cannot switch on the hazard warning indication, you must display a red light forward.

You must continue for at least 2 km (1¼ miles) beyond the obstruction and stop there.

You must then tell the signaller in the quickest way possible, if you have not already done so.

When the signaller tells you that signal protection has been provided, you must place a track circuit operating clip on each affected line.

You must place a track-circuit operating clip and three detonators 20 metres (approximately 20 yards) apart on each affected line if one of the following applies. **driver**

- The signaller cannot provide signal protection.
- You have not been able to contact the signaller.

If either of those applies, you must show a hand danger signal to any train that is approaching the obstruction.

If you see something wrong which could put another train in danger, you must, if possible, alert the driver of the other train by the most appropriate means. **guard**

44.2 When a following train is put in danger

If you see an obstruction or something wrong which could put a following train in danger, you must not proceed beyond the next stop signal until you have told the signaller. **driver**

44.3 When your train is put in danger

If you become aware of something which could put the safety of your train in danger, you must stop your train as soon as possible. **driver, guard**

You must, if possible, avoid stopping the train:

- in a tunnel
- on a viaduct
- at any other unsuitable place.

44.4 When trains will not be put in immediate danger

If you see something wrong which will not put trains in immediate danger, you must tell the signaller at the first available opportunity. **driver**

45 Trespassers

The person responsible: ***driver***

45.1 Reporting trespassers

The person responsible: ***driver***

driver

If you see any trespassers, you must report this to the signaller immediately using the train radio.

You must give the signaller as much information as possible including:

- train reporting number
- the location of the trespassers
- whether trespassers are on the lineside or on or near the line
- if the trespassers are moving, which direction they are moving in
- whether the trespassers appear likely to endanger trains
- a brief description of the trespassers. If possible, include distinguishing features such as age and what they are wearing.

45.2 Instructions from the signaller

driver

If a signaller has been told about trespassers on or near the line, the signaller will:

- stop your train if it would proceed over the affected portion of line
- tell you what is happening and to proceed at caution past the location where trespassers have been reported.

driver

If a signaller has been told, or has reason to believe, that trespassers are likely to endanger trains, the signaller will stop your train, tell you what is happening and tell you:

- to proceed at caution past the affected location
- if there is a tunnel in the affected section, not to exceed 10 mph (15 km/h) through the tunnel.

45.3 When the line is again clear

driver

If you find that the trespassers are no longer on or near the line, or do not appear to be in danger from approaching trains, you must tell the signaller.

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46 Vehicles labelled for repair or with a NOT TO BE MOVED board attached

The people responsible: ***driver, guard, train preparer***

46.1 Trains or vehicles with a NOT TO BE MOVED board attached

driver, guard, train preparer

If a train or vehicle has a NOT TO BE MOVED board attached, you must not allow:

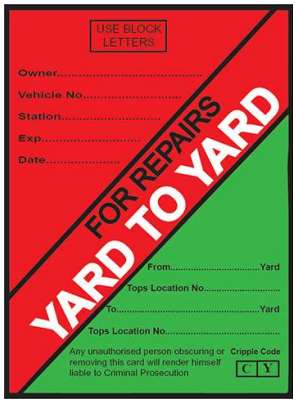
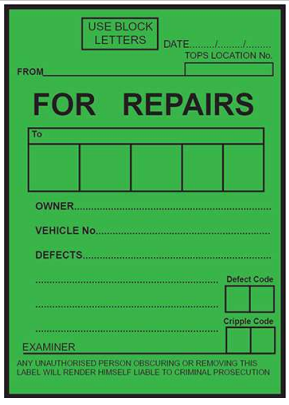
- it to start a journey
- it to be moved
- another vehicle to make contact with it
- the controls on a traction unit to be interfered with.

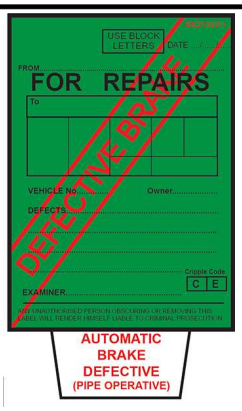
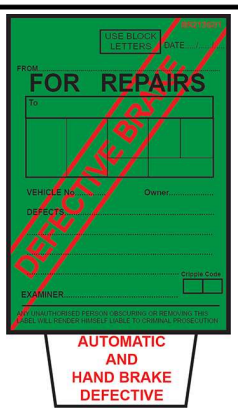
46.2 Vehicles labelled for repair

driver, guard, train preparer

If a train or vehicle has a repair label attached, you must make sure the movement restrictions on the label are carried out.

The meaning of each type of label is shown in the following table.

Label	Meaning	Example
NOT TO GO	Must not: • be worked away from the station, depot, yard or siding, or • be moved within the station, depot, yard or siding unless authorised by a rolling stock technician	
YARD TO YARD FOR REPAIRS	Must only make the journey to a maintenance depot shown on the label	
FOR REPAIRS	May complete the journey and then be dealt with as shown in train operating company instructions	

Label	Meaning	Example
AUTOMATIC BRAKE DEFECTIVE (PIPE OPERATIVE)	Must be treated as a piped-only vehicle	
AUTOMATIC AND HAND BRAKE DEFECTIVE	Must be treated as a piped-only vehicle and must be coupled to another vehicle unless suitably secured	

Label	Meaning	Example
HAND BRAKE DEFECTIVE	Must be coupled to another vehicle unless suitably secured	
FOR URGENT REPAIRS/ RESTRICTED MOVEMENT	Vehicle must be worked to a maintenance depot and must not exceed 35 mph (55 km/h)	

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47 Warning horn

The person responsible: ***driver***

47.1 General

driver

You must only use the horn as much as is necessary to give an effective warning or to make sure safe working takes place.

47.2 Warning tones to use

driver

If two tones are provided, you must use the horn as shown below.

If the horn has no soft/loud setting, you must use the setting provided.

Circumstances	Tones you must use
To give a warning to anyone on or near a running line	High and low tones - use the loud setting
To give an urgent warning to anyone on or dangerously near to the line	High tone - use the loud setting
When passing a whistle board	Low tone - use the loud setting
To give a warning when in a depot or siding	Low tone - use the soft setting
To sound a local or special code	High tone - use the loud setting
Wrong-direction movements	High tone - use the loud setting

47.3 Sounding the horn as a warning

a) Anyone on or near the line

driver

You must sound the horn to warn anyone who is on or near the line on which you are travelling.

Give a series of short, urgent danger warnings to anyone who is on or dangerously near the line who does not:

- acknowledge your warning by raising one arm above the head, or
- appear to move clear out of the way of the train.

b) Whistle boards

You must only sound the horn when passing a whistle board between 0600 and 2359, except in an emergency or when anyone is on or near the line.

c) Within a possession

You must sound the horn on starting your train when making a movement within a possession.

d) Wrong-direction movements

When making a wrong-direction movement on a running line for which there is no signal provided, you must sound a series of short blasts at frequent intervals.

e) Train movements

You must sound the horn at any other time you consider necessary.

48 Working on the outside of a train

The person responsible: ***driver***

driver

You must ask the signaller to stop trains on any adjacent line which could put you, another member of traincrew, or anyone else whose duties mean that person has to be with you, in danger if one of the following applies.

- You or the other person needs to work on the outside of your train ℹ after it has stopped because of a failure or other exceptional incident.
- You or the other person has to walk alongside your train.
- You or the other person needs to check that the working equipment on an on-track machine (OTM) is correctly positioned.

You must do this before you or the other person starts working or walking.

To arrange for trains to be stopped, you must:

- ask the signaller to stop the passage of trains on the lines concerned
- get an assurance from the signaller that this has been done
- reach a clear understanding about which lines have been blocked
- reach a clear understanding about which lines will stay open to traffic
- ask the signaller to read back to you the details that have been recorded.

If you are satisfied that the details recorded by the signaller are correct, you must confirm you understand the arrangements.

ℹ

Work includes checks or examinations for defects or damage which must be carried out to meet the rules, and minor repairs to your train that your employer has authorised you to carry out.

driver

The signaller will then give you an authority number. Until you are given this authority number, you must not consider the adjacent line as being blocked.

If your train is within a protection zone (PZ), you must ask the engineering supervisor to arrange with the signaller for an adjacent line to be blocked.

If you have arranged to stop the passage of trains for another person to work on the outside of your train or walk alongside it, you must explain the arrangements to that person.

When the work on the outside of the train has finished or you, or the other person have finished walking, you must tell the signaller that the normal passage of trains can be resumed.

You must give the signaller the authority number that you were given.

Notes

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Level Crossing Impact Assessment Report (IAR)

TACKLEY BRIDLEWAY LEVEL CROSSING

Station Passenger Crossing and Bridleway with Telephones



Prepared By:	
Name	Ian Aston
Signature	
Job Title	Route Level Crossing Manager
Organisation	Network Rail
Date completed	May 2024

1. Introduction

1.1 Network Rail Infrastructure Limited (**Network Rail**) has a responsibility and legal duty under legislation, including the Health and Safety at Work etc. Act 1974 for the health, safety, and welfare of its employees and for protecting others against risk, and that includes users of a level crossing.

1.2 Network Rail also has a legal responsibility under the Management of Health and Safety at Work Regulations 1999. Section 3 focuses on the requirement for suitable and sufficient assessments of risk to health and safety of employees and others in connection with their undertaking **[IA9]**.

1.3 Network Rail is committed to reducing the risk on the railway and has identified that one of its greatest public risks is at level crossings. This is where the railway has a direct interface with other elements e.g., vehicles and/or pedestrians. Network Rail is working to reduce this risk, so far as is reasonably practicable (**SFAIRP**).

2. Reason for the Risk Assessment

2.1 The Department of Transport (**DfT**) and Office for Rail and Road (**ORR**) mandate that where there would be an increase in public safety risk at a level crossing Network Rail must give due consideration to the impact this risk will introduce on existing rail operations and services and those who would use the crossing.

2.2 Here, at the Tackley level crossing (the **Crossing**), the increase in risk for assessment includes:

i. The real risk presented by misuse that occurs at the Crossing which resulted in a fatality in 2008
ii. That the Crossing needs to be assessed in its capacity as a station passenger crossing that also needs to take into account use by passengers who are defined as vulnerable users
iii. The non-compliant sighting for vulnerable and encumbered users from the down (west) side of the Crossing when looking towards a down direction (northbound) train's approach,
iv. A greater focus on horse riders [being approx. 1% of the total users identified] and the associated specific risks, and
v. A greater focus on cyclists [being approx. 7% of total users identified] and the associated specific risks.

2.3 Following several serious near-miss events the Crossing has been closed under a Temporary Traffic Regulation Order (**TTRO**) since 28 April 2020. The application to the Oxfordshire County Council being that it had been assessed as being unsafe for continued public use and could not reasonably be made safe. The Council confirmed temporary closure was justified and made the Order.

2.4 As part of the level crossing risk assessment process, data is entered into the industry accepted risk modelling support tool (All Level Crossing Risk Model – **ALCRM**) which enables Network Rail to compare risk at all level crossings throughout the network. Reinforced by qualitative assessment made by the Level Crossing Manager, the combined risk assessment is outlined in a site specific Narrative Risk Assessment (**NRA**).

2.5 However, as the Crossing is closed, a standard NRA which redetermines the correct ALCRM rating at the time the assessment is made is not appropriate, as the NRA would record zero

users, with a no risk score of 'M13'. This Impact Assessment Report (IAR) allows for the risk to be assessed and determined should the Crossing be brought back into use. An explanation as to ALCRM Risk Score is included at Appendix D.

2.6 The Crossing was also a Station Passenger Crossing (**SPC**) up until temporary closure and, prior to the temporary footbridge being installed was the only means for all passengers to access platform 2. That means the Crossing must be assessed with use by vulnerable users.

2.7 This risk assessment considers additional the risk associated with SPC, and concludes, if the Crossing is reopened, that requirement to mitigate risk so far as is reasonably practicable (**SFAIRP**) will not be met, given the unacceptable safety risk posed.

3. Information Sources

3.1 The reference sources used in risk assessment include:

- TRUST – Network Rail's train information software used to provide real train count data.
- Safety Management Information System (**SMIS**) – to identify recorded evidence of misuse.
- Geo-RINM Viewer for aerial photo and crossing profile.
- Google Earth for aerial photo and local information.
- Bing Maps for OS map.
- National Electronic Sectional Appendix (**NESA**) website for line speed & line diagram.
- Level Crossing Risk Management Toolkit (**LXRMTK**) website for potential mitigations.
- Automated Intelligent Video Review (**AIVR**) for capturing attainable train speed data

3.2 Further documents referred to throughout the text of this IAR are listed in Appendix B

4. Description of the Crossing

4.1 The technical specification for the Crossing:

Crossing details	
Name	Tackley
Type	FPG (Footpath with Bridle Gates)
Crossing status	Public Bridleway
Overall crossing status	Temporarily Closed
Current FWI (Crossing closed)	0.00
Current ALCRM Rating (Crossing closed)	M13
Current FWI (Crossing Open)	0.010388843
Current ALCRM Rating (Crossing Open)	C2
Route name	Western
Engineers Line Reference	DCL (Didcot-Chester Line), 72m 47ch
OS grid reference	SP485205
Number of lines crossed	2
Line speed (mph)	90
Electrification	No
Signal box	TVSC Oxford Workstation

4.2 The Crossing is located on the Dicot-Chester main line 9 (**DCL**) at 72 miles 47 chains just south of Tackley Station, in the Cherwell Valley 8 miles North of Oxford and 6 miles West of Bicester. Prior to its temporary closure the Crossing also provided the only access to Platform 2 for all rail passengers. The Crossing was a SPC up until the date of the (temporary) closure.

4.3 The Crossing is known as a passive crossing as there is no active method of warning users of an approaching train. A pedestrian user is therefore required to adhere to the Stop, Look and Listen notices, and to look both ways to ensure there are no trains approaching before making the decision to cross. Equestrian users are required to use the telephones to contact the signaller, to confirm if a train is approaching. There are whistle boards at the Crossing but these do not constitute an 'active' warning, as there is still reliance on human factors, and these whistle boards are not/cannot be sited at the required (extensive) distance from the Crossing with regard to a specific user group: vulnerable users (see below). The Crossing is also known as an unprotected crossing. This means it is not protected from train movements and therefore trains can traverse the Crossing, whether clear or not.

4.4 The Crossing: 'Up' Side approach.



Figure 1 – Up Side Approach

4.5 'Down' Side approach:



Figure 2 – Down Side Approach

4.6 It consisted of two 1.54m wide metal bridle gates set in the lineside boundary fence on either side of the Crossing. Of steel construction, these were self-closing gates positioned at the 'decision points' on either side of the railway. The Decision Point being the last position of safety on each side of the railway, being 2.1m on the 'Up' (eastern, Platform 2 side of the railway) and 2.4m on the 'Down' (western, village side of the railway) side from the nearest running rail, and where a user makes the decision whether it is safe to continue to cross.

4.7 The path over the railway crosses at 90^0 to the rails. A non-slip rubber deck was provided over the full length of the Crossing. The deck was made up to a level surface from the approaches, at greater width than the bridle gates, so was wide enough to accommodate all users. With white lines painted along the outer edge of the path, it was 9.4m in length, between the gates.



Up side Looking across crossing	Down Side looking across crossing

Figures 3 & 4 – Looking across Crossing from both sides.

4.8 The approach on the Down side leading to the gate was also made up, but showing signs of maintenance needed. On the Up side approach, the bridleway is a rural path, of compacted soil. At the bridle gate, the tarmacked surface extends roughly 1m outside the gate and turns 90^0, where it forms the pedestrian access to Platform 2.

4.9 Sufficient signage was included at the crossing, positioned either side of the bridle gates. Telephones were provided, with the instruction for equestrian users to telephone the signaller, to ascertain it was safe to cross with horses.

4.10 This instruction therefore requires the horse rider to telephone on each occasion, and which cannot be guaranteed they will comply. The risk is that in failing to ring the signaller, against a 2.1/2.4m decision point, (with 3m otherwise being required at bridle crossings as per NR/L2/XNG/30020/R03 - Requirements for station, footpath, bridleway and user-worked level crossings **[IA24]**) and with the horse rider also being considered as a vulnerable user in leading or riding a horse over a live railway, the horse rider is at a very high risk of an incident.

4.11 Aerial view of crossing:



Figure 5 – Bing Maps extract showing location of the Crossing



Figure 6 – Routeview Image of the Crossing from the south

4.12 Crossing Environment:



Figure 7 – Ordnance Survey map showing location of the Crossing

5 Rail Services

5.1 The Sectional Appendix outlines rail infrastructure, lines, and line speeds in the vicinity of the Crossing as follows:

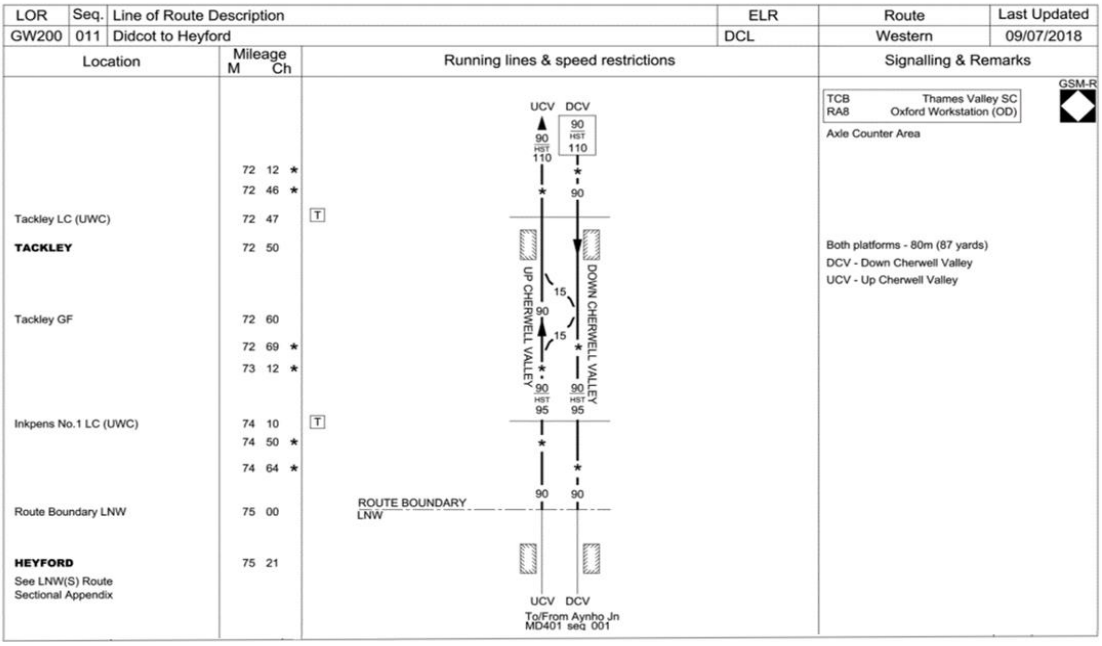


Figure 8 – Sectional Appendix extract showing location of the Crossing (Shown as Tackley LC (UWC))

5.2 The number of train services has reduced since the COVID-19 pandemic began so an average per weekday, of 114 trains, has been used in this risk assessment. This has been calculated by using TRUST to count the trains that actually ran over the crossing between 29/04/2024 – 03/05/2024 and dividing by the number of weekdays (5).

	29/04/2024		30/04/2024		01/05/2024		02/05/2024		03/05/2024	
	Passenger	Freight	Passenger	Freight	Passenger	Freight	Passenger	Freight	Passenger	Freight
	72	32	72	38	79	39	83	38	83	35
Total	**104**		**110**		**118**		**121**		**118**	

Figure 9 – Train count performed

5.3 This 114 number includes scheduled freight trains. This 114 number does not include any unscheduled trains, or engineering trains.

5.4 Generally, the greater the number of trains running the higher is the risk rating. Longer term aspirations for this key trunk route are likely to see enhancements, as to mean that high speed train services may increase significantly. With regard to future train movements, for modelling purposes, the following assumptions are used:

- Passenger trains run for 20 hours per day (0500 – 0200)
- Peak time is considered to mean a 4 hours period (two morning, two evening)
- Freight trains run for 24 hours per day (i.e. including during the NTQP)
- Freight train path utilisation is presently approx. 70% (i.e. not all booked trains run due to traffic demand or route selected)

5.5 There may be fluctuations on a day-to-day basis depending on business needs, including the running of passenger empty stock and engineering trains.

5.6 The line speed (of 90mph) is the attainable speed over the Crossing. Trains can achieve 90mph – in both directions – over the Crossing, when not booked to stop at Tackley Station. Evidence from AIVR (a programme of forward-facing video from trains for infrastructure inspection purposes) shows a class 43 inter-city train traversing the crossing at 88mph. Freight trains, dependent upon their classification, may be travelling at 60mph or slower; others up to their permitted maximum of 75mph thereby giving rise to even more variability in train approach warning times. Freight trains do not stop at the station.

5.7 Stopping trains for Tackley station will be travelling more slowly in both directions over the Crossing; accelerating on the Up line and decelerating on the Down line. Taking all daily trains together, this means a very considerable range and high variation of train speeds when on approach to and passing over, the Crossing, with significantly increasing risk.

5.8 Therefore, non-stopping, non-freight trains can and do pass over the crossing at 90mph – in both directions.

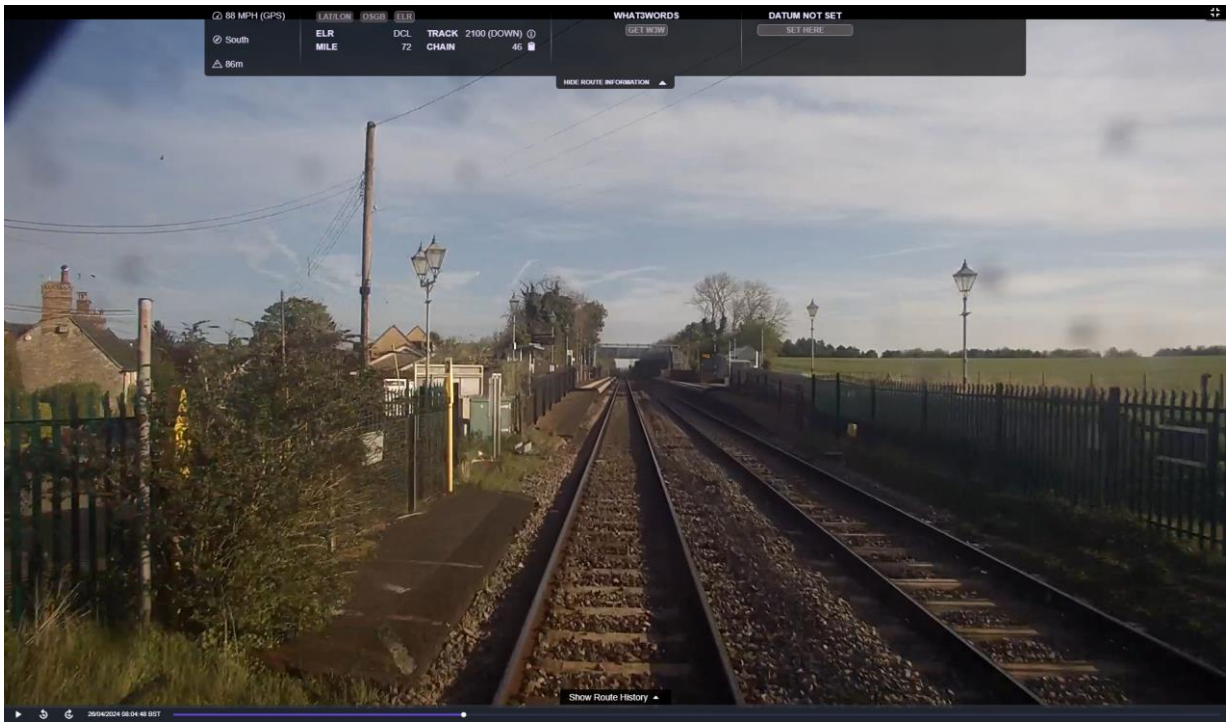


Figure 10 – Still from AIVR showing forward facing footage of a class 43 HST travelling at 88mph at the Crossing

5.9 Of the 114 trains per day, 25 are booked to stop at Tackley Station. This leaves, as shown in the train count in paragraph 5.2, anywhere from 47 to 58 trains traversing the crossing at 90mph - in either direction.

5.10 In addition, this section of line also features Bi-Directional signalling. In times of perturbation or degraded working, trains can travel in the opposite direction along the rails to normal running (i.e. approach on the nearest line from the left), sometimes known as 'running wrong road'. A user would not know when a train was travelling in the wrong direction on either of the tracks.

6 Crossing Usage

6.1 A 10-day census, carried out in October 2018 (**2018 Census**) and used for the reactive risk assessment following the near miss in October 2019:

October 2018	**Pedestrian use to access bridleway**	**Pedestrian use to access platform 2**	**Cyclist use**	**Horse rider use**
Fri 5th (from 10am)	23	9	2	0
Sat 6th	34	21	2	1
Sun 7th	59	2	6	2
Mon 8th	62	25	7	0
Tues 9th	47	37	9	0
Weds 10th	49	26	11	1
Thurs 11th	50	29	8	0
Fri 12th	29	30	4	0
Sat 13th	41	14	11	1
Sun 14th	49	1	2	1
Mon 15th (until 10am)	19	9	2	0

6.2 Using the above data, ALCRM calculated the usage of the Crossing to be 66 pedestrians, 7 cyclists and 1 horse rider per day.

6.3 The 2018 Census was re-used for a 2019 NRA, on the basis that it was the most up-to-date information available due to the reactive nature of the risk assessment.

6.4 Light usage of the Crossing was confirmed to occur from dusk through to sunrise. Some level of night time use was to be expected, as the Crossing is the only means of crossing between platforms; therefore anyone alighting from a late train on platform 2 would have needed to use the Crossing for accessing Tackley village.

6.5 No cyclist users recorded in the 2018 Census had been categorised as vulnerable users. The information available was as is presented above, with no specific, or indeed general vulnerable user categories specified. However, as the Crossing is used as a SPC, it must make adequate provision for all passengers/users of all personal mobilities. Consequently, the Crossing has to be assessed with suitable provision for vulnerable users, as well as non-vulnerable users.

6.6 The traverse time was calculated using the DfT's standard of 1.189m/s walking speed for pedestrians with ability where the level crossing has a good and even surface profile throughout.

6.7 Upon identification of an appropriate proportion of vulnerable users of a level crossing, Guidance Good Practice (LCG02 - Census Good Practice, issue 3 [**IA18**]**)** allows it to be assessed appropriate that the pedestrian traverse time – and by extension, the required sighting distance – be increased by 50%.

6.8 Separately, as Tackley is a SPC, for the reasons given in 6.5, the 50% increase must be incorporated.

6.9 Prior to closure of the Crossing in April 2020, a crossing watchman was deployed and counted usage over the Crossing between 13/12/2019 and 19/01/2020. The full census record is below:

Tackley Attendant's Census		Pedestrian	Station User	Wheelchair user / Walking Aid	Dog walker	Visually Impaired	Cyclist	Horse Rider	Total Users
Friday	13/12/2019	29	41	0	29	0	3	2	104
Saturday	14/12/2019	26	27	1	20	0	6	2	82
Sunday	15/12/2019	47	0	0	22	0	6	0	75
Monday	16/12/2019	22	36	1	21	0	7	0	87
Tuesday	17/12/2019	25	34	1	21	0	4	0	85
Wednesday	18/12/2019	Incomplete Data							
Thursday	19/12/2019	19	39	1	22	0	2	0	83
Friday	20/12/2019	21	37	1	17	0	4	0	80
Saturday	21/12/2019	34	44	0	22	0	11	0	111
Sunday	22/12/2019	46	0	0	28	0	1	1	76
Monday	23/12/2019	30	50	0	32	0	11	0	123
Tuesday	24/12/2019	24	21	0	29	0	2	0	76
Wednesday	25/12/2019	102	0	0	26	0	5	0	133
Thursday	26/12/2019	87	0	0	34	0	0	0	121
Friday	27/12/2019	29	12	0	34	0	3	3	81
Saturday	28/12/2019	39	39	0	23	0	5	1	107
Sunday	29/12/2019	68	2	0	31	0	11	2	114
Monday	30/12/2019	46	26	0	38	0	2	2	114
Tuesday	31/12/2019	74	17	0	35	0	1	0	127
Wednesday	01/01/2020	62	10	0	24	0	6	0	102
Thursday	02/01/2020	35	27	2	21	0	7	1	93
Friday	03/01/2020	48	31	0	28	0	8	2	117
Saturday	04/01/2020	52	19	0	24	0	12	4	111
Sunday	05/01/2020	44	0	1	28	0	11	0	84
Monday	06/01/2020	35	28	0	19	0	4	0	86
Tuesday	07/01/2020	36	40	0	33	0	5	0	114
Wednesday	08/01/2020	39	34	0	19	0	9	0	101
Thursday	09/01/2020	56	29	0	28	0	12	0	125
Friday	10/01/2020	44	39	0	20	0	9	0	112
Saturday	11/01/2020	43	32	2	26	0	18	3	124
Sunday	12/01/2020	61	0	0	33	0	14	12	120
Monday	13/01/2020	30	37	0	38	0	8	0	113
Tuesday	14/01/2020	20	35	0	28	0	4	0	87
Wednesday	15/01/2020	30	29	0	26	0	7	1	93
Thursday	16/01/2020	33	34	0	24	0	7	0	98
Friday	17/01/2020	40	48	0	31	0	5	0	124
Saturday	18/01/2020	49	11	0	25	0	9	2	96
Sunday	19/01/2020	89	0	0	33	0	15	4	141
	Total	**1614**	**908**	**10**	**992**	**0**	**254**	**42**	**3820**
	Average Daily	43.62	24.54	0.27	26.81	0.00	6.86	1.14	103.24

6.10 The user categories above are that as specified by the Route Level Crossing Team to the attendant.

6.11 The above census represents the extent of the data which is held on file from the attendants' period at the Crossing.

6.12 The above census results are the most recent observations Network Rail holds on the usage of the Crossing. These are the most recent observations available to any party. For, the Crossing was closed in April 2020 and so no newer census information can now be obtained.

6.13 Vulnerable users of a level crossing can, generally, be broadly defined as those who:

- are likely to take an extended time to traverse, due to one or more personal factors including disability, immobility or temporary distraction; and/or
- are likely to be at greater risk of harm due to their perception or reduced cognisance of risk.

6.14 Additionally are encumbered users, including those who are temporarily physically encumbered when using a level crossing because of their carrying, pushing (or pulling) an impeding possession – an encumbrance – which could include a buggy or bags, for example.

6.15 At Tackley, specifically, the attendant's census has identified numerous vulnerable users using the Crossing.

6.16 These included cyclists, dog walkers both on and off the lead, children, pedestrians using mobility aids such as wheelchairs, walking frames, and mobility scooters.

6.17 The attendants' census confirms the presence of vulnerable users. This therefore means that, separately from the Crossing's status as a SPC, the level of identified vulnerable use must be accounted for in risk assessment and mitigation.

6.18 Even if the Crossing's status as a SPC and the resulting requirement to consider the crossing as used by vulnerable users was ignored, the evidence of use by vulnerable users confirms that the crossing needs to be compliant for them, which it currently is not.

6.19 The census data shows that the equestrian usage is relatively occasional. It is observed that there were more days without horse riders than there were with.

6.20 What the census shows is that solo, one-way circular trips are made over the Crossing by equestrians, as evidenced by multiple days with one user observed. This has the potential to introduce risk as users may be unfamiliar with how to use a bridleway crossing safely.

6.21 The instructional signage informing equestrian users how to use the crossing safely was clearly visible to any equestrian user who may approach the crossing from either direction.

6.22 What could be inferred from the data, in the absence of a minute-by-minute breakdown, is that group rides also took place across the Crossing.

6.23 Evidence in the misuse record below (paragraph 7.1) shows that group rides did take place over the Crossing.

6.24 It could also be inferred that horse riders turn back on themselves at some point on their journey, and cross over the Crossing twice in one journey. There is, however, no direct evidence of this.

6.25 Evidence from the Level Crossing Occurrence Logs (a record of the phone calls made to the signaller from any specified level crossing) [**IA23**] shows that of the 42 horses taken over the Crossing during the census period, only 19 horses were accounted for by the phone logs.

6.26 It is possible that there is some (minor) mis-recording in the logs, for instance, the entry may show 'horse' when the user at the crossing had 2 horses, however this is deemed to be unlikely as there are multiple entries stating '2x horses' or, in one instance on 27/12/2019, '3x ponies'. Any instance of incorrect logging is therefore more likely to be down to poor information given by the user of the Crossing, rather than lackadaisical record keeping on the signallers' part.

6.27 Using the attendant's census, ALCRM calculates the usage of the Crossing to be: 96 pedestrians, 7 cyclists, and 1 horse rider per day.

6.28 This extended census represents an approximate 50% increase in the number of pedestrian users than identified at the Crossing in October 2018. The exact cause, if there is one, is unknown. The number of users accessing the station appears broadly comparable, so weather, other environmental factors, the festive period, or other, may be contributory factors to the 'leisure'-related increase.

6.29 The attendant's census is broadly comparable to the two 13 hour censuses carried out by Barwood Development Securities Limited in on 11/07/2016 and 07/09/2016 **[IA10]**, which captured 93 users and 126 users respectively. An assessment carried out in 2015 due to a high number of incidents at the crossing (15 in the preceding 12 months) used a combination of a quick 30 minutes census and a 7-day census from September 2014 in the ratio of 10:90. ALCRM calculated the number of users at the crossing for this assessment to be 93. Again, this is broadly comparable to the 2019-2020 attendant's census.

6.30 The attendant's census is considered to be an accurate record of the usage at the Crossing, and is the most current data available.

6.31 The RLCM has re-calculated the crossing risk for the purposes of this IAR using this extended census.

6.32 As the Crossing is closed and fencing alterations have taken place to facilitate the temporary closure, sighting distances, decking condition, signage condition etc. have not been re-assessed – the ALCRM assessment remains the same apart from updating the train and user numbers.

7. Incidents & Misuse

7.1 In addition to the fatality that occurred in 2008, incidents involving users of the Crossing (as per the definitions in Network Rail Work Instruction NR/L3/XNG/308 – Risk Assessing Level Crossings) **[IA11]** preceding the application made for the temporary closure of the Crossing under the TTRO are detailed below:-

Event Date	Description	Narrative Text
31/03/2020	LC (Level Crossing) Misuse - 5x horse riders crossed the Tackley LC without contacting the controlling Signaller.	The Level Crossing Manager reported Level Crossing misuse, Watchman reported 5x horse riders (3 adults and 2 children) crossed the Tackley LC without contacting the controlling Signaller. The Watchman contacted the Level Crossing Manager who reported the misuse to the BTP (British Transport Police). The Crossing Manager inspected the Crossing last week and confirmed as of then the signage was present and intact, and the sighting was clear visibility was good. The Oxford MOM (Mobile Operations Manager) was informed and was asked to check the Crossing again. At 13:01 the Oxford MOM reported signage was clear and present, all phones were working correctly to the controlling Signaller.
08/02/2020	LC misuse - Crossing user with horse at Tackley LC had failed to replace the phone correctly	The signaller reported that a crossing user with horse at Tackley LC had failed to replace the phone correctly, causing it to continually ring in. The driver of 1O10 secured the phone on the cradle.
18/01/2020	LC misuse - A person with a horse had requested to use Tackley level crossing but failed to ring back to report the crossing was clear.	TVSC (Thames Valley Signalling Centre) SSM (Shift Signaller Manager) West advised that a person with a horse had requested to use Tackley level crossing at 16:06 but failed to ring back to report the crossing was clear. TVSC Oxford signaller cautioned 1O20 (13:27 Manchester Piccadilly to Bournemouth) with the driver reporting the crossing gates were closed and the crossing clear. Normal working resumed at 16:27. S&T (Signals and Telecoms) confirmed that the crossing phones were working correctly and all signage was present and clear.
16/10/2019	LC near miss - 1S52 (1347 Southampton Central – Edinburgh Waverley) reported a near miss at Tackley Crossing with two elderly ladies	At 1539 the driver of 1S52, CrossCountry, (1347 Southampton Central – Edinburgh Waverley) reported a near miss at Tackley Crossing with two elderly ladies and their trolleys. The driver, who applied the emergency, advised that the train had missed the individuals by approximately 40 feet. It was thought that the ladies had alighted from 2V45, Great Western Railway, (1507 Banbury – Didcot Parkway). The driver was fit to continue.
27/07/2019	LC misuse - 2V29 (11:08 Banbury - Didcot PW(Parkway)) reported that while at a stand at Tackley, a young female walked across Tackley LC in front of the train in an attempt to get on the train	The driver of 2V29 (11:08 Banbury - Didcot PW) reported that while at a stand at Tackley, a young female walked across Tackley LC in front of the train in an attempt to get on the train. The driver remonstrated with the person and refused travel. It was not declared a near miss and the driver was OK
14/06/2019	LC Near miss - 2V23 (0937 Banbury – Didcot Parkway) reported a near miss at Tackley LC with two members of the public.	At 0958 the driver of 2V23 (0937 Banbury – Didcot Parkway) reported a near miss at Tackley LC with two members of the public. One of the persons motioned to the driver to stop. The driver was shaken by the incident but fit to continue to Oxford where they had booked relief. The BTP were advised. A Mobile Operations Manager attended and reported that signage and sighting was in order, but found that the telephones were not working correctly. The Mobile Operations Manager remained on site until S&T staff were able to rectify the fault by replacing the affected telephones, completed by 1420.
14/06/2019	LC failure - Defective phones at Tackley LC	The MOM reported that when the phones were tested at Tackely LC none worked. The signaller was able to ring the crossing and the fault cleared but still there were still repeated missed call. The MOM stayed on site until S&T staff arrived to rectify the fault. Didcot S&T have replaced the down side higher telephone used by Horse riders and also at the same time they have replaced the lower down side telephone housing to restore normal working at 14:20
09/06/2019	LC failure - Crossing telephones ringing in for no known reason, Tackley level crossing	TVSC Oxford signaller advised the crossing telephones at Tackley level crossing had been ringing in for an unknown reason. The signaller cautioned 1M42 (10:40 Bournemouth to Manchester Piccadilly) for the level crossing. Oxford MOM gave normal working to the TVSC Oxford signaller; the fault cleared when the down side telephone was tested. Didcot S&T were looking at replacing the higher down side crossing telephone for horse riders at a later date.
06/06/2019	LC misuse - Phone left off the hook after a crossing user used Tackley Level Crossing	TVSC Oxford signaller advised that that the phone had been left off the hook after a crossing user used Tackley Level Crossing. The driver of 1M34 (0845 Bournemouth - Manchester Picc) was asked to replace the phone. No further issues reported.
01/06/2019	LC failure - Defective phones at Tackley crossing	Oxford Signaller reported that the crossing phones at Tackley LC were ringing in with no one there. The signaller cautioned trains. The driver of 1E48 (1345 Reading - Newcastle) tested the phones & they were both working although still ringing into TVSC. Normal working resumed. Oxford MOM reported normal working resumed & the fault cleared after it was found that the Down side high level phone was not seated correctly. Didcot S&T tested all they could with the handsets and confirmed all phones were working correctly from their side so the fault was passed to Telecoms to check for a possible intermittent telecoms concentrator fault
21/05/2019	LC misuse - A cyclist crossed over in front 2V35 (12:34 Banbury to Didcot Parkway) at Tackley level crossing	The driver working 2V35 (12:34 Banbury to Didcot Parkway) reported deliberate crossing misuse at Tackley level crossing whilst at Tackley station on the up main Cherwell line. The driver has reported a cyclist crossed over in front of the train but did not classify this as a near miss. The only description given by the driver was a man had been dressed in black Lycra. The driver was okay to continue with the signaller running normally. Didcot S&T advises both telephones tested with no issues, all signage correct and intact with no sighting issues found

06/04/2019	LC misuse - 2V61 (1908 Banbury - Didcot PW) reported that as the train pulled into Tackley a male ran across the station crossing in order to catch the train.	The driver of 2V61 (1908 Banbury - Didcot PW) reported that as the train pulled into Tackley Station a male ran across the station crossing in order to catch the train. The driver did not declare the incident a near miss and confirmed that the male had boarded the train.
01/11/2018	LC near miss - 1M42 (10:45 Bournemouth - Manchester) reported a very near miss with 2 youths on Tackley LC.	The driver of 1M42 (10:45 Bournemouth - Manchester) reported a very near miss with 2 children on Tackley LC. The driver was shaken but able to continue. The driver of 2V35 (12:34 Banbury - Didcot), which was stationary in Tackley station at the time, reported that there is now nobody at the crossing, but believed that the two children got on his train. The MOM confirmed that the crossing signage was all correct and both phones were working properly. The train was met at Oxford by BTP however due to number of people leaving, the two suspects managed to leave the station before police could stop them. On viewing the CCTV it was confirmed that neither were children but young adults around the age of 20.
02/05/2018	LC misuse - 2V09 0608 (Banbury - Reading) reported that two males had walked over the crossing at Tackley (72m 47ch DCL) as the train approached	The driver of 2V09 0608 (Banbury - Reading) reported that two males had walked over the crossing at Tackley (72m 47ch DCL) as the train approached & then boarded the train. The driver stated this was not a near miss. Oxford MOM carried out crossing checks & all was found to be within specification.
13/02/2018	LC Misuse – 2V45 (15:07 Banbury to Didcot Parkway) reported a crossing misuse at Tackley.	At 15:30 2V45 (15:07 Banbury to Didcot Parkway) reported a crossing misuse at Tackley. The driver reported two teenagers accompanied with two adults had walked across in front of train; the driver did speak to them at the time. The Mobile operations manager was advised and had tested both telephones and check the signage at the level crossing with no issues found. The British Transport Police advised. Cause LC Misuse.
20/10/2017	Misuse LC – 2L47 (1508 Banbury to Oxford) reported a male run over the crossing in front of the train at Tackley LC.	At 15:45 2L47 (1508 Banbury to Oxford) reported a male run over the crossing in front of the train at Tackley LC. The male was seen leaving the railway. Driver was ok to continue. Normal working resumed. Level crossing misuse
02/09/2017	LC Misuse - a user at Tackley Crossing had not called back after use	At 1105 the Oxford Signaller reported a user at Tackley Crossing had not called back after use. Train 1O10 was cautioned. The Oxford MOM and BTP were advised. Normal working resumed at 1112 after 1O10 reported the crossing was clear. The MOM checked the crossing and all was OK. Cause - LC Misuse
03/05/2017	LC misuse. A woman crossed in front of 2P22 0625 Banbury - Paddington at Tackley LC	Oxford signaller advised that as 2P22 0625 Banbury to Paddington was coming to a stand at Tackley station a women (40-50 years old, dark hair with a suitcase) crossed over the crossing ahead of the train. The driver was fit to continue, not declared a near miss. The woman attempted to board the train but the driver had closed the doors. BTP advised reference 91.
18/04/2017	LC misuse. A man walked over Tackley LC in front of 1P25 0728 Banbury - Paddington	The Signaller at Oxford reported that when the Driver of 1P25 0728 Banbury to Paddington arrived at Oxford he reported a crossing misuse at Tackley where a white male in their 40's wearing a grey suit came from the Tackley village direction over the crossing in front of the train and onto the platform but was too late to board the train. Driver stated that this was not a near miss. The MOM carried out a crossing check and all was within specification.
26/11/2016	LC Misuse - 2L47 (15:08 Banbury to Oxford) reported whilst stationary at Tackley station, two passenger ran across the track over the level crossing.	Oxford Signaller advised the Driver working 2L47 (15:08 Banbury to Oxford) reported whilst stationary in the up platform at Tackley station, two passenger ran across the track over the level crossing in front of the train in attempt to board the train. The passengers were refused entry onto the train. Oxford MOM advised no issues at Tackley level crossing, all signage was in place. BT Police ref 330.
25/11/2016	LC Failure - Crossing telephone defective at Tackley LC	Level Crossing Manager advised he was unable to contact the Oxford Signaller from Tackley level crossing telephones (72m 47ch) from the down side telephone and the up side telephone was very noisy, he remained on site to avoid the need to caution trains. The Signaller could ring the level crossing and the Level Crossing Manager could hear the Signaller. Didcot S&T advised they changed both telephones at the level crossing but the failure was still present and the fault needed passing to Telecom's. The Telecoms Engineer on site at Oxford PSB (Panel Signal Box) reported the Oxford North concentrator had a system fault lamp lit, test calls made to the crossing but staff at the crossing still could not contact the Signaller. Techs were on route to Sandy Lane and Yarnton lane level crossing as any power down or reset will affect PETS (Public Emergency Telephone System) systems. Telecom's suspects he needed to change services card which required powering down the system. Manning of crossings required. The power down and power up would take about 30 minutes to complete. Telecom's Engineer advised he had changed over the suspect circuit board and was now in the process of testing the telephones. Oxford Signaller advised the fault had been booked in order at 18:25 with normal working resumed and all crossing staff stood down.
01/10/2016	LC Misuse - Crossing user failed to call back the signaller at Tackley LC	Oxford Panel Signaller advised that a crossing user at Tackley LC was authorised to cross over the railway with what was described as a frame. The user then failed to ring back to advise they were clear. The Signaller cautioned 4O52 09.31 Wakefield Europort - Didcot T.C. and 1M58 14.47 Bournemouth - Manchester Piccadilly and both trains confirmed the crossing gates were secure. Cause: Public error
12/08/2016	LC Misuse - User failed to call back clear following using Tackley LC.	Oxford Signaller advised that 1O22 (1427 Manchester Picc - Oxford) had been cautioned over the crossing at Tackley Station after a crossing user failed to phone back.

05/04/2015	LC Misuse - 1B25 (08:50 Paddington > Swansea) reported a jogger crossed Tackley whilst he was on approach.	Signaller Oxford reported that the Driver of 1B25 0850 Paddington - Swansea had reported on approach to Tackley crossing whistle board a jogger with a grey top ran across the crossing. Driver blew horn but did not apply brake & not a near miss. Driver was ok to continue. Oxford Mom reported that all signage was present and correct at the crossing.
28/03/2015	LC Misuse - Male crossed whilst 2P99 (23:45 Banbury > Paddington) was powering up to leave Tackley	Oxford Signaller advised on arrival at Oxford by the Driver of 2P99 (23:45 Banbury to Paddington) who reported a crossing misuse at Tackley. As the train was powering up to leave Tackley station a male crossed on the station crossing from the downside to the upside. Train was not yet moving, not considered a near miss, Driver was ok to continue.
19/03/2015	LC Misuse - 1P25 (07:28 Banbury to Paddington) reported deliberate crossing misuse at Tackley LC	Oxford Signaller advised by the Driver on 1P25 (07:28 Banbury to Paddington) that while stationary in the up platform at Tackley station he witnessed deliberate crossing misuse involving a passenger attempting to board the train. A member of the public was seen at Tackley Station level crossing and after the passage of 1M22 (06:15 Southampton to Manchester Piccadilly) on the down line, he walked across in front of 1P25, the passenger had not boarded 1P25. The Oxford MOM had been requested to go to Tackley Level Crossing and check the signage and sighting at the crossing. Oxford MOM advised, he had checked the signage, sighting and both crossing telephones with no issues found.
17/01/2015	LC Misuse - 2L47(1502Banbury > Oxford) reported whilst stationary a male with a dog crossed the crossing. Tackley LC.	Oxford signaller advised the driver on 2L47 (15:02 Banbury to Oxford) reported while stationary in the up platform at Tackley station, a male with a dog walked across in front of the train over Tackley (Bridleway) level crossing, not classified as a near miss. Oxford MOM on site at Tackley (Bridleway) level crossing, he checked both telephones, all signage and sighting with no issues found, he look around with nobody seen matching the description given.
22/11/2014	LC Misuse - User failed to call clear after using Tackley LC.	Oxford signaller reported that a lady asked permission to cross Tackley Crossing with 3 horses. The lady did not ring back to advise that she had crossed the crossing. 4O14 (09:40 Hamshlflt to Southampton) was cautioned but did not lose time as it was running early. Oxford MOM advised. Oxford signaller advised that he rang Tackley crossing and another user answered and confirmed that the lady and the 3 horses were clear of the line. Normal working resumed at 09:29.
16/10/2014	Person Trespass - 2P22 (06:25 Banbury - Paddington) reported 2 males cross the line infront of him at Tackley station whilst at a stop	07:07 Oxford signaller advised when 2P22 (06:25 Banbury to Paddington) arrived at Oxford the driver reported a trespass incident at Tackley. Whilst the train was stood in the up main platform at Tackley, the doors were locked and driver was preparing the train to depart the station, 2 males in their 20's or 30's crossed in front of the train whilst it was still stationary in an attempt to get on the service. However the driver had already locked the doors and did not let them board the service. Driver ok to continue. 0710 FGW (First Great Western) duty manage advised.
29/09/2014	LC Misuse - 2L47 (1508 Banbury-Oxford) reported male with dog crossed in front of his train whilst stationary at Tackley Station.	The driver on 2L47 (15:08 Banbury to Oxford) on arrival at Oxford Station reported a crossing misuse whilst stationary at Tackley Station on the up main line at 15:30. The driver reported a male with a dog walked across in front of the train going left to right. Oxford MOM will check the crossing for any signage or vegetation issues. BT Police were advised. Unit 166206 is fitted with a forward facing camera. FGW duty manager advised. At 1638 Oxford MOM advised that both telephones had been tested, all signage is correct and there are no vegetation issues at the level crossing. The Oxford MOM has removed a covert camera from the crossing and he will hand this camera over to the level crossing manager to see if there are any pictures from this latest crossing misuse. BTP Ref.335
20/09/2014	LC Misuse - 2L44 (12:16 Oxford - Banbury) reported person crossed in front of train at Tackley LC.	Oxford Panel advised that the driver of 2L44 (12:16 Oxford . Banbury) reported horn sounded for Tackley LC then someone crossed the lines. Driver did not report as a near miss. No description provided. Driver OK to continue. Signaller running normally. MOM advised and will check signage / sighting at the crossing. FGW advised and requested to obtain description from driver. FGW advised that the driver reported trespassers as two teenage girls but they were too far away to get any other description. BTP advised. Oxford MOM checked and Tackley LC and confirmed that all signage is in place and all telephones are working correctly. BTP Ref.261
08/09/2014	LC Misuse – MOP (Member of the Public) crossed LC against signage to board train at Tackley Station.	Oxford MOM advised that he was currently attending Tackley Station following a report from a member of rail staff that at approximately 0955 a Member of Public was seen to cross the line at the crossing (against the signage) to board 2P42 (0935 Banbury - Paddington) worked by 166205. MOM confirmed that all signage was in order (photos to be attached to CCIL (Control Centre Incident Log)). Panel were unaware of the incident, FGW requested to download FFCCTV (Forward-Facing CCTV) from unit. BTP aware locally.

05/09/2014	LC Misuse - 2P22 (0625 Banbury-Paddington) reported male ran across Tackley LC in front of his train. NOT a Near Miss.	Oxford signaller advised that the driver on 2P22 (06:25 Banbury to Paddington standing in the down platform at Tackley Station reported a male who was seen to run across the level crossing in front of his train and board the train. At the time of incident 1M18 (05:15 Southampton Centre to Manchester Piccadilly) was in the area but has not reported seeing anything. The driver has described the person as in his fifties, well built with a receding hair line, wearing a suit with no tie and carrying a ruck sack who went on the board 2P22 at Tackley Station. Oxford Station advised that they have spoken to a BT Police officer at Oxford station who will meet the train on its arrival. FGW and Cross Country advised. Oxford MOM will carry out a crossing check and he advised that the BT Police officer did meet the train and took the male away for questioning. Cross Country advised they have reviewed the front and rear CCTV on 1M18, this does not show anyone at or near the crossing. Oxford MOM on site at Tackley advised there are no issues with the signage, telephones or vegetation. BT Police have requested pictures from the forward facing camera on unit 165117. BTP Ref.86
08/08/2014	LC Misuse - 2L45 12:42 Banbury to Oxford reported a man walk out onto the crossing at Tackley.	Advised by Oxford Signaller that driver of 2L45 12:42 Banbury to Oxford reported a man walk out onto the crossing at Tackley, NOT a near miss, driver was ok to continue. Signaller was running normally. FGW Duty Control Manager informed. Oxford MOM checked the signage. MOM had already been to Tackley crossing just before the incident, he checked the signs were all correct between 11:17 and 12:30. Cause - Public Error
06/08/2014	LC Misuse - 2P42 (0935 Banbury-Paddington) reported male walked in front of his train at Tackley LC. Not a Near Miss.	Advised by Oxford Signaller that driver of 2P42 (0935 Banbury to Paddington) reported that as he was leaving Tackley Station a male, wearing a green jacket, walked out onto Tackley crossing. Driver states NOT a near miss and is OK to continue. Oxford MOM will carry out a crossing check. Oxford AOM (Area Operations Manager) confirms that he will meet the driver on 2P42 upon arrival at Oxford to ensure he is OK. At 1207 Advised by MOM that all signage is clear and legible.
07/07/2014	LC Misuse - Person crossed in front of IP25 (0728 Banbury-Paddington) as it was pulling into Tackley Station. Not a Near Miss.	Oxford signaller reported that 1P25 (0728 Banbury - Paddington) is currently stood at Tackley Station with the driver refusing to depart until a passenger gets off the train. Member of Public crossed in front of 1P25 as it was pulling into the station then boarded the train, driver not alleging a near miss. FGW Duty manager made aware. At 0754 1P25 was on the move from Tackley, FGW arranging for the train to be met at Oxford by BTP.
27/05/2014	LC Misuse - Person with two horses failed to call clear at Tackley LC.	Oxford signaller advised that a person with two horses had requested permission at 11:37 to use the level crossing at Tackley Station (72m 47ch) but had failed to call back to say he was clear of the crossing. The signaller will caution 1M38 (09:45 Bournemouth to Manchester Piccadilly) over the crossing. Oxford MOM requested to check the level crossing at Tackley. At 1146 Oxford signaller advised that the person with the two horses had just telephoned in to say he was clear of the crossing. He has apologised about the lateness of the call but he forgot to call back and had only just realised. The signaller has not cautioned 1M38 and the train is still running normally. Oxford MOM has been called off.
18/04/2014	LC Misuse - Oxford Panel reported a lady with 6 children had asked to across Tackley Crossing but didn't ring back when clear.	Oxford Panel reported a lady with 6 young children had asked to go across Tackley Level Crossing and had been authorised to do so and instructed to ring back when clear. Lady did not phoned back and 1M50 13:22 Southampton - Manchester Piccadilly had been cautioned. BTP advised (log 293). Signaller advised crossing was clear. MOM advised and checked the signage/phones/sighting. At 15:44 Oxford MOM reported that the signage sighting were all in order. Crossing phones were working correctly. Normal Working Resumed
04/03/2014	LC Misuse - 2P42 (0935 Banbury to Paddington) reported person ran in front of train at Tackley Station FP LC. Not a Near Miss.	Oxford signaller advised the driver working 2P42 0935 Banbury to Paddington had reported crossing misuse at Tackley. As 2P42 started to move off, a person intending to join service ran across the station foot crossing ahead of train. Driver did not need to apply brakes and has not categorised as near miss. Driver was OK to continue. FGW advised.
29/01/2014	LC Misuse - A regular user with a horse had failed to ring back after crossing Tackley LC. Cause - Public Error.	Signaller Oxford reported that a regular user with a horse of Tackley LC 72m 47ch DCL had failed to ring back. Signaller advised the Driver of 1M34 08:45 Bournemouth - Manchester Piccadilly to report any findings. Cross Country Trains advised. Signaller Oxford reported that the Driver of 1M34 reported the crossing was clear and all gates were secured. Normal Working Resumed. Cause - Public Error
17/12/2013	LC Misuse - 1P25 (0727 Banbury - Paddington) reported that whilst at a stand at Tackley a person walked across the LC and boarded the train.	1P25 (0727 Banbury - Paddington) reported that whilst at a stand at Tackley a person walked across the level crossing and boarded the train. Not a near miss. The MOM checked all signage and reported it as fit for purpose.
03/09/2013	LC Misuse - MOP at Tackley LC reported that a lady crossed over the crossing with a horse without asking permission of the Signaller.	A MOP at Tackley LC between Banbury and Oxford reported that a lady crossed over the crossing with a horse without asking permission of the Signaller. The reporter advised the lady was aged about 45 wearing a pink top, with a brown horse. Both were clear of the line. The Signaller was running normally. BTP ref 473. The Oxford MOM tested both telephones. No signage or vegetation problems found.

13/07/2013	LC Misuse - 2L39 (0902 Banbury - Oxford) reported a person crossing Tackley Level Crossing whilst on approach.	2L39 (0902 Banbury - Oxford) reported a person crossing Tackley Level Crossing whilst on approach. The driver challenged the person, who gave her name and address. The driver was fit to continue. The unit was fitted with a forward facing camera, which would be downloaded. BTP ref 171.
29/06/2013	LC Misuse - 2L39 (0902 Banbury-Oxford) reported female with dog crossed in front of train at Tackley LC. Not a Near Miss.	Advised by Oxford signaller that driver of 2L39 (0902 Banbury to Oxford) reportsed that a lady with a dog walked over Tackley LC in front of the train, NOT a near miss. Driver is OK to continue. FGW Duty Control Manager informed. Oxford MOM will check the crossing phones and signage. At 1541 Advised by MOM that all signage was clear and readable, sighting in both directions is good.
06/06/2013	LC Misuse - MOP tried to cross Tackley LC to board 1P25 and had to step back off as 1M22 (0615 Southampton Central - Man Picc) approached.	1P25 (0727 Banbury - Paddington) reported crossing misuse at Tackley Station. A MOP tried crossing the line in front of 1P25 to board the train, and the person had to step back off the crossing as 1M22 (0615 Southampton Central - Manchester Piccadilly) approached. Neither driver reported the incident as a near miss. BTP ref 90.
05/06/2013	LC Misuse - 2P42 (0935 Banbury - Paddington) reported whilst carrying out station duties at Tackley 2 people crossed the LC in front of his train.	2P42 (0935 Banbury - Paddington) reported that whilst carrying out station duties at Tackley, two people crossed Tackley LC in front of his train and boarded it.
05/06/2013	LC Misuse - 1P25 (0727 Banbury - Paddington) reported crossing misuse at Tackley LC involving 4 persons trying to catch his train.	1P25 (0727 Banbury - Paddington) reported crossing misuse at Tackley LC involving 4 persons trying to catch his train. The driver did not class the incident as a near miss and was ok to continue. FGW Duty Manager advised.
31/05/2013	LC Misuse - Woman with two horses used Tackley LC after permission had been refused.	Oxford signaller advised that the driver of 2L47 (15:08 Banbury to Oxford) approaching Tackley Station to call on the down main line had witnessed a young lady in her twenties wearing a blue top and ridding jompers, lead two horses across the level crossing just ahead of the station. Not classified as a near miss as the train was calling at Tackley Station and driver was OK to continue. The Oxford signaller advised at 15:30 he had refused permission for a person with horses to cross over the crossing due to 2L47 approaching. FGW senior controller advised, will check the driver at Oxford Station. Oxford MOM advised and will go to check the level crossing. At 1627 Oxford MOM advised that both telephone had been tested, signage is in good condition and no vegetation issues at Tackley LC. BTP Ref.341
13/05/2013	LC Misuse - 1P25 (07:28 Banbury to Paddington) reported a man & a boy walked down side to up side at Tackley LC ahead of the train.	1P25 (07:28 Banbury to Paddington) reported a man and a school boy walked from the down side to the up side at Tackley LC ahead of the train. Not reported as a near miss and the driver was ok to go forward. The man was white and about 6'2", and the boy was aged 12-13. BTP Ref 71. The MOM checked the crossing signs and phones and all were in order.
10/04/2013	LC Misuse - Child rang to use the crossing at Tackley station but did not ring back.	Oxford Panel reported a child had rang to use the crossing at Tackley station but had not rang back. 1E68 (1746 Southampton to York) would be cautioned. The driver of 1E68 reported no-one seen and all the gates were shut. NWR (Normal Working Resumed).
19/02/2013	LC Misuse - Two males walked in front of 1P25 (0728 Banbury-Paddington) as it pulled away from Tackley Station.	Oxford signaller reported crossing misuse at Tackley LC. Two males had walked across in front of 1P25 (0728 Banbury - Paddington) as it pulled away from Tackley Station on the UM (Up Main) line at 07:48hrs. Driver reported to the signaller that this was not a near miss and he is fit to continue. FGW advised at 07:57hrs. Oxford LOM (Local Operations Manager) requested to dispatch Oxford MOM to be to Tackley Crossing. Oxford MOM will attend and check crossing equipment at Tackley. At 1015 Oxford MOM reported that all phones and signage had been checked and all was OK. BTP Ref.75
15/01/2013	LC Near Miss - 1P25 (0728 Banbury - Paddington) reported a near miss at Tackley Station LC with a MOP.	1P25 (0728 Banbury - Paddington) reported a near miss at the crossing at Tackley Station with a member of the public who traversed Tackley LC as the train approached. The MOP gave the driver some abuse when challenged. The driver was shaken by the incident and was relieved on arrival at Oxford. NWR after all signage and telephones were found to be in order. The driver further reported that the MOP was a known person in the area, and his house was on the corner of the crossing. The MOP was crossing with two Springer Spaniel dogs. The incident was witnessed by a Ticket Examiner. FGW were investigating further. BTP ref 79.
06/01/2013	LC Misuse - Oxford Signaller advised that two users on horse back failed to call back to the Signaller as requested at Tackley Crossing.	Oxford Signaller advised that two users on horse back failed to call back to the Signaller as requested at Tackley Crossing. The MOM was asked to check the area was clear before the first train was due over at 0940. BTP advised. Signaller advised normal working resumed at 0908 after the MOM had checked the crossing was clear. The gate was closed and phones were operational. BTP updated.
03/01/2013	LC Misuse - 2P82 (1837 Banbury to Paddington) advised whilst at a stand a young male ran across the crossing at Tackley.	Oxford Panel reported that the driver of 2P82 (1837 Banbury to Paddington) advised of crossing misuse at Tackley Station. Whilst at a stand a young male ran across the crossing. Not being classed as a near miss. The Oxford MOM was requested to check signage etc at the crossing. BTP ref 490. The Oxford MOM advised both telephones were tested and found to be working correctly, all signage was in place and there were no sighting issues

31/07/2012	LC Misuse - 1P25 (0726 Banbury-Paddington) reported 3 people walked over Tackley Holt LC in front of his stationary train.	Oxford signaller advised that the driver of 1P25, 0726 Banbury to Paddington, reports that while he was at a stand in Tackley Station 3 people walked over Tackley Holt LC. No description was given by the driver and it was not considered to be a near miss. Driver is OK to continue. Trains running normally. Oxford MOM will check the signage at the crossing. At 0837 Advised by MOM all signage was in good order and clearly visible.
17/07/2012	LC Misuse - Person using Tackley 1 Level Crossing failed to call back to confirm clear.	At 1958 the Oxford Signaller advised that a person using the crossing at Tackley had failed to call back to confirm that they were clear. 4E70 (1640 Southampton - Wakefield) would be stopped and cautioned as a result. At 2009 the Signaller advised that the driver of 4E70 reported the crossing clear and the gates closed. NWR. BTP ref 631.
05/06/2012	LC Misuse - The Oxford Signaller reported kids playing with the phones at Tackley Crossing.	At 1126 the Oxford Signaller advised that kids were playing with the phones at Tackley Crossing. The driver of 1O84 would be cautioned. The Oxford MOM was advised. BTP Ref 153. At 1145 normal working resumed after the driver of 1O84 reported no one seen. At 1205 the MOM confirmed no one seen.
28/03/2012	LC Failure - MOP reported that the Down side phone was not working at Tackley LC.	At 1715 the Oxford Signaller advised that a MOP had reported that the Down side phone was not working. The Signaller was cautioning trains. The Oxford MOM, and Didcot S&T were advised. At 1742 the MOM was on site. Normal working resumed. At 1834 the MOM advised that the Tech's had arrived on site and the new handset did not work either. It had been proved to be a fault with the handset as when the Up side phone was unplugged and tried on the Down side it worked. The Tech's were returning to base for another handset. The MOM would remain at the crossing so that trains could run normally. At 2054 the fault was booked in order after the handset was replaced.
21/03/2012	LC Misuse - Users with horses failed to confirm clear after using Tackley LC. BTP 605.	At 1829 the Oxford Panel Signaller reported users with horses were authorised to use Tackley Level Crossing and ring back clear, but they had failed to do so. The Driver of 1V91 (14:35 Newcastle - Reading) would be cautioned, and the MOM was advised and en route. Cross Country were advised. At 1838 the Signaller advised that the Driver of 1V91 reported the crossing clear and the gates were closed. At 1915 the MOM advised that the crossing had been checked, and all phones were working and the signage was correct. BTP ref 605.
23/06/2011	Crossing gate left open at Tackley LC.	Advised by Oxford signaller that driver of 4M68 had reported that the crossing gate at Tackley crossing had been left open. Signaller requested driver of 2E95 to stop and close the gate. 1725 Normal working resumed.
19/05/2011	1M70 reported Near Miss with Trespassers at Tackley LC.	At 1948 the driver of 1M70, EH, 1745 Bournemouth – Manchester Piccadilly, reported a near miss at Tackley Footpath Crossing with a group of three persons jogging across the crossing in front of the train. The driver was fit to continue, Mobile Operations Manager attended and reported that the crossing equipment and sighting were in order. Normal working resumed at 2237.
02/05/2011	A member of the public reported that the Down side phone was not working at the Tackley LC.	At 1615 a member of the public reported that the Down side crossing phone at the Tackley LC was not working and trains were cautioned as a result. Techs attened the site at 1945 and rectified the faulted, but the phone then began ringing into Oxford Panel on its own. S&T tested the phone again and stated that it was in working order.
28/06/2010	4M61 reported a near miss with an elderly couple at Tackley LC.	At 1519 the Driver of 4M61 contacted the Signaller at Oxford PSB and reported a near miss with an elderly couple at Tackley Level Crossing. The Driver stated that they had been travelling at 75mph and was approximately 40m from the Crossing when they sighted an elderly man. The OAP stepped out before crossing quickly over as the train approached and was then followed by an elderly lady. The Oxford MOM attended the site and confirmed that there appeared to be no defects associated with the Crossing. The MOM carried out sighting from both the Up and Down sides before stating that trains were visible from 650m on the Up and 390m on the Down. There was no vegetation obscuring the view and all equipment was functioning correctly. BTP Ref: 356
01/06/2010	1V89 reported 4 children playing chicken on Tackley Level Crossing.	At 1646 the Driver of 1V89 contacted the Signaller at Oxford and reported that they had to apply the brakes upon approach to the Level Crossing at Tackley due to four children playing chicken on the Up line. The Driver stated that they were very close to the children but did not classify the incident as a Near Miss. This was later changed by the Driver and reclassified as a Near Miss event. Normal working was resumed at 1656 after 1M58 reported that the Crossing was now clear and that all gates were closed. Crosscountry Trains later stated at 1732 that when the emergency brake was applied it activated the 'One Shot Sander'. However this was not a problem, but the unit was taken out of traffic at Birmingham. The Thames Valley Police were in attendance at 1745 and carried out a thorough search of the nearby area without finding anything or anybody suspicious. The MOM had checked all signs and warning boards and stated that all were in the correct place. All persons then left the site. BTP Ref: 403
05/11/2009	1V87 reported a near miss with a group of people on Tackley Foot Crossing.	Oxford panel advised that they had received a report from 1V87 that they had experienced a near miss with a group of people on the foot crossing at Tackley. The driver reported that the people had to run clear of the train. BTP Ref: 323

26/09/2009	1O42 reported a near miss with a child at Tackley LC	15:10 The driver of 1O42 reported a near miss with a 3 - 4 year old child at Tackley Level Crossing. 15:18 The driver of 1O42 thought that he may have struck the child but a second user at the crossing called the signaller and reported that they had witnessed a family with a young child leaving the crossing, shouting at the child. The signaller cautioned train 2L47 16:01 Oxford MOM reported that all signage is in place and that sighting is good. BTP Ref: 336
24/06/2009	4M55 (Freightliner) - Driver Failed To Sound Warning Horn At Crossing	1110 Advised by Oxford PSB that at 1100 a member of the public reported at Tackley Crossing the Driver of a Train identified as 4M55 0855 Southampton to Lawley Street Freightliner Intermodal service on the DML failed to sound the Horn at the Whistle Board on approach to the crossing, Oxford MOM asked to attend to check the crossing signage and position of the board. 1200 Updated by the Oxford MOM nothing untoward found at the crossing, Whistle Board is in position, and no sighting issues reported. Ranking provided to update PIM model for historic OI events as per instruction 01/12/15, ranking will be amended should the Responsible Manager provide a ranking in a future date. No additional details have been provided.
16/02/2009	1M54 (Cross Country) - Near Miss With Pedestrian On Crossing	1552 Advised by Oxford PSB that the Driver of 1M54 1345 Bournemouth to Manchester Piccadilly had stopped at DM 75 Signal to report a near miss at Tackley Crossing on the DML, a Female approximately 50 years of age walking right-left failed to acknowledge the Drivers Horn, the driver was ok to continue, an off duty FGW Standards Manager was travelling onboard the Train to Banbury and spoke to the driver at Banbury, Cross Country Control advised. 1605 Oxford MOM advised and asked to attend the crossing and check signage etc. 1610 BTP advised REF 440. 1619 NOC advised. 1955 Updated by the Oxford MOM that after attending Tackley Crossing everything is positioned correctly.
23/12/2008	Signaller advises an LC user has failed to ring clear.	The Oxford signaller reports a crossing user failed to phone clear at Tackley Crossing, 1M34 will be cautioned and asked to report back. Cross Country advised. The Oxford signaller advises at 10:48hrs the driver of 1M34 reports all clear at Tackley Crossing.
12/09/2008	Crossing User Failed To Report Clear	1012 Oxford PSB signaller called to report that a crossing user who requested to use Tackley crossing with a horse failed to call back. Signaller will caution 4M50 0725 Southampton to Basford Hall on the down or 1O08 0724 Manchester Piccadilly to Bournemouth on the up to check if crossing is clear. 1025 Normal working resumed.
13/04/2008	Crossing User Failed To Ring In Clear	1609 Oxford panel advise that person on horse requested to use crossing at Tackley but has not reported back to say all clear, requested NRN (National Radio Network) broadcast made to 1V20 1325 Manchester Piccadilly to Oxford to contact signaller. 1614 Advised by Oxford PSB back to Normal Working driver of 1V20 had reported crossing clear.

7.2 The near miss on 16th October 2019 resulted in Western Route's managing director stationing the attendant at the Crossing, up until the Crossing was closed. This was in part due to the similarities between this near miss incident and the fatality in 2008.

7.3 Regarding misuse, users were identified being subject to making accidental human errors of judgment when using the Crossing. This included:

- users who did not look for approaching trains, or only ever looked in one direction, or only looked when actually stood on the Crossing deck
- pedestrians using the crossing whilst wearing headphones or using the crossing while actively using mobile phones
- pedestrians distracted when crossing with horses or dogs
- Users for the station with heavy luggage encumbering their mobility

7.4 Users who deliberately misused the Crossing were identified to include:

- Pedestrians running out in front of an approaching train and not looking in the opposite direction
- Pedestrians running out when a train is stood at a platform that they wished to catch, and not looking in the opposite direction

- Pedestrians crossing when a train is stood at a platform from which they have just alighted, and not looking in the opposite direction
- Youths congregating in the vicinity of the Crossing.

7.5 It is highly likely that, should the Crossing re-open, a similar number of incidents of misuse (whether accidental human error or deliberate) and near misses will occur again at the Crossing.

7.6 The incident history shows that misuse has been a common occurrence at Tackley, and there is no evidence to show or reason to believe that this would change following the Crossing re-opening.

7.7 Vulnerable users cannot receive sufficient warning of a down direction train's approach and are therefore at unacceptable risk.

7.8 Signage instructed horse riders to contact the signaller before crossing, to ascertain if it was safe for them to do so. There have been numerous reports of this not occurring, though this is only recorded if it is witnessed either by staff on site, a member of the public who reports it, or the driver of an approaching train who sees a horse and rider on the Crossing.

7.9 Horse riders place both themselves and the railway at risk if misusing the Crossing. A horse rider can take longer than a pedestrian to operate gates, control their horse over the crossing, and exit the Crossing on the other side, thus increasing the warning time required. This is the reason why horse riders were instructed to telephone.

7.10 As can be seen from the table above there have been numerous incidents of equestrian users not using the Crossing correctly. Three of which occurred whilst there was a railway presence at the Crossing in the form of the attendant. Notably, after the attendant was placed at the Crossing, all of the reported incidents involved horse riders.

7.11 On 18/01/2020, a horse rider failed to telephone the signaller to report the Crossing clear and safe for the passage of trains, as instructed to do so when originally telephoning the signaller to check their traverse. This led to operational delay as the next train was cautioned over the Crossing to confirm it was clear. When not receiving a call back after instructing a user to do so, signallers are required to caution the next train in case there is an obstruction, in this case a horse with the potential to derail a train, on the line.

7.12 On 08/02/2020 a user failed to replace the handset correctly, causing it to continually ring into Thames Valley Signalling Centre. The next train was cautioned and the driver replaced the handset correctly.

7.13 On 31/03/2020, the attendant at the Crossing reported five horse riders, two of which were children, had crossed the Crossing without telephoning the signaller. This incident had extremely high potential for disaster should a train have been approaching from any direction and could have resulted in multiple fatalities.

7.14 There is history of horse riders misusing the Crossing going back as far as 2008 – predominantly, these are incidents of horse riders not calling the signaller back after Crossing to confirm they are safely across and the line is clear and safe for the passage of trains. This is after an express instruction from the signaller to do so.

7.15 Notably, on 31/05/2013 there was an incident in which a horse rider crossing called the signaller to find out whether to cross. Permission was denied, due to an approaching train, headcode 2L47, traveling on the up line from Banbury to Oxford. The driver of 2L47 then reported that on their approach to the station they witness a rider with a horse crossing ahead of their train. Thankfully, the train was due to stop at the station so was approaching slowly. The rider had called the signaller less than 2 minutes prior to the driver arriving at the station. If the train had not been booked to stop at the station, the rider and horse would likely have been killed.

7.16 Further to this, on 03/09/2013 there was an incident reported by a member of the public who stated that they had witnessed a rider cross the Crossing without telephoning the signaller.

7.17 The incident on 03/09/2013 provides significant weight to the argument that there are more incidents of horse riders taking unnecessary risks and not calling before crossing than Network Rail is aware of, because, unless someone witnesses the incident and reports it, there is no-one to report it.

7.18 A horse has the potential to derail a train, therefore any occasion which the rider does not telephone the signaller for permission to cross has extremely high potential consequences. As above, there are numerous recorded incidents of horse riders not telephoning the signaller.

7.19 Other incidents of note include the 26/09/2009, whereby a driver of a non-stopping train reported a near miss with a 3/4-year-old child, thinking their train may have struck the child. A member of the public called the signaller and reported that they witnessed a family with a young child leaving the Crossing, shouting at the child.

7.20 On 04/03/2014, a aspirant passenger ran over the crossing in front of an Oxford bound train as it was moving away from the platform. Fortunately, the driver had not moved far and so did not need to apply the brakes.

7.21 A similar incident to that above occurred on 05/09/2014, this time though the passenger boarded the train. It is noted in the log that another train, heading in the opposite direction on the other line, was in the area at the time, but was not at the crossing at the time.

7.22 A further, 'very' near miss occurred on 01/11/2018, whereby a non-stop Intercity train on the down line reported a very near miss with two children (who on review were suspected to be around their 20s), while a stopping service was stationary in the up direction platform, which they boarded. It is suspected in this case that the two young adults were rushing for the stationary train and so ran ahead of the non-stop train on the adjacent line.

7.23 The above are examples of users demonstrating clear recklessness. No mitigation may diminish the risk associated with this behaviour.

7.24 The variation in train approach speed from the many different classes of trains that traverse the Crossing has not changed and so remains a cause of, or inducement for, misuse. The relative infrequency of stopping trains is a particular factor in encouraging misuse, as passengers who may be rushing for their train will take unnecessary risks to avoid having to wait prolonged periods for the next train, as evidenced by some of the highlighted incidents above.

7.25 These points are explored further in the following sections.

8 Station Passenger Crossing

8.1 The nature of the Crossing, being at a station, and therefore being classified as a SPC, introduces inherent risks not found at crossings in different environments.

8.2 The only route for a passenger wishing to reach the far platform, from whichever direction they may approach, is as follows. The user approaches the gate, which was classed as the decision point for the 2019 NRA. The user then checks for the presence of trains by following the instruction to "Stop, Look, Listen, Beware of Trains", before deciding whether to continue over the Crossing to reach their destination. After crossing both lines, they open the far gate to exit the live railway, and turn 90 degrees to travel up the platform ramp.

8.3 This includes the increased likelihood that users will arrive at the same time as a train, as the Crossing sees a significant proportion of its use by those also using the station.

8.4 It also introduces the risk that a train is within sight when a user wishes to cross, having just disembarked from a train – this is thought to be one of the root causes of the near miss in 2019 which led to the Route Director instructing the presence of a crossing attendant until the Crossing was closed.

8.5 At some stations, for example on a branch line where all trains are scheduled to stop, the nature of a SPC can be a benefit to the actual risk, as trains will be traversing the crossing more slowly than if the station was not there, of the Crossing was further away from it.

8.6 Further, at some stations, alternative provision to reach the 'far' platform is provided in the form of a bridge or an underpass, thereby limiting the number of users who need or choose to cross the railway over the level crossing.

8.7 This is not the case at Tackley, due to the high volume of trains, the variability in the classes of trains that use the line and therefore, the variation in their actual speeds, the fact that some trains stop at the station and some do not, and the fact that there is no alternative means to cross the railway to reach the 'far' platform.

8.8 The lack of safe alternative access to cross the railway means passengers have no choice but to traverse the live railway.

8.9 The increased likelihood of the user being at the Crossing at the same time as a train is therefore heightened by the real possibility that users may be rushing to catch the train and not take as much care when using the Crossing as they would otherwise do. There have been multiple incidents reported of users crossing ahead of their train as it pulls into the platform.

8.10 If they mistake a slower moving non-stopping train for the train they believe is stopping, they are at significant risk.

8.11 If they mistake a fast-moving train which may be further away, thinking it is not approaching at significant speed (incorrectly judging the speed of a train when viewing only the front of it is referenced in RAIB reports), for the train they believe is stopping, they are at incredible risk.

8.12 Conversely, the same is true: there have been multiple reported incidents and indeed near misses when users have left the train at Tackley and rushed over the Crossing to beat the train, rather than waiting for the train to depart and not putting themselves at risk.

8.13 The above points relating the high risk from train traffic are developed further in section 11.

9 Sighting and Traverse

9.1 The general principle of compliance at passive level crossings, where the user must make their own decision when to cross, is that the traverse time must be less than the sighting time of the fastest train for all users. The sighting time, measured in seconds, is the time from which the full front of the train is first visible to the user from the Decision Point to its arrival at the crossing.

9.2 The Decision Point, which applies to footpath and bridleway crossings, is generally identified by the position of the Stop, Look and Listen sign. It is the recommended position as the last point of safety when crossing, where it is safe to stand and to assess whether it is (as they perceive it) appropriate to continue to cross in safety. For a footpath crossing guidance and standards state this is a minimum of 2 metres from the first running rail. For a bridleway and user worked crossing, the guidance and standards state a minimum of 3 metres. Once committed to crossing, the next position of safety is the decision point on the opposite side of the railway, measured at 2m from the last running rail regardless of whether the crossing is a footpath, bridleway, or user worked crossing.

9.3 Although the minimum Decision Point for a bridleway crossing is specified as being 3m for riders/users in charge of animals, in this case, due to the presence of telephones and signs instructing all riders/users in charge of animals to contact the signaller, the decision was taken to calculate the sighting requirement using the decision point of 2.1m/2.4m being the position of the gates. This was because any user in charge of animals should not have to rely on their sighting *provided* they followed the instructions displayed at the Crossing. The decision point was measured at this point as the most likely position for a user to make their decision as to whether it was safe to cross.

9.4 The up side decision point and traverse length for the Crossing was calculated as 2.1m between the gate (Decision Point) and the nearest running rail + 5m (distance between the outer rails) + 2m to the position of safety:

User	Up Side Decision point (m)	Traverse length (m)	Measured from	Minimum Time required to cross
Able Bodied	2.1	9.1	Gate to Position of Safety	7.65s
Vulnerable	2.1	9.1	Gate to Position of Safety	11.48s

9.5 The down side decision point and traverse length for the Crossing was calculated as 2.4m between the gate (Decision Point) and the nearest running rail + 5m (distance between the outer rails) + 2m to the position of safety:

User	Up Side Decision point (m)	Traverse length (m)	Measured from	Minimum Time required to cross
Able Bodied	2.4	9.4	Gate to Position of Safety	7.91s

Vulnerable	2.4	9.4	Gate to Position of Safety	11.86s

9.6 For a train travelling at 90mph (40.23ms), the maximum permitted speed, based on a 9.4 metre crossing traverse and able-bodied user walking at 1.18m/s, the required sighting distance at the Crossing is at least 318m. However, this increases to 477m to give the minimum time required for a vulnerable user to cross in safety.

9.7 The following photographs demonstrate sight lines when the Crossing was last open for use:



Upside looking towards Up Direction Train Approach



Upside looking towards Down Direction Train Approach



Downside looking towards Up Direction Train Approach



Downside looking towards Down Direction Train Approach

Figures 11, 12, 13, 14 – Sighting at the Crossing as seen in 2019.

9.8 The actual sighting of approaching trains is the distance that can be seen in both directions from the Decision Point. At this crossing the actual sighting distances of approaching trains were measured when the Crossing was open for use, using a calibrated range finder. The table below shows the calculated distances when crossing as a pedestrian user:

All distances in metres	Minimum sighting distance required	Measured sighting distance	Is sighting compliant?	If deficient, is sighting distance mitigated?	Comments
Up side looking toward Up direction train approach	477	657	Yes	N/A	Sighting is severely compromised by passengers stood on the platform waiting for a train
Up side looking toward Down direction train approach	477	606	Yes	N/A	Sighting is clear
Down side looking toward	477	603	Yes	N/A	Sighting is severely compromised by rail

Up direction train approach					furniture and passengers stood on the platform waiting for a train
Down side looking toward Down direction train approach	477	453	**No**	**No**	Insufficient sighting due to crossing signage and curvature of the track. Whistle board does not provide adequate warning.

9.9 The table above shows that the sighting distance from the down side when looking toward a down direction train's approach is non-compliant for vulnerable and encumbered users.

9.10 The Crossing is non-compliant and unsafe for use by vulnerable and encumbered users.

10 Risk from Insufficient Sighting

10.1 The primary method of warning of an approaching train at Tackley, for those not instructed to use the telephones (all users other than those in charge of animals), is sighting of an approaching train.

10.2 Network rail standards dictate that the warning time provided by sighting of an approaching train must exceed the time taken to cross.

10.3 The risk is unacceptable where sighting of approaching trains is minimal and there is insufficient time to cross in safety. Here, because one of the sightings is insufficient it must be categorized as being 'non-compliant' and requiring additional means of protection.

10.4 If and when a passive crossing is found to be non-compliant, immediate action must be taken to make the crossing safe.

10.5 This can include closure of the crossing until compliance can be achieved, reducing the speed of trains on the approach to the crossing with the effect of reducing the required sighting distance, and or appointing an attendant at the crossing until compliance by one of the above methods is achieved.

10.6 The RLCM has, in the course of duties at other crossings, imposed emergency and temporary speed restrictions (ESRs and TSRs) on train traffic, and locked crossings out of use because of insufficient sighting distance being discovered.

10.7 Where sufficient sighting cannot be achieved, action must be taken to ensure compliance by another means, - by implementing a long term TSR or a Permanent Speed Restriction (PSR), introducing whistle boards (now out of favour and not deemed a suitable permanent mitigation), or introducing technology to provide an active warning.

10.8 Where the risk of insufficient sighting cannot be managed, permanently closing the crossing is the only remaining option.

10.9 The station environment also introduces permanent and transient obstructions to available sighting distances.

10.10 Those obstructions which are permanent, such as signage or fencing are capable of being removed, and in most cases have been, but those which are transient are not capable of being removed.

10.11 It is the case that following the fatality in 2008 fencing alterations were made to improve the available sighting from at and around the decision point.

10.12 If a group of passengers is stood on the platform, they can reduce the sighting distance available far below that which is required for compliance. MSLs are the only mitigation against this possibility, and are explored in section 17 of this document.

10.13 Reduced sighting gives rise to having insufficient time to cross. At the Crossing, sighting of approaching trains is reduced by several measures as outlined above, including equipment and signage hampering sighting, and passengers standing on the platforms also obstructing sighting of trains approaching the crossing from the north.

10.14 Outside of physical, permanent obstructions, other causes of reduced sighting can include:

Visibility – Foliage

10.15 There are known issues with foliage at this location that might also impair visibility. Vegetation management was a key factor in managing the sighting at the Crossing. Cutting back of densely growing vegetation was frequently necessary from spring through to autumn.

Visibility – Fog

10.16 Fog is defined, by international agreement, as occurring when visibility is reduced to less than one kilometre, particularly for aviation purposes. However, in forecasts for the public, visibility less than 180m is the reported norm. Fog completely removes any sighting of approaching trains that would allow a user to cross in safety. For the purposes of the Fog Data Analysing tool (FDAT), visibility less than 500m has been recorded to reflect the risks associated with sighting of approaching trains (LCG 21 - Evaluating the impact of fog at passive level crossings **[IA20]**).

10.17 With Tackley being in a semi-rural area, with the village west of the railway and open fields to the east, both north and south of the Crossing, fog is known to occur in the vicinity and has been known to be prevalent at this Crossing. Should fog descend on the area, then it's likely it will detrimentally affect a crossing users' ability to see approaching trains. Visibility, looking in either direction, would be reduced. In the event of fog, a user would still be required to adhere to the signage but potentially all users would need to use the telephones, putting a high demand on the signallers' workload, though there was no instructional signage for pedestrian users to telephone in times of limited visibility.

10.18 In addition to masking trains, it might also affect their depth of perception, making an approaching train appear further away than it actually is.

10.19 Dense fog can also affect a crossing users' ability to hear approaching trains. This will equally apply to the train horn when sounded at whistle boards. In the general sense, fog can also have an impact on a user's orientation and perception of risk, making the environment appear less hostile than it actually is. The photographs below, taken at another crossing, demonstrates the loss of distant sighting on a foggy day when compared to a clear day:





Figures 15 & 16 - Photographs from Calcot Mill (West Berkshire) crossing showing the effect of Fog

10.20 Fog also has a compounding effect on the auditory and visual senses of certain vulnerable user groups such as the young and elderly. These users have been identified at the crossing so would be a greater risk from fog, should it be reopened as a SPC.

Visibility – Sun Glare

10.21 Sun glare can seriously affect a users' view of a train approaching at certain times throughout the year. There is no mitigation against sun glare. Even during winter and spring, when the sun is low, it can still be sufficiently bright to cause sun glare. The following gives an example of the effect from sun glare:





Figures 17 & 18 - Photographs from Nuneham Crossing (Oxfordshire) showing the effects of sun glare.

10.22 The above photographs were taken at Nuneham crossing in January 2021. Nuneham crossing, now closed, was also on the DCL roughly 20 miles south of the Crossing and on the same north-south orientation.

11 Risk to Equestrian Users

11.1 Horse riders or those leading their horses over the Crossing benefitted from additional mitigation measures at the Crossing, in the form of telephones and instructional signage telling equestrians to telephone the signaller for confirmation to cross.

11.2 Despite this, there was a real and present risk that horse riders who did not obey the instructional signage would put themselves in unacceptably dangerous positions.

11.3 Signage instructed horse riders to contact the signaller before crossing, to ascertain if it was safe for them to do so. There have been numerous reports of this not occurring, though this is only recorded if it is witnessed either by staff on site, a member of the public who reports it, or the driver of an approaching train who sees a horse and rider on the Crossing.

11.4 Evidence in the occurrence logs and attendant's census show that not all horse riders called the signaller when there was an attendant at the Crossing – a wilful choice to deliberately misuse the Crossing.

11.5 Between January 2020 and the Crossing closing in April 2020, there were three reported incidents of horse riders failing to, or choosing not to, obey either the instructional signage or the signaller's instructions.

11.6 It is important to note that incidents like the one on 31/03/2020 can only be reported if observed, and the potential scale of misuse like that displayed is impossible to quantify. It does, however, only take one incident of misuse to lead to catastrophe.

11.7 Horse riders place both themselves and the railway at intolerable risk when misusing the Crossing. A horse rider can take longer than a pedestrian to operate gates, control their horse over the crossing, and exit the crossing on the other side, thus increasing the warning time required. This is the reason why horse riders were instructed to telephone.

11.8 As can be seen from the table above there have been numerous incidents of equestrian users not using the Crossing correctly. Three of which occurred whilst there was a railway presence at the crossing in the form of the attendant.

11.9 Notably, after the attendant was placed at the crossing, all of the reported incidents involved horse riders. There were no incidents recorded with any other type of user.

12 Risk to Cyclists

12.1 Cyclists are at an increased risk when compared to a user walking across the Crossing. The expectation would be that users dismount when using the Crossing, though there is no specific requirement that they do so.

12.2 Cyclists, even dismounted and walking their cycles across, are encumbered by and can be distracted by their cycle and can therefore be classified as vulnerable users.

12.3 When cyclists are mounted and ride their cycles across, the risk increases significantly as the potential for falling off one's bicycle is exacerbated by the need to open and close the gates on both sides of the crossing, causing users to stop with limited balance, potentially with the rear of their bicycle fouling the line.

12.4 Cyclists often wear protective clothing including helmets and or eyewear, which can impact their senses and inhibit their ability to see or hear approaching trains.

12.5 Cyclists also often ride in groups, which can introduce a 'follow-the-leader' mentality. This introduces high risk as, while the Crossing may have been clear for the first rider to cross, it may no longer be when the second, third, fourth etc. rider is beginning their traverse.

13 Risk from Train Traffic

13.1 Risk is highly influenced by the number of trains running over the Crossing, their speed and variation, and the number of users and how the crossing is used.

High number of trains

13.2 ALCRM calculates that the average number of trains per day over footpath, station passenger, and bridleway crossings on the network is 72. At 114, the daily number of trains over Tackley crossing is therefore 58% higher than the national average.

13.3 This, coupled with the high number of users at the crossing (104 average daily users against a national average for footpath, station passenger, and bridleway crossings on the network of 23 users) gives rise to significant risk.

13.4 On average between the hours of 06:00-20:00, when the crossing is likely to see the highest usage levels by pedestrians, there are 6 trains per hour. This equates, when distributed equally, to one train every ten minutes.

13.5 It is, however, the case that trains are not distributed equally. This can give rise to the perception from users that they are clear as soon as a train has gone by, and therefore not look for another approaching train. A user does not need to be at the crossing for this false perception to take place either, if a user is approaching the crossing from some distance but in sight of it, and witnesses a train go over the crossing, they may arrive at the crossing under false pretences that they do not need to stop look and listen for any other approaching trains.

High speed of trains

13.6 The high line speed of trains naturally gives rise to a heightened risk.

13.7 While it is the case that required sighting distance and therefore compliance is managed by a process that takes account of line speed (in basic terms – the higher the line speed the further a user needs to be able to see), the risks and potential consequences at the Crossing grow with increased speed.

13.8 High line speed inevitably introduces a wider variation in the speed of approaching (stopping and non-stopping) trains – the difference between a train proceeding at caution and a train travelling at line speed on a 40mph line could be up to 35mph. On a 90mph line, as is the case at Tackley, this difference can be up to 85mph, as trains instructed to proceed at caution are required to be able to stop short of any obstruction in their path. This can mean travelling as slowly as 5mph, particularly over a level crossing.

13.9 There is appreciable difficulty in judging the speed of an approaching object when it is viewed head on. This results in users seeing an approaching train from a distance, deciding to cross whilst not registering correctly how quickly it is moving, only to find they are now on the Crossing with much less time to reach a position of safety than they had previously thought.

13.10 Modern trains which utilise this route are considerably quieter than the trains they replace, giving further potential to users not becoming aware of a train with sufficient time if not careful.

13.11 To 'proceed at caution', as defined in Rule Book Module TW1 GERT8000-TW1 means the driver "must, as well as not exceeding any specified speed, proceed at a speed which takes account of conditions (such as the distance they can see to be clear), that will allow them to stop the train short of any train, vehicle or other obstruction, or the end of their movement authority." In railway terms, and in the context of Tackley and the DCL, the end of a movement authority means a signal showing danger.

Variation in Train Speed

13.12 The variation in train speeds of approaching trains is a major factor at the Crossing, which can commonly lead to hazardous confusion to users, as there is a large variation of warning time between the trains that stop at the station and those that do not; and between when the slower freight trains and the faster Inter-City trains are first seen, to reaching the Crossing.

13.13 The variation between Inter-City and freight can be up to 50mph. When a User sees a freight train approaching whilst stood at the Decision Point, and decides to wait until it has passed, it can take longer than double that of a fast Inter-City train to pass over the Crossing. That can lead to impatience.

13.14 The slower train seen advancing does therefore tempt an impatient user to run out in front of it, trying to beat it, rather than to wait for it to clear – especially when looking head-on towards an advancing train when it is not easy to judge its speed. Seen head-on, a user can easily mistake a fast-moving train as a slower train, and instantly decide to cross, thinking they have sufficient time to clear the Crossing; but then realise it is approaching much faster than first thought and have no time to reach a point of safety.

13.15 Further, children, or those with limited mobility, who may see other users cross in front of an approaching train may therefore believe that they also have time to cross. Although they may 'beat the train' on certain occasions, they are at higher risk of being struck by a train approaching at line speed, or one approaching in the opposite direction which they fail to look for. Children were known to congregate at the station and at the Crossing when it was open and were not aware for their own safety.

Hidden Trains

13.16 The Crossing is also at a location where it is known that a second train can pass within 20 seconds of an earlier train travelling in the opposite direction. Many intermodal (container) freight services utilising this route are now 775m in length, and will completely hide the second train approaching. In addition, a user hears the first train passing and the sound of the 2nd train is initially masked, but is then thought to be the sound of the first train pulling away. This creates a very high risk of the second train not being seen by a user for a considerable time, who has waited for the 1st train to pass. They can then walk out into the path of the 2nd train believing that it is safe to cross. This is a known phenomenon that has resulted in many fatalities on the network.

13.17 A previous incident relating to 'another train coming' was recorded, which led to the near miss that contributed to the temporary closure on public safety grounds. The current understanding of the incident, which is highly likely could occur again, if reopened for public use, is as follows:

13.18 The train stopped at platform 2 (the up platform) and some passengers alighted. They made their way off the end of the platform towards the Crossing and proceeded to cross in front of the train which was now ready to leave the station. It is presumed that they were preoccupied at watching this train rather than looking in the opposite direction and proceeded to walk across the rails directly in front of a second train travelling on the other line in the opposite direction that they had neither seen nor heard. They were clear of the line less than 2 seconds before the 2nd train arrived at the Crossing travelling at line speed. The train driver had applied the emergency brakes.

13.19 Users stood at a level crossing naturally walk out as soon as the train passes; they do not wait for it to travel at least 300 metres from the crossing to then look and to see if it is safe to cross.

13.20 All level crossings on the network that cross more than one line have been fitted with additional signage warning users of the dangers of hidden trains (Figure 19). This signage was mandated at applicable crossings following a fatality at Lady Howard crossing, which my colleague Jerry Greenwood will speak to.

13.21 An example image of the new signage is below:



Figure 19 – Now mandated 'Hidden Trains' sign

13.22 It is noted, however, that users at this location were known to ignore instructional signage.

13.23 Prior to its closure the Crossing was fitted with additional signage which served a similar purpose to the new mandated signage.

14 Imported Risk from Users

14.1 The Crossing, if reopened, would see an influx of uncontrolled use throughout the day, each day, by train passengers – including accompanied and unaccompanied children and vulnerable users, walkers – some may be walking a dog, dismounted pedal cyclists and equestrian users. Elderly users would also be anticipated as they had been observed previously, and it is not unlikely that access would be taken by train passengers using a wheelchair or other such mobility vehicle.

14.2 Because Tackley is a station footpath crossing, the likelihood of Crossing users carrying or pulling luggage with them, thus making them classifiable as vulnerable users, is much higher

than at other locations. The near miss in 2019 which led to the closure of the Crossing involved passengers who were pulling suitcases behind them.

14.3 Cyclists represent a user type with high vulnerability. The additional encumbrance of navigating a bicycle through the gates adds time to that taken to cross, and as stated above, as cyclists often ride together (whether adults, or adults with children), the increased distraction and follow-the-leader mentality introduces additional vulnerabilities.

14.4 Approximately 26% of the users identified in the attendant's census were with a dog. There is no evidence that shows which proportion of these had one or multiple dogs, nor which had them on or off the lead.

14.5 Dog walkers, whether the dog is on or off the lead, albeit dogs off leads may present a greater hazard to the user, creating an extremely hazardous and unsafe use of the Crossing. Dog behaviour is unpredictable, especially if a train comes into view. Dogs walked on a short (not extended) lead are perceived by some to be under control but importantly, the user will often remain distracted, not appropriately focussing on traversing – and is in any event an encumbered user; for example, where the dog may itself become distracted, bark or pull, when approached by other users coming in the opposite direction (or by any other event). This in turn causes distraction to the user from properly watching out and listening for approaching trains, etc.

14.6 RSSB has confirmed that pedestrian users – especially on leisure-promoted routes – are subject to making accidental human errors of judgement when using the crossing; a significant number of users do not use the crossing safely. This includes;

- users who do not look for approaching trains or only look in one direction, or only look when actually stood on the crossing deck;
- pedestrians using the crossing whilst wearing headphones or use the crossing while using mobile phones;
- Some pedestrians are known to cross within 20 seconds of a train arriving,
- there is a rising trend of people loitering on the crossing, including people taking photographs/selfies whilst on the crossing.

14.7 Where a horse rider fails to use the phone to ascertain there are no trains approaching, they are at extremely high risk in walking or riding their horse over the railway – especially if a train suddenly appears and sounds its horn in close proximity. A horse has the potential to derail a train.

14.8 In recent years user vigilance for their own safety and adherence to safe protocols has been considerably reduced by the vast increased use of mobile communications and other personal devices. The likelihood of users being distracted by mobile communications has increased and, additionally, the likelihood of people wearing earphones or headphones has also considerably increased which reduces the effectiveness of audible warnings. The use of headphones/earphones has been identified as a concern within a number of risk assessments and has been noted by the Railway Accident Investigation Board in their Reports as being a contributing factor in fatalities at other pedestrian crossings similar to the Crossing.

15 Risk Calculations – ALCRM Calculated Risk

15.1 Risks should be reduced to the lowest reasonably practicable level by taking preventative measures, in order of priority. The below extract from NR/L2/XNG/001 **[IA12]** sets out an ideal order to follow when planning to mitigate risk. The levels in the risk hierarchy of control measures are in order of decreasing effectiveness.

When a risk assessment has been undertaken, reasonably practicable options to mitigate risk shall be identified in accordance with the following hierarchy of controls:

1. Eliminate the risk through closure;

NOTE 1: *where this is a level crossing with public status, this will require a legal temporary stopping up order (TTRO) until the crossing can be permanently closed.*

2. Introduce new or improved technology to upgrade the current crossing protection;
3. Upgrade the crossing with additional levels of protection e.g. AHB to MCB-OD, FPW to FPWMSL;
4. Improve the crossing layout;

NOTE 2: *e.g. reduce skew, provide guide fencing.*

5. Install new clearer instructional signage, ergonomic design to improve user comprehension

NOTE 3: *where this is a level crossing with public status, this may require a legal temporary stopping up order (TTRO) to enable the modified work to improve safety to conclude.*

6. Introduce new or improved operational procedures
7. Educate users, use stakeholder engagement and safety awareness events to improve user comprehension on safe crossing protocols
8. Enforce behavioural change, e.g. red-light safety cameras, mobile safety vehicles, BTP presence and engagement with stakeholders

The reasonably practicable option(s) shall be progressed for implementation based on a combination of cost benefit analysis and structured expert judgement.

Investment in level crossing safety shall be balanced against other safety risks.

Figure 20 – Extract from NR/L2/XNG/001 - Provision and risk management of level crossings

15.2 ALCRM calculates that the following key risk drivers influence the risk at the Crossing.:

- Railway cause: insufficient sighting (for vulnerable users)
- Vulnerable and encumbered users
- Misuse – deliberate misuse (e.g. non-adherence with level crossing signage or non-observance of MWL or barriers, etc.) or inadvertent human error
- Obscured, second train
- Slips, trips, falls on the Crossing

15.3 The ALCRM calculated data based on **114** trains running daily, and the last recorded pedestrian usage of **104** traverses/day is as follows:

The calculated safety risk for this crossing is:	**Risk per Traverse (Letter)**	**Collective Risk (Number)**
	C	**2**
	Risk per Traverse (FWI)	**Collective Risk (FWI)**
Cyclists	0.000000272	0.000694807
Horse Riders		0.000099258
Pedestrians		0.009528786
Train Passengers	0	0.000000001
Train Staff	0.000000002	0.000065923
Derailment Risk		0.000000068
Weighted Average (Users)	**0.000000272**	

Total Risk		**0.010388843**
	Average Consequence	0.78800552
	Collision Frequency	0.013183719

15.4 ALCRM currently deems the highest risks this location is derived from 'does not observe signage'. 'Incorrect use' is the highest risk.

15.5 The risk profile fundamentally changes with the Crossing primarily used as a SPC. ALCRM deems the highest risks would be pedestrian events, misuse from 'does not adhere to signage' followed by 'distraction' and 'second train coming'. Slips, trips and falls and user distraction will be introduced, along with user vulnerability.

15.6 ALCRM has provided the following rating by both increasing or decreasing pedestrian and cyclist use and train numbers within the ALCRM application, to demonstrate risk if the Crossing was to reopen:

Level Crossing Risk	73 Trains, 66 Pedestrians & Cyclists	91 Trains, 83 Pedestrians & Cyclists	Current User	154 Trains, 124 Pedestrians & Cyclists	290 Trains, 150 Pedestrians & Cyclists
ALCRM Risk Score	**C4**	**C3**	**C2**	**C2**	**B2**
FWI	**0.004545068**	**0.006618343**	**0.010388843**	**0.016867831**	**0.038116879**
FWI &age Increase	**-56%**	**-36%**	**0**	**62%**	**267%**

15.7 For the higher calculations, the above calculations use train numbers as provided by Network Rail's train planning team in accordance with the assumptions made above (paragraph 5.4). For the lower calculations, 20% of train movements has been removed cumulatively. The pedestrian and cyclist usage has been changed by 20% cumulatively in both the higher and lower calculations, as there is no substantial predicted driver for user number changes, other than the potential that more stopping services will mean more station users.

15.8 These calculations do not account for any possible change to equestrian use by horse and rider – this remains at an average one user per day in all scenarios.

15.9 For completeness, the calculations have also been run with no change to the user number, just train service changes.

Level Crossing Risk	73 Trains, 104 Pedestrians, Cyclists, Equestrians	91 Trains, 104 Pedestrians, Cyclists, Equestrians	Current User	154 Trains, 104 Pedestrians, Cyclists, Equestrians	290 Trains, 104 Pedestrians, Cyclists, Equestrians
ALCRM Risk Score	**C3**	**C3**	**C2**	**C2**	B2
FWI	**0.007161896**	**0.008292849**	**0.010388843**	**0.014034052**	**0.026427759**
FWI &age Increase	**-31%**	**-20%**	**0**	**35%**	**154%**

15.10 There are no plans, nor is it in the Railway Industry's interest, to run fewer trains along this section. Quite the opposite, the additional trains modelled are the rail industry's stated and in some cases planned increases.

15.11 It can be seen from the table above that the potential risk increase at this location is substantial in any case.

16 Current Mitigations

Whistle Boards

16.1 Although whistle boards were previously provided at the Crossing, these were set at the distance from the Crossing as required to give suitable audible warning where there is no use by vulnerable users. However, passengers with wheelchairs or other passengers who would be considered vulnerable, would require additional warning time. This would require whistle boards to be repositioned further from the Crossing, but that repositioning would exceed the maximum distance of 400m from the Crossing (now superseded ORR guidance document Railway Safety Publication 7 **[IA13]**, Network Rail Standard NR/L2/XNG/30020/A28 **[IA14]**, and Level Crossing Guidance Document LCG05 [**IA15]**: Whistle Boards should not be positioned over 400m from the level crossing as their effectiveness for being heard by a user is reduced) and so could not be used as any advanced warning.

16.2 Those with impaired hearing may not hear the train horn at all, and could potentially cross when an unseen train is approaching. In addition, a horn may not be heard due to ambient background noise, or weather conditions (strong winds or driving rain, etc.).

16.3 Whistle boards could therefore not be provided again at the Crossing on the basis that they would need to be fitted at least 141 metres but ideally 277 metres in excess of the maximum distance they should be placed, taking into account additional consideration needed to account for the speed of sound. They would also be a noise nuisance to dwellings in the vicinity of their location.

16.4 Moreover, train horns are not used between the hours of 0000 and 0600 being the Night Time Quiet Period (**NTQP**). It is known that the Crossing was previously lightly used within this period. A user during these times would have no audible warning other than the sound of the train itself.

16.5 In addition, whistle boards are a historic, legacy mitigation to aid crossing users to decide whether to cross or not, when an approaching train is either hidden from view, or to provide a secondary warning. This places the onus on the train driver to sound a warning which can lead to either no warning being given, or inconsistent warning times (depending on whether the train driver sounds the horn on approach to the board, at the board, or beyond the board, and the variability in these distances at variable speeds).

16.6 The OFF and DfT have both actively promoted the need to remove all whistle boards in conjunction with scoping the provision of alternative mitigations to reduce risk at level crossings.

16.7 Considering the above, whistle boards are not a suitable mitigation for the Crossing.

Telephones

16.8 Telephones are provided and instructional signage for users with horses to use the telephones. Telephone usage was recorded by the signaller at Thames Valley Signalling Centre and was

only to provide protection for bridle users who would use the 'phones, so are not considered a suitable mitigation.

16.9 There is also evidence to show that equestrian users did not always use the telephones at this location, further reducing their suitability as mitigation.

Signage

16.10 The crossing had the following signage installed.



Figure 21 – Signage installed at the crossing

16.11 If reopened, new signage compliant with the Private Crossings (Signs and Barriers) Regulations 2023 and NR/L2/XNG/30020/A28 - Signage for level crossings will be erected.[1]

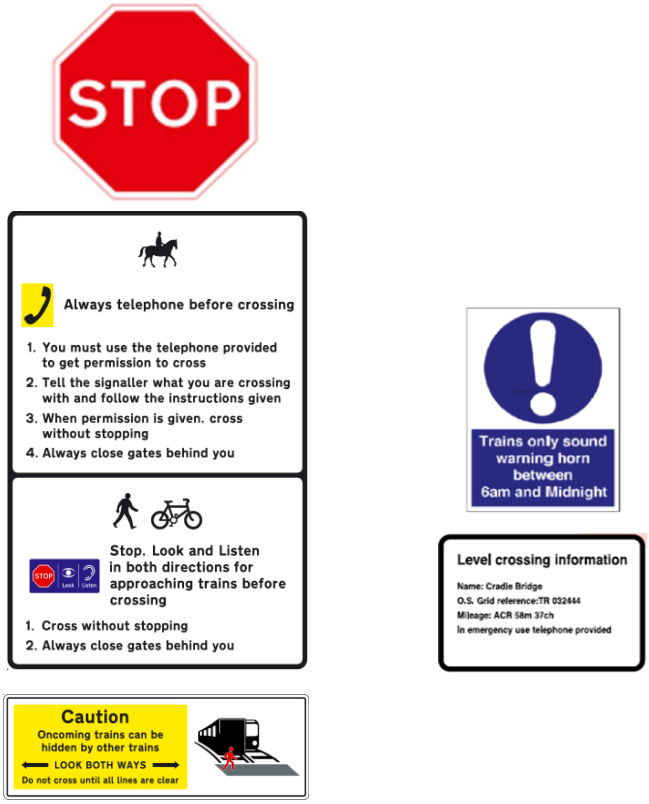


Figure 22 – The signage required at the crossing to comply with the Private Crossings (Signs and Barriers) Regulations 2023

16.12 However, new signage itself does not significantly reduce risk to users of the Crossing.

17 Evaluating options

Miniature Stop Lights

[1] https://www.legislation.gov.uk/uksi/2023/1112/pdfs/uksi_20231112_en.pdf

17.1 Miniature Stop Lights (**MSLs**) provide a level crossing user with an active warning of an approaching train. MSLs are normally equipped with a red light and a green light facing the user on the approach, and an audible alarm on the back of the light units which sound onto the crossing itself. The green light normally shows unless a train is on the approach and has reached the 'strike-in' point.

17.2 When the train reaches the strike-in point, the green light extinguishes, immediately the red light shows, and the audible alarm starts sounding.

17.3 The red light continues to show and the audible alarm continues to sound until the train has passed the 'strike-out' point beyond the crossing in the direction of travel. Once the train has passed the strike-out point, the red light extinguishes and the green light illuminates, and the audible alarm silences.

17.4 In the case that another train may have struck-in on the adjacent line while the first train is still on the approach, the striking-out of the first train will initiate the 'another train coming' warning. This means the red light continues to show, and the audible alarm normally changes either to an increased oscillation and urgency, or provides a spoken warning.

17.5 The 'another train coming' warning will only activate after the first train has passed the crossing and struck out. It does not provide a bespoke warning for 'two trains approaching at once'. This means there would be no indication for a user observing a train stationary in the platform with the red light showing that another train is approaching on the other line. If a user wants to catch said stationary train, or just cross the line, they will assume the red light is solely applicable to that train, not look both ways, and potentially place themselves into the path of another train coming.

17.6 When the second train subsequently traverses the crossing and strikes out, providing there is not a third train approaching the crossing, the red light extinguishes and the green light illuminates, and the audible alarm silences.

17.7 At footpath or bridleway crossings on Western Route, newly installed MSL systems should provide a warning time of 20 seconds, so that users 'trust' the warning – 20 seconds gives sufficient warning time to cross (in all but extreme cases) and reach a position of safety should the system activate during the traverse, whilst not unduly delaying a person's journey if the system activates on the user's approach.

17.8 20 seconds is accepted as a reasonable amount of time to wait before impatience sets in.

17.9 At SPCs, the minimum warning time is to be 40 seconds as per NR/L2/SIG/11201/ModX40, unless otherwise agreed with ORR.

17.10 Any warning time would be set for trains running at line speed, and the warning time duly extended for trains approaching at slower speeds.

17.11 A freight train travelling at 60mph would take 1 minute to reach the crossing after the red light illuminated, a 50% increase on the time taken for an Inter-City train to reach the crossing.

17.12 There are three versions of MSL that have been considered for installation at the Crossing.

17.13 These are Overlay MSL (**OMSL**), Interfaced Overlay "Flex" MSL (with Speed Measuring) (**IOMSL**), and Integrated MSL.

17.14 An OMSL is a MSL system designed to overlay existing signalling infrastructure without interacting with it. It can be used where there the level crossing and the train movements over it are simple.

17.15 An IOMSL is an overlay MSL but with a direct interface to the signalling system. It is used where there are constraints within the crossing strike in area which could lead to extended warning times. The signal interface allows for the clearance of the signal to be regulated to ensure adequate warning time is provided for the crossing user. There is also a station platform interface to determine stopping/non-stopping services in order to also provide a more consistent warning time to crossing users.

17.16 An Integrated MSL is part of the signalling system and is used where there are complex features or train movements associated with the crossing and one of the Overlay MSL systems cannot be used.

17.17 There are three key pieces of infrastructure to consider. Effective solutions need to be found for these in order to provide an MSL which can work reliably.

- Station: Tackley Station stop
- Signals: OD2450 and OD2445 within the strike-in.
- Points: Two crossovers at the North. (Not currently in signalled operation)

The diagram below shows the rail infrastructure around the Crossing:

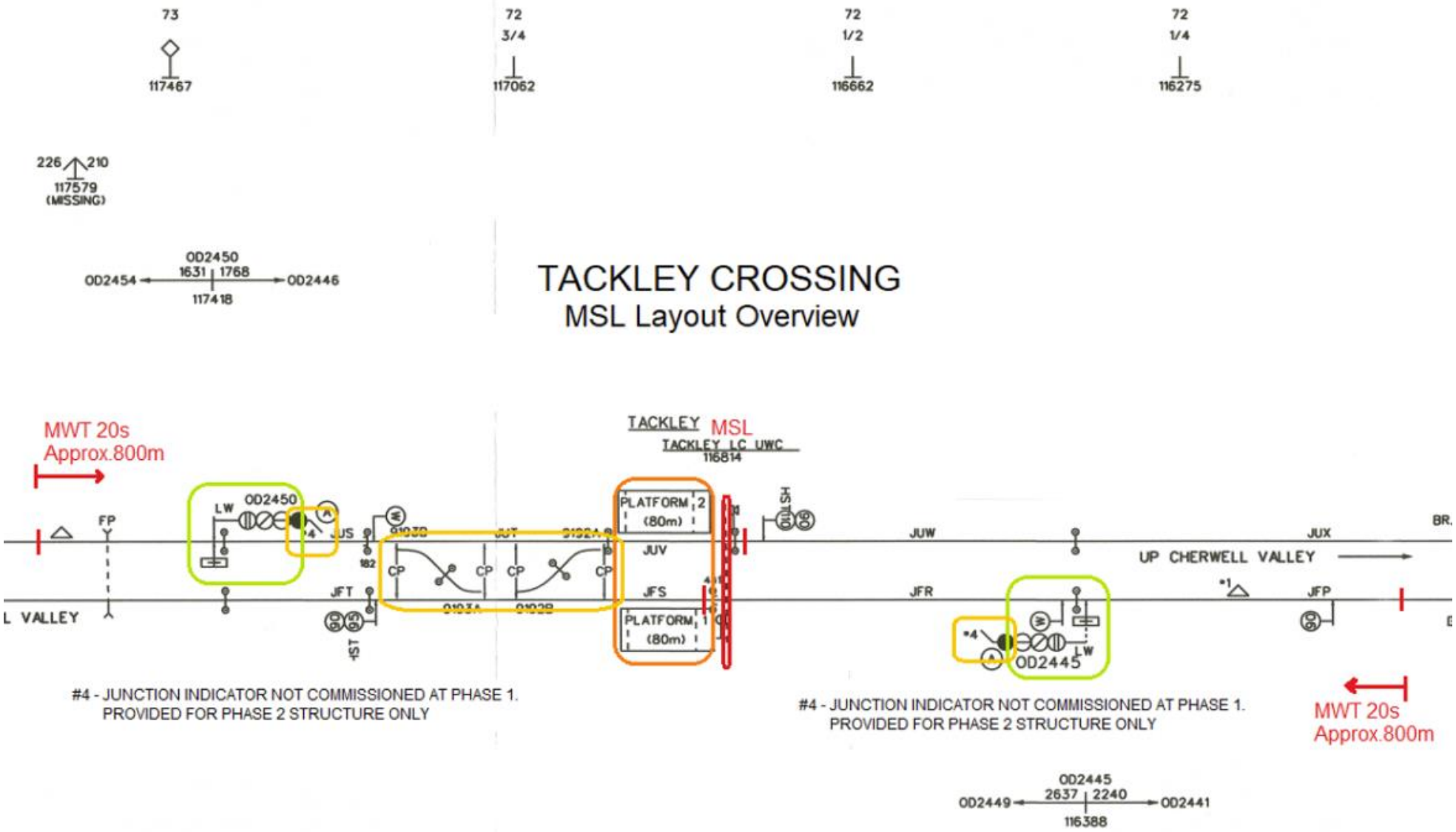


Figure 23: Diagram showing detailed rail infrastructure around Tackley Level Crossing

17.18 The diagram above highlights the approximate location of the strike-in points for a 20 second warning time, as is normal for a footpath or bridleway crossing. SPCs however should provide a warning time of 40 seconds, unless agreed with ORR.

17.19 There is no further complicating infrastructure between the crossing and the approximate location of the required strike-in for a 40 second warning time.

Overlay Miniature Stop Lights (OMSLs)

17.20 Overlay Miniature Stop Lights (**OMSLs**) are the simplest, most cost-effective method of providing an active warning to crossing users, and use should be made of them wherever site circumstances permit, in preference to more expensive and complex solutions.

17.21 OMSLs require simple rail approaches (with no points, junctions, crossovers, or signals) between the strike-in point and the crossing.

17.22 The strike in point for an OMSL is normally a physical point on the tracks at which train detection is fitted, at a calculated distance away from the crossing to provide a suitable warning of the approaching train.

17.23 OMSLs do not have the capability of determining the speed of a train's approach and therefore variability in warning time due to the wide range of train speeds through this location would be unacceptable.

17.24 There are signals on both approaches which can display red signals. This provides another bar to providing a reliable warning time.

17.25 Being adjacent to the station an OMSL must be discounted outright, as trains stopped at the station would force the system to go into 'dark mode'. This being that the system detects the approach of the train, turning the lights to red; but fails to detect the train striking out beyond the Crossing as it has stopped at the station, causing it to turn off all lights on the system and requiring it to be reset. This would happen for every train stopping at the station or held at a signal within the strike-in distance.

17.26 Therefore, the implementation of a OMSL system is not feasible at the location of the Crossing.

Interfaced Overlay Miniature Stop Lights (with speed measuring) (IOMSLs)

17.27 Interfaced Overlay MSLs (IOMSLs) require plain line (with no points, junctions or crossovers) between the strike-in point and the crossing.

17.28 The strike in point for an IOMSL is normally a physical area on the tracks at which train detection is fitted, at a calculated distance away from the crossing to provide a suitable warning of the approaching train.

17.29 An IOMSL would help overcome the issue of the signals within the strike-ins for as long as the junction routes remain out of use. However, it would not resolve the issue of trains coming to a stop at the station.

17.30 An IOMSL system is not technically capable of managing the crossover points north of the station.

17.31 Therefore, they would become unsuitable should the crossovers ever come back into signalled operation.

17.32 IOMSLs can be fitted with speed measuring equipment, which allows them to measure the speed of an approaching train across 2 or 3 individual strike-in points and therefore determine whether a train is due to stop at a signal or a station between the strike-ins and the crossing, or not. If the speed is determined to be low enough that the train is stopping at the station, the crossing activation is deferred until the train leaves the station and passes a final strike-in point.

17.33 However, the variability in train speeds through this section of railway are too complex for this system to work. This is because the system would have no way of knowing whether an approaching train at, for example, 75mph or 60mph is partway through its braking application to stop at the station, or is a freight train not stopping at the station.

17.34 Moreover, because the Crossing is located immediately at the bottom of the platform ramps, it would be impossible to achieve a suitable warning time for users at the Crossing for trains leaving the station.

17.35 Therefore, the implementation of an IOMSL system is not feasible at the location of the Crossing.

Integrated Miniature Stop Lights

17.36 The strike-in points for Integrated MSLs align with existing track circuits, axle counters, or the applicable method of train detection for the area.

17.37 Integrated MSLs are fully integrated with the existing signalling infrastructure, and therefore know whether a danger or proceed aspect is shown at any signals between the strike-in point and the crossing.

17.38 This would be the only feasible solution (in engineering/technological terms). The station location, and track layout however give rise to particular complications.

17.39 An Integrated MSL is achieved by output from the signalling interlocking. This would require a costly data change, and potentially also, axle counter alterations to determine when a warning is to be given to a user of an approaching train. Axle counters are a method of detecting which sections of track are occupied, or not, by trains. Alterations would change the locations of the train detection areas used for the safe signalling of trains and would be extremely expensive.

17.40 Given that the interlocking knows the status of all signals, points and train detection sections it can reliably provide a warning to users.

17.41 The warning may be reliable, but would not be consistent in length.

17.42 It is impossible for the system to determine the speed of an approaching train to the station, and any dwell time. To do this it needs external input. It may be possible to provide 'stopping/non-stopping' controls for the Crossing. These are provided for certain road crossings and initiate the crossing warning when the train reaches point A or point B depending on whether the train is booked to stop at the station.

17.43 This can be an automatic function of an 'Automatic Route Setting' system into the interlocking, or selected manually by a signaller, and would delay the warning initiation to avoid extended warning times when a train stops at the station.

17.44 Stopping/non-stopping controls would likely work well on the Down direction line as the station is beyond the Crossing. However, on the Up direction line the station is immediately on approach to the crossing. Choosing when to commence the warning to give a consistent warning would be difficult.

17.45 There are a few possibilities that may offer some mitigation:

- The warning to be initiated as the train reached the station section JUV (The track section shown on the down line at platform 2 on the track diagram Figure 23), depending on the dwell time.
- The warning to be initiated by a button on the platform operated by the driver when ready to depart.
- Perhaps thirdly, drivers may locally observe the crossing is safe before departing, and the warning initiates immediately on departure mitigated by the slow speeds.

17.46 All the above options would however result in a train approaching extremely close to the Crossing with the lights showing green. This would not be acceptable.

17.47 Also, none of the above options would result in a near consistent warning time for all types of trains.

17.48 Should stopping/non-stopping controls not be technically feasible, a stopping train would see the light red light illuminated for minutes at a time, which would significantly increase the likelihood of impatience from a Crossing user who could then cross into the path of a hidden train or a train approaching on the other line. Inconsistent warning introduces frustration to users causing them to learn to routinely ignore the lights.

17.49 Integrated MSLs would also not address any instances of misuse.

17.50 Integrated MSLs would not be applicable to equestrian users. Equestrian users would need to continue to phone the signaller for permission before crossing.

17.51 The implementation of an Integrated MSL would be at high cost; up to £2,000,000.

Miniature Stop Lights Conclusion

17.52 Cyclists and leisure users, or, more broadly, those pedestrians not using the station would see a substantial calculated risk reduction by implementation of Integrated MSLs. No other MSL system is feasible to implement, on engineering/technological grounds. Integrated MSLs would provide an active visual and audible warning to users, remove the requirement for pedestrians and cyclists to make the decision themselves whether it is safe to cross, and provide a constant indication as to the safety of the crossing. However, the overall effectiveness and safety benefit from Integrated MSLs at the Crossing, is limited. The high cost must also be considered.

17.53 The variability in the achievable warning time materially reduces the real terms safety benefit gained.

17.54 The realistic minimum variance in warning time of 50% between a fast train and a slow moving freight train is significant, and this variance is increased into orders of magnitude when considering stopping and non-stopping trains.

17.55 The evidenced history of incidents involving hidden trains at the Crossing, often involving a stationary train in the platform, prove that trains do regularly cross here, and give unacceptable rise to the 'another train coming' warning scenario as described in paragraph 17.5 above.

17.56 Although the calculated risk level would be lowered, the real risk of someone running over the railway when the lights show red remains high, especially when a passenger is late for their train which is stood in the station. This behaviour is recurrent at the Crossing.

17.57 The above example also demonstrates the real and present potential for a user to assume that the red light shown at the crossing is for the train stood in the station, ignore the red light, and traverse the crossing into the path of another train coming on the other line.

17.58 There is evidence to prove that this location has a history of users, particularly equestrian users, ignoring mitigation measures that have been provided for their safety.

17.59 It is logical to conclude that the installation of MSL would actually increase the temptation for equestrian users to ignore the requirement to phone the signaller. When encountering instructional signage to telephone the signaller when a green light and the word 'safe' is adjacent, it is unlikely that any user who has not historically phoned the signaller would start to do so.

17.60 This brings significant risks to horses, as the alarm set off by the activation of the MSL could spook a horse. If an equestrian user has chosen to cross because the MSL system says it is safe for pedestrians or cyclists to do so, this scenario would, naturally, cause the worst outcome at the worst time – a spooked horse may do when a train is approaching. The requirement to telephone mitigates this risk as the signaller will not grant permission to cross if a train is approaching and will set off the alarm, allowing the rider and their horse to give the crossing some berth while the train approaches and passes.

17.61 Due to the misuse history exhibited by equestrian users, (approximately half of the observed traverses by equestrian users did not have a corresponding phone call in the signaller's occurrence log – while a member of railway staff was on site), and the lack of any evidence to suggest this would change, it cannot be considered that the risk to equestrians users would be mitigated so far as is reasonably practicable by the installation of MSLs.

17.62 Therefore, risk reduction by an Integrated MSL system – or any other MSL system – cannot be considered to be reduced as low as reasonably practicable (ALARP). It is concluded that MSLs do not sufficiently mitigate the key risks at the Crossing, and in some cases do quite the opposite, by introducing new risks.

17.63 Other mitigation measures must therefore by explored to reduce risk at the Crossing, so far as is reasonably practicable.

Further mitigation measures

Implementing self-locking gates – Gates that would lock with the approach of a train

17.64 Self-locking gates would prevent users from entering the Crossing area when a train is approaching, or about to leave the station. However, for their use they would need to be overseen by a signaller, either in an adjacent Signal Box (which there is not one at Tackley) or monitored by CCTV. However, for a well-used Inter-City railway seeing over 100 trains daily (currently), it is impractical to have a dedicated source monitoring CCTV for each and every train approaching the Crossing; hence, is not an appropriate mitigation for anything but a high-usage public road level crossing. In addition, the signaller would not be able to interlock the gates until the Crossing is clear, and if another user enters the crossing area before it is clear, then the delay to non-stopping trains becomes significant. Consequently, providing interlocking gates is not considered a suitable mitigation and is rejected.

Reducing the Line speed – Reduce the speed of trains over the crossing.

17.65 It is not the answer to an unacceptable public safety risk posed by the Crossing to cease certain railway operations or to run fewer or slower trains along this section of the railway. Therefore, reducing the line speed as an option in this case is rejected.

Install a Supplementary Audible Warning Device (SAWD) – Audible Alarm at the Crossing

17.66 The implementation of a SAWD, which replicates the sound of train horn via a speaker at the Crossing itself, is an option that some regions of Network Rail employ as a secondary warning system where there are known problems with train horn audibility.

17.67 It may only be fitted in addition to, not instead of, a whistle board. This is because the system does not have a self-reporting failure system and therefore does not have a sufficient Safety Integrity Level to allow the removal of whistle boards.

17.68 A SAWD must be timed to provide a warning at the same time as a whistle board to provide sufficient warning time before the arrival of the train travelling at line speed.

17.69 ALCRM indicates that when the addition of such a system is installed, there is no additional benefit to be gained over the whistle board assuming that there is no known problem with audibility.

17.70 As the whistle boards are audible, due to vulnerable use, unless the line speed is also reduced, whistle boards cannot be appropriately positioned, which means that there is no risk reduction calculable and no cost-benefit in introducing this system.

Other residual mitigations

17.71 The Level Crossing Risk Management Toolkit (**LXRMTK**) has been interrogated to identify other, residual risk mitigations that could be implemented at the Crossing.

17.72 The risk mitigations offered in the LXRMTK often are not automatically calculable in ALCRM. When this is the case, Level Crossing Guidance Document 14 - Applying Risk Reduction Benefits in ALCRM When Modelling Safety Enhancements (LCG 14) **[IA16]** is consulted to ascertain the manual mitigation amount that can be applied in ALCRM.

17.73 The manual mitigation is given in a percentage, or range of percentages, and is applied manually within ALCRM to the total risk at the crossing as part of the optioneering process.

17.74 When a range rather than an absolute mitigation amount is provided, the guidance instructs the assessor to use structured expert judgement as to the efficacy of the mitigation in the specific circumstance to decide on the amount to apply.

17.75 I have provided the manual mitigation amounts applied for each of the below mitigations, where applicable.

Other residual mitigations (i) – Painted crossing decking

17.76 To highlight users are entering into a danger area, the deck area could be painted yellow.

17.77 This would have the effect of highlighting the crossing and its dangers to users during hours of darkness, or to those users who may have limited sight.

17.78 Risk reduction for painted danger areas is 0-2% at SPCs. Given that the layout of the Crossing is already very good, directing users to the correct position on both sides, the only noticeable change to users would be the different colour of the Crossing surface. The station and street also have some lighting, so the effectiveness is reduced further. A manual mitigation figure of 1% has been applied.

17.79 The small benefit this provides means that this does not reduce the risks so far as is reasonably practicable.

Other residual mitigations (ii) – Solar stud lighting in decking

17.80 Low-level solar stud lighting could be installed along the deck edges. This would help corral users over the crossing safely and reduce the risk of them falling off the edge during darkness.

17.81 As with the yellow decking option, as the Crossing is somewhat illuminated by the environment, the efficacy of this mitigation is limited. The risk reduction specified in the guidance for this mitigation at SPCs is 0%. Therefore it provides nil benefit and is summarily discounted.

Other residual mitigations (iii) – CCTV equipment

17.82 To attempt to curtail the known deliberate misuse, CCTV monitoring equipment could be installed at the crossing.

17.83 This would be monitored by Network Rail and used to gather both census data for ongoing risk management as well as interrogating any reports of misuse, gathering evidence to pass onto the British Transport Police to follow up and potentially prosecute misusers.

17.84 Signage would also be erected in line with legislation informing crossing users that CCTV is in operation.

17.85 This intervention has seen limited success across the Western Route, with multiple cameras being stolen shortly after installation and, in some cases, users seen to 'play up' to the cameras.

17.86 The typical risk reduction applied against total system risk in ALCRM using Network Rail guidance is 1-2%. The manual mitigation figure applied for this intervention was 2%, due to the incident history.

17.87 The small benefit this provides means that this does not reduce the risks so far as is reasonably practicable.

Other residual mitigations (iv) – Tactile Thresholds

17.88 Tactile Thresholds could be installed at or just prior to the crossing gates.

17.89 This would have the effect of highlighting the crossing to users with impaired vision, and centring all types of users' attention on where they are walking.

17.90 This intervention is normally introduced at public road crossings, where there is increased risk of users walking into the road or off the end of the crossing due to there normally being no physical barrier unless the crossing is closed for the approach of a train.

17.91 The manual risk reduction applied for this mitigation is 1%, in line with guidance.

17.92 The small benefit this provides means that this does not reduce the risks so far as is reasonably practicable.

Other residual mitigations – A combination of all suitable mitigations

17.93 Given that none of the residual mitigations (i) – (iv) do provide necessary risk reduction when applied on their own, consideration is given to whether all provided cumulatively, to the extent possible, would mean that residual risk is reduced so far as is reasonably practicable.

17.94 The benefit of these mitigations together is not the sum of the percentages. I have reduced the cumulative risk mitigation from the absolute cumulative 4% to an aggregated 3%, in line with LCG 14.

17.95 As can be seen in the table in section 18, even if all possible residual mitigations were together utilised, the collective risk reduction to Crossing users would be modest, insufficient, and so ineffective in reducing risk so far as is reasonably practicable.

Crossing Closure – Closing the Crossing removes all risks as there is no opportunity to interact with the live railway. Possible ways to close Tackley crossing are:-

- a grade separated solution such as a bridge or underpass
- a diversionary route
- the diversion or stopping up of the bridleway rights

17.96 It is evident that the public bridleway rights over the Crossing cannot be stopped up without alternative provision, and so a meaningful diversion for pedestrians, cyclists and horse riders would be required.

17.97 As the Crossing is also a SPC, then suitable alternatives for train passengers would need to be provided at the station. This would necessitate a ramped footbridge or a stepped footbridge with lifts.

17.98 Due to the lack of additional land take to accommodate extended bridle ramps, a replacement bridle bridge cannot be erected at the site of the station, which would have accommodated all users of the Crossing.

17.99 The impracticalities of ramped bridging options, either over or under the railway, at the location of the Crossing leaves only the option of a stepped footbridge with lifts, to accommodate station use only.

17.100 A second, alternative diversion away from the station is therefore required to accommodate equestrian use. This will necessitate additional distance to the user; however, as any alternative route would be used for leisure, it is considered that the additional distance would not detract from the users enjoyment of their walk. A meaningful diversion has been proposed for equestrian users, allowing horse riders to safely cross the railway at another location.

18 Options Conclusion and Recommendation

Options Analysis Table

	Updated ALCRM Score	Updated FWI Rating	Option Cost	Cost Benefit Analysis	Equivalent Financial Benefit	Cost Benefit Analysis x Gross Disproportionality Factor = Benefit Cost Ratio	Comment
Provision of Overlay MSL	D4	0.002401881	**£250,000***	**0.83**	**£208,441**	**2.075**	Due to the Crossing being located next to a station and the

							crossovers north of the station an Overlay system cannot be used.
Provision of Interfaced Overlay (Flex) MSL	D4	0.002401881	**£500,000***	**0.42**	**£211,172**	**1.05**	Due to the crossovers north of the station an Interfaced Overlay (Flex) system cannot be used. It also would not be able to provide suitable warning due to the crossing being immediately adjacent to the platform.
Provision of Integrated MSL	D4	0.002401881	**£1,000,000* £2,000,000**	**0.21 0.11**	**£212,565 £213,268**	**0.525 0.275**	The only technically feasible MSL option. High cost, likely higher cost than that which is used here for modelling, and residual risks and newly introduced risks result in risk not reduced SFAIRP.
Closure by a stepped Bridge with lifts at the Station and an at-grade bridle Diversion	M13	0	**£5,200,000**	**0.18**	**£956,970**	**0.45**	The bridge maintains station accessibility, whilst the diversion meets the requirement for the Public Right of Way (PRoW). The selected option for total risk elimination, convenience to users, and enhancing the PRoW network.
Closure by an equestrian subway near the station	M13	0	**£11,300,000**	**0.06**	**£680,256**	**0.15**	Although it would meet all requirements for closing the Crossing, there is insufficient land at the station for a ramped bridge
Closure by a stepped bridge with lifts at the station and ramped bridle bridge elsewhere	M13	0	**£13,500,000**	**0.05**	**£680,256**	**0.125**	The combined cost of 2 separate structures, with suitable approaches to a ramped structure, and additional land take discounts the option on cost alone.
Closure by diversion of the bridleway – no bridge at station	M13	0	**£361,575**	**1.88**	**£680,256**	**4.7**	This option does not maintain access to both platforms from the village. Not a viable option as up direction platform would become unusable.
Installation of all applicable residual mitigations (Stud Lighting, Yellow Deck, CCTV Monitoring)	C2	0.010077178	**£45,000***	**0.12**	**£5,339**	**0.3**	Minimal reduction in risk, even when considered cumulatively. Does not sufficiently reduce risk to SFAIRP
Installation of MSL and all applicable residual mitigations (Stud Lighting, Yellow Deck, CCTV Monitoring)	D4	0.002329824	**£1,045,000* £2,045,000**	**0.21 0.11**	**£214,464 £215,128**	**0.525 0.275**	A combination of the only technically feasible MSL option and all potential 'smaller' mitigations. High cost, likely higher cost than that which is used here for modelling, and residual risks and newly introduced risks result in risk not reduced SFAIRP.

18.1 The Table above uses the base ALCRM calculation as presented at the start of this IAR. It does not use future train numbers or future user numbers.

18.2 For the purposes of the CBA, I have used the standard costs for all MSL and residual intervention options. In these cases the costs are marked with a *.

18.3 For completeness, I have also run the Integrated MSL options with the predicted higher-than-standard cost of £2,000,000.

18.4 Below, I expand on the comments of each option in the table above.

18.5 Provision of overlay MSL: Not technically feasible for the reasons set out in paragraphs 17.23-17.26 above. The station and crossovers north of the crossing render this system inoperable.

18.6 Provision of Interfaced Overlay "Flex" MSL: Not technically feasible for the reasons set out in paragraphs 17.29-17.35 above. The crossovers north of the station render this system inoperable.

18.7 Provision of Integrated MSL: The table above shows the Integrated MSL option as having a comparable BCR to the selected option, but crucially, the CBA and GDF process does not and cannot consider the potential future misuse rate which would be seen at the Crossing were MSLs implemented. Further, the MSL would not reduce risk to equestrian users, one of the highest risk user types at the crossing; the inconsistent warning times would cause impatience and introduce mistrust in the system to all user types; and the potential for user confusion in mistaking a red light showing for a stationary train while another is approaching, is unacceptable. Integrated MSLs do not reduce the risk to SFAIRP.

18.8 Closure by a stepped bridge with lifts at the station and an at-grade bridleway diversion: The selected option. This option, while not providing a BCR of >1, results in the elimination of crossing risk which is the preferred and first consideration in any risk assessment process. A safe, convenient alternative to the crossing is to be provided and therefore the option is selected.

18.9 Closure by an equestrian subway near the Crossing: This option is deemed not a viable option given the significant costs to the taxpayer, the considerable disruption to the railway and the impact that removing large volumes of earth would have upon the local environment, including drainage.

18.10 Closure by a stepped bridge at the station with lifts and a ramped bridleway bridge elsewhere: Included for completeness. This option is not viable due to the extremely high cost of providing two structures.

18.11 Closure via diversion of the bridleway only: No bridge at the station – Included for completeness. This option is not viable as it will remove all convenient access to the up direction platform from the village, requiring passengers to walk the near 2km diversionary route.

18.12 Installation of all applicable residual mitigations: This option sees the installation of all applicable mitigations set out in paragraphs 17.81-17.97 above, The RLCM has, in line with LCG 14 [**IA17]**, applied a 3% manual total mitigation to the crossing risk for these combined mitigations. The risk reduction is therefore minimal, it does not come close to reducing risk SFAIRP, and therefore the option is discounted.

18.13 Installation of MSLs all applicable residual mitigations: This option provides the risk reduction seen in the provision of the various MSL options, coupled with the installation of all applicable mitigations set out in paragraphs 17.81-17.100 above. The risk mitigation provided by the MSLs is the key driver in this option, and this has previously been discounted as not reducing risks to SFAIRP, and the subsequent 3% manual mitigation does not suitably mitigate the risks left or introduced by the MSL.

18.14 The Table above indicates that closure by installation of a new Station Footbridge with Lifts and a bridleway diversion offers the strongest business case and safety justification in mitigating all risk SFAIRP.

19 Evaluating Cost benefit Analysis (CBA) and the Gross Disproportionality Test

19.1 Network Rail has a legal duty to reduce risks at level crossings SFAIRP. The Health and Safety at Work etc. Act 1974 places a duty on Network Rail to ensure that it does not expose level crossing users to unnecessary risks to their health and safety.

19.2 In order to understand whether the risk at the Crossing is managed SFAIRP, during routine risk assessments or following notification of an impending change to risk (for example, from a timetable change or proposed development near to the crossing), CBA is undertaken to provide a Benefit Cost Ratio (BCR); the principle being, if the cost and effort of implementing a control measure is grossly disproportionate to the reduction in the risk that might be achieved, then it is reasonable for Network Rail to implement that control measure.

19.3 SFAIRP is therefore not about the total elimination of risk that would otherwise prevent the activity taking place, rather, Network Rail must balance the cost of implementing control measures in terms of money, time and effort, against the aggregated risk reduction to level crossing users.

19.4 If it is shown that there is a gross disproportion, i.e. the risk change is inconsequential to the sacrifice, the measure is not reasonably practicable to progress.

19.5 What is considered grossly disproportionate is not always explicit and requires assessment. In order to understand if risk reduction SFAIRP has been satisfied, Network Rail undertakes both the CBA and a Gross Disproportionality Test for every Long Term or significant Short Term option considered for risk reduction.

19.6 Once all measures which meet this test have been implemented, the risk is reduced SFAIRP.

19.7 As there is currently no routine risk assessment regime for the Crossing, as it is temporarily closed, CBA and a Gross Disproportionality Test has been undertaken as part of this IAR, in line with LCG 04 - Cost Benefit Analysis Assistant User Guide **[IA19]** and LCG 24 - Guidance for Applying Gross Disproportion Factors to CBA **[IA21]**.

19.8 At some locations, there are no reasonably practicable interventions available, and so the risk is reduced SFAIRP.

19.9 To calculate the BCR, Network Rail uses an internal Cost Benefit Analysis tool, which takes into account factors such as cost of the intervention, lifespan of the intervention, safety benefit gained, increases or decreases to operational and maintenance costs, and the Value for Preventing a Fatality (**VPF**).

19.10 In the simplest of terms, the VPF is an annually adjusted Figure, set by the DfT, and is the aggregated value of reducing a small probability of death for a very large number of people.

19.11 Additionally, a Gross Disproportion Factor (GDF) is applied to the BCR using one of the following factors:

- Medium = 1.5
- High = 2.5
- Exceptional = 6

19.12 The criteria for defining the correct factor is determined by considering the level crossing against the following criteria using a question bank [Ref. Appendix A]:

- Culpability – weighting deliberate misuse against genuine mistakes.
- Vulnerability – to reflect a greater responsibility towards those less able to protect themselves.
- Societal aversion – addressing the absence of public appetite for credible mass casualty train accidents.
- Uncertainty – for the degrees of confidence in our knowledge of the pattern of apply, which encompasses elements such as who/how/with/what consequences.

19.13 The GDF question bank is completed for each crossing, in the process of each risk assessment, thereby taking account of any changes that may have occurred since the last time the question bank was completed for the location.

19.14 The Gross disproportionality test therefore allows for an approved method of quantifying hereto qualitative considerations.

19.15 The highest level indicated across all questions determines the appropriate GDF level to use. Tackley has been deemed as a high rated crossing – so, a 2.5 factor is applied (see **Appendix A**).

19.16 The resultant final BCR score informs and supports decision making based on the following criteria:

a. Benefit to cost ratio is ≥ 1: positive safety and business benefit established (GREEN).
b. Benefit to cost ratio is between 0.99 and 0.5: reasonable safety and business benefit established where costs are not grossly disproportionate against the safety benefit (AMBER).
c. Benefit to cost ratio is between 0.49 and 0.0: weak safety and business benefit established (RED).

19.17 The guidance provided to the level crossing / project teams is:

GREEN: There would be a legal requirement to deliver the applicable intervention.

AMBER: A record of the business decision / justification on the applicable intervention (or not where the decision is to not deliver any risk mitigation activity) is required.

RED: No action would be proposed

19.18 This IAR considered all possible options for this crossing, including those in section 17 above. The key information is detailed in the table, in section 18.

20 Application of CBA and GDF on Options

20.1 Against each of the options, closure of the Crossing with suitable facilities provided at the station enables NR to meet accessibility requirements, and providing a suitable bridleway diversion to a safe and convenient point for horse riders to safely cross the railway is the most feasible, on safety, in achieving risk reduction SFAIRP, and on cost.

20.2 The provision of the new bridleway needed to be agreed with the affected landowner and this has been attained. The proposed diversion will add approximately 1,300 metres of new bridleway for equestrian users, cyclists, and pedestrians.

20.3 In recognition that the new bridleway follows the railway boundary fence for a considerable distance, attempts were made to realign it along the opposite field boundary; this option was deemed unfeasible due to flood risk, engineering complexities in managing this risk, culverts and bridges over streams required, all of which added considerable cost and led to the conclusion that the preferred route is the optimal.

20.4 The Table summarises the information which is exclusively quantitative in nature and is free from external influences, i.e. the data comes direct from the ALCRM and CBA tools managed and held by Network Rail.

20.5 This quantitative analysis shows the selected option is the only effective option to reduce risks so far as is reasonably practicable.

20.6 The qualitative element of this assessment clearly shows that closure under the primary option offers the most positive BCR when GDF is applied, which confirms the selection of the preferred option at this level crossing.

21 Conclusion

21.1 The only feasible option that can be progressed, irrelevant of cost, is for closure of the Crossing and to replace it with a new station footbridge with lifts and to implement a suitable diversion for bridleway users.

21.2 No other risk mitigation option, or options taken together, would successfully reduce risk to as low as is reasonably practicable (SFAIRP). Should public rights be rescheduled over the Crossing, the safety risk will increase to unacceptable levels and the risk of serious incident, or a fatality will remain unacceptably high.

21.3 Closure reduces the safety risk overall, SFAIRP, in that the risk from using the Crossing is completely removed, and any risk imposed on users of the diverted bridleway will be significantly less than leading horses over an uncontrolled level crossing.

Appendix A – Level Crossing GDF Level Determination Pro-forma

Tackley Level Crossing GDF assessment

GDF question set tool to support level crossing cost benefit analysis

Version 1.1

Crossing name	Tackley		
ELR, m, ch	DCL 72m 47ch	**Crossing type**	FPG
Name of person completing this form	Ian Aston		
Date of completion	26/04/2024	**GDF result**	**High**

Culpability - accounting for suicides, deliberate misuse and user errors						**Comments**
What is the level crossing incident history since the last risk assessment?	Suicide events only	0 - 5 incidents	6 - 25 incidents	>25 incidents	**GDF Score**	Crossing has been closed since the last risk assessment, however in the period between the prior and the latest risk assessments there were 6-25 incidents
	Medium	**Medium**	**High**	**Exceptional**	**Medium**	
Vulnerability - a greater responsibility exists for those less able to protect themselves						
Who uses the level crossing?	No vulnerable users identified	Vulnerable User CAT 1 *Cyclists and dog walkers only*	Vulnerable User CAT 2 *Those with protected characteristics, e.g., children, elderly, encumbered, disabled, parents with young children*		**GDF Score**	In line with Network Rail's PSED ,as a station footpath crossing and the only means of crossing between the two platforms, users with protected characteristics need to be accounted for
	Medium	**Medium**	**High**		**High**	
Societal Aversion - addressing the absence of public appetite for credible mass casualty events						
What is the worst-case consequence in the most likely scenario for a single event involving a train	Event with the potential of a single specified injury to 5 specified injuries	Event with the potential of between 5 specified injuries and 2 fatalities	Event with the potential of between 2 and 10 fatalities	Event with the potential of greater than 10 fatalities or 10 FWI	**GDF Score**	The most likely scenario for a single event involving a train is an individual being struck and killed at the crossing
	Between 0.1 and 0.5 FWI	*Between 0.5 and 2 FWI*	*Between 2 and 10 FWI*			
	Medium	**Medium**	**High**	**Exceptional**	**Medium**	
Uncertainty - how confident are we that we understand crossing usage correctly?						
Does the level crossing currently have a passive or active warning?			Active	Passive	**GDF Score**	Crossing is currently passive
			Medium	**High**	**High**	
Does the local environment create uncertainty about how the crossing is used and by whom?			No	Yes	**GDF Score**	Station Crossings can bring any and all sorts of user types over the crossing.
			Medium	**High**	**High**	
Uncertainty for private level crossings						
Who uses the crossing?	Authorised users or regular, controlled users only		Irregular/unfamiliar users (delivery drivers etc.)		**GDF Score**	Not Applicable
	Medium		**High**		**N/A**	
Can we be certain about the types of vehicles that use the crossing?		Confirmed by census and other smart sources of information	Described and confirmed by authorised users	Unable to confirm through census or discussion with authorised users	**GDF Score**	Not Applicable
		Medium	**High**	**Exceptional**	**N/A**	
Uncertainty for public road level crossings						
What level of protection is provided at the crossing?		Full barrier	Half barrier *(or open crossing if line speed is equal to or less than 25mph)*	Open crossing *(If line speed is greater than 25mph)*	**GDF Score**	Not Applicable
		Medium	**High**	**Exceptional**	**N/A**	

Appendix B – Reference Documentation

LCG 02	Census Good Practice, issue 3 [**IA18]**
LCG 04	Cost Benefit Analysis Assistant User Guide **[IA19]**
LCG 14	Applying Risk Reduction Benefits in ALCRM
LCG 21	Evaluating the impact of fog at passive level crossings **[IA20]**
LCG 24	Guidance for Applying Gross Disproportion Factors to CBA **[IA21]**
NR/L2/XNG/001	Provision and risk management of level crossings **[IA22]**
NR/L3/XNG/308	Risk Assessing Level Crossings
NR/L2/XNG/30020/R03	Requirements for station, footpath, bridleway and user-worked level crossings **[IA24]**
NR/L2/XNG/30020/A28	Signage for level crossings
Occurrence Log Book	Record of telephone calls to the signaller [**IA23]**
Office of Rail and Road – Principles for managing level crossing safety – 15 June 2021	
Office of Rail and Road – Railway Safety Publication 7-December 2011 (RSP7) Level Crossings: A guide for managers, designers and operators (Parts withdrawn)	

Appendix C – ALCRM Risk Score Explanation

ALCRM calculates the level of risk to individual users (per traverse) and the combined risks for all users, train staff and passengers at level crossings. It provides a consistent and robust quantitative methodology that is supplemented by the local knowledge and professional judgement of risk assessors.

Risk is expressed in fatalities and weighted injuries (FWI). The following values help to explain what this means:

- 1 = 1 fatality per year or 10 major injuries or 200 minor RIDDOR events or 1000 minor non-RIDDOR events
- 0.01 = 20 minor RIDDOR events or 100 minor non-RIDDOR events
- 0.005 = 5 minor non-RIDDOR events

Risk per Traverse

This is the level of calculated risk to an individual crossing user. It applies to a single traverse of the level crossing or each time the crossing is used by an individual.

The Risk per Traverse:

- Can be calculated for crossing users, train staff and passengers. Ranking is based on the risk to users only.
- Does not increase with the number of users.
- Is presented as a simplified ranking A to M. A is highest, L is lowest, and M is 'zero risk' e.g. temporary closed, dormant or crossings on mothballed lines.
- Allows risks to individuals on a per traverse basis to be assessed even if usage and Collective Risk is low.
- Can help in the prioritisation of risk mitigation and investment in safety.

Risk Per Traverse Ranking	Probability		FWI/traverse	
	Upper	Lower	Upper	Lower
A	1 in 1	1 in 500000	1	0.000002
B	1 in 500000	1 in 2500000	0.000002	0.0000004
C	1 in 2500000	1 in 12500000	0.0000004	0.00000008
D	1 in 12500000	1 in 62500000	0.00000008	0.000000016
E	1 in 62500000	1 in 125000000	0.000000016	0.000000008
F	1 in 125000000	1 in 250000000	0.000000008	0.000000004
G	1 in 250000000	1 in 500000000	0.000000004	0.000000002
H	1 in 500000000	1 in 1000000000	0.000000002	0.000000001
I	1 in 1000000000	1 in 2000000000	0.000000001	0.0000000005
J	1 in 2000000000	1 in 5000000000	0.0000000005	0.0000000002
K	1 in 5000000000	1 in 10000000000	0.0000000002	0.0000000001
L	1 in 10000000000	Greater than 0	0.0000000001	Greater than 0
M	0	0	0	0

Collective Risk

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

Collective risk:

- Is presented as a simplified ranking 1 to 13. 1 is highest, 12 is lowest, and 13 is 'zero risk' e.g. temporary closed, dormant or crossings on mothballed lines.
- Can help in the prioritisation of risk mitigation and investment in safety.

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

IA4

PASSIVE LEVEL CROSSING RISK ASSESSMENT

1. LEVEL CROSSING OVERVIEW AND ENVIRONMENT

Network Rail has a responsibility and legal duty under the Health and Safety at Work Act 1974 for the health, safety and welfare of its employees and for protecting others against risk.

Network Rail also has a legal responsibility under the Management of Health and Safety at Work Regulations 1999. Section 3 focuses on the requirement for suitable and sufficient assessments of risk to health and safety of employees and others in connection with their undertaking.

Network Rail is committed to reducing the risk on the railway and has identified that one of its greatest public risks is at level crossings. This is where the railway has a direct interface with other elements e.g. vehicles and/or pedestrians. Network Rail is working to reduce this risk to as low as is reasonably practicable.

1.1 LEVEL CROSSING OVERVIEW

This is a reactive risk assessment for Tackley level crossing after a near miss on 16/10/2019. Details of this near miss are contained in sections 3.4 and 3.5 of this risk assessment.

Crossing details	
Name	Tackley
Type	FPG (Footpath with Bridle Gates)
Crossing status	Public Bridleway
Overall crossing status	Open
Route name	Western
Engineers Line Reference	DCL (Didcot-Chester Line), 72m, 47ch
OS grid reference	SP485205
Number of lines crossed	2
Line speed (mph)	90
Electrification	No
Signal box	TVSC Oxford Workstation

Risk assessment details	
Name of assessor	Ian Aston
Post	Level Crossing Manager (LCM)
Date completed	04/11/2019
Next due date	04/02/2022
Email address	ian.aston@networkrail.co.uk
Phone number	07732640655

ALCRM risk score	
Individual risk	C
Collective risk	4
FWI	0.003402854

In this risk assessment there are references and standard railway terminology that may be unfamiliar to persons reading this document.

1.2 INFORMATION SOURCES

The table below shows the stakeholder consultation that was undertaken as part of the risk assessment.

Consulted	Attended site
Other (Level Crossing Attendants)	Yes
LOM, MOMs	No

Stakeholder consultation and attendance notes:

The Local Operations Manager (LOM) and Mobile Operations Managers (LOMs) were not required to attend site due to the assessor gathering information from them via email. Following the incident on 16/10/2019, a level crossing watchman is now stationed at the crossing between 05:00-00:30 and was present to pass on relevant information for this risk assessment. They are currently conducting a census of crossing users which will be added to this risk assessment once adequate time has passed for an accurate average usage to be calculated.

The reference sources used during the risk assessment included:

- TOPS/TRUST/WinVVTN
- SunCalc
- Level Crossing Decision Support Tool (DST)
- CCIL
- SMIS

TOPS/TRUST/WinVVTN was used to gather information on the amount of trains that run over the level crossing. SunCalc was used to gather information on the sun's movement at the level crossing. Level Crossing DST was used in conjunction with CCIL and SMIS to gather information on incidents and safety-related incidents at the level crossing.

1.3 ENVIRONMENT



Up side crossing approach



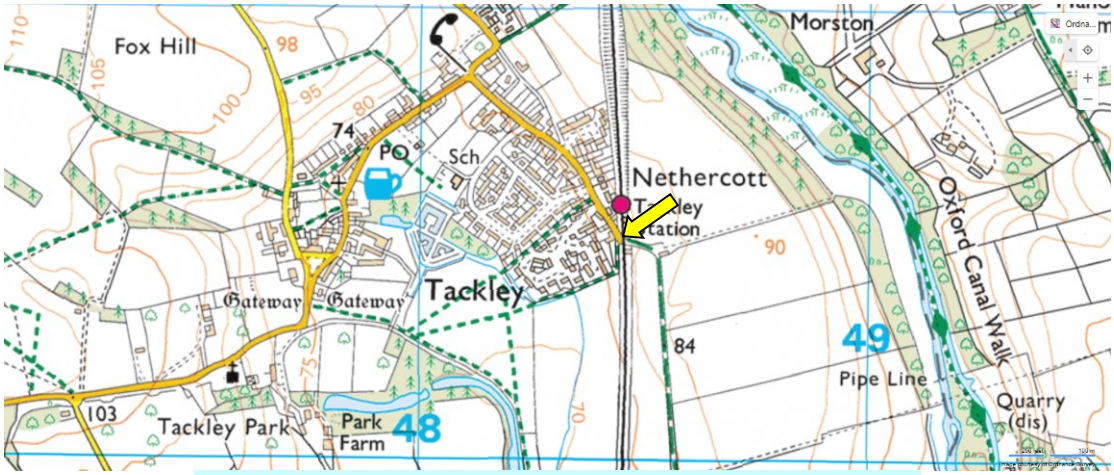
Down side crossing approach

Tackley Level Crossing is an unprotected crossing. This means the crossing is not protected from train movements therefore trains can traverse the crossing whether it is clear or not. Tackley is also known as a passive crossing as there is no method of warning of an approaching train. The crossing relies on a user actively stopping, looking and listening for approaching trains before deciding whether it is safe to cross. Whistleboards are provided as an extra warning that a train is approaching.

At present, there are 661 level crossings on Western Route. Out of this figure Tackley is ranked 35. However, when compared to the other crossings of a similar type it is ranked 35 out of 360



Bing Maps extract showing location of level crossing



Ordnance Survey map showing location of level crossing

Tackley is a Public Bridleway level crossing, located at the end of Tackley Railway Station on Nethercote Road. It is the only means of crossing between the two platforms at the station. To the west of the level crossing is the rural village of Tackley and to the east there is a footpath through fields leading eventually to the rural village Kirtlington approximately 1 ¼ miles away.

At Tackley level crossing the orientation of the road/path from the north is 80°; the orientation of the railway from the north to the up line in the up direction is 140°. The low horizon can result in sun glare, however due to the orientation of the railway it is highly unlikely that the sun would be behind an approaching train.



Routeview Image of the crossing from the north



Routeview Image of the crossing from the south

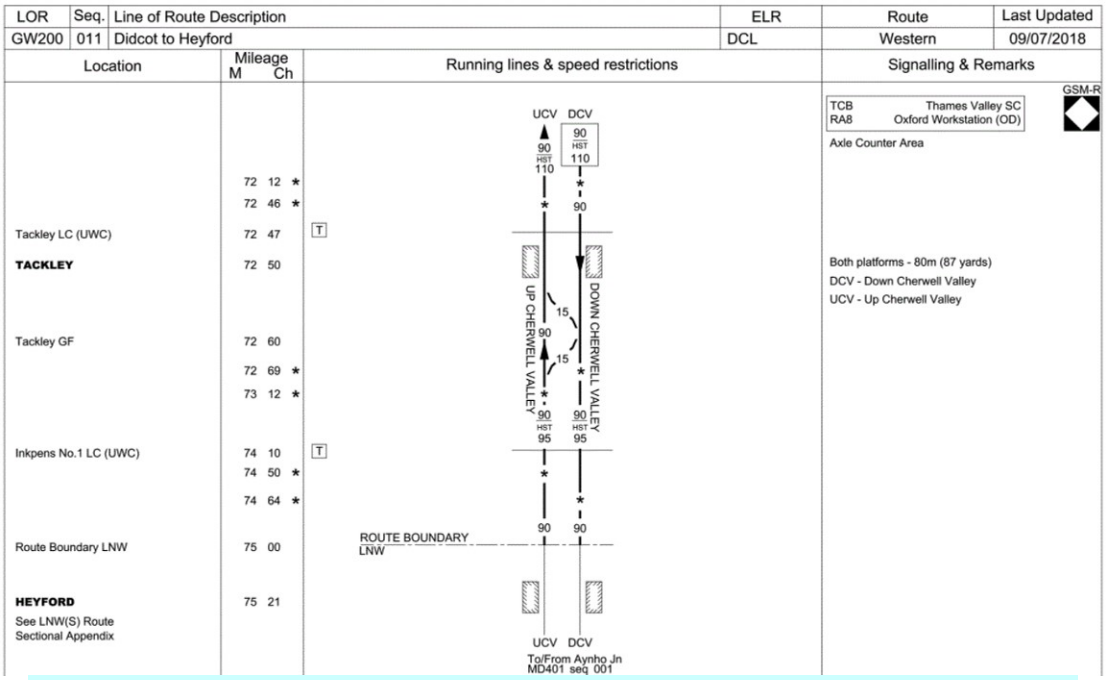


SunCalc image showing sun's movement

2. LEVEL CROSSING USAGE

2.1 RAIL

The train service over Tackley level crossing consists of passenger and freight trains. There are 140 trains per day. The highest permissible line speed of trains is 90mph. Trains are timetabled to run for 24 hours per day. The closest station to the north (in the “down” direction) is Heyford and the closest to the south (in the “up” direction) is Oxford.



Sectional Appendix extract showing the location of Tackley FPG *(Note: Tackley was previously a UWC)*

Assessor’s notes:

“Up” is a term used to describe the line or direction of travel towards the nearest major principality, in this case Oxford. “Down” is a term used for the line or direction of travel away from the nearest major principality.

Of the 140 trains that are scheduled over the crossing 64 are high-speed trains with an average of 5 cars (roughly 115 metres), 31 are high-speed passenger trains with an average length of 3 cars (roughly 69 metres) and 44 are Freight trains with varying lengths, some as short as one single locomotive and some as long as 554 metres. Of the shorter passenger trains 25 are scheduled to stop at the station per day, 12 on the “up” platform and 13 at the “down” platform.

The train operating companies have expressed an interest in increasing the amount of trains that run on the DCL, however Network Rail has blocked this until Tackley level crossing, Sandy Lane and Yarnton Lane AHB (Automatic Half-Barrier) crossings can be closed. Work on these closures is ongoing as part of the Oxford Corridor project.

2.2 USER CENSUS DATA

Due to the reactive nature of this risk assessment, is has not been possible to implement a full 9-day census on this occasion. Therefore, the previous census data from October 2018 has been used. The camera put out at Tackley (5th – 15th October 2018) picked up the following users of the level crossing,

	Pedestrian use to access bridleway	Pedestrian use to access the Up platform	Cyclist use	Horse-rider use
Fri 5th (from 10am)	23	9	2	0
Sat 6th	34	21	2	1
Sun 7th	59	2	6	2
Mon 8th	62	25	7	0
Tues 9th	47	37	9	0
Weds 10th	49	26	11	1
Thurs 11th	50	29	8	0
Fri 12th	29	30	4	0
Sat 13th	41	14	11	1
Sun 14th	49	1	2	1
Mon 15th (until 10am)	19	9	2	0

Available information indicates that the crossing does not have a high proportion of vulnerable users. Network rail categorises vulnerable users as those users that are mobility impaired or otherwise encumbered resulting in a slower traversal speed. No vulnerable users were identified during the census neither has a high proportion been identified previously.

Available information indicates that the crossing does not have a high number of irregular users. Network Rail categorises irregular users as those users who are unfamiliar with the safe operation of a level crossing. No irregular users were identified during the census neither has a high number been identified previously.

Information gathered indicates that Tackley level crossing does not have a high number of users during the night or at dusk. However, some level of night time usage is to be expected as the level crossing is the only means of crossing between the platforms, therefore anyone alighting from a late train on platform 2 will need to use the crossing if going into Tackley.

Assessor's general census notes:

A crossing watchman is now in place and is counting usage over the level crossing. When this data is available the Level Crossing Manager will assess it and if there is a notable disparity between the usage numbers captured and the data that was captured in October 2018 the Level Crossing Manager will update the risk assessment to reflect this.

2.3 USER CENSUS RESULTS

ALCRM calculates usage of the crossing to be 0 road vehicles and 74 pedestrians and cyclists per day.

3. RISK OF USE

3.1 SIGHTING AND TRAVERSE

At Tackley level crossing, the decision point and traverse lengths are calculated as:

	Decision point (m)	Traverse length (m)	Measured from
Up side	2.1	9.1	Gate
Down side	2.4	9.4	Gate

The minimum decision point for a Bridleway crossing is specified as being 3m for riders/users in charge of animals. In this case, due to the presence of telephones and signs instructing all riders/users in charge of animals to contact the signaller, the sighting requirement has been calculated using the pedestrian decision point of 2.1m/2.4m. This is because any user in charge of animals will not ever have to rely on their sighting if they follow the instructions provided at the crossing. The decision point has been measured at this point as the most likely position for a user to make their decision as to whether it is safe to cross.

Rubber decking is provided over the level crossing. The decking is wide enough for all users of the crossing and has a non-slip surface.

	
Up side Looking across crossing	**Down Side looking across crossing**

The traverse times are calculated as:

	Traverse time (s)
Pedestrians	7.91

Where a high proportion of vulnerable users is identified, Network Rail specifies that the traversal time and by extension the required sighting distance must be increased by 50%. The current census has not identified a high proportion of vulnerable users, therefore the pedestrian traverse time has not been increased.

Assessor's traverse time notes:

The traverse time has been calculated using the Network Rail standard of 1.189m/s for able-bodied pedestrians. Within the boundary fences the level crossing has a good and even surface profile throughout.

Sighting was measured by the following means:

- Using known references
- Using Range Finder



Upside looking towards Up Direction Train Approach



Upside looking towards Down Direction Train Approach



Downside looking towards Up Direction Train Approach



Downside looking towards Down Direction Train Approach

Sighting, measured in metres, at Tackley level crossing is recorded as:

All distances are recorded in metres	Minimum sighting distance required	Measured sighting distance	Sighting distance measured to	Is sighting compliant?	If deficient, is sighting distance mitigated?	Notes on deficient sighting time mitigations
Up side looking toward up direction train approach	308	657	Colleague at 73 Mile Post	Yes	N/A	Summarised below
Up side looking toward down direction train approach	308	606	Colleague at AWS Magnet for OD2445 Signal	Yes	N/A	Summarised below
Down side looking toward up direction train approach	318	603	Colleague at OD2450 Signal	Yes	N/A	Summarised below
Down side looking toward down direction train approach	318	453	Colleague	Yes	N/A	Summarised below

Tackley level crossing is compliant on sighting alone, however whistleboards are provided as additional mitigation. Due to the length of time the whistle boards have been in place at the crossing, and the familiarity that the users have with them because of this, it is not recommended to remove them.

Sighting restrictions are recorded as follows:

	Up Direction	Down Direction
Nothing; vanishing point	NO	NO
Track curvature	YES	YES
Permanent structure (building/wall etc)	NO	NO
Signage or crossing equipment	NO	NO
Vegetation	NO	NO
Bad weather on the day of visit	NO	NO
Other	NO	NO

There are known obstructions that could make it difficult for users to see approaching trains. The furniture (fencing/signage etc.) installed at the station and crossing is the largest cause of these potential obstructions, however the assessor has measured sighting from 3m, 2.4m 2.1m and 2m away from the nearest rail and there is sufficient sighting at all these points. There are known issues with foliage, fog or other issues that might impair visibility of the crossing, crossing equipment or approaching trains. Vegetation management is a key factor in managing the sighting at level crossings and the vegetation along this stretch of track has recently been cut back by 8 metres each side allowing for optimal sighting. This is part of an ongoing maintenance program.

3.2 EVALUATION OF MITIGATIONS

Tackley level crossing is provided with whistle boards.

	Line Speed	Distance to whistle board*	Whistle board warning provided (s)	Is the whistle board warning < or > traverse ? (s)	Whistle board compliance with 400m maximum (m)	Is the train horn clearly audible at the crossing?	Comments on audibility and whistle board position
Up line	90	414	9.04	1.13	YES	YES	Train horns noted as audible and effective.
Down line	90	394	8.6	0.69	YES	YES	Train horns noted as audible and effective.

The percentage of users who use the crossing during the night time quiet period, between 2300 and 0700, is estimated as 2%.

Assessor's notes on whistle board suitability as a risk control

Whistle boards are present and visible to drivers. The whistle boards are not utilised during the night time quiet period (0000-0600) however the sighting available is sufficient for a crossing user to make their informed decision on whether it is safe to cross or not without the train sounding their whistle.

3.3 CROSSING APPROACHES



Upside approach to the crossing from the platform

The signs at Tackley level crossing are located on the direct route a user would take over the level crossing, they are positioned so that they are clearly visible to users taking a direct route over the level crossing.



Crossing and footpath signage on the Up approach to the crossing

The approaches to the crossing within the boundary fence are not considered to be steep, slippery or present a tripping hazard to users.

There are adjacent sources of noise that could affect a users' ability to see or hear approaching trains. Airplane noise was fairly continuous on the day of the visit, due to the relative proximity of Oxford airport.

The visibility of the signs is reduced at night or at dusk as there is no direct illumination for these. However, the lighting at the station and the streetlights on Nethercote Road will illuminate the signs to a degree.



Images showing lighting at the station which would illuminate crossing signage

3.4 AT THE CROSSING – ANOTHER TRAIN COMING RISK

Trains are sometimes known to pass each other at this crossing. This situation is what is believed to have led to the near miss that triggered this risk assessment. The current understanding of the incident is as follows:

A train stopped at platform 2 (the up platform) and some passengers alighted here. They made their way off the end of the platform towards the crossing. The train then left the station traversing the crossing, after which the two passengers stepped out behind it and walked across the crossing just in front of a train travelling on the other line in the down direction. They were clear of the line approximately 2 seconds before the train arrived at the crossing. The train driver had to apply the emergency brakes. It is possible that the train that had just left the platform obscured these users' view of the train coming in the down direction resulting in them not knowing they barely had enough time to cross. Had the users waited for the train they had just alighted to move further away from the crossing, this would have resulted in them having sufficient sighting to see the train coming in the other direction. The signs instructing users to "Stop, Look, Listen. Beware of trains" and warning that "Trains run either way on each line" were not adhered to in this instance as the users did not allow themselves the opportunity to look out for trains coming in the other direction.

Network Rail has been aware of the risk of another train coming at this location for some time and has installed non-standard signs here reading "Do not cross the track when a train is approaching or when a train is in the station" to educate and mitigate against this risk. These signs are present and visible to all users of the crossing and it is possible that the users involved in this near miss adhered to these signs, however it is not known if they arrived at the crossing before or after the train left the platform. As a result of this incident, the Level Crossing Manager recommends that the wording on these signs be changed to "Do not cross the track when a train is approaching or when a train is in the platform or when a train is in sight"

3.5 INCIDENT HISTORY

A level crossing safety event has been known to occur at Tackley level crossing in the last twelve months.

Assessor's incident history notes:

Event Date	Description	Narrative Text
2019-10-16	LC near miss - 1S52 (1347 Southampton Central – Edinburgh Waverley) reported a near miss at Tackley UW Crossing with two elderly ladies	At 1539 the driver of 1S52, CrossCountry, (1347 Southampton Central – Edinburgh Waverley) reported a near miss at Tackley UW Crossing with two elderly ladies and their trolleys. The driver, who applied the emergency, advised that the train had missed the individuals by approximately 40 feet. It was thought that the ladies had alighted from 2V45, Great Western Railway, (1507 Banbury – Didcot Parkway). The driver was fit to continue.
2019-07-27	LC misuse - 2V29 (11:08 Banbury - Didcot PW) reported that while at a stand at Tackley, a young female walked across Tackley UWC in front of the train in an attempt to get on the train	The driver of 2V29 (11:08 Banbury - Didcot PW) reported that while at a stand at Tackley, a young female walked across Tackley UWC in front of the train in an attempt to get on the train. The driver remonstrated with the person and refused travel. It was not declared a near miss and the driver was OK
2019-06-14	LC Near miss - 2V23 (0937 Banbury – Didcot Parkway) reported a near miss at Tackley UWC with two members of the public.	At 0958 the driver of 2V23 (0937 Banbury – Didcot Parkway) reported a near miss at Tackley UWC with two members of the public. One of the persons motioned to the driver to stop. The driver was shaken by the incident but fit to continue to Oxford where they had booked relief. The BT Police were advised. A Mobile Operations Manager attended and reported that signage and sighting was in order, but found that the telephones were not working correctly. The Mobile Operations Manager remained on site until S&T staff were able to rectify the fault by replacing the affected telephones, completed by 1420.
2019-06-06	LC misuse - Phone left off the hook after a crossing user used Tackley BW & FP Level Crossing	TVSC Oxford signaller advised that that the phone had been left off the hook after a crossing user used Tackley BW & FP Level Crossing. The driver of 1M34 (0845 Bournemouth - Manchester Picc) was asked to replace the phone. No further issues reported.
Event Date	**Description**	**Narrative Text**

2019-05-21	LC misuse - A cyclist crossed over in front 2V35 (12:34 Banbury to Didcot Parkway) at Tackley level crossing	The driver working 2V35 (12:34 Banbury to Didcot Parkway) reported deliberate crossing misuse at Tackley level crossing whilst at Tackley station on the up main Cherwell line. The driver has reported a cyclist crossed over in front of the train but did not classify this as a near miss. The only description given by the driver was a man had been dressed in black Lycra. The driver was okay to continue with the signaller running normally. Didcot S&T advises both telephones tested with no issues, all signage correct and intact with no sighting issues found
2019-04-06	LC misuse - 2V61 (1908 Banbury - Didcot PW) reported that as the train pulled into Tackley a male ran across the station crossing in order to catch the train.	The driver of 2V61 (1908 Banbury - Didcot PW) reported that as the train pulled into Tackley Station a male ran across the station crossing in order to catch the train. The driver did not declare the incident a near miss and confirmed that the male had boarded the train.
2018-11-01	LC near miss - 1M42 (10:45 Bournemouth - Manchester) reported a very near miss with 2 youths on Tackley UWC.	The driver of 1M42 (10:45 Bournemouth - Manchester) reported a very near miss with 2 children on Tackley UWC. The driver was shaken but able to continue. The driver of 2V35 (12:34 Banbury - Didcot), which was stationary in Tackley station at the time, reported that there is now nobody at the crossing, but believed that the two children got on his train. The MOM confirmed that the crossing signage was all correct and both phones were working properly. The train was met at Oxford by BTP however due to number of people leaving, the two suspects managed to leave the station before police could stop them. On viewing the CCTV it was confirmed that neither were children but young adults around the age of 20.

4. ALCRM CALCULATED RISK

*Tackley **level crossing ALCRM results***

Key risk drivers: ALCRM calculates that the following key risk drivers influence the risk at this crossing:

- Frequent trains
- Large number users
- Near station

Assessor's key risk drivers notes

The key risk drivers identified above are mitigated against in the following ways:

Frequent Trains: The more often trains run over the crossing, the higher the risk of a collision. The standard signage installed at the crossing instructs users to Stop, Look, Listen and Beware of trains, and that trains can run both ways on each line. The crossing is also equipped with telephones available for all users to use, if they wish, and it is specified by the signage that all users in charge of animals must use these phones.

Large number of users: The more people use a crossing, the higher the risk of a collision occurring. The onus is on each individual crossing user to obey the signage provided to ensure their safety. Large groups of people using the crossing at once could introduce a "follow the leader" mentality whereby only the first person in the group checks for trains and everyone else follows assuming it is safe, however large groups of people crossing together is not known to happen at this crossing.

Near Station: This introduces the risk of users assuming an approaching train is going to stop at the station and crossing in front of it at full line speed thinking they have more time than they do, or of a train in the station/having just left the station obscuring a user's view. There are additional non-standard signs at this crossing instructing users not to cross when a train is in the platform or when a train is approaching. Users must obey the other standard signage telling them to Stop, Look, Listen and beware of trains.

Safety risk			
Compared to other	**Individual risk**	**Collective risk**	

crossings the safety risk for this crossing is	**C**		**4**	
	Individual risk (fraction)	**Individual risk (numeric)**		
Car	0	0	0	
Van / small lorries	0	0	0	
HGV	0	0	0	
Bus	0	0	0	
Tractor / farm vehicle	0	0	0	
Cyclist / Motor cyclist	0	0	0	
Pedestrian	1 in 11655	0.0000858	0.00338225	
				Derailment contribution
Passengers			0	0
Staff			0.000020604	0
Total			0.003402854	0
Collision frequencies	**Train / user**	**User equipment**	**Other**	
Vehicle	0	0	0	
Pedestrian	0.004120864	0.000473465	0.001296921	
Collision risk	**Train / user**	**User equipment**	**Other**	
Vehicle	0	0	0	
Pedestrian	0.003346142	0.000007575	0.000028532	

5. OPTION ASSESSMENT AND CONCLUSIONS

5.1 OPTIONS EVALUATED

The options evaluated to mitigate the risks at Tackley crossing include:

Option	Term[1]	ALCRM risk score	ALCRM FWI	Safety Benefit	Cost	Benefit Cost Ratio	Status	Comments
Closure via Underpass	Long Term	M13	0	100%	£4,000,000	0.05	COMPLETE	See Conclusion
Closure via Bridle Bridge	Long Term	M13	0	100%	£8,000,000	0.03	COMPLETE	See Conclusion
Closure via Diversion or Extinguishment	Long Term	M13	0	100%	£50,000	4.27	COMPLETE	See Conclusion
Install footbridge at station and remotely locked gates.	Long Term	C7	0.000063016	98%	£1,100,000	0.06	COMPLETE	See Conclusion
Install Integrated MSLs	Long Term	C4	0.00158683	53%	£650,000	0.07	COMPLETE	See Conclusion
Install Overlay MSLs	Long Term	C4	0.00158683	53%	£120,000	0.37	COMPLETE	See Conclusion
Re-word non-standard signage	Long Term	N/A	N/A	N/A	£200	N/A	COMPLETE	See Conclusion

NOTES
Network Rail always evaluates the need for short[1] and long term risk control solutions. An example of level crossing risk management might be; a short term risk control of a temporary speed restriction with the long term solution being closure of the level crossing and its replacement with a bridge.
[1] Includes interim

CBA gives an indication of overall business benefit. It is used to support, not override, structured expert judgement when deciding which option(s) to progress. CBA might not be needed in all cases, e.g. standard maintenance tasks or low cost solutions (less than £5k).

The following CBA criteria are used as a support to decision making:

a. benefit to cost ratio is ≥ 1: positive safety and business benefit established;
b. benefit to cost ratio is between 0.99 and 0.5: reasonable safety and business benefit established where costs are not grossly disproportionate against the safety benefit; and
c. benefit to cost ratio is between 0.49 and 0.0: weak safety and business benefit established.

5.2 CONCLUSIONS

Assessor's notes:

Options Evaluated:-

Closure via Underpass – RECOMMENDED

This option is currently the preferred option to pursue and there is a fully-funded scheme to deliver this by 2022. The scheme will see the footpath off of the station and the adjoining bridleway diverted south alongside the railway, cross underneath the railway at a point to be determined and join back up with the existing bridleway along the opposite side of the railway. Despite the low CBA score the risk reduction is 100% as it will remove the crossing from the Route. The current plans and discussion notes for this scheme are available in Western Route's electronic filing system.

Closure via Bridle Bridge, Extinguishment or Diversion – REJECTED

These three options are rejected due to their exploration in the past and the objections received from both local residents, local landowners and the local council. Despite the complete removal of risk, it is not possible to pursue these options.

Installation of pedestrian footbridge and retention of gates as on-demand – REJECTED

This option is rejected on two counts. The first is the objections that were received to the proposal of a footbridge by local residents and the local council and the second is the importing of risk by having locking gates. Locking gates require an emergency release mechanism on the inside of the gate to enable users trapped within the crossing to egress safely. This is not recommended at a bridleway crossing where mounted horse riders may use.

Installation of Integrated or Overlay MSLs – REJECTED

MSLs are Miniature Stop Lights and provide users with a visual and audible warning of an approaching train.

Overlay MSLs have a treadle on the tracks on the approach to the crossing which the train activates when it hits it. This turns the green "safe" light at the crossing off, illuminates the red "STOP" light and sounds the audible yodel alarms. There is another treadle beyond the crossing which the train activates turning the lights back to their original position of green "safe" and the audible warnings stop.

Integrated MSLs are interlocked with the signalling system and so whenever a train is in the section of track in which the crossing is located the light will show red "STOP" and the audible alarms will sound. When the train leaves the section the lights revert to their normal state of green "safe" and the audible alarms stop.

Overlay MSLs are not suitable for this location due to the proximity of the station. Because some trains stop at the station and some trains pass through without stopping, the system is unable to be calibrated to function here.

Integrated MSLs are not suitable here as the DCL is not signalled in a way that allows this type of working. The signal sections are far too large for the warning to be effective as the lights would show red "STOP" for a long time, which will introduce the risk of a user crossing while the light is red as they cannot see a train approaching. Over time users could take to ignoring the lights altogether. Until the DCL is re-signalled with a system like this in place this option is rejected. Due to the scale of re-signalling the entire DCL this is not deemed a likely occurrence.

Re-word Non-Standard Signage – RECOMMENDED

This option is recommended by the Level Crossing Manager (LCM) as an effective mitigation against a potential situation. The LCM recommends the wording be changed to something along the lines of "Do not cross the track while a train is within sight or when a train is approaching or when a train is in the station." It is believed by the LCM that this will, if adhered to, potentially prevent another near miss of similar circumstance to that which triggered this risk assessment.

Conclusion

A Planning application by Barwood for 70 houses approx. 200m away from the Level Crossing was granted on appeal in Sept 2017. Network Rail's objections were considered by the Planning Inspector but deemed not sufficient to uphold refusal. At the time of the risk assessment construction has not begun on this development.

Following the near miss on 16/10/19 Network Rail has stationed Level Crossing Attendants at Tackley level crossing between 0500-0030, 365 days a year. These attendants are to be stationed at the crossing until it is closed.

Network Rail submitted a temporary closure application to the local council in October 2019 to stop up the bridleway and construct a temporary pedestrian footbridge between the station platforms to protect the safety of the public until the underpass is completed.

Considering all the above, the LCM recommends pursuing the construction of the underpass and diverting the footpath and bridleway through this. In the medium term, until this can be completed the LCM recommends:

a) exploring the feasibility of adding spoken warnings on trains that stop at Tackley station, instructing passengers alighting here to wait until the train has left their sight, obey all signage and Stop, Look and Listen before traversing the crossing
b) exploring the feasibility of a motion-sensor activated warning to sound on the platform ramps instructing users of the crossing to wait until the train has left their sight, obey all signage and Stop, Look and Listen before traversing the crossing
c) Replacing the non-standard signs with new, differently worded signs instructing users to wait until a train has left their sight before crossing.

ANNEX A – ADDITIONAL PHOTOGRAPHS



Sign instructing all users on horseback to telephone signaller



The lower of the two phones provided on upside of the crossing to contact signaller



Whistleboard for up direction trains



Whistleboard for down direction trains

ANNEX B – HAZARD IDENTIFICATION AND RISK CONTROLS

The table below is intended for use by risk assessors when identifying hazards and risk control solutions. It is not an exhaustive list or presented in a hierarchical order.

	Hazard	Control
Road vehicle and train collision risk	Examples at the crossing include: • insufficient sighting and / or train warning for all vehicle types; known to be exacerbated by the driving position, e.g. tractor • level crossing equipment and signage is not conspicuous or optimally positioned • instructions for safe use might be misunderstood e.g. signage clutter detracts from key messages, conflicting information given • high volume of unfamiliar users, e.g. irregular visitors, migrant workers • known user complacency leading to high levels of indiscipline, e.g. failure to use telephone, gates left open • type of vehicle unsuitable for crossing; - large, low, slow making access or egress difficult and / or vehicle is too heavy for crossing surface - risk of grounding and / or the severity of the gradient adversely affects ability to traverse • poor decking panel alignment / position on skewed crossing • where telephones are provided, users experience a long waiting time due to: - long signal section (Signaller unaware of exact train location) - high train frequency • insufficient or excessive strike in times at MSL crossings • high chance of a second train coming • high line speed and / or high frequency of trains • unsuitable crossing type for location, train service, line speed and vehicle types	Controls can include: • optimising the position of equipment and / or signs • removing redundant and / conflicting signs • engaging with signalling engineers to optimise strike in times • upgrading of asset to a higher form of protection • downgrading of crossing by removing vehicle access rights • optimising sighting lines and / or providing enhanced user based warning system, e.g. MSL • re-profiling of crossing surface • engaging with stakeholders / authorised users to reinforce safe crossing protocol, legal responsibilities and promote collaborative working • widening access gates and / or improving the crossing surface construction material • realigning or installing additional decking panels to accommodate all vehicle types • implementing train speed restriction or providing crossing attendant
Pedestrian and train collision risk	Examples include: • insufficient sighting and / or train warning • ineffective whistle boards; warning inaudible, insufficient warning	Controls can include: • optimising the position of equipment and / or signs • removing redundant and / conflicting signs

	Hazard	Control
	time provided, known high usage between 23:00 and 07:00 • high chance of a second train coming • high line speed and / or high frequency of trains • level crossing equipment and signage is not conspicuous or optimally positioned • location and position of level crossing gates mean that users have their backs to approaching trains when they access the level crossing, i.e. users are initially unsighted to trains approaching from their side of the crossing • instructions for safe use might be misunderstood e.g. signage clutter detracts from key messages, conflicting information given • surface condition or lack of decking contribute to slip trip risk • known high level of use during darkness • increased likelihood of user error, e.g. crossing is at station • free wicket gates might result in user error • high volume of unfamiliar users, e.g. irregular visitors / ramblers, equestrians • complacency leading to high levels of indiscipline, e.g. users are known to rely on knowledge of timetable • high level of use by vulnerable people • where telephones are provided i.e. bridleways, users experience a long waiting time due to: - long signal section (Signaller unaware of exact train location) - high train frequency • insufficient or excessive strike in times at MSL crossings • unsuitable crossing type for location, train service, line speed and user groups • high usage by cyclists • degree of skew over crossing increases traverse time and users' exposure to trains • crossing layout encourages users not to cross at the designed decision point; egress route unclear especially during darkness	• upgrading of asset to a higher form of protection • optimising sighting lines, e.g. de-vegetation programme, repositioning of equipment or removal of redundant railway assets • implementing train speed restriction or providing crossing attendant • providing enhanced user based warning system, e.g. MSL • engaging with stakeholders / authorised users to reinforce safe crossing protocol, legal responsibilities and promote collaborative working • installing guide fencing and / or handrails to encourage users to look for approaching trains, read signage or cross at the designed decision point • re-design of crossing approach so that users arrive at the crossing as close to a 90° angle as possible • installing lighting sources • engaging with signalling engineers to optimise strike in times • providing decking or improving crossing surface, e.g. holdfast, strail, non-slip surface • providing cyclist dismount signs and / or chicanes • straightening of crossing deck

	Hazard	Control
	schools, local amenities or other attractions are known to contribute towards user error	
Pedestrian and road vehicle collision risk	Examples include: • a single gate is provided for pedestrian and vehicle users where there is a high likelihood that both user groups will traverse at the same time • the position of pedestrian gate forces / encourages pedestrian users to traverse diagonally across the roadway • road / footpath inadequately separated; footpath not clearly defined • condition of footpath surface increases the likelihood of users slipping / tripping into the path of vehicles	Controls can include: • providing separate pedestrian gates • clearly defining the footpath; renew markings • positioning pedestrian gates on the same side of the crossing • improving footpath crossing surface so it is devoid of potholes, excessive flangeway gaps and is evenly laid • improving crossing surface, e.g. holdfast, strail, non-slip surface
Personal injury	Examples include: • skewed crossing with large flangeway gaps results in cyclist, mobility scooter, pushchair or wheelchair user being unseated • condition of footpath surface increases the likelihood of users slipping / tripping • degraded gate mechanism or level crossing equipment • barrier mechanism unguarded / inadequately protected	Controls can include: • improving fence lines • reducing flangeway gaps and straightening where possible • providing decking or improving crossing surface, e.g. holdfast, strail, non-slip surface • straighten / realign gate posts • fully guarding barrier mechanisms

ANNEX C – ALCRM RISK SCORE EXPLANATION

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

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

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

INDIVIDUAL RISK

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

Individual risk:

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

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

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

Collective risk:

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

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

IA5

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Issue:	3
Date:	06 March 2021
Compliance date:	05 June 2021

NR/L2/SIG/11201

Module X40

Signalling Design:

Level Crossings: Miniature Stop Lights

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User information

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

Red requirements – no variations permitted

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

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

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

Green guidance – to be used unless alternative solutions are followed

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

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

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

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Issue record

Issue	Date	Comments
1	Dec 2011	First Issue
2	June 2012	Updated to new ORR guidance
3	March 2021	Updated to include linking to POGO where POGO is provided and other, primarily editorial, revisions to template, RAG statuses, requirement wording, and clarifications and improved alignment with ModX39.

Reference documentation

GIRT7033	Lineside Signs
NR/L2/SIG/11201/ModX01	Signalling Design: Module X01 – Level Crossings: General
NR/L2/SIG/11201/ModX02	Signalling Design: Module X02 – Level Crossings: Common Design Requirements
NR/L2/SIG/11201/ModX39	Signalling Design: Module X39 – System Application Specification for Overlay Miniature Stop Light Level Crossings
NR/L2/SIG/30015	Specification for Station, footpath, bridleway and user worked Level Crossings

Legislation

- Common Safety Method EU Regulation 402/2013
- Health & Safety at Work Act 1974
- Level Crossings Act 1983
- Transport & Works Act 1994
- Transport & Works (Scotland) Act 2007
- The Private Crossings (Signs and Barriers) Regulations 1996
- The Traffic Signs Regulations and General Directions 2016
- The Traffic Signs (Amendment) Regulations and General Directions 2017

This is not an exhaustive list of legislation that applies to level crossings.

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

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1 Purpose

This module defines the application requirements and describes the operating characteristics for Miniature Stop Light (MSL) level crossing type.

2 Scope

This document applies to all who are making changes to Network Rail managed level crossings fitted or to be fitted with Miniature Stop Lights.

3 Definitions

For the purpose of this document, the following terms and definitions apply.

Term	Definition
Dark Mode	Where the user indications are supressed when a system failure is detected or a designated operational scenario would otherwise cause the red (not safe to cross) indication for excessive periods. On encountering this mode the user is directed on safe use by the signage provided.
Miniature Stop Light (MSL)	The conventional active warning system used to give visual indications to level crossing users on whether it is safe to cross (green), or not safe to cross (red). The Rule Book refers to this generically as red/green crossings.
On Demand Mode	Used to extinguish audible and visible indications to users deliberately to reduce the environmental impact for noise and light pollution. In this mode, the user is directed by the signage to operate a push button which will activate the user indications (visual and audible as determined by the system state) for a pre-defined period.
Warning Time	The time between the warning to the user starting and a train arriving at the crossing.

Table 1 – Terms and definitions

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4 Principle of operation

4.1.1

Approaching trains automatically initiate the warning sequence by striking in (clause 10). After the crossing is initiated, the green light extinguishes and the red light illuminates (clause 6).

4.1.2

Audible warnings operate whenever the lights are at red. They either change their character if a second train approaches or have a voice message incorporated warning that more than one train might be approaching (clause 6).

4.1.3

Once the train has cleared the crossing the lights revert back to green, unless another train is now approaching (clause 6).

4.1.4

When warning arrangements are affected by infrastructure failure or unusual train movements the crossing enters “Dark Mode” (clause 12) where all lamps are extinguished, audible warnings silenced, and crossing users are directed by the signage to use the telephone to obtain assistance or to follow an alternative procedure.

5 Site criteria

5.1.1

Miniature stop light (MSL) crossings shall only be applied at public footpaths, bridleways, station crossings and private user worked crossings. They cannot be used on public vehicular crossings.

5.1.2

New crossings shall not be installed on sites with more than two lines.

5.1.3

There is no requirement to provide a local control unit.

5.1.4

No On-Demand systems shall be installed.

Experience from trials has shown that users often fail to operate the on-demand controls to request the indications.

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6 Operating sequence

6.1.1

The closing sequence is as follows:

a) the green lights shall extinguish;

b) the red lights shall illuminate; and

c) the audible warnings shall begin to sound.

6.1.2

The closing sequence shall be initiated when the front of an approaching train is detected at a strike-in point, according to clause 10, except when a signal displaying a red aspect is located between the train and the crossing.

6.1.3

Where there is a signal within the strike-in, signal regulation shall be provided in accordance with NR/L2/SIG/11201/ModX02.

6.1.4

The opening sequence is as follows:

a) the red lights shall extinguish;

b) the green lights shall illuminate; and

c) the audible warnings shall be silenced.

6.1.5

The opening sequence shall be initiated as soon as practical after all trains that have struck-in have:

a) passed over the crossing; or

b) stopped at a signal within the strike-in zone which was replaced to red after the crossing activated, and is now free of approach locking.

The opening sequence may be initiated by a device immediately on the approach to the crossing providing the indications to the user do not change until the train is physically on the crossing.

6.1.6

If another train strikes-in when the crossing is indicating red then the visual indications shall continue to show red and the audible warning tone shall change to the increased repetition rate at the point that the first train arrives at the crossing, or have a voice message incorporated warning that more than one train might be approaching.

6.1.7

There is no requirement for minimum road open time. A two track MSL crossing normally operates as two independent single lines.

7 User visual and audible indications

7.1.1

One set of Visual and Audible Warning devices shall be provided for users at each side of the crossing, associated with signage covering the crossing operation.

The Visual Warnings and signage shall be sited and aligned such that users have an unambiguous and clear view of them as they approach the crossing.

7.1.2

The preferred position for the MSL is on the approach side of the crossing facing outwards at nearly 90 degrees to the line of the railway.

For sites with angled approaches, the MSLs should be angled to match the line of the approach, subject to minimising the view by train drivers approaching the level crossing by rail.

7.1.3

If any MSL visual indication unit is required to face within 60 degrees of the line of the railway, the proposed arrangement shall be reviewed by a signal sighting engineer.

If an MSL visual indication unit is required to face within 60 degrees of the line of the railway it might be seen and taken by an approaching train driver for a running signal. The signal sighting engineer may on their own discretion close the matter at this point if they consider no significant risk exists. If they decide there is a significant risk, it shall be dealt with it through the normal signal sighting process.

7.1.4

There are sites where angling the MSLs to match the approach becomes impractical. An example is a station crossing that is associated with tight 90-degree bends at the bottom of the platform ramps next to the crossing.

With this or similar arrangements it can be difficult to find a practical position for an MSL on the approach side where it can be readily seen by pedestrians using the crossing yet not be seen by approaching train drivers.

The best compromise position in this situation might be to place the MSLs on the far side of the crossing facing back across it and provide extra signing on the approach side.

7.1.5

If special fittings or alignment are necessary, that shall be recorded on the ground plan / setting out plan, or on a signal sighting form specially produced for the MSL.

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7.1.6

When positioned on the approach side of the crossing, the position of the MSL visual indicator is the decision point.

7.1.7

The MSL visual indicator should be positioned according to NR/L2/SIG/30015 and to minimise the traverse distance from the decision point to position of safety.

7.1.8

If necessary to obtain adequate sighting, MSL visual indicators may be duplicated on the opposite side of the road/footpath.

7.1.9

Audible warnings shall be arranged to sound onto the level crossing.

Audible warning sounders are normally provided on the rear of the MSL visual indication unit.

7.1.10

Where audible warnings are provided and a footpath exists over the level crossing, they shall be sited on the footpath side of the arrangement.

8 Telephones

8.1.1

All new or extensively renewed crossings of this type shall have a telephone provided to the supervising point.

9 Minimum Warning Time

9.1.1

Minimum warning times for Footpaths or Bridleways are no longer specified in ORR guidance.

Minimum warning time for an MSL at a user-worked crossings (UWC) is given as 20 seconds.

Minimum warning time at station footpath crossings is given as 40 seconds.

These may be negotiated down with ORR if a lower but still sensible warning time is offered.

9.1.2

The minimum warning time provided at all MSLs shall be sufficient for a user to cross from a “decision point” before the crossing to a “position of safety” at the far side, and be in that position of safety for at least 5 seconds before the train arrives.

9.1.3

When the MSL visual indications are positioned on the approach side of the crossing, the position of the MSL visual indicator shall be taken as the decision point.

9.1.4

For purposes of calculating the minimum warning time, the “position of safety” shall be taken as being 2m from the track.

The user will normally be moving away from the track.

9.1.5

On a good surface at rail level, pedestrian walking speed shall be taken as 1.2m/s. On an un-surfaced footpath crossing it shall be assumed to be 1m/s. Vehicles at UWC’s shall be assumed to travel at 2.2m/s (5mph) and shall be taken to be 18.75m long.

9.1.6

The distance between the decision point and the position of safety shall be divided by the speed of the user to find the time required to cross. 5 seconds shall be added to be in a place of safety. The result shall be checked against the minimum warning time for that type of crossing (clause 9.1.1) and if necessary adjusted to comply.

9.1.7

The proposed warning times shall be agreed with the Route Level Crossing Manager.

10 Positioning of strike-ins

10.1.1

Strike-in points shall be positioned so that, from each approach:

a) trains shall not arrive at the crossing in less than the minimum warning time; and

b) the minimum warning time is provided at the maximum permitted line speed after allowing for response times of the system; and

c) at least 50% of trains arrive before twice the minimum warning time; and

d) at least 95% of trains arrive before three times the minimum warning time.

10.1.2

Where bi-directional signalling is provided, wrong direction strike-in points shall be calculated in accordance with the bi-directional signalling system.

10.1.3

The permissible speed of un-signalled (wrong direction) movements used to calculate the wrong direction strike-ins shall be determined by agreement with Operations.

Operational rules limit these movements to a maximum of 50mph. It is common to use half the right-direction permissible speed, subject to the wrong direction permissible speed being a maximum of 50mph.

10.1.4

Wrong direction permissible speed shall be signed with sign AH04m from GIRT7033.

11 Train detection system controls

11.1.1

Track sections situated within the crossing control area, once occupied, shall not release the strike-in controls (by means of a stick control) until:

a) the train has been proved to pass completely over the crossing by sequential operation of track sections; or

b) a suitable time has elapsed after the entrance track section has cleared.

Warning cancellation may be achieved by a device immediately on the approach to the crossing providing the indications to the user do not change until the train is physically on the crossing.

12 Dark Mode

12.1.1

A failure of the MSL system shall cause the crossing to enter “Dark Mode” in which both lights extinguish and audible warnings cease.

On encountering this condition, the user of the crossing is expected to telephone for assistance. As well as internal failures, this failure mode can occur because the train detection system has failed and is indicating occupied.

Deliberately switching off the lights forces the user to use the telephone for permission to cross and in the event of a failure that would otherwise cause the red light to be permanently displayed, it avoids the need for the signaller to authorise a user to pass a red light.

Ref:	NR/L2/SIG/11201/ModX40
Issue:	3
Date:	06 March 2021
Compliance date:	05 June 2021

The failures that cause dark mode are those where the MSL is unable to assure correct operation of the red and green lights and is more fully defined in product failure mode and effect analyses.

12.1.2

The crossing shall enter dark mode if it has been showing a red light for an unusual length of time.

The length of time is 5 minutes by default (which equates to approximately 7 times a 40 second warning time) but may be adjusted to suit particular site conditions with agreement of Operations. Account is to be taken of the expected user behaviour, the train service pattern and approach speeds.

There shall be separate timers for each line.

12.1.3

If the dark mode timer expires on one line and wishes to extinguish the lights in the MSLs, but there is already a second train struck in on an adjacent line, the red lights shall be maintained either until the second train strikes out or the dark mode timer for that line also expires.

12.1.4

After the dark mode timer expires on one line and extinguishes the lights in the MSLs, the MSLs may show a red light for any other train that strikes in on another line.

With this arrangement, on a ‘red to dark’ transition there is a risk that a user observes a red indication, waits until a train passes, observes the indication change to dark, assumes the green light has failed and crosses at risk of conflict with a second train.

With this arrangement, on a ‘dark to red’ transition there is a risk that a user observes the change to a red indication, assumes that the full warning time is available and decides to cross (based on personal judgement of time to cross) at risk of conflict with a train arriving before the normal warning time.

12.1.5

Alternatively, after the dark mode timer expires on one line and extinguishes the lights in the MSLs, the MSLs may remain in dark mode for any other train that strikes in on another line.

This arrangement places greater reliance on the user reacting to the absence a positive indication of a red or green light and following the signed instructions.

The arrangements in both 12.1.4 and 12.1.5 have been assessed as acceptable and systems accepted on the basis of either arrangement.

12.1.6

Recovery from dark mode shall occur automatically after a hard fault is cleared. This shall either be:

a) after a default time of 5 minutes; or

b) by a train detected striking in and striking-out normally on the line for which dark mode was operating; or

c) the MSL system proving that there is no train within the strike-in area.

12.2 Power supplies

12.2.1

The choice of source of electrical power at the site shall take account of the relative costs of supply from:

a) Distribution Network Operator; or

b) a supply from the local signalling system, whether or not the supply is protected; or

c) an off-grid source such as wind and/or solar with battery standby. Wind and/or solar solutions are to provide a power supply system adequate to operate the crossing under the worst credible conditions.

NR/L2/SIG/31000 provides further information regarding the selection and application of off-grid power supplies.

12.2.2

Upon initial power up, the crossing shall enter normal operation as soon as the crossing control system normalises and has ensured that there are no trains within the strike-in.

This clause is likely to require continuous train detection out to the strike-ins by track circuits, a predictor or an axle counter with signaller controlled reset and restoration (e.g. cooperative, conditional with aspect restriction or preparatory).

12.2.3

Where the system cannot ensure that there are no trains within the strike-in upon power up, the crossing control system and train detection shall have a battery standby (default of 12 hours) and these conditions shall apply on the initial power up:

a) the crossing shall enter dark mode for a power up period. This period shall be 5 minutes by default, but may be adjusted to suit particular site conditions;

b) if no train has been detected striking in during the power up period, the crossing shall come out of dark mode, begin to operate normally and show a green light in the MSLs;

c) if a train is detected striking in within the power up period and the period expires before it strikes out, the crossing may either come out of dark mode immediately, begin to operate normally and show a red light in the MSL’s or it may extend the dark mode until the train strikes out when it shall come out of dark mode, begin to operate normally and show a green light in the MSLs;

d) if a train is detected striking in and striking out normally on each line within the power up period, then it may immediately come out of dark mode, begin to operate normally and show a green light in the MSLs.

This clause is likely to apply where treadles are used instead of continuous train detection out to the strike-ins, such as used in overlay systems.

A battery standby avoids the system going through the power up process for every power blip.

12.2.4

Battery standby is not required where there is continuous train detection out to the strike-ins by track circuits, a predictor or an axle counter with signaller controlled reset and restoration (e.g. cooperative, conditional with aspect restriction or preparatory). However, its provision should be considered as it reduces the number of dark mode events that a user may encounter and in turn helps manage signaller workload where users would otherwise be instructed to phone during dark mode events.

12.2.5

On a double track line where a battery is being provided as standby power for the crossing control system or is already available, then the battery shall also be used to provide a standby for the audible warnings.

If audible warnings were to cease due to a power failure just as a first train passed the crossing, but with a second train still approaching, then this might cause a user waiting at the crossing for the line to clear to pass to step into the path of the second train. A power failure event at this critical time has been assessed as very remote in practice, but if a battery is already provided at the MSL, it shall be used to back-up the audible warnings. It is not necessary on a single line.

13 Indications

13.1.1

Where the crossing incorporates “dark mode” and there is a telephone provided, no further indications from the crossing are required.

If otherwise, an indication shall be provided as shown in table 1.

However, consideration may be given to providing matching indications from any new crossings where an existing MSL that does have indications reports to the same supervising signal box.

Table 1 – Signalbox indications at MSL.

Indication	Colour	Meaning
In Order	White	Crossing functioning correctly
Failed	Red	The level crossing has failed

13.1.2

On failure, the “Failed” indication shall flash and an audible warning shall sound until acknowledged by the signaller. The audible alarm shall then be extinguished and the “Failed” indication become steady.

13.1.3

Following clearance of a failure, the “Failed” indication shall be extinguished, the “In Order” indication shall flash and an audible warning shall sound until acknowledged by the signaller. The audible alarm shall then be extinguished and the “In Order” indication shall become steady.

13.1.4

The position of the crossing shall be indicated to the signaller in relation to other infrastructure.

14 Stopping/non-stopping controls

14.1.1

Where trains may stop at stations on the approach side of a MSL crossing, “Stopping/Non-Stopping” controls shall be provided. The arrangements detailed in the AHB module (NR/L2/SIG/11201/ModX10) apply.

15 Link with Power Operated Gate Openers (POGO)

15.1.1

Where both MSL and POGO are provided at a site, the two systems shall be linked such that the MSL informs the POGO system that it is showing red or is in dark mode.

The POGO system uses this link to inhibit the gate from opening when the MSL shows red or is in dark mode. The requirements for this are given in NR/L2/SIG/11201/ModX42.

15.1.2

Where both MSL and POGO are provided at a site, the MSL light aperture shall have a minimum diameter of 200mm.

This requirement reflects the output from trials and risk analysis as it increases the chances of users seeing an MSL change to red after opening the gates.

15.1.3

Where both MSL and POGO are provided at a site, on-demand MSL shall not to be applied or retained.

15.1.4

Where both MSL and POGO are provided at a site, 15 seconds shall be added to the minimum warning time.

The minimum warning time needs to include the maximum gate opening time to mitigate the risk of a user opening the gate just before the MSL turns red but the user continuing to proceed over the crossing.

16 Design documentation

16.1.1

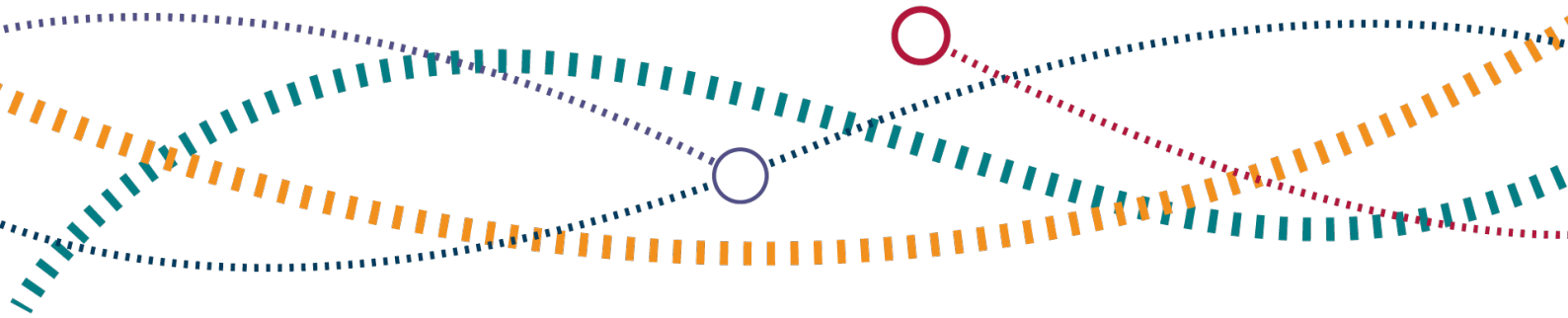
A formal ground plan, as required for public crossings, is not required for MSL crossings. A simpler plan (setting out plan) should be produced in order to control the installation and maintenance of the system equipment, alignment of the visual and audible warnings, signage, and any other crossing equipment affected.

IA6

OFFICE OF RAIL AND ROAD

Principles for managing level crossing safety

15 June 2021



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Foreword

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

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

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

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

Ian Prosser CBE - Director, railway safety



1. Introduction

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

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

ORR's role

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

Who is this document for?

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

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

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

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

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

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

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

How to use this document

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

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

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

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

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

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

Collaboration

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

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

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

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

2. Level crossing risk assessment

Human factors in level crossing design

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

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

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

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

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

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

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

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

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

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

What a risk assessment involves

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

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

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

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

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

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

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

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

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

Principles of prevention

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

1.

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

Elimination

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

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

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

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

Engineering controls

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

Administrative controls

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

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

Reasonable practicability and decision making

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

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

Applying the gross disproportion judgement

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

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

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

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



3. Safe for the user

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

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



User Principle 1: Understand all foreseeable level crossing users.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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



4. Safe railway

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



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Railway Principle 9: Take account of foreseeable environmental conditions.

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

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

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

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

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



5. Safe highway

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



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

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

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

(b) maintain clear information by avoiding signage clutter;

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

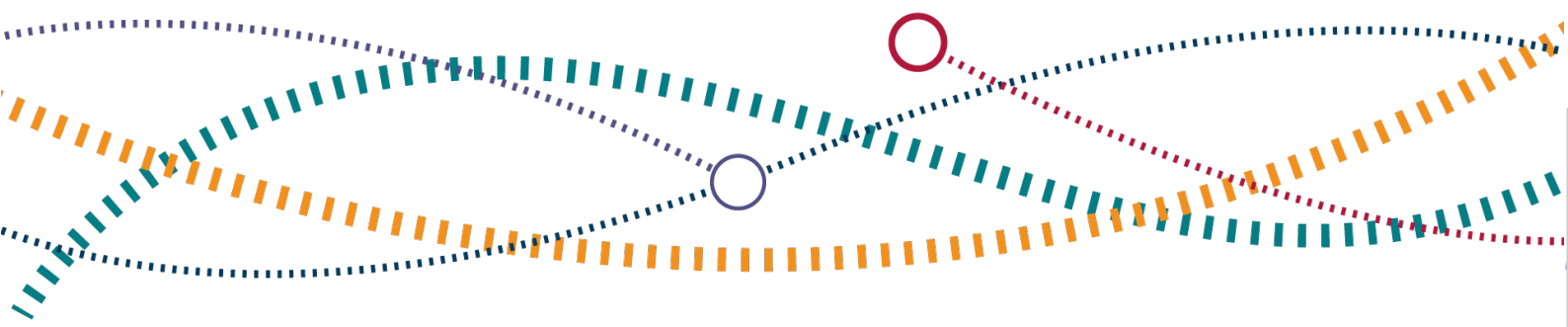


Annex A: Glossary

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

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

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



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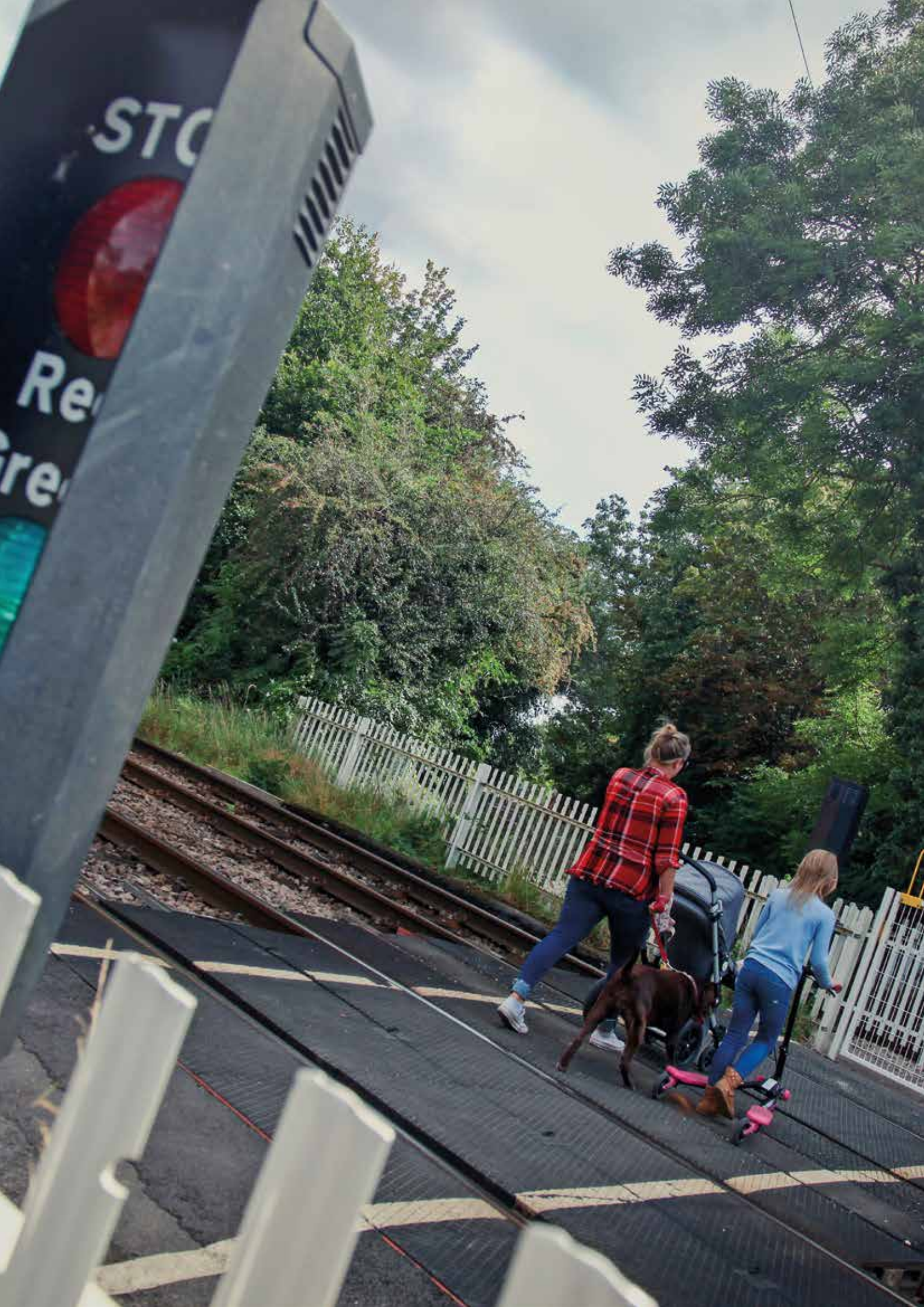
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NetworkRail



Enhancing Level Crossing Safety 2019 – 2029

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



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FOREWORD



Andrew Haines
chief executive

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

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

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

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

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

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



EXECUTIVE SUMMARY

Our approach to managing level crossing safety

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

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

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

Our long-term level crossing safety vision is:

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

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

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

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

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

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

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

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

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





01
INTRODUCTION

Enhancing level crossing safety

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

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

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

The strategy provides:

A clearly defined vision that maximises risk reduction from investment

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

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

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

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

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





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

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



02
OUR SAFETY RECORD

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

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

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

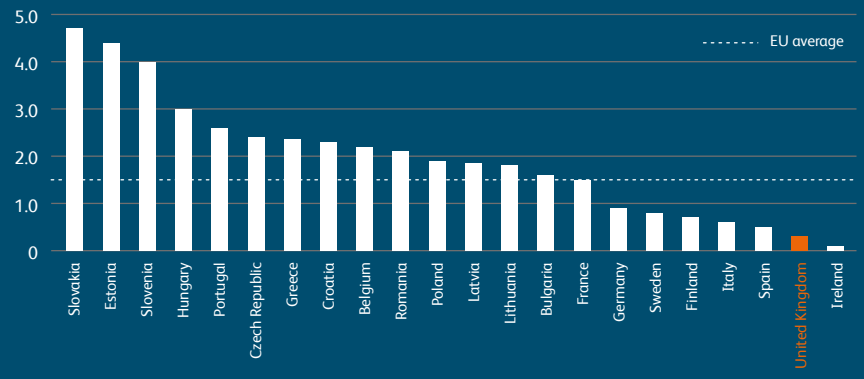


Figure 1: Level crossing incident rate across Europe per thousand track kilometres 2013 – 2017[3]

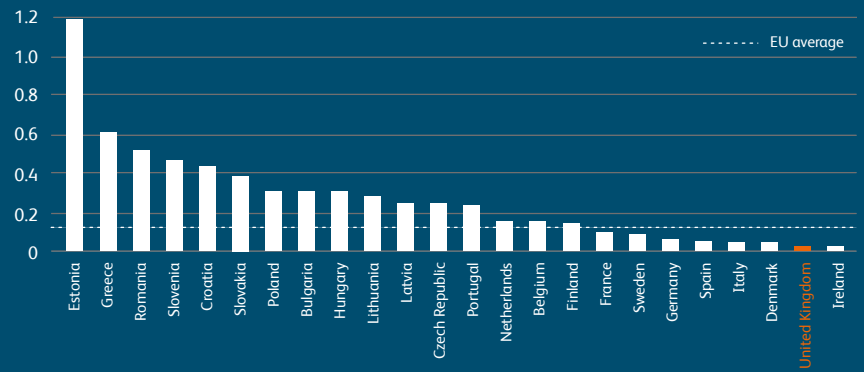


Figure 2: Level crossing incident rate across Europe per million train kilometres 2013 – 2017[3]

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

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

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

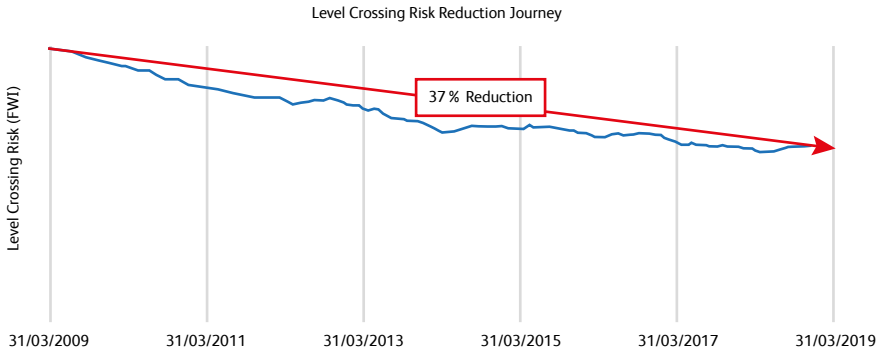


Figure 3: LCRIM calculated risk, March 2019

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

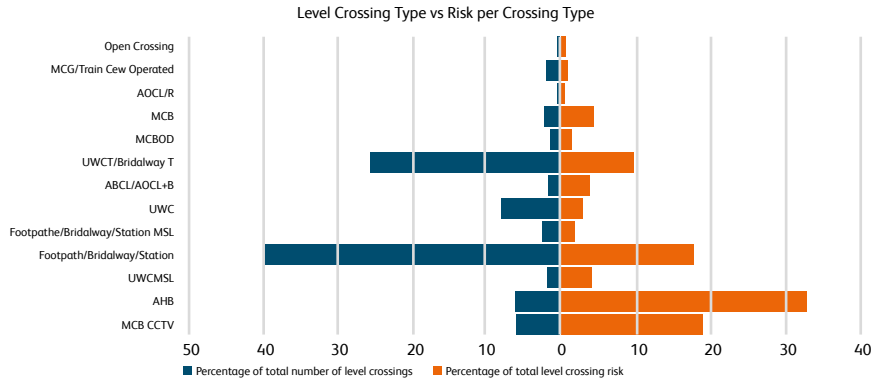


Figure 4: Level Crossing Type vs Risk per Crossing Type

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

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

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

[3] Source: Eurostat Data – extracted 2019.

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


KEEP
CROSSING
CLEAR
SIGNAL BOX

03

OUR PURPOSE, VISION AND APPROACH

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

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

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

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

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

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

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

04

OUR SAFETY VISION, GOALS AND OBJECTIVES



everyone home safe every day

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

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

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

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

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

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

Our long term strategic goals for level crossings are:

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

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



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



05
ROLES AND INTERFACES



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

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

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

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



Figure 5: Everyone: external stakeholders to Network Rail

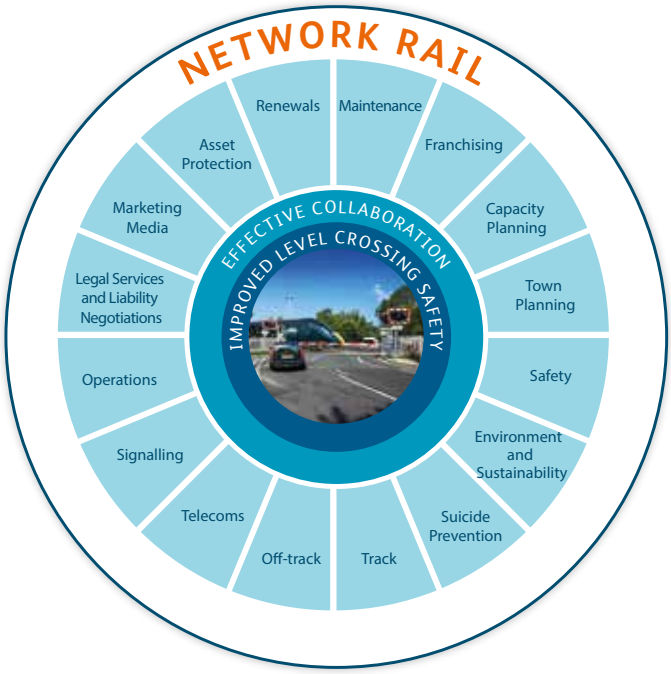


Figure 6: Network Rail's internal stakeholders

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

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

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

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

Managing safety within our own organisation

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

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

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

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

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

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

06

TAKING SAFE DECISIONS

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

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

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

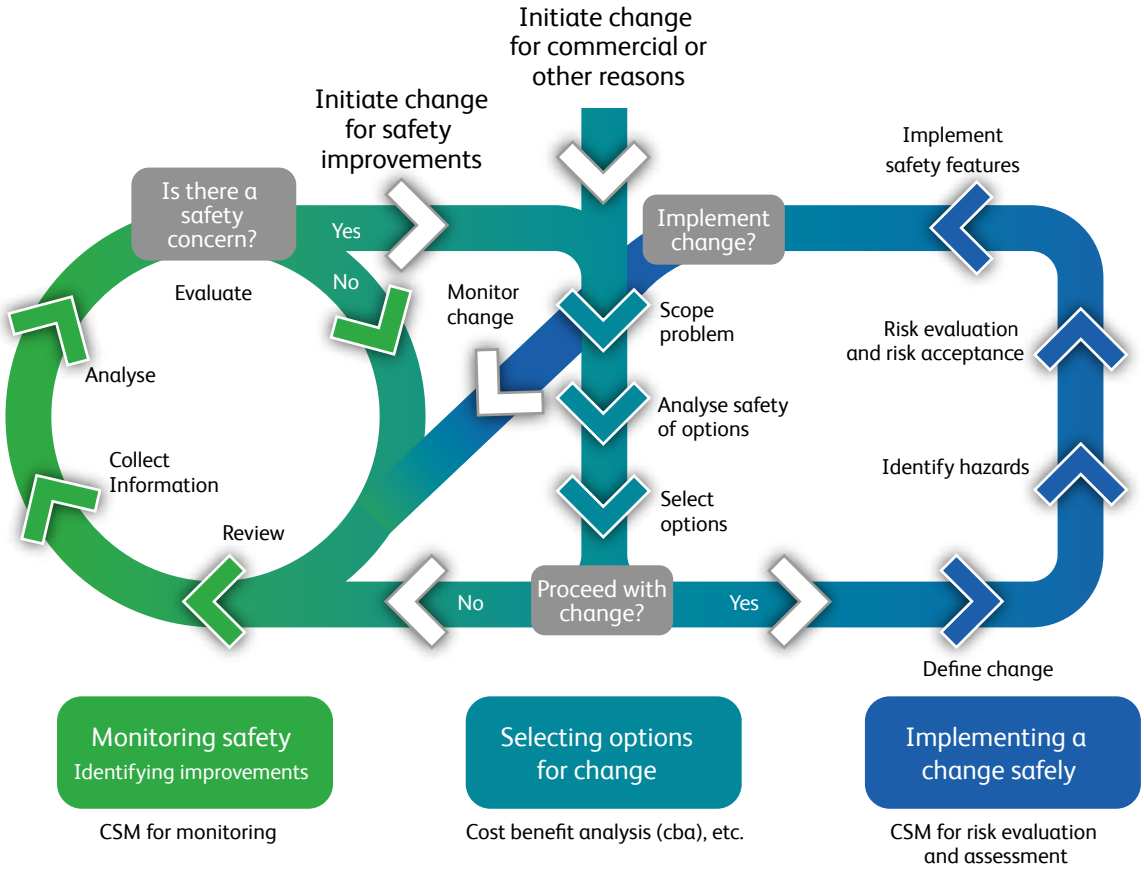


Figure 7: Taking safe decisions

ALARP

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

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

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

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

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







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

Investment in level crossing safety must also be balanced against other safety risks. Competing priorities may, for example, occur with embankments, structures, track, signalling, through trespass and at stations. Thus, it may not be possible and within funding to immediately implement long-term safety improvements at all level crossings. Where such prioritisation is needed, interim controls will be applied to mitigate risk.

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

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

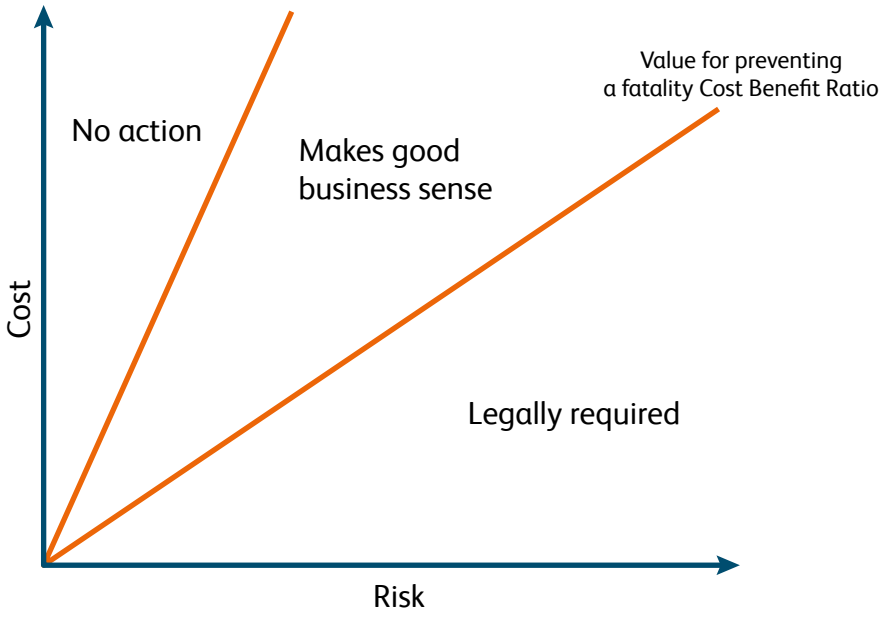


Figure 8: Our appetite for investment in level crossings

OUR FOCUS

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

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

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

Managing level crossing safety in a time of growth

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





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

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

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

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

Closures

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

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

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

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

07

TECHNOLOGY AND INNOVATION

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

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

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

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

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

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

In targeting technology at automatic crossings, we will prioritise:

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

Train detection warning systems

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

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



Automatic half barrier level crossings

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

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

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

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

Improved visual and audible warnings

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

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

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

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

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

Signage

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

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

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

Improved layout

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

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

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

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

The next generation of obstacle detection

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

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

Innovation

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

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

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

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

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



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



08

RISK MANAGEMENT

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

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

We also need to continue improving our risk management capabilities.

Risk assessment process improvements

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

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

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

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

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

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

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

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



09

COMPETENCE MANAGEMENT



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

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

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



10

EDUCATION AND ENFORCEMENT

Influencing user behaviour

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

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

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

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

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

Red light safety equipment (RLSE)

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

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

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

Mobile Safety Enforcement

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

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

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

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







11

DELIVERY

Embedding and delivering our Enhancing Level Crossing Safety Strategy

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

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

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

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




ANOTHER TRAIN
COMING
if lights
continue to show
KEEP
CROSSING
CLEAR

BIBLIOGRAPHY

Network Rail. (2019): Our safety vision. Retrieved from https://www.networkrail.co.uk/who-we-are/our-approach-to-safety/our-safety-vision/

Network Rail. (2018): Network Rail Ltd. Health and safety management system. Retrieved from https://safety.networkrail.co.uk/wp-content/uploads/2017/10/NR-IM-Safety-Authorisation-Part-Two-v4.6-HSMS-September-2018.pdf

RSSB. (2019): Level crossing digest. Retrieved from https://www.rssb.co.uk/Pages/level-crossings.aspx

RSSB. (2018): Leading health and safety on britain's railway. Retrieved from https://www.rssb.co.uk/improving-industry-performance/leading-health-and-safety-on-britains-railway

Eurostat. (2019): Your key to European statistics. Retrieved from https://ec.europa.eu/eurostat/data/database

KEY INFORMATION

Understanding our level crossings

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

Level crossing safety education

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

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

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

Key Stages 3 and 4 (Scotland P7 to S4)
https://www.networkrail.co.uk/communities/safety-in-the-community/safety-education/secondary-school-resources/

Welsh Baccalaureate
We have also worked to develop resources that support the Rail Safety Community Challenge which forms part of the WJEC Welsh Baccalaureate Framework
https://www.networkrail.co.uk/communities/safety-in-the-community/safety-education/welsh-baccalaureate/

Company Strategy

Enhancing level crossing safety 2019-2029

Endorsement and authorisation

Endorsed by:
Andrew Haines, chief executive

Authorised by:
Allan Spence, head of corporate passenger and public safety

Accepted for issue by:
Robert Wainwright, head of level crossings

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IA8

OXFORDSHIRE COUNTY COUNCIL

ROAD TRAFFIC REGULATION ACT 1984 – Section 14(1)

Notice of Temporary Traffic Order
Tackley Bridleway No.379/2/10 Closure
Closure commenced: 8 February 2022
Date of Order: 21 February 2022
Came into force: 1 March 2022

This Order was introduced for public safety during construction of a new footbridge crossing over the rail line. Design and procurement challenges have delayed the work resulting in the closure for a further 18 months.

The effect of the Order is to close temporarily Bridleway 379/2/10 that crosses the rail line to/from Nethercote Road.

Exemptions are included for emergency services and for the works.

Appropriate traffic signs are displayed to indicate the measures are in force.

The alternative route for pedestrians only will be via the temporary footbridge over the rail line.

This Order, with the consent of the Secretary of State for Transport will remain in force until 30 June 2025 or until the works have been completed whichever is the sooner.

Traffic Regulations Team (Ref.T9975/AC) for the Director for Infrastructure Delivery, County Hall, Oxford OX1 1ND. 0345 310 1111.

IA9

STATUTORY INSTRUMENTS

1999 No. 3242

The Management of Health and Safety at Work Regulations 1999

Risk assessment

3.—(1) Every employer shall make a suitable and sufficient assessment of—

(a) the risks to the health and safety of his employees to which they are exposed whilst they are at work; and

(b) the risks to the health and safety of persons not in his employment arising out of or in connection with the conduct by him of his undertaking,

for the purpose of identifying the measures he needs to take to comply with the requirements and prohibitions imposed upon him by or under the relevant statutory provisions and by Part II of the Fire Precautions (Workplace) Regulations 1997.

(2) Every self-employed person shall make a suitable and sufficient assessment of—

(a) the risks to his own health and safety to which he is exposed whilst he is at work; and

(b) the risks to the health and safety of persons not in his employment arising out of or in connection with the conduct by him of his undertaking,

for the purpose of identifying the measures he needs to take to comply with the requirements and prohibitions imposed upon him by or under the relevant statutory provisions.

(3) Any assessment such as is referred to in paragraph (1) or (2) shall be reviewed by the employer or self-employed person who made it if—

(a) there is reason to suspect that it is no longer valid; or

(b) there has been a significant change in the matters to which it relates; and where as a result of any such review changes to an assessment are required, the employer or self-employed person concerned shall make them.

(4) An employer shall not employ a young person unless he has, in relation to risks to the health and safety of young persons, made or reviewed an assessment in accordance with paragraphs (1) and (5).

(5) In making or reviewing the assessment, an employer who employs or is to employ a young person shall take particular account of—

(a) the inexperience, lack of awareness of risks and immaturity of young persons;

(b) the fitting-out and layout of the workplace and the workstation;

(c) the nature, degree and duration of exposure to physical, biological and chemical agents;

(d) the form, range, and use of work equipment and the way in which it is handled;

(e) the organisation of processes and activities;

(f) the extent of the health and safety training provided or to be provided to young persons; and

(g) risks from agents, processes and work listed in the Annex to Council Directive 94/33/EC(**1**) on the protection of young people at work.

(6) Where the employer employs five or more employees, he shall record—

(a) the significant findings of the assessment; and

(b) any group of his employees identified by it as being especially at risk.

(**1**) OJNo. L216, 20.8.94, p.12.

IA10

Baker Rose

CONSULTING

PROPERTY TRANSPORT INVESTMENT DEVELOPMENT

Proof of Evidence

from

David Baker

FRICS FCILT MCIArb

regarding elements relating to the railway

Land off Nethercote Road

Tackley

Oxfordshire

APP/D3125/W/15/3138076

LPA Ref: 15/01999/OUT

On behalf of Barwood Development Securities Ltd

September 5th 2016

Issued

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Proof of Evidence
from
David Baker FRICS FCILT MCIArb
Baker Rose Consulting LLP
53 Davies Street
London W1K 5JH

1. INTRODUCTION

1.1 This Proof of Evidence has been prepared by David Baker, a partner of Baker Rose Consulting LLP, a development consultancy specialising in relationships with transport and logistics undertakings.

1.2 I am a Fellow of the Royal Institution of Chartered Surveyors and a Fellow of the Chartered Institute of Logistics and Transport. I am also a RICS accredited mediator and Member of the Chartered Institute of Arbitrators (as a mediator). I have over 40 years' professional experience, initially in local government, then 35 years in private practice, of which the last 25 years have included projects on and around railway infrastructure.

1.3 This Proof relates in part to the Proof of Evidence on Planning Matters provided by Peter Smith.

1.4 I also address the points raised in the Inspectors note of 31st August 2016 in relation to the bundle sent by Network Rail, of 5th August 2016. In this context I have also addressed the responses submitted by Mr Tim Mayo of Network Rail to PINS on the 2nd and 5th September 2016.

1.5 This Proof has been prepared in accordance with the regulations of my professional bodies and with full regard to my responsibilities to the Inspector as an expert witness. The evidence is my true and honest professional opinion.

2. BACKGROUND

2.1 The Tackley level crossing is defined as a 'passive crossing', which uses a whistle board at which oncoming train drivers are required to sound a horn (after 7am and before 11:00pm) to warn crossing users. The MEC Technical Note of July 2016 observed that this requirement was complied with.

2.2 In addition there are sight lines for pedestrians and cyclists to check for oncoming trains before crossing. The location at which they do this and make a judgement to cross or not, is known as the 'decision point'.

2.3 Paragraph 4.4 of Network Rail's 2 September 2016 report identifies that minimum required sighting distances are 311m, and that available distances at Tackley is 425m or more. This follows recent works carried out by Network Rail, as referenced in Mr Gallop's 4 August 2016 letter.

2.4 The crossing is also part of a bridleway and riders are required to dismount and call the signalman for clearance before they are authorised to cross.

2.5 The crossing is next to a station and provides access to the Oxford and London bound 'up' platform, Platform 1, from the village of Tackley. It is not unique in providing the only access to a platform, it is however I understand unique in also being a bridleway.

2.6 There was a planning application made by Railtrack in 2001 for a bridge to replace the level crossing as part of the major upgrade to this section of track. This application was refused on the grounds of appearance.

2.7 Railtrack then applied for an underpass instead, which was also refused, but after Railtrack went into Railway Administration and was replaced by Network Rail, Network Rail pursued an appeal, which it won in 2003.

2.8 However, by the time the underpass was approved, the work on the upgrade was apparently too far advanced and it was decided instead to reduce the line speed through Tackley's level crossing, to 90mph (from 110 mph)

2.9 Network Rail has significantly changed its management of crossings since then; and indeed since the death at Tackley in 2008. Hence, as stated in Mr Gallop's 4 August 2016 letter, the carrying out of recent clearance works to improve on sight-lines, and to modify fence lines to make the location of decision points easier for crossing users to interpret.

2.10 Network Rail and the ORR have a policy to try to close as many level crossings as possible and as such in the last two 5-year Control Periods[1] separate ring fenced funds have been awarded to Network Rail for improving safety at crossings through closure and improvements.

2.11 In the current Control Period for 2014-2019, Network Rail secured £109m of ring fenced funding for work to remove and make level crossings safer. Until very recently, Network Rail had ring fenced £1.9m for the closure of the crossing at Tackley. The Periodic Review, which will lead to the settlement for the next Control Period, has now commenced.

2.12 It is noted that Network Rail claim that there is no justification for it to spend significant sums at Tackley, based on a cost benefit analysis. In Mr Gallop's letter of 4th August 2016 Network Rail cites the 'asset benefit' value being only £181,000. This is normally the asset benefit value to the enterprise, in this case, the railway network.

[1] A 5 year Control Period *'forms the 'contract' against which the Office of Rail Regulation (ORR) will measure [Network Rail's] performance. It is also intended to assist train operators, funders and stakeholders to plan their businesses with a reasonable degree of assurance in CP5*'. Source: Network Rail Control Period 5 Delivery Plan. Work on the Periodic Review to settle Control Period 6 commenced in May 2016.

2.13 An asset benefit value should relate to the value to the railway network of the item of infrastructure, such that if there is an incident; how long would it take to resolve / is there an alternative route in the meantime / what would be the consequential delays to train operators/ cost of remediation. Thus the seawall at Dawlish in Devon would have a very high asset value; Tackley level crossing, where an incident, however tragic, is unlikely to cause any damage to the rail infrastructure or lasting delays, is very low.

2.14 This is why I believe the ORR ring fenced the Level Crossing fund of £109m, because the prime beneficiary of improvements is not the rail network. Network Rail had £1.9m allocated, only recently withdrawn because it believes it cannot spend this at Tackley before 31st March 2019.

3. THE ALCRM MODEL ANALYSIS

3.1 As the Inspector will have seen from the correspondence, for whatever reason, we have struggled to secure clear outputs from Network Rail as to the impact of the scheme on its ALCRM model.

3.2 Despite a combination of errors and erroneous conclusions in Mr Gallop's letter of 4th August, when adjusted and used with the corrected and revised conclusions in Mr Collins email of 5th August, confirmed in Mr Mayo's response of the 2nd September, I have been able to establish a pattern and logic associated with an increase in numbers of people crossing the level crossing.

3.3 A probability statistic can be displayed as a decimal, where 1 is certain to happen, and 0 can't happen; or as a percentage, where 100% is certain to happen, and 0% can't happen.

3.4 Network Rail presents its ALCRM probability of a fatality a year equivalent, referred to as the Fatality Weighted Injury or FWI, in decimals. This appears complex, but when shown as a %, it appears much more comprehensible to the rest of us. I have therefore set out in the appended worksheet, the FWI probability results in both formats. (See worksheet appended and attached for ease of reference).

3.5 COLLINS / MAYO ALCRM OUTPUT - 5th Aug / 2nd Sep 2016

3.5.1 The Base ALCRM FWI is shown as 0.016533306.
This equates to c1.65%. Network Rail's 2 September 2016 report explains how this "base" case puts the Tackley crossing into risk categories C2, assuming a base of 270 users per day.

3.5.2 Also on the basis of 270 users per day, Network Rail advises that "Tackley does happen to comply with all current standards" (2 September 2016 report, paragraph 3.3(b), a key point also confirmed in Mr Gallop's letter of 4th August 2016.)

I deal with this below as this “base” assessment is made crucial to Network Rails argument, but I do not consider it to be founded on robust assumptions.

3.5.3 Assuming 17 additional daily crossings over the base, this increases to 0.017574292.
This equates to c1.76%

3.5.4 The difference is 0.001040986,
This equates to an increase in the FWI probability of c0.10%.
This is indeed a 6.3% increase on the base 0.016533306 or 1.65%, which is noticeably identical to 17/270, with 270 being Network Rail's assumed base of regular users crossing.

3.5.5 Using the percentage increase over the base, rather than the actual percentage increase in probability, gives a different perception of the change in risk. Further, even with an FWI of 0.017574292, the risk assessment remains C2, within the same ranking ranges.

3.5.6 I note that Network Rail’s various recent letters and reports to PINS do not assert that, if the appeal proposal is consented, Network Rail will take or will be obligated to take some immediate step (for example, pursuing a closure order in respect of the Tackley level crossing). Nor has this been raised as an issue in any discussion. Rather the discussion has been around the s106 conditions should the Inspector decide to grant consent.

3.5.7 Network Rail has powers to pursue remedial steps such as closure orders. This is one of the stated purposes of the ALCRM, as confirmed in paragraph 2.1 of the 2 September 2016 response, and is duty-bound to do so if it considers a level crossing would carry unacceptable safety risks.

3.5.8 This I suggest, is a significant matter for the Inspector when considering whether any increase in usage of the level crossing at this time would represent an **unacceptable** safety hazard.

3.5.9 I sought to ascertain what the mitigation impact would be with Miniature Stop Lights (MSL) installed. Network Rail advised the FWI is 0.008196211.

This equates to a decrease of the percentage risk by c0.94%, a reduction of 54.3% from the base plus 17 additional crossings per day.

3.6 MR GALLOP's ERRONEOUS ALCRM OUTPUT - 4th Aug 2016

3.6.1 The base FWI is shown as 0.006490854, which equates to 0.65%.

With 27 assumed additional crossings, the FWI is shown as 0.011695783.

This equates to 1.82%, a percentage increase of 1.17%, or 180% over the base.

3.6.2 Unfortunately, as is confirmed in Network Rail's 2 September 2016 paper, the base FWI figure is inaccurate. The second digit after the decimal point should it appears have been a "1" not a "0", although the figures have further altered in any event.

3.6.3 The MSL analysis is pretty similar at 0.008481794, or 0.85%, to the Collins/Mayo conclusion, allowing for the fact that the base train numbers or sight line settings may have been slightly different on the different days the model was run.

3.6.4 Without the 1 in front of the 6490854 in the base FWI, which is clearly out of line with the results confirmed by Mr Mayo on 2nd September, the author has concluded entirely erroneously, that the mitigation using MSL's was not enough to even bring the FWI to below the starting base.

3.7 GALLOP ALCRM OUTPUT - BASE CORRECTED

3.7.1 Inserting the missing 1 in the base FWI, to read 0.016490854, equating to c1.65% is now virtually identical to Collins/Mayo corrected analysis. The consequential results then make sense.

3.7.2 The increase in percentage probability for 27 people is 0.17%, 10.2% over the base (virtually identical to 27/270).

3.7.3 Collins/Mayo's FWI scores are for 17, Gallop's were for 27. This therefore allows us to see the changes in FWI for additional people and as such extrapolate to provide a tool to provide indicative results, where all the other elements of probability remain the same, which they do.

3.8 ALCRM MODEL ANALYSIS CONCLUSION - UPLIFTS FROM 270 USERS PER DAY

3.8.1 For 5 extra people per day (275), the FWI risk goes from c1.65% to c1.68%,
an increase of c0.03%

3.8.2 For 17 people per day (287), the FWI risk goes from c1.65% to c1.76%,
an increase of c0.10%

3.8.3 For 27 people per day (297), the FWI risk goes from c1.65% to c1.82%,
an increase of c 0.17%

3.8.4 For 47 people per day (317), the FWI risk goes from c1.65% to c1.94%
an increase of c 0.29%.

4 NETWORK RAIL'S BASE FIGURE OF 270 USERS PER DAY

4.1 Network Rail have used a base of 270 people crossing per day, which both Mr Gallop and Mr Mayo have confirmed is its current use assumption for Tackley Level Crossing and as such this level of use complies with Network Rail's Standards and the ORR's guidance for this type of level crossing. This level of use is published on Network Rails' Level Crossing web site as 'Census results per day'.

4.2 MEC's survey showed that only 93 people actually crossed in a 13 hour period on the day of its survey. I note that the screenshot at paragraph 4.6 of Network Rail's 2 September 2016 report states "usage was measured using a quick census on 28-Oct-2015 at 13:15". This is not, in my judgment, a robust methodology and certainly not one on which to maintain an objection on the grounds of a deemed unacceptable increase in risk from the proposed development.

4.3 In the House of Commons Select Committee on Safety at Level Crossings, it is noted that *'Models are only as good as their underlying data and assumptions. Concerns have been expressed about both of these in relation to the ALCRM. For example: Crossing usage inputs are mostly based on a 30-minute census conducted during an off peak period between 09:30 and 16:30 on weekdays."*[2] These I understand to be referred to as quick censuses, which clearly they are.

4.4 Mr Mayo in his response of the 5th September on the quick census used to base their case, has stated that the 270 conclusion resulted from counting 10 users observed, between 13:15 and 13:45, not associated with the station (there were no stopping trains due) and it was half-term, when he usage of the path was likely to be higher.

4.5 Mr Mayo states that "while the total of 270 might seem high, the judgement was that it can be in that ballpark". The ALCRM based safety assessment has therefore been undertaken on this basis.

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[2] House of Commons Transport Committee. Safety at level crossings. Eleventh Report of Session 2013-14 Section 3 - Making level crossings safer - Risk Assessment para 17 page 11.

4.6 At issue therefore is the purpose this data and output is being used for. A high 'ballpar'k' assumption to stress test the safety of the Level Crossing and to then enforce and apply Network Rail Standards and ORR guidelines to it is commendable. As such Network Rail is quite clear that at 270 users per day, this crossing is compliant.

4.7 The confusion that has arisen is because Network Rail has taken a high 'ballpark' assumption of 270 and then sought to argue that the proposed development will add to this, which it demonstrably will not.

4.8 I consider the MEC figures a much more reliable basis to employ for present purposes, given they consist of actual counting of movements across (and in association with) the level crossing between 6:00 and 19:00. This therefore included the morning commuters to Oxford and London who would use the crossing to Platform 1 (they would not need to use the crossing on their return).

4.9 Importantly, MEC's observations are also confirmed by considering the ORR's published annual estimate of station usage. For Tackley, these are 20,934 (2012/13), 20,996 (2013/14), and 22,612 (2014/15)[3].

4.10 Taking the last figure and assuming 230 working days, results in 98 trips (two-way) per day (22612/230). Only half of these would require crossing the level crossing to Platform 1, i.e. 49 per day. MEC noted 41 level crossing users went to Platform 1 during its 13 hours of observation, the remainder being leisure users.

4.11 The MEC result is in line with the ORR rail usage data which suggests the observations are a realistic base to work from. Certainly a far more realistic base than the 270 assumed at 13:15 in a quick census in October 2015, by Network Rail.

4.12 The much higher base Network Rail has used obviously produces a much higher FWI score. As an indication, if the 93 crossings actually

[3] Series with last published 15th Dec 2015 - ORR Estimate of Station Usage 2014-15

observed by MEC are added to a very much higher number of say 47 crossings from the proposed development (this is not the figure MEC have assumed – it is simply a figure I have tested for sensitivity purposes), then this would total 140 crossings per day, 130 less than Network Rail have used as its base.

4.13 As can be seen from the appended analysis, this would suggest the FWI could be c 0.008572821, or 0.86%, which is virtually identical to the Gallop / Collins figures for FWI with a Miniature Stop Light (MSL) system in place.

4.14 It would also mean that the "true base" + development position is substantially better than the "base" case assumed by Network Rail (and reported as compliant with current standards: paragraph 3.3(b) of the 2 September 2016 paper), and indeed I suspect it could fall within risk categories D3, as does the MSL mitigation with a similar FWI score.

4.15 The Inspector has questioned the robustness of the MEC calculation of anticipated users of the station and the crossing as leisure users. I hope I have shown above that the actual change in risk on wide range of increased users, from 5 to 47, in percentage probability of a Fatal Weighted Injury, appears relatively small, going from 1.65% for 270 people per day, to 1.95% with an additional 47 people. These figures assume Network Rail's "base" case of 270 people currently use the level crossing each day already. For a lower base, the FWI changes may well be smaller still.

4.16 For reasons explained above, it would appear that the development plus the actual observed use of the level crossing (or similar) will in practice be well within the 270 users Network Rail has stated are acceptable at Tackley and in accordance with its Standards and the ORR's guidance for this type of level crossing.

5 DRIVERS FOR CHANGE

5.1 In this location there are a number of significant changes which may affect the ALCRM profile of the crossing at Tackley in the future, entirely irrespective of the proposed scheme.

5.2 These changes include for the benefit of the rail industry:

5.2.1 An increase in the volume of freight trains that could be pathed through Tackley, particularly following the improvements at Reading and gauge enhancement to W10 through to the Port of Southampton from the Midlands.

5.2.2 Electrification of the line and a desire to run more passenger trains faster, as previously planned, at 110mph. The line speed is restricted in this location, only because of the crossing, to 90 mph.

5.2.3 The aspiration of Great Western Rail to increase customers at all stops, including Tackley, evidenced by its funding support for widening the appreciation of the station locally[4].

5.3 These benefits for the rail industry have been the driver for the previous bridge and underpass proposals and as such they are most likely to be the catalyst for change in the future, particularly as there are currently operating restrictions, which Network Rail will no doubt wish to remove when it can.

5.4 The scheme, if consented, is not a catalyst for change in itself. It does not change the risk profile from the existing C2 or D3 rating and does not impact on the configuration of the crossing.

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[4] Customers & Communities Fund 2016 - final schemes approved by the DfT

Transport Focus CEO, Anthony Smith said: "*It is great to see customers and communities helping to shape improvements for their stations and services. There is a great range of projects here, from support for the next generation of railway engineers, through to practical station improvements and help for disabled passengers and low income families to use rail services.*"

5.5 It is accepted that locally there is considerable pressure to see the level crossing replaced with a bridge or bridges. Whilst the proposed scheme does not in my judgment trigger an increase in risk above that which Network Rail has already assumed currently exists and is compliant, if approved, it does create the opportunity to safeguard land for a walkway/cycleway/bridleway to the north of the station.

5.6 The proposed section 106 obligation safeguards relevant land for a bridge crossing for 10 years and makes it potentially available for the sum of £1. In my judgment, that would materially assist Network Rail, should its ambitions for increasing rail traffic and/or line speeds lead to it promoting a further bridge, in realising this objective.

5.7 In the current Control Period (CP5 2014-19) Network Rail secured £109m[5] for level crossing improvements and closures of which £1.9m was allocated for Tackley[6]. As Network Rail believes this is now unlikely to be spent within this Control Period Network Rail have advised me this will be reallocated. It would be surprising if Network Rail did not revisit this issue in connection with the next Control Period monies, as a level crossing closure and new footbridge would appear to be the only way in which any ambitions of increasing line usage and speeds can be realised.

[5] House of Commons Select Committee - Safety at Level Crossings - February 2014

[6] Tackley Parish Council Minutes - Informal Meeting of the Council 16 June 2015.

6.. CONCLUSION

6.1 The ALCRM model is undoubtedly a useful guide for Network Rail to use to compare its level crossings and thus comparative risk and in so doing, aid its management decisions on its own investment.

6.2 The high 'ballpark' of 270 people assumed from a “quick census” of 10 users of the public path identified over 30 minutes one half term afternoon, is considerably in excess of the 93 actually identified by MEC during its survey over 13 hours, starting at 6:00 am on a work day.

6.3 The 270 'ballpark' figure does not tally with the ORR's data for station usage. MEC's does. If a base of 93 or similar is used, the base + development figures will be substantially below those Network Rail says comply with its Standards and the ORR's guidance for this type of crossing. It has satisfied itself using an assumed total base of the much higher 270 crossing users per day.

6.4 The pedestrians crossing the level crossing, whether they are from the new development or existing villagers or others, will face exactly the same risk from trains, with or without the development. The proposed scheme does not impact on the layout, configuration, sight lines or decision point.

6.5 There is no suggestion from Network Rail that the level crossing will be made unsafe if the proposed development is consented. Network Rail has not suggested that the grant of consent will compel it to take steps to close the level crossing for that reason, and thus I do not see how the proposal would result in an unacceptable increase to the risk of an individual pedestrians when using the level crossing, even if its base of 270 were absolute, which it clearly is far from being.

6.6 In due course. for other reasons relating to railway industry benefits, I believe this level crossing will be either closed entirely or its use significantly restricted as alluded to by Mr Gallop in his 4 August 2016 letter, with a platform to platform bridge or two bridges constructed.

6.7 As such I believe it is important that the safeguarding of the land for the northern bridge option is secured. Indeed, the safeguarding obligation would clear away one possible obstacle to the bridge coming forward, quite possibly in Network Rail's next Funding Period, and it ensures Network Rail would only need to pay £1 for the right to locate a footbridge on the safeguarded land.

DAVID BAKER FRICS FCILT MCIArb

APPENDIX

ALCRM FWI Analysis

TACKLEY LEVEL CROSSING

FATALITY & WEIGHTED INJURY ANALYSIS

the probability of a ***regular*** user being killed or seriously injured per year

(in this case a level crossing user, a member of a train crew or a train passenger)

Source Network Rail AUGUST 2016

CASE	LEVEL OF RISK TO AN INDIVIDUAL	LEVEL OF COLLECTIVE RISK	ALCRM FWI	DIFFERENCE	% INCREASE	**FWI PROBABILITY**	RISK CHANGED BY
COLLINS / MAYO ALCRM OUTPUT - ISSUED 5th Aug 2016 CONFIRMED 2nd Sept 2016						**BASED ON 270 people per day**	
BASE	C	2	0.016533306			**1.653%**	
Increase by				0.001040986	6.296%		0.104%
17	C	2	0.017574292			**1.757%**	
Decrease by				-0.009378081	-53.362%		-0.938%
MSL	D	3	0.008196211			**0.820%**	
GALLOP ALCRM OUTPUT - DATED 4TH August 2016						**BASED ON 270 people per day**	
BASE	C	2	0.006490854			**0.649%**	
Increase by				0.011695783	180.189%		1.170%
27	C	2	0.018186637			**1.819%**	
Decrease by				-0.009704843	-53.362%		-0.970%
MSL	D	3	0.008481794			**0.848%**	
GALLOP ALCRM OUTPUT - DATED 4TH August 2016 - With Base Corrected						**BASED ON 270 people per day**	
Adjusted for apparently missing 0.01 in Gallop letter of 4th August, as compared to Collins / Mayo Base data of 5th Aug / 2nd Sep.							
BASE	C	2	0.016490854			**1.649%**	
Increase by				0.001695783	10.283%		0.170%
27	C	2	0.018186637			**1.819%**	
Decrease by				-0.009704843	-53.362%		-0.970%
MSL	D	3	0.008481794			**0.848%**	
CONCLUSION						**BASED ON 270 people per day**	
BASE	from Collins 5th August		0.016533306			**1.653%**	
Increase by				0.000428641	6.296%		0.104%
17	from Collins 5th August		0.017574292			**1.757%**	
Increase by				0.000612345	10.000%		0.165%
27	from Gallop 4th August		0.018186637			**1.819%**	
Increase by				0.000612345	3.704%		0.061%
10	difference between Collins and Gallop		0.017145651			**1.715%**	
Increase by				0.00006123	0.370%		0.006%
1	person based on 10 uplift		0.016594541			**1.659%**	
EXTRAPOLATED	EXAMPLES	BASE	0.016533306			**1.653%**	
Increase by				0.00030617	1.852%		0.031%
5	extrapolated		0.016839479			**1.684%**	
Increase by				0.00287802	17.407%		0.288%
47	extrapolated		0.019411328			**1.941%**	
Assume base of 93 +47 from development				(0.00796049)	-47.971%		-0.796%
-130	extrapolated		0.008572821			**0.857%**	

The above model is indicative based on the supplied data only.

IA11

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

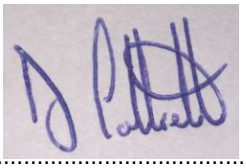
Level 3

Work Instruction

Risk assessing level crossings

Approvals

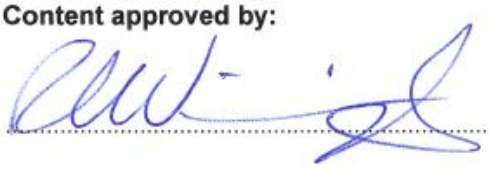
Content Approved by:



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Darren Cottrell,
Technical Lead

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User information

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

Red requirements – *no variations permitted*

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

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

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

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

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

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

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

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

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

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Issue record

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

Reference documentation

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

Legislation

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

Health and Safety at Work etc. Act 1974

The Management of Health and Safety at Work Regulations 1999

Level Crossing Act 1983

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

Road Traffic Act 1988 & 1991

The Traffic Signs Regulations and General Directions 2016

The Private Crossings (Signs and Barriers) Regulations 1996

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

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1 Purpose

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

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

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

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

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

2 Scope

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

a) the core level crossing risk assessment process;

b) frequency of risk assessments;

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

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

e) level crossing risk records.

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

A flowchart of the process is shown in Appendix A.

3 Roles and responsibilities

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

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

Table 1 – RACI chart

4 Definitions

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

Table 2 – Terms and definitions

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

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5 General

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

5.2 Risk assessment of level crossings shall include:

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

b) demonstration of collaborative working with stakeholders;

c) optioneering; and

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

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

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

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

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

6 Competence

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

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

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

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

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

7 Risk assessment frequency

7.1 Calculated Frequency

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

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

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

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

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

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

Table 3 – Risk assessment frequency and risk categorisation criteria

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

7.2 Calculated risk assessment frequency review

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

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

7.3 Additional risk assessment triggers

A level crossing risk assessment shall be carried out:

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

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

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

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

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

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

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

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

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

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

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

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

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

8 Risk assessment process – collate information

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

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

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

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

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

8.2 Follow up contact with authorised users of User Worked Crossings

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

8.3 Prepare for site visit

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

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

b) a review of previous census data;

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

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

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

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

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

8.4 Stakeholder involvement

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

8.5 Carry out site visit

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

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

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

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

8.6 Confirm usage – no users observed

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

EITHER:

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

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

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

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

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

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

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

OR:

a) if local investigations are not possible;

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

Local investigations will generate one of two outcomes:

EITHER:

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

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

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

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

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

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

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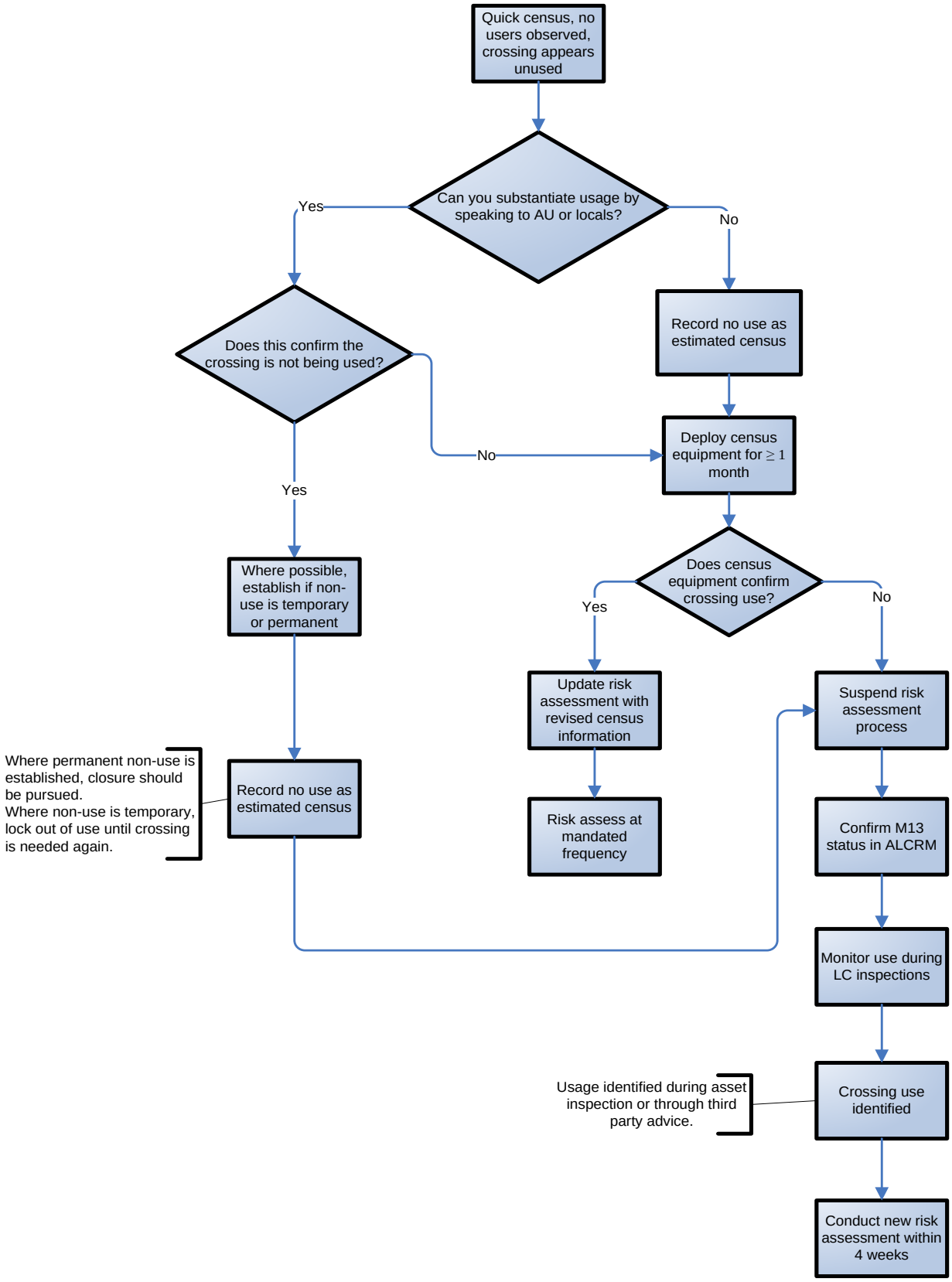


Figure 1 – Action to take when no users observed

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8.7 Post site visit follow up

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

a) checking the accuracy of data collected; or

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

c) conducting an additional site visit.

8.8 Submit data into ALCRM

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

NOTE: *To avoid loss of data, always upload the data collected where full Wi-Fi is available.*

Where risk assessment data is not recorded on the mobile device, e.g. device failure or paper copy used, risk assessors shall manually enter the data into ALCRM.

8.9 Check for existing safety benefits

Check the mitigations tab of the previous risk assessment in ALCRM to determine if any safety benefits have been applied, e.g. spoken alarm or red light safety equipment. Apply the safety benefits to the new risk assessment if still applicable.

8.10 Carry out ALCRM sign-off checks

A sign-off check shall be undertaken for each risk assessment. This shall be conducted by a person who meets the requirements of clause 7.

The person undertaking the check shall focus on key inputs and sense check all data for errors and anomalies. Any issues identified shall be discussed with the relevant risk assessor. Agreement shall be reached on any corrective action to be taken prior to sign off.

8.11 Sign-off ALCRM risk assessment

Risk assessments shall be signed off in ALCRM:

a) within six weeks of the site visit; and

b) by a person who meets the requirements of clause 7.

8.12 Changes to risk assessment frequency

ALCRM provides a warning of change in risk assessment frequency.

If the risk assessment frequency has changed, the risk assessor shall arrange for the relevant MST (Maintenance Schedule Task) in Ellipse to be updated.

NOTE 1: *Information on changes in risk assessment frequency is held on the Analyse Results page. The change in frequency management report (available on the Level Crossings Hub) can be run periodically to identify changes in risk assessment frequency.*

NOTE 2: *MSTs are updated by the Systems Support Manager. If the ALCRM score has changed to M13, the MST should be turned off.*

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9 Risk assessment process – identify risk controls optioneering

9.1 Optioneering short and long term solutions

Optioneering shall be undertaken on all risk assessments. Optioneering shall be undertaken within 12 weeks of the site visit. Options to be progressed shall be identified and set to 'recommended' status within this timescale.

Potential risk controls shall be identified taking account of:

a) the ALCRM outputs;

b) key risk drivers;

c) structured expert judgement; and

d) other sources e.g. advice from other experts or key stakeholders.

Risk controls shall include short and long term solutions as appropriate.

New Level Crossing Orders place requirements on Network Rail and local authorities to agree long term strategies for public road level crossings.

Discussions and agreements shall be referenced in the NRA, see clause 9.10, and recorded in the level crossing file, see clause 12.

NOTE 1: *Risk assessors can create a first version of the NRA to assist with identifying risk controls during optioneering.*

NOTE 2: *The Level Crossing Risk Management Toolkit (LXRMTK) http://www.lxrmtk.com and the Level Crossing Risk Management Catalogue are good sources of risk control and human factors information.*

NOTE 3: *See clause 9.9.2 for action to be taken when risk is deemed to be adequately managed by existing controls and no further mitigations are reasonably practicable.*

NOTE 4: *It is good practice to agree long term strategies for all public road level crossings and footpath crossings with local authorities. All long term strategies should be developed in consultation with the Route Asset Manager.*

9.2 Optioneering interim risk controls

Interim risk controls might be needed in addition to short and long term solutions.

As a minimum, interim risk controls shall be evaluated and progressed in the following circumstances:

a) deficient sighting; or

b) where a significant risk would exist pending delivery of short or long term solution(s).

NOTE: *See guidance on Managing Interim Risk at Level Crossings. Interim risk controls should be modelled as short term options in ALCRM.*

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9.3 Copy previous options

Relevant options from the previous risk assessment shall be copied onto the new live risk assessment.

Relevant options can include those that:

a) control risk and have not previously been recommended or approved;

b) have been previously recommended and are awaiting financial authority to progress to approved stage; or

c) are approved options awaiting delivery.

NOTE: *Previous options being copied should be checked and where needed amended for consistency with the new risk assessment, e.g. census numbers, sighting distances, train service data.*

9.4 Analyse results

Modelled options shall be analysed to determine which:

a) give the greatest safety benefit as measured in Fatalities and Weighted Injuries (FWI);

b) are effective at controlling and / or reducing risk conditions present at the crossing, e.g. address key risk drivers, known incidents of misuse or potential consequences of an incident or environmental risk; and

c) are achievable and practicable.

9.5 Carry out Cost Benefit Analysis (CBA)

CBA shall be carried out on options that meet the requirements of 9.4. The CBA shall be completed using the Network Rail CBA tool.

The CBA will give a benefit to cost ratio. CBA shall be used to support the decision when selecting options that will be progressed.

The following can be used to support decision making:

a) benefit to cost ratio is ≥ 1: positive safety and business benefit established;

b) benefit to cost ratio is between 0.99 and 0.5: reasonable safety and business benefit established; and

c) benefit to cost ratio is between 0.0 and 0.49: weak safety and business benefit established.

CBA might not be needed in all cases, e.g. low cost solutions or remedies for enforcement action. CBA gives an indication of overall business benefit. It should be used to support, not override, structured expert judgement when deciding which option(s) to progress. CBA does not always adequately reflect the safety benefit that can be achieved by implementing an option.

NOTE: *Where a business to cost ratio is < 1, supporting documentation will be needed to progress an option.*

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9.6 Final option selection

Decide which option(s) will be progressed for implementation.

NOTE 1: *This could include discussing with and obtaining the support of the wider Route team.*

NOTE 2: *More than one option can be progressed. Option(s) can include interim, short and long term risk controls.*

9.7 Recommend option(s)

All option(s) that are:

a) being progressed; or

b) are to be progressed in the future;

shall be set to 'recommended' status in ALCRM.

NOTE: *The ALCRM User Guide gives guidance on recommending options. Optioneering guidance is being developed.*

9.8 Seek option approval

Obtain approval for the selected option as appropriate.

Seek financial authority for the selected option(s) where needed.

NOTE: *This includes obtaining the support of an Investment Panel where appropriate. A sponsor might be appointed.*

For technical solutions, establish the high level feasibility of selected option(s).

9.9 Option(s) approved

9.9.1 Options to be progressed

When a feasible option has obtained approval, including financial authority where needed, it shall be set to 'approved' status in ALCRM.

Review the progress of recommended option(s) that have not gained financial authority or where feasibility has not been established within six months. Establish if the option remains viable.

Risk assessors shall revisit option selection if options are not approved or are not viable and evaluate if there are other controls which might be better suited to manage safety.

NOTE: *Further information is in 9.1 and 9.2.*

9.9.2 No options to be progressed

Risk assessors shall 'recommend', 'approve' and 'implement' a 'no further so far as is reasonably practicable (SFAIRP) mitigation identified' option where:

a) risk is deemed to be adequately managed by existing risk controls, e.g. at a CCTV level crossing; and

b) no further safety benefits are reasonably practicable.

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9.10 Complete a Narrative Risk Assessment (NRA)

The risk assessor shall complete a NRA for the level crossing being risk assessed.

As a minimum a NRA shall contain:

a) information automatically extracted from ALCRM;

b) enhanced qualitative narrative to greater articulate the risks present and support decision making;

c) conclusions relating to the management of risk in the interim, short and long term; and

d) evidence of risk control option(s) identified, those being progressed and those identified for future progression.

The NRA shall be completed within 12 weeks of the site visit.

NOTE 1: *The process for creating and guidance for completing NRAs are available on the Level Crossings Hub.*

NOTE 2: *The NRA is a risk assessment report for the level crossing. It should be written in report format.*

NOTE 3: *Review and update the joint long term strategy for all public road crossings when completing the NRA.*

9.11 NRA quality assurance process

All Level Crossing Managers (LCMs), Route Level Crossing Managers (RLCMs) and their nominated representatives shall undertake an assurance of the quality and consistency of level crossing risk assessments.

Checks should include:

a) accuracy of information collected as part of the core ALCRM data collection activity;

b) consistency of information; tracking for content which conflicts or is ambiguous;

c) detail of qualitative information; completeness, robustness, appropriateness;

d) identification of risks and hazards; relative to crossing users and crossing environment;

e) story board of NRA; content flows from beginning to end – e.g. there are no new hazards denoted in the conclusions section which do not feature earlier in the NRA;

f) the risk controls considered, recommended or rejected are appropriate to address the risks and hazards identified and are proportionate to these risks;

g) cost benefit analysis is completed, where this is required, and the BCR supports the recommended action(s) and/or legal, moral and economic considerations together with time, money and effort support proposals;

h) the language used is consistent with agreed protocols and terminology and would not be considered emotive or inappropriate; e.g. Deliberate misuse and user human error are applied correctly, and ‘misuse’ is avoided in narratives

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The NRA assurance process shall be completed within 12 weeks of the site visit.

A flowchart detailing the process overview is shown in Figure 2.

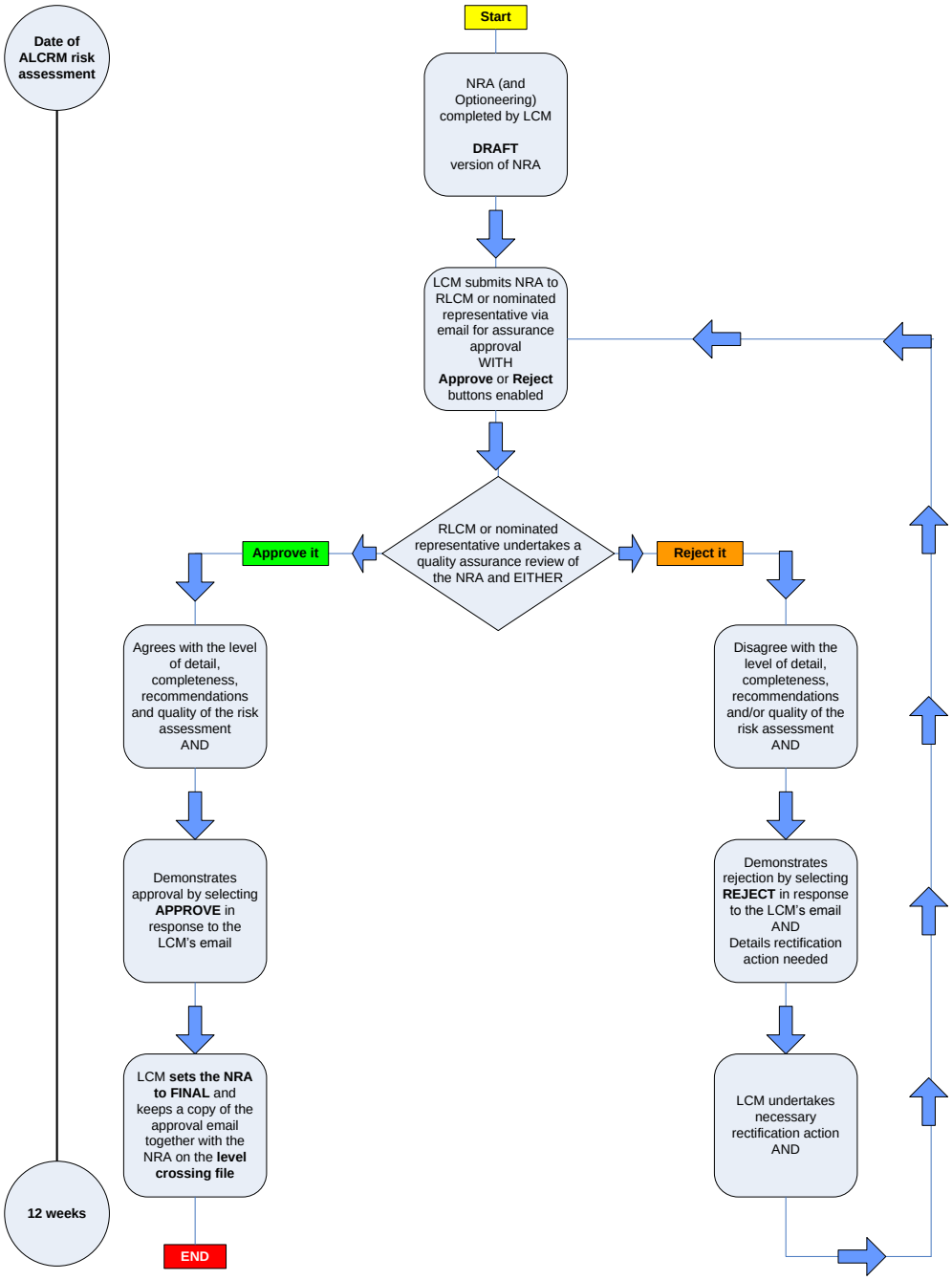


Figure 2 – NRS quality assurance process overview

9.12 Notify authorised users of risk assessment outcome

When the risk assessment is complete, the risk assessor shall send authorised users of user worked crossings the templated authorised user follow up letter and appropriate safe crossing usage information.

If the authorised user has provided alternative contact details, e.g. an email address, and confirmed they prefer to be contacted using these details, the letter shall be sent using the alternative contact details.

NOTE: *Authorised user letter templates are contained in the Level Crossing Sharepoint.*

10 Risk assessment process – implement risk controls

10.1 Stakeholder management

Risk assessors shall:

a) maintain contact with stakeholders to keep them updated on the progress of approved options;

b) inform stakeholders that work is due to take place before it commences.

10.2 Track option implementation

Risk assessors shall progress and track option(s) until they are implemented. Liaise with the sponsor and / or delivery agent as needed.

Work closely with teams implementing the works.

Recommended option(s) that have not been progressed within 12 months of the risk assessment date shall be reported six monthly. The report shall be run by the Route Level Crossing Manager (RLCM) / Operations Risk Advisor (ORA).

NOTE 1: *The suite of ALCRM management reports includes an optioneering report.*

NOTE 2*: Risk assessors should review the recommended options report to advise if options are still viable.*

10.3 Implement delivered option

Risk assessors shall establish that an option has been implemented and the expected safety benefits are achieved.

Evidence of implementation can include:

a) site visit;

b) photographs; and

c) documentary evidence, e.g. changes to ground plans, Level Crossing Orders etc.

When this has been established the option status shall be set to ‘implemented’ in ALCRM.

If the crossing is closed, update ALCRM to reflect temporary or permanent closure by implementing an M13 option and changing the core details to the respective status.

Follow the requirements of 8.12 to determine if the risk assessment frequency has changed.

NOTE 1: *This will generate a new live risk assessment. The risk assessment date will remain as the date of the site visit on which the implemented option is based.*

NOTE 2: *Guidance on closing and archiving crossings in ALCRM is given in AUG/CA, which is available on the Level Crossings Hub.*

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NOTE 3: *Implementing a risk control option can result in a change to the risk assessment frequency and reduce the FWI.*

10.4 Carry over ongoing options

Where more than one option is being progressed, carry over any other ongoing recommended or approved options to the new live risk assessment, see 9.3.

10.5 Notify stakeholders

Notify internal and external stakeholders of implemented options.

10.6 Decide if a new risk assessment is needed

Factors to take into account include:

a) the time elapsed between the date of site visit and delivery of implemented option; and

b) the requirements of 7.3.

Restart the process if a new risk assessment is needed.

11 Level crossing incidents and accidents

11.1 Identifying incidents and accidents

Risk assessors shall review daily Route Control logs and SMIS downloads to identify incidents and accidents affecting level crossings for which they are responsible.

Risk assessors shall also act proactively, taking account of other smart sources of intelligence such as red light safety equipment or census cameras, if such sources identify incidents which are not recorded through Route Operations Control.

This includes incidents of misuse, near misses and accidents.

11.2 Follow op to incidents and accidents

Risk assessors shall implement the actions described in Table 4.

When undertaking trigger risk assessments of user worked crossings, risk assessors shall document the method of contact and attempts to contact authorised users in the relevant level crossing file.

Involve other stakeholders in the review of risk assessments, findings and recommended actions arising from incidents and accidents.

Stakeholders include Highway Authorities, Environment Agency, the BTP (British Transport Police), Emergency Services and Road Rail Partnership Groups, etc.

NOTE 1: *Risk assessors should keep a record of incidents and accidents on the level crossings for which they are responsible to help identify when the triggers given in Table 2 are reached.*

NOTE 2: *Risk assessors should identify potential factors that might cause or increase misuse and the controls to address the risks. Risk assessors should maintain regular contact with Community Safety Managers so they are aware of route crime incidents at level crossings.*

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11.3 Report reconciliation

Risk assessors shall reconcile data recorded in the Route Control log and SMIS for each period within one week of receipt of the report. Risk assessors shall inform the Safety Reporting Team) of any discrepancies. Risk assessors shall reach agreement with the Safety Reporting Team on any discrepancies identified and how they will be recorded in SMIS.

NOTE 1: *Report reconciliation can be undertaken by technical clerks or other nominated representatives should this better align with individual Routes operating structures.*

NOTE 2: *Risk assessors might receive other reports or information about incidents and accidents from local sources that can clarify the location or circumstances of incidents.*

12 Level crossing risk records

All records shall be retained as per the timescales defined in NR/L3/INF/02226.

Records shall include:

a) copies of all correspondence sent to the authorised users of user worked crossings;

b) copies of completed NRAs;

c) correspondence related to the consideration of and decisions about proposed risk controls;

d) correspondence relating to actual or potential closures;

e) long term strategy agreements and proposals;

f) actions taken as a result of monitoring and in response to incidents and accidents;

g) general correspondence relating to the risk management of level crossings.

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Crossing Type	Definition of Misuse	Trigger	Action Required	Definition of Near Miss	Trigger	Action Required	Definition of Accident	Trigger	Action Required
ABCL, AHB, AOCL(+B), AOCR	Crossing of the line during the warning sequence by vehicles or pedestrians Irregular use of the crossing by a long, low or slow moving vehicle	3 times in a period of 12 months	Undertake additional risk assessment unless within 6 months of last routine risk assessment or a risk assessment has already been undertaken in accordance with this table within the last 12 months	Crossing of the line during the warning sequence by vehicles or pedestrians necessitating emergency braking to be initiated by the train driver or too late for avoiding action to be taken	After each reported occurrence	Undertake additional risk assessment unless within 6 months of last routine risk assessment or a risk assessment has already been undertaken in accordance with this table within the last 12 months	Train has struck a vehicle or pedestrian or a vehicle has struck a train	After each reported occurrence (except pedestrian suicides)	Undertake additional risk assessment
MCB type, MG	Crossing of the line during the warning sequence by vehicles or pedestrians Barrier Strikes before the crossing clear button is pressed	3 times in a period of 12 months	Undertake additional risk assessment unless within 6 months of last routine risk assessment or a risk assessment has already been undertaken in accordance with this table within the last 12 months	Barrier Strikes after the crossing clear button is pressed	After each reported occurrence	Undertake additional risk assessment unless within 6 months of last routine risk assessment or a risk assessment has already been undertaken in accordance with this table within the last 12 months	Train has struck a vehicle or pedestrian or a vehicle has struck a train	After each reported occurrence (except pedestrian suicides)	Undertake additional risk assessment

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Crossing Type	Definition of Misuse	Trigger	Action Required	Definition of Near Miss	Trigger	Action Required	Definition of Accident	Trigger	Action Required
Open	Crossing of the line during the approach of a train (within the minimum required sighting distance)	3 times in a period of 12 months	Undertake additional risk assessment unless within 6 months of last routine risk assessment or a risk assessment has already been undertaken in accordance with this table within the last 12 months	Crossing of the line during the approach of a train by vehicles or pedestrians necessitating emergency braking to be initiated by the train driver or too late for avoiding action to be taken	After each reported occurrence	Undertake additional risk assessment unless within 6 months of last routine risk assessment or a risk assessment has already been undertaken in accordance with this table within the last 12 months	Train has struck a vehicle or pedestrian or a vehicle has struck a train	After each reported occurrence (except pedestrian suicides)	Undertake additional risk assessment
User worked crossing type	Crossing of the line during the approach of a train (within the minimum required sighting distance) Non use of telephone when provided (except incidents of the user failing to call back after use) Crossing when the MSLs are red Gates left open	3 times in a period of 12 months	Undertake additional risk assessment unless within 6 months of last routine risk assessment or a risk assessment has already been undertaken in accordance with this table within the last 12 months Make contact with authorised user to invite them to attend the risk assessment	Crossing of the line during the approach of a train by vehicles or pedestrians necessitating emergency braking to be initiated by the train driver or too late for avoiding action to be taken	After each reported occurrence	Undertake additional risk assessment unless within 6 months of last routine risk assessment or a risk assessment has already been undertaken in accordance with this table within the last 12 months Make contact with authorised user to invite them to attend the risk assessment	Train has struck a vehicle or pedestrian or a vehicle has struck a train	After each reported occurrence (except pedestrian suicides)	Undertake additional risk assessment If appropriate, make contact with authorised user to invite them to attend the risk assessment

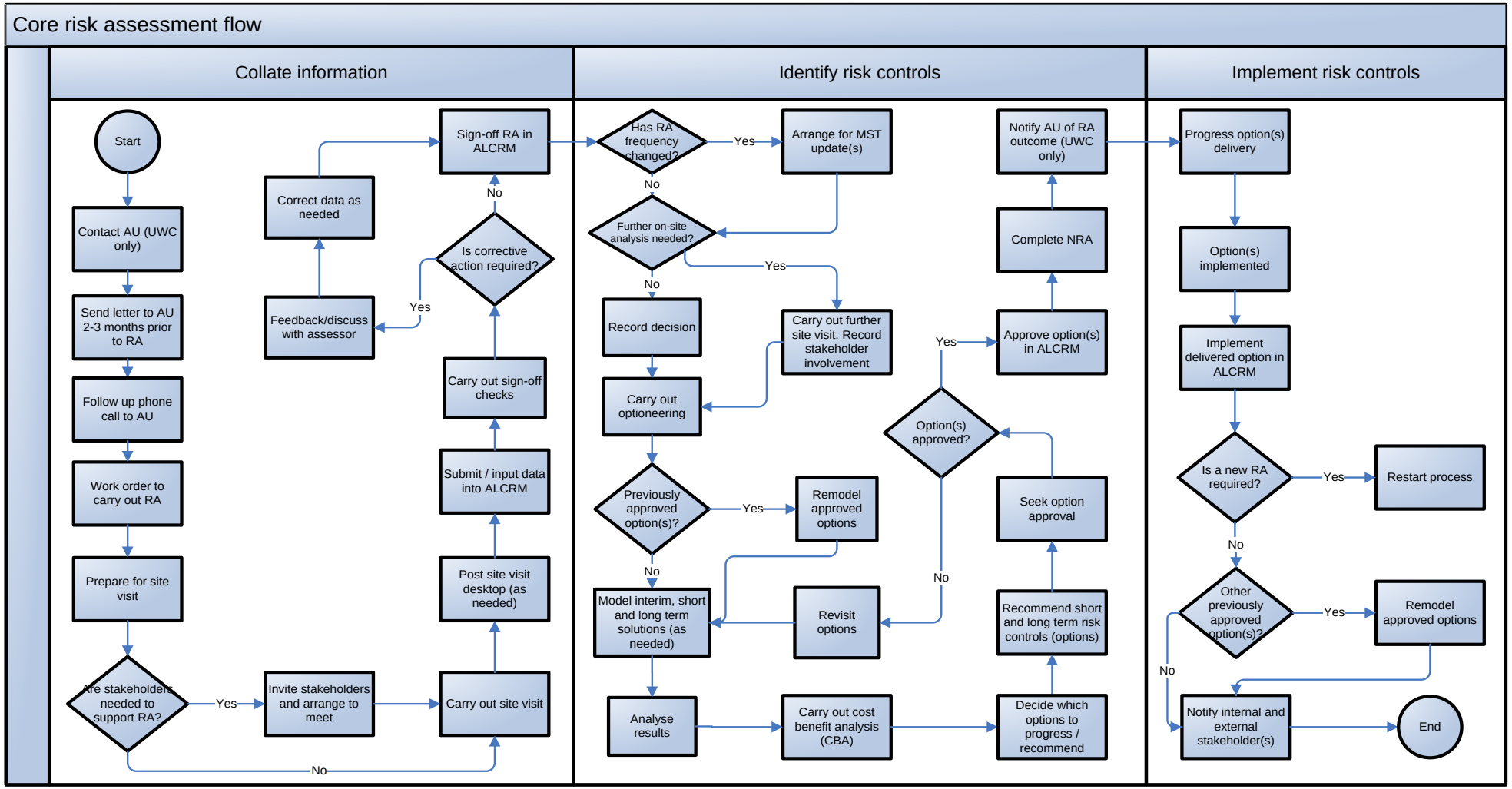
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Crossing Type	Definition of Misuse	Trigger	Action Required	Definition of Near Miss	Trigger	Action Required	Definition of Accident	Trigger	Action Required
BW, FP, Station pedestrian crossings	Crossing of the line during the approach of a train (within the minimum required sighting distance) Crossing when the MSLs are red Crossing when the White Light Indicator is extinguished	3 times in a period of 12 months	Undertake additional risk assessment unless within 6 months of last routine risk assessment or a risk assessment has already been undertaken in accordance with this table within the last 12 months	In any of the following circumstances: • crossing of the line during the approach of a train • crossing when the MWLs are red • crossing when the White Light Indicator is extinguished necessitating emergency braking to be initiated by the train driver or too late for avoiding action to be taken	After each reported occurrence	Undertake additional risk assessment unless within 6 months of last routine risk assessment or a risk assessment has already been undertaken in accordance with this table within the last 12 months	Train has struck a pedestrian or horse	After each reported occurrence (except pedestrian suicides)	Undertake additional risk assessment

Table 4 – Responding to incidents and accidents

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Appendix A - Risk assessment flowchart



Standard and control document briefing note

Ref: NR/L3/XNG/308	**Issue:** 1
Title: Risk assessing level crossings	
Publication date: 05 September 2020	**Compliance Date:** 05 September 2020
Standard/Control Document Owner: Head of Level Crossings	
Technical lead/contact for briefings: Darren Cottrell, Level Crossing Asset Strategy & Planning Manager	**Tel:** 07767 644687

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

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

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

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

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

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

a) the core level crossing risk assessment process;

b) frequency of risk assessments;

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

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

e) level crossing risk records.

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

A flowchart of the process is shown in Appendix A.

Overview of change

All content of NR/L3/OPS/045/3.08 has been transferred to this standard. The technical content has not been amended.

Detail of change

Section(s)/clause(s)	Summary of changes
Throughout	Minor editorial changes. No change in technical content.
9.11	Removal of reference to LCG 18 NRA Route self-assurance process.

Reasons for change

The standard has been published to allow transfer of ownership of all content in NR/L3/OPS/045/3.08 from Operations SCSG to Signals and Level Crossings SCSG. The technical content has not been amended. This transfer has been undertaken to bring level crossing risk management and level crossing competence standards under one framework. This is in line with the level crossing system framework the Technical Authority is moving towards.

NR/L3/OPS/045/3.08 has been withdrawn and made historic.

Affected documents:

Reference	*Impact*
NR/L3/XNG/308 ISSUE 1	New
NR/L3/OPS/045/3.08 ISSUE 1	Withdrawn

Briefing requirements:

Will Briefing Management System be used to deliver the briefing to posts listed below? Yes

Technical briefings are given to those who have specific responsibilities within this standard/control document.

Awareness briefings are given to those who might be affected by the content but have no specific responsibilities within the standard/control document.

Details of the briefing arrangements are included in the associated briefing programme.

All posts identified for briefing must be as described in OrgPlus.

Roles are directly briefed and do not cascade briefings.

Briefing *(A-Awareness/ T-Technical)*	Post	Function	Responsible for cascade briefing? Y/N
A	Route Level Crossing Manager	Regions	Y
A	Level Crossing Manager	Regions	N
A	Route Asset Manager [Signalling]	Regions	N
A	Head of Liability Negotiation	Technical Authority	Y

A	Liability Negotiations Manager	Regions	Y
A	Liability Negotiations Adviser	Regions	N
A	Operations Risk Advisor	Regions	N
A	Programme Manager [Public & Passenger Safety]	Regions	N
A	Head of Corporate Passenger & Public Safety	Technical Authority	Y
A	Health Safety & Environment Director, North West & Central	Regions	N
A	Health Safety & Environment Director, Southern	Regions	N
A	Health Safety & Environment Director, Wales & Western	Regions	N
A	Head of Route Safety Health & Environment	Regions	N
A	Head of Route Safety Health & Environment [North West]	Regions	N

NOTE: *Contractors are responsible for arranging and undertaking their own Technical and Awareness Briefings in accordance with their own processes and procedures.*

IA12

Ref:	**NR/L2/XNG/001**
Issue:	3
Date:	05 December 2020
Compliance date:	06 March 2021

Level 2

Business Process

Provision and risk management of level crossings

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User information

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

Red requirements – *no variations permitted*

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

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

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

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

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

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Compliance

This Network Rail standard/control document is mandatory and shall be complied with by Network Rail Infrastructure Limited and its contractors if applicable from 6th March 2021.

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

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

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

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

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

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Issue record

Issue	Date	Comments
1	December 2006	New standard
2	June 2008	Phase 2A / Engineering reorganisation responsibility change
3	December 2020	Replaces NR/L2/OPS/100 and revised based on current way of working

Reference documentation

NR/L2/OPS/031	Risk assessment and briefing of timetable change
NR/L2/XNG/101	Temporary Vehicular Level Crossings and Temporary Increased Use of Existing Level Crossings
NR/L2/SIG/19608	Level Crossing Infrastructure: Inspection and Maintenance
NR/L2/SIG/30021	Alterations to Authorised Line Speeds
NR/L2/XNG/30012/L110	Protection Choice, Layout Configuration and Overrun Risk
NR/L3/XNG/207	Level Crossing Manager: Competence Framework
NR/L3/XNG/308	Risk Assessing Level Crossings
NR/L3/XNG/309	Level Crossing Administration

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1 Purpose

This procedure sets out the process requirements that enable Network Rail to manage the safety and convenience of its level crossings and fulfil its legal duties under health & safety legislation.

It provides a robust and consistent risk management and option selection process for new and existing level crossings and helps determine the over-arching safety requirements for them.

2 Scope

This process shall be applied to both new and existing level crossings on Network Rail Managed Infrastructure.

This process does not apply to:

- authorised walking routes that cross the railway unless they are classified as a staff crossing with active warning equipment (such as white lights); and
- road rail access points or track access points.

3 Roles and responsibilities

R – Responsible is the person or people who are responsible for performing a certain task or action. **A – An Accountable** person is one who has overall accountability to make sure that a task or action is completed. **C – Consulted** people have an input into the task or action, this can be providing information, reviewing documents or attending workshops etc. **I – Informed** people are those who receive the output of a task or process. * Denotes option for delegation		Level Crossing Manager	Route Level Crossing Manager	Operations Risk Advisor	Operations Risk Control Coordinator	Head of Operations Delivery	Route Director	S&T RAM	Off Track Section Manager	Local Operations Manager	Regional Director, Engineering & Asset Management	Liability Negotiations Manager	Head of Liability Negotiations	Property Director (Regions)	Director, HSQE (Regions)	Head of Maintenance Delivery
5	LC Risk Management Principles	R	R	R	R	C	A*	C	I	I	C	C	C		C	C
6	Competence	I	R	R*		R	A*								R*	
7	Renewals & Enhancements	RC	RC	R*	R	R*	A*	R	C	C	R*	R	R	R*	R* C	
7	Risk Assessment and Risk Management	R	R	R	R		A*	C	C	C		C	C		I	
8	Authorised Users	R	A													
9	Level Crossing Orders	R	A	A											A	A
10	Records	R	RA												A	

Table 1 – RACI chart

4 Definitions

For the purpose of this document, the following terms and definitions apply.

Term	Definition
All Level Crossing Risk Model (ALCRM)	Network Rail's quantitative safety risk modelling system which is used to assess the safety of individual level crossings as part of the risk assessment process.
Authorised walking route	A designated route providing access to places of work for railway staff (including booking-on points and stabling points) and which is suitable for use by people not certificated as competent in personal track safety.
Automatic crossing	A level crossing where the protective equipment is automatically activated by an approaching train and where no interlocked signal protection is provided.
Blocking back	The formation of a stationary or slow-moving queue of road traffic over a level crossing.
Crossing time	Time taken for a user to traverse the crossing from the decision point to a position of safety on the other side of the railway. Crossing time includes time taken for the user to make a decision to cross.
Decision point	The point at which a level crossing user makes a decision to cross or wait for an approaching train to pass.
Level crossing	An intersection where a road, footpath or bridleway crosses the railway over one or more railway tracks on the same level. For the purposes of this standard, this also includes roads within depots and yards and authorised walking routes fitted with active warning equipment.
Level crossing type	A recognised combination of control measures used at level crossings which form asset types, for example ABCL (automatic barrier crossing, locally monitored); CCTV monitored barrier crossing; staffed gated crossing.
Level crossing user ("user")	A person who uses a level crossing to cross the railway.
Narrative risk assessment (NRA)	The documented risk assessment for each level crossing on Network Rail managed infrastructure. It includes the quantitative risk calculations of ALCRM

Term	Definition
	and the qualitative expert judgement of level crossing managers to generate a balanced assessment of risk.
New level crossing	A level crossing, permanent or temporary, provided at a location where previously there was no means of crossing the railway at the same level; or A level crossing altered to provide vehicular access where previously there was no vehicular access; or A level crossing altered to provide access for equestrians and cyclists where previously there was only access for pedestrians
Railway staff	A person employed in the railway industry, acting in accordance with their duties.
SFAIRP	So Far as is Reasonably Practicable – the term used to describe the legal requirement for managing risk. This involves evaluating the magnitude of risk and comparing it against the effort, time and money to control it.
Signaller	A person responsible for the operation of the signalling system, to safely control the passage and regulation of trains, usually located in a signal box.
WARA	Work Activity Risk Assessment
Whistle board	A sign to instruct the train driver to sound the train horn. Normally provided where there is inadequate sighting to warn users of approaching trains.

Table 2 – Terms and definitions

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5 Level crossing risk management and option selection principles

5.1 Principles overview

Level crossings shall be subject to risk assessment in accordance with NR/L3/XNG/308.

In compliance with the Network Rail investment requirements, cost benefit analysis shall be used to support decision making.

Safety risks at level crossings shall always be managed so far as is reasonably practicable (SFAIRP), this involves evaluating the magnitude of risk and comparing it against the effort, time and money needed to control it.

Recognising that the safest level crossing is a closed one, closure shall always be investigated as part of option selection, taking account of public safety, cost, performance and societal needs.

Where it not possible to close a level crossing, downgrading the rights of way (for example removing vehicular rights) shall be investigated.

Where closure cannot be achieved, protection levels shall be informed by the narrative risk assessment and taking account of:

- the risk of harm;
- the impact on convenience of level crossing users;
- the impact on the workload of the operator;
- the impact on the train performance; and
- whole-life cost.

The Level Crossings Act 1983 requires that the level crossing user's convenience, as well as safety, is considered.

Where renewal of level crossing equipment or signalling renewals provides reasonable opportunity, the protection method of level crossings shall be reviewed, and crossings upgraded where reasonably practicable. The narrative risk assessment shall be updated as necessary.

NOTE 1: *by incorporating level crossing upgrades into re-signalling or re-control projects, this should reduce overall costs to Network Rail and introduce efficiencies in how we manage safety of the railway.*

NOTE 2: *Also refer to NR/L2/SIG/30009/E810*

Options which affect the safety, performance or convenience of level crossings, shall be agreed by key stakeholders within Route businesses as part of Steering Group meetings.

NOTE 3: *see Section 7.2 on Steering Group meetings.*

5.2 New level crossings

A new level crossing, permanent or temporary, shall be provided only if it is grossly disproportionate to provide some other means of crossing the railway.

A new level crossing shall provide the minimum rights of way needed to accommodate the required access over the railway.

A new level crossing may also be provided to replace one or more existing level crossings when it enhances the safety of level crossing users and the railway network.

New level crossings shall not be introduced onto Network Rail managed infrastructure in the following circumstances:

1. where the permissible speed is greater than 125mph (200 km/h); or
2. for footpath, bridleway or user worked crossings, where there are more than two running lines.

Proposals for new level crossings shall be reviewed by the Technical Authority. The Regional Managing Director shall authorise new level crossings in accordance with the above conditions.

NOTE 1: *anyone proposing a new level crossing is encouraged to approach the Technical Authority as early as possible in the option selection process and make appropriate provision in the project plan.*

5.3 Existing level crossings

Where level crossings exist, no permissible line speed greater than 125mph (200 km/h) shall be introduced unless the affected level crossings are legally closed.

When a risk assessment has been undertaken, reasonably practicable options to mitigate risk shall be identified in accordance with the following hierarchy of controls:

1. Eliminate the risk through closure;

NOTE 1: *where this is a level crossing with public status, this <u>will</u> require a legal temporary stopping up order (TTRO) until the crossing can be permanently closed.*

2. Introduce new or improved technology to upgrade the current crossing protection;
3. Upgrade the crossing with additional levels of protection e.g. AHB to MCB-OD, FPW to FPWMSL;
4. Improve the crossing layout;

NOTE 2: *e.g. reduce skew, provide guide fencing*.

5. Install new clearer instructional signage, ergonomic design to improve user comprehension

NOTE 3: *where this is a level crossing with public status, this <u>may</u> require a legal temporary stopping up order (TTRO) to enable the modified work to improve safety to conclude.*

6. Introduce new or improved operational procedures
7. Educate users, use stakeholder engagement and safety awareness events to improve user comprehension on safe crossing protocols
8. Enforce behavioural change, e.g. red-light safety cameras, mobile safety vehicles, BTP presence and engagement with stakeholders

The reasonably practicable option(s) shall be progressed for implementation based on a combination of cost benefit analysis and structured expert judgement.

Investment in level crossing safety shall be balanced against other safety risks.

Competing priorities may, for example, occur with embankments, structures, track, signalling, through trespass and at stations. Thus, it may not be possible and within funding to immediately implement long-term safety improvements at all level crossings.

Where such prioritisation is needed, interim controls shall be applied to mitigate risk where reasonably practicable to do so.

Where it has been determined that closure or additional control measures are not reasonably practicable, no further action other than routine inspection and monitoring is required until the next risk assessment is due or reasonable opportunity arises.

6 Competence for undertaking level crossing risk assessments

Level Crossing Managers shall complete all training modules applicable to the role in accordance with the competency requirements needed to undertake their duties.

Route Level Crossing Managers shall have in place a mentorship programme to contextualise the content of the training modules and then assess their competency prior to permitting them to work alone.

Level Crossing Manager competence shall be continuously assessed in accordance with NR/L3/XNG/207.

7 Risk assessment and risk management

7.1 General

An assessment of level crossing safety, performance and convenience shall consist of a signed off NRA, that is compliant with NR/L3/XNG/308, with supporting ALCRM calculations to generate a balanced assessment of risk for each level crossing.

NOTE 1: *NR/L3/XNG/308 details the NRA process*

The narrative risk assessment shall contain evidence of the following:

a) The level crossing environment and local factors;

b) Level crossing usage [train service and user census];

c) Stakeholder consultation;

NOTE 2: *Including but not limited to, engagement with authorised users, operations, ergonomics, asset management, liabilities negotiations*

d) Incident history;

e) ALCRM calculations and risk evaluation;

f) Residual risks and hazards;

NOTE 3: *including but not limited to, infrastructure, rail operations, environmental conditions, user behaviour and third-party interface*

g) Future developments;

NOTE 4: *including but not limited to, third party developments, timetable change, line speed enhancements, re-signalling schemes & local authority transport plans.*

h) Option evaluation and cost benefit analysis;

NOTE 5: *by using the CBA tool available from the Technical Authority.*

i) Summary and recommendations;

j) Steering group decision regarding recommended option(s);

k) Conclusion and sign-off.

NOTE 6: *see Appendix B guidance an NRA content*

The minimum frequency of level crossing risk assessments shall be based on the calculated risk for each crossing as defined in NR/L3/XNG/308.

7.2 Steering group

Each Route (or Region) shall have in place a suitable framework to assess the recommended options within narrative risk assessments (steady or future state), providing assurance that the appropriate form of protection has been selected and documented accordingly.

NOTE 1: *recommended options include interim and long-term plans to manage risk.*

NOTE 2: *to de-risk options taken forward for implementation, the steering group should take place as early as possible following risk assessment and option selection.*

Steering group meetings, or an equivalent, shall:

1. Contain a quorum of stakeholders with the necessary expertise to represent key business areas;

NOTE 3: *includes, Route Level Crossing Managers, Level Crossing Manager(s), Operations Managers/Local Operations Managers, Signalling & other Asset Management representatives, Liability Negotiations Managers – or nominated representatives*

2. Use professional judgement to reach agreement as to whether to approve or reject options, taking account of the qualitative and quantitative rationale contained within the narrative risk assessments;
3. Where options are approved, agree responsible owner to progress funding and agree prioritisation within work-banks;
4. Meet with a periodicity that enables decisions relating to option selection to form part of conclusions within narrative risk assessments and be signed off in accordance with the timescales contained within NR/L3/XNG/308.

The outcome from the steering group shall be recorded and where required provide assurance into the Preliminary Approval stage of the Signalling and Level Crossing Scheme Technical Approval Process, NR/L2/SIG/30035, that the appropriate form of level crossing protection is being implemented.

Where selected options change later in the project lifecycle, for example due to engineering factors identified during the design stage or in later technical approvals, then the changed options shall be resubmitted for reconsidered by the steering group.

7.3 Trigger risk assessments

In addition to the scheduled frequencies, risk assessments shall also be reviewed, and updated as necessary, in the following circumstances:

1. When the volume of vehicular traffic, pedestrians or animals using a level crossing has changed significantly;
2. When the volume of rail traffic has changed significantly;
3. When rail-infrastructure changes have occurred;

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4. Following a report of significant change in the environment on the approach to a level crossing;
5. Upon identification of possible change in land use that could affect the level crossing; and
6. Following an expression of concern that changes the risk profile significantly.

NOTE 1: *an expression of concern might come from within Network Rail, a Train Operator, the safety regulator (ORR), an authorised user, or the relevant Highway Authority for example.*

7.4 Risk Modelling

ALCRM modelling shall be undertaken in the following circumstances:

1. As part of timetable change risk assessment as outlined in NR/L2/OPS/031;
2. Prior to responding to planning proposal consultations;
3. As part of proposals to change the rail infrastructure;
4. As part of franchise specification proposals
5. As part of a significant change in level of land use by authorised users.
6. As part of ALCRM modelling, NRAs shall be reviewed and updated as necessary.

Accidents and incidents at level crossings shall be monitored as part of daily checks of the Route Control Log. Where the incident involves a vehicle being struck or results in an accidental fatality involving a pedestrian, a full risk assessment shall be undertaken. For all other incidents, see NR/L3/XNG/308, a risk-based decision shall be taken as to whether a new risk assessment is required. A record of this decision shall be held on the level crossing file.

8 Level crossing renewals, upgrades and wider enhancements

When a level crossing is due for renewal the conclusions and recommendations of the NRA shall be used to determine the appropriate level crossing type and protection required.

Where an enhancement whether to road or rail is being considered the NRA shall continue to be the sole assessment for the level crossing and options held within it will be progressed through the wider enhancement scheme where reasonably practicable.

Where an enhancement whether to road or rail changes the proposed option, the NRA shall be updated accordingly.

This includes the use of cost benefit analysis.

The reviewed/bolstered NRA shall be then be taken to the Route Steering Group [see section 7.2] to seek acceptance of any revisions to conclusions and recommendations.

9 Third party changes

Changes in land use, including planning applications, shall be evaluated to determine if they have an adverse effect on the safety, performance and operation of level crossings.

Responses to planning applications shall be given in accordance with the required timescales.

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NOTE: *refer to section 7.3 regarding risk modelling and risk assessment requirements*

10 Pursuing closure and/or reduction in status

When the opportunity arises, and there is a viable business case, the relevant Liability Negotiations Manager shall pursue closure or reduction in status of all types of level crossings. The Head of Liability Negotiation shall be accountable to instruct solicitors for the legal release of private rights.

11 Stakeholder engagement

11.1 Operations

Operations shall work collaboratively with Level Crossing Managers as part of assessing the safety of level crossings (as appropriate).

Narrative risk assessments shall include content relating to:

1. Signaller workload and the risks of human error;
2. Signal box ergonomics, incorporating displays and long signal sections;
3. Cross-referenced checks with occurrence books;
4. Notes on voice communication checks undertaken with or by the Local Operations Manager (or nominated deputy);
5. Notes on operational irregularities relating to the level crossing.

NOTE: *further details are contained within Appendix B, section 4.2*

11.2 Authorised users

The NRA process shall confirm the authorised user database is up to date.

Level crossing managers shall make use of suitable opportunities to verify that authorised user details remain correct, and where changes are identified, they shall update the liability negotiations teams with this information.

NOTE: *suitable opportunities includes, as part of asset inspection, during the risk assessment, or when undertaking calls, correspondence or site visits not related to the risk assessment*

Liability negotiations teams shall verify details through land registry checks as appropriate.

Authorised users of each user worked crossing shall be written to as part of each risk assessment.

The letter shall be used to:

1. Invite them to participate in the risk assessment;
2. Remind them of the safe crossing protocols that they need to follow;
3. Remind them of their legal obligations to brief invitees, employees and tenants on safe crossing protocols;
4. Request information about their use of the crossing, patterns of use and the vehicle types used;

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5. Request an understanding of any changes in land use, tenancy details and other matters relating to safe operation; and
6. Ask if they are willing to consider closure of the crossing or lock it when not in use.

11.3 Others

Stakeholder engagement is integral to the risk assessment of level crossings.

So far as is reasonably practicable, Level Crossing Managers shall work collaboratively with internal and external stakeholders to manage the safety of level crossings. Those internal to Network Rail shall provide the necessary support as part of this process.

Intelligence received and other discussions that help inform risk-based decisions shall be recorded within the narrative risk assessment.

12 Level crossing orders

Level crossing orders for public road level crossings shall be maintained in compliance with the Level Crossing Act 1983 and the Level Crossing Regulations 1997.

Level crossing orders shall be required when:

1. amending the arrangements at a level crossing already subject to an order;
2. changing the level of control at a public road level crossing that does not have a current order;
3. requested to submit an order by the Secretary of State.

***NOTE 1**: General Counsel provides legal guidance to those preparing orders*

13 Level crossing files

A file shall be maintained for each level crossing in accordance with NR/L3/XNG/309.

It shall contain as minimum:

1. Level crossing order, if applicable
2. Ground plan, if applicable;
3. Narrative risk assessment (current and historical);
4. Correspondence regarding risk reduction and other works;
5. General correspondence’

Level crossing files shall be maintained for the lifetime of a level crossing and for 7 years thereafter.

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Appendix A - Minimum combinations of control measures for renewals, upgrades and new level crossings

The requirements in the table in this appendix shall be followed where risk assessment has identified improvements in protection arrangements are required so far as is reasonably practicable.

	Controlled by:	Monitored by:	Type of barrier required	Fixed signs required?	Phone to signaller required for user?	Active visible warning required?	Active audible warning required?	Limit on train speed	Additional requirements	Current crossing type meeting these requirements
A	Railway passenger at a station to gain access to a platform (pedestrian only)	Not monitored	None	Yes	No	Sometimes - see additional requirements	Sometimes – see additional requirements	Not to be provided where permissible train speed > 100 mph	An active visible warning is required where direct observation of trains does not give sufficient warning time e.g., white light indicators. Audible warning of the approach of a second train shall be considered where the level of risk justifies it.	Station footpath crossing
B	Railway staff supervised at a station to gain access to a platform (pedestrian only, or with barrows and trolleys)	Not monitored	None	Yes	Sometimes - see additional requirements	Sometimes - see additional requirements	No	Not to be provided where permissible train speed > 100 mph	**Either** an active visible warning (e.g., white light indicators) or a phone to signaller is required where direct observation of trains does not give sufficient warning time	Barrow crossing

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	Controlled by:	Monitored by:	Type of barrier required	Fixed signs required?	Phone to signaller required for user?	Active visible warning required?	Active audible warning required?	Limit on train speed	Additional requirements	Current crossing type meeting these requirements
C	User (pedestrian only)	Not monitored	Gate or stile	Yes	No	Sometimes - see additional requirements	Sometimes - see additional requirements	Not to be provided where permissible train speed > 125 mph	Active visible and audible warnings are required where direct observation of trains does not give sufficient warning time or where permissible train speed > 100 mph.	Footpath crossing
D	User (including vehicle driver, horse rider, cyclist, person moving farm animals on the hoof and pedestrian)	Not monitored	Gate or lifting full barrier	Yes	Sometimes - see additional requirements	Sometimes - see additional requirements	Sometimes - see additional requirements	Not to be provided where permissible train speed > 125 mph	**Either** a phone to signaller **or** an active visible warning is required where direct observation of trains does not give sufficient warning time or permissible train speed > 100 mph. An active audible warning is also required where an active visible warning is provided at a crossing over which there is a public right of way. Not to be provided on public roads.	Bridleway crossing. User worked crossing.
E	User (including vehicle driver, horse rider, cyclist, and pedestrian)	Not monitored	None	Yes	No	No	No	The speed of trains over the crossing should not exceed 10 mph	There should not be more than one line over the crossing. Only to be provided in depots or on sidings. The maximum daily traffic moment not normally to exceed 2000 or the peak hour traffic moment 30 or the maximum actual daily road vehicle user 200. The 85%ile road speed at the crossing to be less than 35 mph.	OC (Open Crossing)

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	Controlled by:	Monitored by:	Type of barrier required	Fixed signs required?	Phone to signaller required for user?	Active visible warning required?	Active audible warning required?	Limit on train speed	Additional requirements	Current crossing type meeting these requirements
F	Automatic control system	Train driver	None	Yes	Yes	Yes	Yes	Speed of trains to be limited so that drivers can stop short of the crossing from the point at which the crossing comes fully into view. The crossing speed shall not exceed 55 mph	Only to be provided in a depot/siding and not to be provided where there is more than two running lines.	AOCL (Automatic Open Crossing, locally monitored)
G	Automatic control system	Train driver	Lifting half barrier	Yes	Yes	Yes	Yes	Speed of trains to be limited so that drivers can stop short of the crossing from the point at which the crossing comes fully into view. The crossing speed shall not exceed 55 mph	Not to be provided where there are more than two running lines. Barriers are to close only the entrances to the crossing, leaving the exits clear.	ABCL (Automatic Barrier Crossing, locally monitored)

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	Controlled by:	Monitored by:	Type of barrier required	Fixed signs required?	Phone to signaller required for user?	Active visible warning required?	Active audible warning required?	Limit on train speed	Additional requirements	Current crossing type meeting these requirements
H	Automatic control system	Signaller	Lifting half barrier	Yes	Yes	Yes	Yes	Not to be provided where permissible speed > 100 mph	Not to be provided where there are more than two running lines. Not to be provided where grounding or blocking back of traffic is considered likely. Not to be renewed if adjacent to stations or near schools. Barriers are to close only the entrances to the crossing, leaving the exits clear.	AHBC (Automatic Half Barrier Crossing)
I	Automatic control system	Train driver	Lifting full barrier	Yes	Yes	Yes	Yes	Speed of trains to be limited so that drivers can stop short of the crossing from the point at which the crossing comes fully into view. The crossing speed shall not exceed 55 mph	Not to be provided where there are more than two running lines.	AFBCL (Automatic Full Barrier Crossing, locally monitored)

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	Controlled by:	Monitored by:	Type of barrier required	Fixed signs required?	Phone to signaller required for user?	Active visible warning required?	Active audible warning required?	Limit on train speed	Additional requirements	Current crossing type meeting these requirements
J	Train crew, locally	Train crew (integral with working of crossing)	Gate or lifting full barrier	Yes	No	Sometimes - see additional requirements	Sometimes - see additional requirements	Not applicable - train comes to a halt at the crossing	Active visible and audible warnings are required, except where existing crossings are fitted with gates and road usage is minimal.	Train crew operated gated crossing. Train crew operated barrier crossing.
K	Signaller or crossing keeper, remotely (by CCTV)	Signaller or crossing keeper (integral with working of crossing)	Lifting full barrier	Yes	No	Yes	Yes	Not to be provided where permissible train speed > 125 mph		CCTV monitored barrier crossing.
L	Obstacle detection	LIDAR/RADAR	Lifting full barrier	Yes	No	Yes	Yes	Not to be provided where permissible train speed > 125 mph		Obstacle detection monitored barrier crossing.
M	Signaller or crossing keeper, locally	Signaller or crossing keeper (integral with working of crossing)	Gate or lifting full barrier	Yes	No	Sometimes - see additional requirements	Sometimes - see additional requirements	Not to be provided where permissible train speed > 125 mph	Active visible and audible warnings are required, except where existing crossings are fitted with gates and road usage is minimal.	Staffed gated crossing. Staffed barrier crossing.

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Appendix B – Core requirements for a narrative risk assessment template

The details shown below set out the core elements that shall be included within relevant narrative risk assessments to confirm a robust assessment of safety is undertaken.

NOTE: *the elements below do not mandate an order in which information should be written*

Photographs should be used to support observations within narrative risk assessments wherever practicable.

1 Title page

Crossing name, date of risk assessment and a photograph of the level crossing.

The photograph should contextualise the crossing within its environment i.e. a crossing approach picture should be used.

2 Reason for risk assessment

A reason why the risk assessment has been undertaken should be identified within the NRA, for example as part of a scheduled risk assessment frequency, following an accident or a series of safety events, following local environment changes, or following infrastructure/operational changes.

3 Level crossing overview

3.1 Summary

The level crossing overview familiarises readers with the location, crossing type and ALCRM calculated risk.

Summary details includes:

1. Level crossing name
2. Level crossing type
3. ELR, miles and chains
4. Route and/or Region
5. Number of running lines
6. Maximum permissible line speed over the level crossing
7. Electrification and type
8. Supervising signal box / control centre
9. Road name and type or footpath number
10. OS grid reference.
11. Postcode
12. Local / highway authority
13. Title & date of the level crossing order (if applicable)

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14. Level crossing layout plan – number, version and date (if applicable)
15. ALCRM calculations – total FWI, risk per traverse letter and collective risk number

Orientation of the crossing or the railway as appropriate

3.2 Description of the crossing and its environment

A satellite image and map provides a visual representation of the topography of the crossing, including nearby roads and the crossing approaches

NOTE: *a minimum 1:25,000 scale should be used*

Extract from the sectional appendix contextualises the railway environment

Asset description including a summary of the protection provided and/or layout characteristics such as guide fencing

3.3 The geographical nature of the area

Describe the surrounding area and land use.

1. Rural, urban or coastal location
2. Residential, industrial, town or village environment
3. Local properties, businesses and amenities that could affect safety of the crossing, for example shops, supermarkets, schools, sheltered housing, rail/bus station, religious centres, cinemas, pubs, seasonal events

NOTE*: local amenities or attractions that can affect the level crossing might not always be adjacent to it*

4. Highways information, for example the route over the crossing might be classified as a designated diversionary route, it might be subject to flooding and might have specific gritting arrangements in place
5. Notable changes in land use and/or changes in authorised users
6. Whether it is a heritage, conservation or SSSI area
7. Whether adverse weather is known to occur such as fog and sea mist
8. If the crossing is on a flood plain

3.4 Approaches

Name, classification and road number as appropriate:

1. Whether roads and footpaths are public or private and if bridleway rights exist;
2. Highway layout including the number of lanes, reference to junctions and side roads, whether a pavement is provided, surface characteristics which might cause reflections or poor adhesion for vehicles and whether tactile paving is present;
3. Impact of any gradients, this includes both approaches and the area within the confines of the crossing which might result in risk of grounding;

NOTE 1: *Nairn's risk assessments should support this*

4. Legal speed limit on the approaches and over the level crossing, qualitative notes on compliance to the speed limits;
5. Whether the crossing is on a skew and if it causes a safety risk for users;

NOTE 2*: see guidance documents, LCG06 Deviating from the marked carriageway and LCG19 Skewed crossings, assessing the effects on pedestrian users.*

6. If sun glare is a known risk when viewing the crossing equipment or approaching trains;

NOTE 3: *also see guidance document, LCG13 Risk assessing for sun glare at public road level crossings.*

7. Condition of the approaches such as vegetation that could obscure signs or road traffic signals;
8. Distraction risks such as parked cars, low flying aircraft, ambient noise;

NOTE 4: *include notes on audibility of train horns especially where whistle boards are fitted.*

9. Lighting in the vicinity of the crossing that might result in glare or necessitate eyes to adjust, including going from light approaches to a darker crossing environment.

4 Rail operations

Rail operations and Signaller interface is a key component of the risk assessment.

4.1 Rail approach and usage

Train count for passenger and freight. For station level crossings, and those in close proximity to stations, include the mix of stopping and non-stopping services

Details relating to line speed(s):

1. Speed over the crossing;
2. Permissible speed changes on the approach to the crossing, including speed differentials for different classifications of trains;
3. Attainable speeds/variations in speed due to junctions, stations, including the impact of stopping and non-stopping services
4. Likelihood of trains passing on the crossing and whether there a risk to sighting from trains passing each other in the vicinity of the crossing

Operational risks such as:

1. Trains that may stop on the crossing or on the approach to the crossing due to location of signals for train regulation purposes, stabling of rolling stock, looping of freight trains etc. This can have an impact on access and sighting
2. Shunting movements that may impact on sighting or crossing activation
3. Bi-directional train movements that may also impact on sighting or crossing activation

Whether the railway line over the crossing is on a potential diversionary route

Details of the risk of overrun at protecting signals as detailed within NR/L2/SIG/14201 Signalling Risk Assessment Handbook (where applicable)

NOTE: *details of NR/L2/SIG/14201 assessments will be available from the Route Operations Risk Control Coordinator who can also help interpret the results and advise on any mitigation needed*

4.2 Signaller interface

It is important to evaluate the interface with Signallers within the narrative risk assessment. Areas of focus should include:

1. Signaller workload, incorporating risk of human error, workload issues, repetition of tasks, number of crossings the Signaller has to interface with, signal box special instructions relating to level crossings, local methods of working when granting permission to cross or application of stopping/non-stopping controls, considering long signal sections – include reference to WARA and other assessments if known
2. Signal box ergonomics, incorporating long signal sections risks, reference to crossings recorded on diagrams/panels/VDUs, crossings ordered chronologically on diagrams/panels/VDUs and telephone concentrators, CCTV monitor blind spots/bleaching (B&W or colour) – include reference to ergonomic risk assessments if known
3. Cross-reference checks with occurrence books to gain intelligence on use, patterns of use and time requested, and given, to cross
4. Notes on voice communication checks with LOM
5. Notes on operational irregularities, e.g. trapping of pedestrians and vehicles, permission to cross with a train in section, failure to caution, incidents involving hand signallers and/or during engineering work (including un-signalled movements)

4.3 Train operator interface

Notes on:

1. Intelligence of incidents, local practices observed, and other risks and hazards identified by train crew including sighting of the crossing, interface with whistle boards and multi-tasking/distraction risks
2. Details of any cab rides undertaken, and sighting observations made

5 Level crossing design, operation and condition

Asset condition, design, performance and future plans inform risk-based decision-making.

Include information on:

1. Renewal date from SICA report (if applicable)

2. Derogations to current standards e.g. equipment type, layout, operational compliance.
3. Faults and failures including trends and impact on performance:
    - Asset inspection
    - SICA report
    - FMS
    - DST
4. Warning times of level crossing equipment incorporating design and onsite observations
5. Impact of crossing closure on society, user convenience and willingness to wait:
    - Barrier down time within the hour – peak time and average throughout the day
    - Train arrival times and compliance to relevant standards

NOTE: *proximity to stations, train frequency and likelihood of trains passing will influence this*

6. Notes on additional mitigation such as red standing man, red light safety cameras, barrier protection, surveillance cameras
7. Notes from any discussions with the RAM team relating to future plans for the crossing, including incorporation within re-signalling projects if known

6 Census

6.1 General

User census incorporating frequencies, patterns of use and user demographics (including vehicle types) is a critical element of the risk assessment process.

NOTE: *guidance on census can be found in level crossing guidance document LCG02 Census good practice.*

Reference should be made to type of census, date and duration and other intelligence such as engagement with authorised users, operations, local residents and businesses etc.

The following information should also be supplied:

1. The weather conditions at the time
2. General observations relating to user behaviour, deliberate misuse, user error or unusual occurrences, user distractions, ambient noise, parked cars, road traffic diversions, road works etc.
3. Commentary on peak and off-peak census, including patterns of use (where known)

Where seasonal variation is identified, a second census should also be referred to within the narrative risk assessment and detailed in the same way.

6.2 Road traffic census

A vehicular census should include information on:

1. Number of cars
2. Number of light goods vehicles
3. Number of motorcycles
4. Number of heavy goods vehicles
5. Number of agricultural vehicles (tractors and vehicles with trailers)
6. Number of buses
7. Number of pedal cyclists
8. Number of equestrians
9. Occurrences of herded animals

Include a narrative of any occurrences of large and slow-moving vehicles, including those with abnormal loads (if applicable)

Include narrative on average speeds – are they in keeping with environment, speed limits

Also include information on blocking back (if applicable)

NOTE: *blocking back information should consider the impact on safety and also crossing operation and performance*

6.3 Pedestrian Census

A pedestrian census should include information on:

1. Number of adult pedestrians
2. Number of accompanied children
3. Number of unaccompanied children
4. Number of cyclists
5. Number of equestrians
6. Number and types of vulnerable and encumbered users, which might include:
    - the elderly;
    - mobility impaired or in mobility scooters/wheelchairs;
    - dog walkers (dogs both on, and off the lead);
    - pedestrians wearing head covering clothing (i.e. hoodies);
    - pedestrians using a mobile device or wearing headphones;
    - pedestrians riding or pushing a cycle (behavioural);
    - pedestrians carrying heavy bags or equipment affecting ability to cross safely

NOTE: *guidance on vulnerable users can be found in level crossing guidance document LCG02 Census good practice.*

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7 Sighting and traverse time requirements

Sighting and traverse requirements inform us as to whether we are meeting legal compliance, in addition to determining if further risk controls are required.

Should include:

1. Description of decision points and actual distance (metres) from the nearest running rail
2. Distance from decision point to 2m clear of the furthest running rail
3. Whether decking is provided, if it is skewed, type and provision of non-slip surface
4. Traverse time (seconds) for pedestrians and vehicles (as detailed in LCG01), accounting for:
    - Vulnerable users
    - Slowest vehicles type
5. Minimum sighting requirements taking account of:
    - highest line speeds,
    - temporary or emergency speed restrictions
    - attainable speeds (where this can be justified and is recorded within the NRA)
6. Actual sighting distances available
7. Include impact of signalled bi-directional movements

8 Impact of sun glare

The risk of sun glare should be noted for both passive and protected crossings.

Depending on the crossing type, notes should refer to either the orientation of the crossing or the orientation of the railway and highlight the risks of sun obscuring crossing equipment or approaching trains respectively.

For level crossings on public roads, where LCG13 - Risk assessing for sun glare at public road level crossings, has identified level crossings shown within Annex D, the risk assessment form in Annex C shall be completed and appended to the NRA.

This process shall also be applied to public road level crossings where sun glare risk is identified as a concern and that do not already feature in Annex D.

9 Incident history

Provide details of safety events at the level crossing that are relevant to the risk assessment. This should include:

1. Accidental fatalities
2. Deliberate acts (suicides/attempted suicides)
3. Collisions

4. Near misses
5. Road vehicle violations including collisions with equipment
6. Other user errors or deliberate acts including gates left open or incorrect methods of crossing operation etc.

In addition to summary details and volume of events, also include:

1. Where the data has been obtained from, e.g. SMIS, DST, RLSE, MSVs, Signaller misuse reporting tool, including third-party advice/stakeholder engagement
2. A narrative relating to the frequency of incidents, incorporating whether there are regular types of events, patterns of events or other trends identified

10 Risks and hazards

Identified risks and hazards, including precursor events are critical to the risk assessment and deciding if risk is tolerable or intolerable.

Refer to ALCRM calculations, key risk drivers and assessors structured expert judgement within the narrative.

10.1 Vehicular risks

List the vehicular risks, the list provided is not exhaustive:

1. Weaving around lowered barriers
2. Red light violations
3. Risk of grounding
4. Sunlight issues including sun glare, bleaching out of crossing equipment, reflections from the road surface following rain
5. Late braking exacerbated by fast straight roads and/or steep gradients
6. Blocking-back or other issues caused by nearby road junctions
7. High and frequent vehicle moment, high proportion of HGVs, those which are large and slow moving or carrying hazardous goods
8. Insufficient carriageway width for large vehicles to pass easily on the crossing
9. Overhead line equipment which might impact high-sided vehicles
10. Ice, mud, flooded or pot-holed roads which effect traction and ability to stop

Risks associated with crossing design incorporating levels of protection, audible, visual warnings, signage, positioning of equipment and layout

Parallel roads that are in close proximity to the crossing and which might exacerbate the risk of vehicles turning onto the railway in error

Conspicuity of crossing equipment taking account of road approaches, road speeds and risks of distraction

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Provision or absence of street lighting which may introduce human factor risks when transitioning from light approaches to a darkened level or crossing or vice versa i.e. sensitivities associated with eyes

UWCTs which are in long signal sections

Decision points and visibility of approaching trains from within seating positions of vehicles likely to use the level crossing, taking account of height and length of vehicles which might also foul gauge

10.2 Pedestrian, cyclists and horse riders' risks

List the risks, the list provided is not exhaustive:

1. Sighting compliance and calculated crossing times
2. Audibility and suitability of whistle boards (where provided)
3. Regular bouts of adverse weather conditions which might affect sighting of approaching trains, e.g. fog and sea mist
4. Risk of sun glare, bleaching of MSLs or masking approaching trains
5. Sighting obscuration issues
6. Risks of another train coming including sighting obscuration risks, e.g., hidden trains.
7. Variances in approach speeds due to stopping and non-stopping services, line speed differentials and variances due to junctions, speed restrictions etc.
8. Vulnerable users and associated risks to them
9. Frequency of use and reasons for use, e.g. high-volume, community link, provides access to leisure attraction such as a beach or caravan park, station proximity etc.
10. Access issues (where identified), taking all demographics into account including those on mobility scooters or in wheelchairs, mobility impaired or encumbered e.g. with pushchairs
11. Crossing layout, ergonomic positioning of signs, telephone equipment, gates, chicane fencing etc and risks of poor designs
12. Signage information, optimal with key safety messages prioritised, duplicate information, poorly ordered, signage clutter etc.
13. Where technology is provided, if equipment is ergonomically and optimally positioned, accounting for all user groups including equestrians, if audible warnings are set at the appropriate volume etc.
14. Where technology is provided, if warning time is optimal for pedestrian users, considering the risks associated with willingness to wait
15. Suitability and width of crossing surface accounting for user demographic, including risks of skewed alignment, condition, construction type
16. Observed issues with decision points

17. Risks of distraction, including sources of ambient noise from adjacent buildings or low flying aircraft, locations where only one ticket machine is provided at station crossings, people crossing in groups or with animals etc.
18. Risks associated with darkness or transitioning from dark to light or light to dark environments, including slip, trips and falls, ability to read and follow instructional signage, ability to see approaching trains whilst eyes adjust etc.
19. Deliberate misuse intelligence, including trespass, loitering on or around the level crossing, climbing over lowered barriers or other equipment, deliberately running in front of trains etc.

11 Future developments

1. Record details about any planned future developments that could affect risk at the crossing; e.g. significant infrastructure changes, housing developments, superstores, schools etc. Details are to be provided of the applicable planning authority and the date contact was made. Refer to any correspondence or discussions held within Road Rail Partnership Groups or with authorised users regarding changes in land use. Also include details of any risk modelling undertaken.
2. Provide information regarding any potential line speed changes, service strengthening, planned changes to rolling stock and any associated risks. Include details of the source material; e.g. contact with the RAM, Network Rail planning team, scheme sponsor etc (as applicable).
3. Refer to long-term strategies and Include line of route information such as:
    - nearby level crossings that could be subject to change and which could affect the risk at the level crossing being assessed. Examples include closure of another level crossing which creates a diversion over the assessed crossing or the upgrade of a nearby AHB where the increased barrier down time might lead to an increase in road traffic over the assessed crossing;
    - any proposed upgrade to nearby lines which could lead to increased train paths, either permanently or as a diversionary route. This includes line speed enhancements, re-signalling schemes, electrification projects and the impact of any re-controls. Refer to any correspondence or discussions held and also include details of any risk modelling undertaken; and
    - include any analysis that has been undertaken on the social and economic costs of crossing upgrades through use of the AXIAT.

12. ALCRM output and option evaluation

The corporate CBA tool relating to level crossing safety shall be used to support decision making.

It is important to include both interim and long-term risk mitigation within narratives, risk modelling and CBA (as applicable).

Ref:	NR/L2/XNG/001
Issue:	3
Date:	05 December 2020
Compliance date:	06 March 2021

Evidence should be provided summarising:

1. Interpretation of current risk levels;
2. Evidence of optioneering and safety benefits for evaluated risk mitigation;
3. Cost benefit analysis incorporating whole life cost of risk mitigation;
4. Qualitative judgement supporting recommended risk mitigation; and
5. Recommended options to improve safety or decisions supporting tolerable risk, i.e. risk is managed SFAIRP (as appropriate).

13. Conclusion and recommendations

1. Summary of the risk assessment, incorporating risks and hazards identified, reference to calculated risk (where the asset resides in terms of priority based on type, Route, national data), qualitative structured judgement, observations and stakeholder input
2. Proposed risk mitigation to improve safety and the decisions made by the Steering Group relating to acceptance or rejection of recommendations
3. Anticipated timescale for implementation of agreed recommendation(s) (if known)

Standard and control document briefing note

Ref: NR/L2/XNG/001	**Issue:** 3
Title: Provision and risk management of level crossings	
Publication date: 05 December 2020	**Compliance Date:** 06 March 2021
Standard/Control Document Owner: Head of Level Crossings Safety	
Technical lead/contact for briefings: Tim Clark, Level Crossing Safety Manager	**Tel:** 07799 336978

Purpose:

This procedure sets out the process requirements that enable Network Rail to manage the safety and convenience of its level crossings and fulfil its legal duties under health & safety legislation.

It provides a robust and consistent risk management and option selection process for new and existing level crossings and helps determine the over-arching safety requirements for them.

Scope:

This process shall be applied to both new and existing level crossings on Network Rail Managed Infrastructure.

This process does not apply to:

- authorised walking routes that cross the railway unless they are classified as a staff crossing with active warning equipment (such as white lights); and
- road rail access points or track access points.

Overview of change

NR/L2/OPS/100 has not been updated since June 2008 and does not reflect the implementation of the Level Crossing Manager organisation in 2013. This review will update the standard to reflect the business as usual working of the LCM organisation together with defining the minimum requirements for a Narrative LC Risk Assessment.

The reference number has been amended to reflect transfer of ownership to Head of Level Crossings Safety.

Detail of change

Section(s)/clause(s)	**Summary of changes**
Section 5	Updated to include principles overview and processes updated for new and existing level crossings
Section 6	Competence given its own section and bolstered to reflect current processes
Section 7	Risk assessment section updated to reflect current best practise and to mandate Route Steering Groups
New Section 8	LC renewals, upgrades mandated to use the Narrative Risk Assessment as the sole LCRA
New Section 9	To define processes with third party changes, planning applications etc
New Section 10	Making closure/reduction in status process clear
New Section 11	Stakeholder engagement section to encourage/promote collaboration with Operations. Crossing users etc
Appendix A	Updated and now includes AFBCL & MCBOD
New Appendix B	Setting out the core requirements for the narrative risk assessment and the inclusion of reference to NR/L2/SIG/14201 to include details of LX/SORAT in the NRA.

Reasons for change

The revised standard reflects the changes to level crossing risk management and the implementation of the LCM organisation in 2013. It also introduces the addition of the Narrative Risk Assessment process and defines the minimum requirements for version 2 of that process. Recommendations closed out:.RAIB Moreton-on-Lugg Rec.2, F.I.,Hockham Road A9.1, F.I.,Routs A9.5.

Affected documents:

Reference	*Impact*
NR/L2/OPS/100 ISSUE 2	Superseded

Briefing requirements:

Will Briefing Management System be used to deliver the briefing to posts listed below? No

Technical briefings are given to those who have specific responsibilities within this standard/control document.

Awareness briefings are given to those who might be affected by the content but have no specific responsibilities within the standard/control document.

Details of the briefing arrangements are included in the associated briefing programme.

All posts identified for briefing must be as described in OrgPlus.

Roles are directly briefed and do not cascade briefings.

Briefing *(A-Awareness/ T-Technical)*	**Post**	**Function**	**Responsible for cascade briefing? Y/N**
T	Route Level Crossing Manager	Regions	Y
T	Route Asset Manager [Signalling]	Regions	Y
T	Regional Head of Engineering [Signalling & Telecoms]	Regions	Y
T	Regional Engineer [Signalling & Telecoms]	Regions	Y
T	Principal Route Engineer [Signalling]	Regions	Y

T	Regional Asset Manager [Signalling]	Regions	Y
A	Health Safety & Environment Director, Southern	Regions	Y
A	Health Safety & Environment Director, Wales & Western	Regions	Y
A	Health Safety & Environment Director, North West & Central	Regions	Y
A	Health Safety & Environment Director, Scotland	Regions	Y
A	Head of Health, Safety & Environment [Anglia]	Regions	Y
A	Head of Health, Safety & Environment [East Midlands]	Regions	Y
A	Head of Health, Safety & Environment [East Coast]	Regions	Y
A	Head of Health, Safety & Environment [North East]	Regions	Y
A	Section Manager [Off Track]	Regions	Y
A	Director Engineering & Asset Management, Eastern	Regions	Y
A	Director Engineering & Asset Management, NW&C	Regions	Y
A	Director Engineering & Asset Management, Scotland	Regions	Y
A	Director Engineering & Asset Management, Southern	Regions	Y
A	Director Engineering & Asset Management, Wales & Western	Regions	Y
A	Head of Maintenance Delivery	Regions	Y
A	Infrastructure Director	Regions	Y
A	Local Operations Manager	Regions	Y

Briefing *(A-Awareness/ T-Technical)*	**Role**	**Function**
T	Programme Manager [LXPMO, York]	Capital Delivery

NOTE: *Contractors are responsible for arranging and undertaking their own Technical and Awareness Briefings in accordance with their own processes and procedures.*

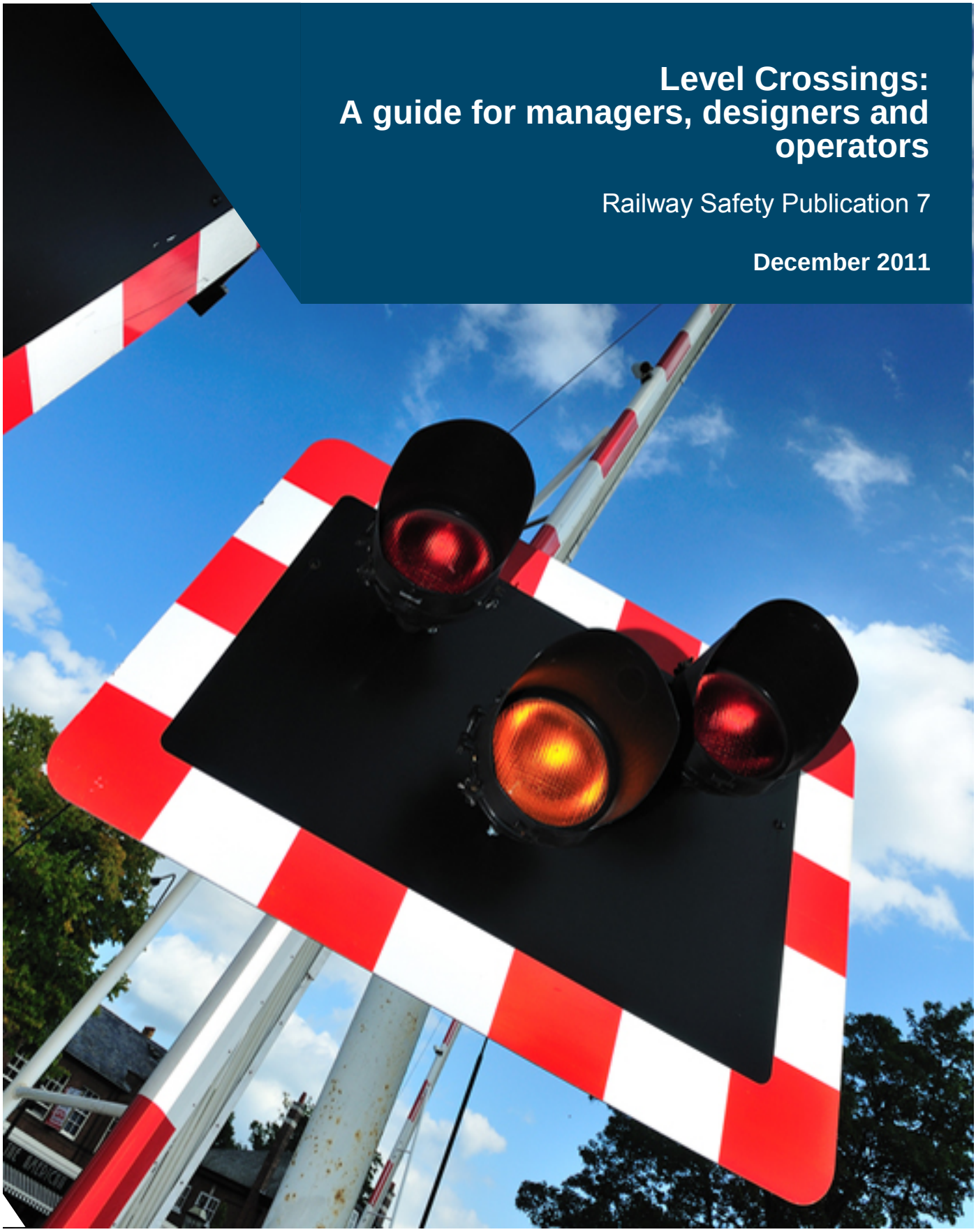
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OFFICE OF RAIL REGULATION

Level Crossings: A guide for managers, designers and operators

Railway Safety Publication 7

December 2011



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Foreword

What is the purpose of this guide?

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

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

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

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

Who is this guide for?

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

6. Interested parties may include any of the following:

(a) railway infrastructure managers;

(b) highway authorities;

(c) road authorities;

(d) planning authorities;

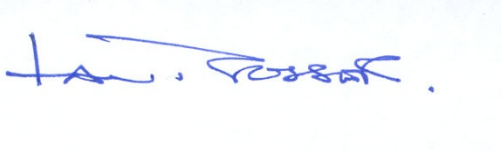
(e) train and station operators;

(f) landowners

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

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

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



Ian Prosser

Director, Railway Safety

Introduction

Why is managing level crossing risk important?

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

What is ORR's policy on level crossings?

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

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

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

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

1. The legal framework

Overview

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

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

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

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

(a) railway infrastructure managers;

(b) level crossing operators;

(c) highway, road and traffic authorities;

(d) employers and employees;

(e) train and freight operators;

(f) land owners;

(g) road users; and

(h) other crossing users

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

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

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

- Transport and Works Act 1992 enables the Secretary of State for Transport to make orders that authorise the construction of a railway in England, including allowing it to cross the highway by means of a level crossing. The authorisation of railway schemes wholly in Wales is by way of an order made by Welsh Ministers. Cross-border rail schemes are authorised by orders made by the Secretary of State subject to the agreement of Welsh Ministers. For Scotland, the Transport and Works (Scotland) Act 2007 enables Scottish Ministers to make orders that authorise the construction of a railway in Scotland, including allowing it to cross the highway by means of a level crossing. Prior to these Acts being made, crossings would have been authorised either by orders made under the Light Railways Act 1896 or under Private Acts.
- Level Crossings Regulations 1997 make it an offence for a crossing operator to fail to comply with a level crossing order.
- Railways and Other Guided Transport Systems (Safety) Regulations 2006 (ROGS), as amended by The Railways and Other Guided Transport Systems (Safety) (Amendment) Regulations 2011, require all infrastructure managers to have a safety management system that enables them to control risk – including risk arising from level crossings. ORR's published guidance on ROGS is at: http://www.rail-reg.gov.uk/upload/pdf/rogs-guidance-may11.pdf
- The Traffic Signs Regulations and General Directions 2002 contain requirements for road signs, including carriageway markings. These are supported by the Traffic Signs Manual found on DfT's website at:http://www.dft.gov.uk/pgr/roads/tss/tsmanual/
- The Private Crossings (Signs and Barriers) Regulations 1996 prescribe the types of signs that may be used on or near private level crossings.
- The Equality Act 2010 places duties on designers and managers to ensure that facilities at crossings do not cause an unnecessary barrier to access across the railway for those with disabilities.
- The current Railway Group Standard relating to level crossings (GK/RT0192, Level Crossing Interface Requirements, Issue 1) defines the requirements for level crossings systems at the interface between the mainline infrastructure manager and railway undertakings. GK/RT0192 can be found at: http://www.rgsonline.co.uk/Railway_Group_Standards/Control%20Command%20and%20Signalling/Railway%20Group%20Standards/GKRT0192%20Iss%201.pdf

Highways and planning law

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

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

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

1.10 Finally, there is a requirement in planning legislation for planning authorities to consult the Secretary of State and the operator of the network where a proposed development materially affects traffic over a

level crossing. For example, a new housing development near a crossing may cause traffic levels over the crossing to increase greatly and mean that existing protection arrangements at the crossing are no longer adequate.

2. Managing risks at level crossings

Introduction

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

Applying the guidance

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

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

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

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

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

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

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

Effects on existing level crossings

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

Operating conditions

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

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

2.12 It is important to take into account:

(a) normal railway operating conditions;

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

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

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

(e) emergency situations.

Design and installation

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

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

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

Structure of the guidance

2.16 This part of the guidance:

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

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

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

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

Terminology

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

should - the primary verb for statements of guidance;

may - where the guidance suggests options;

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

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

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

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

Level crossing types – basic protection and warning arrangements

Figure 1

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

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

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

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

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

Assessing suitability

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

Table 1

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

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

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

General guidance

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

Positioning signalling and other railway infrastructure relative to level crossings

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

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

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

Equipment at level crossings

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

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

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

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

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

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

Gated crossings operated by railway staff

General description

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

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

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

Method of operation

2.34 The gates may be operated by either:

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

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

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

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

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

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

Railway signalling and control

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

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

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

Barrier crossings operated by railway staff

General description

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

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

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

2.45 Telephones for public use are not normally required.

Method of operation

2.46 This type of crossing may be operated:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Railway signalling and control

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

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

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

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

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

Barrier crossings with obstacle detection

General description

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

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

2.61 Telephones for emergency public use should be provided.

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

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

Method of operation

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

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

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

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

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

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

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

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

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

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

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

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

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

Railway signalling and control

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

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

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

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

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

Automatic half barrier crossings (AHBC)

General description

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

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

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

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

Method of operation

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

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

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

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

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

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

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

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

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

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

Railway signalling and control

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

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

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

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

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

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

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

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

Automatic barrier crossings locally monitored (ABCL)

General description

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

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

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

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

2.92 Staff at a supervising point should have:

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

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

(i) in an emergency; or

(ii) in an abnormal situation; and

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

Method of operation

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

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

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

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

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

2.95 Train drivers must be able to bring their train to a stand short of the crossing from the point where they can observe the crossing to be clear and observe an indication that the crossing equipment is functioning

correctly. Consider whether crossings longer than 15m might require an extended sequence to ensure that the crossing is clear before the train reaches the point where the driver has to start braking.

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

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

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

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

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

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

Railway signalling and control

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

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

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

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

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

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

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

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

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

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

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

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

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

Automatic open crossings locally monitored (AOCL)

General description

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

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

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

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

2.115 Staff at a supervising point should have:

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

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

(i) in an emergency; or

(ii) in an abnormal situation; and

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

Method of operation

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

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

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

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

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

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

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

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

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

Railway signalling and control

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

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

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

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

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

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

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

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

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

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

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

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

(a) the railway is a single line;

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

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

(d) station stops are of short duration.

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

Open crossings

General description

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

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

Method of operation

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

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

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

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

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

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

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

Railway signalling and control

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

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

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

User worked crossings (UWCs) for vehicles

General description

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

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

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

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

2.144 In assessing the time required to cross, consider:

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

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

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

‘Example:

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

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

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

Crossing time at 1.5 m/s = 20 seconds

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

2.145 Additional protective equipment that may be provided includes:

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

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

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

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

(iv) the line speed exceeds 100 mph.

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

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

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

(iii) fog is prevalent.

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

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

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

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

Footpath and bridleway crossings

General description

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Method of operation

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

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

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

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

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

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

2.163 Where whistle boards are considered, take account of:

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

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

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

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

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

Foot crossings at stations

General description

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

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

Method of operation

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

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

Provision for pedestrians at public vehicular crossings

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

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

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

Road markings

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

2.173 Clearly mark out a safe place for pedestrians to stand when crossings are closed to road traffic on any footways approaching an automatic or open crossing.

Audible warnings

2.174 Provide audible warning devices at all automatic crossings and barrier crossings operated by railway staff, so that pedestrians on or approaching the crossing are given adequate warning of the closure of the crossing. Devices should be capable of volume adjustment to suit local requirements.

2.175 Where road traffic light signals are provided, the warning sound should begin when the amber lights first show. At all automatic open or half barrier crossings, the warning sound continues until the intermittent red lights are extinguished. At barrier crossings operated by railway staff, the warning sound stops when the barriers are fully lowered.

2.176 At automatic open or half barrier crossings where two trains can arrive at the crossing without providing the minimum road open time, the character of the warning sound should change distinctively after the first of the trains arrives at the crossing.

2.177 At simple, un-automated, open crossings, the audible warning may be provided by horns from approaching trains.

Pedestrian signals

2.178 Traffic signals for pedestrians (Diagram 4006 in the 2002 Regulations) may be provided at crossings, particularly where the volume of pedestrians is high or vulnerable groups use the crossing regularly. The pedestrian traffic signal may be especially helpful at skewed automatic half barrier crossings, at full barrier crossings on one way streets and at auto-lower full barrier crossings.

2.179 Pedestrian signals should face outwards from the crossing towards approaching pedestrians. Pedestrian signals are not normally considered necessary at gated crossings operated by railway staff.

Tactile thresholds

2.180 Provide a suitable *tactile threshold* (see Appendix A) across each footway approaching a level crossing. Tactile thresholds are not required on roads where there is no footway.

2.181 Tactile thresholds should be placed before pedestrian stop markings across the footway on approach to the crossing. The purpose of the tactile threshold is to provide blind and partially-sighted people with an indication of the direction of the footway as well as the line behind which they should wait while the crossing is closed. See the Department for Transport's guidance on use of tactile paving surfaces.

Means to control the flow of pedestrians

2.182 Where vulnerable or large numbers of pedestrians regularly use a crossing, consider appropriate means to deter them from walking on the carriageway such as guard rails on approach. Guard rails should be provided only where the footway is sufficiently wide and does not create a bottleneck.

2.183 Where pedestrians in significantly large numbers cross from one side of the road to the other while the road is closed to allow a train to pass over the crossing, consider providing a double row of non-reflecting road studs to indicate the safe place to cross.

2.184 Where a crossing lies adjacent to a railway station and the entrance or exit to the station is via the platform ramp, pedestrians should be directed from the platform to the road and vice versa so that they are protected by the crossing after leaving or before joining the train.

Pedestrian categories

2.185 The volume of pedestrian and train flow may be determined by the train pedestrian value (TPV) which in turn defines the pedestrian categories. The TPV is the product of the maximum number of pedestrians and the number of trains passing over the crossing within a period of 15 minutes. A detailed method of calculation can be found in Appendix D. Pedestrian categories are given in Table 2.

Table 2 Pedestrian categories

Pedestrian category	Train pedestrian value (TPV)
A	**more than 450**
B	**151-450**
C	**150 or less**

Pedestrian provisions

2.186 As with all aspects of level crossing risk, the precautions for pedestrians should be determined by risk assessment. To guide that process, Table 3 suggests precautions which may be appropriate for these pedestrian categories.

Table 3 Pedestrian provisions

Pedestrian category	Width of footway (metres)	Road markings	Audible warnings*	Pedestrian signals	Tactile threshold*	Guard rails
A	**2 or more**	**YES**	**YES**	**YES**	**YES**	**tt**
B	**1.8 or more**	**YES**	**YES**	**tt**	**YES**	**tt**
C	**1.5 or more t**	**YES**	**YES**	**tt**	**tt**	**tt**

Table 3 Pedestrian provisions
*** Not required at gated crossings operated by railway staff** **ŧ A reduced width of 1 m or lack of approach funnel is normally restricted to those crossings with a daily pedestrian usage of less than about 25** **ŧŧ Yes if necessary**

2.187 At any crossing where the number of pedestrians or the size of the vulnerable group is exceptionally large, automatic crossings may not be suitable and a barrier crossing operated by railway staff may have to be provided.

Additional measures to protect against trespass

2.188 Cattle-cum-trespass guards and fencing protection will normally be required to discourage trespass by pedestrians and, where relevant, animals straying onto the railway.

Cattle-cum-trespass guards

2.189 Guards should be provided where there is movement of animals over the crossing, or where there is a significant risk of trespass by pedestrians.

2.190 Guards should be provided at all types of crossings on third rail electrified railways, except at a gated crossing operated by railway staff, where the gates when across the railway completely fence off the road and any footway from the railway.

2.191 The guards should be adjacent to the footway at the edge of, and level with, the surface of the carriageway. They should extend the full length of the crossing between the boundary fences for a distance of at least 2.6 m in any direction from the edge of the carriageway.

2.192 The guards may consist of arris rails running parallel with the running rails or some other similarly effective system. Arris rails which are triangular in section with the vertical sides approximately 115 mm high, at approximately 150 mm pitch, and with a clear space between them not exceeding 35 mm are considered to be effective.

Fencing

2.193 Provide fencing:

(a) around barrier mechanisms unless protected in other ways; and

(b) to ensure the effectiveness of any cattle-cum-trespass guards.

2.194 At footpath crossings and bridleway crossings, consider whether additional fencing may be required between the boundary fence and the decision point. Where the gate or stile is at the decision point rather than in the boundary fence, provide additional fencing to connect the boundary fence to the decision point..

2.195 Where the road is unfenced and the adjacent land is used for grazing, and crossing gates are not provided, provide a standard highway-type cattle-grid in the roadway.

The crossing

Vertical profile

2.196 The profile over any vehicular crossing should have no sudden changes of vertical curvature. The profile over an automatic half barrier or user worked crossing is critical to safety. At other types of crossing it is less critical because these crossings are either manually operated by railway staff, or locally monitored by the drivers of trains travelling at restricted speeds such that they can stop short of the crossing.

2.197 The profile over automatic half barrier or user worked crossings should not cause a vehicle, such as a low-loader or a tractor and trailer, to become grounded and obstruct the railway. The likelihood of grounding depends on the characteristics of the road surface at the crossing and any potentially low-clearance vehicles that might use the crossing.

Measurement of safe profiles

2.198 Safe profile is determined by considering the wheelbase and ground clearance of road vehicles which might foreseeably use the crossing. The maximum permitted profile hump anywhere on the road surface, over the longest foreseeable wheelbase length, is 75mm.

2.199 At automatic half barrier (AHB) crossings, the safe profile may be defined by the vehicle category, which is in turn determined by the road and rail traffic density. It is defined in Table 4 below.

2.200 Traffic data should be established by census. Take into account the likely increase in road usage following automation of a crossing, as well as other factors, such as the proximity of heavy plant operator premises, which may necessitate a flatter profile. It is important to note that Table 4 below sets minimum requirements. Local information on actual usage may well mean that the profile at a particular crossing needs to be flatter than traffic data alone would suggest.

Table 4 Measuring safe vertical profiles

Actual daily road vehicle usage	or	Daily traffic moment	Vehicle category	Theoretical wheelbase length	
				(metres)	**(feet)**
More than 2000		**More than 80000**	**1**	**15.3**	**50**
2000 or less		**80000 or less**	**2**	**9.75**	**32**
600 or less		**25000 or less**	**3**	**8.5**	**28**

2.201 Provide “risk of grounding” signs as described in Section 19 for crossings with vehicle categories 2 and 3, where the profile does not meet the category 1 standard.

2.202 The profile should be maintained across the full width of the carriageway and the approaches. The approaches extend for a minimum of 20 m from the nearest rail for vehicle category 2 and 3 crossings, and up to 30 m for vehicle category 1 crossings.

2.203 Road approaches to crossings should be regularly inspected by the crossing operator (as well as the traffic authority or private road owners). The profile should be checked when road defects are noted or when track alterations are undertaken. Remedial works on approach roads should be undertaken as required.

2.204 At user worked crossings, determine with the users the types of vehicle or equipment likely to go over the crossing before designing the vertical profile. Once this is determined, use the maximum wheelbase length to design the safe profile based on the same maximum permitted hump of 75 mm. Determine the gradient of the approaches to the crossing in conjunction with the vertical profile required for the type of traffic using it.

2.205 Providing telephones at a user worked crossing does not reduce the need to maintain appropriate profile conditions.

Crossing surface

2.206 The surface of the carriageway over a crossing and on its immediate approaches should be properly maintained and have a skid resistance comparable to that of the road approaches. Consider a higher degree of skid resistance where road speeds are high, the visibility of a crossing is limited or the road slopes downhill towards the crossing. Appropriate measures should be discussed with the traffic authority. The surface should be free from pot-holes, running rails proud of the surface, depressed areas or major undulations. Any timbers or panels used in the surface should be firmly fixed. Flangeway gaps should be kept to a minimum, particularly at skew crossings, to reduce the risk of small or narrow wheels becoming trapped.

2.207 At vehicular crossings with gates which completely fence in the railway when closed to the road or where there is no footway adjacent to the carriageway, the ground at the edges of the carriageway over the crossing should be made up to the same level as the carriageway for at least 1 m.

2.208 At user worked crossings, a satisfactory road surface, appropriate for the type of traffic using them, and adequate approaches should be provided and maintained. Where timbers are used for the crossing surface, they should be securely fixed in position and provide a clear flangeway. Where the surface is predominantly made up of ballast, it should be contained to ensure that the surface is at, or almost at, rail level and the flangeway is maintained.

2.209 At footpath crossings and bridleway crossings, the surface provided between the decision points should be unobstructed. An appropriate level crossing surface should be provided in all but remote rural locations. There should be no movable signalling or track equipment (such as sets of points) on the surface or close by, that might create a hazard. The surface should be maintained in a good and even condition at rail level with suitable non-slip properties.

2.210 The type of surface should be in keeping with, but not necessarily the same as, the surface provided on the approaches to the crossing immediately outside the railway boundary.

2.211 Where the track ballast shoulder is high, either steps or ramps for footpath crossings and ramps for bridleway crossings should be maintained to give access to the surface. Ramps are preferable but where it

is not reasonably practicable, provide steps. On steep slopes, consider whether hand-rails may be needed in addition to steps or ramps.

2.212 Where the surface is other than ballast or stone chippings, provide a non-slip surface. Where the surface is made up to rail level and stone is used as in-fill, provide a means to retain the stone.

2.213 At bridleway crossings, make the surface up to rail level.

2.214 At footpath crossings, make the surface up to rail level, where:

(a) the crossing is in a location where housing, factories, shops etc adjoin or are close to the railway, and the crossing provides an attractive or convenient link between them;

(b) any of the approaches on the path are metalled; or

(c) there is heavy regular use.

Crossing width

2.215 At all crossings, the width of the carriageway over the crossing and on the approaches should, where practicable, be constant. It should be possible for traffic to pass safely on the approaches and the crossing itself should not form an isolated passing place.

2.216 At automatic crossings, the carriageway width over the crossing should be maintained on each approach for the distances shown in Table 5. It may be necessary to increase these distances depending on the types of vehicle using the crossing.

Table 5 Crossing width

Actual daily road vehicle usage	or	Daily traffic moment	Distances measured from the stop line (metres)	
			AHBC and ABCL	AOCL
More than 2000		**More than 80000**	**21**	**21**
2000 or less		**80000 or less**	**14**	**14**
600 or less		**25000 or less**	**14**	**7**

2.217 The carriageway width over an automatic half barrier crossing should normally be at least 6.1 m. A narrower carriageway, to a minimum of 5 m, may be acceptable on less busy roads. As a guide in this instance, a less busy road may be considered to be one with a daily road vehicle usage of less than 4000.

2.218 The carriageway width over a locally-monitored automatic barrier crossing (ABCL) should not normally be less than 5 m. Existing level crossings being upgraded to ABCL may be less than 5 m in width.

2.219 The carriageway width over a locally-monitored automatic open crossing should not be less than 5 m where the actual daily road vehicle usage is greater than 600 or the peak hour traffic moment is greater than 120.

2.220 At user worked crossings, the road surface should be at least as wide as the distance between the gate posts. The width of the crossing should not exceed 5 m to allow the use of single-leaf gates.

2.221 At footpath crossings, the width of the surface should not be less than 1 m, and at bridleway crossings, the width of the surface should not be less than 3 m.

Provision of lay-bys

2.222 Consider whether lay-bys may be required at automatic half barrier crossings so that vehicles, whose drivers are required to telephone before using the crossing, can be parked clear of the carriageway.

Crossing alignment

2.223 At user worked crossings, the alignment of the crossing over the tracks should enable the time required to cross to be kept to a minimum.

2.224 Footpath crossings and bridleway crossings should, where possible, be at right angles to the railway line. Where necessary seek clarification from Rights of Way Officers when determining exact routes and opportunities for diversion. Where it is proposed to divert a public footpath or bridleway crossing, consult closely with the local Rights of Way Officer.

Crossing approaches

2.225 At user worked crossings, the alignment of the immediate approaches to the crossing should be in line with the alignment of the crossing itself. Light sources from road vehicles or equipment should not be allowed to cause confusion with railway signals.

Gates, wicket gates and barrier equipment

Gates

2.226 The gateway should be the full width of the carriageway plus at least 450 mm clearance on each side and the clearance between gate posts should be of equal width at both sides of the railway. Means should be provided to retain the gates in both open and closed positions.

2.227 When closed, the gates should extend over the full width of the carriageway. Unless legally specified otherwise, the normal position of the gates is across the road.

2.228 Consider installing power operated gates at user worked crossings . These avoid the need for multiple crossings in order to open and close gates.

2.229 At crossings on public roads, the gates should be painted white and carry red retro-reflective targets to face outwards when the gates are across the road. Additionally, consider mounting red lamps on the gates which show towards approaching road traffic when the gates are across the road.

2.230 At gated crossings operated by railway staff, the gates should be lockable when closed across the road or railway and should be conspicuous to the drivers of approaching trains when closed across the railway.

Wicket gates

2.231 Where wicket gates for pedestrians are provided, they should be on the same side of the carriageway and open away from the railway. Wicket gates for footpath crossings and gated crossings operated by railway staff should not be less than 1 m wide. Wider gates may be required in accordance with local user needs. Wicket gates for bridleway crossings should not be less than 1.5 m wide.

2.232 All wicket gates should be easy to open from either side and be self-closing. Latches are not normally provided on gates. Where it is appropriate to provide latches, however, they should be easy to operate and not prevent easy egress from the railway. Where wicket gates are provided across the footway at gated crossings operated by railway staff, they should be lockable.

Barriers

2.233 The tops of the barriers when lowered should be at least 900 mm above the road surface at the centre of the carriageway. The clearance between the bottom edge of the lowered barrier and the road surface at the centre of the carriageway should not exceed 1000 mm unless a skirt is fitted. Barriers that are designed to fall under gravity as part of their method of operation should be inclined towards the carriageway at an angle of between 5º and 10º from the vertical.

2.234 When raised no part of the barrier below 5 m should be within 450mm of the edge of the carriageway. Where the barriers cover a footway, no part of the raised barrier less than 2 m above the footway, should be within 150 mm horizontally from the outer edge of the footway.

2.235 The barriers should be as close as convenient to the railway, but no part of the equipment should be within the standard structure gauge.

2.236 Barriers should be at least 125 mm deep at their mid-points and at least 75 mm deep at their tips. Each barrier should display on both sides red and white bands about 600 mm long to the full depth of the barrier. A strip of retro-reflective material not less than 50 mm deep should be provided along the full length of each band.

2.237 Dangerous moving parts of the barrier mechanism, excluding the boom and any skirt, should be guarded effectively.

2.238 Two electric lamps (three on barriers longer than 6 m) of adequate luminous intensity should be fitted to each barrier which, when illuminated, show a red light in each direction along the carriageway. The lamps should be evenly spaced along the barriers with one lamp within 150 mm of the barrier tip. The lamps should show except when the barriers are fully raised. It may be appropriate at some user worked crossings to omit these lamps.

2.239 At barrier crossings operated by railway staff, each road approach should be protected by barriers which, when lowered, extend across the full width of the carriageway and any footway.

2.240 At barrier crossings operated by railway staff and user worked crossings, skirts should be fitted to the barriers where there is a significant risk of pedestrians deliberately passing under the lowered barriers. Where cattle or sheep are regularly walked over the crossing, skirts should be fitted. The skirts should be of a light colour, light construction and fence in the space between the lowered barriers and the road surface. Skirts are not required at automatic crossings with half barriers.

2.241 At user worked crossings, the barriers may be hand-operated and counter-weighted to fall when released. Such barriers should be linked so that they can be raised or lowered together from either side of the crossing.

Single barriers

2.242 Where single barriers are provided they should preferably be pivoted on the left-hand side of the road. On one-way roads or on two-way roads with central reservations where special provision can be made for pedestrians, barriers may be provided on the approach to the crossing only.

Half barriers

2.243 At automatic crossings with half barriers, the barriers should be pivoted on the left-hand side of the road on each approach.

2.244 On skew crossings with half barriers where the tip of the barrier points towards the railway, the point of intersection of the line extended through the barriers and the outer edge of the road, including any footway, should not be within 1000 mm of the nearest rail.

2.245 When lowered, the half barriers should extend to between 150 mm and 450 mm of the centre of the carriageway, but not over the centre line. On carriageways between 5 m and 5.7 m wide, the barriers should extend to within 800 mm of the centre line so as to leave a clear exit of at least 3 m in width. On carriageways narrower than 5 m, shorter barriers may be necessary in order to provide off-side clearance of at least 3 m.

Barriers on lines electrified on the overhead system

2.246 If the railway is electrified with overhead conductors and a barrier, if displaced, could come closer than 150 mm to the conductors, the barrier should either be made of metal or be provided with a continuous conducting strip. The metal barrier or conducting strip should be connected to earth in such a manner as to ensure that inadvertent contact with the overhead conductors causes any controlling circuit-breaker to interrupt the electric traction supply. Consider whether it may be appropriate to sheath the return conductor at any crossing.

Telephones and telephone signs

2.247 Telephones are not normally necessary at barrier crossings operated by railway staff, locally-monitored automatic open crossings or open crossings. At locally-monitored automatic barrier crossings consider providing telephones for public use so that equipment malfunctions can be reported.

2.248 At barrier crossings operated by a member of the train crew, or other railway staff, signs to Diagram 785 giving the telephone number of a supervising point which is always open when the railway line is open should be displayed at each side of the crossing. The name of the crossing should also be shown immediately below each sign.

2.249 Where telephones are provided as part of the safety arrangements, calls should always be routed to a suitable staffed railway location and a definite message as to whether or not it is safe to cross given.

At automatic crossings with half barriers

2.250 Telephones for public use at automatic crossings with half barriers should be suitably weatherproof or housed in cabinets and connected directly to the supervising point. A two-way calling facility should be provided.

2.251 The power supply to the telephones should be suitably backed up so that they remain available if the main power supply fails. Faults on individual telephones or the failure of a user to replace a handset should not prevent the correct operation of the remaining telephones.

2.252 The telephone symbol to Diagram 787 (2002 Regulations) should be displayed on or adjacent to each telephone/cabinet and on two other faces. The telephones should be clearly visible from the crossing. If the telephones are not clearly visible to a person at the location of the sign to Diagram 784.1, signs to Diagram 788 are required directing potential users to the telephones.

2.253 Clear and simple instructions, which are also legible at night, should be provided for users needing to contact the supervising point. The user should not have to dial a telephone number.

2.254 In case the telephone at the crossing is out of order, the name of the crossing, its grid reference and the public telephone number of a continuously staffed supervising point should be clearly displayed.

2.255 When calls are received in the supervising point, a distinctive warning should be sounded, accompanied by a visual indication. These calls should take priority over any other calls on the telephone system and the warning should sound even if the system is currently in use.

2.256 If the railway is not open for 24 hours a day, a means to notify users of the times between which trains do not travel over the crossing should be provided. This may be in the form of a notice which is legible at night or a recorded announcement. It is essential that information given is correct and fully up to date.

2.257 The telephone system should have a facility which records that calls have been made from the crossing during periods when the railway and supervising point are closed. When the supervising point reopens, a visual and audible indication should be given that calls from the crossing have been made during the period of closure.

At user worked crossings and bridleway crossings

2.258 Telephones, where provided, should be positioned adjacent to the gates or barriers on each side of the crossing, mounted in a suitable place, at heights appropriate to the users of the crossing. The telephones should be suitably weatherproof or housed in cabinets and connected directly to a supervising point. A two-way calling facility should be provided.

2.259 The telephone symbol to Diagram 787 should be displayed on or adjacent to the cabinet/telephone. Telephones should be seen readily from the crossing or signs to Diagram 788 provided.

2.260 Clear and simple instructions to direct users to contact the supervising point should be provided. These should also legible at night. The telephone user should not have to dial a telephone number.

2.261 The name of the crossing and its grid reference should be displayed followed by the telephone number of a continuously staffed supervising point in case the telephone at the crossing is out of order.

2.262 Evidence shows that many users fail to use telephones. Telephones create potential for human error during communications, and may distract the signaller from other tasks. Even where telephones are fitted, maintaining adequate *sighting distances* (see Appendix A) at the crossing can still reduce risk to users and the railway.

Miniature stop lights (MSL)

General description

2.263 Miniature stop lights (previously known as miniature warning lights) consist of red and green lights. They can be used at user worked crossings, footpath crossings and bridleway crossings. In some instances it may be appropriate for the warning system to be activated by the user on arrival before using the crossing. The green light normally shows, but an approaching train automatically changes the lights to red. Signs to Diagram 107 in the 1996 Regulations (see Figure 8) instructing users to cross only when the green light shows should be provided.

2.264 MSL alone may not be suitable where livestock or large or slow moving vehicles or equipment cross the railway. Additional arrangements may need to be made as determined in the risk assessment process.

Positioning of MSL

2.265 The MSL should be located so that they face towards an approaching user. They should be clearly visible to the crossing users when operating the gates or barriers. MSL may be mounted in the sign to Diagram 107 (1996 Regulations). At crossings not provided with a telephone, the public telephone number of a continuously staffed supervising point should be displayed, so that users may enquire about crossing safely (and report MSL failure). Use of signs to Diagram 108 should be avoided.

2.266 MSL should normally be placed on the near side of the railway, facing users approaching the crossing unless siting them at the far side is more effective at conveying the message.

MSL equipment

2.267 The red and green lights should be sufficiently bright to be clearly seen by users at the decision point. Light emitting diodes (LED) lamps are brighter and more reliable than traditional filament lamps. Low energy solutions such as flashing or on-call displays might be appropriate in certain locations. Lamps should be fitted with hoods (to aid viewing in bright sunlight) where necessary. Care should be taken to ensure that hoods do not restrict the visibility of MSL for users, including pedestrians operating gates or barriers.

Associated signs

2.268 Traffic signs associated with the use of MSL are shown in Figure 8 of Section 19. These signs are in addition to those required at user worked crossings, footpath crossings and bridleway crossings. These signs are in accordance with the 1996 Regulations.

2.269 At user worked crossings the signs to Diagrams 109 or 110 should be mounted with the MSL on the near side of the crossing facing approaching users.

2.270 At footpath or bridleway crossings the signs to Diagram 114 should be mounted with the MSL on the near side of the crossing facing approaching users. Where a footpath or bridleway is routed over a user worked crossing, care should be taken in the placement of signs (to Diagrams 109/110 and 114) so that instructions to drivers and instructions to pedestrians/riders are not confused.

Railway signalling and control equipment

2.271 MSL should be operated automatically by approaching trains, in accordance with the warning period required for the particular crossing.

2.272 The minimum warning period should be determined by risk assessment of crossing usage and be at least 5 seconds longer than the time required to cross.

2.273 The green light should show until the red light appears. As soon as the train is clear of the crossing, the red light should be extinguished and the green light should appear unless the red light is required to show for another train.

2.274 Bi-directional controls should be provided.

2.275 Consider whether special controls might be required, for example where signals or station platforms lie between the strike-in point and the crossing.

Traffic signals, traffic signs and road markings

2.276 The requirements for road signs, including carriageway markings, are contained in the 2002 Regulations. These are supported by guidance in the Traffic Signs Manual (chapters 4 and 5) and information available via the Department for Transport website. Signs for use at private crossings are described in the 1996 Regulations.

Road traffic light signals

2.277 The construction and specification of road traffic light signals used at level crossings are required to comply with Diagram 3014. The reverse of the backing board should be coloured grey. Lamps to the current European standard should be used.

2.278 A primary road traffic light signal should be located on the left-hand side of the carriageway, on each road approach, as close as possible to the crossing. At crossings where there are barriers, it should be located not more than 1 m before the barrier and adjacent to the barrier machine where this is on the left-hand side.

2.279 A duplicate primary road traffic light signal should be located on the right-hand side of the carriageway on each approach. Consider providing one or more additional road traffic light signals where neither the primary nor the duplicate primary signal can be seen from a side approach. Secondary road traffic light signals, located on the far side, should not be used at crossings.

2.280 No road traffic light signal should be located on the approach side of the vehicular stop line or an extension from it. Drivers stopped at the crossing need to see the road traffic light signals.

2.281 At *acute skew crossings* (see Appendix A and figure 9(b)), the duplicate primary signal may be placed in line with the vehicular stop line to shorten the length of the crossing.

2.282 At *obtuse skew automatic crossings* (see Appendix A), the duplicate primary signal may be placed closer to the railway than normal, provided that a vehicle stopped in line with the signal is not foul of the railway structure gauge. In the risk assessment consider whether special arrangements for pedestrians may be necessary (see Section 13 and Figure 9 (a) at the end of this section).

2.283 Where the normal post mounting of a road traffic light signal is impracticable, it may be mounted over the carriageway provided that no part of the horizontal structure or the signal is less than 5.5 m above the road surface.

2.284 Where a road traffic light signal is mounted over the carriageway and the railway is electrified with overhead conductors and the structure and signal, if displaced, could come closer than 150 mm to the overhead conductors, the structure and the signal should either be made of metal or be provided with a continuous conducting strip. The metal structure and signal or the conducting strip should be connected to

earth in such a manner as to ensure that inadvertent contact with the overhead conductors causes controlling circuit-breaker(s) to interrupt the electric traction supply.

2.285 In exceptional cases, for example where the central reservation is narrow or where, at very acute skew crossings, the duplicate primary road traffic light signal would encroach on the overhang clearance above the carriageway, a special design of the restricted width signal in accordance with the relevant Department for Transport's drawing may be used. Using this restricted width signal requires special authorisation from the Department.

2.286 Where mounted at the side of the road, no part of the road traffic light signal below 5 m should be within 450mm of the edge of the carriageway. This is to minimise the likelihood of damage to the sign from passing vehicles, especially vehicles with large mirrors or overhanging loads. Where the road has a steep camber, the clearance may need to be increased to 600 mm. Offset traffic signal head mounting brackets (or cranked poles) may be needed to ensure that the horizontal clearance is maintained. The centre of the road traffic light signal lens nearest the carriageway should at least 810 mm, but not more than 1500 mm, measured horizontally from the carriageway edge.

2.287 Where the signals are above a footway, a minimum headroom from the lower edge of the signal backing board of 2100 mm should be maintained.

2.288 The distance from which it is desirable that the intermittent red lights and amber lights can be seen varies according to the speed value of the road. The speed is taken as the 85th percentile of the observed speeds of approaching vehicles. Recommended minimum visibility distances are shown in Table 6. If these minimum visibility distances cannot be achieved, consider further measures for example the provision of additional advance warning signs, countdown markers etc.

Table 6: Recommended minimum visibility distances

85th percentile speed of road vehicles		Minimum visibility distance (metres)
kilometres per hour (km/h)	miles per hour (mph)	
50	**30**	**70**
65	**40**	**90**
80	**50**	**150**
95	**60**	**220**
115	**70**	**300**

2.289 Where a crossing is close to a road junction controlled by traffic light signals, consider linking the two sets of road traffic light signals. The results of this consideration should be documented in the risk

assessment. Where they are linked, seek special authorisation from the local traffic authority for the connection between them.

Pedestrian signals

2.290 Pedestrian light signals used at level crossings must comply with Diagram 4006 (2006 Regulations), appropriately positioned to maximise visibility.

2.291 The red figure on the pedestrian signal should be illuminated on commencement of the crossing closure sequence and should flash while the intermittent red lights of the road traffic light signals are lit. The rate of flashing should be the same as that of the intermittent red lights in the road traffic light signal.

Traffic signs

2.292 Appropriate traffic signs should be provided on each road approach. Examples of the layouts are given in Figures 2 to 7 and 9. Details of the signs for use with MSL are shown in Figure 8.

2.293 At automatic crossings with half barriers, signs to Diagram 784.1 should be appropriately positioned on approach to the crossing to suit the road speed (see Figure 4). A sign to Diagram 786 should be provided in association with 784.1 and on the nearside, facing vehicles leaving the crossing.

2.294 Where lay-bys are provided and a Traffic Regulation Order is in force limiting the parking at lay-bys to 'Large or slow vehicles only', the permitted variant to the sign to Diagram 660 should be provided and the road marked in accordance with Diagram 1028.3.

2.295 At automatic crossings and open crossings, signs to Diagram 775 reading 'Keep crossing clear' should be provided on each primary and duplicate primary road traffic light signal post to face traffic approaching the crossing. At open crossings they should be mounted on both sides of the road on or near the posts carrying the St Andrew's Cross signs (Diagram 774).

2.296 Signs to Diagram 775 may be provided at gated and barrier crossings operated by railway staff where standing traffic is a problem.

2.297 At automatic crossings on double-track lines, where two trains can arrive at the crossing without providing the minimum road open time, signs to Diagram 777 reading 'Another train coming if lights continue to show' should be provided on or near each duplicate primary road traffic light signal facing outwards from the crossing.

2.298 At locally-monitored automatic open crossings on double-track lines, where two trains can arrive at the crossing without providing the minimum road open time, signs to Diagram 776 reading 'Another train coming' should be provided on the left-hand side of the road, normally 2 m on the railway side of each primary road traffic light signal and directed towards drivers of vehicles halted at the stop lines. These signs should flash at the same rate as the road traffic light signals.

2.299 Where the width of the road is less than 4 m and the number of vehicles going over the crossing during the peak hour exceeds 120, a Priority Order should be considered and signs to Diagram 615 and 811 provided accordingly.

2.300 At automatic crossings and open crossings, where the road crosses the railway at a skew angle or there are bends on one or both approaches, bend and chevron signs and count-down markers may be required. Consider also whether additional reflecting road studs along the edges of the carriageway may be required to direct drivers along the road.

2.301 Wherever the form of protection at a crossing has been altered, a new educational sign to Diagram 790 reading ‘New level crossing control ahead’ is required to be displayed for a period of not more than 3 months (see Direction 37.1 in the 2002 Regulations).

2.302 At user worked crossings, footpath crossings and bridleway crossings, a sign explaining to the user how to cross safely for example ‘Stop, Look, Listen’ or ‘Cross only if green light shows’ or ‘Stop, always telephone before crossing’, should be provided facing the user at the decision point or at the telephone if provided. It is important that appropriately worded signs are provided whether or not they appear in the 1996 Regulations.

2.303 Information including the name of the crossing, location reference and contact number should also be provided at level crossings. A contact number for the railway operator should also be provided.

2.304 Signs specified in the 1996 Regulations may be placed by a crossing operator on or near a private road or path. It is an offence for a user to fail to comply with any requirement, restriction or prohibition conveyed by a crossing sign lawfully placed on or near a private road or path’ (Transport and Works Act 1992 and Transport and Works (Scotland) Act 2007). A public footpath or bridleway is clearly not a ‘private road or path’, but, where they convey an appropriate message, signs from the 1996 Regulations are commonly used. At footpath, bridleway and private crossings, other suitable signs may be used to inform users, clearly and simply, how to use the crossing safely.

Related to electrified lines

2.305 Where the railway is electrified with overhead conductors, signs to Diagram 779 should be provided with an appropriate plate (Diagram 780A). At user worked crossings, suitable signs warning of the danger from bare electrical conductors such as ‘Danger, overhead live wires’ should be provided and face towards the user approaching the decision point.

2.306 Overhead conductors at level crossings should be at the greatest height practicable. Signs to Diagram 780A should show a safe height which allows for suitable safe clearance under the overhead conductors.

2.307 Where currently overhead conductors at level crossings are not at maximum practicable height, steps should be taken to remedy this situation, so far as is reasonably practicable. In the interim, signs to Diagrams 779 and 780A should be provided at the last available alternative route before the crossing.

2.308 At any crossing where, currently, overhead conductors are not at the maximum practicable height, a height gauge to Diagram 781 should be erected at the ‘safe height’. Signs to Diagram 780.2A should show a safe height which allows for suitable safe clearance under the overhead conductors. At user worked crossings suitable warning signs should be displayed.

2.309 In calculating the ‘safe height’, allowance should be made for the effect of the vertical profile of the carriageway on a road vehicle and its load.

2.310 At crossings where the gradient of the approaches is such that vehicles with large overhangs or conveying a large overhanging load could touch or come dangerously close to the overhead line equipment, even though they are lower than the ‘safe height’ shown on the sign to Diagram 780A or 780.2A, an additional sign depicting the hazard, such as ‘Danger, overhanging load may foul live wires’ should also be provided.

2.311 At crossings where the railway is electrified with a conductor rail, warning notices depicting the hazard, such as ‘Do not touch the live rail’ should be provided.

Related to risk of grounding

2.312 Where there is a risk that vehicles may become grounded on the crossing, signs to Diagram 782 should be erected on the immediate approaches. Advance warning signs to Diagram 782 with distance information to Diagram 573 should be provided at the last available alternative route before the crossing.

2.313 Where telephones are provided at the crossing, signs to Diagram 783 should be mounted beneath signs to Diagram 782 on the approaches. Where telephones are not provided at the crossing, signs to Diagram 785.1 (large) should be provided on the approaches and signs to Diagram 785.1 (small) at the crossing itself.

Road markings

2.314 Road markings should be provided at level crossings in accordance with the 2002 Regulations taking into account guidance in the Traffic Signs Manual.

2.315 Road markings are not normally provided at gated crossings operated only by railway staff, unless the crossing is also signalled.

Transverse and associated road markings

2.316 Transverse road markings should extend across the left-hand half of each two-way carriageway, or across the full width of a carriageway which is either one-way or has no centre line marking.

2.317 Where road traffic light signals are installed, transverse Stop lines to Diagram 1001 should be provided at right angles to the carriageway on each approach approximately 1 m before the primary road traffic light signal. At locally-monitored automatic open crossings (AOCLs) increase this to 2 m. The 300 mm size variant is recommended.

2.318 At open crossings, Give Way lines to diagram 1003 should be provided at right angles to the carriageway on each approach to the crossing, but not less than 2 m from the running edge of the nearest rail. Give Way signs to diagram 602 should also be provided. The triangular road marking to diagram 1023 should be provided in advance of the Give Way lines.

2.319 At user worked crossings on private roads, carriageway markings are not normally used. However, where a STOP sign to diagram 601.1 is provided, a transverse Stop line to diagram 1002.1 and the word STOP to diagram 1022 should also be provided unless the road surface is unsuitable. If the private road is one to which the public has access, these markings must be used, utilising a short length of road surfacing if necessary.

2.320 At automatic crossings and open crossings, a pedestrian Give Way line to diagram 1003.2 should be provided across any footway. It should also be extended across the right-hand side of a carriageway marked with a centre line, unless there are guard rails between the carriageway and the footway. Do not use it at crossings where the full width is controlled by barriers.

2.321 The pedestrian Give Way line should be at right angles to the carriageway. It should be located approximately 1 m on the approach side of any road traffic light signal, except at open crossings where it should be in line with the Give Way markings on the left-hand side of the carriageway. No part of the line should be less than 2 m from the running edge of the nearest running rail.

2.322 At obtuse skew crossings, the pedestrian Give Way line should be provided in conjunction with a pedestrian signal. The end of this pedestrian line at the edge of the carriageway should be located not less than 2 m from the nearest running rail. In these cases the pedestrian Give Way line on the approach side of the road traffic light signal may then be omitted (see Figure 9).

Longitudinal road markings

2.323 The type of longitudinal road marking to use generally depends on the width of the carriageway.

2.324 Where the road passes over the crossing a continuous line to diagram 1012.1 should be provided along each edge of the carriageway. Line widths are detailed in table 4-5 in Chapter 5 of the Traffic Signs Manual. A 100 mm wide line should also be provided along the back edge of each footway and, if separated from the main carriageway, along the front edge. The markings should be continued as necessary on each approach to clearly define the footway.

2.325 Where the width of the carriageway over the crossing is less than 5 m, centre line markings will not normally be provided.

2.326 Where the width of the carriageway over the crossing is between 5 and 5.5 m, the centre of the carriageway between the Stop or Give Way lines should be marked with the appropriate longitudinal warning line to diagram 1004, 1004.1, 1008 or 1008.1. The warning line should extend back from each Stop line for at least the minimum number of marks indicated in table 4-3 of the Traffic Signs Manual Chapter 5, or for at least 6 m if beyond that distance the carriageway is less than 5 m wide.

2.327 Where the width of the carriageway on the immediate approaches is 5.5 m or more, the centre of the carriageway over the crossing should be marked with a double continuous white line to diagram 1013.1A. The lines should be continued along the approaches where justified by the normal visibility criteria for double white lines. At automatic half barrier crossings extend the double continuous white lines for at least 12 m back from the Stop line. Unless the double continuous line extends further back from each Stop line than the distance indicated in table 7, precede it by a double white line to diagram 1013.1D, with the continuous line nearer to drivers approaching the crossing.

2.328 The minimum length of double white lines depends on the 85th percentile speed of cars using the road, and on the general width of the carriageway, excluding any part of the crossing or approaches which may have been specially widened. Recommended overall lengths of the marking to diagram 1013.1A, or a combination of that marking and diagram 1013.1D, are shown in table 7. Where the carriageway is wider than 7.3 m the lengths in table 7 may be increased by up to 50%, but the double lines should not extend beyond the position of the sign to diagram 784.1, where this is used, unless a lay-by is provided.

Table 7: Lengths of double white lines

85th percentile speed	Recommended length of double lines measured from the Stop line
Miles per hour (mph)	metres
up to 30	**up to 30**
31 to 40	**30 to 45**

Table 7: Lengths of double white lines	
over 40	**45 to 60**

2.329 At least one deflection arrow to Diagram 1014 must be provided on each approach to the double centre carriageway markings at crossings. It is normal for two such arrows to be used on each approach. Where a driver's forward view is limited, as at a crest, a third arrow may be necessary to give adequate forewarning. Arrows should be positioned in accordance with part 5 of the Traffic Signs Manual Chapter 5, summarised in Table 8 below.

Table 8: Location of deflection arrows				
Speed limit (mph)	Length of arrow (m)	Distance of tip of arrow from the start of the unbroken line		
		First arrow	Second arrow	Third arrow
30	**4.5**	**13.75**	**43.75**	**79.75**
40	**4.5**	**19.75**	**55.75**	**109.75**
50	**6**	**21**	**66**	**138**
60	**6**	**30**	**84**	**165**

Road studs

2.330 Double continuous white lines must be supplemented by a single row of white road studs. The studs should be white bi-directional reflecting and laid at intervals of between 3 and 4.5m. Any stud within 2 m of a running rail should be made of plastic.

Yellow box markings

2.331 Yellow box markings to diagram 1045 should be provided at automatic half barrier crossings where road traffic flow in any one direction exceeds the guideline figures in table 9 below. A yellow box marking might be appropriate at any type of crossing where blocking by queuing road traffic is foreseeable, regardless of the table 9 figures.

Table 9: Yellow box markings	
Overall width of carriageway (metres)	Yellow box to be provided if vehicle numbers in any one hour in either direction exceed
5.0 to 5.9	**500**
6.0 to 7.4	**600**

Table 9: Yellow box markings	
7.5 and over	**750**

2.332 Where a long yellow box is required the marking should be extended using additional diamond shaped units on the approach side and additional diagonal crosses on the trailing side of the crossing. The maximum permitted length of a yellow box is 30 m.

Figure 2: Typical layout of barrier crossing (with additional risks)

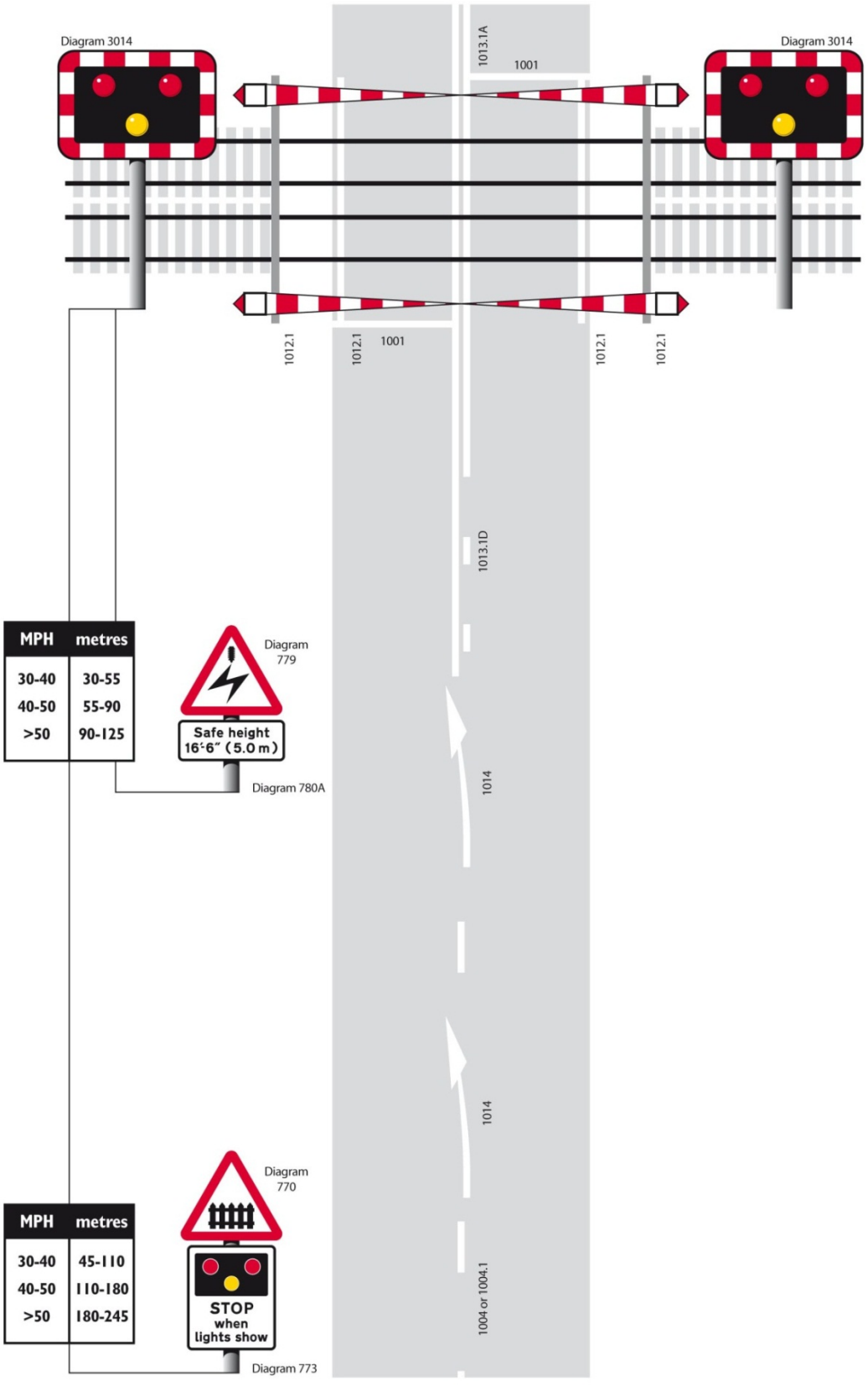


Figure 3: Typical layout of automatic half barrier crossing or automatic barrier crossing (locally monitored)

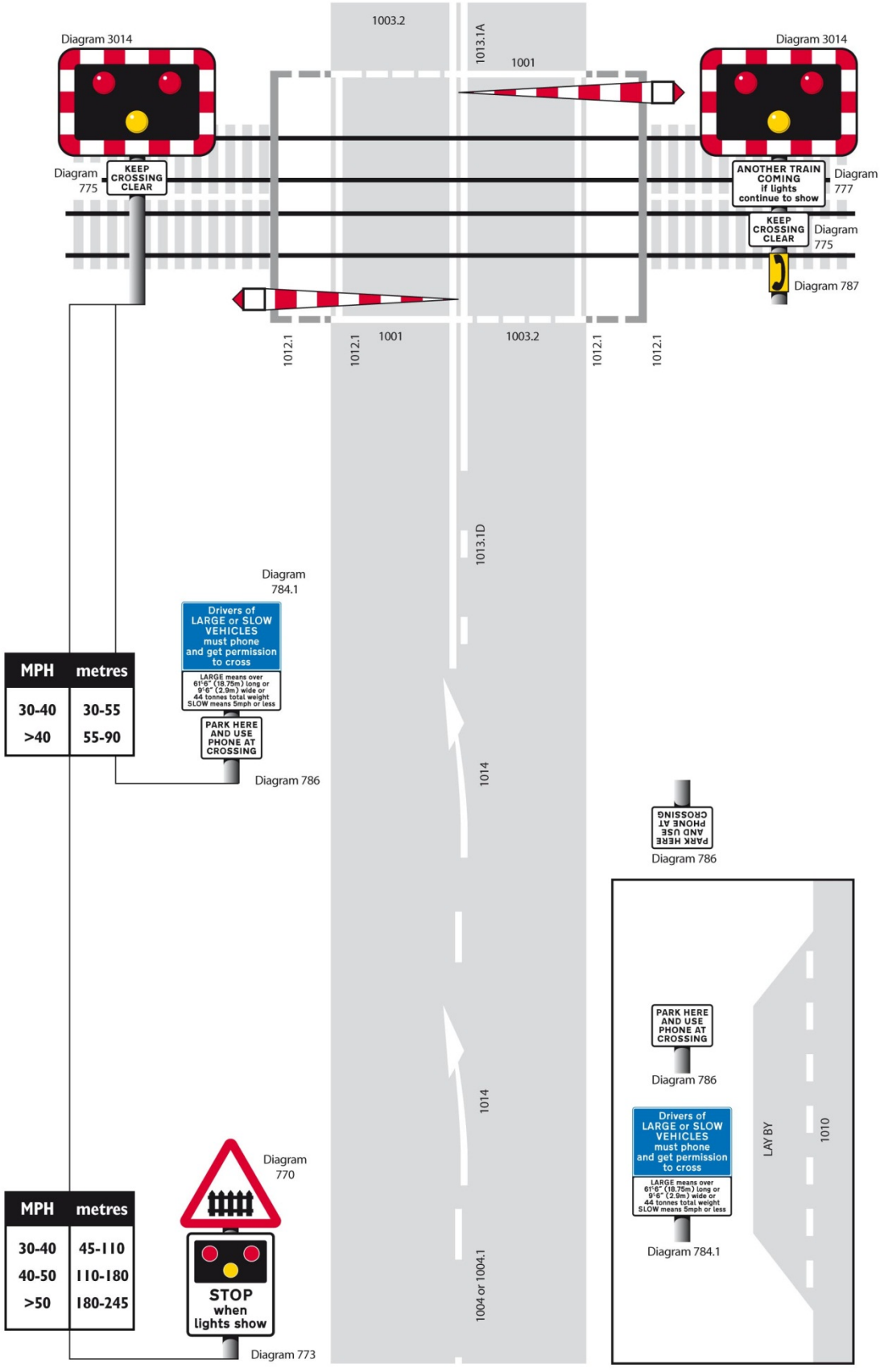


Figure 4: Typical layout of automatic half barrier crossing or automatic barrier crossing (locally monitored) (with additional risks)

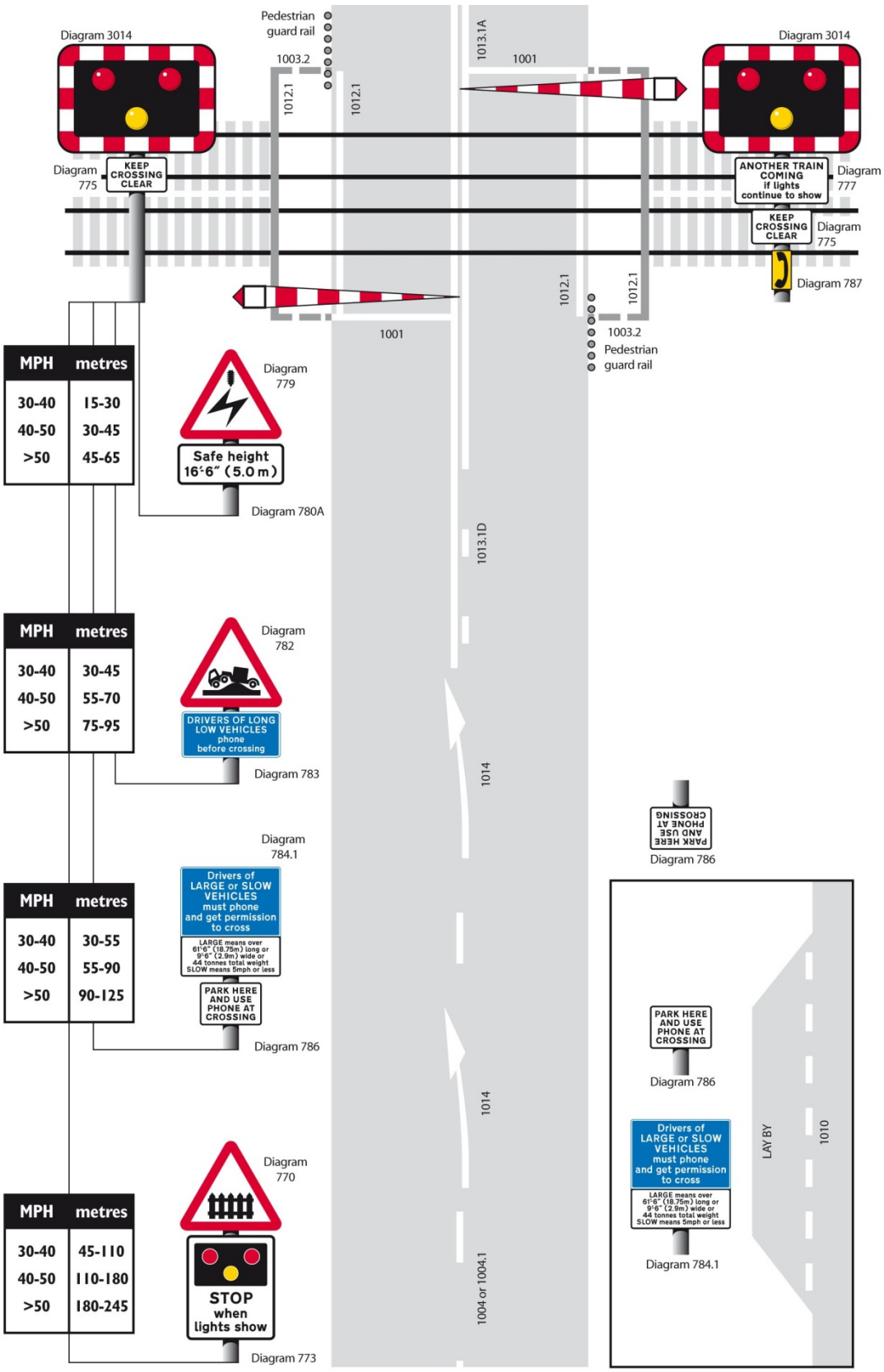


Figure 5: Typical layout of automatic open crossing (with additional risks)

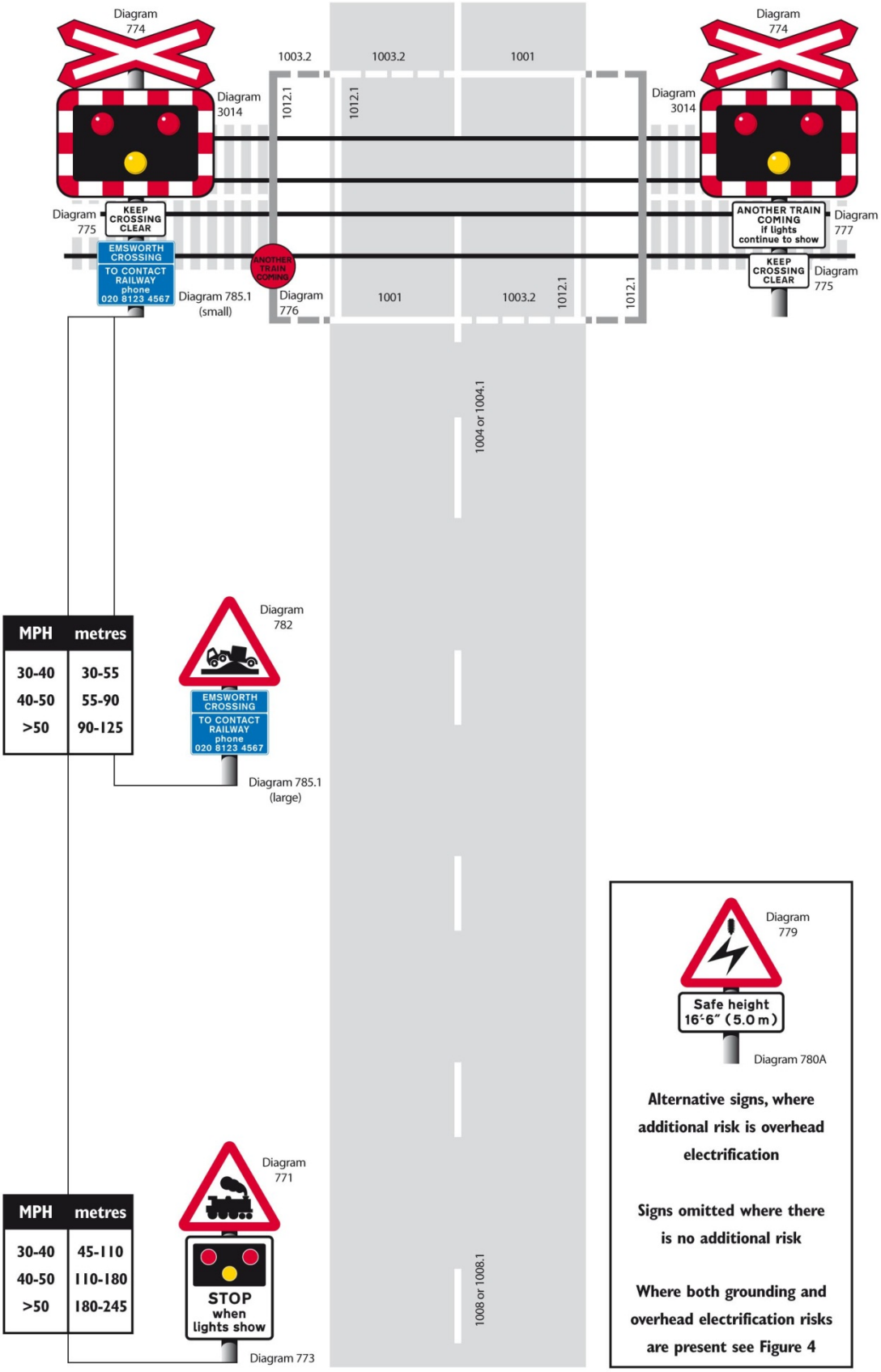


Figure 6: Typical layout of an open crossing

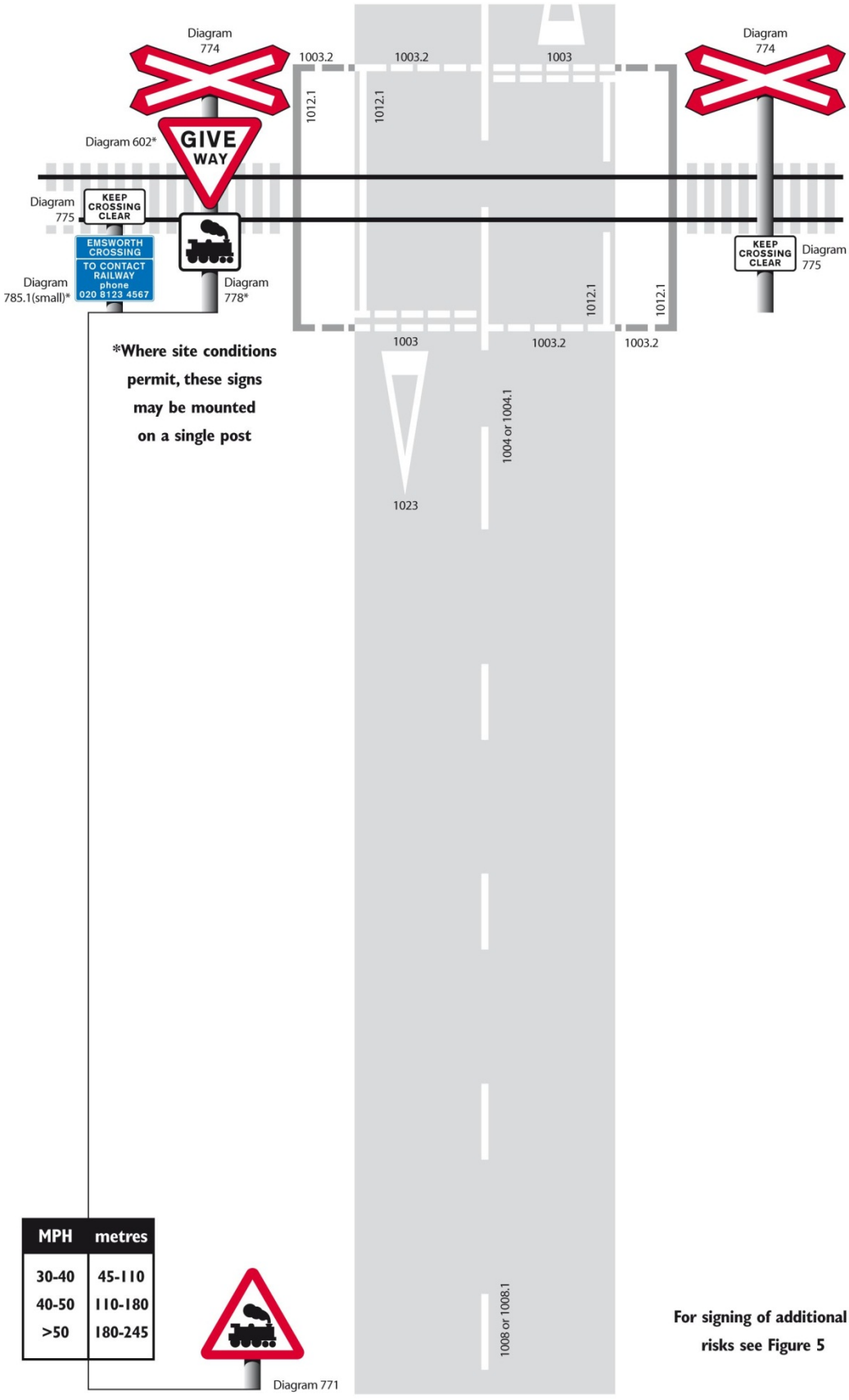


Figure 7: Typical layout of user worked crossing with adjacent footway or bridleway

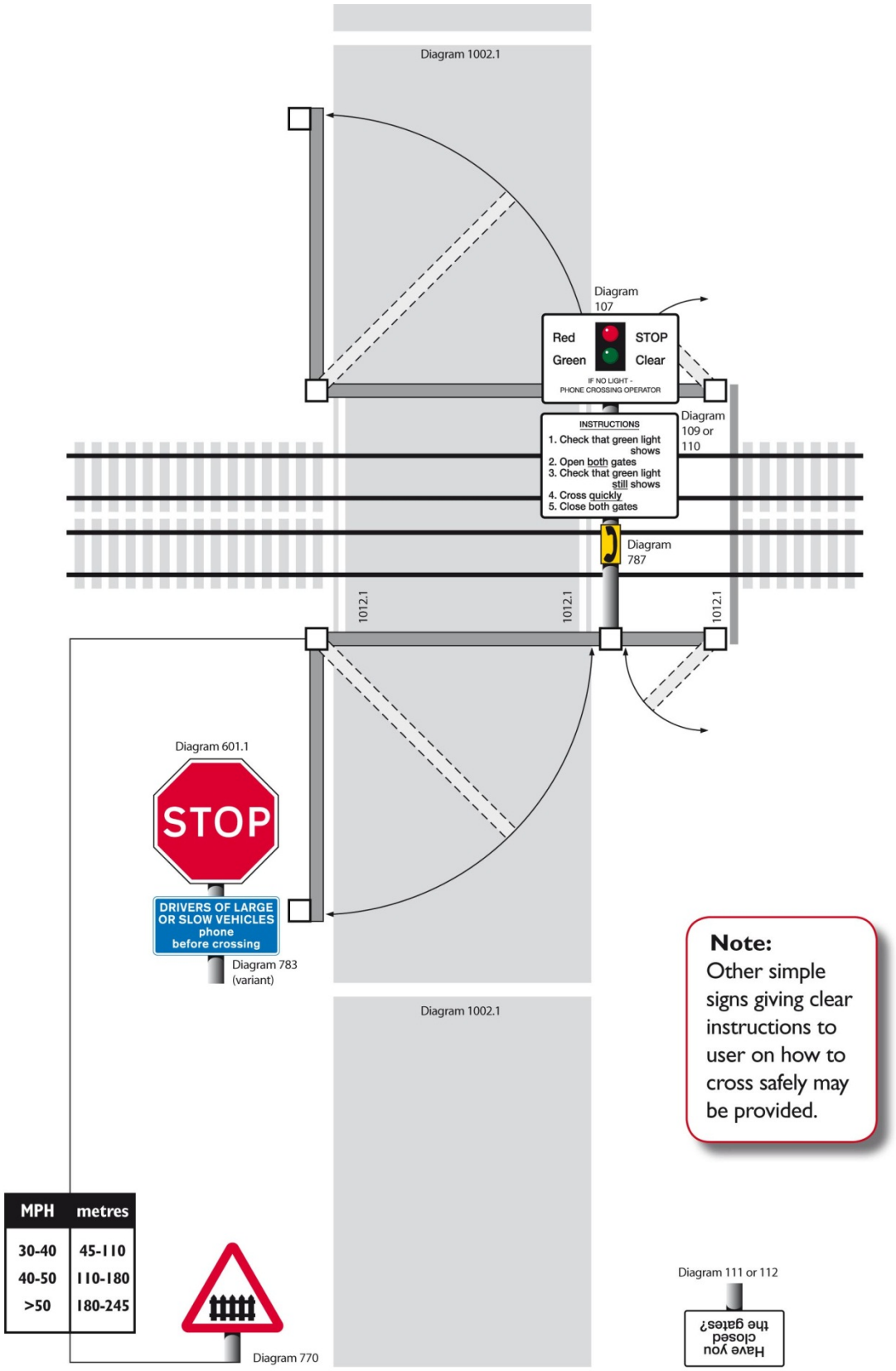


Figure 8: Special signs for use with MSL

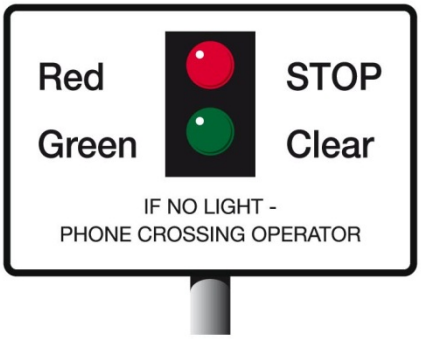


Diagram 107

Preferred – provide telephone number if necessary

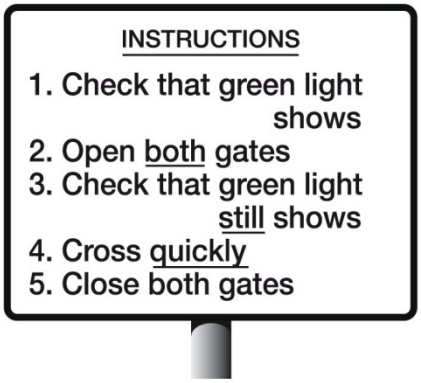


Diagram 109

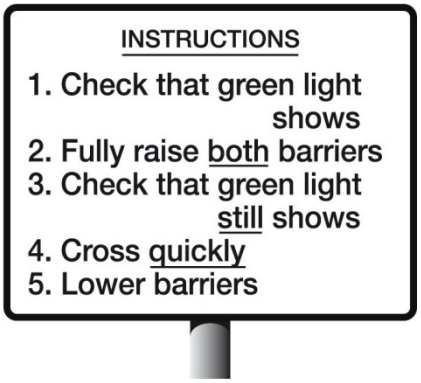


Diagram 110



Diagram 111



Diagram 112

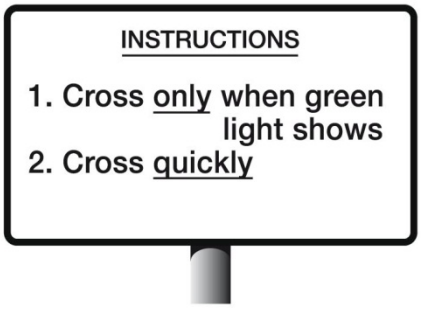
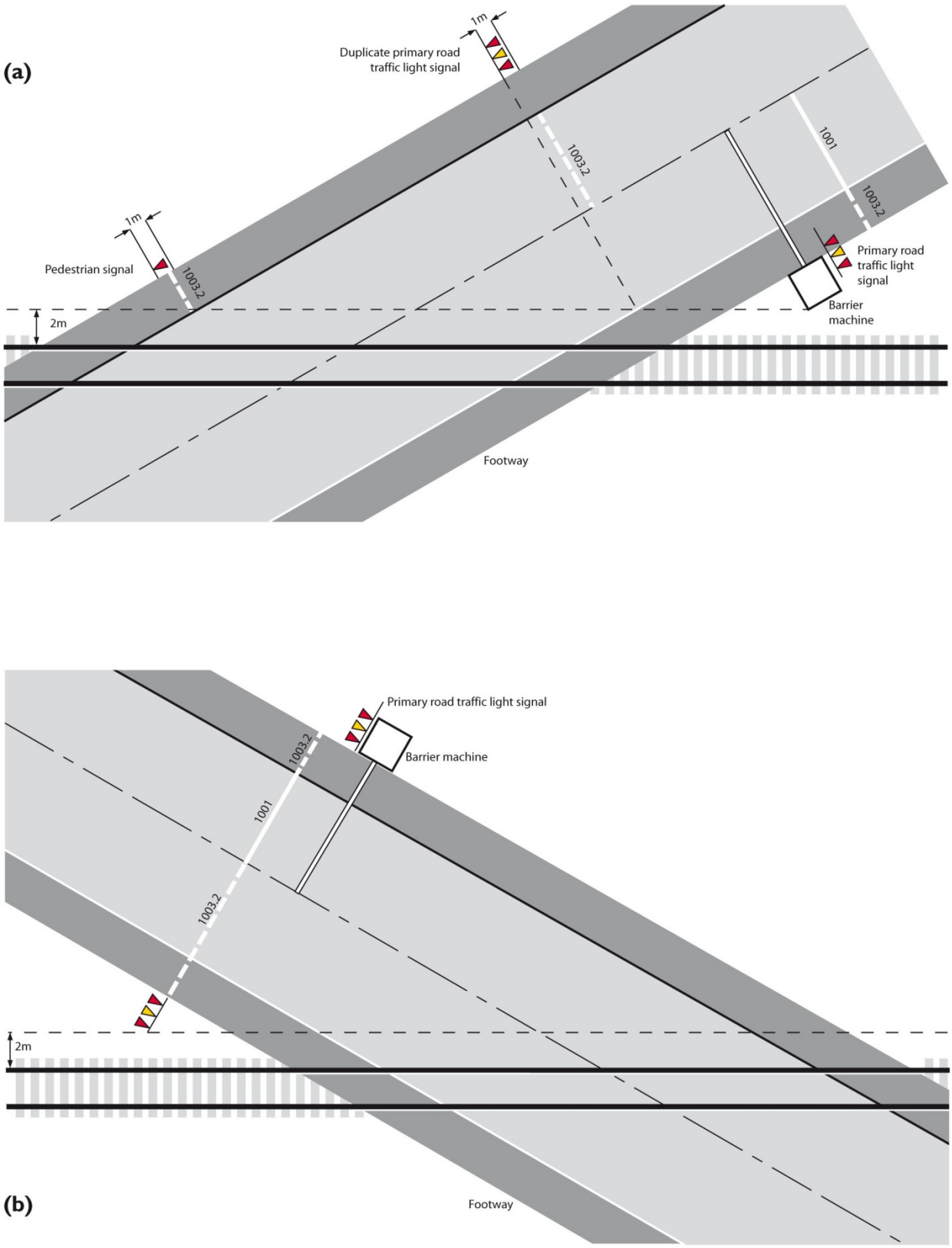


Diagram 114

Figure 9: typical layout of an obtuse skew crossing (a) and an acute skew crossing (b) indicating the arrangement of the transverse road markings and road traffic light signals (not to scale)



Notes to Figure 9

A pedestrian stop line is to be provided across the footway whenever a pedestrian signal is provided. The pedestrian stop line shall be approximately 1 m in advance of the pedestrian signal. This pedestrian stop line shall be positioned in such a manner that the end of the line at the edge of the carriageway is not less than 2 m from the nearest running rail.

The provision of a pedestrian signal may be appropriate at skew crossings with significant pedestrian usage.

In the case of an extremely obtuse skew crossing, like the one in Figure 9, the following arrangement may be considered as an alternative:

(a) the omission of the pedestrian stop line and the pedestrian signal on the right-hand side footway; and

(b) the duplicate primary road traffic light signal and the pedestrian stop line across the footway and across the right-hand side of the carriageway may be positioned closer than the minimum 2 m from the nearest running rail.

3. Level crossing order submissions

Overview and introduction

3.1 When the construction of railways was authorised, mainly in the 19th century, the individual enabling Act of Parliament specified how the railway was to cross other ways (for example roads and footpaths), either by bridge or on the level. Where the crossing was on the level, the arrangements for protecting the users, both railway and highway, were specified.

3.2 Since initial construction, use of the roads and railway has changed considerably, as has the cost of and delay caused by level crossings, and from the 1950s level crossings have been modernised to permit remote or automatic operation with lifting barriers and/or road traffic signals.

3.3 In order to permit the railway operator to change the protective arrangement specified in the original Act, a legal process was introduced which empowered the Secretary of State for Transport to make statutory orders specifying the new or updated arrangements at individual crossings to which the public has access. This process is currently authorised through provisions in the Level Crossings Act 1983.

3.4 This order making process is managed by ORR on behalf of the Secretary of State for Transport. The process is normally initiated by the operator of a level crossing, and requires consultation with the local traffic authority. An order provides for the protection of those using a level crossing and may place duties on both the crossing operator and local traffic authority. An order may make such provision as the Secretary of State considers necessary for the safety or convenience of crossing users.

3.5 This guide is intended to be an *aide-memoire* to assist railway level crossing operators in making level crossing order submissions to ORR for consideration. It also provides information for statutory consultees on the process, together with other background information. It takes account of the changes introduced in the Level Crossings Act 1983 by the Road Safety Act 2006.

The order making process in outline

3.6 The process is normally initiated by the crossing operator proposing a new or amended order. The local traffic authority and the ORR must be consulted. A request and draft order is then submitted and there is a statutory consultation period for the local traffic authority to make representations. On behalf of the Secretary of State, ORR considers any representations, and then decides whether to make the order, with or without amendments. The order is made to come into force when the relevant work is completed.

3.7 This Chapter includes advice on managing of level crossings, what an order should contain, and on the process for requesting, considering and making an order. It also includes contact details (Appendix E) and the wording of the Level Crossings Act 1983, as amended (Appendix F).

Background and other information on level crossing management

Modernisation of existing level crossings

3.8 The primary objective should be to close level crossings permanently, following the closure or diversion of a highway, road or by the provision of a bridge or under-pass. As a secondary objective, it may be practicable to reduce the status of the crossing, for example from vehicular to footpath or bridleway only. Simple renewal and retention of existing crossings should be seen as a last resort. Crossing renewals

should not introduce new risks to the railway or users. In determining whether reasonably practicable solutions exist, other than renewing an existing crossing, the operator should take into account the whole-life costs of installing and maintaining level crossings.

Authorisation of level crossings

3.9 Level crossings on public highways normally need to be authorised by statutory means to establish the rights and obligations of road and rail users. An order under the Level Crossings Act 1983 does not authorise a crossing, but does provide the means for any changed protective arrangements at that crossing to be effectively placed, recorded and enforced.

New level crossings

3.10 Except in exceptional circumstances, ORR does not support the creation of any new level crossings, of any type. A new public highway level crossing in England and Wales may require a Transport and Works Act Order[11] or other appropriate statutory authorisation to create 'the right to cross the railway on the level'. In Scotland an order under the Transport and Works (Scotland) Act 2007 may be required. ORR is consulted on such proposals and may object during any relevant consultation exercise. Normally, any new road required to cross a railway should do so by a bridge or underpass.

3.11 Where a new level crossing is authorised under the Transport and Works Act 1992 or similar legislation, a level crossing order (obtained by the processes outlined in this document) may be needed to specify the necessary protective arrangements.

Temporary vehicular level crossings and temporary increased use

3.12 Bringing into use temporary level crossings, (excepting those for sole use by employees of the relevant transport undertaking) for instance to enable construction works to take place, must comply with the Railways and Other Guided Transport Systems (Safety) Regulations 2006 as amended. This also applies in the case of temporary increased use of private level crossings.

3.13 If the crossing is one to which the public has access, and the protection arrangements need to be altered from those specified in the authorising Act (for example manual gates to remotely operated full barrier CCTV), a level crossing order is the most appropriate mechanism for sanctioning the relevant changes.

Change in line speeds

3.14 Any project involving a change to line speeds over a length of route will require reassessment of risk and operational requirements at all crossings. Closure, where possible, should be pursued. Where a private user worked crossing is one to which the public has access, any significant changes may make it appropriate for all protection arrangements to be recorded in a level crossing order.

Level crossing orders: scope, content and format

3.15 A level crossing order details the protective arrangements at a level crossing. A new or amended order may bring about changes to those protective arrangements. Orders can revoke earlier orders, disapply requirements under other legislation (for example the authorising Act, a Light Railway Order or an order made under the Transport and Works Act 1992) and enable road traffic signs (including signals and road markings) to be placed (and have legal effect) upon a highway or other road to which the public has

[1] See Section 1 & Schedule 1 of the Transport and Works Act 1992. Transport and Works Act Orders are dealt with by the Transport and Works Act Unit, Dept for Transport, Great Minster House, 76 Marsham Street, London, SW1P 4DR

access. It may place duties on both the level crossing operator and the local traffic authority, in relation to the safety or convenience of users of the crossing.

3.16 In England and Wales any level crossing on a "highway[2] or other road to which the public has access" may be subject to a level crossing order made under the Level Crossings Act 1983, though in many cases this will not be necessary. "Access" includes pedestrian, vehicular or on horseback, and is not restricted to a public right of way. It is a matter of fact, rather than right. Thus an order may be made for a "private" crossing if the public has access to it, even though there are no public rights of way over it or over the road up to the crossing. In Scotland the law, and in particular the definition of a 'road', is a little different. The effect is that in Scotland a level crossing order can only be made for a crossing if it is on a road to which the public has a *right* of access.

3.17 Level crossing orders may normally only be requested by the operator of the crossing (defined in relation to a level crossing as the person carrying on an undertaking which includes maintaining the permanent way at the crossing[3]). However, the Secretary of State may make an order without the request of an operator, and ORR may, by serving notice on an operator, require the operator to request an order.

3.18 The level crossing order specifies how the crossing shall be operated and the protective equipment (which includes barriers, traffic signs, signals and road markings) to be provided at the crossing by both the operator and local traffic authority.[4] The type of level crossing should normally conform with one of the types described in this guidance document. The level crossing order consideration process takes account of the safety and convenience of users, road and rail, and the status of the crossing. Where necessary and appropriate to particular circumstances at individual crossings, protective arrangements may be varied from the standard guidance.

3.19 Orders normally contain several parts. The order itself contains the citation, principal duties, revocation of earlier orders and other details. It records who applied for the order in its title, though this does not affect the validity of the order if the operator subsequently changes. It may also explicitly or implicitly disapply parts of earlier legislation applying to the crossing.

3.20 There are three supporting Schedules, which contain details of:

- The location of the crossing (in both road and railway terms), together with a record of the local traffic authority and, if appropriate, the status of the crossing for which the protection is provided (Schedule 1);
- What equipment the operator must provide (Schedule 2 part 1);
- How the operator must operate the crossing (Schedule 2 part 2);
- What the local traffic authority must provide (Schedule 3 part 1); and
- How the local traffic authority shall conduct its undertaking in relation to the level crossing (Schedule 3 Part 2).

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[2] See definition in the Level Crossings Act 1983, inserted by the Level Crossing Regulations 1997 and the Highways Act 1980

[3] See section 1(11) Level Crossings Act 1983

[4] See the amendments made to section 1(20(a) of the Level Crossings Act 1983 by section 50(2) of the Road Safety Act 2006

3.21 Orders for each type of crossing are made to a standard format, for which templates are available from ORR on application. However, where particular features, requirements or equipment need to be included, any proposed additional wording should be discussed with ORR at an early stage. Templates normally contain a number of options or alternative paragraphs (dealing with yellow box markings or centre of carriageway markings, for instance).

3.22 Any change that affects, or alters, the content of a level crossing order (including variation, amendment and revocation orders) requires statutory consultation (see timescales below). There is no mechanism for exemption from statutory consultation, nor can the minimum consultation and two-month period for representations be reduced. Level crossing orders can amend or vary earlier orders, and can revoke an earlier order completely.

3.23 Amendment or variation orders can be used to amend or vary individual words or paragraphs. Variation and amendment orders that affect an earlier order must explicitly provide for the earlier order to remain in force. ORR will not normally progress a variation or amendment order, and will require the submission of a new, complete draft order:

- where there are significant changes to any existing order;
- where a change of level crossing type is proposed;
- where there are already three or more existing amendments or variations to an original order;
- where the traffic sign numbering within an existing order relates to other than the current edition of the 2002 Regulations; or
- where significant time (more than two years) has elapsed since consultation, commissioning has been delayed, or circumstances have changed significantly since the original consultation.

3.24 New orders other than variation and amendment orders should explicitly revoke all earlier orders together with any amendment or variation orders that have not previously been revoked. Where an earlier order is revoked, the correct, full citation as quoted (This order may be cited as…) in the earlier order itself must be used.

Level crossing order request and consideration process

3.25 A “flow chart” outlining the order making process can be found at Figure 10. It is intended to be illustrative rather than prescriptive. In general, the earlier matters are discussed and resolved, the less scope there is for unforeseen timescale and resource problems to affect implementation of the proposed works.

Initial proposals

3.26 Level crossing modernisation project teams should make ORR aware of their proposals 12-24 months or more in advance of the proposed commissioning date so as to allow time to discuss the engineering aspects and the draft level crossing order with ORR. At this stage it is important to resolve issues of principle, such as the risk assessment to inform to what extent the crossing should meet current standards, or whether renewal as a different type of crossing will be appropriate. The proposed use of any novel equipment may require special consideration and should be discussed with ORR at this stage.

3.27 Consider whether a public consultation meeting will be needed (see public meetings below). Either at this stage or as part of the initial consultation with ORR and the local traffic authority, a site visit by interested parties should normally be arranged.

Consultation with local traffic authority and ORR

3.28 New consultation provisions were introduced by the Road Safety Act 2006[5]. Before submitting a request for an order to the Secretary of State, an operator must consult both ORR and the local traffic authority about the draft order he intends to submit to the Secretary of State, and must allow a reasonable period for them to make representations. The purpose is to permit any matters of concern to be raised and resolved in advance of the Secretary of State's formal consideration of the order. The 2006 Act also amended the Level Crossings Act 1983 to permit level crossing orders to place requirements on local traffic authorities[6].

3.29 Clearly, the proposed content of an order, in particular the schedules placing duties on the local traffic authority, needs to be discussed at as early a stage as possible, and particular attention should be given to the first consultation under the new arrangements with each local traffic authority. Attention should also be given at this stage to establishing an agreed status of the crossing, particularly where private vehicular rights are involved. Ideally, all matters should be resolved at this time, and the statutory consultation process should not raise any further issues or matters of comment.

3.30 As a minimum, the crossing operator must consult with the local traffic authority in the area the crossing is situated, and ORR. There is no longer a statutory duty to consult with the planning authority, but ORR considers that it is good practice to continue to do so. The crossing operator should consider consulting on as wide a basis as is felt necessary, for instance with planning authorities, parish and community councils. In the case of crossings with private rights, consider consulting the authorised users and the owner of the private road. Consider also consulting the authorised users, if the crossing is an accommodation or occupation crossing with public footpath or bridleway rights. Where operation of the crossing involves a train operator, such as for train crew operated crossings or automatic crossings initiated by station staff, the relevant train and station operators should be consulted. Responses to this consultation should be directed to and be considered by the crossing operator.

3.31 There is no statutory guidance on the process required or how far in advance of the draft order circulation date this consultation should be carried out. However, it will need to include a written summary of the proposal, a preliminary draft of the proposed order and an outline layout, and may, where appropriate and practicable, include a site visit. A record should be kept of issues raised and the considerations and decisions arising from them.

3.32 Evidence that consultation has been carried out, how it was done, what responses were received and what action has been taken should accompany the later draft order submission.

Public meetings

3.33 Although not a statutory requirement, "public" consultation meetings should also be considered and held with relevant local authorities and other relevant bodies as part of this consultation process where there are significant changes to the method of operation planned (for example conversion of manual gates to automatically controlled barriers). Such meetings within the local community, to describe the railway operator's proposals, will give advance warning of local concerns and allow time to consider any objections raised by the communities concerned.

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5 See the new sections 1(8) and 1(8A) to the Level Crossings Act 1983 introduced by section 50(7) of the Road Safety Act 2006

6 See the new section 1(2)(a) to the Level Crossings Act 1983 introduced by section 50(2) of the Road Safety Act 2006

3.34 The organisation and cost of such meetings are the railway operator's responsibility. ORR has, in the past, chaired such meetings in an independent capacity, and is prepared to continue doing so when requested, provided sufficient advance warning is given. Minutes should be kept and distributed to the communities concerned and ORR. Such meetings should be held as early as possible (12-24 months in advance). Local representatives such as the highway and planning authorities, town, parish and community councils, police (local as well as British Transport Police), other emergency services, National Farmers Union and any other significant local users should be invited as appropriate.

3.35 The railway operator should be prepared to give a brief presentation explaining the operation of the proposed level crossing and should be able to answer technical and any other questions. ORR will be pleased to explain the legislation and order making process to those present. A record should be kept of items raised at these meetings.

3.36 Any undertakings made to local communities should be carefully considered before being given, as failure to honour undertakings can lead to such issues being raised again during the formal consideration of the order, thus possibly delaying the making of the order.

Draft order submission and supporting information required

3.37 A list of supporting documents and information required to accompany order requests is provided in Appendix G. Here you will also find guidance on making and recording the results of a 'suitable and sufficient' risk assessment. Which documents need to be provided will depend on the particular circumstances of each level crossing; the list is for guidance and is neither exhaustive nor prescriptive. Where there are deviations from established guidance or practice, these should be justified. Evidence of the legal status of the crossing should be provided, if necessary.

3.38 If you have any doubts on what information is required, please contact ORR before making your submission. The information provided should come from one single point of contact in the relevant part of the organisation.

3.39 After consulting ORR and the local traffic authority about the draft order, the crossing operator must give them written notice of his intention to make a request for an order to the Secretary of State. That notice must specify a period (of at least two months) within which ORR and the local traffic authority can make representations to the Secretary of State, and must be accompanied by a copy of the draft order that is being requested.

3.40 The consultation letter to the local traffic authority and ORR should include an end date for consultation (at least two months), and a proposed or likely commissioning date for the new arrangements. Responses or objections from consultees at this stage should be directed to the Secretary of State for Transport c/o Level Crossing Team, ORR, One Kemble Street, London, WC2B 4AN.

3.41 The crossing operator should ensure that it can demonstrate delivery of these notification documents to the consultees. Copies of such letters should accompany the request to the Secretary of State. Details of any responses to the initial consultation process, and any action taken should also be included.

Draft order consideration and order making

3.42 Correspondence to the Secretary of State for Transport and the Office of Rail Regulation should be addressed to: The Secretary of State for Transport, c/o, Level Crossing Team, ORR, One Kemble Street, London, WC2B 4AN.

3.43 The draft order will be considered, taking into account guidance, relevant standards and the particular circumstances at the crossing. The primary considerations are whether the proposal is adequately safe and represents an appropriate balance between safety and convenience for all crossing users, road and rail.

3.44 Where relevant issues are raised concerning matters other than the safety or convenience of users, such as rights of way over a crossing, or the convenience of road users other than those using a crossing, these will be taken into account in ORR's assessment of the draft order. However, the draft order may in these circumstances need to be referred to the Secretary of State for a decision.

3.45 It is at this stage that minor amendments to the proposed order, such as correcting dimensions in the original draft, are incorporated. More significant additions may be made, for instance where the assessment process has identified the need to better address particular risks at the crossing.

3.46 Consultation responses are also considered, and if appropriate the order may be modified to take account of these matters.

3.47 If there are public rights of way/convenience issues raised by the consultation, ORR may seek guidance from the Department for Transport. In some cases ORR is not empowered to make an order on behalf of the Secretary of State, and in such cases the draft order will be referred to the Secretary of State with a recommendation. ORR will inform the railway operator as soon as it becomes aware of any issues likely to delay the making of an order that might affect a proposed commissioning date.

Inspection of level crossings subject to orders

3.48 Implementing the arrangements specified in an order remains the responsibility of the crossing operator and local traffic authority. All level crossing works are subject to inspection at ORR's discretion. Variation or amendment orders, detailing minor changes only, may not necessitate inspection.

3.49 The inspection should normally be arranged shortly after the revised arrangements have been brought into use. Consultees, including a representative of the relevant traffic authority, should be invited by the railway operator to join the inspection. Any deficiencies identified should be corrected and the action taken confirmed in writing.

3.50 Failure to implement properly the arrangements specified in an order will be considered using ORR's established enforcement decision making process. Formal enforcement, including notices and prosecution, may be used.

Traffic Signs Authorisations

3.51 Traffic Signs Authorisations are required if the railway operator wishes to place a sign on a public highway that is not shown within the 2002 Regulations, or wishes to place a sign from the 1996 Regulations on a public highway (including a public footpath) or road or other highway to which the public has access. Such requests should be made to ORR along with details of the size of the sign/signal, colour, size of lettering/numerals, etc. A detailed explanation of why the sign is required and copies of any supporting correspondence from local authorities (such as Police, Traffic authority) should be provided. Two copies of a map (minimum scale 1:2500) should be supplied, one showing the position of the proposed sign(s) marked with a cross, the other unmarked. ORR will progress the request on behalf of the railway operator.

Timescales

3.52 Where order requests are incomplete or inaccurate, the timescales indicated below will be extended. Where assessment of an application reveals that it is incomplete, then further assessment may be delayed

until the relevant information is provided. Where a request is grossly deficient ORR may recommend the Secretary of State declines to make an order, and the consultation cycle will need to be restarted from the initial consultation phase. To avoid wasted effort by operators, local authorities and ORR's inspectors, the crossing operator should liaise with ORR at an early stage to ensure all necessary information will be available when required.

Consultation

3.53 Before submitting a request for an order, the crossing operator must formally advise and consult ORR and the local traffic authority of his intention to do so (section 1(8A) of the Level Crossings Act 1983). Consulting the local planning authority is also good practice, even though there is no longer a statutory requirement to do so. The timescales are not set down, but this should be undertaken at the earliest opportunity. Sufficient time should be allowed for a public meeting if necessary and, once the consultation is started, sufficient reasonable time should be allowed for responses to be made and considered. Two months may be considered as an absolute minimum for this to be done effectively. If adequate time is not allowed, or the consultation is otherwise ineffective, it may result in comments being made and needing to be considered after the statutory consultation. If consultation is not effectively carried out, the subsequent draft order submission might be legally challenged.

Circulation of draft order

3.54 The last date for comments should be included in the letter accompanying the draft order. Note that new level crossing orders, and variations or amendments to existing orders, however minor the changes, all have to go through a statutory consultation process in full. There is no power in the Level Crossings Act to shorten or waive the minimum consideration period.

Consideration of draft order together with any consultation responses

3.55 Considering draft orders and making a recommendation for signature cannot take place until the consultation period has ended. The recommendation can be that the order is made as submitted, that an order is not made, or that an amended order is made. In practice the majority of orders made fall into the last category.

3.56 Crossing operators are therefore advised to allow a minimum of four months between circulation of the draft order and the proposed commissioning date. The level crossing is required to comply with the level crossing order at all times and, therefore, the crossing operator must ensure that the new order is dated to 'come into force' on the commissioning date.

3.57 The earlier a crossing operator makes the application for an order, the less likely there will be timescale problems. While ORR will make every attempt to meet reasonable project timescales, it cannot deal with last-minute applications unless there are exceptional circumstances. Poor planning will not be considered as an exceptional circumstance.

3.58 The required "coming into force" date should normally be confirmed to ORR. Cancellation or postponement of a planned commissioning should be advised to ORR at the earliest opportunity. Once made, an order cannot easily be revoked.

Information for local traffic and planning authorities

3.59 A process for making orders in relation to level crossing protection has been in place since the late 1950s, and local authorities have, since that time, been part of that process. Even before level crossing modernisation began, local highway authorities had responsibility for traffic signs on the road approaches to level crossings, and this responsibility has not changed.

3.60 The modifications to the Level Crossings Act 1983 introduced by the Road Safety Act 2006 formalised good practice in consulting on changes to level crossings in advance of formal circulation of a draft order. The changes also permit the order to record and clarify the local traffic authority's responsibility for the approaches to the crossing. Where new traffic control measures are required (such as a centre-carriageway "median strip" to prevent "zig-zagging" around half barriers) the responsibility for provision and maintenance should be agreed through consultation and incorporated in the draft order. The final division of responsibilities will be made clear in the level crossing order. As a general principle, it may be considered appropriate for the party introducing any increased risk to bear the responsibility for controlling it. Where there is any failure to provide or maintain any traffic signs required by the order, ORR will consider whether formal enforcement is appropriate.

3.61 Where traffic signs on the approach to a crossing need to be changed, for example if a local traffic authority wishes to introduce one way traffic flow, proposals must be discussed and agreed with the railway operator in ample time for any necessary revision to the level crossing order to be made. This will determine when revised arrangements may be brought into force.

3.62 New orders may record the need for local traffic authorities and level crossing operators to agree a long term strategy for each crossing. Where appropriate, consideration should be given to what measures may be required, by each party, to permit the crossing to be closed in the long term.

3.63 New orders may also specifically require the local traffic authority and the crossing operator to co-operate in the joint management of risk at the crossing. This will require the local traffic authority to make the crossing operator aware of any significant temporary or permanent changes affecting the nature and characteristics of road traffic approaching the crossing. Such changes might include a revised road layout, traffic calming measures or a change in permissible road speed.

Planning decisions affecting level crossings

3.64 There is a requirement in planning legislation[7] for planning authorities to consult the Secretary of State for Transport and /or the railway operator where development materially affects traffic over any type of level crossing. In Scotland, the requirement is for the planning authority to consult Network Rail Infrastructure Limited or any other railway undertakers likely to be affected where the development is likely to result in a material increase in the volume or material change in the character of traffic using a level crossing over a railway. ORR acts on behalf of the Secretary of State in these matters, and can offer guidance at an early stage as to what might be material in the particular circumstances of individual crossings. Any impact on safety will depend on the type of level crossing involved. Existing protection may no longer be adequate.

3.65 Planning authorities should take careful note of comments from crossing operators. Consideration should be given to opportunities for closure of the level crossing concerned in favour of bridge underpass or diversionary routes. If a planning decision necessitates a change in level crossing protection, consideration should be given to the funding of the changes and to the timescales for implementation consistent with the requirements of the level crossing order making process. Changes in level crossing protection may well incur additional costs for local traffic authorities as well as the crossing operator.

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[7] Town and Country Planning (General Development Procedure) Order 1995 SI 1995 No 419; Regulation 25 and Schedule 5 of the Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2008 as amended

Requiring a request for a level crossing order

3.66 The Level Crossings Act 1983 section 1(6A) gives ORR, where it is of the opinion that an order is required, the power to issue a written notice to the operator of a crossing to require the operator to request a level crossing order. The notice will contain details of the reasons for the opinion, and places a statutory duty on the operator to request an order.

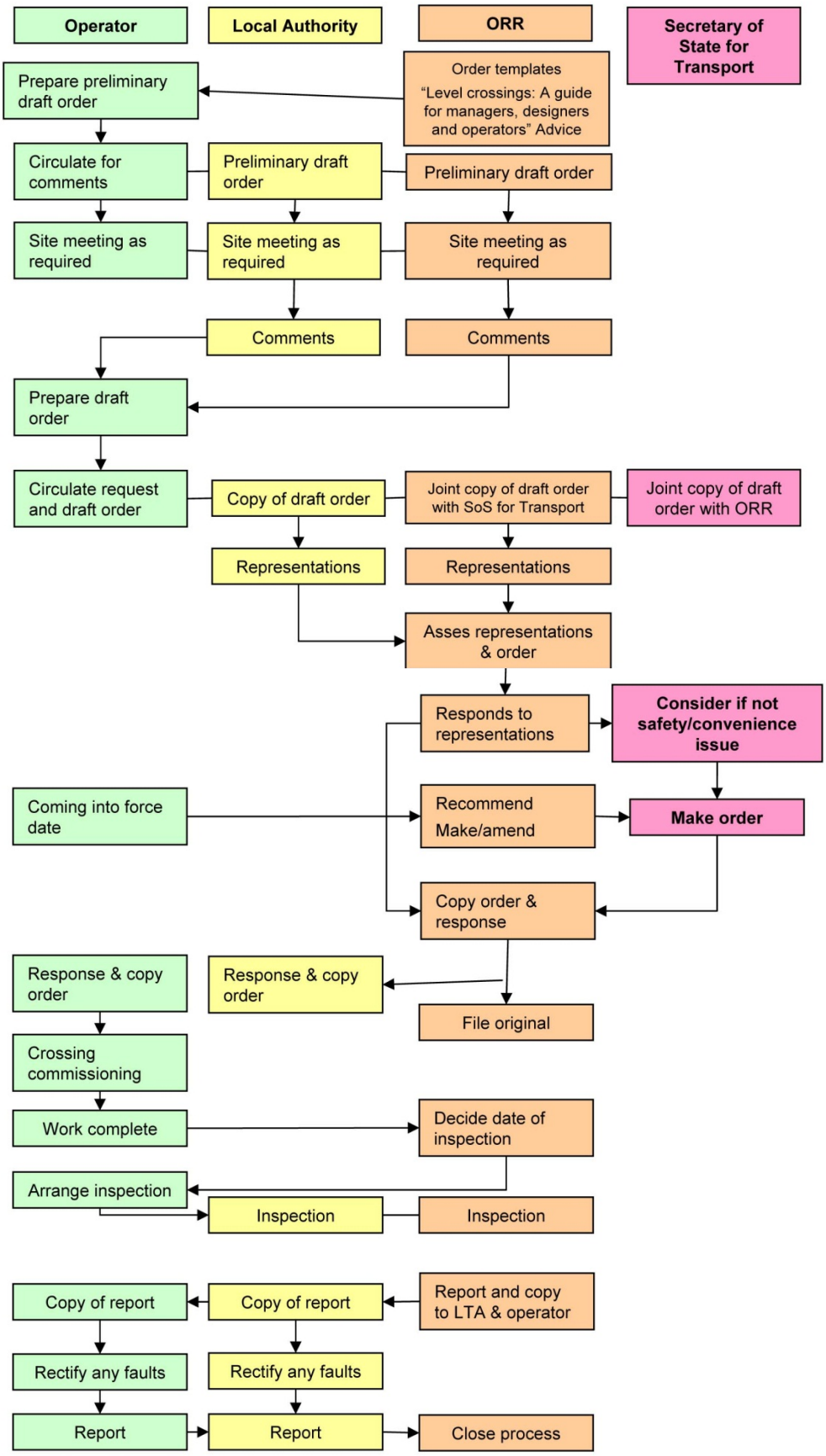
3.67 The subsequent request for an order will be considered by ORR as normal, but making the order is not delegated to ORR in these circumstances. In such cases the order is made by the Secretary of State, taking into account any recommendation from ORR.

3.68 If the operator declines to make a request for an order, the Secretary of State can be advised to make an order without a request. Alternatively, ORR may serve an improvement notice, under the Health and Safety at Work etc Act 1974, requiring an operator to request an order. Failure to comply with such a notice can lead to prosecution.

Relevant legislation and publications

3.69 The most relevant legislation is the Level Crossings Act 1983 (as amended by the Level Crossings Regulations 1997 and the Road Safety Act 2006). Operators should also be familiar with the Health and Safety at Work etc Act 1974, the Railways and Other Guided Transport Systems (Safety) Regulations 2006 as amended and the Traffic Signs Regulations and General Directions 2002. See Appendix H.

Figure 10: Level crossing order process



Appendix A - Common terms

Where possible the document has been written in plain English and the use of technical expressions or jargon has been avoided.

The following explains what is meant by certain terms used within the document that relate specifically to level crossings:

'Actual daily road vehicle usage' means the number of road vehicles passing between 06.00 and 24.00 averaged over a 9-day period.

'Acute (skew) crossing' is a crossing at which the angle measured in an anticlockwise direction from the road to the running rail is less than a right angle.

'Approach locking' is a feature of the signalling interlocking. In the context of a level crossing it should prevent the crossing opening to road traffic after protecting signals have been placed to danger if there is a risk of an approaching train not having received a complete warning sequence of signals.

'Control point' is a location from which the equipment at a crossing is controlled.

'Crossing length' applies to any vehicular crossing. At a crossing equipped with gates or full barriers it is the distance between the gates or barriers measured across the railway. At an open crossing or one equipped with half barriers it is the distance measured from the give way or stop line to a point at which a road vehicle would be clear of the railway or crossing equipment on the far side.

'Crossing speed' applies to locally-monitored crossings and open crossings. It is the maximum speed at which trains are allowed to travel from a point (indicated by the position of a special speed restriction board) on the approach to a crossing until the front of the train arrives at the crossing.

'Decision point' applies to user worked crossings, footpath crossings and bridleway crossings. It is a point where guidance on crossing safely is visible and at which a decision to cross or wait can be made in safety.

'Left-hand side' means the left-hand side of the road or carriageway as it would appear to a person approaching the crossing along that road or carriageway.

'Obstacle detection'**:** An obstacle detector is a device or system for proving a level crossing is clear, as part of the closure sequence. An obstacle detector may comprise one detector or a system of obstacle detectors, for example a primary high-integrity obstacle detector to detect any obstruction capable of derailing a train, together with a lower-integrity Complementary obstacle detector to detect possibly low-lying, obstructions not capable of derailing a train.

'Obtuse (skew) crossing' is a crossing at which the angle measured in an anticlockwise direction between the road and the running rail is greater than a right angle.

'Predictor crossing' is a crossing at which the likely arrival time of trains is calculated automatically by the equipment at crossing. The timing of closure sequence is thus set according to the approach speed of trains

'Right-hand side' means the right-hand side of the road or carriageway as it would appear to a person approaching the crossing along that road or carriageway.

'Road open time' is the time after the road traffic light signals have ceased to show and any barriers are clear of the road, before the road traffic light show again for another train.

'Sighting distance' is the distance measured along the railway from a decision point to the point at which an approaching train becomes visible in any direction from which a train may approach.

'Strike-in point' is the position on the track at which the presence of a train is detected and the operating sequence of the crossing is initiated.

'Supervising point' is the location from where the crossing is supervised. Most commonly this is either a local or remote signal-box but can be another location.

'Tactile threshold' is an area of tactile paving slabs laid in a specific pattern for the guidance of visually-impaired pedestrians.

'Traffic moment' is the number of road vehicles using the crossing multiplied by the number of trains passing in a given period.

'Warning time' is the shortest possible time for trains to travel the sighting distance or, where whistle boards are provided, the shortest time between the sound being heard at the crossing and the train arriving at the crossing. In calculations of warning time the highest attainable train speed should be used.

Appendix B - Limitation on road and rail traffic at AOCL

1 Actual daily road vehicle usage is converted to effective daily road vehicle usage using Table 10 because the relationship between the accident probability and the actual road traffic volume is not linear. Converting the actual road traffic volume to the effective figure will give the same accident probability if the probability:traffic flow relationship is a straight line. (For a detailed explanation, see the report 'Automatic open level crossings - A review of safety' by Professor P F Stott, published in 1987 by HMSO, ISBN 0 11 5508317).

2 The effective daily road vehicle usage is then multiplied by the daily number of trains to give the effective traffic moment and hence the maximum permitted crossing speed which can be derived from Table 11.

Table 10

Actual daily road vehicle usage	Effective daily road vehicle usage
250	**230**
500	**425**
750	**580**
1000	**705**
1250	**810**
1500	**890**
1750	**955**
2000	**1010**
2500	**1080**
3000	**1115**
3500	**1115**
4000	**1080**
4500	**1040**

Table 10	
5000	**990**
6000	**885**
7000	**765**
8000	**650**
9000	**540**
10000	**475**

Table 11	
Effective traffic moment	Maximum permitted crossing speed
	miles per hour (mph)
4000	**55**
4600	**50**
5400	**45**
6500	**40**
8200	**35**
10130	**30**
13100	**25**
15000	**less than 25**

Appendix C - Definition of viewing zone at open crossings

The viewing zone (the shaded region as shown in Figure 11) is defined by lines connecting points ‘X’ and ‘Y’ given in Table 12.

Figure 11: Definition of viewing zone at open crossings

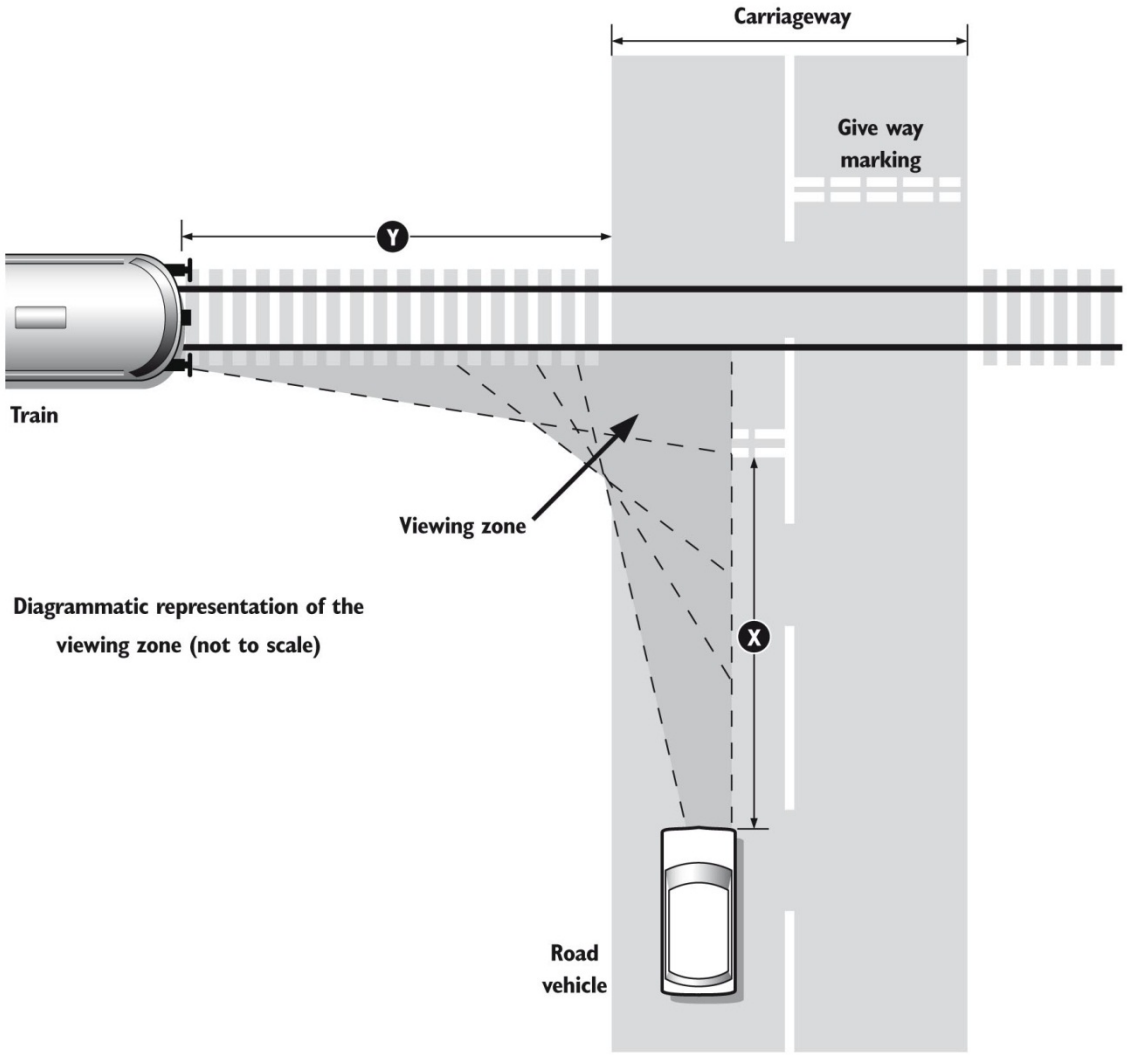


Table 12: Viewing zones			
Distances ‘x’ (metres)	Distances ‘y’ (metres) for crossing lengths of:		
	7 m	**14 m**	**21 m**
2	**140**	**170**	**200**
10	**40**	**45**	**55**
20	**25**	**30**	**35**
40	**20**	**25**	**30**

Distance ‘X’ is the distance of road vehicle users from the ‘give way’ line on the approach. Distance ‘Y’ is the distance of an approaching train from the crossing. A crossing which crosses the railway at right angles over a single line is normally considered to be 7 m long, but at longer crossings it should be possible to see trains earlier. Where road gradients are steep, distances ‘X’ should be varied accordingly. Where the 85th percentile road speed is less than 15 mph (25 km/h), the maximum value of ‘X’ may be 20 m.

Appendix D - Train pedestrian value (TPV) calculation

1 TPVs are calculated by multiplying the number of pedestrians who pass over the railway by any route at the crossing within any period of 15 minutes by the number of trains passing over the crossing in the same period.

2 Normally a census should be taken over a nine day period, between the hours 06.00 and 24.00, particularly where high volumes or vulnerable groups of pedestrians are involved. Where the number of pedestrians is low, the actual number may be determined by an estimate. Where there are regular events which boost pedestrian usage, these should be included in the census.

3 Where the data are obtained from a census, only the maximum number of pedestrians in any period of 15 minutes in the day needs to be established. Where an estimate is accepted, the number of pedestrians used in calculating TPV should be deemed to be 75% of the largest hourly value to obtain an equivalent maximum figure for a period of 15 minutes to cater for the non-uniform distribution of pedestrian flow.

4 The number of trains should be deemed to be 25% of those passing over the crossing in a period of one hour. This hour should be either:

(a) the same hour used to give the estimated hourly value of numbers of pedestrians; or

(b) the hour which includes the 15 minutes when the pedestrian number is established by census.

5 The number of trains should be rounded up to the next integer and should not normally be less than one

Appendix E - ORR level crossings team – Contact details

The ORR Level Crossings Team can be contacted at the Office of Rail Regulation, 3rd Floor, One Kemble Street, London, WC2B 4AN
Telephone: 0207 282 2000.

All submissions (both consultation and requests for orders) should be made to this address rather than direct to any out-based office or inspector. Core operating times are Monday to Friday, 09:00-17:00, though some staff may be available both before and after these times via ORR switchboard telephone number 020 7282 2000.

In addition, a number of local inspectors, working in the Network Rail routes or the heritage sector, take a significant role in the assessment of schemes. These inspectors may be used as the first point of contact for day-to-day enquiries.

Appendix F - Level Crossings Act 1983

Level Crossings Act 1983, as amended by the Transport and Works Act 1992, Level Crossings Regulations 1997, Railways Act 2005 and Road Safety Act 2006

1 -(1) Subject to the following provisions of this section, the Secretary of State may, in relation to any place where a railway crosses a road on a level (in this section referred to as a "level crossing"), by order provide for the protection of those using the level crossing.

(1A) Subsection (1) above applies whether or not the crossing is in use when the order is made; and if it is not in use when the order is made the order shall be made so as to come into force when it is in use.

(2) An order under this section may make such provision as the Secretary of State considers necessary or expedient for the safety or convenience of those using the crossing; and, in particular –

(a) may require the operator of the crossing or the local traffic authority (or both) to provide at or near the crossing any protective equipment specified in the order and to maintain and operate that equipment in accordance with the order; and
(b) may impose on the operator requirements as to the operation of the railway at or near that crossing.

(3) While an order is in force under this section in relation to a level crossing –

(a) (repealed)

(b) subject to any exceptions specified in the order, any provision made by or under any enactment as to the crossing (or level crossings including that crossing) and imposing requirements as to protective equipment at or near the crossing, the supervision of the crossing (including the provision of buildings for the purposes of supervision) or the operation of the railway at or near the crossing shall not apply in relation to the crossing.

(4) Nothing in subsection (3)(b) above affects any provision as to traffic signs made under the Road Traffic Regulation Act 1967; but a traffic sign placed on or near a road in pursuance of an order under this section shall be treated for the purposes of section 54(4) of that Act as having been placed as provided by that Act.

(4A) Nothing in subsection (3)(b) above affects any provision made by or under Part 1 of the Health and Safety at Work etc. Act 1974.

(5) An order under this section –

(a) may be varied or revoked by a subsequent order under this section; and

(b) may impose requirements as to protective equipment provided before the making of the order.

(6) The Secretary of State may make an order under this section in respect of a level crossing on being requested to do so by the operator of the crossing or without a request by the operator.

(6ZA) The Secretary of State may not make an order without a request by the operator unless:

(a) he has consulted the Office of Rail Regulation and the local traffic authority about the order he proposes to make; and

(b) having done so, he has sent to the operator, the Office of Rail Regulation, and the local traffic authority a copy of a draft order he proposes to make and a notice specifying the period (not being less than two months) within which they may make representations to him in respect of his proposal to make the order.

(6A) Where the Office of Rail Regulation gives written notice to an operator of a crossing that in its opinion a request should be made to the Secretary of State to make an order under this section in respect of that crossing and the notice states the reasons for that opinion, the operator shall be under a duty to make such a request.

(7) Where the operator of a crossing requests the Secretary of State to make an order under this section, the request shall be accompanied by a draft of the order which the operator is requesting the Secretary of State to make.

(8) Before making a request the operator–

(a) must consult the Office of Rail Regulation and the local traffic authority about the draft order he intends to submit to the Secretary of State; and

(b) having done so, must give written notice to the Office of Rail Regulation and the local traffic authority of his intention to make a request.

(8A) A notice given under subsection (8)-

(a) must be accompanied by a copy of the draft order which the operator intends to submit to the Secretary of State; and

(b) must specify the period (not being less than two months) within which the Office of Rail Regulation and the local traffic authority may make representations to the Secretary of State in respect of the request.

(9) The Secretary of State shall consider any representations made to him pursuant to subsection 6ZA or 8A above if they have been made within the period specified in the notice referred to in the subsection concerned and may then, if he decides to make the order, make it in accordance with the draft sent to persons pursuant to the subsection concerned or with such modifications as he thinks fit.

(10) This section applies where a Government department is operating a railway at a level crossing as it applies in other cases.

(10A) Any order made under section 124 of the Transport Act 1968 or section 66 of the British Transport Commission Act 1957 and in force immediately before 1st April 1997, including any requirements or conditions laid down under the order, shall have effect as if it had been made under this section.

(10B) In performing his functions under this Act the Secretary of State shall take account of any advice given to him with respect thereto by or on behalf of the Office of Rail Regulation.

(11) In this section –

"barrier" includes gate;

“local traffic authority”, in relation to a crossing, means the authority which for the purposes of the Road Traffic Regulation Act 1984 is the local traffic authority for the road crossed by the railway at the crossing;

"operator", in relation to a crossing, means any person carrying on an undertaking which includes maintaining the permanent way;

"protective equipment" includes barriers, lights, traffic signs, manual, mechanical, automatic, electrical, telephonic or television equipment or other devices;

"road" means any highway or other road to which the public has access; and

"traffic sign" has the same meaning as in the Road Traffic Regulation Act 1984.

2.- (1)This Act may be cited as the Level Crossings Act 1983.

(2) This Act shall come into force at the end of the period of three months beginning with the day on which it was passed.

(3) This Act does not extend to Northern Ireland.

Appendix G - Supporting documentation - level crossing order assessment checklist

Items on this list will normally be required, but you will need to consider the particular circumstances at each individual level crossing to determine whether all the items listed are required, or whether additional documentation may be needed to support your assessment.

Major works at existing level crossings, including change in protection method, complete renewal or major modernisation

1) An outline project description and risk assessment, together with justification that the type of protection proposed is suitable for current or foreseeable road and rail traffic levels. As a minimum, to be suitable and sufficient, the risk assessment process will need to:

- Identify all the hazards at the crossing for each type of user. Consider all possibilities including foreseeable misuse, seasonal variations and abnormal working. Design should eliminate risk where reasonably practicable.

- Evaluate the risks posed to all users, road and rail, by the identified hazards. Consider the likelihood of an accident and the probable results. Level crossing accidents are usually serious, and have the potential to be catastrophic.

- Consider how risks might arise or change over the expected life of the crossing.

- Identify how, and to what extent, the chosen measures control risk. Taking into account the important issue of road-user convenience, all reasonably practicable steps to reduce risk should be taken. Explain how the chosen risk control measures will maintain or, preferably, improve on previous safety arrangements.

- Identify any residual risks and be able to justify why no further action is warranted.

- Be recorded and clearly reflected in the design and installation of the Crossing.

Practical guidance on recording assessment findings

Regulation 3 of the Management of Health and Safety at Work Regulations 1999 requires the making of a ‘suitable and sufficient’ health and safety risk assessment for the purpose of identifying the measures that need to be taken to comply with the relevant law. The *significant findings* of the assessment should be recorded.

i. The simple purpose of all this is to help dutyholders make good decisions in compliance with the law. The record of assessment will set out the reasoning behind those decisions. A written record will also be a convenient means for showing others that a proper process has been followed. The selection of protection arrangements should be based on the findings of the risk assessment.

ii. In making decisions about risk reduction, regard must be given to the 'general principles of prevention' set out in schedule 1 of the above Regulations, whereby avoidance of risk is the first choice and issuing instructions is the last. A reference to the approved code of practice and guidance to the Management of Health and Safety at Work Regulations 1999 can be found in Appendix H – Publications.

iii. There is no single 'right way' of setting out assessment findings. There is no set style or length, though railway infrastructure managers may find it helpful to develop their own standardised formats. In most cases it should be possible to present the significant findings of assessment in a concise manner. There is much up to date information freely available on the topic of safety at level crossings. Railway infrastructure managers should be quite capable of undertaking, in-house, risk assessments and presenting their findings to a good standard. They will, of course, need to take into account the advice, and responsibilities, of other stakeholders, such as local traffic authorities.

iv. The record of assessment should be presented as a single, identifiable, document or bundle of information. Where necessary, and to avoid duplication, reference should be made to other documents such as ground plans, census results, published safety statistics, etc. In many cases a quantitative risk modelling process is used in support of the assessment. This is good, though care needs to be taken to ensure that the workings, sensitivities and limitations of any such process are understood by all concerned.

v. The record of assessment should:

- Describe when and how the assessment was undertaken and who was involved, i.e. the users of user worked crossings;
- Make clear what input data was used and confirm steps taken to ensure its accuracy;
- Explain how assessment findings have been interpreted and 'sense checked' by competent persons;
- Record the arrangements put in place to control risk, providing the reasoning for their selection or, in the case of measures not used, rejection. In determining the cost-effectiveness of new safety measures, pricing should be in line with the competitive market;
- Give proper consideration to the needs of crossing users whether in vehicles or not and whether at public or private.

2) Ground plans showing the level crossing at a scale of 1:50 or 1:100.

3) A plan, at a suitable scale, showing the highway approaches and positions of all proposed signs and road markings and a sketch showing the position of road traffic signals and barriers.

4) For all automatic crossings, half barrier crossings (not locally monitored) and relevant vehicular user worked crossings, a scale drawing detailing the category of road profile proposed, and showing the vertical road profile across the full width of carriageway over the crossing and on all approaches along the length of

the carriageway for a distance of 30 m from the nearest rail. The drawing should demonstrate that the claimed profile is achieved. (Items 3, 4 and 5 can be presented on one drawing).

5) As appropriate to the submission, signalling scheme plans (or relevant parts) showing:

a) for Automatic Half Barrier Crossings (AHBC)

'Strike-in points', control tables for protecting signals if there are station controls or similar within the scheme, distance of protecting signals from the crossing and line speeds and calculations relating to the acceleration of trains, where required.

b) for Automatic Half Barriers Locally Monitored (ABCL) and Automatic Open Crossings Locally Monitored (AOCL)

The position of stop boards, special speed restriction boards (SSRB), advance warning boards (AWB), 'strike-in points', details of the calculations and standards used to position the boards and strike-in points, gradients and line speeds (please contact ORR in advance of making any AOCL or ABCL submission if other signalling alterations are proposed in the vicinity of the level crossing).

c) for Automatic Open Crossings Locally Monitored (AOCL)

A robust, comprehensive, risk assessed justification for the continued provision of AOCL type crossing equipment (or Manually Operated Crossings Locally Monitored) rather than any form of barrier crossing will be required in all cases. Orders for new AOCL crossings will not normally be considered.

d) for Open Crossings (OC)

The position of stop boards, special speed restriction boards (SSRB), advance warning boards (AWB), calculations and standards used to position the boards, gradients, line speeds and details of the viewing zone proposed.

e) for Manually Controlled Barriers with CCTV (MCB CCTV) and for Manually Controlled Barriers (MCB)

The position of protecting signals and control tables, the position of 'strike-in points', if authority for auto-lowering is sought, gradients and line speeds.

f) for Miniature Stop Light crossings (MSL)

'Strike-in points', control tables for protecting signals if there are station controls or similar within the scheme, distance of protecting signals from the crossing, line speeds and details of authorised usage of the crossing.

6) A detailed road traffic census (covering all user types) covering a minimum of a representative 9-day period between 0600-2400 hours to accompany all automatic crossing submissions, particularly AOCL, and at MCB CCTV crossings, if authority for auto-lowering is sought. Seasonal variation in traffic levels should be addressed in any supporting census analysis. Permitted and normal road traffic approach speeds should be included. Rail traffic census details should also be supplied. Recent (less than 18 months old) traffic census information should be available if requested for other submissions. (A project may be delayed

if this information has not been taken into account.) Anticipated barrier down-time should be considered if significant changes are proposed, for example conversion from AHB to MCB.

7) Photographs of the existing level crossing from all road and rail approaches.

8) For new MCB CCTV level crossings or where the signaller's control arrangements are changed, an ergonomics/human factors report on the proposed signaller control functions, workload and furniture layout is required.

9) A statement of the status of the crossing, for example 'private road with public bridleway and footpath' and, if a public vehicular crossing, reference to the authority under which the railway is permitted to cross the road on the level - the original railway Act.

10) A draft level crossing order (or draft variation order) and a request addressed to the Secretary of State for Transport for consideration of the draft, along with copies of the covering letters sent to the statutory consultees.

11) Confirmation of the consultation with local authorities and ORR, with details of any matters raised and resultant changes.

Minor works at existing level crossings

12) A statement of compliance with standards and regulations signed by a competent person within the crossing operator's organisation.

13) An outline description and risk assessment of the proposed work.

14) A draft level crossing order (or draft variation order) and a request addressed to the Secretary of State for Transport for consideration of the draft, along with copies of the covering letters sent to the statutory consultees.

15) Confirmation of the consultation with local authorities and ORR, with details of any matters raised and resultant changes.

16) Items 3-9 above, as appropriate.

Appendix H - Legislation and publications

Legislation

The Railway Clauses Consolidation Act 1845 and the Railways Clauses Consolidation (Scotland) Act 1845

Road and Rail Traffic Act 1933

The Electricity at Work Regulations 1989 (Statutory Instrument No 1989/635)

New Roads and Street Works Act 1991

Transport and Works Act 1992

The Town and Country Planning and General Development Procedure Order 1995 (Statutory Instrument No. 1995/419)

The Private Crossings (Signs and Barriers) Regulations 1996 (Statutory Instrument No1996/1786)

Railway Safety (Miscellaneous Provisions) Regulations 1997
(ISBN 0-7176- 1262-7)

The Provision and Use of Work Equipment Regulations (PUWER) 1998 (Statutory Instrument No 1998/2306)

Railway Safety Regulations 1999 (ISBN 0-7176-2442-0)

The Management of Health and Safety at Work Regulations 1999 (Statutory Instrument No 1999 3242)

Level Crossings Act 1983 (as amended by the Level Crossings Regulations 1997 and the Road Safety Act 2006)

The Railways and Other Guided Transport Systems (Safety) Regulations (ROGS) 2006 (Statutory Instrument No. 2006/599) as amended by The Railways and Other Guided Transport Systems (Safety) (Amendment) Regulations 2011

The Construction (Design and Management) Regulations 2007 (Statutory Instrument No 2007/320)

The Traffic Signs Regulations and General Directions 2002 (as amended by the Traffic Signs (Amendment) Regulations and General Directions 2008 -Statutory Instrument No 2008/2177)

The Equality Act 2010

Publications

A guide to the Level Crossing Regulations 1997 L97 (ISBN 0 7176 1261 9)

Approved Code of Practice: Safe use of work equipment. Provision and use of work equipment regulations 1998 L22 HSE Books 2008 ISBN: 9780717662951

The Traffic Signs Manual, Chapters 4/5, (ISBN 978 0 11 552411 0 and ISBN 0 11 5524797), found on DfT's website at: http://www.dft.gov.uk/pgr/roads/tss/tsmanual/

Installation of Traffic Signals and Associated Equipment (ISBN 0 11 552008 2)

Safety at Street Works and Road Works, Code of Practice
(ISBN 0 11 551958 0)

Railway Group Standards and Network Rail Line Standards and Codes of Practice

Guidance on the use of Tactile Paving Surfaces (rev June 2007) found on DfT's website at:
http://www.dft.gov.uk/transportforyou/access/peti/guidanceontheuseoftactilepav6167

Prevention of Trespass and Vandalism on Railways - a good practice guide
(ISBN 0 7176 1661 4)

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IA14

Ref:	NR/L2/XNG/30020/A28
Issue:	3
Date:	02 March 2024
Compliance date:	01 April 2024

NR/L2/XNG/30020

Module A28

Signage for level crossings

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User information

This Network Rail document contains colour-coding according to the following Red–Amber–Green classification.

Red requirements – *no variations permitted*

- Red requirements are to be complied with and achieved at all times.
- Red requirements are presented in a red box.
- Red requirements are monitored for compliance.
- Non-compliances will be investigated and corrective actions enforced.

Amber requirements – *variations permitted subject to approved risk analysis and mitigation*

- Amber requirements are to be complied with unless an approved variation is in place.
- Amber requirements are presented with an amber sidebar.
- Amber requirements are monitored for compliance.
- Variations can only be approved through the national variations process.
- Non-approved variations will be investigated and corrective actions enforced.

Green guidance – *to be used unless alternative solutions are followed*

- Guidance should be followed unless an alternative solution produces a better result.
- Guidance is presented with a dotted green sidebar.
- Guidance is not monitored for compliance.
- Alternative solutions should be documented to demonstrate effective control.

Compliance

This Network Rail standard/control document is mandatory and shall be complied with by Network Rail Infrastructure Limited and its contractors if applicable from 1st April 2024.

Where it is considered not reasonably practicable[1] to comply with the requirements in this standard/control document, permission to comply with a specified alternative should be sought in accordance with the Network Rail standards and controls process, or with the Railway Group Standards Code if applicable.

If this standard/control document contains requirements that are designed to demonstrate compliance with legislation they shall be complied with irrespective of a project's Project Acceleration in a Controlled Environment (PACE) phase or equivalent governance framework. In all other circumstances, projects that have formally completed PACE strategic development & project selection phase may continue to comply with any relevant Network Rail standards/control documents that were current when PACE phase 1 was completed.

NOTE 1: *Legislation includes National Technical Specification Notices (NTSNs)*

NOTE 2: *The relationship of this standard/control document with legislation and/or external standards is described in the purpose of this standard.*

NOTE 3: *For more information on PACE see NR/L2/P3M/201.*

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[1] *This can include gross proportionate project costs with the agreement of the Network Rail Assurance Panel (NRAP).*

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Issue record

Issue	Date	Comments
1	June 2022	First issue
2	June 2023	Update to reflect changes in signage designs, configuration and application criteria following DfT led consultation and stakeholder feedback.
3	March 2024	Update to reflect revised changes in signage designs as a result of secondary consultation by DfT and new sign identification numbers as prescribed in the new PCSBR 2023.

Reference documentation

NR/L2/XNG/30020	Level Crossing Design Handbook
NR/L2/30020/R01	General requirements for level crossings
NR/L2/SIG/30020/R03	Requirements for station, footpath, bridleway and user worked level crossings
Department for Transport publication	Traffic Signs Manual
Legislation	The Traffic Signs Regulations and General Directions 2016 and The Traffic Signs (Amendment) Regulations and General Directions 2017 [TSRGD].
Legislation	The Private Crossings (Signs and Barriers) Regulations 2023 [PCSBR]

Legislation

This standard/control document has been reviewed to confirm it complies with the following legislation:

- The Traffic Signs Regulations and General Directions 2016 and The Traffic Signs (Amendment) Regulations and General Directions 2017.
- The Private Crossings (Signs and Barriers) Regulations 2023.

Compliance with this standard/control document does not, on its own, provide compliance with the legislation listed.

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Compliance date:	01 April 2024

1 Scope

This module specifies Network Rail's requirements that are applicable to signage at level crossings.

The requirements in this module apply in addition to general requirements specified in NR/L2/XNG/30020/R01 and other modules that are specific to the different types, or particular configurations of level crossings.

This module applies to new level crossings and to existing level crossings where reasonable opportunity to comply with this module is identified.

Signs that are prescribed in PCSBR or TSRGD are not repeated in this module unless there are additional requirements or clarification surrounding their use. For this reason, the majority of this module is focussed on station, footpath, bridleway, and user worked level crossings.

For road markings refer to TSRGD and the Traffic Signs Manual.

This issue does not prescribe Welsh language signs. Where sites are assessed as requiring Welsh language signs then existing Welsh language sign designs should continue to be used until such time as new Welsh language signs have been approved. Where sites are assessed as requiring dual language signs then the existing designs of English and Welsh language signs should continue to be used until such time as new Welsh language signs have been approved and application rules developed for their use together.

2 Definitions

Refer to NR/L2/XNG/30020 index for definitions.

3 General

3.1.1

Only approved signage shall be provided at a level crossing.

The use of any non-approved signage requires an agreed variation to this standard and might require authorisation from DfT.

Further advice should be sought from the Technical Authority (signalengineers@networkrail.co.uk).

Rationale: to avoid uncontrolled bespoke signage or signage that is conflicting or misleading to users.

NOTE 1: *Approved signage means prescribed in relevant legislation, Network Rail standards or product accepted for the purpose.*

NOTE 2: *Approved signage for the purposes of this clause also includes existing Welsh language signs based on existing level crossings acting as a CSM reference system and justified within the Narrative Risk Assessment.*

NOTE 3: *PCSBR Diagram 133 is not approved for use on Network Rail infrastructure and is purposefully not included in this standard.*

NOTE 4: *Samaritans and security services (e.g. Land Sheriffs) signs may be provided via consultation with the Level Crossing Manager regarding their requirements and positioning.*

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Date:	02 March 2024
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3.1.2

Signage at level crossings should be kept to the minimum necessary to avoid clutter and confusion.

Rationale: RSSB research project T984 found that the likelihood of users looking at important safety related signage is influenced by how prominent it appears against its background, and that this is greatly improved by removing other, non-safety signs from a user's direct field of view on approach to a crossing.

3.1.3

Signage on posts should be positioned to protect users, or those otherwise passing by, from exposed edges.

The Traffic Signs Manual chapter 1 and chapter 4 should be consulted for mounting heights and clearances.

NOTE: *The Traffic Signs Manual applies to signs in the Traffic Signs Regulations and General Directions, however it offers good practice guidance that can be used for footpaths, bridleways and user worked crossings, in particular a minimum clearance of 900mm beneath a vehicle sign and the surface.*

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4 Signs for all level crossings

4.1 Level crossing information sign



Identity	PCSBR Diagram 164 variant A (Formerly CC02 A)
Size	W300mm x H200mm
Application requirements	Shall be provided at crossings where fixed telephones are provided.
Positioning requirements	Ideally positioned beneath the telephone, or where it is visible from the telephone on each side of the crossing.
Related signs or configuration requirements	

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Identity	PCSBR Diagram 164 variant B (Formerly CC02 B)
Size	W300mm x H200mm
Application requirements	Shall be provided at crossings where telephones are not provided, and users are not required to telephone the signaller for permission to cross.
Positioning requirements	Should be positioned where clearly visible from the Detailed Instruction sign on each side of the crossing.
Related signs or configuration requirements	The relevant telephone number shall be displayed on the sign. The emergency telephone number provided should connect to a location that is continuously staffed (24/7) such as Route Control.

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Identity	PCSBR Diagram 164 variant C (Formerly CC02 C)
Size	W300mm x H200mm
Application requirements	Shall be provided at crossings where telephones are not provided, and users are required to telephone the signaller for permission to cross, and the emergency contact number is the same as the signaller contact number.
Positioning requirements	Should be positioned where clearly visible from the Detailed Instruction sign on each side of the crossing.
Related signs or configuration requirements	The relevant telephone number shall be displayed on the sign.



Identity	PCSBR Diagram 164 variant D (Formerly CC02 D)
Size	W300mm x H200mm
Application requirements	Shall be provided at crossings where telephones are not provided, and users are required to telephone the signaller for permission to cross, and the emergency contact number is different to the signaller contact number.
Positioning requirements	Should be positioned where clearly visible from the Detailed Instruction sign on each side of the crossing.
Related signs or configuration requirements	The relevant telephone number shall be displayed on the sign. The emergency telephone number provided should connect to a location that is continuously staffed (24/7) such as Route Control.

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4.2 Supplementary signs



Identity	TSRGD Diagram 787 (IS574c)
Size	W90mm x H230mm
Application requirements	Shall be provided with fixed telephones that are intended for use by the level crossing user.
Positioning requirements	Shall be provided on the front and both sides of every telephone, where it can be seen by the user, or if the telephone does not allow, then on the front of the telephone and on bot sides of a supplementary plate.
Related signs or configuration requirements	

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Identity	Anti-trespass sign
Size	W700mm x H400mm W350mm x H200mm W175mm x H100mm
Application requirements	May be provided where required to deter trespass.
Positioning requirements	Should be positioned where it does not conflict with, or appear more prominent than, other signage permitting the use of a level crossing. These should not be positioned on access gates or mounted on the post which host the detailed instructions sign. Ideally these should be positioned inside the infrastructure boundary fence facing towards users adjacent to the level crossing surface.
Related signs or configuration requirements	The smaller size variants are normally preferred to avoid appearing too prominent in comparison to instruction signage (see clause 3.1.2).

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Identity	RBLI 743
Size	W300mm x H420mm
Application requirements	Shall be provided where CCTV is in operation at a level crossing.
Positioning requirements	At least one sign should be provided on each side of the crossing to make it clear that CCTV is in operation in accordance with the Information Commissioners Guidance. Should be positioned at the boundary fence or other location where it does not distract from the user instructions and safety related signage.
Related signs or configuration requirements	

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5 Signs for station, footpath, bridleway and user worked level crossings

5.1 Common requirements for High Level Instruction Signs, Hybrid Instruction Signs and Detailed Instruction Signs

5.1.1

The appropriate selection of the Detailed Instruction signs is determined by the crossing type and method of operation as described in the application requirements in 5.4.

5.1.2

Where provided the signs shown in Figure 1 to Figure 8 shall be applied in a stacked format on the same supporting structure (post or posts) as illustrated in those figures.

Rationale: these configurations reflect the development and human factors trials of the new signs.

Note: the stacked arrangement shown in Figure 1 to Figure 8 form a larger surface area than historic signage arrangements and therefore present an increased wind load which should be taken into account when providing suitable foundations.

5.2 User worked configurations for High Level Instruction Signs, Hybrid Instruction Signs and Detailed Instruction Signs

5.2.1

At user worked Crossings the following signs shall be provided as shown in Figure 1:

- a Diagram 101 (Warning sign as per section 5.9), and
- a Diagram 110 (Stop sign as per section 5.6), and
- a Detailed Instruction sign as per section 5.8.

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5.2.2

Where a user worked crossing is adjacent to a separate footpath or bridleway crossing, a Hybrid Instruction sign as per section 5.7 shall also be provided as shown in Figure 2.

Rationale: to avoid any confusion to users as to which crossing instructions apply to which access point.

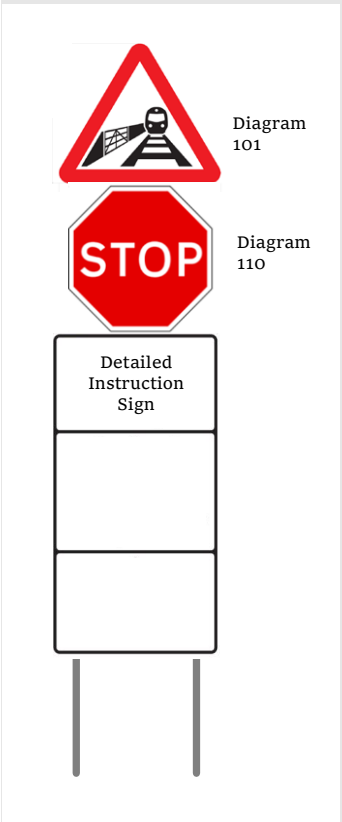


Figure 1 – UWC signage configuration

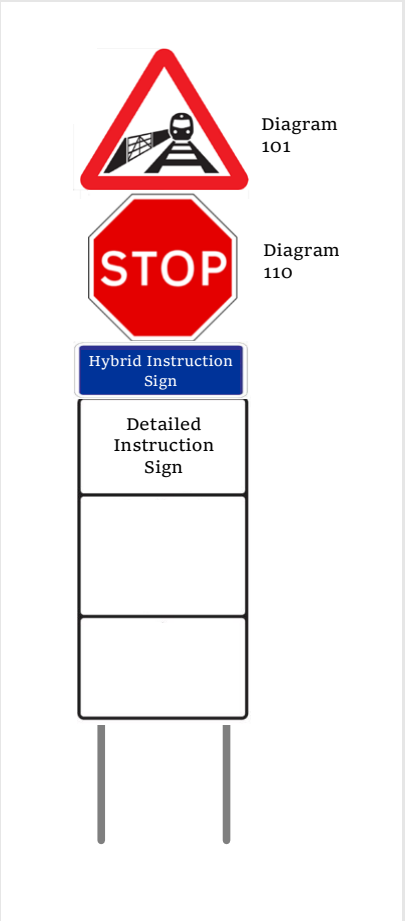


Figure 2 – Hybrid UWC signage configuration

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5.3 Footpath configurations for High Level Instruction Signs, Hybrid Instruction Signs and Detailed Instruction Signs

5.3.1

At footpath crossings a Detailed Instruction sign as per section 5.8 and a High Level Instruction sign as per section 5.6 shall be provided as shown in Figure 3.

5.3.2

Where a footpath crossing is adjacent to a separate user worked crossing, a Hybrid Instruction sign as per section 5.7 shall also be provided as shown in Figure 4.

Rationale: to avoid any confusion to users as to which crossing instructions apply to which access point.

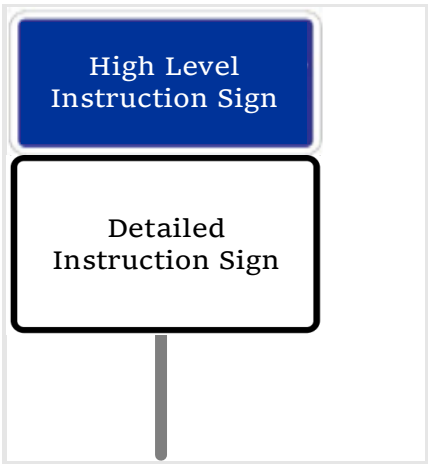


Figure 3 – FP signage configuration

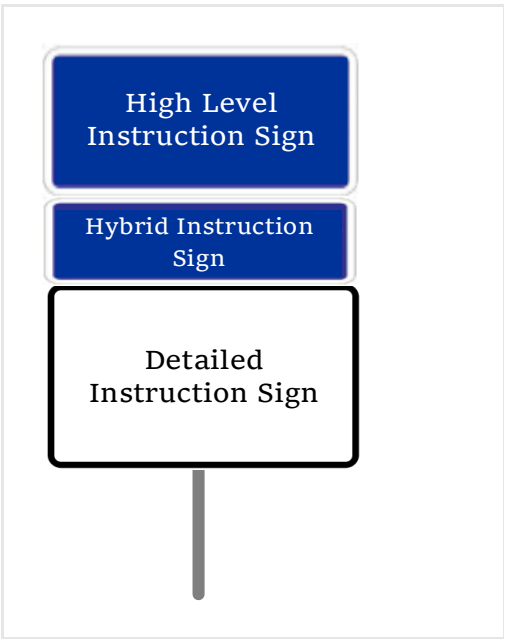


Figure 4 – Hybrid FP signage configuration

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5.4 Bridleway configurations for High Level Instruction Signs, Hybrid Instruction Signs and Detailed Instruction Signs

5.4.1

At bridleway crossings a Detailed Instruction sign as per section 5.8 shall be provided.

5.4.2

At bridleway crossings where the Detailed Instruction sign provides the same set of instructions to all user groups then a High Level Instruction sign as per section 5.6 shall be provided as shown in Figure 5.

5.4.3

At Bridleway crossings where the Detailed Instruction sign provides different instructions to different user groups then a Diagram 110 as per section 5.6 shall be provided instead of a High Level Instruction sign as shown in Figure 6.

Rationale: The High Level Instruction sign is not required in this configuration as the high level instructions for each user group are embedded in the Detailed Instruction sign. The stop instruction applies to all user groups and is provided as a Diagram 110 sign.

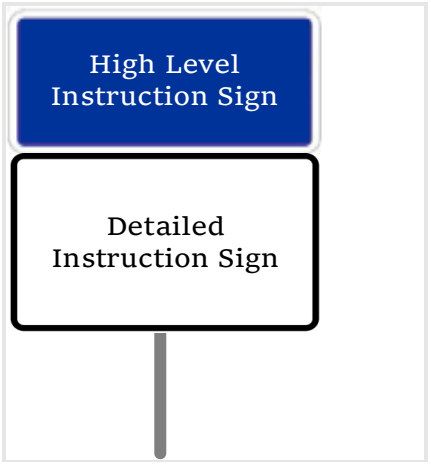


Figure 5 – BW signage configuration with High Level Instruction sign

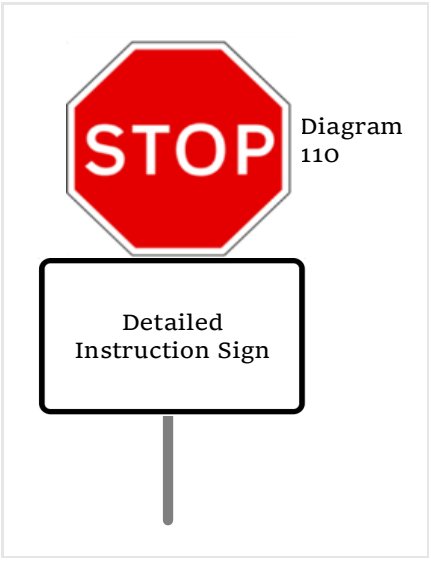


Figure 6 – BW signage configuration with Diagram 110

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5.4.4

Where a bridleway crossing is adjacent to a separate user worked crossing, a Hybrid Instruction sign as per section 5.7 shall also be provided as shown in Figure 7 or Figure 8.

Rationale: to avoid any confusion to users as to which crossing instructions apply to which access point.

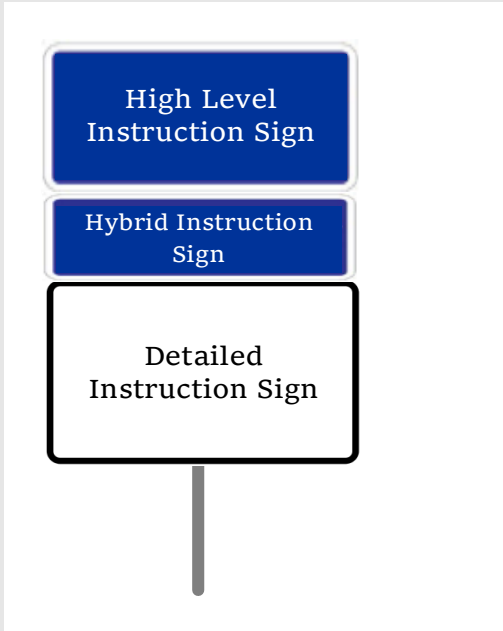


Figure 7 – BW signage configuration with High Level and Hybrid Instruction sign

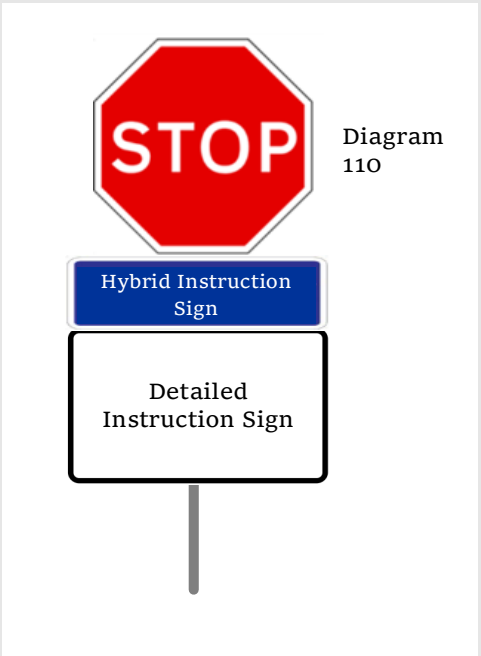


Figure 8 – BW signage configuration with Diagram 110 and Hybrid Instruction Sign

5.5 Positioning

5.5.1

Signage mounted on posts should be 150mm clear of areas likely or intended to be used by pedestrians.

Where this cannot be met then guidance for minimum headroom in the Traffic Signs Manual should be considered.

5.5.2

Where the level crossing requires a user to look for approaching trains then signs shall be positioned so as not to infringe on the required sighting distance.

NOTE: *This includes where signs are affixed to fences or gates, including consideration of gates in the open position and a user's eye position.*

5.5.3

The placing of signs on unlatched gates should be avoided where practicable.

Rationale: the surface area of signs can catch the wind and keep the gate open or shorten the life of the closure mechanism.

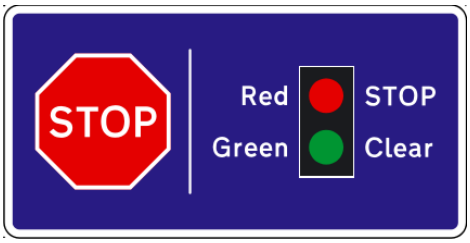
5.6 High Level instruction signs

High level instruction signs convey a simple overview of the user instructions which apply to all users of the crossing.



Identity	PCSBR Diagram 107
Size	W600mm x H300mm
Application requirements	Shall be provided at footpath and bridleway crossings with fixed telephones, where MSLs are not provided, and a user is required to use the telephone for permission to cross.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with sections 5.3 or 5.4.

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Identity	PCSBR Diagram 108
Size	W600mm x H300mm
Application requirements	Shall be provided at footpath and bridleway crossings with MSLs.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with sections 5.3 or 5.4.

	
Identity	PCSBR Diagram 109
Size	W600mm x H300mm
Application requirements	Shall be provided at footpath and bridleway crossings where no telephones or MSLs are provided and a user is required to stop, look and listen for approaching trains before deciding to cross.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with sections 5.3 or 5.4.

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Identity	PCSBR Diagram 110
Size	W500mm x H500mm
Application requirements	Provided in accordance with sections 5.2 or 5.4.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing.
Related signs or configuration requirements	Shall be configured in accordance with sections 5.2 or 5.4. Not to be confused with TSRGD Diagram 601.1 which is a different size.

5.7 Hybrid Instruction Signs

Hybrid instruction signs direct the user to the appropriate detailed instructions for the element of the crossing system which they need to use. They are provided at crossings where some elements of the user instructions differ depending on the type of user.



Identity	PCSBR Diagram 111
Size	W600mm x H100mm
Application requirements	Shall be provided at a user worked crossing with gates adjacent to a separate footpath or bridleway crossing.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing.
Related signs or configuration requirements	Shall be configured in accordance with section 5.2.



Identity	PCSBR Diagram 112
Size	W600mm x H100mm
Application requirements	Shall be provided at a user worked crossing with lifting barriers adjacent to a separate footpath or bridleway crossing.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing.
Related signs or configuration requirements	Shall be configured in accordance with section 5.2.

	
Identity	PCSBR Diagram 113
Size	W600mm x H100mm
Application requirements	Shall be provided at a footpath crossing with gates adjacent to a separate user worked crossing.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing.
Related signs or configuration requirements	Shall be configured in accordance with section 5.3.

	
Identity	PCSBR Diagram 114
Size	W600mm x H100mm
Application requirements	Shall be provided at a footpath crossing with stiles adjacent to a separate user worked crossing.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing.
Related signs or configuration requirements	Shall be configured in accordance with section 5.3.



Identity	PCSBR Diagram 115
Size	W600mm x H100mm
Application requirements	Shall be provided at a bridleway crossing adjacent to a separate user worked crossing.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing.
Related signs or configuration requirements	Shall be configured in accordance with section 5.4.

5.8 Detailed Instruction signs

Detailed instruction signs provide instructions for all users of a level crossing. Where different instructions apply to different user groups, each set of instructions is shown in a separate section of the sign and accompanied by pictograms indicating the user groups to which those instructions are applicable.

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5.8.1 Associated with a vehicle gate/barrier



Identity	PCSBR Diagram 120
Size	W600mm x H1275mm
Application requirements	Shall be provided at a user worked crossing with no telephones, no MSLs or POGO. Applicable to crossings with or without a separate footpath or bridleway crossing. Asset policy and requirements in NR/L2/XNG/30020/R01 should be considered when selecting this sign.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.2. The relevant telephone number shall be displayed on the sign.

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Identity	PCSBR Diagram 121
Size	W600mm X H900mm
Application requirements	Shall be provided at a user worked crossing with POGO (no telephones and no MSLs). Applicable to crossings with or without a separate footpath or bridleway crossing.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.2. The relevant telephone number shall be displayed on the sign.

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Identity	PCSBR Diagram 122
Size	W600m x H935mm
Application requirements	Shall be provided at a user worked crossing with fixed telephones. Applicable to crossings with or without a separate footpath or bridleway crossing.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.2.

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Identity	PCSBR Diagram 123
Size	W600mm x H1010mm
Application requirements	Shall be provided at a user worked crossing with fixed telephones and POGO. Applicable to crossings with or without a separate footpath or bridleway crossing. This sign shall be provided where equestrian users are always required to telephone for permission to cross.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.2.

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Identity	PCSBR Diagram 124
Size	W600mm x H1010mm
Application requirements	Shall be provided at a user worked crossing with fixed telephones and POGO. Applicable to crossings with or without a separate footpath or bridleway crossing. This sign shall be provided where there is no requirement for equestrian users to telephone for permission to cross.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.2.

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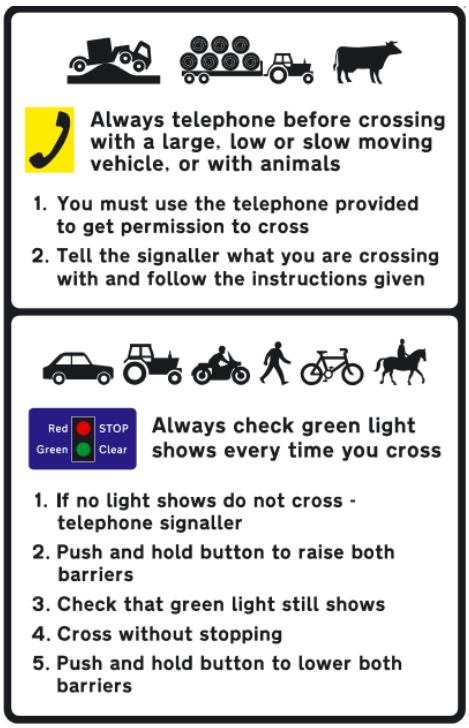
Identity	PCSBR Diagram 125
Size	W600mm x H1330mm
Application requirements	Shall be provided at a user worked crossing with fixed telephones and MSLs. Applicable to crossings with or without a separate footpath or bridleway crossing.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.2.

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Identity	PCSBR Diagram 126
Size	W600mm x H865mm
Application requirements	Shall be provided at a user worked crossing with fixed telephones, MSLs and POGO. Applicable to crossings with or without a separate footpath or bridleway crossing.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.2.

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Identity	PCSBR Diagram 127
Size	W600mm x H935mm
Application requirements	Shall be provided at a user worked crossing with fixed telephones, MSLs and lifting barriers operated by a push button. Applicable to crossings with or without a separate footpath or bridleway crossing.
Positioning requirements	Shall be positioned facing users on approach to the vehicle gates. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.2.

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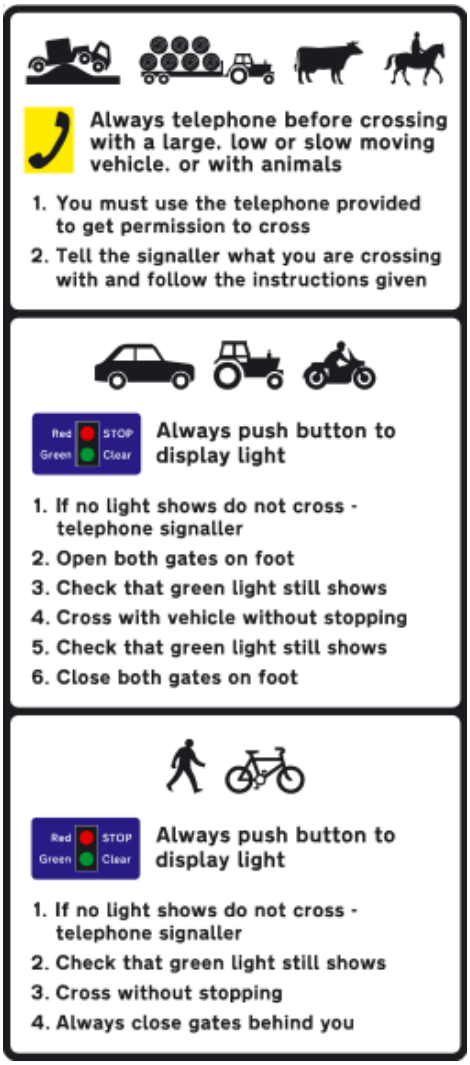
Identity	PCSBR Diagram 128
Size	W600mm x H880mm
Application requirements	Shall be provided at a user worked crossing with fixed telephones, MSLs and lifting barriers operated by a manual pump handle. Applicable to crossings with or without a separate footpath or bridleway crossing.
Positioning requirements	Shall be positioned facing users on approach to the vehicle gates. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.2.

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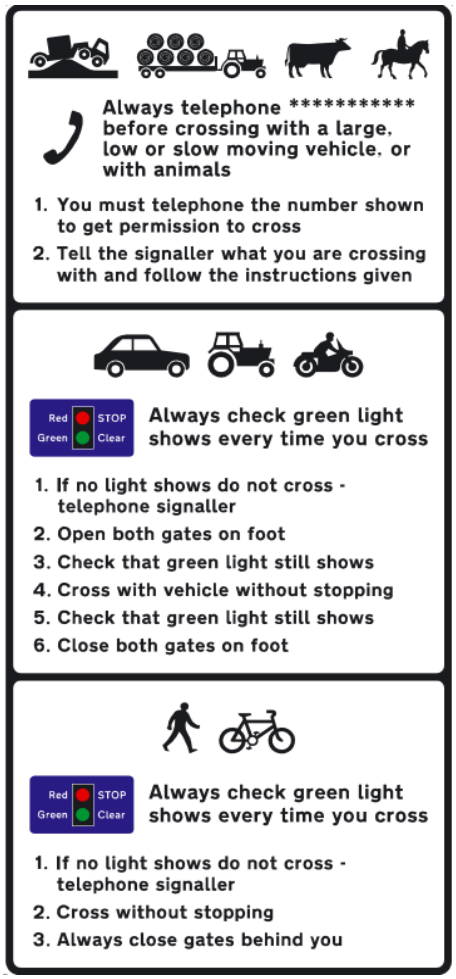
Identity	PCSBR Diagram 129
Size	W600mm x H880mm
Application requirements	Shall be provided at a user worked crossing with fixed telephones, MSLs and lifting barriers operated by a key. Applicable to crossings with or without a separate footpath or bridleway crossing.
Positioning requirements	Shall be positioned facing users on approach to the vehicle gates. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.2.

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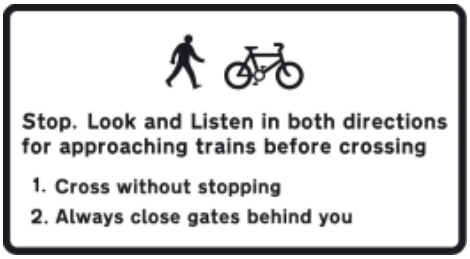
Identity	PCSBR Diagram 130
Size	W600mm x H1365mm
Application requirements	Shall be provided at a user worked crossing with fixed telephones and MSLs on-demand. Applicable to crossings with or without a separate footpath or bridleway crossing.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.2.

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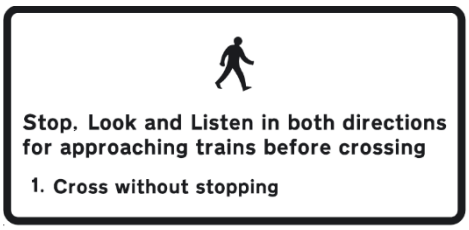
Identity	PCSBR Diagram 140
Size	W600mm x H1345mm
Application requirements	Shall be provided at a user worked crossing with MSLs, and the crossing has no telephones. Applicable to crossings with or without a separate footpath or bridleway crossing. Asset policy and requirements in NR/L2/XNG/30020/R01 should be considered when selecting this sign.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.2. The relevant telephone number shall be displayed on the sign.

5.8.2 Associated with footpath access



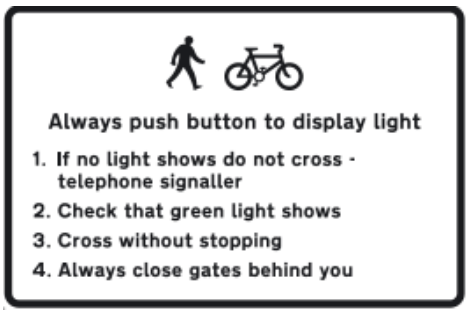
Identity	PCSBR Diagram 131
Size	W600mm x H325mm
Application requirements	Shall be provided at a footpath crossing where gates are provided and the normal method of working is for users to stop, look and listen before crossing.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.3.

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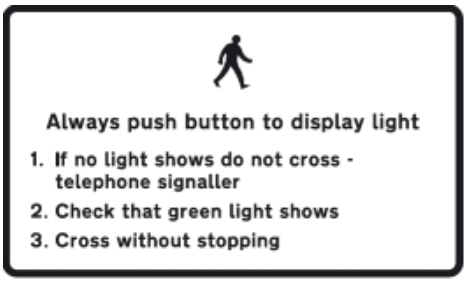


Identity	PCSBR Diagram 132
Size	W600mm x H285mm
Application requirements	Shall be provided at a footpath crossing where stiles are provided or at a station footpath crossing without gates and the normal method of working is for users to stop, look and listen before crossing.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.3.

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Identity	PCSBR Diagram 137
Size	W600mm x H395mm
Application requirements	Shall be provided at a footpath crossing with MSLs on-demand and where gates are provided.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.3.



Identity	PCSBR Diagram 138
Size	W600mm x H355mm
Application requirements	Shall be provided at a footpath crossing with MSLs on-demand and where stiles are provided.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.3.

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Identity	PCSBR Diagram 142
Size	W600mm x H355mm
Application requirements	Shall be provided at a footpath crossing with MSLs and gates and where users are required to telephone for permission to cross if no light shows.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.3.

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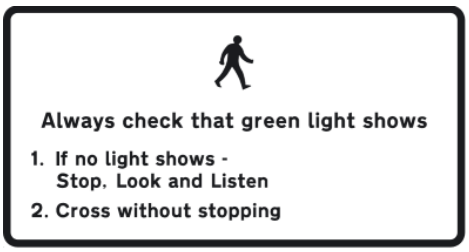
Identity	PCSBR Diagram 143
Size	W600mm x H320mm
Application requirements	Shall be provided at a footpath crossing with MSLs and stiles or at a station footpath crossing without gates and where users are required to telephone for permission to cross if no light shows.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.3.

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Identity	PCSBR Diagram 144
Size	W600mm x H355mm
Application requirements	Shall be provided at a footpath crossing with MSLs and gates and where a user is required to stop, look and listen if no light shows.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.3.

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Identity	PCSBR Diagram 145
Size	W600mm x H315mm
Application requirements	Shall be provided at a footpath crossing with MSLs and stiles and at a station footpath crossing without gates where a user is required to stop, look and listen if no light shows.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.3.

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Identity	PCSBR Diagram 147
Size	W600mm x H520mm
Application requirements	Shall be provided at a footpath crossing with fixed telephones and gates where all users are required to telephone for permission to cross.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.3.

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5.8.3 Associated with bridleway access



Identity	PCSBR Diagram 134
Size	W600mm x H320mm
Application requirements	Shall be provided at a bridleway crossing where the normal method of working is for users to stop, look and listen before crossing.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.4.

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Identity	PCSBR Diagram 135
Size	W600mm x H895mm
Application requirements	Shall be provided at a bridleway crossing with fixed telephones and the normal method of working is for equestrian users to telephone for permission to cross.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.4.

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Identity	PCSBR Diagram 136
Size	W600mm x H935mm
Application requirements	Shall be provided at a bridleway crossing with fixed telephones and MSLs and the normal method of working is for equestrian users to telephone for permission to cross.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.4.

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Identity	PCSBR Diagram 139
Size	W600mm x H395mm
Application requirements	Shall be provided at a bridleway crossing with MSLs on-demand.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.4.

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Identity	PCSBR Diagram 141
Size	W600mm x H355mm
Application requirements	Shall be provided at a bridleway crossing with MSLs and users are required to telephone for permission to cross if no light shows.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.4.



Identity	PCSBR Diagram 146
Size	W600mm x H355mm
Application requirements	Shall be provided at a bridleway crossing with MSLs and where a user is required to stop, look and listen if no light shows.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.4.

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Identity	PCSBR Diagram 148
Size	W600mm x H520mm
Application requirements	Shall be provided at a bridleway crossing with fixed telephones and gates where all users are required to telephone for permission to cross.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15 metres on approach to the crossing. Shall be positioned in relation to the decision point as detailed in NR/L2/SIG/30020/R03.
Related signs or configuration requirements	Shall be configured in accordance with section 5.4.

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5.9 Warning signs



Identity	PCSBR Diagram 101
Size	W600mm x H530mm
Application requirements	Shall be provided at user worked level crossings.
Positioning requirements	Shall be positioned facing vehicle users on approach to the crossing.
Related signs or configuration requirements	Shall be configured in accordance with section 5.2.



Identity	TSRGD Diagram 770
Size	As per TSRGD
Application requirements	Shall be applied at public road crossings in accordance with TSRGD. Should be provided at user worked crossings as an advance warning sign on public road approaches.
Positioning requirements	Should be positioned in accordance with the Traffic Signs Manual Chapter 4.
Related signs or configuration requirements	



Identity	TSRGD Diagram 779
Size	As per TSRGD
Application requirements	Shall be applied at public road crossings in accordance with TSRGD. Shall be provided at user worked level crossings where overhead lines are present.
Positioning requirements	Should be positioned at or near to the access, facing vehicle users on approach to the crossing. Should be visible at 15 metres on approach to the crossing.
Related signs or configuration requirements	Shall be accompanied by a legend indicating the safe height in accordance with TSRGD.

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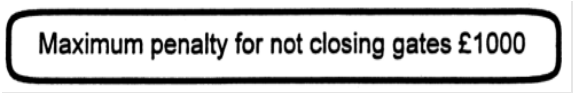
A B

Identity	PCSBR Diagram 102
Size	W525mm x H875mm
Application requirements	The appropriate variant shall be provided at level crossings where there is overhead electrification or live rails.
Positioning requirements	Should be positioned at or near to the access, facing non-vehicle users on approach to the crossing. Should be visible at 15 metres on approach to the crossing.
Related signs or configuration requirements	



Identity	PCSBR Diagram 103
Size	W610mm X H200mm
Application requirements	May be provided where there are regular signalled bi-directional movements at which it is assessed as necessary to remind users that trains can approach from any direction on any line. To avoid sign clutter, this should only be used where the detailed instruction sign does not already inform users to look in both directions.
Positioning requirements	Shall be positioned where readable from the decision point. Should be visible at 15 metres on approach to the crossing.
Related signs or configuration requirements	

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Identity	PCSBR Diagram 104 (formerly Diagram 105)
Size	W460mm x H60mm
Application requirements	May be provided at each user worked crossing.
Positioning requirements	Shall be provided on the back of each user worked vehicular gate, facing inwards towards the crossing.
Related signs or configuration requirements	



Identity	PCSBR Diagram 105 (formerly Diagram 106)
Size	600mm diameter
Application requirements	Shall be provided at all gated vehicle crossings.
Positioning requirements	Should be positioned on the centre of the vehicle gates, facing outwards towards approaching traffic when the gates are closed across the road.
Related signs or configuration requirements	

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A



B

Identity	PCSBR Diagram 106 (formerly Diagram 113)
Size	W700mm x H1000mm
Application requirements	Shall be provided at a user worked crossing that is accessed via a steep gradient and the crossing is used by long wheelbase vehicles, or where there is a risk of over-hanging loads coming into contact with the over-head electrification. The variant with a telephone number provided (variant A) shall be used where a fixed telephone is not provided.
Positioning requirements	Should be positioned at or near to the access, facing vehicle users on approach to the crossing. Should be visible at 15 metres on approach to the crossing.
Related signs or configuration requirements	Should be positioned beneath a TSRGD Diagram 779 and the associated legend indicating the safe height. The relevant telephone number shall be displayed on the sign where a fixed telephone is not provided.

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Identity	Safe height legend for PCSBR Diagram 106 and TSRGD Diagram 779
Size	Size may vary.
Application requirements	Shall be provided with a PCSBR Diagram 106 and TSRGD Diagram 779.
Positioning requirements	Refer to PCSBR Diagram 106 and TSRGD Diagram 779.
Related signs or configuration requirements	Shall be positioned beneath the associated TSRGD Diagram 779. Should be visible at 15 metres on approach to the crossing. Refer to the Traffic Signs Manual for details of the safe height and for information on the appropriate variant to use.

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Identity	RIS-0733-CCS AK203 (Whistle board)
Size	750mm diameter
Application requirements	May be provided to mitigate deficient sighting where appropriate at user worked, footpath and bridleway level crossings where users are required to stop, look and listen. Refer to Level Crossing Guidance Document LCG 05.
Positioning requirements	Should be positioned no more than 400 metres trackside from the level crossing. Refer to Level Crossing Guidance Document LCG 05.
Related signs or configuration requirements	PCSBR Diagram 162



Identity	PCSBR Diagram 162
Size	W300mm x H420mm
Application requirements	Shall be provided at all crossings where a RIS-0733-CCS AK203 (whistle board) is provided for approaching trains.
Positioning requirements	Should be positioned where clearly visible from the Detailed Instruction sign on each side of the crossing when the sign refers to Stop, Look, Listen. Should be visible at 15 metres on approach to the crossing.
Related signs or configuration requirements	RIS-0733-CCS AK203 (Whistle board)

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5.10 Supplementary instruction signs



Identity	PCSBR Diagram 117
Size	W300mm x H420mm
Application requirements	Shall be provided where the public are not permitted to use the level crossing, such as at barrow crossings.
Positioning requirements	Shall be positioned facing users on approach to the crossing. Should be visible at 15m on approach to the crossing.
Related signs or configuration requirements	



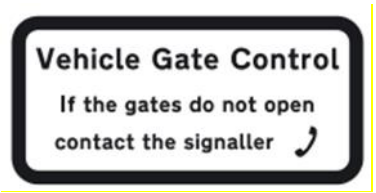
Identity	PCSBR Diagram 118 (formerly Diagram 104)
Size	W300mm x H380mm
Application requirements	May be provided at user worked crossing with lifting barriers operated by a manual pump handle where the Detailed Instruction sign is not clearly visible from the manual pump handle.
Positioning requirements	Shall be provided next to the pump handle
Related signs or configuration requirements	

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Shut and fasten gate	
Identity	PCSBR Diagram 119 (formerly Diagram 115)
Size	W325mm x H60mm
Application requirements	May be provided as part of risk-based decision making where users are required to close the gate.
Positioning requirements	Should be positioned on the front of the gate where visible to a user operating the gate.
Related signs or configuration requirements	

	
Identity	PCSBR Diagram 149
Size	W250mm x H120mm
Application requirements	Shall be provided at crossings fitted with POGO and fixed telephones.
Positioning requirements	Shall be positioned next to POGO operating buttons.
Related signs or configuration requirements	

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Identity	PCSBR Diagram 150
Size	W250mm x H120mm
Application requirements	Shall be provided at crossings fitted with POGO (no telephones).
Positioning requirements	Shall be positioned next to POGO operating buttons.
Related signs or configuration requirements	

	
Identity	PCSBR Diagram 151
Size	W90mm x H90mm
Application requirements	Shall be provided at crossings fitted with POGO.
Positioning requirements	Shall be positioned next to the manual release.
Related signs or configuration requirements	

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Identity	PCSBR Diagram 152
Size	W90mm x H120mm
Application requirements	Shall be provided at crossings fitted with POGO.
Positioning requirements	Shall be positioned next to the emergency release button.
Related signs or configuration requirements	



Identity	PCSBR Diagram 153
Size	W300mm x H420mm
Application requirements	Shall be provided at crossings fitted with POGO.
Positioning requirements	Shall be positioned facing on the outside face of the gate.
Related signs or configuration requirements	

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Identity	PCSBR Diagram 154
Size	W595mm x H175mm
Application requirements	Shall be provided at crossings with overhead line equipment where horse riders are required to dismount before using the crossing.
Positioning requirements	Shall be positioned facing users on approach to the crossing and close to the access point. Should be visible at 15m on approach to the crossing.
Related signs or configuration requirements	Where horse riders are required to dismount due to overhead electrification then this sign should be positioned beneath a PCSBR Diagram 102.

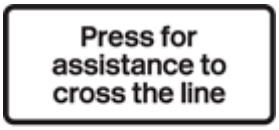
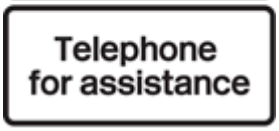
	
Identity	PCSBR Diagram 155
Size	W600mm x H200mm
Application requirements	Shall be provided at private user worked crossings where no public rights of access exist over the crossing.
Positioning requirements	Shall be positioned facing users on approach to the crossing and close to the access point or on the vehicle gate. Should be visible at 15m on approach to the crossing.
Related signs or configuration requirements	

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Identity	PCSBR Diagram 156
Size	W600mm x H200mm
Application requirements	Shall be provided at all footpath, bridleway, and user worked level crossings on greater than single track railway, including those equipped with miniature stop lights. The sign applies to each element of a hybrid crossing (where two separate access points are provided for vehicles and pedestrian users).
Positioning requirements	Shall be positioned facing users on each approach to the crossing and where reasonably practicable, be conspicuous from the position at which a user may be expected to wait for an approaching train. At hybrid level crossings, site specific risk based decisions shall be undertaken in support of sign positioning to determine if one sign on each side of the crossings can be used for both vehicular and pedestrian users, or if two signs are required on each side of the crossing for each access point.
Related signs or configuration requirements	

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 Variant A  Variant B	
Identity	PCSBR Diagram 157
Size	W675mm x H300mm
Application requirements	The appropriate variant may be provided where users are required to request assistance before using the level crossing, such as station barrow crossings.
Positioning requirements	Shall be positioned facing users on approach to the crossing and from where the associated telephone or method of requesting assistance is visible. Should be visible at 15 metres on approach to the crossing.
Related signs or configuration requirements	

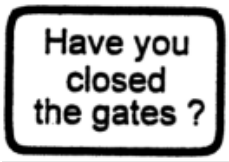
	
Identity	TSRGD Diagram 966
Size	Refer to TSRGD Diagram 966
Application requirements	Shall be provided at footpath and bridleway level crossings where the bicycle symbol is shown on the Detailed Instruction sign.
Positioning requirements	Shall be positioned facing users on approach to the crossing and close to the access point. Should be visible at 15m on approach to the crossing.
Related signs or configuration requirements	

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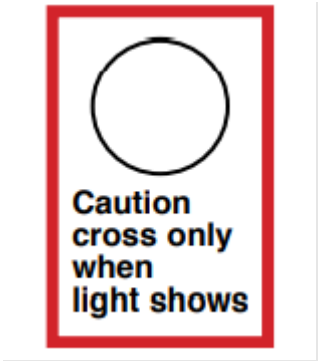
Identity	PCSBR Diagram 163
Size	W300mm x H100mm
Application requirements	Should be provided as part of risk-based decision making where dogs off leads is a known risk (where it is known that dog walkers regularly use the level crossing, or incidents with dogs have occurred).
Positioning requirements	Shall be positioned facing users on approach to the crossing and close to the access point.
Related signs or configuration requirements	

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Identity	PCSBR Diagram 165 (formerly Diagram 111)
Size	W450mm x H275mm
Application requirements	Shall be provided at user worked crossings with gates.
Positioning requirements	Shall be positioned after each exit, facing towards users as they exit the crossing. Should ideally be positioned to allow the longest expected vehicle to stop at the sign and be clear of the gate swing.
Related signs or configuration requirements	

	
Identity	PCSBR Diagram 166 (formerly diagram 112)
Size	W400mm x H375mm
Application requirements	Shall be provided at user worked crossings with lifting barriers.
Positioning requirements	Shall be positioned facing inwards towards the crossing after each exit. Should ideally be positioned to allow the longest expected vehicle to stop at the sign and be clear of the barriers.
Related signs or configuration requirements	

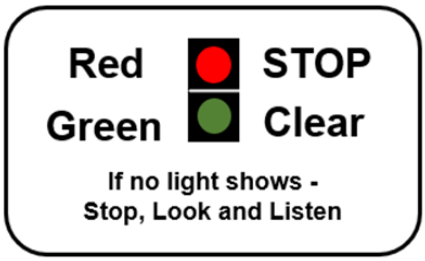
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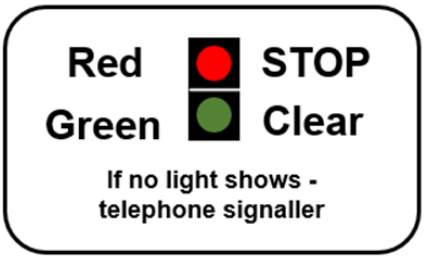
Identity	PCSBR Diagram 116
Size	W400mm x H600mm
Application requirements	Shall be provided at white light staff crossings.
Positioning requirements	Shall be positioned facing users on approach and where visible from the crossing surface. Should be visible at 15 metres on approach to the crossing.
Related signs or configuration requirements	

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5.11 Miniature Stop lights

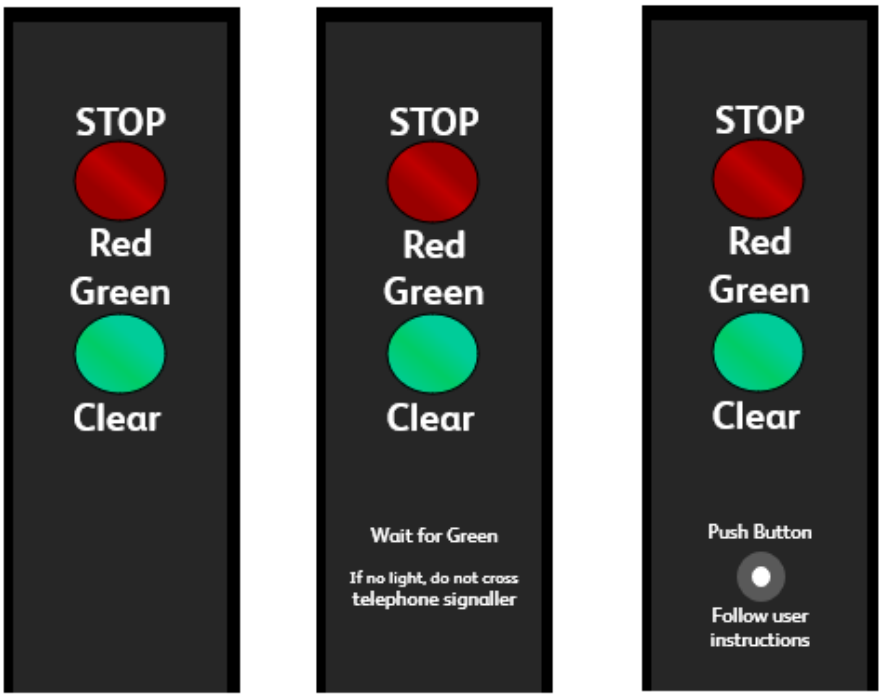


Identity	PCSBR Diagram 158 (supersedes former Diagram 108)
Size	W650mm x H520mm
Application requirements	May be applied at user worked, footpath and bridleway level crossings where users are required to stop, look and listen if no light shows.
Positioning requirements	Refer to module R03.
Related signs or configuration requirements	Lenses may be fitted with cages, masks or louvres, in accordance with the product acceptance requirements, where light pollution or the risk of vandalism is a concern.



Identity	PCSBR Diagram 159 (supersedes former Diagram 107)
Size	W650mm x H520mm
Application requirements	May be applied at user worked, footpath and bridleway level crossings where users are required to telephone if no light shows.
Positioning requirements	Refer to module R03.
Related signs or configuration requirements	Lenses may be fitted with cages, masks or louvres, in accordance with the product acceptance requirements, where light pollution or the risk of vandalism is a concern.

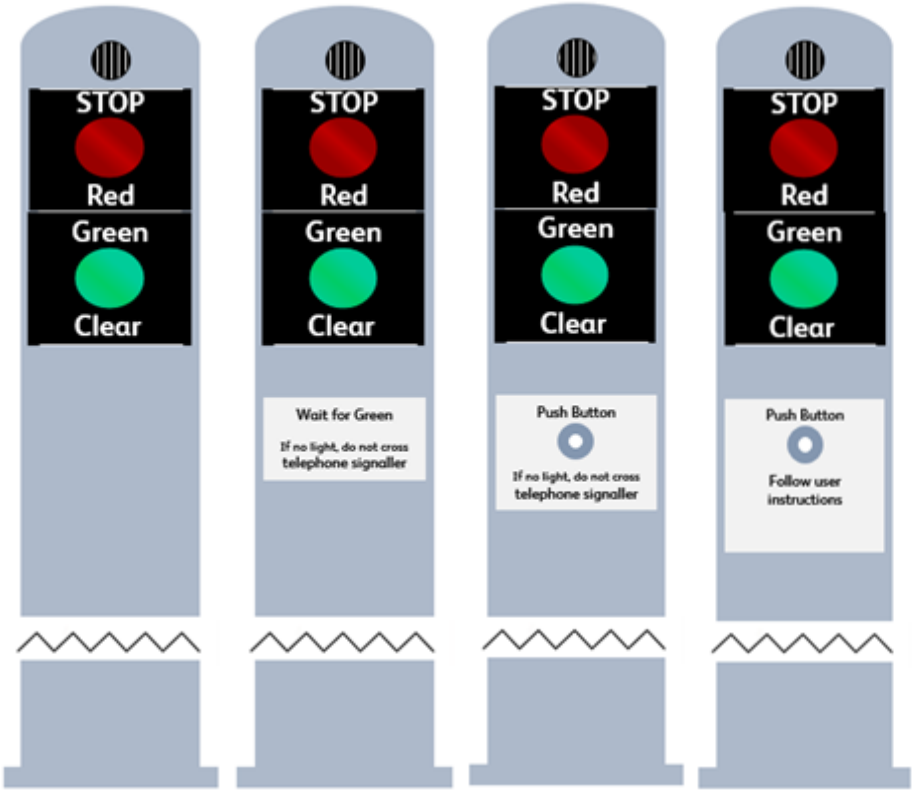
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Variant A Variant B Variant C

Identity	PCSBR Diagram 160
Size	W275mm x H1055mm
Application requirements	May be applied at user worked crossings, footpath and bridleway level crossings. Variant A is provided for use where the fallback procedure if no light shows is to Stop, Look and Listen. Variant B is provided for use where the fallback procedure if no light shows is to telephone the signaller. Variant C is provided for use with an on-demand system.
Positioning requirements	Refer to module R03.
Related signs or configuration requirements	The appropriate variant of message beneath the green light shall be selected to suit the method of operation and user instructions. Lenses may be fitted with cages, masks or louvres, in accordance with the product acceptance requirements, where light pollution or the risk of vandalism is a concern.

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Date:	02 March 2024
Compliance date:	01 April 2024



Variant A Variant B Variant C Variant D

Identity	PCSBR Diagram 161
Size	W375mm x H2050mm
Application requirements	May be applied at user worked crossings, footpath and bridleway level crossings. Variant A is provided for use where the fallback procedure if no light shows is to Stop, Look and Listen. Variant B is provided for use where the fallback procedure if no light shows is to telephone the signaller. Variant C is prescribed in PCSBR however variant D is the preferred option for any new works. Variant D is provided for use with an on-demand system.
Positioning requirements	Refer to module R03.
Related signs or configuration requirements	The appropriate variant of message beneath the green light shall be selected to suit the method of operation and user instructions. Lenses may be fitted with cages, masks or louvres, in accordance with the product acceptance requirements, where light pollution or the risk of vandalism is a concern.

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WHISTLE BOARD EFFECTIVENESS AND PROVISION

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1 Purpose

This document provides guidance on factors to take into account when verifying the effectiveness of existing whistle boards and when deciding on compliant positioning. It also applies when deciding on the provision and positioning of new whistle boards in determining their appropriateness and effectiveness.

2 Scope

This guidance is intended for all people who are responsible for managing risk at level crossing assets.

3 Introduction

Whistle boards can provide mitigation for insufficient sighting at level crossings. Their effectiveness is limited by a number of factors including:

- usage during the night time quiet period;
- ambient environmental noise;
- physical features e.g. cuttings, line curvature, number of whistle boarded level crossings in the same area;
- train usage – high numbers of trains or high line speeds;
- human error – crossing user being distracted, unfamiliar with the meaning of audible warnings or hearing impaired;
- human error – train driver omitting to sound the train horn; or
- crossing users – misuse profile, user demographics.

Because of limiting factors, whistle boards are not able to completely eliminate the risks resulting from insufficient sighting. In all cases the first consideration is to achieve sufficient warning time without the use of whistle boards.

It is important that limiting factors form the basis of decision making on the suitability of whistle boards as appropriate risk controls. Decision making should test that the expected safety benefit is or will be realised.

4 Provision of whistle boards

4.1 General

Whistle boards should conform to the guidance in Railway Safety Publication 7 (RSP 7), *Level crossings: A guide for managers, designers and operators.* The guidance is summarised as follows:

- Whistle boards should only be used on lines with infrequent train services and low line speeds. They should not be positioned further than 400m from the level crossing.
- Whistle boards should only be used to provide a warning to pedestrian or equestrian users. They should not be used as a mitigation for vehicular users.

- Take account of:
    1. the speed of sound (330 m/s) and the speed of the train;
    2. the possibility that train drivers will not sound the horn, especially during the night time quiet period (2300 – 0700);
    3. the possibility that train horns might be inaudible at the level crossing because of ambient noise; and
    4. the possible impact of train horn noise on nearby residents.
- Where whistle boards are provided, they are normally required on all railway approaches.
- The time between a user first hearing a horn and the arrival of the train at the level crossing should be the same for trains travelling in either direction.

4.2 Use of whistle boards

Only use new whistle boards when you have exhausted all other options to manage risk. If a decision is reached within the Route to install new whistle boards, the central team within HQ should be consulted before progressing to design and installation.

NOTE The central team will review the acceptance criteria and decision making.

Where whistle boards currently exist, it is important to re-evaluate their effectiveness. This should be done as part of every risk assessment.

Before deciding if whistle boards are an appropriate risk control, always use structured expert judgement to evaluate the benefits of other safety improvements first. Table 1 shows a range of risk control solutions.

Risk control	Solution
Eliminate risk	Close the level crossing. Divert rights of way via existing bridge / underpass or a protected level crossing Provide new bridge or underpass
Reduce crossing time to achieve compliant sighting	Provide decking where none is currently provided
	Straighten decking where the level crossing is at a skew
Improve sighting to achieve compliance	Heavy de-vegetation – remove all vegetation that obstructs sight lines Lighter de-vegetation – maintain sight lines
	Remove, reposition or replace lineside obstructions, e.g. location cabinets, 'Stop, look, listen' signs, GSM-R equipment (or similar), buffer stops
Provide user based solution	Install MSLs or approved similar product
Reduce line speed to achieve compliant sighting	Implement speed restriction

Table 1 – Risk control solutions

NOTE Table 1 is not exhaustive.

4.3 Evaluating the effectiveness and appropriateness of whistle boards

Evaluate whistle board effectiveness as an integral part of every risk assessment or when considering new whistle board installations. Apply structured expert judgement, local knowledge and the following guidance to decide if whistle boards are an appropriate option:

a) Research the level crossing environment using smart sources of information such as Google Maps, GI Portal, Omni-surveyor to identify any local factors that could impact on whistle board effectiveness.

b) Identify if any of the rolling stock that pass over the level crossing are fitted with quiet train horns.

c) Undertake a site visit at the level crossing
   - Plan the visit to take place when you are likely to see train(s).

d) Evaluate the extent of night time usage.

e) Assess user misuse or indiscipline history.

f) Time the audible warning where whistle boards are provided:
   - Listen for a train horn; time the warning given to crossing users;
   - If you know of existing sources of ambient noise, e.g. local factory, time your visit accordingly; and
   - Take account of the speed/type of train and station proximity.

g) Check that the whistle boards are positioned in accordance with the measurements recorded in ALCRM.

h) Listen for ambient noise that can affect a user hearing the train horn e.g. motorways, airports, factories:
   - Be aware of the impacts of wind, weather or land usage issues that might not be present while on site;
   - Understand the impact of these on the audibility of the train horn; and
   - The train horn should be clearly audible for a range of users.

i) Interview crossing user(s), can they always hear the train horn.

j) Understand the impact of noise from the train horn on the local community.

k) Assess the most suitable position for whistle boards:
   - Use a whistle board calculator that takes account of the speed of sound and allow a 20% margin of safety; and
   - Use the most up to date line speed/traverse information.

l) Document your findings on the level crossing file. Summarise them within the risk assessment whenever possible.

4.4 Deciding on the positioning of whistle boards

If new whistle boards are identified as an appropriate risk control or they are an existing control; it is essential that they provide an effective audible warning for all crossing users.

As a minimum the whistle boards should provide a warning greater than the traverse time of the crossing. Ideally, to provide a margin of safety, whistle boards should provide 20% more warning than the traverse time. Whistle boards should not be placed more than 400m from the level crossing.

Research has shown that providing excessive warning of approaching trains can encourage users to take unnecessary risks at level crossings. Take this into account when deciding where to position whistle boards, particularly where trains regularly stop, e.g. at stations or junctions on the approach to the level crossing.

Whistle boards are most effective where they provide a consistent warning time for crossing users. This provides a consistent user experience and prevents confusion over the arrival time of approaching trains. Therefore make sure that warning time is broadly uniform on each approach to the level crossing. This might include identifying any speed differentials which, if excessive, would reduce the effectiveness of whistle boards.

Positioning of line side equipment and Train Drivers' duties and responsibilities might restrict the possible location of whistle boards. Involving the Signal Sighting Engineer in the decision making process when installing or repositioning whistle boards is therefore essential.

The positioning of whistle boards might also be influenced by the location of residential dwellings near the line. Part of the process to install or reposition whistle boards involves consultation with the local council and local residents.

5 Actions as a result of evaluation

5.1 Where whistle boards are not an effective risk control

The evaluation might identify that whistle boards are not an effective risk control, e.g. where ambient noise prevents users from clearly hearing the train horn. Where whistle boards are not effective, provide other means for mitigating the risk of insufficient sighting. This might include the risk control solutions shown in Table 1.

5.2 Where whistle boards are identified as an effective risk control

Where existing whistle boards have been assessed as providing sufficient warning of approaching trains no further action needs to be taken until their evaluation at the next risk assessment.

Where a whistle board needs to be installed or moved to provide sufficient warning:

a) Undertake a site visit with relevant stakeholders, e.g. Local Authority, ORR Inspector, off-track, to reach agreement on their provision and position;

b) Arrange for signal sighting to be undertaken;

c) Arrange for whistle boards to be added to or re-drawn on existing signalling scheme plan(s);

d) Arrange for publication in the WON so that Train Drivers are aware of the change;

e) For private level crossings with authorised users, notify the AU of the change in the method of operation; and

f) For level crossings with a public right of way, evaluate the need to deploy temporary signage advising of the change in the method of operation. A mail drop to local residents or other localised information campaign might also be appropriate.

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APPLYING RISK REDUCTION BENEFITS IN ALCRM WHEN MODELLING SAFETY ENHANCEMENTS

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Annex A – List of risk reduction benefits for safety enhancements not automatically calculated by ALCRM 7

1 Purpose

This document provides guidance for risk assessors in determining the risk reduction safety benefits which may be applied in the All Level Crossing Risk Model (ALCRM) for safety enhancements which cannot automatically be quantified within its calculations.

2 Scope

This document is intended for Level Crossing Managers and any other persons trained and competent in the use of ALCRM and responsible for the safe management and risk assessment of level crossings. It should be used when modelling the benefits of risk reduction measures within ALCRM, termed optioneering, for safety enhancements which are not automatically calculated and apportioned safety benefits by the risk model.

3 Background

3.1 ALCRM

ALCRM is the risk modelling support tool used within the wider level crossing risk management process. Primarily a quantitative risk model, it enables:

- risk quantification of each asset via a hierarchical risk scoring mechanism and a Fatalities and Weight Injuries (FWI) numerical assessment;
- a comparison of risks between assets and asset types;
- facilitates the modelling of risk control options to target identified risks and hazards; (subject to below); and
- informs decision making regarding a prioritised response to safety expenditure, locally, tactically and strategically.

3.2 Calculated output and the benefit modelling capability of ALCRM

ALCRMs calculations are underpinned by actual accident and incident data through the incorporation of RSSBs precursor based Safety Risk Model (SRM) within its architecture.

The risk model is core type driven and with the support of SRM is able to assign and apportion baseline risk levels for each level crossing type. During the assessment process, the local factors applicable to each level crossing uplift the base values to be more representative of site specific risks and characteristics.

Although a competent risk model, ALCRM is not as successful at quantifying the benefits of general risk reduction measures as it is at calculating the benefits of core type changes, enhancements and upgrades. This is because the core type risks and hazards are predetermined knowns within SRM and feature within the algorithms of the risk model, as defined above. Other risk reduction measures are likely to offer greater subjectivity and risk reduction benefits and in some cases these are unknown or currently unsubstantiated; as is the case of new technology such as audible warning devices. Equally, quantifying the benefits where one or more risk reduction measures are combined is not as simple or straightforward as adding together the perceived benefits of both measures. The process is complex and requires the structured judgement of the assessor, in conjunction with risk modelling capability, to better accurately reflect the improvements or benefits.

3.3 Modelling of risk reduction measures in ALCRM and associated challenges

Currently the optioneering and risk modelling of non-core type changes, i.e. other risk reduction measures, requires:

- tweaks to the content of the recorded risk assessment detail; *e.g. de-vegetation works could generate revised sighting lines which can be modelled by altering the available and current measurements to simulate the benefits;* and / or
- application of risk reduction percentage benefits applied to the target user group, or groups, which benefit from the safety enhancement proposed or evaluated.

The latter approach is commonplace for calculating such risk reduction measures as: Power Operated Gate Openers, Red Light Safety Equipment, Demarcation of the Danger Zone and Audible and Spoken Warnings. The complexity centres on the achievable benefit to be applied and the sometimes differing views across the business of what is considered to be representative of these risk reduction values. Furthermore, it is difficult to target the specific precursors when applying overall risk reduction percentages to a user group or groups. An example would be extended sun hoods at 50w halogen road traffic light signals; the percentage entered would reduce 'all risk' associated with the targeted group or groups, when in actuality, the extended hoods would only target specific precursors such as sun glare.

The application of the structured expert judgement of the Level Crossing Managers in this process has always been encouraged and their views continue to remain instrumental in the decision to afford benefits. This is evidenced by site specifics and local factors which can influence the effectiveness of risk controls between locations. This guidance has been developed to improve consistency in assigning risk reduction benefits and at the same time, utilise local knowledge and expert judgement to scale how the risk reduction measure(s) translate to safety benefits on a site by site basis.

3.4 Guidance development

The RSSBs SRM was chosen as the foundation and basis by which to generate benefit risk reduction values which target the precursors of safety enhancements. This approach is considered to offer a number of advantages which include:

- SRM is a tangible and robust source of risk profiling which has credibility established within its core within the industry
- SRM data is the foundation which underpins the baseline risk in ALCRM and forms part of the calculations of the risk model
- Both SRM and ALCRM represents risk in FWI, meaning that a strong synergy between the two already exists
- The precursors of SRM align with the risk control measures considered, resulting in a robust and targeted approach to determining benefits with greater accuracy
- There is greater credibility, and a heightened defensible position, in our use of structured judgement when assigning risk reduction benefits

3.4.1 The process (overview)

Each risk reduction measure / safety enhancement is assessed in SRM by:

- Identifying the applicable core crossing types relevant to the measure considered
- Undertaking a line by line review of the precursors applicable to each core type to identify those relevant to the measure considered
- Weighting relevant precursors with a forecasted benefit using structured judgement to enable a minimum and capped benefit range to be determined
- Totalling up the revised precursor FWI for each applicable core crossing type and subtracting this from the current SRM values to identify the overall risk reduction benefit attributable to each measure; both at an upper and lower level

4 Applying the risk reduction benefits in ALCRM

4.1 How to apply the percentage reductions to an assessment

The percentage risk reduction benefits shown in Annex 'A' should be applied to modelled options when calculating the effectiveness of the safety enhancements listed. The safety enhancements and risk reduction benefits are segmented by core crossing types.

Assessors should select from the list:

- The safety enhancement proposed;
- The applicable crossing type from those shown in relation to the measure proposed;
- The benefit applicable to the asset from the range supplied (see 4.2 and 4.3).

The safety benefit applies to the total risk as shown in the illustration below; Figure 1.

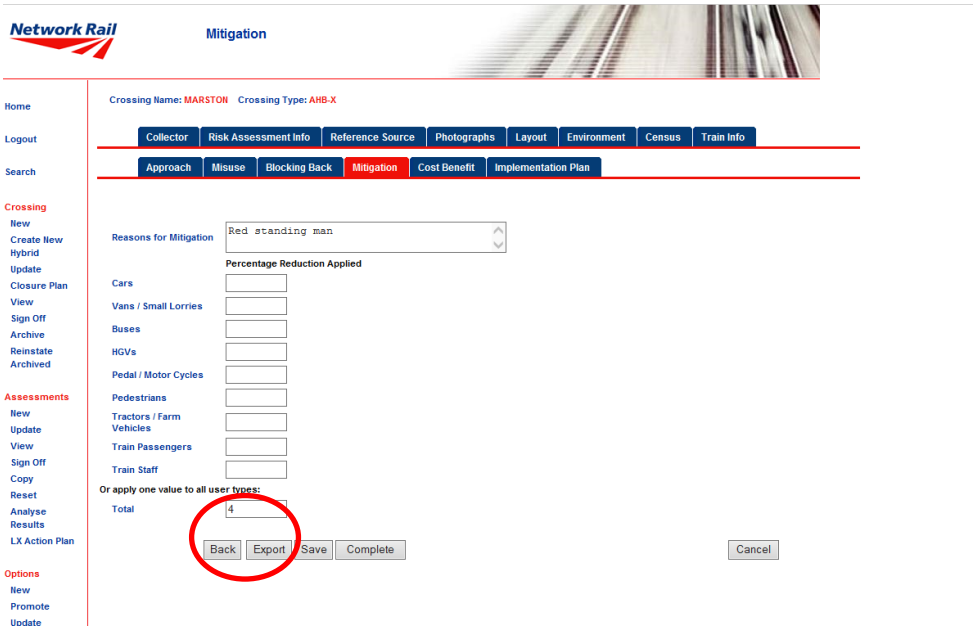


Figure 1

If a crossing type is not listed, the safety enhancement is not considered to offer a benefit for that core type or it has yet to be evaluated (see 5).

In some cases, the evaluated benefit has been quantified as significantly small. Consequently, no ALCRM modelled benefit has been allocated. In these cases, the core crossing types are shown with a '0' risk reduction benefit for completeness and for information only.

4.2 Deciding on the appropriate percentage reduction for an individual safety enhancement

The safety enhancements listed are shown with an upper and a lower risk reduction benefit, or range, in which effectiveness is measured. The upper level is capped, meaning that the percentage reduction for a safety enhancement modelled in isolation should not exceed the value shown.

Assessors should not default to the greatest risk reduction benefit.

Where the benefit range is extensive, structured judgement should be applied when determining the appropriate level of risk reduction expected. In deciding where in the range the appropriate benefit resides, in respect to the asset at which the safety enhancement is proposed, consider:

- If the mitigation is likely to achieve its maximum risk reduction benefit based on the local specifics, risks and hazards associated with the crossing, the accident and incident history and other known precursors, and accounting for usage, the user groups and / or vehicle types, including usage patterns
- Could the safety enhancement unintentionally import risk or fail to achieve the expected risk reduction levels due to conflicting or ambiguous messages. *For example, in the case of non-interlocked POGO at MSL equipped crossings – ergonomic positioning of gate openers and de-cluttered and optimised signage would be necessary to achieve the highest benefit; assuming conformance is expected / foreseen*
- If there are known human factors, ergonomic and / or environmental factors which might reduce or improve overall success of the proposed safety enhancement and thus support where within the benefit range effectiveness resides

4.3 Deciding on the appropriate percentage reduction when safety enhancements are combined

If more than one safety enhancement is proposed, the combined effectiveness of the scheme should not always be determined by simply adding together the risk reduction benefits of each individual measure. It might be more appropriate to apply structured judgement to determine the appropriate benefit of the overall scheme.

This is especially important the more complex the package of safety enhancements; for example, to safeguard against inflated benefit and to avoid double counting of effective risk reduction where risk mitigations target the same precursors.

4.4 Recording structured judgement decision making

The Narrative Risk Assessment (NRA) should be used to record decision making about risk reduction benefits attributed to safety enhancements.

This is especially important for complex schemes were multiple safety measures are packaged and a collective benefit for the suite of risk control solutions is applied in the risk model.

In documenting decision making, record the rationale and supporting information used to determine the benefit reduction assigned.

5 Continual development

Level crossing guidance document LCG 14 will be subject to continual improvement and development. This will include:

- Evolution to incorporate additional safety enhancement schemes*
- Periodical review of benefit risk reduction ranges*
- Alignment with later iterations of SRM

**Frequency in accordance with business requirements*

Annex A – List of risk reduction benefits for safety enhancements not automatically calculated by ALCRM

Percentage risk reduction applies to Total Risk; see 4.1 of this document

Safety Enhancement	Crossing Type	Lower Benefit %	Upper Benefit %	Decision Making (not exhaustive) In determining the success level of the measure, consider such things as:
Audible warning device – supplement to existing whistle boards e.g. COVTEC	FP (non-MSL)	7	18	Crossing environment: Does ambient noise mask the audible warning from whistle boards and will the audible warning device dramatically improve train warning at the location? Night time quiet period: Is there known NTQP usage at the crossing which is currently not mitigated for and which the spoken warning would offer a risk reduction benefit? In conjunction to this decision making, consider how many trains run during the NTQP window. Crossing users: Are a high proportion of users likely to be headphone wearing and/or vulnerable members of society who might be distracted (e.g. large groups of school children) which might limit the risk reduction success of the mitigation measure or does the opposite apply? On-train equipment: Do trains with quieter warning horns operate on the line of route for which the audible warning device will afford mitigation?
Power Operated Gate Openers (POGO) – *not interlocked*	UWC+MSL	-1	4	MSL crossings: There is a risk that non-interlocked gates could conflict with the message of MSL equipment; e.g. opening gates / red light exhibited. This could result in user confusion or falsely generate greater trust in the gates than the lights. It is vital that gate openers are positioned optimally and signage is de-cluttered and ergonomically positioned. Human factors advice should be sought and engagement with AU undertaken. Environment and crossing usage: Consider relations with the AU, incident history and the type of asset; e.g. field to field or occupation crossing. Are users likely to be fully briefed on crossing operation i.e. AUs and AU invitees/employees or is there a greater likelihood of visitors and less familiar users? Vehicle types: Think about the types of vehicles and farm machinery which use the crossing and the position of driving cabs and vehicle entry points – e.g. left side door on a tractor. Ergonomic layout design and signage needed to achieve higher level benefits.
	UWC	6	9	
	UWC+T	0	11	

Safety Enhancement	Crossing Type	Lower Benefit %	Upper Benefit %	Decision Making (not exhaustive) In determining the success level of the measure, consider such things as:
Red Light Safety Equipment (RLSE)	ABCL	1	2	Road approaches, speed and layout: Consider if the layout of the road influences vehicle speed and reduces driver recovery time; thus increasing likelihood of wilful violations. For example, is the road long and straight? Is the road a 'short cut' or link route on a commuter belt with both regular and irregular users which might influence the effectiveness of the RLSE? Camera conspicuity and advance warning signage: Will the camera equipment and signage be significantly visible on approach to the crossing to have a marked impact on driver behaviour? Event history: Where incident history indicates red light violations and/or barrier weaving to be a known problem, use this intelligence to inform structured judgement regarding likelihood of success in determining risk reduction benefits.
	AHB	7	14	
	AOCL	22	38	
	AOCL+B	1	2	
	CCTV	0	2	
	MCB-OD	1	3	
	MCB	1	2	
	MCG	0	1	
Demarcation of danger zone, (yellow decking), optimised and de-cluttered signage at decision point	FP	2	6	Crossing users/usage levels: Think about the types of users and the frequency at which the crossing is used. For example, does the crossing have a high level of vulnerable users which are perhaps more susceptible to distraction (school children, dog walkers etc…) which might reduce the effectiveness of the yellow warning? Could the sheer number of users lead to a shepherding mentality which could impact on the success of the measure? Crossing type/location/train service: Consider how the asset type and its location might influence user behaviour. Does the level crossing provide a community link to amenities and dwellings? Is it located at a station and/or is the crossing part of a school walking route etc...? Is the train service infrequent, which could result in user complacency? Media awareness: In determining mitigation success (aside of improved asset conspicuity), user appreciation of the 'danger zone' is an important factor. Widespread deployment of yellow decking would need to be accompanied by a national media campaign; although local initiatives such as temporary signage, user engagement, letter drops and local radio could support localised cases.
	FP+MSL	1	3	
	SBC	2	5	
	SPC+MSL	0	1	
	SPC	0	2	
	UWC+MSL	0	2	
	UWC	0	2	
	UWC+T	1	3	

Safety Enhancement	Crossing Type	Lower Benefit %	Upper Benefit %	Decision Making (not exhaustive) In determining the success level of the measure, consider such things as:
LED RTLs – *sun glare affected sites*	ABCL	0	2	Impact of sun glare: Consider if LED RTLs manage the effects of sun glare or if residual risk remains. Road approaches, speed, layout and topography: Think about the approach speeds of vehicles and the road approaches; are they likely to offer drivers surplus time to react to the LED RTLs (and barrier equipment where provided) or are they such that sun glare risk is still likely to remain a problem.
	AHB	0	2	
	AOCL	0	2	
	AOCL+B	0	2	
	CCTV, MCB, MCB-OD, MCG	0	0	
LED RTLs – *sun glare not an issue*	ABCL	0	1	
	AHB	0	1	
	AOCL	0	1	
	AOCL+B	0	1	
	CCTV, MCB, MCB-OD, MCG	0	0	
Yellow box markings	ABCL	0	1	Compliance: If blocking back remains significantly problematic, consider whether the box marking is actually offering a risk reduction benefit as a stand-alone measure. ***Note:*** *Don't forget to review the Level Crossing Order and, if appropriate, make arrangements to update it.*
	AHB	0	1	
	AOCL	0	1	
	AOCL+B	0	1	

Safety Enhancement	Crossing Type	Lower Benefit %	Upper Benefit %	Decision Making (not exhaustive) In determining the success level of the measure, consider such things as:
Extended hoods for 50w halogen RTLs – *sun glare affected sites*	ABCL	0	1	Impact of sun glare: Consider if the extended hoods are able to fully manage the effects of sun glare or if residual risk remains. Road approaches, speed, layout and topography: Think about the approach speeds of vehicles and the road approaches; are they likely to offer drivers surplus time to react to the RTLs and/or barrier equipment (where provided) or are the extended hoods likely to have limited benefit as a stand-alone option.
	AHB	0	1	
	AOCL	0	1	
	AOCL+B	0	1	
	CCTV, MCB, MCB-OD, MCG	0	0	
Second train coming spoken warning – half barrier & AOCL	ABCL	1	5	Crossing users: Applying local knowledge about the different types of crossing users, which might include commuters, groups of children etc.., think about how successful the measure will be in safeguarding against both inadvertent and wilful acts. Crossing usage/environment: Based on the number of users, both vehicular and pedestrian, and accounting for the location in which the asset resides (e.g. proximity to station); is there sufficient expectation that the measure, combined with societal expectation to adhere to warning lights, alarms and barriers, will offer a significant benefit? Ambient noise: Consider the volume and effectiveness of the audible alarm by evaluating the ambient noise from the surroundings, stationary road traffic and passing trains. Train pattern: In determining the risk reduction benefit, consideration should also be given to the frequency, booked, known or expected, at which trains pass in close proximity to each other.
	AHB	1	2	
	AOCL	0	1	
	AOCL+B	1	5	
Second train coming spoken warning (as part of MSL enhancement)	FP+MSL	2	6	As above - SFAIR
	SPC+MSL	5	15	
	UWC+MSL	1	4	

Safety Enhancement	Crossing Type	Lower Benefit %	Upper Benefit %	Decision Making (not exhaustive) In determining the success level of the measure, consider such things as:
Anti-slip surface (passive estate)	FP	1	2	Crossing users/usage: Using census intelligence, consider the user groups and their frailty/susceptibility to slip, trip and fall risk. Crossing type/location: Consider the location of the asset and how this could influence user behaviour; for example, is the crossing at a station where there might be an increased likelihood that users will hurry their traverse? Alternatively, is the crossing positioned within a rural location with less frequent and more controlled traverses? Inclement weather/environment: Take account of the impact of typical weather conditions and the crossing environment which might include field to field approaches for example. How might weather and topography affect overall effectiveness of the anti-slip?
	FP+MSL	1	2	
	SBC	1	2	
	SPC+MSL	1	2	
	SPC	1	2	
	UWC+MSL	1	2	
	UWC	1	2	
	UWC+T	1	2	
Pedestrian stop signal (public road crossings) 	ABCL	0	1	User behaviour: Applying local knowledge about the varying user groups which use the crossing (e.g. commuters), think about how successful the measure will be in deterring wilful violations. Crossing usage/environment: Based on the number of users, both vehicular and pedestrian, and accounting for the location in which the asset resides (e.g. proximity to station, high street); is there sufficient expectation that the measure, combined with societal expectation to adhere to warning lights, alarms and barriers, will offer a significant benefit or will light usage limit its success?
	AHB	1	4	
	AOCL	0	1	
	AOCL+B	1	2	
	CCTV	0	3	
	MCB	0	2	
	MCB-OD	0	3	
	MCB	0	2	
	MCG	0	1	

Safety Enhancement	Crossing Type	Lower Benefit %	Upper Benefit %	**Decision Making** (not exhaustive) In determining the success level of the measure, consider such things as:
Stud lighting in crossing deck (passive estate - pedestrian walkway only)	FP	0	4	Ambient lighting (FP): Account for ambient lighting in your decision to assign risk reduction benefits. An unlit or poorly lit approach and crossing will likely benefit the greatest from stud lighting on the crossing surface. Darkness usage (FP): Utilising census intelligence and local knowledge, consider the level of darkness usage at the crossing and the proportional use compared to that of daylight hours. Inclement weather/environment (FP): Take account of adverse weather conditions in your decision making; for example, areas prone to bouts of fog, sea mist or driving rain. Also consider the lighting benefit at locations which are partially shielded from light by vegetation for example.
	FP+MSL	0	1	
	SBC, SPC+MSL, SPC	0	0	
	UWC+MSL	0	1	
	UWC	0	1	
	UWC+T	0	1	

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CENSUS GOOD PRACTICE

KNOW YOUR CROSSING, ITS USERS AND ITS ENVIRONMENT

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1 Purpose

This document provides guidance in the undertaking of census data collection as part of the risk assessment of level crossing safety.

2 Scope

It is intended for Level Crossing Managers and any other competent person responsible for the safe management and risk assessment of level crossings. It may also be used by other Network Rail personnel undertaking census data collection in support of level crossing risk assessments.

It should be applied to all risk assessments of level crossings and used to support decision making regarding the best means to obtain accurate census data, so far as is reasonably practicable.

3 The importance of accurate census

Census is one of the underpinning elements of a level crossing risk assessment. It is one of the most important influences on the level of risk. Therefore it is vital that a robust census is undertaken to achieve a meaningful and accurate risk assessment.

In general, the window of opportunity for an accident at a level crossing increases with a high level of crossing usage and a high number of train movements. Therefore, the number of level crossing users and the equivalent train moment, or trains per day, is a key influence of risk.

Census is also a key input of the All Level Crossing Risk Model [ALCRM] and forms a critical component in the calculated levels of risk. Underestimating or overestimating census can have a varying effect on the modelled output, which could influence decisions taken by the assessor or the business to manage safety. For example, crossings with a high individual risk and a low collective risk can be sensitive to changes in census data. In this circumstance, ALCRM might evaluate a crossing with weak census data to represent a slightly lower risk than that of the true risk profile. This could result in a lack of intelligence about the level of risk at an asset, leading to inaccuracies in strategic planning to manage safety.

In addition to the volume of use, it is also vital to understand the user demographic; i.e. the types of users who make up the census number, so as to identify hazards which may be prevalent to one or more user segments and to better target risk mitigation in these areas. Accurate census will therefore help us to better identify, and encapsulate within risk assessments, the types and vulnerabilities of users of our assets.

4 Census types, selection criteria and enhancing census accuracy

4.1 General

In general it may be considered that the greater the duration of census data collection activity, the greater the opportunity to improve the accuracy of the census.

This is an especially pertinent point in relation to determining pedestrian usage and in the undertaking of all census at footpath, bridleway and private user worked crossings.

In some cases due to seasonal fluctuations or peaks and troughs in use, it might be necessary to undertake more than one census data collection activity so as to broaden understanding regarding daily/annual usage. ALCRM can accommodate two censuses for this purpose.

In addition to physical on-site data collection techniques, an array of smart-sources of intelligence should also be used to support understanding; see 8. In determining robust knowledge of crossing usage, it might be necessary to use multiple combinations of on-site activities and other research based intelligence to accrue the complete picture.

4.2 Types of census and the preferred approach

Non-estimated census

The quick census is the least favoured of the non-estimate types due to its limited capacity to accurately reflect usage levels or identify all segments of users. A quick census can be susceptible to the time and date of the visit, omitting or overly including, peaks, troughs, seasonal activity and omitting weekend, evening and variances in use. It has, however, been independently endorsed as a broadly capable method for counting vehicles at public road crossings.

Where-ever possible, nine day census or greater (extended census) should be the census of choice for assessors. It offers strength in accuracy and endorses the company's approach to continuous improvement by enhancing the accuracy of risk assessments and improving level crossing safety.

Estimated census

Estimated census should ideally be a last resort unless using forecast figures to determine the impact of a proposed housing development for example.

If it is to be used as the primary source, every effort should be made to determine usage levels using actual census data collection activity and prior to adopting it as the chosen census gathering technique. As with all census gathering activity, but especially so when using estimated structured judgement, all available intelligent sources should be used to aid decision making; see 5.7 and 8.

Table 1 details the types of census which can be used within the risk assessment process. It also highlights some of the benefits and dis-benefits associated with each census type.

Type	When to use	When not to use	Strengths and weaknesses	Census owner
Nine day or extended duration	**In all cases where a census is required**. Applicable to all asset types and all assessments from steady-state to project work where it is a prerequisite; e.g. re-signalling schemes and level crossing (LC) renewals. Serves to enhance understanding of LC usage and user behaviour, e.g. identifying night time usage, confirming vulnerable or irregular users, identifying peaks and troughs etc.		**Strengths:** High level of accuracy leading to improved modelling of risk in ALCRM and informed decision making for the assessor and the business. **Weaknesses:** Internal resources needed to deploy equipment and analyse footage. Availability of mobile or fixed camera technology within the Route. Cost to employ external supplier to undertake census. Availability of external supplier to meet business timescales/deadlines. ***TIP:*** *Camera equipment should be directed away from train movements to prevent spurious activations and to improve analysis time and resource.*	Level Crossing Manager or External Supplier
24 hours	To support understanding of LC usage and where time-constraints prevent use of nine day or extended duration census. *NOTE: At lesser used crossings a longer census will be more appropriate to identify consistent usage and afford greater accuracy*.	Not appropriate for understanding weekend, consistent night time usage or where there are known or suspected peaks and troughs in usage which are likely to extend beyond 24 hours.	**Strengths:** A better level of accuracy than a quick census and might otherwise improve the accuracy of the risk assessment. Could be undertaken as a physical count by Network Rail staff in the absence of technology, for expediency or to facilitate engagement with users. **Weaknesses:** Does not provide the same level of accuracy as a nine day census. Resource implications for Network Rail staff to deploy technology or undertake a physical count. Cost and availability of external supplier to meet business timescales/deadlines.	Level Crossing Manager, Operations Staff or External Supplier

Type	When to use		When not to use	Strengths and weaknesses	Census owner
Quick 30 to 60 minutes, Mon to Fri between 9:30 - 16:30	Weakest of all non-estimated census types. Primarily best suited for vehicle count at public roads.		Not appropriate where pedestrian usage is inconsistent throughout the day or unlikely to be witnessed during the census, but is known or suspected, or where vehicle use at private crossings is subject to variation. Where an assessor is seeking to identify weekend use, night time usage or where there are known or suspected peaks and troughs in usage, including seasonal variations.	**Strengths:** Speed of data collection and assessor can observe and interact with users of the crossing. **Weaknesses:** Less accurate than a nine day, extended census or a 24 hour census. Only provides a snapshot of use observed during the site visit. Provides poor understanding of crossing user demographic.	Level Crossing Manager
Estimate at passive crossings including 24 hour usage	**No crossing usage witnessed**	Authorised user data available where: a). Authorised user provides written daily usage information; or b). Interview conducted with authorised user(s).	Not advisable if an authorised user is known or suspected to provide inaccurate information, e.g. over estimates usage due to fear of asset closure.	**Strengths:** Reasonable expectation of accuracy. **Weaknesses:** Reliability of data provided by user. Behavioural patterns not observed.	Level Crossing Manager
		Interview conducted with crossing user.	Not advisable if it is established or suspected that the user is unfamiliar with the crossing.	**Strengths:** Data potentially more accurate than relying on visual appearance of crossing. **Weaknesses:** Individual's opinion might not reflect accurate usage. User demographic might be misinformed.	
		Based on appearance of crossing.	Not advisable when trying to establish sleeping dog status, or where suspected or known high usage exists. Census needs to be supported with further evidence and is better suited to a nine day count.	**Strengths:** Allows use of structured expert judgement. **Weaknesses:** Relies on structured expert judgement being accurate. Unsupported by factual information. Behavioural patterns not observed.	

Type	When to use	When not to use	Strengths and weaknesses	Census owner
Estimate at protected crossings	For modelling the effect of changes in predicted traffic flows, e.g. impact of new developments on LC usage.	Not advisable where real time data is available.	**Strengths:** Allows forecast changes to be modelled in ALCRM enabling the impact to safety to be understood. This intelligence enables, for example, informed decision making in regard to planning application approvals or objections. **Weaknesses:** Relies on projected data to be accurate, as far as is reasonably practicable.	Level Crossing Manager

Table 1 Types of census

4.3 Selecting an appropriate census type

Although a nine day or extended census offers the greater opportunity for accuracy and is therefore the preferred choice, as detailed in 4.2, there are many factors that might ultimately influence the type of census chosen by an assessor.

Decisions that influence census selection might include matters such as the availability of source material; such as mobile camera technology, the readiness of resources required to undertake the census or deploy equipment, the confidence in existing intelligence or the financial outlay if using third party suppliers or procuring technology. In addition there are other considerations which can vary between assets and which will influence the requirement. For example:

- Reason for census – e.g. the census is required to support a risk assessment at which intelligence is already rich and relatively current, to verify and quantify vulnerable usage or to support a re-signalling or renewal project.
- Peaks and troughs – where usage can vary significantly during the hours of the day and days of the week, a nine day census or longer is more likely to provide a much better picture of crossing use than a quick 30-60 minute census.
- Seasonal variations – where usage varies significantly at different times of the year, e.g. due to holiday periods, leisure attractions or agricultural use, a second census is advised as this will provide better quality data relating to annual usage.
- Weekend peaks – where high weekend usage is suspected e.g. crossing is on a route to a tourist attraction or is used as a leisure walkway, a nine day census or longer will offer a much better picture of crossing use than a quick mid-week or 24 hour census.
- Logistics, practicalities and costs – e.g. an extended census might be needed for a duration of between nine days to several months to substantiate usage or the crossing might be in a remote location.

To illustrate this further, the table below offers examples of how factors may shape decision making. The content of Table 2 is not exhaustive.

Factor	Requirement	Census suitability
Uncertainty over night-time quiet period usage	Need to establish the level of use during the hours when whistle board protection is removed.	Quick census is unsuitable for this purpose as it will not offer a consistent picture or pattern. A nine day census or extended census is needed. Deployment of mobile camera technology or third party supplier required.
School in close proximity to level crossing	Need to better understand behavioural patterns and the volume of crossing usage by vulnerable users. *NOTE: Whilst it is essential to understand the effect the school has on crossing usage, it is also important that a quick census does not focus solely on school arrival and departure times or during a lull in activity during the day.*	A nine day census or extended census offers to the best opportunity to identify trending patterns of use. Deployment of mobile camera technology or third party supplier required. A 24 hour census is better suited for this purpose than a quick census, but is not as robust as a nine day or extended census.
24 hour operational business resides in close proximity to level crossing	Need to understand the impact that shift change or deliveries might have on level crossing safety, e.g. night time quiet period, darkness risk and peaks in usage.	Quick census is unsuitable for this purpose as it will not offer a consistent picture or pattern. A nine day census or extended census offers to the best opportunity to identify trending patterns of use. Deployment of mobile camera technology or third party supplier required. *NOTE: Speaking to local businesses for information on working hours can enhance understanding of business impact on level crossing safety.*

Table 2 Additional census selection factors

5 Good practice regarding census data collection activity

5.1 General

This section contains good practice guidance for assessors when undertaking quick or 24 hour census in-house, in addition it details items to consider when actively recruiting an external supplier to undertake a 24 hour, nine day or extended census.

Section 5 also features guidance on vulnerable users.

5.2 Quick and 24 hour 'manual count' census undertaken by Network Rail staff

If a nine day or extended census cannot be undertaken, it is important that assessors are confident that either a 24 hour or quick census is appropriate to reflect reasoned accuracy for the asset being assessed. Census selection is discussed in 4.

Preparation	**Quick & 24 hour census** ✓ Always review previous censuses to re-familiarise yourself with the user demographic recorded and take cognisance of observations relating to vulnerable users, irregular users, peaks, troughs and seasonal fluctuation. ✓ Also use this information to determine the appropriateness of using a 24 hour or quick census. **Quick census** ✓ Previous census might also offer intelligence to inform decision making when deciding on the best time of day or day of the week to undertake census data collection activity. ✓ Make sure that you source equipment, tools and other items in a timely manner. Such items might include: downloading of electronic forms, iPad (charged), paper collection forms (contingency), pens, compass, range finder, measuring wheel, camera (charged/memory card with capacity) and appropriate clothing aside of corporate PPE; e.g. taking forecast weather conditions into account, the crossing location and the need for personal comfort. ✓ Prepare and obtain necessary SSOWPs to assure your site safety during the visit. **24 hour census** ✓ Agreement with relevant operations staff will be needed if a 24 hour 'manual count' census is considered appropriate. Consideration will need to be given to staff welfare; the ability for this method to provide a robust count and take cognisance of resource implications, so as to justify why this approach is better suited than deploying technology or employing outside parties. ✓ If a 24 hour 'manual count' census is considered appropriate, a template for this purpose should be provided to staff undertaking the task.

On site behaviour	**Site safety and staff welfare is the first priority** ✓ Take the census from a position of safety where the crossing is fully visible. ✓ Do not obstruct user access or distract users during the traverse/within the confines of the crossing. ✓ Park road vehicles appropriately, e.g. do not obstruct signage, crossing equipment or impair safe use of the crossing. ✓ Do not stand where you might obstruct crossing signage or equipment. ✓ If engaging with users to determine a broader understanding of the risk profile: – be approachable, professional and prepared to listen; – be cognisant of the environment and the positions of safety; and – only engage in conversation when it is safe and appropriate to do so
Data collection	✓ Note the start time, date and duration of the activity. ✓ Take cognisance of the type of crossing you are at and the level of concentration that is needed to conduct an accurate census, e.g. are you at a public highway crossing with high traffic moment or are you at a rural passive crossing that is lightly used? ✓ Observe usage: – is it in keeping with the calculated traverse time? – are users operating the crossing safely? – are there a high number of vulnerable and irregular users and how does this translate into applying the 50% safeguard? ✓ It is always useful to engage with users to obtain census information. It might lead to intelligence on risks and hazards that you might be unsighted to. It is often good practice to ask them about user demographics, if they have observed deliberate misuse or safety events and if they have any issues of concern with the asset, e.g. slippery surface, confusion with instructions on safe crossing protocol etc. ✓ Be aware of extreme weather conditions; this might influence the level of use witnessed during the census gathering activity. This can be particularly relevant at footpath or bridleway crossings. For example, very bad weather (gale-force winds, sleet, snow and very cold conditions) might lead to a reduction in the number of crossing users seen and conversely very good weather (heatwave) might result in slightly more users being out-and-about. Whilst both extremes are valid user moment experiences, in terms of quick census they could distort accuracy levels if significant. It is important therefore to consider if the weather conditions might have distorted the accuracy of the census. If appropriate, evaluate the need to revisit the crossing at another time.

Table 3 Quick and 24 hour ‘manual count’ census data gathering

5.3 Identifying vulnerable users

5.3.1 Vulnerable user definition

Vulnerable level crossing users can be defined as people who, when compared with typical users:

- are likely to take an extended time to traverse due to disability or distraction; and/or
- might be at greater risk of harm due to their perception of risk.

5.3.2 Defining vulnerability

There are a number of factors that can result in people being at greater risk when using level crossings. These can include but are not limited to:

- Limitations in mobility (take into account not only the ability to walk, but also the ability to turn their bodies or heads and look for oncoming trains)
- Visual or hearing impairment
- Cognitive ability, e.g. making safety related decisions (very young and elderly people are more likely to make poor decisions on the distance and speed of large moving objects such as trains)
- Being encumbered, e.g. crossing with bags, pushchairs, cycles or dogs (consider if dogs are on or off a lead (including the use of extendable versions), and if owners are in charge of more than one dog; it becomes increasingly harder to control multiple animals)
- Inability to comprehend English, i.e. to read signage and / or speak to Signallers

5.3.3 Types of vulnerable users

Vulnerable users can include, but are not limited to:

- People with physical and/or mental disabilities or other impairments; incl. those using mobility scooters
- Young children; unaccompanied or in groups
- Elderly people
- Dog walkers
- Cyclists, e.g. where known not to dismount and considered ‘at risk’
- People carrying heavy bags or large objects, with pushchairs etc.
- Non-English language speakers, e.g. migrant workers

5.3.4 Identifying vulnerable users by location

The likelihood of a level crossing being used by vulnerable users can be influenced by its proximity to:

- Sheltered housing or care homes; residential and nursing
- Schools
- Stations
- Residential thoroughfares
- Busy high streets
- Parks, play areas, known walking areas
- Fixed local attractions, e.g. beaches, caravan sites

5.3.5 Means of identifying vulnerable users

Crossings that might have vulnerable users can be identified by:

- Observation; census
- Research into the crossing environment using intelligent sources of information
- Interviewing users in nearby businesses, residential dwellings etc.
- Near miss or other reporting of precursor events

Other influencing factors can include:

- Location and/or crossing type, e.g. field to field crossings with stiles are less likely to have a high proportion of vulnerable users than a gated footpath crossing in an urban area
- Condition of the asset which might influence user traverse speed further, e.g. skewed crossing, stepped approaches etc.

5.3.6 Higher than average

5.3.6.1 What is higher than average?

NOTE: The below illustrative example does not offer a ratio of application, nor does it take precedence over structured expert judgement where for example, an assessor considers it an essential requirement to protect a minority user group or single person.

If there is ambiguity or uncertainty then, additional research and/or extended census might be necessary to inform decision making.

Deciding on whether higher than average vulnerable usage is prevalent should always be based on structured expert judgement and assessor's acquired knowledge. Decisions should be supported by all available evidence gathered as part of the risk assessment; taking cognisance of physical on-site observation and

intelligent sources of information. As an illustrative means only, it might be appropriate to consider, if for every five users:

- only one in five is made by a vulnerable user, the 50% safeguard might not typically be applied
- two in five is made by a vulnerable user, it is especially important that a risk based decision is made
- three to five are made by vulnerable users, the 50% safeguard would always be applied

The table below can be used to help decide which groups are considered vulnerable; however, it remains the LCMs final decision to add the 50% safeguard

	Vulnerabilities	When users are not normally considered vulnerable
Physical or mental disability	Users with known or suspected disabilities should always be considered as vulnerable; records should support this	N/A
Children	Easily distracted	Observed to be using the crossing correctly and safely as an individual user
	Subject to peer group pressures	Observed to be using the crossing correctly and safely as part of a group of users
	Low cognitive ability to interpret risk	Older children who may not be considered to be vulnerable users
	Observed to be unaware of or ignoring safe crossing protocols	Observed using the crossing correctly and safely whilst dismounted from a bicycle, scooter or similar
	Very young children most susceptible to all of the above vulnerabilities	
	Unaccompanied	
	Mounted or pushing a bicycle, scooter or similar	

	Vulnerabilities	When users are not normally considered vulnerable
Elderly *Judgement is needed as not all elderly people are slow or less able to use a crossing safely. The elderly are often in less of a hurry and can equally take greater time and care when crossing.*	Observed using walking aids or other obvious signs of mobility impairment	Observed to be using the crossing correctly and safely as an individual user
	Encumbered with shopping trolleys or large heavy bags	Observed to be using the crossing correctly and safely as part of a group of users
	Slower cognitive ability and/or reaction times	Observed to be compensating for sensory loss by checking carefully and moving as quickly as possible
	Using a mobility scooter; risks associated with negotiating decked surface (including width considerations) or getting stuck on the flange-way at skewed crossings	Persons who display physical fitness such as ramblers and leisure walkers
	Mounted or pushing a bicycle	
	Have become complacent and overly familiar with the train timetable and safe crossing protocol	
Dog walkers	Distracted due to: • dogs off leads • multiple dogs on leads • dogs on extendable leads	Observed to be using the crossing correctly and safely whilst keeping dogs on leads and under control
	Users who put themselves in danger to recover dogs off leads who are lineside	
	Type of access, stile/gate, and relative position of safety which may import risk to users who are unduly focusing on their dogs rather than making a safe crossing	
Cyclists	Failing to dismount and cycling across the crossing	Individuals observed dismounted and using the crossing correctly and safely
	Groups observed riding over the crossing together	Observed negotiating the crossing from a position of safety when manoeuvring their bicycle through the access and egress points
	Families on outings with small, young children on bicycles	
	Cyclists with trailers	
	Cycling event routes which attract and encourage crossing use by mounted riders	
	Type of access, stile/gate, and relative position of safety which may import risk to users who are unduly focusing on their bicycles	

5.4 Pedestrian usage at public highway crossings

If undertaking a quick census at public highway crossings, in the absence of the availability of a nine day or extended traffic census, it is good practice to sense-check pedestrian count. Whilst vehicular traffic flow remains 'broadly' consistent, pedestrian moment can be much more volatile and subject to environmental influences. These same environmental factors will also dictate the 'typical' volume of pedestrian use of level crossings; generating peaks and troughs which could be missed by a quick census. For example, if an asset is located in close proximity to residential dwellings and/or community links such as shops or schools, the chances are that the pedestrian footfall is notable; i.e. you would expect to see pedestrian users. If a 30 minute quick census was undertaken mid-morning and resulted in very nominal numbers observed or no pedestrian users witnessed, this might not represent 'typical' pedestrian moment, but could be a rare lull in use. In addition, where users are witnessed, this might not represent the complete user demographic; schoolchildren, students etc. If uncertainty exists, a nine day or extended census might be needed. Utilisation of other intelligent sources, see 7, would be advisable and might also serve to substantiate concerns.

5.5 Nine day, extended or 24 hour census undertaken by external suppliers

There are companies that can be appointed to undertake 24 hour, nine day or extended census gathering activities. Research might be necessary to identify local companies with the capability to do this type of work or if appropriate and economical, national organisations might also be available for this purpose.

Funding for census data collection activity undertaken by external suppliers will need to be considered. Sources of funding for such work might incorporate use of the Route Safety Fund or additionally project funding, for example if census relates to a renewal or enhancement activity, might be available for this purpose.

It might also be necessary to undertake a formal tender process if the cost of work necessitates this. If in doubt, please confirm business protocol requirements.

Instructions to companies undertaking census data collection activities should include requirements for:

a) when the census is to be undertaken and its duration;

b) data to be recorded, e.g. types of users (vulnerability of users: persons encumbered, disabled, unaccompanied children, elderly, dog walkers, headphone wearing, texting etc…), vehicle types (HGV, tractors, buses, cars, vans etc…), and the date/time they are observed;

c) how the data is to be presented, e.g. hourly, daily, mean average per user type and/or hazardous event (e.g. children, elderly, texting, using mobile phone, hood up); and

d) when the data is required by

GRD007 Level Crossing Census Requirements contains further details on this.

5.6 Modelling of nine day or extended census activity

It is recommended that daily usage is recorded by respective user groups so as to enable an average to be taken per group for the census duration. In this way, the 24 hour entry in ALCRM represents the average daily moment per user group as opposed to overestimating or underestimating usage patterns by taking the highest or lowest daily figure witnessed during the census data collection activity.

5.7 Estimated census

As discussed in 4.1, estimated census is likely to be the least accurate of all census types and is the non-preferred approach. In all cases, actual census activity should be undertaken whenever practicable.

Where estimate census is used, it should only be applied to very lightly used crossings, such as field to field crossings in rural areas or private vehicular crossings with evidence of limited usage e.g. rusty padlock, overgrown approaches.

To estimate the usage of the crossing:

a) use information supplied by the authorised user(s) if applicable/available;

b) If applicable, interview the landowner or neighbouring landowners and ask how often the crossing is used, by whom and if applicable, by what type of vehicles. Ask whether or not there are particular periods which might generate use or greater use e.g. harvesting, holidays etc;

c) speak to owners of nearby dwellings or facilities that might use or witness use of the crossing;

d) look for evidence of use such as tracks or trodden paths, litter or other signs, analyse the extent of vegetation growth around the access points, take account of rust on padlocks (where fitted); and

e) utilise intelligent sources of information to help in the application of structured judgement; see 7.

6 Influencing factors affecting crossing usage

There are many factors that can influence usage patterns over level crossings. These factors might impact census flow daily, weekly, monthly or even annually.

It is important that such intense changes are evaluated when undertaking census gathering activity so as to avoid over or under inflating calculated risk. Where such usage patterns are identified, steps should be taken to provide a balanced census count. This might involve re-commissioning census or an extended census to better reflect accuracy and/or involve adding a second census in addition to the first so as to afford a more accurate representation of user moment.

Intelligent sources of information in addition to on-site observations can help assessors identify influencing factors; see 7.

The table below details a selection of factors that might influence user moment. The content is non-exhaustive.

	Asset Type		
Influencing factor	Public road	Footpath or bridleway	User worked crossing
Road network: full or partial closures, minor road works, diversionary routes in utilisation, road traffic accidents, road layout alterations under construction	✓		
Asset located near to attractions: funfairs, leisure retreats, historical or tourist matters of interest, beaches, race courses, motor racing circuits, theatres, concert halls, proximity to 'night-life' – e.g. clubs, bars, restaurants etc…	✓	✓	
Proximity of schools, hospitals, health clinics, community centres, shops etc…	✓	✓	
Proximity of businesses, types of businesses and hours of operation	✓	✓	
Type of private asset: field to field access for tending to crops or cattle, residential access, entrance to private facility or business use			✓
Harvest: types of crops, seasonal variance, hours of crop management			✓

Table 4 Influencing factors affecting user moment

NOTE: *For further information on census at private vehicle crossings, please also see guidance document LCG12 – Intensive use at UWCs.*

7 Using in-house technology to collect census information

In-house technology is widely used by assessors to help gather census intelligence. Available technologies adopted include use of mobile cameras, gate counters, pressure pads and SmartCam fixed equipment.

Camera equipment offers the best intelligence gathering capability as it can be used not only to count users, but to identify user demographics, including the presence of vulnerable users, and capture the behavioural attitude of users of level crossings. Naturally cameras are suited to 24 hour, nine day and extended censuses.

Gate counters and pressure pads, although suited to similar census conditions, have weaknesses which limit their successful deployment and effectiveness. The primary shortcomings with these census solutions is their inability to differentiate between user groups, provide capability for assessors to interrogate behaviour and the uncertainty of activation; e.g. a counter could be triggered by wind moving a gate or an animal standing on a pressure pad.

7.1 Use of fixed or mobile camera solutions

7.1.1 General and pre-planning activity

Deploying camera technology for nine days or more or using fixed equipment (where available) offers the greatest opportunity for accurate census.

It is important to pre-plan this activity well in advance so as to maximise the accuracy of the census gathering opportunity. You should take account of the date of the planned risk assessment and the duration of the census needed to provide a robust census, so that sufficient time is allocated to deploy camera technology. This applies where a single census is proposed to portray annual usage or where a second census is needed to support a more balanced annual picture.

When using camera equipment for the purpose of census gathering data collection, there are other important things to consider and procedures to follow. These are discussed below.

7.1.2 Knowing the law and complying with our legal obligations

Network Rail is subject to various acts of legislation and codes of practice. In particular, information security and data protection acts apply to the use of camera technology where it is used for the purpose of gathering census information at level crossings.

It is important that these instructions are adhered to so as to prevent legal or reputational risks to the company or individuals within the company. This includes regulatory or other operational threats and financial penalties which might ensue.

7.1.2.1 Notifying the general public/private land owners

Before camera equipment is switched on and during its operational use, it is essential that a conspicuous notice is provided on each side of the crossing informing users of its operational status and purpose.

The wording of notices shall be:

“A CCTV recording system is operated at this level crossing for the purposes of safety and the prevention of crime. The organisation responsible for the management of the system is Network Rail, which can be contacted on 03457 114141”.

These legal notices demonstrate that Network Rail is complying with the requirements of the Data Protection Act 1998. Specifically we must demonstrate that we are conforming to the following principles:

- Personal data shall be processed fairly and lawfully – *Organisations must be transparent about how they intend to use the data and give individuals appropriate privacy notices when collecting their personal data.*
- Personal data shall be obtained only for one or more specified and lawful purposes – *Organisations must be clear from the outset about why they are collecting personal data and what they intend to do with it.*

7.1.2.2 Data security

Data security is an important aspect of our company compliance with legislation and codes of practice. It is important that camera equipment is secured against vandalism or theft, and where equipment is mobile, that all practical steps are taken to reduce the temptation or likelihood of such acts.

The essential requirements that must be undertaken when deploying any camera technology are:

- Placing the camera equipment in a security box which is securely located and padlocked; and/or
- Encrypting the SD card prior to use.

In addition, locating equipment which will reduce attention, conspicuity or the likelihood of tampering is strongly advised.

7.1.2.3 Data retention/storage

Census data cannot be held indefinitely without good reason. A reason for retention of footage or an image might be necessary because it highlights a risk or bad practice that can be used to promote awareness and educate others. Before images are shared, whether externally or internally, it is essential that they are redacted so as to preserve a user's identity. Retention shall be by exception and a record should exist of any pictures held including where they are located.

In normal operation, data must be deleted once the census has been completed and intelligence analysed.

When making decisions about retention, consider the implications of the following principle of the Data Protection Act 1998:

- Personal data processed for any purpose or purposes shall not be kept longer than is necessary for that purpose or those purposes – *Organisations need to:*
  - *Review the length of time personal data is kept for;*
  - *Consider the purpose or purposes the information is held in deciding whether (and for how long) to retain it;*
  - *Securely delete information that is no longer needed for this purpose or these purposes; and*
  - *Update, archive or securely delete information if it goes out of date.*

7.1.2.4 Subject access requests (SARs)

So as to comply with SARs, a log of camera deployment, a record of data deletion and the location of any retained images or footage (as above 6.1.2.3) must be kept.

7.1.3 Positioning of mobile solutions

NOTE: *When deploying camera solutions always remember that your personal safety is essential – make sure you have arranged a safe system of work before you begin.*

It is important to position camera equipment so that it can record the very best footage and afford the very finest intelligence. In deciding on the location of equipment there are many things that need to be taken into consideration. These include, but are not limited to:

- The quality and capability of the technology; e.g. will the image quality be sufficiently robust to depict the user demographic and age profile if positioned remote from the asset.
- Optimal positioning so as to facilitate the identity of the user demographic, identify vulnerable, encumbered or obviously impaired users, whilst contextualising the user and the asset and helping to identify behaviours, hazards and risks.
- The likelihood that equipment may suffer from theft or vandalism.
- The possibility that the environment may trigger spurious activations where motion detection is in use due to vegetation, wildlife or passing trains.
- Battery life and data capacity; the greater the number of users/motion activated triggers, the greater the impact on battery drain and memory card capacity.
- The need to understand greater second train coming frequency.

There are a number of good practice indicators which have been identified within the Level Crossing Manager community in regard to camera deployment. Excerpts of these are shown below:

- When mounting census equipment within the railway boundary, ensure that it does not interfere with the safe operation of trains, crossing equipment or positioned so as to result in user distraction.
- Try to avoid installing equipment on the direct route a user will travel to minimise the likelihood that the camera might be subject to theft or tampering.
- Take cognisance of the trespass history of the crossing in determining the positioning or appropriateness of deploying camera technology.
- It is advisable to mount camera equipment at a height of between 2ft and 6ft from the ground to reduce the likelihood of spurious activations from vegetation or animals.
- Where camera equipment is located in close proximity to trees or other shrubbery, make sure that branches will not foul the field of vision during bouts of wind or rain.

- Be aware of positioning equipment in such a way that activity from roads or paths parallel to the railway might cause spurious activations and result in unanticipated battery drain and/or quickly fill capacity of memory cards.

7.2 Use of gate counters and pressure pads

Due to the limited capabilities of gate counters and pressure pads in comparison with camera technology, as discussed in 6, the value added ability of this equipment is to support census intelligence by validating user numbers. For example, the use of quick census combined with multiple intelligent sources might, in isolated cases, provide enough information on which to make a judgement regarding user demographic, vulnerable usage and user behaviour. Gate counter or pressure pad technologies, could therefore help assessors to determine usage numbers over a sustained period of time and in doing so validate the quantitative output of the quick census.

In addition and where equipment can record date and time of activations, gate counters or pressure pads might be used to provide intelligence relating to peaks and troughs and night-time quiet period usage for example.

In summary and as illustrative examples, these technologies can be used for confirming:

a) sleeping dog status;

b) night-time quiet period use or usage during darkness;

c) peaks and troughs: daily or weekly;

d) provide a numerical count to check the accuracy of a quick census or validate other intelligent sources of information; and

e) to gather generic data, i.e. not user type intelligence, in support of level crossing closures.

8 Identifying crossing use through intelligent sources of information

8.1 General

As discussed in 4.1, it is important in addition to on-site census activity, to make full use of all available intelligent sources when determining usage of level crossings.

The fatality at Frampton level crossing on 11th May 2014, involving unknown unauthorised use of the bridleway element of the crossing by trail bike riders, highlights the type of activity that takes place across our network. It is acknowledged even with extended census and the use of intelligent sources, that this type of event might still go undetected, but the broader the research and active data collection, the greater the opportunity to identify such practices.

It is therefore advocated that the combined use of census which is nine day or greater, with the proactive use of intelligent sources (internet searches, researching social media and local club sites), in addition to seeking visual cues when on-site

(tyre tread patterns or other clues); betters the opportunity for identifying the risk of unsafe or unauthorised activity than a quick, 24 hour or nine day census in isolation.

This is especially important so as to identify usage or patterns of use that might not be apparent even where nine day or extended census is undertaken. For example, organised groups promoting monthly or annual events which impact on the use of a level crossing could be missed from census activity alone, even where extended census is applied.

Utilisation of intelligent sources might also serve to identify vulnerable users or unauthorised use of level crossings. In this regard it can help assessors to identify organised groups so as to engage with them proactively and/or target risk mitigation appropriately.

8.2 Use of intelligent sources

Intelligent or smart-sources of information can take many forms. The information sources detailed below are not exhaustive, but they are a good source from which to build a portfolio of research material. Their sequence is also not representative of any hierarchical order of importance.

8.2.1 The internet

The world-wide web offers an abundance of opportunities to identify information to support census gathering intelligence. This rich smart-source may hold the key to significantly increasing assessor knowledge about the use of a level crossing and/or its users.

Detailed internet searches may yield information about the immediate environment, identify the promotion of rights of access or events and highlight use of level crossings by organisations or societies. When using the internet, consider:

- Local authority websites – might contain information on redevelopment proposals, road diversions, public attractions such as funfairs or other risk influencing intelligence.
- Rights of way maps and other mapping services – will highlight risk influencing factors within the immediate environment such as schools, businesses, public attractions, road layouts and afford understanding of how an asset serves the local community; e.g. provides a thoroughfare link, commuter route etc. The Definitive Map will help to identify if the route over a level crossing is publically promoted.
- Social media sites – intelligence relating to the use of level crossing might be available from social media channels such as: Facebook, YouTube, Twitter and Instagram. Individuals and organisations often promote activities via these network channels. Intelligence might include *posts* on forthcoming organised events within the locality, video footage or images of actual crossing use (including unauthorised or risk taking activity) and/or highlight

trends in use or frequencies of use including use by an unknown user demographic.

- Dedicated websites or chatroom forums – National groups such as the Ramblers or more localised groups such as off-road trail bike, 4x4 vehicle communities or regional scout groups often share or discuss experiences, social activity and promote events on their dedicated websites. A search for such communities and groups within the area of a level crossing may yield unknown intelligence about level crossing activity.

8.2.2 Highways authority traffic surveys

It is prudent to discuss with local authorities their programme of traffic surveys; both planned works and available footage or census data from completed activities. It might be possible to utilise this intelligence within risk assessments wholly or partially with agreement. Direct liaison with local authority contacts or through Road Rail Partnership Groups is advised.

8.2.3 Discuss the level crossing with the local experts

It might be that the best intelligence is accrued from the local community or those who interface with the asset directly. Often information may come to light through engaging with persons or groups that would otherwise reside unknown from census activity alone. Such intelligence might be obtained through discussion with people or groups such as:

- Local authority rights of way officers or community leads
- Council or Highways Agency officials
- Level crossing users
- Authorised users of private level crossings
- Local residents or businesses, schools or colleges
- Local user groups or clubs
- Signalling staff (Signallers or Crossing Keepers)
- Off-track, S&T, patrolling or other operational staff; e.g. MOMs
- Train operating companies (Drivers, Guards, station staff)
- British Transport Police

8.2.4 Operational records of crossing use

For private vehicle crossings equipped with telephones or automatic half barrier crossings (AHBs), record keeping in the form of occurrence books should exist to supplement intelligence for vehicle movements; albeit only for large or slow movements in the case of AHBs. In addition, in cases where the crossing provides

access to business premises, there might be separate registers or site visitor logs which could support intelligence regarding vehicle use.

Accuracy of records is unlikely to be such that numbers or intelligence can be considered to be 100% assured, but if information is combined with additional research, it might contribute toward a broader understanding of actual crossing usage.

8.2.5 Tagging

At very lightly used or perceived dormant crossings, tagging a gate can be a useful way to determine if the asset is actually used, by whom and at what frequency. There is no guarantee that a user will make contact if they break the tag to cross, but its presence might:

a) Promote contact, resulting in useful intelligence that would not otherwise be forthcoming; or

b) If removed to cross, but no contact is made, it will be apparent to the assessor during the next risk assessment or asset inspection; an obvious sign that the crossing has been used and that greater intelligence is needed.

If tagging a gate, the user instruction should be stored in a waterproof container with the tag in a conspicuous place. As a minimum its contents should include:

- Level crossing details; name, type, UID (ELR, miles, chains)
- Date tag was placed at the crossing and the reason for the tag
- Telephone number and/or email address of contact point (typically this might be a Control Centre to ensure a 24 hour response)

9 Intelligence driven response to census

9.1 General

The undertaking of active census in conjunction with the use of intelligent sources of information will often confirm ‘known’ or suspected patterns of use, substantiate risks or hazards and endorse the user demographic; including the presence of vulnerable users. In other cases it may highlight unknown threats, unauthorised use or unsafe practices which require immediate interim actions, in addition to long-term plans, to control.

As a prerequisite of risk management protocol, it is important that intelligence is acted upon to mitigate threats or hazards and manage safety. In no hierarchical order, actions or parallel actions might include:

- Redeploy camera equipment (if appropriate) to better identify usage, patterns of use, user groups or collate additional evidence to support intelligence.
- Work collaboratively with operations staff (OM, LOM, and MOM), BTP, train operators and other stakeholder partners. If regular patterns of use are identified and as appropriate, arrange for evening or weekend visits to the

crossing, so as to talk directly with users to re-educate them regarding unauthorised use and unsafe acts. A BTP presence might also serve to enforce key messages. Operations staff working on a shift basis, such as MOMs, may be best placed to support this approach, unless by agreement, a Level Crossing Manager volunteers to work 'out-of-hours'.

- Revisit the internet and make specific use of targeted user group searches; specifically this should include using social media and local community or club websites to identify groups or clubs that observed users may belong to.
- Make direct contact with relevant local organisations, such as trail bike, 4x4, equestrian or walking societies, so as to promote safe crossing protocols, highlighting the risks and hazards associated with level crossings and unauthorised use. Work collaboratively to address safety concerns.
- Make contact with any county or national organisations if it is possible that the group or organisation is broader than the immediacy of the parish. Contact the central level crossing team if there are national implications and transferrable risks. It is important and advantageous to engage with and promote safety within larger institutions.
- Work collaboratively with local authorities, highways agencies and rights of way officers to:
  - determine if public and private status is accurately represented in documentation such as the Definitive Map;
  - identify whether restrictions and prohibitions by vehicles or other groups is suitably recorded and visible in public documentation; and
  - understand what additional actions can be taken by local authority colleagues to support Network Rail in managing asset safety.
- Take practicable steps to improve safety through delivery of physical improvements and provision of mitigation:
  - Re-evaluate closure opportunities, diversionary access and downgrades in status (where applicable).
  - Evaluate the requirements to provide risk reducing mitigation such as MSL, POGO for example.
  - Signage: review optimal positioning and order of signs, clarity of instructions; are there too many leading to signage cluttering and ambiguity or confused information, is there unnecessary signage or duplication, if appropriate and safe to do so without resulting in distraction or dilution of safety critical information – is there scope to provide an additional safety information or trespass sign etc…
  - Take steps to improve the crossing layout and undertake general infrastructure improvements: channelling, user segregation, improving traverse, sighting etc…

10 Census protocol

10.1 General

Every effort should be made to undertake a new census when undertaking a new risk assessment. In this way data is kept current with latest intelligence and:

- recorded census is reflective of the most current position, taking account of environmental or other external influences and the user demographic;
- calculated risk is representative of the current threat; and
- it facilitates analysis of the trending risk profile of the asset.

Where a quick census is used, see 4.2, this should be undertaken at the time of the site visit. In exceptional circumstances, it might be necessary to undertake the census on a different day, for example, if weather conditions adversely affect the accuracy of census data on the planned day of collection. If the census needs to be taken on another day, it should be undertaken as close to the date of the original site visit as possible.

Where a 24 hour, nine day or extended census is used, pre-planning activity should facilitate a structured timeline to deploy census gathering equipment or arrange external support, so as to tie-in with the date of the risk assessment site visit.

Where additional census is needed, this should be undertaken during the most appropriate parameter; taking account of intelligence, the reason for the second census and all other pertinent factors.

10.2 Applying new census data to an existing risk assessment

10.2.1 Acceptable use

Sometimes, more recent census data than that used in the current risk assessment becomes available or a need for new census data is identified. For example:

- a Network Rail project might commission a nine day census as part of an asset renewal or re-signalling scheme;
- a developer might submit a current nine day census for comparison against projected usage;
- an authorised user might provide unsolicited census data;
- an additional census might have been undertaken to capture seasonal variations in use;
- a Highways Authority might undertake a traffic survey and share it directly with the Level Crossing Manager or through Road Rail Partnership Groups; or
- a third party report might be received which generates a requirement for a more recent census, for example, usage is identified during the night-time quiet period at a whistle board protected crossing.

The new census information can be applied to the existing risk assessment provided there is confidence that all other cumulative data remains fit for purpose. If there is any doubt or ambiguity over this or if an extended period has lapsed since this data was accrued, a complete new risk assessment might be necessary.

If there is a significant change in the ALCRM score as a result of using new census data:

a) evaluate the need to undertake a new risk assessment;

b) re-evaluate the need for new or additional risk control measures or the need to expedite planned mitigations or implement interim controls; and

c) review the impact of the change on the risk assessment frequency.

10.2.2 How to record this in ALCRM

When it has been established that it is appropriate to use new census data in an existing risk assessment (in place of existing data), this should be recorded in ALCRM as follows:

a) Create a new option below the current (LIVE) risk assessment and in the census tab enter the new census date;

b) Enter the name or source of the census taker/provider, duration and type for the census being used and the census data itself;

c) Add any pertinent information about the new census within the notes section and explain why the decision to use it has been made; and

d) Set the option to recommend, approved and implemented so that it becomes the LIVE risk assessment.

10.3 Using old census data in new risk assessments

10.3.1 Acceptable use

In exceptional circumstances it might be appropriate to use census data that pre-dates the risk assessment being undertaken. This is only appropriate where the census is believed to give greater accuracy than that completed during the site visit. Examples are shown in table 4.

Wherever possible, the old census data should be compared to the census completed during the site visit. This is important to establish if the old census continues to provide accurate data on crossing usage.

Old census	New census	Validation	Comments
Nine day or extended census or 24 hour census	Quick census	Compare the daily usage from the new quick census with the daily usage from the previous nine day, extended or 24 hour census.	If the data is broadly comparable, use the nine day, extended or 24 hour census. If there is significant variation, decide which census offers the greater accuracy using structured judgement and accounting for intelligent sources of information. If needed, undertake a new nine day, extended or 24 hour census.
Estimate provided by an authorised user	Quick or estimate census	Compare the daily usage from the new quick or estimate census with the data provided previously by the authorised user. *NOTE: A quick census might over or under estimate usage. The AU estimate might identify different patterns of use not identified by a quick or visual estimate.*	If the data is broadly comparable, use the estimate provided by the authorised user. If there is significant variation, decide which census offers the greater accuracy using structured judgement and accounting for intelligent sources of information.
Quick census, users witnessed	Quick census, no users witnessed and estimate made	Apply structured expert judgement to decide if either census is appropriate or if a new census is needed.	Use the old census data if it is believed to more closely reflect usage than the estimate made, making use of structured judgement and accounting for intelligent sources of information within decision making. If not satisfied that either census reflects crossing usage accurately, a new nine day or extended census should be undertaken.

Table 5 Examples of using old census data

10.3.2 How to record this in ALCRM

When it has been established that it is appropriate to use old census data in a new risk assessment, this should be recorded in ALCRM. The date of the old census should be recorded appropriately and any pertinent information about the old census, including the decisions taken to use it and any comparison or validation with new census data, should be documented within the notes section.

10.4 Comparing new census with historic census

10.4.1 General

It is good practice to compare new census information with historic census so as to:

a) identify when significant changes have taken place such as:
   - changes in user numbers;
   - changes in user demographic, e.g. increase in vulnerable and/or irregular users
   - changes in vehicle use or type, e.g. increase in or introduction of HGVs; and

b) take account of historic census activity so as to utilise all intelligence and remain consistent in the identification of vulnerable and irregular users or types of vehicles and patterns of use, SFAIRP;

c) consistently apply an appropriate traverse time applicable to the user demographic or vehicle moment;

d) apply the correct minimum sighting requirements appropriate to the user demographic or vehicle moment; and

e) reduce the likelihood of errors within census counts so as to increase the accuracy of modelled risk and the application of structured judgement within risk assessment.

A comparison of data between new and historic censuses can help to identify trends, highlight any potentially significant changes in risk or signpost errors in census data. It is good practice to make this comparison using more than the last census taken so as to comprehensively take account of all available information.

Changes to look for should include:

- significant movement in usage figures;
- alterations in use by vulnerable and irregular users; taking account of any broader demographic change; and
- peaks and troughs and seasonal variation.

Such transitions in use or by users can significantly impact on the risk controls in place, or those proposed. It might also serve to provide assessors with a true holistic understanding of the assets history and an insight into future risks.

10.4.2 Analysis and actions

Where significant changes are identified, it might be necessary to undertake further detailed analysis to validate new intelligence. This will enable assessors to determine the full impact on risk.

Examples of changes that might trigger further investigation include:

a) the new census does not identify vulnerable users when they have been identified previously;

b) previous census(es) indicate night-time quiet period use and the new census does not;

c) previous census(es) include vehicle types which import risk, e.g. tractors and trailers or HGVs, the new census does not;

d) there are significant changes in user numbers (vehicle and pedestrian);

e) previously identified irregular use is not recorded in the new census, e.g. irregular usage previously recorded due to: leisure attractions, seasonal variation (beach access, fruit farms) etc.

Where conflicting information between assessments exists, it is important to utilise intelligent sources of information, in addition to further census activity or site-visits, to determine the accurate position.

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LEVEL CROSSING COST BENEFIT ANALYSIS ASSISTANT USER GUIDE

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1 Purpose and background

The purpose of this document is to provide guidance on the use of the Level Crossing Cost Benefit Analysis (CBA) Assistant. The Assistant is embedded within the Network Rail Safety-Related CBA Tool.

The Level Crossing CBA Assistant has been developed to provide a single tool for conducting cost benefit analyses for level crossings. It was developed in response to the Rail Accident Investigation Branch (RAIB) investigation into a fatal accident at Gipsy Lane footpath crossing. The RAIB's report identified that two different CBA tools were in use within Network Rail, the inbuilt ALCRM tool and the Safety-Related CBA tool. It recommended that the tools be combined so that all benefits are considered as part of the CBA assessment of risk reduction measures at level crossings.

This has been realised by making the Safety-Related CBA Tool more intuitive and easier to use when conducting level crossing CBAs. No fundamental changes have been made to the CBA calculations.

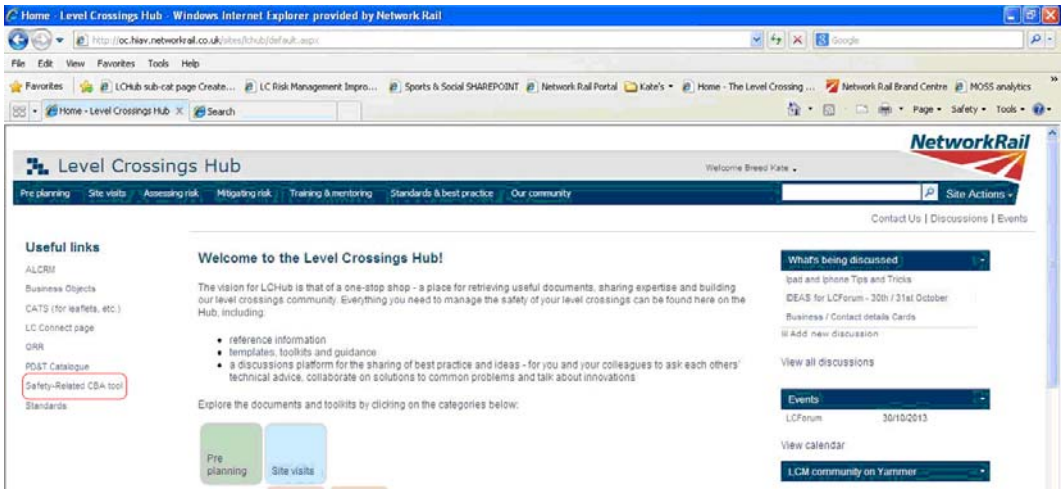
NOTE: This change is not retrospective. CBAs that were conducted using the inbuilt ALCRM tool prior to the Level Crossing CBA Assistant being released remain valid.

2 Scope

This guidance is intended for all people who undertake CBAs for risk reduction measures at level crossings.

3 Accessing the Level Crossing CBA Assistant

The Level Crossing CBA Assistant runs within Network Rail's Safety-Related CBA Tool, the current version of which is hosted on Connect. A link to the Connect tool has been provided on the 'Useful Links' menu of the Level Crossings Hub (LCHub): http://oc.hiav.networkrail.co.uk/sites/lchub/default.aspx

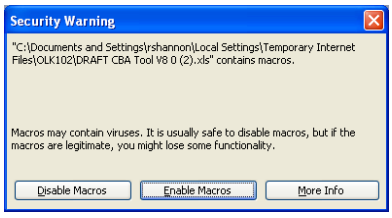


When starting a new CBA always go to the LCHub and click on the link to open a **new copy** of the CBA Tool. By doing this you will always start a new CBA using the **latest version**:

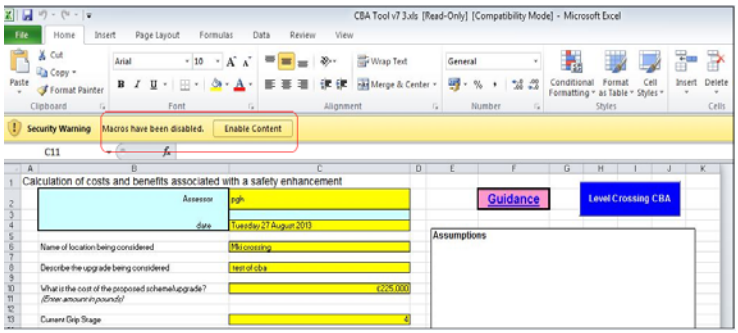
- Click on the '*Safety-Related CBA Tool*' link followed by '*Save*'.
- Save a version of the Safety-Related CBA Tool locally so that you can work on the CBA you are undertaking.
- Open the saved file and click '*Enable Macros*' or '*Enable Content*' where prompted.

NOTE: Some macros in the first release of the Level Crossing CBA Assistant cannot function when viewed in-browser. Therefore it is essential to download and save a new version of the Safety-Related CBA Tool locally, each time a new CBA is started. You should also keep an individually-named copy of each completed CBA fore future reference.

Windows XP:

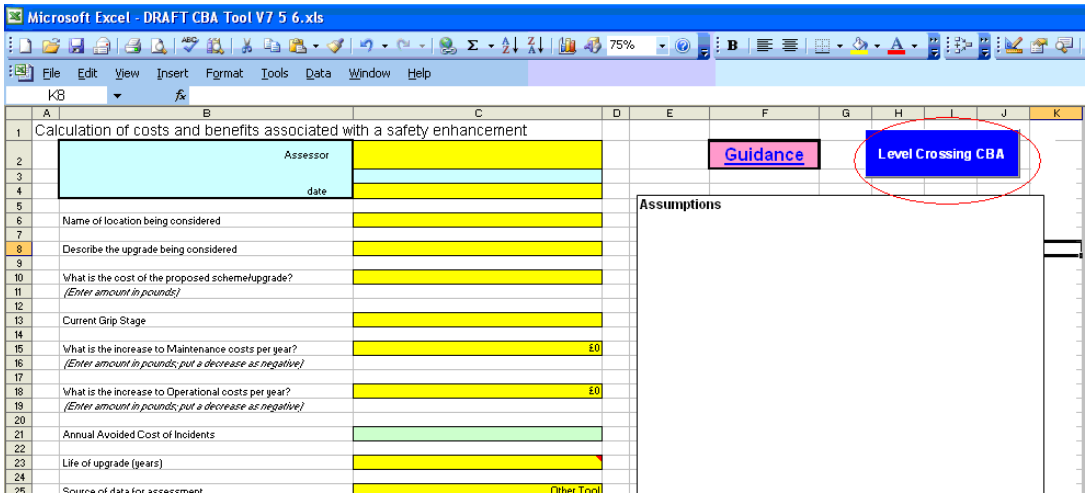


***Windows 7*:**



4 Opening the Level Crossing CBA Assistant

Open the Level Crossing CBA Assistant by clicking on the '*Level Crossing CBA*' button within the Safety-Related CBA Tool.



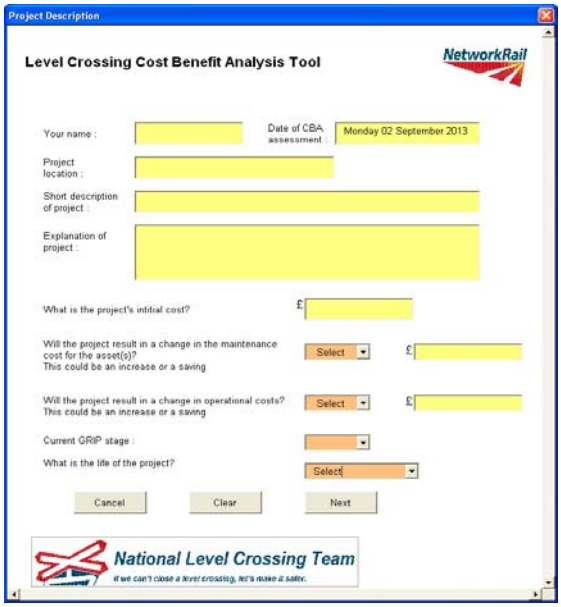
5 Completing the Level Crossing CBA Assistant

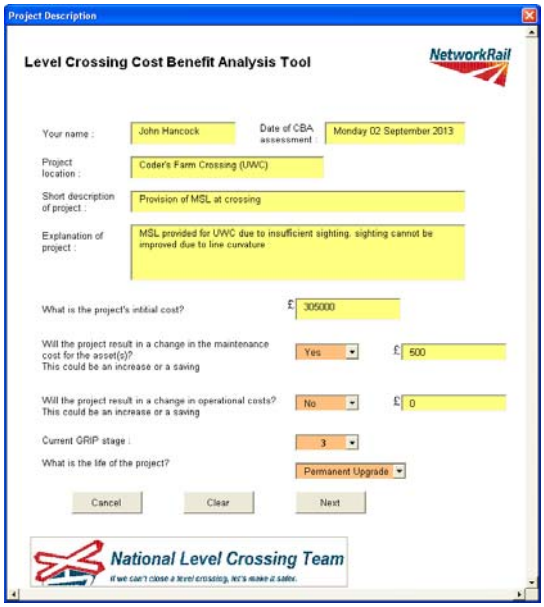
5.1 Project description

Opening the Level Crossing CBA Assistant takes you to the '*Project Description*' screen. To complete this screen:

- Enter text in the yellow fields; and
- Select the relevant option from the drop-down menus in orange fields.

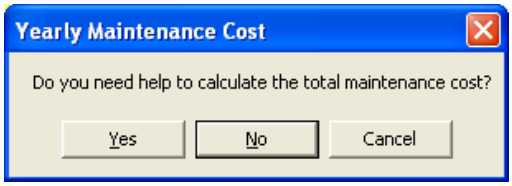
NOTE: Enter numeric values as numbers only, do not use commas. Enter cost savings as negative numbers.

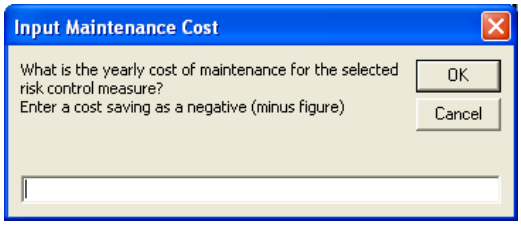




If you select '*Yes*' in response to the question '*Will the project result in a change in the maintenance cost for the asset(s)?*' the '*Yearly Maintenance Cost*' dialogue box will appear.

- Click '*No*' if you already have a value for the cost or saving that will be incurred. Enter your value into the '*Input Maintenance Cost*' dialogue box.

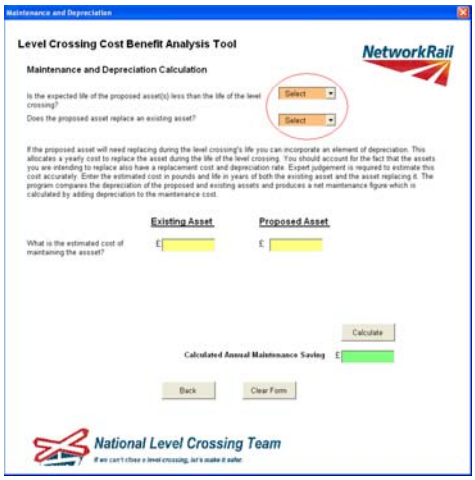


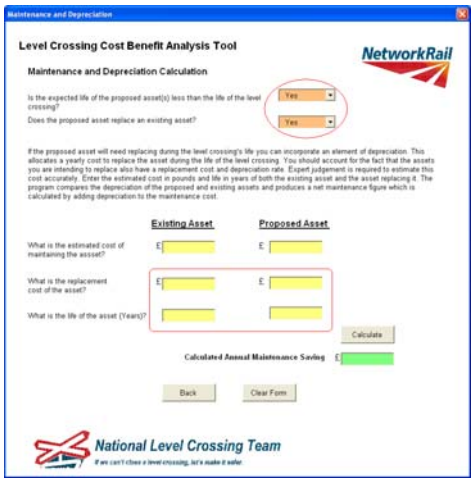


- Click '*Yes*' in the '*Yearly Maintenance Cost*' dialogue box if you want the Assistant to help you calculate any increase or saving in maintenance costs.

5.2 Maintenance and depreciation

The available input fields will vary depending on the responses you make to the two drop-down options:



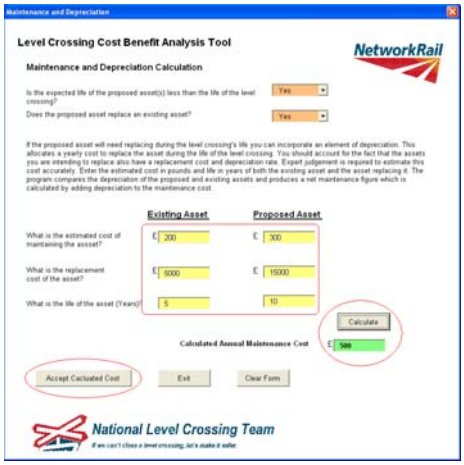


- Answer '*Yes*' to the first question if the new equipment will need to be replaced during the life of the level crossing.

NOTE: The Assistant incorporates the cost of depreciation of the new equipment into the maintenance cost.

- Answer '*Yes*' to the second question if existing equipment is going to be replaced.
- Complete the yellow fields and click on '*Calculate*'. The annual maintenance cost or saving will be displayed in the green field.
- Click '*Accept Calculated Cost*' or '*Accept Calculated Saving*' to accept the calculated value and return to the '*Project Description*' screen.

NOTE: The text displayed will vary depending on whether the calculated value represents a cost or a saving.

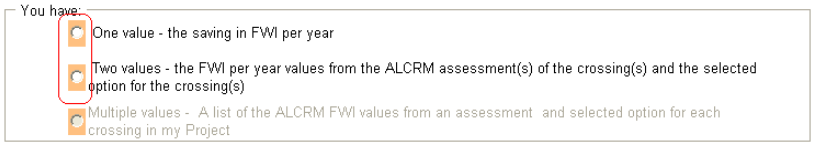


5.3 Project scope

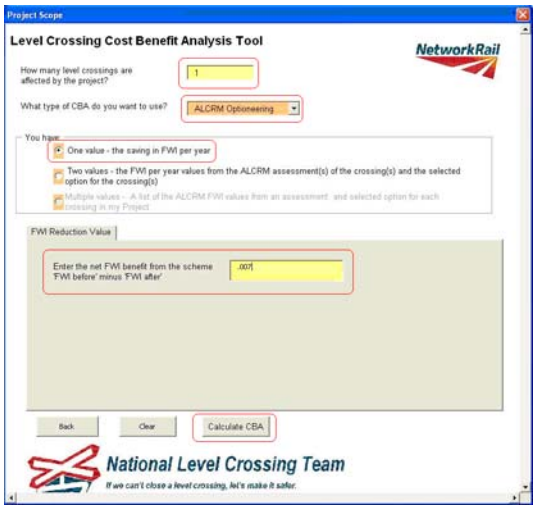
NOTE: The first release of the Level Crossing CBA Assistant can only conduct ALCRM optioneering CBAs. Later releases will be able to conduct SRM and Risk Matrix Model CBAs.

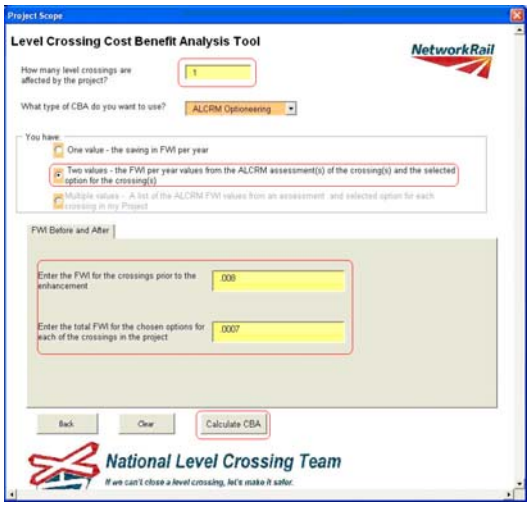
- Select the appropriate radio button for the FWI value(s) you want to use.
- Complete the yellow fields for the number of crossings in the project and the FWI value(s) you are using.

NOTE: The radio button selected determines which input screen is displayed. The 'Multiple values' option is not available in the first release of the Level Crossing CBA Assistant.



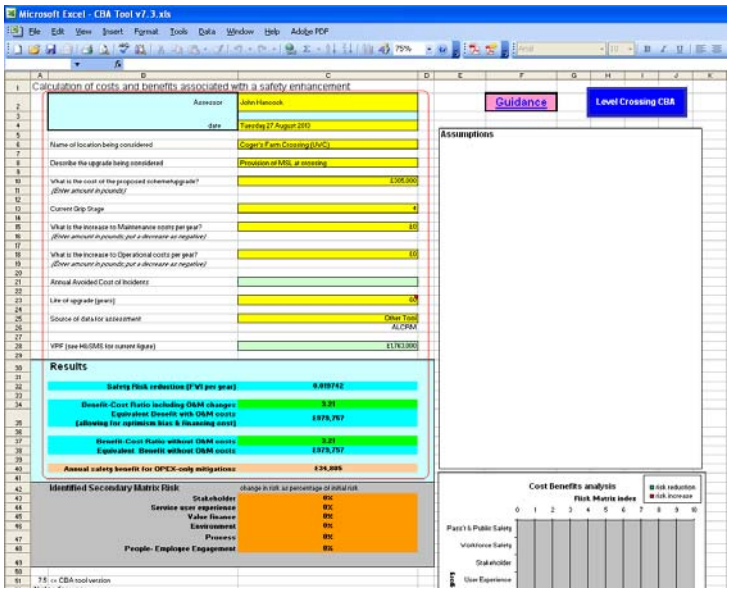
- Click '*Calculate CBA*'.





6 Populating the Safety-Related CBA Tool

The Level Crossing CBA Assistant calculates the CBA and populates the relevant fields on the main page of the Safety-Related CBA Tool.



The Level Crossing CBA Assistant does not complete the ‘Assumptions’ section. Complete this for any assumptions you have made.

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	Issue:	1
EVALUATING THE IMPACT OF FOG AT PASSIVE LEVEL CROSSINGS	Date:	October 2021
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EVALUATING THE IMPACT OF FOG AT PASSIVE LEVEL CROSSINGS



LEVEL CROSSING GUIDANCE

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1 Purpose

This document provides guidance on assessing the prevalence of fog at passive level crossings. It shall be incorporated within the risk management process for assessing level crossing safety.

2 Scope

This guidance is intended for Level Crossing Managers and any other competent person responsible for the safe management and risk assessment of level crossings.

It must be used in conjunction with the *Fog Data Analysis Tool* and other intelligence, as shown in this guidance document, to determine the level of risk presented by fog and help identify if additional mitigations are required to manage safety.

The contents of this guidance shall be applied:

- during the risk assessment and option selection process, with details incorporated within narrative risk assessments, and
- as a bespoke exercise if third party intelligence indicates that fog has become a safety issue, and
- in determining a risk-based priority for interim and long-term solutions where fog is considered to be a contributory factor.

3 Background

At 09:58 on Wednesday 6th February 2019, a male aged 72, was struck and killed by a passenger train at Tibberton No.8 footpath crossing in Western Route[1].

It is understood that the male, a rambler, had no prior experience of using Tibberton No.8, a sighting only footpath level crossing. On the day in question, he was researching a new walking route for his rambling group. It is known that fog was prevalent at the time of the incident and that he waited in a position of safety for the passage of a train but was tragically struck by a second train as it emerged from the haze.

RAIB identified that fog was a causal factor of the incident, as the second train was not visible until it was 3-4 seconds from the level crossing.

[1] NOTE: Tibberton No.8 has subsequently transferred to North West and Central Region as part of boundary changes between Routes.



Library image of Tibberton No.8, insert FFCF from the day

RAIB made the following recommendation based on the conclusions of their investigation:

The intent of this recommendation is for Network Rail to understand the risk to crossing users presented by fog at passive level crossings and to ensure that the risk to an individual using a passive level crossing in fog is acceptably low.

Network Rail should analyse and evaluate the risk of fog affecting the safe use of those passive level crossings where users are entirely reliant on the sighting of trains. This analysis should take into account regional and local variation of the likelihood of fog, its potential impact on visibility and the effectiveness of any existing mitigation measures. Network Rail should then use the output of this evaluation to develop and implement a strategy to adequately mitigate the effects of fog at passive level crossings (paragraphs 114c and 115). This strategy should include the development and provision of:

- guidance for level crossing managers on how to identify crossings at which fog is a reasonably foreseeable risk;
- a range of possible mitigation measures to make crossings safe to use in fog (this may involve other railway parties such as the Rail Delivery Group);
- a methodology for prioritising level crossings on the basis of the risk arising from fog at the crossing; and
- a timebound plan for the implementation of the appropriate mitigation measures at the prioritised crossings.

4 Improving the assessment of fog within narrative risk assessments

In addressing the intent of the RAIB recommendation and determining how the risk of fog can be better considered within narrative risk assessments, Network Rail engaged the services of specialist consultancy AECOM to lead on developing a **Fog Data Analysis Tool (FDAT)**. The FDAT utilises historical MetDesk[2] records relating to fog visibility to plot the number of foggy days in a given month and year at passive level crossings. Data from the nearest weather stations is used to generate the best levels of accuracy. The FDAT is an Excel based tool that must be used in conjunction with the contents of this guidance document.

[2]*MetDesk is Network Rail's meteorological service provider.*

What follows in this guidance is a reasonably practicable way of improving our risk-based decision-making about fog. It is designed to:

- help you understand the influencing factors that might result in occurrences of fog;
- identify the historical presence of fog at passive level crossings;
- determine actions you might deploy to help address the risk of fog; and
- consider how fog might influence the prioritised delivery of risk controls.

5 Understanding fog

5.1 What is fog?

Essentially, fog is a cloud that is on or very near to ground level. It typically occurs when the temperature of air near the ground is cooled to the air's dew point. At this point, water vapor in the air condenses and becomes visible. Fog is defined, by international agreement, as occurring when visibility is reduced to less than one kilometre, particularly for aviation purposes. However, in forecasts for the public, visibility less than 180m is the reported norm.

For the purposes of the FDAT, visibility less than 500m have been recorded to reflect the risks associated with sighting of approaching trains.





5.2 Types of fog

Fog is classified according to the manner in which it forms and is dependent upon the current temperature and the amount of water vapor in the air. The main types of fog described by the UK Met Office are detailed in the table below.

Name	Formation
Radiation fog	*Radiation fog usually occurs in the winter, aided by clear skies and calm conditions. The cooling of land overnight by thermal radiation cools the air close to the surface. This reduces the ability of the air to hold moisture, allowing condensation and fog to occur. Radiation fog usually dissipates soon after sunrise as the ground warms. An exception to this can be in high elevation areas where the sun has little influence in heating the surface.*
Advection fog	*Advection fog occurs when moist, warm air passes over a colder surface and is cooled. A common example of this is when a warm front passes over an area with snow cover. It is also common at sea when moist tropical air moves over cooler waters. If the wind blows in the right direction, then sea fog can become transported over coastal land areas.*
Valley fog	*Valley fog forms where cold dense air settles into the lower parts of a valley, condensing and forming fog. It is often the result of a temperature inversion, with warmer air passing above the valley. Valley fog is confined by local topography and can last for several days in calm conditions during the winter.*
Upslope fog	*Upslope fog or hill fog forms when winds blow air up a slope (called orographic uplift). The air cools as it rises, allowing moisture in it to condense.*
Evaporation fog	*Evaporation fog is caused by cold air passing over warmer water or moist land. It often causes freezing fog, or sometimes frost. When some of the relatively warm water evaporates into low air layers, it warms the air, causing it to rise and mix with the cooler air that has passed over the surface. The warm, moist air cools as it mixes with the colder air, allowing condensation and fog to occur. Evaporation fog can be one of the most localised forms of fog*
Coastal fog	*Coastal fog is usually a result of advection fog which forms when relatively warm, moist air passes over a cool surface. In the UK, the most common occurrence of coastal fog is when warm air moves over the cool surface of the North Sea towards the east coast of the UK.* *When this happens, the cold air just above the sea's surface cools the warm air above it until it can no longer hold its moisture. This forces the warm air to condense, forming tiny particles of water which forms the fog that we see.* *Coastal fog usually occurs in the spring and summer months when conditions begin to warm up but the sea (which warms more slowly) stays relatively cold.*

5.3 Is fog predictable?

Whilst there are localised factors that can have an influence on the presence of fog, it is extremely complex to forecast. Fog can form at any time of the day and at any point throughout the year. It is, however, most likely to form during the night and in the early mornings and is more commonplace throughout the Autumn and Winter seasons.

5.4 Influencing factors of fog at level crossings

The environment in which the level crossing resides might increase the likelihood of fog occurring. The following features have the potential to influence the presence of fog:



Valleys



Adjacent water courses



Low lying open landscapes

6 How fog can affect user safety at passive level crossings

6.1 Crossing users perspective

It is recognised that the presence of fog will detrimentally affect a crossing users ability to see approaching trains. In addition to masking trains, it might also affect their depth of perception, making an approaching train appear further away than it actually is.

Dense fog can also affect a crossing users ability to hear approaching trains. This will equally apply to the train horn when sounded at whistle boards.

In the general sense, fog can also have an impact on a user's orientation and perception of risk, making the environment appear less hostile than it actually is.

Fog will also have a compounding effect on the auditory and visual senses of certain vulnerable user groups such as the young and elderly.

6.2 Train drivers perspective

In the same way that fog can disorientate crossing users, it can also have the same effect on train drivers. It heightens the risk that whistle boards could be obscured from the drivers view and result in the train horn not being applied or being applied too late, thereby eliminating or reducing the warning for crossing users.

Fog also makes it more difficult for train drivers to see if there are users on a level crossing, reducing the window of opportunity for them to take recovery action in an emergency.

7 Assessing the impact of fog at passive level crossings

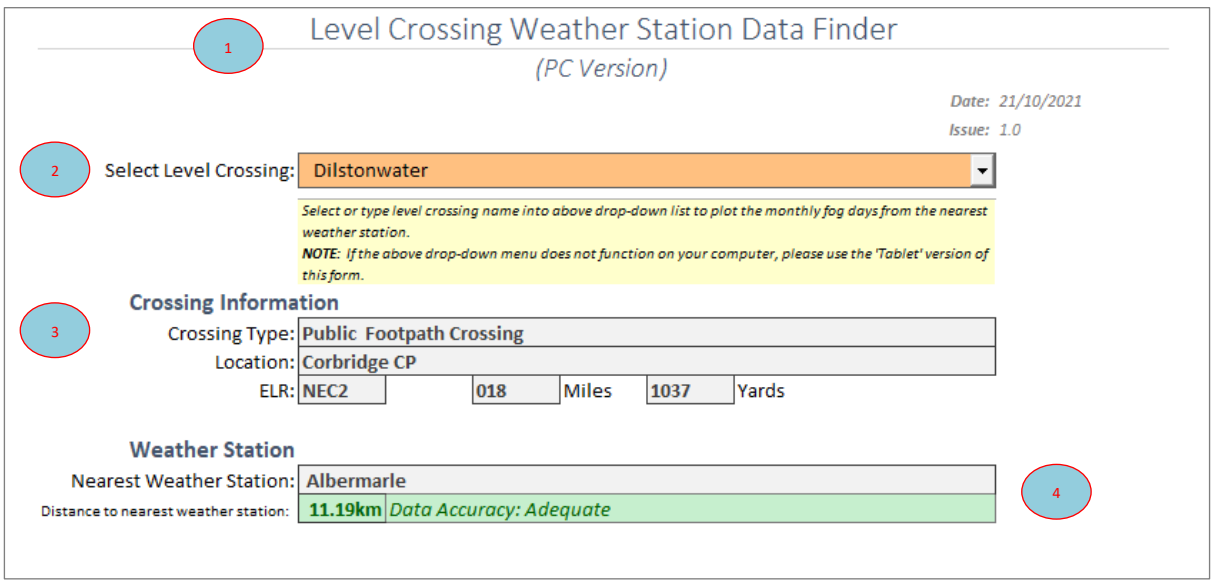
7.1 Using the Fog Data Analysis Tool (FDAT)

The FDAT helps to corroborate your understanding about the history of fog at passive level crossings or challenge your thinking.

7.1.1 Selecting your level crossing

1. Upon opening the FDAT, you will be presented with the main tab.
2. Select your level crossing by typing the crossing name in the 'Select Level Crossing' field and use the drop-down menu as necessary to refine your selection.
3. Confirm that you are viewing the correct crossing from within the 'Crossing Information' fields.
4. Confirm the distance from the nearest weather station and use this information to determine how accurate the data for the level crossing is (see 7.1.3).

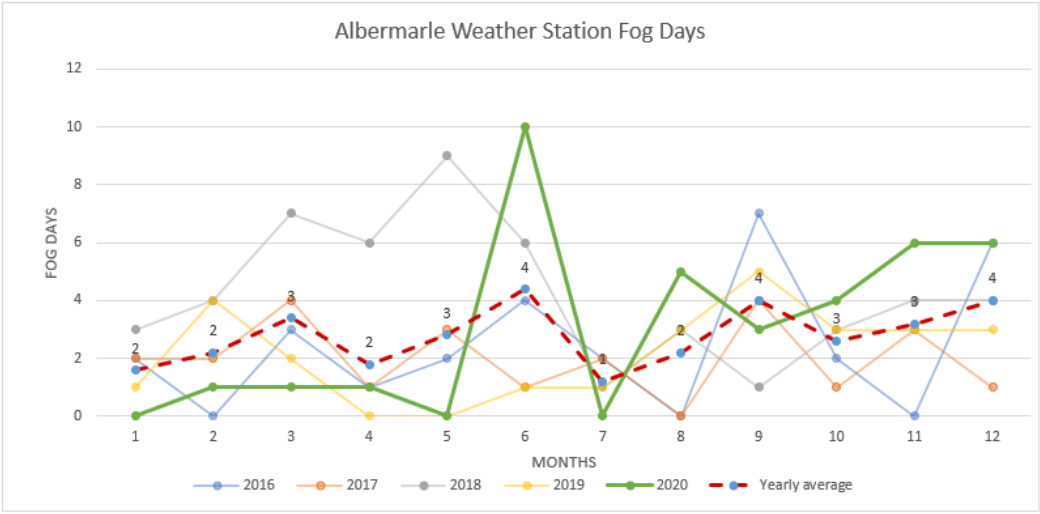
Illustration mapped to above process



7.1.2 Presentation of results and inclusion within narrative risk assessments

The FDAT presents the results in a table, with the number of foggy days in each month shown for years 2016 through to 2020 inclusive. The total number of annual events and the average number of events per month are also provided. Results are also plotted as a chart to improve the visual presentation of data. These should be included within narrative risk assessments to support your decision-making.

Illustration



Albermarle Weather Station Fog Days

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
2016	2	0	3	1	2	4	2	0	7	2	0	6	29
2017	2	2	4	1	3	1	2	0	4	1	3	1	24
2018	3	4	7	6	9	6	1	3	1	3	4	4	51
2019	1	4	2	0	0	1	1	3	5	3	3	3	26
2020	0	1	1	1	0	10	0	5	3	4	6	6	37
Average	2	2	3	2	3	4	1	2	4	3	3	4	

7.1.3 Using the data as part of risk-based decision-making

The output of the FDAT can be used to support what you know, or think you know, about the presence of fog, or it might challenge your knowledge.

The accuracy of the information it provides is influenced by real world factors such as topography and the range between the weather station and the selected level crossing.

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Confidence in the information it provides is categorised as follows:

Distance from weather station to level crossing	Data accuracy level	How this should be applied as part of the risk assessment
0km to 20.49km	***Adequate***	*Data provides a satisfactory indicator as to the prevalence of fog.* *Other intelligence should still be used to support it SFAIRP.*
20.50km to 30.49km	***Low***	*Confidence in data is less certain.* *Other intelligence must be used to support it SFAIRP.*
30.50km and above	***Unreliable***	*Confidence in data is not reliable.* *Other intelligence must be used to determine the presence of fog.*

Where confidence in data is shown to be **'adequate'** or **'low'**, it represents intelligence that can be used in conjunction with other sources of information to help inform your risk-based decisions.

When evaluating the data, it is worth considering the following factors (not exhaustive):

- Are there particular months of the year when fog is prevalent?
- Do the bouts of fog appear to represent a consistent trend throughout each month and year or are they more sporadic and unpredictable?
- Have the number of foggy days in a given month remained static, increased or decreased in recent years?
- Have the number of foggy days increased or decreased on an annual basis?
- How does the previous year compare to the average number of events by month/year?
- Are the number of foggy days in a given month considered to represent a high percentage of all days in the same month, increasing the risk over a longer period?

7.2 Making use of other intelligent sources of information

It is important to make use of all available intelligent sources of information when evaluating the impact of fog.

7.2.1 Using your own local knowledge

If you are an experienced level crossing manager, it is likely that you will have accrued knowledge about the weather conditions at your level crossings based on:

- Asset inspection and risk assessment site visits
- Intelligence gathered to complete narrative risk assessments
- Census data, including camera footage
- Incident data
- Third-party communications
- Environment of the level crossing
  - Whether valleys, water courses or open landscapes are adjacent to the level crossing
- User groups and usage patterns
  - Whether the crossing is used early in the morning or late at night when fog is likely to be most prevalent, particularly during Autumn and Winter

Your own local knowledge should be used in conjunction with the output of the FDAT or applied as a key source of intelligence if data within the FDAT is not reliable.

Note: *It is good practice to keep a record of instances of fog and poor visibility when these are observed during site visits. Time, date and notes on visibility levels held make good reference points, as will photographs. This information, if transferred to a database, will help develop your local knowledge and support you when correlating the data within the FDAT.*

7.2.2 Stakeholder engagement

To bolster intelligence or to verify information, particularly where the data in the FDAT differs from your own local knowledge, it is prudent to engage with users, authorised users and/or lineside neighbours to gain greater intelligence about the prevalence of fog and the hours and duration it lasts, including the patterns of crossing use.

In addition to speaking with local user groups, conversations with train operating companies, signallers, crossing keepers and track workers might also provide useful intelligence to help inform your decision-making.

Where data differs and challenges your own local knowledge, it is important to evaluate this, taking account of combined intelligence to reach decisions.

7.3 Making informed conclusions

Use everything at your disposal to evaluate the risks associated with the prevalence of fog.

Consider:

- The data analysis undertaken in response to the output of the FDAT and the conclusions you have reached.
- The pooled knowledge that you have about the presence of fog at the level crossing, the patterns of use, the impact on risk and on any safeguards such as the audibility of whistle boards.
- Third-party knowledge received about fog and patterns of use at the crossing.
- Thinking like a user of the crossing during poor visibility.

8 Managing the risk and prioritising mitigation measures

8.1 Evaluating mitigation measures

The prevalence of fog and its impact on safety might be sufficient reason for you to introduce risk mitigation as an interim control and/or long-term objective. In equal measure, fog might compound other hazards and drive the same requirement. When evaluating options to mitigate the risk of fog, it is important to consider the user groups and the mitigation best suited to the associated risks.

Options to manage the risks of fog might include:

- Temporary closure of the level crossing (public right of way or private access)
- Alternative safe methods of use formally agreed with AU(s) (private access)
    - Crossing is locked out of use;
    - Crossing is not used during poor visibility;
    - Where telephones are provided, and if practicable taking account of signaller workload, pedestrians shall use the telephone during poor visibility;
    - Other means of access is used during poor visibility, e.g. use of alternative crossing with technology (if applicable)
- Permanent closure of the level crossing
- Introduction of miniature stop light systems
- Reduction in line speed through ESR/TSR/PSR to reduce the consequence of a collision

Note: *Whilst reductions in line speed can reduce the consequence of an accident, it is also possible that a slower, quieter train, which is harder to hear, could import additional risks to pedestrians during fog and poor visibility. As always, site appropriate solutions must be considered.*

8.2 Prioritising the delivery of mitigation measures

Where interim controls and long-term mitigation is required, the risk and prevalence of fog must factor into decision-making relating to the urgency of its introduction. This might mean that crossings at which fog is considered a significant risk are given greater priority when programming in works delivery.

When reaching conclusions and comparing how the prevalence of fog affects the priority of risk mitigation, it is worth considering:

- How prevalent fog is likely to be throughout the year, and how this compares to user and train moment, resulting in intolerable risks and hazards
- The duration required to implement the control measure(s) and whether fog risk is tolerable during this time
- How the risk of fog compares to other risks that require investment and mitigation to manage safety

Note for RLCMs/Steering Groups: *It might help in determining the prioritisation of mitigation measures if a weighting or points system is used. Such a methodology could be applied to other risk influencing factors such as long signal sections or incident history for example and help where competing priorities and funding constraints exist.*

It is important that Route level crossing safety strategies reflect the management of fog and other environmental conditions. This will help with business planning generally and also in determining future control period funding requirements at the earliest opportunity.

9 Record keeping

9.1 Recording your decisions

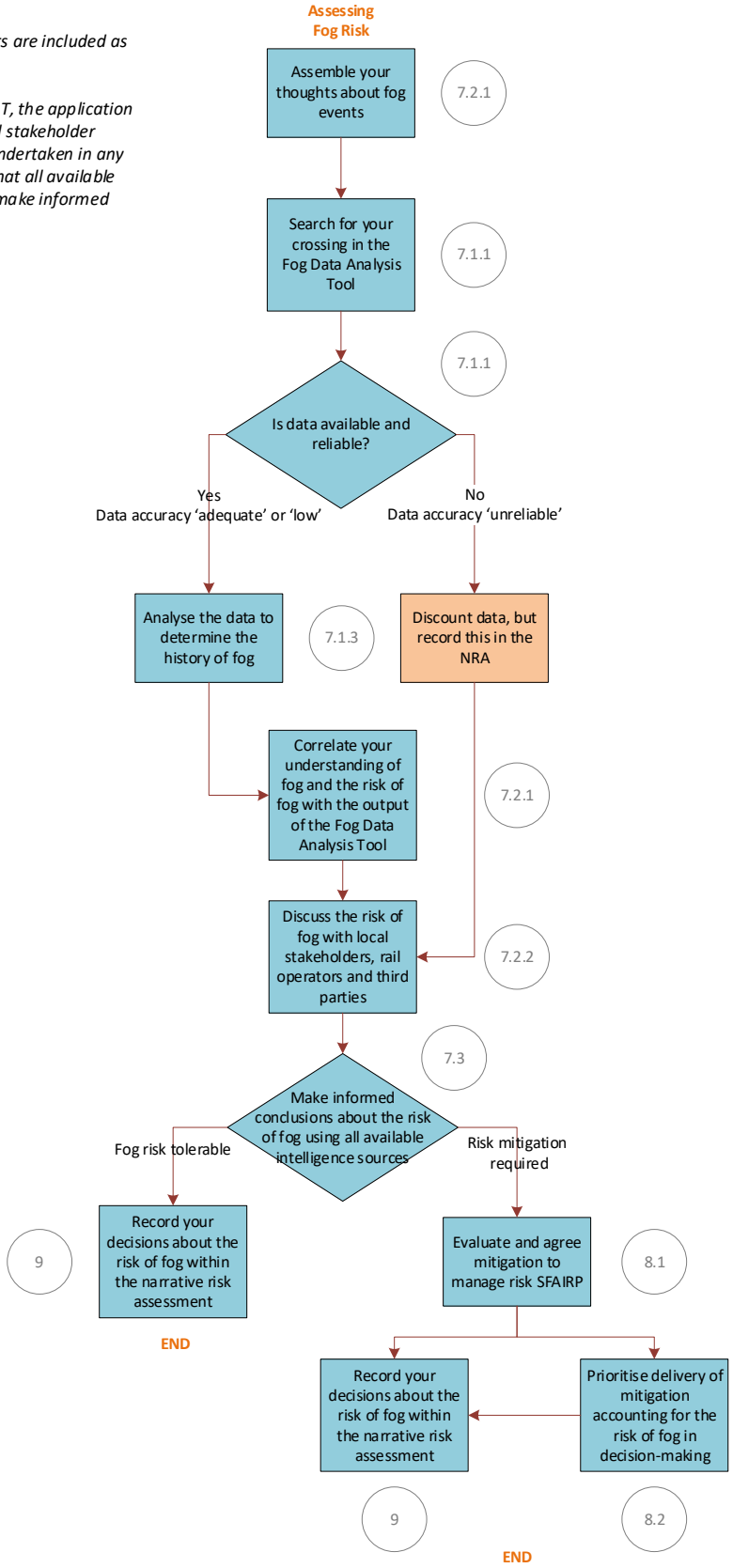
It is important that your evaluations relating to the risk of fog are included within your narrative risk assessments, incorporating any data from the FDAT that may support your decision-making. This includes any action undertaken to manage risk which might not be included within ALCRM optioneering. For example, reaching a formal agreement with an authorised user regarding a safer method of use, such as using an alternative crossing equipped with technology or using phones as a pedestrian during adverse weather (if practicable).

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Annex A: Process Overview

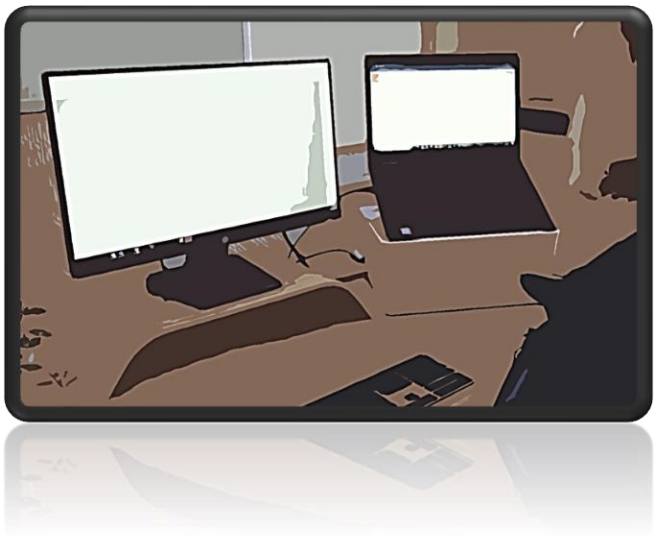
Note 1: *Clause numbers are included as reference points.*

Note 2: *Use of the FDAT, the application of local knowledge and stakeholder engagement may be undertaken in any order. It is important that all available intelligence is used to make informed decisions.*



IA20

GUIDANCE FOR APPLYING GROSS DISPROPORTION FACTORS TO COST BENEFIT ANALYSIS



LEVEL CROSSING GUIDANCE

Technical Authority, Level Crossing Safety Team

If we can't close a level crossing, let's make it safer.

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1. Purpose

This document provides guidance on applying Gross Disproportion Factors (GDF) within the Cost Benefit Analysis (CBA) process. It applies to the process of optioneering and must be used as a support to risk-based decision making to manage risk so far as is reasonably practicable.

2. Scope

This guidance is intended to aid Level Crossing Managers (LCMs) in the management of level crossing risk so far as is reasonably practicable. It provides the structure to be followed where level crossings are impacted, including but not limited to, business as usual level crossing risk assessment, enhancement schemes, timetable change and renewal projects.

It must be used in conjunction with the cost benefit analysis tool, as shown in this guidance document, to determine whether the cost of implementing a control measure is **grossly disproportionate** to the reduction in risk that might be achieved. The output must then be used to support risk-based decision making to reduce risks so far as is reasonably practicable.

The contents of this guidance document set out the framework for the application of a suitable factor of gross disproportion as part of the level crossing risk assessment process.

3. Background

The ORR raised concerns that Network Rail's CBA tool does not adequately account for gross disproportion as required to comply with health and safety law.

The Health and Safety at Work Act 1974 (HSWA) places duties on Network Rail to conduct its undertaking to ensure, so far as is reasonably practicable, that it does not expose level crossing users to risks to their health and safety. In doing so, Network Rail must consider the cost of implementing risk control measures (in terms of money, time and effort) against the reduction in risk those measures might achieve.

To provide structure and a consistent framework in determining whether an option is grossly disproportionate, Network Rail has developed Gross Disproportion Factors (GDFs) that shall be applied to the Cost Benefit Analysis calculation. To be grossly disproportionate, the cost of implementation must significantly outweigh the risk to the user.

4. Determining the Gross Disproportion Factor (GDF)

To support LCMs determine what is grossly disproportionate, a question set has been devised which takes account of the local factors of the crossing. This specific focus on localised risks is used to establish the appropriate GDF value to be applied on a crossing by crossing basis. Four key factors that need to be considered when determining the correct GDF to apply have been incorporated within the question set, these are: **Culpability**, **Vulnerability**, **Societal Aversion** and **Uncertainty**.

GDF scaling has been discussed and agreed with our executive leadership team. The options align with Network Rail's risk appetite and are in line with accepted practice in other comparable industries. The below table illustrates the range of suitable Gross Disproportion Factors that can be applied to the CBA result.

GDF Level	GDF Scale
Medium	1.5
High	2.5
Exceptional	6

Table 1: Gross Disproportion Factors

4.1 Culpability

Culpability involves looking at the history of level crossing incidents since the last risk assessment and taking into account events involving people who intended to take their own life, in addition to deliberate or accidental user error events.

Culpability - accounting for suicides, deliberate misuse and user errors				
What is the level crossing incident history since the last risk assessment?	Suicide events only	0 - 5 incidents	6 - 25 incidents	>25 incidents
	Medium	**Medium**	**High**	**Exceptional**

[1] *Includes both deliberate and accidental user error events, accidents and collisions*

4.2 Vulnerability

Vulnerability looks at the demographic of level crossing users. Network Rail has a greater responsibility for those less aware of the dangers or less able to protect themselves at level crossings. Greater weighting is given to crossings with high numbers of the most vulnerable users or at locations where LCMs have highlighted individuals, or groups of individuals, who are encumbered or with protected characteristics.

In determining which GDF level to use, the structured expert judgement shown in the risk assessment, as per the guidance within LCG 02 census good practice, should be used.

Vulnerability - a greater responsibility exists for those less able to protect themselves			
Who uses the level crossing?	No vulnerable users identified	Vulnerable User CAT 1 *Cyclists and dog walkers only*	Vulnerable User CAT 2 *Those with protected characteristics, e.g., children, elderly, encumbered, disabled, parents with young children*
GDF Level	**Medium**	**Medium**	**High**

4.3 Societal Aversion

Societal aversion considers what the **worst-case consequence is in the most likely scenario for a single event involving a train**. This is determined by looking at the current line-speed at the crossing, the volume of train services, the volume and demographics of pedestrian users and the types of vehicles, and the surrounding infrastructure within the immediate vicinity of the level crossing which might influence the outcome.

Greater weighting is given to events with the potential to cause the largest number of fatalities or injuries.

Societal Aversion - addressing the absence of public appetite for credible mass casualty events				
What is the worst-case consequence in the most likely scenario for a single event involving a train	Event with the potential of a single specified injury to 5 specified injuries	Event with the potential of between 5 specified injuries and 2 fatalities	Event with the potential of between 2 and 10 fatalities	Event with the potential of greater than 10 fatalities or 10 FWI
	Between 0.1 and 0.5 FWI	*Between 0.5 and 2 FWI*	*Between 2 and 10 FWI*	
GDF Level	**Medium**	**Medium**	**High**	**Exceptional**

Illustrations of application

Example 1

A frequent bus service, four each hour between 8am and 7pm, pass over a rural AHB each weekday. Evidence within the risk assessment has highlighted that blocking back occurs with buses.

In this case, a decision is reached that the worst-case consequence, in the most likely scenario, is that a bus has entered the confines of the crossing with its exit obstructed. Based upon passenger occupancy within the bus, and the risk of derailment, an **Exceptional** rating is awarded.

Example 2

There are frequent movements involving HGVs, vans, small lorries and cars at an AHB. The road provides access to a small number of residential properties and a large industrial complex. There is no recorded evidence of blocking back, but there have been several incidents of barrier weaving and red light running involving cars and small lorries.

Based upon the known evidence within the risk assessment, a **High** rating is awarded, accounting for a collision with a car or lorry which could result in multiple fatalities. This being the most likely scenario.

4.4 Uncertainty

Uncertainty looks at the level of confidence we have in understanding who uses the crossing, whether they are regular or irregular crossing users and how convinced we are that they are practiced in using the crossing safely. It also captures the level of protection provided at a crossing, whether it is active or passive, and how the current control measure provides a user with information on whether or not a train is coming.

4.4.1 Uncertainty for all crossings

This question set is to be applied to all crossings.

Uncertainty - how confident are we that we understand crossing usage correctly?		
Does the level crossing currently have a passive or active warning?	Active	Passive
GDF Level	**Medium**	**High**
Does the local environment create uncertainty about how the crossing is used and by whom?	No	Yes
GDF Level	**Medium**	**High**

Note: Includes elements such as who/how/when/and with what consequences they are used

4.4.2 Uncertainty for private level crossings

This question set is to be applied to all **private** crossings as well as **4.4.1.**

Uncertainty for private level crossings			
Who uses the crossing?	Authorised users or regular, controlled users only	Irregular/unfamiliar users (delivery drivers etc.)	
GDF Level	**Medium**	**High**	
Can we be certain about the types of vehicles that use the crossing?	Confirmed by census and other smart sources of information	Described and confirmed by authorised users	Unable to confirm through census or discussion with authorised users
GDF Level	**Medium**	**High**	**Exceptional**

4.4.3 Uncertainty for public road level crossings

This question set is to be applied to all **public** road crossings as well as **4.4.1.**

Uncertainty for public road level crossings			
What level of protection is provided at the crossing?	Full barrier	Half barrier *(or open crossing if line speed is equal to or less than 25mph)*	Open crossing *(If line speed is greater than 25mph)*
GDF Level	**Medium**	**High**	**Exceptional**

5. Applying the results

Culpability - accounting for suicides, deliberate misuse and user errors				
What is the level crossing incident history since the last risk assessment?	Suicide events only	0 - 5 incidents	6 - 25 incidents	>25 incidents
	Medium	**Medium**	**High**	**Exceptional**
Vulnerability - a greater responsibility exists for those less able to protect themselves				
Who uses the level crossing?	No vulnerable users identified	Vulnerable User CAT 1 *Cyclists and dog walkers only*	Vulnerable User CAT 2 *Those with protected characteristics, e.g., children, elderly, encumbered, disabled, parents with young children*	
	Medium	**Medium**	**High**	
Societal Aversion - addressing the absence of public appetite for credible mass casualty events				
What is the worst-case consequence in the most likely scenario for a single event involving a train	Event with the potential of a single specified injury to 5 specified injuries	Event with the potential of between 5 specified injuries and 2 fatalities	Event with the potential of between 2 and 10 fatalities	Event with the potential of greater than 10 fatalities or 10 FWI
	Between 0.1 and 0.5 FWI	*Between 0.5 and 2 FWI*	*Between 2 and 10 FWI*	
	Medium	**Medium**	**High**	**Exceptional**
Uncertainty - how confident are we that we understand crossing usage correctly?				
Does the level crossing currently have a passive or active warning?			Active	Passive
			Medium	**High**
Does the local environment create uncertainty about how the crossing is used and by whom?			No	Yes
			Medium	**High**
Uncertainty for private level crossings				
Who uses the crossing?	Authorised users or regular, controlled users only		Irregular/unfamiliar users (delivery drivers etc.)	
	Medium		**High**	
Can we be certain about the types of vehicles that use the crossing?		Confirmed by census and other smart sources of information	Described and confirmed by authorised users	Unable to confirm through census or discussion with authorised users
		Medium	**High**	**Exceptional**
Uncertainty for public road level crossings				
What level of protection is provided at the crossing?		Full barrier	Half barrier *(or open crossing if line speed is equal to or less than 25mph)*	Open crossing *(If line speed is greater than 25mph)*
		Medium	**High**	**Exceptional**

In this example the GDF factor applied would be **Exceptional** as that is the highest level achieved on the question set.

Once you have completed the question set, the table below must be used to determine the suitable Gross Disproportion Factor to apply to the CBA results.

GDF Level	GDF Scale
Medium	1.5
High	2.5
Exceptional	6

The gross disproportion factor is then applied to the benefit cost ratio as calculated using the Cost Benefit Analysis tool to aid decision making when deciding which option(s) to progress.

Example

- A Cost Benefit Analysis for implementing MSL's on this user worked crossing has returned a benefit cost ratio of **0.20**
- The GDF question set has returned a GDF level of 'Exceptional' at the crossing making the **GDF scale to be applied, 6**
- The new benefit cost ratio when taking into account the Gross Disproportion Factor is calculated as: **0.20 (the benefit cost ratio) X 6 (the GDF) = a benefit cost ratio of 1.2**

6. Recording your findings

It is required to include the Gross Disproportion Factor into your calculation of each benefit cost ratio in the optioneering section of your NRA. Therefore, the benefit cost ratio must be the final figure which includes the GDF multiplication. You must also include your Gross Disproportion Factor findings, including your completed question set, as an appendix to your Narrative Risk Assessment. You may choose to use the form in Appendix C, or the Excel based tool that accompanies this guidance, to complete the necessary questions.

Where projects and enhancement schemes require level crossing risk modelling to take place, LCMs will need to provide the output of optioneering, inclusive of the combined benefit cost ratio results, for each option. Retain this information on the level crossing file.

7. Using GDF as part of a holistic crossing risk profile

ALCRM, Cost Benefit Analysis and Gross Disproportion Factors are decision support tools that help Network Rail determine the reasonably practicable control measures to be applied at each of its level crossings.

There are, however, some factors that are not taken into consideration through the quantitative calculations of these tools. Reasonable practicability needs to also include a qualitative understanding of these 'unmeasured risk factors' when making risk-based decisions concerning crossing upgrades and enhancements.

Although qualitative structured expert judgement is essential to a balanced safety assessment, it is important that we avoid double counting risk, so far as is reasonably practicable, within the ALARP decision making process.

7.1 Measured risk factors

Appendix A identifies risk factors that are already accounted for in ALCRM, the GDF process and/or the Cost Benefit Analysis process. Therefore, these arguments should **not** be used as further justification for an upgrade if the benefit cost ratio is below 1. It also highlights areas of compliance that must be dealt with outside of any ALARP decisions.

7.2 Unmeasured risk factors

Appendix B identifies risk factors that are not accounted for within ALCRM, GDF and/or the CBA process and therefore could continue to form part of the qualitative judgement of the level crossing manager when evaluating whether or not a level crossing's safety risk is managed to ALARP.

There are also some factors determined to be unmeasured that would also need to be taken into consideration for level crossing design, these are:

- Trains blocking back over crossings
- Crossings close to loops/points

When applying structured expert judgement, evidence based justification is required to support decision-making.

Appendix A: Factors already accounted for in ALCRM, the Cost Benefit Analysis tool and/or GDF

Risk Factor	Covered by
Large number of vulnerable users	ALCRM caters for a large number of users GDF - Vulnerability
Vulnerable use isn't accounted for in the risk score of protected crossings	GDF - Vulnerability
Large scale pre-planned events that introduce or promote increased use of the crossing	Route owned local instructions and operating protocols
Nearby attractions for youths to congregate resulting in known misuse events to occur	GDF - Culpability
Distractions near to crossings e.g., low flying aircraft, attractions or beauty spots, resulting in known misuse events to occur	GDF - Culpability
Local schools, stores or amenities close to a crossing which promote increased use and result in known misuse events to occur	GDF – Culpability and Uncertainty
Vulnerable use not yet identified	GDF – Uncertainty
Speeding vehicles approaching the crossing	If there is evidence of this causing incidents GDF – Culpability
Level crossing equipment failure rates	CBA tool under maintenance savings
Derelict buildings in close proximity to the crossing which promote poor behaviours and result in known misuse events to occur	GDF - Culpability
Suicide hotspot	GDF - Culpability
Non-SMIS incident data such as intelligence from the Signallers Reporting Tool, MSVs, RLSE, TRUST or BTP Fusion Data	Should be included in the NRA and incorporated within GDF GDF – Culpability
Crossing is on a locally promoted walking/cycling route	Census in ALCRM
Train horn audibility/whistle boards at crossings - Crossing non-compliances/underfoot conditions - Automatic crossings near junctions with different strike in times - Vertical profile test discrepancies between design and maintenance - Crossings not showing on signal panels	These are compliance issues that must be addressed as part of our legal duties under health and safety law, CBA is not required, improvements must take place

Appendix B: Factors that could be taken into account separately as part of the qualitative assessment of managing level crossing safety risk to ALARP

Unmeasured Risk Factors
Blocking back over the crossing is a known risk or foreseeable concern
For level crossings at stations restrictions on platform/amenity access e.g., ticket machine on one platform only and no footbridge
Impact of barrier down time on user convenience leading to poor public behaviour
Heavy concentrations of traffic over the crossing at specific periods, for example during commuter times or school times or visitors to local attractions
Crossings with a pronounced risk of adverse weather
Crossings within long signal sections and/or where extended waiting times exist
Signaller workload could be considered an 'unmeasured factor' if identified as a concern, whether contributing to incidents or identified as part of a separate workload risk assessment
Justifiable safety risks not accounted for previously, such as youths congregating in the vicinity of the level crossing, not resulting in known misuse events, but potentially causing distraction and/or extending the time crossing users take to enter or egress safely

Appendix C: Blank form for application

Crossing name				
ELR, m, ch			**Crossing type**	
Name of person completing this form				
Date of completion			**GDF result**	
Culpability - accounting for suicides, deliberate misuse and user errors				
What is the level crossing incident history since the last risk assessment?	Suicide events only	0 - 5 incidents	6 - 25 incidents	>25 incidents
	Medium	**Medium**	**High**	**Exceptional**
Vulnerability - a greater responsibility exists for those less able to protect themselves				
Who uses the level crossing?	No vulnerable users identified	Vulnerable User CAT 1 *Cyclists and dog walkers only*	Vulnerable User CAT 2 *Those with protected characteristics, e.g., children, elderly, encumbered, disabled, parents with young children*	
	Medium	**Medium**	**High**	
Societal Aversion - addressing the absence of public appetite for credible mass casualty events				
What is the worst-case consequence in the most likely scenario for a single event involving a train	Event with the potential of a single specified injury to 5 specified injuries	Event with the potential of between 5 specified injuries and 2 fatalities	Event with the potential of between 2 and 10 fatalities	Event with the potential of greater than 10 fatalities or 10 FWI
	Between 0.1 and 0.5 FWI	*Between 0.5 and 2 FWI*	*Between 2 and 10 FWI*	
	Medium	**Medium**	**High**	**Exceptional**
Uncertainty - how confident are we that we understand crossing usage correctly?				
Does the level crossing currently have a passive or active warning?			Active	Passive
			Medium	**High**
Does the local environment create uncertainty about how the crossing is used and by whom?			No	Yes
			Medium	**High**

Uncertainty for private level crossings				
Who uses the crossing?	Authorised users or regular, controlled users only		Irregular/unfamiliar users (delivery drivers etc.)	
	Medium		**High**	
Can we be certain about the types of vehicles that use the crossing?	Confirmed by census and other smart sources of information		Described and confirmed by authorised users	Unable to confirm through census or discussion with authorised users
	Medium		**High**	**Exceptional**
Uncertainty for public road level crossings				
What level of protection is provided at the crossing?	Full barrier		Half barrier *(or open crossing if line speed is equal to or less than 25mph)*	Open crossing *(If line speed is greater than 25mph)*
	Medium		**High**	**Exceptional**

IA21

Tackley Level Crossing Occurrence Log – July 2019 to April 2020

Entry No	Date	Time of Call	Nature of Request	Time Permission Refused	Time Permission Granted	Time Reported Clear	Was Next Train Cautioned
1.	28-07-2019	16:44	Pedestrians	16:44	16:45	16:46	N/A
2.	31-07-2019	15:17	Pedestrians	-	15:17	-	N/A
3.	04-08-2019	07:50	Horse	-	07:50	07:51	N/A
4.	21-08-2019	17:44	1x Horse	-	17;44	17:45	N/A
5.	02-10-2019	18:01	Horse	18:01	18:05	18:05	N/A
6.	12-10-2019	10:43	Horse	10:44	10:46	10:47	N/A
7.	19-10-2019	09:18	Horse	-	09:18	09:19	N/A
8.	31-10-2019	12:44	Person	-	12:44	12:44	N/A
9.	03-11-2019	09:35	Horse	-	09:35	09:36	N/A
10.	12-11-2019	10:15	2x Horses	10:15	10:17	10:18	N/A
11.	17-11-2019	09:49	Horse	-	09:49	09:50	N/A
12.	22-11-2019	09:45	Horse	09:45	09:47	09:48	N/A
13.	28-11-2019	10:22	3x Horses	10:22	10:28	10:29	N/A
14.	29-11-2019	09:57	Horse	-	09:57	09:58	N/A
15.	05-12-2019	10:15	Horse	-	10:15	10:16	N/A

16.	07-12-2019	10:18	2x Horses	-	10:18	10:19	N/A
17.	08-12-2019	12:03	Horse	12:03	12:06	12:07	N/A
18.	22-12-2019	15:21	Horse	-	15:21	15:22	N/A
19.	27-12-2019	11:00	3x Ponies	11:00	11:03	11:04	N/A
20.	28-12-2019	11:01	1X Horse	-	11:01	11:02	N/A
21.	29-12-2019	10:13	2x Horses	-	10:13	10:14	N/A
22.	02-01-2020	12:11	Horse	-	12:11	12:12	N/A
23.	03-01-2020	15:20	Horse	15:20	15:26	15:27	N/A
24.	03-01-2020	17:23	Pedestrians	-	17:23	17:24	N/A
25.	12-01-2020	09:38	2x Horses	-	09:38	09:39	N/A
26.	12-01-2020	11:56	2x Horses	11:56	11:59	12:00	N/A
27.	12-01-2020	12:05	2x Horses	-	12:05	12:06	N/A
28.	12-01-2020	15:26	2x Horses	15:26	15:27	15:28	N/A
29.	15-01-2020	11:02	Horse	-	11:02	11:03	N/A
30.	18-01-2020	16:06	Horse	-	16:06	-	Yes
31.	20-01-2020	12:15	Generator	12:15	12:17	12:19	N/A
32.	21-01-2020	16:30	Horse	16:30	16:35	16:36	N/A

33.	23-01-2020	09:18	Horse	09:19	09:22	09:23	N/A
34.	23-01-2020	10:21	Horse	-	10:21	10:22	N/A
35.	28-01-2020	16:20	Pedestrian Child	16:20	16:21	16:22	N/A
36.	31-01-2020	10:21	Horses	-	10:21	10:23	N/A
37.	01-02-2020	10:35	2x Horse	10:35	10:38	10:39	N/A
38.	02-02-2020	15:56	Horse	-	10:56	10:57	N/A
39.	07-02-2020	10:17	Horse	-	10:17	10:18	N/A
40.	08-02-2020	10:57	Horse	-	10:57	10:58	N/A
41.	17-02-2020	10:27	Horse	-	10:27	10:28	N/A
42.	18-02-2020	10:44	3x Horses	10:44	10:47	10:48	N/A
43.	08-03-2020	10:47	1x Horse	-	10:47	10:48	N/A
44.	21-03-2020	11:40	2x Cyclists	-	11:40	11:42	N/A
45.	22-03-2020	15:58	Pedestrian	-	15:58	15:58	N/A
46.	22-03-2020	17:29	Horse	-	17:30	17:30	N/A
47.	22-03-2020	18:25	Horse	-	18:25	18:26	N/A
48.	29-03-2020	16:17	Cyclists	-	16:17	-	-
49.	29-03-2020	16:52	Horse	-	16:52	16:54	N/A

50.	29-03-2020	17:13	3x Cyclists	-	17:13	-	-
51.	30-03-2020	19:08	Horse	19:08	-	-	-
52.	04-04-2020	17:04	3x Cyclists	-	17:04	17:05	N/A
53.	04-04-2020	18:03	3x Cyclists	18:03	18:05	18:06	N/A
54.	07-04-2020	07:41	3x People	07:41	07:46	07:46	N/A
55.	08-04-2020	13:13	Wheelbarrow	-	13:13	13:14	N/A
56.	08-04-2020	13:19	Wheelbarrow	-	13:19	13:20	N/A
57.	08-04-2020	13:24	Wheelbarrow	-	13:25	13:26	N/A
58.	08-04-2020	13:33	Wheelbarrow	-	13:33	13:34	N/A
59.	09-04-2020	11:41	Wheelbarrow	-	11:41	11:42	N/A
60.	09-04-2020	11:51	Wheelbarrow	-	11:51	11:52	N/A
61.	09-04-2020	14:00	Wheelbarrow	-	14:00	14:00	N/A
62.	09-04-2020	14:10	Wheelbarrow	-	14:10	14:10	N/A
63.	09-04-2020	14:23	Wheelbarrow	-	14:23	14:23	N/A
64.	09-04-2020	14:33	Wheelbarrow	-	14:33	14:34	N/A
65.	10-04-2020	18:11	2x Horses	-	18:11	18:12	N/A
66.	15-04-2020	19:18	2x Cyclists	-	19:18	19:18	N/A

67.	16-04-2020	16:28	Pedestrian	16:28	16:31	16:32	N/A
68.	26-04-2020	15:33	Bikes	-	15:33	15:34	N/A
69.	26-04-2020	17:23	Pedestrian	-	17:23	-	N/A
70.	26-04-2020	18:12	Horse	-	18:12	18:12	N/A