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Guidance on Level Crossing Interface Requirements

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Rail Industry Guidance Note for GK/RT0192



Documents

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Guidance on Level Crossing Interface Requirements

Issue record

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One	06 February 2010	Original document
Two	01 December 2012	Small scale change. Amended to provide additional guidance on the amended text in GK/RT0192, clause 4.1.1.1 – compliance requirements

Superseded documents

This Rail Industry Guidance Note does not supersede any other Railway Group documents.

Supply

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Guidance on Level Crossing Interface Requirements

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Guidance on Level Crossing Interface Requirements

Part 1 Introduction

1.1 Purpose of this document

This document gives guidance on interpreting the requirements of Railway Group Standard GK/RT0192. It does not constitute a recommended method of meeting any set of mandatory requirements.

All requirements in GK/RT0192 are reproduced in the sections that follow. Guidance is provided as a series of sequentially numbered clauses prefixed 'GN' immediately below the text to which it relates. Where there is no guidance given, this is stated.

Specific responsibilities and compliance requirements are laid down in the Railway Group Standard itself.

This document has been amended under the Railway Group Standards Code (Issue Three) as a small scale change. Reference to the amendments has been made in the 'Issue record'. All other parts of the document are unchanged from the previous issue.

1.2 Copyright

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1.3 Approval and authorisation of this document

The content of this document was approved by:

Control Command and Signalling (CCS) Standards Committee on 13 September 2012.

This document was authorised by RSSB on 25 October 2012.

Guidance on Level Crossing Interface Requirements

Part 2 Guidance on Level Crossing Interfaces

2.1 Requirements for stop signals and ETCS block markers at level crossings

2.1.1 Stop signals and ETCS block markers at controlled level crossings worked by signallers or crossing keepers

2.1.1.1 A stop signal or ETCS block marker shall be provided on each signalled approach to controlled level crossings that require movement authorities to be withdrawn before being opened to road traffic. Further requirements for stop signals are set out in GK/RT0045. Further requirements for ETCS block markers are set out in GI/RT7033.

GN01 Controlled level crossings that are worked by signallers or crossing keepers include:

- a) Manually controlled barriers operated locally using direct observation
- b) Manually controlled barriers operated remotely using a video monitoring system at the control point, for example, Closed-Circuit Television (CCTV)
- c) Hand operated or mechanically worked gates, including wicket gates.

GN02 The stop signals and ETCS movement authorities are interlocked with the level crossing so that movement authorities can only be displayed to train drivers after the level crossing has been operated to close the road. The signaller or crossing keeper is responsible for operating the level crossing and checking that the level crossing area is clear of obstructions before clearing the signal.

2.1.1.2 Stop signals and ETCS block markers shall be located within 600 m of the level crossing, except where the risk associated with an increased distance is acceptable.

GN03 The maximum 600 m distance from a stop signal or block marker to the level crossing is associated with degraded operations when a train has been stopped on the approach to the level crossing and the train driver is instructed by the signaller to proceed over the level crossing at caution (see GE/RT8000 Rule Book). The risk being controlled is the train driver not proceeding at caution as instructed, which could arise if the distance travelled and the time taken to reach the level crossing after passing the signal is excessive.

GN04 Although controlled level crossings are not usually regarded as an obstruction within the overlap:

- a) Where practicable, stop signals should be positioned so that the overlap does not include a level crossing. This is to reduce the likelihood of a train reaching a level crossing in the event of a Signal Passed at Danger (SPAD)
- b) On ETCS lines, block markers should be positioned so that the supervised stopping position is located on the approach to the level crossing.

GN05 Where stop signals are not positioned at overlap distance from a controlled level crossing, warning class route controls may be considered for signalling train movements towards protecting stop signals when the controlled level crossing is open to road traffic. This provides a similar control to that provided with reduced overlaps by slowing the train down before the train approaches the stop aspect, thus reducing the likelihood of a train reaching a level crossing in the event of a SPAD.

GN06 The consequence of a SPAD should be further mitigated by designing the level crossing controls so that the road traffic signals are activated whenever a SPAD is detected.

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2.1.1.3 Stop signals and ETCS block markers shall be positioned at least 50 m from the level crossing, except where either:

- a) The level crossing is immediately beyond a station platform, in which case the stop signal or ETCS block marker associated with the platform shall be positioned at least 25 m from the level crossing, or
- b) The signalling system is configured so that movement authorities towards the stop signal or ETCS block marker are only displayed when the level crossing is closed to road traffic.

- GN07 Where a level crossing is located either within a signalling overlap, or between a home signal and the clearing point, or between an ETCS block marker and the supervised location, the GE/RT8000 Rule Book permits the signaller to authorise train movements towards that stop signal or ETCS block marker when the level crossing is open to the road.
- GN08 GE/RT8270 Assessment of Compatibility of Rolling Stock and Infrastructure, sets out the process for assessment of compatibility that is required before a material change (that is to say, a change that has the potential to affect physical or operational interfaces) is introduced on the railway. This should include an assessment of the SPAD risk at stop signals and ETCS block markers protecting level crossings, which should take account of:
- a) The risk of a train exceeding its movement authority and reaching the level crossing when it is open to road, and
 - b) Other measures provided to mitigate SPAD risk (for example, TPWS equipment).
- GN09 The specified minimum distance between the end of a movement authority and a level crossing provides train drivers with a standard minimum overrun distance to the level crossing, which may be open to the road user when the train approaches the end of its movement authority. Train driving competence includes route knowledge about the location of stop signals, ETCS block markers and level crossings, so train drivers should understand the consequence of exceeding the movement authority.
- GN10 At stations, an overrun distance of less than 50 m should only be used where it is necessary to accommodate a train within the available platform length or to stop the train at an optimum stopping position in the station. In this case, the signal overrun risk assessment should take account of the number of trains that are expected to stop at the station and the likelihood of the signal displaying a stop aspect.
- GN11 In exceptional circumstances, a stop signal or block marker may be positioned less than 25 m from a controlled level crossing. Because the limited safe overrun distance may be of little use to train drivers, the signalling system should be designed so that movement authorities can only be issued for trains to approach the signal protecting the level crossing when either:
- a) The road has been closed and the level crossing area is detected to be clear, or
 - b) The level crossing closing sequence is automatically initiated when a train is approaching, with sufficient time to mitigate the effects of a SPAD, should that event occur.

Guidance on Level Crossing Interface Requirements

2.1.2 Stop boards at train crew operated level crossings

2.1.2.1 A stop board shall be provided on each signalled approach to train crew operated level crossings. Further requirements for stop boards are set out in GK/RT0045.

GN12 Stop boards display a fixed stop aspect to train drivers, who are required to stop the train on the approach to the level crossing before they operate the level crossing.

GN13 The instructions displayed on the stop board should be compatible with the published level crossing operating instructions and set out the requirements for passing the stop board.

GN14 GK/GN0645 Guidance on Lineside Signals, Indicators and Layout of Signals, provides additional guidance about aspect sequences approaching stop boards.

2.1.2.2 The stop board shall be positioned at least 50 m from the level crossing, except where the crossing is immediately beyond a station platform, in which case the stop board associated with the platform shall be positioned at least 25 m from the level crossing.

GN15 The specified minimum distance between the stop board and the level crossing provides train drivers with a standard minimum overrun distance to the level crossing, which should be open to the road user when the train approaches the end of its movement authority. Train driving competence includes route knowledge about the location of stop boards at train crew operated level crossings, both of which are visible objects, so train drivers should understand the consequence of passing the stop board.

GN16 GE/RT8270 sets out the process for assessment of compatibility that is required before a material change (that is to say, a change that has the potential to affect physical or operational interfaces) is introduced on the railway.

GN17 The position of stop boards relative to train crew operated level crossings should take account of:

- a) The risk of a train exceeding its movement authority and reaching the level crossing when it is open to road
- b) Other measures provided to mitigate SPAD risk (for example, TPWS equipment)
- c) The requirement for train crew to operate the level crossing
- d) The risk of a train entering a level crossing area that is open to road.

GN18 At stations, an overrun distance of less than 50 m should only be used where it is necessary to accommodate a train within the available platform length or to stop the train at an optimum stopping position in the station. In this case, the signal overrun risk assessment should take account of the requirement for all trains to stop at the station.

2.1.3 Stop signals and ETCS block markers at automatic level crossings remotely monitored by the signaller

2.1.3.1 A stop signal or ETCS block marker shall be provided on each signalled approach to automatic level crossings that are remotely monitored by the signaller.

2.1.3.2 Except where alternative arrangements are provided on Radio Electronic Token Block (RETB) signalled lines (see 2.1.3.3) or lines with ETCS level 2 (see 2.1.3.4), stop signals shall be positioned so that the running time at permissible speed from the signal to the level crossing does not exceed 10 minutes.

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- GN19 Automatic level crossings remotely monitored by the signaller are not interlocked with the signalling system. Typically these are automatic half barrier level crossings.
- GN20 Subject to signal regulation controls, automatic level crossing warning sequences are normally initiated when an approaching train is detected to have reached a predetermined 'strike-in' point. Strike-in points take account of the level crossing warning time required and the permissible speed(s) but do not take account of the distance required for a train to stop before reaching the level crossing. This means that it is not possible to display an indication requiring the driver to stop the train if the level crossing fails to close the road.
- GN21 Automatic level crossings remotely monitored by the signaller are provided with emergency telephones. In the event of an incident being reported by a member of the public, the stop signal provides a means of withdrawing movement authorities for trains approaching automatic level crossings that are supervised by the signaller.
- GN22 Where differential speeds apply, the 10 minute criterion should be applied to the highest permissible speed.
- GN23 Level crossing guidance published by the Office of Rail Regulation (ORR) states that the protecting stop signal should preferably be positioned at not less than the longest service braking distance for any train on each signalled approach to remotely monitored automatic level crossings. This is so that the train is capable of stopping before reaching the level crossing if the driver observes the stop signal being replaced to danger in an emergency.

2.1.3.3 On RETB lines, the stop board at the previous token exchange point shall protect the level crossing. In this case, it shall not be necessary to apply the 10-minute criterion set out in 2.1.3.2 if either:

- a) A continuous voice communication system is available between the stop board and the level crossing for the signaller to contact the train driver, and the risk of a train not being stopped is acceptable, or
- b) Before passing a designated point within 10 minutes running time on the approach to the level crossing, the driver of each train is required to contact the signaller to obtain permission to proceed over the level crossing.

- GN24 On RETB signalled lines, stop boards are provided at the commencement of each RETB section (typically at the exit of passing loops on single lines). If the radio system provides adequate coverage, it is not necessary to provide additional stop boards within ten minutes running time of the level crossing. This is because the voice radio system provides an alternative means for the signaller to instruct the train driver to stop the train in an emergency.

2.1.3.4 On ETCS level 2 fitted lines (without lineside signals), the previous ETCS block marker shall protect the level crossing. In this case, it shall not be necessary to apply the 10-minute criterion set out in 2.1.3.2.

- GN25 Where continuous data radio coverage is available on lines signalled with ETCS, the signalling system may be configured so that the signaller can withdraw or co-operatively shorten the movement authority before the train reaches the level crossing. The guaranteed voice radio coverage provides an alternative means for the signaller to instruct the train driver to stop the train in an emergency.

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2.1.3.5 Where all trains are required to stop between the strike-in point and the level crossing, the stop signal or ETCS block marker shall be positioned to indicate the stopping point for the train.

GN26 At some locations, typically where a station is positioned on the approach to an automatic level crossing, all trains are required to stop before proceeding over the level crossing. In such cases, the stop signal, stop board or ETCS end of authority indicates to train drivers where to stop the train. The stopping position has to be compatible with the level crossing controls, which are usually configured to delay the closing sequence until the train is ready to proceed.

GN27 Because train drivers need to know when it is safe to proceed over the level crossing, a movement authority or driver's level crossing indication should only be displayed after the level crossing closing sequence has been initiated. This is to provide sufficient warning time for the road user before the train reaches the level crossing (see 2.1.6).

2.1.3.6 Where the stop signal between the strike-in point and the level crossing is a stop board, a driver's level crossing indicator shall also be provided to authorise the train to proceed. Further requirements for driver's level crossing indicators are set out in GK/RT0045.

GN28 A stop board should only be provided where absolutely necessary, for example where the level crossing coincides with the start of an RETB section. In such cases, a driver's level crossing indicator consisting of a flashing white light only should be provided at the stop board. GK/GN0645 provides further guidance about the indications displayed by driver's level crossing indicators at stop boards.

GN29 Where a stop board is provided, train drivers should understand that the flashing white light means that the level crossing closure sequence is correctly operating. The stop board should include the written instructions that set out the actions to be taken (for example, 'Obtain white light before proceeding').

2.1.3.7 The stop signal, ETCS block marker or stop board shall be positioned at least 50 m from the level crossing, except where the crossing is immediately beyond a station platform, in which case the stop signal, ETCS block marker or stop board associated with the platform shall be positioned at least 25 m from the level crossing.

GN30 The specified minimum distance between the end of a movement authority and an automatic level crossing provides train drivers with a standard minimum overrun distance to the level crossing, which may be open to the road user when the train approaches the end of its movement authority. Train driving competence includes route knowledge about the location of stop signals, ETCS block markers and automatic level crossings, so train drivers should understand the consequence of exceeding the movement authority.

GN31 GE/RT8270 sets out the process for assessment of compatibility that is required before a material change (that is to say, a change that has the potential to affect physical or operational interfaces) is introduced on the railway. This should include an assessment of the SPAD risk at stop signals and ETCS block markers protecting automatic level crossings, which should take account of:

- a) The risk of a train exceeding its movement authority and reaching the level crossing when it is open to road, and
- b) Other measures provided to mitigate SPAD risk (for example, TPWS equipment).

Guidance on Level Crossing Interface Requirements

GN32 At stations, an overrun distance of less than 50 m should only be used where it is necessary to accommodate a train within the available platform length or to stop the train at an optimum stopping position in the station. In this case, the signal overrun risk assessment should take account of the number of trains that are expected to stop at the station and the likelihood of the signal displaying a stop aspect.

2.1.4 Stop signals and ETCS block markers at automatic level crossings locally monitored by the train driver

2.1.4.1 Where provided, stop signals, ETCS block markers and stop boards shall be positioned at least 50 m from the level crossing, except where the crossing is immediately beyond a station platform, in which case the stop signal, ETCS block marker or stop board associated with the platform shall be positioned at least 25 m from the level crossing.

GN33 There are no specific requirements to provide a stop signal or block marker on the approach to automatic locally monitored level crossings (typically, Automatic Barrier Level Crossing Locally Monitored (ABCL)) because the train driver is required to check that it is safe to pass over the level crossing before doing so. The train driver uses the indication displayed by the driver's level crossing indicator and observation of the level crossing area to do this (see 2.7).

GN34 At some locations, stop signals or block markers may be provided for other reasons. Where a stop board, stop signal or block marker is provided, the guidance for 2.1.3.7 about the minimum overrun distances is applicable to automatic locally monitored level crossings.

2.1.4.2 A stop board (or stop signal displaying the ON aspect) shall be provided on the approach to the level crossing to indicate the stopping point for the train if either:

- a) There is an operational requirement for all trains to stop on the approach to the level crossing (for example, at a station), or
- b) The available visibility of the level crossing area is insufficient to enable a safe crossing speed to be set.

GN35 Stop boards are provided on the approach to automatic locally monitored level crossings where it is necessary for all trains to stop before proceeding over the level crossing. The stop board indicates the stopping position, which has to be compatible with the level crossing controls (see 2.1.6).

GN36 A stop board may be required:

- a) If there is a ground frame or station between the strike-in point and the level crossing and all trains have to stop. In this case it may not be possible to provide a consistent warning time to road users without providing some form of stop signal, and
- b) If there is only limited visibility of the level crossing area on the approach to the level crossing, which means that trains need to be stopped before the train driver checks that the level crossing is clear.

GN37 The decision to provide a stop board or a worked signal should take account of railway undertaking operational requirements for stopping and non-stopping trains.

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2.1.4.3 Where the level crossing is initiated by train crew using a control device (see 2.8.1), the stop board shall include written instructions that set out the actions to be taken (for example, 'Press plunger and obtain white light before proceeding').

GN38 The operating instructions for each train crew operated level crossing are published in either the sectional appendix or in local operating instructions. The wording on the stop board should be compatible with these instructions because it reminds the train driver about what is required before the train is authorised to pass the stop board.

GN39 The wording on each stop board should take account of all of the actions required by the train driver, for example, actions associated with token exchange, movements through points, TPWS and level crossings.

2.1.5 Shunting movements over level crossings

2.1.5.1 Where shunting movement authorities can be issued over a level crossing, stop signals, ETCS block markers and shunt entry boards shall be positioned so that:

- a) Shunting movements can pass completely over the level crossing before reversing, and
- b) Trains are not required to stop over the level crossing.

GN40 When designing the provision and position of signals and shunt entry boards, the infrastructure manager should obtain information from relevant railway undertakings about the maximum lengths of trains and any shunting operations required over level crossings. GE/RT8270 sets out the process for assessment of compatibility that should be used to check that planned train movements are compatible with the operation of the level crossing equipment.

GN41 Shunting operations over level crossings typically include:

- a) Setting back and running round movements, and
- b) Shunting movements to and from sidings.

GN42 Where shunting movements over level crossings are required on un-signalled lines, the infrastructure manager should assess the risk and provide suitable protection arrangements, for example, stop boards.

2.1.6 Delayed clearance of signals, delayed display of driver's level crossing indicators and delayed issuing of ETCS movement authorities

2.1.6.1 Where it is necessary to delay the clearance of a stop signal, delay the display of a flashing white light indication or delay the issuing of an ETCS movement authority, the required time delay shall be determined using acceleration data obtained from the relevant railway undertakings for a light locomotive or any existing or proposed rolling stock which has better acceleration characteristics, which is operated, or is likely to be operated, on the line.

GN43 At automatic level crossings where a stop signal or ETCS route setting position is positioned between the strike-in point and the level crossing, the signalling controls should be configured so that accelerating trains do not reach the level crossing before the minimum level crossing warning time has elapsed (this control is known as signal regulation).

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- GN44 Signal regulation controls should be configured so that the level crossing closing sequence commences when the movement authority is ready to be issued, but before it is displayed. The display of the movement authority should be delayed for a predetermined time that is compatible with the shortest time taken for a stationary train to accelerate from the signal to the level crossing. For example:
- | | |
|--|------------|
| Required level crossing warning time: | 27 seconds |
| Shortest time taken for a train to reach the level crossing: | 13 seconds |
| Signal regulation time setting (27 – 13) = | 14 seconds |
- GN45 Where trains are required to stop between the strike in point and the level crossing, or where a stop board is provided, the initiation of the level crossing closing sequence should take account of the time required before the train may be restarted (for example, after token exchange or station duties have been completed). In some cases, this may require provision of a train crew operated control device (see 2.8.1).
- GN46 GE/RT8270 sets out the process for assessment of compatibility that is required before a material change (that is to say, a change that has the potential to affect physical or operational interfaces) is introduced on the railway. This should include the operating requirements at stations and the acceleration data used to calculate signal regulation times at automatic level crossings. The decisions (including any assumptions about future rolling stock operations) should be recorded in signalling records.
- GN47 Railway undertakings should manage rolling stock acceleration rates so that trains operate safely at automatic level crossings.

2.2 Train crew operated barrier level crossings

2.2.1 Default position for barriers

- | | |
|---------|--|
| 2.2.1.1 | The default position for barriers at train crew operated barrier level crossings shall be barriers raised. |
| 2.2.1.2 | The control of the barriers shall be arranged so that they remain raised if there is a loss of power. |

- GN48 Train crew operated barrier level crossings are typically provided on lightly used lines where minimum signalling facilities and operating conditions are not compatible with the provision of a signaller/crossing keeper controlled level crossing or an automatic level crossing.
- GN49 The barriers should be designed so that they do not lower because of a power failure. This type of level crossing is monitored locally by the train crew, which in practice means that barrier failures can only be detected when a train is present.
- GN50 Train drivers expect to approach the stop board protecting train crew operated barrier level crossings when the road is open to traffic. If the barriers are already down when the train arrives, the train driver should recognise this as an irregularity and report the failure to the signaller in accordance with the Rule Book. Other level crossing failures that occur during operation should be indicated to the train driver by the level crossing control and indication facility (see 2.2.2).

2.2.2 Control and indication system

- | | |
|---------|---|
| 2.2.2.1 | A level crossing control and indication facility shall be provided for use by train crew. |
|---------|---|

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- 2.2.2.2 The control and indication system functionality and interface shall be determined using the process for assessment of compatibility set out in GE/RT8270, which shall include an assessment of all of the following:
- a) The requirement for train crew to initiate the barriers lower sequence
 - b) The requirement for train crew to initiate the barriers raise sequence
 - c) The requirement for train crew to stop the level crossing barriers at any position during the lower and raise sequences
 - d) The requirement for train crew to observe that the barriers are fully raised
 - e) The requirement for train crew to observe that the barriers are fully lowered
 - f) The requirement for train crew to observe that the road traffic light signals are operating correctly
 - g) The requirement for train crew to detect a loss of a primary power supply to the telephone system, where level crossing telephones are provided.

- GN51 These requirements apply to all train crew operated level crossing control and indication facilities, including:
- a) Level crossing control units provided for the train crew to operate the level crossing at ground level, and
 - b) Auxiliary control and indication devices, which may be provided so that train drivers can operate the level crossing from the driving cab.
- GN52 The level crossing controls and indications are provided because a member of the train crew (typically a train driver, shunter, or guard, who is an authorised level crossing operator) is responsible for:
- a) Operating the level crossing controls to close the road after the train has stopped at the stop board
 - b) Checking that the level crossing closing sequence has operated correctly before the train proceeds over the level crossing
 - c) Operating the level crossing controls to reopen the road after the train has completely passed over the level crossing, unless automatic controls are provided to do this
 - d) Checking that the level crossing opening sequence has operated correctly before the train departs.
- GN53 The level crossing control devices should be provided so that the road closure and road opening sequences can be activated by the train crew in accordance with the operating instructions published in the relevant operating instructions.
- GN54 At least one ground level control unit should be provided at each train crew operated barrier level crossing. The barrier raise, lower and stop controls should be provided using push button control devices, labelled:
- LOWER: To initiate and restart the barrier lowering sequence
 - STOP: To stop the barriers at any time during the lowering or raising sequence
 - RAISE: To initiate and restart the barrier raising sequence

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- GN55 Where an auxiliary control unit is provided using a driver's pull cord, the lower and stop functions should be activated by a single pull, for example:
- | | |
|--------------|-------|
| First pull: | LOWER |
| Second pull: | STOP |
| Third pull: | LOWER |
- GN56 Auxiliary control units should not be used to initiate the level crossing opening sequence. Automatic raising functionality should be provided unless operational requirements are compatible with use of the ground level control unit.
- GN57 The STOP functionality should be designed so that the barriers stop moving as soon as possible after the STOP control has been operated. This is because the train crew are responsible for supervising the safe operation of the level crossing and may have to stop the barriers to avoid striking a road user.
- GN58 Where auxiliary control units are provided to support normal operations from the driving cab, the ground level control unit should also be provided because it provides a means of controlling the level crossing if the auxiliary control unit cannot be used (for example, during degraded operations).
- GN59 The level crossing indications are provided so that the train crew have sufficient information to decide that either:
- The level crossing has correctly operated, or
 - A level crossing failure needs to be reported to the signaller.
- GN60 As a minimum, the indications should display information about:
- The correct functioning of the road traffic signals
 - The detected positions of the barriers (raised and lowered)
 - Power supply status.
- GN61 In order to facilitate safe and efficient operations, additional level crossing indications may be provided, either as part of the level crossing control unit or, separately, in association with the level crossing.
- GN62 Examples of additional indications provided at train crew operated barrier level crossings include:
- The driver's level crossing indicator, which is typically provided where a driver's pull cord is provided as the primary method of controlling the level crossing from the driving cab, and
 - The barriers up 'BU' indicator, which should be provided in connection with the 'auto-raise' functionality.
- GN63 Where there is more than one train crew operated barrier level crossing along a line of route, all of the level crossing control devices should operate in a similar way and the indications should be displayed using a similar format.

2.2.2.3 The level crossing control and indication facility shall be located so that the train crew:

- Can conveniently operate the level crossing, and