

CRR-G-006-C

Guidelines for the Design of Railway Infrastructure and Rolling Stock – Section 5 Level Crossings

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Abbreviations

AHB	Automatic Half Barriers
AOC	Automatic Open Level Crossings
BP	Barrow Path
CRR	Commission for Railway Regulation
IM	Infrastructure Manager
MB	Manual Barrier
MWL	Miniature Warning Lights
PC	Pedestrian Level Crossings
RSC	Railway Safety Commission
RU	Railway Undertaking
TPV	Train Pedestrian Value
TSM	Traffic Signs Manual
UWLC	User-Worked Level Crossings

5 LEVEL CROSSINGS

5.1 The Principles

5.1.1 Safe for users and trains

Where an accommodation of way crosses the railway at track level, safety arrangements commensurate with the level of risk at that place should be determined and provided.

5.1.2 Information to users

Sufficient and appropriate information to enable crossing in safety should be presented to users.

5.1.3 Safe crossing place

The actual crossing place should be of adequate width, surface quality and profile for all reasonably foreseeable users to cross in safety.

5.1.4 Closure of level crossings

Level Crossings should be closed where possible and practicable, and the introduction of new level crossings resisted. Closure of a level crossing should be possible when the land on both sides is no longer in common ownership and Iarnród Éireann progress such closures while complying with all legal requirements. Where it is possible to reach an agreement with a local authority to close a public road Level Crossing (OP type) this opportunity should be pursued with the relevant authority. The local authority can exercise their statutory function under Section 73 of the Roads Act 1993 (to extinguish any public right of way over the road) and thus facilitate the closure of the OP type level crossings.

5.2 GENERAL GUIDANCE

5.2.1 General description

This section gives general guidance on the positioning of, and equipment that applies at, all types of level crossings.

The guidance is applicable when alterations are made to the protection arrangements at existing crossings. When alterations are made at a public road level crossing, the protection arrangements are described in and authorised by a Regulation Order made under the relevant sections of the appropriate level crossing transport act.

Each level crossing should have a unique reference number, normally displayed on each side of the crossing.

5.2.2 Structure of the guidance

This level crossings section:

- a) establishes the level crossing types and the conditions for suitability;
- b) provides general guidance applicable to each type of level crossing;
- c) gives specific details of signalling and level crossing controls for each type of level crossing;
and
- d) provides guidance on carriageway aspects and crossing equipment and signs.

5.2.3 Positioning of level crossings

The positioning of a level crossing and its associated signalling arrangements should ensure that, during normal working, no part of a stationary train should stand obstructing the level crossing. The proximity of a station to a level crossing may mean special arrangements are necessary.

A risk assessment should be made to determine the relative positioning of a level crossing and its associated protecting signals, if provided. It should take into consideration the likelihood and consequences of a train passing the signals without authority. If it is not reasonably practicable to achieve the optimum positions, appropriate measures should be provided to reduce the potential risk to an acceptable level.

Where a level crossing traverses electrified lines, additional measures are needed to protect road users. See section **Error! Reference source not found.** for the positioning of the appropriate warning signs.

5.2.4 Equipment at level crossings

All equipment and controls used for the operation of level crossing equipment should be designed and documented to appropriate safety standards. All level crossing equipment should be installed clear of the railway structure gauge.

At all automatic crossings, an alternative power supply should be provided to allow the level crossing equipment to function fully under normal operating conditions in the event of the failure of the main power supply for a period of up to 12 hours. This will ensure the safe operation of the level crossing until the main power supply is restored or an alternative arrangement is put in place.

Where trains run after dark, illumination of the level crossing may be provided to ensure its safe operation. If the road approaches to a crossing are lit, the level 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 nor cause avoidable annoyance to local householders.

At level crossings which are locally monitored by the driver of an approaching train, additional lighting may be necessary to enable the train driver to see that the level crossing is unobstructed from the point at which the driver may have to brake the train.

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 or monitoring point or the user of the level crossing within a reasonable time of the occurrence.

References to regulations or directions in this section are to the Traffic Signs Manual (TSM). The legal framework for traffic signage (including signs, devices, notices and markings) is contained in the Road Traffic Acts. Where references in this document to the Road Traffic (Signs) Regulations, these regulations are made under Section 95 of the Road Traffic Act 1961. The most up to date information on Acts, Regulations and other publications are available at www.dttas.gov.ie and www.trafficsigns.ie/current-traffic-signs-manual .

5.2.5 Effects on existing level crossings

Where new or altered level crossings might introduce incompatibilities or inconsistencies with adjacent or nearby level crossings, appropriate arrangements should be made to address any safety implications which may include modifications to the existing level crossings.

5.2.6 Operating conditions

The choice and design of the level crossings will depend not only on the guidance expressed in this document but also on the operational requirements of the railway and the Level Crossing Risk Model.

To ensure that the level of protection afforded by the level crossing is adequate and appropriate, an assessment of the suitability of the type of level crossing at the location concerned should be made:

- a) whenever circumstances at the crossing are to change (e.g. rolling stock, signalling, electrification, speed etc);
- b) whenever circumstances at the level crossing are found to have altered (e.g. housing or industrial developments etc).

In assessing the suitability of any proposed safety measures or arrangements, it is important to take into account:

- a) normal 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; and
- d) emergency situations.

5.3 TYPES OF CROSSINGS

5.3.1 Types of crossing

The various types of crossing may be classified as in Figure 1.

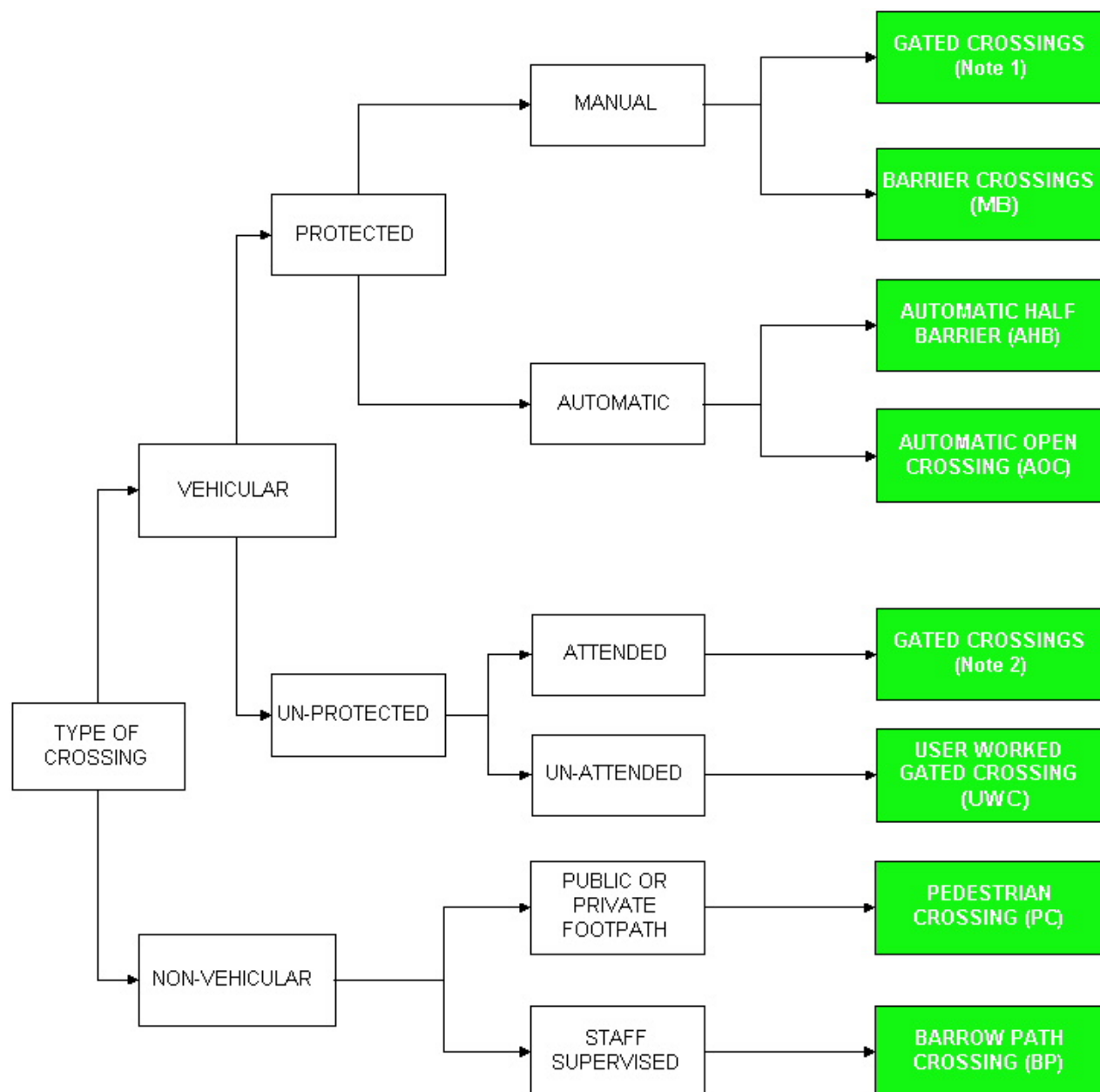


Figure 1: Types of Level Crossing

Note 1: Gated level crossings operated by railway staff with protecting railway signals (see section 5.4.3).

Note 2: Gated level crossings operated by railway staff without protecting railway signals (see section 5.4.3).

Note 3: A level crossing is “protected” when a railway operated warning system is provided to level crossing users or approaching trains e.g. road lights or railway protecting signals.

Note 4: Level crossings equipped with Miniature Warning Lights or White Lights can be classed as protected.

Note 5: Automatic Level Crossings may be locally monitored by drivers of trains (see section 5.11).

Note 6: For manual and attended level crossings. Railway staff includes “train crew”. The term “supervising point” is used when referring to the point of train regulation (e.g. controlling signal box). The term “crossing keeper” is used where duties include operation of the level crossing and associated railway protecting signals. The term “attendant” is used where duties include only the operation of the gates i.e. no protecting railway signals.

Note 7: The following are examples of level crossing designations currently in use on Iarnród Éireann (for information purposes only):

- a. For attended gated level crossings (with protecting railway signals):
 - *Type C* has gates normally across the road, except when required to pass road traffic.
 - *Type CN* has gates normally across the road, except when required to pass road traffic and during night-time.
 - *Type CD* has gates normally across the road, except when required to pass road traffic and during daytime.
 - *Type CX* has gates normally across the railway, except when required to pass rail traffic.
- b. For attended gated level crossings (without protecting railway signals):
 - *Type A* has gates normally across the road, operated by an attendant with telephone communication to a railway supervising point.
- c. For manual barrier level crossings (MB):
 - *Type MB* is an attended barrier crossing controlled by railway staff or train crew at the level crossing.
 - *Type MB (CCTV)* is an attended barrier level crossing controlled by railway staff with the aid of closed-circuit television.
 - *Type M or EWB* is a mechanically or electrically operated barrier level crossing with protecting signals operated by a level crossing keeper or train crew.
- d. For automatic half barrier level crossings (AHB):
 - *Type AHB* is an Automatic Half Barrier level crossing.
- e. For automatic open level crossings (AOC):
 - *Type LB* is an automatic open level crossing controlled by road traffic lights & warning bells.
- f. For unattended user worked level crossings (UWLC):
 - *Type OP* has gates normally across a public road, operated by road users.
 - *Type F* is a gated private user field level crossing.
- g. For private or public pedestrian level crossings (PC):
 - *Type P* is a pedestrian level crossing.
- h. For staff supervised barrow path level crossings (BP):
 - *Type BP* is a barrow path.

5.3.2 Conditions for suitability

The decision to introduce a level crossing or upgrade an existing level crossing should follow a suitable risk assessment and after all possibilities for a grade separated level crossing have been evaluated and discounted as not reasonably practicable.

The suitability of the types of protection for new or altered level crossings depends on various factors, one of which may be traffic volume. This document gives guidance on the factors to be considered for any given location. The choice of level crossings should avoid causing unnecessary delay to road users and should consider local plans and developments which may affect the use of the level crossing in the future (e.g. housing development).

An important aspect in the safety of level crossings is providing, in so far as specific locations and types of crossing permit, arrangements, which provide a consistent appearance to the users of any level crossing. In order to achieve this several standard level crossing types have been developed over a number of years. This document sets out the detailed protection arrangements for each of these ‘standard’ types.

Level crossing types not included within this guidance which are currently in use on Iarnród Éireann should be assessed and upgraded so far as reasonably practicable with due consideration of the guidance and the conditions of suitability.

Table 1: CONDITIONS FOR SUITABILITY		
Section	Type of Level Crossing	Conditions for Suitability
5.4	Gated level crossings operated by railway staff (With protecting railway signals)	The traffic moment and annual average daily traffic usage should be low (see Table 4 section 5.14.2). Railway stop 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 warning signals are at stop. <i>Note: The sole use of distant signals at service braking distance from the gates should not be considered for new or altered level crossings.</i>
	Gated crossings level operated by railway staff (Without protecting railway signals)	This type of crossing should not be considered for new or altered level crossings. For existing level crossings, the traffic moment and line speed and the annual average daily traffic usage should be low (see Table 4 section 5.14.2). The attendant should be in contact with the supervising point/signaller to ascertain that there is no train approaching before the gates can be open to road traffic and the gates should be closed to road traffic before a train is allowed to proceed towards the level crossing.

Table 1: CONDITIONS FOR SUITABILITY		
Section	Type of Level Crossing	Conditions for Suitability
5.5	Barrier level crossings operated by railway staff (MB)	<p>Generally suitable for most road and rail traffic arrangements (see section 0).</p> <p>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.</p> <p>The crossing keeper or signaller has a clear view of the level crossing from the control point. This may be achieved with the aid of closed-circuit television (CCTV).</p>
0	Automatic half barrier level crossings (AHB)	<p>The speed of trains over the level crossing should be determined by an appropriate risk assessment and should not normally exceed 130 km/h.</p> <p>There should not generally be more than two running lines over the level crossing.</p> <p>The carriageway on the approaches to the crossing should be sufficiently wide to enable vehicles to pass safely.</p> <p>Road traffic should not be excessive and use in suburban areas or areas of heavy traffic should be avoided. 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.</p> <p>Appropriate means to stop any train approaching the level crossing in an emergency or abnormal situation are required. This may include the provision of an indication to train drivers that the level crossing barriers and warning lights are in operation (see section 5.8).</p>
5.7	Automatic open level crossings (AOC)	<p>The speed of trains over the level crossing should be determined by an appropriate risk assessment and should not normally exceed 130 km/h.</p> <p>There should not generally be more than two running lines over the level crossing.</p> <p>The carriageway on the approaches to the level crossing should be sufficiently wide to enable vehicles to pass safely.</p> <p>Road traffic should not be excessive and use in suburban areas or areas of heavy traffic should be avoided. 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.</p> <p>Appropriate means to stop any train approaching the level crossing in an emergency or abnormal situation are required. This may include the provision of an indication to train drivers that the level crossing warning lights are in operation (see section 5.8).</p>

Table 1: CONDITIONS FOR SUITABILITY		
Section	Type of Level Crossing	Conditions for Suitability
5.8	User-worked level crossings (UWLC)	<p>This type of level crossing should not be considered for new or altered level crossings and should only be used on roads where the user(s) are familiar with the operating conditions.</p> <p>The speed of trains over the level crossing should be determined by an appropriate risk assessment and should not normally exceed 130 km/h.</p> <p>There should not normally be more than two lines over the level crossing.</p> <p>The warning period should be greater than the time required by users to traverse the crossing surface between the decision points at either side of the level crossing.</p> <p>Additional protection may be required in order to provide an adequate warning period.</p> <p>The provision of additional protection may require the warning period to increase, and the relevant sections of this guidance should be observed.</p>
5.9	Pedestrian level crossings (Private or public footpath level crossing) (PC)	<p>Suitable for private or public access.</p> <p>The speed of trains over the level crossing should be determined by an appropriate risk assessment and should not normally exceed 130 km/h.</p> <p>There should not normally be more than two lines over the level crossing.</p> <p>The warning period should be greater than the time required by users to traverse the level crossing surface between the decision points at either end of a pedestrian level crossing on foot.</p> <p>Additional protection may be required to provide an adequate warning period.</p> <p>The provision of additional protection may require the warning period to increase, and the relevant sections of this guidance should be observed.</p>
5.10	Barrow path level crossings (Staff supervised footpath level crossing within a station area) (BP)	<p>This type of level crossing should not be considered for new or altered level crossings and should only be used within station areas where station staff will supervise their use.</p> <p>The speed of trains over the level crossing should be determined by an appropriate risk assessment and should not normally exceed 130 km/h.</p> <p>There should not normally be more than two lines over the level crossing.</p> <p>The warning period should be not less than 30 seconds. Additional protection may be required to provide an adequate warning period.</p> <p>The provision of additional protection may require the warning period to increase, and the relevant sections of this guidance should be observed.</p>

5.4 GATED LEVEL CROSSINGS OPERATED BY RAILWAY STAFF

5.4.1 General description (for user worked gates see section 5.8)

This type of level 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 level crossing is manually operated by railway staff who open and close the gates.

The gates, painted white and red, are normally kept closed across the road. Alternatively, where rail traffic is much less frequent than road traffic, the gates may be closed across the railway. Dependent on road and rail traffic patterns the usual position of the gates may be altered on a regular daily basis e.g. for the road or railway closed during the daytime or night-time.

Red lamps and red retroreflective targets mounted on the gates, which show towards approaching road traffic when the gates are across the road, should be provided.

5.4.2 Method of operation

The gates are operated by train crew or competent railway staff who are permanently stationed at a control point adjacent (within 50m) to the level crossing when the line is open to rail traffic.

The person operating the gates should have a good view of approaching road traffic and the whole of the level crossing area.

Where the level crossing is operated by competent railway staff, the person should have an appropriate indication of the approach of trains and clear instructions as to when the gates should be closed to road traffic.

5.4.3 Railway signalling and control

Railway signals, which provide full protection to the level crossing, should be provided on both railway approaches to the level crossing. Alternatively, railway caution signals may be provided on both railway approaches at normal train braking distance from the level crossing gates. Red lamps and red retroreflective targets mounted on the gates, which show towards approaching railway traffic when the gates are across the railway, should be provided in this instance. In either instance the signals are required to 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 their most restrictive position.

Where crossings have no protecting signals the attendant and the signaller should have a means to communicate with each other. The attendant should ascertain that there is no train approaching the level crossing before opening the gates to road traffic. The signaller should ascertain that the gates are closed to road traffic before allowing a train to approach the level crossing.

5.5 BARRIER LEVEL CROSSINGS OPERATED BY RAILWAY STAFF (MB)

5.5.1 General description

This type of level crossing is protected by road traffic light signals and lifting barriers on both sides of the railway. Where the width of the roadway permits, individual barriers are provided for both the nearside and offside of the roadway on each side of the level crossing to facilitate the release of any user who may have become trapped during the lowering sequence. 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 roadway on each approach.

The level crossing is operated by competent railway staff. The display of the road traffic light signals towards approaching road traffic may be initiated manually, or automatically by approaching trains followed by the lowering sequence of the barriers. The lowering and raising cycles may be initiated manually or automatically by approaching trains.

Note: Road traffic light signals may only be omitted where the barriers are normally in the lowered position, the number of road vehicles during the peak hour does not exceed 20 and the line speed of the railway does not exceed 130 km/h.

Telephones, connected to the controlling point, are provided for the use of the public. Telephones should be visible and accessible from inside the level crossing and outside the level crossing.

This type of crossing may be operated by one of the following methods:

- a. by competent railway staff who are permanently stationed at a control point adjacent (within 50m) to the level crossing when the line is open to rail traffic.
- b. By competent railway staff who are permanently stationed at a control point remote from the level crossing, with the use of closed-circuit television (CCTV), whenever the line is open to rail traffic.

For all methods of operation, the person operating the crossing equipment should have a clear and full view of the level crossing, including the barriers, from the control point either directly or via the closed-circuit television.

5.5.2 Method of operation

Where the barriers are normally in the raised position, the sequence of events to close the crossing to road traffic, once the lowering cycle has been initiated either manually or automatically, should be as follows:

- a. The amber lights of the road traffic light signals immediately show and the audible warning for pedestrians begins. The amber lights should show for approximately 5 seconds;
- b. Immediately the amber lights are extinguished, the intermittent red lights should show;
- c. Approximately 6 to 8 seconds later the entrance barriers should begin to descend. Approximately 5 seconds after the entrance barriers begin to descend, the exit barriers begin to descend. The time for each barrier to reach the lowered position should normally be 6 to 8 seconds.
- d. the audible warning should stop when all the barriers are fully lowered; and
- e. the intermittent red lights should continue to show.

The sequence of events to open the crossing to road traffic, once the raising cycle has been initiated either manually or automatically, should be as follows:

- a. All barriers begin to rise simultaneously and should normally rise in 6 to 8 seconds; and

- b. The intermittent red lights should continue to show until the barriers have fully raised.
- c. In emergency or abnormal situations (see section 0) with manual raise initiated the offside barriers should be allowed to fully rise before the nearside barriers are allowed to rise. This will allow the controlled release of any vehicle or person that may have become trapped on the level crossing.

Where automatic lowering of barriers is to be employed, the lowering of the barriers should not take place unless, at least, one red light in all the red road traffic light signals facing in each direction is working. If closed circuit television monitoring is provided, initiation of automatic lowering should switch on the CCTV monitor and give an audible indication at the control point.

Where automatic raising of barriers is provided, the barriers should rise as soon as practicable after all trains, for which the lower sequence has been initiated, have passed clear of the level crossing.

When the lowering cycle has been initiated and the barriers have started to descend, the lowering cycle should be 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 the barriers have not started to descend, they should remain in the raised position.

5.5.3 Railway signalling and control

Railway signals, which provide full protection to the level crossing, are required on all railway approaches. These signals are required to 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.

Where the barriers are power operated, there should be discrete function controls to command the barriers to be raised, stopped or lowered from the operating position. It should not be possible to clear any protecting signals until a further function control to confirm the 'Crossing Clear' has been operated with the barriers down.

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 caused to lower.

The level crossing operator should be provided with a device to operate the level crossing in emergency or abnormal situations. The operation of the device should:

- a. With the level crossing closed to road traffic, place the level crossing protecting signals to Stop, the road traffic light signals should continue to show an intermittent red light and the barriers should remain lowered. In this instance the barriers may be raised manually, after a suitable time interval to ensure rail traffic has been brought to a stand, the offside barriers raising first before the nearside barriers are raised.
- b. With the level crossing open to road traffic, immediately show intermittent red lights on the road traffic signals, omitting the amber phase, and the audible warning should start. The barriers should not be caused to lower unless under the manual control of the operator. The level crossing protecting signals should also be prevented from clearing with the device operated.

The status of the level crossing equipment, including the road traffic light bulb filaments and mains power supply, should be indicated at the control point to ensure it operates safely when the railway line is open to traffic.

5.5.4 Safety Validation

The safety validation of new, upgraded, or renewed station and mid-section type level crossings must follow the process already used in 2014: reference 140821.IARIM117(B) – Letter of Acceptance – New National Level Crossings (Stations & Mid-Section Type GASC) – see next page.



140821.IARIM117(B) – Letter of Acceptance – New National Level Crossings (Station & Mid-Section Type GASC)

Acceptance Type	Acceptance of the safety validation for new national level crossings based on Station & Mid-Section Type GASC	Expiry	No expiry due to the existing operational nature of these crossings See Conditions (below)
Name of Railway Undertaking	Iarnród Éireann (IE), Connolly Station, Dublin 1 (represented by: Iarnród Éireann IM, Inchicore Works, Inchicore, Dublin 8)		
Type of Infrastructure	<p>IE intends to upgrade conventional relay-based level crossings in a programme of modernisation known as The National Level Crossing System project. This project will enhance safety, reliability and operability of the whole crossing system primarily based on a fail-safe Programmable Logic Controller (PLC) level crossing controller combined with a number of fail-safe Q-Style relays. The sub-systems included are:</p> <ul style="list-style-type: none"> • Siemens S7 Station or Mid-Section Type Level Crossing Controller, including the Local Control Panel; • Remote Control System, using either a touch panel interface or a hardwired remote control panel; • CCTV System; • Barrier System; • Warning Systems for Road Users. 		
Context	<p>This Letter of Acceptance is issued to accept the safety validation of new installations of either Station Types or Mid-Section Type level crossings.</p> <p>This acceptance effectively withdraws the improvement notice issued by the Railway Safety Commission on 17/08/2012 under Railway Safety Act 2005, Improvement Notice (Section 77) (Reference RSC – L – 77/003).</p>		
Basis of Acceptance	<p>The following documentation has been subject to review by the RSC and provides the basis for this Letter of Acceptance:</p> <ol style="list-style-type: none"> 1. ITLR-T32851-001-Issue1 – <i>Independent Safety Assessment review and CSM-AsBo report by Interfleet</i>; 2. NCLS Cert A – <i>IM Certificate of Validation, Project ID 162, Certificate ID 531</i>; 3. SET-NLCS-SAF-1101 Safety Management Plan Ver 2.0 – <i>National Level Crossing System Safety Management Plan</i> 4. SET-NLCS-SAF-1102A CCTV_HazRec Ver 1 0_200514 - <i>National Level Crossing System CCTV System Hazard Identification & Risk Assessment Workshop Report</i>; 5. SET-NLCS-SAF-1102B_WSRU_HazRec Ver 1.1_080514 - <i>National Level Crossing System Warning Systems for Road Users Hazard Identification & Risk Assessment Workshop Report</i>; 6. SET-NLCS-SAF-1102C_Barrier_HazRec Ver 1.1_020514 - <i>National Level Crossing System Barrier/Boom Hazard Identification & Risk Assessment Workshop Report</i>; 		

	<p>7. SET-NLCS-SAF-1102D_Control_System_HAZLOG_V1_3 – National Level Crossing System Hazard Record in accordance with IM-SMS-014 for PLC based Level Crossing Control System for Station and Mid-section Type CCTV Supervised Level Crossings;</p> <p>8. SET-NLCS-SAF-1103 Station and Mid-Section Type GASC_V1 2 - NATIONAL LEVEL CROSSING SYSTEM Station & Mid-Section Type Level Crossing System Generic Application Safety Case;</p> <p>9. SET-NLCS-SAF-1105 NLCS GASC - IM-SMS-014 ASV 1 0 - Application for Safety Validation in accordance with IM-SMS-014.</p>		
Conditions	<p>This letter of acceptance is qualified on the basis that the following conditions are demonstrated as satisfied to the acceptance of the RSC:</p> <p><u>C1</u>: DART Level Crossing Outstanding Safety Issue No. 2 (OSI 2): The Siemens S7 'DART' type Level Crossing Controller shall be subject to a 6-month period of trial operation.</p> <p><u>C2</u>: The Safety-Related Application Conditions, as mentioned in Appendix A of the GASC (SET-NLCS-SAF-1103), shall be validated in each specific project implemented from 21.08.2014.</p> <p><u>C3</u>: Each installation shall be informed to the RSC in the form of a Notice of Installation which shall provide confirmation of full compliance with the GASC (SET-NLCS-SAF-1103).</p>		
Notes	Iarnród Éireann carry the risk should design or implementation issues arise during testing, commissioning, or bringing into service the works associated with CCRP or the National Level Crossing Project.		
Prepared by	Sean Wilkinson, for RSC		
Signature	Sean Wilkinson	Date	21.08.2014
Authorised by	Mary Molloy, Principal Inspector Approvals		
Signature	Mary Molloy	Date	21.08.2014

Annex – List of Letters of Acceptance

Letter of Acceptance Ref.	Issued Date	Expiry Date	Purpose
140702.IAR094	02.07.2014	6 Months trial operation following first implementation.	To enable IE to enter trial running period with the DART Crossing PLC Controller.
140821.IARIM117(A)	21.08.2014	None	To accept the safety validation of the existing 121 station and mid-section type level crossings
140821.IARIM117(B)	21.08.2014	None	To accept the safety validation of new station and mid-section type level crossings

5.6 AUTOMATIC HALF BARRIER LEVEL CROSSINGS (AHB)

5.6.1 General description

This type of level crossing is protected by road traffic light signals and a lifting barrier on the nearside of the roadway 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 level crossing leaving the exits clear.

The level crossing equipment is initiated 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 red road traffic light signals and the arrival of the fastest train should be sufficiently long (normally 32 seconds) to enable road vehicles and pedestrians to clear the level crossing.

The barriers rise immediately the train has passed unless another approaching train is so close that the minimum road open time (normally 9 seconds) cannot be achieved. In this situation the barriers remain lowered, and the intermittent red lights continue to flash but signs indicating the words “Second Train Coming” should be illuminated as soon as the first train has passed the level crossing.

Telephones for use by the public and 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, which is always open when the railway line is open. An indication comprising of a yellow light and an appropriate instruction notice should be provided inside or adjacent to each telephone to inform users, if illuminated when there is no reply to the telephone, that the railway line is closed to railway traffic.

A supervising point should have the appropriate means to stop any train approaching the level crossing and means of communicating with any competent railway staff operating the level crossing equipment locally at the level crossing in an emergency or abnormal situation.

5.6.2 Method of operation

The operation of the level crossing equipment is initiated automatically by a train as it approaches the level crossing.

The time elapsed between the amber lights of the road traffic light signals starting to show and the train arriving at the level crossing should not be less than 37 seconds. The train should pass as soon after 37 seconds as possible. Where the level crossing length is longer than 15m, the 37 seconds should be increased by 1 second for every additional 3m of level crossing length.

The sequence of events to close the level crossing to road traffic is as follows:

- a. The amber lights of the road traffic light signals immediately show and an audible warning for pedestrians begins. The lights should show for approximately 5 seconds.
- b. Immediately the amber lights are extinguished the intermittent red lights should show; and
- c. Approximately 6 to 8 seconds later the barriers should start to descend and take a further 6 to 8 seconds to reach the lowered position.

If the barriers remain down for another train, the second train coming warning sign should be illuminated when the first train has passed the level crossing and should remain illuminated until the

second train has passed clear of the level crossing. The character of the audible warning to pedestrians may also be changed by either increasing the intensity or ringing rate.

Both barriers should begin to rise simultaneously and should take normally 6 to 8 seconds to reach the raised position after a train has passed clear of the level crossing. The intermittent red lights of the road traffic light signals should not be extinguished, and the audible warning should not stop until the barriers have fully raised.

If both intermittent red lights in any of the road traffic light signals fail, the barriers 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 lights of the road traffic light signals should continue to show.

5.6.3 Railway signalling and control

Appropriate means are required to stop any train approaching the level crossing in an emergency situation. The nearest worked signal on each rail approach capable of being placed at Stop under instruction from the supervising point should be at a distance of not more than the equivalent of 10 minutes running time from the level crossing for the fastest train. If there is a railway signal on each approach, in the normal direction of working, it should preferably be located at a distance from the level crossing not less than the longest service braking distance for any train.

Alternatively, an arrangement as described in section 5.11 may be provided to inform train drivers approaching the level crossing that the barriers and road traffic lights are correctly operating.

On a double-track line, bi-directional control to initiate the level crossing equipment is required.

If a train passes a signal at Stop located between a strike-in point and the level 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 in the normal sequence.

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 level 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;
- b) by a means that is only effective when the presence of a train is detected, e.g. 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.

Note: To comply with the timings, the clearance of the signal may need to be delayed.

Facilities should be provided for manual operation of the level crossing equipment and effective means are required to prevent its unauthorised operation. The status of the level crossing equipment, including the mains power supply and the availability of the road traffic lights, e.g. bulb filaments,

should be indicated at the control point to ensure it operates safely when the railway line is open to traffic.

5.7 AUTOMATIC OPEN LEVEL CROSSING (AOC)

5.7.1 General description

This type of level crossing has no barriers but is protected by road traffic light signals and an audible warning is provided for pedestrians.

The level crossing equipment is initiated automatically by an approaching train. The period between the initial display of the red road traffic lights and the arrival of the fastest permissible train should be sufficiently long (normally 24 seconds) to enable road vehicles and pedestrians to clear the level crossing.

The road traffic light signals cease to show and the audible warning to pedestrians stop immediately the train has passed clear of the level crossing unless another approaching train is so close that the minimum road open time (normally 9 seconds) cannot be achieved. In this situation the road traffic signals continue to show, the audible warning to pedestrians continues to sound and signs indicating the words “Second Train Coming” are displayed as soon as the first train arrives at the level crossing.

Telephones for use by the public and those who are required to phone for permission to cross are provided adjacent to each nearside road traffic light. The telephones are connected to a supervising point, which is always open, when the line is open. An indication comprising of a yellow light and an appropriate instruction notice should be provided inside or adjacent to each telephone to inform users, if illuminated when there is no reply to the telephone, that the railway line is closed to railway traffic.

A Supervising point should have the appropriate means to stop any train approaching the level crossing and means of communicating with any competent railway staff operating the level crossing equipment locally in an emergency or abnormal situation.

5.7.2 Method of operation

The operation of the level crossing equipment is initiated automatically by a train as it approaches the level crossing.

The time lapse between the amber lights of the road traffic light signals starting to show and the train arriving at the level crossing should not be less than 29 seconds. The train should pass as soon after the 29 seconds as possible. Where the level crossing length is longer than 15m, the 29 seconds should be increased by 1 second for every 3m of level crossing length.

The sequence of events to close the level crossing to road traffic is as follows:

- a) The amber lights of the road traffic light signals immediately show and an audible warning for pedestrians begins. The lights should show for approximately 5 seconds; and
- b) Immediately the amber lights are extinguished the intermittent red lights should show.
- c) The intermittent red lights of the road traffic light signals should be extinguished, and the audible warning stopped as soon as possible after a train has cleared the crossing. If, however, another train is approaching the level crossing, the lights should continue to show unless a minimum road open time (normally 9 seconds) cannot be achieved.

If the intermittent red lights continue to show for another train, as soon as the first train arrives at the crossing, the “Second Train Coming” signs should be illuminated. The character of the audible warning to pedestrians may also be changed by either increasing the intensity or ringing rate.

5.7.3 Railway signalling and control

Appropriate means are required to stop any train approaching the level crossing in an emergency situation. The nearest worked signal on each rail approach capable of being placed at Stop under instruction from the supervising point should be at a distance of not more than the equivalent of 10 minutes running time from the level crossing for the fastest train. If there is a railway signal on each approach, in the normal direction of working, it should preferably be located at a distance from the level crossing not less than the longest service braking distance for any train.

Alternatively, an arrangement as described in section 5.11 may be provided to inform train drivers that the road traffic lights are correctly operating.

On a double-track line, bi-directional control to initiate the level crossing equipment is required.

If a train passes a signal at Stop located between a strike-in point and the level 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.

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;
- b) By a means that is only effective when the presence of a train is detected, e.g. 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 level crossing and is interlocked with the signalling system using a 'stopping/non-stopping' control.

Facilities should be provided for manual operation of the level crossing equipment and effective means are required to prevent its unauthorised operation. The status of the level crossing equipment, including the road traffic light bulb filaments and mains power supply, should be indicated at the control point to ensure it operates safely when the railway line is open to traffic.

5.8 USER-WORKED LEVEL CROSSINGS (UWLC) WITH GATES OR LIFTING BARRIERS

5.8.1 General description

This type of level crossing is only applicable where the railway crosses a private road or field access or a public road which has a low Daily Traffic Moment (see Table 4 section 5.14.2). It is normally protected by iron 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 road users. Barriers are normally closed across the road or field. A sign(s) is displayed on each side of the level crossing describing the correct method of operating the gates, including the use of any telephones, if provided, to the road or access users.

Black and yellow marker posts and/or white STOP lines may be provided to indicate the safe point (decision point) where it is safe to stop clear of the railway, while checking the view along the track.

Users should have sufficient time from first seeing an approaching train from the decision point, or otherwise being made aware of the approach of a train with the aid of additional protective equipment, to cross safely.

A safe waiting place should be provided, where practicable, within the railway boundary to allow a road vehicle to stop clear of moving trains. The size and arrangements of the safe waiting place should be determined for each crossing based on the proximity of the railway boundary and the private users' vehicular requirements.

5.8.2 Method of operation

Additional protective equipment should be provided if the warning time is less than 5 seconds greater than the time required by the reasonably foreseeable users to traverse the level crossing. A suitable study should be undertaken to determine the time for the normal user to traverse the level crossing under reasonably foreseeable worst-case conditions. Where the 5 seconds warning time is not achievable the study should evaluate and identify the additional protective equipment to be provided.

In assessing the time required to traverse the level crossing, consideration should be given to:

- a) the type of vehicles or equipment likely to go over the level crossing;
- b) the surface provided on the level crossing and its immediate approaches;
- c) the position at which the vehicle, after going over the level crossing, would be clear of the railway or gate on the far side; and
- d) movement of animals.

Additional protective equipment that should be considered is as follows:

- a) audible warnings from the trains – Audible Warning Signs/Whistle Boards must be erected at a distance 5% to 10% greater than the minimum viewing distance for the particular class of line;
- b) telephones - connected to a supervising point, which is always open when the railway line is open, may be provided on both sides of the level crossing 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;
 - (iv) the actual daily road vehicle user exceeds 50;

- (v) there are more than two running lines; or
- (vi) the line speed exceeds 130 km/h
- c) miniature warning lights - miniature warning lights, as described in section 5.17 should be provided on both sides of the level crossing where:
 - (i) the minimum warning time of trains cannot be obtained, and the actual daily road vehicle user 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.

To achieve the required warning time, it may be necessary to reduce the train speed over the level crossing.

Where telephones are provided, users are expected to telephone the supervising point to seek permission to cross.

5.8.3 Decision Support System

The Decision Support System is installed at some user worked level crossings. The application of this system is permitted at four different types of UWLC and on single lines only. These installations can provide additional safety measures to the users of these level crossings. The Decision Support System detects trains approaching a level crossing which cause indicator lights at the level crossing to display a red light to the level crossing user and an audible warning is sounded. The user is instructed not to cross the railway when the red indicator lights are displayed, and the audible warning is sounded.

Installation of the Decision Support System must meet the requirements of Iarnród Éireann technical management standard CCE-TMS-382 and the application specific project safety case, **TMS382 Checklist**. The **TMS382 Checklist** is contained in the Iarnród Éireann generic project safety case.

5.9 PEDESTRIAN LEVEL CROSSINGS (PC) PRIVATE OR PUBLIC FOOTPATH

5.9.1 General description

This type of level crossing is applicable where the railway crosses a footpath which exists as a public or private accommodation of way or a roadway which has segregated pedestrian traffic.

Users are expected to use reasonable vigilance to satisfy themselves that no trains are approaching the level crossing before they start to cross the line, and to cross as quickly as possible. Users should have sufficient time from first seeing or being warned of an approaching train to cross safely.

Pedestrian level crossings should be protected by a stile or self-closing wicket gate (normally the decision point) 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.

A sign(s) should be displayed at an appropriate position at or before the decision point on either side of the pedestrian level crossing explaining the way to proceed safely over the level crossing.

Where the type of level crossing passes over multiple railway tracks and an interval between tracks exists so that a fenced, safe waiting place can be created for users, the level crossing on each side of the interval should be treated as a separate level crossing. A chicane may be provided on the level crossing to make the position of the safe waiting place clear.

The minimum width between fences at the decision point or safe waiting area should be 1m for pedestrian crossings. This should be increased, or a larger waiting area provided if there is foreseeable use by those with prams or in wheelchairs etc.

Care should be taken not to provide misleading displays to level crossing users. Where, for instance, miniature warning lights are provided on one part of a divided level crossing, they should be provided on all parts of the level crossing.

At a user-worked level crossing, which is subject to additional footpath rights, stiles for pedestrians or separate gates for use by the pedestrians should be provided. The guidance in this section should be applied in conjunction with that for the vehicular use of such combined level crossings.

5.9.2 Method of operation

The warning time should be greater than the time required by users to traverse the level crossing surface between the decision points at either end of a level crossing. In assessing the speed at which users will traverse the level crossing, allowance should be made for the mobility of the reasonably foreseeable users and the type of level crossing surface.

A speed of 1.2 metres per second (m/s) should be used where the surface is at or near to rail level and 1 m/s where the surface is at the standard profile of the ballast. The calculated time in traversing the level crossing should be increased to take account of foreseeable circumstances such as impaired mobility of users, numbers of prams and bicycles or where there is a slope or step up from the decision point.

Where the warning time is insufficient, additional protective equipment may be provided as follows:

- a) audible warnings from trains - whistle boards positioned not more than 400m from the level crossing;
- b) telephones;
- c) miniature warning lights as described in section 5.17.

Where whistle boards are provided, the following factors should be considered in deciding their location:

- a) the speed of sound (330 m/s) and the speed of the train;
- b) the sound may be inaudible at the level crossing because of ambient noise; and
- c) there may be objections to the noise of train horns in residential or built-up areas.

Where whistle boards are provided, they are required on all railway approaches. The difference in warning times should be a maximum of 3 seconds.

Telephones and their associated signs may be provided where:

- a) the warning time exceeds the time required to traverse the level crossing by less than 5 seconds;
or
- b) the highest permissible train speed exceeds 130 km/h; or
- c) the line speed has been increased.

At pedestrian level crossings, miniature warning lights may be provided where:

- a) the level crossing is the only access to houses;
- b) the highest permissible train speed exceeds 130 km/h; or
- c) the provision of whistle boards is considered inappropriate.

An audible warning device should be provided at the level crossing if unaccompanied partially sighted or blind people regularly use it.

5.10 BARROW PATH LEVEL CROSSINGS (BP) STAFF SUPERVISED

5.10.1 General description

Barrow paths should only be in use for lightly used stations where the line speed does not exceed 130 km/h and no alternative arrangements are reasonably practicable. Where there is unescorted passenger or public use, this level crossing arrangement is not suitable and an alternative arrangement such as a bridge or subway should be provided. This may be a public roadway level crossing rather than a dedicated route on the station premises.

The surface of barrow paths should be non-slip, level with the head of the rails either side of the rail head, even across its full extent, securely fixed and have no gaps that could trap either the heel of a shoe or the wheel of any barrow, cycle etc. The level crossing should be wide enough for all foreseeable uses and extend far enough back from the nearest rail to allow space for any user to wait while ensuring it is safe to cross.

5.10.2 Method of operation

Passengers or members of the public using the level crossing should be accompanied by competent railway staff.

Additional protective equipment should be provided when the visibility gives less than 30 seconds warning of an approaching train as follows:

- a) miniature warning lights as described in section 5.17; or
- b) a white light extinguished for 40 seconds before the arrival of a train travelling at the maximum permissible line speed with a notice reading 'Caution – Cross only when white light shows'.

5.11 LOCAL MONITORING OF AUTOMATIC LEVEL CROSSINGS (AHB & AOC)

5.11.1 General description

In the absence of suitable protecting signals, the operation of the level crossing equipment and the absence of obstruction on the automatic level crossing may be monitored by the driver of an approaching train.

Train drivers should be provided with a railway signal indicating the correct operation of the level crossing equipment.

Train drivers are required to stop their trains short of the level crossing unless they have received an indication that the level crossing equipment is operating correctly and have observed that the level crossing is clear.

5.11.2 Method of operation

Trains normally approach the level crossing at a steady speed, known as the *crossing speed*, so that they can be halted short of the level crossing from the point at which it comes clearly into the train driver's view. The highest permissible crossing speed is 90 km/h.

Note: The preferred arrangement is for trains not to stop before passing over a level crossing unless it is not practicable to arrange otherwise, e.g. if a crossing lies immediately beyond a station platform.

The road traffic light signals and barriers (if provided) should continue to operate following a failure of the main power supply, but the indication to the train driver that all the level crossing equipment is functioning correctly should not be displayed.

5.11.3 Railway signalling and control

The indication to the train driver should only be displayed when at least one of the intermittent red lights in each road traffic light signal is lit and the barriers (if provided) have begun to descend, and the main power supply has not failed.

Any railway signals which lie between the strike-in point and the level crossing should not give information which conflicts with the indication given to the train driver when the level crossing equipment is functioning correctly.

A special speed restriction board is required at the point from which the crossing speed begins. This board may display two different crossing speeds for different types of train.

An advance warning board is required at the service braking distance from the special speed restriction board to enable 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 100m on the approach to the special speed restriction board.

Where all trains are required to stop at a station between the strike-in point and the level crossing, a stop board should be located at least 50m from the level crossing and an advance warning board located at service braking distance from the stop board.

5.12 PROVISIONS FOR PEDESTRIANS AT PUBLIC VEHICULAR CROSSINGS

5.12.1 General description

At all public road level crossings, provisions for pedestrians should be made according to the number and frequency of pedestrians and trains.

A footpath of adequate width should be provided on both sides of the carriageway where possible or practicable.

Note 1: 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 prams and in wheelchairs.

Note 2: Where there are either narrow or no footpaths on the approaches to a crossing, the width of the footpath should gradually increase to the width of the footpath on the crossing.

Note 3: Where appropriate, access to the footpath over the crossing for wheelchair users should be provided.

The footpath over the level crossing should be maintained in a good and even condition.

5.12.2 Road markings

The footpath for the safe route for pedestrians to walk over the level crossing is delineated between the carriageway Yellow Box marking and the cattle-cum-trespass guards, where provided. Longitudinal road marking may be provided along each edge of each footpath provided they do not conflict with the yellow box markings.

Transverse road markings for pedestrians to stand behind in a safe place while the level crossing is closed to road traffic should be provided over the footpaths at all barrier and open level crossings.

5.12.3 Audible warnings

Audible warning devices are required at all automatic crossings and barrier crossings operated by railway staff, so that pedestrians on or approaching the level crossing are given adequate warning of the closure of the level crossing.

Where road traffic light signals are provided at the level crossing, the warning sound should begin when the amber lights first show and, at all automatic level crossings, continue until the intermittent red lights are extinguished. At barrier level crossings operated by railway staff, the warning sound stops when the barriers are fully lowered.

At automatic level crossings where two trains can arrive at the level crossing without providing the minimum road open time, the character or tone of the warning sound should change distinctively as soon as the first train arrives at the level crossing.

At unattended level crossings, the audible warning may be provided by horns from approaching trains.

Note: Where audible warnings may cause a disturbance to local residents the warning may stop or continue at reduced volume when the barriers are fully lowered.

5.12.4 Pedestrian signals

At automatic level crossings, traffic signals for pedestrians should be provided where the volume of pedestrians is high or vulnerable groups of pedestrians use the level crossing on a regular basis, e.g. primary school children or people with disabilities whose schools, hospitals or homes are immediately adjacent to the level crossing.

Pedestrian signals should be placed below or adjacent to the road traffic light signals so that they face outwards from the level crossing towards pedestrians approaching the level crossing, as well as towards those halted at the transverse road markings across the footpaths.

Note: Pedestrian signals are not considered necessary at gated level crossings and barrier level crossings operated by railway staff.

5.12.5 Tactile thresholds

Where the number of pedestrians using a level crossing is high, or a significant number of blind or partially sighted people use the level crossing, a tactile threshold, of an appropriate design, should be provided across each footpath.

This threshold should not be on the railway side of the transverse road markings across the footpath.

Note: The purpose of this provision is to provide blind and partially sighted people with an indication of the direction of the footpath as well as the line behind which they should wait while the level crossing is closed.

5.12.6 Means to control the flow of pedestrians

Where the number of pedestrians using a level crossing is high, or vulnerable groups of pedestrians use the level crossing on a regular basis, appropriate means to prevent pedestrians from walking on the carriageway or to control the direction of flow of pedestrians may be provided, e.g. guard rails and road studs. Guard rails should be provided only where the footpath and its approach are wide enough to prevent any bottleneck to pedestrians or encouragement to walk on the carriageway.

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 level crossing, a double row of non-reflecting road studs to indicate the safe place to cross may be provided.

Where a level 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 level crossing after leaving or before joining the train.

5.12.7 Pedestrian categories

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 level crossing within a period of 15 minutes. A detailed method of calculation can be found in section 5.12.9.

Pedestrian categories are given in Table 2.

PEDESTRIAN CATEGORY	TRAIN PEDESTRIAN VALUE (TPV)
A	More than 450
B	151 - 450
C	150 or less

5.12.8 Pedestrian provisions

The provisions required for pedestrians at a level crossing according to its pedestrian category are defined in Table 3.

Pedestrian Category	Width of Footpath (m)	Road Markings	Audible Warnings *	Pedestrian Signals**	Tactile Threshold*	Guard Rails
A	2 or more	YES	YES	YES	YES	‡
B	1.8 or more	YES	YES	‡	YES	‡
C	1.5 or more †	YES	YES	‡	‡	‡

* Not required at gated crossings
 ** Only at automatic crossings
 † A reduced width of 1m or lack of approach funnel is normally restricted to those crossings with a daily pedestrian user of less than about 5.
 ‡ YES if necessary.

Note: At any level crossing where the number of pedestrians or the size of the vulnerable group is exceptionally large, automatic level crossings may not be suitable and a barrier level crossing operated by railway staff may have to be provided.

5.12.9 Train pedestrian value (TPV) calculation

TPVs are calculated by multiplying the number of pedestrians who pass over the railway by any route at the level crossing within any period of 15 minutes by the number of trains passing over the level crossing in the same period.

Normally a census, over a nine-day period, between the hours 06.00 and 24.00, should be taken, 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 the data is obtained from a census, only the maximum number of pedestrians for 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.

The number of trains should be deemed to be 25% of those passing over the level 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.

The number of trains should be rounded up to the next integer and should not normally be less than one.

5.13 ADDITIONAL MEASURES TO PROTECT AGAINST TRESPASS

5.13.1 General description

Cattle-cum-trespass guards and fencing protection should be provided to discourage trespass by pedestrians and animals straying onto the railway.

5.13.2 Cattle-cum-trespass guards

The guards should be adjacent to the footpath at the edge of, and level with, the surface of the carriageway. They should extend the full length of the level crossing between the boundary fences.

5.13.3 Fencing

Fencing may be required:

- a) to shield all barrier mechanisms unless protected in other ways; and
- b) to ensure the effectiveness of any cattle-cum-trespass guards.

At pedestrian crossings, 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, additional fencing to connect the boundary fence to the decision point should be provided.

Where the road is unfenced and the adjacent land is used for grazing and level crossing gates are not provided, a standard highway-type cattle-grid in the roadway should be provided.

5.14 THE LEVEL CROSSING

5.14.1 Vertical profile

The vertical profile over any vehicular level crossing should have no sudden changes of vertical curvature. The profile over an automatic crossings or user-worked level crossings is critical to safety. At other types of level crossings, it is less critical because the level crossings are manually operated by railway staff.

The profile over vehicular level crossings should not cause a long, low vehicle, e.g. a low-loader, to become grounded and obstruct the railway.

5.14.2 Measurement of safe profiles

It is the relationship of the wheelbase with the ground clearance of a road vehicle, which is used to determine safe profiles. The profile is measured in terms of the maximum permitted hump of 75mm anywhere on the road surface over a length equal to the wheelbase of a specified nominal road vehicle.

At any automatic level crossing, the safe profile is defined by the vehicle category, which is in turn determined by the road and rail traffic density. It is defined in Table 4.

ACTUAL DAILY ROAD VEHICLE USER	OR	DAILY TRAFFIC MOMENT	VEHICLE CATEGORY	THEORETICAL WHEELBASE LENGTH
More than 2000 (high)		More than 80,000	1	15.3m
2000 or less (medium)		80,000 or less	2	9.75m
600 or less (low)		25,000 or less	3	8.5m

Note 1: The Daily Traffic Moment is the Actual Daily Road Vehicle User x the maximum daily train movements over the level crossing.

Note 2: The traffic data in Table 4 should be established by census. Any reasonably foreseeable increase in road usage following automation of the level crossing should be taken into account. Other factors, such as the proximity of heavy plant operators, which may necessitate a flatter profile, should be taken into account. Vehicle weight or road width limitations may permit a more curved profile than the figures in Table 4 indicate.

Series of Bumps or Hollows signs as described in TSM specifications should be provided for level crossings with vehicle categories 2 and 3.

Where a level crossing is to be converted to an automatic level crossing, the profile should be checked to ensure that it conforms to the appropriate category. The profile should exist across the full width of the carriageway and the approaches. The approaches extend for a minimum of 20m from the nearest rail for category 2 and 3 level crossings, and up to 30m for category 1 level crossings.

At user-worked level crossings, the type of vehicles or equipment likely to go over the level crossing should be determined before the design of the vertical profile of the level crossing. Once this is determined, the maximum wheelbase length should be used to design the safe profile based on the same maximum permitted hump of 75mm. The gradient of the approaches to the level crossing should be determined in conjunction with the vertical profile commensurate with the type of traffic using it.

Note: The provision of telephones at a user-worked level crossing does not preclude the need to adhere to the above profile conditions.

5.14.3 Level crossing surface

The surface of the carriageway over a level crossing and on its immediate approaches should be capable of being maintained in good order and have a skid resistance comparable to that of the road approaches. A higher degree of skid resistance may be needed where road speeds are high, the visibility of a level crossing is limited or the road slopes downhill towards the level crossing. The surface should be free from potholes, upstanding rails, depressed areas or major undulations. Any timbers or panels used in the surface should be firmly fixed.

At vehicular level crossings with gates which completely fence in the railway when closed to the road or where there is no footpath adjacent to the carriageway, the ground at the edges of the carriageway over the level crossing should be made up to the same level as the carriageway for at least 1m.

At user-worked level crossings, a satisfactory road surface, commensurate with the type of traffic using them and adequate approaches should be provided and maintained. Where timbers are used for the level 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.

At pedestrian crossings, the surface provided between the decision points should be unobstructed. There should be no movable signalling or track equipment on the surface (such as sets of points) or close by, that might create a hazard. The surface should be maintained in a good and even condition. The rails are not considered to constitute an obstruction or uneven surface.

The type of surface should be in keeping with, but not necessarily the same as, the surface provided on the accommodation of way on the approaches to the level crossing immediately outside the railway boundary.

Where the track ballast shoulder is high, steps or ramps for pedestrian level crossings should be maintained to give access to the surface. On steep slopes, handrails may be needed in addition to steps or ramps.

Where the surface is other than ballast or stone chipping, a non-slip surface should be provided. Where the surface is made up to rail level and stone is used as in-fill; a means to retain the stone should be provided.

At pedestrian crossings, the surface should be made up to rail level, where:

- a) the level crossing is in a location where housing, factories, shops etc. adjoin or are close to the railway,

and the level crossing provides an attractive or convenient link between them;

- b) any of the approaches on the right of way are metalled; or
- c) there is heavy regular use.

The surface of all level crossings should have no gaps other than the flangeway that could trap either the heel of a shoe or the wheel of a cycle, pram etc.

The surface should also be removable to permit occasional inspection of the track where there is a high risk of corrosion due to use of the level crossing by animals or road salting.

5.14.4 Level crossing width

At all level crossings, the width of the carriageway over the level crossing and on the approaches should be constant.

At all automatic level crossings, open level crossings, and user-worked level crossings, it should be possible for traffic to pass safely on the approaches and the crossing itself should not form an isolated passing place.

At automatic level crossings, the carriageway width over the level crossing should be maintained on each approach for the distances shown in Table 5.

Table 5: LEVEL CROSSING WIDTH				
ACTUAL DAILY ROAD VEHICLE USER	OR	DAILY TRAFFIC MOMENT	DISTANCES MEASURED FROM THE STOP LINE (m)	
			AHB	AOC
More than 2000		More than 80,000	21	21
2000 or less		80,000 or less	14	14
600 or less		25,000 or less	14	7

Note: It may be necessary to increase these distances commensurate with the type of vehicles which use the level crossing.

The carriageway width over an automatic half barrier level crossing should not be less than 6m, but where the actual daily road vehicle user is less than 4000, the width may be reduced to not less than 5m.

The carriageway width over an automatic open level crossing should not be less than 5m where the actual daily road vehicle user is greater than 600 or the peak hour traffic moment is greater than 120.

At user-worked level crossings, the road surface should be at least as wide as the distance between the gateposts. The width of the level crossing should normally not exceed 5m to allow the use of single-leaf gates.

At pedestrian level crossings, the width of the surface should not be less than 1m.

5.14.5 Provision of lay-bys

Lay-bys may be required at automatic level crossings so that large or slow vehicles can wait while drivers telephone the control point. These may be required where sight lines would otherwise be obstructed or where there is risk of blocking to and from the level crossing, caused by waiting vehicles.

5.14.6 Level crossing alignment

At user-worked level crossings, the alignment of the level crossing over the tracks should enable the time required to traverse the level crossing to be kept to a minimum.

Pedestrian level crossings should be at right angles to the railway line.

5.14.7 Level crossing approaches

At user-worked level crossings, the alignment of the immediate approaches to the level crossing should be in line with the alignment of the level crossing itself. The alignment of the approaches to the level crossing should be such that any light source from road vehicles or equipment should not cause confusion with railway signals.

5.15 GATES, WICKET GATES AND BARRIER EQUIPMENT

5.15.1 Gates

The gateway should be the full width of the carriageway plus at least 450mm clearance on each side. The clearance between gateposts 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.

When closed, the gates should extend over the full width of the carriageway. Unless specially authorised, the normal position of the gates is across the road. At a user-worked level crossing, they should not be closer to the track than the decision point.

At level crossings on public roads, the gates should be painted white and carry red retroreflective targets to face outwards when the gates are across the road. Where there are red lamps mounted on the gates, which show towards approaching road traffic when the gates are across the road, red retroreflective targets may also be appropriate.

At gated level crossings operated by railway staff, the gates should be lockable when closed across the road or railway. They should be conspicuous when closed across the railway to the drivers of approaching trains.

5.15.2 Wicket gates

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 pedestrian level crossings and gated level crossings operated by railway staff should not be less than 1m wide.

All wicket gates should be easy to open from either side and be self-closing. Latches, which might prevent a wicket gate being opened quickly, should not be used. Where wicket gates are provided across the footpath at gated level crossings operated by railway staff, they should be lockable.

5.15.3 Barriers

The tops of the barriers when lowered should not be less than 840mm above the road surface at the centre of the carriageway. The clearance between the bottom edge of the lowered barrier and the road surface should not exceed 1000mm. When raised, the barriers should be inclined towards the carriageway at an angle of between 5° and 10° from the vertical.

No part of the barrier equipment, which is less than 5m above the level of the carriageway, should be horizontally displaced from the nearer edge of the carriageway by less than 450mm. Where the barriers cover a footpath, no part of the barrier equipment, which is less than 2m above the level of the footpath, should be horizontally displaced from the edge of the footpath that is furthest from the carriageway, by less than 150mm.

The barriers should be as close as convenient to the railway, but no part of the equipment should be within the standard structure gauge.

Barriers should be at least 125mm deep at their mid-points and at least 75mm deep at their tips. Each barrier should display on both its sides red and white bands about 600mm long to the full depth of

the barrier. A strip of retroreflecting material not less than 50mm deep should be provided along the full length of each band.

The moving parts of the barrier mechanism, excluding the boom and any skirt, should be shielded from the public.

Two electric lamps of adequate luminous intensity should be fitted to each barrier and, 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 150mm from the barrier tip. The lamps should show except when the barriers are fully raised.

At level crossings with a high pedestrian usage or where there is a risk of trespass barriers should be designed to inhibit bending or skewing preventing pedestrians traversing the level crossing between barriers.

5.15.4 Skew level crossings

On skew level crossings 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 footpath, should not be within 1000mm of the nearest rail.

5.15.5 Barrier level crossings operated by railway staff

At barrier level 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 footpaths.

At barrier level crossings operated by railway staff and user-worked level crossings, skirts should be fitted to the barriers. The skirts should be of a light colour, light construction, and fence in the space between the lowered barriers and the road surface.

Note: Skirts are not required at automatic level crossings with half barriers.

5.15.6 User-worked level crossings

At user-worked level crossings, the barriers should be hand-operated and counter-weighted to fall when released. The barriers should be linked so that they can be raised or lowered together from either side of the level crossing.

5.15.7 Single barriers

Single barriers should not normally be provided for use on one-way roads or on two-way roads with central reservations. In such cases special provisions for pedestrians may be required.

5.15.8 Half barriers

At automatic level crossings with half barriers, the barriers should be pivoted on the left-hand side of the road on each approach.

When lowered, the half barriers should extend to between 150mm and 450mm from the centre of the carriageway. On carriageways between 5m and 5.7m wide, the barriers should extend to within 800mm of the centre line so as to leave a clear exit of at least 3m in width.

If the line is electrified on the overhead system and a barrier, if capsized, could come closer than 150mm to the overhead conductors, that 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 conductor causes controlling circuit-breaker(s) to interrupt the electric traction supply.

5.16 TELEPHONES AND TELEPHONE SIGNS

5.16.1 General

Telephones should be provided with appropriate back-up power arrangements. The telephone system should be designed to minimise the risk that a fault on an individual telephone or the failure of a user to replace the handset on any telephone should not prevent the correct operation of the remaining telephones, where practicable.

A symbol depicting a black telephone handset on a yellow background should be displayed on or adjacent to the cabinet. The telephones should be clearly visible from the level crossing. If the telephones are not clearly visible to a person at a particular location a similar telephone handset sign with a directional arrow should be provided to direct potential users to the telephones.

5.16.2 At automatic level crossings

Telephones for use by the public at automatic level crossings with half barriers should be housed in cabinets and connected directly to the supervising point. A two-way calling facility should be provided.

Inside or adjacent to the telephone cabinet, clear and simple instructions, which are also legible at night, should be provided to tell users to contact the supervising point. The telephone user should not have to dial a telephone number.

In case the telephone at the level crossing is out of order, its unique reference number should be displayed adjacent to the telephone cabinet followed by a public telephone number of a continuously staffed railway location to be used when the line is open.

The telephone system should have a facility which records that calls have been made from the level crossing during periods when the supervising point is closed.

5.16.3 At barrier level crossings operated by railway staff

Telephones for use by the public should be provided at each entrance to and exit from the level crossing. The phones at the entrance to the level crossing should be located adjacent to the nearside primary road traffic signal and face outwards from the level crossing. The phones at the exits from the level crossing should be located adjacent to the offside barrier, face into the level crossing and be accessible to users who may be trapped within the level crossing. They should be housed in cabinets and connected directly to the supervising point. A two-way calling facility should be provided.

5.16.4 At gated level crossings operated by railway staff

Telephones for public use are not normally provided at gated level crossings operated by railway staff. Where the gates are normally closed across the road a device should be provided on each road approach to the gates to alert the level crossing operator of the requirement to open the carriageway. The devices should be accessible and clearly visible to road and pedestrian users and provided with clear operating instructions.

Gated level crossing without protecting signals should have a dedicated telephone for the sole use of the attendant to communicate with the signaller.

5.16.5 At user-worked level crossings

Telephones, where provided, should be positioned adjacent to the gates or barriers on each side of the level crossing. The telephones should be housed in cabinets and connected directly to a supervising point. A two-way calling facility should be provided.

Inside the cabinet, clear and simple instructions, which are also legible at night, should be provided to direct users to contact the supervising point. The telephone user should not have to dial a telephone number.

The name and its unique reference number of the level crossing should be displayed adjacent to the door of each telephone cabinet followed by a telephone number of a continuously staffed railway location to be used when the line is open, in case the telephone at the level crossing is out of order.

5.17 MINIATURE WARNING LIGHTS (MWL)

5.17.1 General description

Miniature warning lights consist of red and green lights. They can be used at user-worked level crossings and pedestrian level crossings. The green light normally shows, but an approaching train automatically changes the lights to red. Signs instructing users to cross only when the green light shows should be provided.

Note: MWL may not be suitable at level crossings where movement of cattle or heavy farm equipment is involved. Alternative arrangements may need to be made.

5.17.2 Positioning of MWL

The MWL should be located so that they face towards an approaching user. They should be clearly visible to the level crossing users when operating the gates or barriers. MWL are mounted in the sign at a level crossing with a telephone or in the sign at a level crossing without a telephone.

At pedestrian level crossings, the MWL should be placed on the far side of the level crossing from an approaching user and face inwards towards the railway.

At user-worked level crossings, the MWL should be placed on the approach side of the level crossing facing towards approaching road users. This should still apply where there is an adjacent pedestrian level crossing.

5.17.3 Equipment of MWL

The red and green lights should be of adequate luminous intensity to convey the safety message to users at the decision point. The distance between the edges of the lenses should not be less than 40mm. Each lamp should be fitted with a hood against sunlight.

Consideration should be given to the use of standard highway pedestrian signals (see TSM).

5.17.4 Railway signalling and control equipment

The MWL should be operated automatically by trains in accordance with the warning period required by the particular type of level crossing as listed in Table 6.

TYPE OF LEVEL CROSSING	MINIMUM WARNING PERIOD (seconds)
User-worked level crossings	40
Pedestrian level crossings	20

The minimum warning periods should be at least 5 seconds longer than the time required to traverse the level crossing.

The green light should show until the red light appears. As soon as the train is clear of the level crossing, the red light should be extinguished, and the green light should appear unless the red light is required to show for another train.

Bi-directional controls should be provided.

Where signals or station platforms lie between the strike-in point and the level crossing, special controls may be required.

Note: A standby power supply is not considered necessary.

5.18 TRAFFIC SIGNALS, TRAFFIC SIGNS AND ROAD MARKINGS

References to regulations or directions in this section are to the Traffic Signs Manual (TSM). The legal framework for traffic signage (including signs, devices, notices and markings) is contained in the Road Traffic Acts. Where references in this document to the Road Traffic (Signs) Regulations, 1997 and 1998 they will be quoted as being included in the Traffic Signs Manual (TSM) issued by the Department of Transport (DoT).

Signs should be positioned so as not to be a hazard to road users and pedestrians using the level crossing e.g. 2100 mm headroom clearance may be required where the sign is positioned adjacent to a footpath.

Minimum clearances between road traffic light signals and level crossing signs and the road edge should be maintained in accordance with those specified in the TSM.

5.18.1 Road traffic light signals

The lens layout of the traffic light signal is set out in the TSM. The light board will be black, with a minimum size of 1320mm x 860mm with a 100mm white border. The lens diameter will be a minimum of 200mm. The reverse of the light board should be coloured grey or black.

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 level crossing. At level crossings where there are barriers, it should be located not more than 2m before the barrier and adjacent to the barrier machine where this is on the left-hand side.

A duplicate primary road traffic light signal should be located on the right-hand side of the carriageway on each approach. An additional road traffic light signal may be required 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 of the crossing, should not be used at level crossings.

Advance warning road traffic signal consisting of two flashing amber lights aligned horizontally may be located on the approach to level crossing if the primary and duplicate primary signals cannot be viewed from the distance required by Table 7. The advance lights should be located not more than 300 metres from the level crossing and there should be continuous sighting of the level crossing lights from the advance traffic light signal.

No road traffic light signal should be located on the approach side of the vehicular stop line or an extension from it.

At acute skew level crossings, the duplicate primary signal may be placed in line with the vehicular stop line to shorten the length of the level crossing.

At obtuse skew automatic crossings, 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. Special arrangements for pedestrians may be necessary.

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 5.5m above the road surface.

Where a road traffic light signal is mounted over the carriageway and the line is electrified on the overhead system and the structure and signal, if capsized, could come closer than 150mm 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.

The road traffic light signals, if mounted at the side of the road, should be positioned so that the centre of the lens nearest the carriageway is not less than 810mm and not more than 1500mm from the carriageway edge.

Where the signals are above a footpath, minimum headroom from the lower edge of the signal backing board of 2100mm should be maintained.

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. Recommended minimum visibility distances are shown in Table 7. If these minimum visibility distances cannot be achieved, further measures may be necessary, e.g. the provision of additional advance warning signs, count-down markers etc.

85%ILE SPEED OF ROAD VEHICLES (km/h)	MINIMUM VISIBILITY DISTANCE (metres)
40	40
60	80
80	130
100	190
120	270

Where a level crossing is situated close to a road junction equipped with road traffic light signals, the two sets of road traffic light signals may need to be linked. Where they are linked, the connection between them requires special authorisation.

5.18.2 Pedestrian signals

The construction and specification of pedestrian signals used at level crossings are required to comply with the TSM.

The red figure on the pedestrian signal should be illuminated internally by an intermittent light while the intermittent red lights of the road traffic light signals are lit. The rate of flashing should be the same as one of the intermittent red lights in the road traffic light signal.

5.18.3 Traffic signs

Appropriate traffic signs should be provided on each road approach.

Details of the signs for use with MWL are shown in the Traffic Signs Manual.

At automatic crossings, signs should be positioned as close as possible to the level crossing, commensurate with the likely approach speed of the vehicles to which they refer.

Note: The height and position of the second train coming sign may require to be adjusted to give maximum visibility to vehicles standing at the stop line. In some circumstances this may require the sign to be positioned under the duplicate primary road traffic light signal.

At automatic level crossings and open level 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. Additional reflecting road studs along the edges of the carriageway to direct drivers along the road may be required.

At user-worked level crossings and pedestrian level crossings, a sign(s) explaining to the user how to proceed safely over the level crossing should be provided facing the user at, or on the approach to, the decision point (e.g. IÉ publication “The safe use of unattended railway level crossings”).

5.18.4 Related to electrified lines

Where the line is electrified on the overhead line system, signs should be provided with an appropriate plate. At user-worked level crossings, suitable signs warning of the danger from bare electrical conductors e.g. ‘Danger, overhead live wires’ should be provided and face towards the user approaching the decision point.

Where the minimum wire height over a public level crossing cannot be achieved, advance warning signs to TSM specifications should be provided at the last available diversion before the level crossing.

The signs to TSM specifications should show a ‘safe height’ which is at least 300mm below the height of the overhead conductor for 1.5 kV DC systems.

At any level crossing where the height of the overhead conductor is below that normally required for a public crossing, additional measures should be provided along with signs to TSM specifications showing a ‘safe height’ which is at least 300mm below the height of the overhead conductor for 1.5 kV DC systems.

Note: 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.

At level 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 signs to TSM

specifications, an additional sign depicting the hazard, e.g. 'Danger, overhanging load may foul live wires' should also be provided.

5.18.5 Related to risk of grounding

Where there is a risk that vehicles may become grounded on the crossing, signs to TSM specifications should be erected on the immediate approaches. Advance warning signs to TSM specifications with distance information at the last available diversion before the crossing. See the TSM for the details of which crossings require signing.

Where a lay-by or parking is provided near the crossing to enable drivers of long vehicles to pull in, signage, a telephone and appropriate information notices should be provided nearby as per the TSM.

5.18.6 Road markings

Transverse road markings are not normally provided at gated crossings operated by railway staff, but where they are, they should conform to guidance in this section.

Road markings should be provided at user-worked crossings, except where the road surface is unsuitable.

5.18.7 Transverse and associated road markings

Where road traffic light signals are installed, transverse stop lines to TSM specifications should be provided on the left-hand side of the carriageway. The lines should be at right angles to the carriageway approximately 1m in front of the primary road traffic light signal. At automatic open crossings this may be increased to 2m. The lines should also extend across the adjacent footpath and be 300mm wide.

Where road traffic light signals are installed transverse pedestrian road markings are required to extend across the right-hand side of each carriageway. The lines should be at right angles to the carriageway approximately 1m in front of the secondary road traffic light signal. At automatic open crossings this may be increased to 2m. The lines should also extend across adjacent footpath on each crossing approach. The lines should be located in accordance with the TSM and be 300mm wide, 900mm long with a 450mm space.

At user-worked crossings, if a stop sign to TSM specifications is provided, then a transverse stop line to TSM specifications should be provided unless the road surface is unsuitable.

5.18.8 Longitudinal road markings

The type and arrangement of longitudinal road marking is shown in the TSM.

Where the width of the carriageway over the crossing is less than 5m, a centre of carriageway marking is not normally required.

Where the width of the carriageway over the level crossing is 5m or over, but less than 6m, the centre of the carriageway, between the stop lines, should be marked with the appropriate longitudinal lines to TSM specifications. The lines should continue for a minimum of 15m beyond the stop line or, alternatively, for at least 6m beyond this distance the carriageway is less than 6m in width.

Both edges of the footpaths over the level crossing should be marked with a continuous longitudinal marking to TSM specifications. Discretion should be used when positioning the edge of carriageway lines so as not to conflict with yellow box markings.

5.18.9 Double white Lines

Where the width of the carriageway over the level crossing and on the immediate approaches is 6m or over and there is a risk of overtaking, the centre of the carriageway over the level crossing should be marked with a double line system to TSM specification. The lines should continue along the approaches to the level crossing to a distance justified by the visibility for oncoming traffic.

At automatic barrier level crossings, where the carriageway width permits, a central traffic island may be provided on the approach to the stop lines as an additional form of protection against vehicles attempting to “zigzag” the level crossing.

5.18.10 Yellow box markings

Yellow box markings to TSM specifications should be provided on the carriageway over the level crossing area at all controlled barrier and automatic level crossings. Typical arrangements of the markings are depicted on TSM specifications.

5.18.11 Road studs

Reflecting road studs may be laid on the centre line of the roadway over the level crossing and on the approaches to the level crossing. The studs should be white bi-directional reflecting and positioned at 6m intervals. Any studs laid within 2m of a running rail should be of plastic construction.

5.19 TYPICAL ROAD LAYOUTS AND SIGNAGE

For information on the relevant current road signage on approach to level crossings please see the Traffic Signs Manual and contact IÉ-IM for any additional required signage. Level crossing road layout information is available from IÉ-IM and additional details as per the Traffic Signs Manual.