

CD/3.1



RAILWAY

SAFETY

PRINCIPLES

and

GUIDANCE

**Guidance
on level
crossings**

CONTENTS

FOREWORD *v*

1 INTRODUCTION *1*

Application of the guidance *1*

Other regulations and standards *3*

Structure of the guidance *3*

Terminology *3*

2 CHOICE OF CROSSING TYPE *5*

Types of crossing *5*

Conditions for suitability *6*

3 GENERAL GUIDANCE *9*

Positioning of level crossings *9*

Equipment at level crossings *9*

4 GATED CROSSINGS OPERATED BY RAILWAY STAFF *10*

General description *10*

Method of operation *10*

Railway signalling and control *10*

5 BARRIER CROSSINGS OPERATED BY RAILWAY STAFF *12*

General description *12*

Method of operation *12*

Railway signalling and control *13*

6 AUTOMATIC HALF BARRIER CROSSINGS (AHBC) *15*

General description *15*

Method of operation *15*

Railway signalling and control *16*

7 AUTOMATIC BARRIER CROSSINGS LOCALLY MONITORED (ABCL)	18
General description	18
Method of operation	18
Railway signalling and control	20
8 AUTOMATIC OPEN CROSSINGS LOCALLY MONITORED (AOCL)	22
General description	22
Method of operation	22
Railway signalling and control	23
9 OPEN CROSSINGS	25
General description	25
Method of operation	25
Railway signalling and control	25
10 USER-WORKED CROSSINGS (UWC) WITH GATES OR LIFTING BARRIERS ON PRIVATE ROADS	27
General description	27
Method of operation	27
11 FOOTPATH CROSSINGS AND BRIDLEWAY CROSSINGS	29
General description	29
Method of operation	30
12 PROVISIONS FOR PEDESTRIANS AT PUBLIC VEHICULAR CROSSINGS	32
Road markings	32
Audible warnings	32
Pedestrian signals	33
Tactile thresholds	33
Means to control the flow of pedestrians	33
Pedestrian categories	33
Pedestrian provisions	34

13 ADDITIONAL MEASURES TO PROTECT AGAINST TRESPASS 35

Cattle-cum-trespass guards 35

Fencing 35

14 THE CROSSING 36

Vertical profile 36

Crossing surface 37

Crossing width 38

Provision of lay-bys 39

Crossing alignment 39

15 GATES, WICKET GATES AND BARRIER EQUIPMENT 40

Gates 40

Wicket gates 40

Barriers 40

16 TELEPHONES AND TELEPHONE SIGNS 43

At automatic crossings with half barriers 43

At barrier crossings operated by railway staff, locally-monitored automatic open crossings and open crossings 44

At user-worked crossings and bridleway crossings 44

17 MINIATURE STOP LIGHTS (MSL) 45

General description 45

Positioning of MSL 45

Equipment of MSL 45

Associated signs 45

Railway signalling and control equipment 45

18 TRAFFIC SIGNALS, TRAFFIC SIGNS AND ROAD MARKINGS 47

Road traffic light signals 47

Pedestrian signals 48

Traffic signs 48

Road markings 51

Typical layouts and sign drawings 54 - 61

APPENDIX A - LIMITATION ON ROAD AND RAIL TRAFFIC AT AOCL 62

APPENDIX B - DEFINITION OF VIEWING ZONE AT OPEN CROSSINGS 63

APPENDIX C - TRAIN PEDESTRIAN VALUE (TPV) CALCULATION 64

APPENDIX D - LEVEL CROSSING PRINCIPLE 65

APPENDIX E - COMMON TERMS 67

FOREWORD

This document is one of eight which provide guidance on specific aspects of railway construction. It continues the tradition of providing written advice started by the Railway Inspectorate soon after its formation in 1840.

This latest version of the guidance under its new title *Railway safety principles and guidance* revises and updates the previous advice contained in the *Railway construction and operation requirements for passenger lines and recommendations for goods lines* documents which became known throughout the industry as 'The Blue Book' or simply the 'Requirements'.

The guidance is now being published in two distinct 'Parts'. Part 1 sets out the top level safety principles and gives an indication of the factors which need to be taken into account in implementing them.

Part 2 consists of eight separate sections dealing with specific aspects of railway construction. It provides an expansion of the advice given in Part 1 and also gives examples of good practice acceptable to the Inspectorate, for those who would find such advice of assistance.

The eight sections in Part 2 deal with specific aspects of railway construction:

- A The infrastructure;
- B Stations;
- C Electric traction systems;
- D Signalling;
- E Level crossings;
- F Trains;
- G Tramways;
- H Minor railways.

The RSPG series Parts 1 and 2 can be found on the HSE website at:
<http://www.hse.gov.uk/railways/information.htm> under Railway safety principles and guidance.

As with previous guidance, these documents are intended to give advice and not set an absolute standard.

During the development of the new format and preparation of the principles and guidance, the Railway Inspectorate has consulted extensively with the railway industry and other organisations who could usefully contribute to the work. Much assistance and many constructive comments have been received and the Inspectorate is most grateful for the time and help it has been given.

It is hoped that the railway industry of today will find this new guidance to be of as much help as the Blue Book's advice was in the past.



1 INTRODUCTION

1 *Railway safety principles and guidance* is intended to give guidance and advice to those involved in the design and construction of new and altered works, plant and equipment (which includes trains and other rail mounted vehicles) capable of affecting the safety of railways, tramways or other guided transport systems, which require approval under the Railways and Other Transport Systems (Approval of Works, Plant and Equipment) Regulations 1994.

2 This document is not intended to set out mandatory standards. It supports and amplifies the Part 1 level crossing safety principle by giving examples of established good practice acceptable to the Inspectorate, for those who would find such advice of assistance. This principle and its factors can be found in Appendix D - Level crossing principle.

Application of the guidance

3 Application of this guidance should provide a sufficient level of safety for approval to be given by the Inspectorate, provided that it has been demonstrated that the use of the guidance is wholly applicable to the level crossing.

4 If this is not the case, then the Inspectorate will wish to be satisfied that due consideration has been given to implementing the safety principles in the Part 1 document *Railway safety principles and guidance* in a way that ensures that all intolerable risks have been eliminated and that all remaining risks have been reduced to be as low as reasonably practicable (known as ALARP).

5 The guidance is intended to assist those who have responsibility for the provision and maintenance of the protection arrangements at level crossings. As well as the railway infrastructure controller, the Highway Authority should also take account of the guidance in so far as it applies to the roadway aspects of the protection arrangements. It is hoped that the elected members and officers of those authorities who have a statutory right to be consulted on any modifications to the protection arrangements at a level crossing will find this document of help.

6 A level crossing may take many forms depending on whether the crossing is on a public or private road, for vehicle, horse or pedestrian use. The type of protection arrangements which are appropriate at any particular level crossing will depend upon the crossing location, the level of usage and the nature of railway traffic.

7 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 crossing. 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.

8 The guidance is applicable when alterations are made to the protection arrangements at existing crossings. When alterations are made at a public vehicular level crossing, the protection

arrangements are described in and authorised by a Statutory Order made under the appropriate level crossing legislation. Alterations to the arrangements at other crossings will require approval under the Railways and Other Transport Systems (Approval of Works, Plant and Equipment) Regulations 1994.

Effects on existing level crossings

9 *Railway safety principles and guidance* does not apply retrospectively to existing level crossings. However, new or altered level crossings might introduce incompatibilities or inconsistencies with the existing crossings. In this case, approval may only be given if appropriate arrangements have been made to address these safety implications which may include modifications to the existing level crossings.

Operating conditions

10 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.

11 An assessment of the suitability of the type of crossing at the location concerned should be made whenever:

- (a) circumstances at the crossing are to change (eg rolling stock, signalling, electrification, speed etc);
- (b) circumstances at the crossing are found to have altered (eg housing or industrial developments etc); or
- (c) after a period of not less than two or more than four years, as specified in the last assessment

to ensure that the level of protection afforded by the crossing is adequate and appropriate.

12 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.

Design and building

13 The guidance applies to the finished level crossing but not to the processes of designing or building. Designers and builders need to be aware of the responsibilities imposed upon them by the Construction (Design and Management) Regulations 1994 made under the Health and Safety at Work etc Act 1974.

Other regulations and standards

14 Works, plant or equipment at level crossings may be subject to other specific regulations, for example, the Electricity at Work Regulations 1989. In implementing the guidance in this document, compliance with these regulations must be considered and specific reference is made to the more significant regulations.

15 Similarly, any material or article used in the provision of the works, plant or equipment may need to comply with a specific standard. The guidance in this document does not make reference to these numerous standards, however, an indication is provided where standards may be appropriate.

Note: Any reference in this guidance to any material or article complying with a specific standard should be satisfied by compliance with any relevant standard recognised in any member state of the European Communities, providing that the standard in question offers guarantees of safety, suitability and fitness for purpose equivalent to those offered by the standard referred to in this guidance.

16 Where references are made in this document to the Traffic Signs Regulations and General Directions 1994 or to the Private Crossings (Signs and Barriers) Regulations 1996 they will be quoted as the 1994 Regulations and the 1996 Regulations respectively. References to sign diagram numbers are to diagrams in those Regulations.

Structure of the guidance

17 The document:

- (a) establishes the crossing types appropriate to the prevailing conditions;
- (b) provides general guidance applicable to all types of crossing;
- (c) gives specific details of types of crossing; and
- (d) provides guidance on carriageway aspects and crossing equipment.

18 A 'Note' is used to provide additional information which is relevant to the paragraph(s) of guidance which precede it.

Terminology

19 Throughout the document, verbs with specific meanings are used:

- (a) **should** - the primary verb for statements of guidance;
- (b) **may** - where the guidance suggests options;
- (c) **must** - only used where there is a legal/statutory requirement for the measures described to be employed. Reference to the Act or Regulations will be provided;

(d) is (are) required - having decided upon a particular option or arrangements, some consequential choices stem from that first decision. This expression is used to indicate those consequential choices and where firmer guidance is considered appropriate.

20 Where possible the document has been written in plain English. However, some words or expressions are used in a way which has a slightly wider meaning than their natural meaning. Some terms that relate specifically to level crossings have a special meaning, and where these terms are first mentioned in the text they are italicised. These words can be found in Appendix E - Common terms.

2 CHOICE OF CROSSING TYPE

Types of crossing

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

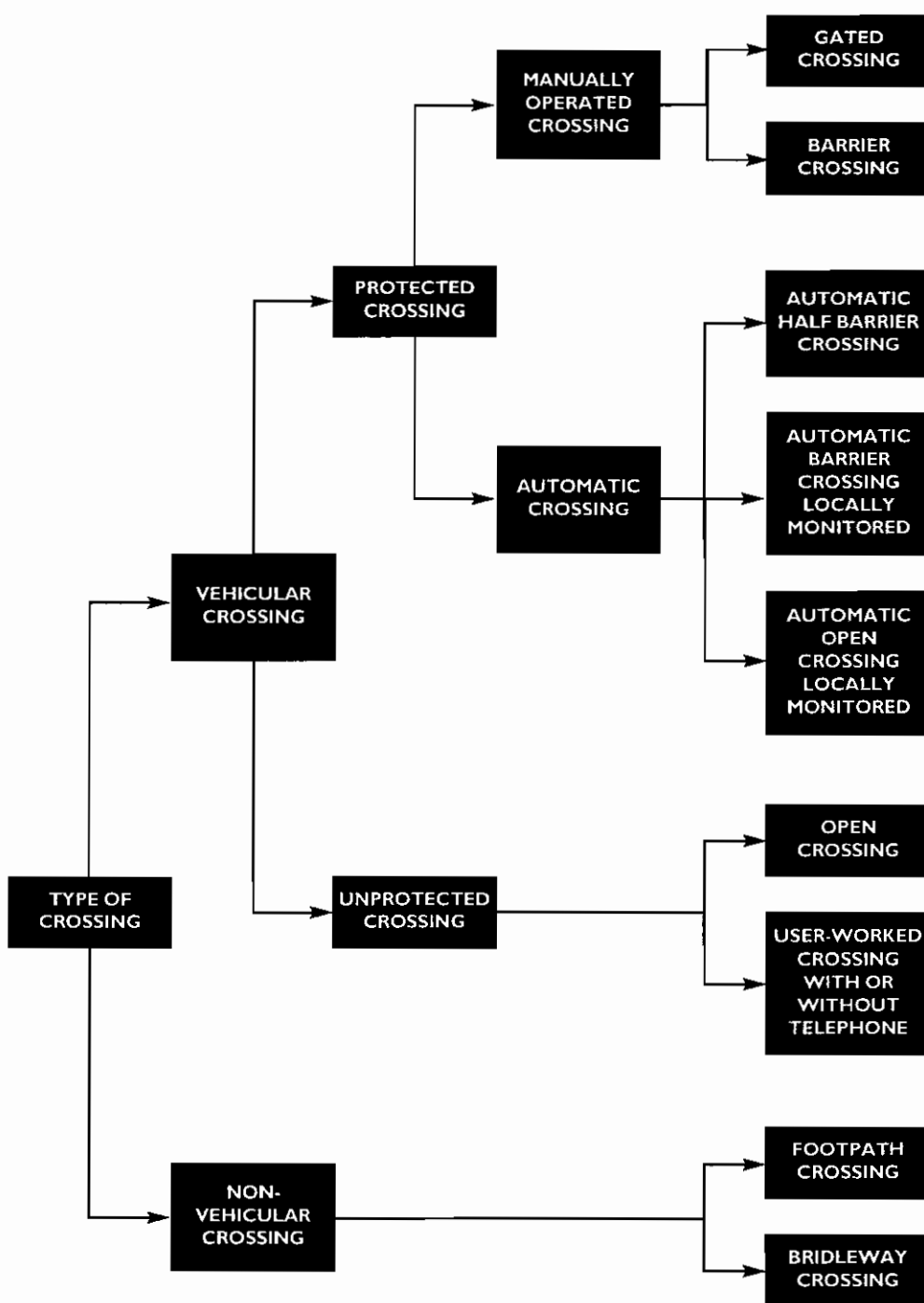


Figure 1: Types of crossing

Note: Any user-worked crossing, footpath or bridleway crossing equipped with miniature stop lights can be classified as a protected crossing.

Conditions for suitability

22 The suitability of the types of protection for new or altered crossings depends on various factors, one of which may be traffic volume. Table 1 gives guidance on the factors to be considered for any given location. The choice of level crossings should avoid causing unnecessary delay to road users.

TABLE 1

CHAPTER	TYPE OF CROSSING	CONDITIONS FOR SUITABILITY
4	Gated crossings operated by railway staff	<p>The <i>traffic moment</i> and <i>actual daily road vehicle user</i> should be low.</p> <p>Railway signals interlocked with the gates are required so that it is not possible to clear the signals unless the road is fully closed by the gates, nor is it possible to open the road unless the signals are at Stop.</p>
5	Barrier crossings operated by railway staff	<p>Generally suitable for any situation.</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>
6	Automatic half barrier crossings (AHBC)	<p>The speed of trains over the crossing should not normally exceed 160 km/h.</p> <p>There should not be more than two running lines.</p> <p>Appropriate means to stop any train approaching the crossing in an emergency situation are required.</p> <p>Trains should arrive at the crossing in not less than 27 seconds after the amber lights of the road traffic light signals first show. At least 95% of trains should arrive within 75 seconds and 50% within 50 seconds.</p> <p>The carriageway on the approaches to the crossing should be sufficiently wide to enable vehicles to pass safely.</p> <p>There is no limit to the amount of road traffic, but the road layout, profile and traffic conditions should be such that road vehicles are not likely to become grounded or block back obstructing the railway.</p>

CHAPTER	TYPE OF CROSSING	CONDITIONS FOR SUITABILITY
7	Automatic barrier crossings, locally monitored (ABCL)	<p>The speed of the trains over the crossing should not exceed 90 km/h.</p> <p>There should not be more than two running lines.</p> <p>The carriageway on the approaches to the crossing should be sufficiently wide to enable vehicles to pass safely.</p> <p>There is no limit to the amount of road traffic, but the road layout, profile and traffic conditions should be such that road vehicles are not likely to ground or regularly to block back obstructing the railway.</p>
8	Automatic open crossings, locally monitored (AOCL)	<p>The speed of the trains over the crossing should not exceed 90 km/h.</p> <p>There should not be more than two running lines.</p> <p>The limits on road and rail traffic are defined in Appendix A.</p> <p>The carriageway on the approaches to the crossing should be sufficiently wide to enable vehicles to pass safely.</p> <p>The road layout, profile and traffic conditions should be such that road vehicles are not likely to ground or regularly to block back obstructing the railway.</p>
9	Open crossings	<p>The speed of the trains over the crossing should not exceed 15 km/h.</p> <p>There should not be more than one line over the crossing.</p> <p>The maximum daily traffic moment not normally to exceed 2000 or the peak hour traffic moment 30 or the maximum actual daily road vehicle user 200.</p> <p>The 85thile road speed at the crossing to be less than 35 mile/h (60 km/h).</p> <p>The road layout, profile and traffic conditions should be such that road vehicles are not likely to ground or regularly to block back obstructing the railway.</p>

CHAPTER	TYPE OF CROSSING	CONDITIONS FOR SUITABILITY
10	User-worked crossings (UWC)	<p>The speed of trains over the crossing should not exceed 160 km/h unless additional protection is provided.</p> <p>There are no limitations upon the frequency of rail traffic.</p> <p>These crossings should only be used on private roads.</p> <p>There should not normally be more than two lines over the crossing.</p> <p>Where no additional protection is provided, the time required by likely users to traverse the <i>crossing length</i> to be at least 5 seconds less than the <i>warning time</i> available.</p> <p>Where miniature stop lights are provided, the warning period should be greater than the time required by likely users to traverse the crossing length by not less than 5 seconds.</p>
11	Footpath crossings and bridleway crossings	<p>The speed of trains over the crossing should not exceed 160 km/h unless additional protection is provided.</p> <p>There are no limitations upon the frequency of rail traffic.</p> <p>There should not normally be more than two lines over the crossing.</p> <p>The warning time should be greater than the time required by users to traverse the crossing surface between the <i>decision points</i> at either end of a footpath crossing on foot, or on horseback at a bridleway crossing, unless additional protection is provided.</p> <p>Where miniature stop lights are provided, the warning period should be greater, by not less than 5 seconds, than the time required by users to traverse the crossing surface between the decision points at either end of a footpath crossing on foot, or on horseback at a bridleway crossing.</p>

3 GENERAL GUIDANCE

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

Positioning of level crossings

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

25 A risk assessment should be made to determine the relative positioning of a 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.

26 Where a crossing goes over electrified lines, additional measures are needed to protect road users. See Chapter 18 for appropriate warning signs and Part 2, Section C *Electric traction systems*.

Equipment at level crossings

27 All equipment and circuits used for the operation of crossing equipment should be designed and documented to appropriate safety standards. All crossing equipment should be installed clear of the railway structure gauge and at least 450 mm clear of the edge of the carriageway.

28 At all *automatic crossings*, an alternative power supply should be provided to allow the crossing equipment to function fully under normal operating conditions in the event of the failure of the main power supply until the main power supply is restored or an alternative arrangement is put in place to ensure the safe operation of the crossing.

29 Where trains run after dark, illumination of the crossing may be provided to ensure its safe operation. If the road approaches to a crossing are lit, the crossing should be illuminated to at least the same standard. Any lighting should not cause glare to either road users or train drivers, interfere with the visibility of railway signals nor cause avoidable annoyance to local householders.

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

31 Any failure or damage to the equipment at a level crossing, which may lead to incorrect or unsafe operation, should be evident to the *control point*, the driver of an approaching train, or the user of the level crossing within a reasonable time of the event occurring.

4 GATED CROSSINGS OPERATED BY RAILWAY STAFF

(For user-worked gated crossings see Chapter 10)

General description

32 This type of crossing is protected by gates, on both sides of the railway, which complete the fencing of the railway when closed across the road or the railway. The crossing is manually operated by railway staff who close the gates alternately across the road and the railway.

33 The gates are normally kept closed across the road. Alternatively, where rail traffic is much less frequent than road traffic, the gates may be kept closed across the railway (under formal authorisation by the Inspectorate). Where the gates do not completely fence in the railway when open to road traffic, cattle-cum-trespass guards may be required.

34 Road traffic light signals may be provided to operate the gates safely. Where they are not provided, 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.

Method of operation

35 The gates may be operated by one of the following methods:

- (a) by assigned railway staff who are permanently stationed at a control point adjacent (within 50 m) to the level crossing when the line is open to rail traffic; or
- (b) by a member of the train crew of an approaching train at a control point adjacent to the level crossing after the train has been stopped short of the crossing.

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

37 Where road traffic light signals are provided, they should be arranged to show before any attempt is made to close the gates to road traffic and should continue to show when the gates are not across the railway.

38 Where the crossing is operated by assigned 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.

39 Where the crossing is operated by a member of the train crew of an approaching train, the train is required to stop short of the crossing to allow the person to close the gates to road traffic. The train may then only proceed over the crossing when the train driver receives the authority from the person operating the gates.

Railway signalling and control

40 Railway signals which provide full protection to the crossing should be provided on both

railway approaches. These 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 Stop.

41 Where road traffic light signals are provided, a train passing a protecting signal at Stop should cause the road traffic lights to immediately show an intermittent red light, omitting the steady amber phase.

42 If the crossing is operated by a member of the train crew, interlocking between signalling and gates is not required. Instead, a warning board is to be provided at full service braking distance from a stop board placed at a suitable point, not normally less than 50 m, before the crossing to remind the train driver to stop short of the crossing.

5 BARRIER CROSSINGS OPERATED BY RAILWAY STAFF

(For user-worked barrier crossings see Chapter 10)

General description

43 This type of crossing is protected by road traffic light signals and lifting barriers on both sides of the railway. An audible warning to pedestrians is also provided. The barriers are normally kept in the raised position and, when lowered, extend across the whole width of the carriageway on each approach.

44 The crossing is operated by assigned railway staff who initiate the display of the road traffic light signals towards approaching road traffic followed by the lowering of the barriers. The lowering and raising cycles may be initiated manually or automatically.

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 160 km/h.

45 Telephones for the use of the public are not normally provided.

Method of operation

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

- (a) by assigned railway staff who are permanently stationed at a control point adjacent (within 50 m) to the crossing when the line is open to rail traffic;
- (b) by assigned railway staff who are permanently stationed at a control point remote from the crossing, with the use of closed-circuit television (CCTV), whenever the line is open to rail traffic;
- (c) by a member of the train crew of an approaching train at a control point adjacent to the crossing after the train has been stopped short of the crossing.

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

48 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 begins. The amber lights should show for approximately 3 seconds;
- (b) immediately the amber lights are extinguished, the intermittent red lights should show;

- (c) approximately 4 to 6 seconds later the barriers should start to descend. Where pairs of barriers are provided, the *right-hand side* barriers should not begin to descend until the *left-hand side* barriers are fully down. The time for each barrier to reach the lowered position should normally be 6 to 10 seconds;
- (d) the audible warning should stop when all the barriers are fully lowered; and
- (e) the intermittent red lights should continue to show.

49 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 the barriers begin to rise simultaneously and should normally rise in 4 to 10 seconds; and
- (b) the intermittent red lights should continue to show until the barriers have risen to at least an angle of 45° above the horizontal.

50 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.

Note: For automatic lowering to be permitted, two barriers on each approach are required.

51 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 crossing.

52 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.

Railway signalling and control

53 Railway signals, which provide full protection to the crossing, are required on both 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.

54 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.

55 If a train passes a protecting signal at Stop, the road traffic light signals should immediately show an intermittent red light, omitting the steady amber phase, and the audible warning should start. The barriers should not be lowered.

56 If the crossing is operated by a member of the train crew, interlocking between the signalling and barriers is not required. Instead, a warning board is to be provided at full service braking distance from a stop board placed at a suitable point, not normally less than 50 m, before the crossing to remind the train driver to stop short of the crossing. The control point should be placed adjacent to the crossing.

57 The status of the crossing equipment should be indicated at the control point to ensure it operates safely when the railway line is open to traffic.

6 AUTOMATIC HALF BARRIER CROSSINGS (AHBC)

General description

58 This type of crossing is protected by road traffic light signals and a lifting barrier on both sides of the railway. Audible warning to pedestrians is also provided. Lifting barriers are normally kept in the raised position and pivoted on the left-hand side of the road. When lowered, the barriers only extend across the entrances to the crossing leaving the exits clear.

59 The 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 road traffic light signals and the arrival of the fastest train should be sufficiently long to enable road vehicles and pedestrians to clear the crossing.

60 The barriers rise immediately the train has passed unless another approaching train is so close that the minimum *road open time* cannot be achieved. In this situation the barriers remain lowered and the intermittent red lights continue to flash but the sound emitted by the audible warning device changes in character as soon as the first of the trains arrives at the crossing.

61 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.

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

Method of operation

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

64 The time elapsed between the amber lights of the road traffic light signals starting to show and the train arriving at the crossing should not be less than 27 seconds. The train should pass as soon after 27 seconds as possible. At least 95% of trains should arrive within 75 seconds and 50% within 50 seconds, once the sequence of events to close the crossing to road traffic has begun. Where the crossing length is longer than 15 m, the 27 seconds should be increased by 1 second for every additional 3 m of crossing length.

65 The sequence of events to close the 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 3 seconds;
- (b) immediately the amber lights are extinguished the intermittent red lights should show; and

- (c) approximately 4 to 6 seconds later the barriers should start to descend and take a further 6 to 10 seconds to reach the lowered position.

66 If the barriers remain down for another train, as soon as the first of the trains arrives at the crossing the warbling rate of the audible warning for pedestrians should be increased.

67 Both barriers should begin to rise simultaneously and should take normally 4 to 10 seconds to reach the raised position after a train has cleared the crossing. The intermittent red lights of the road traffic light signals should not be extinguished and the audible warning for pedestrians should not stop until the barriers have risen to at least an angle of 45° above the horizontal.

68 If both intermittent red lights in any of the road traffic light signals fail, the barrier should remain lowered. If there is a total power failure, the barriers should fall and remain lowered. If either barrier fails to reach the lowered position, neither barrier should rise until both have been fully lowered. If either barrier fails to rise from the lowered position, the intermittent red lights of the road traffic light signals should continue to show.

Railway signalling and control

69 Appropriate means are required to stop any train approaching the crossing in an emergency situation. 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 crossing not less than the longest service braking distance for any train. On a double-track line, bi-directional control to initiate the crossing equipment is required.

70 If a train passes a signal at Stop located between a *strike-in point* and the crossing, the road traffic light signals should immediately show an intermittent red light, omitting the steady amber phase, the audible warning for pedestrians should begin and the barriers start to lower in the normal sequence.

71 Where trains may be required to stop because railway signals or stations lie within or close to the strike-in points, the sequence of events to close the crossing to road traffic may be initiated:

- (a) automatically by an approaching train where stopping times of trains at a station can be predicted reasonably accurately and the time taken for trains to arrive at the crossing are within those specified in paragraph 64;
- (b) by a means that is only effective when the presence of a train is detected, eg 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 given in paragraph 64, the clearance of the signal may need to be delayed.

72 Facilities should be provided for local initiation of the crossing equipment and effective means are required to prevent its unauthorised operation.

73 The status of the crossing equipment should be indicated at the supervising point to ensure its safe operation when the railway line is open to traffic.

7 AUTOMATIC BARRIER CROSSINGS LOCALLY MONITORED (ABCL)

General description

74 The appearance of this type of crossing to the road user is identical to that of an automatic half barrier crossing. This type of crossing is protected by road traffic light signals and a lifting barrier on both sides of the railway. Audible warning to pedestrians is also provided. Lifting barriers are normally kept in the raised position and pivoted on the left-hand side of the road. When lowered, the barriers only extend across the entrances to the crossing leaving the exits clear. The period between the initial display of the road traffic light signals and the arrival of the fastest train should be sufficiently long to enable road vehicles and pedestrians to clear the crossing.

75 The crossing equipment is normally initiated automatically by an approaching train. The operation of the crossing equipment and the absence of obstruction on the crossing is monitored by the driver of an approaching train.

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

77 The barriers rise immediately the train has passed unless another approaching train is so close that the minimum road open time cannot be achieved. In this situation the barriers remain lowered and the intermittent red lights continue to flash, but the sound emitted by the audible warning device changes in character as soon as the first of the trains arrives at the crossing.

78 Telephones provided for use by the public are connected to a supervising point which is always open when the railway line is open.

79 Staff at a supervising point should have:

- (a) direct control of all train movements over the crossing;
- (b) a means of communicating with any assigned railway staff operating the crossing equipment locally at the crossing:
 - (i) in an emergency; or
 - (ii) in an abnormal situation; and
- (c) a means of communicating with the train driver approaching the crossing.

Method of operation

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

81 The time elapsed between the amber lights of the road traffic light signals starting to show and the train arriving at the crossing should not be less than 27 seconds. The train should pass as soon after 27 seconds as possible. At least 95% of trains should arrive within 75 seconds and 50% within 50 seconds, once the sequence of events to close the crossing to road traffic has begun. Where the crossing length is longer than 15 m, the 27 seconds should be increased by 1 second for every additional 3 m of crossing length.

82 The sequence of events to close the 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 3 seconds;
- (b) immediately the amber lights are extinguished the intermittent red lights should show; and
- (c) approximately 4 to 6 seconds later the barriers should start to descend and take a further 6 to 10 seconds to reach the lowered position.

83 If the barriers remain down for another train, as soon as the first of the trains arrives at the crossing, the warbling rate of the audible warning for pedestrians should be increased.

84 Both barriers should begin to rise simultaneously and should normally take 4 to 10 seconds to reach the raised position after a train has cleared the crossing. The intermittent red lights of the road traffic light signals should not be extinguished and the audible warning for pedestrians should not stop until the barriers have risen to at least an angle of 45° above the horizontal.

85 Trains normally approach the crossing at a steady speed, known as the *crossing speed*, so that they can be halted short of the crossing from the point at which it clearly comes into the train driver's view. The preferred arrangement is for trains not to stop before passing over a crossing unless it is not practicable to arrange otherwise, eg if a crossing lies immediately beyond a station platform.

86 If both intermittent red lights in any of the road traffic light signals fail, the barriers should continue to operate normally. If there is a total power failure, the barriers should remain in the raised position.

87 If the crossing remains closed for longer than could be caused by passing trains, it should be automatically reopened to road traffic. The indication to the train driver that all the crossing equipment is functioning correctly should be extinguished at least 30 seconds before the barriers start to rise. The equipment should then automatically reset for another train.

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

Railway signalling and control

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

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

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

92 Where trains are not required to stop before passing over the crossing, the sequence of events to close the crossing to road traffic should be initiated automatically by approaching trains.

93 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 trains.

94 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 100 m on the approach to the special speed restriction board.

95 Where all trains are required to stop at a station between the strike-in point and the crossing, a stop board should be located at least 50 m from the crossing and an advance warning board erected at service braking distance from the stop board. The sequence of events to close the crossing to road traffic may be initiated:

- (a) automatically by an approaching train where stopping times of trains at a station can be predicted reasonably accurately and the times taken for trains to arrive at the crossing are within those specified in paragraph 81;
- (b) by a means that is only effective when the presence of a train is detected, eg a train crew-operated plunger linked with the train detection system.

Note: To comply with the timings given in paragraph 81, the clearance of the signal may need to be delayed.

96 Where *not* all trains are required to stop at a station between the strike-in point and the crossing, the sequence of events to close the crossing to road traffic may be initiated:

- (a) automatically by an approaching train where a Stop signal is provided between the strike-in point and the crossing, and is interlocked with the signalling system using a 'stopping/non-stopping' control; or

- (b) automatically by an approaching train where stopping times of trains at a station can be predicted reasonably accurately and the times taken for trains to arrive at the crossing are within those specified in paragraph 81.

97 Facilities should be provided for the local initiation of the crossing equipment and effective means are required to prevent its unauthorised operation.

8 AUTOMATIC OPEN CROSSINGS LOCALLY MONITORED (AOCL)

General description

98 This type of crossing has no barriers but is protected by road traffic light signals and an audible warning is provided for pedestrians. The period between the initial display of the road traffic light signals and the arrival of the fastest train should be sufficiently long to enable road vehicles and pedestrians to clear the crossing.

99 The crossing equipment is normally initiated automatically by an approaching train. The operation of the crossing equipment and the absence of obstruction on the crossing is monitored by the driver of an approaching train.

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

101 The road traffic light signals cease to show and the audible warning stops immediately the train has passed unless another approaching train is so close that the minimum road open time cannot be achieved. In this situation the road traffic light signals continue to show, flashing signs indicating the words 'Another train coming' are displayed, and the sound emitted by the audible warning device changes in character as soon as the first of the trains arrives at the crossing.

102 Telephones for the use of the public are not normally provided. Signs giving the public number of a supervising point, which is always open when the railway line is open, and signs giving the name of the crossing should be provided on each side of the crossing.

103 A supervising point should have direct control of all train movements over the crossing and a means of communicating with any assigned railway staff operating the crossing equipment locally at the crossing in an emergency or abnormal situation as well as with the train driver approaching the crossing.

Method of operation

104 Trains normally approach the crossing at a steady speed, known as the crossing speed, so that they can be halted short of the crossing from the point at which it clearly comes into the train driver's view.

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

105 The time elapsed between the amber lights of the road traffic light signals starting to show and the train arriving at the crossing should not be less than 27 seconds. The train should pass as soon after 27 seconds as possible. At least 95% of trains should arrive within 75 seconds and 50% within 50 seconds, once the sequence of events to close the crossing to road traffic has begun. Where the crossing length is longer than 15 m, the 27 seconds should be increased by 1 second for every additional 3 m of crossing length.

106 The sequence of events to close the 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 3 seconds; and
- (b) immediately the amber lights are extinguished the intermittent red lights should show.

107 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, but if another train is approaching the crossing, the lights should continue to show unless a minimum of 10 seconds road open time can be achieved.

108 If the intermittent red lights continue to show for another train, as soon as the first of the trains arrives at the crossing, the illuminated 'Another train coming' signs (see Chapter 18) begin to flash and the warbling rate of the audible warning for pedestrians should be increased.

109 If the intermittent red lights of the road traffic light signals continue to show longer than could be caused by passing trains, they should be automatically extinguished. The equipment should then automatically reset for another train.

110 The road traffic light signals should continue to operate following a failure of the main power supply but the indication to the train driver that all the crossing equipment is functioning correctly should not be displayed.

Railway signalling and control

111 The indication to the train driver should only be displayed if at least one of the intermittent red lights of each road traffic light signal is lit and the main power supply has not failed.

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

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

114 Where trains are not required to stop before passing over the crossing, the sequence of events to close the crossing to road traffic should be initiated automatically by approaching trains.

115 A special speed restriction board is required at the point from which the crossing speed begins.

116 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 100 m on the approach to the special speed restriction board.

117 Where all trains are required to stop at a station between the strike-in point and the crossing, a stop board should be located at least 50 m from the crossing and an advance warning board erected at service braking distance from the stop board. The sequence of events to close the crossing to road traffic may be initiated:

- (a) automatically by an approaching train where stopping times of trains at a station can be predicted reasonably accurately and the time taken for trains to arrive at the crossing are within those specified in paragraph 105; or
- (b) by a means that is only effective when the presence of a train is detected, eg a train crew-operated plunger linked with the train detection system.

118 Where *not* all trains are required to stop at a station between the strike-in point and the crossing, the sequence of events to close the crossing to road traffic may be initiated:

- (a) automatically by an approaching train where a Stop signal is provided between the strike-in point and the crossing, and is interlocked with the signalling system using a 'stopping/non-stopping' control; or
- (b) automatically by an approaching train where stopping times of trains at a station can be predicted reasonably accurately and the time taken for trains to arrive at the crossing are within those specified in paragraph 105.

119 Additionally, where the station is between the strike-in point and the crossing, and a Stop signal is not provided between the station and the crossing, the sequence of events to close the crossing to road traffic may be initiated automatically by an approaching train if the following conditions are met:

- (a) the railway is a single line;
- (b) the actual daily road vehicle user is less than about 2000;
- (c) not more than 10% of trains stop at the station; and
- (d) station stops are of short duration.

120 Facilities should be provided for local initiation of the crossing equipment and effective means are required to prevent its unauthorised operation.

9 OPEN CROSSINGS

General description

121 This type of crossing does not have barriers or road traffic light signals, and only road traffic signs are provided. Road users are required to give way to trains at the crossing. Road users can see approaching trains in sufficient time for them to be able to cross the railway or stop safely. Train drivers are required to stop the trains short of the crossing unless they have observed that the crossing is clear. Train drivers are also required to sound the horn of the trains between 07.00 and 23.30.

122 Telephones for the use of the public are not required. Signs giving the public the telephone number of a supervising point, which is always open when the railway line is open, and signs giving the name of the crossing are required on each side of the crossing.

Method of operation

123 Trains normally approach the crossing at a steady speed, known as the crossing speed, so that trains can be halted short of the crossing from the point at which it clearly comes into the train driver's view.

Note: The preferred arrangement is for trains not to stop before passing over a crossing unless it is not practicable to arrange otherwise.

124 Trains are required to stop before proceeding over the crossing where:

- (a) road users cannot see approaching trains across the viewing zones (defined in Appendix B); or
- (b) the train driver cannot see the crossing from the point at which the brake should be applied to stop short of the crossing.

125 Trains are not required to stop *again* before proceeding over the crossing where:

- (a) the train has stopped at a station platform on the approach to the crossing; or
- (b) the train has already stopped for other reasons at a point from which the train driver can see the crossing.

Railway signalling and control

126 Where trains are not required to stop before passing over the crossing, a combined speed restriction and whistle board should be provided at a point from which the crossing speed begins. This board displays the crossing speed of 15 km/h for all types of trains.

127 An advance warning board should be provided at the service braking distance from the combined speed restriction and whistle 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 placed 100 m before the combined speed restriction and whistle board on the approach side.

128 Where all trains are required to stop before passing over the crossing, a stop board should be located at least 25 m from the crossing and an advance warning board erected at the service braking distance from the stop board.

10 USER-WORKED CROSSINGS (UWC) WITH GATES OR LIFTING BARRIERS ON PRIVATE ROADS

General description

129 This type of crossing is only applicable where the railway crosses a private road. It is normally protected by gates, or lifting barriers (only when authorised by the Inspectorate), 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. A sign is displayed on each side of the crossing describing the correct method of operating the gates, including the use of any telephones, if provided, to the road users.

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

Method of operation

131 No additional protective equipment is required if the warning time, a minimum of 20 seconds, is at least 5 seconds greater than the time required by the likely users to traverse the crossing.

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

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

133 Additional protective equipment that may be provided is as follows:

- (a) audible warnings from the trains - where train speeds are low and the service infrequent, whistle boards positioned not more than 400 m from the crossing may be acceptable;
- (b) telephones - telephones connected to a supervising point, which is always open when the railway line is open, should be provided on both sides of the 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 160 km/h.
- (c) miniature stop lights - miniature stop lights, as described in Chapter 17 should be provided on both sides of the 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.

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

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

136 Where miniature stop lights are provided, users should only cross when the green light shows.

11 FOOTPATH CROSSINGS AND BRIDLEWAY CROSSINGS

General description

137 This type of crossing is applicable where the railway crosses a footpath or bridleway.

Footpaths and bridleways are those which:

- (a) are shown on definitive maps and statements maintained under Part III of the Wildlife and Countryside Act 1981; or
- (b) have come into being following public path creation agreements or public path creation orders under Part III of the Highways Act 1980; or
- (c) otherwise exist as either public or private rights of way.

138 Users are expected to use reasonable vigilance to satisfy themselves that no trains are approaching the 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.

139 Footpath crossings should be protected by a stile or self-closing wicket gate on both sides of the railway. They should not have a gate on one side and a stile on the other, nor different widths or types of gates.

140 Bridleway crossings should be protected by a self-closing wicket gate on both sides of the railway. It should be possible for a mounted horse rider to open the gates without dismounting.

Note: Unless required to dismount, because of the presence of overhead live conductors, it should be assumed that horse riders will remain mounted while traversing the crossing. Allowance may have to be made for young or inexperienced riders to lead their mounts. It should be assumed that cyclists using bridleway crossings will cross dismounted.

141 At bridleway crossings any space between a gate and the decision point should be sufficient to allow a person on horse-back to make a decision from a place of safety.

142 A sign should be displayed at the decision point facing the user on either side of each type of crossing explaining the way to proceed safely over the crossing.

143 Where the type of 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 crossing on each side of the interval should be treated as a separate crossing. A chicane may be provided on the crossing to make the position of the safe waiting place clear.

144 The minimum width between fences at the decision point or safe waiting area should be 1 m for footpath crossings and 3 m for bridleway crossings. This should be increased or a larger waiting area provided if there is foreseeable use by those with prams or in wheelchairs etc.

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

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

Method of operation

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

148 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 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.

149 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 400 m from the crossing;
- (b) telephones (only applicable at bridleway crossings); or
- (c) miniature stop lights as described in Chapter 17.

150 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 crossing because of ambient noise; and
- (c) there may be objections to the noise of train horns in residential or built-up areas.

151 Where whistle boards are provided, they are required on all railway approaches. The difference in warning times should be 3 seconds or less.

152 At bridleway crossings, telephones and their associated signs may be provided where:

- (a) the warning time exceeds the time required to traverse the crossing by less than 5 seconds; or
- (b) the speed of trains over the crossing exceeds 160 km/h.

153 At footpath crossings and bridleway crossings, miniature stop lights may be provided where:

- (a) the crossing is the only access to houses;
- (b) the highest attainable train speed exceeds 140 km/h; or
- (c) the provision of whistle boards is considered inappropriate.

154 An audible warning device may be provided at the crossing if it is regularly used by unaccompanied partially-sighted or blind people.

12 PROVISIONS FOR PEDESTRIANS AT PUBLIC VEHICULAR CROSSINGS

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

156 A footway of adequate width should be provided on both sides of the carriageway.

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 footways on the approaches to a crossing, the width of the footway should gradually increase to the width of the footway on the crossing.

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

157 The footway should be made up to the level of the carriageway and maintained in a good and even condition.

Road markings

158 Longitudinal road markings should be provided along each edge of each footway, to delineate the required width of the footway and define the safe route for pedestrians to walk over the crossing.

159 Transverse road markings for pedestrians to stand behind in a safe place while the crossings are closed to road traffic should be provided over the footways at all automatic and open crossings.

Audible warnings

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

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

162 At automatic crossings where two trains can arrive at the 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 crossing.

163 At open crossings, the audible warning may be provided by horns from approaching trains.

Pedestrian signals

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

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

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

Tactile thresholds

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

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

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

Means to control the flow of pedestrians

168 Where the number of pedestrians using a crossing is high, or vulnerable groups of pedestrians use the 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, eg guard rails and road studs. Guard rails should be provided only where the footway and its approach is wide enough to prevent any bottleneck to pedestrians or encouragement to walk on the carriageway.

169 Where pedestrians in significantly large numbers cross from one side of the road to the other while the road is closed to allow a train to pass over the crossing, a double row of non-reflecting road studs to indicate the safe place to cross may be provided.

170 Where a crossing lies adjacent to a railway station and the entrance or exit to the station is via the platform ramp, pedestrians should be directed from the platform to the road and vice versa so that they are protected by the crossing after leaving or before joining the train.

Pedestrian categories

171 The volume of pedestrian and train flow may be determined by the *train pedestrian value (TPV)* which in turn defines the pedestrian categories. The TPV is the product of the maximum number of pedestrians and the number of trains passing over the crossing within a period of 15 minutes. A detailed method of calculation can be found in Appendix C.

172 Pedestrian categories are given in Table 2.

TABLE 2 PEDESTRIAN CATEGORIES	
PEDESTRIAN CATEGORY	TRAIN PEDESTRIAN VALUE (TPV)
A	more than 450
B	151 - 450
C	150 or less

Pedestrian provisions

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

TABLE 3 PEDESTRIAN PROVISIONS						
PEDESTRIAN CATEGORY	WIDTH OF FOOTWAY (metres)	ROAD MARKINGS	AUDIBLE WARNINGS *	PEDESTRIAN SIGNALS **	TACTILE THRESHOLD*	GUARD RAILS
A	2 or more	YES	YES	YES	YES	††
B	1.8 or more	YES	YES	††	YES	††
C	1.5 or more †	YES	YES	††	††	††

* Not required at gated crossings operated by railway staff

** Only at automatic crossings

† A reduced width of 1 m or lack of approach funnel is normally restricted to those crossings with a daily pedestrian user of less than about 25

†† YES if necessary

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

13 ADDITIONAL MEASURES TO PROTECT AGAINST TRESPASS

174 Cattle-cum-trespass guards and fencing protection may be required to discourage trespass by pedestrians and animals straying onto the railway.

Cattle-cum-trespass guards

175 Guards should be provided where there is regular and frequent movement of cattle on the hoof over the crossing, or where there is a significant risk of trespass by pedestrians.

176 Guards should be provided at all types of crossings on railways electrified on the conductor rail system, except at a gated crossing operated by railway staff, where the gates when across the railway completely fence off the road and any footway from the railway.

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

178 The guards should consist of arris rails running parallel with the running rails.

Note: Arris rails which are triangular in section with the vertical sides approximately 115 mm high, at approximately 150 mm pitch, and with a clear space between them not exceeding 35 mm are considered to be effective.

179 The guards should be at least 2.6 m wide measured at right angles to the edge of the carriageway. Where there is insufficient room for a cattle-cum-trespass guard of standard width to be provided immediately adjacent to an existing platform ramp, the toe of the ramp may be cut back, leaving a step not exceeding 300 mm high, to accommodate the guard. The guards may have to be extended between the platform ramps. Additional fencing at right angles to the edge of the platform and extending from the back edge to within 750 mm of the front edge, may be required.

Fencing

180 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.

181 At footpath crossings and bridleway 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.

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

183 Details of fencing can be found in Part 2, Section A *The infrastructure*.

14 THE CROSSING

Vertical profile

184 The vertical profile over any vehicular crossing should have no sudden changes of vertical curvature. The profile over an automatic half barrier crossing or user-worked crossing is critical to safety. At other types of crossings it is less critical because either the crossings are manually operated by railway staff, or locally monitored by the train driver and the speed of trains over the crossings is restricted so that drivers can stop their trains short of the crossing if the crossing is obstructed.

Note: When existing gated crossings operated by railway staff are being modernised with barriers or are to be converted to open crossings, or locally-monitored automatic crossings, no improvement to the road profile is necessary unless it is known that heavy vehicles have grounded at the crossing.

185 The profile over automatic half barrier crossings should not cause a long, low vehicle, eg a low-loader, to become grounded and obstruct the railway.

Measurement of safe profiles

186 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 75 mm anywhere on the road surface over a length equal to the wheelbase of a specified nominal road vehicle.

187 At any automatic half barrier 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.

TABLE 4 MEASUREMENT OF SAFE PROFILES					
ACTUAL DAILY ROAD VEHICLE USER	OR	DAILY TRAFFIC MOMENT	VEHICLE CATEGORY	THEORETICAL WHEELBASE LENGTH	
				(metres)	(feet)
more than 2000		more than 80 000	1	15.3	50
2000 or less		80 000 or less	2	9.75	32
600 or less		25 000 or less	3	8.5	28

Note: The traffic data in Table 4 should be established by census. Any likely increase in road usage following automation of the 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. Road weight or width limitations may permit a more curved profile than the figures in Table 4 indicate.

188 Risk of grounding signs as described in Chapter 18 should be provided for crossings with vehicle categories 2 and 3.

189 Where a crossing is to be converted to an automatic half barrier 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 20 m from the nearest rail for category 2 and 3 crossings, and up to 30 m for category 1 crossings.

190 At user-worked crossings, the type of vehicles or equipment likely to go over the crossing should be determined before the design of the vertical profile of the 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 75 mm. The gradient of the approaches to the 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 crossing does not preclude the need to adhere to the above profile conditions.

Crossing surface

191 The surface of the carriageway over a 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 crossing is limited or the road slopes downhill towards the crossing. The surface should be free from pot-holes, upstanding rails, depressed areas or major undulations. Any timbers or panels used in the surface should be firmly fixed.

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

193 At user-worked 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 crossing surface, they should be securely fixed in position and provide a clear flangeway. Where the surface is predominately 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.

194 At footpath crossings and bridleway 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.

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

196 Where the track ballast shoulder is high, steps or ramps for footpath crossings and ramps for bridleway crossings should be maintained to give access to the surface. On steep slopes, hand-rails may be needed in addition to steps or ramps.

197 Where the surface is other than ballast or stone chippings, 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.

198 At bridleway crossings, the surface should be made up to rail level.

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

- (a) the crossing is in a location where housing, factories, shops etc adjoin or are close to the railway, and the crossing provides an attractive or convenient link between them;
- (b) any of the approaches on the right of way are metalled; or
- (c) there is heavy regular use.

Crossing width

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

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

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

TABLE 5 CROSSING WIDTH				
ACTUAL DAILY ROAD VEHICLE USER	OR	DAILY TRAFFIC MOMENT	DISTANCES MEASURED FROM THE STOP LINE (metres)	
			AHBC & ABCL	AOCL
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: However, it may be necessary to increase these distances commensurate with the type of vehicles which use the crossing.

203 The carriageway width over an automatic half barrier crossing should not be less than 6.1 m, but where the actual daily road vehicle user is less than 4000, the width may be reduced to not less than 5 m.

204 The carriageway width over a locally-monitored automatic barrier crossing should not be less than 5 m.

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

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

207 At footpath crossings, the width of the surface should not be less than 1 m. At bridleway crossings, the width of the surface should not be less than 3 m.

Provision of lay-bys

208 Lay-bys may be required at automatic crossings equipped with half barriers so that vehicles, whose drivers are required by regulation 16 of the 1994 Regulations to telephone before using the crossing, can be parked clear of the carriageway.

Crossing alignment

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

210 Footpath crossings and bridleway crossings should be at right angles to the railway line.

Crossing approaches

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

15 GATES, WICKET GATES AND BARRIER EQUIPMENT

Gates

212 The gateway should be the full width of the carriageway plus at least 450 mm clearance on each side. The clearance between gate posts should be of equal width at both sides of the railway. Means should be provided to retain the gates in both open and closed positions.

213 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 crossing, they should not be closer to the track than the decision point.

214 At 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.

215 At gated 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.

Wicket gates

216 Where wicket gates for pedestrians are provided, they should be on the same side of the carriageway and open away from the railway. Wicket gates for footpath crossings and gated crossings operated by railway staff should not be less than 1 m wide. Wicket gates for bridleway crossings should not be less than 1.5 m wide.

217 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 footway at gated crossings operated by railway staff, they should be lockable.

Barriers

218 The tops of the barriers when lowered should not be less than 900 mm above the road surface at the centre of the carriageway. The clearance between the bottom edge of the lowered barrier and the road surface should not exceed 1000 mm. When raised, the barriers should be inclined towards the carriageway at an angle of between 5° and 10° from the vertical.

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

220 The barriers should be as close as convenient to the railway, but no part of the equipment should be within the standard structure gauge (see Part 2, Section A *The infrastructure*).

221 Barriers should be at least 125 mm deep at their mid-points and at least 75 mm deep at their tips. Each barrier should display on both its sides red and white bands about 600 mm long to the full depth of the barrier. A strip of *retroreflecting material* not less than 50 mm deep should be provided along the full length of each band.

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

223 Two electric lamps (three on barriers longer than 6 m) 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 150 mm from the barrier tip. The lamps should show except when the barriers are fully raised. At user-worked crossings, these lamps may be omitted by agreement with the Inspectorate.

Skew crossings

224 On skew 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 footway, should not be within 1000 mm of the nearest rail.

Barrier crossings operated by railway staff

225 At barrier crossings operated by railway staff, each road approach should be protected by barriers which, when lowered, extend across the full width of the carriageway and footways.

226 At barrier crossings operated by railway staff and user-worked crossings, skirts should be fitted to the barriers where there is a significant risk of pedestrians deliberately passing under the lowered barriers. Where cattle or sheep are regularly taken over the crossing on the hoof, skirts should be fitted. The skirts should be of a light colour, light construction and fence in the space between the lowered barriers and the road surface.

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

User-worked crossings

227 At user-worked 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 crossing.

Single barriers

228 Where single barriers are provided they should preferably be pivoted on the left-hand side of the road. On one-way roads or on two-way roads with central reservations where special provision can be made for pedestrians, barriers may be provided on the approach to the crossing only.

Half barriers

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

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

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

16 TELEPHONES AND TELEPHONE SIGNS

At automatic crossings with half barriers

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

233 The power supply to the telephones should be independent of that for the crossing equipment. Faults on individual telephones or the failure of a user to replace the handset on any telephone should not prevent the correct operation of the remaining telephones.

234 The telephone symbol to Diagram 787 should be displayed on or adjacent to the cabinet. The telephones should be clearly visible from the crossing. If the telephones are not clearly visible to a person at the locations of the sign to Diagram 784, signs to Diagram 788 are required directing potential users to the telephones.

235 Inside 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.

236 In case the telephone at the crossing is out of order, the name of the crossing and its grid reference should also be displayed within the door of each telephone cabinet followed by a public telephone number of a continuously staffed railway location to be used when the line is open.

237 When calls are received in the supervising point, a distinctive warning should be sounded, accompanied by a visual indication. These calls should take precedence over any other calls on the telephone system and the warning should sound even if the system is currently in use.

238 If the railway is not open for 24 hours a day, a means to notify users of the times between which trains do not travel over the crossing should be provided inside the telephone cabinet.

Note: This may be in the form of a recorded announcement or a notice which is legible at night and should read:

**'RAILWAY NORMALLY CLOSED (followed by appropriate times).
AT SUCH TIMES ONLY, YOU MAY CROSS IF
THERE IS A RINGING TONE AND
THERE IS NO REPLY AFTER TWO MINUTES'.**

239 The telephone system should have a facility which records that calls have been made from the crossing during periods when the supervising point is closed. When the supervising point reopens, a visual and audible indication should be given that calls from the crossing have been made during the period of closure.

At barrier crossings operated by railway staff, locally-monitored automatic open crossings and open crossings

240 Telephones are not normally provided at barrier crossings operated by railway staff, locally-monitored automatic open crossings and open crossings.

241 At barrier crossings operated by a member of the train crew, signs to Diagram 785 giving the telephone number of a supervising railway office should be displayed at each side of the crossing. The name of the crossing should also be shown immediately below each sign.

At user-worked crossings and bridleway crossings

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

243 The telephone symbol to Diagram 787 is to be displayed on or adjacent to the cabinet. The telephones should be in good view from the crossing and if not, signs to Diagram 788 are required.

244 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.

245 The name of the crossing and its grid reference should be displayed within 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 crossing is out of order.

17 MINIATURE STOP LIGHTS (MSL)

General description

246 Miniature stop lights consist of red and green lights. They can be used at user-worked crossings, footpath crossings and bridleway 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: MSL may not be suitable at crossings where movement of cattle or heavy farm equipment is involved. Alternative arrangements may need to be made.

Positioning of MSL

247 The MSL should be located so that they face towards an approaching user. They should be clearly visible to the crossing users when operating the gates or barriers. MSL are mounted in the sign to Diagram 107 at a crossing with a telephone or in the sign to Diagram 108 at a crossing without a telephone.

248 At footpath crossings and bridleway crossings, the MSL should be placed on the far side of the crossing from an approaching user and face inwards towards the railway.

249 At user-worked crossings, the MSL should be placed on the approach side of the crossing facing towards approaching road users. This should still apply where there is an adjacent footpath crossing or bridleway crossing.

Equipment of MSL

250 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 40 mm. Each lamp should be fitted with a hood against sunlight.

Associated signs

251 Traffic signs associated with the use of MSL are shown in Figure 8 of Chapter 18. These signs are in addition to those required at user-worked crossings, footpath crossings and bridleway crossings.

252 At user-worked crossings the signs to Diagrams 109 and 110 should be mounted with the MSL on the approach side of the crossing facing towards approaching users.

253 At footpath or bridleway crossings the signs to Diagram 114 should be mounted with the MSL on the far side of the crossing from an approaching user and facing inwards. Duplicate signs without the red/green lamps should be mounted on the approach side of the crossing facing towards approaching users.

Railway signalling and control equipment

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

TABLE 6 MINIMUM WARNING PERIODS	
TYPE OF CROSSING	MINIMUM WARNING PERIOD (seconds)
User-worked crossings	40
Footpath crossings	20
Bridleway crossings	40

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

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

257 Bi-directional controls should be provided.

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

Note: A standby power supply is not considered necessary.

18 TRAFFIC SIGNALS, TRAFFIC SIGNS AND ROAD MARKINGS

259 References to regulations or directions in this chapter are to the Traffic Signs Regulations and General Directions 1994 or to the Private Crossings (Signs and Barriers) Regulations 1996, and references to sign diagram numbers are to diagrams in those Regulations.

Road traffic light signals

260 The construction and specification of road traffic light signals used at level crossings are required to comply with Diagram 3014. The reverse of the backing board should be coloured grey.

261 A primary road traffic light signal should be located on the left-hand side of the carriageway, on each road approach, as close as possible to the crossing. At crossings where there are barriers, it should be located not more than 1 m before the barrier and adjacent to the barrier machine where this is on the left-hand side.

262 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, should not be used at crossings.

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

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

265 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 (see Chapter 12 and Figure 9 at the end of this chapter).

266 Where the normal post mounting of a road traffic light signal is impracticable, it may be mounted over the carriageway provided that no part of the horizontal structure or the signal is less than 5.5 m above the road surface.

267 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 150 mm to the overhead conductors, the structure and the signal should either be made of metal or be provided with a continuous conducting strip. The metal structure and signal or the conducting strip should be connected to earth in such a manner as to ensure that inadvertent contact with the overhead conductors causes controlling circuit-breaker(s) to interrupt the electric traction supply.

268 In exceptional cases, eg where the central reservation is narrow or where, at very acute skew crossings, the duplicate primary road traffic light signal would encroach on the overhang clearance

above the carriageway, a special design of the restricted width signal in accordance with the relevant Department of Transport's drawing may be used. The use of this restricted width signal requires special authorisation.

269 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 810 mm and not more than 1500 mm from the carriageway edge.

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

271 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, eg the provision of additional advance warning signs, countdown markers etc.

TABLE 7 RECOMMENDED MINIMUM VISIBILITY DISTANCES		
85%ILE SPEED OF ROAD VEHICLES		MINIMUM VISIBILITY DISTANCE (metres)
km/h	mile/h	
50	30	70
65	40	90
80	50	150
95	60	220
115	70	300

272 Where a 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.

Pedestrian signals

273 The construction and specification of pedestrian signals used at level crossings are required to comply with Diagram 4006.

274 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.

Traffic signs

General provision

275 Appropriate traffic signs should be provided on each road approach. Examples of the layouts are given in Figures 2 to 7.

276 Details of the signs for use with MSL are shown in Figure 8.

277 At automatic crossings with half barriers, signs to Diagram 784 should be as close as possible to the crossing, commensurate with the likely approach speed of the vehicles to which they refer. Signs to Diagram 783 may be required where the approach view and visibility of the sign to Diagram 784 is limited.

278 Where lay-bys are provided and a Traffic Regulation Order is in force limiting the parking at lay-bys to 'Large or slow vehicles only', the permitted variant to the sign to Diagram 660 should be provided.

279 At automatic crossings and open crossings, signs to Diagram 775 reading 'Keep crossing clear' should be provided on each primary and duplicate primary road traffic light signal post and face traffic approaching the crossing. At open crossings they should be mounted on both sides of the road on or near the posts carrying the St Andrew's Cross signs.

280 Signs to Diagram 775 may be provided at gated and barrier crossings operated by railway staff where standing traffic is a problem.

281 At automatic crossings on double-track lines, where two trains can arrive at the crossing without providing the minimum road open time, signs to Diagram 777 reading 'Another train coming if lights continue to show' should be provided on or near each duplicate primary road traffic light signal and should face outwards from the crossing.

282 At locally-monitored automatic open crossings on double-track lines, where two trains can arrive at the crossing without providing the minimum road open time, signs to Diagram 776 reading 'Another train coming' should be provided on the left-hand side of the road, normally 2 m on the railway side of each primary road traffic light signal and directed towards drivers of vehicles halted at the stop lines. These signs should flash at the same rate as the road traffic light signals.

283 Where the width of the road is less than 4 m wide and the number of vehicles going over the crossing during the peak hour exceeds 120, a Priority Order should be considered and signs to Diagram 615 and 811 provided accordingly.

284 At automatic crossings and open crossings, where the road crosses the railway at a skew angle or there are bends on one or both approaches, bend and chevron signs and count-down markers may be required. Additional reflecting road studs along the edges of the carriageway to direct drivers along the road may be required.

285 Wherever the form of protection at a crossing has been altered, a new educational sign to Diagram 790 reading 'New level crossing control ahead' is required to be displayed for a period of not more than 3 months (see Direction 32).

286 At user-worked crossings, footpath crossings and bridleway crossings, a sign explaining to the user how to proceed safely over the crossing eg 'Stop, Look, Listen' or 'Cross only if green light shows' or 'Stop, always telephone before crossing' should be provided facing the user at the decision point.

287 A sign indicating the name of the crossing should be provided at user-worked crossings.

288 At bridleway crossings, a sign requiring cyclists to dismount should be provided.

Related to electrified lines

289 Where the line is electrified on the overhead line system, signs to Diagram 779 should be provided with an appropriate plate. At user-worked crossings, suitable signs warning of the danger from bare electrical conductors eg 'Danger, overhead live wires' should be provided and face towards the user approaching the decision point.

290 Where the minimum wire height over a public crossing cannot be achieved, advance warning signs to Diagrams 779 and 780 should be provided at the last available diversion before the crossing (see Part 2, Section C *Electric traction systems*).

291 The signs to Diagram 780 should show a 'safe height' which is at least 600 mm below the height of the overhead conductor for 25 kV systems and 460 mm for systems on lower voltages.

292 At any crossing where the height of the overhead conductor is below that normally required for a public crossing, a height gauge to Diagram 781 should be erected at the 'safe height'. Signs to Diagram 780.2 should show a 'safe height' which is at least 530 mm below the height of the overhead conductor for 25 kV systems and 380 mm for systems on lower voltages.

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.

293 At crossings where the gradient of the approaches is such that vehicles with large overhangs or conveying a large overhanging load could touch or come dangerously close to the overhead line equipment, even though they are lower than the 'safe height' shown on the sign to Diagram 780 or 780.2, an additional sign depicting the hazard, eg 'Danger, overhanging load may foul live wires' should also be provided.

294 At crossings where the railway is electrified on conductor rail system, warning notices depicting the hazard, eg 'Do not touch the live rail' should be provided.

Related to risk of grounding

295 Where there is a risk that vehicles may become grounded on the crossing, signs to Diagram 782 should be erected on the immediate approaches. Advance warning signs to Diagram 782 with distance information to Diagram 573 should be provided at the last available diversion before the crossing. See paragraphs 186 to 192 for the details of which crossings require signing.

296 Where telephones are provided at the crossing, signs to Diagram 783 should be mounted beneath signs to Diagram 782 on the approaches. Where telephones are not provided at the crossing, signs to Diagram 785 (large) should be provided on the approaches and signs to Diagram 785 (small) should be provided on the crossing.

Road markings

297 The following paragraphs describe the use of reflectorised road markings as prescribed in the 1994 Regulations.

298 Road markings are not normally provided at gated crossings operated by railway staff, but where they are, they should conform to guidance in this chapter.

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

Transverse and associated road markings

300 Transverse vehicular road markings are required to extend across the left-hand side of each two-way carriageway, across the whole of a one-way approach carriageway, or across the whole of a carriageway if no centre of carriageway markings are provided.

301 Where road traffic light signals are installed, transverse stop lines to Diagram 1001 should be provided at right angles to the carriageway on each approach approximately 1 m in front of the primary road traffic light signal. At locally-monitored automatic open crossings this should be increased to 2 m.

302 At user-worked crossings, if a stop sign to Diagram 601.1 is provided, then a transverse stop line to Diagram 1002.1 together with a road marking to Diagram 1022 should be provided unless the road surface is unsuitable.

303 At open crossings, 'give way' lines to Diagram 1003 should be provided at right angles to the carriageway on each approach, but not nearer than 2 m from the running edge of the nearest rail. Additionally, a road marking to Diagram 1023 should be provided unless special exemption is given.

304 At automatic crossings and open crossings, a pedestrian stop line to Diagram 1003.2 should be provided across any footway and across the right-hand side of any carriageway whose centre line is marked, but it may be omitted from the right-hand side of any such carriageway where there are guard rails between it and a footway or under other special circumstances.

305 The pedestrian stop line should be at right angles to the carriageway. It should be located approximately 1 m on the approach side of any road traffic light signal, except at open crossings where it should be in line with the 'give way' markings on the left-hand side of the carriageway. No part of the line should be nearer than 2 m from the running edge of the nearest rail.

306 At an obtuse skew crossing, a pedestrian stop line across the footway should be provided in conjunction with a pedestrian signal. The end of this pedestrian stop line at the edge of the carriageway should be located not less than 2 m from the nearest rail. The pedestrian stop line across the footway on the approach side of the road traffic light signal may then be omitted (see Figure 9).

Longitudinal road markings

307 The type of longitudinal road marking generally depends on the width of the carriageway.

308 Where the road passes over the crossing, continuous longitudinal lines to Diagram 1012.1 should be provided along each edge of each footway. The markings should be continued as necessary on the approaches.

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

310 Where the width of the carriageway over the crossing is 5 m or over, but less than 5.5 m, the centre of the carriageway, between the stop lines, should be marked with the appropriate longitudinal lines to Diagram 1004, 1004.1, 1008 or 1008.1. The lines should continue for 15 m beyond the stop line or, alternatively, for at least 6 m if beyond this distance the carriageway is less than 5 m in width.

311 Where the width of the carriageway over the crossing and on the immediate approaches is 5.5 m or over, the centre of the carriageway over the crossing should be marked with a double continuous line to Diagram 1013.1A. The lines should continue along the approaches to the crossing where justified by the visibility for oncoming traffic.

312 At automatic half barrier crossings, the double continuous lines should be extended at least 12 m beyond each stop line.

313 On the approaches, the centre of the carriageway should have a continuous line with a broken line on its right-hand side to Diagram 1013.1D. The length of lines required on the approaches depends on the speed value of the road and the general width of the carriageway (ie excluding any part of the crossing or approaches which may have been specially widened).

314 Recommended lengths of double white lines for carriageways not more than 7.3 m wide are shown in Table 8.

TABLE 8 RECOMMENDED LENGTHS OF DOUBLE WHITE LINES		
85%ILE SPEED OF ROAD VEHICLES		RECOMMENDED LENGTH OF DOUBLE LINES (metres)
km/h	mile/h	
50 or less	30 or less	up to 30
50 - 65	30 - 40	30 - 45
over 65	over 40	45 - 60

315 For roads having carriageways over 7.3 m wide the lengths in Table 8 may be increased by not more than 50%. The double lines should not extend beyond the position of the sign to Diagram 784, unless a lay-by is provided.

316 At least one, but normally two arrows to Diagram 1014 should be provided on each approach to the double lines at all types of crossing as in Table 9.

TABLE 9 POSITION OF ARROWS			
85%ILE SPEED (mile/h)	LENGTH OF ARROW (metres)	DISTANCE FROM THE START OF THE DOUBLE WHITE LINE	
		First arrow	Second arrow
30	4.5	13	40
40	6	18	54
50	6	22	67
60	6	27	81

Yellow box markings

317 Yellow box markings to Diagram 1045 should be provided at automatic half barrier crossings if the road traffic flow in any one direction exceeds the figures given in Table 10.

TABLE 10 YELLOW BOX MARKINGS	
OVERALL WIDTH OF CARRIAGEWAY (metres)	YELLOW BOX TO BE PROVIDED IF THE NUMBER OF ROAD VEHICLES IN ANY HOUR IN EITHER DIRECTION EXCEEDS:
5.0 - 5.9	500
6.0 - 7.4	600
7.5 or over	750

Road studs

318 Reflecting road studs must be laid between double white lines to Diagram 1013.1 as required by regulation 28 of the 1994 Regulations. The studs should be white bi-directional reflecting and laid at 4 m intervals. Any studs laid within 2 m of a running rail should be of plastic construction.

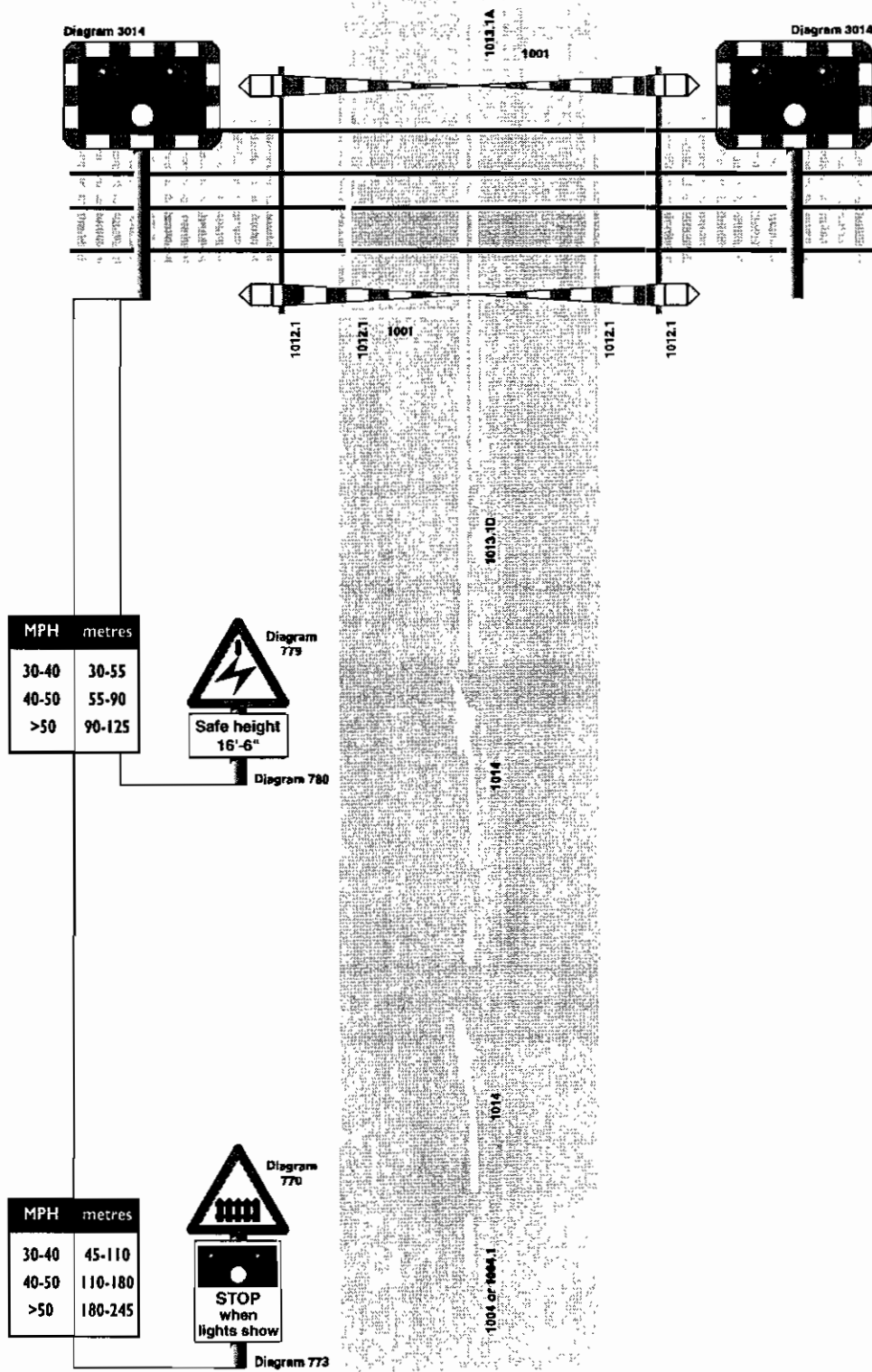


Figure 2: Typical layout of barrier crossing (with additional risks)

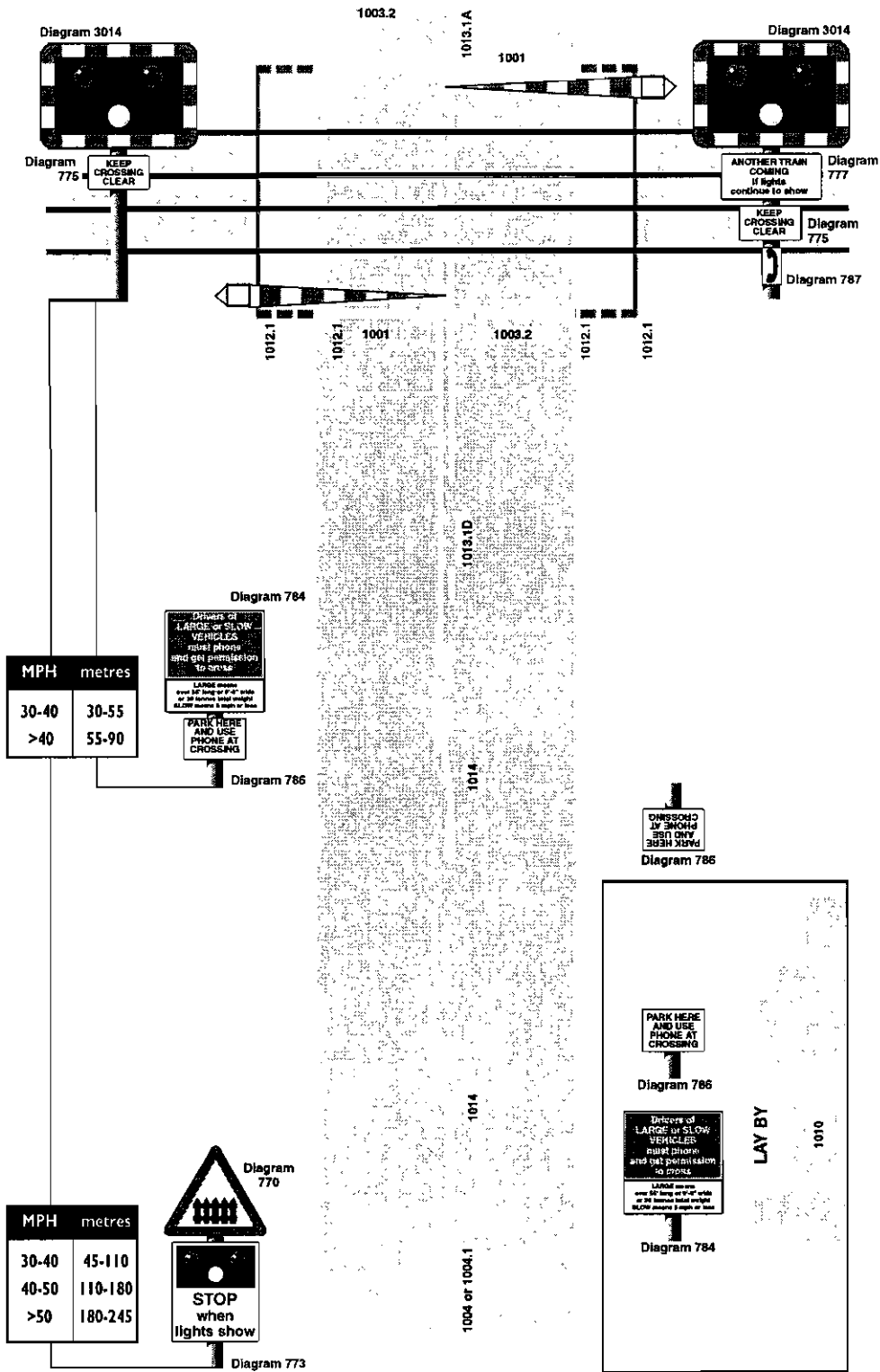


Figure 3: Typical layout of automatic half barrier crossing or automatic barrier crossing (locally monitored)

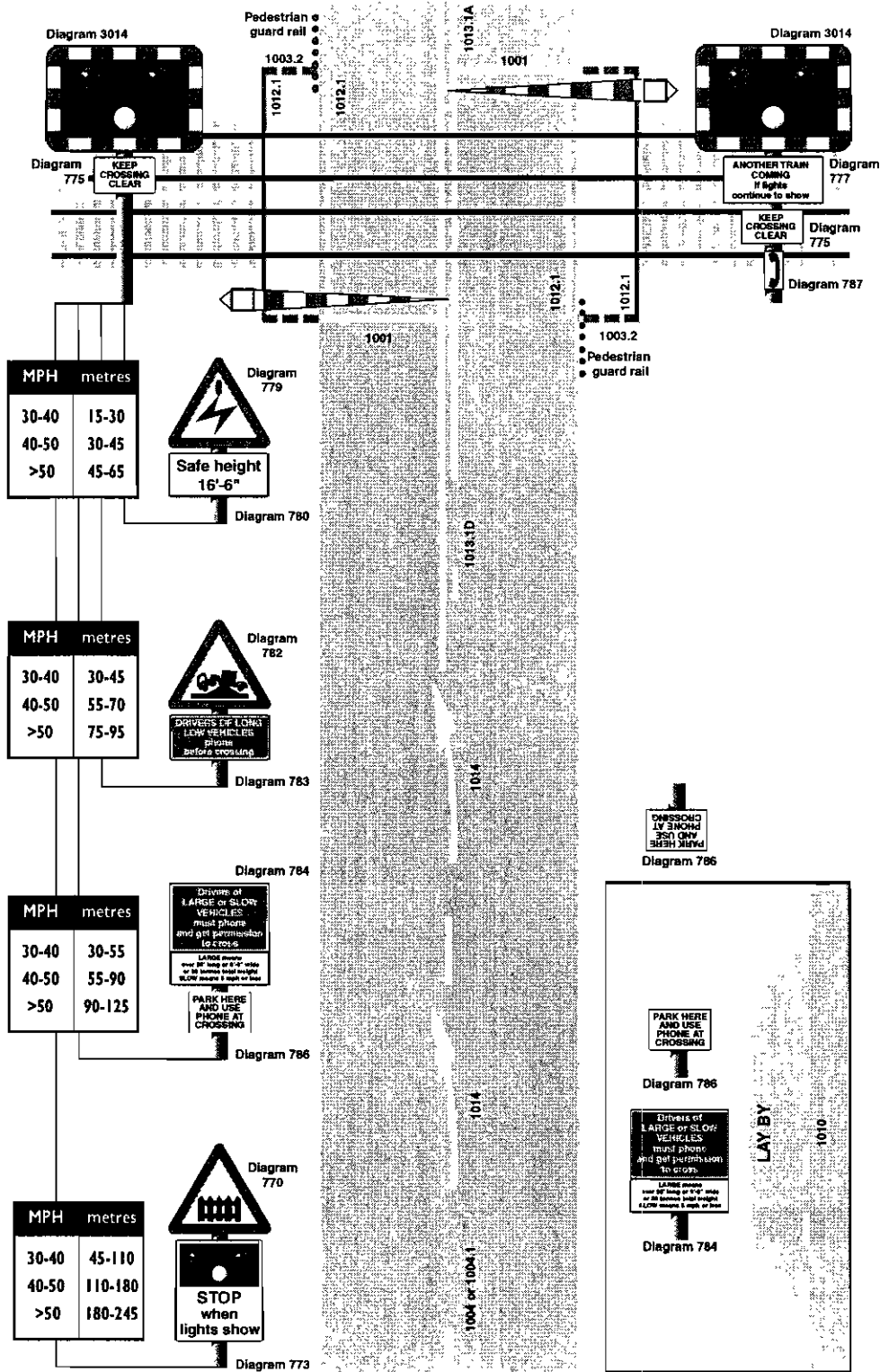


Figure 4: Typical layout of automatic half barrier crossing or automatic barrier crossing (locally monitored) (with additional risks)

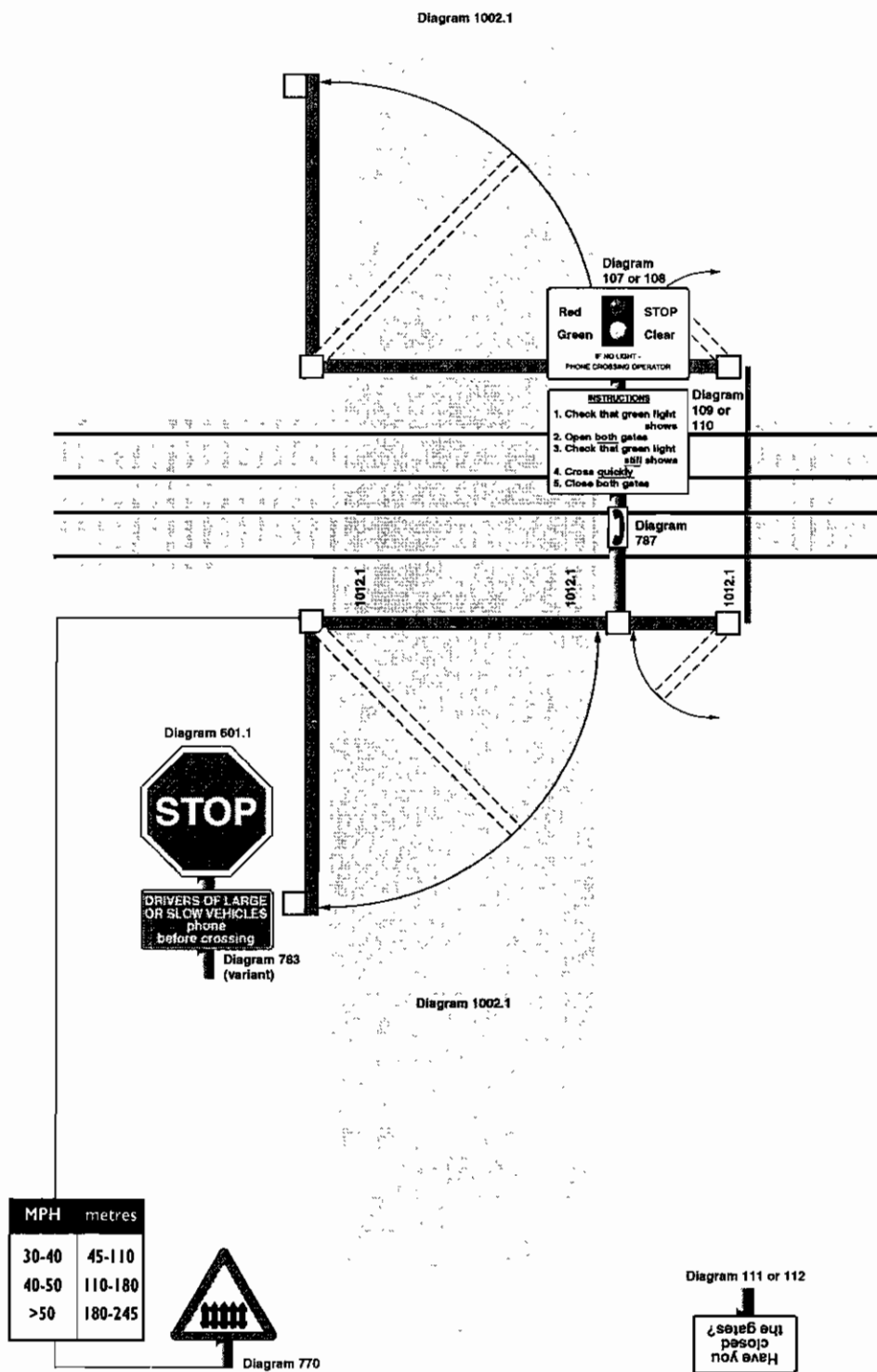


Figure 7: Typical layout of user-worked crossing with adjacent footway or bridleway

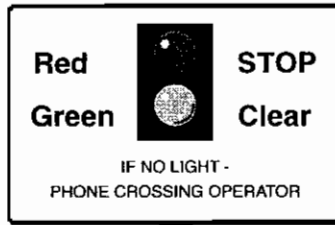


Diagram 107

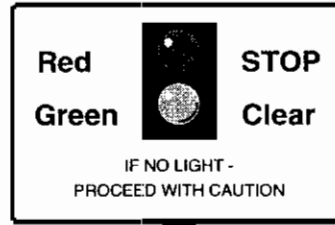


Diagram 108

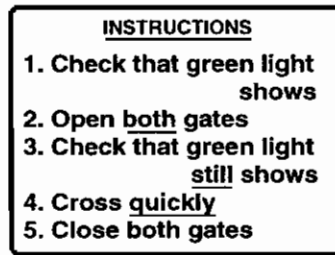


Diagram 109

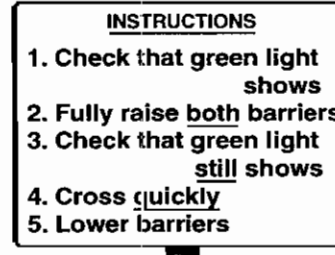


Diagram 110

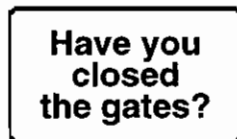


Diagram 111

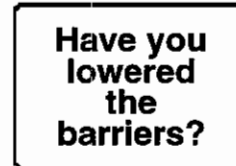


Diagram 112

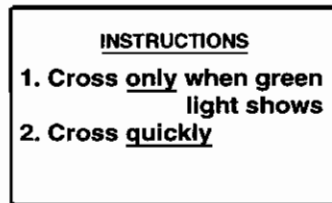


Diagram 114

Figure 8: Special signs for use with MSL

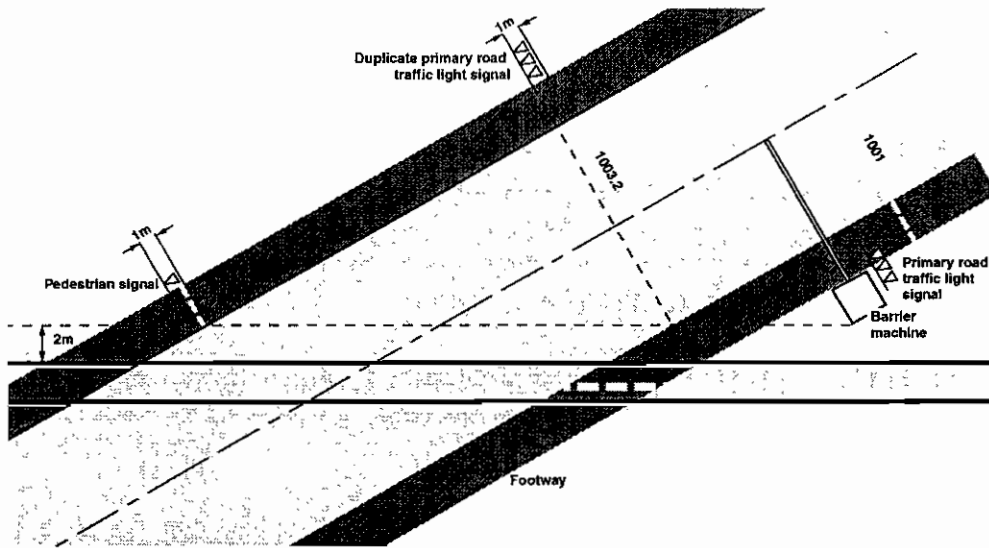


Figure 9: Typical layout of an obtuse skew crossing indicating the arrangement of the transverse road markings and road traffic light signals (not to scale)

Notes to Figure 9

A pedestrian stop line is to be provided across the footway whenever a pedestrian signal is provided. The pedestrian stop line shall be approximately 1 m in advance of the pedestrian signal. This pedestrian stop line shall be positioned in such a manner that the end of the line at the edge of the carriageway is not less than 2 m from the nearest running rail.

The use of a pedestrian signal may depend on the following factors:

- (a) number of lines of track;
- (b) visibility problem;
- (c) level of pedestrian usage;
- (d) economic fact; or
- (e) degree of skew.

In the case of an extremely obtuse skew crossing, like the one in Figure 9, the Inspectorate may consider the following arrangement as an alternative:

- (a) the omission of the pedestrian stop line and the pedestrian signal on the right-hand side footway; and
- (b) the duplicate primary road traffic light signal and the pedestrian stop line across the footway and across the right-hand side of the carriageway may be positioned closer than the minimum 2 m from the nearest running rail.

APPENDIX A - LIMITATION ON ROAD AND RAIL TRAFFIC AT AOCL

1 Actual daily road vehicle user is converted to effective daily road vehicle user using Table 11 because the relationship between the accident probability and the actual road traffic volume is not linear. In converting the actual road traffic volume to the effective figure, this will give the same accident probability if the probability-traffic flow relationship is a straight line. (For a detailed explanation, see the report *Automatic open level crossings - A review of safety* by Professor P F Stott, published in 1987 by HMSO, ISBN 0 11 550831 7.)

2 The effective daily road vehicle user is then multiplied by the number of trains within the period to give the effective traffic moment and hence the maximum permitted crossing speed is derived from Table 12.

TABLE 11	
ACTUAL DAILY ROAD VEHICLE USER	EFFECTIVE DAILY ROAD VEHICLE USER
250	230
500	425
750	580
1000	705
1250	810
1500	890
1750	955
2000	1010
2500	1080
3000	1115
3500	1115
4000	1080
4500	1040
5000	900
6000	885
7000	765
8000	650
9000	540
10 000	475

TABLE 12		
EFFECTIVE TRAFFIC MOMENT	MAXIMUM PERMITTED CROSSING SPEED	
	(mile/h)	(km/h)
4000	55	88
4600	50	80
5400	45	72
6500	40	64
8200	35	56
10 130	30	48
13 100	25	40
15 000	less than 25	less than 40

Note: The metric equivalents shown in Table 12 are not exact.

APPENDIX B - DEFINITION OF VIEWING ZONE AT OPEN CROSSINGS

1 The viewing zone (the shaded region as shown in Figure 10) is defined by lines connecting points 'X' and 'Y' given in Table 13.

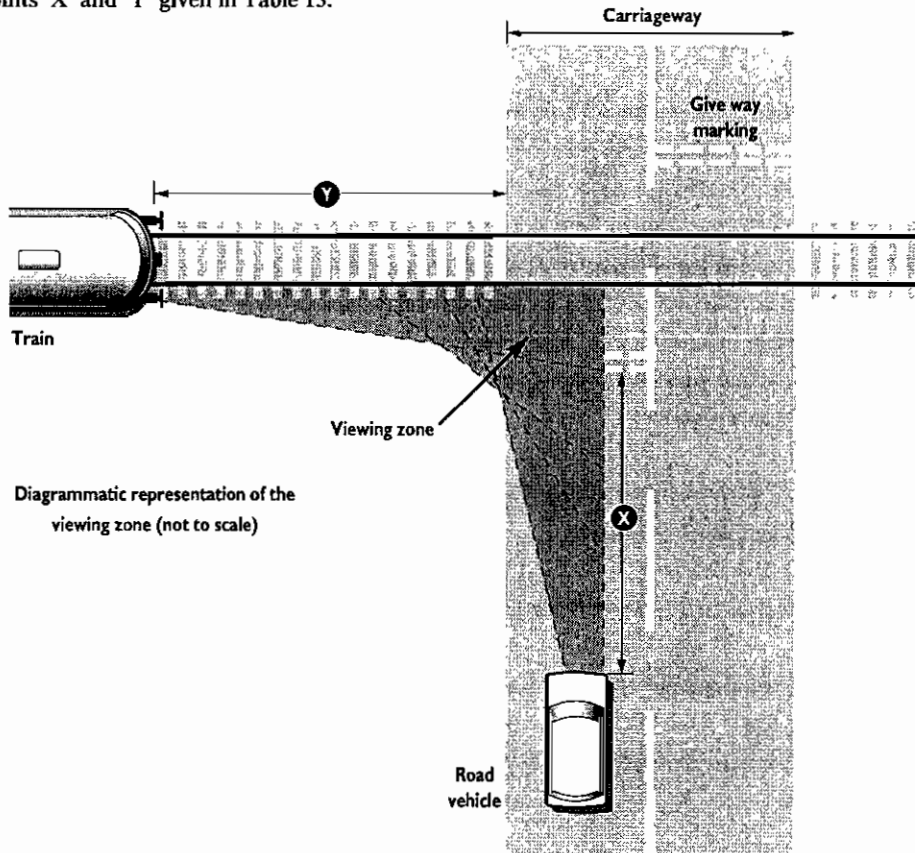


Figure 10: Definition of viewing zone at open crossings

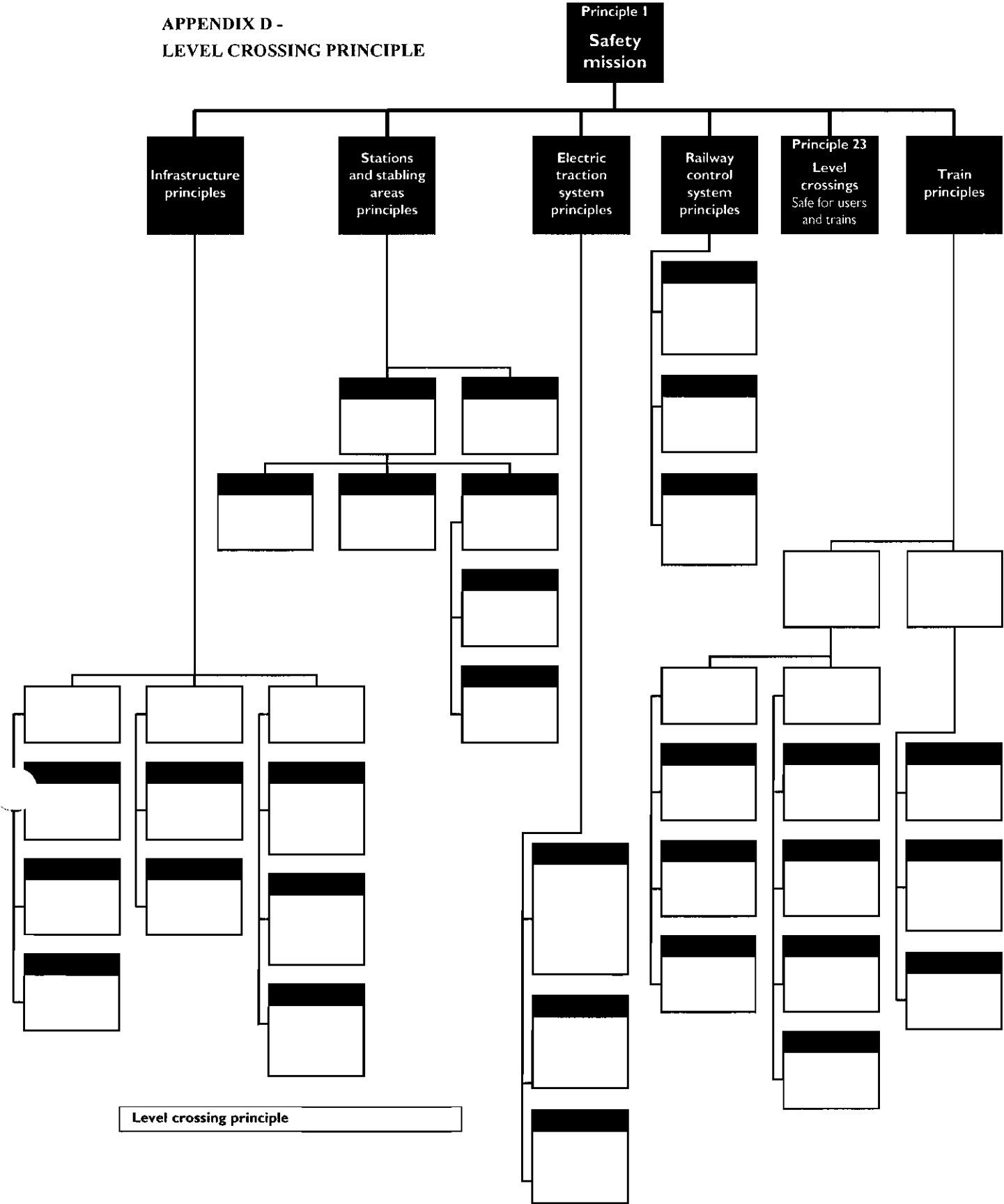
TABLE 13 VIEWING ZONES			
DISTANCES 'X' (metres)	DISTANCES 'Y' (metres) FOR CROSSING LENGTHS OF:		
	7 m	14 m	21 m
2	140	170	200
10	40	45	55
20	25	30	35
40	20	25	30

2 Distance 'X' is the distance of road vehicle users from the 'give way' line on the approach. Distance 'Y' is the distance of an approaching train from the crossing. A crossing which crosses the railway at right angles over a single line is normally considered as 7 m long, but at longer crossings it should be possible to see trains earlier. Where road gradients are steep, distances 'X' should be varied accordingly. Where the 85%ile road speed is less than 25 km/h (15 mile/h), the maximum value of 'X' may be 20 m.

APPENDIX C - TRAIN PEDESTRIAN VALUE (TPV) CALCULATION

- 1 TPVs are calculated by multiplying the number of pedestrians who pass over the railway by any route at the crossing within any period of 15 minutes by the number of trains passing over the crossing in the same period.
- 2 Normally a census, 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.
- 3 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.
- 4 The number of trains should be deemed to be 25% of those passing over the crossing in a period of one hour. This hour should be either:
 - (a) the same hour used to give the estimated hourly value of numbers of pedestrians; or
 - (b) the hour which includes the 15 minutes when the pedestrian number is established by census.
- 5 The number of trains should be rounded up to the next integer and should not normally be less than one.

**APPENDIX D -
LEVEL CROSSING PRINCIPLE**



PRINCIPLE 23

Safe for users and trains

Level crossings

Where a right of way crosses the railway at track level, appropriate arrangements should be provided to warn and protect level crossing users, and safeguard the railway.

Note 1: This principle does not apply to a tramway in the highway.

Note 2: All proposals for level crossings should be examined to determine whether there is such a need.

Note 3: The appropriate local authorities and enforcement agencies should be consulted in the planning of any level crossing.

Factors

The factors for consideration should include:

- (a) the types of level crossing users and the frequency and speed of expected rail, road and pedestrian traffic;
- (b) the uniform visual appearance of each type of level crossing;
- (c) the possibility of slow or abnormal road traffic using the level crossing;
- (d) the type of road or path on either side of the level crossing;
- (e) the need to deter trespass and straying onto the railway;
- (f) the protection of the level crossing by the signalling system;
- (g) the effect of equipment failure on the safety of trains and level crossing users;
- (h) the arrangements to avoid danger if a level crossing user is trapped;
- (i) the need for local operation; and
- (j) the interface with any electric traction system.

APPENDIX E - COMMON TERMS

Where possible the document has been written in plain English and the use of technical expressions or jargon has been avoided. However, to keep the document reasonably concise and to avoid the repetition of phrases which only serve to provide an extended definition, some words or expressions are used in a way which has a slightly wider meaning than their natural meaning, or a meaning that is different to that accepted by disparate parts of the Railway Industry.

The following are terms used within the document:

Railway terms

'Railway' means all guided transport systems to which the Railway and Other Transport Systems (Approval of Works, Plant and Equipment) Regulations 1994 apply. It includes main-line (heavy) railways, mass transit, light rail, tramway and heritage systems.

'Tramway' means a system of transport used wholly or mainly for the carriage of passengers which:

- (a) employs parallel rails which provide support and guidance for vehicles carried on flanged wheels; and
- (b) has been designed to have a significant element which operates on line-of-sight on a highway.

Note: In the context of tramways, 'highway' is used to mean any, or any combination of the following: carriageway, bridleway, cycle track, footpath, land on the verge of the carriageway or between two carriageways and any other place to which the public has access (including access only on making a payment).

'Heritage system' means a railway or tramway which has retained or has assumed the character and appearance and, where appropriate, operating practices of railways or tramways of former times. For example, it may replicate a railway branch line of former times, or may reflect no particular era but demonstrates a wide variety of motive power and rolling stock at work, irrespective of company (or country) of origin.

'Other guided transport system' means a system, other than a railway or tramway, where the vehicles operating on it are guided by means external to the vehicles (whether or not the vehicles are also capable of being operated in some other way). The term therefore includes monorails and airport transit systems.

Note: Trolleybuses are excluded because they are not in any circumstances guided externally, and funiculars are not included because they fall under the definitions of railway or tramway.

People terms

'People' means workers on the railway, passengers, emergency services personnel, people on

business, level crossing users and trespassers (those who are on railway property when they have no right to be there) on the railway.

There are four types of 'people':

- (a) 'Workers' means staff and contractors directly employed on the railway (including the train crew, station staff, signalling staff etc) and contractors employed in the supply industries, maintenance facilities and disposal organisations. The workers may be employed at a fixed location or move about the railway.
- (b) 'Passenger' means any person who is on railway property and is travelling, or intends to travel, or has recently completed travelling on the railway. Consideration should be given to a wide range of passenger characteristics and classifications, for example:
- passengers who are disabled (visually, hearing or mobility impaired);
 - children and unusually short and tall adults;
 - passengers with heavy luggage, pushchairs, young children etc.

Passengers may be on the station premises (waiting to purchase a ticket, waiting on the platform etc) or on a train.

- (c) 'People on business' means people who:
- visit railway premises as non-travelling 'passengers' (people meeting or seeing off passengers, train spotters, customers of station retail units etc);
 - are official visitors to the railway.
- (d) 'Level crossing users' means people crossing the railway on or at a level crossing. This includes pedestrians, horse-riders and occupants of road and agricultural vehicles.

Infrastructure terms

'Infrastructure' means works, plant and equipment used for the operation of a railway including its permanent way, and plant and equipment used for signalling or exclusively for supplying electricity for operational purposes to the railway, but it does not include a station. It refers to track, structures supporting it, signalling, and fixed electrical plant such as feeders, switchgear, sub-stations and the like.

Station terms

'Station' means a railway passenger station or terminal, but does not include any permanent way or plant used for signalling or exclusively for supplying electricity for operational purposes to the

railway. For tramways, 'station' is used to include a tramstop or platform. A station includes a halt, terminal station and a station complex with or without retail units. 'Station' does not include areas associated with station premises, such as car parks, which lie outside those premises.

'Sub-surface station' means a station of which more than half of any one platform is within a tunnel or under a building.

Train terms

'Train' means any vehicle or combination of vehicles which run on the railway. Therefore, a train may consist of a single vehicle or a number of vehicles coupled together including any locomotives or power units. A train may be composed of one or more vehicles and vehicle inter-connections. These can be passenger and freight, also maintenance and construction, vehicles. It also includes on-track machines, engineers' trolleys, cranes and other plant while operating on a railway (commonly referred to as on-track plant or machines). For tramways 'train' means a tramcar or two or more tramcars coupled together and includes non-passenger vehicles.

Electric traction system terms

'Electric traction system' means the electrical equipment and conductors necessary to power trains on the railway. It includes the switchgear and transformers which control the electric current at line voltage, the distribution network and overhead line or conductor rail equipment. It does not include the collection equipment of the train or other on-board equipment.

Safety terms

'Foreseeable' means that which is likely or possible.

'Hazard' means a situation with the potential to cause harm including human injury, damage to property, plant or equipment, damage to the environment, or economic loss.

'Risk' means the chance of something adverse happening and its severity. It is the combination of the probability, or frequency, of the occurrence of a defined hazard and the magnitude of the consequences of the occurrence.

'Safety' means the freedom from unacceptable risks of personal harm, ie the avoidance of accidents and incidents.

Operational conditions or states

'Normal conditions' means the conditions which a part of the railway is designed to accommodate. This would include the peaks, eg rush hours, and troughs in demand experienced during the day.

‘Degraded conditions’ means the state of the part of the railway system when it continues to operate in a restricted manner due to the failure of one or more components.

‘Abnormal conditions’ means extreme loading on a part of the railway system. For example, this may be the result of extended delays on one part of the service impinging on another.

‘Emergency situation’ means a current unforeseen or unplanned event which has life threatening or extreme loss implications and requires immediate attention, eg a fire.

Level crossing terms

Some terms that relate specifically to level crossings have a special meaning.

‘Actual daily road vehicle user’ means the number of road vehicles passing between 06.00 and 24.00 averaged over a 9-day period.

‘Acute (skew) crossing’ is a crossing at which the angle measured in an anticlockwise direction from the road to the running rail is less than a right angle.

‘Automatic crossing’ is a crossing where the protective equipment is automatically activated by the approaching train.

‘Control point’ is a location from which the equipment at a crossing is controlled.

‘Crossing length’ applies to any vehicular crossing. At a crossing equipped with gates or full barriers it is the distance between the gates or barriers measured across the railway. At an open crossing or one equipped with half barriers it is the distance measured from the give way or stop line to a point at which a road vehicle would be clear of the railway or crossing equipment on the far side.

‘Crossing speed’ applies to locally-monitored crossings or open crossings. It is the maximum speed at which trains are allowed to travel from a point defined by a special speed restriction board on the approach to a crossing until the front of the train arrives at the crossing. It should not be less than 15 km/h and should be selected so that in normal visibility train drivers will have a clear view of the crossing (not more than 600 m) before reaching braking distance from it.

‘Decision point’ applies to user-worked crossings, footpath crossings and bridleway crossings. It is a point where guidance on crossing safely is visible and at which a decision to cross or wait can be made in safety. For footpath crossings this should be not less than 2 m from the nearest running rails or 3 m where the line speeds are higher than 160 km/h. For bridleway crossings and user-worked crossings this should not be less than 3 m from the nearest running rail.

‘Left-hand side’ means the left-hand side of the road or carriageway as it would appear to a person approaching the crossing along that road or carriageway.

‘Obtuse (skew) crossing’ is a crossing at which the angle measured in an anticlockwise direction between the road and the running rail is greater than a right angle.

‘Retroreflecting material’ is a highly reflective material, the performance requirements of which are to be found in relevant British or equivalent standards.

‘Right-hand side’ means the right-hand side of the road or carriageway as it would appear to a person approaching the crossing along that road or carriageway.

‘Road open time’ is the time after the road traffic light signals have ceased to show before they show again for another train.

‘Sighting distance’ is the distance measured along the railway from a decision point to the point at which an approaching train becomes visible in any direction from which a train may approach.

‘Strike-in point’ is the position on the track at which the presence of a train is detected and the operating sequence of the crossing is initiated.

‘Supervising point’ is the location from where the crossing is supervised. Most commonly this is either a local or remote signal-box but can be another location.

‘Tactile threshold’ is an area of tactile paving slabs laid in a specific pattern for the guidance of visually-impaired pedestrians.

‘Traffic moment’ is the number of road vehicles using the crossing multiplied by the number of trains passing in a given period.

‘Warning time’ is the shortest possible time for trains to travel the sighting distance or, where whistle boards are provided, the shortest time between the sound being heard at the crossing and the train arriving at the crossing. In calculations of warning time the highest attainable train speed should be used.

FURTHER INFORMATION

HSE priced and free publications are available by mail order from HSE Books, PO Box 1999, Sudbury, Suffolk CO10 2WA Tel: 01787 881165 Fax: 01787 313995 Website: www.hsebooks.co.uk (HSE priced publications are also available from bookshops and free leaflets can be downloaded from HSE's website: www.hse.gov.uk.)

For information about health and safety ring HSE's Infoline Tel: 08701 545500 Fax: 02920 859260 e-mail: hseinformationservices@natbrit.com or write to HSE Information Services, Caerphilly Business Park, Caerphilly CF83 3GG.

The Stationery Office publications are available from: The Stationery Office, PO Box 29, Norwich NR3 1GN Tel: 0870 600 5522 Fax: 0870 600 5533 e-mail: customer.services@tso.co.uk Website: www.tso.co.uk (They are also available from bookshops.)

This document contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do.

© *Crown copyright* This publication may be freely reproduced, except for advertising, endorsement or commercial purposes. First published 10/96. Web version published 2005.

Please acknowledge the source as HSE.