5.3.2 NATIONAL VARIANTS

Fig 5.2 Information Sign Language Variants - Portuguese ANGOLA and MOZAMBIQUE

Fig 5.3 National Variant Sign IN16 - Nam NAMIBIA
TRAFFIC SIGNALS

SECTIONS

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MAY 2012
6.1 INTRODUCTION

6.1.1 Scope

1 Traffic signals are standard devices comprising prescribed arrangements of signals for the regulation of vehicular road traffic, pedestrians and pedal cyclists. Signals are used at locations such as:
   (a) signalised road junctions;
   (b) signalised pedestrian and pedal cyclist mid-block crossings;
   (c) the intersection of roads with exclusive public transport rights of way;
   (d) single traffic lanes that carry two-way traffic;
   (e) freeway ramps and toll booths;
   (f) roadworks;
   (g) reversible lanes; and
   (h) railway crossings.

2 This chapter covers the more important requirements that traffic signals must comply with. Additional details regarding traffic signals are given in Volume 3: Traffic signal design, which contains guidelines for the practical design of road and traffic signals.

3 The traffic signals covered in this chapter are those shown in Figures 6.1 and 6.2. The figures show all traffic signals in colour as if they are illuminated, which obviously does not occur under operational conditions.

4 Unless the context indicates otherwise, words and expressions used in this chapter shall have the meanings given in Chapter 10: Glossary of Terms.

6.1.2 Recommended and alternative systems

1 The preparation and contents of the Manual have been motivated by a requirement to harmonise the road traffic sign systems of the SADC member states into one common system. In the case of electrically operated traffic signals there are two basic systems in use in the region. Given the very high investment in existing traffic signal installations it is considered financially and operationally impractical to achieve total harmonisation of these traffic signal systems in the short term.

2 The two basic traffic signal systems are the Recommended System, which is recommended because it is considered to represent the system used in the majority of traffic signal installations in the region and is used in at least half of the member states, and the Alternative System. The most significant differences between the two systems are as follows:

   (a) In the Recommended System the traffic signal switching cycle is GREEN - YELLOW - RED, whereas in the Alternative System the switching cycle is RED plus YELLOW - GREEN - YELLOW - RED.

   (b) The Recommended System utilises a FLASHING GREEN ARROW LIGHT SIGNAL instead of a STEADY GREEN ARROW SIGNAL when giving right of way to turning movements.

   (c) The Recommended System uses FLASHING RED LIGHT SIGNALS on all approaches to indicate an out of order signal. The Alternative System utilises FLASHING YELLOW LIGHT SIGNALS for this purpose.

   (d) In the Recommended System the pedestrian/cyclist “do not start to cross” message is given by a FLASHING RED light signal, whereas in the Alternative System this same message is given by a FLASHING GREEN light signal.

   (e) In the Recommended System the required principal traffic signal faces are required to be mounted on the far and near side of the intersection, whereas the Alternative System requires these signal faces to be mounted only on the near side of the intersection.

   (f) In the Recommended System the FLASHING RED disc light signal used at railway crossings is displayed with a STOP sign R1; in the Alternative System a no STOP sign is used and a FLASHING WHITE disc light signal may be used when no train is approaching.

3 Both systems are described in this chapter, but differences between the two systems are clearly identified. The user, however, must be aware of the differences in the two systems and must take care in differentiating between the two systems.

4 In South Africa, the Recommended system is prescribed and shall be complied to.

6.1.3 South African Bureau of Standard specifications

1 Traffic signals should be manufactured and installed in a disciplined and standardised manner. The use of the following South African Bureau of Standards specifications is therefore recommended for both the Recommended and Alternative systems:

   (a) SANS 1459: Traffic lights

   (b) SANS 1547: Traffic signal controllers

2 In South Africa, these specifications are prescribed and shall be complied to.
6.1.4 Approval of traffic signals

1 Due to the complexity of traffic signal systems, decisions concerning the design, installation, and operation of traffic signals, should only be undertaken by professionals with a high level of skill and knowledge of the subject.

2 A responsible registered PROFESSIONAL ENGINEER or registered professional TECHNOLOGIST (engineering) of the road authority concerned SHALL approve every traffic signal installation at a signalised junction or pedestrian or pedal cyclist crossing, and sign a declaration containing the following:
   (a) scaled drawing of the layout of the junction or crossing, indicating lane markings and road layout;
   (b) number, type and location of traffic signal faces;
   (c) pedestrian and pedal cyclist facilities, including pedestrian push buttons;
   (d) phasing, time plans and offset settings;
   (e) date of implementation; and
   (f) name, signature and registration number of the engineer or technologist (engineering) who approved the signal, and date of signature.

3 The declaration shall be kept by the road authority in control of the traffic signal concerned.

6.1.5 Transitional arrangements

1 All traffic signals installed after 30 June 2002 shall be displayed substantially in accordance with the requirements of this chapter.

2 All traffic signals installed on or before this date, and which could validly be displayed in terms of the National Road Traffic Act, may notwithstanding the requirements of this chapter, be displayed until the 31 December 2010.
Figure 6.1: Traffic signal faces and Traffic signal arrow signs
Control hand signals for use by traffic officers SS1

(a) 
(b) 
(c) 
(d) 

Flag signals SS2

(a) Stop 
(b) Proceed 

Using stop/proceed flag signals to slow traffic down

Warning flag signal

Warning traffic in two directions

Flashing yellow warning signal SS3

Flashing Red Disc (FRD) signal at railway crossings

Figure 6.2: Other road signals
6.2 VEHICULAR TRAFFIC SIGNALS AT JUNCTIONS AND CROSSINGS

6.2.1 Introduction

1. The traffic signals and signal faces described in this section are specifically for the control of vehicular traffic at signalised road junctions and signalised pedestrian and pedal cyclist crossings.

2. The function of a vehicular traffic signal is to successively give right of way to, and stop, vehicular traffic with respect to other conflicting movements of traffic, subject to normal priority rules in regard to turning movements and pedestrians or pedal cyclist.

3. Warrants for the installation and removal of traffic signals at road junctions and pedestrian crossings are given in Volume 3, Traffic signal design. Traffic signals should not be installed unless they are not warranted.

6.2.2 Area of Control

1. Traffic signals, as defined by the National Road Traffic Regulations, shall control traffic only at a junction or a pedestrian or pedal cyclist crossing. The signals shall control ALL approaches to the junction or crossing.

2. Slipways can be controlled independently of the main junction. However, a slipway for traffic turning left or right at a junction which is traffic signal controlled, shall be separated from the lane to the right or left of such slipway by a constructed island.

3. A slipway that is signal controlled would normally only have signals controlling the slipway, and any potential conflicts must be prevented at the main junction. All conflicting movements at the main junction, including the right-turn movement from the opposite direction, must face a RED LIGHT SIGNAL while the slipway receives a GREEN SIGNAL.

6.2.3 Control Precedence

1. The traffic control at a junction or pedestrian or pedal cyclist crossing may include the use of road signs, road markings and road signals and the control precedence SHALL be as follows:

   a. A road sign which prohibits or prescribes directional movement of traffic at a junction or pedestrian or pedal cyclist crossing which is controlled by a traffic signal, shall have precedence over any light signal which permits right of way.

   b. A light signal that permits right of way shall have precedence over the stop line RTM1.

   c. A light signal that has the significance that traffic shall stop, has precedence over any other road traffic signal or another light signal that permits right of way, EXCEPT when such other light signal (permitting right of way) has a higher precedence level. The precedence levels for light signals are as follows, given from the highest to lowest precedence level:

   (i) steady or flashing pedestrian and pedal cyclist light signals;
   (ii) steady or flashing bus or tram light signals;
   (iii) steady or flashing arrow signals, or steady disc signals with traffic signal arrow signs ST1 to ST5; and
   (iv) steady disc light signals.

6.2.4 Road signs

1. NO road sign except –

   a. a street name sign;
   b. a direction route marker sign;
   c. information signs IN14, IN15 and pedestrian and pedal cyclist signs relating to the function of the traffic signal;
   d. a one-way roadway sign;
   e. a no-entry sign;
   f. a left-turn prohibited, right-turn prohibited or a U-turn prohibited sign;
   g. a proceed straight through only, proceed left only, or proceed right only sign;
   h. a pedestrian prohibited sign R218; or
   i. a traffic signal arrow sign ST1 to ST5;

   SHALL be used in conjunction with a traffic signal, and such signs may be mounted on the same post or overhead cantilever or gantry as that of the traffic signal.

2. The following signs, in particular, may NOT be used in conjunction with a traffic signal, even if the signal is out of order (however, the signs may be used when the traffic signal has been masked out):

   a. STOP sign R1 or any of its derivatives.
   b. YIELD sign R2.
   c. RIGHT-OF-WAY sign IN7.
   d. Any sign that conflicts with or gives right of way over the traffic signal.

   A slipway, however, can be STOP or YIELD controlled as it is regarded as a separate junction.

3. The PEDESTRIAN PROHIBITED SIGN R218 is used to prohibit pedestrians from proceeding beyond the sign. The sign must be posted on the near side of the junction, in the direction to which it is applicable (and in both directions of the crossing).

4. TRAFFIC SIGNAL ARROW SIGNS ST1 to ST5 may be used in conjunction with traffic signals. The signs indicate to the driver of a vehicle, when displayed vertically above a traffic signal face, that any light signal installed in such face only applies to the direction of movement indicated by the arrow.

5. The following information signs related to the operation of traffic signals, may be used at signals:

   a. Where signal timings are co-ordinated for a fixed speed, information sign IN14 may be displayed on the relevant exit from a junction.
   b. Where a traffic signal has three or more vehicular signal phases, information sign IN15 may be located directly below a signal face.
   c. Pedestrian and pedal cyclist information signs.
6.2.2 VEHICULAR TRAFFIC SIGNALS

6. The TRAFFIC SIGNAL AHEAD SIGN W301 may be used to warn a road user of the presence of a traffic signal. This sign should be displayed in advance of:
   (a) Any new traffic signal installation. The sign may be removed after a period of three months.
   (b) Any approach where the approach speed is 70 km/h or more, or where the signal is not visible within 180 m of the junction.
   (c) A remotely located junction or mid-block pedestrian crossing.

7. A TEMPORARY TRAFFIC SIGNAL AHEAD SIGN TW301 may be used in advance of any traffic signal that is used temporary at roadworks.

8. The TRAFFIC SIGNAL OUT OF ORDER SIGN TW412 may be used to warn a road user that the traffic signals ahead are out of order. If a TRAFFIC SIGNAL AHEAD SIGN W301 is located in advance of the traffic signal, the temporary warning sign TW412 may be placed over the W301 sign for the period the signal is out of order.

6.2.5 Road markings

1. The minimum road markings required at a signalised junction or crossing includes the stop line (RTM1), pedestrian crossing lines (RTM3) and the no-overtaking line (RM1). Additional road markings will be required at more complex junctions.

2. Pedestrian crossing lines (RTM2) are used to indicate the position where pedestrians (or pedal cyclists) may cross at a junction or a mid-block crossing. Block pedestrian crossing markings (RTM4) may also be used instead of the crossing lines at both junctions and mid-block crossings, particularly in locations where pedestrian volumes are high.

3. Pedestrian crossing lines (or block pedestrian crossing markings):
   (a) SHOULD as a general rule be provided at all traffic signal controlled intersections, even if the junction is used by no pedestrians (except where pedestrians are specifically prohibited);
   (b) MAY be provided without pedestrian or pedal cyclist signals being installed at a junction;
   (c) SHALL be provided where pedestrian signals are installed at junctions or crossings; and
   (d) SHALL NOT be provided when PEDESTRIAN PROHIBITED R218 signs have been posted.

4. Pedestrian crossing lines not only mark crossing positions for pedestrians, but also serve to improve the visibility of the junction and to assist drivers in recognising and identifying a junction as being signal controlled.

6.2.6 Vehicular light signals

1. Vehicular light signals are described in the following sections. Vehicular traffic light signals shall have the meanings assigned to them in the National Road Traffic Regulations.

2. The following basic sequence of vehicular light signals shall be used on each approach road to a signalised junction or pedestrian or pedal cyclist crossing, and on each traffic signal face:
   (a) In the Recommended System (see Figure 6.3a):
      (i) a FLASHING or STEADY GREEN LIGHT SIGNAL, followed by:
      (ii) a STEADY YELLOW LIGHT SIGNAL followed by:
      (iii) a STEADY RED LIGHT SIGNAL, where it is provided on a signal face (not provided on S10L, S10R, S10B and S10T signal faces); provided that on the S9 and S10L signal faces, the STEADY YELLOW ARROW LIGHT SIGNAL may be omitted from the sequence subject to the conditions that:
         (iv) the FLASHING GREEN ARROW LIGHT SIGNAL must immediately be followed by a STEADY GREEN LIGHT SIGNAL which allows the left-turn movement to turn; and
         (v) when pedestrian or pedal cyclist signals are provided, no GREEN PEDESTRIAN OR PEDESTRIAN CYCLIST LIGHT SIGNAL may be displayed following the flashing green arrow light signal. The yellow arrow light signal shall NOT be omitted when such green pedestrian or pedal cyclist light signal is displayed.
   (b) In the Alternative System (see Figure 6.3b):
      (i) a STEADY YELLOW AND RED LIGHT SIGNAL (together), followed by:
      (ii) a FLASHING or STEADY GREEN LIGHT SIGNAL, followed by:
      (iii) a STEADY YELLOW LIGHT SIGNAL followed by:
      (iv) a STEADY RED LIGHT SIGNAL, where it is provided on a signal face;

3. Light signals of different colours shall NOT be displayed at the same time to the same turning movement. A driver may, for example, not receive a red signal at the same time as a yellow or green signal (even at a staggered or very wide junction).

4. Under no circumstances SHALL a GREEN LIGHT SIGNAL be used at some time in a STEADY mode and other times in a FLASHING mode.

5. When traffic signals are not in operation, such as during installation, all traffic signal faces SHALL be suitably masked so as to obscure them from the sight of drivers, pedestrians or pedal cyclists. Advance information signs relating to the signal shall also be masked. While the traffic signal is not operational, each non-priority side road approach to the junction shall be controlled by a STOP sign R1, or a YIELD sign R2, or all approaches shall be controlled by all-way STOP signs R1.3 or R1.4. These signs shall be removed immediately once the traffic signal has come into operation.
6.2.7 Red vehicular light signals

1 A STEADY RED DISC LIGHT SIGNAL (without a traffic signal arrow sign ST1 to ST5) indicates to the driver of a vehicle that he or she shall stop his or her vehicle behind the stop line RTM1 and that he or she shall remain stationary until a green light signal is displayed, and it is safe to proceed, and in the event that a pedestrian light signal is not provided, indicates to a pedestrian that he or she shall not cross the roadway until a green light signal is displayed and it is safe to do so.

2 A STEADY RED BUS LIGHT SIGNAL indicates to the driver of a vehicle allowed in an exclusive bus lane that he or she shall stop his or her vehicle behind the stop line RTM1 and that he or she shall remain stationary until a green bus light signal is displayed, and it is safe to proceed.

3 A STEADY RED TRAM LIGHT SIGNAL indicates to the driver of a vehicle allowed in an exclusive tram lane that he or she shall stop his or her vehicle behind the stop line RTM1 and that he or she shall remain stationary until a green tram light signal is displayed, and it is safe to proceed.

4 A STEADY RED ARROW LIGHT SIGNAL or A STEADY RED DISC LIGHT SIGNAL WITH A TRAFFIC SIGNAL ARROW SIGN ST1 to ST5 INSTALLED ABOVE THE SIGNAL indicates to the driver of a vehicle that he or she shall stop his or her vehicle behind the stop line RTM1 if he or she intends turning in the direction indicated by the steady red arrow light signal or the traffic signal arrow sign and that he or she shall remain stationary until a green light signal is displayed that allows movement in the direction of the arrow and it is safe to proceed. The steady red arrow light signal is used only in the Alternative System and may NOT be used in the Recommended System.
6.2.8 Yellow vehicular light signals

1 A STEADY YELLOW DISC LIGHT SIGNAL indicates to the driver of a vehicle that he or she shall stop his or her vehicle behind the stop line RTM1 and that he or she shall remain stationary until a green light signal is displayed, and it is safe to proceed; provided that if he or she is so close to a stop line RTM1 when the steady yellow disc light signal is displayed that he or she cannot stop safely, he or she may proceed with caution against such yellow light signal, and in the event that a pedestrian light signal is not provided, indicates to a pedestrian that he or she shall not cross a roadway until a green light signal is displayed and it is safe to do so. The use of this signal shall be SUBJECT TO THE FOLLOWING CONDITIONS:

(a) It shall NOT be displayed to right-turning traffic at the same time as a GREEN LIGHT SIGNAL is displayed to traffic on the conflicting opposing approach. This means that a phase allowing traffic to turn right may not be terminated while a green light signal is still being displayed on the conflicting opposing approach (Right-turning traffic receiving yellow may not know that the opposing traffic is still receiving green and may turn right into the face of oncoming traffic).

(b) It should be followed by a clearance or all-red interval to allow vehicles to clear the junction before green light signals are displayed to conflicting traffic movements.

(c) The duration of the yellow and clearance or all-red intervals is calculated using procedures given in Volume 3: Traffic signal design.

(d) An enforcement tolerance should be provided during the all-red interval to accommodate drivers who are unable to stop during the yellow interval. Law enforcement should only commence during the last one second of the all-red interval.

2 A STEADY YELLOW BUS LIGHT SIGNAL indicates to the driver of a vehicle allowed in an exclusive bus lane that he or she shall stop his or her vehicle behind the stop line RTM1 and that he or she shall remain stationary until a green light signal is displayed, and it is safe to proceed; provided that if he or she is so close to a stop line RTM1 when the steady yellow bus light signal is displayed that he or she cannot stop safely, he or she may proceed with caution against such yellow light signal. The use of this light signal is SUBJECT TO THE CONDITIONS given for the STEADY YELLOW DISC LIGHT SIGNAL.

3 A STEADY YELLOW TRAM LIGHT SIGNAL indicates to the driver of a vehicle allowed in an exclusive tram lane that he or she shall stop his or her vehicle behind the stop line RTM1 and that he or she shall remain stationary until a green light signal is displayed, and it is safe to proceed; provided that if he or she is so close to a stop line RTM1 when the steady yellow tram light signal is displayed that he or she cannot stop safely, he or she may proceed with caution against such yellow light signal. The use of this light signal is SUBJECT TO THE CONDITIONS given for the STEADY YELLOW DISC LIGHT SIGNAL, except that the duration of the yellow and clearance intervals must be adjusted to accommodate the operational characteristics of the tram.

4 A STEADY YELLOW ARROW LIGHT SIGNAL indicates to the driver of a vehicle that he or she shall stop his or her vehicle behind the stop line RTM1 if he or she intends turning in the direction indicated by the yellow arrow light signal and that he or she shall remain stationary until a green light signal allowing the movement is displayed, and it is safe to proceed; Provided that if he or she is so close to stop line RTM1 when a steady yellow arrow light signal is displayed that he or she cannot stop safely then he or she may proceed with caution against such yellow arrow light signal. The use of this light signal is SUBJECT TO THE CONDITIONS given for the STEADY YELLOW DISC LIGHT SIGNAL.

6.2.9 Green vehicular light signals

1 A STEADY GREEN DISC LIGHT SIGNAL indicates to the driver of a vehicle that he or she may proceed through a junction or crossing, or turn to the left or right, subject to any restricting road traffic sign or light signal, but shall yield right of way to other vehicular traffic and to pedestrians lawfully within the junction or crossing, at the time a steady green disc light signal is displayed, and in the event that a pedestrian light signal is not provided, to indicate to a pedestrian that he or she may cross the junction within the pedestrian crossing markings RTM3 or RTM4 as appropriate, provided that a conflicting flashing green arrow, bus or tram light signal is not displayed at the same time. The use of this signal is SUBJECT TO THE FOLLOWING CONDITIONS:

(a) It shall NOT be displayed at the same time on the same approach as a STEADY GREEN ARROW LIGHT SIGNAL.

(b) With the exception of the S12 traffic signal face, it shall NOT be displayed for a duration less than 7 seconds (preferably not less than 11 seconds).
2 A STEADY GREEN BUS LIGHT SIGNAL indicates to the driver of a vehicle allowed in an exclusive bus lane that he or she may proceed through a junction or crossing, or turn to the left or right, subject to any restricting road traffic sign or light signal, but shall yield right of way to other vehicular traffic and to pedestrians lawfully within the junction or crossing, at the time such steady green bus light signal is displayed. The use of this signal is SUBJECT TO THE CONDITION that it shall NOT be used to indicate a FLASHING GREEN BUS LIGHT SIGNAL at another time.

3 A STEADY GREEN TRAM LIGHT SIGNAL indicates to the driver of a vehicle allowed in an exclusive tram lane that he or she may proceed through a junction or crossing, or turn to the left or right, subject to any restricting road traffic sign or light signal, but shall yield right of way to other vehicular traffic and to pedestrians lawfully within the junction or crossing, at the time such steady green tram light signal is displayed. The use of this signal is SUBJECT TO THE CONDITION that it shall NOT be used to indicate a FLASHING GREEN TRAM LIGHT SIGNAL at another time.

6.2.10 Steady green arrow light signals

1 The Recommended System utilises the steady green arrow light signal mainly to indicate the direction of one-way streets. In the Alternative System it is used to signal directional movements that are unopposed.

2 In the Recommended System a STEADY GREEN ARROW LIGHT SIGNAL indicates to the driver of a vehicle that he or she may proceed in the direction indicated by the steady green arrow light signal, subject to any restricting road traffic sign or light signal, but shall yield right of way to other vehicular traffic and to pedestrians lawfully within the junction or crossing, at the time such green light signal is displayed and in the event that a pedestrian light signal is not provided, indicates to a pedestrian that he or she may cross the junction within the pedestrian crossing markings RTM3 or RTM4 as appropriate, provided that a conflicting flashing green arrow, bus or tram light signal is not displayed at the same time. The use of this signal is SUBJECT TO THE FOLLOWING CONDITIONS:

(a) It should preferably only be used to indicate the direction of ONE-WAY roads or streets.

(b) It shall NOT be used when there is a conflicting traffic movement from the opposite direction (the movement is opposed). The STEADY GREEN RIGHT ARROW LIGHT SIGNAL, in particular, may NOT be used when there is an opposing traffic movement (e.g. on two-way roads).

(c) It shall NOT be displayed at the same time on the same approach as a STEADY GREEN DISC LIGHT SIGNAL.

(d) A maximum of two STEADY GREEN ARROW LIGHT SIGNALS, showing in different directions, may be located in one signal face.

(e) It shall NOT be used to indicate a FLASHING GREEN ARROW LIGHT SIGNAL at another time.

(f) It shall NOT be displayed for a duration less than 7 seconds (preferably not less than 11 seconds).

3 In the Alternative System, a STEADY GREEN ARROW LIGHT SIGNAL indicates to the driver of a vehicle that he or she may proceed in the direction indicated by the arrow and that such movement is unopposed by other traffic. The use of this signal is SUBJECT TO THE FOLLOWING CONDITIONS:

(a) It shall NOT be used to indicate a FLASHING GREEN ARROW SIGNAL at another time.

(b) It shall be displayed only when the indicated movement is protected, and no opposing or conflicting vehicular, pedestrian or pedal cyclist movement has explicit or priority right of way. Conflicting movements through the junction shall face RED LIGHT SIGNALS.

(c) When no pedestrian signal is provided, pedestrians do not have right of way when the signal is displayed. However, separate pedestrian signals are recommended at junctions where such signals are displayed. Alternatively, pedestrian movements may be prohibited by means of PEDESTRIAN PROHIBITED SIGNS R218.

(d) It shall NOT be displayed for a duration less than 4 seconds (preferably not less than 7 seconds).

6.2.11 Flashing green vehicular light signals

1 The Recommended System utilises the flashing green vehicular light signals to signal directional movements that are unopposed. In the Alternative System, steady green light signals are used for this purpose.

2 A FLASHING GREEN BUS LIGHT SIGNAL indicates to the driver of a vehicle allowed in an exclusive bus lane that he or she may proceed and that his or her movements are unopposed by other traffic. The use of this light signal is SUBJECT TO THE CONDITIONS given for the FLASHING GREEN ARROW LIGHT SIGNAL except that it shall NOT be used to indicate a STEADY GREEN BUS LIGHT SIGNAL at another time.

3 A FLASHING GREEN TRAM LIGHT SIGNAL indicates to the driver of a vehicle allowed in an exclusive tram lane that he or she may proceed and that his or her movements are unopposed by other traffic. The use of this light signal is SUBJECT TO THE CONDITIONS given for the FLASHING GREEN ARROW LIGHT SIGNAL except that it shall NOT be used to indicate a STEADY GREEN TRAM LIGHT SIGNAL at another time.
4 A FLASHING GREEN ARROW LIGHT SIGNAL indicates to the driver of a vehicle that he or she may proceed in the direction indicated by the flashing green arrow light signal and that his or her movement is unopposed by other traffic. The use of this signal is SUBJECT TO THE FOLLOWING CONDITIONS:

(a) It shall NOT be used to indicate a STEADY GREEN ARROW LIGHT SIGNAL at another time.
(b) It SHALL be displayed only when the indicated movement is protected and no opposing or conflicting vehicular, pedestrian or pedal cyclist movement has explicit or priority right of way. Conflicting movements through the junction shall face RED LIGHT SIGNALS.
(c) When no pedestrian signal is provided, pedestrians do not have right of way when the FLASHING GREEN ARROW LIGHT SIGNAL is displayed. However, separate pedestrian signals for the control of pedestrians are recommended at junctions where such signals are displayed. Alternatively, pedestrian movements may be prohibited by means of PEDESTRIAN PROHIBITED SIGNS R218.
(d) It shall NOT be displayed for a duration less than 4 seconds (preferably not less than 7 seconds).

6.2.12 Yellow and red light signals displayed together in the Alternative System

1 The Alternative System displays a yellow and red light signal together immediately before a green light signal. This signal is NOT used in the Recommended System.

2 A STEADY YELLOW LIGHT SIGNAL shall be shown together with a STEADY RED LIGHT SIGNAL immediately prior to the commencement of a GREEN LIGHT SIGNAL to indicate to drivers that such a green phase is about to commence.

3 The yellow and red light signals shown together may form part of the clearance time provided at a traffic signal, and may be treated as an all-red interval.

6.2.13 Flashing and other modes of operation

1 Flashing and other modes of operations include:

(a) FLASHING LIGHT SIGNALS on ALL approaches.
(b) No light signal illuminated (all signal aspects switched off).
(c) Manual signal advance, whereby the timings of green light signals can be changed manually;

2 In the Recommended System A FLASHING RED DISC, BUS OR TRAM LIGHT SIGNAL indicates to the driver of a vehicle that he or she shall act as for a 3-way stop sign R1.3 or 4-way stop sign R1.4 and shall yield right of way to all pedestrians crossing his or her path, and the signal indicates to a pedestrian that he or she may cross the roadway if it is safe to do so. This use of this signal shall be SUBJECT TO THE FOLLOWING CONDITIONS:

(a) It shall NOT be displayed at the same time as ANY other light signal on any approach road, and the pedestrian and pedal cyclist signals shall be switched off (except when a pelican phase is provided).
(b) At a pedestrian crossing it may be used during a "Pelican" phase to indicate to drivers of vehicles that pedestrians may be clearing the road and have right of way. During this phase, the FLASHING RED LIGHT SIGNAL may be displayed only at the same time as the FLASHING RED MAN or PEDAL CYCLIST RED LIGHT SIGNAL. Pedestrians or pedal cyclists may not enter the crossing on the flashing red signal, and the duration of this interval should therefore NOT exceed the time required to clear the crossing.

3 In the Alternative System a FLASHING YELLOW DISC, BUS OR TRAM LIGHT SIGNAL indicates to the driver of a vehicle that he or she shall act as for a 3-way stop sign R1.3 or 4-way stop sign R1.4 and shall yield right of way to all pedestrians crossing his or her path. The signal indicates to a pedestrian that he or she may cross the roadway if it is safe to do so. The use of this signal shall be SUBJECT TO THE FOLLOWING CONDITIONS:

(a) It shall NOT be displayed at the same time as ANY other light signal on any approach road, and the pedestrian and pedal cyclist signals shall be switched off (except when a pelican phase is provided).
(b) At a pedestrian crossing it may be used during a "Pelican" phase to indicate to drivers of vehicles that pedestrians may be clearing the road and have right of way. During this phase, the FLASHING YELLOW LIGHT SIGNAL may be displayed only at the same time as the FLASHING GREEN MAN or PEDAL CYCLIST GREEN LIGHT SIGNAL. Pedestrians or pedal cyclists may not enter the crossing on the flashing green signal, and the duration of this interval should therefore NOT exceed the time required to clear the crossing.

4 The operations at the signal when light signals are in flashing mode or when signal aspects are not illuminated, are similar to that of a 3- or 4-way STOP controlled junction.

5 When a traffic signal is out of order, it may be placed in the flashing mode of operation, or all the light signals shall be switched off.

6 At no time SHALL an operational traffic signal be intentionally switched off, other than for maintenance or repairs or when controlled by a traffic officer or an authorised pointsman (part-time operation of traffic signals is NOT allowed).

7 A traffic officer or an authorised pointsman may intervene with the operation of a traffic signal. The traffic signal may then be placed in any one of the flashing modes of operation.
8 The planned operation of traffic signals in flashing mode for part of the day or night, in place of normal traffic signal operations, is not recommended. Under conditions of low traffic flow, the following alternatives should first be considered:
(a) Reduce cycle length, but with pedestrian phases still available on demand (in which case the cycle length may have to be increased to accommodate pedestrian crossing times).
(b) Vehicle-actuated control.

9 It is recommended that, where and when possible, a traffic signal should be placed in a flashing mode of operation or switched off by first introducing STEADY RED LIGHT SIGNALS on all traffic signal faces for a duration of at least 3 to 5 seconds.

10 The traffic signal should again be returned to the normal mode of operations, or switched on, by using one of the following methods:
(a) The flashing mode of operation should be followed by a STEADY RED LIGHT SIGNAL for a duration of between 3 and 5 seconds. This steady red light signal in turn, should be followed by a GREEN LIGHT SIGNAL on the main road (where possible).
(b) A switched-off traffic signal should be switched on again by first placing the signal in the flashing mode of operation for a duration of not less than 5 seconds, followed by STEADY RED LIGHT SIGNALS for a duration of between 3 and 5 seconds, followed by a GREEN LIGHT SIGNAL on the main road (where possible).

6.2.14 Arrangement of light signals on a traffic signal face

1 The number and positioning of light signals on a traffic signal face SHALL conform to one of the standard traffic signal face arrangements. The relative position of each light signal relative to the others on a particular traffic signal face is of significance in the interpretation of the meaning of light signals.

2 The RED, YELLOW and GREEN LIGHT SIGNALS on a traffic signal face that contains three or more light signals, shall be positioned in line vertically with the RED LIGHT SIGNAL at the top, the YELLOW LIGHT SIGNAL immediately below the red and the GREEN LIGHT SIGNAL immediately below the yellow signal. If there is a second GREEN ARROW LIGHT SIGNAL, it shall be located in line vertically below the first green arrow signal. A straight-ahead arrow shall be located above a right or left arrow and a right-arrow shall be located above a left.

3 The YELLOW and GREEN LIGHT SIGNALS on a traffic signal face that contains two light signals, shall be positioned in line vertically with the YELLOW LIGHT SIGNAL at the top and the GREEN LIGHT SIGNAL immediately below the yellow signal.

4 When vehicular signal faces are mounted adjacent to each other in a horizontal group, all light signals of the same colour must be located on the same horizontal level, except that for S5, S6, S7 traffic signal faces, the second green arrow light signal may be located immediately below the level of the green light signals.

5 No light signal shall be located at the same level as a light signal of a different colour (except for pedestrian or pedal cyclist light signals).

6 DUPLICATE light signals shall NOT be provided in a traffic signal face. Providing such light signals would mean that the signal face no longer conforms to one of the standard traffic signal faces. Where increased conspicuity is required, additional standard traffic signal faces may be provided.

6.2.15 Standard traffic signal faces

1 Standard traffic signal faces are prescribed by the National Road Traffic Regulations. The standard faces are shown in Figure 6.1. All traffic signal faces SHALL conform to one of the standards.

2 The standard traffic signal faces have been developed to ensure uniformity and adequate comprehension by all road users. They will meet all practical signal requirements and applications. The use of any other signal arrangements is not necessary and is NOT allowed.


4 TRAFFIC SIGNAL ARROW SIGNS ST1 to ST5 may be used in the Recommended System to indicate the directions in which light signals are applicable. The use of the signs is subject to the following conditions:
(a) The signs shall ONLY be used when it is necessary to assign to traffic signal faces S1L and S1R a higher precedence level (using signs ST3 and ST2 respectively).
(b) When the arrow signs are used with the S1L and S1R signal faces, arrow signs may optionally also be used with signal faces S1, S2, S3, S4, S5, S6 and S7. However, when these signal faces are erected immediately adjacent to the S1L and S1R signal faces (typically on the same post), the use of arrow signs with the signal faces is recommended as shown in Figures 6.4a and 6.4b.

6.2.16 Standard Signal Faces for the Recommended System

1 The following signal faces may be used in the Recommended System:

2 The standard TRAFFIC SIGNAL FACE S1 is used when traffic is permitted to proceed in any direction that is allowed at the junction. The signal face is also used at signalised pedestrian and pedal cyclist crossings, as well as for the control of two-way traffic on a single lane. The signal face may NOT be used on the same approach as signal faces S2, S3, S4, S5, S6 and S7 (because of the conflicting meanings of the green light signals).

3 Standard TRAFFIC SIGNAL FACES S1B and S1T are only applicable to vehicles allowed in exclusive bus and tram lanes respectively. The faces may NOT be used to control buses or trams travelling in non-exclusive lanes.
4 Standard TRAFFIC SIGNAL FACES S1R and S1L are used to signal protected-only turning phases. The flashing green signals indicate that the turning movement is unopposed by any conflicting movements during the turning phase. During other phases, turning is prohibited by the red light signal. The use of the signal faces is subject to the following conditions:
(a) The signal faces may be used without TRAFFIC SIGNAL ARROW SIGNS ST2 and ST3 on approaches to junctions serving only one turning movement or on signalised slipways that are separated from other turning movements by a constructed island.
(b) The signal faces must be used in combination with TRAFFIC SIGNAL ARROW SIGNS ST2 and ST3 on approaches to junctions from which more than one direction of movement is allowed. Examples of the combined use of the traffic signal faces and arrow signs are shown in Figures 6.4a and 6.4b.
(c) The signal faces may only be used when the conditions for the use of red, yellow and green light signals given in this chapter are met.

5 Standard TRAFFIC SIGNAL FACES S2, S3, S4, S5, S6 and S7 may be used where traffic is permitted to proceed only in particular directions. The use of the signal faces is subject to the following conditions:
(a) The signal faces should preferably only be used to indicate the direction of ONE-WAY roads or streets.
(b) Traffic signal faces S2, S6 and S7 may ONLY be used if there are no vehicular movements from the opposite direction conflicting with the right-turn movement.
(c) The signal faces shall NOT be used on the same approach as signal face S1 (because of the conflicting meanings of the green light signals).
(d) The green arrow light signals on signal faces S5, S6 and S7 shall be indicated concurrently.

6 Standard TRAFFIC SIGNAL FACES S8, S8B, S8T, S9, S9B and S9T may be applied in a similar way than traffic signal faces S1, S1B and S1T, except that provision is made for signalling of a protected/permitted turning phase. During the turning phase, the movement is protected and unopposed by any conflicting traffic movement. During other phases of the signal, the turning movement is permitted (e.g. by means of gap acceptance). The use of the signal faces is subject to the following conditions:
(a) The signal faces may only be used when the conditions for the use of red, yellow and green light signals given in this chapter are met.
(b) The traffic signal faces can also be provided as two separate but adjacent traffic signal faces (e.g. faces S1 and S10R instead of face S8).

7 Standard TRAFFIC SIGNAL FACES S10R, S10L, S10B and S10T may be used to signal protected/permitted right-turn or left-turn phases. The use of the signal faces is subject to the following conditions:
(a) The light signals shall only be displayed during the protected turning phase and shall NOT be displayed at any other time.
(b) The signal faces may only be used when the conditions for the use of yellow and green signal faces given in this chapter are met.
(c) The signal faces can be used as stand-alone signal faces or in combination with other signal faces. The stand-alone configuration, however, is not recommended (since no red light signal is available in these faces).

6.2.17 Standard Signal Faces for the Alternative System
1 The following signal faces may be used in the Alternative System:
2 The standard TRAFFIC SIGNAL FACE S1 is used when traffic is permitted to proceed in any direction that is allowed at the junction. The signal face is also used at signalised pedestrian and pedestrian cyclist crossings as well as for the control of two-way traffic on a single lane. The signal face may NOT be used on the same approach as signal faces S2, S3, S4, S5, S6 and S7 (because of the conflicting meanings of the green light signals).
3 Standard TRAFFIC SIGNAL FACES S1B and S1T are only applicable to vehicles allowed in exclusive bus and tram lanes respectively. The faces may NOT be used to control buses or trams travelling in non-exclusive lanes carrying other types of vehicles.
4 Standard TRAFFIC SIGNAL FACES S1A, S1AR and S1AL may be used to signal protected turning phases, and may be used only if the turning movements are unopposed by any conflicting movements.
5 Standard TRAFFIC SIGNAL FACES S2, S3, S4, S5, S6 and S7 may be used where traffic is permitted to proceed only in particular directions. The use of the signal faces is subject to the following conditions:
(a) The signal faces should preferably only be used to indicate the direction of ONE-WAY roads or streets.
(b) Traffic signal faces S2, S6 and S7 may ONLY be used if there are no vehicular movements from the opposite direction conflicting with the right-turn movement.
(c) The signal faces shall NOT be used on the same approach as signal face S1 (because of the conflicting meanings of the green light signals).
(d) The green arrow light signals on signal faces S5, S6 and S7 shall be indicated concurrently.
Figure 6.4a: Signalling for protected-only right turn at a T-junction

Figure 6.4b: Signalling for protected-only right turn at a 4-way junction (road divided by a median)
6.2.18 Numbers and locations of signal faces

1 Traffic signal faces for use at junctions and crossings are classified as follows:
   (a) Principal traffic signal faces are faces provided to meet the minimum legal requirements of the National Road Traffic Regulations.
   (b) Supplementary traffic signal faces are additional traffic signal faces, not being principal traffic signal faces, provided to meet requirements in respect of visibility and conspicuity or improved traffic operations.
2 In the Recommended System, the following PRINCIPAL traffic signal faces SHALL be provided at a signalised junction, signalised slipway or signalised pedestrian or pedal cyclist crossing for the control of vehicular traffic for each direction from which vehicles may approach the junction, slipway or crossing (these requirements shall not necessarily apply to traffic signals used at other locations):
   (a) FAR-SIDE PRINCIPAL SIGNAL FACES. At least two traffic signal faces that contain red light signals shall be provided on the far side of the stop line RTM1 at locations:
      (i) that are NOT on the near side of a junction or slipway;
      (ii) that are not less than 6 metres (but preferably not less than 10 metres) from the stop line RTM1;
      (iii) such that the two traffic signal faces shall not be less than 3 metres and not more than 20 metres apart; Provided that where it is unavoidable that the traffic signals are more than 20 metres apart, additional principal traffic signals shall be provided in such a manner that no traffic signals are more than 20 metres apart (signals should preferably not be more than 16 metres apart);
      (iv) at a signalised junction, but not a pedestrian or pedal cyclist crossing, where a straight-through movement is permitted from an approach to the junction, and where the roadway continues straight through the junction, a traffic signal face for the control of straight-through movements shall be provided subject to the requirements of subparagraphs a) (i) to (iii), on either side of the roadway on the far side of the junction; Provided that when the roadway is divided at the junction by a constructed median island of adequate width to accommodate a signal, the right-hand traffic signal face shall be situated on the median island;
   (b) NEAR-SIDE PRINCIPAL SIGNAL FACES. At a signalised junction or slipway, but not a pedestrian or pedal cyclist crossing, at least one signal face containing a red light signal shall be provided on the near side of the junction or slipway, on the left- or right-hand side of the roadway at a position not further than 3 metres from the prolongation of the stop line RTM1. Although not prescribed, the near-side signal face is also recommended at pedestrian and pedal cyclist crossings.
   (c) PRINCIPAL SIGNAL FACES FOR TURNING PHASES. When a separate left- or right-turn signal is required, at least two traffic signal faces that incorporate a flashing green arrow light signal, flashing green bus light signal or a flashing green tram light signal, shall be provided, one on the far side of the stop line RTM1 subject to subparagraphs a) (i) and (ii), and the other on the far or near side;
3 In the Alternative System, the following PRINCIPAL traffic signal faces SHALL be provided at a signalised junction, signalised slipway or signalised pedestrian or pedal cyclist crossing for the control of vehicular traffic for each direction from which vehicular traffic may approach the junction or crossing (these requirements shall not apply to traffic signals used in other locations):
   (a) At least two traffic signal faces shall be provided at a location on the near side of the junction or crossing (including a signalised slipway that is separated from other turning movements by a constructed island) at locations:
      (i) approximately on the prolongation of the STOP LINE RTM1, one on the left side and one on the right side of the roadway, provided that when the roadway is divided at the junction by a constructed median island of adequate width, the right-hand traffic signal face shall be situated on the median;
      (ii) where the two traffic signal faces shall not be less than 3 metres and not more than 20 metres apart (but preferably not more than 16 metres apart);
   (b) When a separate right-turn signal is required, at least two signal faces S1AR that incorporate a right-turn green arrow light signal shall be provided, one on the near side of the junction and the other on either the far side or on the near side of the junction.
   (c) When a separate left-turn signal is required, at least one signal face S1AL that incorporates a left-turn green arrow light signal shall be provided on the near side of the junction.
   (d) When specifying the use of Type S1AR and/or S1AL signal faces, at least one such signal face shall be combined with a Type S1 signal face to cater for other traffic movements.
Additional traffic signal faces may be provided at the junction or crossing at any suitable location, even if the minimum requirements for principal traffic signal faces have been met. Supplementary signal faces must be provided where the minimum visibility requirements cannot be achieved by means of the principal faces alone.

The position of a signal face on an approach, including an overhead mounted signal face, in relation to any lane on the approach, is generally not significant in the interpretation of the light signal by the road user (although positions of traffic signals may be prescribed).

### 6.2.19 Two-way traffic on a single lane

Traffic signals may be installed to successively give right of way to traffic from opposite directions on a single traffic lane, such as a narrow bridge and tunnel, or at roadworks when only one lane of the road is open.

At least two traffic signal faces of type S1 shall be provided on a two-way single lane road, one on each side of the road, at a position not less than 6 m (but preferably not less than 10 m) beyond the stop line RTM1. However, where the traffic signal is manually operated (such as at roadworks), only one such signal face may be provided.

An all-red interval of sufficient duration is necessary that would allow slow moving traffic to clear the single lane section before the onset of the opposing green. For fixed time operation, this may be established based on the 15th percentile free-flow speed on the lane (judgement may be required to establish whether this would be adequate).

When sufficient sight distance is provided, the signal may be placed in flashing mode to indicate that drivers can proceed if no vehicles are present in the opposite direction on the single lane section.

### 6.2.20 Left- and right-turn signal phases

Turning movements at traffic signals can be permitted, prohibited or protected. The different modes of operation are as follows:

(a) Permitted-only mode in which a turning movement is permitted but no exclusive turning phase is provided.

(b) Protected/permitted mode in which an exclusive protected turning phase is provided, but the turning movement is also permitted during the main phase. This mode can NOT be accommodated in the **Alternative System**.

(c) Protected-only mode in which vehicles are only allowed to turn during a protected phase.

(d) Prohibited mode in which no turning movement is allowed.

### 6.2.21 Signals on high-speed roads

The speed limit on any approach to a signalised junction or pedestrian or pedal cyclist crossing shall NOT exceed 80 km/h.

At traffic signals where the speed limit is 70 km/h or higher, the following measures can be considered to improve the visibility of the signals:

(a) high intensity traffic light signals; or

(b) overhead mounted traffic signal faces;

At traffic signals where accidents occur due to high speed, or transgression of posted speed limits occurs, consideration may be given to the measures given above as well as the following corrective measures:

(a) law enforcement of the speed limit;

(b) high visibility warning signs in advance of the signals;

(c) skid resistant road surface, particularly on downhill approaches to the signals;

(d) speed calming measures (e.g. rumble strips), but only if they are not distracting to drivers (such measures should preferably be introduced in advance of the traffic signal and not at the traffic signal); or

(e) converting the traffic signal to a traffic circle.
6.2.22 Optical requirements

1 The optical components of a traffic signal are important and care should be taken to ensure that they meet minimum requirements. Compliance with SANS 1459: Traffic lights is recommended (prescribed in South Africa).

2 The luminous intensity level of a signal aspect defines the brightness of a light. Two intensity levels are available, namely NORMAL or HIGH. Normal intensity lights should always be specified for pedestrian signals. Normal or high intensity lights may be used for vehicular signals, depending upon the operating conditions. Conditions where high intensity lights should be used, include any one or more of the following:

(a) Where the speed limit on a road is 80 km/h or higher.
(b) Where increased visibility is necessary due to a confusing background of bright lights or other traffic lights or signs.
(c) Where visibility is affected by a rising or setting sun in the east/west direction.
(d) Where drivers would not normally expect to encounter a signal, such as in rural areas or on the edges of a town or city.

3 High intensity traffic lights may cause "discomfort glare" or "disability glare" at night, especially in dark surroundings and in the absence of street lighting. It is recommended that, in such situations, a facility for automatically dimming signal lamps at night should be provided. Such dimming can be operated by a photo-electric cell.

4 Flashing signals shall operate at a frequency of between one and two flashes per second and the luminous intensity shall be zero for 30% - 50% of the period and not less than the specified minimum for 30% - 50% of the period.

5 Two sizes of signal aspects may be used, namely 210 mm and 300 mm nominal diameter. Either size may be used for pedestrian and vehicular signals. The larger aspect is not often used because it does not contribute significantly to visibility as much as luminous intensity, particularly when used to display disc light signals.

6 Pedestrian aspects of 210 mm diameter should be adequate for normally-sighted people up to a distance of 35 m. The larger aspect may be considered for crossings wider than 35 m, but then it would be preferable to provide a staggered crossing. The larger aspect can be used at a crossing that is regularly used by elderly people or people with impaired vision.

7 Louvers and visors are provided to modify the angular visual coverage of the light signal and/or to shield the optical system from incidental light that may cause sun-pheno effects. The use of louvers should be restricted because of the loss of efficiency of the optical system. They should only be used when the visors alone are unable to provide the necessary cut-off. Louvers SHALL not be used in association with symbolic displays such as arrows, pedestrian and pedal cyclist signals.

8 A suitably designed visor SHALL be fitted to each vehicular signal aspect. Pedestrian and pedal cyclist signal aspects may also be fitted with visors. The visor shall have a length of at least 160 mm at the top. The visor should not prevent required visibility of the optical system. They should only be used when the visors alone are unable to provide the necessary cut-off. Louvers SHALL not be used in association with symbolic displays such as arrows, pedestrian and pedal cyclist signals.

9 A background screen (backboard) SHALL be provided for each vehicular signal face while background screens may be provided (but are not necessarily recommended) for pedestrian and pedal cyclist signal faces. Where it is necessary to increase the conspicuity of a traffic signal, the border of the white background screen provided for a signal face may be white retro-reflective.

10 Traffic signal posts should have a diameter of at least 100 mm. The standard, post or cantilever shall be golden yellow (portions of which may be retro-reflective). However, this provision shall not be applicable to an overhead traffic signal mounted on a GANTRY.

<table>
<thead>
<tr>
<th>Table 6.1: RECOMMENDED SIGHT DISTANCES FOR TRAFFIC SIGNALS</th>
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<tbody>
<tr>
<td><strong>Speed limit or advisory speed (km/h)</strong></td>
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<tr>
<td>-------------------------------------------</td>
</tr>
<tr>
<td>Add for a downgrade of:</td>
</tr>
<tr>
<td>-5%</td>
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<tr>
<td>40 km/h (*)</td>
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<td>50 km/h (*)</td>
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<td>60 km/h</td>
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<tr>
<td>80 km/h</td>
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<tr>
<td>90 km/h</td>
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(*) To be used only in conjunction with an advisory speed sign, e.g. at a horizontal curve.
11 Retro-reflective strips may be provided on traffic signal to increase the conspicuity of the signs, particularly when there is a loss in the electrical supply. Three horizontal yellow retro-reflective strips can be fitted on ALL yellow signal posts. The width of the strips may be between 120 and 150 mm. The width of the openings should be about the same as that of the strips. The bottom strip should not be installed lower than 1.2 m and the top strip not higher than 2.1 m above the ground level.

6.2.23 Visibility requirements

1 Under normal atmospheric conditions, traffic signal faces should be clearly visible and recognisable on approaches to a signal. Where the principal signal faces alone cannot provide the required visibility, additional traffic signal faces must be provided to supplement the principal signal faces.

2 The overriding objective in deciding the number and location of supplementary traffic signal faces is that light signals should be clearly visible to the approaching vehicles for which they are intended, taking into account:
   (a) the position of the vehicle on the approach;
   (b) the alignment of the approach;
   (c) obstructions to visibility (including other vehicles that may be queued on an approach);
   (d) distracting lights and signs; and
   (e) required sight distances.

3 Street lights, illuminated signs and distracting advertising signs close to, or behind traffic signals may be confusing and distracting to drivers. Such distracting features should not be permitted.

4 Signal faces should be visible over the minimum distances described below. In each case, all light signals in a face must be visible from a reference point 1.05 m above the centre line of each lane of traffic for which the signal face is intended.

5 At least two traffic signal faces - principal or supplementary - should be visible at any one time over the minimum sight distances from the stop line given in Table 6.1. The sight distances given in the table allow for driver recognition, reaction and stopping times from the speed limit or posted advisory speed.
   (a) Minimum and preferable sight distances are given for urban roads. The minimum sight distances given for rural roads are the preferred distances for urban roads. The minimum sight distances are based on a shorter reaction time, and should only be used at junctions where drivers would expect a traffic signal. The longer sight distances should be used when traffic signals are not expected and a longer reaction time is required to respond to the signals.
   (b) The sight distances also vary according to the approach grade to a junction or crossing. Note that sight distances for speeds lower than 60 km/h should be permitted only in circumstances where the geometry of the approach ensures that vehicles reduce speed, and an appropriate advisory speed and warning sign is posted.

6 At least two traffic signal faces on the far side of the stop line should be visible from a distance of 50 m or more, up to the stop line.

7 At least one traffic signal face should lie within the average driver's "cone of vision". The cone of vision is measured from the stop line position, 20 degrees on either side of the continuation of the centre line of each approach lane.

8 At least one traffic signal face on the far side should be visible for right-turning vehicles waiting inside the junction to turn right. This traffic signal should preferably be located on the far right-hand corner of the junction.

9 Additional supplementary signal faces may (and preferably should) be provided to ensure consistency and uniformity along a road or street. For instance, if an overhead mounted signal face is provided at one location, then such signals should be provided at other junctions and pedestrian and pedal cyclist crossings on the road or street (but only while roadway and other characteristics remain the same along the road or street and when signals are spaced at distances closer than 1 km apart).

10 The optical axis of each light signal should be positioned and aligned so that it is at the greatest effectiveness to the approaching traffic for which it is intended. The optical axis of each light signal should be aligned on the reference point in the centre of the approach lane or lanes midway over the distance that it is intended to control.

11 CARE SHOULD BE TAKEN TO ENSURE THAT NO TRAFFIC SIGNAL FACE INTENDED FOR TRAFFIC ON ONE APPROACH IS ALIGNED SO THAT IT COULD BE WRONGLY TAKEN TO APPLY TO ANOTHER APPROACH AT THE SAME JUNCTION.

12 The provision of road lighting at signalised junctions and mid-block pedestrian crossings will promote safe operations at night. Consideration should therefore be given to providing such lighting at all signalised junctions and crossings.

6.2.24 Mounting of vehicular signal faces

1 Traffic signal faces may be mounted on one of the following supports:
   (a) standard post;
   (b) extended (longer) post; or
   (c) overhead cantilever or gantry; Supporting traffic signal faces by means of catenary wires or cables, is NOT allowed.

2 A lateral clearance of at least 0.5 m should generally be provided from the edge of a roadway and any post or any part of a signal face, including the backboard (background screen). If there is a significant tipping of vehicles to one side due to camber or crossfall on the road, or where vehicles tend to cut corners, it is preferable to increase the clearance to 1.0 m or more.

3 On medians, where insistence on the 0.5 m lateral clearance would mean that signal faces cannot be provided on the median, the lateral clearance can be reduced to an absolute minimum of 0.1 m, but only if the camber or crossfall of the roadway falls away from the median.
4 Principal traffic signal faces should preferably be post-mounted at the side of the road. Supplementary traffic signal faces may be either post-mounted or mounted above the road surface on a gantry or cantilever. Traffic signal faces on the left-hand side of the road, should generally be located not more than 2 m to the left of the continuation of the left-hand edge of the approach roadway, measured parallel to the road centre line and excluding any approach splay.

5 Traffic signal faces that are mounted on posts at the side of the road, should be not less than 2.3 m and not more than 3 m above the level of a point on the road surface nearest to the post, measured to the centre of the lowest (green) signal aspect. A minimum clearance of not less than 2.1 m above the sidewalk should also be provided.

6 Where it is necessary to achieve the minimum visibility requirements (e.g. on a vertical curve), supplementary traffic signal faces may be mounted on posts at the side of the road at a height exceeding 3 m. These supplementary traffic signal faces may be mounted on the same post, provided that the two traffic signal faces shall be not less than 1 m apart, measured from the centres of the two nearest light signals on the two signal faces. There is no maximum limit, but line-of-sight and stability factors should be taken into consideration and a practical limit would be 5 m (between centres of two closest light signals).

7 Overhead mounted signals would be required when it is not possible to comply with the requirement that principal signal faces may not be further than 20 m apart (preferably not further than 16 m apart).

8 Consideration should also be given to providing overhead mounted signal faces as supplementary signal faces at junctions or crossings where accidents occur due to high speed, or to ensure consistency and uniformity along a road or street.

9 Any traffic signal face that is mounted on a gantry or cantilever above the roadway SHALL have a minimum clearance above the road of not less than 5.2 m. The height to the lowest light signal should not exceed 6.2 m on a level road. The vertical part of the gantry or cantilever structure may be used to mount a signal face at the side of the road. The cantilever may be of any horizontal reach, although in practice a reach that exceeds 5 m will present stability problems. Alternatively, an overhead gantry can be used when a longer reach is required.

10 The position of the traffic signal face mounted on a gantry or cantilever, relative to the traffic lane over which it is located, is not of significance in the meaning of the signal. However, the cantilever should preferably be located on the left-hand side of the road.
6.3 PEDESTRIAN AND PEDAL CYCLIST SIGNALS

6.3.1 Introduction

1 Pedestrian and pedal cyclist traffic is subject to control by any traffic signal that is intended for vehicular traffic. Separate signals, however, can be provided for the control of pedestrians and pedal cyclists.

2 Pedestrian and pedal cyclist signals SHALL be operated only in conjunction with vehicular traffic signals. They will normally be provided where a significant number of pedestrians or pedal cyclists experience difficulty and/or delay in crossing a road at certain times during the day. Situations in which pedestrian or pedal cyclist signals may be used are:

(a) at signalised road junctions; and

(b) at signalised mid-block pedestrian and pedal cyclist crossings.

3 Warrants for the provision of signals at pedestrian and pedal cyclist mid-block crossings are given in Volume 3: Traffic signal design.

4 The general provisions for vehicular traffic signals shall also apply to pedestrian and pedal cyclist signals and to vehicular traffic signals used in conjunction with pedestrian and pedal cyclist signals, except where otherwise noted in this chapter.

5 Where pedestrian signals are not provided at a junction, vehicular traffic shall yield right of way to pedestrians lawfully in the junction. Pedal cyclists, however, do not have the same right of way and are treated similar to vehicular traffic when pedal cyclist signals are not provided.

6.3.2 Pedestrian and pedal cyclist signals

1 The operation of pedestrian and pedal cyclist signals in the Recommended and Alternative Systems is the same except for one aspect, namely the flashing signal used to indicate the “do not start to cross” message. This flashing signal is given as follows:

(a) **Recommended System** – indicated by a **FLASHING RED MAN or PEDAL CYCLIST LIGHT SIGNAL** (See Figure 6.5a).

(b) **Alternative System** – indicated by a **FLASHING GREEN MAN or PEDAL CYCLIST LIGHT SIGNAL** (See Figure 6.5b).

2 Pedestrian light signals shall comprise:

(a) a **STEADY GREEN MAN LIGHT SIGNAL**, followed by:

(b) a **FLASHING RED OR GREEN MAN LIGHT SIGNAL**, followed by:

(c) a **STEADY RED MAN LIGHT SIGNAL**.

3 Pedal cyclist signal installations shall comprise:

(a) a **STEADY GREEN PEDAL CYCLIST LIGHT SIGNAL**, followed by:

(b) a **FLASHING RED OR GREEN PEDAL CYCLIST LIGHT SIGNAL**, followed by:

(c) a **STEADY RED PEDAL CYCLIST LIGHT SIGNAL**.

4 Pedestrian and pedal cyclist light signals shall have the significance assigned to them in the National Road Traffic Regulations.

Figure 6.5a: Recommended system - Pedestrian and pedal cyclist signal sequence

Figure 6.5b: Alternative system - Pedestrian and pedal cyclist signal sequence
5 A STEADY GREEN MAN LIGHT SIGNAL indicates to a pedestrian that he or she may cross the roadway within the pedestrian crossing markings RTM3 or RTM4 as appropriate, and that the driver of a vehicle shall yield right of way to a pedestrian crossing such roadway.

6 A STEADY GREEN PEDAL CYCLIST LIGHT SIGNAL indicates to a pedal cyclist that he or she may cross the roadway within the pedal cyclist crossing, and that the driver of a vehicle shall yield right of way to a pedal cyclist crossing such roadway.

7 A FLASHING RED or GREEN MAN LIGHT SIGNAL indicates to a pedestrian (a) who has not yet commenced crossing the roadway that he or she shall not cross the roadway until the steady green man light signal is displayed, or (b) who is within a pedestrian crossing that the steady red man light signal will follow shortly.

8 A FLASHING RED or GREEN PEDAL CYCLIST LIGHT SIGNAL indicates to a pedal cyclist (a) who has not yet commenced crossing the roadway that he or she shall not cross the roadway until the steady green pedal cyclist light signal is displayed, or (b) who is within a crossing that the steady red pedal cyclist light signal will follow shortly.

9 A STEADY RED MAN LIGHT SIGNAL indicates to a pedestrian that he or she shall not cross the roadway until the steady green man light signal is displayed.

10 A STEADY RED PEDAL CYCLIST LIGHT SIGNAL indicates to a pedal cyclist that he or she shall not cross the roadway until the steady green pedal cyclist light signal is displayed.

11 A GREEN MAN or PEDAL CYCLIST LIGHT SIGNAL shall not be displayed at the same time as a STEADY RED or FLASHING RED or GREEN MAN or PEDAL CYCLIST LIGHT SIGNAL on the same crossing.

12 A pedestrian signal face shall comprise two light signals, one depicting a red standing man and the other depicting a green walking man. The standard signal face Type S11P shall be used. The red man signal shall be located in line directly above the green man signal aspect.

13 A pedal cyclist signal shall comprise two light signals, displaying a green and red pedal cycle symbol respectively when illuminated. The standard pedal cyclist signal face Type S11C shall be used. The red pedal cyclist shall be located directly in line above the green pedal cyclist aspect.

14 Pedestrian and pedal cyclist signal aspects may have a 210 mm or 300 mm nominal diameter. The larger diameter may be used for improved visibility or conspicuity.

6.3.3 Operation of pedestrian and pedal cyclist signals

1 The function of the steady GREEN MAN and GREEN PEDAL CYCLIST LIGHT SIGNAL is to provide a limited initial "step off" or "launching" interval for pedestrians and pedal cyclists. IT SHALL always be followed immediately by a FLASHING RED or GREEN MAN or PEDAL CYCLIST LIGHT SIGNAL.

2 The STEADY GREEN MAN or PEDAL CYCLIST LIGHT SIGNAL shall be displayed for an interval appropriate for the particular traffic conditions and shall be not less than a minimum of 4 seconds. A longer interval of 5 to 7 seconds, however, is usually more desirable.

3 Sufficient time must be provided after the green man or pedal cyclist light signal for a pedestrian to walk or pedal cyclist to push his or her bicycle across the roadway to the other side of the road, or up to the median island where such median is provided. Where the median is set back from the pedestrian crossing, sufficient time must be provided to allow crossing of the junction in one stage.

4 A design walking speed of 1.2 m/s should be used for calculating the pedestrian or pedal cyclist clearance time under normal operating conditions. A slower speed of 1.0 m/s may be used for elderly or infirm pedestrians. The pedestrian or pedal cyclist must be able to clear the roadway by the time the parallel vehicular intergreen ends (end of the all-red interval).

5 The FLASHING RED or GREEN MAN or PEDAL CYCLIST LIGHT SIGNAL should not be displayed for a period longer than the duration of the pedestrian or pedal cyclist clearance time. The flashing signal can, however, be displayed for a shorter period if a STEADY RED MAN or PEDAL CYCLIST LIGHT SIGNAL is displayed for the remainder of the clearance time. The flashing signal should not be displayed for a period shorter than the minimum of the following two values:

(a) 75% of the clearance time; or
(b) the clearance time less the parallel vehicular intergreen period.

6 At road junctions, the pedestrian or pedal cyclist phase may run concurrently with a parallel vehicular phase. The vehicle phase, however, SHALL not include any exclusive turning phase in conflict with the pedestrian or pedal cyclist green phase.

7 The green man (and pedal cyclist) signal normally starts at the same time as the vehicular green. The vehicular green light signal, however, may be delayed to allow pedestrians to enter the roadway ahead of vehicles. Care should be taken in using delays longer than 3 seconds as such delays can lead to undesirable behaviour. Such behaviour may include illegal turning manoeuvres by drivers and pedestrians (or pedal cyclists) utilising the delay to cross the junction in the wrong direction.
At a mid-block pedestrian or pedal cyclist crossing, other than where a "Pelican" phase has been provided, a vehicular red light signal SHALL be displayed for at least the full duration of the green and flashing red or green man or pedal cyclist intervals. It may also be necessary to introduce an "all-red" interval.

At a mid-block pedestrian or pedal cyclist crossing, a "Pelican" phase may be provided to indicate to drivers of vehicles that pedestrians may be clearing the road and have right of way. During the "Pelican" phase, vehicular FLASHING DISC LIGHT SIGNALS are displayed at the same time as the FLASHING RED or GREEN MAN or PEDAL CYCLIST LIGHT SIGNAL. Pedestrians may not enter the crossing on the flashing red or green man, and the duration of this interval should therefore NOT exceed the time required by pedestrians to clear the crossing.

When vehicular signals are in flashing mode, pedestrian and pedal cyclist signals must be switched off, giving no pedestrian or pedal cyclist indications (except when the signal is operating in pelican mode).

### Layout of pedestrian and pedal cyclist signals

1. A pedestrian signal face Type S11P or a pedal cyclist signal face Type S11C is provided for each direction of movement at a junction or mid-block crossing (both sides of the roadway).

2. The signal faces may be mounted on the same posts as vehicular signal faces, either parallel or perpendicular to the vehicular faces. The following criteria should be used in selecting posts for the mounting of pedestrian signal faces:
   - The signals should be in line with the pedestrian crossing, at a position where pedestrians can readily see the signals.
   - The signals should not be located at a position where vehicles stopping at, or slightly beyond, the stop line may obstruct the visibility of the signals. Attention must particularly be given to the possible obstruction of the signal face by buses and heavy vehicles.
   - The signal posts should not impede the flow of pedestrian traffic.
   - The number of signal posts should be restricted to avoid clutter on the sidewalk and to reduce installation and maintenance costs.

3. At signalised mid-block pedestrian or pedal cyclist crossings, type S1 traffic signal faces SHALL be used to control vehicular traffic. The left-hand S1 signal faces should not be located more than 2 m laterally from the edge of the roadway.

### Mounting of pedestrian and pedal cyclist signals

1. Pedestrian and pedal cyclist signals should preferably be post-mounted. The signals should have a minimum clearance above the sidewalk of not less than 2,1 m. The signal face should be not more than 3,0 m above the level of a point on the road surface nearest to the post, measured to the centre of the lowest (green) light signal.

2. Where the pedestrian or pedal cyclist signal face is mounted adjacent to a vehicular signal face, the red man or pedal cyclist signal aspect SHALL not be mounted higher than the level of the lowest vehicular green signal aspect. The pedestrian or pedal cyclist signal faces should not be located in a line vertically with any vehicular signal aspect facing the same direction and should be offset to the left or right of such signal aspect.

3. The pedestrian or pedal cyclist push button should be mounted approximately 1,1 m above the sidewalk surface. A pedestrian or pedal cyclist sign should preferably be placed immediately above or below the push button.
6.4 TRAFFIC SIGNALS TO CONTROL INDIVIDUAL VEHICLES

6.4.1 Operation

1 Traffic signals for the control of individual or single vehicles, as distinct from those that give right of way to groups of vehicles, are used to control traffic at locations such as freeway on-ramps, toll booths and roadside checkpoints.

2 The Type S12 traffic signal face is used for the control of individual vehicles as shown in Figure 6.6. The signal face comprises only a RED DISC and a GREEN DISC LIGHT SIGNAL.

3 A yellow signal aspect is not provided in the S12 signal face. The signals should therefore not be used to control vehicles other than those that are stationary or travelling at low speed. This can be achieved by:
   (a) displaying the green signal only to a vehicle that has already stopped at a stop sign, or other similar sign, near to the signal (such as at toll booths and checkpoints); or
   (b) resting the signal in red and displaying the green signal ONLY when required, and then only for a few seconds to allow one stopped vehicle to depart at a time (such as when ramp metering is applied).

4 Where it is required to give continuous right of way to all approaching vehicles, the green light signal may be displayed continuously. When it is necessary to switch the signal to red, a flashing red light signal should first be displayed for a duration of at least 5 seconds.

5 At no time SHALL an operational traffic signal be intentionally switched off and blacked out, other than for maintenance or repairs or when controlled by a traffic officer or an authorised pointsmen. Flashing red light signals may also be used to indicate that the signals are out of order.

6.4.2 Application at toll booths and checkpoints

1 The S12 traffic signal face is used at toll booths and checkpoints to instruct vehicles either to stop or to continue.

2 A STOP sign R1, or any other sign that instructs the driver to stop, should be displayed at the stopping point. At least one S12 traffic signal face should then be provided per lane of traffic, located on the right-hand (driver’s) side of the lane. The signal face should be located not less than 6 m beyond the stop position.

3 The signal should wherever possible, be controlled automatically. The duration of the green light signal and change to red can best be controlled by the output from vehicle detectors in each lane. The illumination of the green light signal may be performed automatically, e.g. linked to a toll booth cash register, or manually.

6.4.3 Application in ramp metering

1 Ramp metering is applied to restrict the number of vehicles allowed to enter a freeway in order to ensure an acceptable level of service on the freeway or that the capacity of the freeway is not exceeded.

2 For the purpose of ramp metering, a STOP LINE RTM1 shall be provided on the on-ramp. At least two S12 traffic signal faces should be provided for ramp metering at a distance not less than 6 m (preferably not less than 10 m) beyond the stop line.

3 When ramp metering is in operation, the S1 signals should normally rest in red, and a green light signal displayed ONLY when required and then only for the time required by a departing vehicle to clear the line of vision of the signal face. Such timing should preferably be achieved by means of vehicle detectors. Two detectors would normally be required for this purpose, namely the check-in and check-out detectors.

4 The check-in detector is located at the position where vehicles would normally stop at the stop line. The check-in detector is used to actuate the green light signal when an approaching vehicle is detected AND a minimum red period has expired.

5 The check-out detector actuates the red light signal as soon as a vehicle is detected. The detector must be located beyond the last traffic signal at a point where the red light signal will not be visible to the departing vehicle.

Figure 6.6: Single vehicle release operating sequence
6.5 LANE DIRECTION CONTROL SIGNALS

6.5.1 General

1 Lane direction control signals are used to signalise reversal of traffic flow along a road lane to accommodate the tidal nature of traffic flow during different times of a day. The signal shall be used to indicate the permitted direction of traffic movement along a lane of a road and to prohibit the entry of traffic into, and the movement of traffic along, that lane from the opposite direction. In this way, right of way can be allocated alternately on a predetermined basis, to one of two possible directions of traffic movement in the lane, or lanes, so signalised.

2 Lane direction control signals shall ONLY be used to permit or prohibit traffic movements in situations where at least one lane is subject to reversals of the direction of traffic flow. If there is a need for such application, use can be made of VARIABLE MESSAGE SIGNS.

3 The signal faces that may be used for lane direction control are the S16, S17, S18 and S19 signals shown in Figure 6.7a. Permitted variants of the S16 and S17 signal faces are shown in Figure 6.7b. The variants S(16)-17 and S16-(17) may be provided as variable signals where both the cross and arrow can be displayed on a single matrix.

4 The STEADY GREEN DOWNWARD-POINTING ARROW SIGNAL S16 is used to indicate to the driver of a vehicle that he or she may drive his or her vehicle in the lane over which the arrow is displayed.

5 The STEADY RED CROSS SIGNAL S17 is used to indicate to the driver of a vehicle that he or she shall not drive his or her vehicle in the lane over which the cross is displayed and that the lane is open to vehicles travelling in the opposite direction.

6 The YELLOW LEFT AND RIGHT ARROW SIGNALS S18 and S19 are used to indicate to the driver of a vehicle that the lane over which the arrow is displayed is closed ahead and that he or she shall leave the lane in the direction of the arrow when it is safe to do so.

6.5.2 Installation

1 LANE DIRECTION CONTROL SIGNALS shall comprise of two independently illuminated signal aspects, Types S16, and S17. The signals SHALL be mounted in PAIRS as shown in Figure 6.7c, one facing in each direction, centrally over the traffic lane subject to reversal in direction of use.

2 PAIRS of the lane direction control signals S16 and S17 shall be placed at the beginning and end of each lane subject to reversed flow and at intermediate points along the lane that will enable a driver to see at least two light signals at any time, the distance apart not exceeding half the minimum sight distance for urban conditions given in Table 6.1.
3. It is recommended that fixed display lane direction control signals, or fixed "arrow" or "cross" signs, be placed over all OTHER lanes that are not subject to reversible traffic flow, to supplement the LANE DIRECTION CONTROL SIGNALS.

4. LANE DIRECTION CONTROL SIGNALS S18 or S19 may be placed in advance of the lane closure, over the centre of the lane to be closed. Signals S18 or S19 shall be operated on the basis that they are either illuminated or switched off. The signals shall be illuminated when they precede an illuminated S17 RED CROSS signal over the reversible flow lane. If it is necessary to provide a long merging distance, more than one S18 or S19 signal may be used, in sequence, over the approach lane. These signals do not have to be mounted in pairs.

5. The roadway signals S18 or S19 should be located in advance of the lane closure at a distance as given in Table 6.1. This distance should be increased in accordance with the difficulty which traffic may experience in merging with traffic in the adjacent lane.

6. The lane direction control signal faces are normally gantry mounted and the standards for height and clearance are the same as for other signals. The faces may NOT be mounted with the centre of the signal aspects at a height exceeding 6.2 m above the road. There shall also be a vertical clearance of not less than 5.2 m from the road to the lowest part of any light assembly or supporting structure.

6.5.3 Operation

1. Reversal of the direction of traffic flow along a road lane, or lanes, may be used where it will be beneficial to make use of the tidal nature of traffic flow. Such traffic flow reversals, however, shall be used only where it can be certain that it will operate safely. The technique is not recommended for use on roads with a speed limit exceeding 80 km/h.

2. Careful attention should be given to capacity requirements and channelisation of traffic at each end of the lane(s) subjected to reversed traffic flows. Inadequate capacity to meet the increased directional flow will mitigate against the effectiveness of the action. Some drivers may get confused as to which lanes to use at the terminal points and extra control signals or other measures may be needed at these locations.

3. Traffic flow in any one direction shall be for continuous periods of not less than one hour. Changeover should preferably occur at the same time of each day of the week and when traffic volumes are not at, or near, the peak. It is recommended that there should be no more than two changeovers in one day, i.e. one period of reversed flow per day.

4. Prior to permitting vehicles to use a reversible direction lane, all the signals along each section shall show crosses in both directions to provide sufficient time to ensure that the traffic lane is free of moving or trapped vehicles.

5. Signals may be switched off when not required, provided that in such circumstances the direction of flow of traffic and the bounds of traffic lanes are obvious from other permanent road traffic signs.

Figure 6.7c: Back-to-back mounting of lane direction control signals
6.6 FLASHING RED DISC LIGHT SIGNAL AT RAILWAY CROSSINGS

6.6.1 Recommended system for railway crossings

1 The National Road Traffic Act permits the railway operator (Transnet Limited) to erect road traffic signs at railway crossings as they may deem expedient. However, provision is also made in the act that such operator can be directed to display or remove signs as may be required.

2 No person shall stop a vehicle on the roadway of a public road within the railway reserve at a level crossing, except in order to avoid an accident, or in compliance with a road traffic sign or with a direction given by a traffic officer.

3 Railway crossings should be marked with the rail crossing warning signs W403 or W404. Sign W403 is displayed on approaches to single railway level crossings, while sign W404 is displayed on approaches to level crossings with more than one railway line. In addition to these signs, the advance warning sign, W318, can be applied with good effect, particularly under circumstances where visibility is obscured.

4 A number of road signs may be used for the control of traffic at level railway crossings. These include the use of FLAG SIGNALS SS2 as well as STOP SIGNS R1 and YIELD SIGNS R2 singly or in combination with the W403 or W404 warning signs.

5 FLASHING RED DISC LIGHT SIGNALS (FRD) may also be used to warn drivers that a train is approaching a level crossing. Two such signals shall be used in conjunction with a STOP SIGN R1 and a warning sign W403 or W404. The signals shall be mounted below the stop sign R1 and above the warning signs W403 or W405 as shown in Figure 6.8a. The flashing red disc signal indicates to the driver of a vehicle that he or she shall stop his or her vehicle and shall not proceed until it is safe to do so, and such signal shall have the same significance as stop sign R1.

6 The two flashing red light signals are used to indicate to a driver that he or she shall stop his or her vehicle. The preferred mode of operation is that a flashing red disc light signal is displayed at least 30 seconds before the arrival of a train. If gates or barriers protect the crossing, the flashing red light signal should start 20 seconds before the gate or barrier closes.

7 The two flashing red disc light signals shall be arranged to flash alternately in such a way that the alternating flashes remain constantly out of phase i.e. when one disc is fully illuminated the other disc has zero luminous intensity and vice versa.

8 The flashing red light signals at railway crossings SHALL be situated on the near side of the railway crossing, on the left side of each approach roadway. The flashing red light signals shall conform in all respects to the requirements laid down for vehicular traffic signals at road junctions and pedestrian crossings, except that:
   (a) The signal face shall comprise a single red disc aspect and shall be mounted on the same post as the stop signs R1 and the warning signs W403 or W404.
   (b) The red disc aspect shall be displayed only in flashing mode, as and when required to warn of the approach or presence of a train, and shall not display a steady red light signal at any time.
   (c) Two flashing red disc signal aspects shall be provided on the same post.
   (d) The flashing red disc signal may be accompanied by an audible signal.
   (e) The signal posts shall be as for road signs.

Figure 6.8a: Recommended system - Flashing red disc light signals at railway crossings
6.6.2 **Alternative system** for railway crossings

1. In the alternative system, a number of road signs may be used at level railway crossings. These include the railway level crossing warning signs W403 or W404 and other control signs. Sign W403 is displayed on approaches to single railway level crossings, while sign W404 is displayed on approaches to level crossings with more than one railway line. In addition to the railway crossing signs, the advance warning sign W318 can also be used where the visibility to the crossing is obscured for whatever reason.

2. Additional road signs that may be used include FLAG SIGNALS SS2 as well as STOP SIGNS R1 and YIELD SIGNS R2 singly or in combination with the W403 or W404 warning signs.

3. A **FLASHING RED DISC LIGHT SIGNAL** (FRD) may be used to warn drivers that a train is approaching a level railway crossing. One such signal SHALL be used in conjunction with a warning sign W403 or W404. The signal shall be mounted above the warning signs W403 or W405 as shown in Figure 6.8b. The red flashing light signal shall be used to indicate the approach of a train and that the driver of a vehicle shall stop his or her vehicle and shall not proceed until the signal ceases to flash, and it is safe to do so.

4. It is recommended that at other times, when there are no approaching trains, a **FLASHING WHITE DISC LIGHT SIGNAL** be displayed to indicate to drivers of vehicles that the railway crossing light system is operational, that there are no trains approaching, and that they may proceed across the lines PROVIDED it is otherwise safe to do so.

5. The preferred mode of operation is that a flashing red disc light signal is displayed at least 30 seconds before the arrival of a train. If gates or barriers protect the crossing, the flashing red light signal should start 20 seconds before the gate or barrier closes. A flashing white light signal is recommended to follow the FRD once the crossing is open to traffic.

6. The flashing red light signal at a railway crossing SHALL be situated on the near side of the railway crossing, on the left side of each approach roadway. The signal shall also conform in all respects to the requirements laid down for vehicular traffic signals at road junctions and pedestrian crossings, except that:
   a. The signal face shall comprise a single red disc aspect, optionally the signal face may also include a white disc aspect, and the signal face shall be mounted on the same post as and directly above the warning signs W403 or W404.
   b. The red disc aspect shall be used to display only a flashing red disc light signal, as and when required, to warn of the approach or presence of a train, and shall not display a steady red light signal at any time.
   c. Duplicate aspects may be provided on one signal face and these may flash alternately.
   d. The FRD may be accompanied by an audible signal.
   e. The signal posts shall be as for road signs.

Figure 6.8b: **Alternative System** - Flashing red disc light signals at railway crossings
6.7  HAND AND OTHER SIGNALS

6.7.1  General

This section covers a number of traffic signals that involve manual indications or other signals that are no operated electrically, and include the following:

(a) control hand signals for use by traffic officers SS1;
(b) flag signals SS2;
(c) flashing yellow warning signals SS3; and
(d) flare signals SS4.

6.7.2  Control hand signals for use by traffic officers SS1

1 CONTROL HAND SIGNALS FOR USE BY TRAFFIC OFFICERS SS1 may be used to control the movement of traffic and/or pedestrians and as such are regulatory signals. Such signals will normally be used when some other form of traffic control is out of operation or when traffic volumes are such that special control needs to be exercised to reduce congestion and establish order, or when there is a need to stop traffic for a specific reason.

2 A control hand signal SS1 shall conform to the requirements of one of the standard hand signals as shown in Figure 6.9a and shall be:

(a) a hand signal to stop traffic approaching from the front, indicating to the driver of a vehicle approaching a traffic officer from the front, who is displaying the signal, that he or she shall stop until the signal referred to in d) below is displayed;

(b) a hand signal to stop traffic approaching from the rear, indicating to the driver of a vehicle approaching a traffic officer from the rear who is displaying the signal, that he or she shall stop until the signal referred to in d) below is displayed;

(c) a hand signal to stop traffic approaching from the front and the rear, indicating to the driver of a vehicle approaching a traffic officer from the front or rear who is displaying the signal, that he or she shall stop until the signal referred to in d) below is displayed; or

(d) a hand signal to show traffic to proceed from the front, left or right, indicating to the driver of a vehicle that he or she may proceed if a traffic officer displays the signal.

3 In addition to the above hand signals, the traffic officer may use other hand signals to supplement those described above. It is common practice, for instance, for a traffic officer to select the vehicle that he or she wishes to stop some distance back in a traffic stream and to clearly identify it by pointing prior to giving the appropriate hand signal. In a similar way, a traffic officer may indicate by pointing to one of several stopped streams of traffic that the vehicles in the indicated stream may proceed.

4 Having given a stop signal to road users the traffic officer may lower the hand used for such signal and use it to execute other hand signals. The road users stopped by such original signal shall not proceed until directed to do so by the traffic officer.

5 When dealing with complex traffic movements it may be necessary for a traffic officer to give signals that combine more than one of the elements of those described above. For example, when directing turning traffic, it may be necessary for the traffic officer to cut-off traffic flow from the left by holding his extended arm at 90 degrees to his body instead of parallel to his body.

6 A traffic officer using hand signals should be positioned within the junction in a position most visible from all approaches and as close as possible to the centre of the junction, subject to paths of the vehicles that are permitted to enter the junction at any given time.

6.7.3  Flag signal SS2

1 FLAG SIGNALS SS2 may also be used to control the movement of traffic, and as such are regulatory signals. Such signals will generally be used at roadworks and for the control of traffic during sporting and other events taking place on a public road. It is particularly appropriate for small and mobile works where flags may also be combined with road signs and/or construction vehicles.

2 A flag signal SS2 shall conform to the requirements of the flag signals shown in Figure 6.9b and shall be:

(a) a flag signal to stop, indicating to the driver of a vehicle that he or she shall stop until the flag signal referred to in b) below is displayed; and

(b) a flag signal to proceed indicating to the driver that he or she shall proceed when the flag signal is displayed.

3 A WARNING FLAG SIGNAL may also be used to warn a road user to proceed slowly and be alert of a hazard in or adjacent to the roadway ahead.

4 Innovative techniques may also be employed with a warning flag signal to good effect. A flagman may, for instance, stand at a particularly important road sign and point to it with a second flag.

5 Flagmen should wear conspicuous and distinctive clothing such as fluorescent-coloured helmets, bright coloured overalls together with a safety vest or jacket utilising retro-reflective and/or fluorescent panels in red, yellow, and/or white.

6 Flagmen should be located well in advance of the hazard to which attention is being drawn. This distance should at least provide sufficient time for vehicles to slow down before reaching the hazardous location, but not at such a distance that drivers will tend to increase speed. The flagman should stand in a very visible position.

7 The flagman should either stand on the shoulder adjacent to the lane of traffic they are controlling or in a barricaded lane. Under no circumstances should they stand in the traffic lane. The flagman should stand alone, and nobody should be allowed to gather around the flagman.
8 Flag warning signals SS2 should be square with a minimum side length of 450 mm. A side length of 600 mm is preferred for high-speed approaches (over 60 km/h) or high traffic volumes. Flags should be made of a bright red or red-orange material attached to a staff approximately 1 m in length. The free edge, and if necessary the diagonal of the flag may be stiffened to maximise the visible area. However, such stiffening should not remove all capability of the flag to be waved. Retro-reflective and/or fluorescent materials are recommended. Flags shall be kept clean at all times.

6.7.4 Flashing yellow warning signal SS3

1 The FLASHING YELLOW WARNING SIGNAL SS3 may be used to warn a road user of the presence of a particular hazard or traffic control device. Signal SS3 may be combined with REGULATORY or WARNING signs as illustrated in Figure 6.9c, and it forms part of an emergency flashing light warning sign W346 or TW346.

2 The signal light shall conform in all respects to the requirements for a traffic light signal. The exceptions are as follows:

(a) The light signal shall be used to display a FLASHING YELLOW DISC LIGHT SIGNAL only, and shall not be used to display a steady light signal.

(b) No other light signal shall be displayed at, or alongside, the flashing yellow warning signal.

(c) Duplicate light signals, up to a maximum of four, may be provided at one sign and these may flash alternately.

(d) Signal posts shall be as for road signs.

3 Whilst the signal should be conspicuous, it shall not obscure the sign or distract attention from it. The brightness of the signal should not cause "discomfort glare" or "disability glare", particularly at night. If necessary, provision should be made to reduce the luminous intensity of light signals automatically during the hours of darkness.

4 The signal may be operated 24 hours every day, or intermittently, as required. Intermittent operation may be achieved by means of a time switch, or by an external input, for example, upon the actuation of a pedestrian push button at a pedestrian crossing.

5 It is recommended that flashing yellow warning signals should only be used in conjunction with road signs. The installation and operation of a flashing yellow warning signal is warranted where hazardous conditions exist on the road and/or it is necessary to draw attention to a road sign and reinforce its effect. If the signal can be warranted, an appropriate road sign must similarly be warranted. The road sign will indicate to drivers the specific nature of the hazard which the flashing signal cannot do. Installations shall be permanent except at roadworks where flashing yellow warning signals may be used with any of the prescribed temporary warning signs.

6 Single flashing yellow warning signals can only be used with warning signs where it is necessary to draw attention to the warning sign and reinforce its effect.

7 Two or four flashing yellow warning signals may be used with any road sign, but the arrangement and brightness of the signal should not detract attention from the sign or cause disability glare. The signals should flash alternately (singly on in pairs) and not randomly.

8 Flashing signals shall operate at a frequency of between one and two flashes per second and the luminous intensity shall be zero for 30% - 50% of the period and not less than the specified minimum for 30% - 50% of the period.

6.7.5 Flare signal SS4

1 The FLARE warning signal SS4 may be used to warn the road user of a temporary hazard in the roadway ahead and to serve as indication that they should reduce speed immediately.

2 Road safety flare signals SS4 are temporary devices with a high visual impact which may be used as an "immediate action" device by traffic officers attending the scene of a collision or other incident which affects the use of all or a portion of a roadway. Such flare signals should emit a red or red/orange light and moderate smoke. Flare signals permit traffic officers to deal as speedily as possible with any life threatening aspects of the incident before giving more detailed attention to traffic control.

3 It is recommended that two flares be used at any location. These should be placed well in advance of the incident site. As a guideline the first flare should be located a distance 2xD metres in advance, where "D" is the speed limit in km/h. The second flare should be located at a similar distance in advance of the first flare.

4 Before setting out flare signals the following checks should be carried out:

(a) Does the incident involve any hazardous/flammable materials?

(b) If it does, can these drain in the direction of the flares?

(c) Is the roadside vegetation, in combination with inflammable materials?

(d) Can the flare signal be made safe from falling over or rolling in the prevailing wind? FLARE signals shall not be held in the hand, or waved in the air.
Figure 6.9a: Control hand signals for use by traffic officers SS1

(a) (b) (c) (d)

Figure 6.9b: Flag signals SS2

(a) Stop (b) Proceed

Using stop/proceed flag signals to slow traffic down

Warning flag signal

Figure 6.9c: Flashing yellow warning signal SS3

Using stop/proceed flag signals to slow traffic down

Warning traffic in two directions

Figure 6.9c: Flashing yellow warning signal SS3
ROAD MARKINGS

SECTIONS

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7.1 Introduction
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CHAPTER 7: ROAD MARKINGS

7.0 CONTENTS

This contents listing illustrates each officially approved road marking in the regulatory, warning and guidance classes with the marking number and name. A page reference is given within this chapter where details of the function and basic dimensioning of each road marking can be found. Where appropriate, a cross reference is given to Volume 4, Chapter 12, where full dimensional details and other data are given.

Section 7.2: REGULATORY - Transverse Road Markings

- RTM1 - STOP LINE
  Ref. Vol 1-7.2.1

- RTM2 - YIELD LINE
  Ref. Vol 1-7.2.2

- RTM3 - PEDESTRIAN CROSSING LINES
  Ref. Vol 1-7.2.3

- RTM4 - BLOCK PEDESTRIAN CROSSING MARKINGS
  Ref. Vol 1-7.2.4
Section 7.3: REGULATORY MARKINGS

- **RM1 - NO OVERTAKING LINE**
  Ref. Vol 1-7.2.5

- **RM2 - NO CROSSING LINES**
  Ref. Vol 1-7.2.10

- **RM3 - CHANNELIZING LINE**
  Ref. Vol 1-7.2.11

- **RM4.1 - LEFT EDGE LINE**
  Ref. Vol 1-7.2.13

- **RM4.2 - RIGHT EDGE LINE**

- **RM5 - PAINTED ISLANDS**
  Ref. Vol 1-7.2.15  Vol 4-12.2.3/11
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RM6 - PARKING BAYS
Ref. Vol 1-7.2.17

RM7 and RM7.1 - EXCLUSIVE PARKING BAY
Ref. Vol 1-7.2.19 Vol 4-12.1.3 and 12.4.7 to 12.4.13

RM8 - MANDATORY DIRECTION ARROWS
Ref. Vol 1-7.2.20 Vol 4-12.3.2 to 12.3.4
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RM9 plus Word Marking RM17

RM9 plus Symbol Marking RM17
RM9 - EXCLUSIVE USE LANE LINE
Ref. Vol 1-7.2.21 and 7.2.31 Vol 4-12.1.3, 12.4.3, 12.4.6 and 12.5.1 to 12.5.7

RM10 - BOX JUNCTION
Ref. Vol 1-7.2.23 Vol 4-12.2.12

RM11 - ZIG-ZAG ZONE LINES
Ref. Vol 1-7.2.25 Vol 4-12.2.13
RM12 - NO STOPPING LINE (24 hour)  
On road surface  
Ref. Vol 1-7.2.26

RM13 - NO PARKING LINE (24 hour)  
On road surface  
Ref. Vol 1-7.2.27

RM14 - NO MOTOR CYCLES MARKING  
Ref. Vol 1-7.2.20, Vol 4-12.4.2

RM15 - TRAFFIC CIRCLE MANDATORY DIRECTION ARROWS  
Ref. Vol 1-7.2.28, Vol 4-12.3.5/6

RM16 - DISABLED PERSONS PARKING BAY  
Ref. Vol 1-7.2.30, Vol 4-12.1.2 and 12.4.5

RM17 - EXCLUSIVE USE LANE/PARKING SYMBOLS  
Ref. Vol 1-7.2.31, Vol 4-12.4.3/12.4.5/12.5.2
Section 7.3: WARNING MARKINGS

WM1 - RAILWAY CROSSING AHEAD
Ref. Vol 1-7.3.1 Vol 4-12.4.14

WM2 - CONTINUITY LINE
Ref. Vol 1-7.3.2

WM3 - DIVIDING LINE
Ref. Vol 1-7.3.3

WM4 - REVERSIBLE LANE LINES
Ref. Vol 1-7.3.4

WM5 - YIELD CONTROL AHEAD
Ref. Vol 1-7.3.4 Vol 4-12.4.15

WM6 - LANE REDUCTION ARROWS
Ref. Vol 1-7.3.5 Vol 4-12.4.7.8
Section 7.5: GUIDANCE MARKINGS

GM1 - LANE LINE
Ref. Vol 1-7.4.1

GM2 - GUIDE LINES
Ref. Vol 1-7.4.2

GM3 - BIFURCATION ARROWS
Ref. Vol 1-7.4.3 Vol 4-12.3.13/14

GM4 - INFORMATION ARROWS
Ref. Vol 1-7.4.3 Vol 4-12.3.15

GM5 - BICYCLE GUIDE LINES
Ref. Vol 1-7.4.4
GM6.1  Cycle Facility
GM6.2  Airport
GM6.3  Disabled Person Facility
GM6.4  High Occupancy Vehicle

GM6 - ROAD MARKINGS SYMBOLS
Ref. Vol 1-7.4.5 Vol 4-12.4.3 to 12.4.6

GM7 - WORD MARKINGS
Ref. Vol 1-7.4.6 Vol 4-12.5.1 to 12.5.9

GM8 - KERBFACE MARKINGS
Ref. Vol 1-7.4.6
CHAPTER 7: ROAD MARKINGS

7.1 INTRODUCTION

7.1.1 General

1 Developments in road traffic signing in Southern Africa have increasingly tended towards European practices. The details given on road markings in this manual conform closely to general European practice whilst also incorporating many of the ad hoc concepts already used in Southern African cities, provinces and countries.

2 Road markings may be defined as markings embedded in, or applied, or attached, to the road surface, kerbing, or to objects within or adjacent to the roadway for the purpose of regulating, warning or guiding traffic and to delineate the limits of the roadway and all, or portions, of the travelled way. The term ROAD MARKINGS therefore includes roadstuds, and other lateral delineation devices such as guardrail delineators and traffic cones. Roadside markings may be used to supplement road signs and traffic signals, or they may be used on their own.

3 The modus operandi in developing the system of road markings has been:

(a) to make clear the functional purpose of each type of marking; and
(b) to optimise the effectiveness of road markings, recognising that the application of markings and the maintenance of them is an on-going budgetary problem for road authorities.

4 Road markings have the limitation that they may be obliterated under adverse weather conditions. Their conspicuity is impaired, often significantly, when wet or dirty and their durability depends to a great extent on their exposure to traffic wear. Road markings perform a very necessary function by conveying requirements and information to drivers which might not be possible with road signs. They may often be visible when signs are obscured and are able to provide message continuity to a driver of a moving vehicle which is difficult and costly to achieve by signing.

5 The following sections of this chapter detail the individual types of road markings. These types of markings comprise the "tools" which a road designer may utilise. It is highly recommended that, particularly when undertaking road junction design, the road marking requirements be considered at the planning stage. The use of these road markings "tools" is in fact part of the design process. Typical details of applications and combinations of various road markings are covered in Volume 2.

6 Erasing road markings remains a difficult process. Although research is being undertaken to find improved methods, erasing of markings should be limited wherever possible. Since the removal of incorrect or badly positioned road markings is so difficult to do well it is very important that designers are conscious of the need to plan with care and attention to detail so that only necessary markings are applied. This is particularly important in urban areas where a lack of adequate planning can result in markings being applied to large areas of the road surface. Without the necessary care, this problem may become so extensive as to create a skidding risk, particularly for motorcyclists, and in any event will be expensive to eradicate or maintain (see also Subsections 7.1.12 and 7.1.15).

7.1.2 Objectives

1 The continuing increase in traffic volumes on our roads makes the extensive and correct use of road markings essential. By so doing the full and efficient use of often limited road space may be achieved. The widespread use of lane markings is desirable to enhance lane discipline, which in turn adds significantly to improved traffic flows and road safety. In urban areas particular advantages accrue from the use of adequate and accurate road markings at junctions.

2 Objectives to be aimed for in providing road markings therefore are:

(a) road safety;
(b) conformity of practice;
(c) good traffic management leading to optimum road capacity;
(d) provision of the correct marking first time.

7.1.3 Classification of Road Markings

1 Road markings may comprise any of the following types, either separately or in combination:

(a) transverse markings (approximately at right angles to the roadway centre line);
(b) longitudinal markings;
(c) arrows;
(d) painted islands;
(e) symbols;
(f) words, letters and/or numerals;
(g) parking markings;
(h) roadstuds;
(i) other delineation devices.

2 Since many of these types of marking can have more than one functional purpose, road markings are classified as follows:

(a) regulatory markings;
(b) warning markings;
(c) guidance markings;
(d) roadstuds;
(e) other delineation devices.

3 It is essential that road authority officials and road designers correctly understand the significance of markings they wish to utilise.

7.1.4 General Design Principles

1 Road markings are provided not only to satisfy traffic engineering requirements but should also be economically and environmentally suitable. Road markings should therefore embody the following properties:

(a) good visibility by day and night;
(b) good skid resistance;
(c) durability;
7.1.2 INTRODUCTION

(d) clarity of message;
(e) where appropriate, symbolic markings should be elongated in the direction of movement of traffic (an elongation of at least 3 to 1 compared to a similar symbolised on a sign face is recommended);
(f) elongated markings should be sized in relation to the operating speed of traffic;
(g) short drying or application times to keep traffic disruption to a minimum;
(h) low environmental impact (products shall not contain substances banned under national or international law).

2 The visibility of road markings depends on the observation angle, the length of the marking and the contrast in the levels of light reflected by the marking and by the surrounding surfaces. This LUMINANCE CONTRAST is considered to result under conditions of identical illumination of the contrasting surfaces. Illumination of road markings may occur by virtue of the generally diffuse, or scattered, light provided by daylight or by overhead street lighting, or by the more direct light provided by vehicle headlamps. The luminance of a marking is dependent on the amount of pigment, the presence of glass beads (which reduces the luminance) and the method or manner of application. To be visible, markings must contrast adequately with the surface to which they are applied.

3 Night-time illumination by vehicle headlamps results in low levels of marking illumination, certainly at medium to long range. At such low levels the contrast sensibility and colour perception properties of the eye are significantly reduced. This results in colours merging into the background and perception of detail is severely diminished. To improve contrast it is generally recommended that road markings which have night-time significance be made retroreflective by the use of glass beads (ballotini), applied either in a mixed form or after application of a paint. The need to provide retroreflective road markings on road surfaces illuminated by overhead street lighting will be determined by the grade of street lighting to be used. Under lower grades of street lighting the use of retroreflective street markings may still be warranted (see Subsection 7.1.8).

4 It has been demonstrated by experiment that due to the optical circumstances of night-time driving the best roadway delineation can be achieved by placing the delineation devices as low as possible i.e. on the road surface, and as laterally close to the vehicle path as possible.

5 The following general rules are useful to help one understand why a wide variety of lines have been developed. This variety indicates that the system is becoming complex, which places a duty on designers to apply the various types of marking with care. In general:
(a) broken longitudinal lines are permissive in character;
(b) continuous solid longitudinal lines are restrictive in character;
(c) double continuous solid lines indicate maximum levels of restriction;
(d) the width of line is an indication of the degree of emphasis attached to the marking.

6 The effectiveness of road markings will deteriorate rapidly if their application is not adequately specified and controlled. When road markings have poor durability the road authority is forced to re-mark more frequently which results in poor cost-efficiency. If road markings are not durable or well maintained the accident potential for sections of roadway may be significantly increased, with further adverse economic effects (see Subsection 7.1.15).

7 Since the presence of water on the road surface rapidly makes road markings ineffective, critical attention must be given to rapid drainage of surface water from the roadway.

7.1.5 Dimensioning and Setting Out

1 The minimum width of any line marking shall be 100 mm.

2 In general the diagrams given in this chapter do not include dimensions. The principal dimensions are, however, given in the descriptive text for each marking. Detailed dimensions are given diagrammatically in Volume 4. It should be noted that minimum dimensions are stated for most road markings. Many of these minimum dimensions are also prescribed by legislation. However, there is no impediment to using wider line dimensions. Many existing practices already use wider than minimum values for particular emphasis. Care should be exercised in this regard, however. There are a very limited number of possible line markings and many markings with different functions have a similar appearance. The need to maintain a visual indication of such functional differences must be recognised.

3 All broken line markings are described by a LINE-TO­GAP RATIO and recommended dimensions of line and gap lengths are given in each appropriate Subsection. Longitudinal broken line markings are designed for convenience to be set out in MODULES. A module may comprise one or several line-plus-gap combinations.

4 The STANDARD MODULE dimension for rural roads is 12m and for urban roads is 9 m. When undertaking geometric design, it is recommended that taper lengths, painted island lengths etc. be dimensioned in multiples of the appropriate module length. This will generally improve the ease of setting out of all changes in direction and/or line type, broken line markings and roadstudls when the latter are required.

5 The appearance of a standard module may be modified by an alteration in the line-to-gap ratio. This type of treatment may be used particularly with a LANE LINE marking GM1, or a CONTINUITY LINE marking WM2. The line length remains a standard length and the gap length is altered. This has the effect of increasing or decreasing the number of line-plus-gap combinations within a standard module. This technique is illustrated in Figure 7.1 and specific details of the different module dimensions are given in the relevant subsections. The standard module is therefore an intermediate form of the road marking which may be modified to produce a REDUCED density form or an EXTRA density form. When a multi-lane road is marked or re-marked with parallel broken lines such as DIVIDING LINE marking WM3, LANE LINE marking GM1, and/or CONTINUITY LINE marking WM2, it is normal practice to line up parallel modules at regular cross-section intervals. The line markings may be lined up at the front or back of the module cross-section, or the markings may be centred on the module cross-
section as illustrated in Figure 7.2. Adoption of one of these approaches will also assist the regular positioning of roadstuds when these are specified.

6 On multi-lane roadways which have a curving alignment it is recommended that modules be set out on the centre or DIVIDING LINE. The effect of the curvature will increase the circle perimeter outside the centre line and reduce it on the inside of the centre line. Setting out will be simplified in such circumstances if the outer modules are extended and the inner modules shortened so that markings line up on cross-sections. This will assist matching of modules into and out of curves and onto straight lines.

7 Although detailed dimensions of all arrow, symbol, letter and numeral markings are given in Volume 4, generally recommended lengths of such markings related to operating speeds of traffic are given in Table 7.1. More detailed comments on the appropriate lengths of specific markings are given in the relevant subsections and in Volume 2, Table 2.3.

7.1.6 Location

1 In order that the effects of dirt and surface water may be minimised longitudinal road markings should not be located closer than 150 mm from the edge of roadway surface. If roadstuds are required between a line and the edge of road surface the line should be located 250 mm from the road edge.

2 When roadstuds are to be applied next to a longitudinal continuous solid line marking the roadstuds should preferably be placed 50 mm from the line on the side outside the travelled way. This spacing may be reduced to 25 mm in exceptional cases.

3 When parallel longitudinal lines are marked close to each other they should be spaced a minimum of 50 mm apart. If roadstuds are to be applied between such lines the lines should then be spaced at least 150 mm apart.

4 In general STOP LINE marking RTM1 and YIELD LINE marking RTM2 should be located in relation to the edge of the main road or according to the junction geometry if the junction is channelised. These lines should NOT arbitrarily be located in line with the road reserve boundary. Unless the junction is controlled by a traffic signal or a 3- or 4-way stop control adequate Shoulder Sight Distance must be available to drivers of vehicles when they are stopped in the prescribed manner at a STOP or YIELD marking. This Shoulder Sight Distance must allow for drivers of stationary vehicles to see enough of the main road in order to move off, to cover a distance comprising the total of the distance of the STOP or YIELD marking from the edge of the intersecting roadway, plus the width of that roadway, plus the length of their vehicle. Such a manoeuvre must be able to be completed in the time it takes a vehicle, which has just come into view on the main road as the driver on the controlled road moved off, to reach the junction (see Subsections 7.2.1 and 7.2.2 and Section 2.2 including Figures 2.7 and 2.8).

7.1.7 Materials

1 Road markings may be applied in a paint, plastic or bonded sheet form. The texture and preparation of the road surface to which markings are to be applied determine, to a great extent, the effectiveness of the application and therefore the life of the markings.

2 Road marking paints may be applied in a range of thicknesses of the order of 0.2 mm to 0.5 mm and are designed to be quick drying. Thin-application paints with limited durability are appropriate only to lightly trafficked roads or roads likely to be subjected to maintenance within the longer life of more appropriate thicker-application markings used on busier roads. The skid resistance of painted markings may be low and specifications should ensure that this aspect is adequately covered and that compliance with specifications is achieved (see Subsection 7.1.8).

<table>
<thead>
<tr>
<th>Operating Speed (km/h)</th>
<th>Typical applications</th>
<th>Table 7.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-40</td>
<td>City Centre</td>
<td>Arrows, Symbols, Letters (m)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.25 or 2.5</td>
</tr>
<tr>
<td>50-60</td>
<td>Urban</td>
<td>2.5 or 4.0</td>
</tr>
<tr>
<td>70-90</td>
<td>Urban Arterial/Rural Expressway</td>
<td>4.0 or 5.0</td>
</tr>
<tr>
<td>100-120</td>
<td>Rural Roads and Freeways</td>
<td>5.0</td>
</tr>
<tr>
<td>Special Applications</td>
<td>High Speed/High Accident Incidence Sites</td>
<td>7.5</td>
</tr>
</tbody>
</table>

**NOTES:**

(1) The marking lengths given are for general applications. There are variations to these recommendations which are covered in the individual road marking subsections.

(2) Lengths of arrows vary greatly depending on their type. For full details see Volume 4, Chapter 12, Section 3.
3 Thick-application materials in the form of thermoplastics or cold-applied plastics have greater skid resistance properties. Thermo-plastic materials, although expensive, can be cost effective, particularly if used for transverse lines, pre-cut symbols, larger marked areas and for markings on sections of road subject to very high traffic flows. Thermo-plastic material may be spray applied (1 mm to 1.5 mm thickness) or screed-applied (up to 3 mm thickness). Cold-applied plastics are even more expensive and their durability can be cost effective under conditions of extreme wear.

4 Bonded sheet or pre-formed bonded tapes are generally too expensive to be cost effective for large scale use. Permanent and temporary grades of bonded tape are available. The permanent grade can be cost effective for transverse markings, pre-cut symbols and larger marked areas and possibly for all markings on sections of road subject to very high traffic flows. Application of the temporary grade in controlled quantities at road-works, as removable temporary markings, can be recommended due to the difficulty experienced in the removal of paint markings. Such temporary markings may have to be adjusted in position regularly. The result of over-painting and re-painting at road-works sites can be extremely confusing and therefore potentially hazardous to drivers. Until such time as a more effective method of removing road markings is available which does not leave a residual effect which, under certain lighting conditions, gives the appearance of road markings, the use of black or grey bonded tapes to eliminate unwanted markings is recommended.

5 Care must be exercised to ensure that the temporary grade only is used for road markings which may be required for short periods of time and which may need to be relocated from time to time to accommodate changing traffic patterns, particularly at road-works (see Subsection 7.1.12).

7.1.8 Specification

1 The specification of applied road markings and the testing of such markings for compliance to specification is not well developed. The testing procedures require expensive equipment and highly skilled operators and very few suitable items of equipment are available in Southern Africa. Details given in this section are therefore for the guidance only of any authority wishing to carry out testing, and are given to encourage the development of effective testing procedures and specifications. The various values given are not prescriptive and are subject to alteration as a result of research and experience, and by the eventual publishing of appropriate standards for applied road markings.

2 In South Africa SABS Specifications CKS 192-1971, CKS 1001-1981 and SANS 731-1987 refer for Drop-on Type Reflectorised Road-marking Paint, High-build Non-Skid Road-marking Paint and Road-marking Paint respectively, and deal with the quality of paint manufacture and offer limited testing advice. They do not cover a number of important properties of road marking paints, nor do they cover other road marking materials, nor any application specifications.

3 The annual cost to road authorities of re-marking roads within their jurisdiction can be considerable. In order to ensure that, in the interests of road safety, markings remain of an acceptable standard the effectiveness of such expenditure should be carefully monitored. In order to achieve an adequate and cost effective quality of road marking it is recommended that road authorities entering into contracts specify their requirements for the road markings as applied to the relevant road surface or surfaces, in addition to specifying the materials as manufactured. The specification can cover the durability required from materials by specifying an acceptable deterioration in quality over a period of time. By specifying in such a manner authorities should be able to establish parameters for the maintenance of road markings in an efficient manner. Such a specification can be made independent of the actual road marking materials and tenders can be reviewed in terms of the initial cost AND the time span performance likely from different materials.

4 Factors which should be included in a specification of an applied road marking material are:

   (a) colour;
   (b) luminance factor;
   (c) coefficient of retro-reflectivity;
   (d) skid resistance (particularly for urban areas).

The required durability for these properties can be specified by indicating the minimum time period which should elapse before the acceptable "used" values are reached (see paragraph 7.1.8.5).

5 The values given in Table 7.2 for new materials may be used to assess original work. The values given for used materials may be used to establish rates of deterioration in terms of factors (a), (b) and/or (c). According to the working environment a used marking may reach the lower limits acceptable for one of the factors before the others. A decision to re-mark may be taken based on the deterioration in terms of only one factor. By building up a database of information road authorities should ultimately be able to assess which factor/most critical and under what circumstances.

6 The degree to which the acceptable values are attained for new or "first-time" applications of sprayed, brushed or screed road marking materials is most likely to depend on:

   (a) the time which the new surface has had to "cure";
   (b) the application rate used for the road marking materials.

It is common practice when painting road markings to cater for the surface curing time by using two applications at closely spaced intervals. This factor must be considered when writing contract specifications and when assessing tenders.

7.1.9 Warrants

1 Precise warrants for the use of road markings in a general sense are not well developed. A limited number of specific road markings have a warrant available, details of which are given in the relevant subsections.

2 Warrants for signal controlled and yield controlled mid-block pedestrian crossings, which in turn warrant the use of the relevant road markings are covered in Chapter 6, Subsection 6.8.11 where a range of warrant charts are also provided in Figures 6.16 to 6.27.
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**Detail 7.1.1**  
**Lane Line markings GM1**

- **Reduced** 100mm
- **Standard** 100mm
- **Extra** 100mm

**Detail 7.1.2**  
**Continuity Line markings WM2**

- **Reduced** 200mm
- **Standard** 200mm
- **Extra** 200mm

**NOTES:**

1. See Figure 7.2 for alternative methods of lining up markings across a roadway when setting out.
2. Refer to Subsection 7.1.9 and to Subsection 7.4.1 - LANE LINE marking and Subsection 7.3.2 - CONTI-

**Fig.7.1**  
**Standard, Reduced and Extra Modules for Broken Line Markings**
7.1.6 INTRODUCTION

NOTES:
1. Details illustrate urban STANDARD MODULES for LANE LINE marking GM1 and EXTRA MODULES for DIVIDING LINE marking WM3 (see Subsections 7.4.1 and 7.3.3 respectively).
2. Details are also relevant to REDUCED or EXTRA LANE LINE marking MODULES.

Fig. 7.2 Lateral Alignment of Modules for Broken Line Markings
### INTRODUCTION

**TABLE 7.2**

<table>
<thead>
<tr>
<th>Factor</th>
<th>New Materials</th>
<th>Used Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>White</td>
<td>Yellow</td>
</tr>
<tr>
<td>$x^{(1)}$</td>
<td>0.305</td>
<td>0.494</td>
</tr>
<tr>
<td>Colour</td>
<td>0.335</td>
<td>0.470</td>
</tr>
<tr>
<td>$y^{(1)}$</td>
<td>0.325</td>
<td>0.493</td>
</tr>
<tr>
<td>Luminance Factor</td>
<td>0.295</td>
<td>0.522</td>
</tr>
<tr>
<td>Coefficient of Retroreflection (minicandelas/lux/m²)</td>
<td>150</td>
<td>100</td>
</tr>
<tr>
<td>Skid Resistance BNP(2)</td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**

(1) The co-ordinates given refer to the Chromaticity Chart in Figure 1.20. The co-ordinates measured for the colour should fall within the area defined by the co-ordinates given.

(2) BPN "stands for a value determined by the British Portable Pendulum Number measurement method applicable to all colours of markings.

3 Warrants for the use of various road markings are likely to be different for rural applications and urban applications. In the absence of a wider range of developed warrants for road markings the following factors, which are largely subjective and may be more relevant in a rural situation than an urban situation, should be considered:

(a) a LEFT EDGE LINE marking RM4.1 is warranted on the left side of the travelled way of any rural or urban roadway which has been provided with a surfaced emergency shoulder (the marking may also be warranted on the left side of roadways which do not have surfaced emergency shoulders but which are subject to edge damage due to vehicles wandering off the surfaced roadway);

(b) a RIGHT EDGE LINE marking RM4.2 is warranted on the right side of all freeway carriageways carrying traffic travelling in one direction only (Class A1 freeways) whether the median is provided with a barrier or not (such an edge line is also warranted on non-freeway dual carriageways which have a median which is not defined by barrier or unmountable kerbs);

(c) GUIDE LINE markings GM2 are warranted when more than one turning lane is provided for the left or right turning movements at a junction even if one of the two lanes is a shared through and turning lane (this marking may also be warranted to guide pedestrians to the safest crossing point at channelised or wide road junctions - this latter marking application may also be warranted in an urban situation to make the existence and location of a junction more obvious to approaching drivers);

(d) a CONTINUITY LINE marking WM2 is warranted when a dedicated or exclusive turning lane is provided at a rural or urban junction; such a marking is also warranted on the left side of a roadway to define the through portion of the roadway at wide junctions when the provision of a LEFT EDGE LINE marking RM4.1 through the junction is not appropriate and/or the combination of horizontal and/or vertical curvature together with an uphill approach on the intersecting roadway makes definition of the alignment of the left edge of the roadway unclear;

(e) a range of markings are warranted at the junctions of one-way and two-way roadways in urban areas to reinforce the correct direction of travel;

(f) the use of PARKING BAY markings RM6 is warranted in any situation where a driver is charged for the use of the parking, or where, from experience, the behaviour of drivers has indicated a need to control their parking activities;

(g) in addition, if the following are provided, the use of the appropriate road marking is warranted as indicated:

(i) a STOP sign R1 to R1.5 - a STOP LINE marking RTM1;

(ii) a YIELD sign R2, YIELD TO PEDESTRIANS sign R2.1 or a YIELD AT TRAFFIC CIRCLE sign R2.2 - YIELD LINE marking RTM2;

(iii) traffic signals - STOP LINE marking RTM1 and normally PEDESTRIAN CROSSING LINES marking RTM3;
TABLE 7.3

<table>
<thead>
<tr>
<th>Operating speed (km/h)</th>
<th>Taper Rate for Line Shift Without Kerbed Island (1 in ...)</th>
<th>Taper Rate for Line Shift Preceding Kerbed Island (1 in ...)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Width of kerbed island</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0,6 m-1,25 m</td>
<td>1,75 m-2,5 m</td>
</tr>
<tr>
<td>30</td>
<td>20 Rural Urban</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>50</td>
<td>25 Rural Urban</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30</td>
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<td>60</td>
<td>35 Rural Urban</td>
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<td>80</td>
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<td></td>
<td></td>
<td>40</td>
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<tr>
<td></td>
<td></td>
<td>35</td>
</tr>
</tbody>
</table>
(b) whether only road markings are offset (in particular the DIVIDING LINE between opposing flows of traffic);
(c) whether a channelizing or median island (or barrier) is introduced in conjunction with the shift in alignment.

Table 7.3 indicates a range of appropriate TAPER RATES. When a change in alignment occurs simultaneously with the introduction of an island (or barrier) the flatter or slower taper rate quoted should be used. When introduced into the traffic flow a narrow island or obstruction may be potentially more hazardous than a wider one. The table therefore recommends flatter taper rates for narrower obstructions. Designers must also be aware of the requirements of the Code of Procedure or design requirements of the Authority under whose jurisdiction the roadway falls.

5 The taper rates given should be considered as nominal rates. The setting out of road markings will be simplified if the length of tapering sections is fixed at a rounded dimension. This length should preferably represent a full number of rural or urban STANDARD MODULES as this will simplify the matching of any parallel longitudinal broken line markings to the changes in alignment. For example a 1.70 m shift at a rate of 1 in 50 requires a taper length of 85 m. It is recommended that the taper length be adjusted to 84 m for rural conditions (7 x 12m modules) and 81 m for urban conditions (9 x 9 m modules). This approach will therefore result in actual taper rates of 1 in 49.4 and 1 in 47.6 respectively (see also paragraph 7.1.5.4).

6 Changes in alignment and tapers may occur between lanes carrying traffic in opposite directions or lanes carrying traffic in the same direction. A wide range of line types may be involved in the detailed treatment of such sections. The intends function of each line type is covered in the remaining sections of this chapter. Details of the applications of various line types involving tapers are illustrated in Volume 2.

7.1.11 Junction Channelisation

1 The majority of detail relating to the use of road markings for junction channelisation is given in Volume 2.

2 Designers wishing to utilise various types of marking should read the relevant text in this chapter so that they are familiar with the intended functions of such markings.

3 A particular aspect relevant to the road marking of junctions, which designers should note, is the functional difference between line markings used for the separation of vehicles travelling in the same direction and line markings used for the separation of vehicles travelling in opposite directions.

7.1.12 Temporary Road Markings

1 Any type of road marking may be used temporarily during a period when road construction is in progress or traffic is deviated from its normal route for whatever reason. It must be remembered, however, that there is no visual difference to drivers between permanently placed road markings and temporarily placed ones. Great care must be exercised so that there is no confusion when it is required to use temporary road markings. Whenever possible a clearly visual discontinuity should be created between a remaining, but no longer relevant, permanent longitudinal marking and a temporary longitudinal marking intended to re-place the original marking and to perform a similar function. Conversely, the intended continuation of a permanent longitudinal marking into a temporary longitudinal marking should be visually reinforced by whatever means is practical under the circumstances. In preparing such treatments designers should pay particular attention to their effectiveness at night. The use of wider markings, roadstuds or delineator hazard markers may be considered.

2 Due to the difficulty in erasing road markings it is strongly recommended that wherever possible temporary markings be applied using one of the following techniques:

   (a) by using a lightly applied non-emulsion paint such as PVA which will quickly wear under traffic operations (the use of PVA paint is preferable for short-term work which still requires a limited amount of marking, or in situations where regular remarking to accommodate the rapid wear is acceptable);
   (b) by using temporary, pre-formed, adhesive-backed tapes (this material although costly has the advantage that it can be put down and lifted a number of times with limited wastage and can be cost effective when used carefully; a black version of this tape is available which is useful to temporarily blank-out existing markings, particularly at temporary changes of direction when lane, edge or barrier lines would otherwise continue across the line of the deviation or detour, and would otherwise have to be erased; care should be taken to see that only the temporary grade of tape is used in such circumstances);
   (c) by using temporary roadstuds at close spacings to simulate a road marking line (roadstuds used in this manner must be easily removable).

7.1.13 Freeway Road Markings

The road marking of freeways is covered generally under the subsections dealing with specific road markings. Due to the almost universally high speeds pertaining to freeways it is normal to specify line widths which are greater than the minimum values and to generally make details such as painted islands as bold as possible.

2 Certain aspects of the road marking of freeways require particular care in detailing and specification. These are:

(a) edge lines (see Subsection 7.2.8);
(b) off-ramp ore painted islands (see Subsection 7.2.9 and Volume 2, Chapter 2);
(c) on-ramp gore markings (see paragraph 7.1.13.3 and Volume 2, Chapter 2);
(d) median edge lines (see Subsection 7.2.8);
(e) "No Entry" markings including roadstuds, at junctions of off-ramps with crossing roads (see Subsection 7.5.2 and Volume 2, Chapter 2);
(f) lane reduction arrows (see Subsection 7.3.6 and Volume 2, Chapter 2);
(g) at the beginning and end of freeways (see Volume 2, Chapter 2);
(h) at the termination of climbing lanes (see Volume 2, Chapter 2).
3 On-ramp gore markings may vary according to the type of on-ramp being marked. A loop ramp turning through 180°
to 360° may benefit from the use of a painted island marking in the joining gore with the main freeway
carriageway or collector-distributor road. A tangential
type of on-ramp does not normally require a painted
island in the gore area.

7.1.14 Pedestrian and Cyclist Road Markings

1 Road markings indicating exclusive pedestrian and/or
cyclist portions of the roadway and the positions where
pedestrians and/or cyclists cross the path of vehicular
traffic are covered in the various subsections of this
chapter and in Volume 2, Chapters 2 and 3.

2 Designers using these road markings should remember
that they also apply to pedestrians and cyclists and to be
effective must be clearly visible to them. This comment
applies to the use of PEDESTRIAN CROSSING AHEAD
"zigzag" marking RM11, and GUIDE LINE marking GM2
in particular.

7.1.15 Maintenance

1 The maintenance of road markings is an expensive
operation and has been commented on in earlier sub-
sections. When re-marking is undertaken it should be
done carefully and accurately to avoid creating a ragged
appearance to the marking. A high standard of
maintenance of road markings, including roadstuds, is
essential if they are to fulfil their purpose.

2 The following aspects should be considered by road
authorities when developing a systematic approach to
road marking maintenance:

(a) before re-marking, particularly after a road or street
has been reconstructed or re-surfaced, the
functional need for all existing markings should
be assessed;

(b) if a marking has been deemed necessary it is in the
interests of public safety that it be well maintained;

(c) the most cost effective form of maintenance need not
necessarily be the re-marking of markings at ever-
shorter intervals of time due to the labour cost
component; other options should be assessed on an
economical basis;

(d) mechanical street cleaning and the washing of
devices such as guardrails (and their delineators) is
used in several parts of the world to extend
replacement maintenance periods and should be
assessed from time to time as it may become cost
effective in the Southern African context in terms of
time and materials.

3 If, for whatever reason, a marking has been applied to
the road surface which is no longer required the removal of
such a marking must be carried out skilfully. The traditional methods of erasing an unwanted road marking are:

(a) to paint it over with flat black or grey paint;
(b) to burn the marking off the road surface;
(c) to grind the marking off the road surface;
(d) to remove the marking with a very high pressure
water jet.

These methods can all, on occasion, fail to achieve the
desired objective in that they leave marks, which, under
certain light conditions may appear as clearly as the
original road marking. Research on this issue continues
on a world-wide basis; however, a technique worth
considering is to try to disguise the shape of the markings
being removed by making the area of over-painting,
burning or grinding an irregular rather than regular shape
which does not conform exactly to the pattern being
erased.

7.1.16 Road Marking Diagrams

1 As stated in paragraph 7.1.1.5 the individual road
markings detailed in this chapter are the "tools" which
may be used to design an often complex road marking
plan. The subsections dealing with each road marking
include a diagram of the actual marking. In many cases
the diagram details basic examples of only one or two
modules, or patterns, of what is in effect a continuous
marking which may, when applied, stretch for kilometres.
In addition to the diagrams a limited number of figures
are provided in order to illustrate basic applications.

2 In order that the orientation of each diagram and figure can
be made clear an indication is given in all relevant
instances of the direction of travel of traffic in relation to
the marking or markings. This indication is given by the
following triangular device:

```
\[\xrightarrow{\text{pointing in the direction of travel}}\]
```

This triangle appears in black on the grey background of
the diagram and should not be misinterpreted as an
arrow on the road surface.
7.2.1 Stop Line

1. A STOP LINE regulatory marking RTM1 imposes a mandatory requirement upon drivers of vehicles, when combined with a STOP sign R1, a RED traffic signal indication, or the signal of a traffic officer, that they shall stop their vehicle immediately behind such line, and such line shall have the significance assigned to STOP sign R1. In any other circumstance STOP LINE markings shall have the significance assigned there to by STOP sign R1. (STOP sign R1 includes any and all derivations of sign R1 – see Subsection 2.2.1 and Chapter 6.)

2. This has the effect that in the event that a STOP sign R1 at a road junction has fallen down or is temporarily missing, or if a traffic signal is temporarily out of order, the STOP LINE marking RTM1 shall have the full significance of the sign R1, or the traffic signal RED indication, as if they were still in position or functioning.

3. STOP LINE markings RTM1 shall only be used in conjunction with STOP sign R1 and TRAFFIC SIGNALS. STOP LINE markings shall not be used where regular but short term point duty is performed by a traffic officer or a scholar patrol or at non-signal controlled pedestrian crossings. STOP LINE markings shall not be used in conjunction with GUIDE LINE marking GM2, within a junction which is controlled by traffic signals, since the control required over turning traffic is YIELD control (see Subsection 7.2.2, paragraph 7.2.2.2). When a random temporary road-block is operated by a traffic officer temporary STOP LINE markings RTM1 shall be placed on the road surface for the duration of the road-block and shall be completely removed immediately the temporary control ceases (see Subsection 7.2.2.7.2.3 and 7.2.4).

4. A STOP LINE shall comprise a continuous solid white line with a minimum width of 300 mm in urban areas and 500 mm in rural or other areas. STOP LINES, which have been warranted, shall extend across the full width of that portion of all surfaced road junction approaches used by traffic travelling towards the junction, with the exception as noted in paragraph 7.2.1.5. In the case of two-way roadways stop lines shall extend from the edge of the roadway to the NO OVERTAKING LINE marking RM1, or the NO CROSSING LINE marking RM2, whichever indicates the dividing line between opposing traffic movements as specified in paragraph 7.2.1.6. In the case of one-way roadways stop lines shall extend from the left kerb line to the right kerb line. For the purposes of these requirements the junction between the road surface and a drainage channel may be taken to represent the kerb line.

5. A STOP LINE marking RTM1 shall be combined with a YIELD LINE marking RTM2 to permit left turning filter movements at junctions under control of STOP/YIELD sign R1.2.

6. When a STOP LINE is marked across a portion of a two-way roadway the DIVIDING LINE marking WM3, shall be replaced by a minimum length of NO OVERTAKING LINE marking RM1, or NO CROSSING LINE marking RM2, whichever is appropriate in terms of the functions of these markings (see Table 7.5).

7. When used in conjunction with PEDESTRIAN CROSSING LINES marking RTM3, a STOP LINE should be spaced at least 1 m, and at signalised mid-block crossings preferably 3 m, in advance of the PEDESTRIAN CROSSING LINE. When pedestrian crossing lines are not marked, the stop line should be located so as to give the best line of sight to crossing road users consistent with the turning requirements of vehicles entering the roadway on which the stop line is marked. The STOP LINE should be located not more than 15 m or less than 1.2 m from the line representing the continuation of the edge of the intersecting roadway (see Figure 2.8, Section 2.2).

8. Typical examples of the application of STOP LINE markings are given in Volume 2, Chapters 2 and 3.

9. It is recommended that the word “STOP” in the standard WORD markings GM7 be marked on the road surface approximately 1 m in advance of the STOP LINE marking RTM1 when used in conjunction with a STOP sign R1. The marking of the word “STOP”, with or without INFORMATION ARROW marking GM4.1, in advance of a stop line may be used as an optional additional marking when sight distance to the STOP sign R1, is unavoidably poor (see Subsection 7.4.4).
7.2.2 Yield Line

1 A YIELD LINE regulatory marking RTM2 imposes a mandatory requirement upon drivers of vehicles that they shall yield right-of-way at the point marked by the line:

(a) to all traffic on the public road which is joined by the road on which they are travelling,
(b) to all rail traffic on the railway line which is crossed by the road on which they are travelling;
(c) to pedestrians and/or cyclists crossing the roadway, or waiting to cross the roadway at a crossing marked with PEDESTRIAN CROSSING LINES marking RTM3 and/or BLOCK PEDESTRIAN CROSSING marking RTM4;

AND such marking shall have the significance assigned to YIELD sign R2 (YIELD sign R2 includes any and all derivations of sign R2).

2 This has the effect that, in the event that a YIELD sign R2 at a road junction or pedestrian crossing has fallen down, or is temporarily missing, the YIELD LINE marking RTM2 shall have the full significance of YIELD sign R2. A YIELD LINE marking RTM2 when marked across a turning lane demarcated by GUIDE LINE marking GM2, within a junction which is controlled by traffic signals, shall have the full significance of YIELD sign R2 without the use of such sign.

3 YIELD LINE markings RTM2 shall only be used in conjunction with YIELD sign R2, YIELD TO PEDESTRIAN sign R2.1, or YIELD AT TRAFFIC CIRCLE sign R2.2, or as indicated in paragraph 7.2.2.2. YIELD LINE markings shall be used at any location, which is not controlled normally by a traffic signal, where regular but short term point duty is performed by a traffic officer or a scholar patrol (see Subsections 7.2.1.7, 7.2.3 and 7.2.4).

4 A YIELD LINE shall comprise a broken white line with a minimum width of 300 mm in urban areas and 500 mm in rural or other areas. YIELD LINES, which have been warranted, shall extend across the full width of that portion of all surfaced road junction approaches used by traffic travelling towards the junction, with the exception noted in paragraph 7.2.2.7. A line-to-gap ratio of 2 to 1 should be used with the recommended lengths of 600 mm line and 300 mm gap. These should be extended a 1 000mm and 500 mm in rural areas when the yield controlled portion of the intersecting roadway exceeds 5 m in width.

5 When a YIELD LINE is marked across a portion of a two-way roadway the DIVIDING LINE marking WM3 shall be replaced by a length of NO OVERTAKING LINE marking RM1, or NO CROSSING LINE marking RM2, which ever is appropriate in terms of the functions of these markings. The minimum lengths of such markings shall be as given in Table 7.5. At a marked pedestrian crossing YIELD LINE marking RTM2 may be used in conjunction with PEDESTRIAN CROSSING AHEAD LINE markings RM1. For details of this and other pedestrian crossing markings see Subsection 72.15.

6 When used in conjunction with PEDESTRIAN CROSSING LINES marking RTM3, and/or BLOCK PEDESTRIAN CROSSING marking RTM4, a YIELD LINE should be spaced at least 3 m and preferably 6 m in advance of the PEDESTRIAN CROSSING LINE or BLOCK PEDESTRIAN CROSSING marking.

7 A YIELD LINE marking RTM2 shall be combined with a STOP LINE marking RTM1 to permit left turning filter movements at junctions under control of STOP/YIELD sign R1.2.

8 When used at a road junction a YIELD LINE should be located not less than 1,2 m from the line representing the continuation of the edge of intersecting roadway. When used on a turning roadway (slip road) care should be taken to locate the YIELD LINE so that drivers have an adequate line of sight to converging traffic on the cross road in order that they may yield right-of-way at the line (see Figure 2.7, Section 2.2).

9 A YIELD LINE, in conjunction with a YIELD sign R2 may be used to control traffic on the approach to a railway crossing which is infrequently used, provided that a good line of sight to the railway line is available.

10 Typical examples of YIELD LINE markings are given in Volume 2, Chapters 2, 3 and 7.

11 It is recommended that the YIELD CONTROL AHEAD marking WM5 be marked on the road surface approximately 1 min advance of the YIELD LINE marking RTM2. YIELD CONTROL AHEAD marking WM5, with or without INFORMATION ARROW marking GM4.1, may be used as an optional additional marking when sight distance to the YIELD sign R2 is limited (see Subsections 7.3.5 and 7.4.4 and Volume 2).
7.2.3 Pedestrian Crossing Lines

1 A PEDESTRIAN CROSSING LINES regulatory marking RTM3 imposes a mandatory requirement that drivers of vehicles shall yield right-of-way, by slowing down or stopping if need be to so yield, to a pedestrian who is crossing the roadway or a portion of roadway, or to a pedestrian waiting to cross the roadway, and regulatory marking RTM3 imposes a mandatory requirement that pedestrians shall only cross the roadway within the crossing defined by the markings and the edges of the roadway and/or median or other traffic island (if such are provided) provided that:

(a) if such PEDESTRIAN CROSSING LINES marking RTM3 is used in conjunction with a road sign or traffic signal, or STOP LINE marking RTM1 or YIELD LINE marking RTM2 the significance of these road traffic signs shall take precedence;
(b) pedestrians are crossing the roadway or portion of roadway in accordance with the prescribed indications of a traffic signal when such is provided.

2 PEDESTRIAN CROSSING LINES markings shall always comprise two continuous white lines. These lines shall be a minimum of 100 mm wide and shall be placed at least 2.4 m apart. A separation of 3 m is preferred, and where large volumes of pedestrians are present the distance separating the lines should be increased. The lines should extend across the full width of a roadway or portion of roadway and should normally be parallel to each other and at 90° to the direction of traffic movement. However, crossings may be skewed if this is in the best interests of pedestrians and the safe movement of traffic.

3 PEDESTRIAN CROSSING LINES shall be preceded by a STOP LINE marking RTM1 when used at a traffic signal controlled crossing, or a YIELD LINE marking RTM2 when used at a road sign controlled crossing. Marking RTM3 shall not be marked on top of, or as an extension to such lines, but as separate markings. It is not recommended that PEDESTRIAN CROSSING LINES be marked on the approaches to uncontrolled or partially controlled junctions. If it is required to provide guidance to pedestrians when their numbers do not warrant the installation of a formal crossing it is recommended that GUIDE LINE markings GM2 be provided in a similar manner to PEDESTRIAN CROSSING LINES. This type of informal crossing is intended to assist pedestrians identify the section of public road over which they may cross safely.

4 Warrants for the installation of various types of mid-block pedestrian crossing are given in Section 6.8. The pedestrian crossing marking used will depend on the type of control warranted. As a general rule PEDESTRIAN CROSSING LINES marking RTM3 should be provided at all approaches to a junction controlled by traffic signals. However they may be omitted if:

(a) for some reason it is considered unsafe for pedestrians to cross a particular approach; in such circumstances the normal crossing position should be covered by a NO PEDESTRIANS sign R218 and the safe route through the junction made clear to pedestrians if necessary by means of pedestrian guidance signs;
(b) the pedestrian crossing volumes in a particular direction average less than 50 per hour during daylight.

5 It is recommended that PEDESTRIAN CROSSING LINES marking RTM3 is only used in conjunction with a traffic signal either at a junction or in a mid-block location. Pedestrian crossings controlled by YIELD TO PEDESTRIAN sign R2.1, which may operate with or without part-time control by a traffic officer or a scholar patrol shall use the BLOCK PEDESTRIAN CROSSING marking RTM4 because of the greater visual impact of this marking. In the event that the type of control at a mid-block pedestrian crossing is altered from road sign to traffic signal, or vice versa, it is acceptable to use both markings. In such situations, the "block" markings should be separated from the line markings to obtain a better visual effect (see Subsections 72.4 and 72.15).

6 Where PEDESTRIAN CROSSING LINES are marked in an un-signalled mid-block location, they should be preceded by a PEDESTRIAN CROSSING warning sign W306 on each approach in accordance with the provisions of Subsection 3.4.6. If marked at a signalised mid-block location warning signs W301 and W306 may be used.
7.2.4 Block Pedestrian Crossing Markings

1 A BLOCK PEDESTRIAN CROSSING regulatory marking RTM4 imposes a mandatory requirement that drivers of vehicles shall yield right-of-way, by slowing down or stopping if need be to do so yield, to a pedestrian who is crossing the roadway or a portion of a roadway, or to a pedestrian waiting to cross the roadway, and regulatory marking RTM4 imposes a mandatory requirement that pedestrians shall only cross the roadway within the crossing defined by the markings and the edges of the roadway and/or median or other traffic island (if such are provided). PROVIDED that:

(a) if such BLOCK PEDESTRIAN CROSSING marking RTM4 is used in conjunction with a road sign or traffic signal, or STOP LINE marking RTM1 or YIELD LINE marking RTM2, the significance of these road traffic signs shall take precedence;

(b) pedestrians are crossing the roadway or portion of roadway in accordance with the prescribed indications of a traffic signal when such is provided.

2 BLOCK PEDESTRIAN CROSSING markings shall comprise a number of rectangular white painted markings of minimum length 2.4 m and minimum width 600 mm, spaced 600 mm apart which shall extend across the full width of the roadway or portion of roadway. A length of marking of 3 m is preferred, and this dimension may be further increased if large volumes of pedestrians are present, to enable reasonable compliance with the provisions of paragraph 7.2.4.1. The necessary width may be determined by making the length of marking equal to 0.6 m for every 125 pedestrians/hour based on the four peak hours. A maximum length of 5 m is recommended.

3 BLOCK PEDESTRIAN CROSSING marking RTM4 shall be preceded by a STOP LINE marking RTM1 if used at a traffic signal controlled crossing, or a YIELD LINE marking RTM2 when used at a road sign control- led crossing (see Subsection 7.2.3, paragraph 7.2.3.3).

4 It is recommended that BLOCK PEDESTRIAN CROSSING markings be used at any pedestrian crossing controlled by YIELD TO PEDESTRIAN sign R2.1. Such crossings should normally be mid-block pedestrian crossings which may operate with or without part-time control by a traffic officer or a scholar patrol. In the event that the type of control at a mid-block pedestrian crossing is altered from road sign to traffic signal, or vice versa it is acceptable to use both BLOCK PEDESTRIAN CROSSING markings and PEDESTRIAN CROSSING LINES markings to avoid the need to erase the "block" markings. The line markings should be separated from the "block" marking to achieve a better visual impact. BLOCK PEDESTRIAN CROSSING markings may be used elsewhere if necessary to enhance the visibility of a pedestrian crossing point at traffic signal controlled road junctions or mid-block crossings (see Subsections 2.2.3, 7.2.2, 7.2.3 and 7.2.15 and Volume 2).

5 Warrants for the installation of various types of mid-block pedestrian crossings are given in Section 6.8. The pedestrian crossing marking used will depend on the type of control warranted.

6 BLOCK PEDESTRIAN CROSSINGS may be used in rural areas but their common application is in busy urban areas where, at schools, stadia, arcades, malls, cinemas and other centres of attraction, it is necessary to assign priority to pedestrians crossing the roadway.

7 Where BLOCK PEDESTRIAN CROSSING markings are marked in a mid-block location they should be preceded by a PEDESTRIAN CROSSING warning sign W306 on each approach in accordance with the provisions of Subsection 3.4.6.

8 Non-signalled pedestrian crossings should not be marked:

(a) on any section of roadway with inadequate vertical or horizontal sight distance;

(b) close to a junction controlled by traffic signals.
7.2.5 No Overtaking Line

1 A NO OVERTAKING LINE regulatory marking RM1 imposes a mandatory requirement that drivers of vehicles, when such marking is used to the left of, or in place of, a DIVIDING LINE marking WM3 to demarcate those portions of a roadway used by traffic travelling in opposite directions, shall:

(a) not drive a vehicle in such a manner that it is on the right side of such marking; and

(b) not drive a vehicle in such a manner that it or any part of such vehicle crosses the NO OVERTAKING LINES marking;

UNLESS the vehicle is driven:

(i) to gain direct access to any land on the opposite side of the NO OVERTAKING LINE;

(ii) to gain direct access from any land to that portion of the roadway on the opposite side of the NO OVERTAKING LINE;

(iii) to pass a stationary obstruction in the roadway;

ProvidED that, in all instances it is safe to do so.

2 The NO OVERTAKING LINE marking performs the function of the marking previously known as a BARRIER LINE. Terminology has been amended to differentiate more clearly between the functions of single and double barrier lines used with or without a DIVIDING LINE marking WM3. An additional NO CROSSING LINE marking RM2 is therefore provided. The NO OVERTAKING LINE and NO CROSSING LINE markings remain, in function, as barrier lines (see Subsection 12.2.6).

3 The significance attached to NOOVERTAKING LINES is such that these lines shall only be used between portions of roadway carrying vehicles travelling in opposite directions. If it is required to achieve a no overtaking function within a portion of roadway carrying only vehicles which are travelling in the same direction a version of the CHANNELISING LINE marking RM3 shall be used. Although the application of a CHANNELISING LINE marking may commonly call for a wider line than is used for a NO OVERTAKING LINE marking this need not be the case. These markings can therefore appear identical and on occasion they may have an identical significance. The major functional difference therefore lies in the application of the NO OVERTAKING LINE to two-way traffic and the CHANNELISING LINE to one-way traffic.

4 NO OVERTAKING LINES shall be provided at vertical and horizontal curves, and elsewhere, on two-way roadways where overtaking is to be prohibited because of dangerously restricted sight distances or other hazardous conditions.

5 NO OVERTAKING LINES should be marked where the Barrier Sight Distance between a point 1.05 m high (equivalent to eye height) and a point 1.30 m high (equivalent to vehicle height) on vertical or horizontal curves is less than the value given in Table 7.4. The Barrier Sight Distance allows sufficient time for two vehicles approaching each other in a head-on situation to stop if they should be left with no other option for avoiding action. This distance therefore approximates to twice the Stopping Sight Distance.

6 NO OVERTAKING LINE markings shall comprise a single continuous solid white line with a minimum width of 100 mm. The effective continuity of a NOOVERTAKING LINE is subject to a number of factors covered in the following paragraphs.

7 The length of a NO OVERTAKING LINE depends on whether its principle use is for traffic control purposes (commonly urban), or for reasons of limited sight distance (commonly rural). When used to control overtaking manoeuvres under conditions of limited sight distance a NO OVERTAKING LINE may be used according to one of the systems given in Figure 7.3 in which case the length will depend on an engineering assessment (see Table 7.4, paragraph 7.25.10 and Figures 7.4 and 7.5).

8 The minimum length of a NOOVERTAKING LINE may vary according to the circumstances in which it is being used. Prescribed and recommended values are given in Table 7.5.

9 In undertaking an engineering assessment consideration should be given to:

(a) operating speed;

(b) Barrier and Decision Sight Distances;

(c) the distance between the end of one section and
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the start of a new section of NO OVERTAKING LINE which should not be less than 120 m;
(d) multi-lane approaches;
(e) the existence of property accesses;
(f) traffic volumes;
(g) compliance with the DIVIDING LINE marking WM3 warrant given in Subsection 7.3.3.

10. In both rural and urban areas NO OVERTAKING LINES may be marked as part of the geometric treat-

-ment of road junctions. The treatment may according to many factors. Examples are given in Volume 2.

11. In order to warn traffic that a DIVIDING LINE is about to be combined with or replaced by a NO OVERTAKING LINE, NO OVERTAKING LINE AHEAD arrow markings WM8, should be marked on the DIVIDING LINE (see Subsection 7.3.8).

<p>| TABLE 7.4 | WARRIORS FOR NO OVERTAKING LINE |</p>
<table>
<thead>
<tr>
<th>Design Speed (km/h)</th>
<th>Minimum Barrier Sight Distance (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td>60</td>
<td>180</td>
</tr>
<tr>
<td>80</td>
<td>250</td>
</tr>
<tr>
<td>100</td>
<td>300</td>
</tr>
<tr>
<td>120</td>
<td>400</td>
</tr>
</tbody>
</table>

NOTES:
(1) Methods of determining the available Barrier Sight Distance are illustrated in Figures 7.4 and 7.5.

<p>| TABLE 7.5 | MINIMUM NO OVERTAKING LINE LENGTH |</p>
<table>
<thead>
<tr>
<th>Condition</th>
<th>Length (m)</th>
<th>Prescribed Min.</th>
<th>Recommended Min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban junction</td>
<td>9</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Urban junction - traffic signal or uncontrolled approach</td>
<td>9</td>
<td>18 or 27(3)</td>
<td></td>
</tr>
<tr>
<td>Urban junction - STOP or YIELD controlled approach</td>
<td>9</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Rural junction</td>
<td>12</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Rural junction - uncontrolled approach</td>
<td>12</td>
<td>24 to 60(4)</td>
<td></td>
</tr>
<tr>
<td>Rural junction - STOP or YIELD controlled approach</td>
<td>12</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>Rolling terrain/curving roadway</td>
<td>N/A</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Mountainous terrain</td>
<td>N/A</td>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>

NOTES:
(1) The prescribed values apply ONLY PROVIDED a NO OVERTAKING LINE has been warranted and there is sufficient surfaced roadway to which the marking may be applied.
(2) All lengths are a whole number of the relevant markings MODULE lengths.
(3) A length of 27 m is preferred for multi-lane approaches. Greater lengths may be used.
(4) MINIMUM length should be increased with increased operating speed. Greater lengths may be used.
NOTES:

(1) The marking arrangements shown above indicate "centre line" treatments for two-way roadways. To avoid risks of confusion (particularly in a legal context) the terms "centre line" and "barrier line" are no longer used. The line separating opposing streams of two-way traffic may comprise a DIVIDING LINE marking WM3 (permitting overtaking), a NO OVERTAKING LINE marking RM1 (prohibiting overtaking but permitting crossing), or a NO CROSSING LINE marking RM2 (prohibiting overtaking and crossing), or some combination of these lines.

(2) Details 7.3.1 and 7.3.2 show systems of line marking between opposing streams of traffic which involve the replacement of DIVIDING LINE WM3 by NO OVERTAKING LINE RM1.

(3) Detail 7.3.3 shows a system where, in effect, two NO OVERTAKING LINES RM1 added to DIVIDING LINE WM3, create a NO CROSSING LINE RM2. With such a system it is necessary to discontinue the marking if it is required to give access in a local situation to a property or side road.

(4) Markings WM3, RM1 or RM2 may be used with or without LEFT EDGE LINE marking RM4.1, or on a multi-lane road they may be used with LANE LINE marking GM1.
NOTES:

(1) It should be noted that the need for NO OVERTAKING LINES, applied to both directions of travel, will result in sections of NO CROSSING LINE (see Figure 7.3).

(2) The assessment should be carried out for vertical and horizontal curvature at the same time. The recommended minimum distance between successive lengths of NO OVERTAKING LINE or NO CROSSING LINE is 120 m. This separation is relevant whether the consecutive lengths of NO OVERTAKING LINE are in the same direction or in opposite directions. The adequacy of this distance should be checked by an engineering assessment involving all factors relevant to a specific site.

(3) The detail in Figure 7.5 illustrates the effect of Minimum Barrier Sight Distance applied to a horizontal curve. It is recommended that this assessment be based on a line of sight not encroaching beyond the shoulder breakpoint. This makes allowance for occasional encroachment of vegetation beyond the normal clear cut-line.

Fig. 7.4 No Overtaking Lines for Vertical Curves
Fig. 7.5 No Overtaking Lines for Horizontal Curves
7.2.6 No Crossing Lines

1. A NO CROSSING LINES regulatory marking RM2 imposes a mandatory requirement that drivers of vehicles shall:
   
   (a) not drive a vehicle in such a manner that it is on the right side of such markings; and
   (b) not drive a vehicle in such a manner that it or any part of such vehicle crosses the NO CROSSING LINES markings;

   UNLESS the vehicle is driven to pass any stationary obstruction in the roadway and it is safe to do so.

2. NO CROSSING LINES markings shall always comprise two continuous solid white lines. The minimum width of each line shall be 100 mm. The separation of the two lines may vary from a minimum of 30 mm without roadstuds in urban areas, to a maximum of approximately 400 mm to accommodate a central DIVIDING LINE marking WM3 and two longitudinal rows of RED roadstuds (see Section 7.5). The minimum separation between NO CROSSING LINES and a central DIVIDING LINE marking should be 50 mm if roadstuds are not to be used. The minimum lengths of a NO CROSSING LINES marking shall conform to those prescribed for NO OVERTAKING LINE marking RM1 as indicated in Table 7.5 in Subsection 7.2.5. It is recommended that greater than minimum lengths be specified in the majority of instances.

3. NO CROSSING LINES shall be used in the same manner as NO OVERTAKING LINE marking RM1 when it is expressly intended to prohibit turning movements across the line markings in addition to the actions prohibited by a NO OVERTAKING LINE marking.

4. In urban areas, as development occurs, it may become necessary to restrict right-turn access movements to and from a property in the interests of safety and optimum traffic flow. When the provision of a raised island or central barrier is not possible NO CROSSING LINES may be used in such circumstances. The application of this form of control is particularly relevant in relatively close proximity to traffic signal controlled junctions where right turn access movement can be particularly hazardous under moderate to heavy traffic conditions.

5. In rural areas NO CROSSING LINES will more commonly be used on long lengths of roadways carrying two-lane two-way traffic. Should it become necessary to permit access to or from any property abutting such a roadway the NO CROSSING LINES marking should be replaced by a NO OVERTAKING LINE marking, the minimum length of which should conform to the provisions of Table 7.5.
7.2.7 Channelising Line

1 A CHANNELISING LINE regulatory marking RM3 imposes a mandatory requirement that drivers of vehicles shall not drive a vehicle in such a manner that it, or any part of it, crosses such a marking. A CHANNELISING LINE shall only be used between streams of vehicles travelling in the same direction. With the exception of this factor a CHANNELISING LINE has the same significance as a NO CROSSING LINE marking RM2. In effect a CHANNELISING LINE also functions as a NO OVERTAKING LINE for vehicles travelling in the same direction on a multi-lane roadway (see paragraph 7.2.5.3).

2 A CHANNELISING LINE shall comprise a continuous, solid white line with a minimum width of 200mm except when used on one side of a LANE marking GM1 when a minimum width of 150 mm may be used, and when used as a "Stacking Line" when a minimum width of 100 mm may be used. This has the effect that at intersections "Stacking Lines" adopt the same width as the preceding lane line or continuity line. The minimum lengths of CHANNELISING LINES shall conform to those prescribed for NO OVERTAKING LINE marking RM1 as indicated in Table 7.5.6 Subsection 7.2.5. A width of 300 mm and a minimum length of 60 m are recommended for roads with operating speeds of over 80 km/h.

3 A "Stacking Line" marking is a CHANNELISING LINE used at junctions on multi-lane roads between lanes carrying through traffic. "Stacking Lines" should be located immediately in advance of the prolongation of the near side edge of an intersecting side road. "Stacking Lines" replace LANE LINE marking GM1 and have the intended function of stabilizing traffic flow through a junction by prohibiting lane changing or overtaking in the immediate vicinity of the junction. A "Stacking Line" may be used either in combination with a transverse STOP LINE marking RTS1 or a YIELD LINE marking RTM2, or without such markings.

4 When a CHANNELISING LINE marking has been used in advance of a split-in direction of traffic flows it will commonly form the left boundary line of a channelising PAINTED ISLAND. When such an island precedes a kerbed or un-kerbed island or space to the right of a turning roadway the CHANNELISING LINE may be reduced to 100 mm minimum to form a continuing RIGHT-EDGE LINE marking RM4.2. This line may then define the right edge and alignment of the turning roadway, slip road or freeway off- or on-ramp.

CHANNELISING LINES should be considered in situations where it is necessary to control one-way traffic movement on a portion of roadway at more complex at-grade junctions or at freeway interchanges to prevent weaving and other similar conflict movements when such are potentially hazardous due to lane configurations and/or heavy traffic volumes. In particular a CHANNELISING LINE is recommended to demarcate the diverging portion of an EXCLUSIVE or DEDICATED exit or turn lane. A CHANNELISING LINE may occasionally be warranted in combination with a LANE LINE marking GM1 on a one-way roadway, to control lane changing or overtaking manoeuvres, from the side on which the CHANNELISING LINE is marked. This application may be particularly appropriate when such manoeuvres have been shown to be a contributory cause of accidents, i.e. such as if a CHANNELISING LINE is marked across the length of the exit to a freeway off-ramp to prohibit a lane change from a right side lane towards the off-ramp, in a potentially hazardous manner. Basic applications are illustrated in Figure 7.6.

6 A CHANNELISING LINE should normally be preceded by a section of CONTINUITY LINE marking WM2.

7 A CHANNELISING LINE may be used to replace a PAINTED ISLAND when junction space is very limited. Additional examples of the use of CHANNELISING LINES are included in Volume 2, Chapters 2 and 3.
7.2.12

NOTES:

(1) Details 7.6.1 and 7.6.2 illustrate only three of the many possible applications of CHANNELISING LINE marking RM3. Further applications are covered in Volume 2, Chapters 2 and 3.

Fig. 7.6

Channelising Lines
7.2.8 Left Edge Line/Right Edge Line

1. LEFT EDGE LINE and RIGHT EDGE LINE regulatory markings RM4.1 and RM4.2 impose a mandatory requirement on drivers of vehicles:

   (a) in the case of a LEFT EDGE LINE marking RM4.1 marked on a roadway with more than one lane in either or both directions of travel:

      (i) not to drive on the area (shoulder) to the left of such a line;

      (ii) not to use the area (shoulder) to the left of such a line for the purpose of overtaking another vehicle;

      (iii) to make every reasonable effort to move their vehicle completely to the left of such a line in the event of an emergency stop;

   (b) in the case of a RIGHT EDGE LINE marking RM4.2 when such marking is used on the right edge of a one-way portion of roadway to demarcate a dividing space or barrier which is not protected by barrier or unmovable kerbs not to drive a vehicle in such a manner that it crosses such RIGHT EDGE LINE so as to travel on, over, across or within the median island, dividing space or barrier.

   An authority marking o-way roadway with LEFT EDGE LINE markings RM4.1 so that surfaced shoulders are created, shall take the necessary steps to permit overtaking on the left side of a turning vehicle proceeding in the same direction (see paragraph 7.2.8.9).

2. A LEFT EDGE LINE shall comprise a continuous solid yellow line with a minimum width of 100 mm.

3. A LEFT EDGE LINE may be used to demarcate the left hand edge of the roadway, and a surfaced emergency shoulder between the roadway and the verge or kerb-line on the left hand side of a roadway. When used without a surfaced shoulder it should be marked a minimum distance of 150 mm from the edge of roadway surface.

4. LEFT EDGE LINE markings should not be marked on the right hand side of one-way carriageways of urban or rural dual carriageways, including freeways. A RIGHT EDGE LINE marking RM4.2, shall be used for this purpose if required.

5. A RIGHT EDGE LINE shall comprise a continuous solid white line with a minimum width of 100 mm.

6. RIGHT EDGE LINES shall be provided on the right side of all one-way roadways comprising part of a dual carriageway freeway whether the dividing space between the carriageways is a median island or a barrier. Use of the line may be similarly warranted on the right side of one-way roadways comprising part of a non-freeway dual carriageway road. However, subject to the level of street lighting and the need to provide right side visual delineation, it is not necessary to provide RIGHT EDGE LINES adjacent to urban median islands which are defined by barrier or unmovable kerbs.

7. In addition to their regulatory function LEFT EDGE LINES can perform an important safety function by:

   (a) providing a continuous demarcation of the edge of roadway, thereby reducing the tendency of drivers of vehicles to drift off the edge of the roadway, especially at night;

   (b) providing lateral continuity of the edge of roadway when a driver is faced with on-coming headlights on a two-way roadway;
(c) providing guidance to pedestrians and cyclists, especially when no sidewalk is provided;
(d) reducing the travel, particularly by heavy vehicles, on shoulders of limited structural strength.

8 When shoulders are not permanently surfaced their gravel surface may provide adequate colour contrast with the permanent road surface by day. At night, however, this effect may be significantly diminished. As a result the edge of the surfaced roadway can become ravelled and ragged due to vehicles regularly straying off and on the edge. This in turn can constitute a hazard. Where there is a lack of colour contrast between shoulder and travelled way, or the roadway edge condition needs regular maintenance the marking of a LEFT EDGE LINE is recommended.

9 When two-lane two-way roadways are marked with LEFT EDGE LINES so that a shoulder is created these lines should be tapered towards the edge of the roadway opposite an intersecting side road to permit vehicles to pass to the left of other vehicles which are waiting to turn, or are in the process of turning, to the right, so that they do not need to cross the LEFT EDGE LINE. The LEFT EDGE LINE should be set back in this manner for a sufficient distance to permit the smooth flow of traffic. Marking RM4.1 should be run parallel to this edge and 150 mm from it. Whilst this treatment is recommended to permit safe and legal overtaking manoeuvres the adequacy of such a treatment with regard to traffic volumes should be assessed by an engineering study. The treatment described should not be considered as an alternative to the provision of properly designed auxiliary lanes with continuous shoulders. LEFT EDGE LINES may be continued round the left side of left turn lanes, turning slip roads or corner perimeters at road junctions.

10 When used on freeways LEFT EDGE LINES shall be marked as described in earlier paragraphs. When approaching an off-ramp the LEFT EDGE LINE should turn and continue as the off-ramp LEFT EDGE LINE. The main carriageway LEFT EDGE LINE should then re-commence as the boundary of the freeway gore island and continue until a point 600 mm transversely to the right of the on-ramp right side CONTINUITY LINE warning marking WM2. The freeway LEFT EDGE LINE should then be discontinued until its prolongation intersects the on-ramp LEFT EDGE LINE at which point it should be continued. The sections where the LEFT EDGE LINE has been omitted across the off-ramp and on-ramp should be marked with a CONTINUITY LINE (see Subsection 7.3.2).

11 If the terrain is such that slower vehicles are likely to constitute an obstruction to normal traffic it is recommended that shoulders formed by a LEFT EDGE LINE should NOT be created. This should discourage the development of the practice of slow-moving traffic running on such shoulders. Preference should rather be given to marking an additional lane line which will permit safe overtaking by faster traffic.

12 Examples of typical applications which include the use of LEFT EDGE LINE and RIGHT EDGE LINE markings are given in Volume 2, Chapters 2 and 3.
7.2.9 Painted Islands

1 A PAINTED ISLAND regulatory marking RMS imposes a mandatory requirement that drivers of vehicles shall not drive a vehicle in such a manner that it, or any part of it, crosses such a marking, or to park or stop a vehicle upon such marking.

EXCEPT:
(a) if directed to do so by a traffic officer;
(b) in the case of an emergency.

2 A PAINTED ISLAND MARKING shall comprise either:
(a) a single continuous solid white boundary line with a minimum width of 100 mm and another boundary formed by a kerb line, and within the area contained by these boundaries, yellow marked sloping bars in a diagonal pattern of a minimum width of 150 mm and a maximum width of 1 m, measured across the line at 90° to the slope of the bar; the recommended ratio of bar width to space between bars is 1 to 2 measured on the line of the centre line of the island; or
(b) two continuous white boundary lines each with a minimum width of 100 mm, and, within the area contained by these lines, yellow marked sloping bars in either a diagonal or chevron pattern of a minimum width of 150 mm and a maximum width of 1 m, measured across the line at 90° to the slope of the bar; except that in one-way roadway applications, one boundary line may be a yellow line (LEFT EDGE LINE marking RM4.1); the recommended ratio of bar width to space between bars is 1 to 2 measured on the line of the centre line of the island; or
(c) two continuous solid white NO OVERTAKING LINE markings RM1 containing a continuous solid yellow marking with a minimum width of 200 mm up to a maximum width of 600 mm so that there is a minimum clear space between each marking of 50 mm if road studs are not used or 150 mm if road studs are used.

3 The diagonal or chevron bar of a PAINTED ISLAND shall not normally extend to the boundary line. In order to obtain maximum conspicuity from the painted island marking a minimum gap of 150 mm should be left between the ends of the sloping bars and a boundary line. If an application calls for yellow sloping bar widths of 600 mm to 1 m these may be applied in an open box form to economise on materials e.g. for a 1 m bar the line can be made up of marked boundary lines 300 mm wide with a gap between of 400 mm, both measured at 90° to the slope of the bar.

4 PAINTED ISLANDS should be marked with bars in one of two ways, according to the type of traffic flow around the island:
(a) with diagonal bars sloping forward in the direction of traffic movement at an angle of 30° to the centre line or edge line as appropriate, when traffic flows ONLY on the left, or ONLY on the right of the island, or in opposite directions on each side of the island;
(b) with chevron bars sloping forward in the direction of travel of traffic, with an included angle of 60° (or 30° on each side of the centre line) when traffic flows in the same direction on each side of the island.

5 The setting out of a PAINTED ISLAND in the gore approach to a channelising island may present difficulties due to the rate of divergence of the traffic streams or the offset of the island end. In some instances a curved island centre line may be effective in producing...
an aesthetically acceptable set of sloping bars. In such case the bars may not all slope at the same angle to the centre line. It may be better in fact to maintain a constant angle to the curving edge line of the island (see Volume 2, Chapter 2).

6 There are many possible applications for PAINTED ISLAND markings. Among the more common are:
   (a) in advance of pedestrian refuge islands on two-way roadways;
   (b) in advance of the start of a median island;
   (c) in advance of channelising kerbed islands;
   (d) at freeway off-ramp gores;
   (e) at freeway on-ramp gores following 180° to 360° loop ramps;
   (f) as a separator island between opposing flows of traffic when there is insufficient space for a median island or barrier;
   (g) as a channelising device to prevent straight through traffic entering a turning lane which is in line across a junction from a similar lane serving turning traffic in the opposite direction;
   (h) as a “shadow” island next to a kerbed island to control general traffic movement but allow over-running by extra-large vehicles.
### 7.2.10 Parking Bays

1. PARKING BAY regulatory markings RM6 impose mandatory requirements that drivers of vehicles shall:

   (a) park their vehicles wholly within the lines defining the limits of a parking bay; AND
   
   (b) park their vehicles within 150 mm of the kerb line when the parking bays are marked at an angle to such kerb; OR
   
   (c) park their vehicles as far forward as possible onto the adjacent verge if the roadway does not have a kerb, without encroaching on any sidewalk.

2. PARKING BAY markings shall be white lines with a minimum width of 100 mm. They may take a range of forms according to whether the parking is angled or parallel to the kerb or edge of roadway, or whether it is all-day parking or time-limited parking. The PARKING BAY marking spacing may also be varied as necessary to cater for special vehicles such as motorcycles, mini-buses or buses. (Examples of typical parking layouts in roadways are given in Volume 2.)

3. In order to give adequate indication of the limits of individual parking bays for the purpose of reasonable enforcement of relevant regulations the minimum effective marking that shall be provided for each bay shall be, for each side of the bay:

   (a) a 600 mm length of white line extending from the outer limit of the bay towards the kerb line at an angle appropriate for the type of parking being marked; AND
   
   (b) a 600 mm length of white line parallel to the kerb line forming a "T" with the line in (a).

   PROVIDED that:

   (i) if the parking bay is available during off-peak hours only, and the space occupied by the bay is used as a traffic lane during peak hours, the length of line forming the head of the "T" may be omitted;
   
   (ii) if the line is the line at the beginning or end of a number of parking bays only half of the marking forming the head of the "T" shall be marked, and the line shall be marked for the full distance to the kerb.

4. When parking bays are marked to the minimum level as described in paragraph 7.2.10.3(b)(i) it is recommended that the NO STOPPING LINE marking...
RM12 or NO PARKING LINE marking RM13, applicable during parts of the day, be marked in line with the outer edge of the bays to improve the visibility of such line markings and to give adequate general longitudinal delineation to a block of parking bays.

5 The minimum marking indicated in paragraph 7.2.10.3 may be supplemented by an additional inner 600 mm length of white line extending outwards from the kerb or channel towards the outer "T". The inner and outer lines may be joined to make a continuous boundary line to the parking bay if a road authority or developer wishes to improve the visual impact of the markings. This will, however, significantly increase the line marking maintenance costs. The minimum width of a parking bay should be 2.2 m and an effective length of at least 6 m should be provided for all bays except those at the end of a block of parallel bays UNLESS some other street feature prevents end-on-entry to such bays.

6 The marking of a guide dot on the right hand side of the parking bay, or on the kerb or sidewalk in one-way streets, is recommended at parallel parking bays to improve the placing of cars within such bays.

7 PARKING BAY markings RM6 shall be marked on the road surface to supplement the significance of a regulatory sign related to parking or in conjunction with parking meters. It is recommended that parking bays should also be marked when there is no restriction on their use or charge for their use. By so doing the use of the available space will be optimised in the interests of all road users.
7.2.11 Exclusive Parking Bay

1 EXCLUSIVE PARKING BAY regulatory marking RM7 imposes a mandatory requirement upon drivers not to park or stop their vehicles within the area of the bay unless their vehicle is of the class indicated by letter(s) in supplementary oval marking RM7.1, or in the case of a bay marked at an SOS emergency telephone not to park or stop their vehicle except in an emergency.

PROVIDED that specific applications of EXCLUSIVE PARKING BAY marking RM7 impose additional mandatory requirements upon drivers as follows:

(a) when the bay is a LOADING ZONE (Letter “L” within marking RM7.1) no vehicle, other than a goods vehicle, or a motorcycle, motor tricycle or motor quadricycle designed or adapted to convey goods on a public road shall park or stop in the bay while it is being used for the loading or unloading of goods and only for a period which is reasonably necessary for the loading or unloading of goods;

(b) when used for a bus or minibus (letters “B” or “MB” respectively within marking RM7.1) no vehicle other than a bus or minibus, as appropriate, while it is operating on a fixed route shall park or stop in the bay.

2 EXCLUSIVE PARKING BAY markings may be used in a similar manner contemplated for PARKING BAY markings RM6, in which case the mandatory provisions of paragraph 7.2.10.1 shall apply mutatis mutandis.

3 EXCLUSIVE PARKING BAYS shall be demarcated by a continuous solid yellow boundary line on three sides with a minimum width of 100 mm and a minimum depth from the kerb line of 2.2 m. The length of the bay marking is not fixed, but it shall be greater than 6 m. An oval marking RM7.1 containing the appropriate letter(s), also in yellow, shall be marked so that it is visible to drivers even when the bay is occupied. Marking RM7.1 shall be marked approximately in the centre of the bay. When the bay is more than 30 m in length two or more RM7.1 markings shall be displayed.

4 An EXCLUSIVE PARKING BAY may be used in conjunction with a BUS STOP RESERVATION sign R325, a MINIBUS STOP RESERVATION sign R326 or an SOS emergency telephone in such a manner that it replaces part or all of a shoulder demarcated by a LEFT EDGE LINE marking RM4.1. In such circumstances the LEFT EDGE LINE marking should be discontinued. OR, preferably, tapered at an appropriate rate to the edge of the roadway, then continued parallel to the edge of the roadway and 150 mm from it for the required length of the EXCLUSIVE PARKING BAY and then returned to its normal shoulder position at an appropriate taper rate.
MANDATORY DIRECTION ARROWS

For dimensions ref. Vol. 4 pages 12.3.2 to 12.3.4

RM8

7.2.12 Mandatory Direction Arrows

1 MANDATORY DIRECTION ARROW regulatory markings RM8 impose a mandatory requirement that drivers of vehicles shall only proceed in the direction indicated by such arrow.

2 MANDATORY DIRECTION ARROWS shall be marked in yellow and should be of a size as indicated in Table 7.1. Arrows may be used to indicate a mandatory requirement to turn left only, turn left or proceed straight only, proceed straight only, turn right only or turn right or left only.

3 MANDATORY DIRECTION ARROWS will most commonly be marked in lanes although in some instances such as slip roads or turning roadways they may be marked in such a roadway. The arrows may be marked on controlled or uncontrolled approaches to a junction whether the control is by means of a road sign or a traffic signal. When marked in a lane they should be located between the CHANNEISING LINE markings RM3 and approximately 1m before the point of entry into a junction but not beyond any transverse road marking. If a STOP LINE or YIELD LINE is provided, and the word "STOP" or YIELD AHEAD marking is used, the arrow should be located approximately 1m before such markings.

4 A MANDATORY DIRECTION ARROW shall be marked:
   (a) a lane when the lane is an EXCLUSIVE or DEDICATED TURN lane;
   (b) a lane when more than one directional movement is permitted from the lane e.g. a right turn movement AND a straight-on or through movement;
   (c) a lane adjacent to a kerbed or painted channelising island which defines a turning roadway or slip road;
   (d) all lanes, when turning movements are permitted to the left and/or right, from two or more lanes.

5 In order that drivers may be made aware of mandatory direction control ahead as early as possible, MANDATORY DIRECTION ARROWS shall be preceded by at least one or preferably two DIRECTION ARROW AHEAD markings WM7, in each lane which is controlled (see Subsection 7.3.7.)

6 Neither a MANDATORY DIRECTION ARROW nor a DIRECTION ARROW AHEAD marking shall be used to indicate a split in lanes ahead or an increase in the number of lanes ahead e.g. when an exclusive right turn lane is developed. The appropriate arrow marking in such a situation is the BIFURCATION ARROW guidance marking GM3.
7.2.13 Exclusive Use Lane Line

1 EXCLUSIVE USE LANE LINE regulatory marking RM9, when used in conjunction with an appropriate EXCLUSIVE USE LANE SYMBOL or WORD marking RM17, imposes a mandatory requirement that drivers of vehicles shall not drive, park or stop in a lane with such markings if the vehicles they are driving are not of the class indicated by the SYMBOL or WORD marking RM17; PROVIDED, that if such a marking is used in conjunction with an appropriate road sign, the lane may be used by such class or classes of vehicle as indicated by symbol on such sign. The significance of the marking may be time-limited by virtue of the enabling regulatory sign message (see paragraph 7.2.13.7).

2 EXCLUSIVE USE LANE LINE marking RM9 may be designated for the exclusive use of a specific class of vehicle by the addition of symbol marking RM17 and an appropriate road sign at regular intervals, subject to a maximum spacing of 250 m, as follows:
   (a) for exclusive use by bicycles - by the addition of SYMBOL marking RM17.1 and CYCLE LANE RESERVATION regulatory sign R304;
   (b) for exclusive use by high occupancy vehicles - by the addition of SYMBOL marking RM17.4 and HIGH OCCUPANCY VEHICLE LANE RESERVATION regulatory sign R338;
   (c) for exclusive use by buses - by the addition of WORD marking RM17.2, "BUS", and BUS LANE RESERVATION regulatory signs R302 and/or R303;
   (d) for exclusive use by trams - by the addition of WORD marking RM17.2, "TRAM", and TRAM LANE RESERVATION regulatory sign R339.

3 EXCLUSIVE USE LANE LINE marking RM9 shall comprise a broken yellow line with a minimum width of 150 mm. A standard line-to-gap ratio of 1 to 1 shall be used with line and gap lengths of 750 mm. When being used to mark a full width traffic lane (2.8 m to over 4 m) marking RM9 shall be marked in addition to, and on the inside of, a LANE MARKING GM1 or other appropriate marking (such as a length of "Stacking Line" CHANNELISING LINE RM3). The parallel lane lines should be marked with a 50 mm lateral space between them. If a situation arises where it is required to provide an EXCLUSIVE USE LANE with other lanes on both sides of it then marking RM9 should be used on both sides of the lane as described above.

4 The use of EXCLUSIVE USE LANES by public transport vehicles can result in many possible detail variations according to mode of operation and multiple classes of vehicle. The indication of such detail variations should be made by use of the most appropriate road sign, in conjunction with a standard or common road marking treatment for all variations (with the exception of the relevant GM6 or GM7 markings). In urban environments, particularly in one-way street networks, exclusive use lane variations may include lanes shared by more than one class of vehicle and/or the use of an exclusive right side lane instead of the more common exclusive left side lane. In this way marking RM9 may be used to cater for the following situations (see Chapter 2, Section 2.5):
   (a) right side exclusive use lanes by:
      (i) buses - R348;
      (ii) high occupancy vehicles - R352;
   (b) shared use of a left side exclusive use lane by:
      (i) buses and minibuses - R328 and R329;
      (ii) buses and trams - R343 and R344;
      (iii) buses, trams and minibuses - R346 and R347;
   (c) similar shared use of a right side exclusive use lane by:
      (i) buses and minibuses - R349;
      (ii) buses and trams- R350;
      (iii) buses, trams and minibuses- R351.

5 It should be noted that in terms of the legal definitions of the different classes of public transport vehicles a "midi bus" is covered by the definition of a "bus". A midi bus may therefore use a facility set aside for the use of buses unless expressly prohibited from doing so. In
order to keep the road marking of public transport exclusive use lanes by more than one class of vehicle as simple as possible it is recommended that WORD message markings be limited to "BUS" and/or "TRAM" irrespective of whether the lane in question is also used by minibuses or midi buses. This recommendation does not preclude the use "MINI BUS" or "MIDI BUS" word messages (which will have to occupy two lines of message within the lane). The positioning of RM17 markings should be done with particular care if pedestrians are likely to need to cross exclusive use lanes (see Volume 2, Chapter 8).

The most common use of marking RM9 is likely to be to mark an exclusive use lane used by buses and/or other public transport vehicles (including high occupancy vehicles). Such lanes may be WITH-FLOW i.e. the traffic in the exclusive use lane is travelling in the same direction as traffic in the adjacent lane, or CONTRA-FLOW i.e. the traffic in the exclusive use lane is travelling in the opposite direction to traffic in the adjacent lane(s).

The indication of CONTRA-FLOW exclusive use lanes is of particular importance to pedestrians. To assist pedestrian awareness of a CONTRA-FLOW situation is recommended that, when a CONTRA-FLOW lane is created in a street which previously catered only for one-way traffic, the street be marked and signed as a two-way traffic street (see Volume 2, Chapter 8). When signing a CONTRA-FLOW exclusive use lane the signs, such as R303, should be provided to face in both directions, preferably mounted back-to-back on a common support.

The significance of EXCLUSIVE USE LANES may be time-limited by means of SELECTIVE RESTRICTION versions of the various regulatory signs mentioned in paragraphs 7.2.13.2 and 7.2.13.4 which state the time of applicability of the signs, and thereby the markings.

An EXCLUSIVE USE LANE LINE marking RM9 shall end AT LEAST 20 m before an intersecting side road where vehicles are permitted to turn left or right, as the case may be, across the line of the lane. In such situations the use of warning road markings END OR EXCLUSIVE USE LANE ARROWS WM11.1 or WM11.2 is recommended.

EXCLUSIVE USE LANE LINE marking RM9 shall be used with SYMBOL marking RM17.1, with the same colour and dimensions as given in paragraph 7.2.13.3, to demarcate a bicycle lane. The minimum width recommended for a bicycle lane is 1.5 m. If a bicycle lane marked by line RM9 is under 2.8 m in width a LANE LINE marking GM1 shall not be provided as well as marking RM9. An exclusive use bicycle lane may sometimes be contiguous with a roadway and at other times be separated from the road. Marking RM9 is not required when the bicycle lane is separated from the road (see Volume 2, Chapter 3).
7.2.14 Box Junction

1. A BOX JUNCTION regulatory marking RM10 imposes a mandatory requirement that drivers of vehicles shall not enter the box marked area within a junction if they are not able to leave such box marked area due to stationary vehicles ahead of them.

EXCEPT that, vehicles turning to the left or to the right may enter such box junctions.

2. BOX JUNCTION markings shall comprise continuous yellow boundary lines of a minimum width of 100 mm, enclosing cross-hatched continuous yellow diagonal lines of a minimum width of 100 mm. The boundary lines should preferably be spaced at least 500 mm from PEDESTRIAN CROSSING LINE markings RTM3 or pedestrian guide markings, when these are marked. The cross-hatching lines should be related to the diagonals of the overall BOX JUNCTION marking. If the perimeter of the box is less than 20 m in length, the cross-hatching should be limited to the diagonals. If the box has a perimeter of 20 m or more in length, additional cross-hatching should be marked at approximately equal spacings between the diagonal and the corner of the box so that no two lines are more than approximately 3 m apart. If the sides of the box junction are such that one pair of sides are more than twice the length of the other pair then the cross-hatching may be modified to produce a more "square" appearance. In this case diagonals will not be marked but the other guidelines will still apply. Insufficient cross-hatching will result in the BOX JUNCTION marking RM10 having poor visual impact, particularly when road profiles occur such as a crest curve within a junction (see Figure 7.7).

3. Care must be taken with the application of BOX JUNCTION markings. They are not a substitute for traffic signals. They are simply an aid to traffic flow when, for various reasons, traffic queues may extend across junctions to the extent that this has a detrimental effect on surrounding junctions in the area leading eventually to a "lock-up" of such junctions. All junctions are not suitable for BOX JUNCTION markings. An engineering study should be undertaken to ascertain the extent and nature of the problem which it is considered would be assisted by the use of BOX JUNCTION markings. A traffic survey should be undertaken to determine what benefits or disbenefits might be achieved, and to consider what other remedial measures might be effective.

4. Factors which should be considered are:
   (a) the junction should not be controlled by traffic signals;
   (b) blocking back from one or more adjacent junctions should already be occurring, even if only for short periods;
   (c) there should preferably be heavy traffic flows on both opposing approaches to the junction;
   (d) entrances to and exits from the junction should be opposite each other; however, in exceptional circumstances the markings may be considered for a right-hand stagger on the minor road provided there is a maximum box length of 30m and asymmetrical box shapes are avoided (two half boxes may be considered as an alternative);
   (e) normally there should be at least two lanes on each major road approach;
   (f) the roadway beyond the junction should be free of obstructions (this may require the relocation of bus stops and/or the imposition of time limits on loading operations);
   (g) when there is a sufficiently high percentage of right turning traffic BOX JUNCTION markings are less effective, therefore such sites should be given particular careful attention.

5. A HALF BOX JUNCTION marking may be used, in which only half the junction is marked. This is commonly appropriate at T-junctions. Marking RM10 may also be placed over part of an approach lane, outside the area of the junction. This application may be useful to keep a right turning path clear in narrow roadways (see Figure 7.7).

6. BOX JUNCTION marking RM10 shall be applied using materials with a superior skid resistance quality.
Detail 7.7.1  Box Junction Markings in a One-Way

Detail 7.7.2  Box Junction Markings Applied to Turning Lanes Only

NOTE:
(1) The Details given here are representative only. Many other variations are possible.

Fig. 7.7  Typical Box Junction Markings
7.2.15 Zig-Zag Zone Lines

1. Zig-Zag Zone Lines regulatory markings RM11 impose a mandatory requirement that drivers of vehicles:
   (a) shall not bring their vehicles to a stop within the “zig-zag” zone marked by such lines EXCEPT to:
      (i) yield right-of-way to pedestrians on the crossing; or
      (ii) stop behind a vehicle complying with paragraph (i);
   (b) shall not change lanes within the zig-zag zone.

   AND the markings impose a mandatory requirement that pedestrians shall not cross the roadway within a zig-zag zone except at a PEDESTRIAN CROSSING LINES marking RTM3 or BLOCK PEDESTRIAN CROSSING marking RTM4.

2. Zig-Zag Zone LINE markings shall comprise a broken white zig-zag line with a minimum width of 100 mm, using a line length of 2 m and a gap length of 150 mm.

3. The total area on both approaches contained within the zig-zag marking shall be known as the zig-zag zone.

4. Zig-Zag Zone LINES shall replace LEFT EDGE LINE markings RM4.1, LANE LINE markings GM1, and DIVIDING LINE markings WM3, or NO OVERTAKING LINE markings RM4 on both approaches to a non-signal controlled mid-block pedestrian crossing. PROVIDED that for reasons of safety, road curve delineation etc., a NO OVERTAKING or NO CROSSING LINE marking may be retained in addition to marking RM11. PEDESTRIAN CROSSING AHEAD LINES should extend at least 30m back from the YIELD LINE marking RTM2 on each approach.

5. Parking bays should not be marked within 30 m of a non-signalised mid-block pedestrian crossing. They may, however, be provided within 30 m of the crossing if they are marked on an area that is fully recessed to the left of the normal kerb line. If parking bays are provided in this manner the Zig-Zag Zone LINE markings RM11 shall be retained.

6. Pedestrian crossings should be located so that no crossing of zig-zag marking RM11 by traffic is necessary.

7. There are a number of different ways in which a pedestrian crossing can be indicated. Details of the relevant markings are covered in Subsections 7.2.1, 7.2.2, 7.2.3, 7.2.4, this subsection and Subsection 7.4.2. It is important that a high degree of standardisation be achieved in the practice of indicating pedestrian crossings in the interests of pedestrian safety. Details of the various options for the indication of pedestrian crossings are given in Volume 2, Chapters 2 and 3.
7.2.16 No Stopping Line

1 A NO STOPPING LINE regulatory marking RM12 imposes a mandatory requirement that drivers of vehicles:
   (a) shall not stop their vehicles adjacent to such line;
   (b) where such line is a broken line, shall not stop their vehicles adjacent to such line during the time period indicated by an accompanying road sign.

2 A NO STOPPING LINE shall comprise:
   (a) for 24-hour applicability, a continuous solid red line with a minimum width of 150 mm; OR
   (b) for applicability during limited periods of the day, a broken red line with a minimum width of 100 mm. (The line length may be varied to suite the PARKING BAY markings RM6. For 6 m long bays a line length of 4 m and a gap of 2 m is recommended.)

3 A NO STOPPING LINE may be marked parallel to a left side kerb line EXCEPT that for urban one-way roadways the line may also be marked on the right side. The line may be marked on the kerb itself to improve visibility of the line and to reduce wear on the marking. Otherwise the line may be marked between 150 mm and 2.5 m from the kerb line depending on what other markings are present on the road surface.
7.2.17 No Parking Line

1 A NO PARKING LINE regulatory marking RM13 imposes a mandatory requirement that drivers of vehicles:

(a) shall not park their vehicles adjacent to such line;
(b) where such a line is a broken line, shall not park their vehicles adjacent to such line during the time period(s) indicated by an accompanying road sign.

2 A NO PARKING LINE shall comprise:

(a) for 24-hour applicability, a continuous solid yellow line with a minimum width of 100 mm; OR
(b) for applicability during limited periods of the day, a broken yellow line with a minimum width of 100 mm. (The line length may be varied to suite the PARKING BAY markings RM6. For 6 m long bays a line length of 4 m and a gap of 2 m is recommended.)

3 ANO PARKING LINE shall only be marked on an urban roadway which is subject to the general speed limit for urban areas, other than a freeway.

4 A NO PARKING LINE may be marked parallel to a left side kerb line at a minimum distance of 150 mm and a maximum distance of 2.5 m from such kerb, EXCEPT that for urban one-way roadways the line may also be marked on the right hand side. It is recommended that the line be marked 2.5 m from the edge of the roadway when used in isolated situations to improve awareness of the marking.

5 NO PARKING LINES may be short in length and are commonly used in urban areas where it is impractical to erect an individual NO PARKING sign R216, or one of its variants. It should be noted that parking may be automatically prohibited by general road traffic legislation in some situations. On an area-wide basis the effect of not duplicating these messages may have a significant economical benefit (see Volume 2, Chapter 3).
For dimensions ref. Vo/4 page 12.4.13

7.2.18 No Motor Cycles Marking

1 NO MOTOR CYCLES regulatory marking RM14 imposes a mandatory requirement that drivers of motor cycles shall not proceed beyond such a marking.

2 Marking RM14 may be used in addition to NO MOTOR CYCLES sign R222 to amplify the message of the sign. Marking RM14 may also be used on its own at specific points where provision of a sign is not practical. It is recommended that in the latter circumstances an effort be made to erect sign R222 in close proximity to marking RM14, if not at the same point.

3 NO MOTOR CYCLES marking RM14 shall comprise an elongated image representing the prohibition shape and symbol of sign R222 and it shall be yellow in colour.

4 Notwithstanding the provision of marking RM14 and/or sign R222 it is good practice to give motor cyclists an advance indication of a prohibition on motorcycles ahead of them. Sign R222 may be incorporated into a map-type or diagrammatic sign with a distance indication to the point of prohibition. The use of marking RM14 in advance of the point of prohibition is not recommended.
7.2.19 Traffic Circle Mandatory Direction Arrows

1 The TRAFFIC CIRCLE MANDATORY DIRECTION ARROWS regulatory markings RM15 indicate a mandatory requirement that drivers of vehicles shall only proceed in the direction indicated by the arrows. When a raised channelising island is not provided at a traffic circle a painted traffic island shall be marked in the appropriate position relative to the design of the traffic circle, which shall indicate a mandatory requirement that drivers of vehicles shall drive their vehicles in such a manner as to not encroach onto the circle, nor to fully cover the circle or pass to the right of it.

2 TRAFFIC CIRCLE MANDATORY DIRECTION ARROWS shall be marked on the road surface, in yellow, in sets of three arrows, at all mini circles where the size of the circle is such that the full circular roadway created can be seen by approaching drivers. The three arrow markings shall be equally spaced but may be positioned to best suit the number and angle of intersection of the approach roadways.

3 The provision of a painted traffic island, round which traffic is required to drive in a clockwise direction, is an alternative to a raised channelising traffic circle and is particularly appropriate for use in mini circles. If a raised island is not constructed a painted traffic island shall be provided at a junction intended to operate as a mini circle. The marked circle is a form of PAINTED ISLAND marking RM5. The circumference of the circle should comprise a white boundary line with a minimum width of 300 mm. The central portion may be marked with a solid yellow marking so that there is a minimum gap of 200 mm between the central area and the boundary line. For larger painted circles the central area need not be fully painted. This area may be replaced by an inner circular yellow marking 300 mm wide.

4 A minimum diameter of 2 m and a maximum diameter of 6 m are recommended for marked mini circles. It is recommended that the road surface be raised but mountable by traffic over the area of the marked circle. Central channelising islands may be defined by mountable or un-mountable kerbing depending on the dimensions of the circle and the junction.

5 The recommended lengths of arrow for use with mini circles up to 2 m in diameter is 4 m, whilst for larger circles 5 m arrows may be used. The size of arrow chosen should also be dependent on the width of the circular roadway. If the roadway width is narrow the smaller arrow should be used. If necessary 7.5 m arrows may be specified for larger circles (see Volume 2, Chapters 2 and 3).

6 As with any form of road marking care must be always taken to reduce the risk of presenting motor-cyclists with large areas of surface with poor friction properties. Since a relatively large portion of the road surface within a traffic circle may be marked by arrows and a central circle the use of materials with the best friction qualities is recommended.

7 Traffic circles may range widely in size and functions. They may be used in the form of mini circles as an alternative to 4-way stop or traffic signal control, particularly as part of a traffic calming exercise. Traffic circles, or roundabouts, may also be used as a form of geometric junction design with specific traffic capacity design parameters, often as an alternative to traffic signal control. If a roundabout is designed to accommodate more than one lane of traffic on any approach the road marking treatment should be similar to that for other types of junction. CHANNELISING LINE marking AM3 ("stacking line"), LANE LINES marking GM1 and PAINTED ISLAND marking RM5 will commonly be required. It should be noted that a CHANNELISING LINE marking is subject to a minimum length requirement (see Table 7.5 in Subsection 7.2.5). For details of appropriate road signs see Subsection 2.2.4.
7.2.20 Disabled Persons Parking Bay

1. DISABLED PERSONS PARKING BAY regulatory marking RM16 imposes a mandatory requirement upon drivers of vehicles *not to park their vehicles within the area of the bay unless their vehicle is transporting a person or persons with a physical disability.*

2. DISABLED PERSONS PARKING BAY markings RM16 may be used in a similar manner contemplated for EXCLUSIVE PARKING BAY marking RM7, when provided as a parallel parking bay. Marking RM16 may, however, be provided in any of the traditional patterns of parking bay, in which case the requirement not to use the parking bay unless the vehicle is transporting a person with a physical disability is applicable.

3. DISABLED PERSONS PARKING BAYS shall be demarcated by a continuous solid yellow boundary line on three sides with a minimum line width of 100 mm. The internal area of the parking bay shall additionally be marked with a yellow diagonal line, of minimum width 100 mm, running from the front left corner of the bay to the inner or back right corner. A yellow DISABLED PERSONS SYMBOL marking RM17.3 shall be marked approximately in the centre of this diagonal line. When the parking bay is a parallel bay it should have a minimum width from the kerb line of 2.2 m. It is recommended that angled or 90° DISABLED PERSONS PARKING BAYS be marked at a greater width than normal to allow for the frequent need to accommodate a wheelchair next to the parked vehicle.

4. Marking RM16 may be marked in convenient positions within ranks or rows of conventional PARKING BAY markings RM6 to best suit the needs of disabled persons for safe movement from the parking area to their destination. Whenever practical, and subject to overall demand, it is recommended that RM16 markings be placed in a convenient position in a segregated group. Such a practice is likely to assist enforcement.

5. Since marking RM16 is a regulatory marking it can be enforced without additional regulatory signs. RM16 parking bays are commonly placed within large parking areas such as at shopping centres or educational institutions. It is therefore recommended, particularly in such environments, that DISABLED PERSONS VEHICLE PARKING RESERVATION regulatory signs R323-P be provided. These signs will further aid observance of the bays or enforcement, and will also make the location of the bays within the parking area discernible from a distance.
7.2.21 Exclusive Use Lane/Parking Symbols

1 EXCLUSIVE USE LANE/PARKING SYMBOLS (which include WORD markings for this function) may be used in conjunction with EXCLUSIVE USE LANE LINE marking RM9 or DISABLED PERSONS PARKING BAY marking RM16, as appropriate to indicate to drivers the specific applicability of markings RM9 and RM16. Approved EXCLUSIVE USE LANE/PARKING SYMBOLS are:

(a) yellow BICYCLE SYMBOL marking RM17.1 which shall be used in conjunction with EXCLUSIVE USE LANE LINE regulatory marking RM9 (see Subsection 7.2.13);

(b) yellow BUS, TRAM or other WORD symbol marking RM17.2 which shall be used in conjunction with EXCLUSIVE USE LANE LINE regulatory marking RM9;

(c) yellow DISABLED PERSONS SYMBOL marking RM17.3 which shall be used with DISABLED PERSONS PARKING BAY regulatory marking RM16 (see Subsection 7.2.20);

(d) yellow HIGH OCCUPANCY VEHICLE (HOV) SYMBOL marking RM17.4 which shall be used with EXCLUSIVE USE LANE LINE regulatory marking RM9 (see Subsection 7.2.13).

Only approved symbols shall be used.

2 The length of RM17 markings should generally be in accordance with Table 7.1. Dimensional details of all RM17 symbol or word markings are given in Volume 4, Chapter 12.

3 If a new symbol is being considered for use with EXCLUSIVE LANE marking RM9 under free-flow traffic conditions the length relationship between the symbol and a normal pictogram of the subject should involve a lengthwise elongation of the order of three times or more. The marking should be sized to be fully contained within a lane. If a suitable symbolic message cannot be derived an appropriate RM17.2 word message may be used.
7.3.1 Railway Crossing Ahead

1. RAILWAY CROSSING AHEAD warning marking WM1 is to warn road users of a railway crossing ahead.

2. A RAILWAY CROSSING AHEAD marking is classified as a symbol marking and shall comprise a cross consisting of two continuous white lines of minimum width 200 mm and length 4 000 mm in urban areas, and 400 mm and 7 500 mm in rural areas.

3. Warning marking WM1 should be used in conjunction with one of the warning signs GATE W314, or RAILWAY CROSSING W318, or HEIGHT RESTRICTED W320, as appropriate. The marking should be located between the sign and the railway crossing (see Volume 2, Chapter 7, for the application of signs and markings to railway crossings).
7.3.2 Continuity Line

1. A **continuity line** warning marking WM2 is to warn road users of a discontinuity in the through portion of the roadway and to warn road users that if they are travelling to the left of such a line on the left side of the roadway, or to the right side of such a line on the right side of the roadway, the portion of roadway on which they are travelling will shortly deviate from the through roadway.

2. A **continuity line** marking shall comprise a broken white line with a minimum width of 200 mm, marked as a Standard, Reduced or Extra density line as indicated in Table 7.6. The recommended line width for use on freeways is 300 mm.

3. A **continuity line** shall only be used to define the continuity of the through travelled way and if used between two streams of traffic shall only be used between streams travelling in the same direction.

4. A **continuity line** should be used:
   
   (a) as a continuation of a **left edge line** marking RM4.1 to warn that such a line is discontinued or diverted at an off-ramp or on-ramp on freeways;
   
   (b) at a turning slip road, at junctions with a geometric design which includes raised or painted islands;
   
   (c) on the main road at junctions where **stop line** marking RTM1 or **yield line** marking RTM2 are significantly set back from the edge of roadway (particularly when the side road intersects on a horizontal and/or vertical curve);
   
   (d) as a definition of the edge of roadway if an edge line is not used;
   
   (e) in place of a **lane line** marking GM1 to warn of the fact that the lane in question is not on the through travelled way but is dedicated to a left or right turn movement ahead.

5. If a **continuity line** application is required over some considerable length, particularly for an **exclusive** or **dedicated** turn lane, or a weaving lane on a freeway, the marking should be commenced as a reduced density line. This should then be changed to a standard density marking and then, if an increased level of warning message is required, to an extra density marking. It is recommended that whenever space permits, a section of **channelising line** regulatory marking RM3 should be preceded by a section of **continuity line**.

6. Further details involving applications of **continuity line** warning markings are given in Volume 2, Chapters 2 and 3.

<table>
<thead>
<tr>
<th>TABLE 7.6</th>
<th>CONTINUITY LINE-LINE/GAP MODULES</th>
<th>TABLE 7.6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Line Density</strong></td>
<td><strong>Urban</strong></td>
<td><strong>Rural</strong></td>
</tr>
<tr>
<td>Module(m)</td>
<td>Line/Gap (m)</td>
<td>Module(m)</td>
</tr>
<tr>
<td>Standard</td>
<td>9 m-</td>
<td>1,5m,3 m,1,5m,3m</td>
</tr>
<tr>
<td>Reduced</td>
<td>9m-</td>
<td>1,5m,7,5m</td>
</tr>
<tr>
<td>Extra</td>
<td>9 m-</td>
<td>1,5m,1,5m,1,5m,1,5m,1,5m,1,5m</td>
</tr>
</tbody>
</table>

**WARNING**
7.3.3 Dividing Line

1 A DIVIDING LINE warning marking WM3 is to warn road users that vehicles travelling on the other side of such a marking are travelling in the opposite direction (and if they wish to cross such a line, for whatever reason, they must wait until it is safe to do so).

2 A DIVIDING LINE marking shall comprise a broken white line with a minimum width of 100 mm and a line-to-gap ratio of 1 to 2 using dimensions on a 12 m module of 4 m and 8 m on rural roads, and on a 9 m module of 3 m and 6 m on urban roads. PROVIDED that the 12 m module using a 4 m line on an 8 m gap may be used on urban or peri-urban roads with a speed limit of 80 km/h or higher. When a DIVIDING LINE is used on multi-lane roadways it is recommended that the line width be increased to 150 mm and that the line-to-gap ratio be altered to 1 to 1 (see Figure 7.2).

3 A DIVIDING LINE marking shall only be used between portions of roadway carrying traffic travelling in opposite directions. The marking may be used in conjunction with a NO CROSSING LINE regulatory marking RM2 or a NO OVERTAKING LINE regulatory marking RM1 (see Subsections 7.2.5 and 7.2.6). It should be noted that a DIVIDING LINE has the same marking module length as a LANE LINE marking GM1, but has a different line-to-gap ratio. On multi-lane two-way roadways it is recommended that the DIVIDING LINE and LANE LINE modules be commenced at the same point whenever possible (see Figure 7.2).

4 A DIVIDING LINE shall be marked on all permanently surfaced rural roads with a surface width of 5.5 m or more. A DIVIDING LINE may be marked on roads of lesser width, in rural or urban areas, if, on engineering assessment, it is considered beneficial in safety terms to do so. The marking may be used also for relatively short distances. Likely situations for such use include sharp horizontal and/or vertical curvature, the approaches to road junctions, railway crossings or bridges/culverts, on roadways under 5.5 m in width, to warn traffic to pay particular attention to the risk of straying into the path of oncoming traffic.
### 7.3.4 Reversible Lane Lines

1. A REVERSIBLE LANE LINE warning marking WM4 is to warn road users that the lane so marked may be used by vehicles in the opposite directions at different times of the day and/or night. PROVIDED that warning marking WM4 shall only be used in conjunction with signing and/or other traffic control measures which make it clear in which direction the lane is in use at a particular time.

2. Such signs or devices are:
   
   (a) an overhead variable message sign or signal indicating whether the lane is open or closed to travel in a particular direction, or whether the lane is available only to a specific class of vehicle (such a message may be given by use of a custom de-signed overhead variable message guidance sign or by use of OVERHEAD LANE DIRECTION CONTROL signals S16 and S17);

   (b) temporary delineation devices.

3. A REVERSIBLE LANE LINE marking shall comprise two broken white lines marked side by side, each of minimum width of 100 mm, spaced 100 mm apart, and with a line-to-gap ratio of 1 to 2, using dimensions of 3 m and 6 m on urban roads. (This is in effect a double DIVIDING LINE warning marking WM3.) When the reversible lane is NOT a kerbside or median island-side lane both sides of the lane shall be marked using REVERSIBLE LANE LINE markings.

4. The use of REVERSIBLE LANE LINE markings should only be considered after a detailed engineering study of alternative methods of traffic control and after careful assessment of the necessary regulatory, warning and/or guidance signs or signals.

5. INFORMATION ARROW markings GM4.2 should be marked as described in Subsection 7.4.4.

### 7.3.5 Yield Control Ahead

A YIELD CONTROL AHEAD warning marking WM5 is to warn road users of a YIELD sign R2 or YIELD LINE marking RTM2 ahead (including any and all derivatives of sign R2).

2. A YIELD CONTROL AHEAD marking shall comprise an elongated white open block triangular symbol. The length of the marking should be determined from Table 7.1.

3. It is recommended that a YIELD CONTROL AHEAD marking be marked on the road surface approximately 1m in advance of the YIELD LINE marking RTM2. The marking may also be displayed in advance of a junction controlled by a YIELD sign R2 where inadequate approach sight distance or other factors make the form of control unexpected. A white INFORMATION ARROW marking GM4.1 may also be marked beyond marking WM5 to indicate that the yield control is some distance ahead. The marking should be used in conjunction with warning sign YIELD CONTROL AHEAD W303 and should be located between the warning sign and the YIELD regulatory control sign and/or marking.
7.3.6 Lane Reduction Arrows

1. A LANE REDUCTION ARROWS warning marking (WM6) is to warn road users that a lane on a multi-lane roadway ends some distance ahead either from the left or the right, or from both left and right.

2. A LANE REDUCTION ARROWS marking shall comprise two white arrows, normally one straight and one bent, (WM6.1 or WM6.3) but occasionally two bent arrows (WM6.2). Arrows shall be located on the centre lines of the appropriate lanes. The bent arrow head shall be inclined towards the lane which continues. When two lanes reduce in width from both sides of the roadway to form one lane, two bent arrows shall be used.

3. The length of the straight arrow should be determined from Table 7.1.

4. In order to achieve smooth, high speed, merging of two adjacent streams of traffic at a lane drop the LANE LINE marking GM1 should be terminated before the beginning of the edge line and/or no overtaking line taper. For high speed roads it is recommended that three sets of the appropriate LANE REDUCTION ARROWS WM6 be marked on the lane marked section so that the last of the WM6 arrow markings coincides with the last GM1 marking. Provided the LANE LINE marking GM1 has been set back from the beginning of the taper as recommended extra single bent arrow markings (WM6.4 or WM6.5) may be provided one quarter and one half of the distance into the lane line free plus taper section (see Figure 7.8 and Table 7.7). The treatment described is a standard geometric traffic engineering principle detailed in the MUTCD from the United States. Under no circumstances should LANE LINE marking GM1 be continued INTO the tapering section of roadway since this will result in late efforts by drivers to merge into one traffic stream. This will, in turn, result in unnecessary "friction", when traffic density is even moderately high, to the extent that traffic will slow significantly in the taper or even come to a stop.

5. PAINTED ISLAND marking RM5 should be marked on the shoulder or the dividing line on the side of the road which is tapered. Lane reduction markings may be used in conjunction with DIAGRAMMATIC guidance signs GS101 to GS106 and their overhead or temporary variants (see Section 4.12).

6. A lane reduction may be a permanent or temporary feature of a roadway and may be achieved on the left (slow) side OR the right (fast) side. The selection of a left or right side lane drop is dependent on many factors and should be determined as a result of a thorough engineering assessment. Any detail given in this manual does not imply a preference for one system over the other.

7. If it is necessary to drop more than one lane on a section of roadway each lane should be dropped separately with a correctly designed taper and the appropriate road signs and markings, including LANE REDUCTION ARROWS. There should also be a stabilising section of roadway between successive lane drops. Such a treatment is particularly appropriate for temporary lane drops at roadworks. The use of temporary bonded tapes for LANE REDUCTION ARROWS is recommended at temporary lane drops.

<table>
<thead>
<tr>
<th>Operating Speed</th>
<th>Distance to Last Arrow</th>
<th>Marking Spacing (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Urban</td>
</tr>
<tr>
<td>60</td>
<td>96</td>
<td>27</td>
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<td>36</td>
</tr>
<tr>
<td>100-120</td>
<td>144-192</td>
<td>48</td>
</tr>
</tbody>
</table>
NOTES:

(1) The detail represents a typical road marking treatment for a lane drop (dropping the "slow" lane). The lengths of taper and recovery area are not to scale.

(2) It is strongly recommended that the length of roadway required to achieve safe merging of traffic include a section without LANE LINE marking GM1 in addition to the taper. The overall length of roadway from the end of the lane marking should be defined by engineering assessment (see United States MUTCD).

(3) Single bent arrows may be used as illustrated (see paragraph 7.3.6.4).

Fig 7.8 Example of the Use of Lane Reduction Arrows
**7.3.7 Mandatory Direction Arrow Ahead**

1. MANDATORY DIRECTION ARROW AHEAD warning markings WM7 are to warn road users that a MANDATORY DIRECTION ARROW marking RM8 is ahead which will require the driver to proceed only in the direction indicated by the arrow. The MANDATORY DIRECTION ARROW AHEAD marking used in a lane shall have the identical shape to the MANDATORY DIRECTION ARROW marking RM8 used in such a lane.

2. MANDATORY DIRECTION AHEAD arrows shall be marked in white and should be of a size as indicated in Table 7.1.

3. At least one WM7 arrow marking shall precede an RMB arrow marking. EXCEPT when the RMB marking is in a recessed EXCLUSIVE or DEDICATED left or right-turn lane which is less than 25 m in length. The MANDATORY DIRECTION ARROW AHEAD marking shall be marked at least 25 m in advance of the RM8 marking to which it refers. A spacing between markings of 30 m to 40 m is preferred. Where sufficient approach length is available the use of two WM7 arrow markings located at spacings of 30 m to 40 m is recommended. However, NO WM7 arrow shall be marked in such a way that another intersecting side road is located between the WM7 marking and the junction to which it refers.

4. MANDATORY DIRECTION ARROW AHEAD markings shall NOT be used to indicate the development of additional lanes, such as left or right turn lanes, because the mandatory direction arrows which follow in the two lanes may bear no relationship to the arrow used to indicate the lane split. If it is required to indicate a lane split the appropriate version of the BIFURCATION ARROW marking GM3 should be used (see Subsection 7.4.3).
7.3.8 No Overtaking Line or No Crossing Line Ahead

1. A NO OVERTAKING LINE OR NO CROSSING LINE AHEAD warning markings WM8 are to warn road users that a NO OVERTAKING LINE marking RM1 or NO CROSSING LINE marking RM2, is ahead.

2. A NO OVERTAKING LINE or NO CROSSING LINE AHEAD marking shall normally comprise a white arrow which shall be marked on top of an appropriate DIVIDING LINE marking to form the composite marking WM8.2. If marking WM8 is required in both directions within a common section of DIVIDING LINE the composite marking WM8.3 may be used. Marking WM8.1 may be used on its own if necessary.

3. Two, and preferably three, such arrow markings should be marked in advance of the start of RM1 or RM2 markings at decreasing spacings of four, three and two DIVIDING LINE modules towards the start of such regulatory markings. (This amounts to 24 m, 60 m and 108 m from the start of the no overtaking line for rural and 18 m, 45 m and 81 m for urban conditions - see Volume 2, Chapter 2.)

4. The length of the WM8 marking shall be the same as the length of the DIVIDING LINE marking WM3.

7.3.9 Arrester Bed/Escape Road Ahead

1. An ARRESTER BED/ESCAPE ROAD AHEAD warning marking WM9.1 WM9.2 is to warn road users that an arrester bed/escape road is ahead.

2. ARRESTER BED AHEAD marking WM9.1 shall comprise a chequer-board arrangement of white and red markings elongated in the direction of travel. Recommended dimensions are 3 m by 1 m, with gaps in the longitudinal direction between markings of 3 m. The lateral gaps will depend on the width of surface but should be of the order of 250-300 mm. An ARRESTER BED AHEAD marking "pattern" comprises two transverse rows of rectangular markings.

3. ESCAPE ROAD AHEAD marking WM9.2 shall comprise a similar pattern to marking WM9.1 but using hollow box markings in the same alternating red and white pattern. Marking WM9.2 may commence in the middle of a roadway (see Volume 2, Chapter 2).

4. Arrester beds may be provided on the left or right side of a carriageway according to the road geometry and the topography of a site. For additional warning of the exit to the arrester bed the red and white blocks should be marked along the shoulder, in advance of the exit for approximately 75 m.

5. The markings shall be applied in skid resistant materials of a superior quality. ARRESTER BED/ESCAPE ROAD AHEAD markings may be used in conjunction with ROADSTUDS and shall be used in conjunction with DIAGRAMMATIC guidance signs in the GS500 series (see Section 4.12 and Volume 2, Chapters 2 and 11). It is suggested that LEFT EDGE LINE marking RM4.1 be continued unbroken across the entry to an arrester bed.
7.3.10 Speed Hump

1 A SPEED HUMP warning marking WM10 is to warn road users of a speed hump in the roadway.

2 A SPEED HUMP marking shall comprise diagonal white lines with a minimum width of 200 mm. The marking shall be applied to the approach side of the speed hump. Its use on the whole speed hump is optional.

3 It is recommended that when speed humps are used a NO OVERTAKING LINE marking RM1 be marked from 9 m in advance to 9 m beyond the speed hump.

4 If speed humps are used in areas which are environmentally sensitive and special roadway finishes have been used the SPEED HUMP marking need not be used. It is recommended that a similar pattern of diagonal lines be incorporated into the roadway surface finish if possible.

5 Examples of typical applications of SPEED HUMPS are given in Volume 2, Chapter 12.

7.3.11 End of Exclusive Use Lane Arrows

1 END OF EXCLUSIVE USE LANE ARROW warning markings WM11.1 and WM11.2 are to warn road users that an exclusive use lane has ended and that they may move into the continuation of such lane subject to normal lane changing protocols.

2 END OF EXCLUSIVE USE LANE ARROW markings WM11.1 and WM11.2 shall be marked in white. Marking WM11.1 shall have a minimum overall length of 7.2 m and marking WM11.2 shall have a minimum length of 6.0 m. The arrow markings shall be positioned symmetrically over the relevant LANE LINE marking GM1 or CONTINUITY LINE marking WM3 so that the transverse shaft falls in a gap in these lines.

3 Exclusive use lanes may be provided for priority movement of buses, trams, high occupancy vehicles or bicycles, (see Subsection 7.2.13). When other traffic is to be permitted to turn left (or right) at an intersecting side road EXCLUSIVE USE LANE LINE marking RM9 should be stopped in advance of the side road to permit traffic to move into the lane prior to turning. Marking WM11.1 may be used to indicate that this option is available and shall be followed, in the turning lane, by a MANDATORY DIRECTION ARROW marking RM8.1 (or RM8.5). It may be necessary to terminate an exclusive use lane to permit other traffic use of the lane for some distance. In this case arrow marking WM11.2 may be used.

4 If an exclusive use lane is provided on the right side of a roadway mirror-images of markings WM11.1 and WM11.2 may be used.
7.4.1 Lane Line

1. A LANE LINE guidance marking GM1 may be used to demarcate traffic lanes for road users travelling on a roadway or portion of roadway in the same direction.

2. A LANE LINE marking shall only be used within a portion of roadway carrying only vehicles which are travelling in the same direction. On a section of roadway where LANE LINE markings should generally be parallel to a DIVIDING LINE marking WM3, a NO OVERTAKING LINE marking RM1 or a NO CROSSING LINE marking RM2. On multi-lane roadways it is recommended that all broken line modules be synchronised across the road cross-section (see Subsection 7.1.5, Figure 7.2, Subsections 7.2.7 and 7.3.2 and paragraph 7.4.1.5).

3. The minimum width of a lane is generally covered by standards or specifications used by road authorities. It is recommended that a LANE LINE marking GM1 is provided when a portion of a roadway carrying traffic travelling in one direction is 6.8 m or more in width, and that no lane be marked with a width less than 2.75 m.

4. A STANDARD LANE LINE marking MODULE shall comprise a broken white line with a minimum width of 100 mm and a line-to-gap ratio of 1 to 2 with dimensions of 2 m lines and 4 m gaps for freeways and rural roads and 1.5 m lines and 3 m gaps for urban roads. Marking GM1 may also be used in a REDUCED or EXTRA density MODULE form. A REDUCED density module utilises a line-to-gap ratio of 1 to 5 with dimensions of 2 m and 10 m on freeways and rural roads and 1.5 m and 7.5 m on urban roads, and is generally appropriate to long straight sections of roadway. An EXTRA density module utilises a line-to-gap ratio of 1 to 1 with the dimensions of 2 m lines and 2 m gaps for rural roads and 1.5 m lines and 1.5 m gaps for urban roads. As can be seen in Figure 7.1 the effect of these dimensions is that a module may consist of one (reduced), two (standard) or three (extra) line/gap groupings.

5. It is generally recommended at multi-lane junctions, whether on free-flowing or STOP/traffic signal controlled approaches, that "Stacking Lanes" be marked on all multi-lane approaches. A "Stacking Lane" comprises a minimum length of solid CHANNELISING LINE marking RM3 (12 m in rural and 9 m in urban areas), PRECEDED by a length of EXTRA density LANE LINE marking GM1 for all through, or shared through/two lanes (or CONTINUITY LINE WM3 for EXCLUSIVE or DEDICATED turn lanes - see Subsections 7.2.7 and 7.3.2). The minimum recommended length for this section of EXTRA GM1 marking is two modules or 24 m in rural and 18 m in urban situations. Longer lengths may be specified, particularly when longer than 36 m or 27 m queues of traffic are likely to form. In urban environments provided with on-street parking, including one-way street networks, this marking arrangement enables legal movement from parking on one side of the street to a turn lane on the other side.

6. EXTRA LANE LINE marking GM1 may also be specified for curves and other areas where drivers are known to stray out of their lanes, but in which the marking of a CHANNELISING LINE marking RM3 is not considered appropriate i.e. on multi-lane undivided roadways.

7. LANE LINE marking GM1 should be replaced by a CONTINUITY LINE marking WM2 to indicate DEDICATED or EXCLUSIVE exit or turning lanes, whether to the left or right, from which traffic may not proceed in the direction of the through roadway (see Subsections 7.2.7 and 7.3.2).

8. The rural module LANE LINE marking GM1 may be considered for use in peri-urban or urban areas with a speed limit of 80 km/h or higher. The urban module may similarly be specified for sections of rural road with a speed limit under 80 km/h.
7.4.2 Guide Lines

1 GUIDE LINE guidance markings GM2 may be used to give additional guidance to road users within a junction. Use of the marking is OPTIONAL.

2 A GUIDE LINE marking shall comprise a broken white line with a minimum width of 100 mm and a line-to-gap ratio of 1 to 3 with dimensions of 500 mm and 1.5 m. Guide line marking in modules is not appropriate.

3 GUIDE LINE markings may be used to provide guidance to both drivers and pedestrians in a number of ways, examples of which are:
   (a) to provide TURNING GUIDANCE, particularly for right turning traffic at dual carriageway or other wide junctions where a GUIDE LINE may be marked in a curve to guide turning traffic through the most efficient path in terms of safety and turning capacity - this application is highly recommended when traffic is permitted to turn from more than one adjacent lane-in which case a GUIDE LINE should be marked from the right side of each lane to discourage traffic from straying into the path of the other turning lane;
   (b) to provide ALIGNMENT GUIDANCE across wide and/or complex junctions when there is a shift in alignment through a junction (in such situations a GUIDE LINE may be marked from the end of one or all lane lines (or stacking lines), across the junction in a straight or curved alignment as appropriate, to meet the appropriate far side lane line);
   (c) a pair of parallel guide lines may be used at uncontrolled junctions, to guide pedestrians to a preferred crossing point when a formal pedestrian crossing is not warranted; such situations include:
      (i) footpath extensions in wide road reserves when the surfaced roadway(s) take up a small portion of the reserve;
      (ii) turning roadways at channelised junctions to guide pedestrians on the most efficient or safe route through a complex junction.

4 Attention should be given to the appearance of guide line(s) when viewed by drivers travelling on the intersecting roadway to avoid the risk of creating a confusing situation for such drivers.

5 When used in the manner indicated in paragraph 7.4.2.3(a) one or more YIELD LINE markings RTM2 may be incorporated into the guideline marking to advise drivers of the likely need to yield, within the turn, to oncoming traffic.

6 When GUIDE LINE markings are used in the manner indicated in paragraph 7.4.2.3(c) there is a risk, as there is with all forms of pedestrian crossing, whether controlled or uncontrolled, that pedestrians may infer a false sense of security from the markings. It should therefore be understood that the principle employed in the use of such markings is one of guidance only. This guidance is directed mainly at pedestrians but is also of value to drivers. The alternative practice of using a PEDESTRIAN CROSSING LINES marking RTM3 at an uncontrolled junction, or in mid-block for that matter, is not recommended because such a marking is normally associated with traffic signal control and is even more likely to infer a false sense of security to pedestrians.
7.4.3 Bifurcation Arrows

1 A BIFURCATION ARROWS guidance marking GM3 may be used to indicate to road users an increase in the number of lanes ahead.

2 A BIFURCATION ARROWS marking shall comprise two elongated white arrows. These may be arranged in any appropriate combination of straight and inclined arrows to indicate the general direction in which the additional lane is provided. The angle included between the arrows may be varied according to the rate of taper by which the additional lane is created. The marking should be located within the tapering section of roadway between 10 m and 25 m from the start of the additional lane.

3 This type of arrow marking shall be used to offer drivers guidance only. The marking bears no relationship to any MANDATORY DIRECTION ARROW markings RMS which may occur in the roadway ahead (see also Subsections 7.2.12 and 7.3.7).

4 A BIFURCATION ARROWS marking may be used to guide drivers, in generally free running, higher speed traffic conditions when an extra lane is added, when an EXCLUSIVE or DEDICATED right or left turn lane is provided or when directional ramps split (commonly within intersections).

7.4.4 Information Arrows

1 An INFORMATION ARROW guidance marking GM4.1 and GM4.2 may be used to indicate to road users the direction of travel permitted in a particular lane or roadway. Marking GM4.2 is appropriate in a lane subject to controlled reversals in the direction of travel permitted and may be used to supplement EXCLUSIVE USE LANE LINE regulatory marking RM9 or REVERSIBLE LANE warning marking WM4 (see Sub- sections 7.2.13 and 7.3.4).

2 An INFORMATION ARROW marking GM4.1 shall comprise a white arrow with a length according to Table 7.1. Marking GM4.2 shall be sized in such a manner that both arrow heads are the same size as those of an equivalent GM4.1 arrow head. An INFORMATION ARROW marking should be located on the approximate centre line of the lane. The shape of the INFORMATION ARROW marking is different to that of all other arrow markings.

3 The arrow can be useful when drivers may have difficulty in determining exit paths from entry paths. The arrow should be used in preference to WORD markings GM7 such as "NO ENTRY", KEEP LEFT or "AHEAD".

4 INFORMATION ARROW marking GM4 is also of advantage in one-way streets, particularly in guiding traffic entering such roadways from minor intersecting roads, in support of regulatory signs such as NO ENTRY R3, ONE-WAY ROADWAY R4.1, R4.2 or R4.3, or KEEP LEFT or RIGHT R103 or R104, or PROCEED LEFT, RIGHT or STRAIGHT ONLY R105, R106 or R107, as appropriate.