CHAPTER 3: TRAFFIC SIGNAL FACES

3.1 INTRODUCTION

1 The traffic light signal is the means by which a traffic signal communicates with the driver. This communication is of fundamental importance for the efficient and safe operation of a traffic signal installation.

2 Due to the importance of the traffic light signal and signal faces in the communication with drivers, light signals and faces are regulated by the **National Road Traffic Regulations**, while minimum requirements are given in Chapter 6 of Volume 1 of the **Road Traffic Signs Manual**. It is important that that these regulations and standards shall be strictly adhered to in order to ensure uniform and safe traffic signalling.

3.2 LIGHT SIGNALS AND FACES

1 The *light signal* is the basic element of communication with the road user. A light signal consists of a single illuminated signal aspect and can be coloured green, yellow or red. A signal aspect is the lamp unit that displays a light signal when illuminated.

2 A vehicular light signal can be either a *disc* or an *arrow* light signal. Special light signals are also available for the control of *buses, trams, pedestrians* and *pedal cyclists* (as well as reversible lanes).

3 The vehicular disc light signal applies to ALL traffic movements, while the arrow (or a disc light signal combined with the Traffic Signal Arrow Sign ST1 to ST5) applies only to a particular turning movement or movements.

4 A light signal can also be either *steady* or *flashing*.

5 At traffic signals where no *pedestrian* signals are provided, the vehicular light signals will also apply to pedestrians.

6 The *traffic signal face* contains a number of signal aspects in particular arrangements. Standard traffic signal faces are prescribed and only those signal faces SHALL be used in traffic signal installations.

3.3 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 A JUNCTION is defined by the National Road Traffic Regulations ***"as that portion of an intersection contained within the prolongation of the lateral limits of the intersecting roadways and include any portion of the roadway between such lateral limits, and any stop or yield line marking which is painted at such intersection***".

3 An INTERSECTION is defined by the regulations as the ***"the area embraced within the prolongation of the lateral boundary lines of two or more public roads, open to vehicular traffic, that join one another at any angle, whether or not one such public road crosses the other"***.

4 The above definition of a junction allows for the provision of slipways adjacent to the junction that can be controlled independently of the main junction. A SLIPWAY is a roadway that passes to the left (or in the instance of one-way systems, to the right) of the main junction without intersecting the main junction. The regulations, however, require that ***"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".***

5 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 A PEDESTRIAN CROSSING is defined by the National Road Traffic Regulations as ***"a) any portion of a public road designated as a pedestrian crossing by appropriate road traffic signs or b) that portion of a public road at an intersection included within the prolongation or connection of the kerb line and adjacent boundary line of such road, when no pedestrian crossing has been designated by appropriate road traffic signs"***.

7 The above definitions are illustrated in Figure 3.1. The figure shows an intersection defined by the boundary lines of the two intersecting roads. Two junctions are also shown in the figure, the main junction as well as a slipway junction. A number of marked pedestrian crossings as well as one unmarked pedestrian crossing are also shown. **Pedestrian crossings are always defined at junctions (whether they are marked or not), except when pedestrians are specifically prohibited from crossing the junction.**

3.4 CONTROL PRECEDENCE

1 According to the National Road Traffic Regulations, ***"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;***

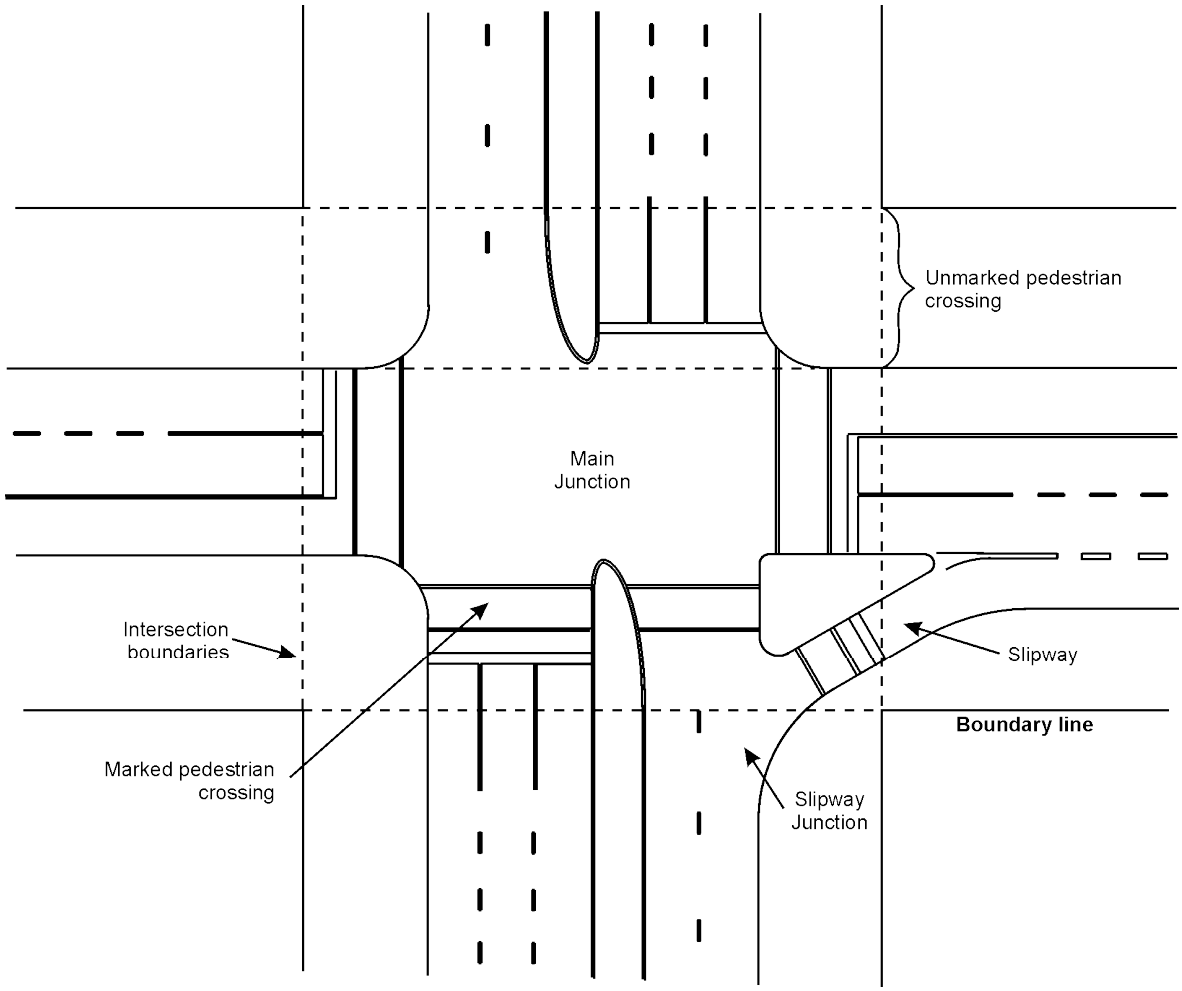

Figure 3.1: Definition of intersections, junctions, slipways and pedestrian crossings

(c) ***A light signal that has the significance that traffic shall stop, has precedence over any other road traffic sign 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".***

2 The National Road Traffic Regulations require that ***"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". Examples of such signs are shown in Figure 3.2.

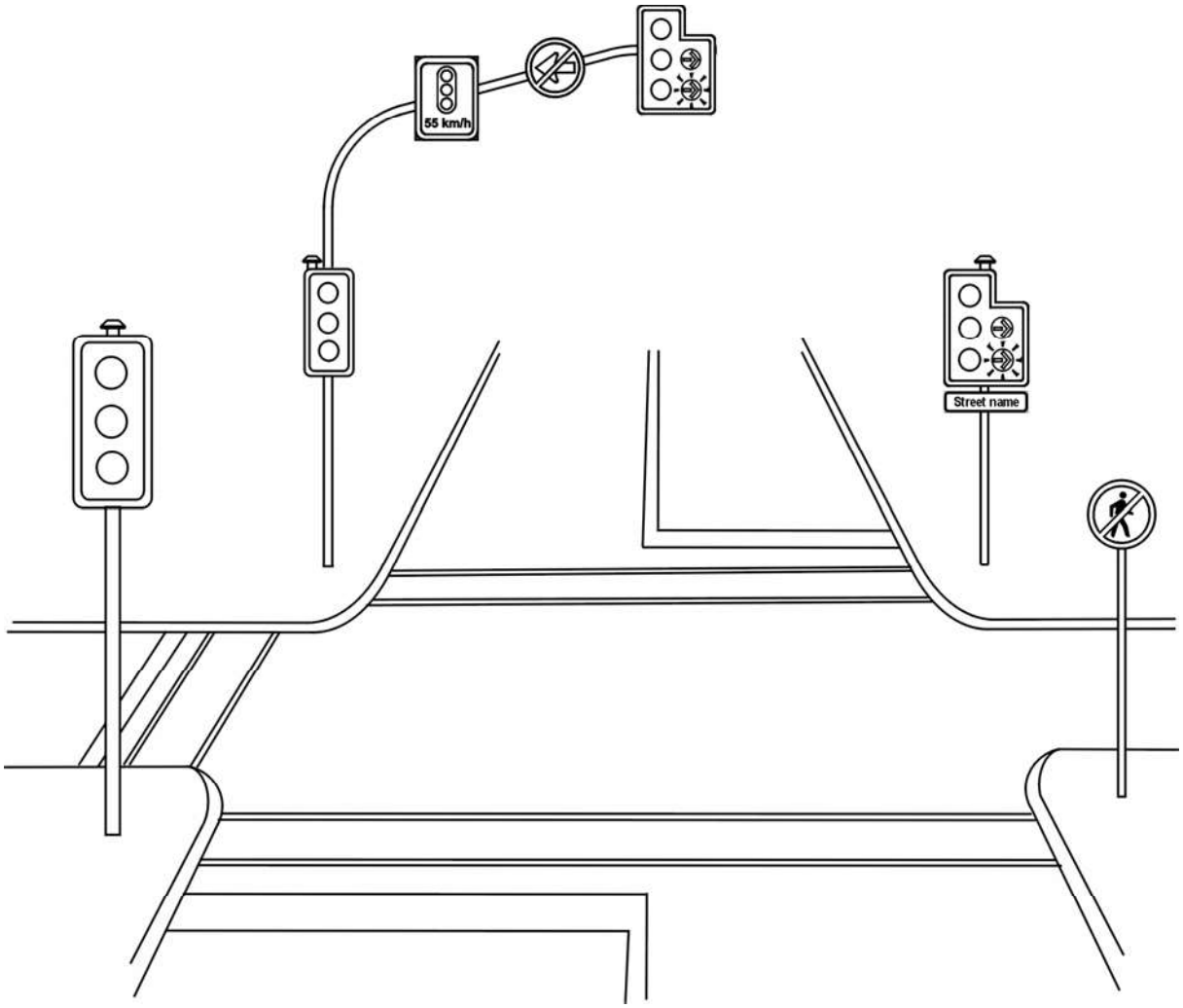

Figure 3.2: Examples of road signs used in conjunction with traffic signals

3 **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.**

4 According to the definition of a junction, a slipway at a signalised junction is defined as a separate junction, operating independently of the main junction. **A slipway therefore can be STOP or YIELD controlled as it is regarded as a separate junction.**

5 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).

6 TRAFFIC SIGNAL ARROW SIGNS ST1 to ST5 may be used in conjunction with traffic signals. According to the National Road Traffic regulations, 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".***

3.5 VEHICULAR LIGHT SIGNALS

3.5.1 General requirements

1 Vehicular light signals are described in the following sections. Appropriate combinations of the light signal may be used at a signalised road junction or pedestrian or pedal cyclist crossing.

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) a FLASHING or STEADY GREEN LIGHT SIGNAL, followed by:

(b) a STEADY YELLOW LIGHT SIGNAL followed by:

(c) a STEADY RED LIGHT SIGNAL, where it is provided on a signal face (not provided on S10L, S10R, S10B and S10T signal faces).

3 On the S9 and S10L traffic signal faces, the STEADY YELLOW ARROW LIGHT SIGNAL may be omitted from the signal sequence subject to the conditions that:

(a) 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

(b) when pedestrian or pedal cyclist signals are provided, no GREEN PEDESTRIAN or PEDAL 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.

4 **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).**

5 Under no circumstances SHALL a GREEN LIGHT SIGNAL be used at some times in a STEADY mode and other times in a FLASHING mode. A RED LIGHT SIGNAL, however, may be used in both flashing and steady modes. The YELLOW LIGHT SIGNAL may under no circumstances be used in flashing mode on a traffic signal face.

6 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.

7 The meanings assigned to vehicular light signals given in the following subsections are quoted directly from the National Road Traffic Regulations.

3.5.2 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 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 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"***.

5 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.** Information on the timing of pedestrian and pedal cyclist signals is given in Chapter 4 of this manual.

3.5.3 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 Chapter 6 of this manual (Volume 3).

(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.

3.5.4 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.

4 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).

5 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.

6 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.

7 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).

3.6 FLASHING AND OTHER MODES OF OPERATIONS

1 Flashing and other modes of operations include:
   (a) FLASHING RED LIGHT SIGNALS on ALL approaches.
   (b) No light signal illuminated (signals switched off).
   (c) Manual signal advance, whereby the timing of green light signals can be changed manually.

2 The operations at the signal when light signals are flashing red or when the light signals are not illuminated, are similar to that of a 3- or 4-way STOP controlled junction. According to the National Road Traffic Regulations, ***"when no light signal is illuminated on an approach to a signalised junction, the driver of a vehicle shall act as for a 3-way stop sign R1.3 or a 4-way stop sign R1.4".***

3 According to the National Road Traffic Regulations, ***"a traffic signal may be placed in a mode of operation indicating that it is out of order, and this mode of operation shall be that either all the light signals shall not be illuminated, or that all vehicular red light signals shall be flashing and pedestrian and pedal cyclist light signals shall be switched off".***

4 **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).

5 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 above modes of operation.

6 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.

7 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.

8 The traffic signal should again be returned to the normal mode of operations, or switched on, by using one of the following methods:
   (a) A FLASHING RED LIGHT SIGNAL 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 displaying FLASHING RED LIGHT SIGNALS 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).

3.7 ARRANGEMENT OF LIGHT SIGNALS ON A 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 shown in Figure 3.3. 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 (as shown in Figure 3.7), 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 conform to one of the standard traffic signal faces of Figure 3.3. Where increased conspicuity is required, additional standard traffic signal faces may be provided.

3.8 STANDARD SIGNAL FACES

1 Standard traffic signal faces are prescribed by the National Road Traffic Regulations. The standard faces are shown in Figure 3.3 and in the colour plate provided at the beginning of this manual (Volume 3). All traffic signal faces SHALL conform to one of the standards, and no other faces may be used.

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

3 TRAFFIC SIGNAL FACES S16 to S19 are used for individual lane control and are discussed in Chapter 13 of this manual (Volume 3). The faces are included in Figure 3.3 to indicate that they form part of the numbering system.

4 Dimensions for the standard traffic signal faces are given in Volume 4 of the Road Traffic Signs Manual and in the standard specifications SANS 1459: *Traffic lights*.

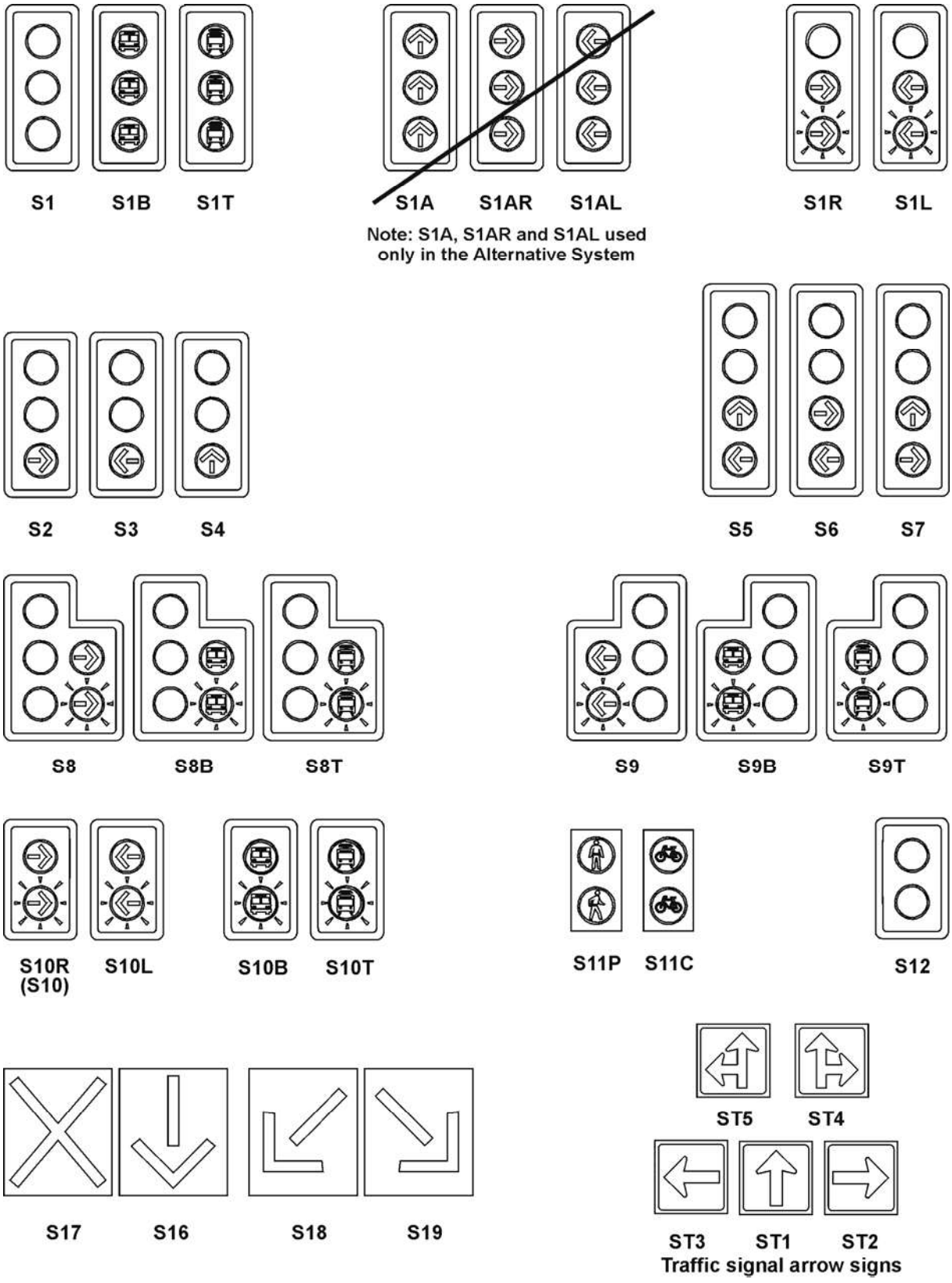

Figure 3.3: Standard traffic signal faces and traffic signal arrow signs

5 TRAFFIC SIGNAL ARROW SIGNS ST1 to ST5 may be used 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 3.4a and 3.4b.

6 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).

7 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.

8 Standard TRAFFIC SIGNAL FACES S1A, S1AR and S1AL are used ONLY in the **Alternative System**. The faces are used to signal protected turning phases, and may only be used if the turning movement indicated by the direction of the arrows is unopposed by any conflicting movements.

9 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 signals 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 3.4a and 3.4b.

(c) The signal faces may only be used when the conditions for the use of red, yellow and green light signals given in Sections 3.5.2 to 3.5.4 of this chapter are met.

10 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.

11 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 Sections 3.5.2 to 3.5.4 of 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).

12 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 Sections 3.5.2 to 3.5.4 of 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).

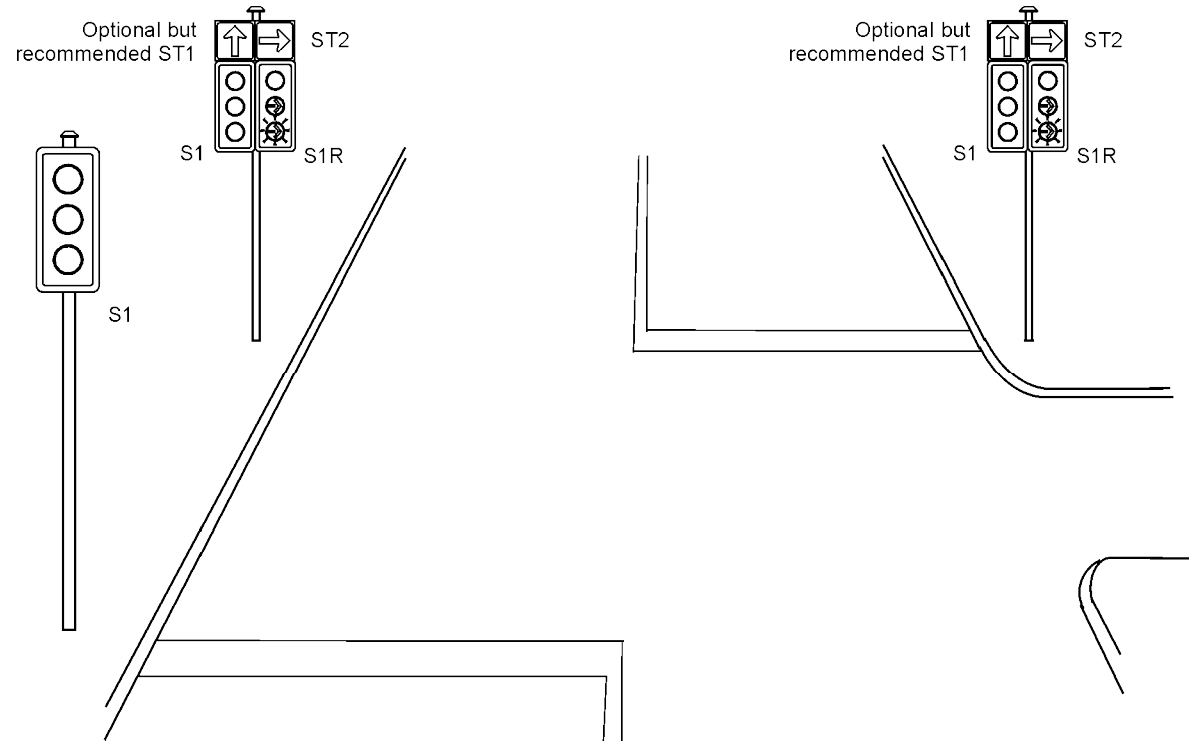

Figure 3.4a: Signalling for protected-only right turn at a T-junction

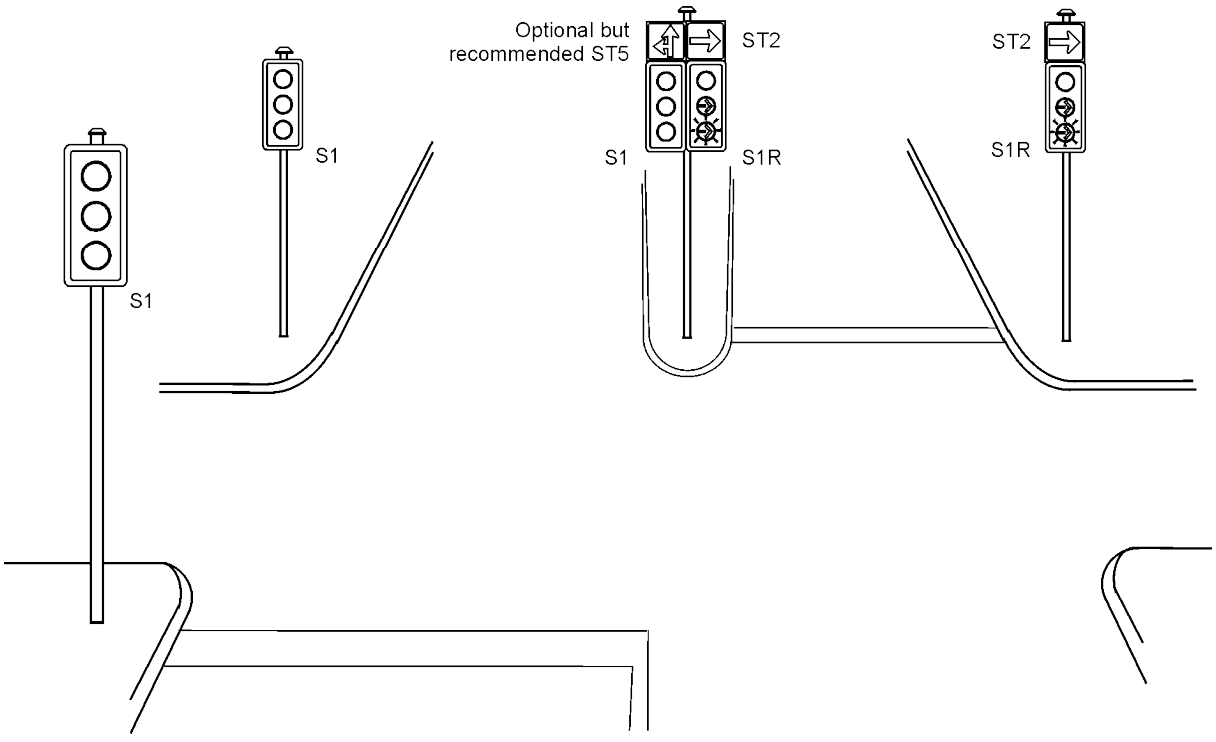

Figure 3.4b: Signalling for protected-only right turn at a 4-way junction (road divided by a median)

3.9 NUMBER AND LOCATION OF TRAFFIC SIGNAL FACES

3.9.1 General requirements

1 Traffic signal faces for use at junctions and pedestrian or pedal cyclist 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 According to the National Road Traffic Regulations, 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, 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 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 According to the National Road Traffic Regulations ***"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.

4 **With the exception of Traffic Signals S16 to S19, 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).**

5 A number of examples of traffic signal layouts showing the minimum required principal traffic signal faces are given in Appendix B of this manual.

3.9.2 Two-way traffic on a single lane

1 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.

2 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.

3 The stop line should be suitably located on the wider part of the road so that opposing traffic can pass any vehicles waiting at the stop line.

4 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 vehicle-actuated control is provided, the all-red period can be determined by the controller from vehicle detector inputs.

5 When sufficient sight distance is provided, the vehicular red light signal may be followed by a flashing red light signal to indicate that drivers can proceed if no vehicles are present in the opposite direction on the single lane section.

3.9.3 Left- and right-turn signal phases

1 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.
   (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.

2 Protected signal phases can be provided as follows:
   (a) *Protected/Permitted mode* – traffic signal faces S10R, S10L, S10B or S10T used singly or in combination with another suitable signal face that contains a red light signal (preferably not singly). Signal faces S8, S8B, S8T, S9, S9B and S9T can also be used for this purpose.
   (b) *Protected-only mode on an approach other than a signalised slipway* – traffic signal faces S1R and S1L with TRAFFIC SIGNAL ARROW SIGNS ST2 and ST3 respectively.
   (c) *Protected-only mode on a signalised slipway* – traffic signal faces S1R and S1L without TRAFFIC SIGNAL ARROW SIGNS ST2 or ST3.

3 When one of the traffic signal faces S1R and S1L is used to control a turning movement, the straight-through and other turning movement must be controlled using another suitable traffic signal face. When used on an approach other than a signalised slipway, separate lanes must be provided for the turning movements controlled by the S1R and S1L signal faces. Such lanes should preferably be separated from other lanes by a WM2 CONTINUITY LINE, a RM5 PAINTED ISLAND or a constructed island.

4 Figures 3.5a and 3.5b illustrate a number of traffic signal operating sequences for right-turn phases. Details are shown for leading as well as lagging right-turn phases, for situations where the phases start or end with the main phase or where they run before or after the main phase. Figure 3.5a shows the details for *protected/permitted* right-turn phases and Figure 3.5b the details for *protected-only* phases.

3.10 SIGNALS ON HIGH-SPEED ROADS

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

2 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;

3 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.

4 Speed discrimination equipment may be used to continually vary the intergreen period depending on vehicle approach speeds. The cost of the equipment may, however, mitigate against the use of such equipment. Where operating speeds are higher than the speed limit, it would be advisable to enforce the speed limit.

3.11 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.

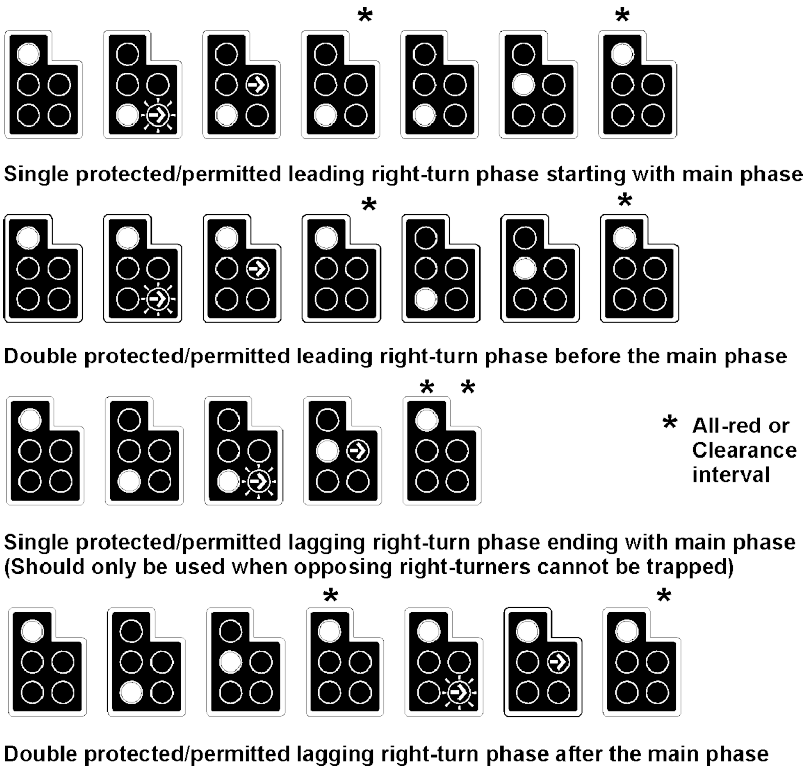

Figure 3.5a: Traffic signal sequence for protected/permitted right-turn phases using a S8 signal face

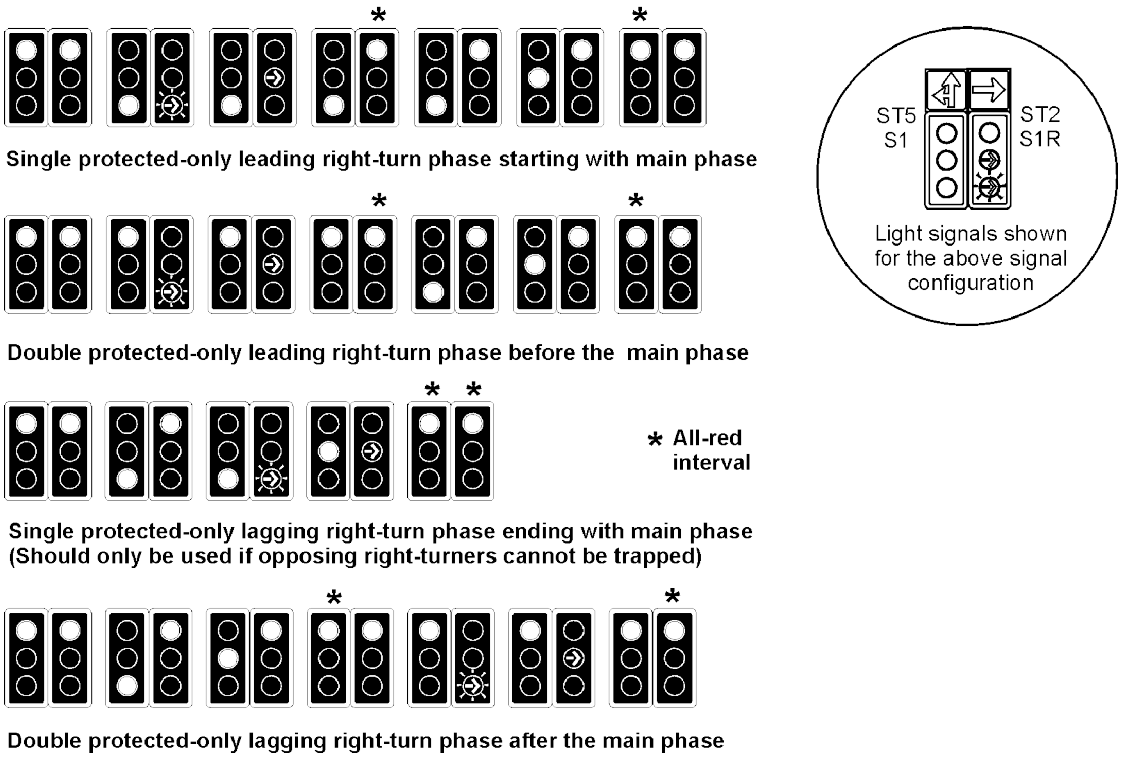

Figure 3.5b: Traffic signal sequence for protected-only right-turn phases using the S1 and S1R signal faces in conjunction with ST5 and ST2 traffic signal arrow signs.

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 3.1. 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 were 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" as shown in Figure 3.6. 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.

3.12 MOUNTING OF VEHICULAR TRAFFIC SIGNALS

3.12.1 General

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. 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.

3.12.2 Post-mounted traffic signals

1 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.

2 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.

3 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, as shown in Figure 3.7. A minimum clearance of not less than 2,1 m above the sidewalk should also be provided.

4 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, as shown in Figure 3.8. 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).

Table 3.1: RECOMMENDED SIGHT DISTANCES FOR TRAFFIC SIGNALS						
Speed limit or advisory speed (km/h)	Minimum for urban conditions (where signals are expected)	Preferable for urban conditions and minimum for rural conditions	Adjustments for grades			
			Add for a downgrade of:		Subtract for an upgrade of:	
			-5%	-10%	+5%	+10%
40 km/h (*)	55 m	130 m	0 m	5 m	0 m	5 m
50 km/h (*)	80 m	160 m	5 m	10 m	5 m	5 m
60 km/h	110 m	190 m	10 m	20 m	5 m	10 m
70 km/h	140 m	215 m	10 m	25 m	10 m	15 m
80 km/h	170 m	240 m	15 m	35 m	10 m	20 m
90 km/h	210 m	270 m	20 m	45 m	15 m	25 m
(*) To be used only in conjunction with an advisory speed sign, e.g. at a horizontal curve						

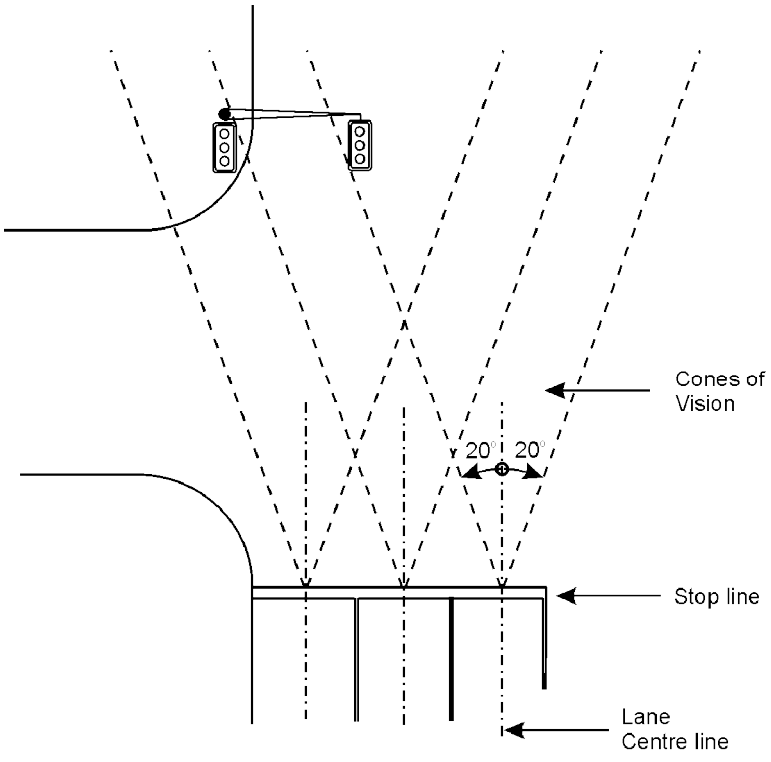

Figure 3.6: Cone of vision in horizontal plane

3.12.3 Overhead traffic signals

1 Overhead mounting may be used for any principal or supplementary traffic signal face (principal signal faces should preferably be post-mounted). Overhead mounting will also 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).

2 Consideration should 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.

3 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, as shown in Figure 3.9.

4 The vertical part of the gantry or cantilever structure may be used to mount a signal face at the side of the road.

5 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. The light signals displayed by such signal face apply to the approach and NOT just the lane over which it is located (does not apply to signals S16 to S19). **The cantilever should, however, preferably be located on the left-hand side of the road.**

6 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.

3.13 TRAFFIC SIGNAL LAYOUT PLANS

1 Traffic signal layout plans are used to show the numbers, types and location of traffic signal faces, as well as other elements of the traffic signal.

2 The National Road Traffic Regulations require that the layout plans SHALL be approved by a ***"responsible registered professional engineer or registered professional technologist (engineering) of the road authority concerned",*** and that the signal plan shall be kept by the road authority in control of the traffic signal."

3 According to the regulations, the plan must at least contain the following information:

(a) scaled drawing of the layout of the junction, indicating lane markings and road layout;

(b) number, type and location of traffic signal faces;

(c) number, type and location of pedestrian and pedal cyclist facilities, including pedestrian push buttons; and

(d) name, signature and registration number of the engineer or technologist who approved the signal, and date of signature.

4 An example of a traffic signal plan is given in Figure 3.10. The example shows a scaled drawing of the layout of the junction, lane markings, traffic signal faces, vehicle detection loops, pedestrian facilities and other data as required above. The plan also shows the signal groups that display exactly the same sequence of light signals at the same time (more information on signal groups is given in Chapter 6 of this manual).

5 The example traffic signal plan in Figure 3.10 utilises text to indicate types of traffic signal faces. This method is used throughout this manual. Symbols may also be used to indicate traffic signal faces as shown in Figure 3.11. The symbols used in this figure are pictorial and can be readily interpreted without reference to a legend.

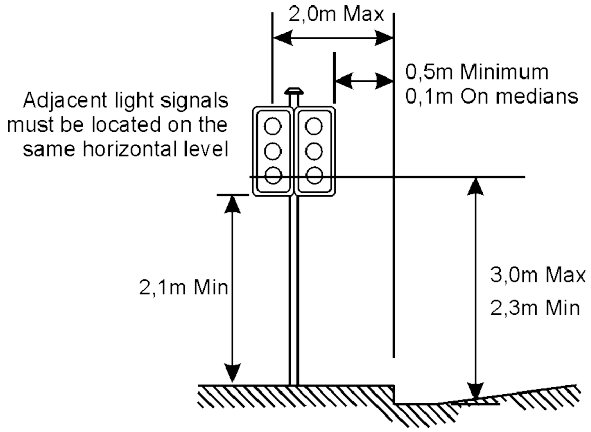

Figure 3.7: Standard post mounting

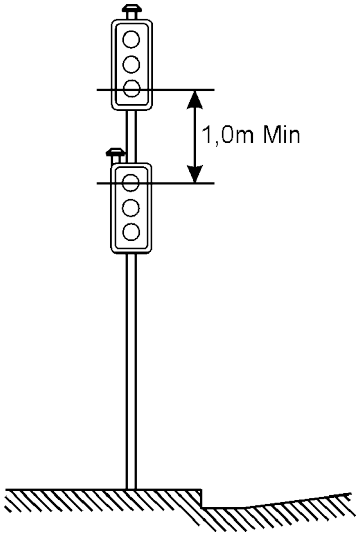

Figure 3.8: Extended post mounting

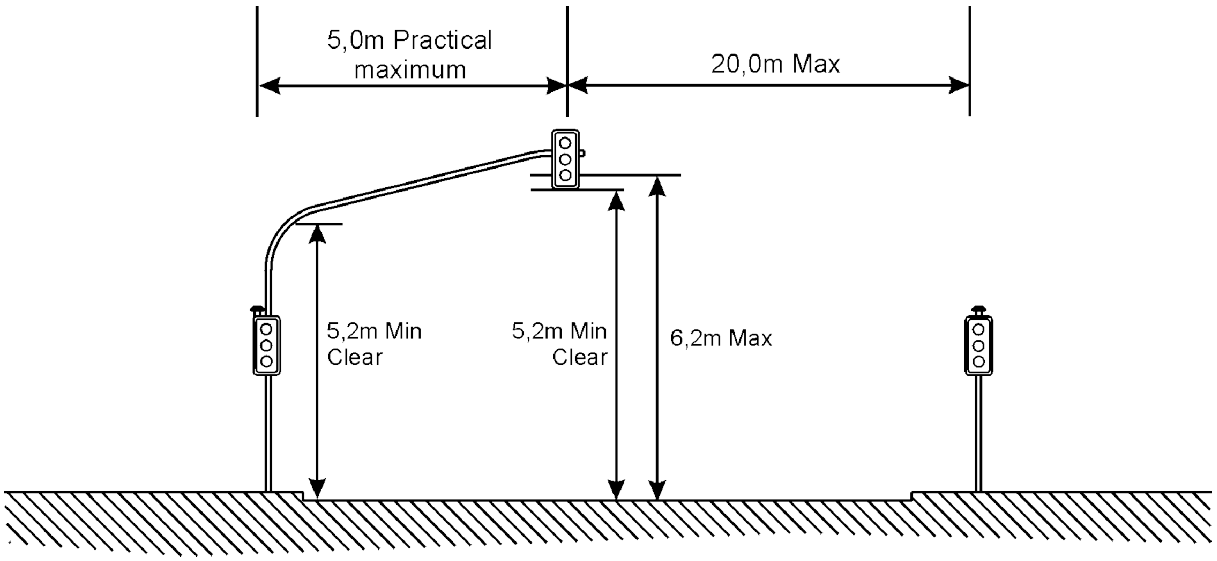

Figure 3.9: Overhead (cantilever) mounting of traffic signal faces

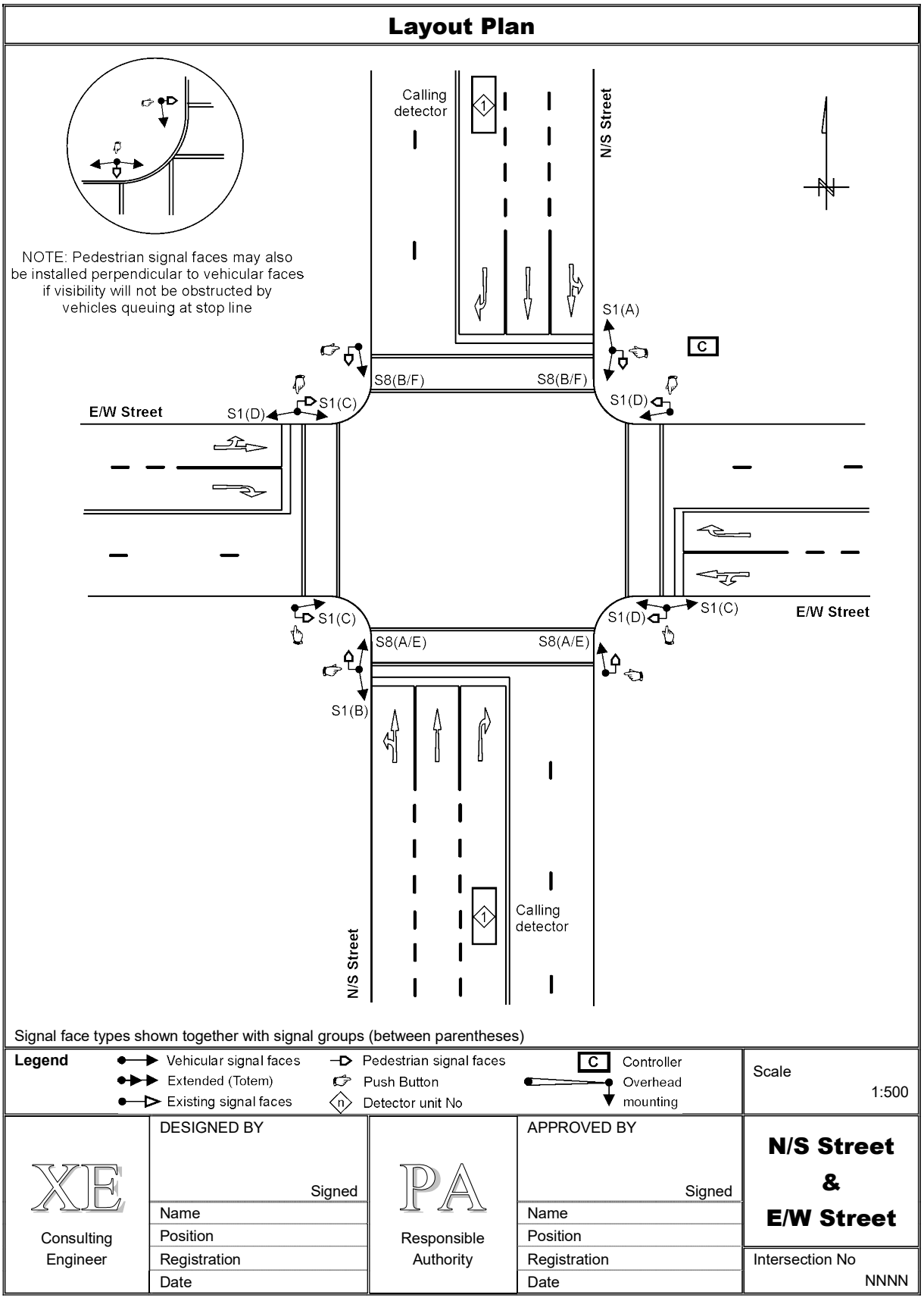

Figure 3.10: Example traffic signal layout plan

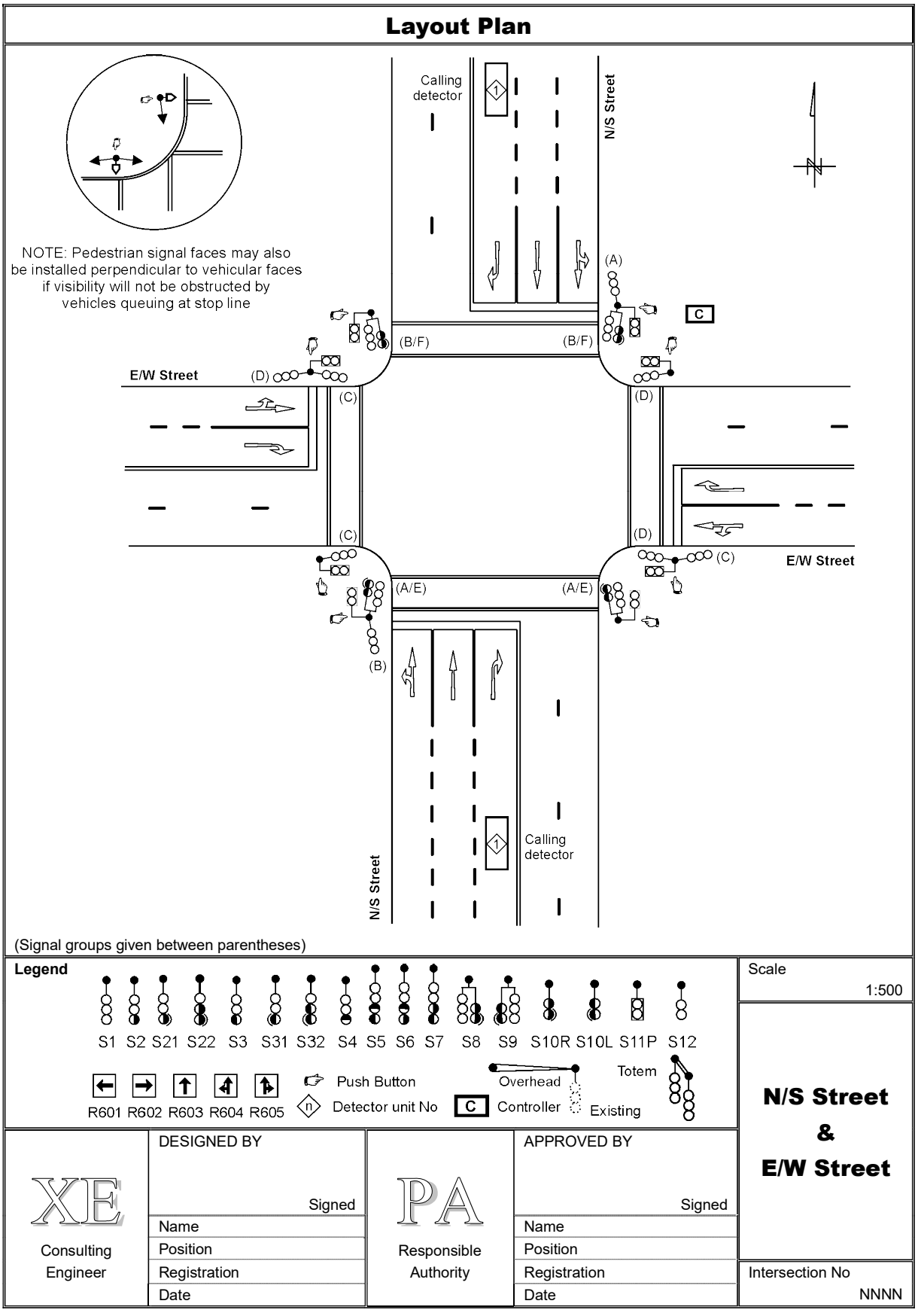

Figure 3.11: Alternative traffic signal layout plan using graphic symbols for signal faces