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DRAFT EAST AFRICAN STANDARD

Traffic control devices — Roads pavement markings and traffic signage — Code of practice

EAST AFRICAN COMMUNITY

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Foreword

Development of the East African Standards has been necessitated by the need for harmonizing requirements governing quality of products and services in the East African Community. It is envisaged that through harmonized standardization, trade barriers that are encountered when goods and services are exchanged within the Community will be removed.

The Community has established an East African Standards Committee (EASC) mandated to develop and issue East African Standards (EAS). The Committee is composed of representatives of the National Standards Bodies in Partner States, together with the representatives from the public and private sector organizations in the community.

East African Standards are developed through Technical Committees that are representative of key stakeholders including government, academia, consumer groups, private sector and other interested parties. Draft East African Standards are circulated to stakeholders through the National Standards Bodies in the Partner States. The comments received are discussed and incorporated before finalization of standards, in accordance with the Principles and procedures for development of East African Standards. XXXXXX.

East African Standards are subject to review, to keep pace with technological advances. Users of the East African Standards are therefore expected to ensure that they always have the latest versions of the standards they are implementing.

The committee responsible for this document is Technical Committee EASC/TC 028, *[Construction of roads, rails, air and water transport infrastructure]*.

Attention is drawn to the possibility that some of the elements of this document may be subject of patent rights. EAC shall not be held responsible for identifying any or all such patent rights.

EAS 982 consists of the following parts, under the general title *Bitumen and bituminous binders — Specifications*:

Introduction

Clear and efficient signing is an essential part of the road network for the enforcement of traffic regulations and for road safety, and a road with poor signing or with badly maintained signs is an unsatisfactory road.

This standard addresses the harmonisation of road signs, traffic signals and markings. For the purpose of this standard traffic signs include road signs, traffic signals and markings; sometimes referred to as traffic control devices (TCD). This standard presents a review of the legal traffic signs and recommended practices in the EAC Partner States.

Traffic signs include road signs, traffic signals (traffic lights), and road markings. They are used by road authorities to communicate with road users with view to regulate their behaviour, to guide, warn or inform them for their own safety and convenience on the public road networks. International conventions provide a framework for traffic signs and each Partner State has adopted a set of traffic signs to meet their current needs through their traffic law and/or traffic signs manual.

Traffic signs regulations and manuals keep evolving to meet the needs of the travelling public. The harmonization of traffic signs in the EAC is essential to the safety and convenience of the public travelling on the road networks whether for trade, tourism, education or other purposes.

Road Signs

Generally, there exists no big difference in the use of road signs in the EAC Partner States. To ensure greater uniformity in the installation of road signs the following are recommended.

a) The guidelines on mounting, placement and sign plate sizes as a function of road design speed should be provided in the EAC Partner States road signs manuals. A harmonized regime is proposed in this chapter.

b) EAC Partner States regulatory and warning signs schedules are generally similar. Integrated regulatory and warning signs schedules (both permanent and temporary signs) are recommended for adoption by the Partner States.

c) Guidance and information signs schedules in use across the EAC Partner States tend to differ in colour code. A consistent colour code and a schedule for guidance and information signs are recommended in this chapter for adoption by the Partner States.

d) Road authorities in EAC Partner States should adopt management practices that will ensure consistent application and maintenance of road signs at all relevant locations at all times. In particular, we recommend the adoption of Full Fibreglass Traffic Signs System (FFTSS) to overcome the persistent problem of vandalism of road signs made of metallic materials that have a ready market as scrap metal.

Road Markings

The use of pavement markings across the EAC Partner States is generally similar with the exception of the use of solid yellow marked lines to separate traffic travelling in opposite directions and the use of solid white line which varies across the EAC Partner States.

Since there are circumstances which may require installation of road studs for better visibility, EAC Partner States are encouraged to adopt their use. In particular, road studs should be used throughout the regional routes to ensure durable and all weather visibility of centrelines. To increase safety at pedestrian crossings it is recommended to provide blinking lights wherever a pedestrian is crossing to warn drivers of pedestrian presence and drivers should be required by law to wait when the lights are blinking.

Traffic Signals

There are no major differences in the regulations for operation of traffic signals in the EAC Partner States The meaning of the lights and sequencing are generally consistent and road users can quickly adapt to the slight

differences that exist. However, de-legalizing of traffic signals based only the red and green light (two lights system) allowed under the laws of some EAC Partner States but not practiced is desirable. The installation of two sets of signal heads per approach, one set on the near side of the approach and the other set at the far side of the approach is desirable especially on arterial road junctions.

Technology is advancing very rapidly and road authorities should be on the look-out in order to take advantage of research and development from best practice countries. The application of lighting in the cases mentioned in this section may be accomplished by solar power. This is very appropriate given the unreliability of electric power supply facing all the EAC Partner States. The innovation that allows the indication of remaining red (or green) time should be adopted.

Traffic control devices — Roads pavement markings and traffic signage —Code of practice

1 Scope

This Draft East Africa Standard specifies the requirements and code of practice for road safety traffic signs, signals and markings also known as Traffic Control Devices (TCD)

It provides details of the traffic control devices which are used on roads, including their layout and symbols, the circumstances in which each sign may be used and rules for siting and positioning them. The standard also provides guidance on the temporary traffic measures required at roadworks.

It applies to all classes of roads and is applicable to the construction of new roads and the rehabilitation of the existing roads.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EAS 293-1: 2007 Road marking materials — Part 1: Physical properties

EAS 927:2019 - Road marking paints — Specification (1st Edition)

EAS 928-1:2019 Hot applied thermoplastic road marking paint — Specification, Part 1, Constituent material and mixtures

EAS 928-2:2019 Hot applied thermoplastic road marking paint — Specification — Part 2, Road performance Specification

EAS 999:2021 Drop-on materials for road marking paint – Specification (1st Edition).

ISO 4998:2023 Steel sheet, zinc-coated and zinc-iron alloy-coated by the continuous hot-dip process, of structural quality

ASTM D4956-19 Standard Specification for Retroreflective Sheeting for Traffic Control

EAS 1206: 2025 Geometrical design of roads — Code of practice

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
traffic control devices (TCD)
all signs, signals, markings, and other devices used to regulate, warn, or guide traffic, placed on, over, or adjacent to a street, a road, pedestrian facility, or bikeway by a competent authority

3.2
road
the entire surface of any way or street open to public traffic

3.3
carriageway
part of a road normally used by vehicular traffic; a road may comprise several carriageways clearly separated from one another by, for example, a dividing strip or a difference of level

3.4
lane
part of a road which has been marked out for use by one moving line of vehicles

3.5
cycle lane
designated facility within or adjacent to a roadway, intended for the use of cyclists, and identified through markings, signs, or physical delineation

3.6
intersection
where two or more roads meet, cross, or converge, allowing traffic to change directions

3.7
level-crossing
any level intersection between a road and a railway or tramway track with its own track formation driver any person who drives a motor vehicle or other vehicles (including a cycle)

3.8
pedestrian crossing
part of a road which is painted with white stripes, also known as a “zebra crossing”

3.9
road user
any person using the road or its facilities, including drivers, passengers, pedestrians, cyclists, and persons controlling animals

3.10
traffic
moving vehicles, pedestrians, cyclists, and other conveyances along a road

3.11
traffic island
an area within the roadway, raised or flush and delineated by kerbs, markings or other devices, provided to separate or guide traffic streams or to provide pedestrian refuge

3.12
vehicle
any machine, wheeled, self-propelled, or towed mechanisms designed primarily for transporting people or goods on roads

3.13
module
repeating longitudinal unit used for setting out broken line road markings, consisting of one or more successive line segments and the corresponding gaps between them, arranged according to the specified line-to-gap ratio.

3.14
taper rate
the rate at which the width or lateral position of a traffic lane, pavement marking, or roadway feature changes along its length, expressed as a ratio of longitudinal distance to lateral offset

3.15
retroreflective
property of a material or surface that reflects incident light back toward its source with minimal scattering, thereby improving the visibility of road markings and signs to drivers.

4 General principles and classification of traffic control devices

4.1 General principles of traffic control devices

4.1.1 Signs shall give road users their message clearly and at the correct time. The message shall be unambiguous and speedily understood. Using standard signs assists in their quick recognition, as does uniformity of shape, colour and lettering for each type. To obtain the fullest benefits of uniformity, there shall not only be uniformity of signs, but also uniformity in their use, siting and illumination.

4.1.2 Signs are provided to control and guide traffic and to promote road safety. They should only be used where they can usefully serve these functions.

4.1.3 Signs are only effective if:

a) they are visible,

b) they are legible,

c) they are understandable,

d) the road users know what they mean, and

e) the road user is motivated to behave correctly.

Items a) and b) depend on the correct siting and maintenance of signs; item c) depends on the design of the signs and symbols being as self-explanatory as possible; items d) and e) depend on the implementation of education and enforcement.

4.1.4 In order that they may best fulfil their required function traffic control devices shall:

a) fulfil a need;

b) command attention;

c) convey a clear, simple meaning at a glance;

d) command the respect of road users;

e) allow adequate time to the correct response from road users.

4.1.5 **T**o achieve these objectives, traffic control devices should exhibit high levels of:

a) conformity;

b) accuracy of signface display;

c) uniformity of signface display;

d) consistency of sign use practice;

e) continuity of message display.

4.1.6 It is important that the message be presented in a simple way. A picture or symbol can be much more effective than words, and can be understood by those who cannot read. Use worded signs only where there is no alternative.

4.1.7 Signs should be sited where the background will not distract the eye from the sign.

4.1.8 The symbols and legends on signs shall be easy to read. This means that the symbols and lettering need to be large enough to enable drivers to read it at the required distance.

4.1.9 Traffic signs shall be clearly visible at night. It is not sufficient to rely on illumination by vehicle headlights, and signs shall be reflectorised either wholly or in part.

4.1.10 Traffic signs should be constructed and erected so that they will last for long time without any attention apart from occasional cleaning.

4.1.11 All traffic signs shall conform to the requirements of paragraph 4.2.2. The guidelines given in the standard conform, in general terms, to the following basic principles or assumptions:

a) give a positive message in preference to a negative message whenever such a choice is available;

b) use symbols or diagrams in preference to words;

c) signs should preferably have the same appearance by day and by night (use of retroreflective material);

d) limit the amount of information given at any one time to what can reasonably be observed and processed by road users;

e) when two required messages are linked or complement each other, such as a regulatory message and a warning message, it will commonly improve the effectiveness of message transfer to mount the relevant signs together;

f) the overall approach to signing should embody the principles of positive guidance;

g) all candidate destination names cannot be displayed at any given point;

h) pre-trip planning is essential;

i) regional, area or district names are not a precise enough source if information.

4.1.12 The design and use of guidance signs further requires a disciplined approach to the understanding and application of principles as follows:

a) navigation

i. primary aids:

— route maps

— route numbers

- interchange (EXIT) and junction numbers
- selective destination displays to provide orientation
- distance to high speed exits;

ii. sign information functions:

- location (you are here)
- direction
- orientation
- confirmation;

b) system efficiency:

i. functional requirements (see 4.2.2);

ii. criteria to meet the required functions;

c) sign face design function:

i. clear and simple message transfer to enable road users to:

- see sign (conspicuity)
- recognise sign function (class identification)
- read the sign (legibility)
- interpret the message (comprehension)
- make a decision
- act on a decision timeously;

ii. important message transfer factors:

- amount of information
- length of words
- similarity of words
- letter/background contrast
- upper/lower case letters
- letter size and style
- legibility distance/reading time
- angle of display;

d) information display:

i. use standard symbols rather than words;

ii. display a standard quantity of information in a standard way;

iii. limit total amount of information.

4.1.13 In particular, when considering the selection of appropriate destination names, they should not be selected on a localised basis. Their selection should be as a result of a broader consideration of the road network as a whole. The following criteria are important in deciding which destination will be most effective:

a) availability at the destination of motorist services;

b) ability to provide navigational orientation (familiarity);

c) the next destination;

d) the proximity of other destinations;

e) importance in terms of:

i. population;

ii. regional centre (economic activity);

iii. traffic generation;

i. transient tourist population;

f) junction or termination of routes.

4.2 Environmental Impact

4.2.1 The provision of a road traffic sign represents a conflict of interests. On the one hand it is considered necessary to communicate a message to road users and in order to do this, the necessary road traffic sign is designed to intrude into the field of view of road users. On the other hand, this field of view may have some particular environmental or aesthetic value.

4.2.2 This conflict of interests is, in practice, rarely avoidable in the interests of road safety. However, its effect should be recognised and considered, particularly in visually sensitive environments and the impact minimised if possible. In almost any environment the over-supply of road traffic signs, or indeed any other form of sign, can be considered to have an unacceptable environmental impact.

4.3 Awareness and Education

4.3.1 Public awareness of traffic control devices and the changes incorporated into the sign system is crucial for their proper use. It is important for all relevant authorities to coordinate awareness and educational campaigns targeting the following groups:

a) road users;

b) road authority officials;

c) traffic officers;

d) those involved in vehicle driver training;

e) traffic control device manufacturers;

f) international visitors.

4.3.2 Awareness and educational effort should be directed at the operational principles of the signing system.

4.4 Classification and use of road traffic control devices

4.4.1 Classification

Road traffic control devices are broadly classified according to their functions as follow:

a) Regulatory signs which give instructions, prohibitions or restrictions which road users shall obey;

b) Warning signs which warn of hazards on the road ahead;

c) Guidance signs, which give road users information on how to find their way to their destination, and

d) Information signs which may take the form of a supplementary plate that provides additional information to that given on the primary sign or to indicate the presence of an information centre or other facility

4.4.2 Use of road traffic control devices

Road traffic control devices shall be used by all road users in compliance with laws and regulations applicable in road traffic.

4.4.3 Road traffic signs

Figure 1 gives a generic classification of road traffic sign classification.

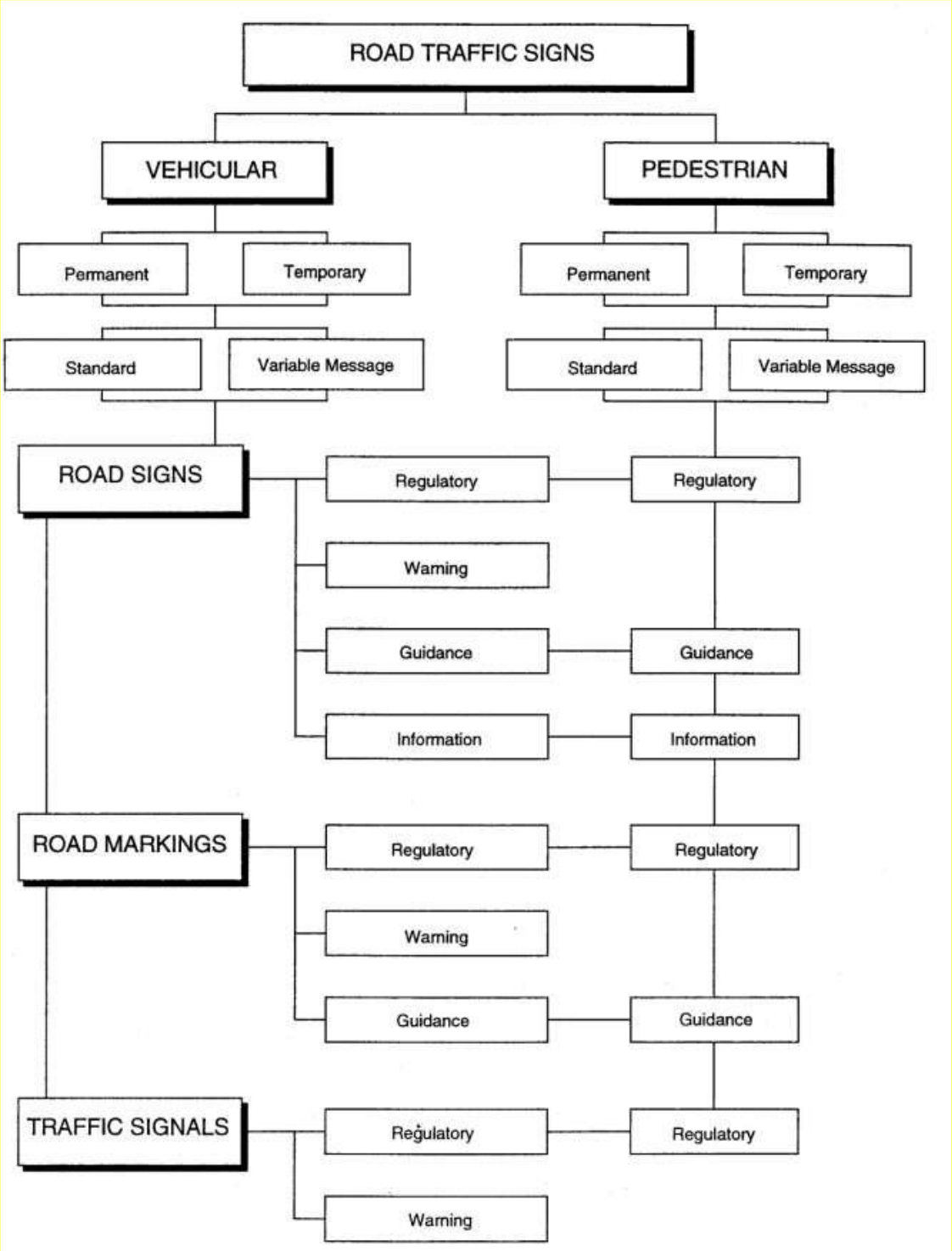

Figure 1 – Road Traffic Sign Classification

4.5 Signing system

There are three basic types of traffic sign: signs that give orders, signs that warn and signs that give information. Each type has a different shape. A further guide to the function of a sign is its colour. All circular signs give orders, most of all triangular signs warn, all rectangular signs inform.

Another important group of signs are road markings. These can regulate, warn and inform, and some help clarify or emphasise the message given by other signs.

5 Road traffic signs and traffic signals

5.1 General

5.1.1 In order to simplify the design of the regulatory and warning road signs defined in this standard, the size of the signs shall be specified in terms of the designation of the road on which they shall be erected. Where additional impact is required, it may be necessary, in certain circumstances, to specify a larger sign than the road designation requires. This can generally be done where a sign is erected on or at the end of a section of road where vehicle speeds have not been constrained by road surface condition or geometry. It may also be necessary to increase the size of a sign where experience has shown that drivers ignoring a sign, has led to accidents.

5.1.2 Minimum sizes for various road traffic sign types may be prescribed in Legislation. In the case of regulatory and warning road signs the minimum sizes are linked to increments in speed limit.

5.1.3 The minimum size prescribed in Legislation normally refers to the overall size of the road traffic sign in the form of a height, length or diameter. In some cases, the minimum dimension applies to one component (a traffic signal aspect), or to only one of the dimensions (the width of a road marking line).

5.1.4 Table 1 gives the minimum sizes for various traffic signs and roads markings. Authorities shall not use signs of sizes less than those prescribed.

Table 1 – Minimum dimensions of road traffic sign, traffic signals and roads markings

Road Traffic Sign	Function		Minimum External dimensions (mm)			
			Type Speed Limit (km/h)			
			≤ 60	80	100	120
Road signs						
Circular regulatory (Diameter)	General		600	900	1200	1200
	Overhead		900	1200	1200	1600
	Parking/Stopping		450	900	1200	1200
Rectangular regulatory (Height x Width)	General		600 x 450	900 x 675	1200 x 900	1200 x 900
	Overhead		900 x 675	900 x 900	1200 x 900	1600 x 1200
	Parking/Stopping		445 x 338	900 x 675	1200 x 900	1200 x 900
	Bus & Minibus stop		450 x 225	900 x 300	800 x 400	900 x 450
Triangular Regulatory and Warning (Side Length)			900	1200	1200	1500
Sign R2.1 – plate (Height x Width)	Yield to Pedestrians		300 x 225	450 x 338	600 x 450	750 x 563
Signs W401 and W402 (Height x Width)	Hazard Marker/Delineator		300 x 225	450 x 338	600 x 450	750 x 563
Signs W403 and W404 (Diagonal)	Railway Crossing		800	1200	1200	1200
Signs W405 to W410 (Height)	Hazard Marker		450	450	600	600
Sign TW411 (Height x Width)	Barricade		200 x 1200	300 x 1800	400 x 2400	400 x 2400
Traffic Signals						
Circular Disc Aspect	Signal Indications (including symbols)		210	210	210	210
Road Markings						
Longitudinal (Width)	Regulatory, Warning and Guidance		100	100	100	100
Longitudinal (Length)	Regulatory	Urban	9000	9000	9000	9000
		Rural	12000	12000	12000	12000

NOTES:

(1) A tolerance of 5% below all minimum external road sign dimensions is permitted.

(2) A tolerance of 10% below the minimum width of a longitudinal road marking is permitted.

(3) A tolerance if 10% below the minimum diameter of a traffic signal disc is permitted.

(4) A STOP sign R1 or any of its derivatives shall conform to the minimum external dimensions given for the same size circular regulatory sign, except that such sign used for a scholar patrol may have a minimum diameter of 450 mm. Signs R1.3 and R1.4 shall be the same size as one side of the STOP sign R1 with which they are used.

(5) A sign for pedestrians and/or cyclists may have a minimum diameter of 300 mm.

(6) A KEEP LEFT sign R103 used on the vertical face of a bollard may have a minimum diameter of 300 mm.

(7) A ONE-WAY ROADWAY sign R4.1, R4.2 or R4.3 shall have a minimum short side of 450 mm and a minimum long side of 600 mm.

(8) A PEDESTRIAN PRIORITY sign R5 shall have a minimum side length of 450 mm.

(9) An exclusive secondary message sign shall have the same length as the diameter or width of the upper primary sign with which it is used.

5.2 Legibility

5.2.1 The size of the information signs and supplementary plates shall be governed by the lettering height of the lettering used on the sign. The sizes of information signs containing text shall be determined by the size of text required. This is defined in terms of the height of an upper case “A” or lower case “x” and is referred to as the “A- height” and the “x-height” respectively.

5.2.2 A sign shall be capable of transmitting its message clearly and at the right time to road users travelling at the normal speed for the road during day and night. To achieve this, a sign shall have correct legibility distance, appropriate target value, simple content and layout, and effective reflectorisation. Signs shall also be adequate in design and construction.

5.2.3 The legibility of signs shall be determined by the size of the symbol or lettering used. Contributory factors include the use of adequate colour contrast between the symbols or lettering and the background and the type of any alphabet used.

The factors which determine the distance over which a sign message is legible shall include:

a) size of symbol or text;

b) number of messages to be scanned;

c) lateral distance of the sign from the edge of carriageway; and

d) The speed of the approaching vehicle

5.3 Regulatory signs

5.3.1 Use

5.3.1.1 Regulatory signs are used to control the actions of road users in the interest of safety and efficient use of road space. Regulatory signs are classified as follows:

5.3.1.2 Regulatory signs shall put into practical effect the road traffic regulation or control of traffic. Regulatory signs are either mandatory/obligatory or prohibitory.

5.3.1.2 The mandatory signs shall give instructions to drivers about what they shall do.

5.3.1.3 Mandatory signs shall be circular in shape with a white symbol and border on a blue background.

5.3.1.4 The prohibitory signs shall give instructions to drivers about what they shall not do. Prohibitory signs shall be circular in shape with a red border.

5.3.1.5 Regulatory signs shall only be used where it is considered essential that traffic be controlled for safety reasons or for efficient use of the road system.

5.3.1.6 Portable STOP signs shall not be used except for emergency and temporary traffic control zone purposes.

5.3.2 Classification

Regulatory signs are classified as follows:

a) ***Control:*** which exercise control over the right of way of traffic

b) ***Command***: which instruct drivers what to do

c) ***Prohibition:*** which instruct drivers what they must not do

d) ***Reservation:*** *which r*eserve road space for specific vehicle types or road users

5.3.3 Code and schedule of regulatory signs

The following Table 2, provide the recommended shape and colour code for permanent regulatory signs is recommended.

Table 2 – Shape and colour code for permanent regulatory signs

Group	Shape	Border	Background	Symbol
Control	Varies	Red	Varies	Usually white
Command	Circular or Rectangular	White	Blue	White
Prohibit	Circular	Red	White	Black
Reservation	Rectangular	White	Blue	White
End of Restriction	Circular	Gray	White	Gray

5.3.4 Temporary signs

The colours of the Control Group of signs such as STOP sign should not change when the sign is used on a temporary basis, but the background of command, prohibition and reservation group sign when are used for temporary restrictions such as at road works should be yellow. The shape and colour code for temporary regulatory signs in use are summarised in the following Table 3:

Table 3 – Shape and colour code for temporary regulatory signs

Group	Shape	Border	Background	Symbol
Control	Varies	Red	Varies	Usually white
Command	Circular or Rectangular	Black	Yellow	Black
Prohibit	Circular	Red	Yellow	Black
Reservation	Rectangular	Black	Yellow	Black
End of Restriction	Circular	Gray	White	Gray

5.3.5 Sizes and siting

5.3.5.1 The size of the regulatory signs shall depend upon the designation of the road on which they were erected. The size of sign shall be as shown on Table 1.

5.3.5.2 Signs giving effect to traffic regulation orders, and intended to be read from a moving vehicle, shall be of sufficient size to enable drivers to recognise them and assimilate the information in time. They shall therefore need to be of a size appropriate to the prevailing traffic speed on the road on which they are used.

5.3.5.3 Exception to the standard sizes shall be on Stop signs, Go signs and Give Way signs which shall be 750 mm except within urban areas where there may be a case for a 600 mm sign.

5.3.5.4 Regulatory signs shall be sited at or near the point where the instruction applies. It is important to make sure that there is no confusion about which road they refer to. Drivers shall be able to see the sign from at least 60 m away (75 m on National roads, Road Class 1 and Class 2) so that they have time to read the message and act on it.

5.3.5.5 Regulatory signs shall be placed at the driving side of the road, but a second sign on the opposite may be used where extra impact is needed.

5.3.6 Traffic speed restriction signs

Speed limits should be both reasonable and enforceable. Departures from the National speed limit should only be imposed where the situation is such that it is definitely unsafe for vehicles to maintain the higher speed.

This should only be used in urban areas with considerable pedestrian traffic and for traffic crossing a bailey bridge. Traffic calming measures such as road humps should be incorporated to introduce an element of "self-enforcement".

5.3.7 Regulatory signs schedule

Recommended regulatory signs schedule are given in Annex C and are presented under the following subsections:

a) Control signs

b) Command signs

c) Prohibition signs

d) Reservation signs

e) Supplementary signs

f) Regulatory signs to be abandoned

g) Priority signs

NOTE Drawings of each of the regulatory signs may be shown in the relevant laws and regulations applicable in each East Africa Partner State.

5.4 Warning signs

5.4.1 Use and positioning od warning sign

5.4.1.1 Warning signs shall be used to alert drivers to danger or potential danger ahead. They shall indicate a need for extra caution by road users and may require a reduction in speed or other manoeuvre.

5.4.1.2 Adequate warning signs can greatly assist road safety. To be most effective however, they should be used sparingly. Their frequent use to warn of conditions which are otherwise readily apparent tends to detract from their effectiveness.

5.4.1.3 Warning signs shall not be used in situations where the problem is obvious, or is so minor that no extra care is necessary. Side road junctions for example are not usually a danger when traffic speeds are low.

5.4.1.4 Warning signs shall be triangular in shape with a red border encompassing a black symbol on a white background. The black symbol shall normally be a diagram of the hazard.

5.4.1.5 Additional information should be put onto a supplementary plate below the main sign. There shall always be a distance clear of obstructions in advance of the sign. The sign should not be sited just after an obstruction or a sharp bend. Drivers shall be able to see the sign from at least 60 metres away and75 metres on National roads (Road Class 1 and Class 2) so that they have time to read the message. Warning signs shall be placed at the right-hand side of the road.

5.4.1.6 It takes time for a driver to act on the message given by a sign and slow his/her vehicle down to a safe speed. Therefore, signs shall be sited sufficiently far ahead of the hazard to allow for this. Signs shall also be large enough to be read clearly by drivers travelling at above average speeds. In general, the sizes and distances are determined by the design speed, however in order to simplify the specification of warning signs, Table 1 gives the sizes and Table 4 stipulates the distances in terms of road designation. If it is necessary to site the sign away from the standard position, the distance to the hazard should be indicated on the supplementary plate

Table 4 – Siting of warning signs

Road class	Minimum distance of Signs from hazard (m)
National roads (Road class 1 and Class 2)[a]	180
District roads (Road class 3)[a]	100
Town and urban roads (Road class 4 and Class 5)	50
Locations of signs in town and on urban roads (Road class 4 and Class 5)[a] where additional impact is required [b].	50
[a] The road design class, their function and name convention are as per EAS 1206. [b] The definition of "where additional impact is required" is to be found in 6.1.	

5.4.2 Classification

The warning signs are classified into the following two groups:

a) **Advanced warning signs**: which are roads layout, movement and symbol

b) **Hazard Marker signs**: which are curve and object markers

5.4.3 Shape and colour code and schedule of warning signs

5.4.3.1 The recommended shape and colour code for warning signs are summarised as follow:

a) The shape of warning sign is triangular, the apex pointing up

b) The border is red

c) The background White for permanent sign Yellow for a temporary sign

d) The symbol is black

5.4.3.2 The sign with yellow background is used in the following temporary situations such as road works, loose stones, edge drop, Stop/Go control ahead and road crash.

5.4.3.3 The schedule of recommended regulatory signs is given in Annex C.

Note Drawings of each of the warning signs may be given in the relevant laws and regulations applicable in each East Africa Partner State.

5.5 Guidance signs

5.5.1 Use and Classification

5.5.1.1 These signs shall give drivers information to enable them to find their way to their destination.

5.5.1.2 These information signs may serve one of the following purposes:

a) they may give advance information of prohibitions or restrictions ahead or they may indicate the end of a restriction or prohibition;

b) they may give civic or geographical information such as the name of a town or village; and

c) they may give information about facilities ahead such as parking places, lay-bys, picnic areas, etc.

5.5.1.3 The guidance signs shall be classified into five classes as per the Table 5

Table 5 – Classification of guidance signs

Group	Description	Proposed sign number prefix
Location	Place names, river names	GL
Direction	Direction signs before and at junctions	GD
Tourism	Direction to tourist attractions, services and facilities	GF
Location direction	Direction signs for minor, local destinations in urban areas	GDL
Diagrammatic	Signs warning of a change in road layout ahead (e.g. start and finish of climbing lane)	GS

5.5.2 Direction signs

5.5.2.1 Good direction signing should help to reduce delay and frustration; to keep traffic flowing smoothly and safely through junctions; and to promote commerce and tourism.

5.5.2.2 Direction signs belong to the following groups:

a) advance direction signs which give a driver information about his route ahead before he reaches a road junction;

b) direction signs which give route information at a junction; and

c) route confirmatory signs which give confirmation and often additional information about the route ahead after a road junction.

5.5.2.3 The size of the sign depends on the amount of text. Typically letter sizes depend on the approach speed.

5.5.2.4 To avoid confusion, limit the number of destinations to four per sign. In one direction limit the number of destinations to two with the nearest one at the top.

5.5.2.5 Table 6 below give typical letter sizes for different situations depending on approach speed.

Table 6 – Typical letter sizes of direction signs

Approach speed	Typical situation	Capital letter height (mm)	Lower case letter height (mm)
< 50 km/h	Very minor roads	112	80
50 km/h	Local urban and rural roads	140	100
60 km/h	Urban and rural 2-lane roads and urban dual carriageways	175	125
80 km/h	Good standard rural main roads	210	150
≥ 100 km/h	High standard rural main roads, and all signs mounted overhead	280	200

5.5.2.6 Table 7 below gives the recommended placement of advanced directions signs (GD1, GD5, GD8).

Table 7 – Recommended placement distance of direction signs

Approach speed	Distance of sign from junction (m)
≤ 60 km/h	50 - 90
80 km/h	90 - 150
≥ 100 km/h	150 - 220

5.5.3 Overhead signs

5.5.3.1 An overhead sign may be required:

a) where the message is applicable to a particular lane (or lanes), over which the sign is placed;

b) on a roadway of two or more lanes in one direction where heavy traffic may interfere with the visibility of a roadside sign;

c) where roadside development with brightly lit commercial signs seriously detract from the effectiveness of a roadside sign;

d) where vertical or horizontal curvature limits the visibility of a roadside sign;

e) for consistency, where other signs on a section of a road are overhead;

f) on an overhead structure, to indicate a low clearance;

g) to identify a cross street or a turn control at a signalized intersection; and

h) where it is deemed necessary to place a warning sign assembly with a large backboard and/or flashing light overhead for emphasis.

5.5.3.2 Overhead mounted signs shall provide a vertical clearance of not less than 5.2 m to the sign, light fixture, or sign bridge, over the entire width of the pavement and shoulders except where a lesser vertical clearance is used for the design of other structures.

5.5.3.3 Overhead sign should be illuminated for emphasis at night.

5.5.4 Guidance signs lettering

For direction signs, the upper and lower case lettering shall be used. The direction signs, with the exception of temporary diversion signs, shall use either white lettering and symbols on a dark green background or black lettering and symbols on a white background. Temporary diversion signs will use black lettering and symbols

on a yellow background. The background on the signs which are dark green should not be reflectorised, but the letters and symbols should be. Other direction signs should be reflectorised.

5.5.5 Shape colour code and schedule for guidance signs

5.5.5.1 The shape of guidance signs shall rectangular. The size depends on the amount of text and lettering sizes (design and speed).

5.5.5.2 The recommended colour coding for the guidance signs shall be as per the Table 8.

Table 8 – Recommended colour coding for guidance signs

Group	Description	Border	Background	Symbol/letter
Location	Place names	Blue	White	Black
Direction	Direction signs	White	Green	White
Tourism / services	Tourist attractions, Services and facilities	White	Gray	White
Local direction	Destination within urban areas	Gray	White	Black
Facilities	Facility type	No border	Gray	White
Diagrammatic	Warning of change in road layout	Red	White	Black

5.5.5.3 The recommended guiding signs schedule are given in Annex E.

NOTE Drawings of each of the information signs are may be shown in the relevant laws and regulations applicable in EAC Partner States.

5.6 Information Signs

5.6.1 Use and classification

5.6.1.1 Information sign may take the form of a supplementary plate that provides additional information to that given on the primary sign or to indicate the presence of an information centre or other facility.

5.6.1.2 The recommended sizes and design principles of information signs shall be as per Table 9 below.

Table 9 – Recommended sizes and design principles of information signs

Supplementary signs	Sizes/colour
Lettering, symbol and border of supplementary plates	Black
Background	White
Width of Supplementary plates	Should match that of the primary sign
Capital letter height size	140 mm
Lower case letter height	100 mm
Cul-de-sac	600 mm (h) by 450 mm (w)
When the supplementary plate is to be used with a small sign such as a 600 mm diameter regulatory sign the text size may be reduced to 112 mm/80 mm	

5.6.2 Shape and colour code of information signs

5.6.2.1 The recommended shape of information sign shall be rectangular.

5.6.2.2 The supplementary information sign must have the same width as the primary sign

5.6.2.3 The colour coding for border and background shall be as follow:

a) **Border colour**: White for the main signs, black for the supplementary signs

b) **Background**: Green when it is a primary sign and white if providing supplementary information to a primary sign. For expressways the background shall be blue for primary sign.

c)

5.6.2.4 The proposed information signs basic schedule (examples) is given in Annex F.

NOTE Drawings of each of the supplementary signs may be shown in the relevant laws and regulations applicable in each East Africa Partner State.

5.8 Supplementary signs

Supplementary plates shall give additional information or clarify the message given by the main signs. They are mostly used with regulatory or warning signs. They shall not be used on their own. The supplementary plates shall be mounted 75 mm below the primary sign. The text shall have a capital letter height of 60 mm.

5.9 Road Signs Management

In addition to the considerations for design, placement and materials for road signs, there are additional issues that should be addressed by road authorities to ensure uniformity in control of traffic:

a) To make sure that every location that needs a traffic signs is provide with an appropriate sign. Road authorities should adopt management practices that will ensure consistent application and maintenance of road signs at all relevant locations at all times.

b) To ensure that where a sign is no longer needed it is removed,

c) To take precautions against vandalism of road signs, and

d) To ensure that signs are properly maintained and are visible.

5.10 Traffic light signals

5.10.1 This group of signs comprises of two categories:

a) signs for the control of vehicles; and

b) signs for the control of pedestrian crossing movements.

5.10.2 The signal head should be mounted so that its lower edge is a minimum of 2.3 m above carriageway level. The signal should be close to the kerb or edge of the carriageway, but sufficient clearance shall be left to prevent the signal head being struck by vehicles. The signal lenses should have hoods to prevent them being seen by drivers on other approaches.

5.10.3 Where appropriate, a 300 mm diameter version of a regulatory sign (such as “no right turn”) may be displayed at the side of the signal head, preferably level with the green light.

5.10.4 The traffic signals ahead warning sign may be needed on the approaches to the junction.

5.10.5 Signs for the control of vehicles

5.10.5.1 The primary purpose of a traffic signal installation at a road junction shall be to reduce conflict between traffic streams. Conflict at a junction is manifested as an increase in delay and an increase in the accident rate. The installation should be designed to achieve safety and efficiency within the confines of the available road space.

5.10.5.2 Traffic control shall be done by means of red, amber and green light signals, supplemented by additional green, amber and red arrow light signals and regulatory signs as necessary.

5.10.5.3 Traffic light signals shall be placed on the nearside of each approach and shall be known as primary signals. Additional primary signals may be required on one-way streets. The stop line shall be marked on the carriageway 1.3 m in advance of the signal. The signal and stop line may be set back to accommodate a pedestrian crossing, or to make turning movements easier for long vehicles.

5.10.5.4 Each road which meets at the junction shall be described as an arm of that junction and each arm shall be considered as having one or more approaches depending on the intended direction of travel of the traffic stream on leaving the signalled area.

5.10.5.5 Additional displays may be included beyond the junction and shall be known as secondary signals.

5.10.5.6 The main purpose of the secondary signal shall be to indicate to vehicles close to the stop line, the same information as the primary signal. In certain circumstances the secondary signal may not be positioned beyond the junction on a particular approach. On these occasions the secondary may be on the entry side of the junction, preferably on the offside and beyond the stop line.

5.10.5.7 Each traffic stream shall have clear vision of the primary signal on its approach and the additional displays which are associated with it. The sequence signalling shall be red, green, amber and red.

5.10.5.8 The instruction conveyed by each coloured light signal is defined as follows:

a) Red light - Denotes that traffic is prohibited from proceeding beyond the stop line.

b) Green light - Indicates that vehicular traffic may proceed beyond the stop line, and may turn in any direction, subject to the normal priority rules being observed and provided that the turn is not prohibited by a supplementary light signal (red arrow) or a regulatory traffic sign.

c) Amber light - Conveys same prohibition as red signal except where vehicles are so close to the stop line that they cannot safely stop before stop line, they should proceed. This phase is usually displayed for three seconds.

5.10.5.9 Additional green arrows may be fitted as follows

a) on the left of the three light display indicating a movement to the left. The arrow light may also be lit when the main signal is red to indicate that vehicles may turn left only.

b) on the right of the three light display, indicating a movement to the right.

5.10.5.10 When green arrows are used, drivers have come to expect an exclusive right of way. Therefore, there should be no conflict with traffic already using the junction.

5.10.5.11 An additional amber left arrow may be fitted on the left of the three light display indicating a movement to the left even when ahead may be shown as a red signal. The amber left arrow indicates that it is permissible to go left provided that vehicles give way to traffic using the junction. This type of arrow should not be used in conjunction with a pedestrian crossing.

5.10.5.12 An additional red light arrow may be fitted on the right of the three light display indicating that a turn to the right is prohibited when the arrow light is lit.

5.10.5.13 Wherever green or amber narrow lights are used, the arrow light shall flash for 3 seconds before it is turned off. Red arrow lights shall not flash before being turned off.

5.10.6 Signals to control pedestrian movements

5.10.6.1 Pedestrian signals shall only be used in conjunction with traffic lights. Signal-controlled pedestrian crossings are appropriate at sites where traffic speeds are high or where pedestrian flow is very heavy.

Crossings with pedestrian signals can also be incorporated in junctions controlled by traffic lights.

5.10.6.2 The light signals to be displayed on a pedestrian signal are red, green and flashing green. Phasing of Pedestrian signal with traffic signal is detailed in Table 10. The instructions conveyed by each coloured pedestrian signal are:

a) Red standing man - Denotes that pedestrians are prohibited from crossing the road.

b) Green walking man - Denotes that pedestrians may cross the road with care.

c) Flashing green man - Denotes that pedestrians are prohibited from crossing the road except where they have started to cross the road, in which case they should continue to cross the road.

Table 10 – Phasing of Pedestrian signal with traffic signal

SN	Pedestrian Signal	Vehicle Signal	Period
1	Red standing man	Green	Dependent upon cycle time
2	Red standing man	Amber	3 seconds
3	Red standing man	Red	Minimum to clear traffic in the junction
4	Green walking man	Red	6-12 seconds depending upon carriageway width and pedestrian density(see note below)
5	Flashing green man	Red	See note below
6	Red standing man	Red	1-3 seconds, but see note below
Note Timings for green man may not apply for signal controlled junctions. The time of periods 5 and 6 together (in seconds) are equal to the width of the carriageway in meters divided by 1.2. When the green man pedestrian signal is lit, it may be justified to use a simultaneous audible signal.			

5.10.6.3.3 The signal head is normally sited on the same post as the traffic light. The signals controlling pedestrian movements shall face across the road so that the signal can be clearly seen by pedestrians. This signal lenses shall be hooded to prevent the signal being seen by drivers.

5.11 Signs at road works

5.11.1 General

5.11.1.1 When any work is carried out on or close to a road or street adequate measures shall be taken to warn and protect both road users and road workers.

5.11.1.2 Good signing on road works should warn, inform and direct road users. It should warn road users that there is a hazard ahead, so that they can be ready to take action. It should inform them of what kind of thing to expect, so that they know what manoeuvre or action to be made and it should direct them how to pass through the hazard in a safe manner. Good signing should also help protect the workers on the road and keep traffic delays to a minimum.

The road works site Engineer shall:

a) plan ahead - It is his/her responsibility to sign the works safely and think what signs and cones needed before leaving the site;

b) provide high visibility- All persons working on or near the road shall wear brightly-coloured clothing, preferably an orange or yellow waistcoat/jacket;

c) face the traffic when setting out signs - The Road Works Ahead warning sign shall be put out first and then moved towards the works site, and always the site Engineer should face the traffic when setting out the signs and cones;

d) fix the signs properly - The signs shall be secured so that they cannot be blown over or dislodged by moving traffic. Signs that are mounted on a metal or wood frame which keeps the sign face off the ground should be used. A sand bag or rock placed across the base of the frame should be used to stop the sign being blown over. The signs should be checked regularly to see if they are all still in place;

e) ensure the signs are visible at night - The road works site Engineer should make every effort to finish the work before dark, but, if this is not possible, reflective signs and cones shall be used, and preferably they should be supplemented with flashing lights;

f) remove unnecessary signs - The road works site Engineer shall never leave signs on the road once they are no longer needed;

g) keep the site tidy - The road works site Engineer should take up as little road space as possible, and store construction materials and equipment off the road;

h) always use the standard signs - The road works site Engineer or his/her representative shall not design his own. All signs shall be authorized by the competent authority before using them.

5.11.1.3 The typical layouts of traffic signs at road works is given in Annex H.

5.11.2 Basic sign needed

5.11.2.1 The temporary signs should retain their prescribed standard backgrounds, while the warning signs shall have a yellow background.

5.11.2.2 The Road Works Ahead sign - shall be the first sign to be seen by the driver. It shall be placed well before the work site at a distance as per the Table 11). Put the sign where it can be seen from a distance. For example, if the works are just after a bend in the road, put the sign before the bend. This sign has a black symbol on a white background, all within a red triangle.

Table 11: Sign siting distances

Traffic Speed (Km/h)	Siting distance of first sign in advance of roadworks (m)	Minimum number of warning signs in advance of road (spaced at equal distance)
Up to and including 50 km/h	30 - 50	1
Over 50 and up to and including 80 km/h	100 - 250	2
Over 80 km/h	250 - 750	3

5.11.2.3 The Road narrows ahead sign – shall warn drivers which side of the road is obstructed. It should only be used on high-speed national roads (Road Class 1 and Class 2).

This sign should be placed midway between the Road Works Ahead sign and the works site. This sign has a black symbol on a white background, all within a red triangle.

5.11.2.4 Keep left or, if appropriate, Keep right – These signs shall be placed at the beginning and end of the works at the point where the works extend furthest into the road. These signs have a white arrow on a light blue background.

5.11.2.5 A line of traffic cones – Shall be used to guide pedestrian and vehicle traffic past the works. Some working space shall be left between the line of cones and the actual excavation or works area. Traffic cones should be red, and, if used at night, shall have white reflective sleeves.

5.11.2.6 STOP / GO signs - Where there is a lot of traffic or the works site is very long, the traffic shall be controlled manually using these STOP / GO boards operated by a trained flagger . If the obstruction is less than 30 m long and is on a straight section of road, a single board operating at one end or in the middle shall be used. Flags should be used by an trained flagger for not confusing road users.

Sign plates for use on high-speed roads should be 750 mm high. On low-speed (50km/h or less) roads, 600 mm high signs should be used.

6 Positioning of road signs and road markings

6.1 Road signs

Three things shall be considered when positioning a traffic sign:

a) its siting in relation to the junction, hazard, etc., to which it refers;

b) Its position in relation to the edge of the carriageway; and

c) the height of the sign plate and its angle to the road.

The following should be checked before sign positioning:

a) the signs are clearly visible;

b) there is no confusion about which road they refer to;

c) the signs do not obstruct the view of drivers; and

d) the signs are not placed where they could be struck by vehicles.

6.2 Siting

6.2.1 Drivers shall be given the message at the right time, neither too late for the driver to take action, nor too soon that the driver has forgotten it by the time he has to act on it.

6.2.2 Regulatory signs shall be sited at or near the point where the instruction applies.

6.2.3 Each sign shall be designed to be read from a certain distance, which is determined by the road designation. The sign shall be sited where it can be seen from this distance.

8.2.4 Signs should generally be sited on the right-hand side of the road. However, at sharp right- hand bends, it may be better to put the sign on the left-hand side of the road where it can be more noticeable.

8.2.5 Most warning signs, and some direction signs, shall be sited in advance of the hazard or junction to which they relate. The distance depends on the road designation. When signs need to be sited far away from their standard position, a supplementary plate may be used to give the distance to the junction or hazard. The distance between a sign and the junction or hazard to which it relates should be increased, rather than being decreased.

6.3 Position relative to the edge of the carriageway

6.3.1 Signs should be placed so that no part of the sign is closer than 1200 mm from the outer edge of the shoulder, or carriageway in the case of roads without shoulders

6.3.2 This also applies to signs positioned on traffic islands. This is to reduce the risk of them being hit by passing vehicles. The siting of signs at places where vehicles stop or park on the shoulder should be avoided.

6.3.3 Height and angle of the sign plate Signs should be mounted so that the lower edge of the sign plate is 2100 mm above the level of the carriageway. This helps to discourage vandals and bill posters from defacing the sign plate.

6.3.4 Signs should never be mounted less than 1000 mm above ground level.

6.3.5 Where two warning signs are to be mounted on the same post, the sign that relates to the nearest hazard should be at the top.

6.3.6 Temporary road signs should be mounted on a frame which keeps the sign above ground by at least 300 mm.

6.3.7 Signs erected over footways and in urban areas shall be high enough to enable pedestrians to walk beneath them. The lower edge of the sign place should be about 2.10 metres above the surface of the footway.

6.3.8 Sign plates shall be mounted so that they face the driver. On unlit roads, the plate should be angled at 95° away from the road to avoid mirror reflection when illuminated by vehicle headlights (see Figure 2).

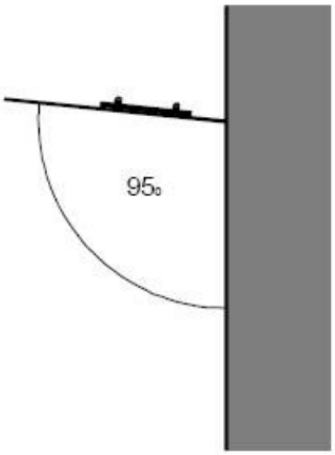

Figure 2 – Angle of sign plate

6.4 Placement of traffic control devices

6.4.1 In general, when it is relevant to give specific dimensions relating to the placement of signs, the information given is limited to longitudinal dimensions. These are most commonly referred to:

a) the distance from a junction or hazard; or

b) the distance between successive signs which form a sequence of signs (or markings) e.g. temporary signing at roadworks.

6.4.2 Traffic control devices and their supports shall be placed for the purpose of regulating, warning, guiding and informing road users only on the authority of a public body or official having jurisdiction. No traffic control device or its support shall bear any advertising message or any other message not essential to the control of traffic, with the exception of STREET NAME signs and SUBURB NAME signs.

6.4.3 Details of the orientation, lateral and vertical placement of signs are given in Figures 3 to 9. Figure 3 illustrates a number of common pitfalls or difficulties relating to the placement of signs which need to be avoided or overcome.

6.4.4 Competent Authority have the power in terms of Road Traffic Legislation, to remove, or order the removal of any non-prescribed or unauthorised sign.

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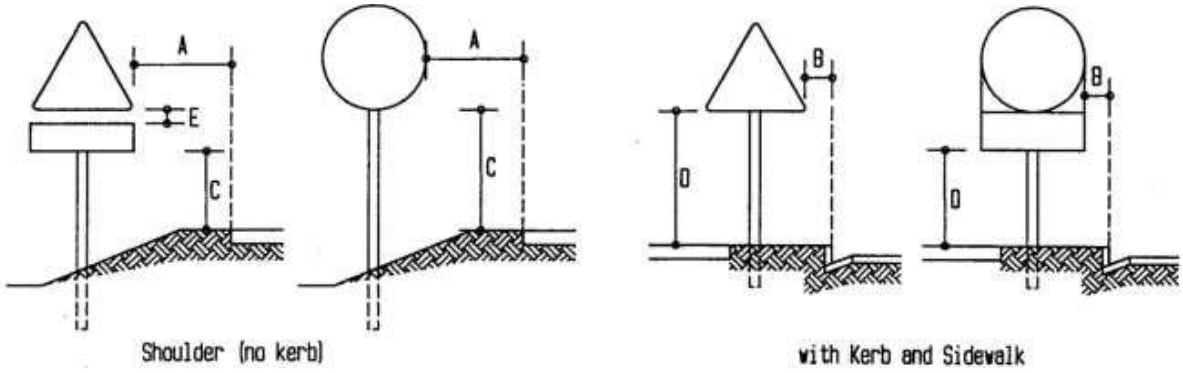
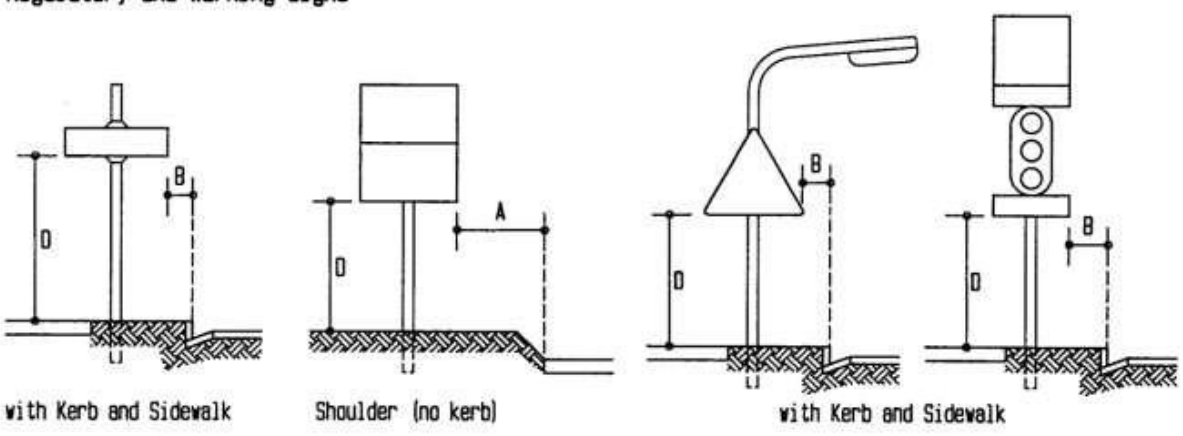


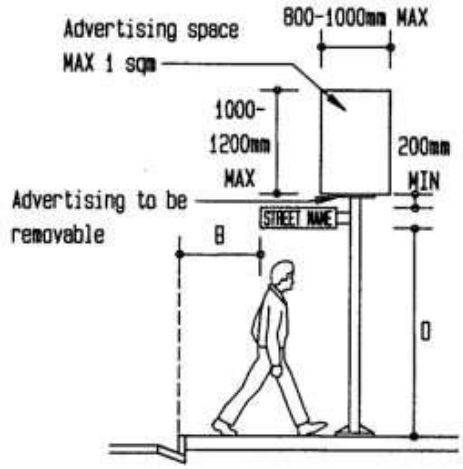
Regulatory and Warning Signs



Location and Route Marker Signs

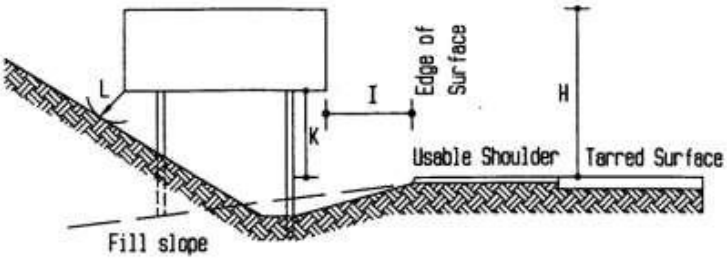
Small Signs on Host Supports

TABLE PERMANENT SIGN PLACEMENT DIMENSIONS			
Dimension	Minimum (mm)	Preferred (mm)	Maximum (mm)
A	1200	1500	2000
B	500	750	-
C	600	2100	2500
D	2100	2500	3000
E	0	0	200

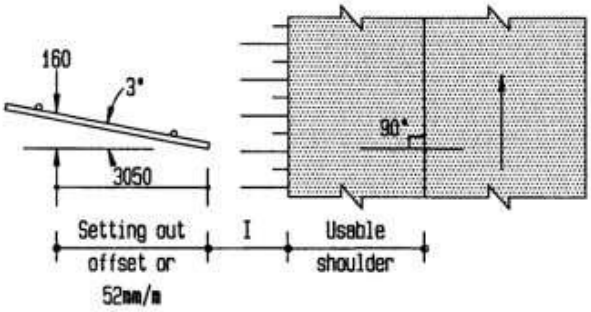


Advertising with STREET NAME

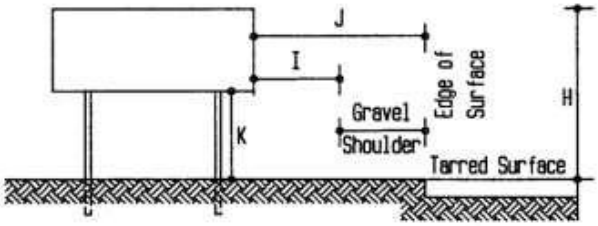
Figure 3 – Lateral and vertical clearances for small single support signs



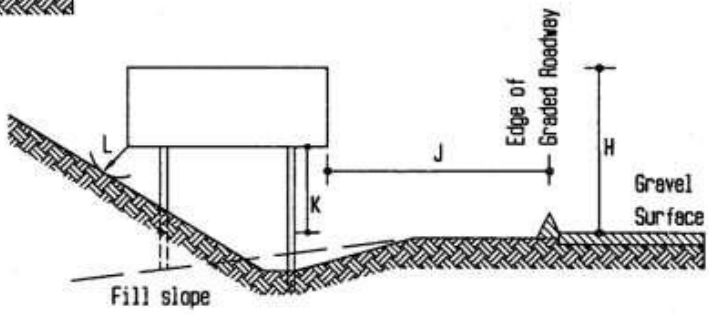
Beyond a Usable Shoulder



Sign Offset to Avoid Specular Reflection



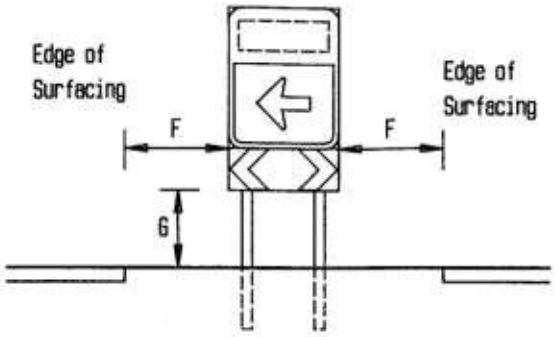
Ground Mounted Direction Signs

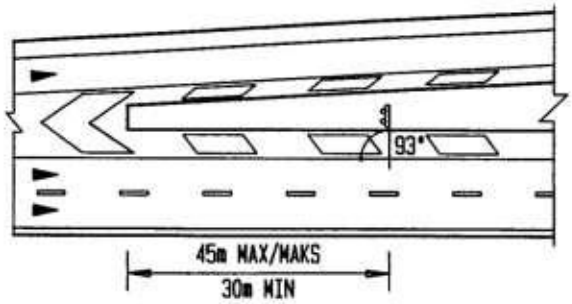


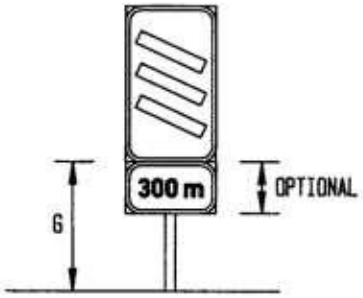
Ground Mounted Direction Sign

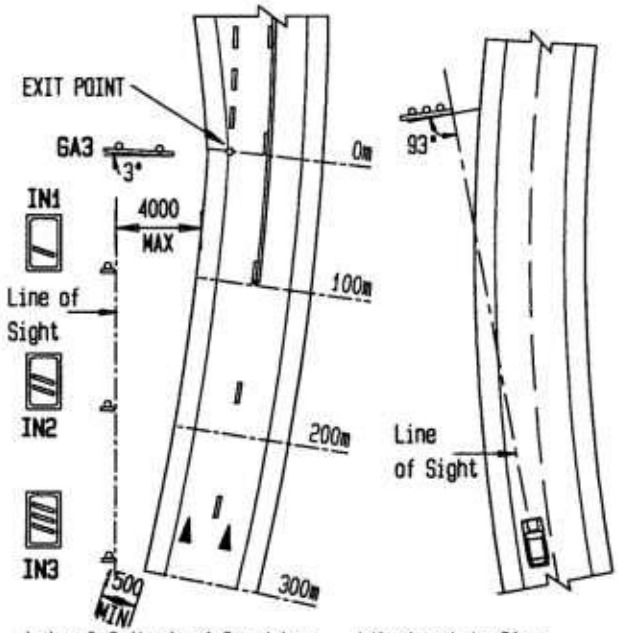
PERMANENT SIGN PLACEMENT DIMENSIONS			
Dimension	Minimum (mm)	Preferred (mm)	Maximum (mm)
H	-	-	6000
I	1500	2500	-
J	2500	4000	-
K	1600	2000	2400
L	1200	-	-

Figure 4a – Lateral and vertical clearances for larger multiple support signs



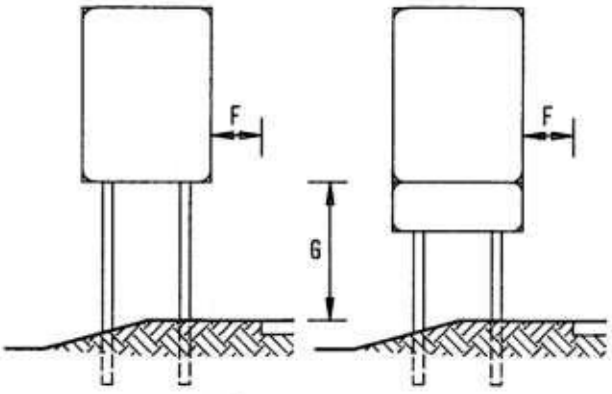






Lateral Setback of Countdown Signs to Avoid Obscuring of Exit Sign - GA3

Adjustment to Sign Orientation on Right Hand Curve



PERMANENT SIGN PLACEMENT DIMENSIONS			
Dimension	Minimum (mm)	Preferred (mm)	Maximum (mm)
F	1200	1500	2000
G	800	1200	1600

Figure 4b – Lateral and vertical clearances for larger multiple support signs

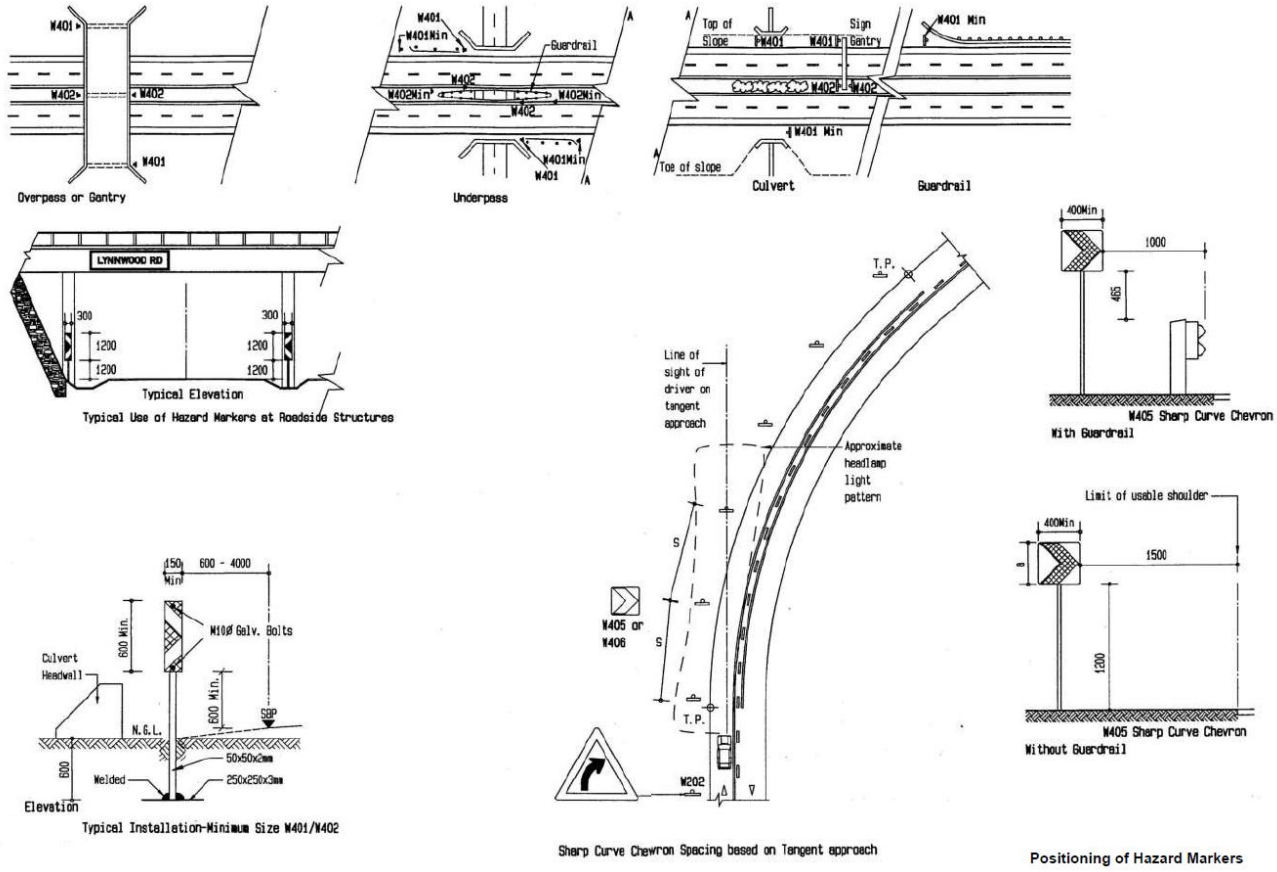
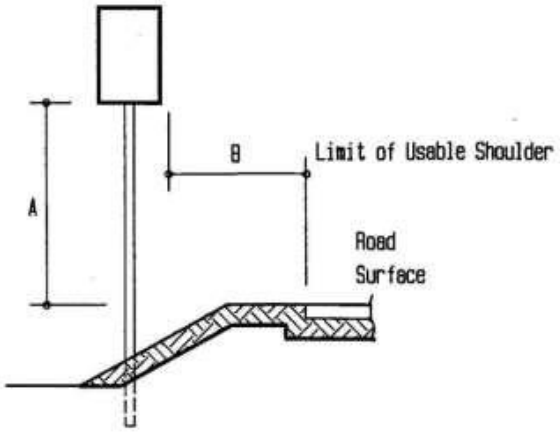
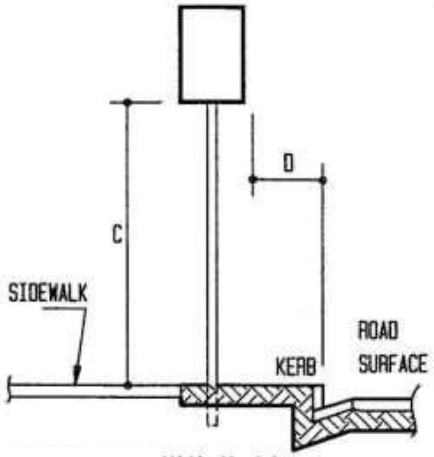


Figure 5 – Positioning of Hazard Markers



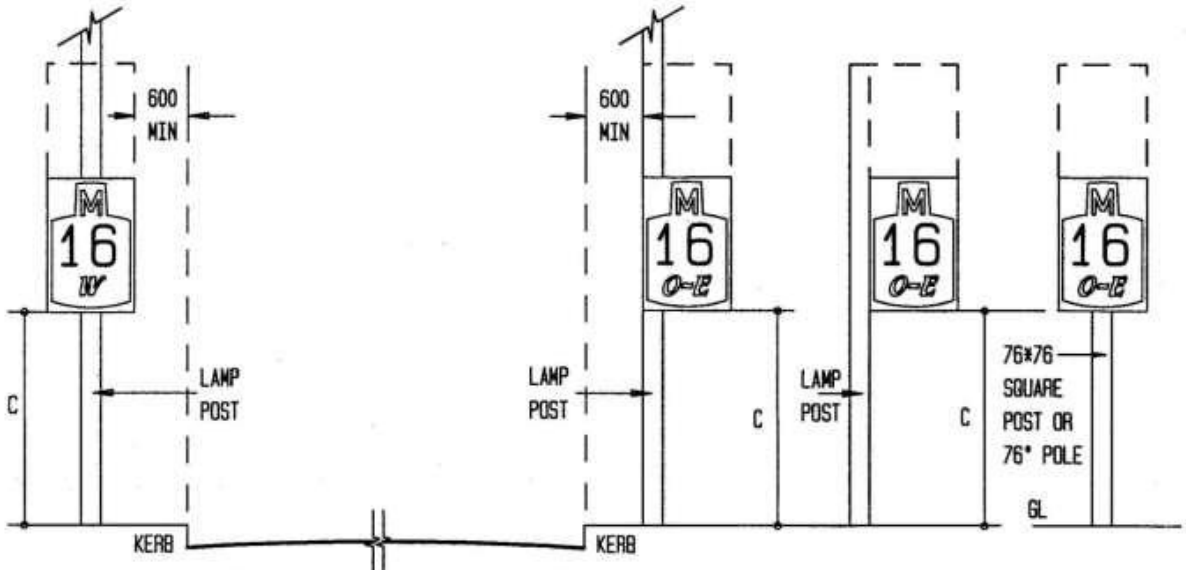
Shoulder (no Kerb Line)



With Kerbing

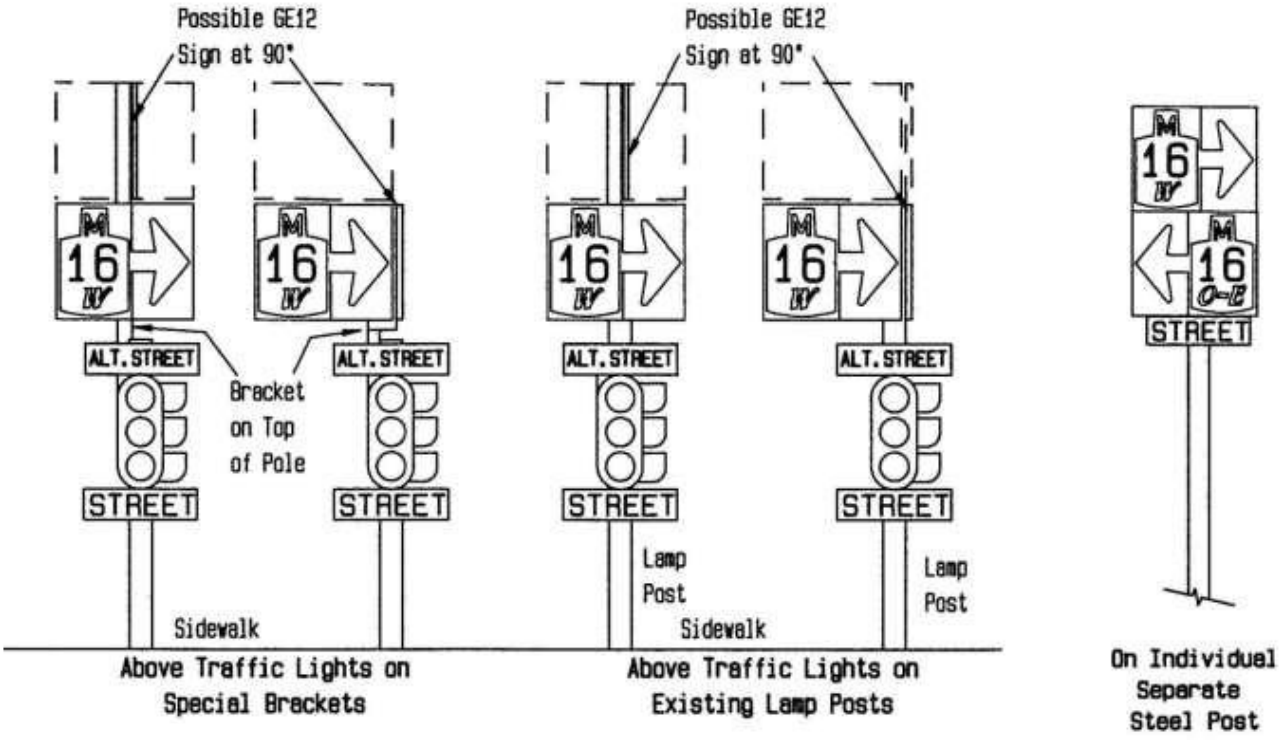
	PREFERRED	MINIMUM
A	3000	2100
B	2500	1500
C	3000	2100
D	1500	600

Confirmation signs should be located on existing street furniture wherever possible. Signs may be mounted centrally on poles, or cantilevered left or right according to pole positions in relation to a kerb line. Signs may be mounted on the right side of one-way roadways.

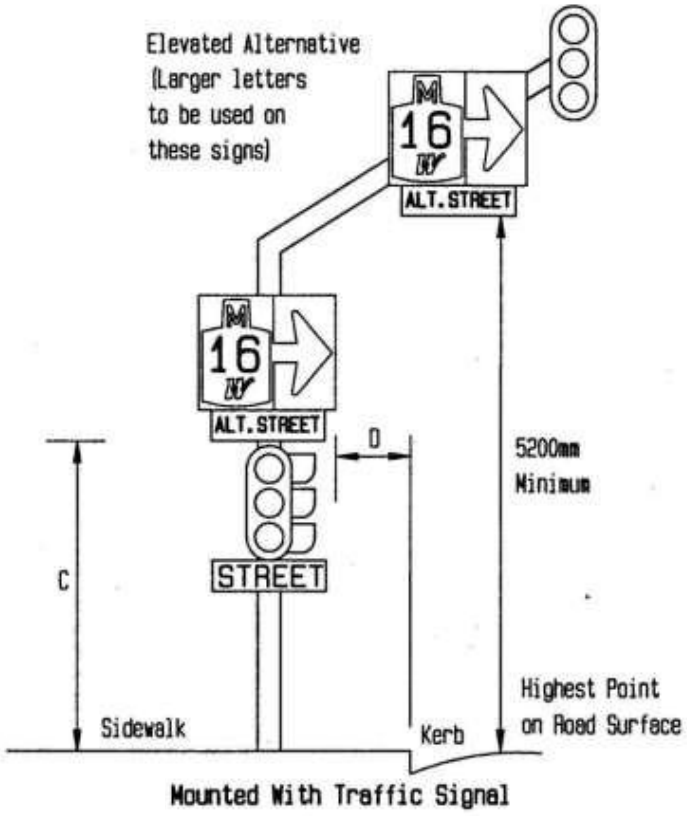


Route Marker Mounting Between Junctions (Confirmation Signs)

Figure 6a – Positioning of route marker signs



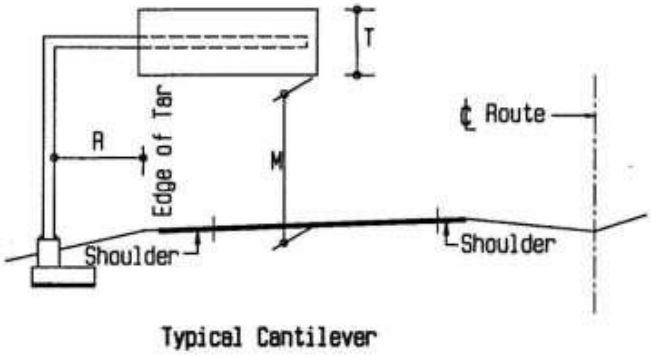
Route Marker Mounting in Relation to other Road Traffic Signs at Intersections/Junctions



NOTES:

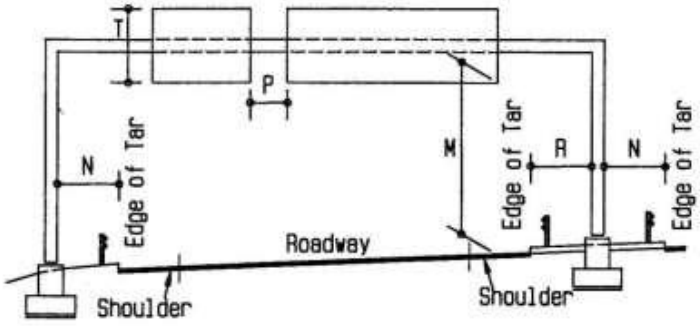
1. Higher mounting heights are preferred for visibility over trucks and buses and also to deter vandalism.
2. The minimum mounting height should be used for signs on their own individual posts.
3. The longitudinal position of confirmation route marker signs is 30m - 60m beyond a junction.
4. Repeat confirmation signs are recommended between junctions at 450m - 550m intervals for 60km/h, and at 650m - 750m intervals for 80km/h operating speeds.
5. Advance route marker signs may be provided at from 60m to 240m in advance of a junction when there are multiple lanes and/or when sight distance to the junction is poor.

Figure 6b – Positioning of route marker signs

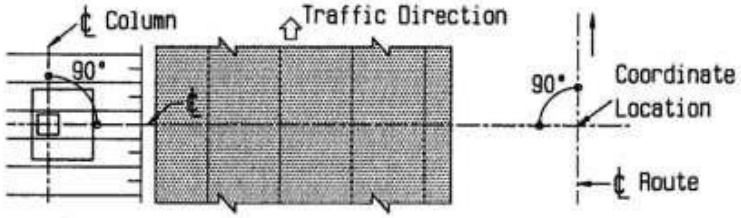


Typical Cantilever

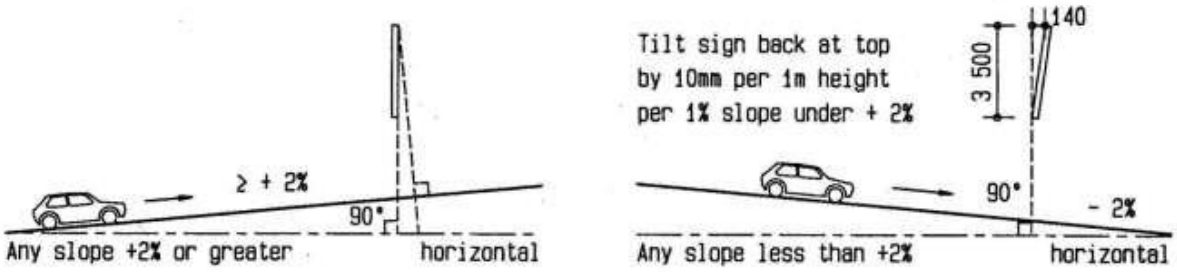
PERMANENT SIGN PLACEMENT DIMENSIONS			
Dimension	Minimum (mm)	Preferred (mm)	Maximum (mm)
M	5200	5700	6200
N	1500	2000	-
P	50	1000	-
R	4000	4500	-
T	1800	-	4200



Typical Gantry



Overhead Sign Positioning



Adjustment of Signface to Avoid Specular Reflection

Figure 7 – Lateral and vertical clearances for overhead sign structures

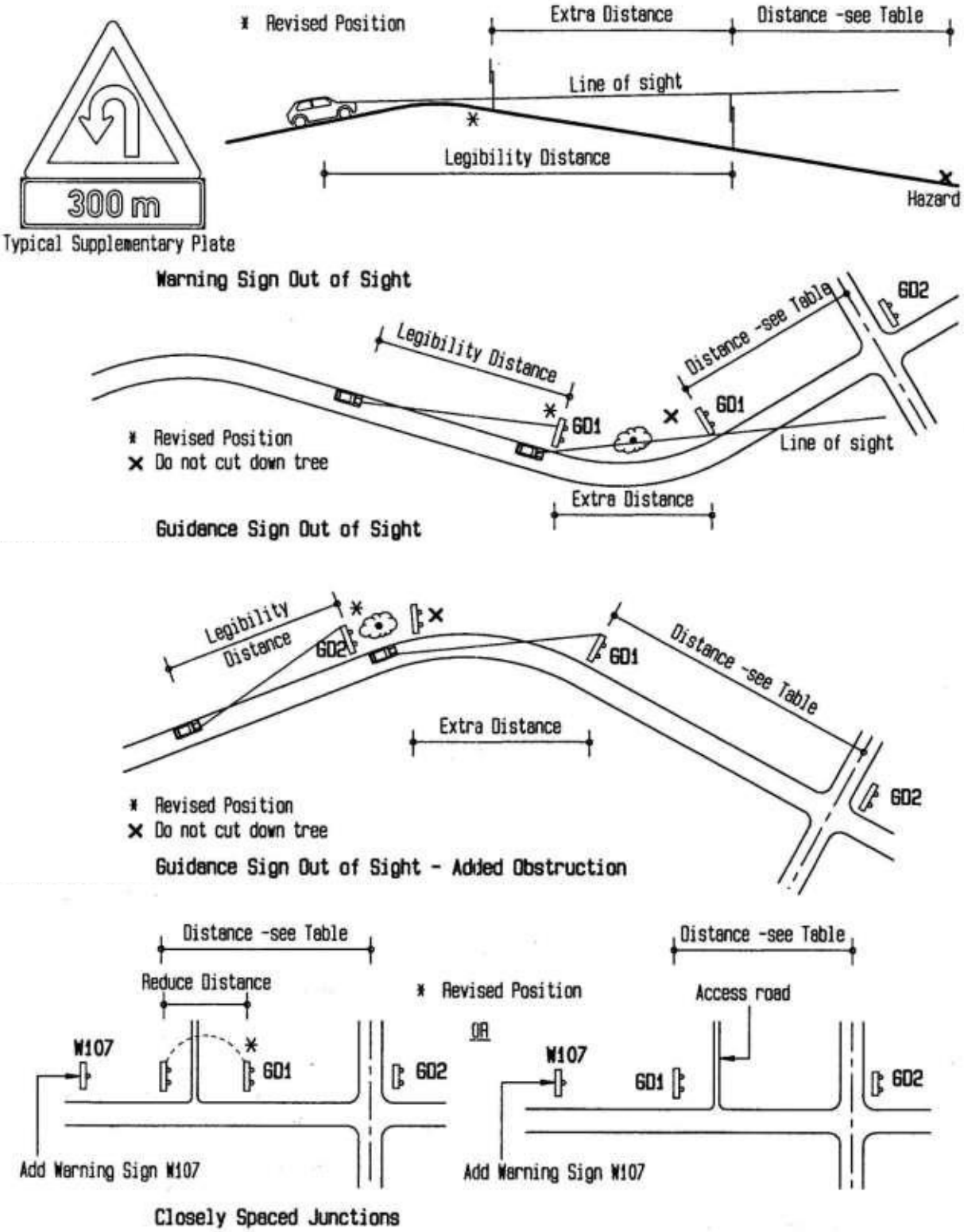
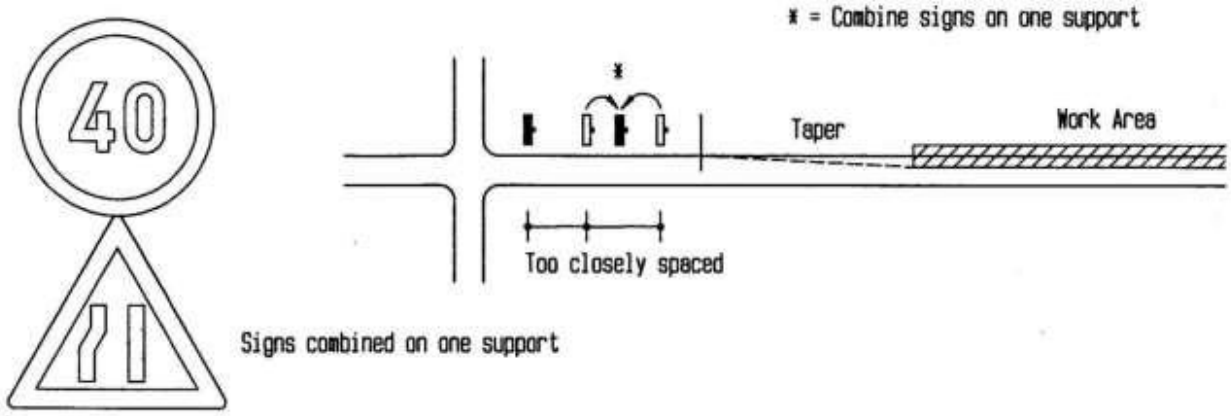
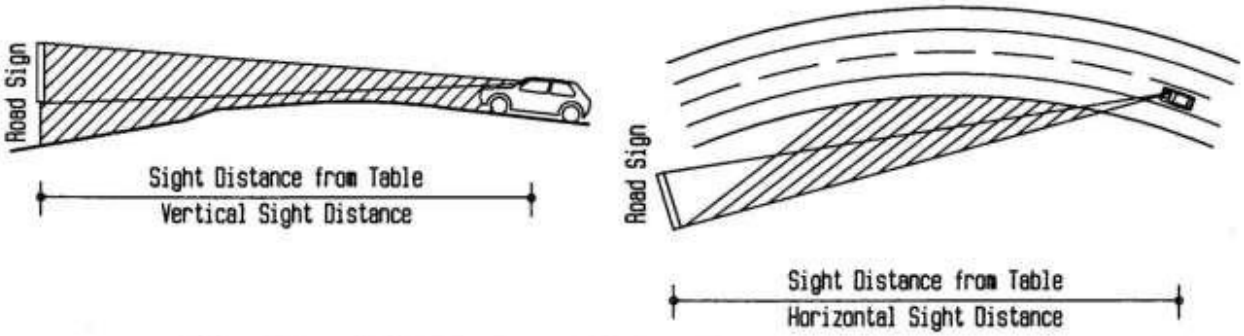


Figure 8a – Typical problems and aspects of longitudinal positioning of road signs



Insufficient Longitudinal Space for Several Signs



Clear Line of Sight to Larger Guidance Signs

CLEAR SIGHT DISTANCE REQUIREMENTS	
Letter Size (mm)	Sight Distance (m)
490	380
420	340
350	300
280	260
210	220
140	180
112	160

NOTES:

1 As an alternative to repositioning signs the shaded area may be cleared of obstructions.

2 The "Clear Sight Distance" values include the legibility distance for the letter size PLUS 100 m to allow for observation of the sign prior to reading.

Figure 8b – Typical problems and aspects of longitudinal positioning of road signs

7 Road markings

7.1 General

7.1.1 Road markings perform a very necessary function by conveying requirements and information to drivers which might not be possible by means of road signs. They may often be visible when signs are obscured and are able to provide message continuity to drivers of moving vehicles, which may be difficult and costly to achieve using road signs.

7.1.2 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 the quality of their application to the road surface and on their exposure to traffic wear.

7.1.3 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. Road markings may be provided in a range of materials in addition to the traditional paint. The initial installation cost of many of these materials can be high, but they may be sufficiently durable that, in spite of this, their performance is cost-effective.

7.1.4 The purpose of road markings shall be to control, warn, or guide road users. They may be used to supplement other traffic signs or they may be used alone. Their major advantage is that they can give a continuing message to the driver. Thus they can be used to guide drivers in the correct positioning of their vehicles so that the traffic flows smoothly and safely.

7.1.5 Road markings should be considered in detail at the design stage of new or improved junctions. The markings for existing junctions are often best considered on plan before the work is undertaken.

Note Drawings of each of the road markings are may be shown in the relevant laws and regulations applicable in each East Africa Partner State.

7.2 Road Marking Classification

7.2.1 Road markings are made up of the following types;

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.

7.1.2 Road markings are classified by their functional purpose. In this way a particular type of marking such as an arrow, which is identical in shape to another arrow, may take on a different function according to the manner in which it is used or according to its colour. It should be noted that whilst different markings are applied in different colours, specific colours are not linked generically to specific functions i.e. whilst (with one

minor exception) yellow is only used for regulatory markings, all regulatory markings are not yellow in colour. The exception to the use of yellow occurs when SYMBOL MARKINGS GM6 and/or WORD MARKINGS GM7 are used with a regulatory marking, under which circumstances it is recommended that the GM6 and/or GM7 markings also be marked in yellow. Proposed road marking styles, patterns, and symbols are illustrated in Figures 9 to 15, and full details of their characteristics are listed in Annex A.

7.1.3 The functional classification of road markings is as follows:

(a) regulatory markings;

(b) warning markings;

(c) guidance markings;

(d) roadstuds;

(e) other delineation devices.

7.2.4 The following rules apply in general to the wide range of road markings:

(a) broken longitudinal lines are permissive in character;

(b) continuous solid longitudinal lines are restrictive in character;

(c) double continuous solid longitudinal lines indicate maximum levels of restriction;

(d) an increase in the width of a line and/or in the density of a broken line is an indication of increased emphasis in the message being given by the marking.

7.2.5 Broken line markings are not random patterns of lines and gaps. Each such marking type has specific dimensions and the patterns are repeated at regular intervals as MODULES

7.3 General Principles of road marking dimensions

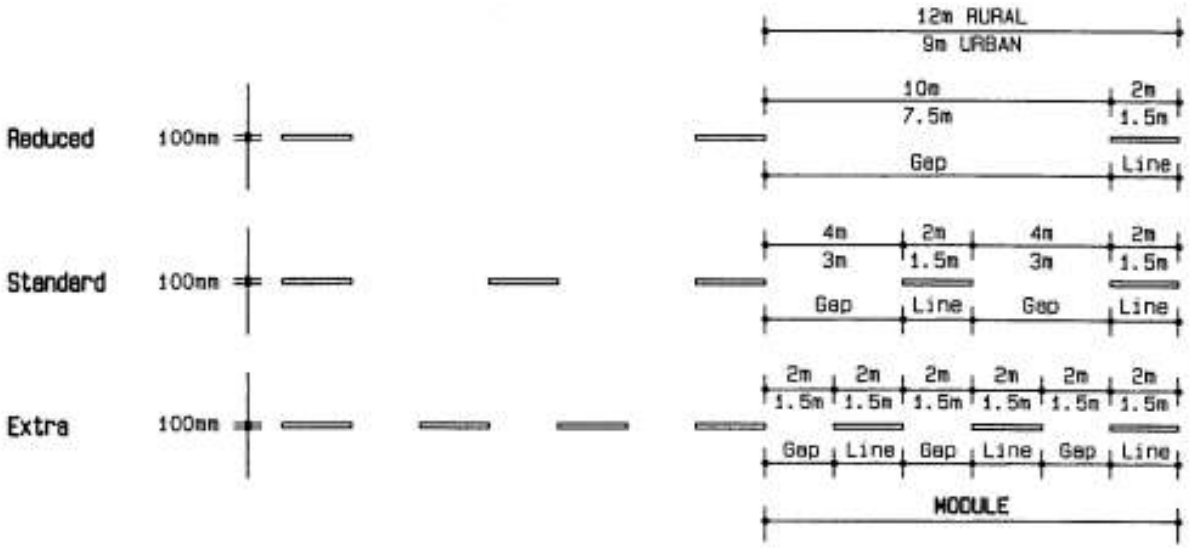
7.3.1 The width and length of many types of road marking may be varied. However, the majority have recommended and/or mandatory minimum dimensions. The mandatory minimum dimensions are summarised in Annex A.

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

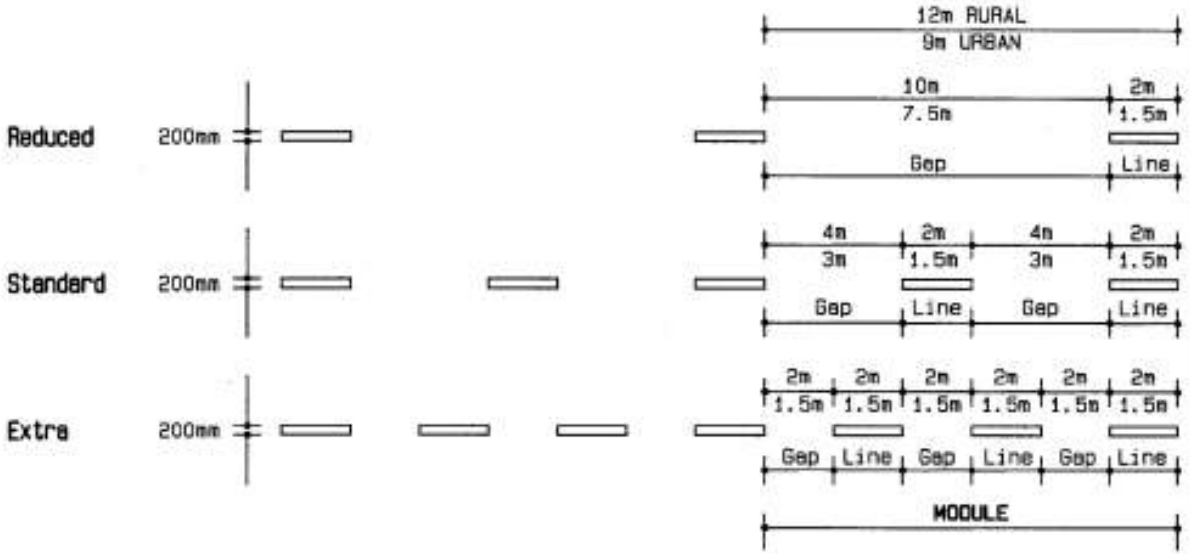
7.3.3 All broken line markings are described by a LINE-TO-GAP RATIO and recommended dimensions of line and gap lengths are given in Annex A. Longitudinal broken line markings are designed for convenience to be set out in repeating MODULES. A module may comprise one or several line-plus-gap repetitions.

7.3.4 The STANDARD MODULE dimension for rural roads is 12 m, 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 roadstuds, when the latter are required.

7.3.5 The appearance of a standard module can be modified by alteration of the line-to-gap ratio in a standard manner. This type of treatment may be used particularly with LANE LINE marking GM1, or CONTINUITY LINE marking WM2. The line length remains a standard length and the gap length is altered. This has the effect of increasing the number of line-plus-gap combinations within a standard module. This technique is illustrated in Figure 9 and Figure 10 for rural examples. Specific details of module dimensions are given in Annex A and in Figures.



Lane Line Marking GM1



Continuity Line Marking WM2

Figure 9 – Typical modules for broken line markings

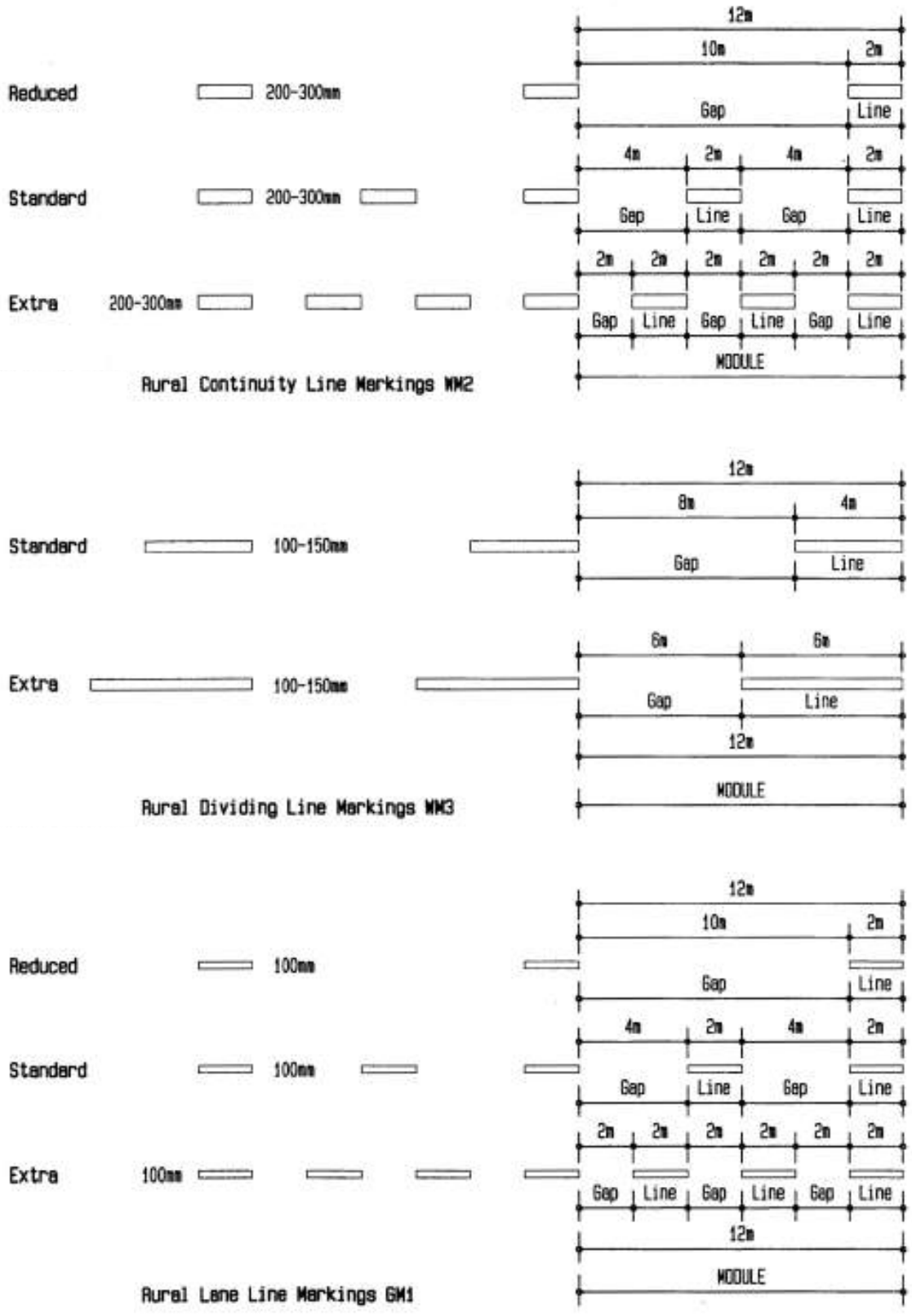


Figure 10 – Rural broken line module characteristics

7.3.6 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.

7.3.7 The DIVIDING LINE marking WM3 may be modified in a similar way although in this instance only two variations are available and the modification involves a change in both the length of the line and of the gap. The two options are designated STANDARD and EXTRA.

7.3.9 Dimensions for the majority of symbols, arrows and letters allow for the following general range of standard sizes (lengths): 1.25 m: 2.5 m : 4.0 m : 5.0 m : 7.5 m. It should be noted that certain arrows are not appropriate in all the sizes indicated and others may be occasionally used in a size outside the range. This information is given in Annex A.

7.3.10 WORD marking GM7, shall be done with letter size of 5.5 m.

7.3.11 If it is required to mark on the road surface a symbol used elsewhere in the road traffic sign system, it is recommended that, to be effective, the symbol be elongated by a factor of at least three times, whilst retaining the original width. These criteria should only be used for experimental purposes, as approved by the relevant Minister.

7.4 Basic Design Principles

7.4.1 Road markings are provided to satisfy requirements for driver guidance, in terms of the geometric arrangement of their longitudinal and lateral alignment and location. They must, in doing so, also be provided in an economically and environmentally suitable way. Road markings should therefore embody the following properties:

a) good visibility by day and night;

b) good skid resistance;

c) durability;

d) clarity of message;

e) where appropriate, symbolic markings should be elongated in the direction of movement of traffic;

f) elongated markings should be sized (length) 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).

7.4.2 The visibility of road markings depends on the observation angle, the length of the marking and the contrast in levels of light reflected by the marking and by the surrounding surfaces. This LUMINANCE CONTRAST is considered to result from conditions of identical illumination of the adjacent contrasting surfaces. The luminance of a marking is dependent on the amount of pigment, the presence of glass beads (which reduce the luminance) and the method or manner of application. To be visible, markings must contrast adequately with the surface to which they are applied. For this reason, it is sometimes necessary to specify that a black outlining background be applied to light coloured road surfaces before marking white or yellow markings.

7.4.3 To improve contrast it is generally recommended that road markings which have a night-time significance be made retroreflective by the means of suitable materials such as glass beads, applied either in a pre-application mixed form, or after the application of a paint.

7.4.4 When the alignment and/or width of a roadway is altered due to an increase or decrease in the number of lanes, or the introduction or removal of a dividing island, or at a constriction, it is commonly necessary to re-align the longitudinal road markings. Such a change in alignment is achieved by shifting the line marking laterally at a constant rate until it reaches the new position. This rate of shift is generally referred to as the TAPER RATE. In this context a "taper" can be considered to occur either when the road is widening or narrowing.

7.4.5 For purposes of road marking a taper rate of 1 in 50 (or 1 metre shift in 50 metres longitudinal distance) is considered "flat", whereas a taper rate of 1 in 10 is considered "sharp". Subject to the road space available the ends of the tapering section may be softened, both visually and geometrically, by the introduction of circular or parabolic curves. Such treatment is more appropriate when using "sharp" taper rates but may also be used with "flat" tapers on high speed roads.

7.4.6 The TAPER RATE to be used in a specific situation is dependent on:

(a) the operating speed of traffic;

(b) whether only road markings are offset without similar changes to the road edge or to kerbing;

(c) whether a channelizing or median island (or barrier) is introduced as well as the shift in alignment.

7.4.7 Table 12 indicates a range of appropriate TAPER RATES. When a change in alignment occurs simultaneously with the introduction of an island (or barrier) the flatter taper rate quoted should be used. When introduced into the traffic flow a narrow island may be potentially more hazardous than a wider one, therefore flatter taper rates are recommended for narrower obstructions.

Table 12 – Tapered rate for line shift preceding kerbed island

Operating speed	Taper rate for line shift without kerb island		Tapered rate for line shift preceding kerbed island		
			Width of kerb island		
			600mm – 1.25m	1.75m – 2.5m	3m or more
30	20	Rural	50	20	10
		Urban	25	10	
50	25	Rural	50	20	15
		Urban	30		
60	35	Rural	50	25	20
		Urban	35		
80	45	Rural	50	35	30
		Urban	45		
120	50	Rural	50	40	35

7.4.8 It is often difficult to adequately indicate through the road markings that a road carries two-way traffic. This is particularly the case when one-way and two-way roads closely follow on another or join each other. Drivers can, in fact, have difficulty putting the correct interpretation on what they see. Designers should note and understand, the functional or operational difference between longitudinal line markings used for the separation of vehicles travelling in the same direction, and those used for the separation of vehicles travelling in opposite directions, even though the markings may be similar or even identical in appearance. Designers

should be careful to identify such situations and be prepared to use design techniques such as wider line thicknesses to add emphasis to the markings that are most difficult to interpret.

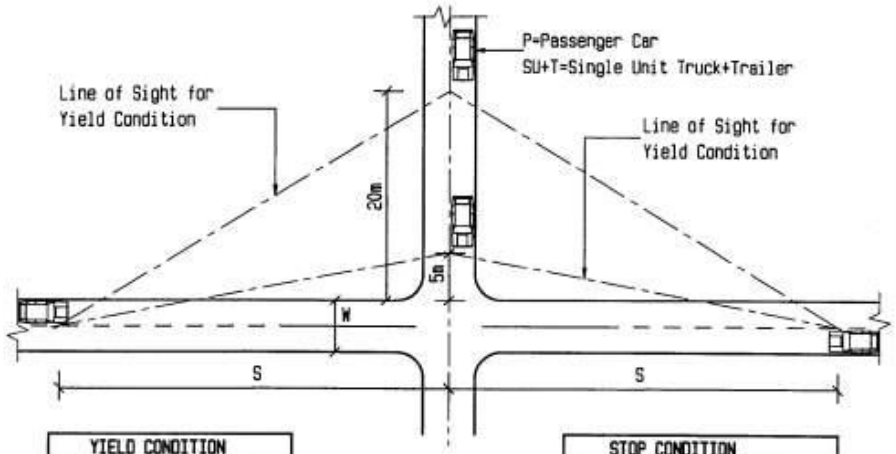
7.4.9 Two of the most common groups of road marking applications, used in all environments, and covered in this subsection because of their basic importance, are:

a) STOP LINE marking RTM1 or YIELD LINE marking RTM2;

b) the marking of DIVIDING LINE WM3, NO OVERTAKING LINE RM1 and NO CROSSING LINES RM2 in relation to each other.

7.4.10 Figure 11 gives details of the sight distance considerations appropriate to the decision to mark a STOP LINE marking RTM1 or a YIELD LINE marking RTM2 at an intersecting side road. The position of markings RTM1 and RTM2 are very much related to the positions of STOP sign R1 and YIELD sign R2 respectively.

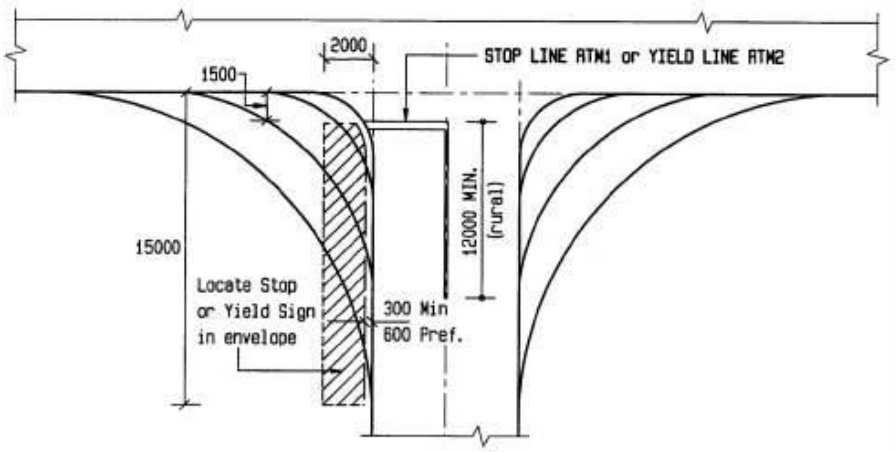
However, when lines RTM1 or RTM2 are marked it is the marking at which drivers have to stop or yield (not the sign). The markings in particular, must therefore be positioned with adequate sight distance in mind. The minimum width requirements specified for markings RTM1 and RTM2 in Annex A should be noted.



YIELD CONDITION		
Speed-main Road (km/h)	S (m) P	SU+T
60	95	140
80	130	185
100	155	230
120	190	280

STOP CONDITION		
Speed-main Road (km/h)	S (m) W=7,5/P	W=15/SU+T
60	120	250
80	160	330
100	195	420
120	235	500

Basic Sight Distance Criteria (Ref: Volume 1 - Chapter 2)



Detail 2.13.2 Position of Stop or Yield Signs and Markings

Figure 11– STOP and YIELD Sight Distance Considerations

7.4.11 The marking of a line between streams of traffic travelling in opposite directions is perhaps the most commonly used road marking on our roads. Which line should be used is dependent on the need to control overtaking manoeuvres. When traffic volumes are low, operating speed is acceptable, and visibility is good, the "centre" of the road may be demarcated by a DIVIDING LINE marking WM3 which permits overtaking (with due regard to safety) in both directions of travel. A DIVIDING LINE shall be marked on all permanently surfaced rural roads with a running surface width of 5.5 m or more. A DIVIDING LINE may be marked on rural or urban roads of lesser width in the interests of safety, subject to engineering assessment. Marking WM3 may be used economically for relatively short distances on roads under 5.5 m width. When traffic volumes are low, likely situations for such use include sharp horizontal and/or vertical alignment, the approaches to road junctions, railway crossings, or bridges and culverts, in order to warn drivers to pay particular attention to possible on-coming traffic. Traffic volumes above the very lowest levels will warrant road widths in excess of 5.5 m, in which case the use of a NO OVERTAKING line will most likely be warranted in the types of situation described above.

7.4.12 When warranted a DIVIDING LINE should be replaced by either a NO OVERTAKING LINE marking RM1 or a NO CROSSING LINE marking RM2.

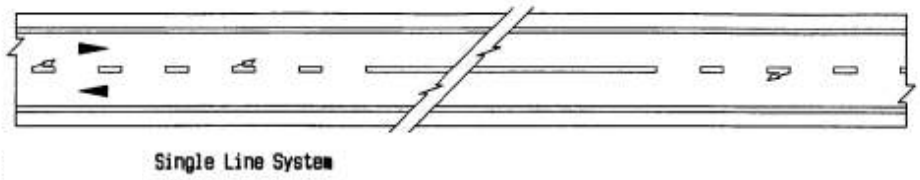
7.4.13 Apart from the visual impact of the two line types RM1 and RM2, the basic operational difference between them is that NO OVERTAKING LINE RM1 permits drivers to cross the line to gain access to land on the opposite side of the line, and vice versa, and with due regard to safety to pass a stationary obstruction in the road. In contrast the only circumstance under which a driver may cross a NO CROSSING LINE RM2 is to pass a stationary obstruction in the road if it is safe to do so.

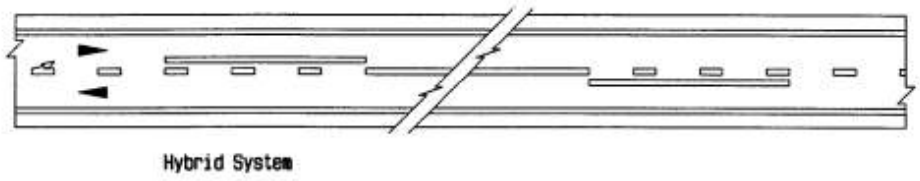
7.4.14 A prohibition on overtaking may be marked according to one of three systems, namely (see Figure 12):

a) a "Single Line System" in which a DIVIDING LINE WM3 is replaced by a single NO OVERTAKING LINE RM1;

b) a "Hybrid System" in which a section of NO OVERTAKING LINE RM1 is added to the left of the DIVIDING LINE – this prohibits overtaking only in the direction of travel on the side of the RM1 marking - overtaking is permitted in the direction of travel on the side of marking WM3 (this type of combined line marking may be replaced over some sections of the road by a single RM1 marking, hence the term "hybrid");

c) a "Two Continuous Line System" which retains the DIVIDING LINE throughout the section of road on which the prohibition is marked - where NO CROSSING is required two solid continuous white lines are marked, one on each side of the dividing line.





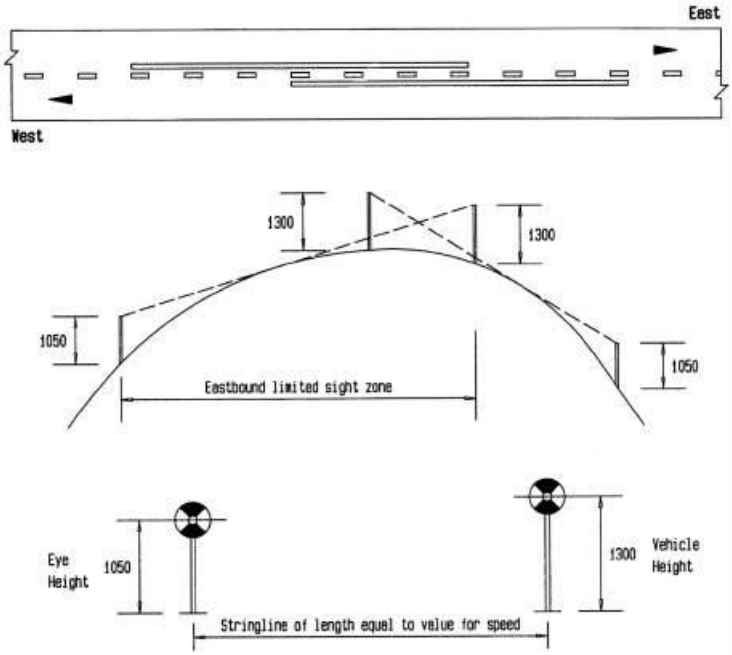
NOTE 1 The marking arrangements shown above indicate “centre line” treatments for two-way roadways. To avoid risks of confusion (particularly in a legal context) the terms “centre line” and “barrier line” are no longer used. The line separating opposing streams of two-way traffic may comprise a DIVIDING 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.

NOTE 2 Markings WM3, RM1 and 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.

Figure 12 – Line combinations incorporating no overtaking markings

7.4.15 Marking of NO OVERTAKING LINE RM1 and/or NO CROSSING LINE RM2 is warranted 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 Figure 13. The

Barrier Sight Distance allows sufficient time for two vehicles approaching each other in a head-on situation to stop if should be left with no other option for avoiding action. This distance therefore approximates to twice the Stopping Sight Distance.

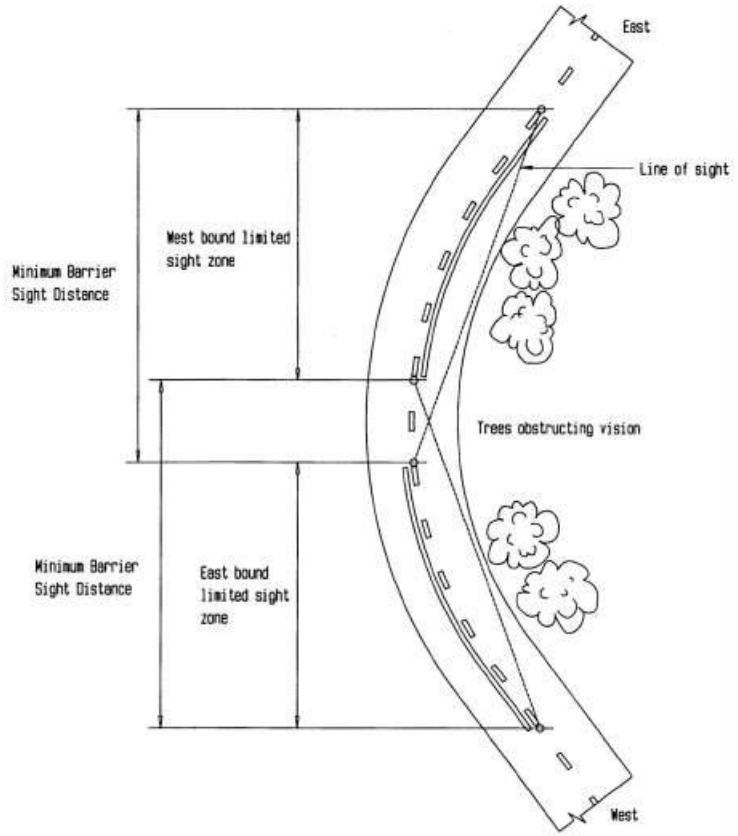


WARRANTS FOR NO OVERTAKING LINE	
Design speed (km/h)	Minimum Barrier Sight Distance (m)
50	150
60	180
80	250
100	300
120	400

MINIMUM LENGTH OF NO OVERTAKING LINE	
Road Condition	Recommended Minimum Length RM1 (m)
Rolling terrain/Curving roadway	150
Mountainous terrain	60

Figure 13 – No overtaking lines for vertical curves

7.4.16 The length of a NO OVERTAKING LINE RM1 depends on whether its principle use is for traffic control purposes (commonly at junctions), or for reasons of limited sight distance (commonly between junctions). Figures 8 give details of the setting out of NO OVERTAKING LINES for vertical curves and horizontal curves respectively. Annex A indicates minimum and recommended minimum lengths of NO OVERTAKING LINE RM1 and NO CROSSING LINE RM2 when these are used at junctions. Information on recommended minimum lengths of these line types, when used on sections of road between junctions, is given in Figure 14.



NOTE 1 An assessment of the need for NO OVERTAKING LINE RM1 should be undertaken for both directions of travel and for horizontal and vertical curvature.

NOTE 2 Figure 5 gives details of minimum Barrier Sight Distance warrants for the provision of NO OVERTAKING LINES. A Minimum distance between successive lengths of markings RM1 or RM2 of 120 m is recommended, whether the lines are in the same direction or in opposite directions. Such overtaking lengths should be checked for adequacy by engineering assessment.

NOTE 3 On horizontal curves minimum Barrier Sight Distance should be assessed based on the line of sight not encroaching beyond the shoulder break point.

Figure 14 – No overtaking lines for horizontal curves

7.5 Specifications

7.5.1 The requirements and test methods for retro reflective and other road marking materials, both permanent and temporary are specified in EAS 928-1, EAS 928-2 and EAS 927 as applicable. The glass beads shall confirm to EAS 999.

7.5.2 The annual cost to road authorities of re-marking roads 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.

7.5.3 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 authority should be able to establish parameters for the maintenance of road markings in an efficient manner. Such 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.

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

(a) colour;

(b) luminance factor

(c) coefficient of retroreflection;

(d) skid resistance (particularly for urban areas).

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

7.6 Roadstuds

7.6.1 ROADSTUDS may be used to supplement road markings where these are subject to conditions of below average visibility. Roadstuds achieve their effectiveness because they project above the road surface and they incorporate retroreflective lenses which efficiently reflect the light from vehicle headlamps over considerable distances.

7.6.2 Road authorities may adopt policies which require the use of roadstuds universally or selectively. If a universal policy is adopted consideration should be given to intensifying the application rate of the roadstuds in areas where below average conditions are predictable.

7.6.3 Occurrence of the following conditions, either separately or in combination may warrant the selective or intensified use of roadstuds:

(a) regular occurrence of mist, fog or rain resulting in:

(i) significantly reduced visibility;

(ii) reduced performance of conventional road markings due to standing water;

(b) heavy traffic volumes resulting in:

(i) poor visibility due to glare from headlamps of on-coming vehicles;

(ii) restricted forward vision due to traffic density (and resultant close following distances)

(iii) rapid wear of conventional road markings;

(c) isolated low standard road design resulting from:

(i) changing vertical and/or horizontal alignment;

(ii) reduced carriageway width or lateral clearance to street furniture;

(iii) a speed limit set well below the general limit for the class of road, or an advisory speed displayed which is much lower (>20%) than the general speed limit;

(iv) poor surface water drainage

(d) hazardous sites, with documented accident records, involving:

(i) T-junctions;

(ii) wrong-way travel;

(iii) complex lane layouts;

(iv) sharp curves;

(v) at-grade railway crossings;

(e) roadworks sites of significant time duration to demarcate:

(i) temporary road alignments;

(ii) temporary lane arrangements;

(iii) rapid lane indication after resurfacing;

(f) on all freeways.

7.6.4 It is essential that the meaning imparted by roadstuds, and the guidance given by them, is consistent and predictable. Only three colours of roadstud are permitted to supplement road markings. The meanings to be conveyed by the three colours, in conjunction with relevant road markings, are:

(a) RED shall mean PROHIBITION;

(b) YELLOW shall mean WARNING;

(c) WHITE shall offer GUIDANCE.

7.6.5 The functions of these permitted colours of roadstud are:

(a) RED:

(i) to supplement any road marking to indicate potential "wrong way" driving situations;

(ii) in conjunction with a white NO OVERTAKING LINE marking RM1;

(iii) in conjunction with a white NO CROSSING LINE marking RM2;

(iv) in conjunction with a white RIGHT EDGE LINE marking RM4.2;

(b) YELLOW:

(i) in conjunction with yellow road markings with the exception of any application covered by sub-paragraph 7.6.4.

(c) WHITE (or clear):

(i) in conjunction with white road markings with the exception of any application covered by sub-paragraph 7.6.4.

7.6.6 It is recommended that only roadstuds which comply with the requirements of the EN 1463-2 be used. Roadstuds may be omnidirectional, uni-directional or bi-directional. Omnidirectional roadstuds are only appropriate where all-round visibility of the stud does not conflict with the colour code or function provisions detailed in paragraphs 7.6.5 and 7.6.5. The most likely application of omnidirectional roadstuds to comply with these requirements is with a LANE LINE marking GM1. Uni-directional roadstuds may be specified for use in white, yellow or red. Bi-directional roadstuds may be specified as:

(a) white/white;

(b) white/red;

(c) yellow/yellow;

(d) yellow/red;

(e) red/red.

7.6.7 When the conditions given in paragraph 7.6.4 are likely to occur, either separately or in combination, it is recommended that the use of roadstuds be considered particularly with the following types of road marking:

(a) NO OVERTAKING LINE RM1;

(b) NO CROSSING LINE RM2;

(c) CHANNELISING LINE RM3;

(d) LEFT EDGE LINE RM4.1;

(e) RIGHT EDGE LINE RM4.2;

(f) PAINTED ISLANDS RM5;

(g) CONTINUITY LINE WM2;

(h) DIVIDING LINE WM3;

(i) REVERSIBLE LANE LINE WM4;

(j) ARRESTOR BED AHEAD WM9;

(k) LANE LINE GM1.

7.6.8 The use of roadstuds is generally NOT recommended in the following circumstances:

(a) if they are likely to be a risk to cyclists;

(b) where traffic speeds are low;

(c) when road surfacing is planned in the near future;

(d) when street lighting is of sufficient standard to ensure adequate night-time visibility;

(e) specifically across the exit point to freeway off-ramps and the entry point from freeway on-ramps, and any other similar situation where traffic leaves or joins a major roadway in a free-flowing or merging manner.

7.6.9 The terms "Normal", "Intermediate" and "Abnormal" used in are general terms intended to offer a limited grading of the severity of conditions which may warrant the use of roadstuds.

7.6.10 Roadstuds shall be spaced so that there are no fewer than three roadstuds in each longitudinal line are visible to drivers to adequately define the alignment of the lines. When horizontal and/or vertical alignment is of a low standard this need may require an upgrading from Normal to Intermediate spacing, or Intermediate to Abnormal spacing.

7.6.11 When commencing setting out of roadstuds over some distance the position of the first transverse row of studs for edge lines, lane lines, dividing line etc. should be determined from one of the broken line types on the section of road i.e. a LANE LINE GM1 or DIVIDING LINE WM3. From this first "cross-section", subsequent roadstuds can be positioned at the appropriate modular spacings on all longitudinal lines.

7.6.12 When roadstuds are to be applied next to a continuous longitudinal 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.

7.6.13 The lateral separation between multiple longitudinal lines such as NO OVERTAKING LINE RM1, DIVIDING LINE WM3 and NO CROSSING LINES RM2, should be such that if a roadstud is to be placed between any two parallel lines there should be a minimum of 150 mm between the lines to allow a minimum clearance between the lines and roadstuds of 25 mm.

7.6.14 When a longitudinal marking is more than 200 mm wide it is recommended that two roadstuds of the appropriate colour be placed side-by-side within 150 mm to 200 mm short breaks in the line.

7.7 Materials and Maintenance

7.7.1 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.

7.7.2 Road marking paints may be applied in a minimum thickness of 3 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.

7.7.3 The skid resistance of painted markings can be low. Specifications should ensure that adequate skid resistance will be achieved, particularly for large areas of road marking such as symbols or arrows, and that compliance with these specifications actually occurs.

7.7.4 Thermo-plastic materials, although costly, can be cost effective, particularly if used for transverse lines, pre-cut symbols or arrows for areas with high traffic flows. Thermo-plastic materials 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 costly, but their durability may still be cost effective under conditions of extreme wear. Specially textured materials are available which improve wet weather performance and durability, and quality plastic materials generally have very good skid resistance properties.

7.7.5 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 constructed or re-surfaced, the functional need for all markings which existed before the work should be assessed;

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

(c) the most cost effective form of maintenance need not necessarily to 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 for cost effectiveness.

7.8 Temporary Markings

7.8.1 Due to the difficulty in effectively erasing road markings it is strongly recommended that the provision of temporary markings be carefully planned with respect to the number of iterations which may be necessary on any specific section of road, and the materials to be used. Attention must be paid to the method of removal of road markings, with particular regard to the anticipated lighting conditions likely to prevail on the sector of road. Under adverse conditions, such as a low angle of sunlight, markings which have been erased may show up more clearly than when they still existed as painted markings.

7.8.2 A lightly applied, non-emulsion paint such as PVA, which will wear quickly under traffic operation, may be viable for short term work. Short term work can also include situations where frequent re-marking of a section of road is scheduled due to variations in temporary traffic accommodations.

7.8.3 Temporary pre-formed, adhesive-backed tapes may be used, particularly for smaller areas of application. These are designed to be applied and lifted, and re-applied a number of times, and can therefore be cost effective if used carefully. A black version of this tape is available which can be used to temporarily "blank-out" markings which could be confusing, particularly at temporary changes in direction when lane, edge or dividing lines would otherwise continue across the line of the deviation.

7.8.4 Temporary roadstuds, placed at closely spaced intervals, may be used to simulate road markings. Such roadstuds are designed for easy removal after use.

7.9 Warrants

7.9.1 Precise warrants for the use of road markings are not well developed. The following may be considered as general warrants for the use of certain common road markings:

a) a LEFT EDGE LINE marking RM4.1 is warranted on any rural or urban roadway which has been provided with a shoulder, particularly a surfaced shoulder, if a shoulder is not surfaced marking RM4.1 may be applied within 150 mm of the edge of surfacing to inhibit edge damage (250 mm if roadstuds are to be provided);

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 freeway), whether the median is provided with a barrier or not; marking RM4.1 is also warranted on at-grade dual carriageways which have a median that is not defined by barrier or unmountable kerbs;

c) a GUIDE LINE marking GM2 is warranted within a junction when more than one turning lane is provided for the right or left turning movements, even if one of the two lanes is a shared turning and through lane;

d) a CONTINUITY LINE marking WM2 is warranted when a dedicated or exclusive turning lane is provided at a rural or urban junction; marking WM2 is commonly also warranted if LEFT EDGE LINE marking RM4.1 is dropped through the opening of a wide (including bell-mouths) side road junction.

7.9.2 When the following traffic control devices are used the indicated road marking is also warranted:

a) STOP sign R1 (and its derivatives) - STOP LINE marking RTM1;

b) YIELD sign R2, YIELD TO PEDESTRIANS sign R2.1, and YIELD AT TRAFFIC CIRCLE sign R2.2 - YIELD LINE marking RTM2;

c) TRAFFIC SIGNALS - STOP LINE marking RTM1 AND PEDESTRIAN CROSSING LINES marking RTM3;

d) EXCLUSIVE PARKING BAY marking RM7 – appropriate designatory letter RM7.1;

e) BUS LANE RESERVATION sign R302, BICYCLE LANE RESERVATION sign R304, HIGH OCCUPANCY VEHICLE RESERVATION sign R336 or TRAM LANE RESERVATION sign R339 - EXCLUSIVE USE LANE LINE marking RM9;

f) EXCLUSIVE USE LANE LINE marking RM9 – symbol markings BICYCLE GM6.1 and HIGH OCCUPANCY VEHICLE GM6.4, and WORD MARKINGS GM7;

g) in advance of a mid-block pedestrian crossing - ZIG ZAG ZONE LINES marking RM11;

h) in advance of a railway crossing - RAILWAY CROSSING AHEAD marking WM1;

i) in advance of a lane drop - LANE REDUCTION ARROW markings WM6;

j) (j) in advance of a NO OVERTAKING LINE marking RM1 or a NO CROSSING LINE marking RM2 - NO OVERTAKING LINE AHEAD marking WM8;

k) in advance of an arrest or bed - ARRESTOR BED AHEAD marking WM9;

l) at a speed hump - NO OVERTAKING LINE marking RM1 and SPEED HUMP marking WM10.

7.10 Reflectorisation

7.10.1 At night it becomes much more difficult to see and understand the road and junctions ahead. Road markings can be of great help, especially if they are reflectorised. This is achieved by the addition of glass beads known as ballotini which is either incorporated in the paint mix or applied after the marking is laid.

The improved efficiency of reflectorised lines is substantially reduced when the lines are wet, although they are still at least as good as unreflectorised lines. Because of their advantage over unreflectorised lines in dry weather much more use of reflectorised lines is justified.

The following road markings should be reflectorised to improve the visibility:

a) transverse stop lines;

b) continuous white lines (barrier lines);

c) all markings at major junctions; and

d) centre and edge of carriageway lines on sections of main road with many curves or gradients.

7.10.2 White coloured reflective road studs should be considered for continuous white lines along the centre line of the road and around traffic island markings. Red coloured reflective road studs should be considered for outlining physical traffic islands. There may also be situations where white coloured reflective road studs are proposed to improve longitudinal markings for lane line and hazard warning line markings.

7.11 Road centre line marking

A continuous road center line marking shall be provided to prohibiting overtaking on lengths of road where visibility is limited. The system shall use a single line of minimum width of 100 mm which is continuous where overtaking is prohibited. Where additional impact is required, the width of the line should be increased to 150 mm. Where overtaking is not prohibited, but it may be dangerous to overtake, a hazard warning line shall be provided.

8 Manufacture of road signs and road markings

8.1 Sign lettering

9.1.1 The size of the lettering shall be referred to in terms of the capital letter height. This shall be the height of the uppercase letter.

8.1.2 To ensure correct lettering spacing when forming a word, the characters in each alphabet should be placed on tiles. The tiles shall vary in width, according to the size of the character, and shall have a fixed height which ensures correct line spacing. For the purpose of design, the line spaces shall be measured to the edge of the tiles and not to the actual characters. The tile height is given on Figure 15 below.

8.1.3 Details of the lettering are shown in Table 13. Each letter has been put onto a tile which is related to the height and width of each letter of the alphabet.

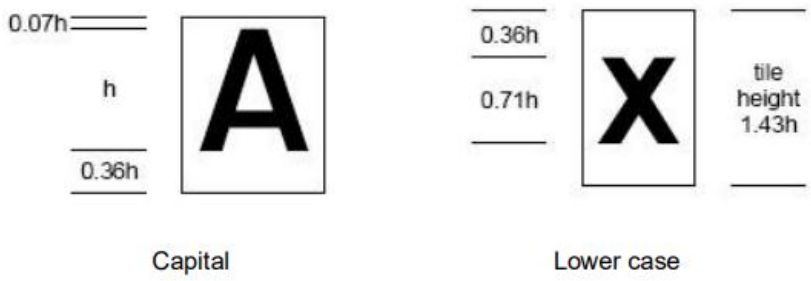


Figure 15 – Lettering title

Table 13 – Capital and tile heights for lettering

Sign type	Capital height (mm)	Tile height (mm)
Place identification signs	200	285
Direction signs on national roads (Class 1 and Class 2) [a]	150	215
Bridge name plate sign (Name of bridge)	150	215
Direction signs on feeder roads and other minor roads	100	145
Supplementary plates	60	85
[a] The road design class, their function and name convention are as per EAS 1206.		

The standard lettering style is given in Table 14.

The widths of letters and numerals are given in terms of their capital height h.

Table 14 – Width of letters and numerals

Upper case		Lower case		Numerals	
Letters	**Widths**	**Letters**	**Widths**	**Numbers**	**Widths**
A	1.01	a	0.79	1	0.60
B	1.04	b	0.87	2	0.89
C	1.08	c	0.76	3	0.97
D	1.07	d	0.85	4	0.99
E	0.97	e	0.79	5	0.93
F	0.86	f	0.56	6	0.92
g	1.11	g	0.84	7	0.76

H	1.14	h	0.85	8	0.99
I	0.52	i	0.39	9	0.92
J	0.68	j	0.51	0	1.04
k	0.99	k	0.81	Punctuation marks	
L	0.84	l	0.45	&	0.91
M	1.33	m	1.24	(	0.82
N	1.20	n	0.85	)	0.82
O	1.13	o	0.82	?	1.04
P	0.96	p	0.86	.	0.40 full stop
Q	1.15	q	0.86	:	0.40 colon
R	1.06	r	0.61	,	0.49 comma
S	1.04	s	0.71	-	0.51 hyphen
T	0.84	t	0.60		
U	1.12	u	0.86		
V	0.95	v	0.76		
W	1.38	w	1.14		
X	0.93	x	0.79		
Y	0.91	y	0.76		
Z	0.85	z	0.66		

8.2 Construction

The materials used in the signs and the method of construction shall comply with ASTM D4956. Retroreflective sheeting used for the construction of sign plates is a type of material which is capable of reflecting light in the general direction of the light source. For simplicity this shall be referred to hereafter as reflective sheeting.

8.3 Reflectorisation

8.3.1 General

8.3.1.1 Signs should be fully reflectorised except for those parts of the sign which are coloured black. If a sign is required to have a reflectorised background, the sign face shall be made of reflective sheeting.

8.3.1.2 Signs which are intended to be positioned parallel to the direction of traffic flow such as parking sign shall not be reflectorised.

The reflective sheeting shall conform to the following requirements:

a) the sheeting shall have high reflectivity normal to vehicle headlights dependent on the angle of incidence. The reflective material shall be sharp and glareless and directed towards the light source at an approved angle of incidence;

b) the surface of the sheeting shall be smooth and flexible. No cracking shall occur when bent. Reflective sheeting shall have high durability under all weather conditions, heat and moisture and be strongly fungus-resistant.

c) the sheeting shall not delaminate, blister, crack, peel and chip during the manufacturing process and during its expected service life;

d) the sheeting supplied shall be free from dirt, solid lumps, scales, ragged edges and non-uniformity of colour;

e) the colour of the sheeting shall be even and free from any spots or loss of colour. The colour shall not fade appreciably under local weather conditions during its expected service life;

f) colours of sheeting used shall correspond to the colours of the sheeting supplied as samples;

g) the reflective surface of the sheeting shall be durable and remain sharp during its expected service life. Bad weather conditions such as rain, dew, etc. shall not considerably reduce the reflectivity;

h) the reflective surface of the sheeting shall be easily cleaned with soap and water with no adverse effect on its reflectivity and durability when used on the roads; and

i) the adhesive used on the backing of the sheeting shall give a high quality bonding to clean, smooth and grease free aluminium or other sign plates approved by the sheeting manufacturer. The adhesive shall withstand the conditions without allowing the sheeting to peel.

8.3.2 Retroreflective materials for road signs

8.3.2.1 Many road signs and road markings are specified with retroreflective materials. Certain parts of some road signs shall be retroreflective and for others the use of retroreflective materials is optional. These requirements are summarised in Table 6.

8.3.2.3 When specifying the manufacture of a road sign which requires the superimposition of one colour of retroreflective material on another, care must be taken to ensure that adequate luminance and contrast rates are achieved from the sign for the message to be legible. As a general rule a contrast ratio of the coefficients of retroreflection of colours placed on each other is recommended as follows:

(a) for small finely detailed areas (letters and symbols) – a minimum ratio for light-to-dark of 7 to 1, with a preference for 10 to 1 or more;

(b) for large areas (arrows or blocks) a minimum ratio of 3,5 to 1, with a preference for 5 to 1. Recommended retroreflective material class combinations are given in Table 15.

Table 15 – Retroreflective materials for road signs

Permanent Road Signs (1)	**Sign Segment**			
Type	Border	Symbols	Letters	Background
REGULATORY				
Control	Retroreflective	Retroreflective	Retroreflective	Retroreflective
Command	Retroreflective	Retroreflective	Retroreflective	Retroreflective
Prohibition	Retroreflective	Semi-matt	Semi-matt	Retroreflective
Reservation	Retroreflective	Retroreflective	Retroreflective	Optional
Comprehensive	Retroreflective	Retroreflective	Retroreflective	Retroreflective
De-restriction	Retroreflective	Retroreflective	Retroreflective	Retroreflective
WARNING				
Advance	Retroreflective	Semi-matt	Semi-matt	Retroreflective
Hazard	Retroreflective	Retroreflective	-	Retroreflective
GUIDANCE				
Location	Semi-matt	Optional	Semi-matt	Retroreflective
Route Marker	Retroreflective	Retroreflective	Retroreflective	Retroreflective
Trailblazer	Retroreflective	Retroreflective	Retroreflective	Retroreflective
Direction	Retroreflective	Retroreflective	Retroreflective	Optional (2)
Freeway Direction	Retroreflective	Retroreflective	Retroreflective	Retroreflective
Tourism	Retroreflective	Retroreflective	Retroreflective	Optional (2)
Local Direction	Retroreflective	Semi-matt	Semi-matt	Optional
Diagrammatic	Retroreflective + BLOCK	Semi-matt	Semi-matt	Retroreflective
Pedestrian	Retroreflective	Semi-matt	Semi-matt	Optional
INFORMATION	Retroreflective	Retroreflective	Retroreflective	Optional
NOTES: (1) All temporary road signs shall have a retroreflective background, and semi-matt border, symbol, arrows or letters. (2) Certain signs may be specified as retroreflective				

8.4 Frames supports and fittings

8.4.1 Steel frames shall be free from scale and rust by blast cleaning or pickling and protected by one of the following methods:

a) thermally spraying with aluminium or zinc to a nominal thickness of 100 µm;

b) hot dip galvanising in accordance with ISO 4998 followed by a coat of suitable pre-treatment primer where a finishing coat is to be applied;

c) applying two coats of inhibitive primer followed by one of undercoat;

d) applying a plastics coating.

8.4.2 When the frame is of welded construction, the weld areas shall be freed of scale and treated to give a protection equivalent to that given to the remainder of the frame. The frame shall be fabricated prior to the application of any finishing coat.

8.4.3 Steel fittings and accessories such as clips, brackets, screws, bolts, nuts, rivets and washers shall be prepared and finished as above.

8.4.4 The reverse of signs should have a top coat finish colour of either grey or black. All post shall be painted in alternate black and white stripes at 200 mm to 250 mm band widths.

8.5 Back support frame

Unless otherwise specified, aluminium sign plates, and steel sign plates greater than 0.4 m^2 in areas, shall be supplied with a back support frame of a size and design to avoid the plate being deformed due to wind pressure, or manipulation by vandals (other than severe attack). The frame shall normally be made of a steel angle riveted or bolted to the sign plate, and shall incorporate brackets to enable the sign plate to be bolted to the sign post.

All screws, bolts, nuts, washers, rivets, etc., shall be protected against corrosion. Steel fixings that come into contract with aluminium must be coated with zinc or cadmium to prevent corrosion through electrolytic action.

The complete sign when mounted on its support in accordance with the manufacturer's instructions shall be rigidly locked in position to resist twisting.

8.6 Sign plate preparation and coatings

The choice of aluminium or steel shall be governed by the type of sign being manufactured. The sign plates for all fully reflective signs should be aluminium.

Non-reflective or partially reflective signs shall use steel sign plates. Wood or reinforced concrete shall not be acceptable as materials for sign plates.

8.6.1 Aluminium

If aluminium is chosen, the aluminium sheeting shall be 2 mm thick unless otherwise specified. After any cutting and punching has been completed all sharp edges shall be uniformly rounded off and smoothed down.

The metal plate shall be degreased either by acid or hot alkaline etching and all scale/dust removed to obtain a smooth, plain surface.

After cleaning, metal shall not be handled except by a device or clean canvas gloves.

There shall be no opportunity for metal to come into contact with grease, oil, or other contaminants prior to the application of the reflective sheeting.

8.6.2 Steel

8.6.2.1 If steel plate is chosen, the steel plate shall be the minimum of 1.2 mm thick. However, plate thicknesses of 1.5 mm which is more generally available, or 2.0 mm are acceptable. After any cutting, welding and punching has been completed, all sharp edges shall be uniformly round off and smoothed down.

8.6.2.2 All physically adhering contaminants shall be removed and the surfaces abrasive-blasted and then thoroughly cleaned and degreased. Unless the application of a primer follows within 4 hours of the abrasive blasting and before any oxidation of the prepared surfaces takes place, the surface shall be given one coat of wash primer immediately after blasting.

8.6.2.3 The prepared surface shall be given two coats of a zinc chromate primer. The first coat is to be applied within 12 hours in the case of wash-primed surfaces and within 4 hours, but before any oxidation of the surface takes place, in the case of abrasive-blasted surfaces that have not been wash-primed.

8.6.2.4 There shall be no opportunity for the metal to come into contract with grease, oil or other contaminants prior to the application of the reflective sheeting.

8.6.3 Coating

Parts of the sign plate not covered by reflective sheeting (including the reverse of the plate and the back support frame) shall be coated using either by painting, stove enameling or powder coating processes. The colour of the reverse of sign plates and support frame shall be grey or black.

8.7 Installation of signs

8.7.1 Mounting posts

Mounting posts should be installed in accordance with the accepted practice of manufacture. The steel tube, to be used should have at least 50 mm internal diameter, however 78 mm by 38 mm C- channel should be equally acceptable and has the added advantage of giving a flat surface on which to bolt the sign plate. Posts constructed from wood or reinforced concrete will not be acceptable.

Before using other types of steel section for posts, the competent authority shall need to be consulted that the proposed post shall not suffer any permanent deformation or other form of failure when it is subjected to the estimated working stresses.

8.7.2 Fixing

8.7.2.1 The method of fixing the sign plate (and frame if used) to the mounting post(s) should be such as it shall facilitate its removal for replacement purposes. A typical method of fixing unframed signs to a circular post is by the use of half clips which are riveted, bolted or welded to the sign plate. A typical method for fixing a larger framed sign is for the back support frame to have two flanges one at the top and one at the bottom.

The sign is then fixed to the sign post by bolting through the flanges.

8.7.2.2 Each type of sign plate and mounting post presents its own fixing problem, but the aim should be to provide a fixing for the sign plate (and frame if used) so that although it can be easily removed for replacement purposes, it is held firmly enough to withstand the loading to which it will be subjected. All nuts, bolts, washers etc, shall be protected against corrosion. Steel fixings that come into contact with aluminium shall be coated with zinc or cadmium to prevent corrosion through electrolytic action.

8.7.2.3 In order to help prevent theft of the sign, the ends of the threads of fixing bolts should be filled

down, deformed with a hammer or the thread spot welded.

8.7.2.4 Where a sign is mounted on a single post, care should be taken to prevent the forced rotation of the sign round it. In the case of a circular post, this may be achieved by means of a pointed grub screw in the clip which is screwed into the post.

8.7.2.5 Care should be taken to prevent the rotation of the post in its foundation. This may be achieved by passing a length(s) of bar through holes drilled in the base of the post below ground level. For additional rigidity, the bar can be welded to the base of the post.

8.7.3 Foundations

8.7.3.1 The type of foundations required, particularly for larger direction signs, shall vary with the local soil conditions. These may be in mass concrete or reinforced concrete. The buried section should be at least one-third the overall length of the post. Unless otherwise specified the foundation for a single post should be at least 450 mm x 450 mm and 600 mm deep. The concrete should be a 1:3:6 cement: sand: gravel mixture.

After pouring, it should be properly compacted with a tamper. The top surface should be smooth with a slight slope outwards from the post to ensure proper drainage. The top surface of the finished concrete should not be proud of the surrounding ground surface as the provision of foundation blocks or plinths can enable vandals to reach the sign plate more easily.

8.7.3.2 The foundation should be designed and placed at such a depth that it shall safely support the sign under its loading conditions without causing failure due to shear or heave in the surrounding soil. Special precautions should be taken to ensure the adequacy of foundations in made up ground. Foundation for the large directions signs should not be covered up until they have been inspected and approved by the Engineer.

8.7.3.4 Temporary struts should be used to hold the post in position until the foundation is complete, making sure that the post is vertical and that the sign plate is level and at the correct angle to the road. The installation date should be painted on the back of the sign.

8.8 Road markings

8.7.4.1 The paint used for road markings should be manufactured specifically for this purpose and should comply with EAS 927:2019, EAS 928-1:2019, EAS 928-2:2019 or EAS 999:2021 as applicable. It should be quick-drying, durable, and have a good skid-resistance.

8.7.4.2 The paint may be applied by brush or machine, however before ordering paint, the proposed method of application should be specified to the manufacturer to ensure that the correct type of paint is ordered. Hot sprayed plastic or thermoplastic may also be used.

8.7.4.3 Markings shall not be laid until the correct temporary traffic signs are in place. The road surface shall be clean and dry, and completely free from dirt, grease or any other material that might prevent the paint from adhering properly. The outline of the marking should be marked on the road surface with chalk or paint spots.

It is worth making templates for the more complicated markings such as arrows. The paint may be applied by brush or by machine. Traffic shall not be allowed over the markings until they are dry. On completion the longitudinal lines should present a smooth visual flow to be the eye with no kinks or sudden bends.

8.7.4.4 Carriageway markings may be laid either by hand or by machine. The choice shall depend on such factors as the type of material, the pattern of the marking, how frequently the pattern is repeated, and on the amount to be laid. In busy urban areas, consideration shall be given to clearing the street of parked vehicles; the only alternative may be to operate at night, or at weekends.

8.7.4.5 All types of carriageway markings should be skid-resistant in wet conditions. Adequate skid resistance is particularly important where the camber or crossfall is steep and at junctions where turning traffic includes an appreciable number of two-wheeled vehicles.

8.7.4.6 As it is not possible to lay carriageway markings to precise dimensions and in order to allow for the markings “spreading” in service, certain tolerances in the prescribed dimensions may be permitted.

These are:

a) 3 m or over Plus or minus 15%;

b) 300 mm or over, but under 3 m Plus or minus 20%; and

c) Under 300 mm Plus 30% or minus 20%

8.7.4.7 The maximum projection of the line marking above the surface should be 6 mm. This should not be exceeded because of the danger to traffic, especially to two-wheeled vehicles, and to pedestrians. Where markings are relaid over existing markings after surface dressing of the carriageway, care should be taken to ensure the overall projection of the markings should also not exceed 6 mm.

8.9 Reflective road studs

8.9.1 General

The following points should be considered when specifying studs:

a) glass lenses are much more resistant to wear than plastic;

b) corner cube reflectors have a greater reflective performance than bi-convex lenses but tend to be more expensive; and

c) strong fixing is vital for safety - road nails plus epoxy glue is advisable for asphalt, however using anchored road studs on surface dressed road is not advised as it is likely to result in a weakness in the impermeable surfacing which could lead to local failure.

8.9.2 Installation of bonded road studs

8.9.2.1 Bonded road studs should be fixed in accordance with the manufacturer's instructions.

8.9.2.2 The road surface should be cleaned and dust, oil, grease and other contaminants removed. The surface should, where possible, be allowed to weather and compact for a minimum period of 6 weeks to 8 weeks depending on traffic conditions prior to the installation of permanent studs.

8.9.2.3 Road studs should not be installed on white lines or on joints in the road surface. They should be installed when the road surface is completely dry unless the manufacturer of the adhesive recommends that it is suitable for use in other conditions.

8.9.2.4 A blowlamp may be used to prepare the road surface in damp or cold weather, but care should be taken not to overheat the road surface as this can weaken it.

8.9.2.5 In cases of doubt, the adhesive manufacturer's advice should be obtained on whether the adhesive is appropriate to the surface in question.

8.9.3 Method of use of adhesive

8.9.3.1 Any settling of fillers or pigments in the adhesive components should be completely dispersed by stirring before the components are mixed.

8.9.3.2 Just before use, the components should be thoroughly mixed to give a homogeneous mixture of uniform colour. The manufacturer's instructions should be followed regarding the application of the adhesive and any safety precautions. The adhesive should be used as quickly as possible after mixing and never after it has started to set in the container.

8.9.3.3 The whole of the bottom surface of the road stud should be allowed to set sufficiently before allowing traffic to overrun the stud.

8.9.4 Installation of anchored road studs

Anchored road studs should be fixed in accordance with the manufacturer's instructions.

The cavities formed in bituminous surfaces should be thoroughly cleaned. In cold weather, the temperature of the bituminous material immediately surrounding the cavities formed to accept the anchored part of an

anchored road stud, may be gently heated in order to prevent rapid cooling of any heated bituminous adhesive or grout used in the cavity.

Care is taken not to overheat the road surface as this can weaken it.

8.10 Maintenance of signs and road markings

8.10.1 General

8.10.1.1 Traffic signs, traffic lights and carriageway markings, including reflecting studs, shall be maintained to fulfil their purpose.

8.10.1.2 All signs and markings including reflecting road studs, should be inspected at regular and frequent intervals both by day, and when appropriate, for reflectance at night. They should be renewed as necessary. Signs become less effective not only when characters or colouring deteriorate, but also when dirty or damaged or displaced as a result of accidents. Damaged or dirty signs lessen road users' respect for the signs. A periodic inspection of signs should be made to ensure their early repair and/or replacement when necessary, and after dark inspections should be made of reflectorised signs.

8.10.1.3 Regular cleaning of all signs shall be done.

8.10.1.4 To ensure proper maintenance, a suitable schedule should be established for the inspection. Cleaning of signs should occur at least twice a year and signs should be replaced immediately when damaged or missing. One inspection per year should be carried out at night to ensure adequate brilliance of reflectorized surfaces.

8.10.1.5 Care should be taken that vegetation does not obstruct the sight line of a traffic sign. Deep snow may require the seasonal raising of sign heights.

8.10.1.6 For illuminated signs, a regular schedule of lamp replacement should be maintained so that lamps are renewed before they are normally expected to burn out.

8.10.1.7 Markings should be renewed or relaid after resurfacing or on the completion of road works which may have interfered with them.

8.10.1.8 Arrangements should be made to protect road studs during surface dressing operations.

8.10.1.9 Road law enforcement, maintenance staff and other public agencies whose duties require that they travel on the roadways should immediately report a damaged, deteriorated or obscured and missing sign at the first opportunity.

8.10.2 Maintenance regime

8.10.2.1 Proper record-keeping and regular inspection should be the key to good maintenance. An inventory of markings, signs, and other road furniture should be helpful. In addition to a description of the item and its location, it can usefully include installation and inspection dates, and repair details. The inventory number should be painted on the back of the sign plate.

8.10.2.2 Inspections should be made at least twice a year, preferably after routine cleaning has been done. The things to look for are:

a) signs that are missing or in the wrong location;

b) signs that are pointing the wrong way or are tilting;

c) signs that are hidden by trees or bushes;

d) posts that are loose in their foundations;

e) sign plates that are loose;

f) corrosion of sign plates and posts;

g) accident or other damage;

h) flaking or faded sign faces and painted surfaces;

i) poorly reflecting sign faces (best checked at night); and

j) worn or faded road markings.

8.10.2.3 The faults that are found and the action taken shall be recorded.

8.10.3 Cleaning

Signs should be cleaned at least twice a year, and priority should be given to low-mounted signs. Any long grass, bushes or tree branches which hide the sign face shall be cut back. Water and a mild detergent to wash the sign should be used and care note to scratch the surface shall be taken.

Clean water shall be used to remove and rinse all traces of detergent. Road tar can be cleaned off with petrol or white spirit, but the cleaner shall be careful not to dissolve the paint.

8.10.4 Repairs

Minor repairs and repainting can be done on-site. Repainting should only be done in dry weather and after

proper preparation of the surface. Paint shall not be applied to reflective sheeting, because this makes it nonreflective. Similarly, ordinary road paint shall not be used on reflectorised road markings.

8.10.5 Storage and transport of signs

Signs shall always be stored where they cannot be damaged. They shall be stacked vertically, if possible, and sheets of cardboard or thick paper shall be put between them to prevent the sign faces from getting scratched.

Care shall be taken when loading signs on and off trucks, and they shall not be allowed to bounce around while being transported.

8.10.6 Assessment of effectiveness of signs and road markings

As part of the maintenance programme, the location and frequency of accidents should be recorded. From these records, it can be established where accidents on the road network most frequently occur. Accident sites should be looked at in more detail to establish whether better signing or road marking would improve safety and reduce accidents.

Annex A
(normative)

Summary of road marking dimensions

Marking Number (Colour)	Descriptions	Dimensions (mm)		Area (m^2) or (m^2/distance)	
		Rural	Urban	Rural	Urban
Regulatory Transverse Markings:					
RTMI (White)	STOP Line	Width 500 •	Width 300 •	3 m^2/6 m	1,8 m^2/6 m
RTM2 (White)	YIELD LINE	Width 300 • Line-Gap 600-300	Width 200 • Line-Gap 600-300	1,17 m^2/6 m	0,78 m^2/6 m
RTM3 (White)	Pedestrian Crossing Lines	Width 100 •	Width 100 •	2 lines 1,2 m^2/6 m	2 lines 1,2 m^2/6 m
RTM4 (White)	Block Pedestrian Crossing Marking	Width 2400 • 3000 Line-Gap 600-600	Width 2400 • 3000 Line-Gap 600-600	7,2 m^2/6 m 9 m^2/6 m	7,2 m^2/6 m 9 m^2/6 m
Regulatory Markings:					
RM1	No Overtaking Line	Width 100 • Continuous	Width 100 • Continuous	100 m^2/km	100 m^2/km
	("Stacking" Length)	1200	9000	1,2 m^2	0,9 m^2
RM2 (White)	No Crossing Lines	Width 2x100 •	Width 2x100 •	200 m^2/km	200 m^2/km
RM3 (White)	Channelizing	Width 100 • 150 200 300 Continuous	Width 100 • 150 200 Continuous	10 m^2/100 m 15 m^2/100 m 20 m^2/100 m 30 m^2/100 m 200 mm	10 m^2/100 m 15 m^2/100 m 20 m^2/100 m 150 mm
	("Stacking" Length)	1200 •	9000 •	2,4 m^2	1,35 m^2
RM4.1 (Yellow)	Left Edge Line	Width 100 • Continuous	Width 100 • Continuous	100 m^2/km	100 m^2/km
RM4.2 (White)	Right Edge Line	Width 100 • Continuous	Width 100 • Continuous	100 m^2/km	100 m^2/km
RM5 (White and yellow)	Painted Islands	Edge Line width 100 • Bar 200	Edge Line width 100 • Bar 150	Variable -subject to site	Variable -subject to site
RM6 (White)	Parking Bays	Width 100 •	Width 100 •	Variable	Variable

Marking Number (Colour)	Descriptions	Dimensions (mm)		Area (m^2) or (m^2/distance)	
		Rural	Urban	Rural	Urban
Regulatory Markings (continued):					
RM7 (Yellow)	Exclusive Parking Bay	Width 100 •	Width 100 •	Variable	Variable
RM7.1 (Yellow)	Exclusive Parking Bay Symbol	Length 1000 Width 680	Length 1000 Width 680	0,25 m^2	0,25 m^2
RM8 (Yellow)	Mandatory Direction Arrows	Length	Length		
	RM8.1/RM8.5				
	CBD		2500		0,67 m2
	50-90 km/h	4000	4000	1,14 m^2	1,14 m^2
	100-120 km/h	5000	5000	1,45 m^2	1,45 m^2
	Special	7500	7500	2,23 m^2	2,23 m^2
	RM8.2/RM8.4				
	CBD		2500		0,89 m^2
	50-90 km/h	4000	4000	1,43 m^2	1,43 m^2
	100-120 km/h	5000	5000	1,78 m^2	1,78 m^2
	Special	7500	7500	2,66 m^2	2,66 m^2
	RM8.3				
	CBD		2500		0,66 m^2
	50-90 km/h	4000	4000	1,06 m^2	1,06 m^2
	100-120 km/h	5000	5000	1,32 m^2	1,32 m^2
	Special	7500	7500	1,98 m^2	1,98 m^2
	RM 8.6				
	CBD		2500		1,03 m^2
	50-90 km/h	4000	4000	1,68 m^2	1,68 m^2
	100-120 km/h	5000	5000	2,12 m^2	2,12 m^2
	Special	7500	7500	3,20 m^2	3,20 m^2
RM9 (Yellow)	Exclusive Use Lane Line	Width 150 • Line-Gap 750-750	Width 150 • Line-Gap 750-750	7,5 m^2/100 m	7,5 m^2/100 m
RM10 (Yellow)	Box Junction 10 m x 10 m	N/A	Line Width 100 •	N/A	150 mm border 100 mm diags. 15,72 m^2
RM11 (White)	Zig Zag Zone Lines	Width 100 • Line-Gap 2000-150	Width 100 • Line-Gap 2000-1500	2 lines 9,2 m^2/50 m	2 lines 9,2 m^2/50 m
RM12 (Red)	No Stopping Line	Width 100 •	Width 100 •	10 m^2/100 m	10 m^2/100 m
	24hr.	150	150	15 m^2/100 m	15 m^2/100 m
RM13 (Yellow)	No Parking Line	Width 100 •	Width 100 •	10 m^2/100m	10 m^2/100m
	24hr.	150	150	15 m^2/100 m	15 m^2/100 m
RM14 (Yellow)	No Motorcycles	Length	Length 2000		0,48 m^2
		4000	4000	1,92 m^2	1,92 m^2

Marking Number (Colour)	Descriptions	Dimensions (mm)		Area (m^2) or (m^2/distance)	
		Rural	Urban	Rural	Urban
Regulatory Markings (continued):					
RM15 (Yellow and White)	Traffic Circle Mandatory Direction Arrows	N/A	Length 4000 5000 7500	 N/A N/A N/A	 1,10 m^2X3 1,53 m^2X3 2,09 m^2X3
	Circle Diameter 2000	N/A	Border 300 Centre	 N/A N/A	 1,60 m^2 0,78 m^2
	Circle Diameter 6000	N/A	Border 300 Innercircle 500	 N/A N/A	 5,37 m^2 5,06 m^2
RM 16 (Yellow)	Disabled Persons Parking Bay	N/A	Width 100 • Symbol 1200	N/A N/A	1,60 m^2 approx. 0,31 m^2
RM17 (Yellow)	Exclusive Use Lane/ Bay Symbols		Length		
	Cycle Lane RM17.1	N/A	1600	N/A	0,54 m^2
	Bus Lane (Word) RM17.2	N/A	4000	N/A	4,62 m^2
	Disabled Persons Parking Bay RM17.3	N/A	1000	N/A	0,22 m^2
	High Occupancy Vehicle Lane RM17.4	N/A	4000 8000	N/A N/A	4,26 m^2 8,24 m^2
Warning Markings:					
WM1 (White)	Railway Crossing Ahead	Line Width 400 • Length 7500	Line Width 200 • Length 4000	 6,00 m^2	 1,84 m^2
WM2 (White)	Continuity Line	Width 100 •	Width 100 •		
	Recommended	300 Module 12000	200 Module 9000		
	Reduced	Line/Gap 2m/10m	Line/Gap 1,5m/7,5m	Using recomm. 5 m^2/100m	Using recomm. 3,33 m^2/100m
	Standard	Line/Gap 2m/4m	Line/Gap 1,5m/3m	 10 m^2/100 m	 6,67 m^2/100 m
	Extra	Line/Gap 2m/2m	Line/Gap 1,5m/1,5m	 15 m^2/100 m	 10 m^2/100 m
WM3 (White)	Dividing Line	Width 100 •	Width 100 •		
	Recommended	150 Module 12000	150 Module 9000		
	Standard	Line/Gap 4m/8m	Line/Gap 3m/6m	Using recomm. 50 m^2/km	Using recomm. 50 m^2/km
	Extra	Line/Gap 6m/6m	Line/Gap 4,5m/4,5m	 75 m^2/km	 75 m^2/km

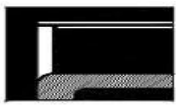
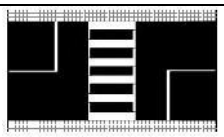
Marking Number (Colour)	Descriptions	Dimensions (mm)		Area (m^2) or (m^2/distance)	
		Rural	Urban	Rural	Urban
Warning Markings (continued):					
WM4 (White)	Reversible Lane Lines	N/A	Width 2 x 100 Module 9000 Line/Gap		
	Standard		1,5m/3m	N/A	6,67 m^2/100 m
WM5 (White)	Yield Control Ahead	Length	Length		
	CBD		1250		0,2 m^2
	50-60 km/h		2500		0,83 m^2
	70-120 km/h	4000	4000	2,15 m^2	2,15 m^2
WM6 (White)	Lane Reduction Arrows	Length	Length		
	CBD WM6.1/WM6.3		4000		2,08 m^2
	50-60 km/h		5000		2,61 m^2
	70-90 km/h	7500	7500	3,92 m^2	3,92 m^2
	100-120km/h	12000		6,56 m^2	
	CBD WM6.2/WM6.4/WM6.5		3200		2,06 m^2/1,03 m^2
	50-60 km/h		4000		2,58 m^2/1,29 m^2
	70-90 km/h	6000	6000	3,88m^2/1,94m^2	3,88 m^2/1,94 m^2
	100-120 km/h	9600		6,20m^2/3,10m^2	6,20 m^2/3,10 m^2
WM7 (White)	Mandatory Direction Arrow Ahead	Length	Length		
	WM7.1/WM7.5				
	CBD		2500		0,67 m2
	50-90 km/h	4000	4000	1,14 m^2	1,14 m^2
	100-120 km/h	5000	5000	1,45 m^2	1,45 m^2
	Special	7500	7500	2,23 m^2	2,23 m^2
	WM7.2/WM 7.4				
	CBD		2500		0,89 m^2
	50-90 km/h	4000	4000	1,43 m^2	1,43 m^2
	100-120 km/h	5000	5000	1,78 m^2	1,78 m^2
	Special	7500	7500	2,66 m^2	2,66 m^2
	WM7.3				
	CBD		2500		0,66 m^2
	50-90 km/h	4000	4000	1,06 m^2	1,06 m^2
	100-120 km/h	5000	5000	1,32 m^2	1,32 m^2
	Special	7500	7500	1,98 m^2	1,98 m^2
	WM7.6				
	CBD		2500		1,03 m^2
	50-90 km/h	4000	4000	1,68 m^2	1,68 m^2
	100-120 km/h	5000	5000	2,12 m^2	2,12 m^2
		7500	7500	3,20 m^2	3,20 m^2
WM8 (White)	No Overtaking Line Ahead				
	WM8.1	4000	3000	0,82 m^2	0,62 m^2
	WM8.2	4000	3000	1,42 m^2	1,07 m^2
	WM8.3	4000	3000	2,24 m^2	1,69 m^2
WM9 (Red and White)	Arrester Bed Ahead	Width 1000 Length 3000	Width 1000 Length 3000	3 m^2 per block	3 m^2 per block

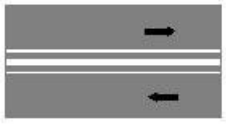
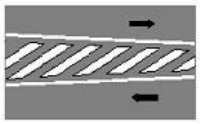
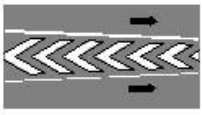
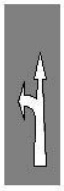
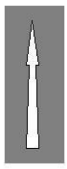
Marking Number (Colour)	Descriptions	Dimensions (mm)		Area (m^2) or (m^2/distance)	
		Rural	Urban	Rural	Urban
Warning Markings (continued):					
WM9 (Red and White)	Escape Road Ahead WM9.2	Width 1000 Length 3000 Line width 500-200	Width 1000 Length 3000 Line width 500-200	1,8 m^2 per block	1,8 m^2 per block
WM10 (White)	Speed Hump 30° to cross section on width of Line	N/A	Width 200 Line/Gap 200/400	N/A	10 m^2 approx.
WM11 (White)	End of Exclusive Use Lane Arrows WM11.1	N/A	Length 7200	N/A	3,35 m^2
	WM11.2		6000		3,33 m^2
Guidance Markings:					
GM1 (White)	Lane Line	Width 100 • Module 12000	Width 100 • Module 9000		
	Reduced	Line/Gap 2 m/10 m	Line/Gap 1,5 m/7,5 m	1,67 m^2/100 m	1,67 m^2/100 m
	Standard	Line/Gap 2 m/4 m	Line/Gap 1,5 m/3 m	3,33 m^2/100 m	3,33 m^2/100 m
	Extra	Line/Gap 2 m/2 m	Line/Gap 1,5 m/1,5 m	5 m^2/100 m	5 m^2/100 m
GM2 (White)	Guide Line	Width 100 • Line/Gap 500/1500	Width 100 • Line/Gap 500/1500	0,25 m^2/10 m	0,25 m^2/10 m
GM3 (White)	Bifunction Arrows	Length	Length		
	CBD GM3.1/GM3.3		2500	N/A	1,30 m^2
	50-60 km/h	N/A	4000	N/A	2,07m^2
	70-90 km/h	5000	5000	2,59 m^2	2,59 m^2
	100-120 km/h	7500	7500	3,89 m^2	3,89 m^2
	CBD GM3.2		2170	N/A	1,27 m^2
	50-60 km/h	N/A	3472	N/A	2,04 m^2
	70-90 km/h	4340	4340	2,55 m^2	2,55 m^2
	100-120 km/h	6510	6510	3,82 m^2	3,82 m^2
GM4 (White)	Information Arrows	Length	Length		
	CBD GM4.1		1250	N/A	0,59 m^2
	50-60 km/h	N/A	2500	N/A	1,17 m^2
	70-90 km/h	4000	4000	1,88 m^2	1,88 m^2
	100-120 km/h	5000	5000	2,35 m^2	2,35 m^2
	CBD GM4.2		2000	N/A	1,05 m^2
	50-60 km/h	N/A	4000	N/A	2,10 m^2
	70-90 km/h	6400	6400	3,36 m^2	3,36 m^2
GM5 (White)	Bicycle Guide Lines	N/A	Width 300 Line/Gap 300/900		2 lines 0.9 m^2/6 m

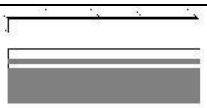
Marking Number (Colour)	Descriptions	Dimensions (mm)		Area (m^2) or (m^2/distance)	
		Rural	Urban	Rural	Urban
Guidance Markings (continued):					
GM6 (White or Yellow)	Symbols	Length	Length		
	Cycle Facility GM6.1	N/A	1600	N/A	0,54 m^2
	Airport GM6.2	N/A	5000	N/A	3,00 m^2
		7500	7500	4,77 m^2	4,77 m^2
		12000		7,83 m^2	
	Disabled Person GM6.3	N/A	600	N/A	0,08 m^2
			1000	N/A	0,22 m^2
			1200	N/A	0,31 m^2
			1800	N/A	0,70 m^2
	High Occupancy GM6.4	N/A	4000	N/A	1,48 m^2
GM7 (White or Yellow)	Word Markings	Length	Length	Average per letter	Average per letter
		4000	4000	1,40 m^2	1,40 m^2
		5500	5500	1,95 m^2	1,95 m^2
	Word "STOP"	4000	4000	4,95 m^2	4,95 m^2
		5500	5500	6,88 m^2	6,88 m^2
	Word "BUS"	N/A	4000	N/A	4,26 m^2
GM8 (Black and White)	Kerbface Marking	Black/White	Black/White	Assumed 180 kerbface	
		600/600	600/600	1,8 m^2/10 m	1,8 m^2/10 m
		1000/1000	1000/1000	1,8 m^2/10 m	1,8 m^2/10 m
		1200/1200	1200/1200	1,8 m^2/10 m	1,8 m^2/10 m

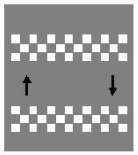
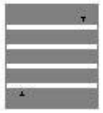
Annex B
(normative)

Pavement markings schedule

SN	Sign	Description	SN	Sign	Description
Regulatory markings					
RTM1		Stop Line	**RTM2**		Give Way Line.
RTM4		Pedestrian Crossing (zebra) markings.	**RM1**		No Overtaking Lin
RM2		No Crossing Lines.	**RM3**		Channelizing Line for lanes in the same direction (do not cross except in emergency)

SN	Sign	Description	SN	Sign	Description
RM4.1		Left Edge Line/Right Edge Line – one way roads only	**RM5.1**		Channelizing Island
RM5.2		Channelizing Island: Do not drive over the line except in emergency	**RM5.3**		Channelizing Island: Do not drive over the line except in emergency
RM6		Parking Bays	**RM8.1**		Mandatory Direction Arrow left (Right – RM8.5)
RM8.2		Mandatory Direction arrow ahead and left (right RM8.4)	**RM8.3**		Mandatory Direction arrow (ahead)
RM9		Exclusive Use Lane Line Plus Word Marking	**RM10**		Box Junction Do not enter unless the exit is clear

RM11		Zig Zag Zone Line on approach to zebra crossing. Do not stop except to let pedestrian cross.	**RM13**		No Parking Line (No parking at any time)
RM13		No Parking Line (Selective time as shown on secondary message signs to R216)	**RM15**		Roundabout Mandatory Direction Arrows
RM17.1		Cycle Facility			
Warning markings: WM7.1, 7.2, 7.3, 7.4 and 7.5 shall be marked together with the word “Ahead”					

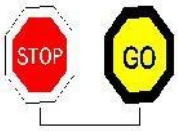
SN	Sign	Description	SN	Sign	Description
WM1		Railway Crossing Ahead			
WM2		Continuity Line between through lanes and turning lanes	**WM3**		Dividing Line
WM7.1		Lane Direction Arrow left Ahead (Right: WM7.5)	**WM7.3**		Lane Direction Arrow (ahead)
WM7.2		Lane Direction Arrow ahead and left (WM7.4 ahead and right)	**WM10**		Speed Hump
WM11.1		End of exclusive use lane – left lane (right lane WM11.2	**WM12**		Rumble strips
Guidance markings					
GM1		Lane Line	**GM2.1**		Turning Guide Line
GM2.2		Pedestrian Guide Line	**GM3.1**		Bifurcation arrow - left (GM3.2 right)

GM7		Word marking: Examples include Stop Bus Taxi Slow Down □ School Ahead	**GM 8**		Kerb face Marking
GM9		Speed Limit Marking			

Annex C
(informative)

Recommended regulatory signs schedule

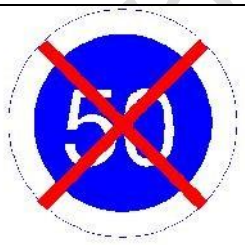
A.1 Control signs

SN	Sign	Brief Description	SN	Sign	Brief Description
R1		Stop	R1.5		Stop/Go Control
R2		Yield / Give Way	R3		No Entry
R4.1		One –Way (Left)	R4.2		One –Way (Right)
R4.3		One –Way (Straight On)	R6		Give Way to Oncoming Traffic

Command Signs

SN	*Sign*	Brief Description	*SN*	*Sign*	*Brief Description*
R101.		Minimum speed			
R103		Keep left	R104		Keep right

R105		Proceed left only	R1O6		Proceed right only
R107		Proceed straight only	R107.1		Proceed straight or right only

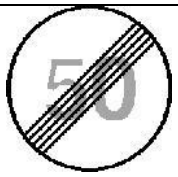
SN	Sign	Brief Description	SN	Sign	Brief Description
R107.2		Proceed straight or left only	R108		Turn left ahead
R109		Turn right Ahead	R110		Pedestrians only
R111		Cyclists only	R121		Buses Only
R131.1		Horses and riders only	R137		Keep left on the round about
End of Command: End of Command signs should be placed where the command no longer apply signs that require end command sign include R101, R110, R111, R121 and R131.1.					
		End of command shown on R101			End of command shown on R111
		End of command shown on R131.1			

(a) Prohibition signs

SN	Sign	Brief Description	SN	Sign	Brief Description

R201		Speed Limit	R202		Mass Limit
R203		Axle Load Limit (single axle)	R204		Height Limit
R205		Length Limit	R206		No Excessive Noise
R209 .		No Left Turn Ahead	R210		No Right Turn Ahead
R211		No Left Turn	R212		No Right Turn
R213		No U – turn	R214		No – Overtaking for all vehicles
R215		Goods vehicles not allowed to overtake	R216		No parking
R217		No stopping	R217		No stopping during the indicated hours

SN	*Sign*	**Brief Description**	*SN*	*Sign*	***Brief Description***
R218		No Entry for Pedestrians	R219		No Entry for Cyclists

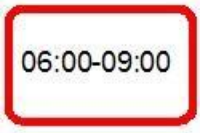
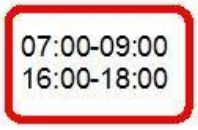
R220		No Cyclists and Pedestrians	R222		No Entry for Motorcycles
R223		No entry for motor cars	R224		No Taxis
R227		No entry for Buses	R229		No entry for Goods Vehicles
R236		No entry for agricultural vehicles	R237		No entry for animal drawn Vehicles
R239		Width Limit	R243.		No entry for handcarts
R245		Axle load limit – tandem / group of axles)	R214600		End of (no overtaking) Restriction - Example
R201		End of Speed Limit Restriction			

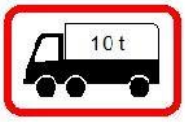
(b) Reservation signs

SN	*Sign*	**Brief Description**	*SN*	*Sign*	***Brief Description***
R301		Area reserved for Buses	R301-P		Bus Parking Area
R302		Bus Lane	R303		Start of Bus Lane
R304		Bicycle Lane	R305-P		Parking area

R306		Limited Duration Parking	R309-P		Parking Area for Taxis
R310		Area Reserved for Minibuses	R310-P		Parking Area for Minibuses
R312		Area Reserved for Use by Delivery Vehicles	R313		Area Reserved for Use by Goods Vehicles
SN	***Sign***	**Brief Description**	***SN***	***Sign***	***Brief Description***
R313-P		Goods Vehicle Parking	R323-P		Disabled Persons Vehicle Parking
R325		Bus Stop (for one bus)	R360		Pedestrian (zebra) crossing

(c) Supplementary signs for use with regulatory signs

(R)501		One Time Period	(R)560		Bus (message on primary sign applied to buses)
(R)502		Two Time Periods	(R)561		Bicycle
(R)503		Two Time Periods	(R)562		Motorcycle

(R)506		Maximum stay during one time period	(R)563		Motor Car
(R)520		Reserved movement Left	(R)564		Taxi
(R)521		Reserved movement Right	(R)567		Delivery Vehicle
(R)522		Reserved movement in both direction	(R)568		Goods Vehicle
(R)535		Distance over which the limit applies	(R)569		Goods Vehicle Over Indicated Gross Vehicle Mass
(R)570		Construction Vehicle			

(d) Regulatory signs to be abandoned

SN	Sign	Brief Description	SN	Sign	Brief Description
1		No Parking Replaced by sign R216	2.		No Stopping Replaced by sign no R217
3.		Road Closed to all Vehicles in both Directions Replace with R3 and “road closed” supplementary plate	4.	All signs not conforming with the approved location, colour and shape code	• Relocate signs on inappropriate locations to recommended locations • Replace all signs that do not conform with the approved code

Annex D
(informative)

Proposed warning signs schedule

S/No.	Sign	Description	S/No.	Sign	Description
W102		Crossroad on Priority Road	**W104**		T-junction
W105		Skew T - Junction (Right)	**W106**		Skew T- Junction (Left)
W107		Side Road Junction (Left)	**W108**		Side Road Junction (Right)
W109		Staggered Junctions (RightLeft)	**W110**		Staggered Junctions (LeftRight)
W111		Sharp Junction (Half left)	**W112**		Sharp Junction (Left)
W113		Sharp Junction (Half Right)	**W114**		Sharp Junction (Right)

W115		Y-Junction	**W116**		End of Dual Roadway (To Right)

S/No.	Sign	Description	S/No.	Sign	Description
W117		End of Dual Roadway (Straight on)	**W118**		Start of Dual Roadway (Straight on)
W119		Start of Dual Roadway (To Left)	**W201**		Roundabout (For countries driving on the right the arrows point the other way)
W202		Gentle Curve (Right)	**W203**		Gentle Curve (Left)
W204		Sharp Curve (Right)	**W205**		Sharp Curve (Left)
W206		Hairpin Bend (Right)	**W207**		Hairpin Bend (Left)
W208		Winding Road (Right – Left)	**W209**		Winding Road (Left – Right)
W210		Combined Curves (Right – Left)	**W211**		Combined Curves (Left – Right)

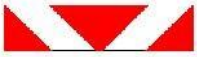
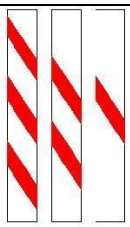
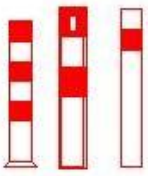
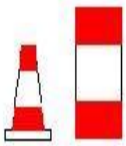
W212.		Two – Way Traffic Ahead	**W213**		Two – Way Traffic Crossroad
W301		Traffic Signals Ahead	**W302**		Traffic Control "Stop" Ahead
W303		Traffic Control "Yield" Ahead	**W306**		Pedestrian Crossing
W306.1		Physically impairment or crossing ahead	**W306.2**		Blind pedestrians crossing ahead
W306.3		Pedestrians with Serious visual impairment crossing ahead	**W307**		Pedestrians ahead
W307.1		Deaf Pedestrians ahead	**W307.2**		Pedestrians with mental health conditions ahead
W308		Children	**W309**		Cyclists
W310		Domestic Animals	**W313**		Wild Animals
W318		Railway Crossing	**W319**		Tunnel

S/No.	Sign	Description	S/No.	Sign	Description
W320		Height Restricted	**W321**		Length Restricted
W322		Steep Descent	**W323**		Steep Ascent
W326		Narrow Bridge	**W327**		One Vehicle Width Structure
W328		Road Narrows Both Sides	**W329**		Road Narrows From Right Side
W330		Road Narrows From Left Side	**W331**		Uneven Roadway
W332		Speed Humps	**W333**		Slippery Road .
W334		Falling Rocks (From Right)	**W335**		Falling Rocks (From Left)

S/No.	Sign	Description	S/No.	Sign	Description

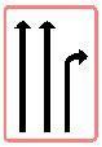
TW336	 **TW 336**	Road Works	**TW338**		Loose Stones
W339	 W339	General Warning	**TW340**		Edge Drop
TW343		Stop/go Control Ahead	**W348**	 W348	Jetty Edge or River Bank or ferry berth
W349	 W349	Crosswinds	**W350**	 W350	Drift
W351	 W351	Low Flying Aircraft	**W352**	 W352	Agricultural vehicles
TW353	 **TW 353**	Road Crash	**W355**	 W355	Traffic Queue

W360	 2.1 m W360	Width Restriction	W 365		Opening Bridge
Series 400: Hazard markers; Use yellow background for temporary situation					

W 401		Danger Plate / Delineator Plate (Left)	W 402		Danger Plate / Delineator Plate (Right)
W403		Railway Crossing	**W404**		Railway Crossing (more than one track)
W405		Sharp Curve Chevron (single) (To the Right)	**W406**		Sharp Curve Chevron (single) (To the Left)
W407		Sharp Curve Chevron (Triple) (To the Right)	**W408**		Sharp Curve Chevron (Triple) (To the Left)
W409		T-junction Chevron	**TW411**		Barricade
W 413		Pass Either Side	**W 415**		Overhead Danger Plate
W416		Distance to hazard: Install marker with decreasing number of stripes as distance to hazard decreases	**D3**		Delineators
TD4		Traffic cones and drums			

Annex E
(informative)

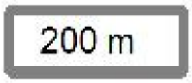
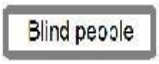
Guidance signs basic schedule (examples)

S/No.	Sign	Description	S/No.	Sign	Description
GD		Direction signs before and at junctions	**GDL**		Direction signs for minor, local destinations in urban areas
GF		Directions to tourist attractions, services and facilities	**GL**		Place names, river names
GS 101		Left-hand lane ends	**GS 205**		Lane added on left hand side
GS 805		Lane preselection sign	**GFS B1-2**		Police symbol
GFS B1-3		Hospital symbol (with name)	**GFS B1-4.**		First aid Post
GFS B2-1		Filling station, workshop	**GFS B3-**		Caravans / other vehicle classes when applicable: Rest or/and service area
GFS B4-1		Restaurant	**GFS B4-2**		Refreshments
GFS B4-3		Take-away	**GFS B4-4**		Café / Rural shop
GFS B5-1		Parking	**GFS B5-2**		Toilets

GFS B5-7		Picnic site	**GFS B5-8**		Tourist information
GFS B5-9		Facility for the handicapped	**GFS B6-3**		Rest and service area
S/No.	**Sign**	**Description**	**S/No.**	**Sign**	**Description**
GD		Ramp for runaway trucks			

Annex F
(informative)

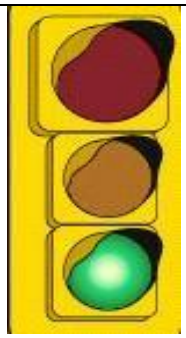
Proposed information signs basic schedule (examples)

S/No.	Sign	Description	S/No.	Sign	Description
IN4		No Through Road (Cul-desac)	**IN5**		No Through Road (Cul-de-sac) – Right Side
IN6		No Through Road (Cul-desac) –Left Side	**IN12**		Information Centre
IN16		Bus Stop Ahead	**IN20**		Oncoming vehicles are required to give way
IN11.1		Supplementary. Plate-Advisory speed	**IN11.2**		Supplementary. Plate-Distance “For”
IN11.3		Supplementary Plate - Distance “To”	**IN11.4**		Supplementary. Plate-Text Message
IN11.502 (11.503)		Arrow left (Arrow right)	**IN11.568**		Supplementary. Plate Vehicle Class
IN11.508		Supplementary sign: Use with W322 – Steep descent Use low gear	IN11.509		Supplementary sign: Use with W322 – Steep descent Trucks use low gear
IN11.510		Supplementary sign: Use with W322 – Steep descent Truck escape ramp			

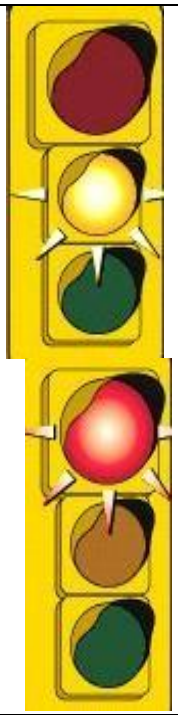
Annex G
(informative)

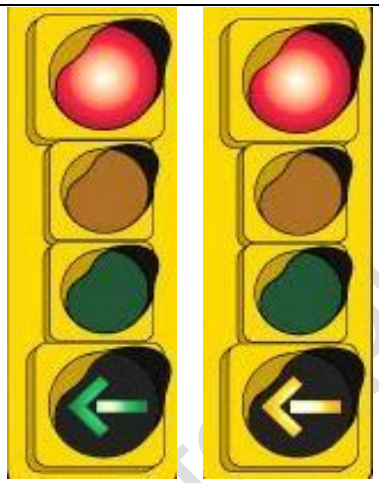
Traffic signal indications in use and their meaning

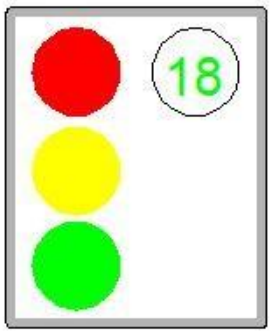
NOTE Table G.1 presents traffic signal indications and their meaning as per international convention and practice across the EAC Partner States.

S/No.	Indication	Meaning
1.		**Steady Green signal** Traffic, except pedestrians, facing a CIRCULAR GREEN (S1) or GREEN ARROW signal indication (S2, S3, S4) may proceed straight through or turn right or left except as such movement is modified by lane-use signs (for example S1B sign for bus use lane), turn prohibition signs, lane markings, or roadway design.

S/No.	Indication	Meaning
2.		**Steady Yellow signal** Traffic, except pedestrians, facing a steady CIRCULAR YELLOW or YELLOW ARROW signal indication is thereby warned that the related green movement is being terminated or that a red signal indication will be exhibited immediately thereafter when vehicular traffic shall not enter the intersection.
3.		**Steady Red signal** Vehicular traffic facing a steady CIRCULAR RED signal indication alone shall stop at a clearly marked stop line, but if there is no stop line, traffic shall stop before entering the crosswalk on the near side of the intersection; or if there is no crosswalk, then before entering the intersection, and shall remain stopped until a signal indication to proceed is shown.

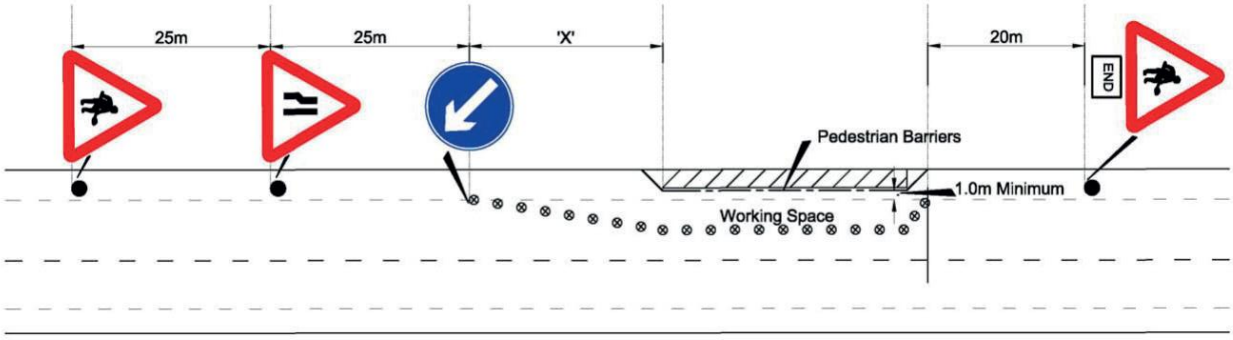
4.		**Flashing signal** Flashing Yellow - When a YELLOW LENS is illuminated with rapid intermittent flashes, vehicular traffic may proceed through the intersection or past such signal indication only with caution. Flashing red - When a red lens is illuminated with rapid intermittent flashes, vehicular traffic shall stop at a clearly marked stop line; but if there is no stop line, traffic shall stop before entering the crosswalk on the near side of the intersection; or if there is no crosswalk, at the point nearest the intersecting roadway where the driver has a view of approaching traffic on the intersecting roadway before entering the intersection.

S/No.	Indication	Meaning
5.		**Steady Arrows** • When a left-turn green arrow is shown with a red light, you may turn left from the left-turn lane.(S3) • When a right-turn green arrow is shown with a red light, you may turn right from the right-turn lane (S2) • When a straight-through (green-arrow-up) green arrow is shown with a red light, you may enter the intersection from the straight-through lane (S4) After the Right/left-turn or up green arrow, a yellow arrow may appear. This means the green light is about to appear for traffic in both directions. Do not start your left turn. Stop if you can do so safely; otherwise, complete your manoeuvre with caution.
6.		**Steady Red Pedestrian Figure** This is displayed to warn pedestrians not to step out onto the road and should wait by the kerb. When the steady red pedestrian is displayed a signal head showing the time left till steady green pedestrian is displayed (see s/no 9 below).

7.		**Green Walking Pedestrian Figure** This is displayed to pedestrians to indicate to them that after checking that it is safe, they may cross the road.
8.		**Flashing Red Pedestrian Figure** This is displayed to warn pedestrians not to step out onto the road and should wait by the kerb, but should finish crossing when already on the road.
S/No.	**Indication**	**Meaning**
9.		**Signal Head Showing Time Left Before the Next Cycle** Display of time left before change from red to green to be provided on all signals

Annex H
(informative)

Traffic Control for Roadworks



Notes

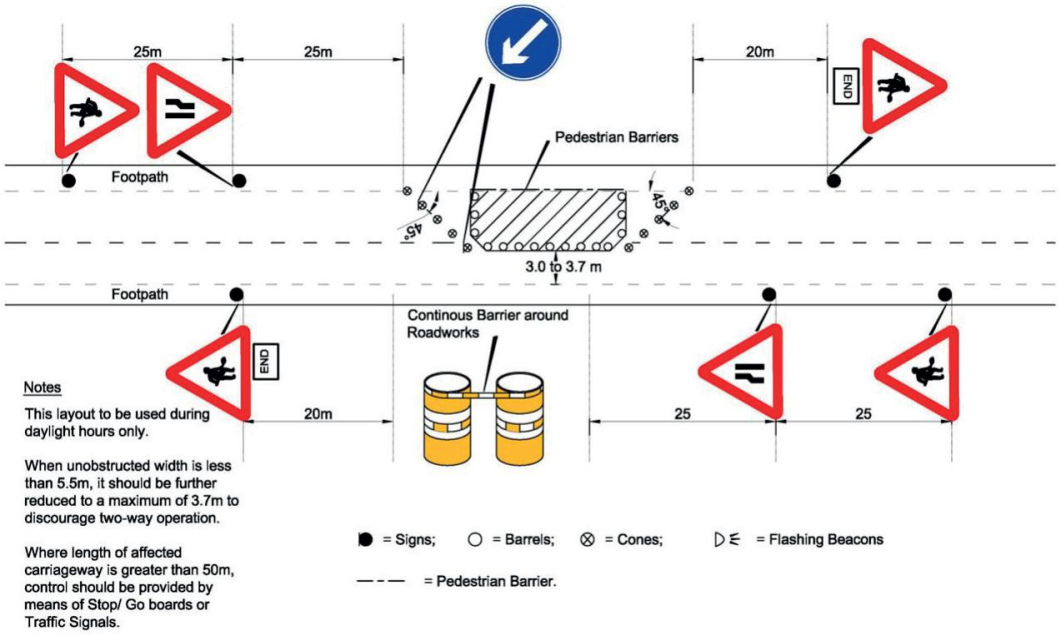
If Pedestrian passageway is less than 1.0m or is obstructed by lamp standards or other street furniture, footpath should be completely cordoned off and layout as shown in Fig. A8.16.

Length of Taper 'X' depends on width of carriageway obstructed. See Table A8.1.

If working space is not required, no signposting or coning is necessary.

● = Signs; ○ = Barrels; ⊗ = Cones; — — — Pedestrian Barrier.

Figure H.1 – Roadworks partially obstructing footpath



Notes

This layout to be used during daylight hours only.

When unobstructed width is less than 5.5m, it should be further reduced to a maximum of 3.7m to discourage two-way operation.

Where length of affected carriageway is greater than 50m, control should be provided by means of Stop/ Go boards or Traffic Signals.

Figure H.2 – Give and take' operation on lightly trafficked minor roads (Unobstructed carriageway width <5.5 m)

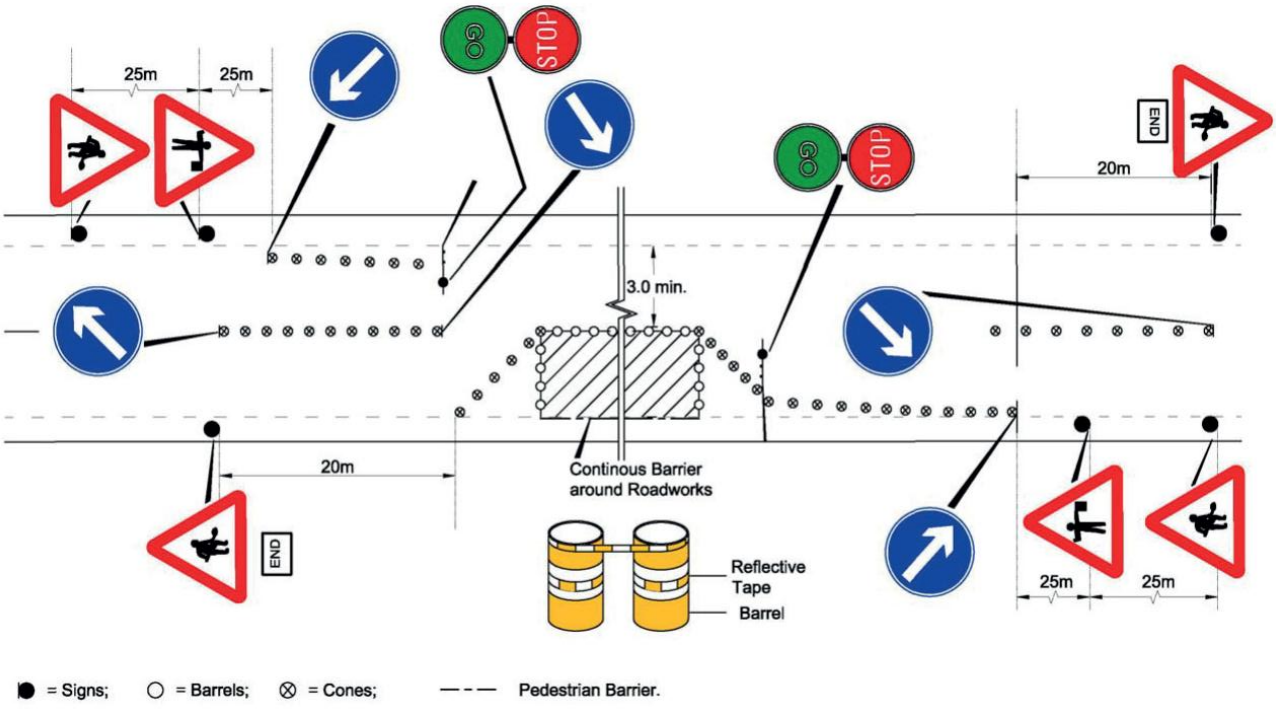


Figure H.3 – One-way shuttle working Using flagmen/ Batten-men (Suitable for daylight only)

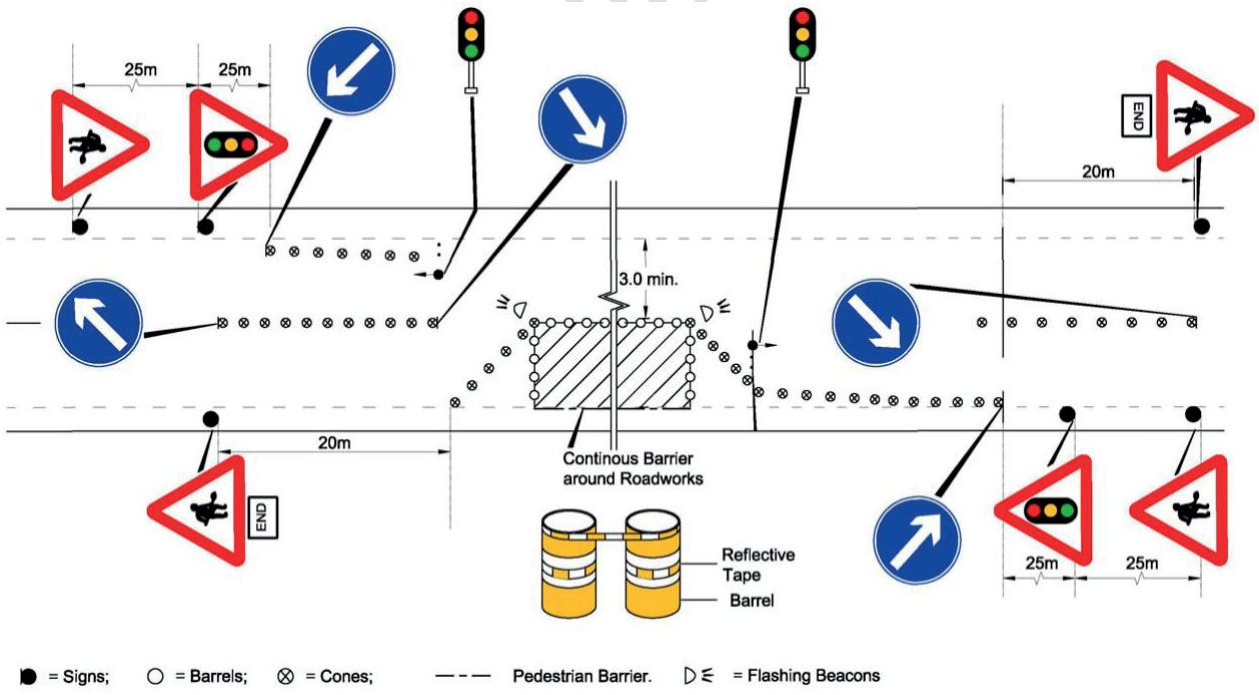


Figure H.4 – One-way shuttle working using temporary traffic signals (Suitable for daylight and darkness)

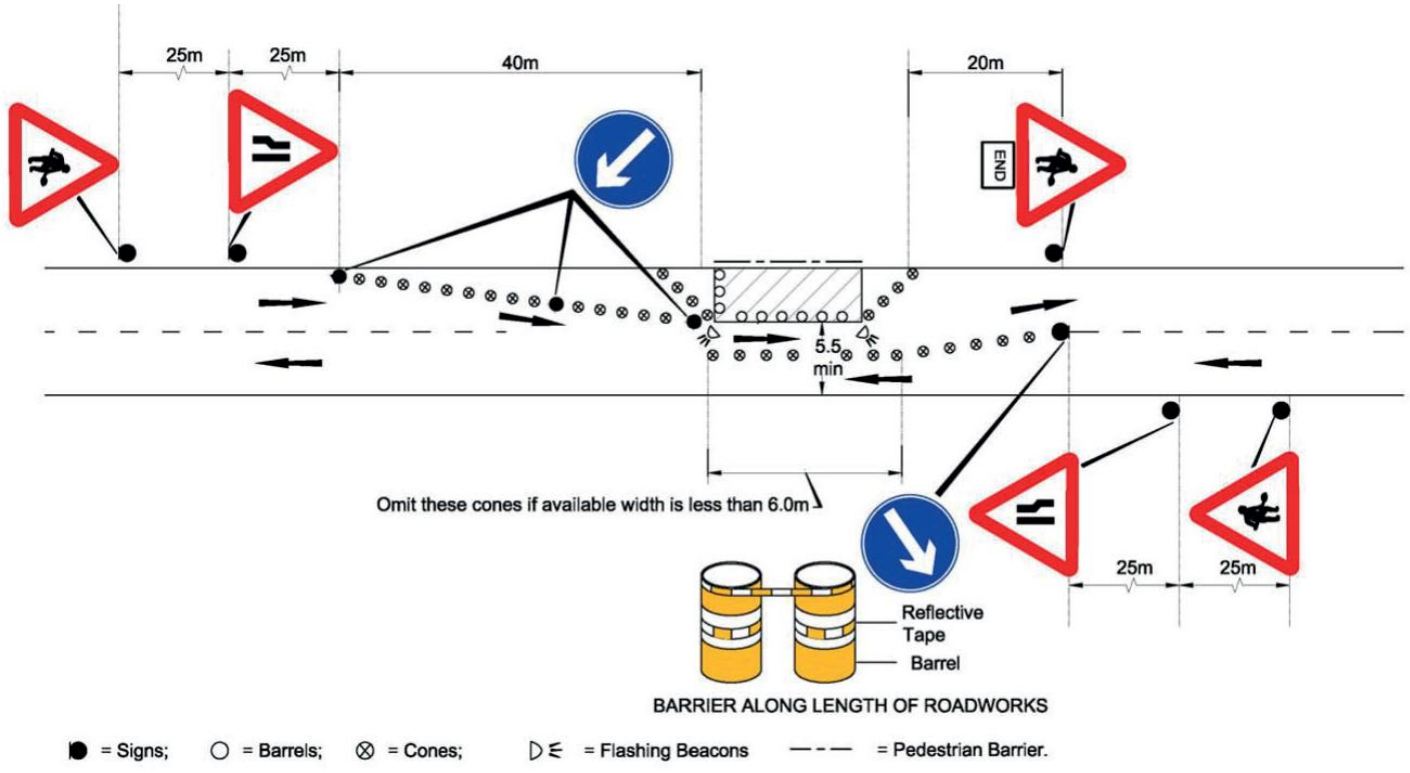


Figure H.5 – Two-way works forcing traffic over centre line

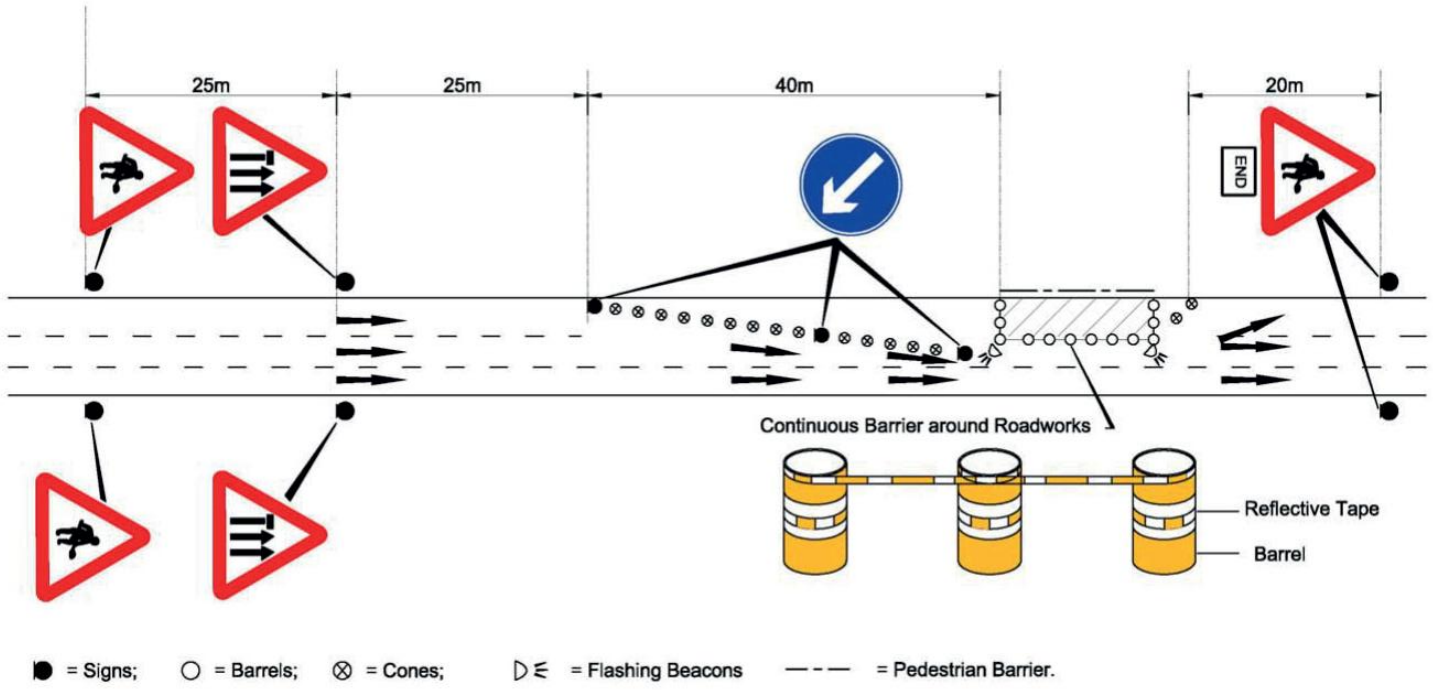


Figure H.6 – Three lane one-way street, works inside lane

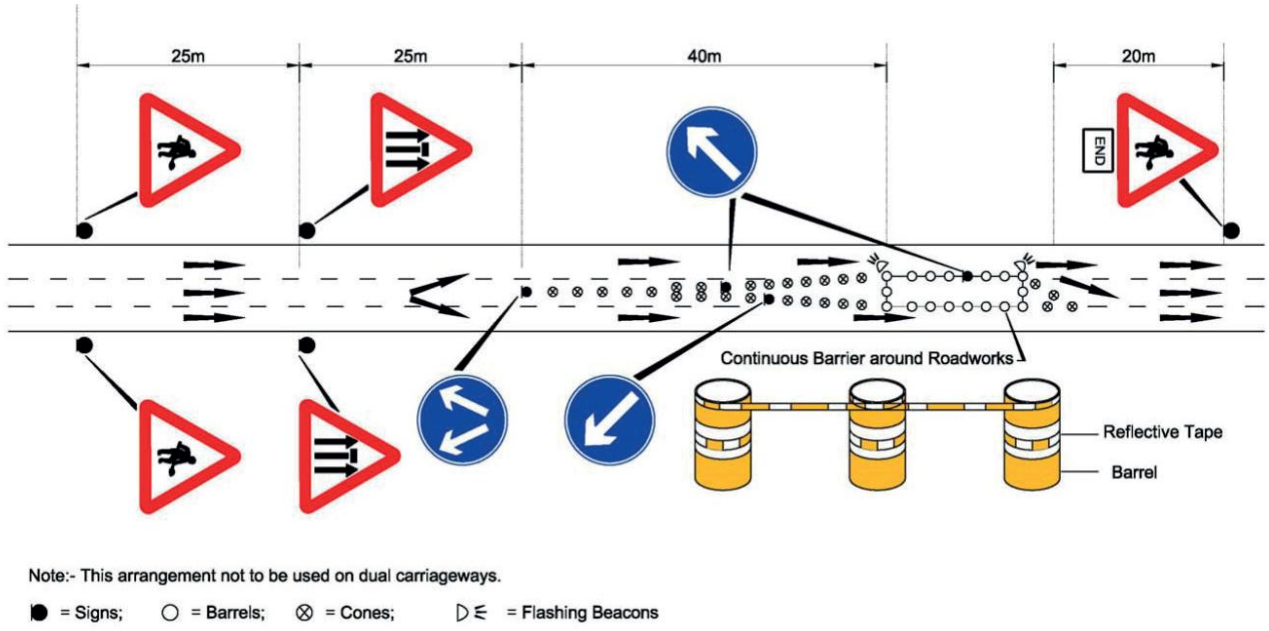


Figure H.7 – Three lane one-way street, works in centre lane

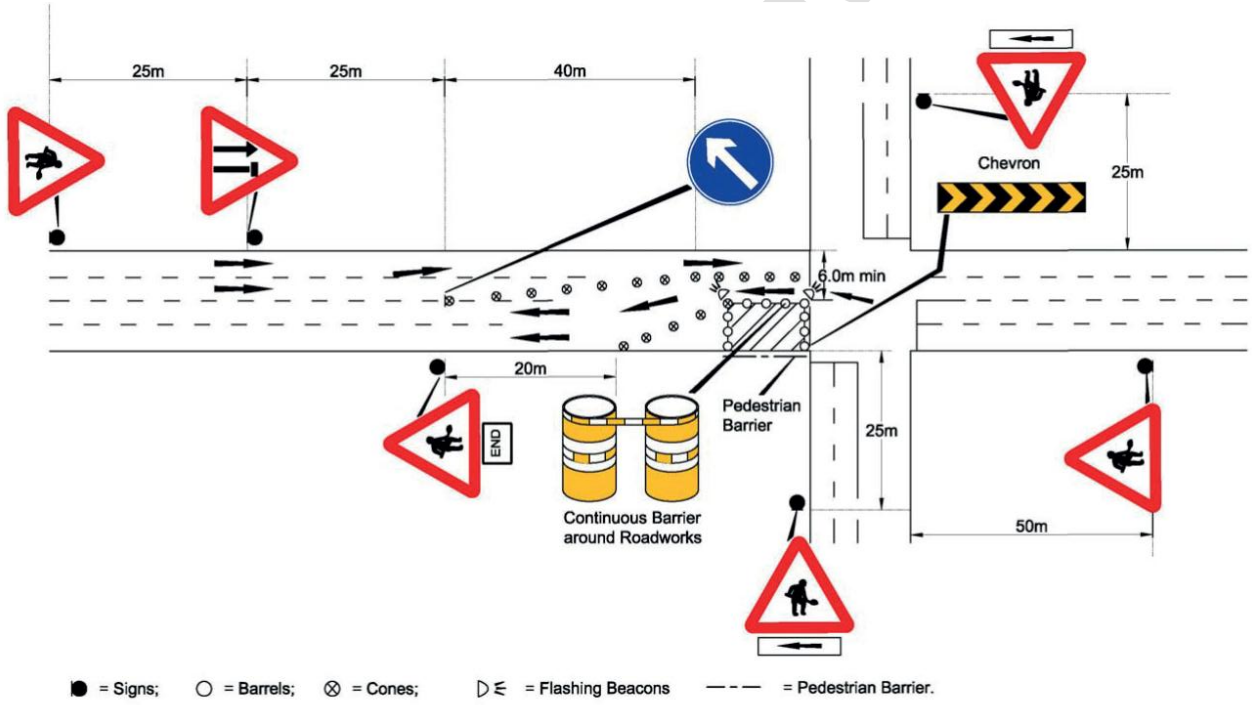


Figure H.8 – Four lane street, works in two lanes at junction

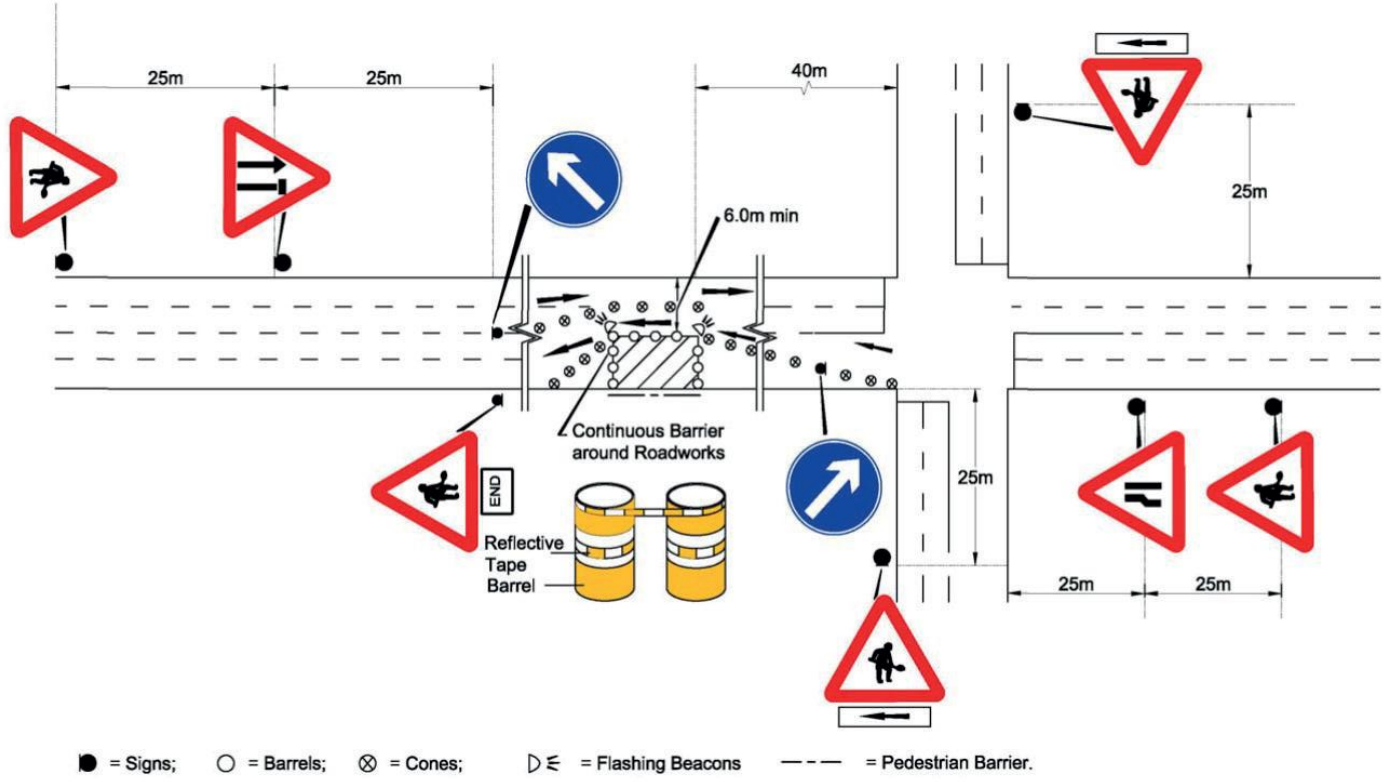


Figure H.9 – Four lane street, works in two lanes near junction

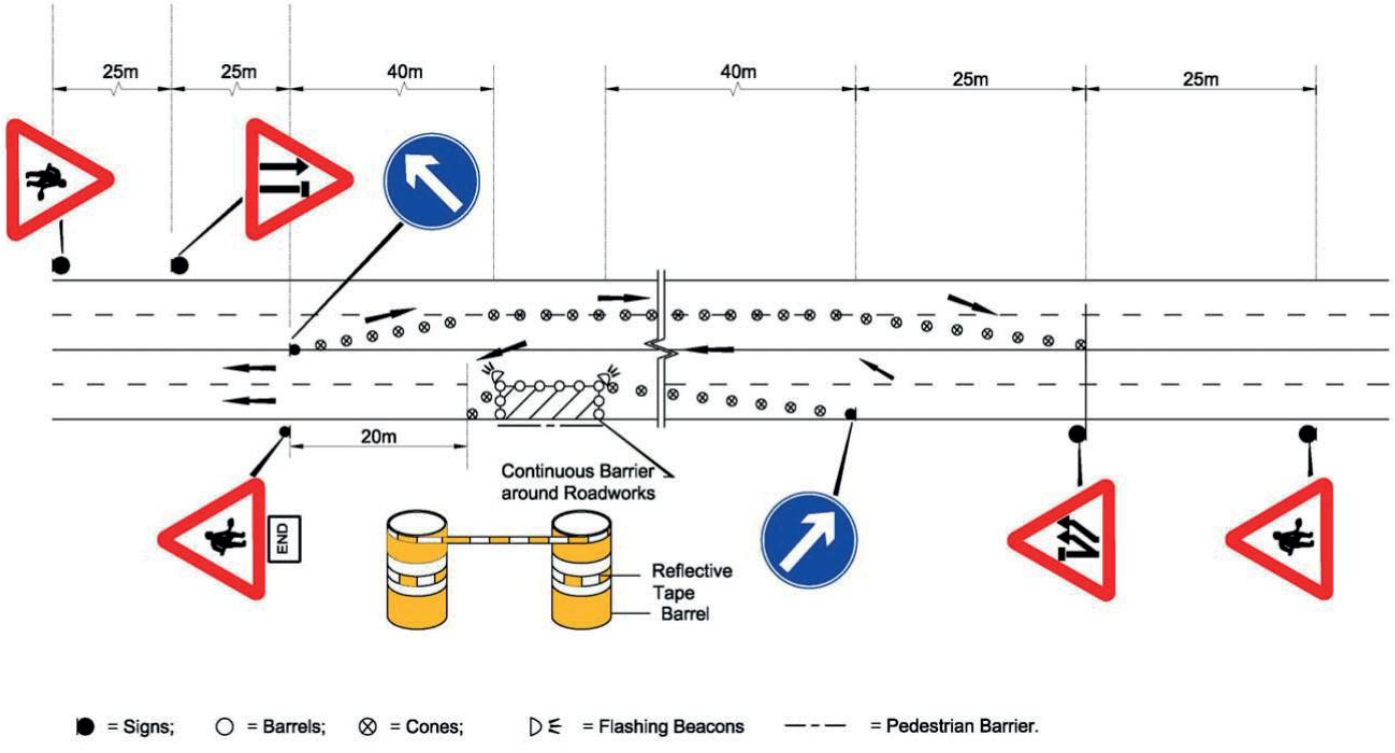


Figure H.10 – Four lane street, works in inner city bound lane, morning peak

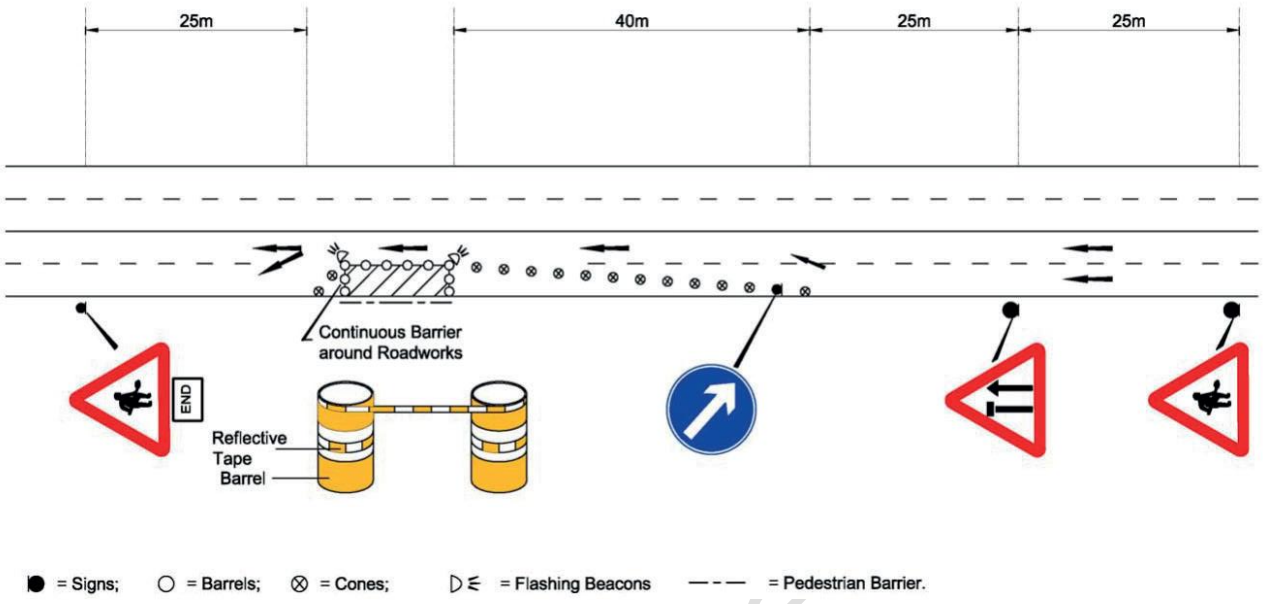


Figure H.11 – Four lane street, works in inner city bound lane, off peak and evening peak

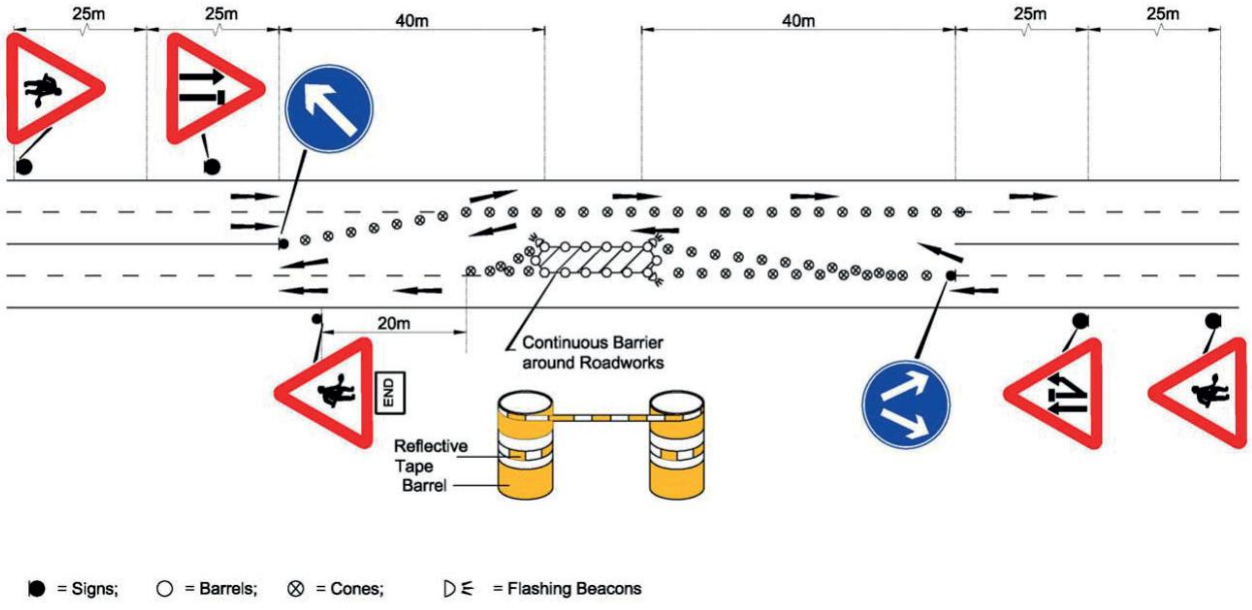


Figure H.12 – Four lane street, works in outer city bound lane, morning peak

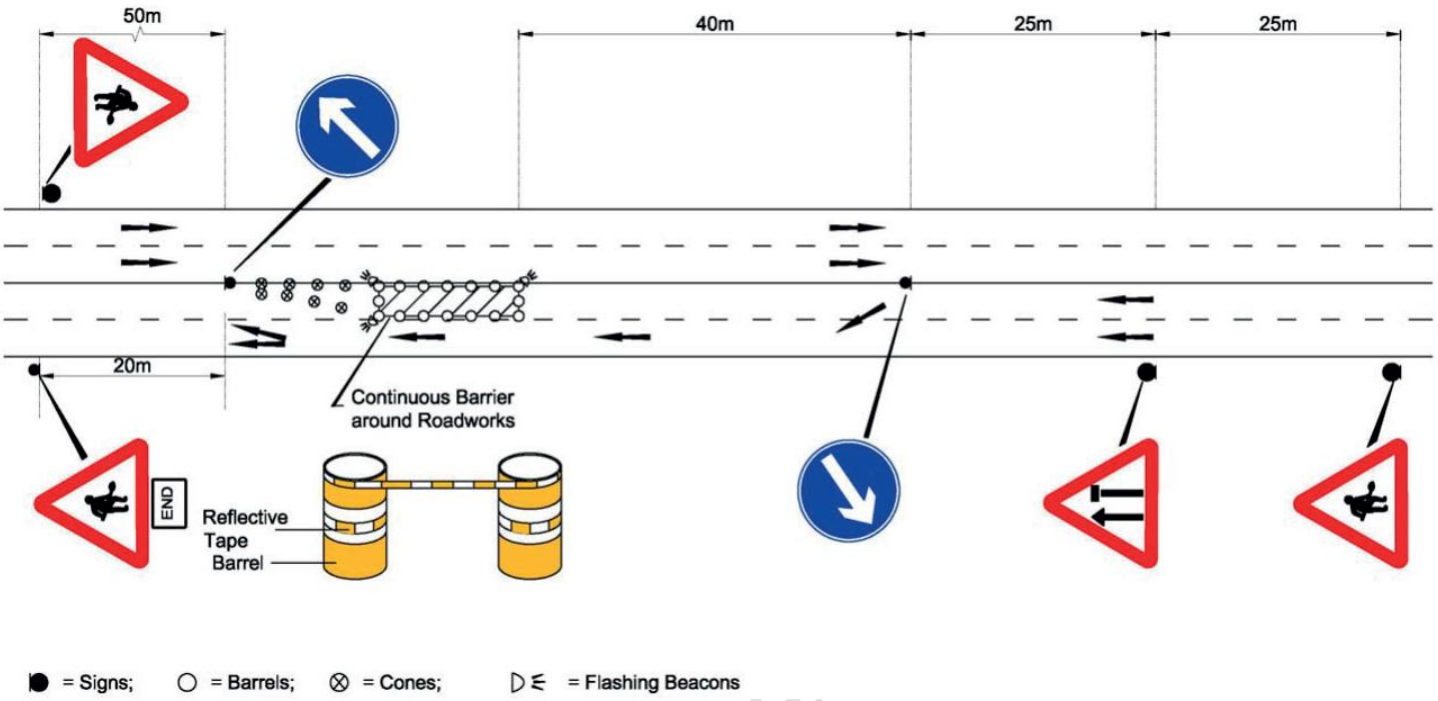
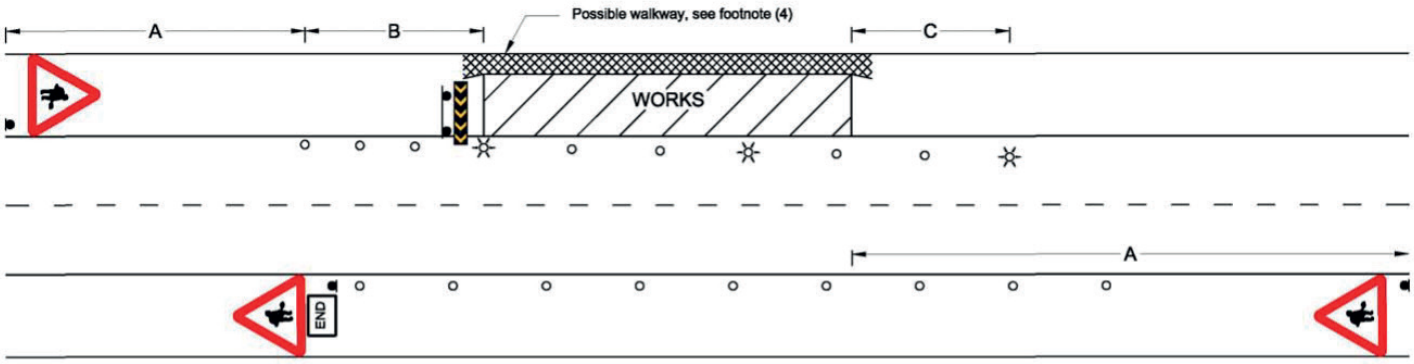


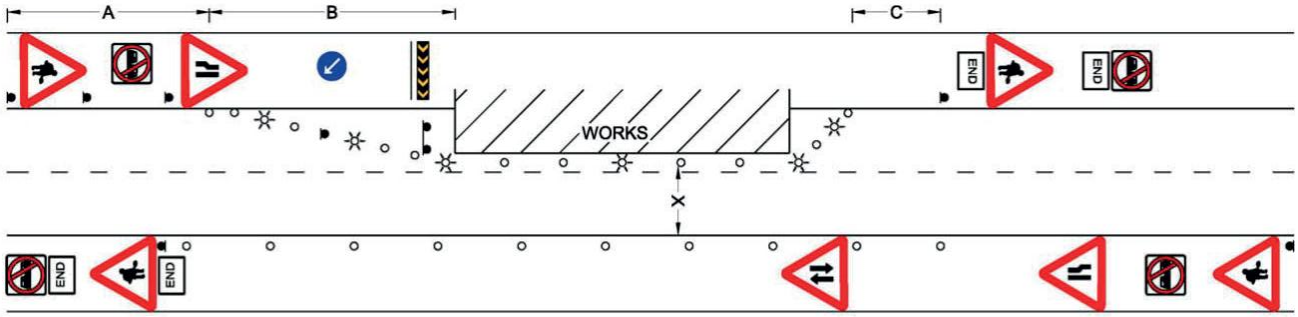
Figure H.13 – Four lane street, works in outer city bound lane, off peak and evening peak



NOTES

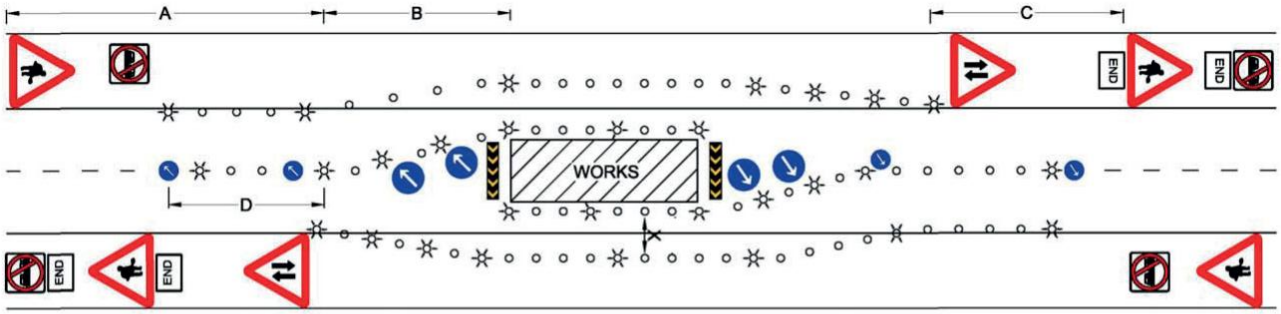
(1) Placement of first sign in advance of works 'A' from table A8.4
(2) Length of lead-in taper 'B' from table A8.5
(3) Placement of 'End' sign after works 'C' from table A8.6
(4) Where a footpath is closed, and alternative of atleast 1.2m is required.
(5) Where all activity takes place off the carriageway, less stringent standards may be applied.
(6) 'Do-not-pass' sign may be used where active works are in progress.

Figure H.14 – Two-way traffic works in margin/Shoulder/Footpath only



NOTES

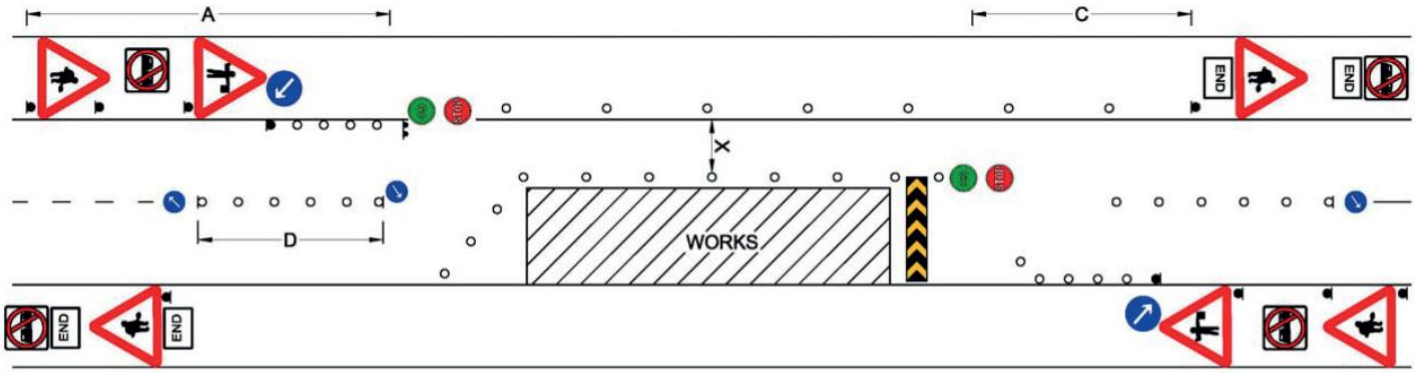
(1) Placement of first sign in advance of works 'A' from table A8.4
(2) Length of lead-in taper 'B' from table A8.5
(3) Placement of 'End' sign after works 'C' from table A8.6
(4) Min. road width 'X' of 5m to retain two-way traffic.
(5) Signs within area 'A' to be at approximately equal spacings.
(6) 'Do-not-pass' sign may be duplicated on the right-hand-side on more heavily trafficked roads.



NOTES

(1) Placement of first sign in advance of works 'A' from table A8.4
(2) Length of lead-in taper 'B' from table A8.5
(3) Placement of 'End' sign after works 'C' from table A8.6
(4) Minimum road width 'X' equals 3m.
(5) Length of centreline coning 'D' should vary with alignment.

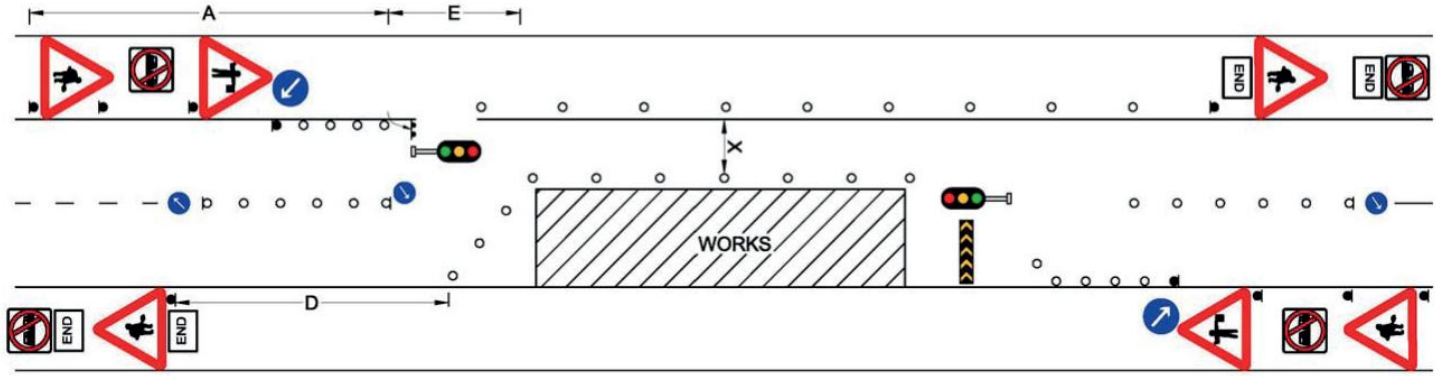
Figure H.16 – Use of road shoulder by traffic



NOTES

(1) Placement of first sign in advance of works 'A' from table A8.4
(2) Placement of 'End' sign after works 'C' from table A8.6
(3) Minimum road width 'X' equals 3m.
(4) Length of centreline coning 'D' should vary with alignment.

Figure H.17 – One-way shuttle working using flagmen/ Batten-men (Suitable for daylight only)



NOTES

(1) Placement of first sign in advance of works 'A' from table A8.4
(2) Placement of 'End' sign after works 'C' from table A8.6
(3) Minimum road width 'X' equals 3m.
(4) Length of centreline coning should vary with alignment.
(5) Length 'E' should be sufficient to give commercial vehicles easy room to manoeuvre.

Figure H.18 – One-way shuttle working using temporary traffic signals (Suitable for daylight and darkness)

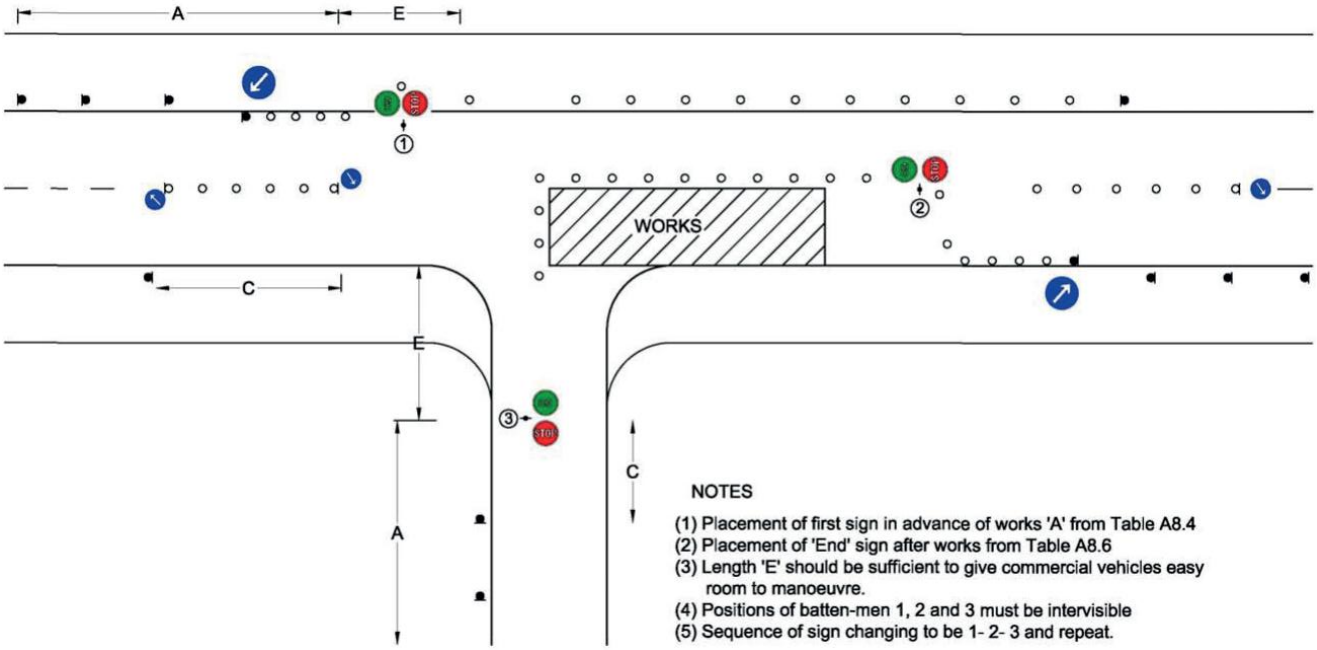
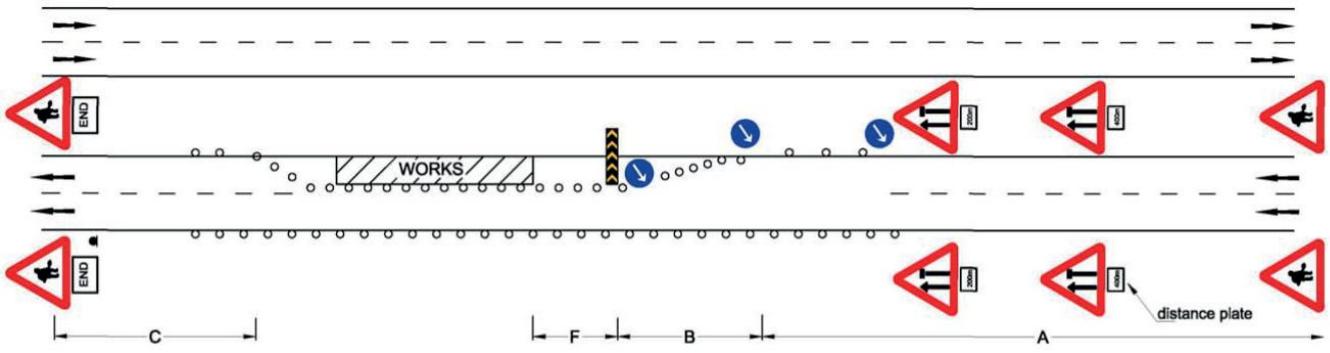


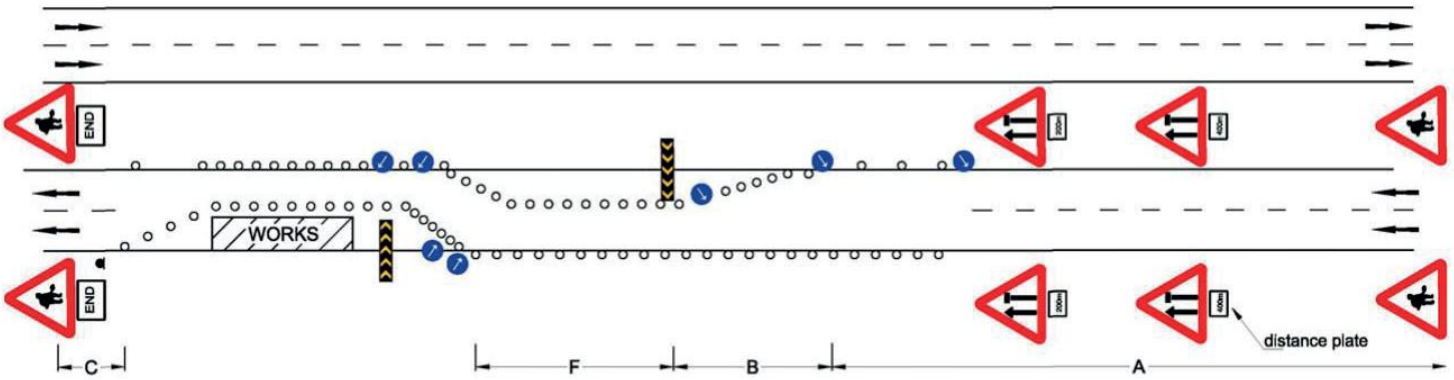
Figure H.19 – One-way shuttle working at a "T" Junction



NOTES

(1) Placement of first sign in advance of works 'A' from table A8.4
(2) Length of lead-in taper 'B' from Table A8.5.
(3) Placement of 'End' sign after works from Table A8.6.
(4) Length of buffer zone 'F' could vary; suitable length 'B' to '2B'.
(5) The use of distance plates, is optional.

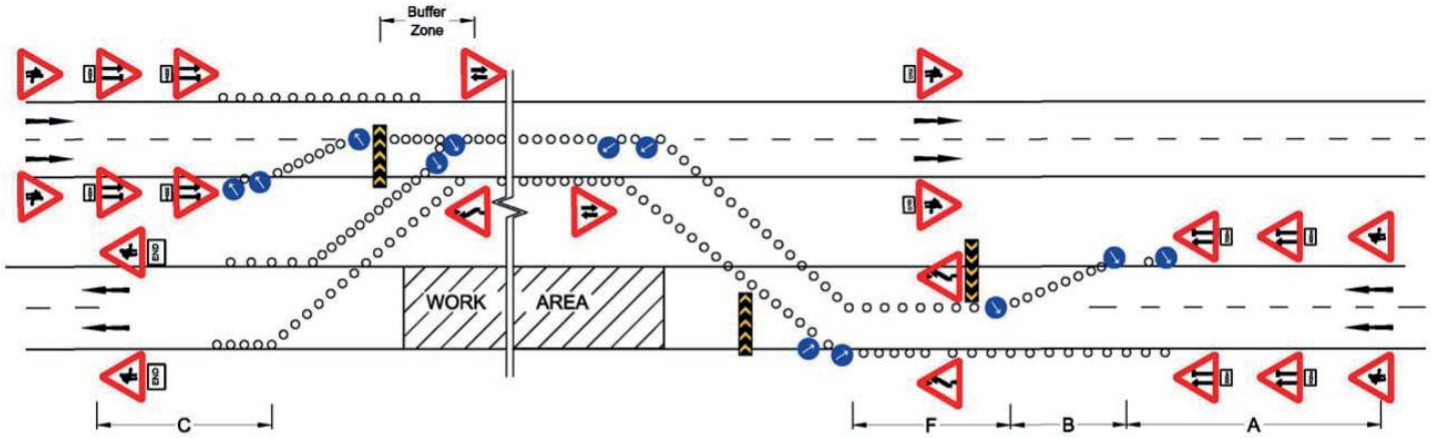
Figure H.20 – Dual carriageway, works in fast lane



NOTES

(1) Placement of first sign in advance of works 'A' from table A8.4
(2) Length of lead-in taper 'B' from Table A8.5.
(3) Placement of 'End' sign after works from Table A8.6.
(4) Length of buffer zone 'F' could vary; suitable length 'B' to '2B'.
(5) The use of distance plates is optional.

Figure H.21 — Dual carriageway, works in slow lane



NOTES

(1) Placement of first sign in advance of works 'A' from table A8.4
(2) Length of lead-in taper 'B' from Table A8.5.
(3) Placement of 'End' sign after works from Table A8.6.
(4) Length of buffer zone 'F' could vary; suitable length 'B' to '2B'.
(5) The use of distance plates is optional.

Figure H.22 — Dual carriageway, one carriageway closed

Bibliography

[1] South Africa road traffic signs manual: Road traffic sign applications — Introduction, Volume 2, 3rd Edition

[2] South Africa road traffic signs manual: Road traffic sign applications — Road markings applications Volume 2,3rd Edition

