SOUTH AFRICAN
ROAD TRAFFIC SIGNS MANUAL

3rd Edition

VOLUME 2
ROAD TRAFFIC SIGN APPLICATIONS

DIGITISED VERSION – May 2012

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INTRODUCTION

SECTIONS

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1.1 General

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SARTSM – VOL 2

CHAPTER 1

TITLE

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ORIGINAL AUTHOR

D Bain

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Director-General: Transport
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PRETORIA
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CHAPTER 1: INTRODUCTION

1.1 GENERAL

1.1.1 Background

1 Volume 2 of the South African Road Traffic Signs Manual was not published with Volumes 1, 3 and 4 in 1993, because it required significant development work and this would have resulted in a delay in the publishing of the other Volumes. In the intervening period the South African Road Traffic Signs Manual, Volumes 1 and 4, has been integrated with the Southern African Development Community Road Traffic Manual to form the harmonized Third Edition of the latter Manual. During this process all road signs, road markings and traffic signals approved by the Road Traffic Signs Technical Committee since 1993 have been incorporated into the Third Edition. Where appropriate these new road signs, road markings and traffic signals are included in the coverage of the chapters of Volume 2.

2 The coverage of Volume 2, namely chapter subjects and chapter contents, was determined by task groups appointed by the Road Traffic Signs Technical Committee and by the Committee itself. The potential scope for coverage, particularly in some subject areas, is huge. In order to contain the scope to manageable proportions, individual practices of road authorities are not recorded where these differ. Instead a more generic range of examples, which should be capable of being used by any road authority, are included in the chapters. Precise adherence to the details of the examples is not mandatory.

3 As a result of the method of development of the content of Volume 2 it has been decided to make the chapters available on an individually bound basis, in an inexpensive format, for a period of 12 to 24 months to gauge the reaction of users. Subject to this reaction and the level of comment received, the chapters may be amended and / or finalised and printed in a format to match the rest of the Manual.

4 At the time of publishing a decision has not been made by the Southern African Development Community representatives whether to adopt Volume 2 or not.

1.1.2 Structure and Layout

1 Notwithstanding the fact that SADC has not accepted Volumes 2 and 3 of the Manual at the time of publishing the Volumes have been prepared to the same standards and the style of layout as Volumes 1 and 4. In Volume 2 references to traffic regulations relate to South African law, and where signface examples indicate destination names, these give South African examples.

2 Ultimately the Third Edition of the Southern African Development Community Road Traffic Signs Manual is likely to comprise:

Volume 1: *Uniform Traffic Control Devices*: Detailing signing policies and design principles together with specific information on the meaning and individual application of all traffic control devices.

Volume 2: *Traffic Control Device Applications*: This volume covers the use of sets of signs, markings and signals for specific applications.

Volume 3: *Traffic Signal Design*: Detailing in depth requirements for the selection and installation of traffic signals and their methods of control.

Volume 4: *Traffic Signs Design*: Dimensional detail for all road signs and their signface components.

3 Whilst the primary function of this volume is to give guidance to users on how to combine the use of road signs of all classes with road markings and traffic signal (rather than dealing with these individually as in Volume 1), different chapters offer additional guidance to varying degrees. In some instances the chapters repeat and combine elements of Volume 1 and Volume 4 chapters with guidance on how to apply the signs, markings and signals. This aspect is covered in more depth in Section 1.2.

4 The text is subdivided into the following numbered components (the examples indicate Chapter 8):

(a)Chapters - 8;

(b) Sections - 8.1;

(c) Subsections - 8.1.1;

(d) Paragraphs - 8.1.1.1;

(e) Figures - 8.1;

(f) Details (within Figures) - 8.1.1;

(g) Tables - 8.1.

These numbers should be used for reference purposes. They are used as such throughout the text.

5 The page layout includes a "header" at the top in which the section name and page number are indicated. Page numbers are restarted in each section e.g. 8.1.1, 8.3.1 etc. A "footer" is located at the bottom of the page and this indicates the date of publication (or re-publication in the case of future amendments), the name of the manual and the volume number, and the chapter name. Figures 1.1 and 1.2 illustrate the above elements.

6 Since the Volume is being published by individual chapters each chapter has been given a Contents section covering all Section and Subsection topics, all Tables and all Figures. No overall index will be published at this stage.

7 The text in the Manual is primarily provided in Arial 8.5 point typeface.

8 A range of text conventions have been used to place emphasis where this has been deemed necessary. The conventions used and their functions are as follows:

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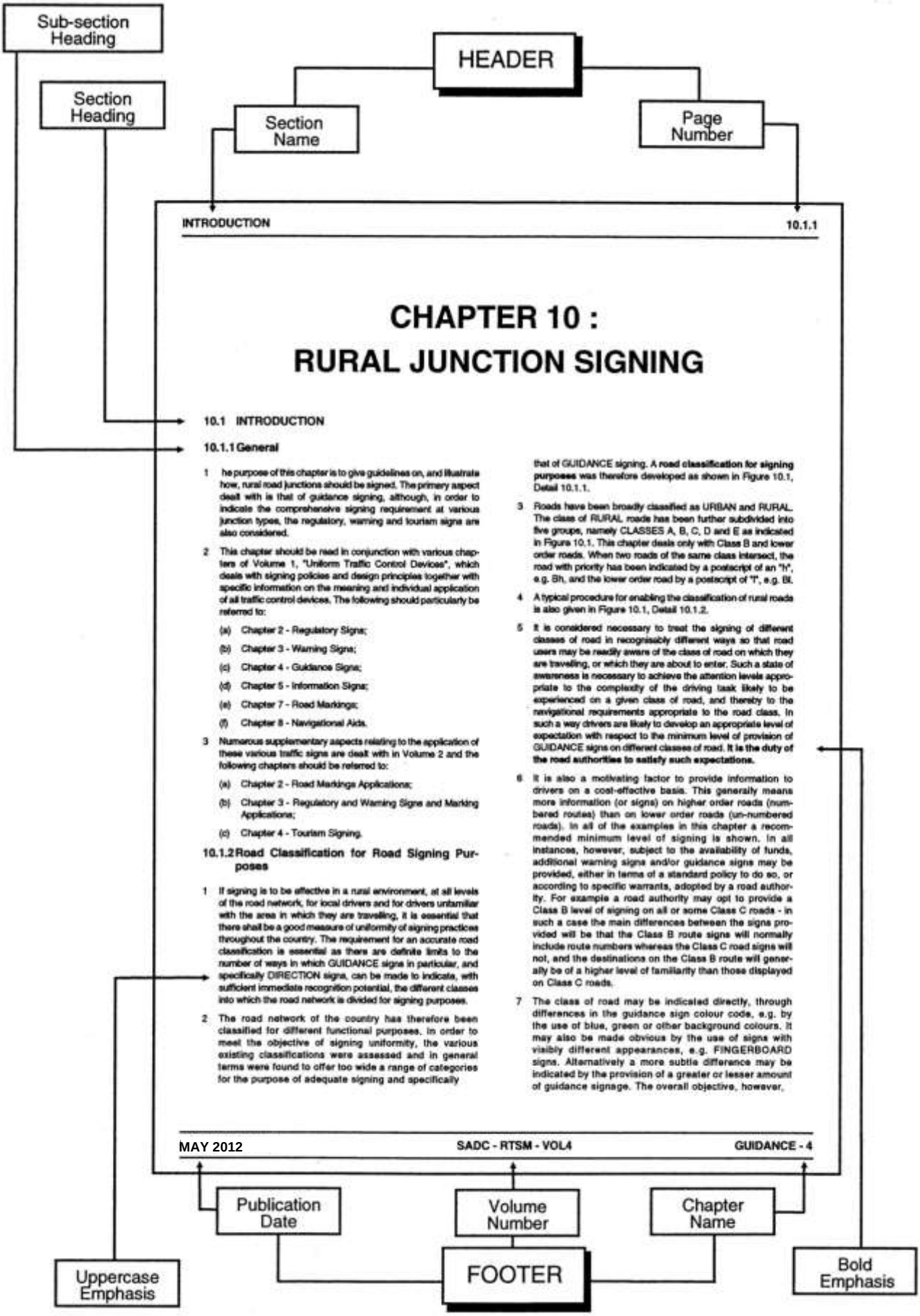

Fig 1.1 **Typical Page Layout and Text Conventions**

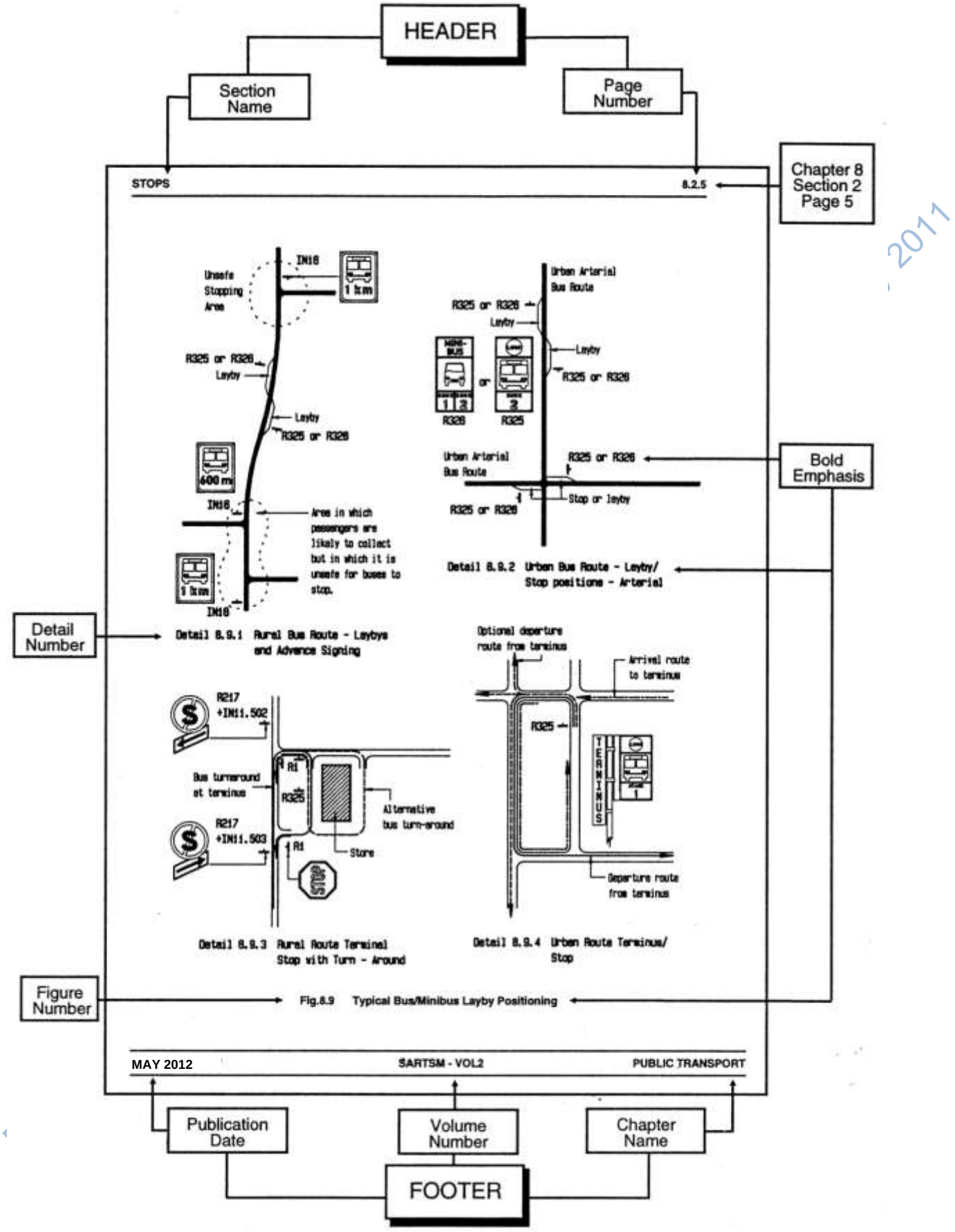

Fig 1.2 **Typical Figure Page Layout**

(a) ***bold italic*** - to indicate the significance of a specific road traffic sign;
(b) **bold** - to place particular emphasis on a word or section of text, including titles and section headings;
(c) *italic* - to indicate the name of a chapter or other document referred to in the text AND to indicate foreign terms used in the text;
(d) UPPERCASE (or CAPITAL) letters - as a lower level of emphasis, but particularly to indicate the specific names given to road traffic signs.

The use of CAPITAL letters may be superimposed in the ***BOLD ITALIC*** or **BOLD** conventions (see Figures 1.1. and 1.2).

9 Figures are used extensively to provide guideline examples of typical situations involving the application of road traffic signs. Many such situations have a specific longitudinal nature to them which is difficult to cater for within a standard A4 page format. A3 figure pages have therefore been widely used throughout this Volume. Even an A3 page presents limitations when trying to illustrate a length of road some 100's of metres in length. For this reason figures are not drawn to scale and are commonly distorted so that the width or cross-section of a road is exaggerated in comparison to the length, in order to improve clarity.

10 This volume of the Manual is not printed in colour. It is important, however, that designers and manufacturers are aware of the correct colours for signs, signals and markings. important, however, that designers and manufacturers are aware of the correct colours for signs, signals and markings. Where it is particularly appropriate road traffic sign examples used to illustrate the various types of sign, signal and marking have been shaded in a black and white coding of the required colours. This coding is illustrated in Figure 1.3.

11 The basic principles of the road traffic sign colour coding system are shown in colour in Volume 1, Chapter 1, Section 1.4, where a limited number of colour pages are indicated, and in the Contents sections of several Volume 1 chapters.

1.1.3 Terminology

1 A considerable effort has been made to obtain a close correlation between the language of the Manual with that used in legislation. Being a guideline document this is less evident in Volume 2 than in Volume 1, where the significance of all road traffic signs is covered in detail. Legal meanings and definitions are, however, very important to the correct application of road traffic signs and where this is relevant in a Volume 2 chapter, these meanings or definitions are quoted in the text (see Chapters 2 and 3).

2 For those users of this Volume who are not familiar with the more formal use of certain words in Volumes 1 and 4, the interpretations attached to these words is repeated in the following paragraphs. An understanding of these interpretations is important in the context of possible legal action against road authorities and their agents.

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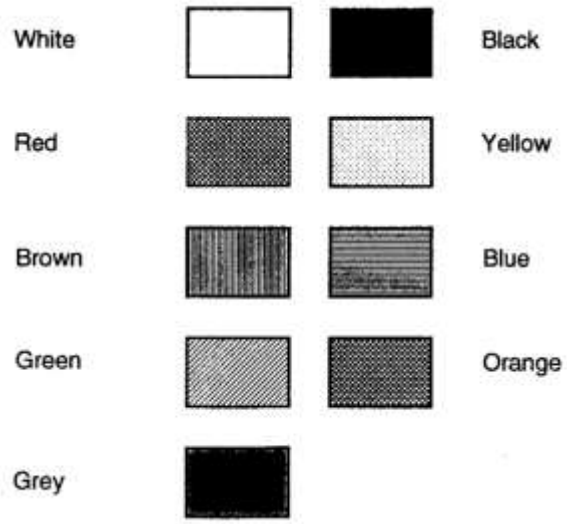

Fig 1.3 **Key to Colour Coding**

3 There are three words used throughout the Manual dealing with the function, design and application of traffic control devices, the interpretation of which is fundamental to the use of the Manual. These words are the very common words "SHALL", "SHOULD" and "MAY". The meanings attached to these words for the purpose of interpreting the Manual shall be:

(a) "**SHALL**" - a mandatory condition - when this word is used it means that the condition or conditions referred to must be compiled with;

(b) "**SHOULD**" - an advisory condition - when this word is used it is advisable or recommended to comply with the condition or conditions referred to (see also "**RECOMMENDED**" in paragraph 1.1.3.5);

(c) "**MAY**" - a permissive condition - the conditions referred to are optional.

The legal significance of these terms must be understood by users of the Manual. It is very likely that authorities will be subject to greater levels of legal action in the future. Failure to adhere to the intention of the Manual as indicated above could affect the outcome of such action to the detriment of the authority.

4 The word "SHALL" is used in two ways. "SHALL" is used to refer to the actions required of road users and in this context the provisions of the regulations take legal precedence. "SHALL" is also used to refer to actions required of authorities in the use of traffic control devices. In many instances such mandate is also provided for in the regulations.

5 When the word "SHOULD" is used the condition referred to is open to a measure of interpretation. This is recognised in the Manual where, occasionally, the word "RECOMMENDED" is used in place of "SHOULD". "RECOMMENDED" should be understood to have a stronger implication than "SHOULD". If an authority chooses not to conform to the recommended action, it would be well advised to record why it has chosen not to do so.

6 The use of the word "MAY" is much wider and less specific than the other two words. It is used directly in relation to the actions road users and/or authorities can take, at their discretion, with regard to the function and use of road traffic signs. "May" is also widely used in a general sense throughout the text of the Manual.

7 The word "yellow" is used throughout the manual in place of "amber" with respect to traffic signal indications. "Yellow" is the more common international term.

8 Traffic control devices include all road traffic signs and other devices, including delineation devices, used to regulate, warn, guide or inform road users. Traffic control devices are thus used to achieve an acceptable level of road safety by providing for the orderly and predictable movement of all traffic, vehicular and pedestrian, throughout all levels of the road network.

9 Road traffic signs, by legal definition, include all prescribed road signs, road markings and traffic signals, and are to be used solely for the purpose of traffic control and are not an advertising medium.

1.1.4 Traffic Control Devices

1 The chapters in this Volume deal with the use of a very wide range of interrelated traffic control devices. How effective this use or application is, relies on an understanding of a range of basic requirements which should be fulfilled when traffic control devices are used. These requirements are covered in detail in Volume 1, Chapter 1.

2 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.

3 To 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 In terms of Section 82 of the Act, the Minister may authorise the use of an experimental traffic control device for a limited period of time so that the suitability and effectiveness may be determined. No new sign or symbol shall be used without prior approval. A draft sign or symbol design may be submitted, but should not be used until it has been refined and approved in terms of the standard design rules.

5 It is desirable, in the interests of uniformity, that the need for a new symbol, sign or marking be submitted, with motivation to:

The Secretary
Route Numbering and Road Traffic Signs Sub-Committee
c/o Department of Transport
Private Bag X193
Pretoria
0001.

1.1.5 Road Traffic Sign Classification

1 Full details of the manner in which road traffic signs are classified and sub-classified, together with their numbering structure are given in Volume 1, Chapter 1.

2 The great majority of road signs may be used in a PERMANENT or TEMPORARY form, although there are a few road signs which shall only be used in one or other form. This is made obvious in Volume 1. At the time of order, temporary sign numbers should always include the first letter "T". Manufacturers in particular, however, should ensure that their orders are sufficiently clear in this regard prior to manufacture.

3 To assist users of Volume 2, the basic road traffic sign classification is illustrated in Figure 1.4.

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1.1.6 Principles of Road Traffic Signing

1 All road traffic signs shall conform to the requirements of paragraph 1.1.4.3. The guidelines given in the Manual 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; however,

(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 (see Section 1.8);

(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.

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

(a) navigation (see Volume 1, Chapters 4 and 8):

(i) primary aids:

- route maps
- route numbers
- interchange (EXIT) and junction numbers
- selective destination display 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 paragraph 1.1.4.3);

(ii) criteria to meet the required functions;

(c) signface design function (see Volume 1, Chapter 4):

(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 (see Volume 1, Chapter 4):

(i) use standard symbols rather than words;

(ii) display a standard quantity of information in a standard way;

(iii) limit total amount of information.

3 For full details of the principles of road traffic signing, refer to Volume 1, Chapter 1, and to the chapter appropriate to the class of sign under consideration. In particular, when considering the selection of appropriate destination names for use on guidance and/or direction signs refer to Volume 1, Chapters 4 and 8. Destination names 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.

4 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;

(iv) transient tourist population;

(f) junction or termination of routes.

1.1.7 Placement of Traffic Control Devices

1 In general in this volume, 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.

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 GL1 and SUBURB NAME signs GL2 (see Volume 1, Chapter 1, Section 1.9).

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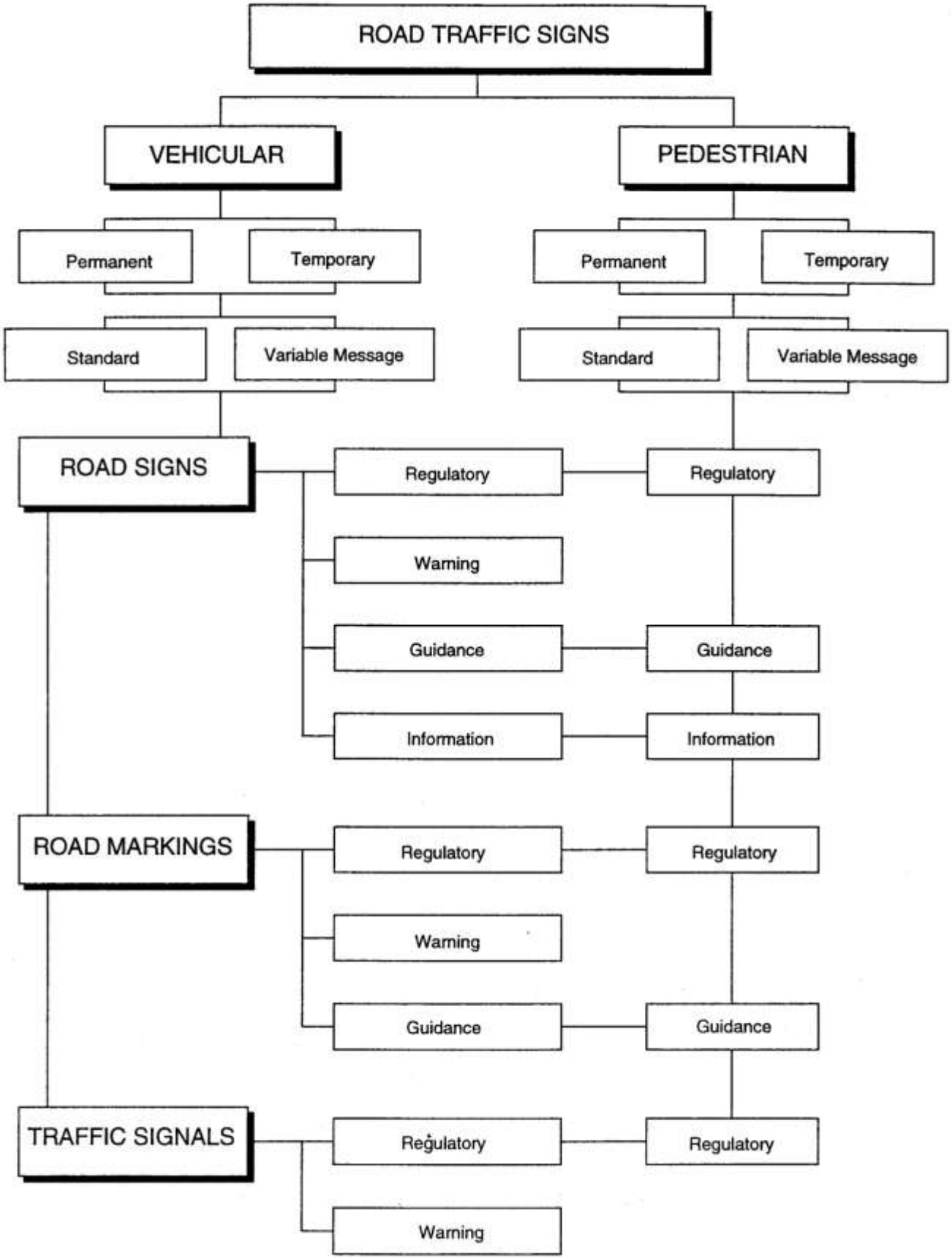

Fig 1.4 **Road Traffic Sign Classification**

3 Details of the orientation, lateral and vertical placement of signs are given in Figures 1.5 to 1.10. Figure 1.10 illustrates a number of common pitfalls or difficulties relating to the placement of signs which need to be avoided or overcome.

4 Ministers, Administrators, or duly authorised officials, have the power in terms of Road Traffic Legislation, to remove, or order the removal of any non-prescribed or unauthorised sign.

1.1.9 Sign Sizes

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

2 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).

3 Authorities shall not use signs of sizes less than those prescribed. To facilitate awareness of these sizes the minimum dimensions are listed in Table 1.1.

1.1.9 Specification and Manufacture

1 For full details relating to specification and manufacture of road traffic signs refer to Volume 1, Chapter 1, Section 1.5. A limited amount of the material given in that section is repeated here.

2 The South African Bureau of Standards has a number of "Specifications" (CKS) and "Standard Specifications" (SABS) which are relevant to the manufacture and appearance of road traffic signs. The most relevant of these are:

(a) SANS 1519-1:2006 and 1519-2:2004 *Road Signs;*

(b) SANS 731-1:2006 and 731-2:2006 *Road Marking Paint;*

(c) CKS 192 - 1981: *Drop-on Type Reflectorised Road-Marking Paint;*

(d) CKS 501 - 1981: *Road Marking Paint, High Build, Non-Skid;*

(e) SANS 1442:2008 *Roadstuds*;

(f) SANS 1459:2004 *Traffic Lights*.

Where these specifications do not include a colour specification, such as for paints, this is covered by:

(a) SANS 1091:2004 *National Colour Standards for Paint;* or

(b) CKS 279 - 1971: *Colours for Paints.*

3 Designers, authorities and manufacturers must ensure that their specifications and manufacturing methods result in road traffic signs which comply with the SABS colour specifications, or similar specifications, and that they remain within accepted tolerance levels for the expected life of the sign. Authorities in particular should monitor performance in this regard since early colour failure could have serious cost implications.

4 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 1.2.

5 Retroreflective material is available in many grades of quality. Three of these grades are specified in SABS 1519 for use on road signs, namely Class I, Class II and Class III. Whilst there are obvious **initial cost** implications to the cost of Class I, II or III materials in preference to materials with a shorter life and poorer retroreflective properties, it is strongly recommended that purchasers of road signs specify at least Class I materials, even for temporary signs. This will almost certainly result in a sign life which is cost effective over time.

6 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 1.2.

1.1.10 Environmental Impact

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.

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.**

1.1.11 Awareness and Education

1 The extent of change in the sign system incorporated in this Edition makes it obligatory on all authorities to co-ordinate awareness and educational campaigns directed at:

(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.

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

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TABLE 1.1 MINIMUM ROAD TRAFFIC SIGN SIZES TABLE 1.1

Road Traffic Sign Type	Function	Min. External Dimensions (mm) 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	1200 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	600 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	600 x 150	600 x 150	800 x 200	800 x 200
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

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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.

TABLE 1.2 RETROREFLECTIVE MATERIALS FOR ROAD SIGNS TABLE 1.2

Permanent Road Signs [1]	Sign Segment				Recommended Class of Retroreflective Material	
Type	Border	Symbols	Letters	Background	Border / Letters	Background
REGULATORY						
Control	4	4	4	4	I	I
Command	4	4	4	4	I	I
Prohibition	4	8	8	4	I	I
Reservation	4	4	4	84	I	8I
Comprehensive	4	4	4	4		I
De-restriction	4	4	4	4	I	I
WARNING						
Advance	4	8	8	4	I	I
Hazard	4	4		4	I	I
GUIDANCE						
Location	8	84	8	4	8	I
Route Marker	4	4	4	4	I	I
Trailblazer	4	4	4	4	I	I
Direction	4	4	4	84[3]	I	8I
Freeway Direction	4	4	4	4	III	I
Tourism	4	4	4	84 [3]	I	8I
Local Direction	4	8	8	84	8	8I
Diagrammatic	4+block	8	8	4	I[2]	8I
Pedestrian	8	8	8	84	8	8I
INFORMATION	4	4	4	84	I	8I

KEY

4 Retroreflective 8 Semi-matt 84 Optional

NOTES:

(1) All temporary road signs shall have a retroreflective background, and semi-matt border, symbol, arrows or letters.

(2) Check luminance factor before specifying higher than Class I.

(3) Certain signs are specified as retroreflective (see Volume 4 Chapters 2, 3, 5, 6, 7 and 13).

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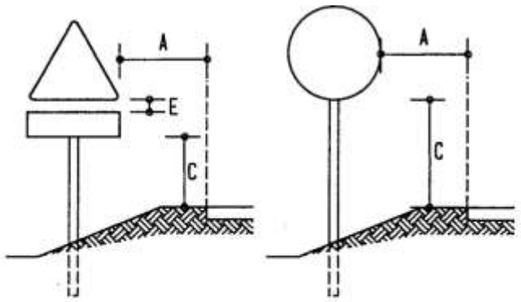
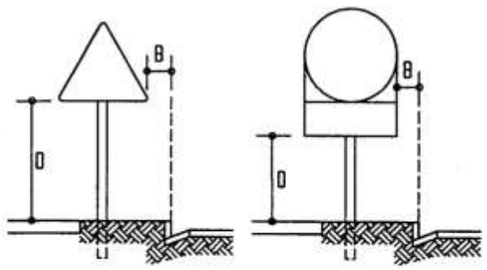
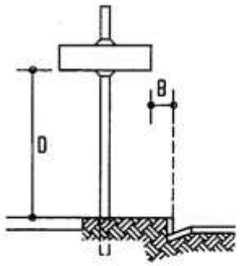


Shoulder (no kerb)

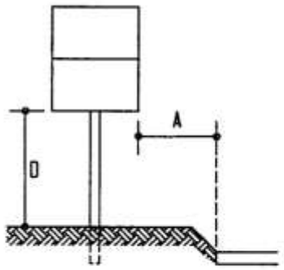


with Kerb and Sidewalk

Detail 1.5.1
Regulatory and Warning Signs

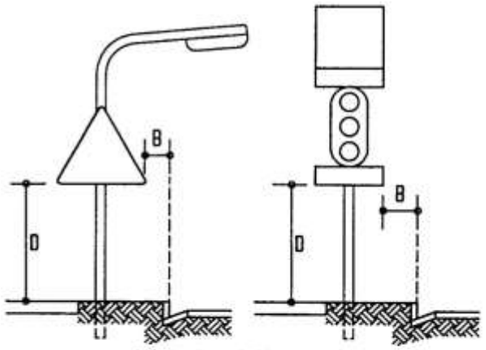


with Kerb and Sidewalk



Shoulder (no kerb)

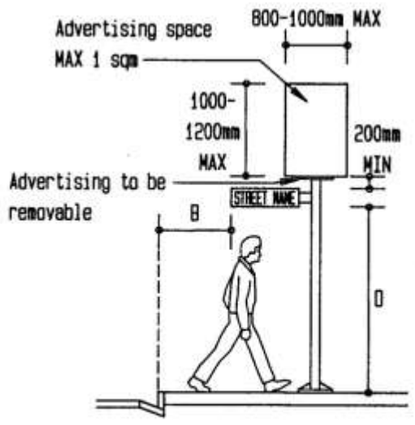
Detail 1.5.2
Location and Route Marker Signs



with Kerb and Sidewalk

Detail 1.5.3
Small Signs on Host Supports

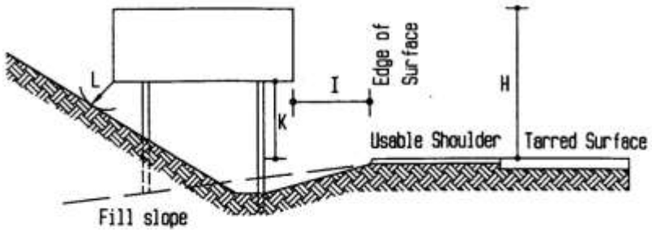
TABLE PERMANENT SIGN PLACEMENT DIMENSIONS			
Dimension	Minimum (mm)	Preferred (mm)	Maximum (mm)
A	1200	1500	2000
B	500	750	-
C	600	2100	2500
D	2100	2500	3000
E	0	0	200



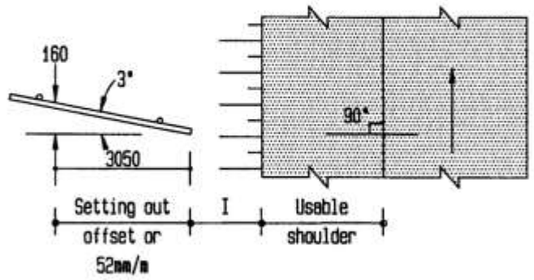
Detail 1.5.4
Advertising with STREET NAME

Fig 1.5 Lateral and Vertical Clearances for Small Single Support Signs

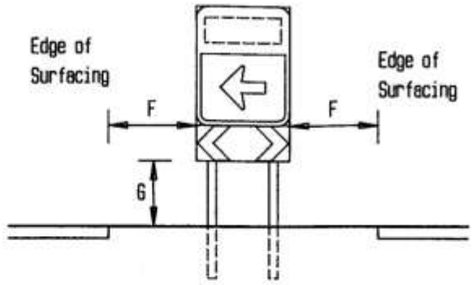
...nters Authorization No. 11542 dated 7th July 2011



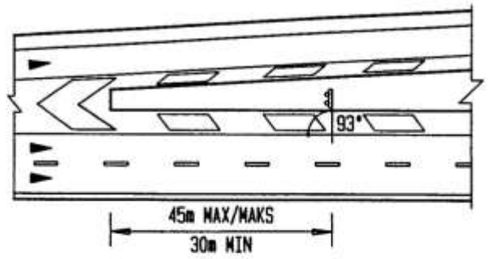
Beyond a Usable Shoulder

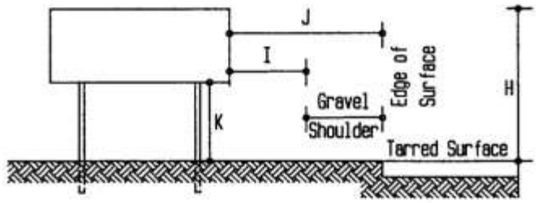


Sign Offset to Avoid Specular Reflection

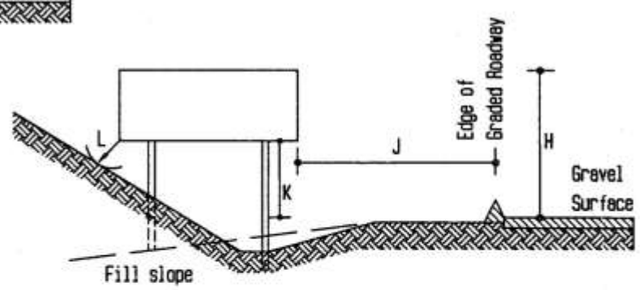


Detail 1.6.2 Gore Sign





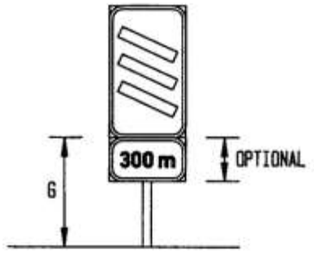
Ground Mounted Direction Signs - Class A and Class B Roads



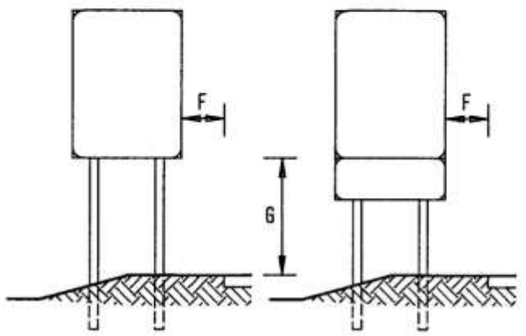
Ground Mounted Direction Sign - Class C Roads

Detail 1.6.1 Direction Signs

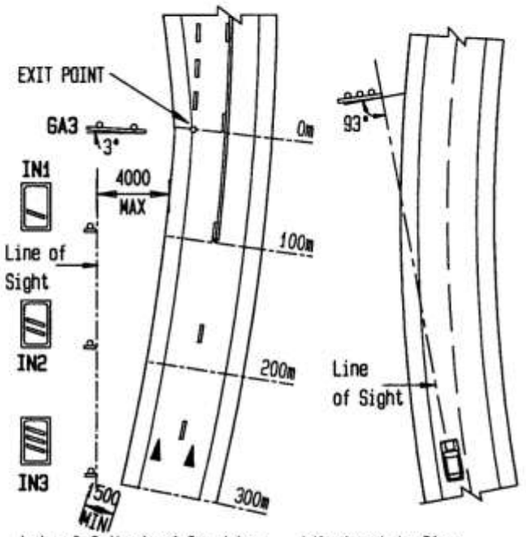
PERMANENT SIGN PLACEMENT DIMENSIONS			
Dimension	Minimum (mm)	Preferred (mm)	Maximum (mm)
H	-	-	6000
I	1500	2500	-
J	2500	4000	-
K	1600	2000	2400
L	1200	-	-



Detail 1.6.3 Countdown Signs



Detail 1.6.4 Diagrammatic Sign



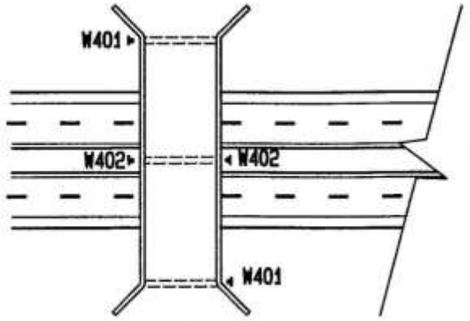
Lateral Setback of Countdown Signs to Avoid Obscuring of Exit Sign - GA3

Adjustment to Sign Orientation on Right Hand Curve

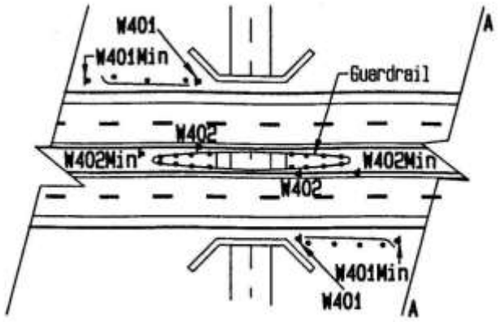
PERMANENT SIGN PLACEMENT DIMENSIONS			
Dimension	Minimum (mm)	Preferred (mm)	Maximum (mm)
F	1200	1500	2000
G	800	1200	1600

(Details 1.6.1 to 1.6.3)

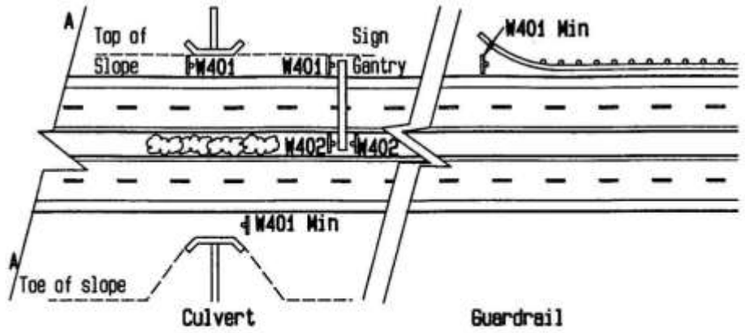
Fig 1.6
Lateral and Vertical Clearances
For Larger Multiple Support Signs

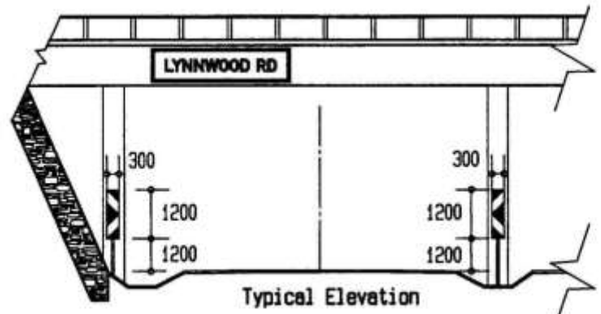


Overpass or Gantry

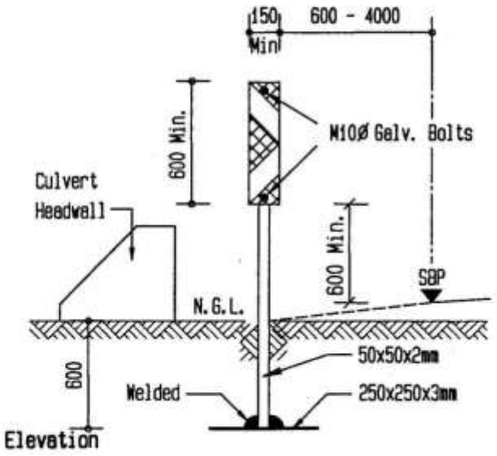


Underpass

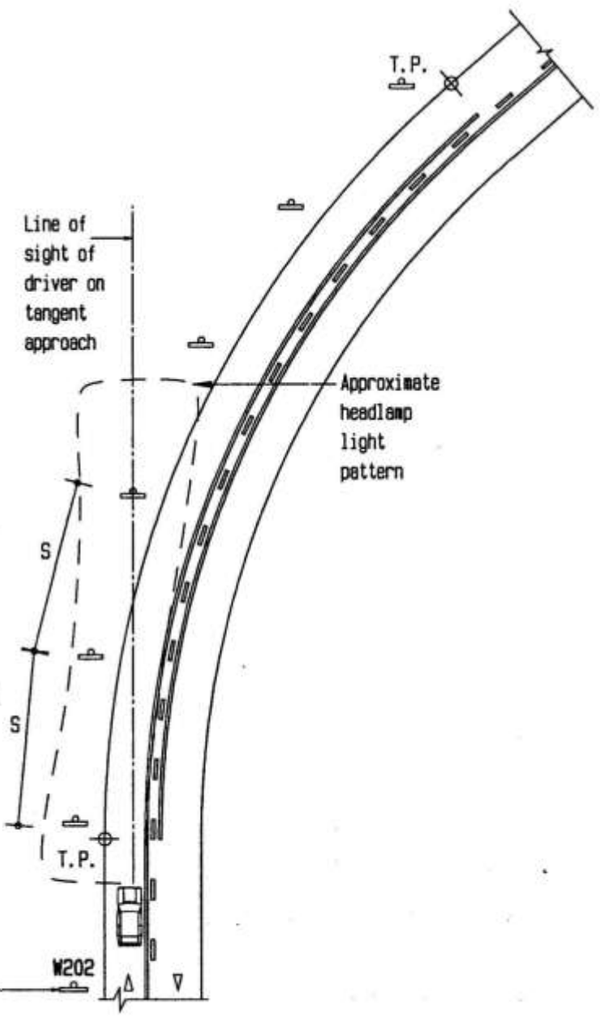




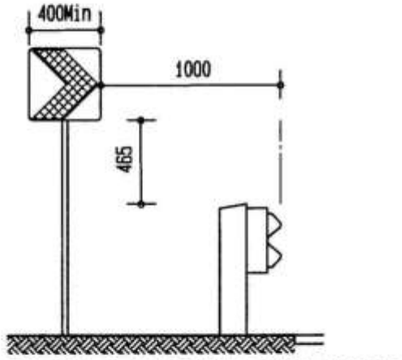
Detail 1.7.1 Typical Use of Hazard Markers at Roadside Structures



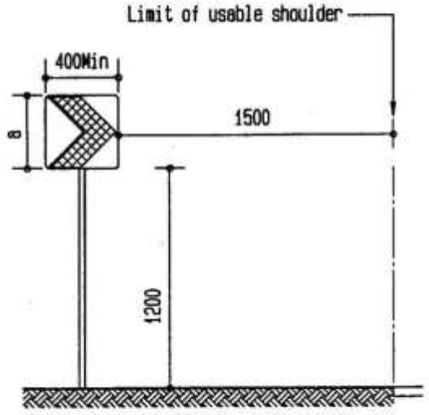
Detail 1.7.2 Typical Installation-Minimum Size W401/W402



Detail 1.7.3
Sharp Curve Chevron Spacing based on Tangent approach

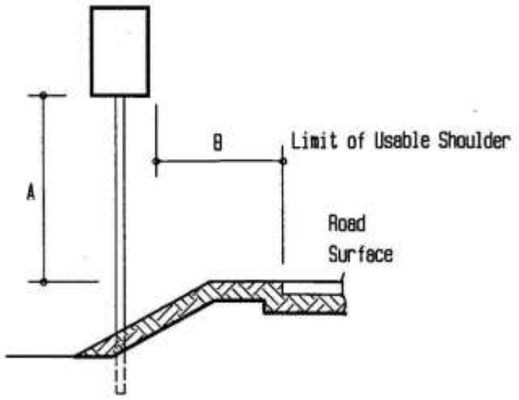


Detail 1.7.4 W405 Sharp Curve Chevron With Guardrail

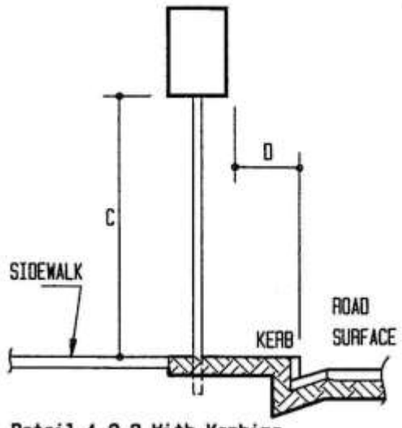


Detail 1.7.5 W405 Sharp Curve Chevron Without Guardrail

Fig 1.7
Positioning of Hazard Markers



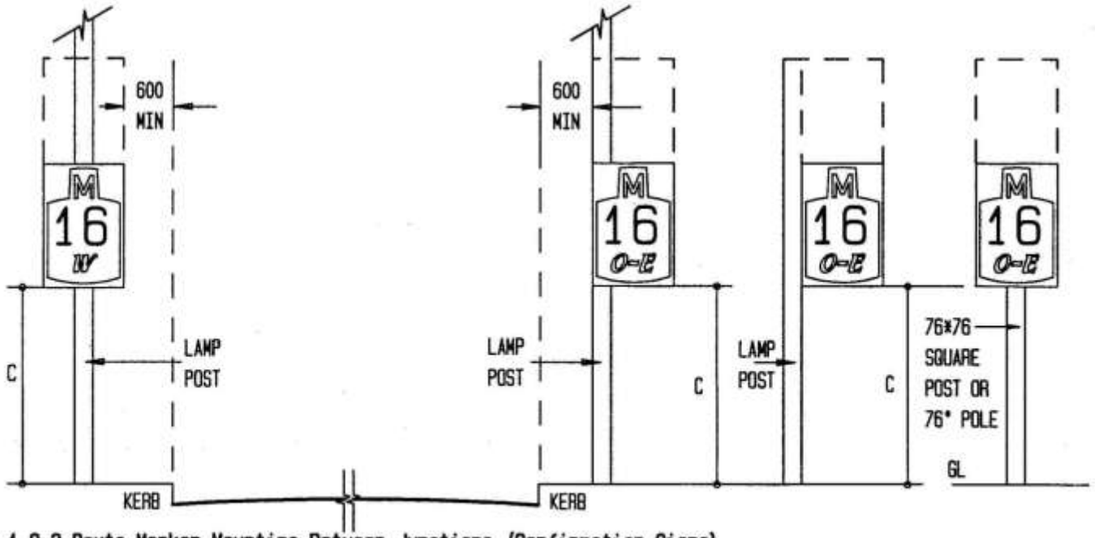
Detail 1.8.1 Shoulder (no Kerb Line)



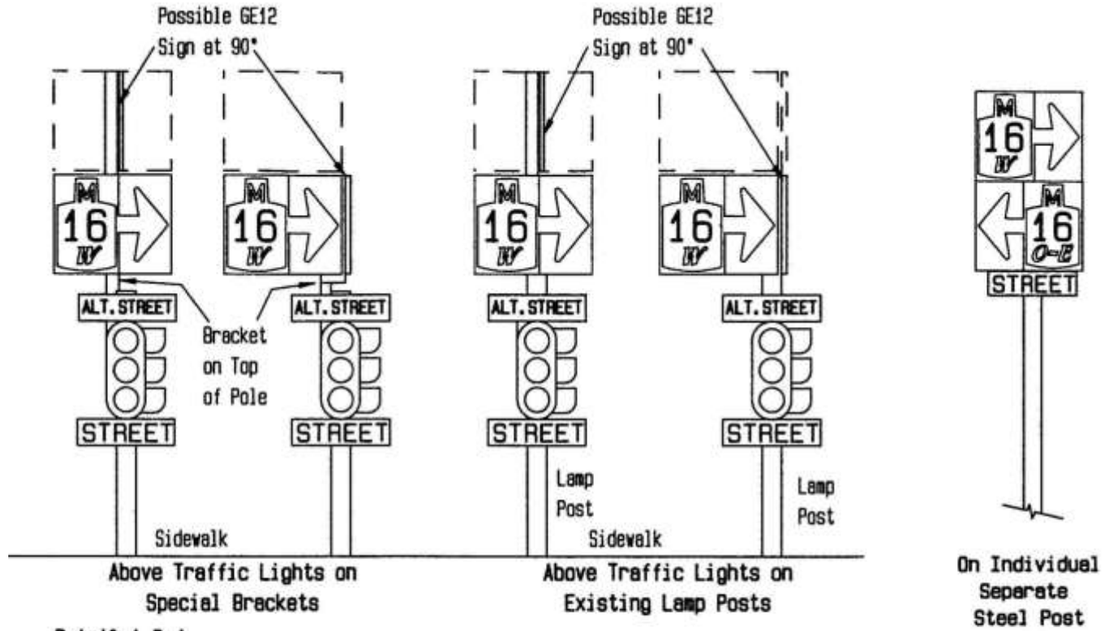
Detail 1.8.2 With Kerbing

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

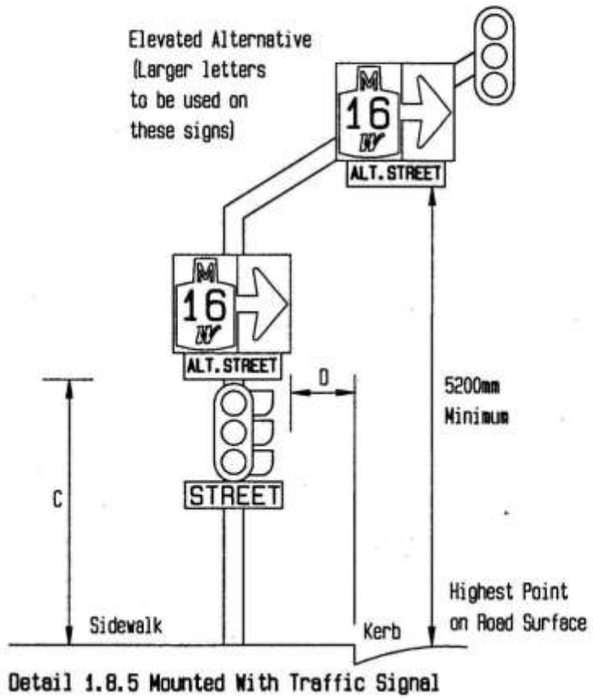
Confirmation signs should be located on existing street furniture wherever possible. Signs may be mounted centrally on poles, or cantilevered left or right according to pole positions in relation to a kerb line. Signs may be mounted on the right side of one-way roadways.



Detail 1.8.3 Route Marker Mounting Between Junctions (Confirmation Signs)



Detail 1.8.4
Route Marker Mounting in Relation to other Road Traffic Signs at Intersections/Junctions

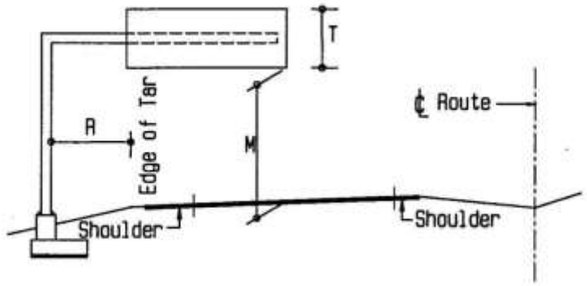


Detail 1.8.5 Mounted With Traffic Signal

NOTES:

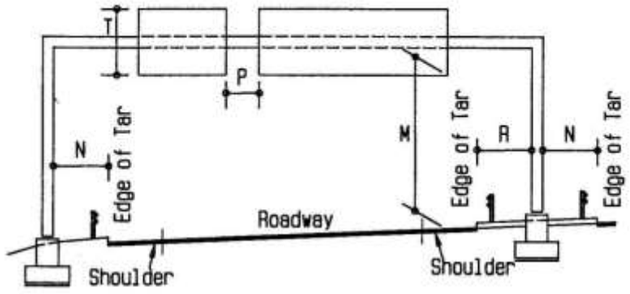
1. Higher mounting heights are preferred for visibility over trucks and buses and also to deter vandalism.
2. The minimum mounting height should be used for signs on their own individual posts.
3. The longitudinal position of confirmation route marker signs is 30m - 60m beyond a junction.
4. Repeat confirmation 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.

Fig 1.8
Positioning of Route Marker Signs

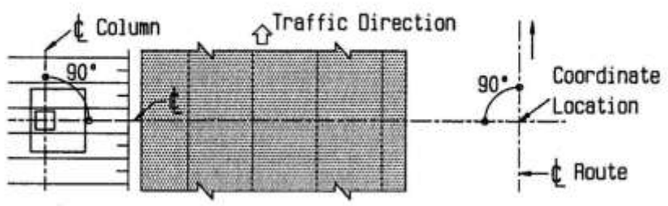


Detail 1.9.1 Typical Cantilever

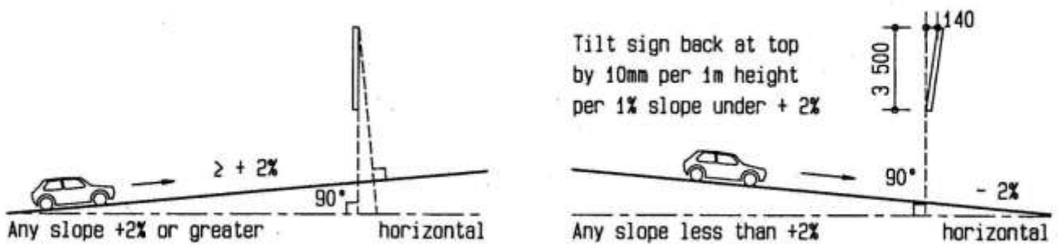
PERMANENT SIGN PLACEMENT DIMENSIONS			
Dimension	Minimum (mm)	Preferred (mm)	Maximum (mm)
M	5200	5700	6200
N	1500	2000	-
P	50	1000	-
R	4000	4500	-
T	1800	-	4200



Detail 1.9.2 Typical Gantry



Detail 1.9.3 Overhead Sign Positioning



Detail 1.9.4 Adjustment of Signface to Avoid Specular Reflection

Fig 1.9 Lateral and Vertical Clearances for Overhead Sign Structures

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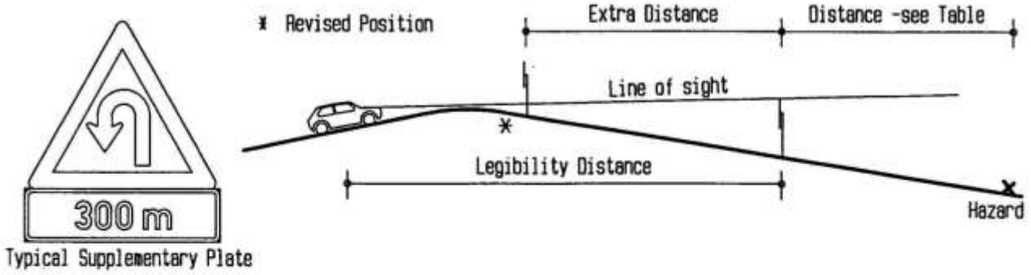
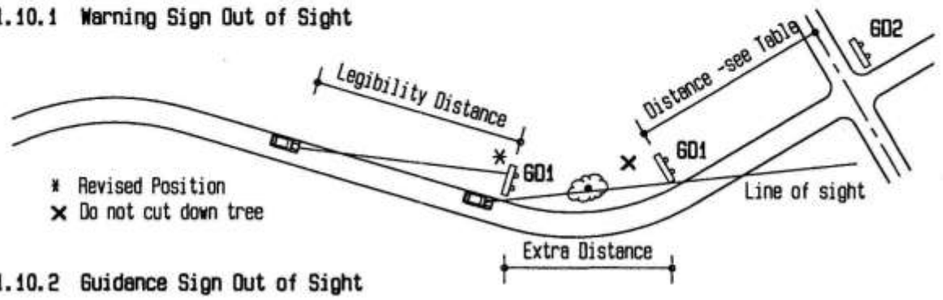
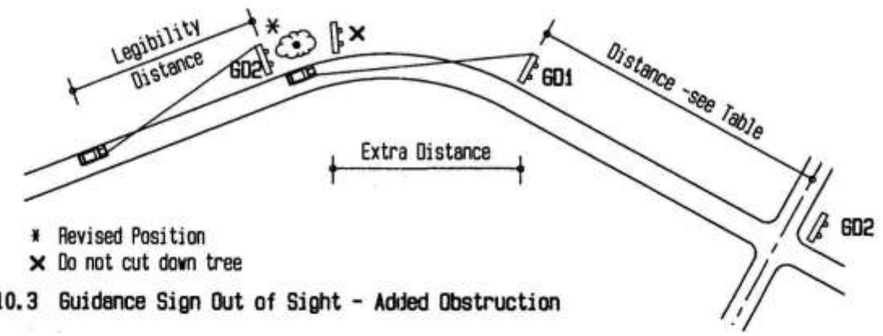


Typical Supplementary Plate

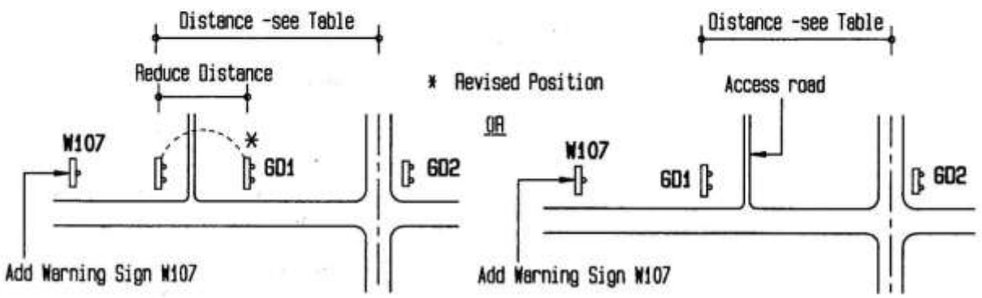
Detail 1.10.1 Warning Sign Out of Sight



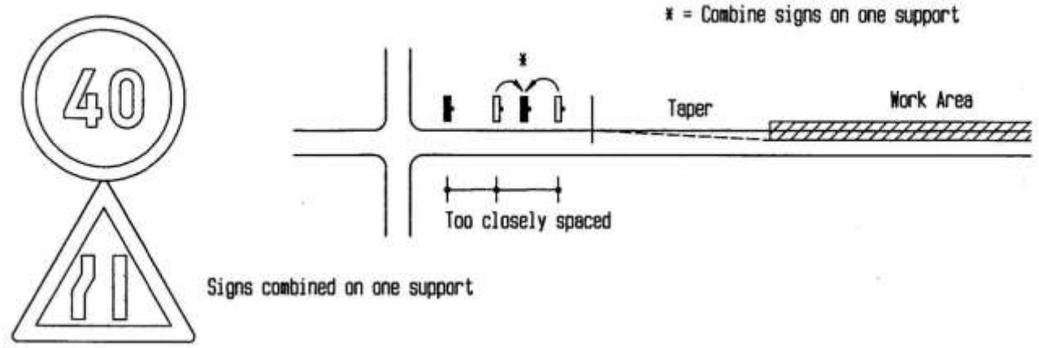
Detail 1.10.2 Guidance Sign Out of Sight



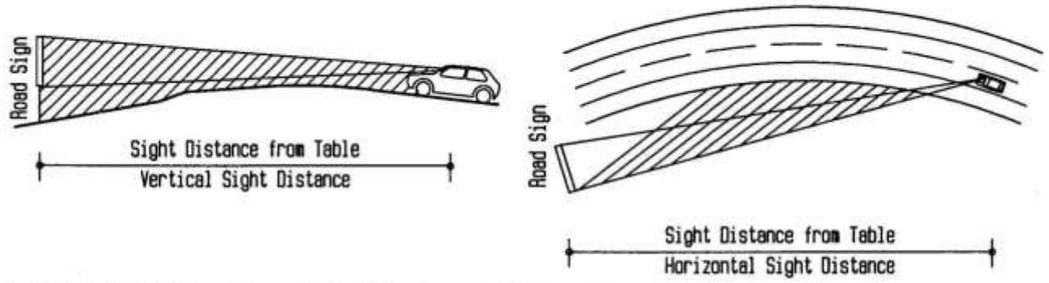
Detail 1.10.3 Guidance Sign Out of Sight - Added Obstruction



Detail 1.10.4 Closely Spaced Junctions



Detail 1.10.5 Insufficient Longitudinal Space for Several Signs



Detail 1.10.6 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.

Fig 1.10
Typical Problems and Aspects of Longitudinal Positioning of Road Signs

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1.2 CHAPTERS

1.2.1 General

1 Table 1.3 lists the principal subjects of each chapter in Volume 2. The subject matter of each chapter is expanded upon in later subsections.

2 In general terms the chapters in Volume 2 are intended to cover the "application" of various road signs, road markings and traffic signals in combination with each other, as appropriate to specific road environment situations. In most instances these "applications" are commonly used, although occasionally they are relatively rare.

3 When the development of Volume 2 started, there were no preconceptions regarding how individual chapters would deal with their subject matter, except that those which had previously been distributed as "Road Signs Notes" were likely to follow the coverage of the "Road Signs Notes". In the main the purpose of the chapters is to provide examples of the use of road traffic signs in terms of the chapter subject area's application requirements. In reality some of the chapter subjects do not specifically cover "applications".

TABLE 1.3 VOLUME 2 CHAPTER SUBJECTS TABLE 1.3

Chapter Number	Subject
1	Introduction
2	Road Marking Applications
3	Regulatory and Warning Signs and Markings Applications
4	Tourism Signing
5	Freeway Signing
6	Toll Route Signing
7	Signing for Railway Crossings
8	Public Transport Signing
9	Urban Guidance Signing
10	Rural Guidance Signing
11	Signing for Heavy Vehicles
12	Signing for Traffic Calming
13	Roadworks Signing
14	Signing for Pedestrian Environments
15	Structural Details of Road Signs
16	Road Signs Management
17	Road Sign Materials
18	Road Marking Materials
19	Variable Message Signs

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4 The various subjects have tended to be treated in one of three basically different ways, according to the needs of the subject as perceived during the development of Volume 2. The chapters can be grouped under methods of treatment as follows:

(a) basic sets of example "applications" - Chapters 3, 5 to 12, and 14;

(b) coverage not based on "application" examples - Chapters 15 to 19;

(c) more in-depth coverage including significant repetition of material from Volume 1 and/or Volume 4, including a wide range of example "applications" - Chapters 2, 4 and 13 (two of these chapters, namely Chapters 4 and 13 replace long-standing Road Signs Notes 3 and 13 respectively).

5 The chapters dealing essentially with sets of application examples are commonly structured in two parts. With the exception of Chapter 3: Regulatory and Warning Signs and Markings Applications, the first part illustrates specific road traffic signs relevant to the chapter subject, and the second part covers the example applications. Chapter 3 does not include a listing of regulatory and warning signs and road markings since the example applications could commonly apply to many of the large number of such signs and markings. Chapter 5: Freeway Signing deals fairly generically with many of its examples because these cover the use of guidance signs in standard sequences. In particular, the examples dealing with the upward-pointing arrow system, for overhead direction signs, cover standard sign sequences and illustrate a range of arrow clusters appropriate to each sequence.

6 The subject matter dealt with in Chapters 15 to 19 is not appropriate to being covered by example applications. Chapters 15 to 18 deal with sign manufacture, road sign management systems, and sign and marking materials in much greater detail and in a more in-depth technical manner than is given in Volumes 1 and/or 4. Chapter 19: *Variable Message Signs*, does illustrate a number of typical applications but primarily covers a systems approach to the use of variable message signs and more technical detail of variable message sign design (see also Volume 1, Chapter 9).

7 Chapter 2: *Road Marking Applications* covers an extensive range of examples of road marking applications but also includes material on the principles of road marking and the basic design parameters such as module dimensions and patterns from Volume 1, together with dimensional details of all unique markings, arrows and symbols from Volume 4. Special coverage is given to options for the use of PAINTED ISLAND marking RM5. Another special feature of this chapter is provided in the form of Table 2.3 which lists all markings by number, type and dimensions, with representative areas of each marking. The latter may be used to estimate quantities for road marking contracts with reasonable levels of accuracy.

8 Chapter 4: *Tourism Signing* similarly covers the subject in greater depth than other chapters. At the time of writing there are still matters of policy relating to tourism signing which are under consideration, or have been requested for re-consideration. The chapter includes new information on:

(a) the structure of tourism organisations;

(b) the processing of requests for tourism signs;

(c) the management of requests for tourism signs;

(d) a re-structured tourism sign classification;

(e) the tourism signing of high density tourism areas.

In addition the tourism signface layout and dimension rules covered in Volumes 1 and 4 are repeated for guidance. These have been condensed into a set of figures for convenient reference.

The coverage of tourism signing in Chapter 4 is centred on rural tourism signing practices. The majority of the information given is also relevant to the design and provision of tourism signs in urban environments, subject to the policies and rules specific to urban tourism signing. These aspects are covered in Volume 2, Chapter 9: *Urban Guidance Signing*. Chapter 4 currently includes a section on tourism signing warrants which is incomplete.

9 At the time of publication, work on the development of tourism signing warrants and certain identified tourism symbol requirements is incomplete. The committee structure dealing with these aspects has recommended that all Tourism Direction and Local Direction signing warrants, both rural and urban be collated in a single document rather than separately in Chapter 4 and 9. This concept has been developed in principle, in the form of a "Supplement 4-9" but is not yet complete, or approved. The conceptual layout of "Supplement 4-9" includes an illustration of all symbols. The listing of symbols currently in Chapter 4 may therefore be deleted when the Chapter is finalised (see paragraph 1.1.1.3). In making the proposal for a "Supplement 4-9" the intention was to create a document which would directly meet the needs of those responsible for assessing compliance with warrants, and which would also be easy to update if new symbols and warrants are required in the future.

10 Chapter 13: *Roadworks Signing* is like other chapters in that it illustrates the range of available temporary signs and has a large number of temporary signing applications for use at roadworks sites. Because the use of temporary signs at roadworks is not covered in Volume 1, this chapter gives information on the following principles relating to signing at roadworks:

(a) traffic management;

(b) setting of speed limits at roadworks;

(c) temporary delineation;

(d) contract specification.

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ROAD MARKING APPLICATIONS

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2.3 Road Marking Applications in Rural Situations

2.4 Road Marking Applications in Urban Situations

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2.6 Road Marking Applications for Parking Applications

2.7 Enhanced Standard Details

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CHAPTER 2

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Chapter 3	R	Chapter 13	R
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CHAPTER 2:
ROAD MARKING APPLICATIONS

2.1 INTRODUCTION

2.1.1 General

1 Road markings comprise a group of traffic control devices within the definition of the term Aroad traffic signs@. Road markings incorporate a wide range of devices which may be embedded in, or applied or attached to, the road surface, kerbing or objects within the roadway for the purpose of regulating, warning or guiding traffic. Road markings also delineate the limits of the roadway and all or portions of the travelled way. Delineation devices such as roadstuds, guardrail retroreflectors and traffic cones are therefore classified as road markings.

2 This chapter is intended to assist both road marking designers in the drawing office and field staff responsible for the actual implementation of the details produced in the drawing office. One main purpose of the material covered is therefore to make designers aware, by means of typical drawings, of the range of road marking "tools" available and how they can and should be used in conjunction with each other. Whilst there is always a desire amongst enthusiastic designers to produce their own style of drawing it is recommended that the figure illustration conventions used in this chapter be incorporated into working drawings so that a standard drawing content and method of display of information may ultimately evolve.

3 In the above context a significant proportion of road marking field work is commonly undertaken without site specific drawings, because it involves the application of basic principles and standards. The second main purpose of this chapter is therefore to assist with such field work.

4 Road markings, particularly longitudinal markings, play a valuable role in maintaining the continuity of visual information to drivers. The provision of continuous road markings along a road is practical whereas the provision of continuous visual information by means of road signs is not. Such road markings are thus important to the driving task and in particular to the task of vehicle control in terms of the disciplined use of road space (see Volume 1, Chapter 1, Sections 1.7 and 1.8).

2.1.2 Objectives

1 The objectives to be aimed for in providing road markings are:

(a) road safety;

(b) conformity of practice;

(c) good traffic management leading to optimum road capacity;

(d) provision of the correct marking first time.

2 The application of road markings to the road surface, and the subsequent maintenance of them, represents an on-going budgetary problem for all road authorities. It is therefore the objective of this chapter to provide sufficient information and guidance to those involved with road markings to create an awareness of the need to ensure the effectiveness of the markings they provide.

2.1.3 Coverage of This Chapter

1 Individual road markings and their functions and basic dimensions are detailed in Volume 1, Chapter 7. These basic dimensions are summarised in this chapter in Table 2.1. Detailed dimensions of individual road markings, such as arrows and symbols, previously included in Volume 4, Chapter12, have been incorporated into this chapter to enhance the completeness of the coverage of the chapter. The specification of road markings and the materials from which they are created is limited. Details of specifications are given in Chapters 1 and 7 of Volume 1.

2 Due to the subject matter of various other chapters in this Volume of the Manual there is potential for overlap in the coverage of different chapters. Whilst duplication has not be avoided entirely it has been kept to a minimum.

3 The typical examples of road marking applications given in this chapter concentrate on combinations of road markings, and , where appropriate, their dimensional relationship, and deal less with road signs or traffic signals than other chapters. Indications of road signs or traffic signals are generally limited to the display of the appropriate sign number or traffic signal symbol.

4 Road markings appropriate to specific subjects are covered in a diagrammatic manner in the figures in the following chapters:

(a) Chapter 7: *Signing for Railway Crossings*;

(b) Chapter 8: *Public Transport Signing*;

(c) Chapter 11: *Signing for Heavy Vehicles*;

(d) Chapter 12: *Signing for Traffic Calming*;

(e) Chapter 14: *Signing for Pedestrian Environments*.

The figures in these chapters do not normally give dimensional details. Not all of the concepts covered by these figures are dealt with in this chapter. As a general rule, however, if designers wish to develop concepts that are not covered in detail, it is very likely that a sufficient number of similar concepts are covered by the typical application examples, for these to act as a toolbox of components. Designers can utilise these to suit their needs (see Subsection 2.1.5).

5 Chapter 3 deals with regulatory and warning road signs and markings and therefore has similar coverage, in many ways, to this chapter. Where there is an overlap in coverage this chapter concentrates on the road markings, including dimensional detailing, and the figures are closer to a scale representation of the roadway. Chapter 3 tends to give a diagrammatic coverage highlighting the relationship between signs and markings, with only nominal dimensional information.

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6 The provision of road traffic signs must be considered during the geometric design of a road or intersection of roads. Whilst this must be undertaken with due regard to the relationship between the signs and markings, it is generally recommended that consideration of the road markings be undertaken as an integral part of the design and this should occur early in the design process. This approach is likely to highlight any geometric deficiencies before completion of the design.

7 The examples of typical road marking details given in this chapter have been broadly grouped into the following categories:

(a) Section 2.2 - Basic Principles;

(b) Section 2.3 - Rural Situations;

(c) Section 2.4 - Urban Situations;

(d) Section 2.5 - Freeways;

(e) Section 2.6 - Parking Environments.

8 In grouping typical applications into rural, urban and freeway, specific examples have been placed in the most appropriate group. Many such examples may also be appropriate to another group. In general the examples are not repeated under these circumstances. This does not mean that the principles, for example, applied to an example of the marking of a rural climbing lane are not appropriate to a climbing lane to be provided within an urban area. What should be adapted to the urban environment are those design components which vary with speed, space or specific urban standards i.e. line marking modules. The same type of situation may occur in terms of details which are grouped as freeway examples but which may also be appropriate on a high speed at-grade road. Whenever possible, attention will be drawn to such examples in the text.

9 Specific details of the many arrows, symbols and letters used as road markings are given in Section 2.7 - Enhanced Standard Details.

10 It is important that the geometric elements of road marking be considered in the context of the geometry of the road on which they are to be marked. This will be highlighted when appropriate in relevant subsections.

2.1.4 Road Marking Classification

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.

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. Approved legal road marking styles, patterns, and symbols are illustrated in Figures 2.1 to 2.9, and full details of their characteristics are listed in Table 2.1.

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.

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.

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 (see Table 2.1 and Figures 2.11 and 2.12).

2.1.5 Figure Conventions

1 Illustration of complex road markings, incorporating the level of detail required to achieve the objectives of this chapter, can result in complex and difficult to read figures when these are confined to an A4, or even an A3 page format. In order to limit the figure complexity much of the information is given by means of a number of conventions, some of which are exclusive to this chapter. These conventions are shown in Figure 2.10.

2 An effort has been made to ensure that the figures are as realistic as possible, at the expense of being absolutely true to scale. In almost all instances which depict a lengthy section of roadway the lateral scale has been exaggerated in relation to the longitudinal scale. In the longitudinal direction the scale of "lines" and "gaps" has been made as true as practical. Wherever possible road markings have been shown in hollow outline rather than solid (although the hollow shapes may be shaded to illustrate a particular colour).

3 Apart from Figures 2.1 to 2.9, which illustrate all the available road marking types, the figures which detail typical applications are generally treated in one of three ways, as follows:

(continued on page 2.1.12)

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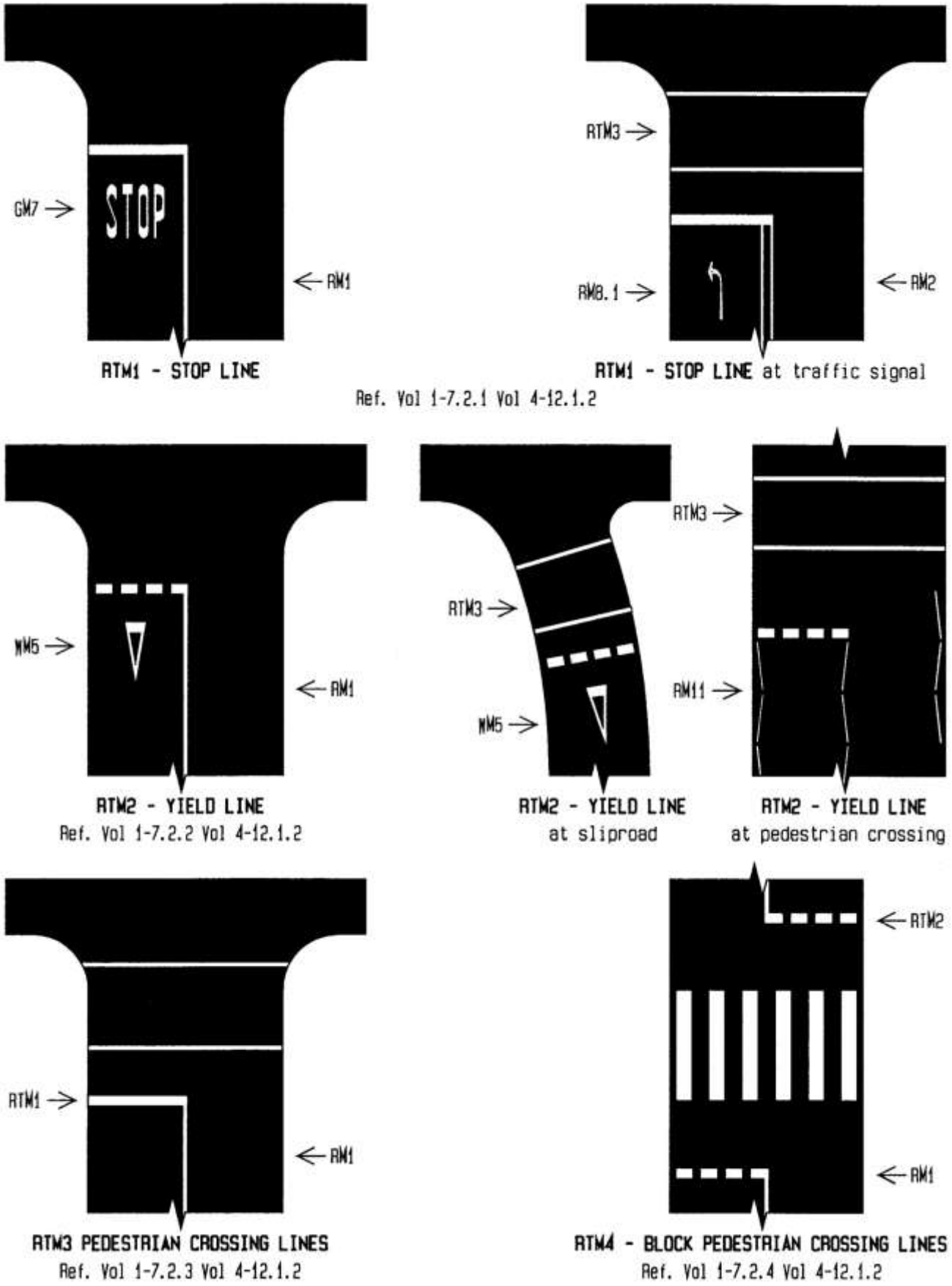

Fig 2.1 **Regulatory Road Markings - 1**

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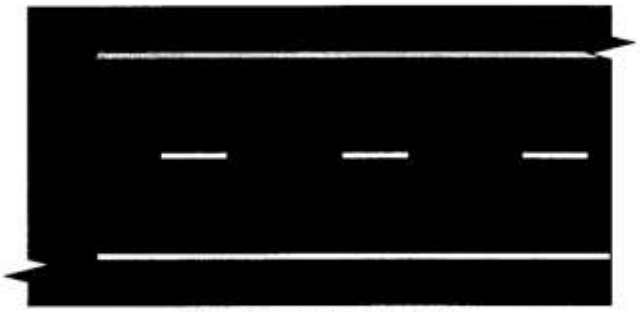
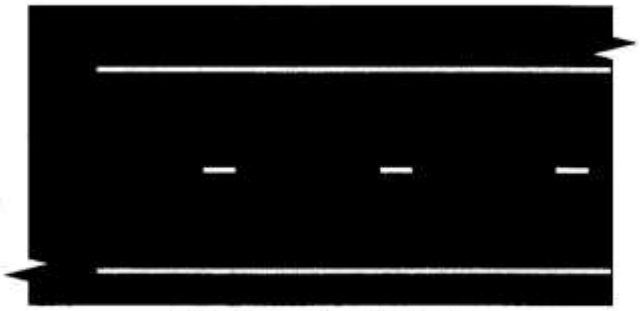
Ref. Vol 1-7.2.6 Vol 4-12.1.2

RM2 NO CROSSING LINES
Ref. Vol 1-7.2.10 Vol 4-12.1.2

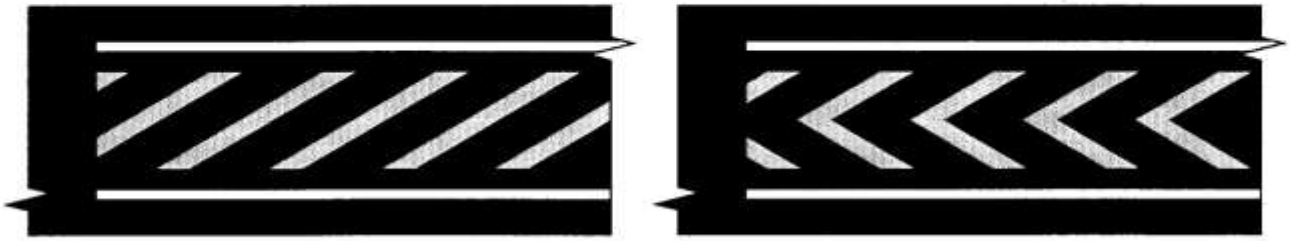
RM3 CHANNELIZING LINE
Ref. Vol 1-7.2.11 Vol 4-12.1.2



RM4.1 LEFT EDGE LINE

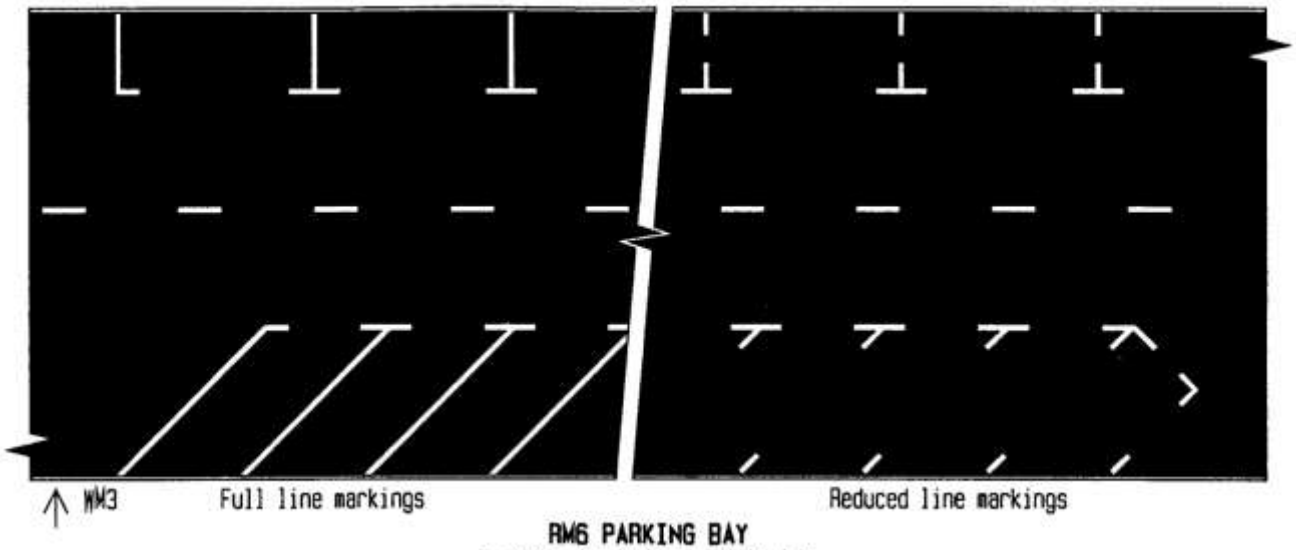


RM4.2 RIGHT EDGE LINE
Ref. Vol 1-7.2.13 Vol 4-12.1.2

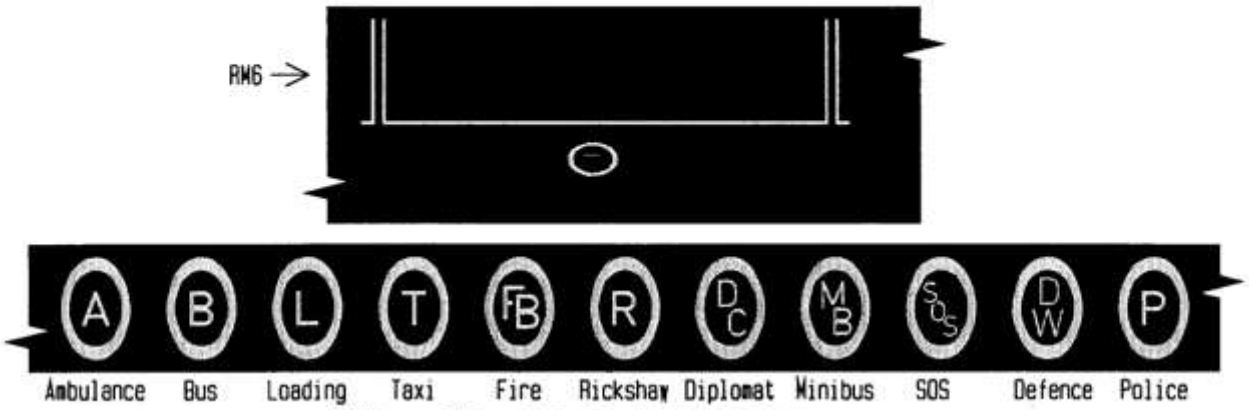


RM5 PAINTED ISLAND
Ref. Vol 1-7.2.15 Vol 4-12.1.2 and 12.2.3 to 12.2.11

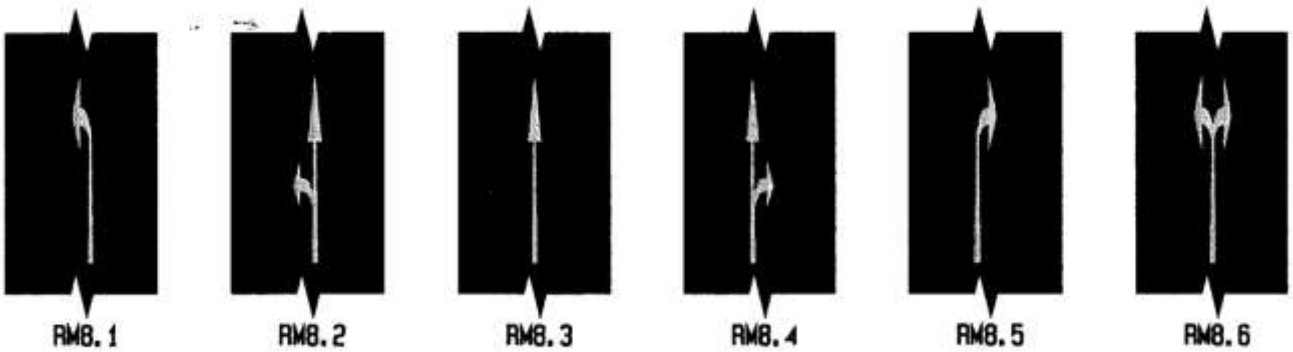
Fig 2.2 **Regulatory Road Markings - 2**



RM6 PARKING BAY
Ref Vol 1-7.2.17 Vol 4-12.1.2

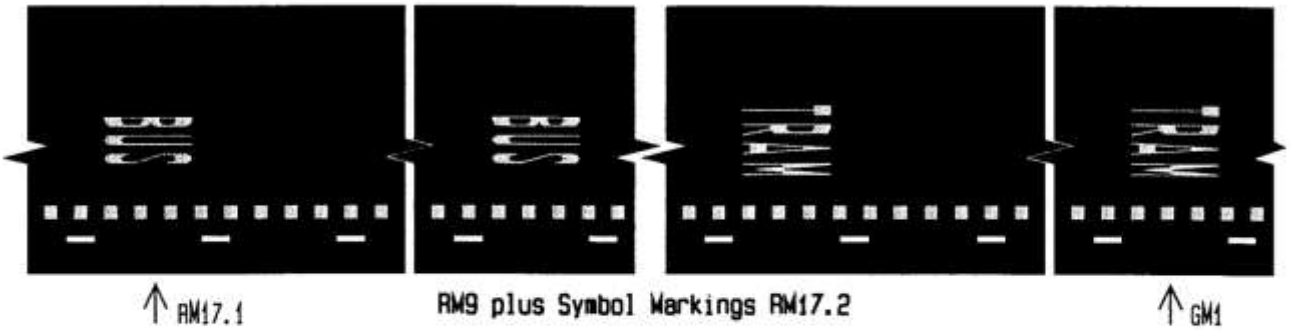


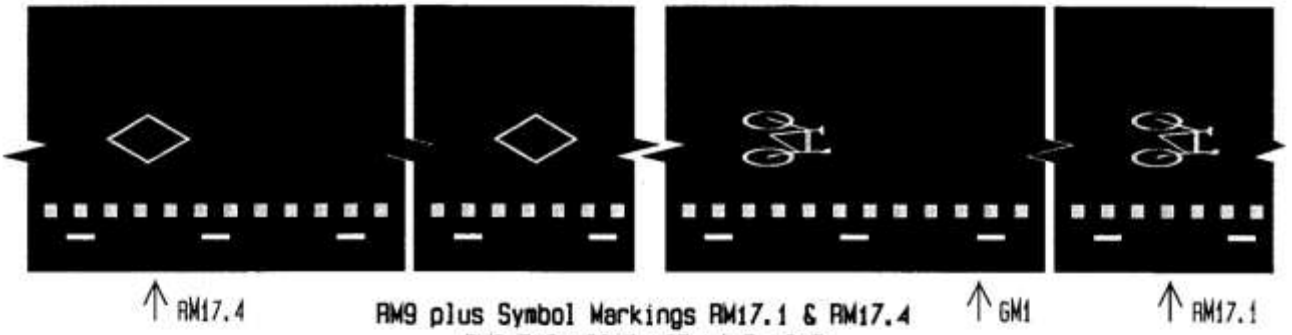
RM7 and RM7.1 EXCLUSIVE PARKING BAY
Ref Vol 1-7.2.19 Vol 4-12.1.3 and 12.4.7 to 12.4.13



RM8 MANDATORY DIRECTION ARROWS
Ref Vol 1-7.2.20 Vol 4-12.3.2-12.3.4

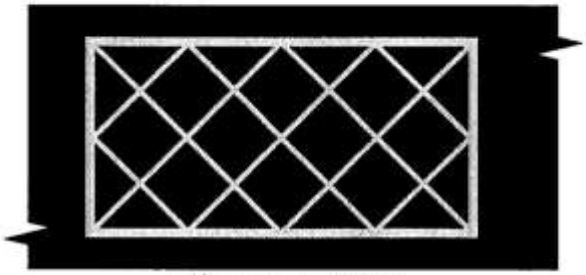
Fig 2.3 **Regulatory Road Markings - 3**





RM9 EXCLUSIVE USE LANE LINE

Ref. Vol 1-7.2.21 and 7.2.31 Vol 4-12.1.3, 12.4.3, 12.4.6 and 12.5.1 to 12.5.7



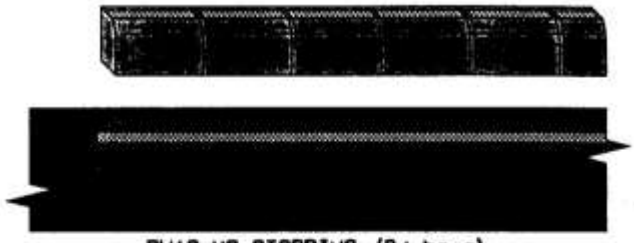
RM10 BOX JUNCTION

Ref Vol 1-7.2.23 Vol 4-12.2.12

RM11 ZIG ZAG ZONE LINES

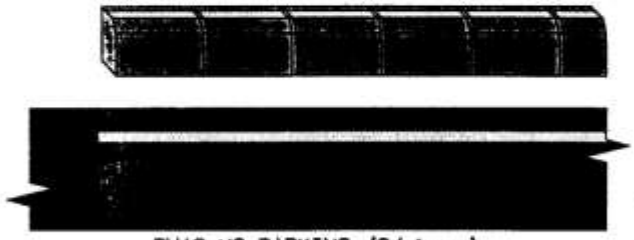
Ref. Vol 1-7.2.26 Vol 4-12.2.13

Fig 2.4 **Regulatory Road Markings - 4**

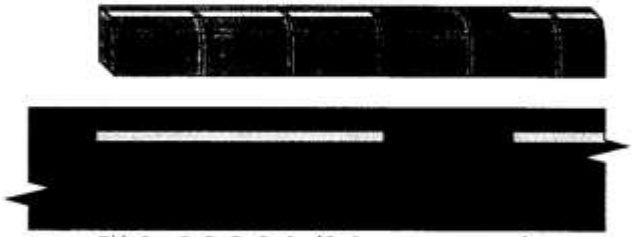


RM12 NO STOPPING (24 hour)
Ref. Vol 1-7.2.26 Vol 4-12.1.3

RM12 NO STOPPING (Selective times)
On road surface or kerbface

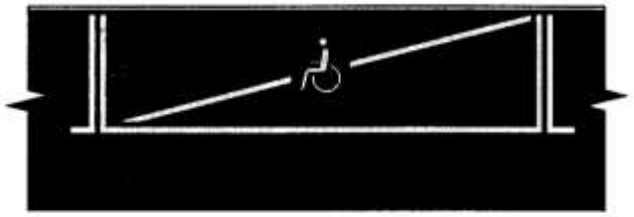


RM13 NO PARKING (24 hour)
Ref. Vol 1-7.2.27 Vol 4-12.1.3

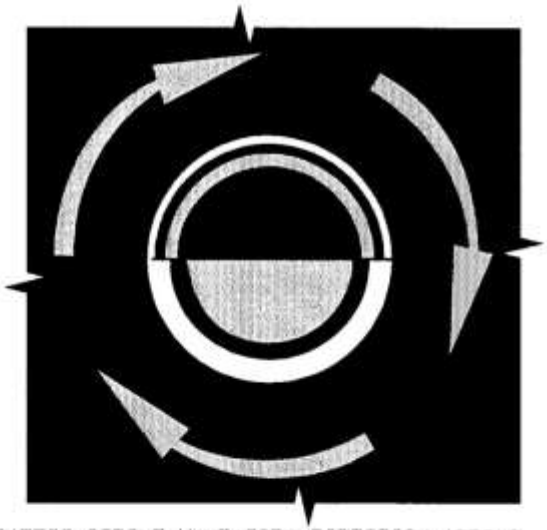


RM13 NO PARKING (Selective times)
On road surface or kerbface

RM14 NO MOTORCYCLES MARKING
Ref Vol 1-7.2.28 Vol 4-12.4.2



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



RM15 TRAFFIC CIRCLE MANDATORY DIRECTION ARROWS
Ref Vol 1-7.2.29 Vol 4-12.3.6/12.3.6

RM17 WORD AND SYMBOLS MARKINGS
Ref Vol 1-7.2.31 Vol 4-12.4.3/12.4.5/12.5.2

Fig 2.5 **Regulatory Road Markings - 5**

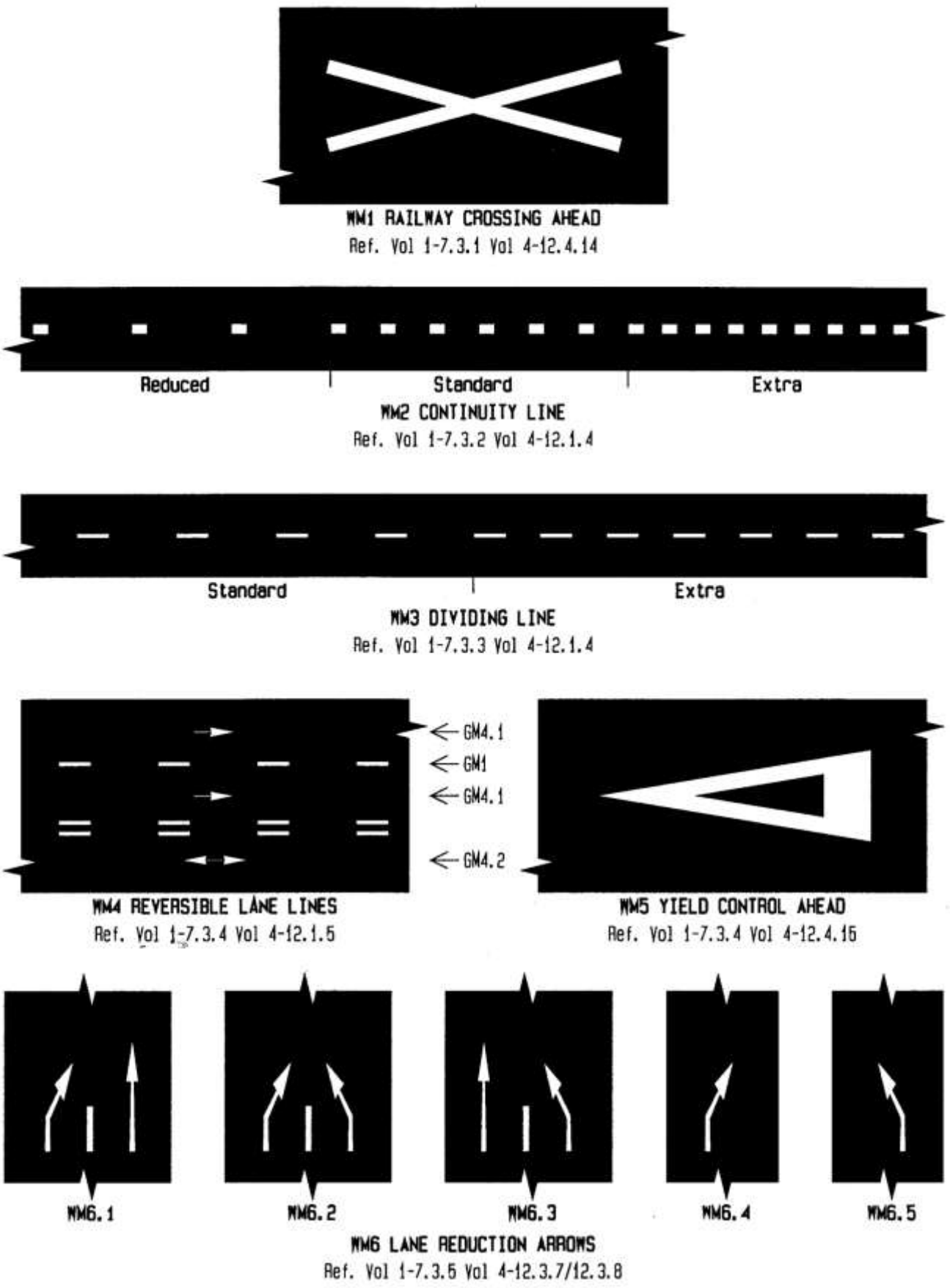
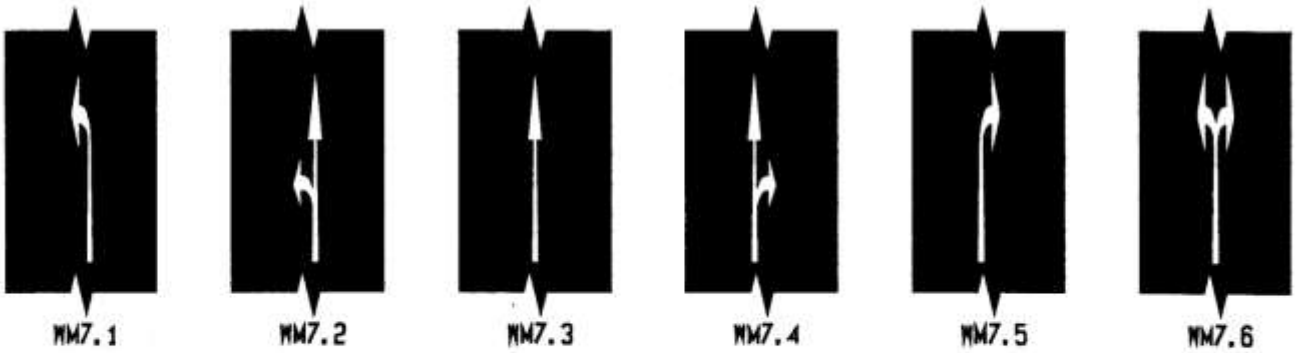


Fig 2.6 **Warning Road Markings - 1**

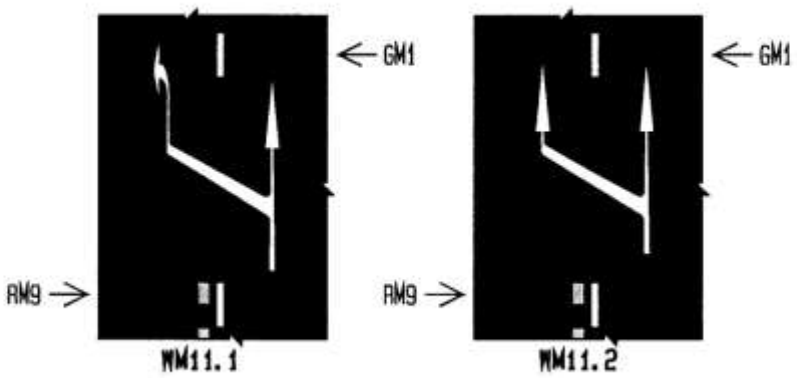


WM7 MANDATORY DIRECTION ARROW AHEAD
Ref Vol 1-7.3.7 Vol 4-12.3.2-12.3.4

WM8 NO OVERTAKING LINE AHEAD
Ref. Vol 1-7.3.8 Vol 4-12.3.9/12.3.10

WM9 ARRESTOR BED / ESCAPE ROAD AHEAD
Ref. Vol 1-7.3.8 Vol 4-12.2.14/12.2.15

WM10 SPEED HUMP
Ref. Vol 1-7.3.9 Vol 4-12.2.16



WM11 END OF EXCLUSIVE USE LANE ARROWS
Ref. Vol 1-7.3.9 Vol 4-12.3.11/12.3.12

Fig 2.7 **Warning Road Markings - 2**

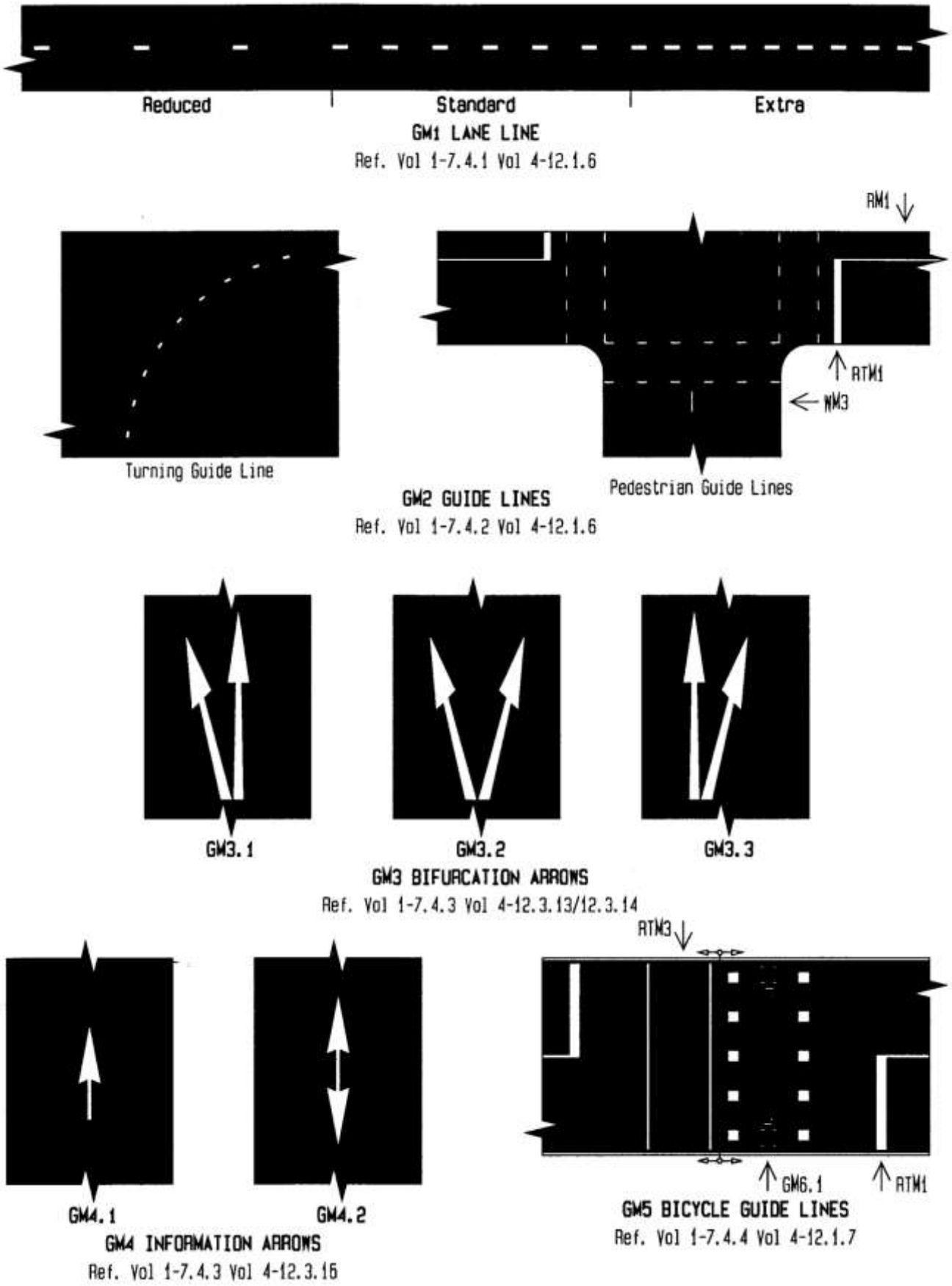


Fig 2.8 **Guidance Road Markings - 1**

GM6.1 Cycle Facility

GM6.2 Airport

GM6.3 Disabled Person Facility

GM6.4 High Occupancy Vehicle

GM6 ROAD MARKINGS SYMBOLS

Ref. Vol 1-7.4.5 Vol 4-12.4.3-12.4.6

GM7 WORD MARKINGS

Ref. Vol 1-7.4.6 Vol 4-12.5.1-12.5.9

GM8 KERBFACE MARKINGS

Ref. Vol 1-7.4.6 Vol 4-12.1.7

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Fig 2.9 **Guidance Road Markings - 2**

(continued from page 2.1.2)

(a) to the smallest practical "scale" which permits several hundred metres of roadway to be illustrated in sections on an A3 page (a 3,7 m lane is shown as 2.5 mm wide) - this scale limits the level of detail - examples may extend to two facing A3 pages;

(b) an intermediate "scale" which permits detail such as roadstuds to be shown effectively (a 3.7 m lane is shown as 10 - 12 mm wide);

(c) a larger "scale" of approximately 1/200 which permits greater clarity of dimensional detail (a 3,7 m lane is shown at 18,5 mm).

4 Figures in Section 2.7 which deal with individual arrow, symbol and letter dimensions are generally drawn to a scale stated in the figure.

5 Whenever practical the colour of all road markings is given by a "black and white" colour shading convention. This is shown in Figure 2.10, Detail 2.10.1.

6 Whenever it has been considered necessary to clarify the direction of travel of traffic in relation to the road markings in the figure this is indicated by means of one or more black triangular arrows. To avoid confusion no other road marking arrows are shown shaded black. An example is illustrated in Detail 2.10.2.

7 In figures which depict significant lengths of roadway the full size width of the road marking lines and their colours are shown within circles which are located at a convenient "end" of a section of roadway. A typical example is shown in Detail 2.10.3.

8 In the smaller scale figures the road marking number and name are both given outside the indication of the roadway. In the larger scale figures the number and name may sometimes be separated so that the number appears within the roadway and the name is kept to the outside of the detail. It is recommended that detailed design drawings being prepared in the drawing office use numbers only, following the method of including the road marking number within the roadway, as close as possible to the actual marking - see Detail 2.10.3.

9 The more commonly used longitudinal broken line markings may be specified as "Reduced", "Standard", or "Extra". The functions of these options are discussed in the relevant subsections but the typical examples include the appropriate word next to the marking or the marking name, according to the availability of space - see Detail 2.10.4.

10 Whenever practical in terms of the "scale" of the figure roadstuds are shown. The roadstuds are illustrated by the convention shown in Detail 2.10.5 and in the larger details they are colour coded in terms of the convention given in Detail 2.10.1. **The use of roadstuds is, however, optional.**

11 The provision of kerbing is an option which is fairly commonly exercised in both rural and urban situations. When the scale of the figure permits, kerbing is illustrated by two thin closely spaced lines. When this convention is used in the figures, black-and-white KERBFACE marking GM8 is normally shown. **The use of marking GM8 is optional.**

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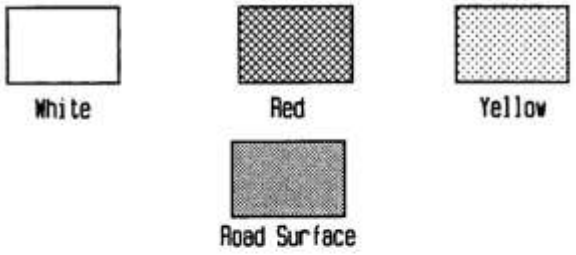
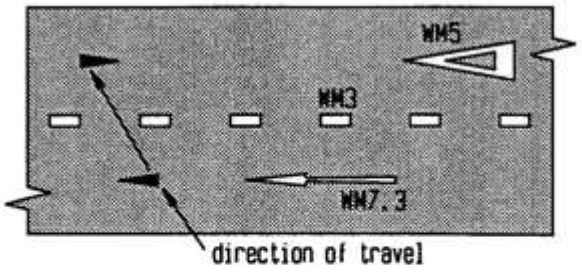
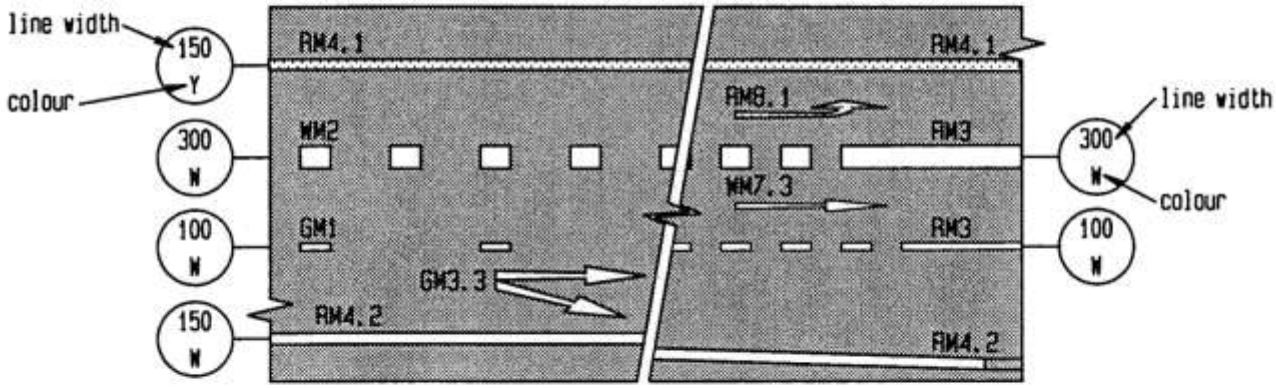


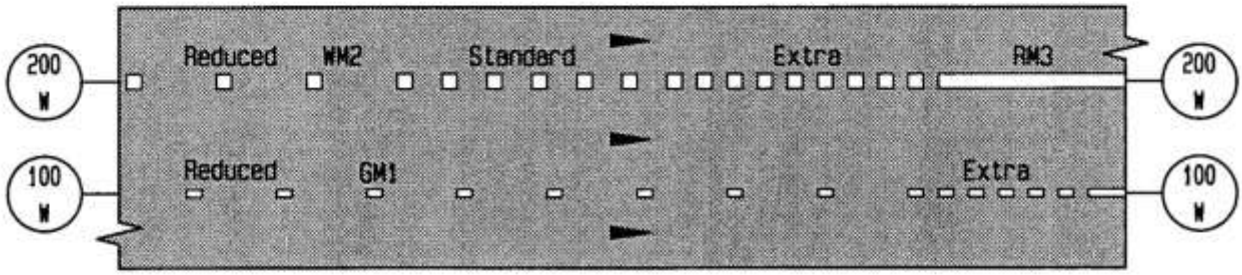
Detail 2.10.1 Colour Code



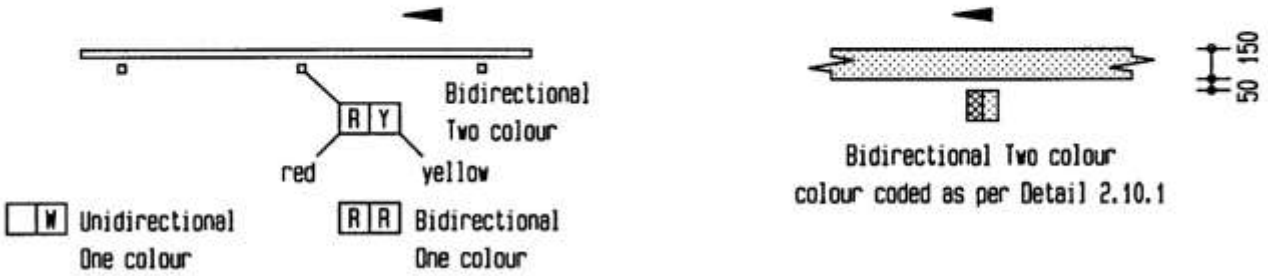
Detail 2.10.2 Direction of Travel



Detail 2.10.3 Road Marking Numbering and Line Width/Colour



Detail 2.10.4 "Reduced", "Standard", "Extra" Broken Line Markings



Detail 2.10.5 Roadstuds

Fig 2.10 **Figure Conventions**

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2.2 GENERAL PRINCIPLES

2.2.1 General

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.

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.

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.

4 This section deals briefly with the various factors relevant to the provision of effective road markings. Greater detail on some of these topics may be found in Volume 1, Chapters 1 and 7.

2.2.2 Figure Dimensions

1 The road marking figures contained in this chapter must be considered as typical. In this context the indication of lane, or even roadway width dimensions is rarely given in the figures. This is because, in reality, there is not a wide range in normal lane width specification, although most road authorities have their own standard requirements.

2 Longitudinal roadway dimensions are, conversely, given in many figures. These commonly relate to geometric components of a road design, as depicted by the road markings. As such the dimensions may cover elements such as:

(a) changes in road width and/or number of lanes;

(b) development of exclusive turning lanes;

(c) the length of such turning lanes;

(d) junction geometry.

The dimension standards given in the figures can generally be considered representative of design for either high speed and/or high standard environments. **The use of these standards and the appropriate dimensions in the figures should not be taken as representing an obligation to provide such standards on the roadway for any specific site or design. The ultimate decisions on dimensions must be made as part of the geometric design process for the site.**

3 In certain of the larger scale figures individual road markings may occasionally be dimensioned to indicate which size, out of a range of sizes, is appropriate in the specific circumstances. In addition all individual arrows, symbols, and letters are fully dimensioned in Section 2.7 - Enhanced Standard Details (see also Subsections 2.1.5 and 2.2.3).

2.2.3 General Principles of Road Marking Dimensions

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 contained in Schedule 3 of the Road Traffic Act, Act 93 of 1996. These dimensions are summarised in Table 2.3.

2 The minimum width of any line marking, as stated in Act 93 of 1996, shall be 100 mm.

3 All broken line markings are described by a LINE-TO-GAP RATIO and recommended dimensions of line and gap lengths are given in Table 2.3. 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.

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.

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 2.11. Specific details of module dimensions are given in Table 2.3 and in Figures 2.19, 2.40 and 2.63 for rural, urban and freeway examples.

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 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.

8 When a multi-lane road is marked or re-marked with parallel broken lines such as DIVIDING LINE marking WM3, LANE LINE marking GM1 and/or CONTINUITY LINE marking WM2, it is common practice to line up the modules at regular cross-section intervals. The line markings may be lined up at the "far" or "near" end of the module cross-section (in the direction of travel), or the markings may be centred on the module cross-section as illustrated in Figure 2.12.

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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 Table 2.3.

10 WORD marking GM7, with a letter size of 5,5 m, has been established for a very long time and many organisations have this size of letter stencil or mask. The dimension of 5,5 m has therefore been retained for GM7 letters in preference to a 5,0 m size.

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. The need for any such road marking should be submitted to:

The Secretary
Route Numbering and Road Traffic Signs Sub-Committee
c/o Department of Transport
Private Bag X193
PRETORIA
0001.

2.2.4 Basic Design Principles

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).**

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.

3 To improve contrast it is generally recommended that road markings which have a night-time significance be made retroreflective by the means of glass beads (*ballotini*), applied either in a pre-application mixed form, or after the application of a paint.

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.

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.

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 Table 2.1 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.

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.

(continued on page 2.2.6)

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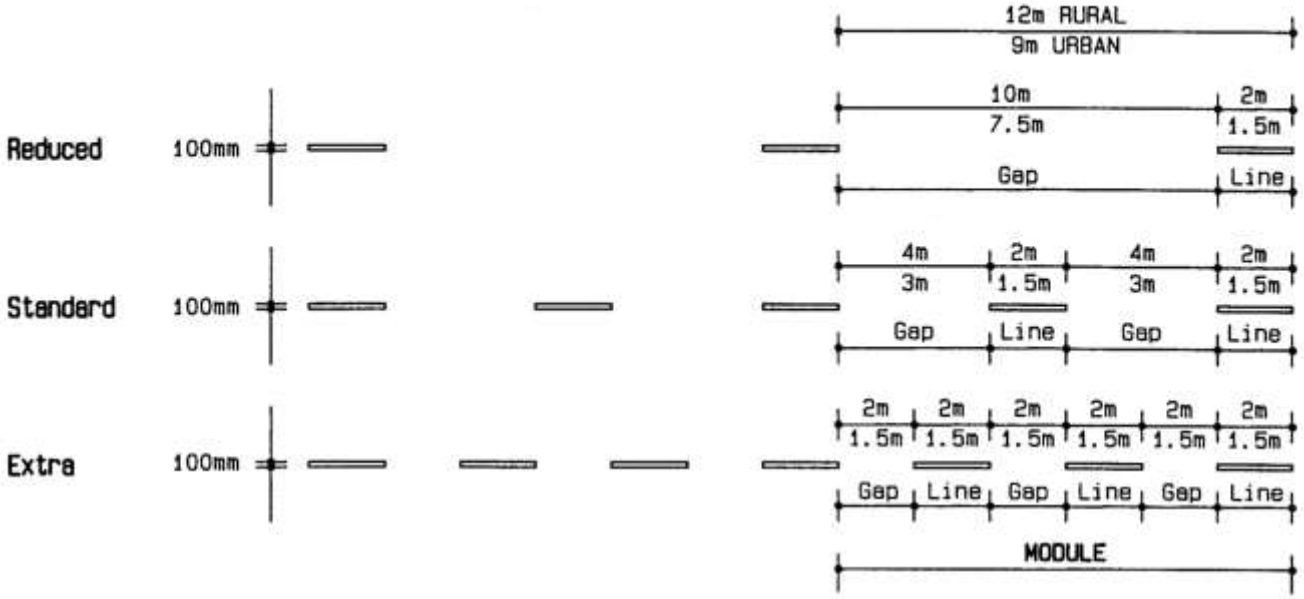
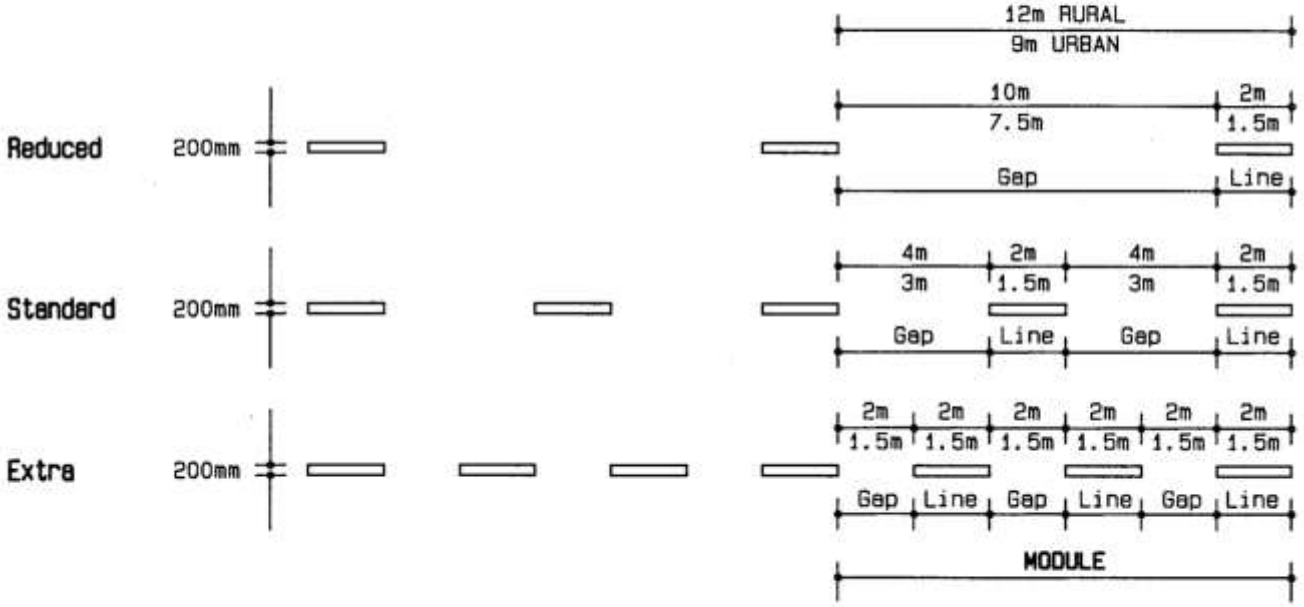
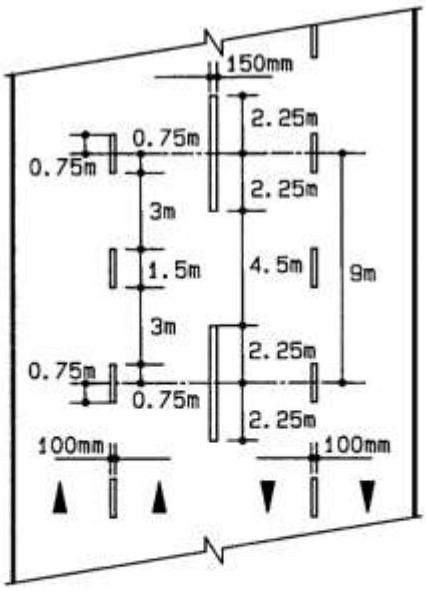


Detail 2.11.1 Lane Line Marking GM1

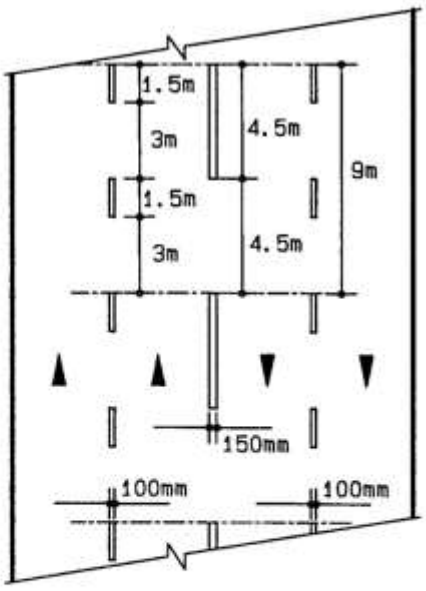


Detail 2.11.2 Continuity Line Marking WM2

Fig 2.11 Typical Modules for Broken Line Markings

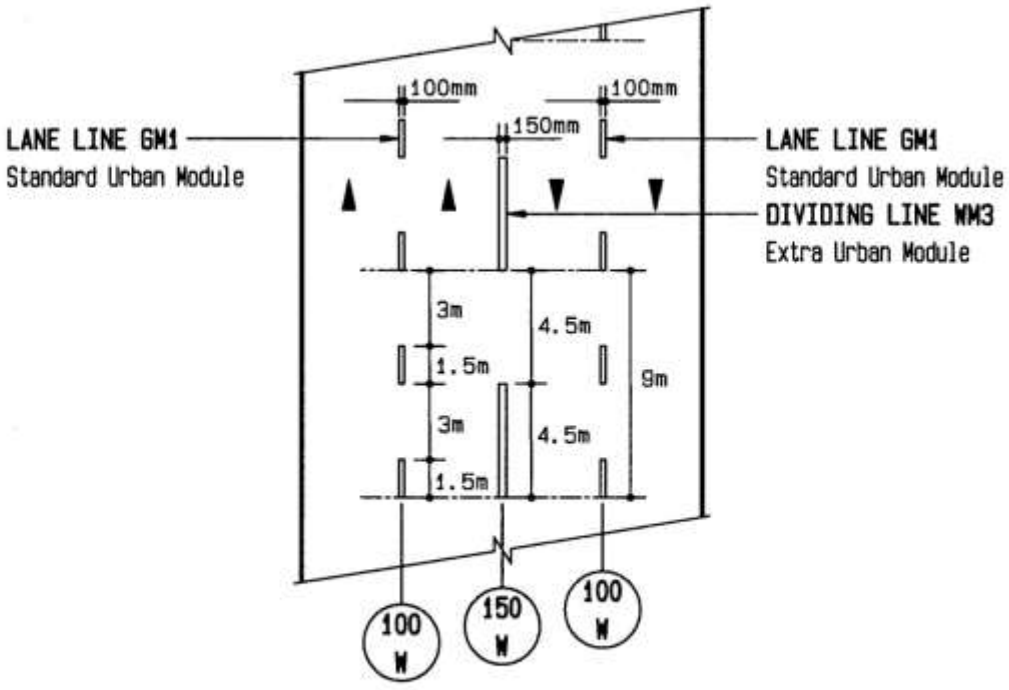


See Detail 2.12.3 for line types etc



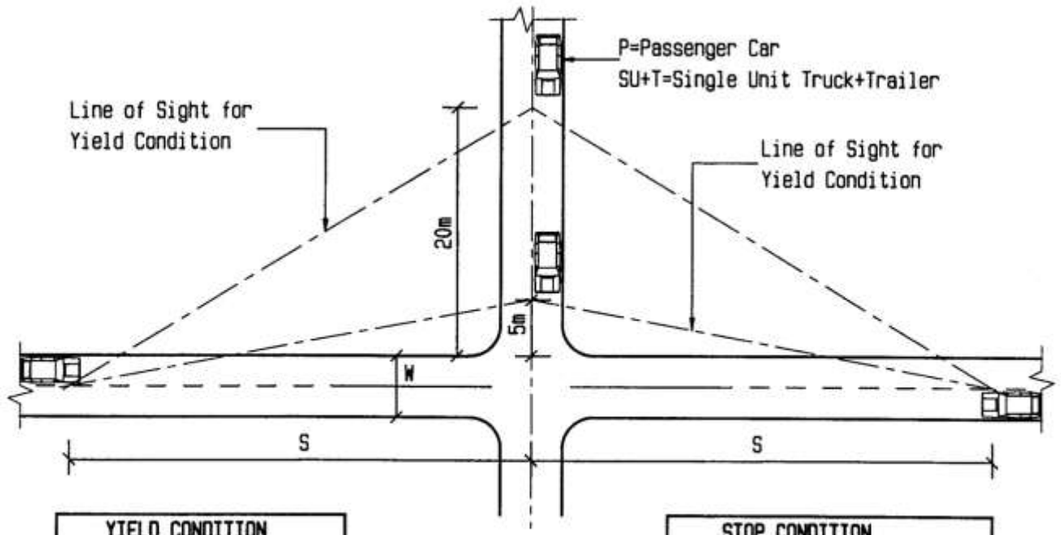
Detail 2.12.1
Modules Lined Up Across the Road on the Centre of Each Marking

Detail 2.12.2
Modules Lined Up Across the Road on the "Far" End of the Dividing Line



Detail 2.12.3
Modules Lined Up Across the Road on the "Near" End of the Dividing Line

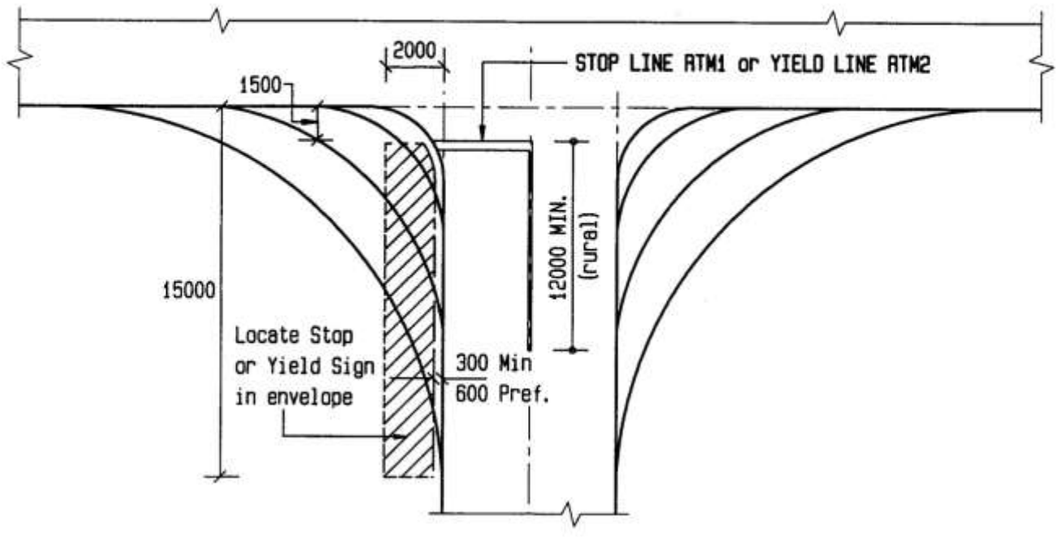
Fig 2.12 Lateral Alignment of Road Marking Modules



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

Detail 2.13.1 Basic Sight Distance Criteria (Ref: Volume 1 - Chapter 2)



Detail 2.13.2 Position of Stop or Yield Signs and Markings

Fig 2.13 STOP and YIELD Sight Distance Considerations

Printers Authorization No. 11542 dated 7th July 2011

TABLE 2.3 SUMMARY OF ROAD MARKING DIMENSIONS TABLE 2.3

NOTE:

The width and length of many road markings may be varried. Arrows, letters and symbols are available in several standard lengths. **Many markings, however, have certain mandatory minimum dimensions prescribed in the Road Traffic Act, Act93 of 1996.** These dimensions are indicated thus •. Marking areas are given as a guide for quantity estimations.

Marking Number (Colour)	Descriptions	Dimensions (mm)		Area (m^2) or (m^2/distance)	
		Rural	Urban	Rural	Urban
Regulatory Transverse Markings:					
RTM1 (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	Width 100 • 150 200	10 m^2/100 m 15 m^2/100 m 20 m^2/100 m 30 m^2/100 m	10 m^2/100 m 15 m^2/100 m 20 m^2/100 m
	("Stacking" Length)	Continuous 1200 •	Continuous 9000 •	200 mm 2,4 m^2	150 mm 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

(Continued on p. 2.2.17)

TABLE 2.1 NOMINAL TAPER RATES FOR LONGIITUDINAL LINES TABLE 2.1

Operating Speed (km/h)	Taper Rate for Line Shift Without Kerbed Island 1 in **		Taper Rate for Line Shift Preceding Kerbed Island 1 in **		
			Width of Kerbed Island		
			600 mm – 1,25 m	1,75 m – 2,5 m	3 m 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		50	40	35

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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.

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

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.

14 A prohibition on overtaking may be marked according to one of three systems, namely (see Figure 2.14):

(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 "Three 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 - if overtaking is to be permitted in one

(continued on page 2.2.10)

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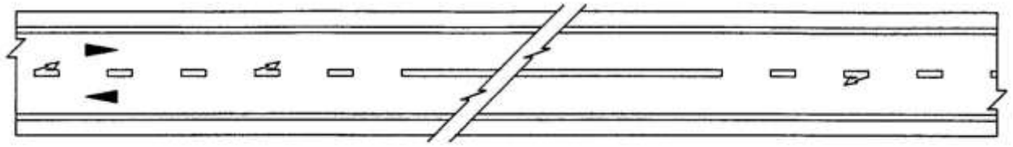
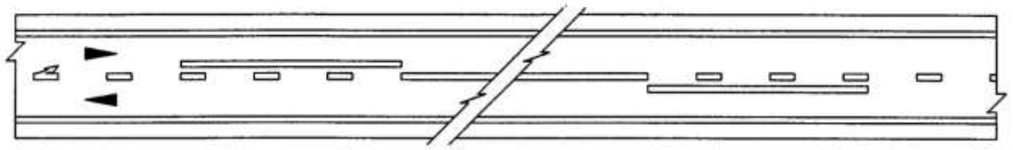
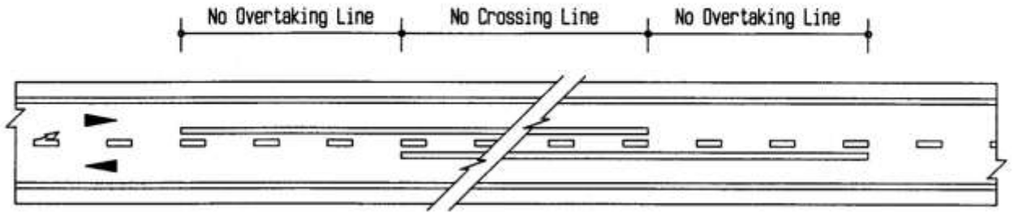


Detail 2.14.1 Single Line System



Detail 2.14.2 Hybrid System



Detail 2.14.3 Three Line System

NOTES:

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

(2) Details 2.14.1 and 2.14.2 show systems of line marking between opposing streams of traffic which involve the **replacement** of DIVIDING LINE wm3 by NO OVERTAKING LINE RM1.

(3) Detail 2.14.3 shows a system where, in effect, two NO OVERTAKING LINES RM1 **added** to DIVIDING LINE WM3, create a NO CROSSING LINE RM2. With such a system it is necessary to discontinue the marking if it is required to give access in a local situation to a property or side road (see Subsection 2.3).

(4) Markings WM3, RM1 and RM2 may be used with or wotout LEFT EDGE LINE marking RM4.1, or on a multi-lane road they may be used with LANE LINE marking GM1.

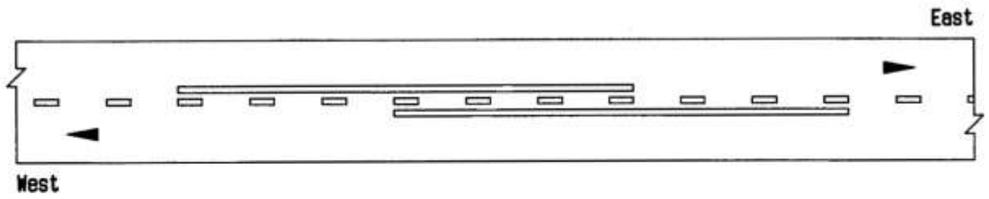
Fig 2.14 Line Combinations Incorporating No Overtaking Markings

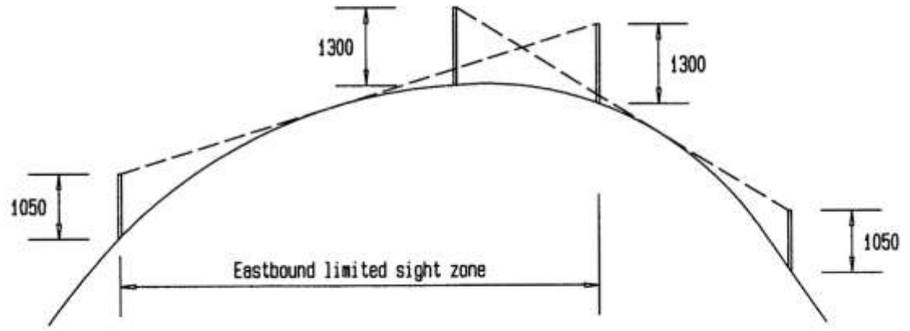
nt Printers Authorization No. 11542 dated 7th July 2011

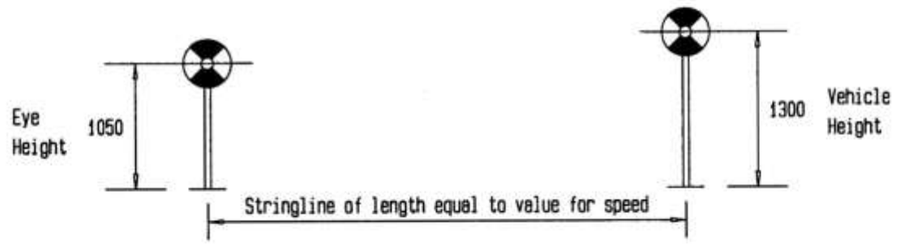
TABLE 2.3 SUMMARY OF ROAD MARKING DIMENSIONS TABLE 2.3

Marking Number (Colour)	Descriptions	Dimensions (mm) Rural	Dimensions (mm) Urban	Area (m^2) or (m^2/distance) Rural	Area (m^2) or (m^2/distance) 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 4000	Length 2000 4000	1,92 m^2	0,48 m^2 1,92 m^2

(Continued on page 2.2.10)







WARRANTS FOR NO OVERTAKING LINE Applicable for Vertical Curves (Fig 2.15) AND Horizontal Curves (Fig 2.16)	
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

Fig 2.15 No Overtaking Lines for Vertical Curves

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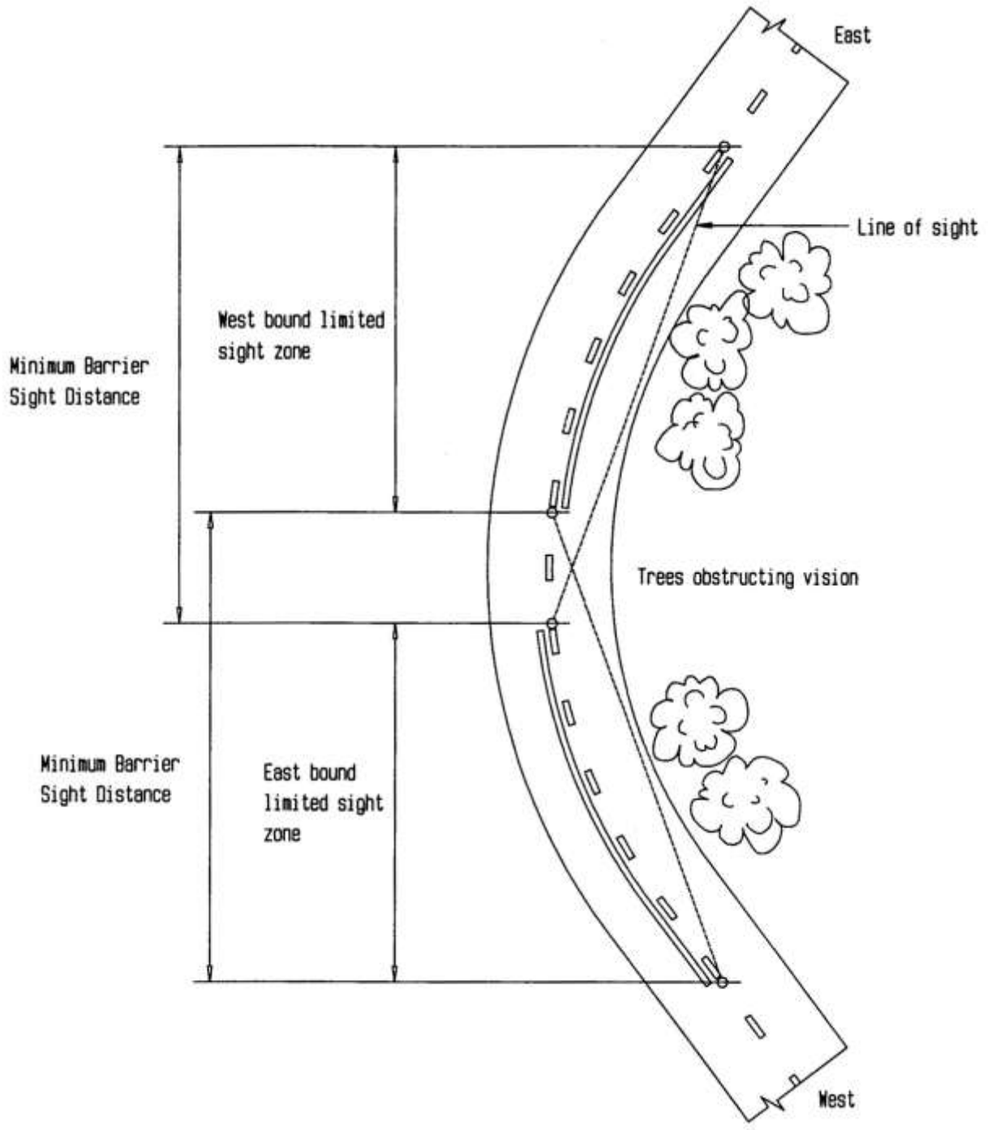

NOTES:

(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. Marking RM1 should then be provided according to one of the three systems described in paragraph 2.2.3.14. If the "Three Line System" is used sections of NO CROSSING LINE may result (see Figure 2.14).

(2) Figure 2.15 gives details of minimum Barrier Sight Distance warrants for the provision of NO OVERTAKING LINES. A Minimum diistance 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.

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

Fig 2.16 No Overtaking Lines for Horizontal Curves

rs Authorization No. 11542 dated 7th July 2011

TABLE 2.3 SUMMARY OF ROAD MARKING DIMENSIONS TABLE 2.3

Marking Number (Colour)	Descriptions		Dimensions (mm) Rural	Dimensions (mm) Urban	Area (m^2) or (m^2/distance) Rural	Area (m^2) or (m^2/distance) 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

(Continued on page 2.2.12)

(continued from page 2.2.6)

direction only for some distance the appropriate solid "third" line is discontinued, permitting overtaking by traffic travelling adjacent to the DIVIDING LINE.

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 2.15. 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.

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 2.15 and 2.16 give details of the setting out of NO OVERTAKING LINES for vertical curves and horizontal curves respectively. Table 2.3 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 2.15. For more information on the positional design of marking RM1 refer to Section 2.3 and Volume 1, Chapter 7.

2.2.5 Specifications

1 The specification of applied road markings, and the testing of such markings for compliance to specification is not well developed. Details given in this section are therefore for the guidance only of any authority wishing to carry out testing.

2 SABS Specifications CKS 192-1971, CKS 501-1981 and SANS 731-1:2006 and 731-2:2006 refer for Drop-on Type Reflectorised Road-marking Paint, High-build Non-skid Road-marking Paint and Road-marking Paint respectively, and deal with the quality of paint manufacture, and offer limited testing advice. They do not cover a number of important properties of road marking paints, nor do they cover other road marking materials, nor any application specifications.

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

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

(a) colour;

(b) luminance factor

(c) coefficient of retroreflection;

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

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.

2.2.6 Roadstuds

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.

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.

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

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(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.

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.

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 2.2.6.5 (a) (i);

(c) WHITE (or clear):

(i) in conjunction with white road markings with the exception of any application covered by sub-paragraph 2.2.6.5 (a) (i).

6 It is recommended that only roadstuds which comply with the requirements of the South African Standard Specification SANS 1442:2008 *Roadstuds* 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 2.2.6.4 and 2.2.6.5. 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 When the conditions given in paragraph 2.2.6.3 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.

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.

9 When roadstuds are specified for use, they should be spaced

(continued on page 2.2.14)

TABLE 2.2 RECOMMENDED LONGITUDINAL ROADSTUD SPACING TABLE 2.2

	Normal (m) Centre - Centre	Intermediate (m) Centre - Centre	Abnormal (m) Centre - Centre
Rural	24	12	6
Urban	18	9	3
Temporary	12	6	3 down to 1

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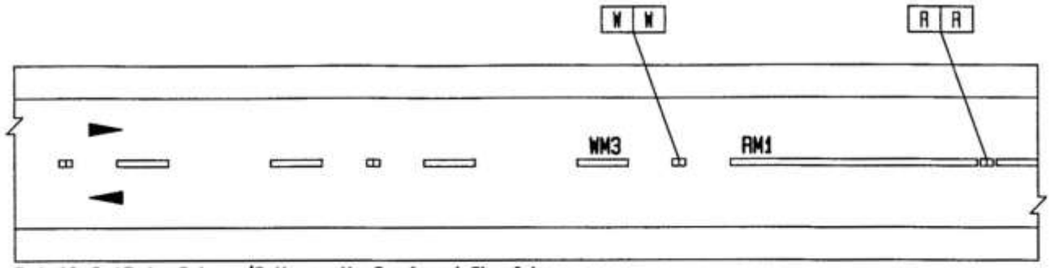
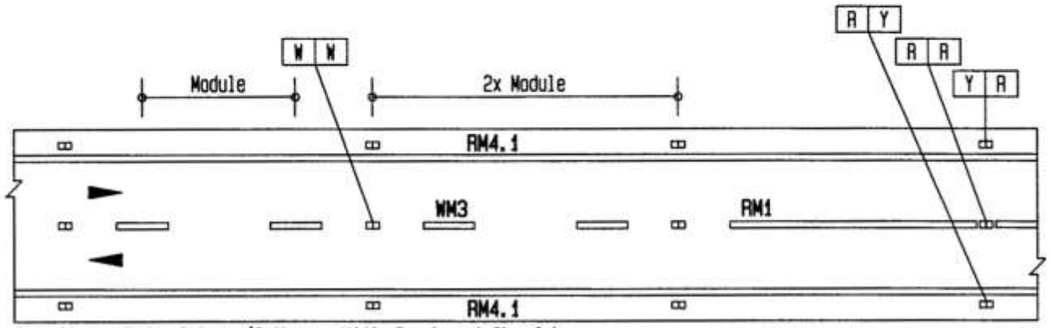
TABLE 2.3 SUMMARY OF ROAD MARKING DIMENSIONS TABLE 2.3

Marking Number (Colour)	Descriptions	Dimensions (mm) Rural	Dimensions (mm) Urban	Area (m^2) or (m^2/distance) Rural	Area (m^2) or (m^2/distance) Urban
Warning Markings (continued):					
WM4 (White)	Reversible Lane Lines	N/A	Width 2 x 100 Module 9000 Line/Gap 1,5m/3m	N/A	6,67 m^2/100 m
	Standard				
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

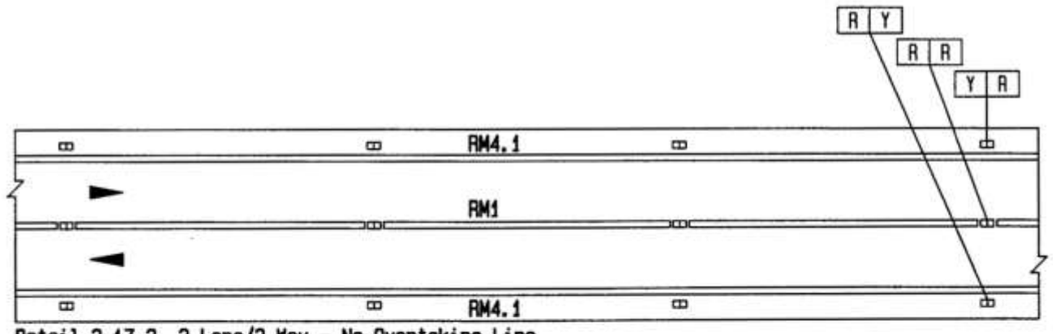
(Continued on page 2.2.14)



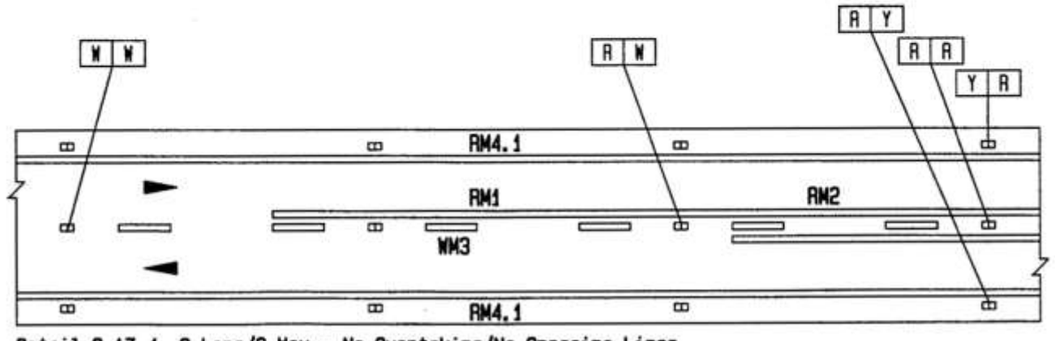
Detail 2.17.1 2 Lane/2 Way - No Surfaced Shoulders



Detail 2.17.2 2 Lane/2 Way - With Surfaced Shoulders



Detail 2.17.3 2 Lane/2 Way - No Overtaking Line



Detail 2.17.4 2 Lane/2 Way - No Overtaking/No Crossing Lines

Fig 2.17 Basic Details of Roadstuds on Two-Lane Two-Way Roadways

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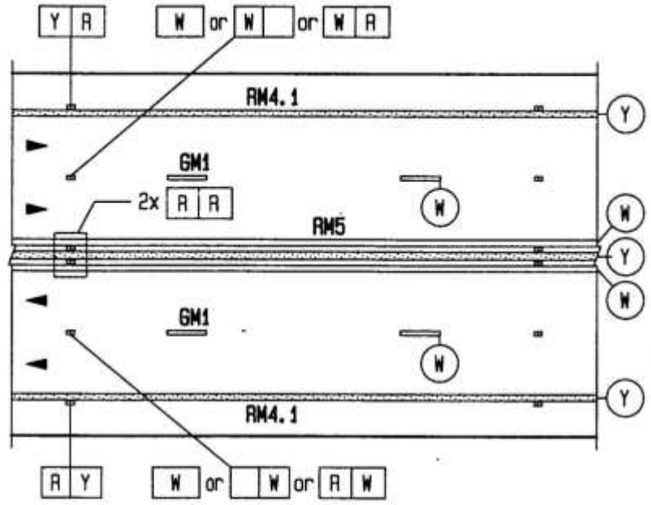
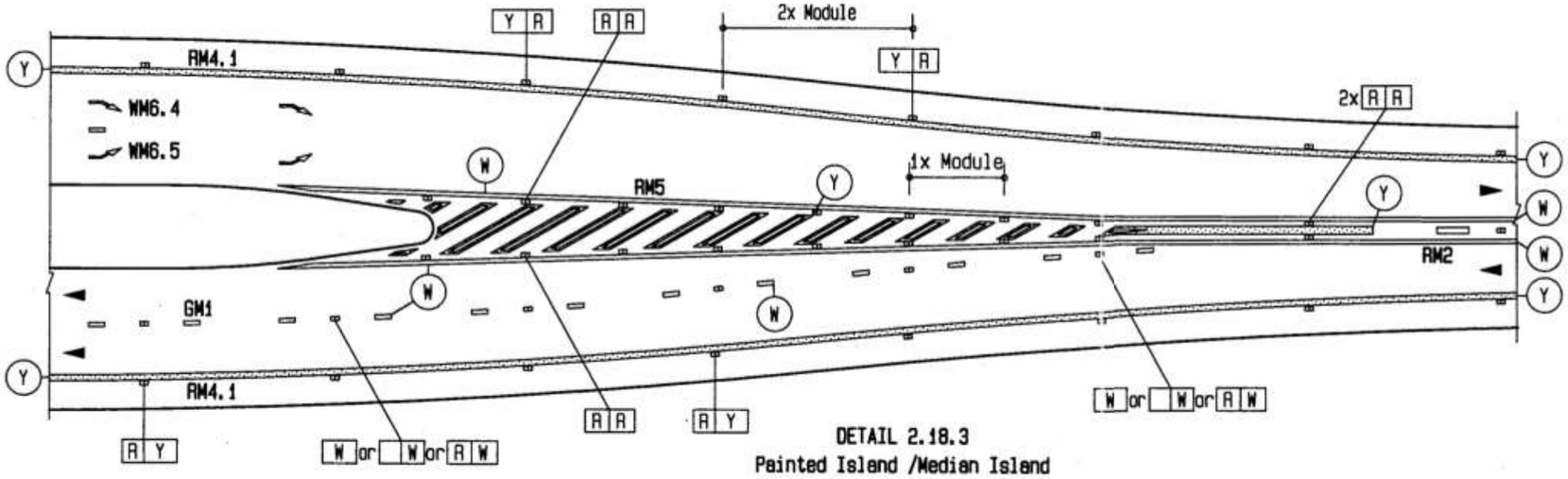
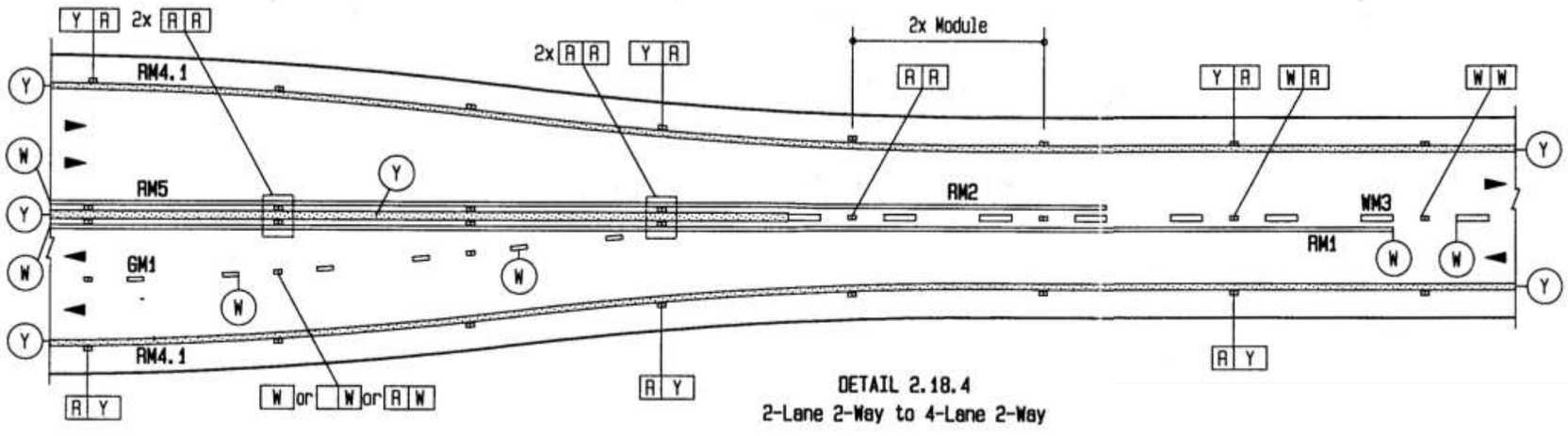


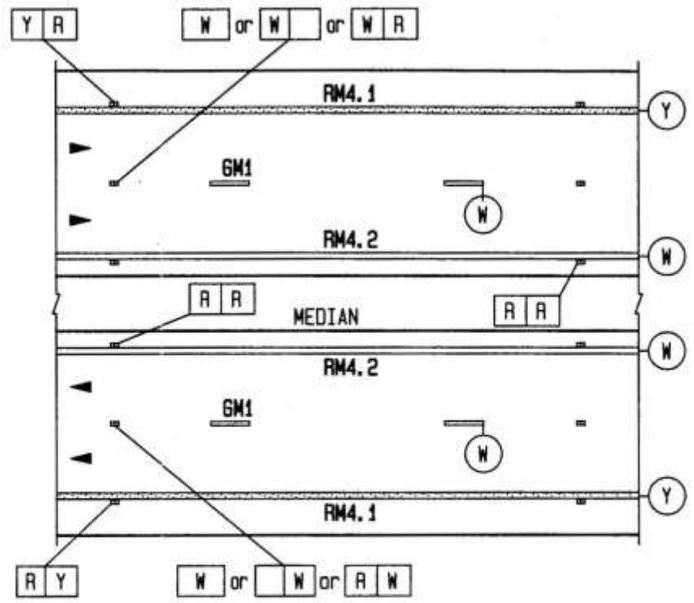
DETAIL 2.18.1
4-Lane 2-Way



DETAIL 2.18.3
Painted Island /Median Island



DETAIL 2.18.4
2-Lane 2-Way to 4-Lane 2-Way



DETAIL 2.18.2
4-Lane Dual Carriageway Road
(Freeway Class A1 or At-Grade)

ROADSTUD KEY

W	Omnidirectional White
W	Unidirectional White
W W	Bidirectional White/White
R W	Bidirectional White/Red
R Y	Bidirectional Yellow/Red
R R	Bidirectional Red/Red

Fig 2.18
Roadstuds on Multi-Lane Roads

TABLE 2.3 SUMMARY OF ROAD MARKING DIMENSIONS TABLE 2.3

Marking Number (Colour)	Descriptions	Dimensions (mm) Rural	Dimensions (mm) Urban	Area (m^2) or (m^2/distance) Rural	Area (m^2) or (m^2/distance) 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	N/A	Width 200 Line/Gap 200/400	N/A	10 m^2 approx.
	on width of Line				
WM11 (White)	End of Exclusive Use Lane Arrows	N/A	Length	N/A	
	WM11.1		7200		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

(Continued on p. 2.2.16)

(continued from page 2.2.11)

longitudinally in accordance with the recommendations in Table 2.2. The terms "Normal", "Intermediate" and "Abnormal" used in Table 2.2 are general terms intended to offer a limited grading of the severity of conditions which may warrant the use of roadstuds.

10 In addition to the requirements of Table 2.2 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.

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. Figures 2.17 and 2.18 illustrate basic roadstud applications and colour codes.

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.

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.

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.

2.2.7 Materials and Maintenance

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

2 Road marking paints may be applied in a range of thicknesses of the order of 0,2 mm to 0,5 mm and are designed to be quick drying. Thin application paints, with limited durability, are appropriate only to lightly trafficked roads or roads likely to be subjected to maintenance within the longer life of more appropriate thicker application markings used on busier roads.

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.

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 ap creed applied (up

(Continued on page 2.2.16)

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.

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.

2.2.8 Temporary Markings

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.

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.

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.

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

2.2.9 Warrants

1 Precise warrants for the use of road markings are not well developed. Guidance is given in Volume 1, Chapter 7 in relation to certain road markings. The following may be considered as general warrants for the use of certain common road markings (see also paragraph 2.2.9.2):

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(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 (see examples in Sections 2.3 and 2.4).

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 (see Chapter 7, Figure 7.4) - RAILWAY CROSSING AHEAD marking WM1;

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

(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 arrestor bed - ARRESTOR BED AHEAD marking WM9;

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

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TABLE 2.3 SUMMARY OF ROAD MARKING DIMENSIONS TABLE 2.3

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

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2.3 ROAD MARKING APPLICATIONS IN RURAL SITUATIONS

2.3.1 General

1 The examples of road marking applications illustrated in this section fall broadly into two groups:
   (a) those relating to the commonly long sections of road between rural junctions comprising mainly longitudinal regulatory and warning markings; and
   (b) those used, often in addition to those in (a) above, at rural road junctions.

2 Examples of applications of road markings in urban and freeway situations are illustrated in Sections 2.4 and 2.5.

3 Situations such as climbing lanes are commonly found on sections of rural road. If such a facility is required on a freeway or in an urban area the detail given in Figures 2.34 or 2.35 should be adapted accordingly by, for instance, use of urban broken line modules in place of rural modules.

4 In some instances the scale of an illustration may limit the amount of detail which can be given. Where necessary, additional enhanced, or enlarged, details are given in Section 2.7. These enhanced standard details are commonly appropriate to several marking applications. In addition, although this section contains specific examples of rural applications of PAINTED ISLAND marking, this marking is covered in detail in Section 2.7 by Figures 2.87 to 2.92.

2.3.2 Section Coverage

1 The examples of rural road marking applications covered in this section start with the basic components and then cover the following groups of application types:

   (a) broken line patterns;

   (b) longitudinal line markings;

   (c) basic junction marking;

   (d) the beginning and ending of dual carriageways;

   (e) lane drops;

   (f) painted islands.

2 There is the potential for much duplication of application examples between various sections. This has been avoided as much as is practical. If the user wishes to view a broader range of examples those in other sections should be assessed. This action may be particularly relevant in peri-urban or urban fringe areas.

3 As part of the action to avoid duplication a number of very basic principles are covered in Section 2.2. These principles have been considered so basic as to apply throughout the road network at virtually all levels. Typical subjects covered in Section 2.2 which are relevant to rural road marking applications are:

   (a) alignment of lane markings on multi-lane roads (Figure 2.12);

   (b) STOP and YIELD sight distances and sign location (Figure 2.13);

   (c) tapers (Table 2.1);

   (d) NO OVERTAKING LINE marking RM1 warrants (Figures 2.14 to 2.16);

   (e) roadstuds (Subsection 2.2.6, Table 2.2 and Figures 2.17 and 2.18).

2.3.3 Specification and Materials Quantities

1 Detailed specifications are not covered but Subsection 2.2.5 gives limited guidance.

2 As an aid to measuring **quantities** of road markings, **by area**, Table 2.3 lists areas by each standard size of individual marking in m^2, or for longitudinal markings by an appropriate length i.e. m^2/100 m. This table stretches over pages 2.2.6 to 2.2.16 and is arranged to fold out so that it can be visible anywhere in the Chapter, or, in fact if the user is working with specific road marking drawings.

3 It should be noted that the minimum width of any road marking line is 100 m. The various application details give recommended line widths in the manner illustrated in Figure 2.10. Road authorities may always use a wider line than indicated in the details. If this option is exercised, however, it is recommended that any line width differential indicated in a detail be maintained.

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2.3.4 Rural Longitudinal Road Markings

1 By far the greatest proportion of road markings on rural roads are longitudinal road markings, either in the form of:

(a) broken line markings; or

(b) continuous line markings.

2 On rural roads longitudinal lines commonly separate traffic travelling in opposite directions. Such lines are recommended to be 150 mm in width on all but the lowest class roads. A line separating opposing streams of traffic is generally referred as a "dividing line". The following line types may be used for this function:

(a) DIVIDING LINE marking WM3 (broken line);

(b) NO OVERTAKING LINE marking RM1 (continuous line);

(c) NO CROSSING LINE marking RM2 (double continuous lines).

3 Figure 2.19 illustrates the longitudinal broken line types most commonly used on rural roads. Broken lines should be marked in a regular repeating modular pattern. **The module length for rural road markings is 12 m.** Modular broken line markings may be applied as STANDARD, REDUCED or EXTRA MODULES. The decision to alter from one type of module to another, or to choose one type of module instead of another, may be warranted by factors such as:

(a) the need to economise where visual impact is not critical;

(b) the need for increased visual impact from road marking due to horizontal or vertical curvature, high traffic volumes or a change in the roadway cross-section or lane configuration;

(c) the need to emphasize to road users the difference between functionally different, but visually similar, types of road markings;

(d) the use of a progressive increase in density of marking approaching a point of divergence, convergence, or potential conflict of traffic.

4 Figures 2.20 and 2.21 illustrate various aspects of longitudinal line markings used in combination with each other. These start, in Detail 2.20.1, with the application of SHOULDER DELINEATOR devices D1, which are classified as a form of road marking due to their function. These devices may be specified for gravel roads or for roads with a narrow surface (under 5,5 m in width) in order to give an indication of road alignment. The spacing between delineators should be reduced for shorter radius curves.

5 Details 2.20.2 to 2.20.7 show a progressive build up in line marking intensity with increasing roadway width through the provision of surfaced shoulders to a dual carriageway cross-section.

6 Figure 2.21 gives examples of the three recognised methods of marking the dividing line on a 2-lane 2-way rural road. The "3-line" system builds upon a continuous DIVIDING LINE marking WM3 by the addition of NO OVERTAKING LINE marking RM1 on one or both sides of the WM3 line according to the requirement to prohibit overtaking. It should be noted that when lines RM1 are placed on both sides of WM3 an effective NO CROSSING LINE marking RM2 is created. The "2-line" system is similar to the three line system, with the exception that, when overtaking is to be prohibited from both sides of the dividing line, the NO OVERTAKING LINE marking RM1 **REPLACES** the DIVIDING LINE marking WM2. A "no crossing" operation is **NOT** automatically created in this instance. The simple "1-line" system works on the basis that the DIVIDING LINE marking WM3 is replaced by the NO OVERTAKING LINE marking RM1, thereby creating a prohibition in both directions. If it is likely that a road will be marked to permit overtaking in one direction, but not in the opposite direction, then either the "2-line" or "3-line" system should be used.

7 Detail 2.21.4 shows the use of NO OVERTAKING LINE AHEAD ARROW marking WM8. These should be marked so that there are always at least two such arrows preceding the start of a NO OVERTAKING LINE marking RM1. This requirement should **not**, however, be taken to mean that minimum length of DIVIDING LINE marking WM2, between successive sections of NO OVERTAKING LINE marking RM1, should or may be 60 m. Such a length should be determined by engineering analysis taking account of the specific terrain characteristics.

8 Figure 2.22 gives details of options which may be used when a NO CROSSING LINE is specified but it is still necessary to permit access to properties at a very limited number of points. Since the specific function of line RM2 is to prevent vehicles from crossing the dividing line there is little point in using it if regular breaks are going to be provided (intervals of less than 200 m).

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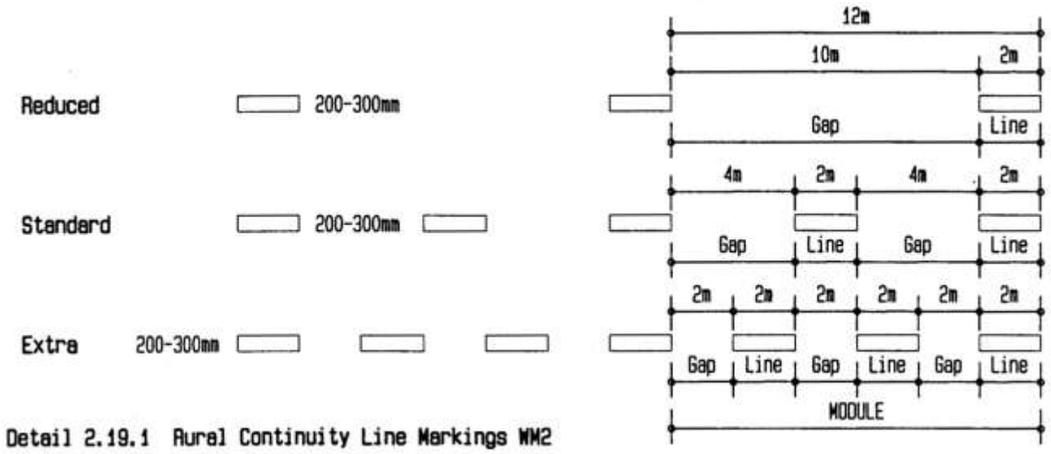
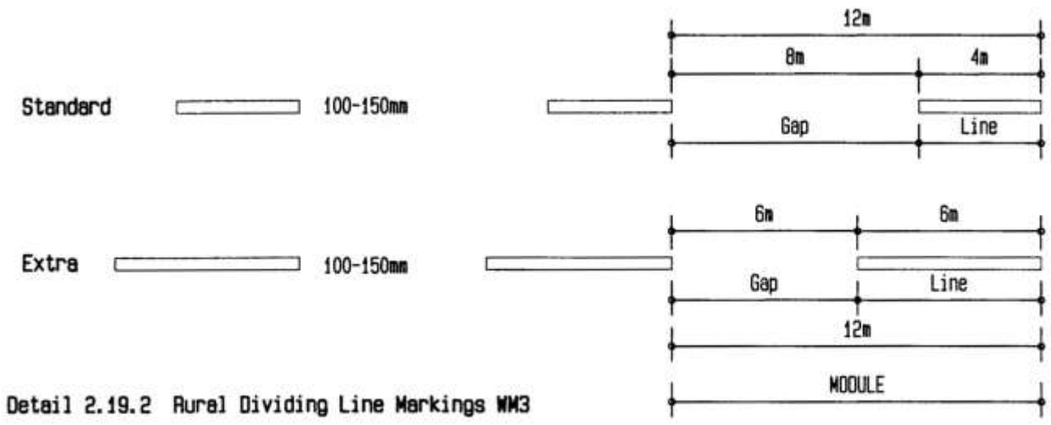
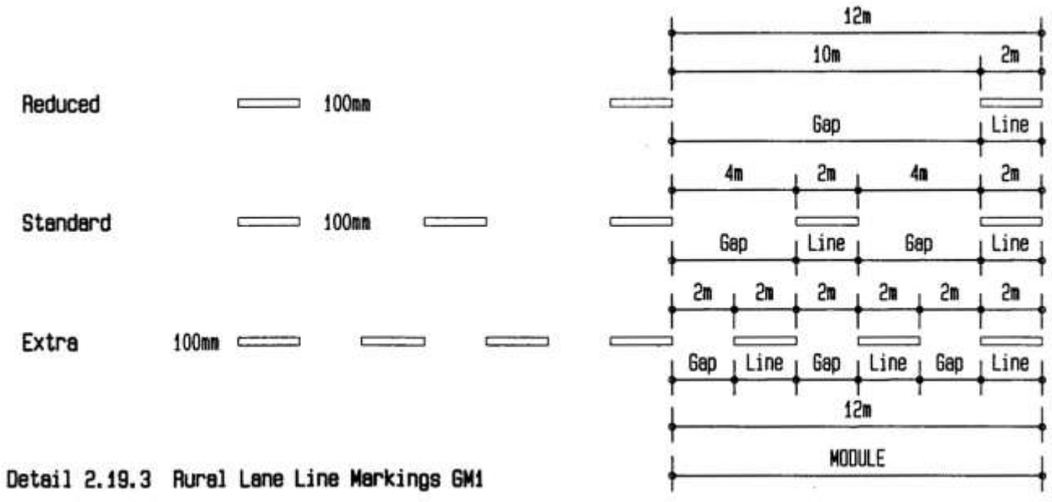


Detail 2.19.1 Rural Continuity Line Markings WM2



Detail 2.19.2 Rural Dividing Line Markings WM3



Detail 2.19.3 Rural Lane Line Markings GM1

Fig 2.19 Rural Broken Line Module Characteristics

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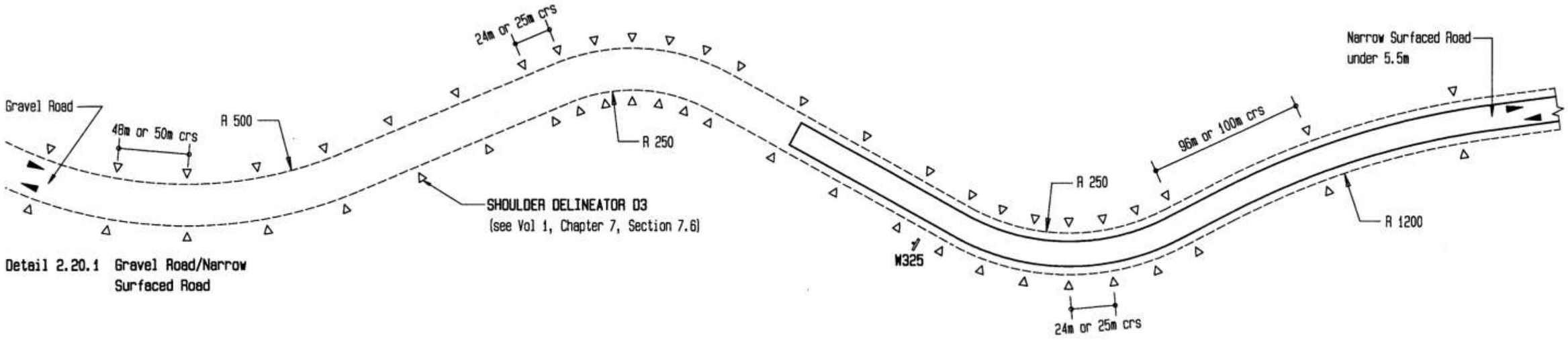
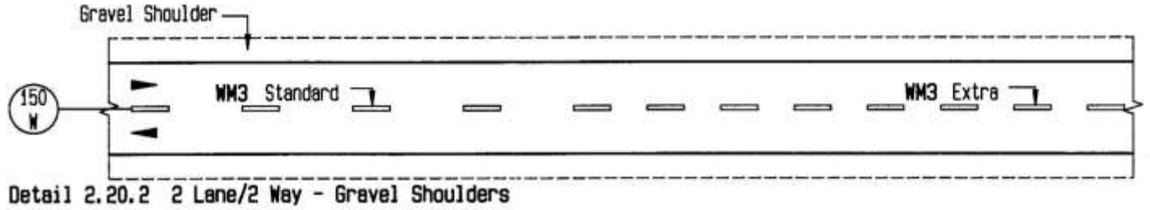
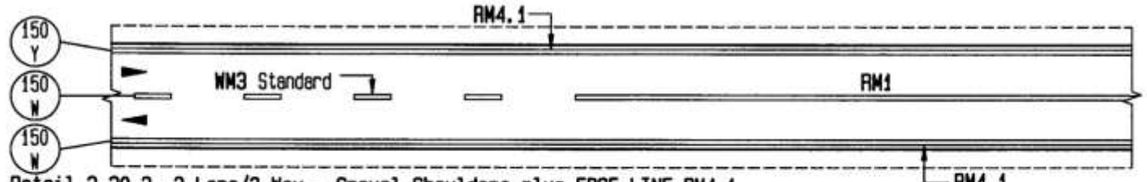


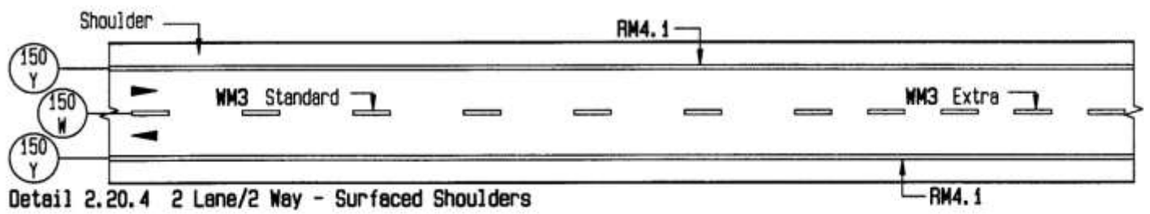
Detail 2.20.1 Gravel Road/Narrow Surfaced Road



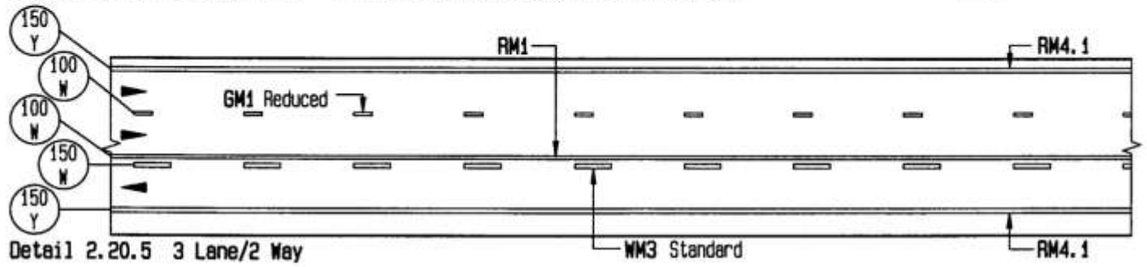
Detail 2.20.2 2 Lane/2 Way - Gravel Shoulders



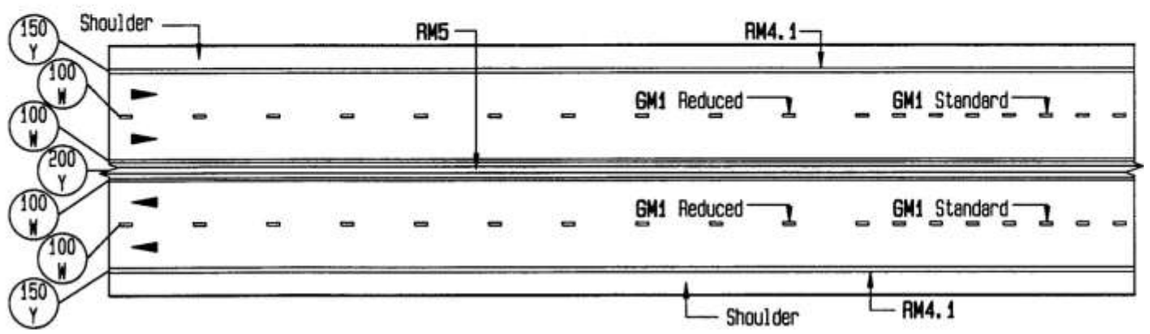
Detail 2.20.3 2 Lane/2 Way - Gravel Shoulders plus EDGE LINE RM4.1



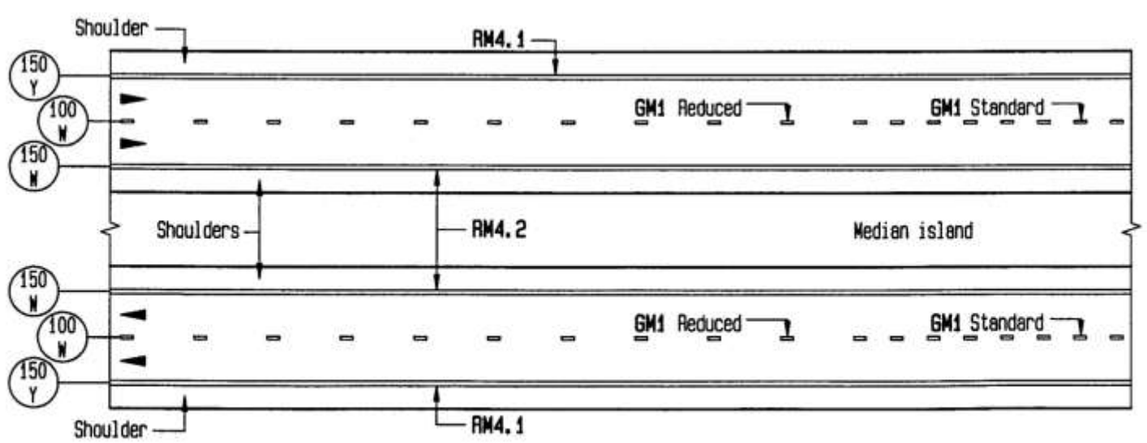
Detail 2.20.4 2 Lane/2 Way - Surfaced Shoulders



Detail 2.20.5 3 Lane/2 Way

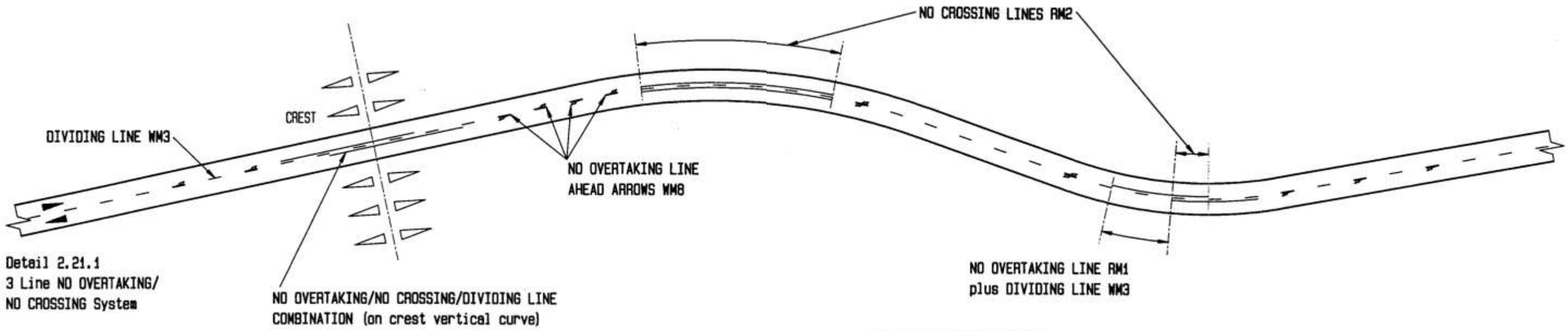


Detail 2.20.6 4 Lane Undivided

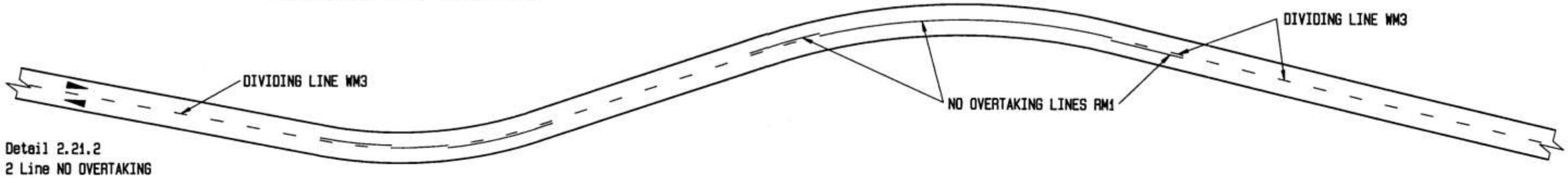


Detail 2.20.7 4 Lane Divided - Dual Carriageway

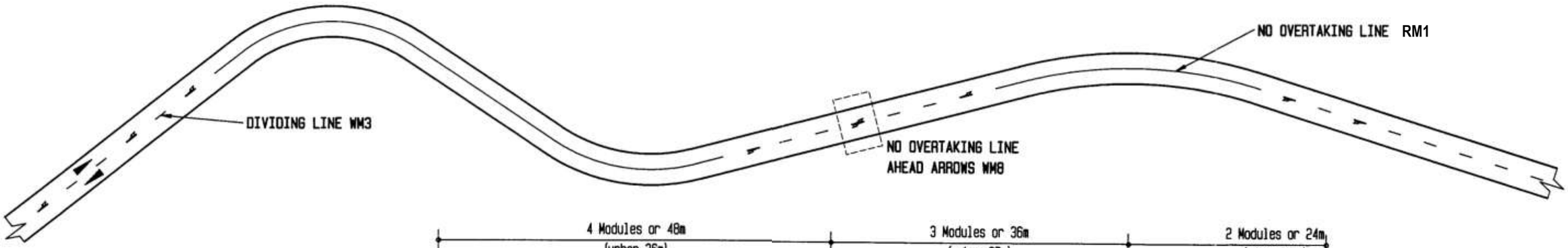
Fig 2.20
Longitudinal Line Combinations - 1



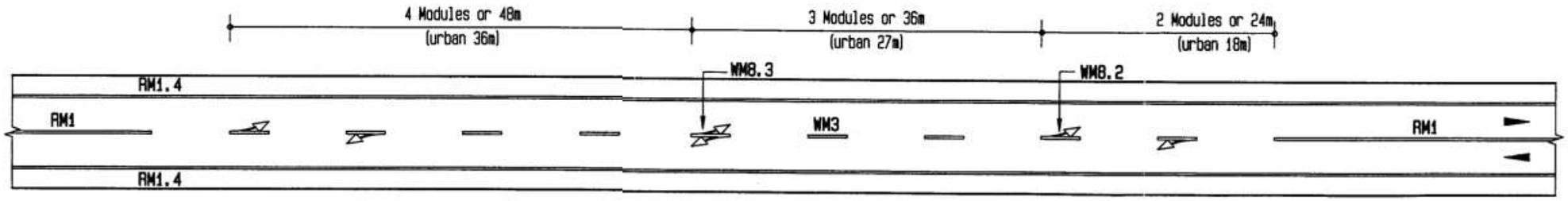
Detail 2.21.1
3 Line NO OVERTAKING/
NO CROSSING System



Detail 2.21.2
2 Line NO OVERTAKING
System



Detail 2.21.3
1 Line NO OVERTAKING
System



Detail 2.21.4
NO OVERTAKING LINE or
NO CROSSING LINE AHEAD WM8 Arrows

Fig 2.21
Longitudinal Line Combinations - 2

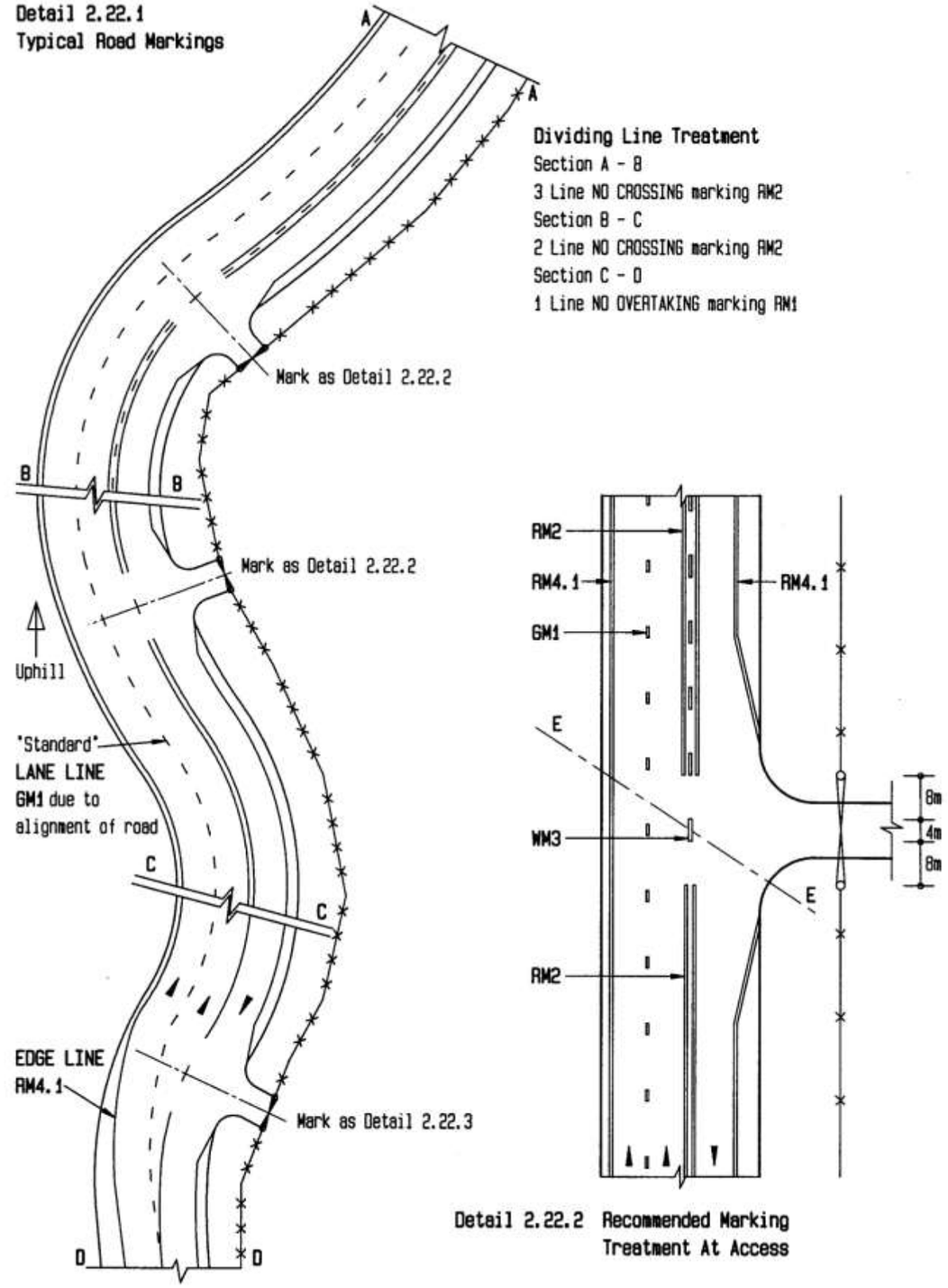


Fig 2.22 Access Across No Overtaking/No Crossing Lines

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ROAD MARKINGS SARTSM – VOL 2 MAY 2012

2.3.5 Basic Junction Marking

1 Figures 2.23 to 2.28 cover the road marking of a range of typical rural road junctions, from a minor main road / gravel side road junction, up to multi-lane approach treatments. Basic regulatory and warning signs are indicated by position in the details, but for more complete information on the signing aspect refer to Chapter 3: *Regulatory and Warning Signs and Markings Applications*.

2 In the various details references have not been made to classes of rural road because, effectively, the marking details are independent of road classification. For example, the first detail in Figure 2.23 could apply to a numbered rural Class B route, just as appropriately as the dual carriageway detail in Figure 2.27. (The signing of the full range of rural junctions by road approach class is covered in Chapter 10: *Rural Junction Signing*.)

3 A principle design factor, which has influenced the details in these figures, has been an attempt to create an awareness of, what might very well be an otherwise invisible side road junction, particularly during the hours of darkness. As a general principle it is, therefore, recommended that this be achieved by a change in the "normal" longitudinal line markings, whatever these may be. Thus, as a basic step, it is recommended that a NO OVERTAKING LINE marking RM1 be introduced on each main road approach, and that this be discontinued through the actual junction. The minimum length of such a line should be 60 m ,but it may be made longer, particularly for high speed approaches. The discontinuity in the RM1 marking should be at least 20 m, comprising a 8 m - 4 m - 8 m, GAP - LINE - GAP, (or short section of typical rural DIVIDING LINE marking WM3), located centrally on the intersecting side road. As junction geometry becomes more complex it may well be necessary to vary this 20 m distance but it is likely to be adequate until the side road is provided with turning lanes.

4 The various examples in Figures 2.24 to 2.26 show a progressive increase in through-road marking intensity for both T-junctions and crossroads, including the following specific features:

(a) dropping of a LEFT EDGE LINE marking RM4.1 and its replacement by CONTINUITY LINE marking WM2;

(b) introduction of an extra lane through the junction in place of an emergency shoulder, with attendant MANDATORY DIRECTION ARROWS RM8 and MANDATORY DIRECTION ARROWS AHEAD WM7 - the line between the two lanes is a LANE LINE marking GM1 (**NOT** a WM2 marking);

(c) introduction of protected right turn lanes using PAINTED ISLAND marking RM5 (this treatment may be achieved without RM5 marking, by means of an extended CONTINUITY LINE marking WM2 on the alignment of the indicated painted island - such a treatment will, however, lack the visual impact of the painted island).

5 **In all instances the vertical profile and horizontal alignment on the approach to a junction must be given adequate consideration. If either or both of these geometric factors is likely to inhibit the effectiveness of the markings, at the dimensions illustrated, the markings should be increased in length so that their visual impact is effective before the start of such a geometric constraint.**

6 Figures 2.27 and 2.28 illustrate typical dual carriageway and single carriageway multi-lane approaches to a rural junction. Whilst an indication is given in these figures of the lengths of additional turning lanes these should be considered as guidelines only and should be subject to engineering assessment.

7 Roadstuds have been shown in these figures as an option. For further details on roadstud applications refer to Subsection 2.2.6 and Figures 2.17 and 2.18.

8 A common principle used through all relevant examples, is to "define" the through traffic portion of the roadway by defining its limits by a "heavier" or more visible longitudinal road marking. Such road markings are normally a CONTINUITY LINE marking WM2 and/or a CHANNELIZING LINE marking RM3 and they commonly form a longitudinal continuation of a preceding LEFT EDGE LINE marking RM4.1, or, on a dual carriageway road, a RIGHT EDGE LINE marking RM4.2.

9 Figure 2.29 gives a number of larger scale dimensional details applicable to typical rural road junctions covering the following requirements:

(a) STOP LINE marking (see also Figure 2.13);

(b) YIELD LINE marking;

(c) typical rural road word marking;

(d) typical deceleration / left turn lane marking;

(e) typical acceleration lane treatment;

(f) various aspects applicable to a median opening in a dual carriageway road.

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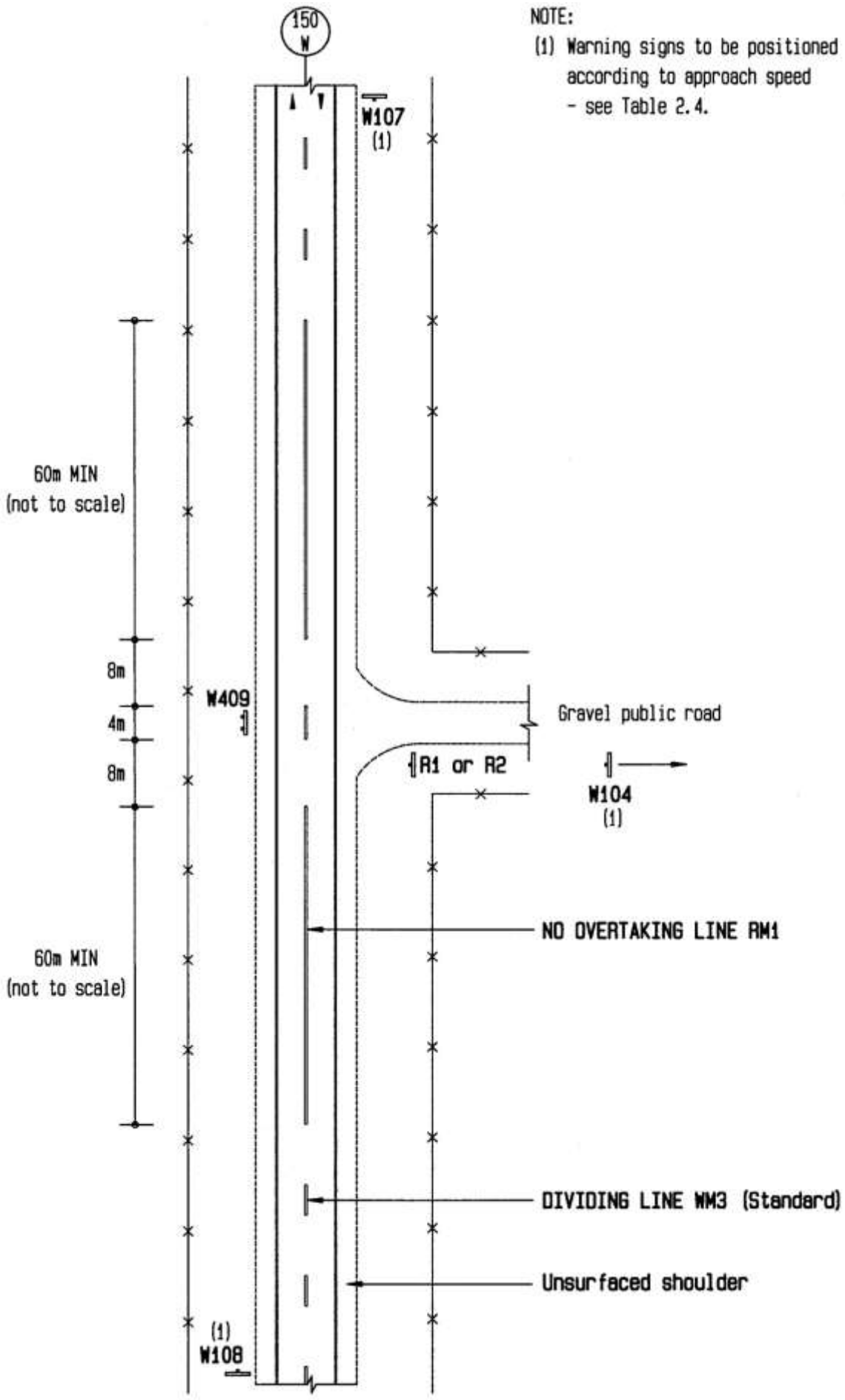

Fig 2.23 **Basic Junction Marking - 1**

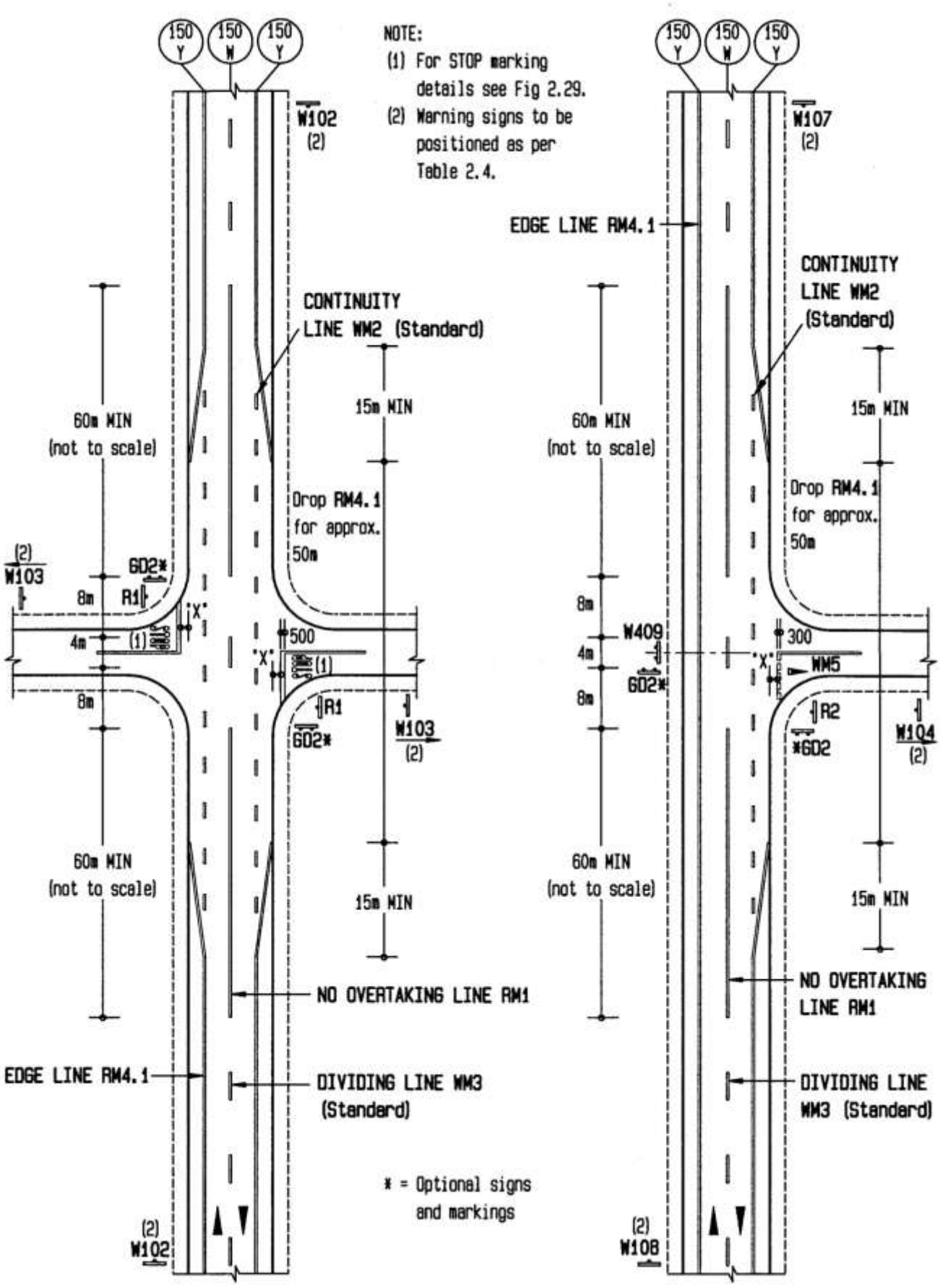

Fig 2.24 **Basic Junction Marking - 2**

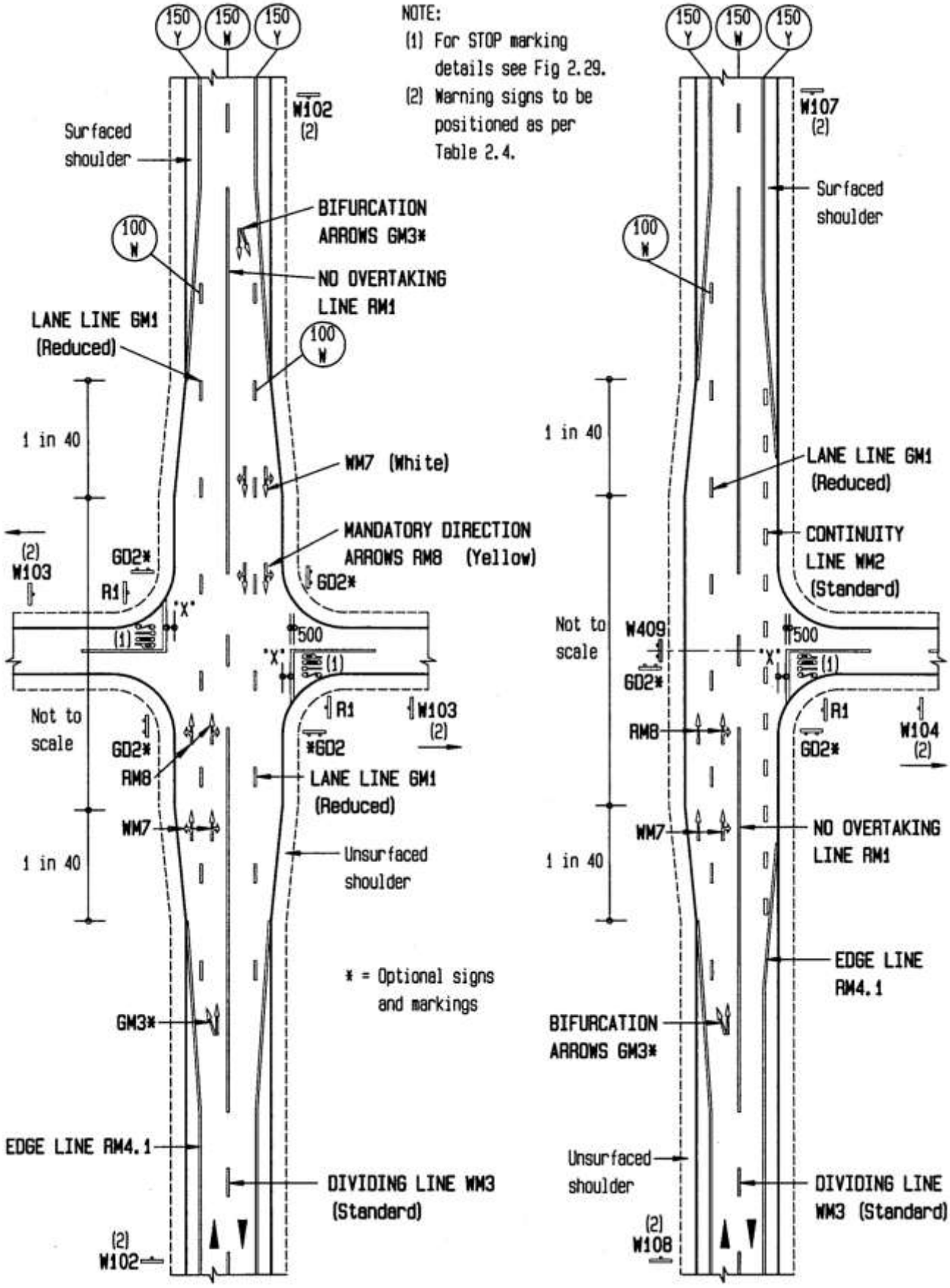

Fig 2.25 **Basic Junction Marking - 3**

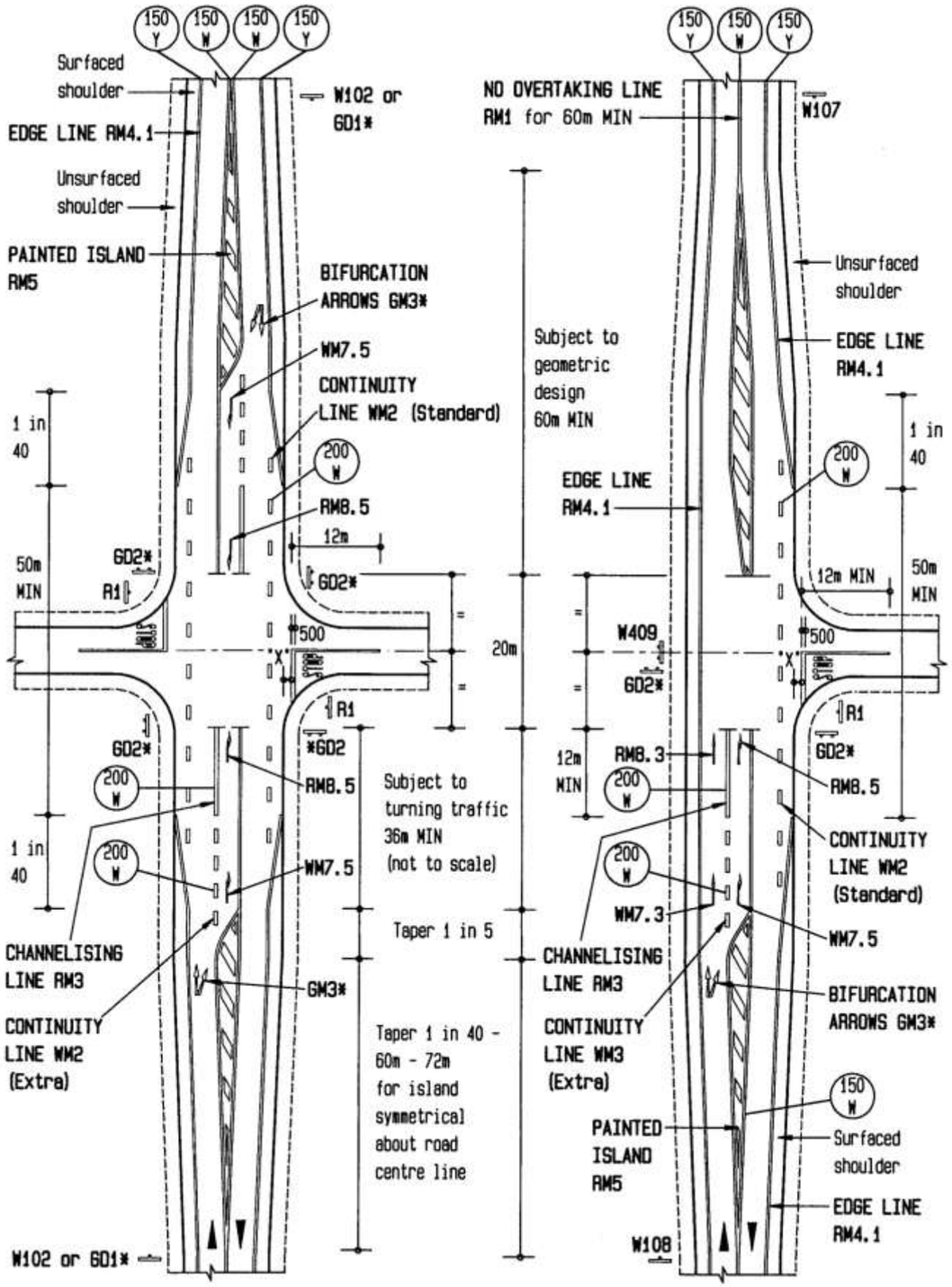

Fig 2.26 Basic Junction Marking - 4

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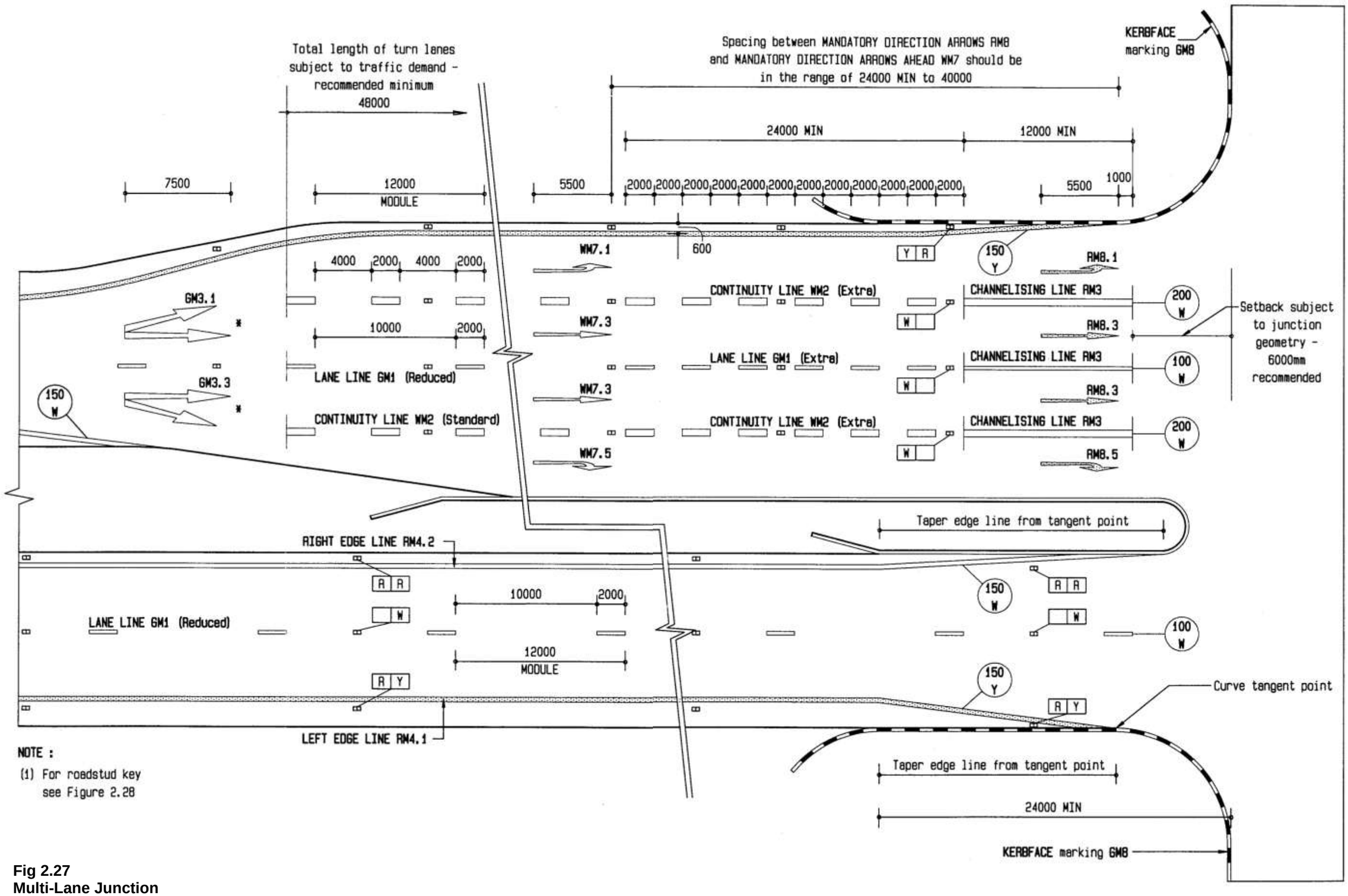
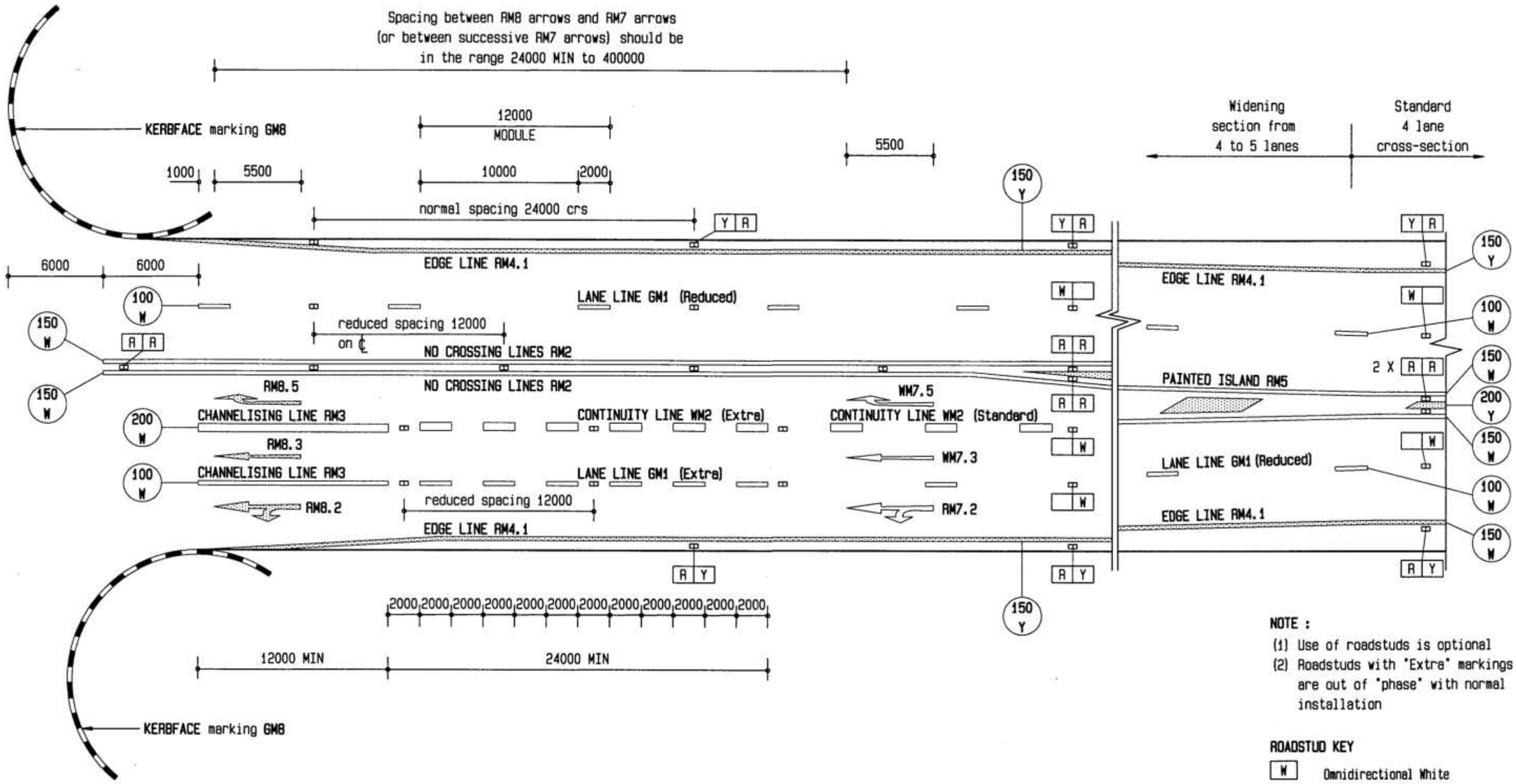


Fig 2.27
Multi-Lane Junction Marking - 1



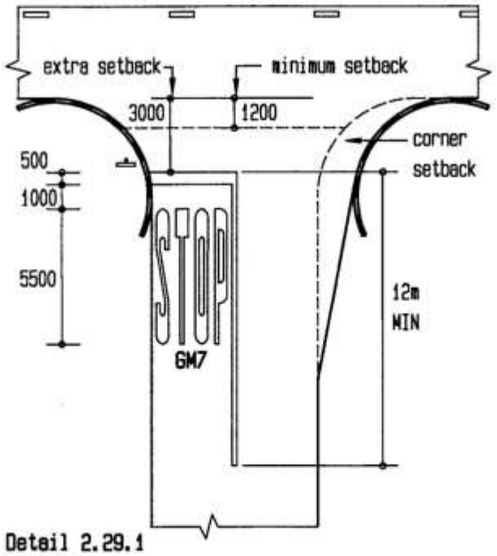
NOTE :
(1) Use of roadstuds is optional
(2) Roadstuds with "Extra" markings are out of "phase" with normal installation

ROADSTUD KEY

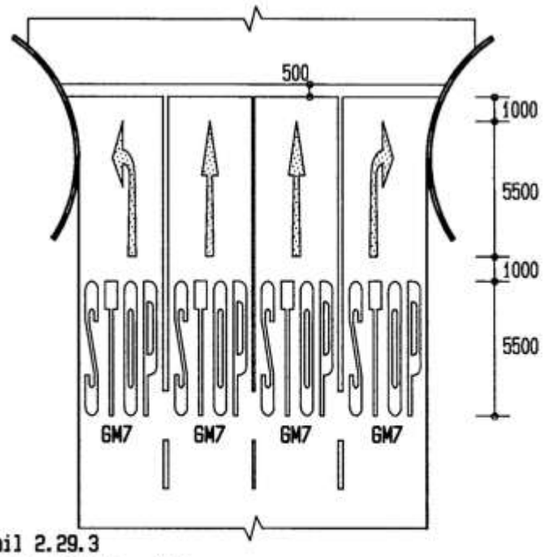
W	Omnidirectional White
W	Unidirectional White
W W	Bidirectional White/White
R W	Bidirectional White/Red
R Y	Bidirectional Yellow/Red
R R	Bidirectional Red/Red

Fig 2.28
Multi-Lane Junction
Marking - 2

Repro

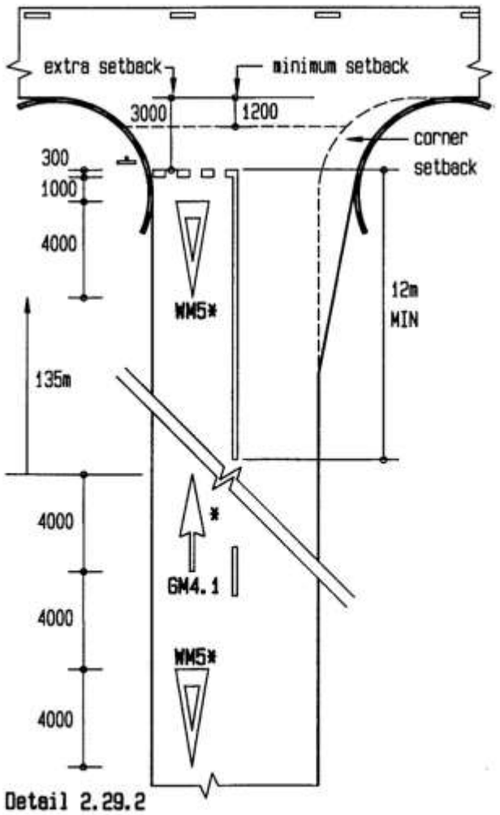


Detail 2.29.1
STOP Line

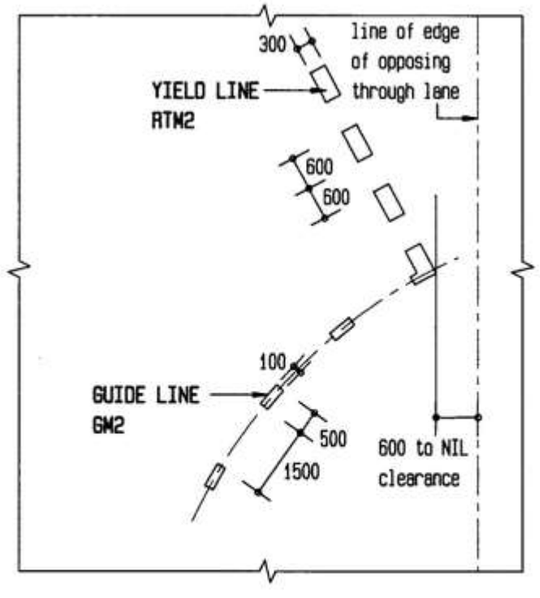


Detail 2.29.3
STOP Word Marking GM7

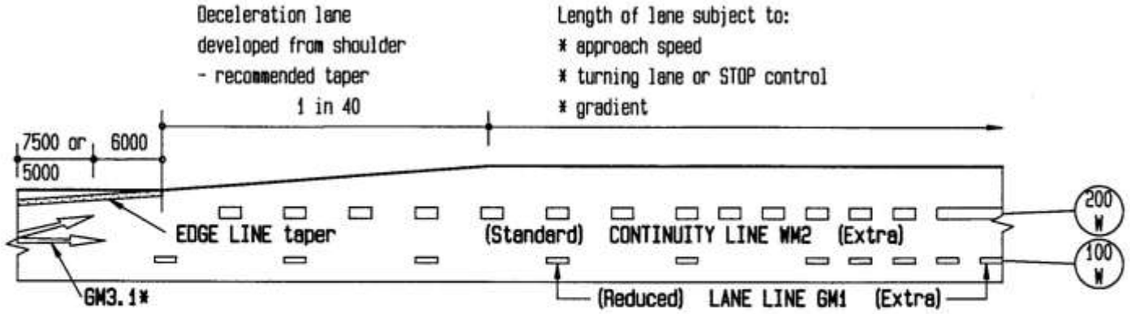
* = Optional Signs and Markings



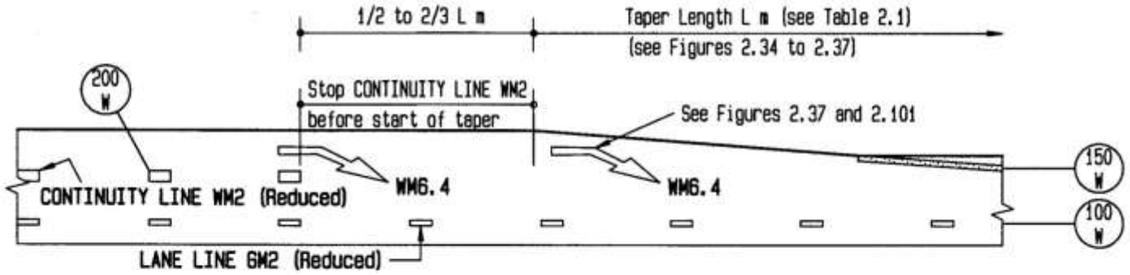
Detail 2.29.2
YIELD Line Treatment



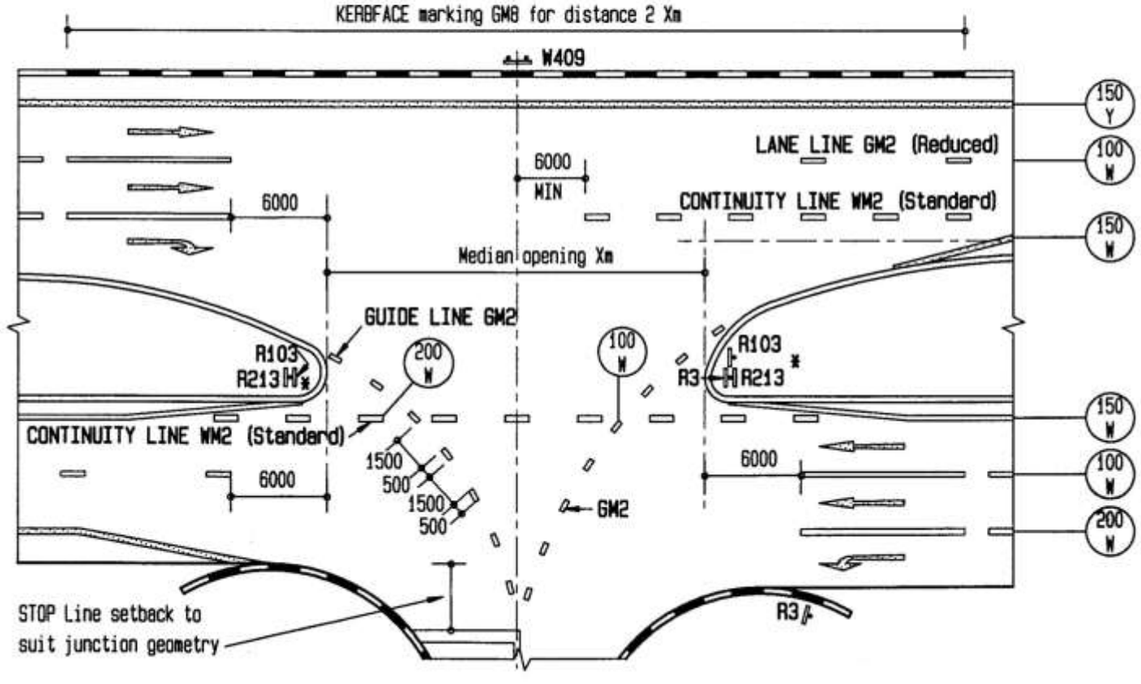
Detail 2.29.4
YIELD Line/ GUIDE LINE within Junction



Detail 2.29.5 Typical Deceleration/Left Turn Lane Treatment



Detail 2.29.6 Typical Treatment of the End of an Acceleration Lane



Detail 2.29.7 Median Opening Treatment

Fig 2.29
Multi-Lane Junction Special Aspects

2.3.6 Dual Carriageway Road Marking

1 The beginning and the end of dual carriageway roadways can present designers with particular road marking difficulties, and if such situations are not treated with care and attention to detail, potentially hazardous conditions may result.

2 Figures 2.30 to 2.33 illustrate a range of road marking options for the beginning and / or end of dual carriageway roadways, according to different geometric treatments.

3 Variables which may be combined in a number of ways include:

(a) slow lane drop;

(b) fast lane drop;

(c) symmetrical reduction in width of both carriageways;

(d) asymmetrical reduction in carriageway and roadway width.

4 Figure 2.30 shows a symmetrical reduction, about the road centre line, from a four lane dual carriageway cross-section to a 2-lane / 2-way cross section. The example shows the dropping of the slow lane on one carriageway with an emergency run-off area being provided on the line of the original shoulder. The remaining lane then shifts to the right until it lies to the left of the road centre line or dividing line. In the opposite direction the lane shifts away from the centre line as the median island is developed, and the second lane is then developed, to the right of the existing lane. This manner of developing the extra lane is recommended since it leads slower moving traffic directly into the left side lane, and faster moving traffic is then required to make a right side overtaking manoeuvre if necessary. On the approach to the beginning of the dual carriageway it is recommended that the dividing line marking be made progressively more "intense" or visible until it develops into a symmetrical painted island.

5 Figure 2.30 also shows a selection of typical DIAGRAMMATIC and HIGH VISIBILITY signs commonly specified for the beginning and end treatment of dual carriageways. These typical signs are relevant for any of the figures in this subsection.

6 Figure 2.31 gives detail of a fast lane drop at the end of a dual carriageway where the 2-lane / 2-way road forms a direct extension of the left side carriageway of the dual carriageway. This arrangement allows for an extensive painted island which acts in the one direction as an emergency run-off area, and in the other direction as a steeply angled "diverter" for the lane which is developed into the new carriageway.

7 Figure 2.32 illustrates a similar situation for the arrangement where the 2-lane / 2-way roadway lies to the right of the dual carriageway centre line (as seen from the dual carriageway).

8 Figure 2.33 shows an example of the reduction in width of a road from a 4-lane dual carriageway to a 4-lane undivided road and then further to a 2-lane / 2-way roadway.

9 Further details of lane drop markings are illustrated in Figure 2.37.

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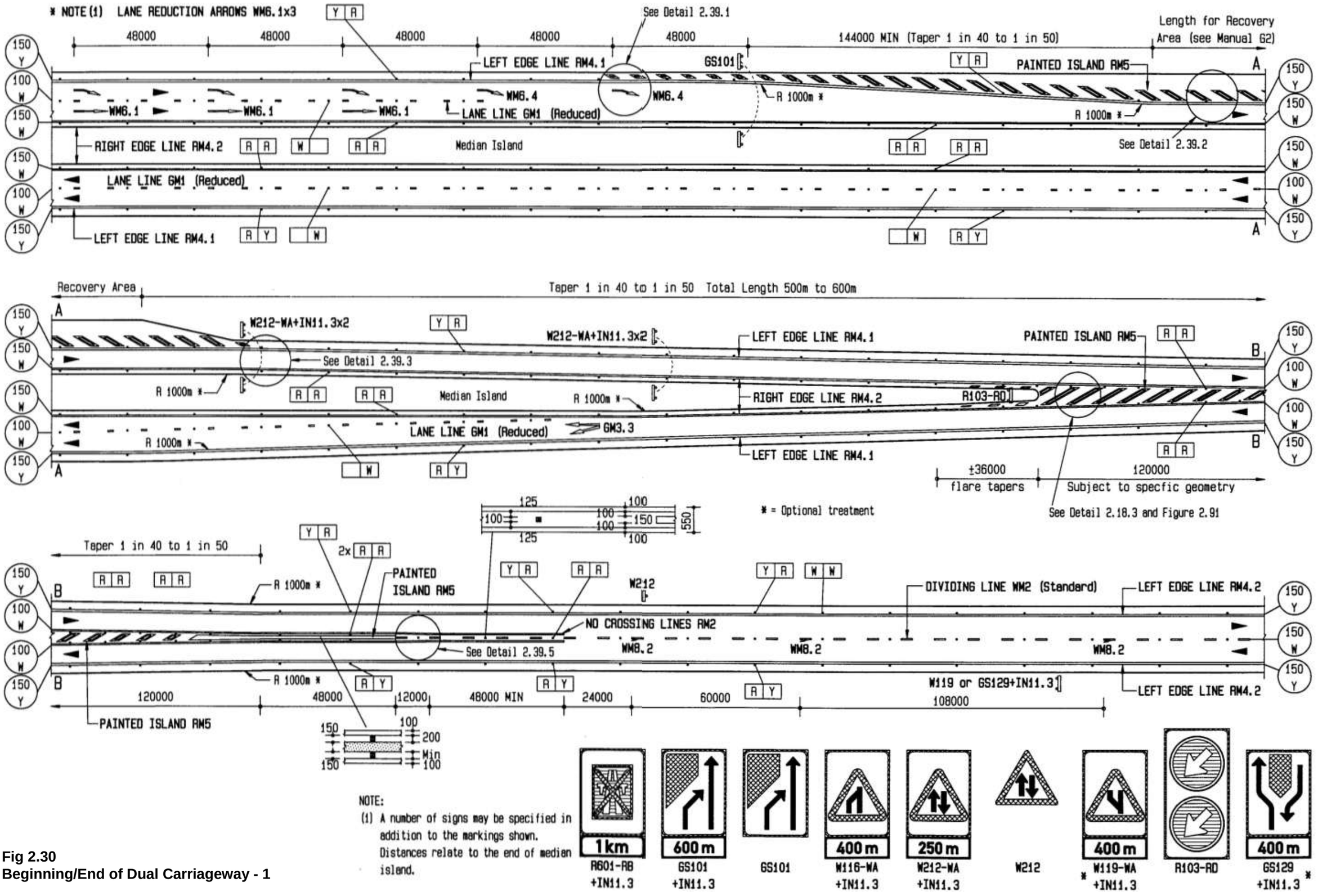
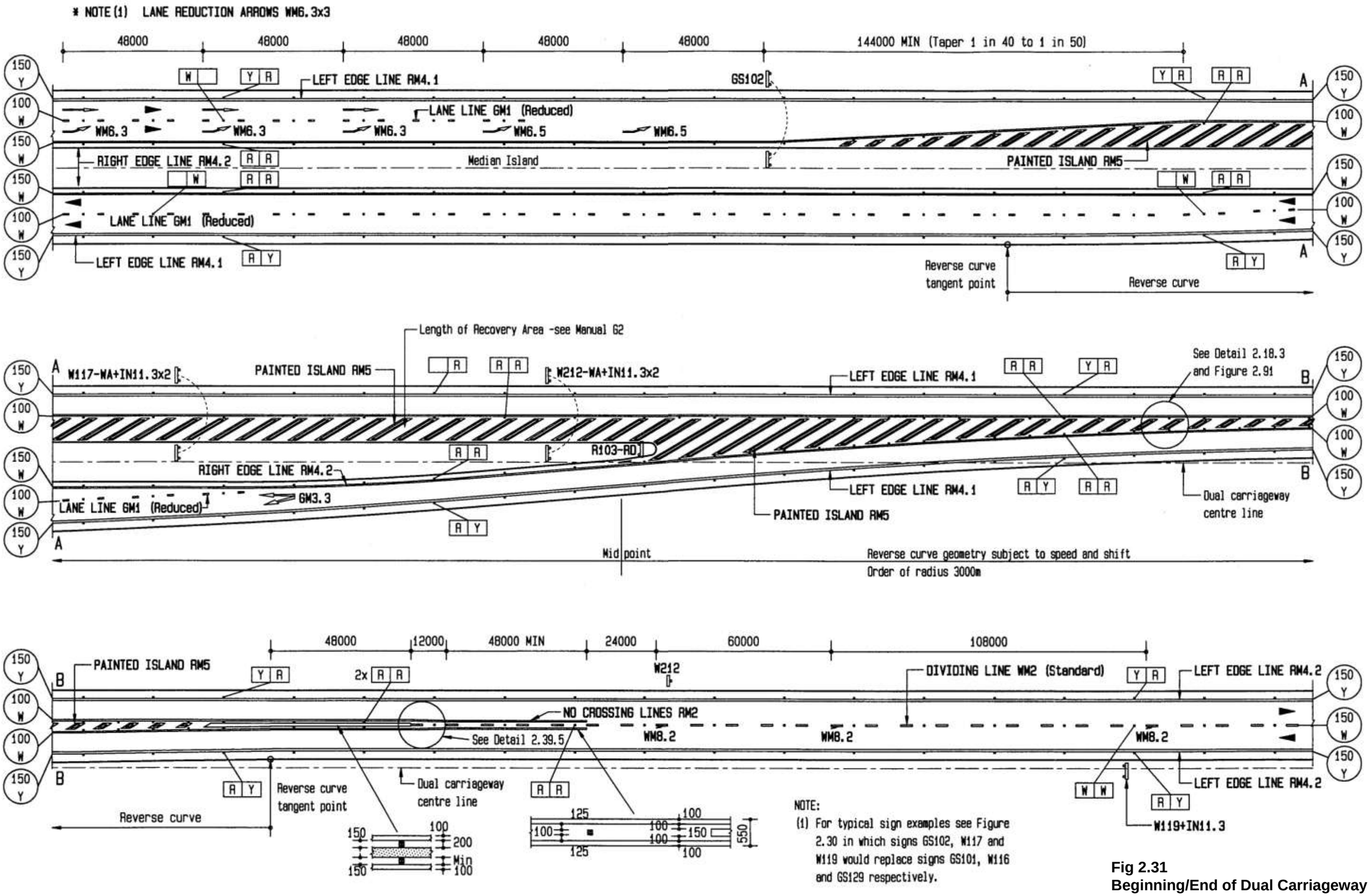


NOTE:
(1) A number of signs may be specified in addition to the markings shown. Distances relate to the end of median island.

Fig 2.30
Beginning/End of Dual Carriageway - 1



NOTE:
(1) For typical sign examples see Figure 2.30 in which signs GS102, W117 and W119 would replace signs GS101, W116 and GS129 respectively.

Fig 2.31
Beginning/End of Dual Carriageway - 2

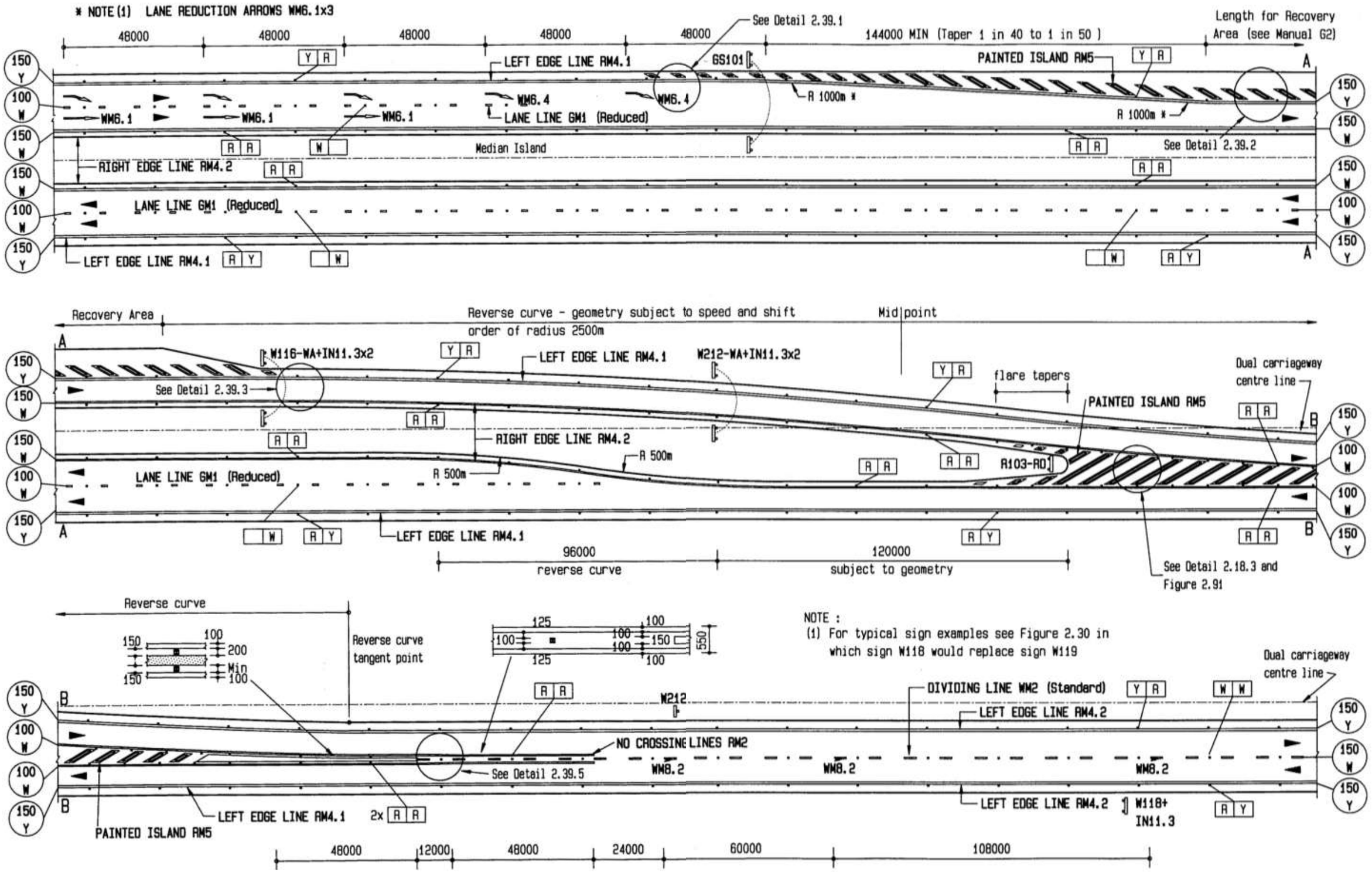


Fig 2.32
Beginning/End of Dual Carriageway - 3

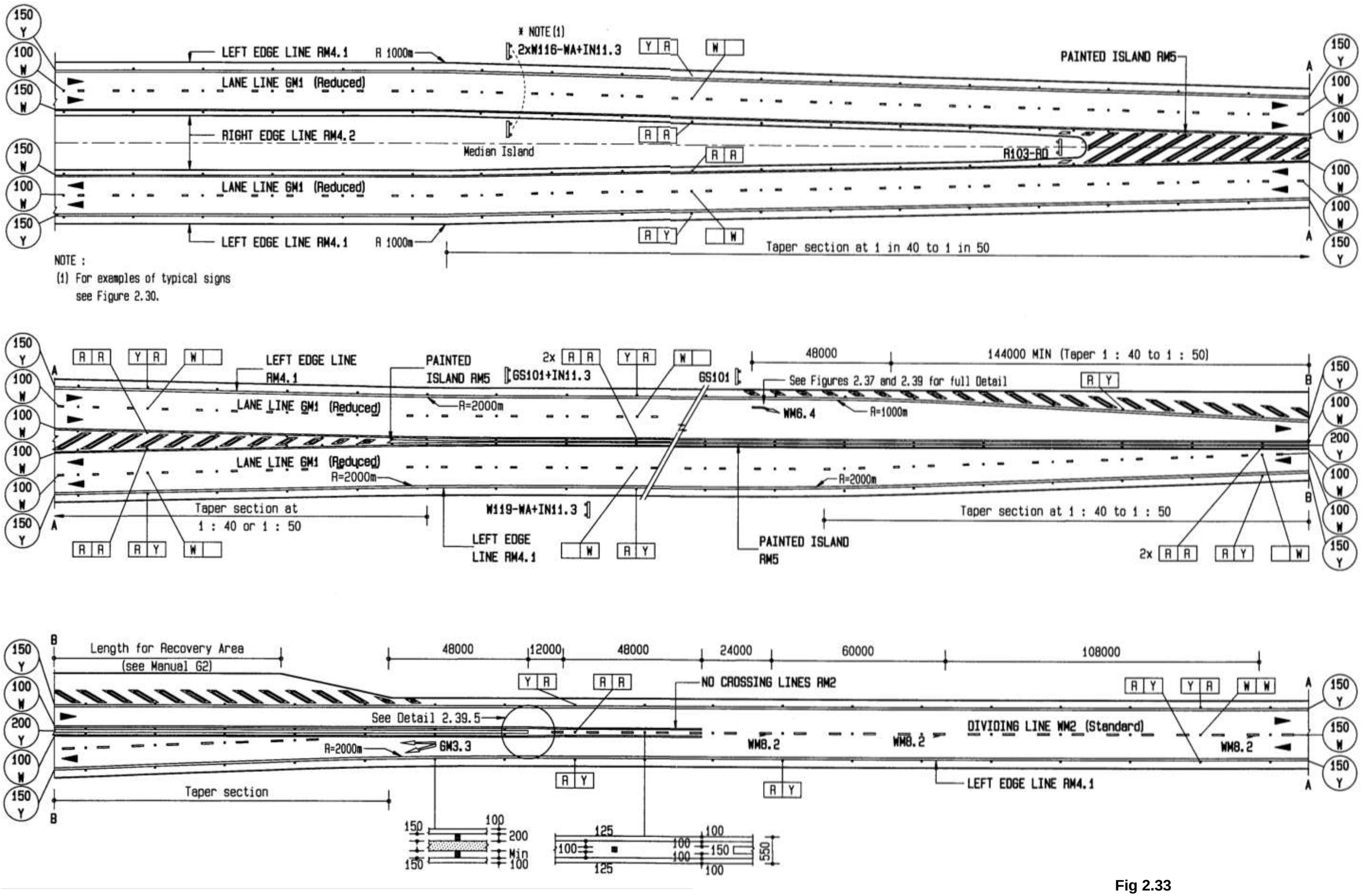


Fig 2.33
Beginning/End of Dual Carriageway - 4

2.3.7 Three Lane Cross-Sections

1 There are many, many kilometres of rural road on which the mix of slow-moving and fast-moving traffic, and a general increase in traffic saturation, dictate consideration of the provision of an additional lane to permit overtaking opportunities.

2 A topographical situation which will commonly warrant the provision of a third lane is an uphill section of roadway. An additional climbing lane will permit uphill overtaking opportunities for faster moving traffic. When such a lane is provided it can be developed one of two ways, namely:

(a) by widening the roadway onto existing shoulders (with these becoming reduced in width);

(b) by providing extra roadway width and maintaining the shoulder through the three lane section (this width may be generated symmetrically about the dividing line, or asymmetrically).

3 Irrespective of the manner of development of the third lane, it may be dropped either by dropping the "fast" lane or the "slow" lane. Figure 2.34 illustrates a fast lane drop operation and Figure 2.35 a slow lane drop. The details of these figures presume the provision of adequate safety features for the termination of a climbing lane, such as;

(a) run-off areas;

(b) effective taper rates or lengths (see Table 2.1);

(c) the adequate continuation of the climbing lane until slow-moving vehicles can pick -up speed to within 85% of the norm for the section of road.

4 Figure 2.36 shows a continuing three lane section of roadway. In this example the cross-sectional treatment alternates between 2-lanes in one direction and one in the opposite direction, and *vice versa*, in order to give each direction of traffic flow opportunities to overtake safely. Such an arrangement may also be appropriate in rolling topography. If this type of road marking is to be specified, it is important to its effectiveness that the taper rates used are adequate, otherwise traffic merging operation in the lane drop situations may not function smoothly (see Table 2.1 for recommended taper rates).

5 An enlarged detail of typical lane drop markings, with recommended spacings, is given in Figure 2.37. This is appropriate to any lane drop situation, whether a fast lane drop or a slow lane drop.

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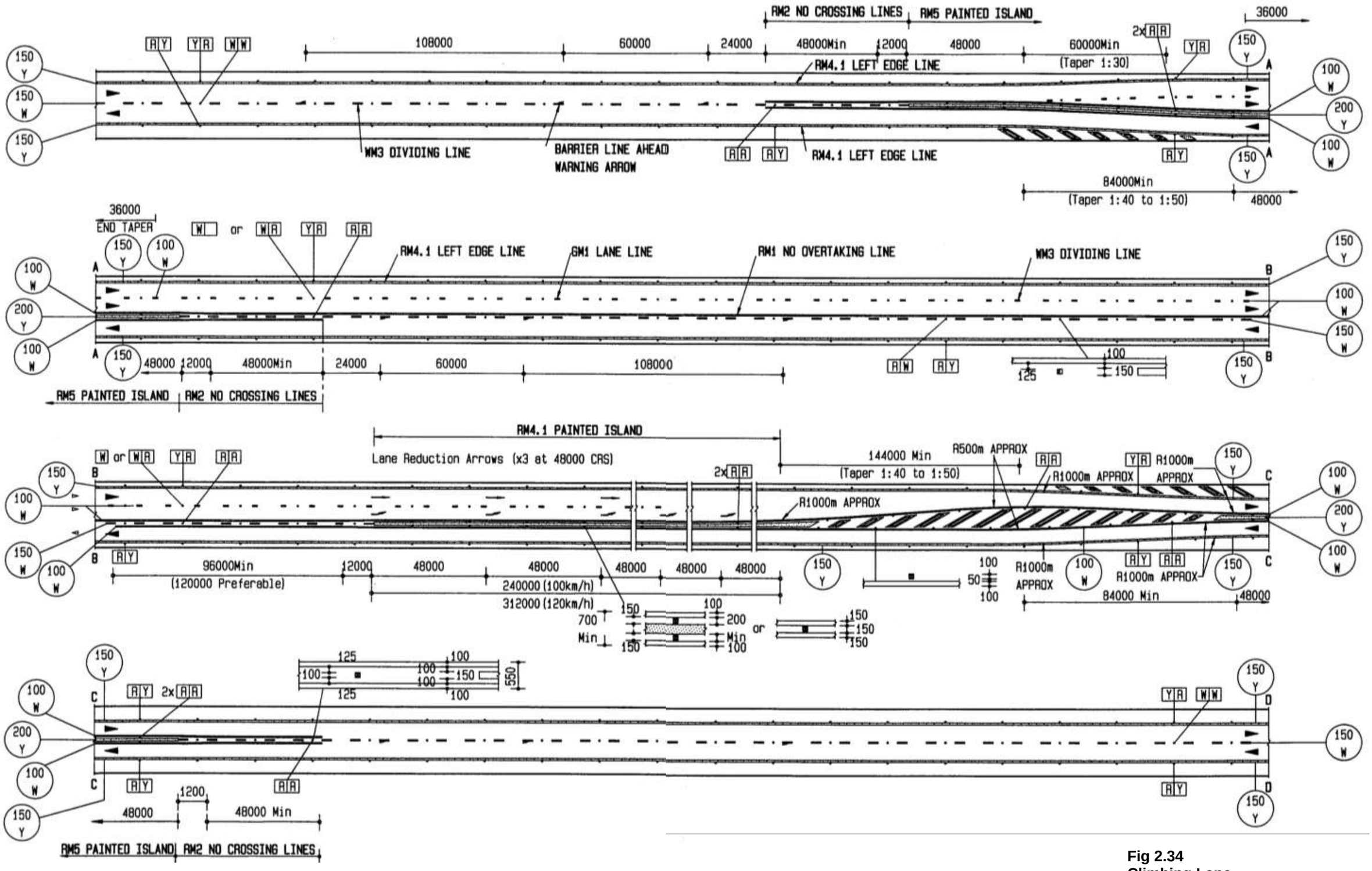
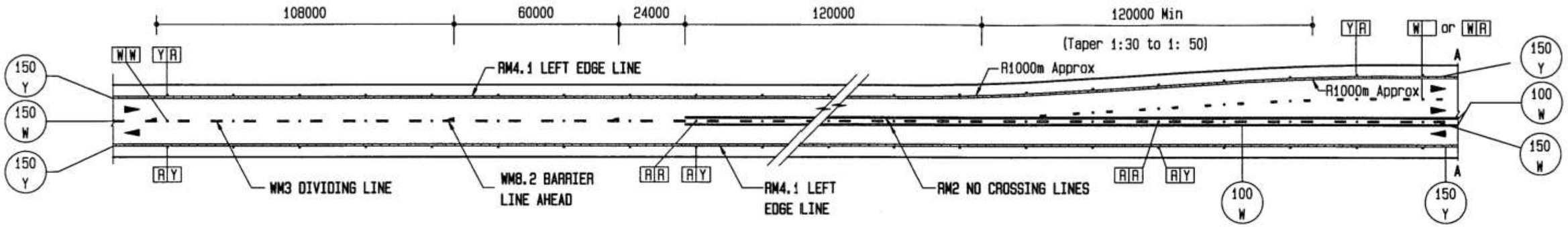
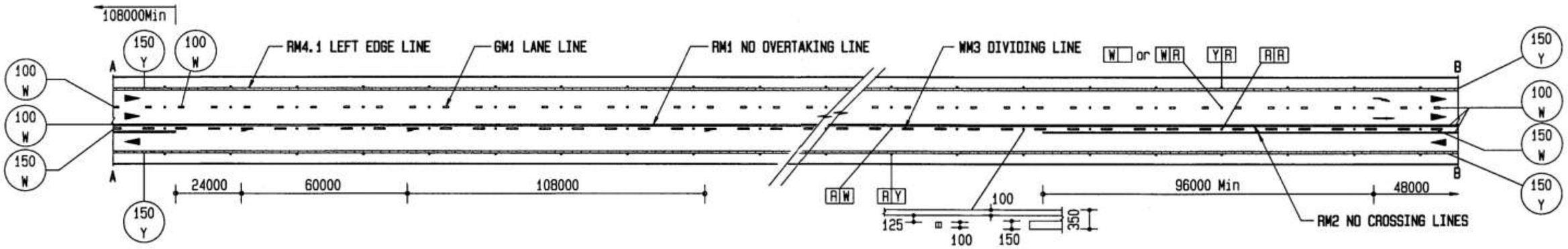


Fig 2.34
Climbing Lane –
Drop Fast Lane





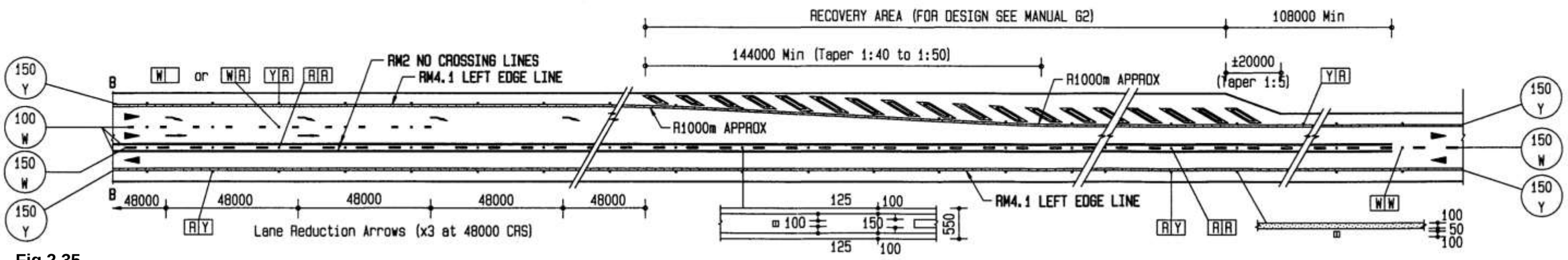


Fig 2.35
Climbing Lane –
Drop Slow Lane

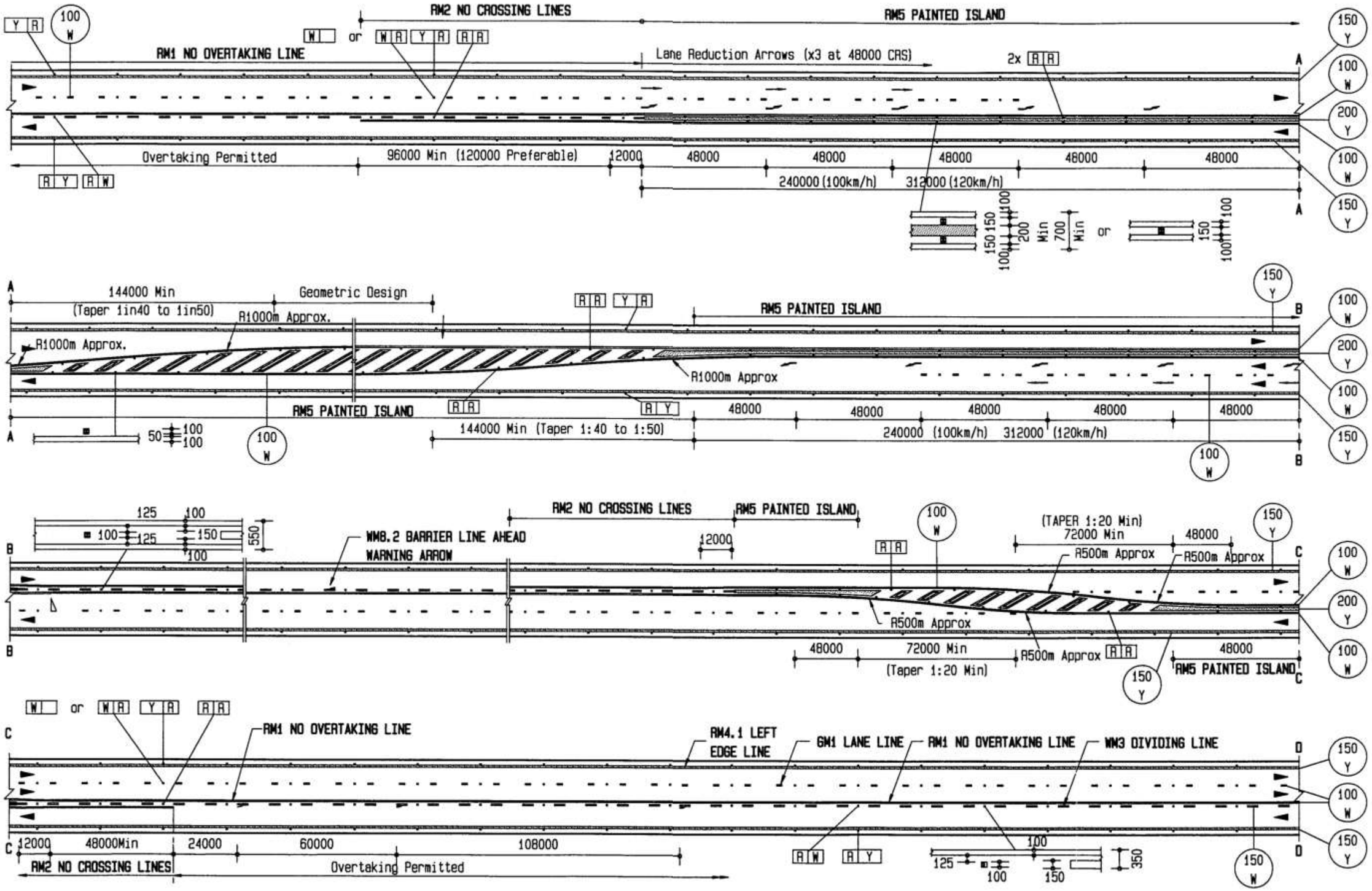


Fig 2.36
3 Lane/2 Way -
Overtaking Opportunity

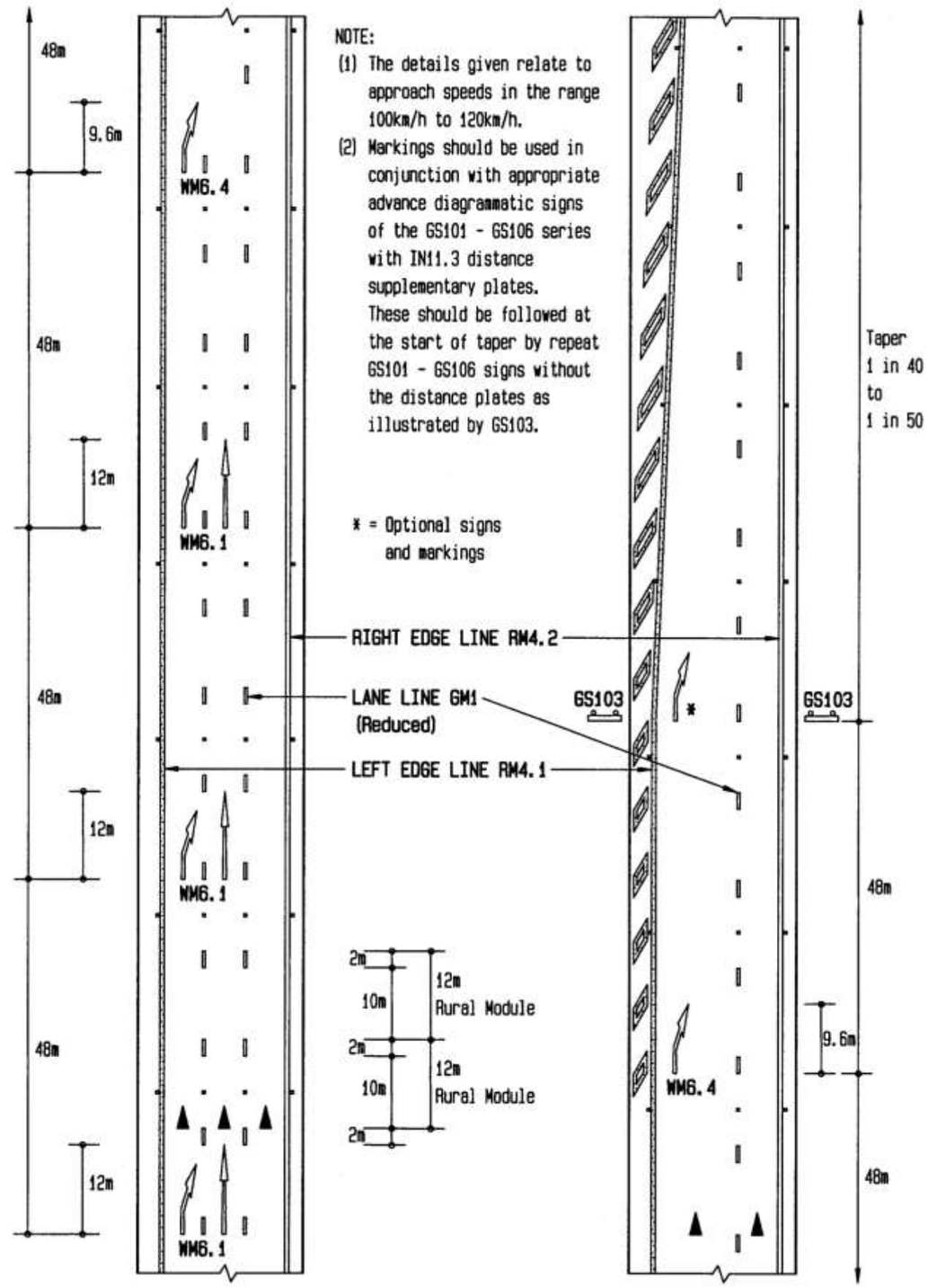


Fig 2.37 **Application of LANE REDUCTION ARROWS WM6**

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2.3.8 Rural Painted Island Markings

1 Enlarged details of PAINTED ISLAND marking RM5 are given in Section 2.7 in Figures 2.87 to 2.92. These details are generic to all forms of painted island. Figures 2.38 and 2.39 in this subsection give specific examples of the application of the generic rules given in Section 2.7 to rural painted islands.

2 The examples given cover such typical applications as:

(a) median painted islands "protecting" traffic from unwitting entry into right turn lanes, either with traffic flow or against traffic flow;

(b) the end treatment of median painted islands to permit non-encroaching turns by large vehicles with a wide swept turning path;

(c) shoulder markings appropriate to left side lane drops and in advance of physical obstructions within emergency shoulders;

(d) a transition section on a dividing line between a three line NO CROSSING LINE marking, and the start of a median PAINTED ISLAND marking.

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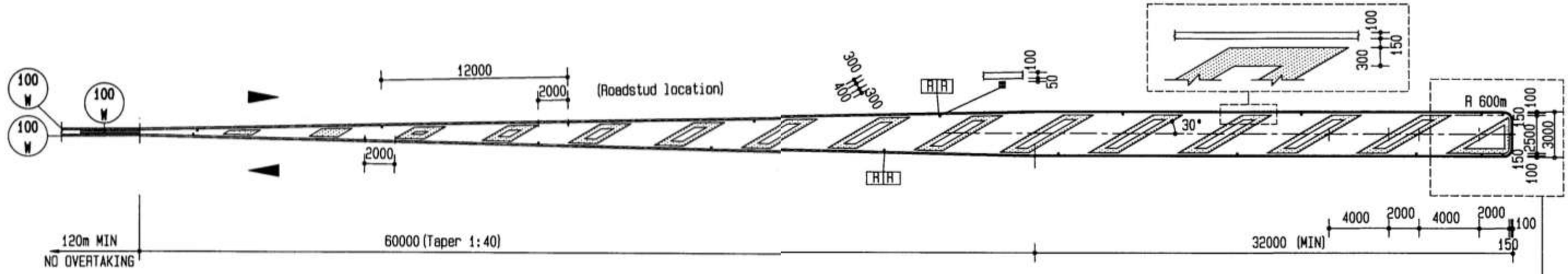
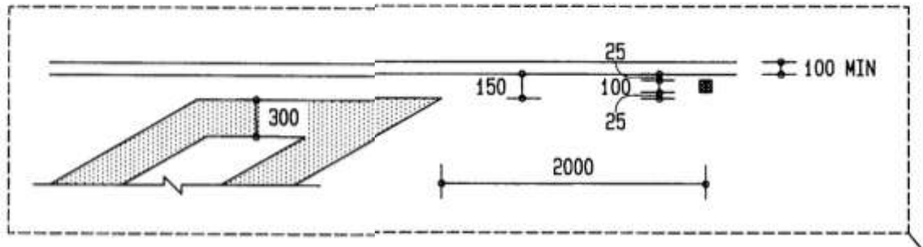
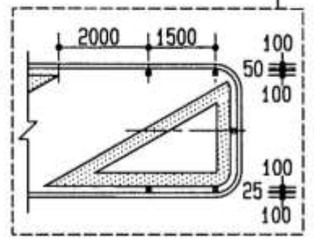
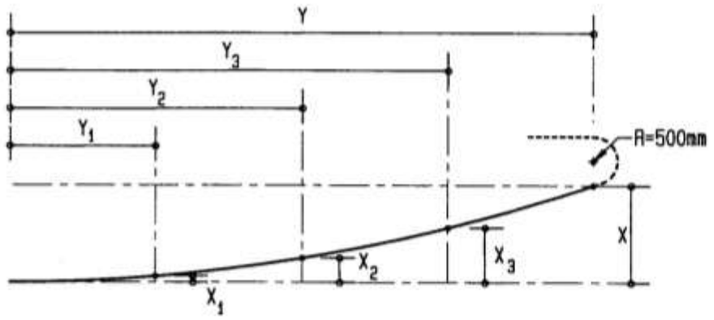


Detail 2.38.1
Typical Median Painted Island
(Protecting Opposed Right Turn Lane)



Detail 2.38.3
Island End Treatment with
Full Turning Path Set-Back





FORMULA for offsets X_1, X_2 etc.

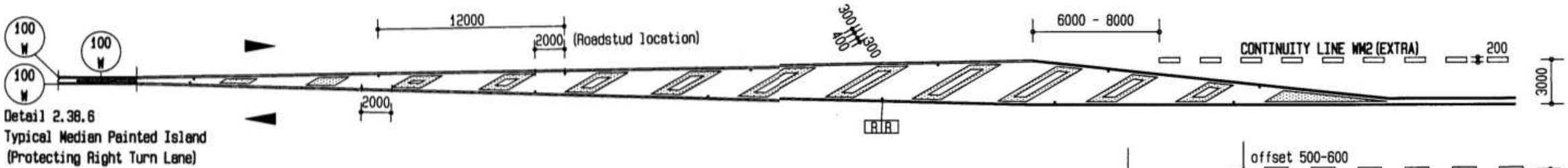
$$X_1 = \frac{X.Y_1^2}{Y^2} \text{ etc.}$$

Detail 2.38.5
Parabolic End Treatment
of Painted Island

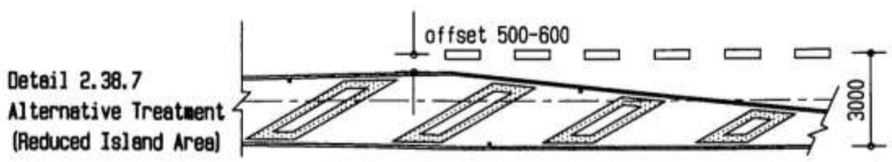
Detail 2.38.4 Alternative Parabolic End Treatment
Shaped to Vehicle Turning Envelope

* see Detail 2.39.4 for
'bar' dimension detail

* See Detail 2.38.5

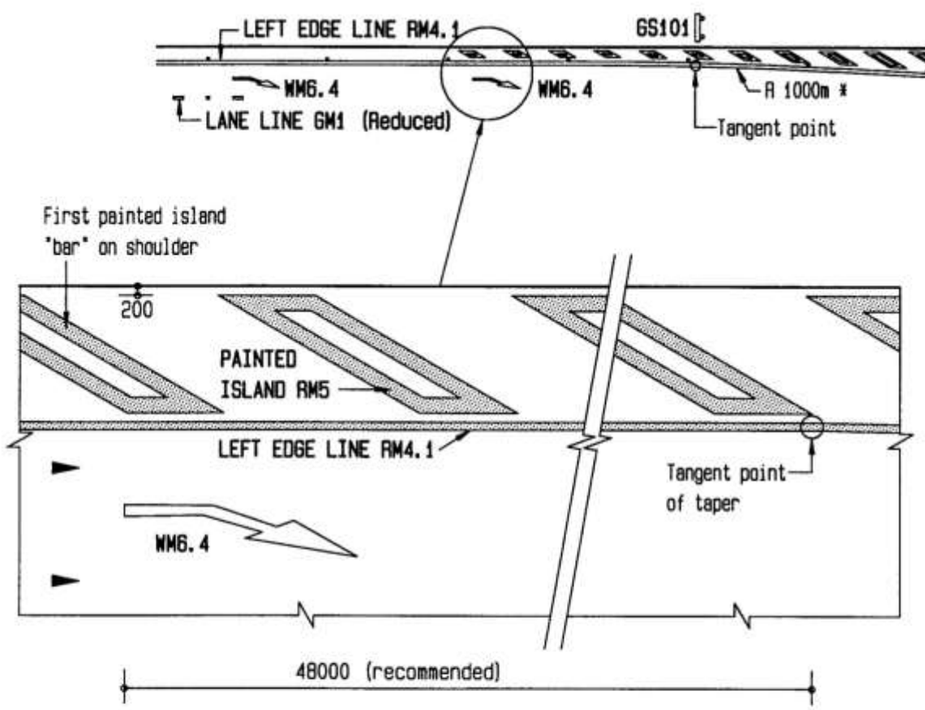


Detail 2.38.6
Typical Median Painted Island
(Protecting Right Turn Lane)

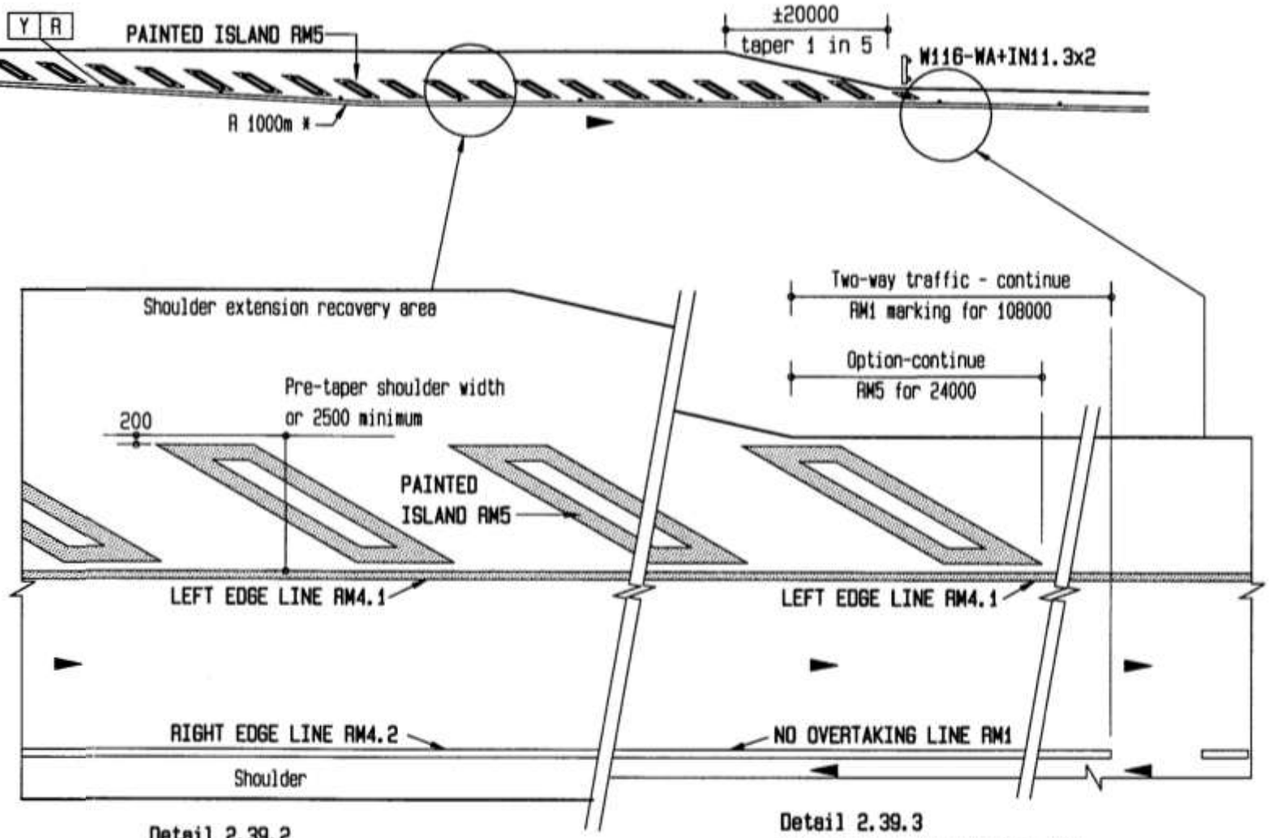


Detail 2.38.7
Alternative Treatment
(Reduced Island Area)

Fig 2.38
Painted Island -
Rural Applications - 1

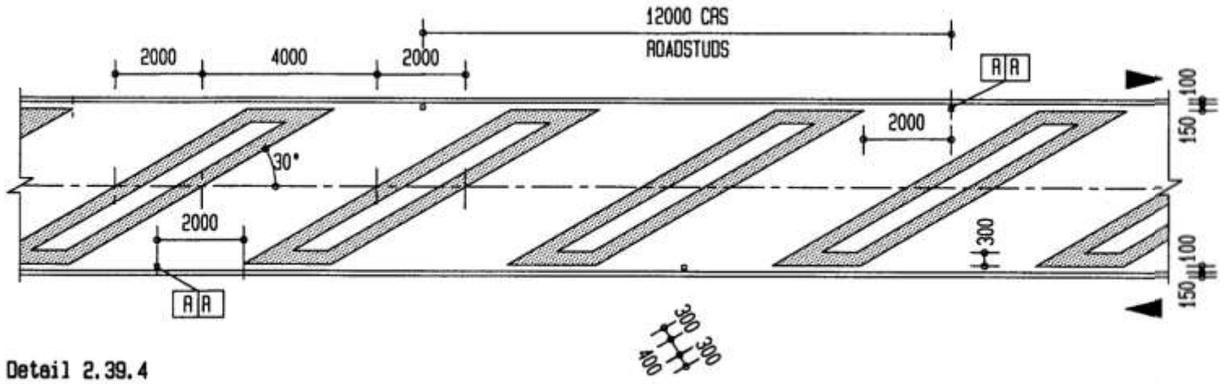


Detail 2.39.1 Pre-Taper Shoulder Marking

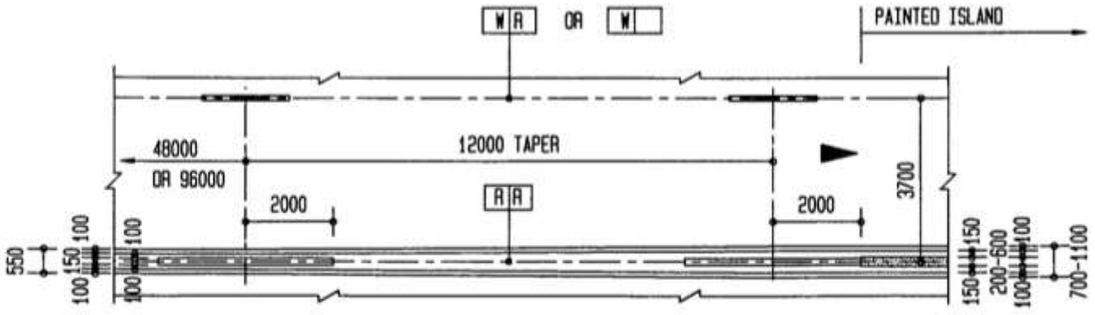


Detail 2.39.2
Shoulder Marking in Taper Area
(in Recovery Area)

Detail 2.39.3
End of Shoulder Marking / No
Overtaking Line



Detail 2.39.4
Typical Painted Island Between Opposed
Traffic Flows



Detail 2.39.5
Transition from No Crossing Line
to Painted Island

Fig 2.39
Painted Island -
Rural Applications - 2

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2.4 ROAD MARKING APPLICATIONS IN URBAN SITUATIONS

2.4.1 General

1 The majority of details in this section relate to the illustration of road markings at urban junctions and in particular to lane markings. Whilst many of these markings are commonly used in urban areas the principles involved may also be used at rural junctions when required. Such details are not repeated in Section 2.3 which deals with rural road marking applications. If the principles of an urban application are applied to a rural situation all longitudinal broken line markings based on standard modules should be altered to reflect the 12 m rural module.

2 Examples of the application of road markings in freeway situations, whether urban or rural, are illustrated in Section 2.5.

3 Urban road marking situations commonly include the need to indicate parking markings. These are illustrated as appropriate but the principles of parking marking applications are dealt with in detail in Section 2.6.

4 Additional enhanced or enlarged details are given in Section 2.7 when it is not possible to include such detail in a general application due to the scale of the illustration. In addition, although this section contains specific examples of certain urban applications of PAINTED ISLAND marking, this marking is covered in detail in Section 2.7 by Figures 2.87 to 2.92.

2.4.2 Section Coverage

1 The examples of urban road marking applications covered in this section start with the basic components and then cover the following groups of application types:

(a) broken line patterns;

(b) longitudinal line markings;

(c) basic junction marking;

(d) central business district road markings;

(e) pedestrian markings;

(f) reversible lane markings.

In addition some less common applications and "do's and don'ts" are illustrated.

2 Duplication of examples in different sections has been avoided as much as is practical. For this reason it is possible that an example in another section will fulfil a need not covered in this section. This is likely to be the case particularly in urban fringe areas or peri-urban areas.

3 As part of the action to avoid duplication a number of very basic principles are covered in Section 2.2. These principles have been considered so basic as to apply throughout the road network at virtually all levels. Typical subjects covered in Section 2.2 which are relevant to urban road marking applications are:

(a) alignment of lane markings on multi-lane roads (Figure 2.12);

(b) STOP and YIELD sight distances and sign location (Figure 2.13);

(c) tapers (Table 2.1);

(d) NO OVERTAKING LINE marking RM1 warrants (Figures 2.14 to 2.16);

(e) roadstuds (Subsection 2.2.6, Table 2.2 and Figures 2.17 and 2.18).

2.4.3 Specification and Materials Quantities

1 Detailed specifications are not covered but Subsection 2.2.5 gives limited guidance.

2 As an aid to measuring **quantities** of road markings, **by area**, Table 2.3 lists areas by each standard size of individual marking in m^2, or for longitudinal markings by an appropriate length i.e. m^2/100 m. This table stretches over pages 2.2.6 to 2.2.16 and is arranged to fold out so that it can be visible anywhere in the Chapter, or, in fact if the user is working with specific road marking drawings.

3 It should be noted that the minimum width of any road marking line is 100 mm. The various application details give recommended line widths in the manner illustrated in Figure 2.10. Road authorities may always use a wider line than indicated in the details. If this option is exercised, however, it is recommended that any line width **differential** indicated in a detail be maintained.

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2.4.4 Urban Longitudinal Road Markings

1 The range of road markings used in urban areas is much more varied than in rural areas or on freeways. Longitudinal markings of the following types still form a significant proportion of urban road markings:

(a) broken line markings; or

(b) continuous line markings.

2 On urban roads longitudinal lines commonly separate traffic travelling in opposite directions. Such lines are recommended to be 150 mm in width on all but the lowest class roads. A line separating opposing streams of traffic is generally referred as a "dividing line". The following line types may be used for this function:

(a) DIVIDING LINE marking WM3 (broken line);

(b) NO OVERTAKING LINE marking RM1 (continuous line);

(c) NO CROSSING LINE marking RM2 (double continuous lines).

3 Figure 2.40 illustrates the longitudinal broken line types most commonly used on urban roads. Broken lines should be marked in a regular repeating modular pattern. **The module length for urban road markings is 9 m.** Modular broken line markings may be applied as STANDARD, REDUCED or EXTRA MODULES. The decision to alter from one type of module to another, or to choose one type of module instead of another, may be warranted by factors such as:

(a) the need to economise where visual impact is not critical;

(b) the need for increased visual impact from road marking due to horizontal or vertical curvature, high traffic volumes or a change in the roadway cross-section or lane configuration;

(c) the need to emphasize to road users the difference between functionally different, but visually similar, types of road markings;

(d) the use of a progressive increase in density of marking approaching a point of divergence, convergence, or potential conflict of traffic.

4 Figures 2.41 and 2.42 give examples of typical applications of longitudinal road markings to urban road cross-sections. For completeness these start in Detail 2.41.1 with a very common urban road cross-section with no continuous longitudinal marking. Details 2.41.2 to 2.42.3 show a progressive building in line marking intensity with increasing roadway width. It should be noted that kerbed cross-sections are relatively common in urban environments, whereas cross-sections with surfaced shoulders are generally less common. For these reasons, essentially continuous longitudinal NO STOPPING LINE marking RM12 and NO PARKING LINE marking RM13 are relatively common, whereas the application of LEFT EDGE LINE marking RM4.1 and RIGHT EDGE LINE marking RM4.2 is less common, except on dual carriageway roads.

5 The use of DIVIDING LINE WM3, NO OVERTAKING LINE RM1 or NO CROSSING LINE RM2 is just as appropriate on certain types of urban road as it is on rural roads. The use of these line types is covered in detail in Subsection 2.3.4. These details are equally relevant to urban applications and are not repeated in this section.

6 Other applications relevant to longitudinal road markings, dealt with in Section 2.3, but also relevant to certain urban environments include:

(a) the use of NO OVERTAKING LINE AHEAD ARROW markings WM8 (see Figure 2.21);

(b) various options to adapt NO CROSSING LINE marking RM2 when it is necessary to permit occasional access across such a dividing line (see Figure 2.22).

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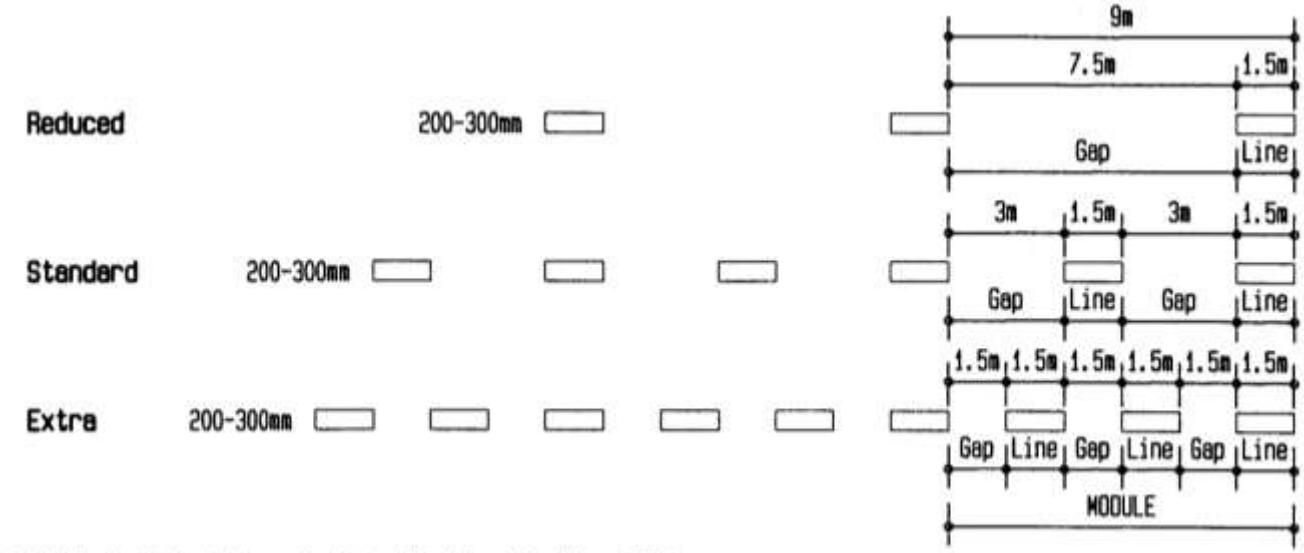
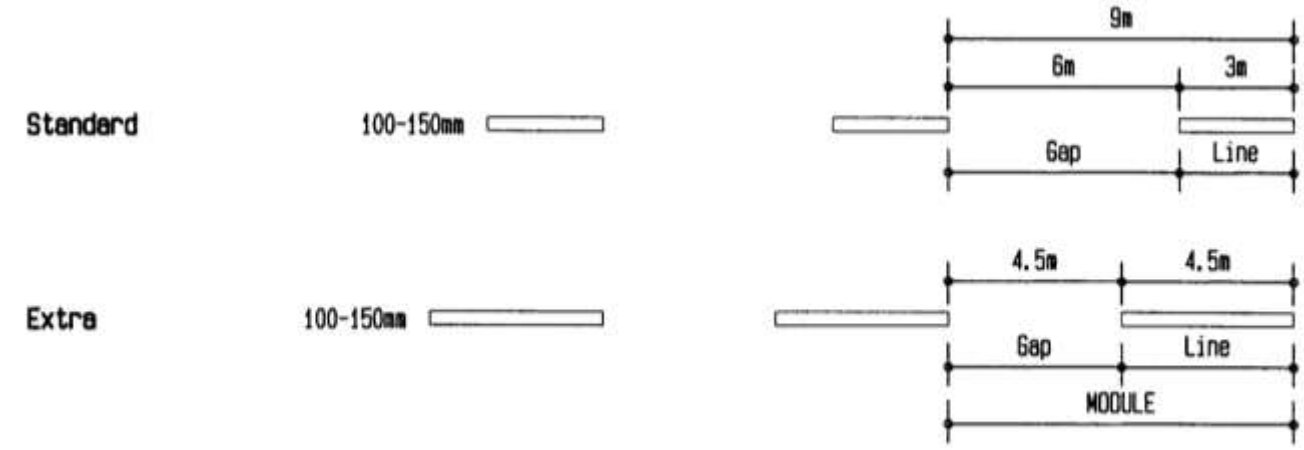
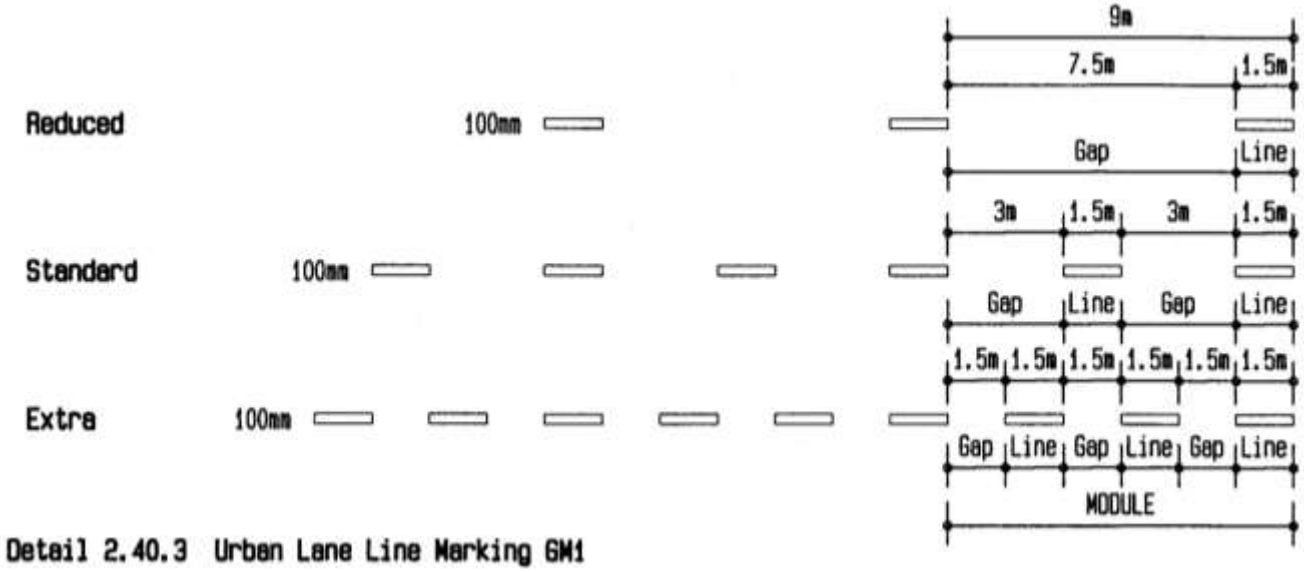


Detail 2.40.1 Urban Continuity Line Marking WM2

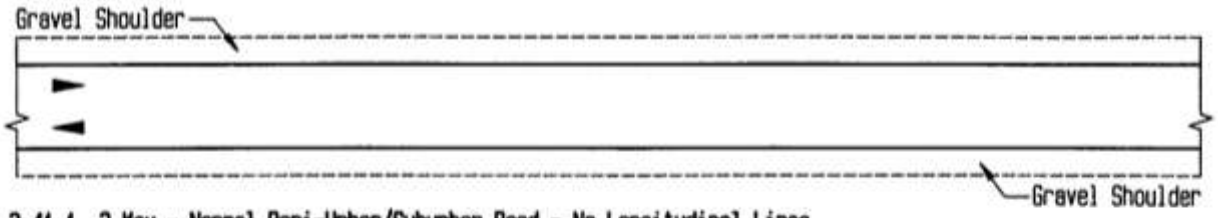


Detail 2.40.2 Urban Dividing Line Marking WM3

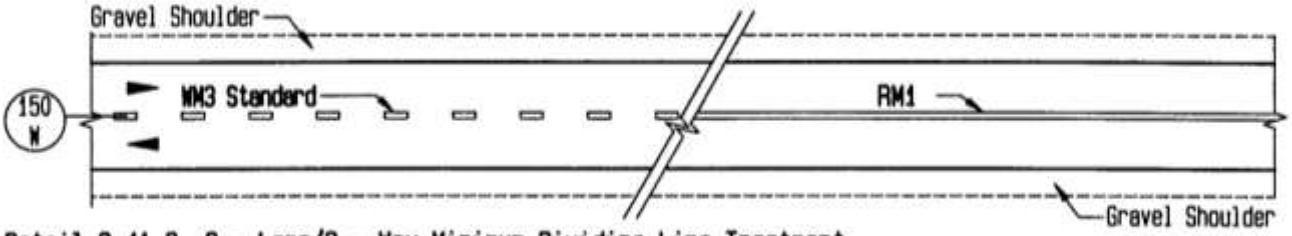


Detail 2.40.3 Urban Lane Line Marking GM1

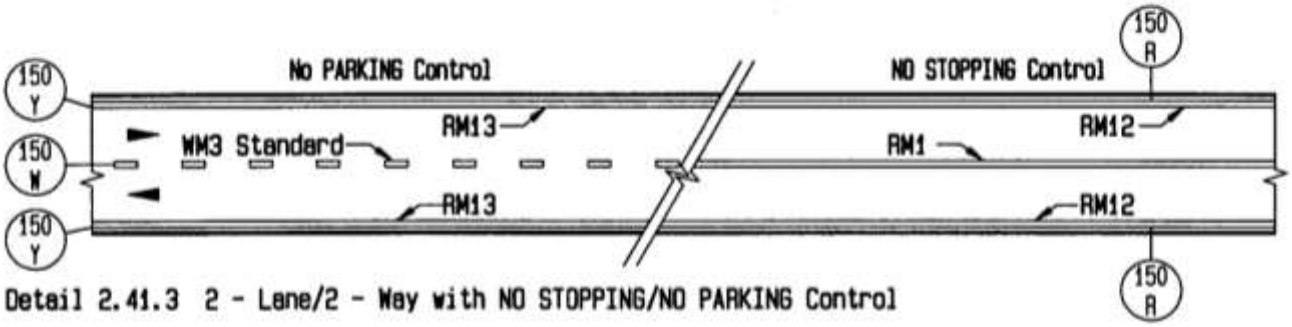
Fig 2.40 Urban Broken Line Module Characteristics



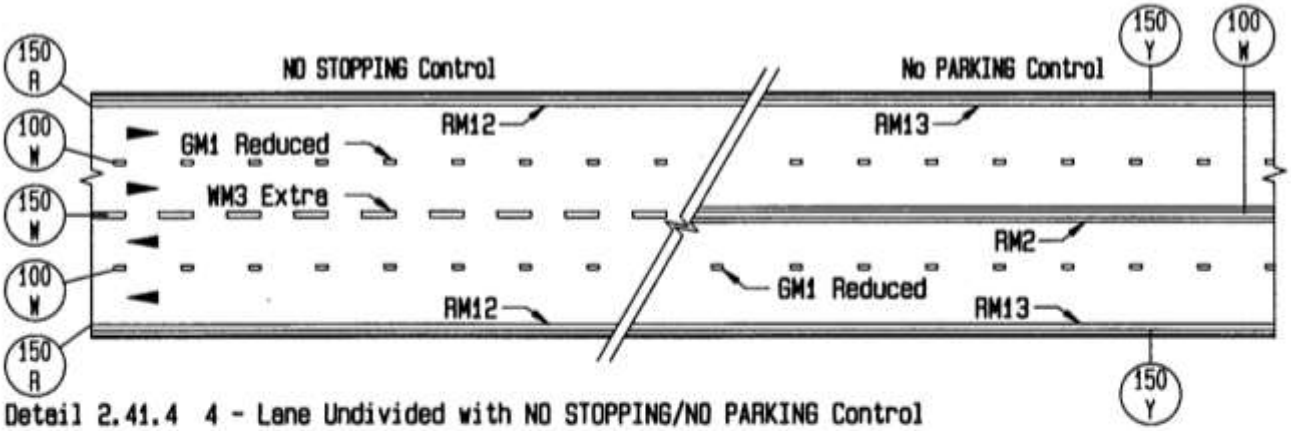
Detail 2.41.1 2 Way - Normal Peri-Urban/Suburban Road - No Longitudinal Lines



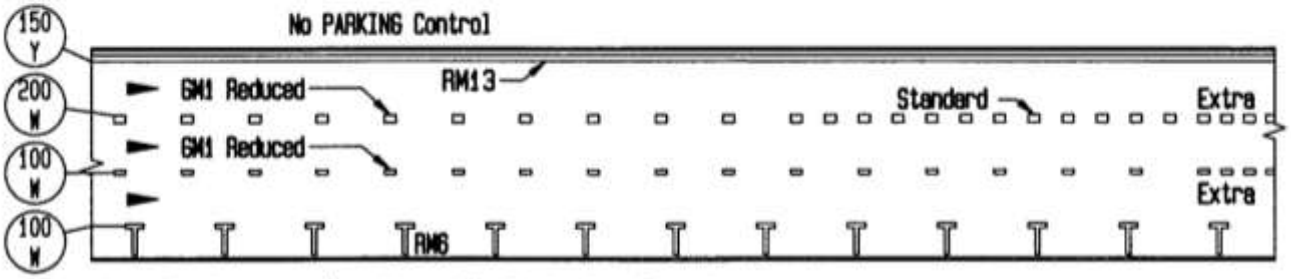
Detail 2.41.2 2 - Lane/2 - Way Minimum Dividing Line Treatment



Detail 2.41.3 2 - Lane/2 - Way with NO STOPPING/NO PARKING Control

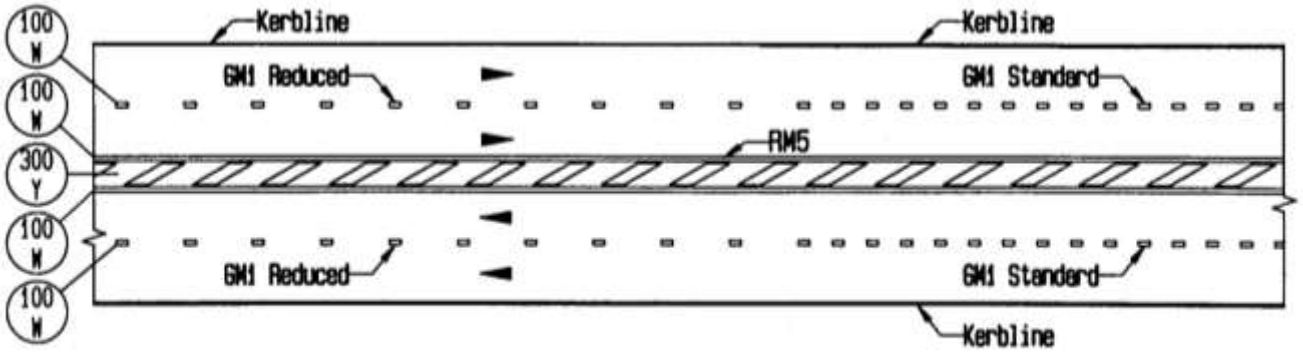


Detail 2.41.4 4 - Lane Undivided with NO STOPPING/NO PARKING Control

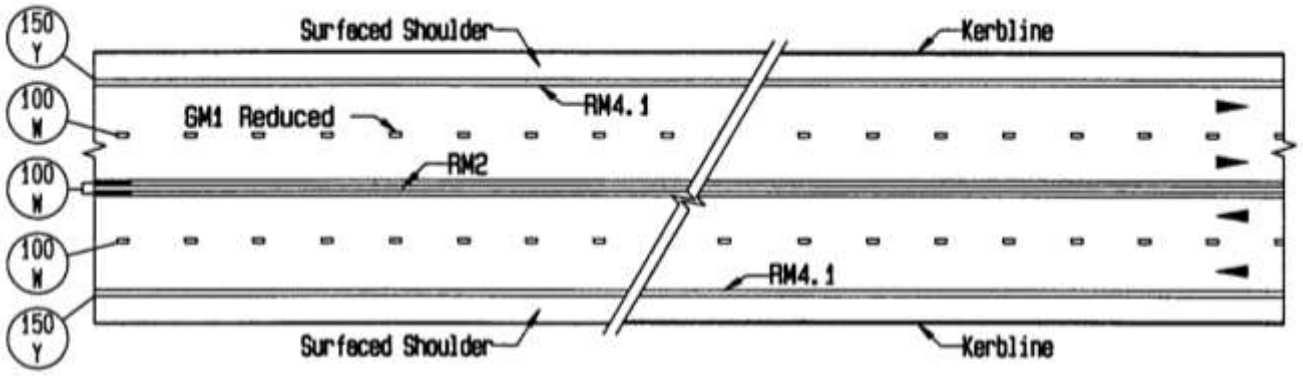


Detail 2.41.5 3 - Lane/One Way with Exclusive Turn Lane

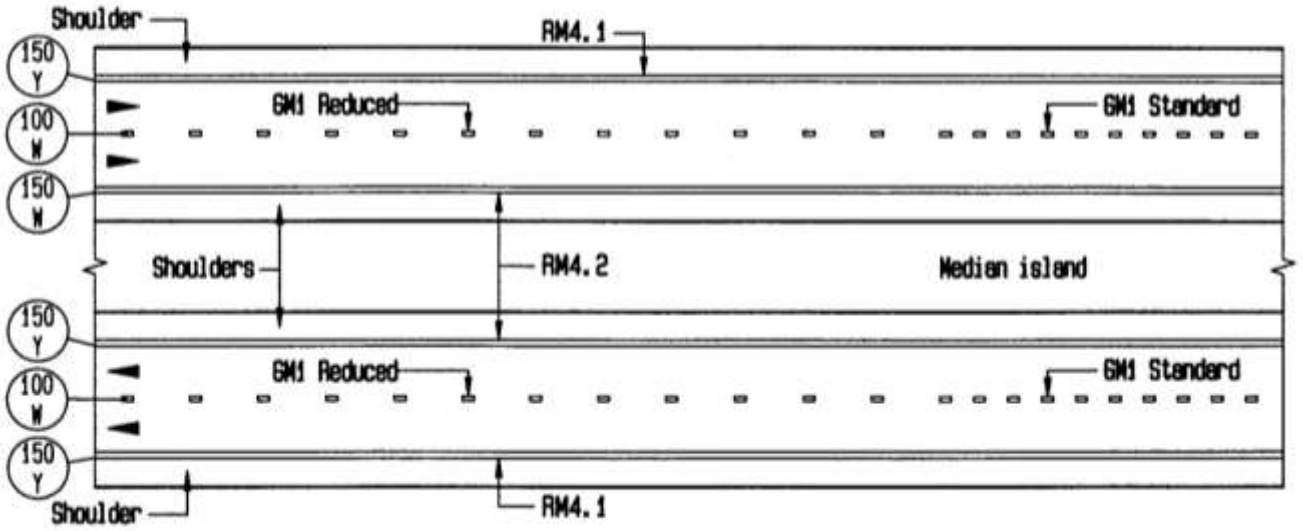
Fig 2.41 Longitudinal Line Combinations - 1



Detail 2.42.1 4 - Lane/2 - Way Undivided with Pedestrian Refuge Island



Detail 2.42.2 4 - Lane Undivided with Surfaced Shoulders



Detail 2.42.3 4 - Lane Divided - Dual Carriageway

Fig 2.42 Longitudinal Line Combinations - 2

2.4.5 Basic Urban Junction Marking

1 Figures 2.43 to 2.49 cover the road marking of a range of urban junctions, some typical and some less common (additional less common junctions are covered, with comment, in Subsection 2.4.9). The junction types covered here range from the most basic junction with a traffic priority indication such as STOP and YIELD control, through various levels of traffic signal control to major dual carriageway layout. In these examples the positions of various relevant signs are indicated. For more complete detail on the use of regulatory and warning signs at junctions refer to Chapter 3 : *Regulatory and Warning Signs and Markings Applications*, and for details of the use of guidance signs at urban junctions refer to Chapter 9 : *Urban Guidance Signing*.

2 The available sight distance should play an important part in the decision as to which form of control should be provided at minor junctions in urban areas. Figure 2.13, in Section 2.2, covers the general principles of sight distance in the context of STOP or YIELD control.

3 In preparing the examples given in this section emphasis has been placed on providing marking arrangements which create, for drivers, an awareness of the presence of a road junction ahead. This technique is particularly relevant to night time driving conditions without street lighting. Due to the density of some urban street networks and the relatively close proximity of junctions, it may not be practical or economically viable to practice such marking techniques at the lowest levels in the street hierarchy. References have not been made in the examples to classes of urban street because essentially the marking techniques are independent of road classification. Whilst the provision of adequate STREET NAME signs GL1 will go a long way to assisting with the visibility of the location of urban junctions at night, basic marking in the manner of Detail 2.43.1 will also assist in the accurate location of a potential point of turn, or point of conflict with other vehicles. As a basic provision, it is therefore recommended that a NO OVERTAKING LINE marking RM1 be introduced on each priority road approach and that this line be discontinued through the actual junction. The appropriate length of such an RM1 marking can vary widely in this urban application. The line shall have a minimum length of 9 m. For practical and effective visual guidance a length in the range of 27 m to 45 m is recommended. The discontinuity in the RM1 marking should be at least 15 m, comprising a 6 m - 3 m - 6 m, GAP - LINE - GAP (or short section of typical urban DIVIDING LINE marking WM3), located centrally on the line of the intersecting side road. As junction geometry becomes more complex it may be necessary to vary this 15 m distance, but it is likely to be adequate until the side road is provided with turning lanes.

4 The various examples in Figures 2.43 and 2.44 show a progressive increase in through-road marking intensity for both T-junctions and crossroads, including the following:

(a) 3-way and 4-way STOP (Details 2.43.1 and 2.43.2);

(b) the introduction of "protected" right turn lanes using PAINTED ISLAND marking RM5 or CONTINUITY LINE marking WM2 (Detail 2.43.3);

(c) mini-circle (Detail 2.44.1);

(d) traffic signalization (Details 2.44.2 and 2.44.4);

(e) dual carriageway (Detail 2.44.3 and Figure 2.46).

5 Figures 2.45 and 2.46 illustrate the detail of typical multi-lane approaches to an urban junction on single and dual carriageway roadways. Whilst indications are given in these figures of lengths of exclusive turn lane components, these should be considered as guidelines only, and should be the subject of engineering assessment. Roadstuds have been shown in these figures as an option, although their use is not common in urban areas.

6 Figures 2.45 and 2.46 also give dimensional details of the more common markings used on the approaches to busy urban junctions. These dimensions may be varied with speed and junction complexity. For full details refer to Table 2.3 and Section 2.7.

7 Figures 2.47 and 2.48 show a selection of examples of the application of GUIDE LINE marking GM2. This marking is most appropriate in urban situations, particularly when the following circumstances arise:

(a) non-standard or non-symmetrical junction approach control (Detail 2.47.3);

(b) turning guidance, particularly where there are two turning lanes (see Details 2.47.6 and Figure 2.48);

(c) unexpected alignment through a junction, either horizontal or vertical, or both;

(d) pedestrian guidance (Detail 2.47.8 and Subsection 2.4.7).

8 Applications of BOX JUNCTION marking RM10 are given in Figure 2.49. These are the preferred applications of marking RM10 used in limited space environments to keep traffic movement paths open. The use of marking RM10 within junctions, particularly a signalized junction, is not recommended for general applications due to difficulties in enforcement.

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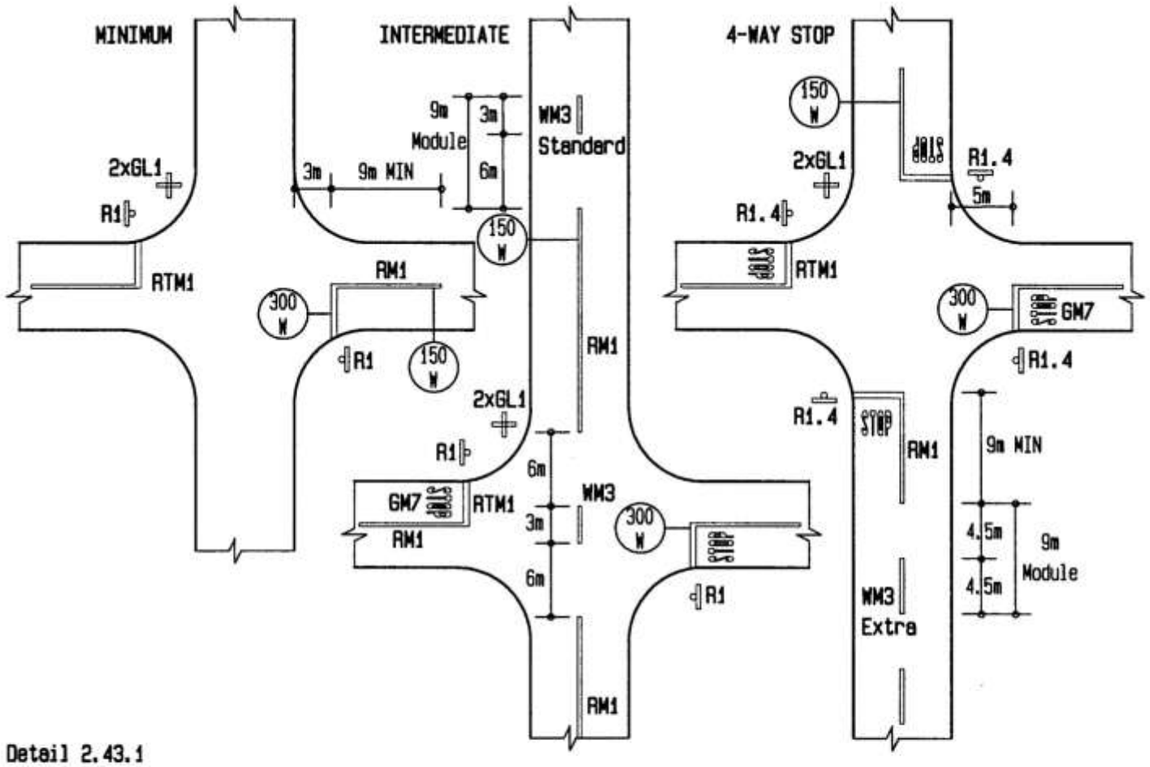
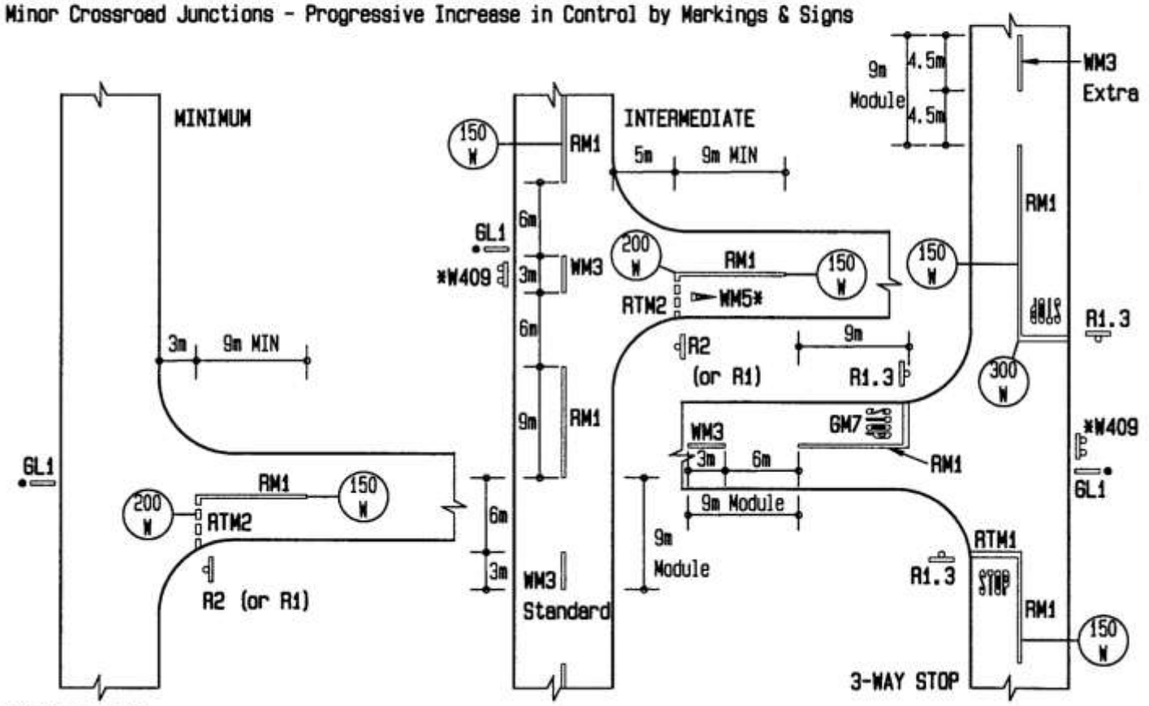
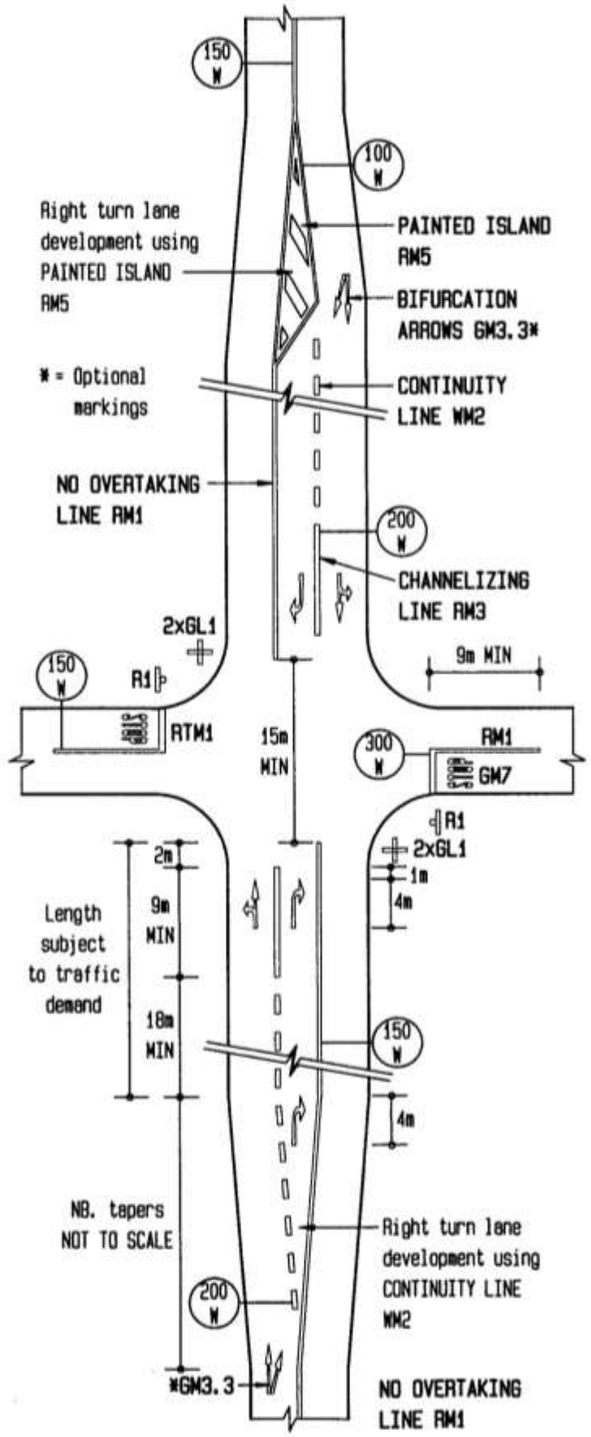


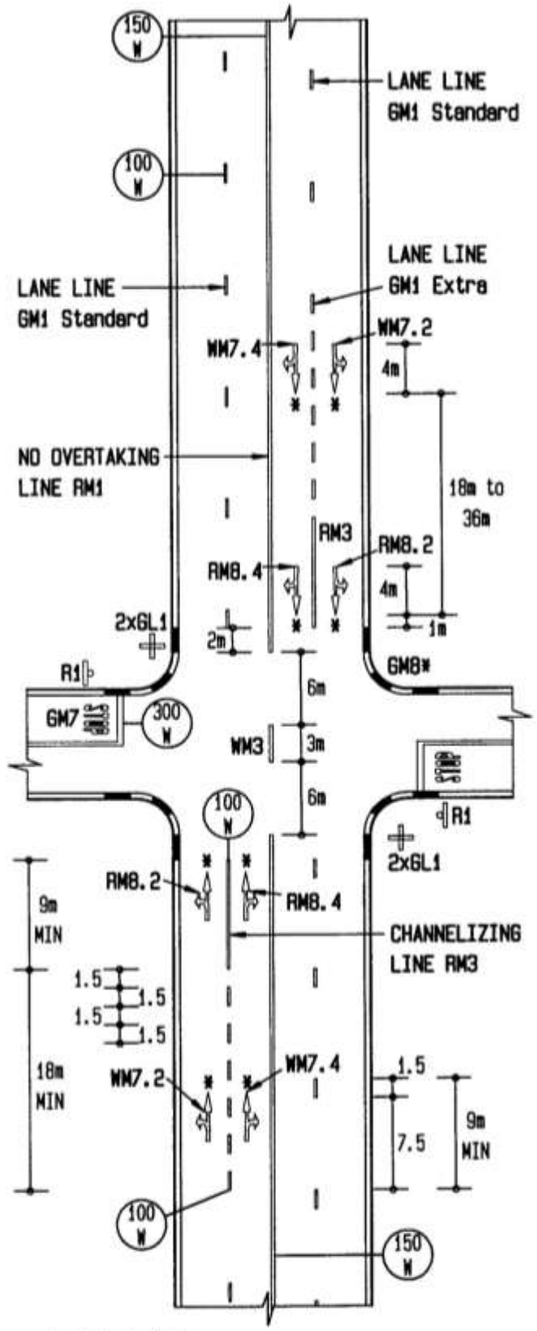
Detail 2.43.1
Minor Crossroad Junctions - Progressive Increase in Control by Markings & Signs



Detail 2.43.2
Minor T - Junctions - Progressive Increase in Control by Markings & Signs

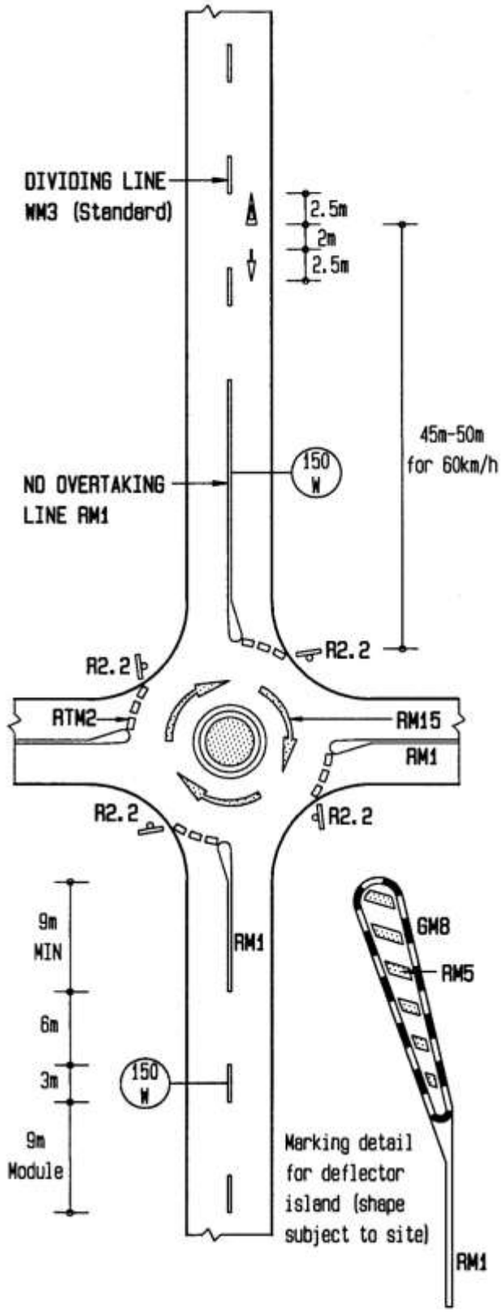


Detail 2.43.3
Addition of Right Turn Lanes at a Crossroad

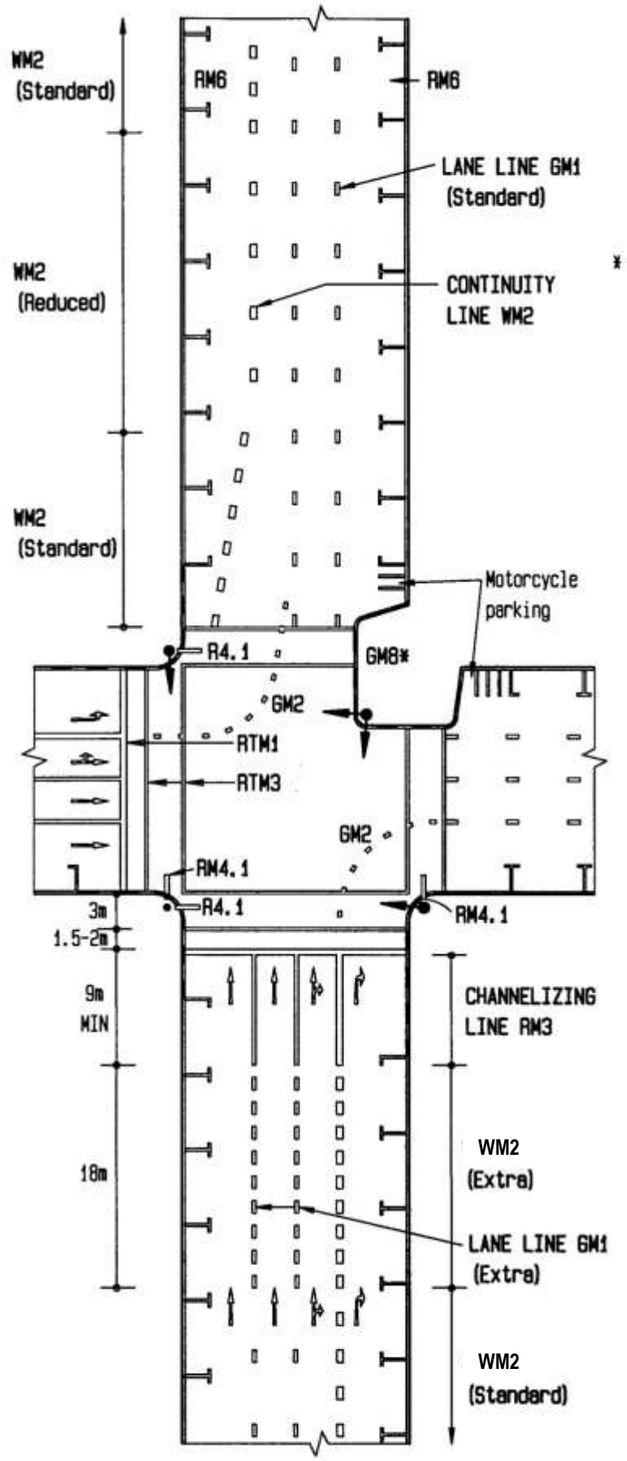


Detail 2.43.4
Typical 4-Lane/Minor Road Junction - Unsignalized

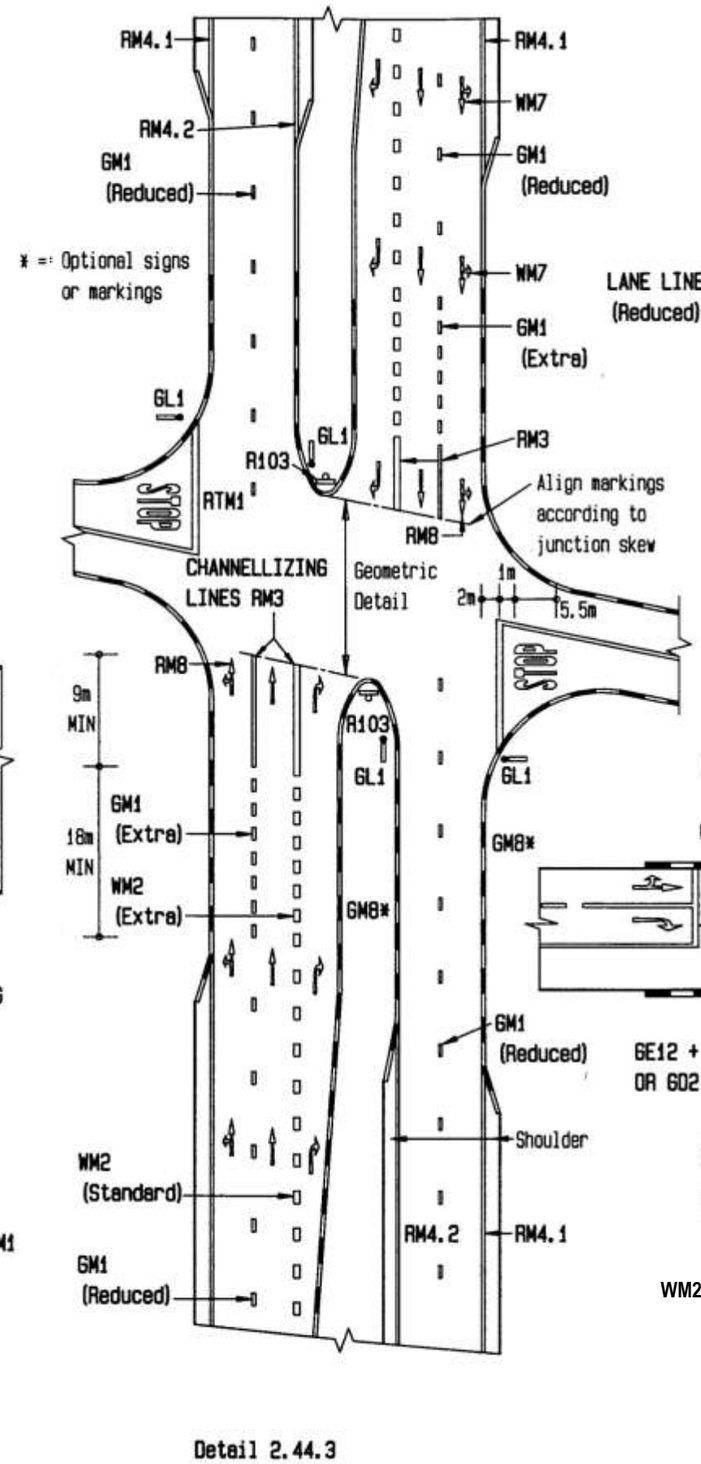
Fig 2.43
Basic Intersection Marking - 1



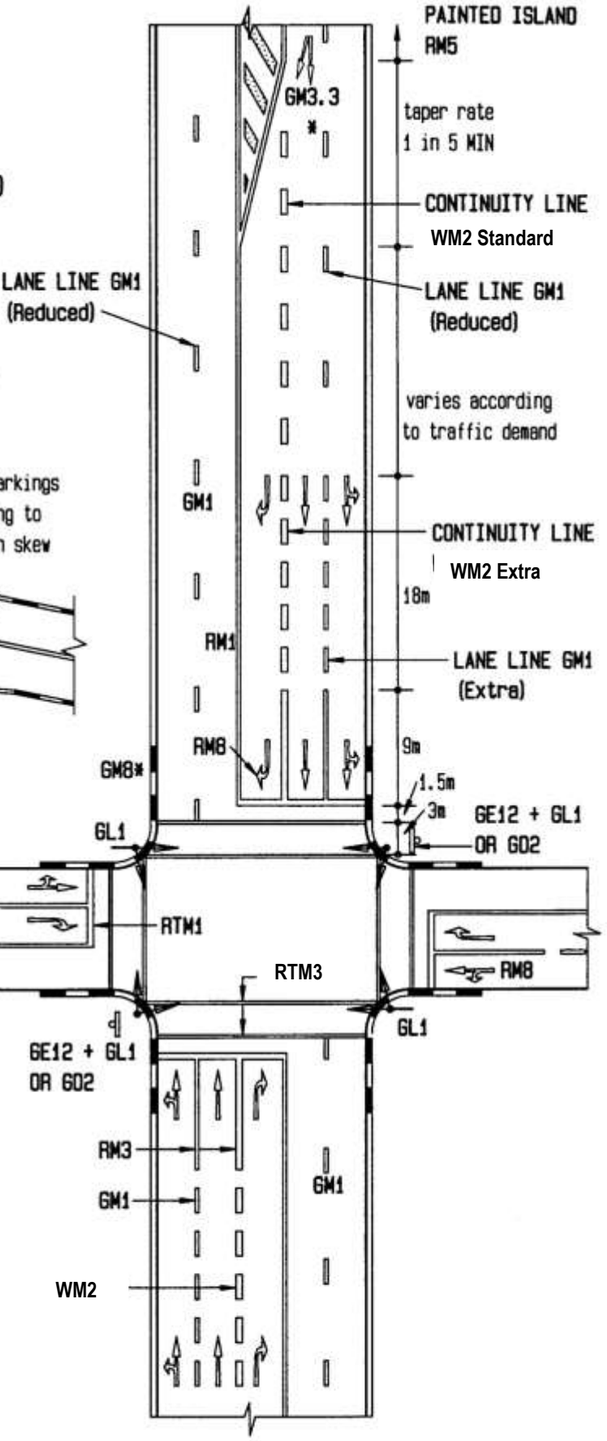
Detail 2.44.1
Typical Mini-Traffic Circle



Detail 2.44.2
Typical One-Way Street Junction

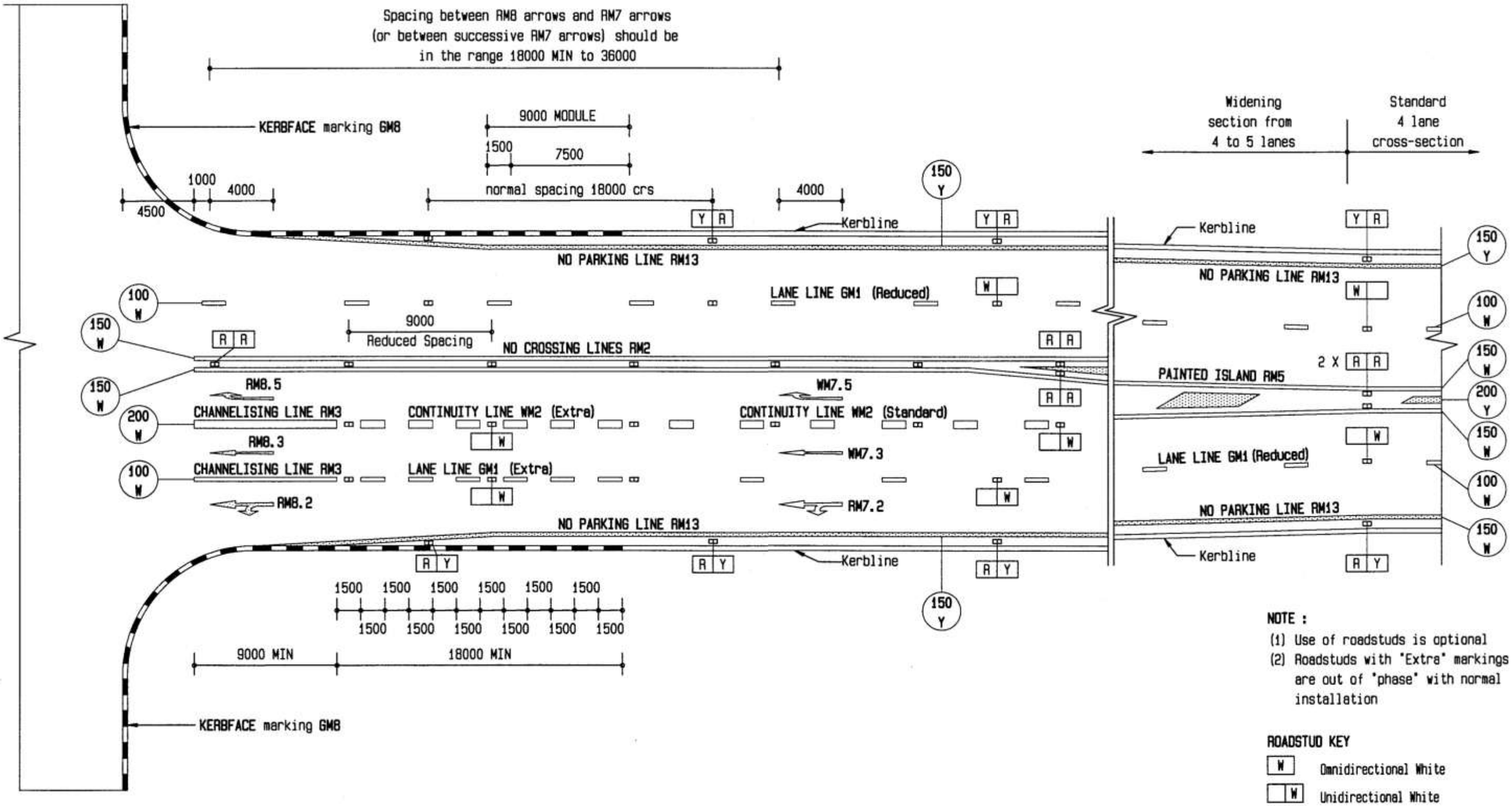


Detail 2.44.3
Typical Dual Carriageway/Minor
Road Junction



Detail 2.44.4
Typical Signalized Multi-Lane Road

Fig 2.44
Basic Intersection
Marking - 2



NOTE :

(1) Use of roadstuds is optional

(2) Roadstuds with "Extra" markings are out of "phase" with normal installation

ROADSTUD KEY

W	Omnidirectional White
☐ | W	Unidirectional White
W | W	Bidirectional White/White
R | W	Bidirectional White/Red
R | Y	Bidirectional Yellow/Red
R | R	Bidirectional Red/Red

Fig 2.45
Multi-Lane Junction Marking – 1
Typical Un-signalised Junction

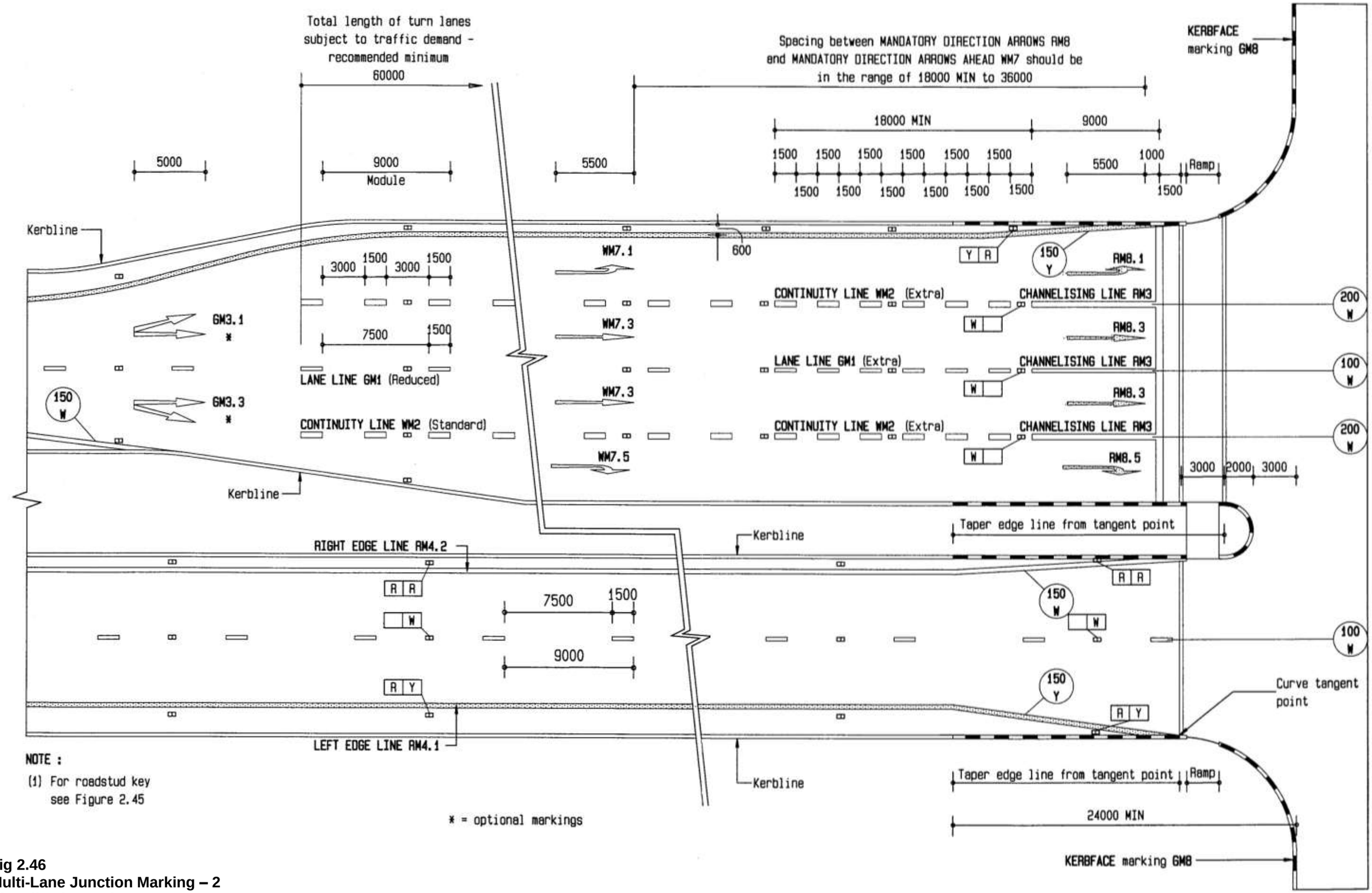
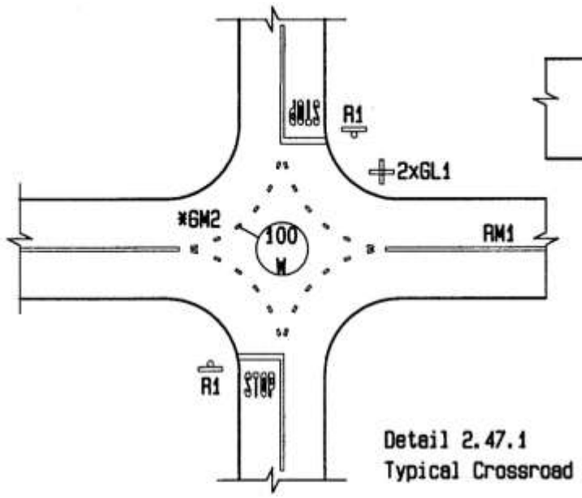
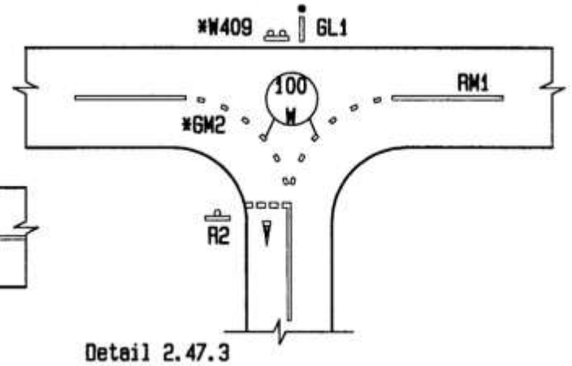


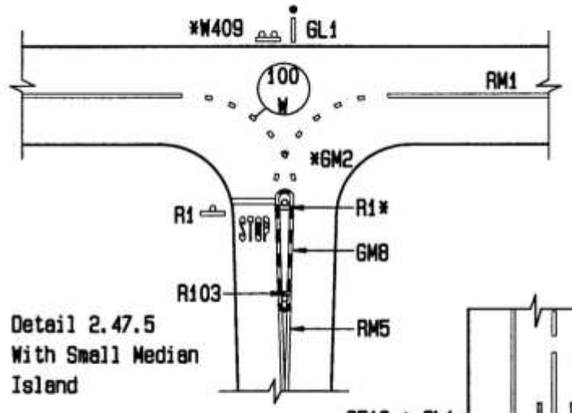
Fig 2.46
Multi-Lane Junction Marking – 2
Signalised Junction



Detail 2.47.1
Typical Crossroad

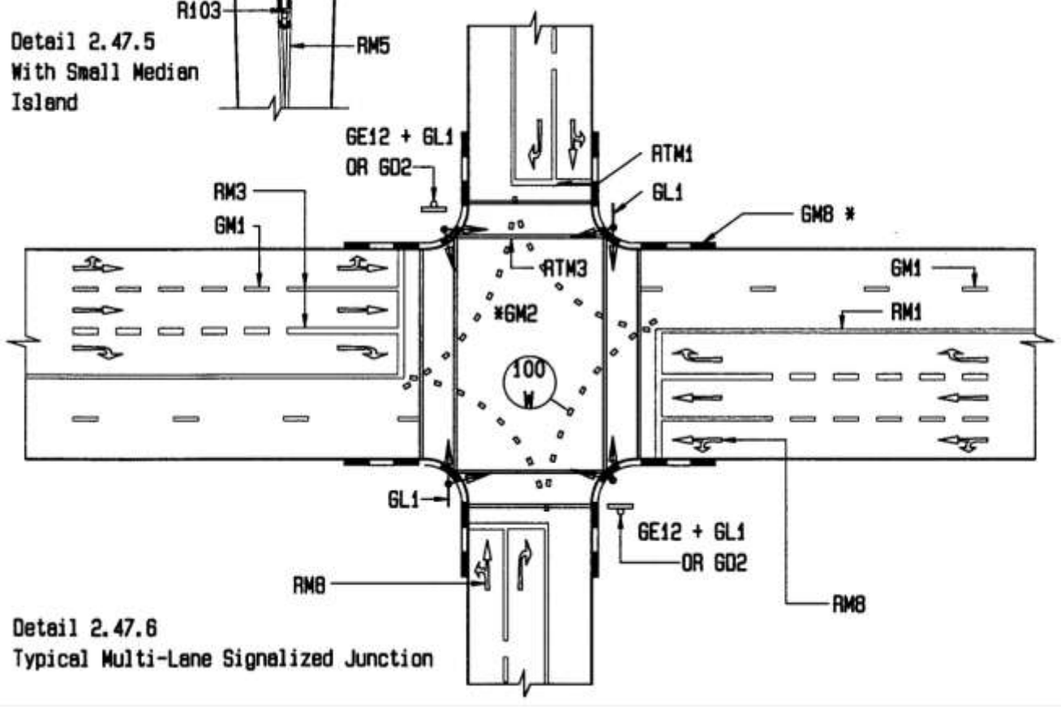


Detail 2.47.3
Typical T-Junction

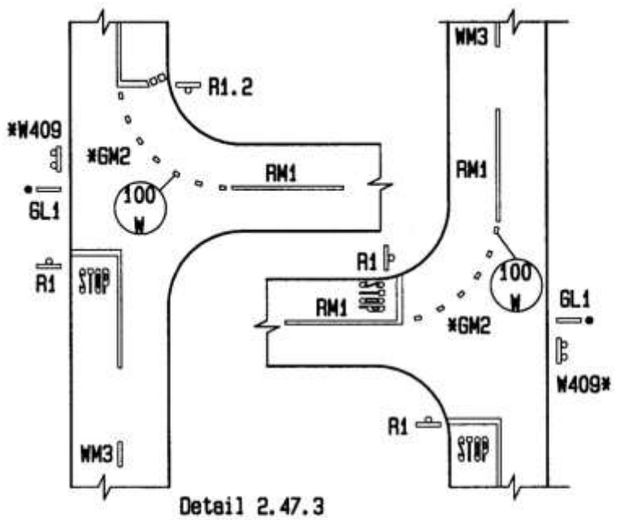


Detail 2.47.5
With Small Median
Island

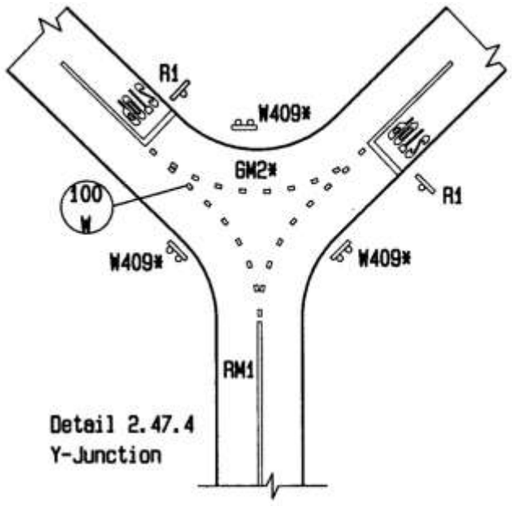
* = Optional signs and markings
For further examples and for
dimensional details see
Figure 2.48



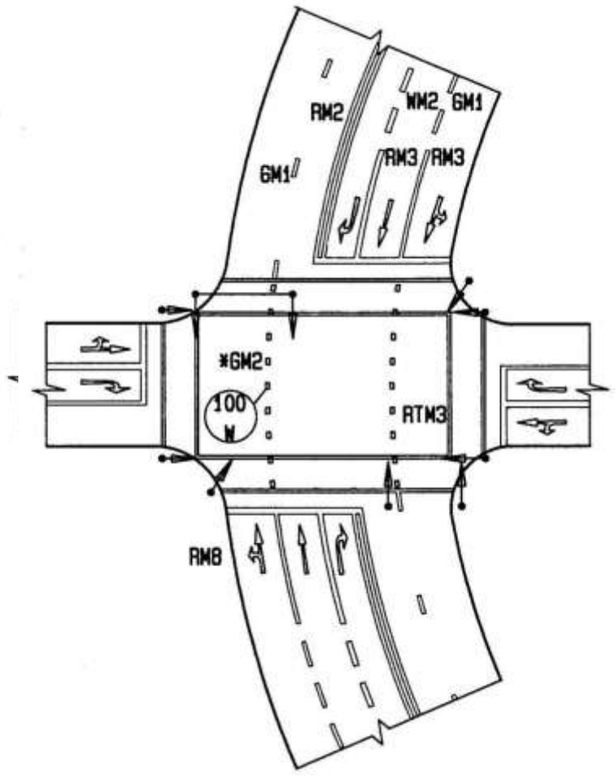
Detail 2.47.6
Typical Multi-Lane Signalized Junction



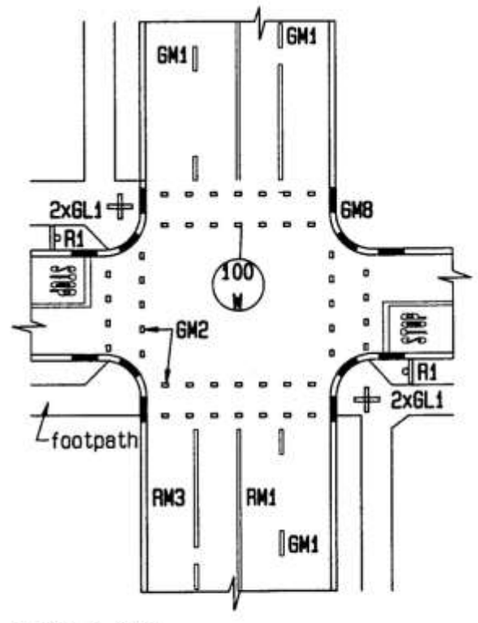
Detail 2.47.3
Non-Standard T-Junctions



Detail 2.47.4
Y-Junction



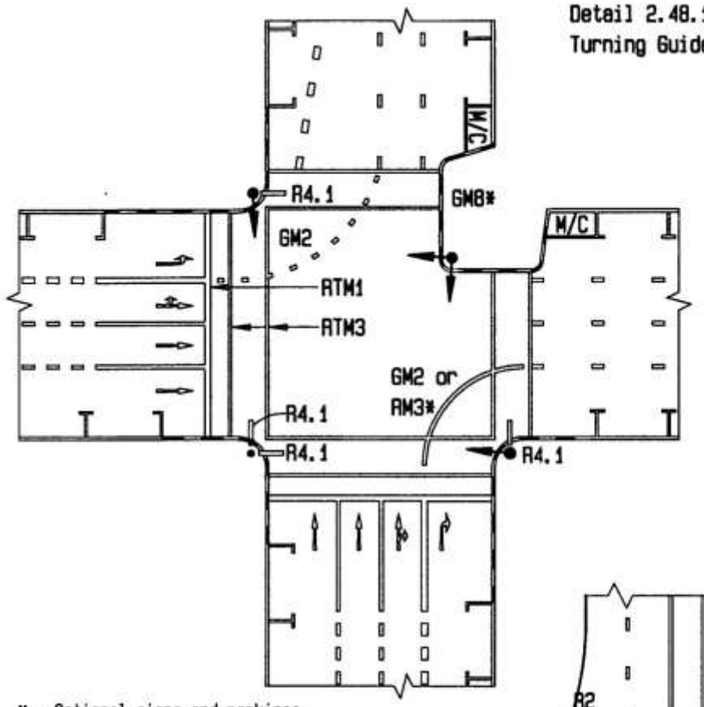
Detail 2.47.7
Indication of Curvature or Skew Through
a Junction



Detail 2.47.8
Pedestrian Guidelines at Crossroad

Fig 2.47
Turning Guide Line GM2
Details - 1

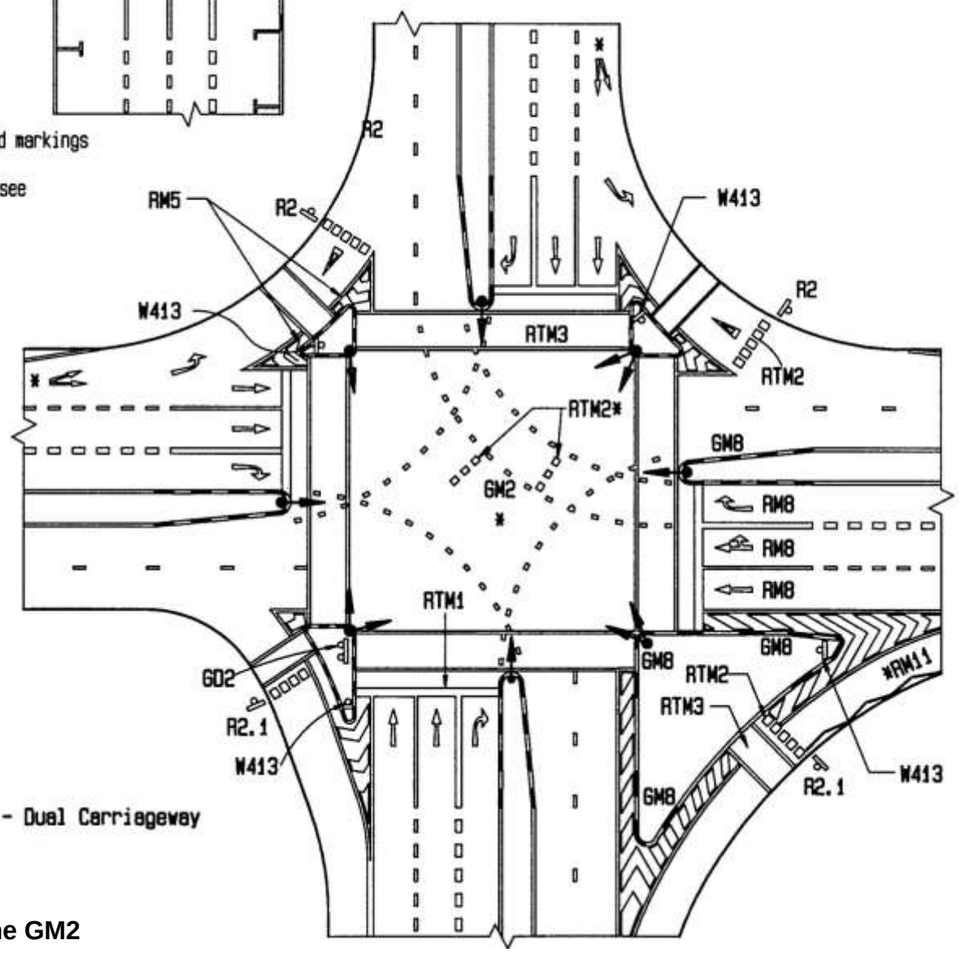
Detail 2.48.1
Turning Guidelines in One-Way Streets



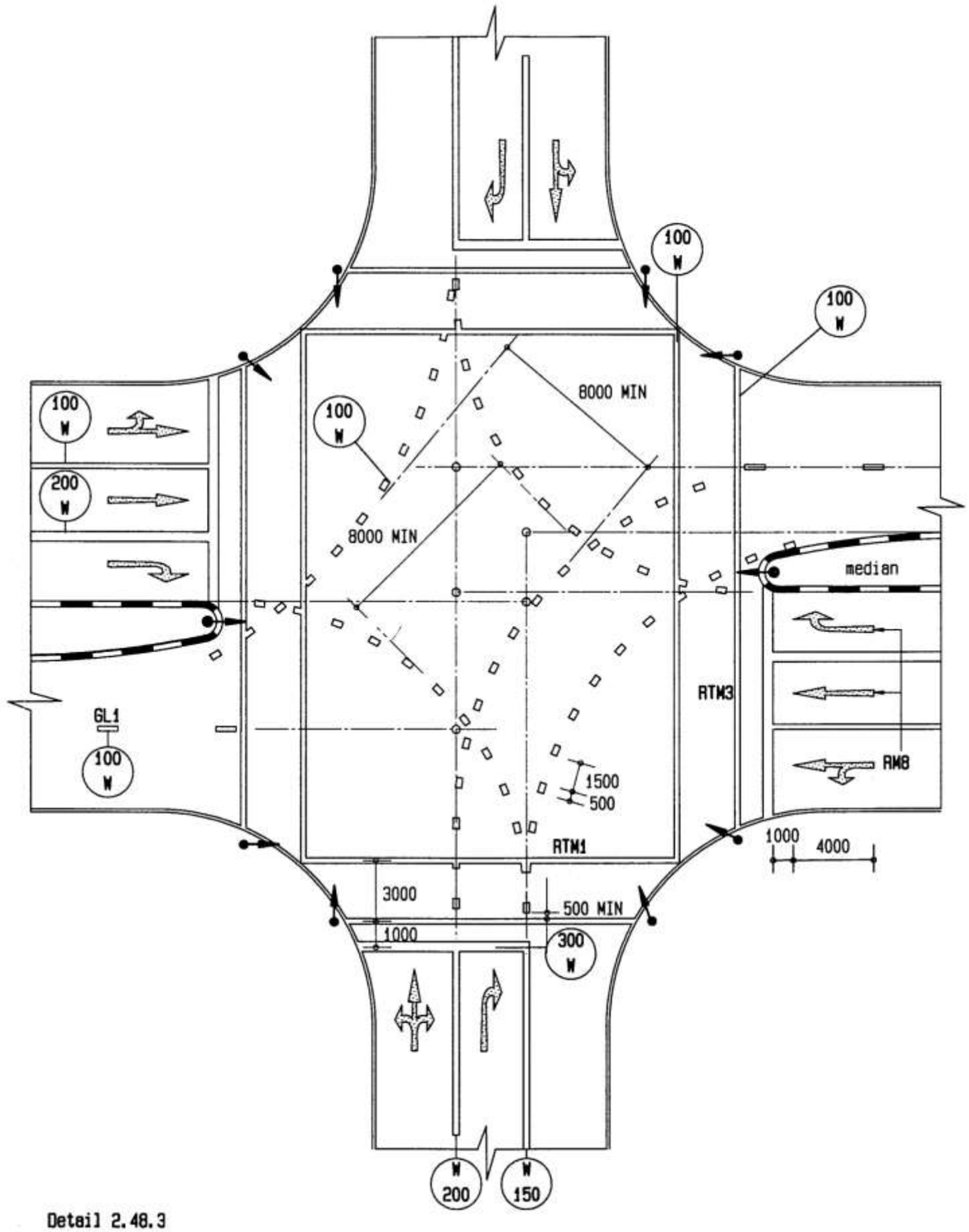
NOTE:
(1) Details 2.48.1 and 2.48.2 include examples of double turn lanes

* = Optional signs and markings

For further examples see Figure 2.47

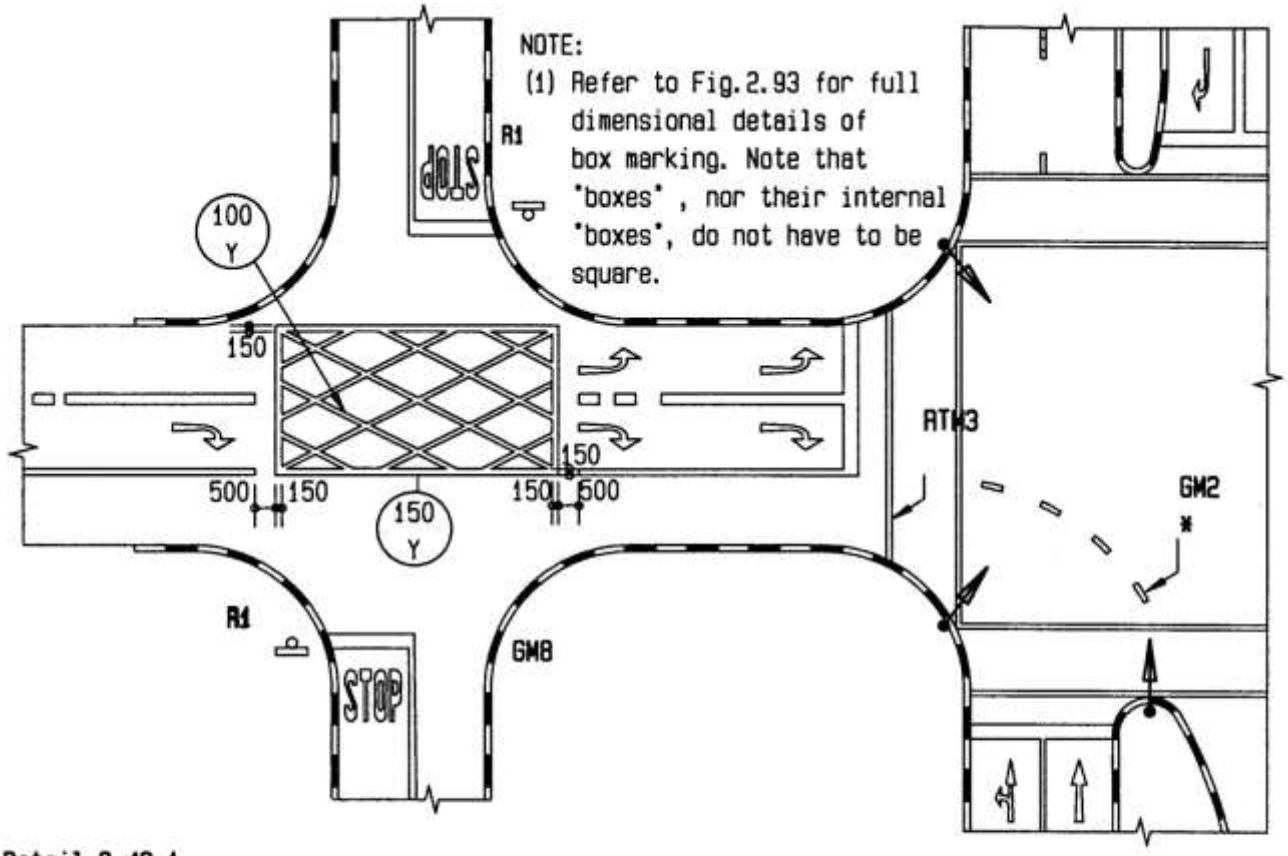


Detail 2.48.2
Turning Guidelines - Dual Carriageway

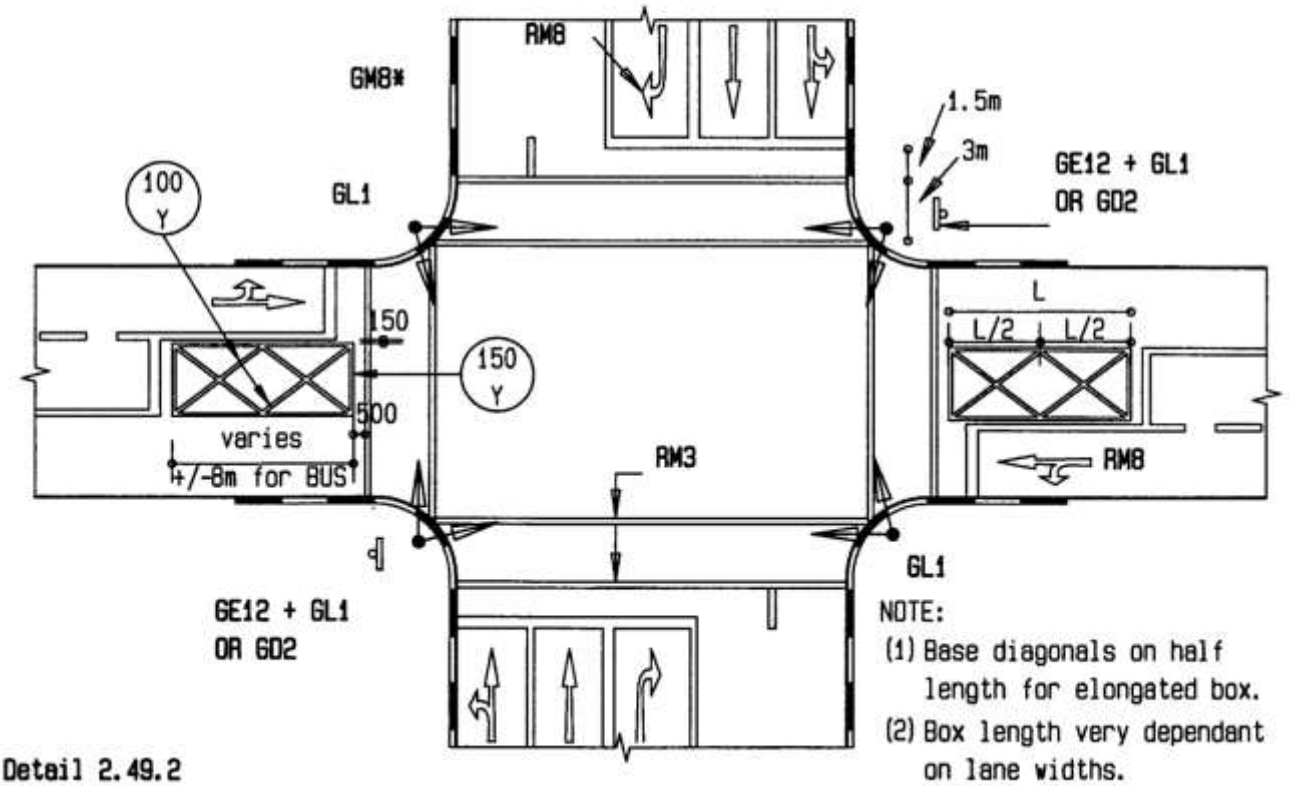


Detail 2.48.3
Dimensional Details of Guide Line Markings GM2

Fig 2.48
Turning Guide Line GM2
Details - 2



Detail 2.49.1
Typical Use of BOX JUNCTION Marking RM10 at Unsignalised Closely Spaced Junction



Detail 2.49.2
Typical Use of BOX JUNCTION Marking RM10 at STOP Line Setback

Fig 2.49 **Box Junction - Examples**

2.4.6 Road Marking in Central Business Districts

1 The examples given in Figures 2.50 to 2.53 cover the majority of road/lane configurations commonly used in the business districts of large cities and towns. A common feature of such environments is the use of one-way road networks. One-way road networks almost exclusively use broken longitudinal line types.

2 Figure 2.50 illustrates the basic markings for 2-way and one-way CBD streets with parallel parking (for the full range of parking marking options refer to Section 2.6). The details in this figures are simple since they do not include exclusive or dedicated turn lanes.

3 One of the most difficult features of a one-way CBD road network to make clear to drivers, and thereby create an efficiently operating traffic system, is that of exclusive or dedicated turn lanes. Such lanes may be provided for right turn, or left turn movements, at a junction, or they may be provided for both in some instances. These exclusive turn lanes are essential to the capacity of a one-way network. It is therefore important that drivers know they are there, and can move across several lanes, often in a short distance, in order to use them. Figure 2.51 shows an option which makes it as clear as possible to drivers, entering the section of road, that a lane ahead has some unusual feature about it. The use of a wider CONTINUITY LINE marking WM2 is designed to create a conscious effect on the part of a driver to enter the lane, or conversely to not enter it, if the driver does not want to. These markings may be further supplemented by diagrammatic signs in the GS 800 series which illustrate the lane configuration existing at the junction ahead.

4 The other feature common to this type of one-way network is that of dual right or left turn lanes. These may both be dedicated turn lanes but the most common combination is one dedicated turn lane and one shared turn-and-through lane. This layout can also be represented suitably in advance of the junction by GS800 series diagrammatic signs. It is important in this dual turn situation to provide a GUIDE LINE marking GM2 or even a CHANNELIZING LINE marking RM3 between the two turning lanes, within the intersection. This practice should inhibit the "inner" turning driver from drifting wide into the path of a parallel turning driver.

5 Figure 2.52 shows exclusive turn lanes in 2-way streets. Due to the fact that there are only two lanes (illustrated), the use of the tapered line technique shown in Figure 2.51, and the 200 mm wide CONTINUITY LINE marking WM2, is not recommended.

6 Figure 2.53 shows a number of marking applications which may occur in many parts of a medium sized town or city. The examples illustrate CBD type applications but this does not preclude their use elsewhere. Details 2.53.1 and 2.53.2 show the use of NO PARKING line marking RM13 across entrances to properties, within parking and no parking, or no stopping, environments. It should be noted that the recommended practice for marking RM13 used in this manner, is for the section of line parallel to the kerb line or property line to be marked 200 mm further out from the kerb line than adjacent parking lines to make it visible to approaching drivers.

7 Figure 2.53 also illustrates the use of PAINTED ISLAND marking RM5 to visually block a dedicated turn lane. Such a treatment may eventually be replaced by a similar raised sidewalk extension, to the benefit of pedestrians crossing the busy one way streets (due regard must be taken of the effects on road drainage, however.)

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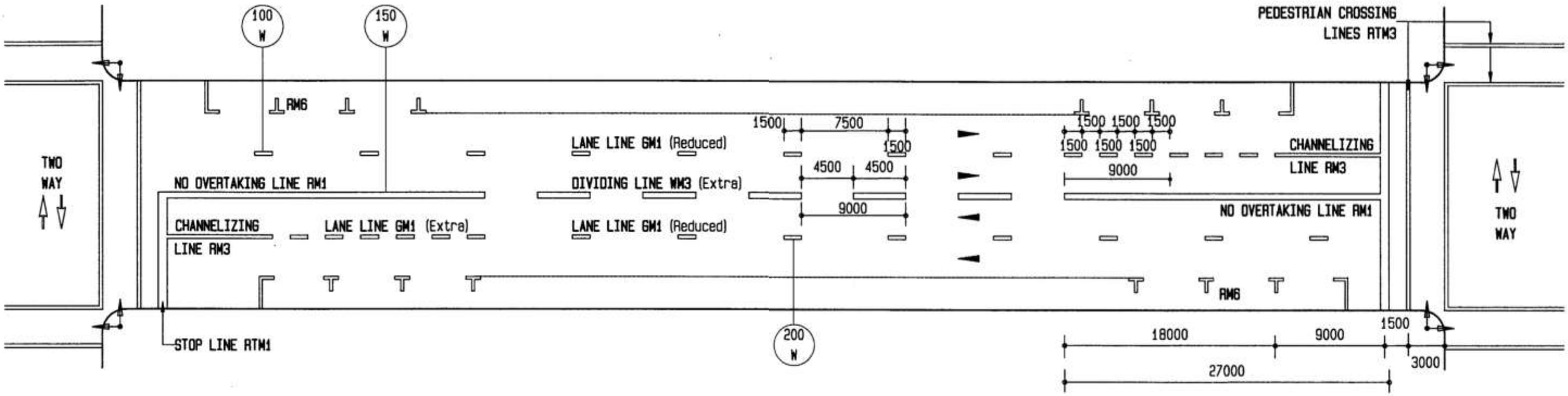
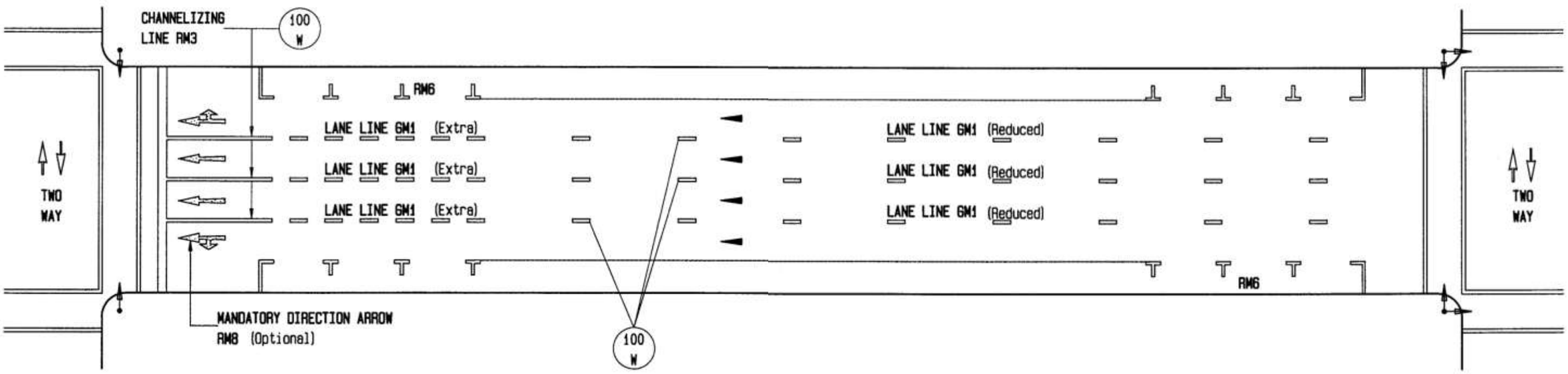
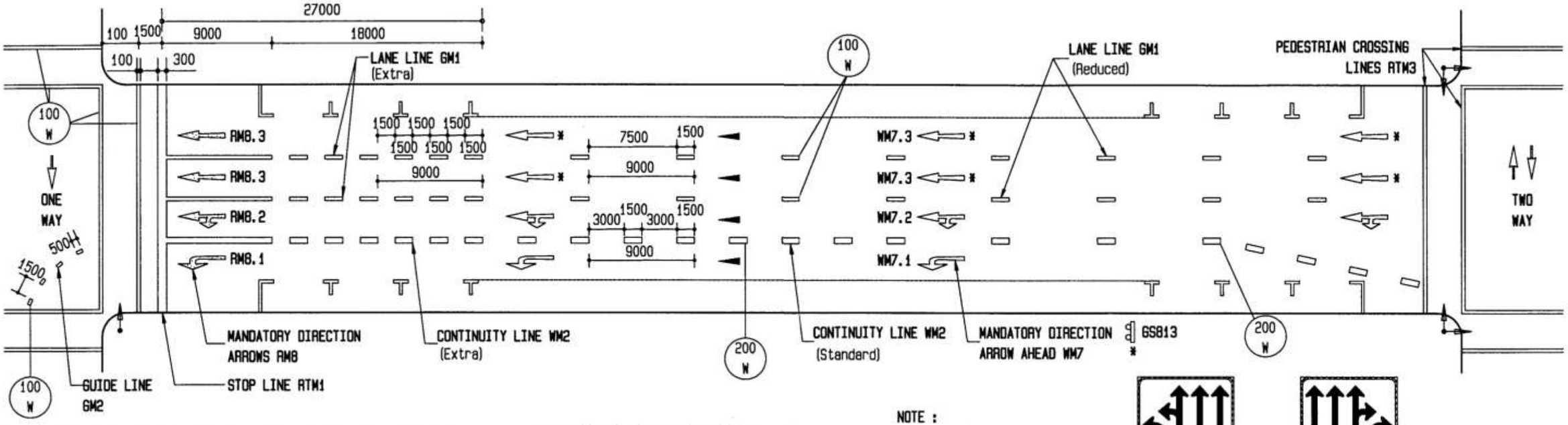


Detail 2.50.1 Typical Two-Way Street

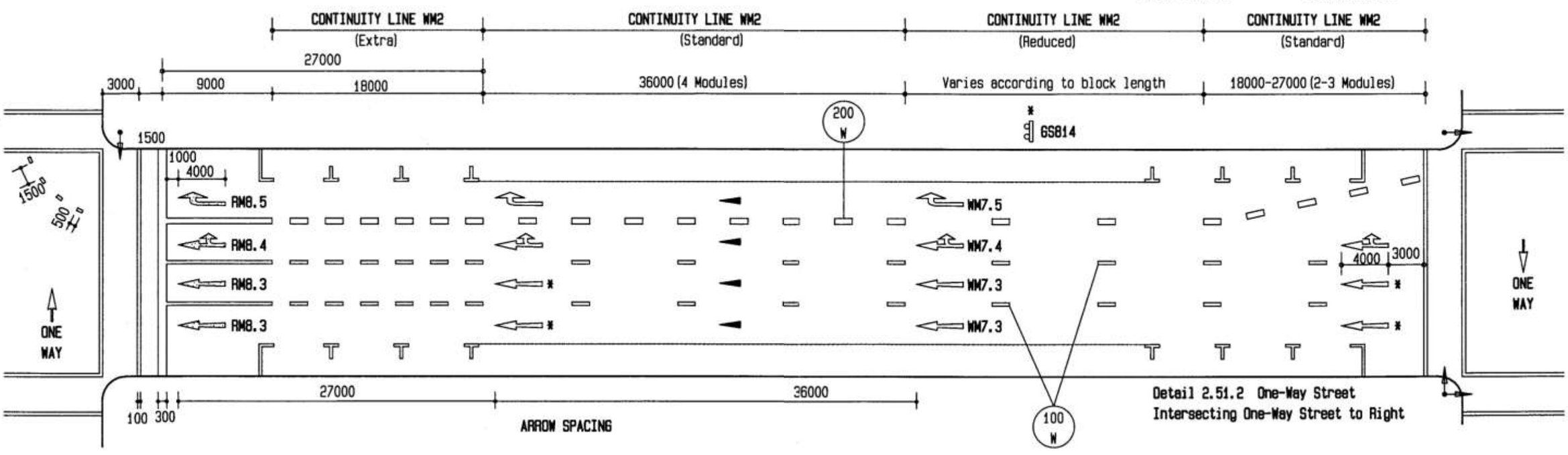


Detail 2.50.2 Typical One-Way Street

Fig 2.50
Central Business District Streets - 1
Basic Lane Markings

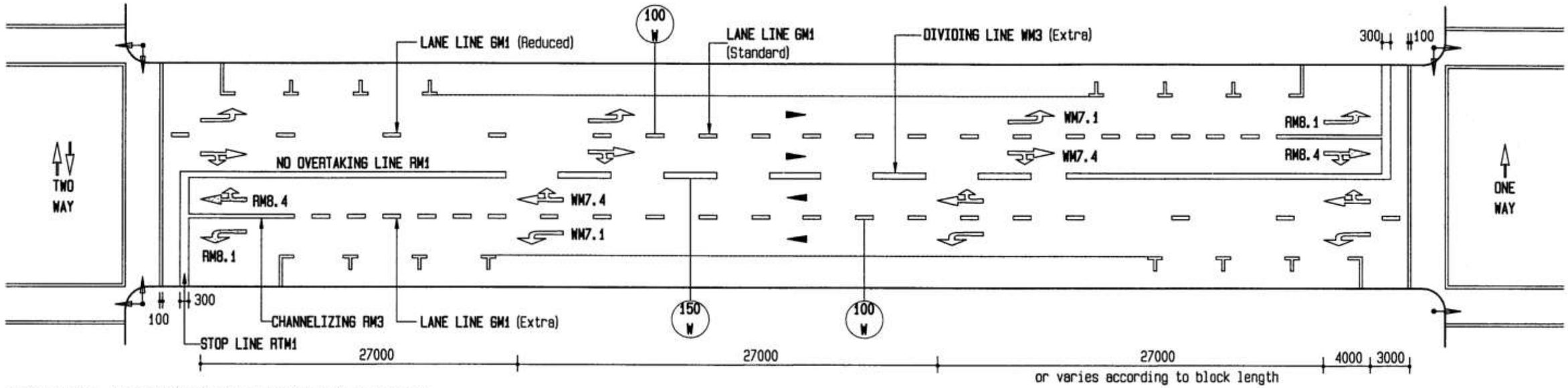


Detail 2.51.1 One-Way Street Intersecting One-Way Street to Left

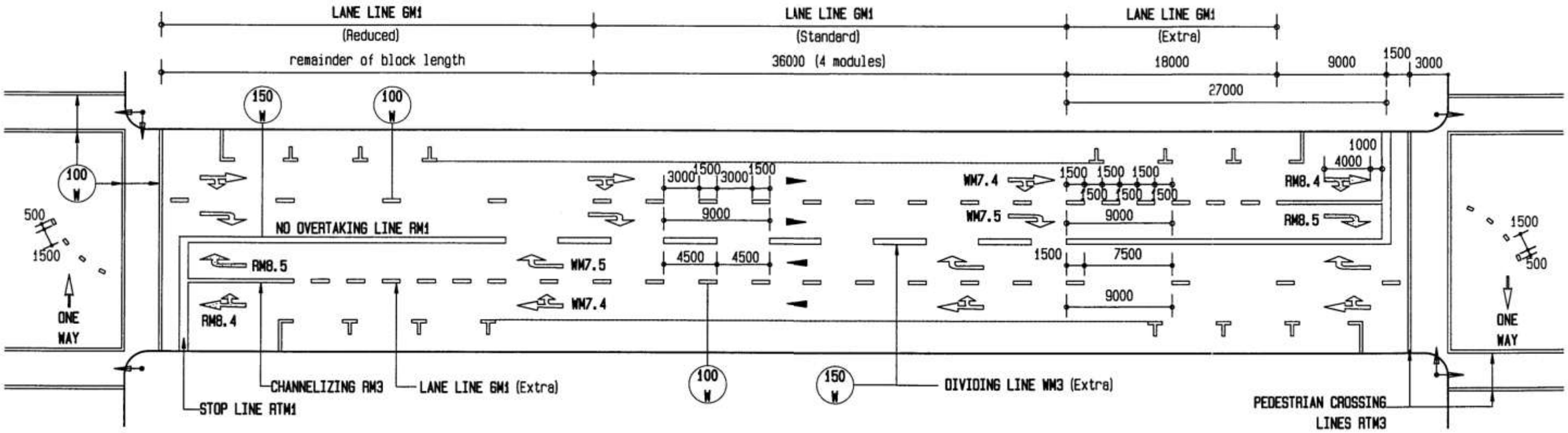


Detail 2.51.2 One-Way Street Intersecting One-Way Street to Right

Fig 2.51
Central Business District Streets - 2
One-Way Street Details

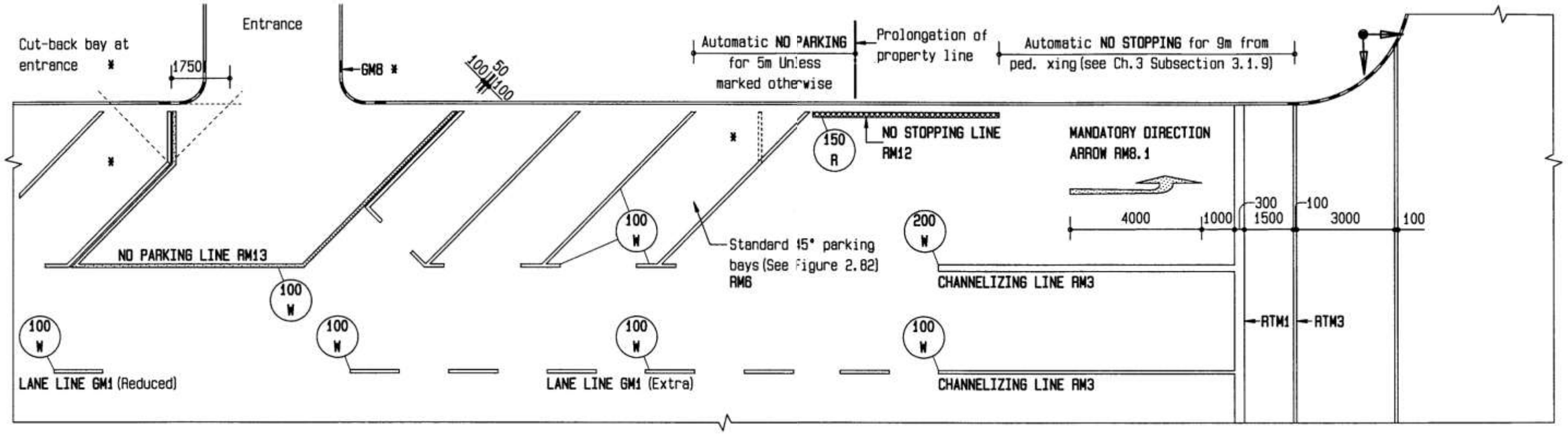


Detail 2.52.1 Two-Way Street with Exclusive Left Turn Lanes

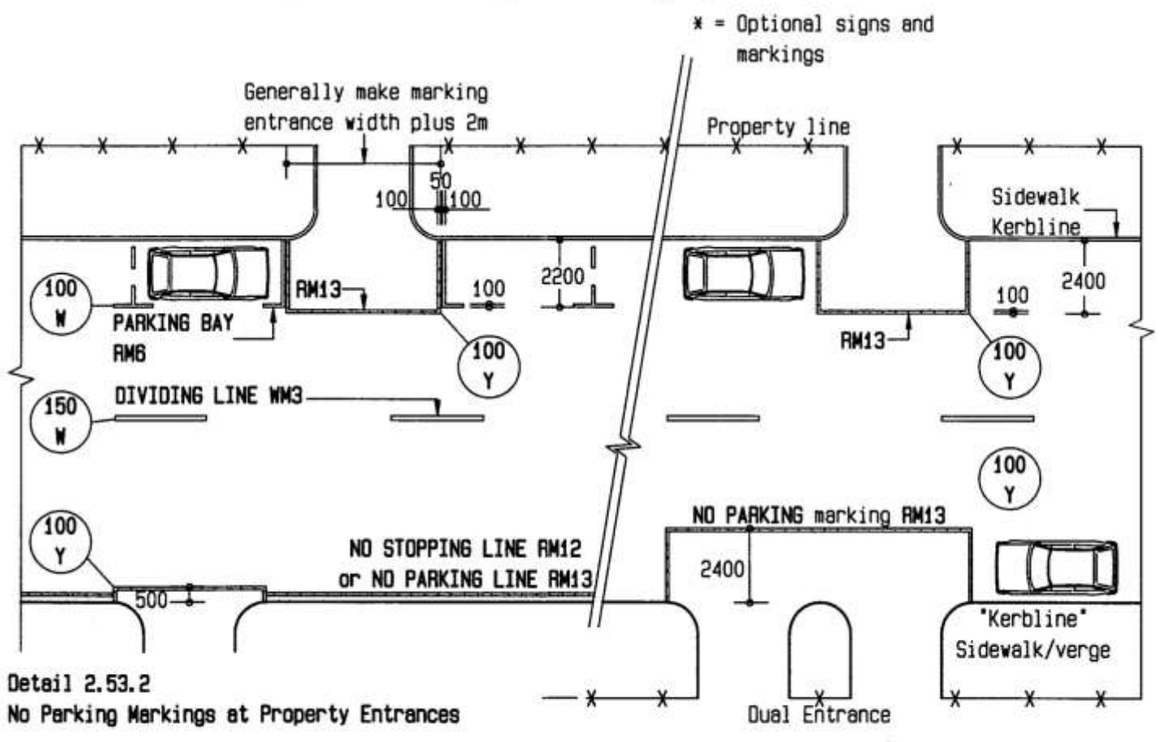


Detail 2.52.2 Two-Way Street with Exclusive Right Turn Lanes

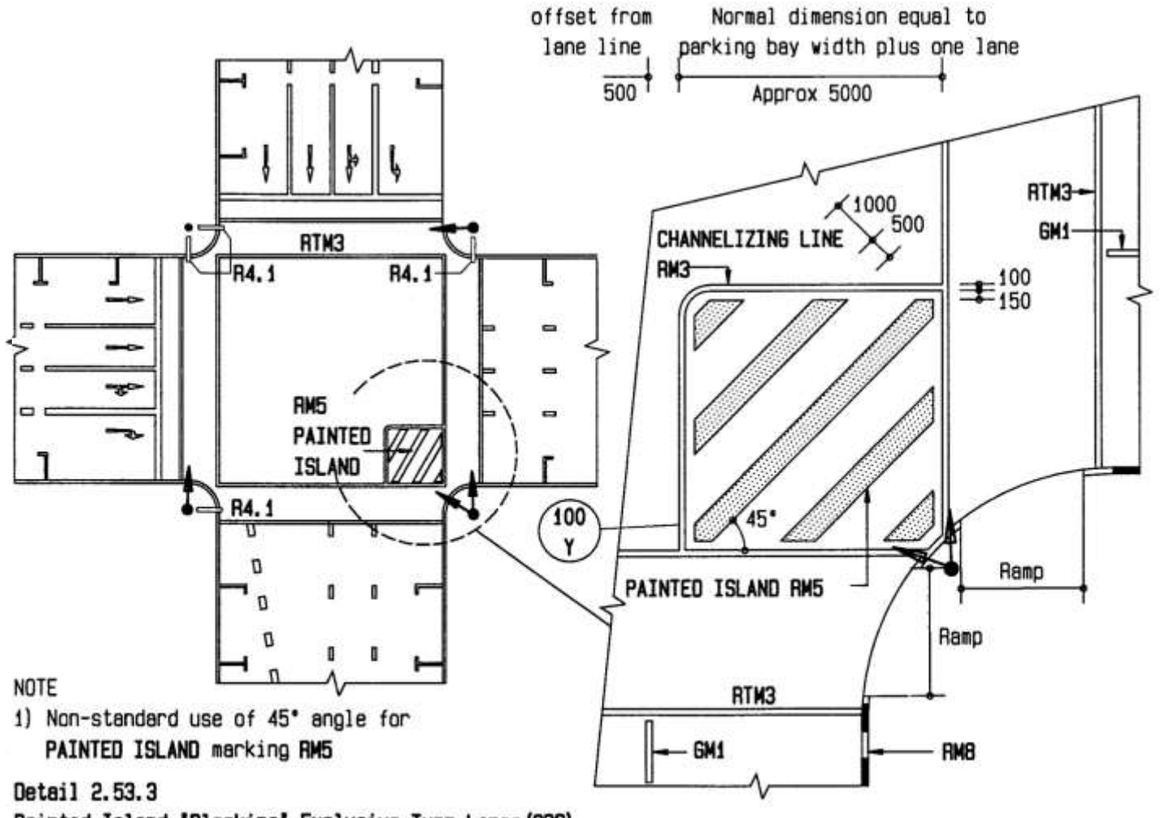
Fig 2.52
Central Business District Streets - 3
Two-Way Street Details



Detail 2.53.1 NO PARKING/NO STOPPING Markings with Parking Bays and Entrances



Detail 2.53.2
No Parking Markings at Property Entrances



NOTE
1) Non-standard use of 45° angle for PAINTED ISLAND marking RM5

Detail 2.53.3
Painted Island "Blocking" Exclusive Turn Lanes (CBD)

Fig 2.53
Examples of Specific Applications of Road Marking Types

2.4.7 Road Marking for Pedestrian Applications

1 Pedestrian crossings are defined in legislation. For full details of the legal aspects refer to Chapter 3: *Regulatory and Warning signs and Markings Applications*, in particular Subsection 3.1.9. Detail 2.54.1 shows the areas legally defined as pedestrian crossings, if no markings or signs are provided, and pedestrians technically have right of way under defined circumstances at these points.

2 The remainder of Figure 2.54 illustrates basic options for marking crossings for pedestrians at junctions. Detail 2.54.2 shows the use of GUIDE LINE marking GM2 at an unsignalised crossroad. Such markings do not qualify as a "pedestrian crossing" in the legal sense, however, they lie within the area legally defined as "pedestrian crossings" and they provide guidance and a measure of control over the width of such crossings as given by the conditions in Detail 2.54.1. Detail 2.54.3 shows the conventional use of PEDESTRIAN CROSSING LINE marking RTM3 at a signalized crossroad.

3 Figure 2.54 also shows other options for marking pedestrian crossings at a signalized junction. The separation of the lines comprising marking RTM3 may be increased to allow for large pedestrian volumes. Another option which is rarely exercised, but which could be considered for sites with poor observance of pedestrians by drivers, is the use of BLOCK PEDESTRIAN CROSSING marking RTM4 (more commonly used in mid-block locations).

4 Figure 2.55 gives a number of examples of mid-block pedestrian crossing markings. Detail 2.55.1 shows the marking of a basic crossing using BLOCK PEDESTRIAN CROSSING marking RTM4. This crossing is controlled by YIELD TO PEDESTRIANS signs R2.1. Detail 2.55.2 shows a similar crossing controlled by traffic signals. In this case, as with signalized junctions, PEDESTRIAN CROSSING LINES RTM3 are normally specified. However, if the signalization is an upgrade in control level of a crossing already marked with block markings, it is not recommended that any attempt be made to remove the large area of marking RTM4. A combination of markings RTM3 and RTM4 should rather be considered.

5 Detail 2.55.3 shows two options for pedestrian crossings operated by Scholar Patrols. In the one case Scholar Patrol control is superimposed upon a full time crossing, normally controlled by signs R2.1 and marking RTM4. Since the Scholar Patrol uses STOP signs R1, these signs over-ride the R2.1 signs whilst the Scholar Patrol is in operation. The real effect of this is that drivers who have stopped (which includes the action of yielding), can no longer choose when to proceed, they are controlled to wait until the Scholar Patrol operator releases them by removing the STOP signs R1. Some school and road authorities prefer that the crossing operated by the Scholar Patrol only becomes operational functional when the Scholar Patrol is present. This approach stems largely from the belief that children should not be encouraged to use an unattended crossing (outside the hours of operation of the Scholar Patrol) due to unreliable observance by drivers of such a crossing, resulting in an unacceptable level of safety for the children. To cater for this a second option is illustrated in which the permanent markings and signs are limited to GUIDE LINE markings GM3 and central sections of NO OVERTAKING LINE marking RM1 on the approaches. What these markings serve to do is to identify for the Scholar Patrol, and the children, the location of the crossing. During operation the Scholar Patrol is identified by temporary SCHOLAR PATROL warning signs TW305 in advance of the crossing and drivers are controlled by the STOP signs R1 used by the members of the Scholar Patrol. Although the markings do not represent a controlled crossing when the Scholar Patrol is not present, it is recommended that permanent CHILDREN warning signs W308, or PEDESTRIAN warning signs W307, be provided on each approach.

6 Details 2.55.4 and 2.55.5 give examples of the use of ZIG ZAG ZONE LINES marking RM11 to create a ZIG-ZAG ZONE marking. This marking may be used on the approach to any pedestrian crossing, irrespective of the level of control in use. It should be noted that the marking may be used on multi-lane approaches and that, notwithstanding the legal effects given below, parking may be provided in a recessed manner outside the lines. Marking RM11 has two legal effects, apart from its visual impact. These are, in brief, that:

(a) drivers shall not stop within the zone except to comply with the actions of pedestrians at the crossing; and

(b) drivers shall not cross such markings.

7 Figure 2.56 shows an application of two different pedestrian crossing markings at a junction. In practice it is generally not recommended that pedestrian crossings controlled by YIELD TO PEDESTRIANS signs R2.1 be provided on the priority approach to a junction controlled on the intersecting approaches by STOP signs R1 or YIELD signs R2. This is because of the risk of confusion in the minds of motorists, on any approach, as to who actually has priority. Such markings are, however, used, and this figure gives guidance on preferred practices.

8 Figure 2.57 illustrates a number of details of support markings to pedestrian crossings when it is desirable to create a refuge for pedestrians part of the way across the road. Such a treatment is particularly recommended when a crossing is known to be used by significant numbers of elderly or handicapped people, or by children. Also shown is a detail of an option to make provision for a pedestrian safety refuge in the middle of a busy roadway on which total control of pedestrians is just not practical, but where numbers of pedestrians are sufficiently high to warrant such a safety measure. This treatment could be particularly appropriate on a busy industrial road or in rural areas in the vicinity of schools, stores or farm buildings.

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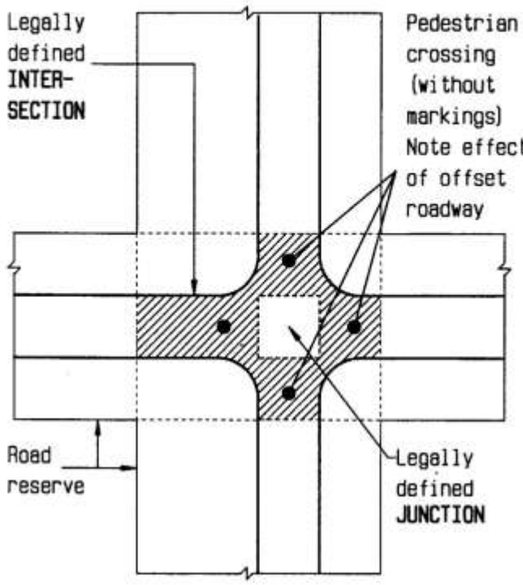
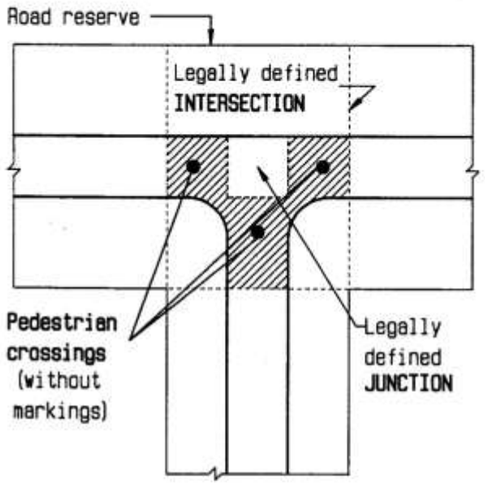


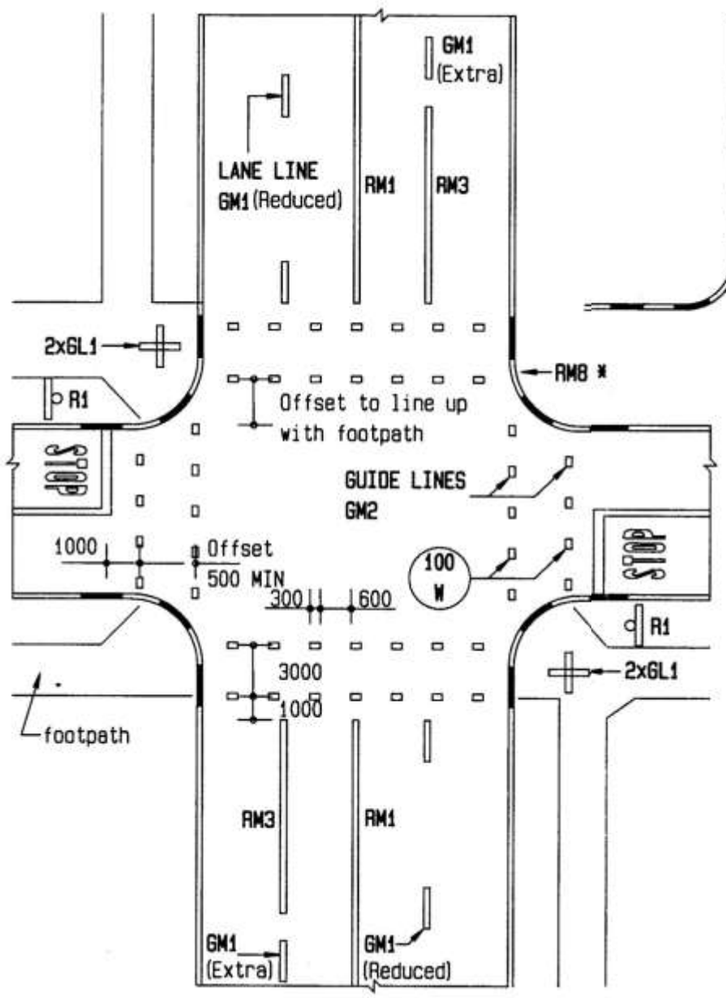
Typical "Legal" Cross Road Pedestrian Crossing



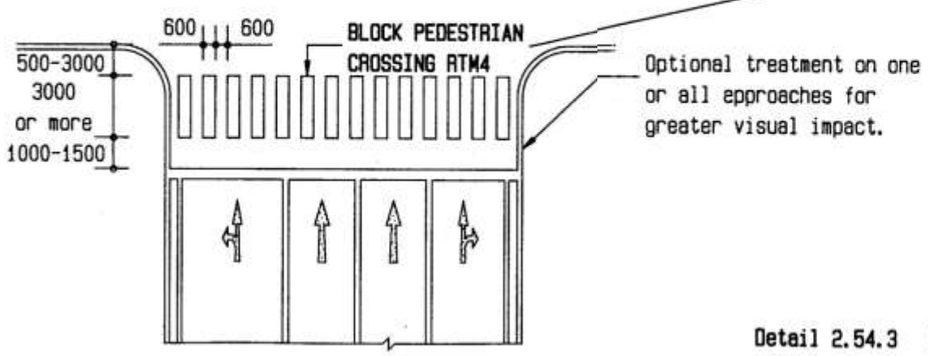
Typical "Legal" T-Junction Pedestrian Crossing

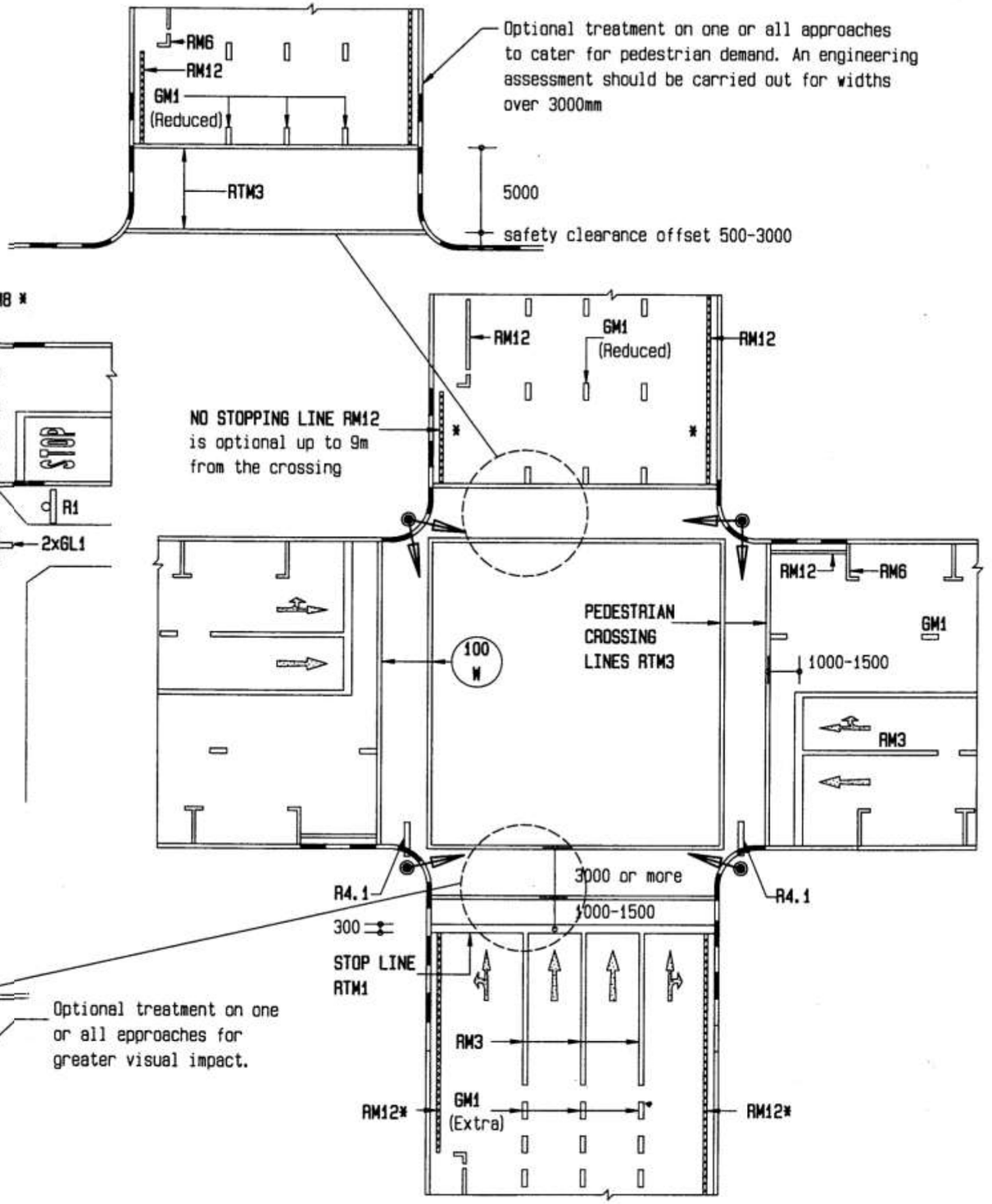
This Detail illustrates the areas legally defined as pedestrian crossings if no markings (or signs) are provided. In theory pedestrians have right of way at these points (for full details see Ch3 Subsection 3.1.9)

Detail 2.54.1
Legally Defined Pedestrian Crossings



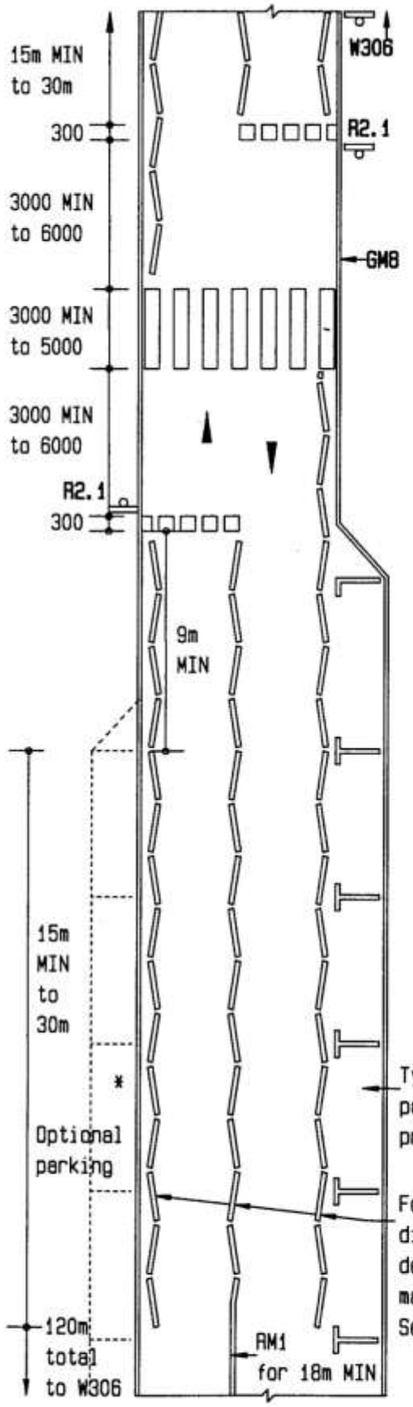
Detail 2.54.2
Guidelines Advising Pedestrians Where to Cross At an Un-signalized Junction



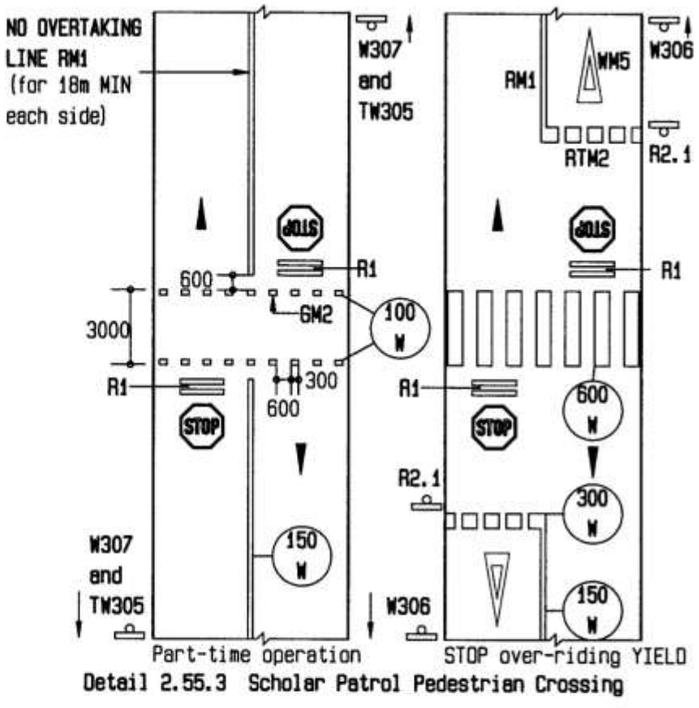


Detail 2.54.3 Typical Signalized Junction with Full Crossing Markings RTM3

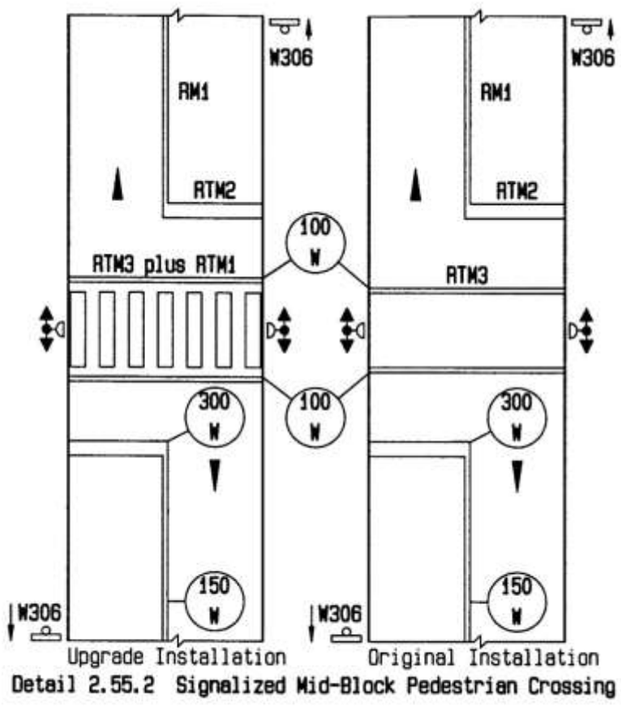
Fig 2.54
Pedestrian Crossings - 1
At Junctions



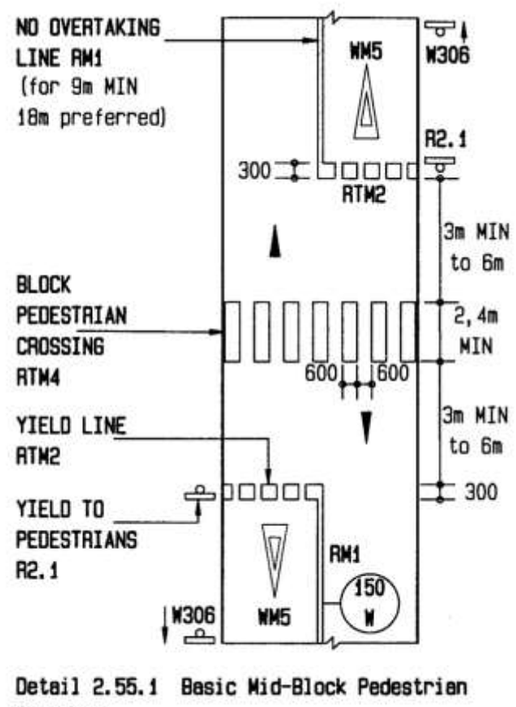
Detail 2.55.4
Application of RM11 Marking - 2-Lane / 2-Way



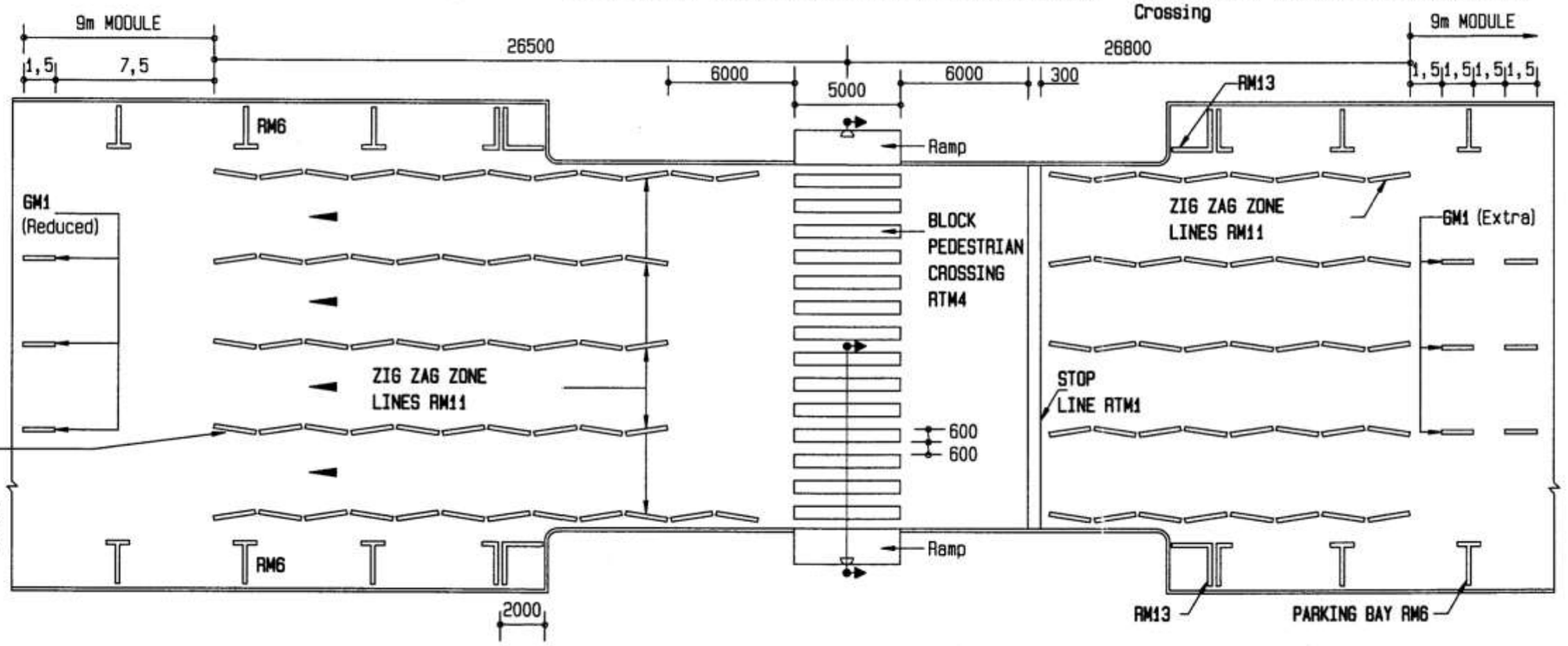
Detail 2.55.3 Scholar Patrol Pedestrian Crossing



Detail 2.55.2 Signalized Mid-Block Pedestrian Crossing



Detail 2.55.1 Basic Mid-Block Pedestrian Crossing



Detail 2.55.5
Application of RM11 Marking - Multi-Lane One-Way Environment (CBD or Dual Carriageway)

Fig 2.55
Pedestrian Crossings - 2
Mid-Block

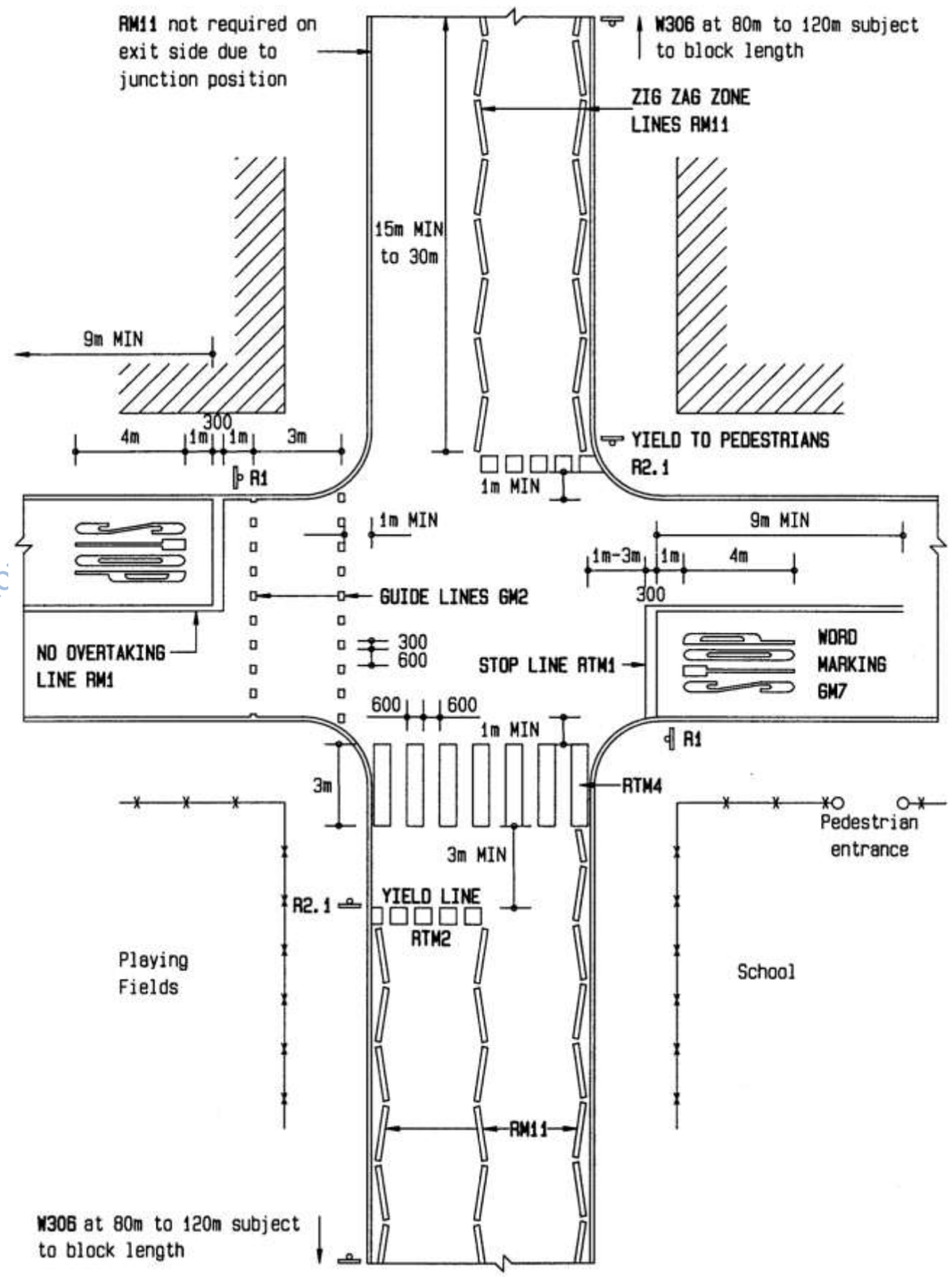


Fig 2.56 **Pedestrian Crossings – 3: Compromise Application for School Crossing at Junction, with or without Scholar Patrol**

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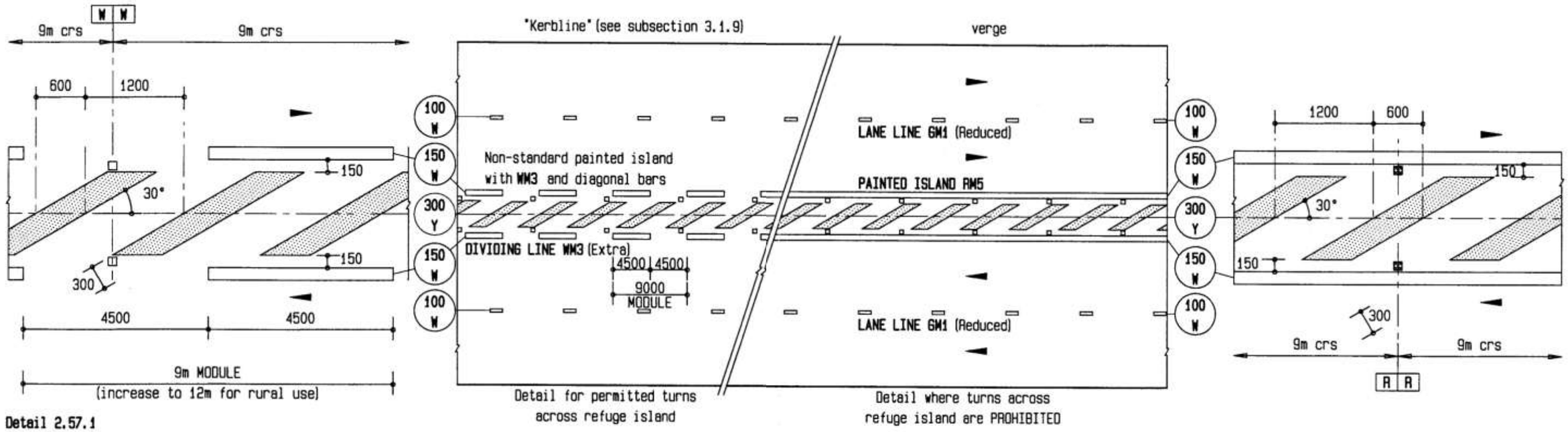
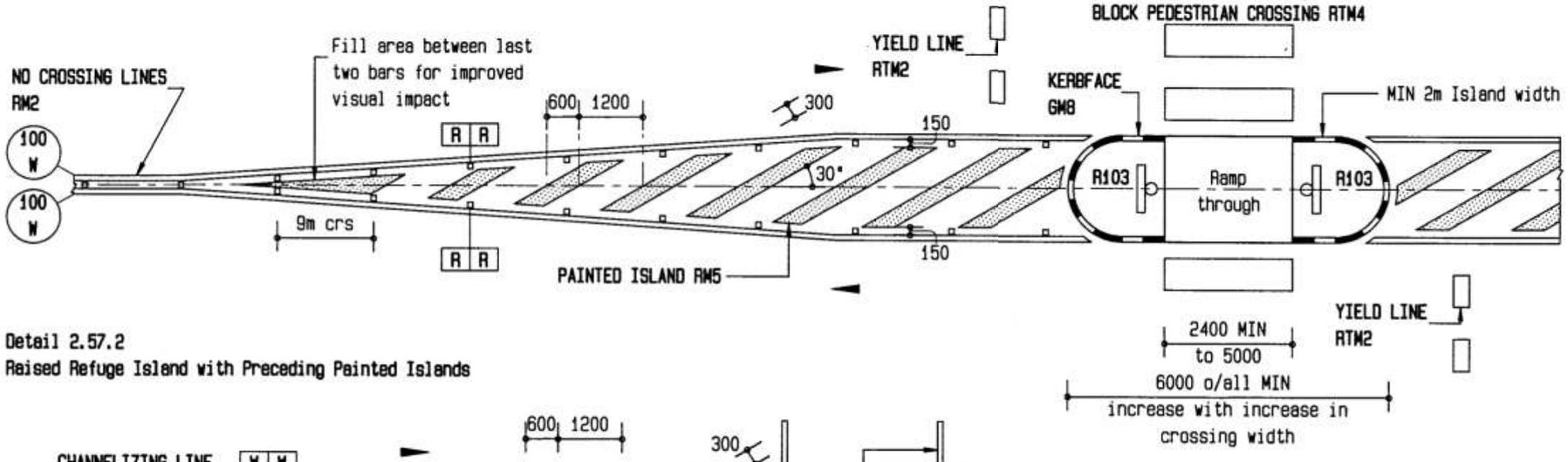
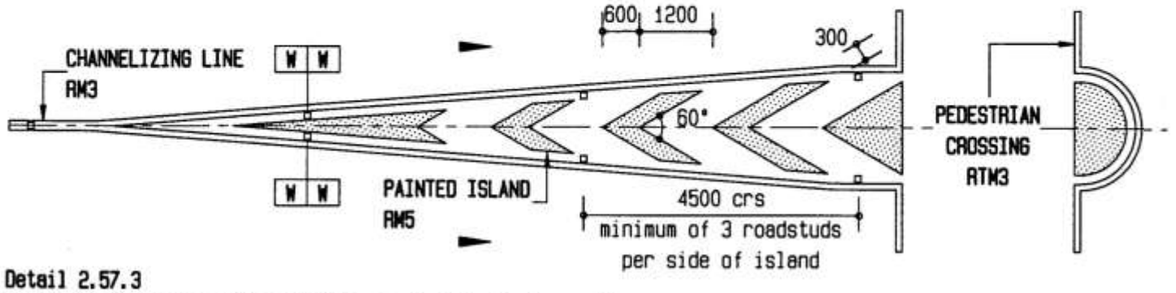


Detail 2.57.1
Examples of Median Refuge Island (Applicable for example to a Busy Industrial Road)



Detail 2.57.2
Raised Refuge Island with Preceding Painted Islands



Detail 2.57.3
Small Painted Refuge Island in One-way Traffic Environment

NOTE:

(1) Pedestrian crossings / refuges should ideally be illuminated. If not, the visual impact should be enhenced by greater than minimum width markings and by roadstuds at close spacings.

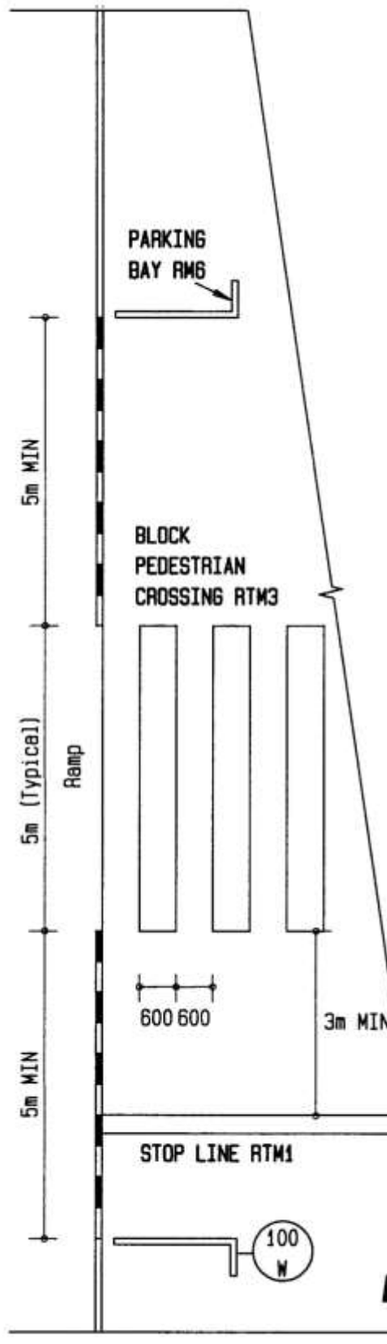
(2) The scales of details are distorted. This will mean that full size examples will generally look less densely marked.

(3) The table below gives a number of criteria relevant to isolated pedestrian refuge island situations.

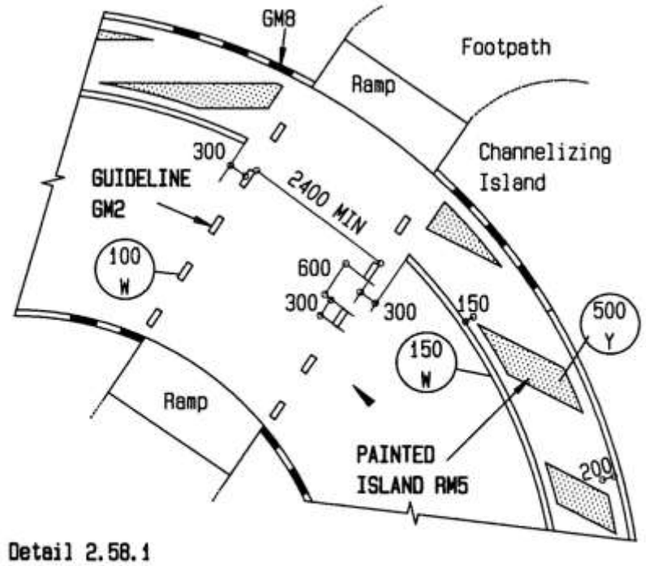
Speed (km/h)	SSD(m)	Taper Rate
40	55	1 in 20
60	85	1 in 35
70	110	1 in 35
80	125	1 in 40

where - speed = operating speed
SSD = stopping sight distance

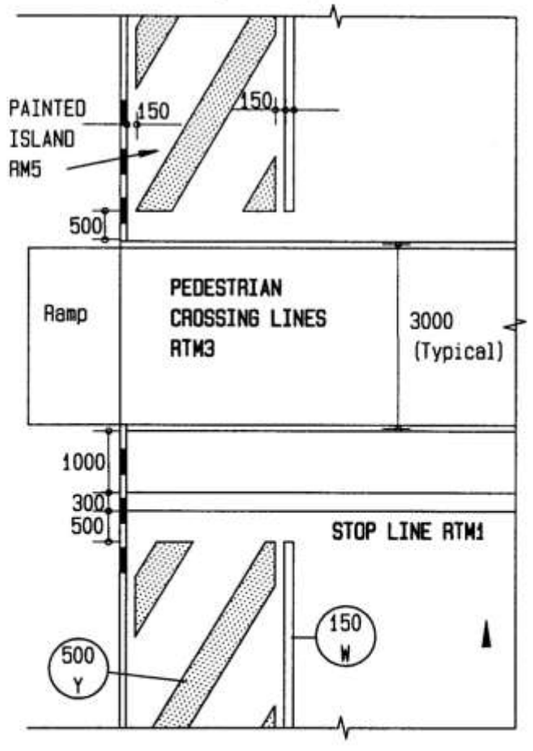
Fig 2.57
Pedestrian Refuge Islands



Detail 2.58.2
Block Pedestrian Crossing / Parking



Detail 2.58.1
Pedestrian Guidelines - Turning Roadway



Detail 2.58.3
Signalized Pedestrian Crossing / Painted Island

Fig 2.58 **Specific Details ofPedestrian Related Applications of Road Markings**

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2.4.8 Reversible Lane Applications

1 The use of REVERSIBLE LANE LINE marking WM4 should only be considered after a detailed engineering assessment of alternative methods of traffic control and after careful assessment of the necessary regulatory, warning and/or guidance signs or signals. The safety of pedestrians should be given particular attention in any such assessment. It is very difficult for pedestrians to perceive changes in the direction of use of lanes. Special attention must also be given to any property access points onto a section of roadway marked with marking WM4.

2 Figure 2.59 shows two examples of marking for reversible lane use, in two-way and (normally) one-way streets. In Detail 2.59.1 the application of single and double reversible lanes is illustrated. REVERSIBLE LANE LINE markings WM4, with a 9 m module to match any other LANE LINE markings GM1 in the roadway, should be marked on both sides of the reversible lane. If the direction of movement in two lanes is changed from time-to-time, marking GM4 should be marked on the outer limits of the two lanes. Detail 2.59.2 shows a reversible lane in a "one-way" street. This form of operation creates, in effect, a true contra-flow situation when the lane use direction is reversed. Only one WM4 marking is required since such a lane must be on one or the other side of the one-way street. It is strongly recommended that for this type of operation the sidewalk on the reversible lane side of the roadway be provided with effective pedestrian control barriers.

3 Reversible lane installations should be controlled by LANE DIRECTION CONTROL signals S16 and S17 mounted above the reversible lanes. The use of S16 and S17 signals over all other non-reversible lanes is optional, but if they are not used similar signs shall be provided over each lane, indicating clearly, by means of a green arrow or a red cross, the direction of travel in each lane. The use of INFORMATION ARROW markings GM4.1 and GM4.2 is recommended. These arrows should be carefully located in strategic positions such as opposite property or side road entrances, and pedestrian crossing points. If a reversible lane is used for bus and/or minibus lanes the use of signs in the GS700 series is recommended (see Chapter 8: *Public Transport Signing*).

4 It is recommended that traffic flow in any one direction should be continuous for periods of not less than one hour. Change-over of direction should preferably occur at the same time of each day and when traffic volumes are not at, or near, the peak. It is further recommended that there should be not more than two change-overs in one day i.e. one period of reversed flow.

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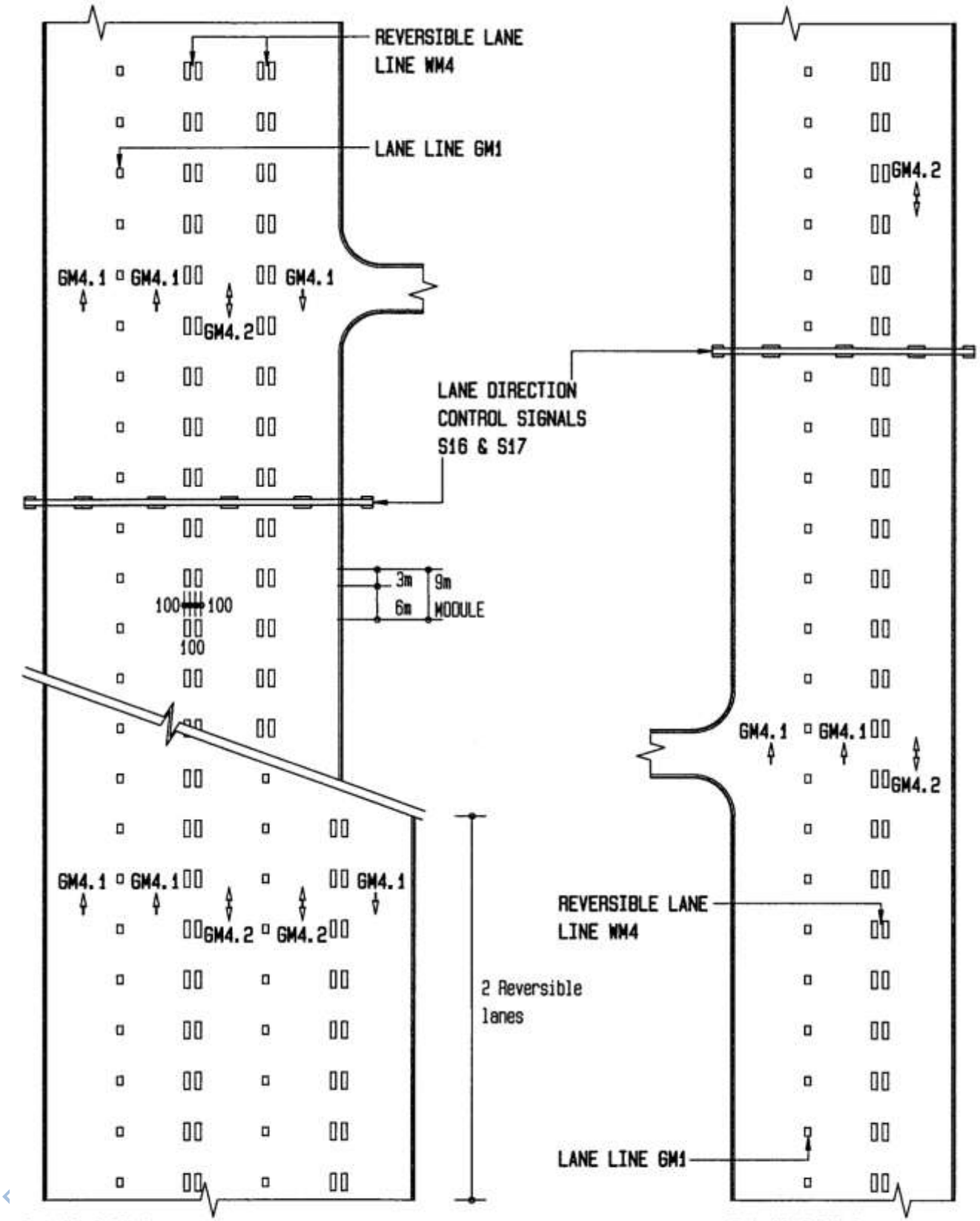

Fig 2.59 **Reversible Lane Applications**

2.4.9 Less Common Urban Road Marking Applications

1 Figures 2.60 and 2.61 illustrate a selection of non-standard junction types and uncommon road marking applications. The inclusion of these examples is to assist those designers dealing with similar existing situations, and **should not be taken as a justification for the creation of similar new applications**.

2 Details 2.60.1 and 2.60.4 show examples of the treatment of closely spaced junctions in light traffic environments. The level of markings illustrated should only be considered if there is a history of bad driving practice and/or accidents, because on-going maintenance costs will be increased.

3 Detail 2.60.2 shows a skew intersection on a relatively small radius curve. The use of NO CROSSING LINE marking RM2, with roadstuds, is intended to prevent encroachment over the road dividing line. CONTINUITY LINE marking WM2 is introduced across the side road intersection to highlight the intersection opening in a situation where drivers' attention on the through road will commonly be drawn to the road curvature.

4 Detail 2.60.3 shows a treatment which narrows the often difficult to negotiate junction width when two wide median dual carriageway roads intersect in a T-junction. Whilst this is primarily a geometric solution to a problem, the example includes relevant road markings which can assist in clarifying the mode of operation of the junction.

5 In Figure 2.61, Details 2.61.1 to 2.61.3 record less common marking situations. Detail 2.61.3 is an optional treatment when dual carriageway roadways are increased/reduced in width from 2 lanes to 3 lanes or *vice versa.* If the choice to continue a specific one of the LANE LINE markings GM1 is not obvious, consideration may be given to omitting all GM1 markings over the length of the tapering section, as illustrated.

6 Detail 2.61.4 shows options for the road markings at a large roundabout with five intersecting legs and a wide disparity in intersecting road width. The detail gives two options for marking (note the cut line through the junction). The decision as to which circle marking, with or without an internal LANE LINE marking GM1, should be used, should be subject to an engineering assessment taking account of local driver familiarity with large roundabout operation.

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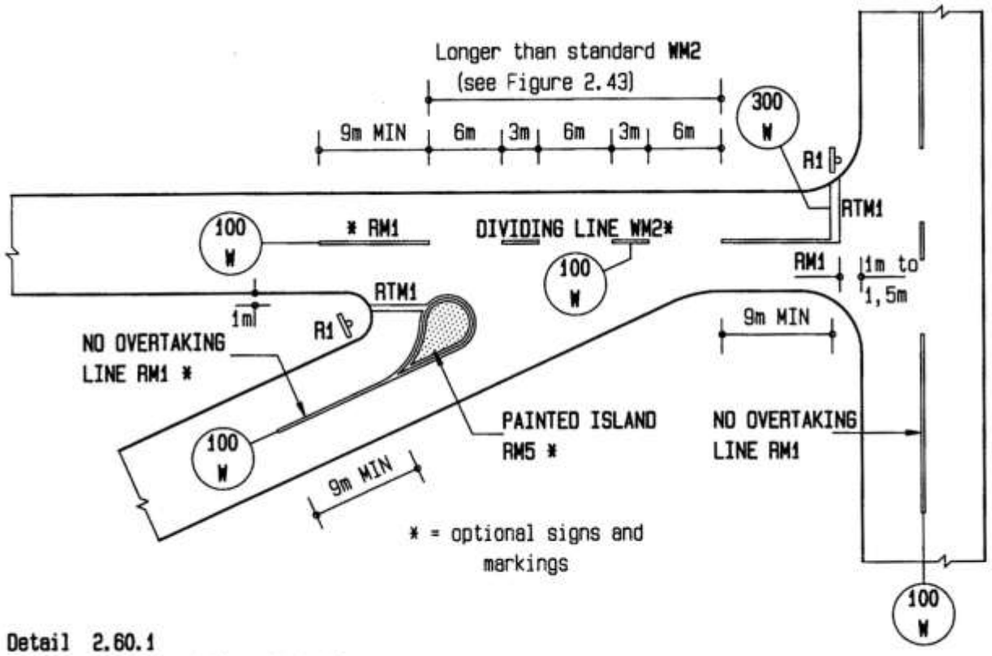
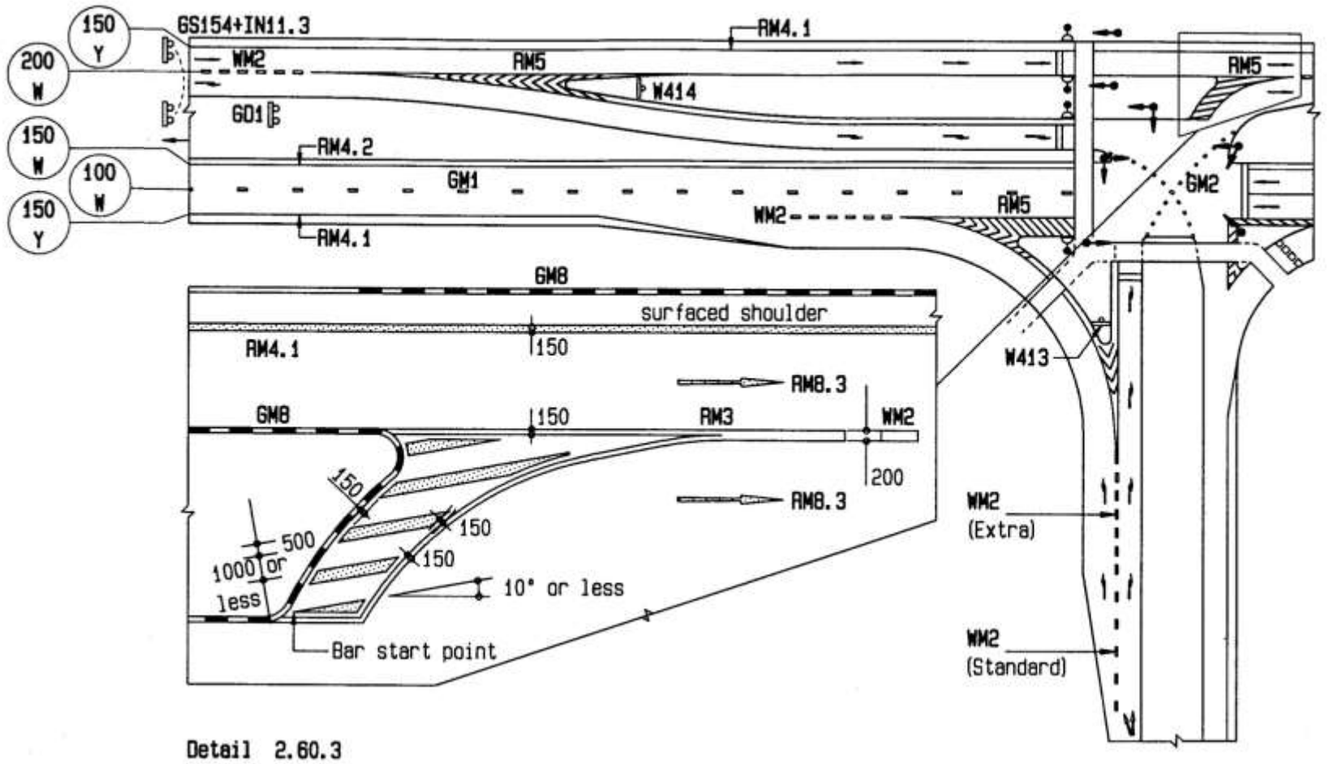
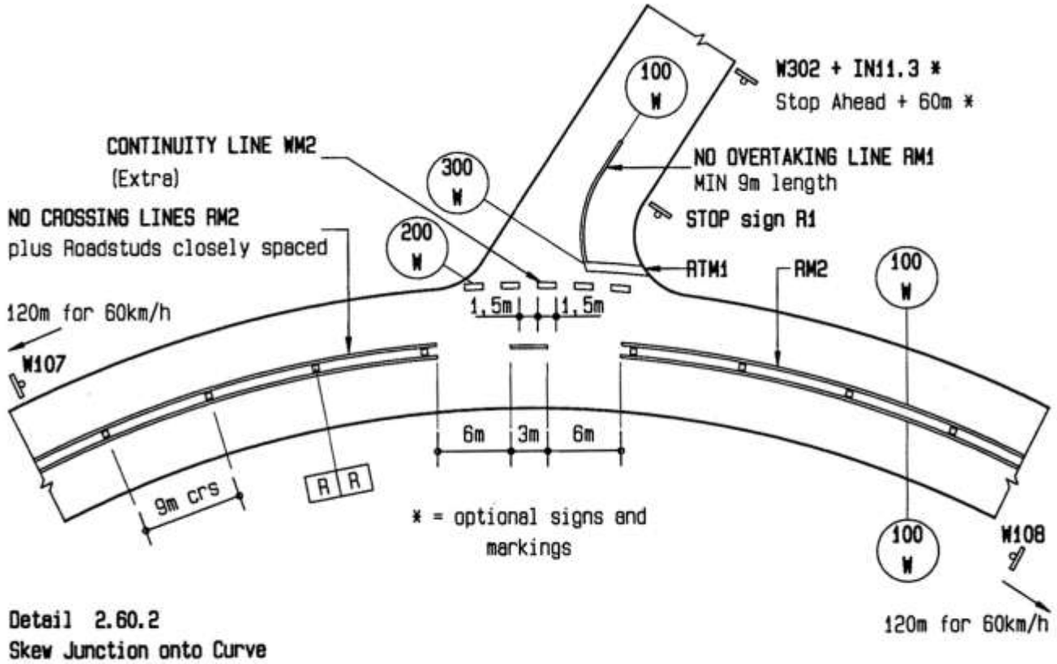


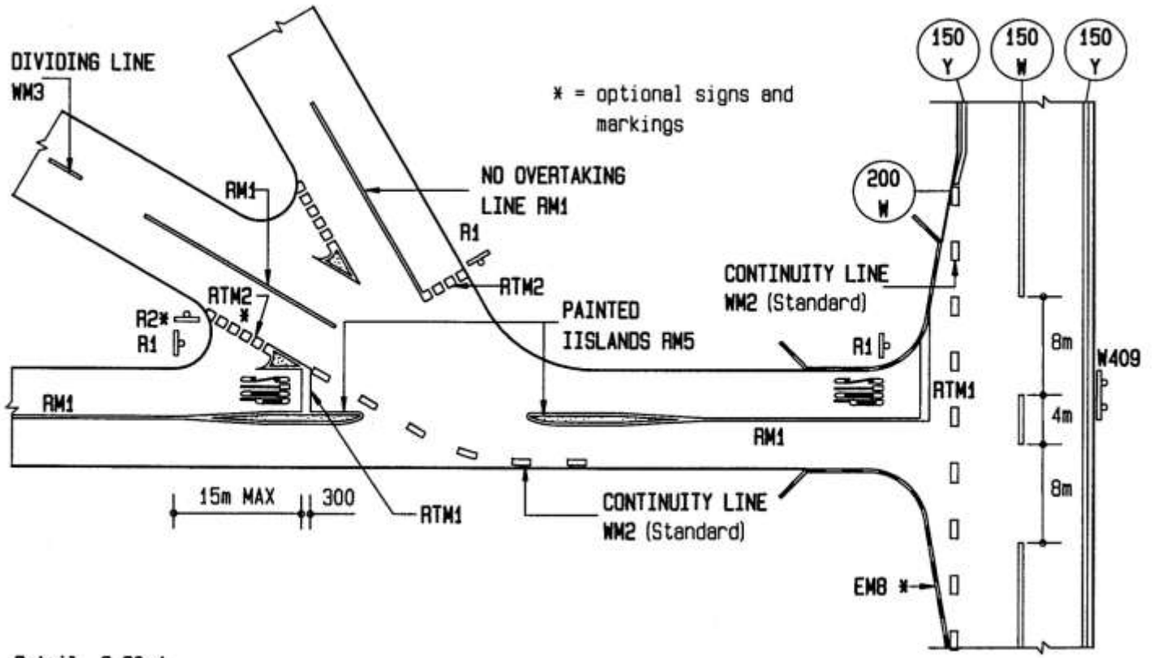
Detail 2.60.1
Closely Spaced and Skewed Junctions



Detail 2.60.3
Road Markings at Very Wide Median Junction



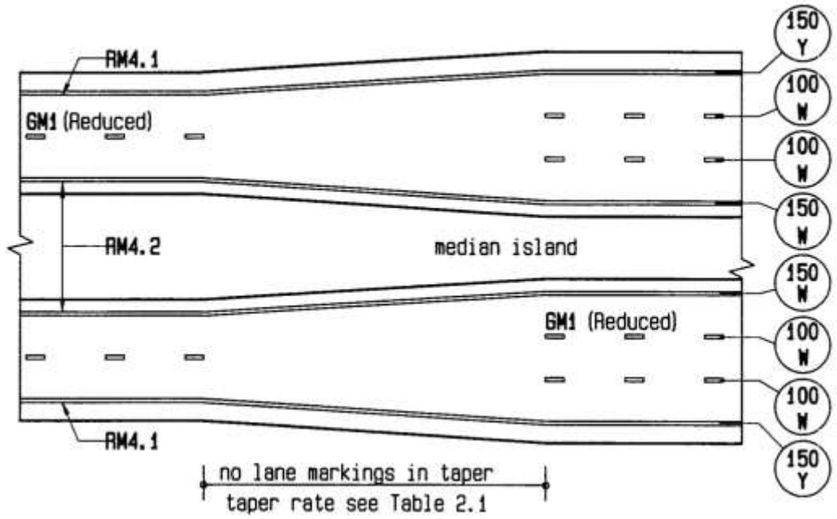
Detail 2.60.2
Skew Junction onto Curve

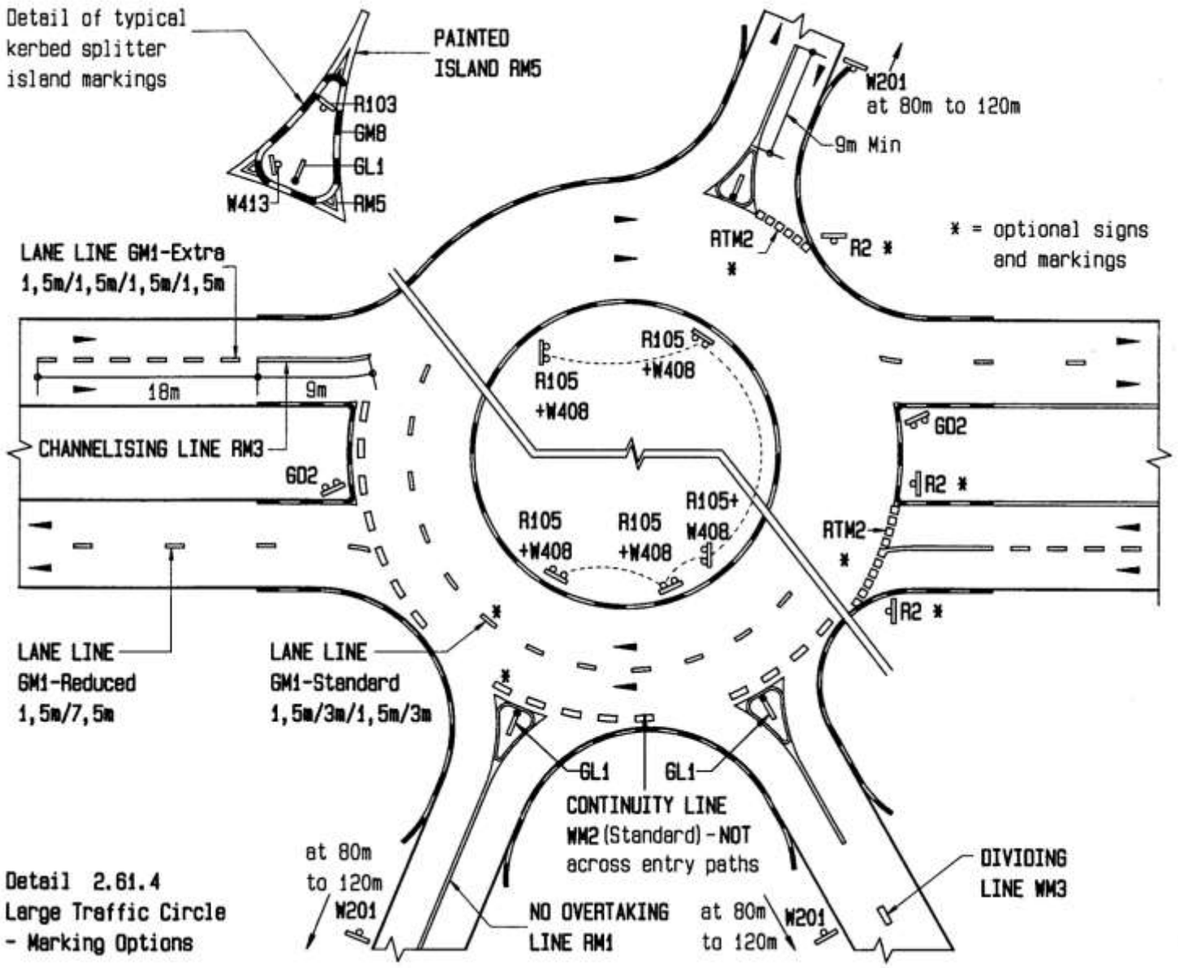


Detail 2.60.4
Road Markings Channelization - C and D Roads

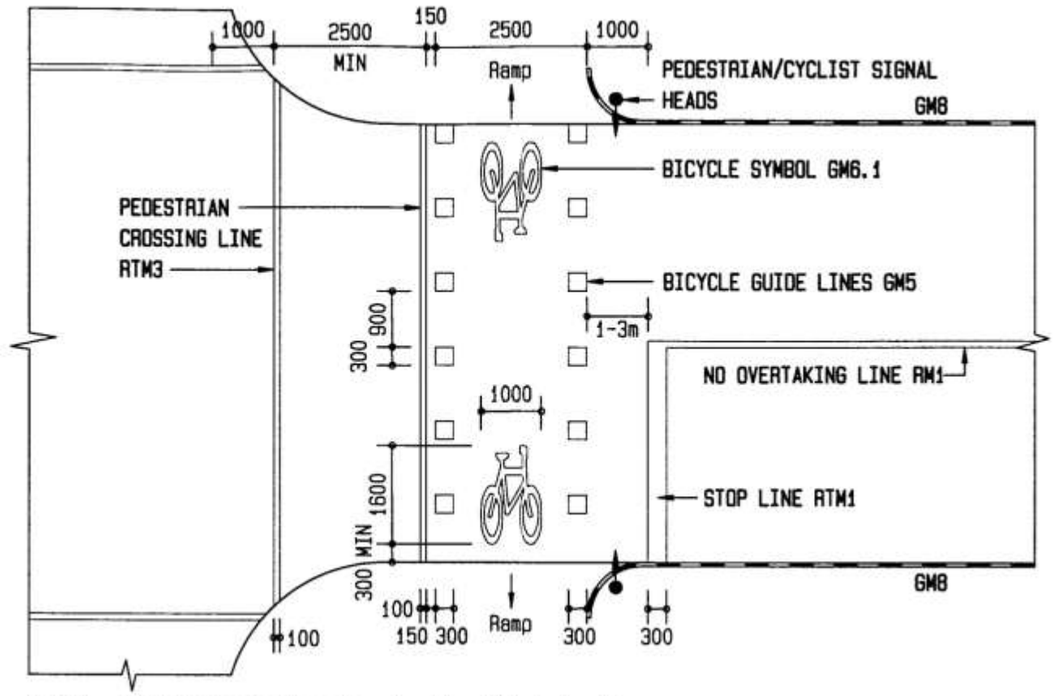
Fig 2.60
Less Common Applications - 1

Detail 2.61.3
Treatment of Symmetrical
Increase from 2 to 3 Lanes
on a Dual Carriageway

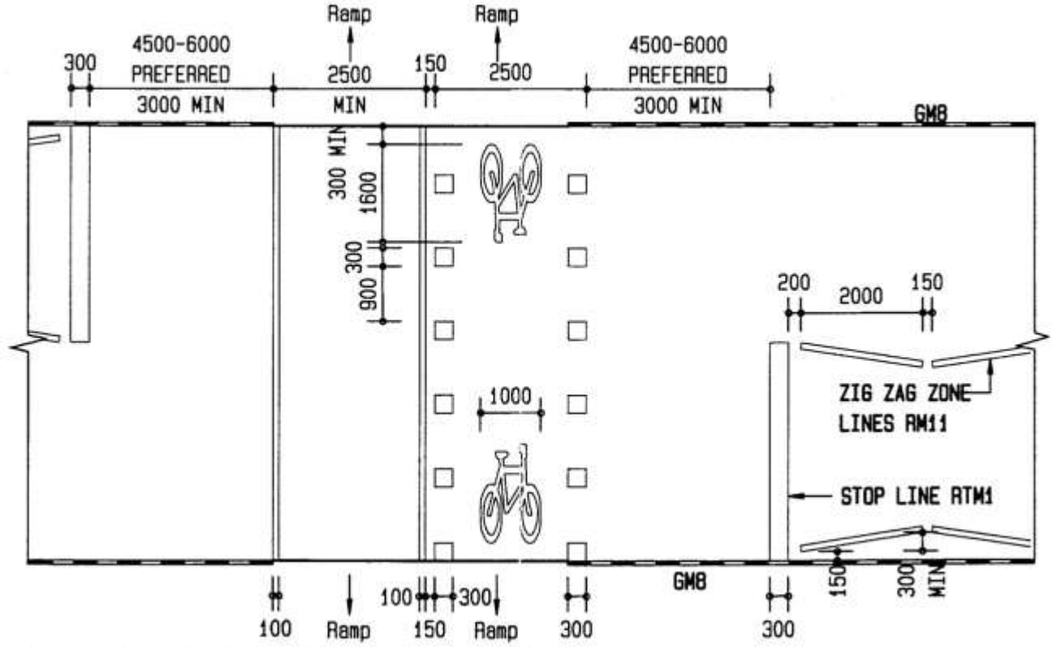




Detail 2.61.4
Large Traffic Circle
- Marking Options



Detail 2.61.1 Bicycle Crossing at a Signalized Junction



Detail 2.61.2 Mid-Block Signalized Bicycle Crossing

Fig 2.61
Less Common Applications - 1

2.4.10 Some Road Marking Do's and Don'ts

1 The three examples included in Figure 2.62 illustrate a few "Do's and Don'ts" of road marking practice. Whilst not obligatory, the "Do's" are recommended for the reasons given below.

2 Detail 2.62.1 shows a preference for the use of GUIDE LINE marking GM1 over PEDESTRIAN CROSSING LINES marking RTM3 at un-signalized crossroad junctions. The use of marking RTM3 at an un-signalized junction, with priority on one of the crossing streets, can lead to drivers incorrectly interpreting the junction as being under traffic signal or 4-Way Stop control. Such errors can particularly result in an unexpected stop or late braking action, with a resultant accident risk.

3 Detail 2.62.2 illustrates the incorrect use of MANDATORY DIRECTION ARROW AHEAD markings WM7.2 (or WM7.4) to indicate an added lane. The use of markings WM7.2 or WM7.4 in this way can result in drivers misinterpreting the marking to mean that they can go straight on AND turn right (or left), from the lane in which the arrow is displayed. Even if the arrow is followed by a yellow MANDATORY DIRECTION ARROW marking RM8.3, it is still an incorrect application, and could result in the unfair commission of a technical offence. The correct optional marking to indicate an added lane is one of the BIFURCATION ARROW markings GM3.1 to 3.3.

4 Detail 2.62.3 has a similar function to Detail 2.62.1 in that the use of a STOP LINE marking RTM1 within a junction could lead to driver confusion, when in fact a yield action is what is required of drivers. The use of YIELD LINE marking RTM2 is therefore preferred.

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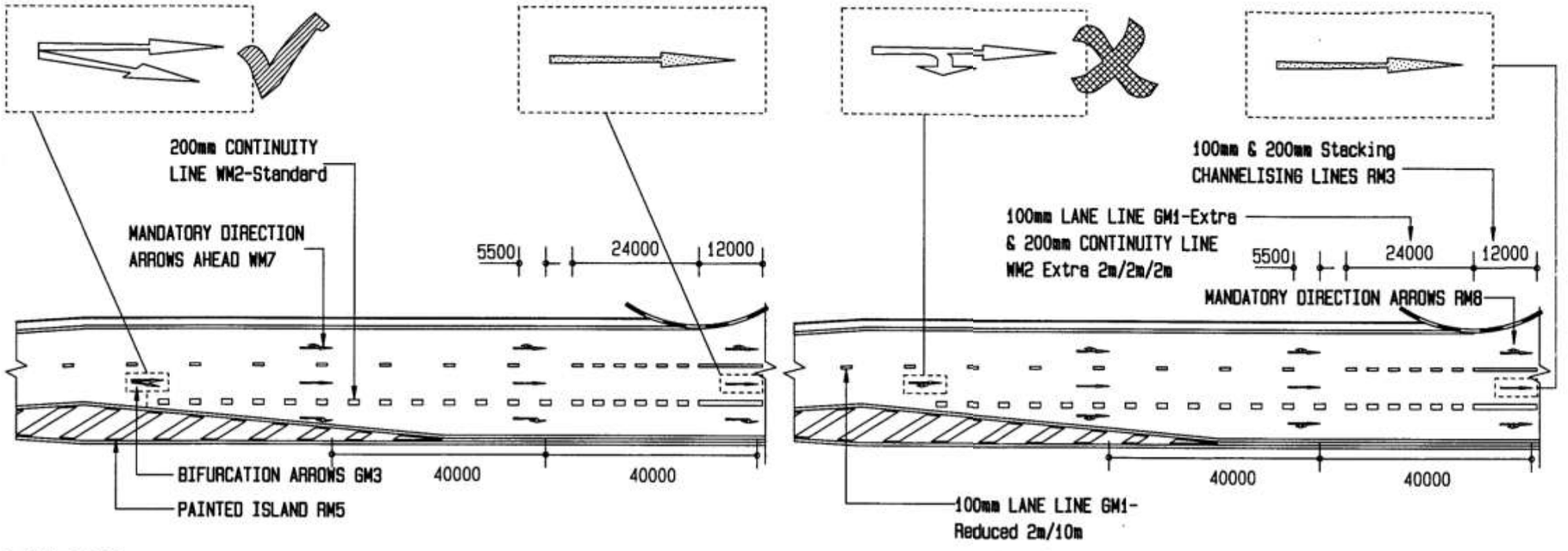
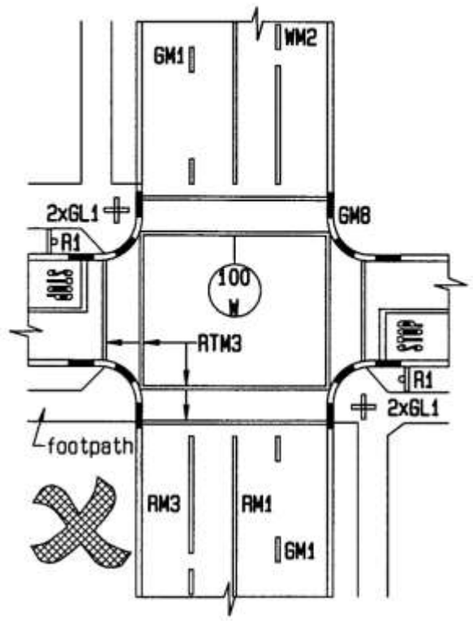
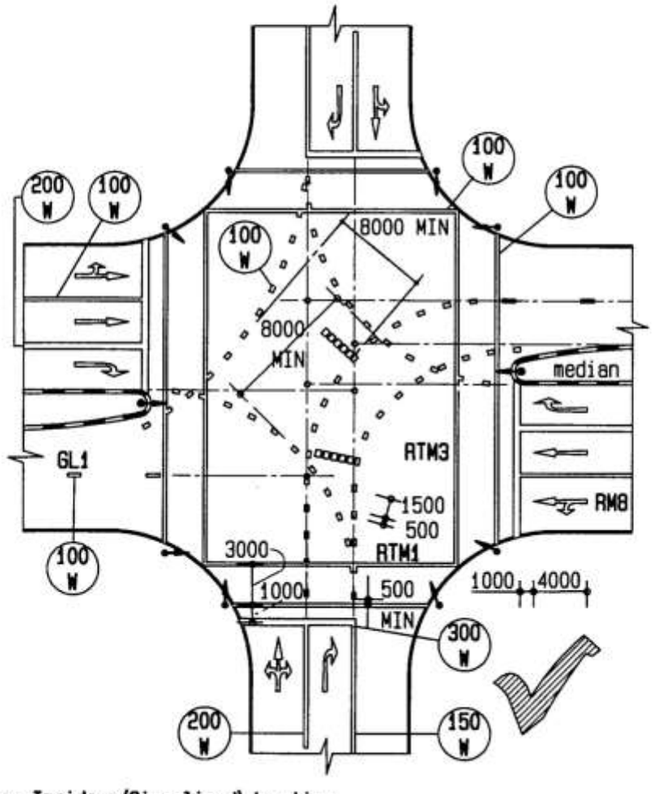
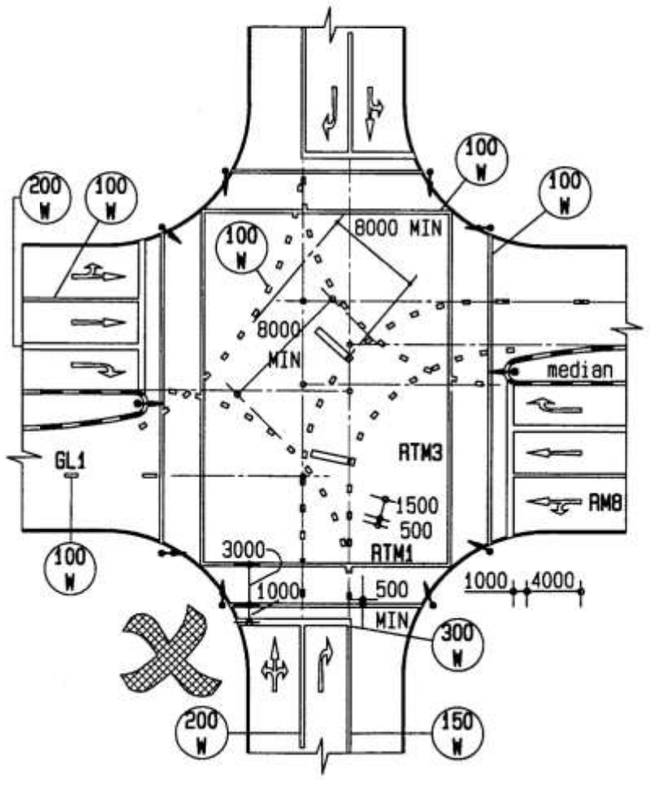


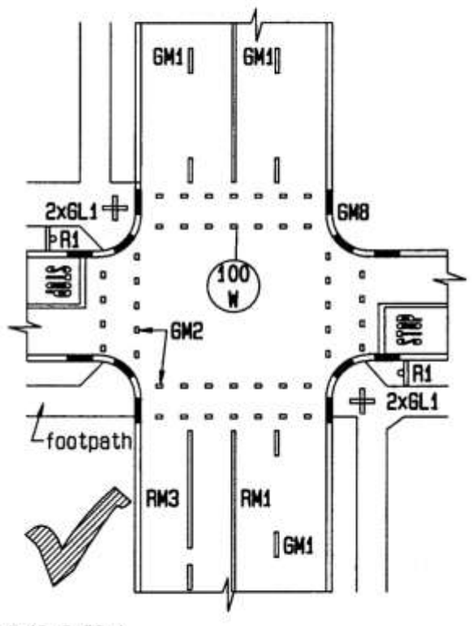
Detail 2.62.2
Don't Use WM7.4 (or WM7.2) to Indicate an Added Lane





Detail 2.62.3
Don't Use STOP Lines Inside a (Signalized) Junction





Detail 2.62.1
Don't Use RTM3 at Unsignalized Junctions

Fig 2.62
Road Marking Do's and Don'ts

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2.5 ROAD MARKING APPLICATIONS FOR FREEWAYS

2.5.1 General

1 The principles involved in road marking sections of freeway carriageway are essentially the same as for any rural or urban dual carriageway road. The details in this section apply to freeways in rural or urban areas.

2 Freeway junction or interchange geometric details can vary significantly and many interchanges may require specific road marking treatment. Whilst it is not possible to detail all interchange types, the road marking principles, illustrated in the figures, incorporate the following components of typical freeway design:

(a) basic longitudinal line types, including continuous or solid lines and broken lines;

(b) exclusive exit lanes;

(c) weaving sections;

(d) heavy vehicle crawler lanes;

(e) off ramp gore areas;

(f) on ramp gore areas;

(g) intersecting cross roads;

(h) arrestor beds;

(i) SOS telephone shoulder treatment.

The details (d), (h) and (i) are equally appropriate to lower classes of road. The details given in this section may be adapted as necessary to be consistent with the local environment in which the markings are to be used. They are therefore not repeated in other sections of this chapter.

3 Freeway road markings embody the majority of general principles described in Sections 2.1, 2.2 and 2.3, particularly with respect to longitudinal markings (see Subsection 2.5.2). Due to the almost universally high speed nature of freeway operation, it is common to specify greater than minimum widths of line marking (see values in Table 2.3). This practice applies particularly when a change in circumstances occurs or is about to occur.

4 Typical subjects covered in Section 2.2 which are relevant to freeway road marking applications are:

(a) the lateral alignment of markings on multi-lane carriageways (Figure 2.12);

(b) tapers (Table 2.1);

(c) roadstuds (Subsection 2.2.6, Table 2.2 and Figures 2.17 and 2.18 for general colour code and spacing rules- although the figures in this section also illustrate roadstud use).

5 Because of the generally high operating speeds of freeways it is recommended that a 12 m marking MODULE be used, whether the freeway (or motorway) lies in a rural or urban environment. It is also recommended that the highest possible levels of uniformity of road marking practice be achieved in order to lessen the risk of driver error in the freeway environment.

6 All other markings such as painted islands, arrows or symbols should be marked in the boldest manner possible. Table 2.3indicates the standard range of sizes for each road marking type together with the area of each marking. This information may be used to measure road marking quantities.

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2.5.2 Longitudinal Freeway Markings

1 The vast majority of road markings on freeways comprise longitudinal marking types, either in the form of:

(a) broken line markings; or

(b) continuous line markings.

2 Freeways may be designed and constructed to one of two classification parameters, designated Class A1 and Class A2. Class A1 freeways are conventional fully access controlled dual carriageway roadways. As such, each carriageway comprises at least two lanes, a left side emergency shoulder and a (normally narrower) right side median shoulder. This configuration is marked from left to right by (see also Figure 2.64):

(a) a LEFT EDGE LINE continuous marking RM4.1;

(b) a LANE LINE broken marking GM1;

(c) a RIGHT EDGE LINE continuous marking RM4.2.

3 The following longitudinal line types may also be specified, commonly on the approach to, or within, interchange areas:

(a) a CONTINUITY LINE broken marking WM2;

(b) a CHANNELIZING LINE continuous marking RM3.

4 Class A2 freeways have an undivided road configuration. A Class A2 road may consist of a 2 - lane/2 - way or a 4 - lane/2 - way configuration. In order to permit overtaking opportunities the 2 - lane/2 - way cross-section should be marked in essentially the same manner as rural 2 - lane/2 - way roadways. This will involve the use of longitudinal line types :

(a) DIVIDING LINE broken marking WM3; **OR**

(b) NO OVERTAKING LINE continuous marking RM1: **OR**

(c) NO CROSSING LINE continuous marking RM2; **AND**

(d) LEFT EDGE LINE continuous marking RM4.1.

Extreme care must be exercised over the use of line type WM3. Due to the proximity of "wrong side" on-ramps, and therefore merging through and entering traffic in an opposing direction, it is strongly recommended that NO CROSSING LINE marking RM2 be marked through interchanges on Class A2 freeways with 2 - lane/2 - way cross-sections.

5 A 4 - lane/2 - way Class A2 freeway should be marked with a central line marking which has the same legal effect as a median island. This may be achieved by either of the following longitudinal markings:

(a) **RECOMMENDED** - continuous PAINTED ISLAND marking RM5 (see Figure 2.87 and Figure 2.65, Detail 2.65.2); or

(b) NO CROSSING LINE continuous marking RM2.

6 Figure 2.63 illustrates the longitudinal broken line types used on freeways. It is recommended that broken lines be marked on all freeways, rural and urban, in a 12 m repeating MODULAR pattern. This modular pattern may be applied as STANDARD, REDUCED, or EXTRA MODULES. The decision to alter from one type of module to another, or to choose one type of module instead of another, may be warranted by factors such as:

(a) the need to economise where visual impact is not critical;

(b) the need for increased visual impact from road marking due to horizontal or vertical curvature, high traffic volumes or a change in the roadway cross-section or lane configuration;

(c) the use of a progressive increase in density of marking approaching a point of divergence, convergence, or potential conflict of traffic.

2.5.3 Exclusive or Dedicated Exit Lanes

1 It is a feature of freeways serving essentially metropolitan areas that exiting traffic volumes and interchange spacing require the provision of dual exit lanes and/or auxiliary lanes between adjacent on- and off-ramps. To reduce the risk of drivers of vehicles, particularly slow-moving ones, being caught inadvertently in an exclusive or dedicated exit lane it is essential that these lanes be clearly signed and marked well in advance of an exit point. Many systems interchanges also include exclusive exit lanes and/or auxiliary lanes within their ramp configurations.

2 Figures 2.66 and 2.67 show typical examples of the use of reduced, standard, and extra CONTINUITY LINE marking WM2, and CHANNELIZING LINE marking RM3, to create awareness of exclusive or dedicated exit lanes or weaving lane sections.

2.5.4 Weaving Section Markings

1 A weaving section occurs when an auxiliary lane is added to the left side of a carriageway, between an on-ramp and the next off-ramp, to allow free flow entry of traffic and free flow exiting of traffic from the lane, together with a weaving movement to and from the main carriageway lanes.

2 Figure 2.67 illustrates two typical uses of an auxiliary lane. The limiting length of an auxiliary lane is a geometric design factor which must take into account the spatial ability to provide adequate guidance signs and road markings. The actual lengths of line type specified must be the subject of engineering assessment.

2.5.5 Heavy Vehicle Crawler Lanes

1 Heavy vehicle monitoring and control is an important component of the operation of the road network. Actual applications tend to require a degree of site specific treatment in terms of road signs and markings.

2 However, a high a degree of standardisation is desirable. Figure 2.68 shows typical situations relevant to heavy vehicle downhill crawler lanes on a freeway. These should be used, where possible, to achieve the desired level of standardisation of treatment.

2.5.6 Lane Drops on Freeways

1 Lanes may be dropped due to a decrease in road capacity or when an additional lane, for example a climbing lane, is no longer required. Lane drops on freeways should be indicated by appropriate diagrammatic signs, and taper rates used should be as generous as is practical (see Table 2.1).

2 Figure 2.69 shows typical "fast" and "slow" lane drop treatments. The decision as to which lane to drop, should be taken in relation to specific site conditions, after due engineering assessment.

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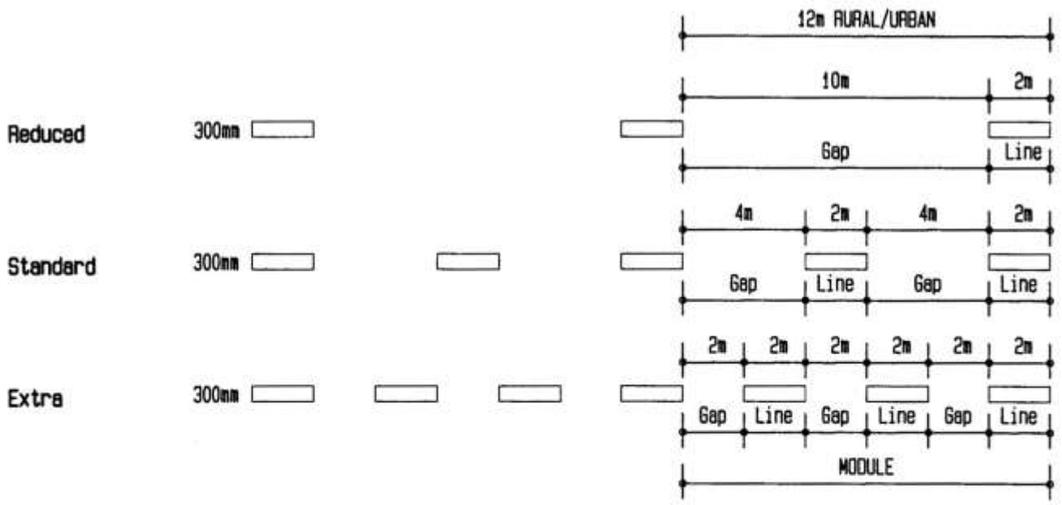
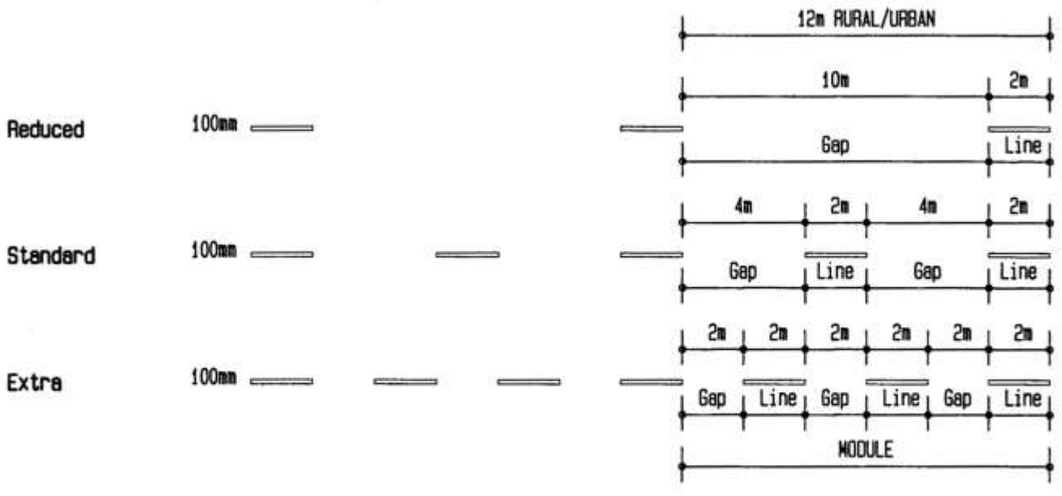


Detail 2.63.1 Freeway Continuity Line Marking WM2



Detail 2.63.2 Freeway Lane Line Marking GM1

Fig 2.63 Freeway Broken Line Module Characteristics

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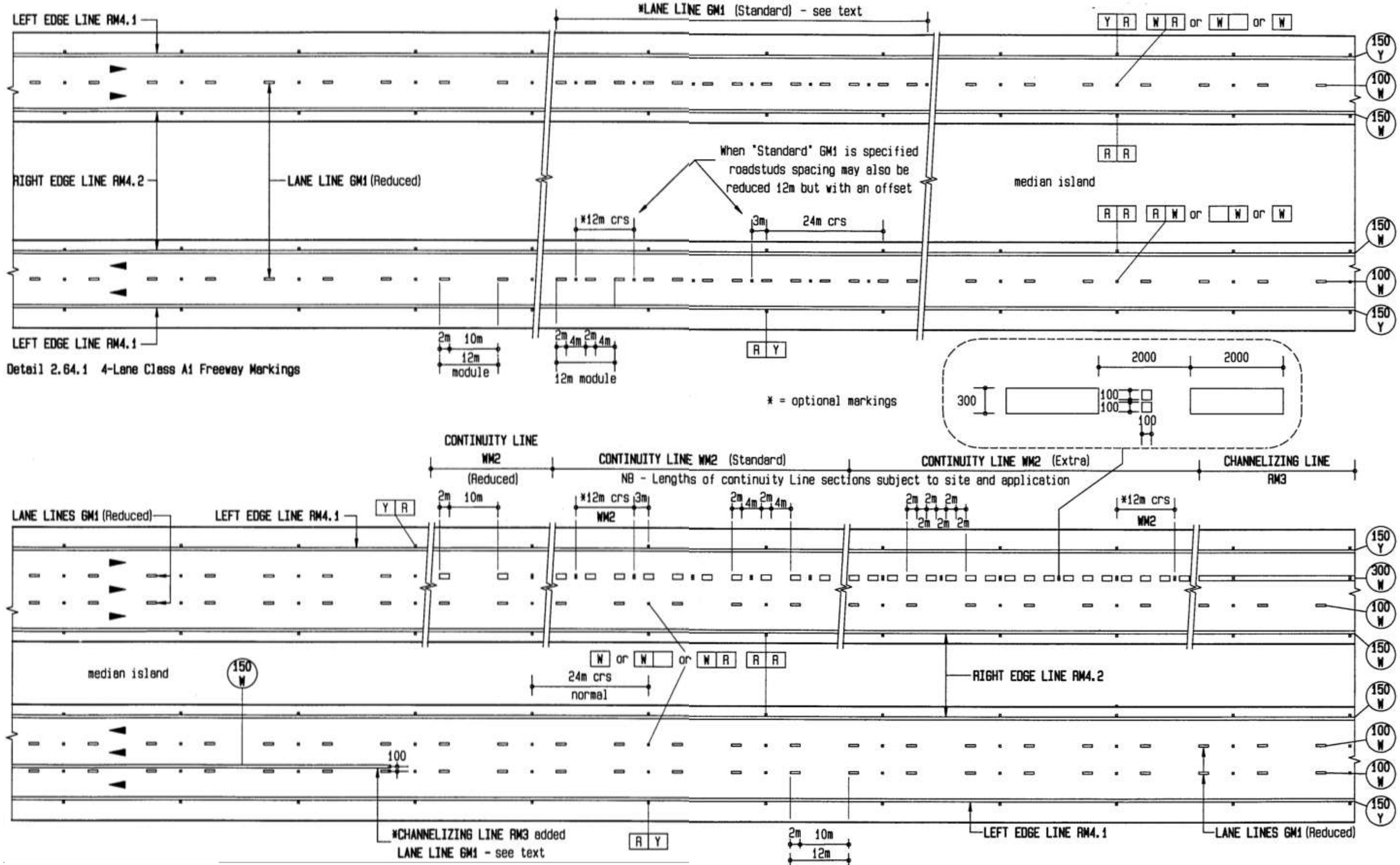
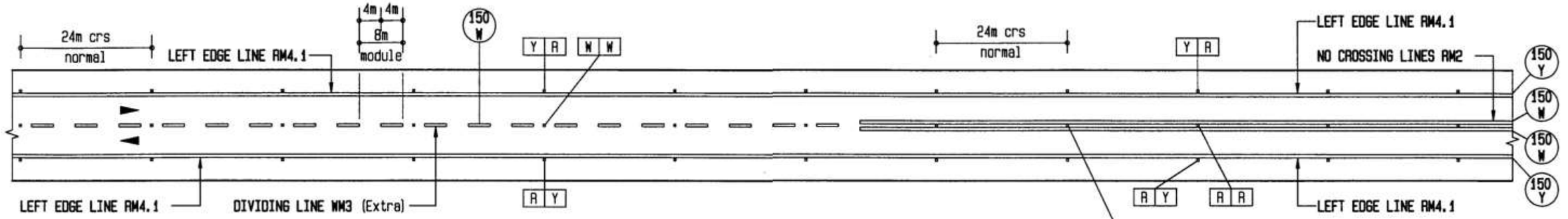


Detail 2.64.1 4-Lane Class A1 Freeway Markings

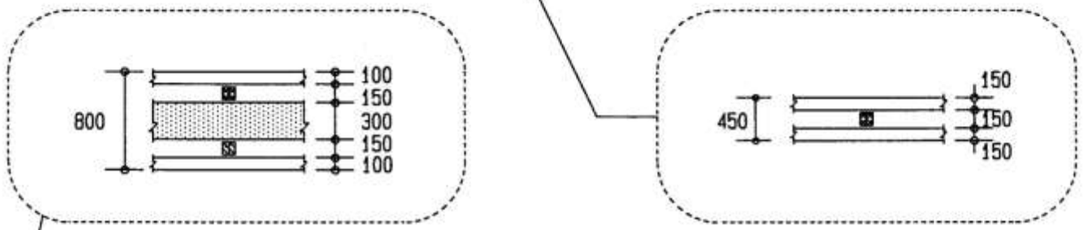
Detail 2.64.2 6-Lane Class A1 Freeway Markings

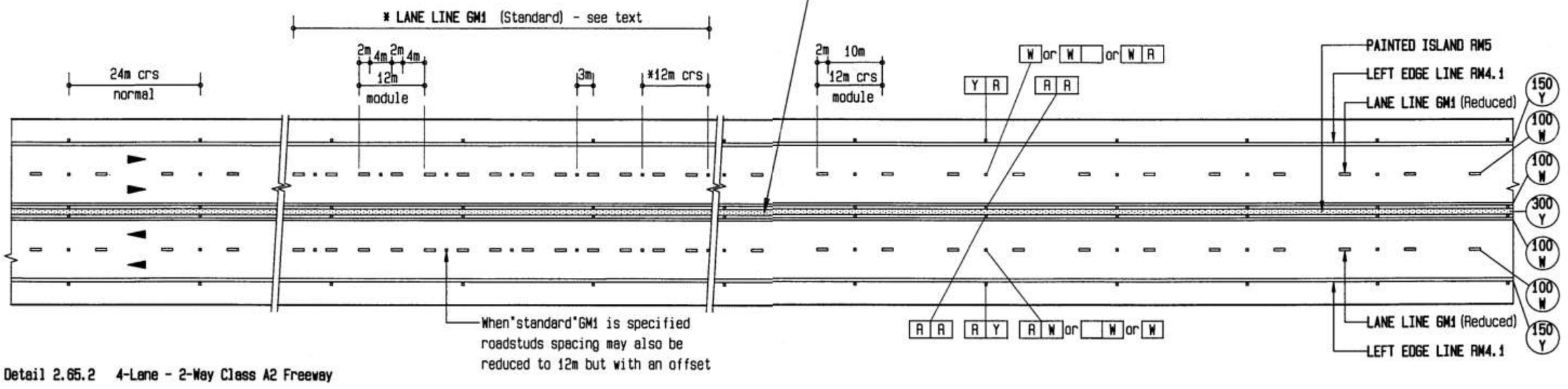
Fig 2.64
Longitudinal Line Combinations - 1



Detail 2.65.1 2-Lane - 2-Way Class A2 Freeway

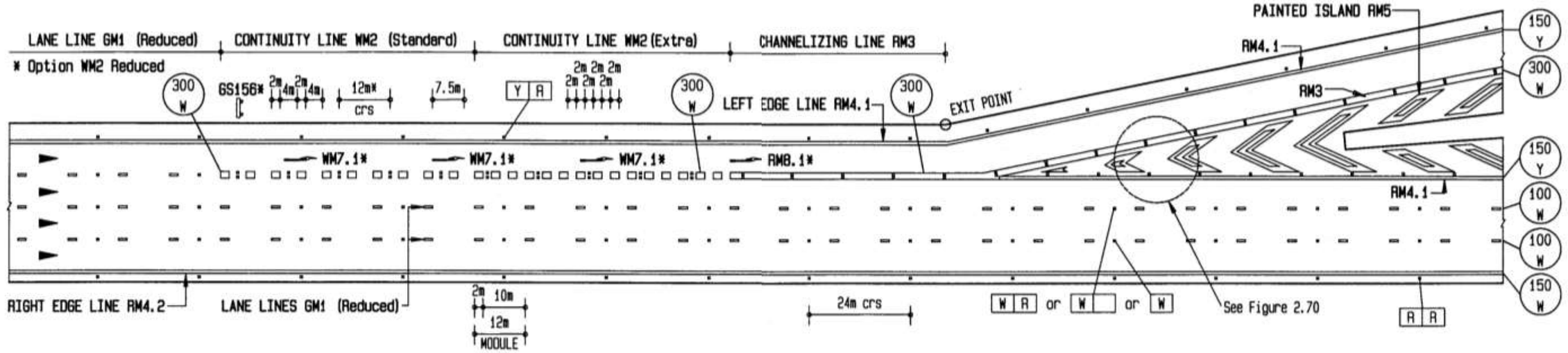
* = optional markings





Detail 2.65.2 4-Lane - 2-Way Class A2 Freeway

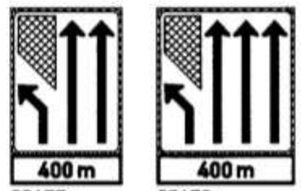
Fig 2.65
Longitudinal Line Combinations - 2

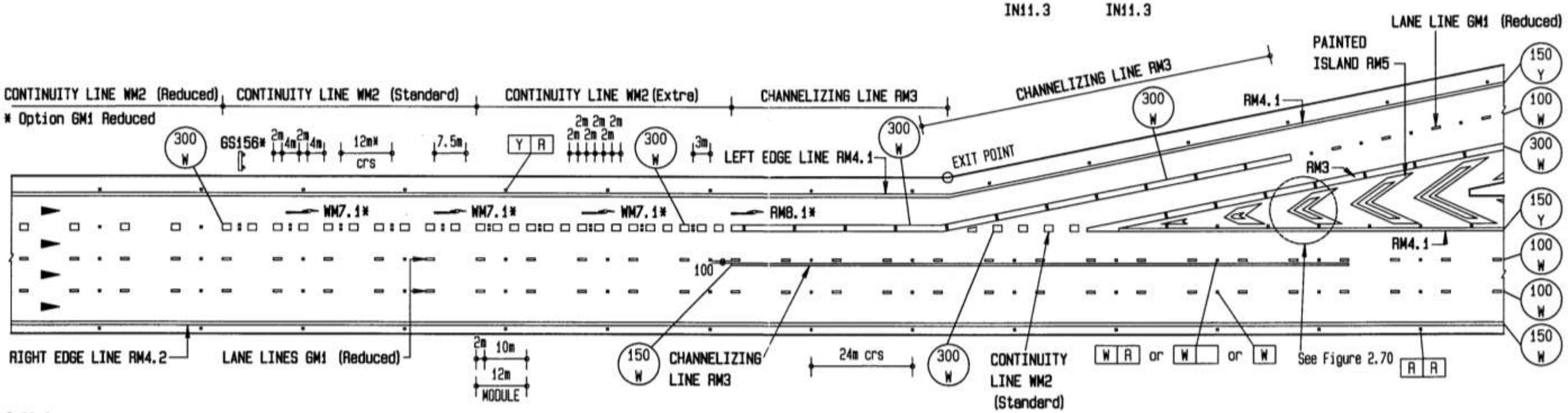


Detail 2.66.1
Single Exclusive Exit Lane

* = Optiional signs and markings

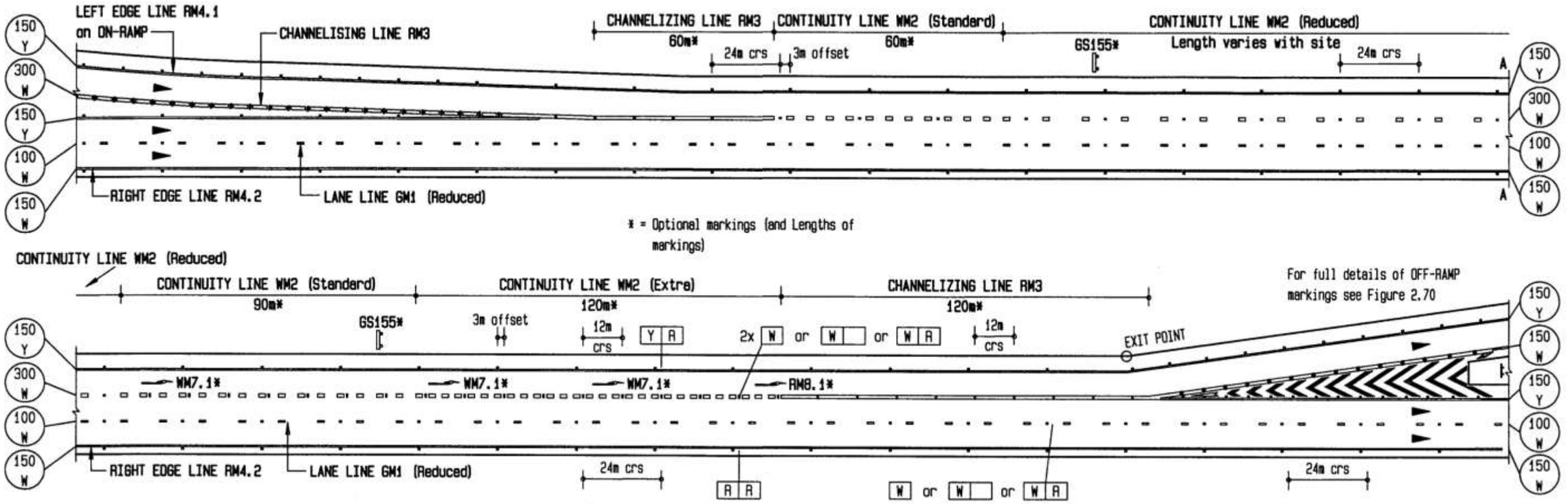
NOTE:
(1) Subject to the nature of the direction signs used - diagrammatic signs may be specified for an exclusive exit lane.



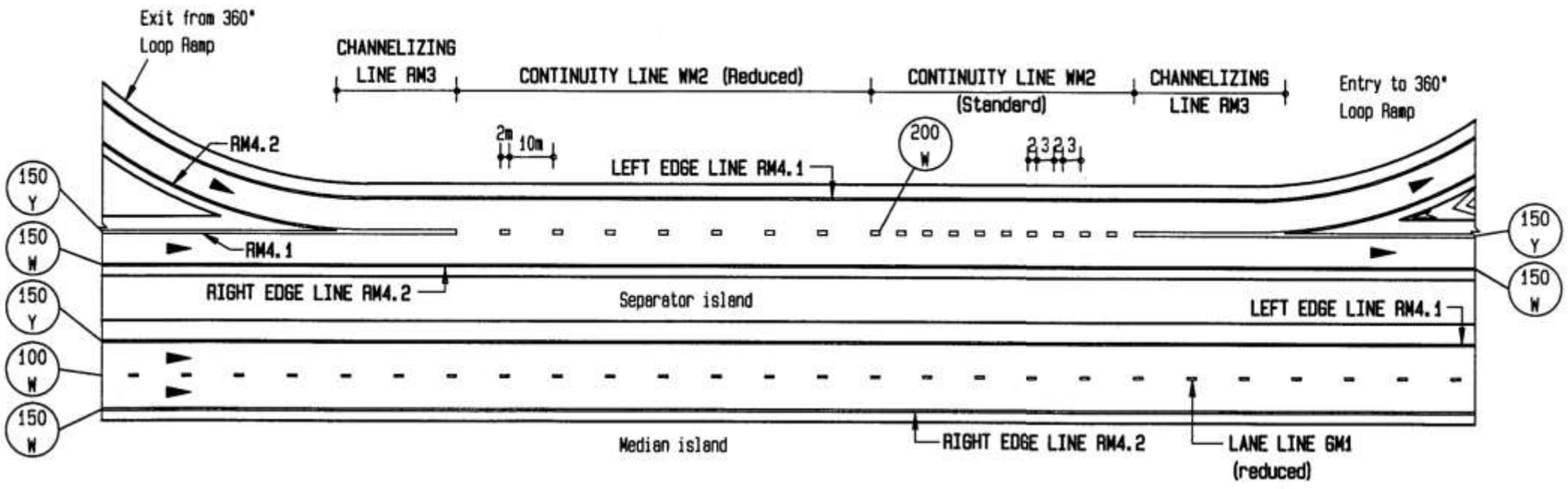


Detail 2.66.2
Dual Exit Lanes - One Lane an Exclusive Exit Lane

Fig 2.66
Exclusive Exit Lanes

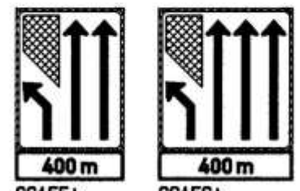


Detail 2.67.1 Typical Weaving Section of an Auxiliary Lane Between Interchanges



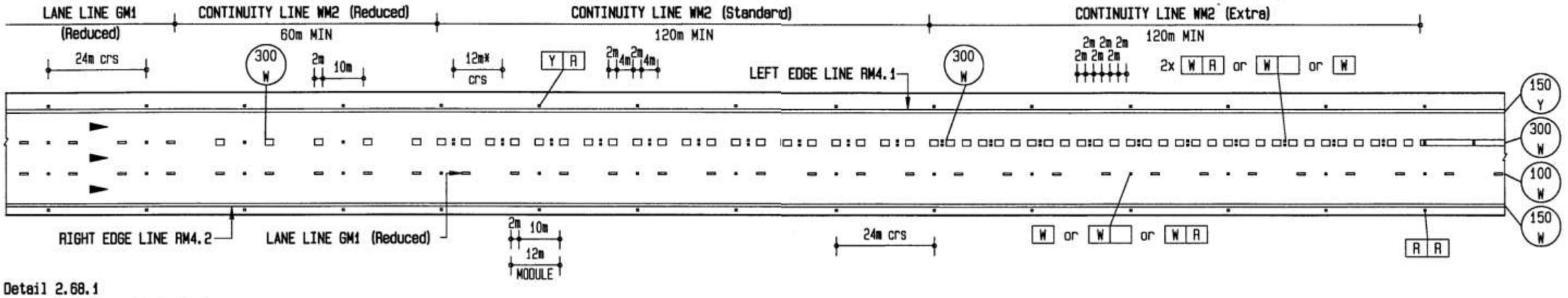
Detail 2.67.2 Typical Weaving Section on a Systems Interchange Collector-Distributor Road

NOTE:
(1) Subject to the nature of the direction signs used - diagrammatic signs may be specified for an exclusive exit lane forming part of a weaving lane.



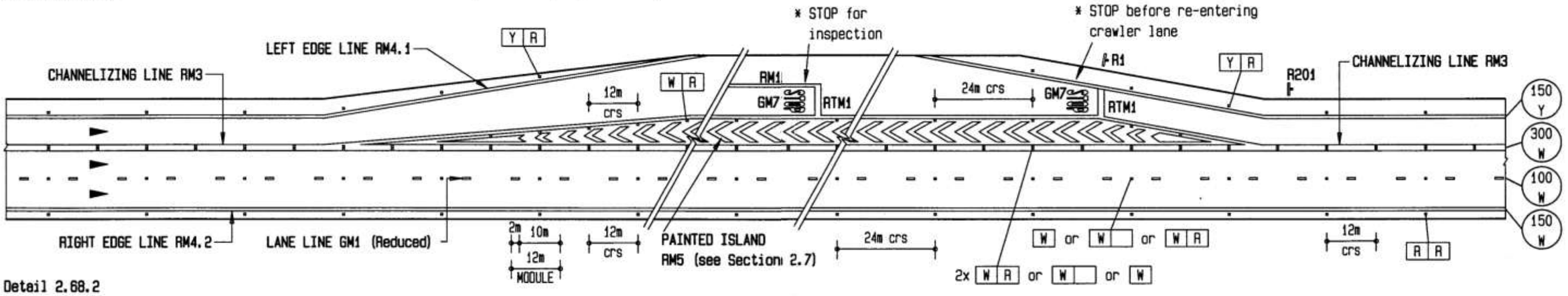
GS155+ IN11.3 GS156+ IN11.3

Fig 2.67
Weaving Lanes

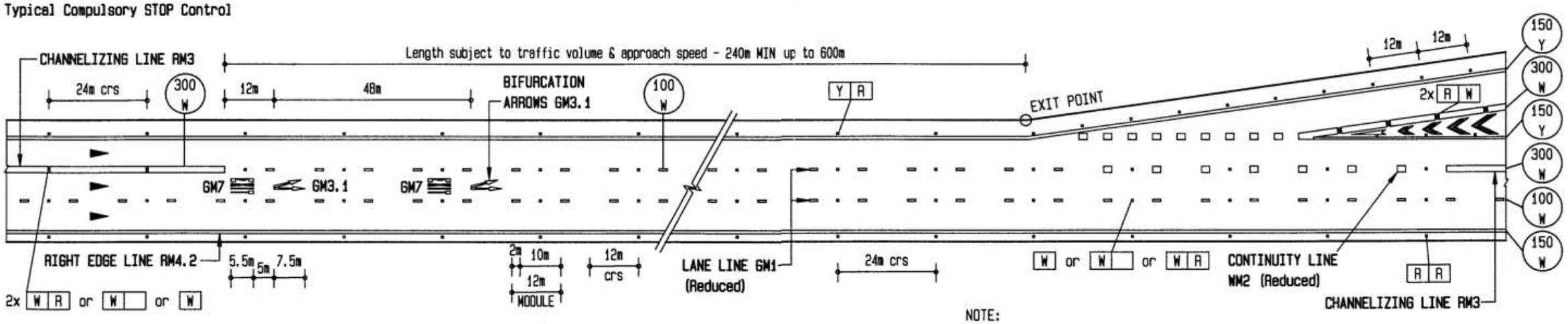


Detail 2.68.1
Approach Markings to Beginning of Crawler Lane

* = Optional signs and markings



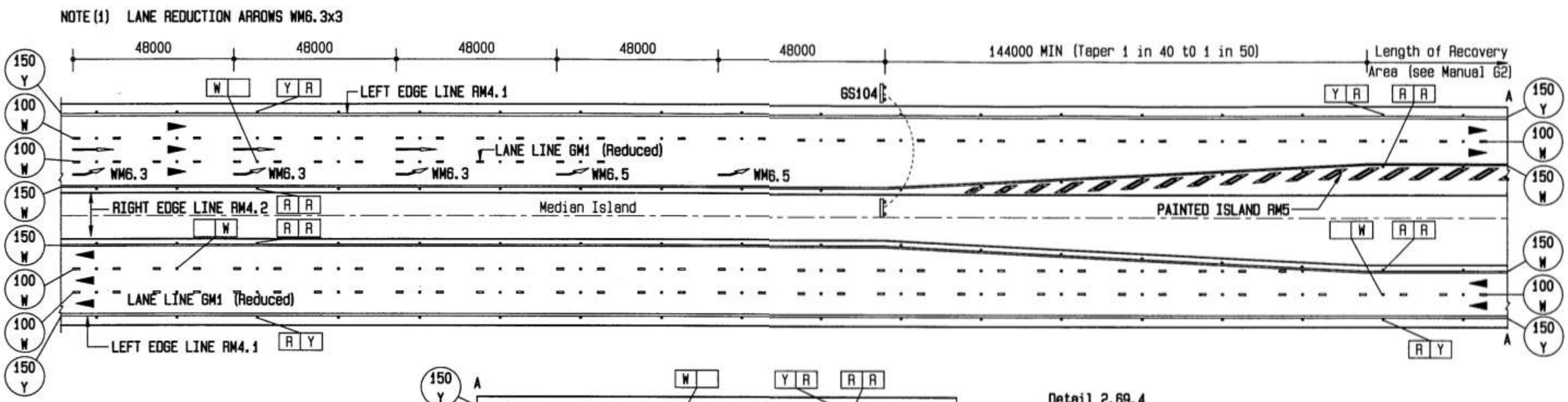
Detail 2.68.2
Typical Compulsory STOP Control



Detail 2.68.3
Treatment at Off-Ramp

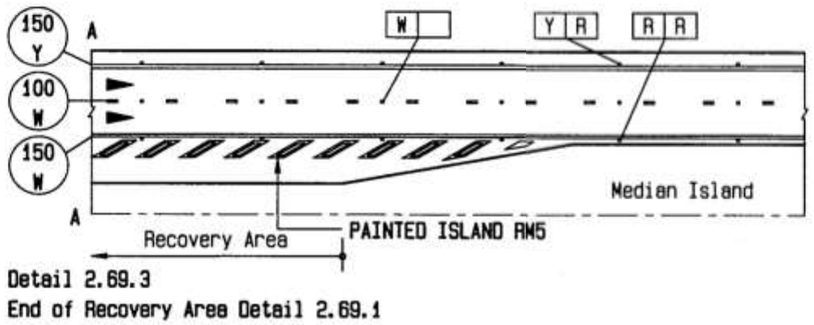
NOTE:
1) Specialised signs will be required in addition to markings shown. (See Chapter 11 - Subsection 11.3.6)

Fig 2.68
Crawler Lane - Heavy Vehicles



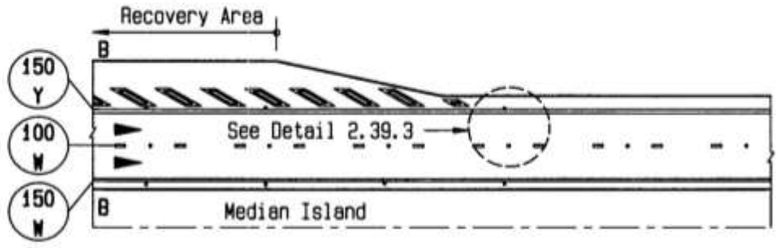
Detail 2.69.1 Lane Drop - Inner or "Fast" Lane

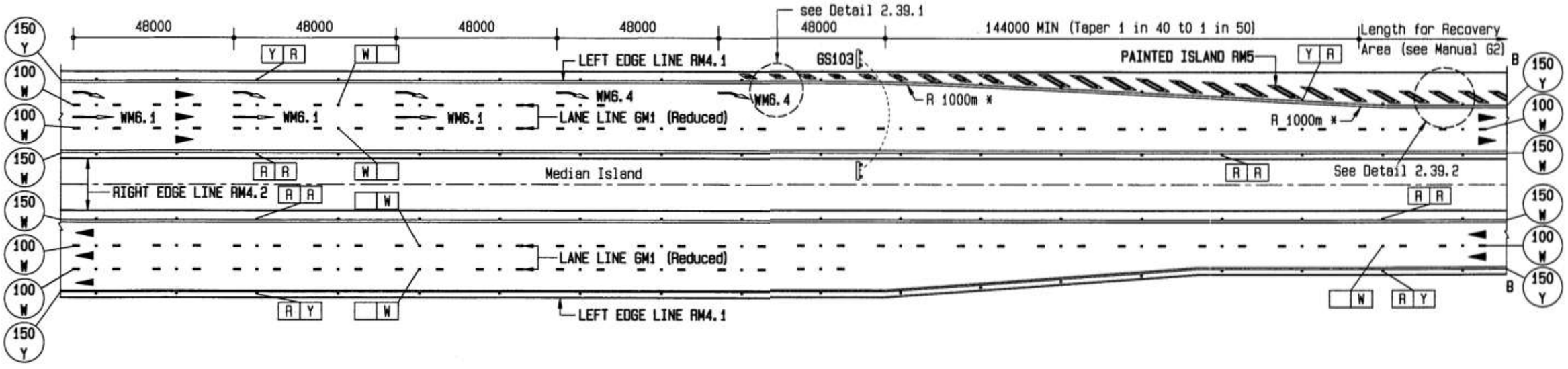
* = optional markings details



Detail 2.69.3
End of Recovery Area Detail 2.69.1

Detail 2.69.4
End of Recovery Area Detail 2.69.2





Detail 2.69.2 Lane Drop - Outer or "Slow" Lane

Fig 2.69
Lane Drop – Fast Lane/ Slow Lane

2.5.7 Off- and On-Ramp Markings

1 Figures 2.70 to 2.74 show various aspects of typical off-ramp and on-ramp road marking. These figures deal with the freeway end detailing of the ramps. The crossroad end detailing of off- and on-ramps is covered, with other aspects of crossroad road marking, in Subsection 2.5.8. Figure 2.70 deals with typical standard off-ramp markings, including enlarged details where necessary, to assist with setting out of the markings. The use of a CHANNELIZING LINE marking RM3 together with the LANE LINE GM 1, as shown in Detail 2.70.1, is recommended. This application is intended to inhibit lane changes and late exit movements from the median side lane. Figure 2.71 provides similar details for typical standard on-ramp markings. In principle the details in both these figures apply irrespective of the off-ramp or on-ramp configuration (ie whether they are diamond ramps or parclo ramps). However, the gore area of a 360 ^{o} on-ramp may be marked with PAINTED ISLAND marking RM5, in a manner similar to a standard off-ramp gore, to inhibit early entry to the main carriageway across the gore area.

2 Figure 2.72 gives details of a number of multi-lane ramp layouts. It is important to the smooth operation of such layouts that drivers are in no doubt as to which destination they may turn towards from any particular lane ahead of the ramp terminal STOP LINE marking. On off-ramps these markings may commonly be used in conjunction with overhead direction signs above the ramp, indicating destinations for the lanes at the ramp terminal. Lane reductions on on-ramps should be achieved well before traffic is forced to join the main carriageway. **It is undesirable to create a yield condition under such circumstances.**

3 Figure 2.73 shows two special ramp configurations which are likely to be rare, but which require special attention to detail if they are to function safely and efficiently. Optional diagrammatic signs are shown in this figure. These may be used to create awareness of the merging of lanes which occurs, because of its rarity, in what can be considered an unconventional manner

4 Figure 2.74 shows a number of small details of other possible special ramp configurations. These may occur most commonly within systems interchanges (see Detail 2.74.1). Wherever possible, although these represent unusual situations, they should be made as easy as possible for drivers to understand by the use of standardised road marking and signing procedures. The use of diagrammatic guidance signs may commonly be effective in such situations.

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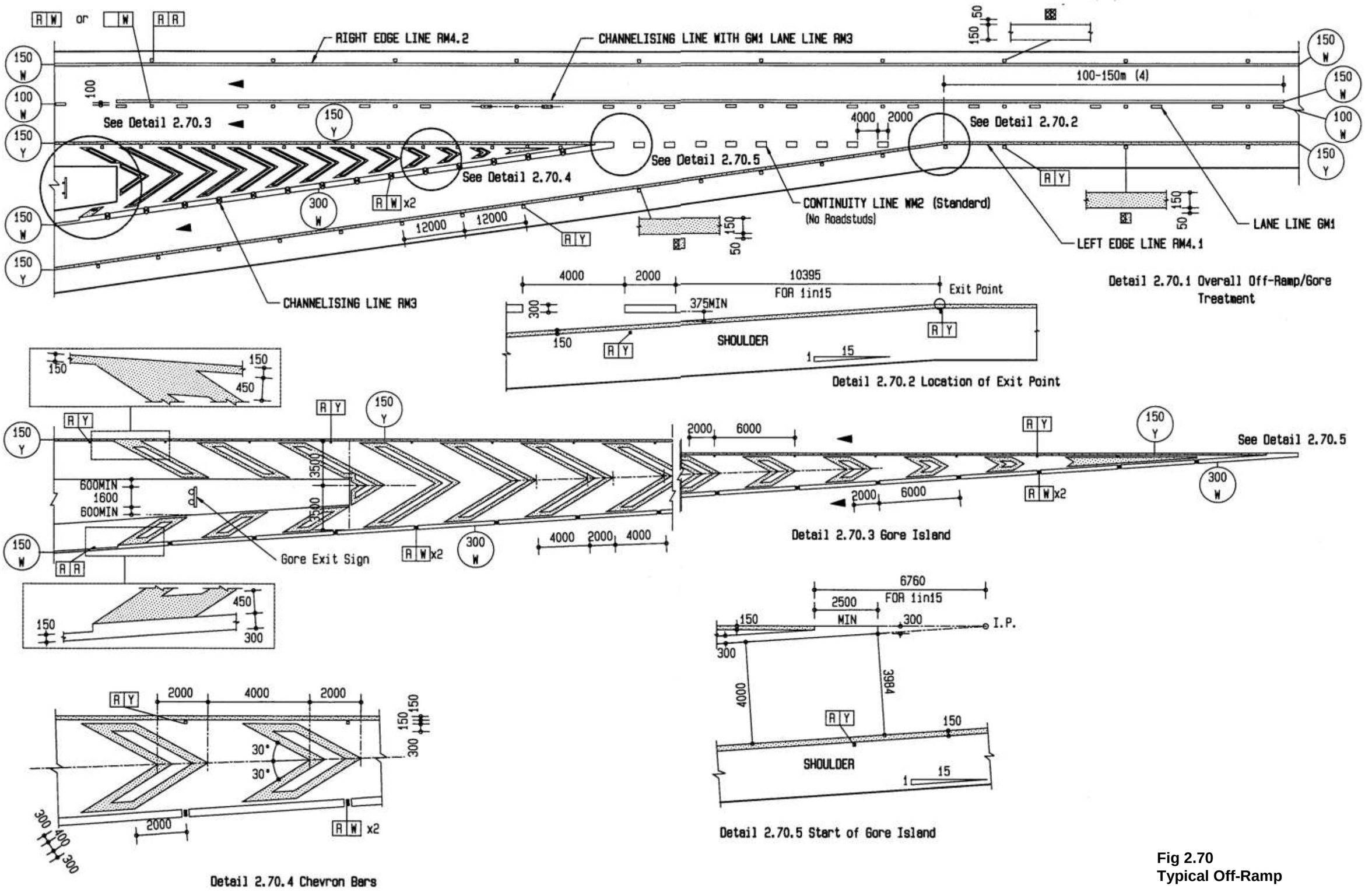


Detail 2.70.1 Overall Off-Ramp/Gore Treatment

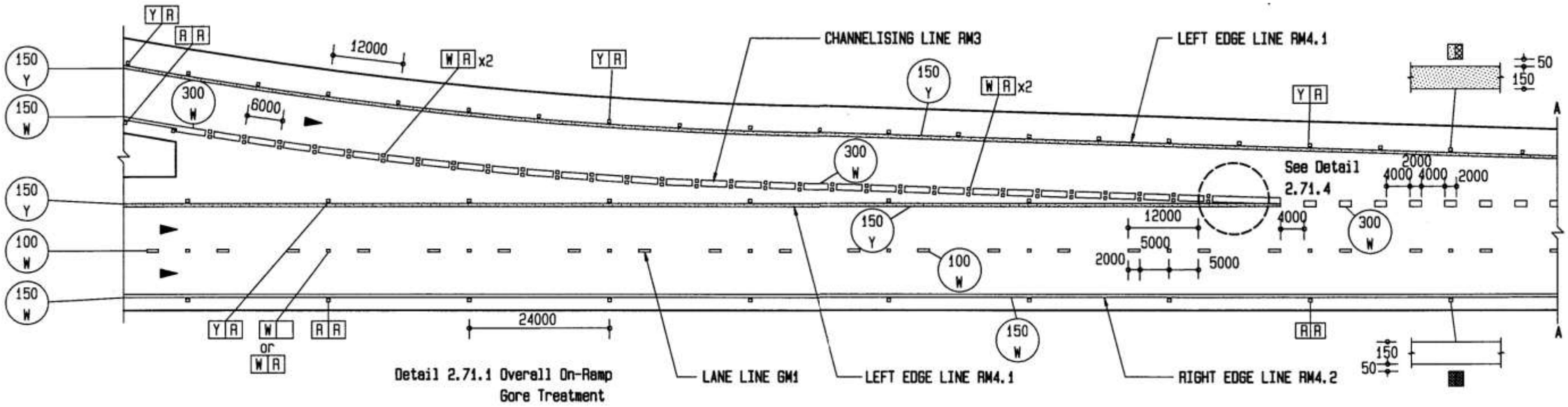
Detail 2.70.2 Location of Exit Point

Detail 2.70.3 Gore Island

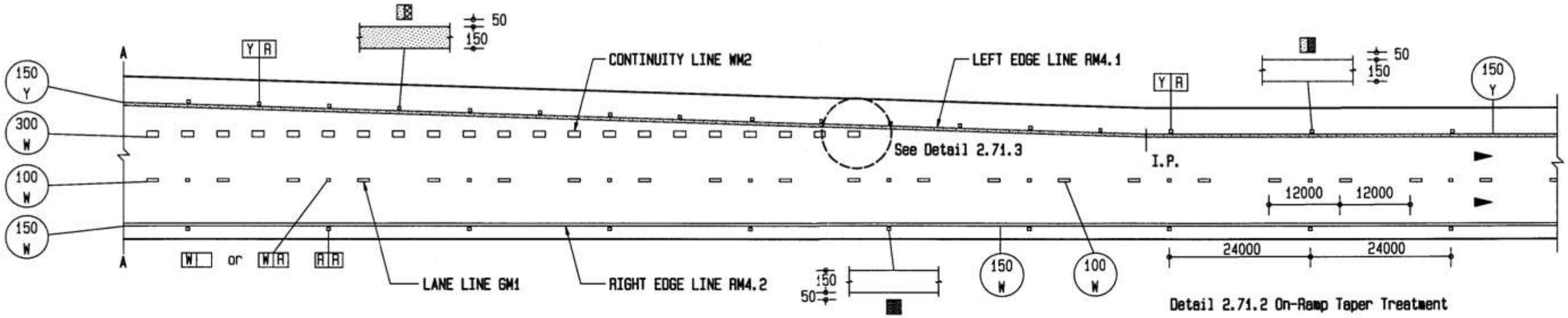
Detail 2.70.4 Chevron Bars

Detail 2.70.5 Start of Gore Island

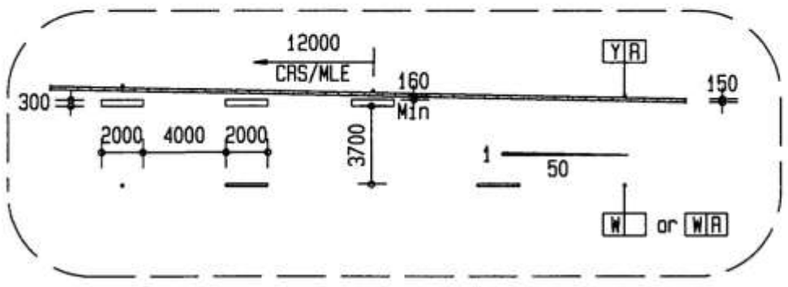
Fig 2.70
Typical Off-Ramp



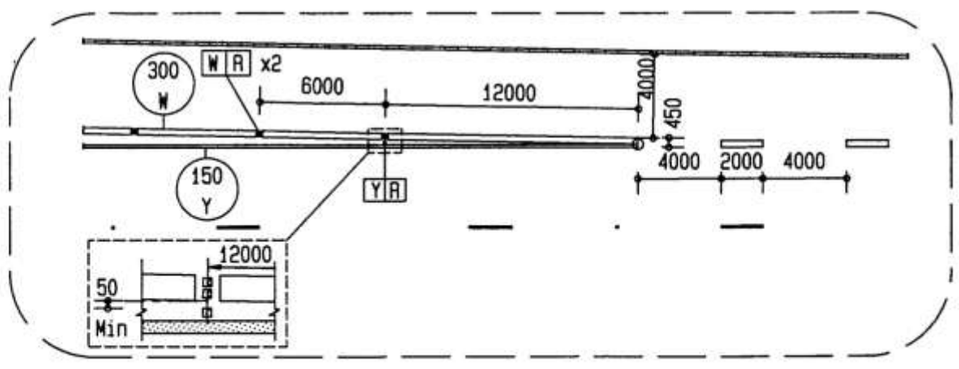
Detail 2.71.1 Overall On-Ramp Gore Treatment



Detail 2.71.2 On-Ramp Taper Treatment

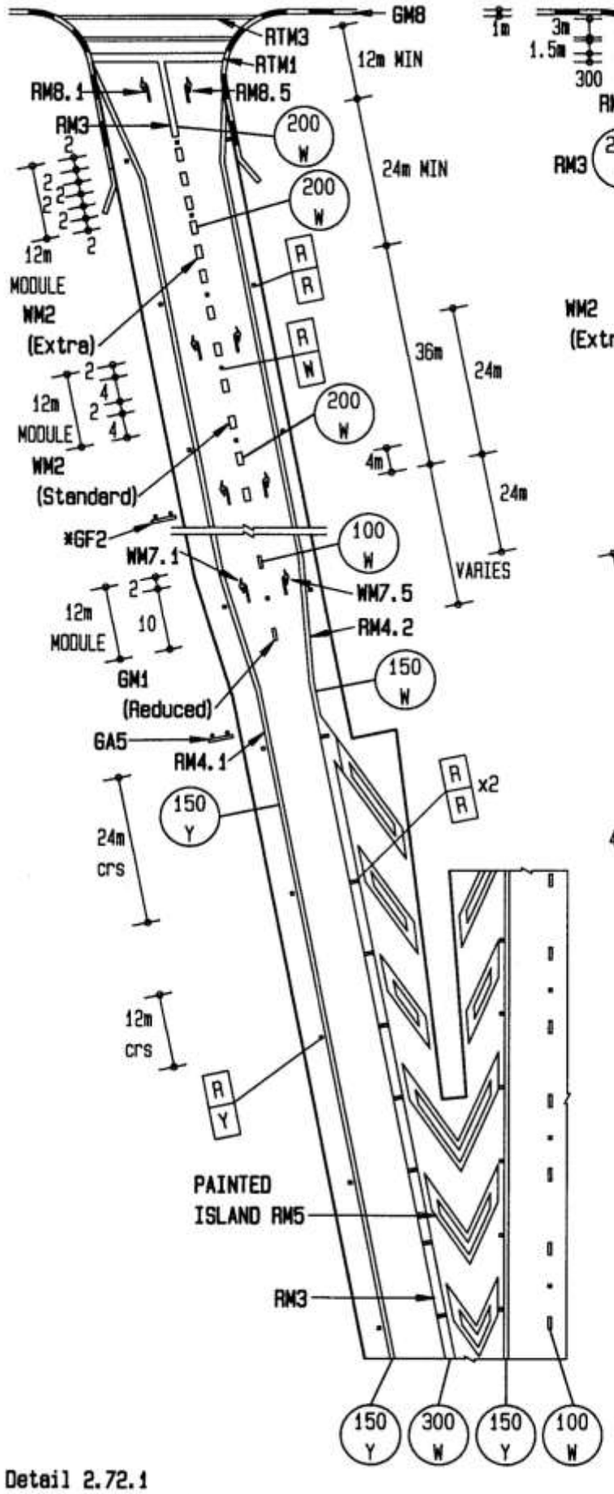


Detail 2.71.3 End of Continuity Line WM2

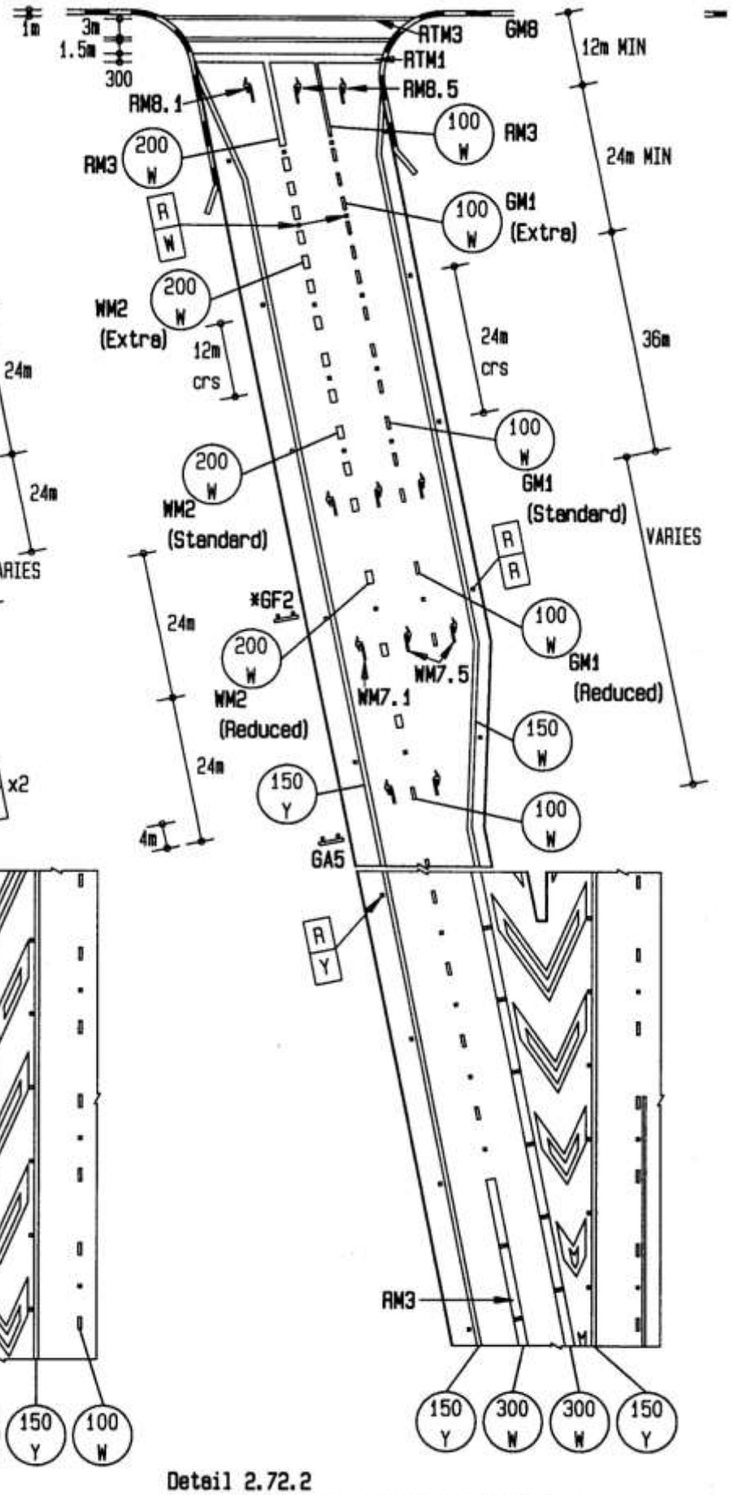


Detail 2.71.4 End of On-Ramp Gore

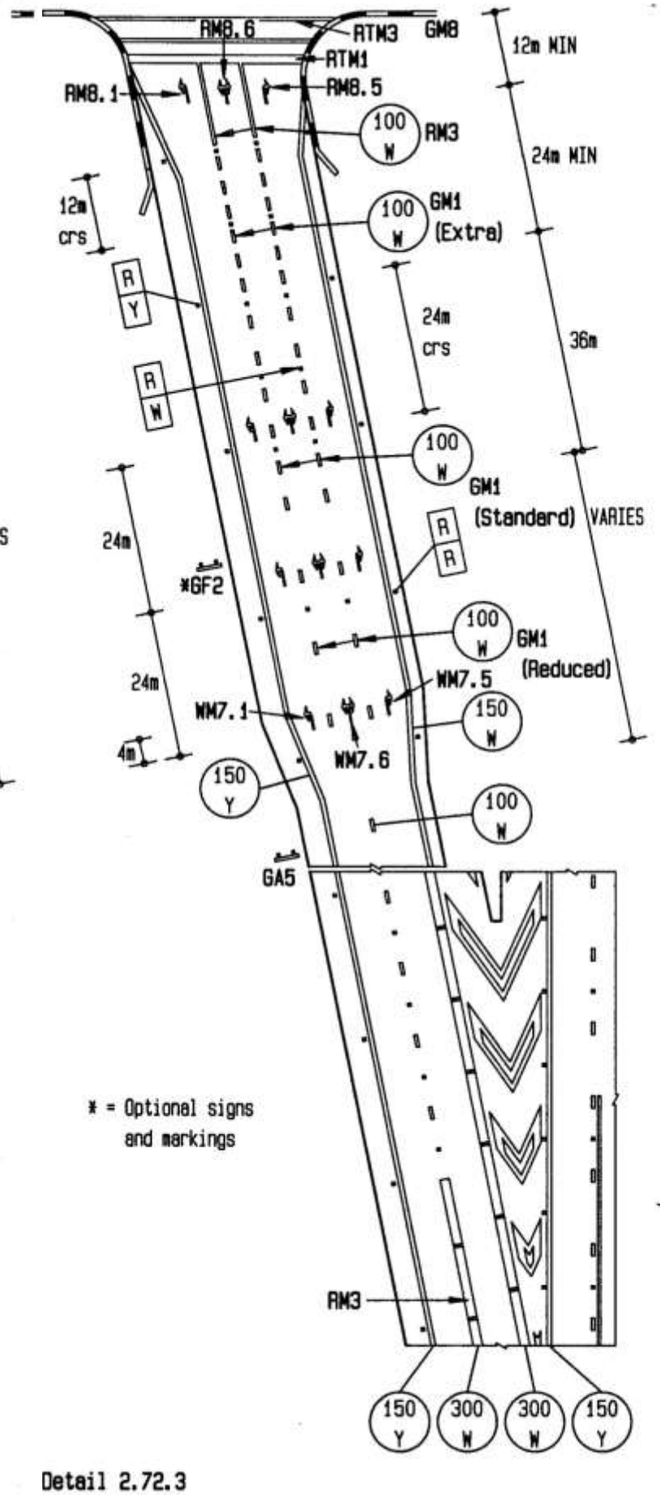
Fig 2.71
Typical On-Ramp



Detail 2.72.1
Typical 2-Lane Off-Ramp

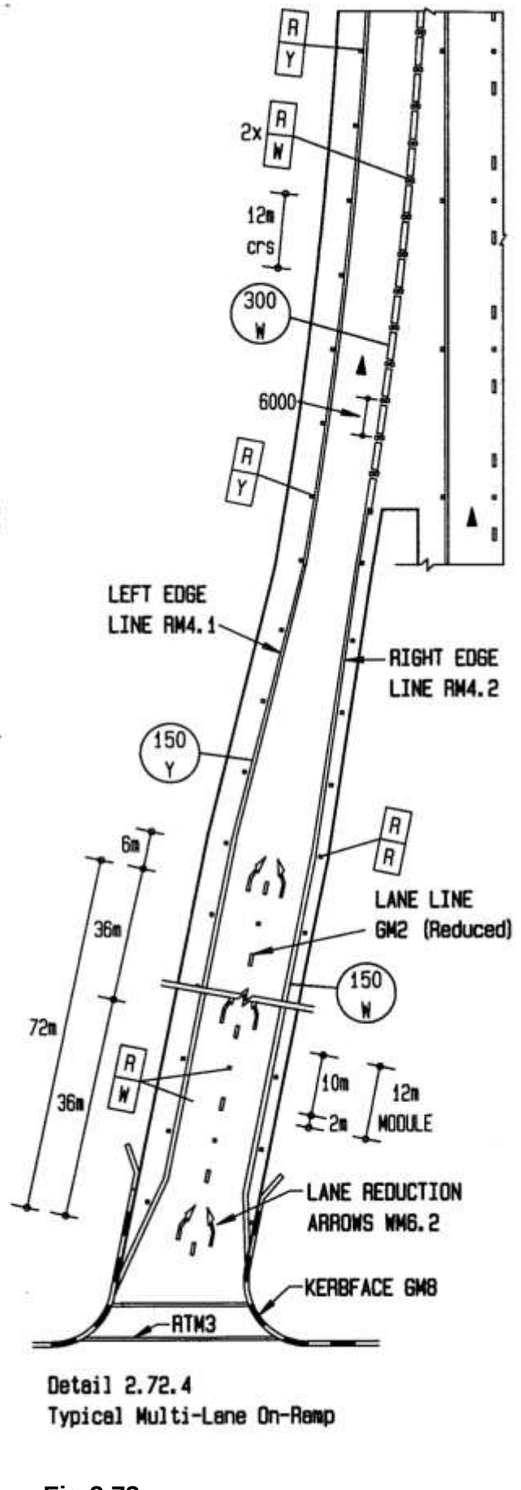


Detail 2.72.2
3-Lane Off-Ramp - Biased to Right Turn



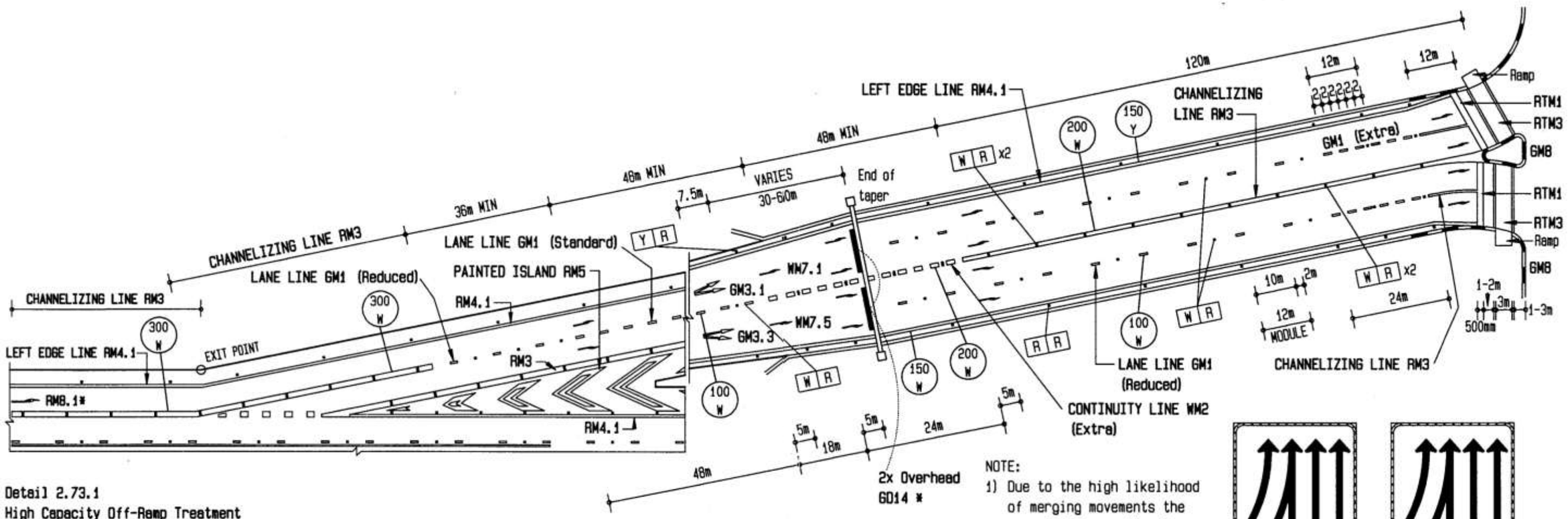
* = Optional signs and markings

Detail 2.72.3
3-Lane Off-Ramp - Balanced Left & Right Turns



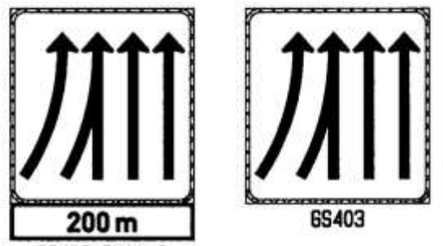
Detail 2.72.4
Typical Multi-Lane On-Ramp

Fig 2.72
Multi-Lane Ramps – Diamond and Parclo

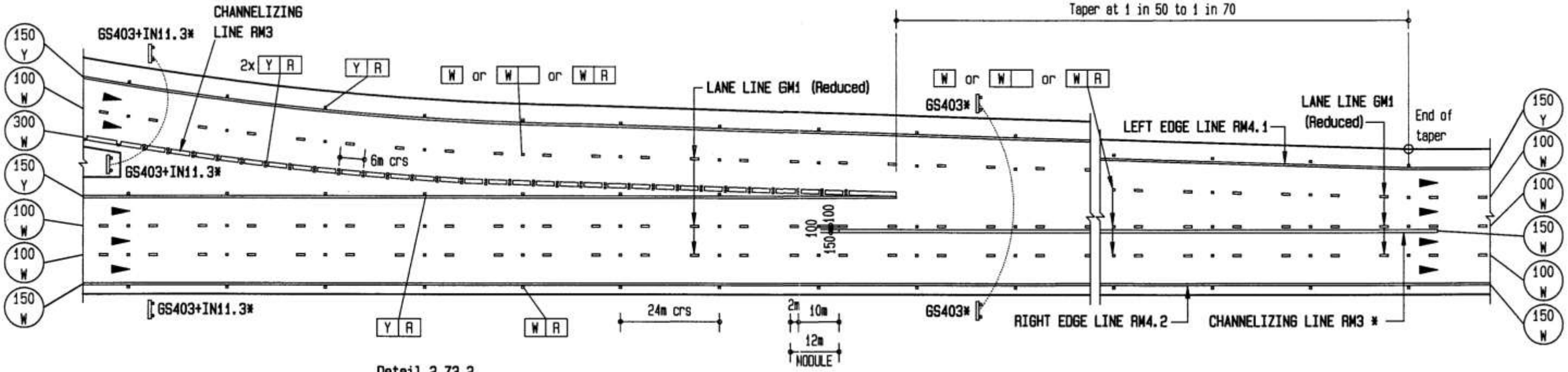


Detail 2.73.1
High Capacity Off-Ramp Treatment

NOTE:
1) Due to the high likelihood of merging movements the use of diagrammatic signs is recommended.



* = Optional signs and markings



Detail 2.73.2
Two-Lane On-Ramp Treatment

Fig 2.73
Special Ramp Configurations - 1

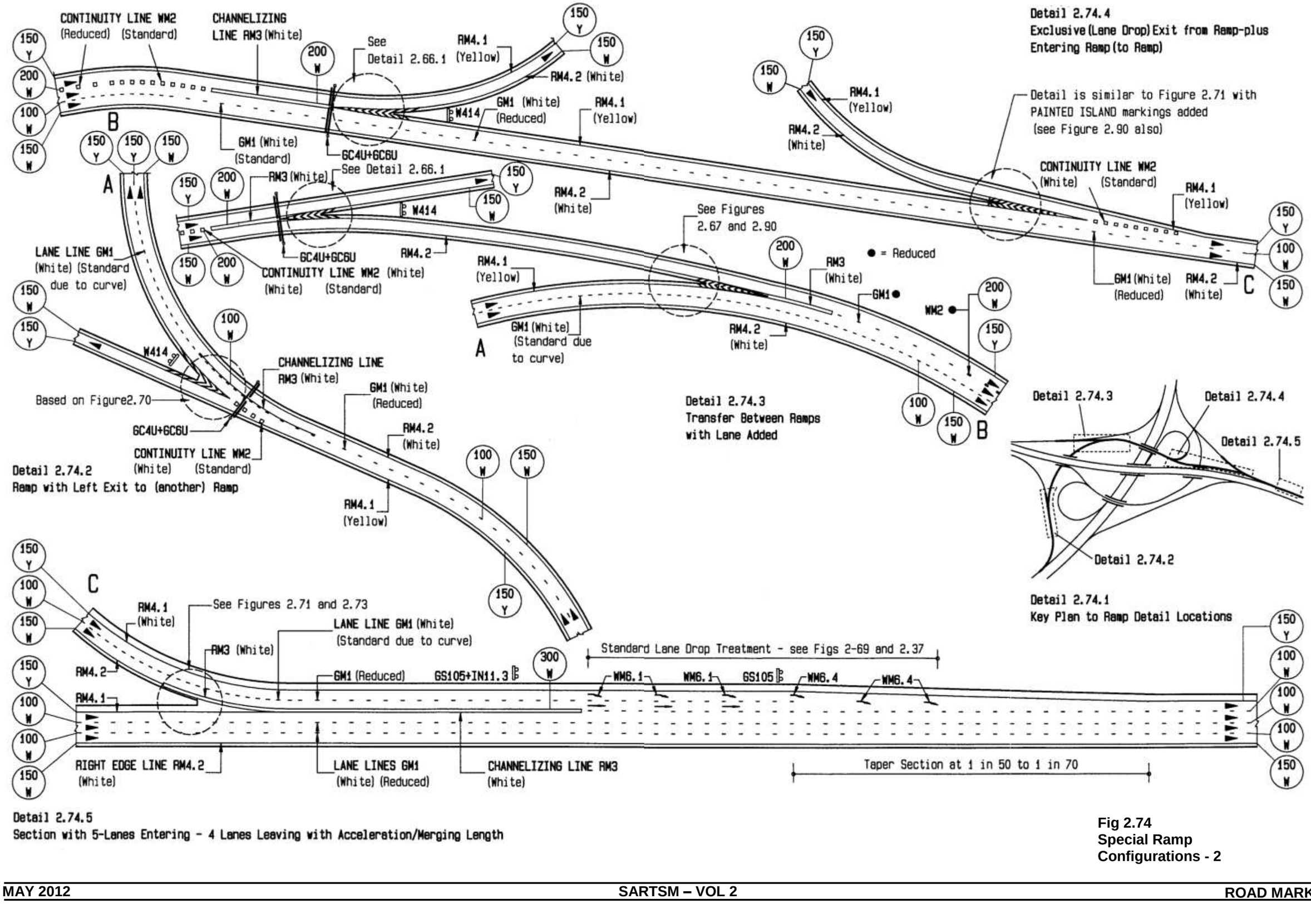


Fig 2.74
Special Ramp Configurations - 2

2.5.8 Crossroad Road Marking Treatment

1 The road marking treatment of crossroads intersecting freeways is very much dependent on the lane configuration on the crossroad and on the geometry of the interchange ramp terminal junctions with the crossroad. Figures 2.75, and 2.76 show typical urban and rural examples, respectively. Details which should be given careful attention include:

(a) clear identification of the off-ramp and on-ramp junctions to drivers on the crossroad approaches;

(b) clear differentiation between off-ramps and on-ramps (with particular regard to possible "wrong way" entry at certain parclo ramp layouts;

(c) adequate identification of right turn lanes, when provided, to prevent inadvertent entry by through traffic;

(d) adequate provision for the safety of pedestrians, even in rural environments.

2 In Figure 2.75 a five-lane urban crossroad is illustrated. This figure shows one ramp terminal to be signalised and the other un-signalised for convenience of the example (such an arrangement will NOT occur in practice). Not illustrated, but fairly common in metropolitan areas, is the requirement for dual right turn lanes onto the freeway. The marking of such a layout should follow convention, with the CONTINUITY LINE marking WM2 lying on the line between the through traffic portion of the roadway and the turning traffic roadway. The line defining the two turning lanes, within the turning roadway area, should be marked by a LANE LINE marking GM1. Details 2.75.2 and 2.75.3 give enlarged details of on-ramp and off-ramp terminal junctions respectively. Figure 2.76 shows similar details for a typical 2 - lane/2 - way rural crossroad with right turn lanes developed on the section between the junctions.

3 Figure 2.77 gives enlarged details appropriate to either of the other two figures. Whilst other ramp/lane configurations may occur, the principles given in the details, can be adapted to all likely configurations.

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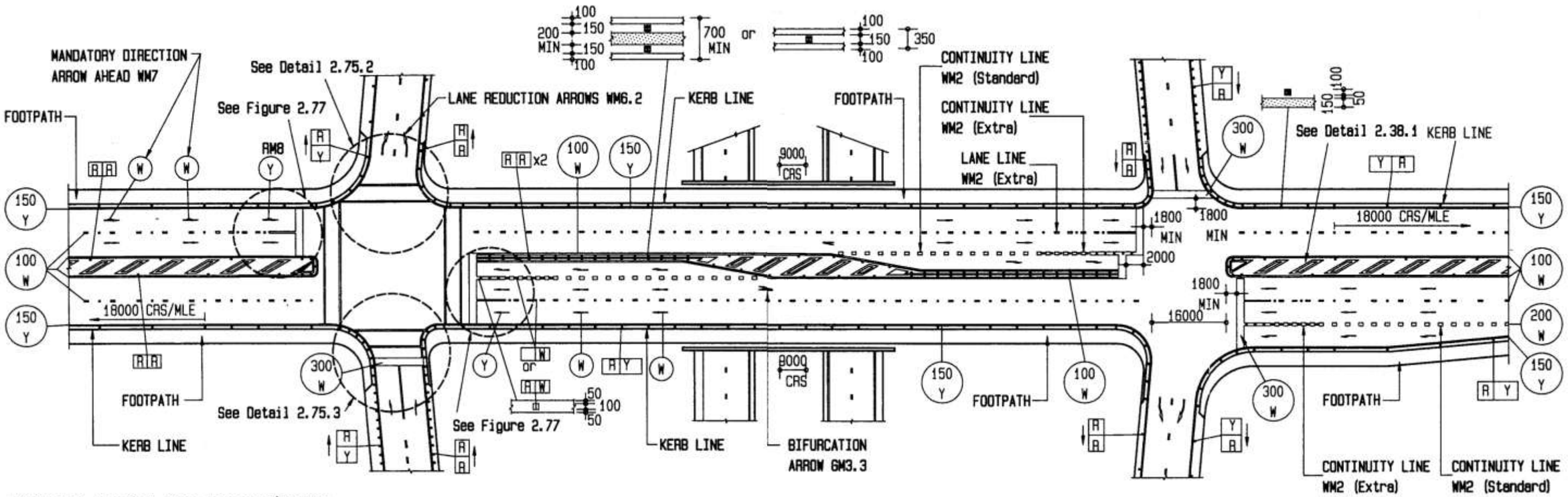
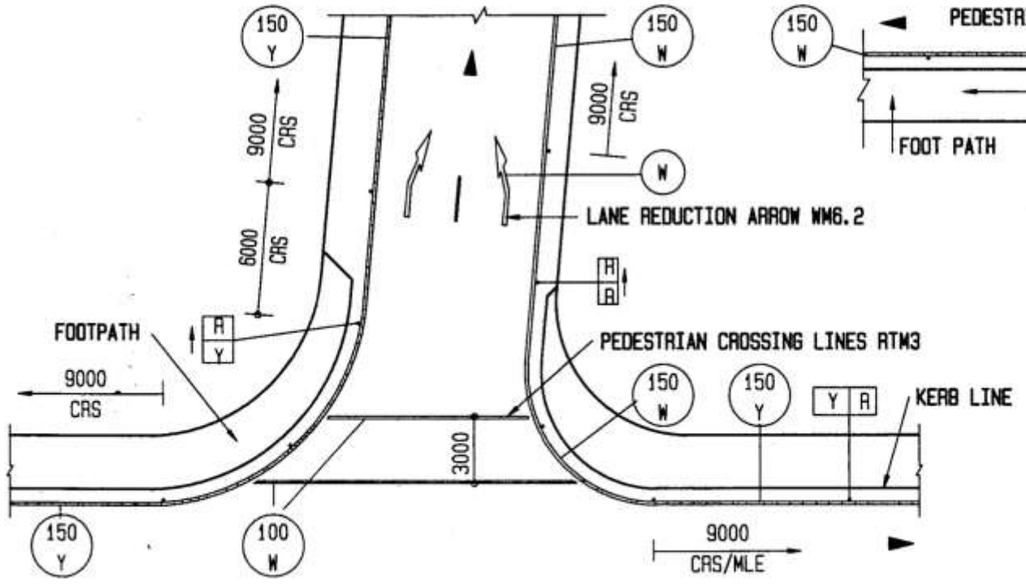
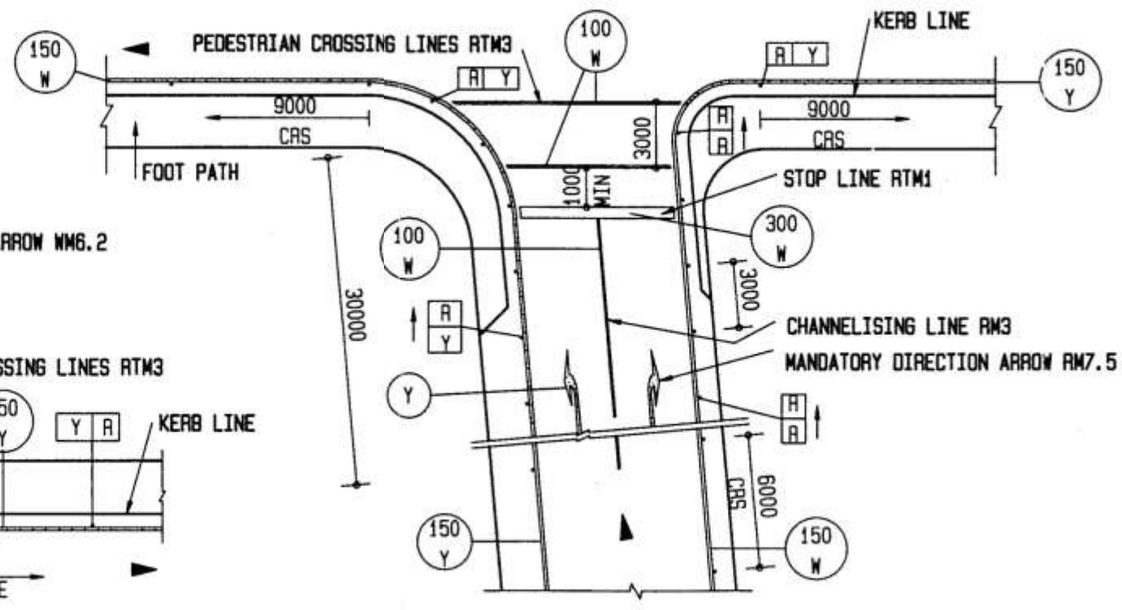


Detail 2.75.1 Typical Urban Crossroad/Freeway Treatment at an Access Interchange

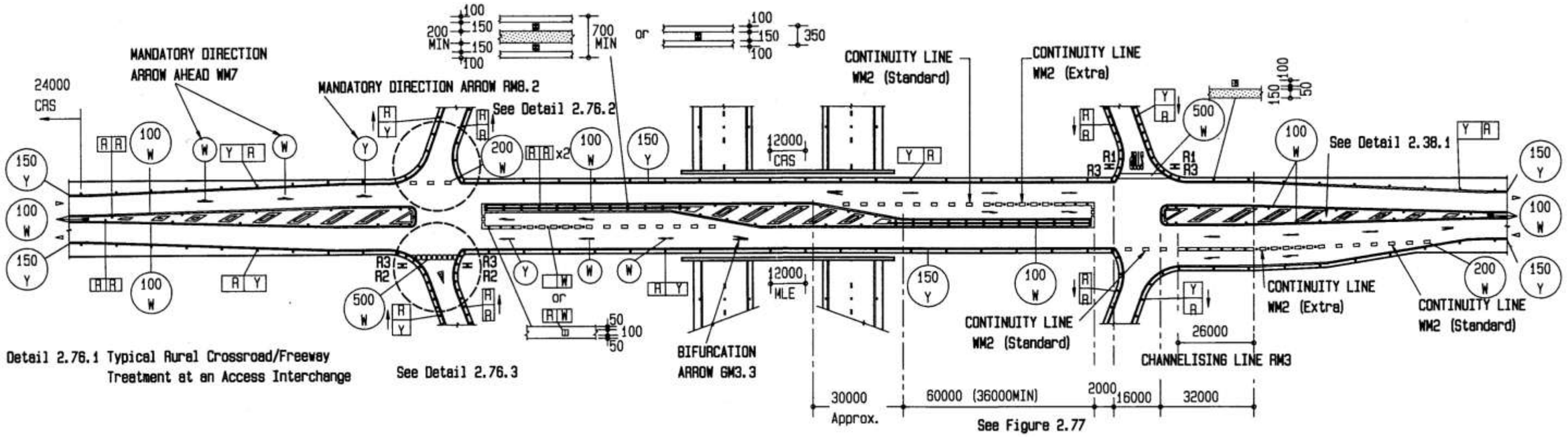


Detail 2.75.2 Typical On-Ramp Terminal

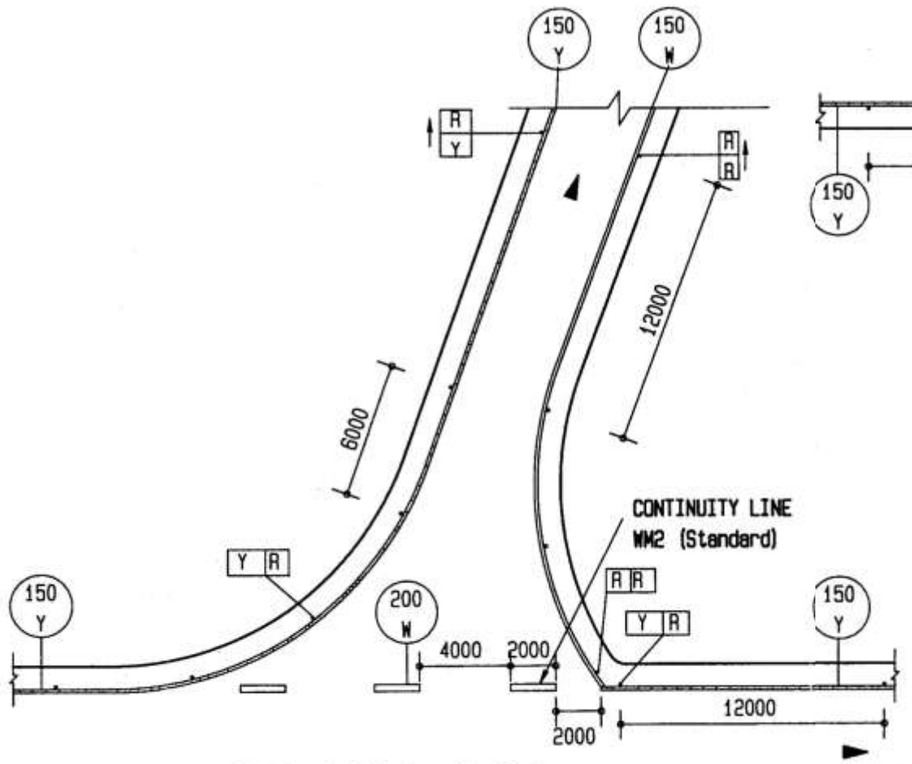


Detail 2.75.3 Typical Off-Ramp Terminal

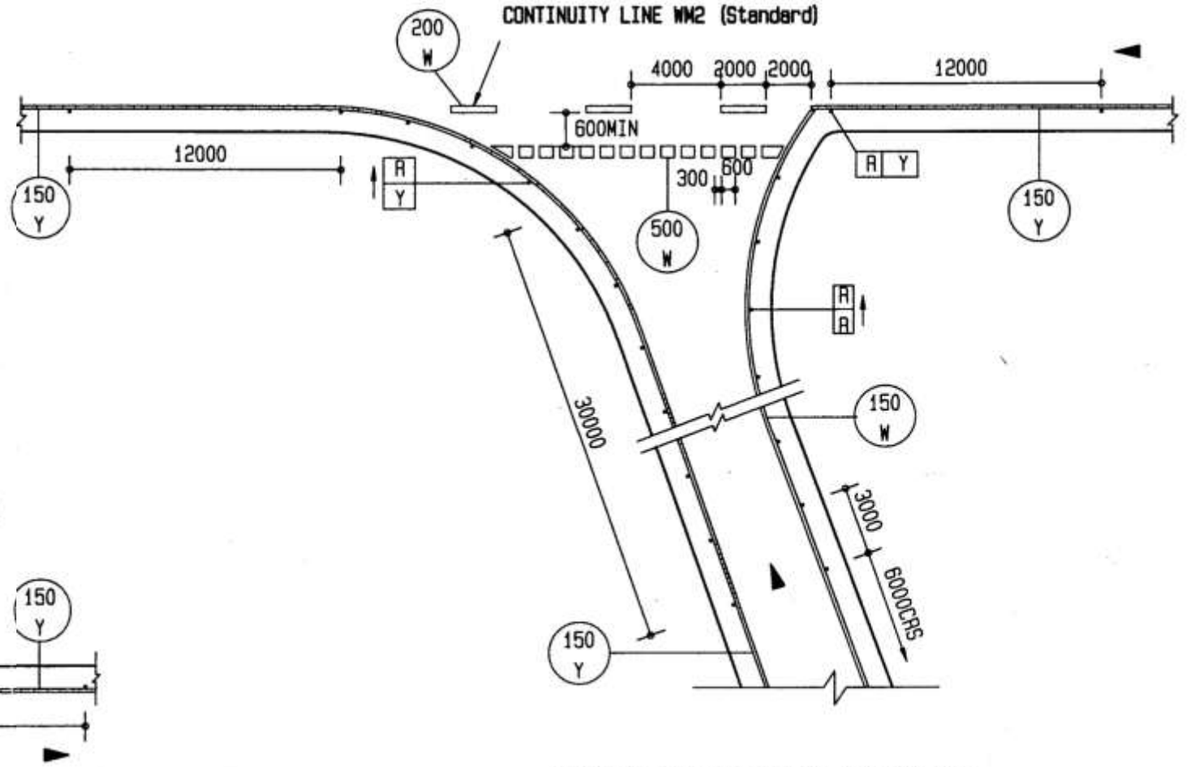
Fig 2.75
Crossroad / Ramp Terminal Treatment - 1



Detail 2.76.1 Typical Rural Crossroad/Freeway Treatment at an Access Interchange

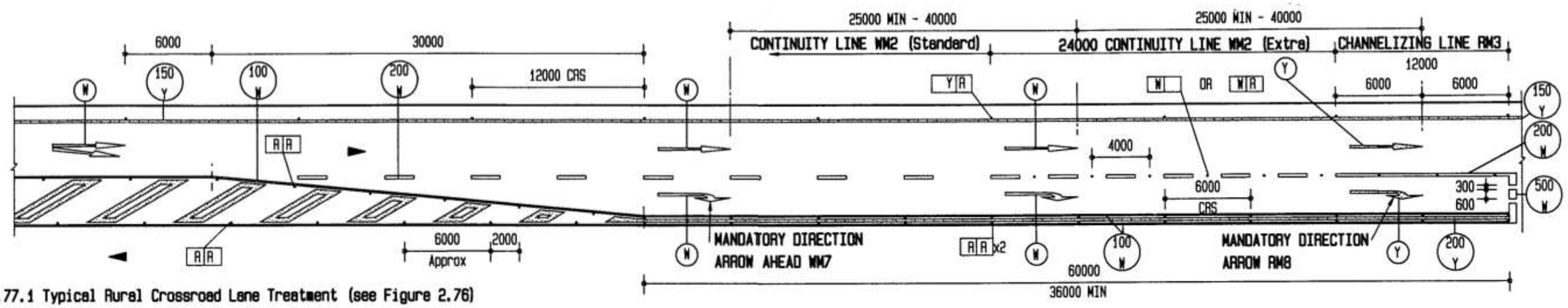


Detail 2.76.2 Typical On-Ramp Terminal

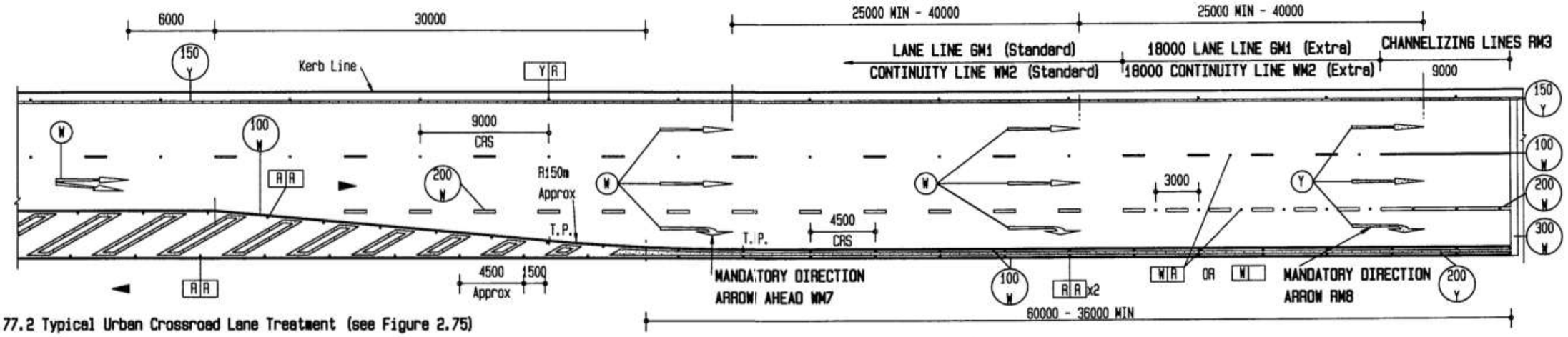


Detail 2.76.3 Typical Off-Ramp Terminal

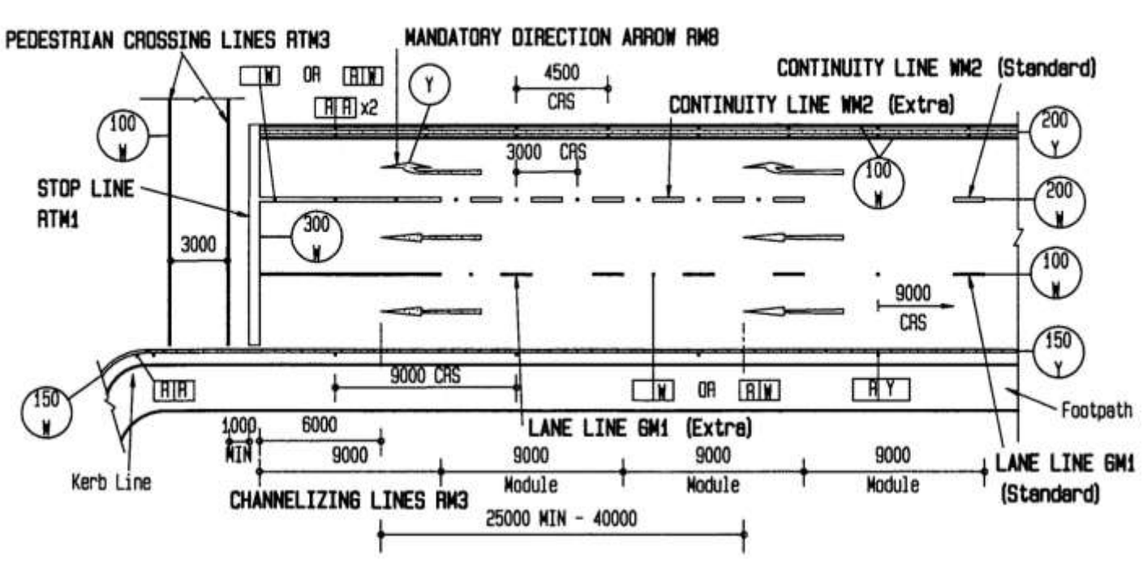
Fig 2.76
Crossroad / Ramp Terminal Treatment - 2



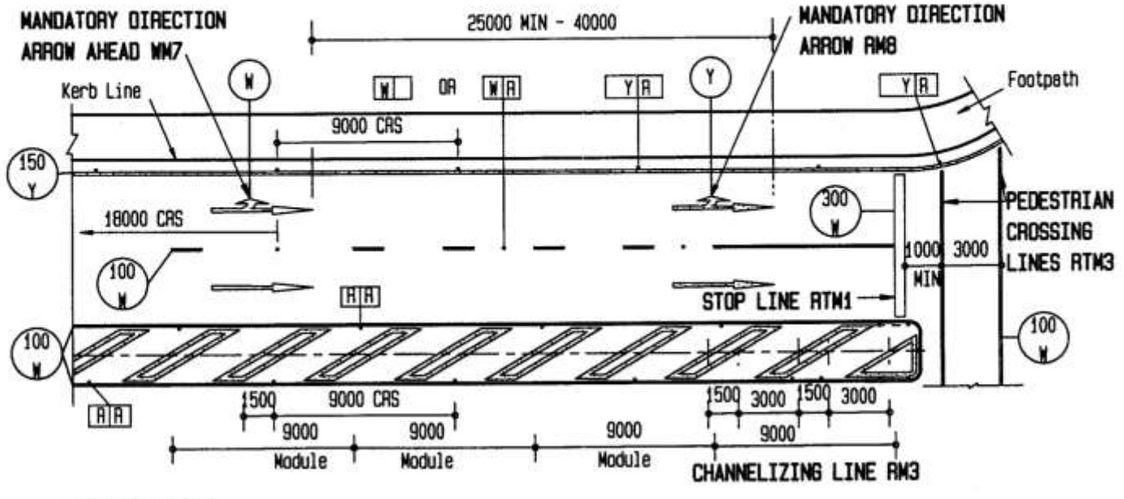
Detail 2.77.1 Typical Rural Crossroad Lane Treatment (see Figure 2.76)



Detail 2.77.2 Typical Urban Crossroad Lane Treatment (see Figure 2.75)



Detail 2.77.3 Approach to Right Turn On-Ramp (Urban)



Detail 2.77.4
Approach to Left Turn On-Ramp (Urban)

Fig 2.77
Crossroad Treatment - 3

2.5.9 Arrestor Bed Markings

1 Figure 2.78 illustrates the basic details of road markings for the approach to a heavy vehicle arrestor bed. Whilst the normal arrangement of an arrestor bed on a freeway is off the left side of the carriageway, a right side exit to an arrestor bed may be the best arrangement in certain topographical and carriageway situations. Detail 2.78.1 gives an example of each type of exit arrangement.

2 Detail 2.78.2 shows the block spacing arrangement on the freeway shoulder and at the shoulder/exit junction (the equivalent of the EXIT POINT at a normal off-ramp). It should be noted that the preferred treatment of the LEFT EDGE LINE marking RM4.1 across the entry to the arrestor bed is to leave it in place. The reasoning behind not breaking this line is that the only entries to the arrestor bed are meant to be emergency entries. It is further reasoned that the driver of a runaway heavy vehicle will not be inhibited by the line whereas those who should not be entering the arrestor bed, without emergency status, will commit a technical offence. Detail 2.78.3 gives details of colours and roadstud location.

3 The full application of signs and markings at arrestor beds is described in Chapter 11: *Signing for Heavy Vehicles*, Subsection 11.3.7.

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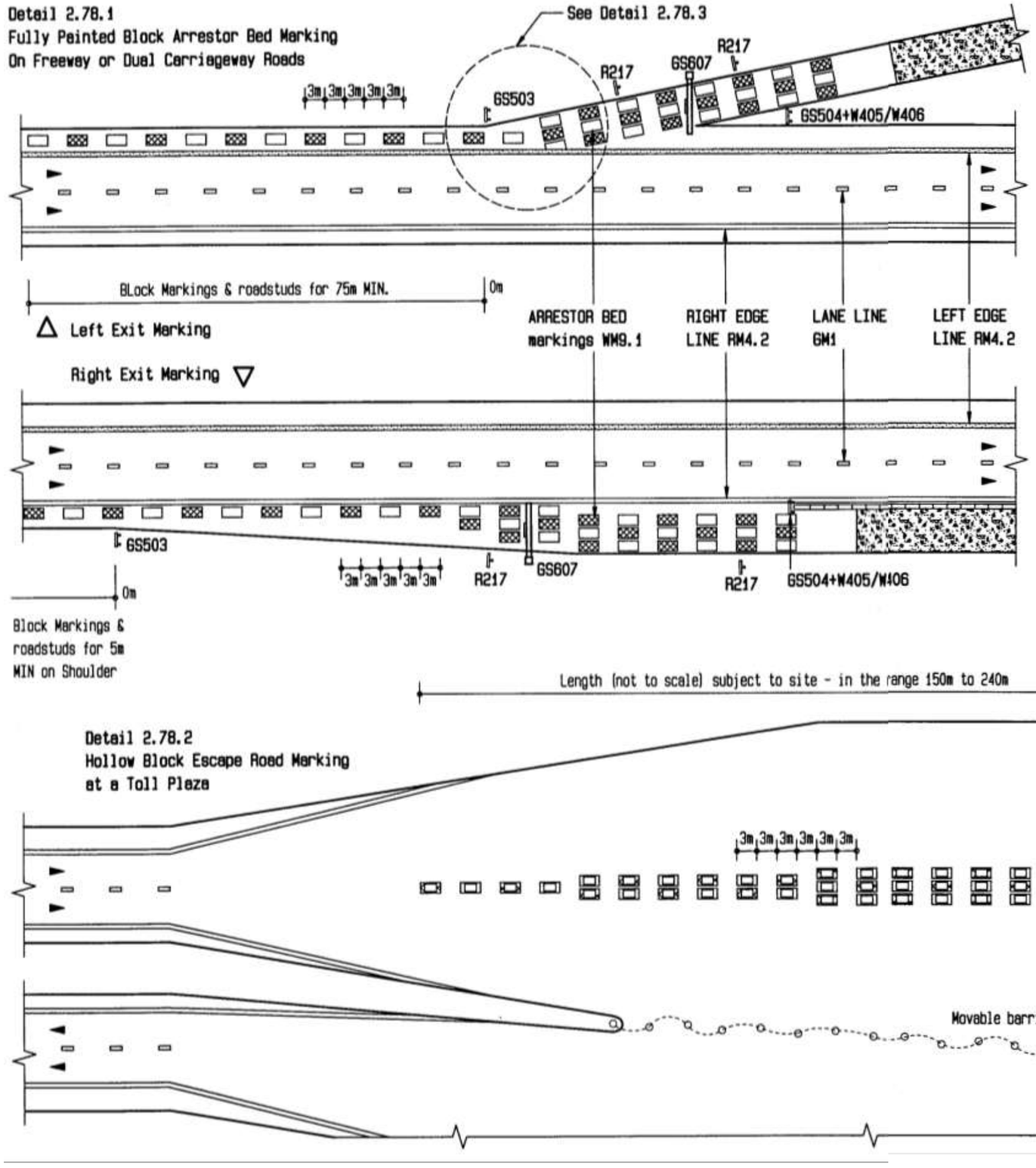
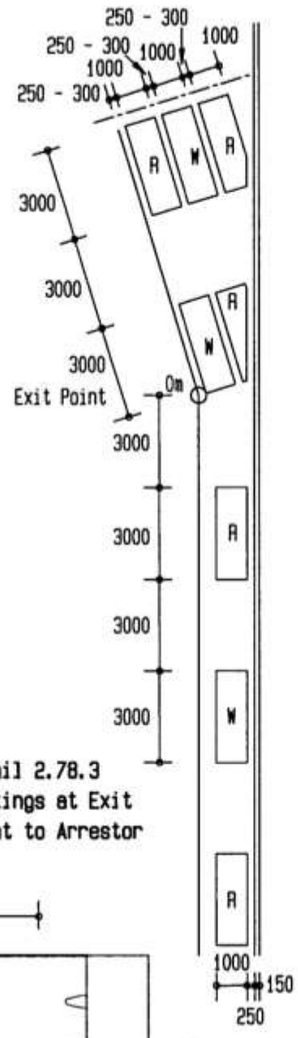
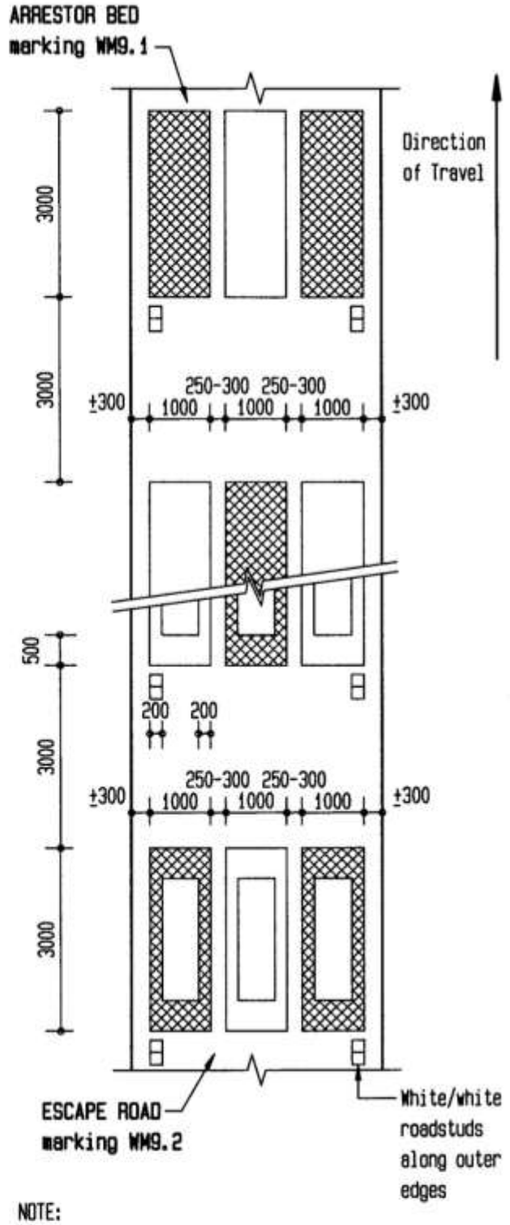


Detail 2.78.1
Fully Painted Block Arrestor Bed Marking
On Freeway or Dual Carriageway Roads

Detail 2.78.2
Hollow Block Escape Road Marking
at a Toll Plaza



Detail 2.78.3
Markings at Exit Point to Arrestor Bed



NOTE:
Either marking may be used for both purposes based on a cost and anti-skid site assessment.

Detail 2.78.4
Arrestor Bed/Escape Road Block Marking Dimensions

Fig 2.78
Arrestor Bed Details

2.5.10 Shoulder Marking for SOS Telephone Points

1 Several sections of the National freeway network are provided with SOS emergency telephones. These telephones are located at the rear of the emergency shoulder. This system can, however, be used for non-emergency messages. Under non-emergency circumstances the user, by being on the emergency shoulder, is technically committing an offence. An EXCLUSIVE PARKING BAY marking RM7 is available for SOS telephone use.

2 Figure 2.79 therefore illustrates the option to use an EXCLUSIVE PARKING BAY marking RM7 on the shoulder, locally, in place of a freeway shoulder marking RM4.1. The locations of SOS telephones are indicated by tourism service signs GF11 and GF12. In order to enhance awareness of the location of the telephones, and the fact that the shoulder may be used, it is recommended that the preceding section of shoulder be marked with PAINTED ISLAND marking RM5 as shown on Details 2.79.1 and 2.79.4.

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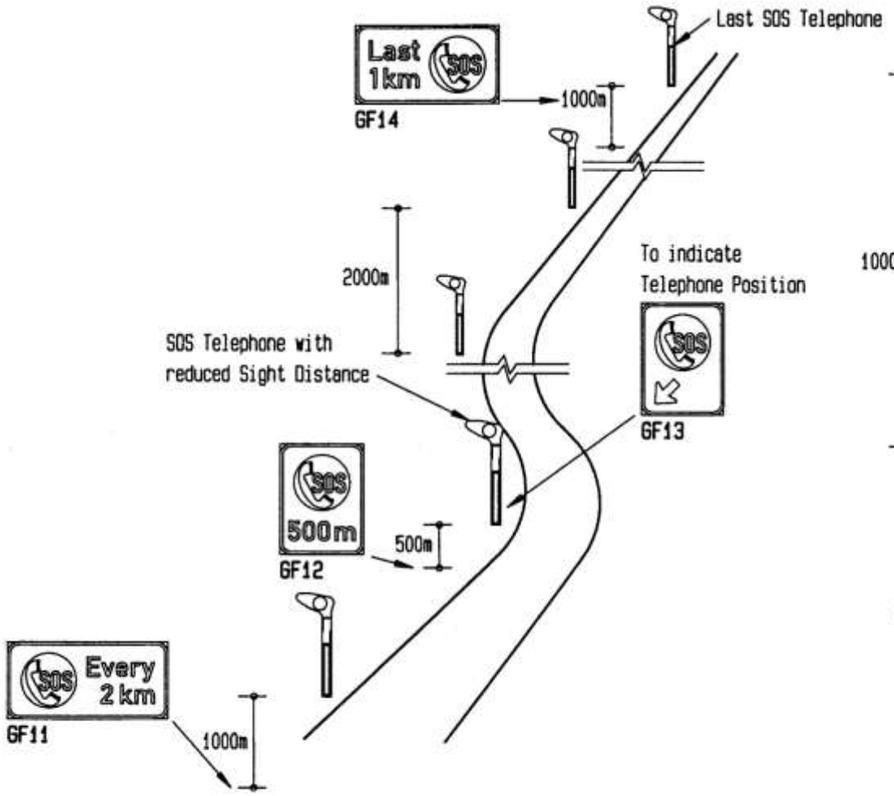
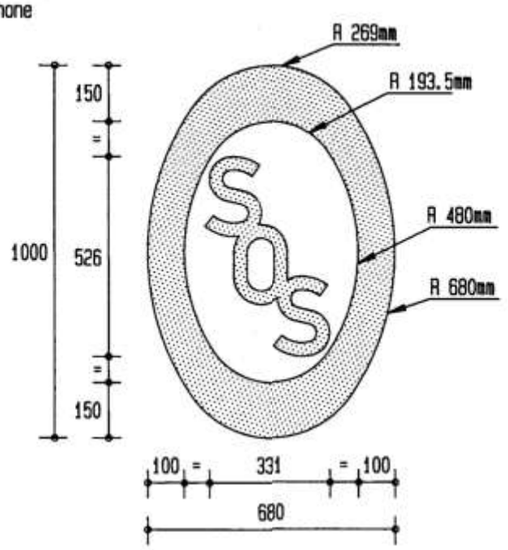
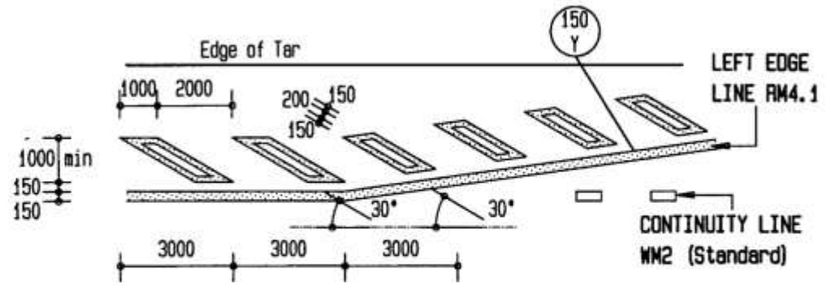


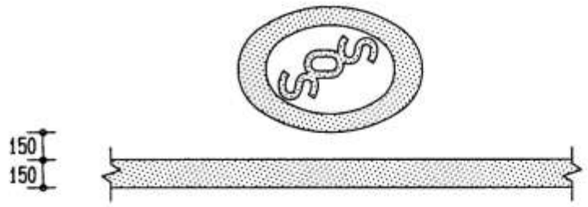
Detail 2.79.2 Advance Signing



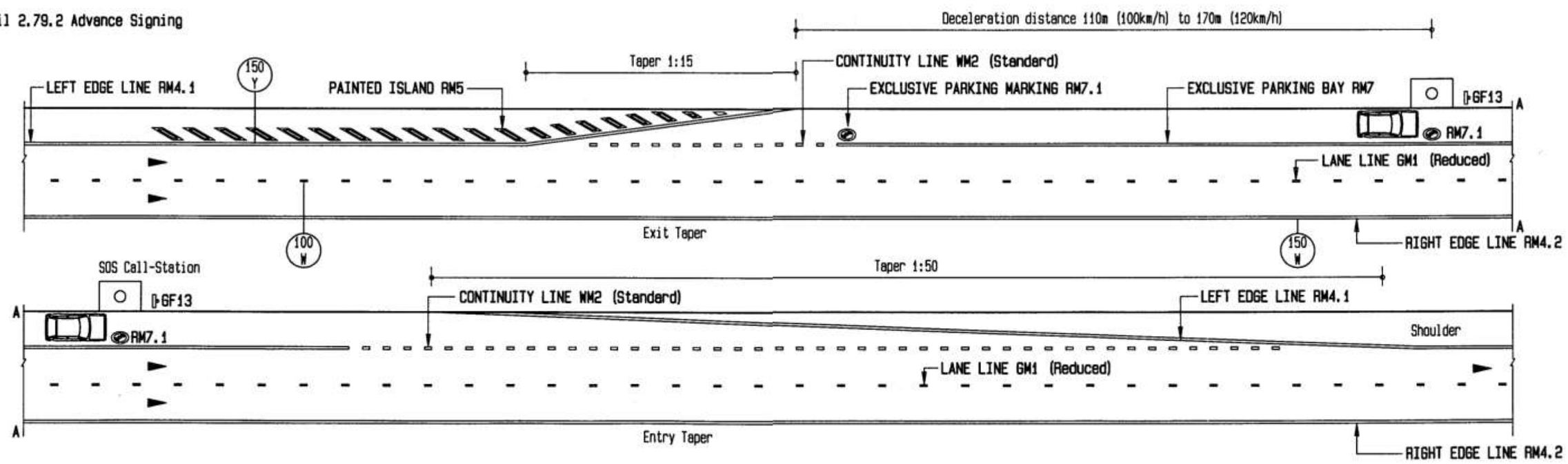
Detail 2.79.3 EXCLUSIVE PARKING BAY Symbol RM7.1



Detail 2.79.4 Shoulder Marking



Detail 2.79.5 Location of Marking RM7.1



Detail 2.79.1 Exit and Entry Taper Treatment

Fig 2.79
SOS Telephone
Shoulder Layout

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2.6 ROAD MARKING APPLICATIONS FOR PARKING ENVIRONMENTS

2.6.1 General

1 The dimensions of various angles of parking bay are detailed in many documents. For completeness in this chapter Figures 2.80 to 2.84 cover dimensional details for 90°, 60° and 45° angled parking bays, and parallel parking bays. The dimensions used in these figures are effectively the mean of those given in a range of other documents.

2 In each case Figures 2.80 to 2.83 give detailed individual bay marking dimensions, including examples of minimum level markings. These figures also give bay, aisle and module dimensions for 90°, 60° and 45° angled parking as applied to off-street car parks and parking garages.

3 Figure 2.80 includes a range of aisle and parking bay widths for 90° parking bays. For this bay pattern a reduced aisle width may be compensated for by an increase in bay width (within reasonable limits). This option may be of particular value in the design of parking bay layouts within buildings, although account will always have to be taken also of column positions.

4 Examples of motor cycle parking bays are included in Figures 2.80 and 2.82. These road markings should be accompanied by MOTOR CYCLE PARKING RESERVATION sign R307-P.

2.6.2 Parallel Parking

1 Figure 2.83 shows a range of examples of typical parallel parking road marking applications. Included in these examples are details of the following marking variations:

(a) full bay markings;

(b) reduced level bay markings;

(c) minimum level bay markings for use with part-time NO STOPPING or NO PARKING markings;

(d) motorcycle bay markings;

(e) guide markings to help drivers centre in bays (always on the right side of the bay);

(f) number/arrow markings for use with "multi"-parking meters;

(g) paired bays with common manoeuvring area (slight bay length benefit).

2 Figure 2.84 shows an option to mark a parking "envelope" in which individual bays are not marked but the area available for parking is identified by a perimeter line. This type of parking may be used for all classes of vehicle where time control is not a particular requirement. The "envelope" can be reserved for a specific class of vehicle, such as vehicles over 10 tonnes, as in the example. Due to the potential for confusion with a LANE LINE marking GM1, it is recommended that this marking option should not be used on multi-lane roads, and that when the marking is used, physical interruption features such as tree or toilet projections be used to visually close long lengths of the parking. This form of marking may be most appropriate in the following instances:

(a) in small towns where heavy vehicles traditionally stop for driver rest periods;

(b) in uncontrolled, but heavy demand, on-street areas used by regular parkers who are likely to park at higher densities than can be achieved when individual bays are marked.

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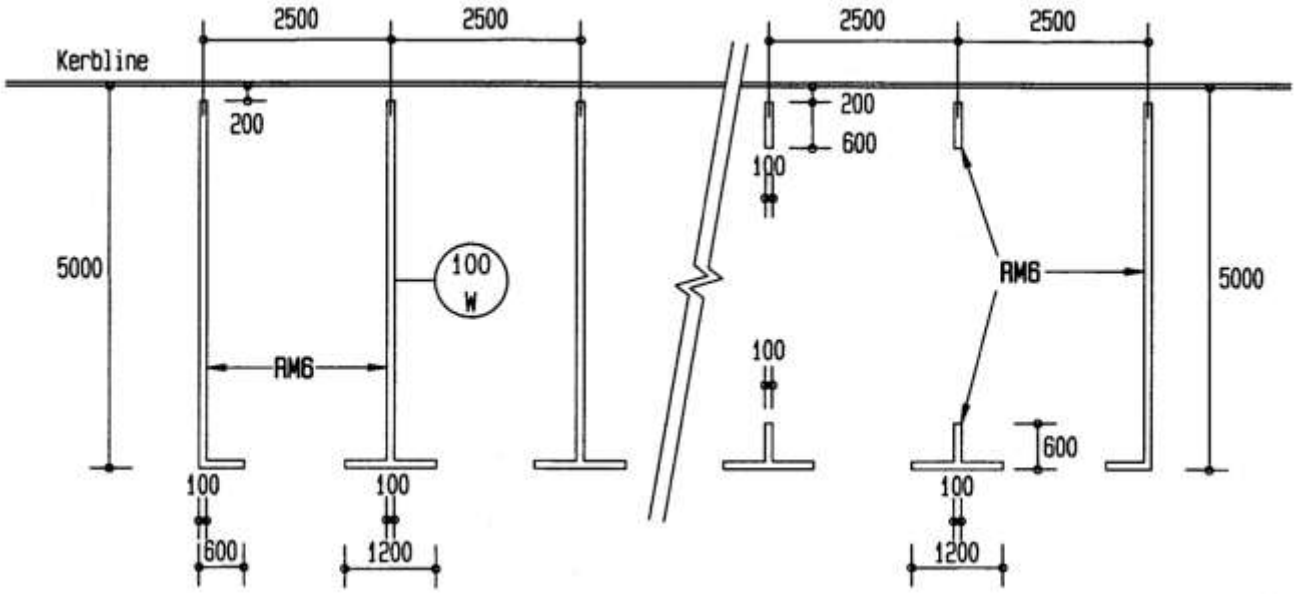
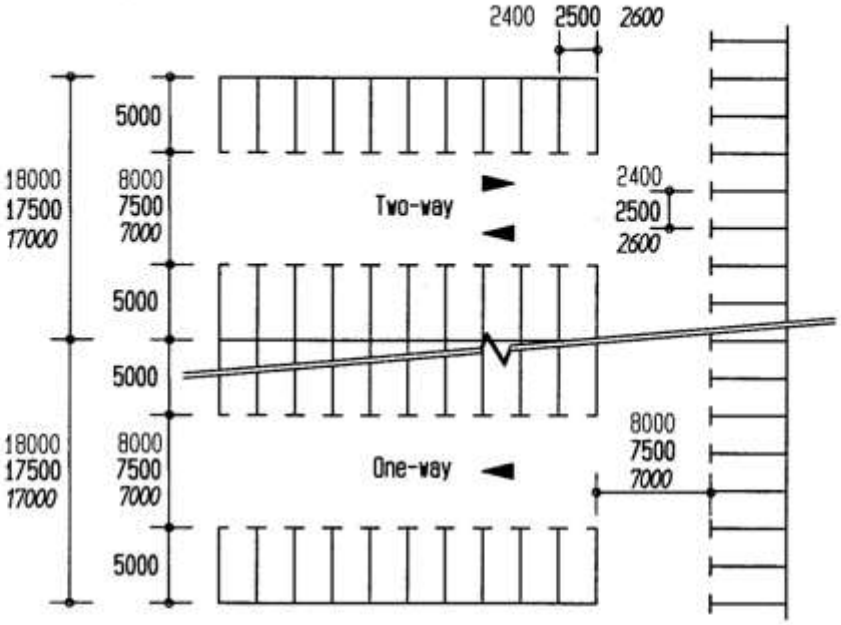
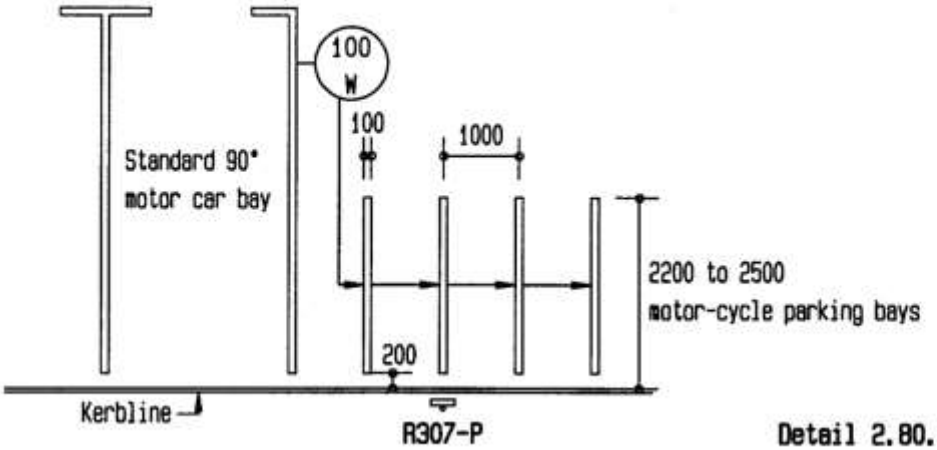


Detail 2.80.1 Basic Bay Marking Dimensions in Full Line and Reduced Line Markings



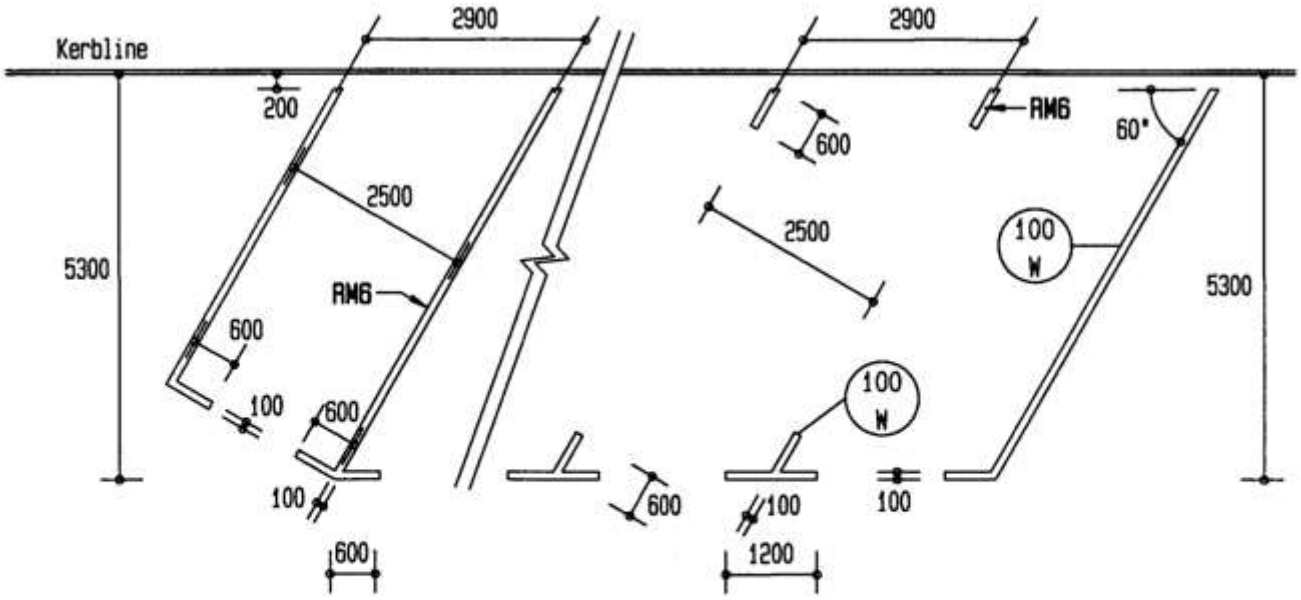
Detail 2.80.2 Aisle and Module Dimensions - 90° Parking

NOTE:
Relationship between bay and aisle width indicated by text variation.

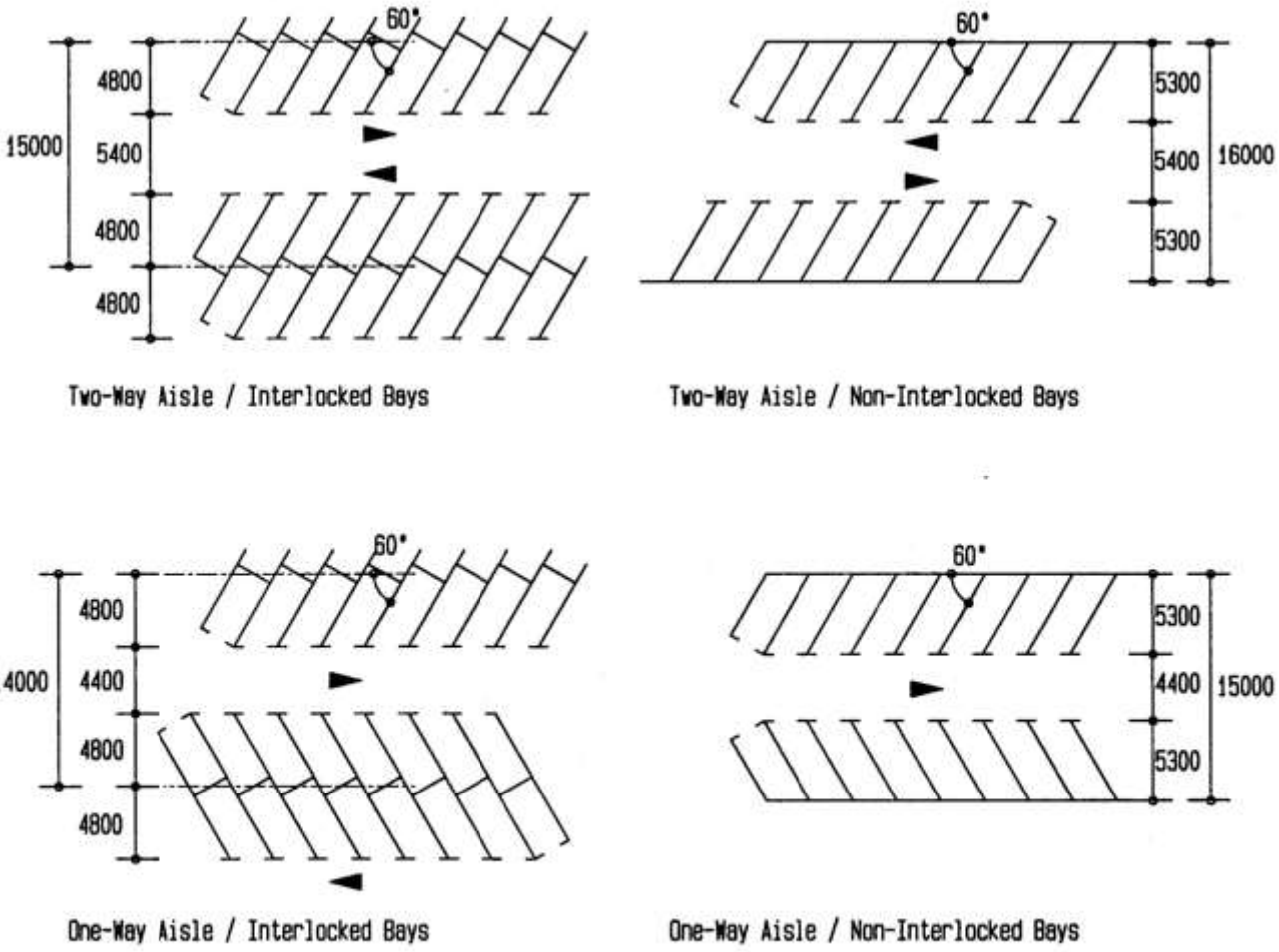


Detail 2.80.3 Motor-Cycle Parking Bay Dimensions

Fig 2.80 **90° Parking – including Motor Cycle Parking**

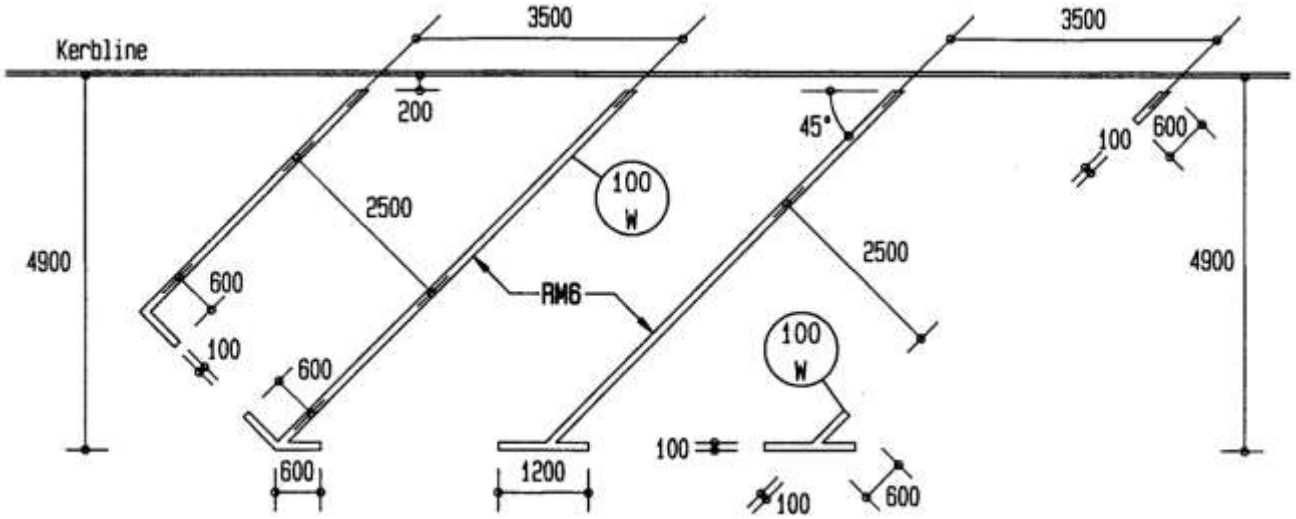


Detail 2.81.1 Basic Bay Marking Dimensions for 60° Angled Parking Bays in Full Line and Reduced Line Markings

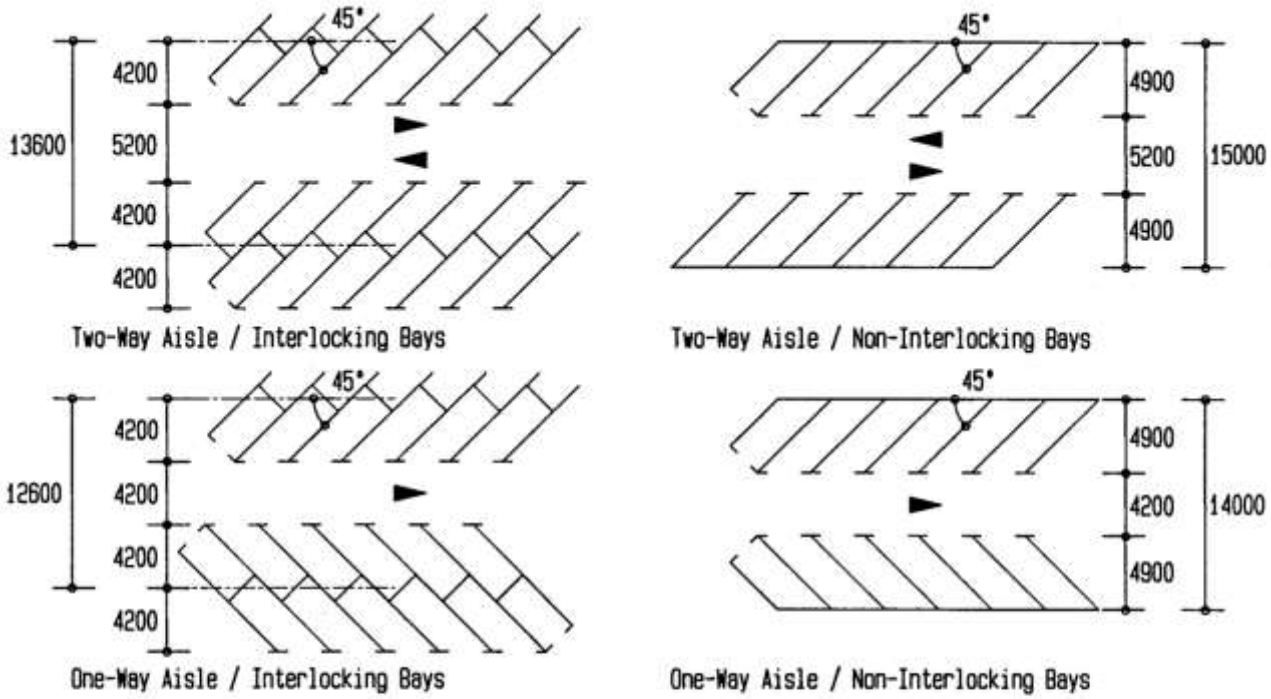


Detail 2.81.2 Aisle and Module Dimensions - 60° Parking

Fig 2.81 **60° Parking**



Detail 2.82.1 Basic Bay Marking Dimensions for 45° Angled Parking Bays in Full Line and Reduced Line Markings



Detail 2.82.2 Aisle and Module Dimensions - 45° parking

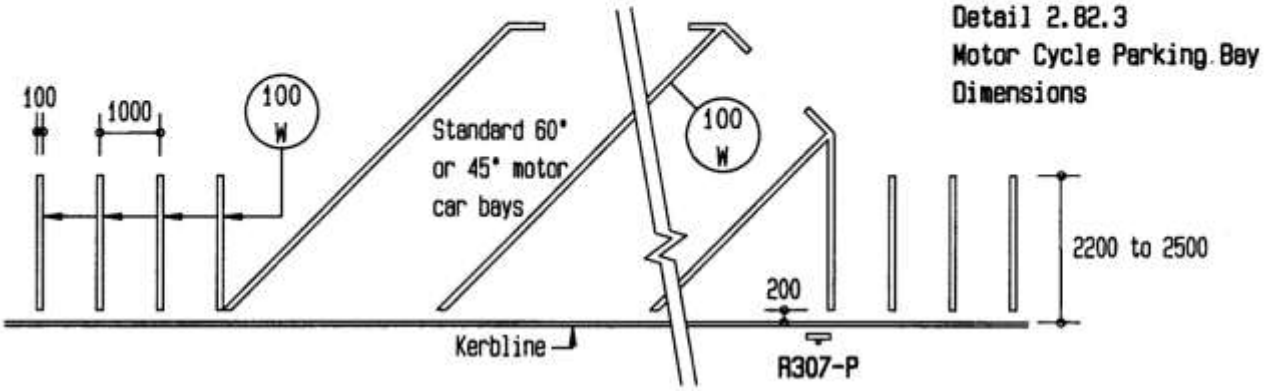
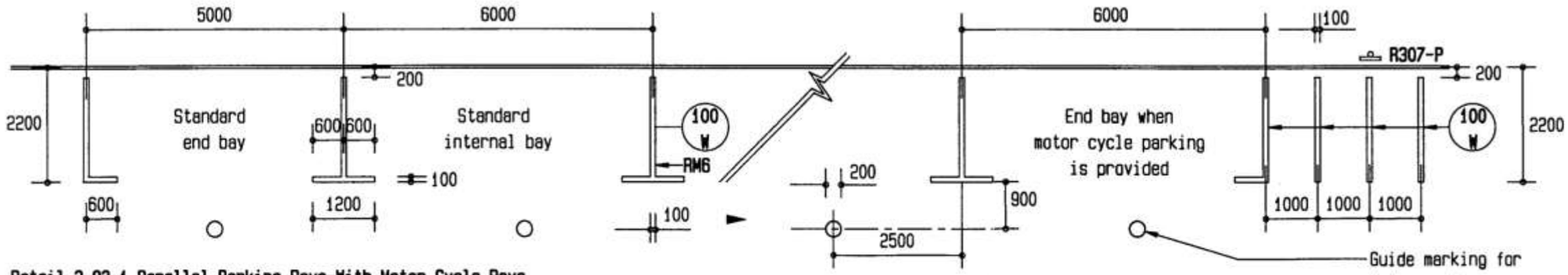
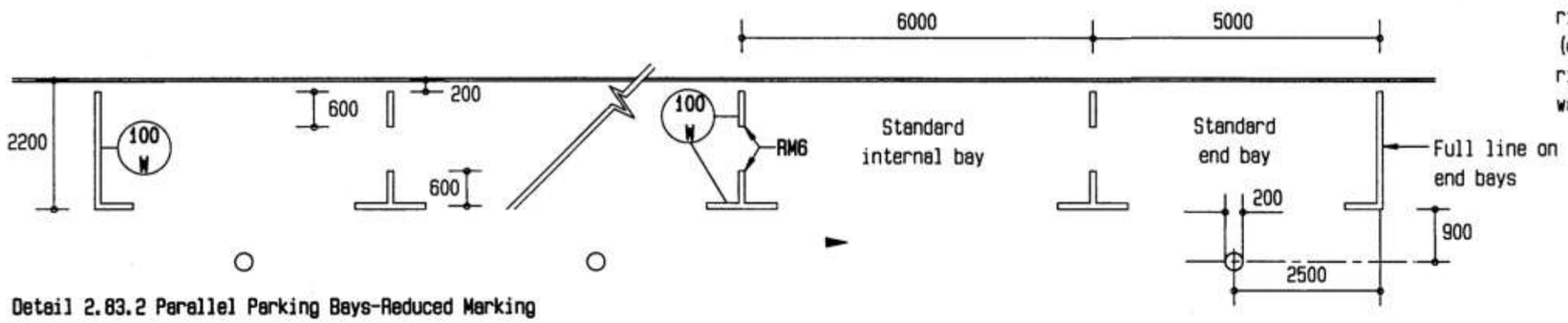


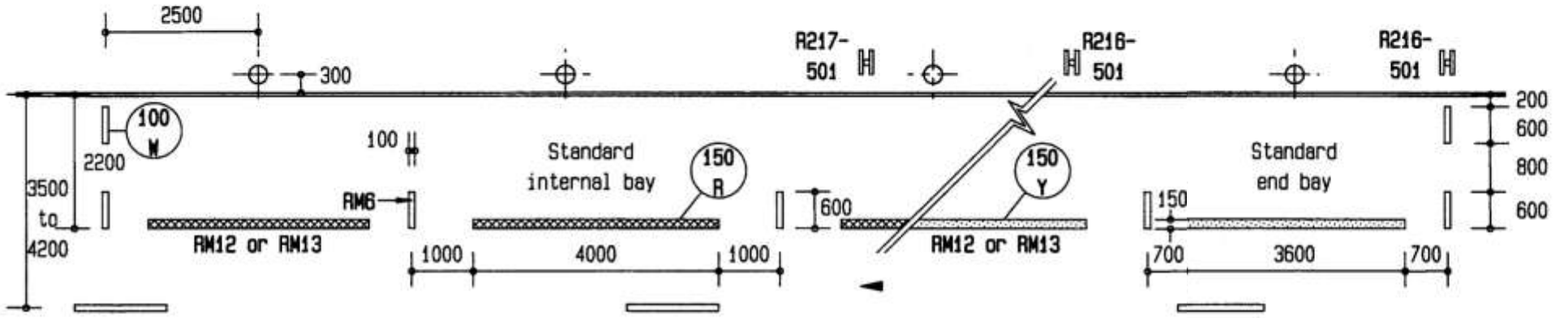
Fig 2.82 **45° Parking – including Motor Cycle Parking**



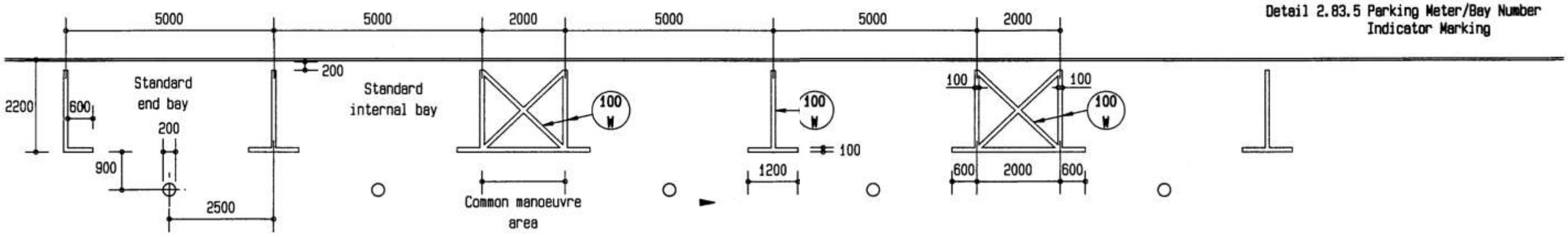
Detail 2.83.1 Parallel Parking Bays-With Motor Cycle Bays



Detail 2.83.2 Parallel Parking Bays-Reduced Marking



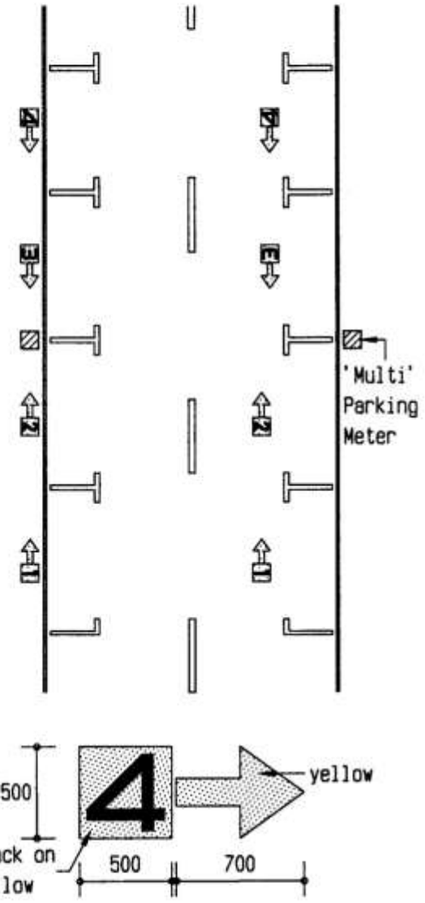
Detail 2.83.3 Parallel Parking Bays-Reduced Marking for use with NO STOPPING or NO PARKING Markings



Detail 2.83.4 Paired Parallel Parking Bays

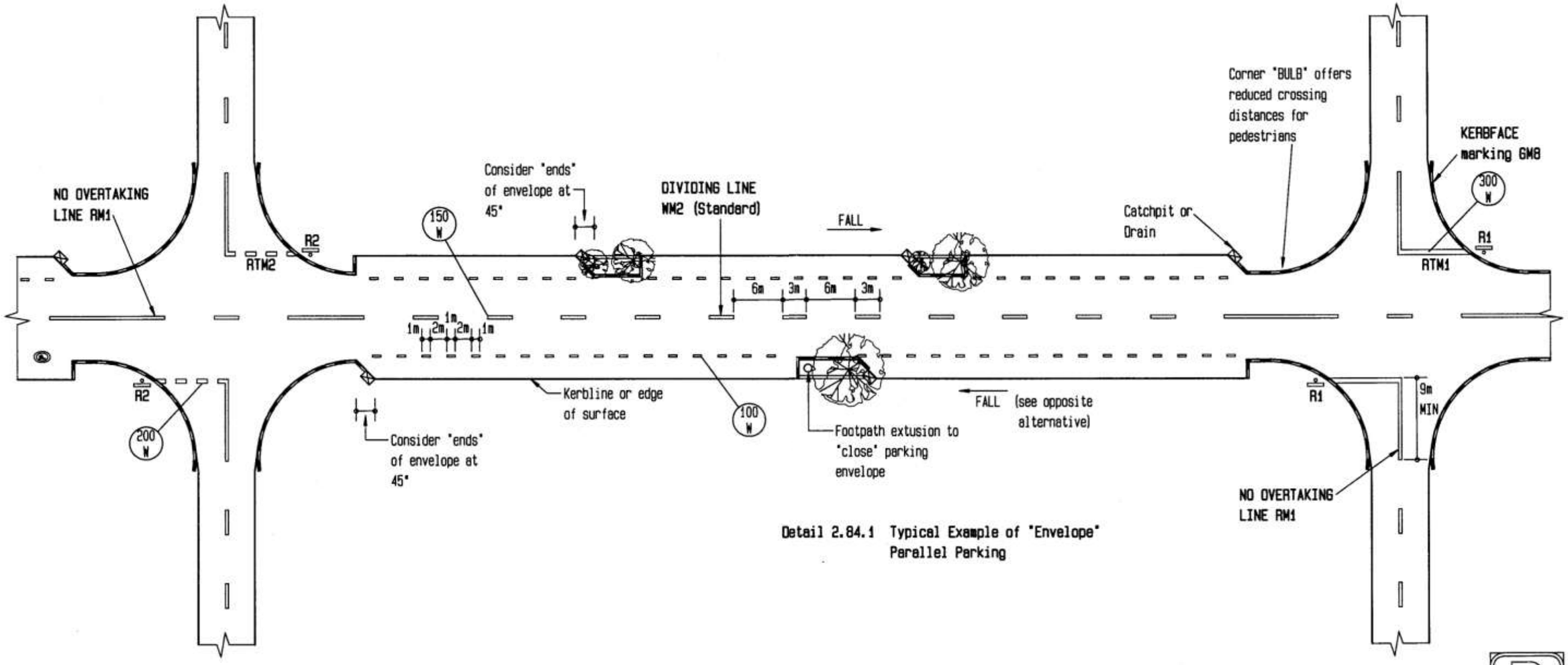
NOTE

(1) Provision of motor cycle parking bays is optional subject to demand. See also Figures 2.80 and 2.82.

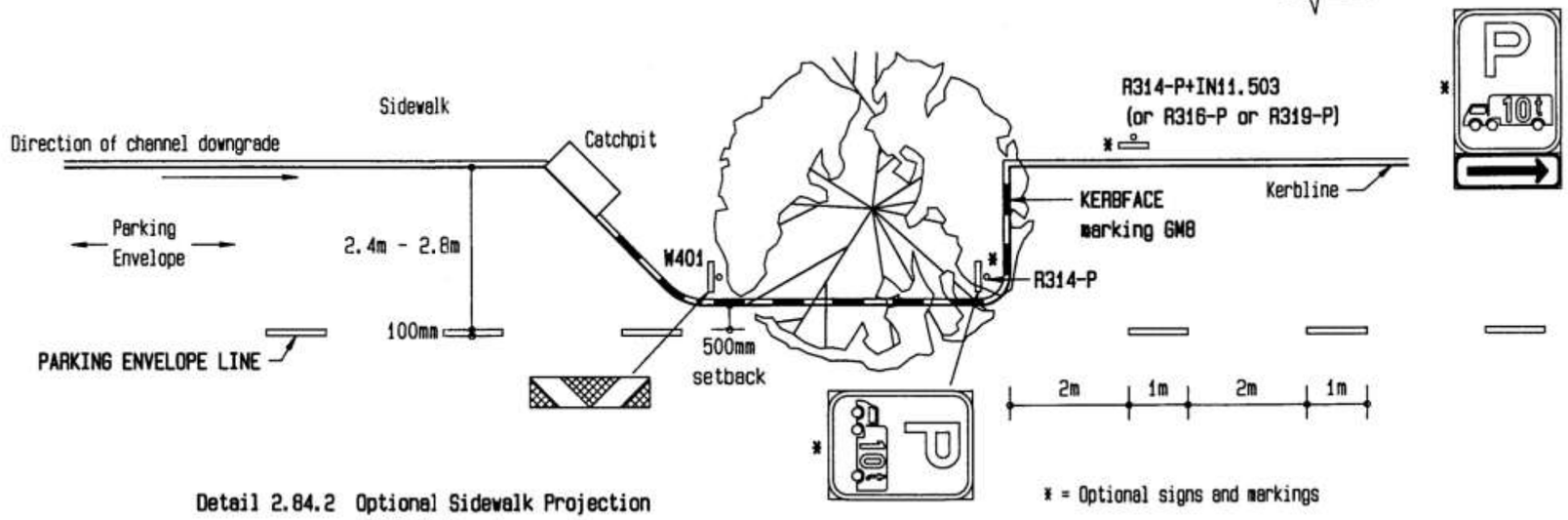


Detail 2.83.5 Parking Meter/Bay Number Indicator Marking

Fig 2.83
Parallel Parking



Detail 2.84.1 Typical Example of "Envelope" Parallel Parking



Detail 2.84.2 Optional Sidewalk Projection into Parking Area

Fig 2.84
Parallel "Envelope" Parking

2.6.3 Exclusive Parking Bays

1 EXCLUSIVE PARKING BAY marking RM7 and its "coded" user symbol RM7.1 can be used for a wide variety of specific purposes. Symbols are available for the following classes of vehicle or purposes (see Figure 2.114 also);

(a) ambulance or emergency vehicle;

(b) bus;

(c) loading zone;

(d) taxi (metred taxi);

(e) fire-fighting vehicle;

(f) rickshaw;

(g) diplomatic vehicle;

(h) minibus;

(i) SOS phone;

(j) defence force vehicle.

2 In Figure 2.85, Details 2.85.1 and 2.85.2 show examples of typical applications of markings RM7 and RM7.1 for buses and minibuses, including an example superimposed on a shoulder of a high speed road.

3 Details 2.85.3, 2.85.4 and 2.85.5 illustrate examples of the use of DISABLED PERSONS PARKING BAY marking RM16 in parallel, angled and 90^{o} parking bay situations respectively. The parking bays for disabled persons shown in these examples have all been enlarged to permit the manoeuvring of wheelchairs when necessary. Care should be exercised in providing a left side parallel bay for disabled persons, as shown in the example, since disabled drivers will have to get into a wheelchair in a traffic lane. Each of the examples also shows the need to provide for a ramp from road level to footpath level. Marking RM16 is enforceable on its own since it is a regulatory marking, however, the optional additional use of PARKING FOR DISABLED PERSONS RESERVATION sign R323-P may be considered. Detail 2.85.5 gives an example of the use of PAINTED ISLAND marking RM5 between bays to inhibit other users from encroaching into the oversized bay areas.

4 Figure 2.86 shows the application of markings RM7 and RM7.1 to:

(a) loading area;

(b) ambulance / fire fighting service parking bay;

(c) part-time parking and loading;

(d) metred taxi parking bay;

(e) diplomatic parking bay.

5 If the LOADING AREA RM7 marking, or any other use of marking RM7, is required to be part-time in operation, it is recommended that appropriate time limiting SELECTIVE RESTRICTION RESERVATION signs such as R306-P-512 be used in conjunction with the relevant NO STOPPING or NO PARKING SELECTIVE RESTRICTION signs.

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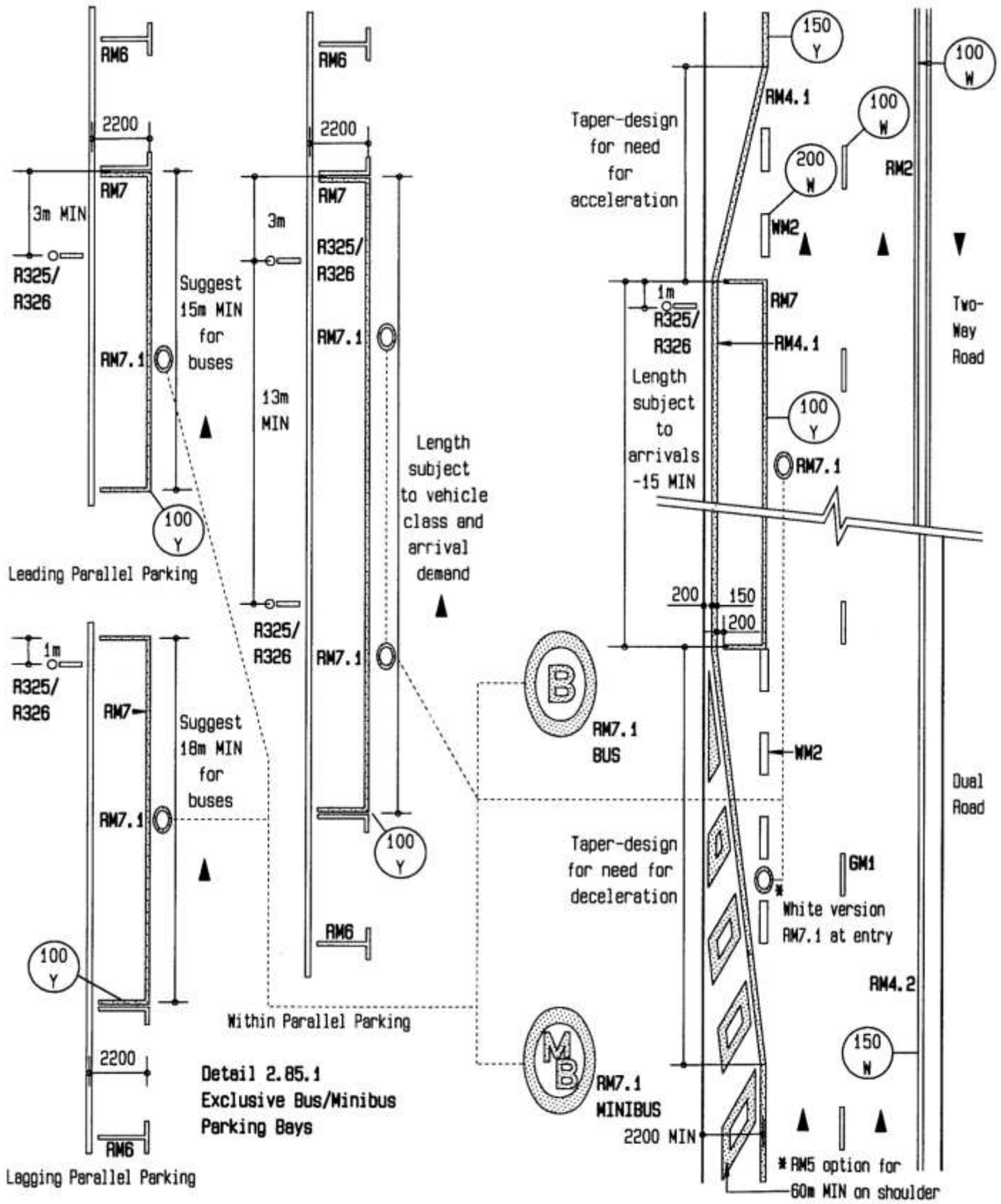
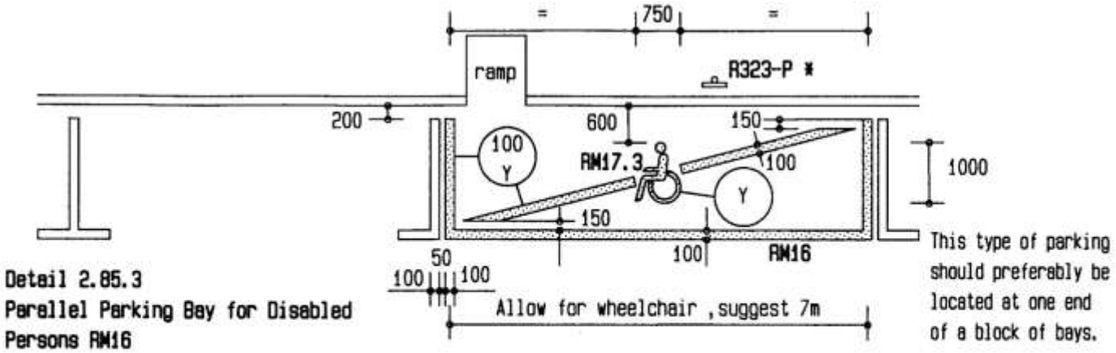


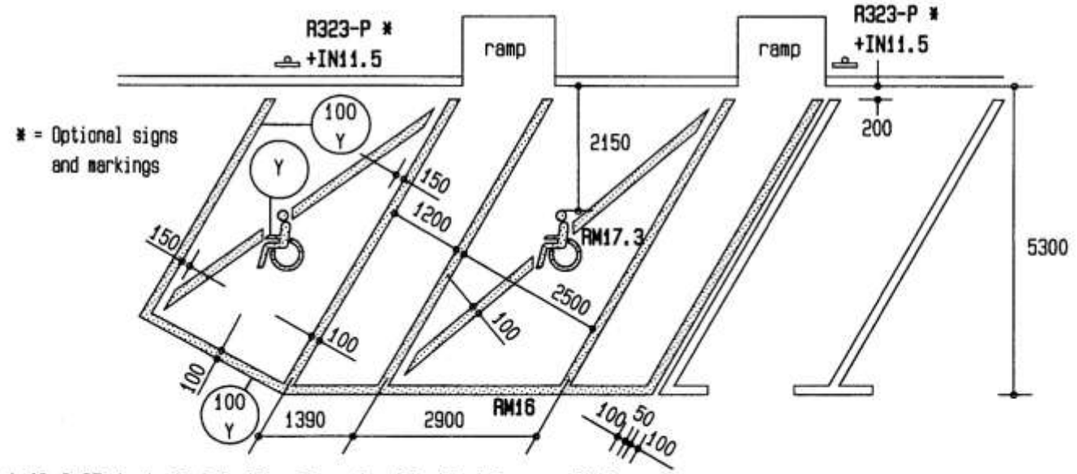
Detail 2.85.1
Exclusive Bus/Minibus
Parking Bays

Detail 2.85.2
Exclusive Bus/Minibus Parking Bays on a Shoulder
on a High Speed Road (80km/h or higher)

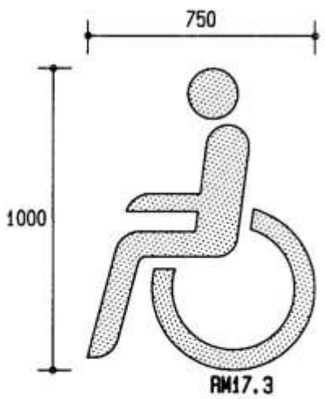


Detail 2.85.3
Parallel Parking Bay for Disabled
Persons RM16

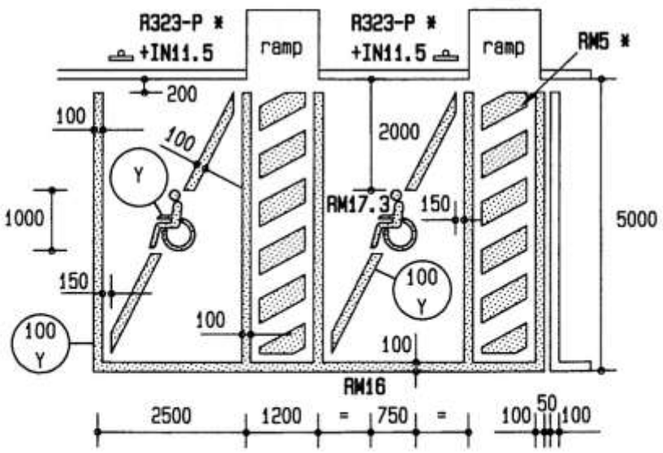
This type of parking
should preferably be
located at one end
of a block of bays.



Detail 2.85.4 Angled Parking Bays for Disabled Persons RM16

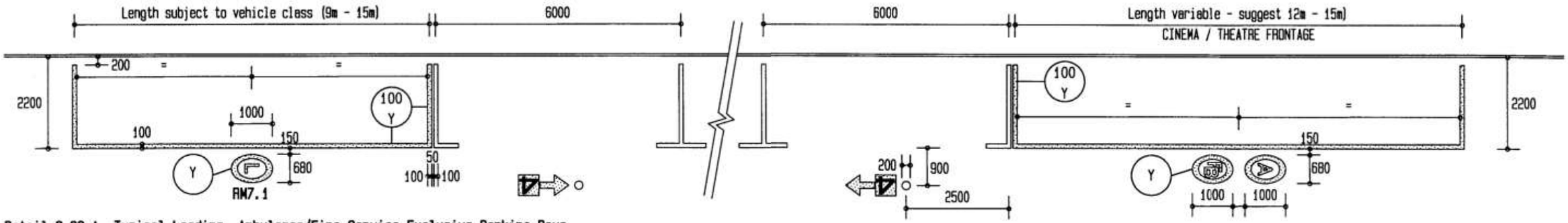


Detail 2.85.6
Symbol for Use in Disabled
Persons Parking Bays RM16

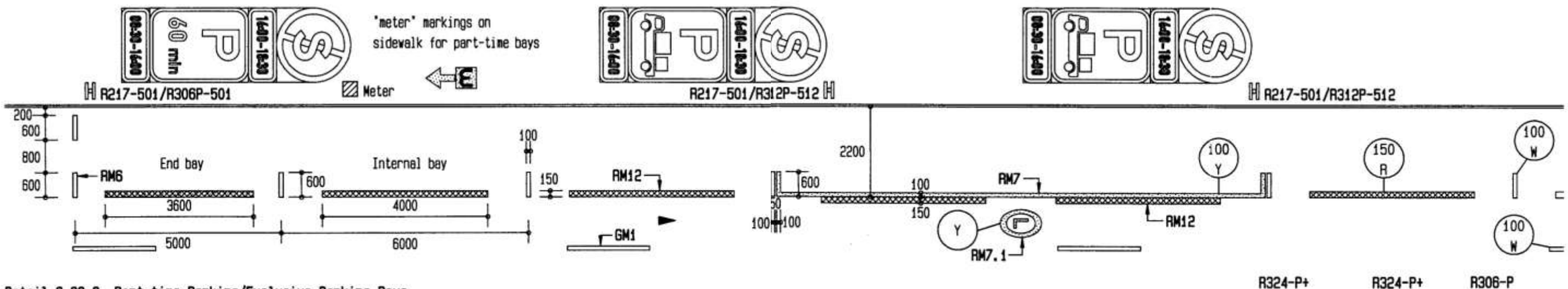


Detail 2.85.5
90° Parking Bays for Disabled Persons RM16

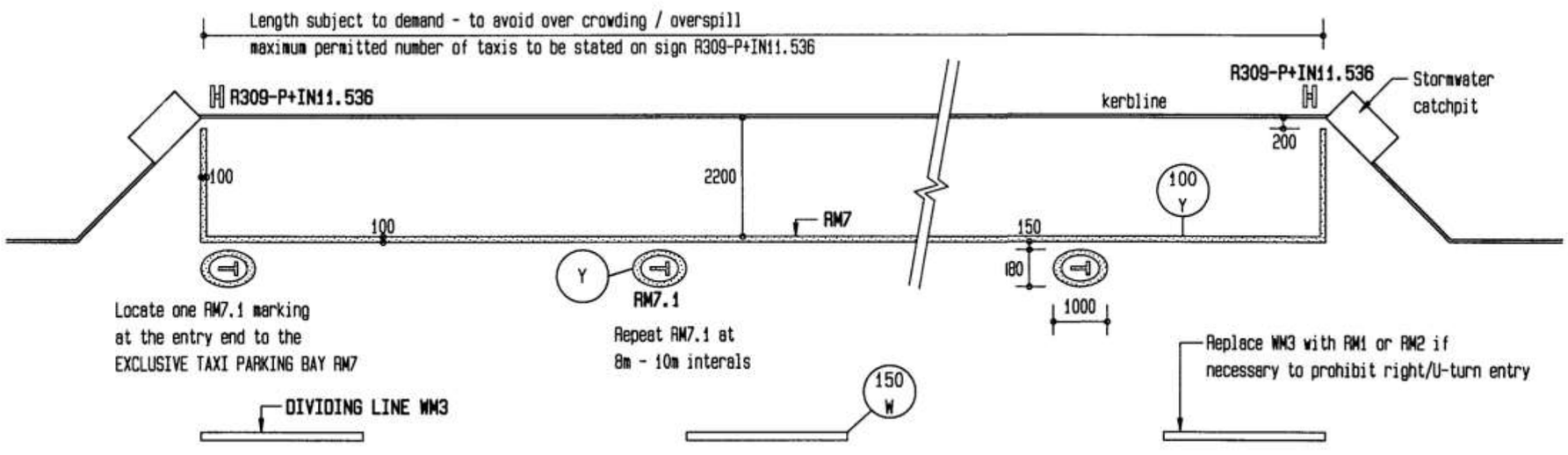
Fig 2.85
Disabled Persons and
Exclusive Parking Bays



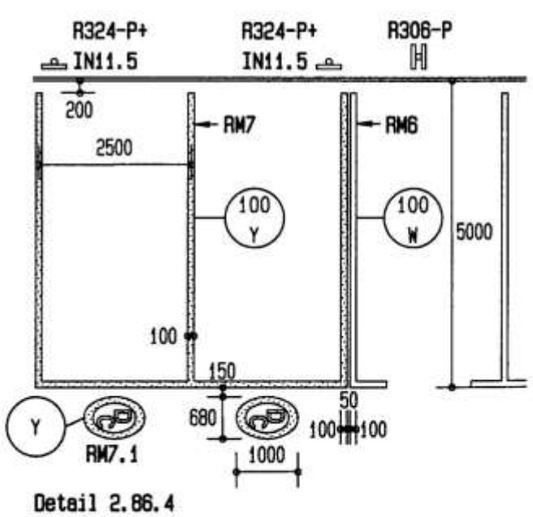
Detail 2.86.1 Typical Loading, Ambulance/Fire Service Exclusive Parking Bays



Detail 2.86.2 Part-time Parking/Exclusive Parking Bays



Detail 2.86.3 Exclusive Parking Bay for Metered Taxis - Shown in Optional Setback Area



Detail 2.86.4
Exclusive Diplomatic Parking Bays

Fig 2.86
Loading Bays and
Exclusive Parking Bays

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2.7 ENHANCED STANDARD DETAILS

2.7.1 General

1 This section provides enhanced or enlarged standard details of specific parts of road marking applications which cannot be covered adequately at the scale of the illustrations in Sections 2.2 to 2.6.

2 A standard detail in this section may thus be applicable in its entirety or with minor modification to several illustrations in more than one section of this chapter.

3 The dimensional details of all the following groups of road marking types are repeated from Volume 4, Chapter 2 for completeness:

(a) arrow types (see Subsection 2.7.4);

(b) symbols (see Subsection 2.7.5);

(c) word letters (see Subsection 2.7.6)

(d) other composite details (see Subsection 2.7.3).

2.7.2 Painted Islands

1 PAINTED ISLAND marking RM5 has a multitude of applications all of which cannot be detailed in this Chapter. Examples of applications appear throughout the sections of this Chapter and several enhanced details specific to painted islands have been covered as follows:

(a) rural road markings - Figures 2.38 and 2.39;

(b) freeway road markings - Figures 2.70, 2.77 and 2.78 (arrestor bed).

2 Figures 2.87 to 2.92 provide basic details of the elements of various types of painted island. The use of these elements is developed through a range of examples, generally increasing in complexity, to illustrate the potential of marking RM5. These examples also illustrate the effects of varying the different parameters which more commonly affect painted island geometry. Although it is not practical to cover every possible variation in road or junction geometry which may require the provision of a painted island, it should, however, be possible to adapt and / or build on the examples given to provide solutions to most problems.

3 Figures 2.87 and 2.88 illustrate the three basic forms of PAINTED ISLAND, namely:

(a) diagonal bars;

(b) chevron bars; and

(c) dividing line.

These figures also cover the basic setting out and dimensional criteria for the three types of bar. Diagonal and chevron bars may be painted solid, or, when the bar width is 600 mm or more a hollow pattern may be used. Details of variations in setting out and dimensional criteria are given in Figures 2.90 to 2.92.

4 Figure 2.89 expands on the basic forms of PAINTED ISLAND to illustrate the ways in which these may be applied to specific geometric or traffic control needs.

5 Figure 2.90 shows a range of applications of the three forms of PAINTED ISLAND in relation to:

(a) direction of travel of traffic, either:

(i) traffic travelling in opposite directions; or

(ii) traffic travelling in the same direction on both sides of the island;

(iii) increasing traffic speed; and

(iv) increasing island size.

For further notes refer to Figure 2.90.

6 Figures 2.91 and 2.92 attempt to highlight the options available for PAINTED ISLAND applications in conjunction with "triangular" kerbed channelizing islands. Figure 2.91 gives a range of basic examples which illustrate the application of different widths of painted island marking, singly, to each side of a triangular channelizing island. Detail 2.91.4 shows a progressive build up of PAINTED ISLAND surrounding a triangular central island. The details in this figure represent small islands of the type. As such they should only be considered as illustrative. For more complete details refer to Figure 2.92.

7 Figure 2.92 uses a large channelizing island to cover setting out and dimensional details. This type of island is typically rural, but the principles are also appropriate to urban applications. The following aspects have a significant effect on the aesthetic appearance of such a PAINTED ISLAND:

(a) width of island segment;

(b) bar width and spacing (ratio always 1 to 2 with limited exceptions - see paragraph 2.7.2.9);

(c) turning roadway radius, and therefore the intersecting segments, if a fully surrounding PAINTED ISLAND is used;

(d) island kerb radius;

(e) use of a "flare" on one or both sides of an end radius (not illustrated);

(f) the presence of STOP LINE marking RTM1 or PEDESTRIAN CROSSING LINES marking RTM3.

8 An acceptable visual or aesthetic effect is likely to be most difficult to achieve, subject to the above factors, in the following areas:

(a) in the intersecting 90^0 corner (a skew junction will vary this angle);

(b) around the turning roadway.

9 The following techniques should be considered, singly or collectively, in order to achieve an acceptable marking pattern:

(a) the angle of bars on the straight sides should be 30^0 to the direction of travel;

(b) the first "bar" may be increased in area for better visual impact - this will also have the effect of moving the subsequent bar pattern towards the kerbed nose - it is recommended that the effective length of the first bar be increased by an order of 3 to 5 times on the leading approach and 2 to 3 times on the trailing approach;

(c) the bar angle on the leading approach to the turning roadway should be 45^0 for the first two or three bars;

(continued on page 2.7.8)

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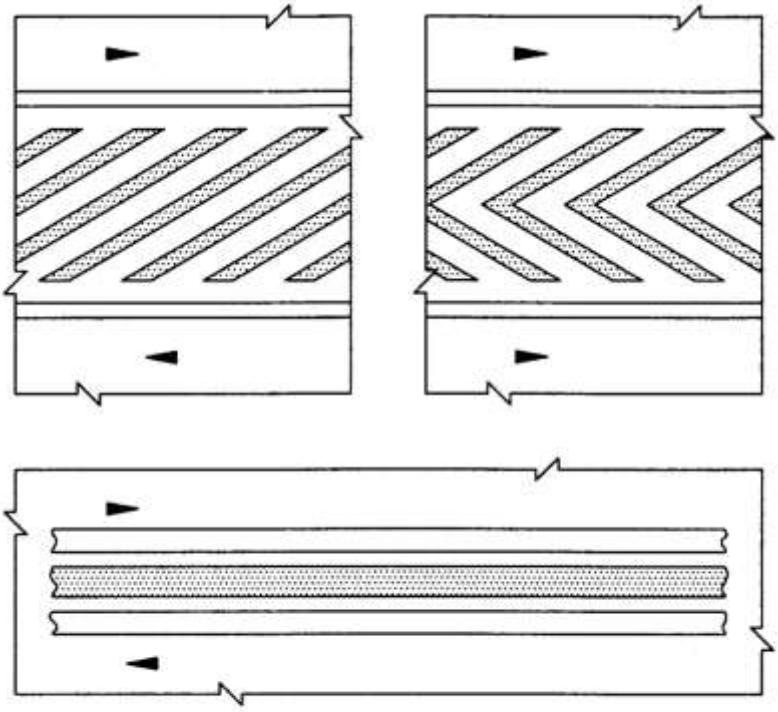
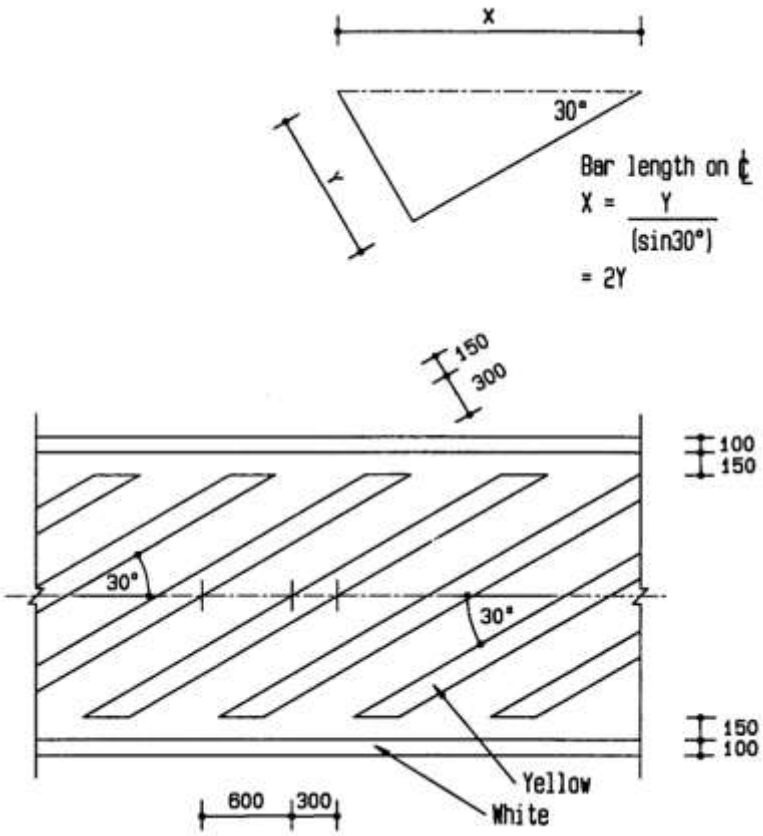


RM5



COLOURS:

Border:	White or yellow
Bars:	Yellow

NOTES:

1 For details of the use of road marking RM5 refer to SADC-RTSM VOL 1, Chapter 7, page 7.2.15.

2 The detail below shows the minimum bar spacing dimensions for a bar or chevron painted island. The bar width may be increased to a maximum of 1000 mm. Ratio of bar width to space is 1 to 2.

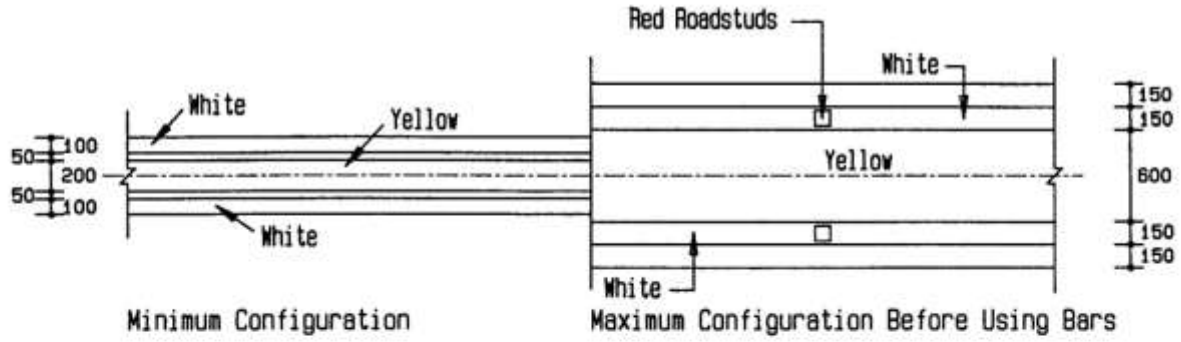
3 For further painted island details see Figures 2.88 to 2.92.

4 Figure 2.88 Detail 2.88.1 illustrates a "dividing line" painted island treatment and the range of dimensions for such a treatment. When the central element reaches 600 mm in width or greater, a bar marking should be used.

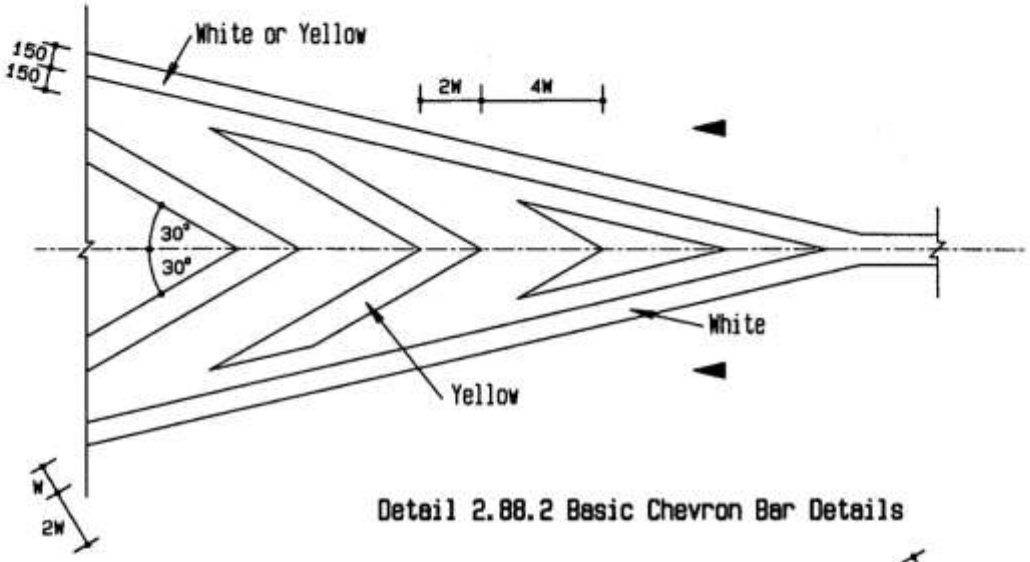
5 Figure 2.88, Detail 2.88.2 shows basic setting out details for a chevron bar based painted island (traffic travels in the same direction on each side of the island). Many variations of this type of island are possible.

6 Detail 2.88.3 shows the principles of hollow bar painted island markings. Such bars may be varied in dimension (see Figure 2.89) but no single leements should ne less than 150 mm in width.

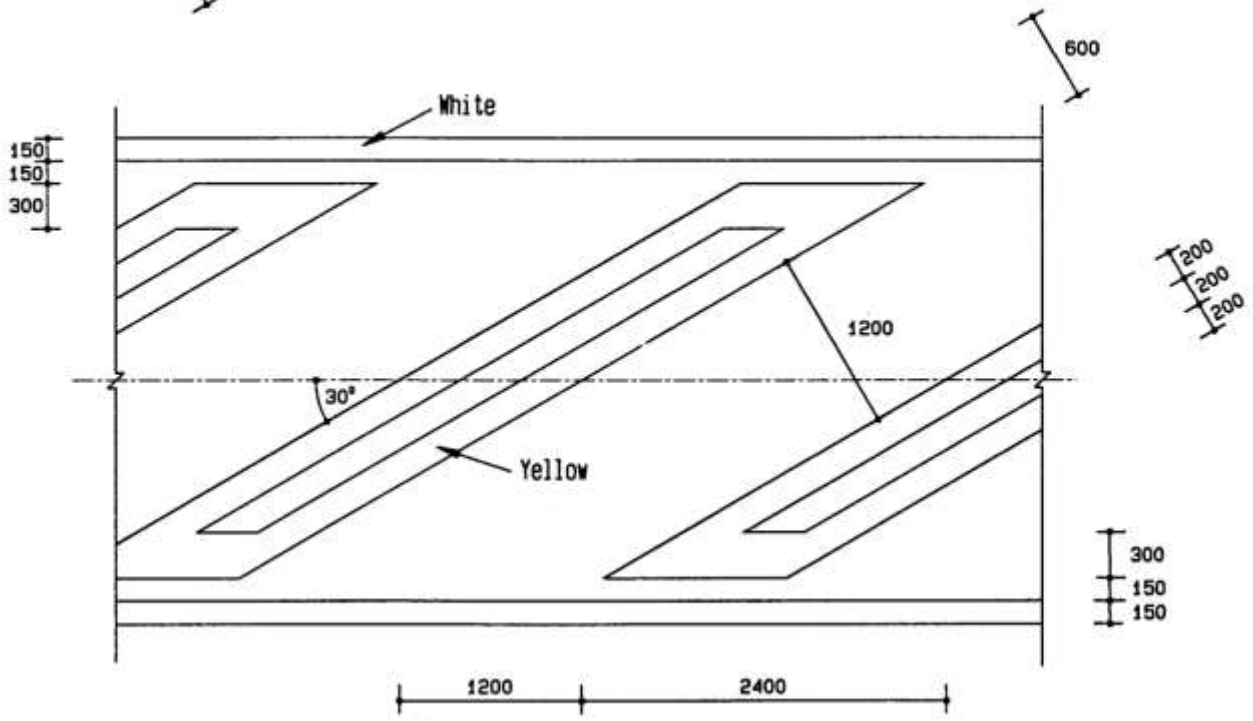
Fig 2.87 RM5 – Painted Islands – 1 – Basic Bar Details



Detail 2.88.1 "Dividing Line"Painted Island Treatment

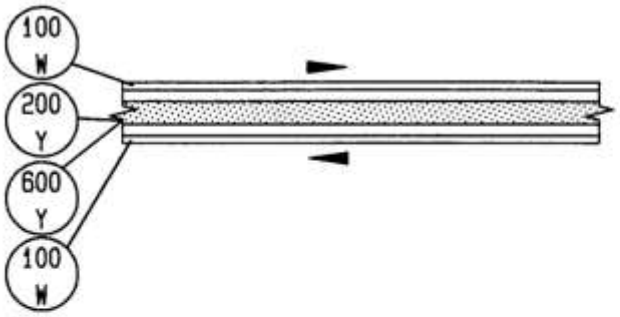


Detail 2.88.2 Basic Chevron Bar Details

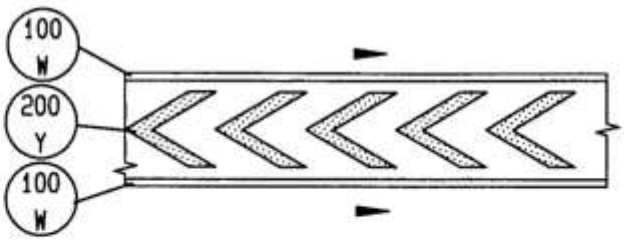


Detail 2.88.3 Basic Hollow Bar Details

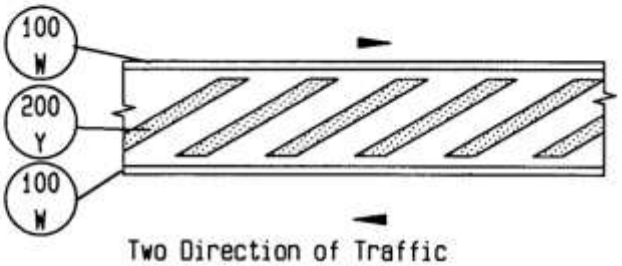
Fig 2.88 RM5 – Painted Islands – 2 – Basic "Dividing" Island/Chevron Bar and Hollow Bar Details



Detail 2.89.1
Narrow "Dividing Line" Painted Island

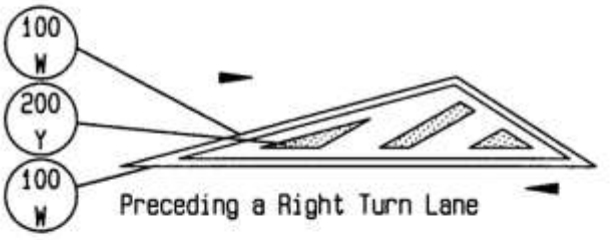


One Direction of Traffic

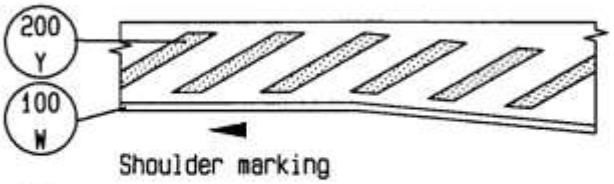


Two Direction of Traffic

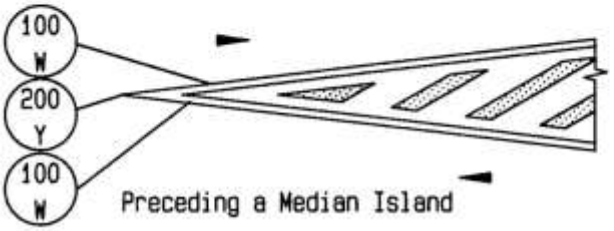
Detail 2.89.2
Separator / Refuge Painted Islands



Preceding a Right Turn Lane



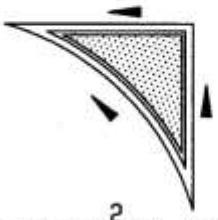
Shoulder marking



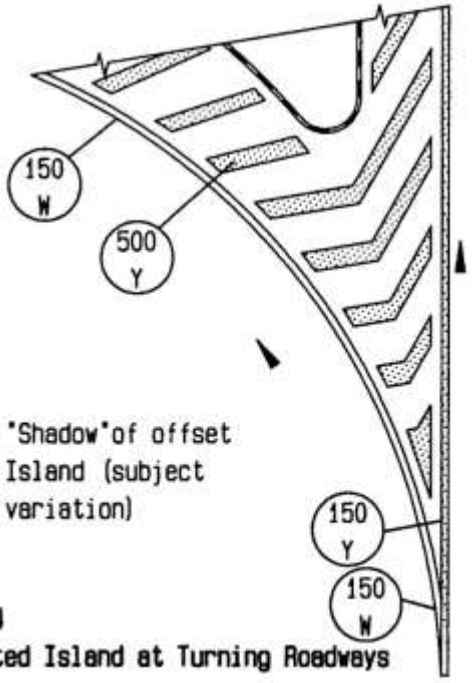
Preceding a Median Island

Detail 2.89.3
Hazard Marking Painted Islands

NOTE:
(1) Marking widths shown here MINIMUM for all applications.

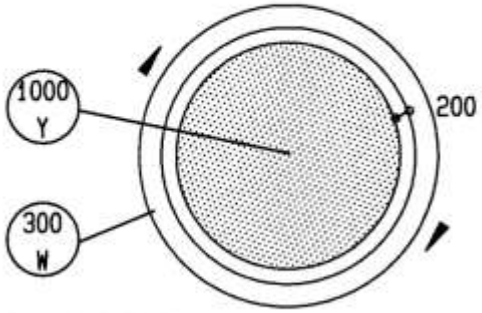


Small Island - 8m^2 or less



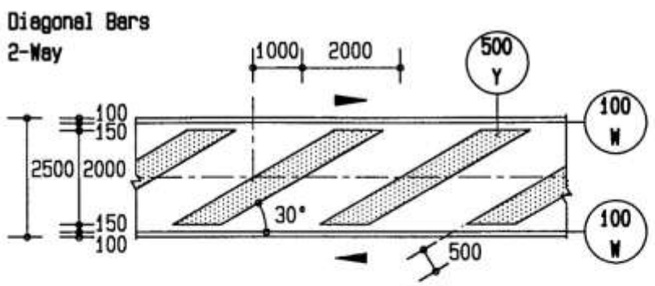
Typical "Shadow" of offset Painted Island (subject to wide variation)

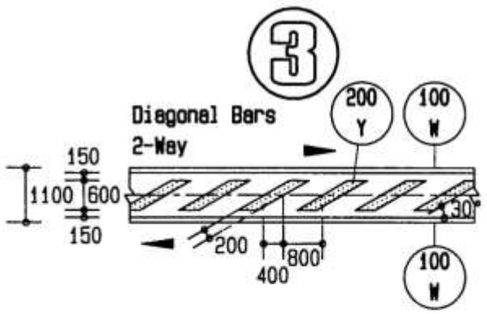
Detail 2.89.4
Typical Painted Island at Turning Roadways

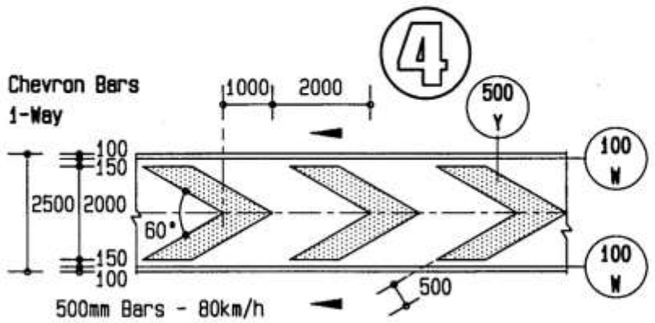


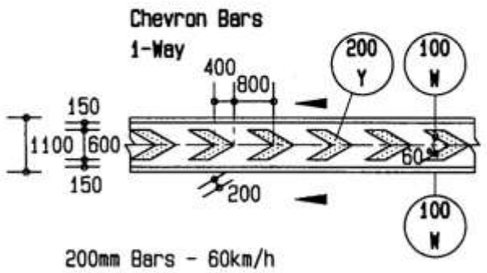
Detail 2.89.5
Painted Island Traffic Circle (part RM15)

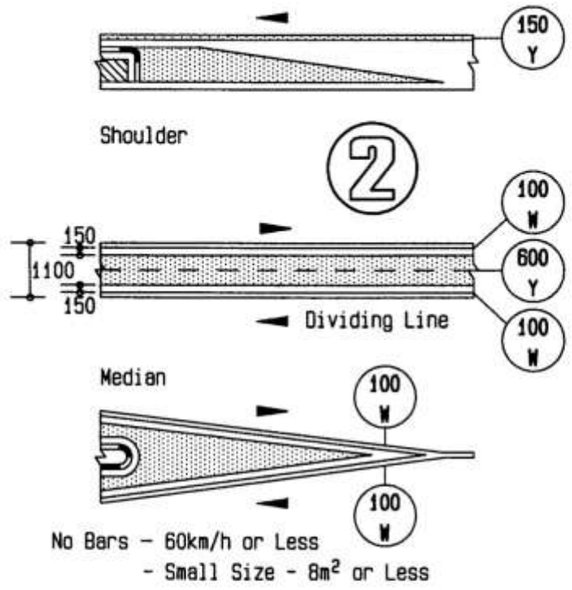
Fig 2.89 **RM5 – Painted Islands – 3: Types/Applications of Painted Island Markings**

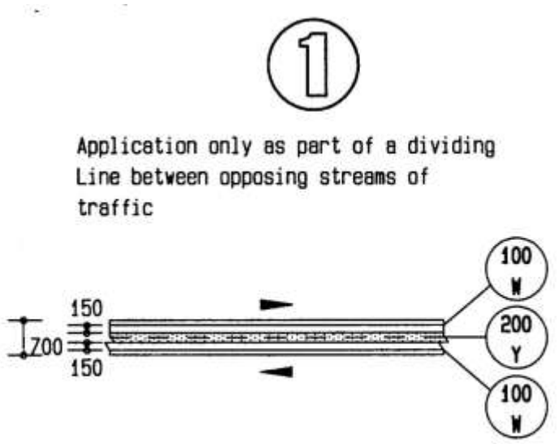






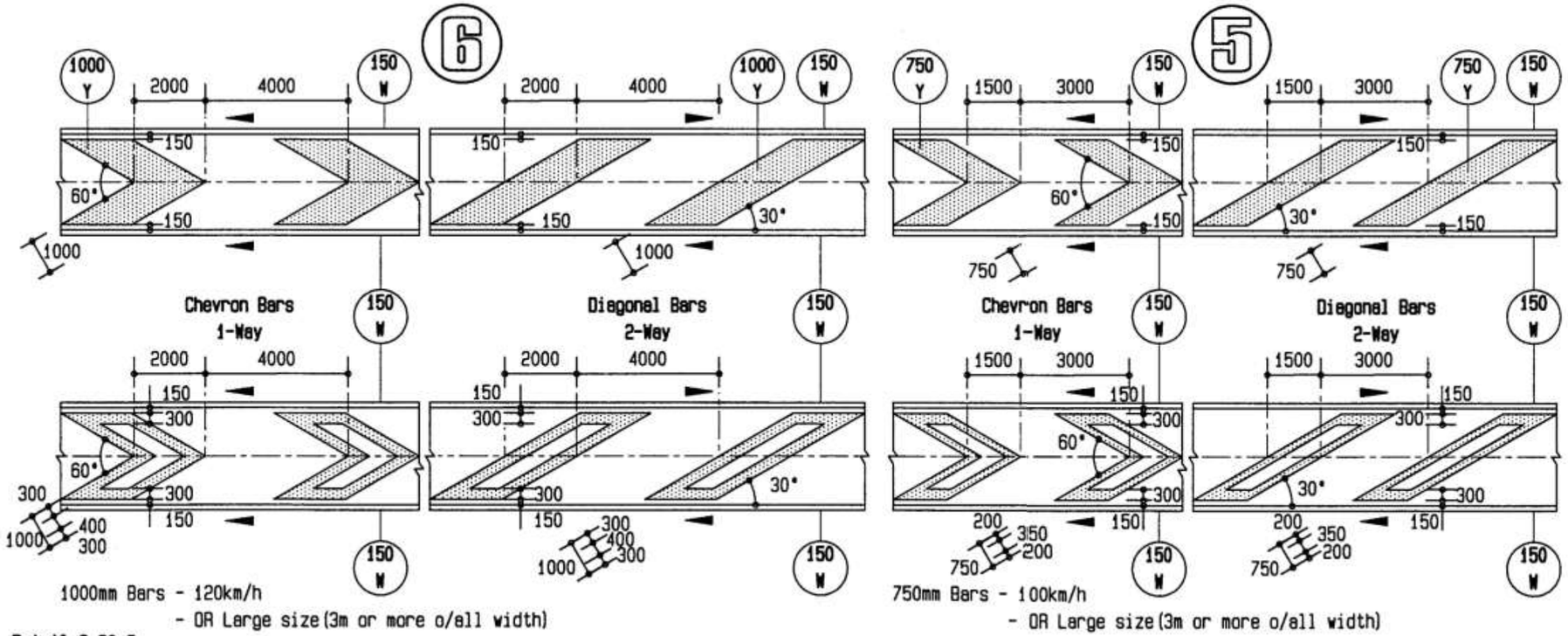






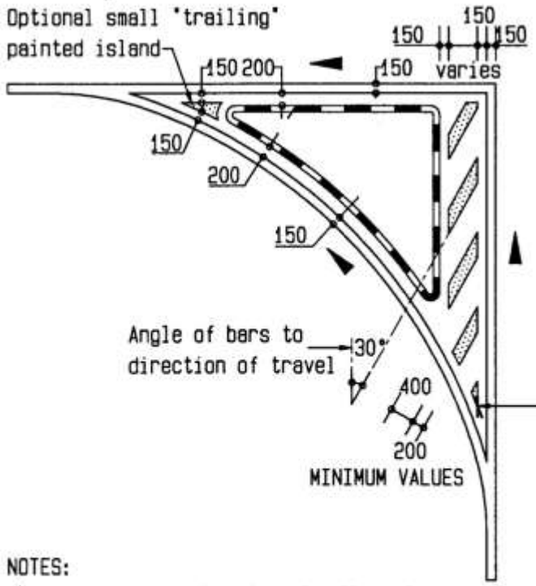
Detail 2.90.1
Simplest Form of Painted Island

Detail 2.90.2 Progressive Increase in Bar Module with Increase in Speed and Size

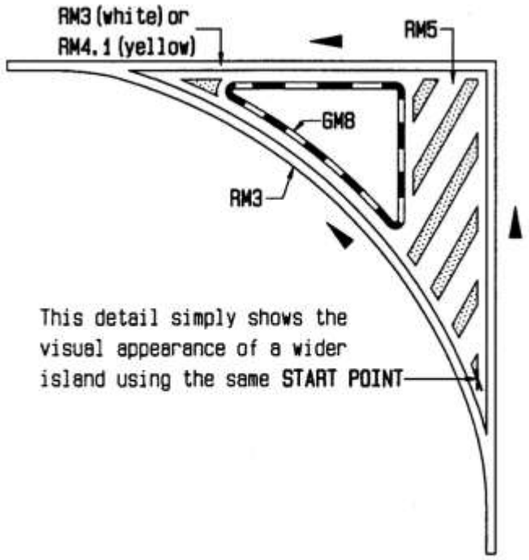


Detail 2.90.3
Further Increase in Bar Module for Increasing Road Speed

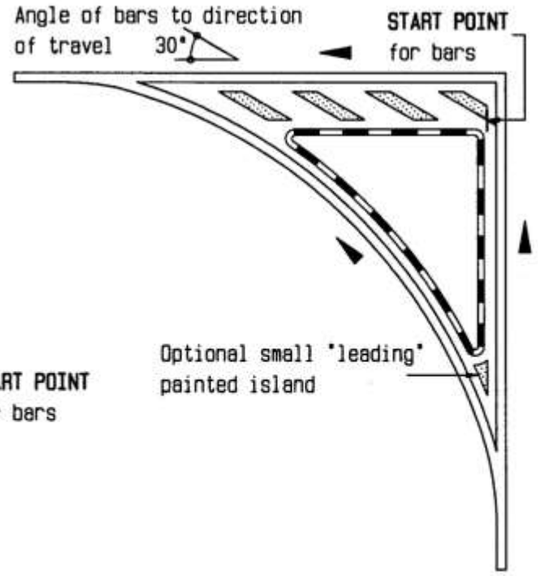
Fig 2.90
RM5 - Painted Islands - 4



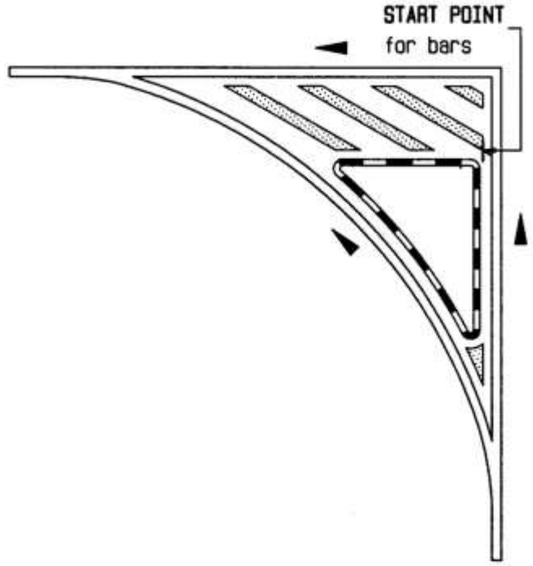
NOTES:
1) Unless noted otherwise the dimensions given above apply to all details in this figure.
2) Two examples are given to show the effect of width of island on appearance and setting out.



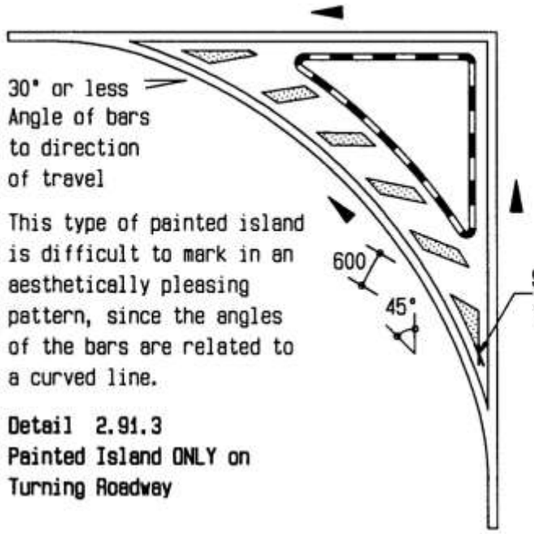
Detail 2.91.1
Painted Island ONLY on Side Road Approach



These details are similar to Detail 2.91.1 but utilize a different recommended START POINT for the island bars due to the shape of the island

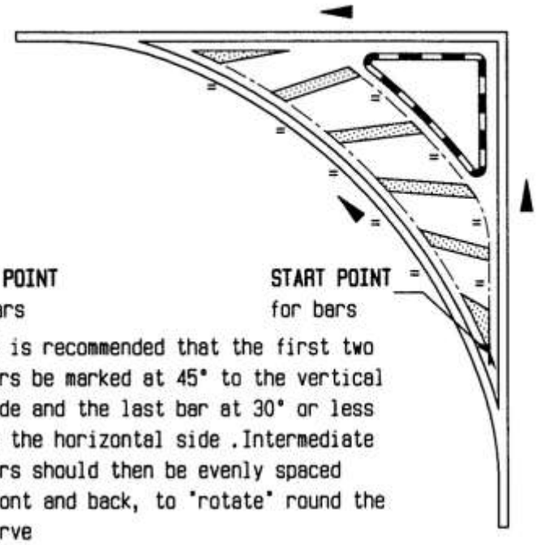


Detail 2.91.2
Painted Island ONLY on Through Road Approach



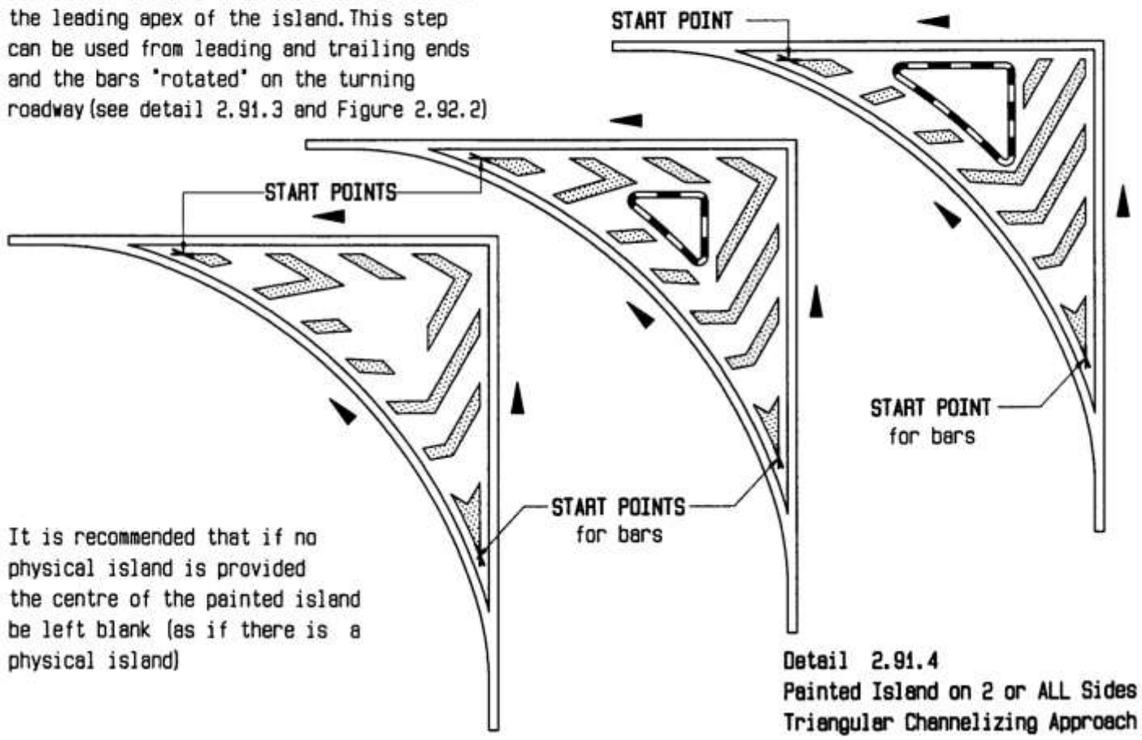
This type of painted island is difficult to mark in an aesthetically pleasing pattern, since the angles of the bars are related to a curved line.

Detail 2.91.3
Painted Island ONLY on Turning Roadway



It is recommended that the first two bars be marked at 45° to the vertical side and the last bar at 30° or less to the horizontal side . Intermediate bars should then be evenly spaced front and back, to "rotate" round the curve

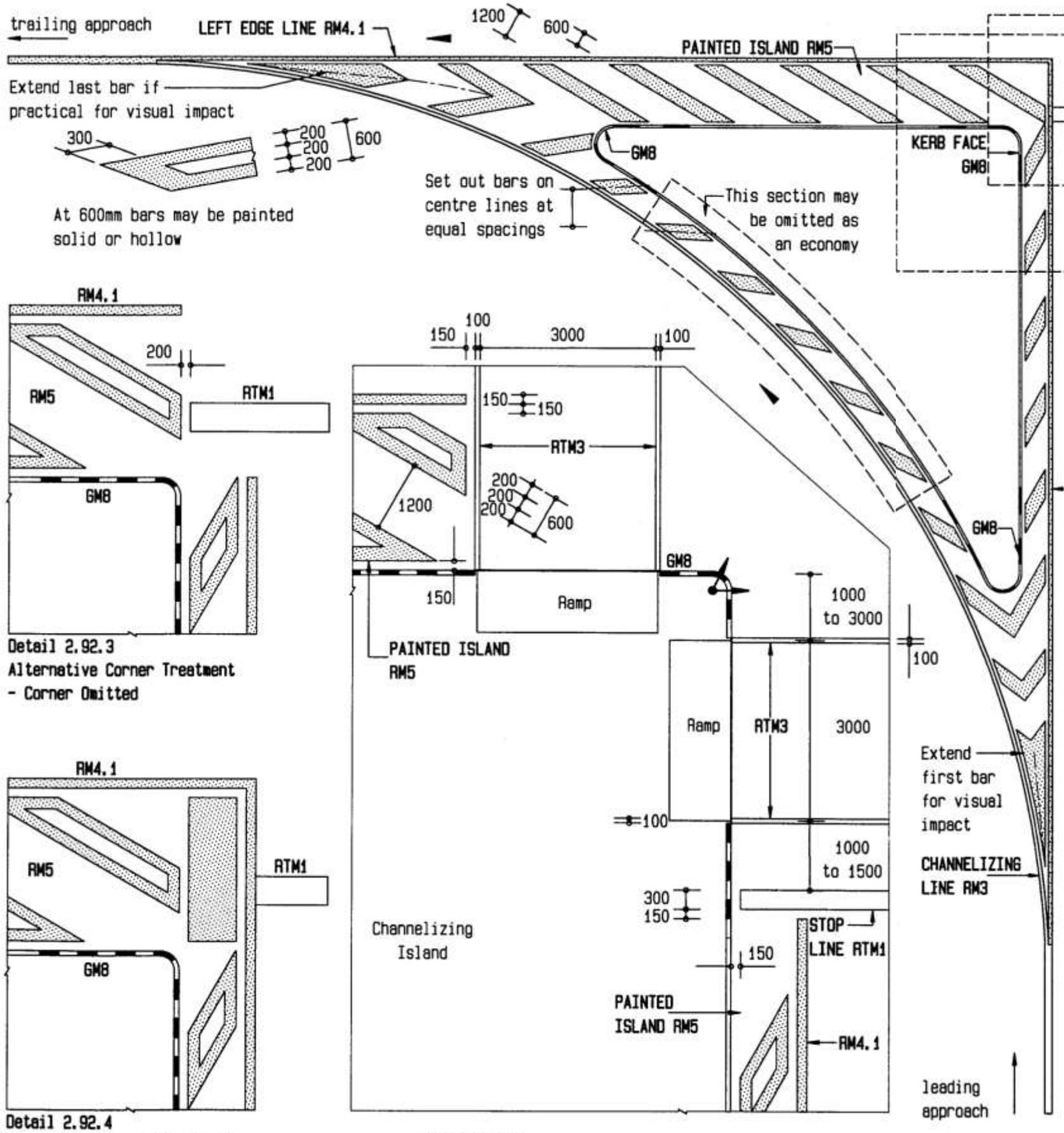
The three examples in Detail 2.91.4 show progressively larger painted islands with "intersecting" segments. It is recommended that the leading "intersecting" segment be set out on a curve from the START POINT to the leading apex of the island. This step can be used from leading and trailing ends and the bars "rotated" on the turning roadway (see detail 2.91.3 and Figure 2.92.2)

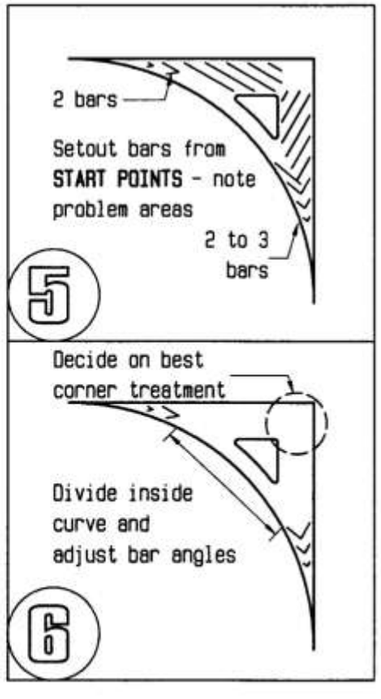


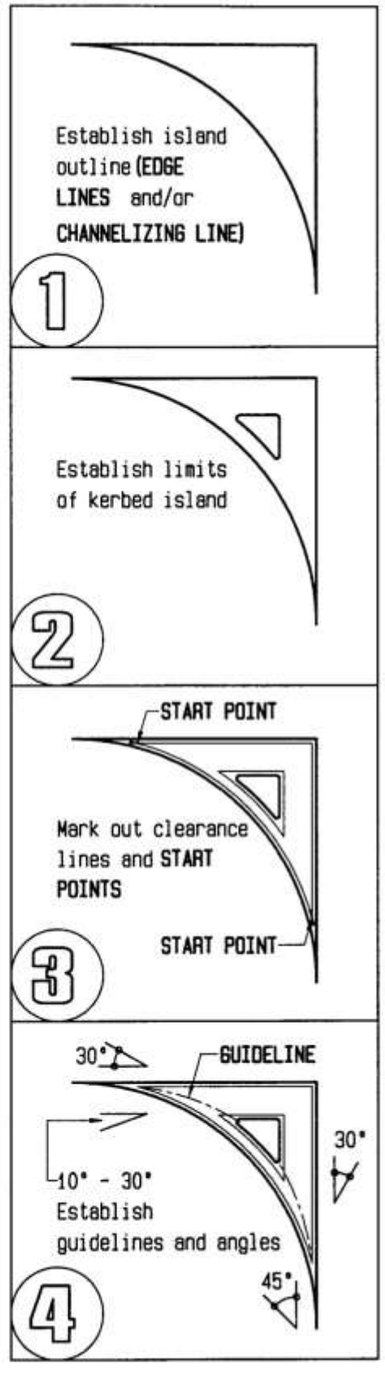
It is recommended that if no physical island is provided the centre of the painted island be left blank (as if there is a physical island)

Detail 2.91.4
Painted Island on 2 or ALL Sides Triangular Channelizing Approach

Fig 2.91
RM5 - Painted Islands - 5







Detail 2.92.1 Design Steps

Fig 2.92
RM5 - Painted Islands - 6

(continued from page 2.7.1)

(d) the bar angle of the last two or three bars on the trailing approach should be 30^0 or less - 10^0 is commonly an effective angle to use;

(e) once the two extremes of the turning roadway have been designed / marked the remaining distance round the curve should be measured on the inside and outside guidelines from centre to centre of already determined bars (see Detail 2.92.1) - these lengths should then be divided into equal parts approximating the standard "bar plus space" dimension (the inner dimension should be less than this and the outer dimension greater) - this will establish the centres of the bars on the curve (these will in fact "rotate" through an angle from leading approach to trailing approach);

(f) use one of the details covered by Details 2.92.3 to 2.92.5 if an awkward combination of bars occurs in the 90^0 corner;

10 Detail 2.92.1 indicates the above factors in a sequence of design or setting out steps.

2.7.3 Other Dimensional Details

1 There are a few enlarged details which do not fall into the detail groups covered by Subsections 2.7.4, 2.7.5 and 2.7.6. These enlarged dimensional details cover the application of the following marking types:

(a) Figure 2.93 - BOX JUNCTION marking RM10;

(b) Figure 2.94 - ZIG ZAG ZONE LINEs marking RM11;

(c) Figure 2.95 - SPEED HUMP marking WM10.

2 BOX JUNCTION marking RM10 is a regulatory marking which requires certain actions of drivers. Its use should therefore be undertaken with care since it will have traffic enforcement implications. Examples of typical applications are given in Section 2.4 - Road Marking Applications in Urban Situations in Figure 2.49.

3 ZIG ZAG ZONE LINES marking RM11 is also a regulatory marking which requires certain actions of drivers. Examples of the application of marking RM11 are given in Section 2.4 - Road Marking Applications in Urban Situations in Figure 2.55. Further examples of the use of pedestrian signs and markings are given in Chapter 14: Signing for Pedestrian Environments.

4 SPEED HUMP marking WM10 is a warning marking the use of which is appropriate in speed controlled environments. Examples of the use of marking WM10 are given in Chapter 12: *Signing for Traffic Calming*.

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COLOURS:

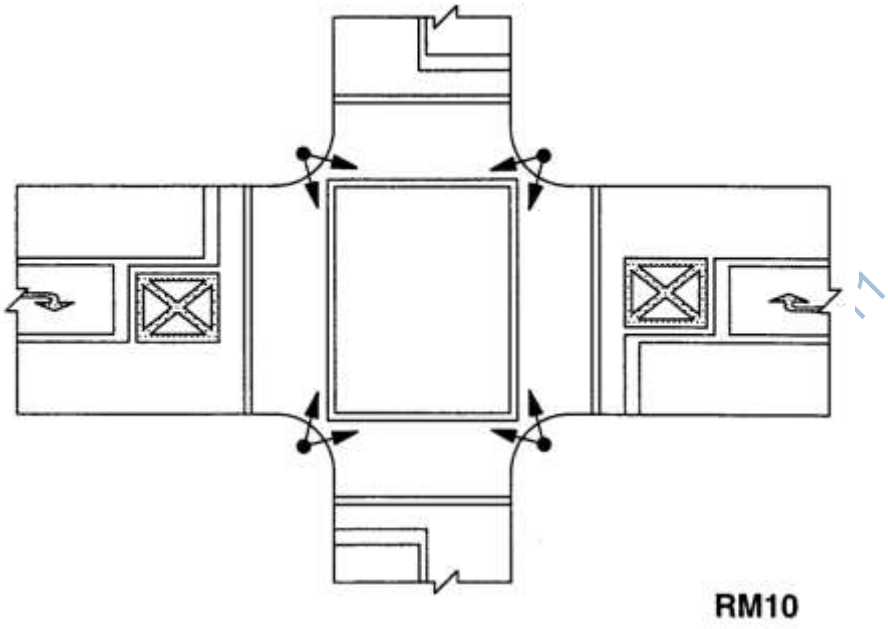
Yellow

NOTES:

1 For details of the use of road marking RM10 refer to SADC-RTSM VOL 1, Chapter 7, page 7.2.23.

2 Mark out box as follows:
   (a) Mark perimeter at least 500 mm inside pedestrian crossings;
   (b) Markdiagonals of the resultant shape;
   (c) Set-off additional "cross hatches" parallel to the diagonals;
   (d) If the box is elongated establish a centre point on the long side and proceed as above.

3 If the perimeter of the box is under 20 m simply mark diagonals. When over 20 m mark additional "cross hatches" at 2000 mm or at roughly equal centres up to a maximum of 3000 mm.



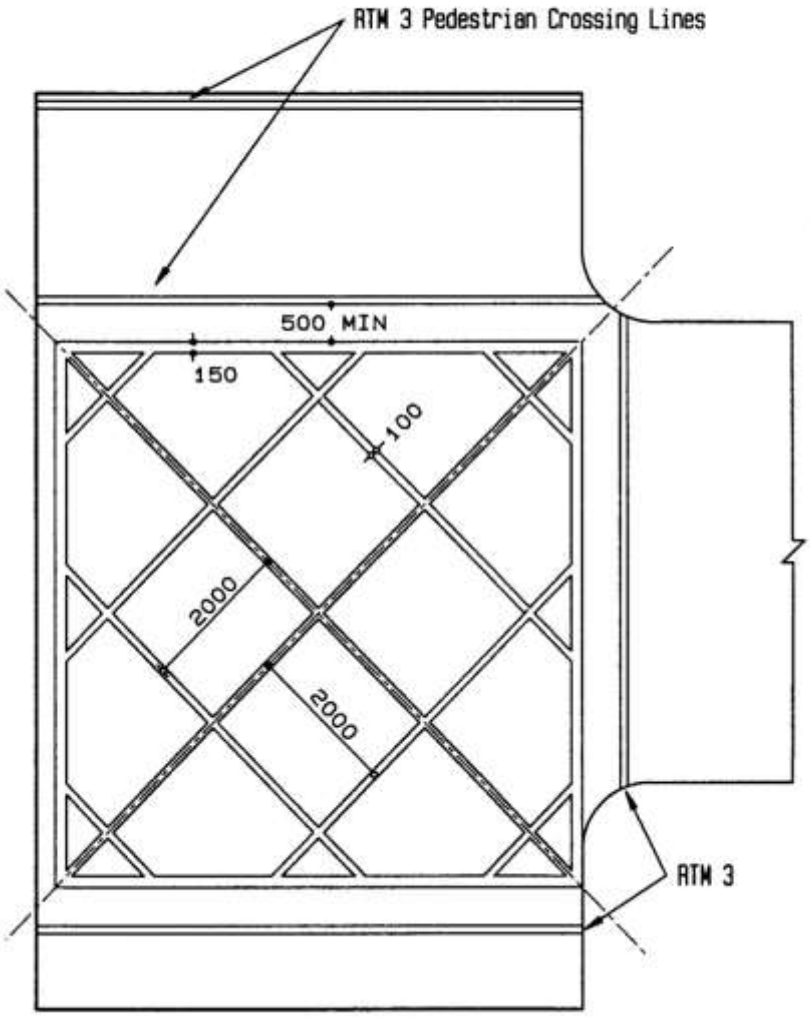


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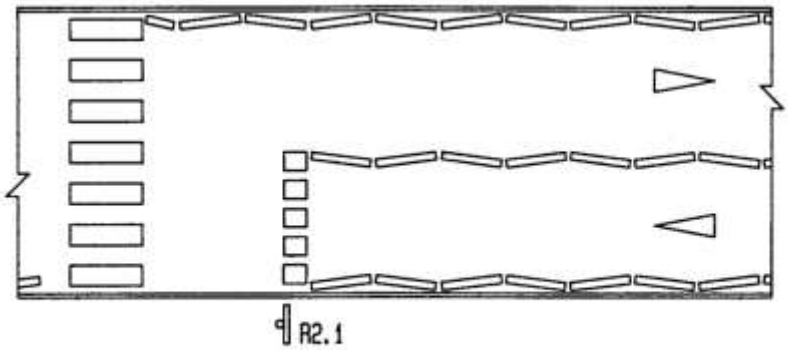
Fig 2.93 **RM10 – Box Junction**



RM11

COLOURS:

White

NOTES:

1 For details of the use of road marking RM11 refer to SADC-RTSM VOL 1, Chapter 7, page 7.2.25.

2 The 2 m length of line may be measured along the line (if using a mask or template (B)), or along the line of the road (for ease of setting out (A)).

3 The zig-zag offset (C) may be reduced from 500 mm to 300 mm for lanes less than 3400 mm in width.

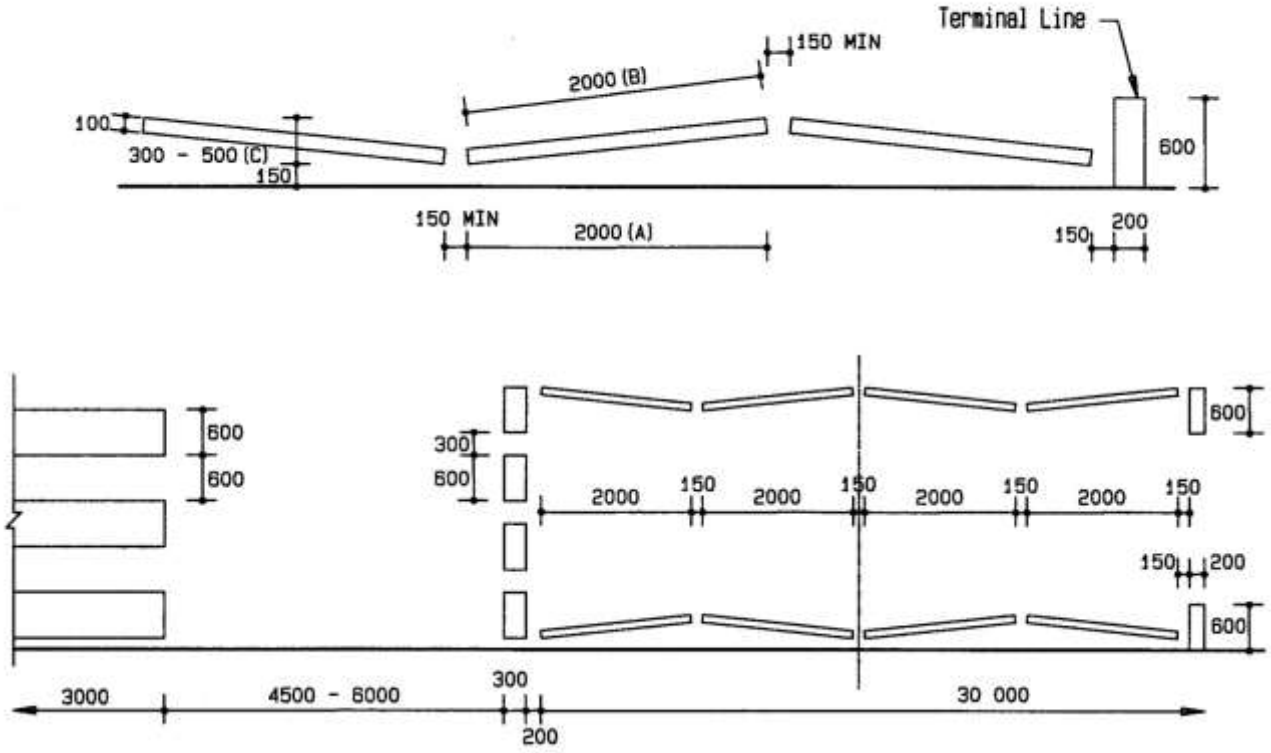


Fig 2.94 **RM11 – Zig-Zag Zone Lines**

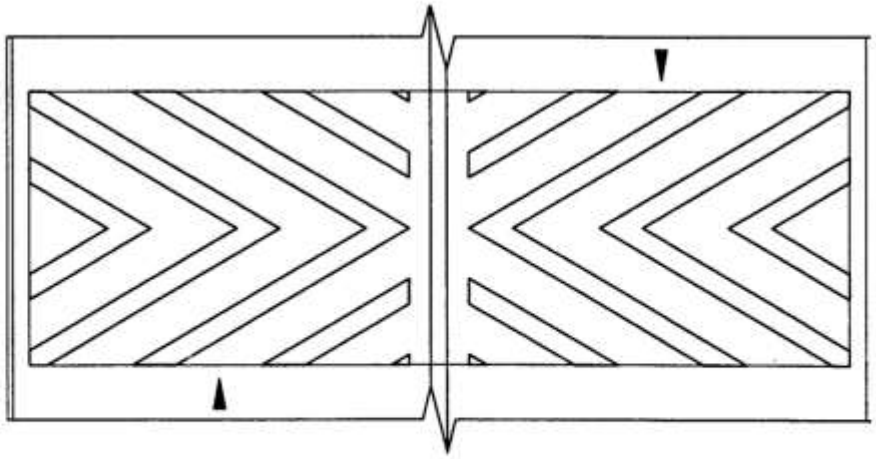
COLOURS:

White

NOTES:

1 For details of the use of road marking WM10 refer to SADC-RTSM VOL 1, Chapter 7, page 7.2.9.

2 Pattern start points shown thus ●. This may be varied. However, it is recommended that all speed humps in a specific area use the same pattern



WM10

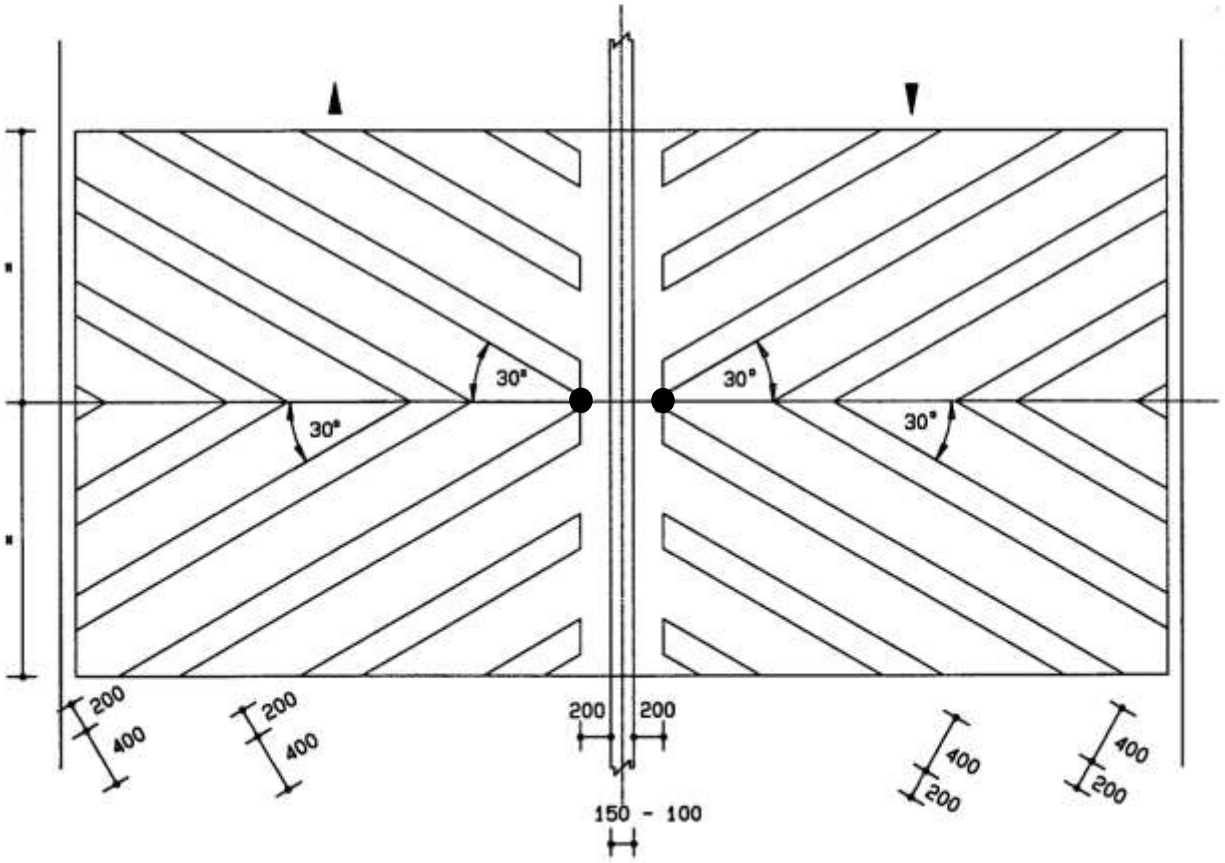


Fig 2.95 **WM10 – Speed Hump**

2.7.4 Arrow Types

1 This Subsection covers the following road marking arrow types in sufficient dimensional detail to enable the setting out of the arrow, or preferably the manufacture of a mask to enable the quick and accurate marking of the road surface:

(a) MANDATORY DIRECTION ARROWS RM8 (Yellow);

(b) MANDATORY DIRECTION ARROW AHEAD WM7 (White);

(c) TRAFFIC CIRCLE MANDATORY ARROWS RM15 (Yellow);

(d) LANE REDUCTION ARROWS WM6 (White);

(e) NO OVERTAKING AHEAD ARROWS WM8 (White);

(f) END OF EXCLUSIVE USE LANE ARROWS WM11.1 AND WM11.2 (White);

(g) BIFURCATION ARROWS GM3 (White);

(h) INFORMATION ARROWS GM4 (White or Yellow).

2 In all instances the arrow types are available in a range of lengths subject to their location of application. The range of locations is classified as follows:

(a) city centre (central business district);

(b) urban/rural expressway (commonly a numbered route);

(c) rural roads and all freeways.

3 Some arrow types include an additional size for special applications. Such applications include locations where markings may be difficult to see, such as:

(a) in misty areas;

(b) in areas subject to high traffic density;

(c) situations without street lighting;

(d) in identified high accident locations.

4 Several of the arrows are detailed in two ways to allow options for scaling to a size suitable for use on the road. In the one case the detail shows the arrow and a selection of dimensional letters, values for which are tabulated for the range of standard arrow lengths. In some cases an arrow is also drawn on a rectangular grid, elongated in the direction of the length of the symbol, to facilitate its enlargement. This type of detail is only given for the most commonly used arrow size. In principle, however, other sizes can be generated by varying the scale factor for the grid element length in proportion to the arrow length. It should be noted that for each arrow type the width of the arrow remains constant, irrespective of the length.

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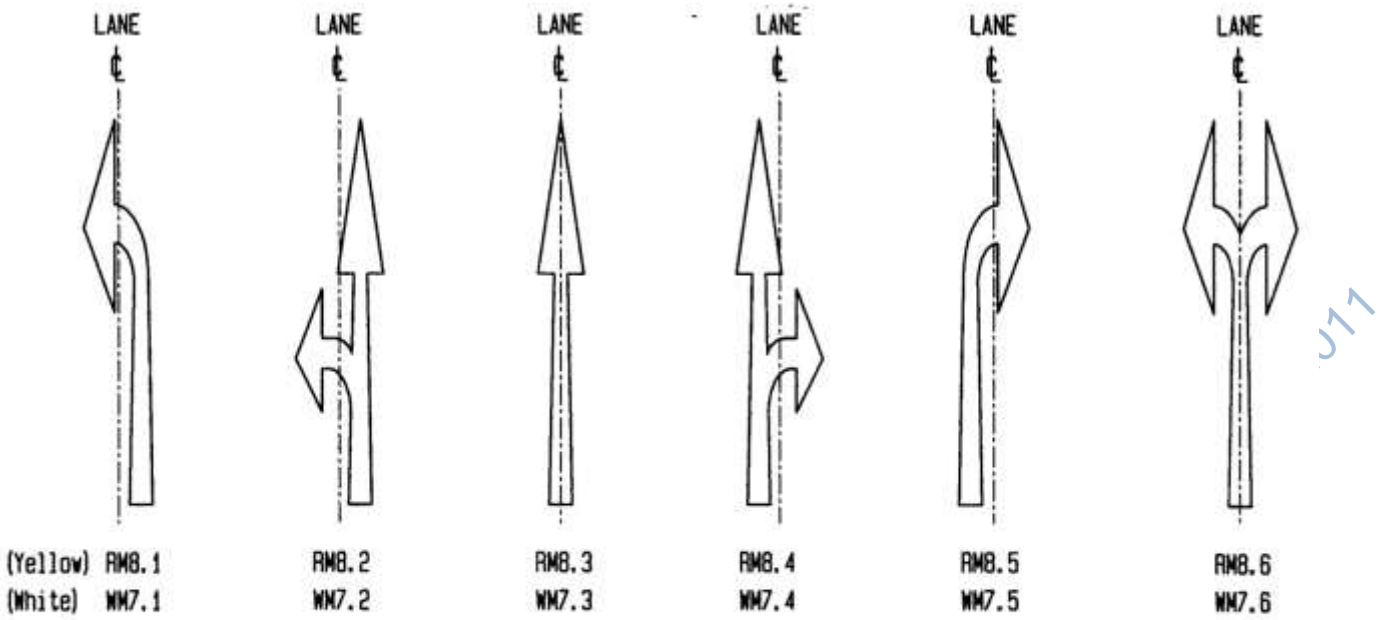


RM8
WM7

COLOURS:

White

NOTES:

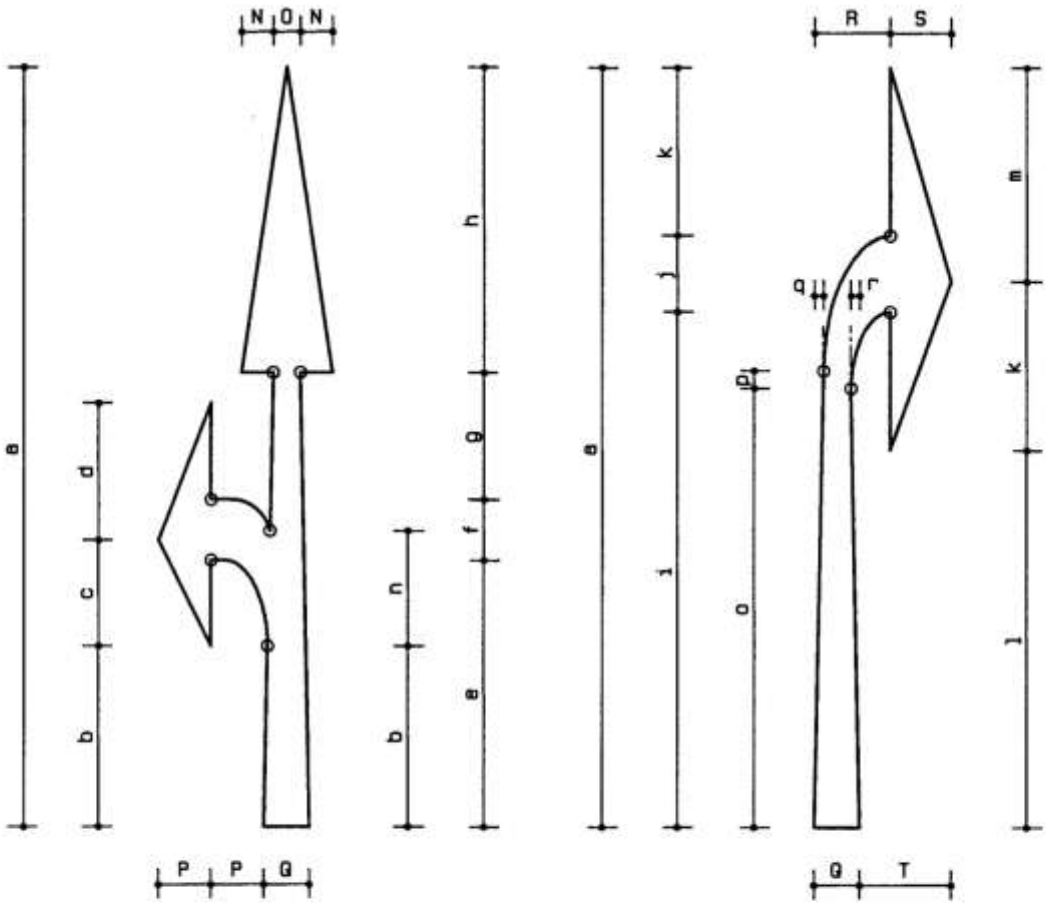
1 For details of the use of road marking RM8 refer to SADC-RTSM VOL 1, Chapter 7, page 7.2.20 and for road marking WM7 to page 7.3.7.

2 Dimensional details of arrows are given in Figures 2.97 and 2.98. Values of dimensions for all standard arrow lengths sre covered in Figure 2.97 in tabulated form, whilst Figure 2.98 illustrates arrow details, to scale, for the 5 m arrow length, on a grid base. It should be noted that the arrow width does not vary with length. The grid detail can be redrawn for other arrow length by retaining, at the full size, the 50 mm width of grid block and by varying the length of the vertical block in proportion to the arrow length as shown opposite:

"a" (arrow length)	grid block length
2500 mm	50 mm
4000 mm	80 mm
5000 mm	100 mm
7500 mm	120 mm

Arrow area m^2				
a	RM8.1/RM8.5 WM7.1/WM7.5	RM8.2/RM8.4 WM7.2/WM7.4	RM8.3 WM7.3	RM8.6 WM7.6
2500	0.67	0.89	0.66	1.03
4000	1.14	1.43	1.06	1.68
5000	1.45	1.78	1.32	2.12
7500	2.23	2.66	1.98	3.20

Fig 2.96 **RM8 – Mandatory Direction Arrows – 1**
WM7 - Mandatory Direction Arrows Ahead – 1



DIMENSIONS (mm) APPLICATIONS

Operating speed km/h	Typical applications	a	b	c	d	e	f	g	h	i
30 - 40	City centre	2500	600	350	450	884	200	417	1000	1700
50 - 90	Urban/Rural expressway	4000	960	560	720	1406	320	666	1600	2720
100 - 120	Rural and freeways	5000	1200	700	900	1767	400	833	2000	3400
ALL	Special applications	7500	1800	1050	1350	2651	600	1250	3000	5100

Operating speed km/h	Typical applications	j	k	l	m	n	o	p	q	r
30 - 40	City centre	250	550	1250	700	380	1450	58	30	29
50 - 90	Urban/Rural expressway	400	880	2000	1120	608	2320	93	48	46
100 - 120	Rural and freeways	500	1100	2500	1400	760	2900	116	60	58
ALL	Special applications	750	1650	3750	2100	1140	4350	174	90	87

All operating speeds and applications	N	O	P	Q	R	S	T
	210	180	350	300	500	400	600

Fig 2.97 **RM8 – Mandatory Direction Arrows – 2**
WM7 - Mandatory Direction Arrows Ahead – 2

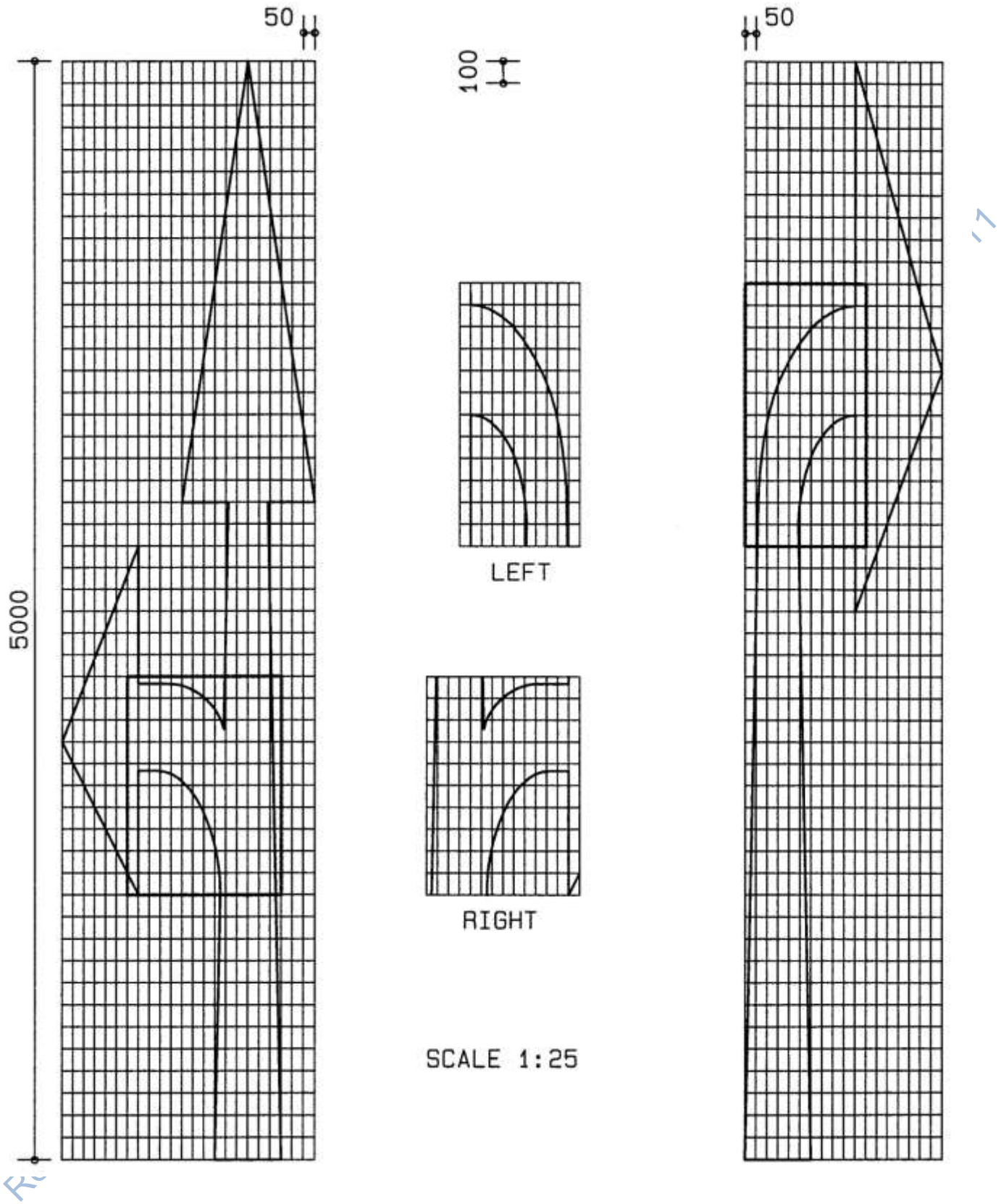
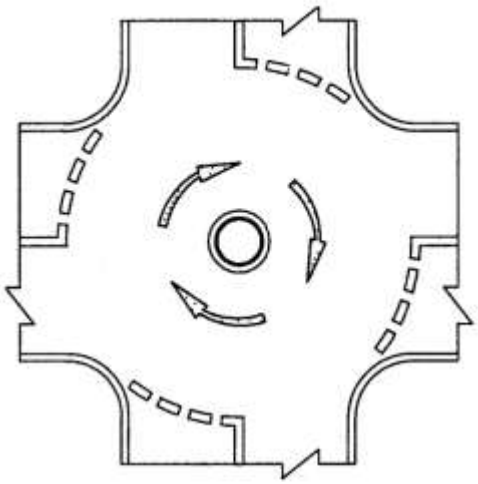


Fig 2.98 **RM8 – Mandatory Direction Arrows – 3**
WM7 - Mandatory Direction Arrows Ahead – 3



COLOURS:

Arrows:	Yellow
Outer circle:	White
Inner circle:	Yellow

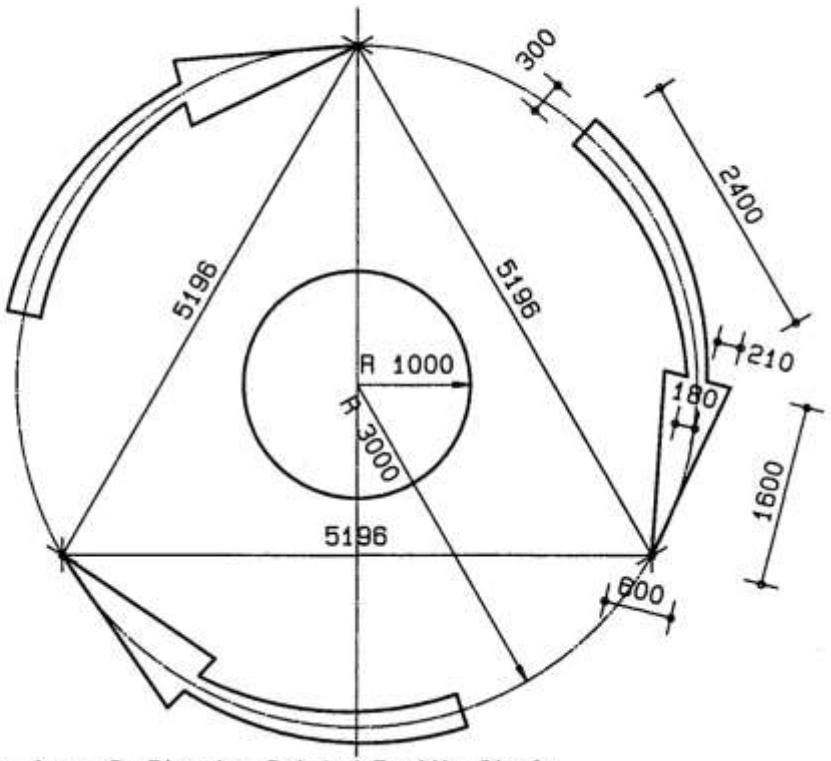
NOTES:

1 For details of the use of road marking RM15 refer to SADC-RTSM VOL 1, Chapter 7, page 7.2.29.

2 2 m, 4 m and 6 m DIAMETER traffic circles are detailed. Other sizes may be used on a proportional basis. The size of the painted circle is a function of the engineering geometric design fo the traffic circle.

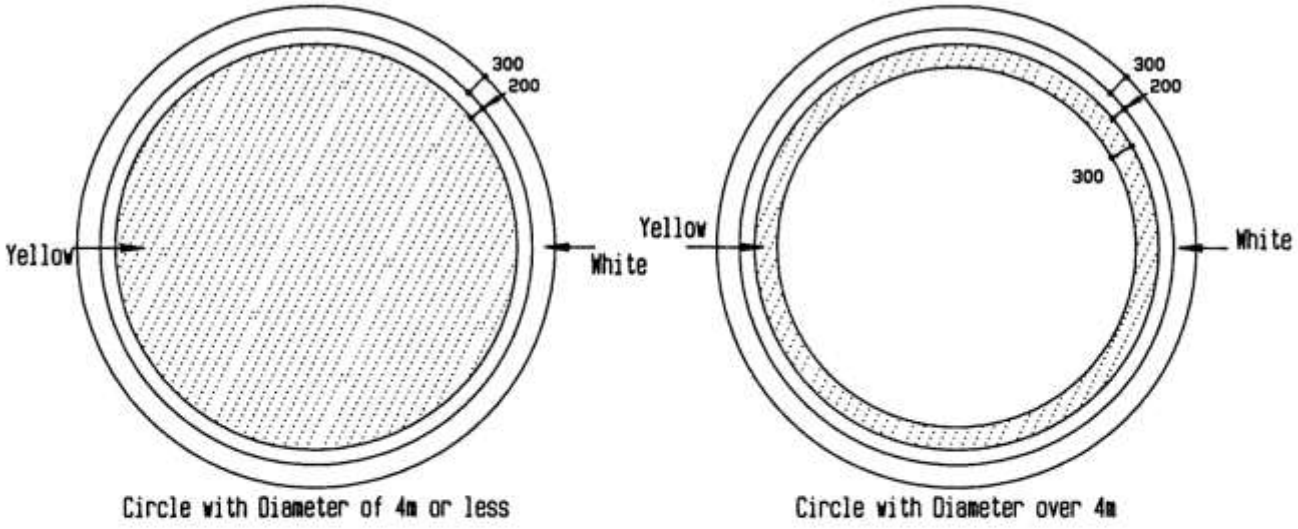
3 The circle portion of the marking shall comprise a white outer ring marking and a yellow central marking. For smal circles (4 m diameter or less) the central marking shoild be solid. For larger ciscles the marking may be an inner yellow ring. See Figure 2.100, Detail 2.100.1.

RM15

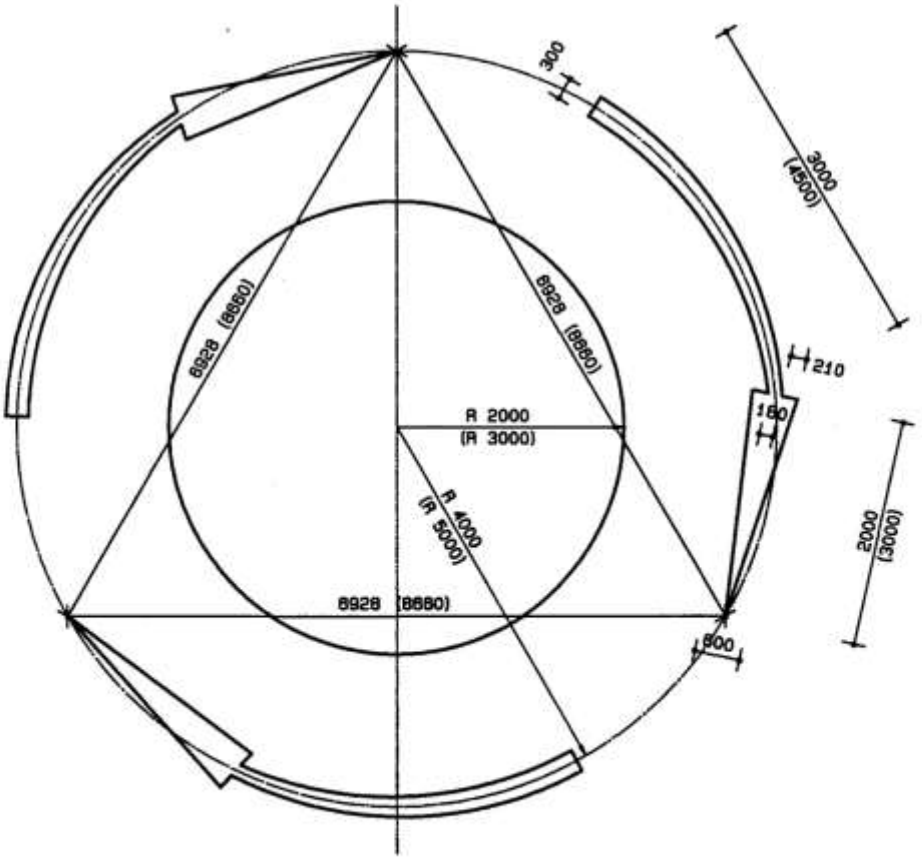


Detail 2.99.1 Diameter for a 2m Diameter Painted Traffic Circle

Fig 2.99 RM15 – Traffic Circle Mandatory Arrows – 1



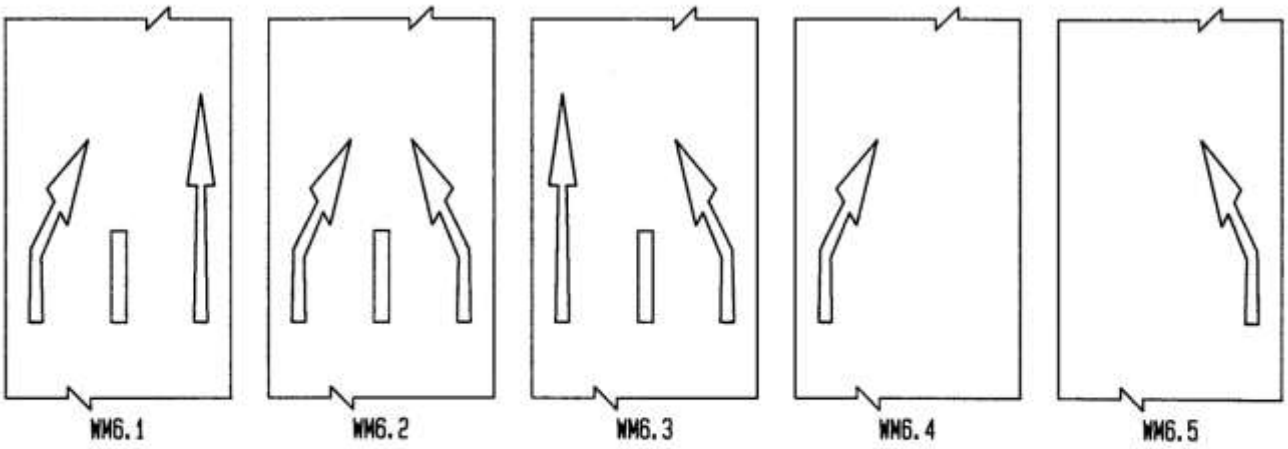
Detail 2.100.1 Traffic Circle Marking Details



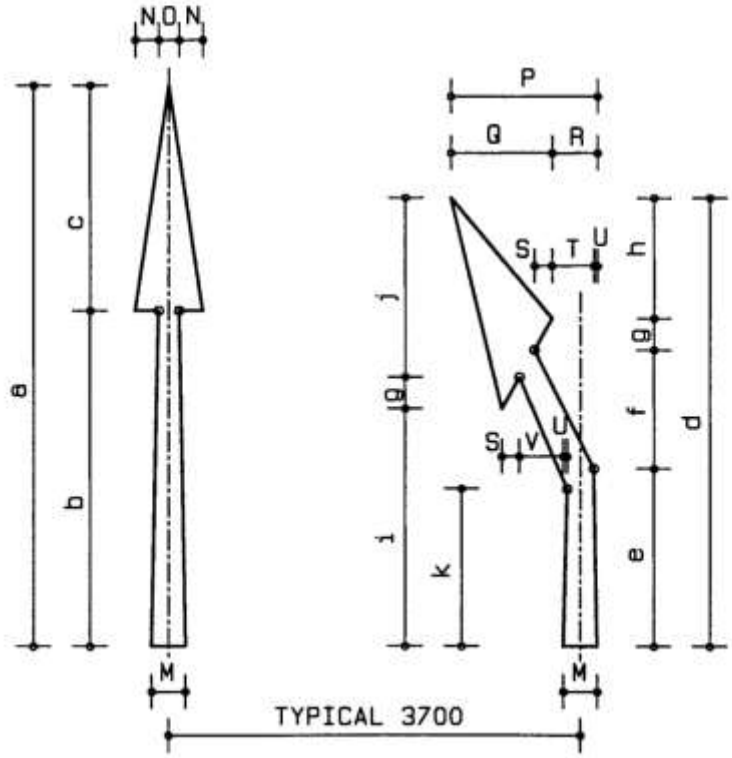
Dimensions which differ for 6m diameter circle are given in brackets

Detail 2.100.2 Dimensions for 4m and 6m Diameter Painted Traffic Circles

Fig 2.100 RM15 – Traffic Circle Mandatory Arrows – 2



WM6



COLOURS:

White

NOTES:

1 For details of the use of road marking WM6 refer to SADC-RTSM VOL 1, Chapter 7, page 7.3.5.

2 This figure details a range of WM6 markings in tabular form. (The length "a" refers to the longer of the two arrows.) Figure 2.102 details a 5 m arrow on a grid base to allow for easy enlargement. Note that arrow width dimensions are constant irrespective of length.

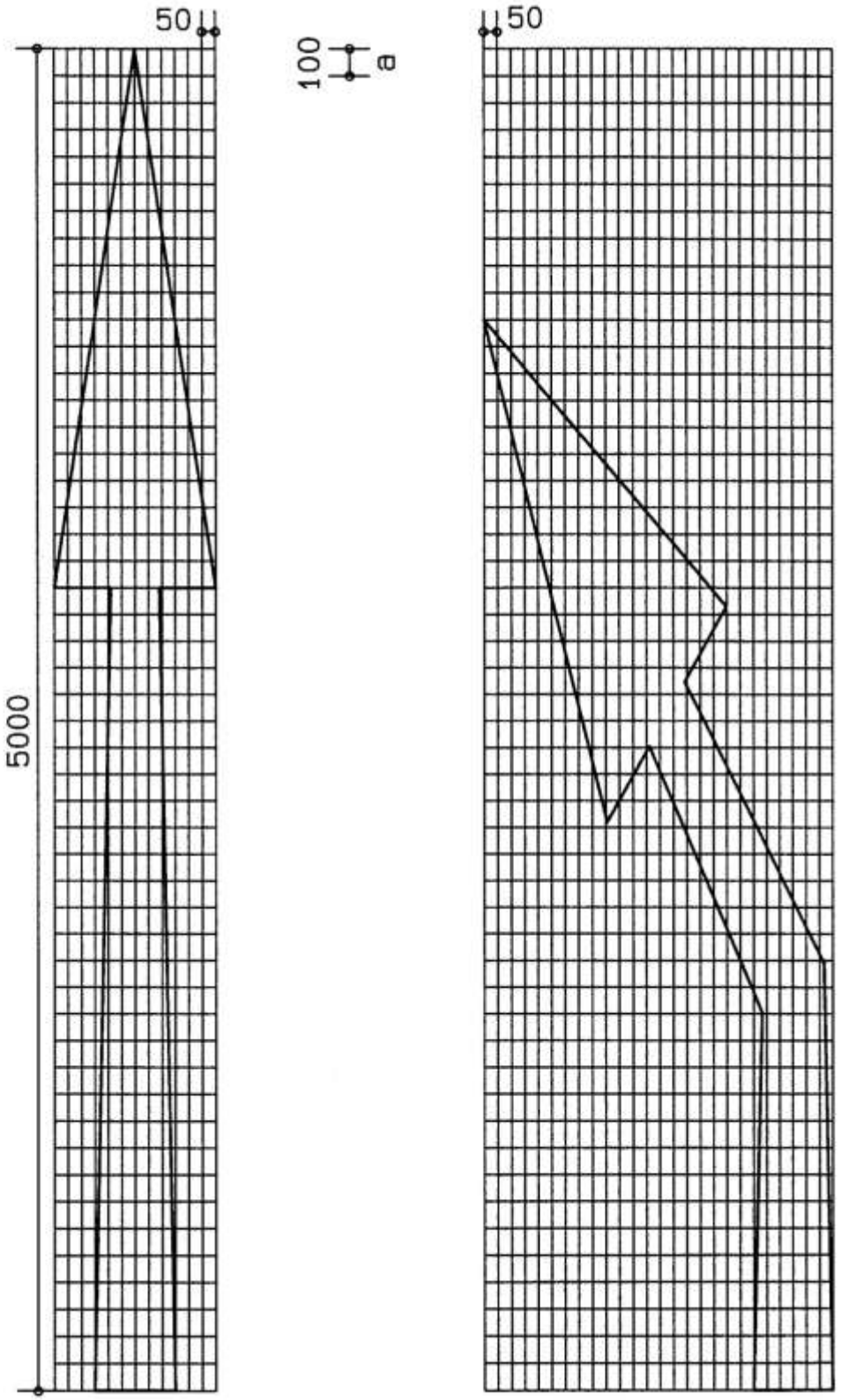
Arrow area m^2		
a	WM6.1/WM6.3	WM6.2
4000	2.08	2.06
5000	2.61	2.58
7500	3.92	3.88
12000	6.56	6.20

DIMENSIONS (mm) APPLICATIONS

Operating speed km/h	Typical applications	a	b	c	d	e	f	g	h	i	j	k
30 - 40	City centre	4000	2400	1600	3200	1271	847	227	855	1696	1277	1126
50 - 60	Urban roads	5000	3000	2000	4000	1589	1058	284	1069	2120	1596	1407
70 - 90	Urban arterial roads/Rural expressways	7500	4500	3000	6000	2384	1587	426	1603	3180	2394	2111
100 - 120	Rural roads and freeways	12000	7200	4800	9600	3814	2539	681	2566	5089	3830	3377

ALL operating speeds and applications	M	N	O	P	Q	R	S	T	U	V
	300	210	180	1300	898	402	155	370	32	390

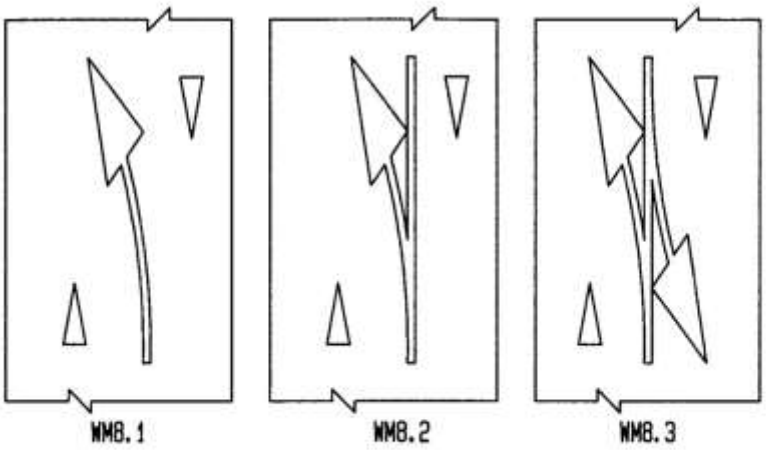
Fig 2.101 WM6 – Lane Reduction Arrows – 1



a	grid block length
4000	80
5000	100
7500	150
12000	240

SCALE 1:25

Fig 2.102 WM6 – Lane Reduction Arrows – 2



COLOURS:

White

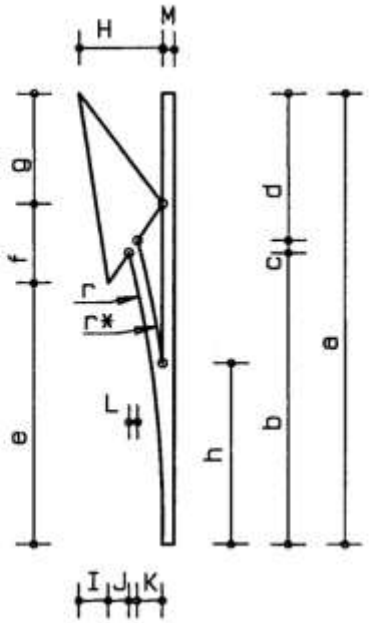
NOTES:

1 For details of the use of road marking WM8 refer to SADC-RTSM VOL 1, Chapter 7, page 7.3.8.

2 Dimensional details are given for the urban and rural sizes of road marking WM8 which is matched to the length of DIVIDIN LINE marking WM3.

3 This figure details the two arrow sizes in tabular form. Figure 2.104 details the arrows on a grid base for easy manufacture of a template or painting mask.

WM8



Arrow area m^2	
a	Per arrow
3000	0.62
4000	0.82

DIMENSIONS (mm)

Typical applications	a	b	c	d	e	f	g	h	r	r*
Urban	3000	1941	83	976	1741	528	731	1206	5620	5820
Rural	4000	2588	111	1301	2321	704	975	1608	9900	10000

ALL applications	H	I	J	K	L	M
	735	260	181	219	75	100 or 150

Fig 2.103 WM8 – No Overtaking Ahead Arrows – 1

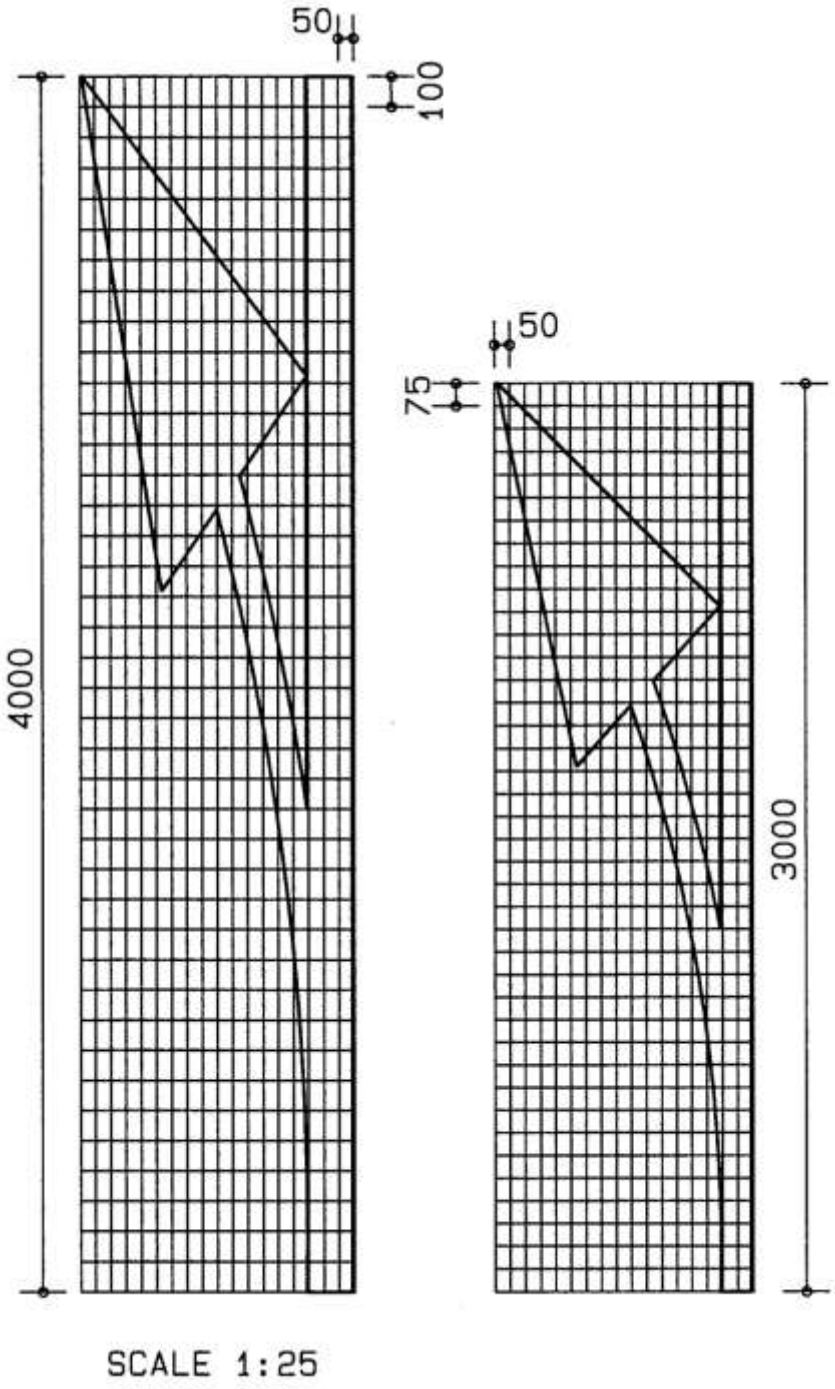


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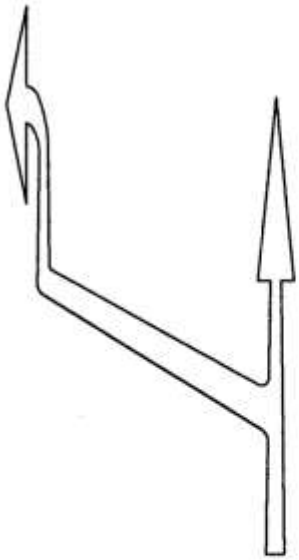
Fig 2.104 **WM8 – No Overtaking Ahead Arrows – 2**



COLOURS:

White

NOTES:

1 For details of the use of road marking WM11 refer to SADC-RTSM VOL 1, Chapter 7, page 7.3.9.

2 Marking WM11.1 is for use with marking RM9. For examples see Volume 2, Chapter 8.

3 The arrow is illustrated on a grid base which makes it suitable for modification to other sizes. The recommended length, with a grid block length of 200 mm, is 7.2 m. It shoul;d be noted that the grid width of 50 mm remains constant irrespective of changes in length.

WM11.1

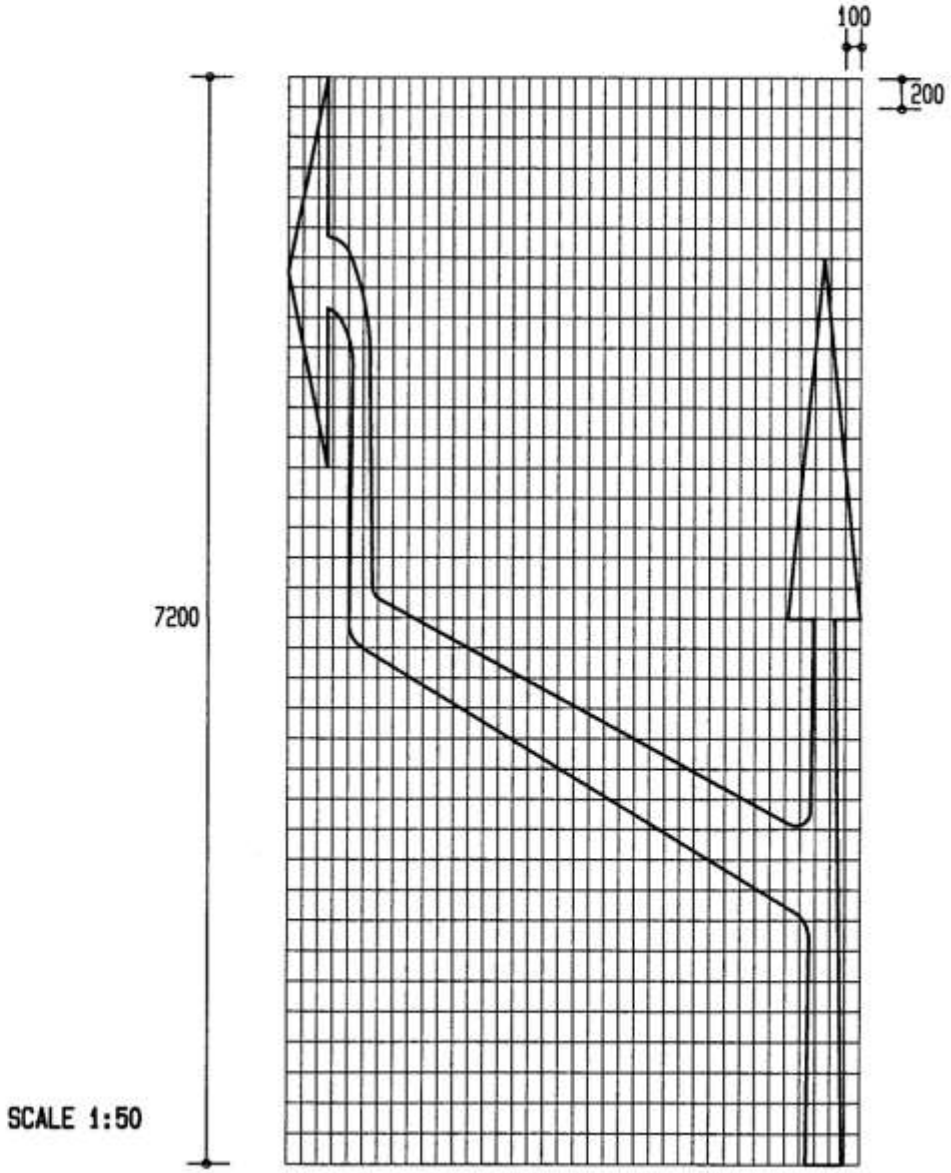


Fig 2.105 WM11.1 – End of Exclusive Use Lane Arrows – Option to Turn

COLOURS:

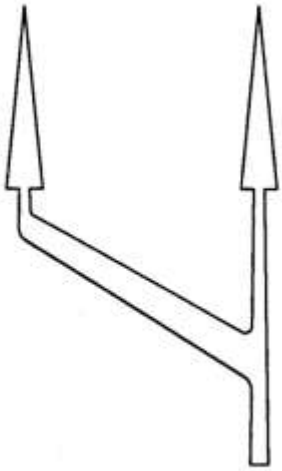
White

NOTES:

1 For details of the use of road marking WM11 refer to SADC-RTSM VOL 1, Chapter 7, page 7.3.9.

2 Marking WM11.2 is for use with marking RM9. For examples see Volume 2, Chapter 8.

3 The arrow is illustrated on a grid base which makes it suitable for modification to other sizes. The recommended length, with a grid block length of 200 mm, is 6 m. It shoul;d be noted that the grid width of 50 mm remains constant irrespective of changes in length.



WM11.2

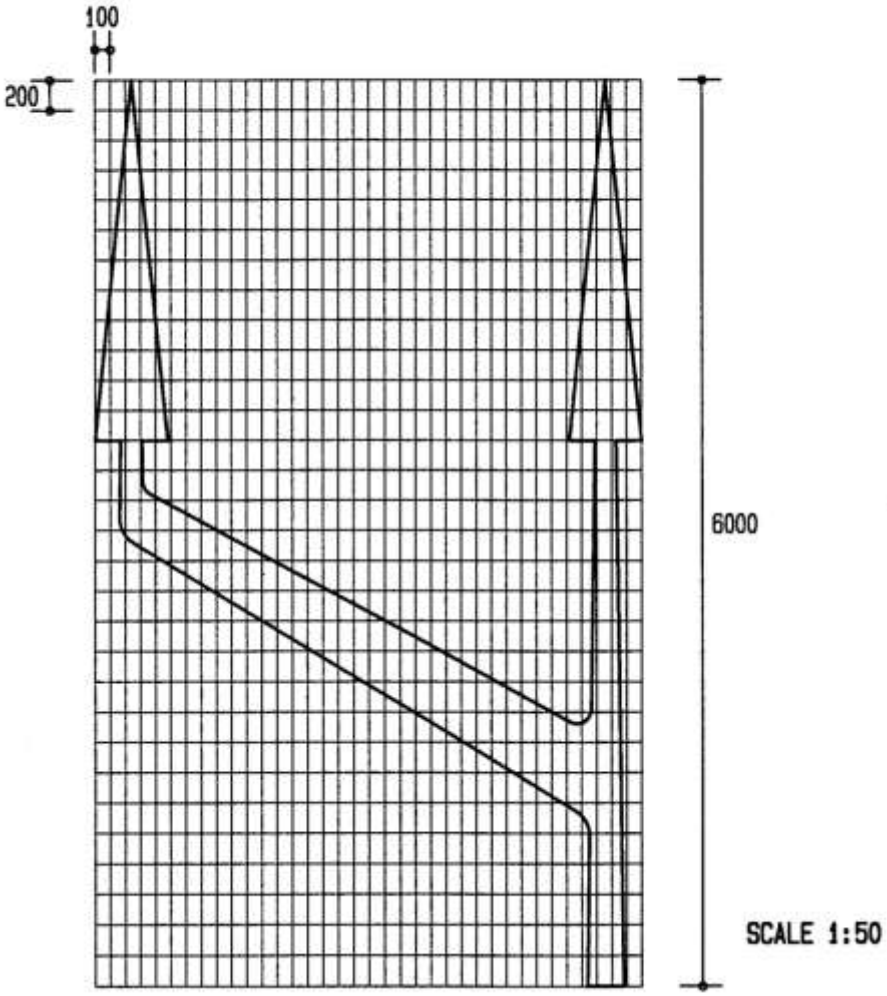
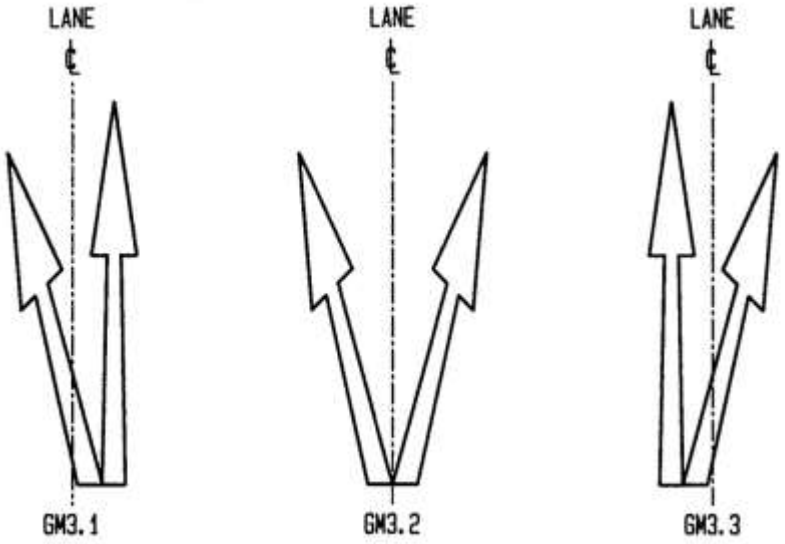


Fig 2.106 WM11.2 – End of Exclusive Use Lane Arrows – Straight-on Option



COLOURS:

White

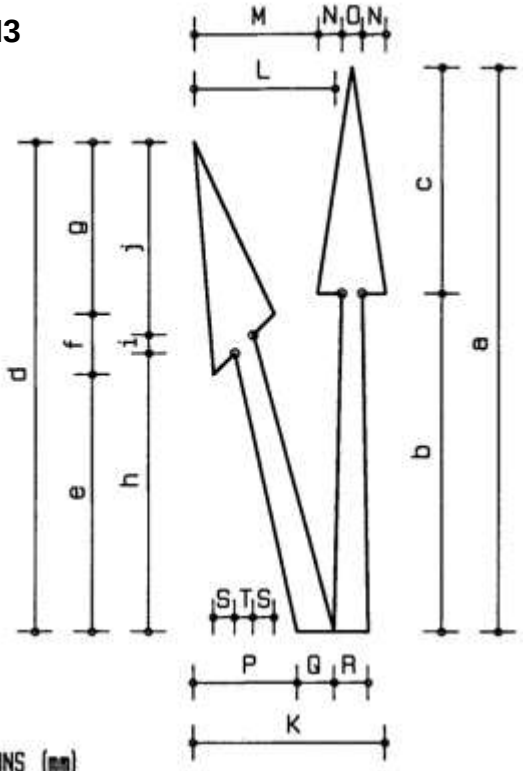
NOTES:

1 For details of the use of road marking GM3 refer to SADC-RTSM VOL 1, Chapter 7, page 7.4.3.

2 This figure details a range of GM3 markings in tabular form. (The length "a" refers to the longer of the two arrows.) Figure 2.108 details a 5 m arrow on a grid base to allow for easy enlargement. Note that arrow width dimensions are constant irrespective of length. The grid detail can be redrawn for other arrow lengths by retaining, at the full size, the 50 mm width of grid block and by varying the length of the vertical block in proportion to the arrow length as follows:

"a" (arrow length)	grid block length
2500 mm	50 mm
4000 mm	80 mm
5000 mm	100 mm
7500 mm	120 mm

GM3



Arrow area m^2		
a	GM3.1/GM3.3	GM3.2
2500	1.30	1.27
4000	2.07	2.04
5000	2.59	2.55
7500	3.89	3.82

DIMENSIONS (mm)

Operating speed km/h	City centre	a	b	c	d	e	f	g	h	i	j
30 - 40	Typical applications	2500	1500	1000	2170	1141	268	761	1235	81	855
50 - 60	Urban	4000	2400	1600	3472	1826	429	1218	1976	129	1367
70 - 90	Urban arterial/Rural expressway	5000	3000	2000	4340	2282	536	1522	2470	161	1709
100 - 120	Rural and freeways	7500	4500	3000	6510	3423	804	2283	3705	242	2564

All operating speeds and applications	K	L	M	N	O	P	Q	R	S	T
	1700	1250	1100	210	180	921	329	300	188	161

Fig 2.107 GM3 – Bifurcation Arrows - 1

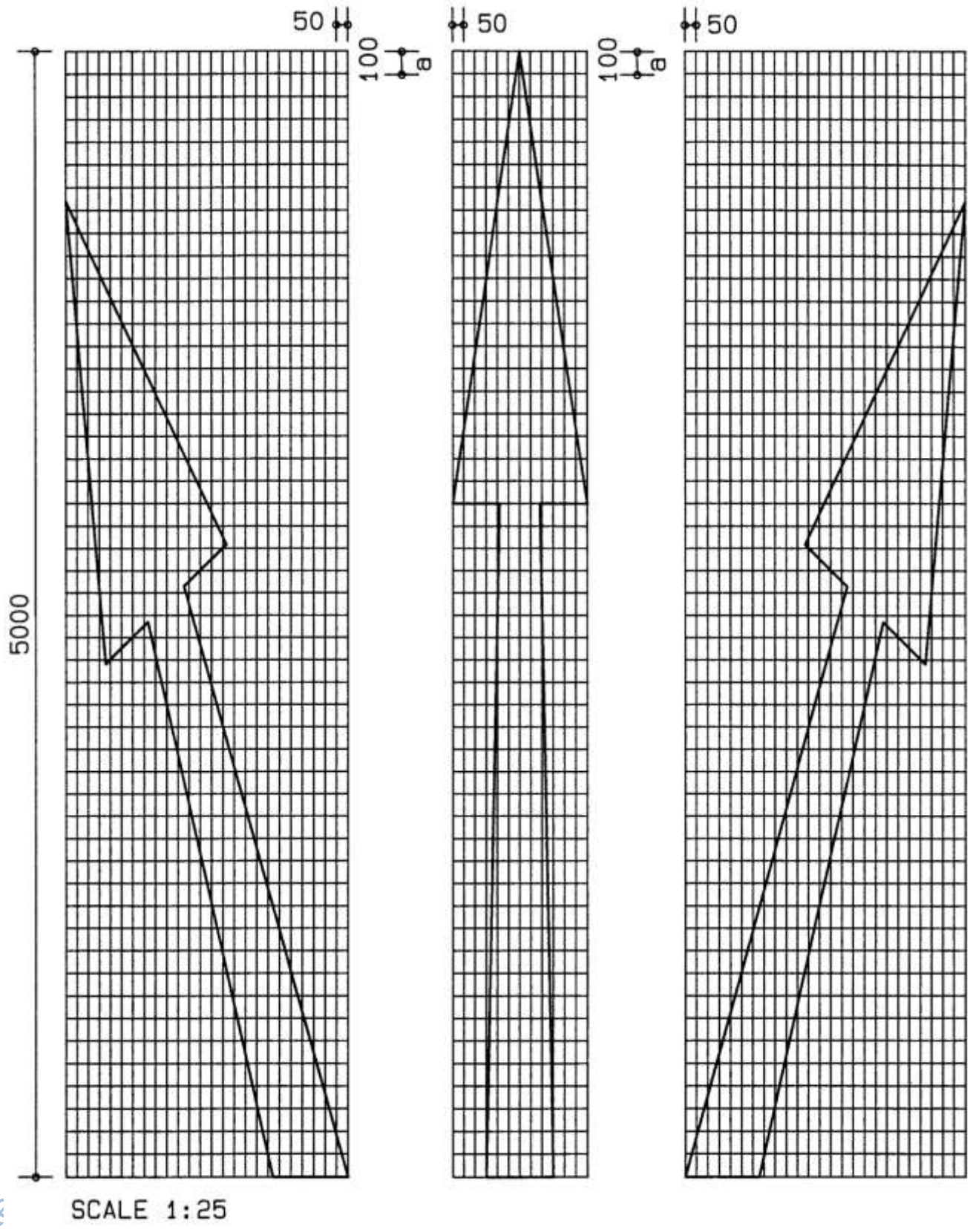
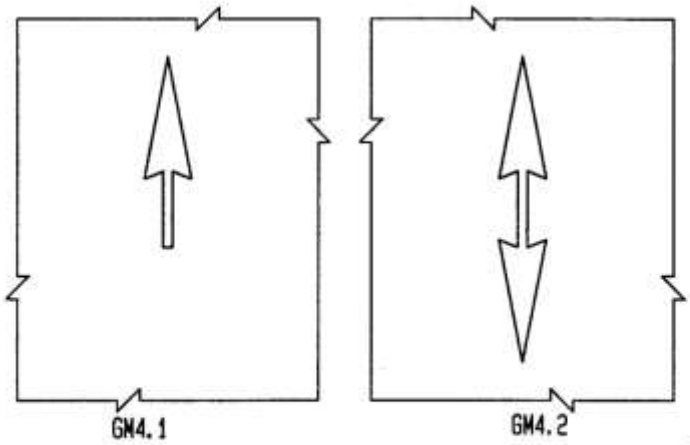


Fig 2.108 GM3 – Bifurcation Arrows - 2



COLOURS:

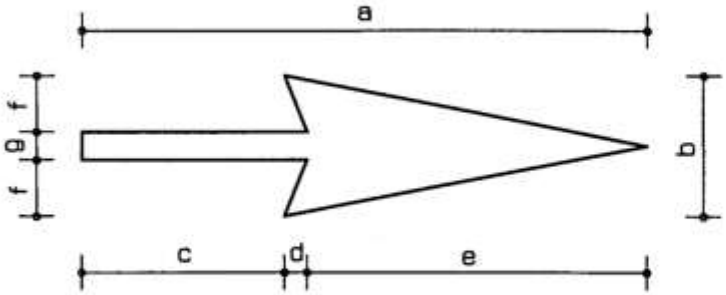
White

NOTES:

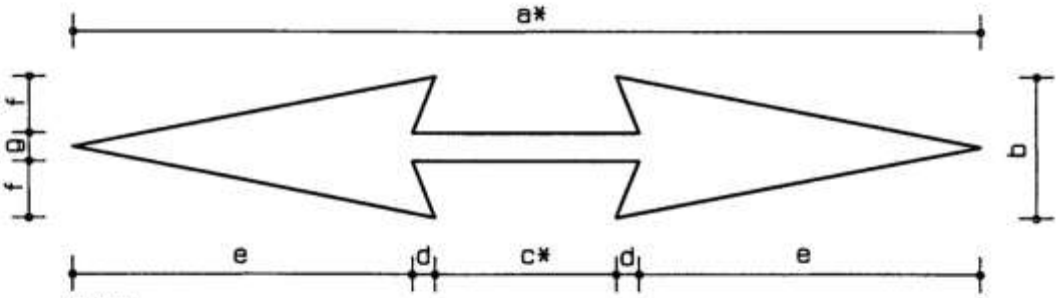
1 For details of the use of road marking GM4 refer to SADC-RTSM VOL 1, Chapter 7, page 7.4.3.

GM4

Area m^2				
Marking	a	Area	a*	Area
GM4.1/ GM4.2(a*)	1250	0.59	2000	1.05
	2500	1.17	4000	2.10
	4000	1.88	6400	3.36
	5000	2.35	8000	4.20



GM4.1



GM4.2

DIMENSIONS (mm)

Operating speed km/h	Typical applications	a	a*	b	c	c*	d	e	f	g
30 - 40	City centre	1250	2000	1250	450	400	50	750	500	250
50 - 60	Urban	2500	4000	1250	900	800	100	1500	500	250
70 - 90	Urban arterial/Rural expressway	4000	6400	1250	1440	1280	160	2400	500	250
100 - 120	Rural and freeways	5000	8000	1250	1800	1600	200	3000	500	250

Fig 2.109 GM4 – Information Arrows

2.7.5 Symbol Types

1 This subsection details a limited number of symbolic road markings. These are not widely used, with one exception, namely RM7.1, but marking GM6.3 is likely to become more widely used with time. Symbols available are:

(a) BICYCLE symbol RM17.1 (Yellow)/GM6.1 (White);

(b) AIRPORT symbol GM6.2 (White);

(c) DISABLED PERSONS symbol RM17.3 (Yellow) / GM6.3 (White) - for use in DISABLED PERSONS PARKING BAY RM16;

(d) HIGH OCCUPANCY VEHICLE (HOV) LANE symbol RM17.4 (Yellow) / GM6-4 (White);

(e) EXCLUSIVE PARKING BAY CATEGORY symbol RM7.1 (Yellow) - for use with EXCLUSIVE PARKING BAY marking RM7.

(f) RAILWAY CROSSING AHEAD symbol WM1 (White);

(g) YIELD CONTROL AHEAD symbol WM5 (White).

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RM17.1
GM6.1

COLOURS:

Yellow (RM17.1) or White (GM6.1)

NOTES:

1 For details of the use refer to SADC-RTSM VOL 1, Chapter 7, pages 7.2.21, 7.4.4 and 7.4.5.

2 The symbol area is 0.54 m^2.

3 BICYCLE LANE symbol RM17.1 is for use with EXCLUSIVE USE LANE LINE RM9 to indicate BICYCLE LANES. Symbol GM 6.1 is for general use in non-regulatory situations.

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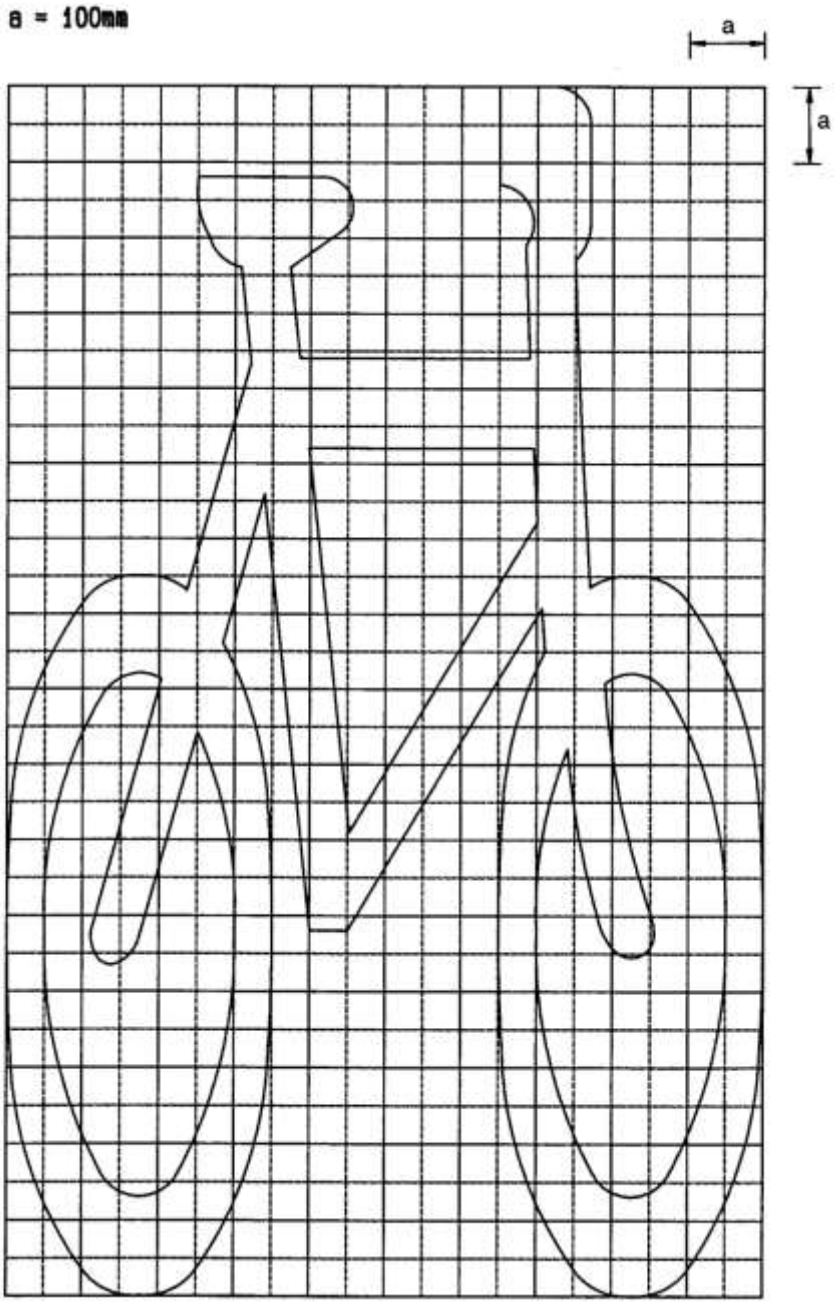

Fig 2.110 **RM17.1 – Bicycle Lane Symbol**
GM6.1 – Bicycle Symbol

COLOURS:

White

NOTES:

1 For details of the use refer to SADC-RTSM VOL 1, Chapter 7, page 7.4.5.

2 The symbol area is 4.77 m^2.

GM6.2

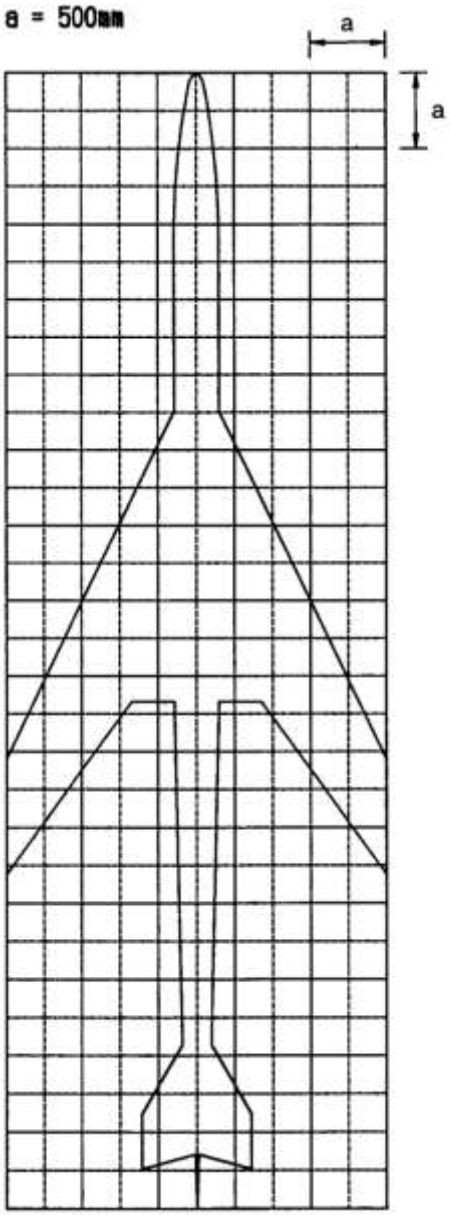

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Fig 2.111 **GM6.2 – Airport Symbol**

RM17.3
GM6.3

COLOURS:

Yellow (RM17.3) or White (GM6.3)

NOTES:

1 For details of the use of road marking refer to SADC-RTSM VOL 1, Chapter 7, pages 7.2.30, 7.2.31, and 7.4.5.

2 This symbol has not been elongated in the direction of travel since its primary function is in connection with parking bays. Symbol GM6.3 is for general use in non-regulatory situations.

3 Symbol RM17.3 is a required part of DISABLED PERSONS PARKING BAY marking RM16.

4 The standard length of symbol is 1000 mm (a=100). Other sizes may be used as follows:

"a"	symbol length
60 mm	600 mm
120 mm	1200 mm
180 mm	1800 mm

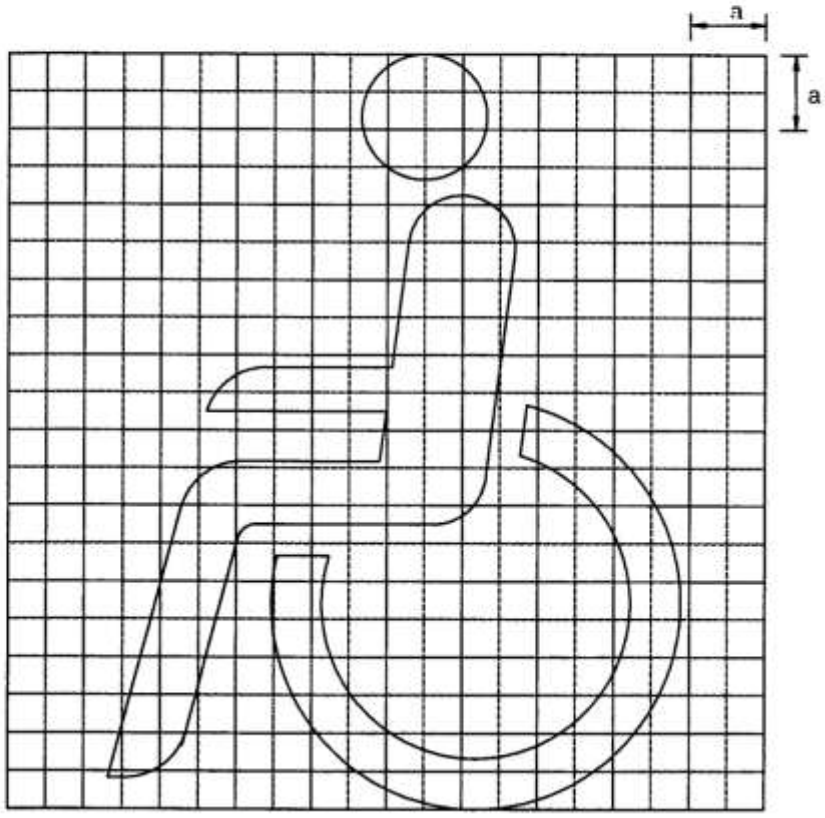


Fig 2.112 **RM17.3 – Disabled Persons Parking Bay Symbol**
GM6.3 – Disabled Persons Symbol

COLOURS:

Yellow (RM17.3) or White (GM6.3)

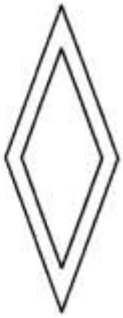
NOTES:

1 For details of the use refer to SADC-RTSM VOL 1, Chapter 7, pages 7.2.21, 7.2.31, and 7.4.5.

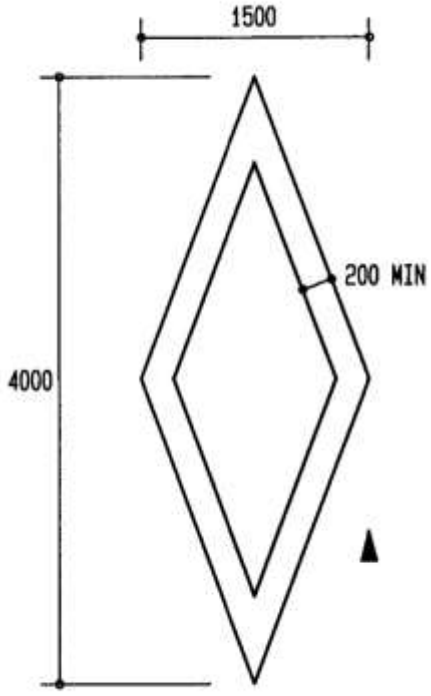
2 HOV (High Occupancy Vehicle) LANE SYMBOL RM17.4 is for use with EXCLUSIVE USE LANE LINE RM9 to indicate that the exclusive use lane is for use by HOV's only. Symbol GM6.4 is for use in non-regulatory situations.

3 Two sizes of symbol are available. Use of the larger symbol is optional. When it is used it is recommended that it be applied using high skid resistance material.

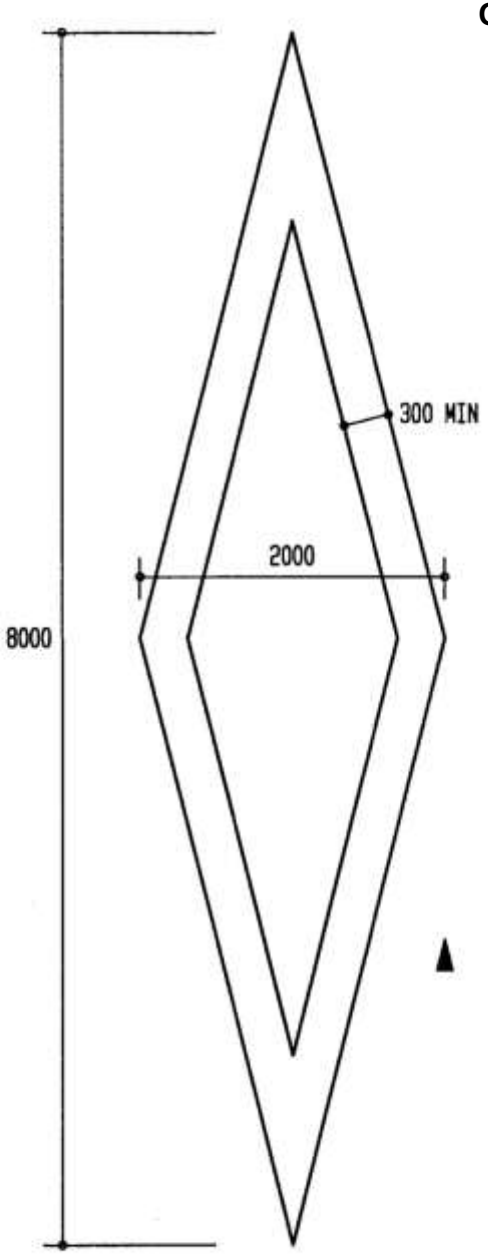
4 The symbol should be positioned in the centre of the exclusive use lane.



RM17.4
GM6.4

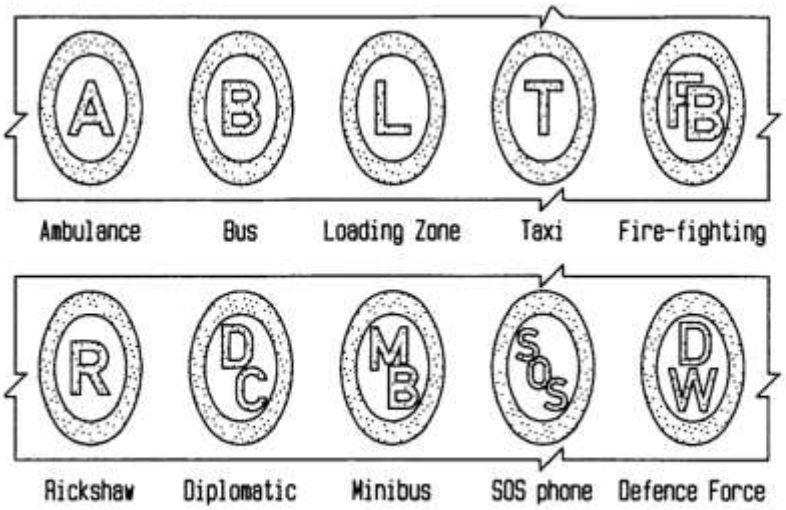


Detail 2.113.1
For Low to Medium Speed Lanes (60 - 80Km/h)



Detail 2.113.2
For High Speed Lanes (100 - 120km/h)

Fig 2.113 **RM17.4 – High Occupancy Vehicle Lane Symbol**
GM6.4 – High Occupancy Vehicle (HOV) Symbol



COLOURS:

Yellow

NOTES:

1 For details of the use refer to SADC-RTSM VOL 1, Chapter 7, page 7.4.19.

2 For details of letters to be used within oval symbol see Figures 2.115 to 2.119.

3 The approximate area of the applied symbol is 0.28 m^2.

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RM7.1

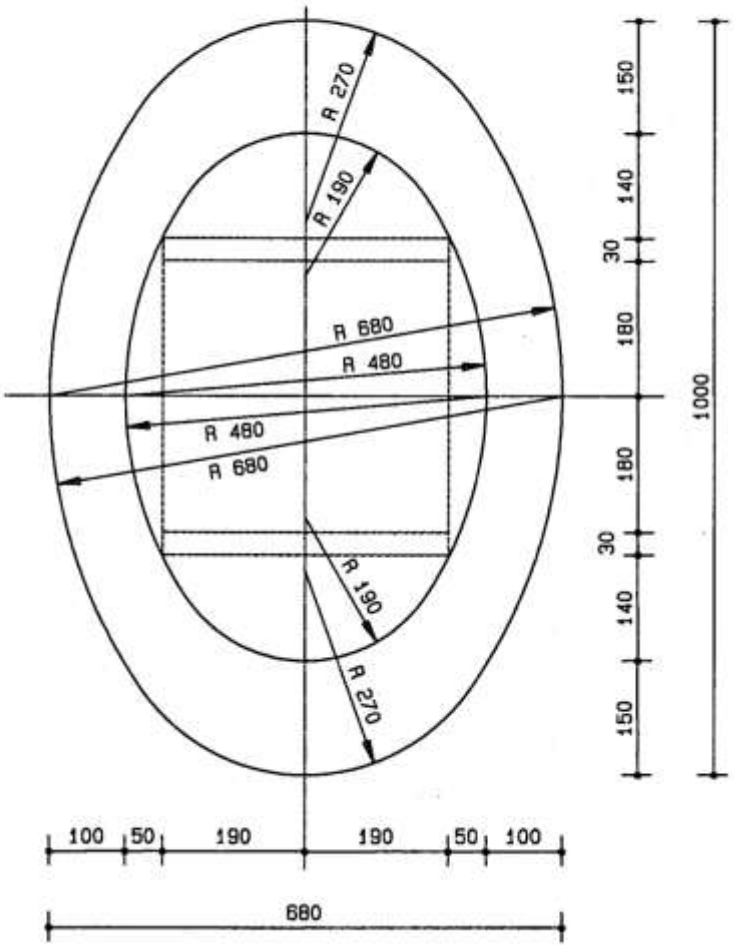
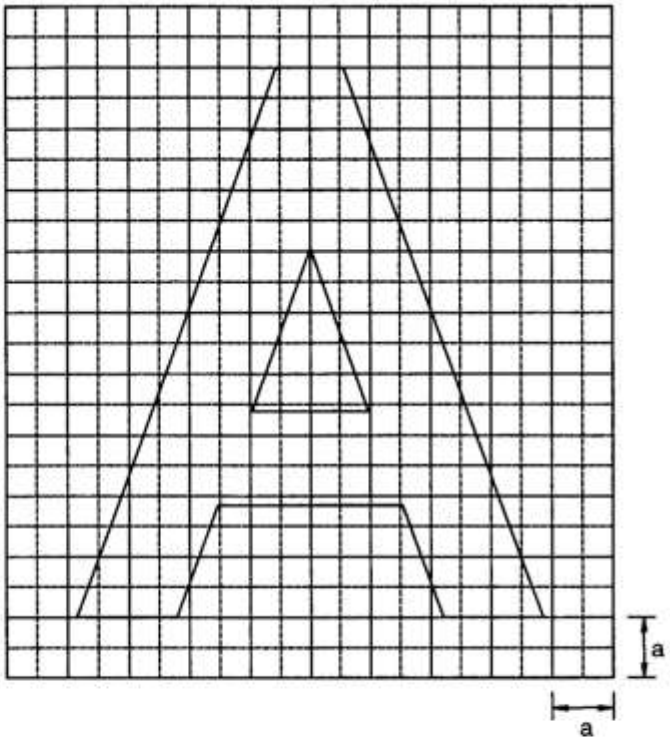
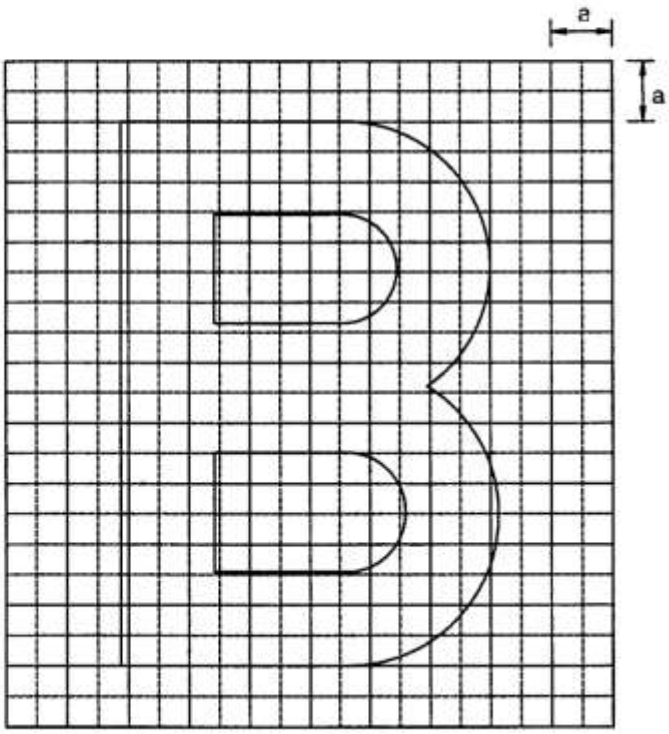


Fig 2.114 **RM7.1 – Details of Oval Symbol for Use with EXCLUSIVE PARKING BAY Marking RM7**

Ambulance
a = 40mm



Bus
a = 40mm



dated 7th July 2011

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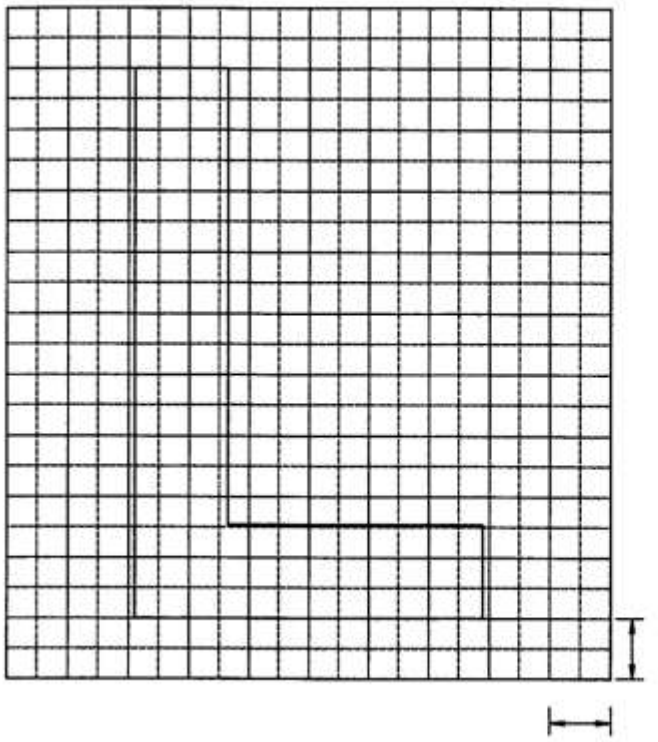
Fig 2.115 RM7.1 – Letter Details - 1



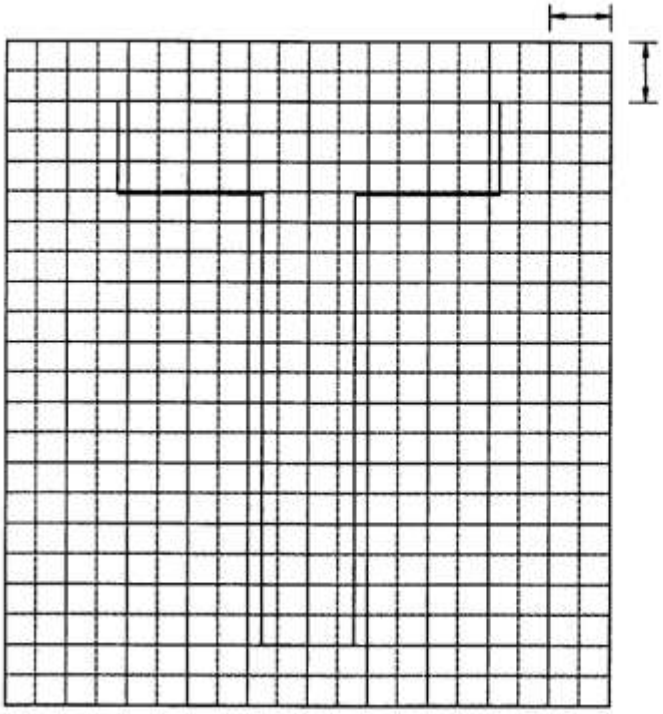


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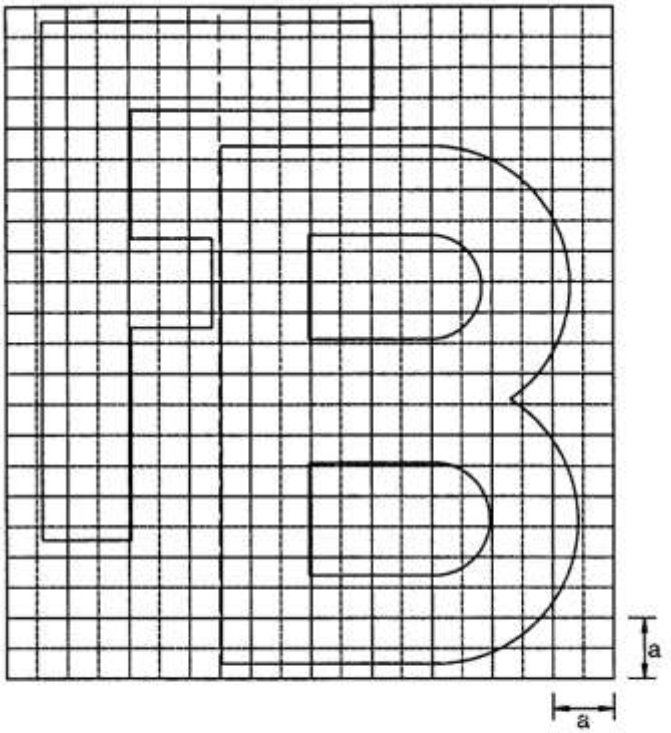
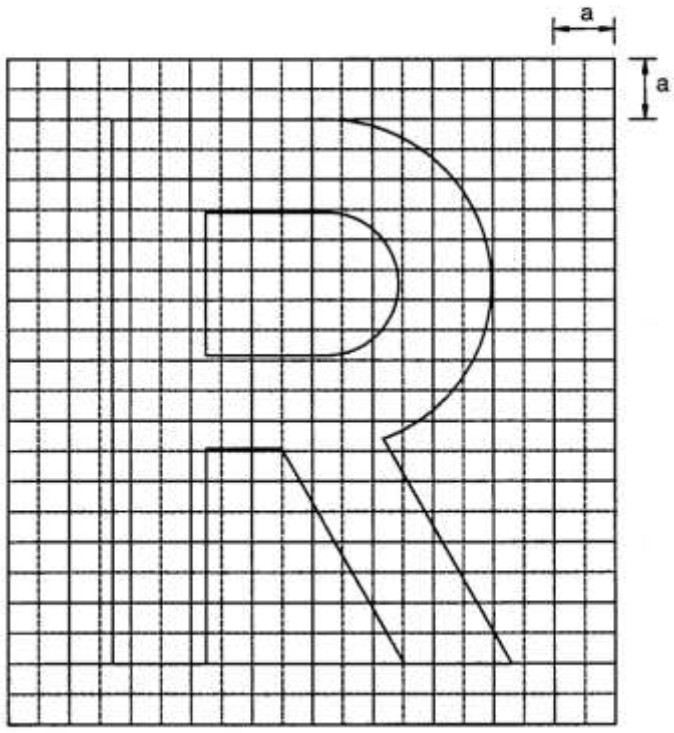
Fig 2.116 RM7.1 – Letter Details - 2

Fire-fighting
a = 40mm



Rickshaw
a = 40mm



dated 7th July 2011
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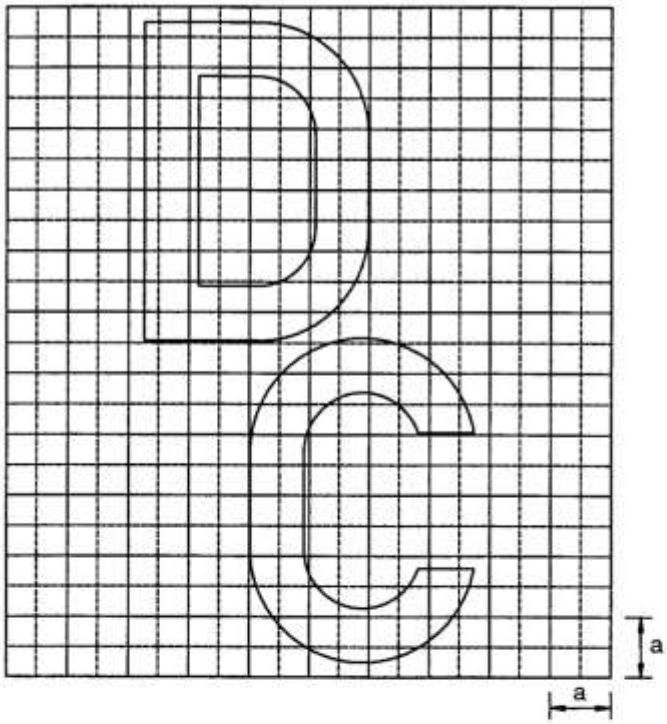
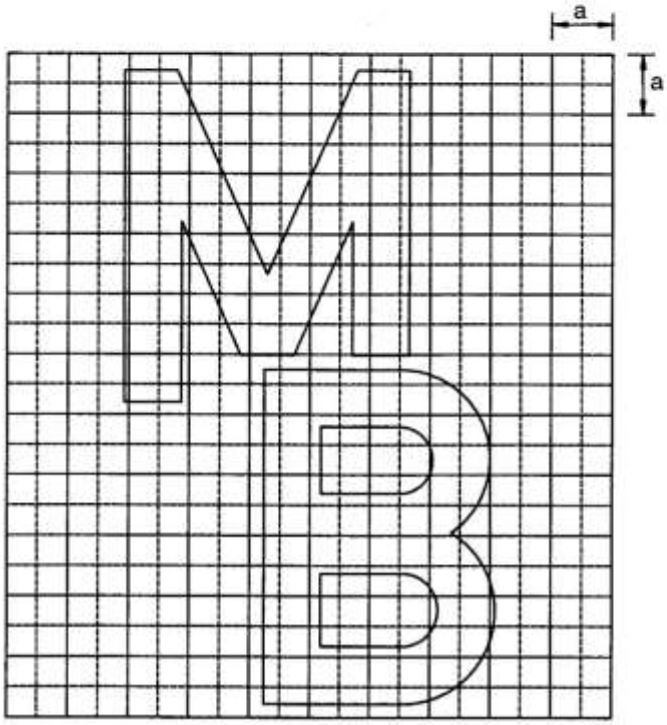
Fig 2.117 RM7.1 – Letter Details - 3



Diplomatic
a = 40mm



Minibus
a = 40mm

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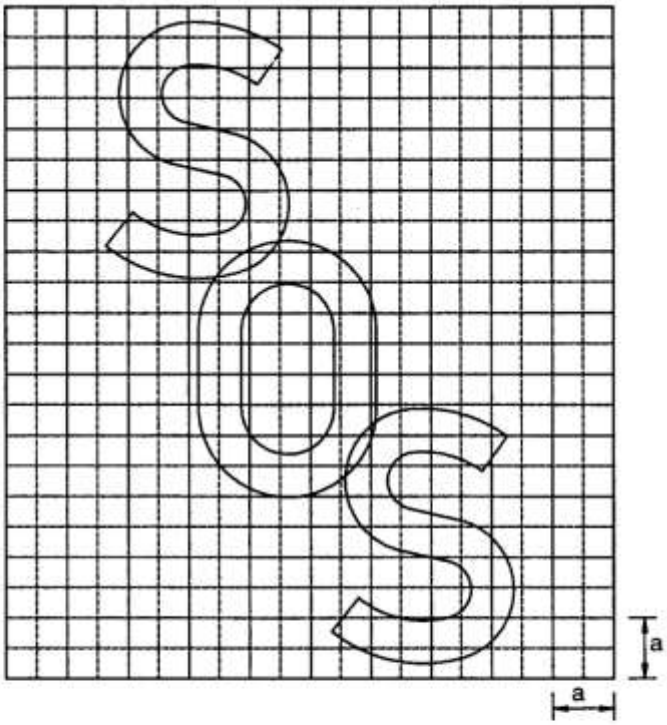
Fig 2.118 RM7.1 – Letter Details - 4

SOS phone
a = 40mm



Defence Force
a = 40mm

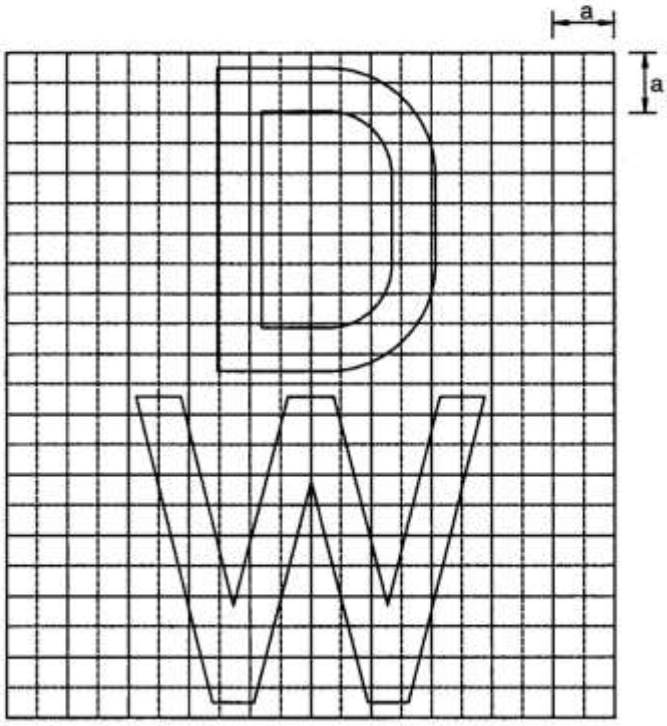


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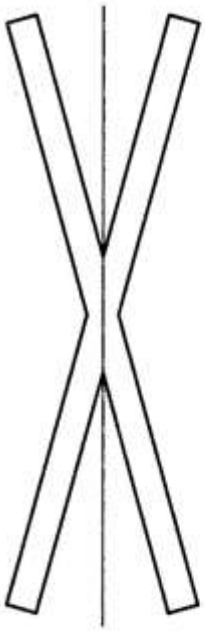
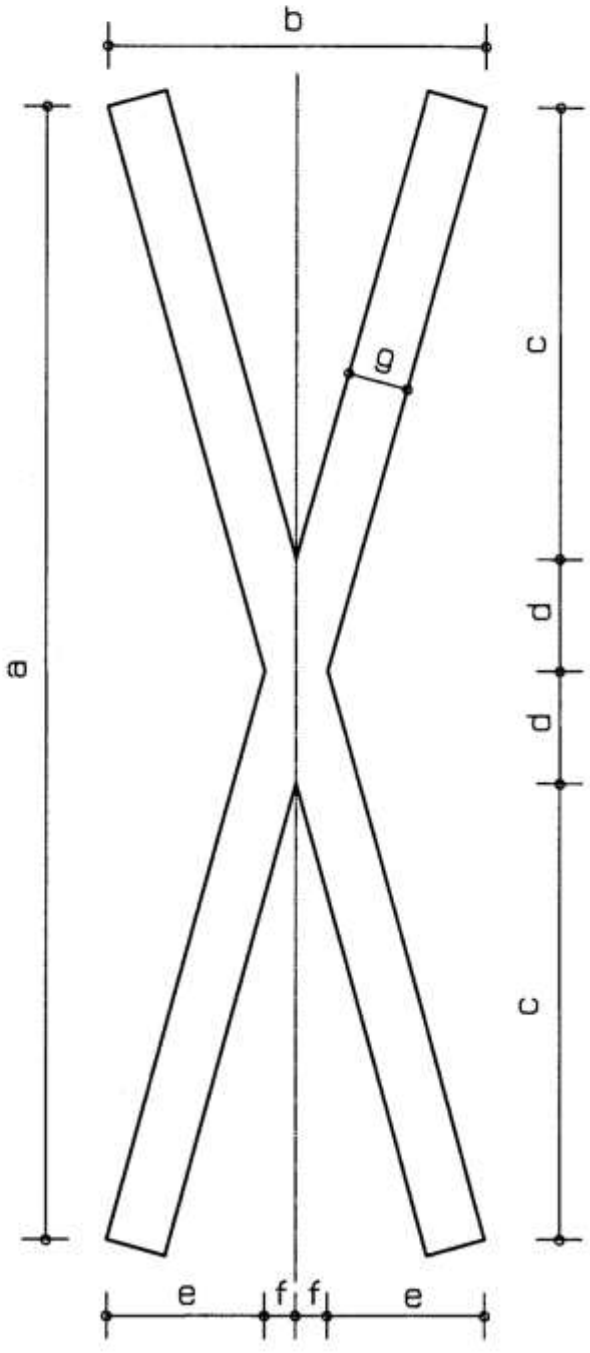
Fig 2.119 RM7.1 – Letter Details - 5



DIMENSIONS (mm)

Typical applications	a	b	c	d	e	f	g
Urban	4000	2500	1797	203	1135	115	200
Rural	7500	2500	3003	747	1042	208	400

2011



WM1

COLOURS:

White

NOTES:

1 For details of the use refer to SADC-RTSM VOL 1, Chapter 7, page 7.3.1.

2 Only two sizes of symbol are recommended. See the table above. The surface areas of the two sizes of marking WM1 are:

(a) For a = 4000 mm area = 1.84 m^2.

(b) For a = 7500 mm area = 6.00 m^2.

Fig 2.120 WM1 – Railway Crossing Ahead Symbol

COLOURS:

White

NOTES:

1 For details of the use refer to SADC-RTSM VOL 1, Chapter 7, page 7.3.4.

2 The symbol areas for the given width “a” are:

(a) For a = 450 mm area = 0.2 m^2.

(b) For a = 850 mm area = 0.83 m^2.

(c) For a = 1350 mm area = 2.15 m^2.

WM5

DIMENSIONS (mm)

Operating speed km/h	Typical applications	Distance from yield line	a	b	c	d
30 - 40	City centre	90m	450	250	100	1250
50 - 60	Urban	120m	850	450	150	2500
70 - 120	Rural	155m	1350	700	250	4000

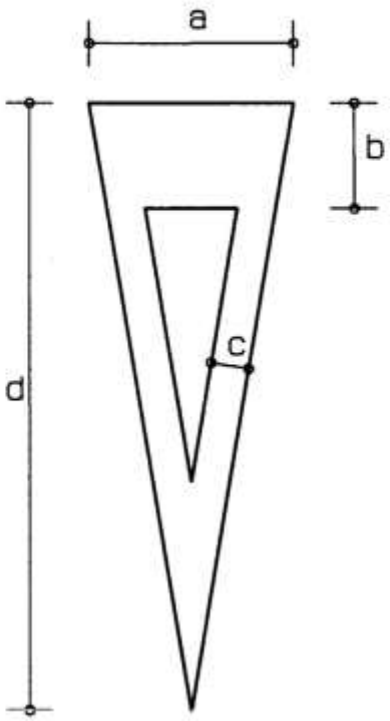


Fig 2.121 WM5 – Yield Control Ahead Symbol

2.7.6 Word Letters

1 This Subsection gives dimensional details for all letters in the alphabet (upper case) and for all numerals.

2 The only practical method of marking letters on the road surface is to do so using letter mask of the appropriate size. Letter masks can be made up from the details given in the tables of dimensions, to any of the following standard lengths:

(a) 1250 mm;

(b) 2500 mm;

(c) 4000 mm;

(d) 5500 mm;

(e) 7500 mm.

3 The 5500 mm length is unique to WORD marking GM7. This letter length is an historic one, and has been retained so that road authorities do not need to make new masks. The equivalent arrow length is 5000 mm.

4 If thermoplastic sheet materials are specified, WORD markings may be cut straight from the material, instead of using a mask. The same dimensional standards should apply.

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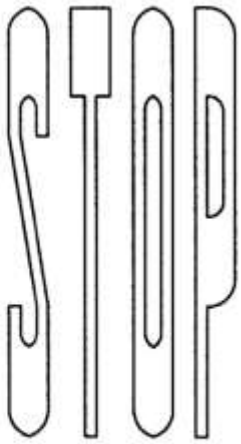

COLOURS:

White or yellow.

NOTES:

1 For details of the use of letter markings to portray simple WORD MARKINGS see SADC-RTSM VOL 1, Chapter 7, page 7.4.6.

2 STOP is the most commonly used WORD MARKING. As a typical example this word is detailed in Figure 1.123 on a grid background. It should be noted that the letter widths do not vary with length. The grid detail can be redrawn for other letter lengths by retaining at the full size, the 50 mm width of the grid block and by varying the length of the vertical block in proportion to the letter length as follows:

"H" (letter height)	grid block length
1250 mm	22.7 mm
2500 mm	45.5 mm
4000 mm	72.7 mm
5500 mm	100.0 mm
7500 mm	136.4 mm.

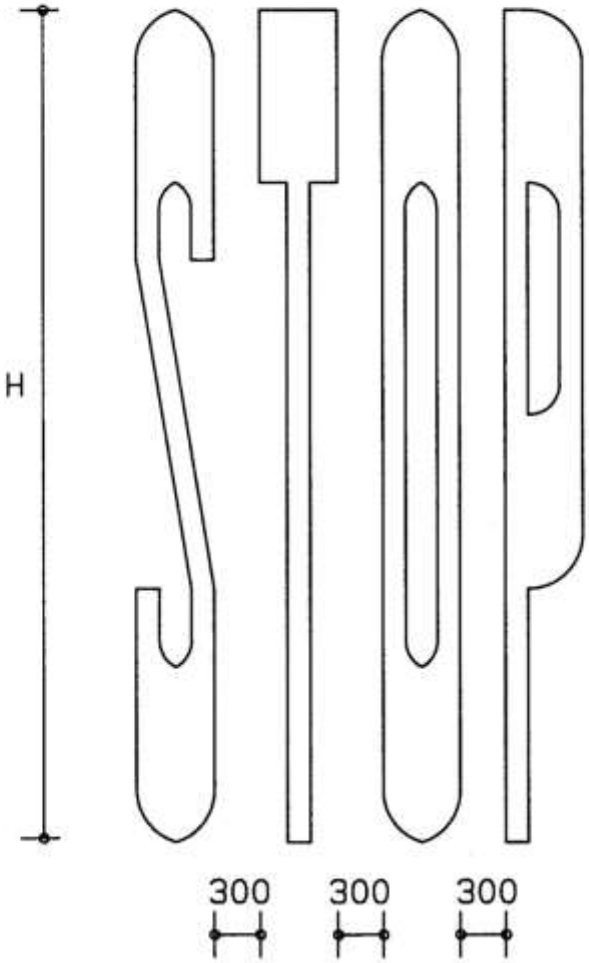

Fig 2.122 **GM7 – STOP Marking - 1**

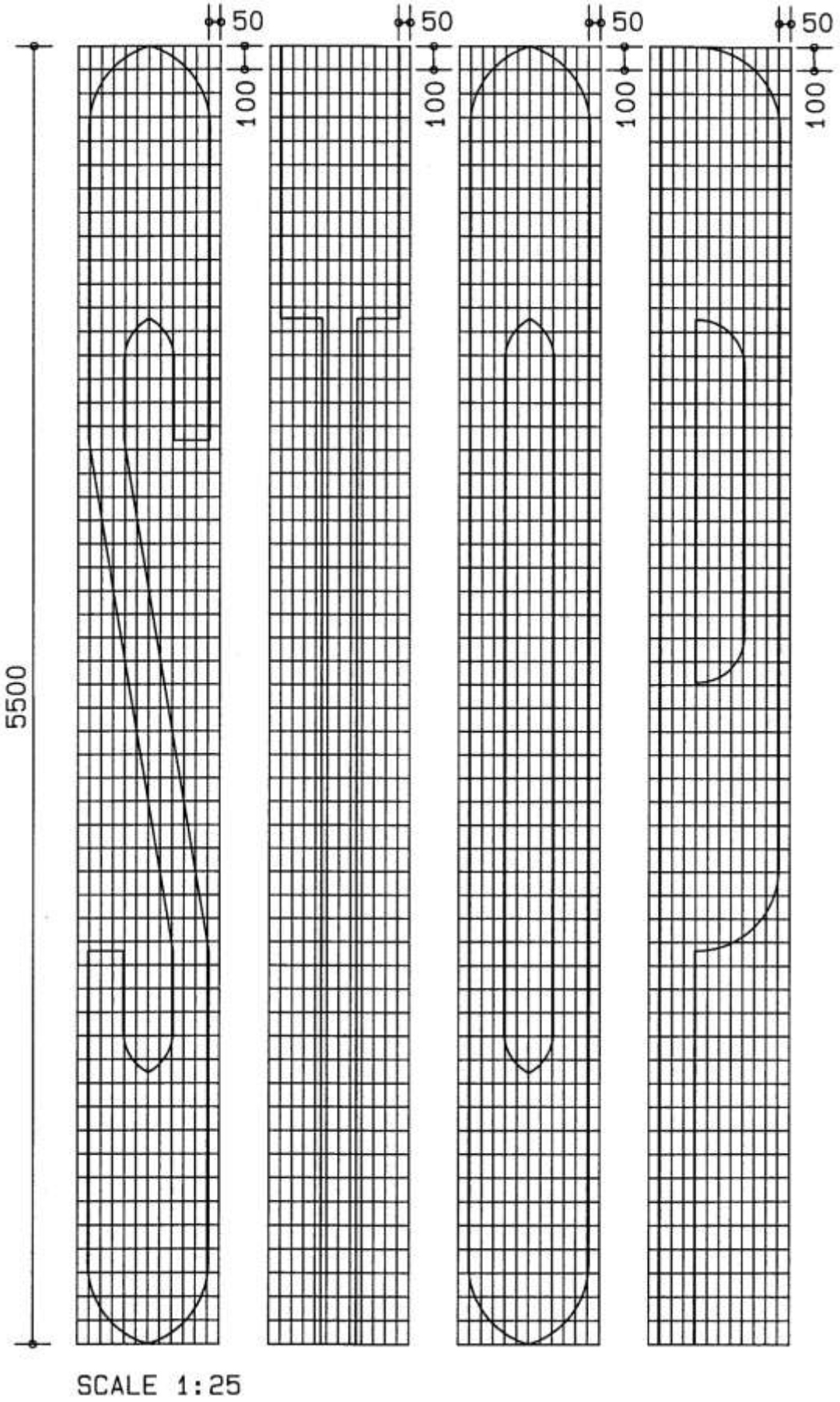

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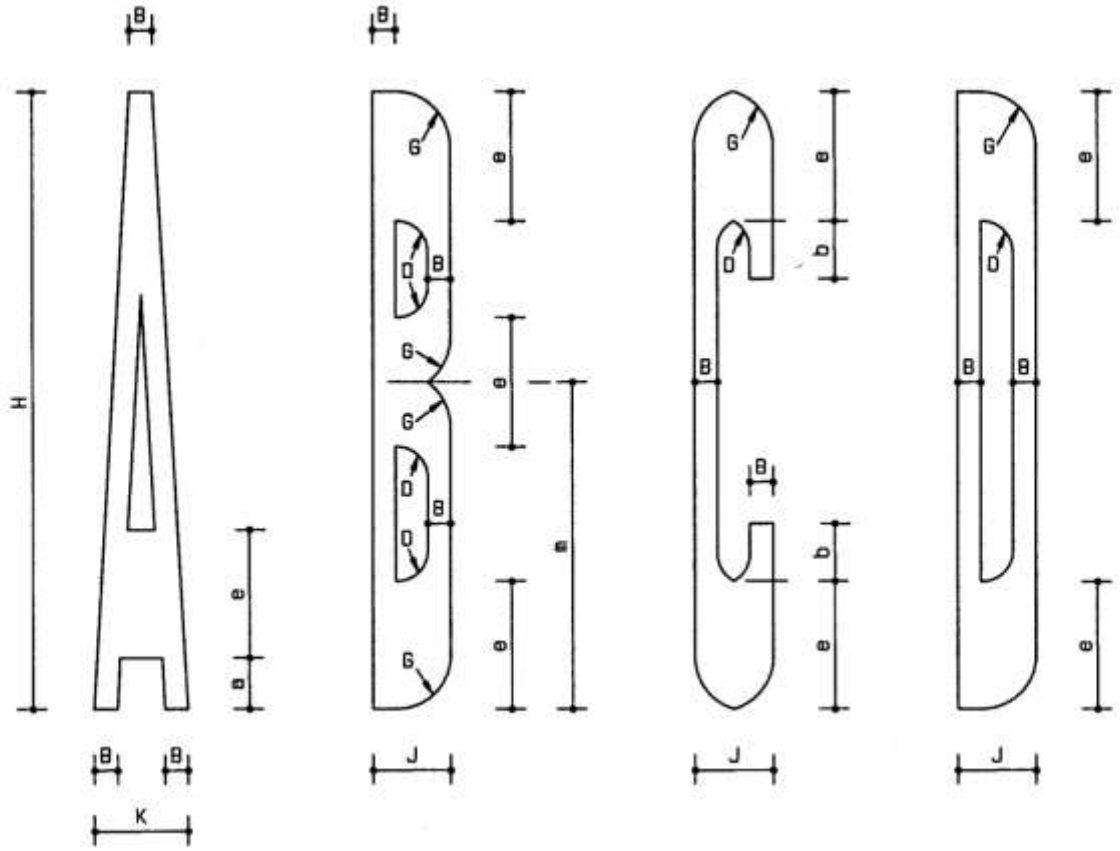
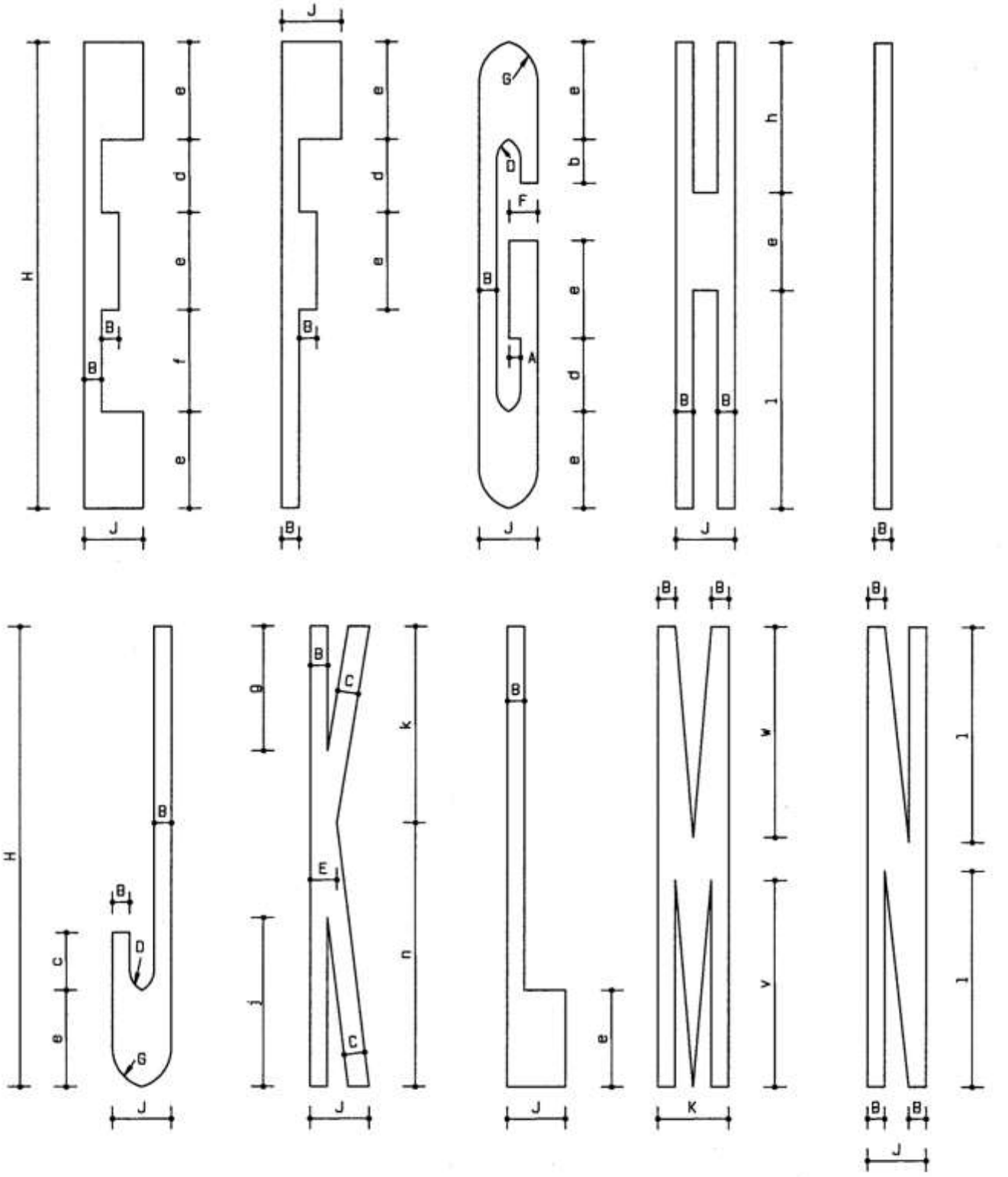
Fig 2.123 RM7 – STOP Marking - 2



H	A	a	B	b	C	c	D	d	E	e	F	f	G	g	h	J	j	K	k	l	M
1250	100	150	150	120	180	155	200	195	230	260	250	275	355	310	405	510	465	610	535	585	40
2500	100	210	150	235	180	310	200	390	230	520	250	550	355	625	810	510	935	610	1070	1170	40
4000	100	335	150	375	180	500	200	625	230	835	250	870	355	1085	1290	510	1461	610	1710	1875	40
5500	100	4600	150	515	180	685	200	860	230	1145	250	1205	355	1375	1775	510	2060	610	2350	2580	40
7500	100	630	150	710	180	935	200	1175	230	1560	250	1645	355	2050	2420	510	2760	610	3200	3520	40

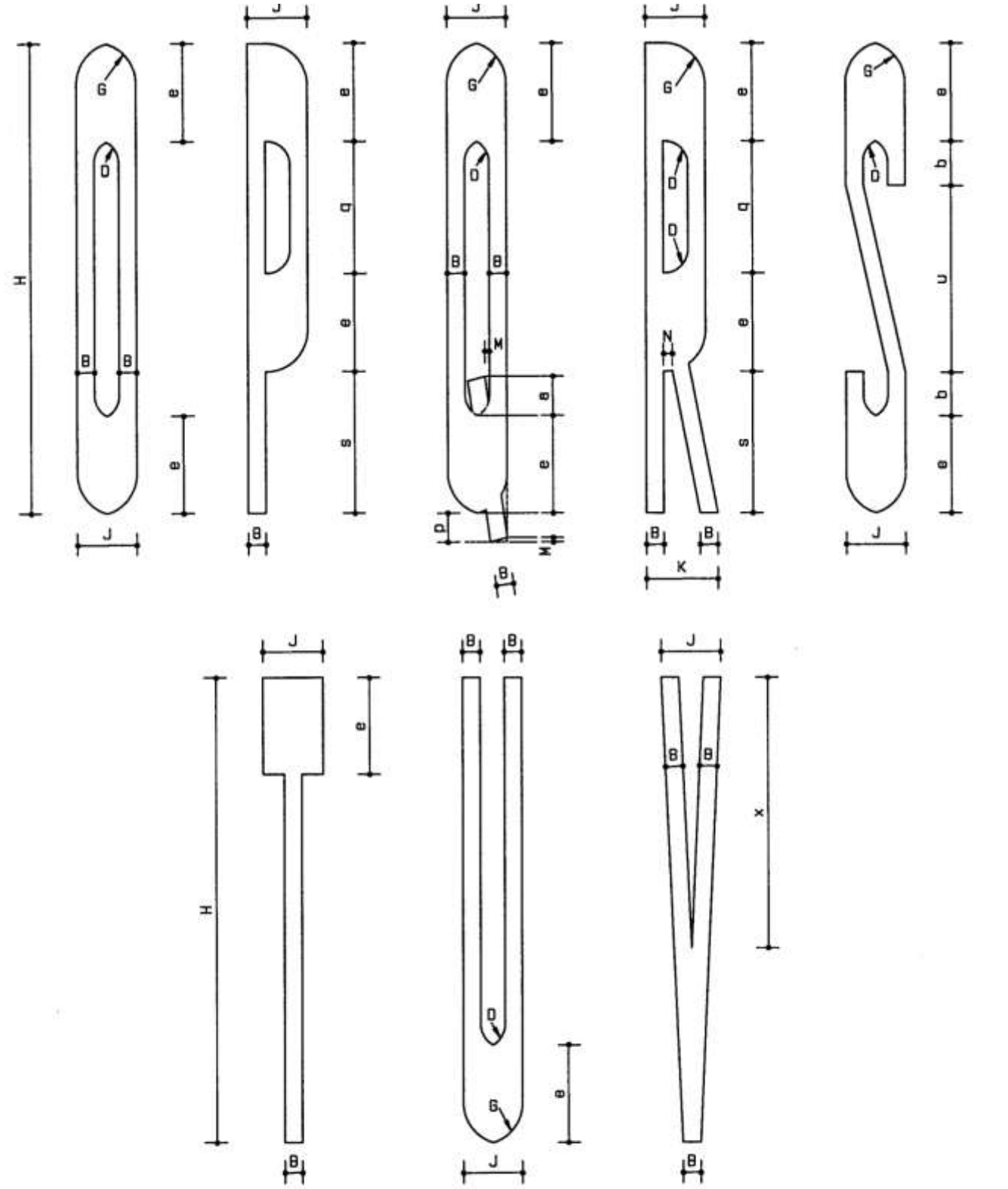
H	m	N	n	o	p	q	r	s	t	u	v	vv	w	ww	x	xx	y	yy	z	zz
1250	665	75	715	90	100	350	365	380	420	495	560	130	575	140	730	170	650	180	610	210
2500	1330	75	1430	185	155	705	730	755	835	990	1120	260	1150	285	1460	340	1300	365	1225	420
4000	2125	75	2290	285	250	1120	1165	1210	1335	1580	1790	415	1835	460	2330	540	2085	580	1955	665
5500	2920	75	3150	405	345	1550	1605	1660	1835	2180	2465	580	2520	630	3210	745	2900	805	2695	905
7500	3980	75	4300	550	470	2125	2190	2265	2765	2960	3360	790	3440	850	4370	1015	3955	1095	3670	1240

Fig 2.124 **GM7 – Letters - 1**



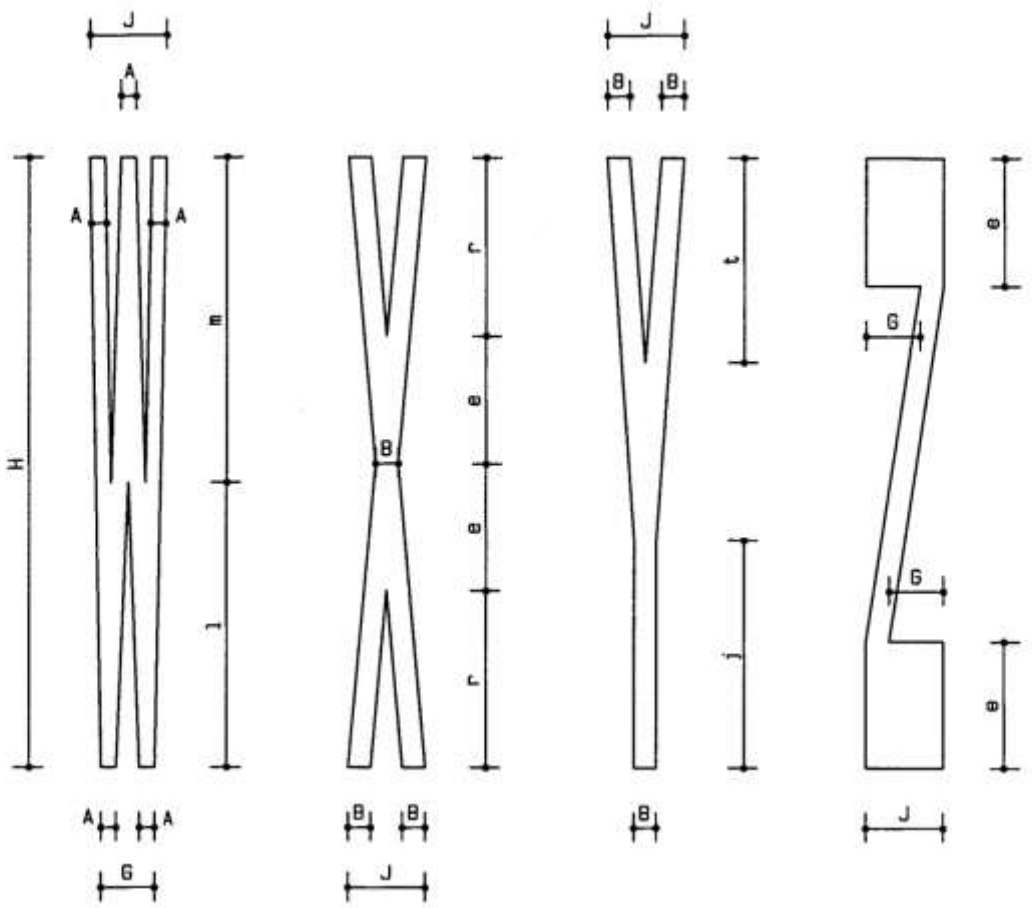
H	A	a	B	b	C	c	D	d	E	e	F	f	G	g	h	J	j	K	k	l	M
1250	100	150	150	120	180	155	200	195	230	260	250	275	355	310	405	510	465	610	535	585	40
2500	100	210	150	235	180	310	200	390	230	520	250	550	355	625	810	510	935	610	1070	1170	40
4000	100	335	150	375	180	500	200	625	230	835	250	870	355	1085	1290	510	1461	610	1710	1875	40
5500	100	4600	150	515	180	685	200	860	230	1145	250	1205	355	1375	1775	510	2060	610	2350	2580	40
7500	100	630	150	710	180	935	200	1175	230	1560	250	1645	355	2050	2420	510	2760	610	3200	3520	40

Fig 2.125 **GM7 – Letters - 2**



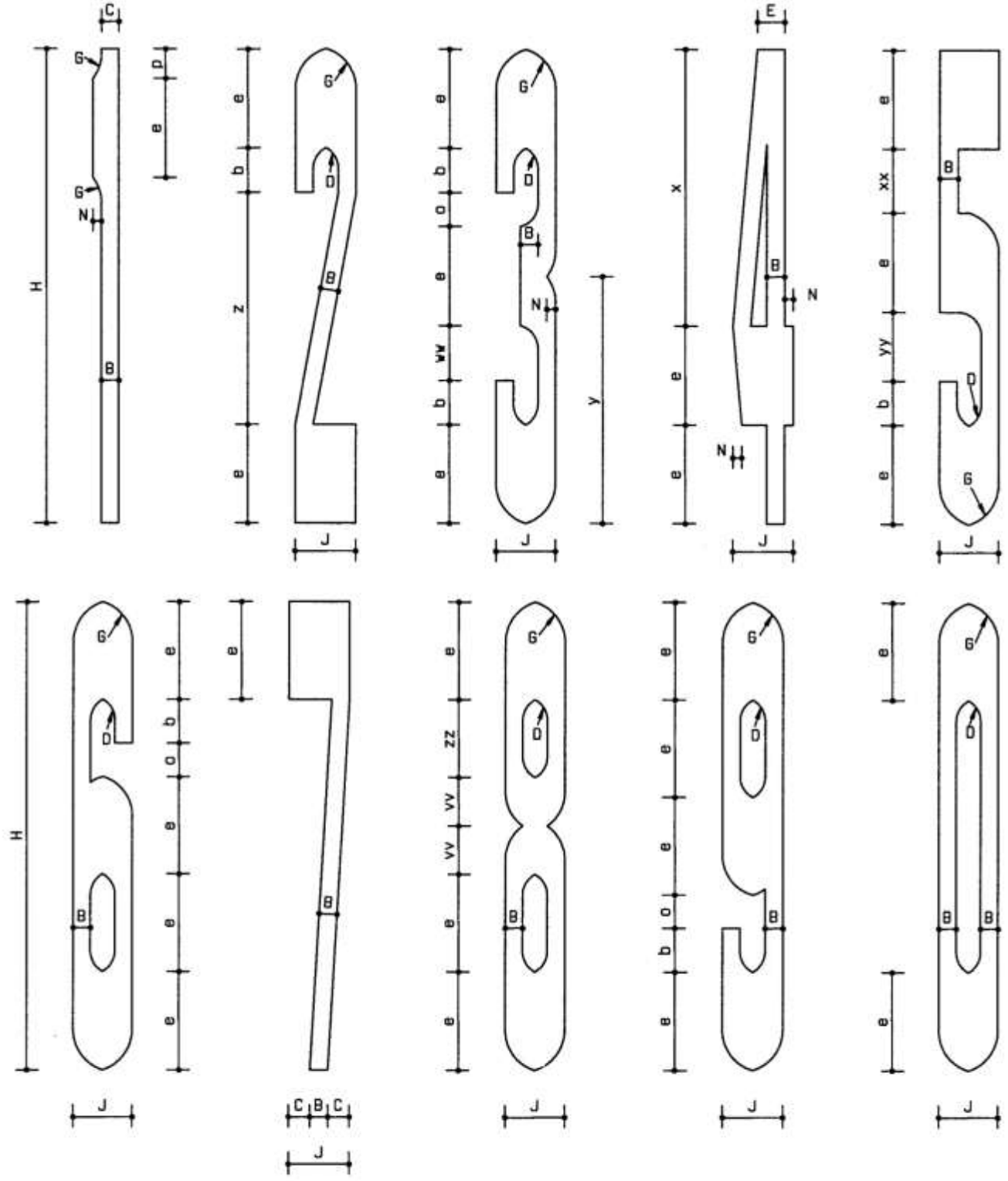
H	m	N	n	o	p	q	r	s	t	u	v	vv	w	ww	x	xx	y	yy	z	zz
1250	665	75	715	90	100	350	365	380	420	495	560	130	575	140	730	170	650	180	610	210
2500	1330	75	1430	185	155	705	730	755	835	990	1120	260	1150	285	1460	340	1300	365	1225	420
4000	2125	75	2290	285	250	1120	1165	1210	1335	1580	1790	415	1835	460	2330	540	2085	580	1955	665
5500	2920	75	3150	405	345	1550	1605	1660	1835	2180	2465	580	2520	630	3210	745	2900	805	2695	905
7500	3980	75	4300	550	470	2125	2190	2265	2765	2960	3360	790	3440	850	4370	1015	3955	1095	3670	1240

Fig 2.126 **GM7 – Letters - 3**



H	A	a	B	b	C	c	D	d	E	e	F	f	G	g	h	J	j	K	k	l	M
1250	100	150	150	120	180	155	200	195	230	260	250	275	355	310	405	510	465	610	535	585	40
2500	100	210	150	235	180	310	200	390	230	520	250	550	355	625	810	510	935	610	1070	1170	40
4000	100	335	150	375	180	500	200	625	230	835	250	870	355	1085	1290	510	1461	610	1710	1875	40
5500	100	4600	150	515	180	685	200	860	230	1145	250	1205	355	1375	1775	510	2060	610	2350	2580	40
7500	100	630	150	710	180	935	200	1175	230	1560	250	1645	355	2050	2420	510	2760	610	3200	3520	40

Fig 2.127 **GM7 – Letters - 4**



H	m	N	n	o	p	q	r	s	t	u	v	vv	w	ww	x	xx	y	yy	z	zz
1250	665	75	715	90	100	350	365	380	420	495	560	130	575	140	730	170	650	180	610	210
2500	1330	75	1430	185	155	705	730	755	835	990	1120	260	1150	285	1460	340	1300	365	1225	420
4000	2125	75	2290	285	250	1120	1165	1210	1335	1580	1790	415	1835	460	2330	540	2085	580	1955	665
5500	2920	75	3150	405	345	1550	1605	1660	1835	2180	2465	580	2520	630	3210	745	2900	805	2695	905
7500	3980	75	4300	550	470	2125	2190	2265	2765	2960	3360	790	3440	850	4370	1015	3955	1095	3670	1240

Fig 2.128 **GM7 – Letters - 5**

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REGULATORY AND WARNING SIGNS AND MARKING APPLICATIONS

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3.2 Signing Applications in Rural Situations

3.3 Signing Applications in Urban Situations

3.4 Signing Applications for Parking Control

3.5 Temporary Signing Applications

3.6 Enhanced Standard Details

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CHAPTER 3

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CHAPTER 3:
REGULATORY AND WARNING SIGNS AND MARKINGS APPLICATIONS

3.1 INTRODUCTION

3.1.1 General

1 The provision of regulatory and warning signs and road markings is appropriate in a wide variety of situations. Many circumstances require a number of regulatory signs and markings, or regulatory and warning signs and markings, in combination or in sequence, in order to adequately transfer the required information to drivers. It is the purpose of this chapter to illustrate such typical situations.

The examples given are not meant to be exhaustive and the practitioner must be acquainted with actual conditions and apply discretion as may be required within the framework of the Act and the Regulations.

2 Many regulatory and warning sign and marking applications are specific to particular subject areas. There is potential for overlap or duplication between these subject areas. This has been avoided to the greatest possible extent by the allocation of specific signing subjects to their own chapters within this Volume of the Manual. The following subjects, dealing commonly with the application of regulatory and warning signs and markings, will not be covered in this chapter but in those indicated below:

(a) Chapter 2: Road Marking Applications;

(b) Chapter 5: Freeway Signing;

(c) Chapter 6: Toll Route Signing - with particular reference to the regulatory and warning signing and marking of interchanges, ramps and toll plazas;

(d) Chapter 7: Signing at Railway Crossings;

(e) Chapter 8: Public Transport Signing;

(f) Chapter 10: Rural Junction Signing;

(g) Chapter 11: Signing for Heavy Vehicles;

(h) Chapter 12: Signing for Traffic Calming;

(i) Chapter 13: Roadworks Signing;

(j) Chapter 14: Signing for Pedestrian Environments;

(k) Chapter 19: Variable Message Signs.

3 There is particular scope for overlap between the contents of some sections of this chapter and some sections of Chapter 2. In order to minimise the effects of any duplication this chapter covers the signs and markings appropriate to various levels of **intersection** whereas Chapter 2 tends to deal with the treatment of road markings, and where appropriate road signs, on **sections of roads between** intersections. The positions of various regulatory and warning signs will be repeated in Chapter 2 figures but the actual signfaces will not normally be illustrated.

3.1.2 General Legal Requirements

1 There are many legal requirements which relate to the display, in particular, of regulatory signs. These requirements are contained in the Road Traffic Act, Act 93 of 1996 and the Regulations to the Act, as amended from time to time.

2 Sections of the Act and Regulations of particular relevance, and their coverage, are as follows:

(a) Act: Chapter IX - Road Traffic Signs and General Speed Limits - Sections 56 to 60;

(b) Regulations: Chapter X - Rules of the Road - Sections 296 to 323;

(c) Regulations : Chapter IX - Matters Relating to Road Traffic Signs and General Speed Limits - Sections 284 to 295;

(d) Regulations : Schedule 3;

(e) Definitions

(i) in Section 1 of the Act;

(ii) in Section 1 of the Regulations;

(iii) in Regulation 284 (only valid in respect of road traffic signs).

3 It is strongly recommended that anyone specialising in the provision of regulatory and warning signs and markings, or who requires to provide for such signs or markings for a situation which they have not previously had to deal with, should become familiar with all sections of the legislation noted above.

3.1.3 Size Requirements

1 The minimum legal external dimensions of regulatory and warning signs are laid down, in relation to the speed limit of the road on which they are to be erected, in Regulation 286. The main requirements are summarised in Table 3.1, but for complete details refer to Regulation 286.

2 The minimum width of any longitudinal regulatory or warning road marking is specified in Regulation 286 as 100 mm, with a tolerance of 10% below such a minimum. Additional legal road marking dimensional requirements are summarised in Table 3.2. Many longitudinal road markings are, however, recommended to be used at widths in excess of the minimum 100 mm. The more relevant of these are given in Table 3.3 and full details are given in Volume 4 Table 12.1.

3.1.4 Colour Requirements

1 Regulation 286A also requires road traffic signs to comply with SABS colour specifications as follows:

(a) Road Signs - SANS 1519-1:2006 and 1519-2:2004;

(b) Road Marking Materials - SANS 1091:2004;

(c) Roadstuds - SANS 1442:2008.

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2 Specifications for the supply of regulatory and warning road signs and road markings should require general adherence to these SABS specifications, including the colour requirements. It should be noted, however, that Regulation 286 also states that failure of a sign to conform to the colours specified does not affect the legal validity of such a sign, in the absence of proof of prejudice.

3 It should also be noted that it is normal for standard specifications to be subject to revision and that any reference to a standard is deemed to be a reference to the latest edition of the standard. Other standards which are relevant with regard to the colour specification of road marking paints, including red road marking paint, are:

(a) SANS 731-1:2006 and 731-2:2006 Road and runway markings;

(b) BS381C: Specification for colours for identification, coding and special purposes.

3.1.5 Material Requirements

1 Schedule 3 to the Regulations requires that all control, command, prohibition and comprehensive regulatory signs and all warning signs be fully retroreflective (with the exception of any black text or symbols which are required to be semi-matt).

2 Rectangular reservation and parking reservation regulatory signs may optionally be specified with a semi-matt signface.

3 The specifications listed in Subsection 3.1.4 also have relevance to road sign and road marking materials including road marking paint used for the obliteration of other road markings (SANS 731-1:2006/731-2:2004 and SANS 1091:2004).

3.1.6 Symbols

1 The symbols used on regulatory and warning signs are registered by inclusion in Schedule 3 of the Regulations to the Road Traffic Act. As such they may only be varied in shape within fine manufacturing tolerances and symbols not registered by inclusion in the Regulations shall not be used on regulatory or warning signs.

2 If a need arises for a regulatory or warning message which is not catered for by symbol the appropriate message should be indicated in words within the sign in black semi-matt DIN 1451 letters of the style and size permitted by the space available in relation to the operating speed of the road, the sign size and the sign position. The effectiveness of a chosen letter size may be checked according to the rules given in Section 4.4 of Volume 1 or by means of the nomograms in that section. A minimum letter size of 70 mm should be adhered to. The number of words used in such a message should be limited to a maximum of three if at all possible. Examples of such signs are given in Volume 4, Chapters 2 and 3, together with recommended minimum letter sizes for different standard sign sizes.

3.1.7 Placement of Road Signs and Markings

1 Guidelines for the placement of road signs are covered in detail in Volume 1, Section 1.6. It is desirable that authorities providing regulatory and warning signs place them according to consistent standards which lie within the range of the stated guidelines. Standard sign positions need to be specified in three ways:

(a) longitudinally;

(b) laterally;

(c) vertically.

2 Regulatory signs are normally located at, or as close as is practical to, their point of application. As such they generally apply either at a point (STOP sign R1), or from the point onwards, until altered by another similar sign (SPEED LIMIT sign R201). Certain regulatory signs have specific longitudinal limits to their applicability whilst others need to be repeated at regular intervals eg. NO OVERTAKING signs R214 and R215 are only applicable for a distance of 500 m beyond the signs. For further details see Volume 1.

3 The function of triangular warning signs is that of **advance** warning. They should therefore be placed an adequate longitudinal distance in advance of the hazard to which they relate so that drivers have time to act accordingly (but not so far that they forget the message before reaching the hazard). Table 3.4 indicates recommended positions for advance warning signs based on a zero or almost zero speed at the hazard. These distances may be shortened if the hazard may be negotiated at some speed. For more detail refer to Volume 1, Section 1.6 and Chapter 3.

4 Hazard marker warning signs, as their name implies, should only be used to mark identified hazards.

5 Table 3.4 also includes recommended lateral and vertical regulatory and warning sign positions.

6 It is important to ensure that those practitioners actually siting and erecting signs, whilst adhering to the basic standards, are aware of circumstances under which these standards should be varied, and that they do not adhere slavishly to standards at the expense of effective signing. These people must be trained to look around the site of a sign to observe potential problems and to think out realistic solutions, on which they must take the initiative. This applies particularly to the obstruction of one sign by another, and relates also to signs which are being replaced or superseded by new signs. **Under such circumstances the work instruction must include a requirement to remove the old sign**. Examples of typical problem situations are covered in Figures 1.15 and 1.16 in Volume 1, Chapter 1, Section 1.6.

3.1.8 STOP versus YIELD

1 The majority of road junctions are controlled by one of the variants of STOP sign R1 or YIELD sign R2. The decision as to which sign to use is commonly made on policy grounds but can be made based on the available sight distance. It is generally recommended in Volume 1 that if adequate sight distance is available a YIELD sign should be used in preference to a STOP sign.

Details of the sight distance requirements for the two signs are given in Figure 3.1.

(continued on page 3.1.6)

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TABLE 3.1 **BASIC MINIMUM DIMENSIONS FOR REGULATORY AND WARNING SIGNS (Refer to Regulation 409)** **TABLE 3.1**

Road Sign Dimension Parameter	Road Sign Type	Dimension (mm) Speed Limit (km/h) 0 - 60	61 - 80	81 - 100	101 - 120	Comments or Permitted Variations
Diameter	**Circular Regulatory**					
	Parking and Stopping	450	900	1200	1200	
	General	600	900	1200	1200	Pedestrians: 300 Cyclists: 300 Keep Left (Bollard) 300
	Overhead	900	1200	1200	1600	
	STOP sign R1	600	900	1200	1200	Scholar patrol: 450
Side Length	**Triangular Regulatory and Advance Warning**	900	1200	1200	1500	
HeightxWidth	**Rectangular Regulatory**					
	Parking and Stopping	445x338	900x675	1200x900	1200x900	
	Bus and Minibus Stop	450x225	600x300	800x400	900x450	
	General	600x450	900x675	1200x900	1200x900	
	R4	450x600				ONE WAY sign
	R1.3 and R1.4	Square equal to one side of sign R1				3 & 4 WAY STOP sign
	R2.1	300x225	450x338	600x450	750x563	
	Overhead	900x675	1200x900	1200x900	1600x1200	
	Secondary message	Length equal to diameter or width of primary sign				
	Special Examples					
Side Length	R5	450				PEDESTRIAN PRIORITY
HeightxWidth	W401 and W402	600x150	600x150	800x200	800x200	
Diagonal	W403 and W404	800	1200	1200	1200	
Height	W405 to W410	450	450	600	600	Length = “n” x ht (1)
HeightxWidth	W411 and TW411	200x1200	300x1800	400x2400	400x2400	
HeightxWidth	TW412	450x900	600x1200	600x1200		

NOTES:

(1) “n” is the number of W405 or W406 modules which make up the W407 to W410 signs. Sign W409 when used with a GD2 sign must be the same length as the GD2 sign.
(2) The above dimensions apply to all temporary sign series as well as permanent signs

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TABLE 3.2	MINIMUM LEGAL DIMENSIONS FOR ROAD MARKINGS			TABLE 3.2
Dimension Parameter	Road Marking Type	Dimensions (mm) Urban	Rural	Comments
Width	Longitudinal Lines	100	100	
Length	Continuous Longitudinal Lines	9000	12000	
Width	STOP line RTM1	300	500	
	YIELD line RTM2	200	300	
	BLOCK PEDESTRIAN CROSSING RTM4	2400	2400	
	BICYCLE GUIDE LINES GM5	300	300	
	Any other transverse line	100	100	

NOTE:
(1) Although the minimum width of a longitudinal road marking shall not be less than 100 mm (subject to tolerance), many types of longitudinal line are recommended to be marked at a greater width – see Table 3.3.

TABLE 3.3	RECOMMENDED WIDTHS FOR LONGITUDINAL ROAD MARKINGS			TABLE 3.3
Road Marking Type	Recommended Width (mm) Urban	Rural	Comment	
NO OVERTAKING LINE RM1	150	150		
NO CROSSING LINES RM2	2 x 150	2 x 150	With 150 space	
CHANNELISING LINE RM3	200	300		
LEFT EDGE LINE RM4.1	150	150		
RIGHT EDGE LINE RM4.2	150	150		
BUS, CYCLE, HOV LANE LINE RM9	150	-		
NO STOPPING LINE RM12	150	150		
NO PARKING LINE RM13	100	100		
CONTINUITY LINE WM2	200	300		
DIVIDING LINE WM3	150	150		
REVERSIBLE LANE LINES WM4	2 x 100	2 x 100	With 100 space	
LANE LINE GM1	100	100		
GUIDE LINE GM2	100	100		

NOTES:

(1) See Table 3.2 for minimum legal widths of longitudinal markings.
(2) See Volume 4, Table 12.1 for more details.

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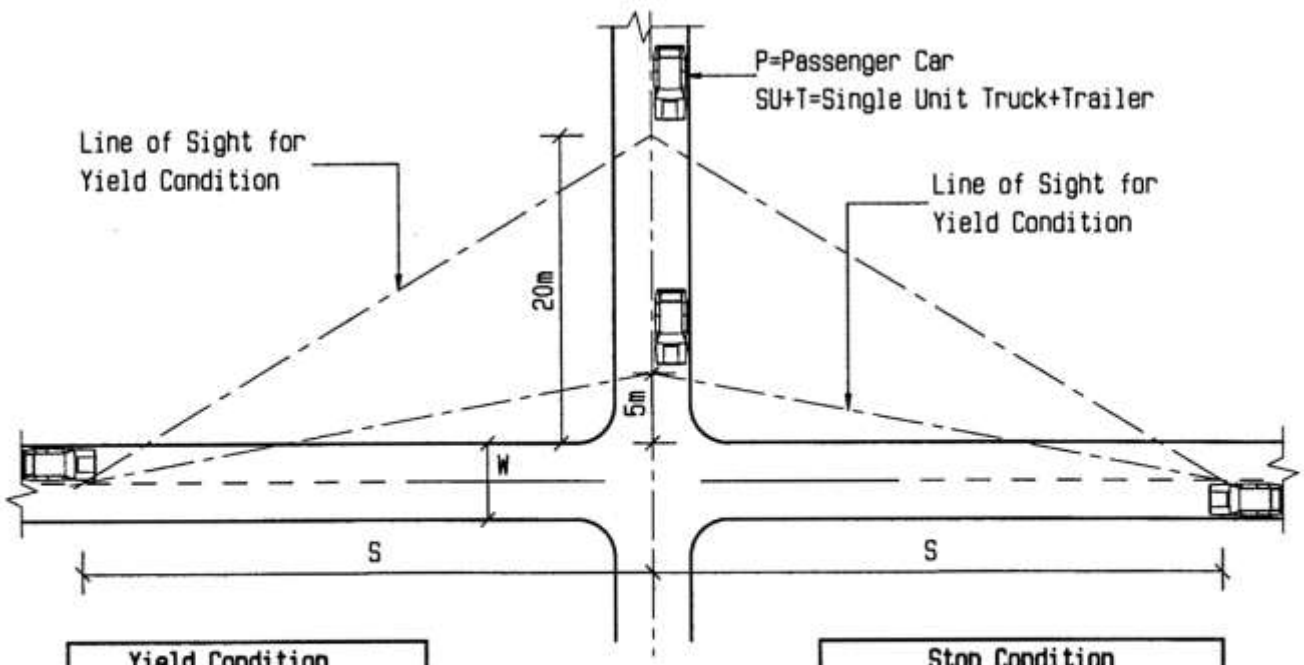
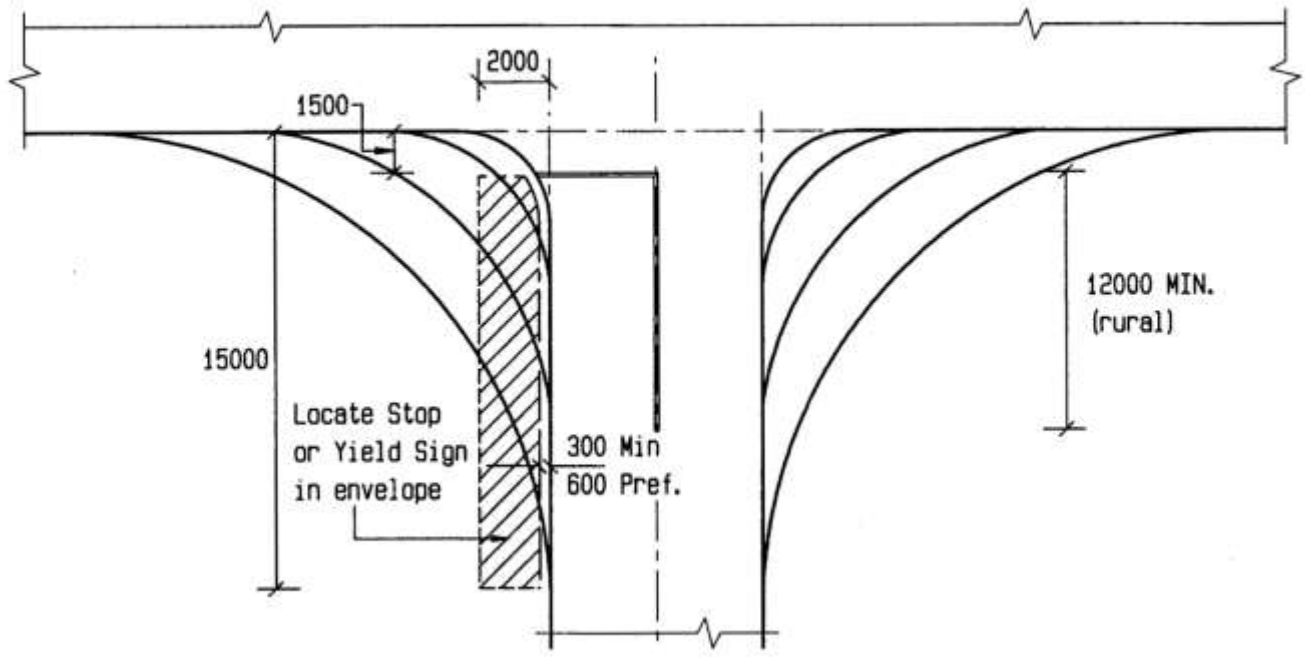


Yield Condition		
Speed-main Road (km/h)	S (m) P	SU+T
60	95	140
80	130	185
100	155	230
120	190	280

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

Detail 3.1.1 Basic Sight Distance Criteria (Ref: Volume 1 - Chapter 2)



Detail 3.1.2 Position of Stop or Yield Signs

Fig 3.1 Junction Sight Distance Consideration

2 Notwithstanding the placing information given in Sub-section 3.1.7 the position of a R1 or R2 sign is often affected by the geometry of the road junction and particularly by the corner radius. Details of a recommended placing "envelope" for R1 and R2 signs are given in Figure 3.1.

3.1.9 Basic Effects of Act and Regulations

1 As noted in paragraph 3.1.2.3 it is essential that regulatory and warning signs and markings practitioners understand the basic effects of the Road Traffic Act, Act 93 of 1996, and its Regulations on their activities. The reality is that the relevant aspects of the Act and the Regulations most commonly have their effects before the application of road traffic signs. They therefore represent the base upon which, the use of particularly regulatory signs and markings is built. Many definitions of terms and the "Rules of the Road" are important in this regard. A good understanding of the Act and Regulations also has the potential to minimise the costs of signing and marking as some of the details given in Figure 3.2 illustrate.

2 In the descriptions of the various details, quotations of definitions of terms and of sections of the Act and Regulations are frequently given. These are sometimes only quoted in part. For full information readers should consult the Act itself. Terms which are defined in the Act or regulations are highlighted in bold letters both when a definition is quoted and again if they form part of another definition. The latter is done to highlight the interdependence of certain terms.

3 "Road traffic signs" is a legal term and includes within its definition road signs, road markings and traffic signals. Only "road traffic signs" should be erected within a road reserve. The only signs, markings or signals recognised as "road traffic signs" are prescribed by the Minister of Transport by inclusion in Schedule 3 to the Regulations and the Act. "Road traffic signs" are classified in a hierarchal manner. Signs, markings and signals may be used to regulate, to warn or to guide or inform. Regulatory signs, markings and signals carry the force of law and clearly are the most important. Warning signs, markings and signals have a different importance because of the responsibility on road authorities to see that they are used meaningfully and when necessary in the interests of road safety.

4 Two important terms which have particular relevance to the placing of "parking" signs and on pedestrian rights of way are "intersection" and "junction". Details 3.2.1 and 3.2.2 in Figure 3.2 illustrate the extent of an intersection and a junction. It should be noted that a junction is always likely to be within an intersection. The term "intersection" is defined in the Act and as such has an important bearing on many aspects of traffic legislation. "Intersection" is defined as follows:

"**intersection:** means the area embraced within the prolongation of the lateral boundary lines of two or more **public roads**, open to vehicular traffic, that join one another at any angle, whether or not one such **public road** crosses the other;"

"junction" is defined for signing purposes only in Regulation 284 as follows:

"**junction:** means that portion of an **intersection** contained within the prolongation of the lateral limits of the intersecting **roadways** and such junctions shall include any portion of the roadway between such lateral limits, and any stop or yield line marking which is painted at such intersection;"

5 Detail 3.2.2 includes pedestrian crossing road markings as would be provided at a signalised junction (within an intersection). It is a provision of Regulation 304, *inter alia*, with certain exceptions, that:

".... no person shall stop a vehicle in the **roadway** of a **public road** (other than to comply with a road traffic sign) -

(h) within nine metres of his approaching side of a **pedestrian crossing** demarcated by appropriate road traffic signs;"

This latter provision also applies, through Regulation 305, to parking.

6 In Detail 3.2.2 the relevance of "intersection" is shown in the context of "parking" as covered by Regulation 305. "Parking", in this instance, means "parking" **and** "no parking". Regulation 305 states, *inter alia*, in paragraph (3) that:

"(4) No person shall park a vehicle on the roadway of a public road within an urban area –

(a) within nine metres of the side from which he or she approached a pedestrian crossing demarcated by appropriate road traffic signs, unless such parking is permitted by appropriate road traffic signs;

(b) within five metres of any **intersection** unless such parking is permitted by a road traffic sign;"

This means that it is not necessary to place NO PARKING signs R216 within five metres of the outer limit of an intersection. Attention to this detail can reduce the number of signs required in terms of the provisions of Regulation 288 (see paragraph 3.1.9.10 and Detail 3.2.4).

7 In order to understand better the interaction of various parts of a public road, knowledge of the definitions of the parts is important. The more relevant definitions are listed below and can be correlated with Detail 3.2.3:

"**public road:** means any road, street or thoroughfare, or except for the purposes of Section 88, any other place (whether a thoroughfare or not) which is commonly used by the public or any section thereof or to which the public or any section thereof has a right of access, and includes -

(a) the **verge** of any such road, street or thoroughfare;
(b) any bridge, ferry or drift traversed by such road, street or thoroughfare; and
(c) any other work or object forming part of or connected with or belonging to such road, street or thoroughfare;"

"**roadway:** means that portion of a road, street, or thoroughfare improved, constructed or intended for vehicular traffic which is between the **edges of the roadway;"**

"**edge of roadway:** means the boundary between the **roadway** and the **shoulder**, which is indicated by an appropriate road traffic sign, or in the absence of such sign -

(a) in the case of a road with a bituminous or concrete surface, the edge of such surface; or

(b) in the case of any other road, the edge of the improved part of the road intended for vehicular use;"

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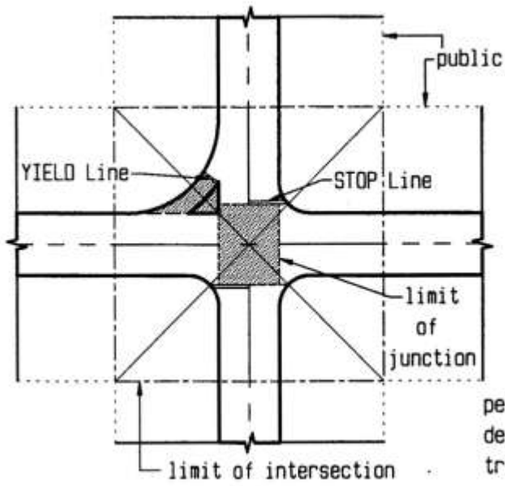
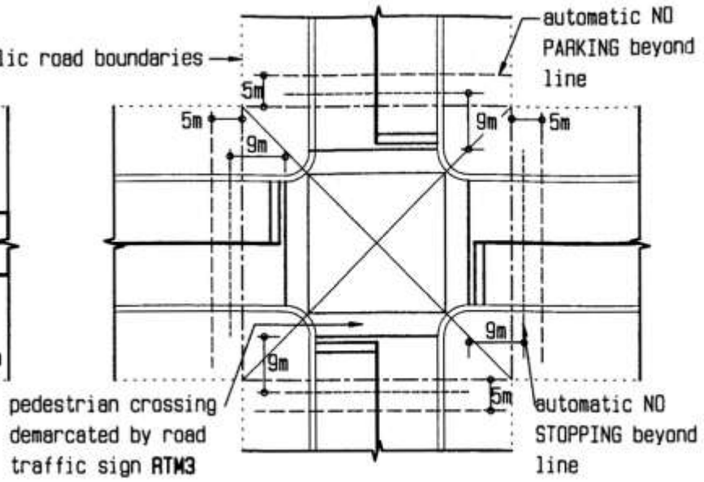
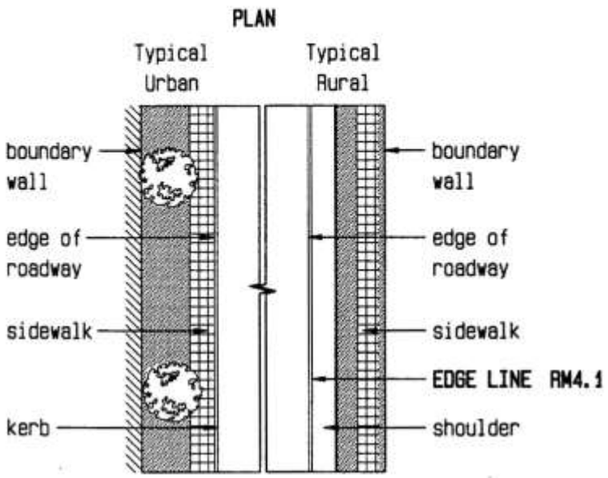


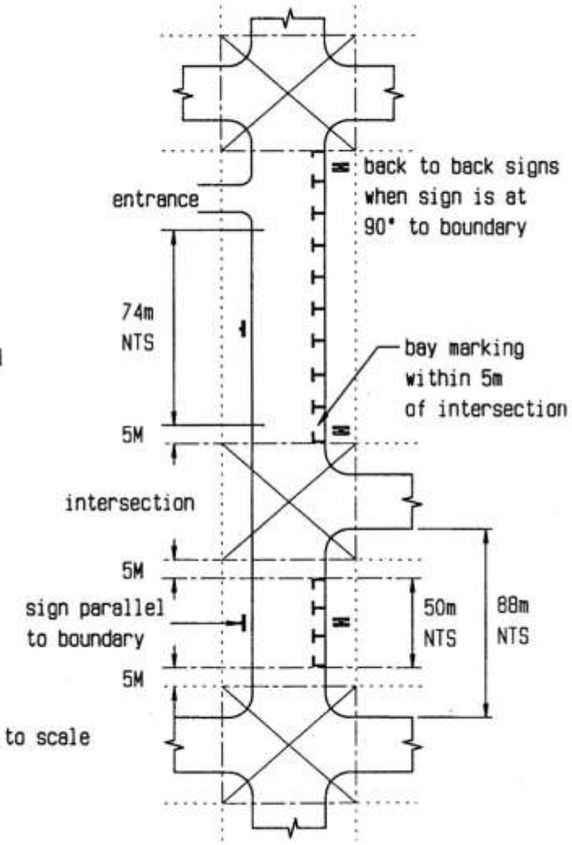
Detail 3.2.1
Limits of Intersection and Junction



Detail 3.2.2
Automatic NO STOPPING and NO PARKING

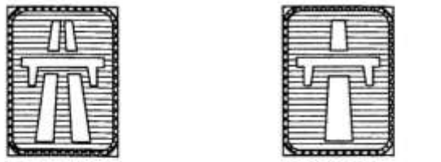


Detail 3.2.3
Anatomy of a Public Road

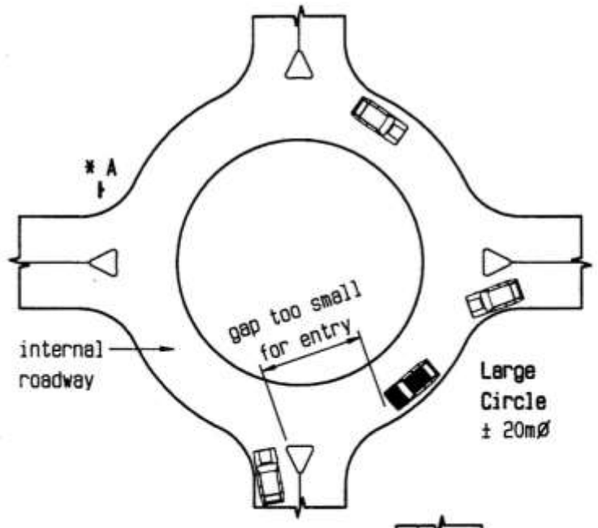


NTS = not to scale

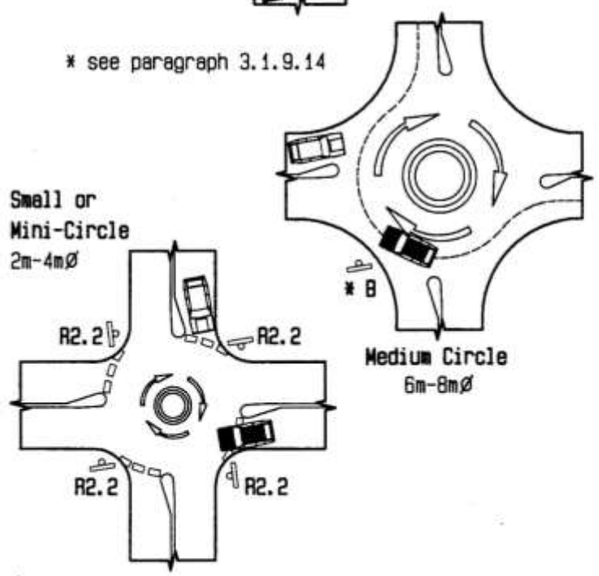
Detail 3.2.4
Requirements for Placing "Parking" Signs



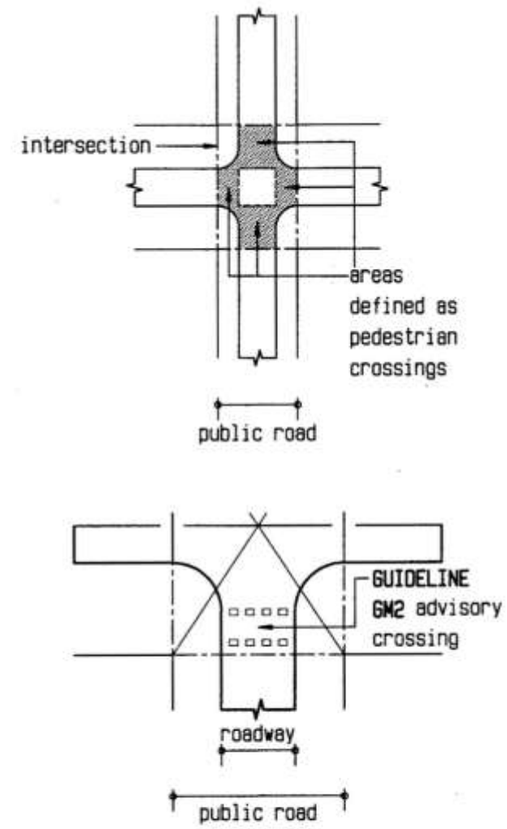
Detail 3.2.5
Designation of a Public Road as a Freeway

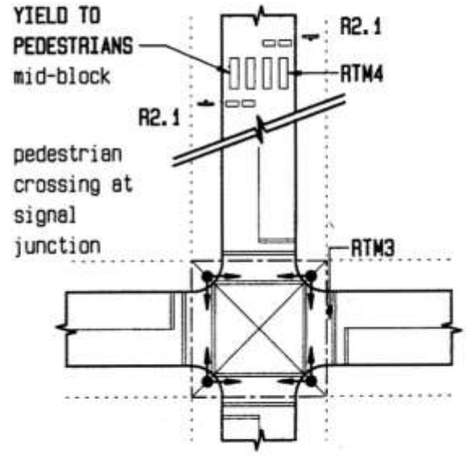


* see paragraph 3.1.9.14



Detail 3.2.6
Right of Way at Traffic Circles





Detail 3.2.7
Pedestrian Crossings

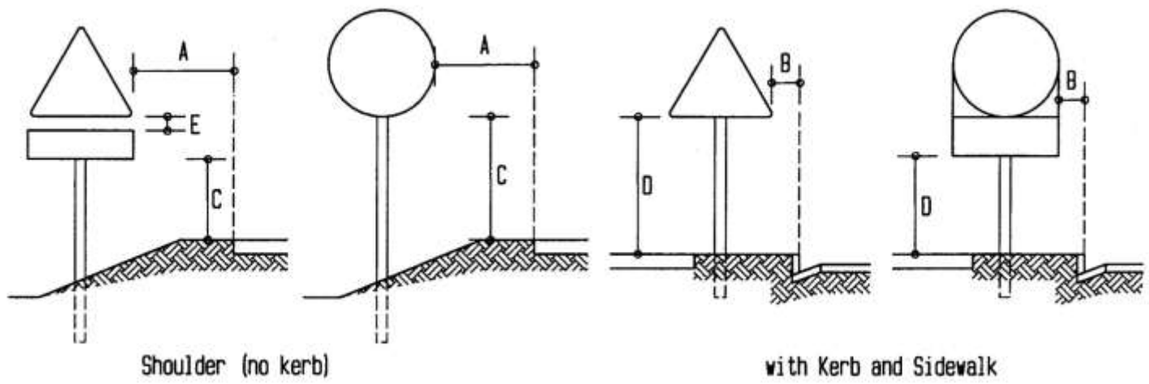
Fig 3.2
Basic Effects of Provisions of the Road Traffic Act and Regulations on Signing and Marking Applications

TABLE 3.4 **RECOMMENDATIONS FOR PLACEMENT OF PERMANENT REGULATORY AND WARNING SIGNS** **TABLE 3.4**

Sign Type	Options	Positions									NOTE
		Longitudinal (m)				Lateral (mm)		Vertical (mm)			
		Approach Speed (km/h)				B	A	D	C	E	
		60	8-	100	120	Urban	Rural	Urban	Rural		(1)
Regulatory	Minimum	At point of application or at regular intervals				600	1200	2100	750		
	Preferred					600	1500	2500	2100		(2)
	Maximum					n/a	2000	3000	2500		
Warning										0-150	
Advance	Minimum	120	150	240	330	600	1200	2100	750		
	Preferred	-	-	-	-	600	1500	2500	1800-2100		(3)(4)
	Maximum	-	-	-	-	n/a	2000	3000	2500		
Hazard Marker											
W401/W402	Minimum	At the hazard				600	600	300	600		
	Maximum					4000	1200	1200	1200		
W405/W406	Minimum	At the hazard				600	1500				
	Maximum					4000	4000	1200	1200		

NOTES:

(1) The letters given in “Lateral” and “Vertical” columns refer to details given below.
(2) A number of regulatory signs have traditionally been mounted at a low level to improve their effectiveness, often at positions where traffic is split into separate paths bt traffic islands – either two-way or one-way movements. Typical of such signs are KEEP LEFT sign R103 and NO U-TURN sign R213. Signs may also occasionally have to be mounted at lower levels to avoid other vertical obstructions.
(3) The longitudinal distances given apply for situations where the hazard is negotiated at zero or almost zero speed. These distances may be shortened for higher negotiating speeds at the hazard. See Figure 3.1 in Volume 1.
(4) Subject to sign support specification the lower limit is not recommended with highly frangible supports.



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"**kerb line:** means the boundary between the **shoulder** and the **verge**;"

"**shoulder:** means that portion of a road, street or thoroughfare between the **edge of roadway** and the **kerb line**;"

"**verge:** means that portion of a road, street or thoroughfare, including the **sidewalk**, which is not the **roadway** or the **shoulder**;"

"**sidewalk:** means that portion of a **verge** intended for the exclusive use of pedestrians;"

8 Regulation 288 deals with stopping and parking of vehicles. As has been noted in paragraphs 3.1.9.5 and 3.1.9.6 these sections cover, amongst other things, some automatic controls on the stopping or parking of vehicles which, therefore, do not require the provision of "parking" signs to be effective for enforcement purposes. (It should be noted, however, that, as is common with such rules, they can be over-ridden by the provision of appropriate road traffic signs.) In addition Regulation 288 also deals with "Signs Regulating Parking". The combined effect of these aspects on the placing of "parking" road signs is illustrated in Detail 3.2.4 and in other figures in Section 3.4. Regulation 288 states, in part, the following:

"(1) A regulatory sign relating to parking of a vehicle shall be displayed at each end and on that side of a portion of public road where the significance of such sign is to be applicable: Provided that -

(a) no **junction** shall be included in any such section of **public road**;

(b) ....

(c) in respect of any section of **public road** which lies between the intersecting **public roads** and which does not exceed 75 metres in length, parking may be prohibited or restricted in such section by displaying only one appropriate sign;

(d) ....

(2) A regulatory sign prohibiting or restricting the stopping of a vehicle, shall be displayed at each end and on that side of the section of **public road** where the significance thereof is to be applicable: provided that -

.... as given in (1)(a) and (1)(c) above;

(3) A regulatory sign relating to the parking or stopping of a vehicle shall, unless it is displayed with the face parallel to the lateral line of the **public road**, display a similar sign on the reverse side."

9 Detail 3.2.4 shows the effects of the judicious collective interpretation of Regulation 288. If the automatic "no parking" within 5 metres of an intersection is applied some sections of roadway may become effectively "less than 75 metres" in length and therefore require only one sign.

In terms of Regulation 288 it is required that "no person shall **park** a vehicle on a **public road** - .... (f) in such a manner as to obstruct any private or public vehicular entrance to such road." This requirement in turn may reduce the "75 metre" sign requirement.

10 In the legal context "parking" includes "no parking" and "no stopping" (prohibition - R200 series) signing and "parking" (restriction - R300 series) signing, including all selective restriction variants of such signs. It is relevant also to note that the definition of "park" given in the Act is as follows:

"**park**: means to keep a vehicle, whether occupied or not, stationary for a period of time longer than is reasonably necessary for the actual loading or unloading of persons or goods, but does not include any such keeping of a vehicle by reason of a cause beyond the control of the person in charge of such vehicle."

11 In terms of Regulation 288 "parking" signs may be placed with the face parallel to the lateral line of a public road, or, by implication, alternatively at 90^{o} to the lateral line of the public road. The regulation requires that in the latter case two signs must be provided each time, mounted back-to-back. The parallel mounting option is therefore the most cost effective system. It should be noted, however, that certain magistrates may require "parking" signs to be mounted at 90^{o} to the road.

12 The definition of a "freeway" given in the Act states:

"**freeway:** means a **public road** or a section of **public road** which has been designated as a freeway by an appropriate road traffic sign." Signs R401 and R402 are the appropriate road traffic signs and they are illustrated in Detail 3.2.5. In terms of the road classification for signing purposes given in Volume 1, Chapter 1 freeways are Class A roads. The class is subdivided into Class A1: Dual Carriageway Freeways designated by sign R401 and Class A2: Single Carriageway Freeways designated by sign R402. Special provisions relating to freeways are dealt with in Regulation 323. A single carriageway freeway may operate with two-way traffic on a two lane or a four lane cross-section, neither of which, by definition, has a median, a central island, a dividing space or a barrier. The rules relating to such a median, a central island, a dividing space or a barrier, as provided on a Class A1 freeway are contained in Regulation 297. These provisions indicate that if a road authority creates an "opening" in such a median an appropriate road traffic sign should be provided to prohibit persons from driving through the opening. When a RIGHT EDGE LINE marking RM4.2 is provided this fulfils the requirement as an appropriate road traffic sign because drivers are precluded from crossing such a line. Figure 5.24 in Chapter 5 gives further details of optional treatment of a median opening for emergency vehicles".

13 The term "traffic circle" is defined for signing purposes in Regulation 284 as follows:

"**traffic circle:** means a **junction** which contains a traffic or painted island, around which a road user shall travel in a clockwise direction."

Mini-circle is not defined and is therefore included in the definition of a "traffic circle". The terms traffic island and painted island are also not defined but TRAFFIC CIRCLE MANDATORY DIRECTION ARROWS marking RM15 includes a form of painted island and this marking reinforces the substance of the definition. It is normal practice to only provide marking RM15 at small to medium sized traffic circles when all three arrows may be visible at the same time. The terms of the definition cover the direction of movement at traffic circles of all sizes, however.

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14 Detail 3.2.6 shows three different sizes of traffic circle and there are further details given in Subsection 3.2.6 (Figure 3.13) and in Subsection 3.3.3 (Figure 3.20). Subsection 3.3.3 in particular goes into detail on the provisions of Section 94 which deals with the "Right of Way at Certain Road Junctions". It is a basic principle of Section 94 that right of way at a traffic circle is established by this rule without the provision of any road traffic signs. In practice this principle is workable for larger circles but becomes more difficult without road traffic signs as circles become smaller. The use of YIELD AT TRAFFIC CIRCLE sign R2.2 is recommended for use at small or mini-circles and its use modifies the rule of the road (see Subsection 3.3.3). The need, or not, for control at larger circles depends on the size of the circle and on traffic volumes, which in turn dictate the size and frequency of gaps in the "internal" traffic flow which allow intersecting vehicles to enter the circle. In Detail 3.2.6 in the large circle example two pairs of vehicles are shown. In the one case the "black" vehicle is so close as to make a yield a likely option for the driver approaching from his left - in other words the gap is too small for entry. The other pair of vehicles, whilst in a similar position are sufficiently far apart for the entering vehicle to proceed, accepting the available gap, without yielding. If traffic movement is such that gaps are commonly small, or marginal, the use of YIELD sign R2 (sign "A") may be considered because the internal "roadway" of the circle can be considered as a roadway in its own right (or that the traffic circle actually consists of four T-junctions). The medium sized circle on the other hand is too small to be considered as separate junctions and if control is required it is recommended that sign R2.2 (sign "B") be used.

15 Since the operation of traffic circles can permit the junction area to be used close to its maximum efficiency it is important that drivers signal their intentions when turning right or left because this may permit another driver to proceed. In terms of Regulation 300 - Driving Signals and Regulation 302 - Procedure When Turning , drivers are required to "... indicate, in the prescribed manner, his intention to turn ...". Clearly failure to do so constitutes an offence. Any authority wishing to use traffic circles successfully is recommended to draw attention to these requirements in any publicity material it prepares.

16 In the Act a "pedestrian crossing" is defined as follows:

"**pedestrian crossing:** means -

(a) that portion of a **public road** at an **intersection** included within the prolongation or connection of the **kerb line** and adjacent boundary line of such road, whether such portion is marked or not; or

(b) any other portion of a **public road** designated as a **pedestrian crossing** by appropriate road traffic signs;"

Detail 3.2.7 shows four options for pedestrian crossings. The upper part of the detail illustrates the provisions of the definition paragraph (a). It should be noted that, technically, with a relatively narrow roadway within a wide road reserve (public road) the legal pedestrian crossings, within which pedestrians have certain rights, are potentially very wide.

17 The central part of Detail 3.2.7 shows the use of guidelines for pedestrians which may usually effectively reduce the width of a potentially wide pedestrian crossing, but which do not comply with paragraph (b) of the definition as "appropriate road traffic signs".The lower part of the detail shows a mid-block pedestrian crossing designated by YIELD TO PEDESTRIAN sign R2.1 and BLOCK PEDESTRIAN CROSSING markings RTM4 and a signalized junction with PEDESTRIAN CROSSING LINE markings RTM3, both of which comply with the requirements of paragraph (b) of the definition. The rights of pedestrians are covered by Regulations 315 and 316. Regulation 315 states that:

"(1) Where a **pedestrian crossing** is situated in conjunction with a robot (traffic signal), a pedestrian shall not enter such crossing except in accordance with the indications of such robot as prescribed;

(2) In circumstances not referred to in subsection (1), the driver of a vehicle shall yield the right of way, slowing down or stopping if need be, to so yield to a pedestrian crossing the **roadway**, within a **pedestrian crossing** when the pedestrian is upon that half of the **roadway** upon which the vehicle is travelling, or when the pedestrian is approaching so closely from the opposite half of the **roadway** as to be in danger; ....."

In terms of the foregoing it is not easy to determine how a pedestrian crossing may be marked at an unsignalised- junction. It is recommended that the use of PEDESTRIAN CROSSING LINE markings RTM3 be reserved for use at signalised junctions. Therefore, if it is required to mark a pedestrian crossing, either in mid-block or at a junction where traffic signals are not installed, it is recommended that BLOCK PEDESTRIAN CROSSING markings RTM4 be used, with or without sign R2.1.

18 In addition to the various terms discussed and defined in earlier paragraphs there are a number of other terms, the significance of which is important to understand. In many instances the significance of a term is related to the significance of some other term included within its definition or statement of meaning. For example the meaning given to NO PARKING sign R216 is:

"Sign R216: indicates to the driver of a vehicle that he shall not **park** his vehicle on any portion of a **public road** where such sign is displayed and that the provisions of Regulation 288(1) are applicable."

The inclusion of "public road" which is a term defined in the Act means that sign R216 is applicable throughout the "public road", including the roadway, shoulders and verges.

19 A shoulder lies between the edge of the roadway and the verge. Many single carriageway roadways have shoulders, the extent of which is indicated by LEFT EDGE LINE marking RM4.1 Dual carriageway roadways commonly have both left and right side shoulders, the latter being indicated by a RIGHT EDGE LINE marking RM4.2. In each case the area on the opposite side of the shoulder from the roadway is verge, so that for the purposes of definition a central median or dividing space is classified as a verge. EDGE LINE markings RM4.1 and RM4.2 have the following significance, given in Schedule 3 of the Regulations:

"Marking RM4.1: indicates to the driver of a vehicle the left edge of the **roadway** and that he shall not drive such vehicle to the left of such marking; and

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Marking RM4.2: indicates to the driver of a vehicle the right edge of the **roadway** and that he shall not drive such vehicle to the right of such marking or cross such marking."

20 Control over driving on a shoulder is covered by Regulation 298A, which states:

"(1) Subject to subsection (2) .... no person shall drive a motor vehicle on the **shoulder** of a **public road.**

(2) Notwithstanding the provisions of subsection (1), the driver of a motor vehicle may, during the period between sunrise and sunset, drive such motor vehicle on the **shoulder** of a **public road** which is designated for one lane of traffic in each direction -

(a) while such motor vehicle is being overtaken by another vehicle; and

(b) if he or she can do so without endangering himself or herself, other traffic, pedestrians or property on such **public road**; and

(c) if persons and vehicles upon the **public road** are clearly discernible at a distance of at least 150 metres."

It should be noted the option to drive on a shoulder does not extend to public roads with more than two lanes, nor to the hours of darkness. This provision places an obligation on road authorities to inspect relevant shoulders for possible obstructions (see Figure 3.43).

21 The following are brief references to other important sections of legislation for those involved with regulatory and warning signs:

(a) Minister may prescribe road traffic signs - Act: Section 56;

(b) Authority to display road traffic sign - Act: Section 57;

(c) Speed Limits - Act: Section 59 and Regulations 292 and 293;

(d) Reverse side of a STOP sign R1 shall be white - Regulation 286A (4);

(e) Minimum dimensions for road traffic signs - Regulation 286 (1) to (4);

(f) if two signs appear to be in conflict a temporary sign shall take precedence over any other sign - Regulation 287(5)(a);

(g) A bus, midi-bus or mini-bus stop sign shall take precedence over a parking or stopping sign - Regulation 287(5)(c).

3.1.10 Figure/Drawing Codes

1 The drawings in this chapter are limited in their ability to convey information by the A4, and even the A3, page formats. For this reason, in depth detail of road marking dimensions has been limited. This information can be found in Chapter 2: *Road Markings*. This refers particularly to recommended line widths for longitudinal markings.

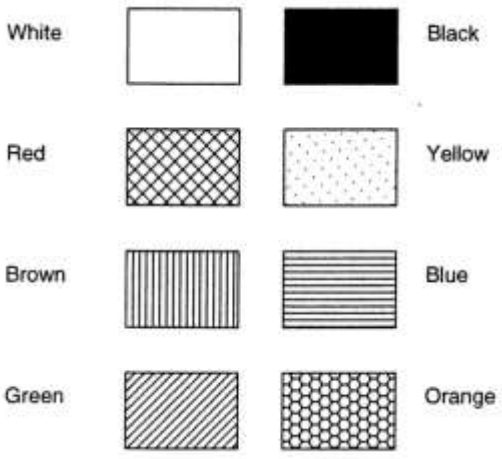
2 Whilst every effort has been made to make these figures as clear as possible in some instances the pressure for information is great. In order to demonstrate a point a geometric detail of a roadway and/or junction is commonly required. The figures must not be seen as geometric design details, however, but as representations of the combined application of many signs and markings. It is also not possible for all such figures to conform to all road authority practices since there are significant variations in practice between local authorities.

3 A road marking which has been in use for many years, KERBFACE marking GM8, has been formally introduced as a type of road marking "road traffic sign". This is illustrated in all figures in which it is used by a short frequency, equal length, black and white pattern. The marking is most commonly used on corner kerbing.

4 In many of the urban figures the level of detail is difficult to portray with great clarity. In particular, at the relative "scales" of the figures, it can be difficult to differentiate between marking GM8 and the broken line versions of markings RM12 and RM13. NO STOPPING marking RM12 and NO PARKING marking RM12 may be applied in a broken line when their function is only a part-time one. These markings are coded as long shaded lines with short breaks and are never shown round a corner radius.

5 The chapters of Volume 2 of the South African Road Traffic Signs Manual (SARTSM) are not prepared in colour. Relevant examples used to illustrate appropriate signs, signals and markings are shaded in a black and white coding which is illustrated below.

6 The basic principles of the road traffic sign colour coding system are shown, in colour, in the SADC-RTSM Volume 1, Chapter 1, Section 1.4, and in the Contents sections of relevant Volume 1 and 4 Chapters.



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3.2 SIGNING AND MARKING APPLICATIONS IN RURAL SITUATIONS

3.2.1 General

1 The examples covered in this section represent very general regulatory and warning sign and marking applications. They have been classified as rural because they will frequently occur in rural situations, however, many of them may occur in almost any type of road environment.

2 Figures 3.3 to 3.7 illustrate a range of typical rural road junctions. The details in these figures are graded from the simplest junctions such as private or farm accesses up to junctions between dual carriageways. **The general principle which has been applied throughout the details is one of attempting to make the positions of junctions clearly identifiable to approaching drivers, even at night.**

3 Figures 3.8 to 3.12 deal with a variety of regulatory and/or warning situations which may occur on sections of rural road. Many other specific situations are possible. The principles of the examples given should be noted and applied to more specific situations when required.

4 Figures 3.13 and 3.14 give some coverage of less common types of rural junction.

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3.2.2 Typical Minor Rural Road Junctions

1 The following comments refer to Figures 3.3, 3.4 and 3.5. Comments on larger rural junctions are given in Subsection 3.2.3.

2 Figures 3.3, 3.4 and 3.5 include examples of six typical minor rural road junctions graded from simplest to more complex. Many other junction configurations are possible but the majority will include features covered in the six examples. The provision of regulatory and warning signs and markings for specific junction types should therefore be evolved from the examples illustrated. If for example the situation illustrated in Detail 3.3.2 actually occurred on a road with surfaced shoulders the treatment of the shoulder markings in the vicinity of the junction should be essentially as illustrated in Detail 3.3.1.

3 The details given in the figures in this subsection are related to the physical features of the junctions illustrated and not *per se* to the classes of roads involved. For example Details 3.3.1 and 3.3.2 are appropriate whether the through road is Class D, C or B and the intersecting side road is Class E, D or C.

4 The principles illustrated for gravel intersecting side roads are that:

(a) if the through road has surfaced shoulders and/or edge line markings the presence of the side road or access is identified by the shoulder or edge line treatment - what happens to the "dividing line" is dependent on the need or otherwise for the use of a NO OVERTAKING LINE RM1, according to the warrants appropriate for the use of such a line;

(b) if the through road does not have surfaced shoulders, or an edge line marking, the presence of the side road or access needs to be identified by the "dividing line" treatment in one of the following ways:

(i) if the dividing line between opposing streams of traffic is indicated by a NO OVERTAKING LINE RM1 (or NO CROSSING LINES RM2) the line should be broken at the junction as indicated in Detail 3.3.2;

(ii) if the dividing line between opposing streams of traffic is indicated by a DIVIDING LINE WM3, an 80 m to 140 m length of NO OVERTAKING LINE RM1, broken at the junction by a section of DIVIDING LINE WM3 may be introduced, as illustrated in Figure 3.4.

5 Detail 3.3.1 shows a gated access. In such circumstances it will not normally be necessary to provide a STOP sign R1 or a YIELD sign R2 since drivers entering the through road will have to stop at the gate.

6 Figures 3.5 and 3.6 illustrate situations where the volume of turning traffic has warranted separation of traffic on the through road into two lanes in one direction. If it is required that one of these lanes becomes dedicated to turning traffic only, then the road marking may be varied as follows:

(a) **for a left turn** - by a demarcation of the left hand lane by 200 mm wide CONTINUITY LINE WM2 and CHANNELISING LINE RM3 on the left side of the through lane (or through and right turn shared lane), with arrow markings as appropriate;

(b) **for right and left turns** - by the provision of shared lanes indicated by the appropriate MANDATORY DIRECTION ARROWS RM8 (yellow) and MANDATORY DIRECTION AHEAD ARROWS WM7 (white) - see Figure 3.5;

(c) **for a right turn** - by the introduction of a painted island to divert all traffic into the other lane and by the use of 200 mm wide CONTINUITY LINE WM2 and CHANNELISING LINE RM3 on the right side of this through lane (or through and left turn shared lane), with arrow markings as appropriate (as shown in Figure 3.6.

7 When a shoulder extension or lane extension is demarcated through a junction by a CONTINUITY LINE WM2, or a LANE LINE GM1, it is recommended that these lines be dropped over the length of the return taper on the exit side of the junction **when the space to the left of these lines is wide enough to accommodate a vehicle** (see Figures 3.4 and 3.5).

8 If such a junction is on a Class B road the provision of directions signs GD1 and/or GD2 may be warranted according to local policies. When these signs are provided the warning signs illustrated in these details may be omitted. However, if the GD1 and/or GD2 signs **do not include sign stacks for all turn directions** an appropriate advance warning sign **shall** be provided a distance Vm in advance of the junction or sign GD1 when such is provided, where "V" is the operating speed of the road (see Chapter 10 for further details).

Checklist

- ❖ has some provision been made in the edge or dividing line treatment of the road markings to indicate the presence of a junction?
- ❖ if turning lanes are provided are they adequately protected from entry by through traffic?
- ❖ is the merging nature of the exit traffic path from the junction evident from the road markings ie. do the markings adequately lead drivers back into the on-going section of the road and not force them onto a shoulder for example?
- ❖ can the position of the junction be further identified by a lower order direction sign (GD4 fingerboard) or by a ROAD NAME sign GL1?
- ❖ if direction signs GD1 and/or GD2 are in place are advance warning signs required or not?

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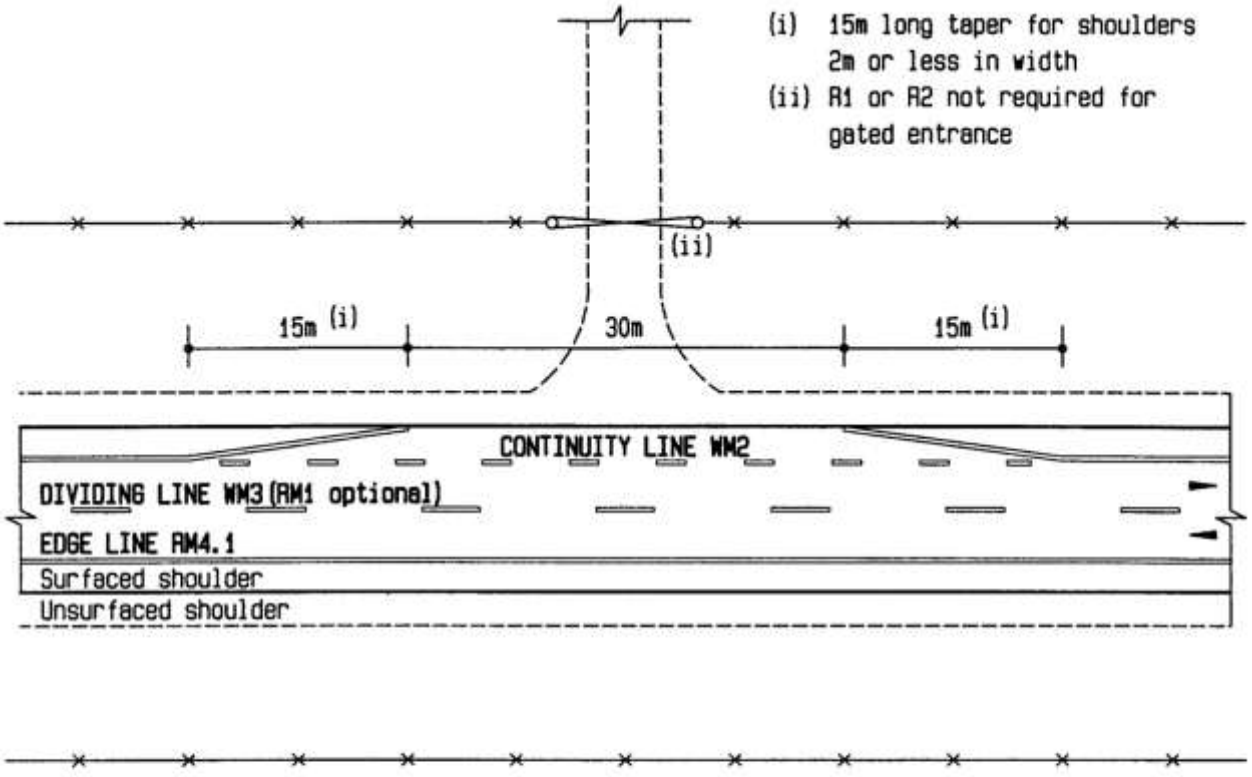
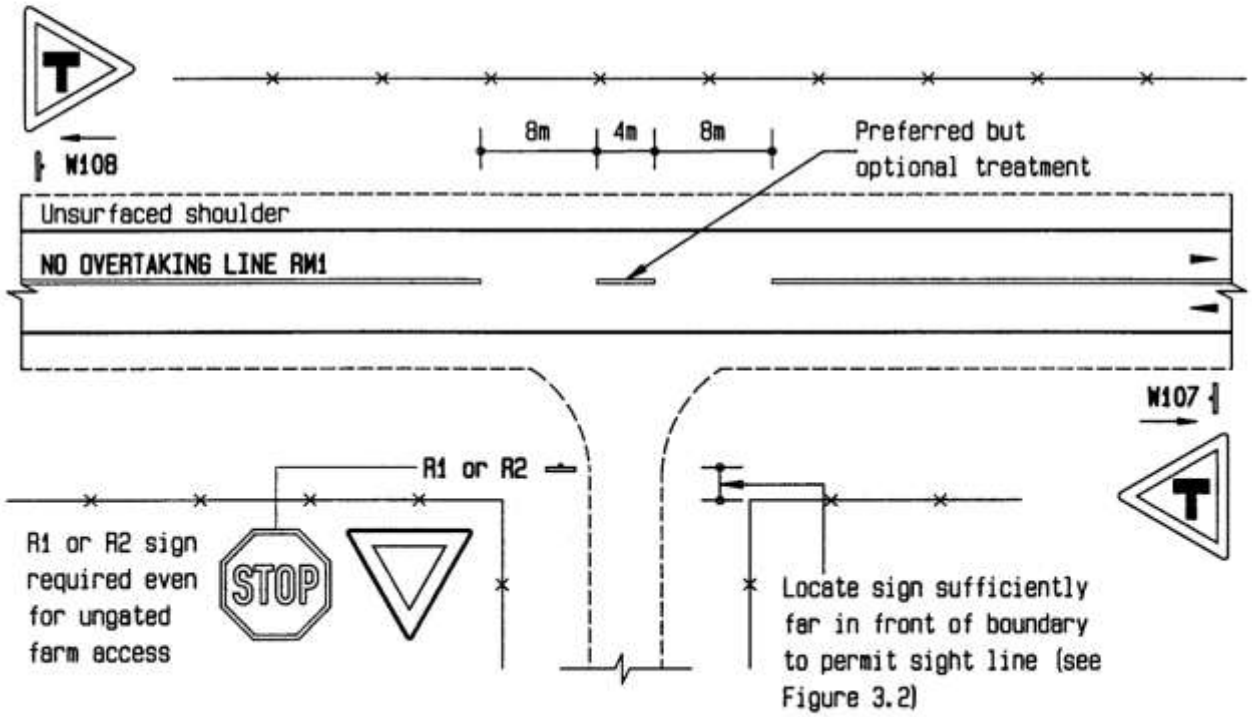
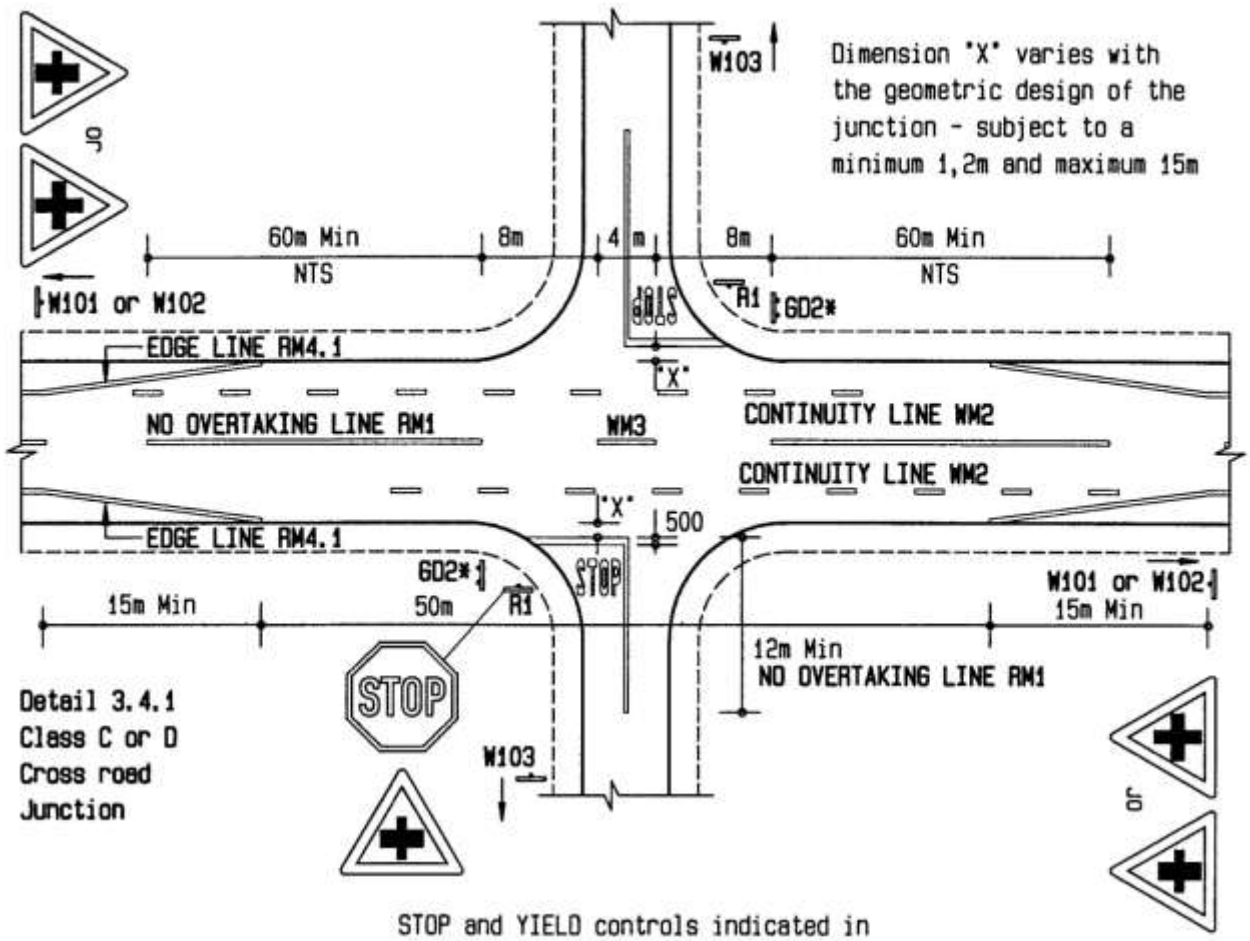


Detail 3.3.1 Gravel Side Road with Gate - Through Road with Surfaced Shoulders



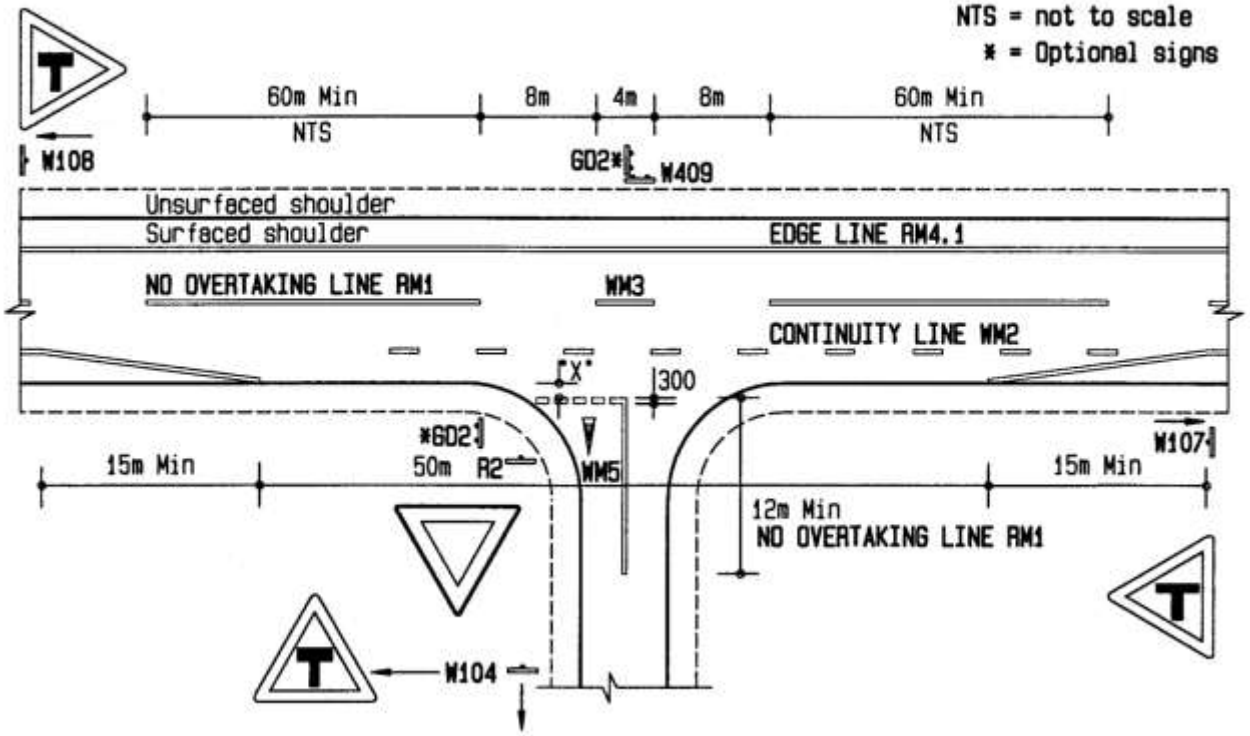
Detail 3.3.2 Un-gated Gravel Side Road - Through Road with Unsurfaced Shoulders (see para. 3.2.2.4 (b) (ii))

Fig 3.3 Unsurfaced Side Roads



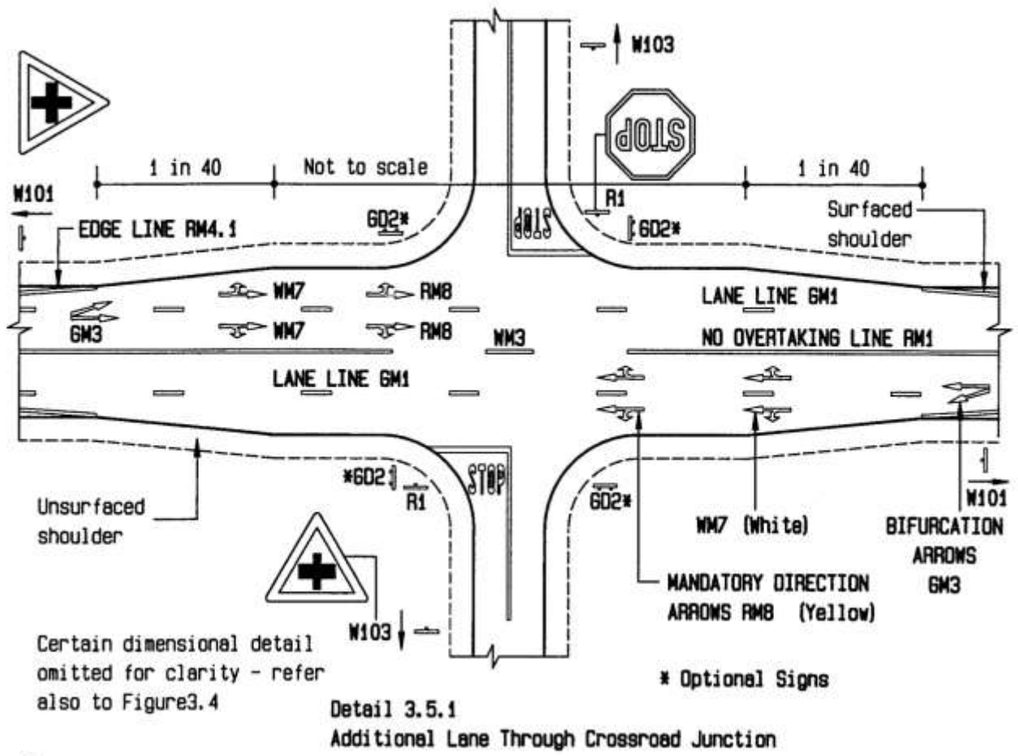
STOP and YIELD controls indicated in the two details are interchangeble

NTS = not to scale
* = Optional signs

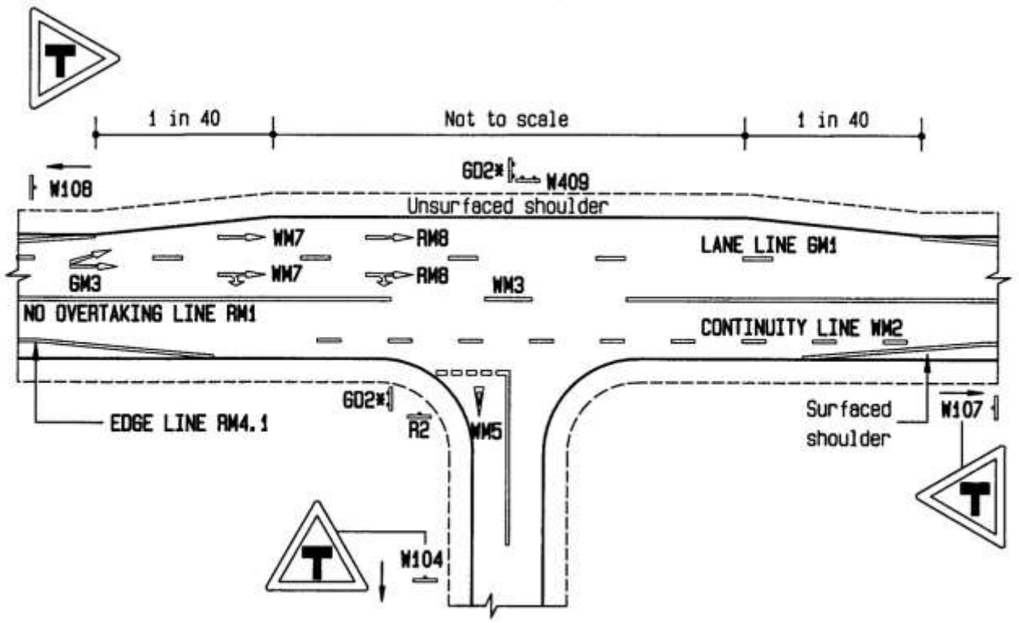


Detail 3.4.2 Class C or D T-Junction

Fig 3.4 STOP or YIELD Control – MinorSurfaced Side Roads



Detail 3.5.1
Additional Lane Through Crossroad Junction



Detail 3.5.2 Additional Lane Through T-Junction

Fig 3.5 STOP or YIELD Control – MinorSurfaced Side Roads With Main Road Widening

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3.2.3 Typical Multi-lane Rural Road Junctions

1 Figures 3.6 and 3.7 show details of the regulatory and warning signing and marking of typical large rural road junctions.

2 Figure 3.6 illustrates a 4-lane undivided road intersected by a lower order crossing road. Both roads are provided with locally developed right turn lanes on all approaches. Detail 3.6.2 shows an alternative side road treatment when the side road is provided with a kerbed central island. Such a treatment may be more common at T-junctions but can be provided at crossroad approaches as well. This detail also illustrates the application of a STOP/YIELD sign R1.2 and appropriate road markings.

3 Figure 3.7 deals with a full dual carriageway junction. Only one approach is shown in full detail but a junction of this size is likely to have common standards on all approaches.

4 Junctions of this size may commonly be provided with turning sliproads of greater or lesser size. The two figures show different sized examples. Whilst the treatment of such turning roads is essentially a geometric exercise, designers must be aware of the limitations of a standardised approach to painted island design as it applies to the painted islands which may partially surround a kerbed island at such a junction. The design of these painted islands is improved by careful attention to the offset of kerb lines from the travelled way (see Chapter 2).

5 Important factors incorporated into the details of these figures are:

(a) the need to set STOP LINE RTM1 well back on narrow intersecting side roads (and/or provide additional width on the exit path for large turning vehicles - Figure 3.6) - values for dimensions "X" and "Y" shown in both figures depend on many factors, particularly lane widths and design vehicles;

(b) the clear definition of the through portion of the travelled way, however many lanes it comprises, by means of wider CONTINUITY LINES WM2 and CHANNELISING LINES RM3 (200 mm width recommended);

(c) identification of the extremities of all kerbed islands, and thereby particularly the turning paths, by the use of KERBFACE marking GM8.

Checklist

- ❖ are dedicated turning lanes fully protected from entry by through traffic?
- ❖ are the turning paths clearly identifiable - or would the use of GUIDELINE marking GM2 by appropriate (see Figure 3.17 and Chapter 2)?

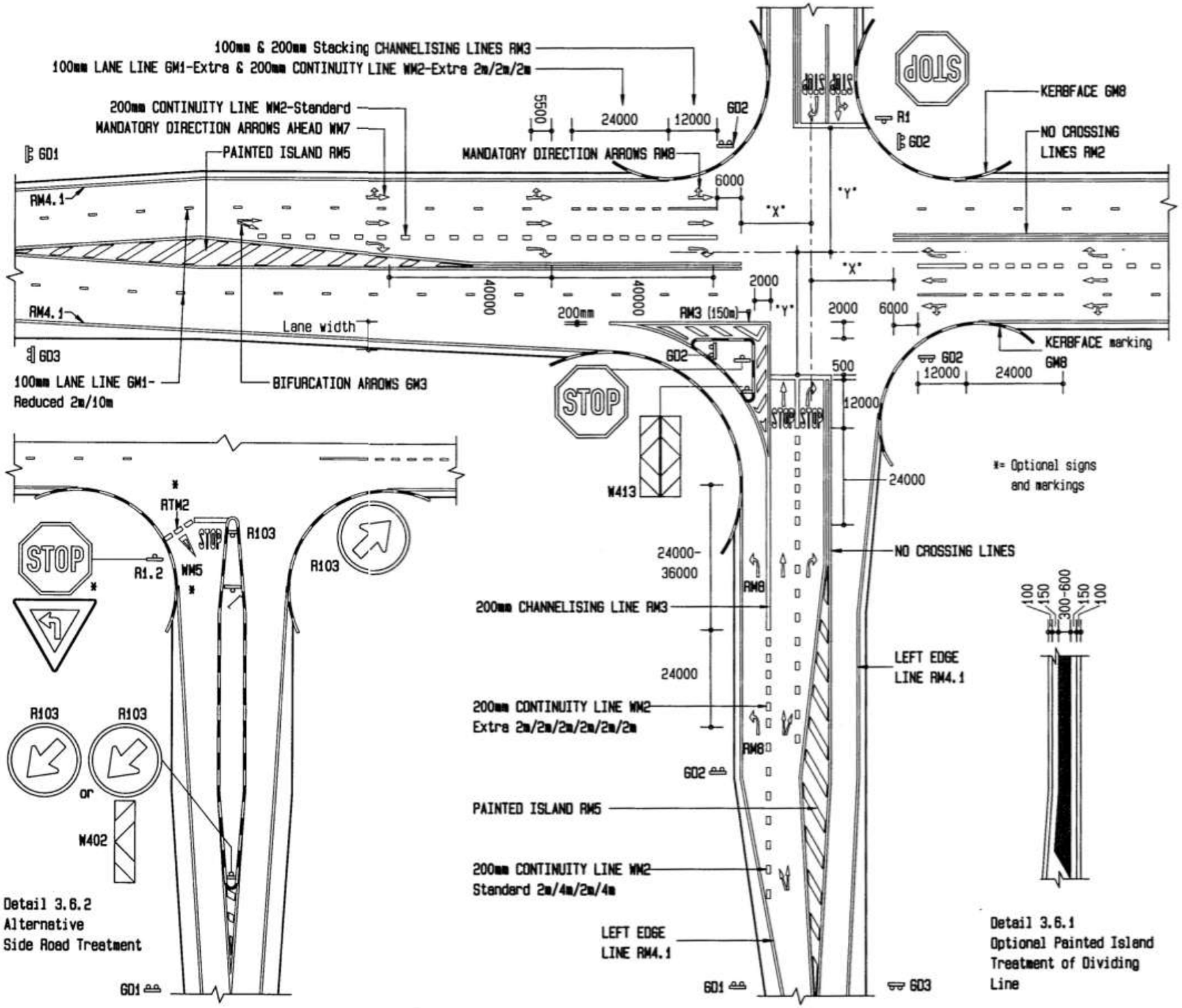

Fig 3.6
Junctions on Multi-lane Roads With Priority

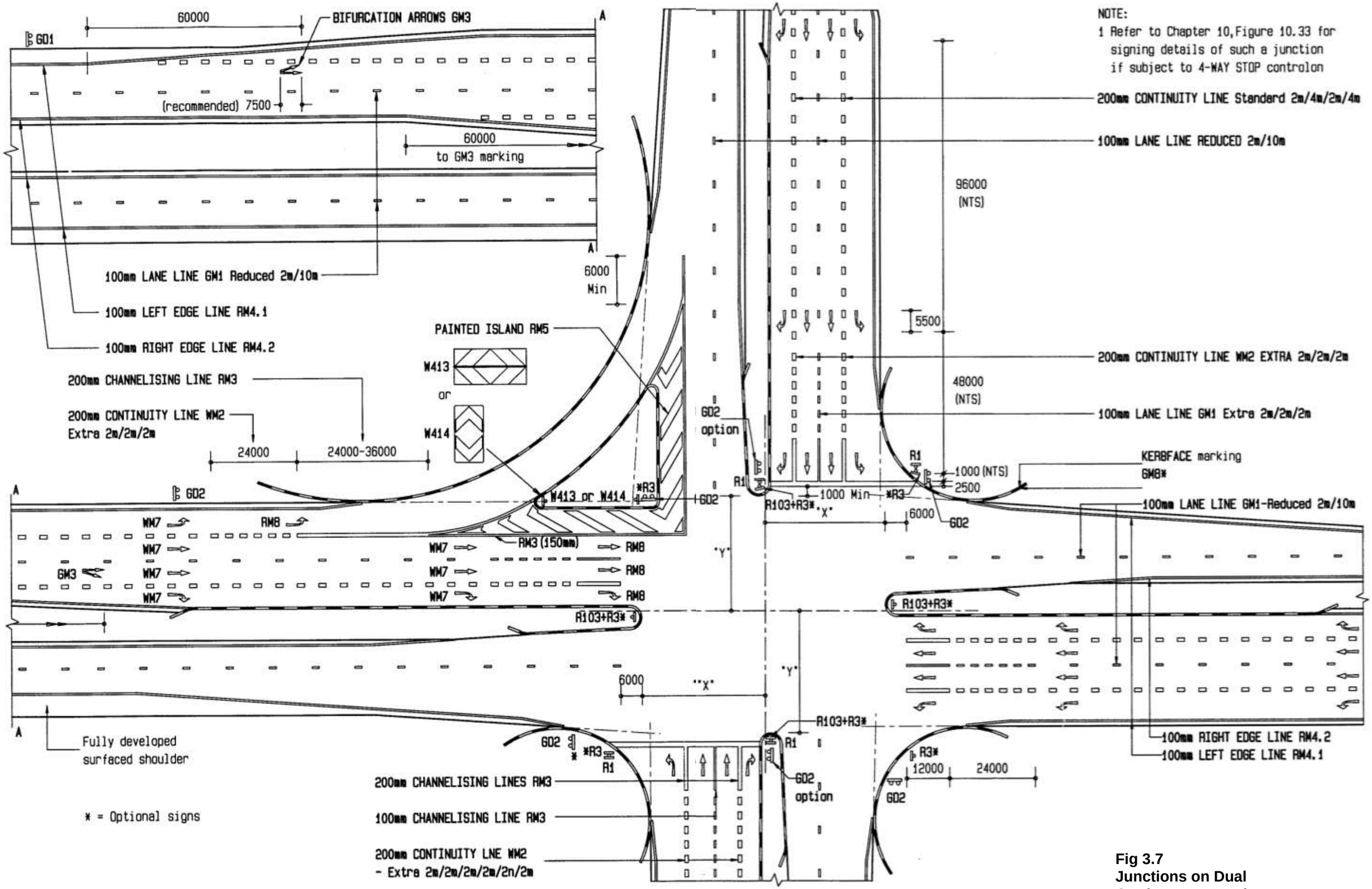

Fig 3.7
Junctions on Dual Carriageway Roads

3.2.4 Typical Rural Road Restrictions

1 Restrictions placed on drivers by means of regulatory signs and/or markings are relatively infrequent on rural roads, particularly in comparison to the total length of rural road within the road network. The most commonly applied restrictions are those imposed by EDGE LINE markings RM4.1 and RM4.2 and by NO OVERTAKING LINE RM1 and NO CROSSING LINES RM2. **It should be noted that the definition and function of parts of the roadway associated with EDGE LINE marking RM4.1 have been significantly altered** (mid-1995) (see Figure 3.2 for further details). The provision of markings RM1 and RM2 are covered in detail in Volume 1, Chapter 7.

2 Detail 3.8.1 shows a typical application of NO STOPPING signs R217 and NO STOPPING LINE RM12 to a short section of rural road. This sort of application is likely to be required in association with the following features located within, or close to, the road reserve:

(a) schools;

(b) rural stores;

(c) bus stops (or other transport exchange points);

(d) tourist related laybys;

(e) rest laybys.

3 Detail 3.8.2 illustrates a typical section of road on which NO OVERTAKING sign R214 is considered necessary. Sign R214 should only be used on a standard two-lane two-way roadway in addition to road markings RM1 or RM2. The sign is intended to apply for relatively short sections of road and the prohibition is only effective for 500 m beyond the sign. It is therefore necessary, to repeat the sign at 500 m intervals on longer sections. Such a restriction on overtaking is likely to lead to driver frustration, particularly if the reason is not immediately obvious. In an attempt to redress this reaction reassurance may be given by a SUPPLEMENTARY PLATE sign IN11 with a suitable brief text message (IN11.4) or with a "Distance for" (IN11.2) i.e. "For 3 km".

4 The use of NO OVERTAKING sign R215 (GOODS VEHICLES BY GOODS VEHICLES) is more appropriate to uphill or downhill sections of multi-lane road on which it is required to restrict the occupation of more than one lane by goods vehicles.

5 Figure 3.9 illustrates prohibitions some distance ahead which are likely to require some drivers to take an alternative route. Such circumstances may be permanent or temporary in nature and may require the provision of special direction signs in addition to anything indicated in Figure 3.9. MAP TYPE sign GD9 is strictly a guidance sign but should incorporate the relevant restriction in the form of **a regulatory sign with a distance message.** Sign GD9 may be used in its permanent form for restrictions which are fixed e.g. a low bridge, or in a temporary form (TGD9) for temporary restrictions e g. a bridge wash-away. It should be noted that, for convenience Figure 3.9 shows two types of restriction. These are unlikely to occur so close together.

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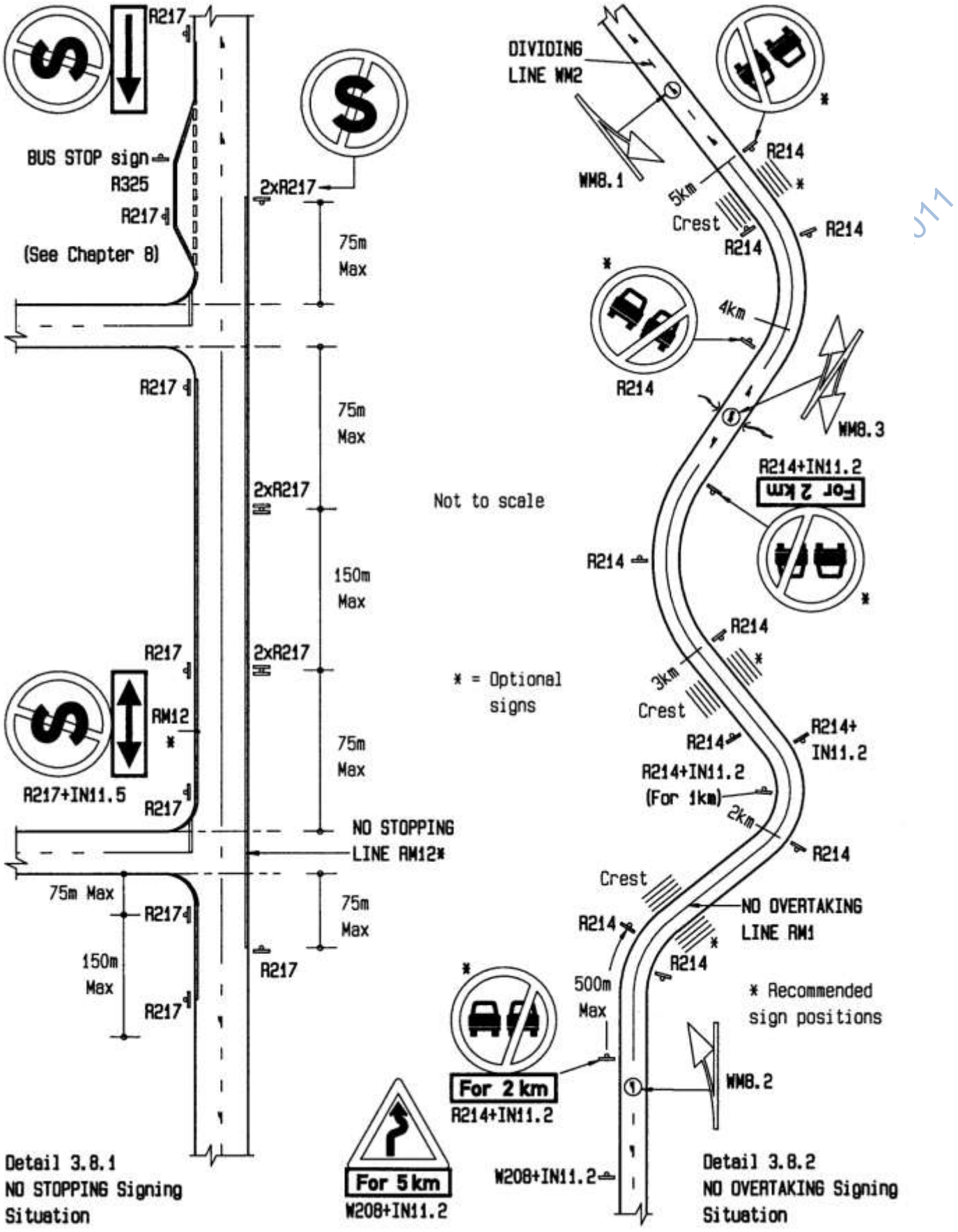

Fig 3.8 **No Stopping/No Parking – No Overtaking**

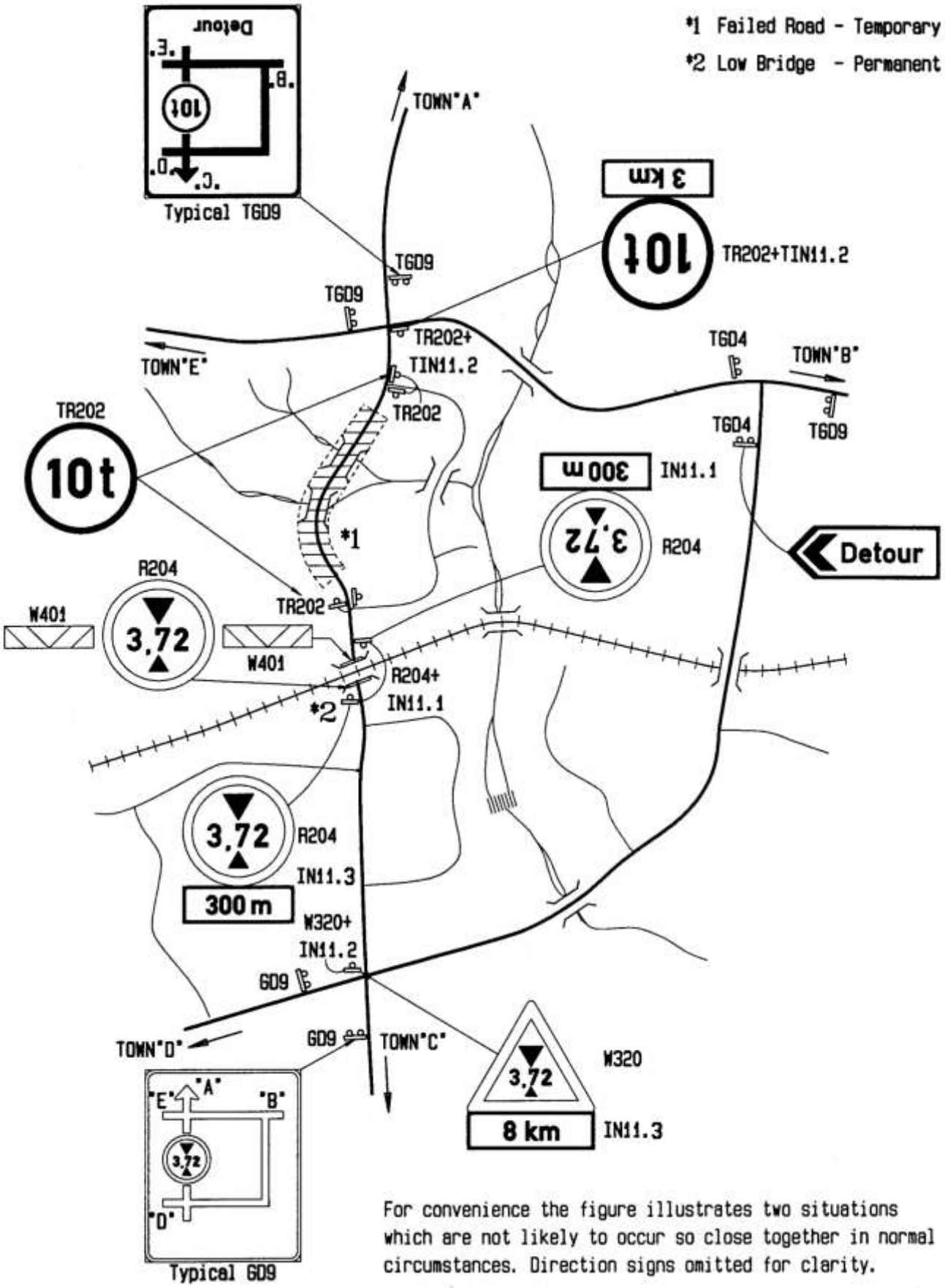

Fig 3.9 **Height/Width or Other Restriction Ahead**

3.2.5 Typical Rural Hazard Situations

1 The situations illustrated in Figures 3.10 and 3.11 are very much everyday physical feature hazards that exist on all rural roads. The principle purpose of the signing is to increase the conspicuity of the hazard to drivers. The signs used are therefore hazard marker warning signs which include:

(a) DANGER PLATES W401 and W402;

(b) SHARP CURVE CHEVRON signs W405, W406, W407 and W408;

(c) GUARDRAIL DELINEATOR D1 (which is classified as a road marking).

2 Physical features which should be marked by such signs are:

(a) bridge abutments and piers on underpasses;

(b) bridge parapets on overpasses;

(c) culvert headwalls and culvert positions;

(d) guardrail sections;

(d) sign gantry columns;

(e) height gauge supports at railway crossings;

(f) any other feature such as trees which are within the safety run-off area at the side of the road.

3 Detail 3.11.2 shows how several SHARP CURVE CHEVRON signs W405 (or W406) may be used in sets, at regular spacings, to define sharp road curvature. Care should be exercised in the placing of such signs to optimise their effectiveness. It is recommended that the first sign to be located be that which will, as nearly as possible, be directly on the line of sight of approaching drivers. All others should then be positioned before and after this sign. The preceding signs should start at, or very close to, the curve tangent point.

4 Figure 3.12 illustrates typical signing which might be called for at a tunnel or a high and exposed viaduct. The situation portrayed is relevant to a typical tourist route where these features may well be linked to panoramic views or even view sites. The signs and markings shown are representative only. Many alternative signs may be warranted at a specific site.

5 In many of the situations illustrated in this subsection the use of roadstuds is likely to enhance awareness of the hazardous circumstances. The use of closer than minimum spacings for the roadstuds will also commonly be warranted.

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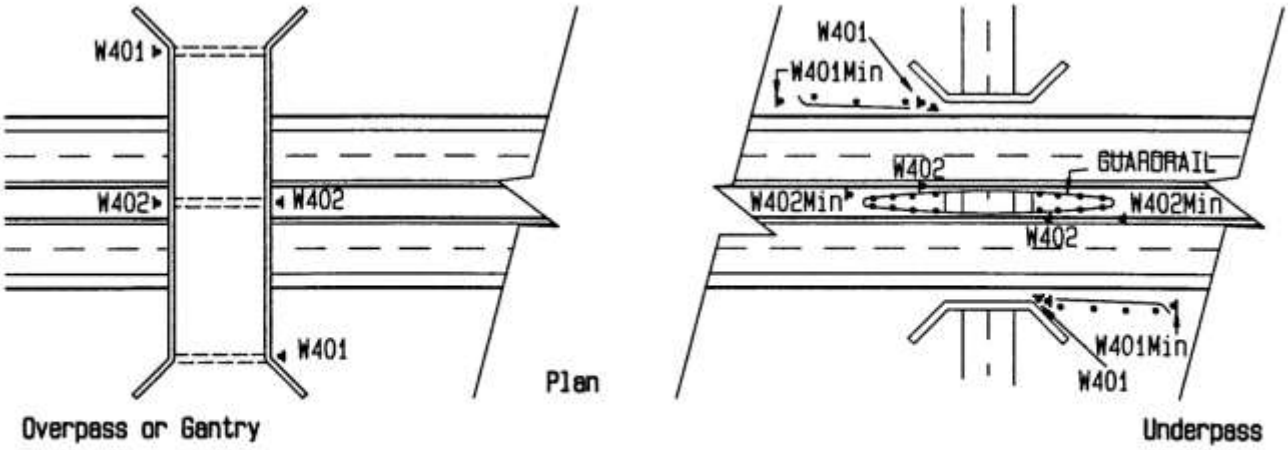
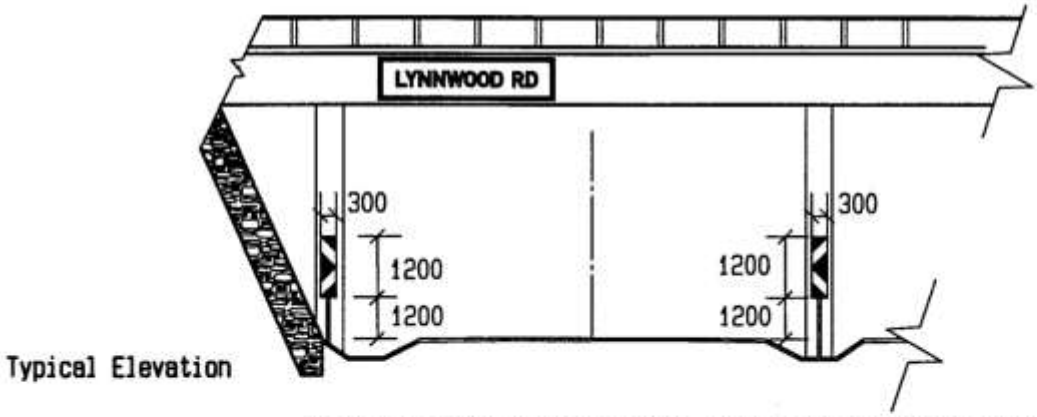
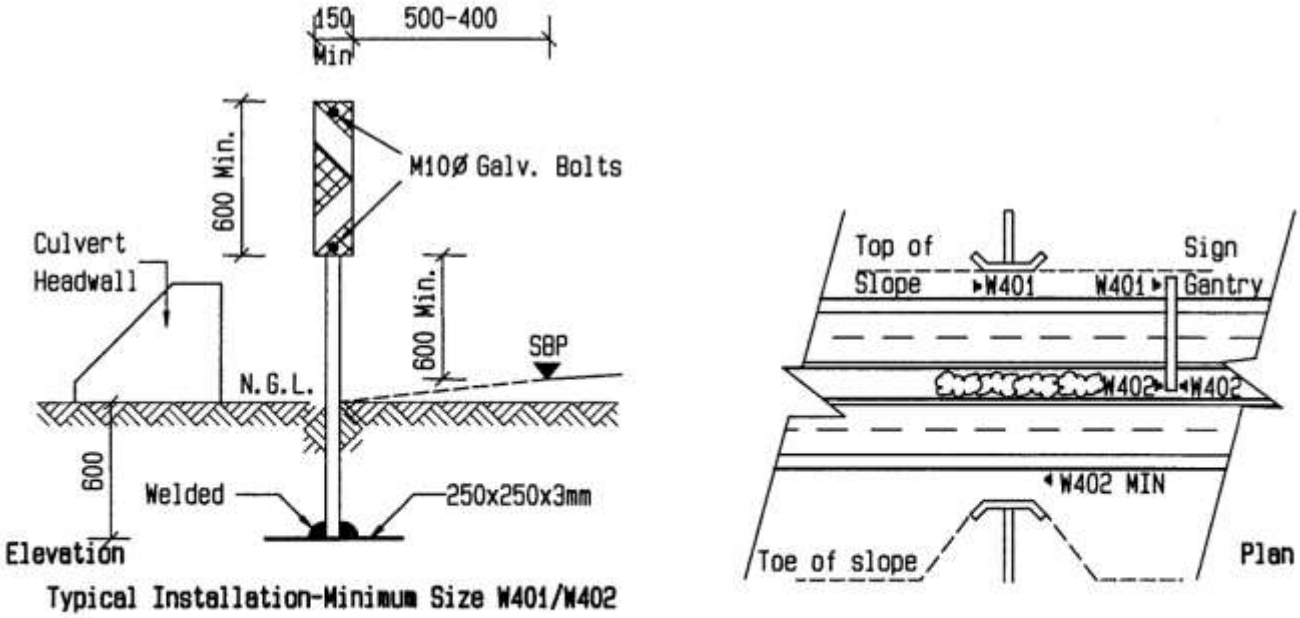


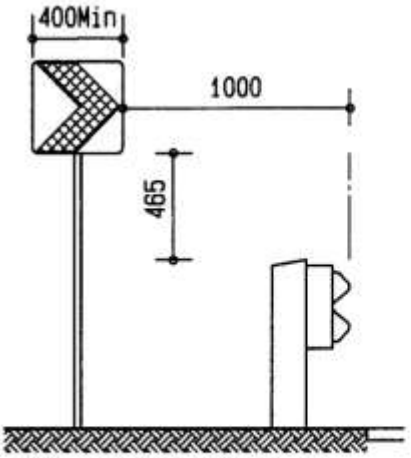


Detail 3.10.1 Bridge or Other Structures (eg Sign Gantries)
Marking Using Danger Plates W401 and W402)

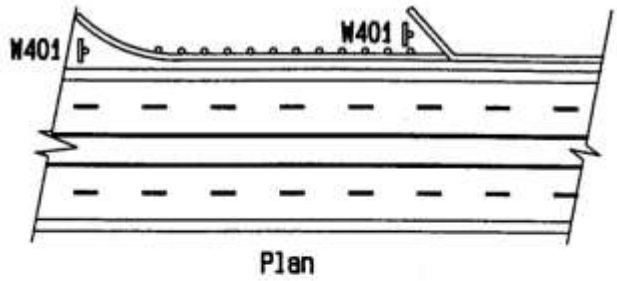


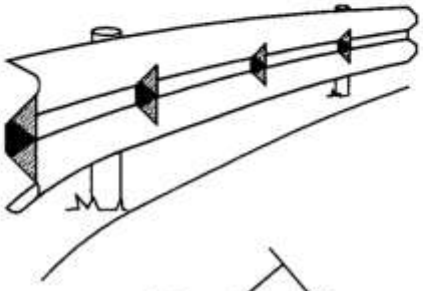
Detail 3.10.2 Typical Culvert or Small River Bridge
Marking Using Danger Plates W401 and W402

Fig 3.10 Culverts and Bridges



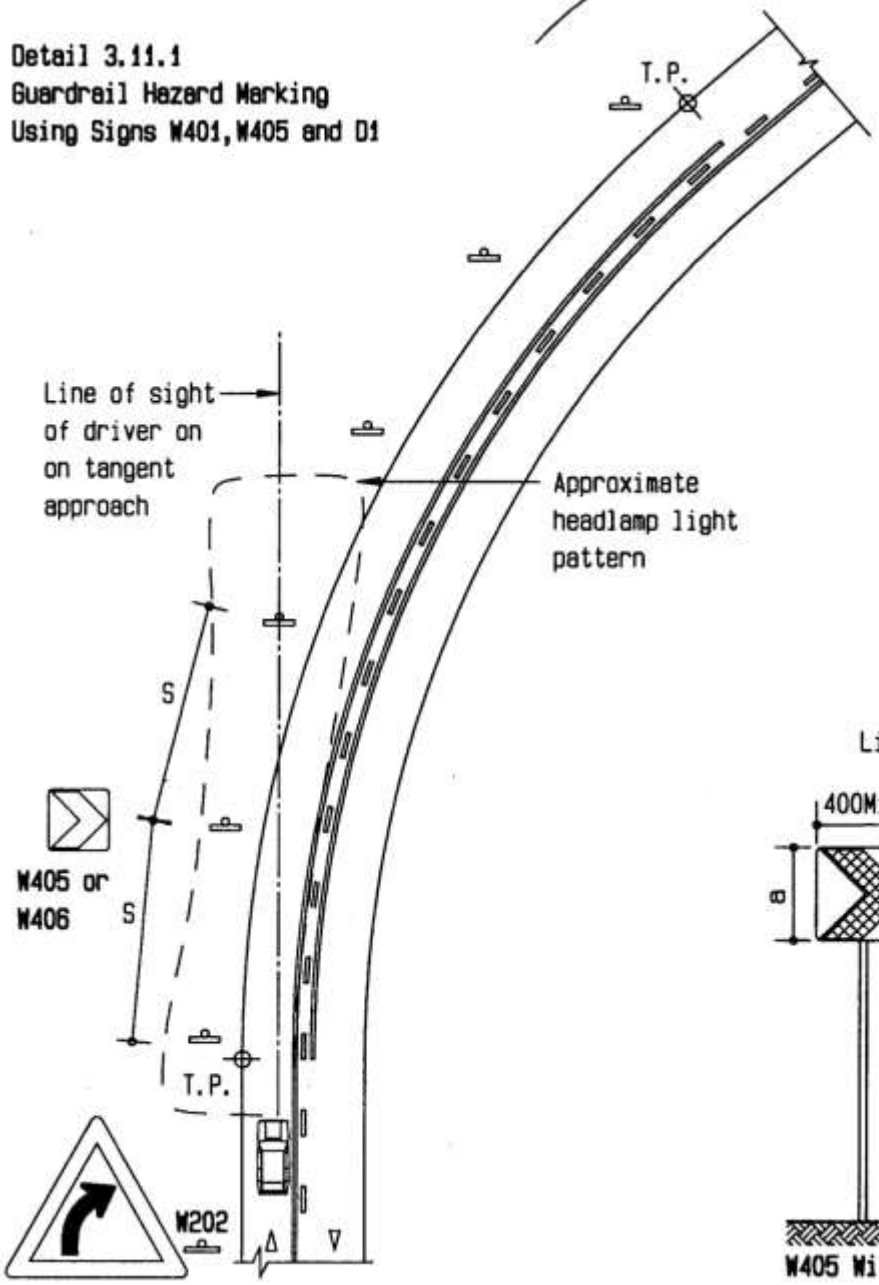
W405 Behind Guardrail on a Curve





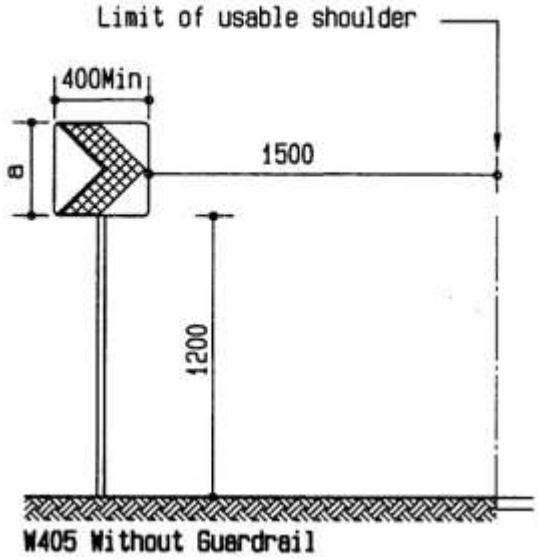
D1 Guardrail Delineator

Detail 3.11.1
Guardrail Hazard Marking
Using Signs W401, W405 and D1



Radius (m)	Spacing S (m)
45	5-8
60	8-15
150	15-25
300	25
600	25

Detail 3.11.2
Hazard Marking of Curves
Using SHarp Curve Chevrons



W405 Without Guardrail

Fig 3.11 Curves and Guardrails

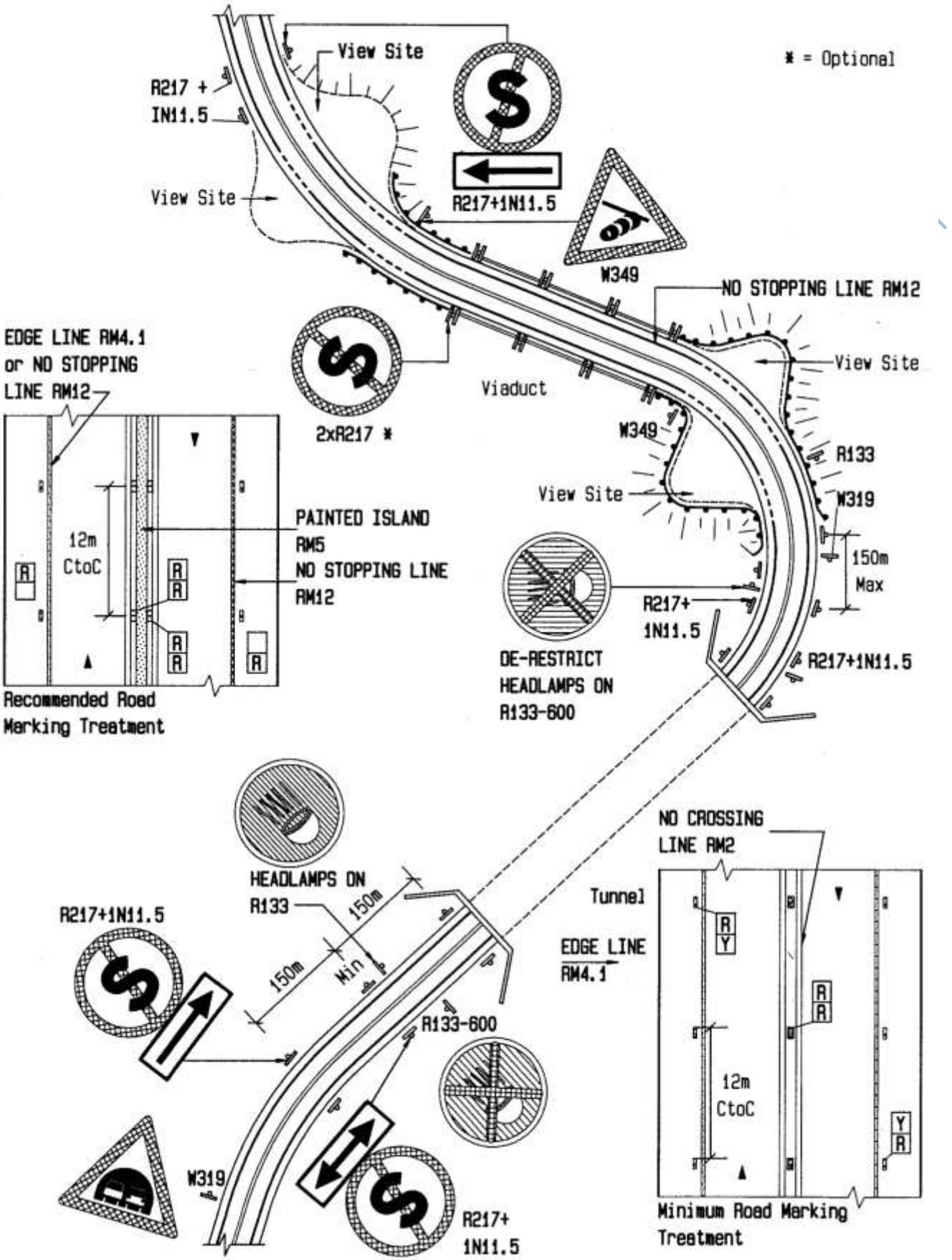


Fig 3.12 **Tunnels and Viaducts**

3.2.6 Less Common Types of Rural Junction

1 Figures 3.13 and 3.14 depict three less common types of junction which may occur occasionally in rural areas. Although the junctions concerned may be considered less common they are none-the-less standard junction types. The inclusion of these examples should not be considered as advocating the use of these types of junction, nor any other junction, incorporating what can be considered as complex or non-standard roadway configurations.

2 The traffic circle shown in Figure 3.13 should be considered as "large" (with an internal island diameter of 20m or more). In terms of Regulation 301 (under the "Rules of the Road" of the Road Traffic Act, Act 93 of 1996), it is strictly not necessary to erect control signs at the entry to the circle because priority is determined in terms of the rule, **unless** "... entry into such junction is controlled by an instruction given by a traffic officer or a direction conveyed by a road traffic sign requiring him to act differently". In this context a "road traffic sign" includes any prescribed road sign, traffic signal or road marking. In the example the signing and marking of the circle is shown to conform to the provisions of the relevant "Rule of the Road" (Regulation 301). No control signs are provided at points of entry to the circle, nor are there STOP lines or YIELD lines. Guidance to define the outer perimeter of the circular roadway is given by CONTINUITY LINE marking WM2.

3 Since traffic circles are not a common type of junction, it is recommended that GD2 direction signs be provided on all exit legs of such junctions even if the class of road concerned does not qualify for direction signs in terms of local policies. The arrow on the GD2 signs may be angled upwards at 45^{o} to indicate the relatively high speed of turn on leaving the circle. The use of an adequately sized FINGERBOARD sign GD4 may be appropriate.

4 Y-junctions are not common. Their particular feature may be that visibility in one direction is significantly worse than in others. It is recommended that, subject to traffic volumes, the approach with the best visibility be the one without control. Three-way STOP control may be considered if the junction has a poor accident history.

5 The other junction illustrated in Figure 3.14 is a form of "Bennet" junction whereby TWO-WAY traffic is permitted on the turning roadways. This form of junction generates traffic movements which unfamiliar drivers may not anticipate. **It should be noted that it is fundamentally incorrect to use signs such as KEEP LEFT sign R103 in the gore areas of the traffic islands.** It is recommended that consideration be given to the careful use of GUIDELINE marking GM2 and INFORMATION ARROW GM4.1. Because of the unusual configuration of the turning roadways it is particularly important that signs and markings be well maintained.

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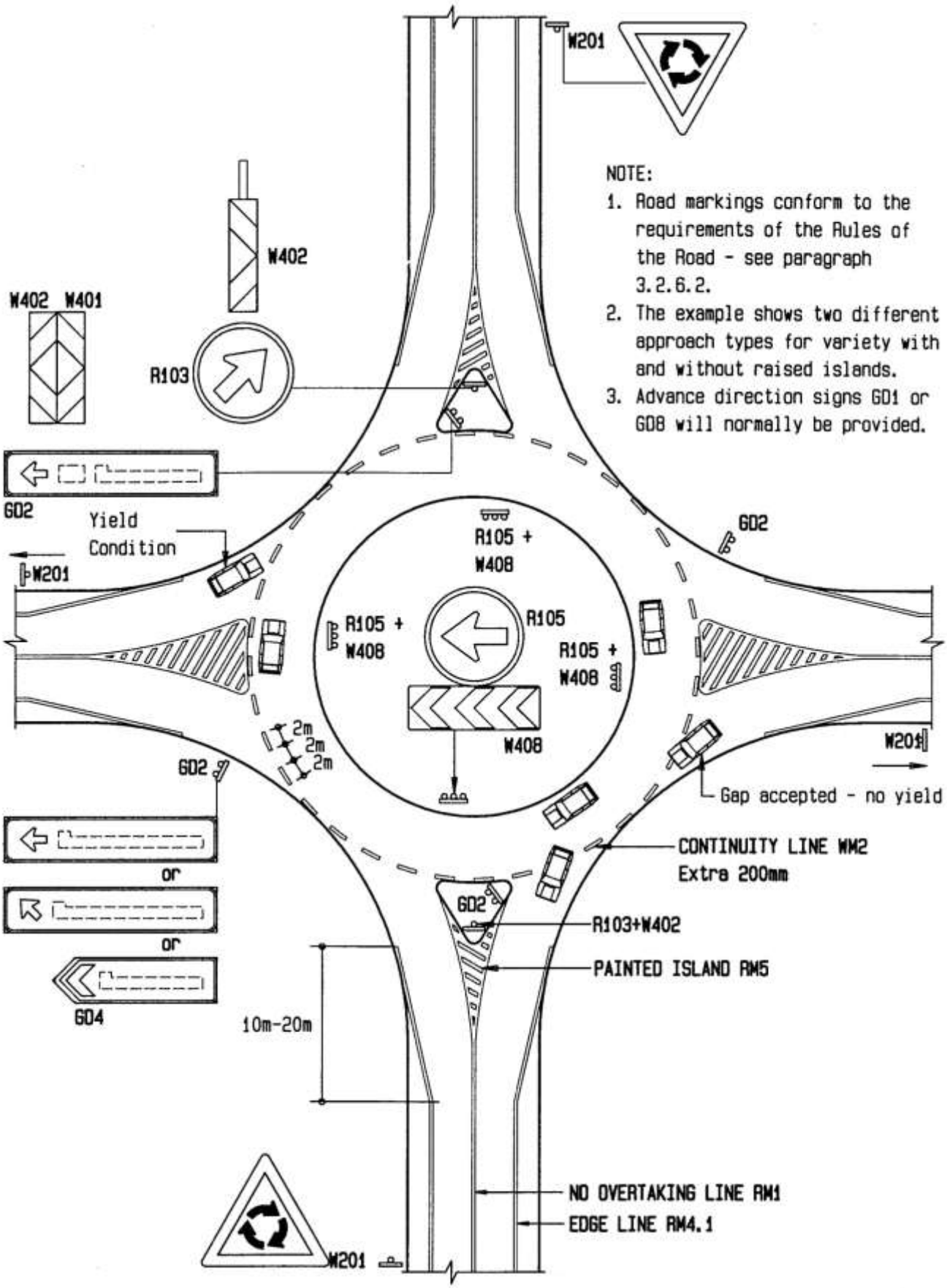
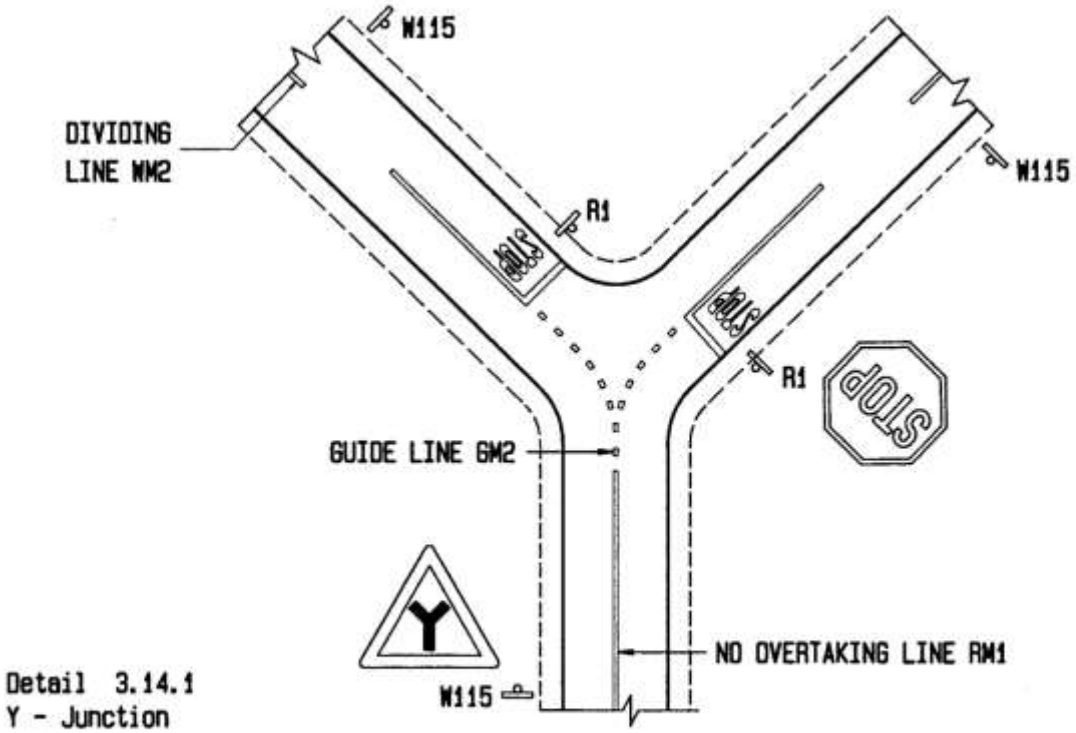
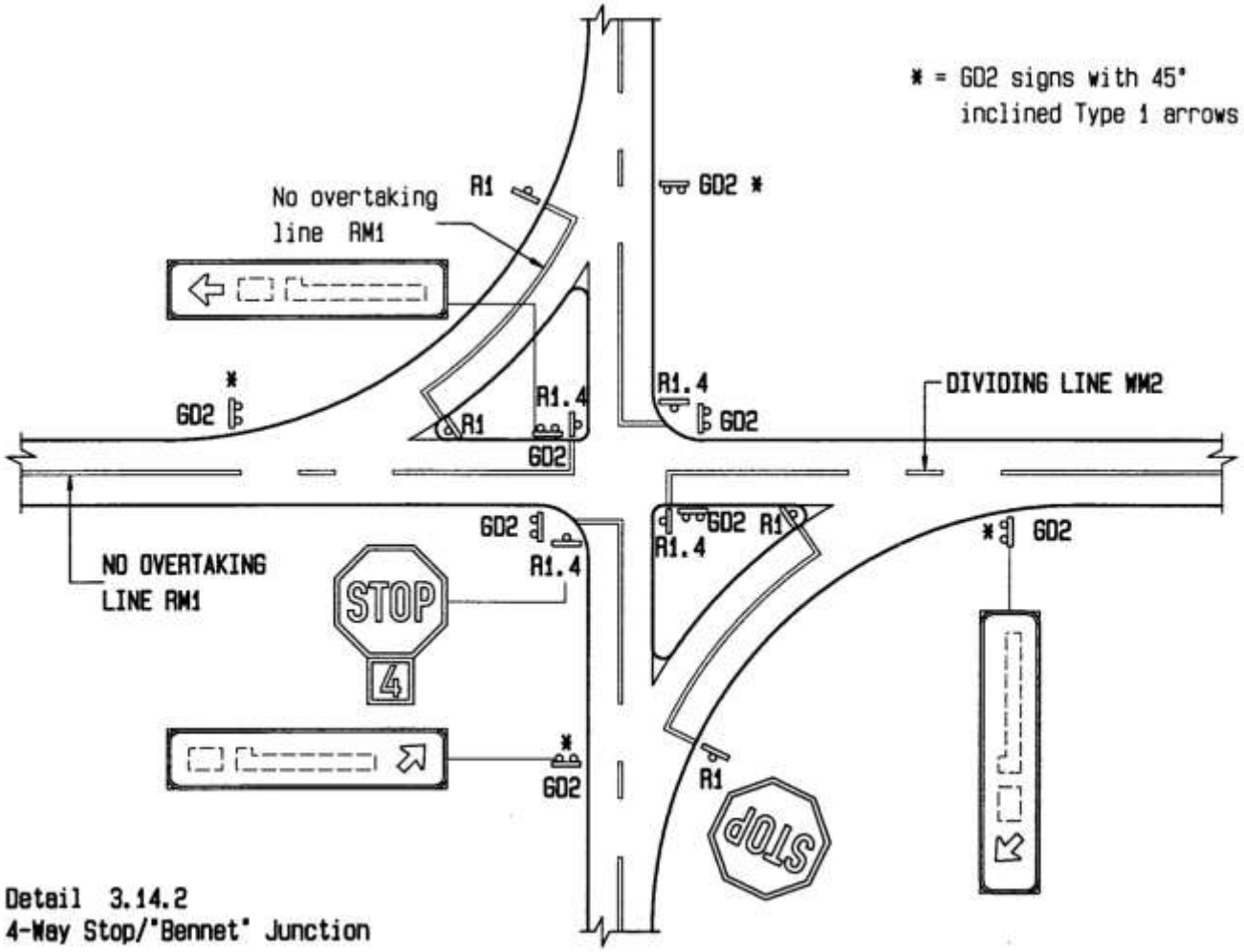


Fig 3.13 **Large Rural Traffic Circle Junction**



Detail 3.14.1
Y - Junction



Detail 3.14.2
4-Way Stop/"Bennet" Junction

Fig 3.14 Uncommon Types of Rural Junction

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3.3 SIGNING AND MARKING APPLICATIONS IN URBAN SITUATIONS

3.3.1 General

1 The situations illustrated by examples of regulatory and warning sign and marking applications in this section are specific to urban areas and many of them relate to central business districts (CBD). Many of the examples covered in Section 3.2 may also be appropriate in urban areas.

2 Figures 3.15 to 3.17 show a wide range of typical urban street junctions. The details in these figures are graded from the simplest cross road or T-junction in a residential area up to junctions between dual carriageways. CBD type junctions, including intersecting one-way streets, are covered in Figures 3.18 and 3.19 and Figure 3.20 gives details of a range of traffic circle types found in urban areas.

3 A variety of less common situations involving the application of regulatory and warning road signs and markings are illustrated in Figure 3.21.

4 No Stopping and No Parking controls common in urban areas, and particularly CBD areas, are covered by Figures 3.22 to 3.24 and the balance of figures up to Figure 3.29 deal with details of:

(a) bicycle facilities;
(b) motorcycle facilities;
(c) concealed entrances; and
(d) shopping centres.

5 Detailed examples of parking control are covered in Section 3.4.

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3.3.2 Typical Urban Street Junctions

1 Detail 3.15.1 shows a typical local traffic area in an urban or metropolitan environment. The simplified urban road network illustrated includes a range of urban street types ranging from a residential Class "D" street up to intersecting Class "B" arterial numbered routes (see Chapter 9). Minor junction types are detailed in Figure 3.15. The majority of these are straight forward typical urban street junctions. The following details illustrate specific less common junction treatments:

(a) Details 3.15.4 and 3.15.5 show two examples of non-standard arrangement of STOP or YIELD control where turning traffic at a T-junction is given priority over on-coming straight-on traffic - this arrangement is only appropriate when traffic flows are particularly heavy on the side road;

(b) Detail 3.15.6A illustrates a preferred treatment for a minor side road entering an arterial dual carriageway road when no median crossing is provided; the traffic island is designed to force a "left-out"/"left-in" movement which can significantly reduce the risk of a wrong-way turn to the right.

2 In Figures 3.16 and 3.17 a progressive build-up in the size of arterial road junctions is catered for. In a similar way to rural situations, illustrated in Section 3.2, traffic should be protected from unwittingly entering exclusive turn lanes. The road marking layout should be designed to "force" drivers into making a specific decision to enter such a dedicated turn lane. Typical of such techniques are:

(a) right turn lanes developed on the approach to a junction should be "protected" against unintentional entry by a painted or physical traffic island (see Details 3.16.1 and 3.17.2);

(b) right or left turn lane markings using 200 mm wide CONTINUITY LINE WM2 and CHANNELISING LINE RM3 to inhibit unintentional movement into the dedicated turn lane to the right or left.

Similar techniques are also illustrated for dedicated turn lanes in a CBD environment in Subsection 3.3.5 and in Chapter 2.

3 The provision of "stacking lanes" is illustrated in several details of multi-lane junctions. It is recommended that the marking of such stacking lanes be standardised as widely as possible. The recommended marking pattern for stacking lanes comprises 9 m of CHANNELISING LINE RM3, preceded by 18 m of "Extra" LANE LINE GM1 or CONTINUITY LINE WM2. The concept described in paragraph 3.3.2.2 of using wider lines bordering dedicated turn lanes is particularly recommended over the stacking lane length (according to this principle a LANE LINE should not be marked with a line wider than 100 mm). Stacking lanes may be made longer than 27 m (or three standard urban road marking modules) if high traffic volumes are likely to generate long queues, particularly at signalised junctions. The lanes should, where practical, be extended in 9 m increments. At minor junctions stacking lanes less than 27 m long may be specified

but for purposes of legal enforcement the minimum length of NO OVERTAKING LINE RM1, NO CROSSING LINE RM2 and CHANNELISING LINE RM3 in an urban area must be 9 m.

4 In an urban environment it may be necessary, in close proximity to a junction, to prohibit right turns from within the stacking lane length, or further, in order to gain access to property. This can be achieved by replacing the dividing NO OVERTAKING LINE RM1 with a section of NO CROSSING LINE RM2. An example is illustrated in Detail 3.16.1.

5 Stacking lanes which are dedicated turn lanes shall be provided with appropriate MANDATORY DIRECTION ARROWS RM8 (yellow). It is recommended that shared turn and through lanes also be provided with RM8 arrows. If these provisions result in only one lane without an arrow it is recommended that RM8 arrows be placed in all lanes. All RM8 arrows shall be preceded by at least one MANDATORY DIRECTION ARROW AHEAD WM7 (white). Detailed positioning of these arrows is given in Chapter 2. **WM7 arrows shall not be used to indicate the addition of a turning lane**. Added lanes should be indicated by BIFURCATION ARROWS GM3 (see Details 13.16.1 and 13.17.1).

6 Figures 3.18 and 3.19 show regulatory signing and marking for typical CBD type urban junctions. These figures are limited to the immediate environs of the junction. Similar details covering NO STOPPING and NO PARKING indications are covered in Subsection 3.3.5 and in Chapter 2 (see also Chapter 8, Figure 8.29).

7 The following design factors are relevant for typical CBD junctions:

(a) ONE WAY signs R4.1 or R4.2 shall always be provided pointing **into** the junction (ie.

(b) on the "downstream" side);

(c) under normal circumstances NO ENTRY sign R3 is not required in addition to signs R4.1 or R4.2;

(d) where practical it is recommended that the potential through path from a dedicated turn lane be visually or physically blocked by a PAINTED (traffic) ISLAND RM5 or by an extension of the sidewalk (this will have the added benefit of shortening pedestrian crossing lengths).

8 Subsection 3.3.5 covers additional aspects of junction signing with regard to parking and its control.

Checklist

- ❖ does the junction have lanes dedicated to right or left turning traffic only?
- ❖ can the treatment of a "non-standard" junction be modified to conform more closely to standards illustrated?
- ❖ are locally developed right turn lanes protected by a painted island?
- ❖ are GUIDE LINES GM2 warranted (see Figure 3.17)?
- ❖ is the provision of optional NO LEFT TURN sign R209 or NO RIGHT TURN sign R210 warranted?
- ❖ is it advisable to warn of a two-way cross street ahead using sign W213?

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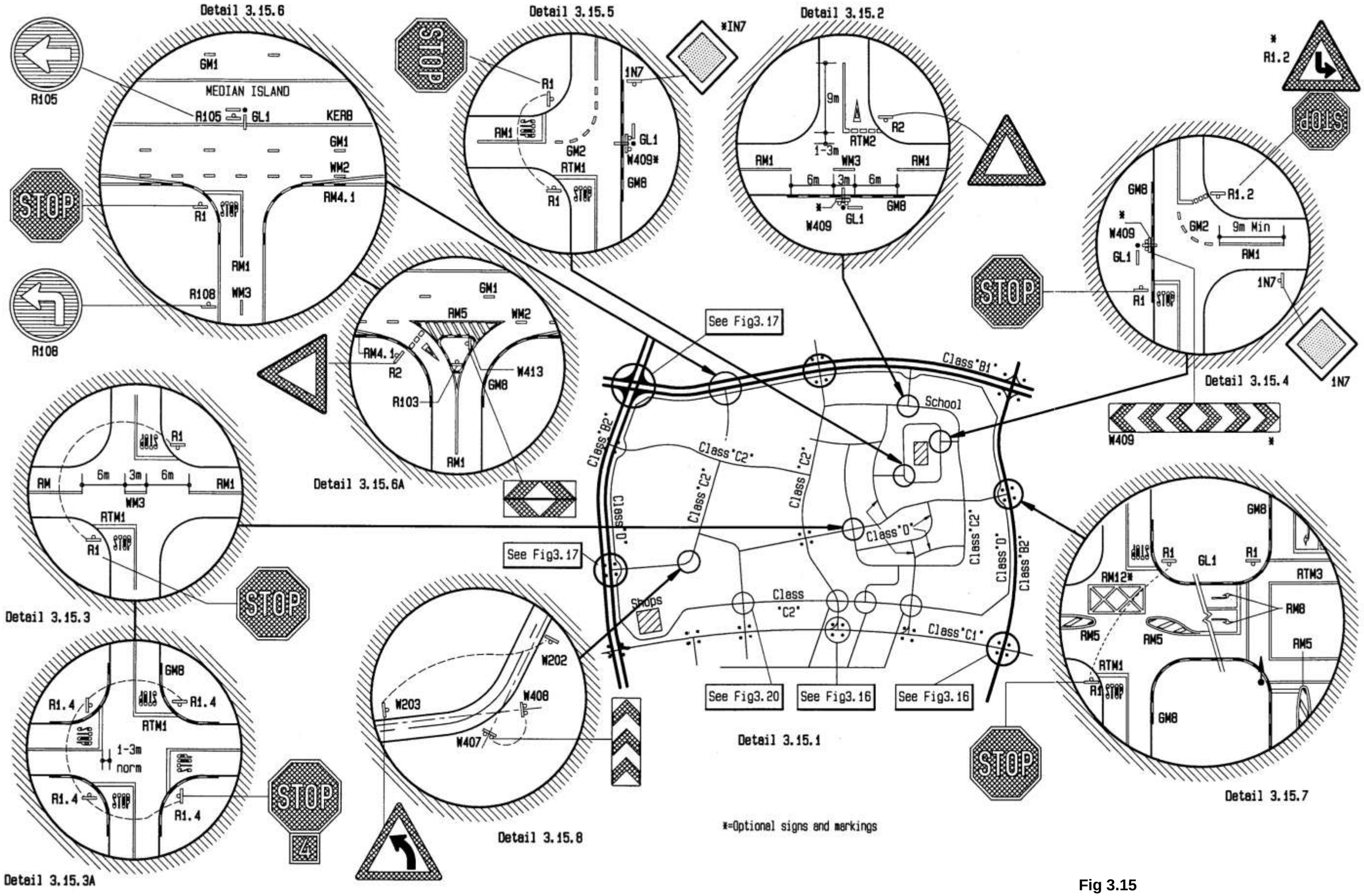
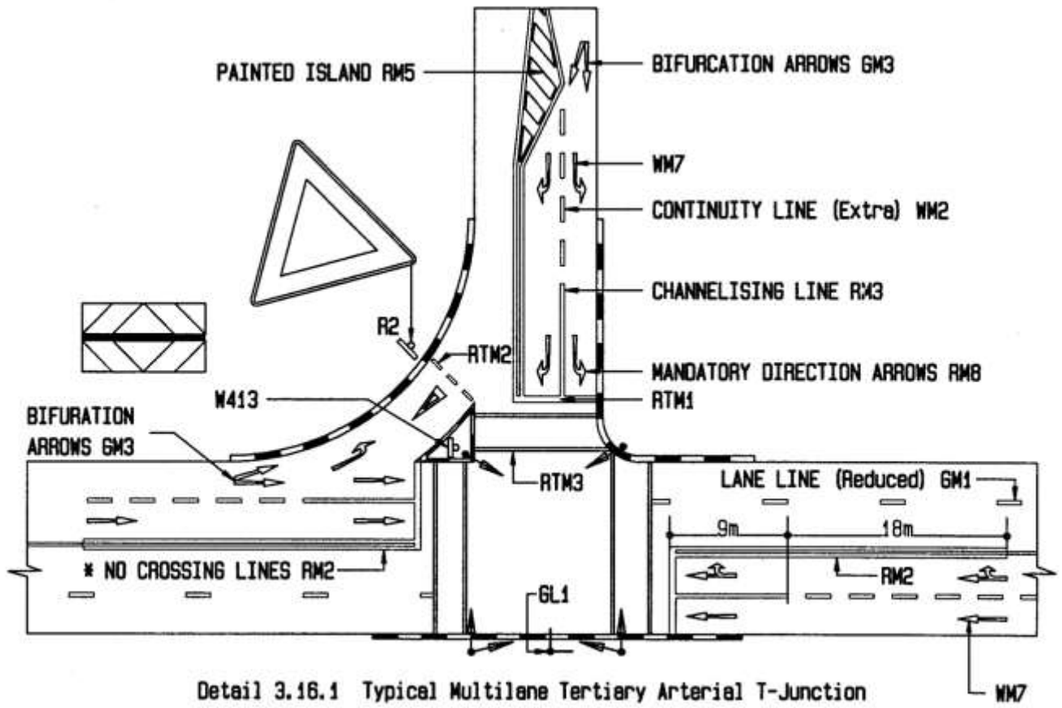
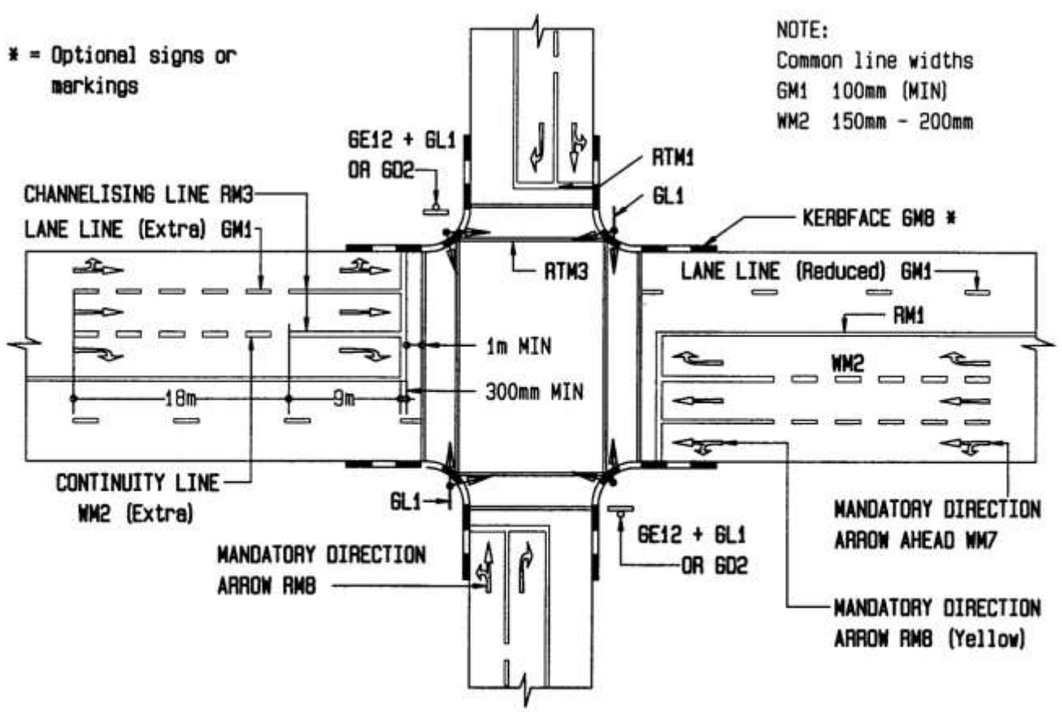


Fig 3.15
Typical Urban Junctions - Residential



Detail 3.16.1 Typical Multilane Tertiary Arterial T-Junction



Detail 3.16.2 Typical Multilane Secondary Arterial Cross Road Junction

Fig 3.16 Typical Urban Junctions – Arterial - 1

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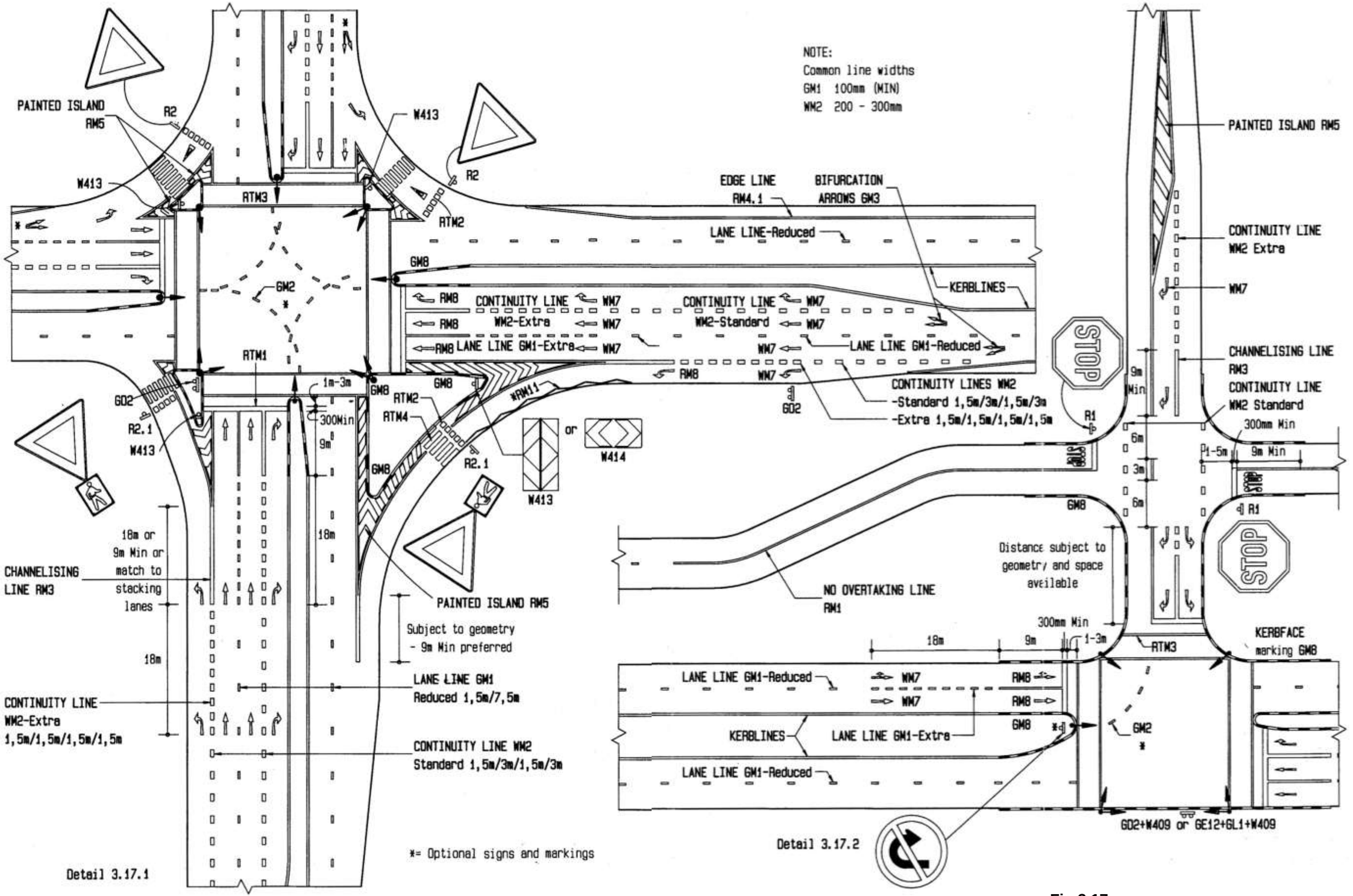
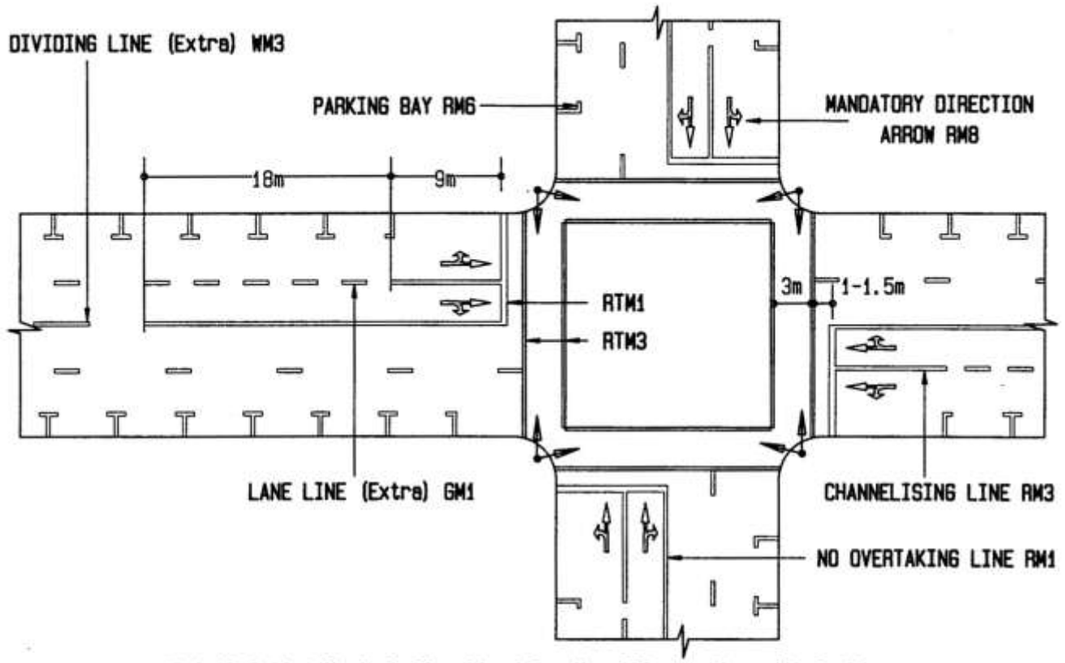
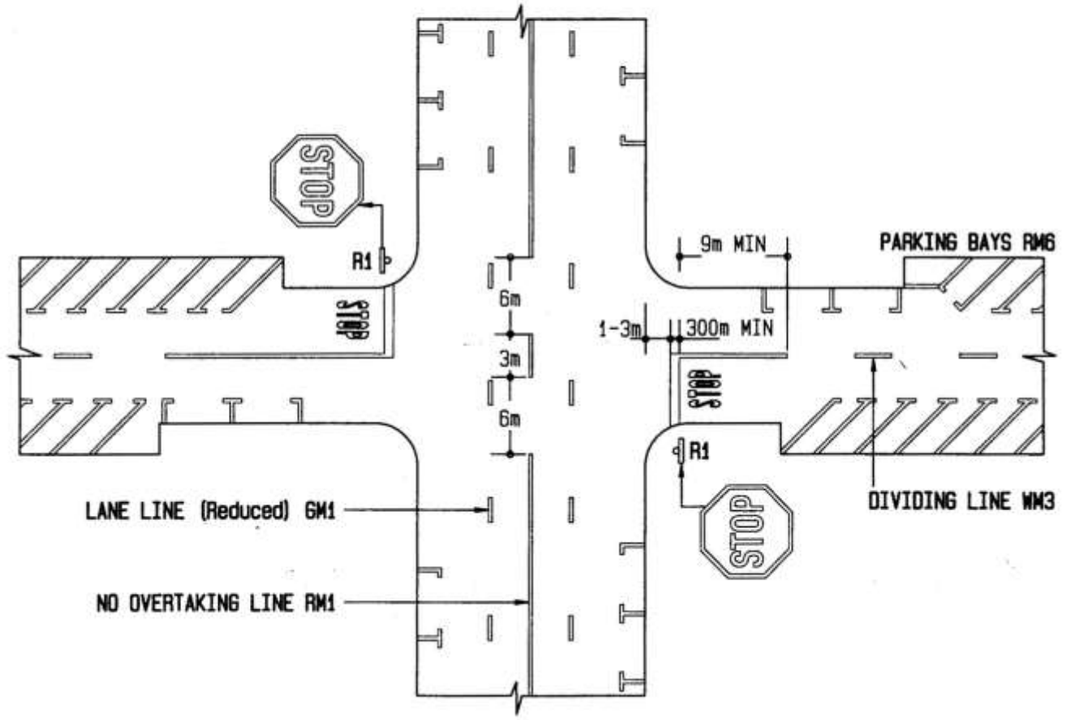


Fig 3.17
Typical Urban Junctions – Arterial - 2



Detail 3.18.1 Typical Signalised Two-Way CBD Junction with Parking



Detail 3.18.2 Typical Unsignalised Two-Way CBD Junction with Parking

Fig 3.18 Typical Urban Junctions – CBD - 1

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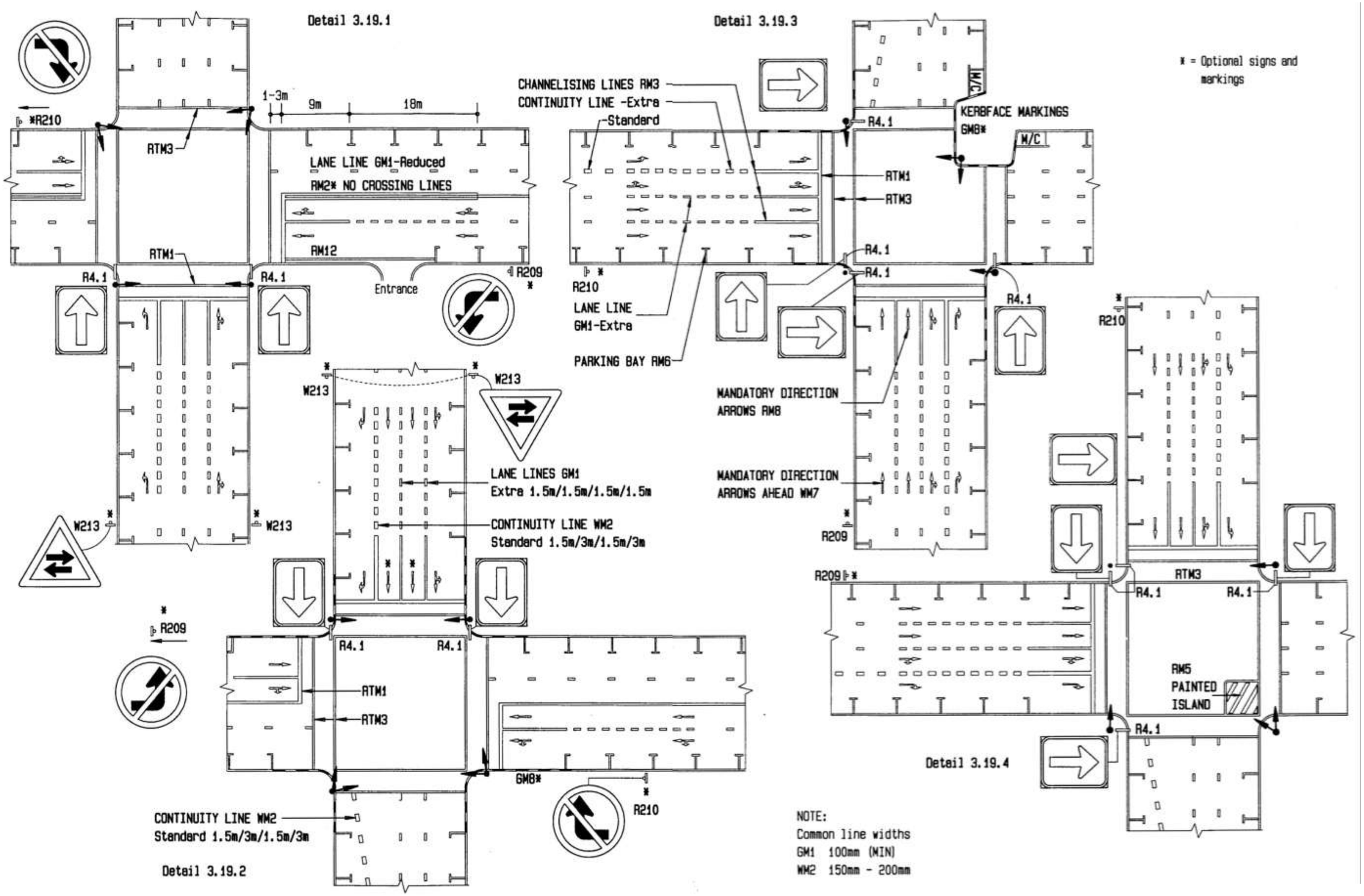
Detail 3.19.1
*R210
RTM3
1-3m
9m
18m
LANE LINE GM1-Reduced
RM2* NO CROSSING LINES
RTM1
RM12
R4.1
R4.1
Entrance
R209 *
W213
W213
W213
W213
LANE LINES GM1
Extra 1.5m/1.5m/1.5m/1.5m
CONTINUITY LINE WM2
Standard 1.5m/3m/1.5m/3m
R209
R4.1
R4.1
RTM1
RTM3
GM8*
R210
CONTINUITY LINE WM2
Standard 1.5m/3m/1.5m/3m
Detail 3.19.2
Detail 3.19.3
CHANNELISING LINES RM3
CONTINUITY LINE -Extra
-Standard
R210
LANE LINE
GM1-Extra
PARKING BAY RM6
MANDATORY DIRECTION
ARROWS RM8
MANDATORY DIRECTION
ARROWS AHEAD WM7
R209
W/C
KERBFACE MARKINGS
GM8*
W/C
R4.1
RTM1
RTM3
R4.1
R4.1
R4.1
* = Optional signs and
markings
R210
R209
RTM3
R4.1
R4.1
RM5
PAINTED
ISLAND
R4.1
Detail 3.19.4
NOTE:
Common line widths
GM1 100mm (MIN)
WM2 150mm - 200mm

3.3.3Traffic Circles

1 The details given in Figure 3.20 relate to the use of traffic circles, large or small, as a form of traffic control and not specifically to "mini-circles" as commonly used in "traffic calming" schemes. Mini-circles used in a traffic calming context are covered in Chapter 12.

2 Traffic circles can provide a very effective form of ordering priority of use of a junction without the potential inefficiencies of a traffic signal or a STOP control on one of the intersecting streets. This is because:
(a) if there is no opposing traffic there is no delay;
(b) as potentially conflicting vehicles approach, many conflicts can be removed simply by drivers signaling their intended movement;
(c) for the remaining movements priority can be established and drivers proceed, taking advantage of all available gaps in the traffic, according to reasonable rules.

3 When considering the regulatory signing and marking of a traffic circle it is important to start from the provisions of Regulation 301 (Road Traffic Act, Act 93 of 1996). The requirements of this section are, *inter alia*, that "The driver of a vehicle shall .... yield right of way to all vehicular traffic approaching from his right, **within such junction**, ...". This means that, if the circle is sufficiently large for a driver to be reasonably able to judge the above requirement, the "Rule of the Road" requires no further support from regulatory signs or markings for priority of movement to be exercised (and for it to be enforceable) (see Figure 3.13).

4 It has been common practice in the past to erect YIELD signs R2 on all approaches to a traffic circle and to also mark YIELD LINE marking RTM2 at the point of entry to the circle. In terms of Regulation 301 the provision of such signs varies the "rule" given in paragraph 3.3.3.2 because Section 94 goes on to state ".... within such junction, **unless** his entry into such junction is controlled by ..... a direction conveyed by **a road traffic sign requiring him to act differently**." YIELD sign R2 and YIELD LINE marking RTM2 are both road traffic signs and marking RTM2 has the same legal significance as sign R2. These regulatory road traffic signs require, *inter alia,* in terms of Schedule 3 to the Regulations of Act 93 of 1996, that ".... the driver of a vehicle approaching such a sign ..... shall yield right-of-way to **all .... traffic on the roadway which is joined by the roadway on which he is travelling .....** where such traffic **is so close as to constitute a danger or potential danger**". Only when a traffic circle is sufficiently large for the circular portion to be considered a "roadway", in its own right, can the effect of using signs R2 on all approaches be considered to be similar to that required by the Regulation 301 rule. As circles become smaller the circular portion tends to become less of a "roadway" and more simply a "junction". At the lower limit of the scale, namely at a mini-circle, it becomes difficult to determine:
(a) whether a vehicle is on an approach to the junction or within it; and
(b) whether the circular portion can be considered as a roadway.

5 The YIELD AT TRAFFIC CIRCLE sign R2.2 has been introduced to cater principally for these difficulties at small traffic circles. Sign R2.2 requires that ".... the driver of a vehicle approaching a traffic circle .... shall yield right of way **to any vehicle which will cross any yield line at such a junction before him** and which, in the normal course of events, will cross the path of such driver's vehicle". The effect of this requirement is to move the point of reference, for a decision to be made by the driver approaching the sign, back to any of the yield lines on the perimeter of the circle rather than to the roadway within the circle. It is evident that it is particularly important to the operational efficiency of traffic circles that drivers comply with the requirements of Regulation 300 and "**give a conspicuous signal** ..... **of his intention to turn his vehicle to the left or to the right** ...." (another "Rule of the Road"). Any authority preparing publicity material relating to traffic circles and their use is recommended to highlight this aspect.

6 It should be noted that provision of regulatory road markings TRAFFIC CIRCLE MANDATORY DIRECTIONAL ARROWS RM15 is likely to assist effective enforcement at mini-circles. The marking of the actual circle, if it is not a raised traffic island, should be according to the requirements of PAINTED ISLAND marking RM5. Detail 3.20.5 illustrates painting options.

Checklist

- are control signs actually necessary?
- which sign is most appropriate, R2 or R2.2?
- on larger circles, can the splitter islands accommodate direction signs (see Figure 3.13)?

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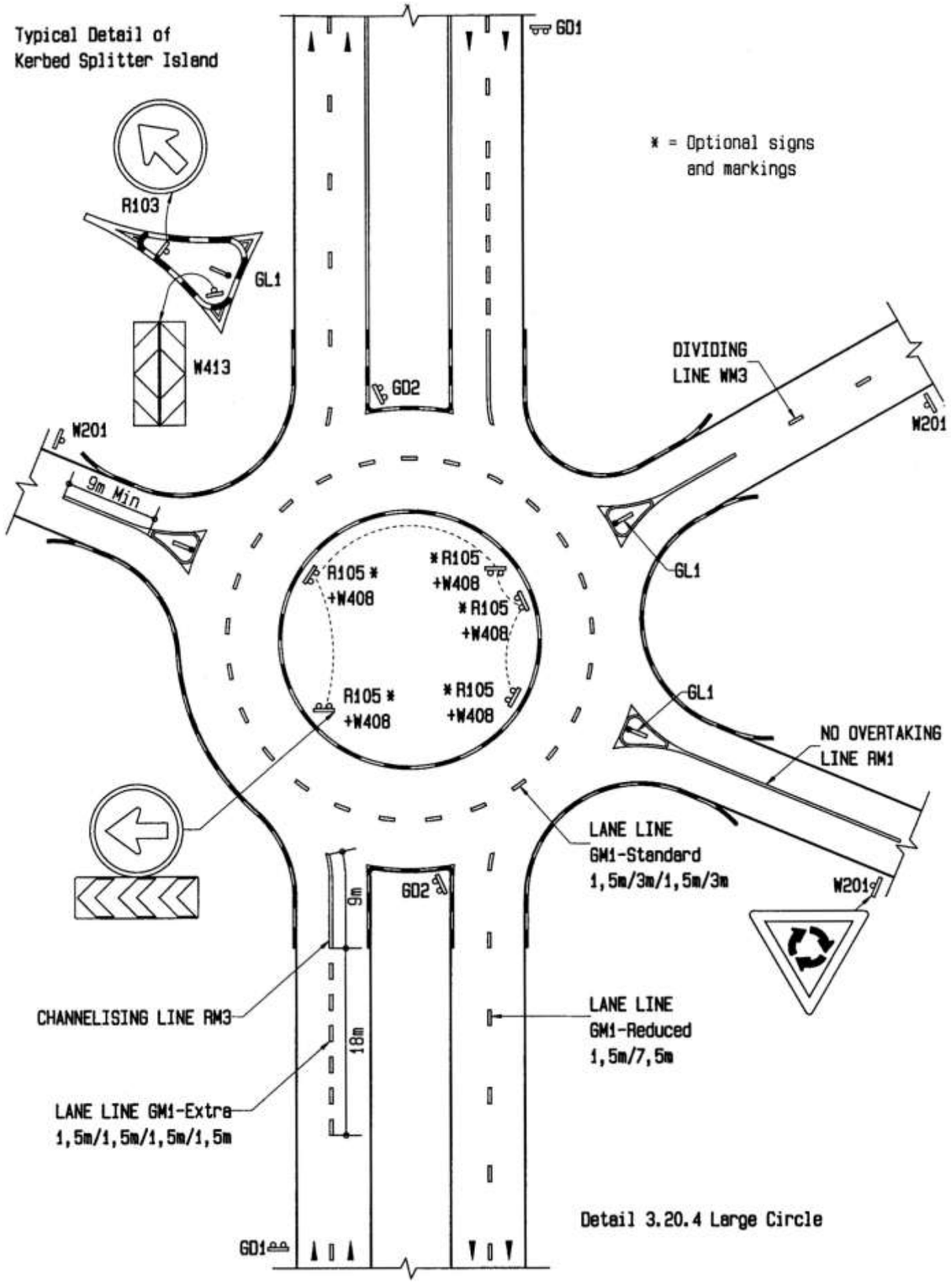
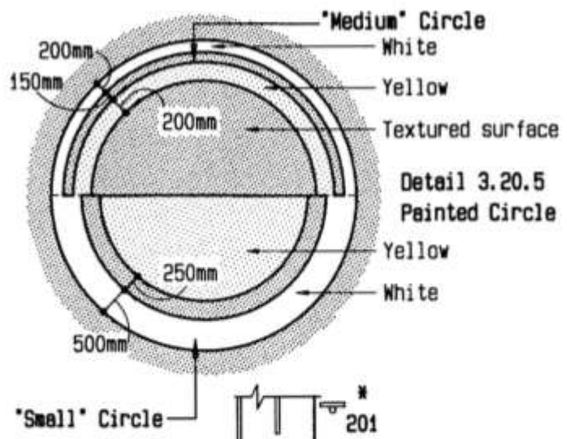
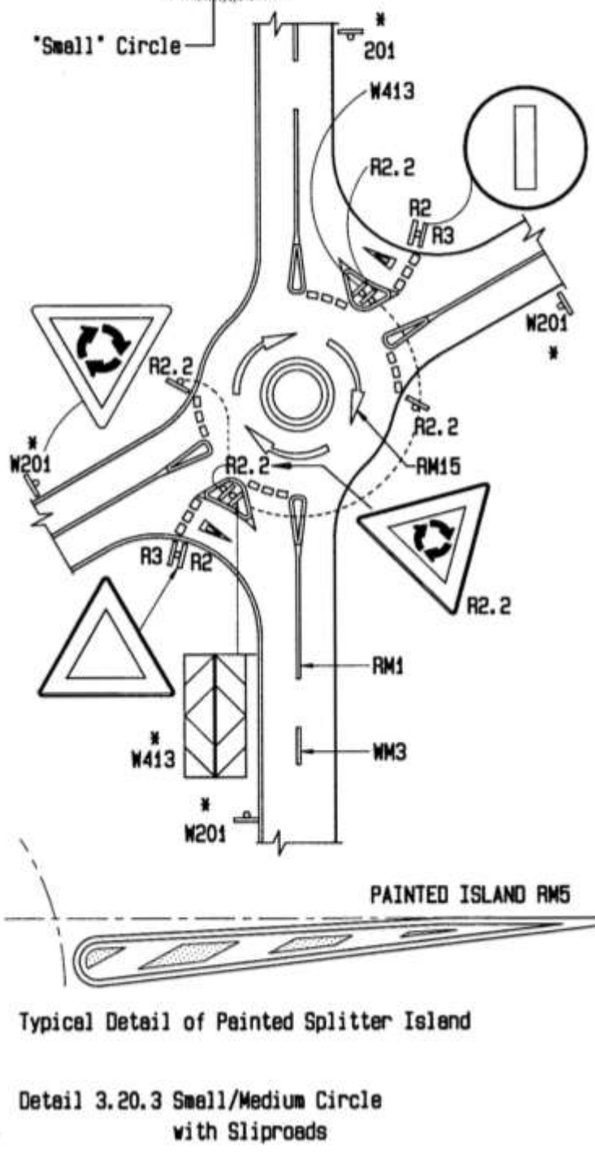


Detail 3.20.4 Large Circle

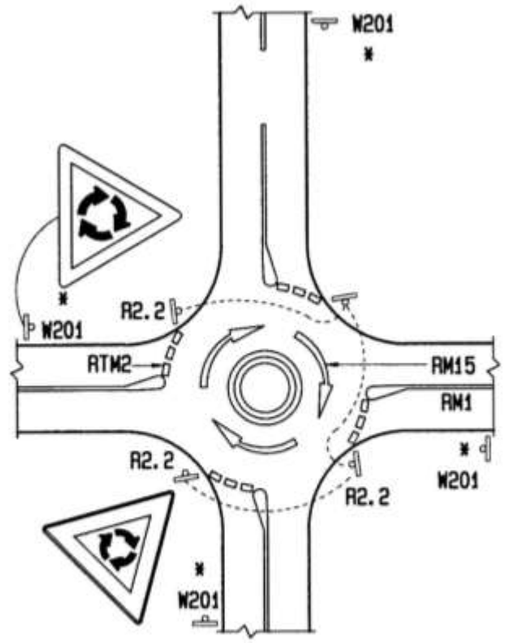


Detail 3.20.5
Painted Circle

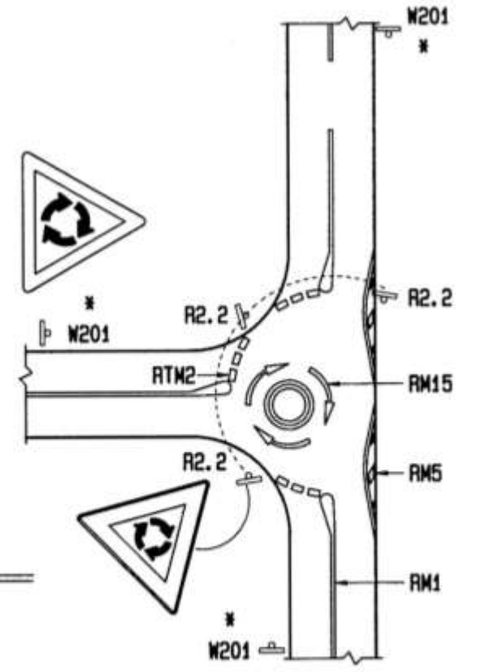


Typical Detail of Painted Splitter Island

Detail 3.20.3 Small/Medium Circle
with Sliproads



Detail 3.20.1 Small Circle at Cross Road



Detail 3.20.2 Small Circle at T-Junction

Fig 3.20
Traffic Circles

3.3.4 Other Traffic Control Situations

1 Figure 3.21 shows a diverse selection of urban road situations which from time to time create some difficulty at the design stage.

2 Detail 3.21.1 covers a typical minor crossroad junction with an urban dual carriageway. The feature of interest is that it is recommended that "stacking lanes" be marked on the dual carriageway approaches to the junction even though traffic in these lanes has priority. The function of this treatment is to increase the awareness of drivers of the existence of the intersecting road and to reduce the likelihood that drivers may change lanes through the junction since this action may affect the judgment of crossing drivers. If the median is very wide a STOP or YIELD condition may be created for crossing or turning traffic within the median opening.

3 Detail 3.21.2 deals with a situation which is not common but does occasionally occur, namely the provision of breaks in the median of a dual carriageway road which are not located at an intersecting side road. The purpose of such breaks is to permit U-turns through the median in a controlled manner. The sequence of median breaks indicated in the detail is recommended to reduce potential conflict situations. Breaks of this nature must be carefully located and well signed. A prohibition on the use of the facility by goods vehicles is recommended and should be signed using the selective restriction sign R213-568. U-turns of this nature should only be considered where visibility of oncoming traffic is of the highest order and the carriageways are wide enough to permit one point turns.

4 Detail 3.21.3 illustrates a Left Turn on Red After Stop (LTORAS) traffic signal installation. The principle features of such junctions, in addition to the provision signal head type S1(L), are that visibility to the right should be good (for a cross street) and pedestrian signal heads should be omitted from the leg of the junction on which LTORAS operates.

5 The detail treatment of bus lanes is covered in Chapter 8. The example covered by Detail 3.21.4 is included to make designers aware of the particular requirements such a situation may have for regulatory and warning signs. Detail 3.21.4 illustrates what is traditionally considered as a "contra-flow" bus lane operating in the opposite direction to a so-called "one-way" flow of normal traffic. The terminology used probably stems from the fact that a previously one-way road (comprising in the example four lanes) has had one lane reversed and reserved for exclusive use by buses. It is common practice under such circumstances to retain ONE WAY signs R4.1 or R4.2 even though the road is operating with two-way traffic. It is not too difficult to make drivers on an intersecting side road aware of the circumstances although careful signing is required. However, there is evidence to suggest that the practice can be very confusing for pedestrians who may cross the street under the impression that it is a one way street and be unaware that buses are travelling in the opposite direction. Detail 3.21.4 shows a signing treatment which treats the road with the bus lane as a two way road and provides additional signs relating to use of the lane as a "busway". To enhance awareness of the bus operation it is recommended that the EXCLUSIVE USE LANE marking RM9 be taken through the junction and that EXCLUSIVE USE WORD "BUS" marking RM17.2 and INFORMATION ARROW marking GM4.1 be used extensively in the line of the bus lane to increase awareness of the presence of buses and their direction of travel (for further detail see Chapter 8, Figure 8.29).

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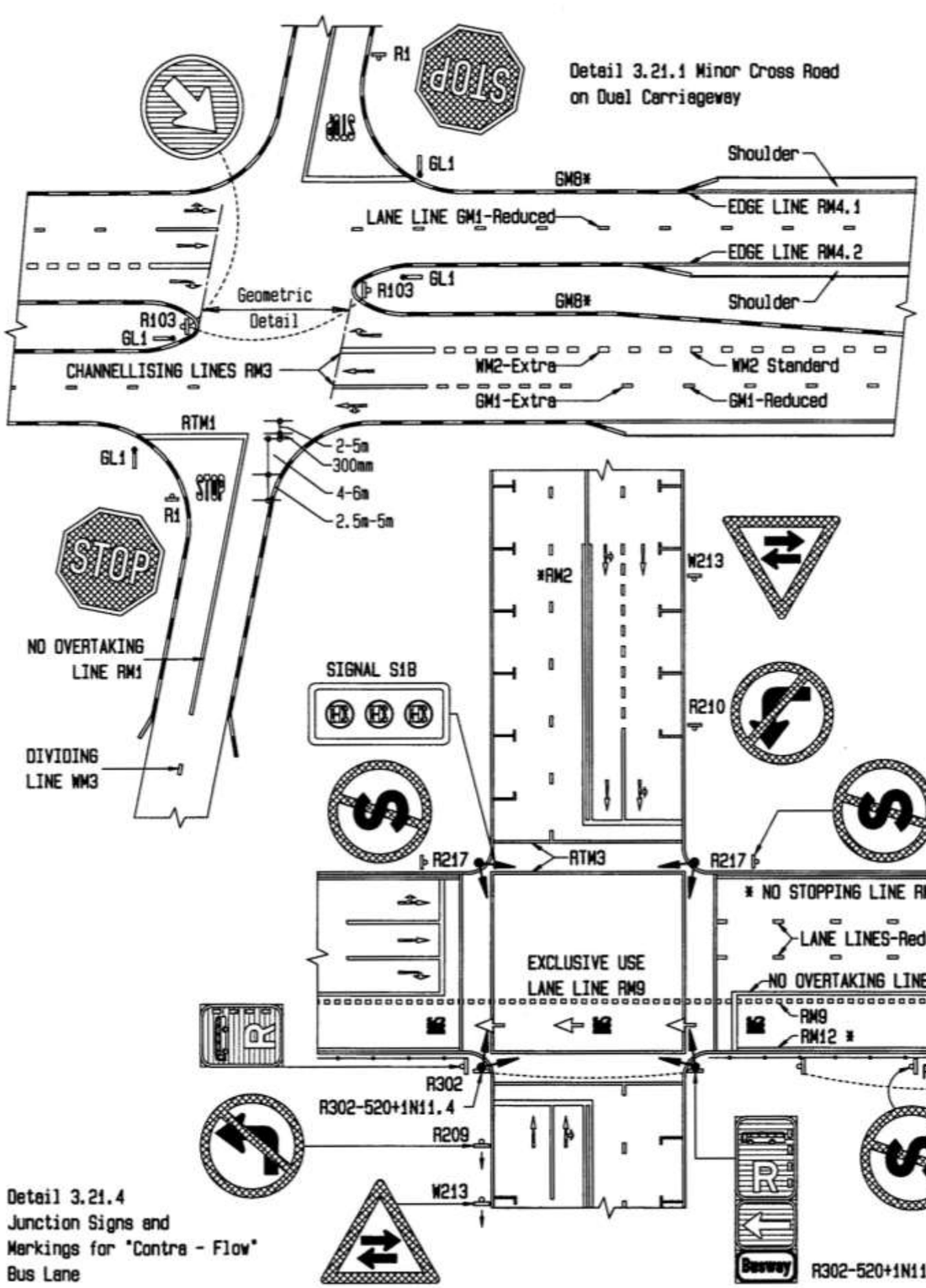
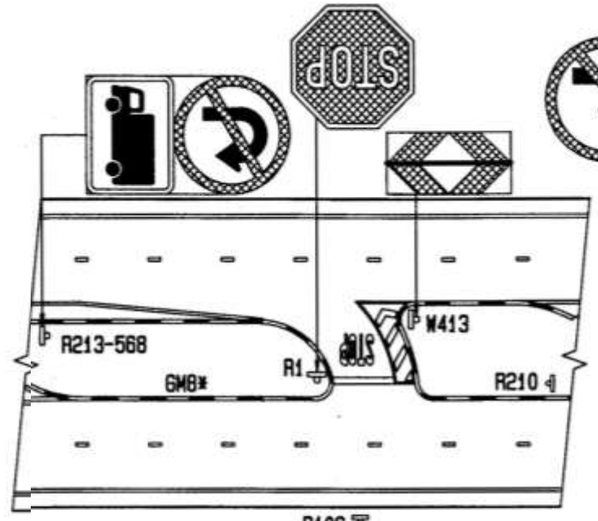
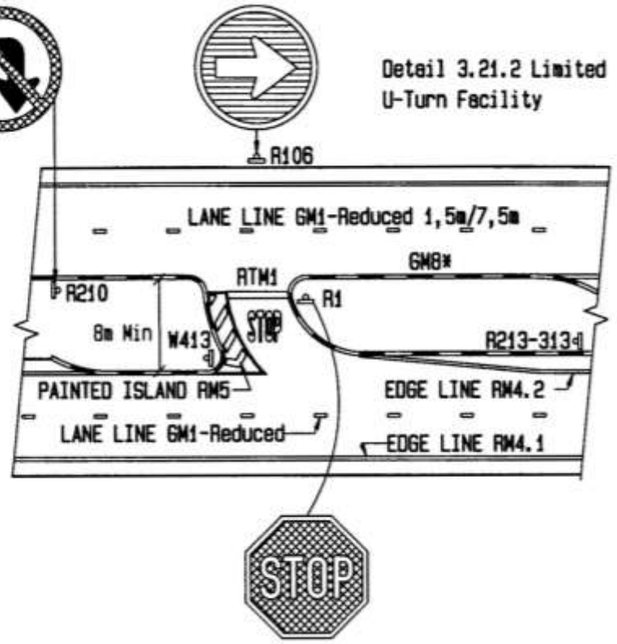
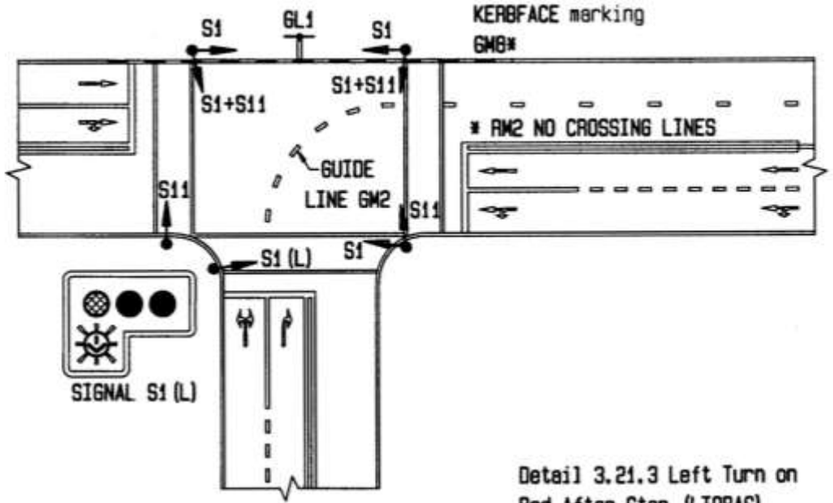


Detail 3.21.4
Junction Signs and
Markings for "Contra - Flow"
Bus Lane





Detail 3.21.2 Limited
U-Turn Facility



Detail 3.21.3 Left Turn on
Red After Stop (LTORAS)

*= Optional signs
and markings

Fig 3.21
Other Less Common Junction Details

3.3.5 No Stopping and No Parking Control

1 Figures 3.22 to 3.24 illustrate a range of typical "No Stopping", "No Parking" and combined situations. The details have all been prepared based on sections of one way street since these most commonly have these types of control imposed on them. The principles illustrated are, however, relevant throughout the urban street network.

2 Stopping and parking (or "No Stopping" and "No Parking) are controlled in the general sense by Sections 97 and 98 respectively of Act 29 of 1989. There are several factors which designers should be aware of relating to no stopping and no parking in these "Rules of the Road". In the context of the positions of regulatory signs and markings to control stopping and parking, however, the following comments are relevant:

(a) as a general rule stopping and parking are prohibited (without the need for signs or markings) within 9m of the approach side of a pedestrian crossing demarcated by a road traffic sign - which means that this applies on the entry side to all signalised junctions with pedestrian crossings marked by PEDESTRIAN CROSSING marking RTM3;

(b) as a general rule parking is prohibited within 5 m of any intersection, unless permitted by a road traffic sign (such as a PARKING BAY marking RM6); because the definition of an "intersection" specifies that it is the area contained within the extensions of the road reserve or property boundary lines, the requirement of the rule means that parking is prohibited 5m back from such boundaries on all approaches to the junction;

(c) no person shall park a motor vehicle on a traffic island ..... .

3 The provision of signs and markings to control stopping and/or parking can therefore be developed around these basic rules although authorities may obviously put signs or markings within such limits for emphasis. Such practices will not, however, represent the most economic approach to the provision of signs and markings.

4 Detail 3.22.1 shows two NO STOPPING conditions. The one side of the street has a permanent (24hr) NO STOPPING control indicated by NO STOPPING signs R217 and NO STOPPING LINE marking RM12. The provision of both signs and markings is for emphasis, either can be provided on its own. The other side of this street has a NO STOPPING control only between 06:30 and 09:00 with an indication of parking restrictions between 09:00 and 18:00. The NO STOPPING prohibition is a **selective restriction** applying only for the time indicated and signed by signs R217-501. The LIMITED PARKING RESERVATION sign R306-P-501 is also provided. This is also a form of selective restriction sign, which permits parking, but only between the times indicated and with the limitation that parkers may only occupy the space for a maximum period of 120 minutes. Since parking bays are marked, NO STOPPING LINE RM12 should be provided as a broken line across the open side of each parking bay or in a similar manner on the kerb face at the rear of the bays. The maximum distance permitted between signs for this type of application is 150 m.

5 Detail 3.22.2 indicates a similar selective restriction condition in combination with a bus lane which operates during the period of the NO STOPPING prohibition. This detail also shows a full time bus lane, with a full time prohibition on stopping, on the intersecting street.

6 Detail 3.23.1 illustrates an example of combined NO STOPPING (selective restriction) and NO PARKING controls on a street. Details 3.23.2 and 3.23.3 show how localised sections of NO STOPPING LINE RM12 or NO PARKING LINE RM13 may be used to control stopping or parking in an area otherwise reserved for emergency vehicles (outside a church or theatre for example) or in the vicinity of the entrance to a property.

7 Figure 3.24 shows examples of NO PARKING control similar to those indicated in Figure 3.22 for NO STOPPING. The examples given include a variety of lane configurations including dedicated turn lanes. The recommended treatment of the commencement of such a lane is indicated in Figure 3.24 by the tapering section of standard CONTINUITY LINE marking WM2. This recommended practice is consistent with the practices recommended in Subsection 3.3.2 to inhibit unintended entry into a dedicated turn lane. The relevant road markings are covered in greater detail in Chapter 2.

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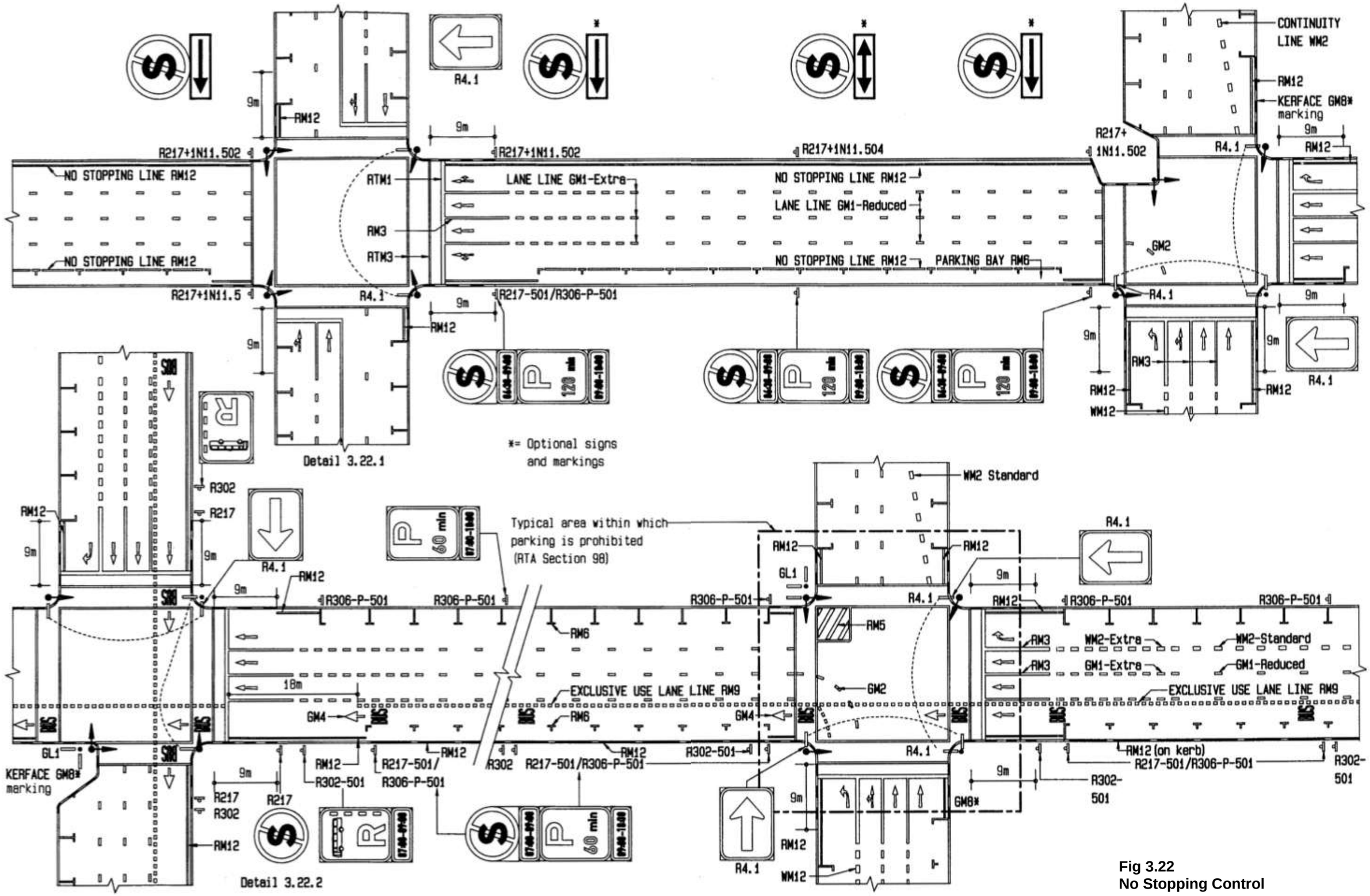
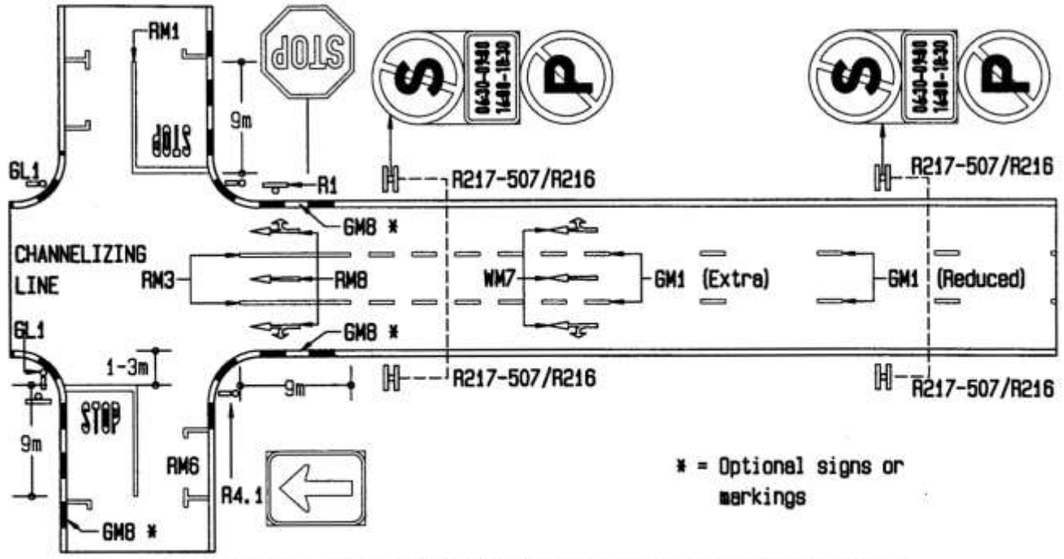
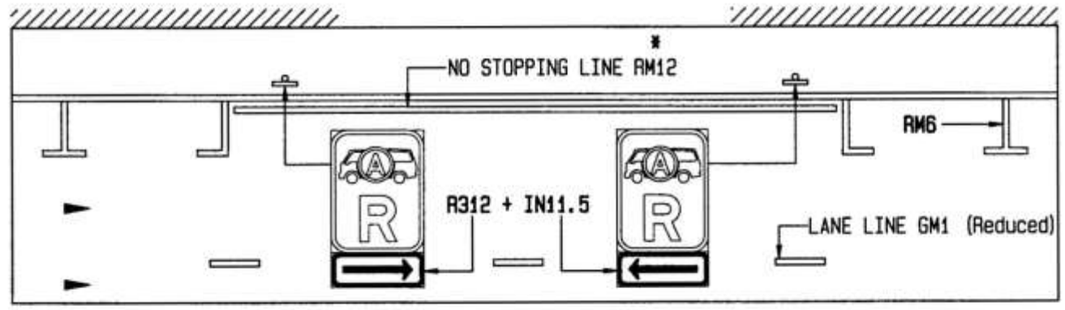


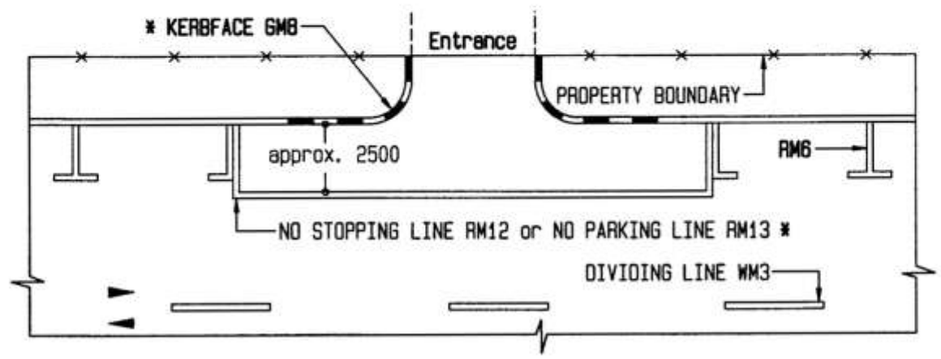
Fig 3.22
No Stopping Control



Detail 3.23.1 Selective No Stopping and 24-Hour No Parking Control



Detail 3.23.2 Optional Treatment at Place of Public Assembly



Detail 3.23.3 Optional Treatment at Property Entrance

Fig 3.23 No Stopping/No Parking Control

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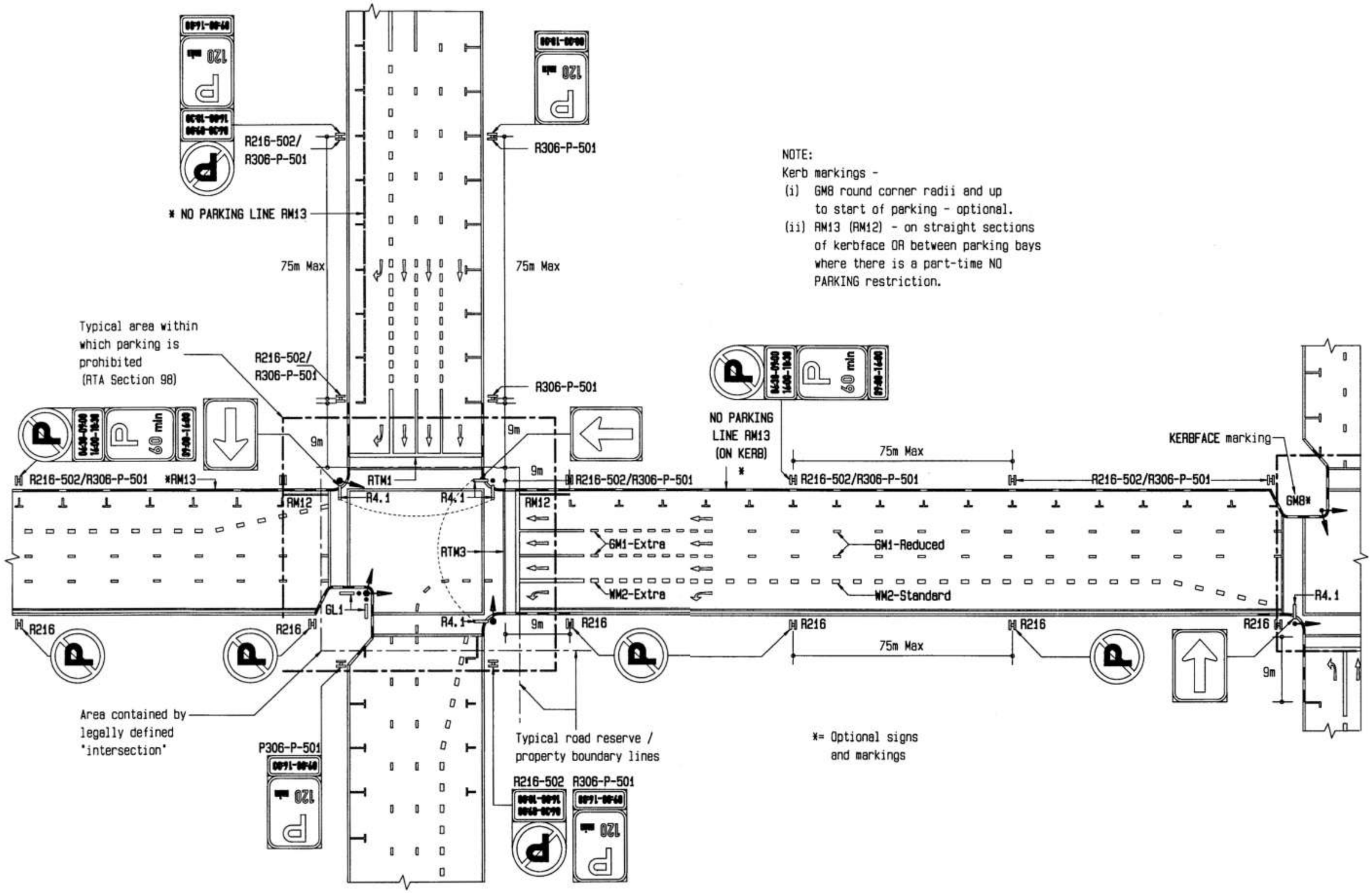

GM8 round corner radii and up to start of parking - optional.

(i) RM13 (RM12) - on straight sections of kerbface OR between parking bays where there is a part-time NO PARKING restriction.

Fig 3.24
Parking Control

3.3.6 Signing for Bicycle and Motor-cycle Control

1 Figure 3.25 depicts a selection of cycle facilities including:
   (a) shared pedestrian and bicycle paths, separated from the roadway;
   (b) a bicycle lane;
   (c) parallel pedestrian and bicycle crossings at a signalised junction; and
   (d) parallel pedestrian and bicycle mid-block signalised crossing.

2 Figure 3.26 gives a higher level of detail for the combined pedestrian/bicycle crossings. It should be noted that BICYCLE Guide LINES GM5 are guidance markings and do not have the same legal force as PEDESTRIAN CROSSING LINES RTM3. It is therefore recommended that where practical both crossing markings be used.

3 Figure 3.27 illustrates two motorcycle control applications. Detail 3.27.1 is likely to have rare application but may occasionally be appropriate. The signs used to require motorcycles to take a specific direction should be mandatory control signs such as R108 and R103. **These can be made selective in their restriction by the addition of SECONDARY MESSAGE sign (R)356 depicting that the instruction of signs R108 and R103 applies only to motorcycles.** The prohibited movement shall be indicated by NO MOTORCYCLES sign R222 and the NO MOTORCYCLES regulatory road marking RM14, which can be marked in each appropriate lane.

4 Detail 3.27.2 shows how a rank of parking bays can be signed to be restricted to use by motorcycles only.

3.3.7 Signing for Concealed Entrances

1 Figure 3.28 shows two typical situations where signing of concealed property accesses or driveways may be warranted. Detail 3.28.1 shows a winding section of roadway with relatively closely spaced entrances. The road curvature can inhibit visibility and judgment of turning or entering traffic.

2 Detail 3.28.2 is very localised but not uncommon. Because of the sharp bend sight distance to the entrances is limited. This example illustrates the option to use the sign design characteristics of CONCEALED DRIVEWAY advance warning signs W216 to W218 with other signs such as SHARP CURVE advance warning signs W204 and W205 (see Volume 1, Chapter 3, Subsection 3.3.10 which allows for variation in the shape of the main arrow in signs W216 to W218).

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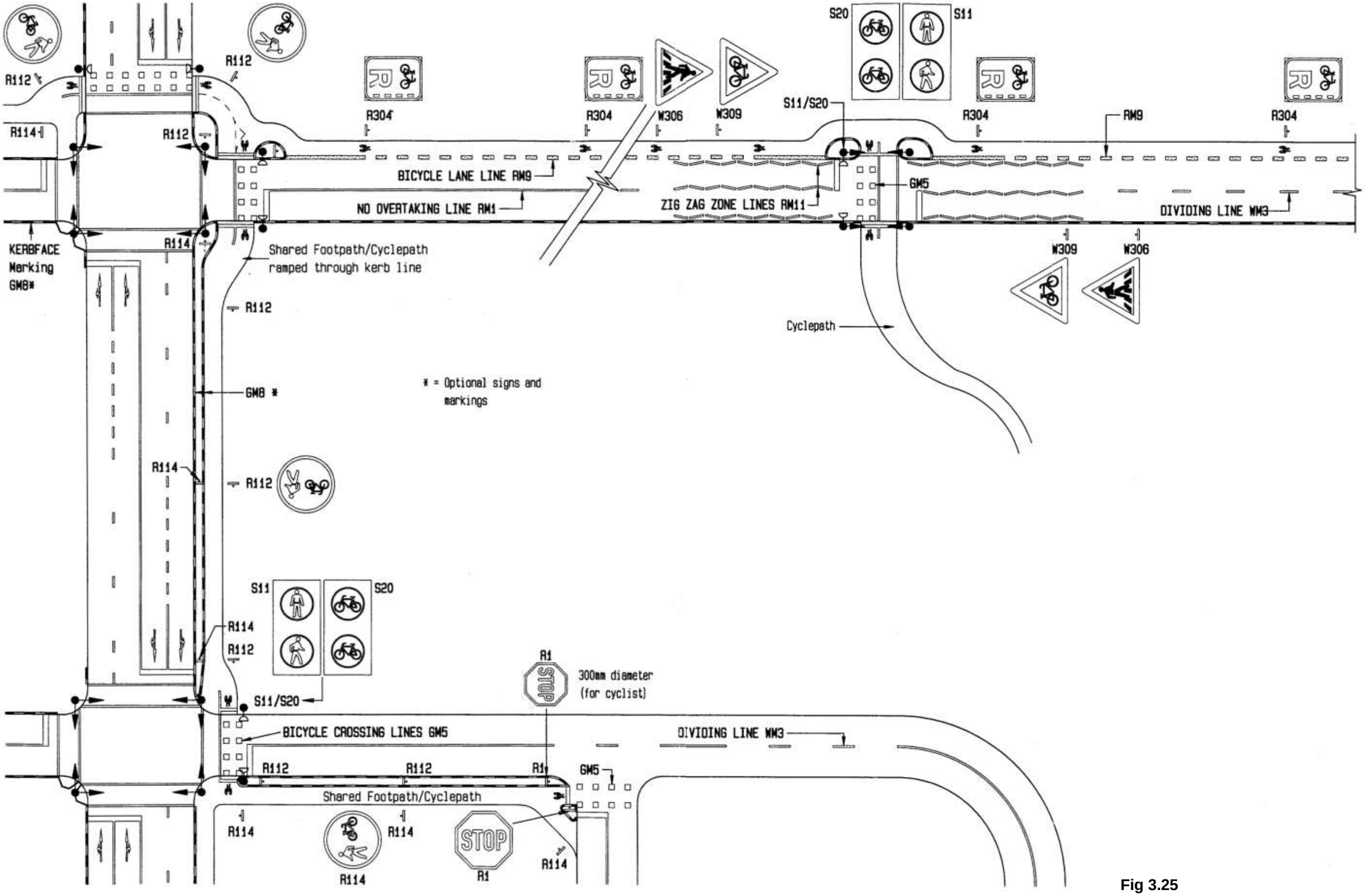
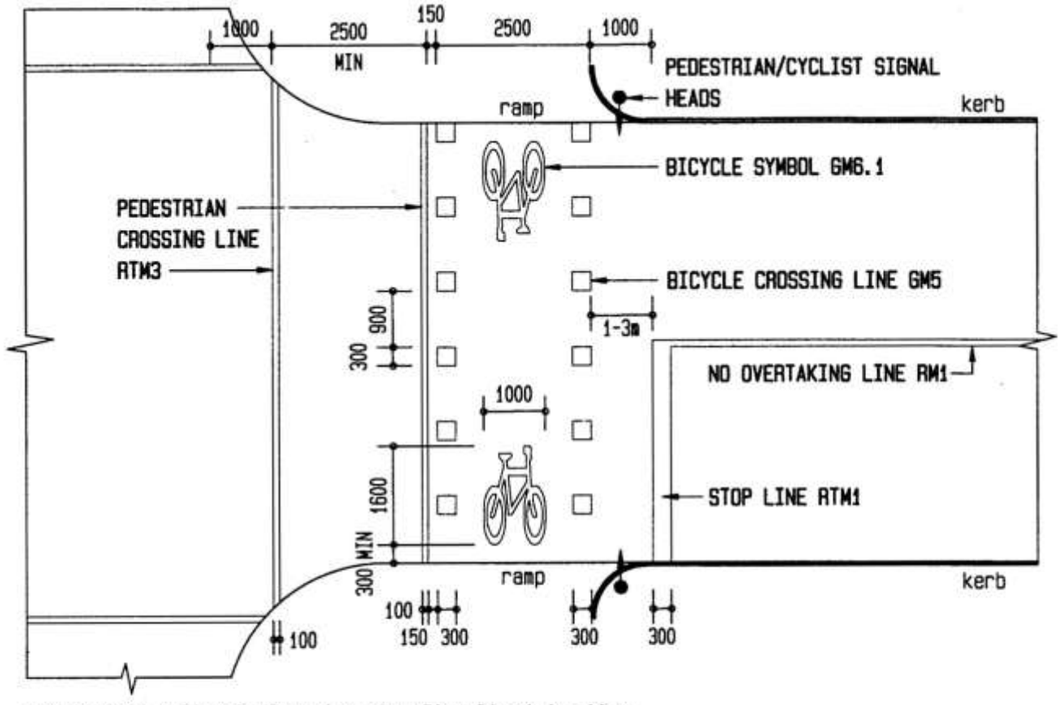
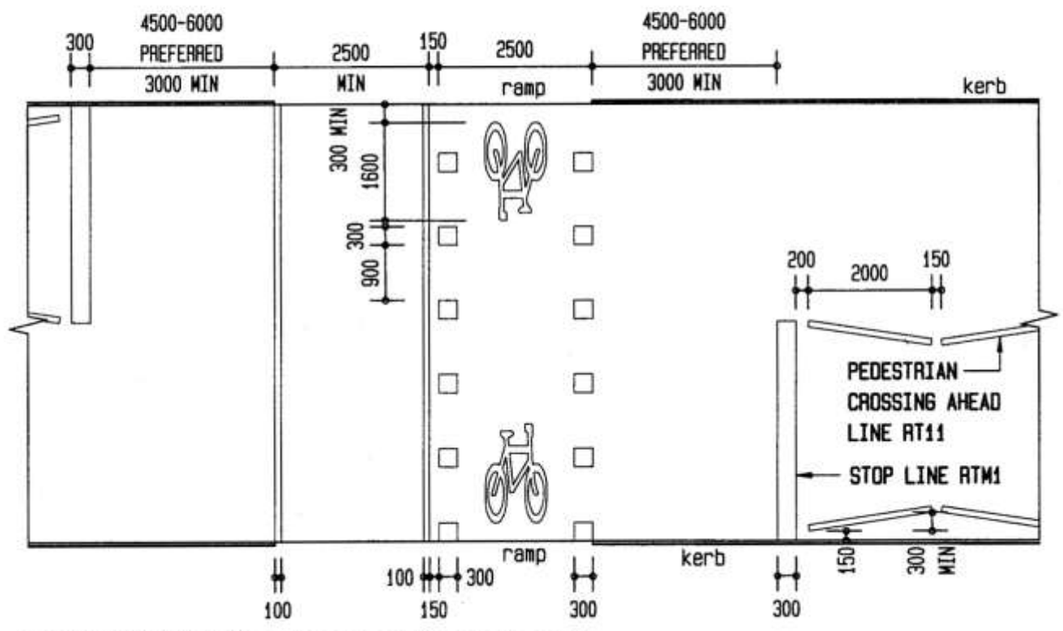


Fig 3.25
Bicycle Facilities - 1



Detail 3.26.1 Bicycle Crossing at a Signalized Junction



Detail 3.26.2 Mid-Block Signalized Bicycle Crossing

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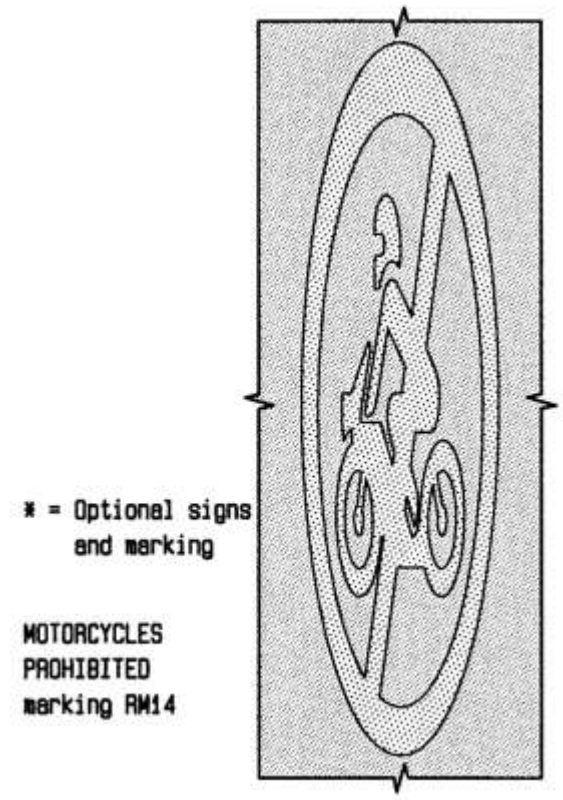
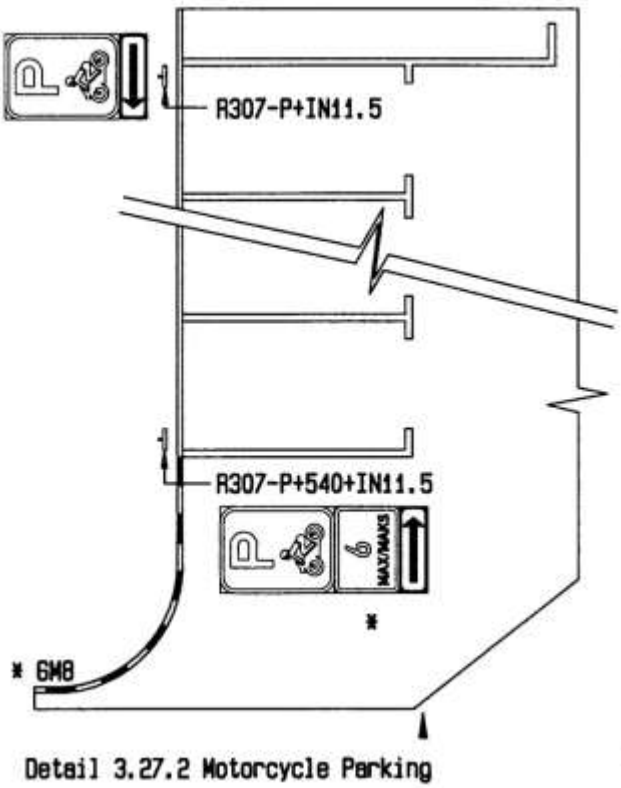
Fig 3.26 Bicycle Facilities - 2



Detail 3.27.1 Freeway Motorcycle Control



Detail 3.27.2 Motorcycle Parking

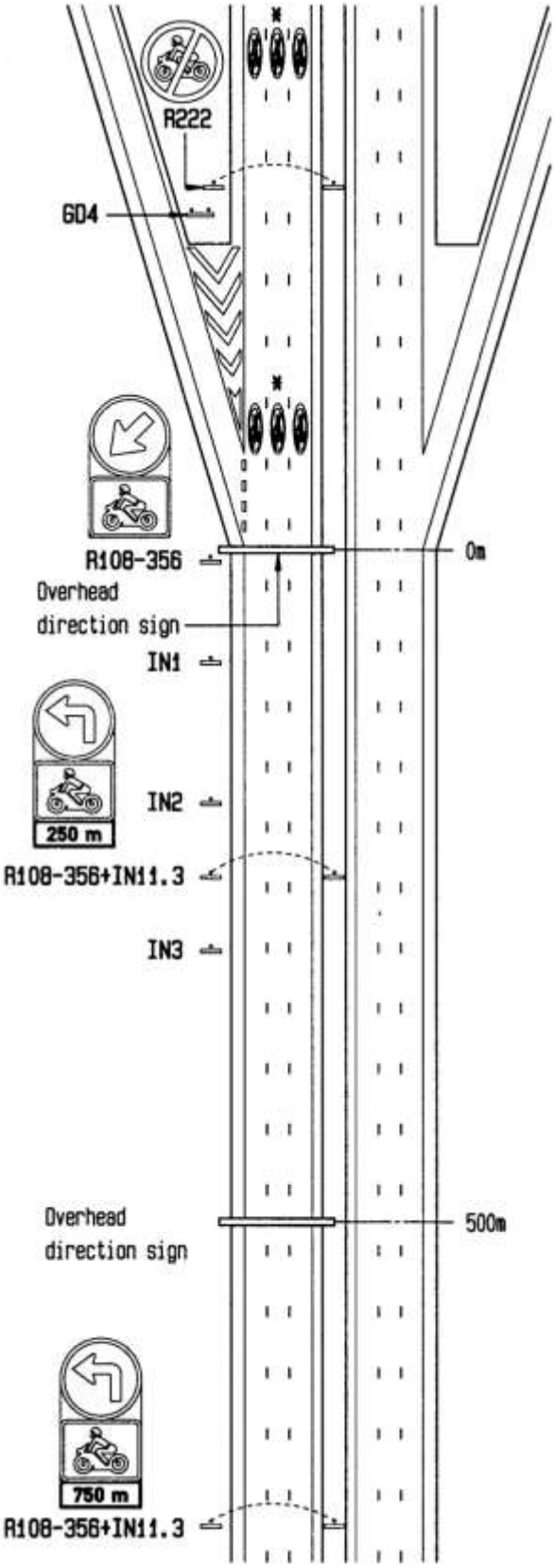


Fig 3.27 **Motor Cycle Facilities and Control**

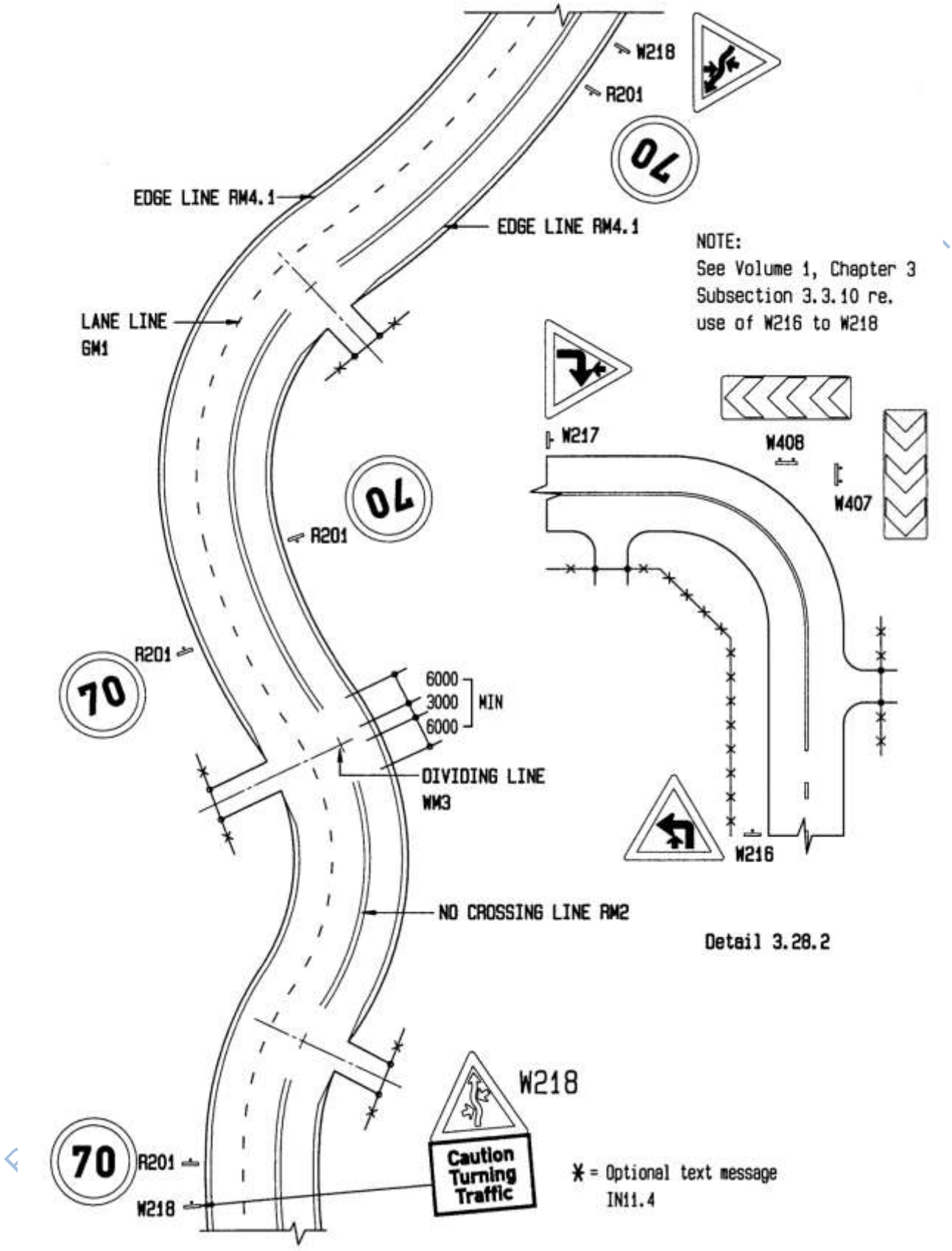
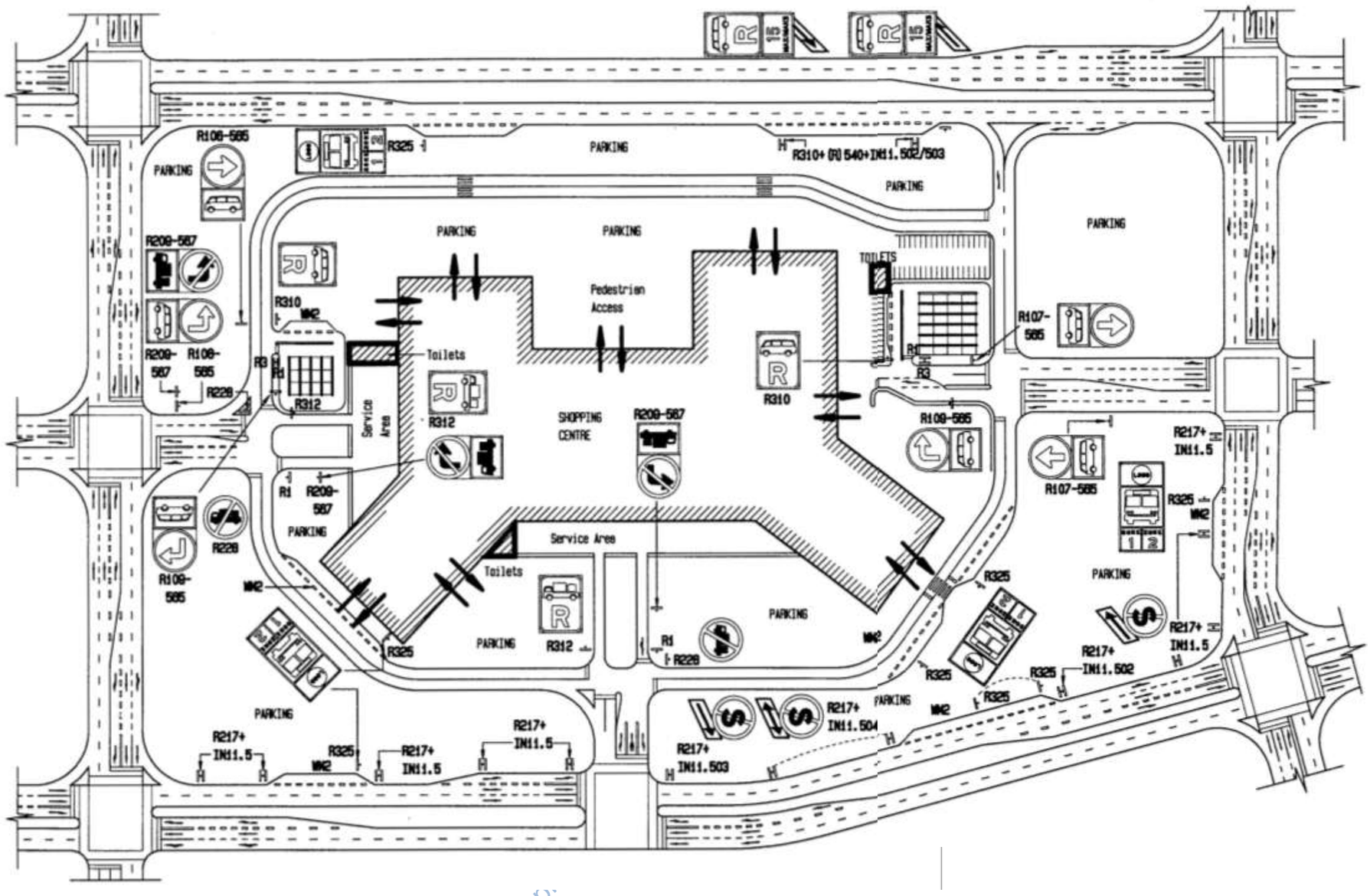


Fig 3.28 **Concealed Entrances**



3.3.8 Traffic Control at Shopping Centres

1 Figure 3.29 also appears in Chapter 8 as an example of the sort of influence catering for public transport facilities within the shopping centre environment might have on signing. The figure includes signing requirements controlling the movement of goods vehicles within the area and a representative selection of other controls such as NO STOPPING signs R217 for general traffic control. In this way it is representative of an environment which may require a wide selection of regulatory signs. This need places a particular burden on signing designers to know the function of the various regulatory (and selective restriction) signs well and to apply them with care.

2 In the example illustrated the majority of access to and from the site is controlled by traffic signals although one "left in/left out" access is shown to the top section of road. Given the proximity of the mini-bus stop this exit would be controlled by STOP sign R1. Internal junctions may be priority allocated with STOP control on one roadway or they may be controlled by 4-way STOP control. It is traditional to control individual parking aisles using STOP sign R1 and STOP LINE marking RTM1. However, there is no reason why, taking due account of internal parking roadways more use cannot be made of YIELD control in this type of low speed environment. In this regard it should be noted that in terms of Schedule 3 of the Regulations to the Road Traffic Act, Act 29 of 1989, STOP LINE marking RTM1 and YIELD LINE marking RTM2 have the same legal force as signs R1 and R2 respectively. It is therefore not essential in this type of environment that signs **and** markings be provided.

Fig 3.29
Traffic Control at Shopping Centres

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3.4 SIGNING AND MARKING APPLICATIONS FOR PARKING CONTROL

3.4.1 General

1 The examples in this section cover basic applications of regulatory signing appropriate to stopping and parking control. These situations are most commonly found in urban areas but may also occasionally be applicable in other situations.

2 The examples covered in Figures 3.30 to 3.34 can be read in conjunction with many of the figures in Section 3.3, in particular Figures 3.22, 3,23 and 3.24. The detail given in this section tends to be at a larger scale which permits a greater degree of detail. The examples given in Figures 3.33 and 3.34 illustrate additional variations to those already illustrated in Section 3.3.

3 Provision of signs for the control of the parking of vehicles cannot be undertaken without full knowledge of rules applicable to the provision of NO STOPPING sign R217 and/or NO PARKING sign R216. The use of these signs is covered by Regulations 304 and 305, under the "Rules of the Road". In particular these sections detail portions of the public road in relation to intersections or junctions on which stopping or parking are automatically prohibited, unless in the case of parking a parking bay has been marked by PARKING BAY marking RM6 (see Figure 3.2 and Subsection 3.3.5).

4 In addition Regulation 288 contains many detail provision applicable to regulatory signs for the control of parking. It should be noted that "parking" in the context of the regulations includes "no stopping", "no parking" as well as signs indicating one or more restrictions on the way in which parking, which has been provided, may be used. Typical of such restrictions, which may be applied singly or together, are:

(a) parking in the public road must be paid for in the manner provided for, including by parking meter, pay-and-display, or some other form of pre-paid token;

(b) parking, even if paid for, is restricted or limited to a maximum period of time;

(c) parking is restricted to a particular time or times of the day (these times may be different for different days of the week);

(d) parking is restricted to a particular class of vehicle.

5 Regulatory signs relating to the stopping or parking of a vehicle may be displayed in one of two ways as follows:

(a) parallel to the lateral edge of a public road in which case only one sign, or "sign set", is required per sign position;

(b) at right angles to the lateral edge of the road in which case each sign, or "sign set", shall display a similar sign set on the reverse side.

A "sign set" refers to, for example, a NO STOPPING selective restriction sign R217-501 mounted with a PARKING RESERVATION selective restriction sign R306-P-501, each sign applying only for part of the day. Signs displayed in either of the ways detailed above may be supplemented by SUPPLEMENTARY PLATE signs IN11.5 displaying arrows pointing in the direction of applicability of the sign(s).

6 A number of other provisions regarding the display of regulatory parking signs are covered in Section 412. Those officials responsible for the provision of parking signs and their enforcement must be familiar with Section 412 in detail. The most relevant aspects affecting designers are:

(a) parking regulatory signs shall be displayed at each end of a section of public road between junctions and on the side of the road to which they apply;

(b) subject to the provisions of paragraph 3.4.1.5, if the section of public road does not exceed 75m in length, only one parking regulatory sign need be provided;

(c) parking regulatory signs may be placed to be applicable to a portion of public road other than the side of the road - this has the effect that such signs may be located on traffic islands (or other raised areas) to apply to any parking bay adjacent to such islands provided that the sign is not more than 500 mm from the nearest bay - when more than one adjoining bay is provided the sign may apply for 75 m on each side of the sign (in this case bays marked within two and a half metres of each other are deemed to be adjoining bays);

(d) no junction shall be included in any section of public road controlled by regulatory parking signs.

7 It is a general interpretation of the above statements that if a section of public road is longer than 150 m parking regulatory signs should be repeated at regular intervals along the section so that the maximum distance between signs does not exceed 150 m. In terms of the provisions of Regulations 304 and 305 of the "Rules of the Road", a section of public road may commence within 9 m of a pedestrian crossing (on the approach side) so far as NO STOPPING signing is concerned, and 5 m beyond the limits of an **intersection** so far as parking signs are concerned (see Figure 3.2).

8 It should also be noted that "public road" is defined in the Road Traffic Act, *inter alia,* to mean "...any road, street or thoroughfare or .... **any place (whether a thoroughfare or not)** which is commonly used by the public .....".

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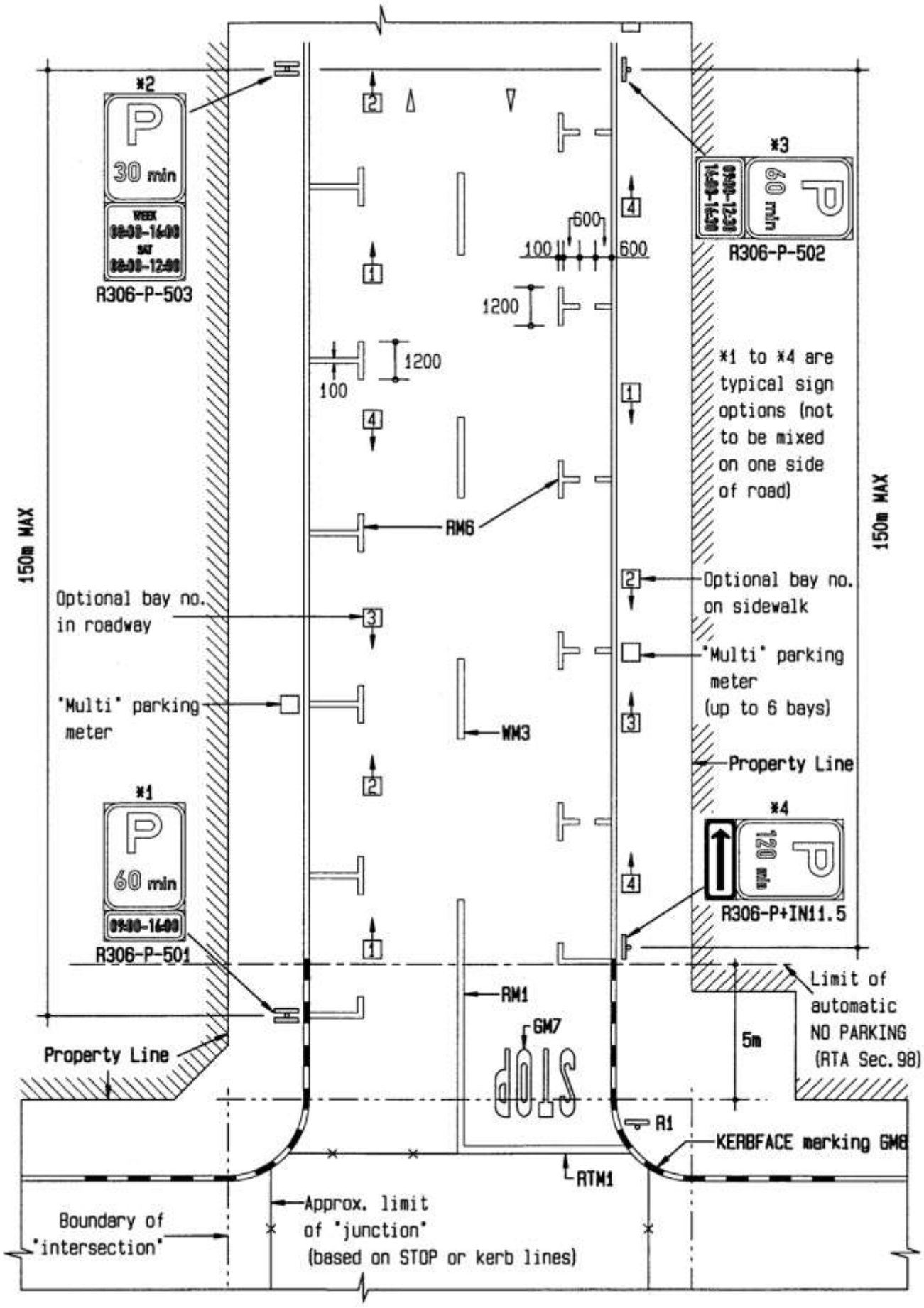


Fig 3.30 General Parking Control - 1

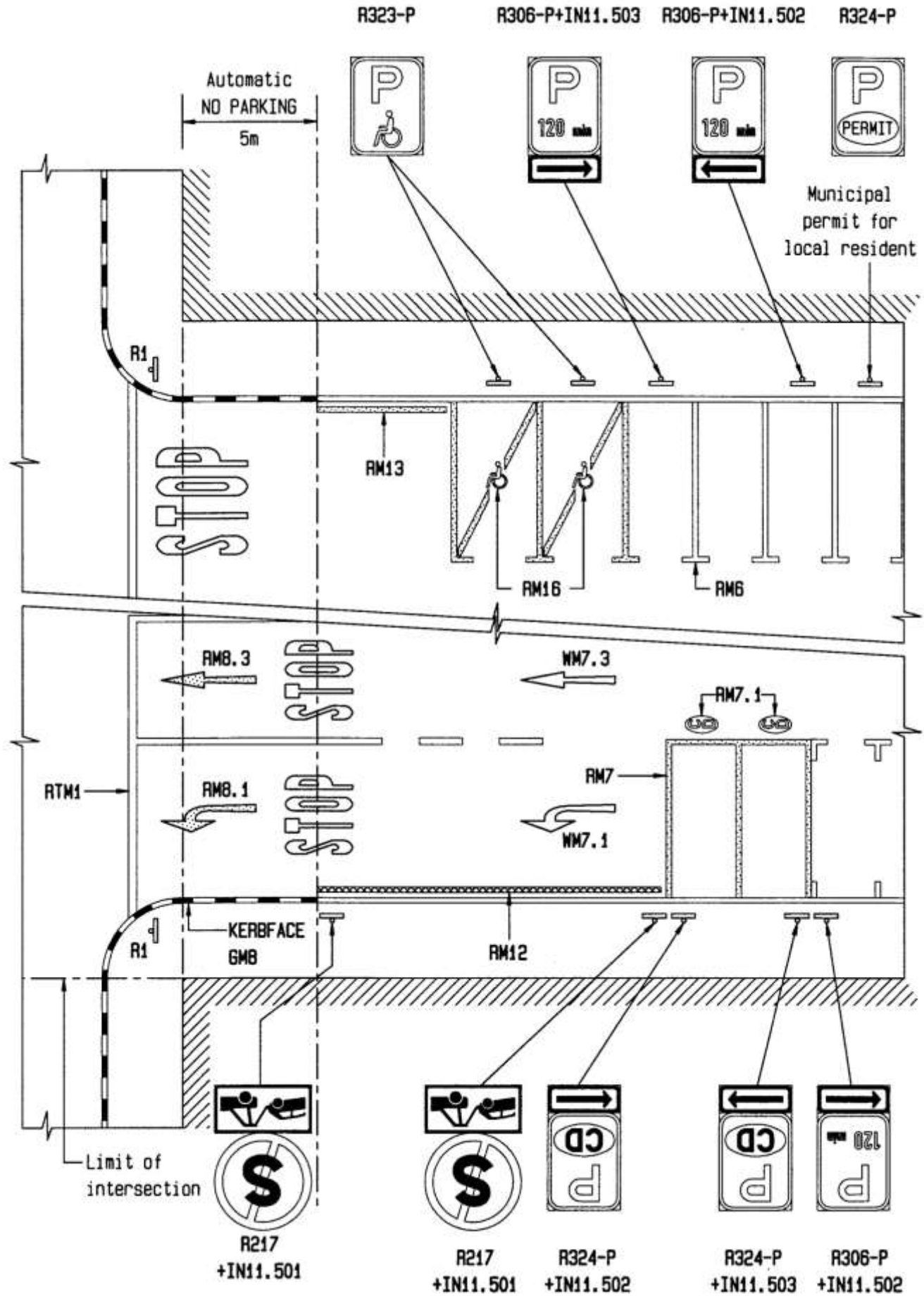
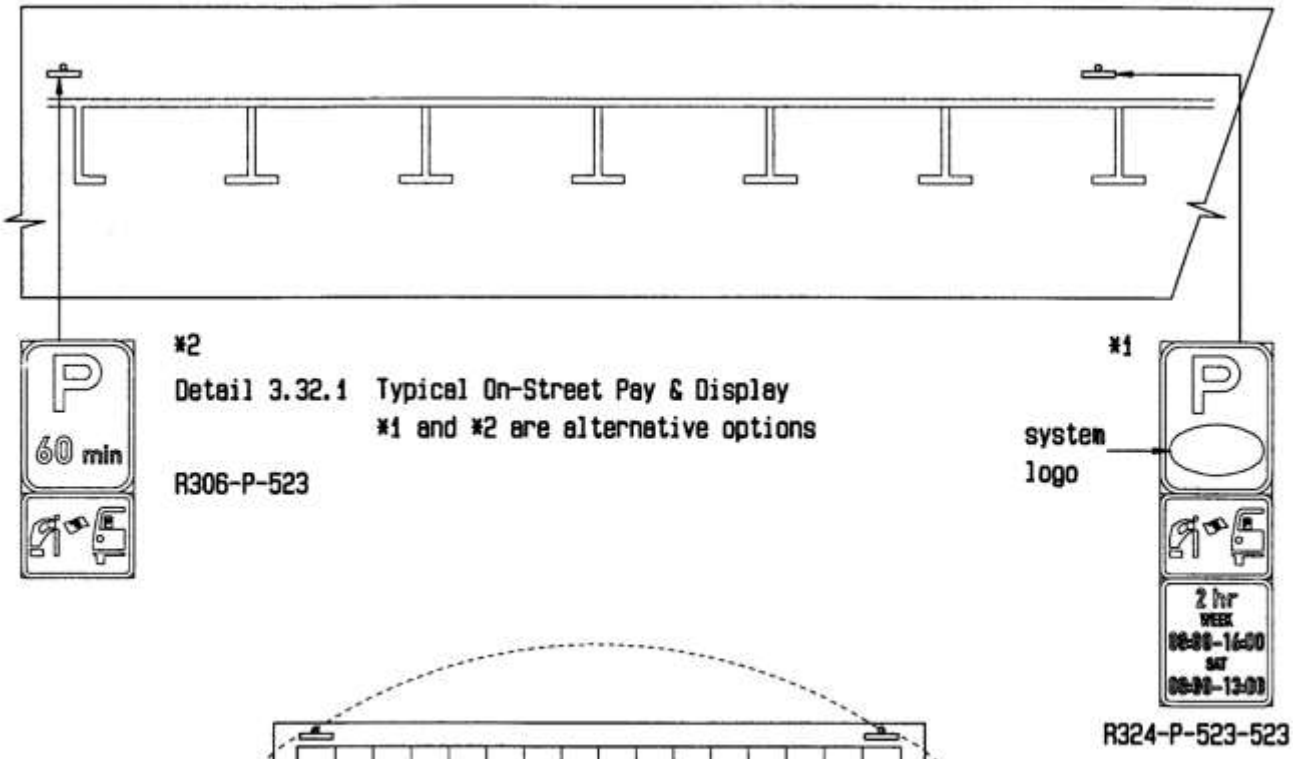
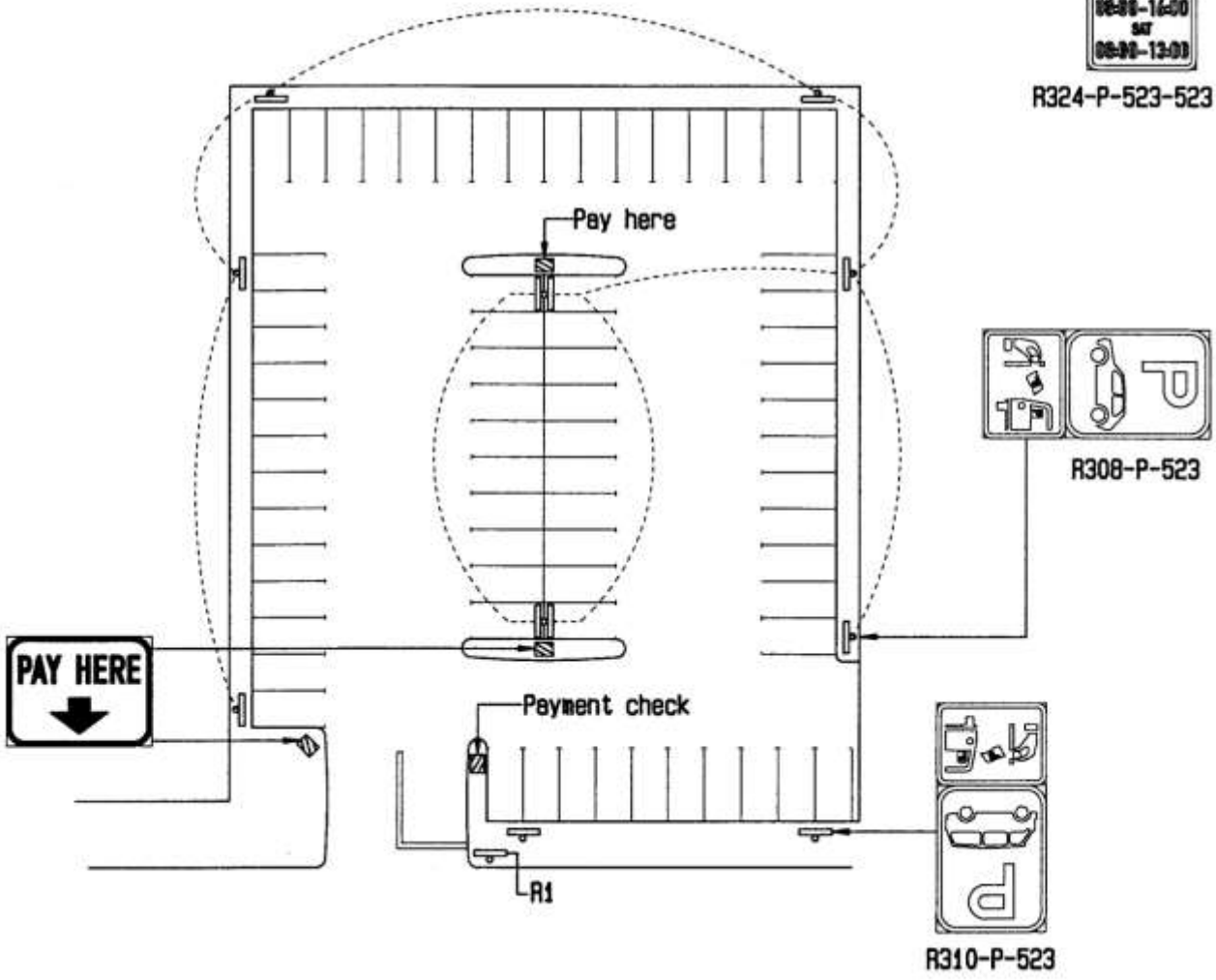


Fig 3.31 **General Parking Control - 2**





Detail 3.32.2 Typical Off-Street Pay & Display

Fig 3.32 Pay and Display Parking Control

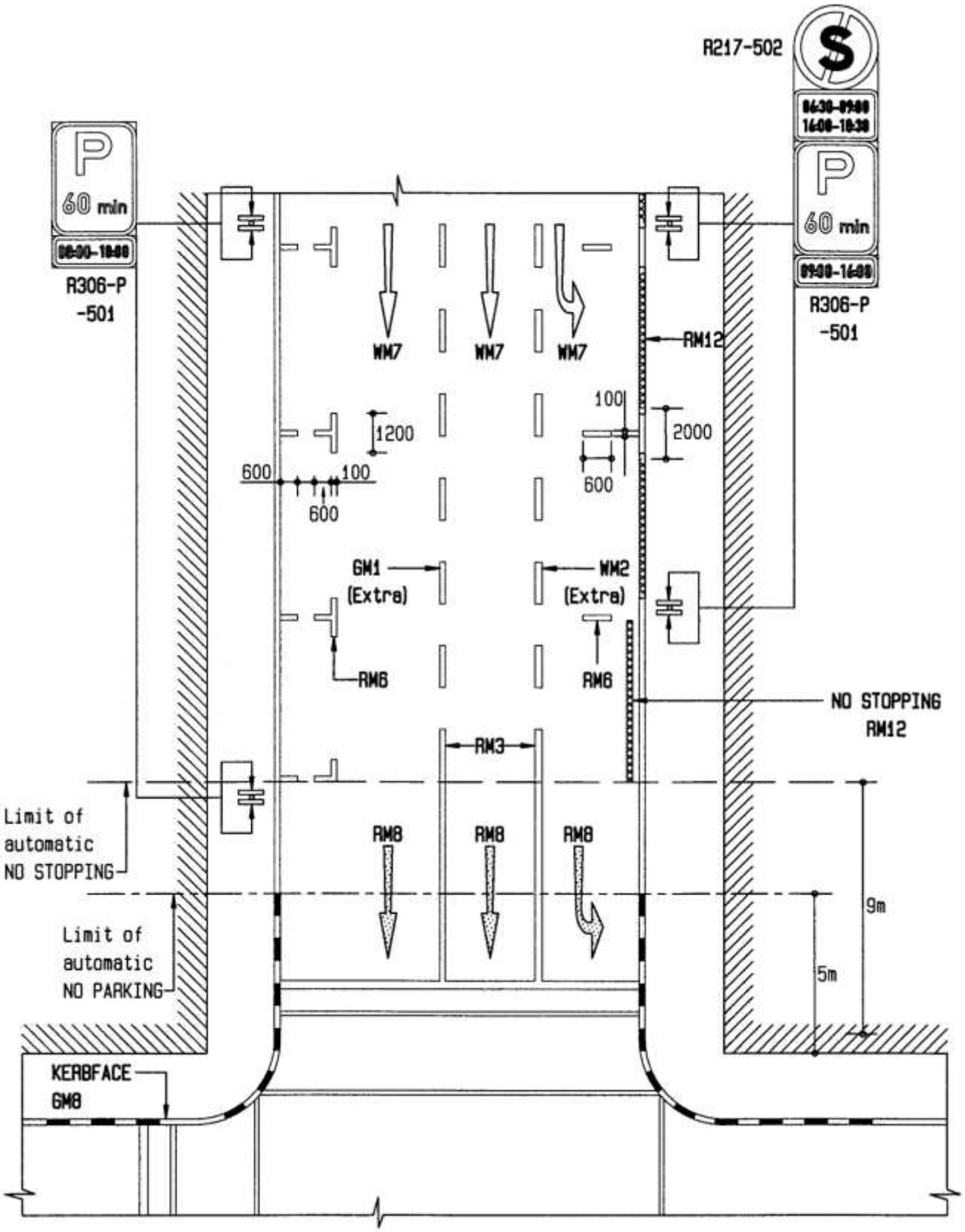


Fig 3.33 **Selective No Stopping/Parking Control**

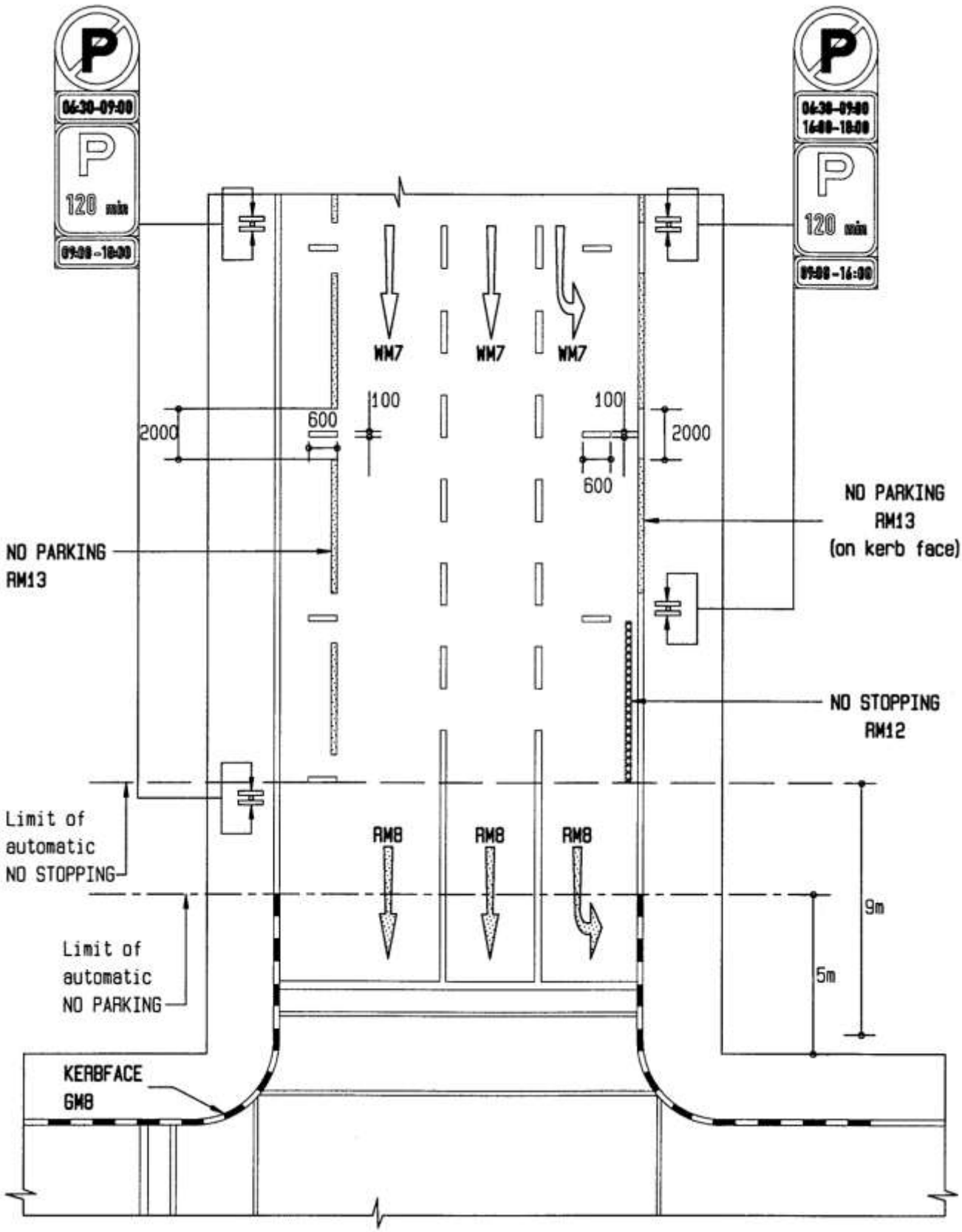


Fig 3.34 **Selective No Parking/Parking Control**

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3.5 TEMPORARY SIGNING APPLICATIONS

3.5.1 General

1 TEMPORARY regulatory and warning signs are commonly perceived to be applicable to roadworks sites only. This perception is not correct, although roadworks applications of temporary signs do certainly constitute the majority of applications. **The message which should be inferred by an observer of TEMPORARY signs is that, in some way, normal or anticipated conditions may not apply.** To understand what type of situations may be considered PERMANENT and what TEMPORARY is sometimes difficult. This difficulty is most common with non-roadworks applications of TEMPORARY signs. The most common sources of confusion are situations which warrant the placing of PERMANENT regulatory (or occasionally warning) signs but which signs do not apply at all times. This type of situation is generally considered to be "part-time" rather than temporary and is normally identified as such by the provision of PERMANENT regulatory SELECTIVE RESTRICTION signs. These indicate the **regular** times when the regulation is applicable, commonly on a daily basis. TEMPORARY signs are more commonly **superimposed** upon an existing sub-system of PERMANENT signs for a short, and often irregular, period of time. Typical of such non-roadworks situations are:

(a) accident scenes;

(b) traffic signals out of order;

(c) traffic control at schools;

(d) traffic control at sporting events;

(e) the movement of livestock.

For further details see Volume 1, Chapter 1, Section 1.3.

2 The applications covered in this section are temporary situations in which regulatory and warning signs, and very occasionally temporary road markings, may be required to be used for regular or irregular short periods of time. The applications are likely to occur in both rural and urban areas.

3 Temporary regulatory and warning signs and markings for roadworks are covered in detail in Chapter 13 : *Roadworks Signing*.

3.5.2 Examples

1 Signing of accident scenes is commonly inhibited by the limited number of signs which the vehicle responding to the accident is able to carry. For this reason it is important that the signs used be maintained in very good condition and it is recommended that they be manufactured from the best quality materials. The details given in Figure 3.35 apply to an immediate action requirement for signing, and are the responsibility of the police or other emergency service vehicle which is first on the scene. If the traffic disruption created by the accident is severe and is likely to last for many hours it is recommended that the signing be converted to that provided by an appropriate roadworks detail given in Chapter 13 i.e. the recommended signing for a lane drop or double lane drop, as soon as is practical.

2 The details given in Figures 3.36 to 3.41 are self-explanatory. There will always be specific situations where some additional signing requirement is necessary but the figure details represent the basic principles which are recommended for the situations concerned. It should be noted that regulatory control signs ie. STOP R1, YIELD R2, NO ENTRY R3, ONE WAY R4 and PEDESTRIAN PRIORITY R5 and any of their derivatives, **do not have temporary versions.**

3 Several of the figures show portable TEMPORARY signs. It is a requirement of the road traffic signing system that the reverse side of portable temporary signs be marked in alternating black and yellow stripes 150 mm in width. The yellow stripes shall be retroreflective if the signs are to be used during the hours of dusk, dawn or night-time.

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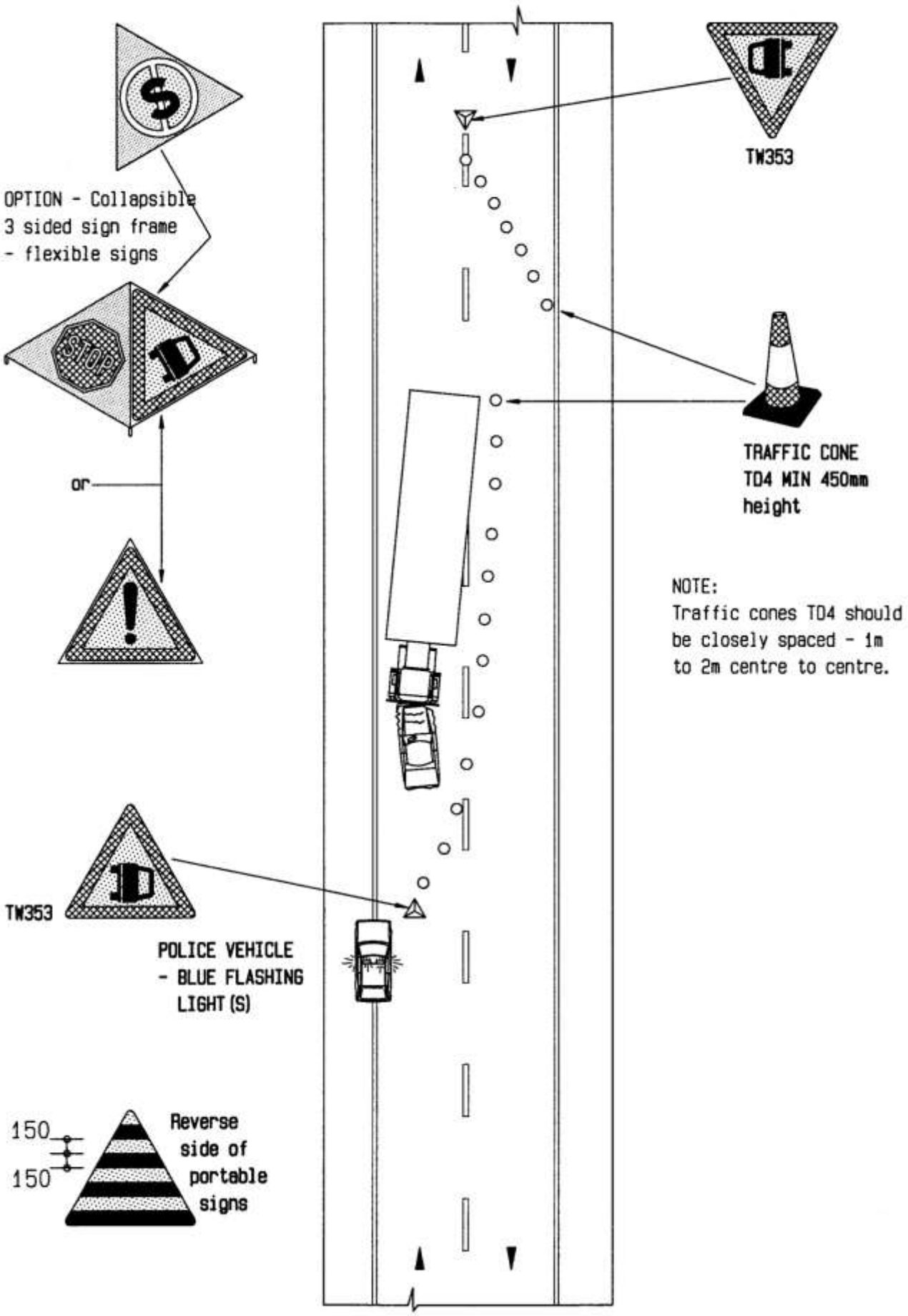

Fig 3.35 **Accident Scene**

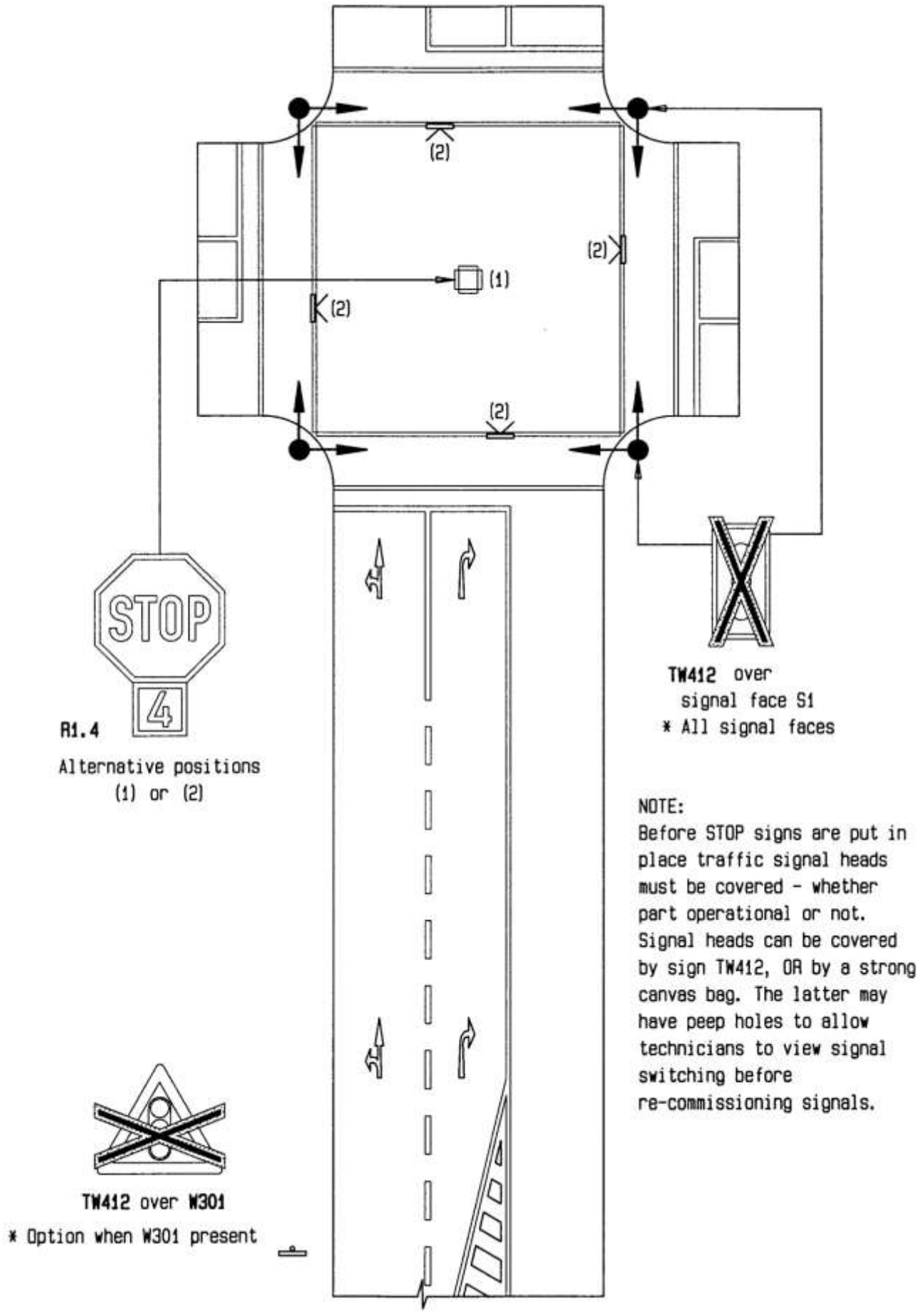

Fig 3.36 **Traffic Signal Out of Order**

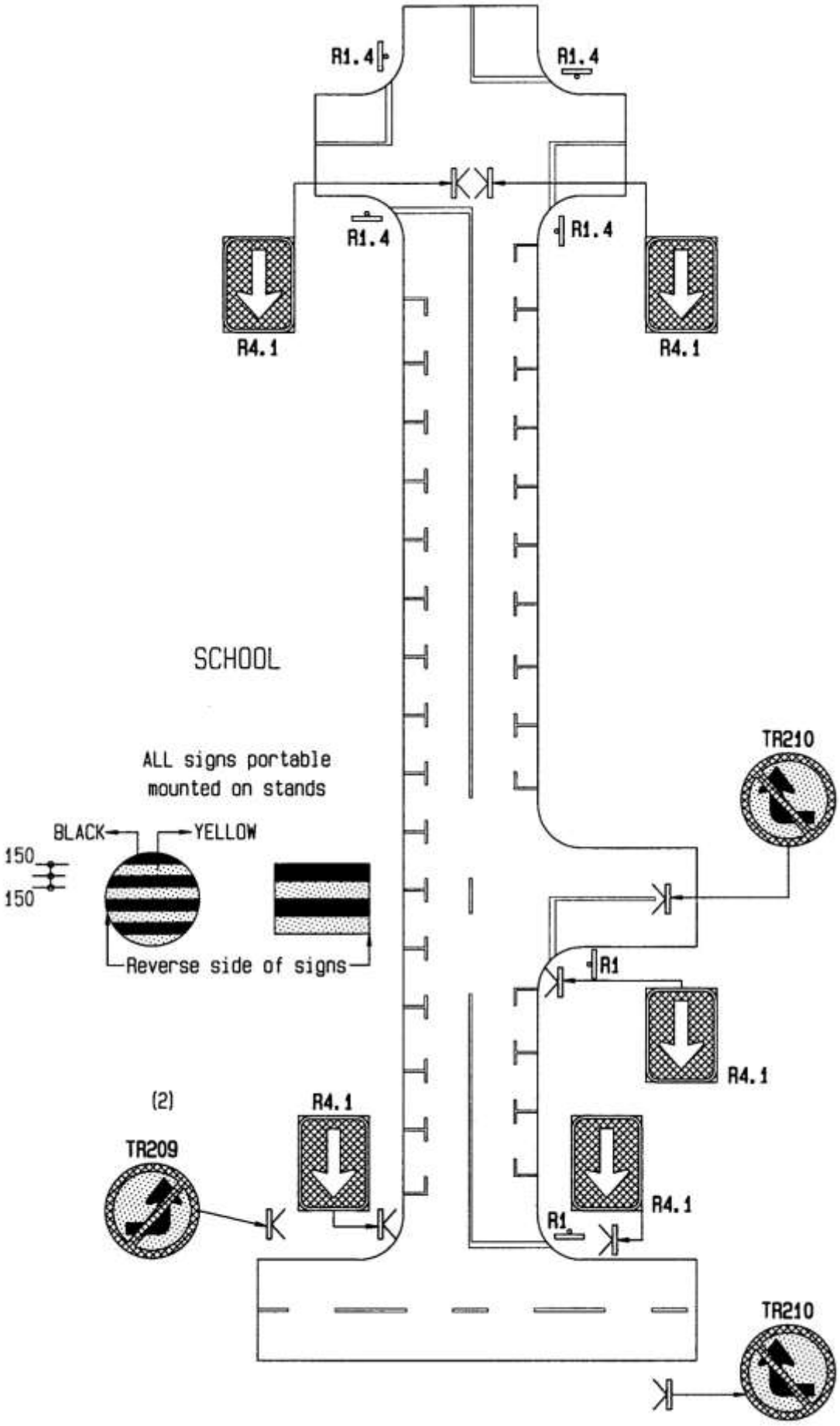

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Fig 3.37 **School Traffic Control**

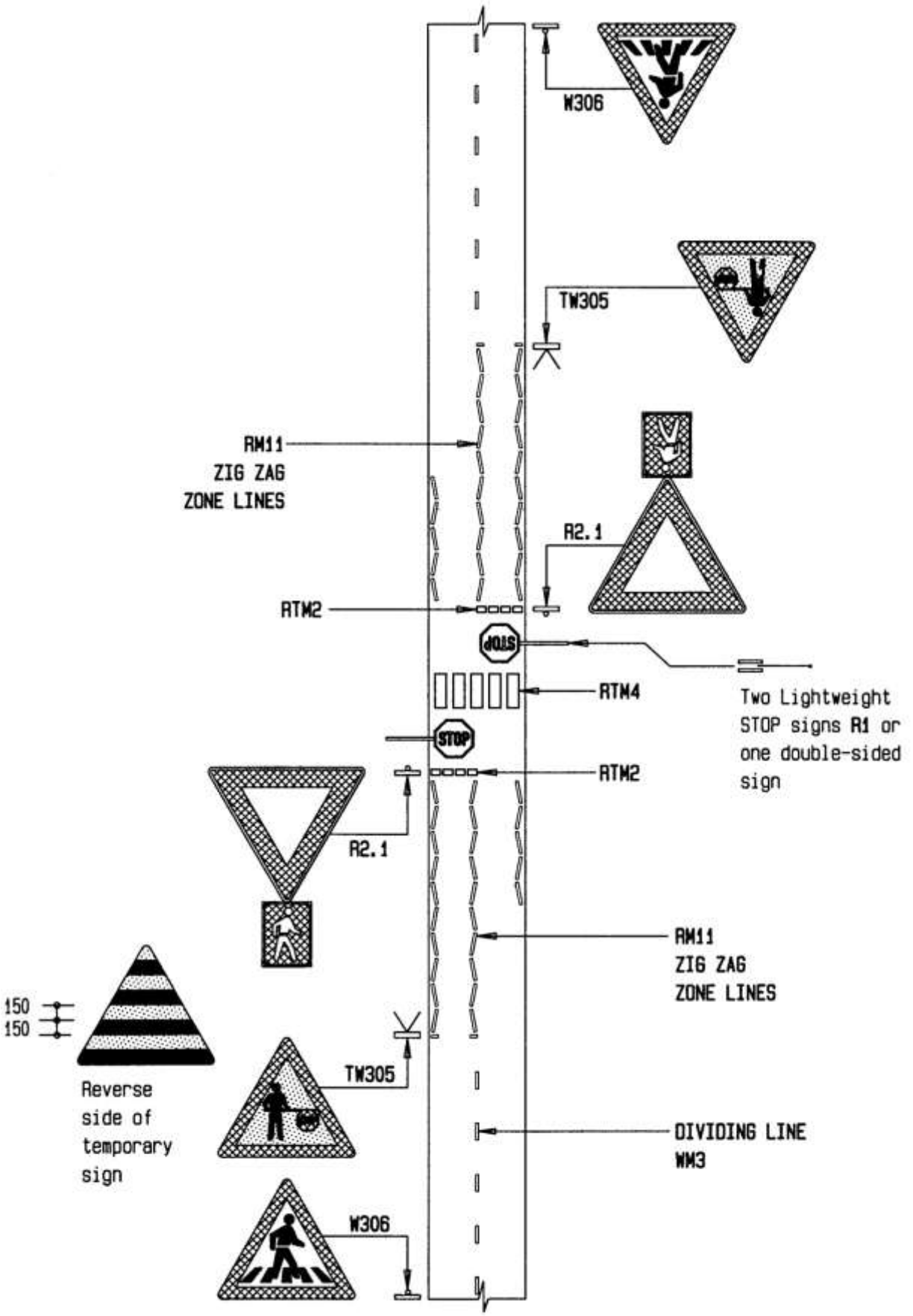

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Fig 3.38 **Scholar Patrol**

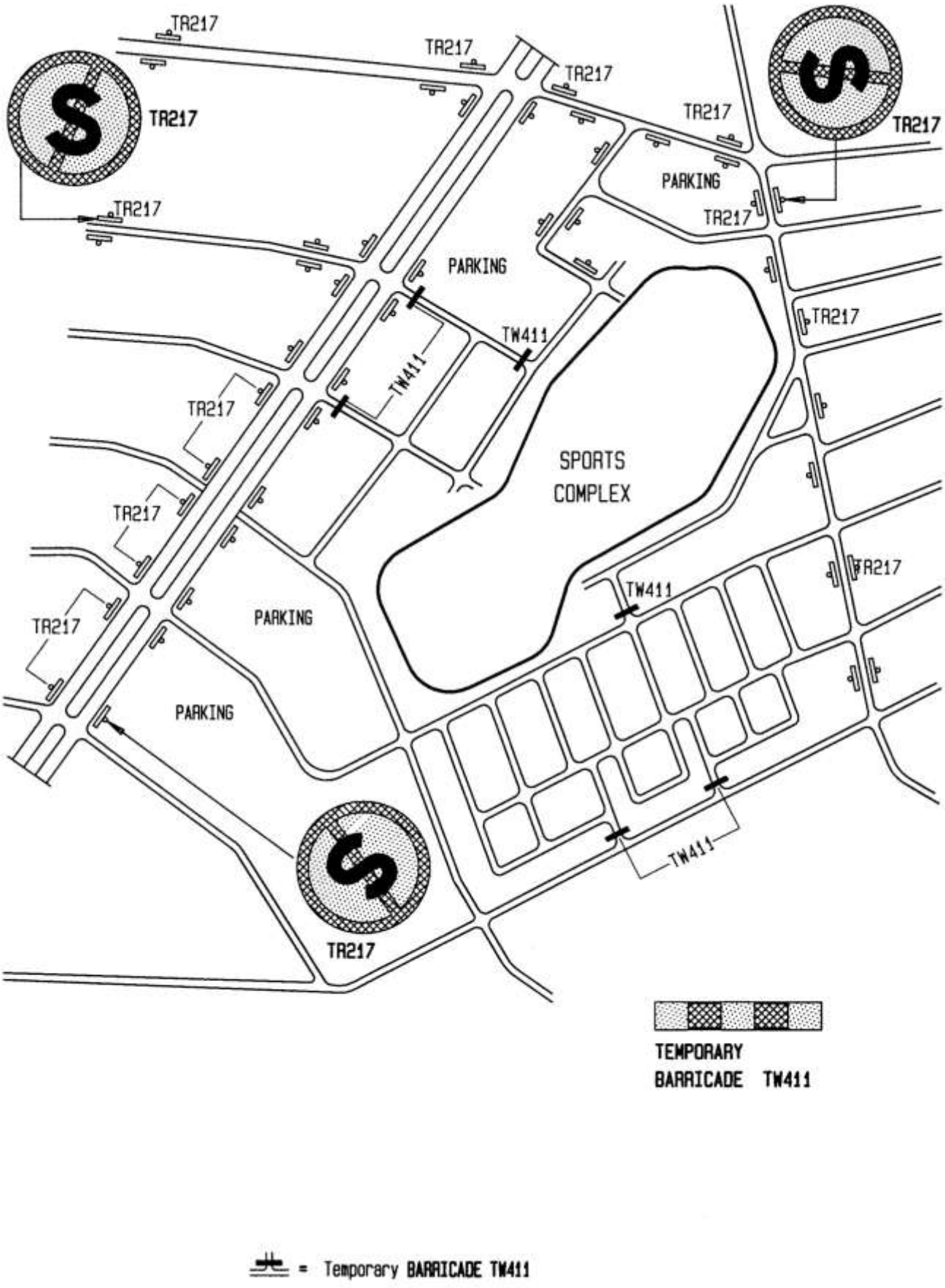

Fig 3.39 **Sports Event Traffic Control**

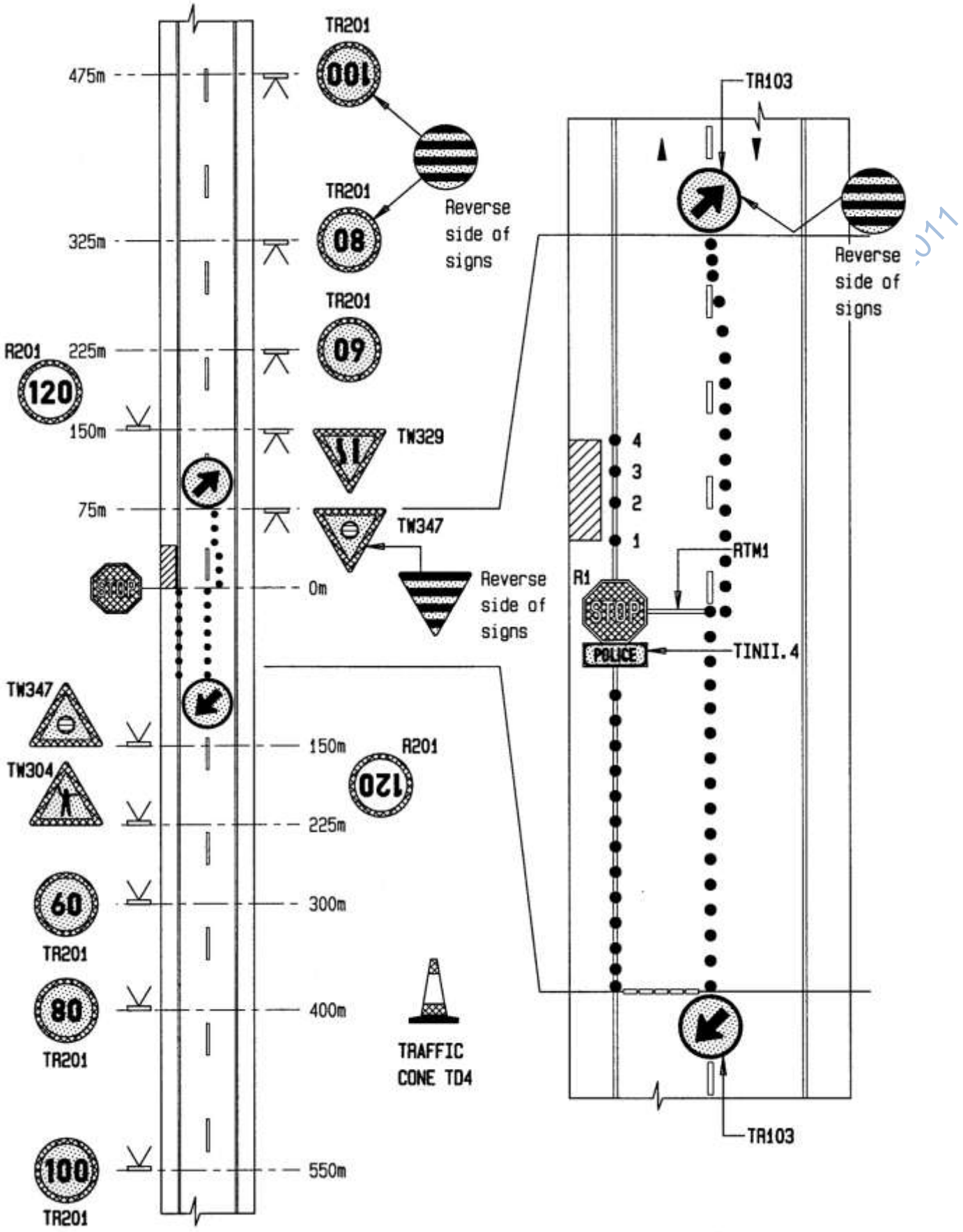

Fig 3.40 **Traffic Check Point**

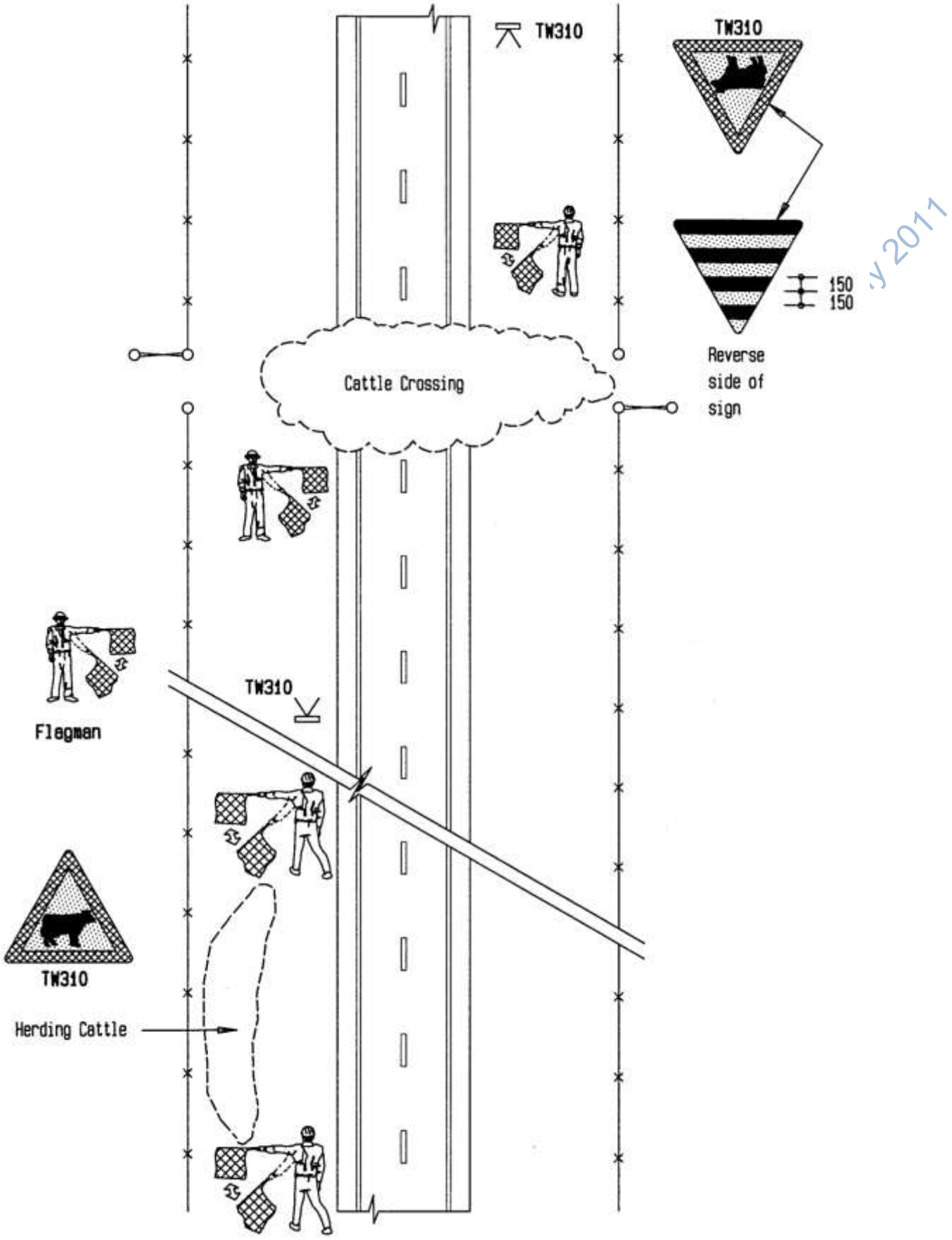

Fig 3.41 **Cattle Crossing/Herding**

3.6 ENHANCED STANDARD DETAILS

3.6.1 General

1 The illustrations in this section provide a higher level of detail than is possible in other sections due to the scale of illustration used in those sections. The details may well be applicable in a wide variety of situations illustrated in this and other chapters.

2 Figures 3.42 and 3.43 show enhanced detail of specific restrictions using regulatory signing and warning signing respectively. The principles illustrated may also be used for:

(a) a mass limit (sign R202) - this may commonly be a temporary application using sign TR202;

(b) an axle mass limit (signs R203 or TR203);

(c) a length limit (R205 or TR205).

3 In the cases of the situations listed in paragraph 3.6.1.2 the restricted sections of road are likely to be of some length. The signing technique should therefore be to repeat the message previously given in terms of the procedure recommended in Figure 3.9 in Section 3.2. The repeat message should be in close proximity to the start of the restricted section of road and preferably where a larger vehicle may be turned around if necessary.

3.6.2 Indication of Height Restriction

1 Figure 3.42 should be read in conjunction with Figure 3.9 in Section 3.2. Figure 3.42 supplies the detail of signs and markings appropriate to the specific site where the height restriction applies. Advance warning signs W320 should be placed at a distance from the site as given by Table 3.3, or further. It is recommended that these signs be provided with a SUPPLEMENTARY PLATE sign IN11.2 indicating the distance to the site. A relevant value HEIGHT LIMIT sign R204 shall be displayed on the structure as indicated in the figure with hazard marker signs DANGER PLATE W401 on each side "pointing" downwards. Sign R204 may be repeated at the side of the roadway, preferably at the effective stopping sight distance (for large vehicles) from the site. This sign may be equipped with flashing yellow warning lights if the site has a history of failure to observe the signs provided.

2 Typical situations which may require such signs are low over-bridges, low overhead signs or height gauges used in conjunction with the railway crossings.

3.6.3 Indication of Width Restriction

1 A width restriction may be indicated in terms of two different forms of measurement, either:

(a) in terms of the limited width of a structure (or roadway) which may be:

(i) less than anticipated (see Detail 3.43.1);

(ii) capable of taking any normal vehicle (as different to an "abnormal vehicle") but only in one direction at a time (see Figure 3.44); or

(b) in terms of the maximum width of vehicle permitted through a structure or along a roadway (see Detail 3.43.2).

2 In Detail 3.43.1 drivers are warned of a narrow structure which can accept two-way traffic of normal legal width but is narrower than might be expected and requires above average caution. This situation is not uncommon and is particularly a potential hazard on the approaches to the structure, on roads with surfaced shoulders on which vehicles are permitted to travel, to the left of EDGE LINE marking RM4.1, whilst being overtaken by faster traffic during the hours of daylight.

3 Detail 3.43.2 illustrates the application of WIDTH LIMIT regulatory sign R239 and WIDTH RESTRICTED warning sign W360 in the immediate vicinity of a narrow structure. This signing application should be used in the manner indicated in Figure 3.9 where early advice is given so that vehicles affected by the limit may follow an acceptable alternative route. It should be noted that signs R239 and W360 could be applied to whole sections of remote narrow rural road to protect them from damage due to wide vehicles regularly running off the edge of the road base. The use of MASS LIMIT sign R202 would probably be equally appropriate in such circumstances.

4 Figure 3.44 shows two ways in which use of a narrow structure can be controlled to operate for traffic in one direction at a time. Detail 3.44.1 illustrates what amounts to a "2-WAY" STOP control whereby all vehicles are required to stop. Vehicles may only proceed when it is safe to do so under such control, which will result in a "first in - first away" operation as is common at 4-WAY STOP junctions. Detail 3.44.2 shows the alternative use of YIELD TO ONCOMING TRAFFIC sign R6 which removes any priority from vehicles travelling in one direction (this form of control is also used at traffic calming installations - see Chapter 12). These forms of control do not require a remote indication such as illustrated in Figure 3.9 unless the site also has a mass, height, width or length **limit.**

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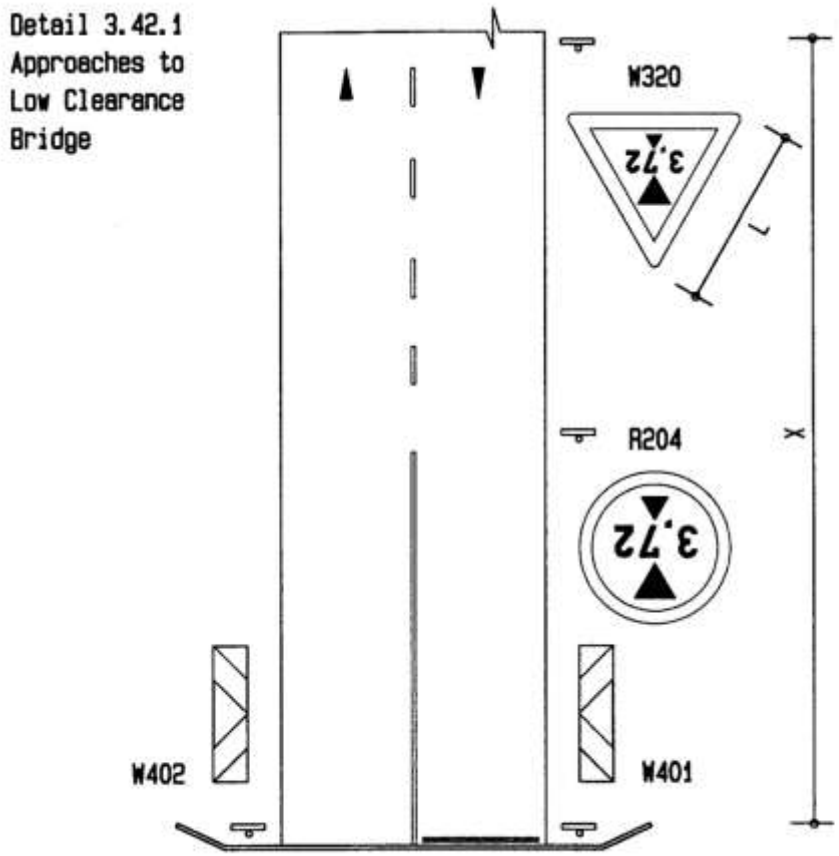
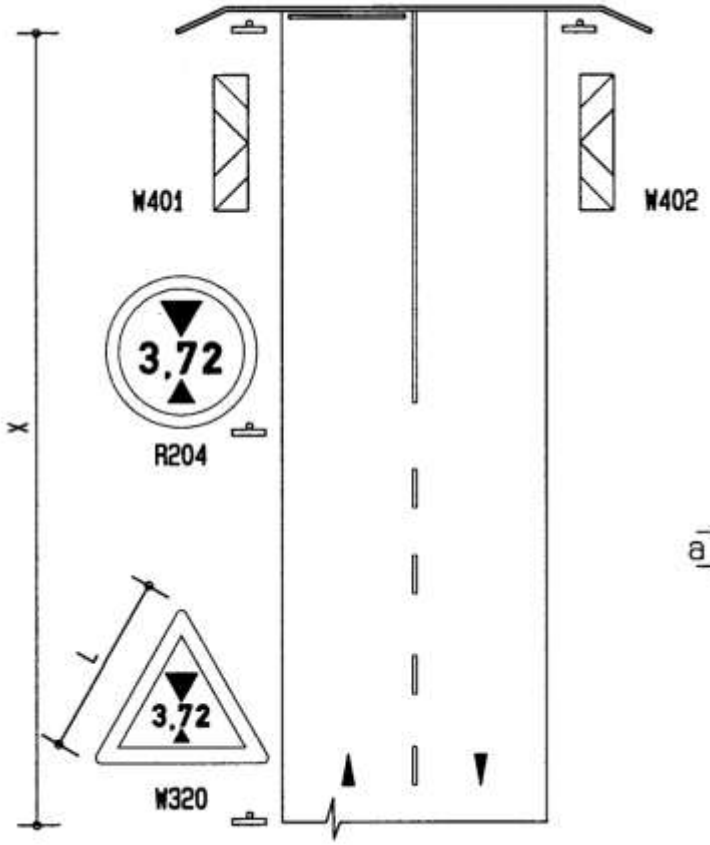
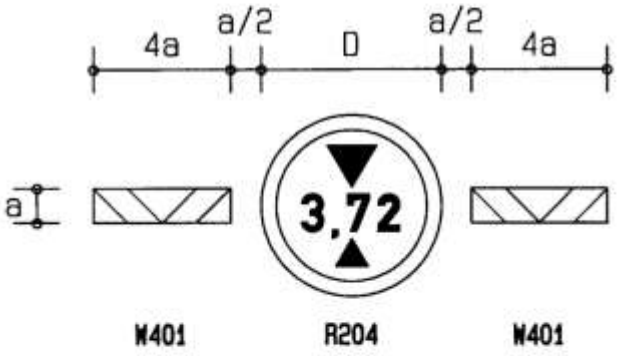
Detail 3.42.1
Approaches to
Low Clearance
Bridge



Overbridge

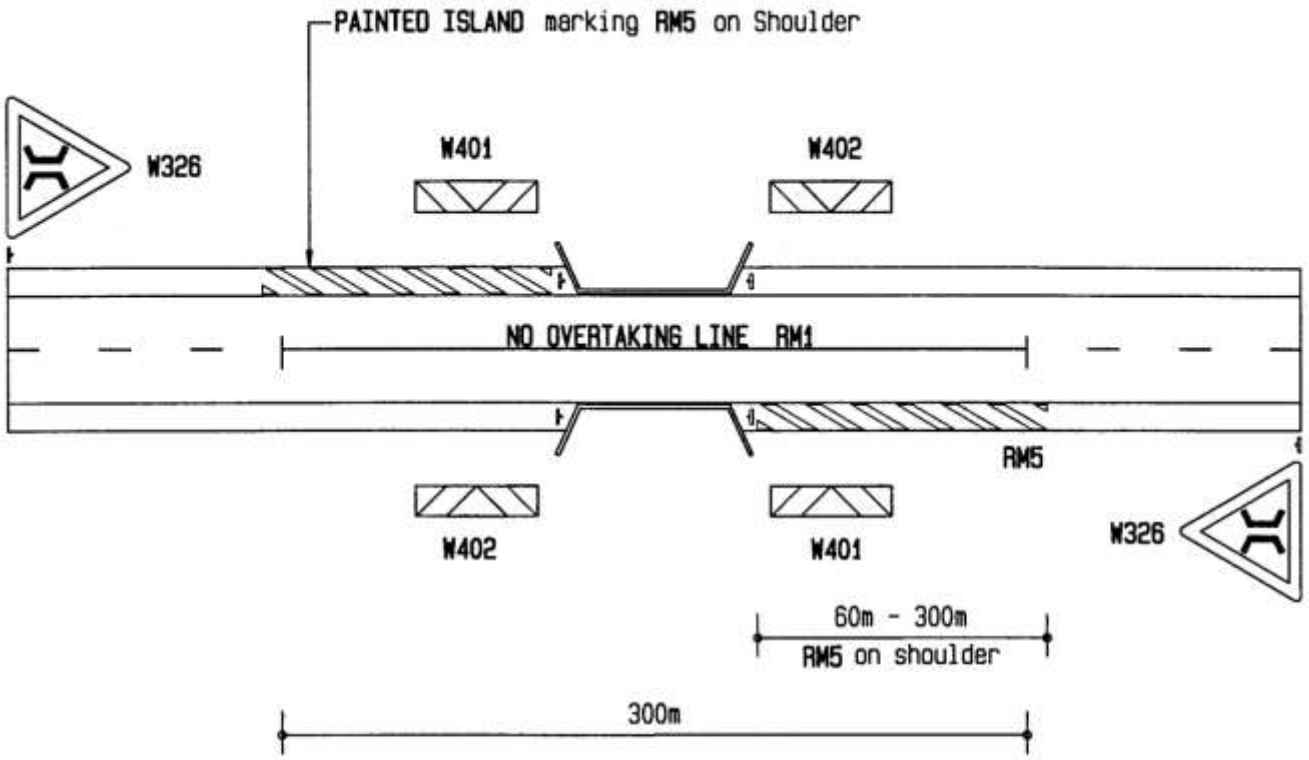


Operating Speed (km/h)	Sign			
	W320		R204	W401
	L	X	D	a
60	900	120	600	150
80	1200	150	900	200
100	1500	240	1200	300
120	1500	330	1200	300

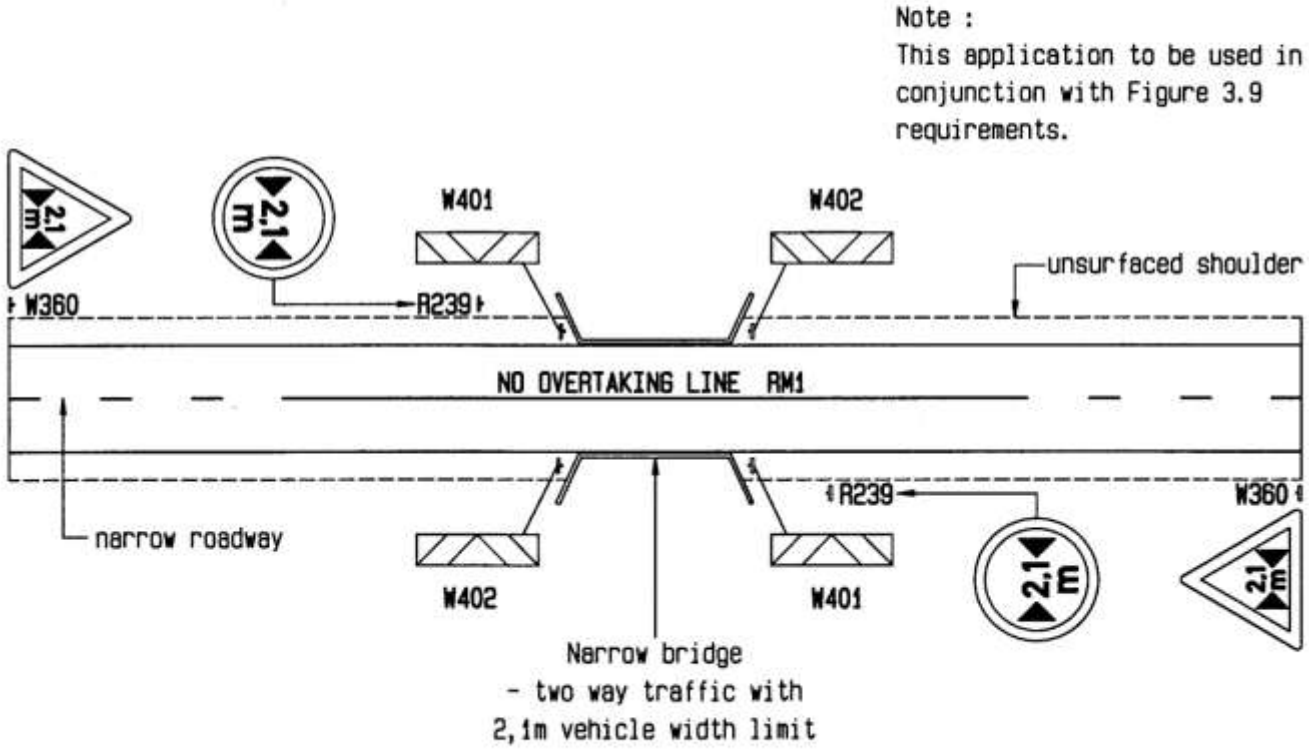


Detail 3.42.2
Sign Detail on Low Bridge
Parapet Face

Fig 3.42 Indication of Height Restriction

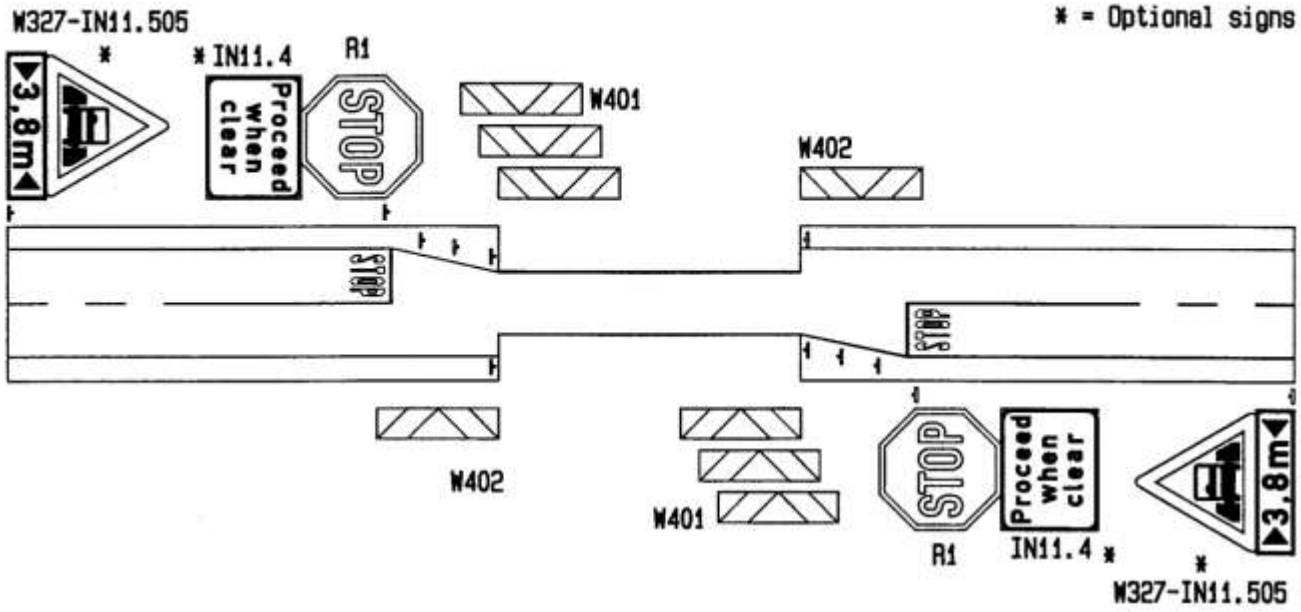


Detail 3.43.1 Narrow Structure - Warning of Reduction / Loss of Surfaced Shoulder

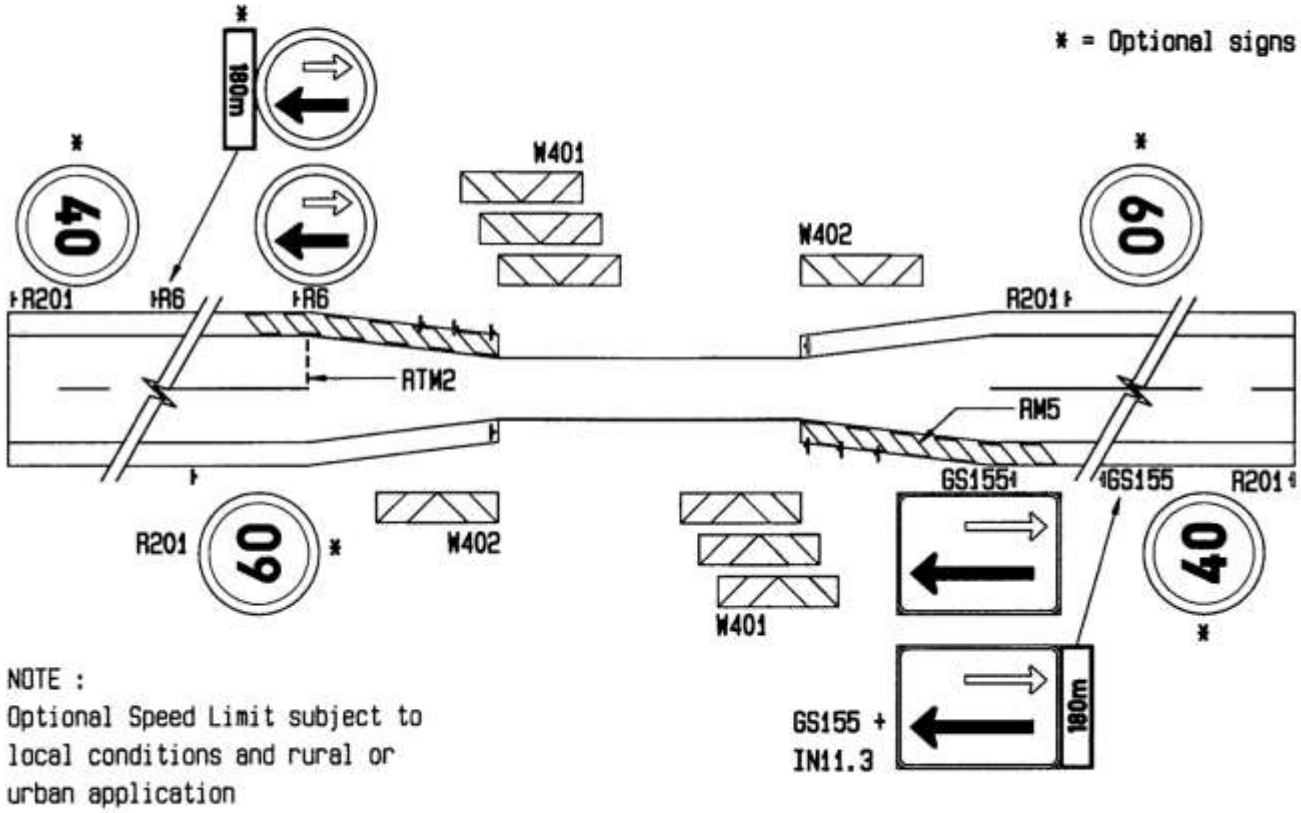


Detail 3.43.2 Narrow Structure - Vehicle Width Limit Signing

Fig 3.43 Indication of Width Restriction - 1



Detail 3.44.1 Single Vehicle Width Structure - "2-WAY" STOP Control



NOTE :
Optional Speed Limit subject to local conditions and rural or urban application

Detail 3.44.2 Single Vehicle Width Structure - Priority to one Direction of Travel

Fig 3.44 Indication of Width Restriction - 2

TOURISM SIGNING

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4.4 High Density Tourism Areas

4.5 Signing of High density Tourism Areas

4.6 Symbols and Warrants

4.7 Tourism Signing Applications

4.8 Terminology

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TOURISM SIGNING

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CHAPTER 4:
TOURISM SIGNING

4.1 INTRODUCTION

4.1.1 General

1 Chapter 1, Volume 2 explains the objectives of Volume 2 and how the various chapters should be read in conjunction with their respective chapters in Volumes 1 and 4. This chapter on Tourism Signing is intended to supplement Section 4.9 of Chapter 4 in Volume 1 which explains the principles affecting tourism and tourism signing. None of those principles will be repeated here, except for clarification purposes. This chapter applies to tourism signing both in the rural and urban environments, as the principles are similar in the context of the overall application of signing principles within the road network. However, some details and typical applications appropriate to tourism signing in urban areas, and how these fit in to the overall destination signing in urban areas, are described in Chapter 9: *Urban Guidance Signing.*

2 At all times throughout the assessment and implementation of tourism signs, the practitioner should remember that tourism signs are "supplementary" signs and are not designed to replace the primary guidance system. **The tourist signs are designed to assist the motorist and should not be seen as advertising signs.**

3 The primary direction signs system on the road network throughout South Africa is a system that promotes the principles of conformity, accuracy, uniformity, consistency and continuity. This system needs to be checked and put in place before consideration is given to the implementation of supplementary signs such as tourism signs and local direction signs. In many instances, a lack of effectiveness of the primary system has led to demands for tourism signs reaching unmanageable proportions. Hence, an improved primary guidance system can do much to prevent unnecessary demands for tourism signs and, frequently, advertising signs from resulting in a potential detriment to the environment. Unless the rule of consistency is applied rigorously, the practitioner will have difficulty in managing the complete signs system.

4.1.2 How to Use This Chapter

1 It must be emphasised that the implementation of tourism signs, in the overall context of road signing principles, is a complex and sensitive issue. The implementation of the principles contained in Volume 1, Section 4.9 (Subsection 4.9.4), together with the application procedures outlined in this chapter, are not always straight forward. Hence, it is recommended that the practitioner obtains a sound knowledge of the guiding principles contained in Volume 1, Section 4.9 before entering the implementation stages (see also Table 4.2).

2 This chapter describes implementation procedures, where a step-by-step method is described to guide the practitioner through the integration of tourism signs into the guidance system and the management of demands from facility owners. This procedure is designed to allow the practitioner to choose an application nearest to his/her own situation, and thereafter a preferred approach can be chosen in a logical sequence, dependent on time, funds and resource availability. There are checklists from past experiences to offer guidance and explain the implications behind adopting certain methods, together with examples in the form of placing sequences.

4.1.3 Structure of Tourism Organisations

1 Tourism organisations play an important role in the management, marketing and co-ordination of tourist information, including that given by tourism signs, from a national level down to local and even individual facility levels. The effective structuring of these organisations and how this structure is integrated with tourism and road departments in all spheres of government, sets the basis for an integrated approach to the provision, marketing, enhancement, and last but not least, the signing of tourism facilities on the road network.

2 Different levels of tourism organisation are illustrated in Figures 4.1 and 4.2. The functions of these organisations differ within the different levels but as far as tourism signing is concerned common functions of each organisation can be described as follows:

(a) to liaise with all role players to identify the need for tourism signing in the relevant area of jurisdiction;

(b) to develop an understanding of and to incorporate guidance signing principles into criteria developed for the signing of tourism facilities;

(c) to initiate the process of preparing a tourism signing plan for the area under their jurisdiction;

(d) to actively participate, at appropriate levels, in tourism communities comprising tourism, roads and other relevant officials, to consider and process applications for tourism signs.

3 In Figure 4.1 a typical structure is given for the activities of a Provincial Tourism Organisation (in the example Gauteng and its established Regional Tourism Organisations are used).

4 The processing of applications for tourism signs is not handled by the organisations directly but by a Regional Tourism Liaison Committee (RTLC). This Committee should comprise representations from the Regional Tourism Organisation, the relevant Road or Local Authority (at whatever level of official such Authority deems relevant) and Local Tourism Organisations in the region. For practical reasons the representative of an LTO in whose area an applicant resides should attend meetings when such applications are dealt with, but need not attend all meetings of the RTLC. In addition, representatives of SATOUR, the Automobile Association, the Provincial Tourism Organisation, FEDHASA and the National Department of Transport may have a standing invitation to attend, or may be requested to attend when a specific application requires their input on a question of standards or grading (AA,SATOUR or FEDHASA) or related interest (NDOT). The application process is covered in more detail in Section 4.2.

(continued on page 4.1.4)

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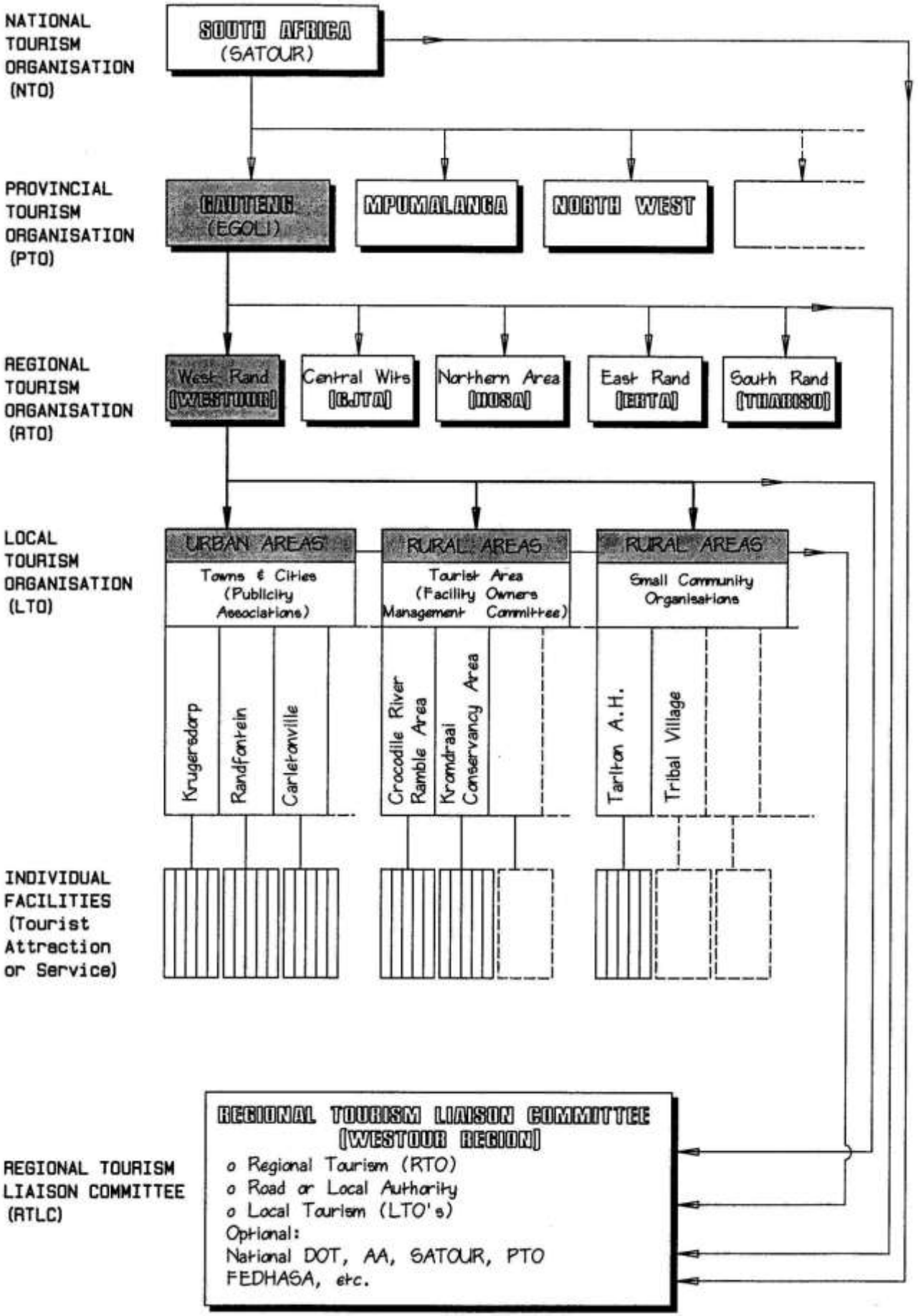
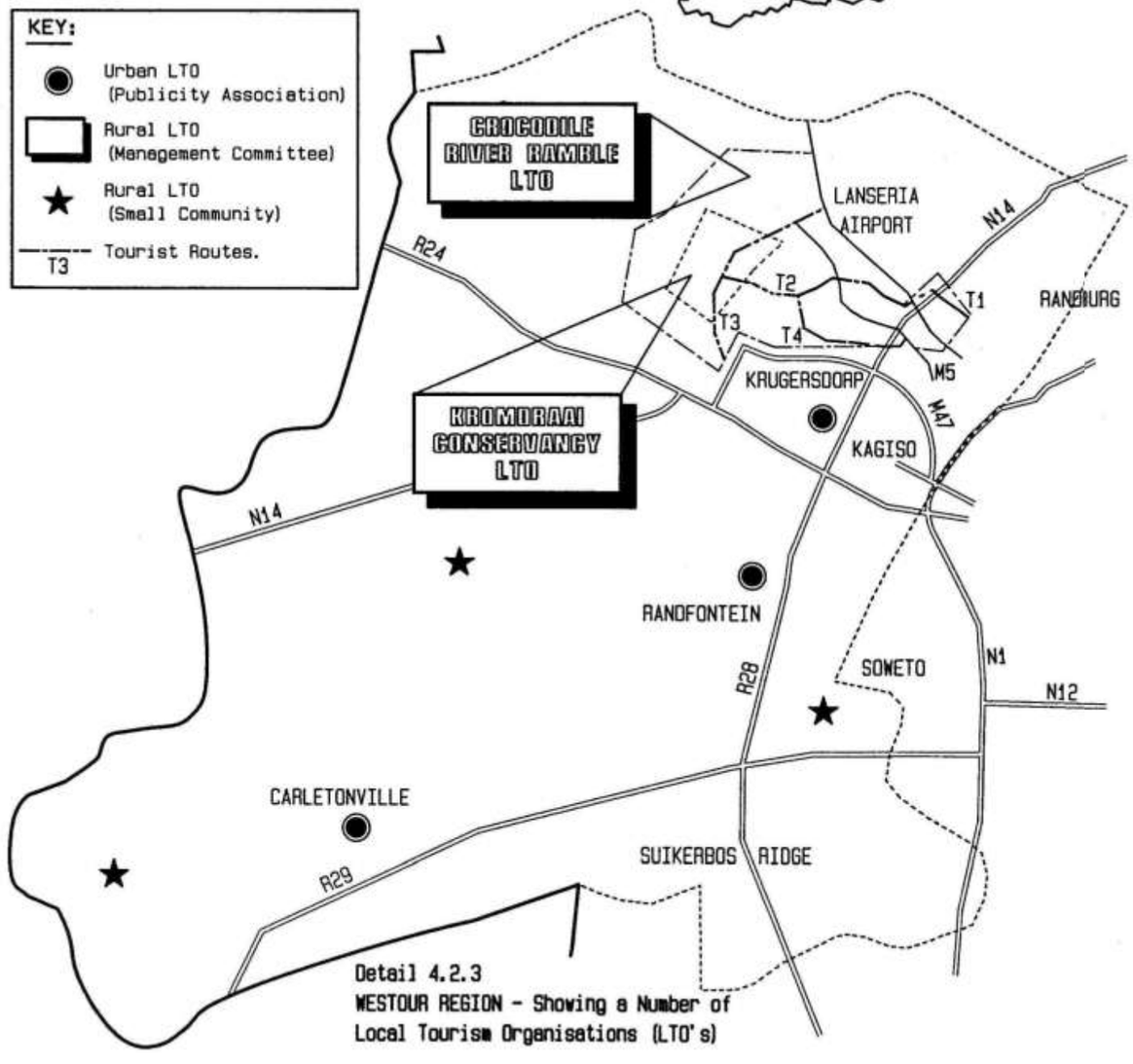


Fig 4.1 Structur of Tourism Organisations and Committees

Detail 4.2.1
SOUTH AFRICA - PROVINCES

Each Province has a Provincial Tourism Organisation (PTO)

NOTE :
Provincial Tourism Organisations may adopt any name but the relevant organisation is the PTO eg. Gauteng's PTO is the Egoli Tourism Authority



Detail 4.2.3
WESTOUR REGION - Showing a Number of Local Tourism Organisations (LTO's)

Detail 4.2.2.
GAUTENG PROVINCE - Showing Regional Tourism Organisations (RTO's)

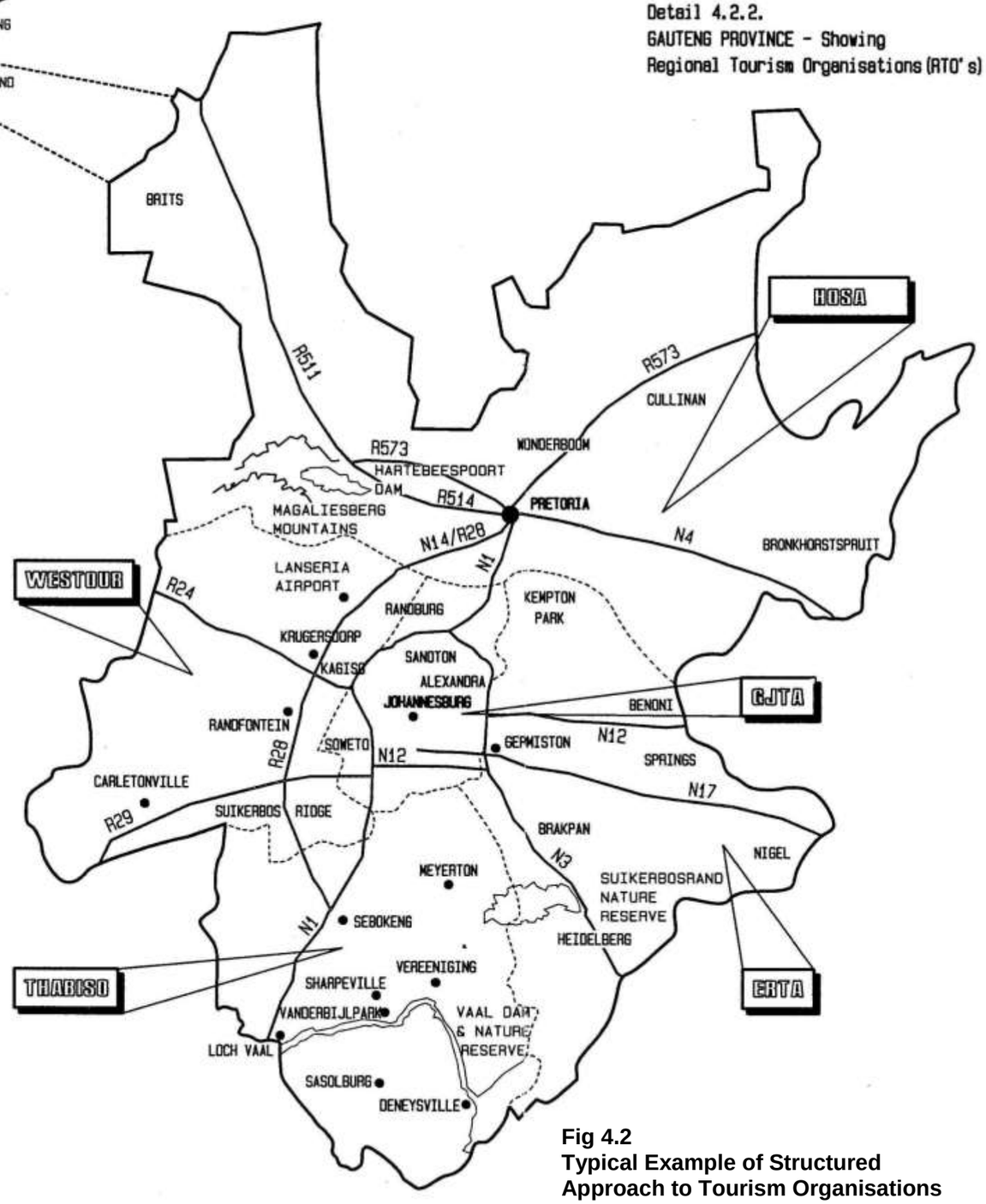


Fig 4.2
Typical Example of Structured Approach to Tourism Organisations

(continued from page 4.1.1)

4.1.4 Layout and Cross-referencing to Other Chapters

1 This chapter is linked with the other sections within the SARTSM by the following division of aspects relating to tourism signing:

(a) Volume 1: Planning and principles;

(b) Volume 2: Implementation and warrants (application);

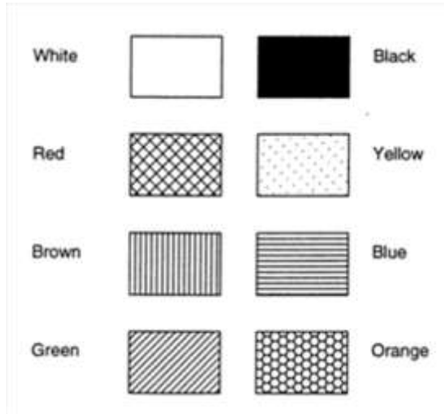
(c) Volume 4: Dimensional detail and signface components.

2 Hence, while Volume 1 establishes the underlying principles, this chapter in Volume 2 describes the application of those principles, together with practical approaches and situations likely to occur.

4.1.5 Road Traffic Sign Colour Indication

1 The chapters of Volume 2 of the South African Road Traffic Signs Manual (SARTSM) are not prepared in colour. Relevant examples used to illustrate appropriate signs, signals and markings are shaded in a black and white coding which is illustrated below.

2 The basic principles of the road traffic sign colour coding system are shown, in colour, in the SADC-RTSM Volume 1, Chapter 1, Section 1.4, and in the Contents sections of relevant Volume 1 and 4 Chapters.



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4.2 IMPLEMENTATION OF TOURISM SIGNS

4.2.1 General

1 For the principles of Tourism Signing, reference is made to Volume 1, Section 4.9. The following section deals with the Tourism Signing Process and methods of managing tourism sign applications.

2 A decision as to whether to erect a tourism sign, or not, will almost certainly result from one of three circumstances:

(a) a written request for a tourism sign from the operator of a tourist facility submitted through a regional or area tourism committee; or

(b) an investigation of all tourist facilities within a defined area, whether undertaken by a road or local authority, or by an appointed agent; or

(c) the policy of a road authority.

3 As a result of the growth in demand for tourism signs the major road authorities have experienced difficulty processing applications satisfactorily. To overcome this problem and because of the supplementary role of TOURISM signs in the final stages of a journey, it is recommended that applications for tourist signs be processed at a regional and local level. If the tourism regions of a province are large it may be necessary to further sub-divide a region into manageable areas. In such an instance applications should preferably be processed at the area and local levels, with overall co-ordination coming from the region. In this way the parties involved will become more aware of the functioning of tourism signing in their area and of the need to maintain measures of control. This activity will also better equip those involved in the processing of applications to think and act pro-actively or collectively, when such actions may be in the better interests of quality guidance signing.

4 The processing of applications for tourism signs should be carried out by a Regional Tourism Liaison Committee (RTLC) and by Local Tourism Organisations (LTO's). Membership of the RTLC should include representatives of the Regional Tourism Organisation (RTO), the relevant Road and/or Local Authority for the region and the Local Tourism Organisations in the region. Whilst Local Tourism Organisations may vary widely in their membership (because they can be made up of public officials or they can be voluntarily constituted by business interests), LTO's should be responsible for assessing the compliance of individual applicants with relevant warrants and for reporting their findings to the RTLC. The LTO in an urban area may commonly be the local Tourist Association. In a rural environment the LTO may be a management committee made up of representatives of existing tourist facilities in the area, if tourism is well developed, or even of a local community committee where tourist activities are just starting to develop.

5 A Regional Tourism Liaison Committee may thus have several potential LTO member representatives. However, all LTO representatives do not need to attend all meetings since, normally, members should attend in order to report on applications being processed.

6 In addition to the membership mentioned it is desirable the RTLC's invite attendance by representatives of organisations such as SATOUR, the Provincial Tourism Organisation (PTO), the Automobile Association and FEDHASA in order to promote awareness beyond strictly regional levels and to maintain contact with organisations responsible for developing standards and warrants at a national level. When a National Route passes through a region it will be desirable to have representation on the RTLC from the National Department of Transport.

4.2.2 Guidance Sign Information "Layers"

1 TOURISM signs are just one sub-group within the major GUIDANCE sign class. The function of TOURISM signs is supplementary to the primary DIRECTION sign sub-group and their application is most commonly carried out at a local level in the road network. In the context of tourism signs, a "tourist" is considered to be a person travelling to or for pleasure in the broadest sense. Tourist destinations which may warrant inclusion on a TOURISM sign therefore include tourist attractions of all sorts, from large to very small, and any services which motorists may strategically need along the way. In urban environments particularly, but not exclusively, another group of destinations has been recognised as being similarly supplementary to the DIRECTION sign system at a local level, but which are not considered to fall within the terms of reference of tourist destinations. These destinations, when warranted, should be signed using LOCAL DIRECTION signs as described in Chapter 9: *Urban Guidance Signing*.

2 When considering applications for TOURISM signs account should be taken of the total guidance system in the area, particularly when considering the provision of tourism signs on numbered metropolitan, regional, provincial or national routes. Information available to tourists comes from two basic sources:

(a) information sources outside the direct road environment; and

(b) information received within the road environment.

3 Information available outside the road environment and used primarily to plan trips, but also carried by tourists on trips, comprises:

(a) maps;

(b) publicity or promotional brochures, whether specific to a facility, or of a more general area application;

(c) newspaper or magazine articles;

(d) radio or television programmes;

(e) video material;

(f) accommodation booking correspondence;

(g) publicity associations;

(h) tourist information centres.

(continued on page 4.2.4)

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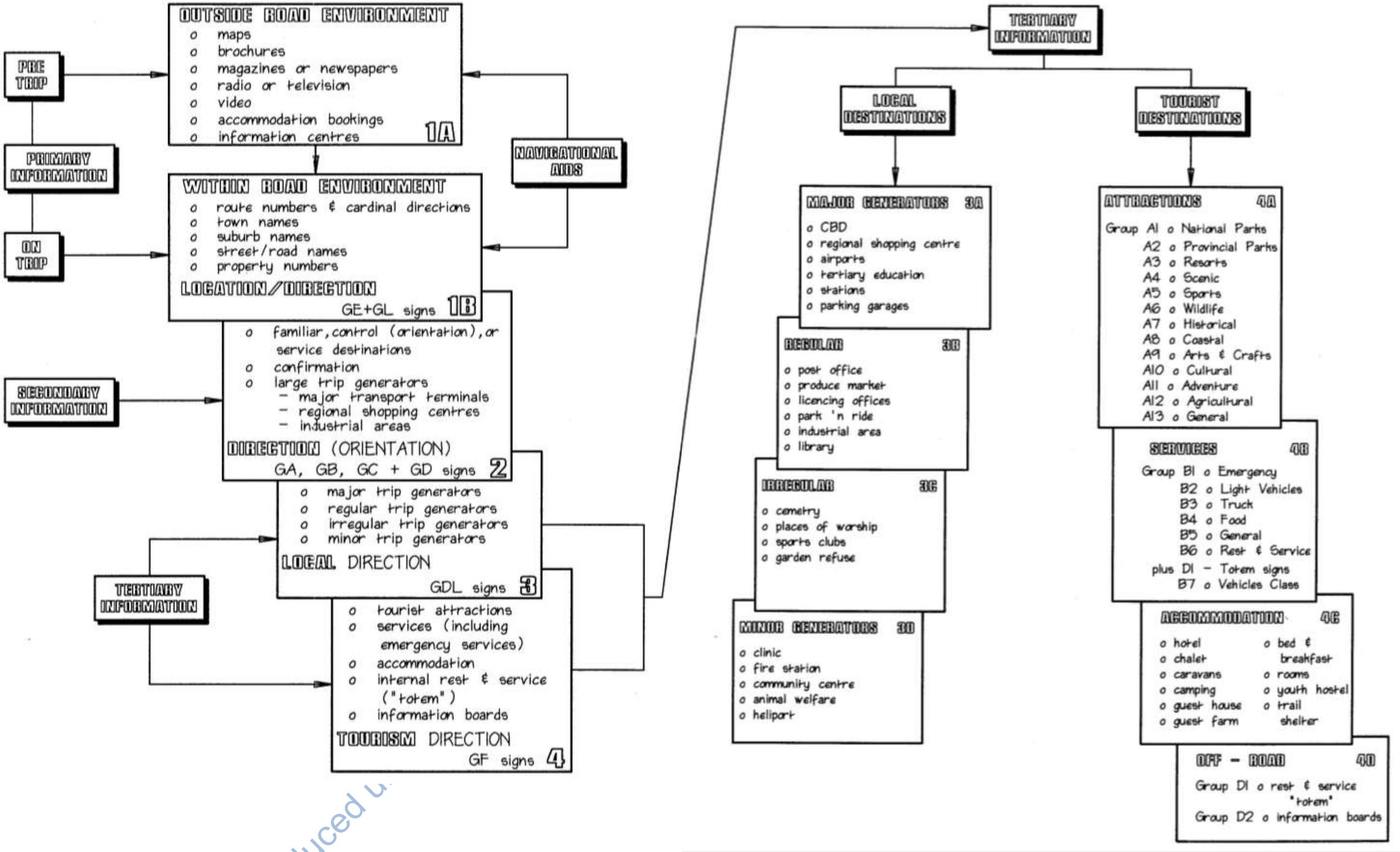

Fig 4.3
The "Layer" Approach to Guidance Sign Information

1 REQUEST FOR TOURISM SIGN APPLICATION FORM

made to any of...

available from any of...

Standard Tourism Sign Application Forms

PROVINCIAL TOURISM ORGANISATION (for example Egoli Tourist Association)
- o WESTOUR RTO
- o HOSA RTO
- o GJTA RTO
- o ERTA RTO
- o THABISO RTO

(see Fig.4.2)

RTLC →
- *Road or Local Authority*
- *Local Tourism Organisation*
- *Regional Tourism Organisation*
- *Automobile Association*
- *SATOUR*
- *FEDHASA*
- *Provincial Tourism Organisation*

2 APPLICANT COMPLETES & SUBMITS FORMS–3 COPIES
(one organisation may forward to others)

FACILITY CLASSIFICATION
- o Most Important Activity
- o Tourist or Local Destination
- o Attraction/Service/Accommodation/Special Event
- o Generic Family Group
- o Individual Type
- o Availability

FACILITY EVALUATION
- o Accessibility
- o Public Amenities
- o Vehicle Amenities
- o Business Requirements
- o Social Importance

FACILITY ENVIRONMENT
- o On Un/numbered Road
- o On/in Existing Tourist Route/Area
- o Need for Collective Signing?
- o Full route guidance signs in place?
- o Identify Tourist Route/Area Route Segments

3 LOCAL TOURISM ORGANISATIONS

4 INVESTIGATE & REPORT
- o Facility classification
- o "Sign "Layers"
- o Facility evaluation
- o Facility grading
- o Facility Environment
- o Signing Details
- o Report

ROUTE SEGMENT AND ROUTING EVALUATION
- o No. and Standard of Attractions
- o No. and Standard of Services
- o No. and Population of Small Communities
- o Roadway Conditions
- o Scenic Beauty
- o Conservation Rating
- o Publicity/Promotion Rating
- o Total Distance and Travelling Time
- o Tourist Route or Tourist Area
- o Assign T-route numbers
- o Marketing Theme
- o Unique Collective Name
- o Control/Management Body

TOURIST ROUTE/AREA CLASSIFICATION
- o Localised/Macro Area
- o High Facility Density
- o Single Route/Network of Roads
- o Localised/Super Tourist Route
- o Localised/Super Tourist Area

3 REGIONAL TOURISM LIAISON COMMITTEE (WESTOUR REGION)

4 FACILITY GRADING

RTLC ensures industry gradings are up to date in terms of:
- o Attractions – social importance (RTO)
- o Services (AA)
- o Food & Accommodation (SATOUR, FEDHASA, etc)

5 REGIONAL TOURISM LIAISON COMMITTEE (WESTOUR REGION)
- o Verify evaluation details
- o Need for signing collectively?
- o If yes, do route segment and routing evaluation
- o Tourist Route or Area Classification
- o Do/es facility, Tourist Route/Area comply with Warrants
- o Approve or not
- o Sign types, symbols and locations

NO

6 REPLY
to facility applicant or organisation giving reasons

3 ROADS AUTHORITY
Provincial or Local Authority

4 IN-ROAD STANDARDS
- o Guidance Signing Plan in Place
- o Tourism sign application management
- o Traffic safety requirements

YES

6 SIGN TYPE
- o Conventional
- o Tourist route/area
- o Part-time
- o Temporary
- o Symbols

SYMBOLS
- o Existing or New
- o Specific or Generic
- o General

7 ROADS/LOCAL AUTHORITY
- o Agree financing
- o Agree erection/monitor responsibility

YES

8 ERECT SIGNS

Fig 4.4
Organisational Flowchart for Processing Requests for Tourism Signs

4 Information received within the road environment is available from:

(a) the road system and specifically the guidance signs within the system; or

(b) tourist information lay-byes.

5 It is fundamental to the effectiveness of the road sign system that those who provide the material for the information sources outside and within the road environment recognise the existence, functions, interdependence, and limitations of the other information sources. Regional Tourism Liaison Committees must ensure that those they represent incorporate the primary navigational aids correctly into promotional material they produce for the information of tourists outside the road environment.

6 The scope of information display on GUIDANCE signs, and particularly on TOURISM signs, is wide. The guidance information system can be described systematically as forming a number of levels, or "layers", as illustrated in Figure 4.3. The "layers" of guidance information illustrated in Figure 4.3 can be described as follows:

(a) **Layer 1** includes all information outside the road environment but coordinated with that within the road environment and monitored by the committee structure processing tourism sign applications; it also includes the principle navigational aids provided by the guidance signing system;

(b) **Layer 2** includes secondary level (but still important), information to the road user, such as destination names that correlate with maps and provide navigational orientation;

(c) **Layers 3 and 4** include tertiary information to supplement the orientational information, when warranted, such as local destination types **(3)** and tourist attractions, emergency services, rest and service and accommodation **(4)**.

7 The local and tourist destination categories within the "layers" is based on recent examples of pro-active signing, on an area basis, and may be revised with experience.

8 For completeness, Figure 4.3 shows the relationship, and possible conflict between LOCAL DIRECTION signing and TOURISM DIRECTION signing. For further discussion of the implications of both categories of supplementary signs, particularly in urban areas, see Chapter 9. The tourism information system and the application procedure for tourism signs are closely linked. This can be seen by comparison between Figures 4.3 and 4.4.

4.2.3 Application to Erect a Tourism Sign

1 Figure 4.4 shows how a Regional Tourism Liaison Committee might approach applications for tourism signs. In due course an RTLC and its LTO's are likely to build up a library of details covering specific locations within their area of influence. Parts of the application process will thus not need to be repeated with every application for a tourism sign, unless a need arises due to demand, to review the co-ordinated approach for a specific location and to consider the use of either:

(a) a regional or area collective symbol (see symbols GFS A1 to GFS A13 in Subsection 4.3.10); and/or

(b) a tourist information lay-by; and/or

(c) a tourist route.

2 When dealing with an application relating to **Layers 3 or 4**, an RTLC should operate within the scope of the relevant warrants given in Section 4.6, and in addition should consider the relationship to other facilities in order to pro-actively assess the level of co-ordination needed to sign all tourist facilities within an area.

3 Applications for tourism signs will, if approved, rarely require only one sign to be erected. More complete details of a range of typical tourism sign sequences are given in Section 4.7. 2

4 The procedure described in Figure 4.4 assumes that while currently, requests for tourism signs often come directly to the road authority concerned, it is not the role of the road authority to grade the respective tourist attractions, nor monitor their performance in relation to the various warrants, as described in Section 4.6. Hence, Regional Tourism Liaison Committees under the aegis of the Provincial and Regional Tourism Organisations, should design an appropriate standard application form, through which a facility owner may apply for a tourism sign.

5 Three copies of the standard application form should be submitted to the Road Authority (or Local Authority), the relevant Local Tourism Organisation (or Publicity Association), and the Regional Tourism Liaison Committee. Ideally one of these three organisations should act as a "clearing agency" for the region by ensuring that the correct copies get to the correct people.

6 Following the respective investigation processes (described in detail in Subsection 4.2.4), a letter of recommendation can be issued and the sign can be erected.

7 In general payment for the provision of tourism signs is normally dependant on the policy of the road authority. The road authority will, however, normally provide the necessary tourism signs for emergency services such as police stations or government hospitals. All other tourism signs for attractions or services are normally paid for by the owner/operator of the facility. **The road authority retains jurisdiction over sign face design and the display or removal of any such signs within the road reserve.** Agreement to provide tourism signs shall be subject to the submission of a formal application to a Regional Tourism Liaison Committee, which should include amongst its members representatives from (see Figure 4.4)

(a) the road authority (provincial, metropolitan or local);

(b) any affected local community;

(c) regional tourism organisations (WESTOUR, etc.);

(d) the local tourism organisations or tourist associations;

and on an invited basis, other organisations such as:

(e) the Automobile Association;

(f) SATOUR; and

(g) FEDHASA (the Federated Hospitality Association of South Africa).

The Regional Tourism Liaison Committee may potentially have several LTO members. Subject to local policy all LTO's need not

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attend all meetings, but an LTO must be present for applications within its area of representation.

8 Local Tourism Organisations will be responsible for processing the applications, and for co-ordinating the input from the other organisations, in terms of applicable warrants. It will then submit recommendations to the Regional Tourism Liaison Committee as illustrated by the flow chart in Figure 4.4.

9 In processing applications, the regional and local organisations should take the following factors into account for the region or area as a whole:

(a) the overall information demand in the area/environment;

(b) the facility classification;

(c) the facility grading in terms of the warrants; and

(d) the sign type and symbols taking into account the various "layers" of guidance information available (see Figure 4.3).

4.2.4 The Management of Tourism Sign Applications

1 There are various approaches that an RTLC may wish to adopt in managing tourism sign applications. These approaches range from *ad-hoc* to a pro-active and they may be summarised by presenting their applicability through benefits and disbenefits, together with a checklist and a series of examples. This approach assumes that all the necessary approvals, as shown in Figure 4.4, have been received. The questions given in Figure 4.5 then need to be answered.

2 **Question 1.** Is the full Route Guidance System (advance and direction signs, route marker, confirmation, suburb and street names) in place (refer to Volume 1, Section 4.7)?
The goal of this question is to establish the status quo of recommended guidance signs i.e.. are the correct signs, required by the Guidance Signing Plan, in the correct location, showing the correct information and in an acceptable condition? For example, many applications for tourism signing are due primarily to the lack of sufficient primary guidance information. If this primary information is in place, the demand for supplementary signs can be rationalised more easily. Hence, this question addresses the technical responsibility of the RTLC and forms the basis of managing tourism signs applications.

3 **Checklist 1:**

(a) Has a destination analysis been performed (refer to Volume 1, Chapter 8)?

This analysis will select appropriate destinations for direction signs along the route, and produce an "ideal system design" to ensure consistency and continuity.

(b) Has a signs inventory been produced?

This assessment aims to ensure that the correct destinations chosen above are placed on the correct sign, in the correct location, that the sign is in an acceptable condition, and that this information is recorded in a retrievable manner;

(c) Has a Guidance Signing Plan been prepared in terms of the guidance signing policy applicable to the region?

This checklist provides guidance to the next step e.g. if no destination analysis has been performed, such an evaluation must proceed before Question 2 can be addressed.

4 **Question 2.** Can the requested tourism sign be accommodated in the road reserve?
The goal of this question is to assess whether or not there is an available location for a tourism sign, or available space on an existing tourism sign. There may currently be tourism signs occupying the available location, in which case an "overload of information" may arise. In addition, this request for a tourism sign may lead to further requests and the need to adopt an holistic approach might become apparent.

5 **Checklist 2:**

(a) Is the tourism information correct?

(b) Is the quantity of information acceptable?

(c) Is there an available sign or location to which this information can be added?

(d) Are there other tourism demands at this location or in the area?

This checklist can be used as a guide as to which approach to adopt for the implementation of the tourism sign, i.e. the final step in the methodology.

6 **Question 3.** Which implementation approach should be adopted?

The goal of this question is to determine the most cost-effective approach to erecting the tourism sign. The two approaches described below make allowance for the simplest case through to a most comprehensive investigation. They are described as *"ad-hoc"* and "pro-active".

4.2.5 The *Ad-hoc* Approach

1 This approach involves little or no engagement with the community and could be appropriate for isolated intersections or small areas with little tourist demand or, alternatively, a location having a robust sign guidance system in place, i.e.. no Guidance Signing Plan has been prepared.

4.2.6 The Pro-active Approach

1 This approach actively encourages stakeholder participation and could be relevant where there are many tourism demands and in areas where tourism is identified as a major attraction to the area. This is the recommended approach because it permits the full inclusion of all relevant stakeholders and, hence, a longer-term solution is more likely to be both acceptable and sustainable. When a Guidance Signing Plan for the area is already in place, or is in a planning stage, the introduction of tourism signs will likely supplement the primary signs in an acceptable way.

4.2.7 Sign System Quality

1 Detail 4.5.2 in Figure 4.5 shows graphically how the choice of approach can affect the quality of the signing system. While initially the *ad-hoc* approach (Approach "A") may appear appropriate, and indeed it can provide a fast response, there is the chance of long-term problems arising and the system quality falling over time.

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TABLE 4.1 APPROACH TO MANAGING TOURISM SIGN REQUESTS TABLE 4.1

BENEFITS	APPROACH	
	AD-HOC	**PRO-ACTIVE**
System Quality	4 Short-term 8 Long-term	4 Short-term 8 Long-term
Sustainability	4 Short-term 8 Long-term	4 Short-term 8 Long-term
Meeting Expectations	8 Unstable	84 Short-term 4 Long-term
Accepted by Tourism Stakeholders	4 Short-term 8 Long-term	84 Short-term 4 Long-term
Costs and Effectiveness	4 Short-term 8 Long-term	4 Short-term 4 Long-term
Costs and Resources	Low – Short-term High – Long-term	Low – Short-term High – Long-term

NOTE:

"unstable" can be defined as a seemingly stable sign system but with potential to become very unstable, very quickly
The subsequent demend on resources and finances can thus be swift and large, as previous efforets are repeated to try to maintain the *status quo.*

This would therefore necessitate greater costs at a later stage due to poor sustainability.

2 An approach between "A" and "B" never quite meets tourism demands and thus while it may create expectations, good system quality cannot be achieved. This approach tends to be unproductive while incurring high cost, and is thus not cost-effective and cannot be recommended.

3 The pro-active approach (Approach "B") is the recommended approach. Although it appears to incur relatively high costs at an early stage, this should be measured against the associated benefits and longer-term sustainability and acceptance. Hence, as this approach progresses (and using the approval process depicted in Figure 4.4) deeper understanding by the tourism stakeholders and RTO's would lessen the workload on the road authority. Hence, there would be a long-term improvement and subsequent maintenance of the road signing system quality in a cost-effective manner. In addition, the likelihood of conflict would be reduced. For this level of effectiveness to be achieved a primary guidance signing system needs to be in place.

4 **Checklist 3:**

1 The checklist for determining which approach to adopt requires a thorough understanding of the tourism environment (present and future) together with the technical component of the guidance system in place:

(a) What is the potential demand for tourism signing in the region or area? (NB: ad-hoc responses can often stimulate further demands and "special cases" should be avoided);

(b) How organised and representative are the local and regional tourism bodies?

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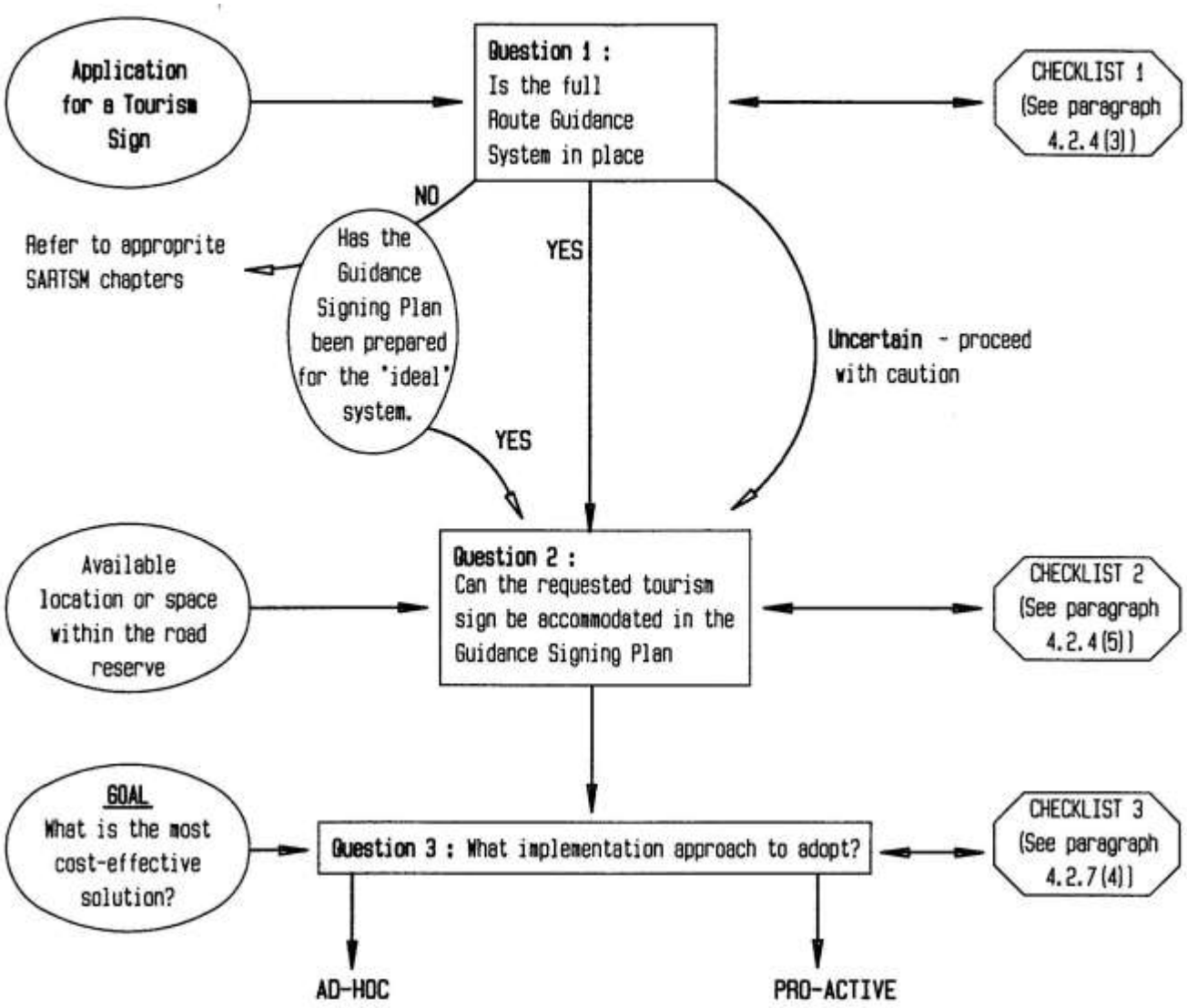
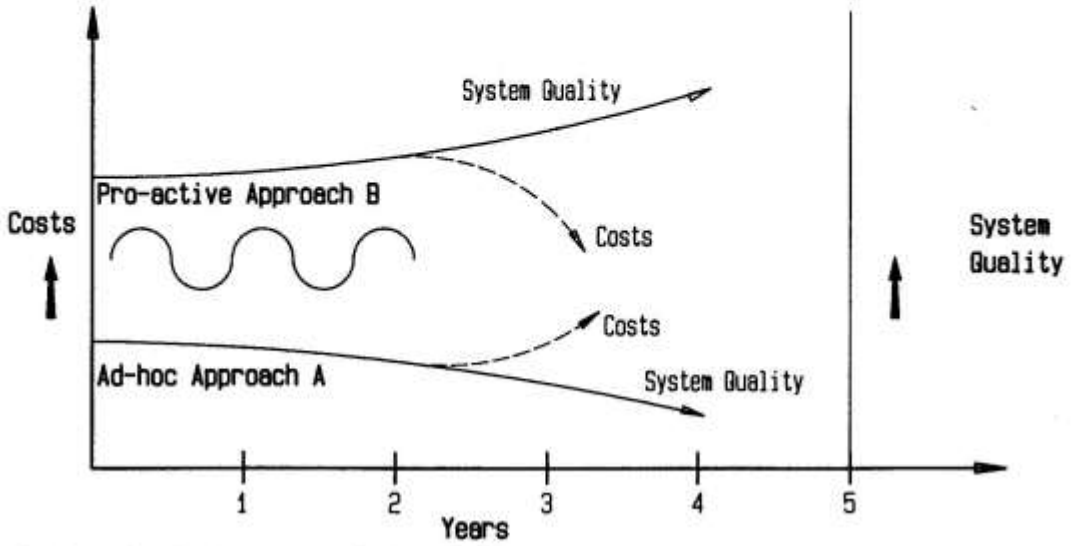


Detail 4.5.1 The Road Authority's Approach to Managing Requests



Detail 4.5.2 Managing Costs versus System Quality

Fig 4.5 Managing Requests for Tourism Signs

(c) How knowledgeable is the tourism community on guidance signing principles?

(d) Does an area-wide document exist that combines signing principles with tourism needs?

(e) Is there commitment from the road authority and the tourism industry to address the concerns in the long-term?

5 **It should be emphasised that the recommended approach is the pro-active one. While it is the most cost-effective, long-term solution, its cost should be proportional to the magnitude of the tourism demands and need not be disproportionately expensive if the tourism stakeholders become involved and accept responsibility for various tasks.** The potential effects of the different approaches to the management of tourism sign applications are summarised in Table 4.1.

4.2.8 Classification of Tourism Destinations

1 In order to successfully implement tourism signs it is recommended that the structured approach described in this section be followed. It is necessary also to have available a well-structured classification of tourist destinations so that applications from facility operators can be assessed in a standard way in terms of a range of recognised types of activity, attraction or service. Classifying applications in this way, according to destination type, will also make it possible for the relevant tourism committee and the road authority, to allocate the appropriate symbol for use on approved signs.

2 It is possible that an applicant, or the assessing official, may feel that there is more than one option for classification. In general it is recommended that, wherever possible, the most generic classification be used since this is likely to result in the use of a more easily recognisable tourism symbol on the sign. In this context, if a facility offers more than one activity, attraction or service the applicant should be asked to choose which one is most appropriate for classification purposes.

3 To assist the classification process tourist attractions have been reorganised into generic or "family" groupings. Table 4.2 illustrates this revised classification and the listing of approved symbols covered in Subsection 4.3.10 has been organised into the same groupings.

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2011

PERMANENT TOURISM SIGNS

TOURIST ATTRACTIONS - GF1/GF2/GF3 Signs

Group A1 National Parks
- National Parks

Group A2 Provincial Parks
- Gauteng
- Free State
- Western Cape
- Kwazulu Natal
- Eastern Cape
- Northern Cape
- North West
- Northern Province
- Mpumalanga

Group A3 Resorts
- Country Club
- Hot Springs
- Inland Water
- Seaside/ Beach
- Berg/ Mountain

Group A4 Scenic
- Nature Reserve
- Natural Heritage
- Botanical Gardens
- Gardens (flower)
- Waterfall
- Lake or Dam (no water-sport)
- Caves
- Viewpoint
- Forest (natural)
- State Forest
- Mountain/ Berg

Group A5 Sports
- Motor Racing
- Golf Course
- Equestrian
- Fishing
- Cricket Field
- Swimming Pool
- Sports Stadium

Group A6 Wildlife
- Conservancy Area
- Game/Farm Reserve
- Bird Park
- Zoo
- Snake Park
- Crocodile Park
- Rhino Park
- Lion Park

Group A7 Historical
- National Monument
- Museum
- Historic Mine
- Historic House
- Historic Railway
- Historic Battlefield
- Historic Cemetery
- Geological Site

Group A8 Coastal
- Marine Reserve
- Maritime Museum
- Aquarium
- Whales
- Dolphins
- Light House
- Dockyard
- Boat Launch
- Fishing
- Crayfish
- Oceanarium
- Beach

Group A9 Arts & Crafts
- Painting & Drawing
- Pottery
- Jewellery
- Weaving & Knitting
- Leatherwork
- African Arts and Crafts
- Woodwork
- Metalwork

Group A10 Cultural
- Theatre
- Amphitheatre

Group A11 Adventure
- Hiking Trail
- Horse Trail
- 4x4 Trail
- Bike Trail
- River Rafting
- Scuba Diving
- Ballooning

Group A12 Agricultural
- Wine Cellar
- Wine Route/ Estate
- Showground
- Cherry Farm
- Ostrich Farm with riding
- Ostrich Farm
- Fish Farm
- Butterfly Farm

Group A13 General

Any attraction not covered by an individual attraction in Group A1 to A12.
- Animal Theme Park

SERVICES - GF1/GF2/GF3 Signs

Group B1 - Emergency Services
- Telephone
- Police
- Hospital
- First Aid
- SOS Phone
- NSRI
- Ambulance
- Fire Station
- Cell Phone

Group B2 - Light Vehicle Services
- Filling station & Workshop
- Filling Station
- Workshop
- Tow-in Service

Group B3 - Truck Rest & Service
- Truck Service Area

Group B4 - Food Services
- Restaurant
- Refreshments
- Take-away

Group B5 - General Services
- Parking Area
- Toilets
- Shower
- Drinking Water
- Fireplace
- Cooking Facility
- Picnic Area
- Tourist Information
- Handicapped Person Facility
- Roadside/ Curio Stall
- Post Office
- Rural Shop

Group B6 - Rest & Service Areas
- Rest Area - Class 1
- Rest Area - Class 2
- Service Area - Class 3

PLUS D1 - "Totem Signs"
- Motor Cars
- Caravans
- Buses
- Trucks
- Motor Cycles
- Take-away
- Restaurant
- Refreshments
- Shop
- Facility for Handicapped Persons
- Toilets
- Straight-on Arrow
- Left/Right Arrow
- Diagonal Left/Right Arrow
- Advance Left/Right Arrow
- Exit (Route Number)
- Parking
- Filling Station & Workshop
- Filling Station
- Picnic Area
- Tourist Information
- Motor Car Wash
- Truck Wash
- Drinking Water
- Fireplace
- Cooking Facilities
- Shower

Group B7 - Vehicle Class
- Motor Cars
- Caravans
- Buses
- Trucks
- Delivery Vehicles
- Motor Cycles

ACCOMMODATION - GF1/GF2/GF3 Signs

Group C1 - Accommodation
- Hotel, Motel, Inn
- Chalet
- Caravan Site
- Camp Site
- Guest House
- Bed & Breakfast
- Rooms
- Youth Hostel
- Trail Shelter
- Guest Farm

PART-TIME ATTRACTIONS - GF17 Signs

REGULAR EVENTS / FIXED VENUE			IRREGULAR EVENTS
SEASONAL	MONTHLY	WEEKLY	PERMANENT VENUES
eg. Flower show	eg. Rambles Flea Markets	eg. Flea Markets	eg. Conferences Training Courses

TEMPORARY TOURISM SIGNS

SPECIAL EVENTS - TGF17 Signs

- Sport
- Shows
- Conferences
- Auctions
- Open Days
- Tournaments
- Festivals
- Galas
- Fetes
- Rallies
- Projects

NOTES:

(1) From time to time additional tourist destination types may be added. This table illustrates the approved groupings with typical examples but will not be updated regularly. For the latest categories of tourist destination refer to the symbol lists in Subsection 4.3.10.

(2) The order of facilities in these lists, and the symbol order in Subsection 4.3.10, do NOT imply any priority of importance. If space for a sign, or on a sign-face, is limited the indication of Emergency Services should take priority over all other options.

Table 4.2
Classification of Tourism Destinationsfor Signing Purposes

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4.3 RANGE OF APPLICABLE SIGNS AND SYMBOLS

4.3.1 General

1 This section gives examples of each of the various TOURISM signs in the GF number series. These signs comprise part of the GUIDANCE SIGNS class of road traffic signs. In addition details are given, with figures, of the signface design rules applicable to tourism signs since these are commonly not followed correctly by designers and/or manufacturers. Finally the section lists all approved TOURISM SYMBOLS in the various GFS series.

2 TOURISM signs may be used in conjunction with FREEWAY DIRECTION signs, DIRECTION signs and/or LOCAL DIRECTION signs or they may be specified on their own, either at the final turn towards a tourist facility or in advance of this point when there are no other orientational destinations which warrant the provision of a DIRECTION sign. In this manner tourism signs and local direction signs are both supplementary sign systems which may support and amplify the orientational DIRECTION sign system when warranted. Since they are supplementary they should only be provided in accordance with relevant warrants (see Section 4.6 and Chapter 9).

3 The examples of tourism signs given in Figures 4.6 to 4.10 are relevant in rural and urban areas, and for use with direction signs or on their own. Limited details of specific aspects of tourism signing are also covered in the following Volume 2 chapters:

(a) Chapter 5: *Freeway Signing;*

(b) Chapter 9: *Urban Guidance Signing;*

(c) Chapter 10: *Rural Guidance Signing.*

4 In particular Chapter 9: *Urban Guidance Signing* covers the warrants appropriate to the provision of tourism signs in urban areas, whereas the warrants given in this chapter are relevant to rural and, in many instances, peri-urban areas. Chapter 9 also covers the option to combine the display of supplementary tourism signs and local direction signs, although examples are illustrated in Figure 4.10 for completeness.

5 Details of the positioning of tourism signs are covered in Section 4.7 and in Chapter 9.

4.3.2 Tourism Signface Design Details

1 Figure 4.6 illustrates a representative selection of FREEWAY ADVANCE EXIT signs GF1. This type of sign will only be warranted on a freeway when the exit leads directly to the facility indicated and will not normally be warranted when the intersecting route is a numbered route. Detail 4.6.1 gives examples of single panel GF1 signs indicating tourist attraction and service destinations. The Kranskop 1-Stop sign serves as a final turn sign, at the point of exit, to a direct access rest-and-service area serving freeway traffic - it would be preceded, at one kilometre from the exit by the similar sign given in Detail 4.6.3. The Witbank Hospital example illustrates the unique use of the facility name with a service symbol reserved for hospitals offering 24 hour emergency services. Detail 4.6.2 shows two typical examples of 2-panel GF1 signs with tourist attraction, service, tourist route and accommodation tourist destinations.

2 Detail 4.6.3 gives examples of two maximum display criteria, namely:

(a) a maximum of three panels (or stacks - see Figure 4.11) on any one sign; and

(b) a maximum of three lines of text in one panel;

(c) a maximum of 12 bits of information on any sign or in any sign cluster.

3 In Figure 4.7, the most common two tourism direction signs, ADVANCE TURN sign GF2 and FINAL TURN sign GF3, are illustrated. These signs may be used on any class of at-grade road, in rural or urban areas, according to various rules and warrants. In Detail 4.7.1 the Platorand example of a GF2 sign is unusual in that it includes a regional route number indicating that the route serves only tourism destinations of importance. The straight-on example to uMkhelekehle Waterfall is also unusual and is only generally specified when the facility is further from the junction than might be expected, or is located on a dead-end route. The two Police examples illustrate the option to include a distance on such a sign, an important piece of information in an emergency.

4 Detail 4.7.2 shows typical GF3 signs to a tourist attraction, hospital (24 hour emergency service), camping services, with a 3-line panel example and a 2-panel example.

5 The majority of the rest of the range of tourism sign types are given in Figure 4.8. GORE EXIT sign GF4 is appropriate only at a high speed exit to a direct access rest-and-service area, normally from a freeway. LAYBY signs GF5 and GF6 may be used in advance of, and at, a roadside layby. The symbol on the signs may be varied (see Volume 1, Chapter 4). Two examples of tourist destination CONFIRMATION signs GF7 indicate options to indicate a service or a tourist attraction and are normally only warranted when the distance to the facility is further than road users are likely to expect.

6 Sign types GF8 and GF9 deal with sequences of service facilities available at exit points on the road ahead. The GF8 sign shows three exits over a range of 13 kilometres on the perimeter or by-pass of a town. The GF9 signs only show two facilities per sign according to a principle whereby each sign shows the next facility approximately 2 kilometres ahead and the subsequent facility some 40 kilometres to 50 kilometres ahead (see Figures 4.43 to 4.48).

7 TOTEM signs GF10 may be used within a rest-and-service area, or other area such as a large park or game reserve. They should be used in clusters as shown in Figure 4.16. Signs GF11 to GF14 are for use in conjunction with a roadside SOS telephone service. GF15 may be specified to mark or identify a free parking area and GF16 similarly may be used to identify a tourist information layby, centre or office.

(continued on page 4.3.7)

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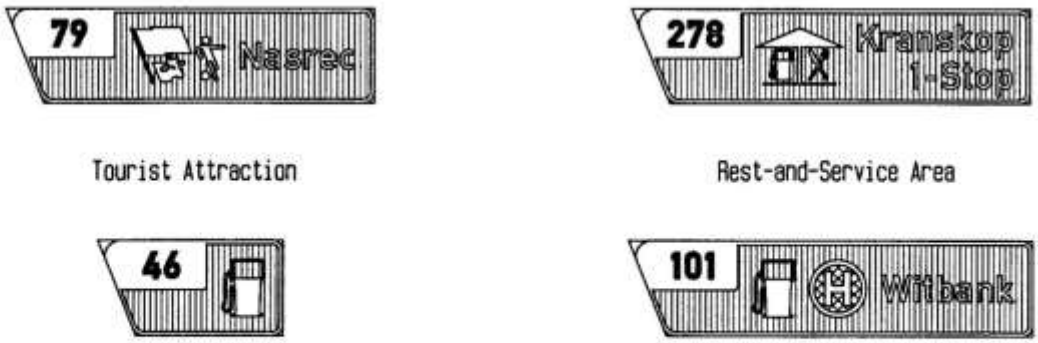
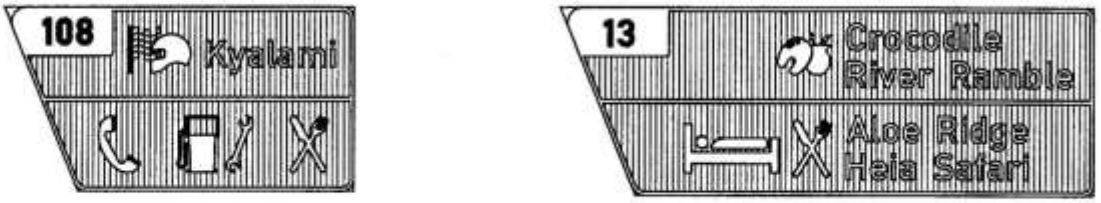
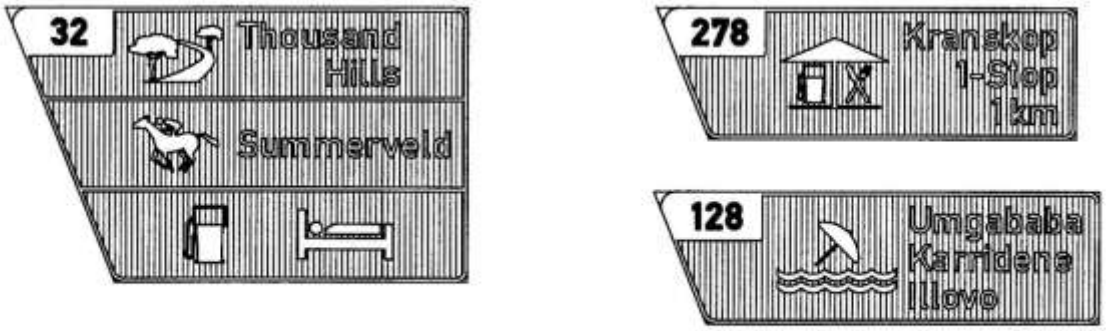


Detail 4.6.1 Typical Single-Panel GF1 Signs



Detail 4.6.2 Typical 2-Panel GF1 Signs



Detail 4.6.3 Typical Examples of GF1 Sign Maximum Displays

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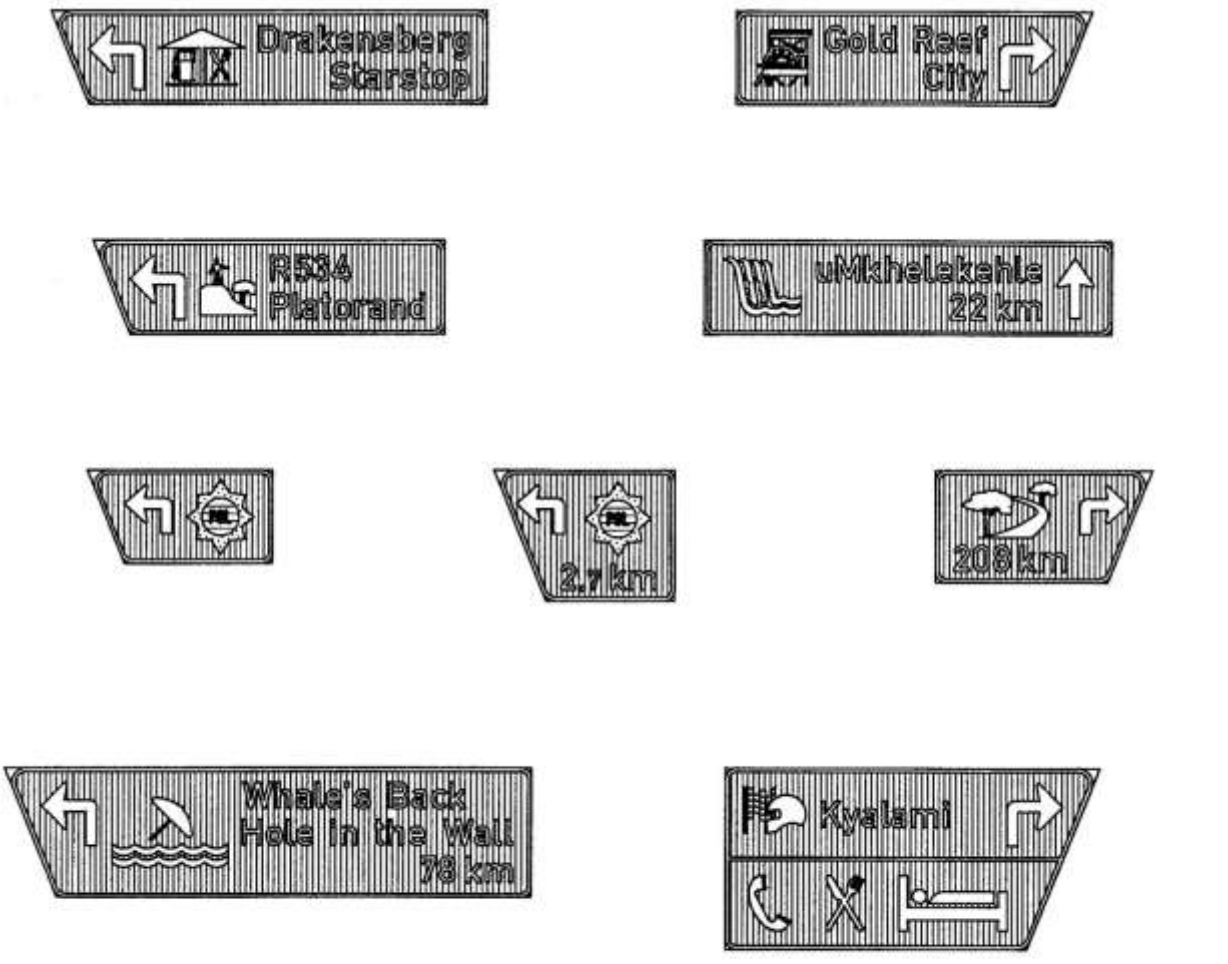
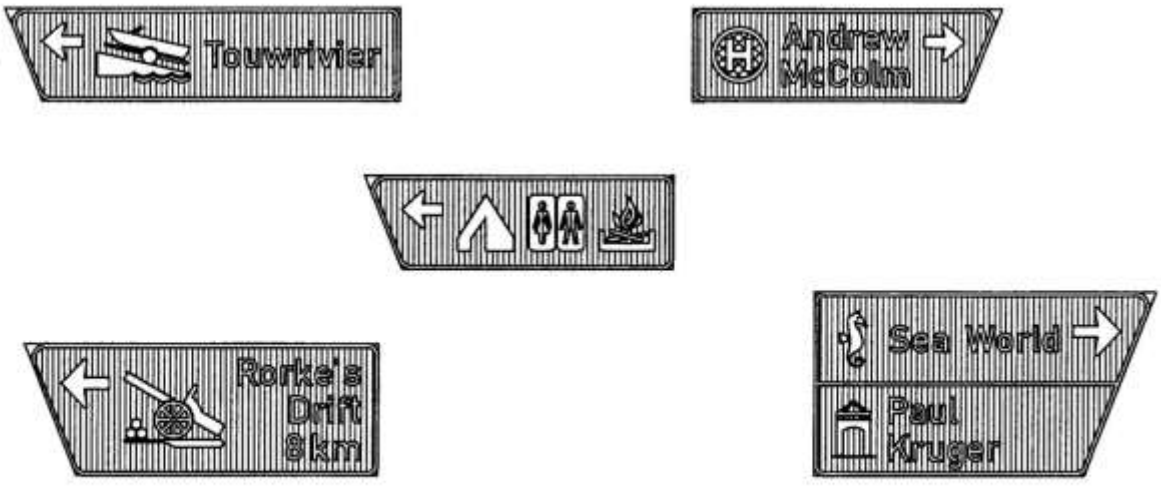
Fig 4.6 Freeway Tourism Advance Exit Signs



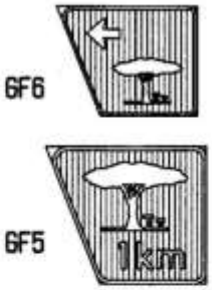
Detail 4.7.1 GF2 Advance Turn Direction Signs



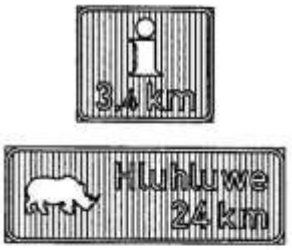
Detail 4.7.2 GF3 Final Turn Direction Signs

Fig 4.7 At-Grade Tourism Direction Signs

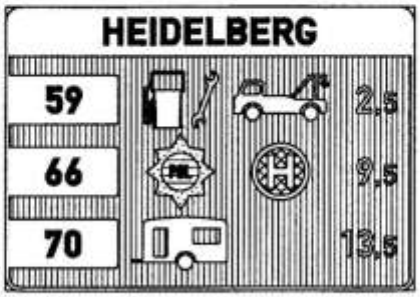
GF4 Gore Exit Sign
(Tourism)



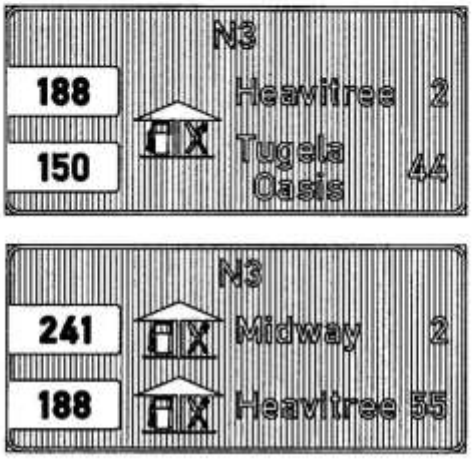
Layby Signs



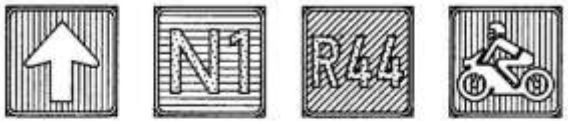
GF7 Confirmation Signs



GF8 Service Exit Sequence Sign



GF9 Rest and Service Exit Sequence Signs



GF10 "TOTEM" Signs (Rest and Service Areas)

GF11

GF12

GF15 Parking

GF17 Part-time Facility

GF13

GF14

SOS Service Signs

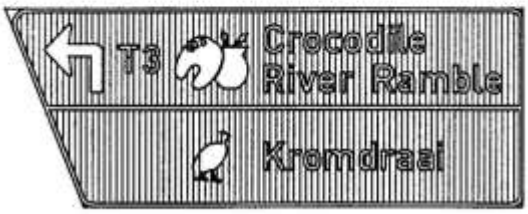
GF16 Information
(Tourist)

TGF17 Temporary Facility

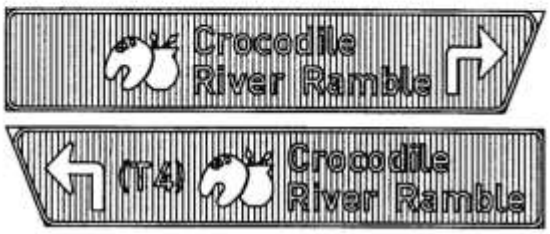
Fig 4.8 Other Tourism Signs

GF1 Freeway Advance Exit Sign to a Tourist Route

GF2 Advance Turn Sign to a Tourist Route



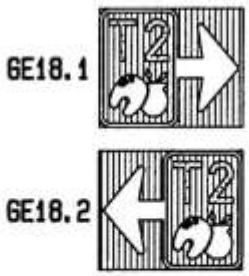
GF2 2-Panel Advance Turn Sign to a Tourist Route



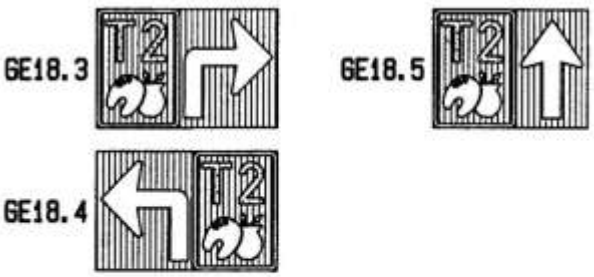
2xGF2 Advance Turn Signs with 2-Stack/1 Panel/2 Panel Layout

Detail 4.9.1 Typical Tourism Direction Signs with Tourist Route Numbers (for High Density Tourist Areas)

GE18 Tourist Route Confirmation Sign



Direction Tourist Route Marker Sign



Advance Direction Tourist Route Marker Signs

Detail 4.9.2 GE18 Tourist Route Marker Signs

Fig 4.9 Signs for Numbered Tourist Routes

GF2 Advance Turn Sign Combined with Supplementary Symbols (warrant applicable)

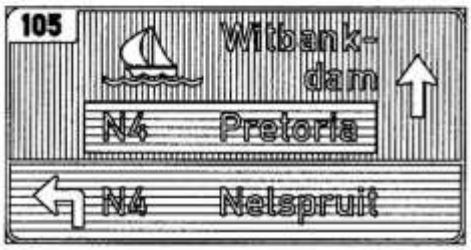
Detail 4.10.1 Tourism Sign / Supplementary Symbol Combination

GB1 Advance Local Direction Sign with Tourism Insert Panel

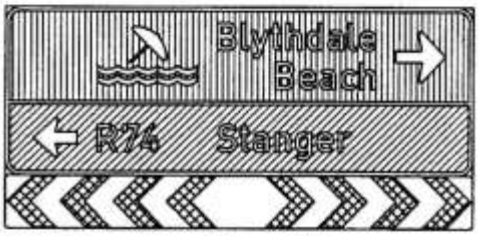
NOTE:
For further details of Local Direction signs see Volume 1, Chapter 4 and Volume 2, Chapter 9.

GDL1/GF2/GDL1 Combination

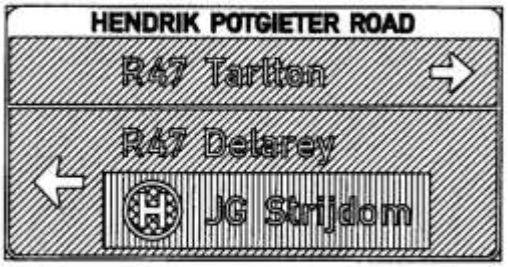
Detail 4.10.2 Tourism Sign / Local Direction Sign Combinations



GB1 Advance Direction Sign with Tourism Panel



GD2 Direction Sign with Tourism Panel



GD2 Direction Sign (Urban) with Tourism Insert Panel

Detail 4.10.3 Tourism Sign Panels / Inset Panels with Direction Signs

Fig 4.10 Tourism Sign Combinations

(continued from page 4.3.1)

8 Two examples of typical fingerboard PART-TIME FACILITY signs GF17 are illustrated. These signs are more compact than sign types GF2 and GF3 and as such are suitable for high density tourist areas where many signs may be required. <+>Sign TGF17 is a similar type of sign for temporary short term use to sign functions of tourist interest.

9 Signs which may be used to indicate numbered tourist routes are shown in Details 4.9.1 and 4.9.2 of Figure 4.9. Detail 4.9.2 gives the range of TOURIST ROUTE MARKER signs GE18 available to mark tourist routes in a similar manner to the way navigational numbered routes are marked, particularly in metropolitan areas, by ROUTE MARKER signs GE12 to GE15.

10 Tourism signs, tourism sign stacks or panels and tourism sign insert panels may be used in combination with DIRECTION or LOCAL DIRECTION signs. In addition supplementary symbols may be combined with a normal tourism signface as shown in Figure 4.10, Detail 4.10.1 (see Section 4.6 for appropriate warrants). Detail 4.10.2 gives two examples of ways in which TOURISM and LOCAL DIRECTION destination information may be combined and Detail 4.10.3 similarly gives examples of combinations of TOURISM and DIRECTION destinations.

11 The various signface design rules covered in the previous paragraphs and illustrated in Figures 4.6 to 4.10 are summarised together with dimensioning rules, in Figures 4.11 to 4.17.

4.3.3 Sign Dimensions - General

1 This subsection gives details of the dimensions of tourism direction signs and the symbols used on them so that they may be accurately specified and manufactured. The most important signface display dimensioning rules are also detailed in Figures 4.11 to 4.17. Rules governing when a tourism sign may be displayed are given in Volume 1, Chapter 4, in Section 4.9.

2 **Tourism signs conform to the basic rectangular shape code of the guidance signs class but are unique in that all turn signs shall have the arrow side edge cut back from top to bottom at a slope of 2 in 5 to create a trapezoidal shape. They are also unique in the use of a brown background colour.** Other tourism signs, such as straight-on signs, confirmation signs, exit sequence signs, information centre identification signs and information boards and parking signs are rectangular. "Totem" signs used within rest and service areas are square.

3 Tourism signs are STACK-TYPE signs and a separate STACK shall be provided for each direction which requires a tourism sign at the junction ahead. (The exit point of a freeway off-ramp is considered as one junction, and the ramp terminal with the intersecting cross-road as a second and separate junction. A freeway advance exit tourism sign shall therefore only comprise one STACK oriented to the left.)

4 A tourism STACK-TYPE sign may be arranged in up to three PANELS, each separated from the other by an internal border line. When a tourism sign cluster comprises more than one STACK the total number of STACKS and/or PANELS shall be limited to three (see Figure 4.11).

5 Tourism signface design is based on bold SYMBOLS to transfer the required message to road users. Designers should refer to Volume 1 for tourism sign design principles, restrictions and limitations.

6 **Symbols other than those detailed in this Manual shall not be used without the prior consent of the Road Traffic Signs Technical Committee.** Wherever possible the facility type requiring signing should be classified into one of the "generic" groups (see Subsection 4.3.10). If the need arises for a symbol which is not detailed in this Chapter, or cannot be covered by the principle indicated above, the designer or manufacturer shall make this need known, with a sketch proposal, to:

The Secretary,
Route Numbering and Road Traffic Signs Sub-Committee,
c/o Department of Transport,
Private Bag X193,
Pretoria,
0001.

4.3.4 Sign Sizing

1 Dimensional details of tourism signs are based on the factor "d". This factor represents one seventh (<$E1/7>) of the height of the upper case DIN 1451 Part 2 lettering specified for the principle message on the signface and is equal to the stroke width of this lettering. Once the letter height appropriate to the amount of message to be displayed has been selected the sign height can be determined, and the sign length may be found from a combination of spacings based on the factor "d" plus the length of the message to be displayed. Sign sizes for the full range of letter sizes available may thus be determined from one detail.

2 The selection of an appropriate letter size is based on the number of "bits" of information required on the signface, the approach speed of traffic and the lateral distance from the drivers eye to the sign, (see Volume 1, Chapter 4 for full details of letter size determination).

3 All arrows and symbols used on tourism signs are also specified in terms of factor "d". In a limited number of cases the sign design requires letters, symbols or other components in more than one size on the signface. In these cases the secondary factor size is represented by a variation of "d" such as "d✱" or "d✱✱".

4 It should be noted that the vertical spacings between components and the horizontal spacings between certain components are not the same as on direction signs. The spacings used on tourism signs are to a lower standard than direction sign standards, consistent with the supplementary role of tourism signs and with the desired objective to limit overall sizes of tourism signs. **Letter spacings remain standard.**

5 Sizing a sign around the stroke width factor "d" may result in a vertical sign height which is not a multiple of 200 mm. Since the construction of guidance signs from standard 200 mm planks is common with some authorities, this will result in a need to "round-up" the sign height to a multiple of 200 mm. The extra dimension

(continued on page 4.3.10)

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Notes on Figures 4.11 and 4.12

The details in Figures 4.11 and 4.12 illustrate BASIC RULES which apply universally to TOURISM signs. Other RULES dealing with text, symbols, and sign dimensions are covered on following pages.

Rule F1:
Tourist facilities shall be classified for signface design into one of the following groups (see Table 4.2):

(a) tourist attraction;

(b) tourist service;

(c) accommodation;

(d) off-road;

(e) part-time;

(f) temporary.

Rule F2:
The background colour of TOURISM signs shall be BROWN, and text and symbols shall follow normal DIRECTION sign conventions.

Rule F3:
TOURISM Direction signs for full-time facilities shall be stack-type signs, and for part-time facilities shall be fingerboard signs.

Rule F4:
TOURISM signs shall be rectangular in shape and all signs indicating a turn to the right or left shall have a sloping side "pointing" in the direction of turn.

Rule F5:
TOURISM Direction sign stacks may be divided into a maximum of three panels.

Rule F6:
A TOURISM sign cluster may comprise 2 or 3 signs, SUBJECT to an overall total of 3 stacks and/or panels.

AND

F6.1 right turn stacks shall be placed above left turn stacks;

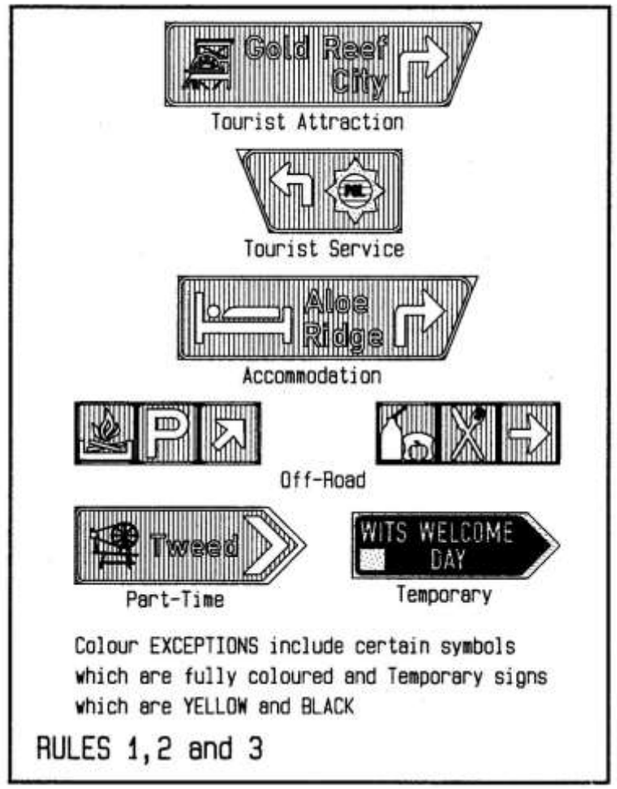
F6.2 a straight on stack shall be placed above any right and/or left turn stacks;

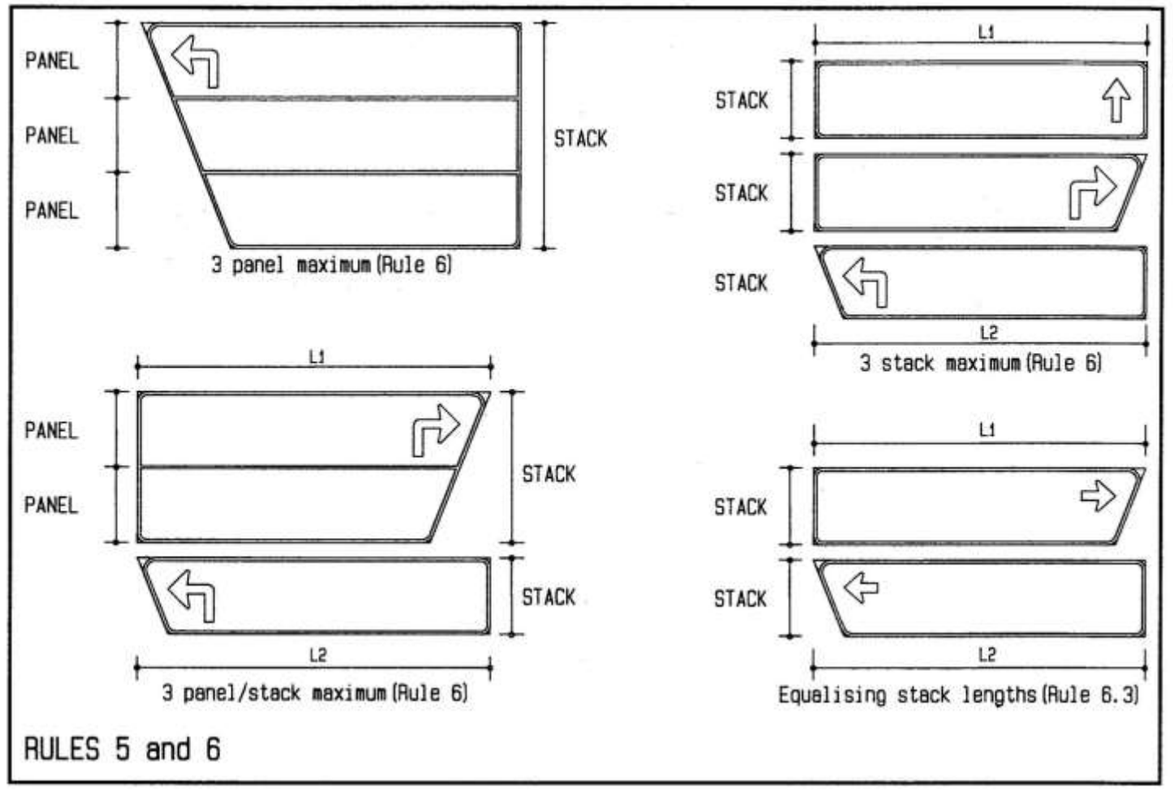
F6.3 multi-stack signs shall be mounted on common supports with a small vertical separation and should preferably be of equal length even if this increases the length of one or more stack.

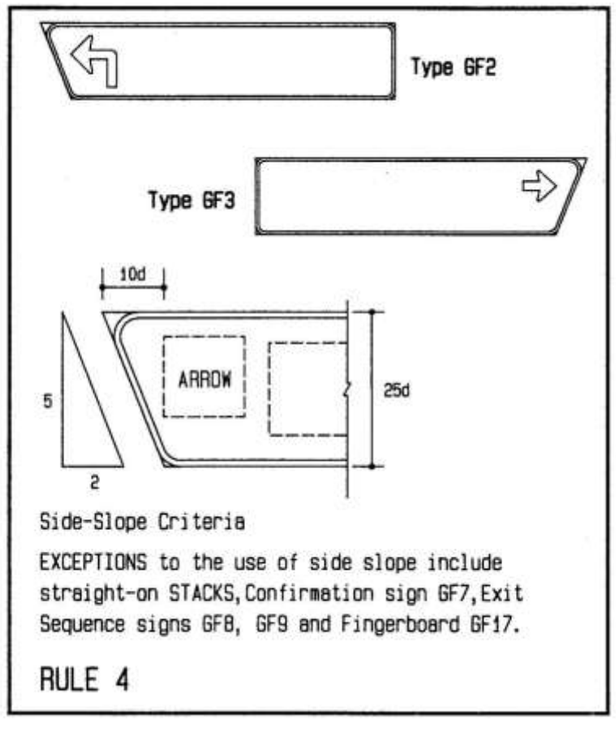
Rule F7:
Due to the sloping side shape, Stack-Type TOURISM Direction signs need not display an arrow. FREEWAY TOURISM signs GF1 shall have only one stack and shall not display an arrow. It is, however, recommended that arrows be used on ADVANCE TURN GF2 signs and FINAL TURN GF3signs.

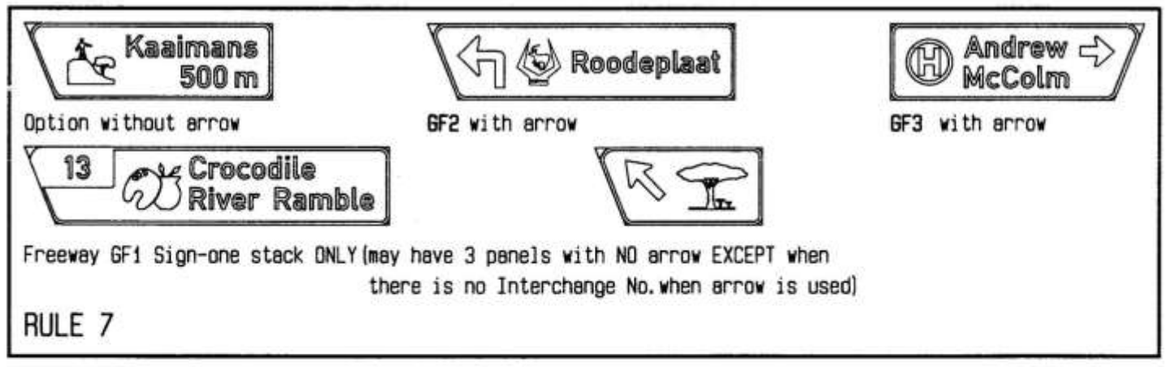
Rule F8:
In the context of all other signface rules, all aspects of signface design shall be undertaken so as to minimise the areas of TOURISM signs.

Rule F9:
Basic internal signface spacing standards shall be at least 20% less than for DIRECTION signface design.









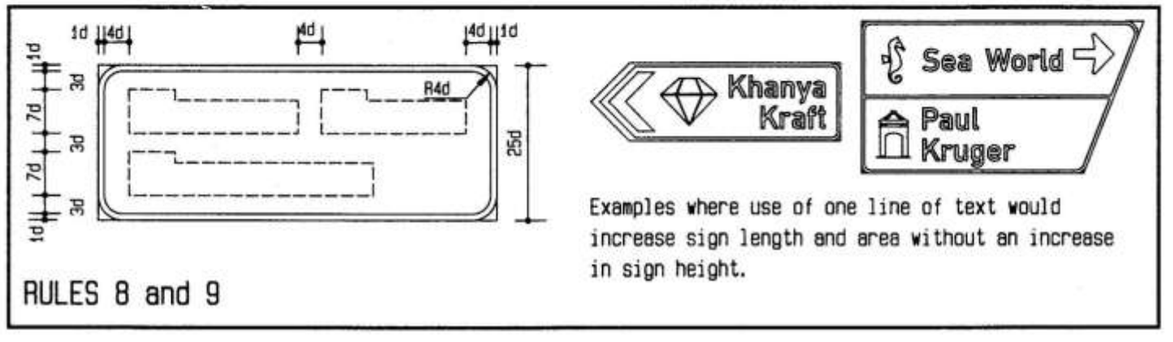
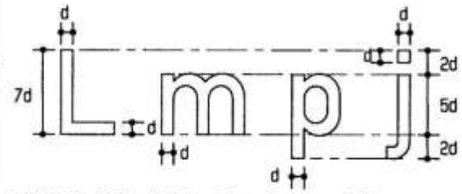
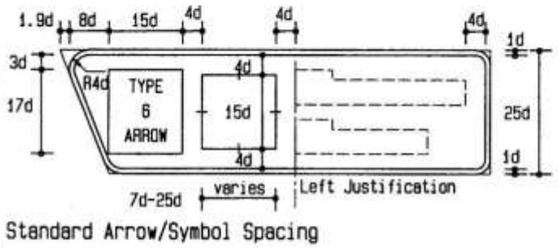
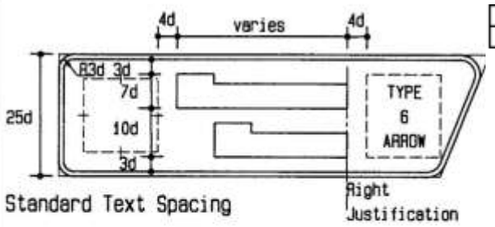


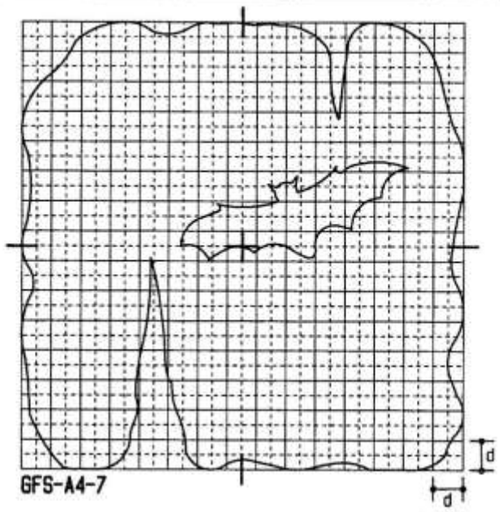
Fig 4.11
Illustration of Basic Tourism Signface Rules - 1







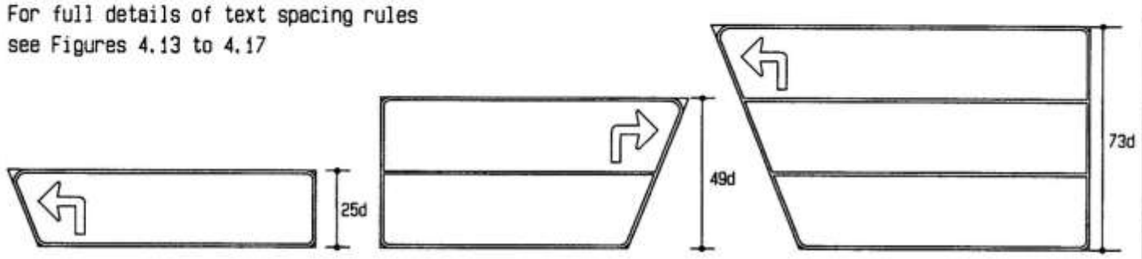
For full details of text spacing rules see Figures 4.13 to 4.17



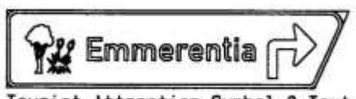
"d" mm	60	50	40	30	25	20	16
Legend	420/300	350/250	280/200	210/150	175/125	140/100	112/80

SCALE: 1"5
For "d" = 40 mm

For further details of symbol spacing rules see Figures 4.13 to 4.17. All symbols are drawn to scale in Volume 4, Chapter 7.

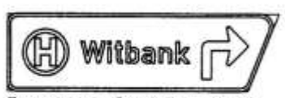


RULE 10



Tourist Attraction Symbol & Text

Accommodation Symbol & Text



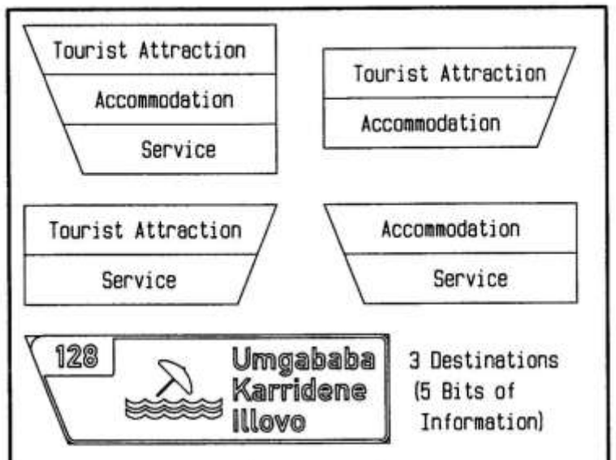
Emergency Symbol & Text

Rest & Service Symbol & Text

Tourist Attraction
Symbol Only

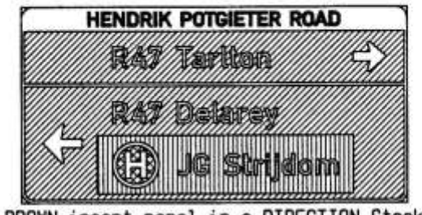
Tourist Attraction
Text Only

RULE 11

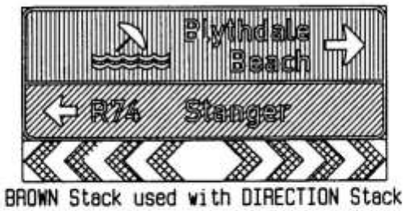


Example 7.75 Bits of Information

RULES 12 and 13



BROWN insert panel in a DIRECTION Stack



BROWN Stack used with DIRECTION Stack

This technique is only relevant where space for signs is limited or there is no orientation destination.

RULE 14

Rule F10:

All TOURISM Direction signs shall be designed and manufactured using DIN 1451 Part 2 lettering and shall be dimensioned in terms of the factor "d", where "d" is the DIN letter stroke width, and the standard DIN letter height is 7"d".

AND

F10.1 in line with Rule F9, basic internal spacing standards, given in multiples of factor "d", shall be less than those used on DIRECTION signs;

F10.2 stack and panel heights are dictated by the 15"d" standard symbol height;

F10.3 all TOURISM SYMBOLS shall be specified in terms of factor "d", within a range of nominal standard widths and height (see Figure 4.13);

F10.4 stack and panel heights are specified as multiples of factor "d", SUBJECT to whether the sign construction uses standardised horizontal planks;

Rule F11:

The TOURISM Direction sign system shall be symbol based i.e. the main message comes from the symbol.

AND

F11.1 any text message used on a TOURISM Direction signs shall be limited to the "primary name" of a tourist attraction i.e. "Tsitsikamma" is the primary name for the "Tsitsikamma National Park" and the symbol used means "National Park"; a primary name thus qualifies the message of the symbol by making it specific to a particular facility;

F11.2 a primary name may be used as part of a tourist attraction or accommodation message, and may be used for a 24 hour emergency service hospital, and for rest and service areas SUBJECT to compliance with warrants;

F11.3 a tourist attraction symbol may be used on its own;

F11.4 only approved symbols listed in Subsection 4.3.10 shall be used on TOURISM signs;

F11.5 if an approved symbol is not available for a tourist attraction, a primary name may be used on its own.

Rule F12:

Different classes of facility shall be indicated in different panels, and different types of facility within one class shall be indicated in different panels so that the most important attraction is in the top panel, BUT so that sign length is otherwise minimised, SUBJECT to the maximum given in Rule F6 of 3 stacks and/or panels.

AND

F12.1 different facilities shall be placed in panels such that tourist attractions are above accommodation or service and accommodation is above service;

F12.2 up to 3 primary names of facilities of the same type may be indicated in one stack or panel SUBJECT to Rule F13.

Rule F13:

The maximum number of "bits" of information on a TOURISM Direction sign or sign cluster should be 12 "bits".

Rule F14:

A tourist destination may be displayed on a BROWN stack or insert panel on a DIRECTION sign when the tourist destination is the only destination or where there is not enough space to locate the sign safely.

Fig 4.12
Illustration of Basic Tourism Signface Rules - 2

(continued from page 4.3.7)

should be distributed evenly through the vertical spaces. "Rounding-down" is not recommended with tourism signs since the inter-line spaces are a minimum in terms of the reduced standards adopted, unless the symbol being used is less than 15 "d" in height and there is only one line of text in the stack or panel.

For complete details of all aspects of guidance sign face design refer to Volumes 1 and 4. Volume 4, in particular, includes many more dimensional details than covered by the illustration of signface display rules in this section.

4.3.5 Sign Text

1 Tourism sign displays include a symbol plus a primary name for tourist attraction facilities, and certain accommodation signs. In order to obtain maximum benefit from the use of the symbol therefore, every effort should be made to limit the text displayed on tourism signs to the minimum consistent with getting the required message over to road users.

2 Service facility signs display only symbols, with the exception of hospitals with 24 hour emergency services, and Class 3 rest and service areas, which also display the primary name of the facility.

3 Basic tourism sign displays, as illustrated in Figure 4.11, can carry one or two lines of text without an increase in sign size. When the primary name of a facility is in two parts, or is long but capable of being hyphenated, it is highly recommended that the name be displayed in the two lines available. **Although this is not the style of display used for direction signs, it is once again consistent with the supplementary role of tourism signs that this method be used to limit sign length.** When the name of a facility is displayed in this manner the text shall be justified to the right of the sign to differentiate the display from that of two names of two separate facilities, which shall be displayed in the normal left justified manner (see Figures 4.15 and 4.16).

4 As implied the term "primary name" of a tourism facility is that part of the name of the facility which **CANNOT** be represented by the symbol used on the sign. This name will identify a particular facility from another of the same type. **The display of all other superfluous text should be avoided.**

5 When the primary name requires only one line it shall be centred vertically on the stack or panel. Indication of a route number, distance or supplementary symbols in addition to the facility name this is an acceptable variant (see Figures 4.6 to 4.10).

6 Occasionally two names to be displayed on a tourism sign may be of considerably different lengths. This will result in a very unbalanced signface layout. The possibility to centre a shorter message over, or under, a longer message may be considered.

7 The lettering used on tourism signs should normally be DIN 1451 Part 2, Style "B". Style "A" may be used when space is severely limited and speeds are not high.

4.3.6 Symbols

1 **Only approved symbols given in Subsection 4.3.10, as amended from time to time, shall be used on tourism signs. Direction sign symbols shall not be used on tourism signs**

2 If a tourism sign display includes a symbol plus a primary name **the symbol shall always precede the primary name irrespective of the direction indicated by the sign,** EXCEPT when supplementary symbols are used (see Figure 4.14).

3 Approved symbols have been designed within a range of basic sizes with a **nominal** height of 15d and **nominal** widths of 25d, 15d and 11d. Many symbols, however, vary from these nominal dimensions either vertically or horizontally, or occasionally in both dimensions. The dimensioned sign examples all illustrate one or other, or several, of these nominal sizes. **All symbols are centred vertically on the stack or panel, and stack or panel heights are fixed as a multiple value of factor "d", irrespective of the actual vertical dimensions of the particular symbol(s) in use, or the text displayed, UNLESS noted otherwise.** Vertical centre marks are indicated with each symbol for this purpose. The range of vertical symbol dimension varies from 20d (Police symbol) to 7d (Bus symbol). When a Police symbol is specified, the stack or panel height is not normally increased. In this case the vertical spaces are reduced. Examples of this principle are illustrated in Figure 4.13.

4 Sign dimensions will vary horizontally according to the symbol, or symbols, specified. As the **actual** symbol width is greater or less than the **nominal** sizes shown on the dimensioned examples so will the final sign length become greater or less. **The standard spacing between symbols, or between symbols and text, should be maintained irrespective of the variation in actual symbol width, UNLESS noted otherwise.** Horizontal centre marks are indicated with each symbol to assist accurate positioning and the correct vertical application of symbols. This latter aspect may be difficult with circular symbols and symbols which are not symmetrical. Actual symbols widths range from 25d to 7d (Workshop symbol). Examples of horizontal symbol spacings are given in Figure 4.13.

5 A few symbols project outside the boundaries of their height and width "grid" by small amounts. These projections are taken up in the surrounding spaces and do not affect the function of centre marks.

6 The tourism sign symbols detailed in Volume 4 are drawn to a scale of 1 in 5 for "d" = 40 mm, or in other words for a sign letter size of 280 mm/200 mm. The symbols are superimposed on a grid of 4 mm x 4 mm squares so that "d" equals two grid squares. **If the tourism sign display includes three or more lines of text the symbol may be increased in size to maintain its proportion with the overall sign size.** The symbol is specified by "d✱", where "d✱" is normally the next largest standard value of "d" (see Figures 4.15 and 4.16 - Rule D19).

7 In order to prepare a full size symbol the detail given may be enlarged photographically, by projection, or by drawing. In each case the grid should be such that the line centres are a distance of one half (1/2) "d" apart, where "d" is the stroke width of the letter size with which the symbol is to be used.

(continued on page 4.3.16)

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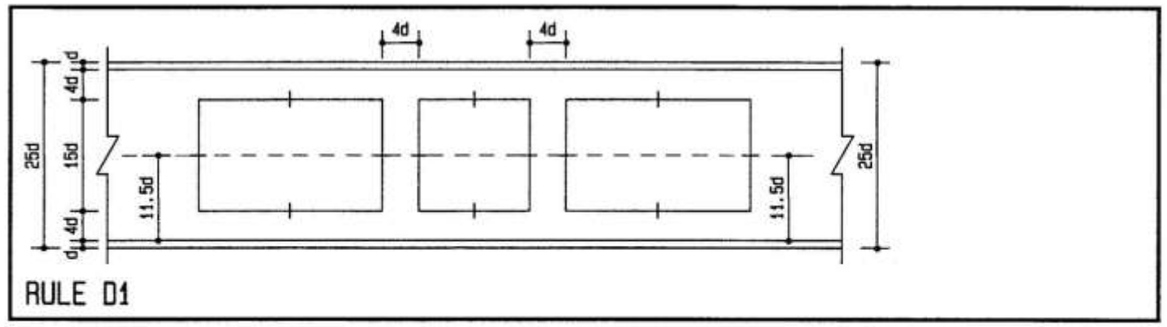
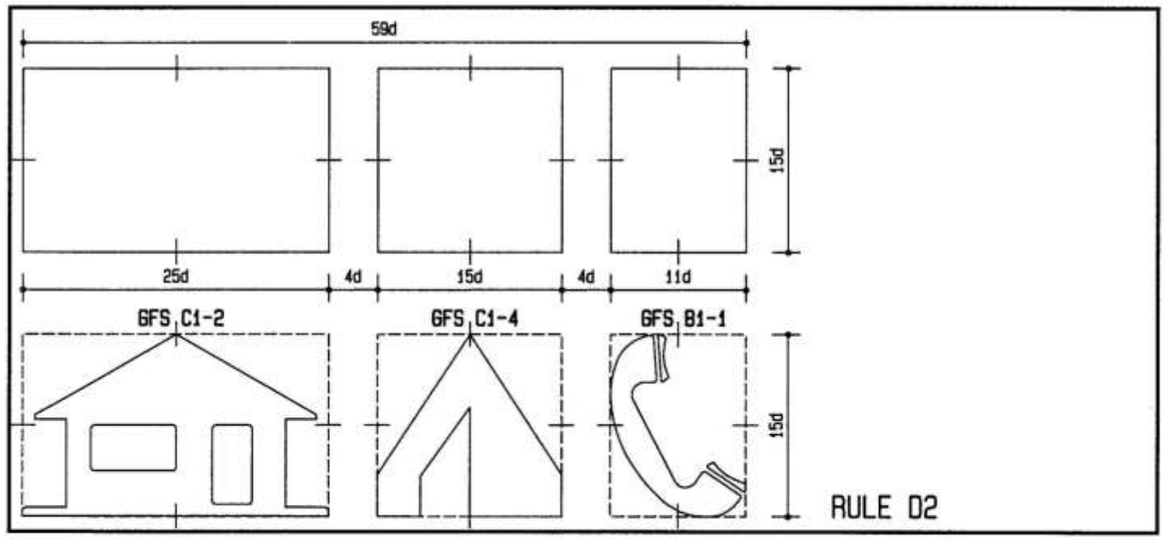
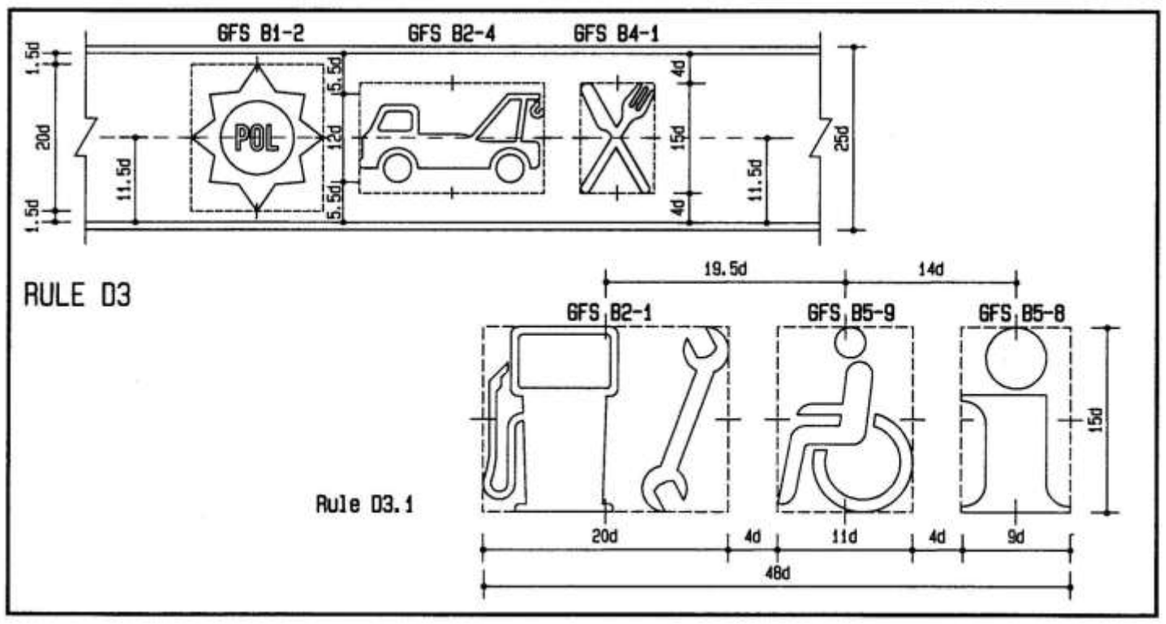
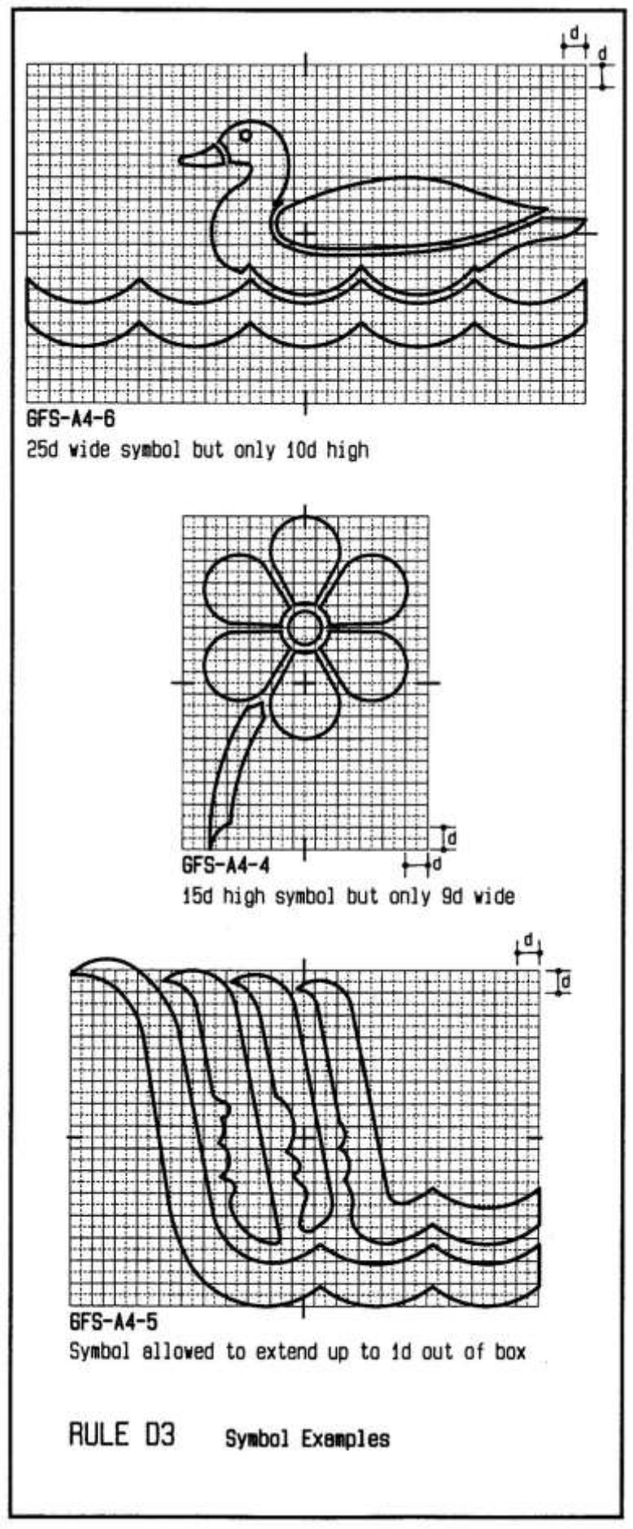








Notes on Figures 4.13 and 4.14

The details given in Figures 4.13 to 4.17 deal with a wide range of DISPLAY RULES relevant to the use of symbols, and symbols and text on TOURISM signs. These rules should be considered as an extension of the BASIC RULES covered by Figures 4.11 and 4.12.

It should be noted that Basic Rule F10 states that all TOURISM Direction signs shall be dimensioned in terms of factor "d", where "d" is the DIN 1451 letter stroke width.

TOURISM Direction sign symbols are numbered in a GFS series, and are classified into the same groupings as tourist destinations. The symbols are further divided into generic sub-sets. Each tourist attraction sub-set is provided with a generic symbol (see Table 4.2 and Subsection 4.3.10)

(For clarity of illustration there is an element of repetition of detail between the two sets of figures. Whilst generally, symbol rules are covered by Figures 4.13 and 4.14, and text rules by Figures 4.15 and 4.16, users of this chapter should familiarise themselves with all rules.)

Rule Fd1:

TOURISM sign symbols shall be centred vertically in a stack or panel, irrespective of actual symbol size, and they shall be separated from text or another symbol by a 4"d" space. (To assist this process, both on drawings and at time of manufacture, all symbols are drawn to scale, with vertical and horizontal centring marks, in Volume 4, Chapter 7.)

Rule Fd2:

All TOURISM sign symbols shall be prepared around the concept of a "box" of standard nominal height of 15"d" and of one of the standard nominal widths, 25"d", 15"d" or 11"d". (When submitting designs of new symbols, designers must attempt to make their symbols "touch the sides" of the box SUBJECT to reasonable proportions. This process will simplify drawing and manufacture.)

Rule Fd3:

When symbols are less than the nominal 15"d" height a stack or panel **shall not** be reduced in **height** - the range in height of existing symbols is from 7"d" to 20"d" (see Figure 4.12 for standard stack and panel heights of one, two and three stack/panel signs):

AND

Fd3.1 stack and panel lengths **shall** be reduced in **length** when symbols are less than nominal length;

Fd3.2 when a symbol has a particularly elongated or pointed shape the pointed extremity may be permitted to extend outside the basic "box" in order not to prejudice good target value for the rest of the symbol.

Fig 4.13
Illustration of Tourism Signface Symbol/Text Rules - 1

Rule Fd4:

When a full size symbol is used (see Rule F8), it shall always precede the primary name text, whether the sign is directing drivers to the right, left, or straight-on.

AND

Fd4.1 if a TOURIST Route Number is to be displayed on the sign it shall precede any full size symbol;

Fd4.2 if a symbol design implies a sense of direction the symbol should be rotated to face in the same direction as the turn arrow on the sign, UNLESS the symbol is the facility operators' LOGO.

Rule Fd5:

A standard stack or panel displaying a symbol designed within the nominal size range can support two lines of text without an increase in stack or panel height (see further rules on the use of text on TOURISM Direction signs).

Rule Fd6:

If a stack or panel displays three lines of text, the symbol preceding these lines of text shall be increased in size so that the 15"d✱✱" for the symbol equals 15"d + 10 mm", (or 15 times "d" for the next larger standard letter size).

Rule Fd7:

Supplementary symbols may be used **in place of** full size symbols on accommodation class signs to limit signface area, and **in addition** on other signs, SUBJECT to compliance with Level 3 Warrants (see Section 4.6):

AND

Fd7.1 supplementary symbols shall be reduced in size so that the 15"d✱" for the symbol equals 15"d/2";

Fd7.2 when used, supplementary symbols shall be located below the primary name, in the position reserved for a second line of text.

Rule Fd8:

A tourist service stack or panel shall not display more than 5 service symbols;

AND

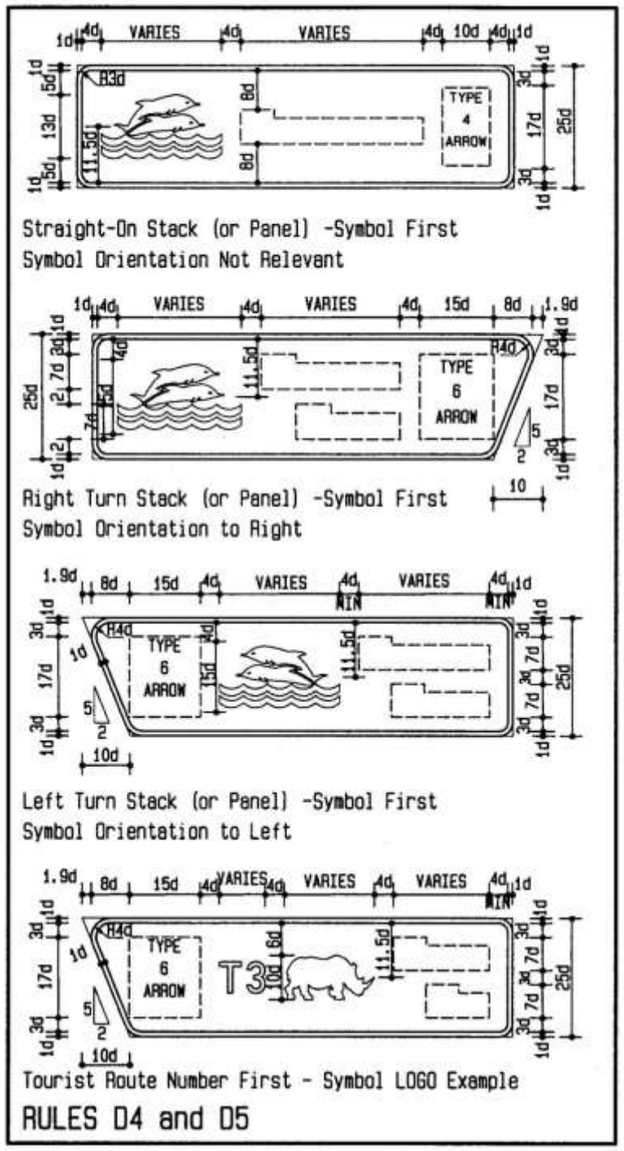
Fd8.1 SUBJECT to the influence of other rules, if a service stack displaying only symbols will otherwise exceed 4 m in length, such a stack should be altered to contain two panels;

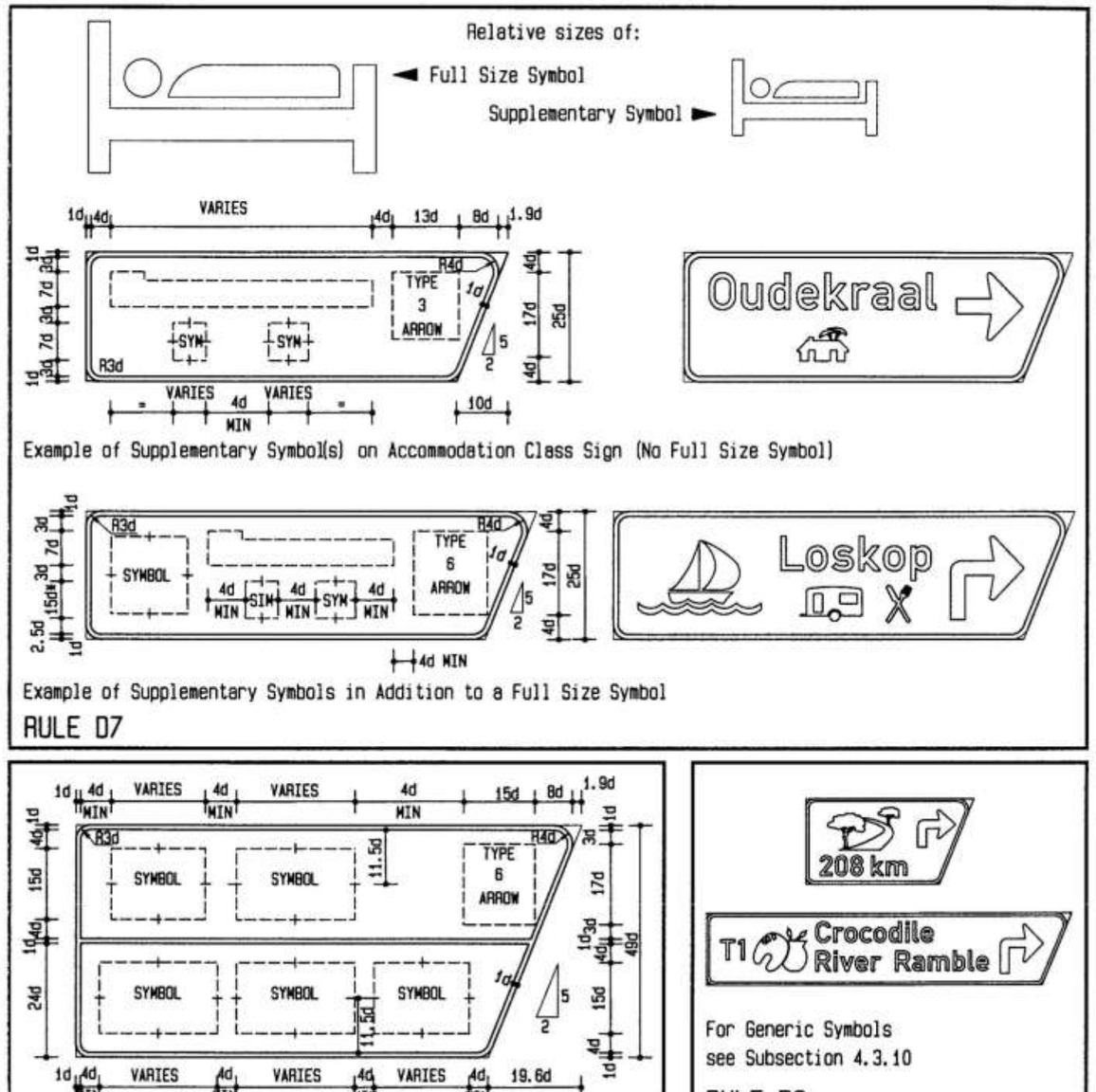
Fd8.2 multiple service symbols shall be arranged in a stack or panel in order of sub-sets i.e. B1 to B7.

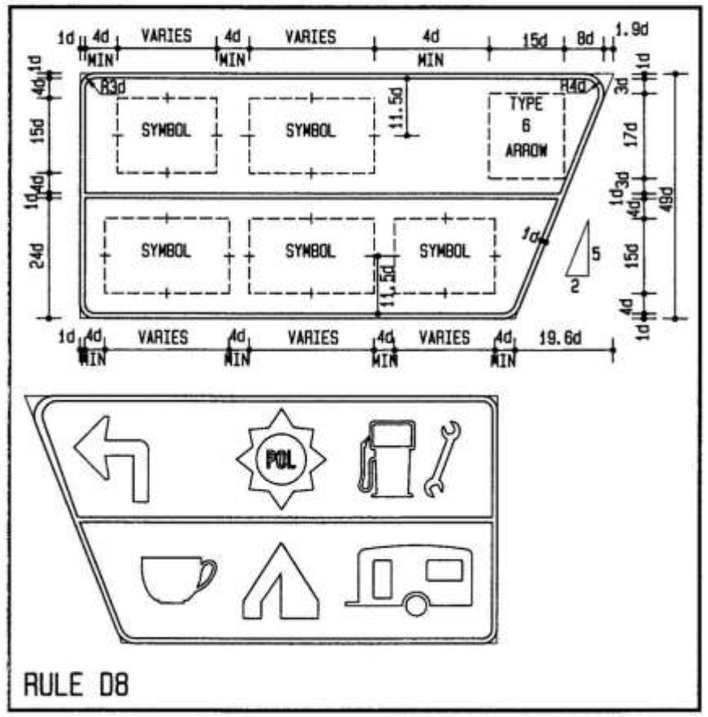
Rule Fd9:

Wherever possible, generic symbols should be used in preference to individual symbols.

Rule Fd10:
The above rules for symbol display on stacks and panels shall also apply to the display of symbols on GF17 fingerboard signs, EXCEPT that symbols shall not be used on temporary fingerboard signs TGF17.







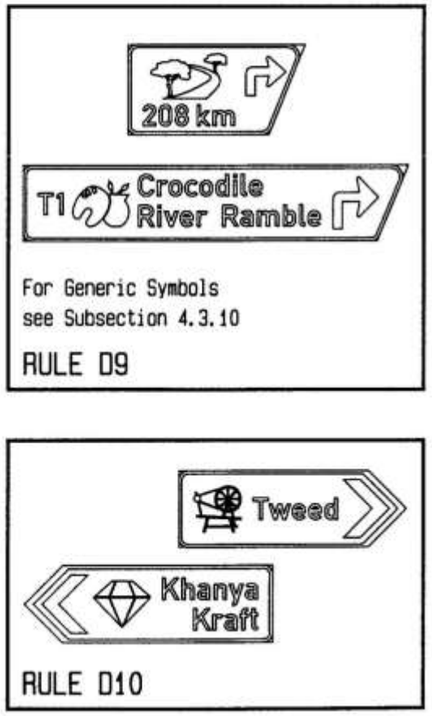
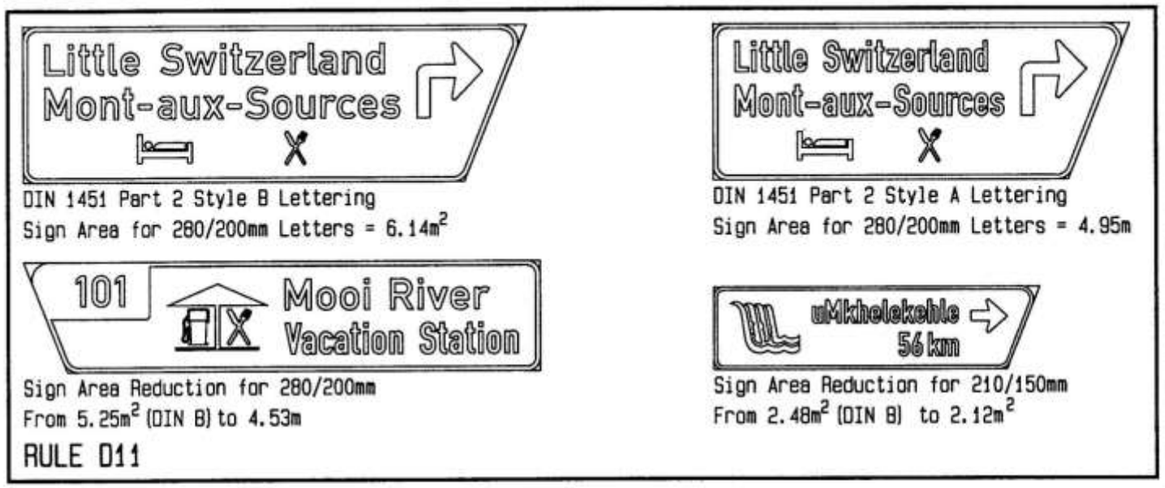
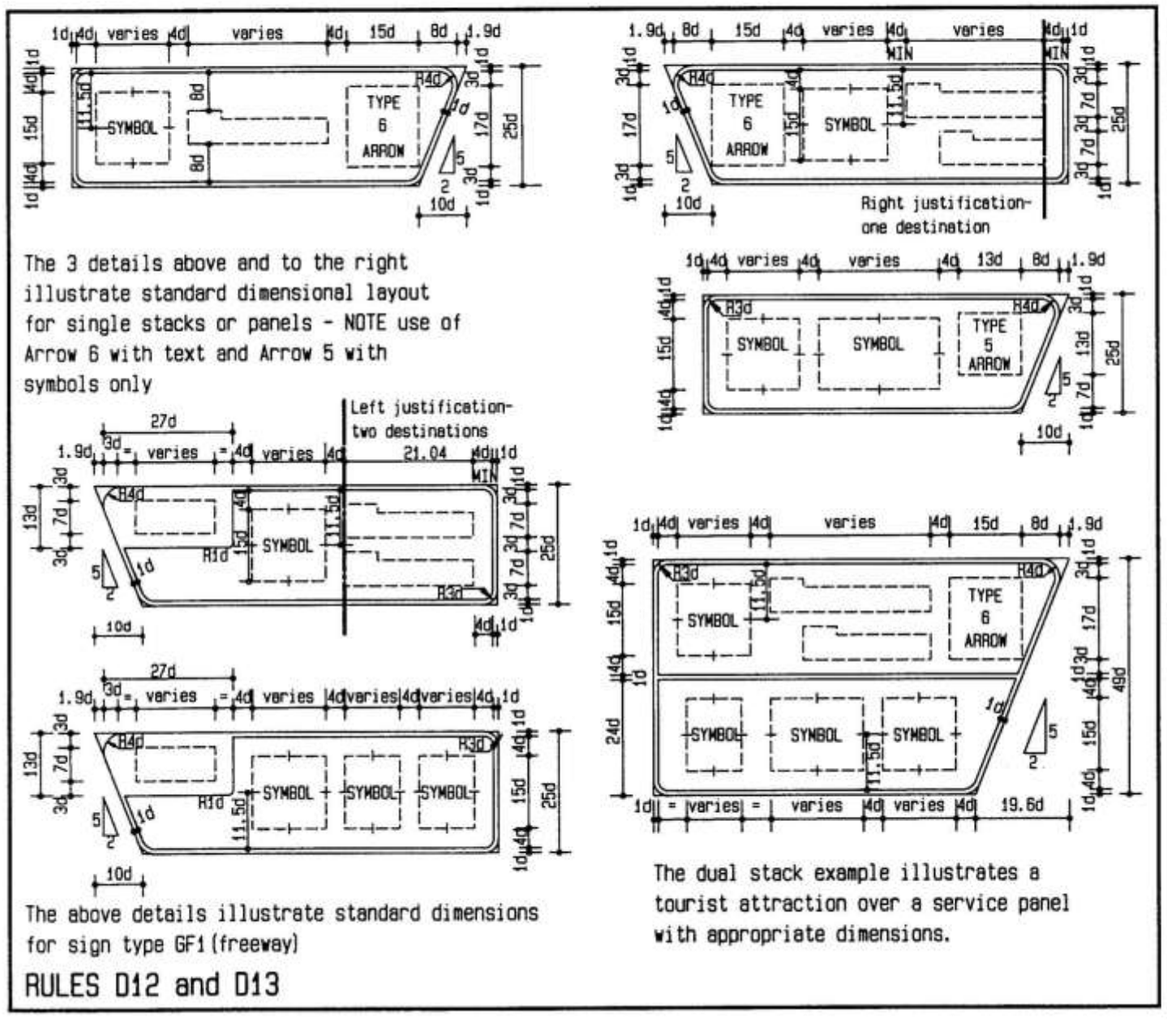
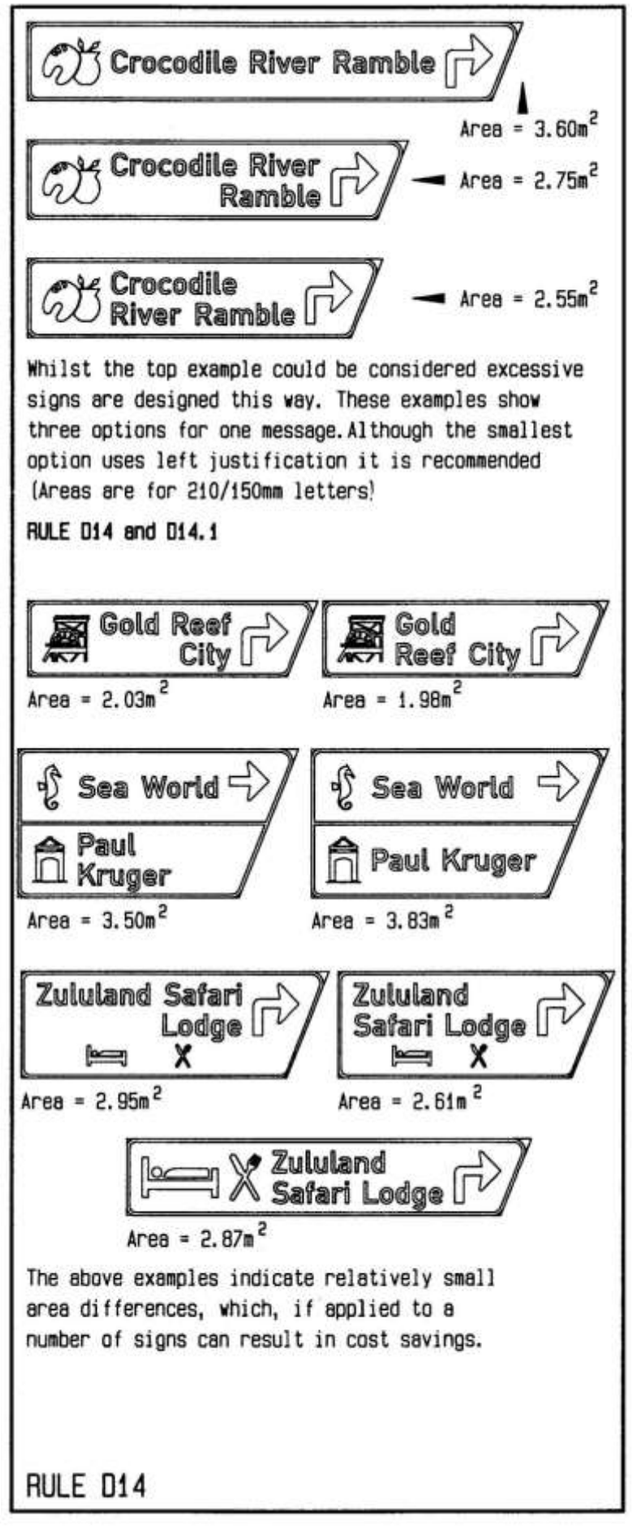


Fig 4.14
Illustration of Tourism Signface Symbol/Text Rules - 2







Notes for Figures 4.15 and 4.16:

The details given in Figures 4.13 to 4.17 deal with a wide range of DISPLAY RULES relevant to the use of symbols, and symbols and text on TOURISM signs. These rules should be considered as an extension of the BASIC RULES covered by Figures 4.11 and 4.12.

It should be noted that Basic Rule F10 states that all TOURISM Direction signs shall be dimensioned in terms of factor "d", where "d" is the stroke width of a DIN 1451 Part 2 letter. DIN 1451 lettering is fully proportional and it is normal design practice to dimension a word in the BASIC LETTER HEIGHT of 112 mm (uppercase size) from tables, and then for the required letter size by multiplying by a factor. The factor can be obtained by dividing the required uppercase letter size by 112 mm i.e. 210 mm divided by 112 mm gives a factor of 1,875 for 210 mm x 150 mm lettering. Tables of letter widths and spacings are given in Volume 4, Chapter 11.

(For clarity of illustration there is an element of repetition of detail between the two sets of figures. Whilst generally, symbol rules are covered by Figures 4.13 and 4.14, and text rules by Figures 4.15 and 4.16, users of this chapter should familiarise themselves with all rules.)

Rule Fd11:

Any text used to indicate a destination name in the display on a TOURISM Direction sign shall be provided in DIN 1451 Part 2 lettering, either in Style "B", or in Style "A". The latter is a condensed letter style.

Rule Fd12:

The minimum horizontal spacings between words, and between words and other signface components such as arrows and symbols, and any of these components and the inner edge of a vertical border line shall be 4"d".

Rule Fd13:

The minimum vertical spacing between lines of text, and between lines of text and the inner edge of a horizontal border line shall be 3"d" (for details of symbol spacings refer to the examples in Figures 4.13 and 4.14).

Rule Fd14:

Because TOURISM sign symbols are sized to support two lines of text, it is cost effective and therefore recommended, to use two lines of text wherever possible, to limit sign length, SUBJECT to the effects of other rules:

AND

Fd14.1 **if a tourist destination name** is long and can be hyphenated, or has two or more words, the text should be split to minimise sign length;

Fd14.2 when a name is split into two lines the lower row of text should preferably be shorter than the upper row and the text should be right justified;

Fd14.3 if it is not practical to have the lower row shorter then the text should be left justified.

NOTE:

Although reducing sign area will save cost and reduce environmental intrusion, certain word groups may be considered better than others i.e. "Gold Reef" rather than "Reef City" and "Safari Lodge" rather than "Zululand Safari". This factor may influence a final decision on signface layout.

Fig 4.15
Illustration of Tourism Signface Symbol/Text Rules - 3

Rule Fd15:

When a symbol supports two or three different names of the same type of facility i.e. beaches, then the rows of text shall be left justified, and the destinations should be ordered so that the first, or the first to have a change of direction, is at the top, and so on; SUBJECT to right destinations always being above left destinations on FREEWAY Advance Exit sign GF1.

Rule Fd16:

FREEWAY Advance Exit sign GF1 shall display an Interchange Number when the freeway concerned has numbered interchanges.

Rule Fd17:

If a road serving only a tourist destination has a route number this number may be displayed on the tourism sign.

Rule Fd18:

On multiple stack or panel signs, for aesthetic appearance (which may improve reading times), it is recommended that in certain instances symbols be lined up vertically, and text be justified vertically across stack and/or panel borders; this may result in larger than minimum spacings.

Rule Fd19:

A distance to a tourist facility may only be displayed on a tourism sign when the facility is further from the first, or subsequent "follow-up" signs than might reasonably be expected, or is at the end of a dead-end road, or the sign is an Exit Sequence sign GF8 or GF9 indicating the distance to two or more facilities or sets of facilities:

AND

Fd19.1 when a single distance is displayed on a sign the letters "km" shall follow the numerals;

Fd19.2 when more than one distance is displayed only the numeral shall be displayed;

BUT

Fd19.3 **the distance to a facility shall not be displayed on a freeway** - the distance to the freeway exit may be displayed on sign GF1 when it is in advance of the exit and when the exit gives direct access to the facility.

Rule Fd20:

Fingerboard sign GF17, used **only** for Part-time facilities, may be made to standard lengths, and the length of sign messages adjusted to suite by use of letter Styles "A" and "B", as appropriate, with abbreviations if necessary; an appropriate standard sign length can be determined for an area by studying the likely destinations.

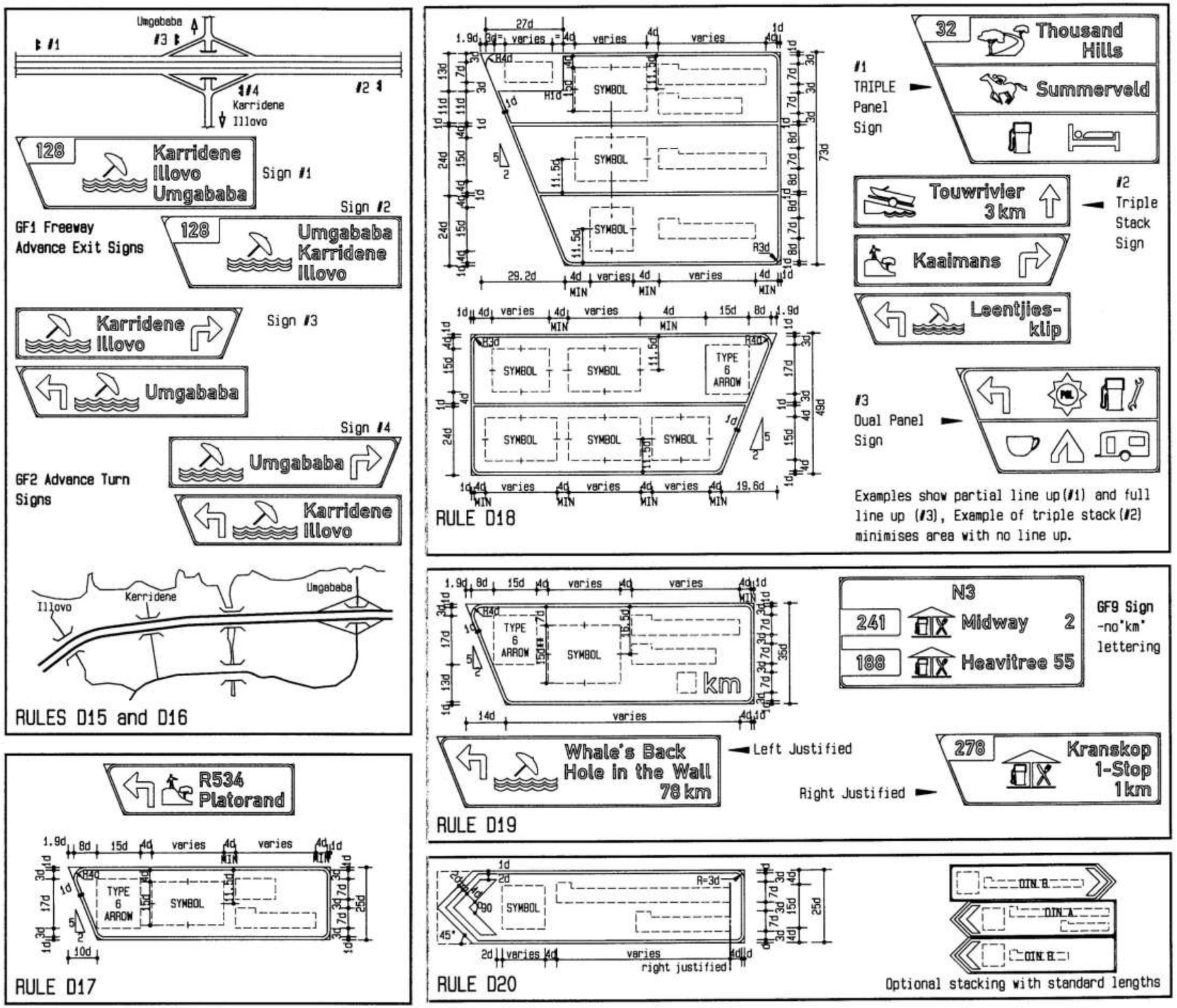
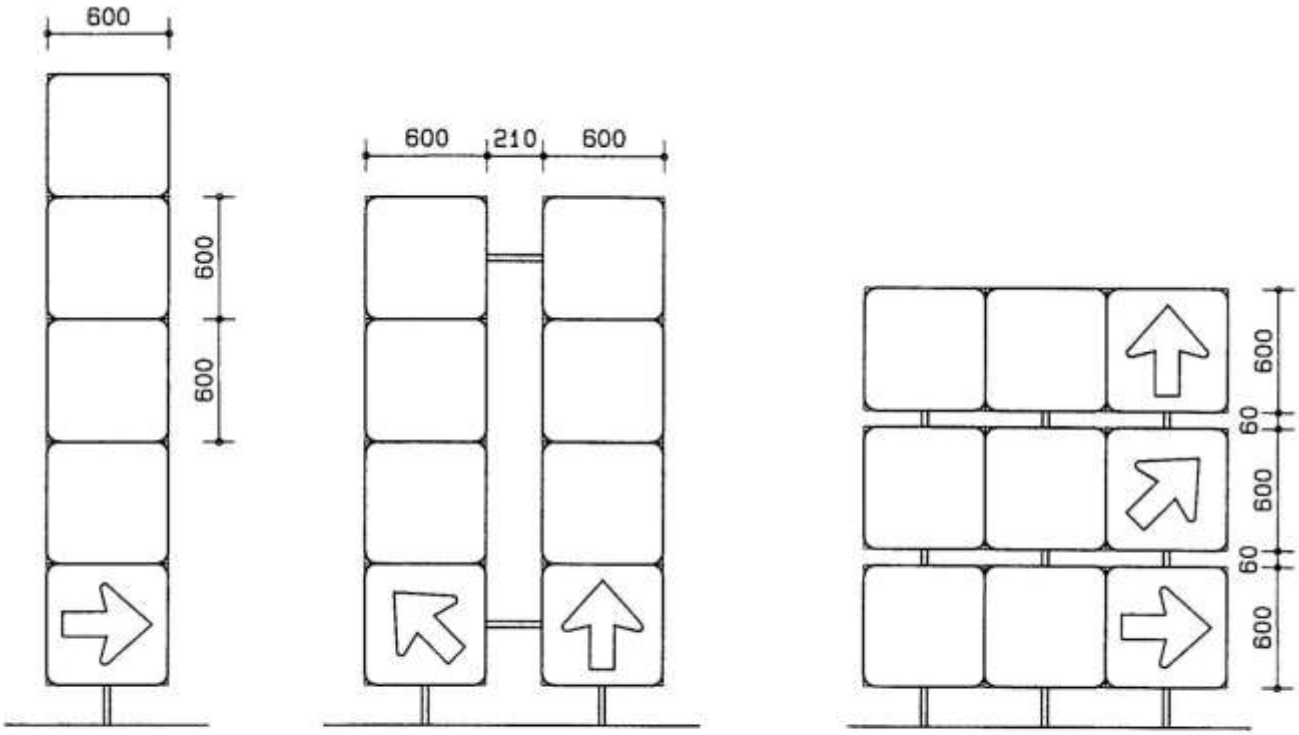


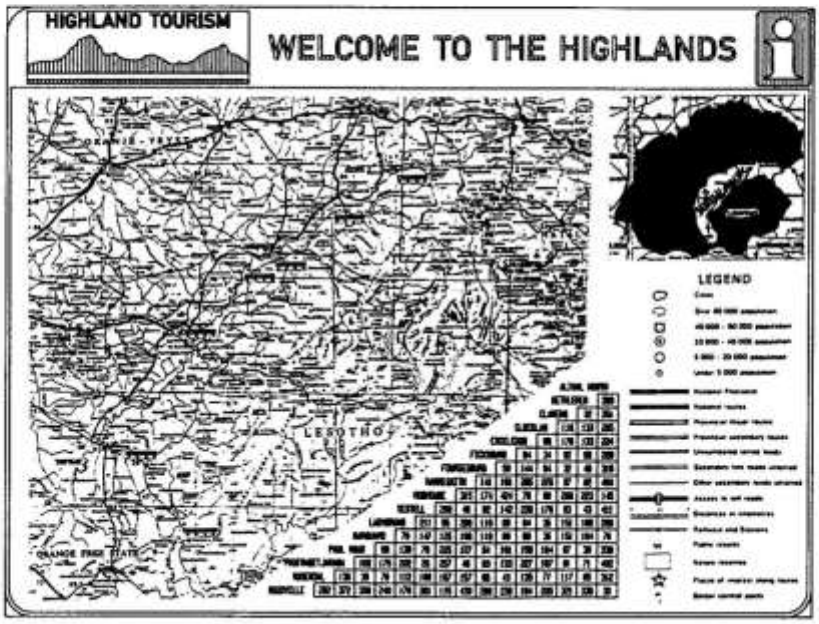
Fig 4.16
Illustration of Tourism Signface Symbol/Text Rules - 4



Detail 4.17.1 Exemples of Typical Clusters

For details of available Group D1 symbols see Section 4.3.10.

Detail 4.17.2 Typical 'Totem' Sign Combinations



Detail 4.17.3 Typical Information Board Displaying a Group D2 Symbol

Fig 4.17 Typical Off-Road Tourism Signs

(continued from page 4.3.10)

8 Values of "d" for the more standard letter sizes are:

d = 60 mm for 420 mm/300 mm letters

d = 50 mm for 350 mm/250 mm letters

d = 40 mm for 280 mm/200 mm letters

d = 30 mm for 210 mm/150 mm letters

d = 25 mm for 175 mm/125 mm letters

d = 20 mm for 140 mm/100 mm letters

d = 16 mm for 112 mm/80 mm letters.

9 Service facility signs normally use symbols without text. The value of "d" appropriate to the preparation of these symbols may be derived in one of the following ways-

(a) when several symbols are used, by counting the number of "bits" of information and applying the sizing process to determine factor "d" as detailed in Volume 1, Chapter 4;

(b) if a single symbol is used, by treating the sign as a basic tourist attraction sign, with a primary name, and using the value of factor "d" so derived;

(c) if the service symbol display forms one stack, or one panel, of a multi-stack or multi-panel sign the value of factor "d" used should be derived for the full sign display, not for each stack or panel individually.

10 When a symbol is not symmetrical about its vertical centre-line, and the symbol implies a sense of direction, the symbol should be turned to face in the direction of the arrow or sloped sign edge, as appropriate. **This requirement does not apply to "logo" type symbols e.g. the kwaZulu Natal Parks Board rhino, which have a fixed orientation based on their use as "logos".**

11 Service symbols shall appear in a stack or panel, from left to right, in the following order-

(a) emergency services;

(b) light vehicle services;

(c) truck services;

(d) food services;

(e) general services;

EXCEPT when a hospital emergency service, with its primary name, is displayed, in which case this message should be located to the right of all other service symbols displayed in the line in which it is to appear.

12 Some tourist attraction/service stack/panel combinations may result in a very unbalanced signface layout. This may commonly happen when there is only one service symbol to be displayed. In such cases the overall sign appearance may be improved by centralising the service symbol in its stack or panel. This treatment need not be followed if additional service symbols are anticipated during the useful life of the sign.

4.3.7 Supplementary Symbols

1 Supplementary symbols are half sized symbols which may occupy the position of a line of text with slightly reduced spacings above and below the supplementary symbols. In order to size a supplementary symbol, (where the height of the symbol is commonly 15d✱), "d✱" should be taken to equal "d"/2.

2 Subject to Level 3 warrant requirements, supplementary symbols may be used as follows:

(a) in place of main symbols, under the primary name of an accommodation facility;

(b) in addition to a main symbol, under the primary name of a tourist attraction facility.

3 The use of supplementary symbols on accommodation facility tourism signs is recommended in order to reduce sign size.

4 The use of supplementary symbols in addition to a main symbol should only occur if there is a very good reason, in the interest of road users, why such supplementary information should be displayed. The use of supplementary symbols should be in conformity with the warrants (see Section 4.6).

4.3.8 Arrows

1 Arrows used on tourism signs are standard STACK-TYPE arrows as used on ground-mounted direction signs.

2 For details of STACK-TYPE arrows see Volume 4, Chapter 5.

4.3.9 Off-Road Tourism Signs

1 Tourism signs are available for off road applications as follows:

(a) "totem" signs; and

(b) information boards.

2 These off road signs use symbol ranges which are unique to their applications (see Group D1 and Group D2 symbols in Subsection 4.3.10).

3 The use of "Totem" signs within a rest and service area or other large tourist environment is a unique application. "Totem" signs are mounted in clusters and as such are different to other tourism signs (see Figure 4.17).

4 "Totem" signs should not be used alongside an open high speed roadway. Their use may be considered for use within other recreational or park areas where there are many internal facilities and vehicle speeds are low.

5 Information boards may utilise Group D2 symbols in addition to all other available tourism symbols. Group D2 symbols are commonly "logo" symbols appropriate to specific geographical areas or commercial groupings of resorts or facilities.

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4.3.10 Symbols for Tourist Attractions

1 All approved tourism sign symbols in the various GFS series are listed below. These will be updated and added to from time to time.

2 Symbols in the GFS A series are provided for tourist attractions. These series have been restructured to assist those working with tourism signs. There are now twelve groupings of analogous attractions. Each group has been allocated a symbol which is illustrated on the first page of the listing and again at the beginning of each group listing.

3 The generic or family symbol may be used on signs to identify collective groups of tourist attractions, commonly either along a tourist route or in a high density tourist area, to be followed on signs at the individual tourist attractions by one of the other symbols in the appropriate group. The use of symbols from other groups is not precluded by this principle but the objective is to develop common tourism themes. The family symbols may alternatively be used for all facilities on a route or in an area.

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Tourist Attractions: Group A1 - National Parks

GFS A1-1
National Parks

Tourist Attractions: Group A2 - Provincial Parks

GFS A2-1
Gauteng

GFS A2-2
Free State

GFS A2-3
Western Cape

GFS A2-4
Kwazulu Natal

GFS A2-5
Eastern Cape

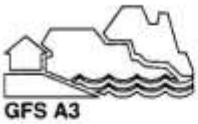
GFS A2-6
Northern Cape

GFS A2-7
North West

GFS A2-8
Northern Province

GFS A2-9
Mpumalanga

Tourist Attractions: Group A3 - Resorts Attractions



GFS A3
Generic - Resorts

GFS A3-1
Country Club (Golf major activity)

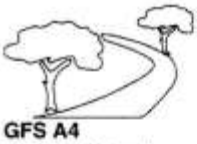
GFS A3-2
Hot Springs Resort

GFS A3-3
Inland Water Resort

GFS A3-4
Seaside/Beach Resort

GFS A3-5
Berg/Mountain Resort

Tourist Attractions: Group A4 - Scenic Attractions



GFS A4
Generic - Scenic Attractions

GFS A4-1
Nature Reserve

GFS A4-2
Natural Heritage

GFS A4-3
Botanical Garden

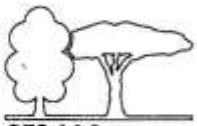
GFS A4-4
Gardens (Flower)

GFS A4-5
Waterfall

GFS A4-6
Lake or Dam (no watersport)

GFS A4-7
Caves

GFS A4-8
View Point



GFS A4-9
Forest (Natural)

GFS A4-10
State Forest

GFS A4-11
Mountain / Berg

Tourist Attractions: Group A5 - Sports Attractions

GFS A5
Generic -
Sports Attractions

GFS A5-1
Motor Racing
Track

GFS A5-2
Golf Course

GFS A5-3
Race Course

GFS A5-4
Equestian
Events

GFS A5-5
Fishing

GFS A5-6
Cricket
Field

GFS A5-7
Swimming
Pool

GFS A5-8
Sports Stadium

Tourist Attractions: Group A6 - Wildlife Attractions

GFS A6
Generic -
Wildlife

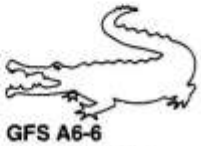
GFS A6-1
Conservancy
Area

GFS A6-2
Game
Reserve

GFS A6-3
Bird Park/
Sanctuary

GFS A6-4
Zoo

GFS A6-5
Snake Park



GFS A6-6
Crocodile Park

GFS A6-7
Rhino Park

GFS A6-8
Lion Park

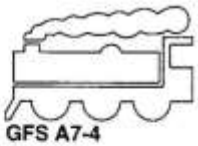
Tourist Attractions: Group A7 - Historic Attractions

GFS A7
Generic-
Historic

GFS A7-1
National
Monument

GFS A7-2
Museum

GFS A7-3
Historic
Mine



GFS A7-4
Historic
Railway

GFS A7-5
Historic
Battlefield

GFS A7-6
Historic
Cemetery

GFS A7-7
Geological
Site

Tourist Attractions: Group A8 - Coastal Attractions

GFS A8
Generic-
Coastal

GFS A8-1
Marine
Reserve

GFS A8-2
Maritime
Museum

GFS A8-3
Aquarium

GFS A8-4
Whales

GFS A8-5
Dolphins

GFS A8-6
Lighthouse

GFS A8-7
Dockyard

GFS A8-8
Boat Launch

GFS A8-9
Fishing

GFS A8-10
Crayfish

GFS A8-11
Oceanarium

GFS A8-12
Beach

Tourism Attractions: Group A9 - Arts & Crafts Attractions

GFS A9
Generic - Arts & Crafts

GFS A9-1
Painting & Drawing

GFS A9-2
Pottery

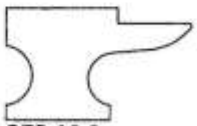
GFS A9-3
Jewellery

GFS A9-4
Weaving & Knitting

GFS A9-5
Leather Work

GFS A9-6
African Arts & Crafts

GFS A9-7
Woodwork



GFS A9-8
Metalwork

Tourism Attractions: Group A10 - Cultural Attractions

GFS A10
Generic - Cultural

GFS A10-1
Theatre

GFS A10-2
Amphitheatre

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y 2011

Tourist Attractions: Group A11 - Adventure Attractions

GFS A11
Generic - Adventure

GFS A11-1
Hiking Trail

GFS A11-2
Hourse Trail

GFS A11-3
4 x 4 Trail

GFS A11-4
Bike Trail

GFS A11-5
River Rafting

GFS A11-6
Scuba Diving

GFS A11-7
Ballooning

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Tourist Attractions: Group A12 - Farming Attractions

GFS A12
Generic - Farming

GFS A12-1
Wine Cellar

GFS A12-2
Wine Route

GFS A12-3
Showground

GFS A12-4
Cherry Farm

GFS A12-5
Ostrich Farm with Riding

GFS A12-6
Ostrich Farm

GFS A12-7
Fish Farm

GFS A12-8
Roadside Stall

GFS A12-9
Butterfly Farm

Tourist Attractions: Group A13 - General Attractions

GFS A13
Generic- General Attractions

GFS A13-1
Animal Theme Park

Tourism Services: Group B1 - Emergency Service

GFS B1-1
Telephone

GFS B1-2
Police

GFS B1-3
Hospital
(with name)

GFS B1-4
First Aid
Post

GFS B1-5
SOS Call
Station
(sign)

GFS B1-6
SOS Call
Station
(Post)

GFS B1-7
NSRI

GFS B1-8
Ambulance/
Medical
Services

GFS B1-9
Fire
Station

GFS B1-10
Cell Phone
Emergency
No.

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Tourism Services: Group B2 - Light Vehicle Services

GFS B2-1
Filling Station
& Workshop

GFS B2-2
Filling Station

GFS B2-3
Workshop

GFS B2-4
Tow-in
Service

Tourism Services: Group B3 - Truck - Rest and Service

GFS B3-1
Truck Rest &
Service Area

Tourist Sevices: Group B4 - Food Services

GFS B4-1
Restaurant

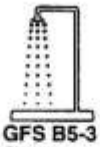
GFS B4-2
Refresh-
ments

GFS B4-3
Take -
Away

Tourist Services: Group B5 - General Services

GFS B5-1
Parking Area

GFS B5-2
Toilets



GFS B5-3
Shower

GFS B5-4
Drinking Water

GFS B5-5
Fireplace

GFS B5-6
Cooking Facilities

GFS B5-7
Picnic Area

GFS B5-8
Tourist Information

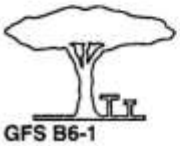
GFS B5-9
Facility for Handi-capped

GFS B5-10
Roadside Stall/Curio Shop

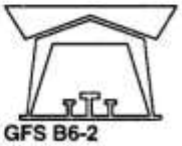
GFS B5-11
Post Office

GFS B5-12
Rural Shop/ Cafe/Cor-ner Shop

Tourist Services: Group B6 - Rest and Service Areas



GFS B6-1
Rest Area Class - 1



GFS B6-2
Rest Area Class - 2

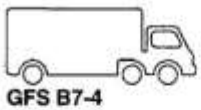
GFS B6-3
Service Area Class - 3

Tourist Services: Group B7 - Vehicle Class

GFS B7-1
Motor Cars

GFS B7-2
Caravans

GFS B7-3
Buses



GFS B7-4
Trucks

GFS B7-5
Delivery
Vehicles

GFS B7-6
Motor Cycles

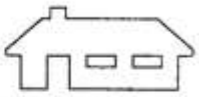
Accommodation Services: Group C1

GFS C1-1
Hotel, Boat,
Motel, Inn

GFS C1-2
Chalet/Self-
Catering

GFS C1-3
Caravan
Site

GFS C1-4
Camp
Site



GFS C1-5
Guest House

GFS C1-6
Bed and
Breakfast

GFS C1-7
Rooms
(Bed
Only)

GFS C1-8
Youth Hostel/
Centre/Camp

GFS C1-9
Trail
Shelter

GFS C1-10
Guest Farm

GFS C1-11
Ethnic
(Zulu)

Off Road: Rest and Service Area: Group D1 - "Totem" Signs

GFS D1-1
Motor Cars

GFS D1-2
Caravans

GFS D1-3
Buses

GFS D1-4
Trucks

GFS D1-5
Motor Cycles

GFS D1-6
Take-Away

GFS D1-7
Restaurant

GFS D1-8
Refreshments

GFS D1-9
Shop

GFS D1-10
Facility for Handicapped Persons

GFS D1-11
Toilets

GFS D1-12
Telephone

GFS D1-13
Straight-on Arrow

GFS D1-14
Left/Right Arrow

GFS D1-15
Diagonal Left/ Right Arrow

GFS D1-16
Advance Left/ Right Arrow

GFS D1-17
Exit (Route Number)

GFS D1-18
Parking

GFS D1-19
Filling Station and Workshop

GFS D1-20
Filling Station

GFS D1-21
Picnic Area

GFS D1-22
Tourist Information

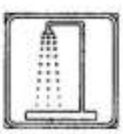
GFS D1-23
Motor Car Wash

GFS D1-24
Truck Wash

GFS D1-25
Drinking Water

GFS D1-26
Fireplace

GFS D1-27
Cooking Facilities



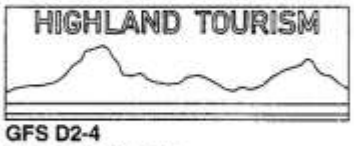
GFS D1-28
Shower

Off Road: Tourism Information Boards: Group D2

GFS D2-1
North. & Central Drakensberg Resorts

GFS D2-2
Southern Drakensberg Resort

GFS D2-3
Midlands Meander (Kwazulu-Natal)



GFS D2-4
Highlands Tourism (Free State)

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4.4 HIGH DENSITY TOURISM AREAS

4.4.1 General

1 This section deals with the management of high density tourism areas. Such an area could be defined as follows:

"the complexity of multiple routes and the proliferating demand for individual tourism signs exceeds the capability to supply signs conforming to agreed guidance signing principles (within a definable area)".

2 Consequently, a need may be evident to combine information lay-byes, route guidance information and public information centres to provide a holistic approach that can be fully supportive of promoting tourism in a non-commercial manner within the guidelines of acceptable signing principles.

3 In any area concerned with developing tourism, there will be a maturing process as facility owners become more and more commercial and they seek new ways of attracting visitors. One of these ways will be the request for tourism signs and the road authority must manage those applications in the manner recommended in Section 4.2.3. The following list describes how a tourist area might develop:

(a) seasonal - once per year;

(b) restricted hours - variable or limited opening times;

(c) low density - isolated clusters of attractions;

(d) medium density - groups of clusters of attractions;

(e) high density - area-wide attractions.

4 High density of tourist facilities in a area normally generates a high level of demand, from motorists and operators of the facilities, for more guidance signing in the area. In terms of the normal rules applicable to the provision of supplementary tourist direction signs, a potential could exist that any attempt to deal with the demand conventionally, would almost certainly, result in a chaotic number of signs, at considerable expense, and in such a way that by their very numbers, the signs would be ineffective.

5 The challenge therefore is to come up with a systematic guidance sign scheme for a specific area which can satisfy the demands without incurring high costs or creating a chaotic situation. The intention is to develop a generic procedure which can be applicable to any high density tourist area.

4.4.2 Consultative Process

1 Once the basic data on the existing guidance sign system in an area has been obtained, attention should be turned to assessing the tourism signing needs. The first step in this process is to identify a consultative group to allow local participation. A representative Regional Tourism Liaison Committee (see Figure 4.1) for the region should be set up. The principal role players serving on such a consultative committee should be identified and should include:

(a) the Regional Tourism Organisation in the area;

(b) a committee representing facility owners and operators forming a Local Tourism Organisation; and

(c) representatives of the road authority.

2 A meeting should be set up with the above parties to:

(a) introduce the procedure to be followed in preparing a Tourism Signing Plan for the region;

(b) discuss goals and objectives;

(c) develop planning criteria and introduce steps to assess the tourist facilities available via public participation; and

(d) explain the Motorist Information System, the road sign hierarchy (layering concept), and the function of a Guidance Signing Plan.

3 Various aspects relating to guidance signing principles and policies should be explained to members of the committee. The following points summarise some issues that need to be addressed at such a meeting:

(a) the principles of navigation and orientation and how these are provided by a network of numbered routes and optimum destinations on direction signs at junctions on these routes;

(b) the concept of familiar, control and service destinations in relation to the need for more local information at a local level; and

(c) the design criteria by which the information on direction signs is transferred to drivers, namely the size of letters used in relation to vehicles speeds, the consistent positioning of signs, and the limitations on the amount of information which a driver can be expected to take in.

4 It should be made clear that the first objective of an upgrading of the guidance signing in the area would be to ensure that the direction signs required by a Guidance Signing Plan are correctly located and that their messages conform to the results of the network optimisation and destination analysis. In this way basic navigation needs into, and through, the area can be achieved.

5 The background to the principles of the supplementary tourist signing system and how such a system might be applied to the area should be explained. In this context the following main points should be noted:

(a) tourist signs may only be provided from a numbered route at the direct access to a facility, or in advance of a turn onto a lower order road towards a facility, subject to compliance with warrants;

(b) the amount of information which can be displayed in such circumstances is limited by the same design criteria which apply to direction signs, and because tourist signs are a separate system supplementing the main system, the total amount of information displayed has to be carefully monitored and controlled;

(c) the demand for tourist signs normally far exceeds the limits of design criteria; and

(d) the need to develop some unique compromise solution which would satisfy the needs of tourists and facility operators within the technical constraints identified.

(continued on page 4.4.4)

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	TOURISM SIGNING PRINCIPLE	VOLUME 1 REFERENCE		POLICY STATEMENT
1.	Tourism signs for the benefit of tourists	4.9.1.2		Tourism signs are provided for the benefit of tourists and should not be construed as advertisements for the facilities concerned.
2.	Pro-active attitude	4.9.1.4		Co-operation with significant role players in a structured way through consultative committee.
3.	Discretion	4.9.1.5 4.9.1.6		Roads Branch retain discretion on the display or removal of all tourism signs within road reserve.
4.	Cost responsibility	4.9.1.10		Signs to all commercially active centres to be paid for by applicant.
5.	Names and symbols	4.9.1.11		Both to be displayed for Holiday and Recreational, Tourism Attraction and Sports Venues if graded or supported by SATOUR. Service facilities: Symbols only. Accommodation facilities: Symbols, plus names if graded by SATOUR if there are no restrictions on access (eg. children under 14 years not allowed).
6.	Guidance in final stage of trip	4.9.2.1(a)		Basic objective in respect of Holiday and Recreational facilities, Accommodation facilities, Sport Venues and certain Tourism Attractions (ie. all facilities where a measure of advance planning or reservations are necessary to ensure access).
7.	Information on existance of facility	4.9.2.1(b)		Basic objective for all Service Facilities and certain Tourism Attractions (ie. all facilities where advance planning would not be applicable).
8.	Competitive advertising	4.9.2.2(c)		Tourism signface design remains absolute prerogative of road authority and is done to standardised procedures.
9.	Preferred to advertisements	4.9.2.2(d)		Tourism signs are erected under specific requirement that other advertisements or obsolete signs relating to same facility and directed at the road user are removed; failing which the approval for the display of the relevant Tourism signs is revoked.
10.	Tourists plan journeys	4.9.3.2		Tourism signs towards Holiday and Recreational facilities, Accommodation facilities, Sports Venues and certain Tourism Attractions are considered based on this hypothesis; Tourism signs to Service facilities and to drop-in Tourism attractions are not based on this hypothesis.
11.	Tourism signs are supplementary to Direction signs	4.9.3.4(a)		Accepted as basic principle.
12.	Obvious access to facility Duplicate Direction sign information	4.9.4.1.(a)		**Allow Tourism sign in preference to advertisement.** No Tourism signs.
13.	Tourism signs are supplementary to Direction signs	4.9.4.1(b)		Accepted as basic principle.
14.	Tourism signs from nearest numbered route or from nearest town	4.9.4.1(c)		Accepted as the basic principle for all Tourism signs **except for those towards Service facilities and certain Tourism attraction facilities.** Should a specific facility be accessible from different directions then Tourism signs may be displayed from the nearest numbered route from each direction, but not from one route leading to another route. If an Accommodation facility is deemed to provide accommodation for the general tourist (ie. drop-in rather than pre-booking) such facilities may be considered as Service facilities and not be treated on the nearest numbered route principle. (Note that such facilities do not qualify for names on Tourism signs: refer to policy numbers 5 and 20.
15.	Limiting distance to display Tourism signs	4.9.4.1(d)		Tourism signs to Holiday and Recreation facilities, Sports Venues and certain Tourism Attraction facilities shall not be displayed from farther than the nearest numbered route or the nearest town that can reasonably be used as the basis for pre-trip planning. Tourism signs towards Rest and Service Areas may be displayed on the main road to which service is targeted, but not from farther than 50km, nor from beyond the nearest town where similar services are being provided, whichever is the nearest.
16.	Limiting distance to display Tourism signs to Service facilities	4.9.4.1(e)		Emergency services: as the needs of road users will best be served. In-trip services: at (or in advance of) the direct access to the road or at a nearby junction to the location of the Service facility (with due regard to the regional availability of similar facilities). Recommended limits: Urban environment - 1km. Rural environment - 5km (more if density of service facilities is very low). Accommodation services: from the nearest street, numbered route, significant intersection or landmark that may be used in en-route directions.

Table 4.3
Tourism Signing – Operational Principles

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TOURISM SIGNING PRINCIPLE	VOLUME 1 REFERENCE		POLICY STATEMENT
17. Standard of service	4.9.4.1(f)		To be approved by SATOUR or the consultative committee.
18. Large number of facilities	4.9.4.1(h)		The possibility of a Tourism information Layby, or using a collective name, shall be considered prior to erecting a large or complex Tourism sign (see VOLUME 1, paragraph 4.9.4.1(m) as well).
19. Tourism signface design	4.9.4.1(i)		Refer to Volume 4, Chapter 5: Guidance signface design.
20. Use of names and symbols	4.9.4.1(j) 4.9.4.1(k)		Refer to policy number 5 above.
21. Distance on signface	4.9.4.1(l)		Distance shall be included on signface only if the road leading to a Tourism facility is Class C or lower AND the distance to the final turn exceeds 20km. Distance **shall** be included on signface only if the road leading to a Service facility exceeds 5km (especially an Emergency service facility).
22. Discretionary principles	4.9.4.2 4.9.4.3		Discretionary principles included in VOLUME 1 shall be used with extreme caution to ensure that their use does not become so common that the integrity of the Tourism sign system is put in jeopardy. **All cases where these discretionary principles are being considered shall be fully motivated and referred to the Director: Transportation Engineering for consideration.**
23. Classification of facilties	4.9.5		Classification of VOLUME 1 is accepted.
24. Accommodation facilities: Symbols	4.9.5.5		Symbol and Supplementary symbols shall only be provided if the facility does not place a restriction on tourists that may request drop-in accommodation at the facility (eg. children under the age of 14 years).
25. Special Event facilities	4.9.5.7		Tourism signs for Special Events may be erected provided they are erected as per requirements relating to facilities where pre-trip planning is needed. Note that the Automobile Association is authorised in the Road Traffic Act to display road traffic signs.

(continued from page 4.4.1)

6 Another problem which is likely to occur within a high density tourist area is that the on-going requests for signs from the tourist operators will place a heavy processing burden on the road authority. The process described in Figure 4.4 should be followed so that the provision of signs can be kept under control and so that standards and principles are maintained to the benefit of the environment.

7 The principles dealing with the provision of tourism signs and which remain appropriate in the main to the signing of high density tourism areas, are detailed in Volume 1, Chapter 4, Subsection 4.9 and summarised in Table 4.3.

4.4.3 Inventory of Tourist Facilities and Services

1 An inventory of all the facilities in a study area should be compiled during road logging and/or the photo inventory of existing guidance signs. The route kilometre distance to the turnoff to each facility, and the services provided should be identified. The facilities and services should be recorded in detail on a route-by-route basis (see example in Table 4.4). A public participation questionnaire to assess the facilities as to the nature of services offered and their location, could give useful information for the preparation of a tourism signing plan.

2 The consideration of the full-time facilities normally does not present a significant problem, because in general, they are covered by existing standards and warrants and many are accessed from existing numbered routes.

3 The presence of part-time facilities, mainly accessed from un-numbered routes, however, presents in many areas the essence of the problem of designing a cohesive signing system for a high density tourism area.

4 The practitioner should remember that the unique brown-coloured tourist signing system provides for the signing of facilities and services as follows:

(a) tourist attractions are indicated by an appropriate symbol, followed by the primary name of the facility (indicated by a single word whenever possible); and

(b) services are indicated by symbol only.

5 Examples of typical tourist signs are given in Figures 4.6 to 4.10.

4.4.4 Quality Assessment of Tourist Facilities

1 The information obtained from the inventory and possible questionnaires will help to identify the limits of the area. Typical problem areas are:

(a) area could constantly change in size and scope;

(b) area is not well-defined within clear boundaries;

(c) there could be too many tourist facilities on un-numbered roads to possibly show all of these on one tourist sign at a turnoff from the nearest numbered route;

(d) some of the facilities may only be open part-time, i.e. one weekend per month and thus not always available to the public; and

(e) some facilities are members of the Local Tourism Organisation, while others are not.

4.4.5 Options for the Signing Treatment of a High Density Tourism Area

1 Whilst there are areas which may immediately warrant consideration as high density tourism areas, and these can be assessed in terms of the criteria given in this section, it is likely that many high density tourism areas will evolve in the future as a result of the growth of tourism as an industry. A concentration of tourist facilities can develop along a road, or collection of connecting roads, until eventually an area served by a number of such roads can be considered as a tourist area. The principles developed to assist with the signing of high density tourist areas can be applied throughout this growth process in such a way that they can be made to work for a single "route" or for an area.

2 Tourist "routes" may thus require to be identified singly or there may be several within a high activity tourism area. It is already a common practice amongst facility operators to recognise such "routes" and to name them in accordance with some common theme or geographical location. In the context of signing such a "route" it becomes appropriate to extend the theme concept to the symbol to be used on any tourism signs. In this way the generic or group identity of the "route" can be made visible to road users through the medium of the signs. This grouping approach to tourist destination types has been built into the classification of these destinations, as is illustrated in Table 4.2 (see Section 4.2). In Table 4.2 a wide range of tourist attractions have been grouped according to some 12 identifiable themes e.g Group A8 facilities all have a "Coastal" theme. The use of the "Coastal" theme symbol (see Subsection 4.3.10), to identify a route or area theme, does not preclude the use, along the route, of appropriate symbols from other theme groups if the relevant facility occurs in addition to the "Coastal" facilities.

3 The evolution of a tourist "route" can occur along a road that is already identified within the national, provincial, regional or metropolitan road networks as of significant navigational importance, to the extent that it has been allocated a navigational route number, or it can occur along an un-numbered road . An illustration of the development of a tourist "route" along a single linear numbered navigational route is given by Figure 4.18, whereas Figure 4.19 shows how a similar situation could occur along a single linear un-numbered road. The example in Figure 4.18 has been identified as an historical route and has been given the name "The Gold Diggers (historical theme) Route". Similarly the example route in Figure 4.19 has been identified as the "Disa Valley (scenic theme) Route". Provided they remain isolated "routes" neither of the types of tourist routes described are recommended to be allocated a tourist route number (see Subsection 4.5.3). In the example given in Figure 4.18 the allocation of such a number would clash with that already allocated for navigational purposes. For this reason the duplication (continued on page 4.4.10)

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ROUTE - km	FACILITY NAME	TOURIST ATTRACTION Groups A1 - A13	EMERGENCY SERVICES Group B1	MOTORIST & FOOD SERVICES Groups B2 - B4	GENERAL SERVICE Group B5	ACCOMMODATION Group C1
17,09 RHTurn	Zenex Garage Shopping Centre Cafe (opposite corner) Lion Park (± 1,8km)	 Wildlife	 Phones 	Petrol - 24 hrs Take aways Refreshments	i, Toilets i, Shop Toilets	
± 19,5 LH	Hertford Hotel			Restaurant		Hotel
20,39 RH	Turn off onto D1027: Eugen Hofmann	 Sculpting				
± 22,0 LH	Bayrischer Hotel/Casino			Restaurant		Hotel
23,4 RH	Lanseria Shopping Complex SAAF Museum ? Lindele Knitwear	 Historical Arts & Crafts	Phone	Take aways	i, Shop Post Office	
± 22,5 RH	Gallery XYZ	Sculpting, Painting Arts + Crafts				
± 24 LH	Wilderness Pleasure Resort	Resort				
25,28 RH	Farm Stall				Stall	
26,7 LH	Cafe & Shops			Restaurant -Take aways	i, Shops	
± 27,2 RH	Winsome Valley					Rondavels, Chalets, Caravans.
28,6 RH	New Vaalie Store Whitestar Farm			Restaurant	Shop, Picnic Shop	
28,75 LH	Trek Garage Shop & Cafe		 Phone	Petrol - 12 hs Restaurant -Take aways		
± 29,5	Fleisher Mountain Gallery	Arts & Crafts, Jewellers, Pottery				
± 30	Magaliesberg Conference Centre					
± 31	Alpha Education Centre					
32,1	SVR Creations QED Originals	Antiques Arts & Crafts				
± 39	River Bear Lodge Conference Centre Dietmar Wiening	Arts & Crafts Sculpture				
40	Cafe Supermarket		 Phone	Take aways	 i, Shop	
40,8	Cafe Farm Stall				 i, Shop	

Table 4.4
Typical Example of Tourist Attractions and Services on a Tourist Route in a High Density Tourist Area

July 2011

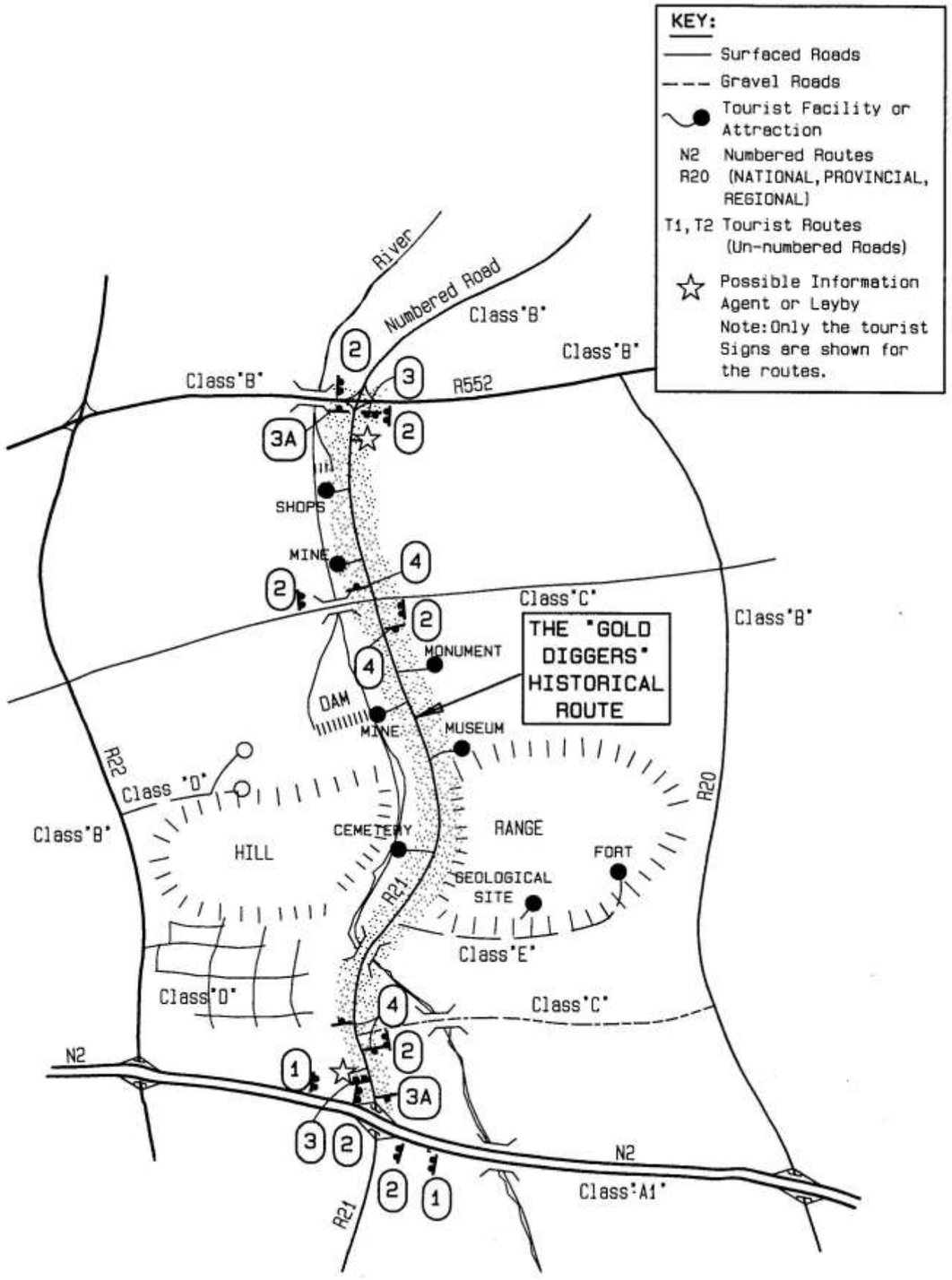

Fig 4.18 **Signing to Identify a Tourist Route Superimposed Upon a Single Navigational Numbered Route**

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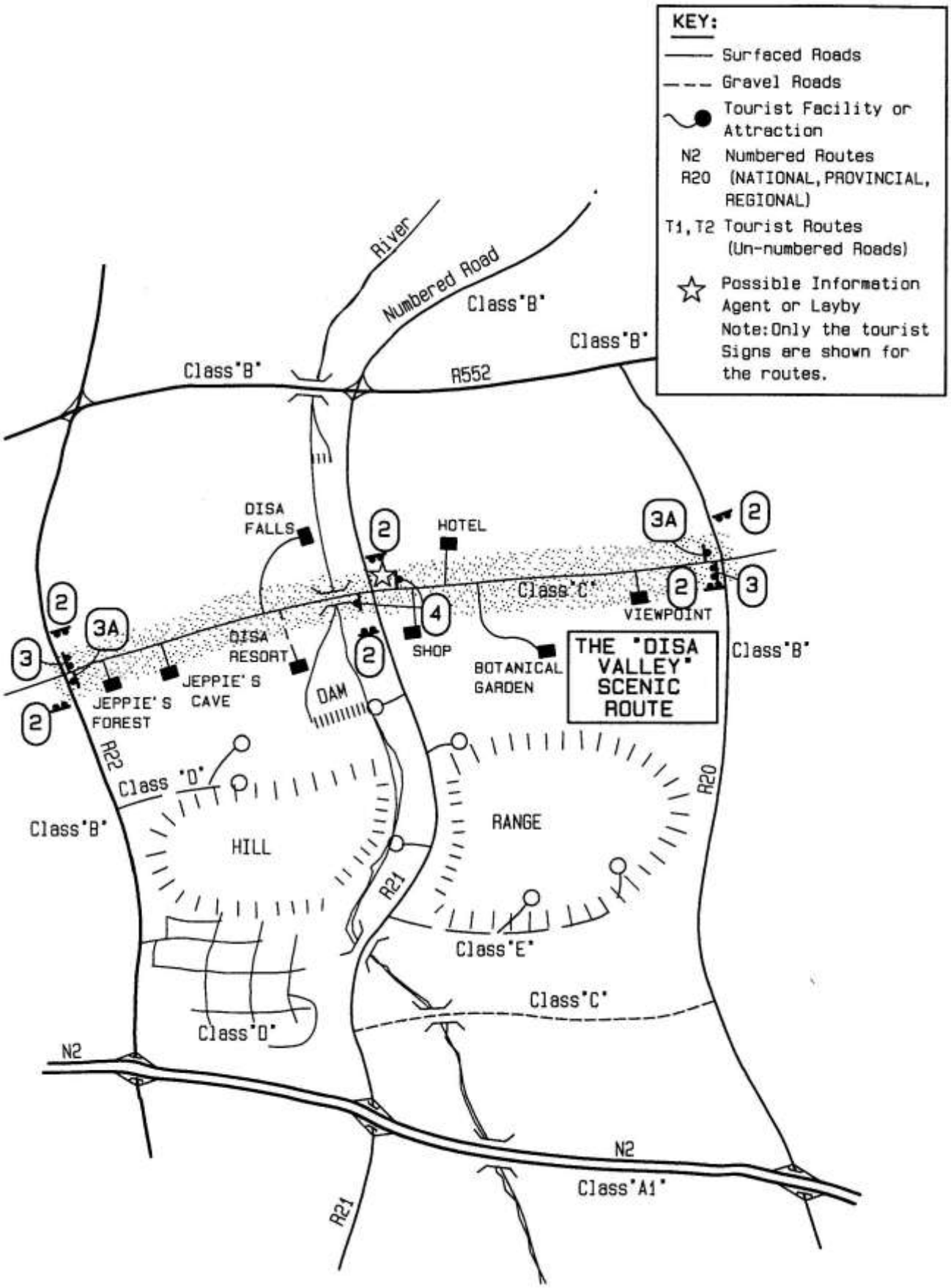

Fig 4.19 **Signing to Identify a Tourist Route on a Single Linear Otherwise Un-numbered Road**

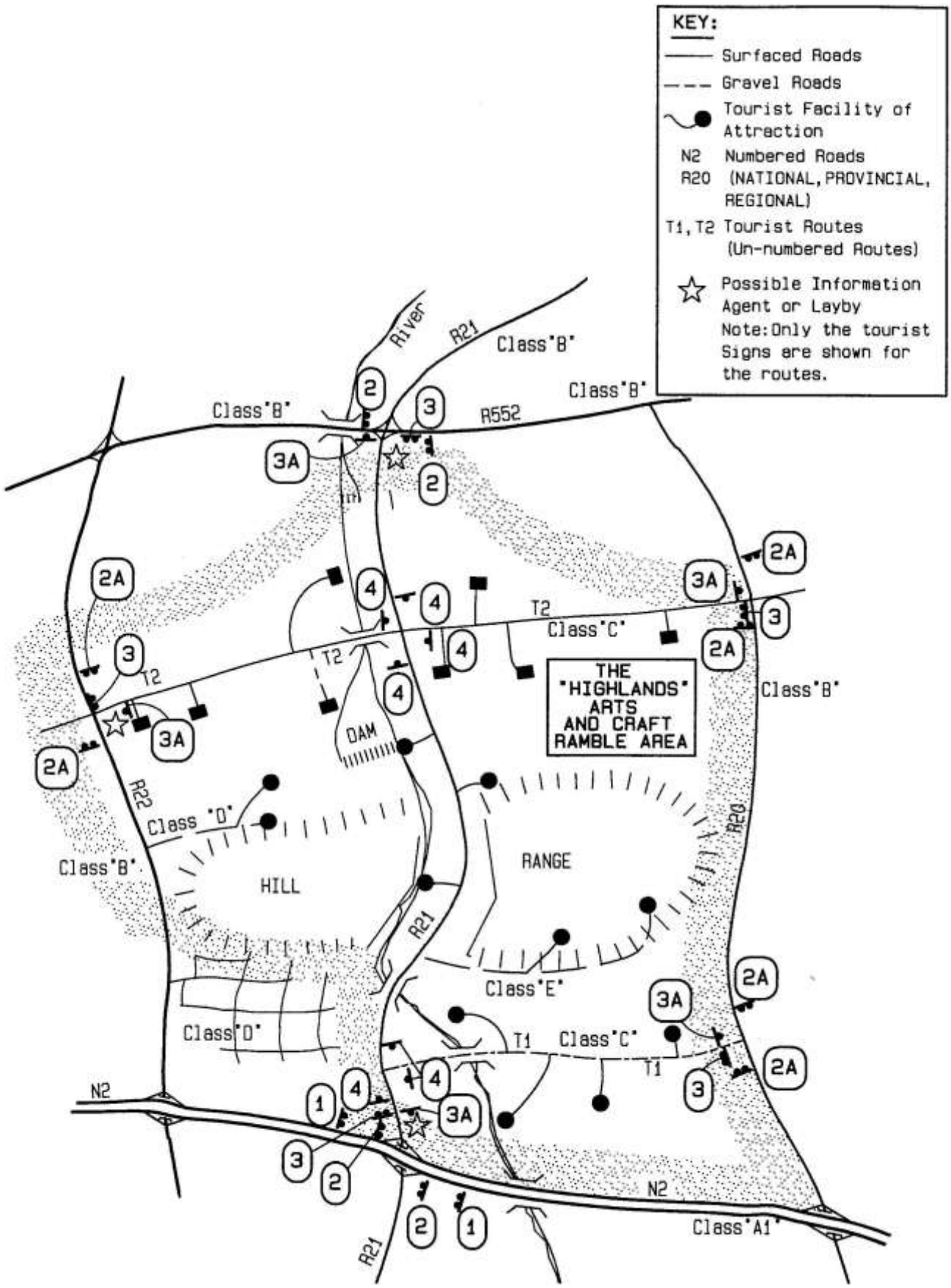

Fig 4.20 **Signing to Identify a Tourist Area Using a Gateway Perimeter Method**

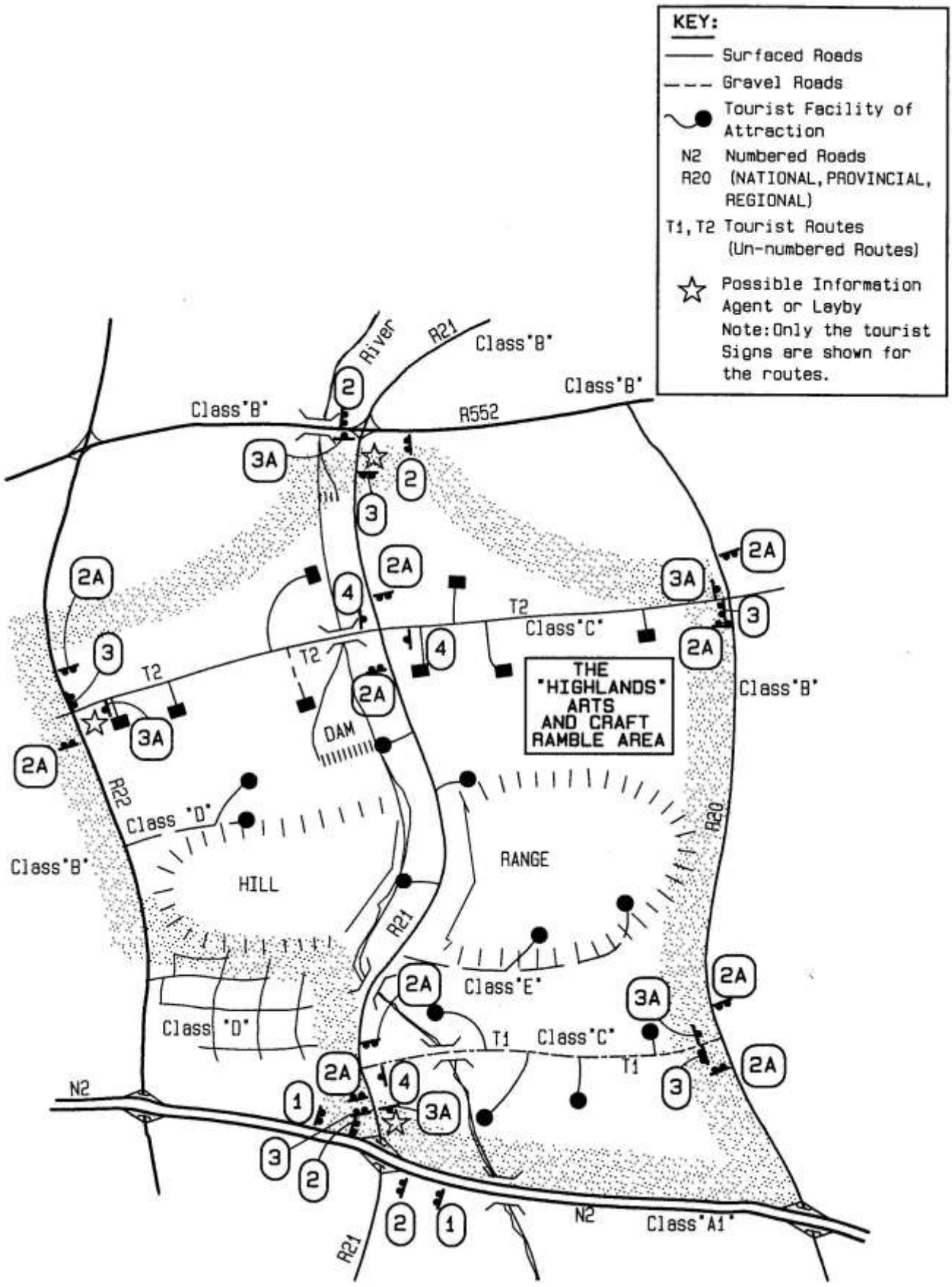

Fig 4.21 **Signing to Identify a Tourist Area Using a Nearest Numbered Route Signing Method**

(continued from page 4.4.4)

or overlapping of navigational and tourist route **numbers** is not recommended.

4 In Figure 4.18 tourism signs pertinent to the indication of the "route" by theme are identified by number (those signs appropriate to identification of individual facilities such as the cemetery are not shown - these should conform to the signing application detail given in Figure 4.29, Subsection 4.7.5). Since access to the "route" can be gained from a crossing freeway, signs (1) may be provided as standard GF1 type signs (see Figure 4.6, Detail 4.6.2), displaying an interchange number, a "route" theme symbol and the name of the route. Signs (2) are standard GF2 type signs which are provided at all other significant non-freeway points of access to the"route", and which display the "route" theme symbol and name. Signs (3) is an optional GL6.3 sign indication the start of the tourist route and sign (3A) a similarly optional sign indicating the end of the route. The signs indicated by (4) are compact tourist route marker GE18 signs, intended to reduce the sign area in comparison to the alternative GF2 sign and to give reassurance to tourists that they are still on the tourist route. These signs display the route theme symbol (without a tourist route number - see Figure 4.24, Detail 4.24.2).

5 Signs (2), (3), (3A), and (4), displayed in Figure 4.19 have the same function and detail as those shown in Figure 4.18 (sign type (1) is not required because there is no freeway). If this type of route is very long and winding, or involves changes of direction then, even although it is an isolated route, the allocation of a tourist route number may be warranted. This tourist route number should be displayed in front of the theme symbol (see Figures 4.9 and 4.14).

6 Recent history and the growing promotion of tourism makes it reasonably predictable that once one tourist route has been successfully established, and it is not totally isolated by its geographical location, the growth of tourist movement along the route will promote the establishment of new tourist attractions so that eventually a whole area may become identifiable (from others) as being a high activity or density tourist area with a specific theme. When this happens the tourism signing of the area can be developed according to one of two principles as illustrated in Figures 4.20 and 4.21. If the same process is occurring in adjacent areas, it is clearly very important that the theme development processes be undertaken in a spirit of close co-operation.

7 Figure 4.20 shows an area in which two numbered tourist routes have been created, in addition to five navigational numbered routes, four of the latter of which create the majority of the perimeter of the theme area. The signing for this example has been developed according to a concept known as the "Gateway Perimeter" method. This concept involves a significant concentration of the information and signing effort at the main points of entry to the area. Signing at internal junctions between numbered routes, including numbered tourist routes, is limited to tourist route marker signs GE18. Because of the likely high number of facilities in the area the "Gateway" method also recommends the establishment of tourist information centres or laybys at the "Gateways". This can be a costly process and requires a high measure of commitment from the tourist operators in the area. The "Gateway" concept is therefore recommended for the most highly developed or concentrated tourist areas.

8 Figure 4.21 shows a very similar area with a similar signing treatment. This signing treatment is developed according to the well-established "Nearest Numbered Route" principle. Because two routes have been allocated tourist route numbers this means that the "Nearest" numbered route is now one level lower in the road hierarchy with the result that tourist route signs can be used to lead tourists closer to facility destinations before the actual facility requires signing. This has the effect of making more of the signs in the area "generic", or theme, signs and reduces the pressure to take facility signs further and further from the facilities. The main difference to the signing shown in Figure 4.20 is that several of the internal signs are shown as GF2 signs in place of GE18 signs. This type of signing treatment is more appropriate for a moderately developed tourism area which would also not warrant or be able to afford the provision of gateway information centres or laybys.

9 In Figures 4.18 to 4.21 the signs shown by number are of the following types:

(a) (1) - GF1 FREEWAY ADVANCE EXIT signs displaying an interchange number, the tourist area theme symbol and the tourist area theme name (if the route to which the freeway exit leads is a numbered tourist route then the tourist route number should be displayed in front of the symbol) - see Figures 4.6 and 4.9;

(b) (2) - GF2 ADVANCE TURN DIRECTION signs displaying the tourist area theme symbol and the tourist area theme name (these lead to a numbered navigational route within the tourist area) - see Figure 4.7;

(c) (2A) - GF2 ADVANCE TURN DIRECTION signs displaying the tourist route number, the tourist area theme symbol and the tourist area theme name - see Figure 4.9;

(d) (3) - optional - GL6.3 TOURIST AREA NAME sign to identify the start of the tourist area - see Volume 1, Subsection 4.5.9;

(e) (3A) - optional - GE18 END OF TOURIST ROUTE/AREA signs - see Figure 4.24;

(f) (4) - GE18 TOURIST ROUTE MARKER signs - see Figures 4.9 and 4.24.

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4.5 SIGNING OF HIGH DENSITY TOURISM AREAS

4.5.1 Concept Development

1 One of the main objectives of the planning and development of a tourism signing plan for an area should be to develop some concept which will offer an adequate compromise solution to the various conflicting problems which exist.

In most cases, the possible solution may lie on two levels, namely:

(a) the signing treatment of the whole area; and

(b) the signing treatment of individual facilities.

2 The concept of identifying certain routes as "tourist routes" has been under consideration throughout the country for some time and experience to date in KwaZulu/Natal and in the Western Cape and developments in Gauteng have shown that the concept is implementable and can support the primary guidance signing system in the area.

3 Throughout the preparation of a tourism signing plan for a high density tourist area, close attention should be paid to finding ways of reducing the need for large signs or large numbers of signs, wherever possible. The motivation for this approach is to achieve the most effective signing reasonably possible by means of the least possible total sign area, and this for two basic reasons:

(a) to limit the overall environmental intrusion of the signs (but still have enough impact for them to achieve their purpose); and

(b) to limit the total cost input to the provision of the signs.

4 Achievement of these objectives can be assisted by the use of the organised provision of tourist information throughout the area and the use of tourist route marker signs.

4.5.2 Area Identification

1 It is an established principle, covered in Volume 1, that signing for an area can be kept within reasonable limits if the area has a uniqueness of identity which can be used on tourism signs, involving:

(a) a Unique Collective Name - the need for alternative means of displaying tourism information will usually arise due to an "overload of information" at an existing intersection or on an existing tourism sign; in this instance, the pro-active approach is recommended whereby a collective "name" or "identity" could be used to replace a number of separate tourism facilities; this option is clearly cheaper than an information lay-by, requiring the usual brown tourism signs only, but it should be facilitated through the local or regional tourism organisations, in consultation with the appropriate tourism stakeholders; hence, the existence of such a tourism body will expedite any discussions and final proposals; to keep sign area down a "collective" name for an area should be kept as short as practical, but should certainly not exceed 2 to 3 words; the name allocated to a tourism area should either be unique to a geographic area or unique to some theme such as historical mining ("Old Digger's Route") or scenery ("Namaqualand Flower Route").

(b) Collective Route or Area Symbol - in the context of tourism signing, the other method by which a tourism area should be collectively identified, as "an area", is by means of an appropriate symbol; the symbol can relate to a descriptive representation of the area, e.g. a "mountain" symbol for an area in the Drakensberg, or to an established theme for the principal activities of the area, e.g. a symbol representing "wine", or "arts and crafts" symbol for an area such as the Crocodile River Ramble Area; the symbol should be used together with the full name of the high density tourism area;

(c) even if generic tourism symbol(s) can be used with a unique or collective name to describe a high density tourist area, it may still be desirable to identify the area with a unique "Emblem" or "Logo"; such an emblem or logo may be used on an off road information sign at a laybye at the gateway to the area, and at the entrances to individual facilities.

2 The use of generic theme symbols such as "arts and crafts", "wildlife" or "scenic" also has the potential to keep within controllable limits the total numbers of symbols available for use on tourism signs. The larger the number of symbols, the greater will be the difficulty experienced by drivers in interpreting them correctly and also in sign manufacturers supplying the correct symbol. The function of the symbol to allow early recognition of the associated destination with a minimised need to read words on a sign will also be eroded by large numbers of symbols, many with distinct similarities.

3 Table 4.2 in Section 4.2 shows that a wide range of individual types of tourist attraction can be signed, in the environment of tourist routes or a tourism area, using 10 to 12 generic symbols. (Table 4.2 represents a recent rationalisation of thinking on the previous tourism destination classification which has evolved over a considerable period of time and not all the generic symbols mentioned are yet available or approved).

4.5.3 Numbering of Tourist Routes

1 Having established the limits of an high density tourism area, the road network within the area (including minor roads) and the locations of candidate tourism facilities and services, consideration should be given as to how to contain the number of tourism signs required at the more important or busy junctions if a traditional approach to the provision of such signs were to be adopted. Many of the minor roads in an area could provide access to three or more facilities or services. It should, therefore, be natural to consider some of the minor roads as "tourist routes".

2 In order to keep the system as simple as possible and for such routes to form a logical extension of the existing numbered route system, the use of the designatory uppercase letter "T" is allowed, e.g. "T1" , "T2", etc. A very significant benefit of this approach is that, in terms of existing policies, the signs on for example, on a provincial numbered route on the approach to a junction with a numbered tourist route, would display a tourist

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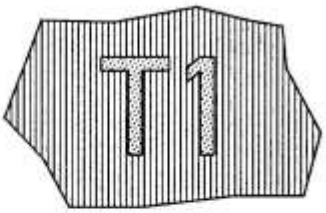
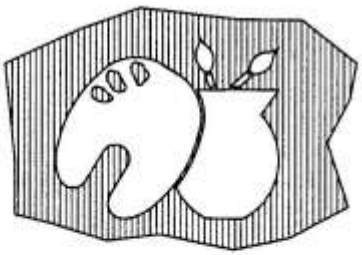


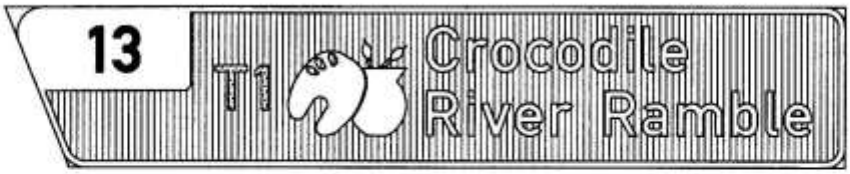
Detail 4.22.1 Tourist Route Number Indication



Detail 4.22.2 Generic Theme Symbol for Area

Crocodile River Ramble

Detail 4.22.3 Unique Collective or Theme Name (Maximum of 3 words)



Detail 4.22.4 Typical Sign at Main Point of Entry to Tourist Area (GF1 example being from a freeway to an entering crossroad)

Detail 4.22.5 Typical Sign GF2 Indicating a Numbered Tourist Route From a Numbered Navigational Route

Detail 4.22.6 Typical GL6 Location at Gateway to Tourist Area

Fig 4.22 Tourist Route or Area Signing, Signface Elements, and Typical Signs Used at Entry Points or Gateways

route number, a generic symbol and the unique collective name. Any such junctions would be signed in this manner, each minor road being identified, where relevant, by the allocated tourist route number, i.e. "T4". In this way the alternative needed to try to indicate a multitude of specific tourism destinations at such junctions is avoided at no disadvantage to the driver or the facility, since an awareness of the tourist route number required to reach a specific facility is a very simple piece of information to promote and acquire. Once on the tourist route, drivers will now expect to see a sign to the specific tourism destination they are seeking. The signface elements for the Crocodile Ramble Area are illustrated in Figure 4.22 as an example of specific signs indicating a tourist route as opposed to a tourism facility.

3 In principle, the signs described above should be provided by the road authority as part of the basic navigational Guidance Signing Plan for a high density tourism area.

4.5.4 Facility Identification

1 The allocation of tourist route numbers and the signing described in Subsection 4.5.2 is intended to enable tourists to make what amounts to a "final" turn from a numbered route towards the tourism destination they seek. It is a criterion of the route design process that the number of tourism destinations at such a turn should not exceed three. This limit is dictated by the norms applicable to tourism signface design and relates to the maximum amount of information which should be displayed at one point, for drivers to read with safety.

2 It should be noted that, in terms of this criterion, signing of specific tourism facilities or services may be provided directly from navigational numbered routes, numbered tourist routes and other roads which have not been allocated a number. For most high density tourism areas it is possible to classify tourism destinations into three groups, as follows:

(a) full-time attractions or services;

(b) part-time attractions or services; and

(c) temporary attractions or services.

The level of signing should be different for each group and the provision of signs in all cases should be subject to approval after formal application.

4.5.5 Full-time Attractions or Services

1 To qualify as "Full-time Attractions or Services" tourist facilities have to comply with numerous warrants given in Subsection 4.6. Briefly, such facilities will need to be available to the public 365 days a year for between 8 and 24 hours per day and must also fulfil various parking, toilet and other normal health and business licencing requirements. Such facilities, if their applications for signs are approved, will be provided with standard GF1, GF2 or GF3 tourism class signs as appropriate, normally at their cost subject to road authority policy. The provision of standard GF1, GF2 and GF3 signs will thereby identify such facilities to the public as full-time facilities. Figures 4.6 to 4.10 illustrate examples of such signs.

4.5.6 Part-time Attractions or Services

1 These facilities are not always available to the public. They commonly only open on a once-a-week or once-a-month basis, or are only available seasonally or by appointment. These facilities represent a source of very real demand for tourism signs. This demand comes both from drivers and from facility operators.

2 In order to clearly differentiate such part-time facilities from full-time facilities within the same area this demand can be satisfied by the provision of a smaller, more compact, and therefore economical, GF17 Fingerboard tourism sign. This type of sign should be used on a permanent basis for approved part-time facilities, however GF17 signs may only be used in an area formally recognised as a high density tourist area (see Section 4.4). Approval should be subject to compliance with warrants to be developed (see Subsection 4.5.5), and subject to an approval process in a similar manner to full-time facilities. (A temporary version of this sign type, TGF17, can similarly be allocated to special event or temporary tourism facilities - see Subsection 4.5.7.)

3 In function, the GF17 sign replaces the larger GF3 sign and it should be provided at the final turn towards the facility. In certain instances, where the facility is not the last property on the side road but is some distance before the end of the road, an additional GF17 sign may be required at the property entrance. Junctions at which GF17 are provided may require advance warning signs W101, W107 or W108 in accordance with the normal warrants for such signs. Sign GF17 is a recognised road traffic sign and as such is placed within the road reserve. It is desirable that part-time facility operators display an additional sign, within their property but clearly visible from the approaching roadway, which should be a changeable sign capable of indicating when the facility is "OPEN" or "CLOSED". The sign may include any unique "Emblem" or "Logo" adopted by the area (see paragraph 4.5.2.1(c)).

4 GF17 signs, like all tourist signs, should display an appropriate symbol plus the primary (short) name for the facility. The symbol used on the GF17 signs may be either the collective symbol for the area or it may be a symbol specific to the principal activity of the facility, if such a symbol is available (see Subsection 4.3.10). Figure 4.23 illustrates examples of such signs.

5 The following are suggested criteria, subject to review and development of warrants during the design and implementation stages, for the provision of GF17 tourist signs for part-time facilities:

(a) the facility must be located within an identified high density tourist area;

(b) applications for part-time tourist facility signs (GF17) must be submitted for processing to the Local Tourist Organisation/publicity association whether the applicant is a member of the organisation or not;

(c) an applicant must sign an agreement to accept the Local Tourist Organisations' decisions with regard to monitoring and control of standards for signing purposes (standards will be set

(continued on page 4.5.6)

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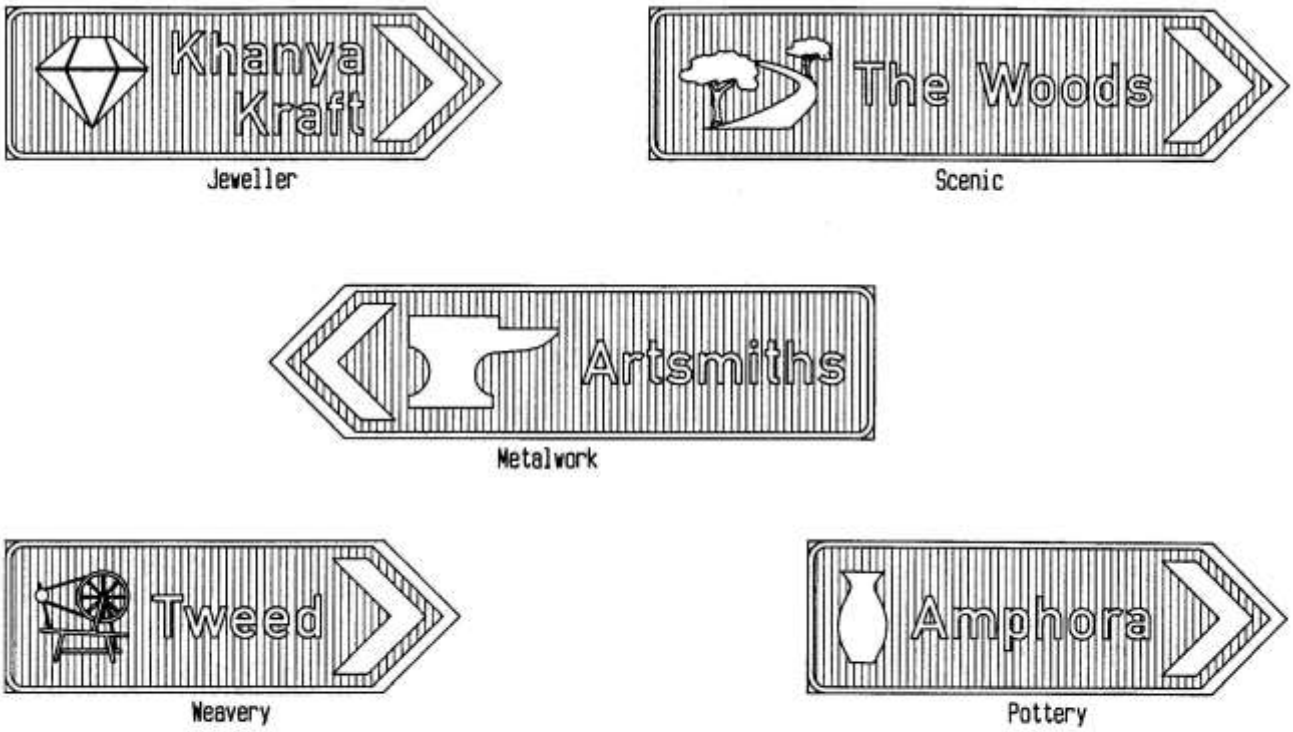
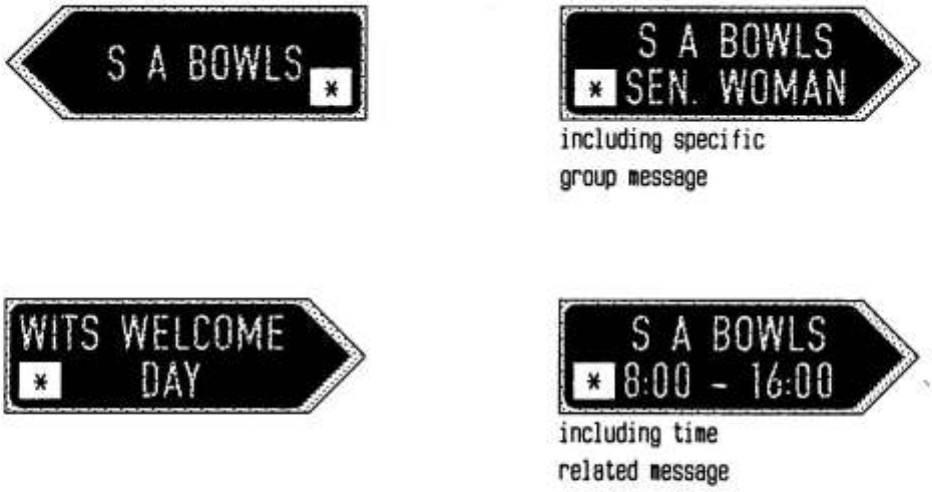


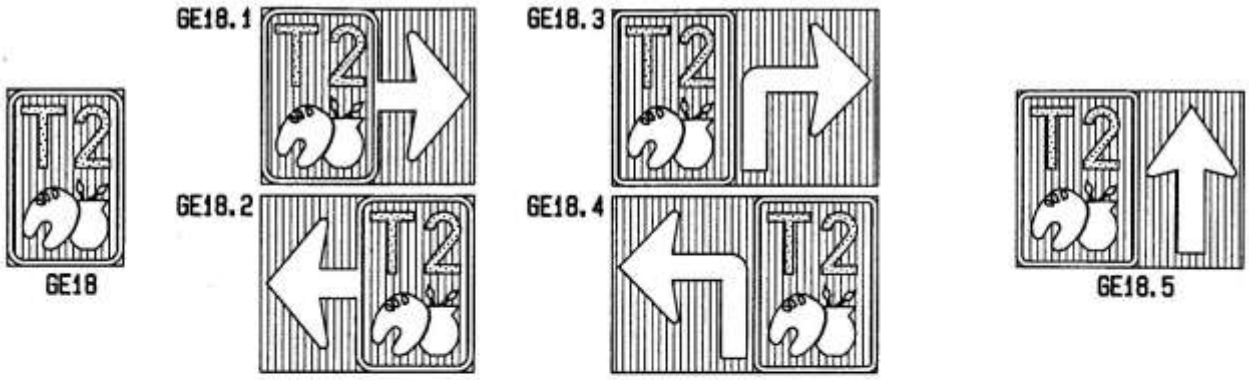
Detail 4.23.1 Examples of Typical GF17 Signs to Part-Time Tourist Attractions (see also Figures 4.8 and 4.16)



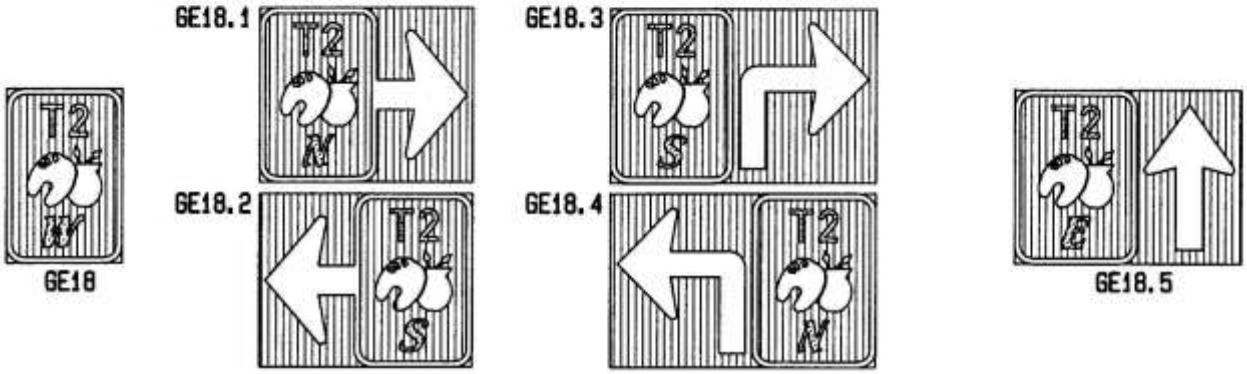
* logo of service organisation responsible for erecting and removing temporary signs

Detail 4.23.2 Examples of Typical TGF17 Signs to Temporary Events

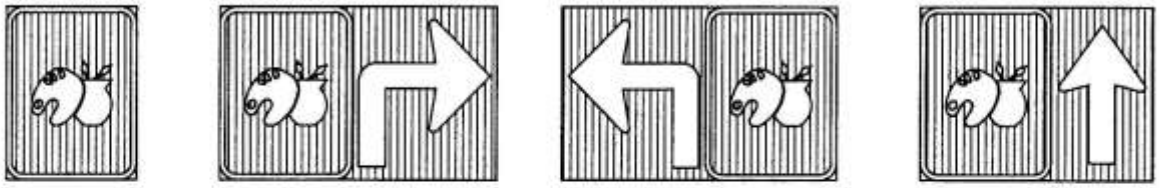
Fig 4.23 Signs Appropriate to Part-Time Tourist Attractions And Services, and Temporary Events



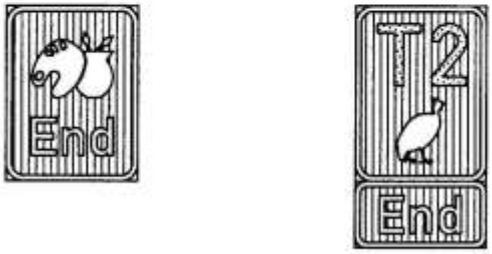
Detail 4.24.1 The Full Range of Tourist Route Marker Signs - GE18



Detail 4.24.2 Optional Display of Cardinal Directions - GE18



Detail 4.24.3 Optional Tourist Route Marker Signs for Use on a Navigational Numbered Route



Detail 4.24.4 Optional "End of Route" Tourist Route Marker Signs

Fig 4.24 **Tourist Route Marker Signs**

(continued from page 4.5.3)

by the Regional Tourist Organisation and the road authority in co-operation with the Regional Tourism Liaison Committee);

(d) the facility must be accepted for inclusion in marketing brochures and maps promoting the area;

(e) the facility must be open to the public on a regular basis;

(f) the facility must be a fixed site or venue;

(g) the facility must comply with minimum hygiene and tourist attraction standards as set from time to time;

(h) the facility must comply with any other requirements set;

(i) the operator of the facility must sign an agreement to remove any unapproved signs, including advertisements, when the tourist sign is erected;

(j) the operator of the facility must sign an agreement accepting the responsibility for the correct display of the approved sign(s) and accepting the jurisdiction of the road authority to remove signs, at the operators expense, if too many complaints are received from the public regarding the operation or availability of the facility; and

(k) adequate safety precautions must be maintained at facilities where members of the public have access to workshops.

4.5.7 Temporary Events

1 Temporary events are, in essence, one-off part-time tourist attractions, although many of them may be regular annual events. These may be signed using sign TGF17 and the signs are commonly erected and removed by a service organisation such as the Automobile Association. These signs should be truly temporary signs and conform to the black-and-yellow temporary sign colour code.

2 Typical temporary events include (examples of temporary event signs are also illustrated in Figure 4.23):

(a) auctions;

(b) festivals;

(c) fetes;

(d) conferences;

(e) gymkhanas (and other infrequent sporting occasions, etc).

3 There is a general trend to provide multi-function venues. These may have a significant potential to attract visitors and from a very wide catchment area. Many of these visitors will be unfamiliar with the location of the venue. Consideration may be given to providing such facilities with part-time tourism signs, GF17, because the facilities are not operating all the time, and relying on such signs to guide visitors rather than providing regular TGF17 signs. An alternative to such an approach, in an urban or peri-urban area might be to use a similar fingerboard LOCAL DIRECTION sign GDL3. The latter would particularly be the case if the events being staged are directed at commercial participation rather than as tourist attractions.

4.5.8 Tourist Route Marker Signs

1 It is anticipated that the manner in which many identified high density tourism areas will be used by the public is in a very informal meandering way. It is quite likely under these circumstances that tourists may lose their bearings and require relatively frequent reassurance as to where they are. Consistent with the objective of limiting total sign area within the system, whenever practical, the concept of utilising compact TOURIST ROUTE MARKER guidance signs, GE18, is worth considering. Since certain roads within a high density tourist area could be recommended to be designated as tourist routes, it becomes relevant to consider using TOURIST ROUTE MARKER signs. Such signs should display the tourist route number and the theme symbol for the area, and can be used for route confirmation purposes. They can also be used instead of the much larger GF2 or GF3 signs at junctions of two tourist routes. Figure 4.24 illustrates typical TOURIST ROUTE MARKER signs GE18.

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4.6 SYMBOLS AND WARRANTS

4.6.1 General

1 The symbols presented in this section have all been through an approval process whereby an assessment has been made of their appropriateness and legibility. Only symbols approved by the Route Numbering and Road Traffic Signs Sub-Committee shall be used and preference will be given to signs having a generic use, rather than a uniquely individual use.

2 The present preference to the use of symbols, logos and names is as follows:

(a) a symbol has priority and should be of a generic nature;

(b) a logo has secondary status;

(c) a logo should not be allowed without a symbol;

(d) the logo should not be bigger than the symbol and preferably the same size;

(e) a full name may be used in conjunction with a symbol alone;

(f) a full name may be used with a symbol and a logo;

(a logo and a full name alone will not be allowed);

3 A logo should identify the region and be part of the general information system e.g. to be included in regional brochures, maps and letterheads. The inclusion of such a regional identifying logo will be allowed on map-type signs at lay-byes, provided it complies with the guidelines given in section 4.7.9. A logo which is seen as a corporate identifier i.e. advertising, will be allowed.

4 In the following warrants, when a distance warrant from the nearest numbered route is quoted, the facility may be signed from the nearest numbered route. In general terms, other facilities will first be signed at a more local level from a road lower in the road hierarchy.

5 If a facility lies beyond the distance warrant limit this does not preclude the facility from being signed from a lower order road.

6 Subject to compliance with other warrants, facilities may also be signed on numbered routes when they take direct access from the route.

4.6.2 Warrant Structure

1 The warrant structure is arranged in three levels:

(a) Level 1:
general criteria relating to location and accessibility applicable to all classes of facility;

(b) Level 2:
criteria specific to each type of facility relating principally to hours of operation, distance from the approach road, and most importantly the quality rating of the facility;

(c) Level 3:
criteria specific to the design of the design of the sign to be provided with particular regard to:

(i) the use of a primary name;

(ii) supplementary symbols;

(iii) an area symbol;

(iv) the distance to the facility;

(v) a route number.

4.6.3 Warrant Criteria

1 **Level 1 Warrant Criteria**:

the following factors are taken into account for all facilities before continuing with the warrant investigation:

(a) locational details:

(i) name and nearest town;

(ii) number of nearest numbered route;

(iii) is facility accessed directly or indirectly from this numbered route;

(iv) identification details of road from which access is obtained (when not a numbered route)

(b) access warrants:

(i) based on the locational details are tourism signs likely to be required or not;

(ii) even if facility is clearly visible from the road are tourism signs necessary to identify the point of access;

(iii) is the access road of an all-weather standard;

(iv) are internal roads of an adequate geometric standard to offer good mobility.

2 The following symbols and warrants are organised to prioritise the provision of services for which detailed warrants are well-established. The subsections therefore describe emergency, vehicle, food, general and rest area services, followed by accommodation facilities and tourist attractions.

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4.6.4 Level 2: Warrant Criteria: Emergency Services: Group B1

1 **Emergency Services**:

(a) **Telephone:**

GFS B1-1

Basic Requirements:

- ❑ rural - within 5 km of the nearest numbered route;
- ❑ urban - within 1 km of the nearest numbered route;
- ❑ shall be accessible 24 hours per day 365 days per year.

(b) **Police:**

GFS B1-2

Basic Requirements:

- ❑ rural - within 10 km of the nearest numbered route;
- ❑ urban - within 5 km of the nearest numbered route;
- ❑ shall be open 24 hours per day 365 days per year.

(c) **Hospital:**

GFS B1-3

Basic Requirements:

- ❑ rural - within 10 km of the nearest numbered route;
- ❑ urban - generally within 5 km of the nearest numbered route, but in metropolitan areas the signing of hospitals should be planned, co-ordinated and implemented, in conjunction with the hospitals, to provide the best possible 24 hour emergency service accessibility for road users.;
- ❑ a casualty or emergency facility shall be open 24 hours per day 365 days per year.

(d) **First Aid:**

GFS B1-4

Basic Requirements:

- ❑ rural - within 10 km of the nearest numbered route;
- ❑ urban - generally within 2 km of the nearest numbered route (see note under GFS B1-3: Hospitals);
- ❑ shall be open 10 hours per day 365 days per year.

(e) **SOS Telephones:**

GFS B1-5

Basic Requirements:

- ❑ when a system is installed signs shall be provided.

NOTE: Symbol GFS B1-6 is a variation of symbol GFS B1-5 for use on the actual phone installation.

4.6.5 Level 2 Warrant Criteria: Vehicle Services

1 **Light Vehicle Services: Group B2:**

All light vehicle service facilities considered for the provision of a tourism service sign shall provide a photocopy of a current trading/operating licence and shall be inspected for compliance with the following criteria by staff of the Automobile Association of South Africa:

(a) **Filling Station and Workshop**:

GFS B2-1

Basic requirements:

- ❑ the premises and operation shall be in accordance with statutory requirements of local and other authorities with regard to planning, construction, water supply, sewage disposal, garbage collection and disposal, fire precautions and general safety;
- ❑ rural - within 5 km of the nearest numbered route;
- ❑ urban - within 1 km of the nearest numbered route;
- ❑ the facility shall be open as a filling station 24 hours per day 365 days per year (subject to compliance with any national controls exercised from time to time);
- ❑ shall have at least six fuel outlet points in urban areas and at least three fuel outlet points in rural areas;

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- ❑ all fuel pumps must be covered by a canopy;
- ❑ the standing area for vehicle refuelling must have a permanent surface;
- ❑ the active area of the facility must be illuminated at night;
- ❑ water and air shall be available during the period that fuel is sold;
- ❑ toilet facilities of an acceptable standard shall be available for sale during normal office hours;
- ❑ a workshop suitable for the repair of all makes and models of popular light vehicle shall be provided;
- ❑ a qualified mechanic trained to repair all makes and models of popular light vehicle shall be available during normal office hours (minimum 8 hours), and be on stand-by for calls after hours;
- ❑ an acceptable range and number of the most necessary spare parts likely to be required by a long distance driver shall be available for all makes and models of popular light vehicle (e.g. fan belts, tyres, tubes, water pipes, windscreen wipers, batteries etc.).

(b) **Filling Station**:

GFS B2-2

Basic requirement:

- ❑ the premises and operation shall be in accordance with statutory requirements of local and other authorities with regard to planning, construction, water supply, sewage disposal, garbage collection and disposal, fire precautions and general safety;
- ❑ rural - within 5 km of the nearest numbered route;
- ❑ urban - within 1 km of the nearest numbered route;
- ❑ the facility shall be open as a filling station 24 hours per day 365 days per year (subject to compliance with any national controls exercised from time to time);
- ❑ shall have at least six fuel outlet points in urban areas and at least three fuel outlet points in rural areas;
- ❑ all fuel pumps must be covered by a canopy;
- ❑ the standing area for vehicle refuelling must have a permanent surface;
- ❑ the active area of the facility must be illuminated at night;
- ❑ water and air shall be available during the period that fuel is sold;
- ❑ toilet facilities of an acceptable standard shall be available to the public during the period that fuel is sold;
- ❑ a telephone shall be available to the public during the period that fuel is sold;
- ❑ road maps of an area in which the facility is situated shall be available for sale during normal office hours;
- ❑ an acceptable range and number of the most necessary spare parts likely to be required by a long distance driver shall be available for all makes and models of popular light vehicle (e.g. fan belts, tyres, tubes, water pipes, windscreen wipers, batteries etc.).

(c) **Workshop**:

GFS B2-3

Basic Requirements:

- ❑ a workshop suitable for the repair of all makes and models of popular light vehicles shall be provided;
- ❑ rural - within 5 km of the nearest numbered route;
- ❑ urban - within 1 km of the nearest numbered route;
- ❑ a qualified mechanic trained to repair all makes and models of popular light vehicles shall be available during; normal office hours (minimum 8 hours), and be on stand-by for calls after hours;
- ❑ an acceptable range and number of the most necessary spare parts likely to be required by a long distance driver shall be available for all makes and models of popular light vehicle (e.g. fan belts, tyres, tubes, water pipes, windscreen wipers, batteries etc.);
- ❑ the active area of the facility must be illuminated at night;
- ❑ water and air shall be available during the period that fuel is sold;
- ❑ toilet facilities of an acceptable standard shall be available to the public during the period that fuel is sold;
- ❑ a telephone shall be available to the public during the period that fuel is sold.

(d) **Tow-In Service**:

GFS B2-4

Basic Requirements:

- ❑ rural - within 5 km of the nearest numbered route;
- ❑ urban - within 1 km of the nearest numbered route;
- ❑ rural - the facility shall be available 12 hours per day 365 days per year;
- ❑ urban - the facility shall be available 24 hours per day 365 days per year.

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2 **Truck Services: Group B3:**

All truck service facilities considered for the provision of a tourism service sign shall provide a photocopy of a current trading/operating licence and shall be inspected for compliance with the following criteria by staff of the Road Freight Association (RFA) and/or NAPTO:

GFS B3-1

Basic Requirements:

- ❑ the premises and operation shall be in accordance with statutory requirements of local and other authorities with regard to planning, construction, water supply, sewage disposal, garbage collection and disposal, fire precautions and general safety;
- ❑ rural - within 5 km of the nearest numbered route;
- ❑ urban - within 1 km of the nearest numbered route;
- ❑ the facility shall be open as a service for trucks ONLY 24 hours per day 365 days per year (subject to compliance with any national controls exercised from time to time);
- ❑ shall have at least four diesel outlet points;
- ❑ all fuel pumps must be covered by a canopy;
- ❑ the standing area for vehicle refuelling must have a permanent surface;
- ❑ the active area of the facility must be illuminated at night;
- ❑ water and air shall be available during the period that fuel is sold;
- ❑ toilet facilities of an acceptable standard shall be available to the public during the period that fuel is sold;
- ❑ a telephone shall be available to the public during the period that fuel is sold;
- ❑ an acceptable number of the most necessary spare parts likely to be needed by long distance truckers shall be available;
- ❑ sufficient parking for at least ten trucks shall be available, free of charge, as rest stops 24 hours per day.

Optional Facilities**:**

If any of the following are provided to an acceptable standard the use of a primary name on the sign may be considered (see Level 3 warrants):

- ❑ at least six chalets accommodation to let;
- ❑ suitable fireplaces for cooking purposes;
- ❑ suitable refreshment or take-away service.

4.6.6 Level 2 Warrant Criteria: Food Services: Group B4:

1 **Restaurant:**

All restaurant facilities considered for the provision of a tourism service sign shall provide a photocopy of a current trading or operating licence and shall be inspected for compliance with the following criteria:

GFS B4-1

Basic requirements:

- ❑ the premises and operation shall be in accordance with statutory requirements of local and other authorities with regard to planning, construction, water supply, sewage disposal, garbage collection and disposal, fire precautions and general safety;
- ❑ rural - within 5 km of the nearest numbered route;
- ❑ urban - within 1 km of the nearest national route;
- ❑ the facility shall be open 40 hours per week 52 weeks per year to serve lunch and dinner;
- ❑ light refreshments shall be available between normal mealtimes;
- ❑ the food shall be good quality, properly cooked and attractively presented;
- ❑ the service shall be efficient and courteous, and be given in both official languages, imparting an atmosphere of welcome and willingness to please;
- ❑ menus, in keeping with the establishment, should be displayed in a weatherproof frame outside the main entrance;
- ❑ menus shall be clean and pleasant to handle and shall provided in both official languages and in sufficient number, and shall indicate prices, VAT and any extra charges;
- ❑ the dining area shall be suitably and adequately illuminated;
- ❑ ventilation, whether natural or mechanical, shall be capable of providing a continuous flow of fresh air to all areas;
- ❑ tables and seating shall be of quality and arrangement to permit customers and staff to circulate easily in the dining area; they shall be of adequate size to enable customers to dine in comfort;
- ❑ floors shall be clean and without dangerous steps, tears in carpets, vinyl tiles;
- ❑ decor shall be in good taste and in good clean condition;
- ❑ table appointments shall be of good quality (this includes cutlery, condiments, ashtrays, tablecloths, napkins, mats etc.);
- ❑ an adequate number of toilets shall be available for men and women and shall be clearly signed; these shall be in first class repair and shall be regularly inspected to ensure cleanliness and overall maintenance; there shall be adequate natural artificial ventilation; attention will be paid to the ease of use by disabled persons;

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- ❑ kitchen equipment shall be adequate and suitable for the type of catering provided; this covers cooking, food storage, and food preparation equipment; floors, walls and ceilings shall be of a suitable type to maintain the highest standards of hygiene; cooking utensils shall be of suitable design and properly stored; waste bins shall be covered and suitably located; yards and approach areas to the kitchen shall be maintained in the same hygienic condition;
- ❑ the restaurant shall be under the constant control of a competent manager or supervisor during operating hours;
- ❑ waiters/waitresses shall be properly trained in the service of food and, if appropriate, drink; they shall be friendly, clean, neat, tidy and pleasant in appearance;
- ❑ kitchen staff shall be competent and clean;
- ❑ indoor seating shall be provided for at least 20 persons.

2 **Refreshments and Take-away:**

All facilities providing refreshment and/or takeaways considered for the provision of a tourism service sign shall provide a photocopy of a current trading/operating licence and shall be inspected for compliance with the following criteria.

GFSB 4-2

GFS B4-3

Basic requirements:

- ❑ the premises and operation shall be in accordance with statutory requirements of local and other authorities with regard to planning, construction, water supply, sewage disposal, garbage collection and disposal, fire precautions and general safety;
- ❑ rural - within 5 km of the nearest numbered route;
- ❑ urban - with 1 km of the nearest national route or within 500 m of the nearest other numbered route;
- ❑ the facility shall be open 12 hours per day 365 days per year;
- ❑ the food shall be of good quality, properly cooked and attractively presented;
- ❑ waiter/menu service shall be efficient, courteous, and clear, and in sufficient number, giving prices, VAT and any extra charges;
- ❑ the entire area shall be suitably and adequately illuminated;
- ❑ an adequate number of toilets shall be available for men and women and shall be clearly signed; these shall be in first class repair and shall be regularly inspected to ensure cleanliness and overall maintenance ;
- ❑ kitchen equipment shall be adequate and suitable for the type of catering provided; this covers cooking, food storage, and food preparation equipment; floors, walls and ceilings shall be of a suitable type to maintain the highest standards of hygiene; cooking utensils shall be of suitable design and properly stored; waste bins shall be covered and suitably located; yards and approach areas to the kitchen shall be maintained in the same hygienic condition;
- ❑ waiter/waitresses shall be properly trained in the service of food and, if appropriate, drink; they shall be friendly, clean, neat, tidy and pleasant in appearance;
- ❑ kitchen staff shall be competent and clean;
- ❑ indoor and/or outdoor seating shall be provided for at least 10 persons;
- ❑ a parking area adequate for 10 light vehicles and 5 heavy vehicles shall be available.

4.6.7 Level 2 Warrant Criteria: General Services: Group B5

1 All facilities shall have a clean, attractive and well-kept appearance and shall be in good state of repair.

(a) **Parking Area:**

GFS B5-1

Basic requirements:

- ❑ according to Parking Policy;
- ❑ according to Parking Management Plan of the Authority.

(b) **Toilets:**

GFS B5-2

(c) **Shower:**

GFS B5-3

(d) **Drinkable Water:**

GFS B5-4

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(e) **Fireplace:**

GFS B5-5

(f) **Cooking Facilities:**

GFS B5-6

(g) **Picnic Area:**

GFS B5-7

(h) **Tourist Information:**

GFS B5-8

Basic Requirements:

- ❑ basic information to be available on a 24 hour basis;
- ❑ sufficient information provided;
- ❑ structure to be provided;
- ❑ a person with a knowledge of tourism to be provided;

(i) **Facilities for Handicapped Persons:**

GFS B5-9

Basic requirements:

- ❑ in central business areas "identified" by the authority;
- ❑ at activity centres approved by authority.

(j) **Roadside Stall:**

GFS B5-10

Basic requirements:

- ❑ access road or lay-by shall be safe and of an acceptable standard of surface;
- ❑ sufficient safe parking shall be available for 5 vehicles;
- ❑ these facilities shall comply with any requirements for the establishment of farm stalls, curio shops or hawking stalls as may be laid down by the relevant road or local authority.

Products are to be South African manufactured or specifically handmade. Location should provide tourism activities to comply with general tourist attraction warrants.

(k) **Post Offices:**

GFS B5-11

Basic requirements:

- ❑ open during office hours;
- ❑ telephone available 24 hours.

4.6.8 Level 2 Warrant Criteria: Rest and Service Areas: Group B6:

1 **Rest Area Class1:**

GFS B6-1

Basic Requirements:

- ❑ tree shade;
- ❑ rubbish bin;
- ❑ table and bench.

2 **Service Area Class 2:**

GFS B6-2

Basic requirements:

- ❑ roofed shade;

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- ❑ toilets;
- ❑ braai;
- ❑ rubbish bin;
- ❑ tables and benches.

3 **Service Area Class 3:**

GFS B6-3

Basic Requirements:

- ❑roofed shade;
- ❑toilets;
- ❑braai;
- ❑rubbish bin;
- ❑tables and benches;
- ❑fuel;
- ❑restaurant for light and heavy vehicle drivers and passengers;

4 In addition the following criteria shall apply:

(a) fuel and restaurant facilities shall comply with warrants for these types of facilities;

(b) a wide range of additional facilities may be provided;

(c) the facility may qualify for the use of primary name on the tourism signs provided;

(d) warrants for signing are given in Volume 1.

4.6.9 Level 2 Warrant Criteria: Vehicle Class: Group B7:

1 This class of facility shall ONLY apply if a rest, service, or rest and service area has different access points for different classes of vehicle. This type of access arrangement is not generally recommended.

GFS B7-1
Motor Cars

GFS B7-2
Caravans

GFS B7-3
Buses

GFS B7-4
Trucks

4.6.10 Level 2 Warrant Criteria: Accommodation: Group C1:

1 All accommodation facilities considered for the provision of a tourism service sign shall provide a photocopy of a current trading/operating licence and shall be inspected for compliance with the following criteria by staff of a Regional Tourism Body at regular intervals. The following are working definitions provided by SATOUR:

(a) Hotel - "A Hotel is a purpose built building which provides lodging, meals and beverages and is accessible to the public";

(b) Chalet/Self-catering Establishment - "Establishments participating in the self-catering category shall consist of at least four units and will have a owner/manager on the premises. This category will include timeshare apartments, game parks, holiday resorts etc";

(c) Guest House - "A Guest House is an owner managed commercial accommodation establishment of not less than 4 and not more than 16 bedrooms, and which has its primary source of business, the supply of tourist accommodation and a substantial breakfast for resident guests, and the provision of a substantial dinner where such facilities are not readily in the vicinity";

(d) Bed and Breakfast - "Bed and Breakfast is an informal, irregular accommodation operation undertaken from a private dwelling";

(e) Youth Hostel - Provide lodging to youth travellers.

2 A distance warrant is not appropriate for accommodation facilities in urban areas. Information lay-byes should provide accommodation information to the public if required. Otherwise it is considered the responsibility of the facility to ensure that its guests know the street address. Correspondingly it is the responsibility of the local authority to ensure that street name signing is of an adequate standard.

A final turn sign shall not be warranted if the facility access is clearly visible or if the hotel can be adequately identified by its street address.

3 **Hotels, Motels, Inns and Lodges:**

GFS C1-1

Basic requirements:

- ❑ SATOUR quality graded or inspected / recommended;
- ❑ the premises and operation shall be in accordance with statutory requirements of local and other authorities with regard to planning, construction, water supply, sewage disposal, garbage collection and disposal, fire precautions and general safety;
- ❑ rural - from the nearest numbered route if graded or within 10 km of nearest numbered route if inspected / recommended;

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- ❑ reception facilities shall be available 12 hours per day 365 days per year, with the capability to accept, by prior arrangement, arrivals 24 hours per day;
- ❑ breakfast and beverages shall be provided;
- ❑ premises to be clean;
- ❑ premises to be well kept in a good state of repair;
- ❑ brochure should be available.

4 **Chalet/Self Catering Establishments:**

GFS C1-2

Basic requirements:

- ❑ SATOUR graded and inspected / recommended;
- ❑ the premises and operation shall be in accordance with statutory requirements of local and other authorities with regard to planning, construction, water supply, sewage disposal, garbage collection and disposal, fire precautions and general safety;
- ❑ may be signed from the nearest numbered route if graded or within 10 km of nearest numbered route if inspected / recommended;
- ❑ reception facilities shall be available 12 hours per day 365 days per year, with the capability to accept, by prior arrangement, arrivals 24 hours per day;
- ❑ available primarily for the lodging or sleeping of travellers with or without booking;
- ❑ well maintained access and internal roads;
- ❑ must provide self-catering facilities;
- ❑ shall have a minimum of 4 accommodation units, with bathroom facilities, separate access and individual parking (i.e. not inter-leading);
- ❑ each chalet shall contain furniture, cupboard space, fittings and equipment of acceptable standard, quality and condition, for sleeping and toilet purposes;
- ❑ brochure should be available.

5 **Caravan Parks and/or Camping Sites:**

GFS C1-3

GFS C1-4

Basic requirements:

- ❑ the premises and operation shall be in accordance with statutory requirements of local and other authorities with regard to planning, construction, water supply, sewage disposal, garbage collection and disposal, fire precautions and general safety;
- ❑ SATOUR quality graded or inspected / recommended;
- ❑ rural - within 20 km of nearest numbered route;
- ❑ urban - within 5km of the nearest numbered route;
- ❑ reception facilities shall be available 12 hours per day 365 days per year, with the capability to accept, by prior arrangement, arrivals 24 hours per day;
- ❑ the facility shall have at least 20 sites;
- ❑ at least 20% of sites shall be available to short-term visitors including single night visits;
- ❑ there shall be adequate space between sites and internal facilities such as ablution blocks;
- ❑ ablution blocks or any other structures provided shall be provided with adequate natural and/or artificial lighting and natural and/or artificial ventilation;
- ❑ hot and cold water shall be available during all reasonable hours;
- ❑ the premises shall be under the regular supervision of a responsible person capable of maintaining order and control;
- ❑ the premises shall be adequately staffed to maintain the above services at all times;
- ❑ brochure should be available.

6 **Guest House**:

GFS C1-5

Basic requirements:

- ❑ SATOUR quality accredited or inspected / recommended;
- ❑ reception facilities shall be available 12 hours per day 365 days per year, with the capability to accept, by prior arrangement, arrivals 24 hours per day;
- ❑ rural - may be signed from nearest numbered route;
- ❑ may be signed from the last public road (urban);
- ❑ parking shall be to an adequate standard;
- ❑ accommodation of 4 bedroom-en-suite (or private bathroom) shall be available;
- ❑ meals shall be provided (self-catering facilities shall not be provided);
- ❑ dining room facilities shall be available;
- ❑ brochure should be available;
- ❑ each room shall contain furniture, lighting, cupboard space, fittings and equipment of acceptable standard, quality and condition, for sleeping.

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Preferred requirement:

- ❑ the premises and operation shall preferably be a registered business run in accordance with statutory requirements of local and other authorities with regard to planning, construction, water supply, sewage disposal, garbage collection and disposal, fire precautions and general safety.

7 **Bed and Breakfast:**

GFS C1-6

Basic requirements:

- ❑ SATOUR accredited or inspected / recommended;
- ❑ may be signed from the last public road;
- ❑ open 12 hours per day, 365 days a year;
- ❑ premises should be clean and attractive and in good state or repair; shall provide breakfast;
- ❑ available primarily for the lodging or sleeping of travellers;
- ❑ provision shall be made for bedding;
- ❑ brochure should be available;
- ❑ parking should be provided;
- ❑ bathroom facilities not be shared with household.

8 **Youth Hostel:**

GFS C1-8

Basic requirements:

- ❑ the hostel, when making application to its Municipality, must be in receipt of a letter from the Youth Hostel Association; the letter will confirm the hostel as being a member and as such, will meet the IYHFs International Operating Standards as mentioned, together with those listed below;
- ❑ the minimum number of beds is 10;
- ❑ the hostel must be clean and secure;
- ❑ the hostel must offer 24-hour access or else, provision must be made for check-ins if the manager/owner is not available;
- ❑ space between beds must be adequate, as must the number of toilets/bathrooms correlate to the number of people, as specified in the IYHF Operating Standards Manual;
- ❑ where bedding is not automatically provided, provision must be made for the hiring thereof;
- ❑ the hostel must be open throughout the year;
- ❑ sufficient parking should be available;
- ❑ the hostel must either provide self-catering facilities or communal dining room facilities with meals;
- ❑ signed from nearest numbered route.

4.6.11 Level 2 Warrant Criteria: Tourist Attractions: Groups A1 to A13:

1 Generic Warrants - all facilities to be signed shall have a clean, attractive and well kept appearance and shall be in a good state of repair. The relevant criteria are listed for each type of facility.

2 **Tourist Attractions Facilities**:
(see Figures 4.30 and 4.31):

- ❑ open to the public;
- ❑ registration (when appropriate);
- ❑ information;
- ❑ toilets;
- ❑ well maintained access and internal roads;
- ❑ parking;
- ❑ rural - within 50 km of the nearest numbered route;
- ❑ urban - within 5 km of the nearest numbered route;
- ❑ reception available 12 hours per day 365 days per year, with the capability to accept, by prior arrangement, arrivals 24 hours per day;
- ❑ brochure should be available;
- ❑ appearance must be clean, neat and be maintained in a good condition.

Preferred requirements:

- ❑ drinking water;
- ❑ accommodation (which shall be subject to the appropriate accommodation type warrant and to statutory requirements;
- ❑ additional facilities designed to make a tourists stay more pleasant;
- ❑ in regard to Nature/Game Reserves, only those reserves exhibiting indigenous flora/fauna and are approved/registered by conservation authorities will be eligible.

4.6.12 Level 3 Warrant Criteria

1 The following are basic criteria which may warrant the use of the stated signface design principle on a tourism sign:

(a) **Primary Name:**

- ❑ tourist attractions;
- ❑ class 3 or 4 rest and service area;
- ❑ grade 2 or higher accommodation;
- ❑ hospitals.

(b) **Supplementary Symbols:**

- ❑ is the availability of supplementary facilities obvious from the main symbol?
- ❑ as a function of the distance to the facility is it necessary to indicate supplementary facilities?

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(c) **"Area" Collective Symbol:**

- ❑ to reduce the need for the indication of many facilities until closer to each facility;
- ❑ alternative in marginal cases to provision of an information layby.

(d) **A Distance:**

- ❑ if distance is greater than might be expected;
- ❑ if road condition is poor;
- ❑ if distance is greater than 20 km;
- ❑ if road is a "dead-end" road.

(e) **A Route Number:**

- ❑ if facility is only public destination on a numbered route.

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TABLE 4.5 TOURIST ATTRACTIONS – SPECIFIC WARRANTS TABLE 4.5

Symbol	Description	Warrants - Specific
GFS A5-1	Motor Sport Circuit	Warrants to be laid down by Automobile Association
GFS A5-2	Golf Course	Classified by the national golf council or approprite body. The symbol can also be used for a country club, where: - it is graded by SATOUR and qualifies for signs - golf is the main activity - accommodation and restaurants are available at the club - other sporting facilities such as tennis, sqhash etc are available - the club's principal name plus the symbol can be signed from the nearest numbered route
GFS A5-4	Riding School (Equestrian Events)	- classified according to Riding School Association of South Africa - to be signd only from Class C or "Collector" Roads in urban areas
GFS A5-8	Stadium	It should be a multi-purpose stadium and: - be accessible to the general public at all times - parking should be adequate - should have the basic infrastructure needed for stadiums - see section on special event signing
GFS A7-5	Historic Railway	Registered by NMC (or appropriate authority) Available for excursions by the general public
GFS A7-6	Historical Battlefield	Interpretation material must be provided on site Acknowledged/Registered by the National Monuments Council (or appropriate authority)
GFS A7-7	Geological Site	Warrants laid down by the Geological Society of South Africa
GFS A9 GFS A9-6 GFS A9-2	Arts and Crafts African Art Pottery	According to warrants provided by the Council for Crafts in South Africa - the business has a working studio (and is not simply a gallery, museum or gift shop) wher the visitor is invited to watch or participate while artists demonstrate their skills - the studio is a separate building or if located in the artists residence, the studio has a separate business entrance to that of the residential sace - at least 50% of crafts available for sale on the property are produced on site and the remainder are crafted in South Africa.

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4.7 TOURISM SIGNING APPLICATIONS

4.7.1 General

1 In order to achieve an acceptable degree of similarity or uniformity between different installations of the same type of TOURISM sign in different parts of the country a number of typical examples of signing applications of TOURISM signs are detailed in this section.

2 The choice of signing applications covered has been based on past experience.

3 The applications covered are generally appropriate for the provision of signs for tourist attractions or tourist services. A number refer particularly to the provision of rest and service areas along major routes and tourist routes and to the provision of a continuing sequence of information relevant to the availability and spacing of such placing where rest and service may be obtained.

4 Specific applications which require a somewhat special treatment are:

(a) the signing of information laybys or centres (see Figures 4.25 to 4.27); and

(b) the signing of by-passed towns (see Figure 4.49).

4.7.2 Sign Location

1 Each application includes a diagram and limited text covering such aspects as -

(a) typical signface layouts and sign sequences for one direction of approach to the facility;

(b) the likely number of signs required;

(c) the types of such signs;

(d) the position in which TOURISM signs may be located, with particular regard to other guidance signs.

2 Where appropriate a ACheckliste of items to be considered before finalising an installation of TOURISM signs is provided.

4.7.3 Tourist Information

1 The provision of tourist information about and within a high density tourist area is very important to the overall effectiveness of the signing and operation of the area. Tourist information can be provided in one or all of three ways:

(a) gateway information centres;

(b) information laybys; and

(c) information agents.

2 Gateway information centres may be situated at the entrances to larger tourism areas. These are intended to be major facilities, commonly manned, and for this reason can normally only be provided for on a limited basis. The whole approach to signing a large high density tourism area can be developed around the provision of high quality gateway information centres.

3 Information laybys with map signs of the area may be strategically located so that tourists entering the area can obtain an overview of the area. As an unmanned facility information laybys can represent a liability of sorts since the information is likely to require regular updating and such facilities are prone to vandalism.

4 It is likely that information lay-byes will need to be self-supporting, i.e. responsibility for updating and maintenance will be for the local/area publicity or tourism body and/or the local authority concerned. However, such facilities, if combined with existing picnic sites or scenic viewpoints, can offer excellent means to disseminate tourist information.

5 The following functions of tourist information boards have been identified:

(a) to indicate to road users that they are entering a particular tourism region;

(b) to provide road users with a schematic map of the region so that they may orientate themselves should they be uncertain of their exact location;

(c) to indicate the towns which have local information offices;

(d) to indicate the locality of the regional tourism office;

(e) to promote tourism by creating an increased tourism culture in the region amongst the inhabitants and role players who reside within the region.

6 The detailing of Tourism Information Boards should include:

(a) design and detail in a variety of forms; the information board should be colourful and attractive and should utilise the same details as those appearing on the tourism signs, such as symbols;

(b) the following information:

(i) the Aie symbol;

(ii) an orientational insert map of the area and surrounding regions;

(iii) legend describing tourist facilities;

(iv) if possible a distance table showing distances between all towns in the region;

(v) the logo of the tourism association;

(vi) legend AWelcome to...." with the area name.

7 The positioning of information boards is one of the most critical elements in order to derive the maximum usage and lifespan from such boards. The following factors are relevant and must be considered in the assessment of likely positions:

(a) a favourable background promoting the region – e.g. a scenic mountain view;

(b) adequate sight distance before the sign so that there is a sufficient safe stopping distance in order to gain access to the layby;

(c) favourable gradient for vehicles pulling away from layby area;

(d) an existing layby would be a preferential position because of the costs involved in building such a layby and the time factor involved;

(e) an undeveloped site with trees in the road reserve would be ideal in order to provide shade;

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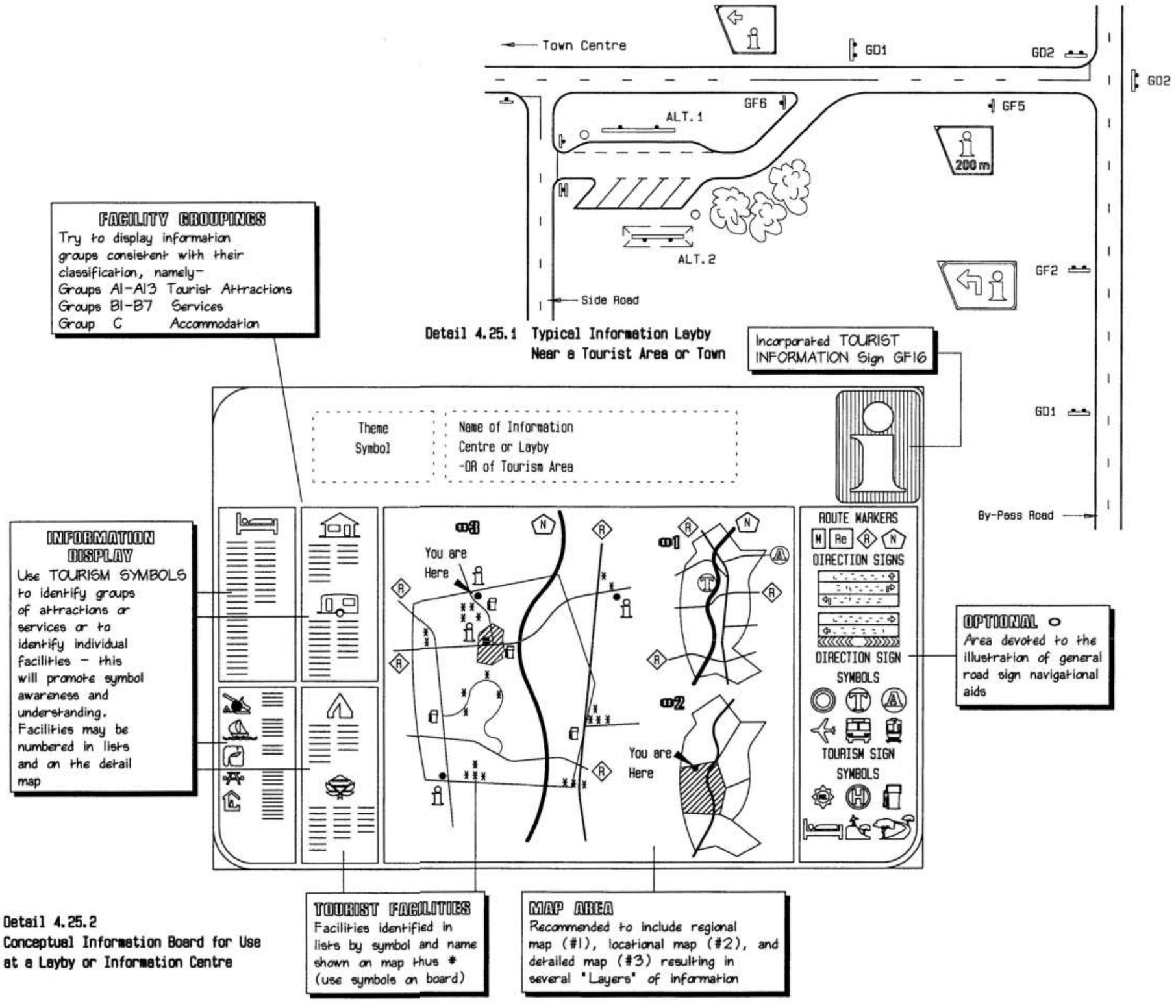

Detail 4.25.1 Typical Information Layby Near a Tourist Area or Town

Detail 4.25.2 Conceptual Information Board for Use at a Layby or Information Centre

Fig 4.25
Information Layby and Board Layouts

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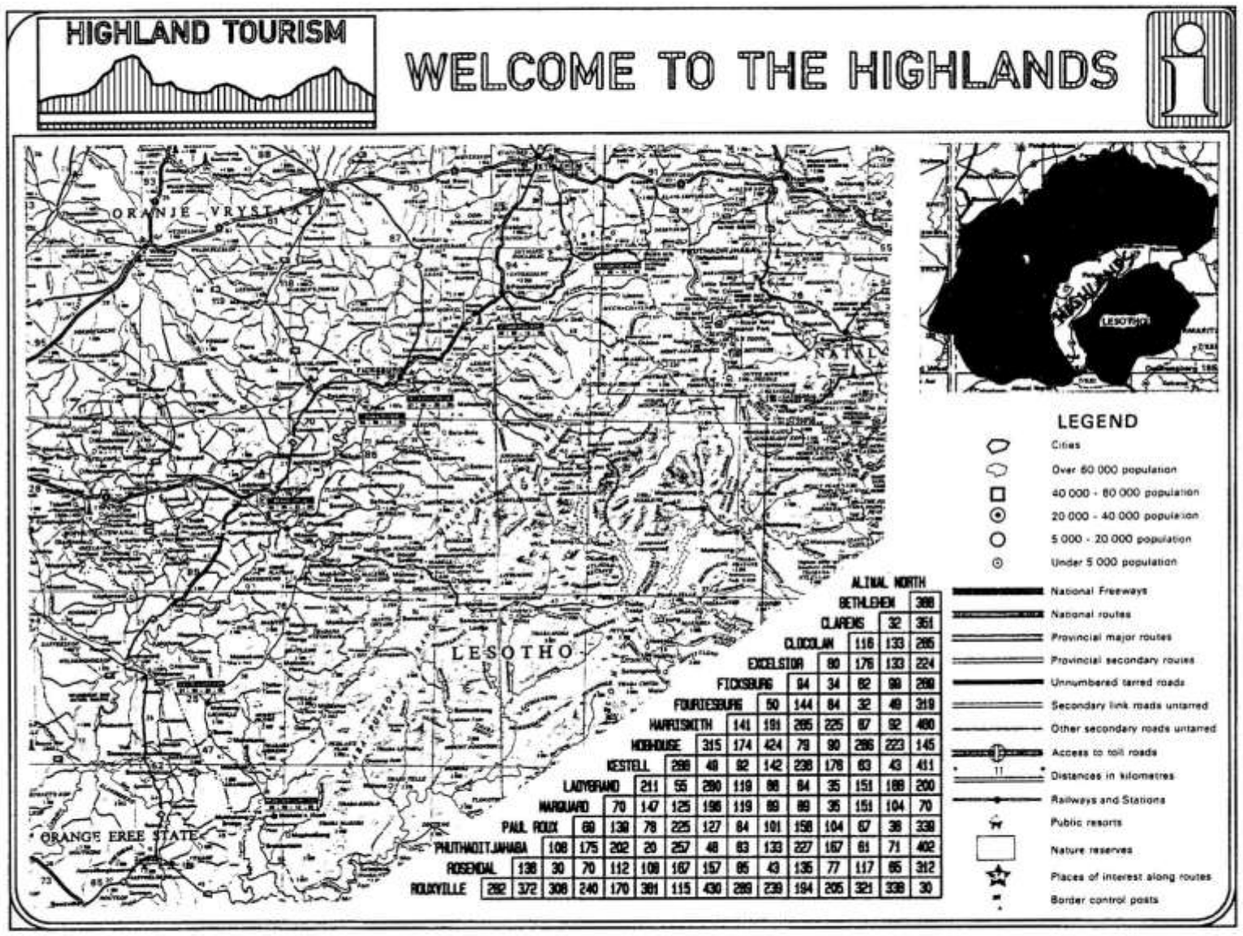
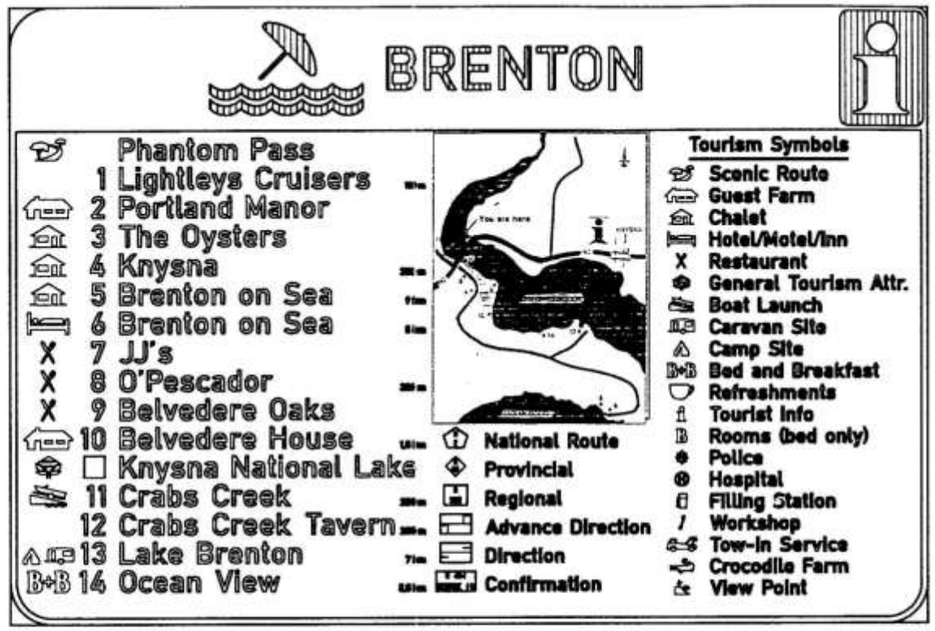
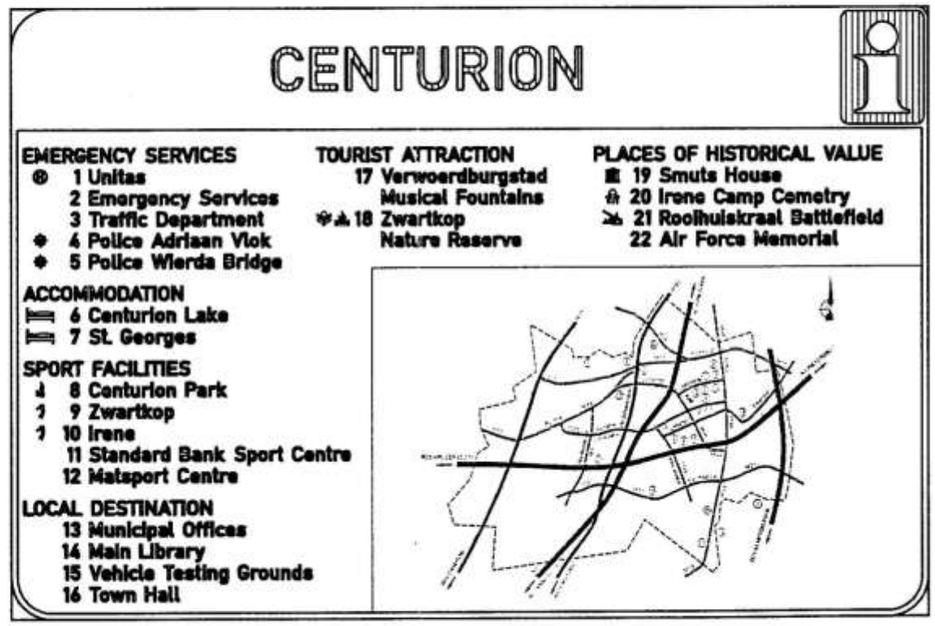


Detail 4.26.1
Example Showing Large Scale Map of Tourism Area with Key and Distance Table

Detail 4.26.2
Example Showing a High Density Tourism Coastal Area Around a Small Town Using Tourism Symbols





Detail 4.26.3
Example Showing a Large Urban Area Using Tourism Symbols

Fig 4.26
Information Board
Examples - 1

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(f) vandalism from pedestrians must be borne in mind and areas where people wait for public transport should be avoided.

(g) positions close to intersections must be avoided because of conflicting traffic manoeuvres which increase the risk of an accident.

8 Subject to the layout of any layby provided (see Figure 4.25) information boards should be placed just like normal road signs at a height of 2m above the shoulder surface and in front of the layby area. Allowance should be made for at least three cars to be parked at a particular layby at any stage in time. This would require approximately 100 m^2 of parking area additional to that of any picnic area. The area should preferably be tarred so that a muddy surface would not deter drivers from parking there and discourage passengers from alighting. The extent of the earthworks required varies from place to place but at least 25 m^3 of compacted natural gravel is estimated.

9 The positions of tourist information laybys should be indicated at least 500 m in advance by means of advanced tourism signs (GF5).

10 Tourist information boards may be designed to be read either by drivers sitting in their vehicles or by persons outside their vehicles standing in front of the board (or both circumstances). The following guidelines may be of assistance in the detailed design of tourist information boards:

(a) letter style - whilst the style of lettering need not be prescribed, the use of clean, uncluttered letter styles is recommended - a typical such style is Helvetica (organisations using Department of Department's ASign Design Program@ may find it convenient to use the DIN 1451 Part 2 letter style, which, being fully proportional, may be reproduced at any size), it is recommended that text be displayed primarily in lower case letters, as in normal written text;

(b) lower case letter height:

(i) 3 mm per metre of viewing distance under good lighting conditions;

(ii) 6 mm per metre of viewing distance under a wider range of lighting conditions;

(iii) 8 mm or above per metre of viewing distance for greater visual impact or to establish an information hierarchy (i.e. for titles);

(iv) the ratio of lower case letter height to uppercase letter height varies from 2:3 to 3:4 according to letter style, the ratio for DIN 1451 Part 2 style lettering is 5:7;

(c) symbols - subject to the complexity of symbols involved these should range between 10:7 and 15:7 times the size of upper case letters used on the board (whilst all symbols may not be uniform height, tourism signs symbols have a nominal ratio of 15:7 and guidance sign symbols have a nominal ratio of 10:7 in relation to DIN 1451 Part 2 upper case letters).
Figures 4.26 and 4.27 show examples of typical information boards, that could be used at information laybys.

11 The use of information agents could be applicable in certain areas. In such areas, it is recommended that the tourism management committee establish a co-ordinated network of information agents by utilising existing service stations, cafes and shops in the area. Such centres of information should be indicated by tourist sign GF17 displaying the TOURIST INFORMATION symbol GFSB5-8. Such a concept will only be effective if the chosen agents are enthusiastic about their role. If they are only open for limited hours, it would be beneficial if they made sure that basic information, such as emergency contact telephone numbers and a map of the area, are available to view on a 24-hour basis.

12 It is also within the area of responsibility of the tourism management committee to see that each and every facility in the area acts as a mini information agent, prepared to promote the area as a whole, and not just their own attractions.

13 Subject to affordability, the technology exists that the centres of information could be fully automated by utilising electronic media tourist information booths which operate in a manner similar to an ATM at a bank.

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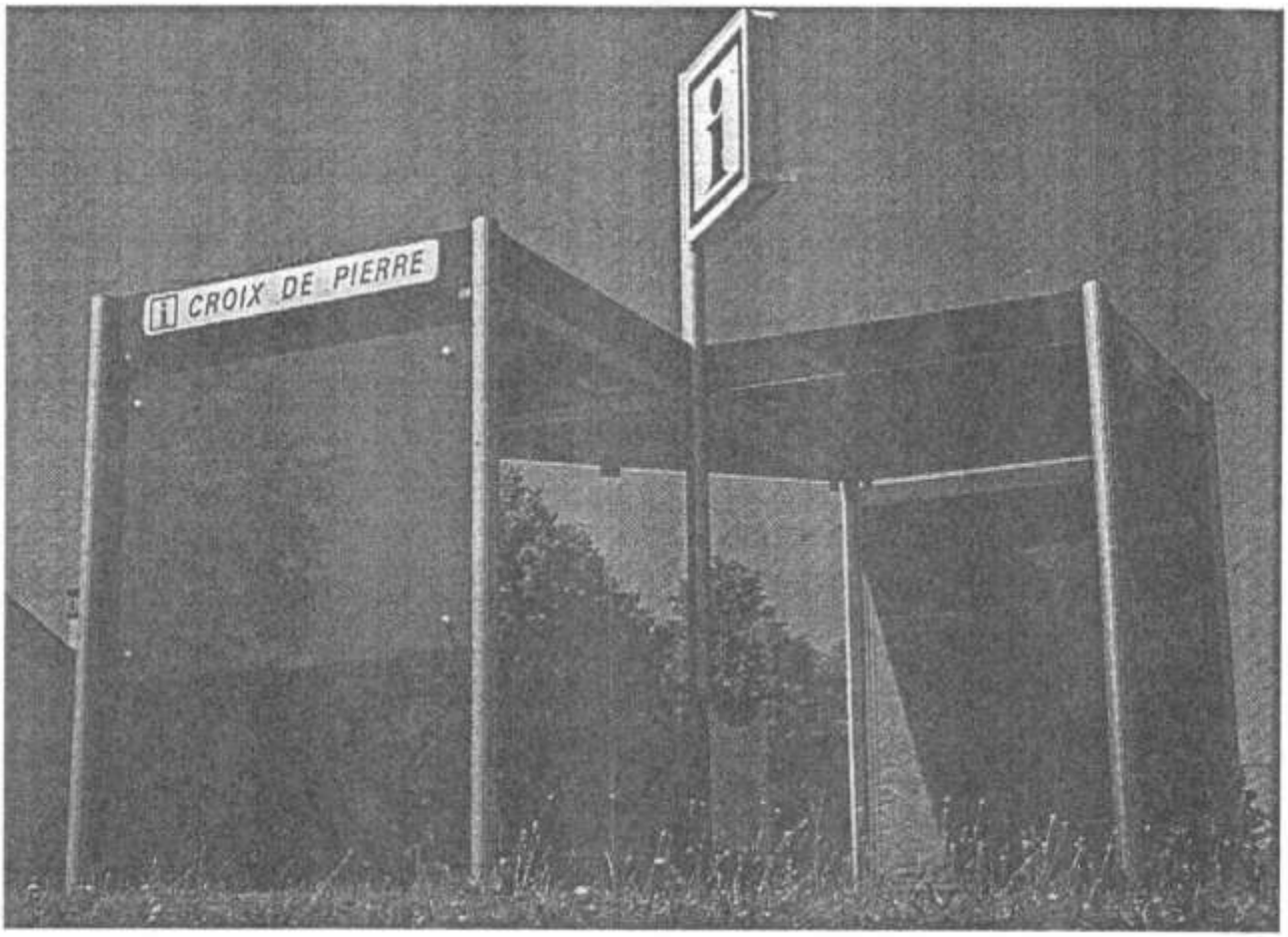

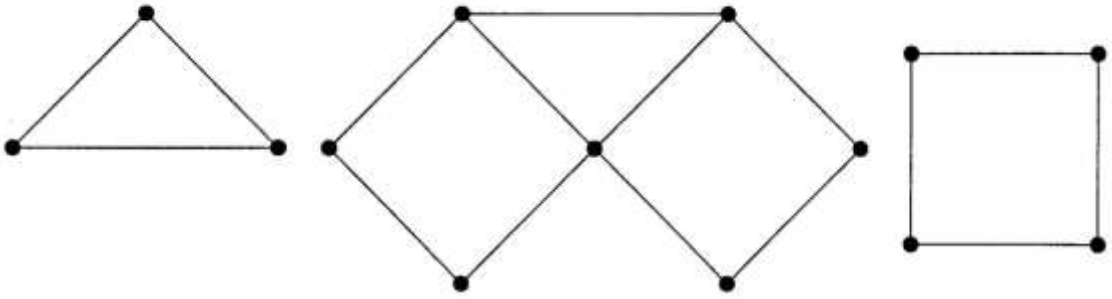

Modular construction to generate maximum surface area from standard components

Fig 4.27 **Information Board Examples - 2**

4.7.4 Direct Access - Numbered or Unnumbered Route

1 This detail illustrates the basic provision of TOURISM signs for the direct access or final turn to a tourist attraction or service facility. This placing sequence may be used from a numbered or an unnumbered road, particularly to a facility which can be considered isolated in the sense that it is not affected by a distance warrant from a nearest junction.

2 The normal requirement is for two signs on each approach from which tourists are likely to drive towards the facility. This provision may be modified in terms of the responses to items in the "Checklist" by either deleting or adding signs.

3 For each approach which is to be signed:

(a) 1 x ADVANCE TURN sign GF2;

(b) 1 x FINAL TURN sign GF3.

4 Signs should be positioned as follows:

(a) the ADVANCE TURN sign should be positioned in advance of the access so that it is two thirds of the standard position of an ADVANCE DIRECTION sign from the access or roadway, whether or not a GD1 sign is in place at the time; under normal circumstances this positioning rule will translate to the following distances:

(i) 120 km/h operating speed - 240 m;

(ii) 100 km/h operating speed - 180 m;

(iii) 80 km/h operating speed - 120 m;

(iv) 60 km/h operating speed - 80 m;

(b) the FINAL TURN sign should be located in the far left corner of the junction of the access and the passing roadway so that drivers entering the access road pass in front of the sign.

Checklist

One or more of the following factors or questions may indicate a need to provide a differing sign treatment, or for some other action to be taken:

- ❑ is the facility visible from the passing road?
- ❑ is the access to the facility safely visible?
- ❑ is the facility one of several covered by an area-wide TOURISM signing exercise and/or information board, layby, or centre?
- ❑ check for Level 3 warrant characteristics.

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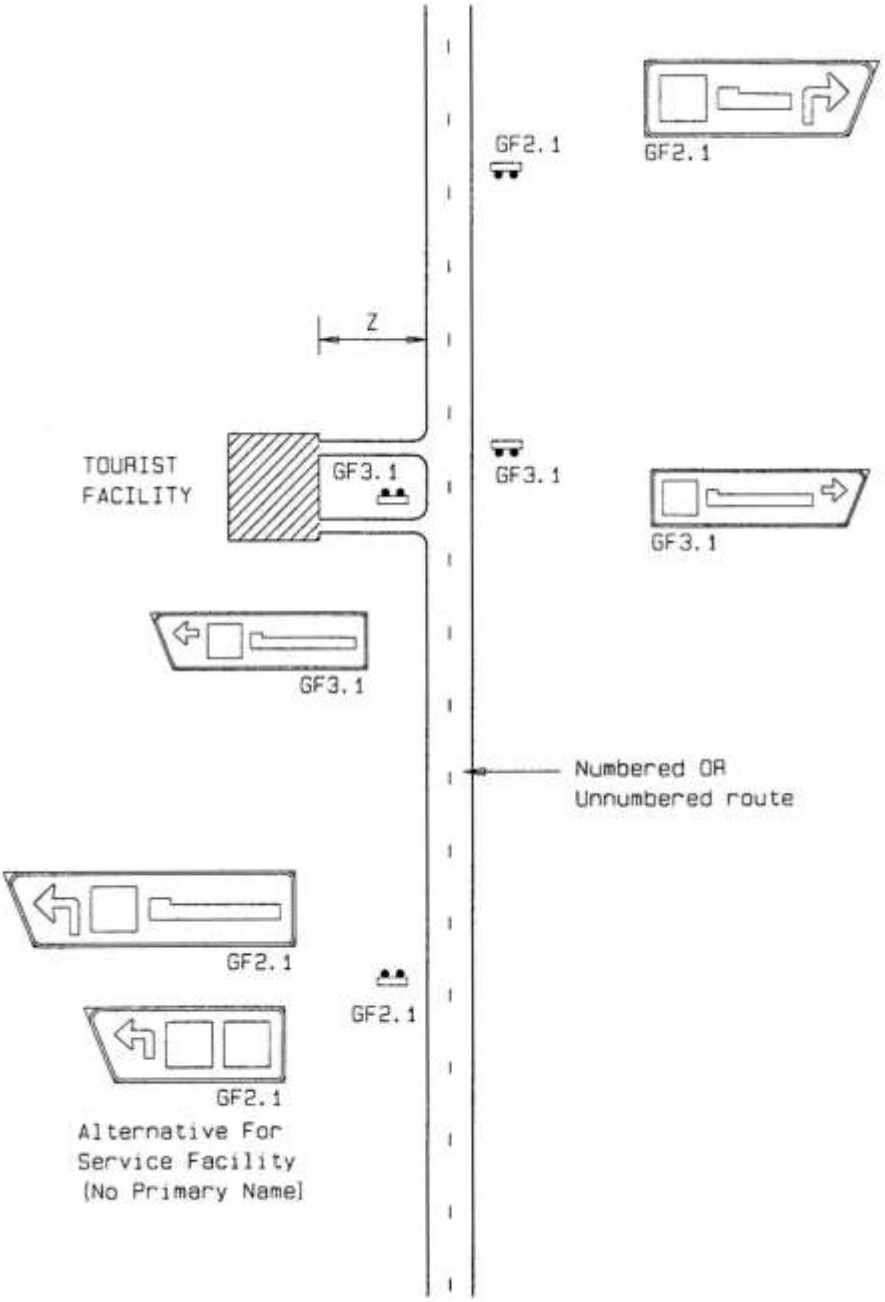

Fig 4.28 Signing for Direct Access from a Numbered Route or Un-numbered Road

4.7.5 Nearest Numbered Route

1 This detail illustrates the signing recommended when a tourist attraction or service facility is accessed from an unnumbered road but lies within the warranted distance **"y + z"** of the nearest junction with a numbered route. (According to the discretionary clause in Volume 1, Subsection 4.9.4 (see also Table 4.2) this sign application may also be appropriate between two numbered routes.)

2 The number of signs required is subject to the number of approaches from which tourists are likely to drive towards the facility. The minimum provision will be two signs. In terms of the example illustrated this number could increase to four signs if all approaches to the junction of the numbered and unnumbered roads are likely to be used. This requirement to increase further to eight signs if tourists can approach from a similar junction located within the warranted distance in the opposite direction.

3 Subject to the circumstances described in paragraph 4.7.5.2:

(a) 1 to 4 x ADVANCE TURN signs GF2;

(b) 1 or 2 FINAL TURN signs GF3.

4 Signs should be positioned as follows:

(a) an ADVANCE TURN sign used on a numbered route approach should be located between the standard GD1 sign and the junction to which it refers so that it is two thirds of the distance of the GD1 sign from the junction; this positioning rule will translate to the following distances:

(i) 120 km/h operating speed - 240 m;

(ii) 100 km/h operating speed - 180 m;

(iii) 80 km/h operating speed - 120 m;

(iv) 60 km/h operating speed - 80 m.

(v) the FINAL TURN sign should be located in the far left corner of the junction of the access and the passing roadway so that drivers entering the access road pass in front of the sign.

Checklist

One or more of the following factors or questions may indicate a need to provide a differing sign treatment, or for some other action to be taken:

- ❑ is the facility visible from the passing road?
- ❑ is the access to the facility safely visible?
- ❑ is the facility one of several covered by an area-wide TOURISM signing exercise and/or information board, layby, or centre?
- ❑ if distance "y + z" for the facility in question is over 10km a distance may be warranted on the GF2 signs, OR a CONFIRMATION sign GF7 may be warranted;
- ❑ check for other Level 3 warrant characteristics.

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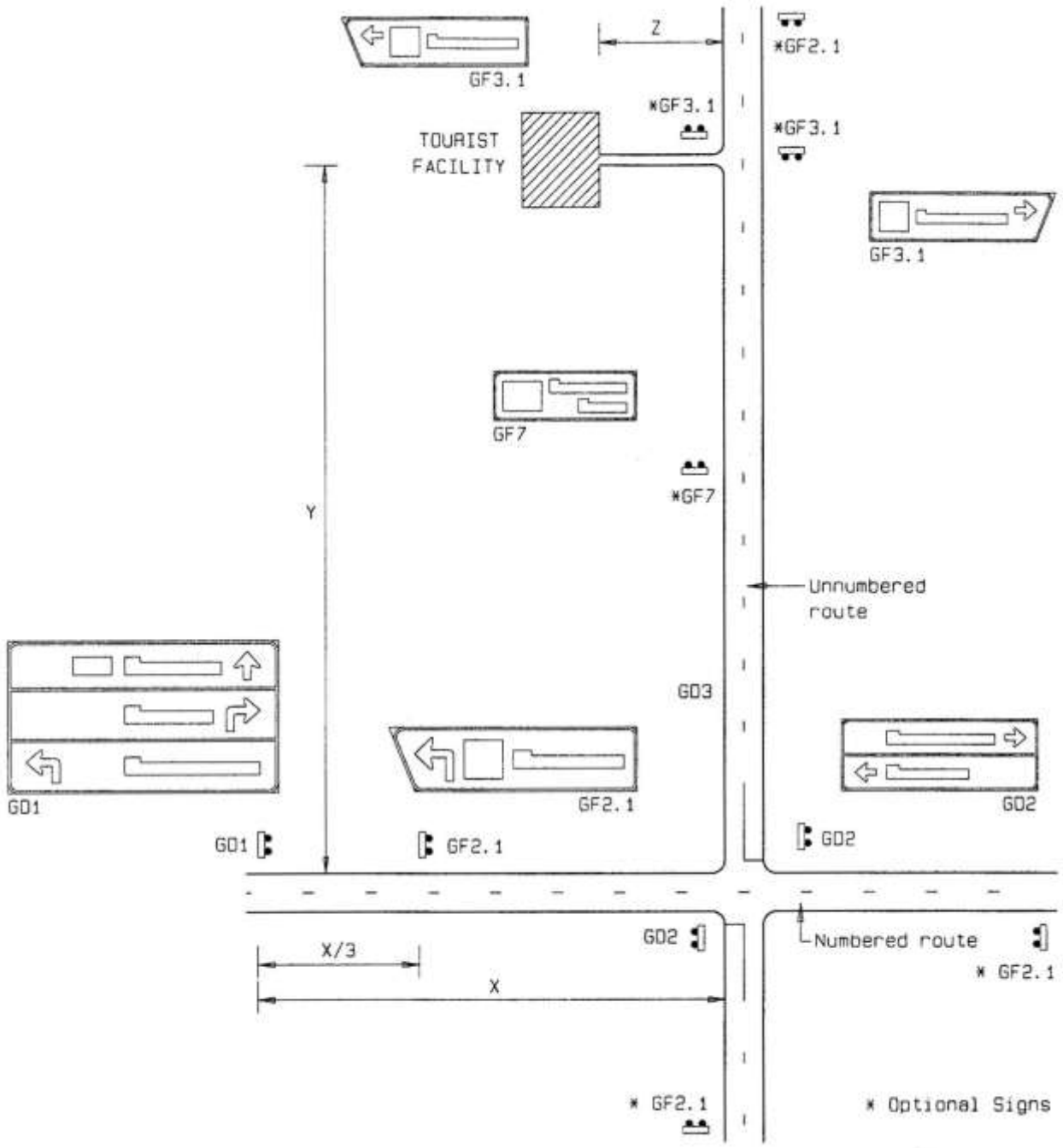

Fig 4.29 **Signing from Nearest Numbered Route – Access Identification**

4.7.6 More than One Facility

1 This figure combines the characteristics of Figures 4.28 and 4.29 with the additional need to differentiate between two tourist attraction or service facilities in relatively close proximity to each other and approached from a common junction. The junction could be any combination of numbered or unnumbered roads. If a large number of facilities exist a tourist information layby should be considered (see Subsection 4.7.3 and Figures 4.25 and 4.26).

2 Additional sign stacks will be required in comparison to the provisions for Figure 4.29 and FINAL TURN signs GF3 may be warranted to clarify the split to the facilities at the common junction remote from the facilities. Once again the total number of signs required is subject to the number of approaches from which tourists are likely to drive towards the facility. The minimum provision will be three signs. The maximum provision covering all approaches could be 10 signs, subject to the need for additional FINAL TURN signs at the main junction.

3 Subject to the circumstances described in paragraph 4.7.6.2:

(a) 1 or 2 x 2 stack ADVANCE TURN signs GF2;

(b) 2 or 4 x 1 stack ADVANCE TURN signs GF2;

(c) 2 to 6 x FINAL TURN signs GF3.

4 Signs should be located as for Figure 4.29. An optional treatment when two GF3 signs (one sign for each direction of approach) are required at the access to a facility, which access is a T-junction, is to locate the GF3 signs on common supports opposite the access branch of the junction as illustrated.

Checklist

One or more of the following factors or questions may indicate a need to provide a differing sign treatment, or for some other action to be taken:

- ❑ is the facility visible from the passing road?
- ❑ is the access to the facility safely visible?
- ❑ is the facility one of several covered by an area-wide TOURISM signing exercise and/or information board, layby, or centre?
- ❑ if distance "y + z" for the facility in question is over 10km a distance may be warranted on the GF2 signs, OR a CONFIRMATION sign GF7 may be warranted;
- ❑ check for other Level 3 warrant characteristics.

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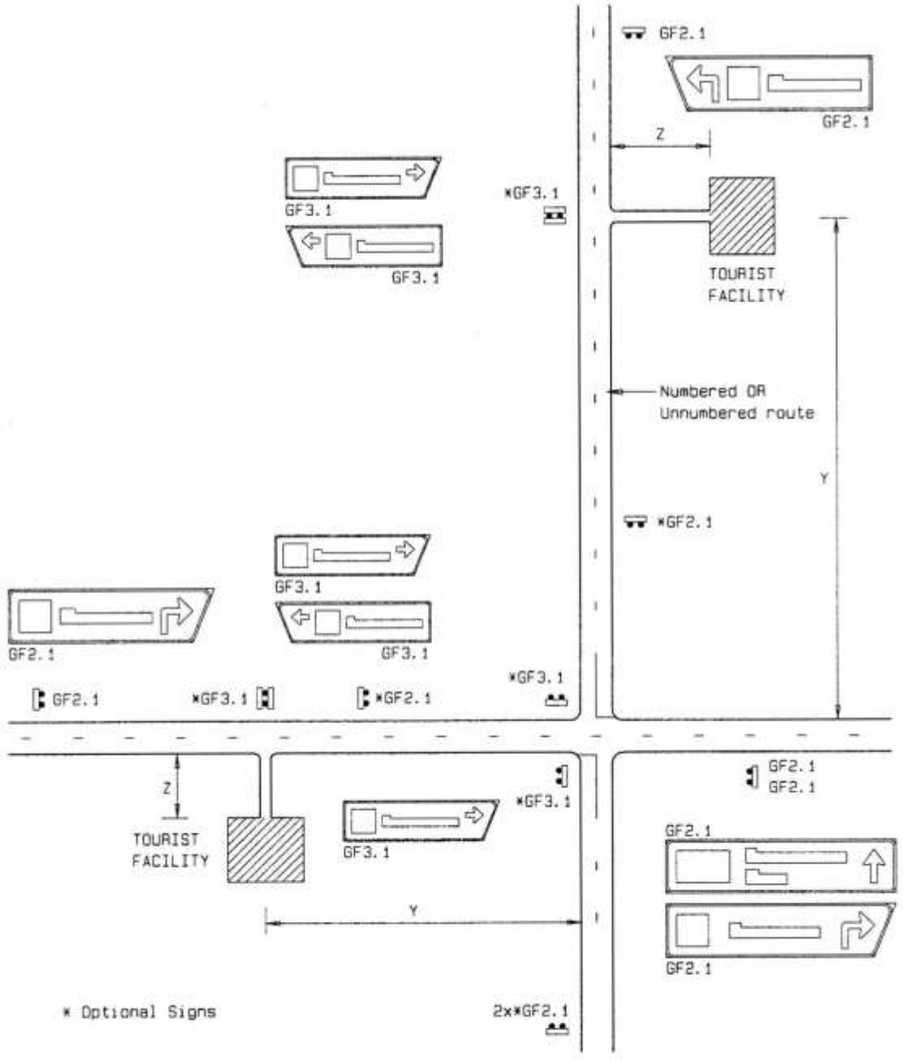
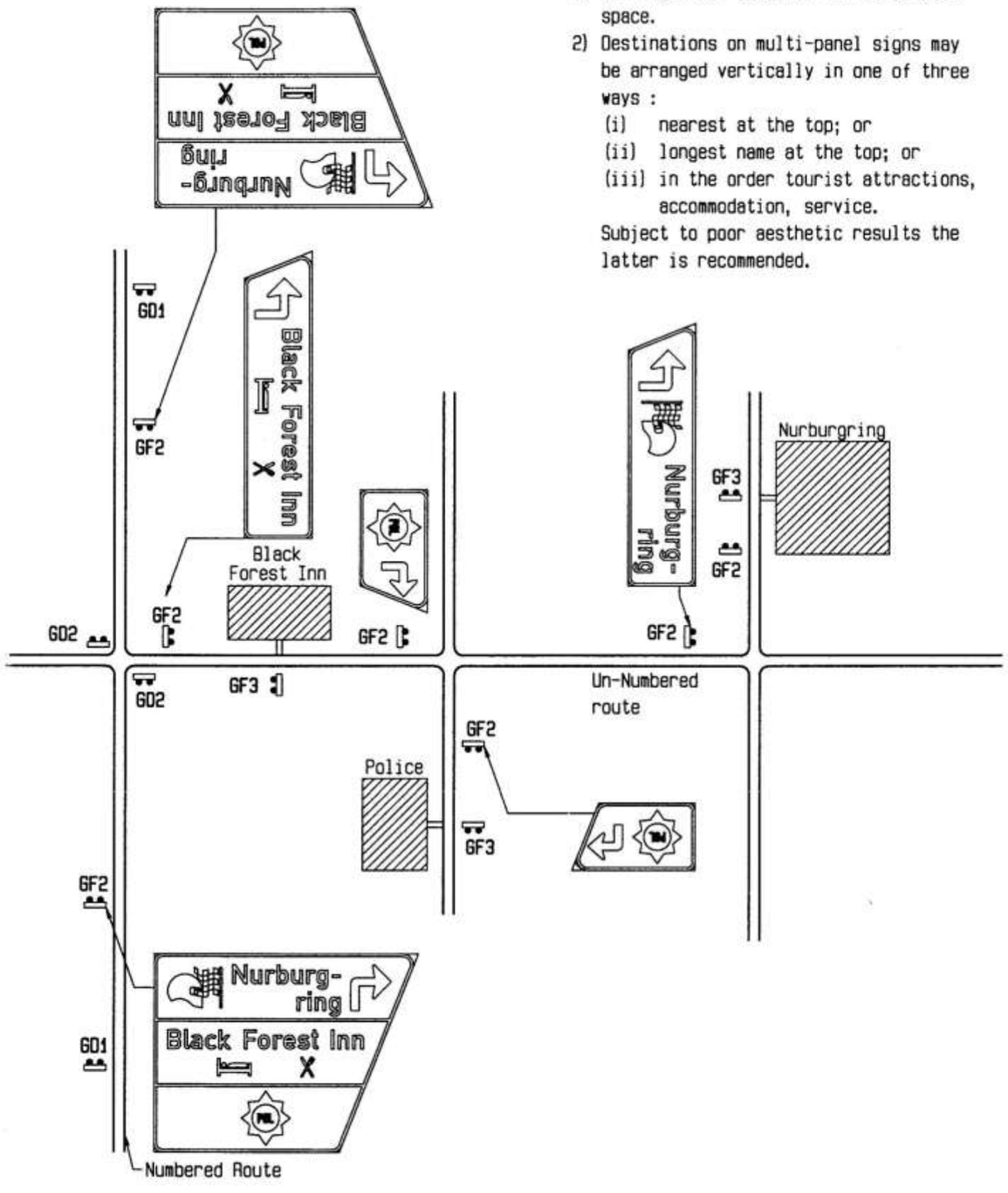


Detail 4.30.1
Typical Signing for More Than One Facility

NOTES :

1) GF3 signs not detailed due to limited space.
2) Destinations on multi-panel signs may be arranged vertically in one of three ways :
   (i) nearest at the top; or
   (ii) longest name at the top; or
   (iii) in the order tourist attractions, accommodation, service.

   Subject to poor aesthetic results the latter is recommended.



Detail 4.30.2
Signs for More Than One Facility-Recommended Panel Order on Multi-Panel Sign

Fig 4.30
Signing for More Than One Facility

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4.7.7 Follow-Up Signs

1 This figure illustrates the signing treatment which may be used when a number of turns are required between the point where the facility is first signed and the final turn towards the facility. Signing for the initial and final turns should be as for Figures 4.29 or 4.30. The signing for intermediate turns may be as for the initial turn, namely using an ADVANCE TURN sign, OR follow-up versions of such signs may be used to reduce cost and space considerations. This placing sequence is particularly appropriate in urban or peri-urban situations..

2 A follow-up ADVANCE TURN sign displays only the symbol used on a preceding ADVANCE TURN sign (the primary name is omitted). The addition of a distance to follow-up ADVANCE TURN signs may also be considered. Subject to the needs of the initial and final turns, which may be determined from Figures 4.28 and/or 4.29, further signs may be required as follows:

(a) 1 x follow-up ADVANCE TURN sign per intermediate turn.

3 Signs should be positioned as follows:

(a) an ADVANCE TURN sign used on a numbered route approach should be located between the standard GD1 sign and the junction to which it refers so that it is two thirds of the distance of the GD1 sign from the junction; this positioning rule will translate to the following distances:

(i) 120 km/h operating speed - 240 m;

(ii) 100 km/h operating speed - 180 m;

(iii) 80 km/h operating speed - 120 m;

(iv) 60 km/h operating speed - 80 m.

(b) a follow-up ADVANCE TURN sign should be positioned in the same way as an ADVANCE TURN sign;

(c) the FINAL TURN sign should be located in the far left corner of the junction of the access and the passing roadway so that drivers entering the access road pass in front of the sign.

Checklist

One or more of the following factors or questions may indicate a need to provide a differing sign treatment, or for some other action to be taken:

- ❑ is the facility visible from the passing road?
- ❑ is the access to the facility safely visible?
- ❑ is the facility one of several covered by an area-wide TOURISM signing exercise and/or information board, layby, or centre?
- ❑ check for Level 3 warrant characteristics.

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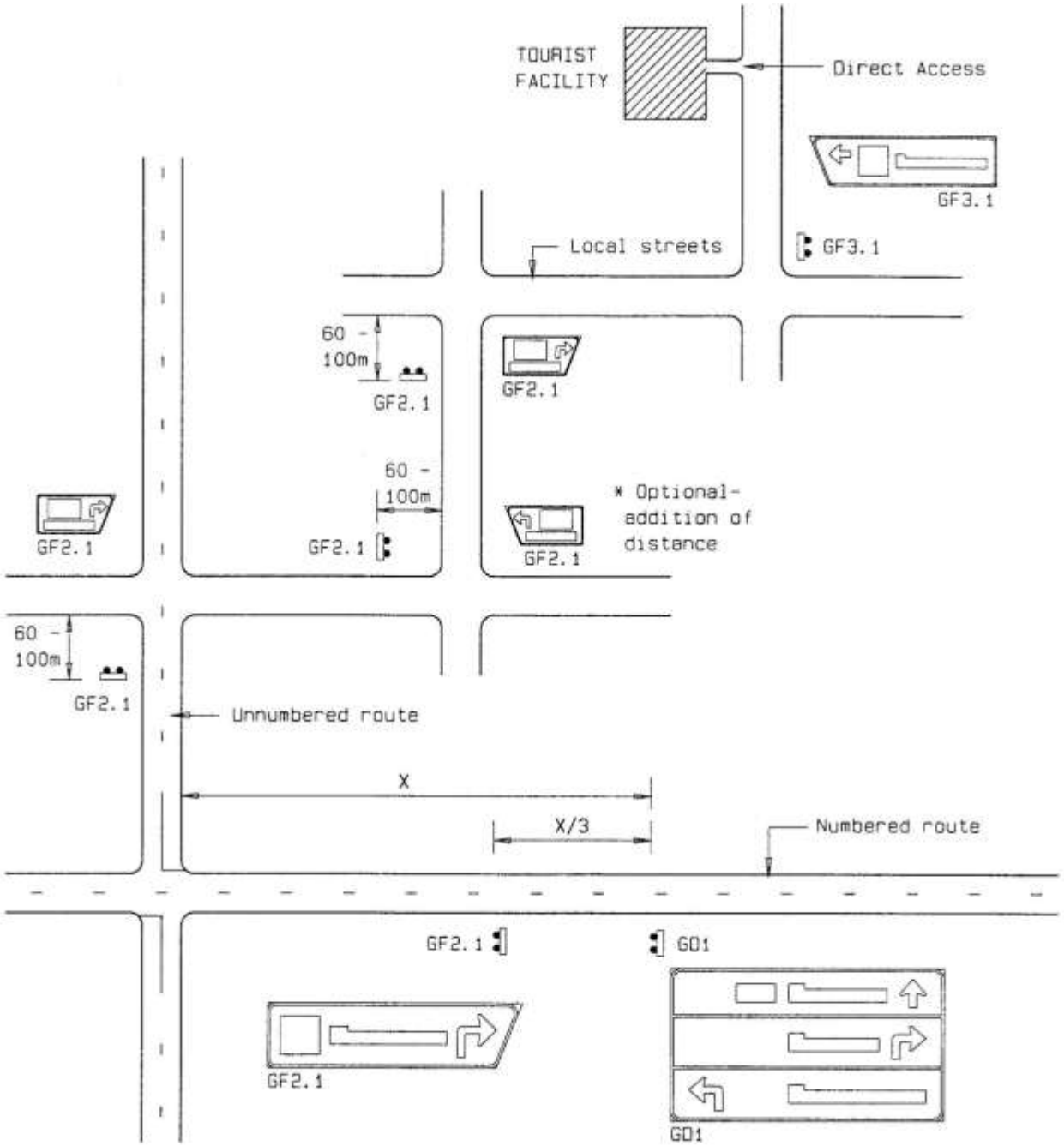

Fig 4.31 Signing for Several Turns – Follow-up Signs

4.7.8 Facility on Minor Route

1 This signing application is a "special case" version of Figures 4.28 or 4.29 where the fact that the access road to the facility is a public road with no other significant public destination results in the FINAL TURN sign being located some distance from the facility. All other aspects of signing should be treated as for Figures 4.28 or 4.29.

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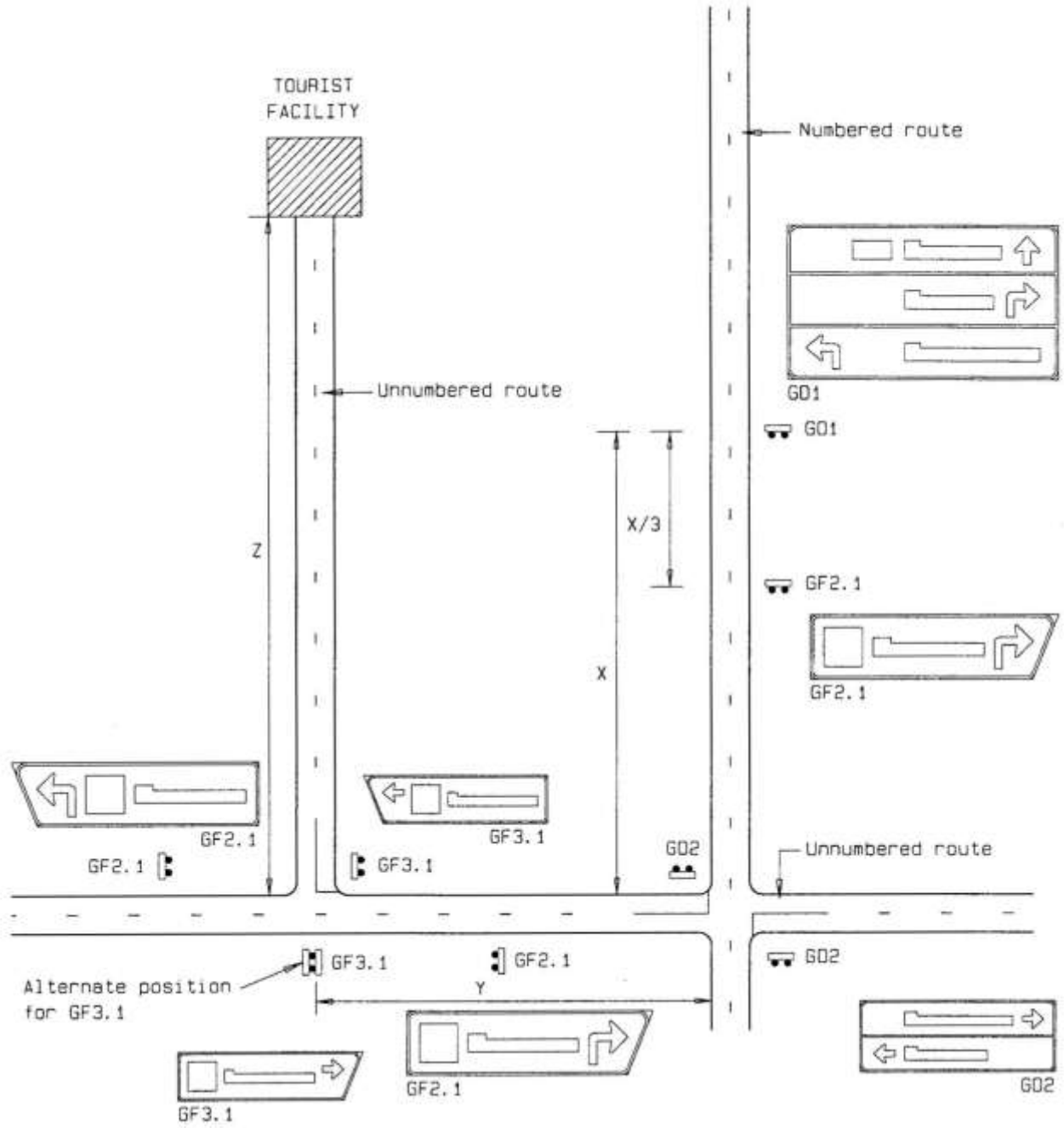

Fig 4.32 Signing from Nearest Numbered Route – Facility Off Minor Public Road

4.7.9 Freeway Sign Sequence

1 This figure illustrates the basic provision of TOURISM signs at a freeway access interchange (the provision of TOURISM signs at a freeway systems interchange is not recommended). This signing application may be used leading to an unnumbered cross road, or within the provisions of Volume 1, Subsection 4.9.4 (see also Table 4.2), leading to a numbered cross route. Additional signs as detailed in earlier Figures are commonly likely to be necessary unless the facility is located in close proximity to the interchange.

2 The normal requirement will be for two signs on each approach to the interchange up to and including the ramp terminal.

3 For each approach the following types of signs are required:

(a) 1 x FREEWAY ADVANCE EXIT sign GF1;

(b) 1 x ADVANCE TURN sign GF2 located on the off ramp.

4 Signs should be positioned as follows:

(a) the FREEWAY ADVANCE EXIT sign should be located on the left side of the roadway approximately 600m in advance of the exit point (this location should be adjusted towards 700m - 800m if a FREEWAY SUPPLEMENTARY EXIT DIRECTION sign is already located at the 500 m point);

(b) the ADVANCE TURN sign should be located on the left side of the off-ramp approximately 60 m-150 m from the ramp terminal; if the off ramp is particularly short the sign should not be located closer to the exit point (see Volume 1, Section 4.8) than half way down the ramp.

Checklist

One or more of the following factors or questions may indicate a need to provide a differing sign treatment, or for some other action to be taken:

- ❑ is the facility visible from the passing freeway?
- ❑ if more than one facility is indicated on the GF1 sign are all facilities to the same direction at the ramp terminal? - if not the GF2 sign should be provided as a two stack sign, one stack to the right over one stack to the left;
- ❑ is the facility one of several covered by an area-wide TOURISM signing exercise and/or information board, layby, or centre?
- ❑ check for Level 3 warrant characteristics.

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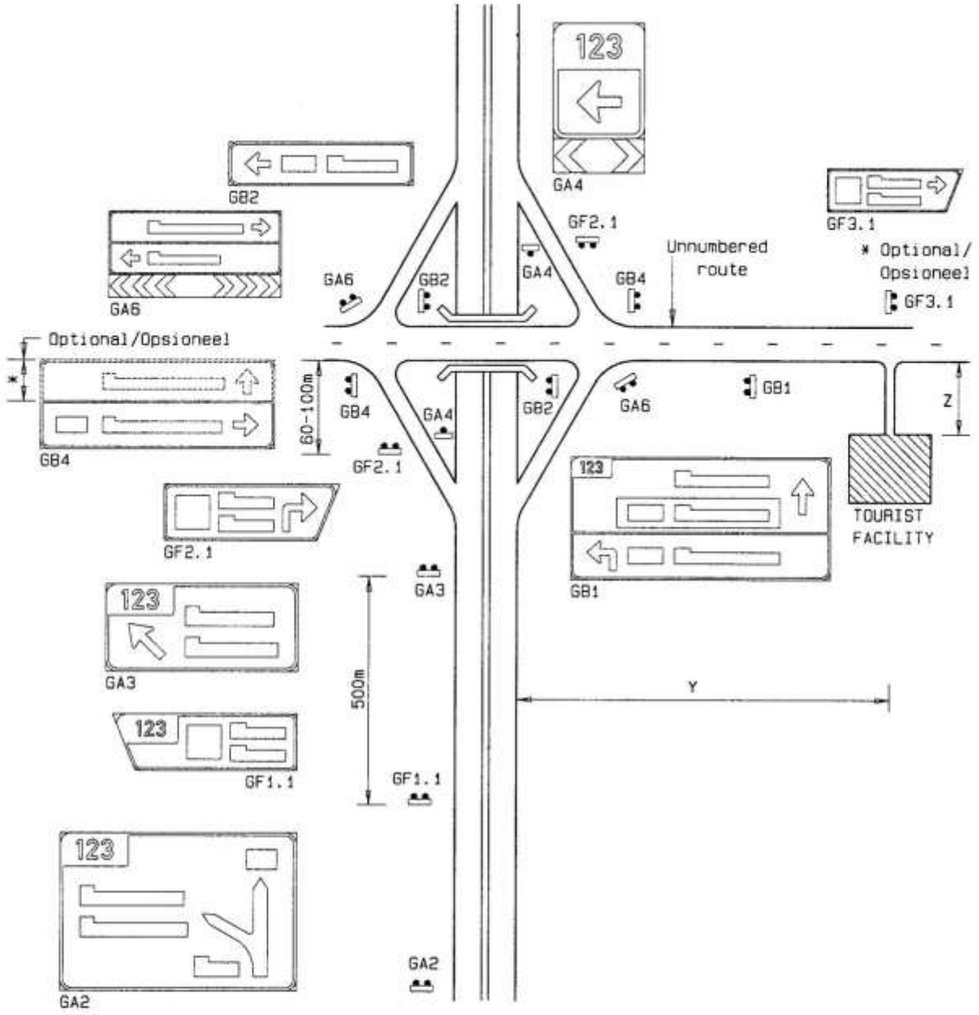
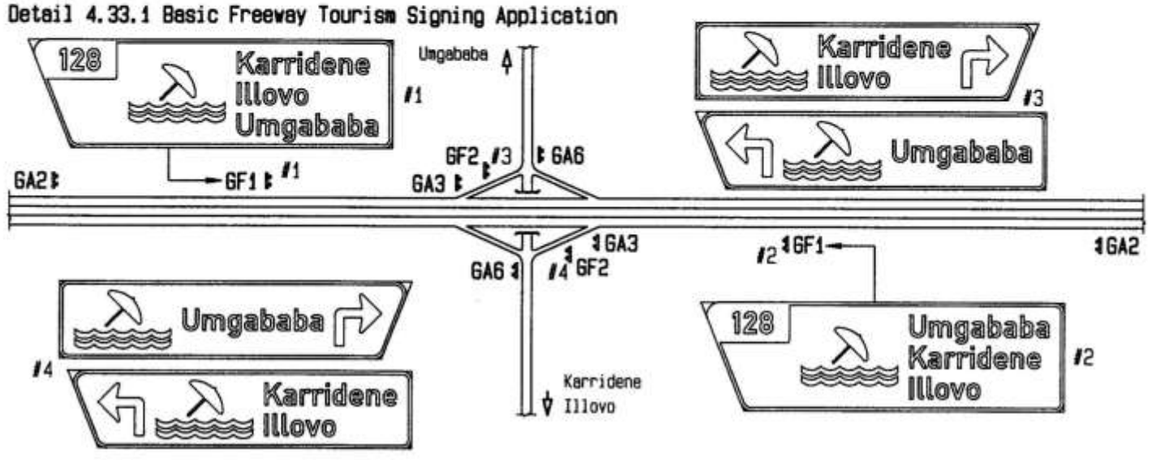
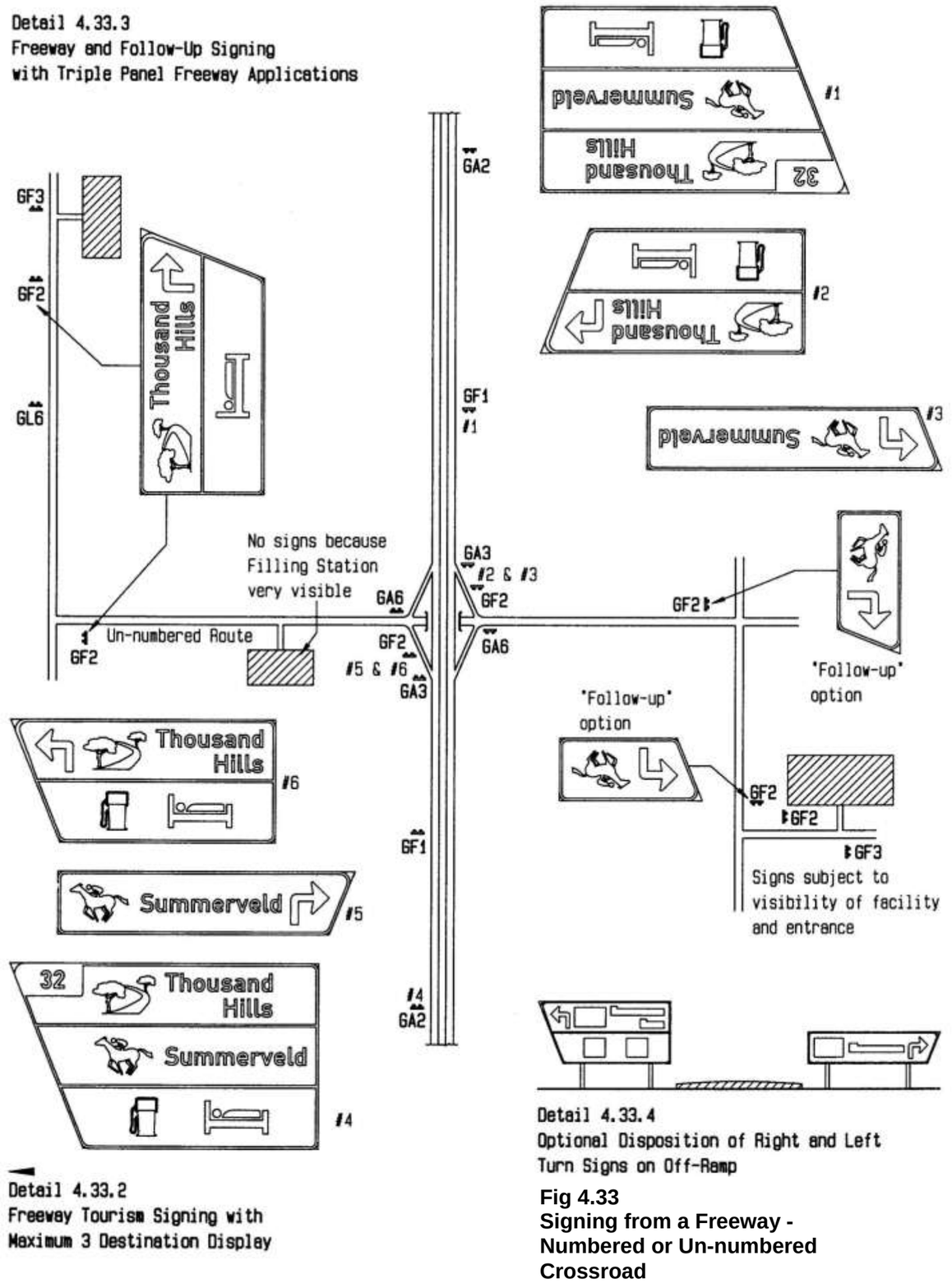


Detail 4.33.1 Basic Freeway Tourism Signing Application



Detail 4.33.3
Freeway and Follow-Up Signing
with Triple Panel Freeway Applications



Detail 4.33.2
Freeway Tourism Signing with
Maximum 3 Destination Display

Detail 4.33.4
Optional Disposition of Right and Left
Turn Signs on Off-Ramp

Fig 4.33
Signing from a Freeway - Numbered or Un-numbered Crossroad

4.7.10 Freeway Service Exit Sequence Signs

1 This figure illustrates the provision of service exit sequence information on a section of freeway. The provision of such information is appropriate when one or more freeway systems intersect and drivers may feel cut off from surrounding areas within which services will be available. The placing sequence is therefore particularly appropriate when the combination of freeway systems intersecting occurs in urban or metropolitan areas. The need for such signs will most likely occur when there are a number of closely spaced interchanges.

2 The normal requirement is for one sign on each appropriate exit side of a freeway systems interchange. If the length of a section of freeway between intersecting freeways, is such that there are very many interchanges, it may be appropriate to provide such signs at regular spacings covering two or three consecutive interchanges.

3 The appropriate sign type is the SERVICE EXIT SEQUENCE sign GF8.

4 The sign should be located at least 1km beyond the last point of entry to the freeway system following a systems interchange, subject to the presence of FREEWAY DIRECTION signs which shall take precedence for position. In addition the sign should preferably not be positioned closer to the first exit indicated than 2km in advance of such exit.

Checklist

One or more of the following factors or questions may indicate a need to provide a differing sign treatment, or for some other action to be taken:

- ❑ is the facility visible from the passing road?
- ❑ only service information may be indicated;
- ❑ primary names shall not be indicated.

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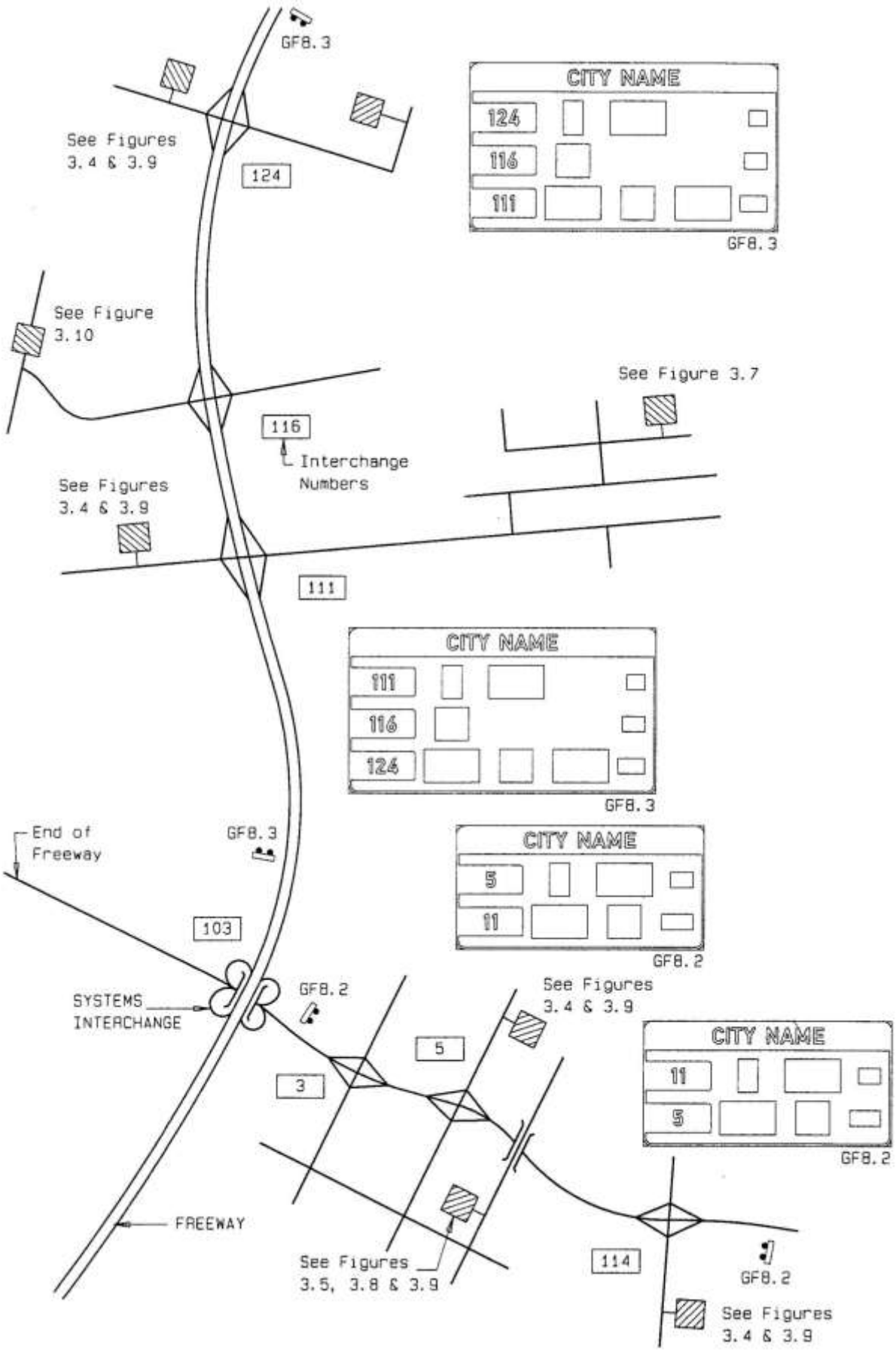

Fig 4.34 **Signing for Service Exit Sequence From a Freeway System**

4.7.11 Freeway Rest and Service Area

1 This figure illustrates the signing treatment of a high standard rest and service area which is provided with direct access from a freeway. The approach signing should be similar to the standard level of FREEWAY DIRECTION signing provided at an access interchange.

2 The normal requirement is for six signs on each approach unless the route in question has been subject to a co-ordinated rest and service area sequence signing exercise in which case seven signs are required on each approach (see Subsections 4.7.12, 4.7.13, 4.7.19 and 4.7.20). This type of facility is commonly provided on both sides of a freeway without interconnecting access.

3 For each approach which has to be signed:

(a) 1 x REST AND SERVICE SEQUENCE sign GF9.1;

(b) 1 x FREEWAY ADVANCE EXIT sign GF1 with distance;

(c) 3 x COUNTDOWN signs IN1, IN2 and IN3 (Brown);

(d) 1 x FREEWAY ADVANCE EXIT sign GF1 without distance;

(e) 1 x GORE EXIT sign GF4.

4 A number of other standard regulatory and warning signs shall be provided, as is the standard treatment for normal freeway off-ramps and on-ramps:

(a) 1 x FREEWAY DE-RESTRICTION sign R601 on the off-ramp;

(b) 1 x SPEED LIMIT sign R201 on the off-ramp;

(c) 1 x FREEWAY BEGINS sign R401 on the on-ramp;

(d) 1 x SHARP JUNCTION sign W112 in the on-ramp gore area;

(e) 1 x SPEED LIMIT sign R201 on the freeway beyond on-ramp.

5 Signs should be positioned as follows:

(a) the REST AND SERVICE SEQUENCE sign should normally be located 2 km in advance of the first exit point shown on the sign;

(b) the FREEWAY ADVANCE EXIT sign indicating a distance should be located at, or within 50 m of, the distance displayed on the sign (this is normally 1km);

(c) the FREEWAY EXIT DIRECTION sign without a distance should be located within 50 m of the point of exit from the freeway;

(d) the GORE EXIT sign should be located within the gore in the conventional manner.

Checklist

One or more of the following factors or questions may indicate a need to provide a differing sign treatment, or for some other action to be taken:

- ❑ the access geometry of the rest and service area shall conform to normal freeway exit and entry treatments;
- ❑ no signs indicating the nature of the services available within the rest and service area shall be located on the freeway (see Figure 4.38);
- ❑ if the distance between rest and service areas exceeds 80 km to 100 km an additional GF9.1 sign may be provided approximately half way between facilities;
- ❑ are further rest and service areas known to be planned for development within the life of the GF9.1 signs?

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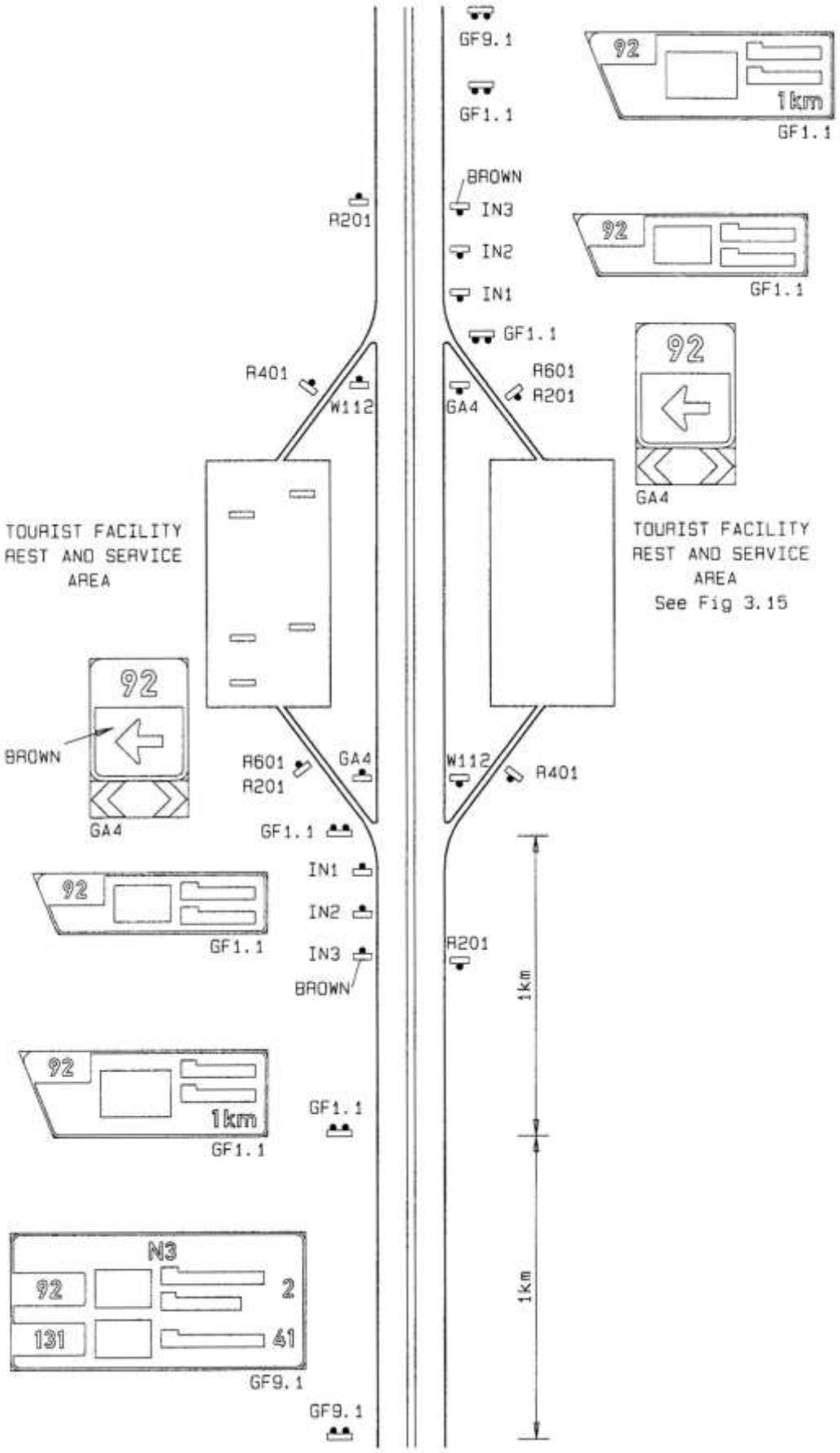

Fig 4.35 Signing for a Direct Access Rest and Service Area from a Freeway

4.7.12 Freeway Rest and Service Exit Sequence Signs

1 This figure illustrates the provision of signs indicating the availability of rest and service facilities along a route. The use of such signs is not appropriate until the availability of such service areas is well developed at regular intervals along the route.

2 On a route basis the decision to provide the signs should be dependent on the number and spacing of the rest and service areas. However, only one sign is required in advance of each area for each direction of approach subject to the provision that if two facilities are more than 80 km to 100 km apart an additional sign may be provided approximately halfway between the facilities.

3 The appropriate sign type is the REST AND SERVICE SEQUENCE sign GF9.1.

4 This sign should be located approximately 2 km in advance of the next available rest and service facility subject to the position of FREEWAY DIRECTION signs.

Checklist

One or more of the following factors or questions may indicate a need to provide a differing sign treatment, or for some other action to be taken:

- ❑ only the next two rest and service areas should be indicated;
- ❑ the signs may indicate named and unnamed facilities, and facilities available to all classes of vehicle or only certain classes of vehicle.

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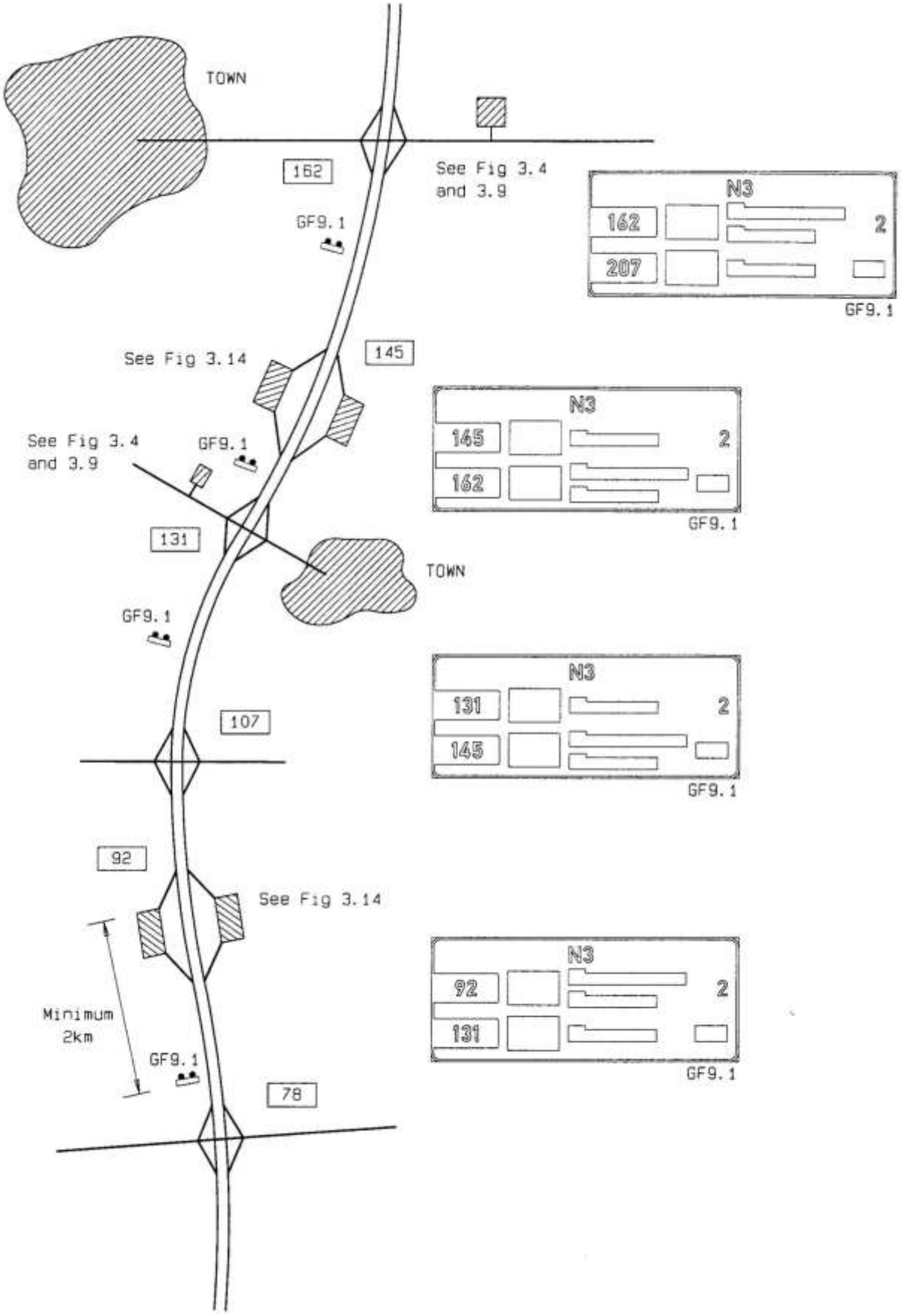

Fig 4.36 Signing for a Sequence of Rest and Service Facilities Along a Freeway Route

4.7.13 Freeway/At-Grade Route Rest and Service Area Sequence Signs

1 This figure illustrates the provision of information relating to the availability of rest and service facilities consistently along a route. The use of such signs is only appropriate once such facilities are established at reasonably frequent intervals. Provision of this type of information along a route will encourage road users to plan their rest and service stops resulting in reduced fatigue and safer driving practices, and thereby reduced accident rates.

2 At least one sign is required, for each direction of travel, in advance of each area supplying the high level service required in terms of rest and service area class 3 and 4 warrants. Additional signs may be provided at approximately 50 km intervals if the distance between rest and service areas exceeds 80 km to 100 km. These signs are included in the placing sequence covered by Subsection 4.7.11.

3 The appropriate sign types are the REST AND SERVICE SEQUENCE signs GF9.1 and GF9.2. This sign type may be used without rest and service area names, particularly if several facilities occur within close proximity of each other. To further reduce sign area, a single symbol may be used if both rest areas offer the same class of service. The possible need for a hybrid GF9.1/9.2 sign in advance of the change from freeway to at-grade sections of route should be noted.

4 The signs should be located approximately 2km in advance of the exit or turn to the rest and service area. In advance of a town on an at-grade section of route a GF9.2 sign should preferably be located in the outer urban area or just beyond the town limits at an increased distance of 5 km to 10 km. GF2 and/or GF3 signs in accordance with Figures 4.28 to 4.31 may be used within towns subject to compliance with distance and other warrants by the facilities and to the availability of roadside space.

Checklist

One or more of the following factors or questions may indicate a need to provide a different sign treatment, or for some other action to be taken:

- ❑ only the next two areas should be indicated on the sign;
- ❑ areas may be given a geographic name in accordance with Section 4.6, and may include generic terms; **the geographic name should not be that of the town in which the facility is located;**
- ❑ signs may display named and un-named facilities, and facilities for all or one vehicle class;
- ❑ if several facilities exist in a town the distance displayed should be to the closest facility, or an average for all;
- ❑ if several facilities exist in a town the sign type GF9.2 should be used without facility names.

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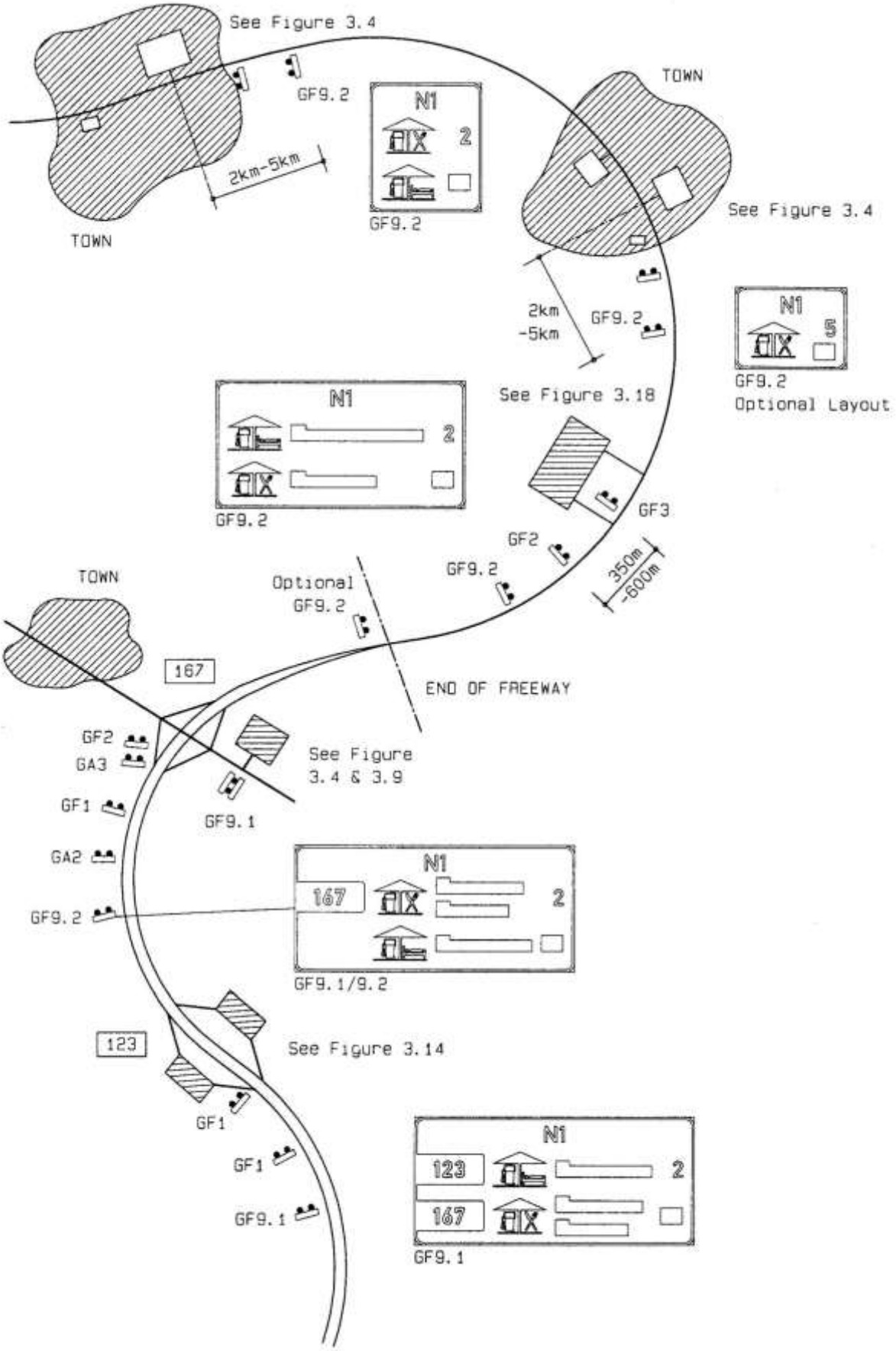

Fig 4.37 **Signing for a Sequence of Rest and Service Facilities Along a Mixed Freeway/At-Grade Route**

4.7.14 "TOTEM" Signing Inside Rest and Service Area

1 This signing application shows an example of the use of "totem" signs within a rest and service area. The example illustrated is a very high standard facility involving detailed landscaping treatment. The use of "totem" signs is equally appropriate for less developed rest and service areas.

2 The number of signs required is entirely dependent on each individual site.

3 The specific types of "totem" signs required is also very site dependent but is likely to include:

(a) arrows;

(b) route number(s);

(c) fuel;

(d) toilets;

(e) food etc.

4 Sign location is dependent on the internal roadway geometry. Signs should be mounted in "totem" clusters close to points where roadways split using one "totem" for each exit road from such internal junctions.

Checklist

One or more of the following factors or questions may indicate a need to provide a differing sign treatment, or for some other action to be taken:

- ❑ "totem" signs shall not be used outside the confines of the rest and service area;
- ❑ is the intention to segregate vehicles by class?
- ❑ is the direction by which drivers return to the freeway clearly visible?

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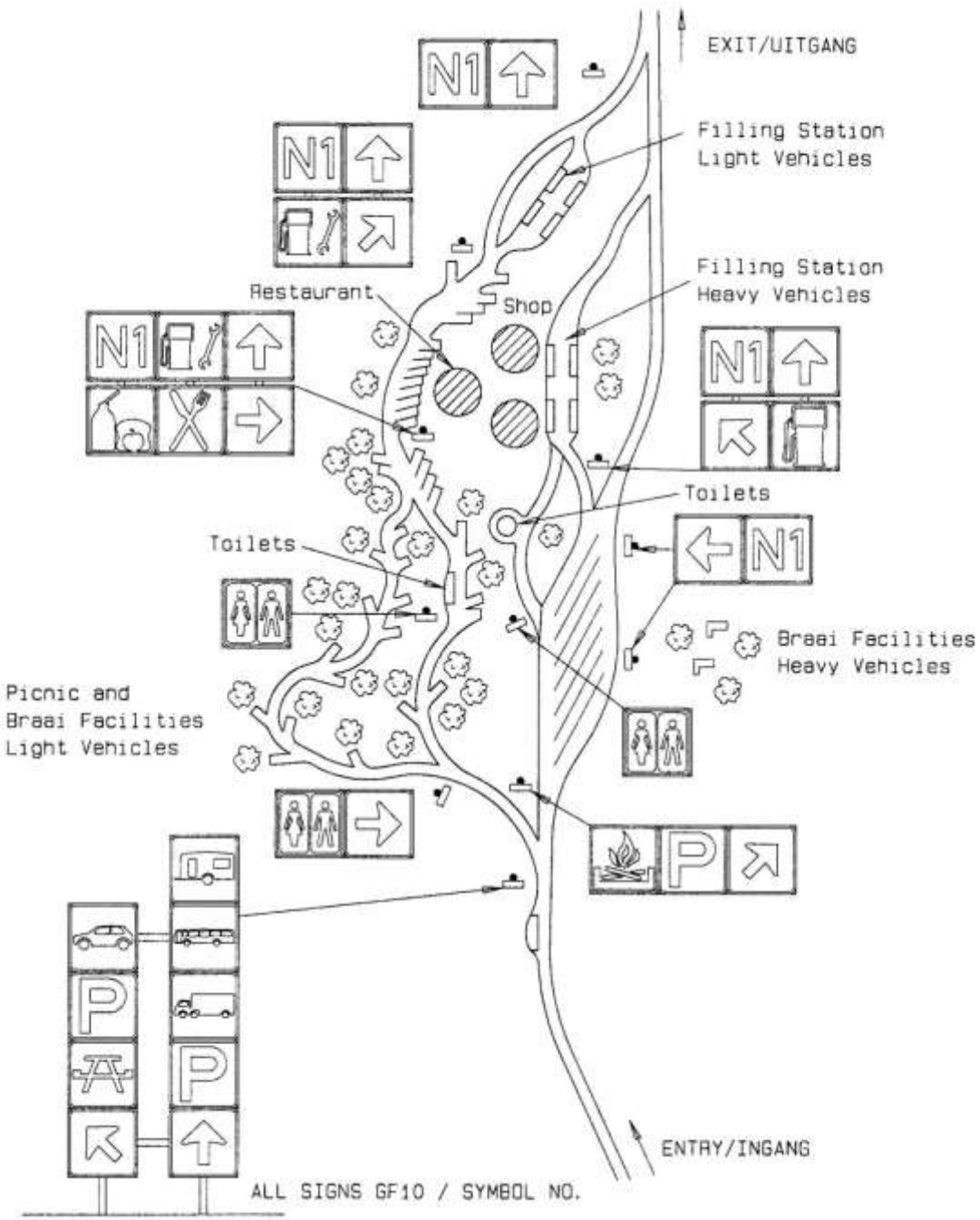

Fig 4.38 **Internal Signing for a Rest and Service Area**

4.7.15 Special Case - Facility Only Destination

1 This signing application is very similar to that covered in Figure 4.33. When the only significant public destination on the cross road is a tourist facility destination the facility may be additionally signed by incorporation of a brown stack into the RAMP TERMINAL DIRECTION sign GA6. This placing sequence is in fact the "final turn" indication to the facility (see typical sign examples in Figure 4.10).

2 All other details are as for Figure 4.33.

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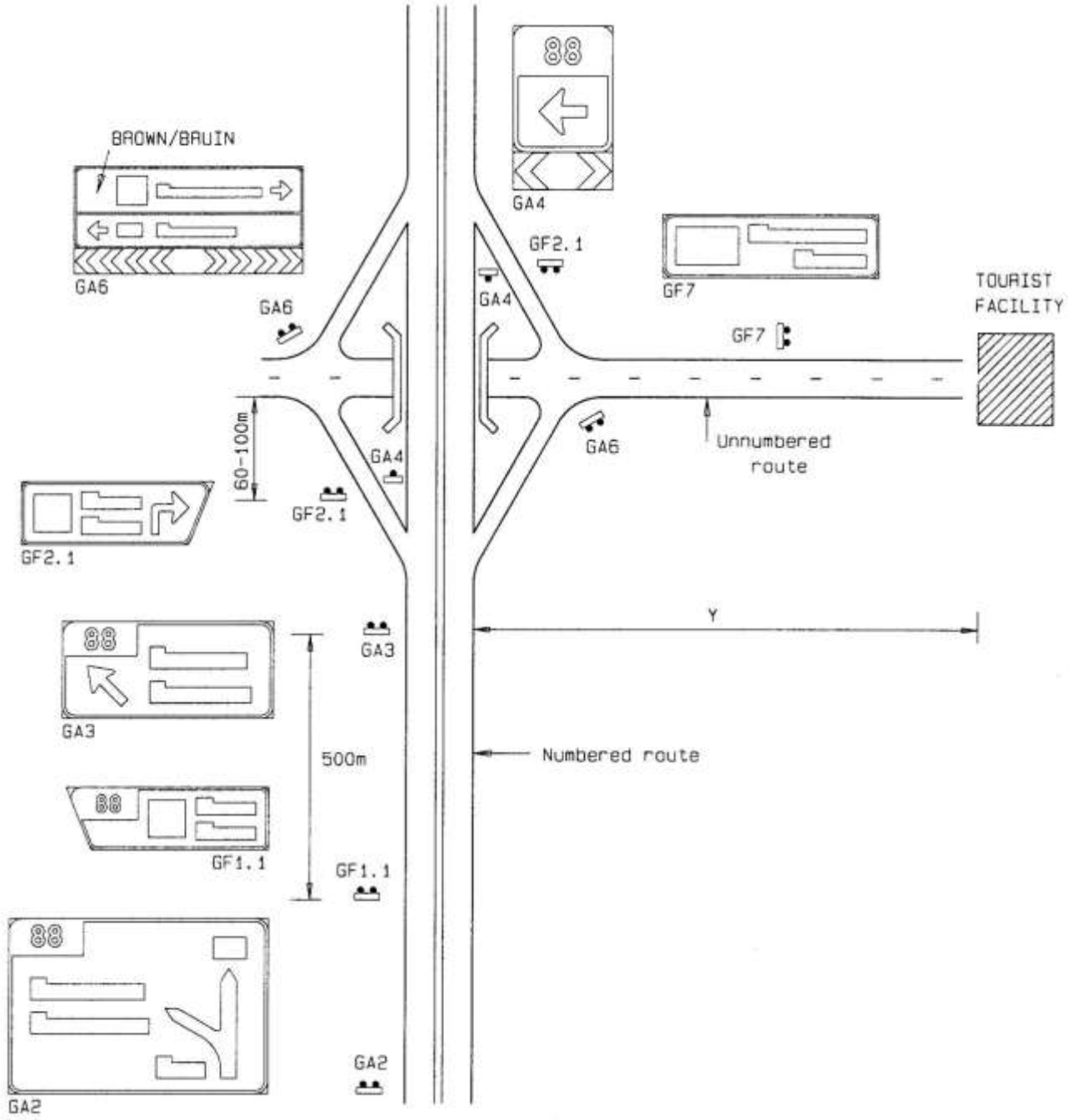

Fig 4.39 Signing from a Freeway – Facility the Only Public Destination

4.7.16 Emergency Services - SOS Telephone

1 This signing application shows a typical section of roadway provided with an emergency service communications network - in this case a SOS TELEPHONE system. Such installations are likely to be provided over distances of many kilometres.

2 The minimum requirement will be for one advance system sign and one end of system sign plus two signs per telephone installation. Such installations normally provide for telephones at regular intervals of between 2 km and 4 km.

3 Types of sign required are as follows:

(a) at the beginning of a section:

1 x EMERGENCY SERVICE SPACING sign GF11;

(b) after every intermediate freeway to freeway junction before the end of the section:

1 x EMERGENCY SERVICE SPACING sign GF11;

(c) for each telephone or other type of installation:

1 x EMERGENCY SERVICE ADVANCE sign GF12; 1 x EMERGENCY SERVICE TURN-IN sign GF13;

(d) at the end of a section:
1 x LAST EMERGENCY SERVICE sign GF14.

4 Signs should be positioned as follows:

(a) the EMERGENCY SERVICE SPACING sign should be located a minimum distance of 1 km in advance of the first telephone;

(b) the EMERGENCY SERVICE ADVANCE sign should be located 1000 m to 300 m in advance of the telephone;

(c) the EMERGENCY SERVICE TURN-IN sign should be located at the telephone;

(d) the LAST EMERGENCY SERVICE sign should be located a minimum distance of 1 km in advance of the last telephone in the system.

Checklist

One or more of the following factors or questions may indicate a need to provide a differing sign treatment, or for some other action to be taken:

- ❑ all signs GF11, GF12 and GF14 shall be located well away from any FREEWAY DIRECTION sign;
- ❑ in terms of the last statement it is common practice to locate telephones within interchanges - in such instances the EMERGENCY SERVICE ADVANCE sign GF12 may be obscured by the GORE EXIT sign GA4 - the position of the GF12 sign should be adjusted towards 300 m from the telephone to reduce this effect.

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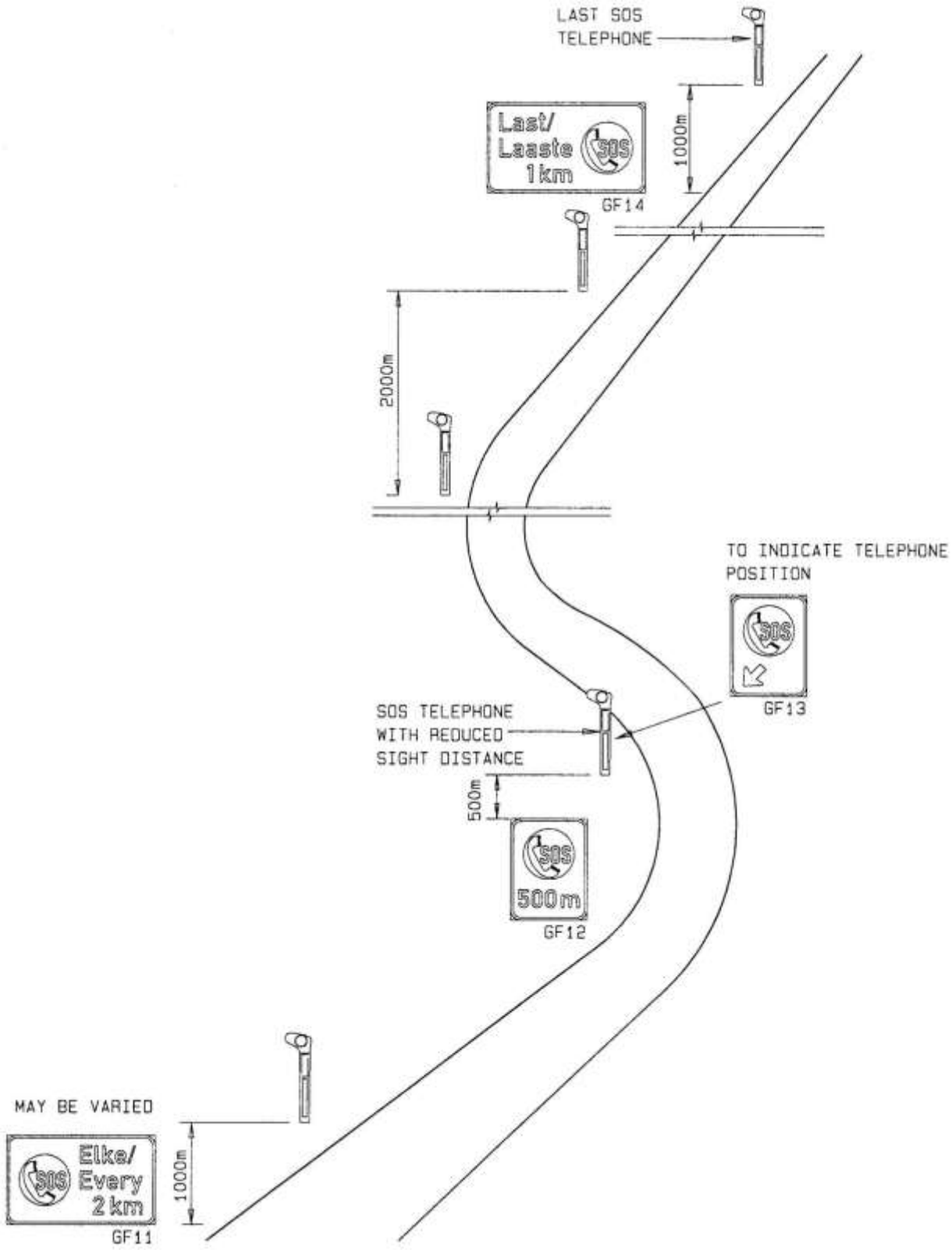

Fig 4.40 **Signing for Emergency Services – SOS Telephone**

4.7.17 Roadside Layby

1 This figure illustrates the signing requirements for a roadside layby provided adjacent to a high speed roadway. The placing sequence is appropriate for a range of laybys provided for rest, water, farm stall, curio shop, etc.

2 The standard requirement is for two signs as follows:

(a) 1 x LAYBY ADVANCE sign GF5;

(b) 1 x LAYBY TURN-IN sign GF6.

3 Signs should be positioned as follows:

(a) the LAYBY ADVANCE sign should be located on the left side of the road approximately 1km in advance of the point of entry to the layby;

(b) the LAYBY TURN-IN sign should preferably be positioned just beyond the point of entry to the lay-by so that an entering driver passes in front of the sign - this may not be practical if the layby is not well set back from the road, in which case the sign may be positioned on the left side of the road just before the point of entry.

Checklist

One or more of the following factors or questions may indicate a need to provide a differing sign treatment, or for some other action to be taken:

- ❑ the layby shall only be signed from the near side direction of approach;
- ❑ UNLESS the point of access is very clearly visible and has a similar level of geometric treatment to intersecting roads on the section of road in question;
- ❑ a layby may only be provided on a freeway if the access treatment is of a similar standard to any other exit or entry point on the freeway.

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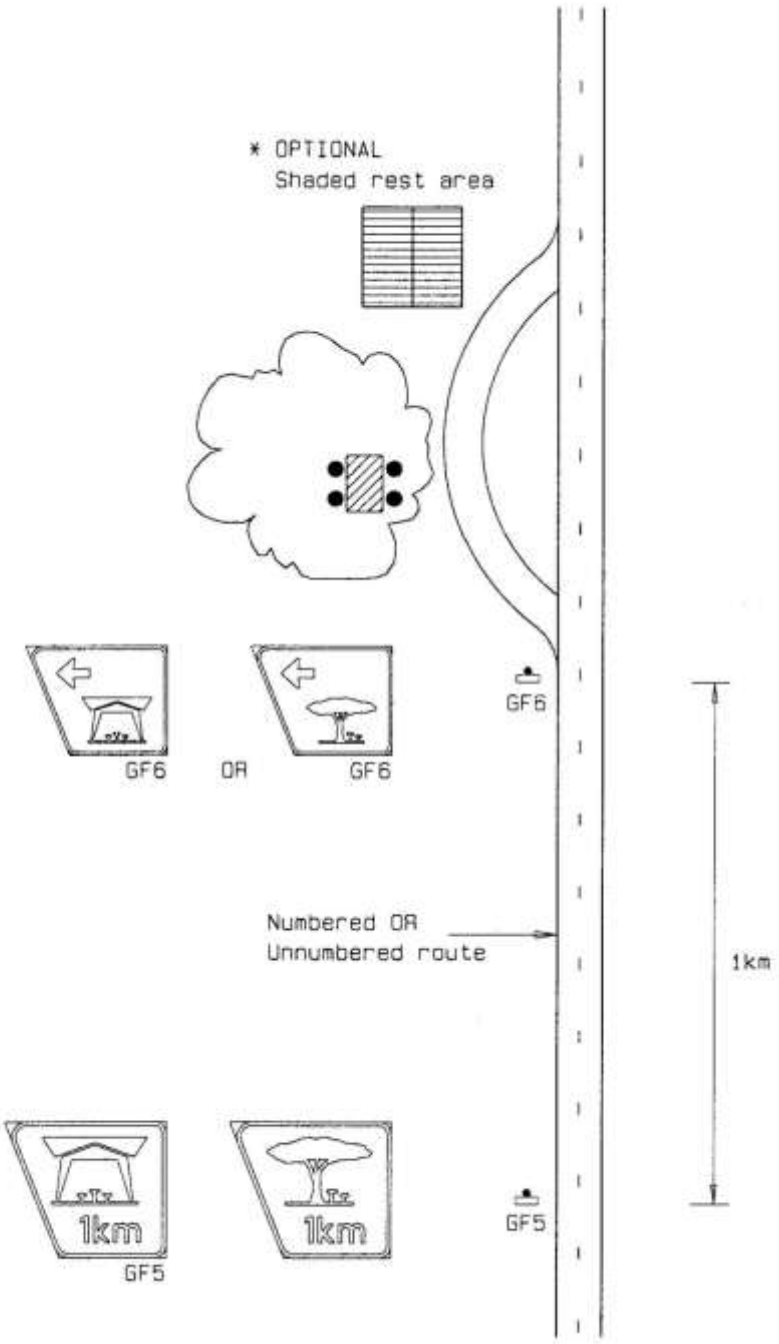

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Fig 4.41 **Signing for a Roadside Layby**

4.7.18 Facilities on Routes Parallel to Freeways

1 This figure represents a further extension to that covered in Subsection 4.7 applicable when tourism facilities exist on a numbered route, or routes, which parallel a freeway. The sign sequences used should conform to those covered by Subsection 4.7.9 - Freeway Sign Sequences.

2 The normal requirement will be for two signs for each freeway approach serving a facility. The proximity of facilities and their optimum accessibility will influence how placing sequences may be combined. Additional signs will be required for additional turns towards facilities and final turn signs may be required subject to the visibility of the facility and its final turn access.

3 The following types of signs will normally be required:

(a) FREEWAY ADVANCE EXIT sign GF1;

(b) ADVANCE TURN sign GF2 (on the off-ramp);

(c) ADVANCE TURN sign GF2 (at subsequent junctions);

(d) FINAL TURN sign GF3.

4 The signs should be located in the positions recommended by the appropriate placing sequences (see Subsections 4.7.9).

Checklist

One or more of the following factors or questions may indicate a need to provide a variation on a standard sign treatment, or for some other action to be taken -

- ❑ are the discretionary principles covered in Volume 1, Subsection 4.9.4 (see also Table 4.2) appropriate?
- ❑ are the additional warrants covered in Section 4.6 appropriate?
- ❑ when more than one facility is indicated on a sign or sign cluster, ensure that the order of display vertically is always such that facilities which are reached after a right turn at the ramp terminal appear above facilities reached after a left turn AND, that once this requirement is satisfied, the closer facility appears above the further facility (see detail of signs in Figure 4.42 for facilities "A", "B" and "C" - and Figure 4.33 for a more detailed general example); these principles are also appropriate at an at-grade intersection under similar circumstances;
- ❑ can follow-up signs be used (see Subsection 4.7.7)?
- ❑ would a tourist information layby be more appropriate or cost effective?

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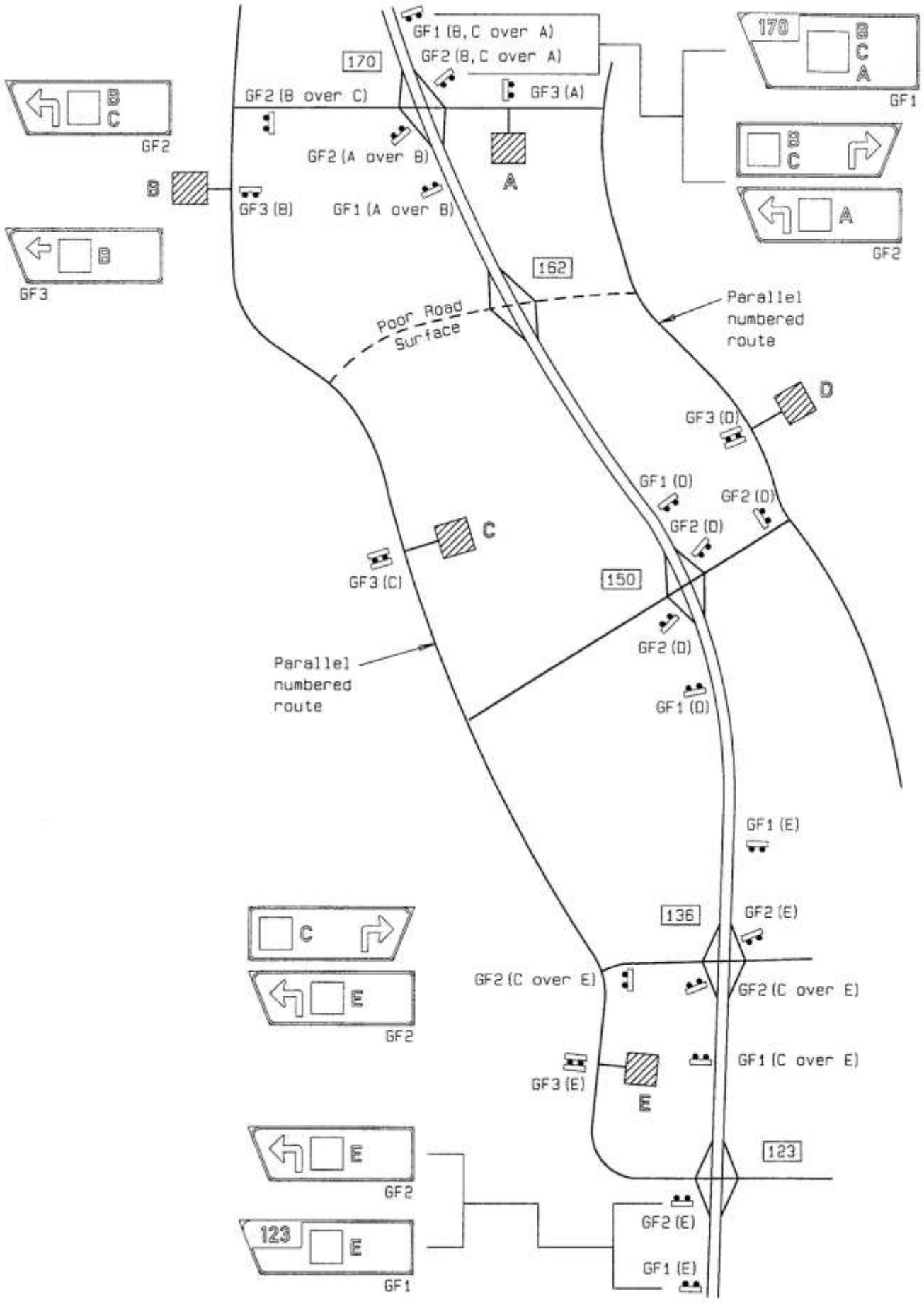

Fig 4.42 Signing for Tourism Facilities on Routes Parallel to a Rural Freeway

4.7.19 At-Grade Rest and Service Area

1 This figure illustrates the signing treatment of a high standard rest and service area which is provided with direct access from an at-grade major route. The choice of sign sequence must be made carefully. The signs provided for the facility may supplement direction signs in which case they should conform to the placing sequences covered by Subsections 4.7.4 to 4.7.6. If direction signs are not required the signing treatment should be similar to that used for a freeway rest and service area (see Subsection 4.7.11).

2 The normal treatment is for two signs on each approach unless the route in question has been subject to a co-ordinated rest and service area sequence signing exercise in which case three signs are required on each approach (see Subsections 4.7.12 and 4.7.13).

3 For each approach the following types of signs are required:

(a) 1 x REST AND SERVICE SEQUENCE sign GF9.2;

(b) 1 x ADVANCE TURN sign GF2 with distance;

(c) 1 x FINAL TURN sign GF3.

4 Signs should be positioned as follows:

(a) the REST AND SERVICE SEQUENCE sign should normally be located 2 km in advance of the final turn;

(b) the ADVANCE TURN sign should be located between 600 m and 800 m in advance of the final turn subject to the presence of other entrances including farm entrances;

(c) the FINAL TURN sign should preferably be located in the far left corner of the junction of the access and the passing roadway but for economy the FINAL TURN signs for both directions of approach may be mounted on common supports opposite the access.

Checklist

One or more of the following factors or questions may indicate a need to provide a differing sign treatment, or for some other action to be taken:

- ❑ no signs indicating the nature of the services available within the rest and service area shall be located on the at-grade route (see Figure 4.38);
- ❑ if the distance between rest and service areas exceeds 80 km to 100 km an additional GF9.1 or GF9.2 sign may be provided approximately half way between facilities;
- ❑ are further rest and service areas known to be planned for development within the life of the GF9.1 or GF9.2 signs?;
- ❑ the use of town or city names on direct access rest and service area signs is not recommended (see Volume 1, Subsection 4.9.22) - the facility names may be omitted altogether.

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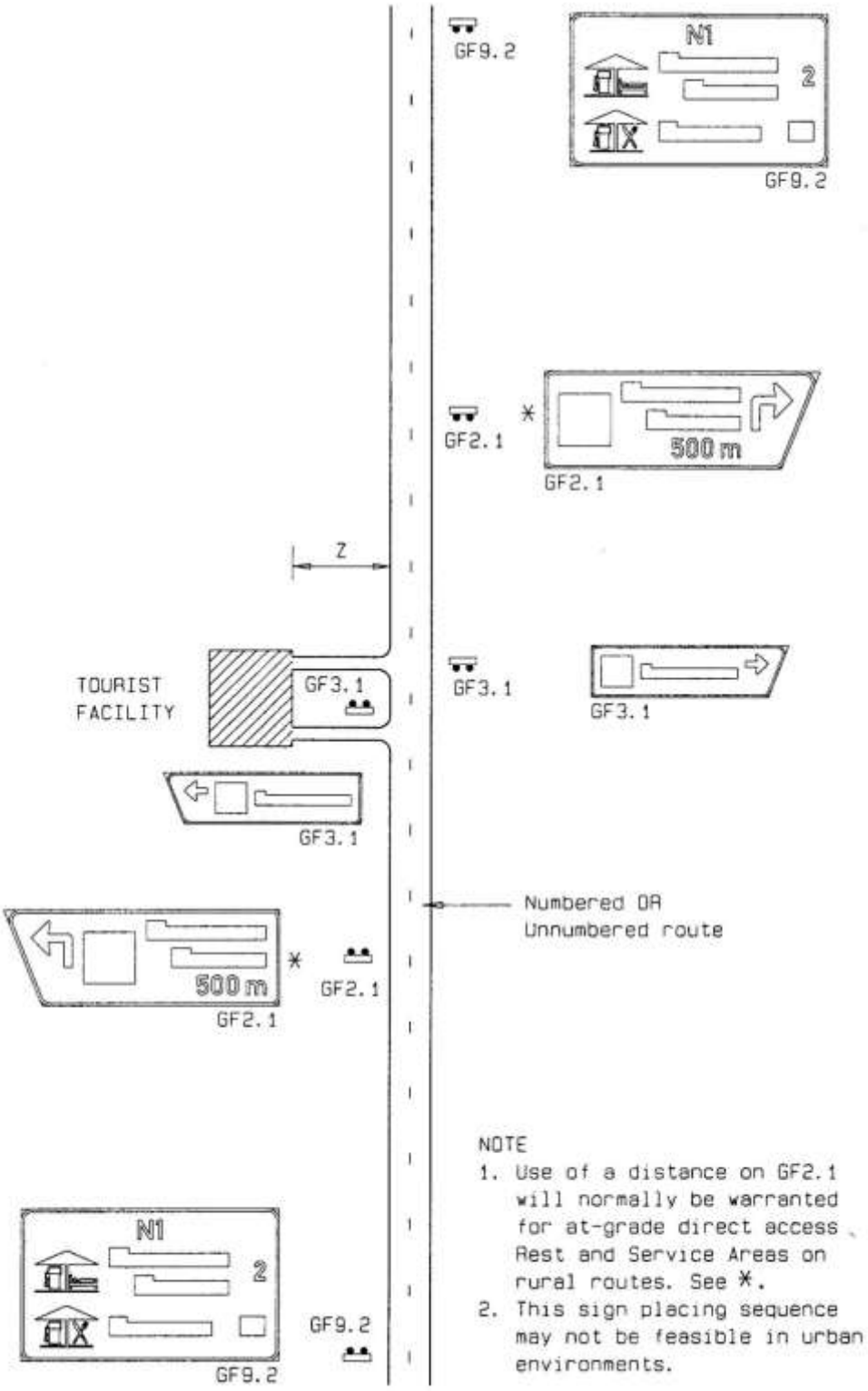

Fig 4.43 **Signing for a Direct Access Rest and Service Area From a Class "B" or Lower Class Route**

4.7.20 Rural Class 3 Rest and Service Area Signing Sequence

1 The provision of Rest and Service Exit Sequence signs to Class - 3 Rest and Service Areas on non-freeway routes requires a different approach to that used on freeways. The need for a specific policy on "exit" sequence signing for non-freeway routes has arisen due to the fact that the nature of the "exits" and the facilities is different to that on freeway routes, i.e. the level of accessibility is far greater on non-freeway routes due to frequent at-grade intersections and to the fact that such routes also often pass through towns. This latter aspect in particular, with the inherent competition between a number of facilities and services, has led to the development of an appropriate policy on the "exit" sequence signing for such facilities. This subsection and Figure 4.44 cover the rural application of the policy, whereas Subsection 4.7.21 and Figure 4.45 cover the urban implications. In addition Figures 4.46 to 4.48 illustrate practical examples of the application of the policies.

2 The policy for rural sections of non-freeway route recommends the provision of REST AND SERVICE EXIT SEQUENCE sign GF9 50 km in advance of selected and approved rest and service facilities. The underlying principle behind this 50 km GF9 exit sequence sign is to offer guidance to motorists as to where they may find specific services of a certain standard in order to plan the rest and service aspects of their journey. To achieve this, it is not necessary to give any corporate reference on the signs and only two lines of information referring to an intermediate-range and a long-range facility are to be displayed. Hence, the signs at "a" and "e" in Figure 4.44 display an enlarged Class - 3 symbol with the distance to the first facility in, what is in this example, a group or cluster of service facilities (intermediate-range), plus the distance to the next long-range facility (380 kilometres).

3 These principles apply equally to 100 km, 150 km etc. signs which would show the distance to the first facility (intermediate range) and the next long-range facility. This is on the proviso that major towns or cities would interrupt the exit sequence signing, i.e. exit sequence sign locations should be determined backwards from the facility to the next facility but no exit sequence signs will be allowed within urban boundaries (see Subsection 4.7.21).

4 In a similar way a REST AND SERVICE EXIT SEQUENCE sign GF9 is recommended at 2km from the intermediate-range facility identified on the preceding GF9 sign. The underlying principle behind this 2km exit sequence sign is to present a short-range and a long-range alternative to the motorist. The short-range facility or facilities shall be those in the immediate vicinity while the long-range facility shall be greater than 50 km from the short-range facility, being consistent with the information shown on the preceding 50 km GF9 exit sequence sign.

5 Figure 4.44 shows a complex example of a cluster of rest and service facilities "B", "C" and "D" in a rural context. Sign "b" shows the first facility in the cluster (short-range) plus the long-range facility. The middle line of information shows the second facility in the cluster but he third facility in this cluster cannot be accommodated on this sign. Because of the existence of the cluster of facilities signs "c" and "d" continue the principles by "rolling-over" the sequence of exits to facilities in the cluster. The inclusion of the long-range facility on all the signs "a", "b", "c" and "d" includes no corporate reference as it is the announcement of a Class - 3 facility to motorists, together with its distance, that is the essential minimum information to be conveyed. This "clustering" of facilities is particularly difficult to manage and has been presented in the rural context as a 'worst case' scenario in order to demonstrate all the principles needed to produce a consistent policy. It should be noted that any group of facilities (two or more) shall be announced on the 50km GF9 exit sequence sign (or at other multiples of 50km) by one symbol and one distance only.

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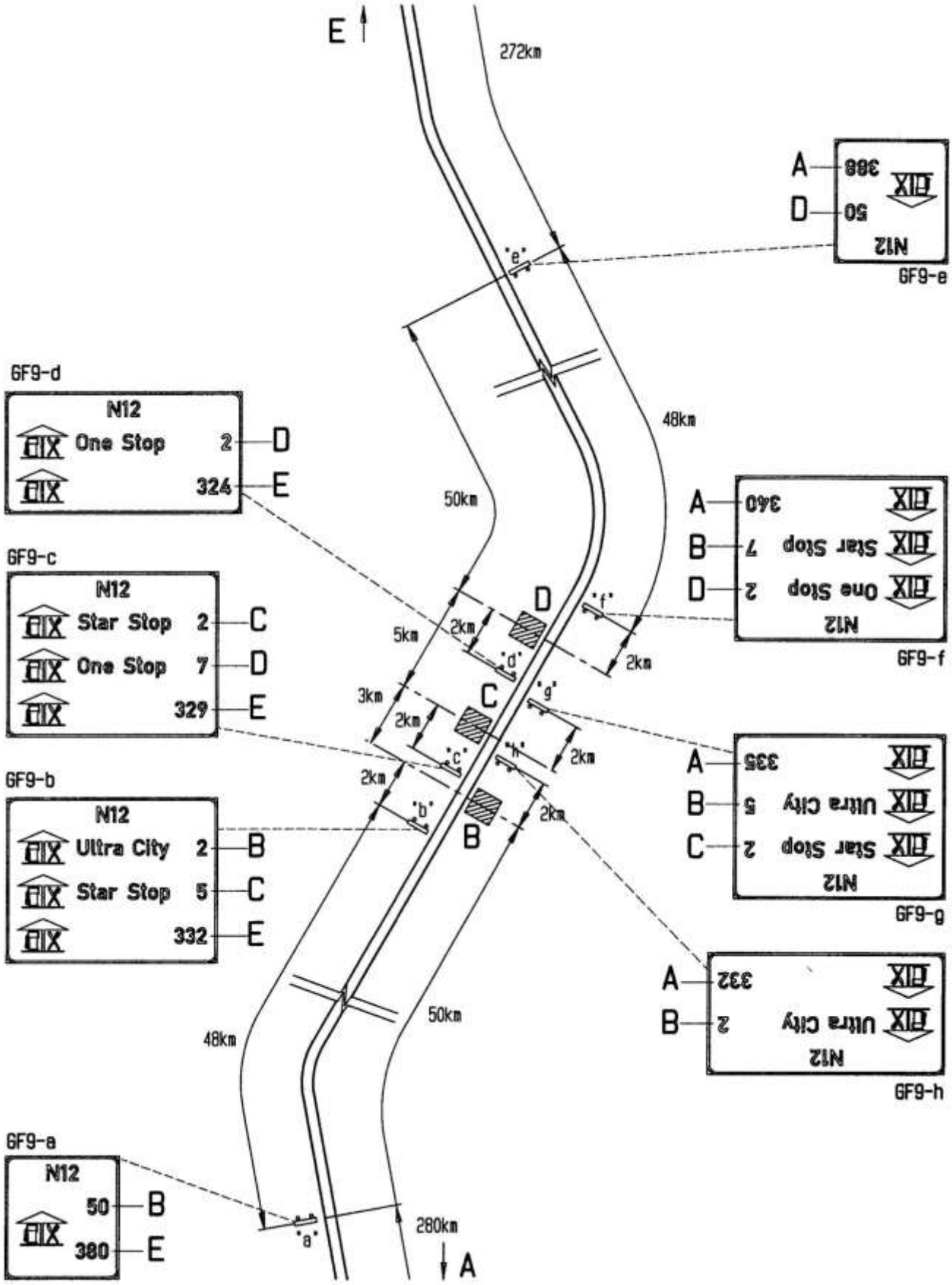

Fig 4.44 Signing for a Sequence of Class 3 Rest and Service Facilities Along a Rural Non-Freeway Route (Cluster Example)

4.7.21 Urban Class 3 Rest and Service Area Signing Sequence

1 The provision of Rest and Service Exit Sequence signs to Class - 3 Rest and Service Areas on non-freeway routes requires a different approach to that used on freeways. The need for a specific policy on "exit" sequence signing for non-freeway routes has arisen due to the fact that the nature of the "exits" and the facilities is different to that on freeway routes, i.e. the level of accessibility is far greater on non-freeway routes due to frequent at-grade intersections and to the fact that such routes also often pass through towns. This latter aspect in particular, with the inherent competition between a number of facilities and services, has led to the development of an appropriate policy on the "exit" sequence signing for such facilities. This subsection and Figure 4.45 cover the urban application of the policy, whereas Subsection 4.7.20 and Figure 4.44 cover the rural implications. In addition Figures 4.46 to 4.48 illustrate practical examples of the application of the policies.

2 The principles applying to the provision of REST AND SERVICE EXIT SEQUENCE signs GF9 at 50 km and 2km distances from approved urban located facilities are identical to those developed in Subsection 4.7.20 except that, to avoid placing sequence signs within an urban boundary, it is recommended that the "2km" position of the sign be considered to be nominal and that it always be placed outside the boundary. Thus, in the case of the 2 km exit sequence sign, the precise distance indicated on the sign to the facility would be greater than 2 km.

3 Where towns or cities interrupt the rural 50 km spacing, without themselves providing an acceptable standard of facility, the GF9 sign may have to be displaced on occasions outside an urban boundary. To maintain consistency of information in such instances, the sign interval should be made less than 50km and the distance displayed on the exit sequence sign to the next facility should be greater than 50 km, i.e. the exit sequence sign should be brought ahead of an urban boundary (in the direction of travel) and not after.

4 The provision of exit sequence(GF9), advance(GF2) nor final turn(GF3) signs within urban boundaries, is generally not considered necessary as it is expected that location and access design in the urban area shall be such that traffic flow and safety will not be compromised.

5 REST AND SERVICE EXIT SEQUENCE signs GF9 are designed to announce Class - 3 facilities only and other facilities shall not be included, i.e. any other facilities graded lower than Class - 3 occurring within or outside urban boundaries shall not appear on the exit sequence signs. (The inclusion of a "small-man" policy could not be accommodated on this sign. The secondary level of guidance information, namely that given on at-grade roads by signs GD1 and GD2 and CONFIRMATION signs GD3, in the form of orientational destinations is adequate to offer alternative facilities to the motorist through the announcement of these destinations, which by virtue of their inclusion as classified orientational destinations have available lower level service facilities. If any other approved Class - 3 service facility is available just off the route, this may be signed in accordance with the policy provisions covered in Volume 1 and substantially in accordance with Subsection 4.7.4 and Figure 4.28 e.g. GF2, GF3 or GF8.3 signs).

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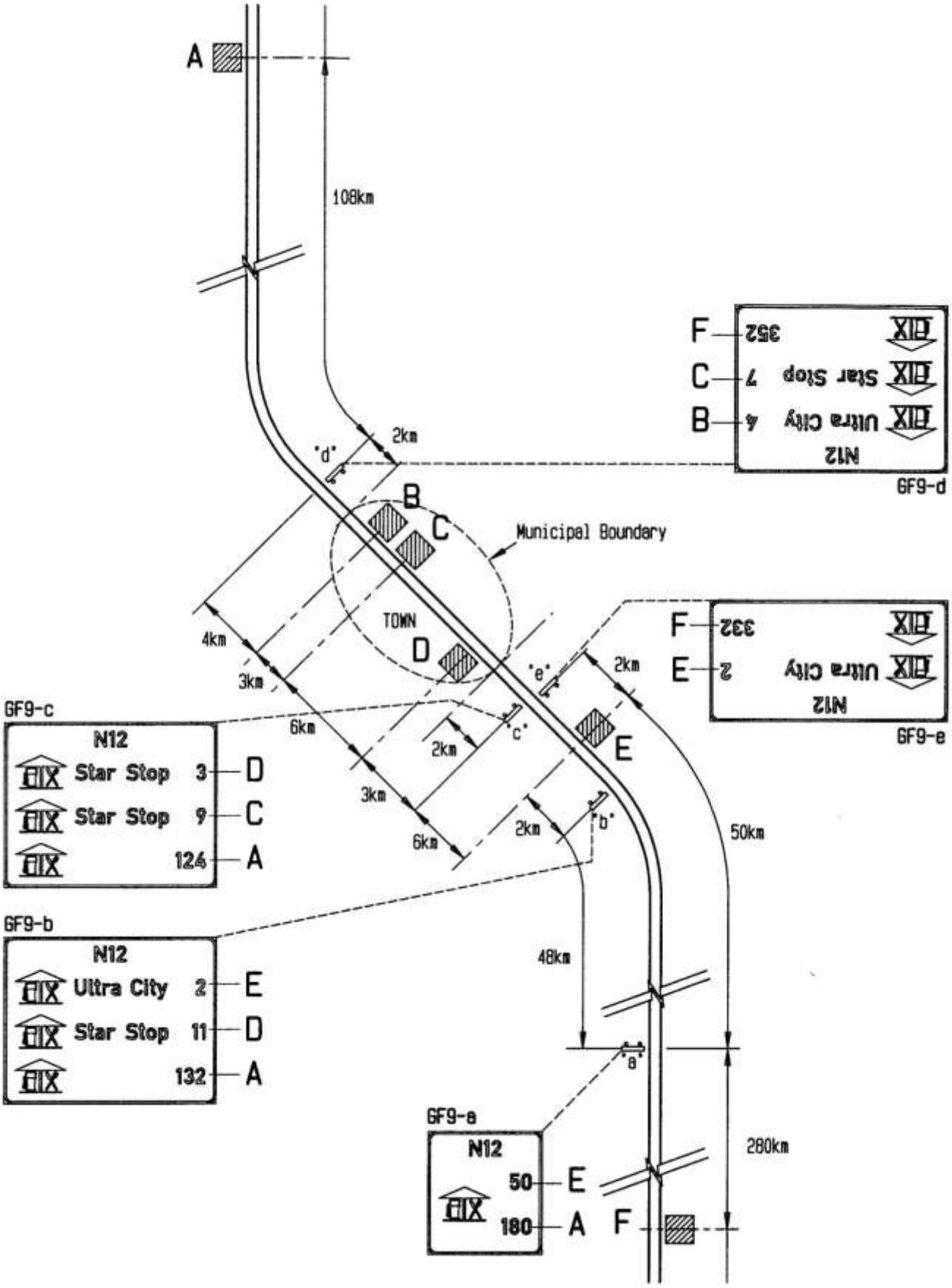

Fig 4.45 Signing for a Sequence of Class 3 Rest and Service Facilities Along an Urban Non-Freeway Route

4.7.22 Typical Examples of the Application of Class 3 Rest and Service Area Signing Principles

1 The examples illustrated in Figure 4.46 to 4.48 have been chosen to test the policy principles developed in Subsections 4.7.20 and 4.7.21. However, it should be noted that the actual sites and facilities alongside the chosen routes have not been investigated thoroughly to confirm the detailed accuracy of the signing solutions given. Hence, while the use of actual examples is useful in practice, a number of assumptions have been made as follows:

(a) that the indicated Class - 3 rest and service areas are assumed to be of a standard deemed necessary to achieve such a grading;

(b) that there are no other Class - 3 facilities within the extent of the examples shown - any exclusion of a facility is unintentional and any facility subsequently upgraded to Class - 3 would alter the sign information as shown.

2 Example 1 - Figure 4.46 - Three Sisters

This example is an isolated, rural case and simply illustrates the policy principles as applied to one facility. The intersection of the N1/N12 could introduce problems of sign location (which should be investigated thoroughly in the field) but the proposed locations are suggested so as not to conflict with the guidance signs. With regard to motorists travelling southbound on the N12, the announcement of facilities on the N12 at 2 km, implies that if the motorist remains on the N12, those services will be found. Hence, when arriving at the N1/N12 intersection, the primary guidance information will be a guide to turn right (on the N12) and not left which would be signed for the N1 only.

It should be noted that by way of example, the exit sequence signs in Figure 4.46 show the long-range distance to Laingsburg and not to Beaufort West. This latter location does not presently have a Class - 3 facility, although the area has become known traditionally as a 'stopping point' for motorists and truck drivers who can receive comparable services from separate locations in the town. This condition highlights the dilemma of sequence signing but until a facility at Beaufort West is adjudged to meet the warrants for Class - 3 Rest and Service areas, a "purist" approach has been adopted, thus omitting Beaufort West from the sequence. Clearly, the town of Beaufort West would be indicated on direction and confirmation signs as part of the system orientational information in the normal manner (see Subsection 4.7.21)

3 Example 2 - Figure 4.47 - Colesberg

The Colesberg example illustrates the rural, clustered situation and, again, the policy principles have been used to guide the sign application design (shown in the southbound direction only). The profusion of signs under these circumstances should be noted and, in particular, the inclusion of a 2 km sign before the "C'berg Ultra City". This inclusion would need to be checked in the field because the distance between the Star Stop and the Ultra City is only 3 km, which could lead to difficulties arising from entry/exit ramps, additional signs or geometric conditions.

4 Example 3 - Figure 4.48 - Kimberley

The Kimberley example highlights the problems associated with a facility positioned within an urban boundary. Travelling in the southbound direction, the 2 km sign becomes a 2,5 km sign (distance to be checked in the field) which also displays the Kwagga Stop on the southern side of Kimberley. If there were another Class - 3 facility inside Kimberley, this should be shown in preference to the Kwagga Stop, but no signs should be included inside the urban boundary. The long-range facilities given in this example are illustrative only.

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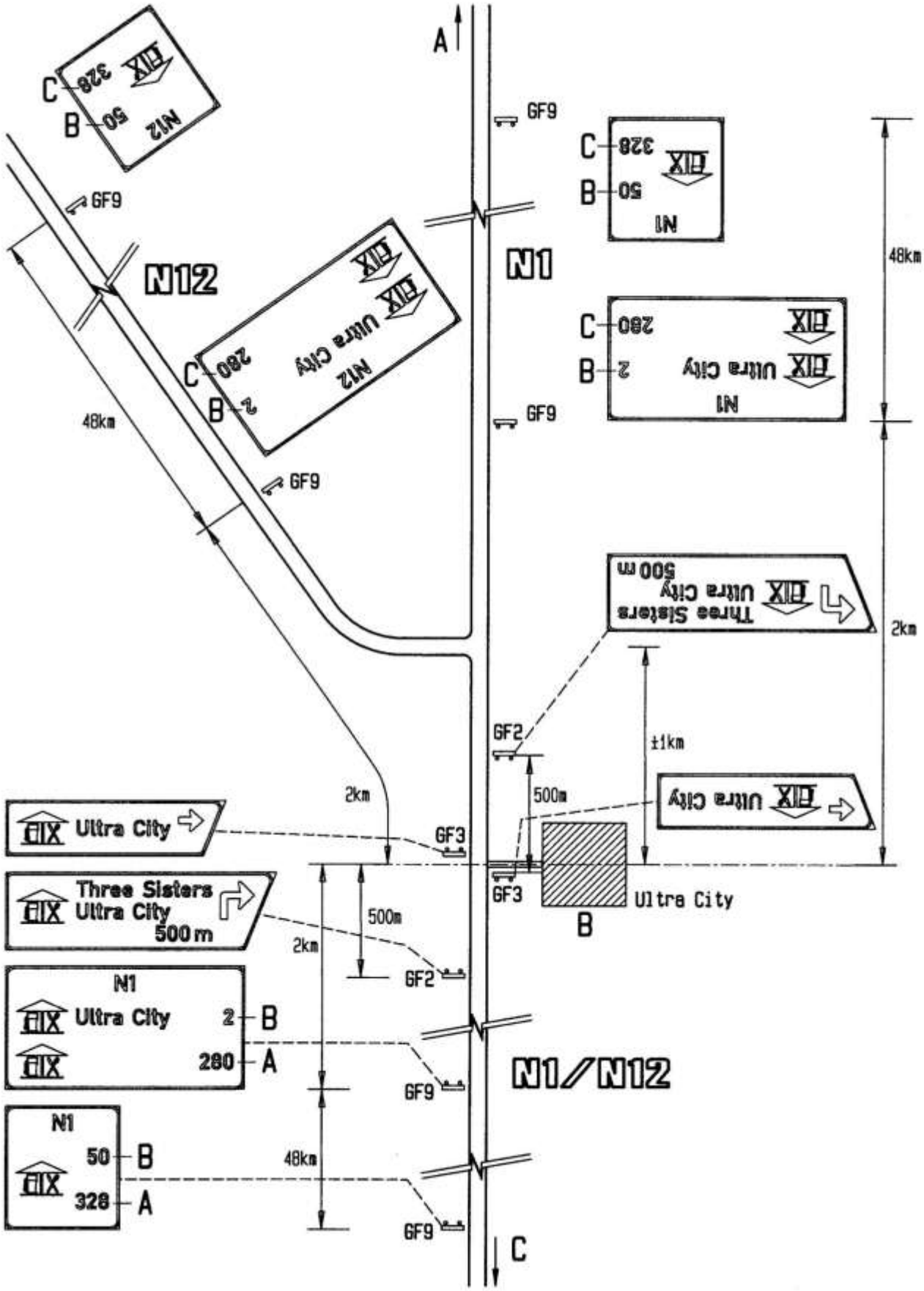

Fig 4.46 Example of Class 3 Non-Freeway Rest and Service Signing Sequence - 1 Three Sisters

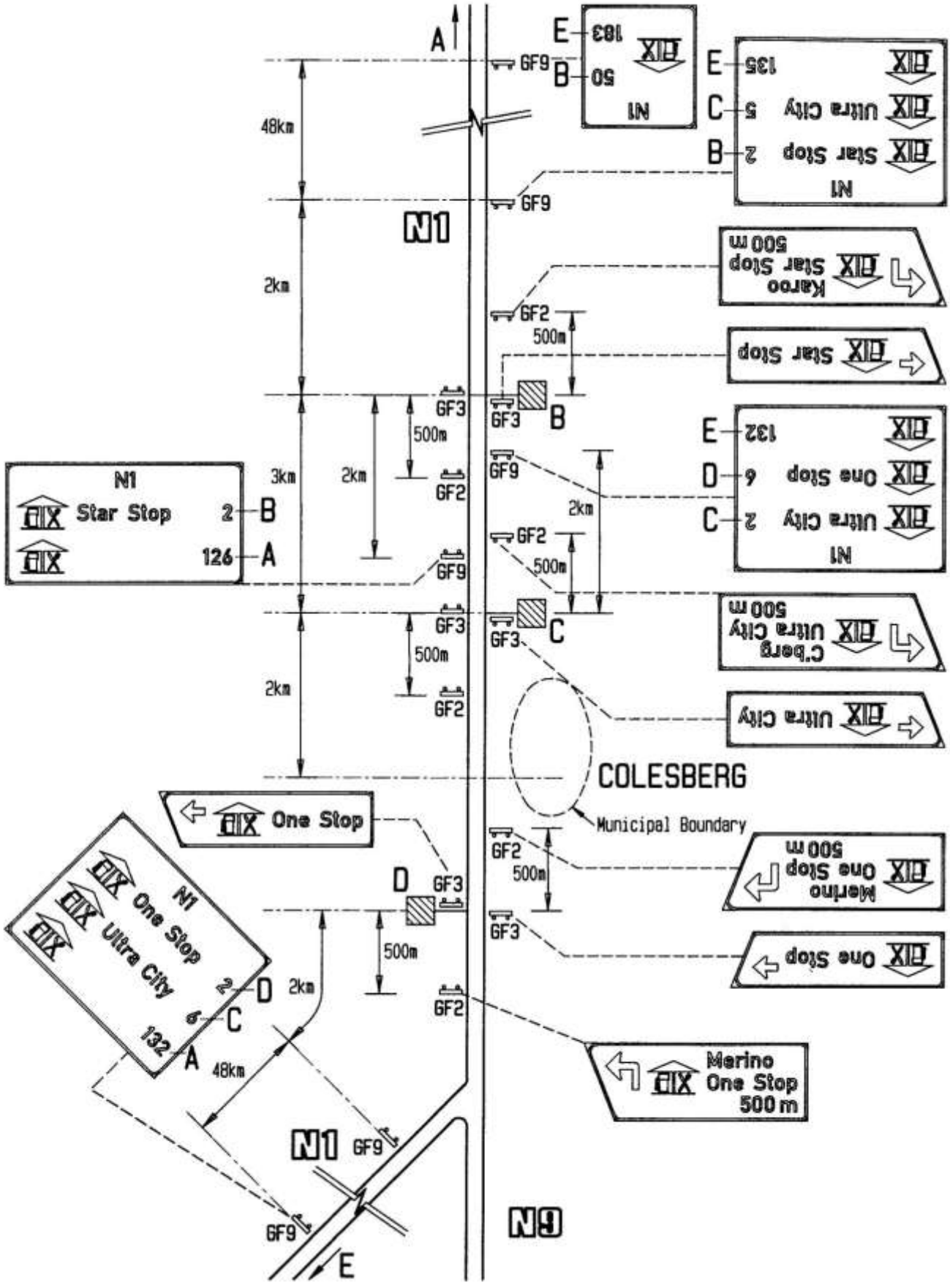

Fig 4.47 Example of Class 3 Non-Freeway Rest and Service Signing Sequence - 2 Colesburg

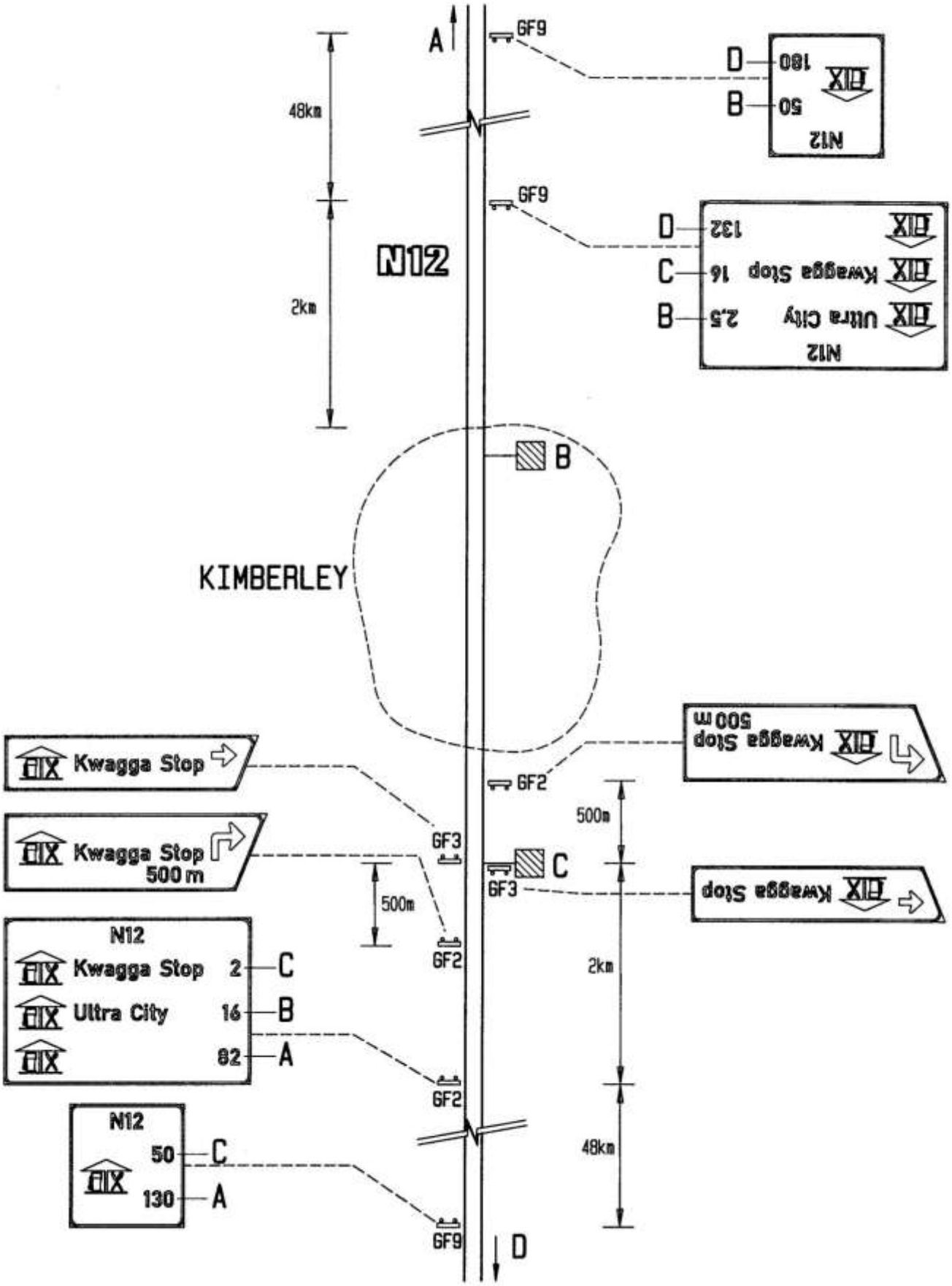

Fig 4.48 Example of Class 3 Non-Freeway Rest and Service Signing Sequence - 3 Kimberley

4.7.23 Basic Principles – Tourism Signing for a By-Passed Town

1 A "By-Passed Town" can be considered to be a town which once had a main navigational numbered route, commonly a Class "B" route, running through the town but which route has subsequently been diverted to avoid the developed area of the town. In principle a small town which has developed alongside such a route could also be considered as being *de facto* a by-passed town.

2 If a by-passed town continues to grow so that it eventually envelopes the passing route the guidance signing, including any direction and tourism signs, should be considered in terms of general policies appropriate to an urban area (see Chapter 9).

3 A by-passed town may offer passing motorists the opportunity to utilise any of the various services available in the town such as emergency services (police or hospital), fuel or food / accommodation, or it may offer tourist attractions in addition. If a town has orientational destination status it can be expected that it offers all or most of the services noted above. However, the change in status brought about as a result of being by-passed can be considered as a warrant to provide a tourism service sign. Such a GF2 sign may have up to five service symbols, comprising emergency, vehicle, food and/or accommodation, and tourist information when this is available. Detail 4.49.1 shows such an indication at a single access by-passed town.

4 Detail 4.49.2 shows a typical tourism signing arrangement when the by-passed town has two (or more) access roads. In such an instance the display of tourism service information should be designed for the optimum convenience of passing motorists. To offer the quickest access to the police service in this example, for instance, "south-bound" motorists are directed past the first access to the second access since this is likely to offer the quickest approach to the police station.

5 When a by-passed town offers tourist attractions or is at the gateway to a tourist area it may be appropriate to provide a tourist layby or information centre in close proximity to an access road / main road junction (see Figure 4.25). Such an information facility may be combined with an adjacent service facility such as a fuel service station.

Checklist

- ❑ do the services in the town comply with normal warrants for such services?
- ❑ is there some reason, such as the recent construction of the by-pass, which strengthens the warrant for tourism service signs?
- ❑ does the town have more than one access road from the by-pass?
- ❑ is an information layby or centre available?

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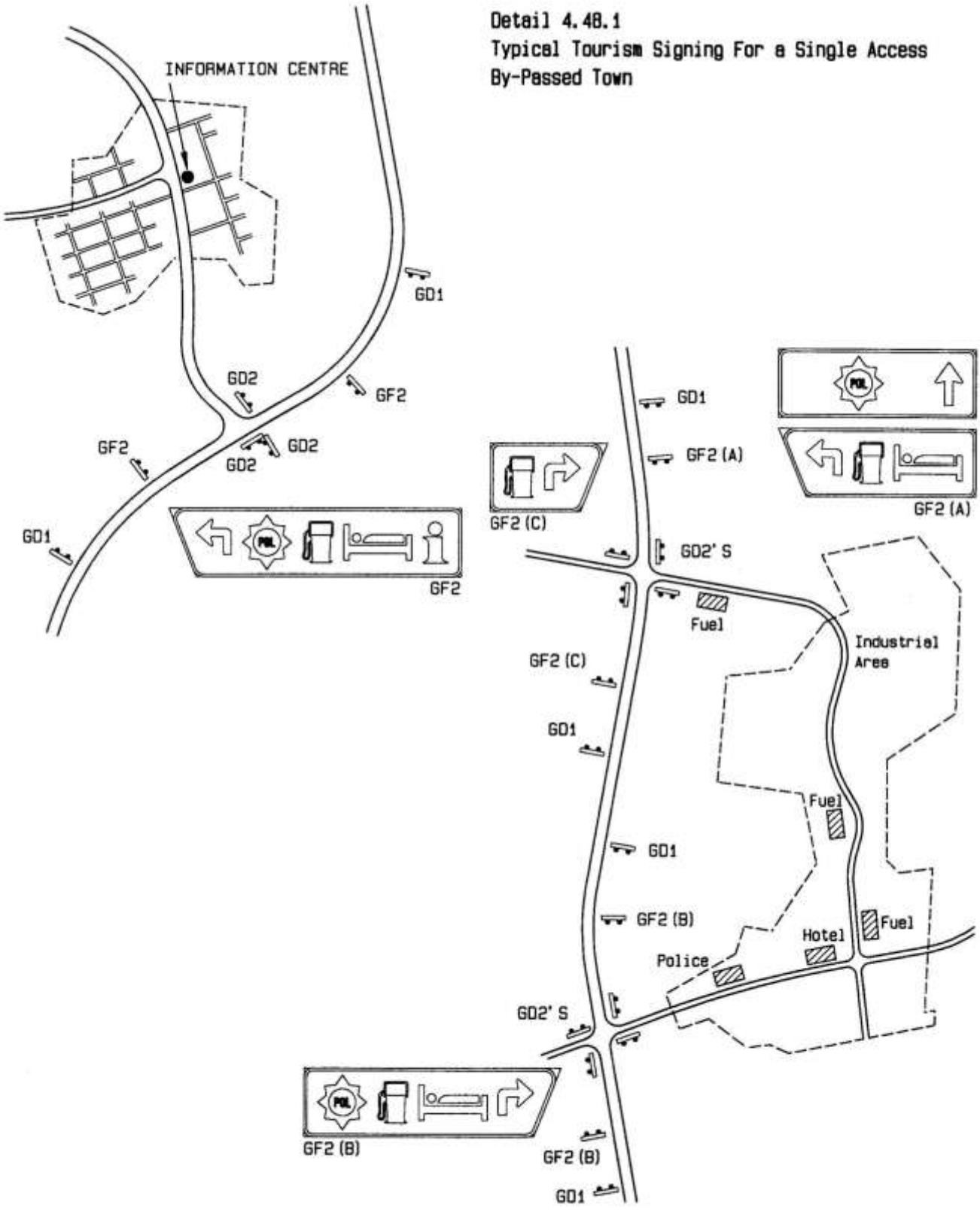

Detail 4.48.1
Typical Tourism Signing For a Single Access By-Passed Town

Detail 4.48.2 Typical Tourism Signing for a By-Passed Town with Two Access Roads

Fig 4.49 Basic Principles – Tourism Signing for a By-Passed Town

4.7.24 Part-Time Facilities

1 Figure 4.50 illustrates two typical situations where signing for part-time facilities may be appropriate. Signing of part-time facilities is generally subject to their location within an identified high density tourism area (see Sections 4.4 and 4.5), and to their compliance with normal and/or specific warrants.

2 Detail 4.50.1 shows a minor dead-end road which provides access to three tourist attractions, two of which are classified as part-time attractions (see Subsection 4.5.6). The use of FINGERBOARD sign type GF17 for part-time facilities is intended to identify these as different from normal "full-time" facilities which, when they are in a common environment, continue to be signed, subject to compliance with warrants, using GF2 and GF3 signs. Detail 4.50.1 therefore demonstrates the ability to sign for a mix of full-time and part-time facilities.

3 Detail 4.50.2 takes the signing for such a mix of full-time and part-time facilities to a more intensive level. In this example the number of facilities warrants the road in question being allocated a tourist route number as described in Subsection 4.5.3. This has the effect that the tourism signs on the main approach road(s) need only indicate this number and an appropriate theme symbol and name, **NOT all the individual facilities on the route**. Once on the tourist route the individual facilities can then be signed using GF2 and GF3 signs for full-time facilities and FINGERBOARD sign GF17 for part-time facilities. Subject to the spacing of facilities it may, when they are closely spaced, be acceptable to use only a GF2 sign OR a GF3 sign, and not both. Slow travelling speeds would support such a decision.

Checklist

- ❑ are there both full-time and part-time facilities?
- ❑ is the road in question a minor road?
- ❑ if the road is not a minor road does it warrant consideration as a tourist route?

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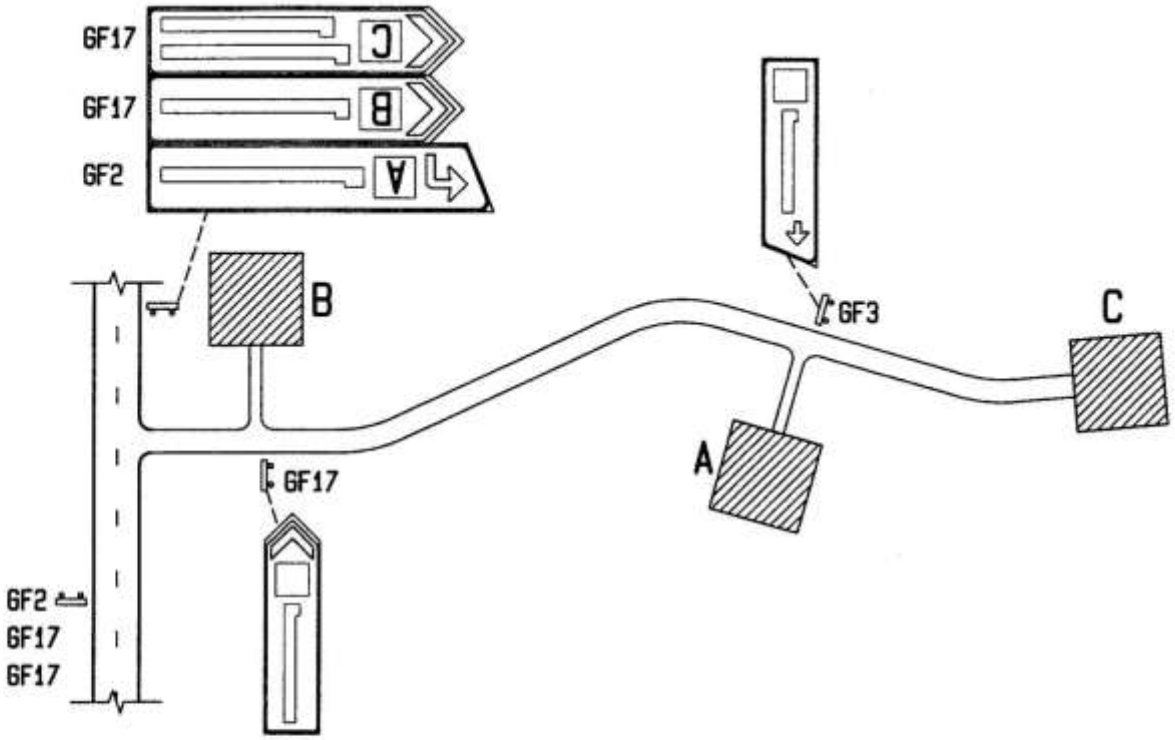
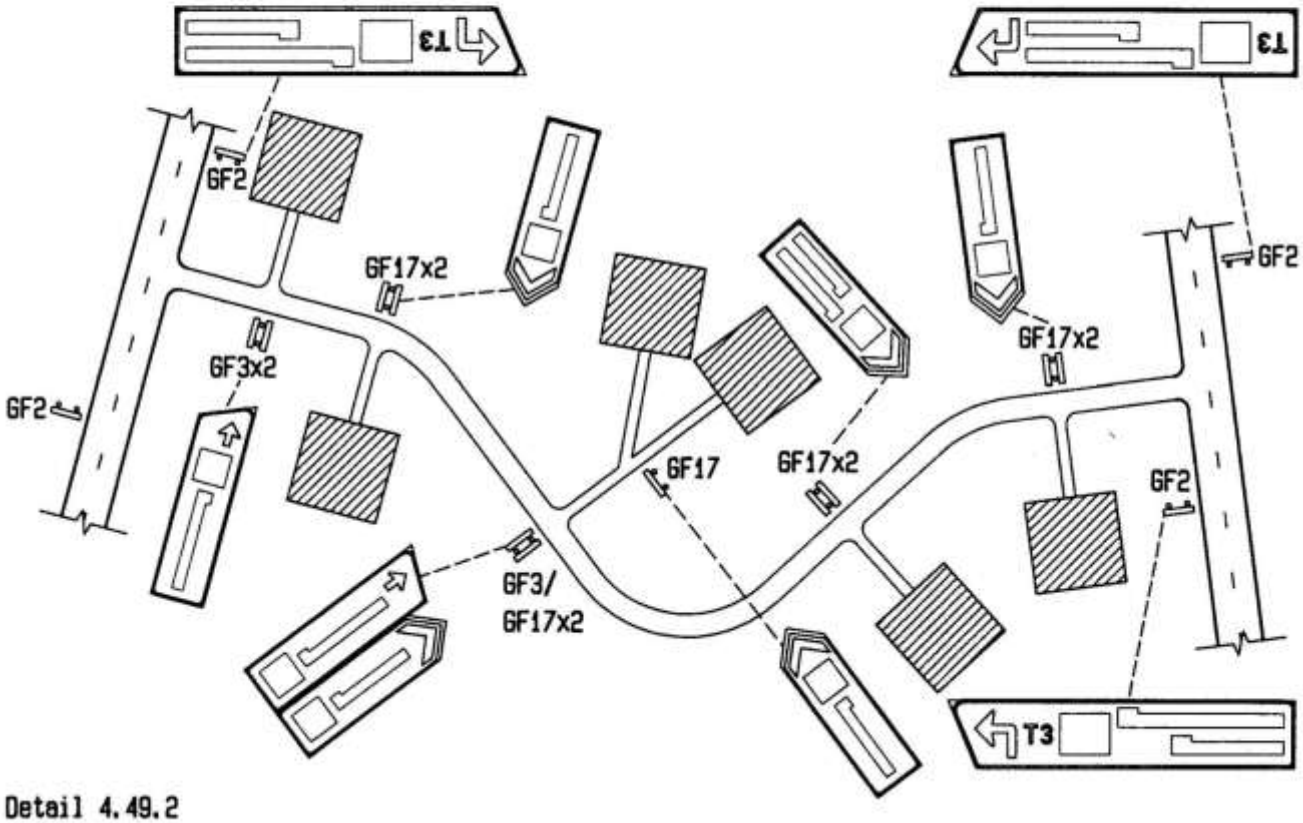


Detail 4.49.1
Mixed Full-Time/Part-Time Facilities - Minor Dead End Road



Detail 4.49.2
Mixed Full-Time/Part-Time Facilities - Tourist Route

Fig 4.50 Signing of Part-time Facilities

4.7.25 Temporary Events

1 The signing of temporary events has been provided for in the past, and covered in Volumes 1 and 4, by the provision of FINGERBOARD sign GF17. The function of this sign has been broadened to be applicable to the signing of "part-time" facilities (see Subsection 4.5.6). Sign GF17 has been replaced for use for temporary events of tourist interest by temporary sign TGF17. Sign type TGF17 is also a fingerboard shaped sign but is simplified in design (see Figure 4.16) and in keeping with its temporary function should be manufactured in yellow and black colours.

2 The principle behind the use of sign TGF17 is that it must be easy to erect and quick to remove. The use of the sign is only appropriate on lower order roads due to its compact size. The highest class of road on which sign TGF17 is recommended for use is a single carriageway Class "B" road. If signing for a temporary event is approved for use on higher order roads the signs provided should be full size temporary guidance signs of the appropriate type i.e. direction, tourism or local direction.

3 Figure 4.51 shows three typical details which illustrate ways in which TGF17 signs may be used.

4 Consistent with the need for TGF17 signs to be quickly erected it is recommended that road or local authorities monitoring their use develop policies which lay down where such signs shall be positioned **AND where they shall NOT be positioned.** Such policies should be developed in a flexible way at a local level but inclusion of details such as the following is recommended:

(a) TGF17 signs shall not be attached to any other type of road traffic sign support, except a STREET NAME sign support;

(b) TGF17 signs should, where practical, be attached to fencing, street trees or street light poles either at the appropriate junction, or up to 60 m in advance of the junction in an urban area or up to 100 m in advance in a rural area;

(c) a maximum of three TGF17 signs for any one temporary facility is recommended; this maximum can be applied with flexibility and should apply to the total number of signs provided on all approaches to the facility (the example given in Detail 4.50.3 shows four signs for one facility, for instance, and assumes that the known "popular" direction of approach will only be from one direction).

5 TGF17 signs catering for temporary events have traditionally been provided by a service organisation such as the Automobile Association. A road or local authority may come to an agreement with such a responsible organisation or other body, to act as an agent for the erection **and removal** of TGF17 signs. The development of a formal agreement based, if necessary on a tender process, with adequate quality control safeguards for the authority, is recommended.

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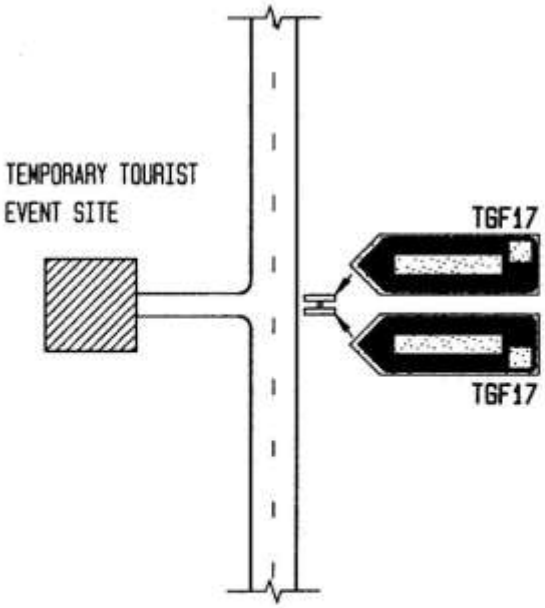
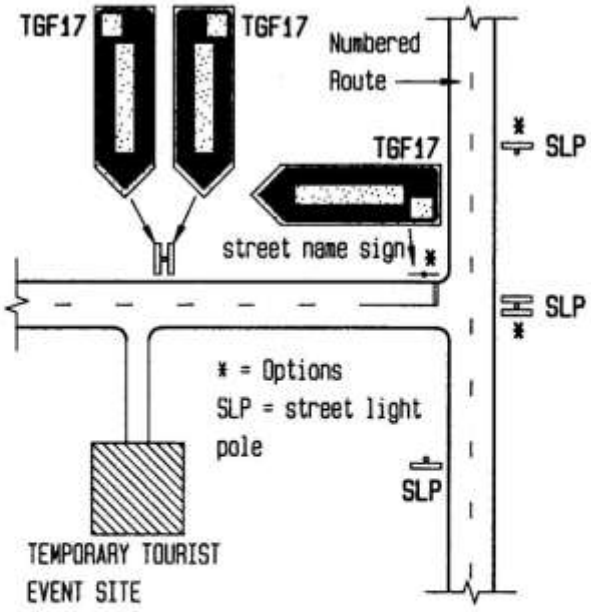
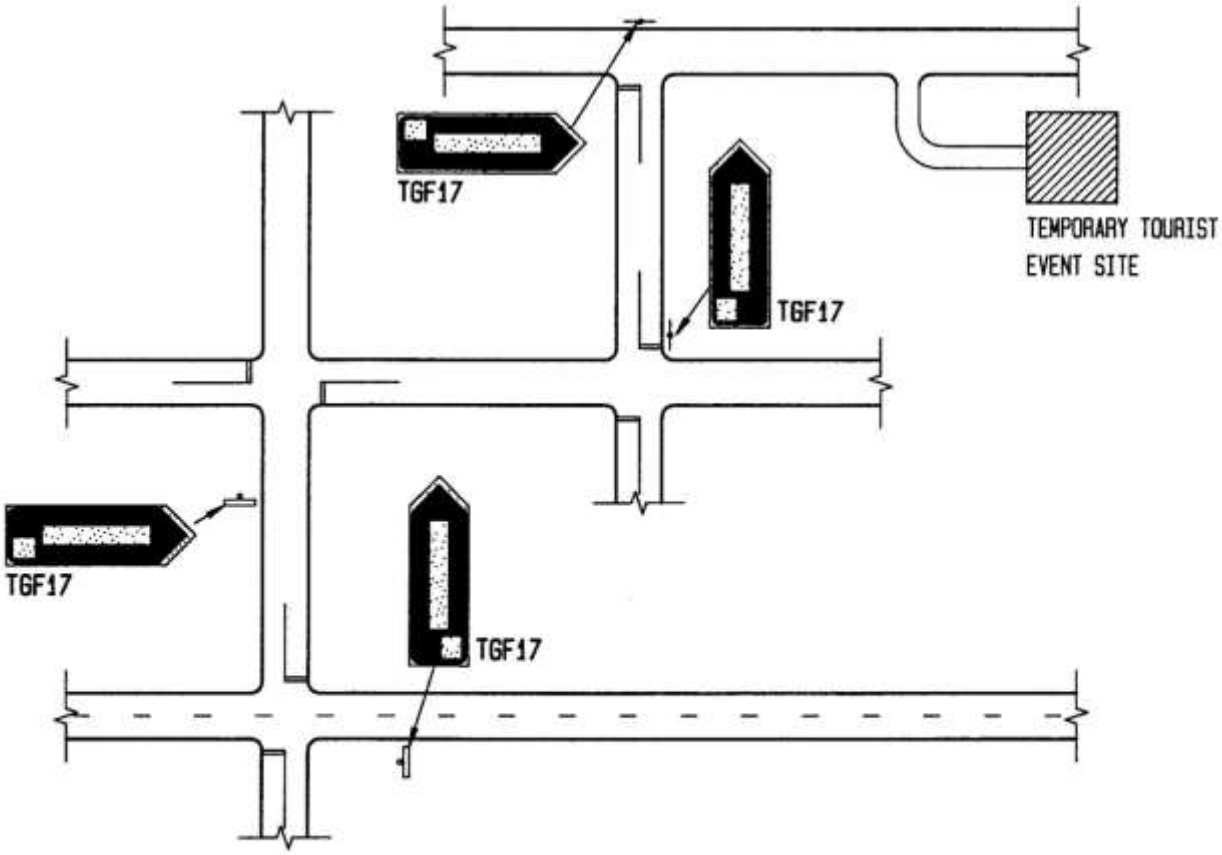


Detail 4.50.1
Minimum Temporary Event Sign Installations



Detail 4.50.2
Temporary Event Signing From Nearest Numbered Route



Detail 4.50.3
Follow-Up Temporary Event Signs - Maximum of Four Signs Total

Fig 4.51 **Signing of Temporary Events**

4.7.26 Signing for High Density Tourism Areas

1 The identification, and signing, of high density tourism areas are covered in Sections 4.4 and 4.5 respectively. This subsection and Figure 4.52 illustrate the types of sign used specifically to identify the area rather than individual facilities within the area. The example given refers to an area using the "Gateway Perimeter Method" of signing (see Subsection 4.4.5 and Figure 4.20).

2 The "Gateway Perimeter Method" of signing a high density tourism area tends to concentrate signing effort at the main entry points, or "gateways" to the area. Tourism signing at internal junctions, in terms of this method of signing, tends to be minimised to the use of TOURIST ROUTE MARKER signs GE18, when tourist routes have been identified.

3 Figure 4.52 shows a typical sign set for a tourism area erected at the nearest exit from an adjacent freeway. This sign set comprises a GF1 FREEWAY ADVANCE EXIT sign and a GF2 ADVANCE TURN sign. It is significant that these signs indicate the generic theme symbol and the name of the area, and do not indicate details of any specific facilities.

4 The gateway to the area, reached from the freeway exit, is identified by a version of GEOGRAPHICAL LOCATION sign GL6.3 giving the symbol and name representing the area, in this case "The Midlands Meander".

5 A particular feature of the "Gateway Perimeter Method" of signing is that information centres or information laybys are provided at each gateway. When a tourism area is created the Local Tourism Organisation, commonly formed by a Facility Owners Management Committee, may well decide to adopt a "theme" logo. This "theme" may be one of the generic or other symbol themes already available in the tourism signing system, or it may be something very specific to the area but which can be linked, for convenience, to an existing tourism symbol. This specific theme logo will also commonly be designed in colour. Since full colour logos are costly to produce on retrospective road signs they are therefore not practical, and the use of these logos is reserved for any information centres or signs provided, within the facility properties, at their entrances. Figure 4.52 shows an example of such a sign used at an information layby (for more details see Figures 4.25 and 4.26).

6 The logo sign at the facility entrance may be further enhanced by the use of a number system, unique to the area, which correlates with tourist maps and brochures produced for the area.

Checklist

One or more of the following factors or questions may indicate a need to treat the signing illustrated in Figure 4-52 in a different way:

- ❑ has the "area" been properly identified as a high density tourism area as described in Section 4.4?
- ❑ are information centres / laybys provided at the entry points to the area? - if not, the "Nearest Numbered Route" signing principle may be more appropriate;
- ❑ will the tourism signing towards and within the area, utilize a standard generic or other existing tourism symbol?
- ❑ does the area have its own theme logo?
- ❑ will property identification numbers be used on the information board and at property entrances?

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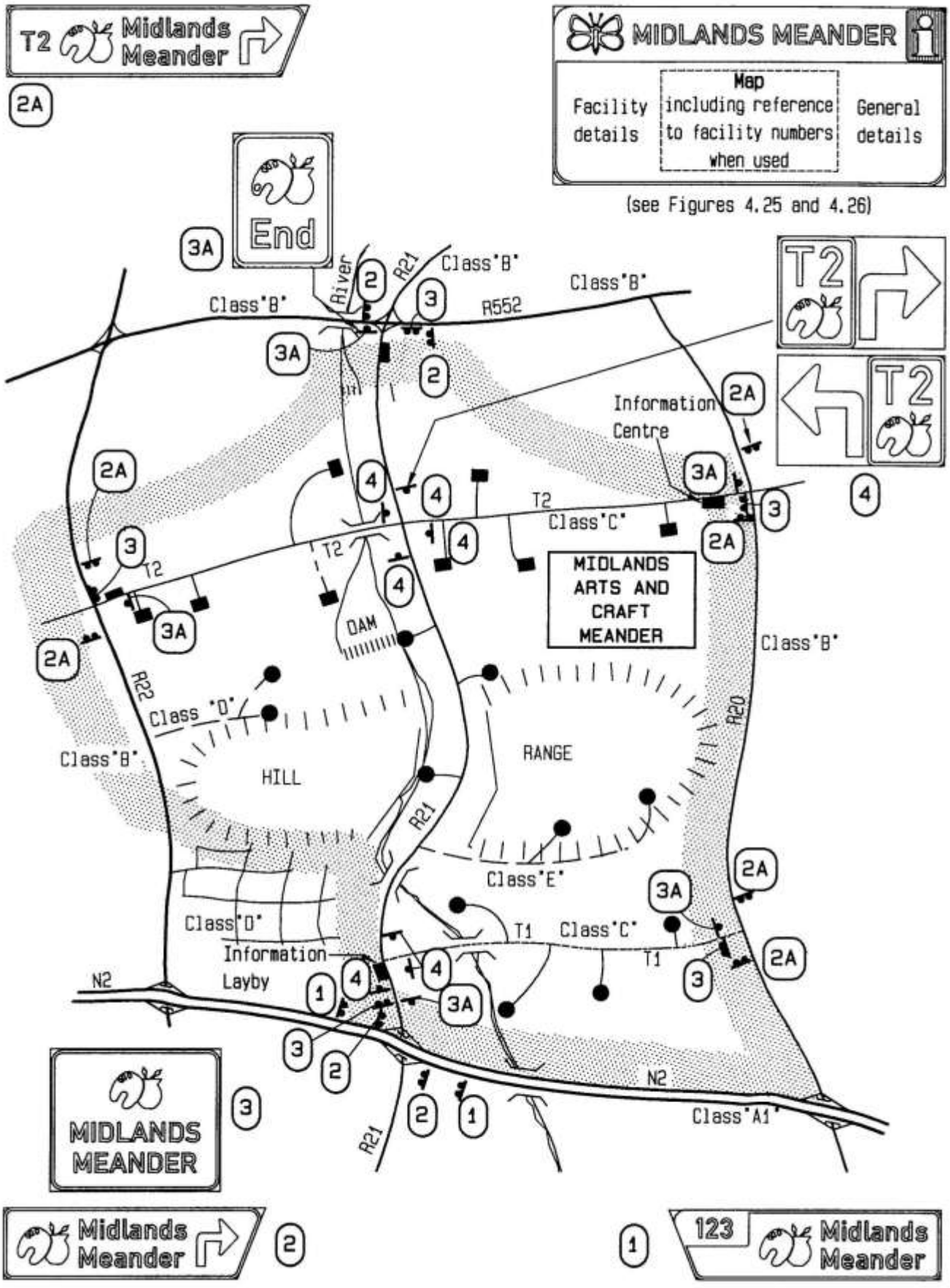

Fig 4.52 **Signing of a High Density Tourism Area**

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4.8 TERMINOLOGY

4.8.1 General

1 The following terms are relevant to any discussion on Tourism Signing and tourist destinations. They are included here to assist practitioners in using this Chapter:

Access Interchange:
Is a grade-separated junction between a freeway (class A1 or class A2), and an adjoining lower order road system.

Accommodation:
For the purpose of by-pass town signing accommodation is limited to hotels, motels, inns (symbol GFS C1-1) or chalets (symbol GFS C1-2) or caravan parks (symbol GFS C1-3) (Other categories of accommodation may be catered for in the general context of tourism signing).

Advertising sign:
Any sign board which is not a road traffic sign and which indicates the availability of a service or product for sale by brand name, or which indicates the occurrence of an event the purpose of which is for gain.

At-Grade route:
Is any route of classes "B", "C" or "D", which includes a predominance of at-grade road junctions.

Beach (Resort):
May include any beach related development offering accommodation facilities, whether registered as a municipality or not; the symbol may be used if necessary within a town, to indicate the direction to a named or un-named beach.

Bed and Breakfast:
Is a form of accommodation in an urban area which is specifically not registered as a hotel, motel etc., offering basic facilities to overnight or holiday tourists; only breakfast should be available.

Berg (Resort):
May include any mountain related development offering accommodation facilities.

"Bits" of information:
In order to assess the ability of a driver to take in the information displayed on the face of a road traffic sign the information has been broken down into "bits"; the maximum recommended number of "bits" of information on a tourism sign face (including all stacks and/or panels) is 12 "bits"; typical values of signface components in terms of "bits" are:

(i) words up to/including 8 letters = 1 bit

(ii) words more than 8 letters = 2 bits

(iii) arrow (stack-type) = 0,25 bit

(iv) route number = 0,5 bit

(v) symbol = 0,5 bit

(vi) distance information = 0,5 bit

(vii) interchange number = 0,5 bit

Boat Launch:
May include any river or coast based boat launch facility open to the general public.

Botanical gardens:
May include any type of botanical garden, whether specialized or not; if such a garden is named after a town, or province etc. it may be necessary to use the words "botanical gardens" in addition to the symbol and/or primary name; in the absence of a symbol for city parks this symbol could be used for such facilities if necessary.

By-pass town:
Any town which once had a class "A" or "B" route running through it, which route has now been diverted to avoid the developed area of the town (when development spreads to the extent that the by-pass becomes incorporated within the town again, albeit with access control, it is recommended that general tourism signing policies apply).

Class "A", "B", "C" or "D" routes:
These classes refer to a route classification for signing purposes; class "A" covers freeways - class "B" other numbered routes etc; for further details see Volume 1 of the Manual.

Cluster (of signs):
A tourism sign cluster is a multi-part tourism sign (maximum three panels or parts) mounted so that stacks applying to different directions are mounted on common supports with a vertical separation of 100 mm to 200mm.

Colour code:
Refers to the background sign colours used for various categories of guidance sign (see Figure 1.18 in Section 1.2).

Curio shop:
May include any facility selling arts and crafts, or farm produce located adjacent to a tourist route but not having direct access to such route.

Dam:
Is a stretch of water which is available to tourists as a picnic or relaxation venue but which does not provide any water based sporting facilities other than public fishing from the shoreline.

Direction sign:
Is a road traffic sign within the guidance sign class, used on class "B" or lower routes, which comprises the principal on-road component of the navigational aids system provided for all road users, both in rural and urban areas; a direction sign displays route numbers and familiar, control or service destination names appropriate to its location in the road hierarchy; freeway direction signs display similar information on class "A" routes.

Ethnic attraction:
Is a tourist attraction with a specific relationship to a racial, religious, linguistic or other population grouping

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Farm stall:
See "Curio Shop".

Game reserve:
May include any natural environment provided for the protection and/or development of fauna, either general or specialized, offering accommodation facilities; such reserves are generally categorized as resorts and may also specialise in flora and other ecological aspects.

General Tourist Attraction:
May include any form of tourist attraction which is not clearly covered by a symbol provided for an existing category of tourist attraction, or which covers such a wide range of categories that the use of no one symbol is appropriate.

"Generic" symbol:
A collective symbol used to identify a wide range of facilities in an area by a group identification in order to simplify tourism sign messages applicable to the area (see symbols GFS A3, A4, A5 etc).

Graded accommodation:
Refers to any operational system used to indicate the grade or quality of accommodation offered, such as the systems operated from time to time by organisations such as SATOUR.

Guest Farm:
See "Holiday Farm".

Guest House:
Is a form of accommodation offering room and board, normally at least breakfast and dinner, which is not registered or graded as a hotel; a guest house may be located in urban, peri-urban or rural environments.

Guidance sign:
Is a basic class of road traffic sign and includes location signs, route marker and trailblazer signs, direction and freeway direction signs, tourism signs and diagrammatic signs used to guide road users from the start to the end of their journeys.

Holiday Farm:
Is a form of accommodation offering room and board, normally all meals, located in a farming environment and offering guests specific involvement in the activities of the farm.

Inland Water Resort:
May include any stretch of water on which water based sporting activities are permitted and adjacent to which accommodation facilities are available; the symbol may also be used if necessary, within a town to indicate the direction to a water sport facility that is not a resort (see "Resort").

Interchange Number:
Several tourism signs include one or more interchange numbers in black numerals on a white block; these numbers represent a kilometre distance from a provincial boundary or the start of a route, increasing in a northerly or easterly direction; they are commonly used on class "A" routes but may also be used on class "B" routes and they also appear on direction and freeway direction signs.

Justification:
Is a term used to describe the vertical lining up of text and/or symbols on the face of a road sign; the rules relating to tourism signs are covered in this chapter - for other guidance signs see Volume 1: Chapter 4.

Lake:
See "Dam"

Manual:
Refers to the current editions of the Southern African Development Community-Road Traffic Signs Manual (SADC-RTSM) and the South African Road Traffic Signs Manual (SARTSM).

Map:
Is a diagrammatic representation of the road network of either a general or specific tourist application; it constitutes a fundamental component of the navigational aids system which may be used outside or inside a vehicle and for pre-trip or on-trip planning; it may also appear as part of the information on a tourist information board or brochures produced by tourism venues; it should always include appropriate route numbers.

Mountain Resort:
See "Berg Resort".

Museum:
May include any items of historical, artistic, scientific or cultural interest to tourists, whether exhibited within a building or in an open air environment; if the building housing the facility is a national monument the "National Monument" symbol GFS A7-1 should be used.

Nature Reserve:
May include any natural environment provided for the protection and/or development of flora, either general or specialised, offering accommodation facilities; such reserves are generally categorized as resorts and may also specialise in fauna and other ecological aspects.

Navigational Aid:
Is any device, including maps, brochures, magazines or newspapers, radio or television, video, accommodation bookings, information centres - outside the road environment, or guidance signs within the road environment, which enable tourists to successfully reach their intended destinations.

Numbered Route:
This includes any class "A" or "B" route (National, Provincial, Regional or Metropolitan).

Parallel Routes:
This applies most commonly to parallel provincial and national routes, normally resulting from the upgrading of a national route to a new but parallel alignment and the subsequent reclassification of the old national route as a provincial or even regional route.

Primary Name:
Is that part of the name of a tourist attraction, or accommodation facility one grade above the lowest grade, or a hospital, which is needed to identify it from another similar facility; the primary name should preferably be short and concise and should preferably not be the name of the town in which the facility is located; a primary name is not used at by-passed towns or on service exit sequence signs.

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Recreation:

Is the refreshment of health and spirits by relaxation and enjoyment

Resort:

Is a tourist venue where people go for a holiday and/or recreation which for the purpose of tourism signing shall include accommodation facilities; a resort may have a specific theme such as beaches, mountains, water (sports) etc. and it may consist of a facility built specifically as a resort, or facilities at an existing village or town, the principle activities of which are related to holiday and recreational activities.

Roadside stall:

Is a facility within or directly abutting a road reserve from which tourists may purchase arts, crafts and/or farm produce (see also "Curio Shop"/"Farm Store").

Reasonable road user/ tourist:

Is a road user having modest or moderate expectations with regard to guidance signing who is, therefore, prepared to make a contributory effort in the navigational process.

Rooms:

Are a form of accommodation which make no provision for the taking of meals, self-catering or otherwise.

Rest and Service Area:

Is a facility provided to offer the road user a wide range of tourist services, of a high standard, in an environment which encourages the tourist to also take a rest with the general objective of improved road safety.

Road Traffic Sign:

This includes all road signs, road signals, road markings or other devices prescribed in terms of the Road Traffic Act, Act 93 of 1996.

Route Numbering and Road Traffic Signs Sub-Committee:

The Route Numbering and Road Traffic Signs Sub-Committee is a technical support committee tasked with considering all comments, proposals or developments for road traffic signs.

Scenic Route:

Is a route, which may be short or long, which includes in its length sections of attractive natural scenery; a scenic route may include man-made features or facilities which impart a theme to the route in addition to its natural beauty.

Seaside Resort:

See "Beach Resort".

Service Facility:

Is a facility which can render assistance or be of importance to a road user and which has been established principally to service the short term needs of motorists and/or their vehicles to cater for emergency situations (in terms of general applications accommodation facilities are categorised separately although they are included in the general description of "service" when applied to the signing of by-passed towns).

Sign Panel:

An internal division of a tourism sign stack - a sign stack may include a maximum of three panels (see Figure 4.11).

Sign Stack:

A sign which contains tourism information relevant to one direction of travel only; a maximum of three sign stacks may make up a cluster (see "Cluster" and "Sign Panel").

Special Event:

A tourist attraction, or service, which is only available for a short time, or on a part -time basis

Supplementary Symbols:

Standard tourism sign symbols used at half size below the primary name of a facility, either in addition to a main symbol or in place of a main symbol; the use of symbols GFS C1-1, (Hotel) and GFS B4-1, (Restaurant), as supplementary symbols on tourism signs for hotels is recommended to keep sign areas down (see Level 3 warrants for use of supplementary symbols - Section 4.6).

Symbols:

Are tourism symbols approved by the Route Numbering and Road Traffic Signs Sub-Committee for use on road traffic signs.

Systems Interchange:

Is an interchange which provides for the free flow of traffic between two or more freeway systems.

Tourism:

Is deemed to include any activity concerned with the temporary movement of people to destinations outside the areas or places in which they normally live and work, and their activities during their stay at these destinations.

Tourist:

Is considered to be a person travelling for pleasure, in the broadest sense.

Tourist Facility:

Broadly includes almost any attraction or service which may be of interest to reasonable numbers of strangers to an area.

Tourism signing:

Guidance information provided to supplement the information given on direction signs, when such information is not appropriate for inclusion on such direction signs, and when road users cannot reasonably perceive the existence or location of tourist attractions or service facilities from the information given on the direction signs.

"TOTEM" signs:

Are a special sub-group of tourism signs only used within a rest and service area or other "closed" tourist facility such as a game reserve or nature reserve.

View Point:

Refers to an elevated position alongside a road or a hiking trail which offers tourists a panoramic view of the area in which they are travelling.

Warrants:

Are written statements given in Section 4.6 relating to specific types of tourist attraction and service which are applied to ensure that the character and quality of the facility complies with standards acceptable to reasonable tourists.

Wine Cellar:

Is a specific tourist attraction open to the public and offering wine-tasting and/or tours of the facility; use of the symbol is not appropriate to groups of wine cellars comprising what is commonly called a "wine route".

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FREEWAY SIGNING

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5.3 Range of Applicable Signs and Markings

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J J A Prinsloo
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FREEWAY SIGNING

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CHAPTER 5;
FREEWAY SIGNING

5.1 INTRODUCTION

5.1.1 General

1 This chapter offers additional guidelines (to those provided in Volume 1 and Volume 4) to aid the designers of signs and sign systems for rural and urban freeways. The primary objective, is to achieve a high quality and level of uniformity of design and practice, in freeway signing throughout South Africa. Freeway signing covers the whole range of sign types and road markings which are necessary to ensure safe and easy travelling along these facilities. It is thus essential to have a comprehensive freeway signing system, which is designed as a system, with the express purpose of minimising driver errors. Such errors can, by virtue of the nature of freeways, with limited points of access, result in significant wastage of time and fuel, and can increase the risk of accidents occurring due to unpredictable manoeuvres on the part of drivers.

2 There are often special circumstances involved in freeway design which preclude the use of a standardised signing treatment. **Although a wide range of options are covered in this chapter in order to assist designers, the availability of these options and the techniques used to develop them should not be seen by freeway geometric designers as a "cure-all" for complex roadway designs.** The geometric design of freeways should be undertaken on the understanding that there are inherent limitations in the signing system. Wherever possible designers should design to standardised sign displays and sequences, and resort to special treatment only if no other reasonable option is available.

3 This chapter should be read in conjunction with various sections of Volume 1: "Uniform Traffic Control Devices" which deal with signing policies and design principles, together with specific information on the meaning and individual application of all traffic control devices. These sections are cross-referenced, where necessary, throughout this chapter.

4 Freeways are sub-classified into Class A1 and Class A2 roadways, where a Class A1 freeway is a dual carriageway roadway and a Class A2 freeway is a single carriageway freeway (see Volume 1, Section 1.2 "Road Classification").

5 Numerous supplementary aspects relating to the application of freeway related road traffic signs are also dealt with in Volume 2, and the following chapters should be referred to:

(a) Chapter 2 - *Road Marking Applications*;

(b) Chapter 3 - *Regulatory and Warning Sign Applications*;

(c) Chapter 4 - *Tourism Signing Applications*;

(d) Chapter 11 - *Signing for Heavy Vehicles*;

(e) Chapter 19 - *Toll Route Signing*.

Specific cross-references are provided, where relevant.

6 The following aspects related to freeway signing are dealt with in this chapter:

(a) general principles of freeway signing;

(b) range of applicable signs;

(c) specific requirements for direction signing;

(d) signing at ramp connections for various types of interchanges;

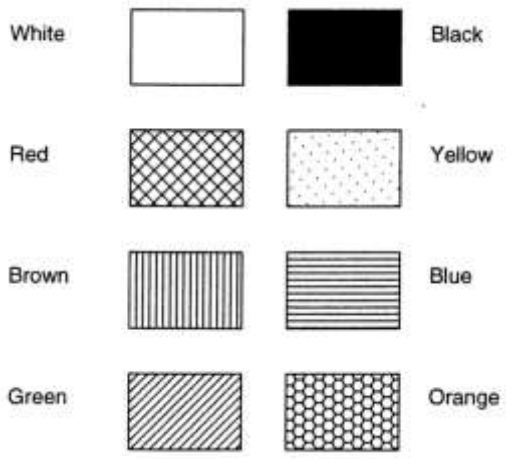
(e) emergency vehicle cross-over control.

7 In a freeway environment additional lanes may occasionally be added or dropped. The addition of a lane for a relatively short distance is most commonly provided to permit slow-moving vehicles to move out of the main traffic stream, thereby maintaining capacity levels. A by-product of such a provision is that overtaking or passing opportunities are enhanced. Signing details of such applications are covered in Chapter 11: *Signing for Heavy Vehicles* and relevant road marking details, including lane drop details are covered in Chapter 2: *Road Marking Applications*.

5.1.2 Road Traffic Sign Colour Indication

1 The chapters of Volume 2 of the South African Road Traffic Signs Manual (SARTSM) are not prepared in colour. Relevant examples used to illustrate appropriate signs, signals and markings are shaded in a black and white coding which is illustrated below.

2 The basic principles of the road traffic sign colour coding system are shown, in colour, in the SADC-RTSM Volume 1, Chapter 1, Section 1.4, and in the Contents sections of relevant Volume 1 and 4 Chapters.



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5.2 FREEWAY SIGNING PRINCIPLES

5.2.1 General

1 Drivers proceed along freeways at high speeds and, following guidance given by direction, and/or other signs, they take action to manoeuvre their vehicles in accordance with the information given and proposed destination. This action is commonly directed at their leaving the freeway via an off-ramp designed for high speed exit.

2 Driver decision making should be aided by a progression of guidance information, given well in advance on a freeway off-ramp, so that drivers are induced to make decisions and take subsequent actions in a sequence of predictable and unhurried manoeuvres, well before the exit point.

3 The driving process requires drivers to make many decisions, and execute many actions, for every kilometre travelled. The decisions resulting from observation of freeway direction signs may comprise a significant portion of this driver work-load. It is therefore desirable to keep the process as simple as possible. Whilst there are many other decisions to make in order to conduct a vehicle safely on the road, the basic decision required by a driver, as a result of reading guidance signs on the approach to a freeway interchange, is likely to be one of the following:

(a) to leave the freeway (which may involve joining another freeway at a systems interchange); or

(b) to stay on the freeway, but prepare to leave it at a subsequent interchange a short distance ahead; or

(c) to continue on the freeway for some distance.

4 In order that a driver may leave the freeway at either the next exit, or another closely following it, sufficient signs shall be provided in such a way that adequate time will be available to permit a safe exit manoeuvre. The configuration of freeway exits may vary widely, and in many instances will require above-average awareness and attention levels from drivers. The freeway direction signs provided should attempt to create such levels of awareness.

5 A decision to remain on the freeway is a much simpler process in that, once taken, little further sign related action is required by drivers. However, the combination of exit and straight-on (or through) information shall be adequate to remove any risk of driver confusion. This is particularly the case when the roadway includes lanes which are provided exclusively for exit purposes. The straight-on driver receives reassurance beyond the interchange from a confirmation sign or an exit sequence sign. These signs are repeated at regular intervals, and also give an early indication to drivers, particularly in rural areas, of the distance to a destination on their route.

6 The navigational process requires that drivers can correlate information, gained before making their trip, with what they see on freeway direction signs. The factor which most drivers would like to see on a sign is likely to relate to features in close proximity to their final destination. It is rarely possible to satisfy such a desire on the signs, and most trips of any length will require drivers to remember several items of navigational information. The use of route numbers and interchange (exit) numbers has been evolved in an effort to simplify this aspect of navigation. However, for these "tools" to be effective they shall be available in a co-ordinated manner in the pre-trip and travel phases of a journey. Rural and urban freeway environs differ significantly in terms of road geometry and driver expectation in terms of potential destinations. The principles relating to freeway sign sequence and signface design, for rural and urban signs, have therefore been developed with this in mind. The increased level of visual "noise" experienced in metropolitan areas complicates the driver observation and decision making processes, making it extremely important that the signing systems be well designed.

7 The more complex the circumstances are, the earlier the sign sequence should commence. The ability to comply with this requirement will commonly be limited in urban areas by closely spaced interchanges and junctions between different freeway systems. In such situations, therefore, the sign sequence for a number of interchanges may start with an EXIT SEQUENCE sign GA8. This sign is intended to make drivers aware that there are, in fact, several points of exit serving one town or city, and that once the first one is reached, the other exits will follow at close intervals. Drivers may immediately be able to identify their intended points of exit by linking the destination to the appropriate interchange (exit) number. If a town is by-passed by a route which has a number of interchanges, the access serving the town centre should be identified.

8 As drivers get closer to the exit point, signs are required which will allow them to assess how and when to make their exit manoeuvre. This manoeuvre may comprise a number of sequential actions in order, for instance, to shift across three or more lanes, in heavy traffic. This traffic itself may be making other lane changing manoeuvres in the process of weaving or overtaking, in order to be in the correct lane for the exit (see Volume 1, Figure 1.29). These signs will be overhead, and shall display the full amount of information appropriate to the exit type (access or systems - rural or urban) at an adequate distance from the exit point. In certain instances at a systems interchange, it may be necessary for drivers to correctly choose one out of two, or even three exit lanes, well in advance of the point where these separate into their opposite directions because it may not be possible to safely make a change of lane closer to the point of separation. It is important that the signs provided make such situations clear, by the accurate display of route numbers and destination names. (Details of basic sign sequences are given in Section 5.4.) If necessary, supplementary signs should be provided when traffic volumes are heavy, and there are significant numbers of heavy vehicles resulting in some signs being obscured, for some of the time during which a driver is on the approach to an exit. The capability of different destination names to provide adequate orientation, varies according to the relative familiarity of a driver with the portion of the road network in which a sign is being read. Destination names may be graded as familiar, control or service destinations on the basis that a stranger will almost certainly know a familiar destination, but is only likely to know the control or service destinations if a map has been consulted,

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or if they represent the specific destination being sought. The grading process for destinations is described in Volume 1, Chapter 8.

9 There are limits to the amount of information which drivers can read and comprehend when travelling at high speed. This does not, however, prevent drivers, collectively, from expecting an almost infinite amount of information. It is not possible to meet this demand, and display all destinations that all travellers may expect. **The information displayed must, therefore, represent a compromise.** Although recommendations are given in the individual sign subsections in Volume 1 regarding standard sign displays and limitations, full details on the effects of the amount of information on the readability of signs are given in Volume 1, Chapter 4, Sections 4.3 and 4.4. The limitations in display of information shall be correlated between the signs and maps, and other sources of navigational information used during pre-trip planning. In this context the correlation of route numbers and interchange numbers is particularly important.

10 Information displayed shall be given with sufficient time and distance in order that drivers may execute required manoeuvres. The detail given in Volume 1, Chapter 4, Subsection 4.4.3 deals with the required and available time to read a sign. The decision process, as a consequence of reading a direction sign on the freeway, is more complex than the reading process. It is recommended that sign designers employ decision sight distance parameters, in order to check whether standard sign spacing and positions, in relation to the exit point, are adequate for the message displayed and manoeuvres required. Critical locations where decision sight distance considerations are most appropriate are:

(a) interchanges with unusual layouts such as a "right" exit;

(b) complex interchanges;

(c) cross-sectional changes such as those at lane drops and toll plazas;

(d) urban areas with visual "noise" intrusion from advertising signs, which compete for drivers' attention;

(e) locations requiring unusual or unexpected manoeuvres.

11 Designers should refer to the following standards:

(a) the "Green" book - A Policy on Geometric Design of Highways and Streets – 6th Edition:2011, published by the American Association of State Highway and Transportation Officials - AASHTO;

(b) TRH 17: Geometric Design of Rural Roads, 1988;

(c) SANRAL G2 Geometric Design Guideline:2012.

The distance to the exit point shall be displayed on all advance exit direction signs and on exit sequence signs (see Volume 1, Chapter 1, Sections 1.7 and 1.8).

12 It is important that drivers are able to orientate themselves when necessary. At a systems interchange, because there are commonly two exits on the left which lead, in effect, to the left **and right**, the signs provided in advance of, and at, each exit shall make it clear to drivers which lane leads left and which right. These signs shall be sufficiently far in advance of the exit point, that drivers will make the correct decision and be able to act on it. At an access interchange, however, orientation is not necessary until after the exit point. The signface displays preceding the exit point need not, therefore, provide orientation. This permits a simplification of display, which is particularly relevant in urban areas, where the driver information work-load approaches limiting levels. For this reason, amongst others, the use of the name of the intersecting cross street is recommended in urban environs. Orientation in such situations is given on the off-ramp and/or at the ramp terminal.

13 Freeway direction signs may be ground-mounted or overhead. Ground mounted signs are normally limited to two-lane freeway carriageways, whilst overhead signs are used on three-or-more-lane freeway carriageways. The information displays are similar for each location and are dealt with in the individual sign subsections in Volume 1. Warrants for the use of overhead guidance signs are covered in Volume 1, Chapter 4, Subsection 4.1.8 and these include reference to reading time and decision making time.

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5.3 RANGE OF APPLICABLE SIGNS AND MARKINGS

5.3.1 Regulatory Signs

1 A wide range of regulatory signs is applicable under specific circumstances on freeways, and on interchange ramps providing access to or egress from the freeway. The details of individual regulatory signs are provided in the respective subsections of Volume 1, Chapter 2 while their application is dealt with in Chapter 3 of Volume 2. The range of applicable regulatory signs is summarised in Table 5.1.

2 The main control signs which are required only on the interchange ramps are:

(a) R1 - STOP sign required at the crossing road intersection;

(b) R2 - YIELD sign required at the crossing road intersection;

(c) R3 - NO ENTRY sign required to prevent traffic entering the off-ramp from the crossing road.

3 The main command signs which are necessary on the freeway are those relating to speed restriction, to signs relating to regulating specific types of vehicles such as heavy vehicles, vehicles carrying hazardous substances, abnormal vehicles, etc., the full range of which are indicated in Table 5.1. For the specific application of signs relating to:

(a) heavy and abnormal vehicles, see Chapter 11;

(b) public transport using freeways, see Chapter 8;

(c) toll signing, see Chapter 6.

4 The prohibition signs related to freeways concern restrictions on speed, vehicle type and vehicle characteristics, either on the freeway as a whole or related to specific lanes (see Table 5.1).

5 A typical reservation type regulatory sign applicable to freeway operation is the R321 sign indicating a reservation applicable for ambulance and emergency vehicles.

6 The comprehensive type regulatory signs which are required on freeways are:

(a) R401 - DUAL CARRIAGEWAY FREEWAY BEGINS;

(b) R402 - SINGLE CARRIAGEWAY FREEWAY BEGINS.

7 Selective restriction signs may also be used, and these provide a secondary message in combination with another regulatory sign. Examples of these signs are:

(a) (R)511 - DAYTIME restriction;

(b) (R)512 - NIGHTTIME restriction;

(c) (R)532 - MASS LIMIT restriction.

Examples of these and various combination signs are given in Figure 5.1

8 The derestriction regulatory signs which are required on freeways are:

(a) R401-600 - DUAL CARRIAGEWAY FREEWAY ENDS;

(b) R402-600 - SINGLE CARRIAGEWAY FREEWAY ENDS.

9 **The warrants for, and placement of, these regulatory signs are dealt with in detail in Volume 1, Chapter 1, Section 1.6, and in the individual subsections in Volume 1, Chapter 2 which deal with each specific sign.**

10 The shape, size and colour of regulatory signs is dealt with in detail in Volume 1, Chapter 1, Section 1.4 and Chapter 2, Section 2.1. Specific details of the control, command and prohibition signs themselves are provided in the respective individual subsections of Volume 1, Chapter 2.

5.3.2 Warning Signs

1 A wide range of warning signs is applicable under specific circumstances on freeways and on interchange ramps providing access to or egress from the freeway. The details of the individual signs are provided in the respective individual subsections of Volume 1, Chapter 3, while their application is dealt with in Chapter 3 of Volume 2. The range of warning signs is summarised in Table 5.2.

2 The warning signs related to road layout which may be required are:

(a) W112 - SHARP JUNCTION FROM LEFT to warn drivers of the interchange on-ramp or junction of two ramps on a systems interchange;

(b) W116 or W117 - END OF A DUAL ROADWAY;

(c) W118 or W119 - BEGINNING OF A DUAL ROADWAY.

3 The warning signs related to direction of traffic movement which may be required are:

(a) W212 - TWO-WAY TRAFFIC AHEAD;

(b) W214 or W215 - LANE ENDS.

4 Occasionally the geometric characteristics of a freeway may change due to the specific environmental factors. Due to the change in conditions the use of various curve warning signs (W202 to W205, and W208 to W211) may be appropriate.

5 There are a number of symbolic type warning signs which may have application where conditions warrant on a freeway. These relate to potential hazardous natural situations such as wild animals crossing the road, falling rocks in cutting sections, slippery road, etc., or to dangerous traffic conditions related to steep grades and slow moving vehicles. See Figure 5.2 for typical examples of these signs.

6 A number of hazard marker type warning signs also have application on freeways. These include:

(a) W401 and W402 - DANGER PLATES;

(b) W405 and W406 - SHARP CURVE CHEVRONS on loop ramps.

7 The warrants for and placement of these warning signs are dealt with in detail in Volume 1, Chapter 1, Section

(Continued on page 5.3.4)

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TABLE 5.1 RANGE OF REGULATORY SIGNS FOR USE ON FREEWAYS TABLE 5.1

Sign Description	Sign Number	Reference Page	
		Volume 1	Volume 4
CONTROL SIGNS (see Figure 5.1)			
Stop	R1	2.2.1	2.2.1
Yield	R2	2.2.6	2.2.5
No Entry	R3	2.2.9	2.2.8
COMMAND SIGNS (see Figure 5.1)			
Minimum Speed	R101	2.3.1	2.3.1
Vehicles Exceeding Mass Only	R102	2.3.2	2.3.2
Minibuses Only	R119	2.3.10	2.3.19
Midi-buses Only	R120	2.3.11	2.3.20
Buses Only	R121	2.3.11	2.3.21
Delivery Vehicles Only	R122	2.3.11	2.3.22
Goods Vehicles Only	R123	2.3.11	2.3.23
Goods Vehicles Over Indicated GVM	R124	2.3.12	2.3.24
Construction Vehicles Only	R125	2.3.12	2.3.25
Vehicles Conveying Dangerous Goods	R126	2.3.12	2.3.26
Abnormal Vehicles Only	R127	2.3.12	2.3.27
Pay Toll	R132	2.3.14	2.3.32
PROHIBITION SIGNS (see Figure 5.1)			
Speed Limit	R201	2.4.1	2.4.1
Mass Limit	R202	2.4.2	2.4.3
No Unauthorised Vehicles	R208	2.4.7	2.4.10
No Overtaking Goods Vehicles by Goods Vehicles	R215	2.4.10	2.4.17
No Motor Cycles	R222	2.4.17	2.4.23
No Taxis	R224	2.4.17	2.4.25
No Minibuses	R225	2.4.17	2.4.26
No Midi-buses	R226	2.4.18	2.4.27
No Buses	R227	2.4.18	2.4.28
No Delivery Vehicles	R228	2.4.18	2.4.29
No Goods Vehicles	R229	2.4.18	2.4.30
No Goods Vehicles Over Indicated GVM	R230	2.4.19	2.4.31
No Construction Vehicles	R231	2.4.19	2.4.32
No Vehicled Conveying Dangerous Goods	R232	2.4.19	2.4.33
No Abnormal Vehicles	R233	2.4.19	2.4.34
No Tour Buses	R235	2.4.20	2.4.36
No Agricultural Vehicles	R236	2.4.20	2.4.37
No Animal-drawn Vehicles	R237	2.4.20	2.4.38
RESERVATION SIGNS (see Figure 5.1)			
Ambulance and Emergency Vehicles	R3212	2.5.9	2.5.21
COMPREHENSIVE SIGNS (see Figure 5.1)			
Dual Carriageway Freeway Begins	R401	2.6.1	2.6.1
Single Carriageway Freeway Begins	R402	2.6.2	2.6.2
SELECTIVE RESTRICTION SIGNS (see Figure 5.1)			
(EXCLUSIVE SECONDARY MESSAGE)			
Daytime Restriction	(R)511	2.7.4	2.7.7
Nighttime Restriction	(R)512	2.7.4	2.7.8
Mass Limit Restriction	(R)532	2.7.6	2.7.15
DE-RESTRICTION SIGNS (see Figure 5.1)			
Dual Carriageway Freeway Ends	R401-600	2.9.1	2.8.7
Single Carriageway Freeway Ends	R402-600	2.9.1	2.8.8

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CONTROL SIGNS

R1

R2

R3

COMMAND SIGNS

R101

R102

R119

R120

R121

R122

R123

R124

R125

R126

R127

R132

PROHIBITION SIGNS

R201

R202

R208

R215

R222

R224

R225

R226

R227

R228

R229

R230

R231

R232

R233

R235

R236

R237

RESERVATION SIGNS

R302

R314

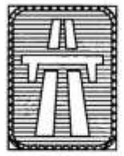
R321

R334

R336

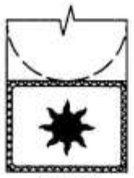
R349

COMPREHENSIVE SIGNS


R401

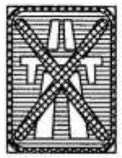
R402

EXCLUSIVE SECONDARY MESSAGE SIGNS
(ONLY for use with primary sign)


(R) 511

(R) 512

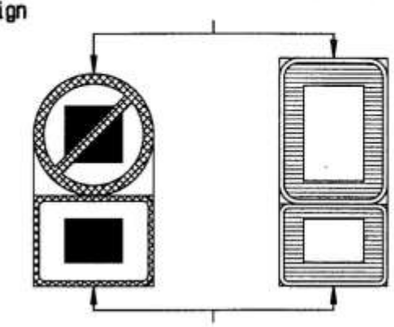
DERESTRICTION SIGNS


R401-600

R402-600

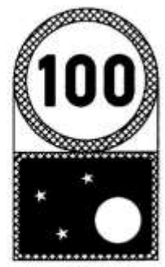
SELECTIVE RESTRICTION SIGNS

"PRIMARY MESSAGE" - standard regulatory sign



"SECONDARY MESSAGE" - this qualifies the primary message by means of an Exclusive Secondary Message sign (R) 500 OR other secondary message

R201-511
Daytime
Speed Limit



R201-512
Nighttime
Speed Limit

COMBINATION REGULATORY/
INFORMATION SIGNS

R132-IN11.3

R215-IN11.2

R401-600
-IN11.3

Fig 5.1
Regulatory Signs Applicable to Freeways

TABLE 5.2 RANGE OF WARNING SIGNS FOR USE ON FREEWAYS TABLE 5.2

Sign Description	Sign Number	Reference Page	
		Volume 1	Volume 4
ROAD LAYOUT SIGNS (see Figure 5.2)			
Sharp Junctions	W112	3.2.3	3.2.12
End of Dual Roadway	W116	3.2.4	3.2.16
	W117	3.2.4	3.2.17
Beginning of Dual Roadway	W118	3.2.4	3.2.18
	W119	3.2.4	3.2.19
DIRECTION OF MOVEMENT SIGNS (see Figure 5.2)			
Two-way Traffic	W212	3.3.4	3.3.12
Lane Ends/Right	W214	3.3.5	3.3.14
Lane Ends/Left	W215	3.3.5	3.3.15
SYMBOLIC SIGNS (see Figure 5.2)			
Wild Animals Ahead	W313	3.4.6	3.4.13
Tunnel	W319	3.4.8	3.4.19
Steep Descent	W322	3.4.10	3.4.22
Steep Ascent	W323	3.4.10	3.4.23
Slow Moving Heavy Goods Vehicle	W324	3.4.11	3.4.24
Slippery Road	W333	3.4.15	3.4.33
Falling Rocks/Right	W334	3.4.15	3.4.34
Falling Rocks/Left	W335	3.4.15	3.4.35
HAZARD MARKER SIGNS (see Figure 5.2)			
Danger Plates/Right	W401	3.5.1	3.5.1
Danger Plates/Left	W402	3.5.1	3.5.1
Sharp Curve Chevron	W405/W406	3.5.3	3.5.3

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(Continued from page 5.3.1)

1.6 and Chapter 3, Section 3.1 and in the individual subsections dealing with each specific sign in Chapter 3.

5.3.3 Guidance Signs

1 Effective and timely guidance is essential on freeways as vehicles are generally travelling at high speeds and exits from the facility are limited. Drivers therefore need to be accurately apprised of their location along the freeway and of the options available for reaching their destination. A wide range of guidance signs is applicable on the freeway itself, at interchange on and off-ramps, and on the crossing road approaches to an interchange. The guidance signs applicable cover the location type, route marker type, direction type, tourism type and diagrammatic type. The details of the individual signs are provided in the respective individual subsections of Volume 1, Chapter 4. The range of guidance signs is summarised in Tables 5.3 to 5.5.

2 The following location type signs which may be used on the freeway are:

(a) GL1 - STREET NAME signs suitably mounted to indicate the overpass or under-passing roadways;

(b) GL3 - TOWN NAME;

(c) GL4 - RIVER NAME;

(d) GL5 - PROVINCIAL or TERRITORIAL BORDER;

(e) GL6 - GEOGRAPHIC LOCATION;

(f) GL7 - ROUTE NAME;

(g) GL8 - INTERCHANGE NAME.

The warrants for and placement of these signs are dealt with in detail in Volume 1, Chapter 4, Section 4.5. These signs are indicated in Figure 5.3 and summarised in Table 5.3.

3 Various route marker signs may be used on the approach roads to a freeway to indicate the best route to the freeway, and to confirm the route once reached. The warrants for, and placement of, these signs are dealt with in detail in Volume 1, Chapter 4, Section 4.6, and for urban areas, in Volume 2, Chapter 9.

4 Freeway direction signs are the main type of guidance sign encountered on the freeway and on the approach roads to interchanges. The general details of these signs are dealt with in Volume 1, Chapter 4, Section 4.8 and are summarised in Table 5.4. The range of signs is indicated in:

(a) Figure 5.4 - Typical Freeway Direction Signs - Ground - Mounted;

(Continued on page 5.3.12)

Detail 5.2.1 Advance Warning Signs

Road Layout Related Signs

Direction of Movement Related Signs

NOTE :
The signs shown illustrate typical warning signs more commonly used on freeways. Other advance warning signs not shown may be used as appropriate.

Symbol Related Signs

Detail 5.2.2 Hazard Marker Signs

Fig 5.2 Warning Signs Applicable to Freeways

TABLE 5.3 RANGE OF LOCATION GUIDANCE SIGNS FOR USE ON FREEWAYS TABLE 5.3

Sign Description	Sign Number	Reference Page	
		Volume 1	Volume 4
LOCATION SIGNS (see Figure 5.3)			
Street Name	GL1	4.6.2	4.2.1
Town or City Name	GL3	4.6.7	4.2.6
River Name	GL4	4.6.7	4.2.8
Provincial or Territorial Border	GL5	4.6.8	4.2.9
Geographical Location	GL6	4.6.8	4.2.11
Route Name	GL7	4.6.9	4.2.13
Interchange Name	GL8	4.6.9	4.2.14

TABLE 5.4 RANGE OF DIRECTION SIGNS FOR USE ON FREEWAYS TABLE 5.4

Sign Description	Sign Number	Reference Page	
		Volume 1	Volume 4
GROUND-MOUNTED FREEWAY DIRECTION SIGNS (see Figure 5.4)			
Pre-Advance Exit Direction	GA1	4.9.17	6.2.1
Advance Exit Direction	GA2	4.9.18	6.2.2
Supplementary Exit Direction	GA2/3	4.9.20	6.2.7
Exit Direction	GA3	4.9.21	6.2.9
Gore Exit	GA4	4.9.23	6.2.13
Advance Off-Ramp Terminal Direction	GA5	4.9.24	6.2.15
Off-Ramp Terminal Direction	GA6	4.9.25	6.2.17
Confirmation	GA7	4.9.27	6.2.21
Exit Sequence	GA8	4.9.28	6.2.22
C-D Road Advance Exit Direction	GA9	4.9.28	6.2.24
C-D Road Exit Direction	GA10	4.9.29	6.2.25
GROUND-MOUNTED FREEWAY CROSSROAD DIRECTION SIGNS (see Figure 5.5)			
Advance Direction	GB1	4.9.31	6.3.1
Near Side On-Ramp Direction	GB2	4.9.32	6.3.3
Far Side On-Ramp Direction	GB3	4.9.32	6.3.4
Far Side On-Ramp Direction	GB4	4.9.33	6.3.5
OVERHEAD MOUNTED FREEWAY DIRECTION SIGNS (see Figures 5.6 and 5.7)			
Pre-Advance Exit Direction	GC1	4.9.17	6.4.1
Advance Exit Direction	GC2D	4.9.35	6.4.3
Through Direction	GC3D	4.9.35	6.4.5
Exit Direction	GC4D	4.9.35	6.4.7
Advance Exit Direction	GC2U	4.9.37	6.4.8
Supplementary Exit/Through Direction	GC3U	4.9.38	6.4.12
Exit Direction	GC4U	4.9.40	6.4.16
Advance Off-Ramp Direction	GC5U	4.9.41	6.4.20
Through Direction	GC6U	4.9.42	6.4.22
C-D Exit/Through Direction	GC7U	4.9.43	6.4.24
Exit/Through Direction	GC8U	4.9.43	6.4.25

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GL1

GL3

GL4

GL5

GL6

GL7

GL8

NOTE:

(1) The symbol to be used on sign GL7 is either GLS-4 or GLS-5 (see Figure 5.5).

For Direction Signs symbols GDS-4 or GDS-5 shall be used.

Fig 5.3 Typical Location Signs Applicable to Freeways

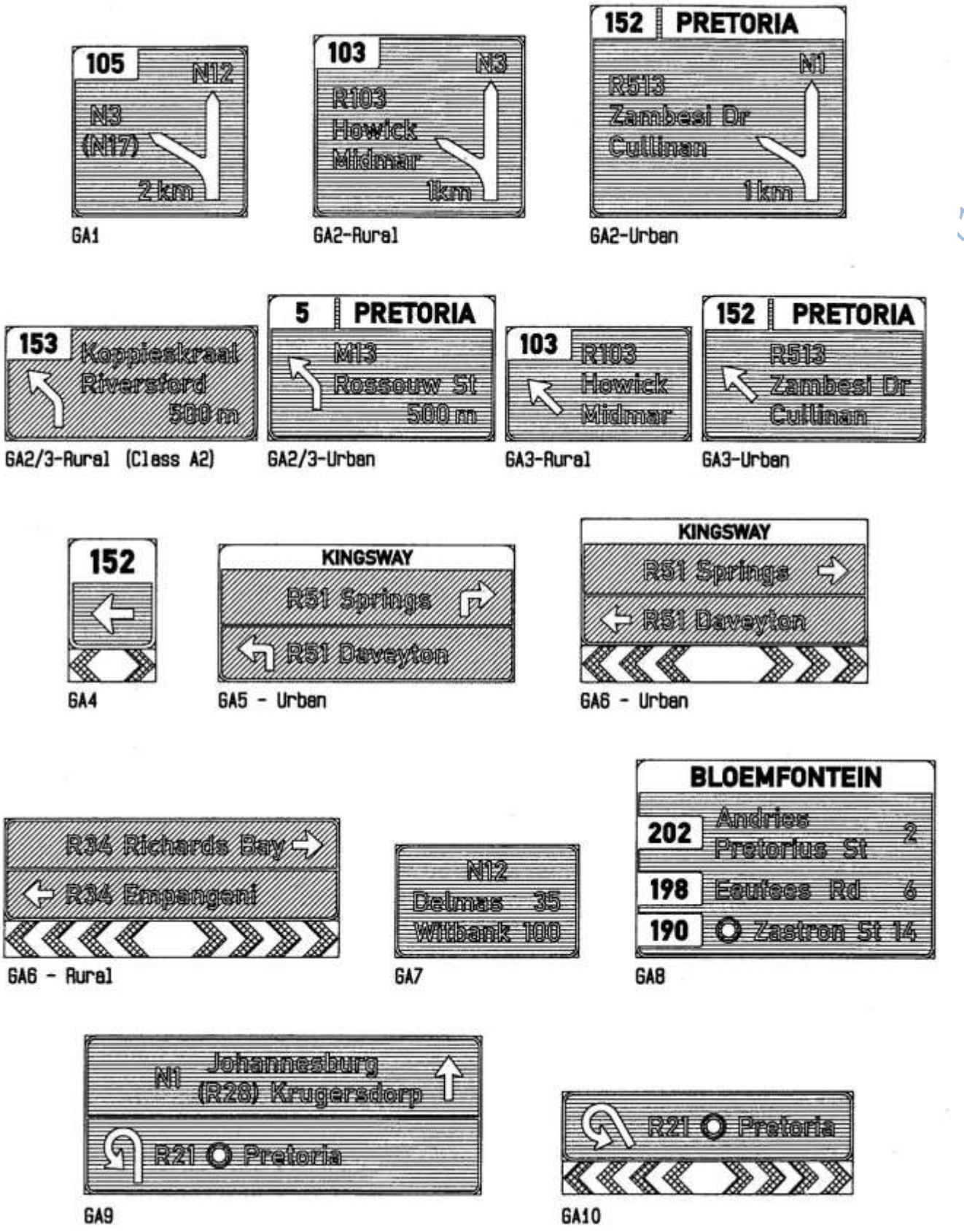


Fig 5.4 Typical Freeway Direction Signs – Ground Mounted

GB1-Urban

GB1-Rural

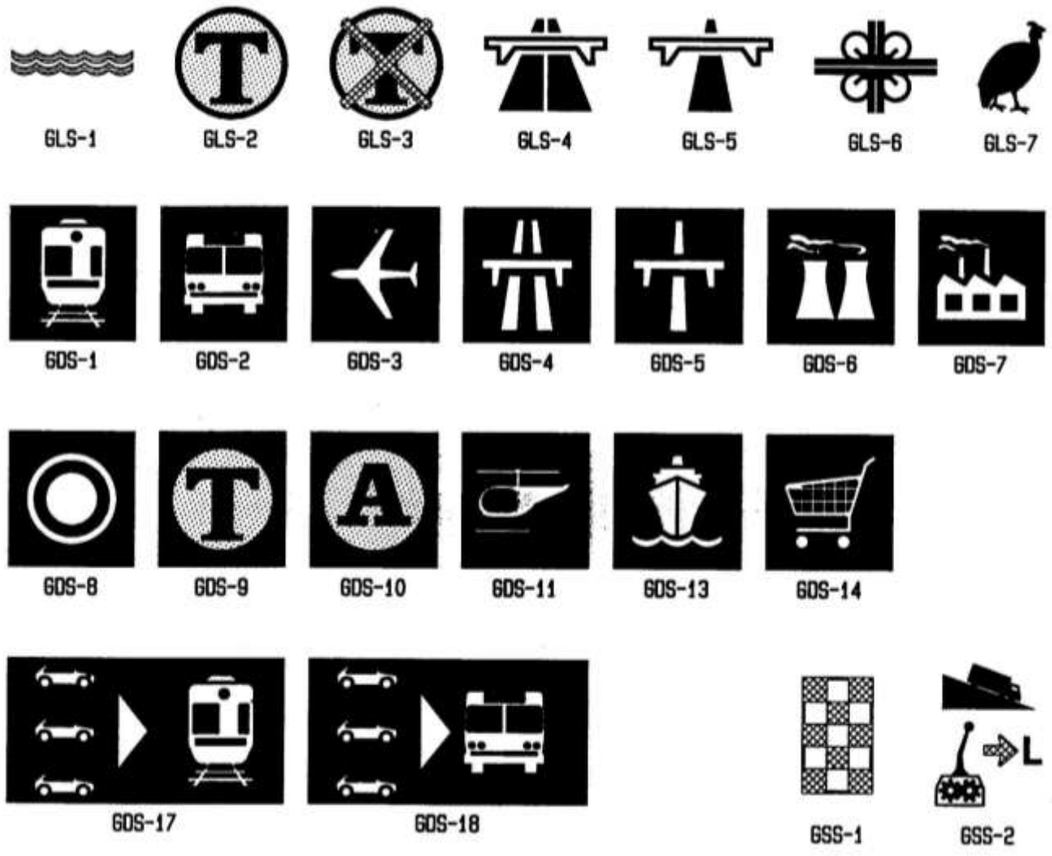
GB2

GB3

GB4-Alt.1

GB4-Alt.2

Detail 5.5.1 Freeway Crossroad Approach Sign.



Detail 5.5.2 Guidance Sign Symbols.

Fig 5.5 **Typical Freeway Crossroad Direction Signs – Ground Mounted – and Direction Sign Symbols**

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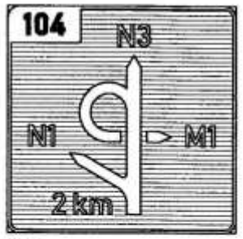
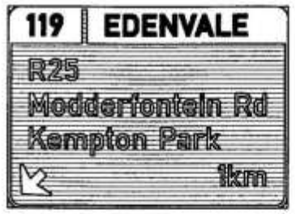


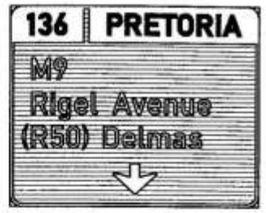
GC1

Detail 5.6.1
Both Arrow Systems



GC2D

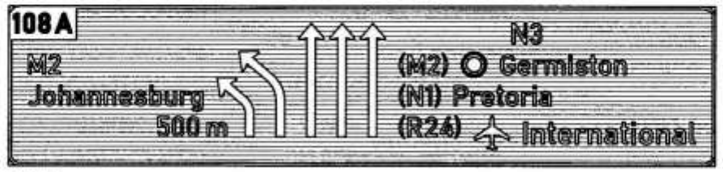
GC3D



GC4D

Detail 5.6.2 Downward Pointing Arrow System

GC2U

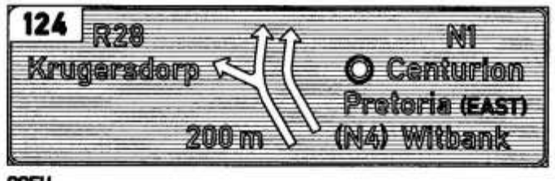


GC3U

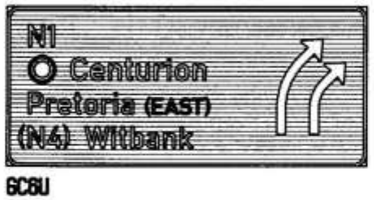
Detail 5.6.3
Upward Pointing Arrow System

GC4U

GC6U

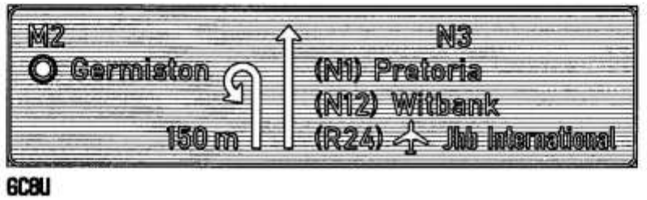


GC5U



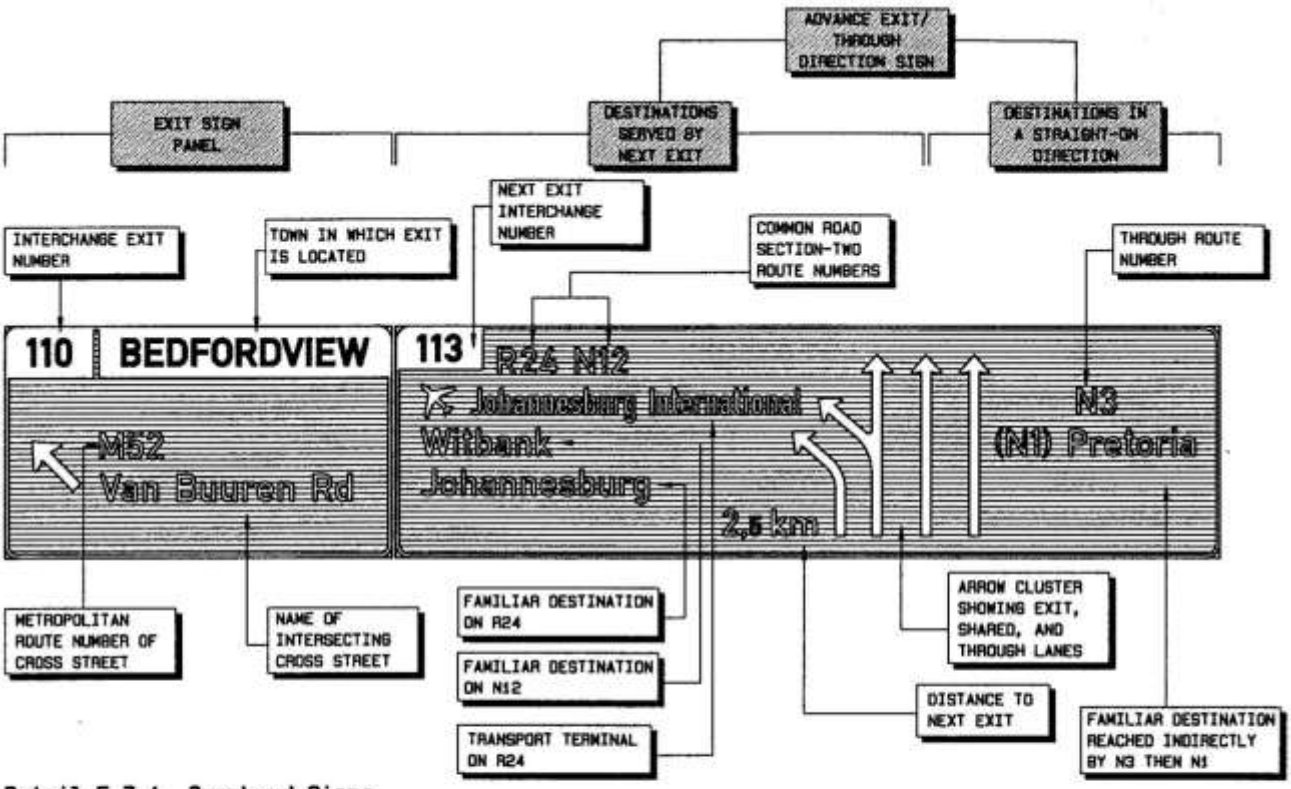
GC6U

GC7U

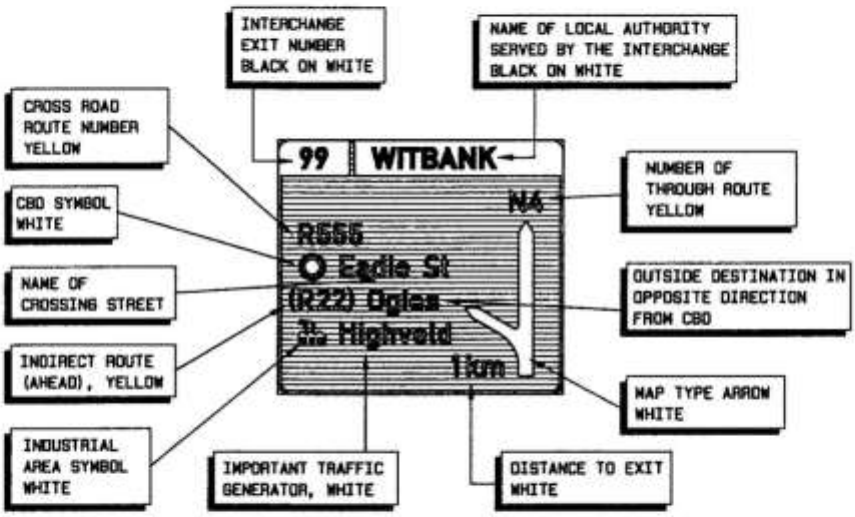


GC8U

Fig 5.6
Typical Freeway Direction Signs
Overhead Mounted



Detail 5.7.1 Overhead Signs.



Detail 5.7.2 Ground Mounted Signs.

Interchange exit number Route number Distance

Detail 5.7.3 Numbers on Signs.

Fig 5.7 Examples of Typical Freeway Direction Sign Detail

TABLE 5.5 DIAGRAMMATIC GUIDANCE SIGNS FOR USE ON FREEWAYS TABLE 5.5

Sign Description	Sign Number	Reference Page	
		Volume 1	Volume 4
DIAGRAMMATIC SIGNS (see Figure 5.8)			
Traffic Movement Affected by Obstruction	GS101-158	4.12.9 - 13	8.2.1 - 57
Added Lane	GS201-214	4.12.15 - 16	8.3.1 - 11
Lane Use Control	GS301-312	4.12.18	8.4.1 - 10
Lane Merge/Converge	GS401-406	4.12.20 - 22	8.5.1 - 7
	GS451-454		8.6.1 - 3
Arrestor Bed	GS501-504	4.12.24	8.7.1 – 3
Heavy Vehicles Change Gear	GS505	4.12.24	8.7.4
Overhead Diagrammatic (typical examples)	GS601-611	4.12.26 - 28	8.8.1 - 16
	GS6106-6501		

(Continued from page 5.3.4)

(b) Figure 5.5 - Typical Freeway Crossroad Direction Signs - Ground - Mounted, and Direction Sign Symbols (appropriate to freeways)

(c) Figure 5.6 - Typical Freeway Direction Signs - Overhead - Mounted.

Signface details are indicated in Figure 5.7.

5 There are a number of symbols which may be incorporated into the direction signs. These give guidance to facilities such as:

(a) GDS-1 - Railway Station;

(b) GDS-3 - Airport;

(c) GDS-6 - Power Station;

(d) GDS-7 - Industrial Area;

(e) GDS-8 - Central Business District.

The general details of these are given in Volume 1, Chapter 4, Section 4.3. The range of symbols appropriate to freeways is given in Figure 5.5. Refer also to Figure 5.7 for examples of the use of some of these symbols.

6 There are several diagrammatic type guidance signs which may be used on freeways. The general details of these are given in Volume 1, Chapter 4, Section 4.12. The most relevant signs are indicated in Table 5.5 and are illustrated in Figure 5.8. SUPPLEMENTARY PLATE signs IN11 may be used with ground-mounted diagrammatic signs in one of five basic types, as follows:

(a) an advisory speed - IN11.1;

(b) a distance "for" - IN11.2;

(c) a distance "to" - IN11.3;

(d) a text message - IN11.4;

(e) a symbolic message - IN11.5.

7 For details of the application of signing related to heavy vehicles, including diagrammatic signs, refer to Volume 2, Chapter 11.

8 For details of the application of signing on freeway toll routes, refer to Volume 2, Chapter 6.

5.3.4 Information Signs

1 The following information signs should be used on freeways where necessary:

(a) COUNTDOWN signs IN1, IN2 and IN3 on the approach to an interchange off-ramp;

(b) IN11 SUPPLEMENTARY PLATES should be applied in conjunction with various other sign types where needed.

The general details of these signs are dealt with in Volume 1, Chapter 5. These signs are illustrated in Figure 5.1 and Figure 5.9 and summarised in Table 5.6.

5.3.5 Tourism Signs

1 The general details of tourism signs are dealt with in Volume 1, Chapter 4, Section 4.10 and their application is dealt with in Volume 2, Chapters 4 and 9. An example of the placement of tourism signs on a freeway is given in Figure 5.10.

5.3.6 Road Markings

1 Road marking details are dealt with in Volume 1, Chapter 7 and specific aspects of their application are dealt with in Volume 2, Chapter 2.

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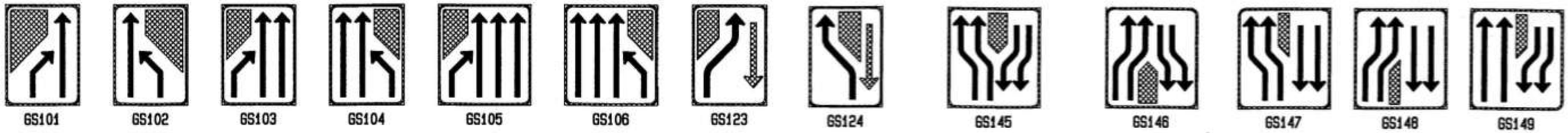
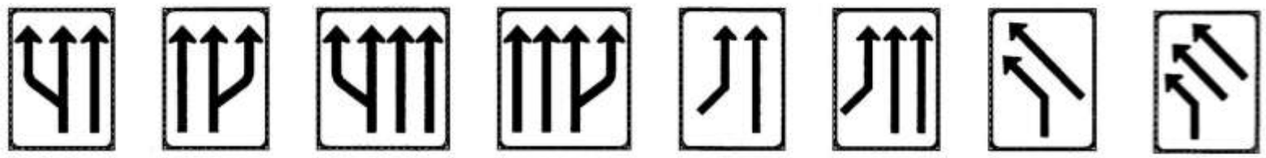
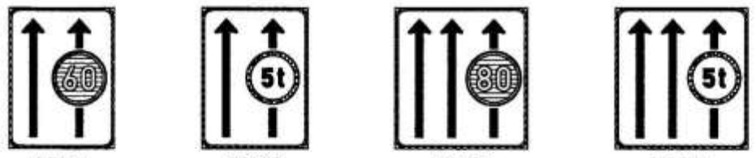


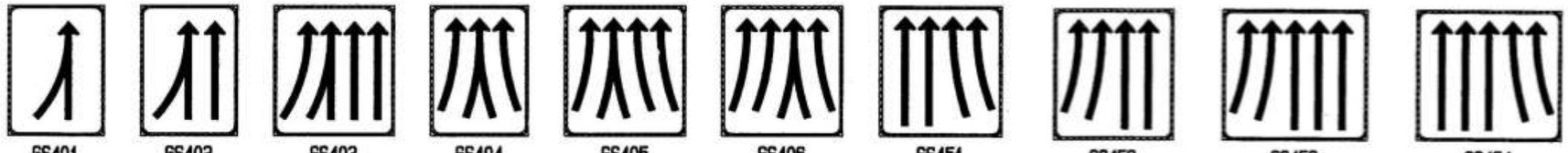
Detail 5.8.1 Traffic Movement Affected by Obstruction



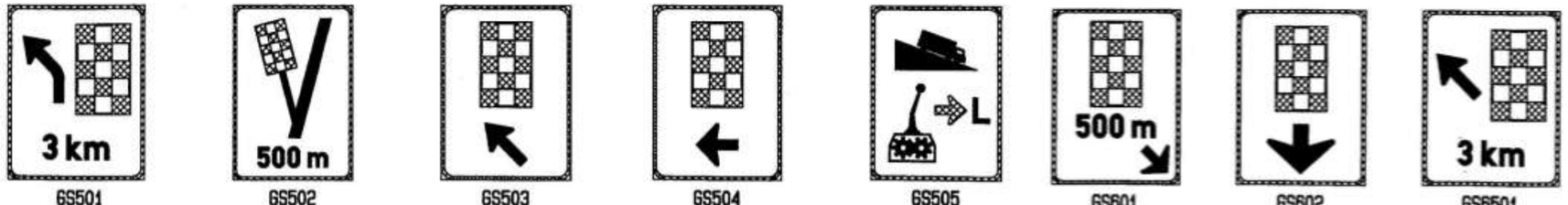
Detail 5.8.2 Added Lane



Detail 5.8.3 Lane Use Control by Regulation

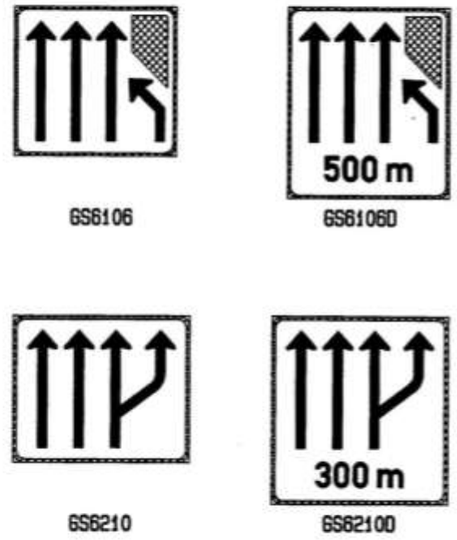


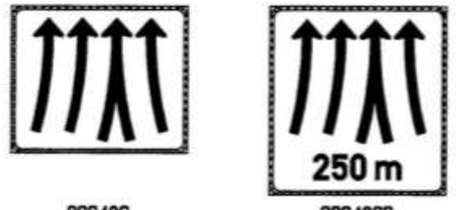
Detail 5.8.4 Lanes Merge / Converge



Detail 5.8.5 Arrestor Bed / Heavy Vehicle Change Gear

Detail 5.8.6 Overhead Lane Use Control





Detail 5.8.7 Examples of Overhead Diagrammatic Signs - with and without Distance

NOTE:

(1) SUPPLEMENTARY PLATE signs IN11 may Be used with ground-mounted diagrammatic signs.

Refer to paragraph 5.3.3.6.

Fig 5.8
Typical Diagrammatic Signs for Use on Freeways

TABLE 5.6 INFORMATION SIGNS FOR USE ON FREEWAYS TABLE 5.6

Sign Description	Sign Number	Reference Page	
		Volume 1	Volume 4
INFORMATION SIGNS (see Figure 5.9)			
Countdown Signs 100 m	IN1	5.2.1	9.2.1
Countdown Signs 200 m	IN2	5.2.1	9.2.1
Countdown Signs 300 m	IN3	5.2.1	9.2.1
Supplementary Plate	IN11	5.2.4	9.2.8/13

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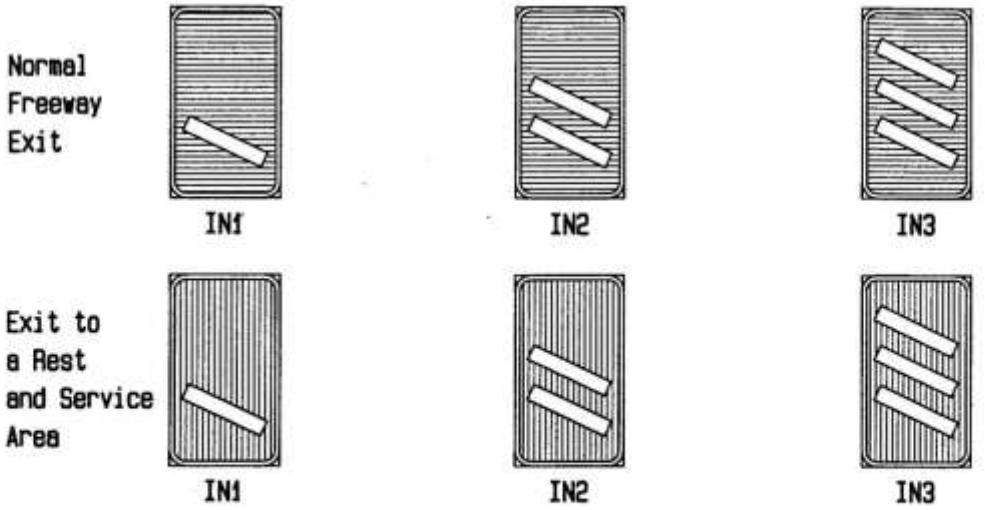

Detail 5.9.1 Countdown Signs.

Detail 5.9.2 Supplementary Plates.

NOTES:

(1) Supplementary plates may be used in one of five basic types, as:

- (a) an advisory speed numbered IN11.1;
- (b) a distance “for” numbered IN11.2;
- (c) a distance “to” numbered IN11.3;
- (d) a text message numbered IN11.4;
- (e) a symbolic message numbered IN11.5.

Fig 5.9 Information Signs Applicable to Freeways

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5.4 FREEWAY SIGNING APPLICATIONS

5.4.1 General

1 This section of the chapter deals primarily with the various aspects of the application of guidance signs on freeways. These are:

(a) required information display for access interchanges - see Subsection 5.4.2;

(b) required information display for systems interchanges - see Subsection 5.4.3;

(c) basic requirements for freeway direction sign sequences - see Subsection 5.4.4;

(d) details of freeway direction sign sequences - see Subsection 5.4.5;

(e) signing at directional interchange ramp merges - see Subsection 5.4.6;

(f) crossing road name signing at non-access crossroads - see Subsection 5.4.7.

Refer also to Volume 1, Chapter 4, Section 4.9.

2 Emergency vehicle cross-over control is also covered.

5.4.2 Required Information Display for Access Interchanges

1 The minimum **primary** information to be displayed on freeway direction signs at **access** interchanges should enable rapid identification of the exit and of the intersecting cross route, and the distance to the exit(s) serving the interchange. This information shall conform to what drivers may expect to see on the signs, having studied a map of the area, and consists of the interchange (exit) number and the number of the intersecting route.

2 **Secondary** information relates to the place names associated with the exit(s). This information is secondary in the sense that most intersecting cross routes provide access to many towns or cities. The process described in Volume 1, Chapter 8 will produce the best possible selection of destination names for rural access interchanges. In urban areas this task is more complex. In order to correlate most effectively with maps, the display of an orientating street name, normally associated with a route number, is recommended on urban freeway signs. Orientation is given by the off-ramp terminal direction sign GA6 once exit from the freeway has been accomplished. It is considered that a driver can effectively make a decision to exit the freeway on the basis of knowledge of the interchange (exit) number and/or the crossing route number and street name.

3 The following items of information may be displayed on the sequence of signs provided at access interchanges:

(a) interchange (exit) number (exit information);

(b) freeway route number (straight on information);

(c) cross route identification by route number (exit information);

(d) cross street name in urban areas (exit information);

(e) names of destinations which can be reached from the exits (orientational information);

(f) local authority name in urban areas in which the exit is located (reassurance);

(g) distance to exits (exit information);

(h) control destinations on the freeway route beyond the interchange (reassurance);

(i) tourist or service facilities served by the exits which conform to the policy for such signing.

5.4.3 Required Information Display for Systems Interchanges

1 At **systems** (or freeway-to-freeway) interchanges the minimum **primary** information to be displayed shall relate to route identification in the form of route numbers. **Secondary** information, or destination names, should be limited to control and/or familiar destinations. Details of the selection of these types of destinations are given in Volume 1, Chapter 8, but unlike at access interchanges, their principle function must be to orientate drivers. In the event of a systems interchange resulting in a split in a route to two significantly different directions the use of cardinal directions is recommended to improve the ability of the signs to give the necessary orientation.

2 In addition the use of a major transport terminal such as an airport or harbour may provide valuable orientation information for visitors to an area.

3 The following items of information may be displayed on the sequence of signs provided at systems interchanges:

(a) interchange (exit) numbers (exit information);

(b) route numbers (exit and straight-on information);

(c) cardinal directions (orientational information);

(d) control or familiar destinations (orientational information);

(e) major transport terminal names (orientational information);

(f) upward-type arrows showing exit lane configuration (safety information);

(g) distance to exits (exit information);

(h) special signing for situations such as lane drops in the vicinity of an interchange (safety information);

(i) control destinations on the exit routes beyond the interchange (reassurance).

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5.4.4 Basic Requirements for Freeway Direction Sign Sequences

1 There are many possible variations of signing sequence on the approach to a freeway interchange. In particular the approaches to systems interchanges vary significantly in their geometry and the signing sequences have to adapt to these variations. In essence a driver needs to be given adequate warning of the approach of an interchange by means of one or more advance exit type signs and then the exit itself must be clearly demarcated.

2 Figure 5.10 illustrates the basic sequence of rural and urban ground-mounted signs for an approach to an access interchange. The minimum sign sequence for a Class A1 freeway shall comprise:

(a) ADVANCE EXIT DIRECTION sign GA2;

(b) EXIT DIRECTION sign GA3;

(c) GORE EXIT sign GA4.

Other additional signs on the approach to the interchange, at the off-ramp and beyond the interchange are also shown. Refer to Volume 1, Chapter 4 and to the subsections on the individual signs for an indication of when their use is recommended.

3 Figure 5.11, Detail 5.11.1, illustrates the basic sequence of urban overhead signs for an approach to an access interchange using downward-pointing arrows. The minimum sign sequence shall comprise:

(a) ADVANCE EXIT DIRECTION sign GC2D;

(b) SUPPLEMENTARY EXIT DIRECTION sign GC2D plus THROUGH (or STRAIGHT-ON) DIRECTION sign GC3D;

(c) EXIT DIRECTION sign GC4D;

(d) GORE EXIT sign GA4.

4 Figure 5.11, Detail 5.11.2, illustrates the basic sequence of urban overhead signs for an approach to an access interchange using upward-pointing arrows. The minimum sign sequence shall comprise:

(a) ADVANCE EXIT DIRECTION sign GC2U;

(b) SUPPLEMENTARY EXIT/THROUGH direction sign GC3U;

(c) EXIT DIRECTION sign GC4U;

(d) GORE EXIT sign GA4.

5 Figure 5.12 illustrates two typical sequences of urban overhead signs for an approach to systems interchanges using upward-pointing arrows. The sign sequence for such an approach is very much affected by the exit/off-ramp configuration which can vary widely. This aspect is dealt with in Section 5.4.5. A typical sign sequence will comprise:

(a) PRE-ADVANCE EXIT DIRECTION sign GC1;

(b) ADVANCE EXIT DIRECTION sign GC2U;

(c) SUPPLEMENTARY EXIT/THROUGH DIRECTION sign GC3U;

(d) ADVANCE OFF-RAMP DIRECTION sign GC5U;

(e) GORE EXIT sign GA4;

(f) EXIT DIRECTION sign GC4U displayed with C-D road THROUGH DIRECTION sign GC6U;

(g) CHEVRON HAZARD MARKER signs W405/W406;

(h) C-D EXIT/THROUGH DIRECTION sign GC7U (or ground-mounted C-D ADVANCE STACK-TYPE DIRECTION sign GA9);

(i) EXIT DIRECTION sign GC4U optionally displayed with C-D THROUGH DIRECTION sign GC6U (or ground-mounted STACK-TYPE DIRECTION sign GC10).

Alternative signs may be required depending on whether the subsequent on-ramp is a loop ramp or a fully directional ramp (see Details 5.12.1 and 5.12.2). This aspect is dealt with in further detail in Section 5.4.5.

6 It is a relatively common feature of interchanges which warrant the use of overhead signs that they include one or more exit lanes which are exclusive or "dedicated" exit lanes. This type of sequence may be equally appropriate at an access or a systems interchange. It is important that drivers NOT wishing to exit at this point shall be made aware that the lane does not continue beyond the exit, so that they may move out of the lane as early as possible. The upward pointing arrow system provides for this in the layout of various cluster-type arrows. This aspect is dealt with in more detail in Section 5.4.5.

7 The sign sequence principles for the conditions described in paragraphs 5.4.4.3 and 5.4.4.4 and illustrated in Figure 5.11 and Figure 5.12 differ significantly. Standard design procedure for access interchanges provides for at-grade junctions between the off-ramp and the intersecting cross road. The exit condition from the freeway is thus relatively conventional although this can be complicated by the provision of two or more lanes on the off-ramp. This latter situation may warrant special signing treatment. The exit from a freeway at a systems interchange is more complex because the left and right turn movements are catered for in a free-flowing manner. This will normally result in secondary exits on the collector-distributor (C-D) road where the left and right turn movements separate. Since systems interchanges are normally subject to heavy traffic flows, particularly on turning movements, drivers seeking left turn movements and those seeking right turn movements need a very clear indication of their correct position on the roadway. To cater for this an exit direction sign is not provided at the exit point from the freeway. Instead an advance direction sign is provided at this exit, which indicates the left-right destinations for the next exit split. This sign is called an ADVANCE OFF-RAMP DIRECTION sign GC5U and it is recommended that the arrow cluster be rotated to the left through 15^{o} to 30^{o} to conform with the normal arrow display practice on advance exit and EXIT DIRECTION signs of sloping the arrow at approximately 45^{o}. At the secondary exit a conventional exit direction sign GC4U is used. The principle of displaying an advance sign for an on-ramp may also be used, particularly if a collector-distributor road is provided and the crossing freeway is carried over the C-D road creating

(Continued on page 5.4.4)

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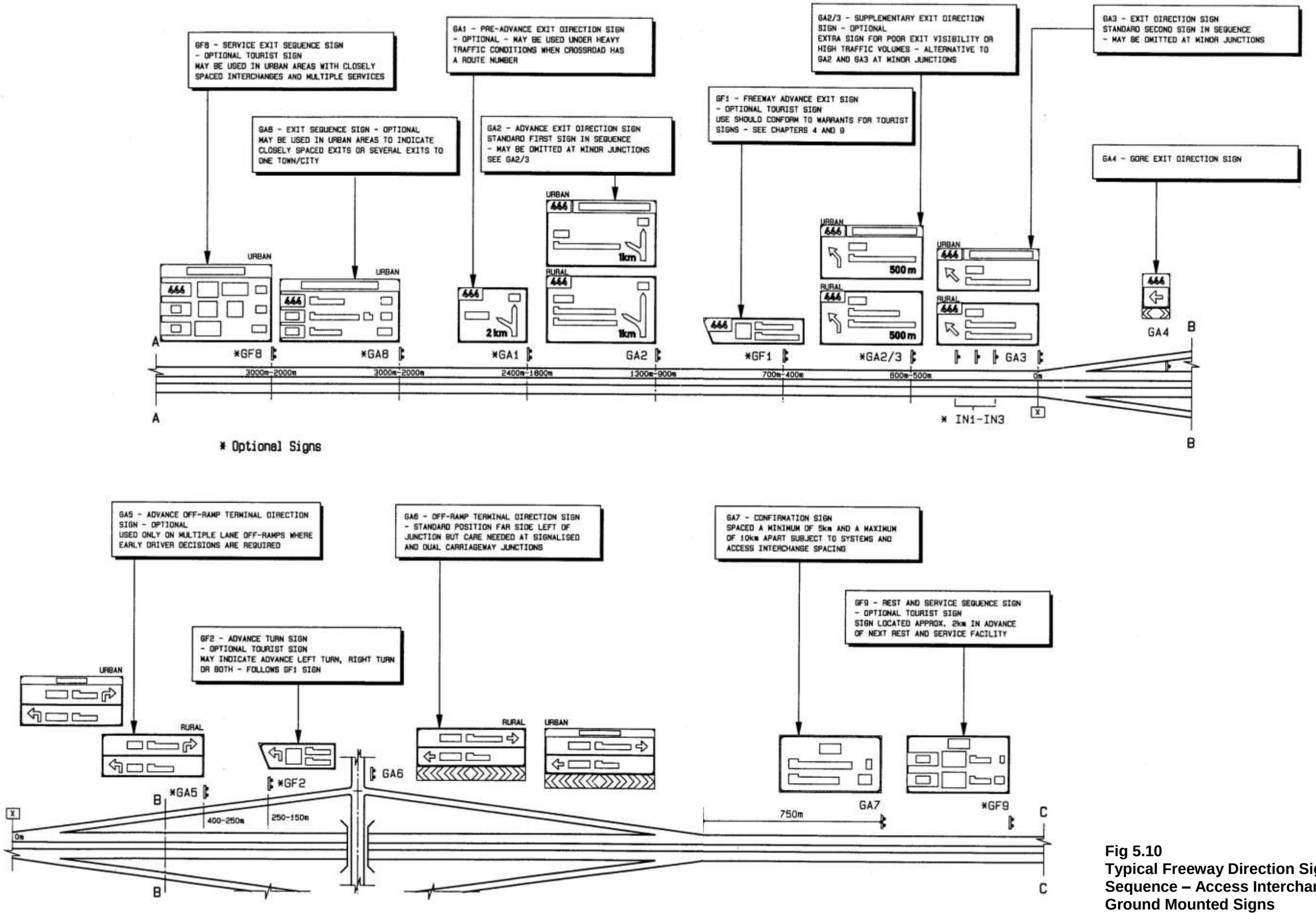

* Optional Signs

Fig 5.10
Typical Freeway Direction Signing Sequence – Access Interchange – Ground Mounted Signs

(Continued from page 5.4.2)

poor sight distance conditions to the junction of the C-D road and the 360° on-ramp loop. Figure 5.10 illustrates a typical arrangement of off-ramp stack-type direction signs at an access interchange which are appropriate irrespective of the form of the preceding signs in the freeway exit sequence. The minimum requirements shall comprise an OFF-RAMP TERMINAL DIRECTION sign GA6. If the off-ramp develops into two or more lanes an ADVANCE OFF-RAMP TERMINAL DIRECTION sign GA5, or even an overhead sign, may be warranted to ensure that drivers select the correct lane for the junction ahead.

8 In order to preserve the standards and effectiveness of the freeway direction signing system, the stack-type direction signs used on the intersecting cross-roads, shall be designed incorporating a number of exclusive features related to their function as direction signs serving a freeway. For this reason these freeway cross-road signs are covered in this section.

9 Figure 5.13 illustrates the basic sequence of rural and urban ground-mounted signs on the cross road approaches to an access interchange. For various types of access interchange configuration the minimum sign sequence on each approach shall comprise:

(a) STACK-TYPE CROSS-ROAD ADVANCE DIRECTION sign GB1;

(b) STACK-TYPE NEAR-SIDE ON-RAMP DIRECTION sign GB2;

(c) STACK-TYPE FAR-SIDE ON-RAMP ADVANCE DIRECTION sign GB3;

(d) STACK-TYPE FAR-SIDE ON-RAMP DIRECTION sign GB4.

10 On narrow interchanges sign GB3 may be omitted, although it is recommended that sign GB3 should be provided whenever practical. If sign GB3 is not provided it is recommended that the letter size specified for sign GB4 be increased by one or two standard size increments to increase the legibility distance to the sign.

11 In urban environments space limitations may require that standard crossroad signs be replaced by variations of MAP-TYPE ADVANCE DIRECTION sign GD7, displaying route numbers and cardinal directions only. This sign can be vertically formatted to save lateral space (see Chapter 9).

12 Table 5.7 gives guidelines for the spacing of signs on freeways, off-ramps and on crossroads. The guidelines are based on an allowance for clear sight distance before reading a sign, but are primarily provided to assist in the location of additional signs in existing sequences rather than for initial design

TABLE 5.7 MINIMUM SPACING BETWEEN SIGNS TABLE 5.7

Operating Speed (km/h)	On-Freeway Signs		Off-Ramp (m)	Crossroad (m)
	Overhead (m)	Ground-Mounted (m)		
120	250	200	100	100
100	200	150	80	80
80	150	100	60	60
60	n/a	n/a	50	50

NOTES:

(1) Recommended longitudinal sign positions are given in Figures 5.11 and 5.12 and repeated in Figures 5.15 and 5.21. Sign spacing can be derived from the given positions.

(2) Any additional signs should be carefully located to reduce any risk of visual obstruction of one sign by another.

(3) The spacings given in this table are guidelines for minimum sign spacings when additional signs are required in existing situations. These values should not be used for design purposes for initial installations. Sign spacings between signs in minimum sign sequences should be increased at the design stage as additional sign needs are identified.

(4) Refer to Volume 1, Chapter 4 for further design criteria.

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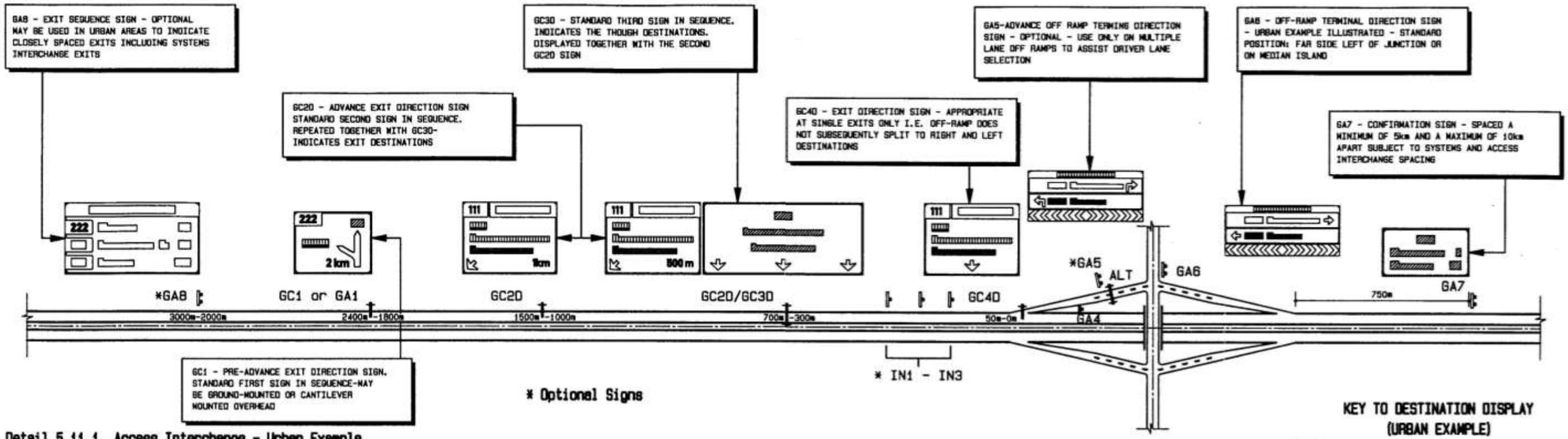
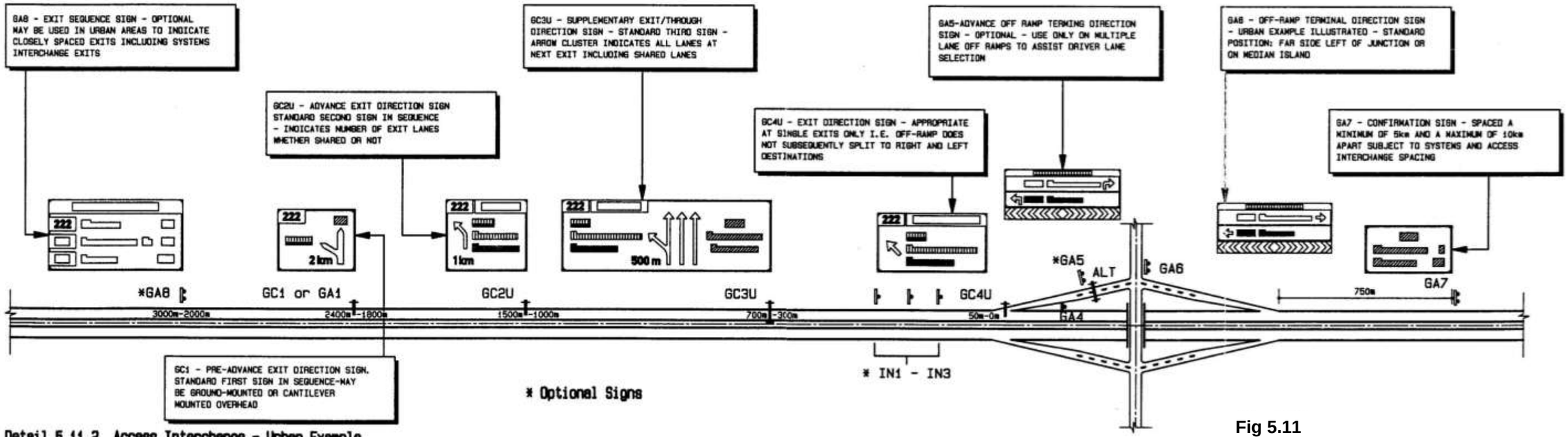
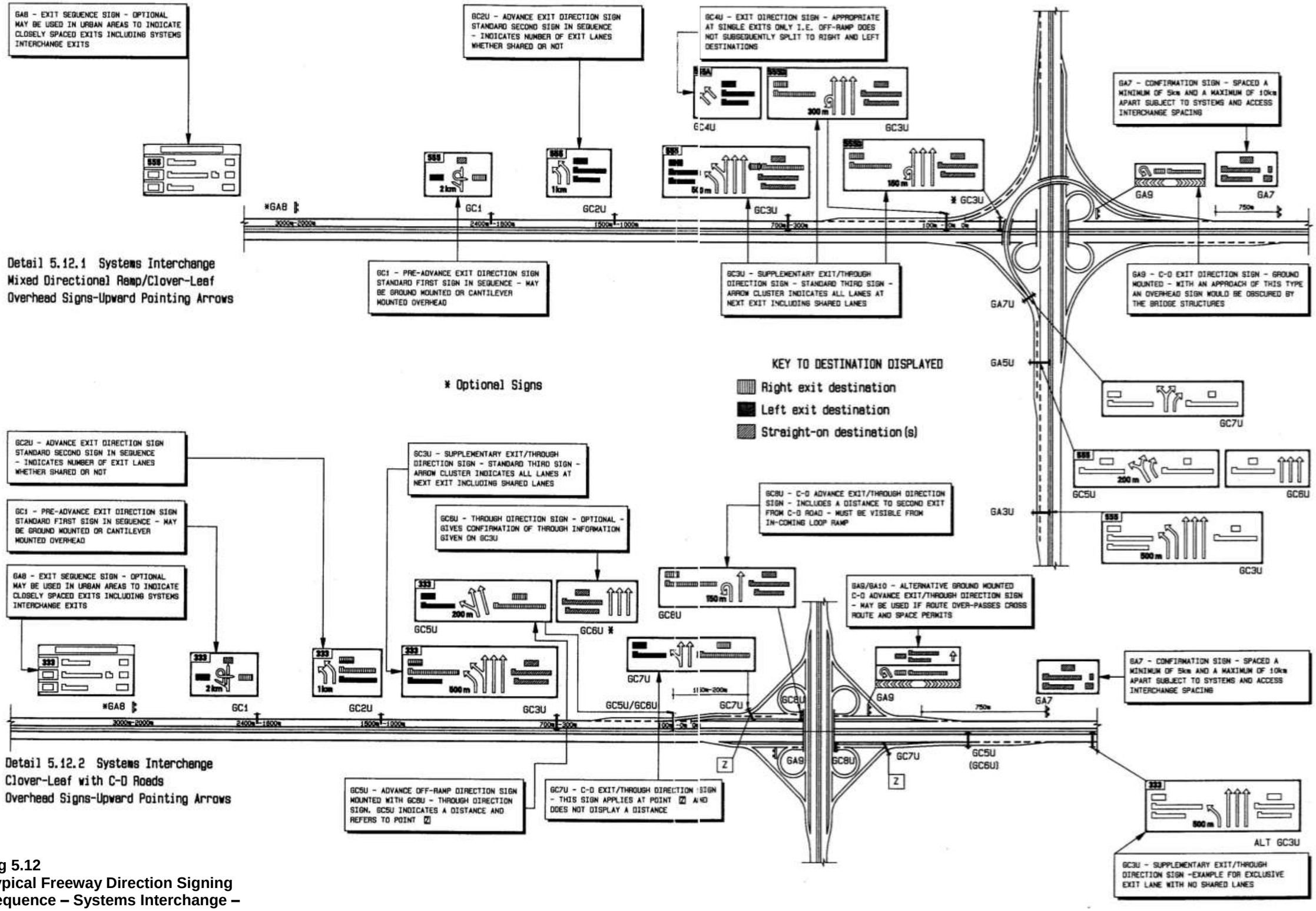


Detail 5.11.1 Access Interchange - Urban Example. Overhead Signing - Downward Pointing Arrow System



Detail 5.11.2 Access Interchange - Urban Example. Overhead Signing - Upward Pointing Arrow System

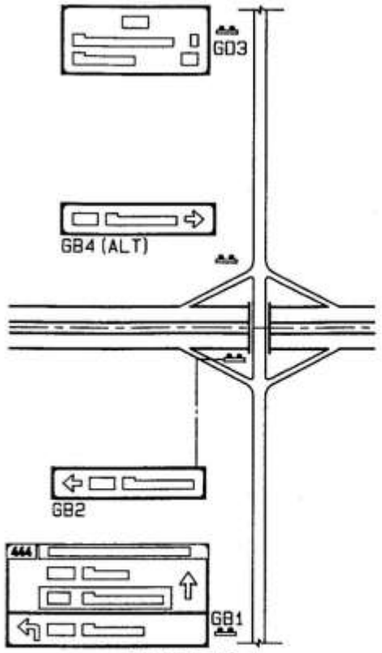
Fig 5.11
Typical Freeway Direction Signing Sequence – Access Interchange – Overhead Signs



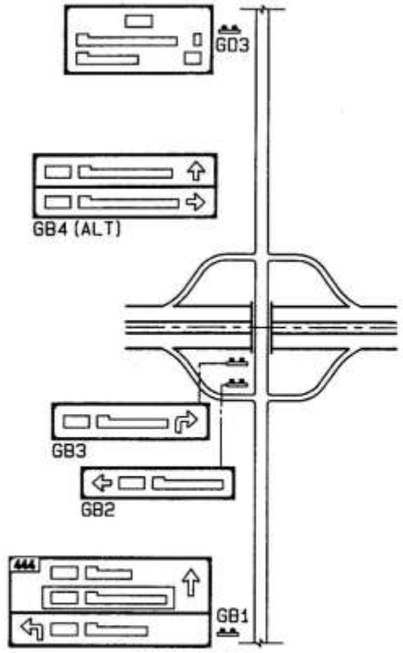
Detail 5.12.1 Systems Interchange
Mixed Directional Ramp/Clover-Leaf
Overhead Signs-Upward Pointing Arrows

Detail 5.12.2 Systems Interchange
Clover-Leaf with C-D Roads
Overhead Signs-Upward Pointing Arrows

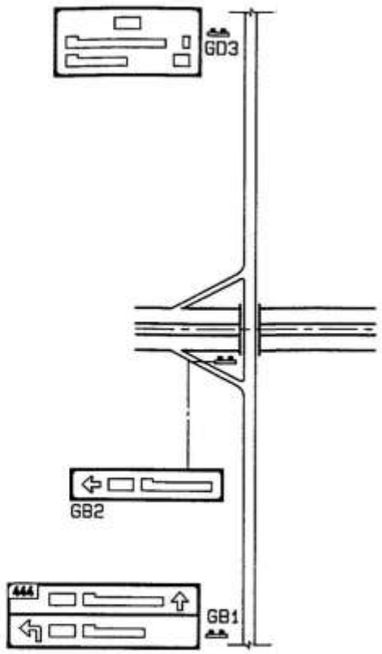
Fig 5.12
Typical Freeway Direction Signing Sequence – Systems Interchange – Overhead Signs



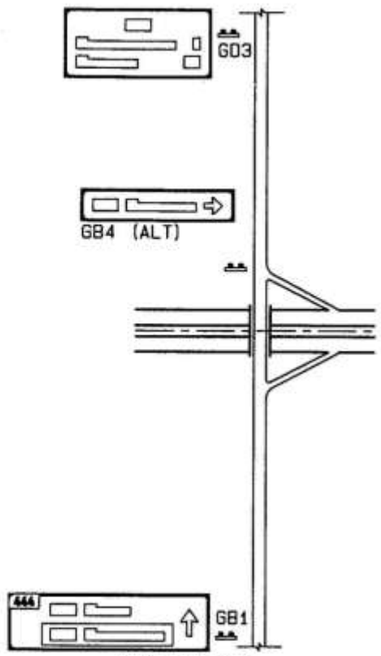
Detail 5.13.1
Narrow Diamond



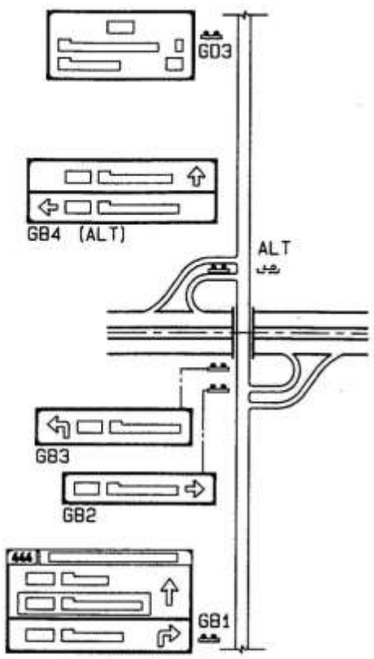
Detail 5.13.2
Wide Diamond



Detail 5.13.3
Half Diamond Left

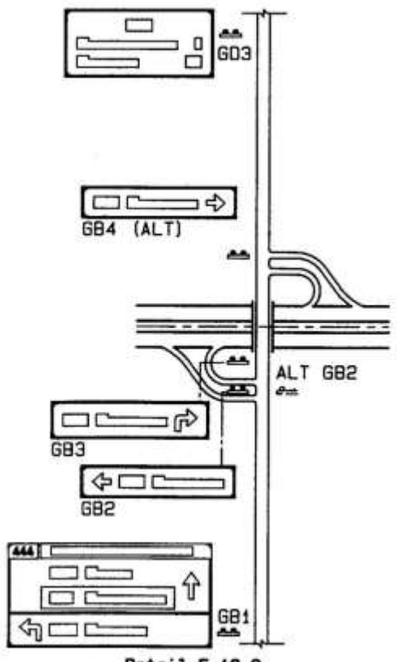


Detail 5.13.4
Half Diamond Right

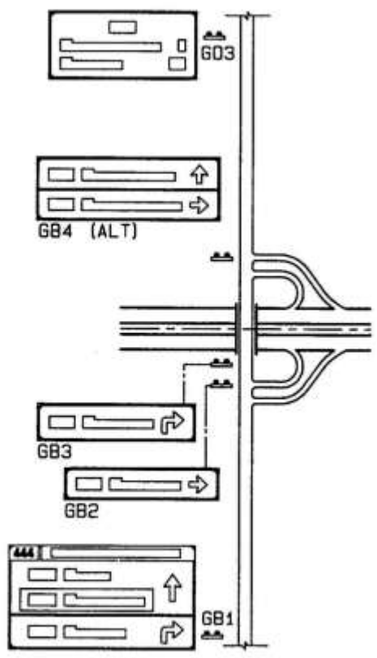


Detail 5.13.5
Parclo - A

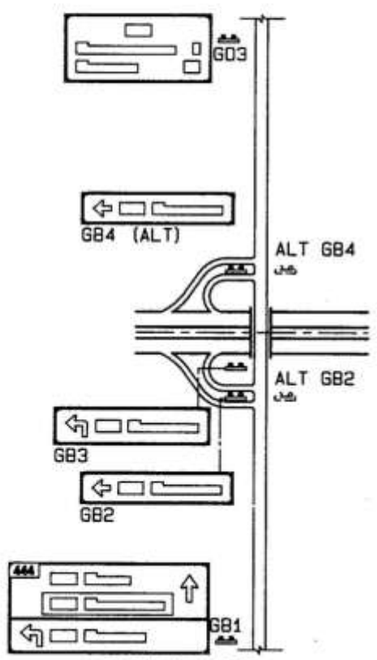
NOTE:
Two options are shown for sign GB4.
The sign may be provided with a straight on stack when warranted by the forward destination and specific traffic movements.



Detail 5.13.6
Parclo - B



Detail 5.13.7
Parclo - AB



Detail 5.13.8
Parclo - BA

Fig 5.13
Typical Direction Signing for Cross-Road Approaches to Various Types of Access Interchange

5.4.5 Details of Freeway Direction Sign Sequences

1 The type of interchange and the freeway and interchange geometric configuration are major factors to be considered in the layout of the direction signs and in particular the arrow types and sequences play a major role in providing a clear indication to the driver of the lane and geometric configuration ahead. This section provides more detail on this aspect.

2 All ground-mounted freeway advance exit direction signs shall be map-type signs, whilst exit direction signs and off-ramp terminal signs shall be stack-type signs. (The GORE EXIT sign GA4 has an exclusive design.)

3 Overhead freeway direction signs may conform to one of two basic signing principles as follows:

(a) the signs may, by means of downward-pointing arrows, utilising one arrow over each appropriate lane, indicate the lane by which drivers may proceed towards their intended destination; OR

(b) the signs may, by means of upward-pointing arrows, either in relation to an exit, or collectively in a cluster in relation to the whole roadway, indicate the lane configuration of the roadway, and which (and how many) lanes specifically may be used to exit the freeway at the access or systems interchange concerned.

Signs incorporating both principles should not be mixed in one approach sequence to an interchange.

4 Notwithstanding the comments made in paragraph 5.4.5.3 regarding upward and downward arrows appearing together in an overhead sign sequence it is acceptable to combine a diagrammatic sign, which displays upward-pointing arrows, in combination with overhead direction signs which display downward-pointing arrows.

5 The various arrow configurations for the sign sequences related to the different interchange types and the different sign mounting are illustrated in a number of figures. In these figures the required sequence of signs and the typical signface layout for each sign in the sequence is indicated on a master layout, but with the arrow type blanked out. The arrow type required on each of the signs is cross-referenced from a table on each figure which indicates the exact requirements for that sign. A comprehensive master listing of all the arrow types is given in Figure 5.14. The individual tables in the figures are cross-referenced to Figure 5.14 arrow types.

6 Figure 5.15 illustrates the exit direction sign sequence related to an access interchange using ground-mounted signs. Both diamond type and parclo type interchanges are considered.

7 Figure 5.16 illustrates the signing required on the off-ramp of a diamond interchange while Figure 5.17 indicates the signing on a parclo B type access interchange off-ramp.

8 Figure 5.18 illustrates the exit direction sign sequence related to an access interchange, using overhead-mounted signs with the downward-pointing arrow system. Both diamond and parclo type interchanges are considered.

9 Figure 5.19 illustrates the exit direction sign sequence related to an access interchange, using overhead-mounted signs with the upward-pointing arrow system. Both diamond and parclo type interchanges are considered.

10 Figure 5.20 illustrates the exit direction sign sequence related to a cloverleaf type systems interchange, using overhead-mounted signs with the upward-pointing arrow system.

11 Figure 5.21 illustrates the exit direction sign sequence related to a fully directional exit ramp common at a systems interchange, using overhead-mounted signs with the upward-pointing arrow system.

12 Thus in order to ascertain the arrow type requirements for a specific interchange, the following procedure should be followed using the relevant figure:

(a) check type of interchange configuration to be signed;

(b) determine the type of signing, both physical type and arrow type;

(c) select the figure related to these requirements;

(d) for each sign type, refer to the table incorporated in the figure which will provide the arrow type configuration definition;

(e) cross-reference this arrow type definition to Figure 5.14 which indicates the physical detail of the arrow type configuration and gives, in the notes, cross references to Volume 4 for individual arrow design details.

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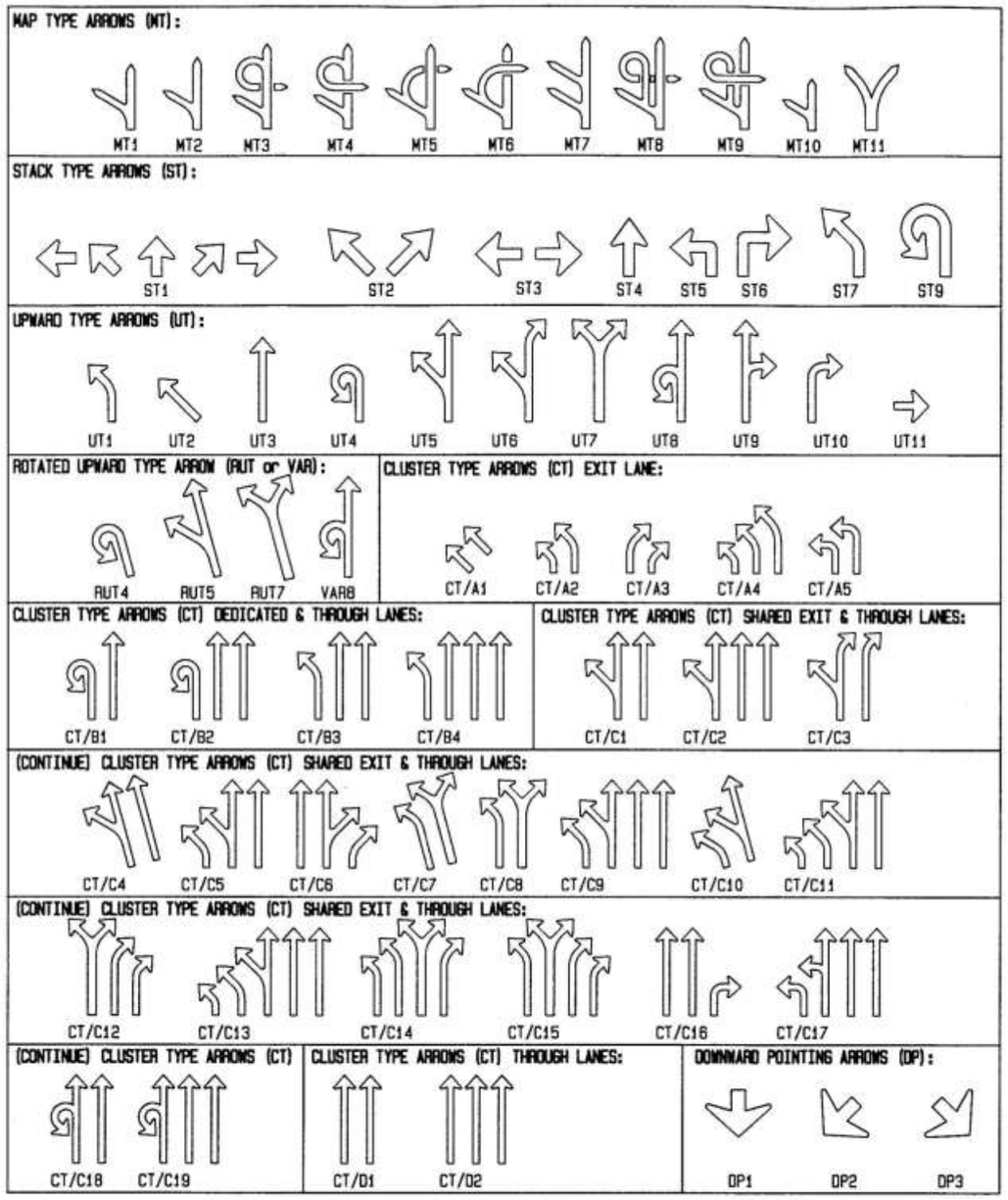


NOTES:

(1) In the arrow "type" tables in the subsequent figures some minor variations of the orientation of the above arrow types may be necessary. The following annotationa apply:

(i) VAR = varied to represent the road configuration ahead i.e. show curvature;

(ii) ROR = rotated to represent the off-ramp orientation more accurately.

(2) For the correct dimensional details of individual arrows and the relationship of arrows in clusters see Volume 4, Chapters 5 and 6.

Fig 5.14 Arrow Types and Configurations for Freeway Direction Signs

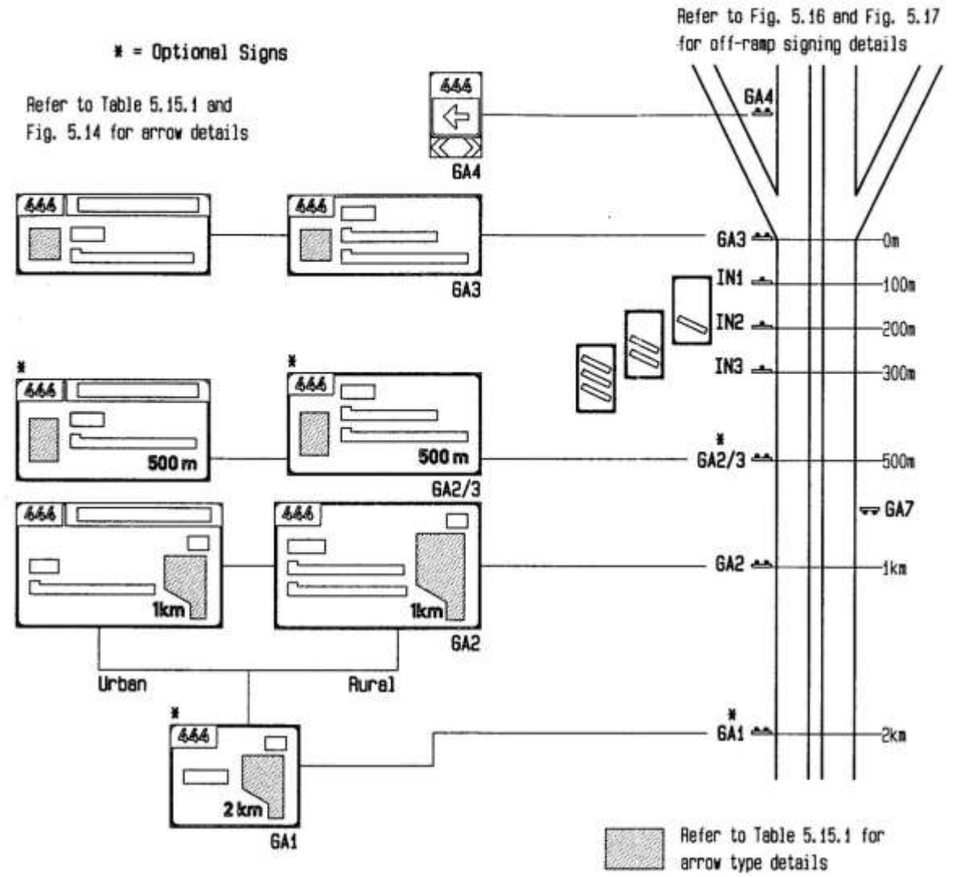


Table 5.15.1: Arrow Type in Sign Sequence

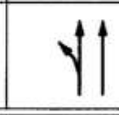
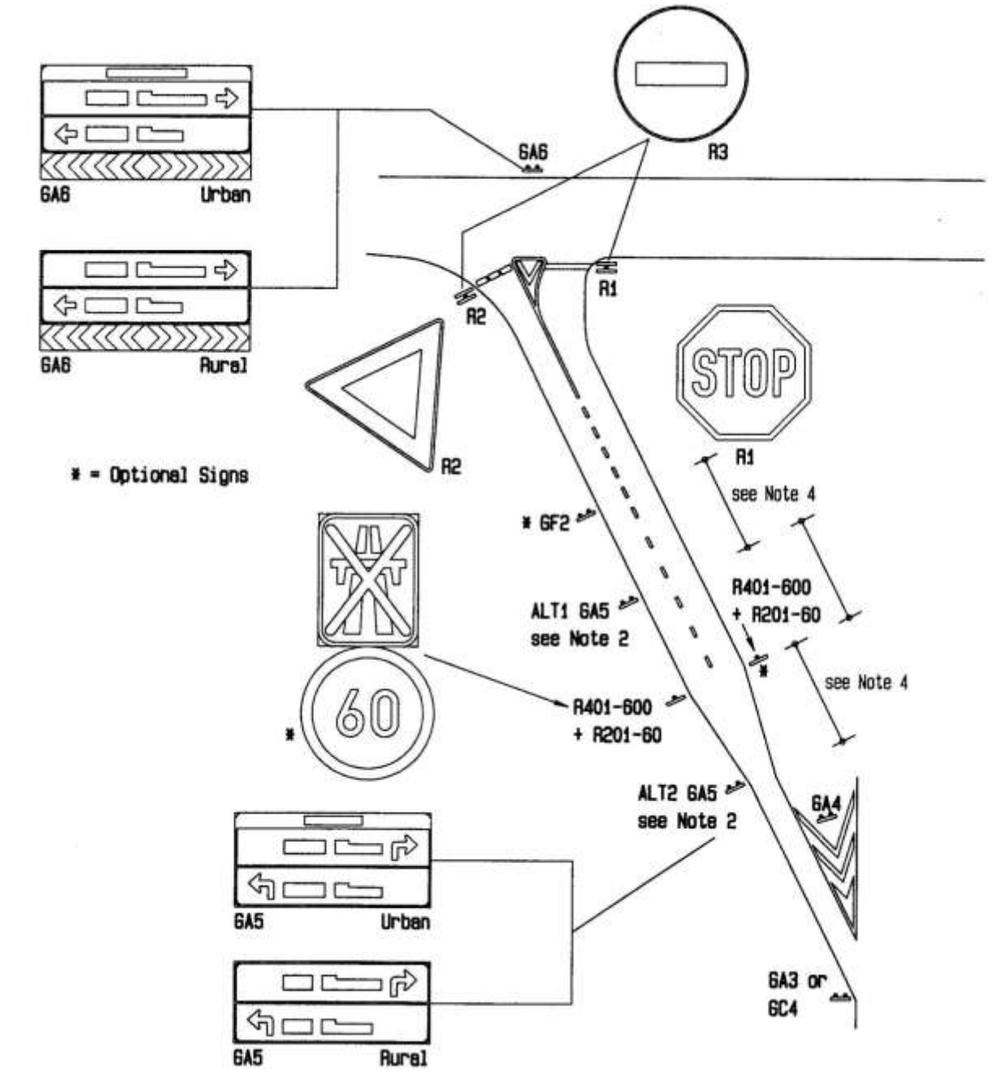
DESCRIPTION	DIAGRAM OF LANES AT INTERCHANGE EXIT AREAS	SIGN TYPE / ARROW DISPLAY TYPE			
		* GA1	GA2	* GA2/3	GA3
ACCESS INTERCHANGE: DIAMOND TYPE 2 THROUGH LANES, 1 SHARED EXIT LANE		MT10	MT1/ MT2	ST7	ST2
ACCESS INTERCHANGE - PARCLO TYPE 2 THROUGH LANES, 1 SHARED EXIT LANE		MT10	MT1/ MT2	ST7	ST2

Fig 5.15 Typical Arrow Types for Ground Mounted Direction Signs - Access Interchange



NOTES:

(1) The signing illustrated may follow ground-mounted or overhead signs used on a freeway.

(2) The positioning of sign GA5 should take into account the future need to provide a TOURISM ADVANCE TURN signGF2. Use position ALT2 if off-ramp widens into two or more lanes.

(3) In the event of very high traffic volumes on the off-ramp, or the provision of more than two lanes, the use of overhead signs should be considered.

(4) Sign spacings must be adequate for all signs to be fully visible and comprehensible – see Table 5.7.

Fig 5.16 Typical Ground Mounted Off-Ramp Direction Signs – Diamond Interchange

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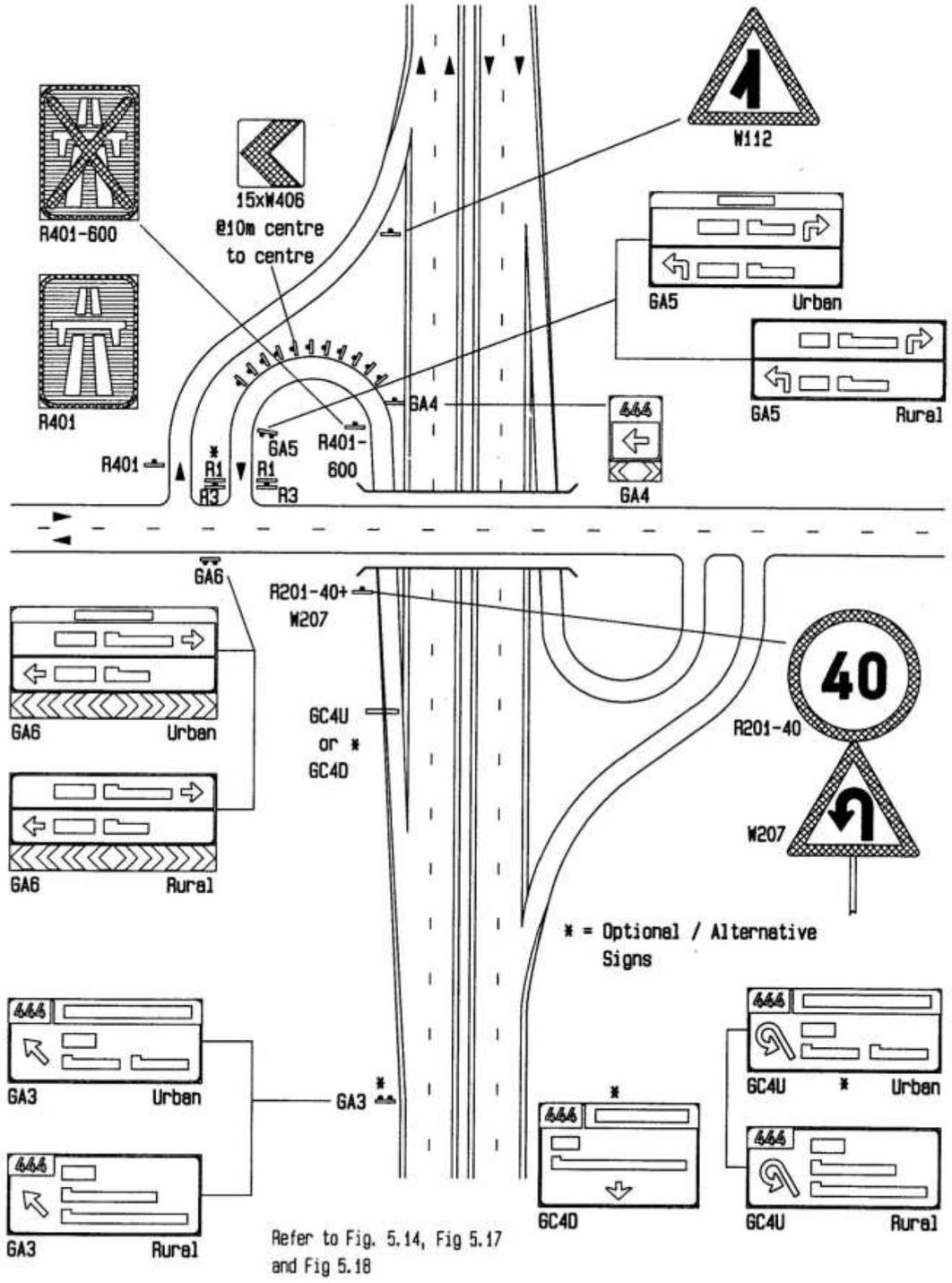

Fig 5.17 Typical Ground Mounted Off-Ramp Direction Signs – Parclo "B" Interchange

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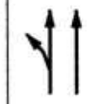
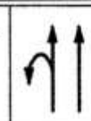
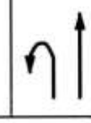
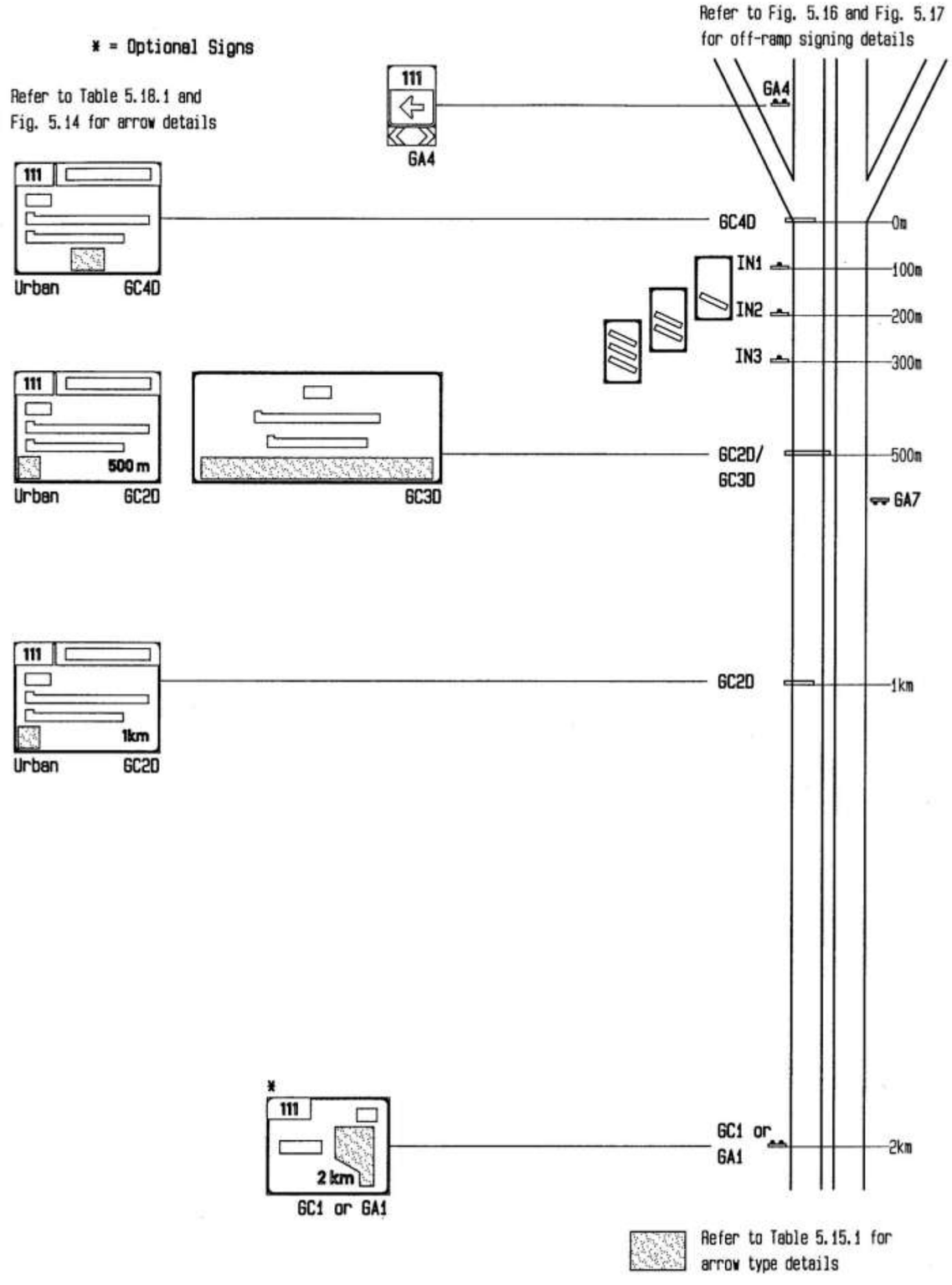
Table 5.18.1: Arrow Type in Sign Sequence

DESCRIPTION	DIAGRAM OF LANES AT INTERCHANGE EXIT AREAS	SIGN TYPE / ARROW DISPLAY TYPE				
		GC1/ GA1	GC2D	GC2D	GC3D	GC4D
ACCESS INTERCHANGE: DIAMOND TYPE 2 THROUGH LANES, 1 EXIT LANE		MT10	DP2	DP2	2xDP1 *(i)	1xDP1
3 THROUGH LANES, 1 EXIT LANE		MT10	DP2	DP2	3xDP1 *(i)	1xDP1
3 THROUGH LANES, 2 EXIT LANES (1 EXCLUSIVE)		MT10	DP2	DP2	3xDP1 *(i)	2xDP2 *(ii)
ACCESS INTERCHANGE - PARCLO TYPE 2 THROUGH LANES, 1 EXIT LANE		MT10	DP2	DP2	2xDP1 *(i)	1xDP1 *(iii)
3 THROUGH LANES, 1 EXIT LANE		MT10	DP2	DP2	3xDP1 *(i)	1xDP1 *(iii)
2 THROUGH LANES, 1 EXIT LANE (1 EXCLUSIVE)		MT10	DP2	DP2	2xDP1 *(i)	1xDP1 *(iii)



NOTES:

(1) ✱(i) 1 x downward pointing arrow above each through lane.
✱(ii) 1 x downward pointing arrow above each off lane
✱(iii) GC4D sign to be placed in advance of bridge if intersecting road crosses over the freeway.

(2) To complete the signage sequence a GA7 (Confirmation) sign is required 750 m beyond the on-ramp merge.

Fig 5.18
Typical Arrow Types for Overhead Direction Signs – Downward Pointing - Access Interchange

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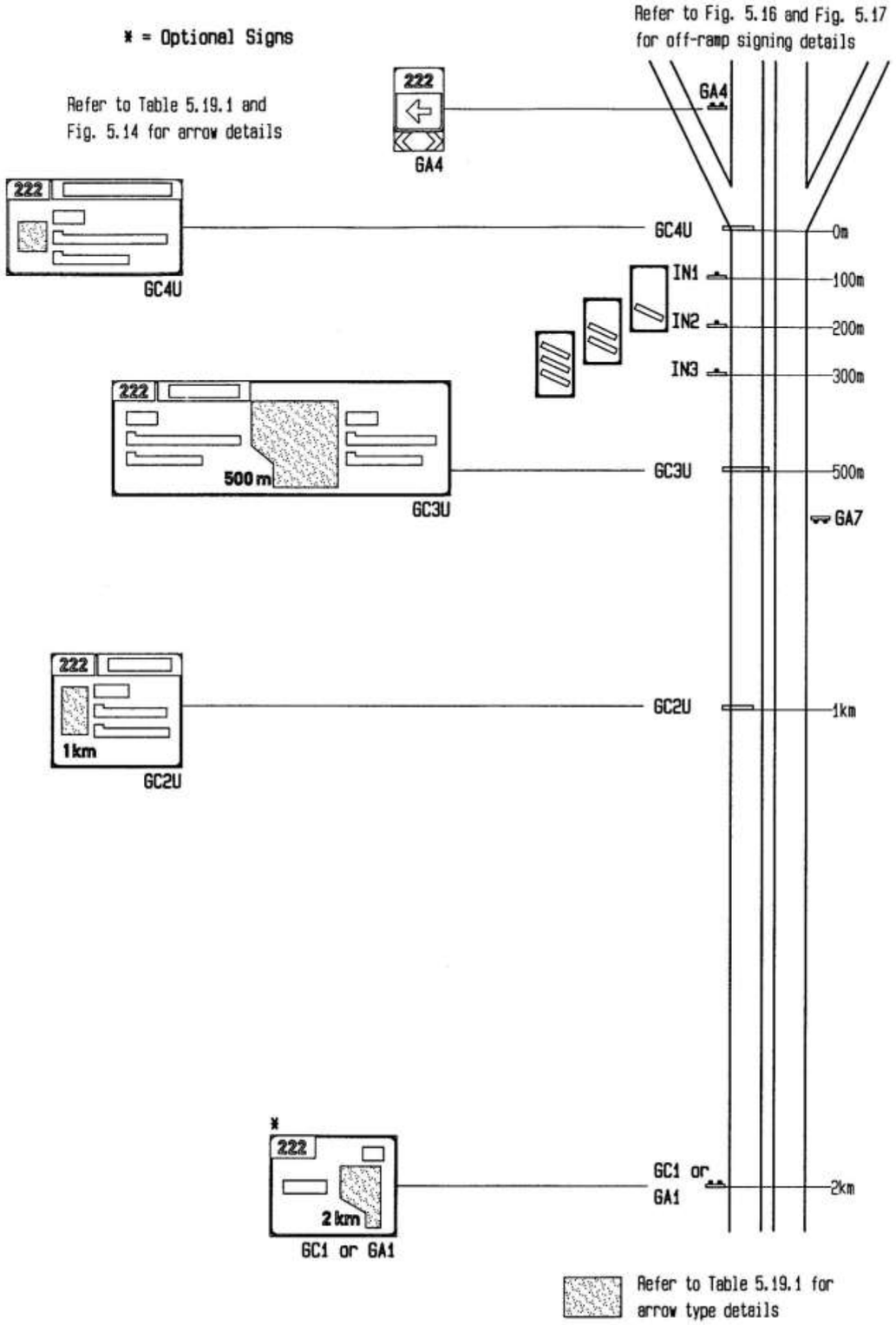

Table 5.19.1: Arrow Type in Sign Sequence

DESCRIPTION	DIAGRAM OF LANES AT INTERCHANGE EXIT AREAS	SIGN TYPE / ARROW DISPLAY TYPE			
		GC1/ GA1	GC2U	GC3U	GC4U
ACCESS INTERCHANGE: DIAMOND TYPE 2 THROUGH LANES, 1 EXIT LANE		MT10	UT1	CT/C1	UT2
3 THROUGH LANES, 1 EXIT LANE		MT10	UT1	CT/C2	UT2
3 THROUGH LANES, 2 EXIT LANES (1 EXCLUSIVE)		MT10	CT/A2	CT/C9	CT/A1
ACCESS INTERCHANGE - PARCLO TYPE 2 THROUGH LANES, 1 EXIT LANE		MT10	UT1	CT/C18	AUT4
3 THROUGH LANES, 1 EXIT LANE		MT10	UT1	CT/C19	AUT4
2 THROUGH LANES, 1 EXIT LANE (1 EXCLUSIVE)		MT10	UT1	CT/B2	AUT4

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NOTES:

(1) ✱(i) 1 x downward pointing arrow above each through lane.
✱(ii) 1 x downward pointing arrow above each off lane
✱(iii) GC4D sign to be placed in advance of bridge if intersecting road crosses over the freeway.

(2) To complete the signage sequence a GA7 (Confirmation) sign is required 750 m beyond the on-ramp merge.

Fig 5.19
Typical Arrow Types for Overhead Direction Signs – Upward Pointing - Access Interchange - 1

Table 5.20.1: Arrow Type in Sign Sequence

DESCRIPTION	DIAGRAM OF LANES AT INTERCHANGE EXIT AREAS	SIGN TYPE / ARROW DISPLAY TYPE									
		GC1	GC2U	GC3U	GC4U (A)	GC3U (B)	GC4U (B)	GC5U	GC6U	GC7U	GC8U
CLOVERLEAF INTERCHANGE NO C-D ROADS 2 THROUGH LANES, 1 LANE EXIT A / 1 LANE EXIT B	B A	MT3 OR MT4	UT1	CT/C1 EXIT A	UT2	CT/C18 EXIT B	RUT4 *(i)	N/A	N/A	N/A	N/A
3 THROUGH LANES, 1 LANE EXIT A / 1 LANE EXIT B	B A	MT3 OR MT4	UT1	CT/C2 EXIT A	UT2	CT/C19 EXIT B	RUT4 *(i)	N/A	N/A	N/A	N/A
3 THROUGH LANES, 2 LANES EXIT A (1 EXCLUSIVE) / 1 LANE EXIT B	B A	MT3 OR MT4	CT/A2	CT/C9 EXIT A	CT/A1	CT/C19 EXIT B	RUT4 *(i)	N/A	N/A	N/A	N/A
CLOVERLEAF INTERCHANGE WITH C-D ROADS 2 THROUGH LANES, 1 EXIT LANE SPLIT: RAMP 1 LANE, C-D 1 LANE		MT8 OR MT9	UT1	CT/C1	N/A	N/A	N/A	RUT5	CT/D1	UT5	UT8 OR CT/B1
3 THROUGH LANES, 1 EXIT LANE SPLIT: RAMP 1 LANE, C-D 1 LANE		MT8 OR MT9	UT1	CT/C2	N/A	N/A	N/A	RUT5	CT/D2	UT5	UT8 OR CT/B1
3 THROUGH LANES, 2 EXIT LANES (1 EXCLUSIVE) SPLIT: RAMP 2 LANES, C-D 1 LANE		MT8 OR MT9	CT/A2	CT/C9	N/A	N/A	N/A	CT/C10	CT/D2	CT/C10 VERT	UT8 OR CT/B1
3 THROUGH LANES, 2 EXIT LANES (2 EXCLUSIVE) SPLIT: RAMP 2 LANES, C-D 1 LANE		MT8 OR MT9	CT/A2	CT/A2 + CT/D1	N/A	N/A	N/A	CT/C10	CT/D1	CT/C10 VERT	UT8 OR CT/B1

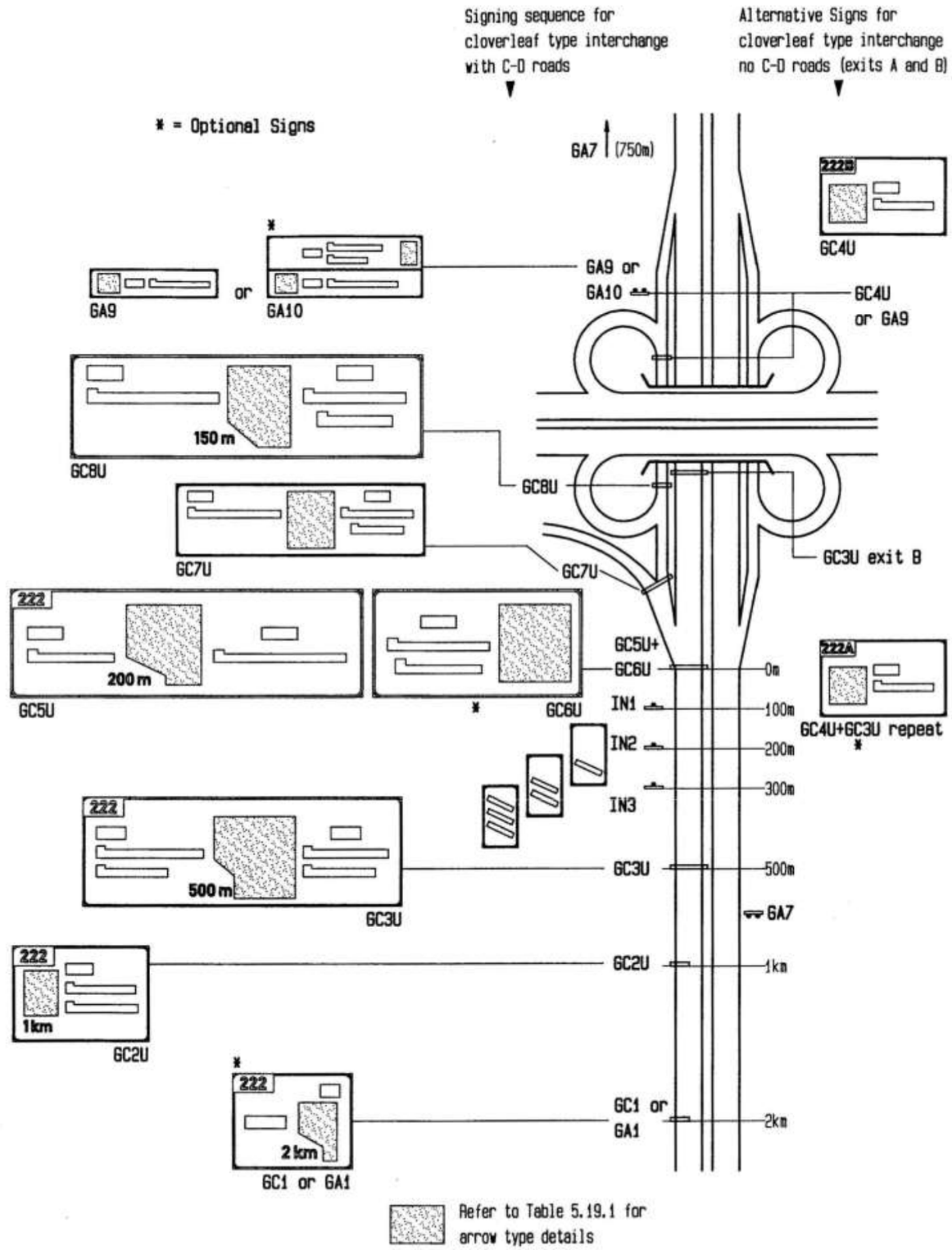

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Fig 5.20
Typical Arrow Types for Overhead Direction Signs – Upward Pointing - Access Interchange - 2

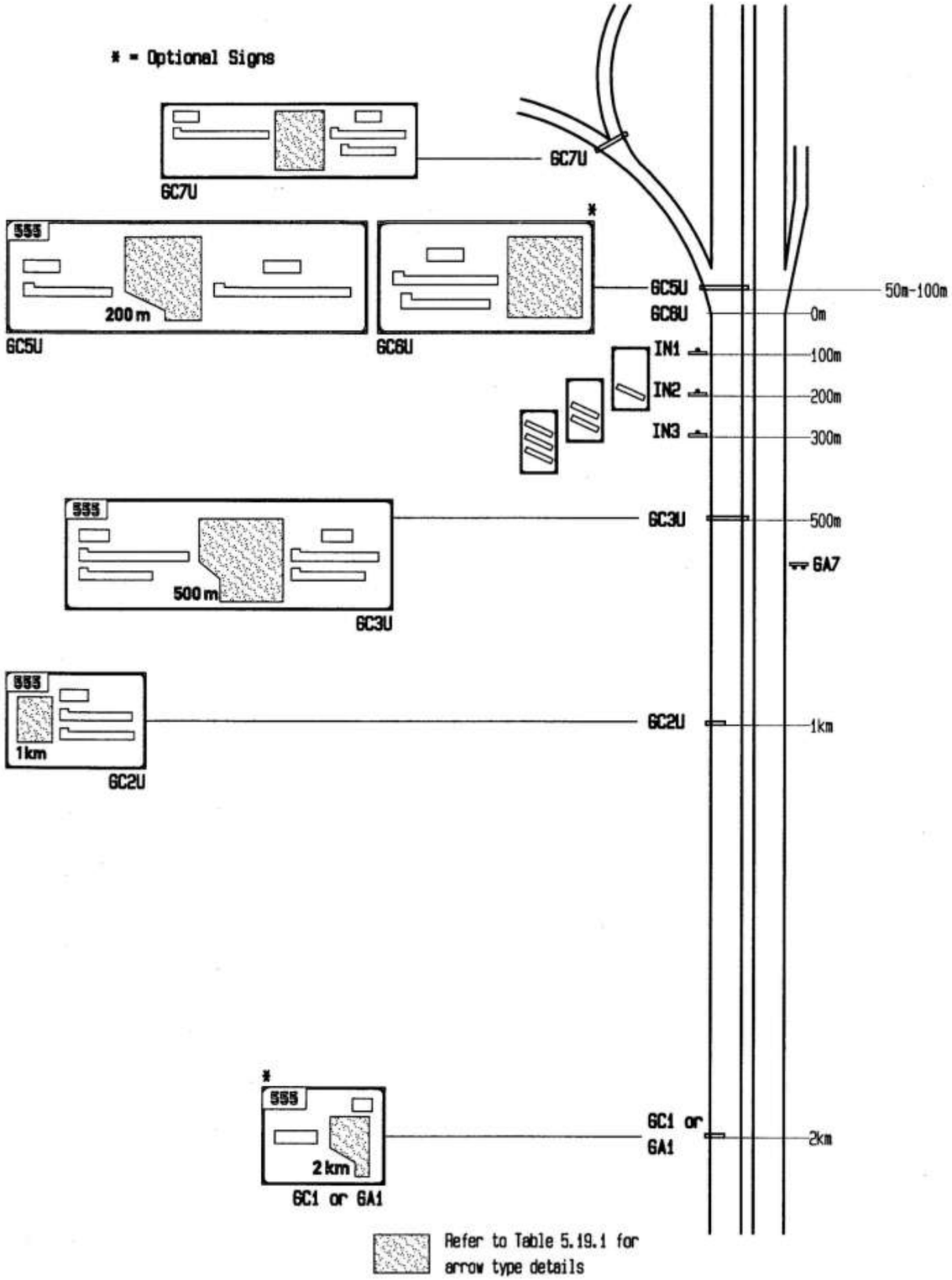

Table 5.21.1: Arrow Type in Sign Sequence

DESCRIPTION	DIAGRAM OF LANES AT INTERCHANGE EXIT AREAS	SIGN TYPE / ARROW DISPLAY TYPE					
		GC1	GC2U	GC3U	GC5U	GC6U	GC7U
SYSTEMS INTERCHANGE: DIRECTIONAL TYPE (4 LEG) 2 THROUGH LANES, 1 EXIT LANE SPLIT 1 LEFT / 1 RIGHT		MT5 OR MT6	UT1	CT/C1	RUT5	CT/D1	UT5
3 THROUGH LANES, 1 EXIT LANE SPLIT 1 LEFT / 1 RIGHT		MT5 OR MT6	UT1	CT/C2	RUT5	CT/D2	UT5
3 THROUGH LANES, 2 EXIT LANES (1 EXCLUSIVE) SPLIT 2 LEFT / 1 RIGHT (1 EXCLUSIVE)		MT5 OR MT6	CT/A2	CT/C9	CT/C7	CT/D2	CT/C10 VERT
3 THROUGH LANES, 2 EXIT LANES (1 EXCLUSIVE) SPLIT 1 LEFT / 2 RIGHT		MT5 OR MT6	CT/A2	CT/C9	CT/C4	CT/D2	CT/C1 VAR.
3 THROUGH LANES, 3 EXIT LANES (2 EXCLUSIVE) SPLIT 2 LEFT / 2 RIGHT (1 EXCLUSIVE)		MT5 OR MT6	CT/A4	CT/C13	CT/C5 ROT.	CT/D2	CT/C5 VAR.
3 THROUGH LANES, 3 EXIT LANES (3 EXCLUSIVE) SPLIT 2 LEFT / 2 RIGHT (1 EXCLUSIVE) (1 EXCLUSIVE)		MT5 OR MT6	CT/A4	CT/A4 + CT/D2	CT/C5 ROT.	CT/D2	CT/C5 VAR.
SYSTEMS INTERCHANGE - DIRECTIONAL 3 LEG "Y" TYPE 2 LANES, SPLITTING 1 LEFT / 2 RIGHT		MT11	UT1	CT/C3	UT2	CT/D1 VAR.	N/A
3 LANES, SPLITTING 2 LEFT / 2 RIGHT		MT11	CT/A2	CT/C14 VAR.	CT/A2	CT/D1 VAR.	N/A
4 LANES, SPLITTING 2 LEFT / 2 RIGHT		MT11	CT/A2	CT/A2 + CT/A3 VAR.	CT/A2	CT/D1 VAR.	N/A

Fig 5.21
Typical Arrow Types for Overhead Direction Signs – Upward Pointing – Directional Systems Interchange

5.4.6 Signing Requirements at Merges - Directional Systems Interchange - Fully Directional Ramps

1 The merging of high speed traffic on fully directional multi-lane ramps at system interchanges is complex and there is a high potential for accidents. Three typical conditions are encountered:

(a) ending of a lane which is normally the outside lane used by slower moving traffic - see the GS100 series of signs;

(b) merging of two converging lanes - see the GS400 series of signs;

(c) the convergence of lanes but without merging - see the GS450 series of signs.

2 Figure 5.22 illustrates typical recommended sign sequences for all three of these conditions.

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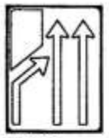
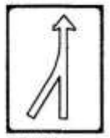
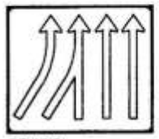
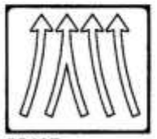
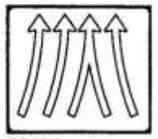
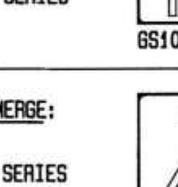
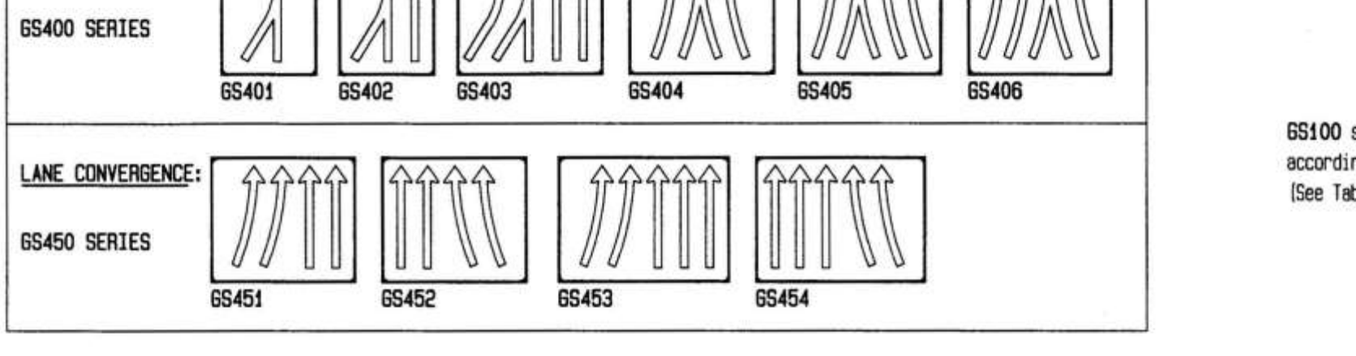
Table 5.22.1 Appropriate Signs

LANE ENDING: GS100 SERIES	GS101	 GS103	GS105			
LANE MERGE: GS400 SERIES	 GS401	GS402	 GS403	GS404	 GS405	 GS406
LANE CONVERGENCE: GS450 SERIES	GS451	GS452	GS453	GS454		





Detail 5.22.2
Typical Lane Drop Signs and Markings on a Directional Ramp

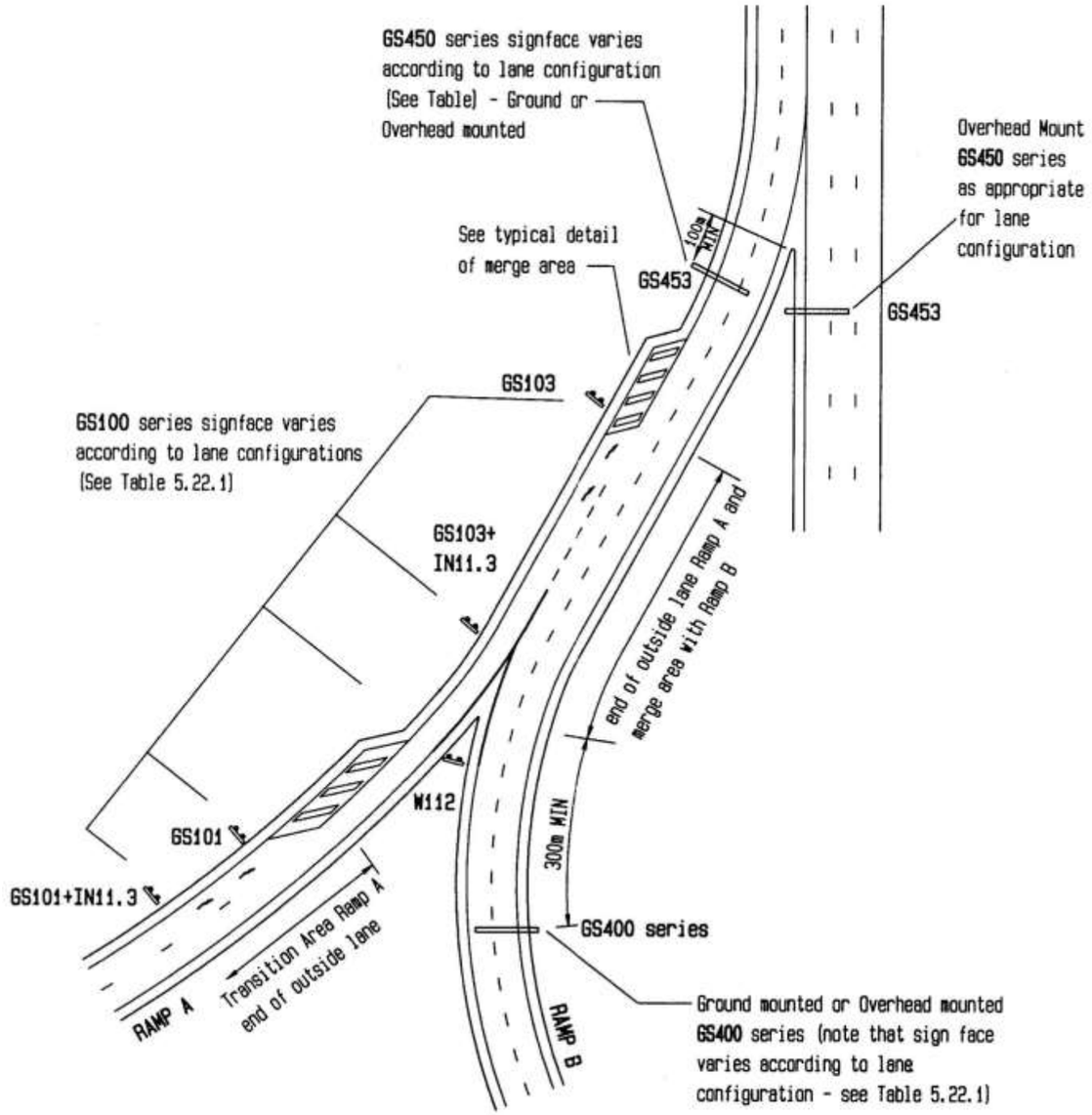


Fig 5.22
Typical Signing Requirements at Ramp Merges on Systems Interchange Fully Directional Ramps

5.4.7 Crossing Road Name Signing in Urban Areas

1 In an urban area where a freeway is crossed by a road/street which does **not** interchange with the freeway, it is recommended, that in order to improve the orientation of drivers on the freeway, the name of the crossing street should be displayed:

(a) on the bridge where the crossing road overpasses the freeway;

(b) on a ground-mounted sign beside the freeway where the crossing road underpasses the freeway.

See Figure 5.23.

2 When a GL1 sign is located on an overpass structure it is recommended that it be positioned centrally over the carriageway.

3 The letter sizing for such GL1 signs should be determined in accordance with provisions of Section 4.4 in Volume 1. Refer also to Figure 4.25 in Volume 1. A style B lettering is to be used.

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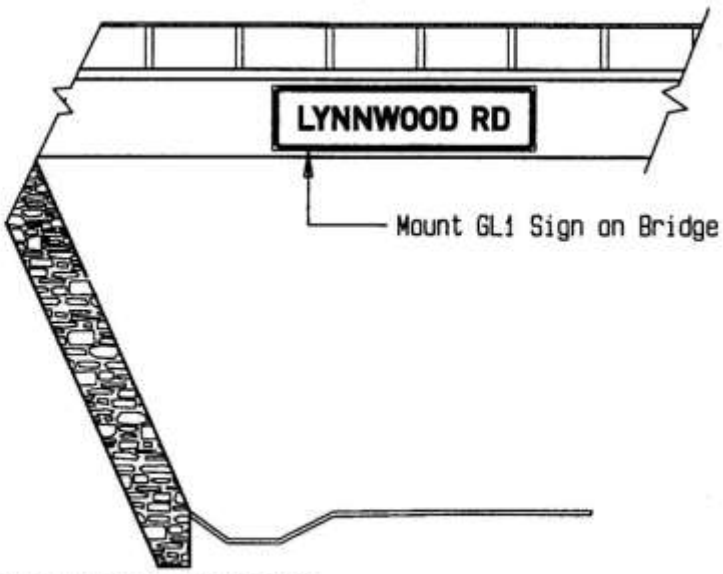
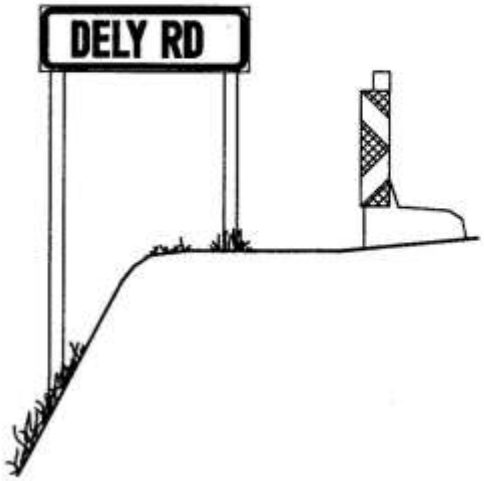


Detail 5.23.1 Cross Road Overpass of Freeway



Detail 5.23.2 Cross Road Underpass of Freeway

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Fig 5.23 **Typical Street Name Location Signing for Non-Access Cross Streets on Freeways**

5.4.8 Emergency Vehicle Signing for Median Crossovers

1 Wide interchange spacings and/or high incident levels on sections of freeway often require a special treatment for accessibility by emergency vehicles. This type of treatment can take a number of different and often unique forms which require specific geometric and signing designs.

2 One feature which has become relatively common, however, is the median crossover reserved for emergency vehicles. Figure 5.24 illustrates typical basic signing requirements for such a crossover.

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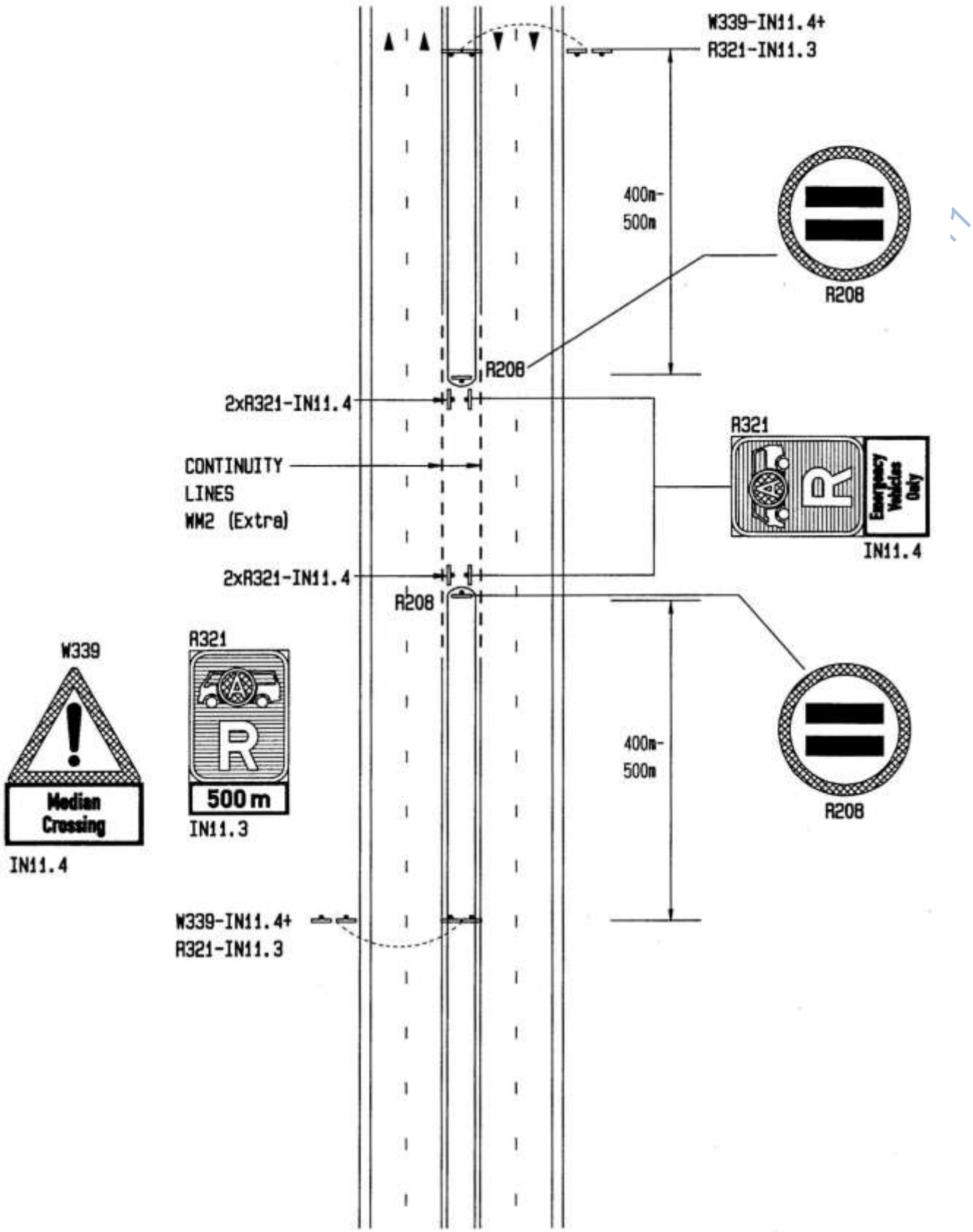

Fig 5.24 **Typical Emergency Vehicle Median Crossover Signing**

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TOLL ROUTE SIGNING

SECTIONS

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6.1 Introduction

6.2 Terminology

6.3 Basic Principles

6.4 Toll Symbols

6.5 Toll Signs

6.6 Signing Applications

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CHAPTER 6

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KEYWORDS

ROAD SIGN, ROAD MARKING, REGULATORY, WARNING

COST: VOLUME 2

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TOLL ROUTE SIGNING

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CHAPTER 6:
TOLL ROUTE SIGNING

6.1 INTRODUCTION

6.1.1 General

1 Toll routes have unique features which place new and additional requirements on the road traffic signs provided for drivers. In particular the display of information relating to the payment of toll charges, and to alternative routes, places an additional load on drivers' attention levels.

2 The levying of tolls on national routes was provided for by the South African National Roads Agency and National Roads Act, Act 7 of 1998, read in conjunction with the original National Roads Act, Act No. 54 of 1971, as amended.

3 The toll route legislation required that an alternative un-tolled route shall be available. In addition during the preparation of this legislation it was stated that these alternative routes would be adequately identified by road signs.

4 The policy and principles given in this section represent basic details which should be borne in mind in the planning phase of a new toll route and adhered to whenever possible. These principles are subject to further development at a detail level with the objective of presenting the driving public with co-ordinated and uniform signing of toll routes. The signing of some sections of toll routes can become extremely complex as a result of such factors as:

(a) the intersecting of two toll routes under the control of different operators;

(b) the siting of toll plazas within interchanges (including systems interchanges) where major, and/or complex, changes of direction occur.

5 The greatest lengths of toll route can be classed as rural, but increasing lengths are likely to occur in future in metropolitan or urban environs. The characteristics of trips undertaken in rural and urban systems differ in significant ways. Principal among these differences are the level of pre-trip planning likely to be undertaken, and the ease with which an alternative route may be indicated on signs. Rural trips are liable to be, and certainly should be, planned in some detail, whereas in an urban environment a far larger percentage of trips are likely to be unplanned. In addition, the indication of an alternative route to the toll route presents differing signing problems in rural and urban areas.

6 In rural situations, to date, an alternative route has commonly been available more or less parallel to the tolled route and the indication on road signs is relatively straightforward. In some cases, however, such a route may not exist and the normal solution to this problem involves permitting motorists to use a section of the tolled route free of charge (*gratis* travel) until they are able to re-join the alternative route, although the free section of route is still maintained by the toll operator.

7 This form of toll operation in which a certain amount of free travel is possible is termed an "Open System" and is more appropriate when traffic volumes do not warrant a "Closed System". To date the system used on South African toll routes is the "Open System". The signing of an "Open System" presents the additional problem of having to indicate which sections of a route operated by a toll operator (and therefore by definition a "Toll Route") are subject to a charge and which are not.

8 The problem of indicating alternative routes in metropolitan areas may be significantly more difficult than in a rural situation. In many cases more than one route may be available. Conversely if an alternative route is not available, it may be much more difficult to arrange a *gratis* section of toll route due to interchange position or the potential loss of revenue such a section may generate. It is therefore important that this aspect be fully investigated at the concept planning stage of a new toll route (see Subsection 6.3.2).

9 It may also be quite difficult to accommodate the full range of additional signs in the often confined space available in metropolitan road reserves.

10 Guidance signs on toll routes shall achieve the same basic guidance requirements fulfilled by guidance signs anywhere else in the road network. The destination information displayed shall conform to the colour code appropriate to the class of road on which the signs appear. Recent toll routes have involved contiguous sections of dual carriageway (Class A1) freeway and single carriageway (Class A2) freeway (see Volume 1, Chapter 1, Section 1.2). This presents a number of difficulties in deciding on the sign background colour.

12 In addition the guidance signs shall still provide adequate orientation and they shall conform to the basic principles of conspicuity, legibility, conformity, accuracy, uniformity, consistency and continuity (see Volume 1, Chapter 4, Section 4.1).

13 The limitations on information display in terms of road geometry, letter sizes and reading time available shall also be taken into account when designing guidance signs for toll routes (see Volume 1, Chapter 4, Section 4.4).

14 In 1988 the Department of Transport started developing a consistent signing policy for toll roads, based on the experience gained during the signing design of the N17. The document "Road Signs for Toll Roads - Towards a Signs Policy" (hereinafter called the Toll Signs Policy document) was issued to selected interested parties in September 1988 and with this document a number of new signing concepts were introduced. During 1989 these concepts were tested in actual situations on various toll routes.

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6.1.2 Purpose of This Chapter

1 This chapter replaces the 1988 Toll Signs Policy document and reflects the latest state of the art. Its purpose is to provide the sign designer with a comprehensive guideline which:

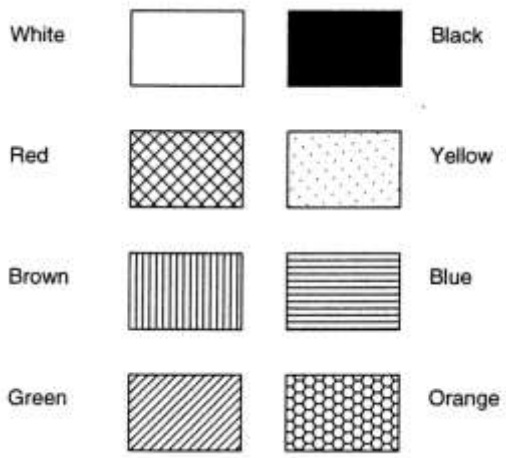
(a) assesses the role of signs in the process of communicating toll related information to the driver;

(b) assists the sign designer with the methodology for signing a toll road so that all toll roads can be signed in a consistent way.

6.1.3 Road Traffic Sign Colour Indication

1 The chapters of Volume 2 of the South African Road Traffic Signs Manual (SARTSM) are not prepared in colour. Relevant examples used to illustrate appropriate signs, signals and markings are shaded in a black and white coding which is illustrated below.

2 The basic principles of the road traffic sign colour coding system are shown, in colour, in the SADC-RTSM Volume 1, Chapter 1, Section 1.4, and in the Contents sections of relevant Volume 1 and 4 Chapters.



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6.2 TERMINOLOGY

6.2.1 General

1 The terms described in this Subsection are also given in Volume 1, Chapter 10, "Glossary of Terms", along with many other more general terms. The terms given here tend to be unique to toll route signing principles. Refer also to Figure 6.1 where the different elements of a toll road are indicated in a practical situation.

2 The following terms are used in subsequent Sections:

"Alternative Route - shall serve the same destinations as the toll route and shall be accessible to road users; it shall commence at or near the beginning and terminate at or near the end of the toll route";

"Freeway - is a normal un-tolled Class A road";

"Throughway - is a freeway or a toll road";

"Point of Entry (POE) - is the point where the driver enters a toll road and may be at one of the following localities:

(a) at the continuation of an un-tolled road;

(b) at an intersection, access interchange or systems interchange and will involve a positive change of direction; entering a toll road via an access interchange from a cross-road, the POE is at the on-ramp/cross-road junction; entering a toll road through a systems interchange the POE will be at the nose of the off-ramp from the freeway";

"*Gratis* Section - sections of a toll road that drivers can travel on without being forced into a situation where toll must be paid;"

"Turn-off to Alternative Route (TTA) - specifically chosen points which have been signed to indicate directions to the alternative route;"

"Point of Commitment (POC) - is the point on the road where drivers finally commit themselves to pay toll; once they go beyond this point they will encounter a toll plaza;"

"**Committed Section** - is that section between the POC and the toll plaza on which all drivers will be obliged to pay toll;"

"**Toll Plaza Approach** - is the section of road on the final approach to a toll plaza on a committed or *gratis* section of road, approximately 2 km long, and on which the driver will encounter the road signs for the toll plaza;"

"Toll Plaza Area - comprises the aprons before the toll booths, the toll booths, the toll administration block and all related parking areas and access roads";

"Beyond the Toll Plaza - the section of road beyond the toll plaza which can simply be the continuation of the toll road or ramp or it can include the nose of an interchange; in the latter case the driver must make a decision to change direction immediately after paying toll";

"Mainline Plaza - is a plaza which straddles all lanes on the route and at which toll is paid by all drivers in one of a number of different ways (a plaza may comprise mainline and ramp components)";

"Ramp Plaza - is a plaza located only on the off-ramp and/or on-ramp at an interchange and at which toll is paid by drivers leaving or entering the toll route, in one of a number of different ways";

"Long Distance Traveller - is one travelling between national orientation points, or provincial orientation points if there are no suitable national orientation points;<+>the long distance traveller's journey would normally be longer than 100 km";

"Automatic Toll - the toll charge is collected by an automatic device which does not give change, therefore the correct change shall be tendered; Automatic Toll can be collected in a number of ways:

(i) by coin only;

(ii) by credit card or debit card;

(iii) by automatic debiting; in future an automatic toll charge may be collected by automatic debiting if vehicle identifiers are used; this system will identify the vehicle in motion and the owner will be invoiced automatically".

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Notes for Figure 6.1

(1) This figure illustrates a number of situations which may well occur in an "Open Section" toll system. The variety shown here is unlikely to occur within such a short length of toll route, but is certainly possible.

(2) Points "F" indicate the start (Point of Entry - POE) and end of a toll route for which one of the toll operators is responsible.

(3) Point "A" shows a Turn-off To an Alternative Route (TTA) and a Point of Commitment (POC) whereas Point "E" involves a TTA but not a POC.

(4) All movements on the toll route at Point "B" and all but one of the entering movements are subject to toll. (The movement from west to south is not subject to toll.)

(5) Point "C" shows an interchange with no plazas but entering traffic travelling south will be subject to toll so it includes two POCs.

(6) Point "D" shows a similar interchange with Ramp Plazas. Note that sections of the toll route may still be free or *gratis* when the toll is levied only on the ramps.

(7) Point "E" shows that Alternative Route re-joining the toll route with *gratis* travel available in both directions.

(8) The term "Beyond the Toll Plaza" is used to refer to sections of toll route on which, in addition to the "Committed" sections, travel is paid for at a Toll Plaza. Such sections may also be *gratis* sections for traffic using the system for shorter distances.

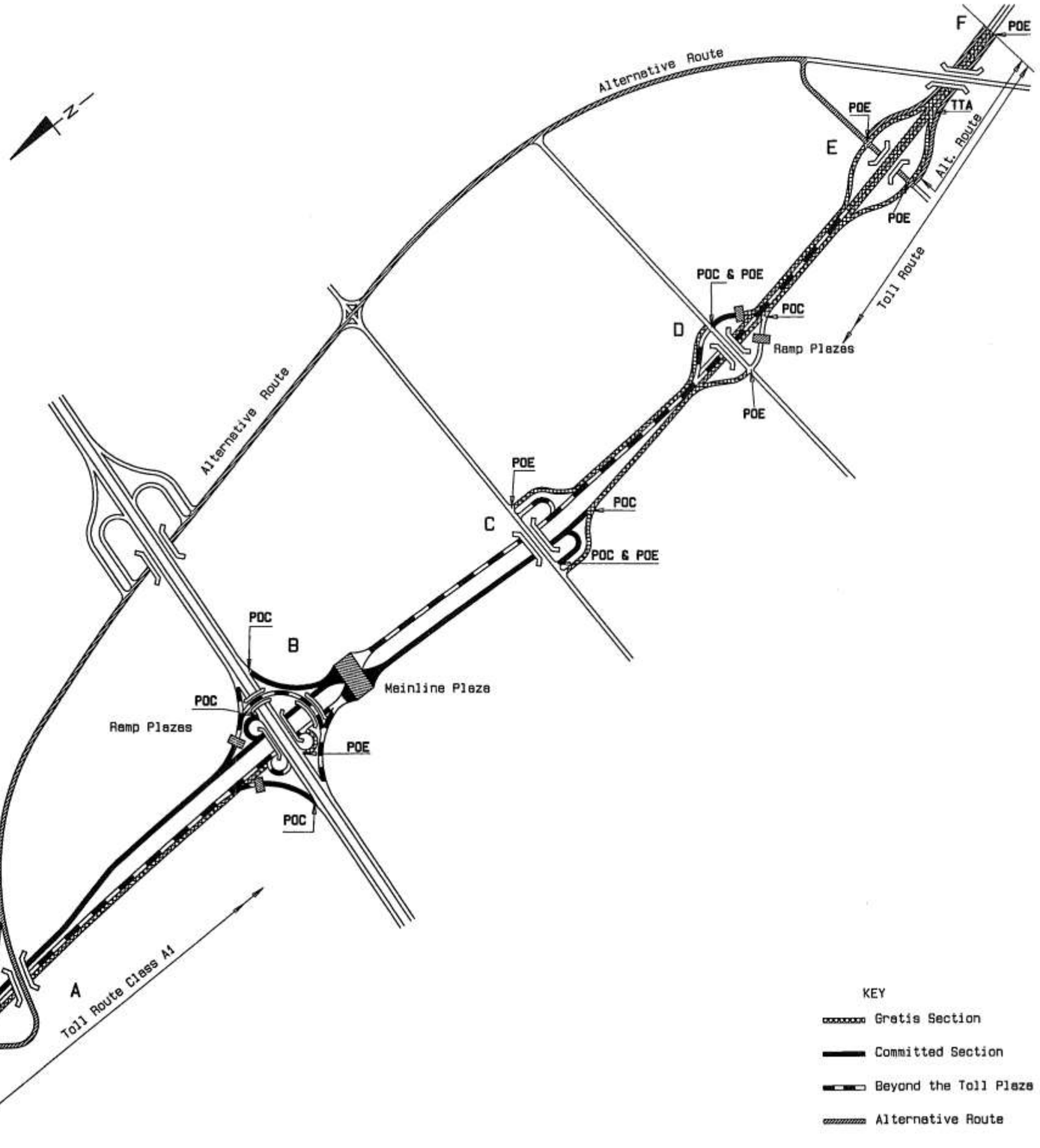

Fig 6.1
Elements of a Toll Route

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6.3 BASIC PRINCIPLES

6.3.1 General

1 The potential complexity of the different elements making up a toll route system is illustrated in Figure 6.1.

2 Before considering individual signs, it is necessary to determine what additional information is required to that normally given for a road of the class subject to a toll charge. When drivers approach a POE they will see the TOLL ROUTE NAME sign GL7.2, the purpose of which is to indicate that there is a choice of either using or not using the toll road to reach their destination. Ideally drivers should then be provided with information relating to:

(a) the tariff at each plaza on the toll route;

(b) the acceptable methods of payment;

(c) the distances by the toll route and any alternative route;

(d) directional guidance to an alternative route.

3 The basic principles used to provide drivers with the necessary information required are derived from the need to clearly identify these elements to drivers. It is, however, virtually always impractical to provide all this information at every approach to a point of entry (POE), especially in urban areas.

4 The information to be provided should therefore be rationalised as follows:

(a) a driver entering a toll route should expect to pay toll at some point, and in choosing the route, undertakes to do so;

(b) toll routes are most commonly along national roads, therefore the information given is directed primarily at long distance travellers (travelling to national or provincial familiar orientation points involving a trip in the region of 100 km or more - see Volume 1, Chapter 8);

(c) direction information shall take priority over toll payment information in terms of the overall limits applicable to a driver's ability to digest information.

5 The basic symbols and signs related specifically to toll routes and their application are discussed in detail in Section 6.4 and Section 6.5 respectively. Their application is dealt with in Section 6.6.

6 Because a toll route may be divided into "*gratis*" and "pay" sections it becomes necessary for this to be evident from the basic signs rather than through additional worded messages.

6.3.2 Alternative Routes

1 Requirements for selection of an alternative route are as follows:

(a) only one alternative route should be chosen and signposted; the choice of route should be made in conjunction with the Department of Transport and the road authority that administers that route;

(b) the alternative route must be of the highest standard available and it should be a national or provincial road or a major municipal arterial;

(c) it must directly or indirectly serve the same destinations as the toll road;

(d) in the interest of public safety short sections of the alternative route may coincide with the toll road, but the alternative route must never be signed in such a way that it only avoids the toll plazas;

(e) when the economic viability of a toll road is considered, the cost of using the toll road must be compared with the cost of using alternative routes and it is important to establish which routes were considered in the economic analysis to assist in choosing an alternative route.

2 When signing an alternative route the following must be borne in mind:

(a) alternative routes are signed for the long distance traveller on the national route; no direction signs to toll road alternative routes should be provided on metropolitan or provincial **approach** routes to the toll road;

(b) direction signs before the TTA must indicate control destinations that can be reached via the toll road;

(c) there is an inherent obligation that once having signposted an alternative route, follow-up signing be provided along this route to enable drivers to navigate their way to their destination;

(d) **it is undesirable that the environment be cluttered unnecessarily by road signs**; it is therefore recommended that the alternative route be identified only up to the point where the familiar destination, which would have been reached if the driver had stayed on the toll route, appears on existing direction signs on the alternative route.

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6.4 TOLL SYMBOLS

6.4.1 General

1 It has been noted in Section 6.3 that the information transfer aspects of a toll route system can become complex. The different elements of such a system are illustrated in Figure 6.1. Consistent with one of the primary objectives of the road traffic sign system, namely to simplify message transfer to drivers, symbols are widely used on road signs specified for toll route environments. Since some of these symbols are unique to toll route signing **a specific sign-based education campaign should be implemented in conjunction with the commissioning of any new toll route.** This requirement is particularly relevant if the toll route is the first one in the area.

2 Whilst the majority of messages on toll signs related to identification of routes and tariffs are given in a symbolic form, the PAY TOLL regulatory sign R132 is also widely used on signfaces. Sign R132 is used to indicate a mandatory requirement to pay toll in the direction associated with the sign. **It should be noted that sign R132 is a regulatory sign and not a symbol. The use of sign R132 carries an ultimate obligation for drivers to pay the appropriate tariff.**

3 It is a basic principle of the development of toll route signing, therefore, that wherever possible standard types of location, direction and information signs have been modified for use on toll routes by the addition of various symbols.

4 Ultimately the signing requirements of a toll route are likely to include the full range of roads signs types (see Volume 1, Chapter 1 for details of the road traffic signs classification). From the perspective of the use of symbols on guidance and information signs, three groups of symbols, each identified as a numbered series, are used as follows:

(a) on LOCATION signs – symbols in the GLS series;

(b) on ROUTE MARKER, DIRECTION and FREEWAY DIRECTION signs (including overhead signs) – symbols in the GDS series;

(c) on INFORMATION signs – symbols in the INS series.

5 Dimensional details of the way in which the various symbols should be incorporated into otherwise standard signface layouts are covered in Volume 4, Chapter 9, “Information Signs” and Chapter 15, “Toll Direction Signs”.

6 All symbols unique to toll routes are detailed in Volume 4, normally on a background grid to facilitate manufacture. The symbols are covered in the following chapters of Volume 4:

(a) Chapter 4: “Location Signs and Route Marker Signs” – all GLS symbols;

(b) Chapter 5: “Direction Signs” – all GDS symbols:

(c) Chapter 9: “Information Signs” – all INS symbols.

6.4.2 Basic Toll Symbols

1 In order to convey toll related messages, specific symbols have been devised. These are (see Figure 6.2):

(a) TOLL ROUTE NAME symbol GLS-2;

(b) END OF TOLL ROUTE symbol GLS-3;

(c) TOLL ROUTE symbol GLS-3;

(d) ALTERNATIVE ROUTE symbol GDS-10;

(e) TOLL PLAZA AHEAD symbol gds-22;

(f) AUTOTOL symbol INS-10 (all vehicles);

(g) AUTOTOL symbol INS-11 (cars only).

These are summarized in Table 6.1 which also provides a cross-reference to Volume 1 and Volume 4.

2 In addition PAY TOLL sign R132 is used on toll signs in the manner of a symbol. The use of sign R132 in this way is discussed in Subsection 6.4.7.

3 The application of the TOLL ROUTE NAME symbol GLS-2 and the END OF TOLL ROUTE symbol GLS-3 is discussed in Subsection 6.4.4.

4. The application of the TOLL ROUTE symbol GDS-9, the ALTERNATIVE ROUTE symbol GDS-10 are discussed in Subsections 6.4.6 respectively.

5 The TOLL PLAZA AHEAD symbol GDS-22, for use on overhead direction signs, is discussed in Subsection 6.4.8. This symbol is incorporated into a variety of arrow types, in particular arrow clusters. Dimensional details of how the symbol may be incorporated are given in Chapter 15, Section 15.4.

6 The AUTOTOL symbols INS-27 and INS-28 are discussed in Subsection 6.4.9.

6.4.3 Toll Tariff Symbols

1 The tariff charged for the use of various sections of toll route operated by The South African National Roads Agency varies according to the class of vehicle. Vehicles are classified by their number of axles and tariffs are indicated according to groups of classes of vehicle.

2 The relationship between toll tariff to be paid and vehicle/axle class is indicated on TOLL TARIFF BOARD signs IN24 and IN25. Vehicle class symbols, in the INS series, are illustrated in Figure 6.2 and accurately represent the axle configuration of the class of vehicle. The range of vehicle/axle class symbols, listed with cross-references to Volumes 1 and 4 in Table 6.1, is as follows:

(a) MOTOR CAR symbol INS-12;

(b) BAKKIE symbol INS-13;

(c) MOTORCYCLE symbol INS-14;

(d) MOTOR CAR plus CARAVAN symbol INS-15;

(e) CARAVAN symbol INS-16;

(f) MINIBUS symbol INS-17;

(g) BUS symbol INS-18;

(h) TRUCK – 2 axle symbol INS-19;

(i) TRUCK – 3 axle symbol INS-20;

(j) TRUCK – 4 axle symbol INS-21;

(k) TRUCK – 5 axle symbol INS-22;

(l) TRUCK – 6 axle symbol INS-23;

(m) TRUCK – 7 axle symbol INS-24;

(n) TRUCK – 8 axle symbol INS-25;

(o) BUS – 3 axle symbol INS-26.

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TABLE 6.1 BASIC TOLL SYMBOLS TABLE 6.1

Symbol Description	Symbol No.	Reference Page	
		Volume 1	Volume 4
TOLL ROUTE NAME symbol	GLS-2	4.0.7	4.4.2
END OF TOLL ROUTE symbol	GLS-3	4.0.7	4.4.2
TOLL ROUTE symbol	GDS-9	4.0.13	5.4.5
ALTERNATIVE ROUTEsymbol	GDS-10	4.0.13	5.4.5
TOLL PLAZA AHEAD (overhead signing) symbol	GDS-22	4.0.13	5.4.13
AUTOTOL (all vehicles) symbol	INS-10		9.3.6
AUTOTOL (cars only) symbol	INS-11		9.3.7
MOTOR CAR symbol	INS-12		9.3.8
BAKKIE symbol	INS-13		9.3.8
MOTORCYCLE symbol	INS-14		9.3.9
MOTOR CAR plus CARAVAN symbol	INS-15		9.3.9
CARAVAN symbol	INS-16		9.3.10
MINIBUS symbol	INS-17		9.3.10
BUS symbol	INS-18		9.3.11
TRUCK – 2 axle symbol	INS-19		9.3.12
TRUCK - 3 axle symbol	INS-20		9.3.12
TRUCK –4 axle symbol	INS-21		9.3.13
TRUCK - 5 axle symbol	INS-22		9.3.13
TRUCK - 6 axle symbol	INS-23		9.3.14
TRUCK - 7 axle symbol	INS-24		9.3.15
TRUCK - 8 axle symbol	INS-25		9.3.16
BUS – 3 axle symbol	INS-26		9.3.11

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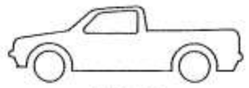
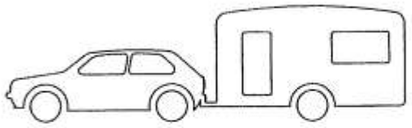
INS-12
Motor Car



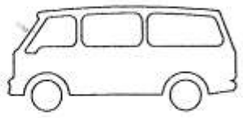
INS-13
Bakkie

INS-14
Motorcycle

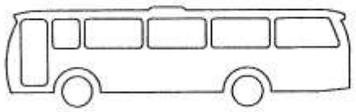


INS-15
Motor Car plus Caravan

INS-16
Caravan

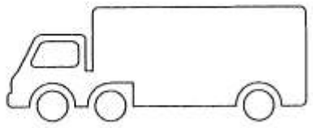


INS-17
Minibus



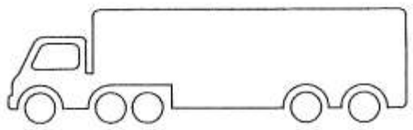
INS-18
Bus - 2-Axle

INS-19
Truck - 2-Axle

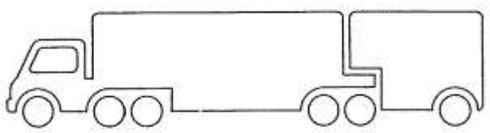


INS-20
Truck - 3-Axle

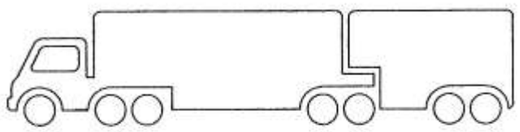
INS-21
Truck - 4-Axle



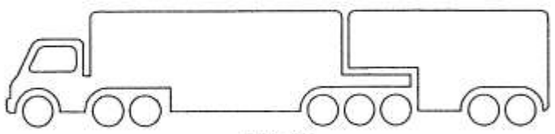
INS-22
Truck - 5-Axle



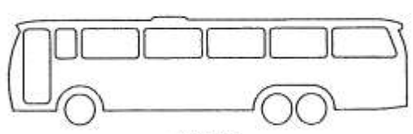
INS-23
Truck - 6-Axle



INS-24
Truck - 7-Axle



INS-25
Truck - 8-Axle



INS-26
Bus - 3-Axle

Detail 6.2.1 Toll Tariff Vehicle/Axle Class Symbols (Information Signs)

GLS-2
Toll Route Name

GLS-3
End of Toll Route

GDS-9
Toll Route

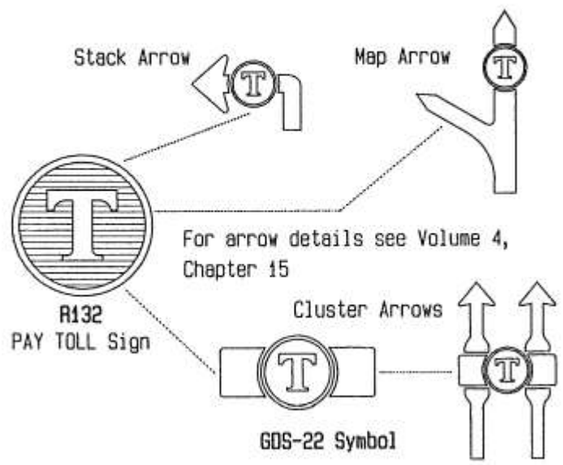
GDS-10
Alternative Route

GDS-22
Toll Plaza Ahead
Arrow Block Symbol - Overhead Signs

INS-10
Autotol - All vehicles

INS-11
Autotol - Cars only

Detail 6.2.2
Other Toll Symbols



Detail 6.2.3
Use of PAY TOLL Sign R132

Notes for Figure 6.2

(1) Symbols used on toll route signs fall into one of three categories, namely:

(a) for LOCATION signs in the GLS series;

(b) for ROUTE MARKER, DIRECTION and FREEWAY DIRECTION signs (including) overhead signs) in the GDS series;

(c) for INFORMATION signs in the INS series.

(2) Detail 6.2.1 shows a range of vehicle class symbols used primarily on TOLL TARIFF BOARD signs IN24 and IN 25. In terms of current toll tariff policy the primary factor which these symbols have to illustrate is the number of axles which each class of vehicle has. From time to time the grouping of vehicles under the one toll tariff rate may change and not all vehicle class symbols may be represented on a sign. If one of the symbols illustrated in Detail 6.2.1 is not displayed the tariff charged will be that of the nearest class vehicle e.g.

(a) a BAKKIE will be charged a MOTOR CAR tariff, or

(b) a MINIBUS towing a CARAVAN will be charged a MOTOR CAR plus CARAVAN tariff.

(3) In Detail 6.2.2 symbol GDS-22 represents a toll plaza. The symbol may be used on overhead signs when a mainline or ramp plaza straddles a number of lanes. The symbol may be varied in length to suit the arrow display on the sign but should only be used for two or more arrows. PAY TOLL sign R132 should be positioned in the centre of symbol GDS-22 (see Detail 6.2.3).

(4) PAY TOLL sign R132 is used to indicate the legal requirement for drivers to pay toll, at least once, on a section of toll route. This indication shall be given at Points of Entry (POE's – see Figure 6.1) by the provision of one or more free-standing examples of sign R132. In addition sign R132 is used extensively by superimposition upon stack, map or overhead type arrows to indicate a direction on, or onto, a toll route in which a toll will have to be paid.

Fig 6.2
Toll Symbols and Sign R132

6.4.4 TOLL ROUTE NAME Symbol

1 The TOLL ROUTE NAME symbol GLS-2 is used in conjunction with the TOLL ROUTE NAME sign GL7.2 (Location – Guidance – Volume 1, Chapter 4, Subsection 4.6.10), which is a derivation of ROUTE NAME sign GL7 (see Figure 6.3). Symbol GLS-2 will commonly appear with either symbol GLS-4 or symbol GLS-5 which indicate the class status of the route if it is a freeway. This sign is to be placed at the beginning of the toll route section. It may also be placed at strategic points along the length of the toll road, e.g. directly after an interchange where large volumes of traffic enter the toll road.

2 The GLS-2 symbol comprises a black semi-matt "T" on a yellow retroreflective background with a black semi-matt border.

3 The END OF TOLL ROUTE symbol GLS-3 is used in conjunction with the END OF TOLL ROUTE NAME sign GL7.3 which is also a derivation of ROUTE NAME sign GL7 (see Figure 6.3). **Symbol GLS-3 is not used with a freeway class symbol.** This sign is placed at the end of the toll route.

4 The GLS-3 symbol comprises a black semi-matt "T" on a yellow retroreflective background with a black semi-matt border and red retroreflective cross.

5 Both of signs GL7.2 and GL7.3 may be supplemented by information indicating the name of the road authority responsible for the toll route. This information may be displayed in a SUPPLEMENTARY PLATE sign IN11.6 below the main sign, although it is not necessary to construct the sign in separate parts (as would be the case with a regulatory or warning sign used with an IN11 sign). For dimensional details see Volume 4, Chapter 9, "Information Signs".

6 For examples of the location of signs GL7.2 and GL7.3 in the relevant sign sequences see Figure 6.12 (Sub-sequence TS3) and Figure 6.17 (Sub-sequence TS7).

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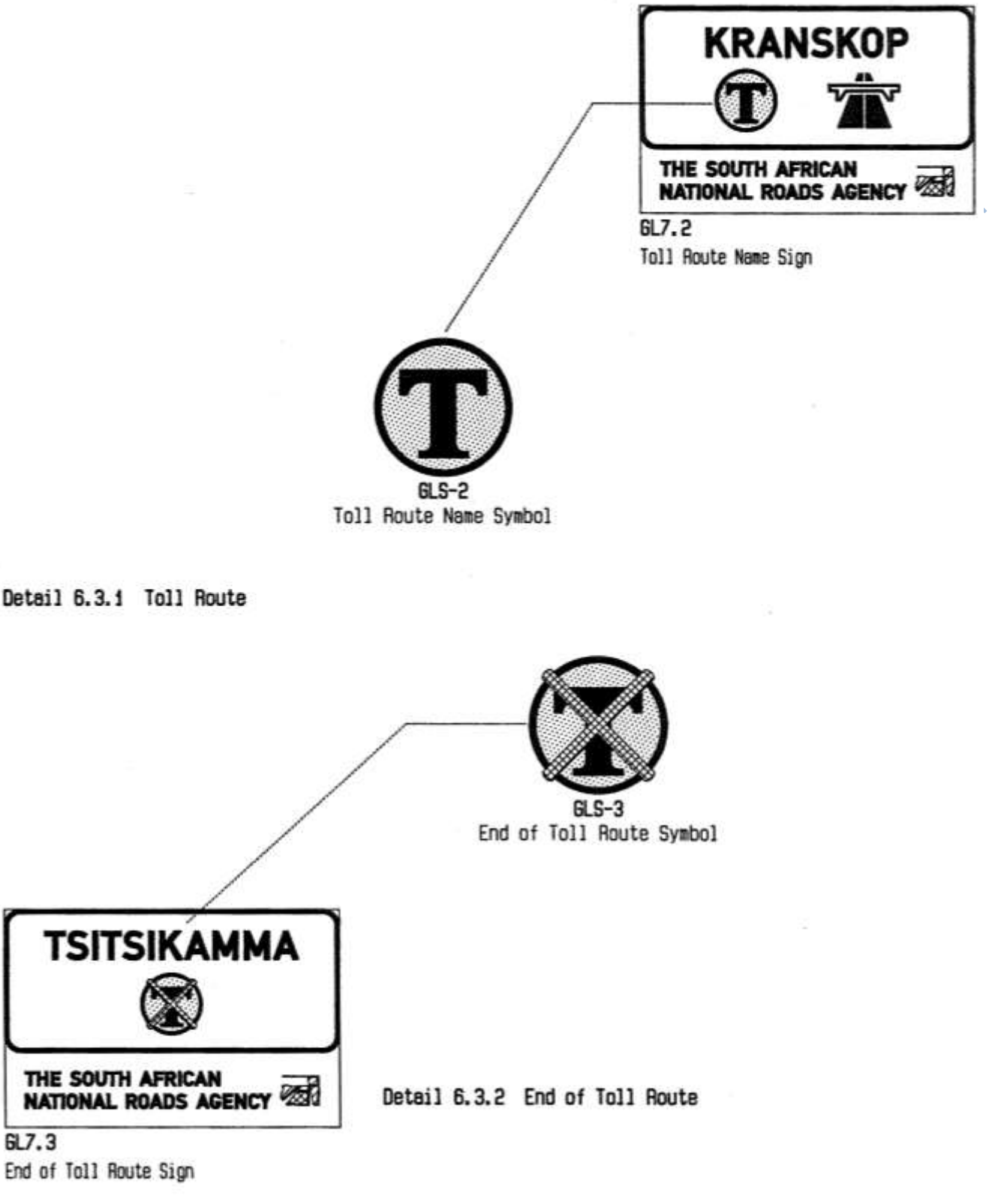

Fig 6.3 **Application of Toll Route Name and End of Toll Route Symbols – GLS-3 and GLS-4**

6.4.5 TOLL ROUTE Symbol

1 The TOLL ROUTE symbol GDS-9 is to be used with the route number to demarcate the extent of the toll route. As such it may be incorporated into various standard signs as required, examples of which are given in Figure 6.4. For dimensional details of how this should be achieved with a various standard Direction – Guidance Signs see Volume 4, Chapter 15, Section 15.2.

2 The GDS-9 symbol comprises a black semi-matt “T” on a yellow retroreflective background.

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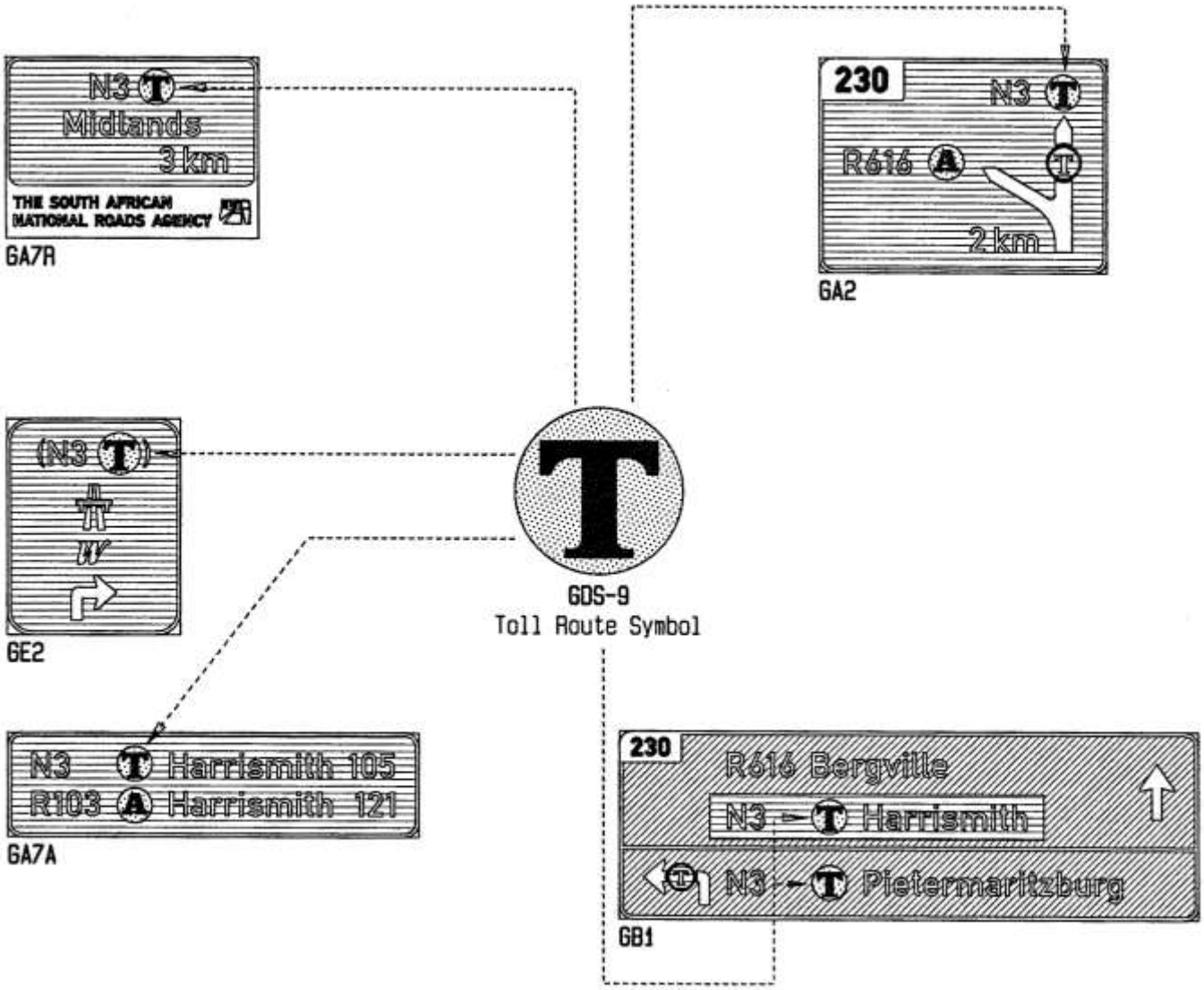

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Fig 6.4 **Application of "Toll Route" Symbol – GDS-9**

6.4.6 ALTERNATIVE ROUTE Symbol

1 The ALTERNATIVE ROUTE symbol GDS-10 is to be used with the route number of the route which has been demarcated as the alternative route to the toll route. As such it may be incorporated into various standard direction signs as required, some examples of which are given in Figure 6.5. The GDS-10 symbol is to be displayed to the right of the number of the alternative route. For dimensional details of how this should be achieved with various standard Direction – Guidance signs see Volume 4, Chapter 15, Section 15.2.

2 The GDS-10 symbol comprises a black semi-matt “A” on a yellow retroreflective background

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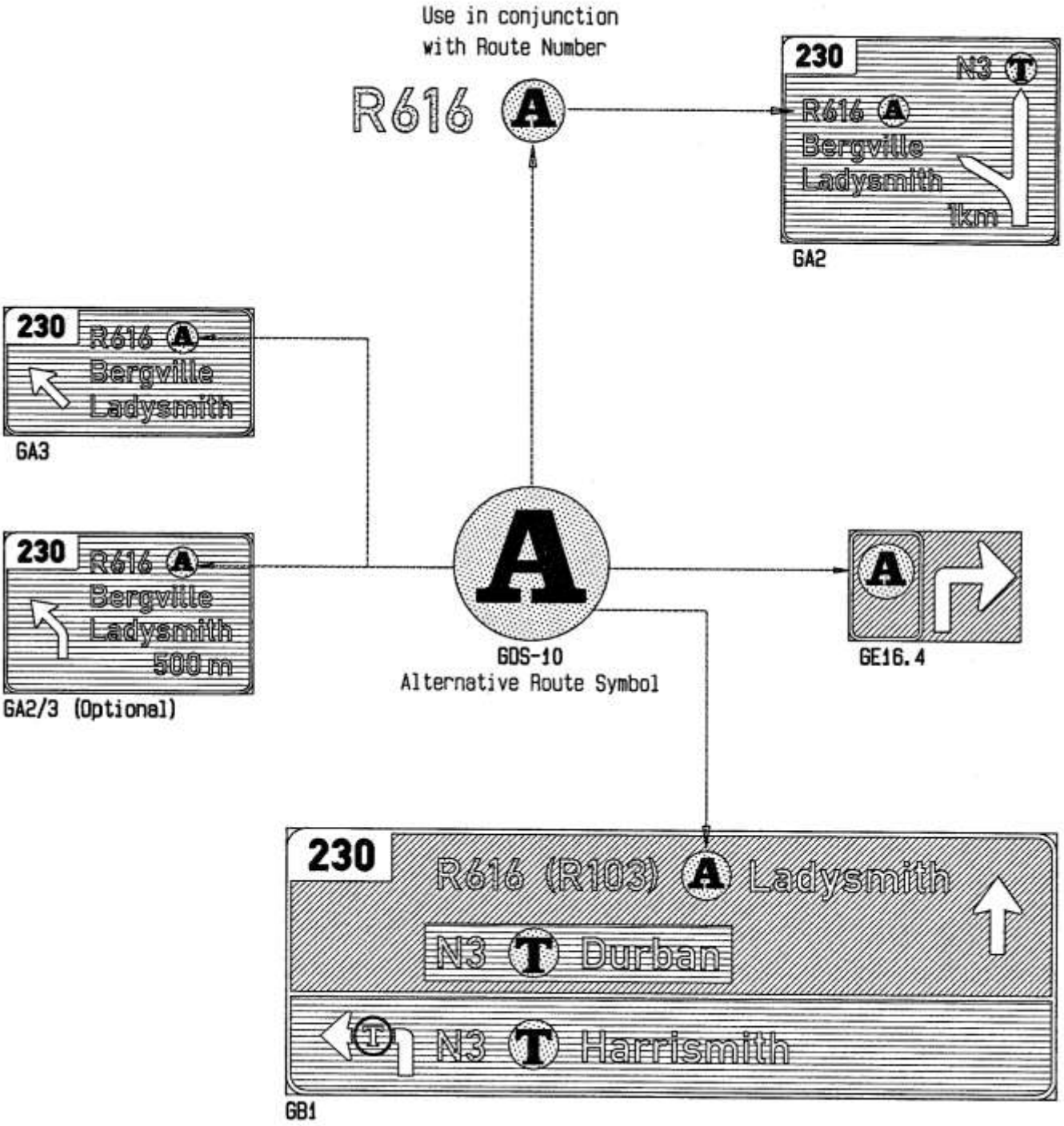

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Fig 6.5 **Application of "Alternative Route" Symbol – GDS-10**

6.4.7 PAY TOLL Sign R132

1 The pay toll regulatory sign R132 imposes a mandatory requirement that drivers of vehicles shall only proceed on a public road designated as a toll route if they are able to pay the toll charge, and that they shall pay the toll charge at the toll plaza or plazas concerned (see Volume 1, Chapter 2, Subsection 2.3.10).

2 In general, the sign is used in the manner of a symbol in conjunction with, or is incorporated into, the format of standard signs as required, examples of which are given in Figure 6.6.

3 The sign comprises a white retroreflective "T" on a blue retroreflective background with a white retroreflective border.

4 Sign R132 shall be displayed at all points of payment at toll plazas. The sign may be combined with a stop sign R1 or an indicator device such as an arrow to make the physical location of the point of payment clear. **A special 150mm diameter size is permitted to enable sign R132 to be displayed on individual toll booth windows.**

5 It is recommended that sign R132 be displayed in conjunction with a speed limit regulatory sign R201 in high visibility backgrounds, as necessary at appropriate distances from the toll plaza in order to slow down approaching traffic. The positioning of these signs will vary according to circumstances and will be influenced by the location of the toll plaza in relation to other roadway elements such as interchanges.

6 In order to indicate the continuance of the toll route and to bring into force its legal requirement, sign R132 should be displayed just beyond the exit point at a high speed exit from a freeway on both sides of a one-way roadway and on the left side of two-way roads. Sign R132 should similarly be displayed on the left side of a two-way roadway just beyond the far left corner of an at-grade junction.

7 The display of sign R132 indicates a point of commitment (POC) to pay a toll charge, and is the last point at which drivers may take action if they do not wish to pay a toll charge. Sign R132 shall be incorporated into the appropriate arrows on ground-mounted stack-type or map-type advance direction signs or on overhead advance direction signs to indicate to drivers that a route ahead, reached either by travelling straight on or by leaving the route on which they are travelling, is subject to toll charges. The direction sign concerned should be located between 400 m and 1200 m in advance of the exit point on a freeway, or between 240 m and 500 m in advance of the near left corner of the on-ramp at a crossroad access interchange on a freeway or of an at-grade junction. The junction indicated on a guidance sign by regulatory sign R132 is therefore the last junction before a toll plaza at which a driver may leave the route on which he is travelling if he does not wish to, or is unable to pay the required toll.

8 An overhead signs PAY TOLL sign R132 may be linked to an arrow cluster by incorporation into symbol GDS22 (see Figure 6.2 and 6.6).

6.4.8 TOLL PLAZA AHEAD Symbol

1 The symbol GDS-22 is used, where appropriate, on overhead signing on the approach to a toll plaza which is associated with an access or systems interchange to indicate the immediate proximity of the plaza. It may be used on GC6U or GC7U type signs mounted to the right of a GC4U sign, although, particularly when a plaza or plazas are associated with a systems interchange, this symbol may be used on a number of different signs. The number of arrows used will be directly related to the number of toll route lanes prior to reaching the plaza (not the number of plaza lanes).

2 The PAY TOLL sign R132 is to be incorporated into the GDS-22 symbol (see Figure 6.2 and 6.6 and Volume 4, Chapter 15 for details).

6.4.9 AUTOTOL Symbols

1 The AUTOTOL symbol INS-10 may be used on information signs to indicate automatic toll facilities at a toll plaza. If automatic toll facilities are only available to motor cars then AUTOTOL (cars only) symbol INS-11 should be used (see Figure 6.2 and Section 6.5.4).

2 To date there has been no need for Autotol symbols for vehicles other than cars, but this need may occur in future. Electronic toll collection is not automatic toll (which uses cash/cards or in/on vehicle automatic debiting devices), but the lane may be shared by all classes of vehicles – not only cars.

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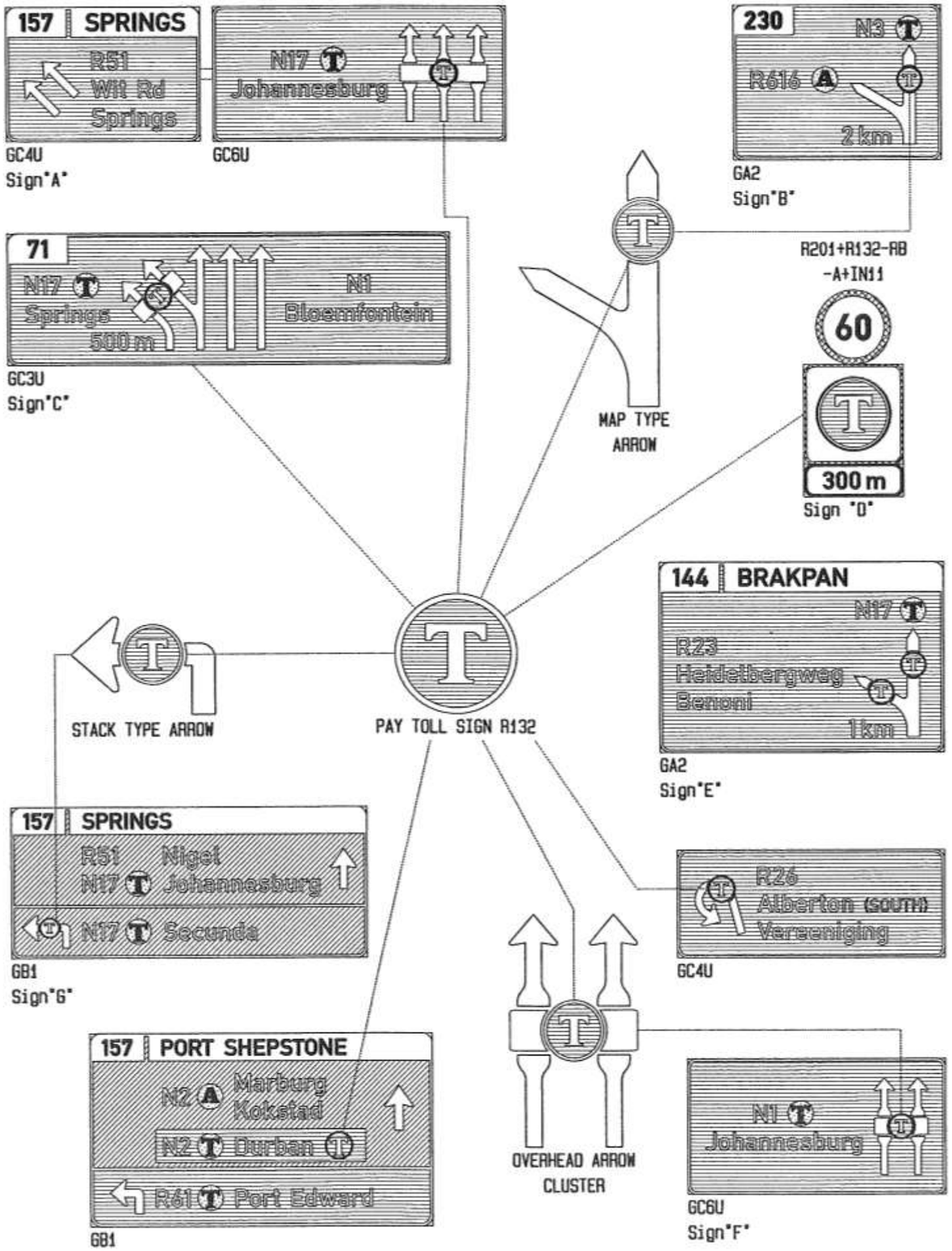
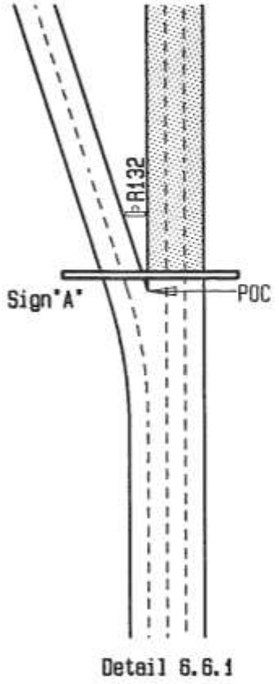
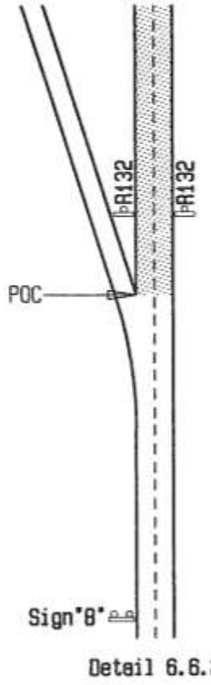
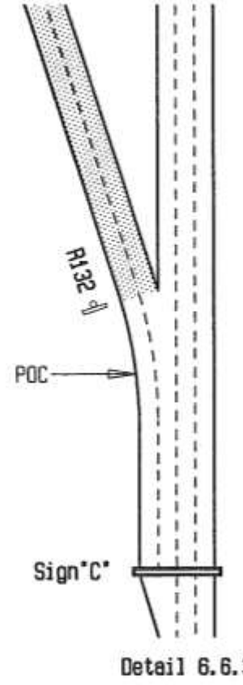




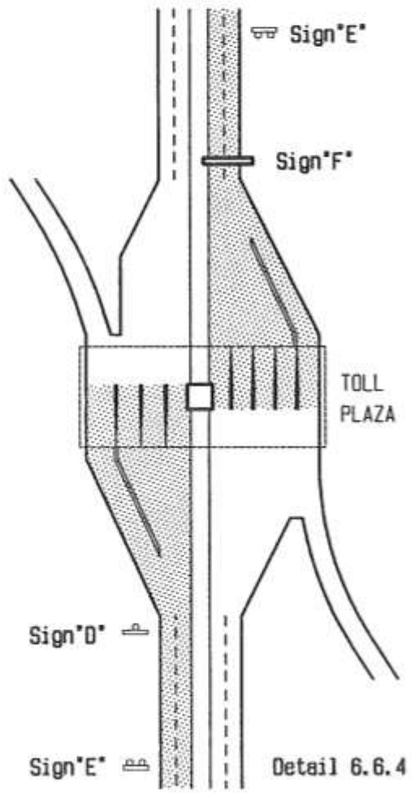
Detail 6.6.1



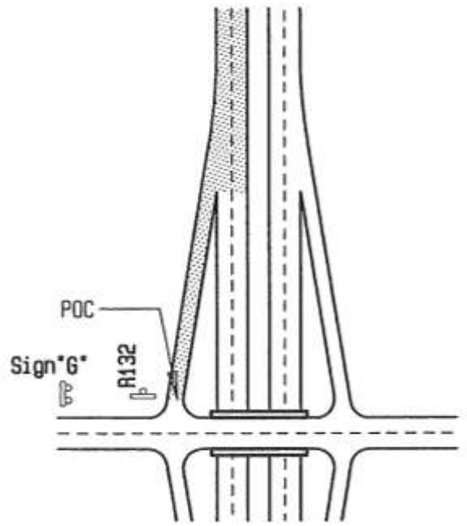
Detail 6.6.2



Detail 6.6.3



Detail 6.6.4



Detail 6.6.5

COMMITTED TO
PAY TOLL

Fig 6.6
Application of the Pay Toll Sign R132
On Guidance and High Visibility Signs

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.5 TOLL SIGNS

6.5.1 General

1 Toll related signs may fall into one of several classifications including regulatory, guidance (location, route marker, direction, freeway direction) and information. A list of all the basic toll related signs as well as the cross-references to Volume 1 and Volume 4 is given in Table 6.2.

2 The regulatory PAY TOLL sign R132 is dealt with in Subsection 6.4.5.

3 The location signs GL7.2 and GL7.3 are dealt with in Subsection 6.4.2.

4 Specific combination type toll related signs are dealt with in Subsection 6.5.2.

5 A selection of toll signs which give general information are dealt with in Subsection 6.5.3 and the more specific toll tariff related information signs are dealt with in Subsection 6.5.4.

6 Guidance signs modified for specific use in relation to toll routes are discussed in Subsection 6.5.5.

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TABLE 6.2 TOLL SIGNS TABLE 6.2

Sign Description	Sign No.	Reference Page	
		Volume 1	Volume 4
TOLL BOOTH STOP	R1-RB	2.0.20	2.1.6
PAY TOLL	R132	2.3.14	2.3.32
TOLL ROUTE NAME	GL7.2	4.6.9	4.2.13
END OF TOLL ROUTE	GL7.3	4.6.9	4.2.13
TOLL/ALTERNATIVE ROUTE DISTANCE	GA7A	4.14.13	15.2.5
TOLL ROUTE AHEAD	GA7R	4.14.13	15.2.7
TOLL PLAZA AHEAD	GA7P	4.14.13	15.2.8
TOLL PLAZA SEQUENCE	GA8P	4.14.13	15.2.9
TOLL TARIFF BOARD - Standard	IN14	5.2.9	9.2.22(9.2.26/27)
TOLL TARIFF BOARD - Reduced	IN15	5.2.9	9.2.23(9.2.26/27)
TEXT MESSAGE	IN26	5.2.10	9.2.24
AUTOTOL	IN27	5.2.10	9.2.25(9.2.28)

6.5.2 Special Toll Booth STOP Sign

1 A special high visibility STOP sign R1-RB, incorporating the STOP sign and the information message "Toll gate", is to be used immediately in front of each toll booth (see Figure 6.7).

2 This sign is unique in that it comprises a normal R1 sign on a high visibility "RB" type background. The high visibility background of this sign is, however, RED and the border is white.

6.5.3 Information from Toll Route Signs

1 A number of signs give information about aspects of a toll route. Although these signs provide various forms of information, like their similar counterparts on normal routes, several of them are classified as types of guidance sign because of their specific applications in terms of sequences of related signs. Signs which indicate a distance to the toll route or a toll plaza, or by an alternative route, are classified as versions of CONFIRMATION sign GA7. A sign which indicates a sequence of toll plazas with distances to them is classified as a form of SEQUENCE sign GA8. Specific signs giving information related to toll routes are as follows:

(a) TOLL AND ALTERNATIVE ROUTE CONFIRMATION sign GA7A;

(b) TOLL ROUTE AHEAD sign GA7R;

(c) TOLL PLAZA AHEAD sign GA7P;

(d) TOLL PLAZA SEQUENCE sign GA8P;

(e) CHOOSE CORRECT LANE sign IN26.

Refer to Figure 6.7 for examples of these signs.

2 The TOLL AND ALTERNATIVE ROUTE CONFIRMATION sign GA7A which indicates the distances along the toll route and alternative route, is to be placed in advance of the TTA (see Section 6.6).

3 The TOLL ROUTE AHEAD CONFIRMATION sign GA7R which indicates that a toll road is ahead, is to be placed in advance of the toll route approach section that is approximately 3 km ahead of the POE (see Section 6.6).

4 The TOLL PLAZA AHEAD CONFIRMATION sign GA7P is to be placed on the final approach to, and approximately 2 km from the toll plaza.

5 The TOLL PLAZA SEQUENCE sign GA8P provides information on which toll plazas are to be encountered along the toll route and the distance to each.

6 A TEXT MESSAGE information sign IN26 displaying the message "Choose correct lane NOW" is to be used on the approach to a Mainline/Ramp combination toll plaza when this type of plaza is located in advance of an interchange. The sign should be located a minimum of 300 m ahead of the appropriate direction sign (normally an EXIT DIRECTION sign GA3 at the start of the plaza apron) or at least this distance from the off ramp nose.

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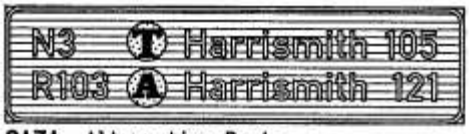
R1-RB

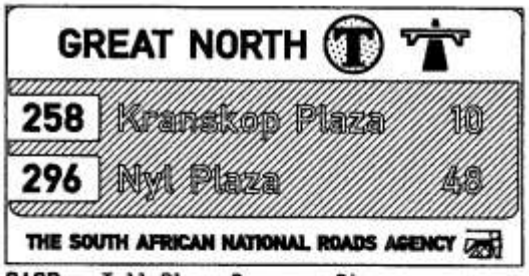
Detail 6.7.1 Regulatory R1-RB Toll Booth Stop Sign

GA7R Toll Route Ahead Confirmation Sign

GA7P Plaza Ahead Confirmation Sign

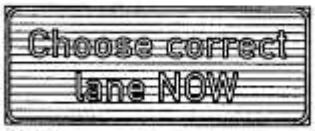


GA7A Alternative Route Distance Confirmation Sign



GA8P Toll Plaza Sequence Sign

Detail 6.7.2 Guidance GA7 and GA8 Signs



IN26

Detail 6.7.3 Information IN26 Text Message Sign

Fig 6.7 Information from Toll Route Signs

6.5.4 Toll Tariff Information Signs

1 Payment information is required to cover the following aspects:

(a) **How much to pay?** - there is to be an indication of how much shall be paid by each class of vehicle (this is usually related to the number of axles on the vehicle) - this amount may be different for Mainline and Ramp Plazas;

(b) **Where to pay?** - traffic may need to be segregated by class on the approach to a plaza, or by intended route beyond a plaza, or for Automatic Toll collection;

(c) **How to pay?** - there is a need to provide information of payment alternatives, namely, in cash with a requirement to receive change, by Credit or Debit card, by correct cash in coins at an Automatic Toll Machine or by automatic vehicle identification and invoicing;

(d) **What is being paid for?** - there is a need to provide drivers with some indication of what they are getting for the toll charge - this information may be given on a CONFIRMATION sign GA7A from which the difference in distance to a familiar destination via the toll route and the alternative route may be determined - signs may be used to identify the start and end of the section of a route controlled by the toll operator (different operators may control contiguous sections of a route).

2 Only the following type of toll payment related signs are to be used along a toll route to display the "how much to pay" message:

(a) TOLL TARIFF sign IN24;

(b) TOLL TARIFF sign (reduced size) IN25;

(c) AUTOTOL TARIFF sign IN27.

3 Tariff boards are required to indicate to drivers of various different classes of vehicle what toll is required to be paid if the toll route is travelled. Only tariff board signs IN24 or IN25 are permitted (see Figure 6.8). A tariff board is to be divided into four distinct vehicle symbol groups, and three sections, as shown in Figure 6.8, namely:

(a) Upper section: should display the name of the next mainline toll plaza;

(b) Middle section: should display the toll tariffs to be paid by each of the four groups of vehicles;

(c) Lower section: may display the logo of and name "The South African National Roads Agency" or the name of the operator of the toll route if the toll route has been privatised.

4 Only the toll charges to be paid at the next mainline toll plaza should be displayed, even if further tolls are to be paid beyond this plaza.

5 Where there is a combination of mainline and ramp plazas, and if there is a difference in the tolls to be paid between ramp and mainline, the tariff board sign on the freeway i.e. the IN24 sign on the approach to the toll plaza, shall only indicate the tariffs for the mainline plaza. Whilst space may make it difficult, an IN24 tariff board indicating the toll to be paid at the off-ramp toll plaza, may be displayed to drivers after entry to the off-ramp (see paragraph 6.5.4.8).

6 The toll tariffs shall be repeated at each toll booth on a small facsimile of sign IN24.

7 If space is limited on crossing road approaches to an interchange access to a toll route a reduced toll tariff sign IN25 may be specified. This sign IN25 should be mounted below an appropriate crossroad direction sign as follows:

(a) GB2 sign;

(b) GB3 sign;

(c) GB4 sign (if single panel).

8 Figure 6.8 illustrates two examples of the combination of a GB3 DIRECTION sign and an IN24 or IN25 INFORMATION sign. This principle may be extended to a TOLL TARIFF sign IN24 provided on the freeway in advance of an off-ramp on which a ramp plaza is located (with no mainline plaza) so that the information given on the EXIT DIRECTION sign GA3 is repeated in a stack above the IN24 sign with a sloping Type 1 STACK-TYPE arrow on the left side of the stack.

9 The "AUTOTOL" symbol is to be displayed above the toll lane and is to indicate the lanes at the toll plaza where automatic payments may be made. If "AUTOTOL" is restricted to cars only, the sign should be displayed on a flexible drape to inhibit larger vehicles from entering the toll lane (see Figure 6.8).

10 If the automatic toll is applicable to all classes of vehicles, the symbol "AUTOTOL" IN-27 only is used. If applicable only to motor cars, the "AUTOTOL" symbol is to be incorporated into the motor car symbol as INS-28 (see Figure 6.2). The sign IN27 is to display the conditions applicable to the use of the automatic payment lane(s) in advance of the plaza. Typical information, where relevant, to be displayed will be:

(a) exact silver coins;

(b) valid cards;

(c) no change given;

(d) the toll tariff;

(e) cars only;

(f) no heavy vehicles.

11 A typical example of an AUTOTOL sign IN27 is given in Figure 6.8.

12 Where regulatory or prohibition signs related to the vehicle types are used in conjunction with the autotol signs, care must be taken to avoid confusion with signs designating specific lanes for specific classes of vehicle.

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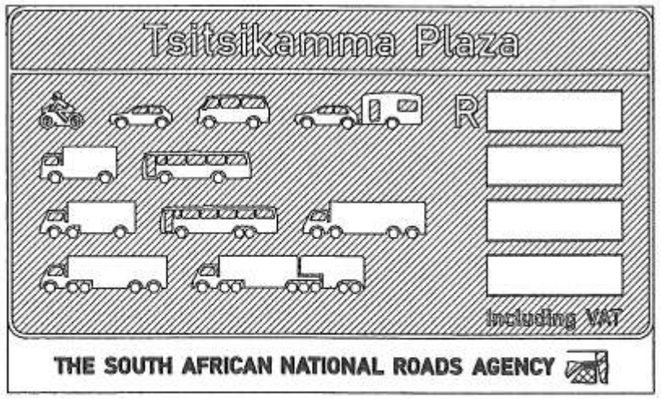
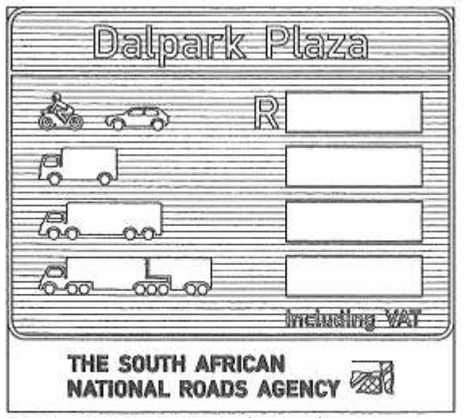
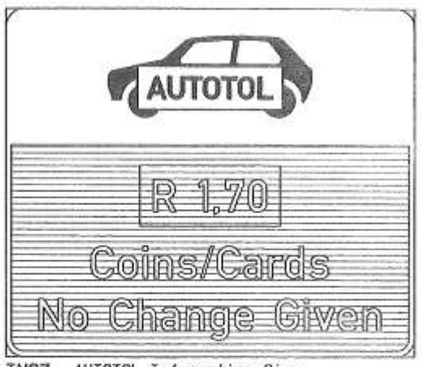


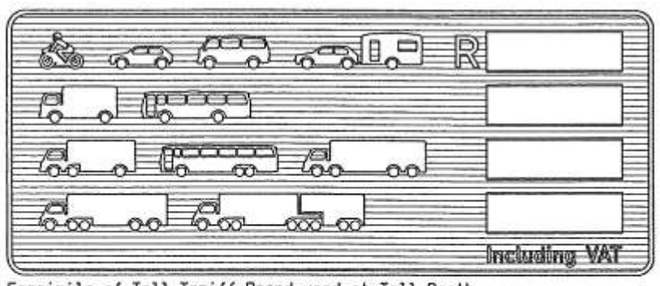
IN24 Toll Tariff Board



IN25 Toll Tariff Board (Reduced)

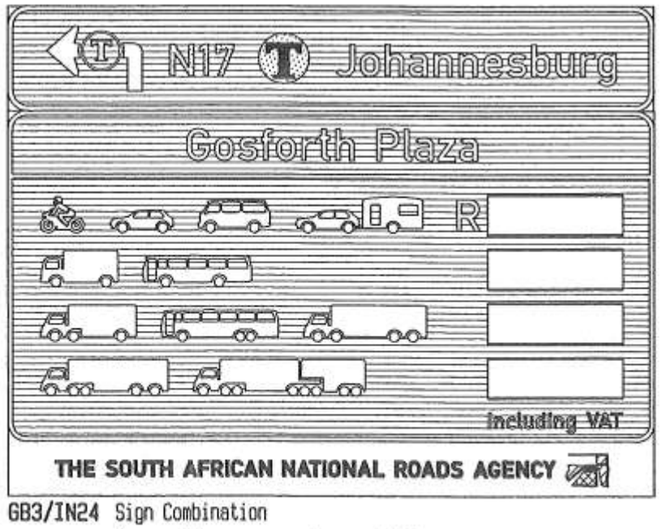


IN27 AUTOTOL Information Sign

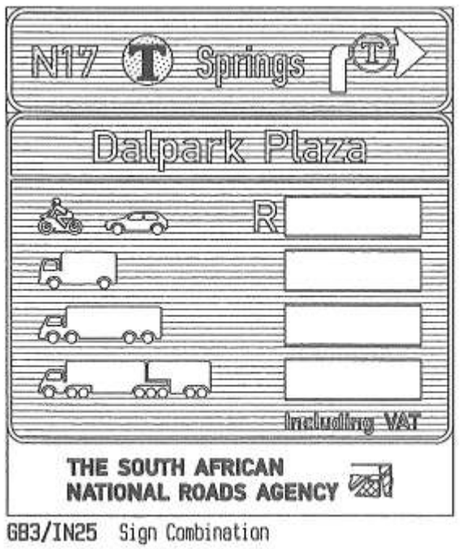


Facsimile of Toll Tariff Board used at Toll Booth

IN27 AUTOTOL Sign Variation (used as a flexible drape at an AUTOTOL lane through a toll plaza)



GB3/IN24 Sign Combination (near side on-ramp advance sign)



GB3/IN25 Sign Combination (far side on-ramp advance sign)

Fig 6.8
Toll Payment Signs

6.5.5 Guidance Signing

1 The basic principle which has been applied to the development of toll route guidance signs has been to modify the standard direction signs by means of appropriate incorporation of the relevant toll symbols/signs, namely:

(a) GDS-9 - TOLL ROUTE symbol (see Figure 6.4);

(b) GDS-10 - ALTERNATIVE ROUTE symbol (see Figure 6.5);

(c) R132 - PAY TOLL sign (see Figure 6.6).

2 The appropriate toll symbols/signs may be incorporated into the following ground mounted freeway related direction signs:

(a) GA1 - PRE-ADVANCE EXIT DIRECTION sign;

(b) GA2 - ADVANCE EXIT DIRECTION sign;

(c) GA2/3 - SUPPLEMENTARY EXIT DIRECTION sign;

(d) GA3 - EXIT DIRECTION sign;

(e) GA5 - ADVANCE OFF-RAMP TERMINAL DIRECTION sign;

(f) GA6 - OFF-RAMP TERMINAL DIRECTION sign;

(g) GA7 - CONFIRMATION sign;

(h) GA8 - EXIT SEQUENCE sign;

(i) GA9 - C-D ROAD ADVANCE EXIT DIRECTION sign;

(j) GA10 - C-D ROAD EXIT DIRECTION sign;

(k) GB1 - CROSS-ROAD ADVANCE DIRECTION sign;

(l) GB2 - NEAR-SIDE ON-RAMP DIRECTION sign;

(m) GB3 - FAR-SIDE ON-RAMP ADVANCE DIRECTION sign;

(n) GB4 - FAR-SIDE ON-RAMP DIRECTION sign.

3 The appropriate toll symbols/signs may be incorporated into the following overhead mounted freeway related signs:

(a) GC1 - PRE-ADVANCE EXIT DIRECTION sign;

(b) GC2D - ADVANCE EXIT DIRECTION sign;

(c) GC3D - THROUGH DESTINATION(S) sign;

(d) GC4D - EXIT DIRECTION sign;

(e) GC2U - ADVANCE EXIT DIRECTION sign;

(f) GC3U - SUPPLEMENTARY EXIT/THROUGH DIRECTION sign;

(g) GC4U - EXIT DIRECTION sign;

(h) GC5U - ADVANCE OFF-RAMP DIRECTION sign;

(i) GC6U - C-D ROAD THROUGH DIRECTION sign;

(j) GC7U - C-D FIRST EXIT/THROUGH DIRECTION sign;

(k) GC8U - C-D SECOND EXIT/THROUGH DIRECTION sign.

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6.6 SIGNING APPLICATIONS

6.6.1 General

1 An indication of how the various toll related signs should be applied along the toll route is dealt with in this section. Not all situations can be covered, but an attempt is made to discuss the more common cases as well as to demonstrate the principles involved.

2 The approach taken in this section to the illustration of the application of toll signing is as follows:

(a) firstly the necessary toll signing related to various basic toll road layout situations is indicated on a number of key illustrations which show the plan layout of the signing in relation to the main toll facilities such as the point of entry (POE), turn-off to the alternative route (TTA), the point of commitment (POC) and toll plazas;

(b) secondly, specific toll signing sub-sequences are illustrated in detail and cross-referenced to the key illustrations;

(c) specific issues related to the sign sub-sequences and/or individual sign applications are discussed.

3 Toll signing in relation to the following situations is dealt with in subsequent subsections:

(a) signing on the approach to a POC and/or TTA, and/or POE (see Subsection 6.6.2);

(b) mainline plaza (with the POC far in advance of the next toll plaza and with the next interchange far beyond the plaza) (see Subsection 6.6.3);

(c) mainline and ramp plaza configuration (with the POC far in advance of the next toll plaza but with the next interchange just beyond the plaza) (see Subsection 6.6.4);

(d) mainline and ramp plaza configuration (plaza just beyond an interchange and the POC immediately ahead of the interchange) (see Subsection 6.6.5);

(e) ramp plaza approach (see Subsection 6.6.6);

(f) crossing road (interchange) (see Subsection 6.6.7);

(g) general signing at a typical mainline plaza and general signing at a typical ramp plaza (see Subsection 6.6.8).

4 The more complex situation of overhead signing on an urban toll route signing is dealt with in Subsection 6.6.9.

5 The distance over which a signing sub-sequence is indicated on the key figures is a minimum distance required to meet the spacing requirements between individual signs appropriate to acceptable message transfer. Where these overall distances vary, an adjustment to the altered situation must be made in accordance with the spacing principles related to the clustering of similar types of sign. The recommended spacing between signs is indicated on the more detailed figures dealing with the individual signing sub-sequences.

6 In all the figures dealing with the details of the signing sub-sequences, the basic minimum signing is identified. In many instances other additional or optional signing may be introduced when considered expedient, and where this is possible such signing has been shown as a "requirement category" as follows:

(a) **Min.** indicates the minimum signing;

(b) **Add.** indicates the additional signing which should only be excluded if spacing does not permit the erection of the sign;

(c) **Opt.** indicates optional signing which may be included, if spacing allows, to provide the driver with added useful information.

7 Refer to Volume 2, Chapter 5 for the correct placement and signing sequence of standard ground-mounted freeway signs.

8 Refer to Volume 2, Chapter 4 for the correct placement and signing sequence of tourism signs.

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6.6.2 Start of Toll Road (POE/POC/TTA)

1 The signing requirements on the approach to the start of the toll road, i.e. the point of entry (POE), the point of commitment (POC) and the turn-off to the alternative route (TTA) are as indicated in Figure 6.9. The details indicated in this example are for ground-mounted signing.

2 The signing sub-sequences related to the initial sections of the toll road up to the POC are as follows:

(a) Sub-sequence TS1: alternative route decision and payment information signs on the approach to a POC and/or a TTA and/or a POE;

(b) Sub-sequence TS2: destination decision signs on the approach to a POC and/or a TTA;

(c) Sub-sequence TS3: signs just beyond a POC or TTA/POC;

(d) Sub-sequence TS4: signs beyond the TTA.

Detail 6.9.1 indicates the situation where the TTA and the POC are separate while Detail 6.9.2 indicates the coincident TTA and POC situation.

3 Signing Sub-sequence TS1 which deals with the initial signing encountered on the approach to a toll road is shown in detail in Figure 6.10. Essentially this signing deals with information on the upcoming toll road, the alternative route and the toll tariffs which are required to be paid, as follows:

(a) the name of the toll route on sign GA7R;

(b) the various toll plazas which will be encountered up ahead on sign GA8P; both mainline and ramp plazas are to be indicated;

(c) in the urban situation the next exit ramps may be indicated on EXIT SEQUENCE sign GA8; in combination with sign GA8P the distance of *gratis* travel along the toll route may be determined; it is used only in urban areas where the street name appears on the exit signs;

(d) the PRE-ADVANCE EXIT DIRECTION sign GA1 must indicate that the turn-off is to the alternative route and that the freeway ahead is a toll route; because of the importance of this first message, sign GA1 is commonly enhanced to repeat all of the information normally provided on the ADVANCE EXIT DIRECTION sign GA2; sign R132 is to be included in the arrow if the exit is a TTA **and** POC, but should not be included on the approach to a TTA only exit;

(e) both of the distances along the toll route and alternative route to the same familiar or control destination (commonly beyond the end of the toll route) are indicated on sign GA7A;

(f) the required toll to be paid by each of the various classes of vehicle, at the next mainline toll plaza, is to be indicated on sign IN24.

4 Signing Sub-sequence TS2, which details the information related to destination decisions on the approach to a TTA, or POC or a TTA/POC, is shown on Figure 6.11. There are subtle differences in the signing and these are evident when one considers each of the signs in the three different sequences dealt with. Tourism signs may also be included in this sub-sequence if so required.

5 Signing Sub-sequence TS3, which deals with the signing sub-sequence beyond a POC, is shown in Figure 6.12. It comprises:

(a) PAY TOLL sign R132 sign indicating that toll is to be paid on the route section ahead before any further exit points; sign R132 is to be placed just beyond the GORE EXIT sign GA4 (see Figure 6.13) but must not be obscured by the latter;

(b) a standard CONFIRMATION sign GD7 is to be placed beyond the interchange;

(c) the TOLL ROUTE NAME sign GL7.2 is to be placed beyond a POC interchange; this confirms that drivers are now on a section of the toll route on which they are committed to pay toll; if space permits, similar signs may be placed after subsequent interchanges on the toll route.

6 Signing Sub-sequence TS4 which deals with the signing on the off-ramp at a TTA/POC situation is indicated in Figure 6.13. This comprises the normal direction signing modified to incorporate the alternative route symbol GDS-10 as appropriate, and any tourism sign if required. A number of variations are possible:

(a) at a TTA access interchange off-ramp (diamond or parclo configuration) the signing would be as indicated in Figure 6.13;

(b) at a TTA exit configuration as shown in Detail 6.9.1 a GA7 sign, incorporating the alternative route symbol GDS-10 next to the route number, should be used at the appropriate location beyond the gore;

(c) at a POC access interchange off-ramp (diamond or parclo configuration) the signing may be as for Sub-sequence TS4 if the alternative route is to be indicated; otherwise the normal signing excluding the GDS-10 symbol is to be used.

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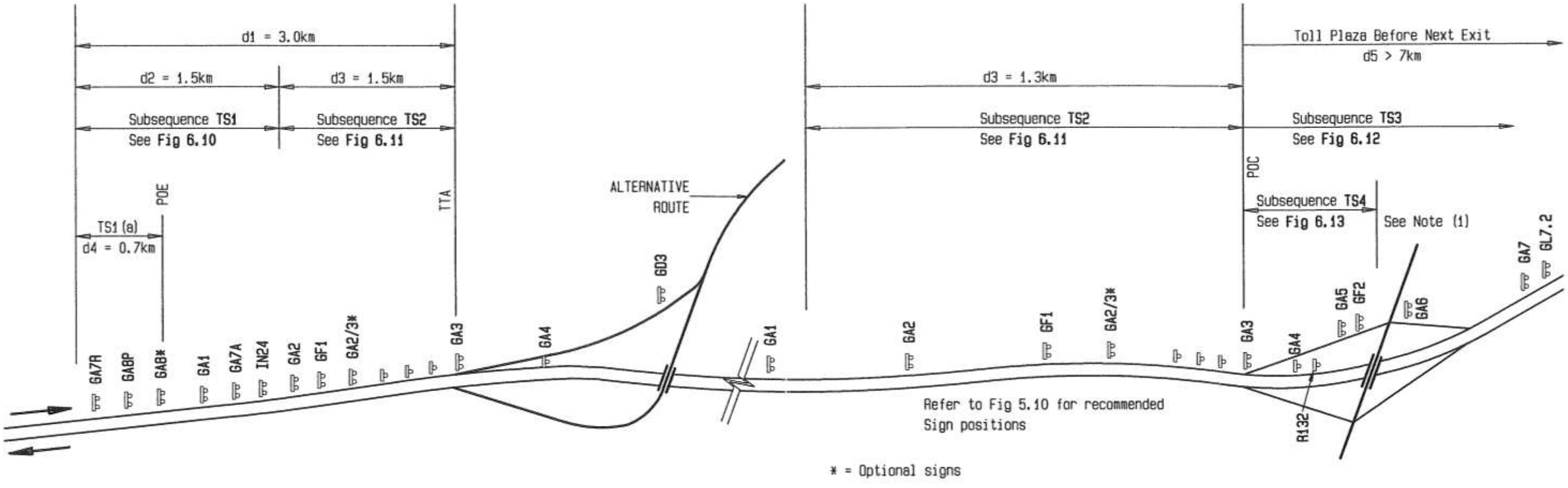
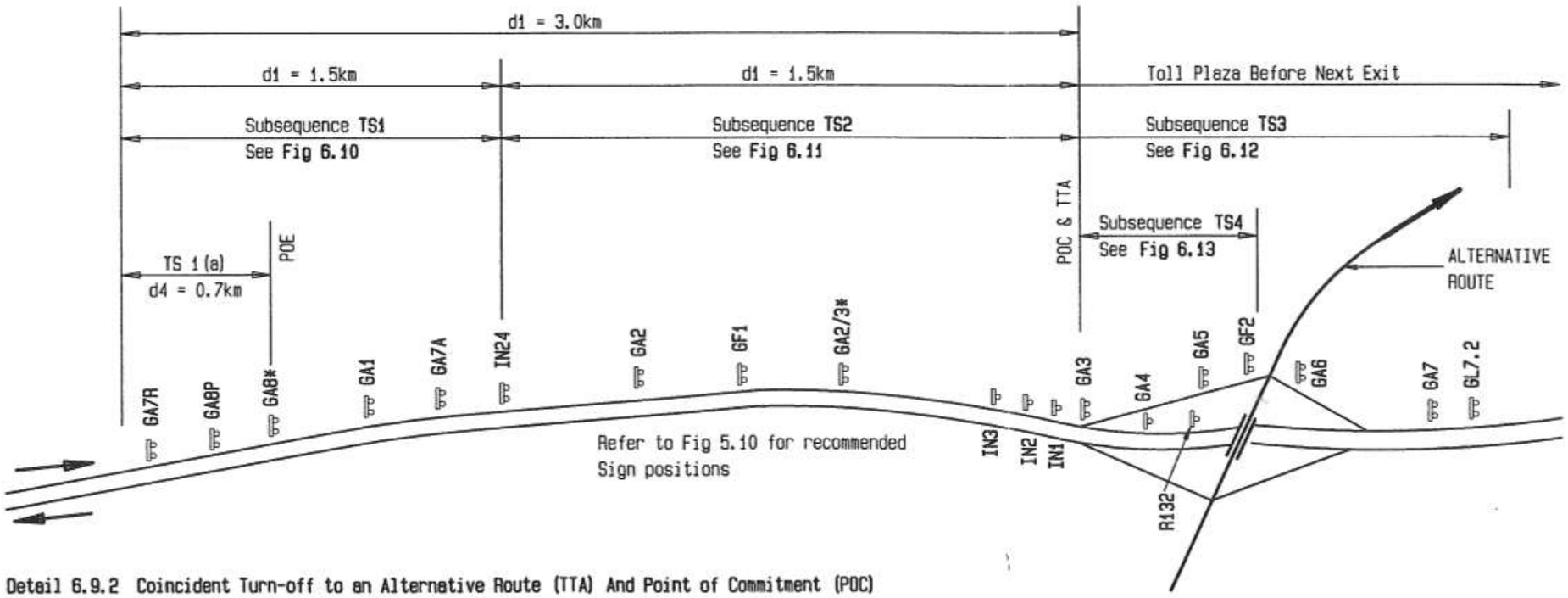


Detail 6.9.1 Separate Turn-off to an Alternative Route (TTA) And Point of Commitment (POC)

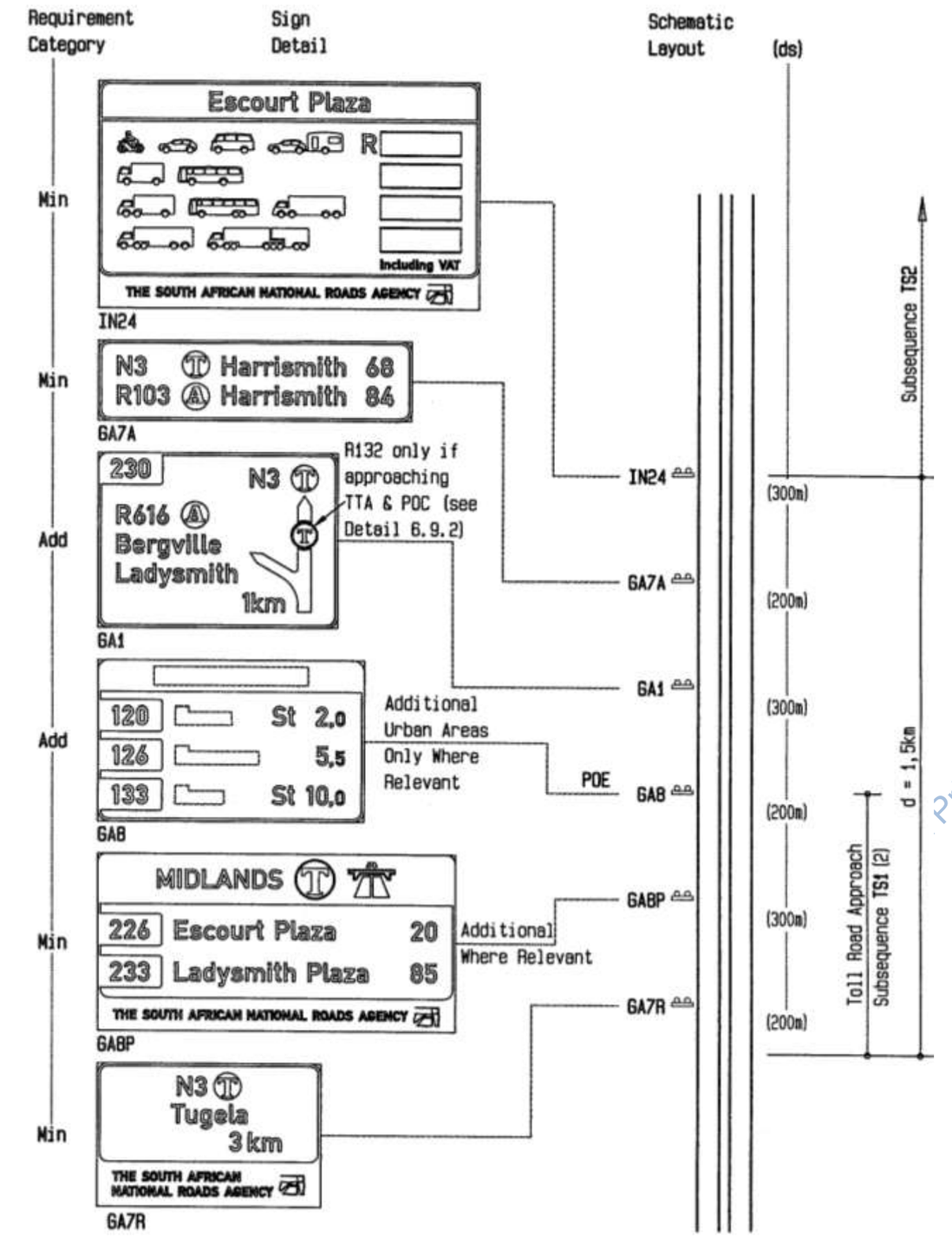


Detail 6.9.2 Coincident Turn-off to an Alternative Route (TTA) And Point of Commitment (POC)

Notes for Figure 6.9

(1) Use Sub-sequence TS4 only if an alternative route is to be indicated. Otherwise provide normal signing for the off-ramp excluding the GDS-10 symbol.

Fig 6.9
Key Plan for Sub-sequences for POE/TTA/POC Approaches



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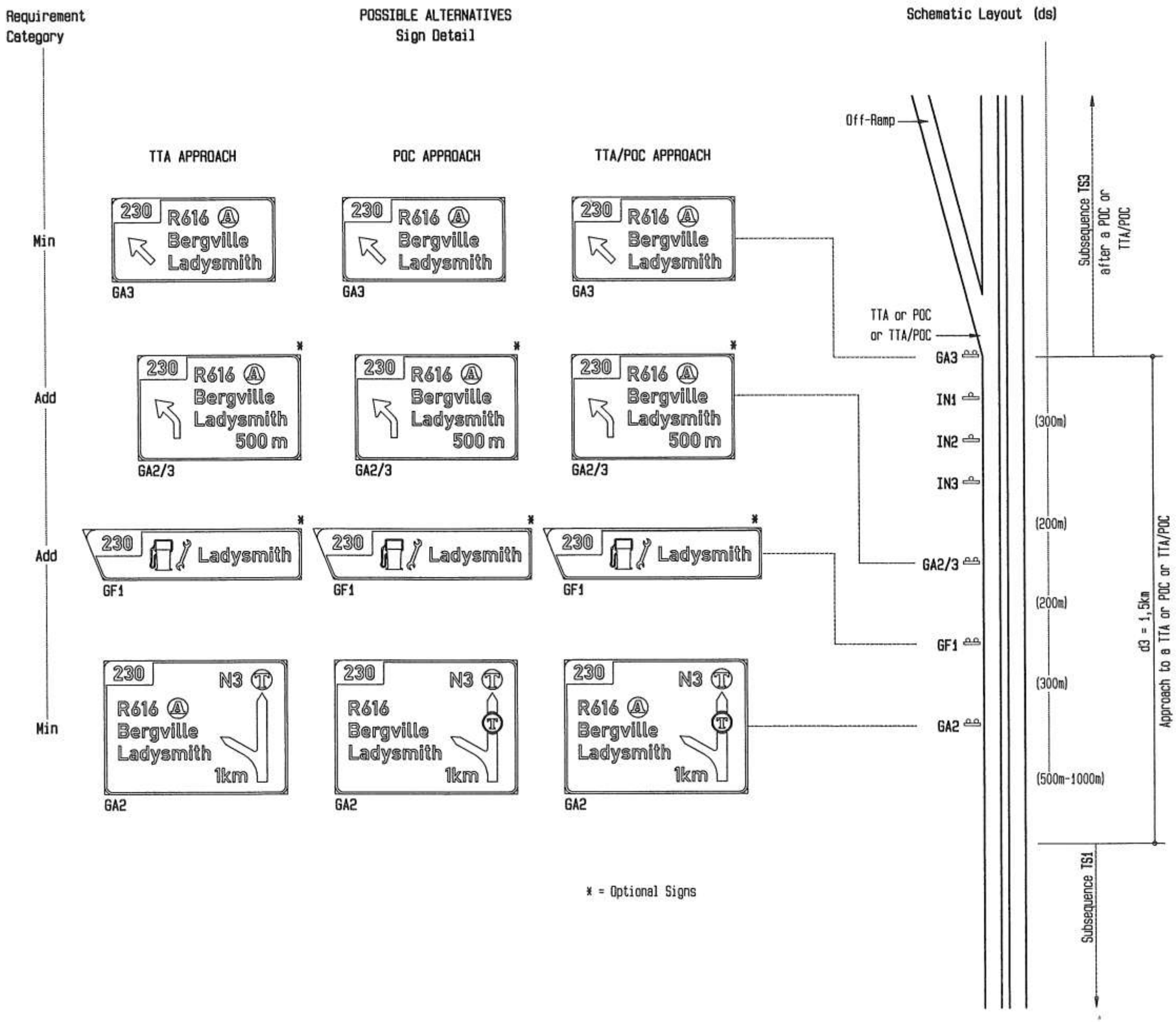
Notes for Figure 6.10

(1) ds = minimum distance between signs.
(2) Refer to Figure 6.9 for overall layout of signing.

Fig 6.10 Signing Sub-sequence TS1

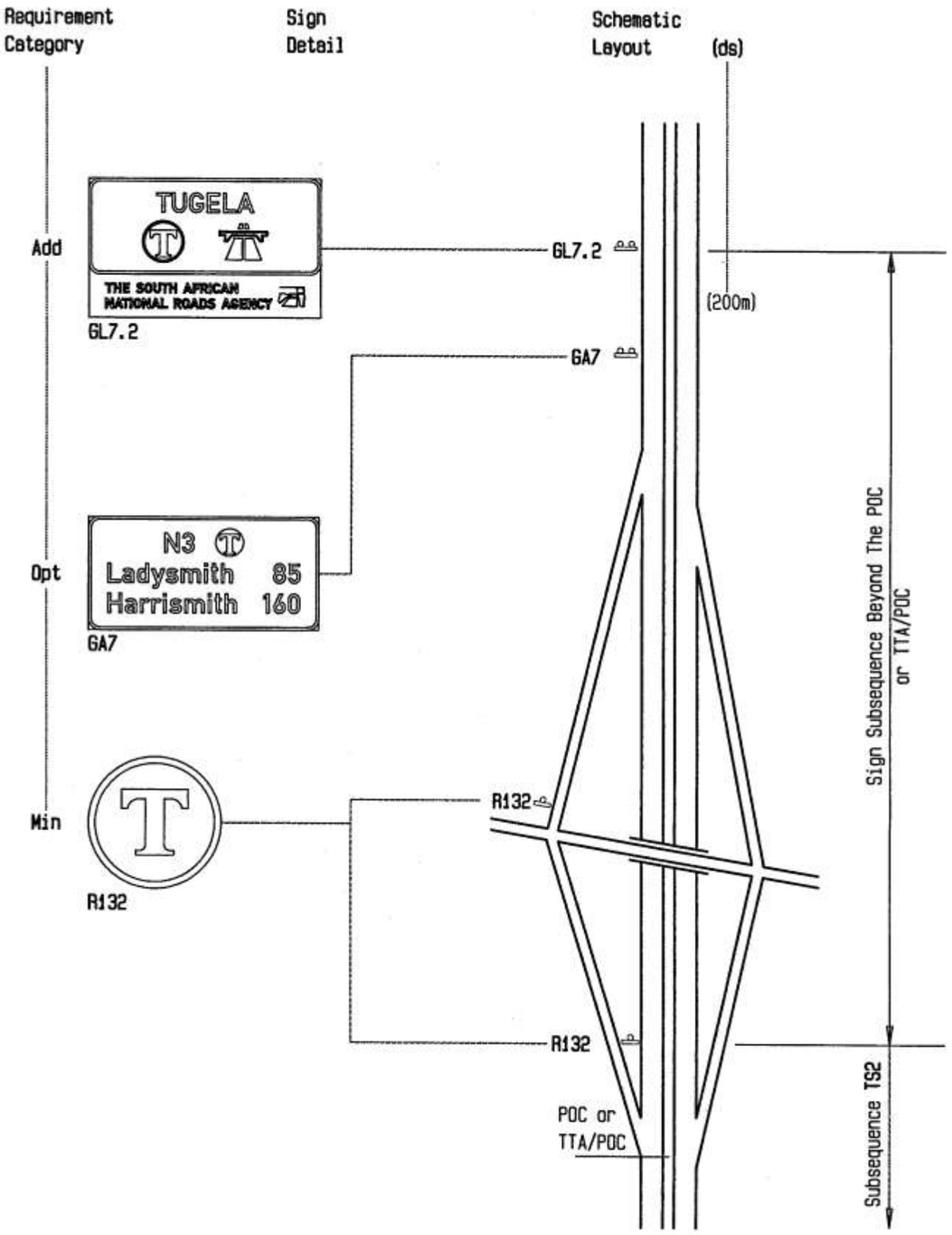


Notes for Figure 6.11

(1) Refer to Figure 6.9 for overall layout of signing.

(2) ds = minimum distance between signs.

Fig 6.11
Signing Sub-sequence TS2



Notes for Figure 6.12

(1) ds = minimum distance between signs.
(2) Refer to Figure 6.9 for overall layout of signing.

Fig 6.12 Signing Sub-sequence TS3

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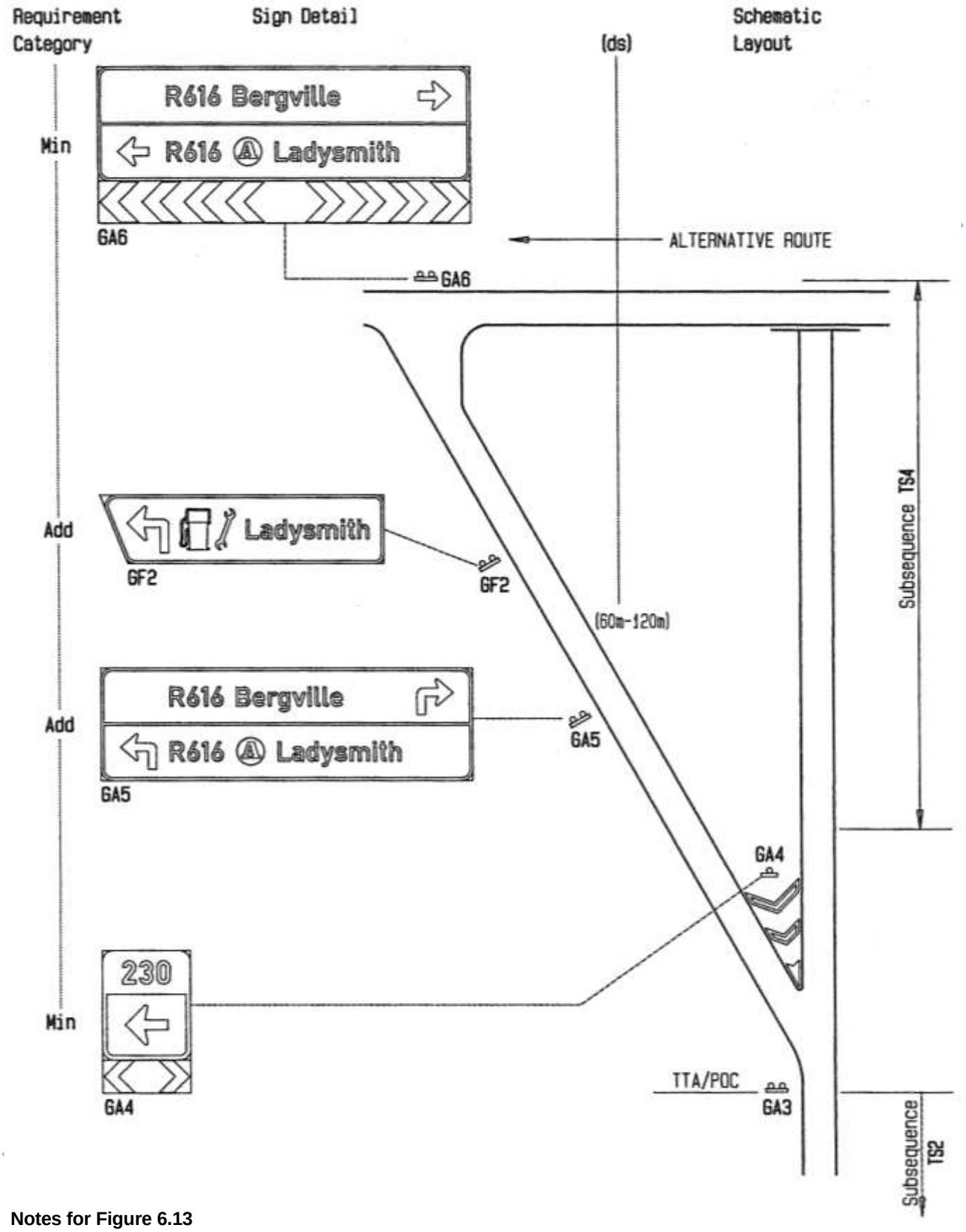

Notes for Figure 6.13

(1) Refer to Figure 6.9 for overall layout of signing.
(2) At a POC the signing to the alternative route is optional.

Fig 6.13 Signing Sub-sequence TS4

6.6.3 Mainline Plaza

1 The signing requirements for a mainline toll plaza for the situation where the point of commitment (POC) is far in advance of the plaza (greater or equal to 7 kilometres) and the next interchange is far beyond the plaza (equal to or more than 2 kilometres) are as indicated in Figure 6.14. The details indicated in this example are for ground-mounted signing.

2 The signing sub-sequences related to this toll plaza situation are as follows:

(a) Sub-sequence TS5: payment information signs;

(b) Sub-sequence TS6: signs on approach to plaza apron;

(c) Sub-sequence TS7: signing immediately beyond the mainline plaza.

3 For an indication of the general signing requirements within the plaza area itself, refer to Subsection 6.6.8.

4 Signing Sub-sequence TS5, which is the initial signing on an approach to a plaza, firstly advises of the pending approach to the plaza and then provides information related to payments, is shown in detail in Figure 6.15. In this example, over and above the basic signing, the means of including the possible additional signing for the emergency communication phones is shown.

5 Signing Sub-sequence TS6, which deals with the signing related to reducing traffic speed on the final approach to the toll plaza apron, is shown in Figure 6.16.

6 Signing Sub-sequence TS7, which deals with the signing requirements immediately beyond a mainline toll plaza, is shown in Figure 6.17. This example is for a situation where the toll route continues for some distance with further toll(s) having to be paid. Where relevant in the urban situation, the numbers of the next off-ramps may be indicated by means of a GA8 sign. In combination with the GA8P sign this will give an indication of the distance of *gratis* travel which is possible by using the exits where no toll has to be paid. Sign GA8 should only be used in urban areas where the street name appears on exit signs and these exits are closely spaced.

7 If the toll route ends just beyond the plaza, Sub-sequence TS7 falls away but an END OF TOLL ROUTE sign GL7.3 should be erected in the position of the GL7.2 sign

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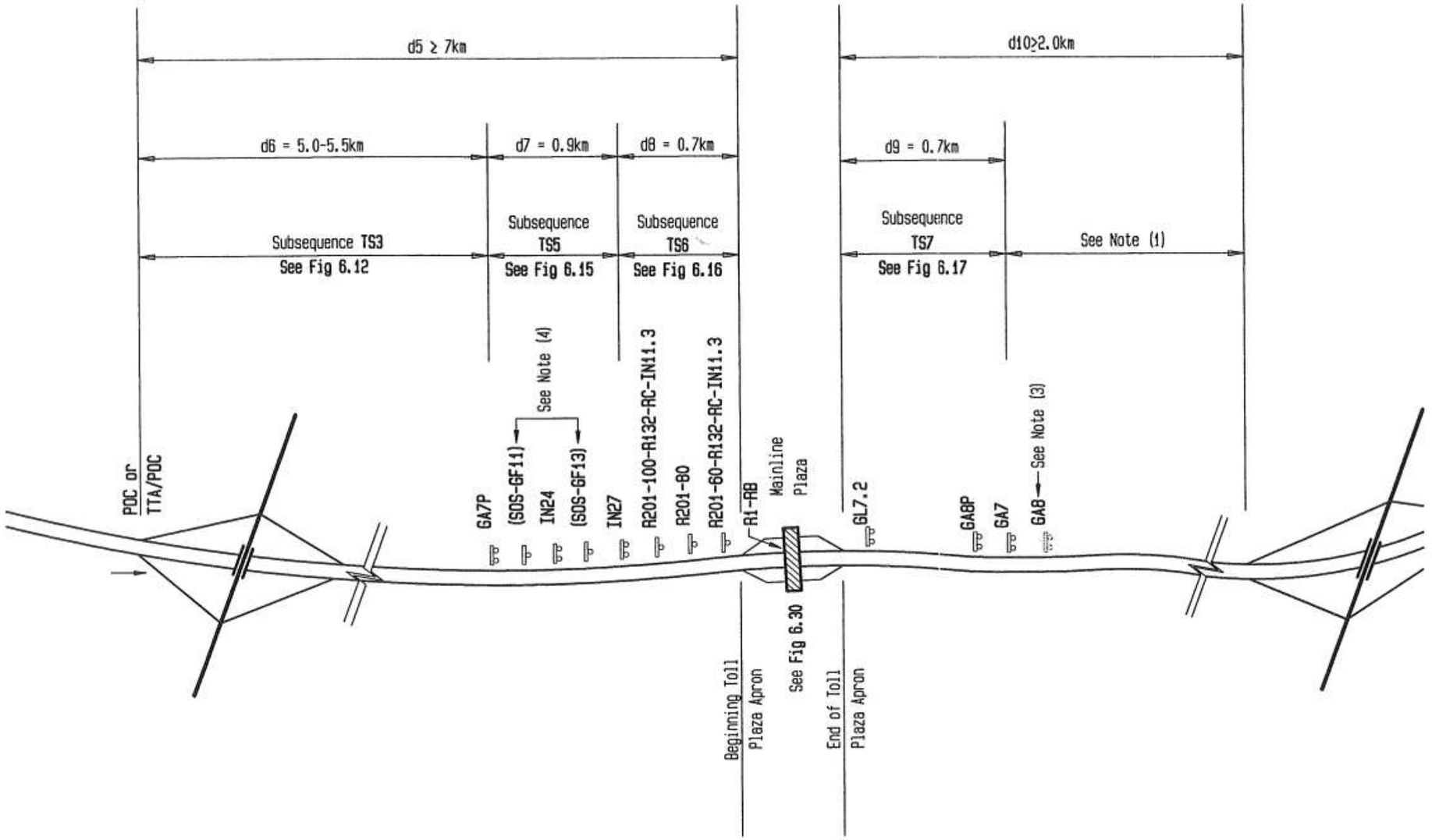

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Notes for Figure 6.14

(1) The signing sequence beyond Sub-sequence TS7, and on the approach to the next interchange, will depend on factors such as:

  (a) a toll plaza on the off-ramp (see Figure 6.23);

  (b) the toll route ends over this section;

  (c) the toll route continues beyond next interchange and no ramp plaza (see Figure 6.11, Figure 6.15 and Figure 6.16).

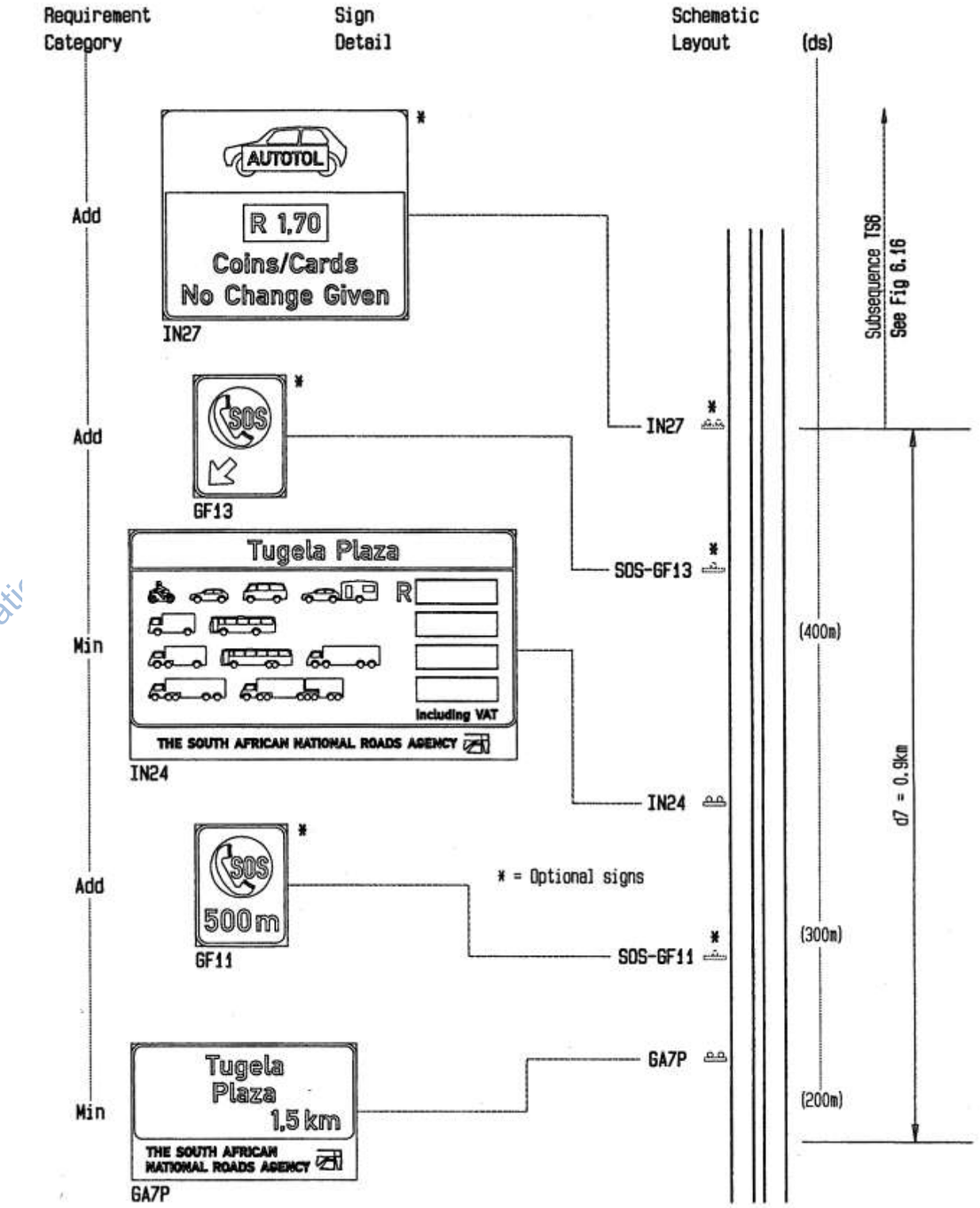
(2) For signing details at plaza see Figure 6.28.

(3) Use EXIT SEQUENCE sign GA8 only in urban areas where necessary.

(4) The SOS emergency telephone signing is indicated for example purposes only, to show how these signs, if required, may be incorporated into a signing sequence.

(5) ds = minimum distance between signs.

Fig 6.14
Key Plan for Signing Sub-sequences on Approach to a Mainline Toll Plaza



Notes for Figure 6.15

(1) ds = minimum distance between signs.
(2) Refer to Figure 6.14 for overall layout of signing.

Fig 6.15 Signing Sub-sequence TS5

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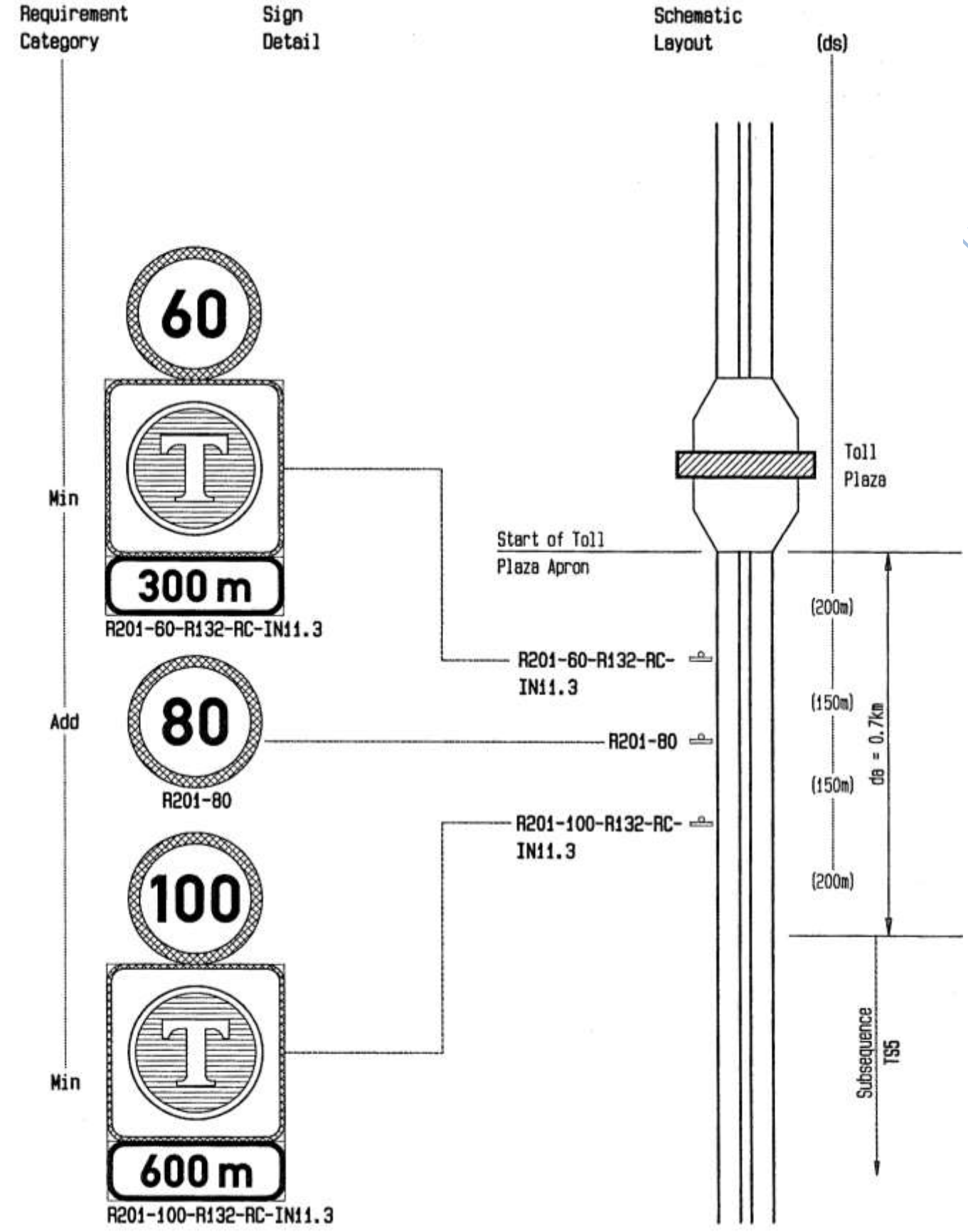
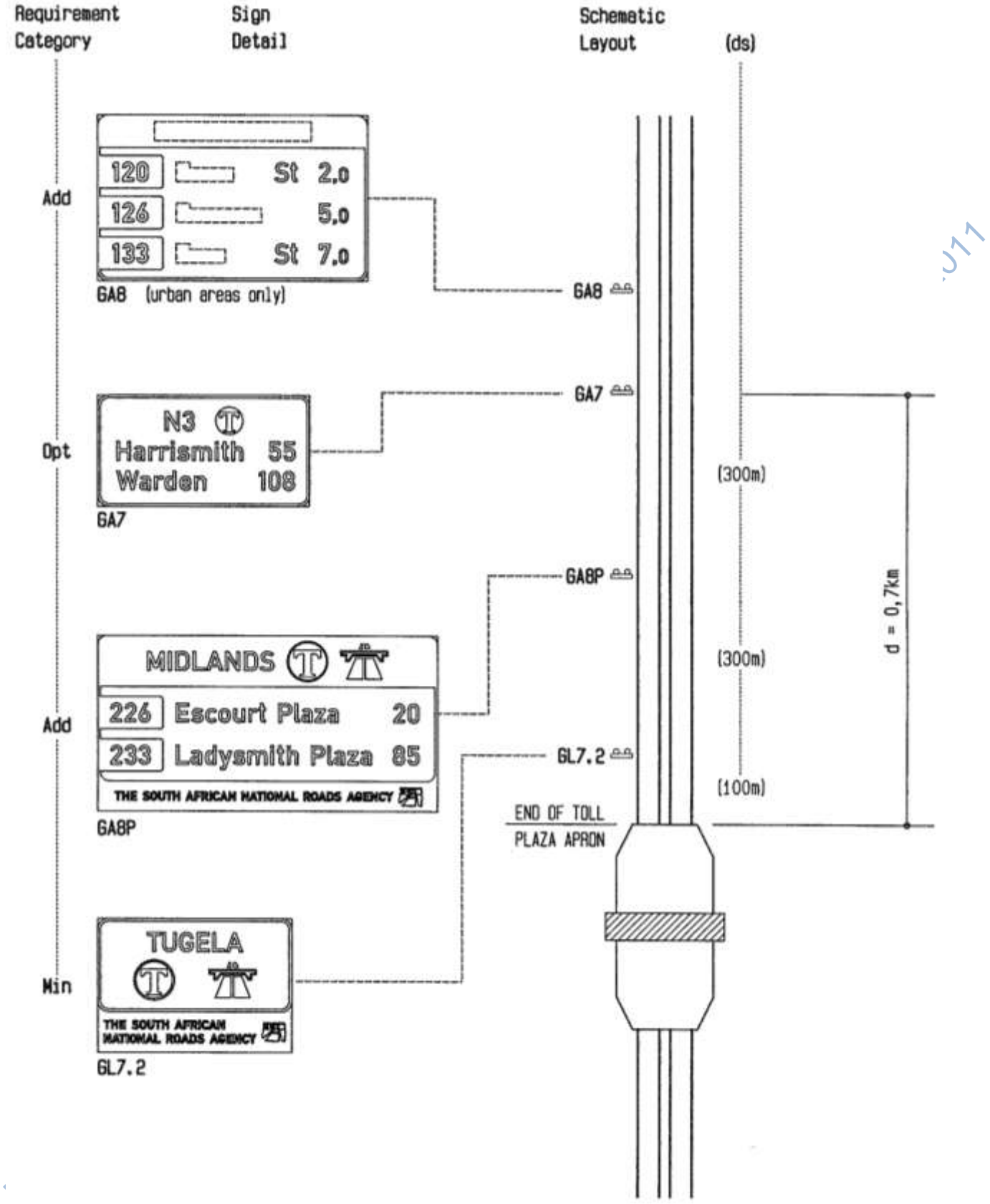


Notes for Figure 6.16

(1) ds = minimum distance between signs.
(2) Refer to Figure 6.14 for overall layout of signing.

Fig 6.16 Signing for Sub-sequence TS6



Notes for Figure 6.17

(1) ds = minimum distance between signs.
(2) Refer to Figure 6.14 for overall layout of signing.

Fig 6.17 Signing for Sub-sequence TS7

6.6.4 Mainline/Ramp Plazas In Advance of an Interchange

1 The signing requirements for combined mainline/ramp plazas immediately in advance of an interchange are as indicated in Figure 6.18. The details indicated in this example are for ground-mounted signing.

2 The signing sub-sequences related to this toll plaza situation are as follows:

(a) Sub-sequence TS5: payment information signs (refer to paragraph 6.6.3.4);

(b) Sub-sequence TS8: destination decisions and signs on the approach to the plaza apron.

3 For an indication of the general signing requirements within the plaza area itself, refer to Subsection 6.6.8.

4 Signing Sub-sequence TS8 which deals with signing related to choice of direction and the slowing down of vehicles on the final approach to the plaza is shown in detail in Figure 6.19. The following aspects should be noted:

(a) it is recommended that the normally ground-mounted EXIT DIRECTION sign GA3 at the start of the toll plaza apron, where ramp traffic and mainline traffic must split into their respective lanes on approach to the plaza itself, should be replaced by overhead sign GC4U; this should be in conjunction with a THROUGH DIRECTION sign GC6U indicating toll payment ahead as shown in Figure 6.19;

(b) SPEED LIMIT sign R201-60 and PAY TOLL sign R132 should be mounted on both the left and right-hand gantry columns when overhead direction signs are used (otherwise these signs need to be adequately separated from other ground-mounted signs such as GA3);

(c) if an EXIT DIRECTION sign is required beyond the plaza, at a ramp gore, it should ideally also be an overhead-mounted GC4U type of sign.

5 Only the mainline tariffs will normally be displayed on the approach to such a combination toll plaza. Ramp tariffs will only be displayed at the toll booth although they may occasionally be warranted on additional TOLL TARIFF signs IN24 positioned on the off-ramp when road or plaza geometry permits.

6 Where possible, it is preferable to have the interchange off-ramp before the mainline plaza and have a separate toll plaza on the ramp. For such an example refer to Subsection 6.6.6 for details of the signing requirements on the approach to such a ramp toll plaza.

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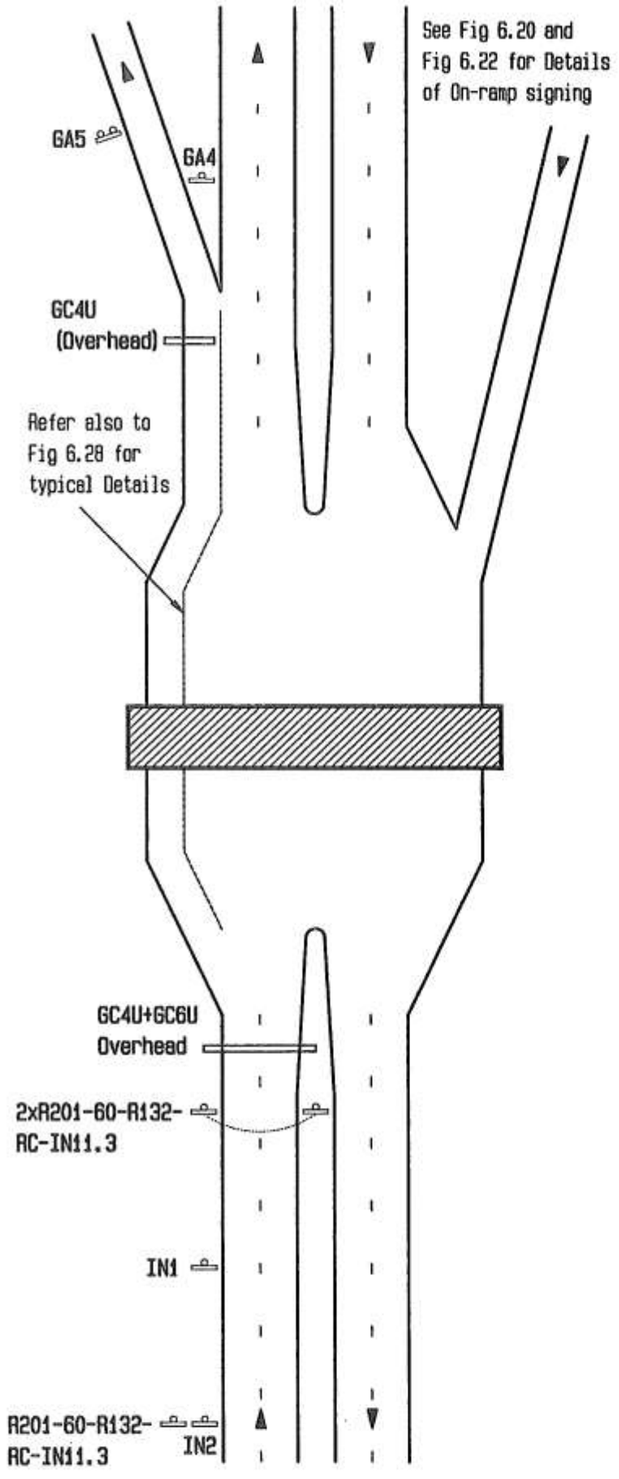
Notes for Figure 6.18

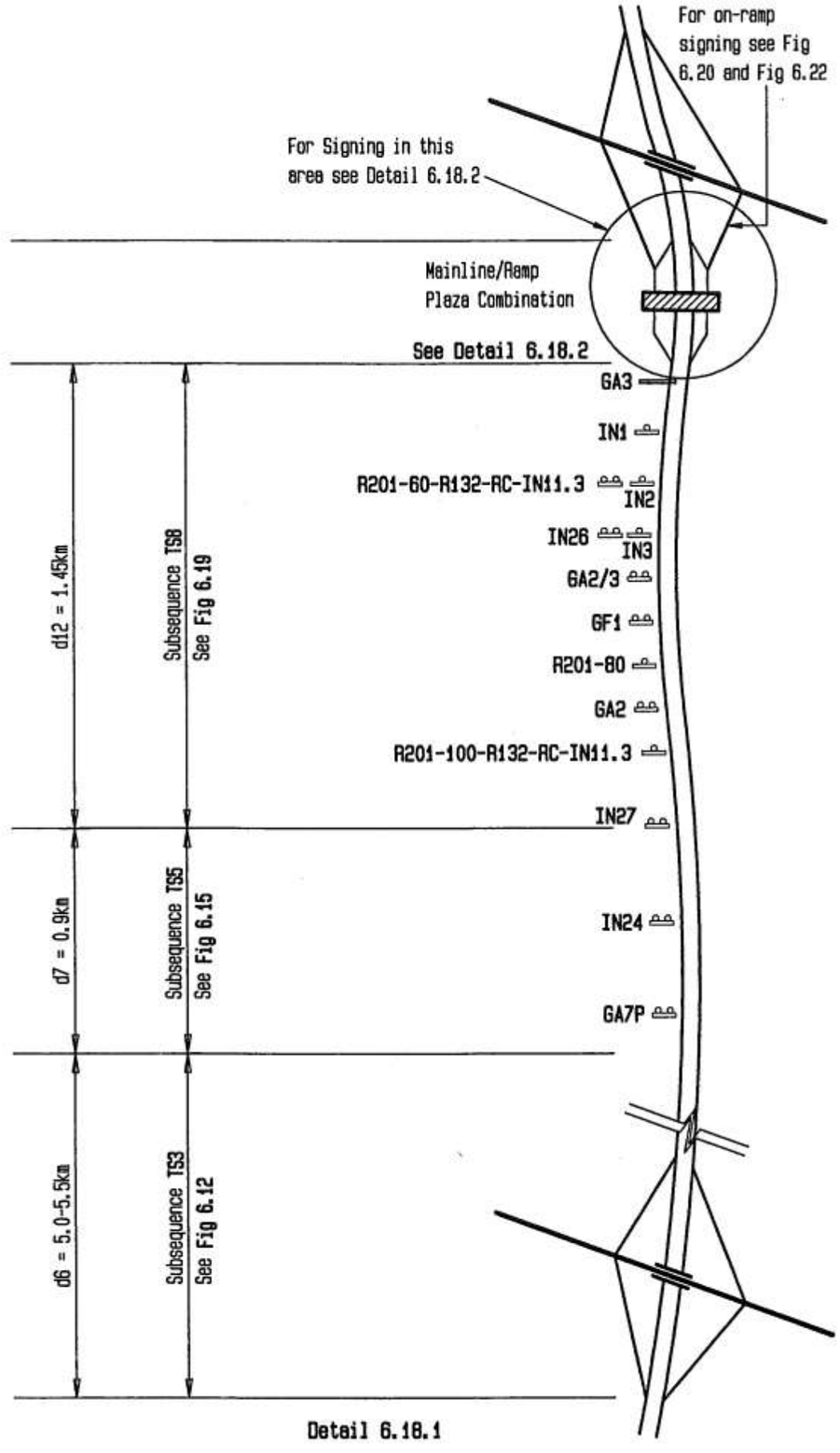
(1) The example indicates a situation of a combined off-ramp and mainline toll plaza where traffic must be separated at the start of the plaza apron.

(2) Refer to Figure 6.23 for signing when ramp plaza is separate from the mainline plaza. This situation where the ramp exit is ahead of the mainline plaza apron is preferable.

(3) Refer to Figure 6.28 for the general layout details of a mainline/ramp plaza and related signing.

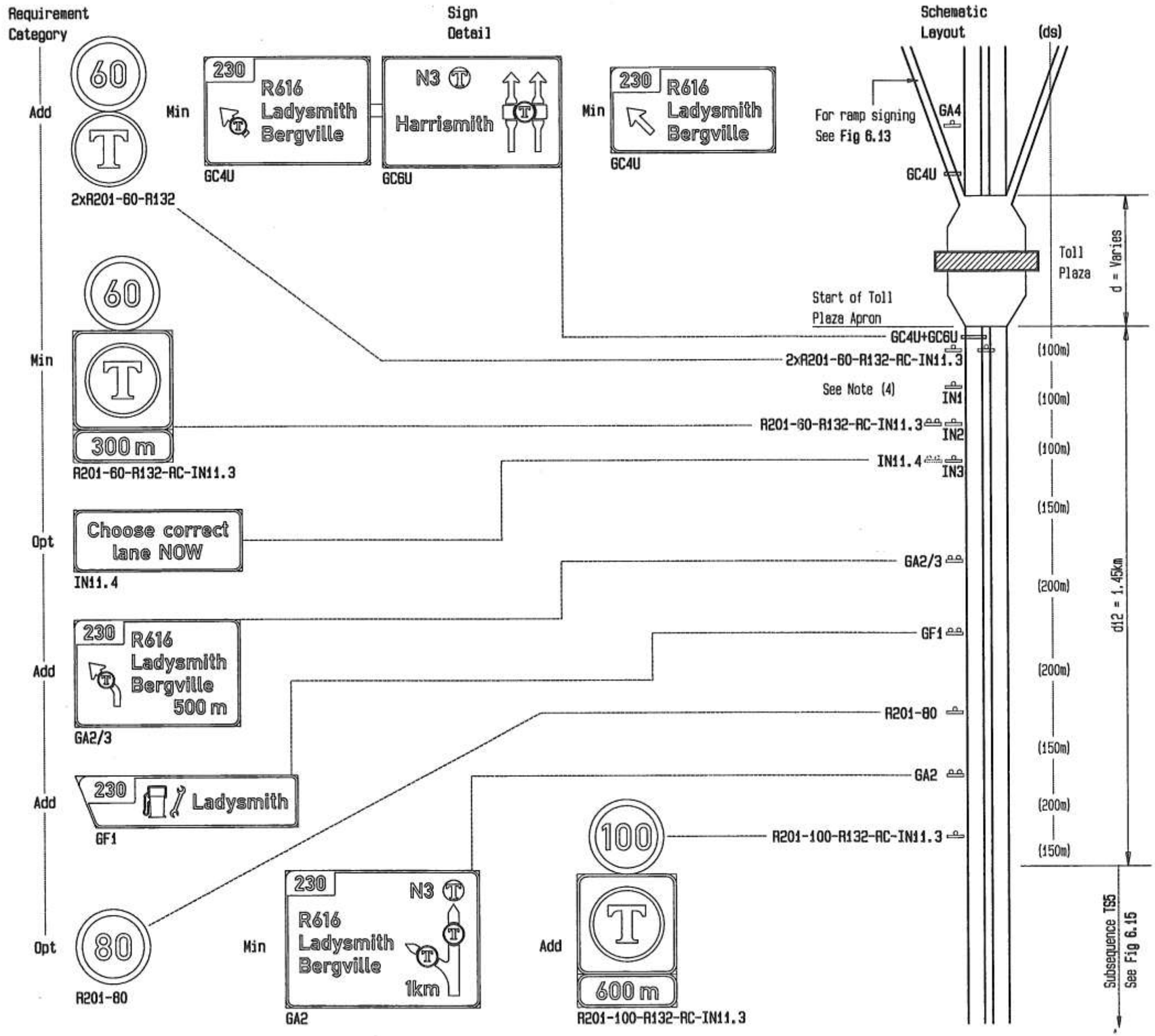


Detail 6.18.2



Detail 6.18.1

Fig 6.18
Signing Sub-sequences at a Main Line/Ramp Toll Plaza Combination (Preceeding an Interchange)



Notes for Figure 6.19

(1) This sub-sequence indicates the signing for a combined mainline and ramp plaza immediately in advance of an interchange where traffic must be separated at the start of the plaza apron.

(2) Refer to Figure 6.28 for general layout details of a mainline/ramp plaza and related signing.

(3) ds = minimum distance between signs.

(4) The GA3 EXIT DIRECTION sign on the apron approach should preferably be replaced by a GC4U EXIT DIRECTION sign mounted overhead in conjunction with a GC6U THROUGH DIRECTION sign. SPEED LIMIT sign R201-60 and PAY TOLL sign R132 should be mounted on both the left and right gantry columns of signs GC4U/GC6U.

Fig 6.18
Signing Sub-sequence

6.6.5 Mainline/Ramp Plazas on Far Side of an Interchange

1 The signing requirements for combined mainline/ramp plazas on the immediate far side of an interchange, with a POC immediately before the plazas are as indicated in Figure 6.20. The details indicated in this example are for ground-mounted signing.

2 The signing Sub-sequences related to this toll plaza situation are as follows:

(a) Sub-sequence TS1: alternative route decision and payment information signs on the approach to a POC; note that the signs relating to the approach to the toll route POE would be excluded, that is Sub-sequence TS1(a) (see Subsection 6.6.2 and Detail 6.9.1 - Figure 6.9);

(b) Sub-sequence TS2: destination decision signs on the approach to a POC (see Section 6.6.2 and Figure 6.11);

(c) Sub-sequence TS9: signs on approach to plaza apron;

(d) Sub-sequence TS10: signs on ramp on approach to plaza apron.

3 For an indication of the general signing requirements within the plaza area itself, refer to Subsection 6.6.8.

4 Signing Sub-sequence TS9, which deals with the signing on the approach to the plaza beyond the interchange off-ramp, and which relates to advice as to the proximity of the plaza and the slowing down of vehicles, is shown in Figure 6.21.

5 Signing Sub-sequence TS10, which deals with the signing on the on-ramp leading to the toll plaza, is shown in Figure 6.22. The spacing of this signing will be dependent on the length of the ramp. Refer also to Subsection 6.6.8 for details of signing on the approach to a toll plaza on an on-ramp.

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Notes for Figure 6.20

(1) Refer to Figure 6.28 for the general layout details of a mainline/ramp plaza and related signing.

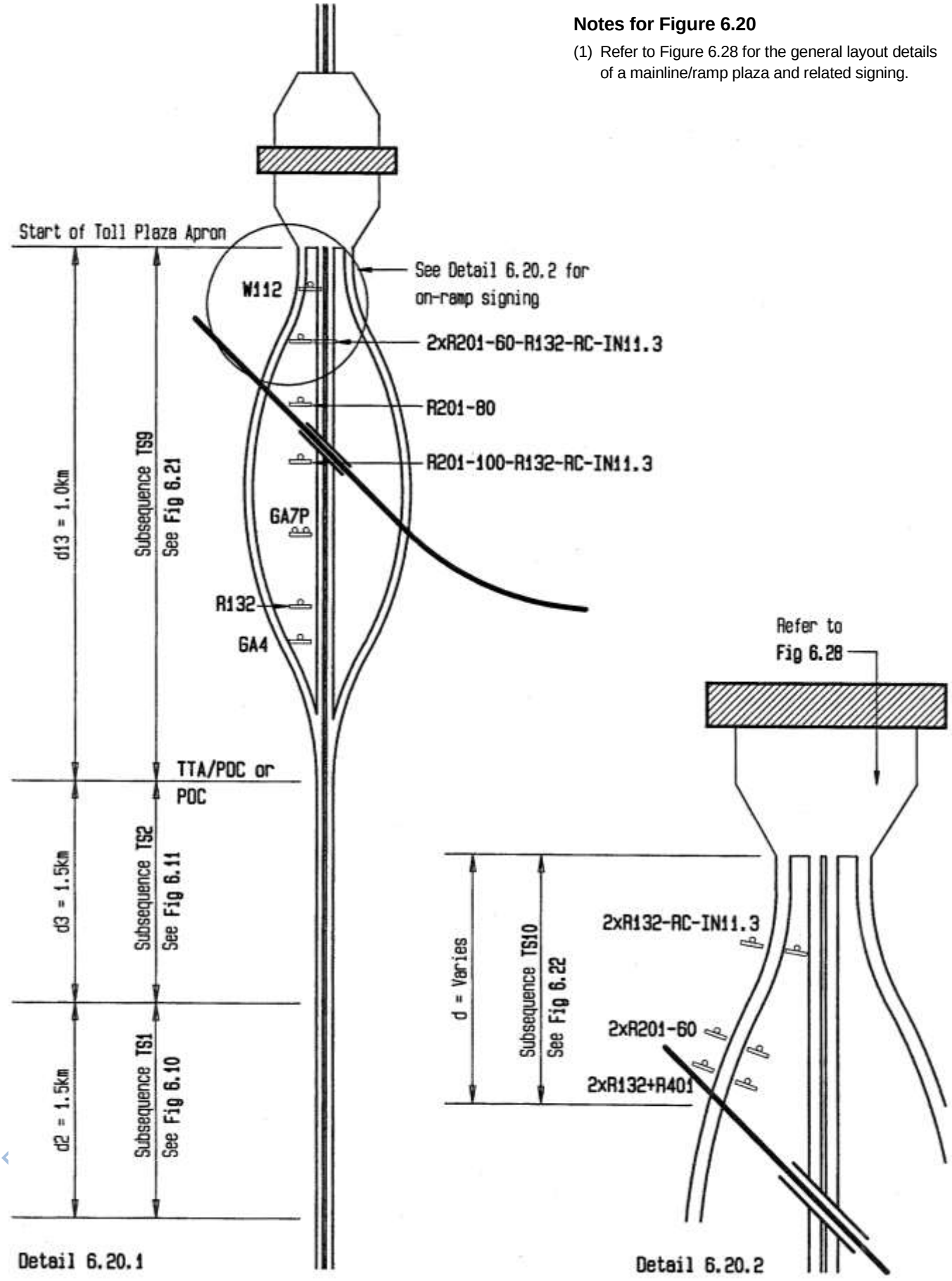
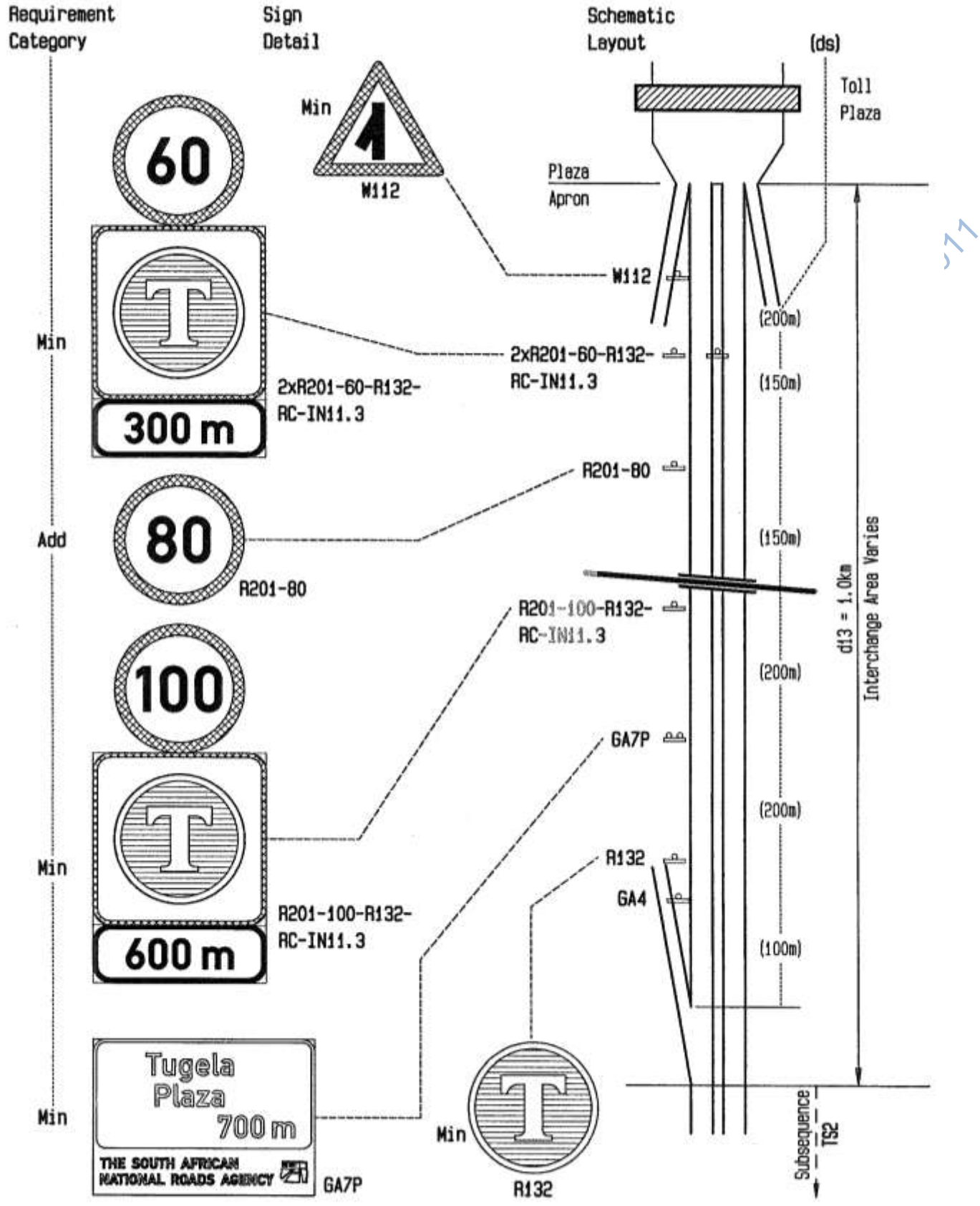


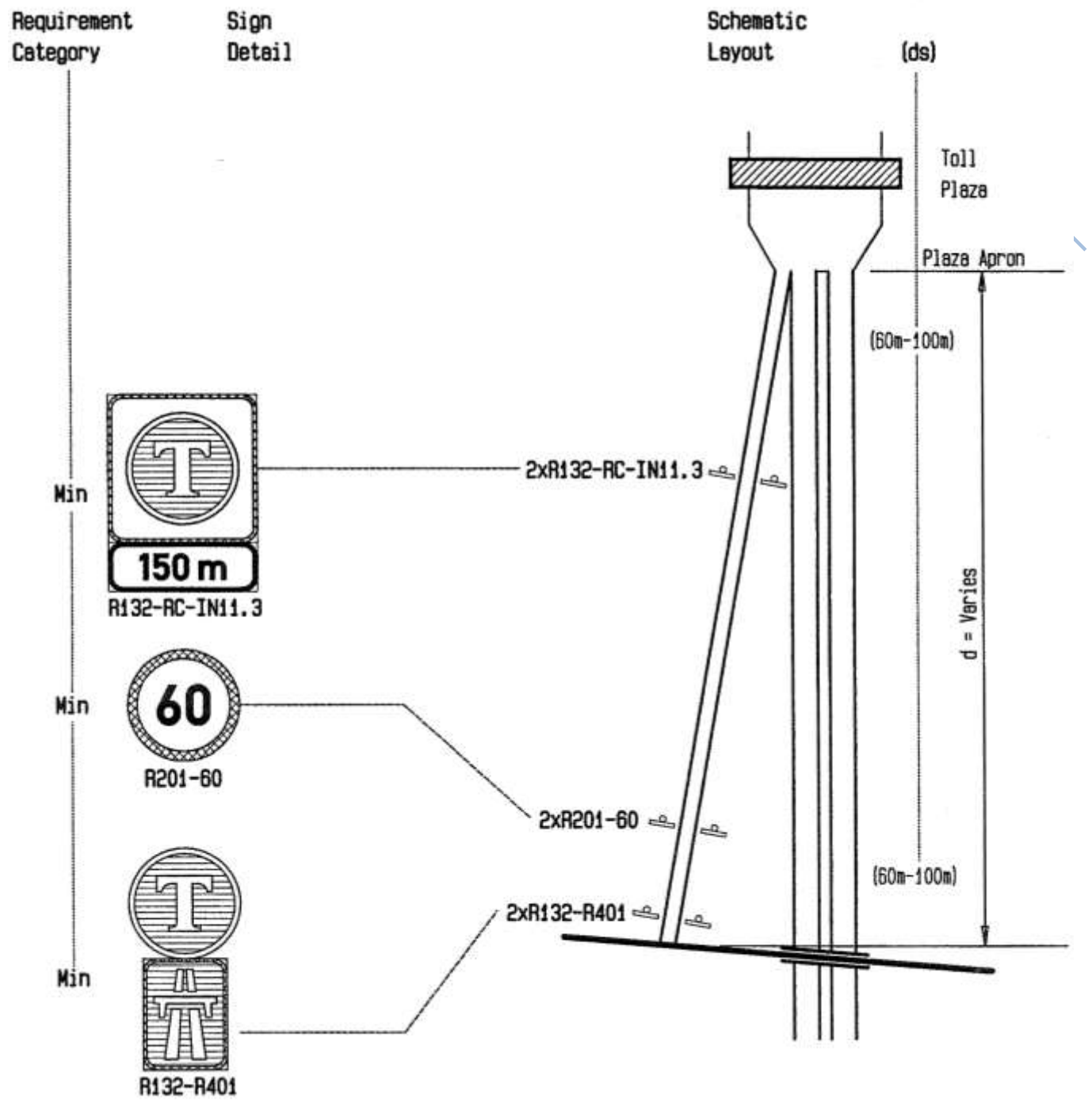
Fig 6.20 Key Plan forSigning for Sub-sequence at a Mainline/Ramp Toll Plaza Combination (Plaza Beyond Interchange)



Notes for Figure 6.21

(1) ds = minimum distance between signs.
(2) Refer to Figure 6.20 for overall layout of signing.

Fig 6.21 Signing for Sub-sequence TS9



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Notes for Figure 6.22

(1) ds = minimum distance between signs.
(2) Refer to Figure 6.20 for overall layout of signing.

Fig 6.22 Signing for Sub-sequence TS10

6.6.6 Ramp Plaza

1 The signing requirements for a ramp plaza on an interchange off-ramp are as indicated in Figure 6.23. The details indicated in this example are for ground-mounted signing.

2 The signing sub-sequences related to this toll plaza situation are as follows:

(a) Sub-sequence TS11: payment information and direction decision signs on approach to the off-ramp;

(b) Sub-sequence TS12: signs on the ramp for the approach to the ramp plaza apron.

3 For an indication of the general signing requirements within the plaza area itself, refer to Subsection 6.6.8.

4 Signing Sub-sequence TS11, which deals with payment information and destination decisions on the approach to the off-ramp on which the toll plaza is located, is shown in Figure 6.24. The following should be noted:

(a) the detail on the direction signing will be dependent on whether there are further mainline toll plazas, or whether the toll route ends at this point; the example shown in Figure 6.24 indicates a continuation of the toll route and a toll plaza ahead (see ADVANCE EXIT DIRECTION sign GA2);

(b) the possible position in the sequence for the ramp plaza TOLL TARIFF sign IN24 is shown, although this board may only be erected on the freeway as shown if there are no further mainline toll plazas ahead; in general the ramp toll tariffs will only be displayed at the toll booth.

5 Signing Sub-sequence TS12, which deals with the signing on the off-ramp itself, on the approach to the ramp toll plaza, and which relates to advise as to the proximity of the plaza and the slowing down of vehicles, is shown in Figure 6.25.

6 It must be ensured that there is sufficient distance beyond the toll plaza to allow for traffic weaving and stacking before the intersection with the crossing road. This distance should also allow for the adequate placing of the normal signs required on an off-ramp (see Sub-sequence TS4 and Figure 6.13). The ramp must, therefore, be sufficiently long to allow an adequate approach distance to the plaza and also allow sufficient operational space beyond

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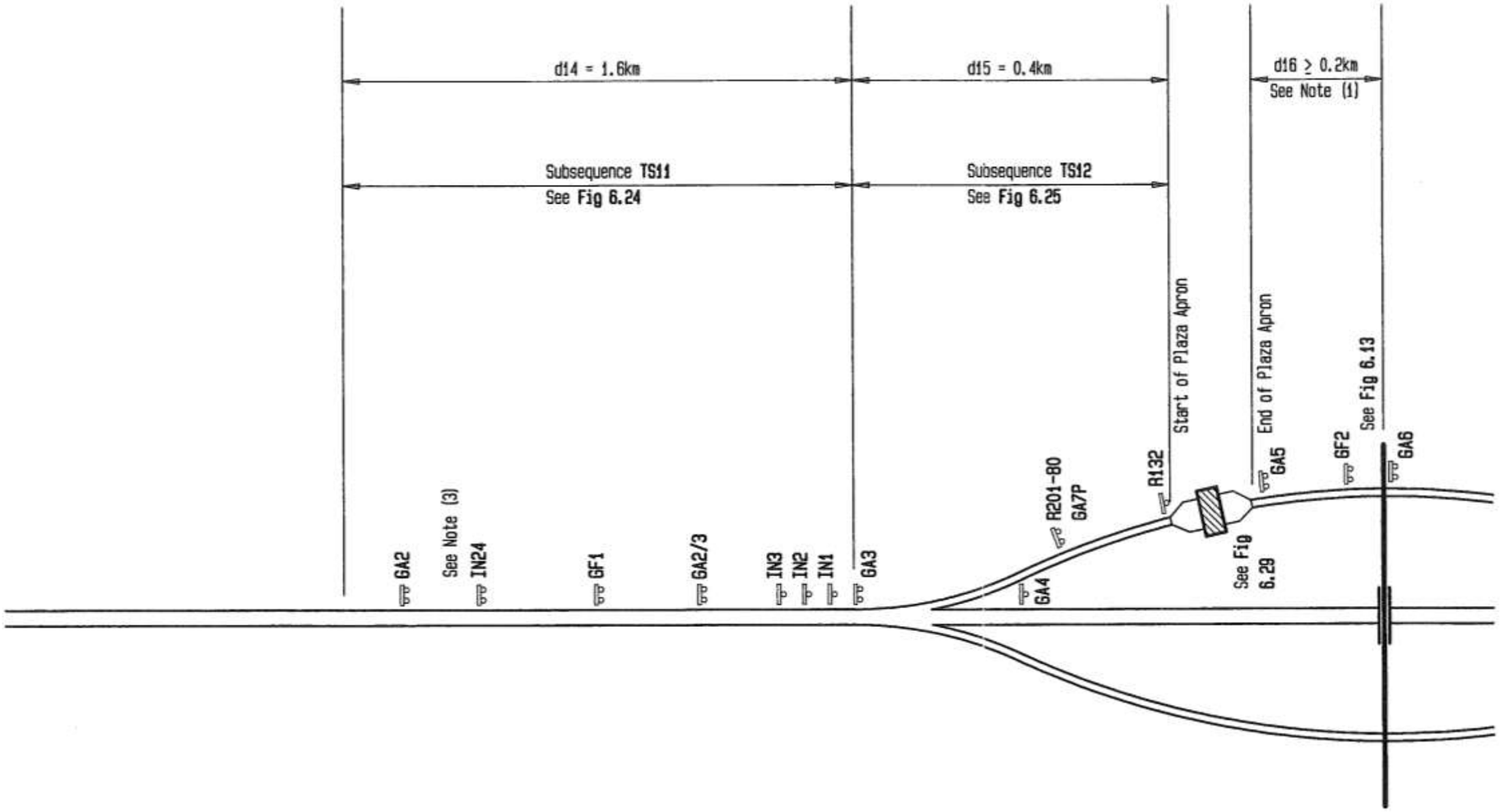

Notes for Figure 6.23

(1) The distance beyond the toll plaza must be sufficient for traffic weaving and stacking.

(2) The detail on the direction signs in Sub-sequences TS11 will depend on whether there are further mainline toll plazas or not.

(3) The toll tariff sign IN24 for the ramp toll plaza is only permitted on the main road in the position shown if there are no further mainline plazas ahead.

(4) Refer to Figure 6.29 for the general layout details at a ramp plaza and related signing.

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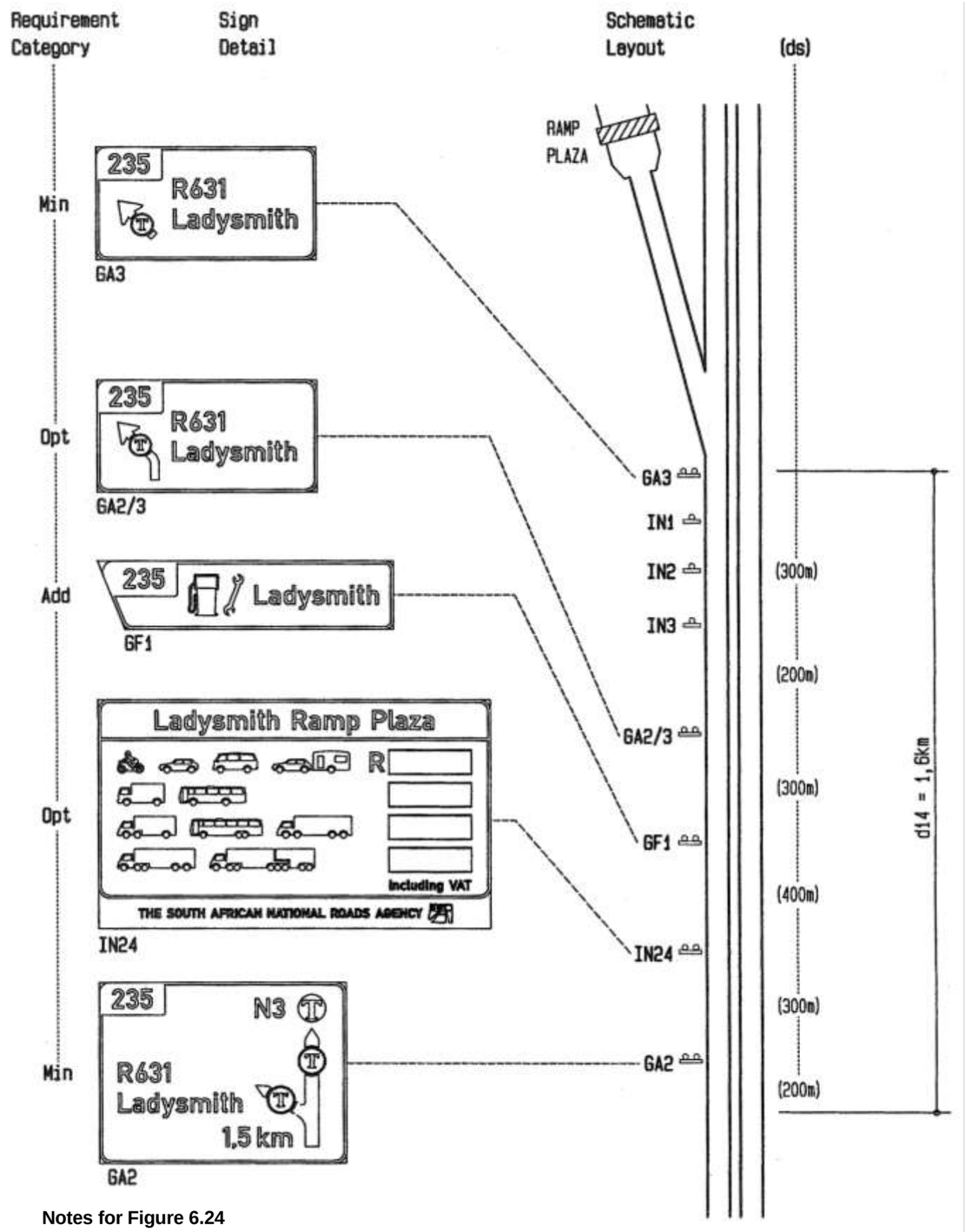
Fig 6.23
Signing Sub-sequence for a Ramp Toll Plaza (Off-ramp)



Notes for Figure 6.24

(1) ds = minimum distance between signs.

(2) Refer to Figure 6.23 for overall layout of signing.

(3) See Notes for Figure 6.23.

Fig 6.24 Signing for Sub-sequence TS11

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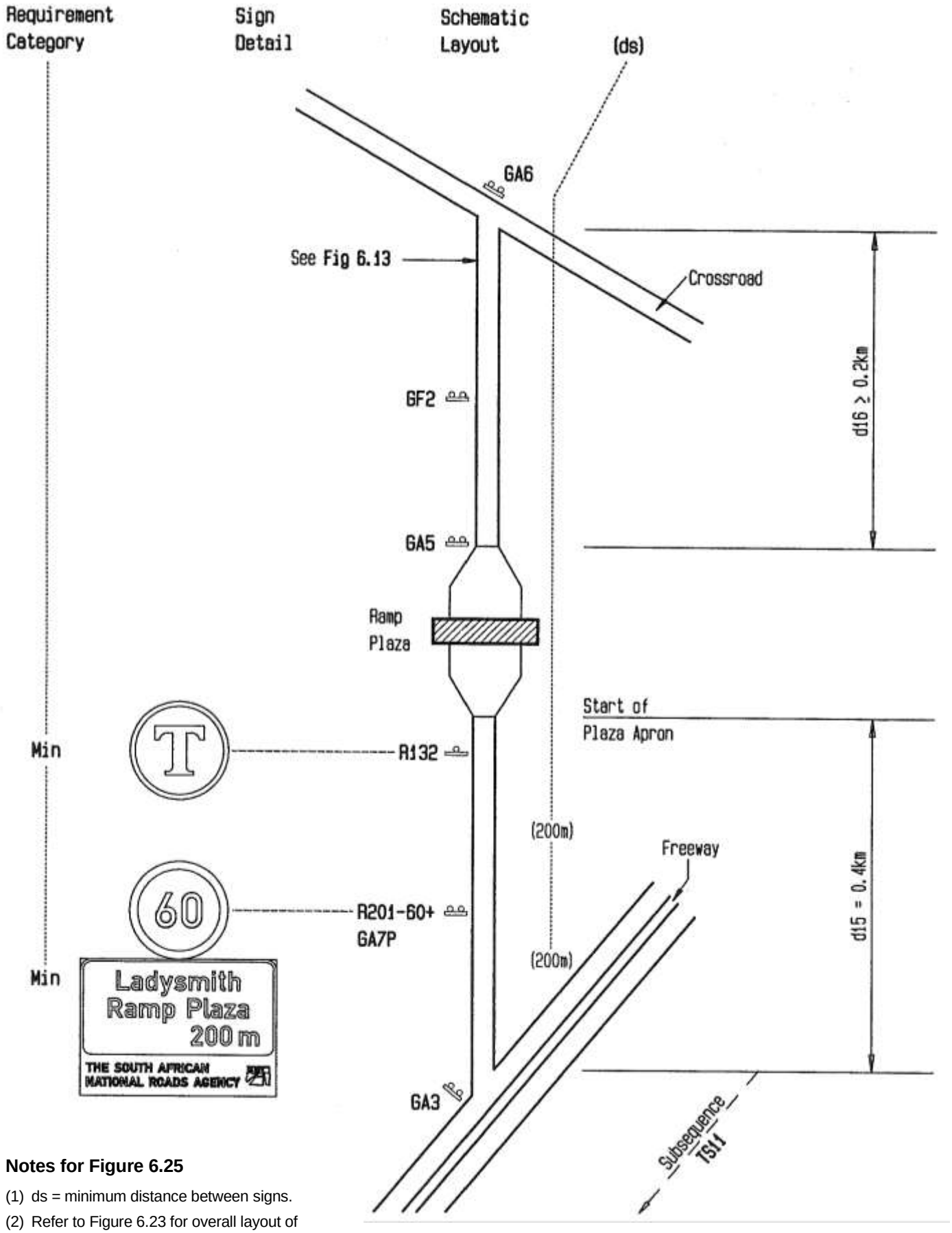

Notes for Figure 6.25

(1) ds = minimum distance between signs.

(2) Refer to Figure 6.23 for overall layout of signing.

Fig 6.25 Signing Sub-sequence TS12

6.6.7 Crossroad Signing

1 The signing requirements for an intersecting crossroad from which access may be gained to the toll route freeway are indicated in Figure 6.26. Detail 6.26.1 illustrates the situation at an access interchange well along the toll route where there are toll plazas in both directions. Detail 6.26.2 illustrates the situation at an access interchange at the start of the toll route, namely at a TTA/POC. The details indicated in this example are for ground-mounted signs.

2 The signing sub-sequence related to an intersecting crossroad approach to the on-ramps at an access interchange is Sub-sequence TS13. The two situations indicated in paragraph 6.6.7.1 above are variations of signing Sub-sequence TS13 and both these alternatives are shown in Figure 6.27.

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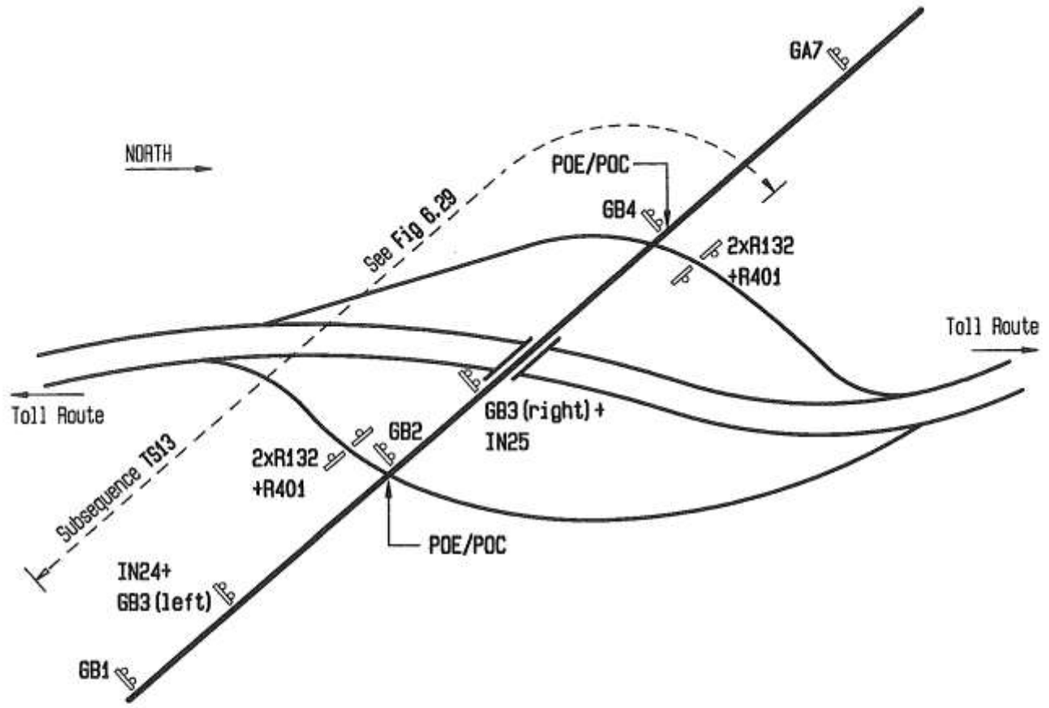
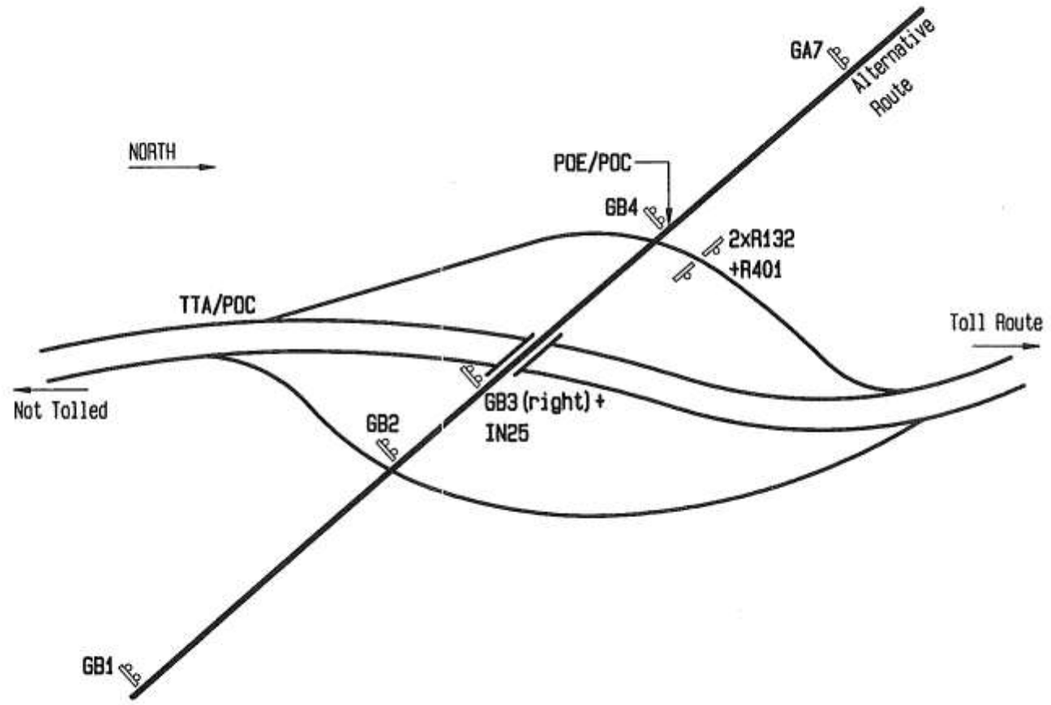


Detail 6.26.1 Crossroad Signing (shown for one approach only) for Access to a Freeway Toll Route which is Tolled in Both Directions



Detail 6.26.2 Crossroad Signing (shown for one approach only) for access to a freeway Toll Route which is Tolled in One Direction Only

Notes for Figure 6.26

(1) Detail 6.26.1 illustrates the situation at an interchange well along the toll route where drivers accessing the freeway in either direction will be required to pay toll.

(2) Detail 6.26.2 illustrates the situation at an interchange at the start of a toll route, namely at a TTA/POC.

(3) Signing Sub-sequence TS13 is only shown on one of the crossroad approaches to the interchange for clarity sake. Both approaches must be signed in a similar manner.

Fig 6.26
Key Plan for Signing Sub-sequences for a Crossroad to a Toll Route Access

Notes for Figure 6.27

(1) Signing as for Detail 6.26.1 illustrates the situation at an interchange well along the toll route with toll plazas in both directions:

(a) the TOLL TARIFF sign IN24 is a full size sign and is mounted below a left turn version of sign GB3 which associates the left turn familiar destination with the toll to be paid; the sign relates to the first (nearside) on-ramp and indicates the toll to be paid at the first toll plaza when travelling towards "Durban"; if there are space restrictions this sign may be displayed with sign GB2;

(b) the TOLL TARIFF sign IN25 is a reduced size sign designed to fit into the limited space normally occupied by sign GB3 and relates to the second (far-side) on-ramp and indicates the toll to be paid at the first toll plaza when travelling towards "Ladysmith".

(2) Signing as for Detail 6.26.2 illustrates the situation at an interchange at the start of a toll route (TTA/POC) where TOLL TARIFF sign IN25 is the only tariff sign on the approach.

(3) ds = minimum distance between signs.

(4) The figure indicates the signing on only one approach to the interchange along the crossroad. The appropriate signing is to be displayed on both approaches.

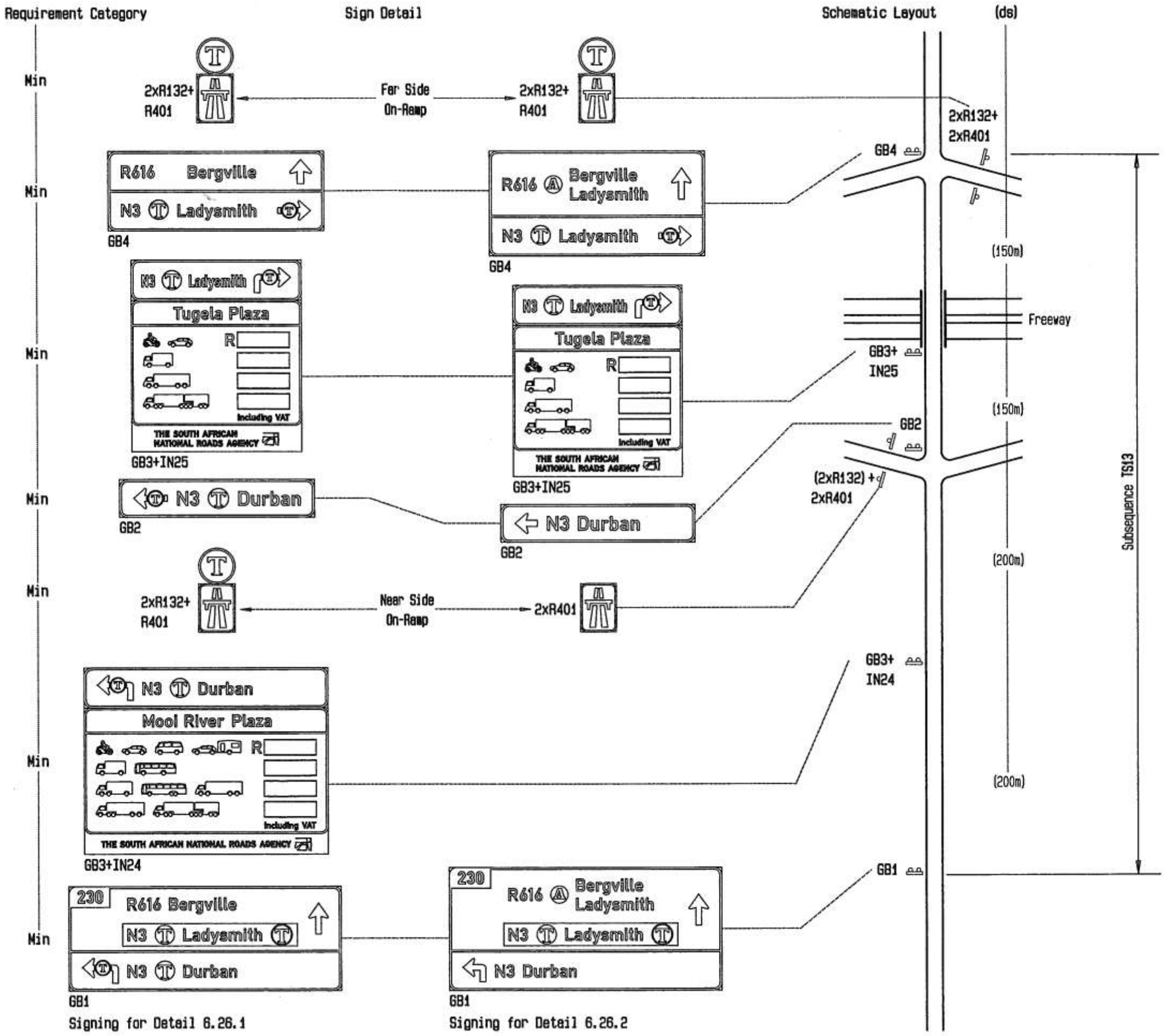


Fig 6.27
Signing Sub-sequence TS13

6.6.8 Signing Within Toll Plaza Area

1 Examples of typical layouts and related general signing for mainline/ramp combination plazas and for a ramp toll plaza are given in Figure 6.28 and Figure 6.29 respectively. For the situation where there is only a mainline plaza the essential details of Figure 6.28 should be used.

2 The following mainline/ramp plaza related signing sequences should also be referred to:

(a) Sub-sequence TS8 - approach to plaza and far side of plaza (ramp related);

(b) Sub-sequence TS9 - approach to plaza.

3 Refer also to the following ramp toll plaza related signing sub-sequences:

(a) Sub-sequence TS4 - general signing on off-ramp;

(b) Sub-sequence TS10 - signing on on-ramp;

(c) Sub-sequence TS12 - signing on off-ramp approach to plaza;

(d) Sub-sequence TS13 - signing on crossroad.

6.6.9 Overhead Signing

1 In urban areas and specifically on multi-lane urban freeways, overhead signing is generally used, particularly for direction signing.

2 For direction signing the upward pointing arrow system is preferred but the appropriate incorporation of the TOLL ROUTE symbol GDS-9 and ALTERNATIVE ROUTE symbol GDS-10 into both the upward arrow and downward arrow systems will allow for a clear indication of the toll routing and alternative routing options.

3 Where relevant, the other major toll related signs and signing sequences dealt with in this chapter may be appropriately mounted overhead.

4 Figure 6.30 illustrates a complex urban toll route/plaza environment. The plaza and apron area are represented in Figures 6.28 and 6.29. Almost fifty signs on the mainline approaches and on the high capacity intersecting crossroad are also illustrated in Figures 6.31 to 6.33. It should be noted that no two situations as complex as this will be anywhere near the same in detail. The example is included to show that complex situations can be catered for and to allow practitioners to work through the example sign by sign.

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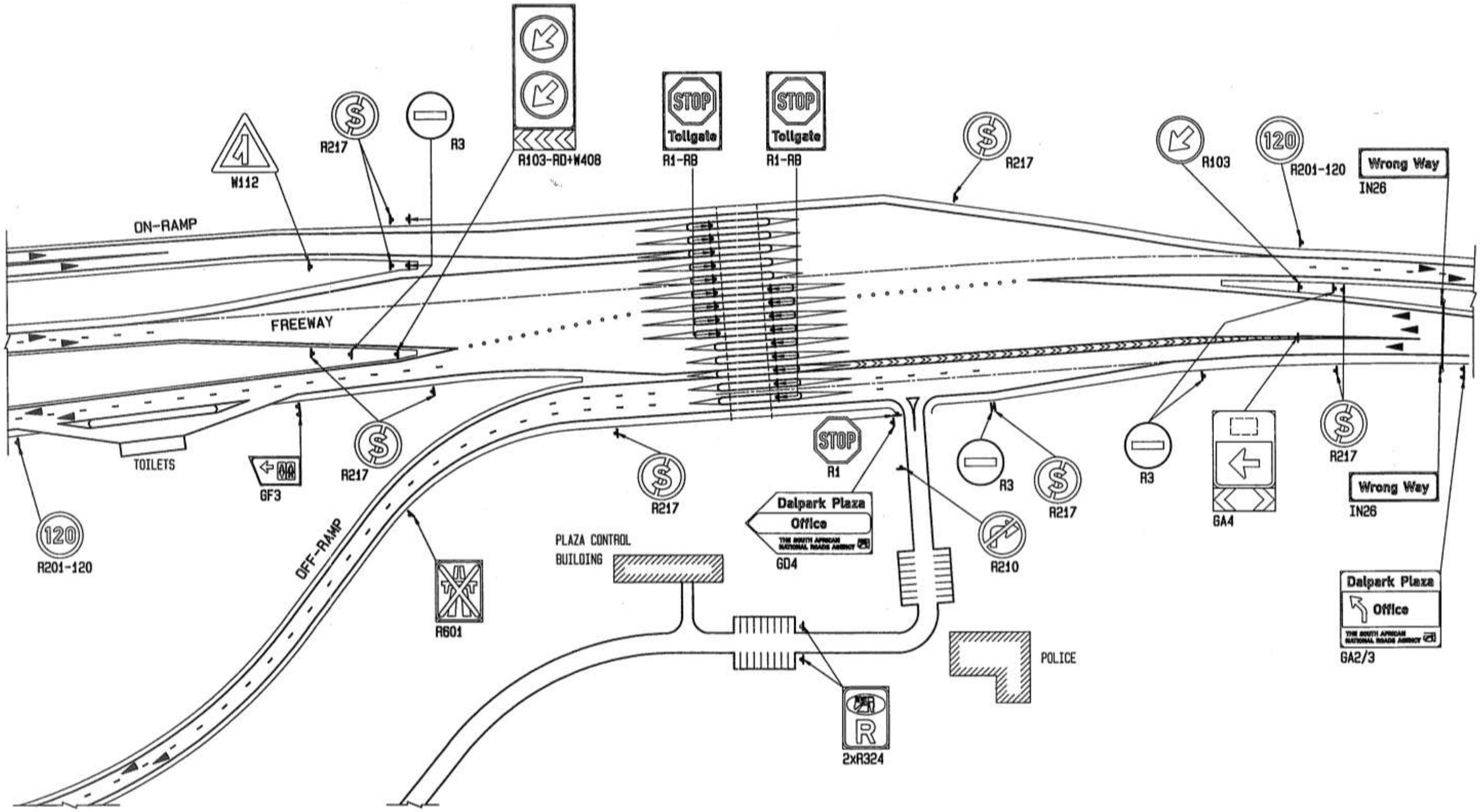


Fig 6.28
Typical Layout and Signing at
Mainline/Ramp Combination Plazas

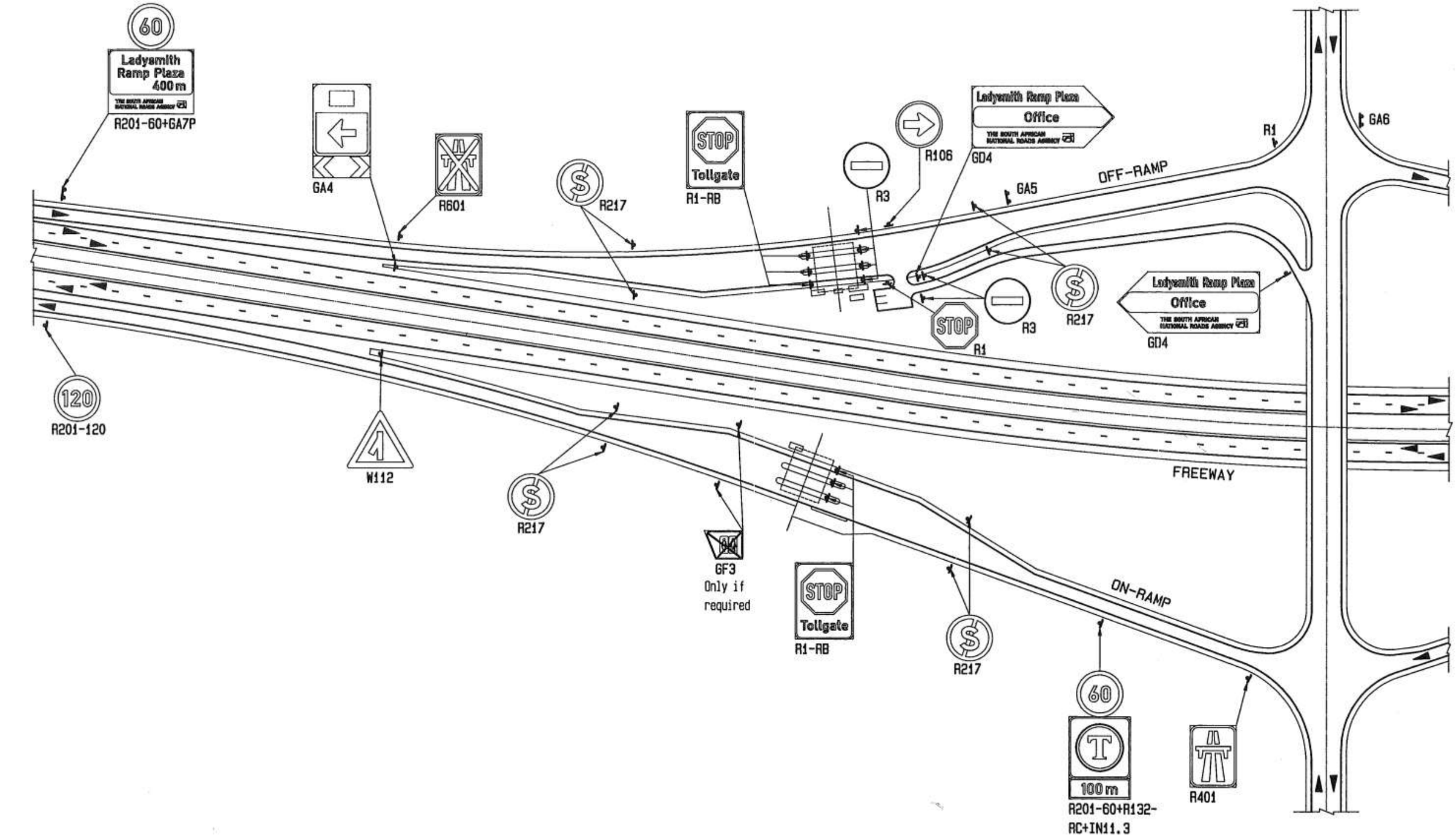
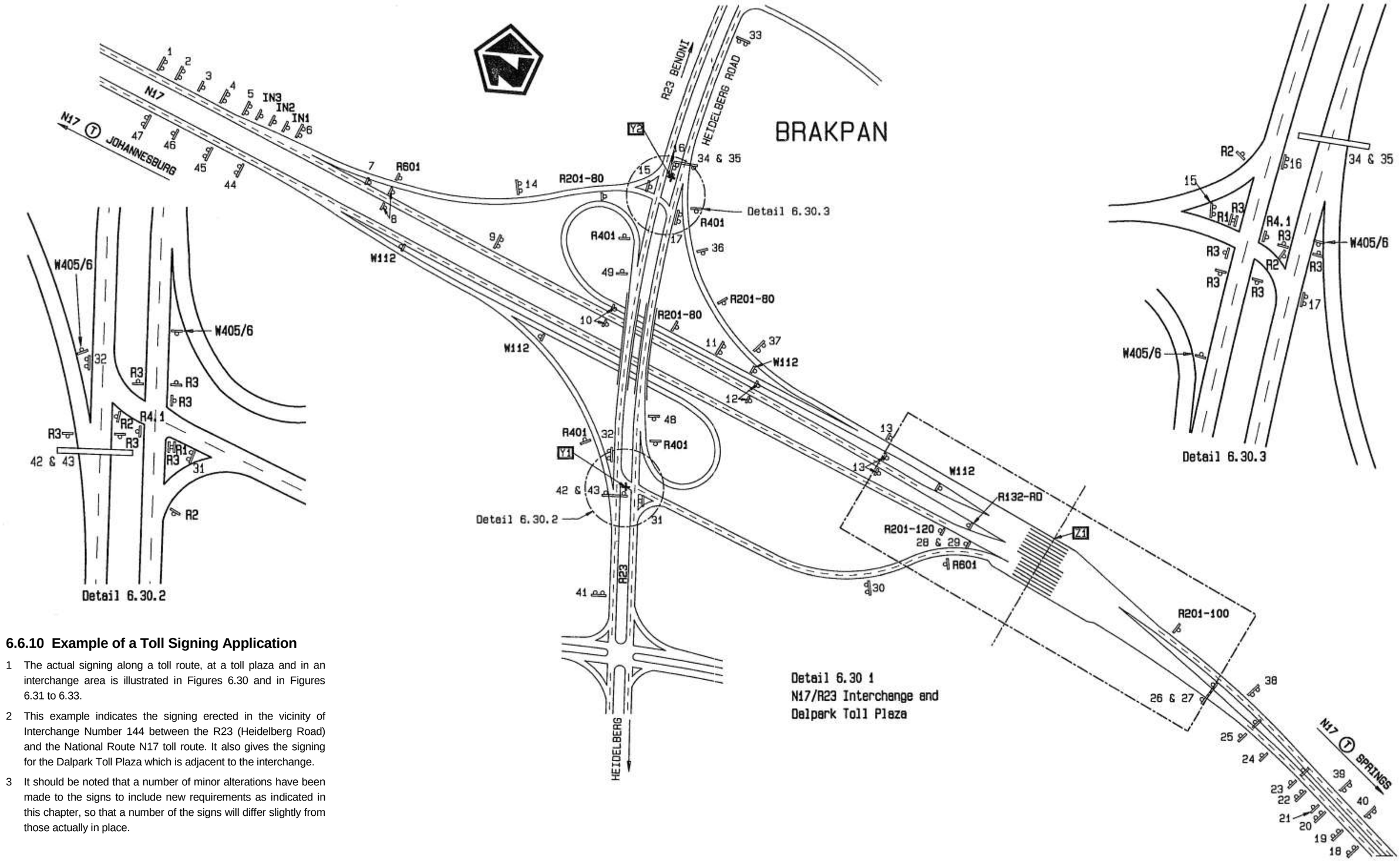


Fig 6.29
Typical Layout and Signing at Ramp Plazas



Detail 6.30.2

Detail 6.30.3

Detail 6.30 1
N17/R23 Interchange and
Dalpark Toll Plaza

6.6.10 Example of a Toll Signing Application

1 The actual signing along a toll route, at a toll plaza and in an interchange area is illustrated in Figures 6.30 and in Figures 6.31 to 6.33.

2 This example indicates the signing erected in the vicinity of Interchange Number 144 between the R23 (Heidelberg Road) and the National Route N17 toll route. It also gives the signing for the Dalpark Toll Plaza which is adjacent to the interchange.

3 It should be noted that a number of minor alterations have been made to the signs to include new requirements as indicated in this chapter, so that a number of the signs will differ slightly from those actually in place.

Fig 6.30
Example of Signing – Interchange and Plaza Layout

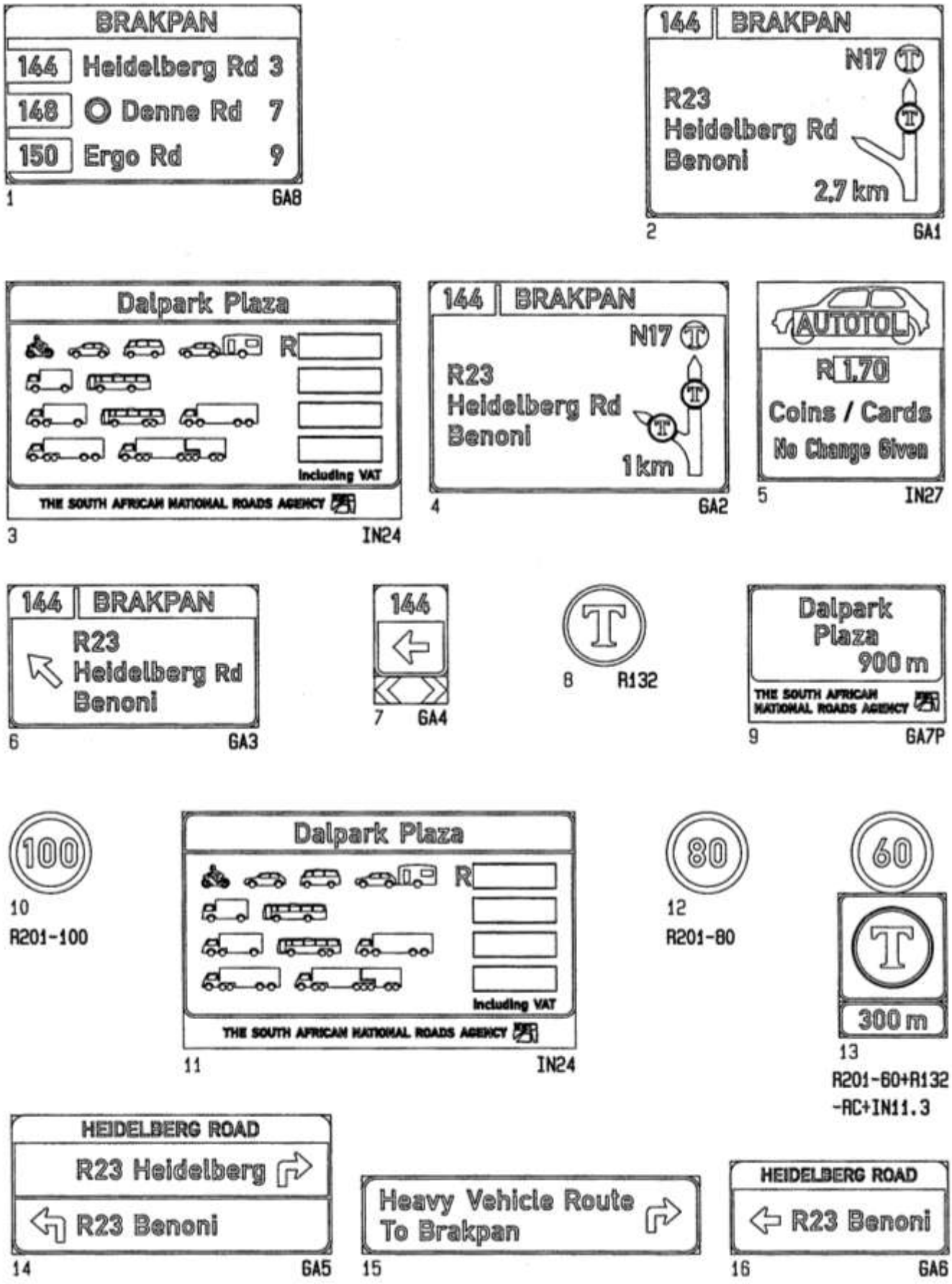


Fig 6.31 **Signs Required for Figure 6.30 – Example-1**

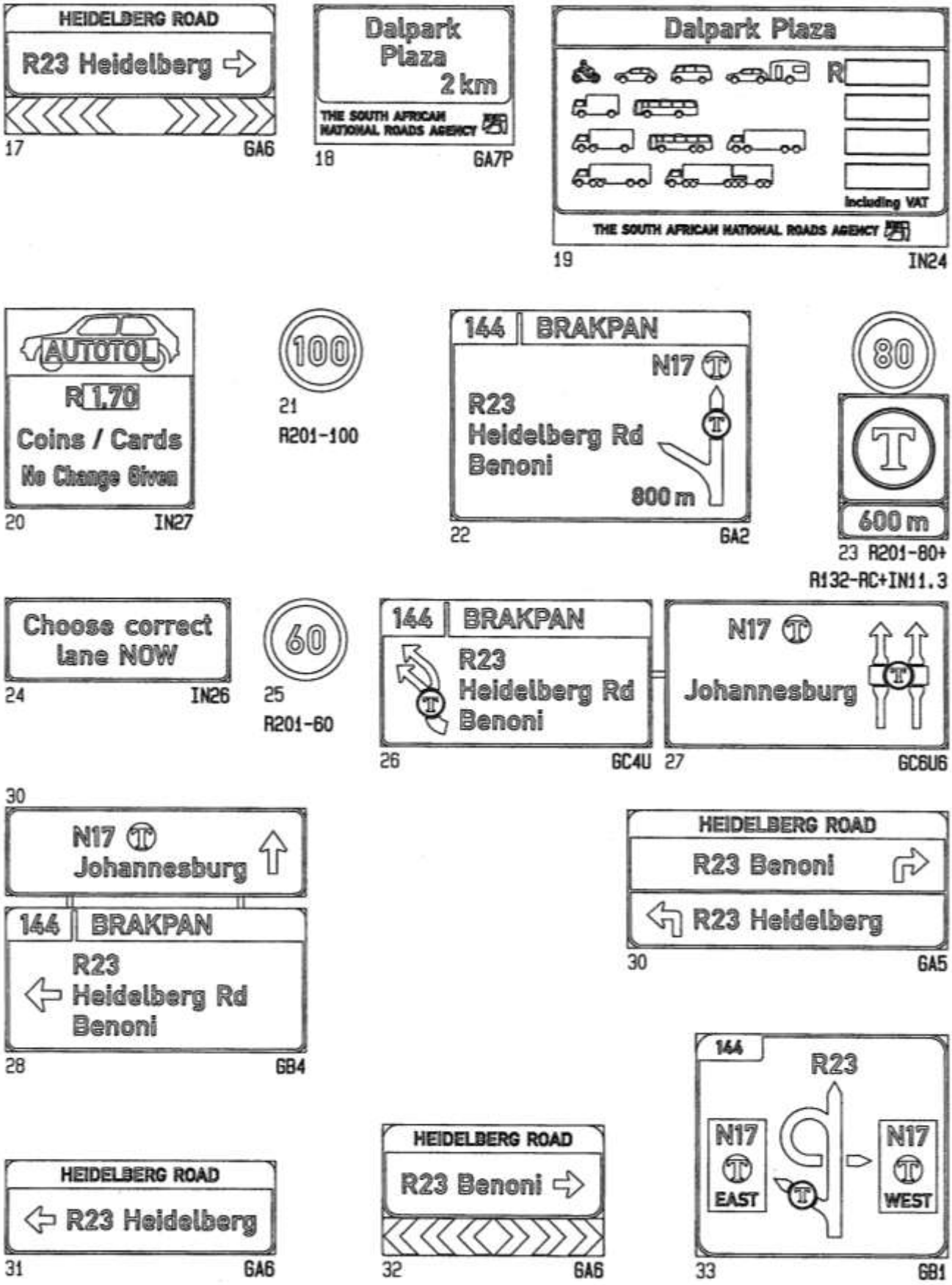


Fig 6.32 **Signs Required for Figure 6.30 – Example-2**

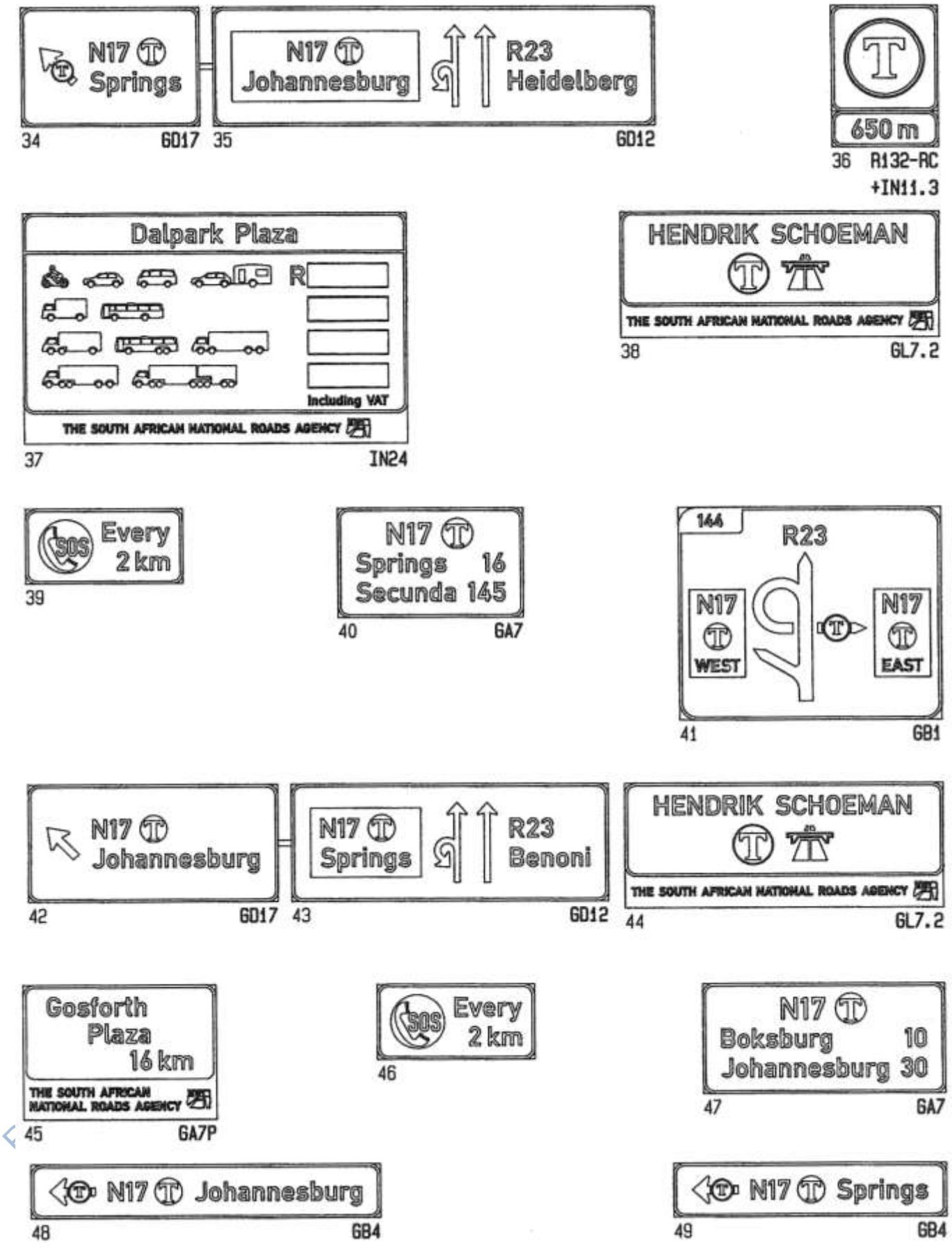


Fig 6.33 **Signs Required for Figure 6.30 – Example-3**

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SIGNING FOR RAILWAY CROSSINGS

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7.1 Introduction

7.2 Modes of Control

7.3 Signing Applications for Rural Situations

7.4 Signing Applications for Urban Situations

7.5 Enhanced Standard Details

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CHAPTER 7

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KEYWORDS

ROAD SIGN, ROAD MARKING, REGULATORY, WARNING

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CHAPTER 7:
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CHAPTER 7:
SIGNING FOR RAILWAY CROSSINGS

7.1 INTRODUCTION

7.1.1 General

1 The purpose of this chapter is to illustrate, and give guidelines on, how road traffic signs i.e. road signs, road markings and traffic signals, may be utilised collectively at railway crossings.

2 A range of circumstances may affect the level of signing recommended at road/rail crossing points. The most relevant factors are:

(a) a poor accident record;

(b) the approach speed of motor vehicles;

(c) the approach speed of rail traffic;

(d) visibility of approaching trains by vehicle drivers;

(e) the presence of overhead electrical power cables;

(f) the vehicle and train traffic volumes;

(g) the number of rail lines;

(h) proximity to a station;

(i) conditions of agreement between the rail operator and the applicant for the railway crossing.

3 Due to the extremely high risk of fatal and serious injury casualties in a motor vehicle - train collision it must be the objective of all authorities concerned to achieve firstly the highest measure of conformity with recommended standard signing practices at railway crossings, and secondly high standards of maintenance of signs, markings and signals once installed.

4 It should be noted that trains in South Africa are now capable of operating at what can be termed as "high" speeds in comparison to past practices. The speed of a train is very difficult for the driver of a vehicle to judge. An increase in operating speed will not be obvious to drivers and their perception of speed differential between a high speed train or a slower train is likely to be poor. It is therefore important that signing relevant to railway crossings be of a very high standard and that authorities have an on-going commitment to maintain the awareness of drivers to the risks involved.

5 There has for some time been a policy to eliminate the most hazardous railway crossings. Whilst there is no less a commitment to creating a safe road environment economic pressures are likely to be such that in the foreseeable future new grade separations will be limited to those that are budgeted as part of a larger development plan. This makes it even more relevant to ensure that the quality and effectiveness of signing practices is of a high standard.

6 The terms "shall", "should" and "may" used throughout this chapter carry the same interpretation as used throughout the manual, namely:

(a) "SHALL" - a mandatory condition - when this word is used it means that the condition or conditions referred to must be complied with;

(b) "SHOULD" - an advisory condition - when this word is used it is advisable or recommended to comply with the conditions referred to (if "RECOMMENDED" is used it is a stronger advisory statement);

(c) "MAY" - a permissive condition - the conditions referred to are optional.

7.1.2 Responsibility for Signing and Maintenance

1 In terms of Section 57(7) of the Road Traffic Act, Act 93 of 1996, the South African Transport Services, now represented by Transnet and the South African Rail Commuter Corporation (SARCC), have the authority to authorise a railway crossing. Transnet and the SARCC may provide such railway crossings for which they are responsible, after consultation with the road authority. Spoornet and Metro, as agents for Transnet and the SARCC, may use the services of a road or local authority for the erection and maintenance of road signs and signals and for the provision and maintenance of road markings.

2 In addition to railway crossings provided by Transnet and SARCC a limited number of railway crossings will occur between private railway lines and public roads. The majority of these are likely to occur within or close to urban areas and are mainly likely to involve industrial sidings or historic lines. Private railway crossings may also occur in connection with lines serving large developments such as sugar or timber plantations. All private railway operators shall ensure that the road approaches to the railway crossings under their control are effectively signed, in conjunction with the relevant road authority.

3 It is also the responsibility of the railway operator to ensure that railway crossings, including relevant signs, signals and markings are effectively maintained.

4 When a new road is constructed over a railway line the cost of new road traffic signs shall be borne by the road authority.

5 Road authorities and railway operators should enter into agreements for the maintenance of the road sections of railway crossings. Road authorities should not carry out maintenance on the road, on the section between points 3 m outside each outer rail of the crossing, without protection being supplied by the railway operator.

(continued on page 7.1.5)

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R2 YIELD sign
Ref:Vol1-2.2.10 Vol4-2.2.5

R1 STOP sign
Ref:Vol1-2.2.1 Vol4-2.2.1

R1 STOP Sign + FLASHING
RED DISC Signal

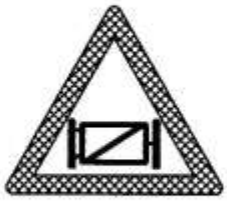
Slow Down

Stop

Proceed

SS2 FLAG signals
Ref:Vol1-6.7.3

W318 RAILWAY CROSSING
Ref:Vol1-3.4.14



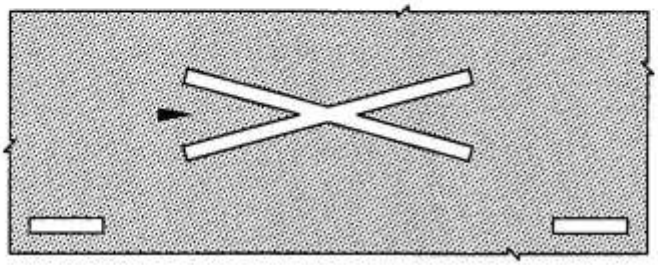
W314 GATE
Ref:Vol1-3.4.12 Vol4-3.4.14

W361 ELECTRICAL SHOCK
Ref:Vol1-3.4.27 Vol4-3.4.61

ONE LINE

TWO OR MORE LINES

W403 RAILWAY CROSSING W404
Ref:Vol1-3.5.3 Vol4-3.5.2



WM1 RAILWAY CROSSING AHEAD
Ref:Vol1-7.3.1 Vol4-12.4.7

► = direction of travel of road traffic

Fig 7.1 **Signs, Markings and Signals Most Commonly Used at Railway Crossings**

R2/W403 Combination

R1/W404 Combination

R1/FRD/W403 Combination

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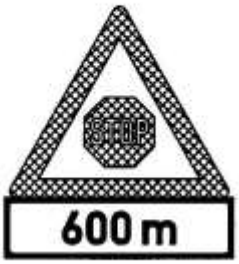
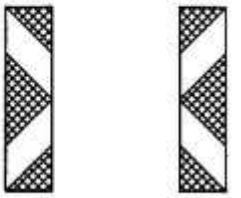
W202-W211



W302 + 1N11.3

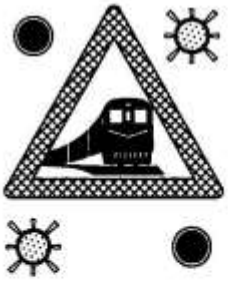


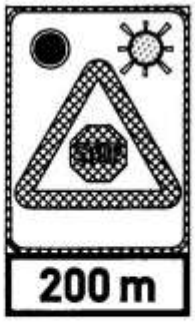
W401 W402

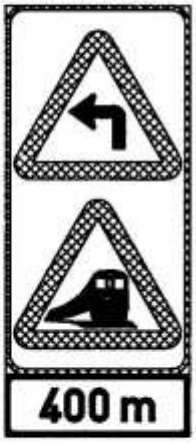
DANGER PLATES

W411 RAILWAY CROSSING BOOM BARRICADE

Ref: Vol1-3.5.10 Vol4-3.5.7

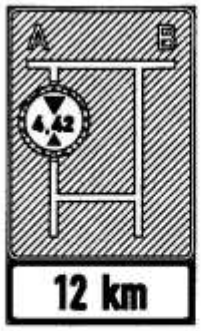






HIGH VISIBILITY AND/OR FLASHING YELLOW WARNING LIGHTS SS3

Fig 7.2 Additional Signs and Sign Combination Options - 1



GD9

W320

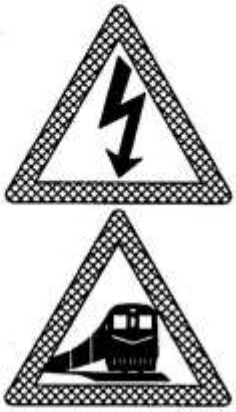
R204

2011

WW7

W361+IN11.4

W361+IN11.4

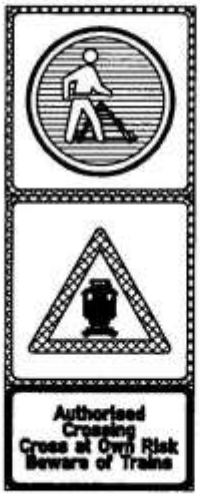


W318+W361

NOTE:
Sign WW7 is an SABS warning class sign

W404+IN11.4

GS901



RR2/WR3+IN11.4

NOTE:
Signs RR2/WR3 are not road traffic signs but are used on railway property.

Fig 7.3 Additional Signs and Sign Combination Options - 2

TABLE 7.1 RAILWAY CROSSING CLASSIFICATION TABLE 7.1

Class (1)	Description	Sight Distance (2)	Minimum (3) Protection	Accident (4) Upgrade
SSH	Single Shunt	n/a	1	3B
MSH	Multiple Shunt	n/a	1	3B
SLS	Single ≤ 60 km/h	Excellent	2A	4C
		Adequate	2A/3A	4C
		Restricted	4A	4C
MLS	Multiple ≤ 60 km/h	Excellent	3A/3B	4C
		Adequate	3C	4C
		Restricted	4A/4B	4C/4D
SHS	Single ≥ 60 km/h	Excellent	3A	4C
		Adequate	3C/3D	4D/5
		Restricted	4A/4B	4D/5
MNS	Multiple ≥ 60 km/h	Excellent	3A	4D
		Adequate	3C/3D	4D/5
		Restricted	4C/4D	5

NOTES:

(1) The railway crossing class designations are abbreviations of the broader class descriptions as follows:

SSH = single shunt line MLS = multiple low speed lines

MSH = multiple shunts lines SHS = single high speed line

SLS = single low speed line MHS = multiple high speed lines

(2) Sight distance gradings are defined as follows:

Excellent = visibility distance for vehicle drivers along rail line exceeds that given for Yield control in Table 7.3 with no likelihood of occasional reduction due to vegetation growth.

Adequate = visibility distance for vehicle drivers along rail line conforms to that given in Tables 7.3 and 7.4 as dictated by the choice of crossing contol with no likelihood of occasional reduction due to vegetation growth.

Restricted = visibility distance for vehicle drivers along rail line cannot be made to comply with the requirements of Tables 7.3 or 7.4 – Class 4 or 5 crossing protection is appropriate.

(3) Refer to Table 7.2 for details of the classification of different levels of railway crossing line protection by means of signs, signals and markings.

(4) A bad history of accidents may warrant an upgrade to a higher level of protection. The recommended upgrade level is Given in this column. Upgraded protection levels should continue to be monitored to assess acceptable performance.

(continued from page 7.1.1)

7.1.3 Railway Crossing Protection

1 Road traffic signs provided at railway crossings for the protection of users fall into two basic functional groups:

(a) warning signs and/or markings comprising a range of advance warning signs, which may be varied according to the specific site circumstances, together with various hazard marker warning signs;

(b) regulatory control signs, markings and signals for the control of vehicular traffic at crossings.

2 Figures 7.1 to 7.3 show a range of appropriate signs, markings and signals which may be used in various combinations according to the relative hazard level of a crossing. Classifications of railway crossing protection and modes of control is given in Section 7.2.

3 A relevant aspect of the warning and therefore safety system appropriate to railway crossings is the requirement, in terms of the "Rule of the Road" given in Section 106 of Act 29, that locomotive drivers shall give sufficient warning to users of the roadway that they intend to cross the roadway. This warning is normally given by a whistle, hooter or other sounding device. The relevant figures in this chapter show the positions of whistle boards for the locomotive driver's attention.

7.1.4 Railway Crossing Classification

1 The following descriptions give a broad classification of types of railway crossing:

(a) station/shunting yard environment;

(b) low speed rail traffic

- industrial sidings;
- private lines (often narrow gauge);

(c) normal rail traffic - involving trains with a maximum approach speed of 60 km/h;

(d) high speed rail traffic

- involving high speed trains of up to 120 km/h
- involving a wide range of train speeds

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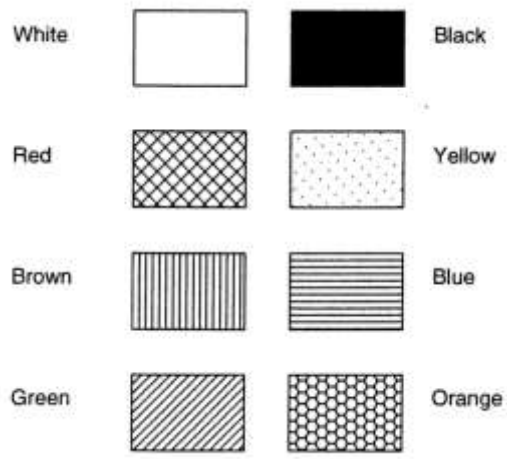
2 These descriptive classes of crossing are developed into a formal classification of railway crossings for purposes of establishing the required level of signing protection and mode of control. This formal railway crossing classification is detailed in Table 7.1.

3 Modes of control, and particularly the level of advance warning signing, may be upgraded to a higher level of protection according to the presence of one or more of the factors listed in paragraph 7.1.1.2. Examples of typical railway crossing situations illustrating combinations of warning signs and modes of control are given in Sections 7.3. and 7.4.

7.1.5 Road Traffic Sign Colour Indication

1 The chapters of Volume 2 of the South African Road Traffic Signs Manual (SARTSM) are not prepared in colour. Relevant examples used to illustrate appropriate signs, signals and markings are shaded in a black and white coding which is illustrated below.

2 The basic principles of the road traffic sign colour coding system are shown, in colour, in the SADC-RTSM Volume 1, Chapter 1, Section 1.4, and in the Contents sections of relevant Volume 1 and 4 Chapters.



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7.2 MODES OF CONTROL

7.1.2 Control Options

1 The signing for vehicles at a railway crossing, comprising the crossing protection, consists of either warning signs or combinations of warning signs and regulatory signs. It is recommended that all railway crossings be provided with a regulatory mode of control when a train is operational within sight of the crossing. The basic options for vehicle control are:

(a) flagman;

(b) YIELD sign R2;

(c) STOP sign R1;

(d) FLASHING RED DISC (FRD) signals plus STOP sign R1.

2 The flagman and FLASHING RED DISC options are only operational when a train is within sight of the crossing. Control by signs R1 or R2 is a permanent form of control requiring a stop or priority action on the part of drivers in all situations.

3 All railway crossings shall be marked by RAILWAY CROSSING hazard marker sign W403 or W404. Advance warning signs and/or markings should normally also be provided except in the case of station, shunting and low rail speed crossings.

7.2.2 Flag Control

1 Control of vehicular traffic at railway crossings may be exercised using FLAG signals SS2. FLAG signals may be used as follows:

(a) as a temporary form of control during construction or during equipment failure; or

(b) during shunting operations.

7.2.3 Sign Control

1 Vehicular control at a railway crossing may be exercised by use of either of the two following signs subject to the criteria listed below:

(a) YIELD sign R2; or

(b) STOP sign R1.

2 Signs R2 and R1 should always be displayed in conjunction with the appropriate RAILWAY CROSSING hazard marker warning sign W403 (single rail line) or W404 (two or more rail lines). The signs should always be mounted on the same support with the regulatory sign above the warning sign.

3 YIELD sign R2 should only be used at a railway crossing under the following circumstances:

(a) if there is no history of accidents at the crossing; and

(b) if the sight distance of drivers to trains, from either approach side, is at least within the requirements given in Table 7.3; and

(c) train operations on the line are infrequent (a maximum of three per day); and

(d) no train operations occur during the hours of darkness; and

(e) the maximum train approach speed will not exceed 60 km/h.

4 STOP sign R1 may be used, with adequate advance warning signs, to control vehicles at a railway crossing under the following conditions:

(a) if a railway crossing controlled by a YIELD sign R2 is subject to even a single vehicle/train accident; and/or

(b) when the sight distance requirements for a YIELD sign R2 given in Table 7.3 are not met; and/or

(c) if any of the conditions given in paragraphs 7.2.3.3(c), 7.2.3.3(d) or 7.2.3.3(e) are not met.

5 **Whether or not a railway crossing is controlled by a YIELD sign R2 or a STOP sign R1 the sight distance available at the YIELD or STOP line to either side of the crossing must comply with the requirements given in Table 7.4 in order that drivers, having stopped at the crossing, can make a safe decision as to whether they may proceed or not.**

6 The requirements given in Table 7.3 assume that drivers on the approach to a railway crossing controlled by a YIELD sign R2 will reduce speed, **at the distance "X" from the crossing,** as follows:

(a) on a rural road with a speed limit of 80 km/h or higher B to approximately 60 km/h; or

(b) on an urban street with a speed limit of 80 km/h or less B to approximately 25 km/h.

These assumptions and the values given for "X" allow for drivers to stop their vehicles if they should make the decision to stop.

7 If it is required to design a mode of control and level of protection for higher vehicular approach speeds significantly larger sight triangles (see Figures 7.5 and 7.15) must be available. Such a design should be the subject of a detailed engineering analysis of the specific site under consideration.

7.2.4 Flashing Red Disc Signal Control

1 The control of vehicles at railway crossings may alternatively be provided by FLASHING RED DISC (FRD) signals in conjunction with STOP sign R1. A pair of FLASHING RED DISC signals may be switchable by a signalman or by means of automatic controls to be illuminated in an alternating flashing mode.

2 The use of FLASHING RED DISC signals should, in conjunction with adequate advance warning signs, be used to control vehicles at a railway crossing when warranted by one or more of the following conditions:

(a) when a crossing has an accident history involving at least three vehicle/train accidents in one year, or alternatively five vehicle/train accidents in three years; and/or

(b) the sight distance requirements in Table 7.4 are not met; and/or

(c) train operations involve reversals of movement across the crossing.

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3 Control by FLASHING RED DISC signals differs from that using STOP sign R1 in that drivers may not proceed until the signals cease to flash, whereas drivers may use their discretion as to whether it is safe to proceed or not, having stopped for sign R1 on its own. The combination of FLASHING RED DISC signals with STOP sign R1 presents a measure of failsafe operation. If the FRD's should fail, control reverts to that of STOP sign R1 on its own, which has the effect of still requiring all drivers to sop and is therefore a "safe" condition. It is permitted for emphasis, or to improve the safety performance of an FRD installation, for FLASHING RED DISC to be mounted on both sides of the approach road. The flashing frequency of FLASHING RED DISC signals should be between one and two flashes per second and the two signals should flash alternately.

4 On remote railway lines the implementation of FLASHING RED DISC signals may be impractical due to the non-availability of electricity. In such instances STOP sign R1 control shall be installed and the approach signing enhanced to the highest practical level. If such a site is still subject to accidents the STOP control sight distance given in Table 7.4 shall be ensured. The frequency of accidents shall be recorded and a medium term plan must be made to provide electricity to the site.

7.2.5 Boom Operation

1 Safety boom operation, either in a half-road width form or a full road width form, should be considered as a high visibility hazard marker warning device and not as a form of railway crossing control. Safety booms once lowered, however, also function to warn against the early release of vehicular traffic. For additional safety boom operation may be combined with the sounding of a loud bell.

2 Since booms require to be lowered either manually or automatically, their use is only recommended as a supplement to FLASHING RED DISCS signal control. In exceptional circumstances booms may be used at a railway crossing controlled by STOP sign R1.

7.2.6 Protection Classification

1 The various options for railway crossing vehicular traffic warning and control are arranged in a hierarchal classification in Table 7.2 and illustrated in Figure 7.4. The different levels of control are linked to a railway crossing classification in Table 7.1.

2 As noted in paragraph 7.1.3.3 the requirement of locomotive drivers to "whistle" prior to crossing a roadway forms an important safety aspect of all levels of railway crossing protection.

3 The recommended sizes and positions of advance warning signs are given in Table 7.5 and the recommended positions of RAILWAY CROSSING marking WM1 are given in Table 7.6. The information given should be considered as a standard which is subject to careful assessment on a site specific basis. Personnel responsible for providing warning signs must take note of local conditions and be prepared to adjust sign or marking positions.

(continued on page 7.2.4)

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TABLE 7.2 PROTECTION CLASSIFICATION TABLE 7.2

Class	Sub-Class	Mode of Control(1)	Advance Warning		
			Level 1	Level 2	Level 3
1		Flagsman (SS2)	--	--	--
2		Locked Gates	--	--	--
	A	YIELD R2	W318	--	
	B	YIELD R2	W318 + WM1	--	--
	C	YIELD R2	W318 + WM1	WM5	--
3	A	STOP R1	W318 + WM1	--	--
	B	STOP R1	W318 + WM1	GM7(2)	--
	C	STOP R1	W318 + WM1	W302 +GM7	--
	D	STOP R1	W318 + WM1	W302 +GM7	Flashing Light SS3(3)
4	A	2 x FRD+STOP R1	W318 + WM1	--	--
	B	2 x FRD+STOP R1	W318 + WM1	GM7	--
	C	2 x FRD+STOP R1	W318 + WM1	W302 +GM7	--
	D	2 x FRD+STOP R1	W318 + WM1	W302 +GM7	Flashing Light SS3
5		2 x FRD+STOP R1 plus BOOM	W318 + WM1	W302 +GM7	Flashing Light SS3

NOTES:
(1) All modes of control to be supported by the appropriate RAILWAY CROSSING hazard marker sign W403 or W404.
(2) GM7 WORD MESSAGE “STOP AHEAD”.
(3) Flashing warning light signal SS3 is a yellow flashing warning light (or several) used in conjunction with an advance warning sign (see Figures 7.2 and 7.4).
(4) **At high frequency accident locations additional measures such as site specific advance warning signs, HIGH VISIBILITY signs or RUMBLE STRIPS may be warranted.**

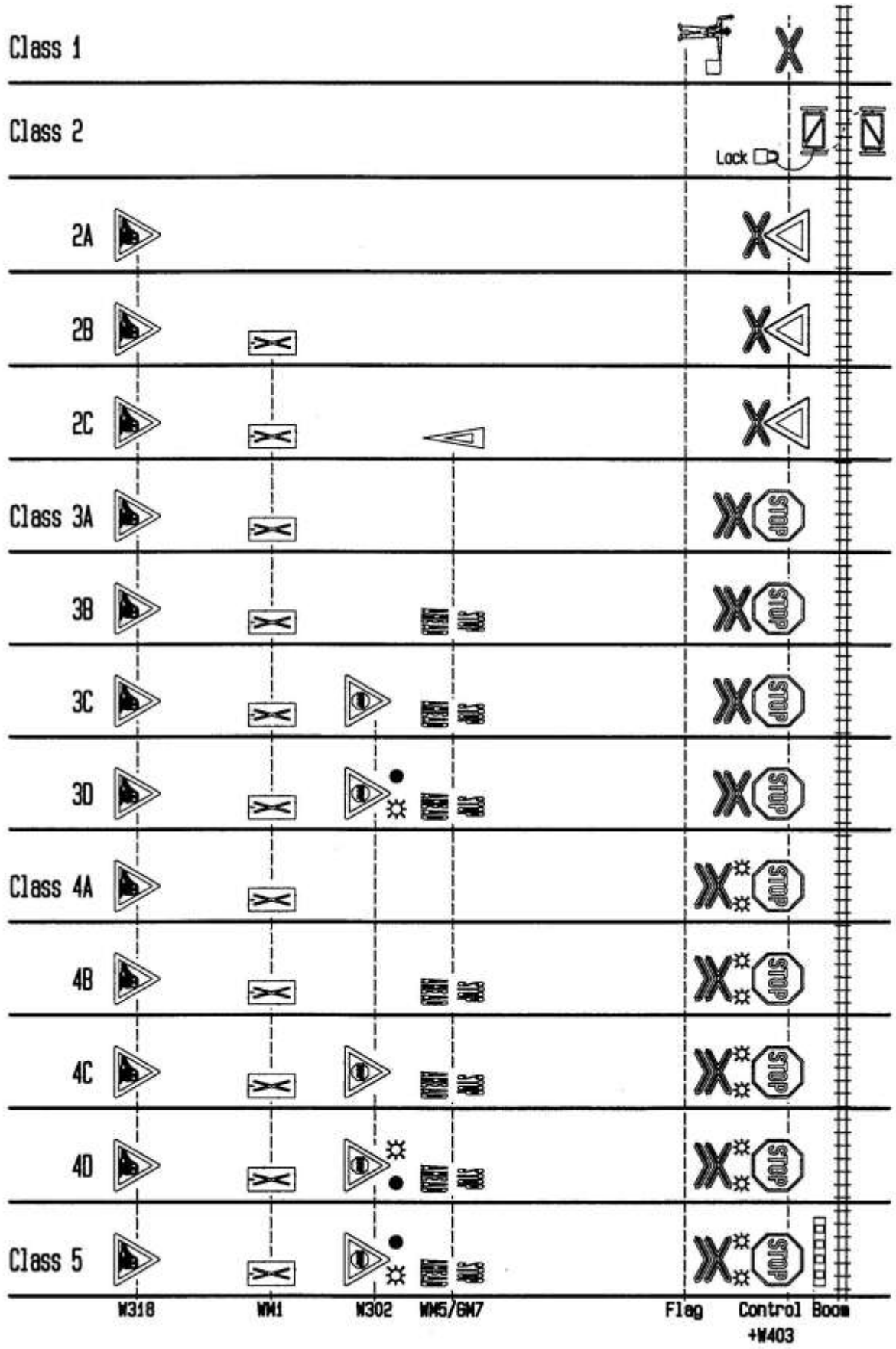

Fig 7.4 **Classes of Railway Crossing Protection**

TABLE 7.3 VISIBILITY DISTANCE ALONG RAIL LINE FOR YIELD CONTROL TABLE 7.3

Train Speed (km/h)	Vehicle Speed (km/h)		X (m)		S (m)
	rural	urban	rural	urban	
120	60	25	45	24	280
100	60	25	45	24	235
80	60	25	45	24	185
60	60	25	45	24	140
40	60	25	45	24	95
20	60	25	45	24	50

NOTES:

(1) In terms of YIELD sign warrants given in paragraph 7.2.3.3 only train speeds of 60 km/h or less are relevant. Other values are given for information.

(2) Distance X (m) is the distance from the near side of the crossing from which drivers must be able to see for distance S (m) along the rail line (see Figures 7.5 and 7.15)

(3) S (m) is the sight distance for drivers of single unit trucks plus trailers (SU+T)

TABLE 7.4 VISIBILITY DISTANCE ALONG RAIL LINE FOR STOP CONTROL TABLE 7.4

Train Speed (km/h)	X (m)	S (m)	
		7.5 m	15 m
120	5	460	500
100	5	385	420
80	5	310	335
60	5	230	250

NOTES:

(1) Distance X (m) is the distance from the near side of the crossing from which drivers must be able to see distance S (m) along the rail line (see Figures 7.5 to 7.8 and, 7.15 and 7.16).

(2) S (m) is the sight distance for drivers of single unit trucks and trailers for 7.5 m and 15 m wide crossings.

(3) These conditions also apply for drivers who have stopped at a YIELD sign R2.

Typical factors, some of which are illustrated in Sections 7.3 and 7.4, which may require such adjustments include (see also Volume 1, Chapter 1, Section 1.6);

(a) horizontal or vertical curvature in the approach road within the viewing distance to the warning sign;

(b) obstruction by trees or other street furniture including other road traffic signs;

(c) regular obscuration by other (heavy) vehicles.

4 The figures given in Sections 7.3 and 7.4 of various typical railway crossing situations include examples of additional measures which can be taken to enhance the effectiveness of advance warning of the crossings. The decision whether or not to use such measures should result from a detailed engineering assessment of a specific site which presumably has a worse than average accident history. Some of the signs which may be used in such circumstances are illustrated in Figures 7.2 and 7.3.

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TABLE 7.5 RECOMMENDED POSITIONS AND SIZES OF ADVANCE WARNING SIGNS TABLE 7.5

Operating Speed (km/h) Road Traffic [1]	Size (mm)	D2 (m) (2)	D3 (m)	D4 (m)
120	1500	330	120	120
100	1500	240	100	100
80	1200	160	80	80
60	900[4]	120	60	60

NOTES:

(1) "Operating speed" refers to the 85%ile (or estimated 85%ile) speed on the roadc approach to the crossing and not to the road design speed.

(2) Distance D1 in Figure 7.5 indicates a site specific distance between the near end of a curve and a crossing. If D1 is less than the appropriate value of D2 above, the sign should be located before the curve.

(3) The distance given in the table refer as follows:
- D2 recommended minimum distance from hazard to advance warning sign (see Figure 3.1 – Volume 1, or Chapter 3)
- D3 minimum separation between consecutive regulatory or warning signs (see Volume 1, Chapter 1)
- D4 minimum clear visibility distance to an advance warning sign

(4) A road authority may elect to use the maximum 1500 mm size at all railway crossing.

TABLE 7.6 RECOMMENDED POSITIONS FOR RAILWAY CROSSING MARKING WM1 TABLE 7.6

Operating Speed (km/h) Road Traffic [1]	C1 (m) (2)	C2 (m)* optional (2)
120	250	400
100	180	300
80	125	200
60	90	150

NOTES:

(1) "Operating speed" refers to the 85%ile (or estimated 85%ile) speed on the roadc approach to the crossing and not to the road design speed.

(2) Distance C1 and C2 are from the hazard to the centre of marking WM1.

(3) A further WM1 marking may be provided 60 m (rural) or 45 m (urban) from a YIELD or STOP LINE.

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7.3 SIGNING APPLICATIONS FOR RURAL SITUATIONS

7.3.1 General

1 The signing applications illustrated in Figures 7.6 to 7.9 are generally appropriate in rural situations. The principle factors pertaining in rural situations, which are less likely to occur in urban situations, are train and/or vehicle approach speeds in excess of 60 km/h. These higher approach speeds will have an effect on the choice of control to be used at the railway crossing and on the size and number of advance warning signs to be provided. Typical urban situations are dealt with in Section 7.4 whilst enlarged details of the actual rail/road crossing area are given in Section 7.5.

2 The examples in this section cover applications ranging from a minor private farm road (Class "E" - Figure 7.5) to a major numbered route (Class "B"). In addition the effects on signing of such situations as the presence of overhead electrical power cables or a poor accident history are illustrated. **These latter conditions may, in principle, occur on any of the road categories and do not specifically relate to the class of road illustrated.**

3 Most figures show minimum signing requirements and optional additional signs. An indication is given, where appropriate, of the classification of the railway crossing (see Table 7.1) and the level of protection or protection classification (see Table 7.2 and Figure 7.4). From an economic standpoint optional signs will generally only be specified on a reactive basis i.e. as a result of a history of incidents or accidents. However, if an area or region is known to have a poor record of observance of safety rules at railway crossings by drivers, standard installations should include the additional optional signs. Exercising the option to provide certain additional signs and/or markings will obviously raise the class of protection offered.

4 In terms of what observed are common signing practices at railway crossings it is relevant to consider improving the visual impact of all railway crossings as a standard practice. In many cases the position of the actual crossing may be difficult for a driver to judge, not with-standing the presence of control signs. This in turn may result in drivers searching in the wrong direction for approaching trains. It is not uncommon for some sort of road furniture to intrude into the road/rail "intersection" area. To improve the definition of this area sets of three or more DANGER PLATE hazard marker warning signs W401 and W402 may be specified on each side of the roadway. Figure 7.16 illustrates an example of this optional treatment. Signs W401 and W402 may also be used to mark other hazards such as height gauge supports. The recommended size for signs W401 and W402 is 200 mm x 800 mm.

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7.3.2 Class "E" or Farm Road Railway Crossing

1 Figure 7.5 shows the typical level of protection for a private Class "E" or farm road railway crossing. Such a road will most commonly be a gravel road. The railway operator shall enter into an agreement with the owner/occupier of the property served by the road to ensure that gates, required on both sides of the rail line in terms of Class 2 level of protection, are only unlocked for individual vehicle movements across the rail line.

2 Notwithstanding such an agreement the railway operator should take action to implement higher levels of protection and control if the private road becomes, for whatever reason, well used by the public. Such action should also occur in the event of a poor accident record even if road traffic volumes are very low.

3 If the private Class "E" or farm road crosses the railway line below overhead electrical power lines, it is recommended that ELECTRICAL SHOCK warning signs W361 be provided on each approach, in addition to the locked gates.

Checklist

When preparing a specification for a new railway crossing, or when reviewing the need for signing of an existing crossing, use of the following checklist is recommended:

- ❑ is the rail line provided with overhead electrical power lines?
- ❑ is sight distance adequate for Yield sign R2?
- ❑ is the crossing free from accidents?
- ❑ if the sight distance is not acceptable for sign R2 is it adequate for STOP sign R1?
- ❑ will sight triangles be maintained year round?
- ❑ is there sufficient sight distance to the crossing to permit safe stopping by drivers? if not, is an advance warning sign required?
- ❑ is there adequate clear sight distance to the chosen position for an advance warning sign?
- ❑ is the crossing clearly identifiable as a crossing? - if not, consider use of three DANGER PLATE signs on each side of each approach;

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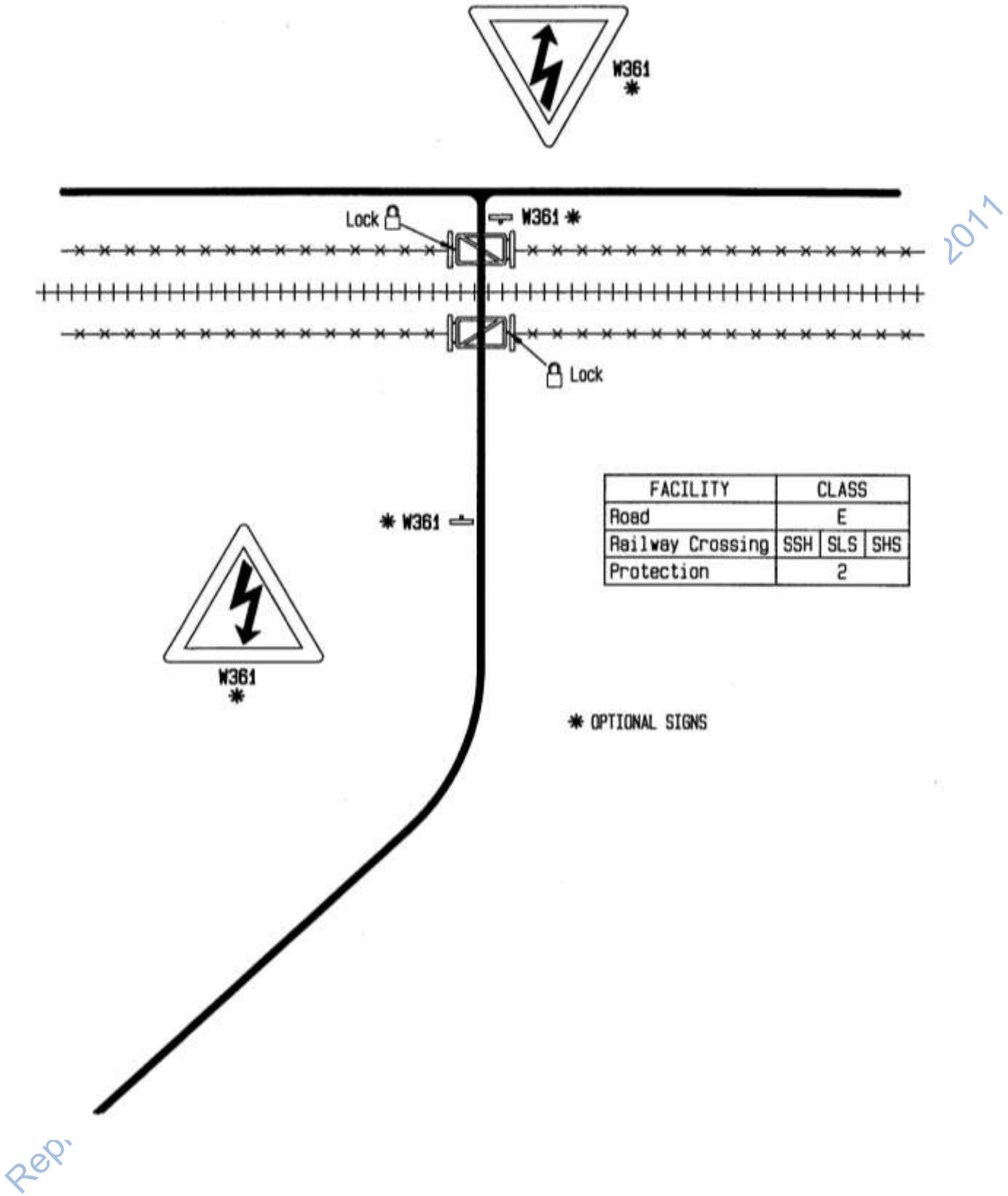

Fig 7.5 **Class “E” or Farm Road Railway Crossing**

7.3.3 Class "C" or "D" Rural Road Crossing

1 Figure 7.6 shows a typical signing arrangement for a surfaced rural road which can range from a minor public road serving no public destination to well-used roads carrying up to approximately 300 vehicles per day (see Figure 7.5 for private (farm) roads). The figure shows crossing control measures involving YIELD sign R2, STOP sign R1, or FLASHING RED DISC signals as preferred options for this class of road. These options represent Class 2A to Class 4C levels of protection (see Table 7.2 and Figure 7.4). Provided the requirements for a YIELD sign R2 can be met, the use of sign R2 represents the lowest level of control. Aside from any accident record, the decision on the use of sign R1 or sign R2 is likely to rest on the available sight distance as indicated in Tables 7.3 and 7.4. For local details on the actual crossing see Figure 7.16 in Section 7.5. Warrants for the use of FLASHING RED DISC signals are given in Subsection 7.2.4.

2 The following are the minimum signs required per approach to this category of railway crossing, subject to the class of protection (see Figure 7.4):

(a) R2 - YIELD control sign; OR

(b) R1 - STOP control sign; OR

(c) R1 - STOP sign plus FLASHING RED DISC signals; **PLUS**

(d) W403 - RAILWAY CROSSING hazard marker warning sign (single line); OR

(e) W404 - RAILWAY CROSSING hazard marker warning sign (two or more lines); **PLUS**

(f) RTM1 - STOP LINE road marking;

(g) RM1 - NO OVERTAKING road marking;

(h) WM1 - RAILWAY CROSSING warning marking;

(i) W318 - RAILWAY CROSSING advance warning sign.

3 Advance signs are more likely to be considered advisable for this class of crossing mainly on the basis of the volume of road traffic. Advance warning signs should be positioned in accordance with the details given in Table 7.5 with due regard to any of the following road or rail features:

(a) poor road sight distance either horizontally or vertically;

(b) road curvature;

(c) poor crossing sight distance to trains;

(d) overhead electrical power cables;

(e) boom protection;

(f) difficult stopping sight distance judgement.

The following signs may therefore be specified in addition to, or instead of, those indicated above:

(g) W202 - W211 - ROAD CURVE advance warning sign;

(h) W302 - STOP CONTROL AHEAD advance warning sign;

(i) W314 - GATE advance warning sign;

(j) W361 - ELECTRICAL SHOCK advance warning sign;

(k) W401 - DANGER PLATE hazard marker warning sign (left side);

(l) W402 - DANGER PLATE hazard marker warning sign (right side);

(m) IN11 - SUPPLEMENTARY PLATE information signs;

(n) RM2 - NO CROSSING LINES road marking;

(p) WM5 - YIELD road marking symbol;

(q) GM7 - WORD road marking ("STOP").

4 When assessing sight distance along the line of rail **allowance should be made for the annual "worst case" situation** when vegetation may significantly restrict sight distance.

Checklist

When preparing a specification for the signing of a new railway crossing, or when reviewing the signing of an existing crossing, use of the following checklist is recommended:

- ❑ is sight distance adequate for Yield sign R2?
- ❑ is the crossing free from accidents?
- ❑ if the sight distance is not acceptable for sign R2 is it adequate for STOP sign R1?
- ❑ if the answer to the previous questions is "NO" can sight distance be cleared at a lower cost than the cost of installing FLASHING RED DISC signals?
- ❑ will sight triangles be maintained year round?
- ❑ is there sufficient sight distance to the crossing to permit safe stopping by drivers? if not, is an advance warning sign required?
- ❑ is there adequate clear sight distance to the chosen position for an advance warning sign?
- ❑ is the crossing clearly identifiable as a crossing? - if not, consider use of three DANGER PLATE signs on each side of each approach;
- ❑ if a STOP control is provided and approach speeds are likely to be in excess of 60 km/h consider the provision of a W302 advance warning sign;
- ❑ if distances are difficult to judge due to road alignment, horizontally or vertically, use SUPPLEMENTARY PLATE signs IN11.3 with advance warning

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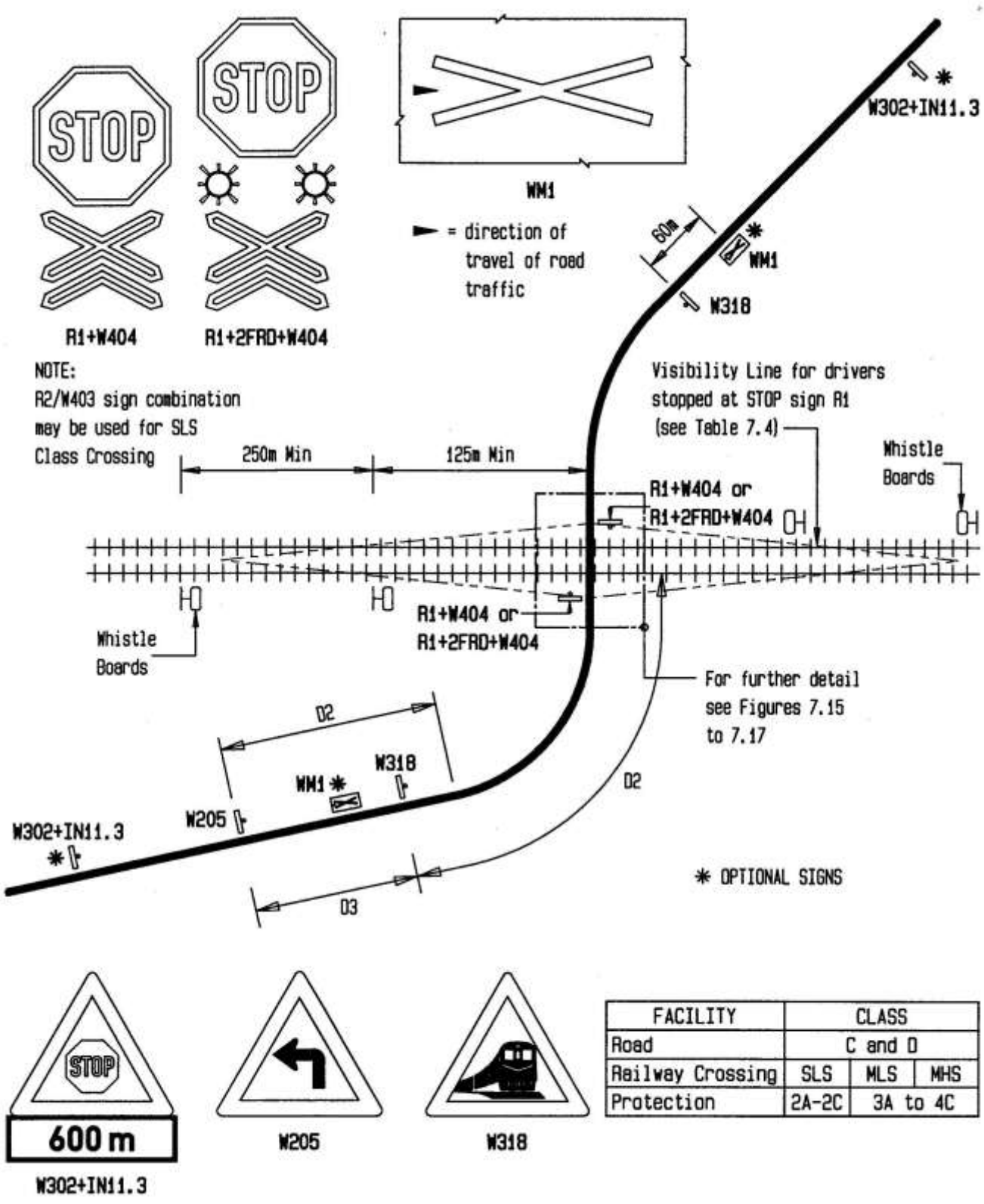

FACILITY	CLASS		
Road	C and D		
Railway Crossing	SLS	MLS	MHS
Protection	2A-2C	3A to 4C	

Fig 7.6 Class "C" or "D" Rural Road Railway Crossing

7.3.4 Class "B" Rural Road Crossing

1 Class "B" rural roads are numbered routes generally carrying significant volumes of traffic. Railway crossings on such roads are commonly grade separated. Crossings that do exist are most likely to be on the regional numbered routes with lower traffic volumes. Figure 7.7 illustrates very much the same principles as Figure 7.6. Due to traffic volumes and the possibility of roadside development restricting sight distance, however, the use of FLASHING RED DISC signals is likely to be more commonly warranted on this class of road.

It should be noted that the actions drivers are required to take at a railway crossing differ significantly according to the form of control used. The use of STOP sign R1 requires all drivers to stop, irrespective of whether there is rail traffic or not. It is then the drivers responsibility to judge when it is safe to proceed. Drivers must therefore have adequate sight distance available to make this decision, then move off and clear the crossing safely. The driver of a heavy vehicle will normally take more time to achieve this sequence of actions than the driver of a motor car. When facing FLASHING RED DISC signals, used with STOP sign R1, a driver must remain stationary until the flashing red disc signals stop flashing and are no longer illuminated. The driver then may make a decision whether it is safe to proceed or not, as he would at any STOP sign. This combination of signs thus provides an effective failsafe operation should the flashing red disc signals fail for any reason. If such signals are manually switched the signal control box must include a pair of well-maintained FLAG signals SS2. This figure illustrates Class 3A or Class 4C level of protection (see Table 7.2 and Figure 7.4).

The following are the minimum signs required per approach to a railway crossing:

(a) R2 - YIELD control sign; OR

(b) R1 - STOP control sign; OR

(c) R1 - STOP sign plus FLASHING RED DISC signals; **PLUS**

(d) W403 - RAILWAY CROSSING hazard marker warning sign (single line); OR

(e) W404 - RAILWAY CROSSING hazard marker warning sign (two or more lines); **PLUS**

(f) RTM1 - STOP LINE road marking;

(g) RM1 - NO OVERTAKING road marking;

(h) WM1 - RAILWAY CROSSING warning marking;

(i) W318 - RAILWAY CROSSING advance warning sign.

3 Advance signs are likely to be considered advisable for this class of crossing mainly on the basis of the volume of road traffic. Overhead electrical power cables are more likely at this class of crossing. For details see Figure 7.8. For an example of a boom protected crossing see Figure 7.17 in Section 7.5.

Advance warning signs should be positioned in accordance with the details given in Table 7.5 with due regard to any of the following road or rail features:

(a) poor road sight distance either, horizontally or vertically;

(b) road curvature;

(c) poor crossing sight distance to trains;

(d) overhead electrical power cables;

(e) boom protection;

(f) difficult stopping sight distance judgement.

The following signs may therefore be specified in addition to, or instead of, those indicated above:

(g) W202 - W211 - ROAD CURVE advance warning sign;

(h) W302 - STOP CONTROL AHEAD advance warning sign;

(i) W314 - GATE advance warning sign;

(j) W361 - ELECTRICAL SHOCK advance warning sign;

(k) W401 - DANGER PLATE hazard marker warning sign (left side);

(l) W402 - DANGER PLATE hazard marker warning sign (right side);

(m) IN11 - SUPPLEMENTARY PLATE information signs;

(n) RM2 - NO CROSSING LINES road marking;

(o) WM5 - YIELD road marking symbol;

(p) GM7 - WORD road marking ("STOP").

Checklist

When preparing a specification for the signing of a new railway crossing, or when reviewing the signing of an existing crossing, use of the checklist given in Section 7.3.3 is recommend

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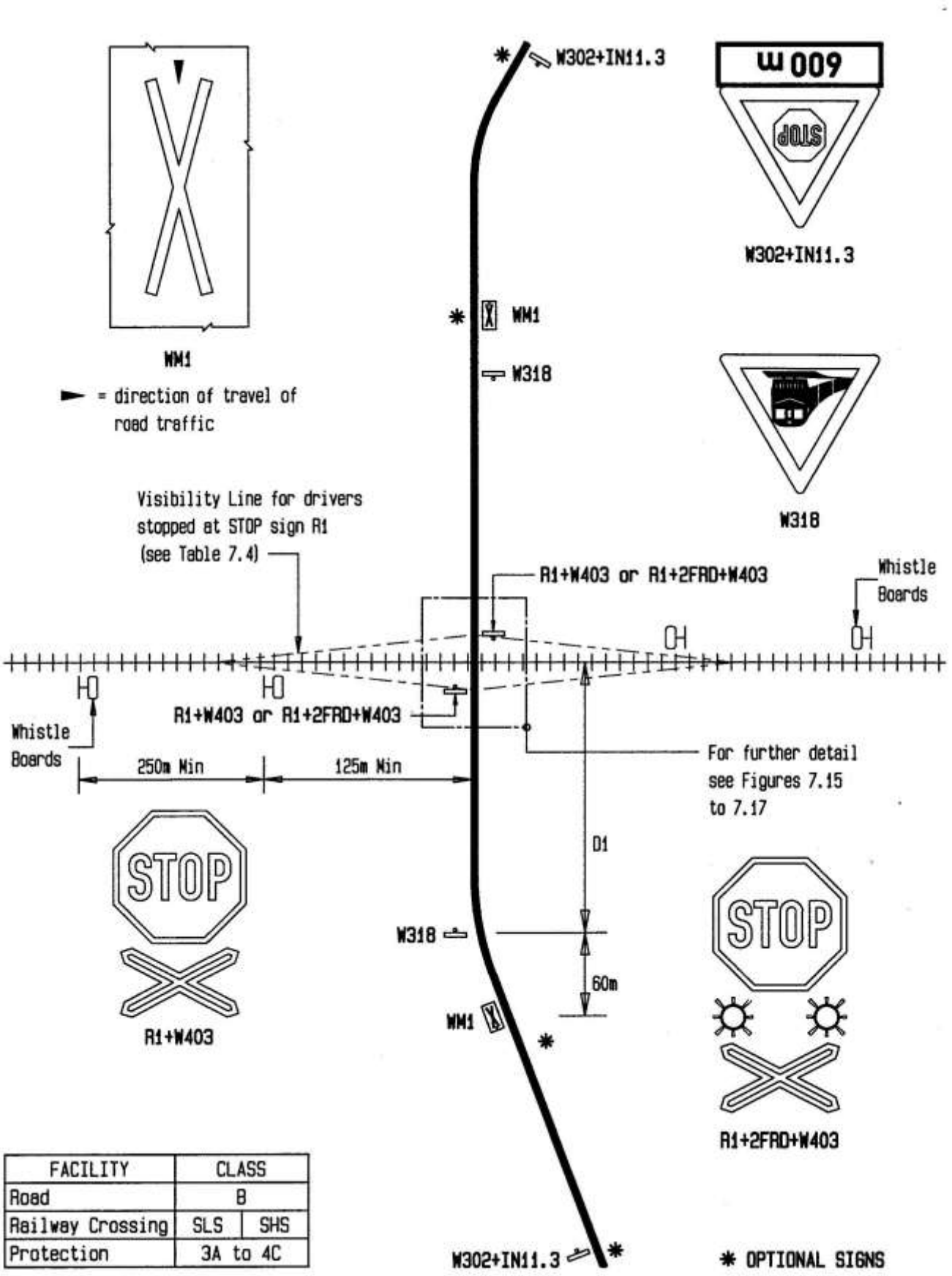

FACILITY	CLASS	
Road	B	
Railway Crossing	SLS	SHS
Protection	3A to 4C	

Fig 7.7 **Class “B” or Rural Road Railway Crossing**

7.3.5 Overhead Electrical Power Cables

1 The detail in Figure 7.8 is as given in Figure 7.6 but for the addition of optional ELECTRICAL SHOCK advance warning sign W361 and the provision of height gauges in advance of the actual power cable at the crossing. It is recommended that, when both are used, advance warning signs W318 and W361 be mounted on the same support to gain benefit from the message association of the two signs. The additional signs illustrated are appropriate irrespective of the road class, railway crossing class or other level of protection or control provided (see Table 7.2 and Figure 7.4).

For further details see Sections 7.3.4 and 7.3.6, and Figures 7.16 to 7.18 in Section 7.5.

2 It should be noted that sign W361 is provided as a warning to road users including drivers, their passengers, and pedestrians, about the risk of raised objects contacting the overhead electrical power cables. SABS sign WW7 (see Subsection 7.3.6 and Figure 7.19) gives the same message to service workers attending to the overhead electrical power cables and is a very small sign not clearly visible to road users on the ground.

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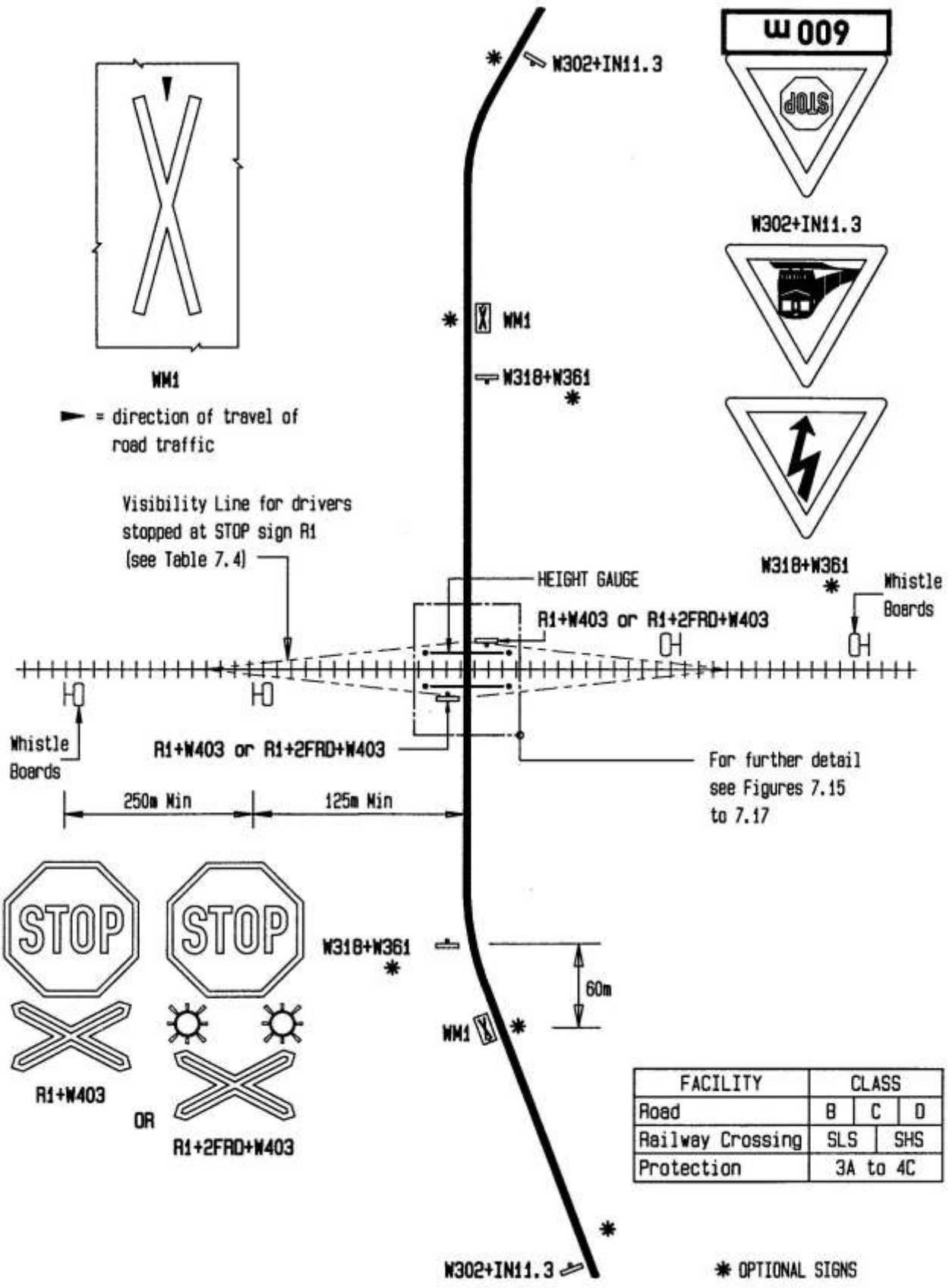

FACILITY	CLASS		
Road	B	C	D
Railway Crossing	SLS		SHS
Protection	3A to 4C		

Fig 7.8 **Signing for Overhead Electrical Power Lines**

7.3.6 Height Restricted Overhead Electrical Power Cables

1 Full details on the provision of height gauges is given in Section 7.5.

2 When overhead electrical power cables are present the following signing should be provided **in relation to the power cable and the preceding height gauge**:

(a) when the power cable is above 5,1 m use SABS sign WW7 on the height gauge;

(b) when the power cable is between 4,7 m and 5,1 m above rail level use SABS sign WW7 and two W401 signs (pointing "downwards") **on the height gauge** and sign W320 in advance of the crossing;

(c) when the power cable is below 4,7 m above rail level use sign R204 and WW7 plus two W401 signs on the height gauge and sign W320 in advance of the crossing.

3 Figure 7.9 illustrates the need to warn drivers well in advance of such a situation so that they may choose an alternative route. MAP-TYPE DIRECTION sign GD9 may be designed to illustrate the specific detail of the alternative route when this is simple. If the alternative route is complex, supplementary guidance signs may be necessary. This signing treatment is recommended for any road carrying over 300 vehicles per day (Class B). Sign GD9 should carry a SUPPLEMENTARY PLATE sign IN11.3 indicating the distance to the height restriction.

4 For further details of the basic and optional signing for the actual rail crossing see Subsection 7.3.4.

5 Advance warning ELECTRICAL SHOCK sign W361 may be specified in addition in all cases. It should be noted that sign W362 is provided as a warning to road users, including drivers, their passengers, and pedestrians about the risk of raised objects contacting the overhead electrical power cables. SABS sign WW7 gives the same message to service workers attending to the overhead electrical power cables and is a very small sign not clearly visible to road users on the ground.

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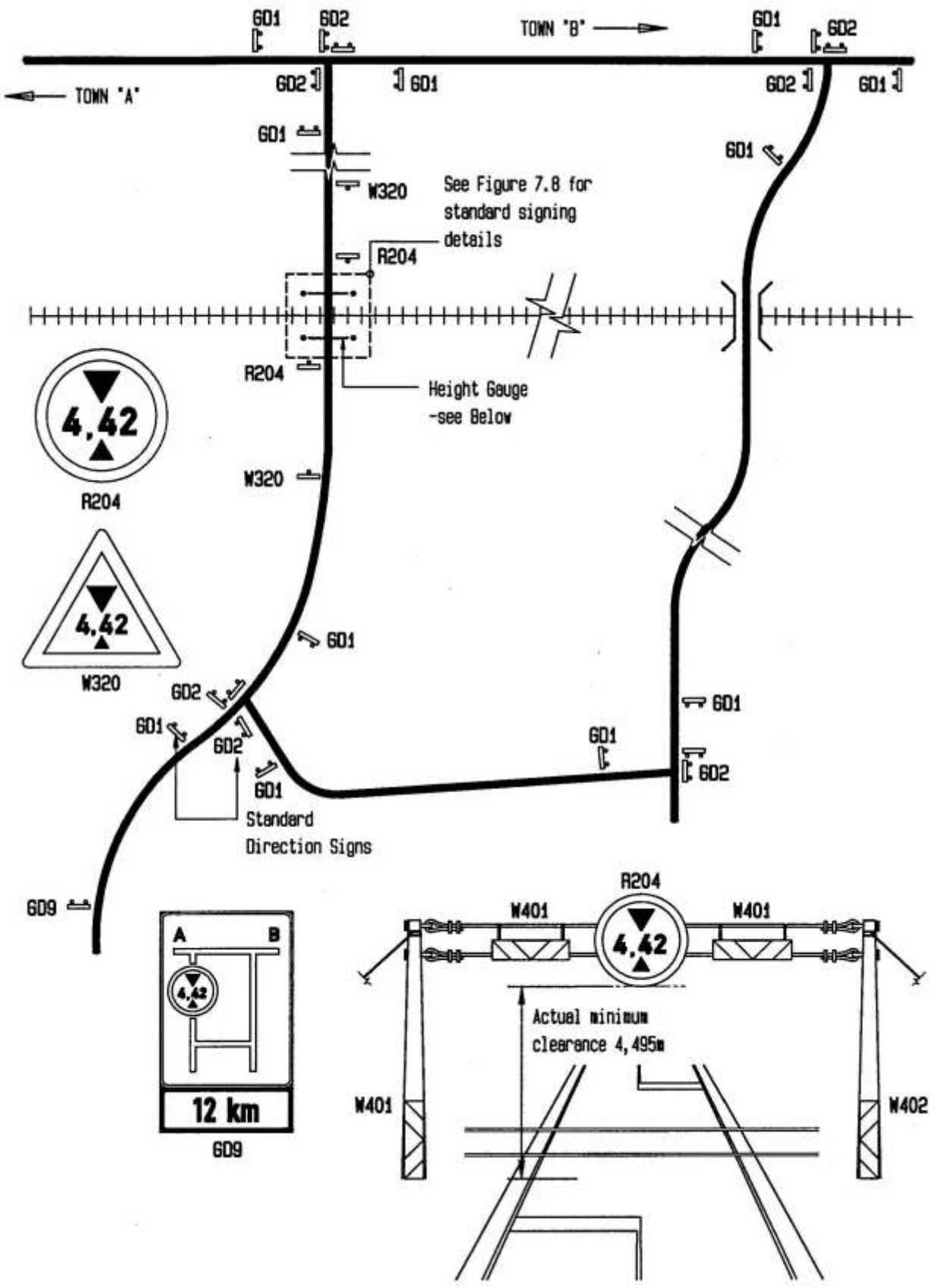

Fig 7.9 **Signing for Low Level Overhead Electrical Power Lines**

7.3.7 High Accident Frequency Crossings

1 Figure 7.10 shows examples of high visibility signs which may be used at railway crossings which are classified as above average hazards. Such signing treatments represent cost-effective interim safety solutions until such time as grade separation of the crossing may be possible. This type of treatment is equally applicable in an urban area even though vehicle approach speeds are likely to be lower. The use of FLASHING YELLOW warning signals SS3 with such signs is recommended.

The additional signs illustrated are appropriate on safety grounds irrespective of the class of road. They are most likely to be warranted at SHS or MHS classes of railway crossing (see Table 7.1) and/or at crossings with a protection classification of 4A or higher (see Table 7.2 and Figure 7.4).

For details of the actual crossing area see Figures 7.15 to 7.18.

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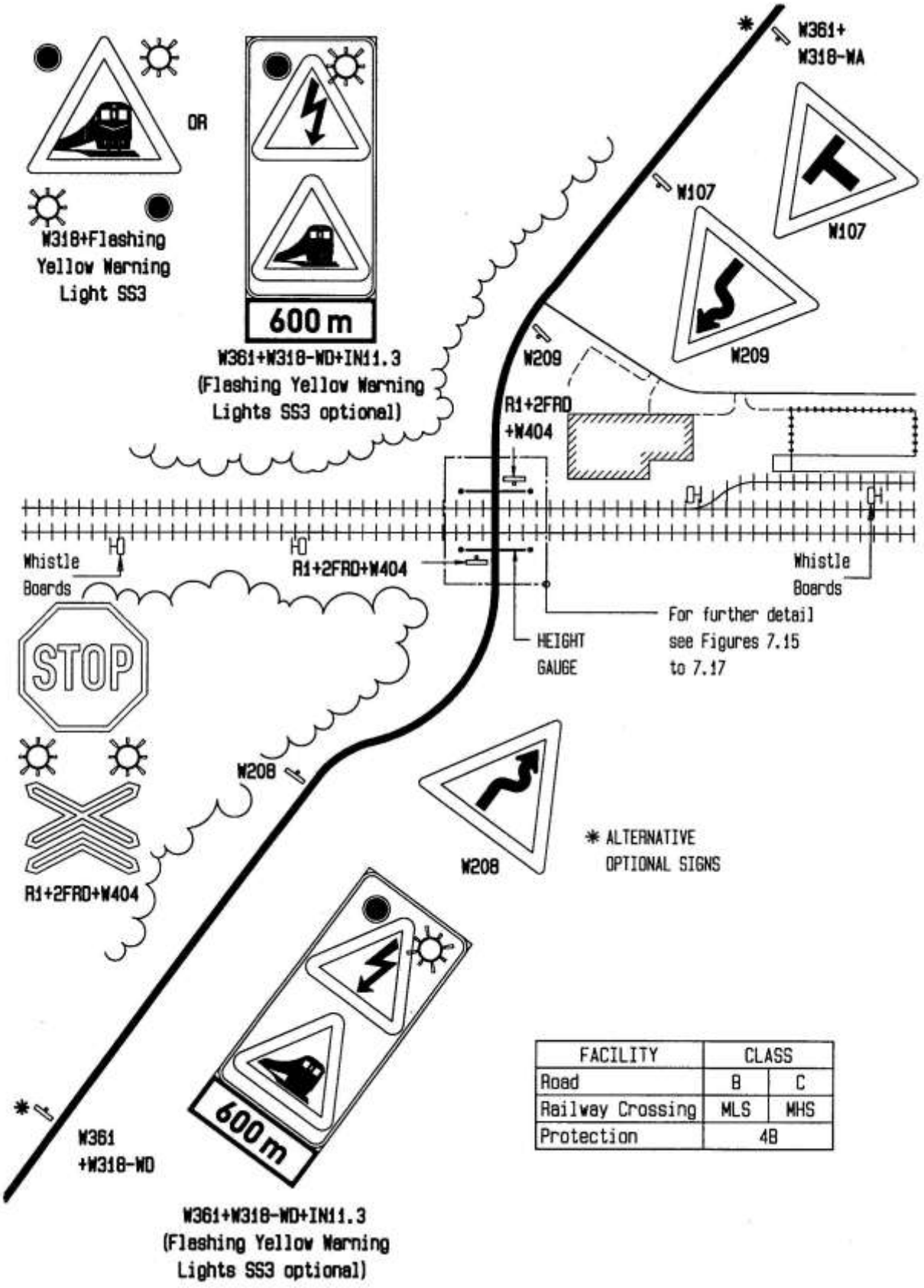

FACILITY	CLASS	
Road	B	C
Railway Crossing	MLS	MHS
Protection	4B	

Fig 7.10 Signing for High Accident Frequency Locations

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7.4 SIGNING APPLICATIONS FOR URBAN SITUATIONS

7.4.1 General

1 The applications of signs illustrated in Figures 7.11 to 7.14 are appropriate to very specific types of urban rail/road crossing situations. These examples should be considered as additional to the signing and control methods given in Section 7.3 for rural situations which are equally relevant in many urban circumstances provided due note is taken of train and vehicle operating conditions and their effects on the choice of signs and the sign positions. Individual isolated crossings, particularly if they are located in the outskirts of an urban area on urban Class "D", "C" or "B" streets, can be treated as covered by Figures 7.6 and 7.7. The balance of figures in Section 7.3, are also appropriate in principle for situations such as the presence of overhead electrical power cables or high accident locations.

2 The choice of the mode of control for an urban railway crossing will be dictated by a combination of the following factors:

(a) road traffic volumes;

(b) road to rail visibility (which will commonly be limited by development around the road/rail crossing);

(c) frequency and speed of train movements.

It is likely that urban railway crossings will operate with significantly lower train and vehicle approach speeds than rural crossings, but are conversely likely to have higher road and rail traffic volumes. The net result of these operational characteristics is that a large percentage of **mainline** railway crossings in urban areas will require the installation of FLASHING RED DISC signals plus STOP sign R1 control.

3 Since the potential for train/vehicle conflicts is somewhat greater at urban crossings than rural crossings the level of signing at main line urban crossings should commonly include the signs classified as optional for rural crossings.

4 As Figures 7.11 and 7.14 illustrate, however, many railway crossings in urban areas will only be provided with the minimum hazard marker signs and no permanent form of vehicle control. This situation is only acceptable when train movements such as industrial area shunting are supported by flagmen or when the operations are within a railway station or marshalling yard environment. Where appropriate, an indication is given of the likely road classification, rail crossing classification (see Table 7.1) and the level of protection or protection classification (see Table 7.2 and Figure 7.4).

5 The generally visually "busy" environment common in urban areas may make the position of a railway crossing difficult for drivers to determine. It should therefore be a primary objective to ensure that all crossings are adequately visible. The use of sets of DANGER PLATE hazard marker warning signs W401 and W402 is a very economical and effective means of achieving higher visibility. In particularly hazardous locations, where there are numerous night-time train movements, it may ultimately be necessary for the safe operation of a crossing to install street lighting. Lighting located at the crossing only should not be provided on an isolated basis, without properly designed approach lighting

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7.4.2 Industrial Siding Railway Crossings

1 All industrial sidings which cross roads shall be appropriately identified on each approach by a RAILWAY CROSSING hazard marker warning sign W403 or W404. These signs may be provided with a rectangular backing board for greater resistance to damage. The backing board may be provided with a semi-matt grey finish. If it is evident that drivers misjudge the number of rail lines to be crossed a SUPPLEMENTARY PLATE information sign IN11.4, with a message such as "4 lines" should be fixed below sign W404. Figures 7.11 and 7.14 illustrate these basic signing principles. This type of crossing will normally be classified as SSH or MSH (see Table 7.1) although it is also possible that such a crossing could include a mainline with shunting lines. The level of protection commonly appropriate at industrial crossings is Class 1 (see Table 7.2 and Figure 7.4).

2 Traffic control should normally be achieved at this type of railway crossing using FLAG signals SS2. This means that at all other times that a FLAG is not displayed vehicle drivers may cross the lines without stopping. All individual train shunting operations should be accompanied by a flagman capable of acting for both road approaches. If this is not practical then two flagmen should be used, one for each approach. All flags must be clean and of a bright red or red-orange colour. A flag may be replaced by a portable RED light signal if night time shunting is required and vehicular traffic volumes are low.

3 If manual control of such crossings is not safely manageable, at night-time for instance, then traffic control must be automated using STOP signs R1 plus FLASHING RED DISC signals in addition to signs W403 or W404.

4 The only additional signing which may be required is the use of DANGER PLATE hazard marker warning signs W401 and W402 to better define the width and position of the crossings, or standard advance warning signs appropriate to a particular roadway approach condition such as a sharp bend (see Figure 7.16).

5 If individual sidings or shunting lines are provided with overhead electrical power cables height gauges and advance warning signs W356 should be installed.

Checklist

The following factors should be checked when signing a new industrial siding railway crossing or when reviewing existing signing:

- ❑ is FLAG control going to be manageable in terms specific site conditions and train and vehicle traffic volumes and manpower resources?
- ❑ if multiple lines are present is more than one line likely to be in use at one time?
- ❑ will night-time shunting operations occur?
- ❑ are height gauges required due to presence of overhead electrical power cables?
- ❑ are crossing positions adequately identified by W403 or W404 signs?
- ❑ are there any conditions which require the provision of advance warning signs e.g.:
  - a sharp bend (with possibly hidden queues of waiting vehicles at a crossing);
  - boom protection (see Figure 7.17);
  - overhead electrical power cables (see Figures 7.8 and 7.19);

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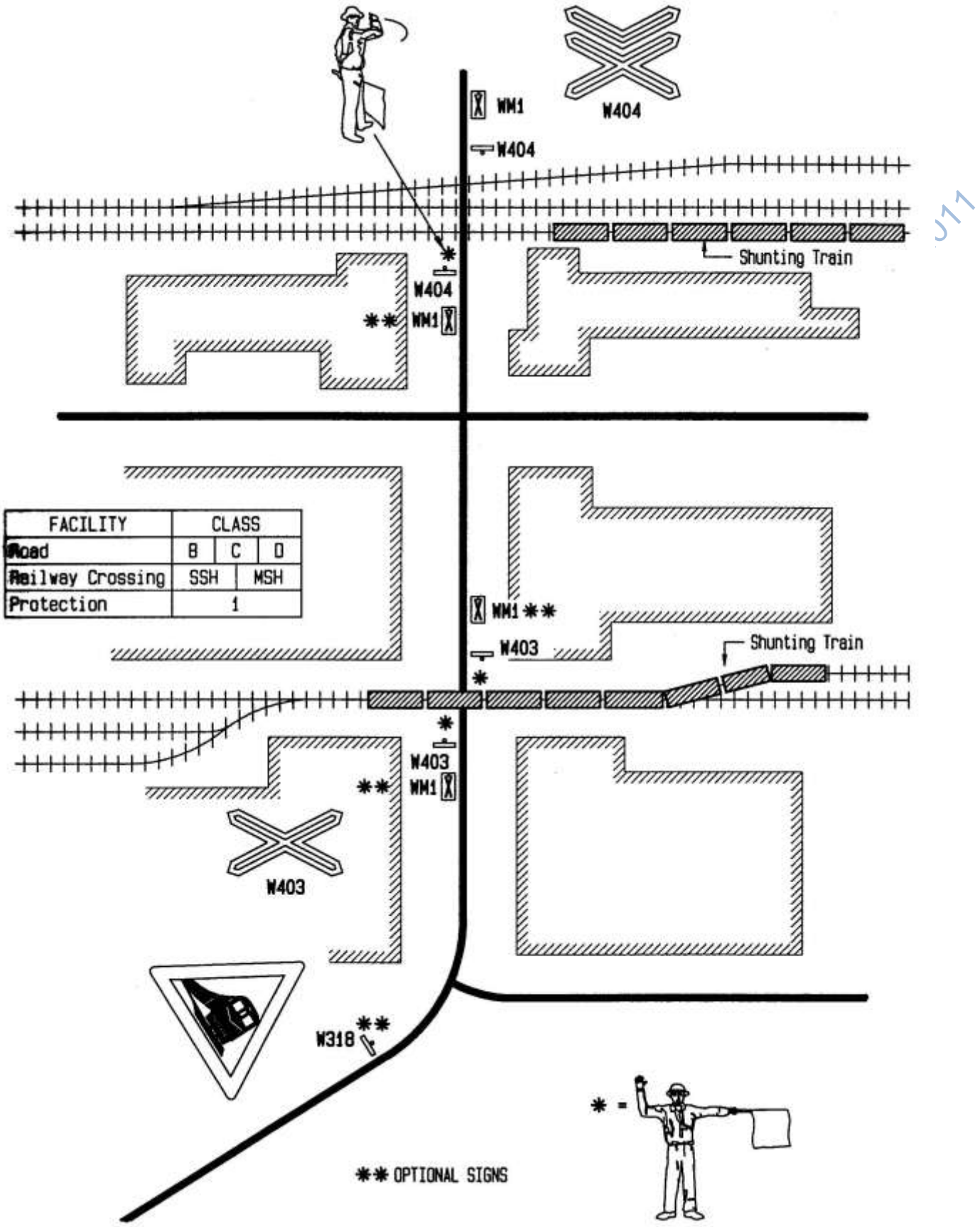

Fig 7.11 **Industrial Siding Railway Crossing**

7.4.3 Class "B" Urban Street Crossings

1 Railway crossings involving Class "B" numbered urban routes are not likely to occur frequently. However, in large towns or cities, crossings on such routes will almost certainly be subject to large volumes of vehicular traffic and in smaller towns the vehicular traffic will probably include significant percentages of long-distance travellers who will not be familiar with local conditions. Visibility of such crossings must therefore be optimised and operational safety maximised by use of the most effective control facilities practicable.

Urban Class "B" routes may commonly be multi-lane roadways. This will add to the complexity of crossing control measures. Figure 7.12 shows a typical four-lane urban road/rail crossing.

2 Traffic control at a Class "B" urban street railway crossing should conform to the principles given in Subsection 7.3.4 for similar rural crossings, subject to adjustment in the positions of signs to take into account different orders of vehicle approach speeds. The use of STOP sign R1 plus FLASHING RED DISC signal control will almost always be required for a Class "B" street crossing, particularly if the street is a multi-lane street. This represents a Class 4C or Class 4D level of protection (see Table 7.2 and Figure 7.4). Only if full visibility of approaching trains is available in accordance with the requirements of Tables 7.3 and 7.4 and other factors influencing driver performance are favourable (see Volume 1, Chapter 1), may a lower level of control be considered.

3 A high volume urban railway crossing may well warrant the installation of boom protection. Boom protection increases the visual impact of the crossing to the first drivers to approach it and also controls the release of vehicles when the lines are once more clear for crossing (Class 5 protection). In addition to FLASHING RED DISC signals and booms it may also be beneficial to install alarm bells, although the environmental impact of such a measure will have to be carefully assessed.

The use of high visibility signs may also be warranted as indicated in Figure 7.12. A multi-lane approach will reduce the effectiveness of standard sized advance warning signs. The signs displayed should take into account the prevailing conditions, such as:

(a) overhead electrical power cables (see Figures 7.17 and 7.19);

(b) boom protection ("gates" - see Figure 7.17);

(c) high speed trains;

(d) low level power cables (see Figure 7.19).

Additional road markings are also recommended. Multi-lane approaches should be treated as for a standard multi-lane signalised junction. RAILWAY CROSSING warning marking WM1 may be used several times, in each lane, to improve awareness of the approaching crossing.

Checklist

When considering the use of optional signs at a Class "B" urban street railway crossing the following checklist may be of assistance:

- ❑ is train visibility such that a mode of control other than STOP sign R1 plus FLASHING RED DISC signals is being considered? - if so additional advance warning may be warranted;
- ❑ if the crossing is an existing one under review does it have a poor accident record? - if so provision of boom protection should be considered;
- ❑ are overhead electrical power cables in place? - if so advance warning must be given and a height gauge provided;
- ❑ do pedestrians cross the railway lines in significant numbers? - if so separate footpaths should be provided with specific signing for pedestrians (see Figure 7.18);
- ❑ if the road has multiple lanes, and there is a significant percentage of trucks and buses, consider providing high visibility advance warning signs (see Volume 1, Section 1.8).

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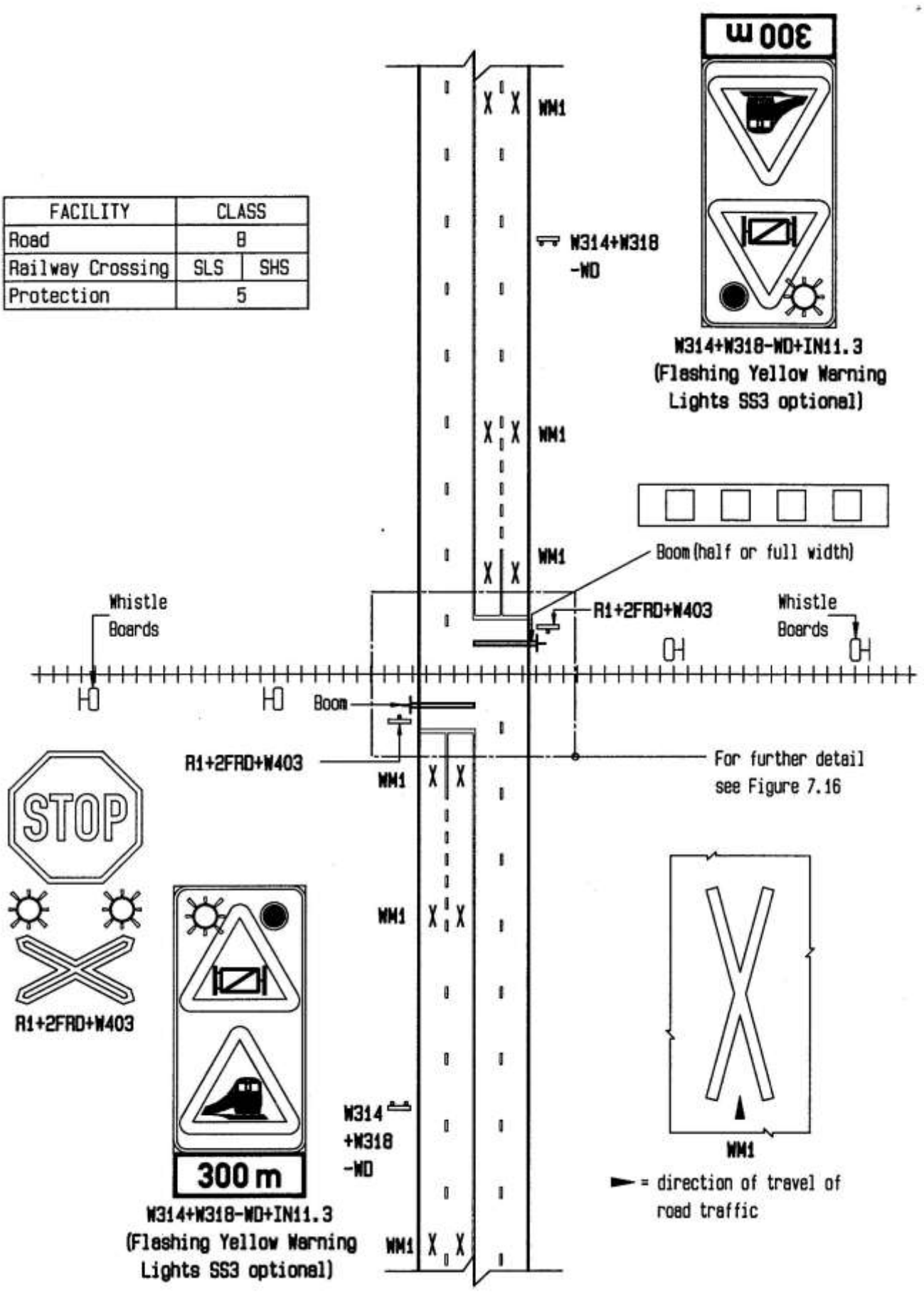

Fig 7.12 Class "B" Urban Street Road Railway Crossing – Multi-lane Street

7.4.4 Urban Crossing of Parallel Railway Lines

1 Figure 7.13 shows an urban situation which is particularly difficult to sign with clarity. The railway lines are commonly very close to the parallel road so that very little warning can be given on one of the crossing road approaches if the presence of the lines is not obvious from the parallel road. Special attention must therefore be given to the need for optional signing.

2 The mode of traffic control must conform to the normal requirements for the use of YIELD sign R2, STOP sign R1, or STOP sign R1 plus FLASHING RED DISC signal. A crossing of this nature could occur on almost any Class "B", "C" or "D" urban street although it is less likely on a Class "B" street. The class of railway crossing could range from an SSH to an MLS (see Table 7.1) and the level of protection from a Class 3A, which is illustrated, to a Class 5 (see Table 7.2 and Figure 7.4).

3 When parallel road and rail lines are close together it may be advisable to provide a specially designed DIAGRAMMATIC sign to inform drivers of the junction/railway crossing configuration. This sign may be warranted for a junction with a closely spaced railway line when otherwise the junction itself would not normally warrant an advance warning sign.

4 Special attention must also be paid to warning pedestrians **and other crossing users** if overhead electrical power cables are present. This may require a very specific supplementary text message on SUPPLEMENTARY PLATE signs IN11.3 such as "BEWARE - Antennae and Fishing Rods". This circumstance may occur in a number of railway crossing situations for both pedestrians and vehicles. The relevant authorities should adhere to a standard treatment so that users of such crossings can become familiar with a consistent message.

Checklist

All standard aspects appropriate to the installation of signs at a railway crossing should be checked (see checklists in Subsections 7.3.2 or 7.3.3). In a situation similar to that illustrated in Figure 7.13, the following aspects should also be considered:

- ❑ can drivers travelling on the parallel road reasonably be expected to know there is a railway crossing immediately around the corner?
- ❑ are overhead electrical power cables likely to be a risk because of limited approach sight distance?
- ❑ do pedestrians represent specific hazard circumstances?

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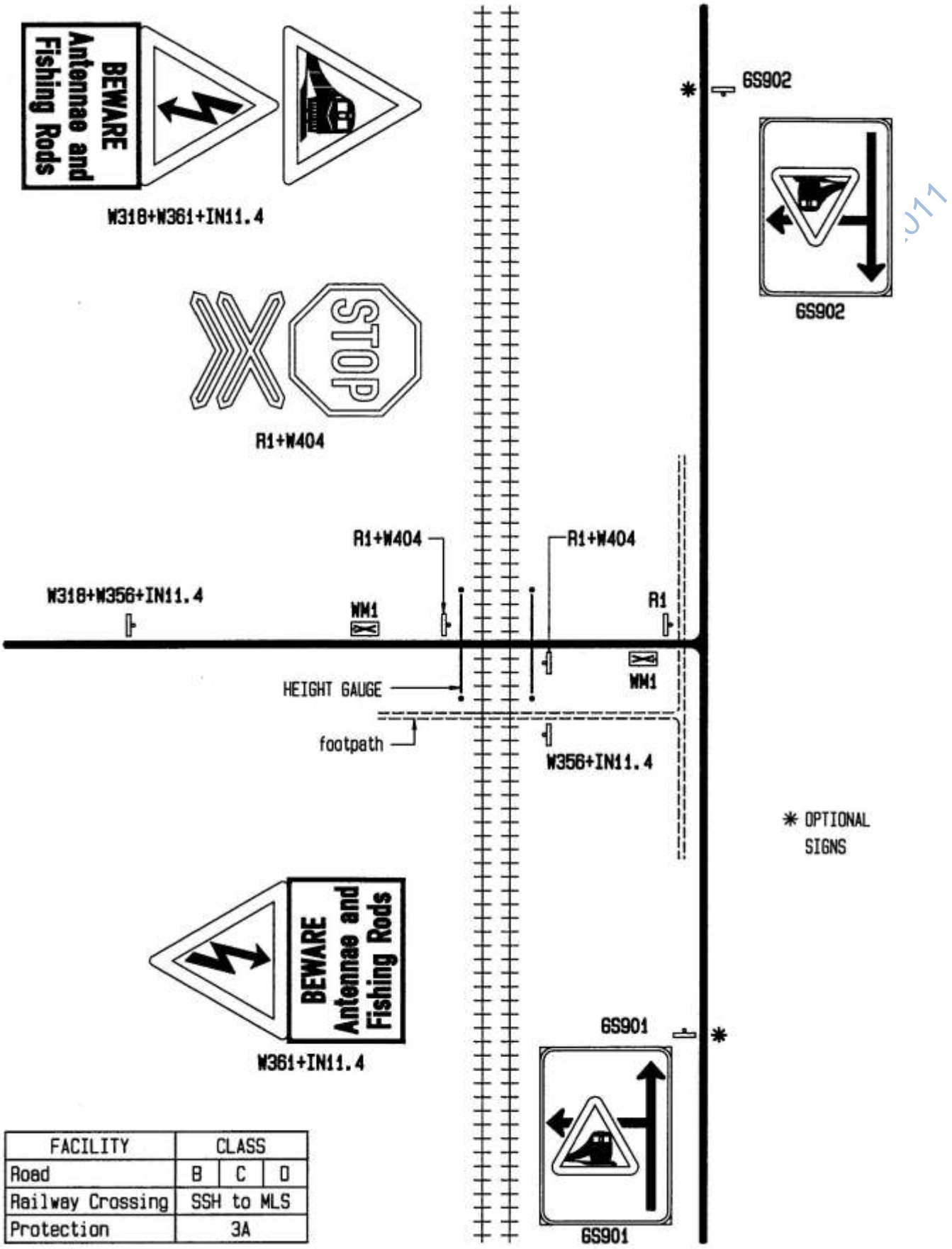

FACILITY	CLASS		
Road	B	C	D
Railway Crossing	SSH to MLS		
Protection	3A		

Fig 7.13 **Urban Crossing of Parallel Railway Lines**

7.4.5 Railway Station or Siding Environments

1 Whilst not widely accessible to the public, railway station or siding environments do commonly have internal roadways used by vehicles which cross railway lines, often under sub-standard circumstances compared to those found at public railway crossings. Personnel charged with the safety of such environments should consider the principles covered in this chapter and, if risks to vehicle drivers are particularly higher than normal, limited signing should be considered. Generally the lowest level of protection, namely Class 1, is appropriate.

2 For example, a specific hazard, which may never be obvious to drivers, is that some lines may carry fast or even relatively fast trains (compared to the rest of the general siding environment). The speed differential between different such trains and normal shunting trains may be difficult to determine, making the provision of appropriate signs justifiable. Alternatively, when several lines are to be crossed the space to accommodate vehicles between sets of lines may be limited. For safety, vehicles must be able to fully clear multiple line crossings. In such instances it may be advisable to add specific text messages to the W403 or W404 hazard markers. Typical messages are illustrated in Figure 7.14.

3 When overhead electrical power cables are present, even if not over all lines, the use of ELECTRICAL SHOCK advance warning signs W361 with SUPPLEMENTARY PLATE signs IN11.4 carrying a message such as "BEWARE - Electrified area" is recommended. Height gauges should also be positioned at the beginning and end of such an access road (see Figures 7.3 and 7.14).

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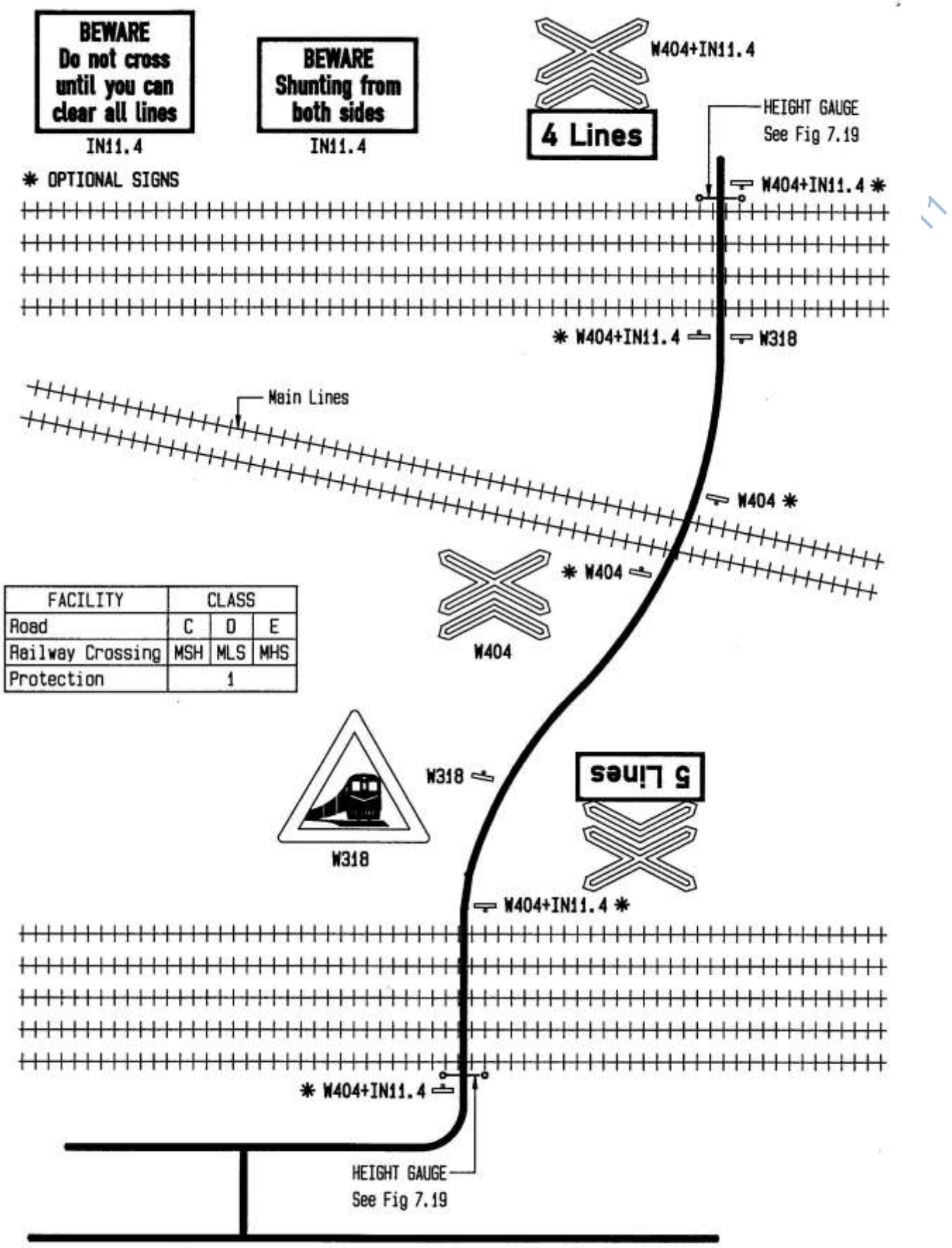

Fig 7.14 **Signing for Railway Siding Environments**

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7.5 ENHANCED STANDARD DETAILS

7.5.1 General

1 The details in this section apply to the examples covered in Sections 7.3 and 7.4. They provide details appropriate to the localised area of rural and urban railway crossings. In effect this means approximately the area contained within the intersecting road and rail reservations.

2 The road signs, road markings and traffic signals within this area are there essentially to perform one of two functions:

(a) firstly to identify clearly to drivers the potential hazard that the railway crossing represents and to indicate accurately its position;

(b) secondly to provide a mode of vehicular control for use at the crossing.

As indicated in the earlier figures all railway crossings must have sufficient signs to fulfil the first function. Signs for the second function may be omitted for low speed, low frequency crossings which are controlled by flagmen but should be provided in accordance with the crossing and protection classifications given in Tables 7.1 and 7.2.

3 Figures 7.15 to 7.18 are typical situations. Many variable factors may be involved which will call for detailed changes, but the basic principles illustrated should be noted and adhered to. The classes of road , crossing, and protection illustrated are as follows:

(a) Figure 7.15:
Class "D" or "E" gravel road, Class SLS crossing, and Class 2A, 2B or 3A level of protection;

(b) Figure 7.16:
Class "B" or "C" road, Class MLS crossing and Class 3A to 3D level of protection;

(c) Figure 7.17:
Class "B" road, Class MHS crossing, and Class 5 level of protection.

4 The following road markings are recommended on all surfaced road approaches to railway crossings:

(a) the dividing line between opposing traffic streams shall be marked as a NO OVERTAKING LINE marking RM1 or a NO CROSSING LINE marking RM2 for a minimum of 96m in rural environs and 48m in urban areas - the lines shall commence at the transverse STOP LINE or YIELD LINE and shall not continue over the railway crossing - longer lengths of line may be used;

(b) STOP LINE marking RTM1 or YIELD LINE marking RTM2 should be marked a minimum of 4,5m from the nearest edge of the line of rail - lines RTM1 or RTM2 may be placed further from the rail lines but this will affect sight distance to approaching trains;

(c) for roads provided with shoulders EDGE LINE marking RM4.1 should be continuous over the crossing to provide visual continuity of the road;

(d) "STOP" WORD marking GM7 may be provided between 1m and 5m prior to the STOP LINE marking - the marking may be repeated in the form "STOP AHEAD", for emphasis, approximately at the appropriate stopping sight distance for the approach speed from the STOP LINE;

(e) RAILWAY CROSSING warning marking WM1 should be provided according to the distances given in Table 7.6 (distance C1) - the marking may be repeated for emphasis near the start of the RM1 or RM2 marking to further inhibit overtaking on the approach to the crossing.

5 Figure 7.18 shows two typical situations in which signs may be required to control or warn pedestrians. Detail 7.18.1 shows a typical pedestrian footpath railway crossing with signs provided specifically for the attention of pedestrians. The example of a pedestrian crossing in a station environment between platforms, Detail 7.18.2, utilizes signs developed by the South African Rail Commuter Corporation for pedestrian signing at stations.

6 Figure 7.19 gives details of the construction and signing of a height gauge.

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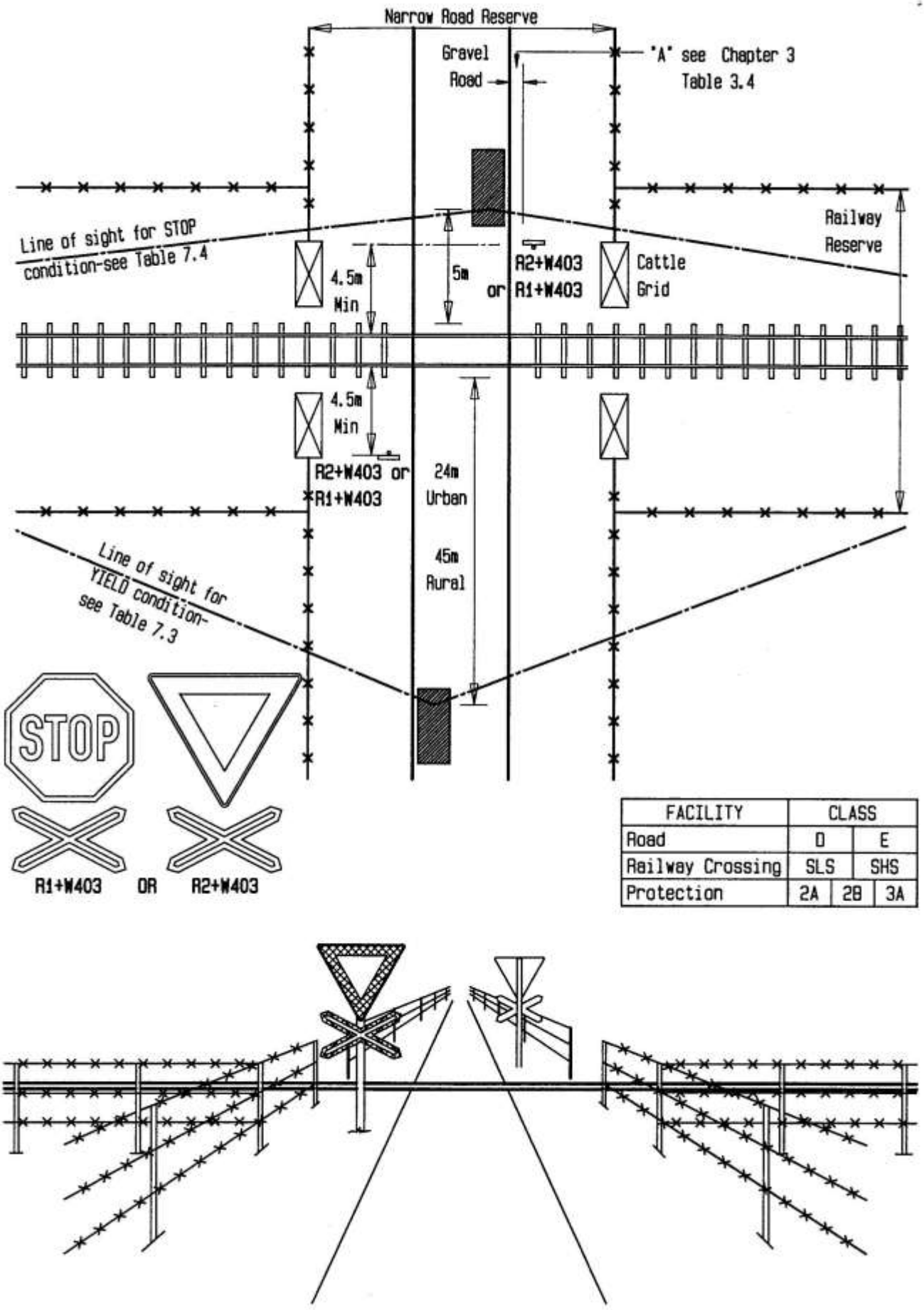


FACILITY	CLASS		
Road	D		E
Railway Crossing	SLS		SHS
Protection	2A	2B	3A

Fig 7.15 Local Detail at a Gravel Road Railway Crossing

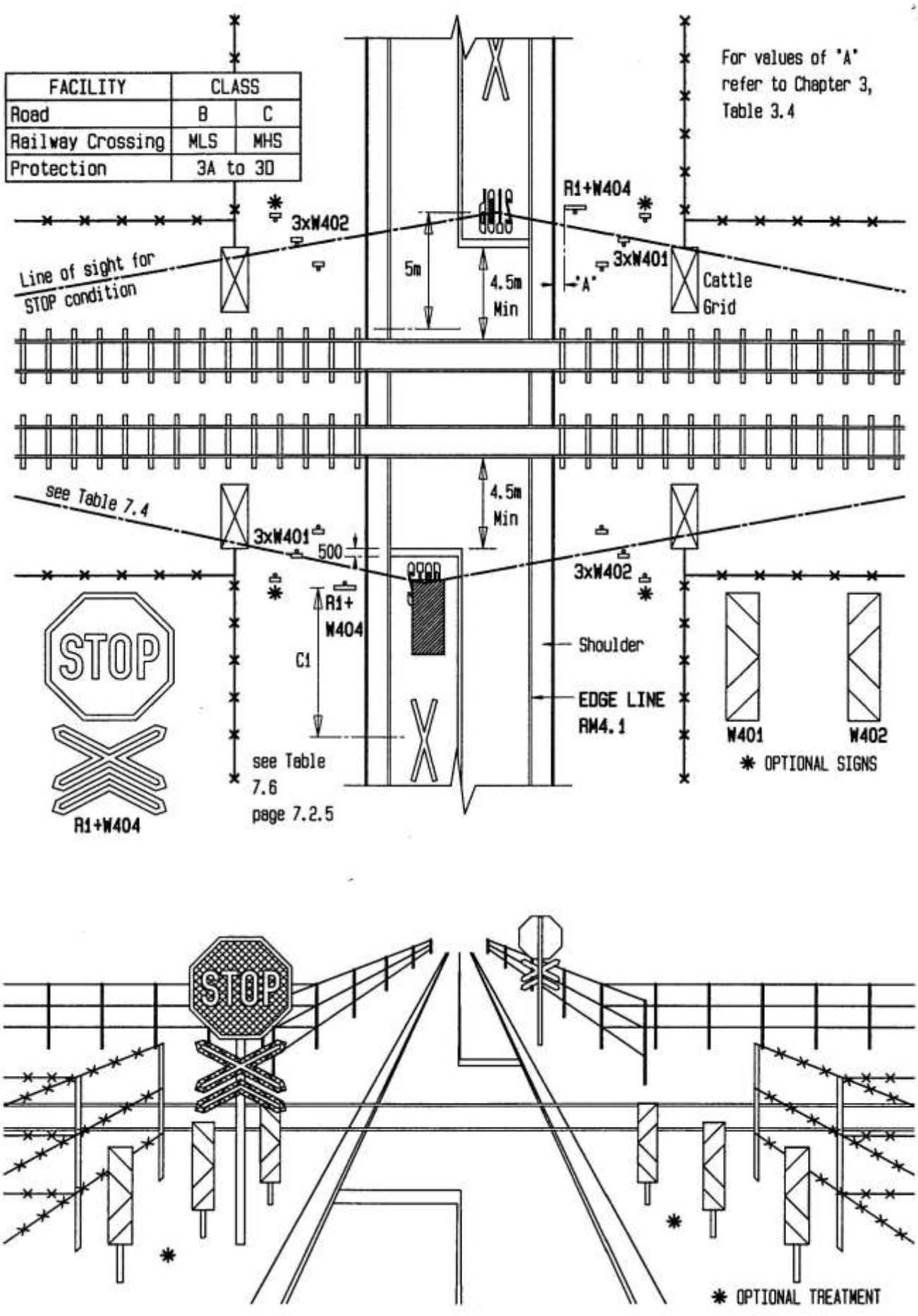
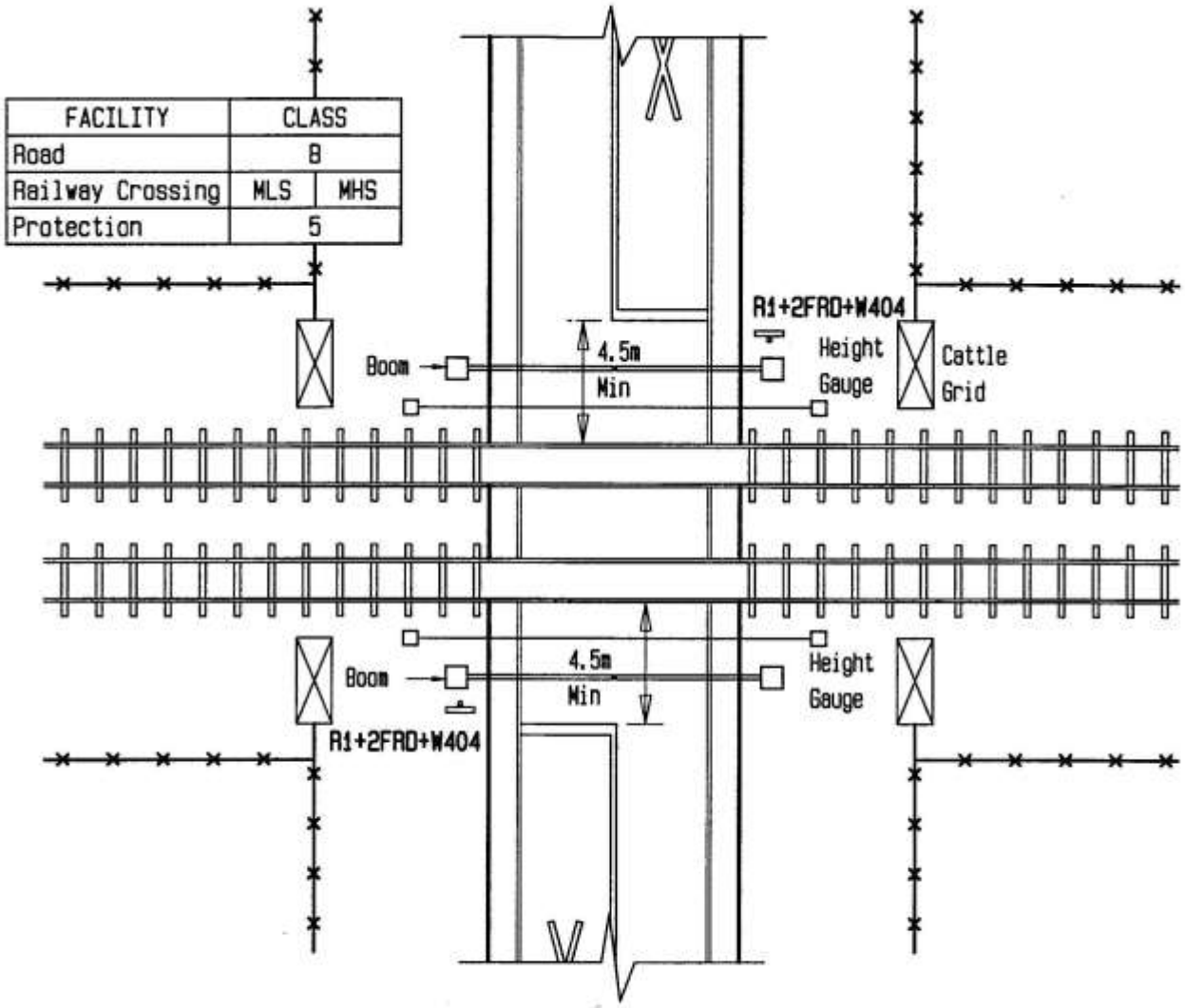


Fig 7.16 Local Detail at a Rural Surfaced Road Railway Crossing



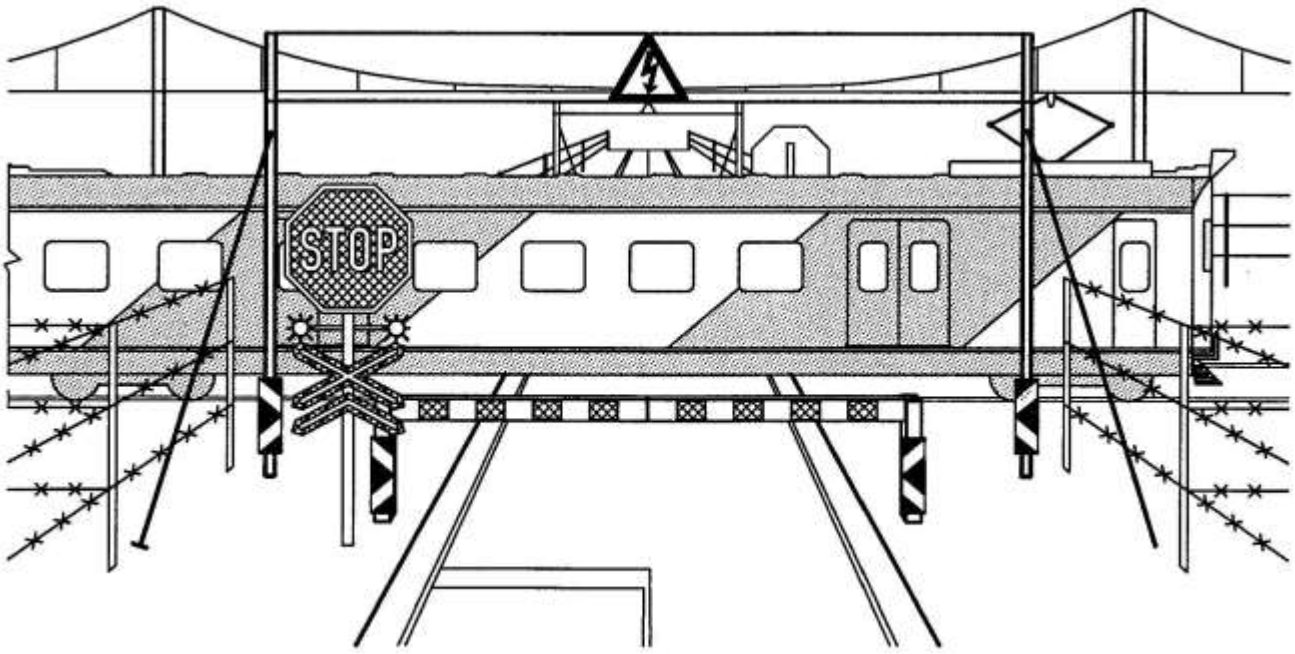
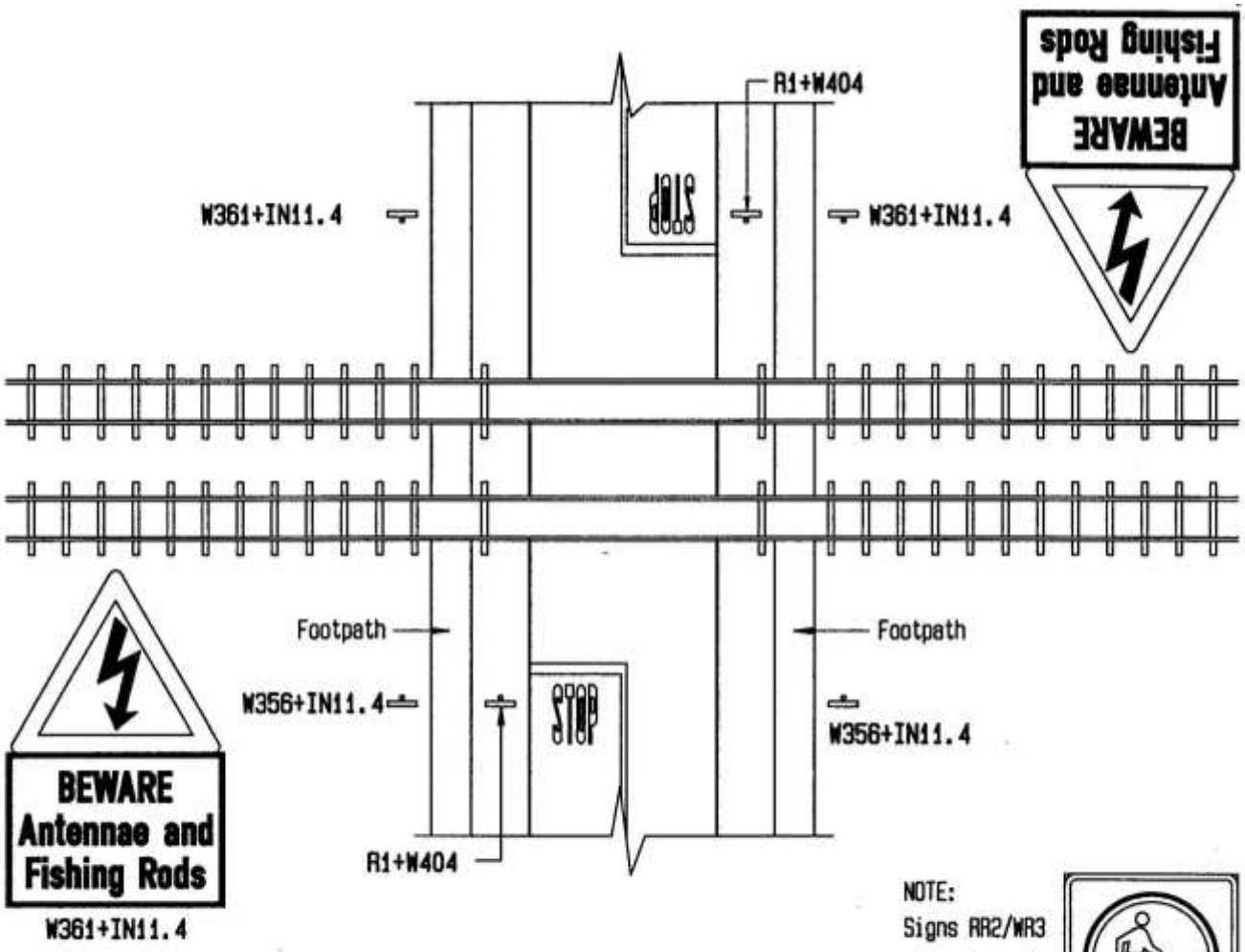


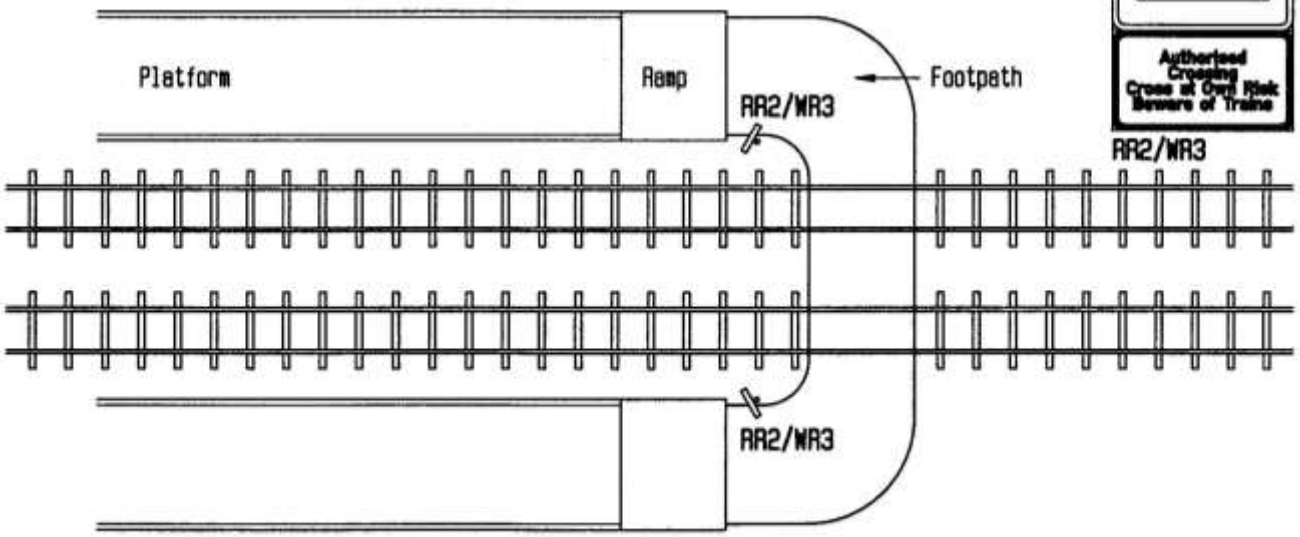
Fig 7.17 Local Detail at Boom Protected Railway Crossing



Detail 7.18.1 Typical Pedestrian / Rail Crossing

NOTE:
Signs RR2/WR3 are not road traffic signs but are used on railway property.

RR2/WR3



Detail 7.18.2 Typical South African Rail Commuter Corporation Pedestrian Signs

Fig 7.18 Signing for Pedestrians at Railway Crossings

7.5.2 Height Gauges and Sign Display Details

1 Details 7.19.1 to 7.19.3 in Figure 7.19 give various criteria for the provision of a height gauge and the correct placing of retroreflective signs.

2 The Road Traffic Act, Act 93 of 1996, Section ** requires the provision of a height gauge in advance of any overhead electrical power cable over a railway crossing. The principle purpose of this gauge is to make drivers aware that high aerials or similar devices may cause a flash-over from the power cable. The gauge should positioned between STOP LINE RTM1 and the railway line(s).

3 The height gauge wires must be positioned 300 mm below the level of the lowest point of the overhead electrical power cable for a 3 kV DC or a 25 KV AC power cable, and 500 mm below the lowest point of the overhead electrical power cable for a 50 KV AC power cable.

4 When the power cable has a minimum clearance H1 in excess of 5,1 m only SABS Symbolic Sign WW7 need be provided on the height gauge over each lane.

5 When clearance is between 5,1 m and 4,7 m two hazard marker signs W401 should be provided approximately 2 m either side of sign WW7. The height gauge should be preceded by advance warning sign W320.

6 If the power cable is lower than 4,7 m an appropriate prohibition HEIGHT LIMIT sign R204 plus two W401 signs shall be displayed on the height gauge and the installation should be preceded by advance warning sign W320. In this case, wherever possible, an alternative route should be signed to divert high vehicles around such a crossing (see Figure 7.9).

7 All measurements of H1 shall be made to the highest part of the road or rail surface.

8 In order to avoid specular reflection from fully retroreflective regulatory and warning signs all such signs must be rotated 3° away from an imaginary line taken at 90° from the road dividing line. Detail 7.19.3 indicates the amount of the offset required to achieve this degree of rotation for the common regulatory and warning sign sizes.

9 It should be noted that sign W361 is provided as a warning to road users including drivers, their passengers, and pedestrians, about the risk of raised objects contacting the overhead electrical power cables. SABS sign WW7 (see Subsection 7.3.6 and Figure 7.19) gives the same message to service workers attending to the overhead electrical power cables and is a very small sign not clearly visible to road users on the ground.

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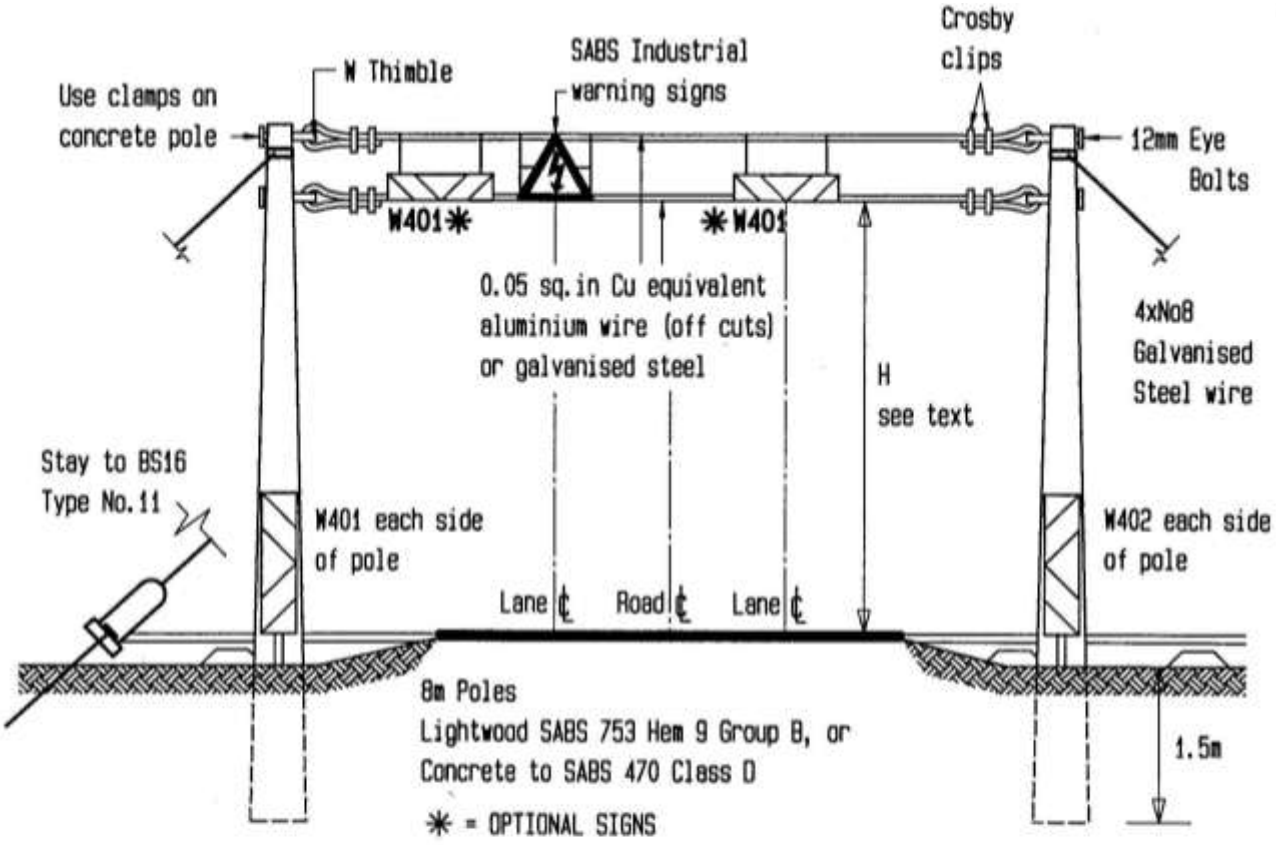
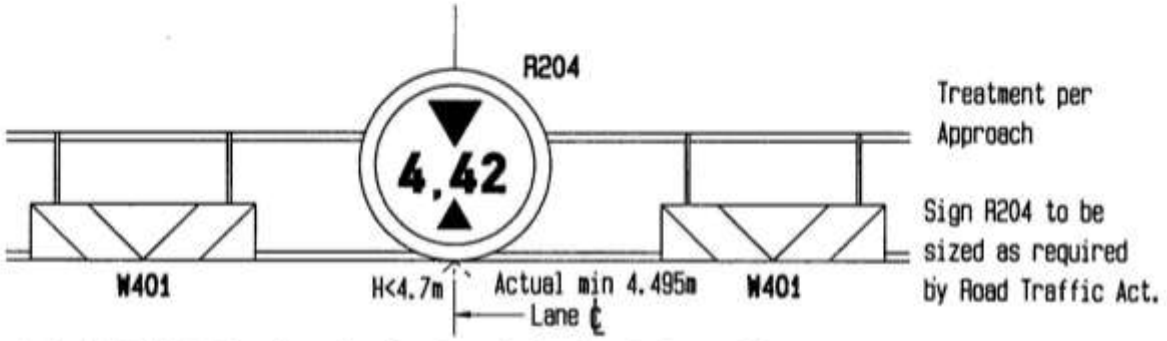
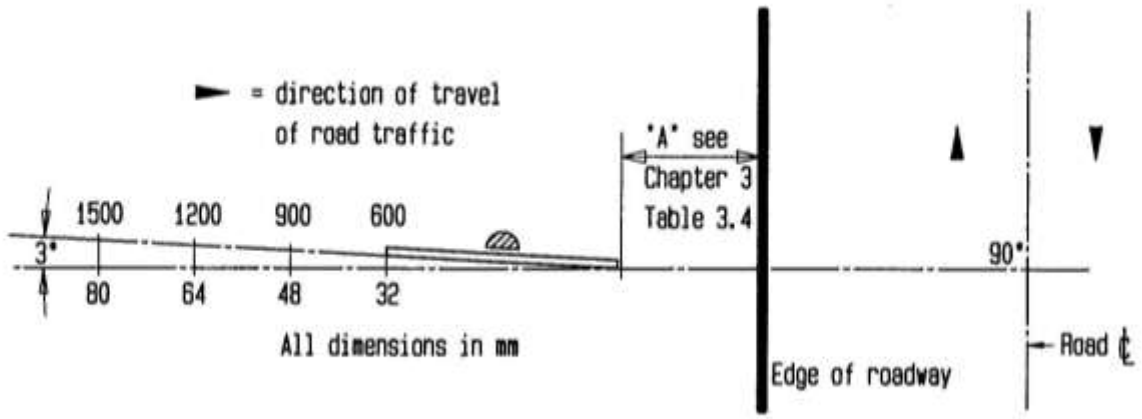


Detail 7.19.1 Standard Height Gauge Construction Details



Detail 7.19.2 Signing for Low Level Overhead Power Lines



Detail 7.19.3 Standard Offset for Small Road signs

Fig 7.19 Height Gauges and Sign Display Details

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PUBLIC TRANSPORT SIGNING

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8.3 Signing Applications for Terminals and Taxi Ranks

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CHAPTER 8:
PUBLIC TRANSPORT SIGNING

8.1 INTRODUCTION

8.1.1 General

1 The purpose of this chapter is to give guidelines on, and illustrate how, road traffic signs i.e. road signs, road markings and traffic signals, may be utilized collectively to sign for a wide variety of traffic management and control situations designed to satisfy the needs of users and operators of public transport.

2 Signing for public transport is primarily an exercise in the application of regulatory signs. Individual regulatory road signs and their functions are detailed in Volume 1, Chapter 2. Section 2.10 of that chapter summarises the principles involved and signs available.

3 So far as the content of this chapter is concerned the following classes of vehicle are included in the general description of road based "public transport":

(a) taxi (motor car, motor tricycle or motor quadrucycle);

(b) minibus;

(c) midi-bus;

(d) bus or Bus Rapid Transit (BRT);

(e) tour bus;

(f) tram or Light Rail Transit (LRT);

(g) high occupancy vehicle (HOV);

(h) "Authorized (Public Transport) Vehicles" indicated by permit.

4 **Taxis**, which are commonly metered, are included because, although they are not strictly a form of "mass" public transport, they tend to be subject to similar on-street management and control as the more traditional public transport vehicles. Taxi ranks are also commonly included at major transport modal transfer facilities.

5 This chapter uses the term **minibus** throughout since this is the legally defined term. All such references do, however, include what are colloquially known as "taxis" or "minibus-taxis". A **minibus** is defined in the Regulations to the Road Traffic Act, Act 29 of 1989, as a motor vehicle designed or adapted solely or principally for the conveyance of more than nine, but not more than 16 persons, including the driver.

6 A **bus** is defined in the Road Traffic Act as a motor vehicle designed or adapted for the conveyance of more than 16 persons including the driver (if any). A **midi-bus** is therefore a type of bus since it is designed to convey more than 16 persons and it can, unless required for management or operational purposes, automatically travel where a bus is permitted to travel and stop where a bus is permitted to stop. A **midi-bus** is, however, defined for signing purposes in Regulation 407 of Act 29 as a **bus** designed or adapted solely for the conveyance of not more than 35 persons, excluding the driver. Due to their chassis characteristics midi-buses can be manoeuvred in spaces which buses cannot negotiate. If an authority or operator wish to segregate classes of vehicle for any control or operational reasons signs are available for such purposes.

7 In a similar way a **tour bus** is a type of **bus** which is used solely or principally to convey tourists and, if required, specific signing may be used for the management or operation of tour buses.

8 There are no **trams,** or street-running light rail vehicles, operating at present. However, their use is under consideration and limited details of signing for LRT operations are included to assist designers.

9 **High occupancy vehicle** signing is also included although **HOV** operation may include private vehicles running within the specific local requirements of an HOV scheme. It should be noted that the definition of a **high occupancy vehicle**, given in Regulation 407 of the Act for signing purposes, describes a motor vehicle in which the number of occupants equals or exceeds the number indicated on the appropriate road traffic sign. Such a sign is HIGH OCCUPANCY VEHICLE RESERVATION regulatory sign R320. The number displayed on the sign may be as low as 3 (or even 2 if this is what the designers of the facility consider will result in an effective overall increase in vehicle occupancy). This display would therefore permit use by private motor cars with such a number of occupants. Alternatively a much higher number may be used to limit entry to an HOV facility to vehicles with large passenger capacities. The choice of occupancy level to be displayed is therefore entirely at the discretion of the designers of the HOV scheme. However, in terms of the definition, an HOV lane cannot be used in a peak hour "return cycle" mode by empty HOV's (see Subsection 8.5.3).

10 "Public transport" vehicles are not defined in road traffic legislation as such. If an authority wishes to provide a facility for use by vehicles which it considers to be "public transport" vehicles such a facility may be signed for use by "Authorized Vehicles". This application of public transport signing is likely to involve several classes of authorized vehicle, although the signing available does not preclude use of a facility by one class of vehicle only. AUTHORIZED VEHICLE RESERVATION signs R324, R353 or

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R354 may also be used for all vehicles run by one "operator". An
"Authorized Vehicle" is defined in Regulation 407 of of the Act for signing purposes as a vehicle of an organization indicated by means of a crest, logo or other device displayed on the relevant regulatory sign. In order to manage such a facility and provide enforcement of the regulations, when deemed necessary, vehicles using the facility should be "permitted" by being required to display the same crest, logo or device used on the relevant regulatory signs. For individual identification these permits should carry a permit number unique to the vehicle. This will have the effect that the driver of a vehicle without an authentic crest, logo or device displayed shall not use the facility. This mode of operation has the advantage over the similar HOV system in that it excludes private vehicles (without permits) and it can be used for returning empty vehicles without contravening the signs.

11 By comparison the Regulations define a **motor car** as a motor vehicle, other than a motor cycle, motor tricycle or motor quadricycle designed or adapted solely or principally for the conveyance of not more than nine persons, including the driver.

12 Public transport schemes which include bus lanes or a busway within already built-up environments are likely to present complex access problems for general traffic. Such problems, in turn, are likely to require complex signing solutions. SELECTIVE RESTRICTION regulatory signs, made up as two-part signs involving the combination of a secondary regulatory message which modifies the applicability of the primary regulatory message above it, may offer acceptable solutions to many such problems (see Subsection 8.5.3 and Figures 8.30 and 8.31). The principles of SELECTIVE RESTRICTION signs are covered in Volume 1, Chapter 2 and in particular in Sections 2.1 and 2.7.

13 In order to simplify the visual information provided by road traffic signs in complex circumstances recognised symbol messages should be used wherever possible. However, some message just cannot be satisfactorily represented by symbol and limited text messages may offer the only means to communicate with drivers.

8.1.2 Typical Public Transport Environments

1 The signing needs of public transport extend over a wide range of environments. The following basic situations are covered in this chapter:

(a) stops and laybys;

(b) ranks;

(c) terminals (and stations);

(d) holding or parking areas;

(e) reserved lanes

(i) tram lanes;

(ii) bus/minibus lanes;

(iii) high occupancy vehicle lanes;

(iv) "authorized vehicle" lanes;

(f) dedicated roadways.

2 The need for such facilities can occur anywhere in the greater road network, including rural areas. The greatest concentration and variety is, however, likely to occur within a metropolitan area where the need to provide an attractive and effective public transport system is greatest. Figure 8.6 illustrates the manner in which many of these facilities may be distributed throughout a metropolitan area. Lanes and roadways dedicated to public transport may be used almost anywhere within the route network. As a result details and operational characteristics are likely to be very site specific. It is not practical to cover all variations which can occur. The examples given in this chapter deal with as wide a range of examples as possible. Individual schemes should be developed from the principles illustrated.

8.1.3 Road Traffic Signs Available

1 A large number of road traffic signs have been created to cater for the broadest needs of public transport authorities and operators. The development of this chapter has highlighted a need for several new road traffic signs. The use of these signs is included in the examples. Individual details of new signs have been incorporated into the regulations and Volume 1 and dimensional details into Volume 4. The range of road traffic signs is illustrated in Figures 8.1 to 8.5.

2 Road traffic signs for public transport facilities are provided in the following categories:

(a) road signs:

(i) regulatory signs;

(ii) warning signs;

(iii) guidance signs - including diagrammatic and occasionally direction signs;

(iv) information signs;

(v) pedestrian signs;

(b) traffic signals including special aspects for rapid transit facilities;

(c) road markings;

(i) regulatory markings;

(ii) warning markings;

(iii) guidance markings.

3 As can be seen from the applications covered by the examples in Sections 8.2 to 8.5 the road traffic signs most commonly used tend to be dictated by the type of environment in which they are required (see paragraph 8.1.2.1).

4 The large range of signs available, particularly of regulatory signs, can make selection of the appropriate sign difficult on occasions. The examples in Sections 8.2 to 8.5 should clarify the options available. However, it may be particularly difficult to decide whether the signs required should come from:

(a) the mandatory COMMAND R100 series (circular signs with a blue background and white symbol(s) and border); or

(b) the conditional RESERVATION R300 series (rectangular signs with a blue background and white symbol(s) and border, plus the letter "R").

5 The functional difference between these sign series' is indicated by the use of the terms "mandatory" and "conditional".

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Simply, the use of **the mandatory sign means that the class or classes of public transport vehicle concerned must pass the sign and not proceed on any other road or portion of road.** The road or portion of road covered by the sign **must also not be used by any other class of vehicle than that displayed.**

The reservation sign has a very similar meaning but allows drivers of the class of public transport vehicle indicated on the sign to choose between using the reserved section of roadway or the rest of the roadway (they may wish to turn to the right for instance, which may not be possible from the reserved position). **The road or portion of road covered by a reservation sign must, however, still not be used by any other class of vehicle than that displayed.**

6 The choice between using R100 series signs or R300 series signs therefore tends to rest on the degree of exclusivity of the public transport facility. As a general rule the R300 series should be preferred as it offers a wider operational flexibility, including shared facilities, if required.

7 Since SELECTIVE RESTRICTION signs are likely to be commonly used for public transport signing a selection of typical selective restriction signs is given in Figure 8.4.

8 In metropolitan areas it is likely that sophisticated and complex demands will be placed on the road traffic signing system by public transport schemes. These demands are likely to stem from the development of rapid transit systems which allocate portions of streets or whole streets for the exclusive use of public transport vehicles. Where such schemes are superimposed on an existing street network one or both of two operational factors will commonly occur, namely:

(a) the so-called "exclusive" street or portion of street will, in fact, have to be shared:

(i) by more than one class of public transport vehicle (see Figure 8.3); and/or

(ii) with local residents (or other members of the public needing access to the properties otherwise cut-off by the mode of operation);

(b) the very nature of "rapid transit" operation makes the risk of conflict between public transport vehicles and pedestrians potentially significantly greater than under normal traffic conditions.

9 The sharing of a facility by more than one class of public transport vehicle can be catered for by the available range of appropriate regulatory signs or by use of selective restriction signs tailored to the specific needs of local access circumstances (see Figures 8.3 and 8.4). **It may be necessary in some situations to display two complementary signs to achieve a clear, legally enforceable message.**

10 Rapid transit schemes are also likely to require special traffic signal control at junctions in the system. In order to allow for signal phasing catering for specific vehicle types additional signal aspects have been provided for bus control and light rail vehicle control respectively. These signal aspects retain the format of existing traffic signals S1 to S10 and S13 to S15 but if they include aspects for buses or trams (light rail vehicles) should be identified by the addition after the number of the letter B (bus) or T (tram) e.g. S1B (see Figure 8.5).

11 When a lane, instead of a whole street, is allocated to public transport **the legal force of this provision is given by an appropriate regulatory sign and road marking together.** One or the other on their own will not have the correct legal significance (see Figures 8.26, 8.29 and 8.31). Figure 8.5 shows a selection of road markings appropriate to public transport operation.

12 Concentrations of public transport vehicles into platoons, possibly moving relatively quickly, or even in a "contra-flow" situation make gap judgement and speed judgement difficult for pedestrians. High levels of control may therefore have to be exercised over pedestrian crossing movements. Such design features may require special signing directed at pedestrians. Examples of typical diagrammatic signs are given in Figure 8.4. In addition signing specifically for pedestrians will be particularly relevant within and adjacent to transport terminals, in particular those terminals offering a change of transport mode (see Figure 8.21).

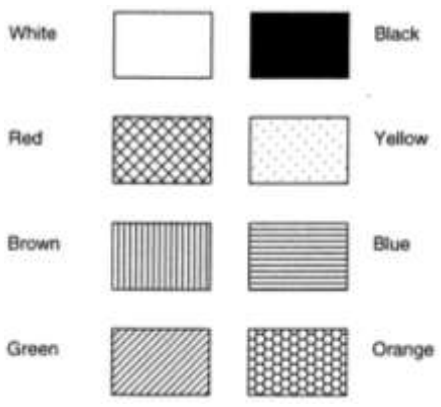
13 The signing system available has sufficient flexibility that, if an authority wishes to control different public transport operators using the same route or facility, this may be achieved by means of secondary message signs used with regulatory signs (selective restriction signs). Bus stop signs in particular may realise this objective by means of the display of the operators logo on the signs.

14 A limited number of information signs are also available to supplement the more frequently used regulatory or guidance signs. The use of SUPPLEMENTARY PLATE signs IN 11 may commonly be warranted and other signs may be used to identify facilities such as park-and-ride areas (see Volume 1, Chapter 5). Details 8.4.4 to 8.4.6 in Figure 8.4 illustrate a range of options for the use of supplementary text messages to, particularly, assist pedestrians. Such use of text messages is optional. The use of English language messages is likely to have the most universal effectiveness, however, the use of other official languages is not precluded.

8.1.4 Road Traffic Sign Colour Indication

1 The chapters of Volume 2 of the South African Road Traffic Signs Manual (SARTSM) are not prepared in colour. Relevant examples used to illustrate appropriate signs, signals and markings are shaded in a black and white coding which is illustrated below.

2 The basic principles of the road traffic sign colour coding system are shown, in colour, in the SADC-RTSM Volume 1, Chapter 1, Section 1.4, and in the Contents sections of relevant Volume 1 and 4 Chapters.



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R118

R119

R120

R121

R129

R134

R135

R136

R138

R139

R140

Detail 8.1.1 Public Transport Mandatory Command Signs
(including those for shared facilities)

R224

R225

R226

R227

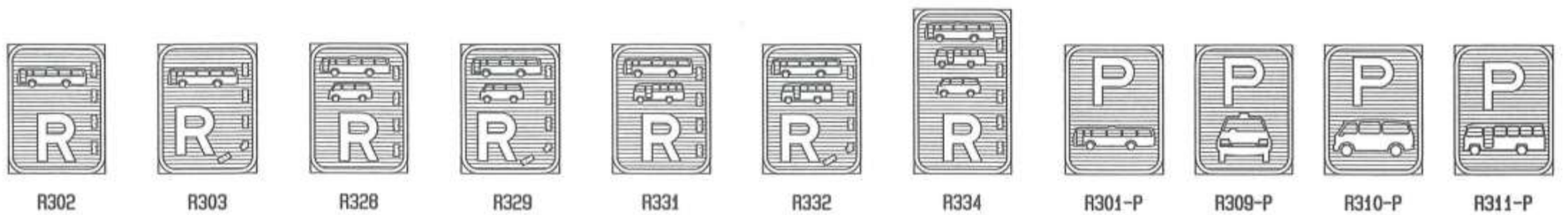
R235

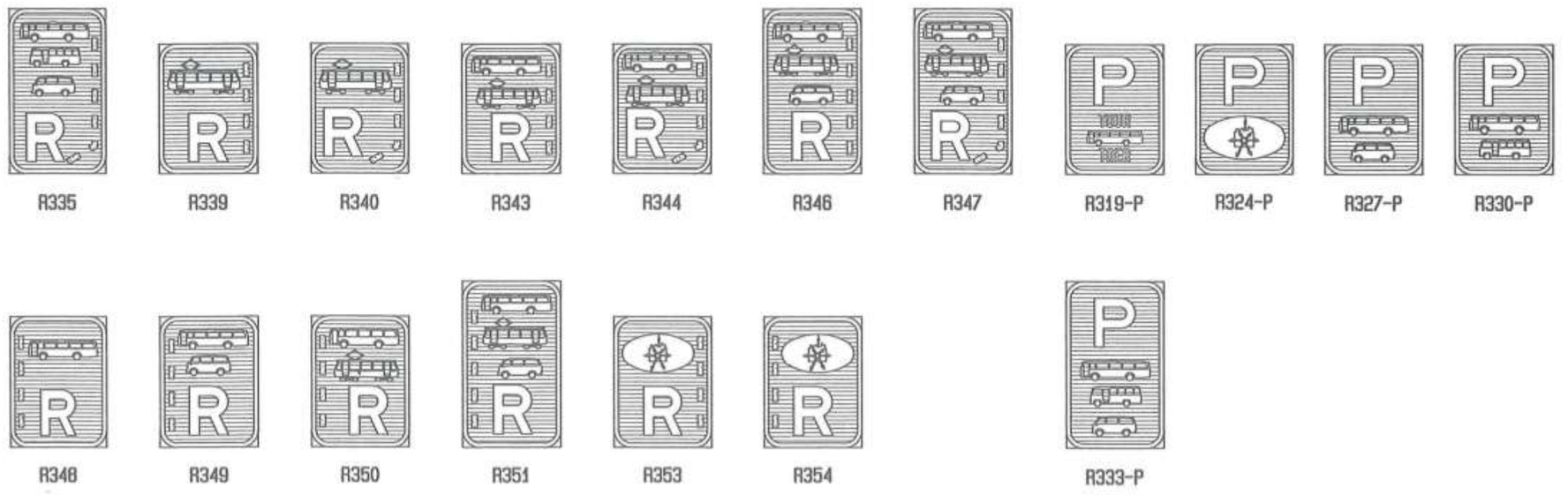
Detail 8.1.2 Public Transport Mandatory Prohibition Signs

Fig 8.1 Mandatory Regulatory Public Transport Signs

Detail 8.2.1 Public Transport - Basic Reservation Regulatory Signs

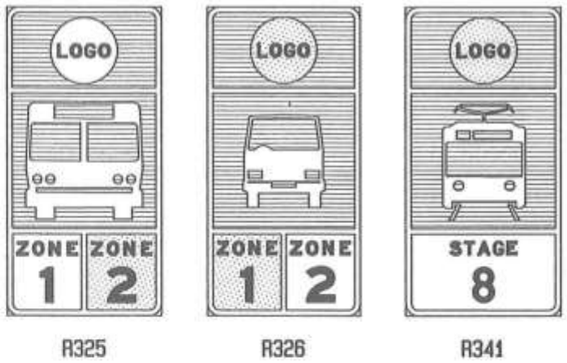
Detail 8.2.2 Public Transport Reservation Regulatory Signs - Shared Facilities



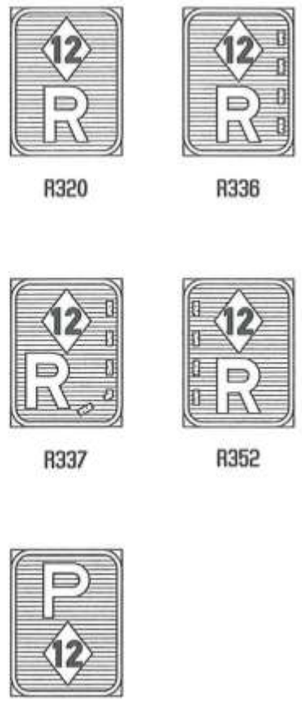


Detail 8.2.3 Public Transport Reservation Regulatory Signs for Lane use Control

Detail 8.2.5 Parking Reservation Signs



Detail 8.2.4 Stopping Place Signs

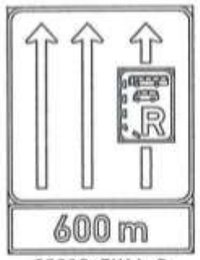


NOTES:

1. The above signs are not exclusively for public transport vehicles. Subject to the number displayed on the sign, private vehicles may use the facility provided they are carrying the appropriate number of passengers.
2. "Beginning of Lane" signs are not shown for right side lanes since these lanes will commonly be signed using overhead signs (see Figure 8.3). If such signs are required they can be produced as a mirror image of the left lane sign (see also Volume 4).
3. Refer also to Subsection 8.1.1

Detail 8.2.6
High Occupancy Vehicle Reservation
Regulatory Signs

Fig 8.2
Reservation Regulatory Signs

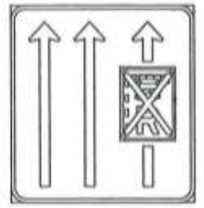


GS309+IN11.3

Typical sign used in advance of start of exclusive use lane

GS309+IN11.2

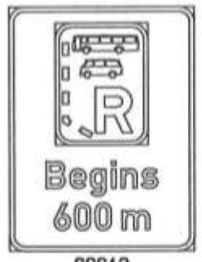
Typical sign used at intervals along an exclusive use lane



GS309-600

Typical sign to indicate the end of an exclusive use lane

Detail 8.3.1 Typical Ground Mounted Diagrammatic Lane Use Control Signs



GS613

Typical sign used in advance of start of exclusive use lane

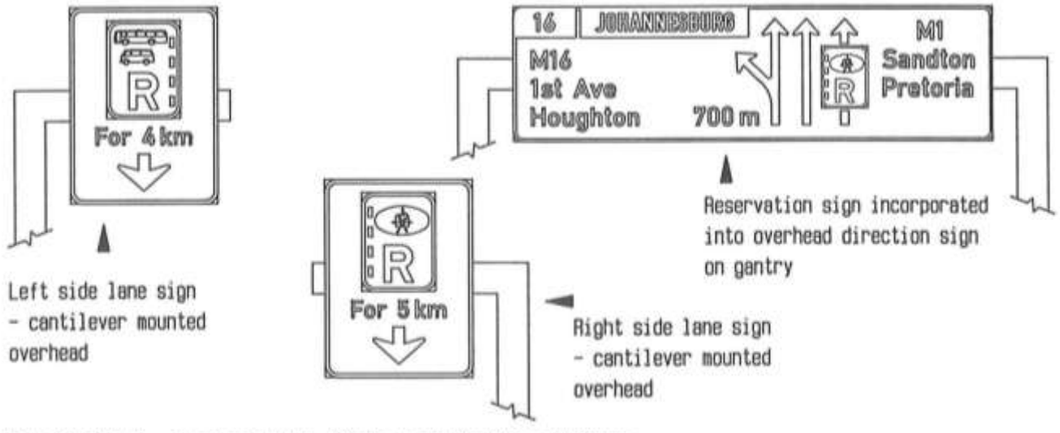
GS612

Typical sign used at intervals along an exclusive use lane

GS614-600

Typical sign to indicate the end of an exclusive use lane

Detail 8.3.2 Typical Overhead Diagrammatic Lane Use Control Signs



Detail 8.3.3 Overhead Sign Display and Mounting Options

Fig 8.3 Other Public Transport Regulatory Signs

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R129-502

R201-583

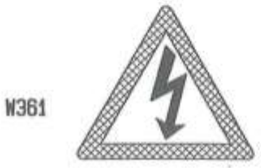
R210-560

R301-501

R301-522

R301-534

Detail 8.4.1 Typical Selective Restriction Signs



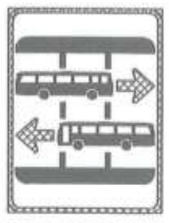
W361

W362

Detail 8.4.2 Advance Warning Signs

GS701

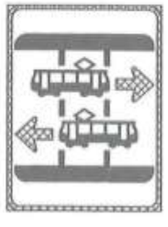
GS702



GS703

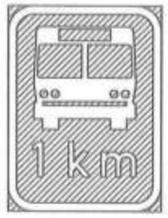
GS704

GS705

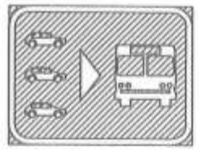


GS706

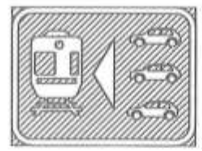
Detail 8.4.3 Diagrammatic Signs



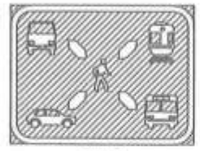
IN16



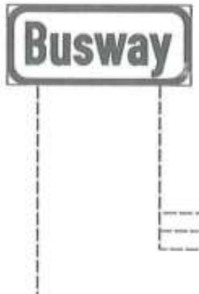
IN9



IN10

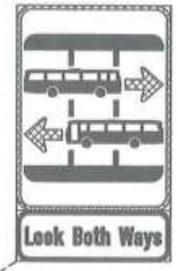


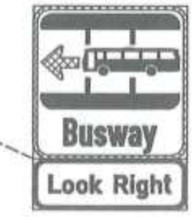
IN19



IN11.4

Detail 8.4.4 Information Signs





R301-522/IN11.4

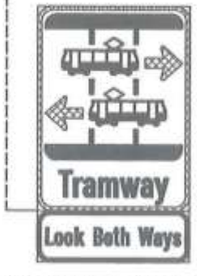
Selective Restriction/
Information

GS702

GS704

Diagrammatic/
Information

Detail 8.4.5 Sign Combinations-1

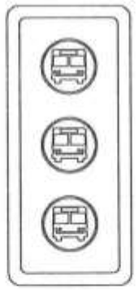


Examples of Supplementary Plate IN11
Options - Primarily for Pedestrains

Detail 8.4.6 Sign Combination-2

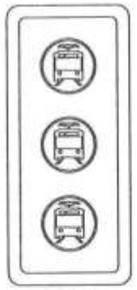
Fig 8.4
Other Road Traffic Signs for Public Transport - 1

Buses

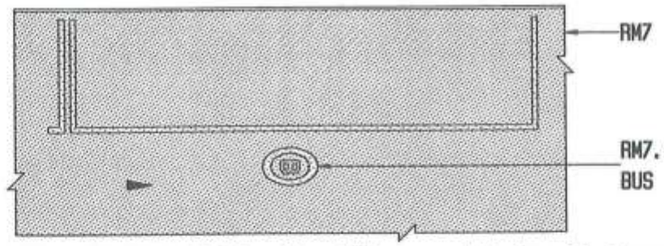


S1B

Trams

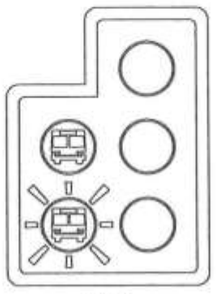


S1T

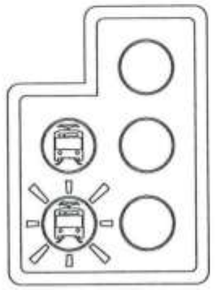


EXCLUSIVE PARKING BAY marking RM7 appropriate for all classes of public transport vehicle

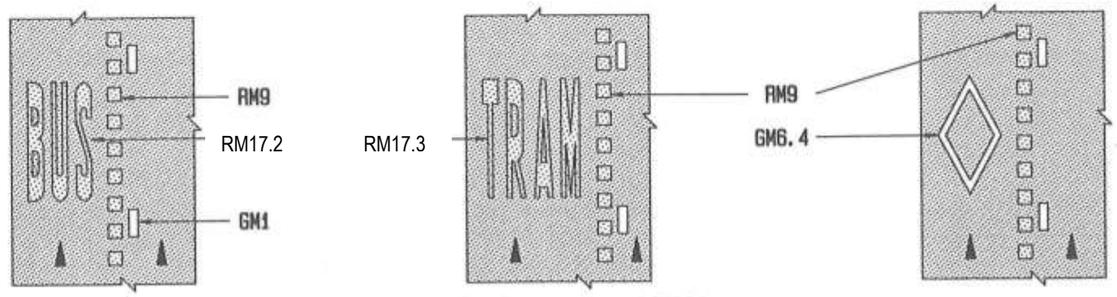
Mini Bus Taxi



S9B

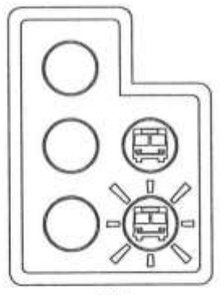


S9T



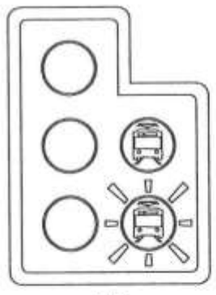
EXCLUSIVE USE LANE LINE RM9 appropriate for Bus Lanes, Shared Public Transport Lanes, Tram Lanes or High Occupancy Vehicles (HOV) Lanes (and Bicycle Lanes)

Special Signal Heads For Busway Control



S8B

Special Signal Heads For Tramway Control

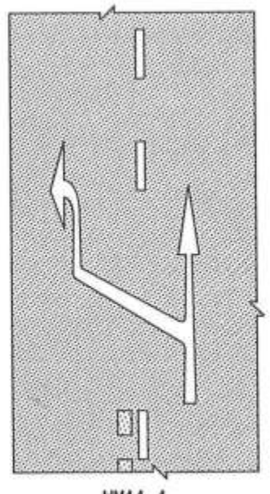


S8T

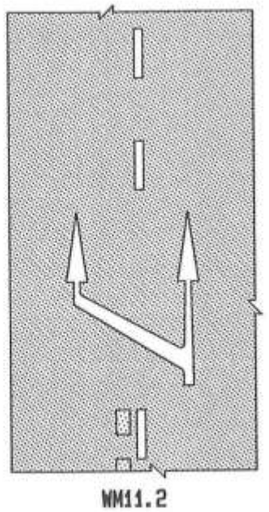
Detail of Signal Aspect Symbol - Buses

Detail of Signal Aspect Symbol - Trams

Detail 8.5.1 Special Traffic Signals for Public Transport



WM11.1

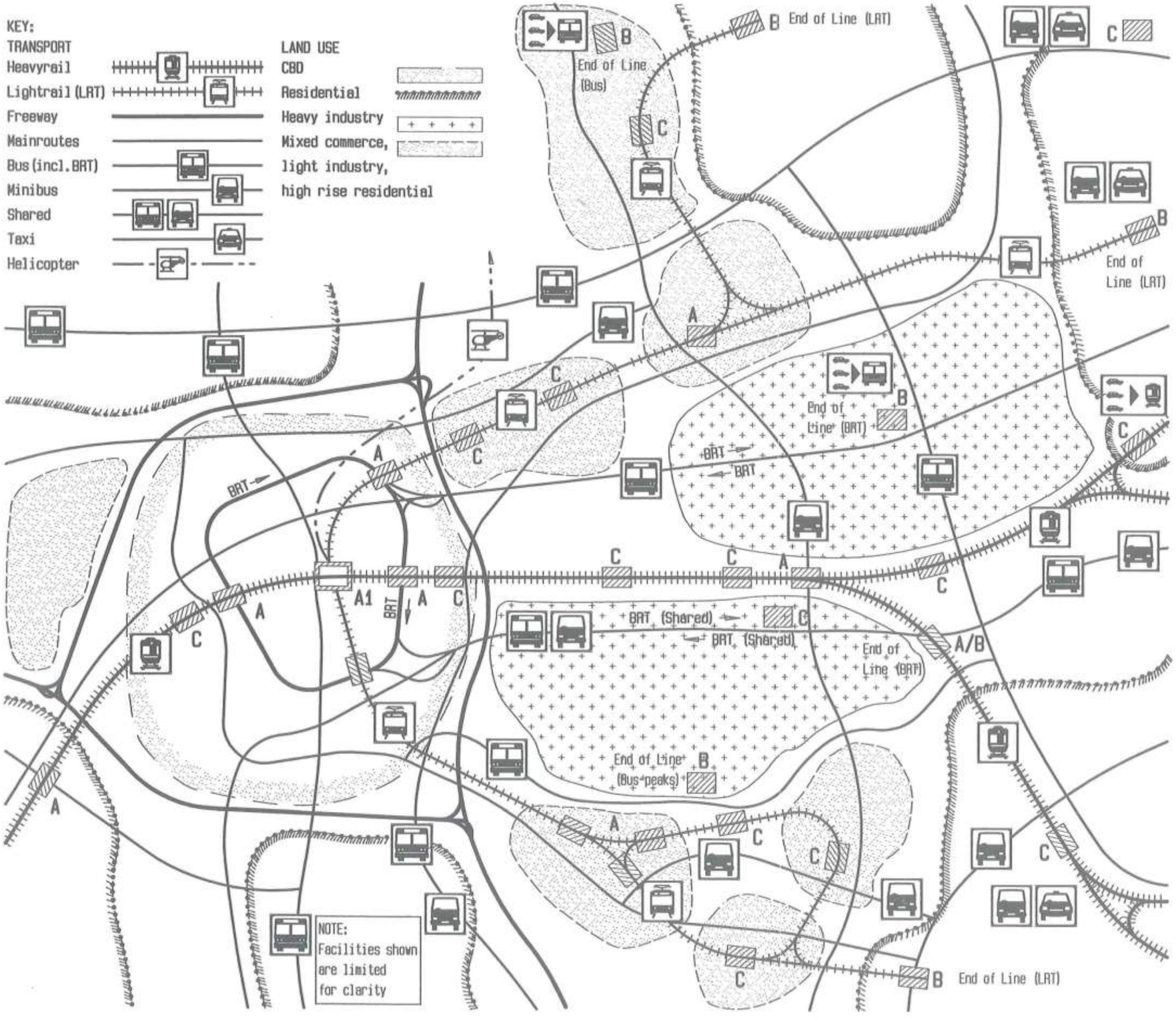


WM11.2

END OF EXCLUSIVE USE LANE arrow markings WM11.1 and WM11.2
WM11.1 for local interruptions of lane - WM11.2 for final end of lane

Detail 8.5.2 Road Markings for Public Transport

Fig 8.5
Other Road Traffic Signs for Public Transport - 2



8.1.5 Notes on Figure 8.6

1 This figure illustrates many of the characteristics of a well-developed public transport system in a large metropolitan area. It shows how various types of public transport may be integrated to provide a conglomerate public service.

2 The transport system illustrated includes the following elements:

(a) heavy rail lines;

(b) light rail lines (LRT);

(c) bus rapid transit (BRT);

(d) bus routes;

(e) minibus services;

(f) taxi ranks.

3 Where these various modes interconnect a terminal facility designed for modal interchange is provided (identified by **A**). In addition each line of the more formal service modes has a remote "end of line" terminal (identified by **B**). The balance of the system is serviced by strategically located terminals (identified by **C**) and conventional stops (not indicated).

4 Terminal types **A** and **B** in particular may also be commercial centres in which the transport facilities are integrated with shops. The signing needs within such a terminal will therefore be largely pedestrian oriented but they will utilize the same symbols as are used on road traffic signs. Road traffic signing as illustrated by the examples in this chapter will occur in the streets and ranks around the periphery of such a terminal. When the terminal, such as **A1**, is served by virtually all modes of transport it is likely that vehicle class control will be common at street level in order to operationally segregate the different road based modes. In a large terminal it may be necessary to provide regional or area directions.

5 Road traffic signing requirements at "end of line" terminals of type **B** are likely to be limited to the provision of bus and minibus stop signs. However as soon as more than one mode utilizes a facility the need for a measure of segregation by class is likely to occur.

6 The formal (rail, LRT, BRT) and informal (minibus, taxi) modes will interface most directly at type **C** terminals where facilities such as park'n'ride are likely to be encouraged. Commercial development at these terminals is likely to be more informal.

7 Components of public transport infrastructure which are likely to require the greatest concentration and complexity of signing are road based formal routes. In particular the signing levels will be high when the transport mode is given some degree of priority over other traffic or in a shared or exclusive mode of operation.

Fig 8.6
Typical Distribution of Public Transport Facilities

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8.2 SIGNING APPLICATIONS FOR STOPS

8.2.1 General

1 Public transport stops may be required almost anywhere along a recognised route. Policy on the siting of stops is outside the scope of this chapter. For convenience generally in this text reference is made to bus stops. Such references are equally appropriate for minibus stops or tram stops. **A "stop" is considered to be a place where passengers are picked up or dropped off but at which buses do not wait for any significant period of time between services.**

2 Public transport stops shall be formally identified by regulatory signs R325 (Bus), R326 (Minibus) or R341 (Tram). These signs reserve the use of the stopping place for the class of vehicle indicated on the signface. If it is desired to permit more than one class of public transport vehicle to stop at a specific place two or more signs, one for each class of vehicle, should be erected. In practice separation of stops for different classes of vehicle, by at least twice the length of a typical vehicle, is recommended. A bus stop sign may be used on its own or it may be supplemented, where necessary, by appropriate road markings (see Figures 8.10 and 8.11). Bus stop signs may be located within a section of street designated as "No Stopping" without any supplementary information, either to the bus stop sign or any NO STOPPING signs R217.

3 Public transport routes commonly commence and end at a terminus. In its simplest form a terminus can be a BUS STOP sign R325 supplemented by a plate displaying the word "TERMINUS". Buses may stand or wait at such stops in order to start their service at a scheduled time. A single terminus stop must therefore be sited with this requirement in mind. **Otherwise public transport vehicles should be discouraged from standing, waiting or parking at a bus stop sign** (see Figures 8.7 and 8.9).

4 Bus stop signs may be reserved for use by one, or perhaps two service operators, or may be made available to "ALL BUSES" (see Volume 4 - Figure 2.8). Bus stop signs may also be utilised by buses on different services operating on coincident sections of route. Such provisions must always be subject to operational safety assessment, particularly with respect to the possibility of more than one bus arriving at the stop at the same time.

5 The requirements for BUS STOP sign R325, MINIBUS STOP sign R326, and TRAM STOP sign R341 permit wide flexibility regarding the information which may be displayed with these signs dealing with for example:

(a) routes;

(b) route zones;

(c) stages;

(d) destinations;

(e) operators.

Figures 8.7 and 8.8 illustrate a number of the principles involved in public transport signing and the possible sign combinations.

6 At the time of writing of this chapter, formal stopping places for minibus services are not common other than at terminal points. If the need should arise for a more formal approach appropriate signs are available. Examples in subsequent sections are included for illustration purposes.

7 Figures 8.9 to 8.11 illustrate examples of typical bus stop and minor terminus locations, together with basic signing and road marking criteria.

8 If an EXCLUSIVE USE LANE facility is provided particular care should be taken in the siting of stops because it will rarely be possible for following vehicles to overtake a stopped vehicle. The use of laybys on such a facility is therefore recommended in order to maximise the lane capacity. If an exclusive lane is to be used by a range of "public transport" vehicles, as determined by the operating authority (see Subsection 8.5.3), it is recommended that when stops are required they be signed by means of BUS STOP sign R325 displaying the public transport logo, used elsewhere on the route in signs R324, R353 and/or R354 (see Figures 8.2. and 8.31).

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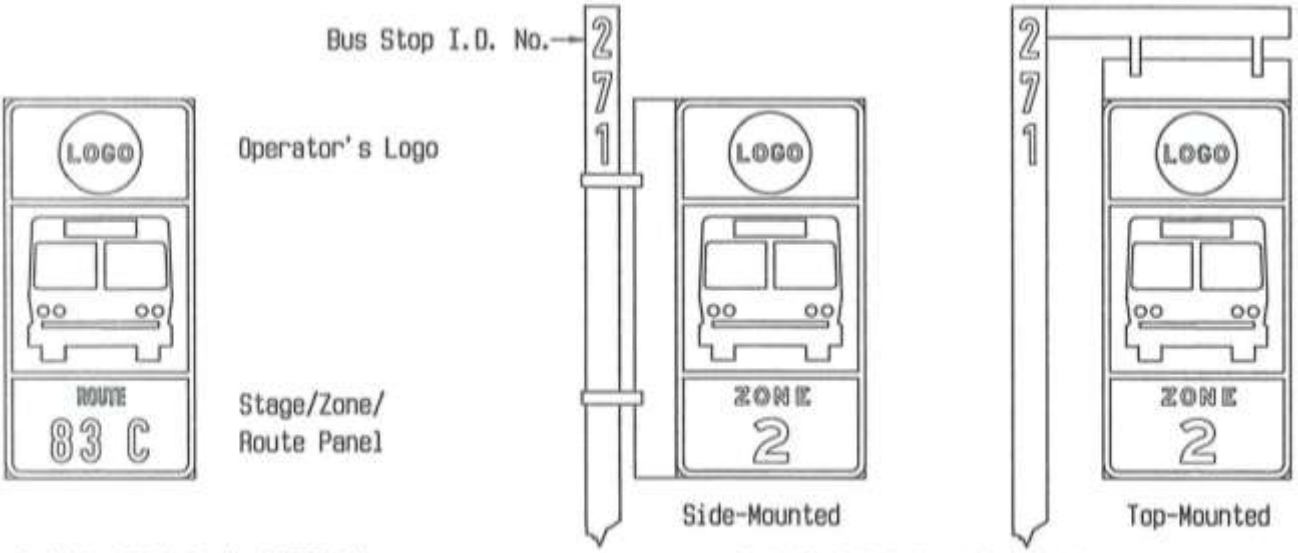
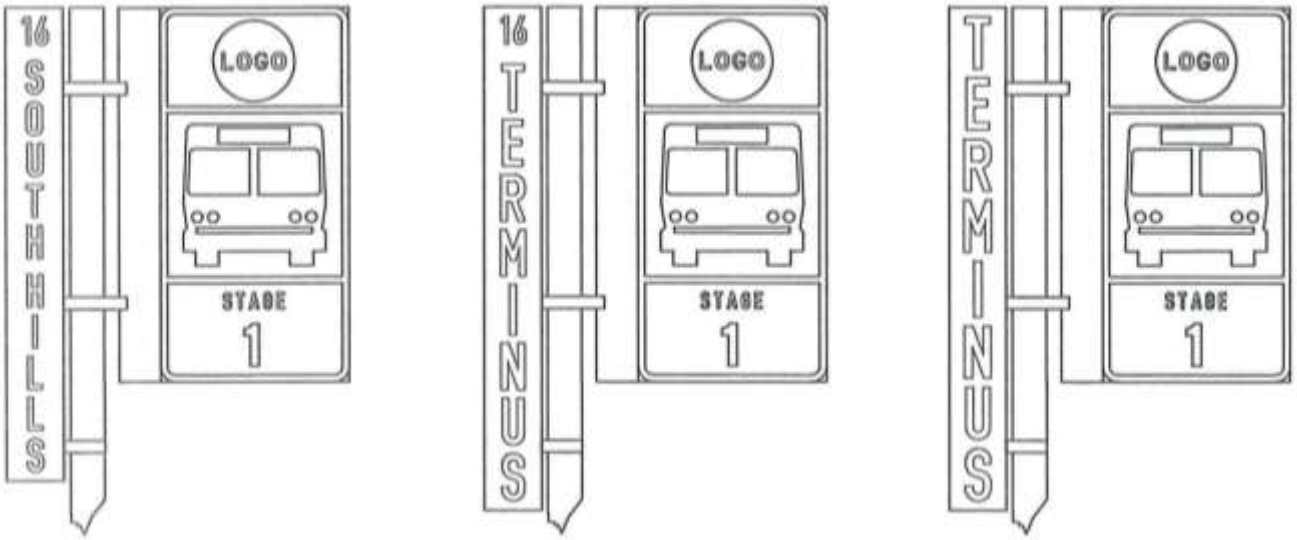


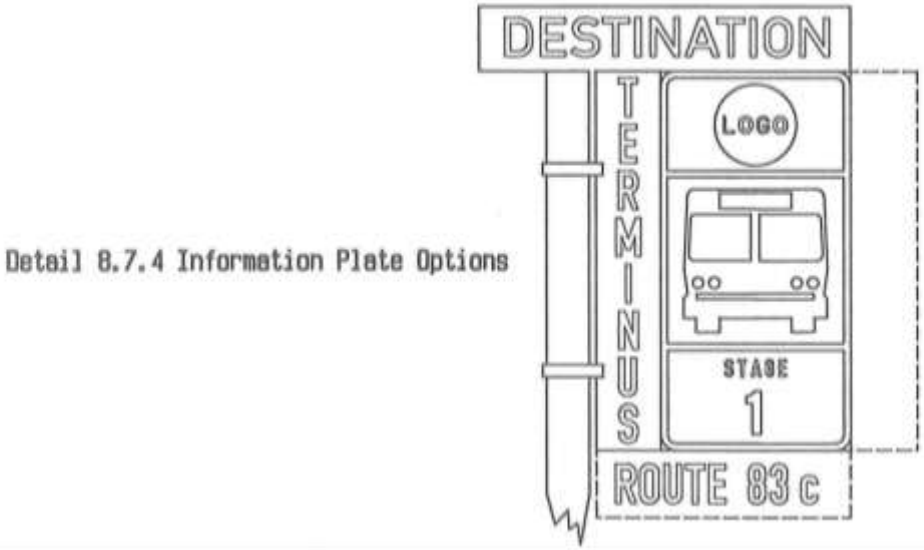
Detail 8.7.1 Basic R325 Sign

Detail 8.7.2 Mounting Options



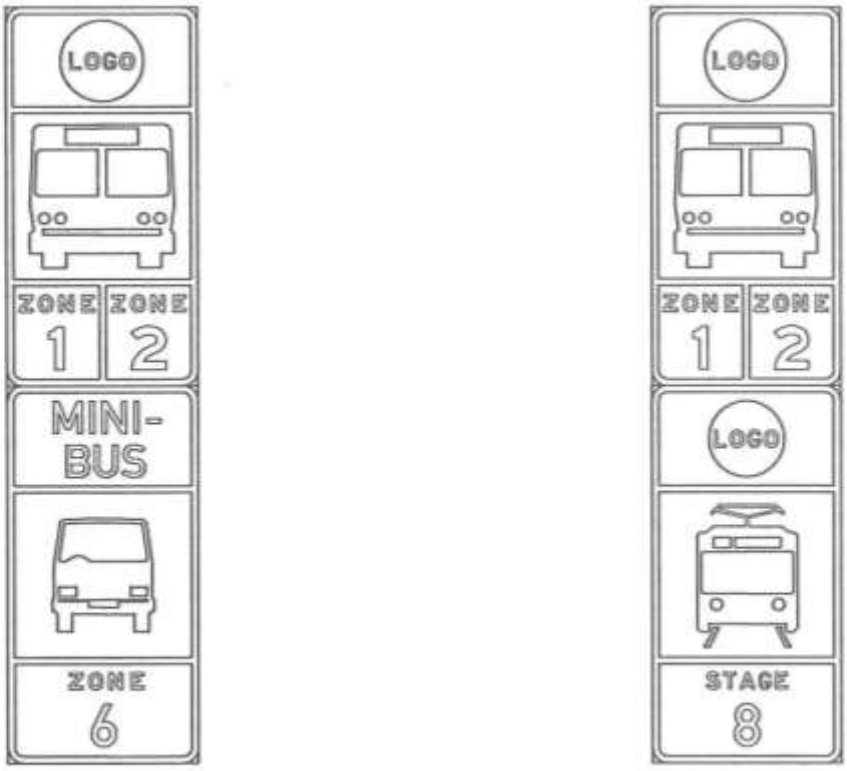
Detail 8.7.3 Terminus Stop Options

(Options : Route Number plus Name/Route Number plus "TERMINUS" / "TERMINUS")



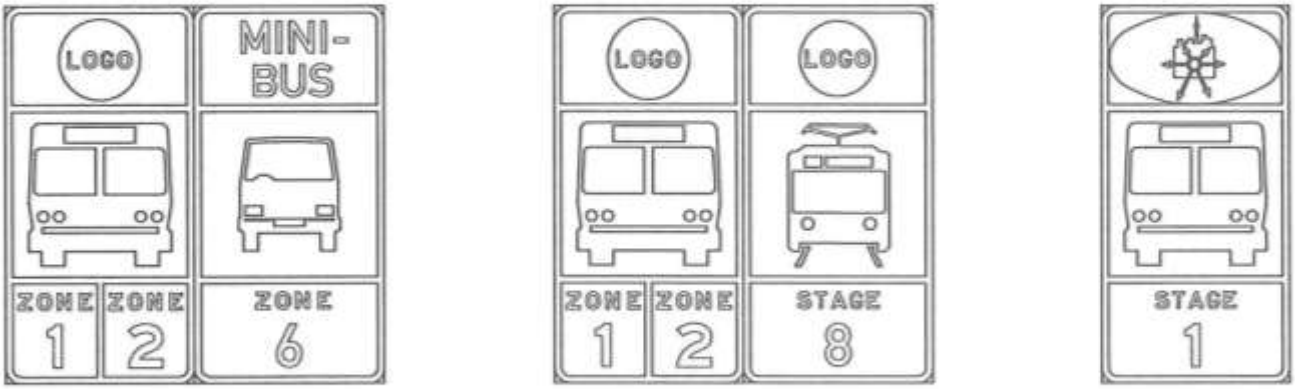
Detail 8.7.4 Information Plate Options

Fig 8.6 **Bus Stop Signs – Permitted Variants - 1**



Bus/Minibus Bus/LRT

Detail 8.8.1 Shared Stop - Signs Mounted Vertically



Bus/Minibus Bus/LRT "Public Transport" in General - see paragraph 8.2.1.8

Sign Mounted Side-By-Side

Detail 8.8.2 Shared Stop

Fig 8.8 Bus Stop Signs – Permitted Variants - 2

8.2.2 Typical Bus/Minibus Layby Positioning and Basic Terminal Treatment

1 The details in Figure 8.9 are diagrammatic only. Whilst they imply good geometric design standards they are not drawn to specific spacing or design requirements.

2 For basic safety reasons rural bus laybys must provide for the bus or minibus to pull off the through portion of roadway. The main functions of any road traffic signing provided for the operational control of buses at laybys or minor terminals are:

(a) to control stopping places to safe locations;

(b) to identify the stopping place to bus or minibus drivers and to potential passengers.

3 Safety requirements may dictate that a stop be located in a position which is not the optimum choice of potential passengers, who, in a rural context, may have walked some distance to reach a particular junction on the route. Where necessary BUS STOP AHEAD information sign IN16 may be provided indicating an appropriate distance to the closest safe stopping place.

4 Rural bus or minibus laybys may commonly experience significant peaking of movements. Their capacity to handle the peak number of vehicles may require the use of more than one BUS STOP sign R325 (or sign R326) with an indication of the destination being served by each stop if necessary (see Figures 8.7 and 8.11).

5 Similarly a larger layby may require a greater set back from the edge of the travelled way due to the level of activity which occurs during the loading of passengers and goods (see Subsection 8.2.4).

6 In urban areas bus stops are commonly located in such a way that stopping buses obstruct traffic. When such a mode of operation becomes no longer acceptable urban authorities often provide laybys in a manner very similar to rural practices, namely away from junctions. This may be a disadvantage, however, when the street in question has trees or parking, and laybys may be difficult to provide.

7 It is therefore fairly common for bus stops to be located immediately before or immediately after a junction. Such positioning also commonly avoids the need for a layby to be provided, particularly if the rest of the street is marked with parking bays.

8 On lesser rural or urban bus routes, where bus numbers are not high, terminal facilities at the outer end of the route will commonly be provided at a bus stop. In both rural and urban situations this terminal stop must be located so that:

(a) buses can turn around safely without obstructing general traffic; and

(b) buses can be stopped for some time to allow drivers to rest or to wait for the scheduled time of departure on the return trip.

Details 8.9.3 and 8.9.4 illustrate typical examples of such terminals. Terminals are covered in more detail in Sections 8.3.

Checklist

- ❑ can the stop be safely located closer to where passengers come from?
- ❑ can passengers safely cross the road in the immediate vicinity of the layby?
- ❑ are advance signs necessary?
- ❑ can buses and minibuses share a facility or not?
- ❑ do the stops need to be shared by different operators?
- ❑ are any stops shared by different routes?
- ❑ are multiple stops required?
- ❑ is the provision of a bus shelter appropriate?

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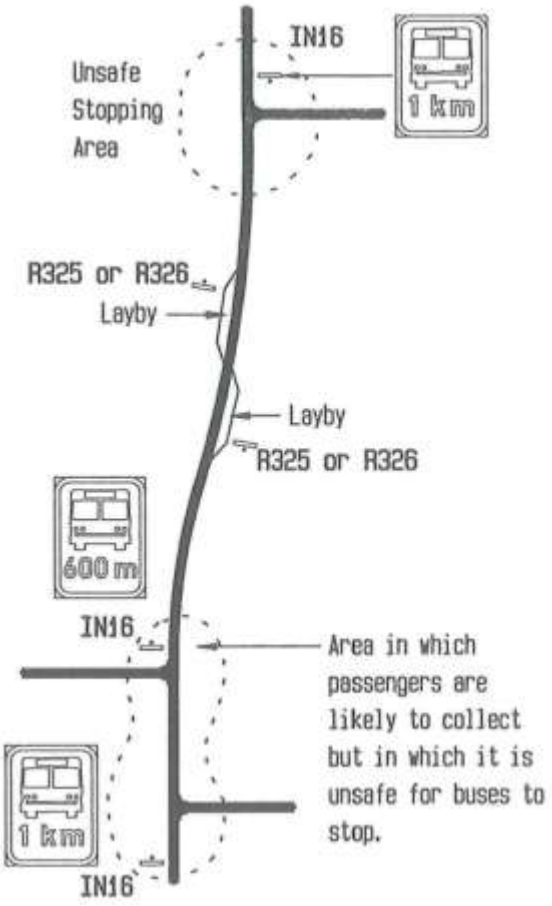
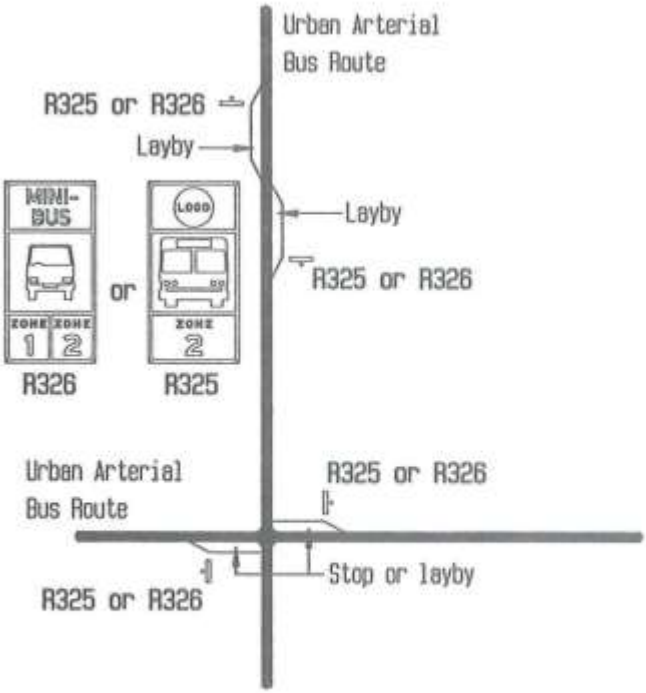
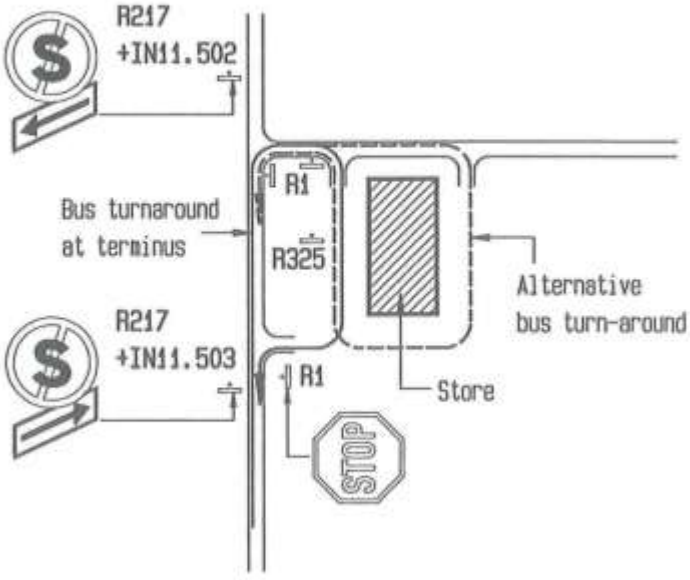


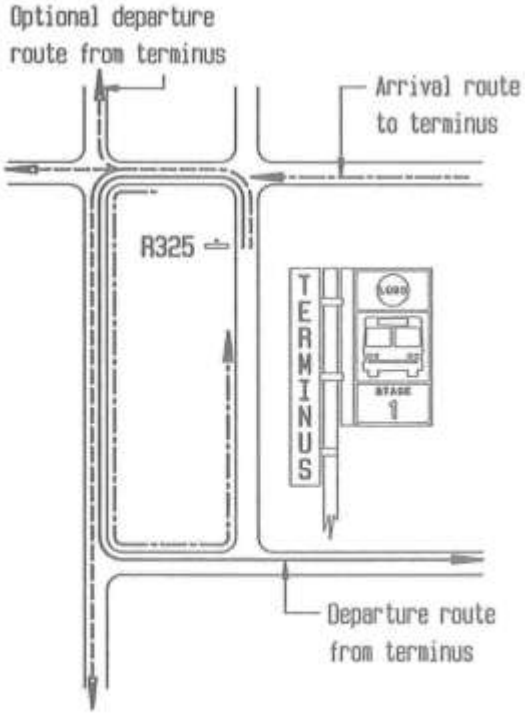
Detail 8.9.1 Rural Bus Route - Laybys and Advance Signing



Detail 8.9.2 Urban Bus Route - Layby/ Stop positions - Arterial



Detail 8.9.3 Rural Route Terminal Stop with Turn - Around



Detail 8.9.4 Urban Route Terminus/ Stop

Fig 8.9 Typical Bus/Minibus Layby Positioning

8.2.3 Typical Bus/Minibus Laybys and Stops

1 The details in Fig. 8.10 are diagrammatic only. Whilst they imply good geometric design standards they are not necessarily drawn to a scale and should not be used as design drawings for actual laybys.

2 The basic reason for providing bus laybys is to allow for the bus or minibus to pull off the through portion of roadway to permit safe stopping and loading/unloading of passengers. In urban areas these benefits to bus operations and passenger safety may be negated by the inability of buses to re-enter the traffic stream from the layby under congested conditions.

3 It is strongly recommended that when a bus stop is provided on a rural road, even on a gravel road, sufficient space must be available for the bus to move sufficiently to the left to allow safe, free flow of through traffic. If this is not possible then the stop must be sited where visibility is such that a driver approaching the rear of a stopped bus has a clear view of any on-coming traffic.

4 Figure 8.10 illustrates a range of options for signing and marking of bus stops. Details 8.10.1, 8.10.2 and 8.10.3 are relevant in rural and urban areas although Detail 8.10.3 is only appropriate on a minor rural road if the lane is sufficiently wide that traffic will not be obstructed by a stopped bus or minibus. Details 8.10.1 and 8.10.2 show single bus stops at laybys on roads with a surfaced shoulder. Detail 8.10.1 shows a layby which is set back completely behind the outer edge of the surfaced shoulder whereas Detail 8.10.2 shows a layby which will require a stopping vehicle to occupy the shoulder or part of the shoulder. In the latter case a stopped bus represents an obstruction on the shoulder. **Since it is now permissible for drivers of vehicles to drive on the surfaced shoulder under certain circumstances when being overtaken, this type of layby must be made adequately visible to such a driver. It is recommended that the section of shoulder preceding the layby be marked with PAINTED ISLAND marking RM5 as illustrated.**

5 Bus or minibus laybys may commonly experience significant peaking of movements. Their capacity to handle the peak number of vehicles may require sufficient length to permit occupation by more than one vehicle and the use of more than one BUS STOP sign R325 (or sign R326), with an indication of the destination being served by each stop, if necessary.

6 If an extended layby is provided so that buses, or minibuses, can arrive and depart independently of each other ie. not queue one behind the other, it is recommended that their correct stopping positions be individually identified by signs R325 or R326 (see Figure 8.11).

7 In urban areas bus stops are commonly located on- street and are demarcated by an EXCLUSIVE PARKING BAY marking RM7. The length of marking RM7 is not fixed but it shall be greater than 6m. Appropriate supplementary oval road markings RM7.1 are optional and may be marked approximately half way along the length of the bay within the adjacent lane. When the bay is more than 30m in length two or more appropriate RM7.1 markings shall be displayed (see Detail 8.10.3).

8 Detail 8.10.3 also illustrates a minimum bus stop installation commonly used in urban areas comprising sign R325 (or R326 or R341) only. The detail shows that such a sign may be located on a street in which an optional NO STOPPING LINE RM12 or NO PARKING LINE RM13 has been marked.

Checklist

- ❑ can a bus be stopped at the stop without causing obstruction to other traffic?
- ❑ if obstruction is caused will it be safe and acceptable?
- ❑ can passengers safely cross the road in the immediate vicinity of the layby?
- ❑ can buses and minibuses share a facility or not?
- ❑ are multiple stops required?

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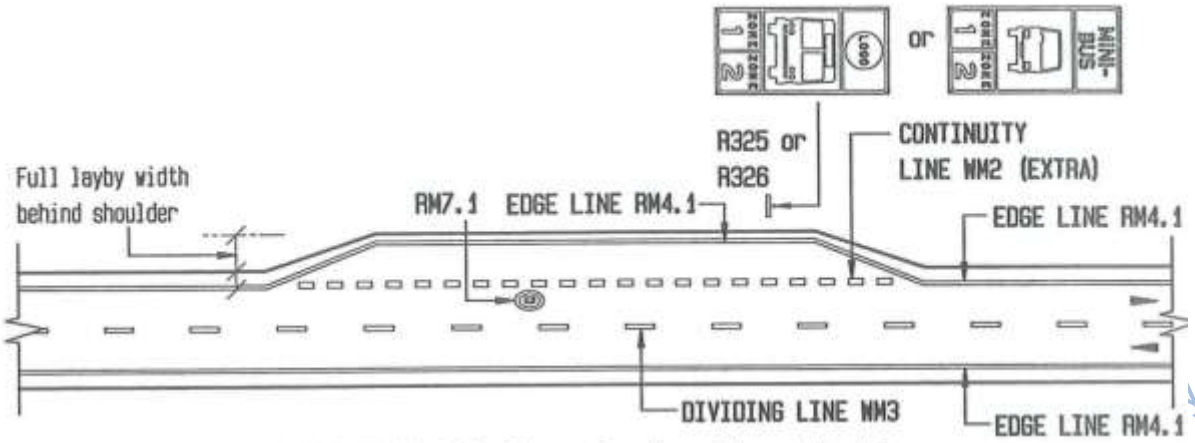
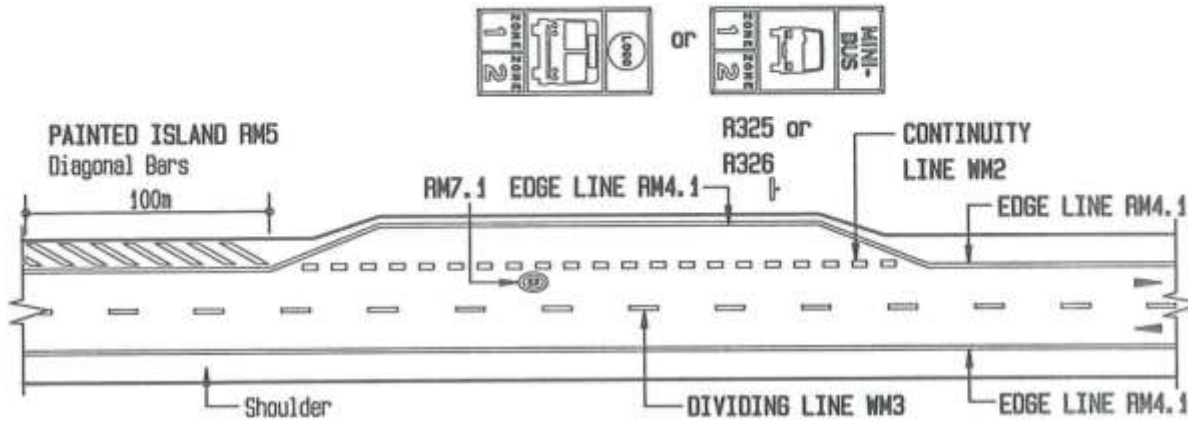
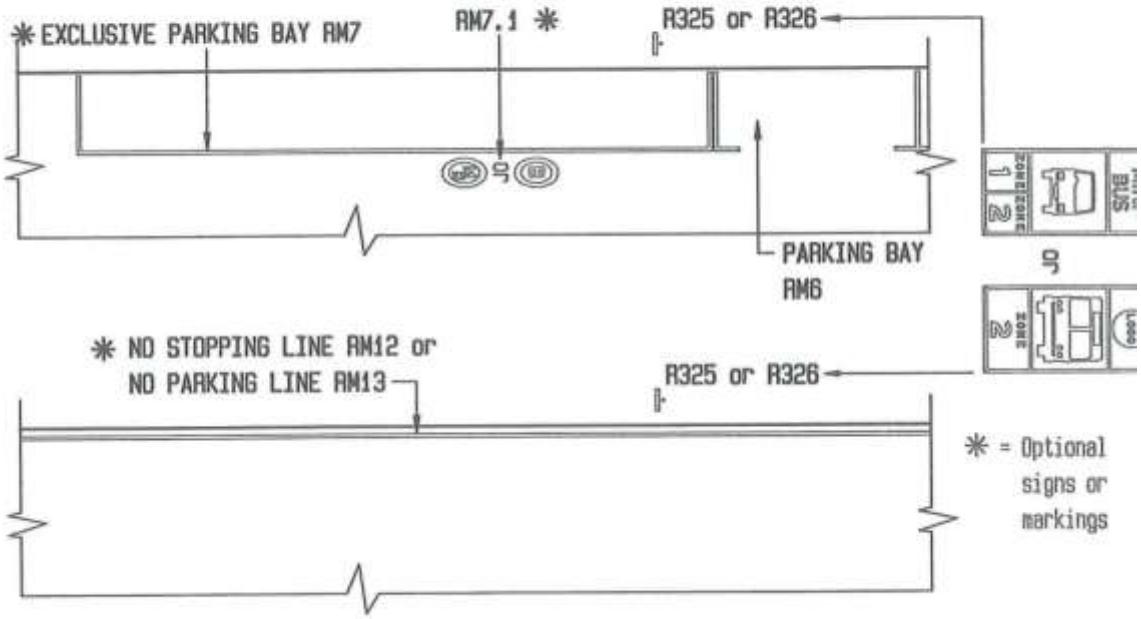


Detail 8.10.1 Layby Fully Behind Shoulder - Rural or Urban Arterial



Detail 8.10.2 Layby Over Shoulder - Rural or Urban Arterial



Detail 8.10.3 Typical Urban Bus/Minibus Stops

Fig 8.10 Typical Bus/Minibus Laybys and Stops

8.2.4 Multiple Bus / Minibus Laybys

1 The details in Figure 8.11 are diagrammatic only. Whilst they imply good geometric design standards they are not drawn to a scale and should not be used as design drawings for actual laybys.

2 Detail 8.11.1 shows a wide long multiple bus layby which is designed to permit individual and independent bus arrivals and departures. To achieve this high operational level the individual bus stops must be sufficiently far apart to permit the entry and exit movements based on the least manoeuvrable class or type of vehicle which is likely to use the layby. This separation should be achieved by careful positioning of the bus stop signs. A multiple layby of this type must also be sufficiently wide to permit passing movements within the layby with a minimum risk of encroachment into the adjacent travelled way. A separating PAINTED ISLAND RM5 or a kerbed island is highly recommended. Detail 8.11.1 shows examples of a multiple layby on a 4-lane 2-way road and a 4-lane dual carriageway road. This type of layby can also be used on a 2-lane 2-way road when bus traffic warrants such treatment. On high-speed roads the entry and exit tapers must be correctly designed geometrically to permit safe slowing down on exit from the road and acceleration on re-entry to the road. If the layby is created over, or beyond, a surfaced shoulder the LEFT EDGE LINE marking RM4.1, which defines the edge of roadway, should be continued through the back of the layby as an edge line.

3 A multiple bus/minibus layby may therefore use more than one BUS STOP sign R325 (or sign R326) with an indication of the destination being served by each stop being available as an option.

4 Detail 8.11.2 gives detail of road signs and markings which may commonly be used in association with bus stops and laybys. It is a common feature of bus stop siting that "inbound" and outbound" stops or laybys are provided in close proximity to each other. It is recommended in such situations that the stops or laybys be staggered in a "tail-to-tail" manner as shown. This arrangement is particularly relevant on 2-lane 2-way roads to eliminate the risk of collisions between buses exiting simultaneously from both laybys. The separation can be increased further if volumes of pedestrians should warrant crossing facilities.

5 Detail 8.11.2 also illustrates the recommended separation of laybys provided for different classes of public transport vehicle. In this detail the DIVIDING LINE marking WM2 could commonly be replaced by a NO OVERTAKING LINE marking RM1 or a NO CROSSING LINE marking RM2. The indicated NO STOPPING LINE marking RM12 is recommended to continue through laybys for buses and/or other public transport classes of vehicle, and may be extended further to suit specific site requirements.

Checklist

- ❑ are opposite flow laybys correctly staggered?
- ❑ do different classes of public transport vehicle need to be catered for?
- ❑ how many destinations are to be served?
- ❑ are buses or minibuses required to pass each other within the layby?
- ❑ is a LEFT EDGE LINE marking RM4.1 provided on the existing road?
- ❑ is NO STOPPING LINE marking RM12 required in the vicinity of the layby(s)?

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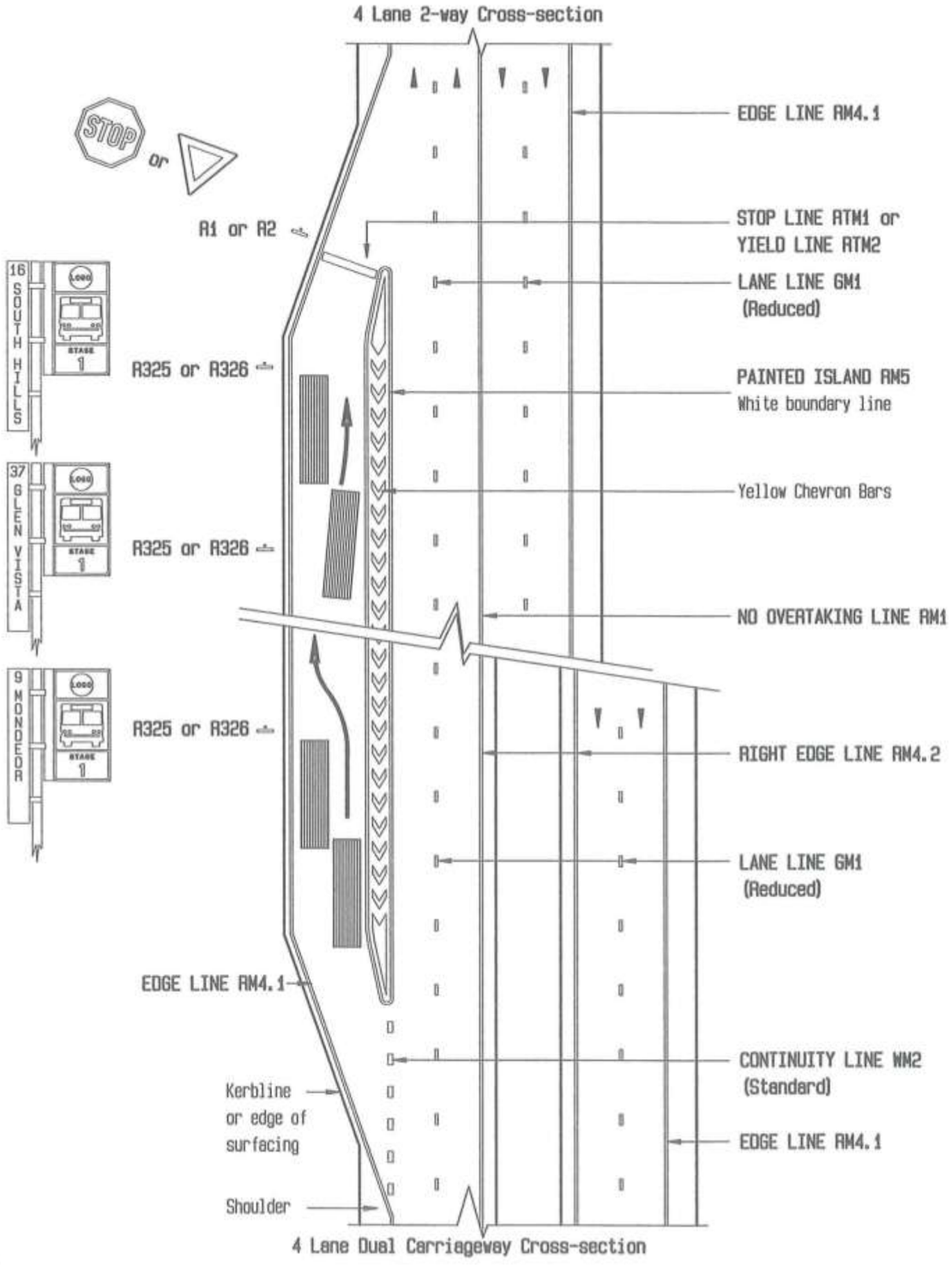
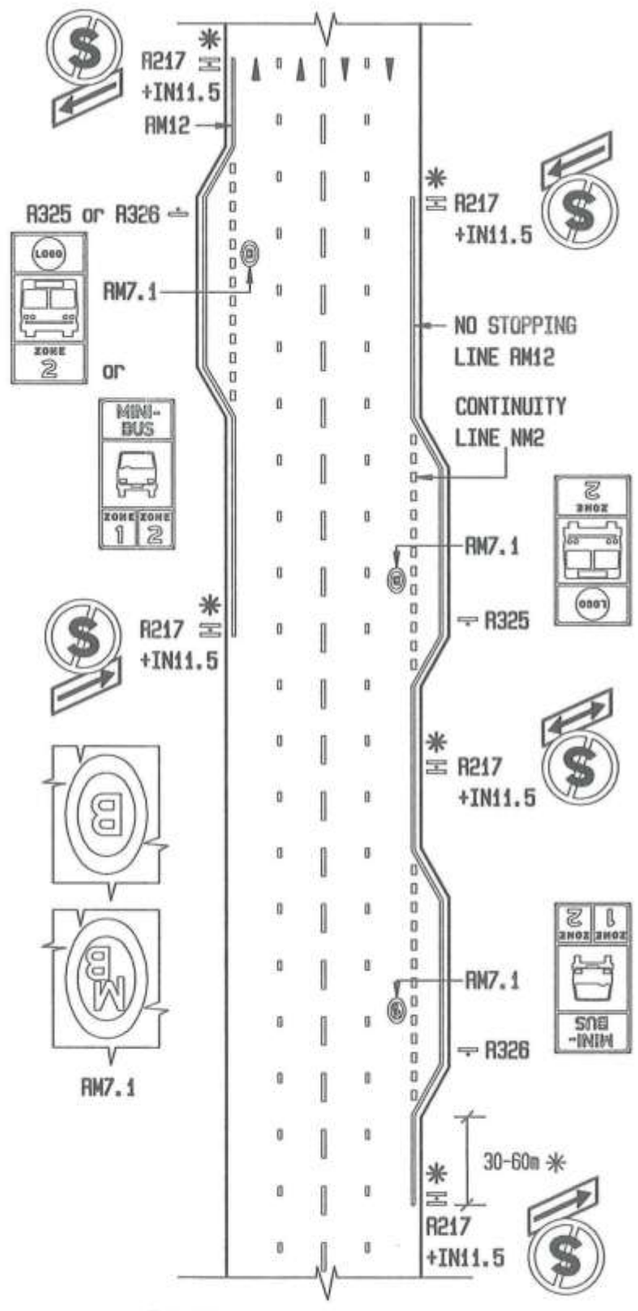


Detail 8.11.1 Layby for Several Buses or Minibuses

NOTES:

1. It is recommended that NO STOPPING LINE marking RM12 be continued through layby's when these markings are otherwise used on the section of road.
2. If a layby is placed over a shoulder or beyond a shoulder, LEFT EDGE LINE marking RM4.1 should be continued round the outer edge of the layby.
3. In Detail 8.11.2 single R217+IN11.5 signs may be placed parallel to the lateral edge of the roadway instead of the back-to-back signs placed at 90° to the road, as illustrated.

✳ = Optional signs or markings



Detail 8.11.2 Typical Layby on a Narrow Urban Arterial

Fig 8.11
Enlarged Laybys and Laybys in Combination

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8.3 SIGNING APPLICATIONS FOR TERMINALS AND RANKS

8.3.1 General

1 The distinction between terminals and ranks can be considered difficult to define. Both terms are used, however, and to clarify signing and operational characteristics it can be beneficial to consider the differences. In general, in this chapter a "terminal" refers to a bus terminal and a "rank" refers to a minibus rank or taxi rank. A minibus rank may **function** as a terminal when it is located at the end of a minibus route. A modal transfer transport terminal may cater for several forms of public transport and its operation should be designed around the efficient movement of passengers between the different modes of transport. Such a terminal can provide an interface between buses and minibuses or even between heavy or light rail and road based public transport (see Figures 8.18, 8.20 and 8.22). It is the primary function of terminals and ranks to provide for large volume picking-up and setting-down of passengers. To achieve this buses and minibuses need to be segregated from normal traffic and commonly from each other. Road traffic signs, and their effective enforcement if necessary, play an important role in providing for the operational efficiency of terminals and ranks.

2 A terminal will commonly be located at the end of a route or at a point where several routes meet, cross or connect with each other. A rank may be similarly located although ranks, because they can occur on-street or off-street, may be located anywhere on a route where passenger numbers require.

3 A bus terminus handling any significant volume of buses will almost certainly be located off-street, either in a large layby (see Figure 8.16), or completely off-street with clearly defined points of entry and exit. Minor terminals on low volume routes may be located on-street provided a waiting bus will not obstruct the reasonable flow of traffic. A common design feature of a bus terminus is that buses can arrive and depart from individual stops without waiting for other buses at other stops within the terminal.

4 Minibus ranks may commonly be located on-street. Such ranks will generally be limited in size. It is becoming more common to provide off-street minibus terminals capable of handling large numbers of passengers and vehicles. An operational feature of minibus terminals and ranks, whether on-street or off-street is that they operate on a queuing principle. In such an operation several minibuses will form a queue behind each other so that only the front minibus can actually leave the queue, at which time the others may move forward and allow a new vehicle to join the end of the queue. At peak times, at the very busy terminals, it is not uncommon for platoons of minibuses to arrive, load and depart virtually simultaneously.

5 Conventional metered taxis normally operate from ranks. These are commonly located on-street within or adjacent to normal parking bays. Taxi ranks can also be located within car parks as an adjunct to "Park and Ride" operations or within the environment of a modal transfer transport terminal.

6 The operational characteristics of terminals and ranks, and their signing requirements, tend to centre around two basic locational or design features:

(a) blocking operation (queuing) or non-blocking operation; and

(b) on-street location or off-street location.

7 Public transport vehicles using urban ranks and terminals and operating commuter services should be discouraged from parking or holding at such ranks and terminals. If a need exists for parking this can be provided separately within the terminus or externally where high parking densities can be achieved (see Section 8.4). This requirement may be relaxed at terminals catering for long distance rural buses for which boarding times tend to stretch over several hours and schedules may not be adhered to very strictly.

8 For purposes of this chapter a rank for taxis or minibuses should have one or more of the following characteristics:

(a) it will be on-street;

(b) it will permit more than one vehicle to take on passengers at a time;

(c) it will permit vehicles to arrive and depart independently of each other;

(d) vehicles will not be permitted to park or hold at the rank (in this context "parking" means that the driver leaves the vehicle unattended).

9 The geometric design and size of ranks and terminals will vary significantly according to where they are located in the road network and on the size and shape of the land available to accommodate them. Terminals located close to residential areas will tend to be smaller than those located in city centres. The entry and exit signing for all should, however, conform to a common practice. **The past practice of signing the access to a bus terminus with a NO ENTRY sign R3 and an "Except Buses" information plate should be discontinued.**

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8.3.2 Bus/Minibus Terminals

1 For the purposes of this section a bus, minibus or indeed a "transport" terminal is normally considered to be a public transport facility which requires the public transport vehicles to leave the roadway completely to drop-off or pick-up passengers. The vehicles then return to the road network to continue their service. The points of entry and exit are therefore specific and need to be clearly identifiable both in terms of the general street scene, and one from the other. The terminus for a very lightly used and/or infrequent service may, however, simply be a roadside BUS STOP sign R325 or MINIBUS STOP sign R326, suitably identified as a terminus (see Figures 8.7, 8.8 and 8.12). It is also possible that the operational and geometric design of a bus terminal may incorporate a layby stop for a specific service, or a minibus or taxi rank, on its outside perimeter.

2 The geometric and operational characteristics of bus and/or minibus terminals have a significant influence on their road traffic signing requirements. Whilst it may be argued that the drivers of public transport vehicles are essentially a "captive audience", who know their routes and terminals in detail, there is sufficient turn-over amongst drivers that clarity and safety need to be satisfied. There are also limits to what can be achieved by road traffic signs and poor geometry and/or operational characteristics cannot be cured simply by signing.

3 The functions of road traffic signs in relation to public transport terminals are therefore primarily as follows:

(a) to permit effective enforcement of regulations when necessary;

(b) to ensure the correct management of the use and operation of the terminus;

(c) to identify specific operational aspects of the terminus such as entry and exit points;

(d) to promote the efficient movement of vehicles and passengers within the terminus.

These functions are illustrated by the examples given in this section.

4 Figure 8.12 shows a medium sized bus terminus which could be expected in a residential environment at the outer end of a busy route. Such a terminal illustrates the following features:

(a) separate entry and exit points;

(b) the ability for buses to return in the direction from which they approached the terminal (in particular, but in other directions as well);

(c) the ability to handle three buses simultaneously with independence of arrival and departure - these buses can service one busy route with small headways or up to three different routes without sharing stops;

(d) a small holding area allows buses to be parked overnight for commencement of service early in the morning (subject to security this arrangement can save a length of "dead' return trip to depot).

5 Figure 8.13 illustrates three options for minibus terminal facilities in a residential environment with increasing handling capabilities shown from Detail 8.13.1 to Detail 8.13.3. Details 8.13.2 and 8.13.3 offer the ability to allow minibuses to return along the route they have used on the outward trip whereas a rank like that in Detail 8.13.1 requires that minibuses reverse their direction by a different route or by going round the adjacent street block.

6 Figure 8.14 shows one way in which bus and minibus terminals can be provided in close proximity to each other for passenger convenience and efficient provision of support services, such as toilets, and yet still achieve the desired segregation of the two classes of vehicle from a traffic management perspective.

Checklist

- ❑ are entry and exit points clearly identifiable?
- ❑ are control measures necessary to keep other vehicles clear of the site?
- ❑ are pedestrians adequately catered for when leaving and entering the site to or from the adjacent street network, and within the site?
- ❑ do stops or groups of stops within the terminus need to be specifically identified from each other to apply to specific services?
- ❑ can buses/minibuses exit the site freely (are traffic signals necessary to achieve this)?

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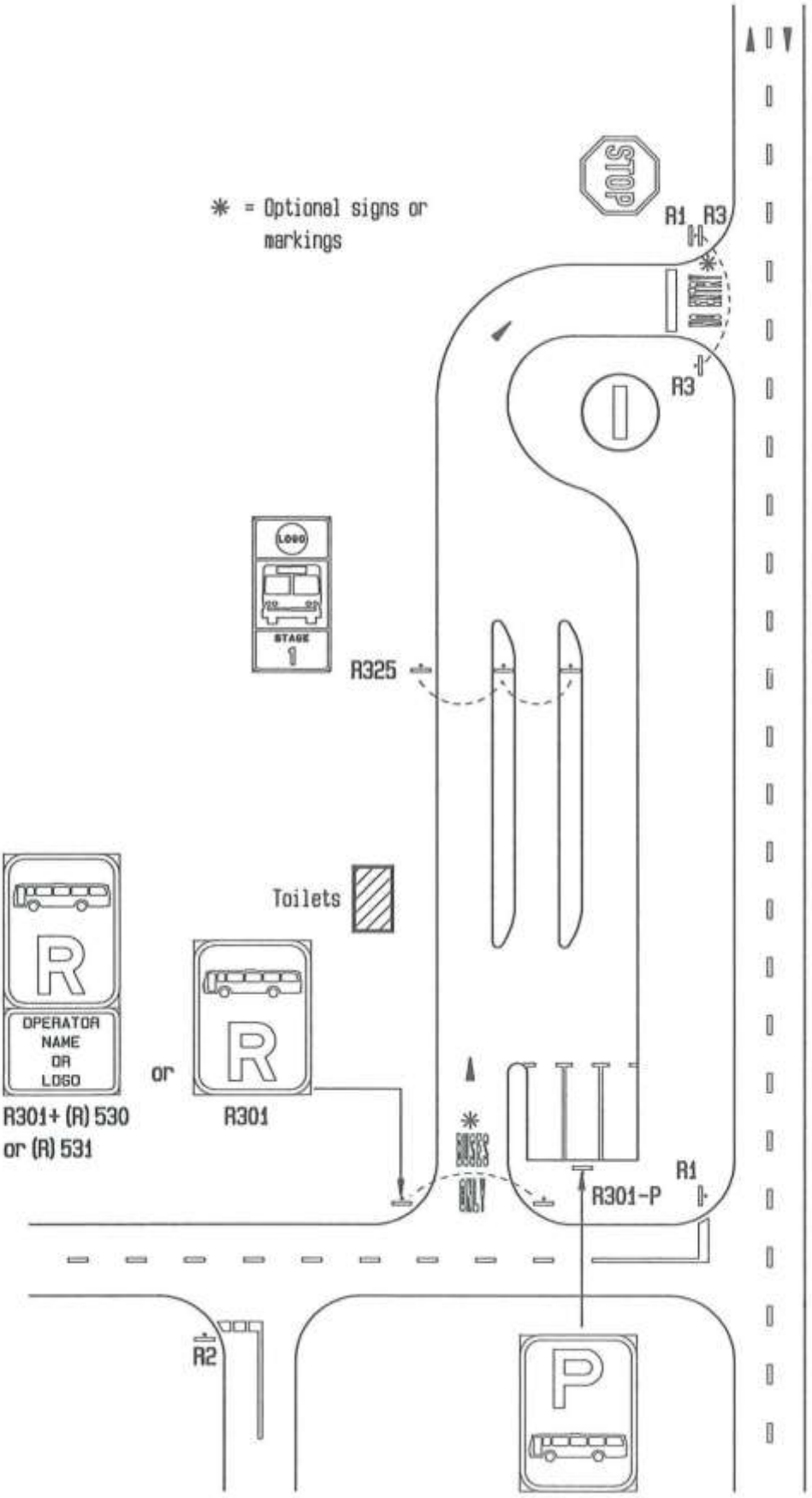

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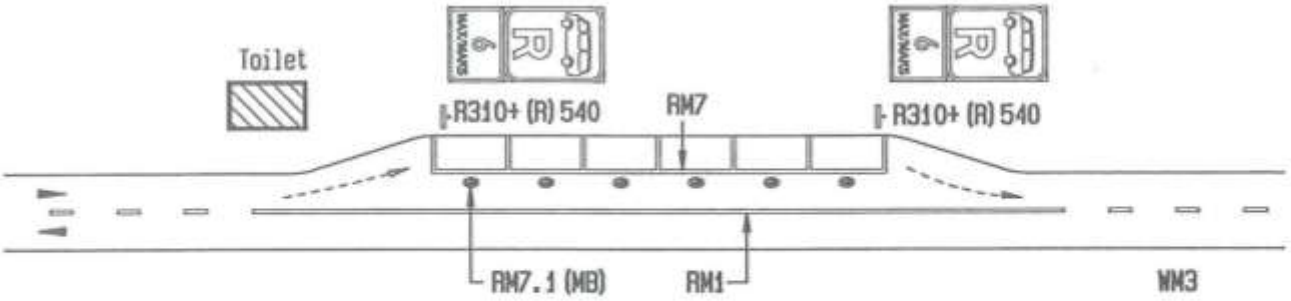
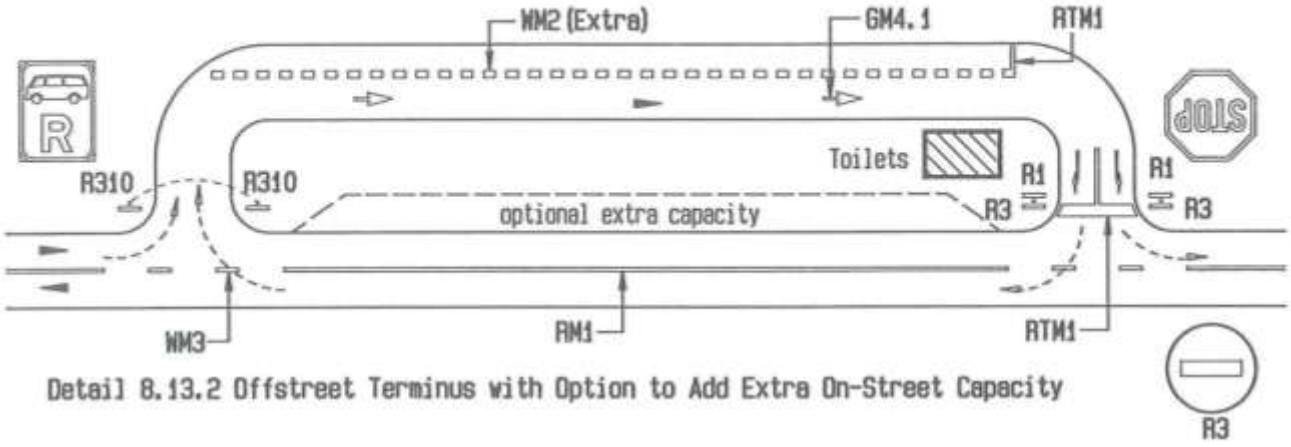
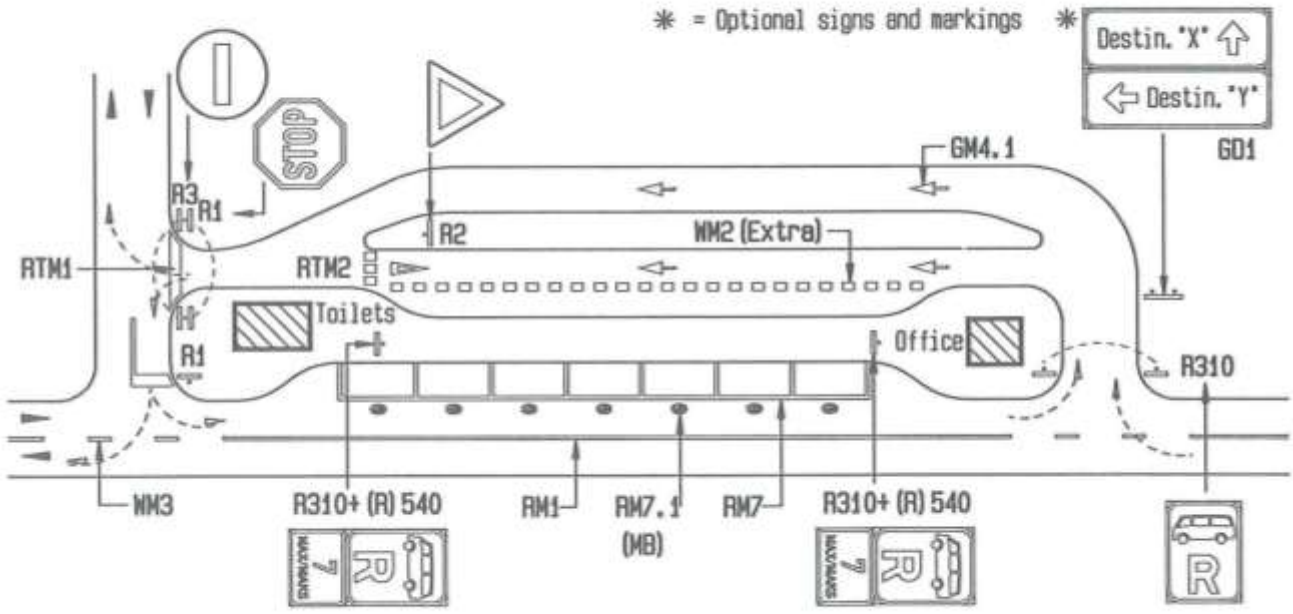
Fig 8.12 **Typical Bus Terminal Signing – Residential Area**



Detail 8.13.1 Roadside Terminus - Maximum 6 Minibuses



Detail 8.13.2 Offstreet Terminus with Option to Add Extra On-Street Capacity



Detail 8.13.3 Larger Terminus with Option to Allocate Aisles to Destinations

Fig 8.13 Typical Minibus Terminal Signing – Residential Area

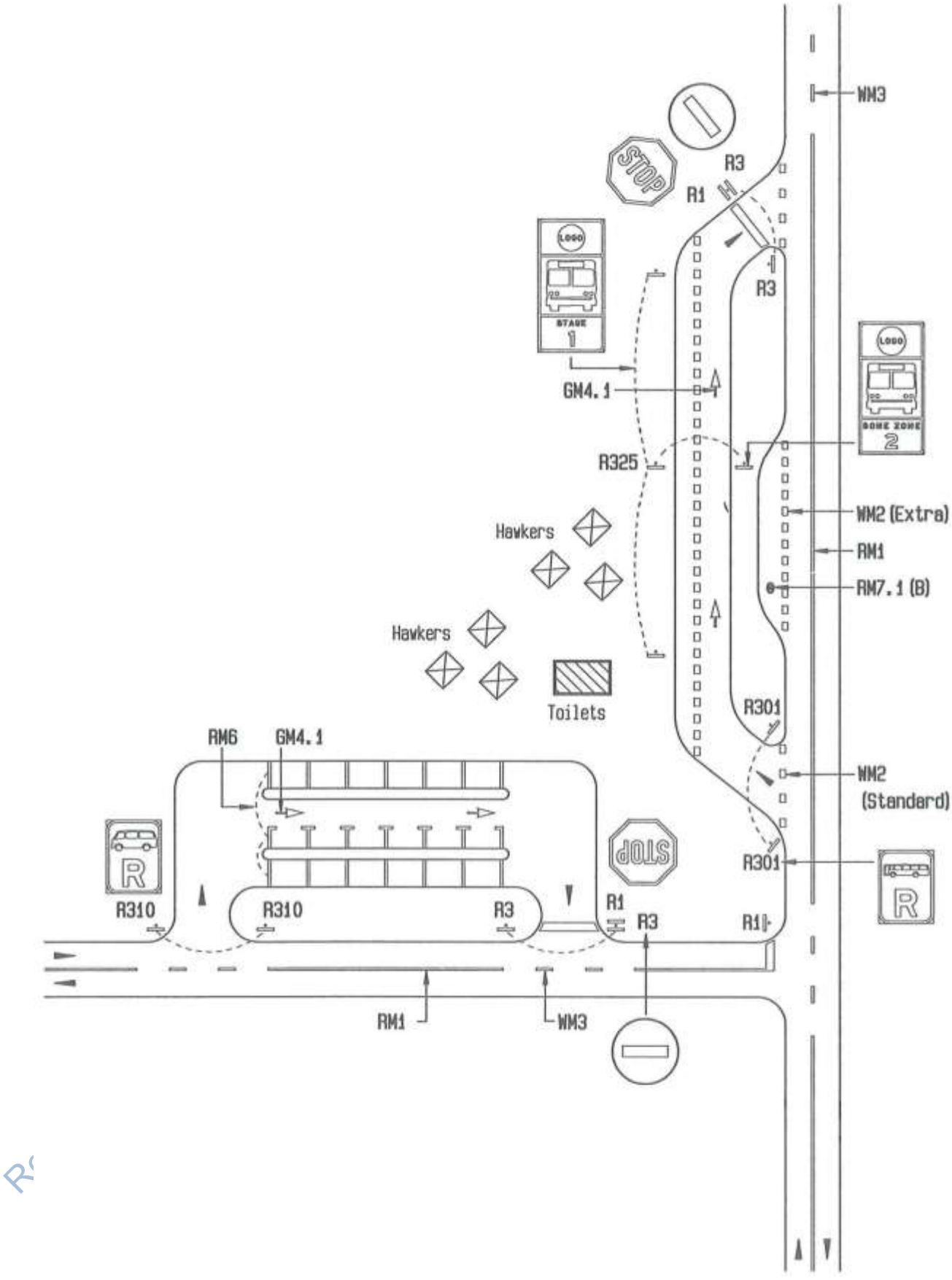


Fig 8.14 **Combined Bus/Minibus Terminals – Residential Area**

8.3.3 Park and Ride Facilities

1 A "Park and Ride" terminal is a point of transfer whereby commuters park their private vehicles and transfer to a mode of public transport in order to reach their final destinations.

2 "Park and Ride" facilities are commonly associated with bus or rail operations because of the high passenger densities these modes of transport offer. If there is a requirement to cater for minibuses or taxis at a "Park and Ride" facility signs are available to cater for this. A "Park and Ride" parking area could in fact be the starting point for an HOV (high occupancy vehicle) operation.

3 "Park and Ride" facilities are normally located as close as possible to a commuter public transport route e.g. a bus route or a railway line (at a station). In order to keep walking distances to a minimum it may be desirable to divert a selected number of buses off their main route to service the "Park and Ride" area. If it is not possible to locate a parking area at a railway station it may be effective to provide a short shuttle "Park and Ride" service from a more remote car park to the station (and in the reverse direction) using minibuses or midi-buses.

4 Figure 8.15 shows the typical signing required for a Park and Ride Terminal. The ADVANCE TRANSPORT TRAILBLAZER signs are versions of signs GE9 utilizing the symbols from information PARK AND RIDE signs IN9 and IN10. The type of signing shown is equally appropriate to a rail related "Park and Ride" operation.

Checklist

- ❑ does the parking area have sufficient spare capacity to satisfy a "Park and Ride" operation?
- ❑ is the parking area clearly visible without direction signs?
- ❑ is the parking area within walking distance of a bus route?
- ❑ do buses need to be diverted to service the area?

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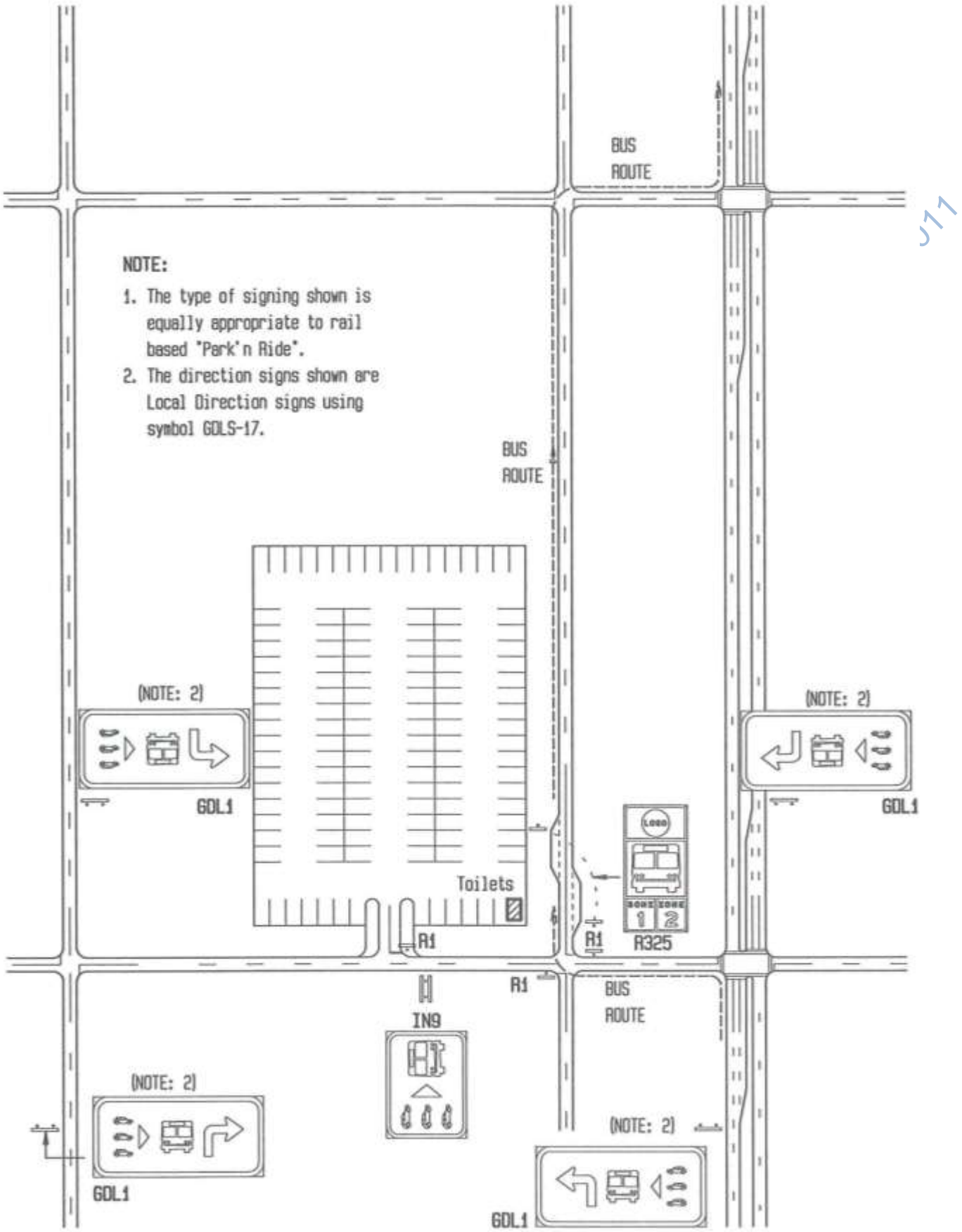

Fig 8.15 **Park and Ride Terminal Signing**

8.3.4 CBD Terminal Facilities

1 Figure 8.16 shows a representative CBD bus terminal facility with the capability to provide segregated loading and drop-off areas for different bus operators internally and at bus laybys located on the adjacent street network. A number of holding bays are also provided in the terminal facility which can be clearly identified as such by PARKING RESERVATION sign R301-P. These holding or parking bays allow for buses to be held during off-peak periods or to be available in case of breakdowns. Such a terminus could ideally be located on the outer fringe of the CBD.

2 A terminus as large as that indicated in Figure 8.16 could be used in a number of ways. The larger area to the north of the site is designed to handle bus services operating to and from the north and east whereas the smaller southern area handles buses from the south. This arrangement allows interaction between the various routes. To achieve this, some sort of internal signing may be necessary for passengers. Typical examples of such signing are shown in Figure 8.21. This type of terminal could also operate very effectively as an interface between long-distance rural services and local urban commuter services. The southern part of the site is designed to cater for very large volumes of passengers on an west-to-east routing. The layby on the north side of the one way street can cater for moderate passenger volumes off peak without buses needing to enter the terminal, thus saving time.

3 All bus stopping points should be provided with BUS STOP sign R325. These may be modified to indicate various routes, regions or areas as shown in Figures 8.7 and 8.8.

4 Figure 8.17 shows a typical CBD minibus terminal facility with separate drop off and loading areas. This figure also shows a typical set of large on-street minibus ranks. MINIBUS STOP signs R326 are provided to indicate the pick-up and drop-off areas clearly.

5 Where roadside minibus ranks are provided consideration should be given to the location of pedestrian facilities in the vicinity of the ranks.

6 Figure 8.18 shows an example of a combined Bus/Minibus terminal located close to an exclusive public transport roadway and a railway station. Special attention must be paid to the signing of roads in the vicinity of such a facility, several of which may be dedicated to road based public transport use.

7 Access to segregated or shared bus and minibus terminals should be controlled by means of reservation signs such as R301, R310 or R327. Where required these signs can be combined into **Selective Restriction** signs by using **Exclusive Secondary Message** signs such as (R)522, (R)530 or (R)531.

8 This use of selective restriction signs may be extended to various prohibition signs such as R209 or R210 or even NO PARKING and NO STOPPING signs R216 and R217 by the use of vehicle class specific secondary messages.

Checklist

- ❑ do stops or groups of stops within the terminus need to be specifically identified from each other?
- ❑ are pedestrians adequately catered for leaving and entering the site to and from the adjacent street network, and within the site?
- ❑ are adjacent roads dedicated for road based public transport use?
- ❑ are there facilities shared by different classes of public transport vehicles?

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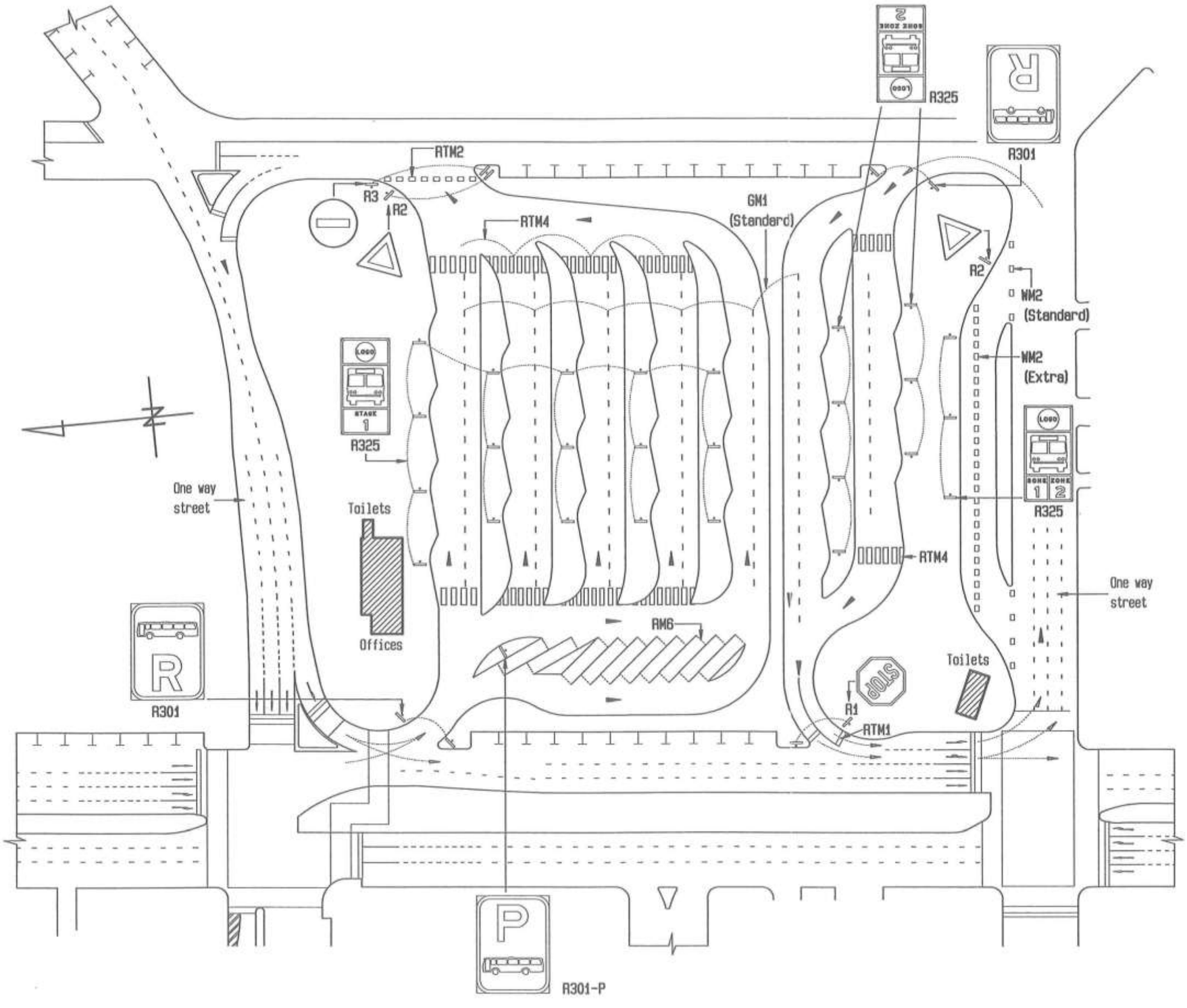

Fig 8.16
Typical CBD Bus Terminal Signing

NOTE:

1. Roadside terminals or ranks require a pair of R310 signs up to 150m apart. For greater lengths additional R310 signs plus IN11.5 supplementary plate signs are required so that signs are not more than 75m apart.

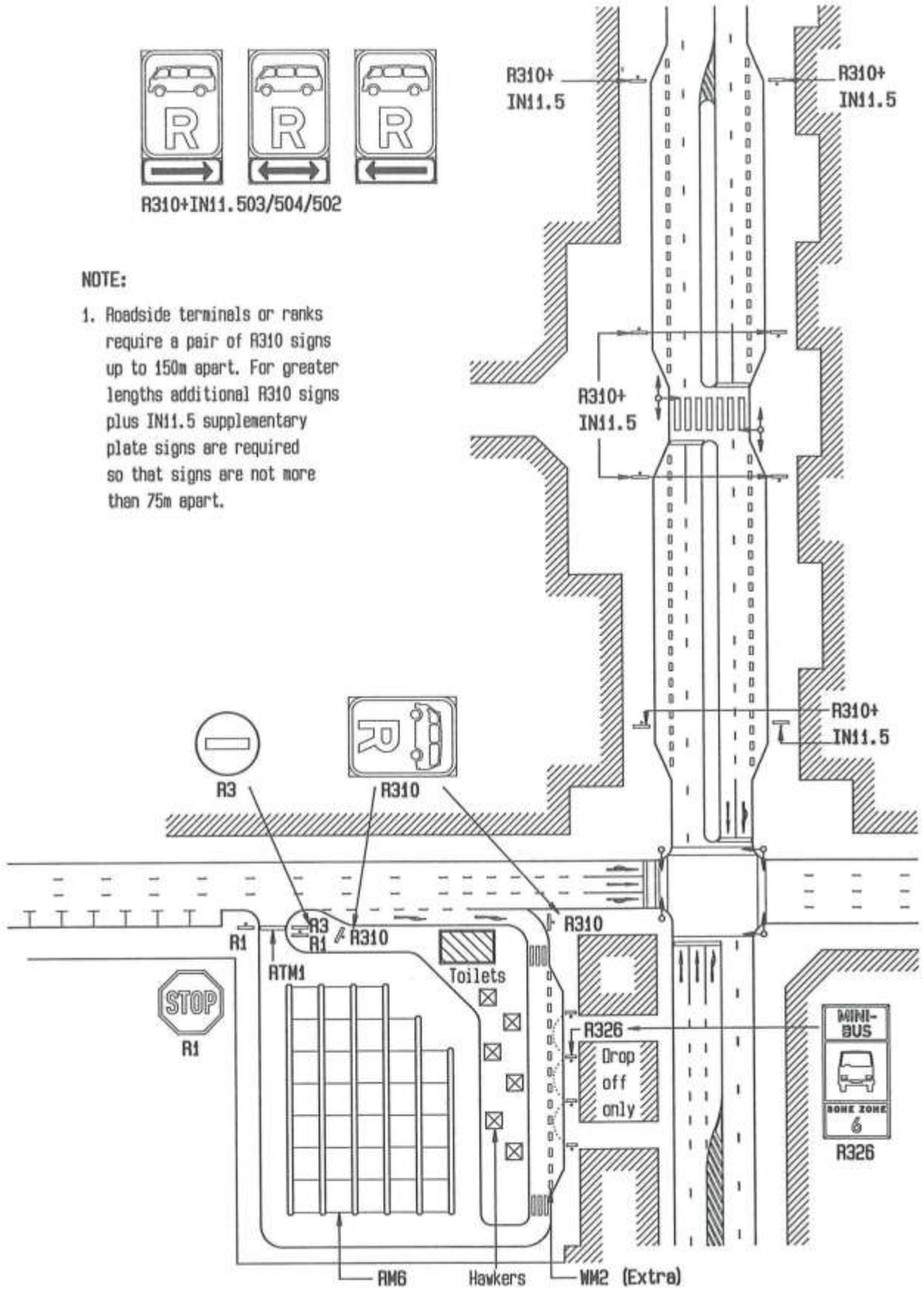

Fig 8.17 Typical CBD Minibus Terminal Signing

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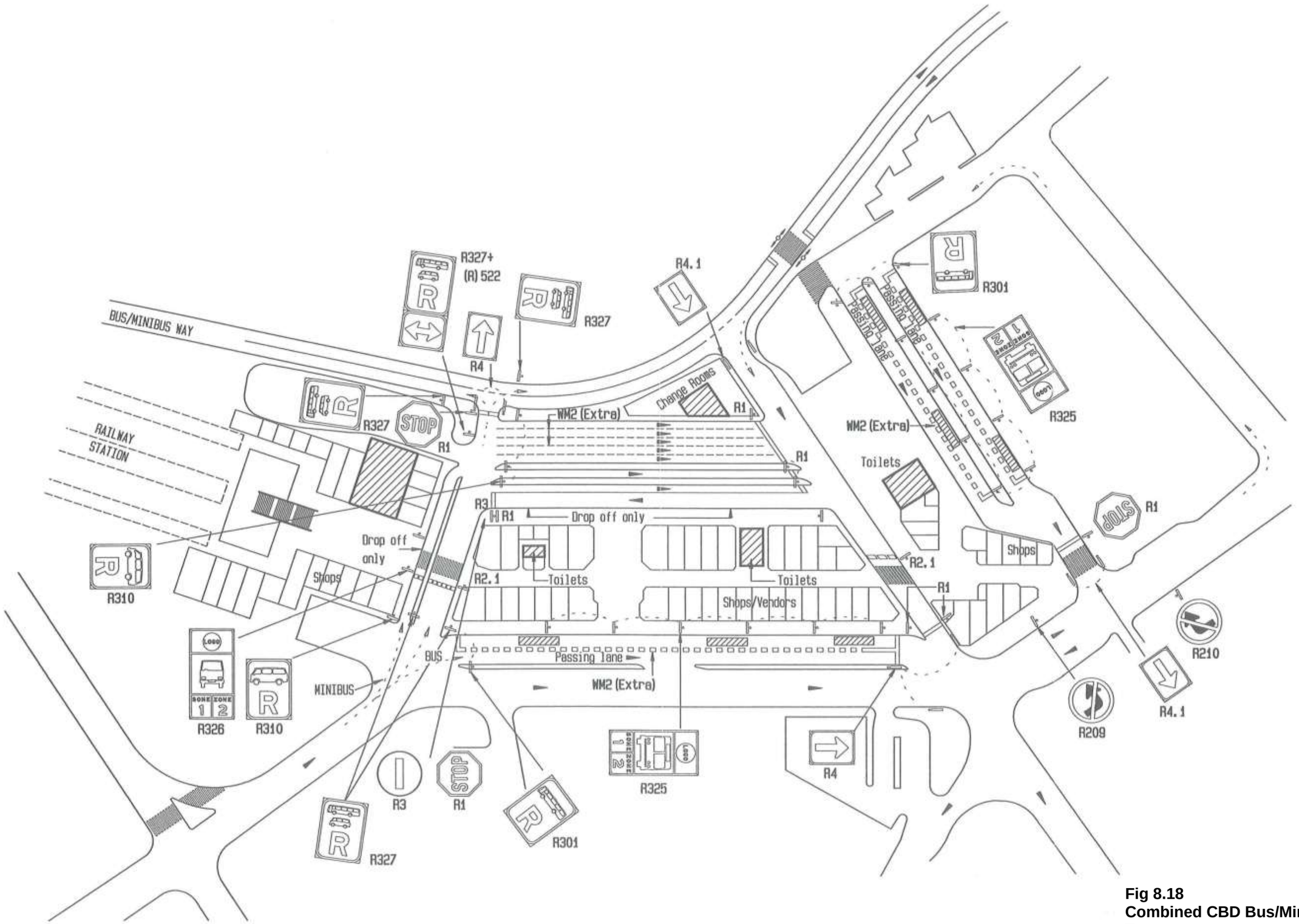

Fig 8.18
Combined CBD Bus/Minibus Terminals

8.3.5 Taxi Ranks

1 Taxi rank facilities can be located both on-and off-street. Access to a taxi rank should be controlled using reservation sign R309. It is recommended that a sign be placed at each end of the rank, whether on-street or off-street.

2 Sign R309 may commonly be used as a selective restriction sign in combination with Exclusive Secondary Message sign (R)540. It may also be advantageous to indicate the extent of the rank by combining these signs with IN11.502, 503 or 504 arrow signs.

3 Taxi ranks located on-street shall be demarcated by an EXCLUSIVE PARKING BAY marking RM7. The length of the parallel Exclusive Parking Bay marking is not fixed but shall be greater than 6m. Supplementary oval marking RM7.1 may be marked approximately in the centre of the bay. When the bay is more than 30m in length two or more RM7.1 markings may be displayed.

4 The word marking "TAXIS" is optional for taxi rank facilities.

5 A taxi rank may be combined with other public transport facilities, when sufficient passengers may need the flexibility offered by taxis, which are not limited to specific routes. This may be particularly appropriate at a modal transfer terminal.

Checklist

- ❑ how many taxis are expected to use the facility at any one time?
- ❑ does a limit need to be placed on the number of taxis in a specific rank at a time?

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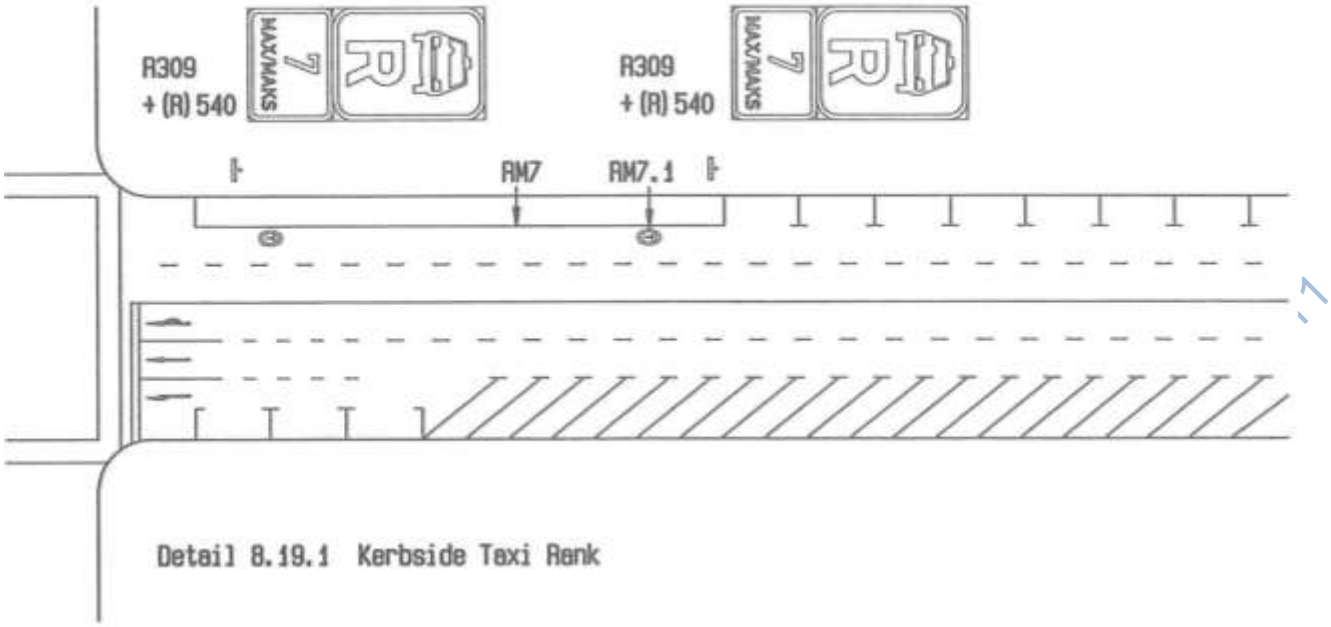
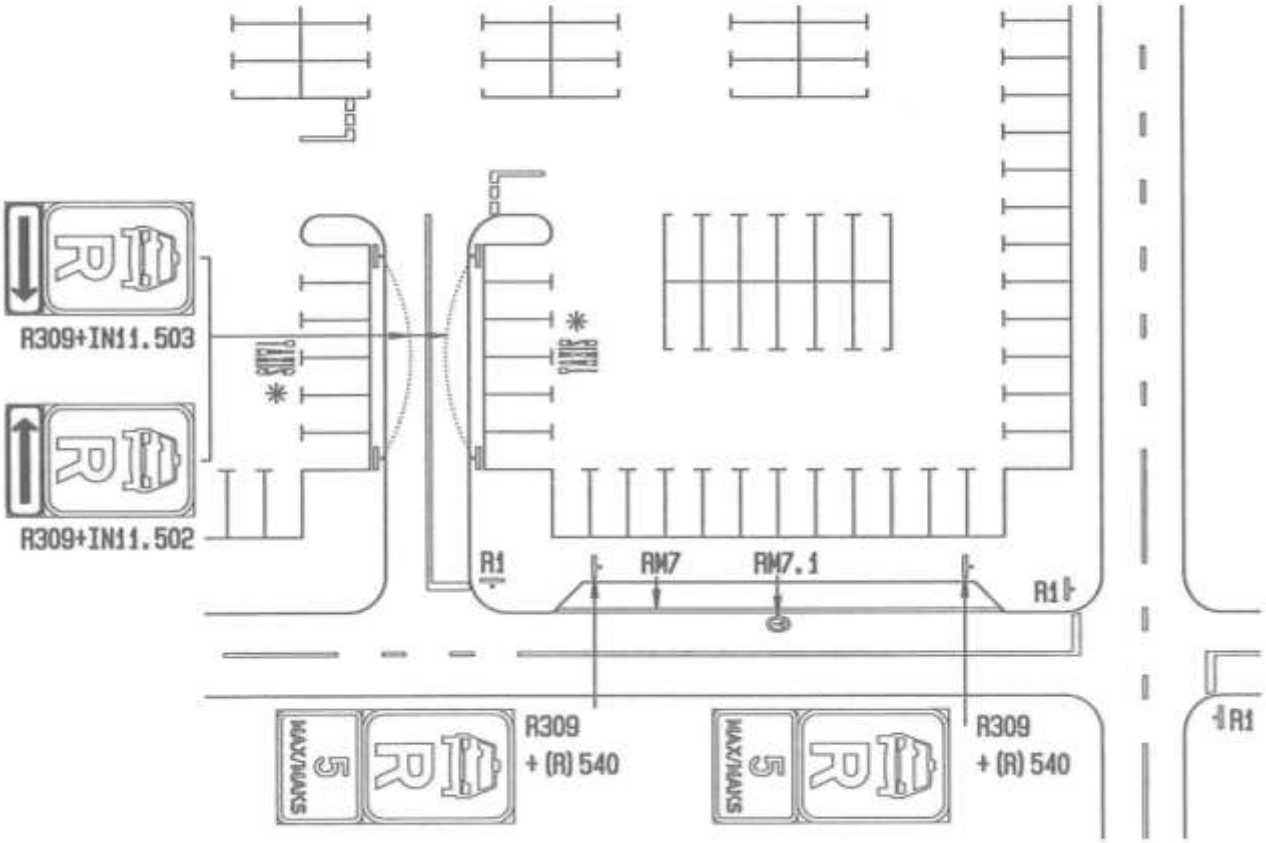


Detail 8.19.1 Kerbside Taxi Rank

* = Optional markings



Detail 8.19.2 Taxi Rank within Car Park

Fig 8.19 Typical Taxi Rank Signing

8.3.6 Public Transport Terminals/Modal Transfer Stations

1 Public transport terminals/modal transfer stations can comprise any combination of rail, bus, minibus and taxi facilities as shown in Figures 8.20 and 8.22. Because of the volumes of people handled at a major terminal or modal transfer station there is almost invariably some form of associated commercial development. Figure 8.20 shows a large shopping centre which was developed in conjunction with the adjacent bus terminus and minibus ranks. Figure 8.18 illustrates a similar situation where there is scope for the development of small shops in support of the passengers using the public transport facilities. Figure 8.22 shows a spread of public transport facilities serving the interface between road and rail transport. In this example only informal commercial support exists in the form of hawkers.

2 The road traffic signs required for large facilities of this nature can be grouped into the following functions and/or areas of activity:

(a) signs to control access to the relevant areas to specific classes of public transport vehicle - this is normally achieved using reservation signs such as R301, R310 or R309 - these signs may, if necessary, be qualified by the use of secondary message signs making them selective restriction signs;

(b) signs such as R325 or R326 to indicate bus and minibus stopping places, both on-street and within the larger components of the terminals;

(c) various prohibition signs to control public transport vehicles so that they operate within acceptable parameters for good traffic management of the terminal and its surrounding area;

(d) guidance signs generally to assist pedestrian passengers to find the transport mode of their choice or the specific route stop which they wish to use.

3 In a similar way to Figure 8.16 the details of Figure 8.20 refer to a bus terminus which is designed to handle slow turnaround rural buses in the main area and high turnover commuter buses in the central loop in front of the offices. Many of the passengers using a terminus of this sort may do so infrequently and they may need some assistance to find the required platform. Detail 8.21.1 in Figure 8.21 gives examples of typical passenger direction signs and platform identification signs.

4 Figure 8.21 also gives examples, in Detail 8.21.2, of modular pictorial signs for passengers, to assist them find their way around a major terminus or modal transfer station. These modular signs form part of the GUIDANCE sign class of road traffic signs and are described in Volume 1, Chapter 4 and in Chapter 14 of this Volume. The signs may be used to give direction, and to actually identify specific facilities such as telephones or toilets.

5 In Figure 8.22 the public transport interface with heavy rail is largely provided by minibuses with ranks on both sides of the line of rail. In order to optimise space both sides of the station are provided with drop-off areas in which minibuses are not permitted to wait. Once passengers have been dropped off the minibus must proceed to the off-street rank or onto its normal route directly. The drop-off areas are identified by MINIBUS STOP signs R326. A small conventional parking area exists on the north east side of the station. In order to control such an area and prevent its use by public transport vehicles the use of sign R308-P is recommended at the entrance to the parking area.

Checklist

- ❑ are all entry and exit point clearly identified by the appropriate signs?
- ❑ are there areas from which public transport vehicles should be prohibited?
- ❑ do bus stops and minibus stops need to be designated for specific destinations (see Figures 8.7 and 8.8)?
- ❑ are pedestrian routes clearly marked and signed?
- ❑ do any minibus ranks or taxi ranks need to be limited to a specific maximum number of vehicles?

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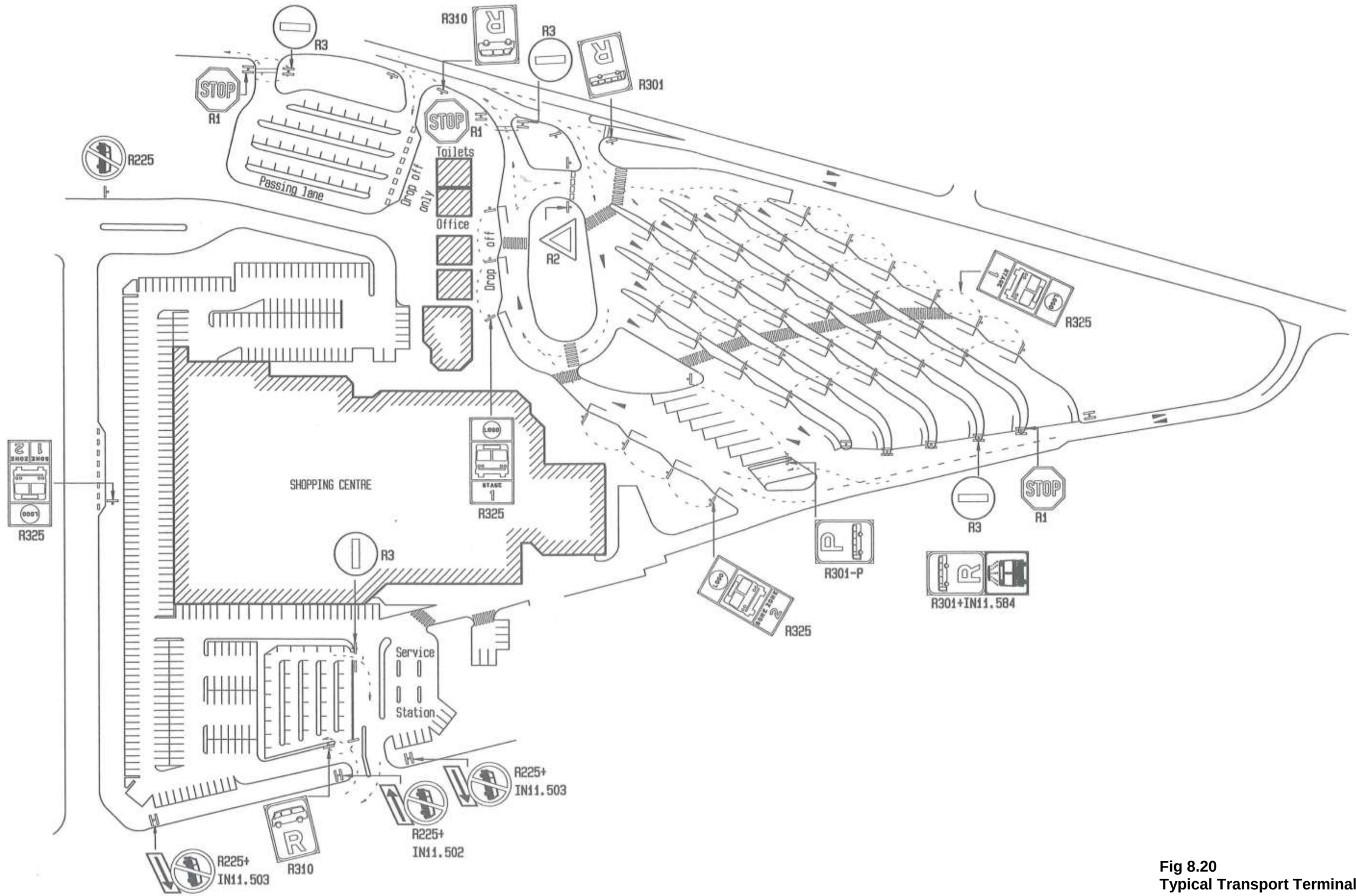
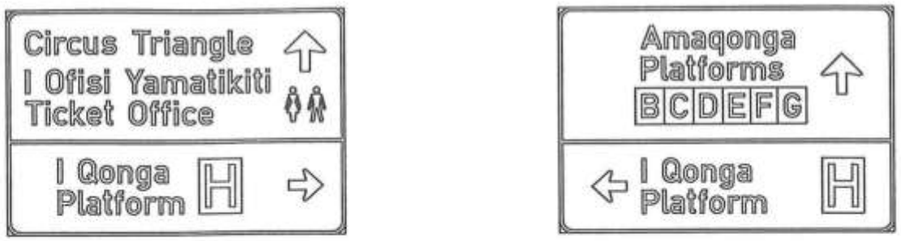
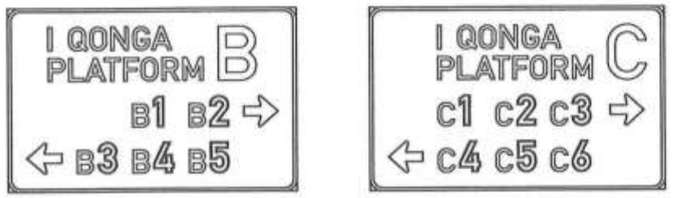


Fig 8.20
Typical Transport Terminal/Modal Transfer Signing - 1



Direction Signs to Platforms Utilizing Platform Colour Coding
Each letter/block is a different colour combination



Colour Coded Signs on Platforms Indicating Shelter Numbers
In this case the signs and their letters take on the
colours from letter/block examples above

Detail 8.21.1 Typical Internal Direction Signs at a Large Bus Terminus

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Detail 8.21.1 Examples of Modular Guidance Signing for Pedestrians

Fig 8.21 Typical Internal Signing at Transport Terminals

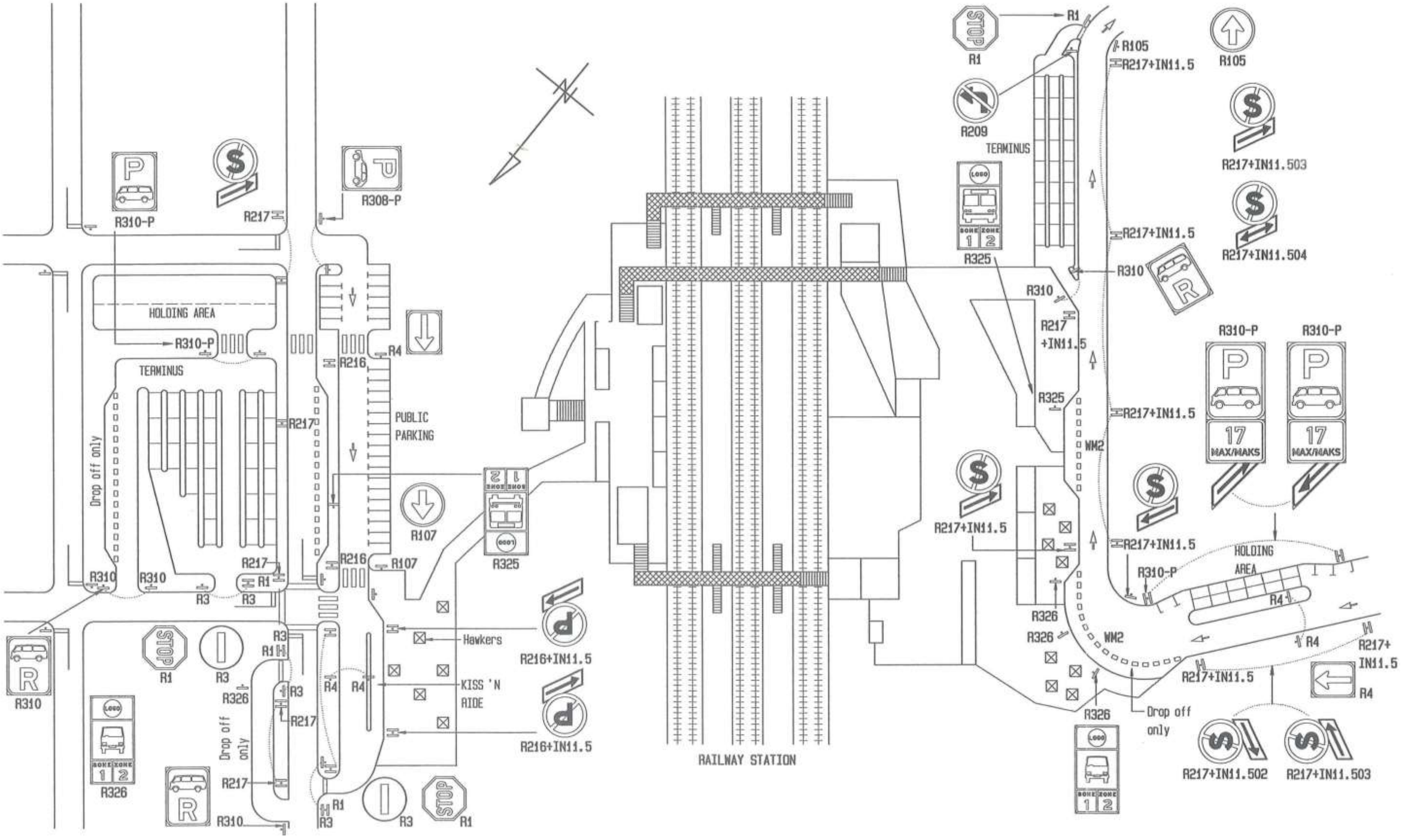

Fig 8.22
Typical Transport Terminal/Modal Transfer Signing - 2

8.3.7 Public Transport at Shopping Centres/Malls

1 The options for the provision of public transport are at shopping centres or malls as varied as the designs and concepts of the shopping centres themselves. This subsection simply identifies the more relevant factors and cannot provide solutions to all possible combinations of circumstances. The details covered deal with situations in which it is desired to cater for accessibility by patrons of the shopping centre to public transport routed past the centre, and to show public transport authorities a number of ways in which such a service may be provided, even to an existing shopping centre. The details given in Figure 8.20 also illustrate a shopping centre situation but are somewhat different in that the shopping centre and bus terminus have been developed as a co-ordinated exercise.

2 Figure 8.23 shows two basic ways in which public transport can be catered for at a large shopping centre. For convenience examples of both types of system are shown in the one figure. It is most unlikely that a specific site would use both although an intermediate compromise is always possible. The two principles involved are:

(a) that all interface with modes of public transport occurs on the external roads forming the perimeter of the site; and

(b) that the public transport vehicles enter the shopping centre internal road network.

3 The external or perimeter treatment is simple and comprises the provision of laybys for buses and minibuses controlled by BUS STOP signs R325 or MINIBUS STOP signs R326. If necessary one or more limited minibus ranks may be provided at laybys. In such an instance control should be provided by reservation signs R310. These may be provided as selective restriction signs R310 + (R)540, if the rank can only accommodate a limited number of minibuses. When bus and minibus laybys are provided on one section of road they should be adequately separated from each other (see Figure 8.11).

4 Given the size of modern shopping centres it is not unreasonable that patrons could expect to have access to public transport within the centre site. Figure 8.23 shows two examples of minibus ranks provided in close proximity to access points to the building itself. The signing indicated is intended to control minibus movement to the shortest possible access route from the external road network to these ranks. Figure 8.23 also shows how a bus, or midi-bus, route could be provided within a shopping centre. This type of public transport provision would have to be designed at the initial development stage because the roadway geometric standards required for buses would exceed those traditionally provided at shopping centres.

5 Although not directly a public transport issue Figure 8.23 also illustrates ways in which signing for delivery vehicles could be applied in the sort of situation illustrated by the figure. This has been included because there is perhaps a potential for increased conflict or congestion when buses, minibus and delivery vehicles have to share common roadways or space.

6 The traditional layout of large shopping centres tends to result in very large space requirements. There may often be an effective synergy for developers if they combine the concepts of modal transfer station with the commercial enterprise of a major shopping complex. In such a situation the provision of a vertical design element can create a viable operation if the shopping areas are located between interfacing public transport modes. A development of this nature may well require a greater provision of guidance signs than is common at normal public transport terminals. The signs for pedestrians illustrated in Figure 8.21 could also be of value.

Checklist

- ❑ are walking distances to the perimeter of the site reasonable?
- ❑ can adequate space be provided at the perimeter for queuing passengers?
- ❑ can a roofed area be provided for queuing passengers to protect them from the weather?
- ❑ can internal roadways accommodate a bus?
- ❑ can a bus get close to pedestrian access points to the building?
- ❑ is there likely to be conflict between public transport vehicles and delivery vehicles?

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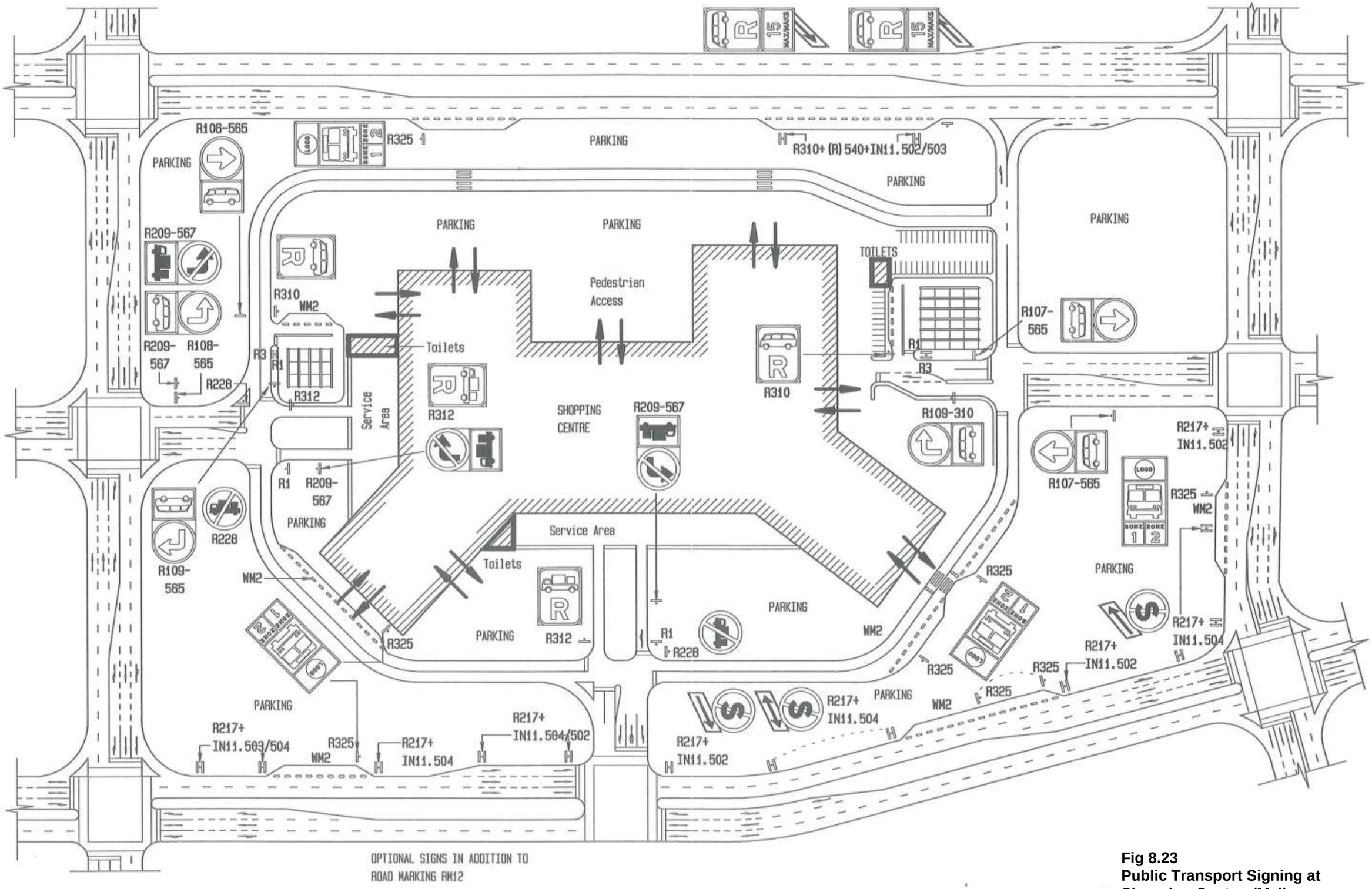

Fig 8.23
Public Transport Signing at Shopping Centres/Malls

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8.4 SIGNING APPLICATIONS FOR PARKING AND HOLDING AREAS

8.4.1 General

1 Parking or holding areas are areas separate from stops, ranks or terminals where buses or minibuses may be held pending re-entry into scheduled service. The main function of such areas is to cater for the excess numbers of vehicles needed during peak operating periods which cannot, and need not, be accommodated at terminal facilities during off-peak periods.

2 Passengers should be discouraged from boarding or alighting from buses in parking or holding areas. Since the vehicles are not required to take on or drop off passengers within the area no space is provided for the movement of pedestrians and the buses or minibuses can be parked to much higher densities than they can within a terminus.

3 Parking/holding areas may also be operationally effective when bus or minibus services comprise many individual driver-operators who do not have their own parking facilities.

4 In order to encourage the use of parking and holding areas direction signs may be necessary to guide drivers towards their allocated parking area. The signs used for this purpose can be LOCAL DIRECTION signs GDL1 or GDL2, displaying symbols such as BUS (GDLS A1-8), or MINIBUS (GDLS A1-9) together with parking symbol "P" (GDLS A1-11). It is also desirable that there is a good system of communication between the relevant ranks and the holding areas so that additional vehicles can be called into service when required.

5 Figure 8.24 shows a possible arrangement for a bus parking/holding area. Detail 8.24.1 shows how GDL2 signs can be used to direct buses from terminal facilities to the holding area. Such an arrangement is most likely to be beneficial to a public transport operation in which unfamiliar or infrequent drivers use the terminal facilities. This may occur at a terminal within an urban area serving rural bus services. Detail 8.24.2 illustrates the typical signing treatment of the entry and exit points from the holding area. The bay arrangement shown is only representative of an area which permits individual bus entry and exit movements. Much higher parking densities can be achieved without this flexibility of movement.

6 Figure 8.25 shows a similar situation for a minibus parking or holding area.

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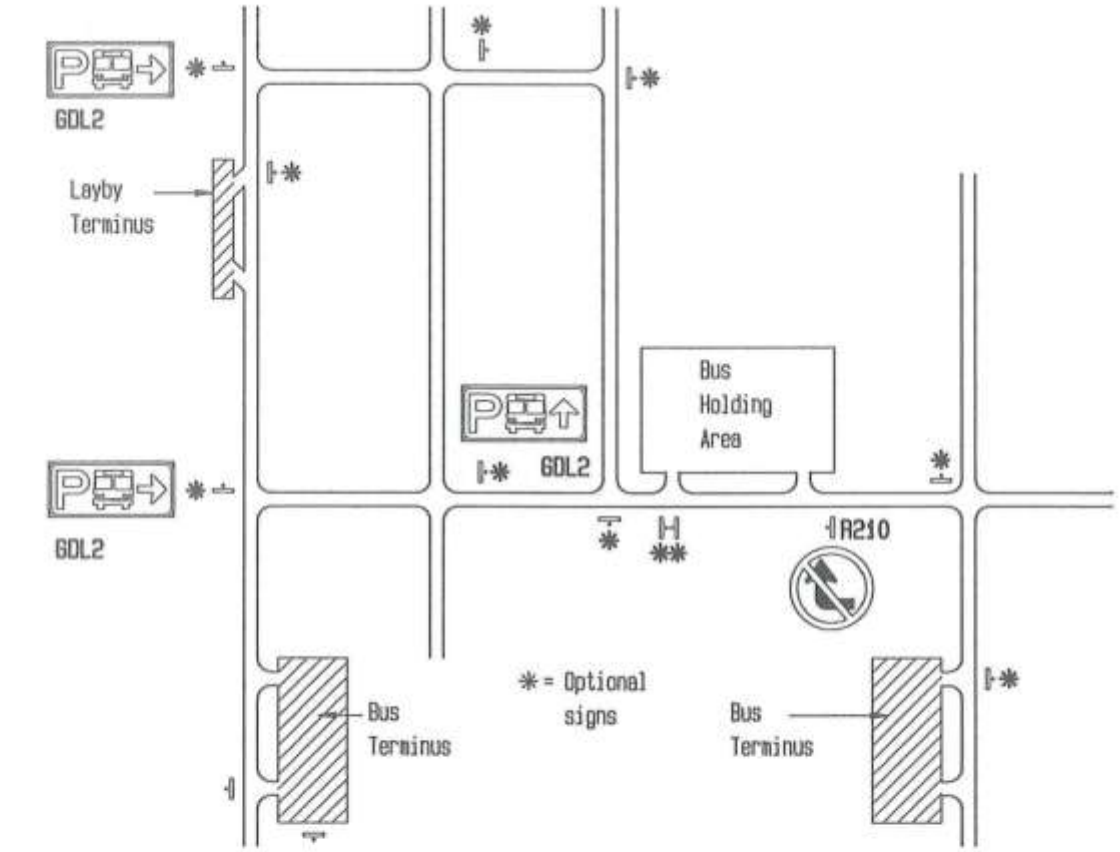
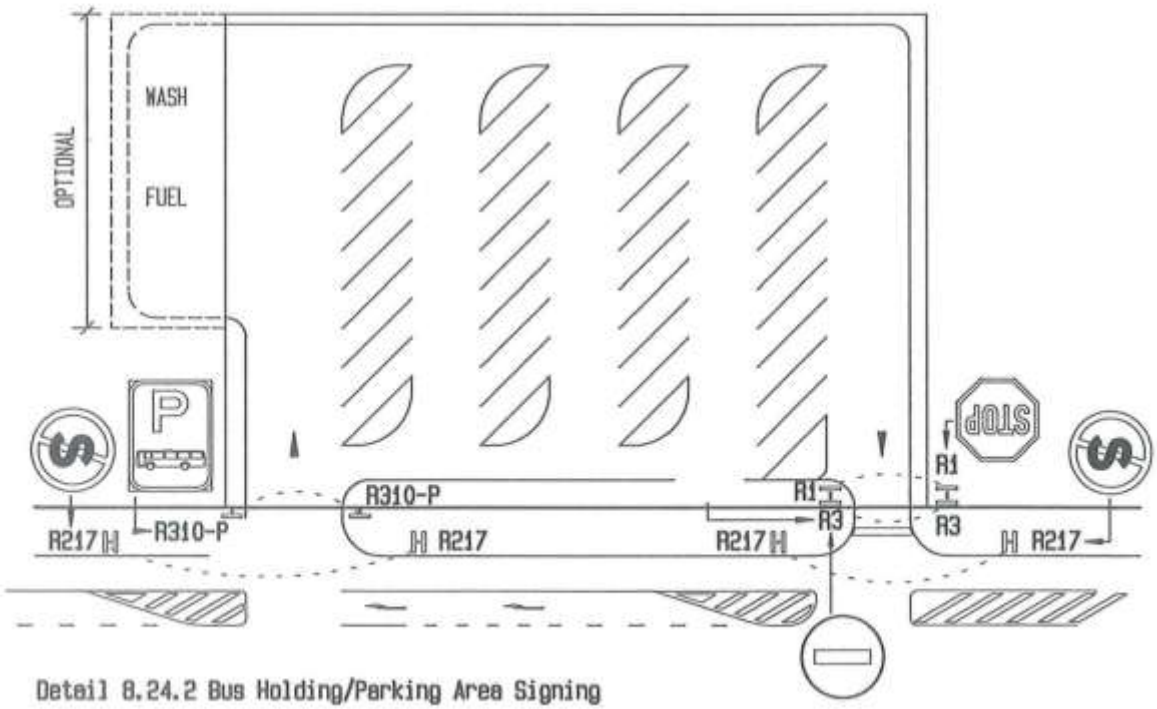


Detail 8.24.1 Direction Signing to Bus Parking Areas



Detail 8.24.2 Bus Holding/Parking Area Signing

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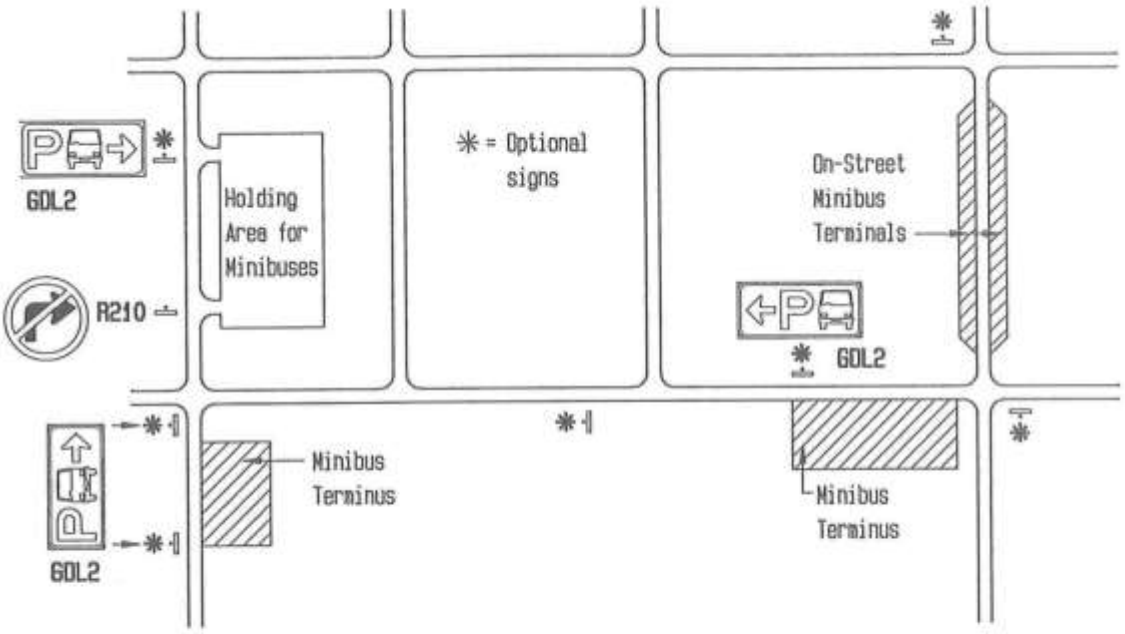
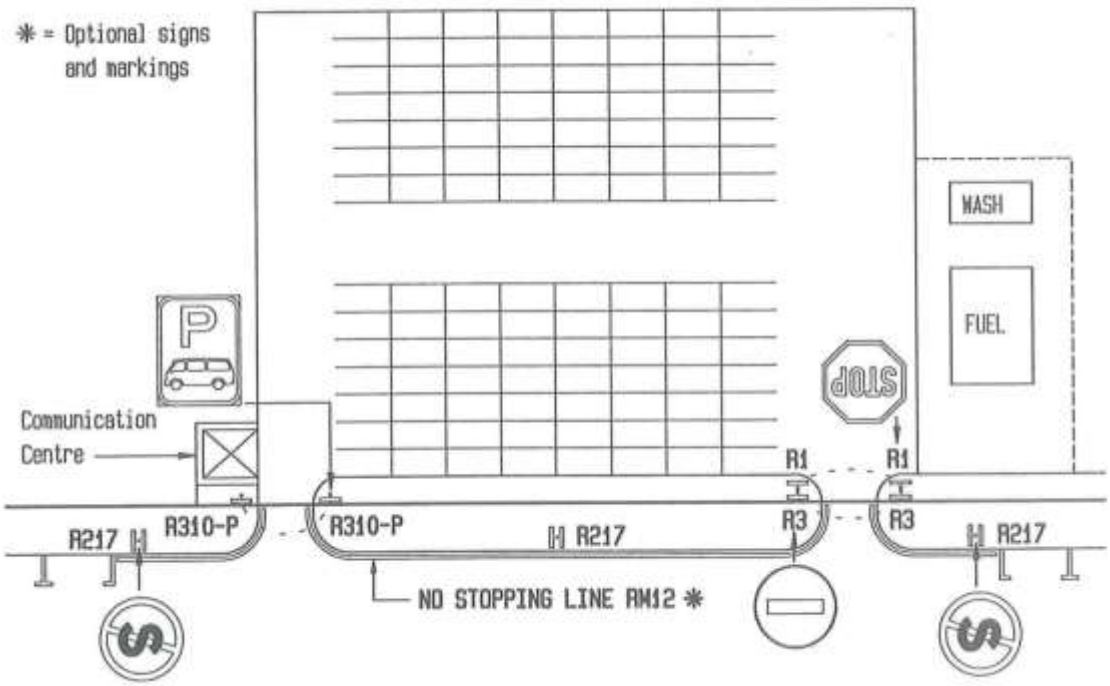
Fig 8.25 **Typical Bus Parking/Holding Area Signing**



Detail 8.25.1 Direction Signing to Minibus Parking Areas



Detail 8.25.2 Minibus Holding Area Signing

Fig 8.26 Typical Minibus Parking/Holding Area Signing

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8.5 SIGNING APPLICATIONS FOR RESERVED LANE/ROAD USE

8.5.1 General

1 When it is considered necessary to significantly increase the priority or road space allocation for public transport this may be achieved in a number of ways including:

(a) by reserving one or more lanes of an existing roadway;

(b) by reserving the whole of the existing roadway;

(c) by building a new and dedicated public transport roadway.

Each of these methods of providing increased levels of priority to public transport vehicles may in turn use techniques such as traffic signal priorities to further enhance the operation of the facility.

2 Public transport lanes may operate in conjunction with general traffic, or they may be physically separated into an exclusive roadway occupying only part of the original road. Public transport lanes may also operate with the flow of general traffic or in the opposite direction to the other traffic lanes of a roadway. This latter manner of operation is commonly referred to as "contra-flow" operation. In addition these operating characteristics may apply to two-way roads or one-way roads. The resultant traffic configurations are therefore many and varied. This factor in itself creates difficult road safety and traffic management conditions, particularly for pedestrians.

3 The so-called "contra-flow" operating condition has specifically proven difficult to implement and operate safely. Particular care must be taken over the signing and marking for this type of operation (see Subsection 8.5.2 and Figure 8.29).

4 Reservation of lanes or roadways may be organised operationally in one of the following ways:

(a) exclusively to one class of vehicle i.e. buses - see paragraph 8.1.1.3;

(b) shared between two or even three classes listed in paragraph 8.1.1.3;

(c) shared by all vehicles classified by a public transport authority as public transport vehicles;

(d) as a high occupancy vehicle (HOV) lane;

(e) shared between public transport vehicles and vehicles requiring local access to property otherwise cut off from access by the lane or roadway reservation.

5 The option listed in paragraph 8.5.1.4(e) presents a difficult combination of circumstances to sign and, if necessary, enforce. The requirement for local access may vary from the need to service a single busy access approached by "identifiable" traffic, to the need to provide for many frontage accesses approached by essentially unidentifiable traffic. In the first instance access may be controlled by the display of two R300 series signs such as R301 permitting access to buses, plus a version of sign R324 permitting access to vehicles displaying a specific symbol, crest or logo appropriate to the identifiable organisation requiring access. The second, more general, example is most likely to be satisfied by the use of a SELECTIVE RESTRICTION sign comprising a primary message element R301 type sign and an EXCLUSIVE SECONDARY MESSAGE element in the (R)500 series involving a text message such as "and Local Access Only" (see Figures 8.28, 8.30 and 8.32).

6 Reserved public transport lanes and roadways are likely to experience pedestrian conflict problems as indicated in paragraph 8.1.3.8.

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8.5.2 Signing for Bus Priority Systems

1 Bus priority systems involve the allocation of priority to buses in one or several forms. The priority may require exclusive phasing at one traffic signal, or a totally dedicated purpose built roadway, or one of many possible intermediate levels of prioritisation. Priority is invariably achieved by the use of road traffic signs. An exclusive traffic signal phase needs to be identified and dedicated roadway needs to be identified at its point of commencement.

2 The concept of bus priority can be described as Bus Rapid Transit, or BRT, and involves both bus priority and high frequency operation. A bus lane may be used for BRT or for less frequent services which are still accorded the priority use of the lane. A bus lane may even only apply for a specific part of the day (see Figures 8.4 and 8.31). The signing of bus lanes involves the use of BUS LANE RESERVATION signs R302 and R303 and BUS LANE road marking RM9. This combination of road traffic signs permits buses to use other parts of the roadway as well as the bus lane should this be necessary (in order to make a turn for example). If it is required that all buses be forced to use the lane, signs R302 and/or R303 should be replaced by BUSES ONLY sign R121. In order to fulfill the legal significance of the road traffic signs used, and allow other road users to cross a bus lane in order to leave the road in which it is located, the bus lane must be interrupted. Signs R302 or R121 must be repeated after any such discontinuity. Although road marking RM9 is essentially continuous (except for the breaks mentioned above) it is necessary to repeat the sign message at regular intervals. Signs R302 (R303 when appropriate), or R121, shall be placed so that no two signs are more than 250 m apart.

3 If a bus lane is interrupted to permit, for example, left turning traffic to enter the lane, and shortly thereafter make a left turn, warning END OF EXCLUSIVE LANE arrow marking WM11.1 may be specified. When an exclusive lane continues beyond such an interruption, marking WM11.1 may be followed by a WHITE warning arrow marking WM7, indicating a turn to the left so as to improve driver's understanding that they must not proceed straight-on from the left lane. If such a lane is terminated in mid-block or just prior to an intersection, warning marking WM11.2 is appropriate.

4 Techniques used to create bus priority can be applied to lanes or roads for other classes of public transport vehicle or in fact to priority situations shared by more than one vehicle class. Signs R302 and R303 or sign R121 may therefore be replaced by any appropriate sign from the range given in Figure 8.3 when the exclusive lane is provided for, or shared with, other classes of public transport vehicle. Concepts used for bus lane treatments can be considered equally appropriate to other forms of public transport, subject to an engineering assessment.

5 Figure 8.26 shows the basic bus lane treatment which is the simplest form of public transport prioritisation. Details worth noting include:

(a) termination of the bus lane a minimum of 20 metres from an intersecting side street or cross street - this requirement only applies if general traffic is permitted to turn across the bus lane - such turns will not occur if the side or cross street is an entering one-way street;

(b) the lane which is allocated to the bus lane must be indicated as a "lane drop" situation - if an advance sign R303 + IN11.3 is used, this, plus the LANE REDUCTION ARROW markings WM6 should be adequate - additional "lane drop" signs such as W214 (or W215) or GS103 (or any of GS101 to GS106) may also be specified;

(c) if it is required to make the bus lane operate for only a part (or parts) of the day SELECTIVE RESTRICTION sign R302-501, or similar, should replace sign R302 - no alteration is made to EXCLUSIVE USE LANE LINE marking RM9.

6 Figure 8.27 illustrates a major bus priority provision where a whole street has been allocated to bus use. In addition the cross street has a bus lane. Particular features of this example are:

(a) the busway is marked to operate always in a two-way mode with the direction of the central lane being reversible at various times of the day - the signing for such operation is not indicated since it is likely to require either overhead or variable message customised signing, or both;

(b) the bus lane in the crossing street is frequently considered as a "contra-flow" lane because all other lanes flow in the opposite direction - it is recommended, however, that to enhance pedestrian safety, the street be treated as a two-way street ie. **the use of ONE WAY signs R4.1 etc is not recommended** - this recommendation is based on the fact that operationally, and certainly from a pedestrian point of view, **the road is running as a two-way road with the difference that traffic in one direction is comprised exclusively of buses** (see also Figure 8.29);

(c) since the movements of buses have a measure of priority (and this might extend to exclusive traffic signal phases) it is recommended that bold diagrammatic signs (GS701 to GS703) be provided for pedestrian guidance;

(d) it should be noted that general traffic on the cross street can only proceed straight through the junction shown.

7 The need to share bus lanes or roadways may extend to local residents or businesses whose means of access to the property they occupy is via the bus lane. The signing of such situations is best achieved by means of SELECTIVE RESTRICTION signs based on signs R302 and R303 (or R121), or by the use of an appropriate version of AUTHORISED VEHICLE RESERVATION sign R324, or AUTHORISED PASSENGER TRANSPORT VEHICLE SIGN R353. Figure 8.28 illustrates such a situation where one half of the roadway is reserved by sign R301 - 531 for buses and local access traffic only. This figure also illustrates the use of dedicated bus priority traffic signal faces S1B and diagrammatic signs for pedestrians. **In this example the use of ONE WAY signs R4.1 is relevant.** Signs R324 or R353 are particularly relevant when the vehicles sharing the bus lane are destined for one location within the bus lane environs (see Figure 8.32). A similar situation in relation to Light Rail Transit is illustrated in Figure 8.33.

(continued on page 8.5.7)

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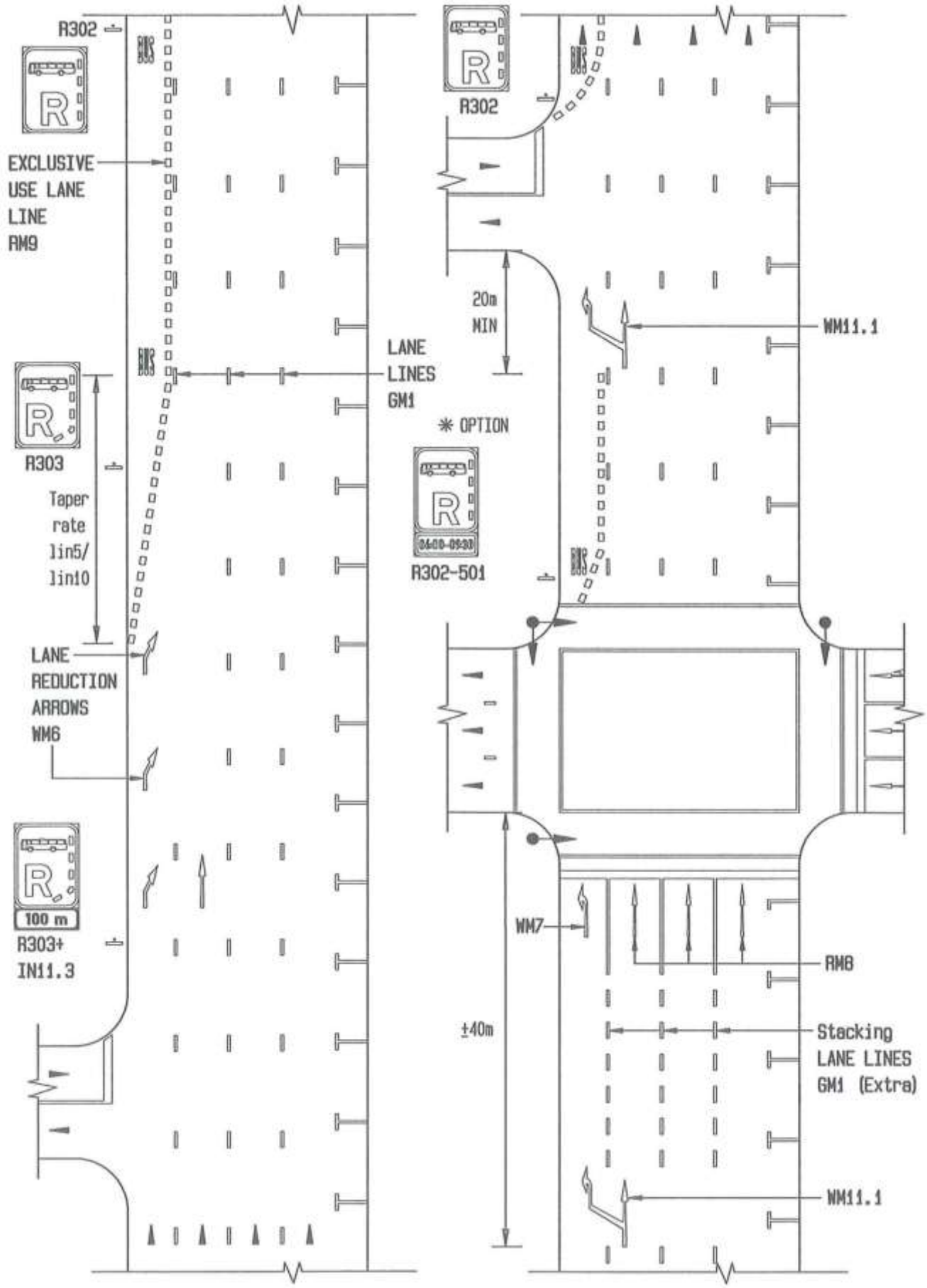

Fig 8.26 **Typical Bus Priority Signing - 1**

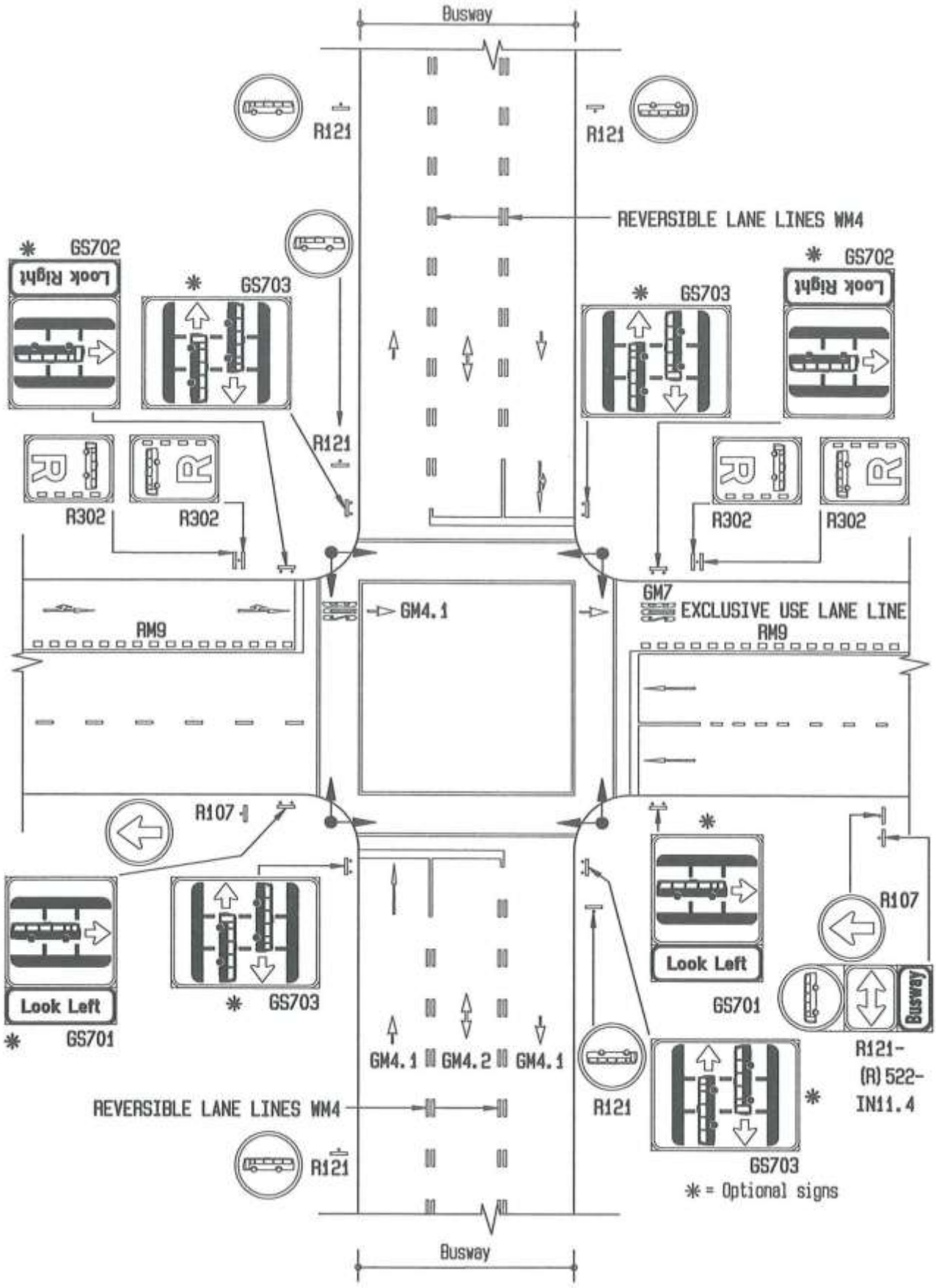

Fig 8.27 **Typical Bus Priority Signing - 2**

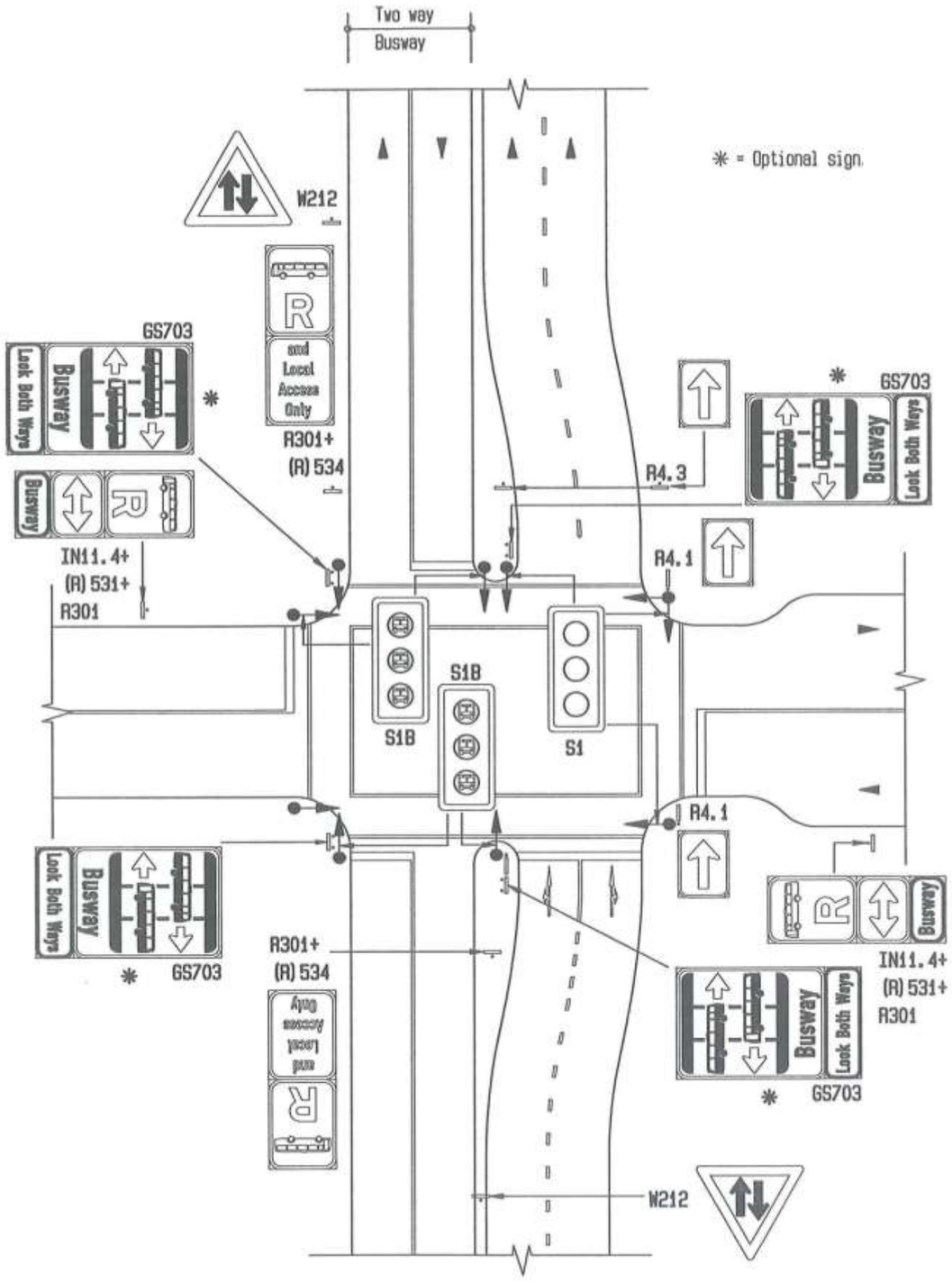

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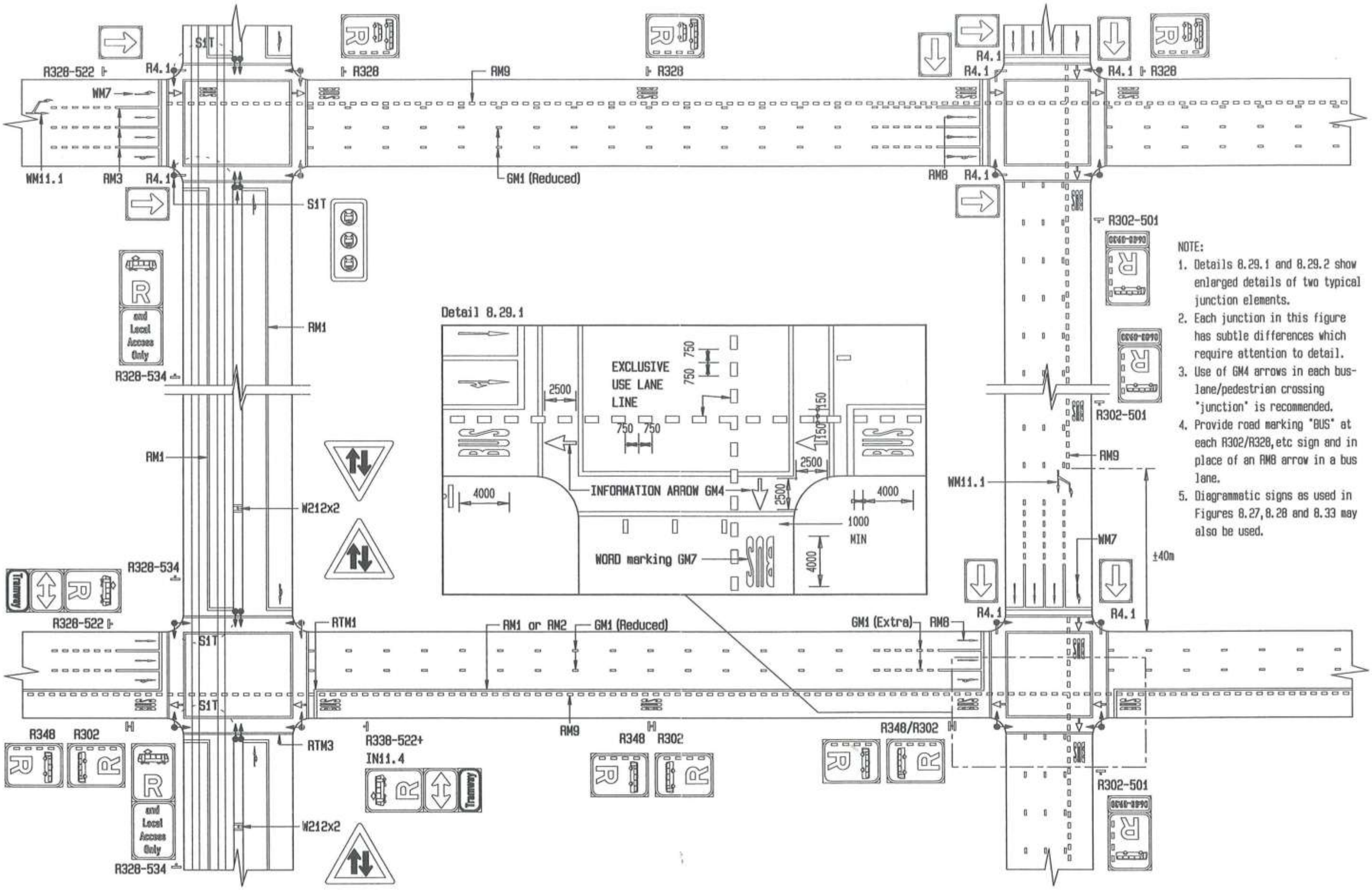
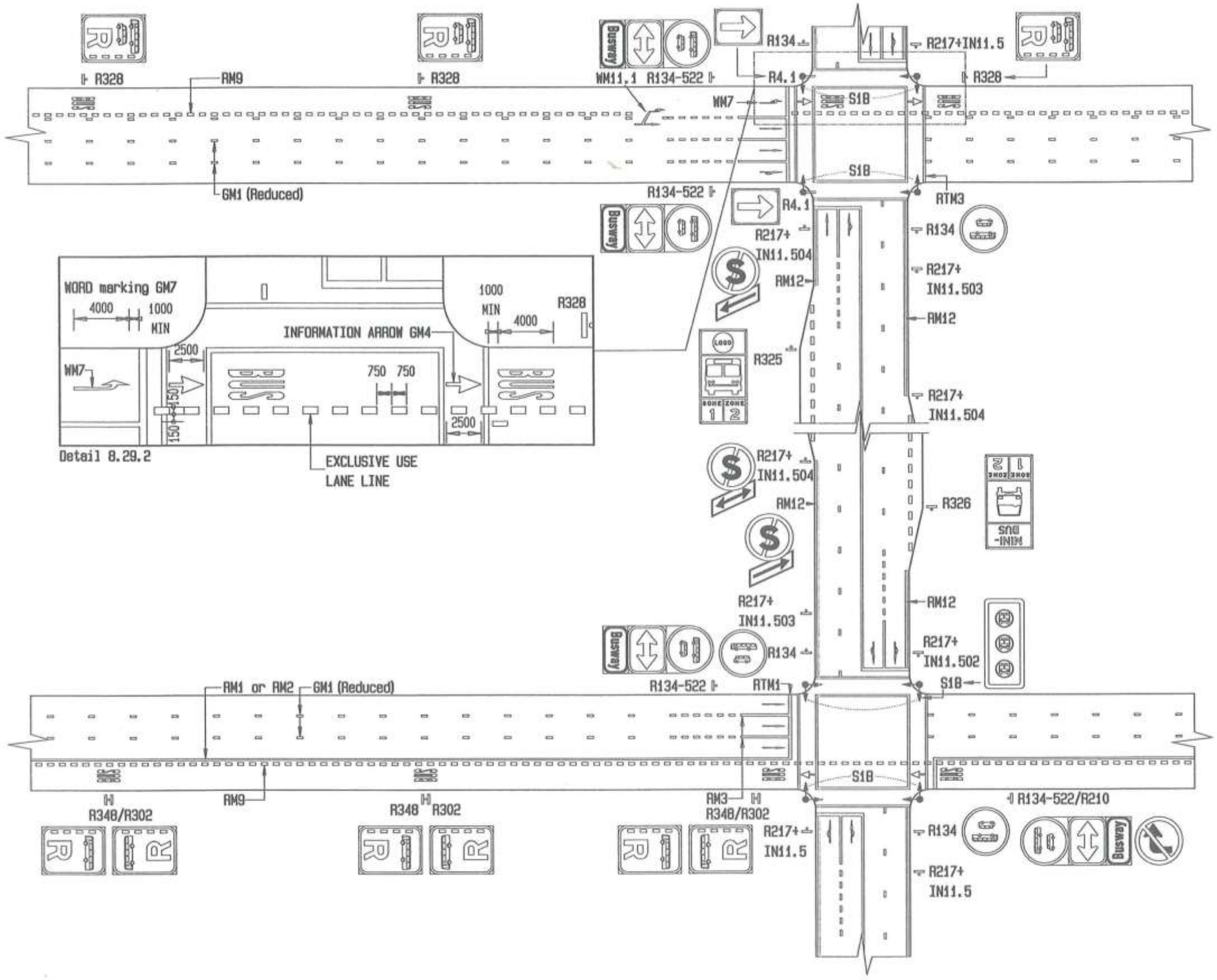
Fig 8.28 **Typical Bus Priority Signing - 3**



NOTE:

1. Details 8.29.1 and 8.29.2 show enlarged details of two typical junction elements.
2. Each junction in this figure has subtle differences which require attention to detail.
3. Use of GM4 arrows in each bus-lane/pedestrian crossing "junction" is recommended.
4. Provide road marking "BUS" at each R302/R328, etc sign and in place of an RM8 arrow in a bus lane.
5. Diagrammatic signs as used in Figures 8.27, 8.28 and 8.33 may also be used.



(continued from page 8.5.2)

8 Figure 8.29 shows a portion of a high order metropolitan public transport system in which a high degree of priority has been allocated to maximising the mobility and efficiency of public transport vehicles. The figure shows a public transport roadway dedicated to buses and minibuses, a shared bus and minibus lane, an exclusive bus only lane in a so-called "contra-flow" mode of operation, and a tramway.

9 The road traffic signing of the individual elements of Figure 8.29 is covered in principle in Figures 8.26 to 8.28 and Figures 8.30 to 8.33. These principles are applied to the broader example offered by Figure 8.29 and amplified where necessary. Road markings in particular are covered in more detail. Public transport systems of the type illustrated tend to require a significant number of signs and markings in addition to what might be required for normal traffic. There is therefore a risk of confusion for drivers, and particularly pedestrians. Special attention must be given to the co-ordinated and orderly provision of all signs and markings to limit this risk.

10 **The need to provide a safe environment for pedestrians cannot be stressed enough**. Figure 8.29 shows a number of conceptual ideas to improve pedestrian awareness, and thereby, safety. **It is recommended that a "contra-flow" operation be signed as a two-way street and not, as a one-way street with "contra-flow" buses. It is considered potentially hazardous for pedestrians to see ONE WAY signs R4.1 and yet for two-way traffic to be operating.** Bus lane related markings are also shown through junctions and pedestrian crossings to further enhance the awareness of both drivers and pedestrians regarding bus operations.

Checklist

- ❑ is signing of the bus priority lane to be developed around sign R121 or the R300 series?
- ❑ is the lane subject to shared use by more than one class of public transport vehicle?
- ❑ is shared use by local residents required?
- ❑ is shared use required by a single traffic generator?
- ❑ is the lane a "contra-flow" lane?
- ❑ is pedestrian safety adequately provided for?
- ❑ is the provision of pedestrian railings adjacent to a bus lane warranted?
- ❑ are traffic signal phases required exclusively for the public transport vehicles?
- ❑ if the bus priority scheme is a new one, do existing route marker signs need to be relocated?

Fig 8.29
Typical Bus Priority Signing - 4

8.5.3 Public Transport Lanes/Roads -Use by Different Vehicle Groups

1 In other subsections reference has been made to shared public transport facilities and to facilities for use by high occupancy vehicles (HOV) which may include public transport vehicles, but which need not be exclusively public transport vehicles. Shared facilities may be controlled by road traffic signs in essentially the same way as for facilities exclusive to a single class of public transport vehicle. Examples of shared facilities are illustrated in Figures 8.30 to 8.32.

2 It is recommended that if a lane or road is to be shared the RESERVATION class of regulatory signs be used rather than the COMMAND mandatory class of regulatory signs. The latter should only be used if use is mandatory to one or more class of vehicle. These classes of sign may be used on a lane only basis, as follows (see also Figures 8.30 to 8.32):

(a) on overhead diagrammatic signs such as GS603;

(b) on ground-mounted diagrammatic signs such as LANE USE CONTROL BY REGULATION signs in the GS300 series.

3 Figure 8.30 shows three similar signing examples, using sign R302 (Detail 8.3.1), R329 (Detail 8.30.2) and sign R337 (Detail 8.30.3). All examples utilise the EXCLUSIVE USE LANE LINE marking RM9.

4 Figure 8.30 also illustrates a point often missed by road, traffic or public transport authorities. The reservation class signs may be any one of six standard sizes, as shown in Detail 8.30.4 (see Volume 4, Chapter 2). There is a tendency to specify signs of the same size as similar parking reservation signs. Parking signs are, however, read at low speeds, or by pedestrians, and are closely spaced. For the higher speeds associated with reserved public transport lanes, and the likely sign spacing of 250 m, a larger size is recommended.

5 Figure 8.31 takes the principles given in Figure 8.30 one step further up the road hierarchy. Exclusive use lanes are shown on a dual carriageway road which could, in fact, be a freeway. In this case the "fast" lane has been allocated to public transport vehicles. This would be most appropriate for a rapid transit operation where the public transport vehicles stay in the median side lane for some kilometres, and would normally only exit the lane when it is discontinued.

6 The signing for the arrangement in Figure 8.31 requires large ground mounted signs of the GS300 series type, or overhead signs in the GS600 series, mounted on cantilever or gantry supports (see Detail 8.31.2). In each case these DIAGRAMMATIC signs incorporate an appropriate RESERVATION class regulatory sign.

7 A variety of sign types may be used to cater for single or multiple classes of vehicle. Detail 8.31.4 shows the variations which may be made to achieve the desired level of control. RESERVATION class regulatory signs can thus be displayed to cover use by:

(a) buses (sign R302);

(b) buses and minibuses (sign R327);

(c) buses and midi-buses (sign R330);

(d) buses, midi-buses and minibuses (sign R334);

(e) HOV with 2 or more passengers **on board** (sign R352);

(f) any vehicle classified by the authority as a public transport vehicle no matter what number of passengers it is carrying (sign R324).

8 If a lane or a roadway is to be reserved for the use of more than one class of vehicle, one of five methods of signing may be considered. The choice should be made according to the mix of vehicle classes permitted to use the facility. The signing principles of the five methods are as follows:

(a) for a lane or roadway used by more than one class of vehicle (up to three classes) the sign used includes the two or three appropriate vehicle class symbols (see examples in Figures 8.3, 8.30 and 8.31); or

(b) for a lane or roadway used by all classes of vehicle which are operating in terms of an authorities' regulations as "public transport", whether full, partly occupied or empty, the sign used should be R324 with a logo or device representing the public transport authority (this logo should appear as a "permit" on all vehicles authorised to use the lane in order for effective enforcement to be exercised); or

(c) for a lane or roadway used by any vehicle, public transport or private, carrying the number of passengers displayed in the symbol on sign R352; or

(d) for limited shared situations there may be a need to permit local access by private vehicle along the reserved public transport lane or roadway - in this case a SELECTIVE RESTRICTION reservation sign such as R301 - 534 is most appropriate (see Figures 8.4, 8.28 and 8.33 for examples); or

(e) for a lane or roadway used by more than one class of vehicle, one of which is **not** a public transport vehicle, two signs should be provided - one should relate to the public transport vehicle(s) and the other to the non-public transport class - the public transport sign may be a shared facility sign- (see the example in Figure 8.32).

As can be seen from Detail 8.31.4 all of the facilities described can be made applicable to a selected time or times of the day by means of appropriate SELECTIVE RESTRICTION signs.

9 Figure 8.32 shows a number of details relating to the sharing of a busway. The example shows a CBD type of environment and the section of busway has only one side access to it, all other property accesses being from other street frontages. Traffic using this access must be identified by a suitable logo. The use of sign R324 and, in this case, sign R108 - 579 is appropriate. Only one lane is available to the private access traffic. Ground-mounted or overhead diagrammatic signs should also be used. The private organisation should be approached to co-operate by ensuring that all vehicles using the lane display the same logo or device on their windscreens as is shown on the signs. Known visitors to the site can be supplied with such a piece of information by FAX if necessary.

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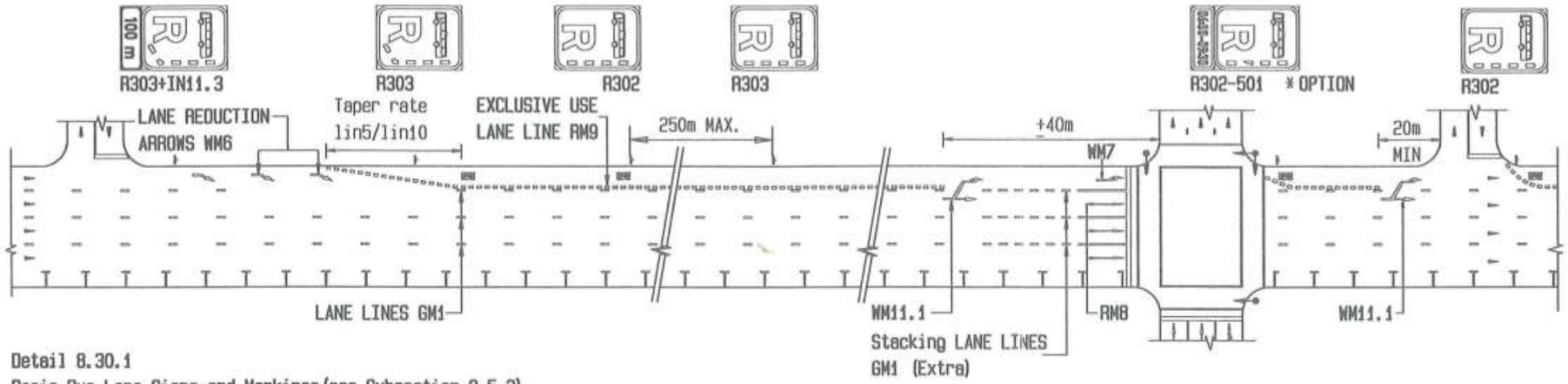
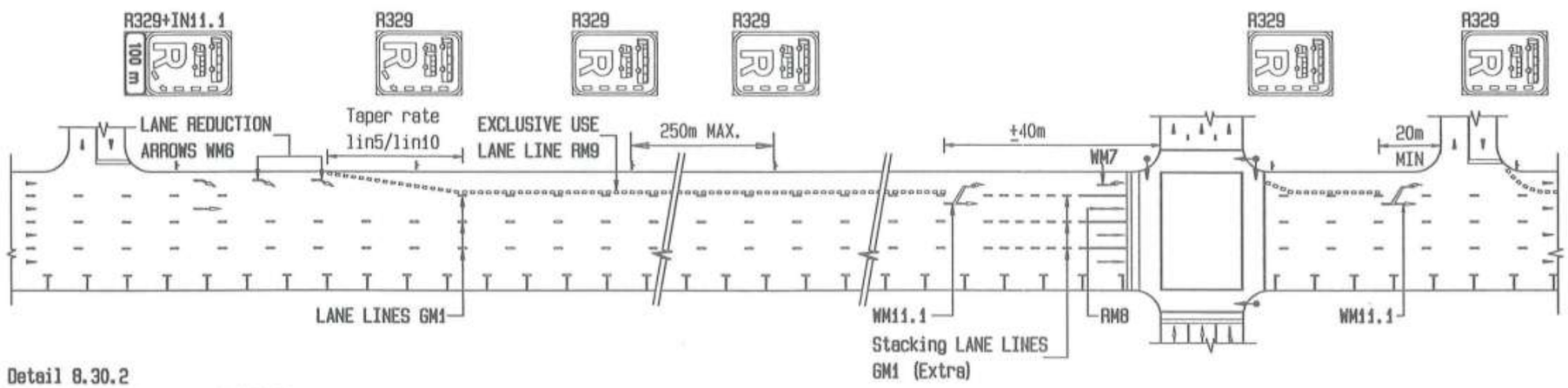
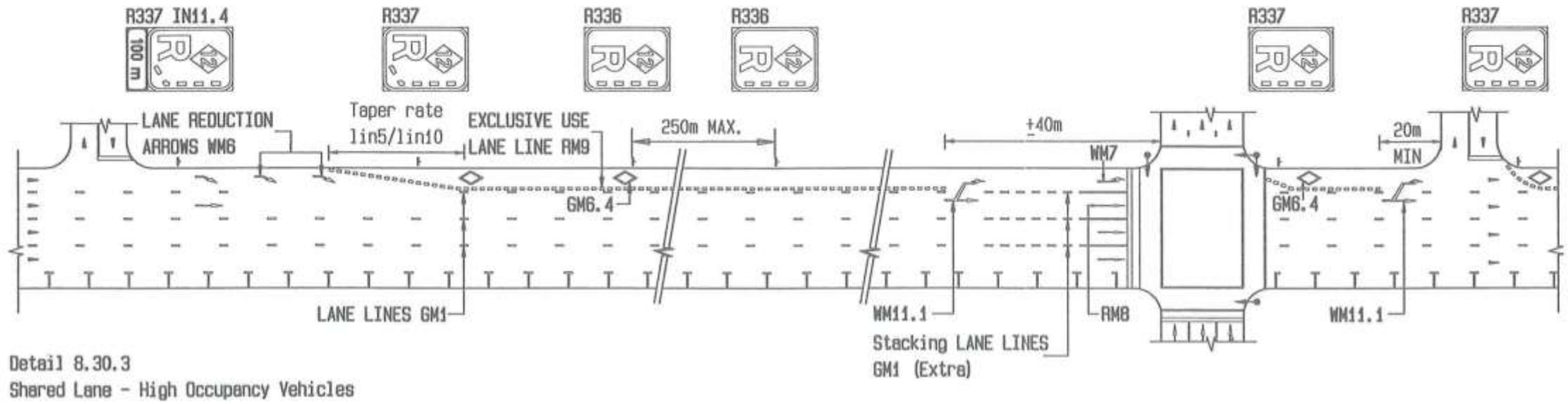


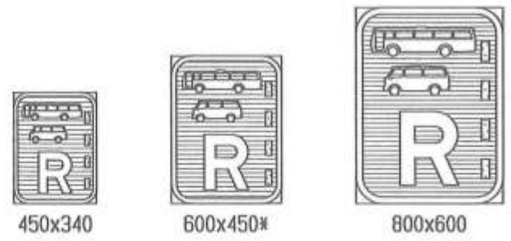
Detail 8.30.1
Basic Bus Lane Signs and Markings (see Subsection 8.5.2)



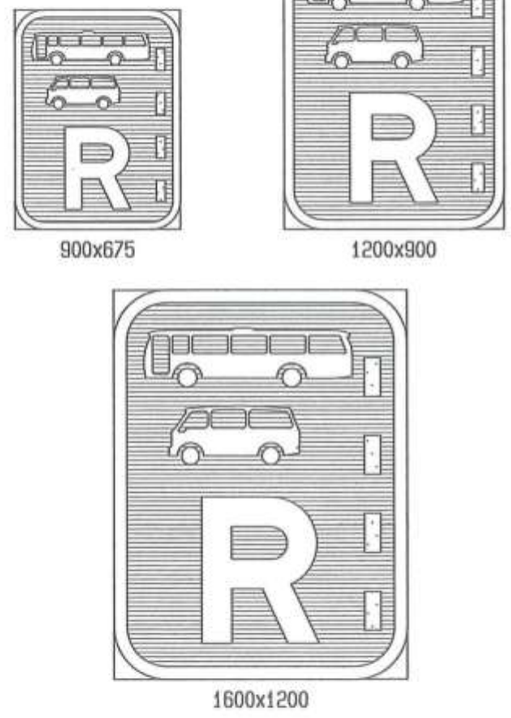
Detail 8.30.2
Shared Lane - Buses and Midi-Buses



Detail 8.30.3
Shared Lane - High Occupancy Vehicles



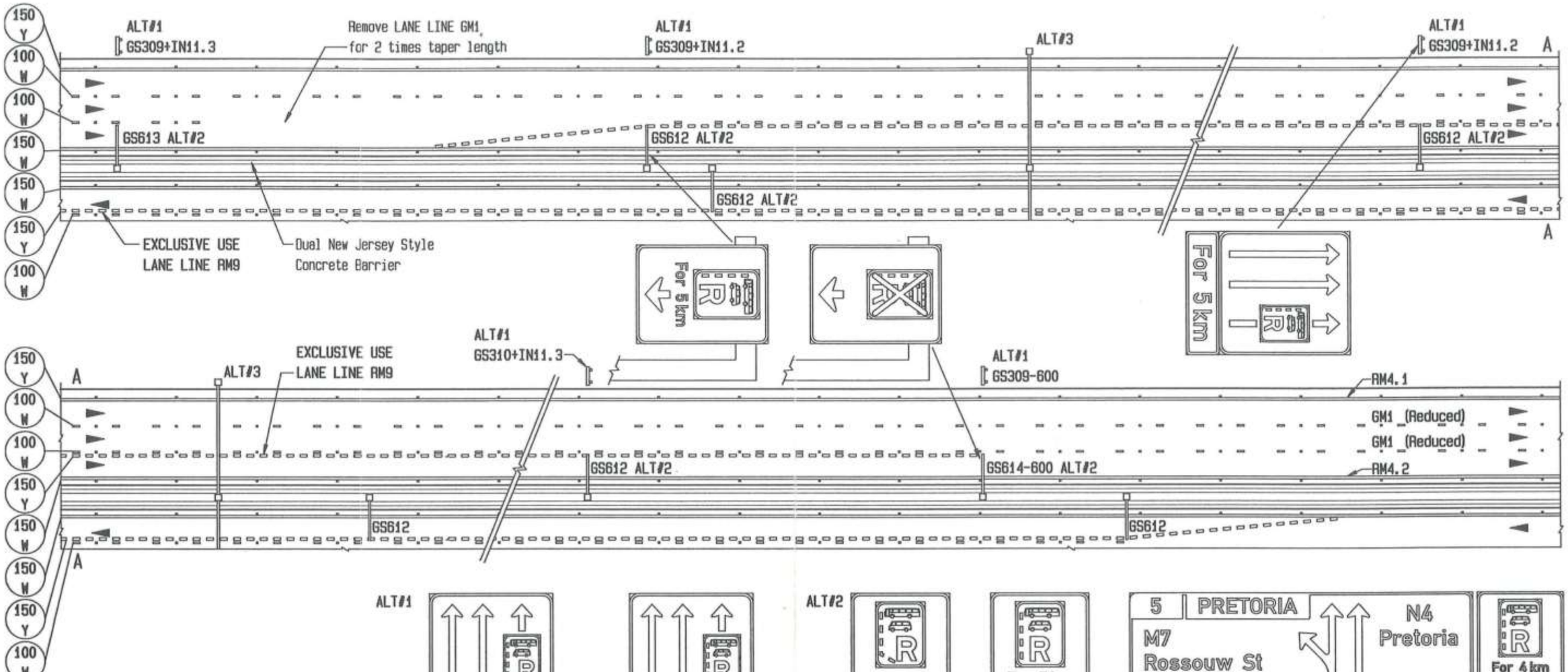
* This is the size most commonly used at 75m spacings for parking control



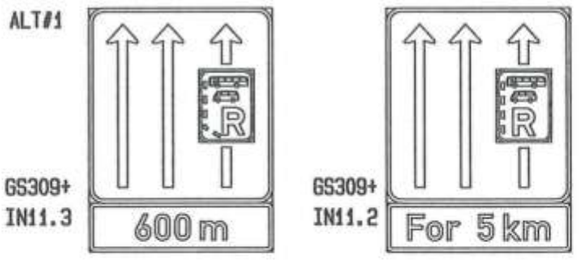
NOTE:
Ensure that a sign size adequate for the specific enviroment and 250m spacings is chosen (see also Fig.8.31)

Detail 8.30.4
Relative Sizes of Lane Reservation Signs - Standard Sizes for Sign R328

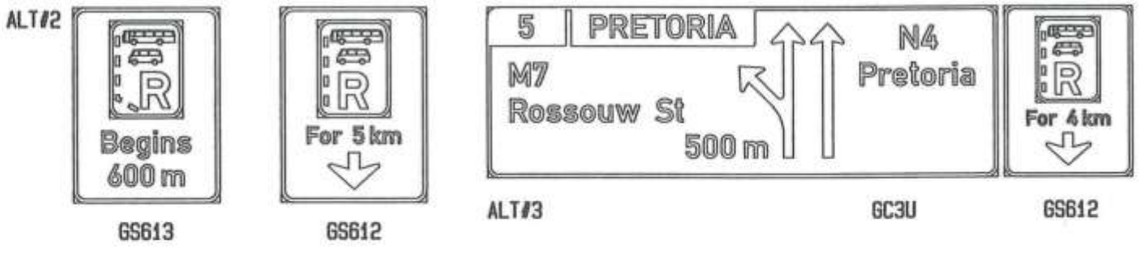
Fig 8.30
Signing for Shared
Public Transport Facilities - 1

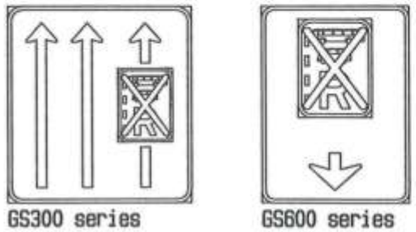


Detail 8.31.1
Example of Public Transport Lane
on High Traffic Volume Road

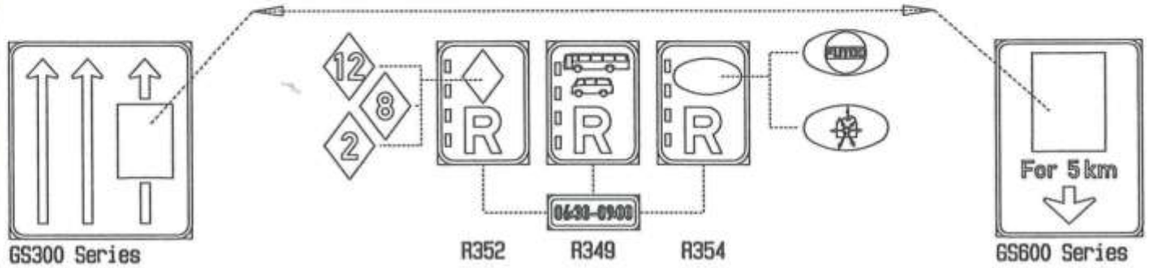


Detail 8.31.2 Signing Alternatives #1 #2 #3





Detail 8.31.3 End of Restriction



Detail 8.31.4 Restriction Signing Alternatives

Fig 8.31
Signing for Shared
Public Transport Facilities - 2

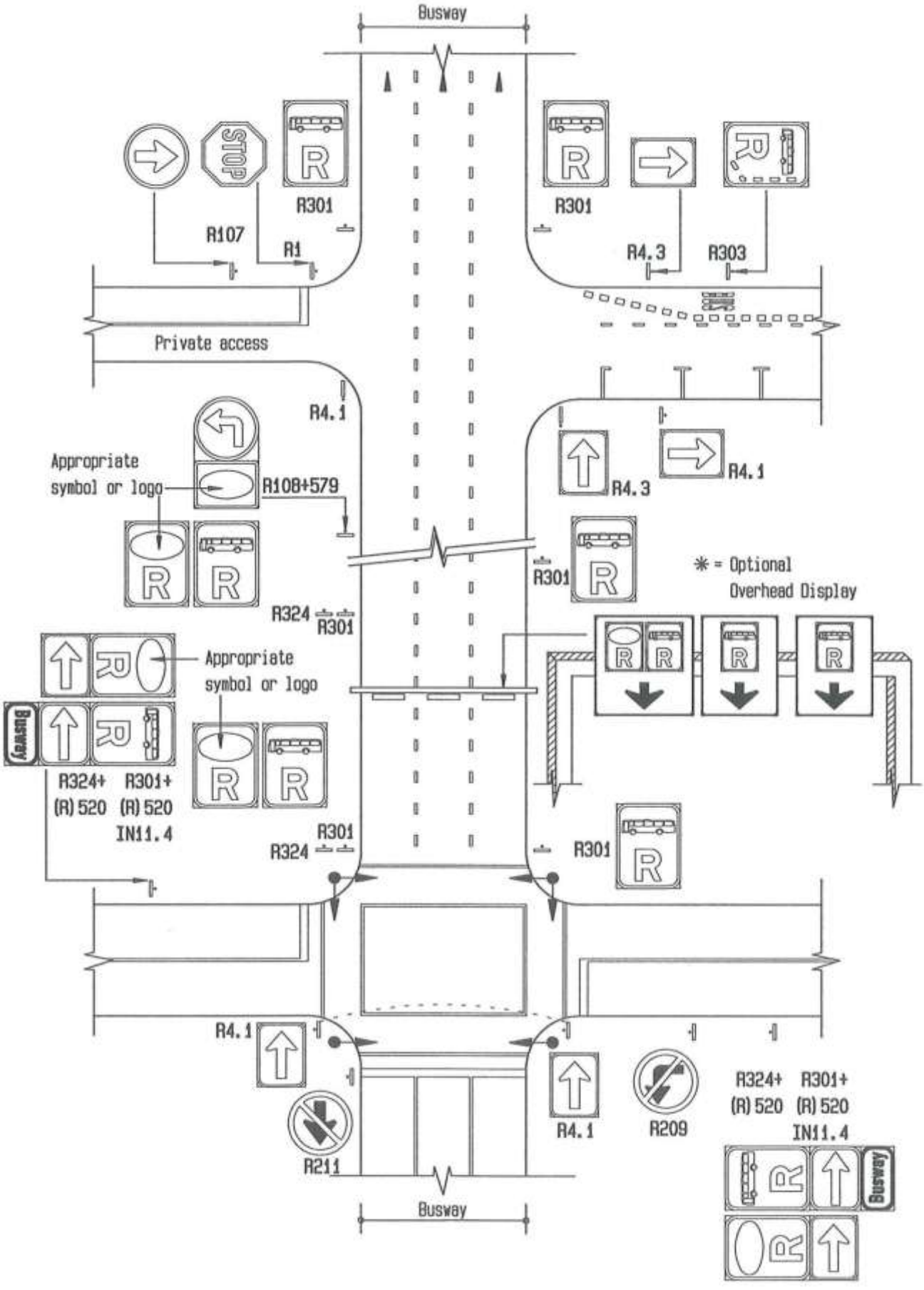


Fig 8.32 Signing for Shared Public Transport Facilities - 3

8.5.4 Light Rapid Transit LRT Signing

1 This chapter of Volume 2 would be incomplete without some guidelines regarding the possible future developments of public transport infrastructure. Cities in other parts of the world, the size of our major South African cities, often have a light rail based public transport system to compliment heavy rail and bus/minibus based systems. Each mode of transport has its place in the overall transport system of a large city. Light rail transit or LRT involves the use of rail-based trams. In order to provide some basis for future planners to work on, appropriate symbols have been adopted to create the basic signs required to set up an LRT public transport system. The relevant signs are shown in Figures 8.1 (R138), 8.2 (R338, R339 and R340) and 8.4 (W362 and GS704 to GS706). Figures 8.3 and 8.5 illustrate other applications of the two tram symbols.

2 Figure 8.33 shows a typical junction on a tramway. This junction represents a conversion of a busway shown in Figure 8.28 to a tramway. The similarity in the two signing plans can be clearly seen. Basically the signing for Figure 8.33 involves the replacement of the bus symbol by the tram symbol.

3 The information given in this subsection is not intended to be conclusive. **It is very likely that if an LRT system is developed in the future there will be a need to adopt or adapt additional specialised signs and/or signals which have been used elsewhere in LRT systems, for the specific direction and guidance of tram drivers.**

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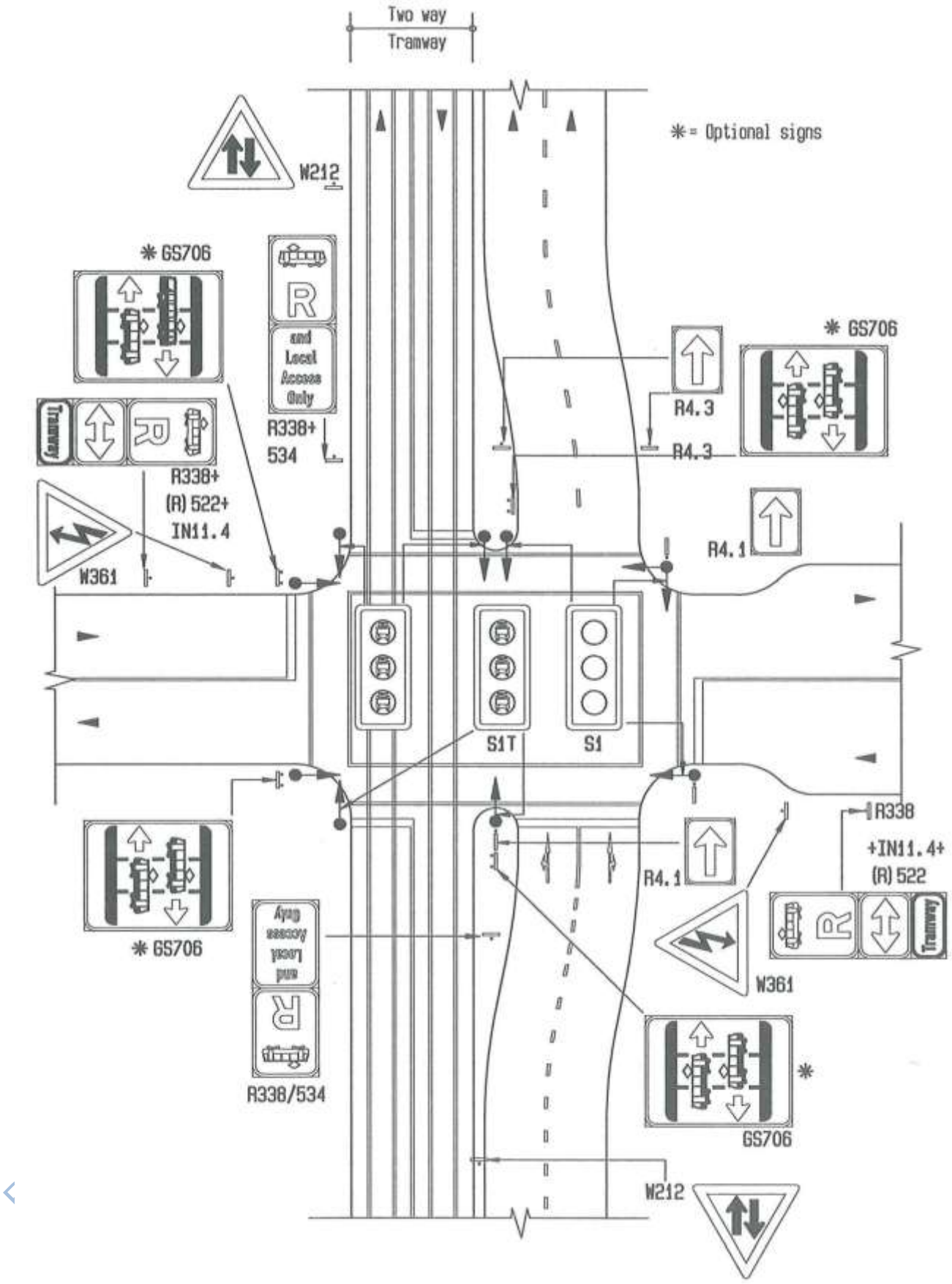

Fig 8.33 **Light Rapid Transit (LRT) Signing**

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URBAN GUIDANCE SIGNING

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9.2 Urban Street Hierarchy

9.3 Urban Guidance Signing Principles

9.4 Urban Local Destination Signing

9.5 Urban Tourist Destination Signing

9.6 Applications of Urban Guidance Signing

9.7 Property Identification

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GFS A8-3	Aquarium (see also generic sysmbol GFS A8)	9.5.31
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GFS A8-10	Crayfish (see also generic sysmbol GFS A8)	9.5.32
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GFS A10	Generic Cultural Attractions	9.5.37
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GFS B5-4	Drinkable Water	9.5.48
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Warrant No.	Title	Page No.
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GFS C1-3	Caravan Parks and/or	9.5.52
GFS C1-4	Camping Sites	9.5.52
GFS C1-5	Guest House	9.5.53
GFS C1-6	Bed and Beakfast and	9.5.53
GFS C1-7	Rooms	9.5.53
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GFS C1-9	Trail Shelter	9.5.53
GFS C1-10	Guest Farm	9.5.53
GFS C1-11	Ethnic (Zulu) Accommodation	9.5.54

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URBAN GUIDANCE SIGNING

9.1 INTRODUCTION

9.1.1 General

1 This chapter has been prepared with the objective of improving on the depth of coverage and guidance given in Volume 1 of the Manual on the subject of urban guidance signing. For a number of reasons direction signing in urban areas is a more complex procedure than in rural areas. A more detailed approach, involving more in-depth research of urban guidance signing needs, has therefore been required in order to evolve more complete guidelines to cater for the wider variety of urban guidance signing applications. These guidelines have been prepared under the jurisdiction of the Urban Signs Working Group of the Route Numbering and Road Traffic Signs Sub-Committee.

2 In the context of this chapter "urban" includes all built-up areas with a formal street network, from small towns up to large metropolitan areas incorporating many towns and/or cities. The signing needs of peri-urban areas and by-passed towns are also addressed. **"Guidance" signing comprises all those road signs which contribute towards the on-road visual information system AND which give direction or reassurance to drivers in the process of navigating their way through the road network.**

3 Since one of the main objectives in the use of traffic control devices is the safety of road users it can be reasonably accepted that a lack of responsibility and attention to detail in the use of traffic control devices contributes to prevailing poor accident histories in many areas. **In all formally structured urban areas the responsibility for the correct placing and maintenance of all traffic control devices must therefore be clearly established.** Even in informal urban developments, where full administrative structures are not yet in place, there is ultimately a "responsible" authority. Such an authority must accept its responsibility for treating the provision of traffic control devices in such an area in a manner appropriate to an urban area, by for example, providing street name signs.

4 It is the nature of many urban administrations that the responsibility for road traffic signs tends to be split between engineering departments, traffic departments, and possibly other departments. When this is the case it is essential that a high degree of co-ordination is set up between departments to avoid inadequate, inconsistent or even conflicting signing. Such a level of co-ordination is particularly appropriate to the provision of urban guidance signs which require a particular traffic engineering approach to their correct provision.

5 Volume 1 of the Manual deals with the subject of urban guidance signing in a summarised way and does recognise various difficulties such as the potentially high demand for guidance signing and the difficulty in selecting limited, but appropriate, destination names for use on urban direction signs. Volumes 1 and 4 also detail specific types of urban guidance sign which include features such as place names or street names which are appropriate to urban areas rather than rural areas. This chapter will utilise the guidance sign "tools" covered in Volume 1 to illustrate as many typical applications of urban guidance signs as is practical. The coverage will also extend to detail on the principles of the preparation of an "Urban Guidance Signing Plan" (see Subsections 9.1.5 to 9.1.7).

6 The principles of primary and secondary levels of direction signing, as developed in Volume 1, are appropriate to urban areas, particularly large metropolitan areas. The primary and secondary levels of a direction sign system define the numbered route network. This network links the familiar orientational destinations by which drivers may navigate through the area. The information provided by the system may be supplemented by a lower (tertiary) order direction sign system, indicating tourist or other destinations of importance at a local level. **It should be noted that the information actually displayed on direction signs can also be described in terms of primary and secondary importance. The use of these terms in two inter-related ways can be confusing. For more details on this aspect of direction sign type and signface layout see Subsection 9.1.3 and Figure 9.4.**

9.1.2 Concept of Urban Guidance Signing

1 When drivers undertake a journey through or into an area with which they are not familiar they invariably require assistance in the form of navigational aids in order to reach their final destination safely and with minimum disruption to other traffic. Information needed in order to navigate successfully through the road network should be obtained initially before starting the journey from maps, road reports or from directions given in the form of written or verbal messages, AND whilst on the journey from roadside aids. **These roadside aids comprise the guidance sign class.** Guidance signs form a main group in the road sign classification (see Volume 1, Chapter 4, Section 4.0). The following signs make up the guidance sign class (see Figures 9.1 to 9.3):

(a) LOCATION signs;

(b) ROUTE MARKER signs – including TRAILBLAZER signs;

(c) DIRECTION signs;

(d) FREEWAY DIRECTION signs;

(e) LOCAL DIRECTION signs;

(f) TOURISM DIRECTION signs;

(g) DIAGRAMMATIC signs.

2 A journey may start in one urban area, proceed primarily through rural areas but pass through varying sizes of town on the way, and end in

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another urban area. Alternatively a journey into an unfamiliar area may occur wholly within a large metropolitan area. The potential need on such journeys to navigate through several changes of direction is normally much greater in an urban area than in a rural area. This need must be catered adequately for by urban guidance signs.

3 Urban guidance signs are used to give directional information to assist drivers to take the correct direction at a junction during their journey. They are also used to give reassurance after turns have been made and to identify "landmarks" along the way. In particular urban guidance signs must identify the final destination on the journey in the form of a street name and some form of property identification.

4 The amount of guidance signing provided in an urban area will tend to vary according to the position of the particular street within the urban street network hierarchy, although other factors often affect the signing level.

5 Urban guidance signing as a signing system is structured in a hierarchical manner into primary and secondary levels, supplemented as necessary by tourism and local direction signs. **The destinations used on primary and secondary level signs provide directional orientation to drivers, whereas the destinations on tourism and local direction signs should be only of supplementary significance at a local signing level.**

9.1.3 Hierarchy of Urban Guidance Signing

1 The whole process of providing road traffic signs has been structured in an orderly manner to assist those who provide the signs, signals and markings to do so in terms of the overall signing system objectives of conformity, accuracy, uniformity, consistency and continuity. Within this overall system guidance signs, and particularly urban guidance signs, have developed a structured hierarchy.

2 The most important sub-group within the guidance sign class, that of direction signs, conforms to a hierarchy which is demonstrated to road users in the form of a sign background colour code. In this way direction signs used at the highest level in the road network have a blue background colour and those at lower levels have a green background. In addition to this basic hierarchy supplementary direction may be given, **subject to the appropriate warrants,** for local destinations on white signs or for tourist destinations on brown signs. At the local level in the urban road network local and/or tourist direction signs may be the only direction signs provided. This hierarchy is illustrated in Figures 9.1 to 9.3.

3 In Figure 9.1 a selection of typical primary and secondary level urban direction signs is illustrated in Details 9.1.1 to 9.1.5. In each detail the sign on the left is the sign used in advance of the "action" point or exit/turn point and the signs on the right are used at the "action" point. Detail 9.1.1 shows primary signs serving a typical exit from an urban freeway. Orientation for the cross street is not given **on** the freeway because, at the time of exiting the freeway, this is not required. This exit is commonly taken at high speed, so it is preferred **not** to overload drivers with information not relevant to the task in hand. The information given on the freeway is therefore kept to the minimum of **the route number and cross street name,** with, for locational reference the interchange number and town name. The street name is carried forward to the next two signs (Detail 9.1.2) and additional orientational information is added for the turns at the ramp terminal. Details 9.1.3 to 9.1.5 show typical secondary direction signs appropriate to Class "B" arterial routes. Detail 9.1.3 applies when the cross street name is the same on both sides of the junction whereas Detail 9.1.5 is appropriate if the street name changes from one side to the other at the junction. Detail 9.1.4 is typical for an urban T-junction between two Class "B" routes.

4 Figure 9.2 shows in Detail 9.2.1 a typical sequence of secondary level direction signs leading to a Class "A1" freeway, hence the use of a "trailblazing" blue colour for the background of the relevant parts of the signs. Detail 9.2.2 illustrates the full range of metropolitan, regional, provincial and national route marker signs. These signs are appropriate as an initial stand-alone low cost system. Primary and secondary level signs may be supplemented in an at-grade street environment by tourist and/or local direction signs, examples of which are given in Detail 9.2.3.

5 Figure 9.3 shows some examples of local and tourism sign combinations together with a selection of typical location guidance signs which identify various points along a route or street.

6 There is also an established hierarchy for the information that appears on direction signs. This is illustrated in Figure 9.4 and listed below:

(a) primary information - street name or other locational information and, when appropriate, route numbers;

(b) secondary information - orientation destinations;

(c) tertiary information - supplementary local and/or tourist destinations.

7 In addition there is a further hierarchy which is relevant to the level of urban guidance signing to be used, namely the urban street classification. All these different levels of importance will be covered in greater detail in subsequent sections.

9.1.4 The Urban Guidance Signing Process

1 The most important overall objective of this chapter is to establish urban guidance signing practices and typical applications which will allow all sizes of urban authority to establish an "Urban Guidance Signing Plan" for their town or city.

2 Such "Urban Guidance Signing Plans" will vary in detail according to the position occupied by the town in the regional, provincial or national road network. Such a plan should also offer an affordable, staged implementation method which should concentrate on the basic requirements first, whilst always aiming for the ultimate goal of as close to perfect an urban guidance signing system as possible.

9.1.4 Volume 1 References

1 Relevant references in Volume 1 which will not be repeated in this chapter are:

(a) general functions of traffic control devices (Sub-section 1.1.5);

(continued on page 9.1.7)

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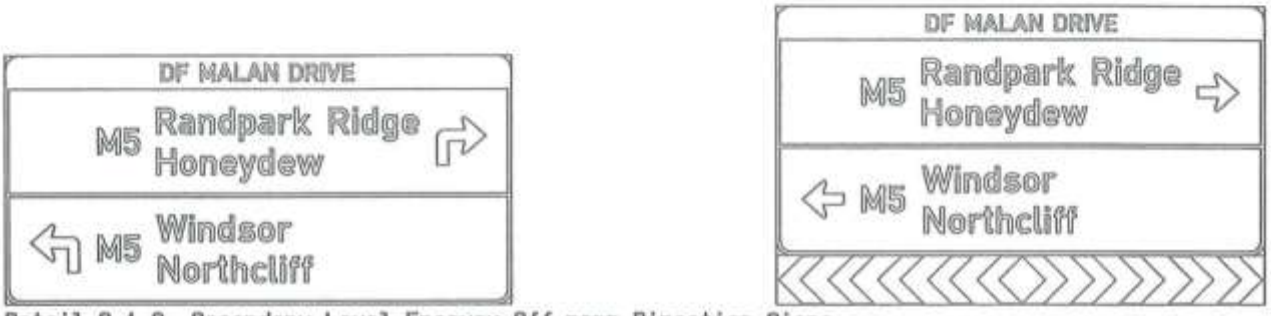
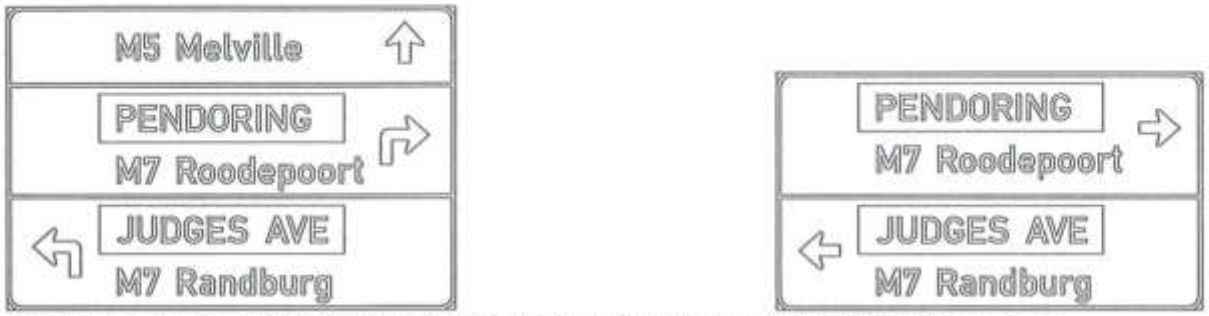
Detail 9.1.1: Primary Level Main-line Freeway Exit Direction Signs



Detail 9.1.2: Secondary Level Freeway Off-ramp Direction Signs

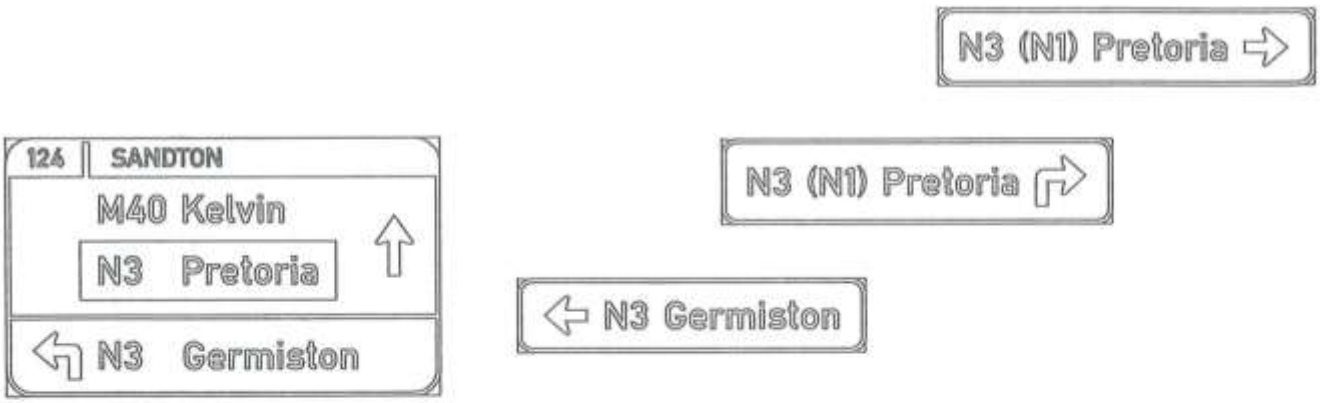
Detail 9.1.3: Secondary Level Direction Signs - At-grade Cross Street

Detail 9.1.4: Secondary Level Direction Signs - At-grade T-junction

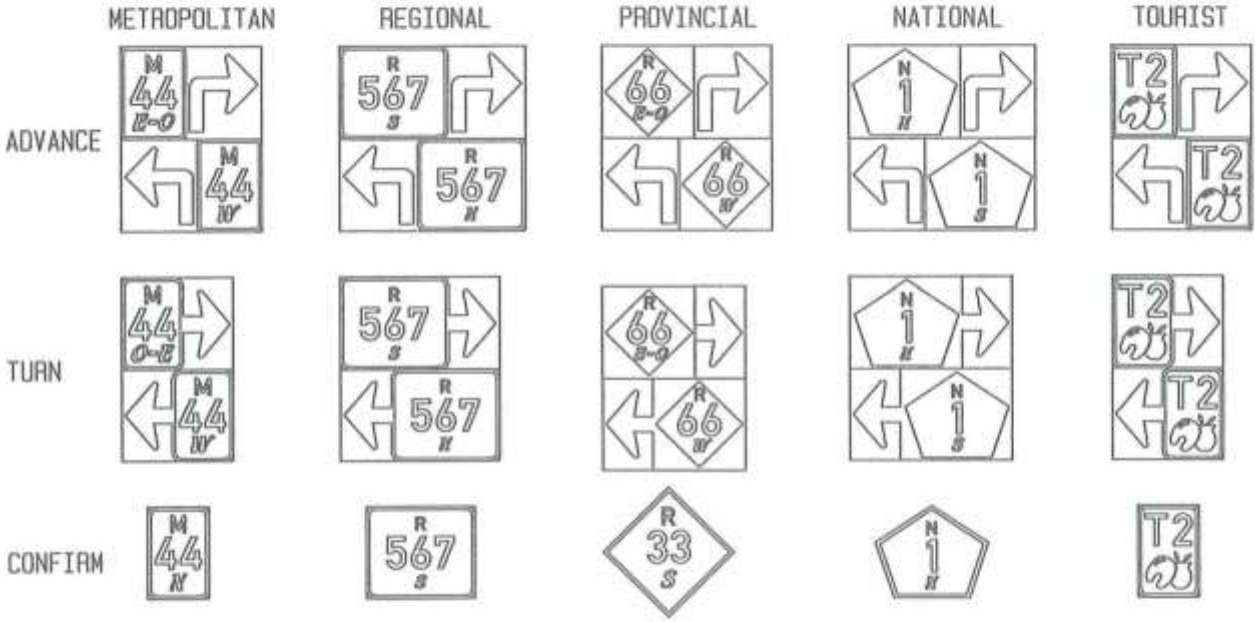


Detail 9.1.5: Secondary Level Direction Signs for Cross Street with Street Name Change at Junction

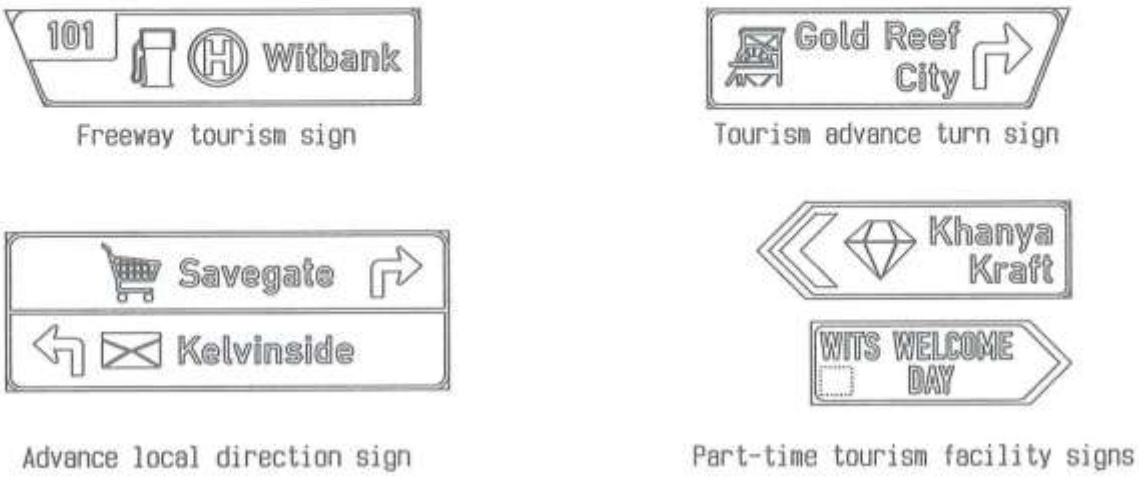
Fig 9.1 **Typical Examples of Primary and Secondary Urban Guidance Signs**



Detail 9.2.1: Cross Street Sign Sequence Entering a Class "A1" Freeway

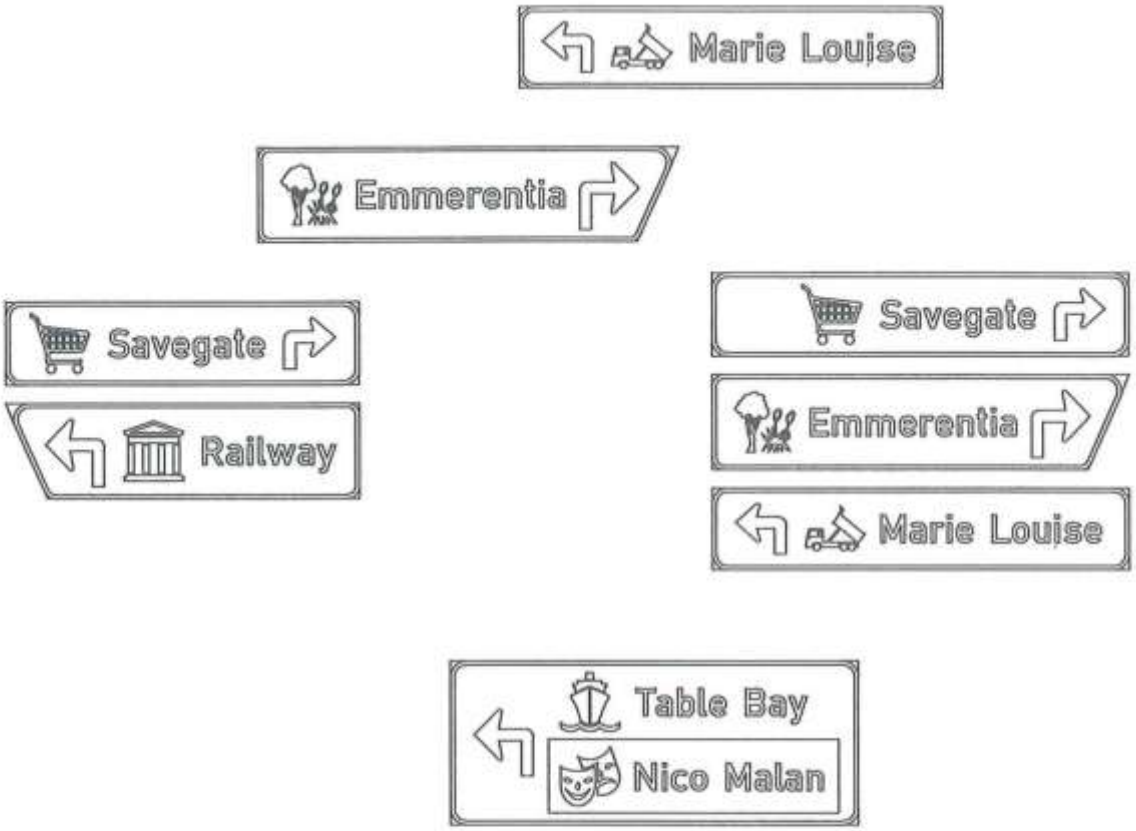


Detail 9.2.2: The Full Range of Route Marker Direction Signs

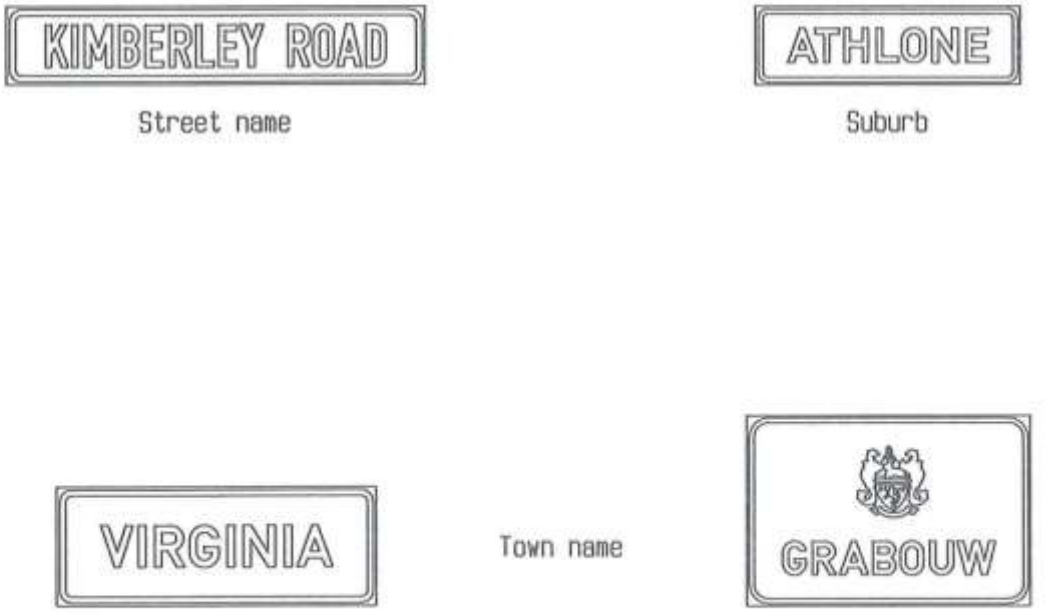


Detail 9.2.3: Typical Tertiary Level Direction Signs (Tourism and Local)

Fig 9.2 Typical Examples of Secondary and Supplementary Urban Guidance Signs



Detail 9.3.1: Various Combinations of Tertiary Level Direction Signs



Detail 9.3.2: Urban Location Signs

Fig 9.3 Guidance Sign Hierarchy

1. SIGN INFORMATION

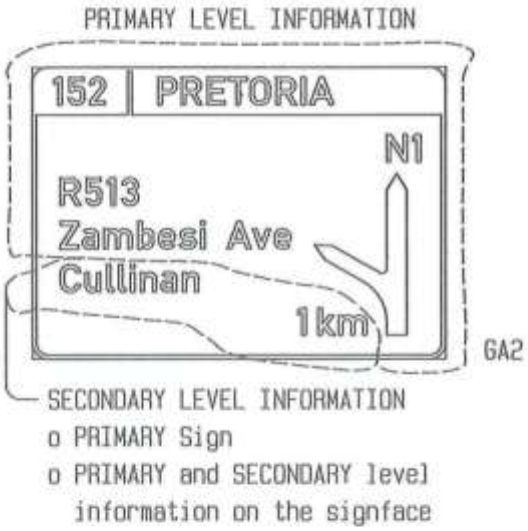
INFORMATION LEVEL	SIGNFACE DETAIL
Primary information	Arrow, route number, street name and location
Secondary information	Orientational destinations
Tertiary information	Local and / or tourism destinations

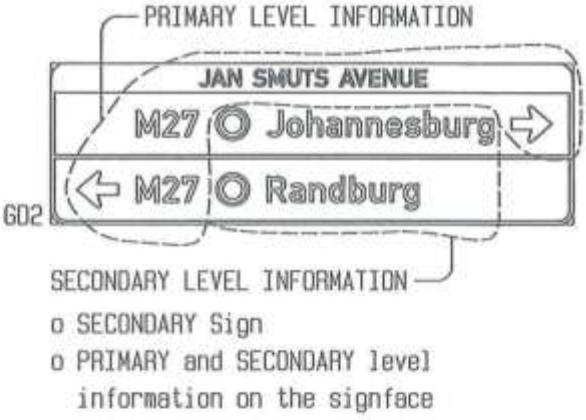
2. SIGNFACE

CATEGORY	COLOUR CODE
Primary signs (freeways)	A1 White-on-Blue
	A2 White-on-Green
Secondary signs (other streets)	White-on-Green
Supplementary Signs (Tertiary)	White-on-Brown
	Black-on-White

BACKGROUND COLOUR

Detail 9.4.1 Guidance Sign Hierarchical Terminology





Detail 9.4.2 Examples of Signface Information Hierarchy

Fig 9.4 Typical Examples of Urban Guidance Sign Combinations and Urban Location Signs

(continued from page 9.1.2)

(b) uniformity of traffic control devices (Subsection 1.1.6);

(c) principles of signing (Subsection 1.1.9);

(d) selection of destinations (Subsection 1.1.11);

(e) road classification for signing purposes (Subsection 1.2.2);

(f) all of Chapter 4: Guidance Signs but specifically:

(i) Section 4.1 - Introduction;

(ii) Section 4.5 - Guidance Signing in Urban Areas;

(iii) Subsection 4.6.4 - Street Name signs;

(iv) Subsection 4.6.5 - Suburb Name signs;

(v) Subsection 4.6.6 - Town or City Name signs;

(vi) Section 4.7 - Route Marker and Trailblazer Signs;

(vii) Section 4.8 - Direction signs;

(viii) Section 4.9 - Freeway Direction signs;

(ix) Section 4.10 - Tourism Direction signs;

(x) Section 4.11 - Local Direction signs;

(xi) Section 4.12 - Diagrammatic signs;

(g) all of Chapter 8: Navigational Aids but specifically:

(i) Section 8.1 - Introduction

(ii) Subsection 8.2.5 - Guidance signs, confirmation signs, Town and Street name signs;

(iii) Subsection 8.2.6 - Property Numbers, Private and Commercial Name signs;

(iv) Section 8.3 - Route Optimisation;

(v) Section 8.4 - Route Numbering;

(vi) Subsection 8.6.6 - Destination Selection for National Freeways in Metropolitan Areas;

(vii) Subsection 8.6.7 - Destination Selection at Smaller Urban Areas and Towns By-Passed by Freeways;

(h) Glossary of Terms;

(i) General Terms;

(ii) Sign Terms.

9.1.6 Volume 2 References

1 Specific applications of various sub-groups of guidance sign are covered in a number of other Volume 2 chapters as follows:

(a) Chapter 5: *Freeway Signing*;

(b) Chapter 6: *Toll Route Signing*;

(c) Chapter 10: *Rural Junction Signing*;

(d) Chapter 11: *Signing for Heavy Vehicles*;

(e) Chapter 19: *Variable Message Signs*.

2 In the case of Chapters 5 and 6 a wider range of applications of freeway signing and toll route signing is covered than in this chapter. Chapter 10 is relevant mainly for comparison purposes to illustrate differences between urban and rural signing standards.

3 Chapter 11 includes examples of signing for heavy vehicle routing which may occur in urban areas. Other examples in Chapter 11 include guidance signs of the types which may commonly be required in urban environments. These examples are not repeated in this chapter.

4 The coverage of Chapter 19 is very relevant to urban guidance signing. This is particularly the case for the major metropolitan areas where the ability to use variable guidance messages is likely to come into its own for incident management, route selection and toll route messages.

9.1.7 Volume 4 References

1 Volume 4 gives all dimensional details for all individually identified guidance sign types. This information is covered as follows:

(a) Chapter 4: *Location Signs and Route Marker Signs,*

(b) Chapter 5: *Direction Signs;*

(c) Chapter 6: *Freeway Direction Signs;*

(d) Chapter 7: *Tourism Signs;*

(e) Chapter 8: *Diagrammatic Signs;*

(f) Chapter 13: *Local Direction Signs;*

(g) Chapter 14: *Pedestrian Direction Signs;*

(h) Chapter 15: *Toll Direction Signs.*

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9.2 URBAN STREET HIERARCHY

9.2.1 Mobility and Accessibility

1 In planning and traffic engineering terms roads tend to be categorised according to the mobility they provide for traffic, or the accessibility they offer to users of the road network. **These concepts are appropriate to the consideration of a classification for urban streets for signing purposes, since most urban streets cater for both functions, with one predominating over the other to varying degrees.** Urban streets have been classified in a number of different ways in the past, for different purposes. In order to establish a structured approach to the provision of urban guidance signing, it is necessary to determine a classification system for urban streets which can be related to preferred levels of guidance signing. **It should be noted, however, that under typical urban conditions the ability to provide direction signs, or not, is dictated as frequently by the availability, or otherwise, of space to accommodate the signs, as it is by the requirement to conform to a particular preferred signing treatment.**

2 Terminology relating to categories of street has also varied in the past. The following basic terms are used **in this chapter** to describe the functions of different types of street:

(a) **Arterial streets** are those streets forming a network of routes whose main function is to carry the major traffic movements within the metropolitan or urban area with the emphasis on **mobility** (different traffic and frontage conditions may require sub-categorisation whereby some streets can be expected, and encouraged, to provide more mobility than others) - arterials are usually numbered routes and include freeways;

(b) **Collector-distributor streets** are those arterial or local streets along which **mobility and accessibility** have very approximately equal priority;

(c) **Local streets** are all streets not classified as arterial. Local streets should lie wholly within a local traffic area bounded by arterial streets (or other physical features) and should have the primary function to provide **accessibility**. Local streets should not be numbered routes.

These categories are illustrated in Figures 9.5, 9.6 and 9.7.

3 Communities or suburbs may be residential, commercial or industrial. Such communities may be large enough to include arterial streets or they may be of such a size that they individually comprise local traffic areas (ie. are bounded by arterial streets). Alternatively a local traffic area may comprise several smaller communities. In an urban context this measure of a community size is relevant when considering the orienting potential of some community names in preference to others.

9.2.2 Urban Street Classification

1 Urban streets may be classified into one of the following classes:

(a) Class "A" - Urban Freeway Arterial (a numbered route). This class may be sub-divided into:

(i) Class "A1" a dual carriageway freeway, or

(ii) Class "A2" a single carriageway freeway;

(b) Class "B1" - Primary Arterial (a numbered route);

(c) Class "B2" - Secondary Arterial (a numbered route);

(d) Class "C1" - Tertiary (or Limited) Arterial;

(e) Class "C2" - Local Collector-distributor Streets;

(f) Class "D" - Local Streets.

2 The following are functional descriptions of the above classes of street:

(a) **Urban freeway arterials** are those streets which have a strictly limited number of access points; they have grade separated junctions thereby offering the highest level of mobility (to be signed using blue background freeway signs such streets should be designated as Class "A1" freeways by the provision, at their points of access, of sign R401 - the use of sign R401 carries with it various regulatory requirements controlling the use of freeways in terms of the Road Traffic Act, Act 93 of 1996); although unlikely to occur in urban areas there is a lower order of freeway, classified as Class "A2", which should be designated as such by display of sign R402 - Class "A2" freeways have a single carriageway with no central median, but do have grade-separated junctions - the direction signs for Class "A2" freeways have a green background;

(b) **Primary arterials** are those at-grade routes for which the most important function is to provide mobility on main through routes for metropolitan or urban traffic not catered for by freeway arterials - these streets will be expected to cater for above average traffic growth and will be numbered routes;

(c) **Secondary arterials** are those streets which have mobility/accessibility functions which may vary considerably (secondary arterials may include special sub-categories such as "scenic arterials" or "shopping arterials" and are numbered routes);

(d) **Tertiary (or Limited) arterials** have an above average degree of traffic friction or conflict and are particularly limited in their ability to cater for traffic growth (they are streets from which traffic might be expected to migrate if given a more attractive alternative street or route) - in reality they are commonly unnumbered routes attempting to carry too much traffic for their physical dimensions or frequency of direct access which result in congestion due to high levels of turning movements;

(e) **Local Collector-distributor streets** are those streets which provide frequent direct access to frontage properties, collect traffic from local streets, and distribute traffic from arterials;

(f) **Local streets** are those streets which are wholly within a residential, commercial or industrial neighbourhood bounded by arterials and/or local collector-distributor streets - their function is that of local access and they should preferably not be connective.

(continued on page 9.2.5)

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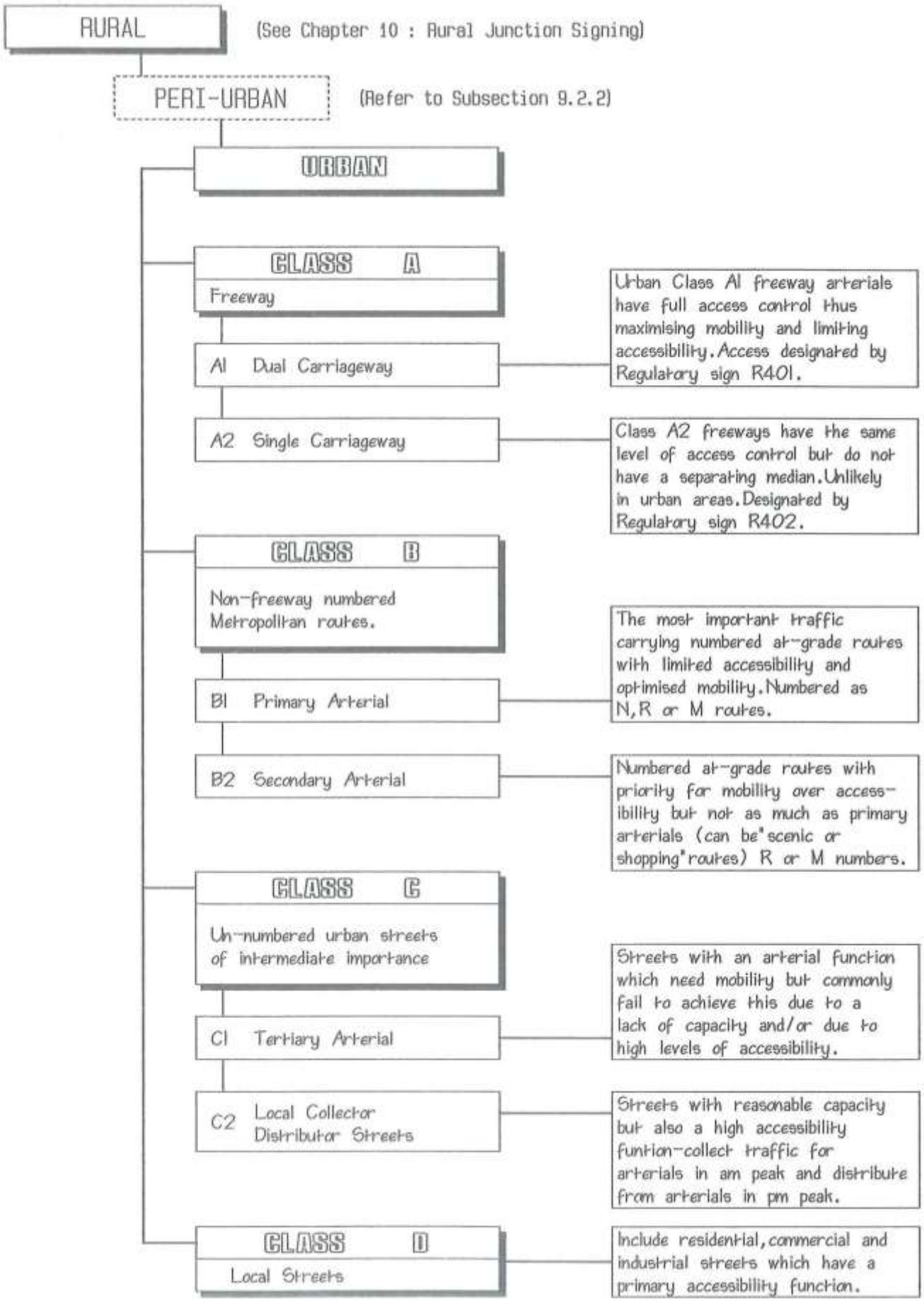

Fig 9.5 Road Classification for Signing Purposes

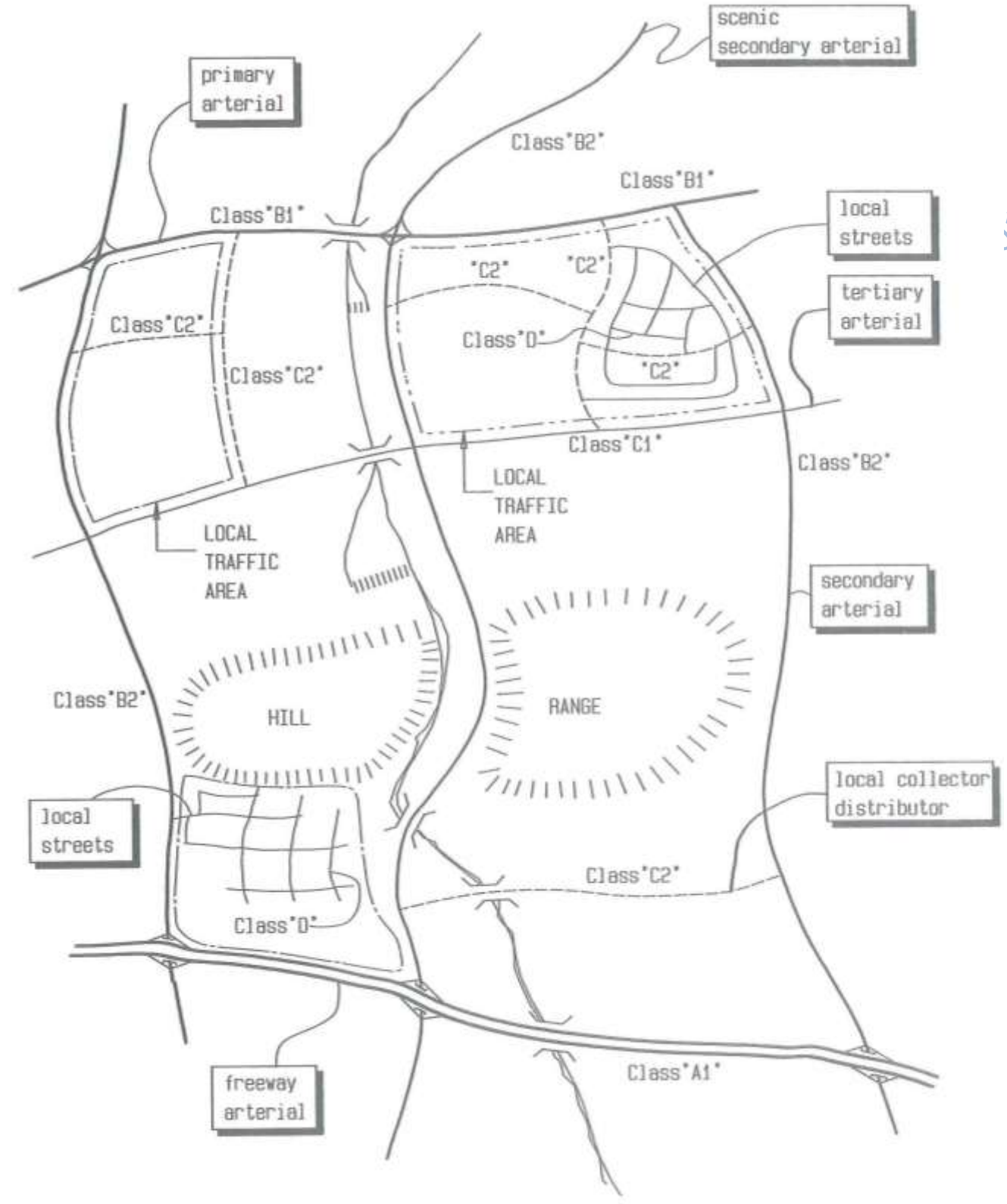

Fig 9.6 **Urban Street Hierarchy**

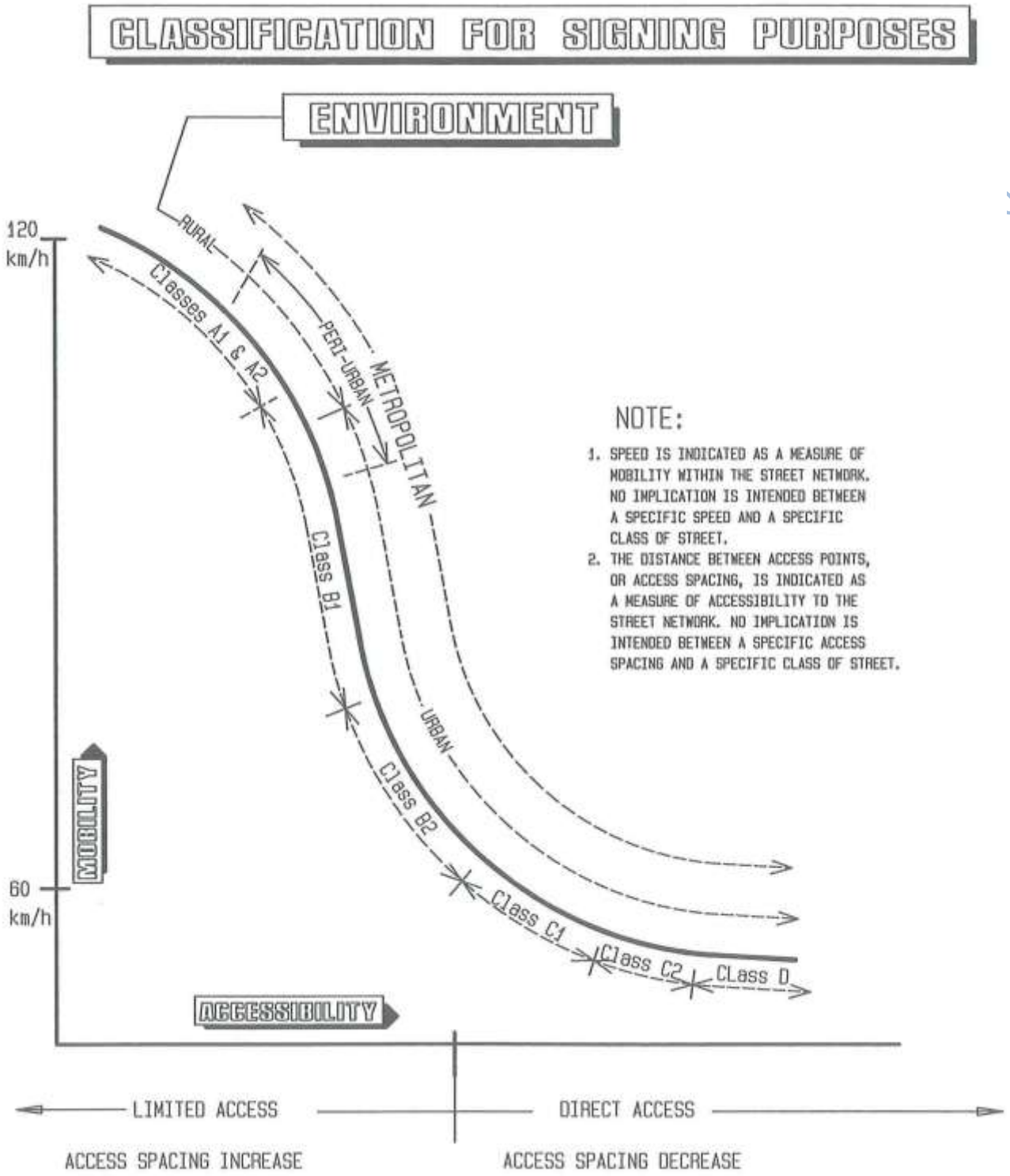

Fig 9.7 **Mobility/Accessibility Diagram**

(continued from page 9.2.1)

These concepts are illustrated in Figures 9.5, 9.6 and 9.7.

3 When direction signs are provided within an urban or metropolitan street network the destinations displayed on signs on the various classes of street will tend to follow a hierarchy which is related to the class of street on which they appear. Thus, if the urban area has sections of freeway arterial, the destinations displayed at this level will normally have an orientational "power" relevant to long-distance provincial or national destinations. If the city or town does not have any freeway arterials the most important primary arterials will display these long-distance provincial or national orientational destinations. Other primary arterials may indicate destinations of regional orientational power. Descending in the street hierarchy to secondary arterials and perhaps the more important tertiary arterials the orientational power of the destinations displayed will diminish. As has been stated above the functions of secondary arterials may vary widely. Similarly the orientational power of any destinations displayed along such routes may vary from places of regional importance, to local suburbs, to simply cardinal directions indicated on route marker signs.

9.2.3 Route Optimisation

1 The choice of an optimum urban route can be made by road users out of preference due to their familiarity with the characteristics of the routes on offer, or this choice can be made by the urban authority to strategically attract road users to a preferred route. How effective such a choice will be is dependent on inter-related variables such as the familiarity of the orientation information given, the trip purpose, the perceived time and cost relationships and the type of vehicle. A desire to avoid less attractive or sensitive areas can also influence selection of a route.

2 The selection of routes through smaller towns or cities will almost certainly be carried out by provincial or national road authorities as the towns are likely to have grown up around a regional, provincial or national route. As towns develop it will become necessary to establish a broader street hierarchy. At such a time the urban authorities should assess their street network for candidate Class "A", "B1", "B2", "C1" and "C2" streets.

3 Once this initial assessment has been made the function of each route should be evaluated in terms of the following criteria to establish the mobility/accessibility characteristics (see also Volume 1, Section 8.3);

(a) "familiarity" or trip generating potential of orientation point destinations as indicated by:

(i) whether it is a city or town, residential suburb or industrial area;

(ii) other local attractor/generator of traffic such as a shopping centre or educational institution;

(b) the road type and quality;

(c) the trip characteristics such as:

(i) traffic volumes;

(ii) trip time;

(iii) trip length;

(iv) trips for leisure;

(d) numbered routes should connect to other numbered routes;

(e) numbered routes should not regularly change direction at junctions;

(f) numbered routes should not double back, cross themselves or another specific numbered route more than once;

(g) an assessment of the accumulated time and cost savings for the majority of road users in comparison to an alternative route.

4 The next step in the optimisation process is to actually classify the chosen routes as Class "A", "B1", "B2", "C1" or "C2" as appropriate to their importance, prior to being allocated a route number if classified as Class "B2" or higher.

5 At this stage it is appropriate to consult other interested parties such as road user groups, and road planning and management groups to test the validity of the allocations. These groups should be consulted again during the process of preparing the Urban Guidance Signing Plan (see Section 9.3).

9.2.4 Route Numbering

1 It is not appropriate for candidate numbered urban routes to follow the same process used to decide whether a rural route should qualify for a route number. The method of classification described above and the requirement that all Class "A", "B1" and "B2" routes be numbered is adequate.

2 The allocation of all urban or metropolitan route numbers shall be co-ordinated with the existing regional, provincial and national numbered route networks to avoid the issuing of conflicting or confusing route numbers in close proximity to each other e.g. R24(provincial) and M24(metropolitan). Care needs to be exercised also when a continuous route passes directly from one metropolitan area to another, or from a metropolitan area into an adjacent provincial region. In cases where the preferred number of an M-route could clash with that of a continuing M-route or a higher order route, the actual route number allocation should be co-ordinated through the Secretary of the Route Numbering and Road Traffic Signs Sub-Committee. It is worthwhile, in a new numbered route network, to establish a basic north-south / east-west order by allocating odd-numbers to north-south routes and even-numbers to east-west routes. (Circular routes can present difficulties in this regard, and also when providing cardinal directions on route marker signs).

3 Once route numbers have been allocated, details of the routes and their numbers must be submitted to all map makers and the police, and other emergency services. Any detailed route changes should be passed to emergency services immediately, and to map makers on a two-to-three yearly basis.

4 For numbered route networks to function as intended, it is essential that the relevant road authorities promote the routes, and their numbers, by using all media forms available. Considerable importance is attached to the display of route numbers, to the extent that the level of signing for a numbered route may consist of only route marker signs. Such a choice may be dictated by a lack of space for larger signs, or by economic considerations

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5 It is recommended that any local authority using a metropolitan route numbering system (M-routes) for the first time should adopt a unique route marker symbol or shape within the sign (see Volume 1, Chapter 4, Subsection 4.7.11 and Volume 4, Chapter 4). This is particularly relevant when the area abuts another area which is also using numbered metropolitan routes. This shape should be as simple in outline as possible.

9.2.5 Peri-Urban Areas

1 Growth of medium to large sized towns, and metropolitan areas, commonly occurs on the outer fringes of the existing developed urban area. This growth is typified by changing land use and by an associated subdivision of land into smaller units. Since the growth will be driven by demand for such land-use change, it is likely to be irregular. Such peri-urban areas have traditionally presented those responsible for the provision of guidance signs with decisions on signing levels and styles which have often proven difficult to make. This decision-making "problem" is commonly made more difficult by the fact that these areas often have a relatively high tourism development.

2 A result of the development style of peri-urban areas is commonly higher levels of trips by strangers to the area, than might occur within adjacent or similar urban areas. Due to their lack of familiarity with such an area drivers are likely to need more detailed levels of signing than is normally provided in the rural environment, from which the peri-urban area has developed. This need relates very closely to the more intensely developing road / access network within the peri-urban area. For this reason it is recommended that road authorities responsible for the guidance signing of peri-urban areas adopt urban practices rather then rural practices. The most direct result of such a policy should be the early allocation of street names to the developing road network. In addition consideration of certain areas as high density tourist areas may also be relevant (see Section 9.5).

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9.3 URBAN GUIDANCE SIGNING

9.3.1 General

1 The first two sections of this chapter have dealt with the available guidance signing tools and the need to approach urban guidance signing in a very structured way. It is very easy for the application of urban guidance signing to become an uncontrolled and ineffective mess of randomly approved, designed, manufactured and installed signs. The emphasis placed on a structured approach is intended to make possible some, or all, of the following:

(a) the ability of strangers to find their way through, and around, urban areas easily and without stress;

(b) the ability of urban road authorities to quickly and affordably provide a consistent basic minimum level of guidance signing, if none is currently provided;

(c) the ability of urban road authorities to develop a long term plan, in consultation with the appropriate role players, for a high quality guidance signing system involving the signs on the ground, adequate records and an effective maintenance system for the signs;

(d) the assurance that the above objectives can be achieved with an acceptable but minimum intrusion into the urban environment.

2 In this section the principles important to the provision of an effective urban guidance signing system are developed in terms of:

(a) urban navigation;

(b) an interim guidance signing plan;

(c) the different levels of guidance signing which are available;

(d) an urban guidance signing plan.

9.3.2 Urban Navigation Principles

1 A brief description of two types of trip involving navigation in or through urban areas is given in paragraph 9.1.2.2. Any trip which is deemed to require navigation must involve drivers travelling into areas with which they are not familiar. In the normal course of events daily commuters do not need assistance from guidance signs for their home-to-work trips, relying rather on "landmarks" to navigate their way. (Re-routing as part of an incident detection traffic management scheme will upset this technique because drivers may no longer have their regular landmarks. Such a system may be best served by variable direction signs).

2 The long distance rural aspects of navigation and navigational aids are covered in depth in Volume 1, Chapter 8. In this context many "nodes" or "points" on the rural network are towns which in themselves present navigational challenges which only the very best maps or map-books attempt to include in their navigational information. It is therefore important when considering navigation in urban areas to cater for the long-distance traveller as well as drivers within a major metropolitan environment.

3 The address being sought, when considered in its fullest sense, involves all the components necessary to successfully find it. The full range of components comprising a specific address can be considered as:

(a) province;

(b) town;

(c) route number;

(d) suburb;

(e) street name;

(f) property number.

The provision of urban guidance signs must be designed around these navigational components.

4 The basic navigational difficulties which drivers are most commonly presented with in an urban environment can be described very simply, although they may present themselves in widely differing ways. The following can be considered as the most basic, yet often most difficult, tasks for a driver to undertake in an unfamiliar urban environment:

(a) finding the specific property which represents the end of a trip whether in a residential suburb, in an industrial area, or in a busy central business district (this can be particularly difficult in a CBD when the organisation sought is one of many tenants in an un-numbered building);

(b) finding the specific street in which the destination property is located and to turn in the correct direction when street name signs, if they exist, are not located in a consistent position and the letter size used is not adequately legible in the circumstances (this difficulty may of course occur several times during the course of a journey in a large urban or metropolitan area).

It is easy to understand that such difficulties can arise frequently.

5 In addition, during the intermediate levels of a trip, drivers may be navigating using route numbers or familiar destination names. **If these are not signed to match the expectations of drivers, difficulties will occur at this stage of a trip.** Such a problem can occur near the beginning of a trip, at many points along the way, or near the end of the trip in combination with the problems noted in paragraph 9.3.2.4.

6 To minimise the effects of such difficulties the following aspects of the navigation process are particularly important:

(a) the provision of accurate navigational aids before and during a trip, and

(b) driver awareness and education of the navigation process so that expectations will tend to match what is provided by the guidance signing system.

7 Navigational aids are available to drivers outside the road environment for trip planning purposes and within the road environment during a trip. The information available can be graded in its importance or effectiveness. Primary information is likely to permit drivers to undertake the majority of their trip and is normally in a very compact form i.e. a route number. At strategic points along the way, secondary information supplements this primary knowledge to assist decisions, normally associated with a change

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of direction. Finally a tertiary level of information may be offered, when warranted, to assist drivers in reaching specific types of destination which commonly are larger attractors or generators of traffic than individual private or business premises e.g. meeting venues or tourist attractions. The structure of this information process is illustrated diagrammatically in Figure 9.8.

8 Navigational aids used by drivers during their pre-trip planning, before they commence their journey into an unfamiliar area, may include some or all of:

(a) road maps, including:

(i) inter-town/city maps showing route numbers and destination (town) names, and frequently interchange exit numbers;

(ii) large detail town/city maps showing route numbers and street names;

(iii) detailed street maps showing route numbers, street names, directions of travel in one way streets, and, if possible, property number sequences (to show the direction of increase and decrease of property numbers);

(b) road reports;

(c) other media formats such as brochures, magazines, newspapers, television or videos;

(d) verbal or written descriptions - which should be transferred to, or correlated with, a road map.

The way in which the information obtained is used is important. It is necessary for drivers to find a suitable way of recording the necessary information. A marked-up copy of the road map will be ideal, whether or not drivers have an assistant "navigator" with them. However, even writing down a consecutive list of route numbers and interchange exit numbers will be very effective for the major part of a long journey.

9 The in-trip navigational aids can include the road maps used in the pre-trip planning and up-dating radio road reports, but the information gained will be confirmed by the information given on the various types of guidance sign provided along the route. The information may comprise:

(a) route numbers on:

(i) route marker and trailblazer signs;

(ii) direction and freeway direction signs;

(iii) confirmation signs;

(b) orienting destination names on:

(i) direction and freeway direction signs;

(ii) confirmation signs;

(c) local destination names on:

(i) town name, suburb name, and street name signs;

(ii) local direction signs;

(iii) tourism direction signs;

(d) property numbers and private or commercial property names.

Interchange numbers are commonly provided at the interfaces between the National route freeway system and lower order urban streets. These numbers are a very valuable navigational aid because the appropriate interchange number may be the only piece of information actually needed to identify the correct exit from the freeway (Class "A") system. It is therefore important that road authorities ensure that information on interchange numbers is made available to map makers and that this information is included on their maps, so that there is the best possible correlation between the maps and the guidance signs used on the road network.

10 The various navigational aids referred to in the previous paragraphs can only work if drivers are aware of their existence, and if drivers are aware what information they should obtain from the pre-trip aids. Drivers will therefore also expect, with a good degree of certainty that the same information will also be found on the in-trip aids. Whilst drivers unfamiliar with this process, may not always have their information expectations confirmed by guidance signs, those that are aware of the process, and are educated in its limitations and how it can be made to work, are likely to have expectations which can indeed be matched by guidance signs. **A very important part of the education process involves those who give directions to drivers on to how to reach a specific destination. They also need to know how the navigation system works, so that they give directions in a form that can be matched by expected guidance signs.**

9.3.3 Typical Urban Street Networks

1 The navigational principles described in Subsection 9.3.2 suggest a long distance journey from a large urban area, perhaps passing through smaller urban areas, until ending in another large urban or metropolitan area. Trips within large urban or metropolitan areas, which include areas with which residents are not necessarily familiar, may be carried out, using exactly the same navigating principles.

2 In determining the solution to a problem it is normally beneficial to analyse the nature of the problem. To work effectively urban navigation principles have to be able to work in any type of urban street network. Urban street networks can be categorised as follows;

(a) **Level 1** - a network of minor streets comprising a town with perhaps one or two "main" streets, none of which warrant classification above Class "C2" (such a description will also commonly apply to suburbs or local traffic areas within larger urban areas);

(b) **Level 2a** - an essentially similar street network to that in (a) but which may have developed around one or two regional, provincial or national numbered routes whereby there is one junction between such routes and the routes pass through the town without a change of direction;

(c) **Level 2b** - a street network similar to that described in (b) but where one or both of the numbered routes changes direction within the town;

(d) **Level 3** - a street network which includes several regional, provincial or national numbered routes - such a network is also likely to include identifiable urban Class "C1" and Class "C2" streets;

(continued on page 9.3.6)

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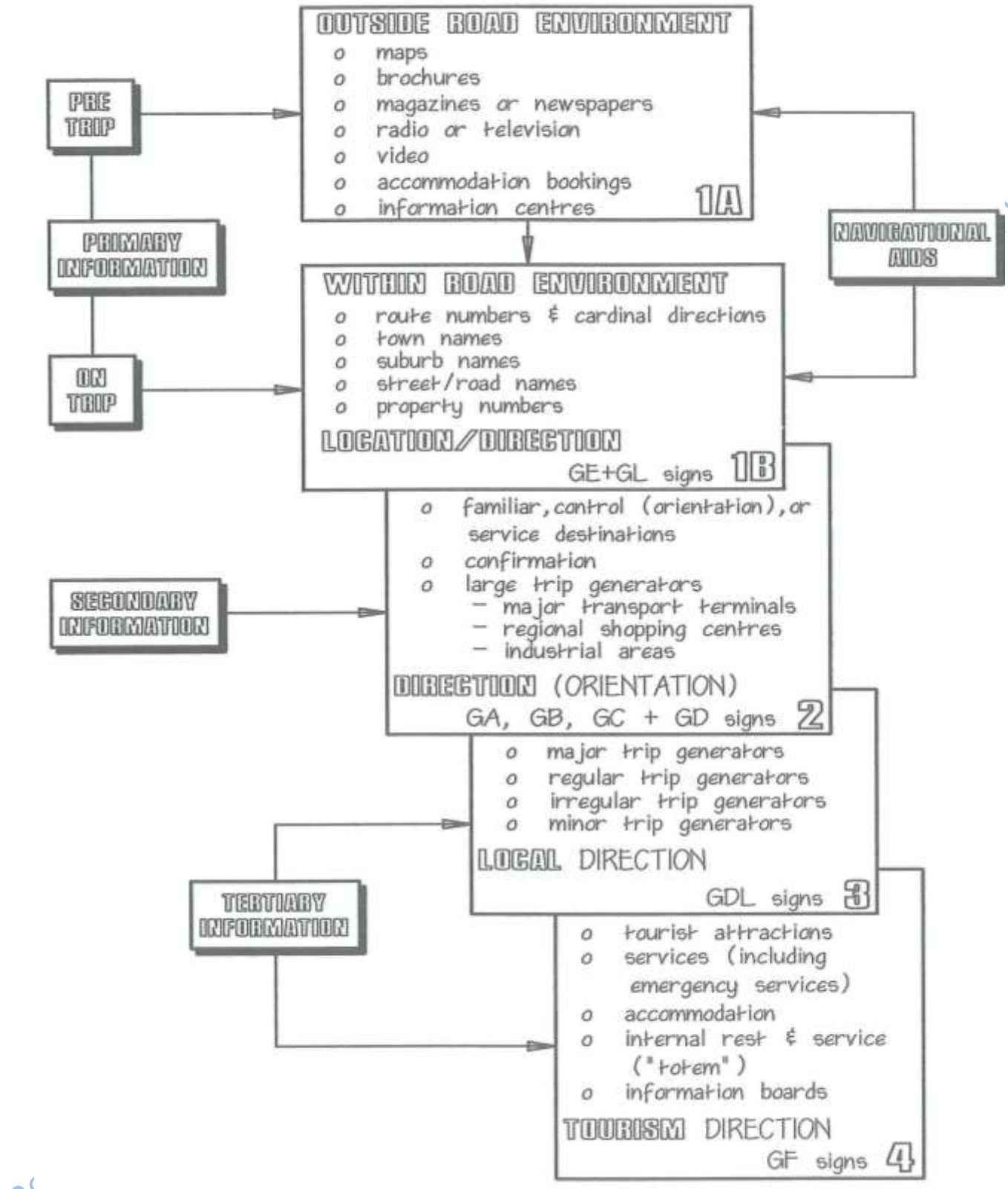
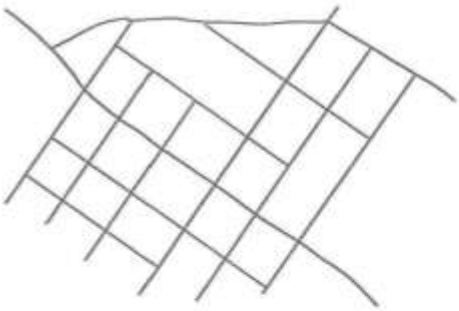
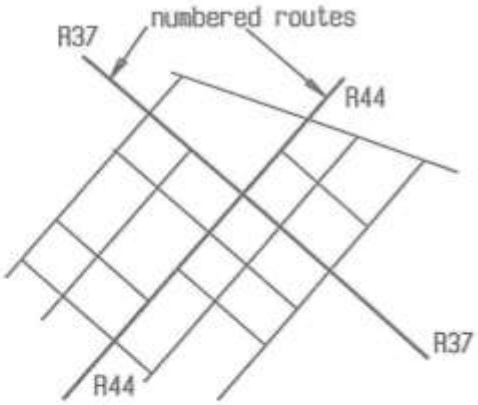


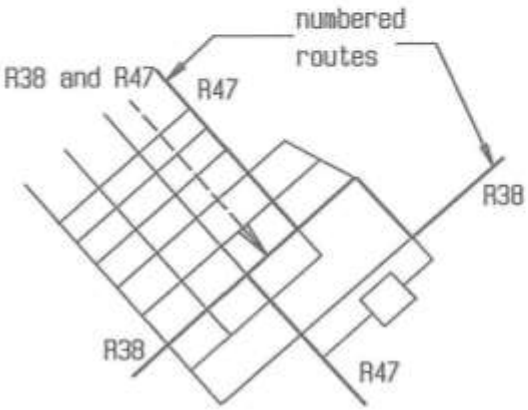
Fig 9.8 **Pre-Trip and In-Trip Information Layers**



Level 1 Network

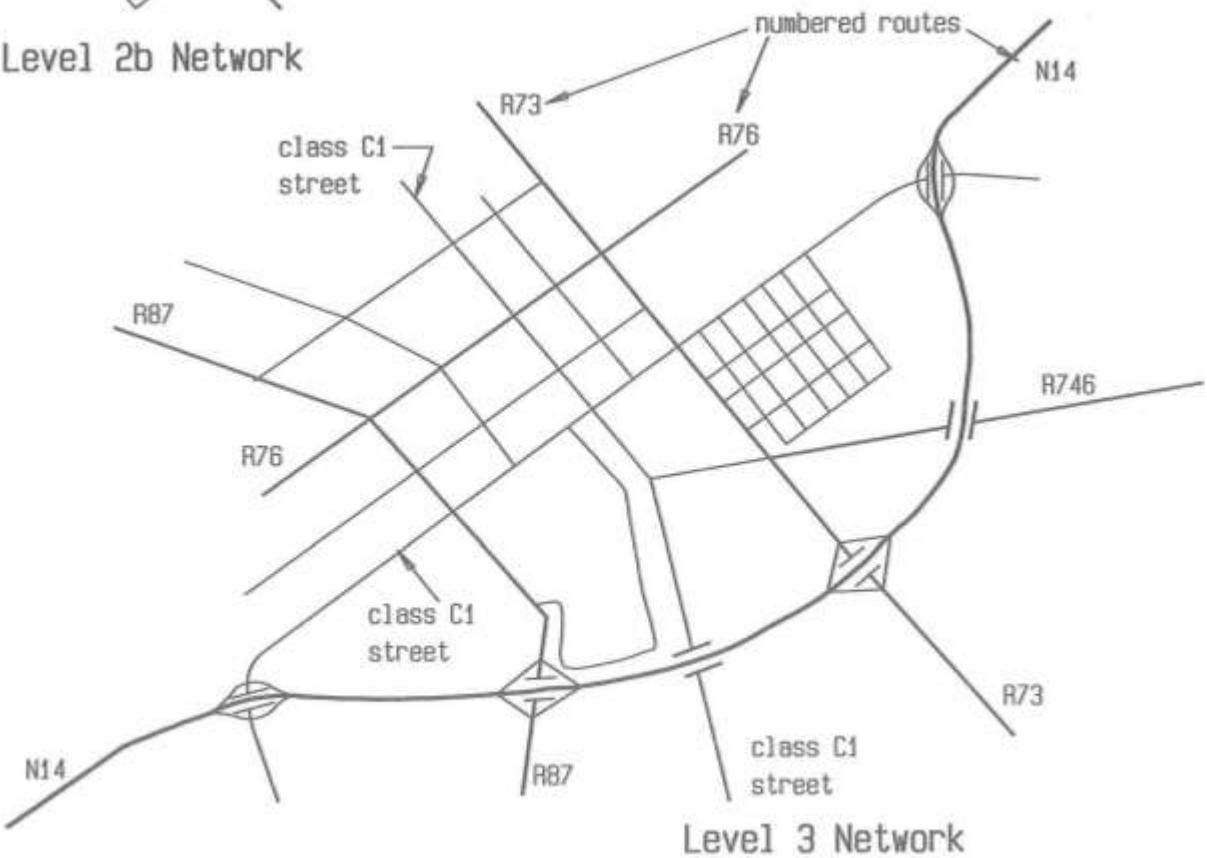


Level 2a Network



Level 2b Network

NOTE: The route numbers used are for illustration purposes and do not imply any specific town



Level 3 Network

Fig 9.9 **Minor Urban Street Networks**

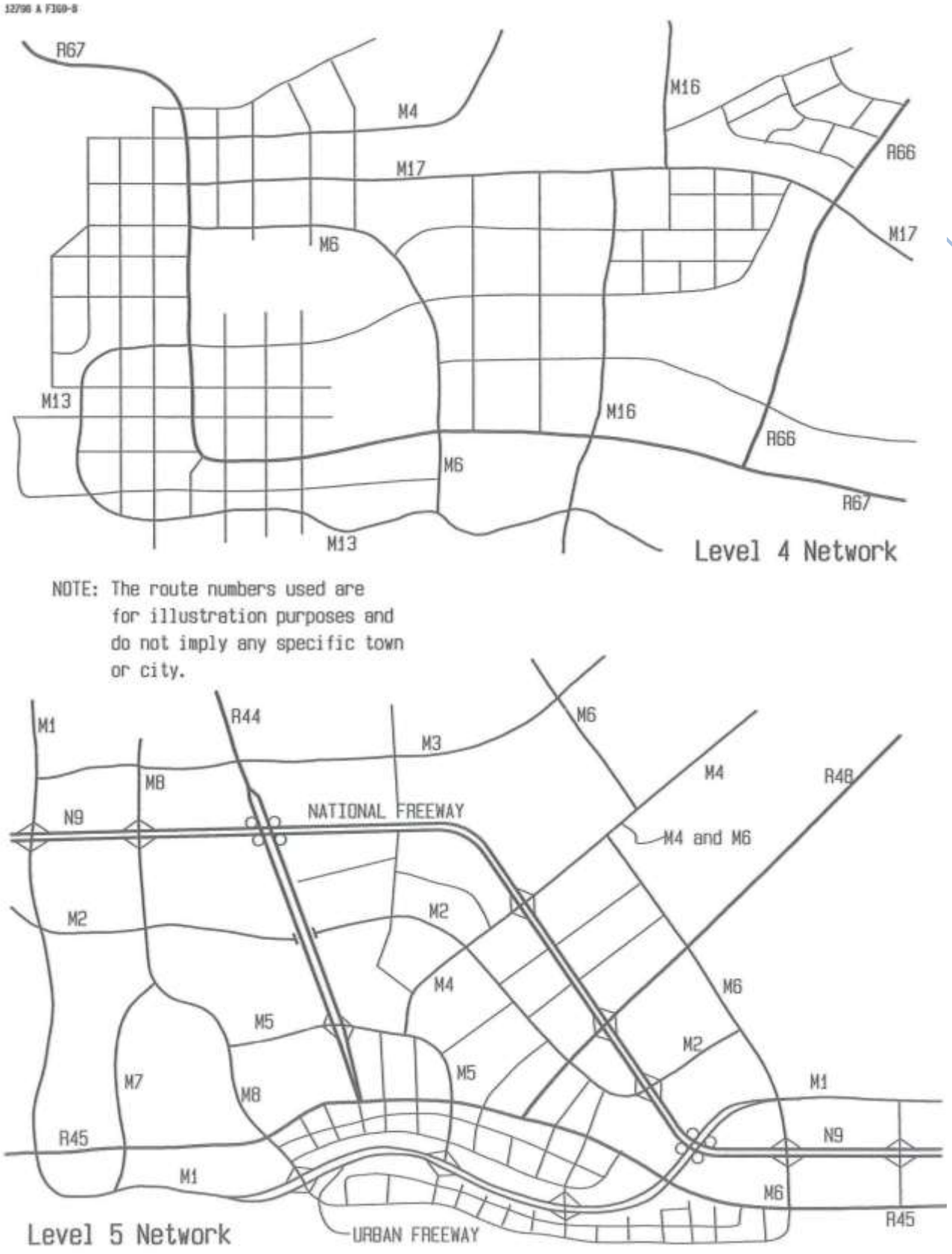


Fig 9.10 **Major Urban Street Networks**

(continued from page 9.3.2)

(e) **Level 4** - a street network in which numbered urban Class "B" ("B1" and/or "B2") streets can be identified in addition to regional, provincial or national numbered routes - historically in South Africa such a network has so far only occurred after one, or several contiguous, urban areas have been designated as a metropolitan area;

(f) **Level 5** - a street network in which the full range of urban street classes, including freeways, can be clearly identified.

Figures 9.9 and 9.10 illustrate this range of typical urban street networks which will all require an urban guidance signing plan of lesser or greater complexity.

3 A relatively common South African road network situation involving urban areas is that of the by-pass route. This can occur at any of the levels given in paragraph 9.3.3.2. Figures 9.9 and 9.10 include examples of such situations. The guidance signing of by-passed towns requires particular care and co-ordination between road authorities and is covered in detail in Volume 1, Chapter 8, Subsection 8.6.7.

4 Figure 9.11 summarises the type of guidance sign destination message which should normally be displayed on the indicated classes of urban street.

9.3.4 Selection of Destinations

1 This Subsection refers specifically to the selection of destination names for use as orientation destinations on Class "A" and Class "B" route direction signs. Local and tourism destination selection is covered in Sections 9.4 and 9.5 respectively.

2 The larger an urban area becomes the more difficult it is to adequately select destinations. The selected destinations are likely to work best, however, if the main factor used in their selection is their orientational value or "power".

3 After the careful process of route classification, route optimisation and route number allocation has been completed the main objective in selecting the most appropriate destinations is to enable unfamiliar road users to make the correct choices of route, whether this involves a turn to the right or to the left, or a straight-on movement. This applies throughout the various stages of their journey until they reach their final destination.

4 The choice of urban destination can be related directly to the level of street network as detailed in paragraph 9.3.3.2. With the exception of a by-pass situation, the destination names which should be selected for any direction signs required in street networks of Levels 1, 2a, 2b or 3 should be the appropriate familiar or control rural destination identified in terms of the provisions of Volume 1, Chapter 8. In a by-pass situation the signing on the by-pass, rather than within the town, will indicate destinations within the town subject to the level of the internal street network. The indication given at access points will normally be as simple as the name of the town if there is no destination beyond the town of any significance. If there are familiar or control destinations beyond the town being by-passed, these should be added to the appropriate direction sign stack, below the town name at the junction concerned.

5 In a Level 4 network the principle for Level 1, 2a, 2b and 3 networks will apply to the destinations for direction signs on any provincial or national numbered routes within the urban area. The destinations to be displayed on any direction signs on regional or urban Class "B" numbered routes should be selected after consideration of the following factors:

(a) the local traffic area or suburb population size (or number of erven) which is likely to offer the best orienting value due to its numerical importance or "power" (if a local traffic area should encompass several suburbs the name to be used to identify the local traffic area as a destination should be either the name of the largest contained suburb or one selected by using of the factors below);

(b) traffic composition (with particular emphasis on the percentage of non-commuters if this is likely to exceed the very general rule of thumb of 15% unfamiliar users);

(c) trip purpose (this may involve a weighting for seasonal variations in unfamiliar users);

(d) the need to avoid less attractive or more sensitive areas;

(e) a preference for a destination identified in (a) which is at, or near, the end of the urban route.

6 In addition a candidate destination should only be considered if the route runs through it or ends within it. All proposed orientational destination names should be subjected to broad scrutiny including the involvement of local key role-players (see Figure 9.12). **These roleвplayers must however be clearly informed on the purpose of the destination names and the limitations applicable in their selection and display. The function of identifying other possible destinations, on the way to the indicated destination, by means of town and suburb name signs should be made clear**. The choice of destination can be weighted because of perceived historical values, but this needs to be considered with circumspection, because it must be determined whether this historical value has merit beyond the immediate local area, in other words to unfamiliar drivers. The preference for "historical" directions tends to lie with, for example, residents giving directions to an in-coming stranger.

7 The availability of supplementary local and tourism signing should be taken into account in the final analysis. It should not normally be necessary to display more than one orienting destination name per exit direction from a Class "B"/Class "B" junction. One exception to this rule should be the inclusion of the names of major traffic generating transport terminals of regional importance.

8 The basis of a Level 5 network should build on that appropriate to a Level 4 network. Class "B1" routes destination names are likely to be the names of the towns making up the metropolitan area or external destinations of provincial or national importance. On Class "B2" routes the names of major suburbs may be used instead of town names, subject to the size of the urban area and the density of the urban route network or the signing may simply consist of the provision of route marker signs (see paragraph 9.2.2.3).

9 The selection of destination names for a Class "A" route within a Level 5 urban street network may present specific problems.

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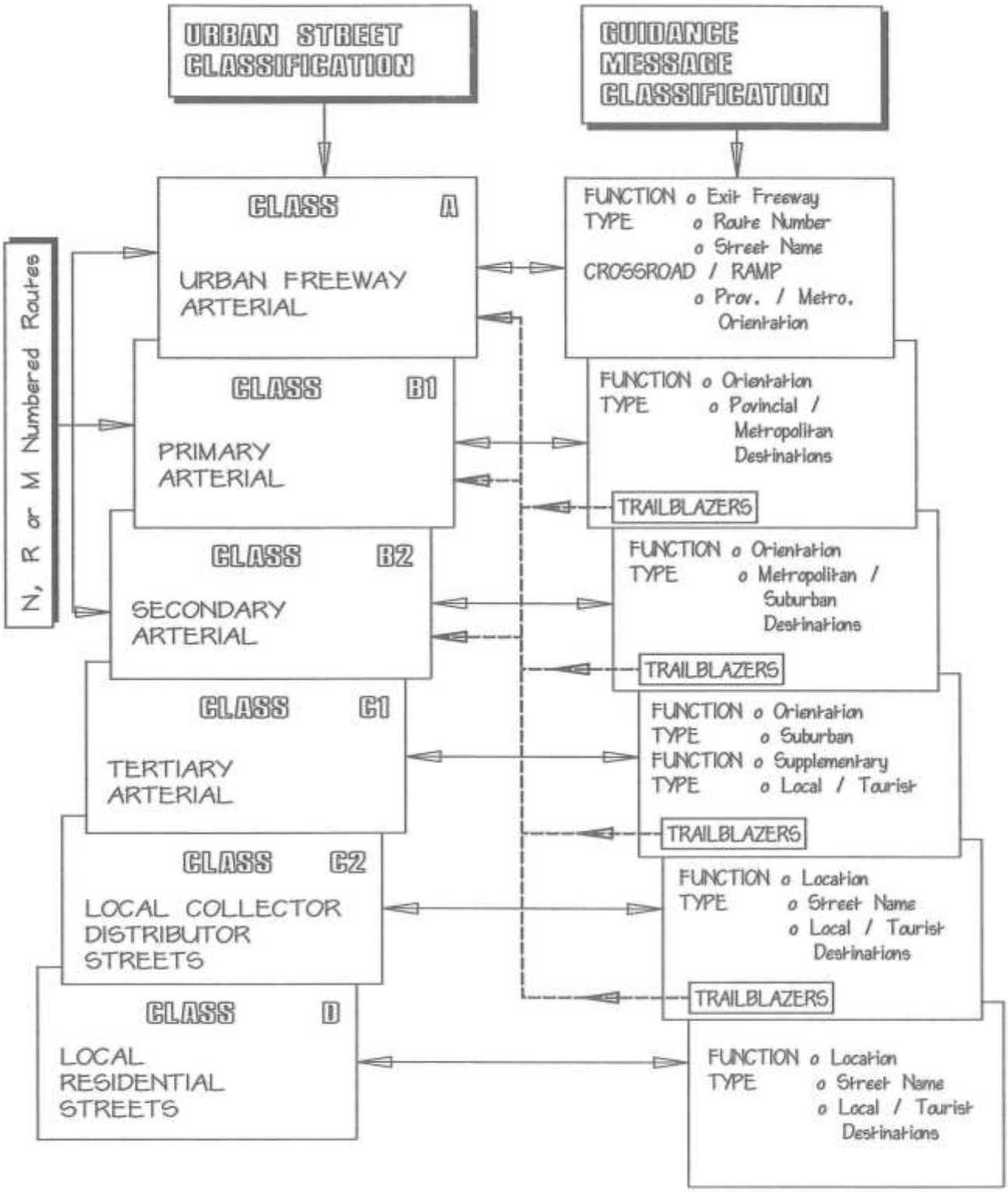

NOTES:

(1) Supplementary local and tourism destination signs may be used on any class of street up to Class "B" subject to warrants and rules (see Volume 2 Chapter 9).

(2) Supplementary tourism direction signs may also be used on Class "A" roads.

(3) Trailblazers are used to indicate numbered routes.

Fig 9.11 **Urban Street Classification Related to Guidance Message Type**

In terms of the approved policy for urban freeway signing given in Volume 1, Chapter 4, Section 4.9 the need for the display of destination names on urban freeway direction signs occurs as follows:

(a) on confirmation signs - for confirmation;

(b) on overhead straight-on signs - for confirmation; on exit signs at systems interchanges (normally overhead signs) - for orientation;

(c) on direction signs on access interchange off-ramps - for orientation when turning onto the cross street;

(d) on direction signs on the intersecting cross street approaching the freeway - for orientation entering the freeway.

10 **The exit direction information given on the freeway up to the point of exit from all urban freeway access interchanges comprises the route number and street name of the intersecting street.** In a peripheral freeway route by-pass situation, the name of a control destination outside the metropolitan area on a regional, provincial or national numbered route may be added. The names of major traffic generators such as transport terminals or large industrial areas may also be added at this level, due to the nature of the traffic generated - i.e. a relatively high percentage of unfamiliar road users, and in the latter case due to the difficulty in manoeuvring heavy vehicles.

11 Metropolitan areas, as they grow, tend to incorporate freeway system-to-system interchanges. Such interchanges invariably handle traffic which is partly that generated by a provincial or national network, and partly generated by the metropolitan area. The direction signs at such an interchange should therefore attempt to display orientational destinations which are familiar at the provincial or national level AND those necessary for orientation at the metropolitan level. A detailed example of such a situation is given in Volume 1, Chapter 8, Subsection 8.6.6. **Some measure of compromise is almost always necessary due to the limitations on the amount of information and the task complexity experienced by drivers in such situations** (see Figure 9.11).

9.3.5 Preparing an Interim Urban Guidance Signing Plan

1 In order to proceed towards the objective of a detailed Urban Guidance Signing Plan it is recommended that urban authorities adopt a structured approach which should use certain basic principles but which may vary in detail according to the size of town and the nature and extent of the street network within the town. The planning process can be conveniently conducted in two parts. **An Interim Plan may be prepared which will not commit the urban authority to detailed sign design but which should establish a complete inventory of the existing signing system and thereby identify the scale of any problem. It will also provide a full road classification for the town.** The complete Urban Guidance Signing Plan can pick up where the Interim Plan stopped and be developed to include an implementation phase with an appropriate budget. The latter should be detailed to the extent that it will include designs for specific urban guidance signs. To these ends a number of procedural steps are recommended. These are illustrated in Figure 9.12 and are described in the following paragraph.

2 The Interim Plan can be considered as a "broad brush" approach to the development of the Urban Guidance Signing Plan involving the first few steps in the overall process. To prepare an Interim Plan the following steps are recommended:

(a) **Step 1:** Collect any previous work undertaken by, or for, the authority which in any way impacts on the provision of guidance signs in the town and create an inventory of existing signs and other relevant data. In some instances this may be as little as a record of the allocated street names for a very small town, or a wide range of detailed reports, designs and research on the subject, up to a detailed computer based inventory of existing signs. (It is very likely that any authority which has the latter will already possess an acceptable Urban Guidance Signing Plan and will only need to review and refine if from time to time.) - Figure 9.12 includes a checklist for this process;

(b) **Step 2:** Discuss the existing situation with key role-players from the community - these role-players should come from all sectors of the community including the decision makers, those people involved in community affairs and those affected by any actions taken - typically representatives of the business, tourism and public sectors should be involved as well as the emergency services, civil defence and traffic officers;

(c) **Step 3:** From the information gained, make an initial assessment of the street network to establish or refine the arterial network including the recording of existing route numbers, if any, and define provisional local traffic areas;

(d) **Step 4:** Discuss the initial design with the role-players identified in Step 2;

(e) **Step 5:** Review arterial assessment and extend the classification to establish optimum routes and if necessary allocate new route numbers and/or rationalise existing ones, and to identify streets with a collector-distributor function (Class "C2") and thereby determine local traffic neighbourhoods or communities;

(f) **Step 6:** Using the criteria given in Subsection 9.3.4 select provisional destination names for the numbered route network on the basis that these must offer the best possible level of orientation for strangers to the area;

(g) **Step 7:** Present the details of the Interim Plan, comprising proposed numbered routes and destination names, together with awareness information on the navigational process, to the previously consulted role-players;

(h) **Step 8:** Refine the Interim Plan in terms of comments received as a result of the consultation in Step 7 and prepare a written description of all routes.

3 Steps 3 and 5 plus the consultative Step 4 result in the creation of a detailed Road Classification for the town or city. Whilst the purpose of this classification is to enable the development of a quality urban guidance signing system it may be of great use for other municipal activities.

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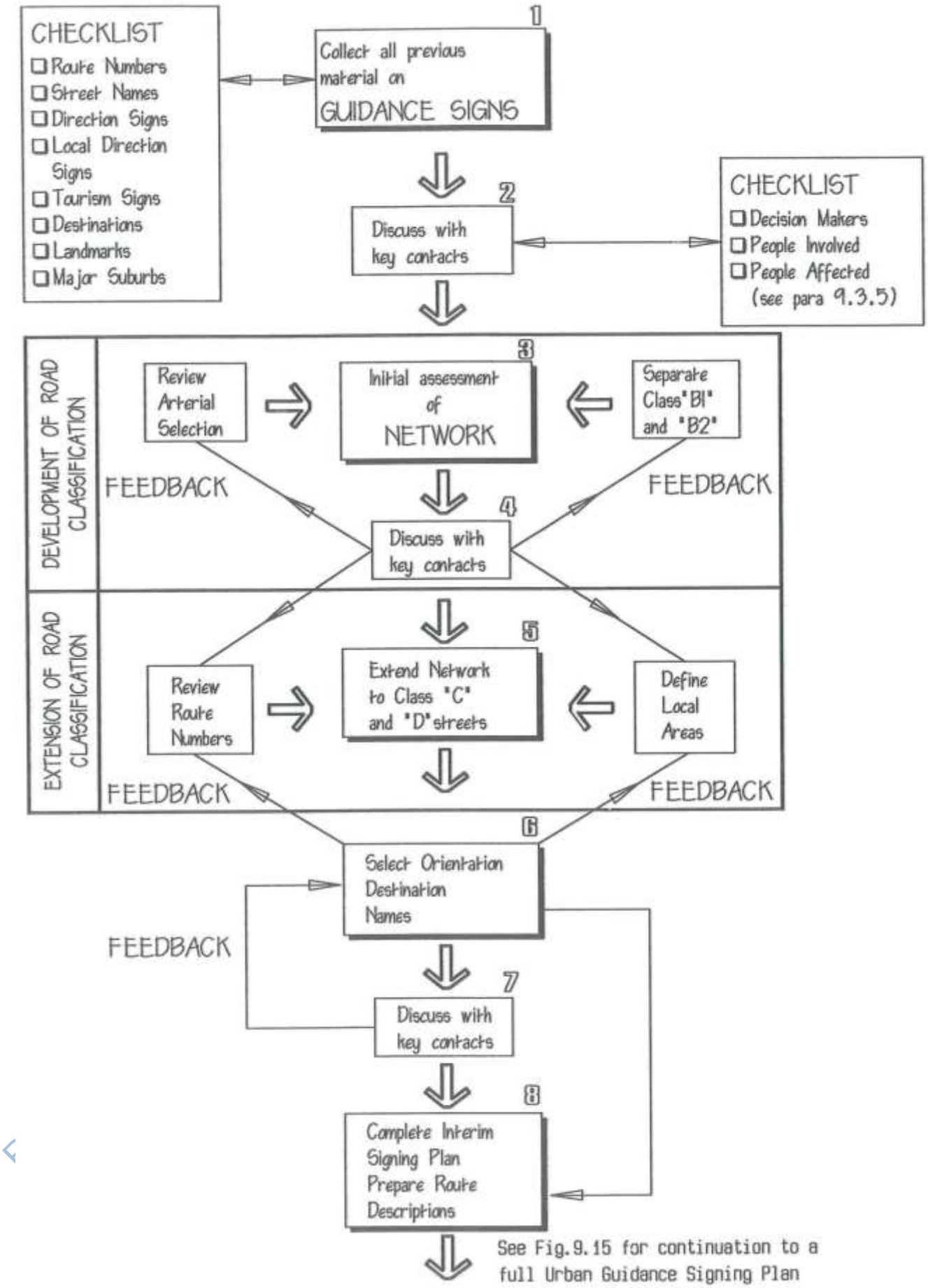

Fig 9.12 Step Process for Interim Guidance Signing Plan

4 It is recommended that, subject to the immediate needs of the urban area concerned, the Interim Plan be extended to a full Urban Guidance Signing Plan as described in Subsection 9.3.12.

9.3.6 The "Layer" Approach

1 An Interim Plan establishes the route classification and the main orientation destinations for a town or city and records existing signing. In order to implement a cohesive Urban Guidance Signing Plan (see Figure 9.15), it is convenient to consider the information given by the signs as comprising a number of information "layers".

2 Figure 9.8 shows three basic layers of guidance information (Layers 1a, 1b and 2) and two optional supplementary layers (Layers 3 and 4) which may be provided subject to various warrants. Layer 1a refers to pre-trip information and, although it must correlate with the on-street information, it is obtained outside the road environment.

3 The important on-street layers in this concept are Layers 1b and 2. **Layer 1b must be considered as obligatory, comprising as it does all street name and route number signs and property numbers.** Layer 2 represents a preferred, but often considered unaffordable, level which brings in orientational destinations. There is, however, a range of economic signing compromises between the two basic levels of information described in Layers 1b and 2. These are described in Subsection 9.3.9. The supplementary Layers 3 and 4 are discussed in Sections 9.4 and 9.5 and illustrated in Figure 9.21.

9.3.7 Minimum Urban Guidance Signing

1 **If the signing level required by Layer 2, and arrived at in terms of the Interim Plan, is considered unaffordable it is imperative, if urban guidance signing is to be effective at all, that the information required by Layer 1b be provided.** The effect of this requirement is illustrated in Figure 9.13 for towns without numbered routes (network Level 1) and in Figure 9.14 for towns with numbered routes (network Levels 2a, 2b, 3, 4 and 5).

2 The example given in Figure 9.13 refers to **the absolute minimum level of urban guidance signing which should be provided by any town.** The example illustrates one street in a Level 1 town, as shown in Figure 9.9 and described in Subsection 9.3.3, and therefore has no numbered routes. The guidance signs which should be provided throughout such a town, as an absolute minimum, are therefore:

(a) STREET NAME signs GL1 at all junctions, and

(b) TOWN NAME signs GL3 at all main points of entry into the town, and

(c) property numbers.

If the town is big enough to have identifiable suburbs SUBURB NAME sign GL2 may be provided as appropriate and CONFIRMATION sign GD3 may be provided at the town limits on any through streets.

3 Figure 9.14 shows a typical section of numbered route within a larger town. **In order to provide the minimum acceptable level of guidance under such circumstances the following guidance signs should be provided in addition to property numbers:**

(a) STREET NAME signs GL1, and

(b) CONFIRMATION ROUTE MARKER signs GE12 to GE14 as appropriate to the category of route, and

(c) DIRECTION ROUTE MARKER signs GE12.1/GE12.2 to GE14.1/GE14.2, and

(d) TOWN NAME signs GL3, and

(e) SUBURB NAME signs GL2.

In addition CONFIRMATION sign GD3 may be provided at the town limits on numbered streets and ADVANCE DIRECTION ROUTE MARKER signs GE12.3/GE12.4/GS12.5 to GE14.3/-GE14.4/GE14.5 may be provided in advance of a junction between two numbered routes, particularly when right and/or left turn lanes are provided.

4 If a town or metropolitan area has prepared an Interim Plan which recommends the provision of one of the identified levels of direction signing , but is unable to implement such a programme of signing within a 12 month period, **it is recommended that the minimum guidance signing illustrated in Figure 9.14 be provided within 12 months.** A co-ordinated programme can then be prepared to provide direction signs to suit the financial resources over a medium to long term (see Subsection 9.3.9).

9.3.8 Discussion on Figure 9.14

1 Figure 9.14 illustrates a section of a numbered route which forms part of an urban arterial lying within a Level 2, 3, 4 or 5 network. The fact that the example includes metropolitan "M" routes indicates that it is more representative of a Level 4 or 5 street network **although the minimum guidance signing principles illustrated remain applicable to the lower levels of network, and therefore to the signing of regional, provincial and national roads within such networks.**

2 The Class "B" route M44, around which the example is structured, is shown from right-to-left crossing the boundary between two towns "S" and "T" - typical of a metropolitan area. The route also crosses from suburb "Z" in town "S" into, successively, suburbs "Y" and "X" in town "T". At the town and suburb boundaries TOWN NAME sign GL3.1 (with a town crest) and SUBURB NAME sign GL2 are indicated in each direction of travel (only those relevant to travel from right-to-left in the figure are indicated by a sketch of a sign). Where both GL3 and GL2 are called for the GL3 sign precedes the GL2 sign.

3 Other class "B" numbered routes, a provincial route R66 and several "M" routes, are shown intersecting route M44. **For each such junction the minimum signing for each approach requires the provision of a STREET NAME sign GL1 and ROUTE MARKER signs GE12.1/12.2 or GE14.1/14.2 as appropriate.** Once again only the route marker signs seen by drivers travelling from right-to-left are illustrated, together with representative signs for other approaches. A ROUTE MARKER confirmation sign GE12 or GE14 should be placed 60 m to 100 m beyond the junction on each numbered route exit.

4 **Typical Class "C" streets are also shown intersecting route M44. Crossroads are recommended to have two STREET NAME signs GL1, whereas one such sign should suffice at a T-junction if properly positioned.**

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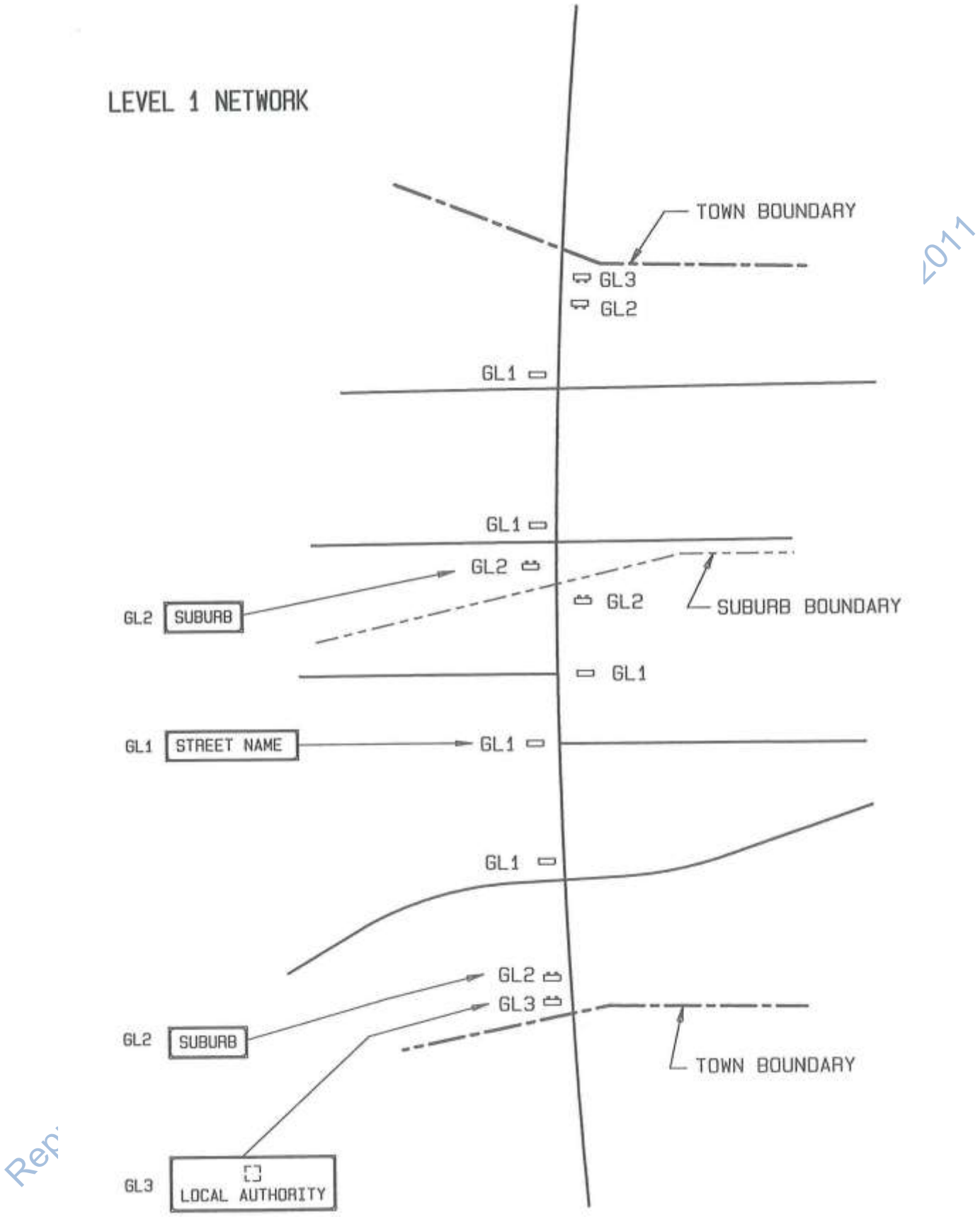

Fig 9.13 **Minimum Urban Guidance Signing - No Numbered Routes**

5 All STREET NAME signs GL1 may be double sided and **because route M44 is a numbered route a minimum letter height of 140mm is recommended for all GL1 signs.** Where ROUTE MARKER and STREET NAME signs are used at a junction they should be mounted on common supports or in close proximity to each other so that they lie in a common cone of vision.

6 ADVANCE DIRECTION ROUTE MARKER signs GE12.3/12.4 or 12.5 may be specified as an option when turning lanes are provided or sight distance to a junction is poor.

7 In urban areas all ROUTE MARKER signs should include a letter representing the appropriate cardinal direction. **When two directions are indicated the right turn sign should always be placed above the left turn sign.**

9.3.9 Selection of Urban Guidance Signing Level

1 If a town is in a position to opt for a signing level above the minimum level indicated in Figures 9.13 and 9.14 a range of options is available. The appropriate signing level is not directly related to the class of numbered route, although it is desirable that the higher the class of route the higher should be the level of guidance signing provided.

2 Criteria which should, **in addition to cost**, possibly influence the decision as to which level of guidance to adopt, are:

(a) traffic volume,

(b) percentage of heavy vehicles (obscuration);

(c) operating speed of traffic;

(d) number of lanes (road width);

(e) horizontal and/or vertical alignment;

(f) junction geometry;

(g) lateral side space (beyond the kerb line or edge of surfacing and up to property boundary);

(h) spacing longitudinally of street furniture (including trees);

(i) underground services (which might affect sign support location or cost of installation);

(j) message continuity;

(k) competition from advertising;

(l) position of the junction within the urban street network;

(m) number of accesses/land use density (trip generation);

(n) junction spacing.

3 The above criteria may be used in the course of an engineering assessment of the levels of guidance signing appropriate to specific urban street situations. Any such engineering assessment should not be conducted in isolation of the rest of the urban street network so that uniform standards of guidance signing will prevail throughout an area. Figure 9.14 provides a decision chart approach to determining an appropriate guidance signing level according to the identified criteria which may facilitate a relatively quick assessment of a complete urban street network. The signing levels referred to are illustrated in Figures 9.26 to 9.36 In Section 9.8.

4 Descriptions of these signing levels are given below where references to classes of urban street are not specific to a particular class i.e. **Class "B" means Class "B1" or Class "B2"** as appropriate to the criteria for specific streets of both classes:

(a) Level OA-S - Overhead Systems Interchange Level
Level OA-A - Overhead Access Interchange Level
Level 1A-A - Access Interchange Level
Level 1A-C - Preferred Class "A" Crossroad Level
Level 2A-C - Minimum Class "A" Crossroad Level;

(b) Level 1B - Preferred Class "B" Level
Level 2B - Intermediate Class "B" Level 1
Level 3B - Intermediate Class "B" Level 2
Level 4B - Minimum Class "B" Level;

(c) Level 1C - Enhanced Class "C" Level
Level 2C - Minimum Class "C" Level;

(d) Level 1D - Enhanced Class "D" Level
Level 2D - Minimum Class "D" Level.

9.3.10 Discussion on Figure 9.15

1 Many factors are involved in the decision making process for the selection of a suitable level of urban guidance signing. The more important of these factors are listed in Subsection 9.3.9. In order to make a detailed assessment involving so many factors, an engineering analysis of some complexity is required. Most authorities are not prepared, or able, to commit the resources needed to do such an analysis.

2 Figure 9.15 has been prepared to provide a quick analysis using the majority of the identified factors. Each section of the figure is numbered for reference purposes - the numbers are not always in a working sequence because several sequences are possible.

3 The figure works on a "yes"/"no" answer basis to stated questions. The outcome of box "1" will decide whether the process continues or whether in fact an engineering assessment really is required (see box "12").

4 The junction configuration requires the selection, in box "2", of a class of junction approach. For Class "B" routes, this leads to an assessment of the "Level of Service" of the route using box "3". The levels indicted can be considered as similar to the normal AASHTO grading. Speed, % of heavy vehicles and traffic volume are **assessed** on a "Low/Medium/High" basis and scores are added and recorded. The score correlates with a typical AASHTO level of service in a range from "A" to "F".

5 Proceeding with the analysis, boxes "4" to "7" relate to the physical characteristics of the junction approach. Alternatively if a Class "A" route is being assessed boxes "8" and "9" are used.

6 Block "11" indicates a level of signing which correlates with the levels illustrated in the figures given in Section 9.6. **Affordability of a particular level will always be in question.**

7 Subsection 9.3.11 deals with representative examples of the use of Figure 9.15.

(continued on page 9.3.14)

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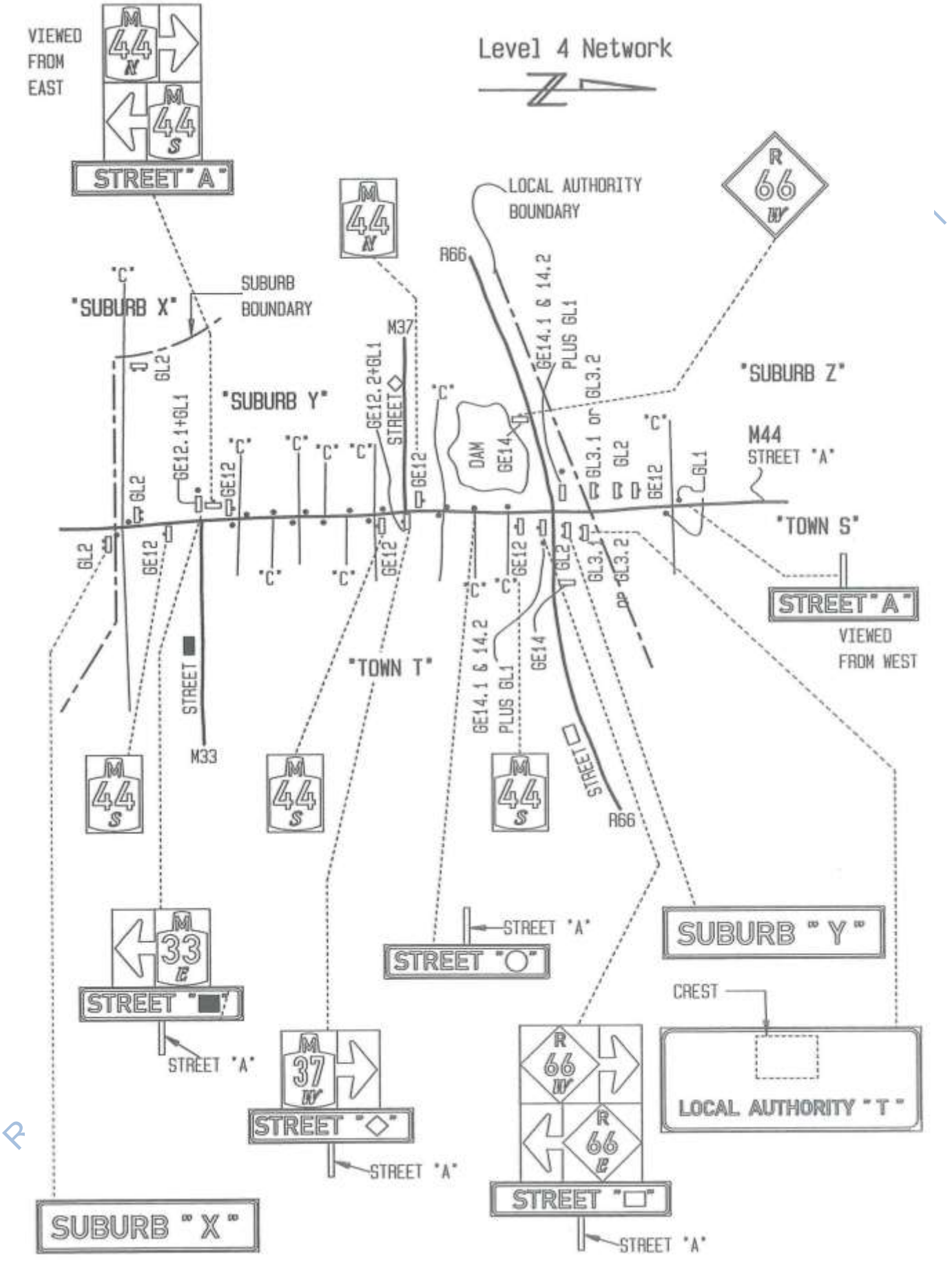

Fig 9.14 **Minimum Urban Guidance Signing - Numbered Routes**

9.3.11 Worked Examples for Figure 9.15

The following examples are typical of urban street situations which may occur during the course of an assessment of an urban street network in terms of an Urban Guidance Signing Plan.

Example 1: Class "B1" Street Approach

Existing conditions:

- the junction is between two metropolitan Class "B" routes;
- the level of service is not known;
- traffic volumes are high;
- the route is a bus route and otherwise carries an average percentage of heavy vehicles;
- average approach speeds are slightly below the speed limit;
- two through lanes on the approach;
- the junction is 400 m from the nearest junction and 1600 m from the nearest previous Class "B" junction.
- space on the approach is limited due to closely spaced trees and street light poles;
- the junction area itself is open.

In addition it has been determined that:

- if direction signs are used message continuity can be maintained;
- underground services are not a problem;
- there are no advertisements;
- the approach is straight and even graded slightly uphill;
- junction geometry is straight forward.

The Decision Chart in Figure 9.15 can now be used. As a result of the given conditions we can move from Box 1 to Box 2 and choose the B/B box. Since the level of service of the approach is not known we work through Box 3. In this case the "Scores" from the three internal blocks of Box 3 will be:

- traffic volume = 1;
- % heavy vehicles = 2;
- speed = 2;

giving a total score = 5.

The level of service is therefore equivalent to Level D. Proceeding to Box 4 there are less than three lanes on the approach so we go on to Box 5. The nearest junction is not close so we can move to Box 6. Since the space on the approach is limited we move to Signing Level 2B in Box 11.

Level 2B represents the Intermediate Level 1 signing level for Class "B" and comprises the following sign sequence (see Figure 9.50):

- GE12.3/GE12.4 - ADVANCE DIRECTION ROUTE MARKER signs;
- GD2 - DIRECTION sign (including the street name).

Example 2: Class "C" Street Approach

Existing conditions:

- the junction is between a tertiary arterial collector-distributor Class "C" street and a Class "B" route;
- the junction is signalised;
- the street is a two lane two way street with no turning lanes;
- the street is tree lined with street lighting poles on the left side.

In addition it has been determined that:

- if direction signs are used message continuity can be maintained;
- underground services are not a problem;
- there are no advertisements;
- the approach is straight and even graded slightly uphill;
- junction geometry is straight forward.

The decision Chart in Figure 9.15 in this case takes us to the C/B block of Box 2. The level of signing for this class of street does not include direction signs so we move straight to Boxes 10 and 11. For Class "C" streets we have a choice of Levels 1C or 2C - see Figure 9.53. Because the route intersects a Class "B" route the Enhanced 1C signing level is recommended. Standard signs are:

- GE12.1/GE12.2 - DIRECTION ROUTE MARKER signs
- GL1 - STREET NAME signs.

Example 3: Class "B2" Approach to A Freeway

- the freeway has been trailblazed for some distance;
- neither services nor advertisements are a problem.

The Decision Chart in Figure 9.15 again leads us to Box 2 and to the one class B/A box. Since the signing level of a B/A approach can only be varied due to a limited space, this box leads directly to Box 8 where the choice is between Signing Levels 1A-C or 2A-C. In this case Level 2A-C is a likely option (see Figure 9.48).

9.3.12 The Urban Guidance Signing Plan

1 The steps involved in preparing an Interim Guidance Signing Plan for an urban area are described in Subsection 9.3.5 and are illustrated in Figure 9.12. This Interim Plan comprises three main components:

(a) numbered routes;

(b) selected orientation destinations;

(c) an inventory of existing guidance signs.

2 To extend the Interim Plan to an Urban Guidance Signing Plan the following steps, which are illustrated in Figure 9.16, should be carried out after the completion of Step 8 of the Interim Plan:

(a) **Step 9:** Record all existing street names, assess any confusing combinations of names at junctions with due consideration to re-naming if necessary, and allocate names to any streets that are unnamed. Record at least the property numbers at the end of

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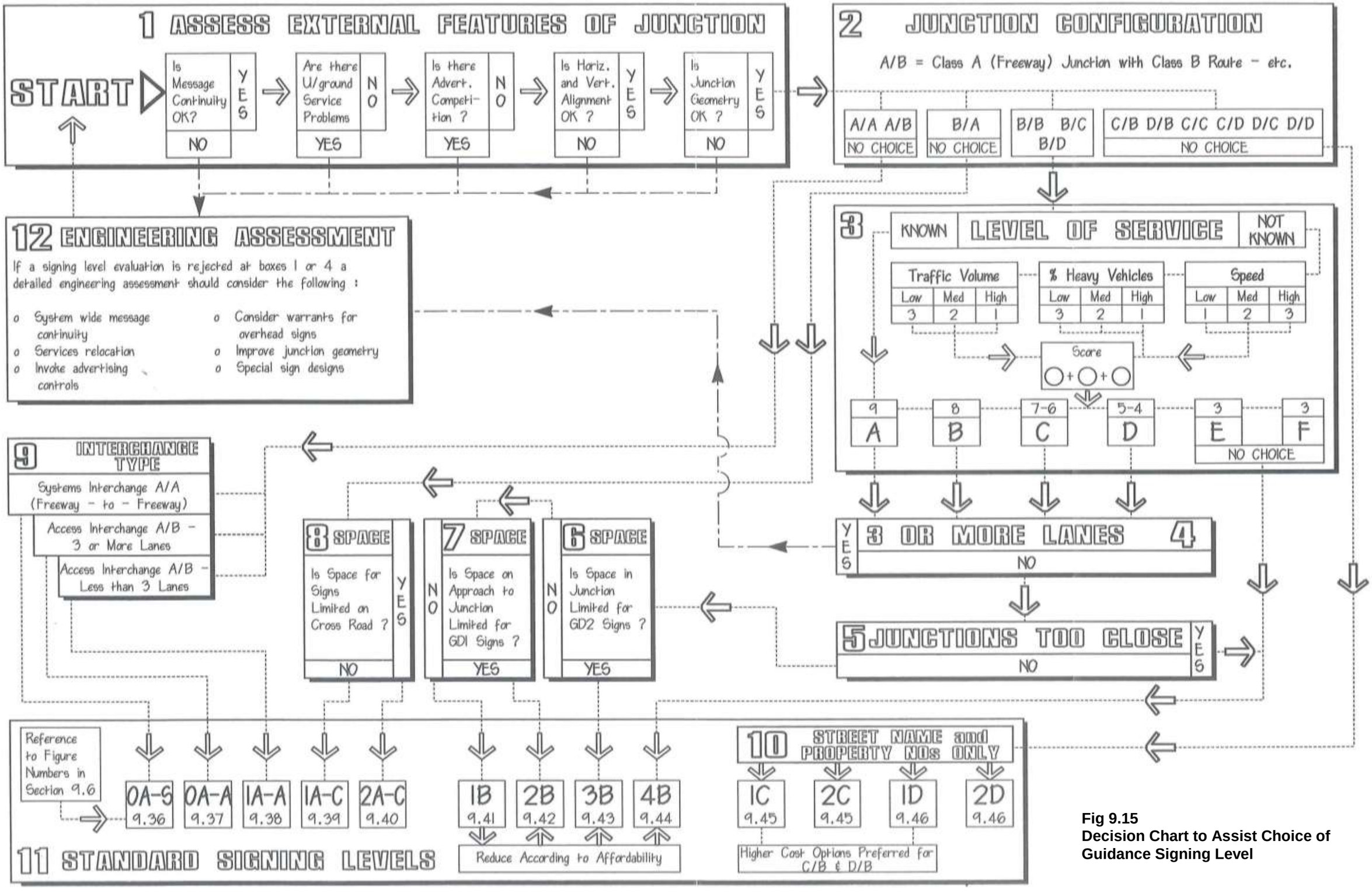

Fig 9.15
Decision Chart to Assist Choice of Guidance Signing Level

each block between intersections, so that the direction of increase or decrease in property numbering is available for inclusion on STREET NAME (GL1) signs, if required.

(b) **Step 10:** Assess the need in the area for at least Group 3A local destinations (see Table 9.1), according to relevant warrants, and record the junctions at which local direction signs will be required. According to the requirements of the urban authority, this process can be continued proactively for Groups 3B, 3C and 3D local destinations. **The priority should be to first identify the local signing needs at junctions at which standard direction signs are likely to be provided, in order that the areas of greatest information pressure for drivers can be subjected to engineering assessment if necessary.** A similar process should be carried out for the tourist destination types listed in Groups 4A to 4D (see Table 9.2).

(c) **Step 11:** For each junction in the network, on Class "A" and "B" routes, survey the relevant criteria and determine the appropriate level of guidance sign for each approach to such junctions (see Subsection 9.3.9 and Figure 9.15). Once this information is obtained record the sign types required appropriate to the chosen level of signing.

(d) **Step 12:** Re-assess the first allocation of guidance signs from Steps 10 and 11 to eliminate any sequential inconsistencies along specific routes e.g. frequent changes in signing level from one junction to another, either upwards or downwards in level. This reassessment should take into account the actual ability to upgrade lower levels of signing at isolated junctions, in terms of certain criteria e.g. the space available for signs. If necessary the reassessment should involve the downgrading of some chosen signing levels to achieve a reasonably consistent level of signing along the route. **During this process all junctions which will be provided with a DIRECTION sign GD2, incorporating the intersecting street name, should be recorded and the requirement for a stand-alone STREET NAME sign GL1 in such a position deleted appropriately.**

(e) **Step 13:** Add the local and tourist direction sign requirements identified in Step 10 and adjust the positions of any ADVANCE DIRECTION signs GD1 to allow all drivers sufficient reading time for all signs provided, OR identify options to establish information laybys and/or centres (see Sections 9.4 and 9.5).

(f) **Step 14:** At this stage the details of the plan should now be submitted to the key role players identified during the Interim Plan phase. Details of the Plan should be adjusted as necessary.

(g) **Step 15:** Carry out the signface design for all guidance sign types (see the checklist in Figure 9.16), allocate accurate positions for all signs and record these details for each sign. Record sign area quantities for budgetary purposes and prepare a local system design for each junction (see Subsections 9.3.15 and 9.3.16).

(h) **Step 16:** Compare the design output from Step 15 with the inventory established in Step 1 and **identify existing signs which are outdated or redundant.** Adjust the budget input for any resultant sign removal or redesign.

(i) **Step 17:** Prepare a budget and implementation programme for the Urban Guidance Signing Plan.

9.3.13 Minimum Requirement - Short Term Plan

1 When the final Urban Guidance Signing Plan is completed, and the implementation plan in terms of available finances has been prepared, the time frame for this will become evident. If it is not possible to budget to achieve the ultimate level of the Plan within two years **it is highly recommended that a minimum implementation plan be prepared which should be carried out within twelve months so that an effective guidance sign navigation system can be in place as soon as possible to minimise the risk of drivers losing their way.**

2 The signing required to complete a minimum implementation plan is as follows:

(a) for a Level 1 network - provision of all STREET NAME (GL1) signs;

(b) for all other levels of urban street network - provide all STREET NAME (GL1) signs and for all numbered routes CONFIRMATION ROUTE MARKER (GE12) and DIRECTION ROUTE MARKER (GE12.1/GE12.2) signs with an option to provide strategic ADVANCE DIRECTION ROUTE MARKER (GE12.3/GE12.4/GE12.5) signs when sight distance to the junction is limited.

9.3.14 Medium to Long Term Plan

1 In conjunction with a minimum requirement short term plan, and any street development and major rehabilitation programmes, a medium to long term plan to implement the balance of the system of orientational direction signs should be prepared, so that the provision of such signs, beyond the minimum plan, can be budgeted for at an affordable rate. Such a medium to long term plan should also take note of the local and tourist direction sign requirements. **A particular aspect of this phase of the work should be the co-ordination of the plan with signs provided in terms of new development, and individual applications, so that, as far as possible, inconsistencies in information display along a route are eliminated.**

9.3.15 Detail Sign Design

1 Detailed signface design can be carried out for the full Plan once it is finalised, or in phases as dictated by budget and design resources.

2 In addition to the design of each signface in the system, a local system design should be undertaken for each junction. This should include the following detail:

(a) allocation of a unique junction reference number which should be co-ordinated with any existing accident record inventory system;

(b) signface designs with full dimensional details for all signs required at the junction - each sign to be allocated a unique identity number;

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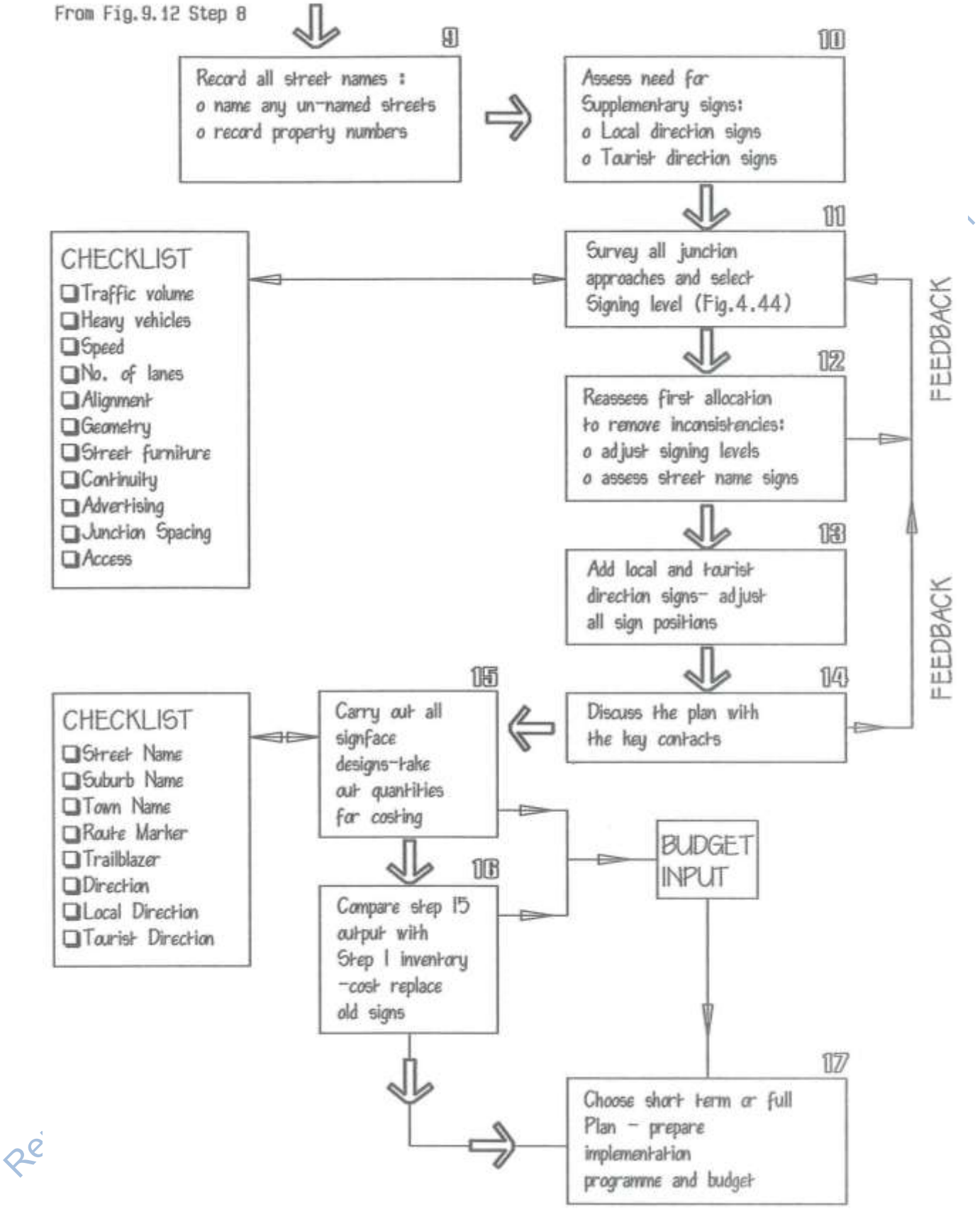

Fig 9.16 **Step Process to an Urban Guidance Signing Plan**

(c) a schedule of sign areas;

(d) signface material requirements;

(e) precise sign positions with locating diagrams;

(f) cost estimates with an indication of responsibility for payment or source of funding and its availability;

(g) a priority listing allocation for implementation;

(h) a record of any unusual requirements e.g. overhead mounting, part of a street construction scheme, illumination, conflict with other services etc.

3 New sign designs can be recorded directly into a sign management database for future reference. Such a database should be updated to include all signs which existed prior to the preparation of the Urban Guidance Signing Plan.

9.3.16 Sign Maintenance Management Plan

1 As soon as any phase of the Urban Guidance Signing Plan is implemented a sign maintenance management plan should be set up. Limited guidelines for such a maintenance plan are given in Volume 1, Chapter 1 and more complete details are covered in Chapter 16 of this Volume.

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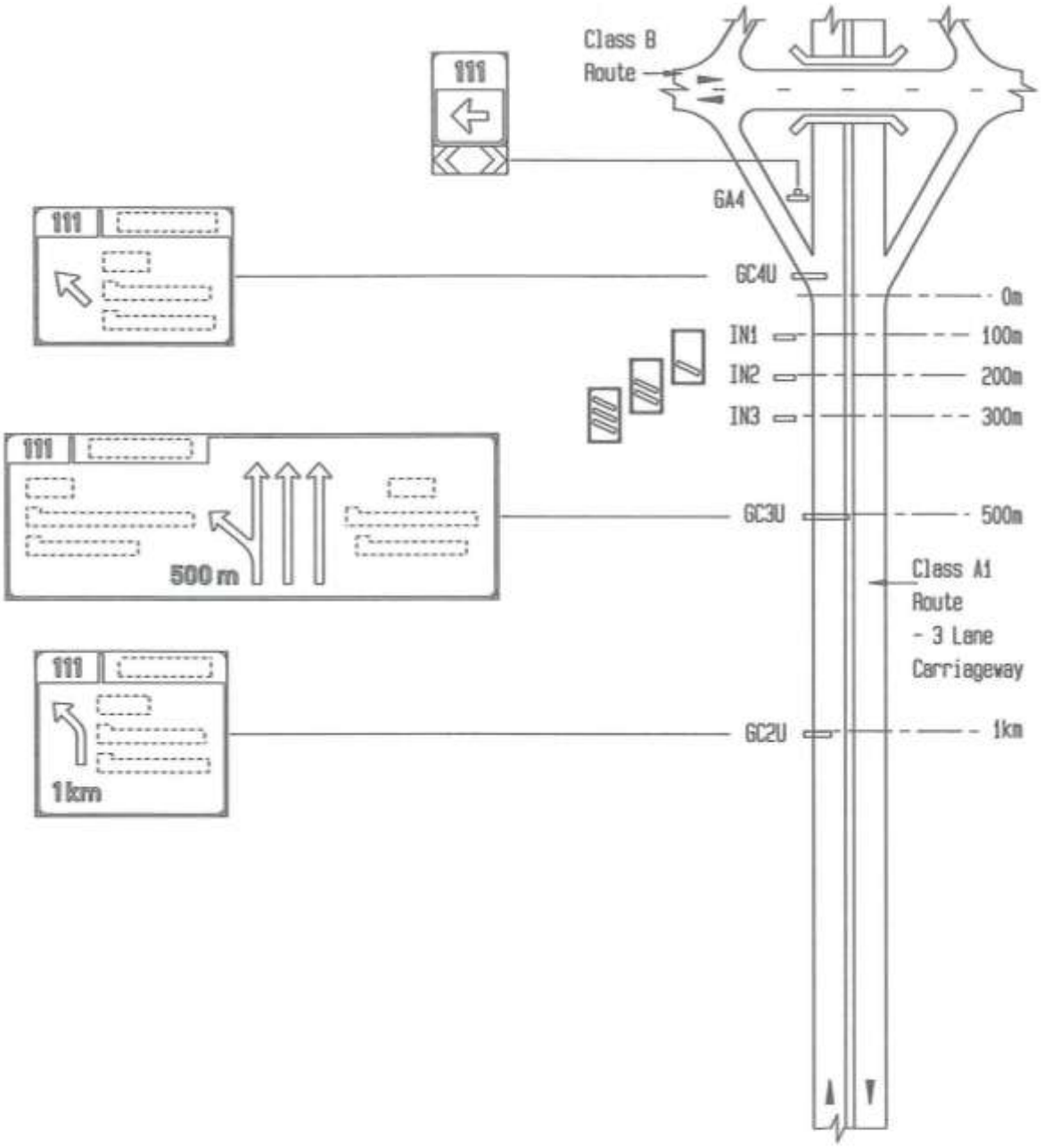


NOTES:

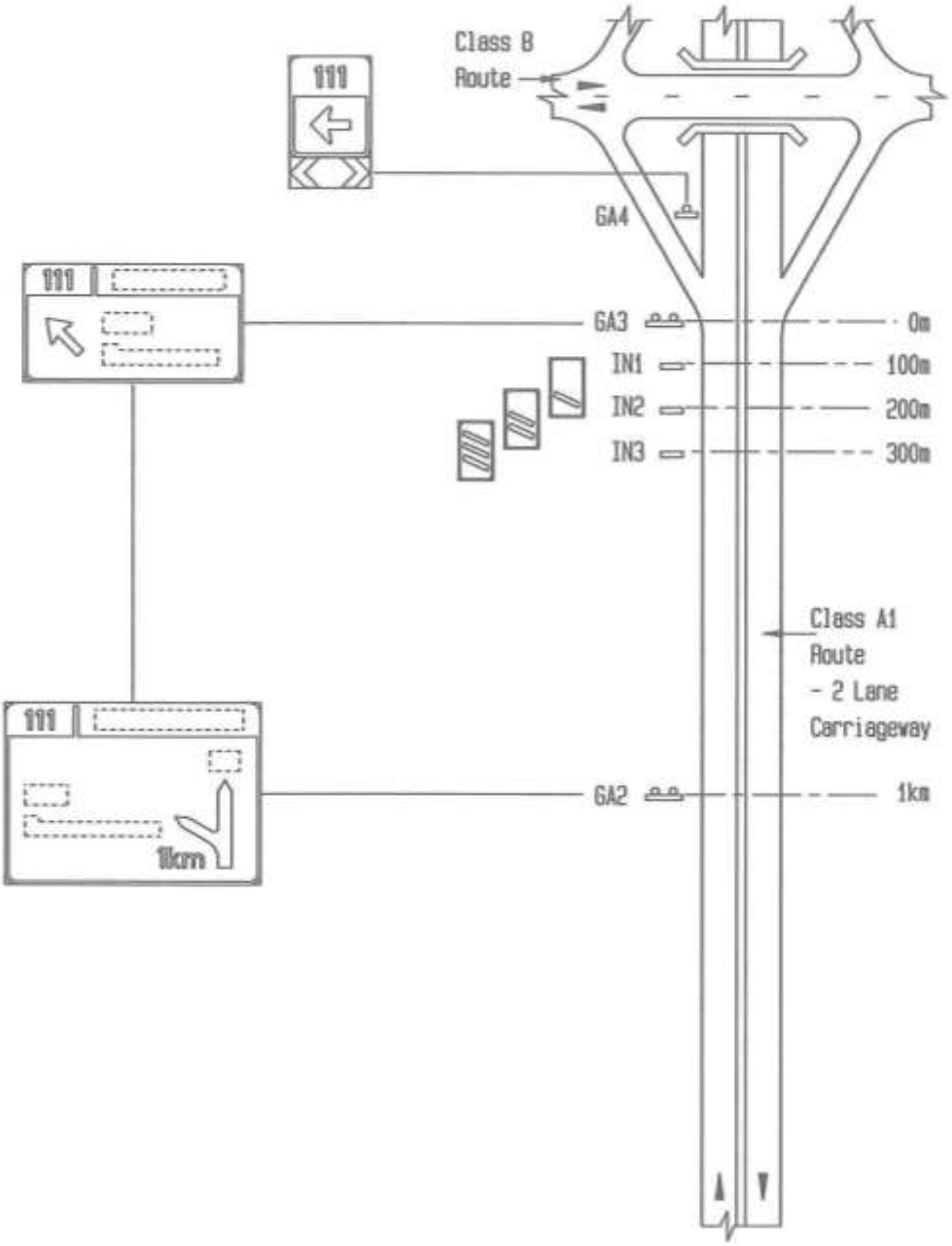
(1) Figure 9.17 shows the basic guidance sign sequence applicable to an urban Class A1 freeway at an access interchange when the freeway carriageways have 3 or more lanes. A number of additional FREEWAY DIRECTION signs may be used to supplement this basic display. For further details see Figures 9.44 to 9.48 in Section 9.6.

(2) Warrants for the use of overhead FREEWAY DIRECTION signs are described in Subsection 9.6.9.

(3) The function and application details of urban overhead FREEWAY DIRECTION signs are described in full in Volume 1, Chapter 4, Sections 4.1, 4.2 and 4.9.

(4) For dimensional details see Volume 4, Chapter 6.

Fig 9.17 Basic Urban Guidance Signing Sequence – Freeway Class A1 Access Interchange – 3 Lane Carriageway



NOTES:

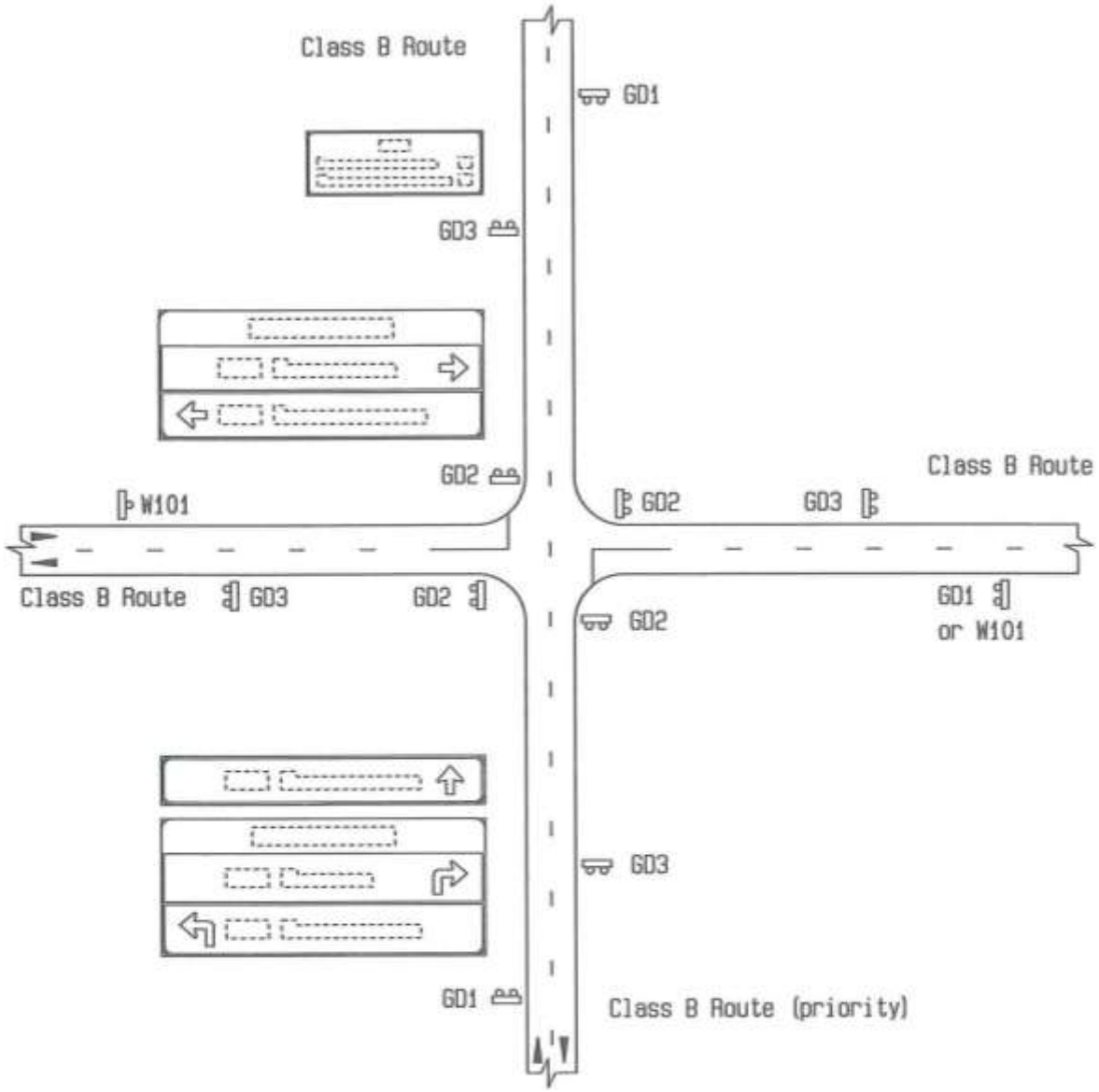
(1) Figure 9.18 shows the basic guidance sign sequence applicable to an urban Class A1 freeway at an access interchange when the freeway carriageways have 2 lanes. A number of additional ground-mounted FREEWAY DIRECTION signs may be used to supplement this basic sequence. For further details see Figures 9.44 to 9.48 in Section 9.6.

(2) The function and application details of urban overhead FREEWAY DIRECTION signs are described in full in Volume 1, Chapter 4, Section 4.1, 4.2 and 4.9.

(3) For dimensional details see Volume 4, Chapter 6.

(4) This same basic sign sequence is appropriate for an urban Class 2 freeway (only one carriageway with no median island). For a Class A2 freeway application the signface background colour is changed from blue to green.

Fig 9.18 Basic Urban Guidance Signing Sequence – Freeway Class A1 Access Interchange – 2 Lane Carriageway



NOTES:

(1) Figure 9.19 shows the preferred basic guidance sign sequence applicable at a junction between two urban Class B routes whether these are designated as N, R or M numbered routes.

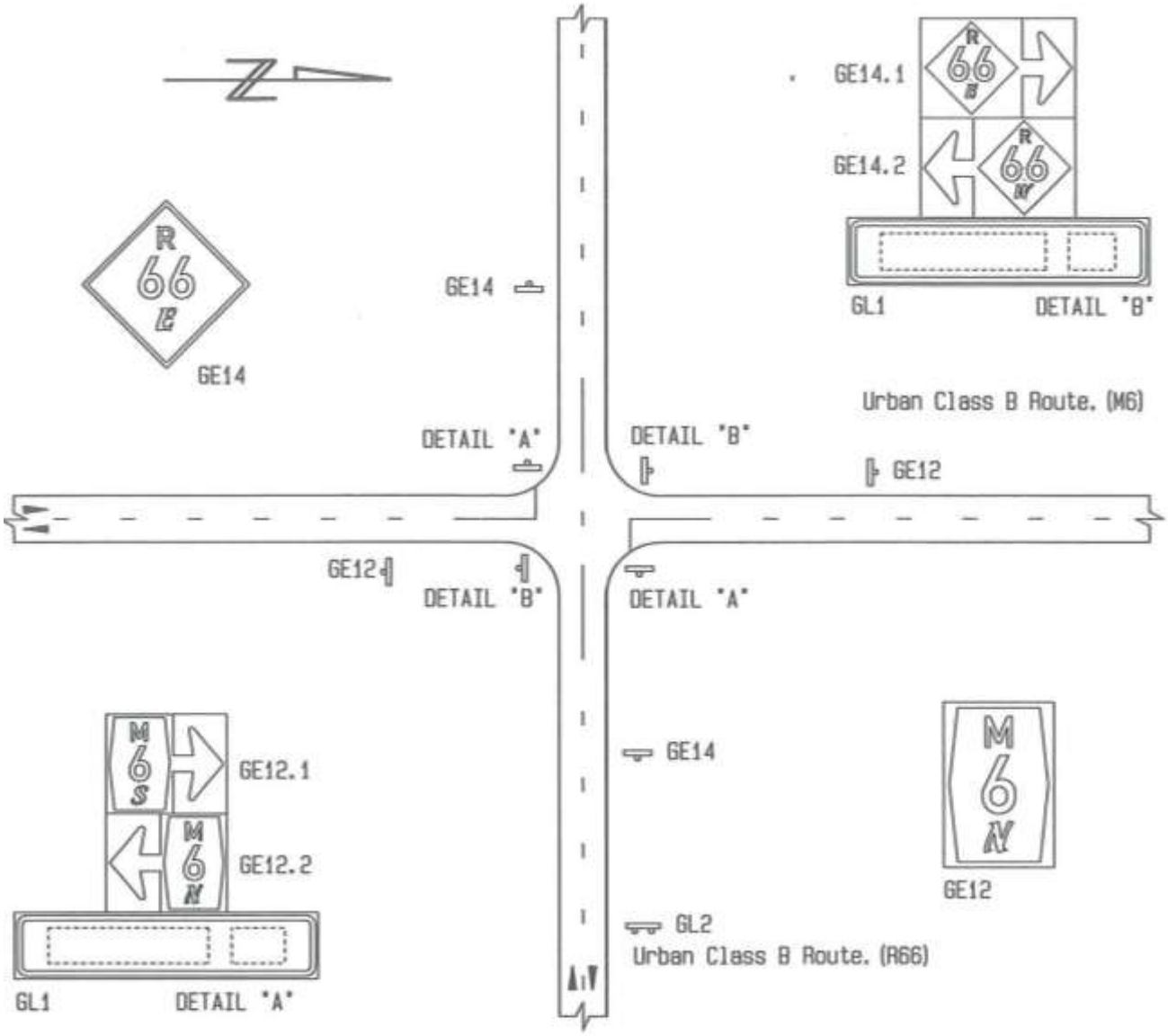
(2) LOCAL DIRECTION and/or TOURIST DIRECTION signs may be added to such sequence. For details of the use of these classes of sign in urban areas refer to Section 9.4 and 9.5.

(3) According to a number of factors described in Section 9.6 this sequence may be varied to reduce sign-face area (and cost) and/or to fit signs into limited available space. For further details see Figures 9.49 to 9.52.

(4) The function and application details of urban DIRECTION signs are described in full in Volume 1, Chapter 4, Section 4.8.

(5) Figure 9.20 shows the minimum guidance signing level appropriate to this category of junction (B/B).

Fig 9.19 **Basic Urban Guidance Signing Sequence – At-Grade Class B Junction – Preferred Signing Level**



NOTES:

(1) Figure 9.20 shows the minimum basic guidance signing level applicable at a junction between two urban Class B routes, whether these are designate as N, R or M numbered routes.

(2) LOCAL DIRECTION and/or TOURIST DIRECTION signs may be added when appropriate. For details of these classes of sign in urban areas refer to Sections 9.4 and 9.5.

(3) The function and application details of urban LOCATION (STREET NAME) signs and ROUTE-MARKER signs are described in full in Volume 1, Chapter 4, in Sections 4.6 and 4.7 respectively.

(4) For dimensional details see Volume 4, Chapter 4.

(5) Figure 9.19 shows the preferred guidance signing level appropriate to this category of junction (B/B).

(6) Figures 9.49 to 9.52 in Section 9.6 illustrate a range of other options for signing Class B junctions.

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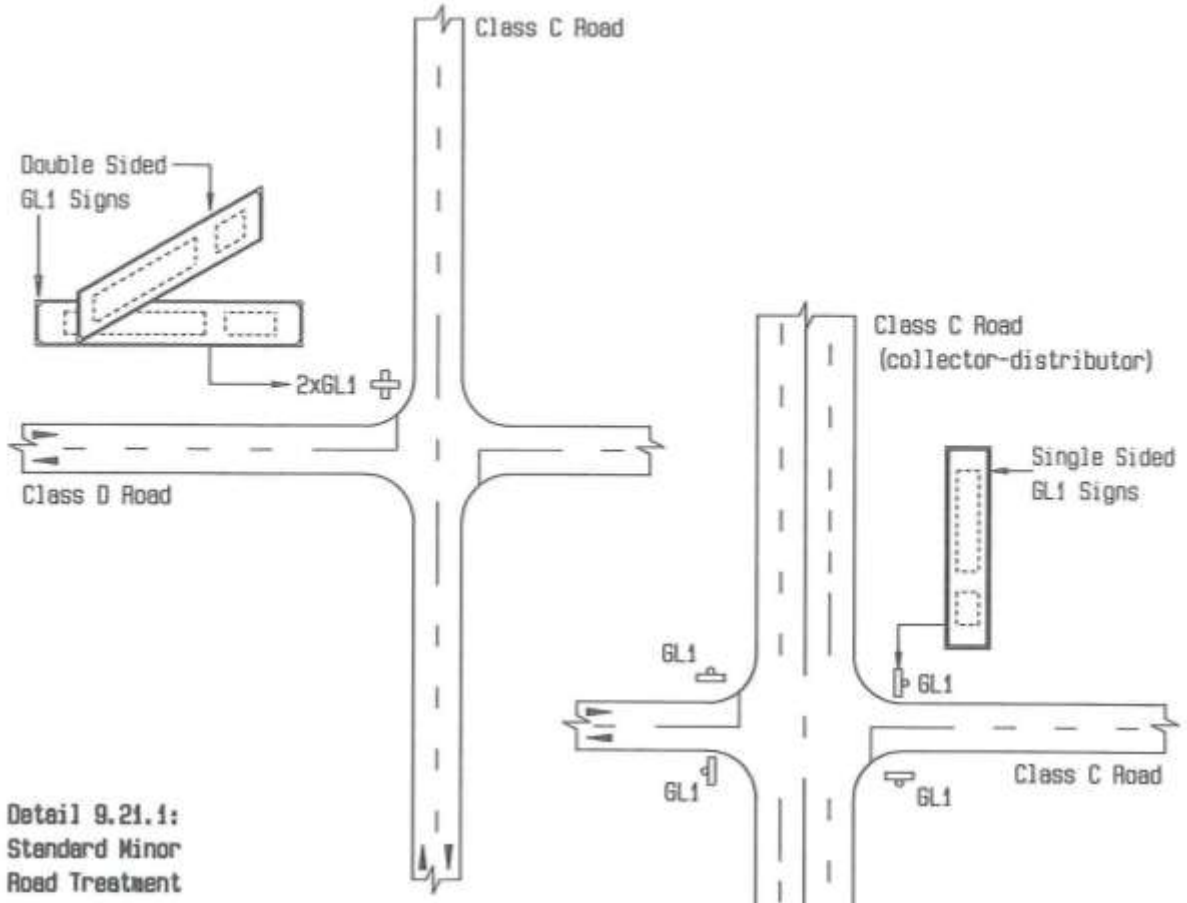
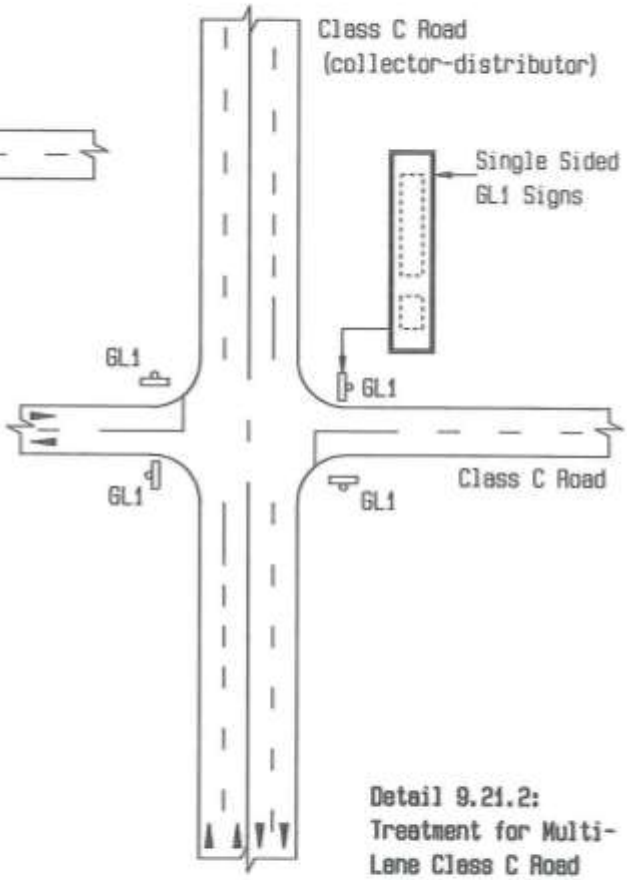
Fig 9.20 Basic Urban Guidance Signing – At-Grade Class B Junction – Minimum Signing Level



Detail 9.21.1:
Standard Minor
Road Treatment



Detail 9.21.2:
Treatment for Multi-
Lane Class C Road

NOTES:

(1) Detail 9.21.1 shows the absolute minimum guidance signing which must be provided at all urban junctions. This comprises two double sided STREET NAME signs GL1, commonly located on a single support. These signs should be located on one of the far side left corners for the priority road.

(2) Detail 9.21.2 shows the preferred STREET NAME signing treatment when one of the intersecting streets has more than two lanes. This signing level requires four single-sided STREET NAME signs, all located on the far side left corners of the junction (for each approach).

(3) Figures 9.53 and 9.54 in Section 9.6 illustrate a range of other options for signing minor urban junctions.

Fig 9.21 **Basic Minimum Urban Guidance Signing - Class C and Class D Junctions**

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9.4 URBAN LOCAL DESTINATION SIGNING

9.4.1 General

1 Figure 9.8 in Section 9.3 describes the information given by guidance signs in diagrammatic form. The illustration develops the information given by the different classes of guidance sign into "Primary", "Secondary" and "Tertiary" layers. Tertiary information is non-orientational and as such can be supplementary to the "Secondary" (orientational) level signs, or it can be used at a lower level in the road network on its own. The "Tertiary" layer of information is provided by both LOCAL DIRECTION signs and TOURISM DIRECTION signs. There are many similarities between the two classes of direction sign. Figure 9.22 shows the relationship between LOCAL and TOURIST DESTINATIONS (for further information on urban TOURISM DIRECTION signs see Section 9.5).

2 The class of LOCAL DIRECTION sign has been provided to supplement the normal direction signing provided in terms of the Navigational Aids policy (see Volume 1, Chapter 8). LOCAL DIRECTION signs are therefore often supplementary to DIRECTION signs. The DIRECTION sign system, which is recommended on all Class "B" routes in urban areas, primarily provides navigational and orientational information. This information is given in the form of route numbers (Class "B" routes are numbered routes), and important destination names. The importance of a destination, in the context of its ability to provide orientation, is recognised by its designation as "familiar"' "control" or "service". "Local destinations" are outside the framework of providing system navigation or orientation, but are considered to generate sufficient traffic interest to warrant the provision of LOCAL DIRECTION signs.

3 The provision of supplementary LOCAL DIRECTION signs on Urban Class "B" routes in addition to DIRECTION signs **must be carried out with care. It is not difficult, in a busy urban street environment, to overload drivers with information to the extent that they are unable to take all the information in.** The ultimate result of such a situation could be confusion leading to an accident, but at the very least the result is a waste of financial resources in providing the ineffective signs (see Subsection 9.4.7). **LOCAL DIRECTION signs shall not be used on freeways.**

4 **An optional application of LOCAL DIRECTION signs may be to use them exclusively on the more important un-numbered or tertiary arterial routes in urban areas instead of DIRECTION signs. If used in this manner they should provide an exit destination for each leg of the junction to which they apply.** Such a practice will ultimately reinforce the road network hierarchy to road users, due to the different signface colour codes (in a similar way in which freeway arterials are identified as higher in the road hierarchy by their blue background colour code). Examples of signs appropriate to this function are given in Volume 1, Chapter 4, Section 4.11 as individual sign types, and in Volume 4, Chapter 13.

5 Since the TOURISM DIRECTION and LOCAL DIRECTION sign sub-classes tend to deal with similar types of non-orientational destinations it can be difficult or confusing trying to allocate a particular type of destination to one or other sub-class. A detailed classification of tourist destination types has been developed and is given in Table 9.2. A more simple classification has been used for local destinations, which is recorded in Table 9.1 (see Subsection 9.4.3). In an urban environment it can be argued that it is probably more important to have uniformity of sign appearance rather than to be concerned about the strictly correct allocation of a destination to a class, particularly when considering low level-of-use destinations. The normal differentiation between classification as a tourist destination or not, ultimately relates to the purpose of travel being for pleasure or recreation.

6 In certain areas it is quite possible that the overall demand for local direction and/or tourism direction signs may be greater than can reasonably be catered for by the provision of individual signs for candidate destinations. Local authorities should approach such potential problem areas in a pro-active manner. A signing plan for local and/or tourism destinations should be prepared as part of the Urban Guidance Signing Plan (see Section 9.3) and Figure 9.16, Steps 10 and 13). Factors such as the following should be taken into account:

(a) an established road user need for a sign;

(b) the availability of access to the destination by the general public (rather than exclusive access to member groups);

(d) proximity of destinations to each other;

(e) traffic safety;

(f) competitive advertising;

(g) any other relevant factor.

Part of a pro-active plan for an area with a potential for an over demand for signs should be the centralisation of information at INFORMATION CENTRES, BUREAUX or LAYBYS (see Section 9.5). **A well organised approach to this level of guidance signing is to be preferred over the permitting of uncontrolled, informal signs to local or tourism destinations by the operators of the facilities at the destinations.**

7 LOCAL DIRECTION signs are very similar in principle to TOURISM DIRECTION signs (see Subsections 9.4.2, 9.4.4 and 9.4.5). Wide use is made of symbols to achieve message transfer to drivers. This is intended to reduce the need for text on signfaces to a minimum, wherever possible. The symbols used on LOCAL DIRECTION signs must be approved, and aesthetically acceptable.

8 LOCAL DIRECTION signs are either STACK-TYPE signs or FINGERBOARD type signs. ADVANCE LOCAL DIRECTION sign GDL1 and LOCAL DIRECTION sign GDL2 are STACK-type signs. They will most commonly be used as single stack signs but multiple stack-type signs may be used when appropriate. ADVANCE LOCAL DIRECTION signs GDL1 shall be located in advance of the turn to which they apply, and, unless this is the final turn towards the destination, they will not normally be followed by a LOCAL DIRECTION sign GDL2. Sign GDL2 is normally used at the final turn towards the destination, which may be the actual access point to a property. When used in addition to DIRECTION

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signs or ROUTE MARKER signs on a Class "B" route, sign GDL1 should be located approximately 2/3 of the distance from the turn that ADVANCE DIRECTION sign GD1 is located (see Figure 9.19). If ADVANCE LOCAL DIRECTION sign GDL1 and LOCAL DIRECTION sign GDL2 are both to be used, as a systematic provision of destination information on urban un-numbered but important traffic carrying routes, they should be positioned as indicated in Figure 9.19 for normal DIRECTION signs. Figures 9.23 to 9.26 illustrate various applications of LOCAL DIRECTION signs.

9 FINGERBOARD signs GDL3 may be used in a similar manner to either sign GDL1 or sign GDL2, but at a lower level in the urban street network, or to lower level of use destinations (see Subsection 9.4.3). If a local authority chooses to use sign GDL3 in significant numbers it is recommended that an assessment of likely destination types be made and a standard length of sign be used. This can result in an attractive and ordered appearance, particularly if many signs are to be provided.

10 If multi-stack LOCAL DIRECTION signs are required a local authority may opt to use COMPOSITE LOCAL DIRECTION signs GDL1/GDL2 (see Detail 9.26.2). This sign type permits the combination of elements of the ADVANCE LOCAL DIRECTION sign GDL1 and the LOCAL DIRECTION sign GDL2.

11 When a local authority uses LOCAL DIRECTION signs in place of DIRECTION signs, as described in paragraph 9.4.1, a street name may be combined with sign GDL2 as illustrated in Figure 9.26 (see Volume 1, Chapter 4, Subsection 4.11.10 and Volume 4, Chapter 13).

12 LOCAL DIRECTION signs may incorporate tourism information in an insert panel and local direction information may be incorporated into DIRECTION signs as an insert panel, or as a complete stack (see Volume 1, Chapter 4, Subsection 4.11.10 and Volume 4, Chapter 13).

9.4.2 Local Direction Signing Principles

1 LOCAL DIRECTION signs, as a sub-class of the guidance sign class, perform a function similar to DIRECTION signs but tend to embody many of the principles developed for TOURISM DIRECTION signs.

2 LOCAL DIRECTION signs provide tertiary level information (see Figure 9.22). As a group they should not be seen as providing a medium to carry an overload of information from the DIRECTION sign system. In a similar sense the information they do provide must be considered in the context of the level of information also provided by DIRECTION and TOURISM DIRECTION signs at specific sites. **It is not good practice to exceed the design criteria for the transfer of information (see Volume 1, Chapter 4, Section 4.4).**

3 For orientational DIRECTION signs to function effectively, it is recommended that a stack should be provided for each exit path from a junction i.e. for a crossroad junction this means a stack for the straight-on direction and one each for the right and left turn directions. **Since local direction signs do not have an orientational function stacks should only be provided for those directions serving warranted local destinations** (however, see paragraph 9.4.1.4). This principle is the same as that used for tourist direction signs.

4 On the approaches to a Class "B" junction, ADVANCE TURN tourism signs GF2 and ADVANCE LOCAL DIRECTION signs GDL1 may be located at two-thirds and one-third of the distance from the junction which would be appropriate for an ADVANCE DIRECTION sign GD1, respectively. Alternatively the two types of sign may be mounted on common supports, one above the other, or they may be designed as a single composite sign, either of which types of sign should be located at "two-thirds GD1" distance from the junction (see Figures 9.23 to 9.26).

5 LOCAL DIRECTION signs GDL2 or FINGERBOARD signs GDL3 should normally only be located at the final turn towards, or at or opposite the point of access, to the local destination (see Figures 9.24 and 9.25).

6 If an urban authority wishes to provide local direction signs for the lower categories of local destination (see Table 9.1), mainly on Class "C" and "D" streets, then a system using only LOCAL FINGERBOARD signs GDL3 may be adopted.

7 It is likely that there will be a demand for both local direction and tourist direction signs at many junctions. **This will add to driver workload when all signs are required, and this aspect must be taken into account in the design (see Volume 1, Chapters 1 and 4).** Therefore, if local AND tourism direction signs are warranted at a junction, signs should preferably be provided in one of the ways indicated in paragraphs 9.4.2.4 and 9.4.2.5, namely:

(a) by combining the two signs on common supports so that the total sign message of the tourist and local destination signs is within the limits stated for a single sign; OR

(b) by designing a composite sign with the tourism message displayed as an "insert" panel on the ADVANCE LOCAL DIRECTION sign GDL1; PROVIDED that if the GD1 sign is not already in place, the position allocated for it from the junction should be increased by 50% if at all possible, and the distances of the supplementary sign be increased accordingly (see Figure 9.23).

8 If local destinations require to be signed in more than one direction the resultant sign should conform to normal stack-type sign rules SUBJECT to any other provisions given below. This rule applies whether the sign concerned is a local sign, a tourism direction sign or a sign combining both destination types.

9 If a numbered route carrying high volumes of traffic generated by local destinations intersects another numbered route which leads to several local destinations an attempt must be made to find group descriptions for the destinations to reduce the display demand. This may take the form of symbols plus SINGLE identifying names. (NOTE: the most likely solution to this problem should be the display of the appropriate collective name as a destination on the normal direction sign system, since, by virtue of its importance or familiarity it is likely to have orientational value - such a name may commonly be the name of the suburb in which all the local destinations are located.)

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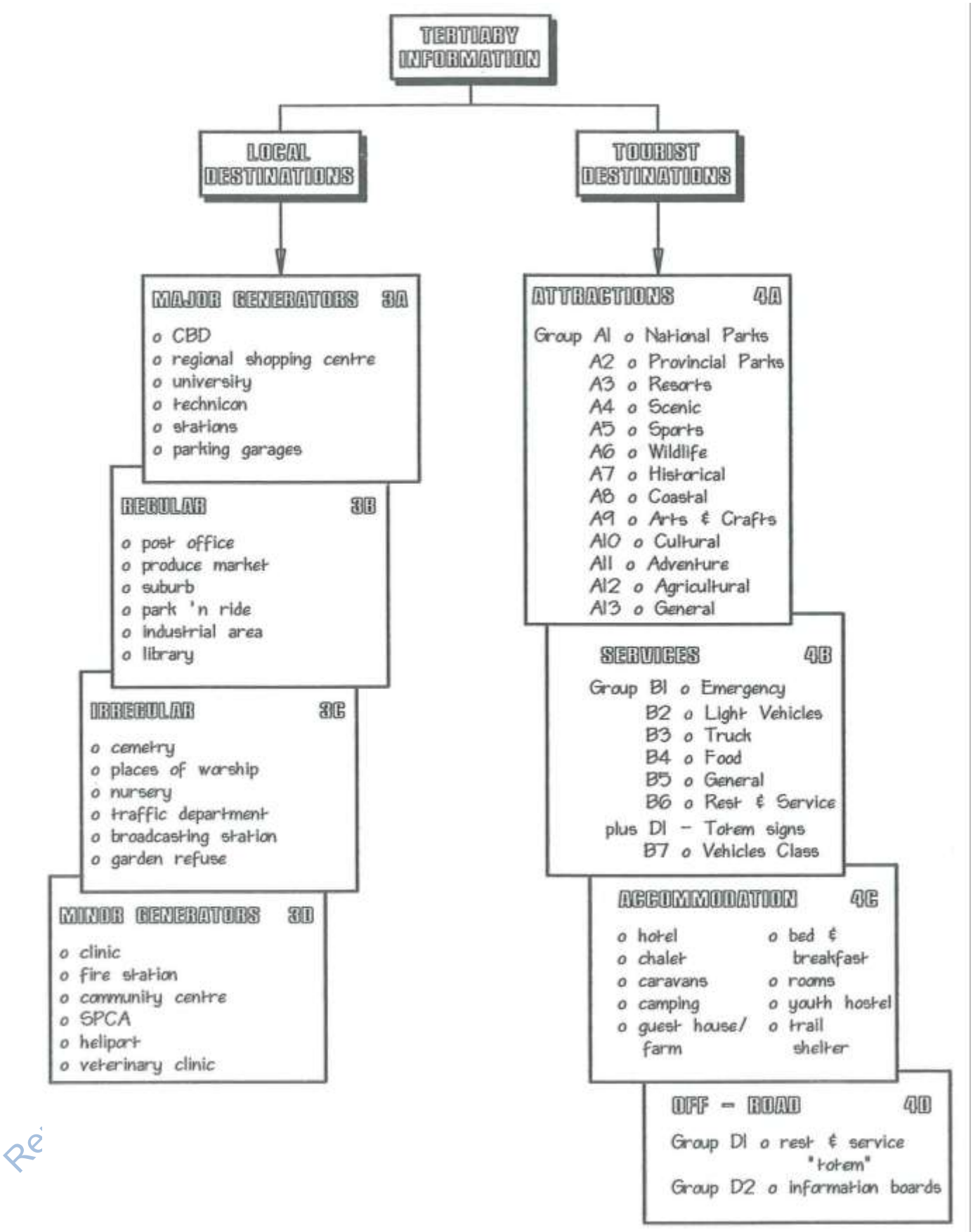

Fig 9.22 **Tertiary Level Guidance Information**

10 Once a local destination has been signed the principle of message continuity shall be applied so that it is signed through subsequent changes of direction until the destination is reached (NOTE: for this reason straight-on local direction stacks are not normally recommended.)

11 A LOCAL DIRECTION sign, as with any other road sign, shall be legible. However, the principle used in the tourism signing system of using one letter size smaller than used on the normal DIRECTION signs should be considered for LOCAL DIRECTION signs if the amount of information displayed is limited. For urban applications this rule should be subject to a normal minimum letter size of 175 mm /125 mm. A letter size less than 140 mm / 100 mm shall not be used.

12 **A limit of 8 "bits" of information should be applied to any combined local/tourism direction sign. If separate signs are used each should be limited to 6 "bits" of information (NOTE: This provision will, particularly in combination with normal direction signs, potentially allow very high levels of information to be displayed. Such high levels of information should not be permitted if all other relevant design factors are not of the highest order i.e. if sub-standard letter sizes are being used - see Volume 1, Chapter 4).**

13 **Subject to the limitation on the number of "bits" of information given above, the maximum number of destination names which may be displayed on any local direction sign or combined local/tourist direction sign shall be four names.**

14 Correctly colour coded route trailblazer panels may be incorporated in the form of "insert" panels, subject to other rule requirements. Such route trailblazer information could be appropriate for drivers wishing to move upwards in the street hierarchy from the local level. It should be noted that if a TRAILBLAZER sign in the GE series is required at a junction it is normally located in the same position as that recommended above for LOCAL DIRECTION signs.

15 If more than one destination name is to be provided on a local direction sign stack, it is recommended that, where possible, the order of appearance of the destination names should such that the name requiring a driver response first be placed above any name in the stack requiring a later response i.e. if one destination is reached before another it should be above the other, OR if a turn comes up first which leads to one destination, that destination should appear above the other.

16 **The LOCAL DIRECTION signing system should not be seen as an overflow system for the primary and secondary systems.**

9.4.3 Classification of Local Destinations

1 The scope for a destination to qualify for inclusion on a LOCAL DIRECTION sign is vast. Subsections 9.4.7 and 9.4.8 deal with warrants for local destinations.

2 Local destination types, which have been identified to date, have been classified into four groups based largely on the level of traffic which the destination generates, or may be likely to generate in the future. A selection of these destination types is illustrated in "layers" 3A to 3D in Figure 9.22. A more complete list is given in Table 9.1 but it is likely that local authorities will need to consider additional types of destination for classification from time-to-time. T**he level of traffic generation used to classify local destinations is not precise.** This is because in one local authority area a specific destination type may generate far more traffic than the same type of destination in another local authority area. The boundaries between the different classes need not therefore be considered to be rigid. The classes of local destination are described as follows:

(a) major traffic generator - major use - traffic has significant daily peaks and continues all day long;

(b) major traffic generator - regular use - traffic does not peak significantly but there is all day use for five or six days of the week;

(c) minor traffic generators - irregular use - traffic may be quite high on one or two days of the week but at a much lower level on other days;

(d) minor traffic generators - minor use - low traffic levels but still reflecting a public demand.

3 It should be noted that although transport terminal destinations such as railway station, airport, bus station, harbour and heliport, and CBD's, industrial areas and power stations are listed as local destination types at a local level, they may also appear on primary (Class "A" routes) and secondary (Class "B" routes) DIRECTION signs, if they are large generators of traffic.

9.4.4 Signface Design Principles

1 The general principles relating to guidance signface design and layout are covered in Volume 1, Chapters 1 and 4.

2 The signface design principles for LOCAL DIRECTION signs are essentially the same as those developed for TOURISM DIRECTION signs. LOCAL DIRECTION signs are likely to be generally simpler in layout than TOURISM DIRECTION signs due to the lesser need to display multiple symbols (tourist services) and the relatively rare likelihood of more than one local destination in one direction. LOCAL DIRECTION signs **do not** have the cut-back vertical side used on TOURISM DIRECTION signs and are therefore rectangular. The use of these standards means that the internal spaces are 20% to 30% less than on DIRECTION signs which is considered acceptable in terms of the supplementary role of LOCAL DIRECTION signs.

3 The use of DIN 1451 Style "B" lettering is recommended. Consideration may be given to the use of DIN 1451 Style "A" lettering in low speed urban environments.

4 **LOCAL DIRECTION signface design places a high reliance on bold SYMBOLS to transfer the main part of the message to road users. When the PRIMARY name of a destination is also used it is used to qualify the reference of the symbol.** The vertical signface dimensioning is related to these symbols rather than the text. The height of each symbol is capable of supporting two lines of text without increasing the vertical height of a sign or

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TABLE 9.1 LOCAL DESTINATION CLASSIFICATION TABLE 9.1

Grouping According to Traffic Generation

Group 3A	Group 3B	Group 3C	Group 3D
MAJOR GENERATORS		MINOR GENERATORS	
MAJOR USE	REGULAR USE	IRREGULAR USE	MINOR USE
Central Business Area (1)(2)	Information Layby	Cemetery	Clinic
Regional Shopping Centre (3)	Post Office	Garden Refuse	Fire Station
Railway Station (1)	Automatic Teller	Places of Worship	Community Centre
Airport (1)	Industrial Area	Sports Club	Heliport
Bus Station (1)	Park 'n Ride	Traffic Department	Bicycle Route (4)
Harbour (1)	Waste Disposal Site	Electricity Department	SPCA/AACL
Mine	Produce Market	Testing Grounds	
Parking Garage	Conference Facilities		
Modal Transfer Station	Educational Establishment		
	Swimming Pool		
	Civic Centre		
	Licencing Offices		

NOTES:

(1) These destination Types may also be used within the primary and secondary direction signing systems.

(2) Central Business Area can also be signed in smaller towns at a lower level of warrant.

(3) Shopping centres (or business areas) may be signed in smaller towns at a lower level of warrant.

(4) A bicycle route should be signed within the route using BICYCLE ROUTE MARKER signs GE17 – see Volume 1.

GENERAL NOTES:

(1) The signing of all local destination types is subject to warrants (see Subsections 9.4.7 and 9.4.8)

sign stack. Two techniques are therefore recommended to further contain LOCAL DIRECTION sign sizes when text is involved. These techniques are:

(a) if the PRIMARY name is a two or more part name-

e.g. "Durban Deep" (mine)

then the name could be placed in two lines in a right-justified form -

e.g.

Durban
Deep

(b) if the PRIMARY name is long and can be satisfactorily hyphenated without risk of loss of meaning or readability then the primary name should be hyphenated and placed in two lines in a right justified form -

e.g. **Mwananya-** **mala** or **Chaman-** **culo**

When, for ease of the arrangement of words, the lower line of text becomes longer than the top line, then the text should be left justified. Two or more lines of text referring to two or more destinations of a common type (i.e. two schools) should be left justified.

5 LOCAL DIRECTION signs also **do not** use the multiple-panel layout of TOURISM DIRECTION signs. If one stack of a multiple-stack sign needs to display two local destinations they should appear in one stack, with the closer one above the further away one. If the two destinations are of the same type only one symbol need be displayed. If the two destinations are of different types then both relevant symbols should be displayed.

6 Since LOCAL DIRECTION signs are commonly used in supplement to DIRECTION signs on which route numbers are displayed, **route numbers shall not be displayed on LOCAL DIRECTION signs even if they are provided on a numbered route.**

7 The fact that route numbers are not used on LOCAL DIRECTION signs, together with the normal use of a symbol preceding the text, means that vertical justification between adjacent stacks is not normally worth providing. However, an improved aesthetic effect will result when two symbols are

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required in one stack, if the symbols are centred over one another, and the following primary names are also left justified.

8 If a destination is located same distance beyond the final turn towards it, a distance may be included on the GDL2 or GDL3 sign. This treatment is not likely to be common in urban areas but can occur fairly frequently in "peri-urban" areas. The distance, given to the nearest 100 m, should be located below the destination name and right justified on it. The distance numerals should be followed by the letters "m" or "km" as appropriate.

9 When the local destination is at the end of the road and it is the only public destination, such a destination may be included in the stack of a DIRECTION sign, provided for the junction in question, within a white "insert panel" (see Volume 1, Chapter 4, Subsection 4.11.10).

10 The various signface design principles described in this section are specifically dimensioned for LOCAL DIRECTION signs in Volume 4, Chapter 13.

9.4.5 Symbols

1 The PRIMARY name of the local destination shall be preceded by an appropriate symbol when one is available. Only one symbol shall be used with one PRIMARY name.

2 If, for whatever reason, the use of a primary name is not considered necessary, a symbol may be used on its own in a LOCAL DIRECTION sign. Such a display may also include a distance in accordance with paragraph 9.4.4.8. This type of symbol-only LOCAL DIRECTION sign may be used as a "follow-up" sign for one or two turns after the first turn towards the destination, provided the same symbol appeared with the destination name as a GDL1 sign at the first turn.

3 LOCAL DIRECTION symbols are sized according to the same dimensional criteria as TOURISM DIRECTION symbols with a nominal design height and width of 15"d" where "d" is the letter stroke width used on the sign (and the letter height is 7"d"). LOCAL DIRECTION symbols may include symbols used on tourism signs, and those used on direction signs provided they are correctly sized.

4 If a symbol should need to be used with three PRIMARY names of three destinations, of the same type in the same direction, then the symbol size should be increased by one standard increment in the value of "d" i.e. from 20 mm to 25 mm, or 30 mm to 40 mm.

9.4.6 Shape, Size and Colours

1 LOCAL DIRECTION signs shall be rectangular in shape, with the exception of the FINGERBOARD type sign which shall have one side shaped to a point. All signs shall be provided with a border of a colour which contrasts with the sign background colour. PERMANENT direction signs have a horizontal format. TEMPORARY local direction signs used within construction sites should, where possible, minimise the horizontal dimension to reduce side space requirements.

2 The size of LOCAL DIRECTION signs is dependent on the symbol and destination messages to be displayed and the choice of letter size to be used (see Volume 1, Chapter 4, Section 4.3).

3 PERMANENT local direction signs shall have a white background colour with black legend and arrows and **blue border**. TEMPORARY local direction signs shall have a yellow background with all other signface details in black.

4 Special colour variations are permitted. A brown "insert" panel may be provided to display a tourist destination or in blue to include a freeway trailblazer message.

9.4.7 Warrants - General

1 Since LOCAL DIRECTION signs are supplementary to primary and secondary level direction signs, **the most important warrant to be satisfied in any specific urban guidance signing situation, involving the possible provision of LOCAL DIRECTION signs, is the ability of drivers to take in the proposed additional information in terms of their driving environment and workload. Therefore, if DIRECTION signs, and/or existing LOCAL or TOURIST DIRECTION signs, contain information in excess of the limits given in Volume 1, Chapter 4, Section 4.4, additional LOCAL DIRECTION signs shall not be provided.**

2 **As with supplementary tourism signs it is a basic hypothesis that, with the aid of map, brochures, verbal directions etc. the existing hierarchy of numbered routes, orientational destinations given on DIRECTION signs, and an adequate system of street name signs, drivers should be able to reach a point in relatively close proximity to their intended urban local destination, before supplementary local direction signs may be considered necessary.**

3 From this hypothesis the provision of LOCAL DIRECTION signs in urban areas should, **irrespective of any individual warrants applicable to the type of local destination,** conform to the following principles:

(a) **LOCAL DIRECTION signs are not warranted when the location of the destination concerned is obvious to road users,** PROVIDED that even if the location of the destination is obvious, if the access to it is not obvious, an appropriate LOCAL DIRECTION sign may be used to identify the point of access;

(b) **the provision of LOCAL DIRECTION signs should not commence further from the destination than the nearest numbered route;**

(c) the facilities available at the local destination must be of a **standard which is acceptable** to a reasonable road user;

(d) when a number of local destinations can be reached in one direction, from a particular junction, an attempt must be made to determine some **single collective name** which will adequately guide road users in the correct direction e.g. a suburb name may be more appropriate than the names of four or five local destinations within, or close to, such a suburb;

(e) in extreme cases where many local destinations (and indeed tourist destinations as well) occur, consideration must be given to providing a suitable **information layby or bureau** with enough local detailed information to simplify the local navigation process; the need for such a facility is

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likely to have arisen from requests for signs from the relevant community or communities; in such a case a special effort will have to be made regarding the funding of the layby or bureau and its facilities, which in all probability will require direct involvement of the community.

4 When considering the application of warrants for local destinations it is very likely that the apparent need for a LOCAL DIRECTION sign will result either from a public need noted by the relevant urban authority based on observed problems or complaints received, OR from applications received from owners or operators of the local facility, who seek to ensure that the public can find their facility. **A very important reason for urban authorities to approach the provision of tertiary level supplementary direction signs with care is the question of precedence. Once one type of destination has been signed, it becomes very difficult to deny further applications to sign similar facilities particularly if the warrant or motivation for the original sign is in any way suspect.** Whilst it is necessary to approach the provision of guidance signs based on an application from a party representing a specific destination, in the fairest and most unbiased way, since there are very definite limits to the accumulation of road-side information which drivers can be expected to take in, **setting a precedent should be done with the full knowledge of its future implications.** Wherever possible any application for local direction signs should be assessed in terms of the real or perceived need for road users to find the facility concerned **and should not be seen simply as a means to promote competitive or commercial interests. It is not a requirement of road traffic signs that they should perform such functions.**

5 Detailed warrants relating to the provision of LOCAL DIRECTION signs in urban areas are given in Subsection 9.4.8. In deriving the warrants, the general provisions described in paragraph 9.4.3.2 relating to traffic generation characteristics have been used as a starting point. The following factors have been considered the most significant in developing further warrant criteria:

(a) traffic generation or attraction;

(b) frequency of use i.e. regularly or irregularly;

(c) the number and quality of facilities or destinations with due regard to the function and likely users of the facility;

(d) the distance from which the local destination may be considered for signing.

6 In order to qualify for the provision of LOCAL DIRECTION signs from the nearest numbered route a local destination must be classified in either Group 3A or Group 3B.

7 Local destinations in Groups 3C or 3D should normally only be signed at a local level on Class "C" or Class "D" roads and normally within a local traffic area. An authority may use discretion to upgrade a specific local destination classified in Groups 3C or 3D if it generates traffic commensurate with the requirements of Group 3A or 3B so that it may be signed from the nearest numbered route.

8 Authorities may also exercise discretion, particularly in upgrading the distance from which a local destination may be signed, including the possibility of signing from one numbered route to another. The following conditions should be considered relevant:

(a) if it can be demonstrated that a significant percentage of those travelling to a local destination travel from outside the region within which the destination is located the following factors may warrant discretionary relaxation of the distance at which the first sign may be located:

(i) the number of users from outside the region are at least 25% to 33% of all users, AND

(ii) the region can be considered to have a "catchment" of 5 km radius for towns or metropolitan areas with populations of less than 100 000 and of 10 km radius for towns or metropolitan areas with populations of 100 000 or more;

NOTE: the onus to satisfy the relevant road authority with regard to the above requirements should rest with an applicant;

(b) if there are several possible approach routes to the facility and the urban authority wishes to:

(i) influence the route used by drivers for whatever reason, or

(ii) avoid wasteful travel due to the possibility of incorrect choice of route, then discretion may be exercised;

(c) if the facility is located on a route (numbered), or street, close to and parallel to another numbered route, then discretion may be used when locating signs;

(d) if the road for which a sign is being considered is a by-pass.

9 If an urban authority decides to use discretion with regard to the norms governing sign positioning, the reasons for this action should be recorded to assist in resolving similar cases in the future, and to maintain consistent and defendable policies.

9.4.8 Warrants for Specific Urban Local Destination Types

1 The classification of local destination types into four groups, as described in Subsection 9.4.3 and as listed in Table 9.1, has been carried out to assist in developing a structured approach to the provision of warrants for signing local destinations. The warrants given in the following paragraphs are subject to review once they have been in the use for sufficient time to access their effectiveness. The warrants developed for destination types in groups 3A and 3B are more rigorous, and more difficult to comply with, than those for group 3C and 3D type destinations.

2 The warrants given below are provided in an attempt to assist urban authorities approach local destination signing in urban areas in a consistent and structured manner. Some urban authorities may well feel that they have to adopt a more relaxed or stringent warrant than that stated, due to their specific circumstances. There is no reason why different authorities may not adopt different warrants, but it will help if they are related to those developed in this Chapter. It is important, therefore, that reasons for varying warrants are recorded for input to future reviews, and for the development training of new staff dealing with the provision of urban guidance signs. As has

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been indicated in Figure 9.16, the provision of LOCAL DESTINATION signs can be planned on a pro-active basis as part of the Urban Guidance Signing Plan (see Steps 10 and 13 in Figure 9.16). Applications for LOCAL DESTINATION signs will also be received from road users and those operating from local destinations. In the event of a dispute over the provision (or not) of LOCAL DIRECTION signs, it is important that applicants be made aware of the environmental and road safety aspects of an over-supply of information. Any dispute should be processed on the basis of consultation with the role-player representatives identified during the development of the Urban Guidance Signing Plan.

3 Subject to all other provisions mentioned above the warrants for the provision of local direction signs for Group 3A facilities are as follows:

(a) regional shopping centre:

(i) may be signed when the factor –
"gross leasable shopping area (m^2)/distance (km) from the nearest numbered route by the shortest practical route agreed to by all involved authorities " ≥ 40 000 subject to a minimum glsa of 40 000; AND

(ii) there are at least 1 000 surfaced and marked parking bays;

(b) university, technicon, educational college:

(i) may be signed when the factor -
"on-site daily student population/distance (km) from the nearest numbered route ≥ 5 000 subject to a minimum factor of 5000;

NOTE: separate campuses of one educational institution shall be assessed separately.

(c) central business area (particularly for towns with a population of 100 000 or less):

(i) may be signed from the nearest numbered route irrespective of distance;

(d) airport, railway station, bus station, harbour, or modal transfer facility:

(i) the destination name may be included on primary and/or secondary direction signs as an orientational destination when the transport terminal is of national or provincial significance - follow-up signing should remain part of the secondary direction sign system or utilise ADVANCE TRANSPORT TRAILBLAZER signs GE9;

(ii) the destination name may be signed on local direction signs from the nearest numbered route irrespective of distance when the transport terminal is of regional significance, PROVIDED the terminal caters for 3 000 or more passengers per day;

(iii) the destination may be signed by a maximum of three local direction signs located up to 1km from the facility or on the nearest numbered route, whichever is the shorter distance, when the transport terminal is of local significance, PROVIDED the terminal caters for 500 or more passengers per day and/or large quantities of freight;

(e) mine within an urban area (operational):

(i) may be signed from the nearest numbered route irrespective of distance PROVIDED the mine "community" comprises 20 000 or more people;

(f) parking garage or surface parking lot:

(i) may be signed from the nearest numbered route irrespective of distance, PROVIDED parking is normally available for most of the day on a casual basis and the garage or parking lot has at least 100 bays - in a major urban area a comprehensive signing system may be required to indicate parking availability - local direction signs may be an integral part of such a system.

NOTE: distance parameters given in this paragraph apply between the point at which a sign is being considered and the point of access to the facility.

4 The local destinations listed in Group 3B may be signed from the nearest numbered route, provided this falls within the distance parameter indicated for each type of facility below. If a distance warrant permits signing from a specific distance, and a numbered route does lie within that distance, the warrant does not extend to signing from one numbered route to another up to the distance indicated in the warrant. Subject to all other provisions mentioned in this subsection the warrants for the provision of local direction signs for Group 3B facilities are as follows:

(a) conference facility, research organisation:

(i) may be signed when the facility has auditorium or lecture space for at least 500 delegates, AND

(ii) there are on-site parking spaces for all delegates;

NOTE: if conference facilities are part of the facilities offered by some other type of identified local destination such as a research organisation then only one local direction sign may be provided at the warranted distance - local direction signs may, however, subsequently be used for individual facilities, within a campus area, even if this includes public streets.

(b) suburb:

(i) may be signed at the most significant access points (normally indicated by classified collector-distributor streets) when the suburb has 100 or more erven;

(c) industrial area:

(i) may be signed at the most significant access points and from a distance of up to 2 km from such access point when the area is known to cater for traffic from outside the region;

(d) produce market, abattoir, power station:

(i) may be signed, when the facility is of regional or greater significance, from a distance of up to 2 km;

(e) waste disposal site:

(i) may be signed, when the facility is of regional or greater significance, from a distance of up to 5 km, OR

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(ii) if the facility caters for members of the public from a distance of up to 10 km or the nearest numbered route whichever is the closest;

(f) park 'n ride:

(i) may be signed from a distance of up to 1 km, PROVIDED there are more than 20 parking bays and that there are bays available on a regular basis;

(g) school:

(i) may be signed from the nearest collector-distributor street by a maximum of three local direction signs, PROVIDED that if the school has over 500 pupils, and hosts visitors from outside the immediate community, on a regular basis, such signs may commence from the nearest numbered route;

(h) library:

(i) may be signed from the nearest numbered route by a maximum of three local direction signs, subject to a maximum distance of 1 km - if a numbered route does not fall within such a range the facility should be signed, if required, from the nearest collector-distributor street;

(i) post office:

(i) may be signed by a maximum of three local direction signs subject to a maximum distance of 1 km, PROVIDED the post office offers a 24-hour telephone service;

(j) layby (industrial or general information ie. not tourist):

(i) may be signed from the nearest numbered route subject to a maximum distance of 1 km;

(k) automatic teller:

(i) may be signed in a central business area subject to a maximum distance of 500 m to 1 km, PROVIDED it is the only facility of its type in the area and a 24-hour service is available.

5 The main difference between Group 3C destination types and Group 3B destination types is the manner in which they are used. Any facility which is deemed to have a level of use which is more in line with the regular use prescribed for Group 3B destinations, may be considered for signing in terms of the most appropriate destination type in Group 3B i.e. places of worship may well have a level of activity similar to a medium sized school (approximately 500 pupils). Otherwise all the destination types in Group 3C may be signed by a maximum of three local direction signs so that the furthest sign is no more than 1 km from the facility, or is on the nearest collector-distributor street, whichever is the nearer, PROVIDED the facility has adequate on-site or adjacent parking for the local congregation who attend an "event" at the facility.

NOTE: an "event" may include a funeral, a church service, a sports meeting, a concert or similar activity.

6 Group 3D destinations may be signed by a maximum of two local direction signs so that the furthest sign is no more than 500 m from the facility, or is on the nearest collector-distributor street, whichever is the nearer, PROVIDED the facility has adequate on-site or adjacent parking, where appropriate, and that visitors do not cause any annoyance or hardship to neighbouring residents.

7 Several of the local destination types listed may cover a large area and may, in themselves, include "sub"-facilities which may warrant signing. Such facilities should only be signed within the immediate environs of the original destination. Such signs may even include a mixture of local destination signs and tourist destination signs. For example, a working harbour may well have internal destinations which can be considered for local direction signing, and others which warrant tourist signs.

8 One-off events, or very irregular events, which do not warrant the provision of permanent local direction signs, may be signed using temporary LOCAL FINGERBOARD sign TGDL3. An urban authority may erect these temporary signs for the duration of the event, or they may authorise a suitable service organisation, such as the Automobile Association, to act on their behalf. The warrant for the provision of sign TGDL3 should be similar to that applicable to the most comparable type of local destination, without the application of any long-term criteria.

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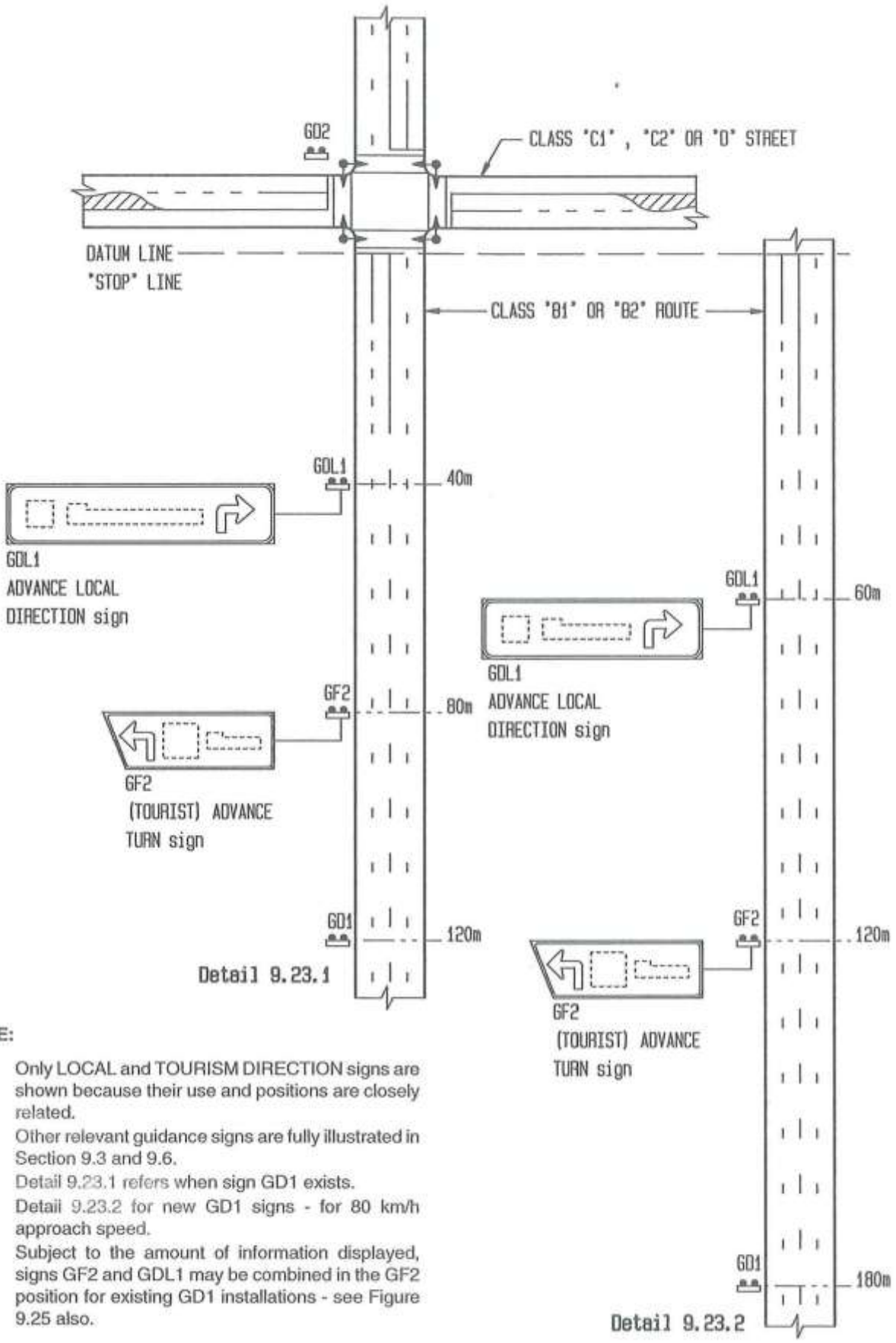


NOTE:

(1) Only LOCAL and TOURISM DIRECTION signs are shown because their use and positions are closely related.

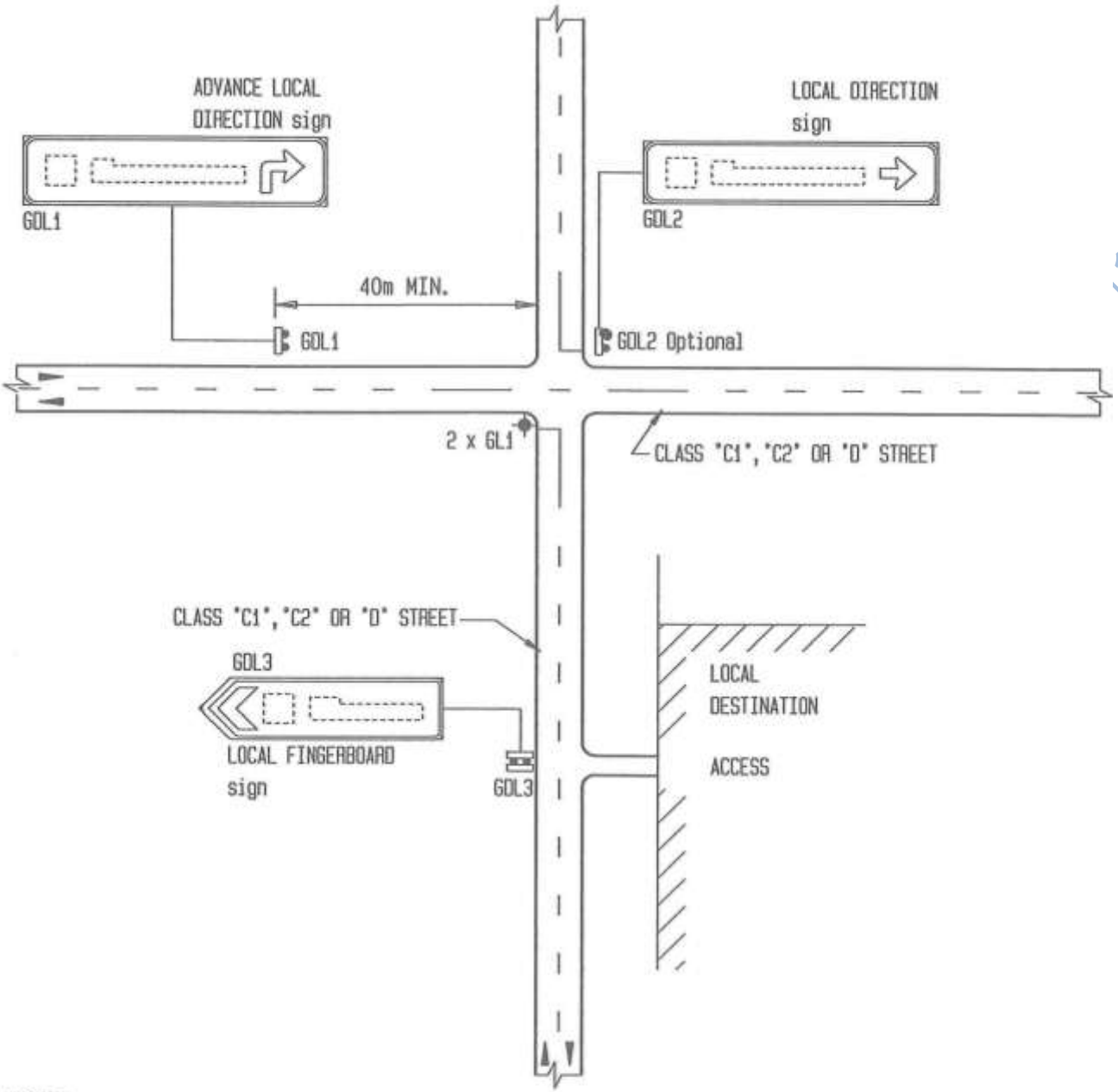
(2) Other relevant guidance signs are fully illustrated in Section 9.3 and 9.6.

(3) Detail 9.23.1 refers when sign GD1 exists.

(4) Detail 9.23.2 for new GD1 signs - for 80 km/h approach speed.

(5) Subject to the amount of information displayed, signs GF2 and GDL1 may be combined in the GF2 position for existing GD1 installations - see Figure 9.25 also.

Fig 9.23 Supplementary Local Direction Signing – Class "B" Route



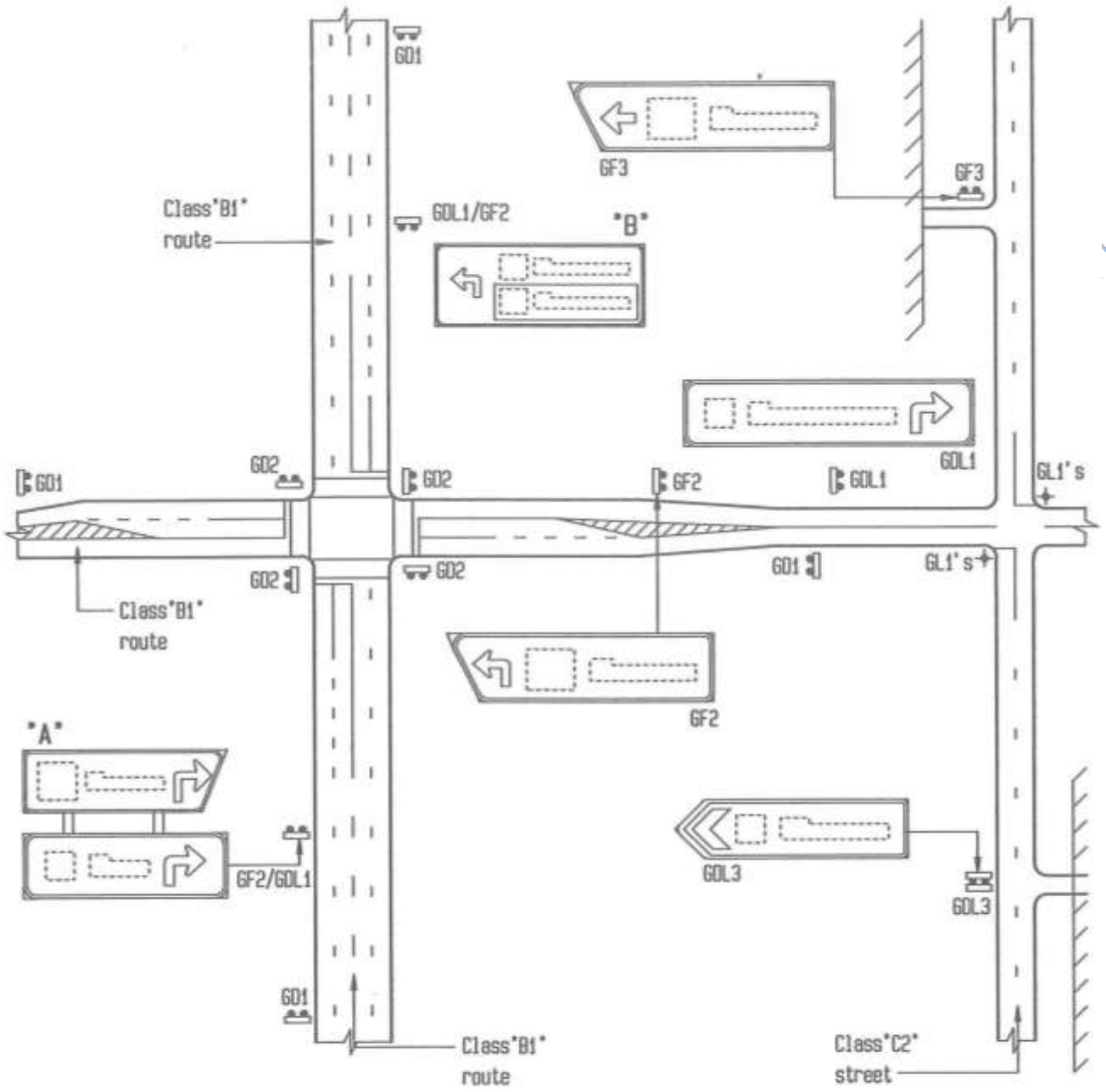
NOTE:

(1) The LOCAL DIRECTION signs shown can be follow-up signs to the signs in Figure 9.23 or they may be the only signs used from a lower class of street (where DIRECTION signs are not warranted).

(2) Arrangement may also be used from Class "B" routes using ROUTE MARKER signs.

(3) The two GDL3 signs shown at the access allow for both directions of approach - this is optional.

Fig 9.24 Local Direction Signing – NO Standard Direction Signs



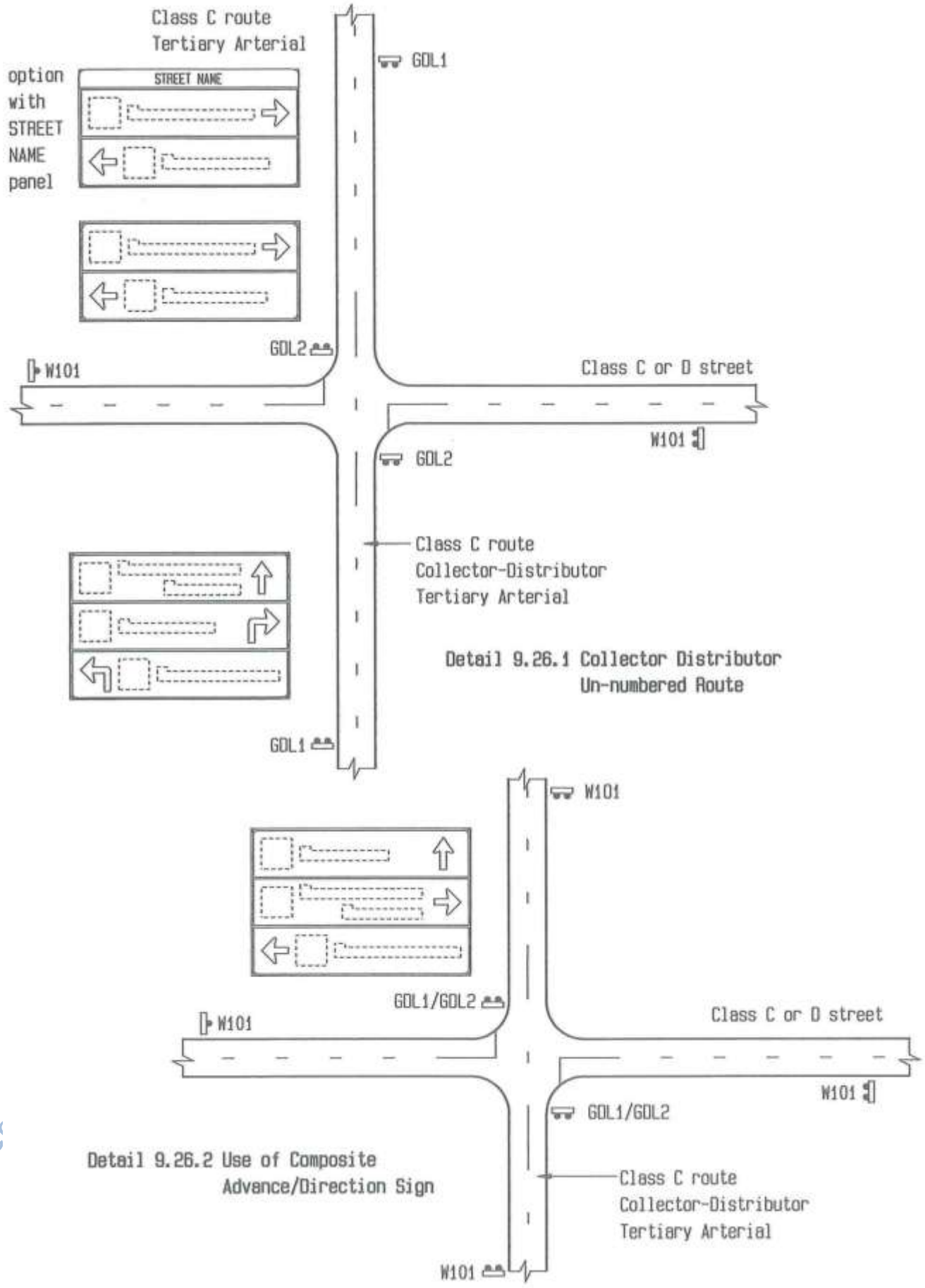
NOTE:

(1) Only LOCAL DIRECTION signs are shown because their use and positions are closely related.

(2) Other relevant guidance signs are fully illustrated in Sections 9.3 and 9.6.

(3) Subject to the amount of information displayed, signs GF2 and GDL1 may be combined in the GF2 position for existing GD1 installations. The signs may be combined on a single signface at "B".

Fig 9.25 Local/Tourist Direction Sign Combinations



Detail 9.26.1 Collector Distributor Un-numbered Route

Detail 9.26.2 Use of Composite Advance/Direction Sign

Fig 9.26 **Local Direction Signing – Tertiary Arterial**

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9.5 URBAN TOURIST DESTINATION SIGNING

9.5.1 General

1 This section is provided to complement the material given in Section 9.4 on the similar supplementary local destination signing with which tourist destination signs in urban areas will commonly have to be co-ordinated. In an urban environment the functional differences between the types of destination classified as Atourist@ and Alocal@ may be quite difficult to determine. In general terms an urban road authority can follow the classifications given in this chapter and is not likely to encounter much opposition from facility operators (regarding classification!). However, if an urban road authority wishes to exercise discretionary powers there is no strong reason why this cannot be done. For example, warrants are given in Subsections 9.5.10 and 9.5.11 which cannot be considered as obligatory. If an urban authority considers that there is good reason for applying a different, but similarly derived warrant, there is no reason why it should not do so. It is recommended that in such instances the authority record the warrant used, and the reasons why it is different. It is also recommended that authorities consult with adjacent authorities in this regard so that similar standards are ultimately applied in similar or adjacent areas.

2 It is a particular feature of tourism signing that the demand for signs is driven by tourist Adestination@ owners or operators. This makes the role of the urban road authorities particularly onerous, because demand is always likely to exceed the ability to satisfy it, whether due to adherence to warrants, information display constraints, spatial constraints, or cost constraints. **A fundamental principle relating to the provision of tourism signs is that their function is to assist motorists reach their destination, and they should not be seen as advertising signs** (see Section 9.7).

3 In a general sense the approach taken in this chapter in differentiating between local and tourist destination types involves the following principles:

(a) local destinations tend to attract or generate traffic from within the urban community, although there will always be Atourists@ who seek these destinations as well;

(b) local destinations tend to occur as individual entities;

(c) tourist destinations, by virtue of their tourist attraction or service, tend to have a grouped attraction within a particular environment - to the extent that the concept of high density tourist areas has developed;

(d) tourist destinations tend to attract strangers or visitors from outside the urban community in which they occur.

4 Figure 9.8 in Section 9.3 describes the information given by guidance signs in a diagrammatic form. The illustration develops the information given by the different classes of guidance sign into APrimary@, ASecondary@ and ATertiary@ layers. Tertiary information is non-orientational and as such can be supplementary to the ASecondary@ (orientational) level signs, or it can be used at a lower level in the road network without other types of guidance sign. Figure 9.22 in Section 9.4 shows the relationship between TOURIST and LOCAL DESTINATIONS (for further information on LOCAL DIRECTION signs see Section 9.4).

5 The provision of supplementary TOURIST DIRECTION signs on urban Class AB@ routes in addition to DIRECTION signs must be carried out with care. It is not difficult, in a busy urban street environment, to overload drivers with information to the extent that they are unable to take all the information in. The ultimate result of such a situation could be confusion leading to an accident, but at the very least the result is a waste of financial resources in providing ineffective signs.

6 In certain areas it is quite possible that the overall demand for TOURIST DIRECTION and/or LOCAL DIRECTION signs may be greater than can reasonably be catered for by the provision of individual signs for candidate destinations. Local authorities should approach such potential problem areas in a pro-active manner. A signing plan for tourist and local destinations should be prepared as part of the Urban Guidance Signing Plan (see Section 9.3 and Figure 9.16, Steps 10 and 13). Factors such as the following should be taken into account:

(a) an established road-user need for a sign;

(b) the availability of access to the destination by the general public (rather than exclusive access to member groups);

(c) proximity of destinations to each other;

(d) traffic safety;

(e) competitive advertising;

(f) any other relevant factor.

Part of a pro-active plan for an area, with a potential for an over demand for signs, should be the centralisation of information at INFORMATION CENTRES, BUREAUX or LAYBYES. A well organised approach to this level of guidance signing is to be preferred over the permitting of uncontrolled, informal signs to tourism or local destinations by the operators of the facilities at the destinations.

7 Chapter 4: *Tourism Signing* deals in depth with all aspects of tourism signing including all facets of tourism signface design and tourism symbols. Chapter 4 has developed largely from the need to provide tourism signing in rural environments. However, the majority of the coverage of Chapter 4 is also relevant to urban, metropolitan and particularly peri-urban environments. Material given in Chapter 4 will not generally be repeated in this chapter. **Readers are therefore recommended to familiarise themselves with Chapter 4 if tourism signing is of specific interest to them.**

8 Chapter 4 also introduces the concept of Ahigh density tourism areas@. Such areas are particularly likely to develop in peri-urban environments. The signing of high density tourism areas is therefore covered in some detail from the urban perspective in Subsection 9.5.8.

9 A specific aspect of tourism signing which has proven to be a problem in the past, and which results from inadequate co-operation between road authorities with abutting areas of responsibility, is that of Afollow-up@ signing. The problem has traditionally resulted from one road authority providing signs on its road network, for a facility within another road authority's

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network. This tends to put an obligation on the latter authority to provide Afollow-up@ signs leading to the facility, or negotiate with the facility representatives to do so, when the provision of the signs may be contrary to the specific signing policies of the latter authority. This problem may commonly arise in a by-pass situation. It is considered bad signing practice not to follow-up on the first sign towards a facility, through subsequent changes in direction, until the final turn towards the facility.

9.5.2 Structure of Tourist Organisations

1 Chapter 4: *Tourism Signing* recommends that tourism signing be approached in a structured way with high levels of co-operation and co-ordination between the various road and tourism authorities and organisations. Figures 4.1 and 4.2 in Chapter 4 illustrate a possible approach to such structures from Provincial to local levels. Figure 9.27 expands upon the urban elements of the Chapter 4 figures. Chapter 4 also provides an organisational flow-chart for the processing of requests from tourist facility owners or operators for tourism signs (Figure 4.4). Whilst the range of authorities catered for in this flow-chart is much greater than will be involved in an urban area, the principles covered by the chart are recommended for use in urban areas.

2 In order to achieve an adequate structure to handle tourism information, including that provided by tourism signs, the various levels of tourism organisation must manage, market and co-ordinate this information **for the benefit of tourists.** In doing so, they will inherently promote the welfare and development of tourism in the area. In an urban context this management of information will take a number of forms, largely dictated by the size of the urban area and its proximity to other urban areas. Figure 9.27 illustrates a typical structure appropriate to large cities and metropolitan areas, and to small to medium sized towns. Ultimately, whatever the size of the specific urban area, its Local Tourism Organisations (LTO's) will have a place in the line of communication to a Regional Tourism Organisation (RTO) and the Regional Tourism Liaison Committee (RTLC). Urban tourism organisations, commonly publicity associations, should rely on their association with the RTO and RTLC for assistance and guidance on facility standards, consistent application of warrants etc. The functions of these organisations differ within the different organisational levels, but as far as tourism signing is concerned, common functions of each organisation include:

(a) liaison with all role players to identify the need for tourism signing in the relevant area of jurisdiction;

(b) development of an understanding of guidance signing principles and the incorporation of these into criteria developed for the signing of facilities;

(c) the preparation of a tourism signing plan for the area under their jurisdiction;

(d) active participation, at appropriate levels, in tourism communities comprising tourism, roads and other officials, to consider and process applications for tourism signs.

3 Membership of the various tourism organisations is split between public and private sectors, although the tendency is for this type of activity to become a privatised activity under the jurisdiction of Aagencies@. Traditionally, representation on the national and provincial NTO and PTO's, comes from the public sector. The activity of the NTO and PTO's are primarily directed at protecting the public, and thereby tourists interests, by specifying quality standards for facilities and seeing that these are adhered to.

4 RTO's and LTO's are most commonly operated by the private sector. Their activities therefore tend to be directed for the benefit of tourist facility operators, which is not to say that the interests of tourists are ignored. In some instances an RTO may be a public run organisation but such instances are likely to decrease with time. In an urban environment RTO's, and LTO's in particular, are likely to be provided, supported and sponsored by the town's or city's Chamber of Commerce. As such, LTO's will commonly function broadly as publicity associations. The terms of reference of a publicity association are much wider than the promotion of tourism, since the associations deal with all facets of business promotion in the town or local council area. It is also likely that the skills of the personnel involved in LTO's may be limited with specific regard to tourism signing. It is therefore recommended that the public sector NTO and PTO representatives make a specific effort to develop awareness of the relevant criteria through the activities of the Regional Tourism Liaison Committee's and through workshops and seminars if necessary. The Regional Tourism Liaison Committee, by virtue of its representation (see Figure 9.27), includes members from both the public and private sectors of the tourism industry. As such it can offer an ideal forum to resolve differences and foster high quality tourism signing practices.

9.5.3 Urban Tourism Direction Signing Principles

1 **The signing of tourist destinations in urban or metropolitan areas should be strictly controlled simply because of the size of the demand and the practical difficulties in satisfying it, and because of the potentially degrading effect on the urban environment of a proliferation of signs, road traffic signs or otherwise.** These difficulties are much more prevalent in metropolitan areas than in smaller urban centres. Tourists do still, however, need to access all levels of tourist attraction, emergency service, and accommodation facilities in almost all urban areas, large or small. **More so than ever, the principle that a facility which is clearly visible does not warrant the provision of a sign, should apply to tourist facilities in urban areas. For instance in a suburban or an arterial environment filling station advertising displays are perfectly adequate to indicate the position of this service facility.** In terms of developing the tourism signing component of an Urban Signing Plan (see Figures 9.12 and 9.16) the philosophy of the following basic principles should be maintained:

(a) large metropolitan areas and other larger towns, which are by-passed by national and the major provincial routes, should co-operate with the national and provincial road authorities in the provision of a basic network of tourism signs, including any necessary follow-up signs, relating to **emergency and basic service facilities** to serve long distance travellers whose need

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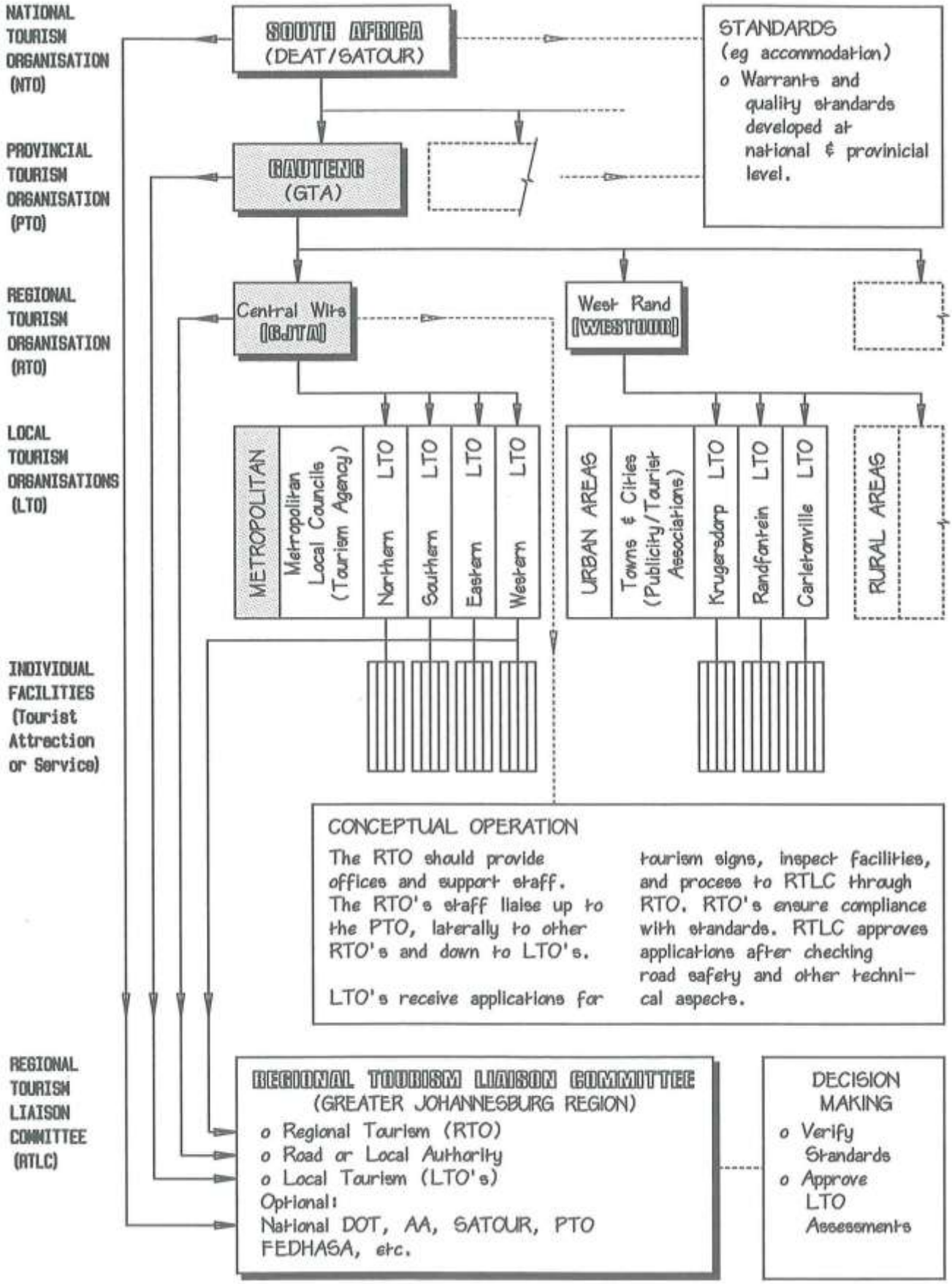

Fig 9.27 **Structure of Urban Tourism Organisations and Committees**

is either urgent or just in passing;

(b) otherwise the needs of tourists within large metropolitan areas, and other larger towns should preferably be catered for by **a strategically planned and co-ordinated network of tourist information centres, bureaux or laybys AND the other standard guidance signing components such as numbered routes, orientation destinations and street names;**

(c) other tourist destinations in metropolitan areas, not covered in terms of paragraph (a), should therefore preferably be dealt with at more remote distances, by tourist information facilities of one sort or another (see Subsection 9.5.9) dealing with regions or areas, and should only be signed, **in accordance with the relevant urban tourism signing warrants, at a local level in the final stages of an approach journey.**

2 The effect of the provisions of paragraph 9.5.3.1(a), presuming a national or provincial freeway by-pass route without direct access to service facilities, **should be that the most convenient access for drivers to the desired type of service facility ONLY, are signed**. An ideal arrangement, when a network of urban freeways exists, is that such signs should be located in advance of the first suitable access interchange AFTER passing through a freeway system-to-system interchange. Such a policy should be adopted for each basic direction of travel in the system. The use of SERVICE EXIT SEQUENCE sign GF8 is recommended in such complex freeway circumstances. The availability of direct access rest-and-service areas is likely to increase within metropolitan environs on freeway networks, and these obviously offer passing drivers the best option in terms of convenience and speed of service.

3 The effect of the provisions of paragraph 9.5.3.1(b) should therefore be a reliance on the use of brown background tourist signs displaying the tourist "i" symbol GFS B5-8. These should be provided in co-ordination with the National and/or Provincial Tourism Organisations who will have guidelines for the provision of adequate tourist information and will inspect and approve appropriate facilities.

4 The effect of the provisions of paragraph 9.5.3.1(c) should result in the provision of specific tourist destination signing at a consistent level in the urban street hierarchy, namely a local level, irrespective of the size of the urban area.

5 TOURIST DIRECTION signs provide tertiary level information (see Figure 9.22). As a group, the information they provide must be considered in the context of the level of information also provided by DIRECTION and LOCAL DIRECTION signs at specific sites. **It is not good practice to exceed the design criteria for the transfer of information** (see Volume 1, Chapter 4, Section 4.4). For orientational ADVANCE DIRECTION signs to function effectively, it is recommended that a sign stack should be provided for each exit path from a junction i.e. for a crossroad junction this means a stack for the straight-on direction and one each for the right and left turn directions. **Since TOURIST DIRECTION signs do not have an orientational function, stacks should only be provided for those directions serving warranted tourist destinations.** This principle is the same as that used for LOCAL DIRECTION signs.

6 On the approaches to a Class "B" junction, ADVANCE TURN tourism signs GF2 and ADVANCE LOCAL DIRECTION signs GDL1 may be located at two-thirds and one-third of the distance from the junction respectively, which would be appropriate for an ADVANCE DIRECTION sign GD1.

7 TOURIST FINAL TURN signs GF3 should normally only be located at the final turn towards, or at or opposite the point of access, to the tourist destination (see Figures 9.34 to 9.36).

8 It is likely that there will be a demand for both TOURIST DIRECTION and LOCAL DIRECTION signs at many junctions. This **will add to driver workload when all signs are required, and this aspect must be taken into account in the design** (see Volume 1, Chapters 1 and 4). Therefore, if tourist AND local direction signs are warranted at a junction, signs may preferably be provided in one of the ways indicated below, namely:

(a) by combining the two sign types on common supports so that the total sign message of the tourist and local destination signs is within the limits stated for a single sign, and locating the combined signs at "two-thirds GD1" distance from the junction; OR

(b) by designing a composite sign with the tourism message displayed as an "insert" panel on the ADVANCE LOCAL DIRECTION sign GDL1, also located at "two-thirds GD1" distance;

PROVIDED that if the GD1 sign is not already in place, the position allocated for it from the junction should be increased by 50% if at all possible, and the distances of the supplementary sign be increased accordingly (see Figures 9.23 and 9.25).

9 If tourist destinations require to be signed at a junction in more than one direction the messages applicable to each direction shall be given in sign stacks, each mounted as a separate stack on common support poles so that a right turn stack sits above a left turn stack. **This principle of the separation of stacks is unique to TOURIST DIRECTION signs** (for signface display rules see Subsection 9.5.5 and Chapter 4: *Tourism Signing*, Section 4.3, Figures 4.11 to 4.15).

10 If a street carrying high volumes of traffic generated by tourist destinations intersects another street which leads to several tourist destinations an attempt must be made to find group descriptions for the destinations to reduce the display demand. This may take the form of symbols plus SINGLE identifying names. (NOTE: the most likely solution to this problem should be the display of the appropriate collective name as a destination on the normal DIRECTION sign system, since, by virtue of its importance or familiarity it is likely to have orientational value - such a name may commonly be the name of the suburb in which all the tourist destinations are located.)

11 Once a tourist destination has been signed, the principle of message continuity shall be applied so that it is signed through subsequent changes of direction until the destination is reached. (NOTE: for this reason straight-on tourist direction stacks are not normally recommended unless the street concerned is lengthy and/or is a cul-de-sac.)

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12 A limit of 8 "bits" of information should be applied to any combined TOURIST/LOCAL DIRECTION sign. If separate signs are used each should be limited to 6 "bits" of information (NOTE: This provision will, particularly in combination with DIRECTION signs, potentially allow very high levels of information to be displayed. Such high levels of information should not be permitted if all other relevant design factors are not of the highest order i.e. a sub-standard letter size is specified - see Volume 1, Chapter 4).

13 Subject to the limitation on the number of "bits" of information given above, the maximum number of destination names which may be displayed on any TOURIST DIRECTION sign or combined TOURIST/LOCAL DIRECTION sign shall be four names.

14 If more than one destination name is to be placed on a TOURIST DIRECTION sign stack, it is recommended that, where possible, the order of appearance of the destination names should be such that if one destination is reached before another it should be above the other, OR if a turn comes up first which leads to one destination, that destination should appear above the other.

9.5.4 Classification

1 In order to successfully implement urban tourism signs it is recommended that a disciplined approach be followed. It is necessary, in order to work in a disciplined way, to have available a well-structured classification of tourist destinations, so that applications from facility operators can be assessed in a standard way in terms of a range of recognised types of activity, attraction or service. Classifying applications in this way, according to destination type, will also make it possible for the relevant RTLC, on which the road authority is represented, to allocate the appropriate symbol for use on approved signs.

2 It is possible that an applicant, or the assessing official, may feel that there is more than one option for classification. In general it is recommended that, wherever possible, the most generic classification be used since this is likely to result in the use of a more easily recognisable tourism symbol on the sign. In this context, if a facility offers more than one activity, attraction or service the applicant should be required to choose which one is most appropriate for classification purposes (see Subsection 9.5.33).

3 To assist the classification process tourist attractions have been organised into generic or "family" groupings. Table 9.2 illustrates this classification and each symbol is illustrated with the appropriate warrants in Subsections 9.5.15 to 9.5.32.

9.5.5 Signface Design Principles

1 The general principles relating to guidance signface design and layout are covered in Volume 1, Chapters 1 and 4. TOURIST DIRECTION signface design rules have been summarised in diagrammatic form in Chapter 4: *Tourism Signing,* in Figures 4.11 to 4.16. Only the most basic principles are therefore repeated here.

2 The signface design principles for TOURIST DIRECTION signs are essentially the same as those developed for LOCAL DIRECTION signs. TOURIST DIRECTION signface design places a high reliance on bold SYMBOLS to transfer the main part of the message to road users. When the PRIMARY name of a destination is also used it is used to qualify the reference of the symbol. The vertical signface dimensioning is related to these symbols rather than the text. The height of each symbol is capable of supporting two lines of text without increasing the vertical height of a sign or sign stack. Two techniques are therefore recommended to further contain TOURIST DIRECTION sign sizes when text is involved. These techniques are:

(a) if the PRIMARY name is a two or more part name-

e.g. "Gold Reef City" (mine)

then the name could be placed in two lines in a right-justified form –

e.g. **Gold Reef City**

(b) if the PRIMARY name is long and can be satisfactorily hyphenated without risk of loss of meaning or readability, then the primary name should be hyphenated and placed in two lines in a right justified form -

e.g. **Suikerbos-rand** or **Makgadi-kgadi**

When, for ease of the arrangement of words, the lower line of text becomes longer than the top line, then the text should be left justified. Two or more lines of text referring to two or more destinations of a common type (i.e. two hotels) should be left justified.

3 The preferred signface display comprises a SYMBOL indicating the category of tourist facility (see Table 9.2). According to warrants, certain facility types may also display the PRIMARY name of the destination, always to the right of the symbol irrespective of the direction in which the sign is pointing (this combination of symbol and primary name is mainly reserved for tourist attraction and accommodation facilities). Details of the warrants are given from Subsection 9.5.10 onwards. The principles behind this type of display are:

(a) to provide early recognition of the facility type by means of the symbol (generally, tourist service destinations and Afollow-up@ signs display a symbol, or symbols, only);

(b) to limit the size of a text message;

(c) to limit the total message display the primary name is that part of the name of the facility, which when combined with a Ageneric@ category symbol describes the specific facility being signed - avoiding the use of additional common terminology such as museum, stadium, dam, park etc.

Text only messages may be used if it is felt that there is no suitable symbol, however, this situation should rarely arise due to the availability of the family or Ageneric@ class symbols, use of which is encouraged.

4 A TOURIST DIRECTION sign, as with any other road sign, shall be legible. However, the principle used in the tourism signing system is to, generally, use one letter size smaller than

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used on the normal DIRECTION signs in the same environment. For urban applications this rule should be subject to a normal minimum letter size on TOURIST DIRECTION signs of 175 mm /125 mm. A letter size less than 140 mm / 100 mm shall not be used. Internal spatial dimensions are also reduced compared to those used on DIRECTION signs. The use of these standards means that signs are commonly 20% to 30% more compact than DIRECTION signs, which is considered acceptable in terms of the supplementary role of TOURIST DIRECTION signs.

5 The use of DIN 1451 Style "B" lettering is recommended. Consideration may be given to the use of DIN 1451 Style "A" lettering in low speed urban environments.

6 TOURIST DIRECTION signs may include straight-on, right-turn and/or left-turn stacks, although the use of straight-on stacks is not common (see paragraph 9.5.3.11). An individual stack may be divided into up to three panels by internal border lines, subject to a total display not exceeding three stacks or a combination of four stacks/panels i.e. two stacks, one with three panels is acceptable, subject to the total amount of information (see paragraph 9.5.3.12). For right-turn and left-turn stacks the right and left sides of the respective signs are Acut-back@ to slope inwards from top to bottom at a rate of 2 horizontal to 5 vertical (for examples of tourism signface designs see Figures 9.2 and 9.3).

7 Since TOURIST DIRECTION signs are commonly used in supplement to DIRECTION signs on which navigational route numbers are displayed, such route numbers shall not normally be displayed on TOURIST DIRECTION signs, unless the only destination in the direction in question is a tourist destination, and the road is a numbered route. The display of a route number is only likely to occur in an urban environment if the route has been numbered as a tourist route.

8 Aesthetic signface design rules include the requirement that the lengths of right-turn and left-turn stacks (and a straight-on stack, if used) mounted on common supports shall be such that all stacks shall be of equal length irrespective of stack or panel message length. To further enhance signface aesthetic treatment, where possible, it is recommended that symbols in different stacks or panels be aligned vertically on the centre lines of the symbols and that the first letters of any primary names be left justified (subject to the effects of any two line displays - see paragraph 9.5.5.2).

9 If a destination is located same distance beyond the final turn towards it, a distance may be included on the GF2 or GF3 sign. This treatment is not likely to be common in urban areas but can occur fairly frequently in "peri-urban" areas. The distance, given to the nearest 100 m, should be located below the destination name and right justified on it. The distance numerals should be followed by the letters "m" or "km" as appropriate.

10 When the tourist destination is at the end of the road and it is the only public destination, such a destination may be included in the stack of a DIRECTION sign provided for the junction in question, either within a brown "insert panel" or a brown stack (see Volume 1, Chapter 4, Subsection 4.11.10).

11 The various signface design principles described in this section are specifically dimensioned for TOURIST DIRECTION signs in Volume 4, Chapter 7.

9.5.6 Symbols

1 TOURIST DIRECTION sign symbols are sized according to the same dimensional criteria as LOCAL DIRECTION sign symbols, with a nominal design height and width of 15"d", where "d" is the letter stroke width used on the sign (and the letter height is 7"d"). The length of a symbol should not exceed 25"d@ and the height should not exceed 15"d@.

2 A tourism symbol is sized so that it may, if necessary support two lines of text within a stack or panel without a need to further increase the height of the stack or panel. When a symbol is used with text it shall always be located to the left of the text. The text may comprise any of the following options:

(a) a single PRIMARY name in one line centred vertically to the right of the symbol;

(b) a single PRIMARY name in two lines to the right of the symbol (see paragraph 9.5.5.2);

(c) two PRIMARY destination names of the same type (in the same direction) to the right of the symbol;

(d) three PRIMARY destination names of the same type (in the same direction) to the right of the symbol.

3 If a symbol should need to be used with three PRIMARY names representing three destinations of the same type in the same direction, then the symbol size should be made "oversize" by one standard increment in the value of "d" i.e. from 20 mm to 25 mm, or 30 mm to 40 mm.

4 Symbols shall not be used on TEMPORARY FACILITY tourist sign TGF17.

5 Wherever possible, sign designers should try to use the Ageneric@ family symbols identified for the sub-groups of tourist attractions (see Table 9.2 and Chapter 4, Section 4.3, Subsection 4.3.10). Adherence to this recommendation will make the learning of the more important symbols more effective. If the need arises for a symbol which is not documented, or cannot be covered by the principle indicated above, the designer or manufacturer shall make this need known, with a sketch proposal, to:

The Secretary
Route Numbering and Road Traffic Signs Sub-Committee
c/o Department of Transport
Private Bag X193
Pretoria
0001.

9.5.7 Shape, Size and Colours

1 TOURIST DIRECTION signs shall be rectangular in shape, horizontal in format and with a cut-back vertical side in the direction of turn, with the exception of the part-time facility FINGERBOARD type sign which shall have one side shaped to a point.

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PERMANENT TOURISM SIGNS

TOURIST ATTRACTIONS - GF1/GF2/GF3 Signs

Group A1 National Parks
- National Parks

Group A2 Provincial Parks
- Gauteng
- Free State
- Western Cape
- Kwazulu Natal
- Eastern Cape
- Northern Cape
- North West
- Northern Province
- Mpumalanga

Group A3 Resorts
- Country Club
- Hot Springs
- Inland Water
- Seaside/ Beach
- Berg/ Mountain

Group A4 Scenic
- Nature Reserve
- Natural Heritage
- Botanical Gardens
- Gardens (flower)
- Waterfall
- Lake or Dam (no water-sport)
- Caves
- Viewpoint
- Forest (natural)
- State Forest
- Mountain/ Berg

Group A5 Sports
- Motor Racing
- Golf Course
- Equestrian
- Fishing
- Cricket Field
- Swimming Pool
- Sports Stadium

Group A6 Wildlife
- Conservancy Area
- Game/Farm Reserve
- Bird Park
- Zoo
- Snake Park
- Crocodile Park
- Rhino Park
- Lion Park

Group A7 Historical
- National Monument
- Museum
- Historic Mine
- Historic House
- Historic Railway
- Historic Battlefield
- Historic Cemetery
- Geological Site

Group A8 Coastal
- Marine Reserve
- Maritime Museum
- Aquarium
- Whales
- Dolphins
- Light House
- Dockyard
- Boat Launch
- Fishing
- Crayfish
- Oceanarium
- Beach

Group A9 Arts & Crafts
- Painting & Drawing
- Pottery
- Jewellery
- Weaving & Knitting
- Leatherwork
- African Arts and Crafts
- Woodwork
- Metalwork

Group A10 Cultural
- Theatre
- Amphitheatre

Group A11 Adventure
- Hiking Trail
- Horse Trail
- 4x4 Trail
- Bike Trail
- River Rafting
- Scuba Diving
- Ballooning

Group A12 Agricultural
- Wine Cellar
- Wine Route/ Estate
- Showground
- Cherry Farm
- Ostrich Farm with riding
- Ostrich Farm
- Fish Farm
- Butterfly Farm

Group A13 General

Any attraction not covered by an individual attraction in Group A1 to A12.
- Animal Theme Park

SERVICES - GF1/GF2/GF3 Signs

Group B1 - Emergency Services
- Telephone
- Police
- Hospital
- First Aid
- SOS Phone
- NSRI
- Ambulance
- Fire Station
- Cell Phone

Group B2 - Light Vehicle Services
- Filling station & Workshop
- Filling Station
- Workshop
- Tow-in Service

Group B3 - Truck Rest & Service
- Truck Service Area

Group B4 - Food Services
- Restaurant
- Refreshments
- Take-away

Group B5 - General Services
- Parking Area
- Toilets
- Shower
- Drinking Water
- Fireplace
- Cooking Facility
- Picnic Area
- Tourist Information
- Handicapped Person Facility
- Roadside/ Curio Stall
- Post Office
- Rural Shop

Group B6 - Rest & Service Areas
- Rest Area - Class 1
- Rest Area - Class 2
- Service Area Class 3

PLUS D1 - "Totem Signs"
- Motor Cars
- Caravans
- Buses
- Trucks
- Motor Cycles
- Take-away
- Restaurant
- Refreshments
- Shop
- Facility for Handicapped Persons
- Toilets
- Straight-on Arrow
- Left/Right Arrow
- Diagonal Left/Right Arrow
- Advance Left/Right Arrow
- Exit (Route Number)
- Parking
- Filling Station & Workshop
- Filling Station
- Picnic Area
- Tourist Information
- Motor Car Wash
- Truck Wash
- Drinking Water
- Fireplace
- Cooking Facilities
- Shower

Group B7 - Vehicle Class
- Motor Cars
- Caravans
- Buses
- Trucks
- Delivery Vehicles
- Motor Cycles

ACCOMMODATION - GF1/GF2/GF3 Signs

Group C1 - Accommodation
- Hotel, Motel, Inn
- Chalet
- Caravan Site
- Camp Site
- Guest House
- Bed & Breakfast
- Rooms
- Youth Hostel
- Trail Shelter
- Guest Farm

PART-TIME ATTRACTIONS - GF17 Signs

REGULAR EVENTS / FIXED VENUE			IRREGULAR EVENTS
SEASONAL	MONTHLY	WEEKLY	PERMANENT VENUES
eg. Flower show	eg. Rambles Flea Markets	eg. Flea Markets	eg. Conferences Training Courses

TEMPORARY TOURISM SIGNS

SPECIAL EVENTS - TGF17 Signs

- Sport
- Shows
- Conferences
- Auctions
- Open Days
- Tournaments
- Festivals
- Galas
- Fetes
- Rallies
- Projects

NOTES:

(1) From time to time additional tourist destination types may be added. This table illustrates the approved groupings with typical examples but will not be updated regularly.

(2) The order of facilities in these lists does NOT imply any priority or importance. If space for a sign, or on a signface, is limited, the indication of Emergency Services should take priority over all other options.

Table 9.2
Classification of Tourism Destinations for Signing Purposes

2 The size of TOURIST DIRECTION signs is dependent on the symbol and destination messages to be displayed and the choice of letter size to be used (see Volume 1, Chapter 4, Section 4.3 and Volume 4, Chapter 7).

3 TOURIST DIRECTION signs shall have a brown background colour with white symbols, text, arrows and border. A limited number of symbols, primarily in the emergency service class, are multi-colour symbols. TOURIST DIRECTION signs are not provided in temporary colours, with the exception of TEMPORARY FACILITY sign TGF17 used for signing short term tourist attractions. The colours of TGF17 signs shall be a black background with yellow text and border.

9.5.8 High Density Tourism Areas/Tourist Routes

1 HIGH DENSITY TOURISM AREAS (HDTA) have commonly, to date, tended to develop in peri-urban areas around the greater metropolitan areas in South Africa, although this does not mean that the conditions relevant to the development of an HTDA cannot occur in the vicinity of smaller urban areas. A summary of the signing criteria for the creation of an HDTA is therefore included in this chapter (for greater detail see Chapter 4). During the development of the Guidance Signing Plan the potential for one or more areas to be treated as HDTA's may be identified. Due to the relative complexity of such areas, identification of the scope and limits of an area will normally require a specific study. A HIGH DENSITY TOURISM AREA can be defined by the following statement :<R>Athe complexity of multiple routes and the proliferation of demand for individual tourism signs exceeds the capability to supply signs conforming to agreed guidance signing principles within a definable area@.<R>In terms of the normal rules applicable to the provision of supplementary TOURIST DIRECTION signs, the sort of complexity which could exist in an HDTA could mean that any attempt to deal with the demand conventionally, would, almost certainly result in a chaotic number of signs, at considerable expense, and in such a way that by their very numbers, the signs would be ineffective. The challenge therefore is to design a systematic guidance signing scheme for a specific area which can satisfy the demands, without incurring high costs or creating a chaotic situation.

2 TOURIST ROUTES are formally numbered routes. As such they effectively take the "nearest" numbered route closer in the road hierarchy to many tourist facilities. The principle effect of numbering a TOURIST ROUTE is that, at the turn off from a numbered navigational route, i.e. R44, **it is only necessary to provide a TOURISM sign identifying the route**. This sign will normally display the tourist route number in yellow, a theme symbol (e.g. scenic, mountains, coastal etc.) and the route name which may be unique or be the same as the theme. This will be significantly less information for drivers to absorb than individual signs to all facilities along the route. This approach may be relaxed if emergency facilities exist on the route. The information relating to any emergency facilities should be given in a separate panel below the route description. TOURIST ROUTES may commonly be warranted within a HIGH DENSITY TOURISM AREA. Additional signing may be necessary to provide route continuity or where two TOURIST ROUTES intersect. It is also anticipated that the manner in which many identified HDTA's will be used by the public is in a very informal meandering way. It is quite likely under these circumstances that tourists may lose their bearings and require relatively frequent reassurance as to where they are. Consistent with the objective of limiting total sign area within the system, whenever practical, the concept of utilising compact TOURIST ROUTE MARKER guidance signs, GE18, is worth considering. Since certain roads within a high density tourist area could be recommended to be designated as tourist routes, it becomes relevant to consider using TOURIST ROUTE MARKER signs. Such signs should display the tourist route number and the theme symbol for the area, and can be used for route confirmation purposes. They can also be used instead of the much larger GF2 or GF3 signs at junctions of two tourist routes (see Figures 9.2, and 9.28 to 9.30).

3 A TOURIST ROUTE can also be established over an existing numbered navigational route. In this case a tourist route number is not allocated. The route is identified by supplementary TOURISM signs giving the route theme symbol and route name. TOURIST ROUTE MARKER signs may also be used for such an application. This type of tourist route is less likely to occur within an urban area, but the criteria remain relevant if a potential need is identified.

4 In any area concerned with developing tourism, there will be a maturing process as facility owners become more and more commercial and they seek new ways of attracting visitors. One of these ways will be the request for tourism signs, and the Regional Tourism Liaison Committee, which includes representation from the road authority, must manage those applications effectively (see Subsection 9.5.2). The following list describes how a tourist area might develop:

(a) seasonal - once per year;

(b) restricted hours - variable or limited opening times;

(c) low density - isolated clusters of attractions;

(d) medium density - groups of clusters of attractions;

(e) high density - area-wide attractions.

5 The preparation of a Guidance Signing Plan will have already established a consultative process with role-players of influence. When considering the possibility of establishing a HIGH DENSITY TOURISM AREA or a TOURIST ROUTE the consultative process must be extended to role-players specific to the area in question. In a similar way to the development of the Guidance Signing Plan (see Figures 9.12 and 9.16), it is essential to explain the signing principles and constraints to the role-players. As part of the subsequent study the following information should be gathered (details of the existing guidance signs, and any deficiencies these may have, will already have been recorded as part of the work on the Guidance Signing Plan):

(a) an inventory of existing tourism facilities and services;

(b) a quality assessment of the facilities;

(c) classification of the facilities as full-time or part-time;

(d) classification of facilities according to Table 9.2;

(e) determine the potential for growth in tourism activity;

(continued on page 9.5.12)

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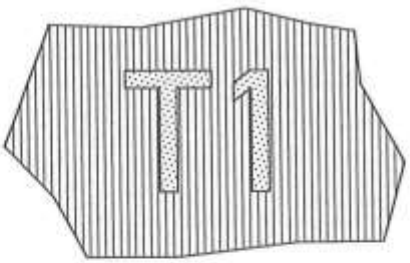
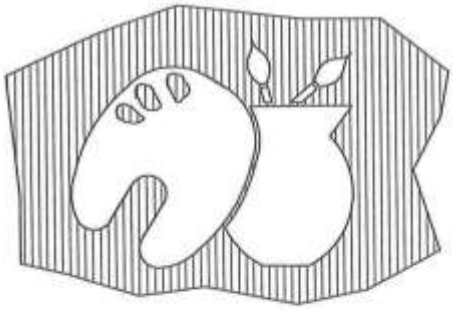


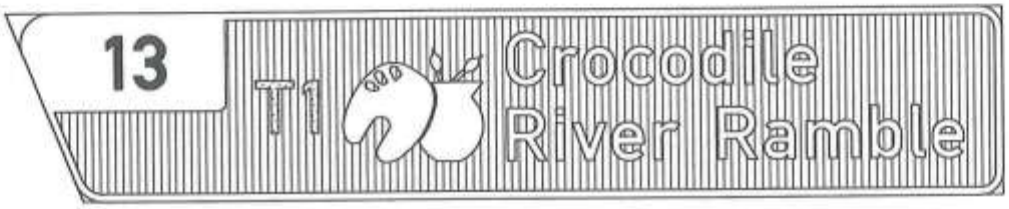
Detail 9.28.1 Tourist Route Number Indication



Detail 9.28.2 Generic Theme Symbol for Area

Crocodile River Ramble

Detail 9.28.3 Unique Collective or Theme Name (Maximum of 3 words)



Detail 9.28.4 Typical Sign at Main Point of Entry to Tourist Area (GF1 example being from a freeway to an entering crossroad)

Detail 9.28.5 Typical Sign GF2 Indicating a Numbered Tourist Route From a Numbered Navigational Route

Detail 9.28.6 Typical GL6 Location at Gateway to Tourist Area

Fig 9.28 **Tourist Route or Area Signing Signface Elements and Typical Signs Used at Entry Points or Gateways**

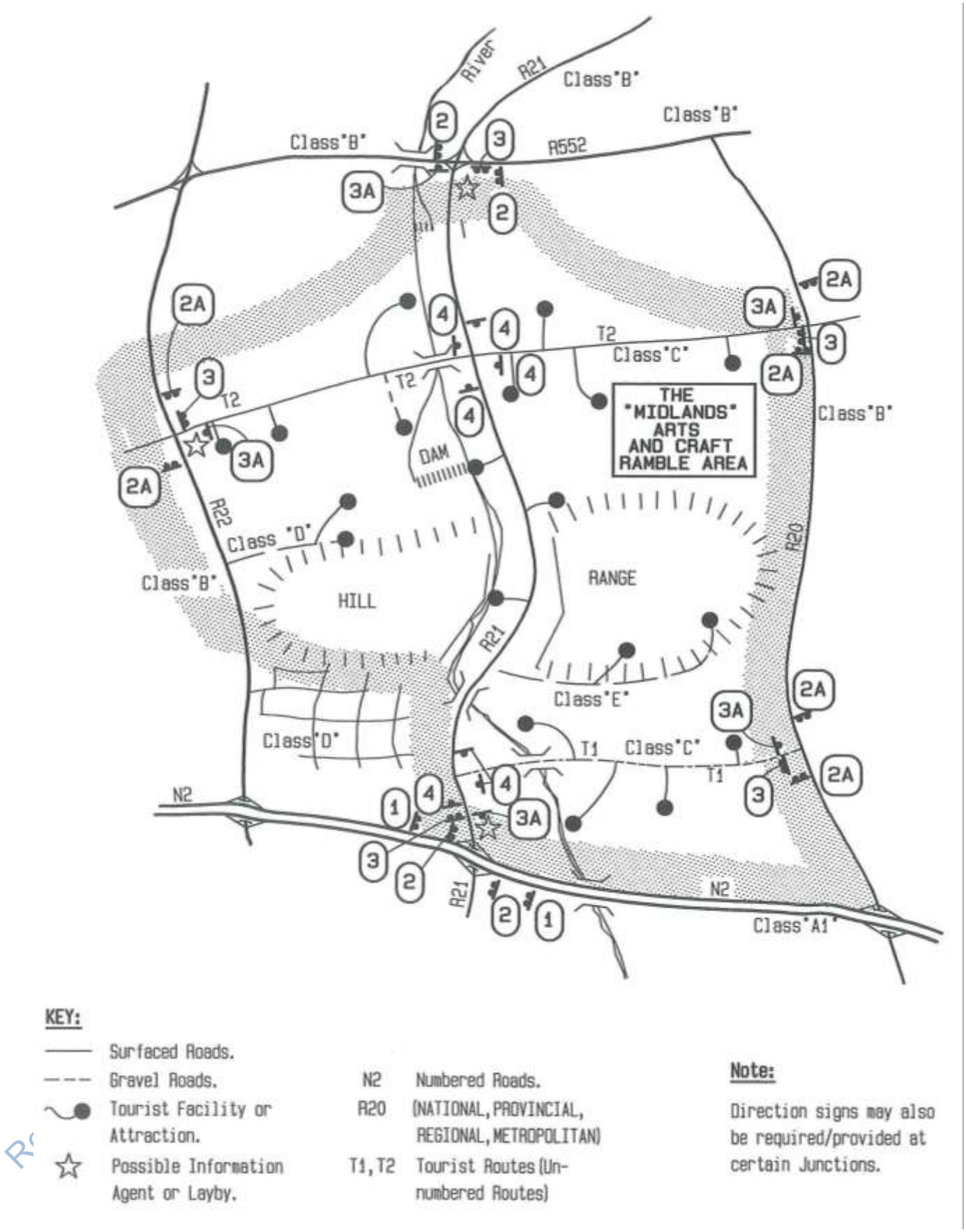
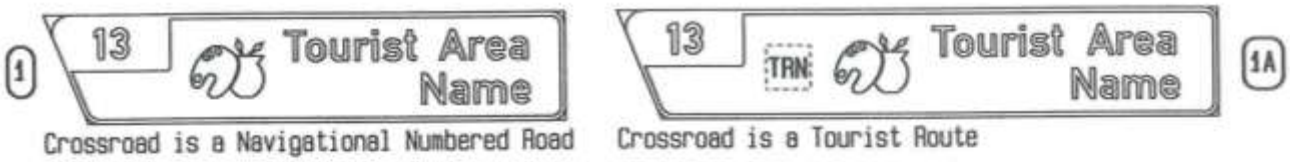


Fig 9.29 **Signing a High Density Tourist Area with Similar Theme Tourist Routes (see Figure 9.30)**



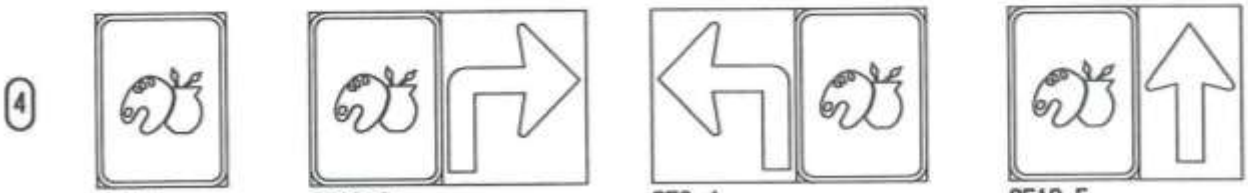
Crossroad is a Navigational Numbered Road — Crossroad is a Tourist Route

Detail 9.30.1 GF1 FREEWAY ADVANCE EXIT Signs

Turnoff onto Navigational Numbered Road — Turnoff onto a Tourist Route

(Sign arrow and slant to suit direction of turn off)

Detail 9.30.2 GF2 ADVANCE TURN Signs



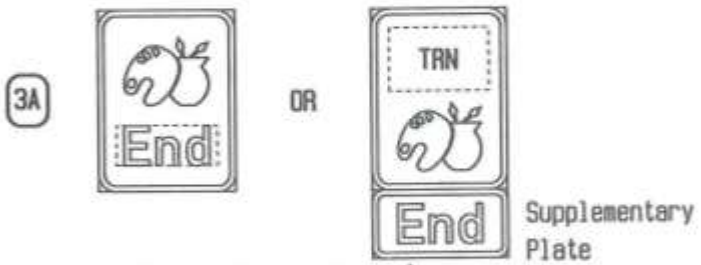
Tourist Route Marker for use on Navigational Numbered Routes

AND

Tourist Route Marker for Numbered Routes

Detail 9.30.3 GE18 Standard TOURIST ROUTE MARKER Signs

Detail 9.30.4 GL6.4 GEOGRAPHICAL LOCATION Sign



Supplementary Plate

End of Tourist Route/Area

Fig 9.30.5 GE18 - TOURIST ROUTE MARKER Signs

NOTES :

1 TRN = Tourist Route Number.

2 (4) = Sign no.- refer to Figure 9.29.

3 • = T-numbers will only be assigned to otherwise un-numbered roads.

Fig 9.30 **Tourist Signs Used to Identify a High Density Tourist Area and Tourist Routes (see Figure 9.29)**

(continued from page 9.5.8)

(f) definition of appropriate boundaries to the area;

(g) assess the need for tourist routes within and/or abutting the area - this has the potential to significantly reduce the overall signing required to achieve a cost-effective plan.

6 It is very probable that candidate HDTA's will include significant numbers of Apart-time@ facilities. It is normally a prerequisite for the signing of tourist facilities that they are open to the public on a full-time basis (or very nearly full-time). The relevant warrant commonly requires the facility to be open for 12 hours a day for 365 days a year. Part-time facilities can, however, represent the core of tourism activity in an area. A special class of PART-TIME FACILITY sign, GF17, has been allocated for use in signing this class of facility (subject to compliance with certain criteria). This sign has a FINGERBOARD shape, but otherwise follows the same signface rules as other TOURIST DIRECTION signs. It is desirable that part-time facility operators display an additional sign, within their property but clearly visible from the approaching roadway, which should be a changeable sign capable of indicating when the facility is "OPEN" or "CLOSED". The sign may include any unique "Emblem" or "Logo" adopted by the area for "branding" purposes.

7 Temporary events are, in essence, one-off part-time tourist attractions, although many of them may be regular annual events. These may be signed using TEMPORARY FACILITY sign TGF17, and the signs are commonly erected and removed by a service organisation such as the Automobile Association. These signs should be truly temporary signs and conform to the black-and-yellow temporary sign colour code. Typical temporary events include (a TGF17 sign is illustrated in Figure 9.2):

(a) auctions;

(b) festivals;

(c) fetes;

(d) gymkhanas (and other infrequent sporting occasions, etc.).

8 There is a general trend towards the provision of multi-function venues. These may have a significant potential to attract visitors, and from a very wide catchment area. Many of these visitors will be unfamiliar with the location of the venue. Consideration may be given to providing such facilities with part-time tourism signs, GF17, because the facilities are not operating all the time, and relying on such signs to guide visitors rather than providing regular TGF17 signs. An alternative to such an approach, in an urban or peri-urban area might be to use a LOCAL DIRECTION sign. The latter would particularly be the case if the events being staged are directed at commercial participation rather than as tourist attractions, although at this level there is no strong argument for one type of sign over the other.

9 **One of the main objectives of the planning and development of a tourism signing plan for an area should be to develop some concept which will offer an adequate compromise solution to the various conflicting problems which exist.** In most cases, the possible solution will be at two levels, namely:

(a) the signing treatment of the whole area; and

(b) the signing treatment of individual facilities.

10 Throughout the preparation of a tourism signing plan for an HDTA, close attention should be paid to finding ways of reducing the need for large signs or large numbers of signs. The motivation for this approach is to achieve the most effective signing reasonably possible by means of the least possible total sign area, and this for two basic reasons:

(a) to limit the overall environmental intrusion of the signs (but still have enough impact for them to achieve their purpose); and

(b) to limit the total cost of the signs.

11 It is an established principle, covered in Volume 1, that signing for an area can be kept within reasonable limits if the area has a uniqueness of identity which can be used on tourism signs (see Figure 9.28), involving:

(a) a Unique Collective Name - the need for alternative means of displaying tourism information will usually arise due to an "overload of information" at an existing intersection or on an existing tourism sign; in this instance, a pro-active approach is recommended whereby a collective "name" or "identity" is used to replace a number of separate tourism facilities; this option is clearly cheaper than an information lay-by, requiring the usual brown tourism signs only, but it should be facilitated through the local or regional tourism organisations, in consultation with the appropriate tourism stakeholders; the existence of such a tourism body will therefore expedite any discussions and final proposals; to keep sign area down a "collective" name for an area should be kept concise, but should certainly not exceed 2 to 3 words; the name allocated to a tourism area should either be unique to a geographic area or unique to some theme such as historical mining ("Old Digger's Route") or scenery ("Namaqualand Flower Route");

(b) Collective Route or Area Symbol - in the context of tourism signing, the other method by which a tourism area should be collectively identified, as "an area", is by means of an appropriate symbol; the symbol can relate to a descriptive representation of the area, e.g. a "mountain" symbol for an area in the Drakensberg, or to an established theme for the principal activities of the area, e.g. a symbol representing "wine", or "arts and crafts" symbol for an area such as the Crocodile River Ramble Area; the symbol should be used together with the full name of the high density tourism area;

(c) even if generic tourism symbol(s) can be used with a unique or collective name to describe a high density tourism area, it may still be desirable to identify the area with a unique "Emblem" or "Logo" - such an emblem or logo may be used on an off-road information sign at a laybye at the gateway to the area, and at the entrances to individual facilities.

12 The use of generic theme symbols such as "arts and crafts", "historic", "wildlife" or "scenic" also has the potential to keep within controllable limits the total numbers of symbols available for use on tourism signs (see Table 9.2). The larger the number of symbols, the greater will be the difficulty experienced by drivers in interpreting them correctly and also in sign

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manufacturers supplying the correct symbol. The function of the symbol to allow early recognition of the associated destination, with a minimised need to read words on a sign, will also be eroded by large numbers of symbols, many with distinct similarities.

13 Once the limits of an high density tourism area, the road network within the area (including minor roads), and an inventory of candidate tourism facilities and services have been established, consideration should be given as to how to limit the number of tourist signs required at the more important or busy junctions. Many of the minor roads in an area could provide access to three or more facilities or services. It should, therefore, be natural to consider some of the minor roads as "tourist routes".

14 In order to keep the system as simple as possible and for such routes to form a logical extension of the existing numbered route system, the use of the designatory uppercase letter "T" is allowed, e.g. "T1" , "T2", etc. A very significant benefit of this approach is that the signs on, for example, a provincial numbered route on the approach to a junction with a numbered tourist route, would display a tourist route number, a generic symbol and the unique collective name. Many such junctions may end up being signed in this manner. In this way, the alternative need to try to indicate a multitude of specific tourism destinations, at such junctions, is avoided at no disadvantage to the driver, or to the facility. This is because an awareness of the tourist route number required to reach a specific facility is a very simple piece of information to promote and acquire. Once on the tourist route, drivers will now expect to see a sign to the specific tourism destination they are seeking. The signface elements for the Crocodile Ramble Area are illustrated in Figure 9.28 as an example of specific signs indicating a tourist route as opposed to a tourism facility.

15 In principle, the signs described above should be provided by the road authority as part of the basic navigational Guidance Signing Plan for a high density tourism area.

16 The allocation of tourist route numbers and the signing described in paragraph 9.5.8.11 is intended to enable tourists to make what amounts to a "final" turn from a numbered route towards the tourism destination they seek. It is a criterion of the route design process that the number of tourist destinations on such a route should be three or more. This limit is dictated by the norms applicable to tourism signface design.

17 It should be noted that, in terms of this criterion, signing of specific tourism facilities or services may still be provided directly from navigational numbered routes, numbered tourist routes and other roads which have not been allocated a number. For most high density tourism areas it is possible to classify tourism destinations into three groups, as follows:

(a) full-time attractions or services;

(b) part-time attractions or services; and

(c) temporary attractions or services.

The level of signing should be different for each group and the provision of signs in all cases should be subject to approval after formal application.

18 Figure 9.29 shows an area in which two numbered tourist routes have been created, in addition to five navigational numbered routes, four of the latter of which create the majority of the perimeter of the theme area. The signing for this example has been developed according to a concept known as the "Gateway Perimeter" method. This concept involves a significant concentration of the information and signing effort at the main points of entry to the area. Signing at internal junctions between numbered routes, including numbered tourist routes, is limited to TOURIST ROUTE MARKER signs GE18. Because of the likely high number of facilities in the area the "Gateway" method also recommends the establishment of tourist information centres or laybys at the "Gateways". This can be a costly process and requires a high measure of commitment from the tourist operators in the area. The "Gateway" concept is therefore recommended for the most highly developed or concentrated tourist areas.

19 In Figures 9.29 and 9.30 the signs shown by number are of the following types:

(a) (1) - GF1 FREEWAY ADVANCE EXIT signs displaying an interchange number, the tourist area theme symbol and the tourist area theme name (if the route to which the freeway exit leads is a numbered tourist route then the tourist route number should be displayed in front of the symbol);

(b) (2) - GF2 ADVANCE TURN DIRECTION signs displaying the tourist area theme symbol and the tourist area theme name (these lead to a numbered navigational route within the tourist area);

(c) (2A) - GF2 ADVANCE TURN DIRECTION signs displaying the tourist route number, the tourist area theme symbol and the tourist area theme name;

(d) (3) - optional - GL6.3 (TOURIST AREA NAME) GEOGRAPHICAL LOCATION sign to identify the start of the tourist area - see Volume 1, Chapter 4, Section4.6, Subsection 4.6.9;

(e) (3A) - optional - GE18 END OF TOURIST ROUTE/AREA signs;

(f) (4) - GE18 TOURIST ROUTE MARKER signs.

9.5.9 Tourist Information Centres, Bureaux or Laybys

1 The provision of tourist information about and within an urban or high density tourist area is very important to the overall effectiveness of the signing and operation of the area. Tourist information can be provided in one or all of three ways (see Figures 9.31 and 9.32):

(a) (gateway) information centres;

(b) information bureaux or agents; and

(c) information laybys.

2 Gateway information centres may be situated at the entrances to larger tourism areas. These are likely to be major facilities, often

(continued on page 9.5.16)

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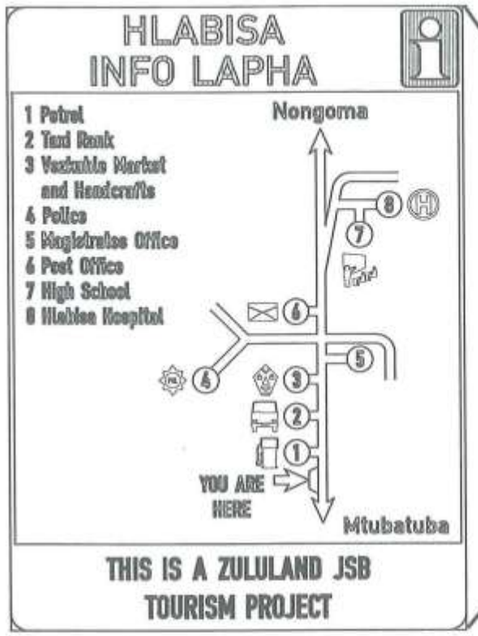
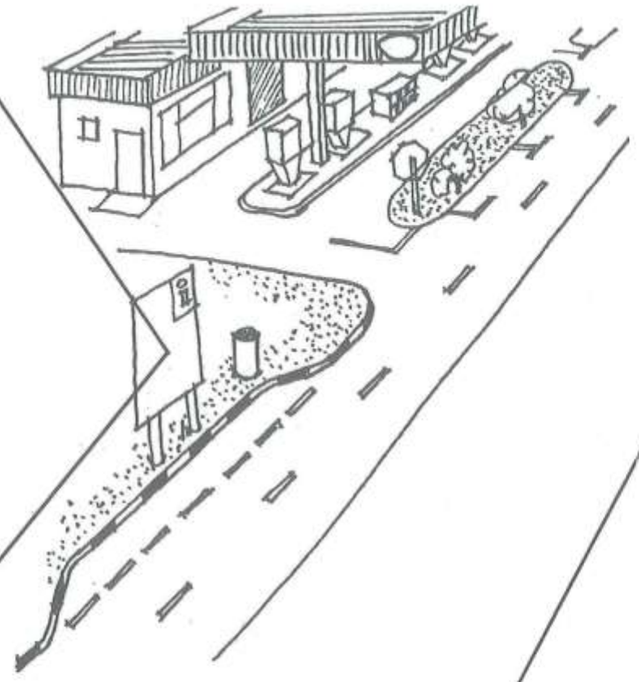
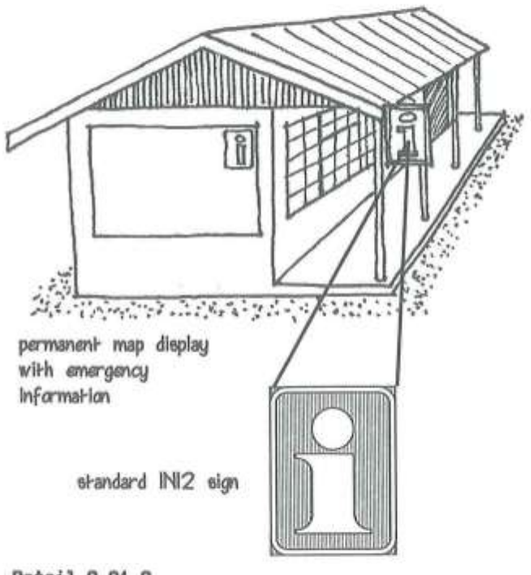


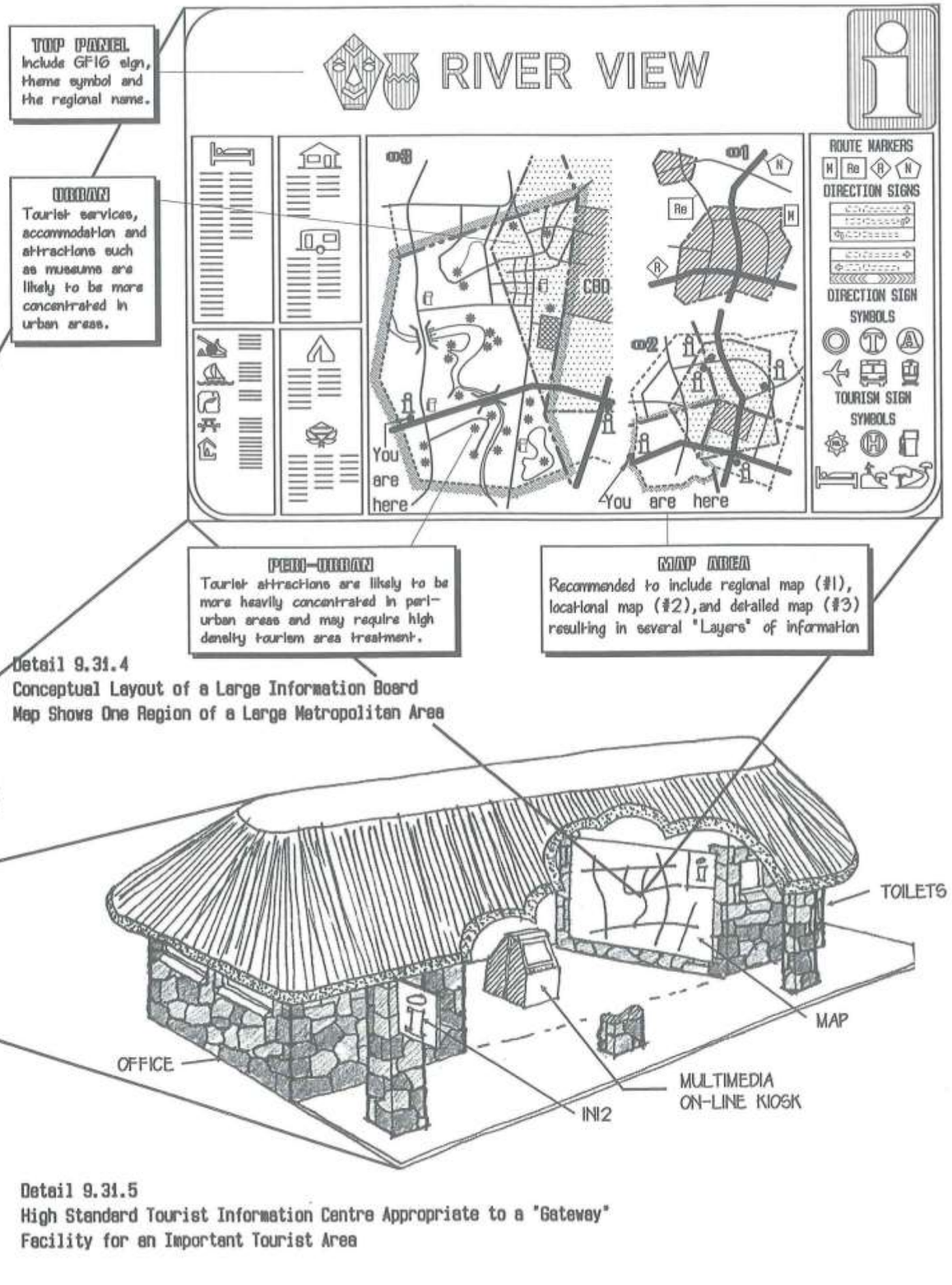
Detail 9.31.1
Conceptual Layout of an Information Board
Appropriate to a Small Country Town





Detail 9.31.2
Small Peri-Urban Store Used to
Provide Tourist Information

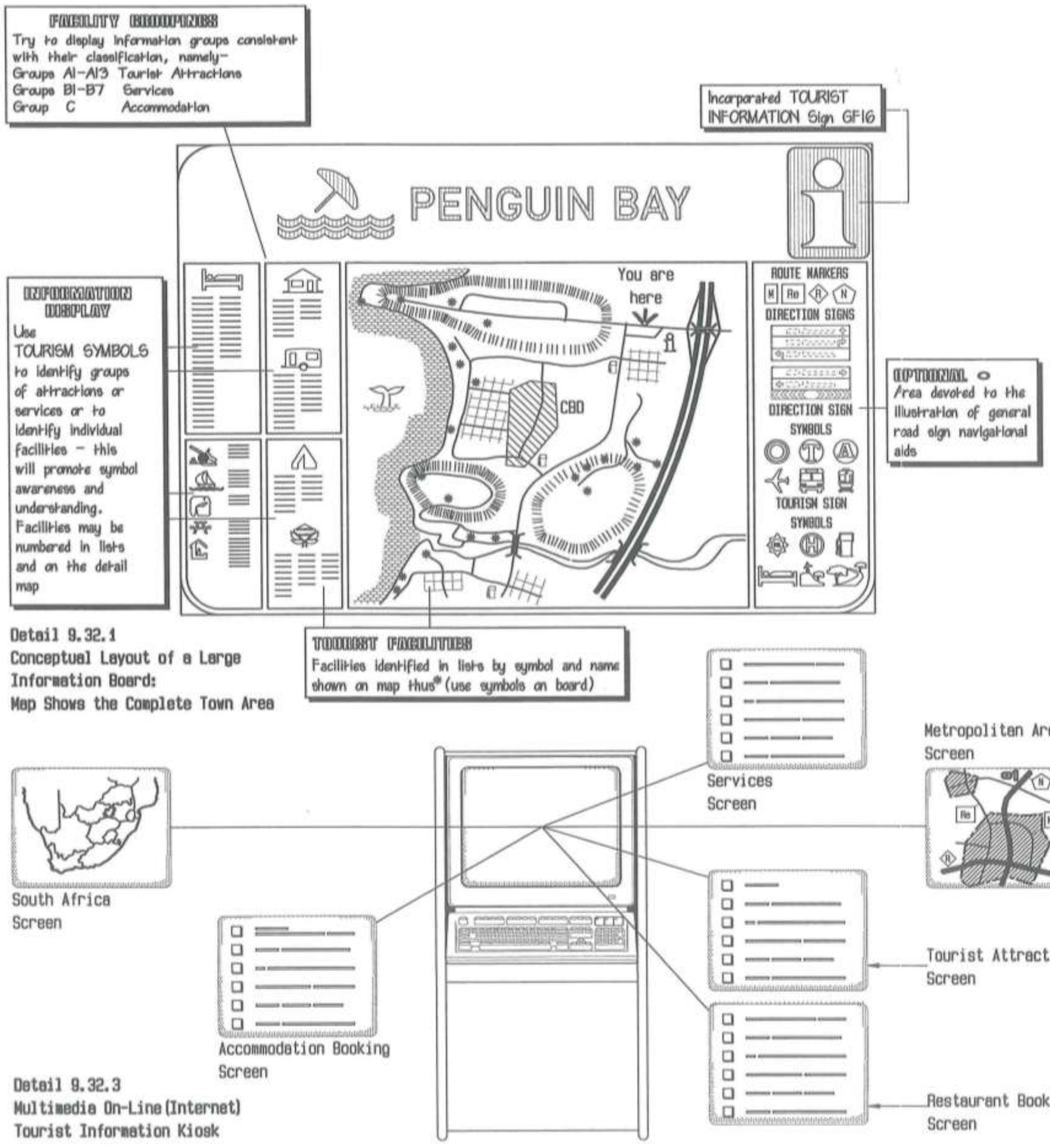
Detail 9.31.3
Basic "Gateway" Information Centre
in a Peri-Urban High Density Tourist Area



Detail 9.31.4
Conceptual Layout of a Large Information Board
Map Shows One Region of a Large Metropolitan Area

Detail 9.31.5
High Standard Tourist Information Centre Appropriate to a "Gateway"
Facility for an Important Tourist Area

Fig 9.31
Urban Tourist Information Facilities - 1



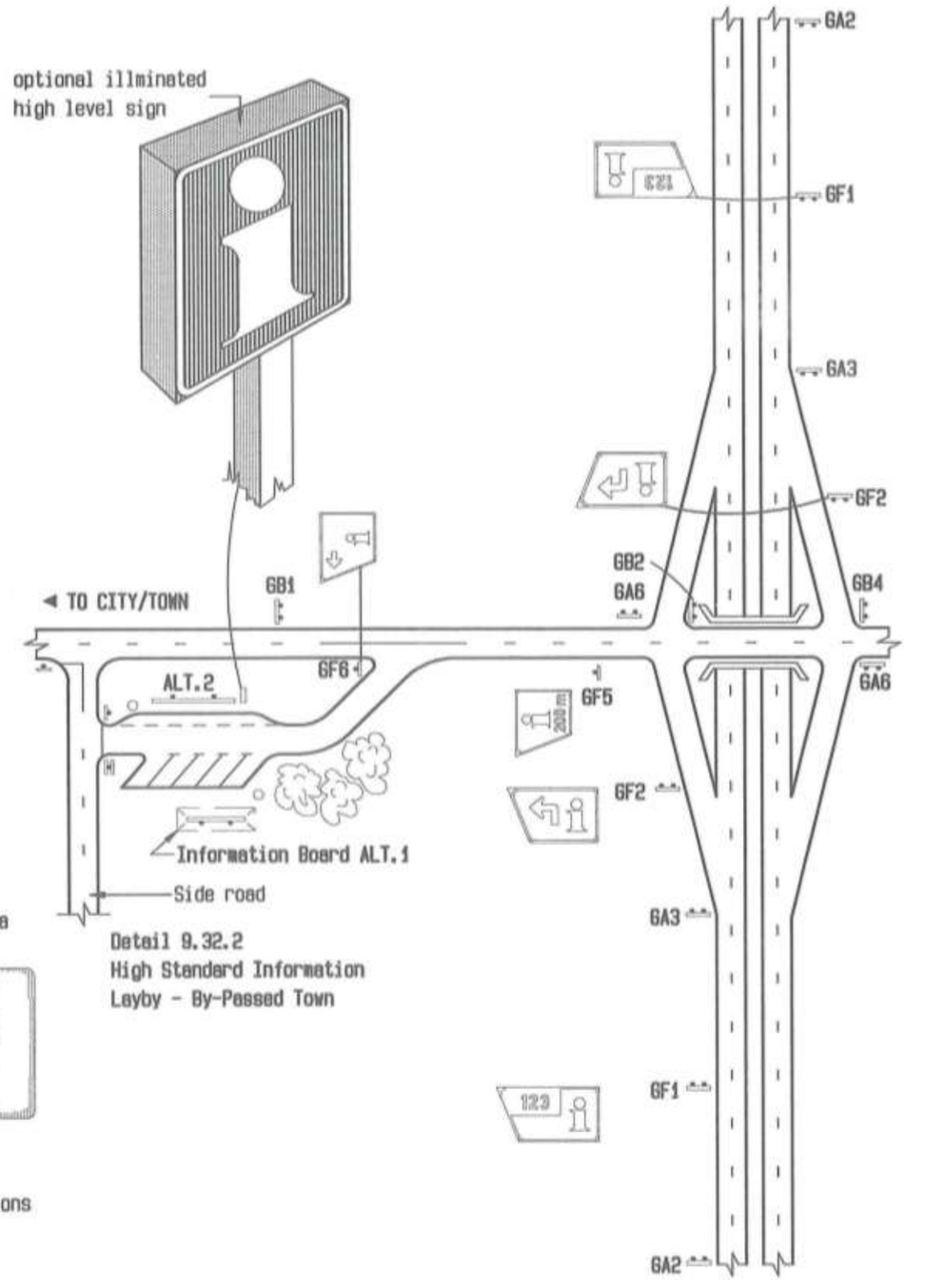


Fig 9.32
Urban Tourist Information Facilities - 2

(continued from page 9.5.13)

manned, and for this reason can normally only be provided for on a limited basis. The whole approach to signing a large high density tourism area can, however, be developed around the provision of high quality gateway information centres.

3 A whole city or town area can be provided with a network of tourist information centres in a similar way to the "gateway" technique. Opportunities may not always exist, however, to locate the tourist information centres at true "gateways" to the city or town. Larger cities and towns may also require strategically located "in-fill" information centres. This type of approach will limit the number of tourism signs that need to be provided, more or less, to "final turn" type signs, because drivers will be able to navigate adequately until they are relatively close to their final destination, as a result of the information obtained at the centres. The number, size and sophistication of this type of information centre will depend entirely on whether the city or town has a tourism appeal which is:

(a) spread evenly throughout the city; or

(b) limited to one or two definable areas; or

(c) not very highly developed at all.

4 A city or town which owes much of its development to tourism appeal is recommended to provide a network of quality tourist information centres, even if the tourism is of seasonal nature. This will limit the demand for individual tourist facility signs. When there are only scattered areas, within or adjacent to the city or town, of tourism appeal, a signing process similar to that used for high density tourist areas is recommended. At the other end of the scale, if tourism is not a significant factor in a town, any tourist information which is relevant can be provided through the local publicity association office or by strategically located layby / tourist information board. It will significantly improve the effectiveness of any tourist information centre or publicity association which is only manned during normal working hours, if it also incorporates a Tourist Information Board, or at least a tourist notice board in the window. These facilities can thereby provide basic information outside working hours.

5 It is recommended that the tourism management committee establish a co-ordinated network of information agents by utilising existing service stations, cafes and shops in the area. Such centres of information should be indicated by tourist sign GF17 displaying the TOURIST INFORMATION symbol GFS B5-8. This concept will only be effective if the agents are enthusiastic about their role. If they are only open for limited hours, it will be beneficial if they make sure that basic information, such as emergency contact telephone numbers and a map of the area, are available to view on a 24-hour basis.

6 It is also within the of responsibility of the tourism management committee to see that each and every facility in the area acts as a mini information agent, prepared to promote the area as a whole.

7 Subject to affordability, the technology exists whereby the centres of information could be fully automated by utilising electronic media tourist information booths which operate in a manner similar to an ATM at a bank.

8 Information laybys with map signs of the area may be strategically located so that tourists entering the area can obtain an overview of the area. As an unmanned facility, an information layby can represent a liability of sorts since the information is likely to require regular updating, and such facilities are prone to vandalism.

9 It is likely that information lay-byes will need to be self-supporting, i.e. responsibility for updating and maintenance will be for the local/area publicity or tourism body and/or the local authority concerned. However, such facilities, if combined with existing service facilities such as strategically located service stations, or picnic sites or scenic viewpoints, can offer an excellent means to disseminate tourist information.

10 The following functions of Tourist Information Boards in an urban environment have been identified:

(a) to indicate to road users that they are entering a tourism area of interest;

(b) to provide road users with a schematic map of the area so that they may orientate themselves should they be uncertain of their exact location;

(c) to indicate where other tourist information offices are in the area;

(d) to indicate the locality of the regional tourism office;

(e) to promote tourism by creating an increased tourism culture in the area amongst the inhabitants and role players.

11 Tourism Information Boards should include:

(a) design and detail in a variety of forms; the information board should be colourful and attractive and should utilise the same details as those appearing on the tourism signs, such as symbols;

(b) the following information:

(i) the Aí@ symbol;

(ii) an orientational insert map of the specific area and surrounding areas;

(iii) legend describing tourist facilities;

(iv) if possible a distance table showing distances between other towns in the region;

(v) the "branding" logo of the tourism association or area;

(vi) legend AWelcome to...." with the area name or area.

12 The positioning of information boards is one of the most critical elements in order to derive the maximum value and lifespan from such boards. The following factors are relevant and must be considered in the assessment of likely positions:

(a) if practical, a favourable background promoting the area – e.g. a scenic view;

(b) adequate sight distance before the sign so that there is a sufficient safe stopping distance in order to gain access to the site;

(c) favourable gradient for vehicles pulling away from the site;

(d) an existing service station or similar site is preferable because of the costs involved in building a dedicated layby, and the time to become operational;

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(e) an undeveloped site with trees is ideal in order to provide shade;
(f) vandalism must be borne in mind, and areas where people wait for public transport should be avoided;
(g) positions close to intersections should be avoided because of conflicting traffic manoeuvres, which increase the risk of an accident.

13 Subject to the layout of any site or layby provided (see Figures 9.31 and 9.32), information boards should be placed, just like normal road signs, at a height of 2 m above ground level and in front of the site. Allowance should be made for at least three cars to be parked at a particular site or layby at any time. This would require approximately 100 m^2 of parking area. The area should preferably be tarred so that a muddy surface does not deter drivers from parking.

14 The positions of tourist information laybys should be clearly indicated using adequately sized LAYBY ADVANCE signs GF5 and LAYBY TURN-IN signs GF6.

15 Tourist information boards may be designed to be read either by drivers sitting in their vehicles or by persons outside their vehicles standing in front of the board (or both circumstances). The following guidelines may be of assistance in the detailed design of tourist information boards. (Figures 9.31 and 9.32 show typical information boards that may be used at information centres and laybys):

(a) letter style - whilst the style of lettering need not be prescribed, the use of clean, uncluttered letter styles is recommended - a typical such style is Helvetica or the DIN 1451 Part 2 letter style; it is recommended that text be displayed primarily in lower case letters, as in normal written text;

(b) lower case letter height:

(i) 3 mm per metre of viewing distance under good lighting conditions;

(ii) 6 mm per metre of viewing distance under a wider range of lighting conditions;

(iii) 8 mm or above per metre of viewing distance for greater visual impact or to establish an information hierarchy (i.e. for titles);

(iv) the ratio of lower case letter height to uppercase letter height varies from 2:3 to 3:4 according to letter style, the ratio for DIN 1451 Part 2 style lettering is 5:7;

(c) symbols - subject to the complexity of symbols involved these should range between 10:7 and 15:7 times the size of upper case letters used on the board (whilst all symbols may not be uniform height, tourism signs symbols have a nominal ratio of 15:7 and guidance sign symbols have a nominal ratio of 10:7 in relation to DIN 1451 Part 2 upper case letters).

9.5.10 Warrants for Signing Urban Tourist Destinations

1 Chapter 4: *Tourism Signing* deals with the management of tourism signing applications in Section 4.2. It is recommended that urban authorities familiarise themselves with this topic. Having done so, it is then relevant for the personnel involved to decide how warrants are to be used in the management process. If knowledge and skills regarding tourism signing are limited it is recommended that warrants be applied as firm policy. If a city or town has well developed guidance signing skills, however, then warrants may be considered as not being binding or mandatory procedures, but rather as structured guidelines to simplify the work of the personnel involved. The personnel may even adapt the warrants given below to suite their specific environment. It is recommended that policies and individual variations in practice be documented for training and consistency purposes.

2 The details given in Subsections 9.5.10 and 9.5.11 are provided to assist urban personnel, Provincial, Regional and Local Tourism Organisations (see Figure 9.27) and members of Regional Tourism Liaison Committees, with the processing of applications for TOURIST DIRECTION signs in urban and peri-urban areas. However, it is recommended that the application of warrants in an urban environment be subject to the adoption of a policy to implement tourism information centres, bureaux and/or laybys, either singly or as a co-ordinated network of such centres. Subject to the level of implementation of tourist information centres, warrants are applicable as follows to determine:

(a) whether a facility should be included in the tourist information system; and

(b) whether a facility should be provided with FINAL TURN sign GF3 or PART-TIME FACILITY sign GF17, as appropriate; and

(c) what rules are applicable to individual signface layout designs; **OR**

(d) what TOURIST DIRECTION signs are applicable if information centres are not effectively provided.

3 The basic requirement to be complied with in the provision of urban TOURIST DIRECTION signs is that drivers shall have sufficient time, in terms of their environment and driving task demand, to safely take in the additional information being offered by the supplementary sign. **Therefore, if existing primary or secondary DIRECTION signs, and/or existing LOCAL or TOURIST DIRECTION signs require all the available attention of drivers, then the additional TOURIST DIRECTION sign under consideration shall NOT be warranted.**

4 **It is a basic hypothesis that, with the aid of tourist maps, brochures and information centres, the existing hierarchy of numbered routes and orientational destinations given on DIRECTION signs, and an adequate system of STREET NAME signs, drivers should be able to reach a point in relatively close proximity to their intended urban tourist destination before supplementary TOURIST DIRECTION signs may be considered necessary.**

5 From this hypothesis the provision of tourist direction signs in urban areas should, **irrespective of any individual warrants applicable to the type of tourist destination,** conform to the following principles:

(a) **tourist direction signs will not be warranted when the location of the destination concerned is obvious to road users, PROVIDED** that, even if the location of the destination is obvious, **if the access to it is not obvious** an appropriate TOURIST DIRECTION sign may be used to identify the point of access;

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(b) **the provision of TOURIST DIRECTION signs should not commence further from the destination than the nearest numbered route i.e. signing for an individual destination should not occur from one numbered route to another numbered route; however, when a tourist attraction may reasonably be approached from two different numbered routes, particularly two parallel or converging routes, signs may be provided on both routes if this is ultimately to the advantage of tourists (see Figure 9.34);**

(c) the facilities available at the tourist destination must be **of a standard which is acceptable** to a reasonable tourist;

(d) when a number of tourist destinations can be reached in one direction, from a particular junction, an attempt shall be made to determine some **single collective name** which will adequately guide road users in the correct direction;

(e) in extreme cases where many tourist destinations (and indeed local destinations as well) occur, consideration should be given to providing a suitable information facility (centre, bureau or layby) with enough local detailed information to simplify the local navigation process.

6 Tourist sign warrants for general use are provided in three levels as follows:

(a) Level 1: general criteria relating to position and accessibility applicable to all groups of facility (see Subsection 9.5.11);

(b) Level 2: criteria specific to each type of facility relating principally to hours of operation, distance from the approach road, and most important the quality rating of the facility (see Subsections 9.5.12 to 9.5.32);

(c) Level 3: criteria specific to the design of the TOURIST DIRECTION sign to be provided with particular regard to (see Subsection 9.5.33):

(i) the use of a primary name;

(ii) supplementary tourist symbols;

(iii) a collective "area" symbol;

(iv) the distance to the facility;

(v) a route number.

7 Level 1 and Level 3 warrants are applicable to all applications for TOURIST DIRECTION signs. Level 2 warrants, because they apply to individual facilities or facility groups, are listed separately in the group and type order given in Figure 9.22 and Table 9.2.

8 As has been noted previously, several generic, family or group symbols, and therefore warrants, are provided. Specific applicants for tourism signs may also not be aware of different symbol options available to them. More than one symbol, and therefore warrant, may, in fact, be permissible to represent their facility. LTO's and Regional Tourism Liaison Committee's should take pro-active action to:

(a) encourage the use of generic symbols as widely as possible (this applies particularly to the signing of High Density Tourism Areas);

(b) otherwise guide applicants to choose **the single most appropriate symbol/warrant**, when options are available;

(c) limit the use of supplementary symbols.

9 Subject to the principles given in paragraph 9.5.10.5 the tourist facility types listed in Table 9.2 may be signed in urban areas in accordance with the detailed requirements of the warrants given in subsequent subsections.

10 Special tourist related events, which occur on a one-off or irregular basis, may be signed using a temporary SPECIAL EVENT sign TGF17, commonly administered and erected by a service organisation such as the Automobile Association. Provision of sign TGF17 should adhere to the principle warrants laid down for similar full-time tourist facilities.

9.5.11 Level 1 Warrant Criteria:

1 The following factors are taken into account for all tourist facilities, before continuing with the warrant investigation:

(a) locational details:

(i) (name of nearest town - rural only);

(ii) number of nearest numbered route (see paragraph 9.5.10.5(b));

(iii) is facility accessed directly or indirectly from this numbered route;

(iv) identification details of road from which access is obtained (when not a numbered route);

(b) access warrants:

(i) based on the locational details are tourism signs likely to be required or not;

(ii) even if facility is clearly visible from the road are tourism signs necessary to identify the point of access;

(iii) is the access road of an all-weather standard;

(iv) are internal roads of an adequate geometric standard to offer good mobility.

2 The Level 2 warrants are detailed in the following subsections, in groups or individually, as appropriate. Where relevant, an illustration of the applicable tourism symbol is given. The subsections describe tourist attractions followed by emergency, vehicle, food, general and rest area services, and accommodation facilities.

9.5.12 Level 2 Warrant Criteria:

Tourist Attractions: All Groups

1 The criteria listed in paragraph 9.5.12.2 are generic to all types of tourist attraction, identified in this Manual or in the future. If a specific criterion is appropriate to a facility type this will be noted in the relevant paragraph. Additional criteria are given for individual facility types in the subsequent subsections. All facility types are listed in these subsections even if they are unlikely to occur in urban areas, on the basis that almost any type of facility can occur in a peri-urban environment.

2 The following generic warrants are applicable to all tourist attraction facilities:

- ❑ shall be open to the public;
- ❑ any on-site buildings shall comply with all statutory requirements of local and other authorities in terms of regulations such as Building Regulations SANS 10400:2011 or later, and if used for trading purposes shall legally be covered

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by a current trading/operating licence;

- ❑ shall have a clean, attractive and well-kept appearance;
- ❑ shall be in a good state of repair;
- ❑ toilet facilities should be available (see paragraph 9.5.12.4):
  - for the public during open hours;
  - for both genders;
  - with adequate and suitable illumination;
  - with adequate natural and artificial ventilation;
  - subject to regular inspection for cleanliness and state of repair/maintenance;
  - shall be clearly signed;
  - shall have floor surfaces and levels that minimize any hazard;
- ❑ shall have adequate safe parking for the highest anticipated visitor demand;
- ❑ shall provide, or be mentioned in, an information brochure;
- ❑ visitors shall be registered;
- ❑ safety/medical response or contact information shall be provided;
- ❑ shall provide an adequate number of rubbish/litter bins together with a regular rubbish removal service;
- ❑ when a tourist attraction includes food and/or accommodation services these shall conform to the warrants for these services given in Subsections 9.5.28 and 9.5.32 respectively.

3 Wherever practical the following should also be provided:

- ❑ drinking water;
- ❑ food services or picnic tables/braai facilities.

4 If a tourist attraction is in a completely natural state, with no built facilities, the requirement for toilets may be waived.

5 In the following subsections the first warrant criterion most commonly stated is a distance warrant. This distance warrant is a maximum distance and is always stated as being from the nearest numbered route. There is no reason why any urban authority may not adapt its own distance standards, but if it does these should be applied consistently. There is also no reason why a tourism symbol/sign cannot be warranted for use from a lesser road such as a tourism route or an un-numbered road. In particular, a lesser facility may be treated as a "sub-facility" off an already signed route to a more important facility i.e. an urban authority might decide to sign a lighthouse only from a road already signed to a destination such as a marine reserve, maritime museum or beach, any of which may have been signed from a nearest numbered route.

6 Certain types of tourist attraction, by virtue of their location and/or type of activity, may include hazards. It is recommended that this type of attraction should make the nature of such hazards known to entering members of the public, and that provision is made for the registration of entry within the facility by members of the public.

9.5.13 Level 2 Warrant Criteria: Tourist Attractions: Groups A1 and A2: National and Provincial Parks

1 Basic Requirements:

- ❑ urban (peri-urban) - within 10 km of nearest numbered route;
- ❑ reception shall be available 12 hours a day, 365 days per year, with provision to make prior reservations;
- ❑ information shall be available from the reservations office;
- ❑ shall exhibit indigenous flora and fauna.

2 Preferred requirements:

- ❑ accommodation complying with appropriate warrants (see Subsection 9.5.32);
- ❑ facilities such as restaurants, picnic tables, braai facilities and boat spillways, each complying with appropriate warrants.

9.5.14 Level 2 Warrant Criteria: Tourist Attractions: Group A3: Resort Attractions

1 Basic Requirements:

- ❑ urban (peri-urban) - within 5 km of nearest numbered route;
- ❑ accommodation shall be provided which complies with appropriate warrants (see Subsection 9.5.32);
- ❑ reception shall be available 12 hours a day, 365 days per year, with provision to make prior reservations;
- ❑ information to be available from the reservations office;
- ❑ if water and/or shoreline activities are included these shall be safely and effectively co-ordinated and certified by the Departments of Environmental Affairs (DEA), Water Affairs(DWA), Tourism (DT) and/or Agriculture, Forestry & Fisheries (DAF&F), as appropriate or their appointed agents;
- ❑ day visitors shall also be catered for;
- ❑ when appropriate changing room facilities shall be provided;
- ❑ food services in the form of restaurants, refreshments, take-away, picnic tables or braai facilities shall be available;
- ❑ if sporting facilities are an integral part of the resort these shall be available to day visitors and residents, and shall comply with appropriate warrants (see Subsection 9.5.16 : Sports Attractions).

2 Other factors:

- ❑ resorts with exclusive membership shall not fulfil the warrant requirements;
- ❑ when appropriate, interpretive material may be provided within the resort;
- ❑ if sporting facilities are provided, indoor and outdoor sports should preferably be catered for and should be available to all visitors.

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9.5.15 Level 2 Warrant Criteria: Tourist Attractions: Group A4: Scenic Attractions

1 **Scenic Route** (and generic Scenic Attractions):

GFS A4

This symbol may be used either to indicate a Scenic Route (which may, or may not, be numbered as a Tourist Route), or to indicate a High Density Tourism Area with a "scenic" theme, subject to compliance with the applicable warrants for a tourist route or HDTA, or any of the individual scenic attractions within Group A4. In the latter two cases the applicable warrants will be those for a HDTA or those listed below.

Basic requirements for an urban Scenic Route are:

- ❑ shall involve primarily a natural and/or open and undeveloped environment with panoramic views;
- ❑ frequent, and adequately signposted and developed stopping/parking areas at specific View Points (see GFS A4-8), or other scenic attractions, shall be provided;
- ❑ may include sections in a built-up urban environment which offer wide vistas of the urban area, particularly including views of buildings of architectural and/or historical significance, but which are not **primarily** arterial routes.

2 **Nature Reserve:**

GFS A4-1

Basic requirements:

- ❑ urban and peri-urban - within 10 km of the nearest numbered route;
- ❑ shall be subject to environmental management as required by the DEA, DWA, DT and/or DAF&F, as appropriate, or their appointed agents;
- ❑ the site shall be open 365 days a year;
- ❑ there shall be adequate sign posting;
- ❑ drinking water shall be provided;
- ❑ a public telephone shall be provided;
- ❑ regular outdoor seating shall be provided;
- ❑ access to, and touring of the site, shall be disabled/elderly friendly;
- ❑ archaeological sites shall be identified, and protected by vehicular and pedestrian barriers;
- ❑ parking shall not be permitted within +/- 100 m of an archaeological site;
- ❑ camping shall not be permitted within +/- 1 km of an archaeological site.

Preferred requirements:

- ❑ if practical, a reception area with adequate information should be provided;
- ❑ interpretive information should be provided, when appropriate, within the site;
- ❑ the availability of picnic sites, wildlife viewing hides, viewpoints and hiking trails should be considered;
- ❑ the availability of refreshments should be considered.

Other factors:

- ❑ if, for whatever reason, the nature reserve is only available by appointment, or is kept locked, a guide should be available and clear instructions given for the collection and return of the key.

3 **National Heritage:**

GFS A4-2(RSA)

Basic requirements:

- ❑ urban and peri-urban - within 10 km of the nearest numbered route;
- ❑ the site shall be a registered South African National Heritage Site.

Preferred requirements:

- ❑ permanent indoor or outdoor exhibitions;
- ❑ permanent information/notice board.

4 **Botanical Gardens:**

GFS A4-3

Basic requirements:

- ❑ urban and peri-urban - within 5 km of the nearest numbered route;
- ❑ the gardens shall be registered with the Natural Botanical Gardens Society;
- ❑ the gardens shall be open 365 days a year;
- ❑ regular outdoor seating shall be provided;
- ❑ access to, and touring of, the gardens shall be disabled/elderly friendly;
- ❑ interpretive information shall be provided within the gardens.

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5 **Gardens (Flower):**

GFS A4-4

Basic requirements:

- ❑ parking shall not be permitted within +/- 100 m of an archaeological site;
- ❑ urban and peri-urban - within 2 km of the nearest numbered route;
- ❑ the gardens shall be open 365 days a year;
- ❑ regular outdoor seating shall be provided;
- ❑ access to, and touring of, the gardens shall be disabled/elderly friendly;
- ❑ interpretive information shall be provided within the gardens.

6 **Waterfall:**

GFS A4-5

Basic requirements:

- ❑ urban and peri-urban - within 10 km of the nearest numbered route;
- ❑ shall be accessible by the public 365 days a year;
- ❑ visiting public shall be provided with effective protection measures if hazards exist.

7 **Lake or Dam (no water-sport)**

GFS A4-6

Basic requirements:

- ❑ urban and peri-urban - within 10 km of the nearest numbered route;
- ❑ shall be subject to environmental management as required by the DEA, DWA, DT and/or DAF&F, as appropriate, or their appointed agents;
- ❑ the site shall be accessible by the public 365 days a year;
- ❑ a public telephone shall be provided;
- ❑ access to, and touring of, the gardens shall be disabled/elderly friendly;
- ❑ regular outdoor seating shall be provided;
- ❑ there shall be adequate signposting.

Preferred requirements:

- ❑ interpretive information should be provided, when appropriate, within the site in addition to conventional visitor information;
- ❑ the availability of picnic sites, wildlife viewing hides, view-points and hiking trails should be considered;
- ❑ food services in the form of restaurants, refreshments, take-away, picnic tables, or braai facilities may be provided.

Other factors:

- ❑ if, for whatever reason, the lake or dam is only available by appointment, or is kept locked, a guide should be available and clear instructions given for the collection and return of the key.

8 **Caves:**

GFS A4-7

Basic requirements:

- ❑ urban and peri-urban - within 10 km of the nearest numbered route;
- ❑ shall be subject to environmental **and safety** management certification by the DEA, DWA, DT and/or DAF&F, as appropriate, or their appointed agents;
- ❑ any areas **not open** to the public shall be clearly identified;
- ❑ archaeological sites shall be identified and protected;
- ❑ the site shall be open for a minimum of 6 hours a day, 365 days a year;
- ❑ subject to the available open time a shaded waiting area shall be provided for the time period(s) when the caves are not open;
- ❑ basic and interpretative information shall be available on site.

Preferred requirements:

- ❑ drinking water should be available.

9 **View Point**

GFS A4-8

Basic requirements:

- ❑ urban and peri-urban - within 5 km of the nearest numbered route;
- ❑ should provide panoramic views of sea, mountain or general landscapes and/or an aesthetic urban scene;
- ❑ the site shall be accessible 365 days a year;
- ❑ the site shall be adequately provided with protective measures against any hazards;

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- ❑ regular outdoor seating shall be provided.

Preferred Requirements:

- ❑ drinking water should be available;
- ❑ an information board detailing specific points of interest may be provided (this board may form part of an integrated urban tourist information system).

10 **Natural Forest**:

GFS A4-9

Basic requirements:

- ❑ urban and peri-urban - within 10 km of the nearest numbered route;
- ❑ shall be subject to environmental management as part of a primary conservation area as required by the DEA, DWA, DT and/or DAF&F, as appropriate, or their appointed agents;
- ❑ regular outdoor seating shall be provided;
- ❑ there shall be adequate sign posting;
- ❑ any areas **not open** to the public shall be clearly identified;
- ❑ visiting public shall be provided with effective protection measures if hazards exist.

Preferred requirements:

- ❑ drinking water should be available;
- ❑ if practical, a reception area with adequate information should be provided;
- ❑ interpretive information should be provided;
- ❑ at least some sections of the forest should be disabled/elderly friendly, if practical;
- ❑ the availability of picnic sites, wild life viewing areas, view-points and hiking trails should be considered.

11 **State Forest:**

GFS A4-10

The basic and preferred requirements should be as stated for Natural Forest (GFS A4-9) except that the environmental management shall be under the jurisdiction of the DEA, DWA, DT and/or DAF&F, as appropriate, or their appointed agents.

12 **Mountain/Berg:**

GFS A4-11

Basic requirements:

- ❑ urban and peri-urban - within 25 km of the nearest numbered route;
- ❑ shall include drives, walks, view-points and resting areas appropriate to the general mountain/berg environment or the specific nature of any unique features of the area;
- ❑ the area shall be adequately signposted.

Preferred requirements:

- ❑ subject to the size of the area adequate provision of drinking water, picnic sites/braai areas etc. should be made;
- ❑ strategically sited public telephones should be available.

9.5.16 Level 2 Warrant Criteria: Tourist Attractions: Group A5: Sports Attractions

1 **Generic Sports Attractions:**

Symbol design pending

This symbol may be used as a collective or generic symbol for any major attraction which caters for a wide range of sports. A road authority may alternatively or additionally adopt the symbol as a generic symbol for all sports attractions within Group A5, subject to the individual warrants given below.

Basic requirements for a major sports attraction complex are:

- ❑ urban and peri urban - within 2 km of the nearest numbered route;
- ❑ shall cater for several sports in one stadium, arena or other environment, or several sports in several integrated stadiums and/or arenas, at national and international level;
- ❑ shall cater for a minimum of 25 000 spectators with full compliance with all generic criteria identified in Subsection 9.5.12 in terms of any applicable local authority regulations or by-laws(this spectator requirement applies for the recognised metropolitan authority areas, a commensurate spectator requirement may be adopted for smaller urban authorities);
- ❑ shall provide adequate parking consistent with the permitted maximum number of spectators (this parking may be provided at remote locations subject to the local authority setting up an exclusive public transport service on the days of events, in which case additional signs shall be provided directing spectators to the remote parking areas).

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2 **Motor Racing Track:**

GFS A5-1

Basic requirements:

- ❑ urban and peri-urban :
- the nearest numbered route for tracks running national and international events;
- tertiary arterial or collector-distributor road (Class AC@) for smaller venues;
- ❑ shall cater for either of the following to qualify for a sign from the nearest numbered route :
- at least one nationally graded event a year; or
- programme of local events over a season lasting several weeks;
- ❑ shall provide adequate points of access and egress to cater for the permitted spectator levels;
- ❑ shall provide adequate, secure on-site parking;
- ❑ if international events are held, a specific traffic management plan shall be available.

3 **Golf Course** (see also symbol GFS A3-1):

GFS A5-2

Basic requirements:

- ❑ urban and peri-urban:
- within 2 km of the nearest numbered route, if the course is graded by the national golf organisation to hold national events;
- within 1 km of a tertiary arterial or collector-distributor road (Class AC@) for smaller venues;
- ❑ shall make adequate provision to comply with the generic criteria identified in Subsection 9.5.12 in terms of any applicable local authority regulations or by-laws when spectators are present at an event.

4 **(Horse) Race Course:**

GFS A5-3

Basic requirements:

- ❑ urban and peri-urban:
- within 2 km of the nearest numbered route, if the course is graded by the national horse racing organisation to hold national events;
- within 1 km of a tertiary arterial or collector-distributor road (Class AC@) for smaller venues;
- ❑ shall provide adequate, secure on-site parking and/or exclusive public transport.

5 **Equestrian Events** (other than exclusive horse racing venues see GFS A5-3):

GFS A5-4

Basic requirements:

- ❑ urban and peri-urban - within 2 km of the nearest numbered route;
- ❑ shall hold equestrian events on at least a monthly basis (otherwise the venue should be considered some other more generic classification such as Ashow-ground@);
- ❑ shall make adequate provision to comply with the generic criteria identified in Subsection 9.5.12 in terms of any applicable local authority regulations or by-laws when spectators are present at an event.
- ❑ shall provide adequate, secure on-site parking.

6 **Fishing**

GFS A5-5

Basic requirements:

- ❑ urban and peri-urban - within 5 km of the nearest numbered route;
- ❑ shall be registered as a venue with a national or provincial angling organisation and shall be monitored by such organisation or by a registered angling club affiliated to the organisation.

Preferred requirements:

- ❑ drinking water should be available close by;
- ❑ picnic and/or braai facilities;
- ❑ adjacent accommodation (subject to appropriate warrants - see Subsection 9.5.32);
- ❑ shall be open to the public 365 days a year (subject to environmental constraints or review for specifically adverse circumstances);
- ❑ information on costs, rules and regulations shall be clearly displayed at the site.

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7 **Cricket Field:**

GFS A5-6

Basic requirements:

- ❑ urban and peri-urban:
- within 2 km of the nearest numbered route for cricket fields catering for national or international events;
- within 1 km of a tertiary arterial or collector-distributor road (Class AC@) for smaller venues;
- ❑ shall provide adequate parking consistent with the permitted maximum number of spectators (this parking may be provided at remote locations subject to the local authority setting up an exclusive public transport service on the days of events, in which case additional signs shall be provided directing spectators to the remote parking areas);
- ❑ if international events are held, a specific traffic management plan shall be available;
- ❑ shall make adequate provision to comply with the generic criteria identified in Subsection 9.5.12 in terms of any applicable local authority regulations or by-laws when spectators are present at an event.

8 **Swimming Pool:**

GFS A5-7

Basic requirements:

- ❑ urban and peri-urban:
- within 2 km of the nearest numbered route for swimming pools catering for national or international events;
- within 1 km of a tertiary arterial or collector-distributor road (Class AC@) for smaller venues;
- ❑ shall provide adequate parking consistent with the permitted maximum number of spectators;
- ❑ shall make adequate provision to comply with the generic criteria identified in Subsection 9.5.12 in terms of any applicable local authority regulations or by-laws when spectators are present at an event.

9 **Sports Stadiums** (see also generic symbol GFS A5):

GFS A5-8

Basic requirements:

- ❑ urban and peri urban - within 2 km of the nearest numbered route;
- ❑ shall cater for a minimum of 25 000 spectators with full compliance with all generic criteria identified in Subsection 9.5.12 in terms of any applicable local authority regulations or by-laws(this spectator requirement applies for the recognised metropolitan authority areas, a commensurate spectator requirement may be adopted for smaller urban authorities);
- ❑ shall provide adequate parking consistent with the permitted maximum number of spectators (this parking may be provided at remote locations subject to the local authority setting up an exclusive public transport service on the days of events, in which case additional signs shall be provided directing spectators to the remote parking areas).

9.5.17 Level 2 Warrant Criteria: Tourist Attractions: Group A6: Wildlife Attractions

1 **Generic Wildlife Attractions:**

GFS A6

This symbol may be used as a collective or generic symbol for a Wildlife Route (which may, or may not, be numbered as a Tourist Route) or High Density Tourism Area with a Awildlife@ theme, subject to compliance with the applicable warrants for a tourist route or HDTA, or any of the individual wildlife attractions within Group A6, or those listed below for individual facilities.

2 **Conservancy Area:**

GFS A6-1

Basic requirements:

- ❑ urban and peri-urban - within 5 km of the nearest numbered route;
- ❑ environmental management principles, including responsible and sustained tourism development principles shall be fundamental to all activities pertaining to the use of the resources;
- ❑ the area shall include at least five tourist attractions that are co-ordinating their efforts in the interests of conserving natural assets of the area and which promote the principles of conservancy;
- ❑ a brochure/map identifying the area and the facilities within it shall be available;
- ❑ the individual facilities within the area, shall, if they include other aspects of tourist interest, conform to the warrants appropriate to these other aspects of interest;
- ❑ the individual facilities shall make adequate provision to comply with the generic criteria identified in Subsection 9.5.12.

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3 **Game Reserve** (see also generic symbol GFS A6) :

GFS A6-2

Basic requirements:

- ❑ urban and peri-urban - within 5 km of the nearest numbered route;
- ❑ shall have approval to operate from a recognised animal protection group or the Zoological Society of Southern Africa, and shall be regularly inspected by such a group/society;
- ❑ environmental management principles, including responsible and sustained tourism development principles shall be fundamental to all activities pertaining to the use of the resources;
- ❑ shall be open to day visitors for at least 6 hours per day, during which a reception facility shall be available, for 365 days a year;
- ❑ shall have a clearly documented communication and emergency procedure to be followed by officials in the event of an incident;
- ❑ comprehensive visitor information, interpretive material, warnings against specific hazards, and procedures to be followed by the public in the event of an emergency shall be clearly displayed;
- ❑ shall provide a daily programme of awareness/ educational presentations.

Preferred requirements:

- ❑ permanent hides or other viewing areas in secure situations to permit visitors to leave their vehicles;
- ❑ any food service which conform to the warrants given in Subsection 9.5.28;
- ❑ secure areas in which visitors may leave their vehicles to picnic or braai - such areas shall be provided with drinking water;
- ❑ accommodation may be provided which conforms with to the warrants given in Subsection 9.5.32 - such attractions may alternatively apply for signing as a resort - see Subsection 9.5.14.

4 **Bird Park/Sanctuary:**

GFS A6-3

Basic requirements:

- ❑ urban and peri-urban - within 5 km of the nearest numbered route;
- ❑ shall have approval to operate from a recognised animal protection group or the Zoological Society of Southern Africa, and shall be regularly inspected by such a group/society;
- ❑ environmental management principles, including responsible and sustained tourism development principles shall be fundamental to all activities pertaining to the use of the resources;
- ❑ shall be open to day visitors for at least 6 hours per day, during which a reception facility shall be available, for 365 days a year;
- ❑ shall have a clearly documented communication and emergency procedure to be followed by officials in the event of an incident;
- ❑ comprehensive visitor information, interpretive material, warnings against specific hazards, and procedures to be followed by the public in the event of an emergency shall be clearly displayed;
- ❑ drinking water shall be available;
- ❑ provision shall be made specifically to cater for the disabled and elderly;
- ❑ shall provide a daily programme of awareness/ educational presentations.

Preferred requirements:

- ❑ any food service which conform to the warrants given in Subsection 9.5.28;
- ❑ areas suitable for a picnic or braai with drinking water.

5 **Zoo** (see also generic symbol GFS A6):

GFS A6-4

Basic requirements:

- ❑ urban and peri-urban - within 5 km of the nearest numbered route;
- ❑ shall have approval to operate from a recognised animal protection group or the Zoological Society of Southern Africa, and shall be regularly inspected by such a group/society;
- ❑ environmental management principles, including responsible and sustained tourism development principles shall be fundamental to all activities pertaining to the use of the resources;
- ❑ shall be open to day visitors for at least 6 hours per day, during which a reception facility shall be available, for 365 days a year;
- ❑ shall have a clearly documented communication and emergency procedure to be followed by officials in the event of an incident;
- ❑ comprehensive visitor information, interpretive material, warnings against specific hazards, and procedures to be followed by the public in the event of an emergency shall be clearly displayed;
- ❑ drinking water shall be available;

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- ❑ provision shall be made specifically to cater for the disabled and elderly;
- ❑ shall provide a daily programme of awareness/ educational presentations.

Preferred requirements:

- ❑ any food service which conform to the warrants given in Subsection 9.5.28.

6 **Snake Park:**

GFS A6-5

Basic requirements:

- ❑ urban and peri-urban - within 5 km of the nearest numbered route;
- ❑ shall have approval to operate from a recognised animal protection group or the Zoological Society of Southern Africa, and shall be regularly inspected by such a group/society;
- ❑ environmental management principles, including responsible and sustained tourism development principles shall be fundamental to all activities pertaining to the use of the resources;
- ❑ shall be open to day visitors for at least 6 hours per day, during which a reception facility shall be available, for 365 days a year;
- ❑ shall have a clearly documented communication and emergency procedure to be followed by officials in the event of an incident;
- ❑ specific safety precautions shall include:
- proper access control;
- an impenetrable perimeter wall;
- warnings to visitors of any specific risks or hazards;
- ❑ comprehensive visitor information, interpretive material, and procedures to be followed by the public in the event of an emergency shall be clearly displayed;
- ❑ drinking water shall be available;
- ❑ provision shall be made specifically to cater for the disabled and elderly;
- ❑ shall have on display a minimum of 20 different types of snake, of which at least half shall be indigenous types of snake;
- ❑ snakes shall be kept in secure, locked areas with no possibility of public contact;
- ❑ shall provide a daily programme of awareness/ educational presentations which shall be from within secure enclosures if snake handling is involved.

Preferred requirements:

- ❑ any food service which conform to the warrants given in Subsection 9.5.28.

7 **Crocodile Park:**

GFS A6-6

Basic requirements:

- ❑ urban and peri-urban - within 5 km of the nearest numbered route;
- ❑ shall have approval to operate from a recognised animal protection group or the Zoological Society of Southern Africa, and shall be regularly inspected by such a group/society;
- ❑ environmental management principles, including responsible and sustained tourism development principles shall be fundamental to all activities pertaining to the use of the resources;
- ❑ shall be open to day visitors for at least 6 hours per day, during which a reception facility shall be available, for 365 days a year;
- ❑ shall have a clearly documented communication and emergency procedure to be followed by officials in the event of an incident;
- ❑ comprehensive visitor information, interpretive material, warnings against specific hazards, and procedures to be followed by the public in the event of an emergency shall be clearly displayed;
- ❑ the main activities shall be crocodile related - other fauna/flora may also be featured;
- ❑ drinking water shall be available;
- ❑ provision shall be made specifically to cater for the disabled and elderly.
- ❑ shall provide a daily programme of awareness/ educational presentations.

Preferred requirements:

- ❑ any food service which conform to the warrants given in Subsection 9.5.28.

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8 **Rhino Park** (see also generic symbol GFS A6):

GFS A6-7

Basic requirements:

- ❑ urban and peri-urban - within 5 km of the nearest numbered route;
- ❑ shall have approval to operate from a recognised animal protection group or the Zoological Society of Southern Africa, and shall be regularly inspected by such a group/society;
- ❑ environmental management principles, including responsible and sustained tourism development principles shall be fundamental to all activities pertaining to the use of the resources;
- ❑ shall be open to day visitors for at least 6 hours per day, during which a reception facility shall be available, for 365 days a year;
- ❑ shall have a clearly documented communication and emergency procedure to be followed by officials in the event of an incident;
- ❑ comprehensive visitor information, interpretive material, warnings against specific hazards, and procedures to be followed by the public in the event of an emergency shall be clearly displayed;
- ❑ the main activities shall be rhino related and a minimum of 10 rhino shall be on view to the public, within the park, at any time - other fauna/flora may also be featured;
- ❑ drinking water shall be available;
- ❑ provision shall be made specifically to cater for the disabled and elderly;
- ❑ shall provide a daily programme of awareness/ educational presentations.

Preferred requirements:

- ❑ guided tours may be provided;
- ❑ permanent hides or other viewing areas may be provided in secure situations to permit visitors to leave their vehicles;
- ❑ any food service which conform to the warrants given in Subsection 9.5.28;
- ❑ secure areas in which visitors may leave their vehicles to picnic or braai - such areas shall be provided with drinking water.

9 **Lion Park** (see also generic symbol GFS A6):

GFS A6-8

Basic requirements:

- ❑ urban and peri-urban - within 5 km of the nearest numbered route;
- ❑ shall have approval to operate from a recognised animal protection group or the Zoological Society of Southern Africa, and shall be regularly inspected by such a group/society;
- ❑ environmental management principles, including responsible and sustained tourism development principles shall be fundamental to all activities pertaining to the use of the resources;
- ❑ shall be open to day visitors for at least 6 hours per day, during which a reception facility shall be available, for 365 days a year;
- ❑ shall have a clearly documented communication and emergency procedure to be followed by officials in the event of an incident;
- ❑ comprehensive visitor information, interpretive material, warnings against specific hazards, and procedures to be followed by the public in the event of an emergency shall be clearly displayed;
- ❑ the main activities shall be lion related and a minimum of 10 lions shall be on view to the public, within the park, at any time - other fauna/flora may also be featured;
- ❑ drinking water shall be available;
- ❑ provision shall be made specifically to cater for the disabled and elderly;
- ❑ shall provide a daily programme of awareness/ educational presentations.

Preferred requirements:

- ❑ guided tours may be provided;
- ❑ permanent hides or other viewing areas may be provided in secure situations to permit visitors to leave their vehicles;
- ❑ visitors may be invited to watch the feeding of the lions;
- ❑ any food service which conform to the warrants given in Subsection 9.5.28.

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9.5.18 Level 2 Warrant Criteria: Tourist Attractions: Group A7: Historic Attractions

1 **Generic Historic Attractions:**

GFS A7

This symbol may be used as a collective or generic symbol for an Historic Route (which may, or may not be numbered as a Tourist Route) or High Density Tourist Area with an Ahistoric@ theme, subject to compliance with the applicable warrants for a tourist route of HDTA, or any of the individual historic attractions within Group A7. In the latter two cases the applicable warrants will be those for a HDTA or those listed below.

2 **National Monument:**

GFS A7-1(RSA)

Basic requirements:

- ❑ urban and peri-urban - within 2 km of the nearest numbered route;
- ❑ shall be a National Monument listed by the National Monuments Council of South Africa and identified by a NMCSA plaque;
- ❑ shall be available for external viewing 365 days a year;
- ❑ shall be open to full public visits on a regular weekly basis throughout the year (including effective access to the insides of buildings/sites i.e. certain areas such as workshops, archives etc. may not be open to the general public);
- ❑ shall otherwise comply, as appropriate to the specific National Monument, with the warrant requirements for museums given below.

3 **Museum** (see also generic symbol GFS A7 and Maritime Museum GFS A8-2):

GFS A7-2

NOTE:

Museums may vary widely in nature and may be located at or in a National Monument (see GFS A7-1). The details given below are subdivided into AGeneral Museums@ and ASite Museums@. The former are generally considered to be primarily contained in buildings, whereas the latter may be open field sites commonly of archaeological interest.

General Museums - basic requirements:

- ❑ urban - within 1 km of the nearest numbered route;
- ❑ peri-urban - within 2 km of the nearest numbered route;
- ❑ the premises shall be open to the public at least 6 days per week, during which a reception facility shall be available, all year round;
- ❑ any rooms/areas not open to the public shall be clearly identified;
- ❑ comprehensive visitor information and interpretive material shall be available;
- ❑ a public telephone shall be available;
- ❑ drinking water shall be available;
- ❑ indoor and outdoor seating shall be provided;
- ❑ the premises shall be disabled/elderly friendly.

Site Museums - basic requirements:

- ❑ urban and peri-urban - within 5 km of the nearest numbered route;
- ❑ environmental management principles shall be fundamental to all activities pertaining to the use of the site;
- ❑ archaeological sites shall be identified, and protected by vehicular and pedestrian barriers;
- ❑ parking shall not be permitted within approximately 100 m of an archaeological site;
- ❑ camping shall not be permitted within approximately 1 km of an archaeological site;
- ❑ the site shall be open to the public 365 days a year;
- ❑ a public telephone shall be available;
- ❑ drinking water shall be available;
- ❑ indoor and outdoor seating shall be provided;
- ❑ access to, and touring of the site, shall be disabled/elderly friendly;
- ❑ visiting public shall be provided with adequate protective measures if hazards exist;
- ❑ comprehensive visitor information and interpretive material shall be available - this shall include adequate pedestrian guidance signing.

Preferred requirements:

- ❑ refreshments and/or a picnic site/braai area should be available;
- ❑ when appropriate view points and/or hiking trails should be considered.

Other factors:

- ❑ if, for whatever reason, the museum or site museum is only available by appointment, or is kept locked, a guide should be available and clear instructions given for the collection and return of the key.

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4 **Historic Mine** (see also generic symbol GFS A7):

GFS A7-3

Basic requirements:

- ❑ urban and peri-urban - within 2 km of the nearest numbered route;
- ❑ shall be open to visitors 365 days a year during which a reception facility shall be available;
- ❑ comprehensive visitor information and interpretive material, including permanent exhibits, shall be provided;
- ❑ a public telephone shall be available;
- ❑ drinking water shall be available;
- ❑ indoor and outdoor seating shall be provided;
- ❑ access to, and touring of the site, shall be disabled/elderly friendly.

Preferred/optional requirements:

- ❑ any food services which comply with the warrants given in Subsection 9.5.28;
- ❑ the historic mine environment may include, or be part of an historic theme park.

5 **Historic Railway** (see also generic symbol GFS A7):

GFS A7-4

Basic requirements:

- ❑ urban and peri-urban - a station or viewing point shall be within 2 km of the nearest numbered route;
- ❑ historic trains shall run on at least 6 days a week all year round (a lesser frequency of operation may be assessed in terms of possible inclusion in a high density tourism area);
- ❑ comprehensive visitor information and interpretive material shall be available;
- ❑ a public telephone shall be available at all stations;
- ❑ drinking water shall be available at regular intervals;
- ❑ special provisions shall be made to accommodate the disabled and elderly.

Preferred requirements:

- ❑ refreshments and/or a picnic/braai area should be available at stations;
- ❑ photo opportunity viewing points may be provided.

6 **Historic Battlefield** (see also generic symbol GFS A7, National Monument symbol GFS A7-1 and Museum symbol GFS A7-2):

GFS A7-5

Basic requirements:

- ❑ urban and peri-urban - the site, or start, and/or other sections, of a tourist route serving several sites, shall be within 2 km of the nearest numbered route;
- ❑ the site shall be open to the public 365 days a year;
- ❑ comprehensive visitor information and interpretive material shall be available;
- ❑ access to, and touring of the site, shall be disabled/elderly friendly.

Preferred requirements (several of these requirements would normally be basic requirements, but, in recognition of the Aopen field@ nature of many historic battlefield sites they are listed as Apreferred@):

- ❑ a public telephone should preferably be available;
- ❑ drinking water should preferably be available;
- ❑ seating should be provided as appropriate;
- ❑ adequate pedestrian guidance signing should be provided.

7 **Historic Cemetery** (see also generic symbol GFS A7 and National Monument symbol GFS A7-1):

GFS A7-6

Basic requirements:

- ❑ urban and peri-urban - the site, or start, and/or other sections, of a tourist route serving several sites, shall be within 2 km of the nearest numbered route;
- ❑ the site shall be open to the public 365 days a year;
- ❑ comprehensive visitor information and interpretive material shall be available;
- ❑ access to, and touring of the site, shall be disabled/elderly friendly.

Preferred requirements (several of these requirements would normally be basic requirements, but, in recognition of the Aopen field@ nature of many historic cemetery sites they are listed as Apreferred@):

- ❑ a public telephone should preferably be available;
- ❑ drinking water should preferably be available;
- ❑ seating should be provided as appropriate;
- ❑ adequate pedestrian guidance signing should be provided

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8 **Geological Site** (see also generic symbol GFS A7):

GFS A7-7

Basic requirements:

- ❑ urban and peri-urban - within 2 km of the nearest numbered route;
- ❑ environmental management principles shall be fundamental to all activities pertaining to the use of the site;
- ❑ the site shall be open to the public 365 days a year;
- ❑ if the site is of archaeological importance, the relevant parts of the site shall be identified and protected by vehicular and pedestrian barriers - parking shall not be permitted within approximately 100 m of an archaeological area nor shall camping be permitted within approximately 1 km of such an area;
- ❑ comprehensive visitor information and interpretive material shall be available.

Preferred requirements (several of these requirements would normally be basic requirements, but, in recognition of the Aopen field@ nature of many historic cemetery sites they are listed as Apreferred@):

- ❑ a public telephone should preferably be available;
- ❑ drinking water should preferably be available;
- ❑ seating should be provided as appropriate;
- ❑ adequate pedestrian guidance signing should be provided.

9.5.19 Level 2 Warrant Criteria: Tourist Attractions: Group A8: Coastal Attractions

1 **Generic Coastal Attractions:**

GFS A8

This symbol may be used either to indicate a (Scenic) Coastal Route (which may or may not, be numbered as a Tourist Route), or to indicate a High Density Tourism Area with a Acoastal@ theme, subject to compliance with the applicable warrants for a tourist route or HDTA, or any of the individual coastal attractions within Group A4. In the latter two cases the applicable warrants will be those for a HDTA or those listed below.

Basic requirements for a Coastal Route are:

- ❑ shall involve primarily a natural and/or open and undeveloped environment with panoramic sea views adjoining or within an urban or peri-urban area;
- ❑ frequent and adequately sign posted developed stopping/parking areas at specific viewpoints (see GFS A4-8),

or other scenic coastal attractions, shall be provided;

- ❑ may include sections in a built-up urban environment which offer wide coastal vistas.

2 **Marine Reserve** (see also generic symbol GFS A8):

GFS A8-1

Basic requirements:

- ❑ urban and peri-urban - within 5 km of the nearest numbered route;
- ❑ shall be registered with a national or provincial nature conservation organisation;
- ❑ shall be accessible to the public at least 12 hours a day for 365 days a year;
- ❑ environmental management principles shall be fundamental to all activities pertaining to the use of the site;
- ❑ comprehensive visitor information and interpretive material shall be available - this information shall include details of restrictions on angling, spear fishing and collection of crustaceans.

Preferred requirements:

- ❑ should exhibit indigenous flora/fauna;
- ❑ drinking water should be available;
- ❑ the reserve may be associated with accommodation provided this complies with the relevant warrants given in Subsection 9.5.32.

3 **Maritime Museum** (see also generic symbol GFS A8 and Museum (Site Museum) symbol GFS A7-2):

GFS A8-2

Basic requirements:

- ❑ urban and peri-urban - within 5 km of the nearest numbered route;
- ❑ environmental management principles shall be fundamental to all activities pertaining to the use of the site;
- ❑ the site shall be open to the public 365 days a year;
- ❑ a public telephone (or telephones) shall be available;
- ❑ drinking water shall be available;
- ❑ indoor/outdoor seating shall be provided as appropriate;
- ❑ comprehensive visitor information and interpretive material shall be available;
- ❑ adequate pedestrian guidance signing shall be provided

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Preferred requirements:

- ❑ refreshments and/or a picnic/braai area should be available;
- ❑ when appropriate, viewpoints and/or hiking trails should be considered.

4 **Aquarium** (see also generic symbol GFS A8):

GFS A8-3

Basic requirements:

- ❑ urban and peri-urban - within 1 km of the nearest numbered route;
- ❑ shall have approval to operate from a recognised animal protection group or the Zoological Society of Southern Africa, and shall be regularly inspected by such a group/society;
- ❑ shall be open to the public 365 days a year;
- ❑ registration/reception shall be available;
- ❑ comprehensive visitor information and interpretive material shall be available.

Preferred requirements:

- ❑ displays should be limited to indigenous marine fish/crustaceans;
- ❑ adequate seating should be provided;
- ❑ refreshments should be available.

5 **Whales** (see also generic symbol GFS A8):

GFS A8-4

Basic requirements:

- ❑ urban and peri-urban - the viewing site, or start, and/or other sections, of a tourist route serving several such sites, shall be within 2 km of the nearest numbered route;
- ❑ shall be accessible to the public 365 days a year (although viewing is expected to be seasonal);
- ❑ adequately sized view sites shall be provided at environmentally acceptable points on the coast line for the purpose of viewing whales (see also GFS A8-5);
- ❑ each view site shall be provided with adequate parking;
- ❑ each view site shall be provided with seating;
- ❑ interpretive information and brochures on whales and their environment shall be displayed/available.

Preferred requirements:

- ❑ drinking water should be available.

6 **Dolphins** (see also generic symbol GFS A8):

GFS A8-5

Basic requirements:

- ❑ urban and peri-urban - the viewing site, or start, and/or other sections, of a tourist route serving several such sites, shall be within 2 km of the nearest numbered route;
- ❑ shall be accessible to the public 365 days a year;
- ❑ adequately sized view sites shall be provided at environmentally acceptable points on the coast line for the purpose of viewing dolphins (see also GFS A8-5);
- ❑ each view site shall be provided with adequate parking;
- ❑ each view site shall be provided with seating;
- ❑ interpretive information and brochures on dolphins and their environment shall be displayed/available.

Preferred requirements:

- ❑ drinking water should be available.

7 **Lighthouse** (see also generic symbol GFS A8):

GFS A8-6

Basic requirements:

- ❑ urban - within 1 km of the nearest numbered route;
- ❑ peri-urban - within 2 km of the nearest numbered route;
- ❑ shall be accessible to the public 365 days a year;
- ❑ shall be provided with seating.

Preferred requirements:

- ❑ visitor information and interpretive material should be available;
- ❑ drinking water should be available.

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8 **Dockyard** (see also generic symbol GFS A8):

GFS A8-7

Basic requirements:

- ❑ urban - within 1 km of the nearest numbered route;
- ❑ peri-urban - within 2 km of the nearest numbered route;
- ❑ shall be accessible to the public 365 days a year;
- ❑ shall include features open to the public for viewing in addition to normal dockyard activities such as :
  - historic features;
  - working features with safe viewing areas and comprehensive visitor information and interpretive material;
  - ship/boat building illustrating various skills and crafts;
- ❑ shall provide effective internal signing for vehicles and pedestrians as appropriate;
- ❑ shall provide adequate rest and refreshment opportunities;
- ❑ shall clearly indicate hazardous areas and areas to which the visiting public are not permitted entry.

Preferred requirements:

- ❑ general visitor information and interpretive material should be provided.

9 **Boat Launch** (see also generic symbol GFS A8):

GFS A8-8

Basic requirements:

- ❑ urban and peri-urban - within 2 km of the nearest numbered route;
- ❑ shall be accessible to the public 365 days a year;
- ❑ the immediate area of the boat launch shall be surfaced with a hard wearing and weather resistant surface and shall be sufficiently large to facilitate easy manoeuvring of vehicles and trailers.

10 **(Coastal) Fishing** (see also generic symbol GFS A8):

GFS A8-9

Basic requirements:

- ❑ urban and peri-urban - within 2 km of the nearest numbered route;
- ❑ shall be registered as a coastal venue with a national or provincial angling organisation and shall be monitored by such organisation or by a registered angling club affiliated to the organisation.

Preferred requirements:

- ❑ drinking water should be available close by;
- ❑ picnic and/or braai facilities;
- ❑ adjacent accommodation (subject to appropriate warrants - see Subsection 9.5.32);
- ❑ shall be open to the public 365 days a year (subject to environmental constraints or review for specifically adverse circumstances);
- ❑ information on costs, rules and regulations shall be clearly displayed at the site.

11 **Crayfish** (see also generic symbol GFS A8) :

GFS A8-10

Basic requirements:

- ❑ urban and peri-urban - the site, or start, and/or other sections, of a tourist route serving several such sites, shall be within 2 km of the nearest numbered route;
- ❑ shall be accessible to the public 365 days a year (although facility is expected to be seasonal);
- ❑ adequately sized sites shall be provided at environmentally acceptable points on the coast line for the purpose of purchasing crayfish;
- ❑ each site shall be provided with adequate parking;
- ❑ each site shall be provided with seating;
- ❑ interpretive information and brochures on crayfish and their environment shall be displayed/available.

Preferred requirements:

- ❑ drinking water should be available.

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12 **Oceanarium** (see also generic symbol GFS A8):

GFS A8-11

Basic requirements:

- ❑ urban and peri-urban - within 1 km of the nearest numbered route;
- ❑ shall have approval to operate from a recognised animal protection group or the Zoological Society of Southern Africa, and shall be regularly inspected by such a group/society;
- ❑ shall be open to the public 365 days a year;
- ❑ registration/reception shall be available;
- ❑ comprehensive visitor information and interpretive material shall be available.

Preferred requirements:

- ❑ displays, which may include aquarium elements, should specifically feature indigenous marine fauna, fish and crustaceans;
- ❑ adequate seating should be provided;
- ❑ refreshments should be available.

13 **Beach** (see also generic symbol GFS A8):

GFS A8-12

Basic requirements:

- ❑ urban and peri-urban - within 2 km of the nearest numbered route;
- ❑ shall be available to the public 365 days a year (and shall not be directly linked to a Aresort@ (see Group A3), or to accommodation);
- ❑ shall be sign posted to indicate whether swimming is safe or not on a Areal-time@ basis;
- ❑ any other regulations pertaining to the use of the beach shall be clearly visible to all;
- ❑ the procedures to be followed in the event of an emergency shall be clearly indicated;
- ❑ the beach shall be cleaned frequently.

Preferred requirements:

- ❑ a public telephone should preferably be available;
- ❑ drinking water should preferably be available;
- ❑ if swimming is permitted, fresh water showers should be provided.

9.5.20 Level 2 Warrant Criteria: Tourist Attractions: Group A9: Arts & Crafts

1 **Generic Arts & Crafts Attractions:**

GFS A9

This symbol may be used either to indicate an Arts & Crafts Route (which may, or may not be numbered as a Tourist Route), or to indicate a High Density Tourist Area with an Aarts & crafts@ theme, subject to compliance with the applicable warrants for a tourist route or HDTA, or any of the individual attractions within Group A9. In the latter two cases the applicable warrants will be those for a HDTA or those listed below.

Basic requirements for an Arts & Crafts Route are:

- ❑ shall involve, primarily (but not exclusively), tourist attractions within close proximity or with direct access from the route in question, which demonstrate a range of arts & crafts of both or either indigenous or non-indigenous origins;
- ❑ whilst the individual attractions may offer products for sale they should promote awareness of the historical background to the skills involved and show the skills in use in the creation of articles of artistic or craft merit;

Other aspects:

- ❑ it is a common feature of Aarts & crafts@ attractions that they are not open to the public on a 365 days a year basis - such facilities will only warrants the provision of Apart-time@ tourism sign type GF17 when they are within a co-ordinated high density tourism area - the density of facilities within such an area will, if warrants are fulfilled, warrant the use of Afull-time@ GF1, GF2 and/or GF3 type tourism signs to indicate the area (not the individual facilities).

2 **Painting and Drawing** (see also generic symbol GFS A9):

GFS A9-1

Basic requirements:

- ❑ urban and peri-urban - within 2 km of the nearest numbered route;
- ❑ shall be open to visitors at least 6 days a week, for 52 weeks a year to qualify for a standard type of tourism sign (see paragraph 9.5.20.1 - AOther aspects@);
- ❑ visitor information and interpretive material, which may include live demonstrations of painting and/or drawing techniques, shall be available;

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- ❑ access to, and touring of the facility, shall be disabled/elderly friendly;
- ❑ a wide variety of products shall be available and the majority of products, by type, shall have been produced on the premises or by the staff of the facility;
- ❑ the balance of material shall have been produced in South Africa or by South African artists.

Preferred requirements:

- ❑ a public telephone should be available;
- ❑ drinking water should be available;
- ❑ refreshments may be provided;
- ❑ seating should be provided;
- ❑ if the facility involves more than one building or covers a wide/landscaped area adequate pedestrian sign posting should be provided.

Other factors:

- ❑ if, for whatever reason, the facility is not open to visitors for the prescribed period, but qualifies for a Apart time@ tourism sign GF17, but can also be viewed by appointment, clear instructions should be available regarding the provision of a key (for a locked gate) or for access to a guide.

3 **Pottery** (see also generic symbol GFS A9):

GFS A9-2

Basic requirements:

- ❑ urban and peri-urban - within 2 km of the nearest numbered route;
- ❑ shall be open to visitors at least 6 days a week, for 52 weeks a year to qualify for a standard type of tourism sign (see paragraph 9.5.20.1 - AOther aspects@);
- ❑ adequate provision shall be made for the safety of visitors when they are in the vicinity of equipment, and for the security of their belongings whilst within the facility site;
- ❑ visitor information and interpretive material, which may include live demonstrations of pottery techniques, shall be available;
- ❑ access to, and touring of the facility, shall be disabled/elderly friendly;
- ❑ the principle activities related to the articles being produced shall occur under a roofed area;
- ❑ a wide variety of products shall be available and the majority of products, by type, shall have been produced on the premises or by the staff of the facility;
- ❑ the balance of material shall have been produced in South Africa or by South African crafts persons.

Preferred requirements:

- ❑ a public telephone should be available;
- ❑ drinking water should be available;
- ❑ refreshments may be provided;
- ❑ seating should be provided;
- ❑ if the facility involves more than one building or covers a wide/landscaped area adequate pedestrian sign posting should be provided.

Other factors:

- ❑ if, for whatever reason, the facility is not open to visitors for the prescribed period, but qualifies for a Apart time@ tourism sign GF17, but can also be viewed by appointment, clear instructions should be available regarding the provision of a key (for a locked gate) or for access to a guide.

4 **Jewellery** (see also generic symbol GFS A9):

GFS A9-3

Basic requirements:

- ❑ urban and peri-urban - within 2 km of the nearest numbered route;
- ❑ shall be open to visitors at least 6 days a week, for 52 weeks a year to qualify for a standard type of tourism sign (see paragraph 9.5.20.1 - AOther aspects@);
- ❑ adequate provision shall be made for the safety of visitors when they are in the vicinity of equipment, and for the security of their belongings whilst within the facility site;
- ❑ visitor information and interpretive material, which may include live demonstrations of jewellery making skills, shall be available;
- ❑ access to, and touring of the facility, shall be disabled/elderly friendly;
- ❑ the principle activities related to the articles being produced shall occur under a roofed area;
- ❑ a wide variety of products shall be available and the majority of products, by type, shall have been produced on the premises or by the staff of the facility;
- ❑ the balance of material shall have been produced in South Africa or by South African crafts persons.

Preferred requirements:

- ❑ a public telephone should be available;
- ❑ drinking water should be available;
- ❑ refreshments may be provided;
- ❑ seating should be provided;

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- ❑ if the facility involves more than one building or covers a wide/landscaped area adequate pedestrian sign posting should be provided.

Other factors:

- ❑ if, for whatever reason, the facility is not open to visitors for the prescribed period, but qualifies for a Apart time@ tourism sign GF17, but can also be viewed by appointment, clear instructions should be available regarding the provision of a key (for a locked gate) or for access to a guide.

5 **Weaving & Knitting** (see also generic symbol GFS A9):

GFS A9-4

Basic requirements:

- ❑ urban and peri-urban - within 2 km of the nearest numbered route;
- ❑ shall be open to visitors at least 6 days a week, for 52 weeks a year to qualify for a standard type of tourism sign (see paragraph 9.5.20.1 - AOther aspects@);
- ❑ adequate provision shall be made for the security of visitors belongings whilst within the facility site;
- ❑ visitor information and interpretive material, which may include live demonstrations of weaving and/or knitting crafts , shall be available;
- ❑ access to, and touring of the facility, shall be disabled/elderly friendly;
- ❑ the principle activities related to the articles being produced shall occur under a roofed area;
- ❑ a wide variety of products shall be available and the majority of products, by type, shall have been produced on the premises or by the staff of the facility;
- ❑ the balance of material shall have been produced in South Africa or by South African crafts persons.

Preferred requirements:

- ❑ a public telephone should be available;
- ❑ drinking water should be available;
- ❑ refreshments may be provided;
- ❑ seating should be provided;
- ❑ if the facility involves more than one building or covers a wide/landscaped area adequate pedestrian sign posting should be provided.

Other factors:

- ❑ if, for whatever reason, the facility is not open to visitors for the prescribed period, but qualifies for a Apart time@ tourism sign GF17, but can also be viewed by appointment, clear instructions should be available regarding the provision of a key (for a locked gate) or for access to a guide.

6 **Leatherwork** (see also generic symbol GFS A9) :

GFS A9-5

Basic requirements:

- ❑ urban and peri-urban - within 2 km of the nearest numbered route;
- ❑ shall be open to visitors at least 6 days a week, for 52 weeks a year to qualify for a standard type of tourism sign (see paragraph 9.5.20.1 - AOther aspects@);
- ❑ adequate provision shall be made for the safety of visitors when they are in the vicinity of equipment, and for the security of their belongings whilst within the facility site;
- ❑ visitor information and interpretive material, which may include live demonstrations of leather making crafts, shall be available;
- ❑ access to, and touring of the facility, shall be disabled/elderly friendly;
- ❑ the principle activities related to the articles being produced shall occur under a roofed area;
- ❑ a wide variety of products shall be available and the majority of products, by type, shall have been produced on the premises or by the staff of the facility;
- ❑ the balance of material shall have been produced in South Africa or by South African crafts persons.

Preferred requirements:

- ❑ a public telephone should be available;
- ❑ drinking water should be available;
- ❑ refreshments may be provided;
- ❑ seating should be provided;
- ❑ if the facility involves more than one building or covers a wide/landscaped area adequate pedestrian sign posting should be provided.

Other factors:

- ❑ if, for whatever reason, the facility is not open to visitors for the prescribed period, but qualifies for a Apart time@ tourism sign GF17, but can also be viewed by appointment, clear instructions should be available regarding the provision of a key (for a locked gate) or for access to a guide.

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7 **African Arts & Crafts** (see also generic symbol GFS A9) :

GFS A9-6

Basic requirements:

- ❑ urban and peri-urban - within 2 km of the nearest numbered route;
- ❑ shall be open to visitors at least 6 days a week, for 52 weeks a year to qualify for a standard type of tourism sign (see paragraph 9.5.20.1 - AOther aspects@);
- ❑ adequate provision shall be made for the safety of visitors when they are in the vicinity of equipment, and for the security of their belongings whilst within the facility site;
- ❑ the arts and crafts shall be of an indigenous and historical African origin;
- ❑ visitor information and interpretive material, which may include live demonstrations of indigenous African artistic and craft techniques, shall be available;
- ❑ access to, and touring of the facility, shall be disabled/elderly friendly;
- ❑ a wide variety of products shall be available and the majority of products, by type, shall have been produced on the premises or by the staff of the facility;
- ❑ the balance of material shall have been produced in South Africa or by South African artists and crafts persons.

Preferred requirements:

- ❑ a public telephone should be available;
- ❑ drinking water should be available;
- ❑ refreshments may be provided;
- ❑ seating should be provided;
- ❑ if the facility involves more than one building or covers a wide/landscaped area adequate pedestrian sign posting should be provided.

Other factors:

- ❑ if, for whatever reason, the facility is not open to visitors for the prescribed period, but qualifies for a Apart time@ tourism sign GF17, but can also be viewed by appointment, clear instructions should be available regarding the provision of a key (for a locked gate) or for access to a guide.

8 **Woodwork** (see also generic symbol GFS A9):

GFS A9-7

Basic requirements:

- ❑ urban and peri-urban - within 2 km of the nearest numbered route;
- ❑ shall be open to visitors at least 6 days a week, for 52 weeks a year to qualify for a standard type of tourism sign (see paragraph 9.5.20.1 - AOther aspects@);
- ❑ adequate provision shall be made for the safety of visitors when they are in the vicinity of equipment, and for the security of their belongings whilst within the facility site;
- ❑ visitor information and interpretive material, which may include live demonstrations of wood-working techniques, shall be available;
- ❑ access to, and touring of the facility, shall be disabled/elderly friendly;
- ❑ the principle activities related to the articles being produced shall occur under a roofed area;
- ❑ a wide variety of products shall be available and the majority of products, by type, shall have been produced on the premises or by the staff of the facility;
- ❑ the balance of material shall have been produced in South Africa or by South African crafts persons.

Preferred requirements:

- ❑ a public telephone should be available;
- ❑ drinking water should be available;
- ❑ refreshments may be provided;
- ❑ seating should be provided;
- ❑ if the facility involves more than one building or covers a wide/landscaped area adequate pedestrian sign posting should be provided.

Other factors:

- ❑ if, for whatever reason, the facility is not open to visitors for the prescribed period, but qualifies for a Apart time@ tourism sign GF17, but can also be viewed by appointment, clear instructions should be available regarding the provision of a key (for a locked gate) or for access to a guide.

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9 **Metalwork** (see also generic symbol GFS A9):

GFS A9-8

Basic requirements:

- ❑ urban and peri-urban - within 2 km of the nearest numbered route;
- ❑ shall be open to visitors at least 6 days a week, for 52 weeks a year to qualify for a standard type of tourism sign (see paragraph 9.5.20.1 - "Other aspects");
- ❑ adequate provision shall be made for the safety of visitors when they are in the vicinity of equipment, and for the security of their belongings whilst within the facility site;
- ❑ a significant element of the workmanship shall involve hand crafting i.e. NOT mechanised or organised on a mass production basis.
- ❑ visitor information and interpretive material, which may include live demonstrations of metal-working techniques, shall be available;
- ❑ access to, and touring of the facility, shall be disabled/elderly friendly;
- ❑ the principle activities related to the articles being produced shall occur under a roofed area;
- ❑ a wide variety of products shall be available and the majority of products, by type, shall have been produced on the premises or by the staff of the facility;
- ❑ the balance of material shall have been produced in South Africa or by South African crafts persons.

Preferred requirements:

- ❑ a public telephone should be available;
- ❑ drinking water should be available;
- ❑ refreshments may be provided;
- ❑ seating should be provided;
- ❑ if the facility involves more than one building or covers a wide/landscaped area adequate pedestrian sign posting should be provided.

Other factors:

- ❑ if, for whatever reason, the facility is not open to visitors for the prescribed period, but qualifies for a "part time" tourism sign GF17, but can also be viewed by appointment, clear instructions should be available regarding the provision of a key (for a locked gate) or for access to a guide.

9.5.21 Level 2 Warrant Criteria: Tourist Attractions: Group A10: Cultural Attractions

1 **Generic Cultural Attractions:**

GFS A10

This symbol may be used as a collective or generic symbol for a Cultural Attractions route (which may or may not be numbered as a Tourist Route), or to indicate a High Density Tourist Area with a "cultural" theme, subject to compliance with the applicable warrants for a tourist route or HDTA, or any of the individual attractions within Group A10. In the latter two cases the applicable warrants will be those for a HDTA or those listed below.

2 **Theatre** (see also generic symbol GFS A10):

GFS A10-1

Basic requirements:

- ❑ urban and peri-urban - within 1 km of the nearest numbered route;
- ❑ shall have approved fire/emergency evacuation procedures including a clearly documented communication procedure for staff;
- ❑ shall have a minimum of 80 seats;
- ❑ shall submit reasonable documentation to support an expected programme of productions which will mean that the theatre is effectively open to the public for a minimum of 35 weeks a year (in reaching this aggregate productions do not need to run continuously from one to another);
- ❑ the premises shall be disabled/elderly friendly;
- ❑ a public telephone shall be provided.

Preferred requirements

- ❑ refreshments should be available.

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3 **Amphitheatre** (see also generic symbol GFS A10):

GFS A10-2

Basic requirements:

- ❑ urban and peri-urban - within 1 km of the nearest numbered route;
- ❑ shall have a minimum of 80 seats;
- ❑ shall submit documentation to support an expected programme of at least 35 events in a year;
- ❑ shall be disabled/elderly friendly;
- ❑ a public telephone shall be available;
- ❑ drinking water shall be available.

Preferred requirements:

- ❑ refreshments should be available, or, if in a natural setting facilities for picnics/braais should be available.

9.5.22 Level 2 Warrant Criteria: Tourist Attractions: Group A11: Adventure Attractions

1 **Generic Adventure Attractions:**

Symbol design pending

This symbol may be used as a collective or generic symbol for an Adventure Attractions route (which may, or may not, be numbered as a Tourist Route), or to indicate a High Density Tourist Area with an Aadventure@ theme, subject to compliance with the applicable warrants for a tourist route or HDTA, or for any of the individual attractions within Group A11. In the latter two cases the applicable warrants will be those for a HDTA or those listed below.

2 **Hiking Trail** (see also generic symbol GFS A11):

GFS A11-1

Basic requirements:

- ❑ urban and peri-urban - the start of the trail shall be within 5 km of the nearest numbered route;
- ❑ all hiking trails shall be approved by a recognised hiking association or club;
- ❑ if a hiking trail is within an environmentally sensitive area it must also be approved by the Department of Environmental Affairs and Tourism or its appointed agent;
- ❑ the trail shall be accessible to visitors 365 days a year, subject to severe weather and/or adverse environmental conditions;
- ❑ a map of the trail shall be readily available;
- ❑ there shall be a registration process to be complied with by hikers entering and leaving the trail;
- ❑ full details of the trail and the entry registration **process** shall be lodged with the appropriate emergency services;
- ❑ there shall be an information board at the start of the trail indicating (this may be repeated at strategic points along the trail):
  - where drinking water can be obtained;
  - the location of overnight stopping places;
  - hazardous areas;
  - emergency procedures to be followed.

3 **Horse Trail** (see also generic symbol GFS A11):

GFS A11-2

Basic requirements:

- ❑ peri-urban - within 5 km of the nearest numbered route (if a horse trail is provided within an urban area the same criteria shall apply);
- ❑ environmental management principles, including particular attention to the potential for erosion on the trail and all access roads, shall be fundamental to all activities pertaining to the planning and use of horse trails;
- ❑ the trail shall be accessible to visitors 365 days a year, subject to severe weather and/or adverse environmental conditions;
- ❑ measures to ensure the safety and security of visitors and their belongings shall be fostered at all times;
- ❑ there shall be adequate signposting.

Preferred requirements:

- ❑ drinking water should be available;
- ❑ access to the trail and carriage riding, where practical, should be disabled/elderly friendly;
- ❑ visitor information such as interpretive brochures, displays and a visitors book should be provided;
- ❑ seating should be provided;
- ❑ the availability of wildlife viewing hides and view-points should be considered;
- ❑ the provision of camping/braai/picnic sites should be considered.

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Other factors:

- ❑ if, for whatever reason, the horse trail is only accessible by appointment, or is kept locked, a guide should be available and clear instructions given for the collection and return of the key.

4 **4 x 4 Trail** (see also generic symbol GFS A11):

GFS A11-3

Basic requirements:

- ❑ peri-urban - the start of the trail shall be within 5 km of the nearest numbered route;
- ❑ all 4 x 4 trails shall be approved by a recognised 4 x 4 association or club;
- ❑ 4 x 4 trails shall not be located within or through environmentally sensitive areas;
- ❑ the trail shall be accessible 365 days a year, subject to severe weather and/or adverse environmental conditions;
- ❑ a map of the trail shall be readily available;
- ❑ there shall be an information board at the start of the trail indicating (this may be repeated at strategic points along the trail):
  - the rules and regulations pertaining to use of the trail (e.g. staying on the trail, no shooting, no littering, actions to be taken at rivers etc.);
  - drinking water availability;
  - the location of overnight stopping places;
  - up to date material about the trail accessibility and condition (related to recent/current weather and environmental conditions);
  - emergency procedures to be followed.

5 **Bike Trail** (see also generic symbol GFS A11):

GFS A11-4

Basic requirements:

- ❑ peri-urban - within 5 km of the nearest numbered route;
- ❑ all bike trails shall be approved by a recognised bike club;
- ❑ the trail shall be available at least two days a week 52 weeks a year;
- ❑ bike trails shall be subject to environmental management principles, including particular attention to the potential for erosion;
- ❑ a map of the area, indicating environmentally sensitive areas, shall be available and this shall be regularly updated with regard to such sensitive areas.

Preferred requirements:

- ❑ drinking water should be available;
- ❑ a brochure providing information on rules and environmental issues should be available.

Other factors:

- ❑ if, for whatever reason (e.g. private property), the bike trail is only accessible by appointment, or is kept locked, a guide should be available and clear instructions given for the collection and return of the key.

6 **River Rafting** (see also generic symbol GFS A11);

GFS A11-5

Basic requirements:

- ❑ peri-urban - within 10 km of the nearest numbered route;
- ❑ river rafting sites, and the access to them, shall be subject to environmental management principles during all planning and use activities;
- ❑ the site shall be available to users 365 days a year, subject to water levels and other environmental factors, and control by experienced rafters;
- ❑ a map or brochure of the river identifying all hazards and access points shall be available;
- ❑ there shall be an information board at all points of access to the river, indicating :
  - the rules and regulations pertaining to use of the river;
  - drinking water availability;
  - the location of overnight stopping places;
  - up to date material about the river conditions and specific hazards;
  - the quality of the river water for drinking purposes and /or required actions;
  - emergency procedures to be followed.

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7 **Scuba Diving** (see also generic symbol GFS A11);

GFS A11-6

Basic requirements:

- ❑ urban and peri-urban - within 5 km of the nearest numbered route;
- ❑ divers shall be required to provide proof of registration with an approved scuba diving association or club i.e. NAUI, SAUU, PADI or SSI;
- ❑ scuba diving sites shall be subject to environmental management principles during all planning and use activities;
- ❑ the site shall be available for at least 6 days a week, 52 weeks a year, subject to adverse weather conditions;
- ❑ information shall be provided by brochure, and/or information board indicating:
- the rules and regulations pertaining to use of the site(s);
- safety procedures;
- emergency procedures to be followed.

Preferred requirements:

- ❑ diving equipment should preferably be available for hire;
- ❑ additional facilities such as charter dive boats and diving courses should preferably be available;
- ❑ adjacent accommodation and/or camping area(subject to appropriate warrants - see Subsection 9.5.32).

8 **Ballooning** (see also generic symbol GFS A11):

GFS A11-7

Basic requirements:

- ❑ peri-urban - a formal launch site shall be within 5 km of the nearest numbered route;
- ❑ launch sites shall be in regular use at least 2 days a week, 52 weeks a year subject to adverse weather conditions;
- ❑ information shall be provided by brochure and/or an information board indicating :
- the rules and regulations pertaining to the use of balloons;
- prevailing weather conditions;
- safety requirements and known hazards e.g. power lines et;
- emergency procedures to be followed.

Preferred requirements:

- ❑ drinking water should be available;
- ❑ seating and shade cover should be available.

9.5.23 Level 2 Warrant Criteria: Tourist Attractions: Group A12: Farming Attractions

1 **Generic Farming Attractions:**

GFS A12

Farming attractions are not likely to be common even in peri-urban areas although it is a feature of smaller towns that certain types of farming attraction occur around the fringes of the built-up area. The various warrants are therefore included here for completeness.

This symbol may be used as a collective or generic symbol for a Farming Attraction or Scenic Farming Route (which may, or may not, be numbered as a Tourist Route), or to indicate a High Density Tourist Area with a Afarming@ theme, subject to compliance with the applicable warrants for a tourist route or HDTA, or for any of the individual attractions within Group A12. In the latter two cases the applicable warrants will be those for a HDTA or those listed below.

2 **Wine Cellar** (see also generic symbol GFS A12):

GFS A12-1

Basic requirements:

- ❑ peri-urban - within 2 km of the nearest numbered route;
- ❑ environmental management principles in relation to the tourist activity shall be fundamental to all activities pertaining to the use of the resources;
- ❑ shall be open to day visitors for at least 8 hours per day for at least 5 days of the week and for at least 6 months of the year;
- ❑ shall incorporate a building with a wine tasting area where visitors may view a selection of the wines available for purchase;
- ❑ the wines sold shall have been manufactured or bottled on the premises;
- ❑ interpretive material on the wine making industry shall be available (see also Wine Route - GFS A12-2).

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Preferred requirements:

- ❑ drinking water should be available;
- ❑ a public telephone should be available;
- ❑ seating should be provided and the premises should be disabled/elderly friendly;
- ❑ guided tours of the premises may be provided;
- ❑ the premises may incorporate a restaurant (subject to compliance with the appropriate warrants - see Subsection 9.5.28).

3 **Wine Route** (see also generic symbol GFS A12):

GFS A12-2

Basic requirements:

- ❑ peri-urban - the wine route, whether numbered as a tourist route or not, shall commence from a numbered navigational route (N, R or M prefix to the route number);
- ❑ shall be over public roads open 365 days a year;
- ❑ a route shall provide access to at least three vineyards which shall be open to the public for at least 6 hours per day for at least 5 days a week and for at least 6 months of the year.

Preferred requirements:

- ❑ the vineyards which are open to the public should provide at least the following:
- the opportunity to tour the vineyard and a representative selection of the working buildings;
- refreshments;
- interpretive material regarding the wine industry.

4 **Showground** (see also generic symbol GFS A12):

GFS A12-3

Basic requirements:

- ❑ urban and peri-urban - within 2 km of the nearest numbered route;
- ❑ shall submit documentation to support an expected programme of at least 35 events in a year;
- ❑ shall be disabled/elderly friendly;
- ❑ a public telephone shall be available;
- ❑ drinking water shall be available.

Preferred requirements:

- ❑ refreshments and/or facilities for picnics/braais should be available.

5 **Cherry Farm** (see also generic symbol GFS A12):

GFS A12-4

Basic requirements:

- ❑ peri-urban - within 5 km of the nearest numbered route;
- ❑ environmental management principles in relation to the tourist activity shall be fundamental to all activities pertaining to the use of the resources;
- ❑ shall be open to day visitors for at least 6 hours per day for at least 5 days of the week and for at least 6 months of the year;
- ❑ cherry farming shall be the main activity of the farm;
- ❑ shall provide a building with reception/sales areas;
- ❑ interpretive material on the wine making industry shall be available (see also Wine Route - GFS A12-2).

Preferred requirements:

- ❑ drinking water, refreshments and/or facilities for picnics/braais should be available;
- ❑ guided tours through the cherry orchards should be offered.

6 **Ostrich Farm with Ostrich Riding** (see also generic symbol GFS A12):

GFS A12-5

Basic requirements:

- ❑ peri-urban - within 2 km of the nearest numbered route;
- ❑ shall be open to day visitors and shall offer rides/demonstration rides during at least a 6 hour period per day for 365 days a year, subject to weather conditions;
- ❑ the farm shall have approval to operate from a recognised animal protection group or the Zoological Society of Southern Africa, and shall be regularly inspected by such a group/society;
- ❑ environmental management principles, including responsible and sustained tourism development principles shall be fundamental to all activities pertaining to the use of the resources;
- ❑ shall have a clearly documented communication and emergency procedure to be followed by officials in the event of an incident;

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- ❑ comprehensive visitor information, interpretive material, warnings against specific hazards, and procedures to be followed by the public in the event of an emergency shall be clearly displayed;
- ❑ shall provide a daily programme of awareness/ educational presentations;
- ❑ ostrich riding shall only occur within a designated area which minimises the risk of injury to the ostriches, riders and onlookers;
- ❑ ostrich riding shall only occur under the control of trained handlers and competent assistants;
- ❑ all ostrich products on sale shall comply with relevant health regulations (including regular inspections by health officials);
- ❑ visitor parking shall be separated a safe distance from ostrich viewing and riding areas;
- ❑ drinking water shall be available.

Preferred requirements:

- ❑ refreshments and/or facilities for picnics/braais should be available.

7 **Ostrich Farm** (see also generic symbol GFS A12):

GFS A12-12-6

Basic requirements:

- ❑ all requirements for GFS A12-5, with the exception of those related to ostrich riding, shall be complied with.

8 **Fish Farm** (see also generic symbol GFS A12):

GFS A12-7

Basic requirements:

- ❑ peri-urban - within 2 km of the nearest numbered route;
- ❑ shall be open to visitors at least 6 hours per day for 365 days a year;
- ❑ environmental management principles, including responsible and sustained tourism development principles shall be fundamental to all activities pertaining to the use of the resources;
- ❑ shall provide comprehensive visitor information, interpretive material and daily awareness/ educational presentations;
- ❑ drinking water shall be available.

9 **Roadside Stall** (see also generic symbol GFS A12):

GFS A12-8

Basic requirements:

- ❑ peri-urban - subject to road authority approval a roadside stall selling farm produce may be located immediately adjacent to any class of road other than a Class AA road;
- ❑ shall be open to the public for 8 hours a day 365 days a year, unless the produce is of a seasonal nature, in which case the stall shall be open to the public on a daily basis for at least 6 months of the year;
- ❑ the lay-by serving such a roadside stall shall:
- be sufficiently set back from the edge of the roadway to be safe;
- be provided with a permanent surface;
- provide for a minimum of 5 visitors vehicles at one time, subject to road authority requirements for a larger number of spaces;
- ❑ the produce on sale shall have been produced on the farm on which, or adjacent to which, it is located.

Preferred requirements:

- ❑ drinking water should be available;
- ❑ seating and shade should be provided.

10 **Butterfly Farm** (see also generic symbol GFS A12):

GFS A12-9

Basic requirements:

- ❑ peri-urban - within 5 km of the nearest numbered route;
- ❑ shall be open to visitors for at least 6 hours per day for at least 5 days a week for 365 days a year;
- ❑ environmental management principles, including responsible and sustained tourism development principles shall be fundamental to all activities pertaining to the use of the resources;
- ❑ shall provide comprehensive visitor information, interpretive material and daily awareness and/or educational presentations.

Preferred requirements:

- ❑ drinking water should be available;
- ❑ seating and shade should be provided.

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9.5.24 Level 2 Warrant Criteria: Tourist Attractions: Group A13: General Attractions

1 **Generic General Attractions:**

Symbol design pending

This symbol may be used for any previously identified class of tourist attraction, or, for any tourist attraction which either cannot be easily allocated to an existing class or which caters for a wide variety of tourist attraction types. Otherwise the principle characteristics of a General Attraction are that is visited primarily by tourists for pleasure and/or relaxation, and that tourists visit in sufficient numbers, and from sufficiently far away from the area of the attraction, that a tourism sign is justified on the grounds of traffic generation.

Basic Requirements:

- ❑ as with all tourist attractions the requirements of Subsections 9.5.11 and 9.5.12 shall be complied with;
- ❑ urban and peri-urban - within 2 km of the nearest numbered route;
- ❑ the general attraction shall be open to visitors 365 days a year;
- ❑ environmental management principles in relation to the tourist activity shall be fundamental to all activities pertaining to the use of the resources;
- ❑ if the general attraction involves fauna it shall have approval to operate from a recognised animal protection group or the Zoological Society of Southern Africa, and shall be regularly inspected by such a group/society;
- ❑ comprehensive visitor information, interpretive material, warnings against specific hazards, and procedures to be followed by the public in the event of an emergency shall be clearly displayed;
- ❑ measures to ensure the safety and security of visitors and their belongings shall be fostered at all times;
- ❑ drinking water shall be available.

Preferred requirements:

- ❑ the facility should be disabled/elderly friendly;
- ❑ seating should be provided;
- ❑ the provision of refreshments and/or picnic/braai sites should be considered.

2 **Animal Theme Park:**

GFS A13-1

Basic requirements:

- ❑ urban and peri-urban - within 2 km of the nearest numbered route;
- ❑ the theme park shall be open to visitors 365 days a year;
- ❑ environmental management principles in relation to the tourist activity shall be fundamental to all activities pertaining to the use of the resources;
- ❑ the theme park shall have approval to operate from a recognised animal protection group or the Zoological Society of Southern Africa, and shall be regularly inspected by such a group/society;
- ❑ comprehensive visitor information, interpretive material, warnings against specific hazards, and procedures to be followed by the public in the event of an emergency shall be clearly displayed;
- ❑ measures to ensure the safety and security of visitors and their belongings shall be fostered at all times;
- ❑ drinking water shall be available.

Preferred requirements:

- ❑ the facility should be disabled/elderly friendly;
- ❑ seating should be provided;
- ❑ the provision of refreshments and/or picnic/braai sites should be considered.

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9.5.25 Level 2: Warrant Criteria: Emergency Services: Group B1:

1 **Telephone:**

GFS B1-1

Basic Requirements:

- ❑ urban - within 1 km of the nearest numbered route;
- ❑ shall be accessible 24 hours per day 365 days per year.

2 **Police:**

GFS B1-2(RSA)

Basic Requirements:

- ❑ urban - within 5 km of the nearest numbered route;
- ❑ shall be open 24 hours per day 365 days per year.

3 **Hospital:**

GFS B1-3

Basic Requirements:

- ❑ urban - generally within 5 km of the nearest numbered route, but in metropolitan areas the signing of hospitals should be planned, co-ordinated and implemented, in conjunction with the hospitals, to provide the best possible 24 hour emergency service accessibility for road users;
- ❑ a casualty or emergency facility shall be open 24 hours per day 365 days per year.

4 **First Aid:**

GFS B1-4

Basic Requirements:

- ❑ urban - generally within 2 km of the nearest numbered route (see note under GFS B1-3: Hospitals);
- ❑ shall be open 10 hours per day 365 days per year.

5 **SOS Telephones:**

GFS B1-5

Basic Requirements:

- ❑ when a system is installed signs shall be provided.

NOTE: Symbol GFS B1-6 is a variation of symbol GFS B1-5 for use on the actual phone installation.

9.5.26 Level 2 Warrant Criteria: Vehicle Services: Group B2:

1 All light vehicle service facilities considered for the provision of a tourism service sign shall provide a photocopy of a current trading/operating licence and shall be inspected for compliance with the following criteria by staff of the Automobile Association of South Africa:

2 **Filling Station and Workshop**:

GFS B2-1

Basic requirements:

- ❑ the premises and operation shall be in accordance with statutory requirements of local and other authorities with regard to planning, construction, water supply, sewage disposal, garbage collection and disposal, fire precautions and general safety;
- ❑ urban and peri-urban - within 500m of the nearest numbered route, provided:
- there has been no qualifying filling station, or filling station and workshop, accessible from the same numbered route within 5 km of the junction under consideration for a sign;
- there is no closer service station at the junction under consideration for a sign;
- ❑ the facility shall be open as a filling station 24 hours per day 365 days per year (subject to compliance with any national controls exercised from time to time);
- ❑ shall have at least six fuel outlet points in urban areas;
- ❑ all fuel pumps shall be covered by a canopy;
- ❑ the standing area for vehicle refuelling shall have a permanent surface;
- ❑ the active area of the facility shall be illuminated at night;
- ❑ water and air shall be available during the period that fuel is sold;

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- ❑ toilet facilities of an acceptable standard shall be available for sale during normal office hours;
- ❑ a workshop suitable for the repair of all makes and models of popular light vehicle shall be provided;
- ❑ a qualified mechanic trained to repair all makes and models of popular light vehicle shall be available during normal office hours (minimum 8 hours), and be on stand-by for calls after hours;
- ❑ an acceptable range and number of the most necessary spare parts likely to be required by a long distance driver shall be available for all makes and models of popular light vehicle (e.g. fan belts, tyres, tubes, water pipes, windscreen wipers, batteries etc.).

3 **Filling Station**:

GFS B2-2

Basic requirement:

- ❑ the premises and operation shall be in accordance with statutory requirements of local and other authorities with regard to planning, construction, water supply, sewage disposal, garbage collection and disposal, fire precautions and general safety;
- ❑ urban and peri-urban - within 500m of the nearest numbered route, provided:
- there has been no qualifying filling station, or filling station and workshop, accessible from the same numbered route within 5 km of the junction under consideration for a sign;
- there is no closer service station at the junction under consideration for a sign;
- ❑ the facility shall be open as a filling station 24 hours per day 365 days per year (subject to compliance with any national controls exercised from time to time);
- ❑ shall have at least six fuel outlet points in urban areas;
- ❑ all fuel pumps shall be covered by a canopy;
- ❑ the standing area for vehicle refuelling shall have a permanent surface;
- ❑ the active area of the facility shall be illuminated at night;
- ❑ water and air shall be available during the period that fuel is sold;
- ❑ toilet facilities of an acceptable standard shall be available to the public during the period that fuel is sold (see Subsection 9.5.12 for details of "acceptable standard");
- ❑ a telephone shall be available to the public during the period that fuel is sold;
- ❑ road maps of an area in which the facility is situated shall be available for sale during normal office hours;
- ❑ an acceptable range and number of the most necessary spare parts likely to be required by a long distance driver shall be available for all makes and models of popular light vehicle (e.g. fan belts, tyres, tubes, water pipes, windscreen wipers, batteries etc.).

4 **Workshop**:

GFS B2-3

Basic Requirements:

- ❑ a workshop suitable for the repair of all makes and models of popular light vehicles shall be provided;
- ❑ urban and peri-urban - within 500m of the nearest numbered route, provided:
- there has been no qualifying filling station, or filling station and workshop, accessible from the same numbered route within 5 km of the junction under consideration for a sign;
- there is no closer service station at the junction under consideration for a sign;
- ❑ a qualified mechanic trained to repair all makes and models of popular light vehicles shall be available during; normal office hours (minimum 8 hours), and be on stand-by for calls after hours;
- ❑ an acceptable range and number of the most necessary spare parts likely to be required by a long distance driver shall be available for all makes and models of popular light vehicle (e.g. fan belts, tyres, tubes, water pipes, windscreen wipers, batteries etc.);
- ❑ toilet facilities of an acceptable standard shall be available to the public (see Subsection 9.5.12 for details of "acceptable standard");
- ❑ a telephone shall be available to the public.

5 **Tow-In Service**:

GFS B2-4

Basic Requirements:

- ❑ urban - within 1 km of the nearest numbered route;
- ❑ the facility shall be available 24 hours per day 365 days per year.

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9.5.27 Level 2 Warrant Criteria: Truck Rest and Service: Group B3:

1 **Truck Services:**

All truck service facilities considered for the provision of a tourism service sign shall provide a photocopy of a current trading/operating licence and shall be inspected for compliance with the following criteria by staff of the Road Freight Association (RFA) and/or NAPTO:

GFS B3-1

Basic Requirements:

- ❑ the premises and operation shall be in accordance with statutory requirements of local and other authorities with regard to planning, construction, water supply, sewage disposal, garbage collection and disposal, fire precautions and general safety;
- ❑ urban and peri-urban - within 500m of the nearest numbered route, provided:
- there has been no qualifying filling station, or filling station and workshop, accessible from the same numbered route within 5 km of the junction under consideration for a sign;
- there is no closer service station at the junction under consideration for a sign;
- ❑ the facility shall be open as a service for (trucks ONLY) 24 hours per day 365 days per year (subject to compliance with any national controls exercised from time to time);
- ❑ shall have at least four diesel outlet points;
- ❑ all fuel pumps shall be covered by a canopy;
- ❑ the standing area for vehicle refuelling shall have a permanent surface;
- ❑ the active area of the facility shall be illuminated at night;
- ❑ water and air shall be available during the period that fuel is sold;
- ❑ toilet facilities of an acceptable standard shall be available during the period that fuel is sold;
- ❑ a telephone shall be available during the period that fuel is sold;
- ❑ an acceptable number of the most necessary spare parts likely to be needed by long distance truckers shall be available;
- ❑ sufficient parking for at least ten trucks shall be available, free of charge, as rest stops 24 hours per day.

Optional Facilities**:**

if any of the following are provided to an acceptable standard the use of a primary name on the sign may be considered (see Level 3 warrants):

- ❑ at least six lettable chalets;
- ❑ suitable fireplaces for cooking purposes;
- ❑ suitable refreshment or take-away service (subject to compliance with the warrants given in Subsection 9.5.28).

9.5.28 Level 2 Warrant Criteria: Food Services: Group B4:

1 **Restaurant:**

all restaurant facilities considered for the provision of a tourism service sign shall provide a photocopy of a current trading/operating licence and shall be inspected for compliance with the following criteria:

GFS B4-1

Basic requirements:

- ❑ the premises and operation shall be in accordance with statutory requirements of local and other authorities with regard to planning, construction, water supply, sewage disposal, garbage collection and disposal, fire precautions and general safety;
- ❑ urban and peri-urban - within 1 km of the nearest national route;
- ❑ the facility shall be open 40 hours per week 52 weeks per year to serve lunch and dinner;
- ❑ light refreshments shall be available between normal mealtimes;
- ❑ the food shall be good quality, properly cooked and attractively presented;
- ❑ the service shall be efficient and courteous, and be given in both official languages, imparting an atmosphere of welcome and willingness to please;
- ❑ menus, in keeping with the establishment, should be displayed in a weatherproof frame outside the main entrance;
- ❑ menus shall be clean and pleasant to handle and shall provided in both official languages and in sufficient number, and shall indicate prices, VAT and any extra charges;
- ❑ the dining area shall be suitably and adequately illuminated;
- ❑ ventilation, whether natural or mechanical, shall be capable of providing a continuous flow of fresh air to all areas;
- ❑ tables and seating shall be of quality and arrangement to permit customers and staff to circulate easily in the dining area; they shall be of adequate size to enable customers to dine in comfort;
- ❑ floors shall be clean and without dangerous steps, tears in carpets, vinyl tiles;
- ❑ decor shall be in good taste and in good clean condition;
- ❑ table appointments shall be of good quality (this includes cutlery, condiments, ashtrays, tablecloths, napkins, mats etc.);

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- an adequate number of toilets shall be available for men and women and shall be clearly signed; these shall be in first class repair and shall be regularly inspected to ensure cleanliness and overall maintenance; there shall be adequate natural and artificial ventilation; attention will be paid to the ease of use by disabled persons;
- kitchen equipment shall be adequate and suitable for the type of catering provided; this covers cooking, food storage, and food preparation equipment; floors, walls and ceilings shall be of a suitable type to maintain the highest standards of hygiene; cooking utensils shall be of suitable design and properly stored; waste bins shall be covered and suitably located; yards and approach areas to the kitchen shall be maintained in the same hygienic condition;
- the restaurant shall be under the constant control of a competent manager or supervisor during operating hours;
- waiters/waitresses shall be properly trained in the service of food and, if appropriate, drink; they shall be friendly, clean, neat, tidy and pleasant in appearance;
- kitchen staff shall be competent and clean;
- indoor seating shall be provided for at least 20 persons.

2 **Refreshments and Take-away:**

All facilities providing refreshment and/or take-aways considered for the provision of a tourism service sign shall provide a photocopy of a current trading/operating licence and shall be inspected for compliance with the following criteria.

GFS B4-2

GFS B4-3

Basic requirements:

- the premises and operation shall be in accordance with statutory requirements of local and other authorities with regard to planning, construction, water supply, sewage disposal, garbage collection and disposal, fire precautions and general safety;
- urban and peri-urban - within 500 m of the nearest numbered route;
- the facility shall be open 12 hours per day 365 days per year;
- the food shall be of good quality, properly cooked and attractively presented;
- waiter/menu service shall be efficient, courteous, and clear, and in sufficient number, giving prices, VAT and any extra charges;
- the entire area shall be suitably and adequately illuminated;
- an adequate number of toilets shall be available for men and women and shall be clearly signed; these shall be in first class repair and shall be regularly inspected to ensure cleanliness and overall maintenance;
- kitchen equipment shall be adequate and suitable for the type of catering provided; this covers cooking, food storage, and food preparation equipment; floors, walls and ceilings shall be of a suitable type to maintain the highest standards of hygiene; cooking utensils shall be of suitable design and properly stored; waste bins shall be covered and suitably located; yards and approach areas to the kitchen shall be maintained in the same hygienic condition;
- waiters/waitresses shall be properly trained in the service of food and, if appropriate, drink; they shall be friendly, clean, neat, tidy and pleasant in appearance;
- kitchen staff shall be competent and clean;
- indoor and/or outdoor seating shall be provided for at least 10 persons;
- a parking area adequate for at least 10 light vehicles shall be available (separate and adequately dimensioned parking may also or alternatively be provided for heavy vehicles).

9.5.29 Level 2 Warrant Criteria: General Services: Group B5:

1 Certain of the services in Group B5 classified as "General Services" are not likely to be individually signposted in urban (or peri-urban) areas, except in circumstances unique to specific urban environments i.e. a shower near a beach in a coastal town. All services in the group are detailed here, however, for completeness.

2 All general service facilities shall have a clean, attractive and well- kept appearance, and shall be maintained in a good state of repair.

3 **Parking Area:**

GFS B5-1

Basic requirements:

- to qualify for the use of the symbol GFS B5-1 on a tourism sign the parking area concerned shall be free, and shall have been provided primarily for tourists (see definitions in Volume 2, Chapter 4, Section 4.8) - the equivalent symbols GDS-20 and GDLS A1-11 (or GDLS A1-12) should be used on DIRECTION or LOCAL DIRECTION signs when the parking is not free and/or is associated with a non-tourist related commercial operation (in this context the classification of the facility as "tourist" or "local" is relevant);
- urban - within 500 m of the nearest numbered route (this criterion may be varied when the point of access to parking has been located to suit an approved development plan);
- peri-urban - within 1 km of the nearest numbered route;

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- ❑ parking shall be available at least 12 hours a day 365 days a year;
- ❑ measures to ensure the safety and security of visitors and their belongings shall be fostered at all times.

4 **Toilets:**

GFS B5-2

Basic requirements:

- ❑ to qualify for the use of symbol GFS B5-2 on a tourism sign the toilets concerned shall have been provided primarily for tourists (see definitions in Volume 2, Chapter 4, Section 4.8);
- ❑ urban - within 200 m of the nearest Class "B" or "C" road;
- ❑ peri-urban - within 500 m of the nearest Class "B" or "C" road;
- ❑ the toilets shall be open to tourists at all times that adjacent tourist attractions and/or services are open to tourists 365 days a year;
- ❑ toilets shall be available:
- for both genders;
- with adequate and suitable illumination;
- with adequate natural and artificial ventilation;
- subject to regular inspection for cleanliness and state of repair/maintenance;
- shall have floor surfaces and levels that minimize any hazard.

5 **Shower:**

GFS B5-3

Basic requirements:

- ❑ to qualify for the use of symbol GFS B5-3 on a tourism sign the showers concerned shall have been provided primarily for tourists (see definitions in Volume 2, Chapter 4, Section 4.8);
- ❑ in an urban or peri-urban environment showers will almost certainly be associated with toilets in which case the service class tourism sign may display both symbols, otherwise distance warrants of 200 m (urban) and 500 m (peri-urban) from the nearest Class "B" or "C" road shall apply;
- ❑ the toilets shall be open to tourists at all times that adjacent tourist attractions and/or services are open to tourists 365 days a year;
- ❑ toilets shall be available:
- for both genders;
- with adequate and suitable illumination;
- with adequate natural and artificial ventilation;
- subject to regular inspection for cleanliness and state of repair/maintenance;
- shall have floor surfaces and levels that minimize any hazard.

6 **Drinkable Water:**

GFS B5-4

Basic requirements:

- ❑ the need to sign "drinkable water" for drivers of vehicles is likely to be rare in an urban or peri-urban environment - should such a need arise a distance warrant of 200 m from the nearest Class "B" or "C" road should be considered.

7 **Fireplace:**

GFS B5-5

Basic requirements:

- ❑ the need to sign "fireplaces" for drivers of vehicles is likely to be rare in an urban or peri-urban environment - should such a need arise a distance warrant of 200 m from the nearest Class "B" or "C" road should be considered;
- ❑ any fireplaces provided for public use in an urban or peri-urban environment shall be kept in a clean and hygienic condition;
- ❑ firewood and/or gas cylinders shall be available;
- ❑ the fireplaces shall be provided with basic cover from rain or sun;
- ❑ each fireplace shall be provided with a rubbish bin.

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8 **Cooking Facilities:**

GFS B5-6

Basic requirements:

- ❑ the need to sign "cooking facilities" for drivers of vehicles is likely to be rare in an urban or peri-urban environment - should such a need arise a distance warrant of 200 m from the nearest Class "B" or "C" road should be considered;
- ❑ any cooking facility provided for public use in an urban or peri-urban environment shall be kept in a clean and hygienic condition;
- ❑ firewood and/or gas cylinders shall be available;
- ❑ the cooking facility shall be provided with basic cover from rain or sun;
- ❑ each cooking facility shall be provided with a rubbish bin.

9 **Picnic Area:**

GFS B5-7

Basic requirements:

- ❑ urban and peri-urban - within 2 km of the nearest numbered route;
- ❑ the picnic area shall be open to public 365 days a year;
- ❑ adequate and scenic parking shall be provided;
- ❑ an adequate number of toilets complying with the requirements for GFS B5-2 shall be provided;
- ❑ drinking water shall be available;
- ❑ adequate rubbish bins shall be provided;

Preferred requirements:

- ❑ cooking/braai facilities complying with the requirements for GFS B5-6 should be provided if practical;
- ❑ the facility should be disabled/elderly friendly.

10 **Tourist Information:**

GFS B5-8

Basic Requirements:

- ❑ to qualify for the use of symbol GFS B5-8 on a tourism sign the information centre, bureau or lay-by shall have been provided primarily for tourists (see definition in Volume 2, Chapter 4, Section 4.8) - the equivalent symbol GDLS A2-1 should be used on LOCAL DIRECTION signs when the information available is of a more general nature and symbol/sign IN12 should be used to identify such a general information centre;
- ❑ urban and peri-urban - within 1 km of the nearest numbered route;
- ❑ essential information shall be displayed in such a way that it is available 24 hours a day 365 days a year;
- ❑ a public telephone shall be available.

Preferred requirements:

- ❑ information centres and bureaux should be staffed by one or more persons with extensive and detailed knowledge of the area, and the tourist attractions and services within the area;
- ❑ an information centre, bureau or lay-by should hold adequate stocks of maps and brochures for the localised area, the province, and South Africa as a whole;
- ❑ an information lay-by may be established at other tourist facilities such as filling stations, rest and service areas and picnic areas.

11 **Facilities for Handicapped Persons:**

GFS B5-9

Basic requirements:

- ❑ an urban or peri-urban authority should identify those facilities for handicapped persons within central business districts and other high density areas which should be signed;
- ❑ these same authorities shall approve signs indicating facilities for handicapped persons in or close to other centres of activity, subject to assessment by a representative of the South African Paraplegic Association or similar representative body;
- ❑ urban and peri-urban - within 2 km of the nearest numbered route.

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12 **Roadside Stall:**

GFS B5-10

Basic requirements:

- ❑ peri-urban - subject to road authority approval a roadside stall selling products of interest to tourists may be located immediately adjacent to any class of road other than a Class AA road;
- ❑ shall be open to the public for 8 hours a day 365 days a year;
- ❑ the lay-by serving such a roadside stall shall :
- be sufficiently set back from the edge of the roadway to be safe;
- be provided with a permanent surface;
- provide for a minimum of 5 visitors vehicles at one time, subject to road authority requirements for a larger number of spaces;
- ❑ the products on sale shall primarily have been produced locally, although products from elsewhere in South Africa may also be sold.

Preferred requirements:

- ❑ drinking water should be available;
- ❑ seating and shade should be provided.

13 **Post Office:**

GFS B5-11

Basic requirements:

- ❑ to qualify for the use of symbol GFS B5-11 on a tourism sign the post office shall be located in an area frequented by tourists (see definitions in Volume 2, Chapter 4, Section 4.8) - such a sign may also be relevant on the fringes of a smaller town by-passed by a numbered route - the equivalent symbol GDLS A 2-2 should be used on LOCAL DIRECTION sign when the post office is a normal community-based facility with no significant tourist clientele;
- ❑ urban - within 500 m of the nearest Class "B" or "C" road;
- ❑ peri-urban - within 1 km of the nearest Class "B" or "C" road;
- ❑ shall be open to the public during normal office hours;
- ❑ one or more telephones shall be available 24 hours a day 365 days a year;
- ❑ a post box shall be available 24 hours a day 365 days a year, on which the collection times are clearly indicated.

14 **Rural Shop/Cafe/Corner Shop**

GFS B5-12

Basic requirements:

- ❑ peri-urban - within 500 m of a Class "B" or "C" road;
- ❑ shall be open 365 days a year;
- ❑ shall have parking for at least 5 vehicles;
- ❑ shall sell drinks and light refreshment.

Preferred requirements:

- ❑ should be a tourist information agent.

9.5.30 Level 2 Warrant Criteria: Rest and Service Areas: Group B6:

1 **Rest Area Class 1:**

GFS B6-1

Basic requirements:

- ❑ tree shade;
- ❑ rubbish bin;
- ❑ table and bench.

2 **Service Area Class 2:**

GFS B6-2

Basic requirements:

- ❑ roofed shade;
- ❑ toilets;
- ❑ braai;
- ❑ rubbish bins;
- ❑ tables and benches.

3 **Service Area Class 3:**

GFS B6-3

Basic requirements:

- ❑ roofed shade;

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- ❑ toilets;
- ❑ braai;
- ❑ rubbish bins;
- ❑ tables and benches;
- ❑ fuel;
- ❑ restaurant(s) for light and heavy vehicle drivers and passengers;

4 In addition the following criteria shall apply:

(a) fuel and restaurant facilities shall comply with warrants for these types of facilities;

(b) a wide range of additional facilities may be provided;

(c) the facility may qualify for the use of a primary name on the tourism signs provided (see Subsection 9.5.33, paragraph 9.5.33.1 (a)).

9.5.31 Level 2 Warrant Criteria: Vehicle Class: Group B7:

1 This class of facility shall ONLY apply if a rest, service, or rest and service area has different access points for different classes of vehicle. This type of access arrangement is not generally recommended.

GFSB7-1
Motor Cars

GFS B7-2
Caravans

GFS B7-3
Buses

GFS B7-4
Trucks

9.5.32 Level 2 Warrant Criteria: Accommodation: Group C1:

1 All accommodation facilities considered for the provision of a tourism service sign shall provide a photocopy of a current trading/operating licence and shall be inspected for compliance with the following criteria by staff of a Regional Tourism Body at regular intervals. The following are working definitions used in the past by SATOUR and which should continue to be used as a basis for determining certain classes of accommodation:

(a) Hotel - "A Hotel is a purpose built building which provides lodging, meals and beverages and is accessible to the public";

(b) Chalet/Self-catering Establishment - "Establishments participating in the self-catering category shall consist of at least four units and shall **have an owner/manager on the premises**. This category shall include timeshare apartments, game parks, holiday resorts etc";

(c) Guest House - "A Guest House is an **owner managed** commercial accommodation establishment of not less than 4 and not more than 16 bedrooms, and which has as its primary source of business, the supply of tourist accommodation and a substantial breakfast for resident guests, and the provision of a substantial dinner where such facilities are not readily available in the vicinity";

(d) Bed and Breakfast - "Bed and Breakfast is an informal, irregular accommodation operation undertaken from a **private dwelling**";

(e) Youth Hostel - Provide lodging for youth travellers.

2 The provision of tourism signs for accommodation facilities in urban areas needs to be addressed on an holistic basis. For example in a large holiday city there will be a real physical difficulty in locating all the signs that could, theoretically, be required by accommodation which complies with warrants. On the other hand a smaller town may only have one or two hotels, well separated from each other. Many towns and cities may in fact have both of these circumstances. It is therefore recommended that, notwithstanding individual compliance with warrants, a clearly stated and recorded policy be adopted by the town or city council specific to the signing of accommodation facilities.

3 The following factors are relevant to the determination of such a policy.

(a) if there are large concentrations of accommodation facilities within a definable area the principles relating to High Density Tourism Areas may be adopted for signing purposes e.g.. TOURISM DIRECTION signs identifying a "North Beach" area from a "South Beach" area (in this sort of situation it will help the effectiveness of the signs if the hotels in the area are encouraged to identify themselves, on their stationery for instance, with "North Beach" or "South Beach"); in terms of such an approach, individual signs should not be provided for specific facilities, unless there is some very unique feature relating to the access to the facility, which, on safety grounds, requires the provision of a final turn sign GF3;

(b) an alternative to the above treatment, particularly when the number of accommodation facilities may still be high, but not so densely concentrated, may be to create a number of strategically located information centres, bureaux or lay-bys with detailed information facilities; technological advances are such that a print-out of the route to be taken to a specific hotel, guest house etc., could be obtainable at such an information centre;

(c) when the concentration of accommodation facilities is such that they are well spaced, a more conventional approach to signing, based on the warrants below, should be followed taking note particularly of the basic requirements covered in Subsection 9.5.10 (the formal recording of policy is particularly important if a town or city will use more than one of the above approaches because the provision of a sign in terms of (c) will be seen to be a precedent for a facility to be covered in terms of (a) or (b)).

4 A distance warrant is only really appropriate, therefore, in a suburban or peri-urban environment. The following warrants are proposed for all classes of accommodation unless noted otherwise:

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- urban and suburban - within 500 m of the nearest Class "B" or "C" road, whichever is the nearer;
- peri-urban - within 1 km of the nearest numbered route.

5 **Hotels, Motels, Inns and Lodges:**

GFS C1-1

Basic requirements:

- quality graded and/or inspected and recommended;
- the premises and operation shall be in accordance with statutory requirements of local and other authorities with regard to planning, construction, water supply, sewage disposal, garbage collection and disposal, fire precautions, access and general safety;
- reception facilities shall be available 12 hours per day 365 days per year, with the capability to accept, by prior arrangement, arrivals 24 hours per day;
- breakfast and beverages shall be provided;
- premises shall be clean;
- premises shall be well kept in a good state of repair;
- a brochure should be available.

6 **Chalet/Self Catering Establishments:**

GFS C1-2

Basic requirements:

- graded and/or inspected and recommended;
- the premises and operation shall be in accordance with statutory requirements of local and other authorities with regard to planning, construction, water supply, sewage disposal, garbage collection and disposal, fire precautions, access and general safety;
- reception facilities shall be available 12 hours per day 365 days per year, with the capability to accept, by prior arrangement, arrivals 24 hours per day;
- shall be available primarily for the lodging or sleeping of travellers with or without booking;
- shall have well maintained access and internal roads;
- shall provide self-catering facilities;
- shall have a minimum of 4 accommodation units, with bathroom facilities, separate access and individual parking (i.e. not inter-leading);
- each chalet shall contain furniture, cupboard space, fittings and equipment of acceptable standard, quality and condition, for sleeping and toilet purposes;
- a brochure should be available.

7 **Caravan Parks and/or Camping Sites:**

GFS C1-3

GFS C1-4

Basic requirements:

- the premises and operation shall be in accordance with statutory requirements of local and other authorities with regard to planning, construction, water supply, sewage disposal, garbage collection and disposal, fire precautions, access and general safety;
- quality graded and/or inspected and recommended;
- urban and peri-urban - within 5 km of the nearest numbered route;
- reception facilities shall be available 12 hours per day 365 days per year, with the capability to accept, by prior arrangement, arrivals 24 hours per day;
- the facility shall have at least 20 sites;
- at least 20% of sites shall be available to short-term visitors including single night visits;
- there shall be adequate space between sites and internal facilities such as ablution blocks;
- ablution blocks or any other structures shall be provided with adequate natural and/or artificial lighting and natural and/or artificial ventilation;
- hot and cold water shall be available during all reasonable hours;
- the premises shall be under the regular supervision of a responsible person capable of maintaining order and control;
- the premises shall be adequately staffed to maintain the above services at all times;
- a brochure should be available.

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8 **Guest House**:

GFS C1-5

Basic requirements:

- ❑ quality accredited and/or inspected and recommended;
- ❑ reception facilities shall be available 12 hours per day 365 days per year, with the capability to accept, by prior arrangement, arrivals 24 hours per day;
- ❑ parking shall be to an adequate standard;
- ❑ accommodation of 4 bedroom-en-suite (or private bathroom) shall be available;
- ❑ meals shall be provided (self-catering facilities shall not be provided);
- ❑ dining room facilities shall be available;
- ❑ a brochure should be available;
- ❑ each room shall contain furniture, lighting, cupboard space, fittings and equipment of acceptable standard, quality and condition, for sleeping.

Preferred requirement:

- ❑ the premises and operation should preferably be a registered business run in accordance with statutory requirements of local and other authorities with regard to planning, construction, water supply, sewage disposal, garbage collection and disposal, fire precautions, access and general safety.

9 **Bed and Breakfast and Rooms:**

GFS C1-6

GFS C1-7

Basic requirements:

- ❑ accredited and/or inspected and recommended;
- ❑ open for registration 12 hours per day, 365 days a year;
- ❑ premises should be clean and attractive and in good state or repair;
- ❑ available primarily for the lodging or sleeping of travellers;
- ❑ provision shall be made for bedding;
- ❑ a brochure should be available;
- ❑ parking should be provided;
- ❑ bathroom facilities shall not be shared with household;
- ❑ breakfast shall be provided in "B+B" facilities.

10 **Youth Hostel:**

GFS C1-8

Basic requirements:

- ❑ the hostel, when making application to its Municipality, must be in receipt of a letter from the Youth Hostel Association; the letter will confirm the hostel as being a member and as such, will meet the IYHFs International Operating Standards as mentioned, together with those listed below;
- ❑ the minimum number of beds shall be 10;
- ❑ the hostel must be clean and secure;
- ❑ the hostel must offer 24-hour check-ins;
- ❑ space between beds shall be adequate, and the number of toilets/bathrooms shall correlate to the number of people, as specified in the IYHF Operating Standards Manual;
- ❑ where bedding is not automatically provided, provision shall be made for this to be hired;
- ❑ the hostel shall be open throughout the year;
- ❑ sufficient parking should be available;
- ❑ the hostel shall either provide self-catering facilities or communal dining room facilities with meals.

11 **Trail Shelter**

GFS C1-9

Basic requirements:

- ❑ peri-urban - this symbol is only likely to be used within a trail (hiking, horse or bike) - as such it is recommended that the distance to the shelter, in metres, be included on the sign;
- ❑ the trail shelter shall be a short distance from a source of drinking water;
- ❑ a rubbish bin shall be provided;
- ❑ the shelter environs and rubbish bin(s) shall be regularly cleaned.

12 **Guest Farm**

GFS C1-10

Basic requirements:

- ❑ quality accredited and/or inspected and recommended;
- ❑ peri-urban - within 5 km of the nearest numbered route;

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- ❑ reception facilities shall be available 12 hours per day 365 days per year, with the capability to accept, by prior arrangement, arrivals 24 hours per day;
- ❑ parking shall be to an adequate standard;
- ❑ accommodation of 4 bedroom-en-suite (or private bathroom) shall be available;
- ❑ meals shall be provided (self-catering facilities shall not be provided);
- ❑ dining room facilities shall be available;
- ❑ a brochure should be available;
- ❑ each room shall contain furniture, lighting, cupboard space, fittings and equipment of acceptable standard, quality and condition, for sleeping.

Preferred requirement:

- ❑ the premises and operation should preferably be a registered farm (or small-holding in a peri-urban environment); the availability of accommodation should be linked to interaction by visitors with the farming activities.

13 **Ethnic (Zulu) Accommodation**

GFS C1-11

Basic requirements:

- ❑ peri-urban - within 5 km of the nearest numbered route;
- ❑ the accommodation shall be registered with the Local Tourist Organisation/Publicity Association;
- ❑ shall be open for arrivals for 12 hours a day 365 days a year;
- ❑ parking shall be in close proximity to bedrooms;
- ❑ the premises shall be clean, neat and maintained in good condition;
- ❑ water-borne sewers to be provided;
- ❑ shower and toilet facilities for exclusive use of guests to be located close to bedrooms;
- ❑ continuous electrical or gas lighting to be available and lights to be provided with shades;
- ❑ clean linen, towels and soap to be provided for each letting;
- ❑ accommodation tariff to be displayed;
- ❑ curtains to be provided for all windows;
- ❑ door and windows to be provided with secure locks in working order;
- ❑ basic equipment of acceptable bedding, chairs, drinking glasses and non-plastic eating utensils to be provided for each guest;
- ❑ waste-paper basket and emergency candle/torch to be provided;
- ❑ if meals are not provided, an electric or gas cooker shall be provided, together with adequate cooking utensils.

Preferred requirements:

- ❑ the name and address of a local doctor and emergency service should be provided/available;
- ❑ mosquito repellent when appropriate.

9.5.33 Level 3 Warrant Criteria: Signface Design

1 The following are basic criteria which may warrant the use of the stated signface design principle on a tourism sign:

(a) **Primary Name:**

- ❑ tourist attractions;
- ❑ Class 3 rest and service area;
- ❑ grade 2 or higher accommodation;
- ❑ hospitals.

(b) **Supplementary Symbols:**

- ❑ the use of supplementary symbols is **not** appropriate for multi-facility venues such as national and provincial parks, and resorts - such facilities shall be required to make a choice and select one specific symbol to represent their principle interest;
- ❑ supplementary symbols are only appropriate for isolated tourist attractions (i.e. not closer than 5 km to a similar facility) where it would be **to the disadvantage of tourists** not to know the nature of the supplementary facilities offered;
- ❑ if the supplementary symbol is intended to indicate a category of accommodation, the accommodation shall be available to passing visitors without bookings; EXCEPT that the use of symbols GFS C1-1 (bed) and GFS B4-1 (knife and fork) **only** as supplementary symbols located below a PRIMARY NAME represents a standard **alternative** signface layout for accommodation facilities offering restaurant facilities in accordance with the individual warrants (the purpose of the alternative is to offer a reduced sign size under certain signface detail circumstances (see Volume 4, Chapter 7)).

(c) **"Area" Collective Symbol:**

- ❑ the use of an "Area" collective symbol is recommended whenever possible to reduce the total signface area of a collective sign installation for a number of tourist facilities;
- ❑ the concept of "Collective" symbols is dealt with in some detail in Volume 2, Chapter 4, Section 4.4.

(d) **A Distance:**

- ❑ if the distance is greater than might be expected;
- ❑ if road condition is poor;
- ❑ if the distance is greater than 20 km;
- ❑ if road is a "dead-end" road over 2 km in length

(e) **A Route Number:**

- ❑ if facility is the only public destination on a numbered route or it is located on a numbered tourist route i.e. T2.

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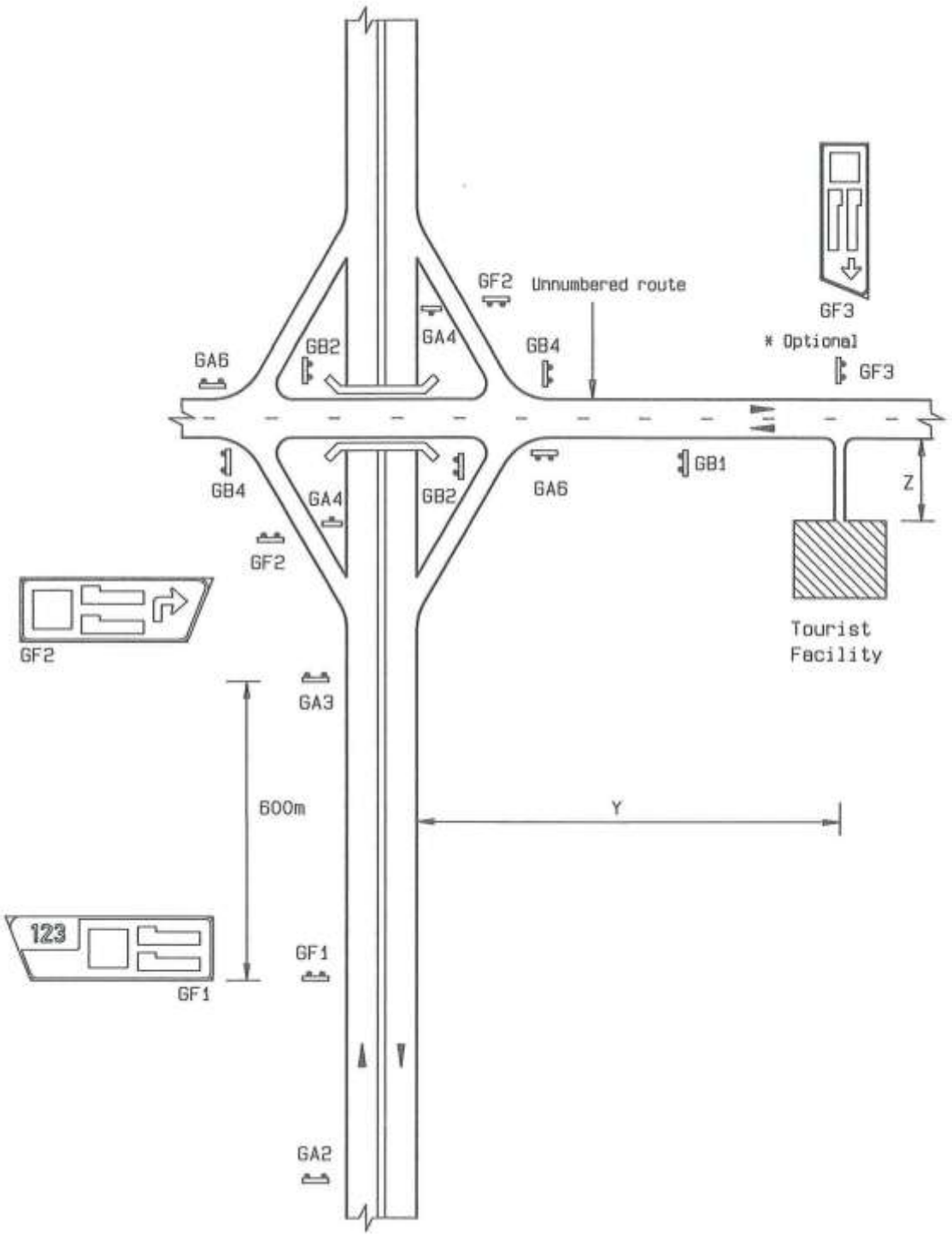

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Fig 9.33 **Supplementary Tourist Direction Signing – Urban Class "A" Routes**

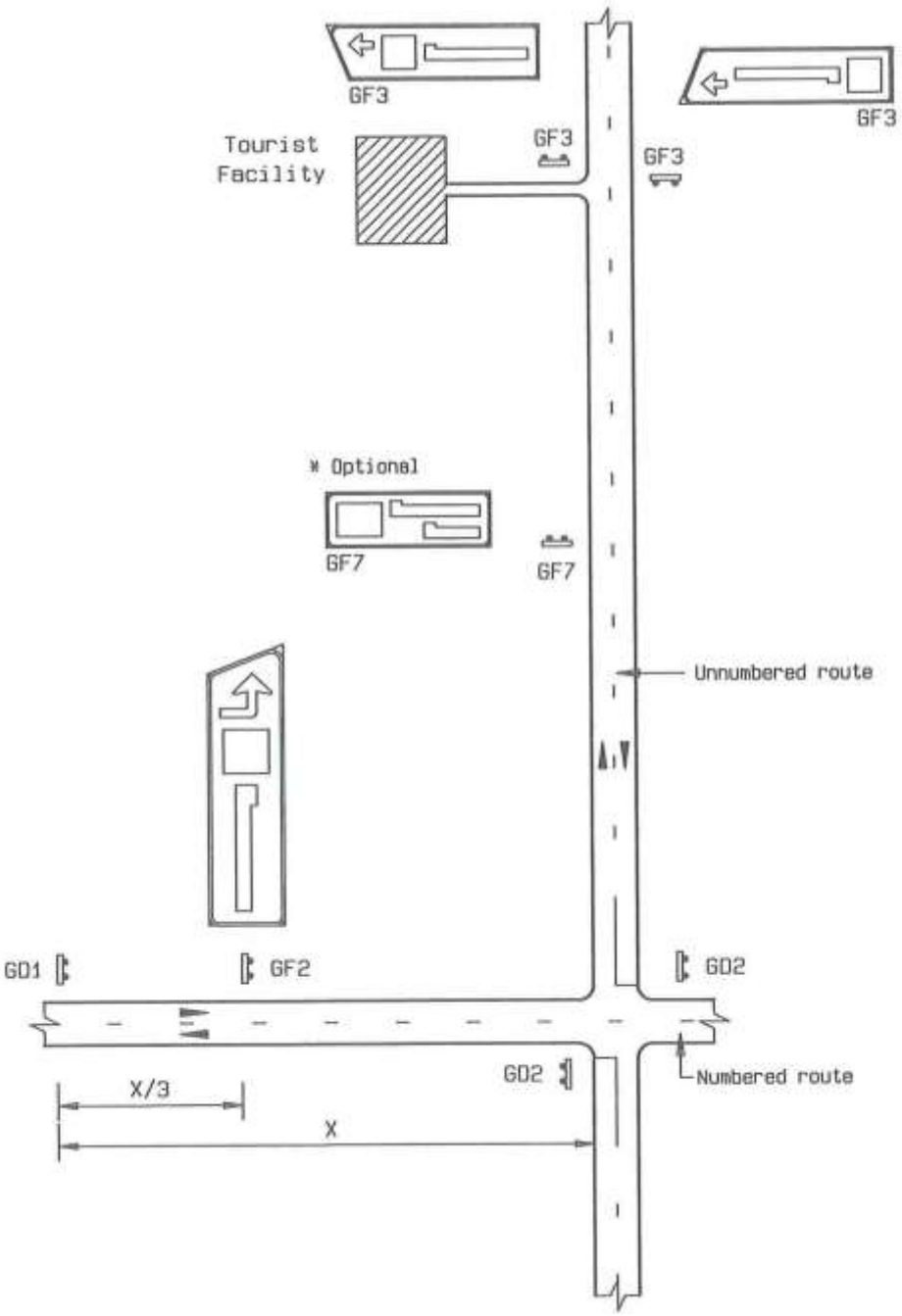

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Fig 9.34 **Basic Supplementary Tourist Direction Signing – Urban Class "B" Routes**

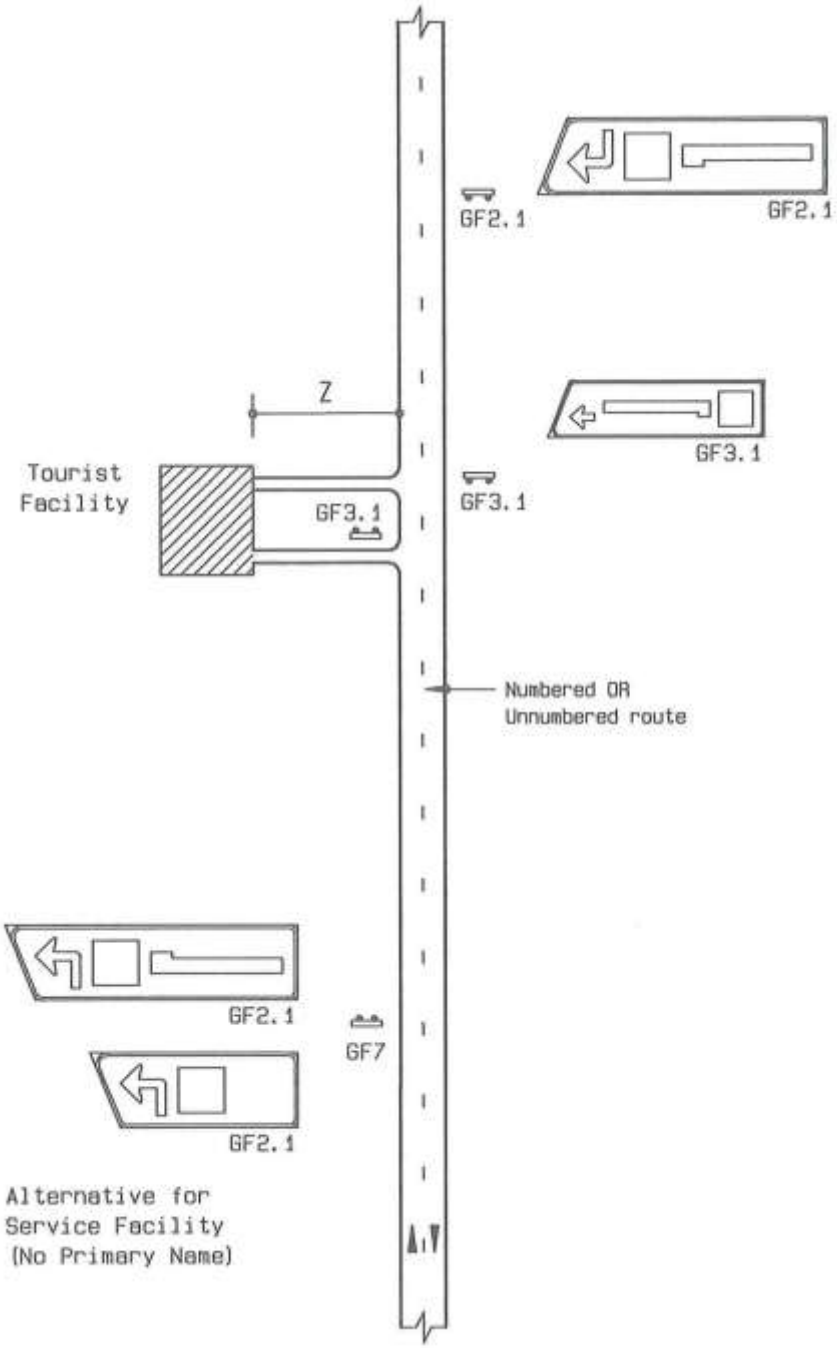

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Fig 9.35 **Basic Supplementary Tourist Direction Signing – Final Turn**

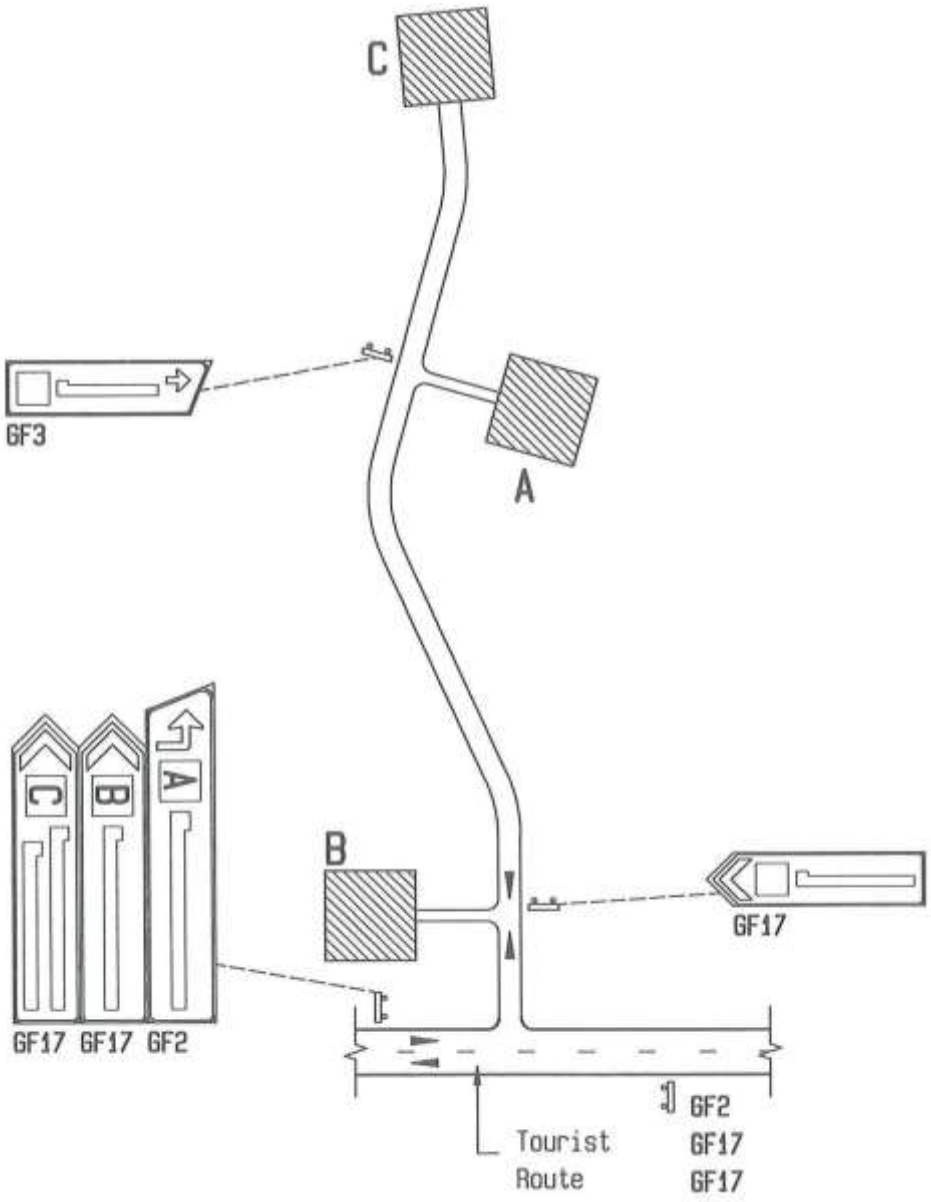

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Fig 9.36 **Basic Supplementary Tourist Direction Signing – From an Urban/Peri-Urban Tourist Route**

9.6 APPLICATIONS OF URBAN GUIDANCE SIGNING

9.6.1 General

1 This Section provides a wide range of examples of typical urban guidance signing sequences. In particular each of the signing levels identified in Subsection 9.3.9 and Figure 9.15 are illustrated.

2 It is very possible that a signing situation will arise which is not specifically covered. A solution to such a problem is almost certain to be available by combining aspects of two or more of the given examples. It should also be noted that further examples of guidance sign applications can be found as follows:

(a) Chapter 4: *Tourism Signing*;

(b) Chapter 5: *Freeway Signing;*

(c) Chapter 10: *Rural Signing.*

9.6.2 Applications of Location Signs

1 In the urban context the most important LOCATION signs are:

(a) STREET NAME signs GL1;

(b) SUBURB NAME signs GL2;

(c) TOWN or CITY NAME signs GL3.

2 Factors which affect the installation of a specific street name sign are:

(a) is the street name to appear on a DIRECTION sign GD2?

(b) its position within the junction - the far left corner is the recommended position;

(c) visibility in the chosen position;

(d) is letter size adequate for legibility?

(e) a special need for long range legibility e.g. in advance of a junction or in an elevated position.

3 Details relevant to the above factors are illustrated in Figure 9.37 and a detailed arrangement of street name sign positions is shown in Figure 9.38 with respect to a network of routes and streets. Examples of specific street name sign mounting problems are further given in Figure 9.39.

4 Although not road traffic signs, property identification signs or street numbers are the ultimate for of LOCATION sign, in the sense that they say "You are here" at the end of a journey. Limited guidelines for effective property identification signs are given in Section 9.7.

9.6.3 Applications of Route Marker and Trailblazer Signs

1 Route marker signs should comprise the major part of a minimum or short term signing plan. They may be provided to one of two levels, namely:

(a) as a full "set" for each approach on a Class "B" route intersecting Class "B" route and comprising:

(i) ROUTE MARKER CONFIRMATION sign GE12 (or GE13, GE14, or GE15 according to status of the route) located 30 m to 100 m beyond the junction, AND at regular intervals of 500 m on lower speed (60 km/h) and up to 1 km for higher speed routes (80 km/h);

(ii) ROUTE MARKER signs GE12.1 and GE12.2 for right and left turns (right mounted above left) located on the far side of the junction in close proximity to the STREET NAME sign GL1, or traffic signal if available;

(iii) ADVANCE ROUTE MARKER signs GE12.3, GE12.4 and GE12.5 in the position normally occupied by ADVANCE DIRECTION sign GD1; OR

(b) a limited "set" consisting only of items (i) and (ii) from paragraph 9.6.3.1(a).

2 TRAILBLAZER signs GE1 to GE8 are generally only applicable in some extraordinary circumstance. They should be provided in addition to any minimum signing level but can also be used in addition to existing secondary level direction signs. Factors which warrant the use of trailblazer signs are:

(a) closely spaced parallel routes;

(b) connections between lower level routes and higher level routes, particularly when a significant traffic generator is located on or near the lesser route;

(c) if space for larger direction signs is limited.

3 It is recommended that cardinal directions be displayed on all route marker and trailblazer signs. Applications of route marker and trailblazer signs are shown in Figures 9.40 and 9.41.

9.6.4 Applications of Urban Local and Tourist Direction Signs

1 LOCAL DIRECTION and TOURIST DIRECTION signs are supplementary to a standardised system of navigational direction signs. In an urban environment this standardised system will relate to road class and other physical factors according to the space available and the status of the system at a given point in time. Since they are supplementary, LOCAL and TOURIST DIRECTION signs are not provided according to road class in a standard manner. However, when provided, after compliance with warrants, they should normally be located according to standardised rules. For details of the positions of LOCAL and TOURIST DIRECTION signs refer to the following sections of this chapter:

(a) Section 9.3 for the relevant steps in the preparation of an "Urban Guidance Signing Plan" - Figure 9.16;

(b) Section 9.4 for full details of the use of LOCAL DIRECTION signs including classification and warrants for their use; for typical applications see Figures 9.23 to 9.26;

(c) Section 9.5 for full details of the use of TOURIST DIRECTION signs including classification and warrants for their use; for typical applications see Figures 9.33 to 9.36.

2 Figures 9.44 to 9.54 in this section also indicate, where appropriate, the position(s) in which LOCAL and/or TOURIST DIRECTION signs may be placed, when warranted.

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3 The provision of LOCAL and TOURIST DIRECTION signs in smaller urban areas should not present difficulties, particularly when tourism is a fairly low key activity. As the level of tourist activity grows the pressure on space dictates that signs in both these categories be provided in a planned and controlled manner on an area wide basis. Specific details of how this planning and control may be exercised are covered in Section 9.5 for TOURIST DIRECTION signs, but the provision of LOCAL DIRECTION signs should become an integral part of such an approach. Figures 9.42 and 9.43 illustrate examples of a planned provision of LOCAL and TOURIST DIRECTION signs in an urban area.

9.6.5 Applications of the Levels of Urban Guidance Signing

1 Figures 9.44 to 9.54 show the 13 levels of urban guidance signing identified in Figure 9.15 and listed in Subsection 9.3.9. The figures illustrate sign sequences and are self-explanatory. Details of individual signface designs and details of design limitations can be found in Volume 1, Chapter 4 and in Volume 4, Chapters 4, 5, 6, and 7.

2 Positions are indicated for the possible inclusion of local and tourist destination signs which can be correlated with Figures 9.23 to 9.26 and 9.33 to 9.36 which show typical sign positions for these signs only and with similar figures in Chapter 4 for tourism signs.

3 The application of guidance signs is related to the urban street classification (see Section 9.2), but the different levels covered in Figures 9.44 to 9.54 are not directly related to street classes such as Class "B1" and Class "B2", or Class "C1" and Class "C2". In other words the chosen signing level is dependent on other factors as illustrated in Figure 9.15. In effect this means that a Class "B2" route in one part of a metropolitan area may be signed at Level 2B (see Figure 9.50) and a Class "B1" route in another part of the area may be signed in exactly the same way because they exhibit the same range of criteria values.

4 In addition to the standard levels of signing illustrated in Figures 9.44 to 9.54 a selection of other situations is covered. These deal with detailed conditions related to specific types of road geometry or traffic control. The type of signing illustrated may be incorporated into any of the layouts given in Figures 9.44 to 9.54 when appropriate.

9.6.6 Applications of Urban Diagrammatic Signs

1 The applications of Diagrammatic guidance signs are very similar whether the signs are provided in a rural situation or an urban one. The principal differences are likely to be:

(a) the size of the signs specified - in urban areas there is commonly insufficient side space to accommodate the larger standard sign sizes - for this reason a special standard urban sign size of 1200 mm (H) x 900 mm (W) is available;

(b) the distance between successive signs in a sequence - due to reduced operating speeds signs may be located closer together than is recommended for higher rural operating speeds (see Volume 1, Chapter 4).

2 The selection of an appropriate sign size must be related to traffic volumes, road width and operating speed (amongst other criteria - see Subsection 9.3.9). If traffic volumes are such that road markings are commonly covered by a queue of vehicles the intermediate 1600 mm (H) x 1200 mm (W) standard sign size should be specified. This size should also be specified when the roadway has four or more lanes and/or the operating speed is over 70 km/h.

3 Diagrammatic signs are commonly specified in a temporary form for urban roadworks. These applications are dealt with in detail in Chapter 13: *Roadworks Signing.*

4 The use of Diagrammatic signs is also relatively common in conjunction with specific types of road marking applications such as:

(a) at lane drop situations;

(b) at the beginning or end of dual carriageway roadways;

(c) where lanes merge or converge.

These types of application are covered in Chapter 2: *Road Marking Applications*.

5 A new sub-class of Diagrammatic sign has been developed which deals with exclusive turning lane situations which are commonly found in urban areas, particularly in one way streets subject to heavy traffic volumes. A range of typical applications of such signs is included in Chapter 2.

6 Figures 9.57 to 9.59 show a selection of typical urban Diagrammatic sign applications and include recommendations on sequential treatment and sign spacing. It is a common practice to provide two or even three diagrammatic signs in a sequence. The first sign, or first and second signs, are displayed with a supplementary plate showing the distance to the point to which the sign applies. The last or final sign in the sequence is mounted as close to this point as possible. It will be common in urban areas that it will only be possible to site an advance sign OR a "final" sign from the desired sequence. In such circumstances the primary objective in choosing the sign position should be to maximise the visibility and therefore effectiveness of the sign.

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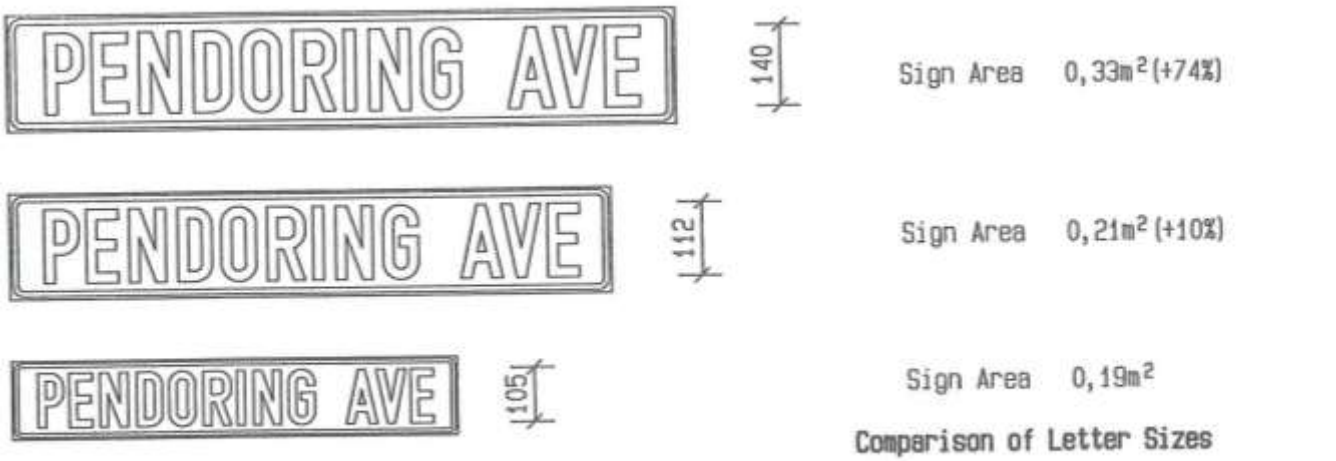
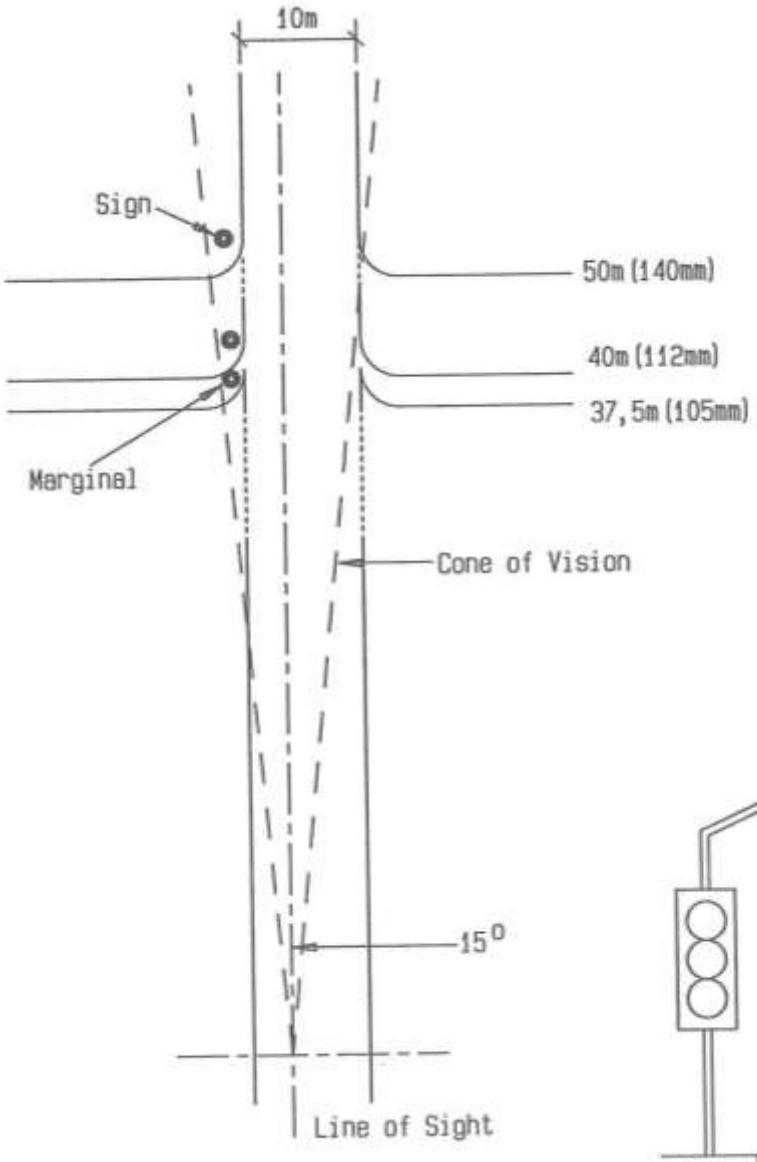
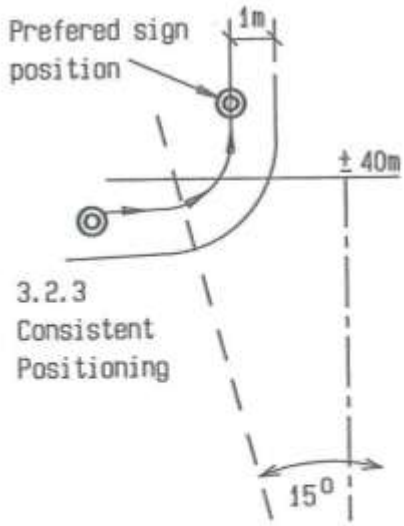


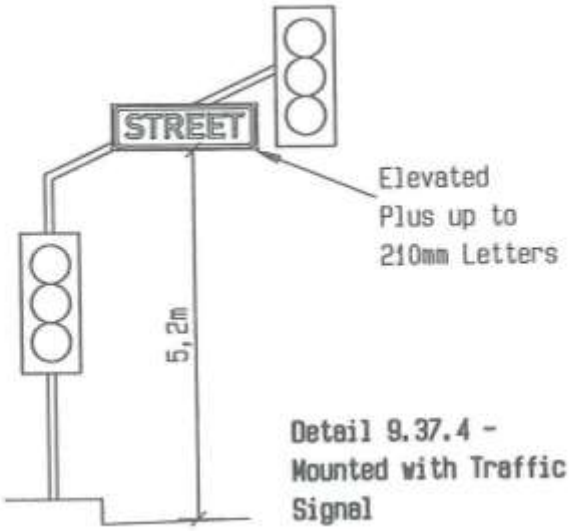
Detail 9.37.1 - Sign Sizing and Areas



Detail 9.37.2 Cone of Vision



Detail 9.37.3 - Consistent Positioning



Detail 9.37.4 - Mounted with Traffic Signal

Fig 9.37 Street Name Signs – Conspicuity/Legibility

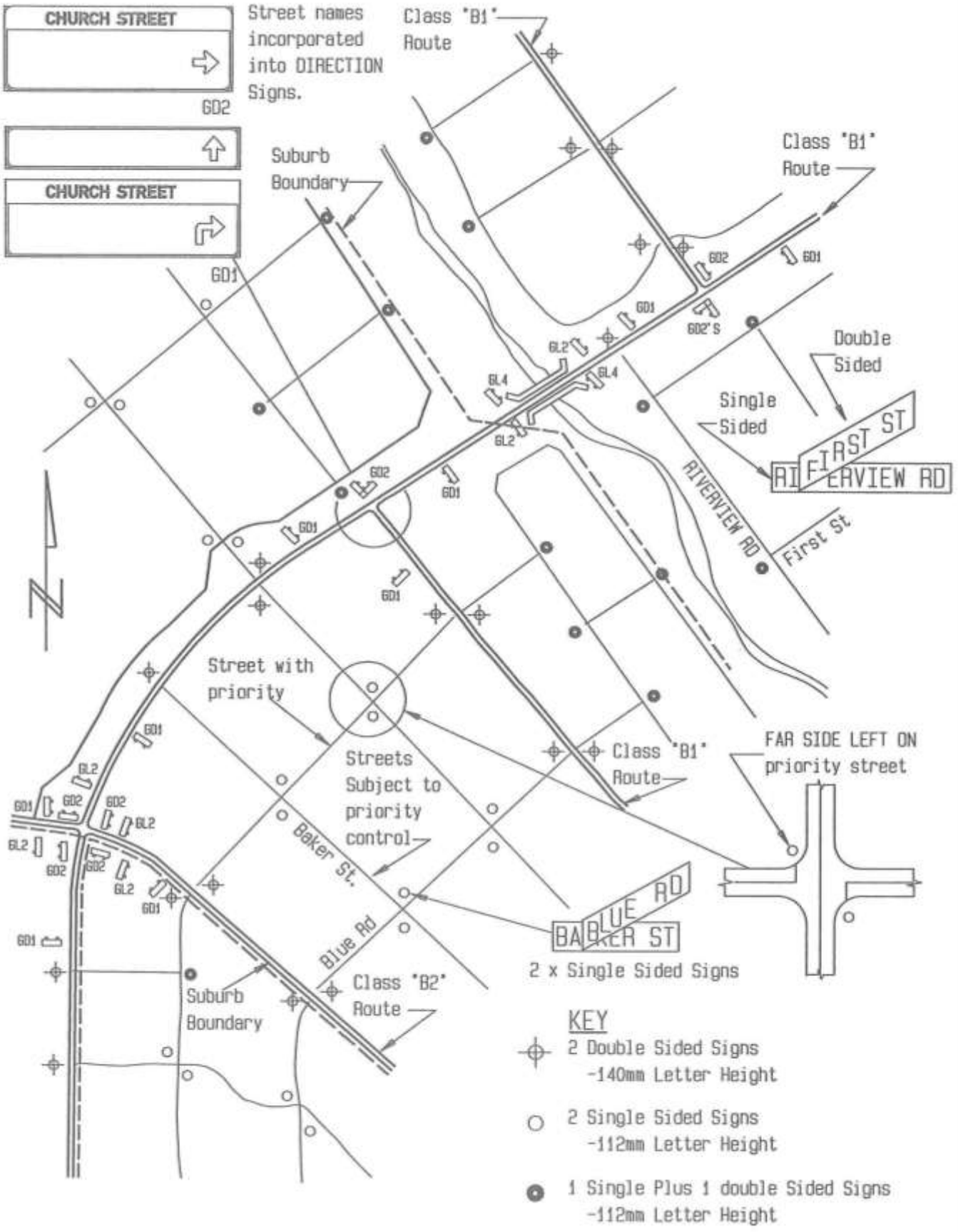
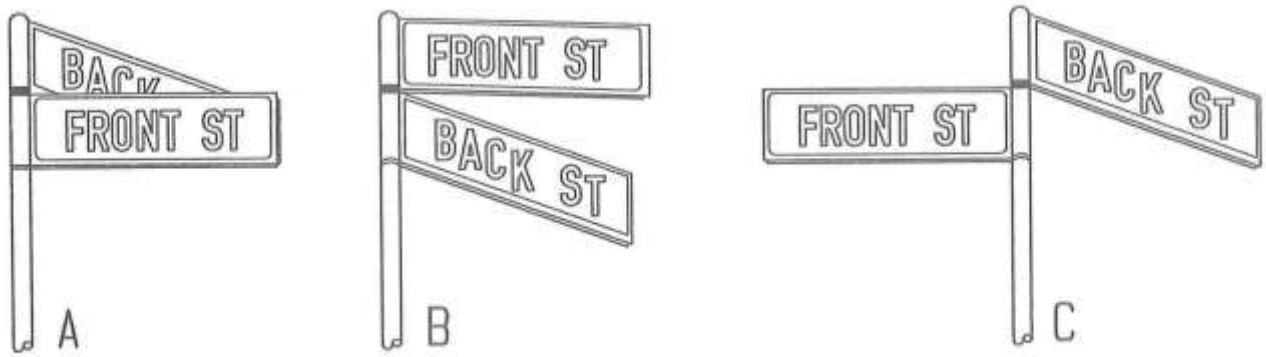


Fig 9.38 Recommended Positioning of Street Name Signs



The positioning and vertical mounting of STREET NAME signs GL1 need to be carefully thought out and co-ordinated. Whilst it is necessary for drivers to be able to read all names, including the name of the street they are in, it is important for good navigation that they can read the name of the intersecting street. One sign must not be allowed to obstruct the view of another, as in A. Detail changes, which may need to vary with site, can be used as in B and C to minimise this effect.

The best solution is subject to:

- method of sign mounting
- mounting height
- sign position in the intersection.

In the wide one-way street example signs at A will be ineffective due to mounting, position and tree cover. Far side mounting at B or C with methods B or C will improve visibility.

STREET NAME signs GL1 are the most numerous in the guidance sign system, and although individually small in area, collectively they represent a significant investment. It is therefore important that they are effective. The examples given are intended to highlight the degree of detail needed to ensure this effectiveness.

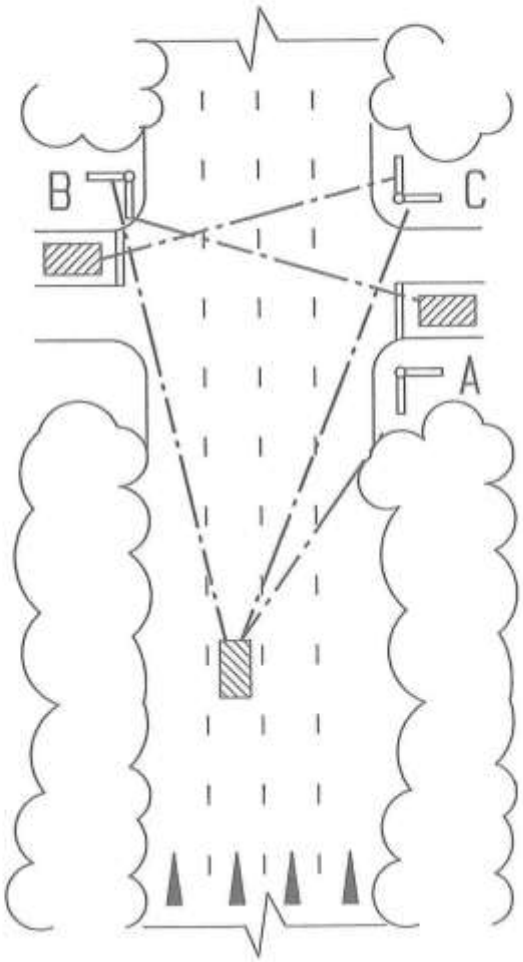


Fig 9.39 Further Difficulties with the Mounting of GL1 Signs

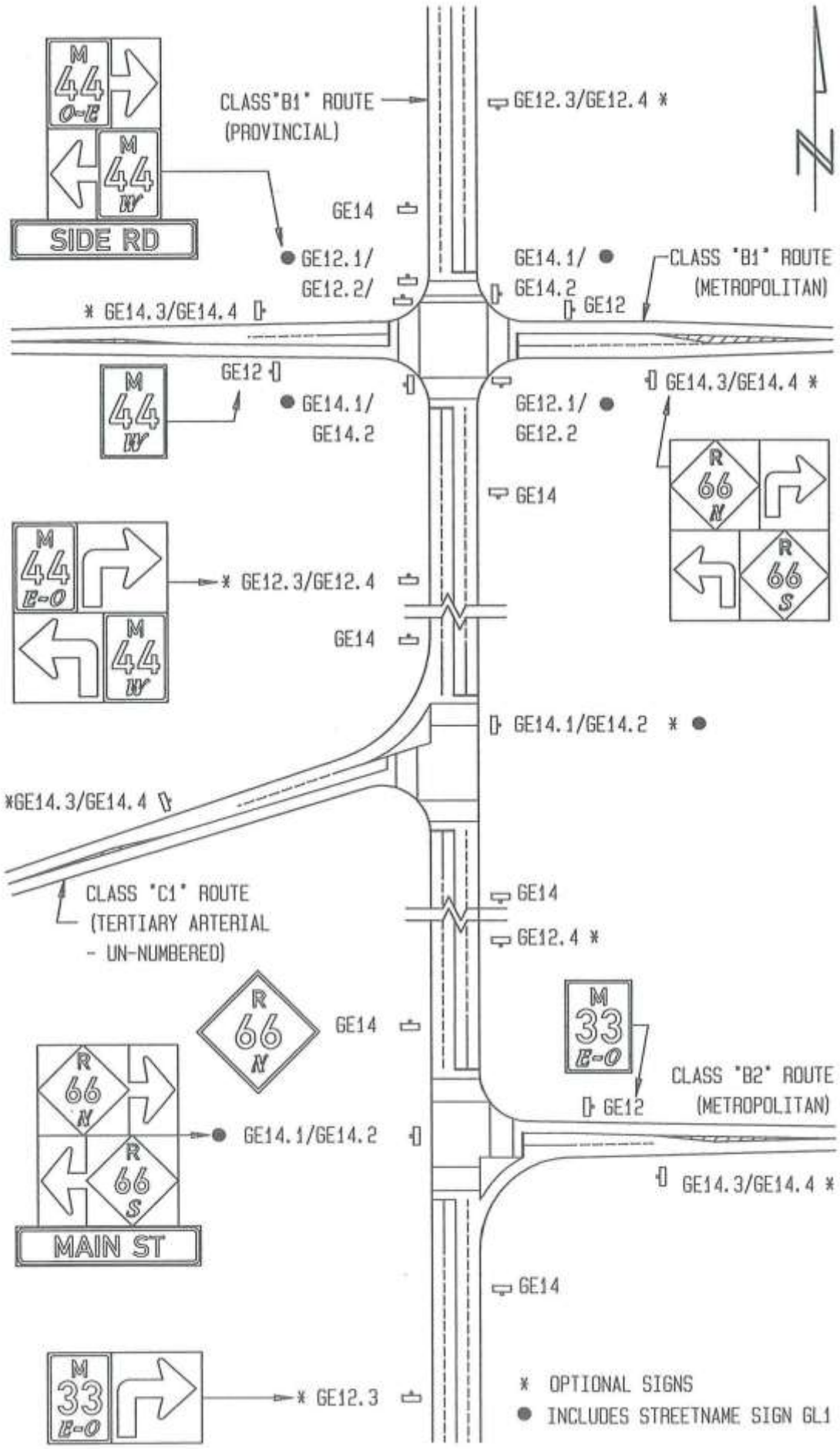


Fig 9.40 **Typical Applications of Route Marker Signs**

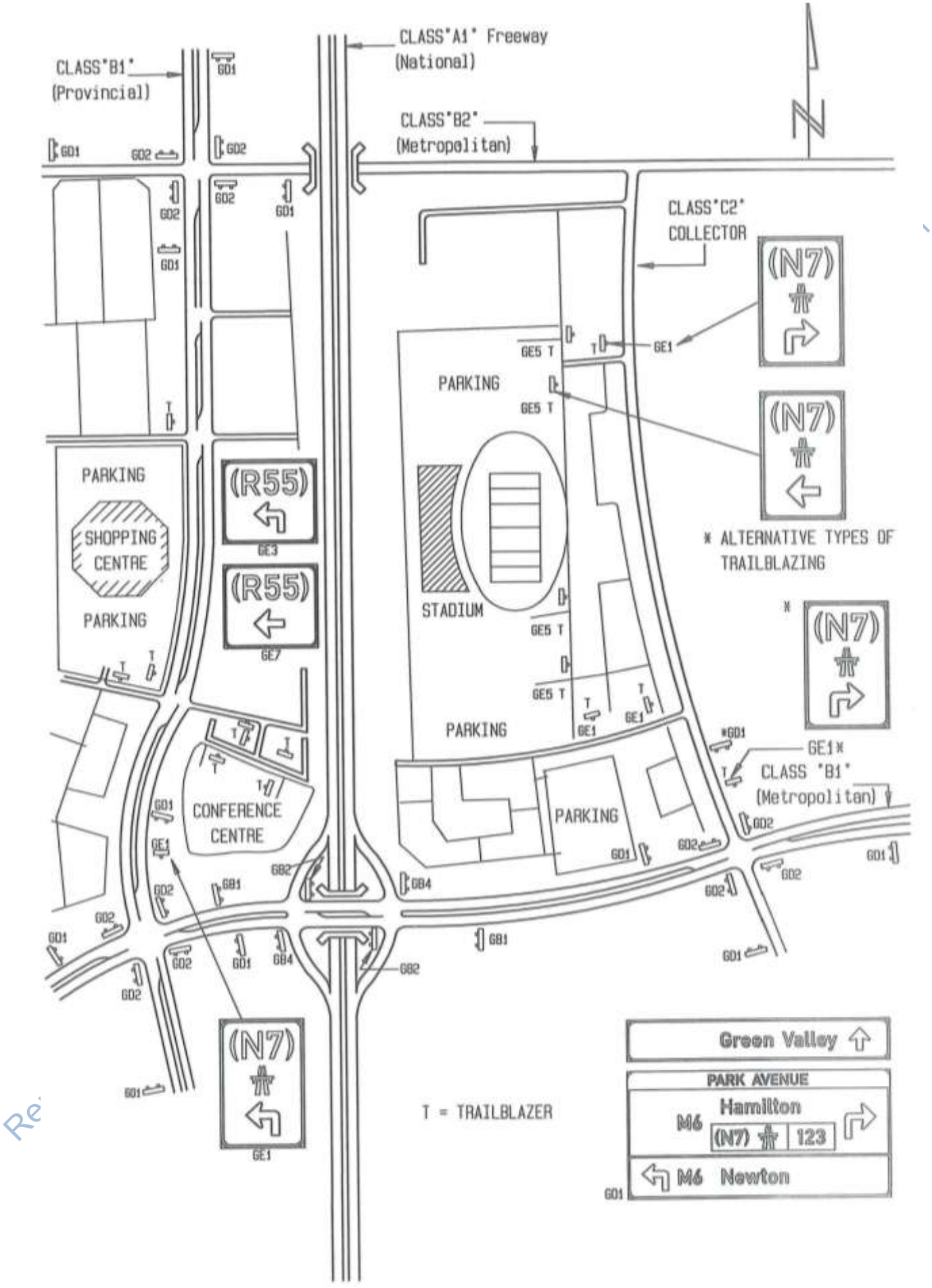
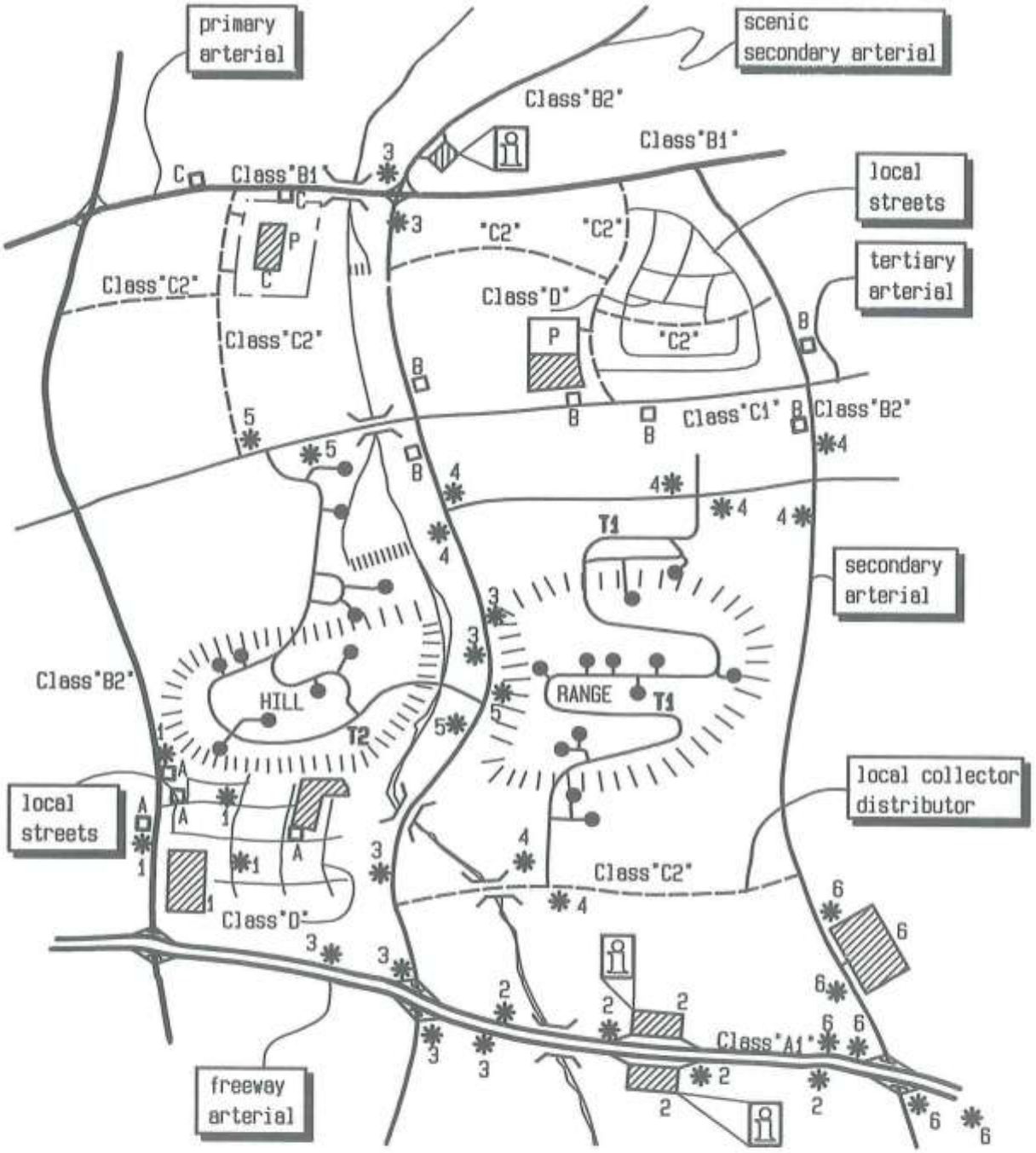


Fig 9.41 **Typical Applications of Trailblazer Signs**



KEY

TOURIST DIRECTION SIGNS :

Gateway Information Centres

*1 Major Hotel
*2 Rest & Service Area
*3 Scenic Tourist Route (on M route)
*4 Tourist Route T1
*5 Tourist Route T2
*6 Regional Hospital (emergency)

LOCAL DIRECTION SIGNS :

□ A Technicon
□ B Regional Shopping Centre
□ C Municipal Offices

Fig 9.42 Local Direction and Tourist Direction Signing - 1

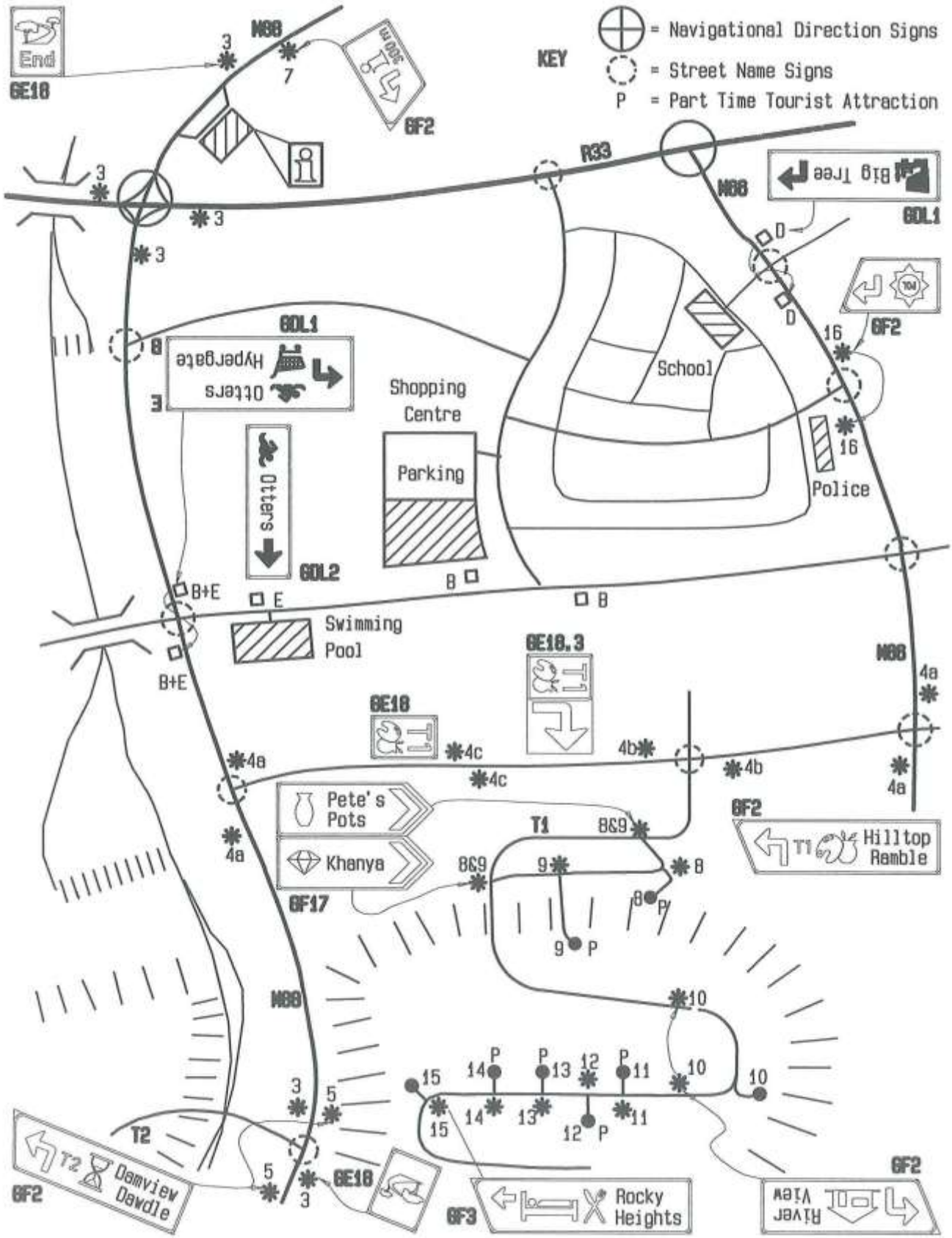


Fig 9.43 **Local Direction and Tourist Direction Signing - 2**

9.6.7 Urban Signing Level 0A-S Class "A" Systems Interchange Overhead Signs

1 General

By definition a systems interchange is a junction between two freeways. Such freeways will almost certainly be Class "A1" freeways in an urban area. The number of lanes and/or space constraints is likely to warrant the use of overhead signs. The example given in Figure 9.44 depicts overhead signs using the upward pointing arrow system (full details of this system and of downward pointing arrow signs can be found in Volume 1, Chapter 4). The interchange illustrates a range of ramp configurations which are possible at such a junction, including:

(a) a fully directional ramp (from south to east);

(b) 360^{o} ramps without a collector-distributor road (on the east/west freeway);

(c) 360^{o} ramps with a collector-distributor road (from north to west).

Each of these conditions will require different detail treatment in terms of signface design and sign positioning. A full sign sequence is given for the east to west movement which has two exit points, one each for the left and right turn movements respectively. A partial sequence is shown for the south to north movement. The example illustrates the applicability of the upward pointing arrow system to exclusive exit lanes and shared exit and straight-on lanes. In the example the left and right turn destinations can be traced through the sign sequence by following the shading of the destination "boxes".

2 Standard Sign Sequence

The following sign sequence is applicable for a single exit from the freeway as illustrated by the directional ramp (south to west and east) or the C-D road (north to east and west):

- GC1 - PRE ADVANCE EXIT DIRECTION sign
- GC2U - ADVANCE EXIT DIRECTION sign
- GC3U - SUPPLEMENTARY EXIT/THROUGH DIRECTION sign
- GC5U - ADVANCE OFF-RAMP DIRECTION sign
- GC6U - THROUGH DIRECTION sign
- GA4 - GORE EXIT DIRECTION sign
- GC7U - C-D/RAMP EXIT/THROUGH DIRECTION sign
- GA10 - C-D EXIT DIRECTION sign (ground-mounted)
- GA7 - CONFIRMATION sign (ground-mounted).

3 Sign Positions

The positions recommended for the standard signs in the sequence (with the acceptable range of positions given in brackets) are:

- GC1 - 2000 m (2400 m - 1800 m)
- GC2U - 1000 m (1500 m - 900 m)
- GC3U - 500 m (700 m - 300 m)
- GC5U - within 50 m of the exit point
- GC6U - mounted with sign GC5U
- GA4 - with the exit gore
- GC7U - within 50 m of the off ramp split
- GA9 - in the gore of the right turn ramp (360^{o} loop ramps)
- GA7 - 750 m beyond the end of the on-ramp (500 m - 1000 m).

4 Optional Signs

The following optional signs may be used either on the approach to, or exit from, a systems interchange:

- GA8 - EXIT SEQUENCE sign to indicate closely spaced interchanges in an urban area (a systems interchange may be indicated when appropriate by the route number and FREEWAY symbol GDS-4) - located between 3000 m and 2000 m from an exit point;
- GF8 - SERVICE EXIT SEQUENCE sign to indicate available primary tourism services at the nearest point (emergency and fuel), - located 1000 m to 2000 m beyond the end of an on-ramp.

Other options exist for modification of the standard sign sequence according to ramp configuration as follows:

- GC4U - EXIT DIRECTION sign - replaces sign CG5U when the exit serves one direction only (normally the left turn) - a second GC3U sign indicating the second exit will commonly be displayed on the same structure as sign GC4U (see example) - located within 100 m of the exit point.

Other combinations of signs GC4U, GC5U, GC6U and CG7U may be used.

Certain additional signs may be required if one or both of the intersecting freeways is a toll route. For further information see Chapter 6: *Toll Route Signing.*

NOTE: No other form of tourism sign other than sign type GF8 is appropriate within the approaches to a systems interchange. Local destination signs shall not be provided on Class "A" roads.

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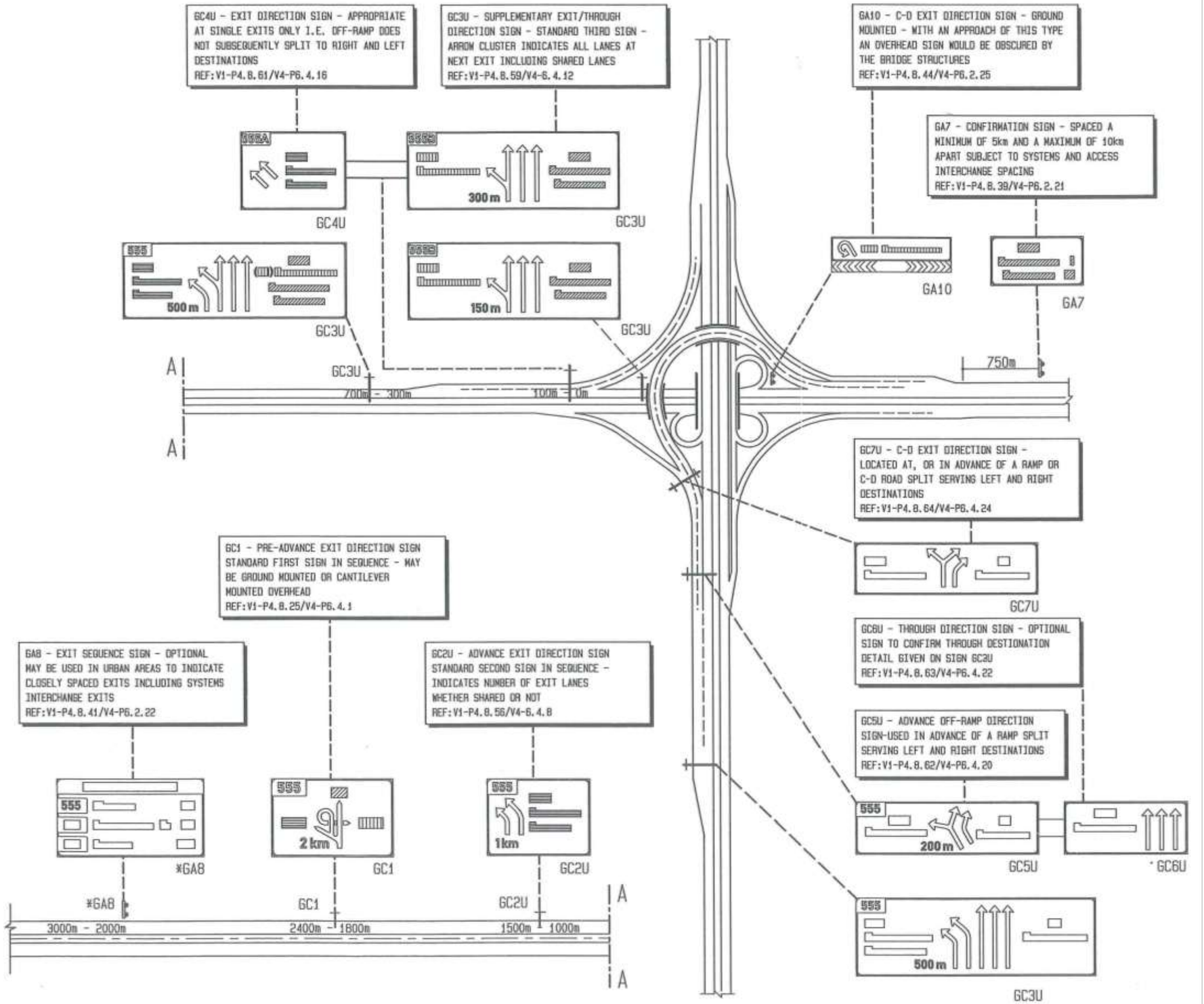

9.6.8 Notes on Figure 9.44

Numbers of Signs Required per Approach

Quantity	Type	Typical Area (m^2)
1	GC1	25
1	GC2U	12
1	GC3U	38
1	GC5U	32
1	GC6U	25
1	GA4	5
1	GC7U	26
1	GA10	8
	GA7	5

The areas given should be considered as guidelines for general estimating only. They are based on the following very general parameters:

- overhead signs d = 60 mm (letter size 420 mm/300 mm)
- ground-mounted signs d = 50 mm (letter size 350 mm/250 mm)
- longest place name = 10 letters
- 4 lines of text on freeway including route number and distance
- 3 lines of text on ramps.

Checklist

One or more of the following factors or questions may require the re-evaluation of the standard signing sequence listed above:

- ❑ ramp exit - one direction or both?
- ❑ provision of collector-distributor road
- ❑ directional ramp - position of additional structures
- ❑ position of main structures - overbridge or under-bridge approach?
- ❑ provision of additional lanes - particularly between closely spaced interchanges
- ❑ unusual junction or ramp alignment (affects arrow alignment on signs)
- ❑ lane drop, weave or merge situations may require diagrammatic signs
- ❑ does the interchange lead into a by-pass situation?

Fig. 9.44
Urban Signing Level 0A-S
Class "A" Systems Interchange
Overhead Signs

9.6.9 Urban Signing Level 0A-A Class "A" Access Interchange Overhead Signs

1 General

An access interchange is where a freeway system and the rest of an urban street network interface or connect with each other. The connecting street will commonly be a Class "B" numbered route. The number of lanes on the freeway and/or space constraints is likely to warrant the use of overhead signs. The example given in Figure 9.45 depicts overhead signs using the upward pointing arrow system supplemented where appropriate by ground-mounted signs (full details of the upward and downward pointing arrow systems can be found in Volume 1, Chapter 4). Figure 9.46 shows a typical ground-mounted guidance sign sequence for an urban access interchange.

Basic factors which may singly or collectively warrant the use of overhead direction signs are (for more detail see Volume 1, Chapter 4, Subsection 4.1.9):

(a) carriageways with three or more lanes on an approach - this should include intersecting crossroads;

(b) all freeways with traffic volumes regularly exceeding 50 000 vehicles/day;

(c) all systems interchanges;

(d) high percentages of large vehicles;

(e) when insufficient space is available to correctly position ground-mounted signs;

(f) to overcome competition from outdoor advertisements.

The upward pointing arrow cluster will vary in configuration with the number of lanes which exit the freeway and with the number of lanes which continue through the interchange. The example illustrates a shared exit and through lane.

2 Standard Sign Sequence

The following is the basic sign sequence which extends to the end of the off ramp and which will commonly be supplemented by optional signs (see below):

- GC2U - ADVANCE EXIT DIRECTION sign
- GC3U - SUPPLEMENTARY EXIT/THROUGH DIRECTION sign
- GC4U - EXIT DIRECTION sign
- GA4 - GORE EXIT DIRECTION sign
- GA6 - OFF-RAMP TERMINAL DIRECTION sign.

3 Sign Positions

The positions recommended for the standard signs in the sequence (with the acceptable range of positions given in brackets) are:

- GC2U - 1000 m (1500 m - 900 m)
- GC3U - 500 m (700 m - 300 m)
- GA4 - within the exit gore
- GA6 - at the ramp terminal - normally on the far side of the cross street.

4 Optional Signs

The following optional signs may be used to supplement the basic sign sequence (see above):

- GF8 - SERVICE EXIT SEQUENCE sign to indicate available primary service at the nearest point beyond a systems interchange - should be located 1000 m to 2000 m beyond the end of an adjacent systems interchange on-ramp but should be no closer than 300 m to any other sign.
- GA8 - EXIT SEQUENCE sign to indicate closely spaced interchanges in an urban area - this should indicate the next two or three interchanges and if there are several closely spaced interchanges (under 5 km spacing) sign GA8 should be used in a "roll-over" manner where one interchange is dropped from the sign and the "new" second or third interchange is added - use of the sign GA8 may remove the need for CONFIRMATION sign GA7 or TOWN NAME sign GL3 on urban freeway by-passes - located between 3000 m and 1500 m from the exit point subject to the provision of other optional signs.
- GC1 - PRE ADVANCE EXIT DIRECTION sign to give early guidance of an exit ahead - appropriate on multi-lane freeways with high traffic volumes and adequate interchange spacing - may not be appropriate if GA8 signs are used.
- GF1 - FREEWAY ADVANCE EXIT (Tourist) sign to give supplementary direction for tourist facilities, service or recreational, **although such applications are limited on freeways, and particularly in urban areas due to the nearest numbered route warrant (see paragraph 9.5.10.3)** - located between 800 m and 600 m from the exit point.
- GA5 - ADVANCE OFF-RAMP TERMINAL DIRECTION sign to give advance guidance to left and right-turn (orientation) destinations - in an urban signing environment these destinations are introduced only on the GA5 or GA6 signs - sign GA5 is appropriate for multi-lane off-ramps but may be replaced by an overhead sign - located 250 m to 200 m from the ramp terminal.
- GF2 - ADVANCE TURN (Tourism) sign to continue a message previously displayed on a GF1 sign (new destination information shall not be introduced by means of sign GF2) - the sign may comprise a left stack or a right stack, or both stacks - if space is limited sign GF2 may be combined with sign GDL1 subject to the signface rules given in Volumes 1 and 4 - located 180 m to 140 m from the ramp terminal.
- GA7 - CONFIRMATION sign to indicate distances to control or familiar destinations on the freeway route - in an urban environment sign GA7 should be provided on a systematic basis at strategic interchanges - located 750 m beyond the end of the on-ramp (range 250 m - 1000 m).

For details of additional signs or variations in signface detail for toll routes see Chapter 6: *Toll Route Signing*.

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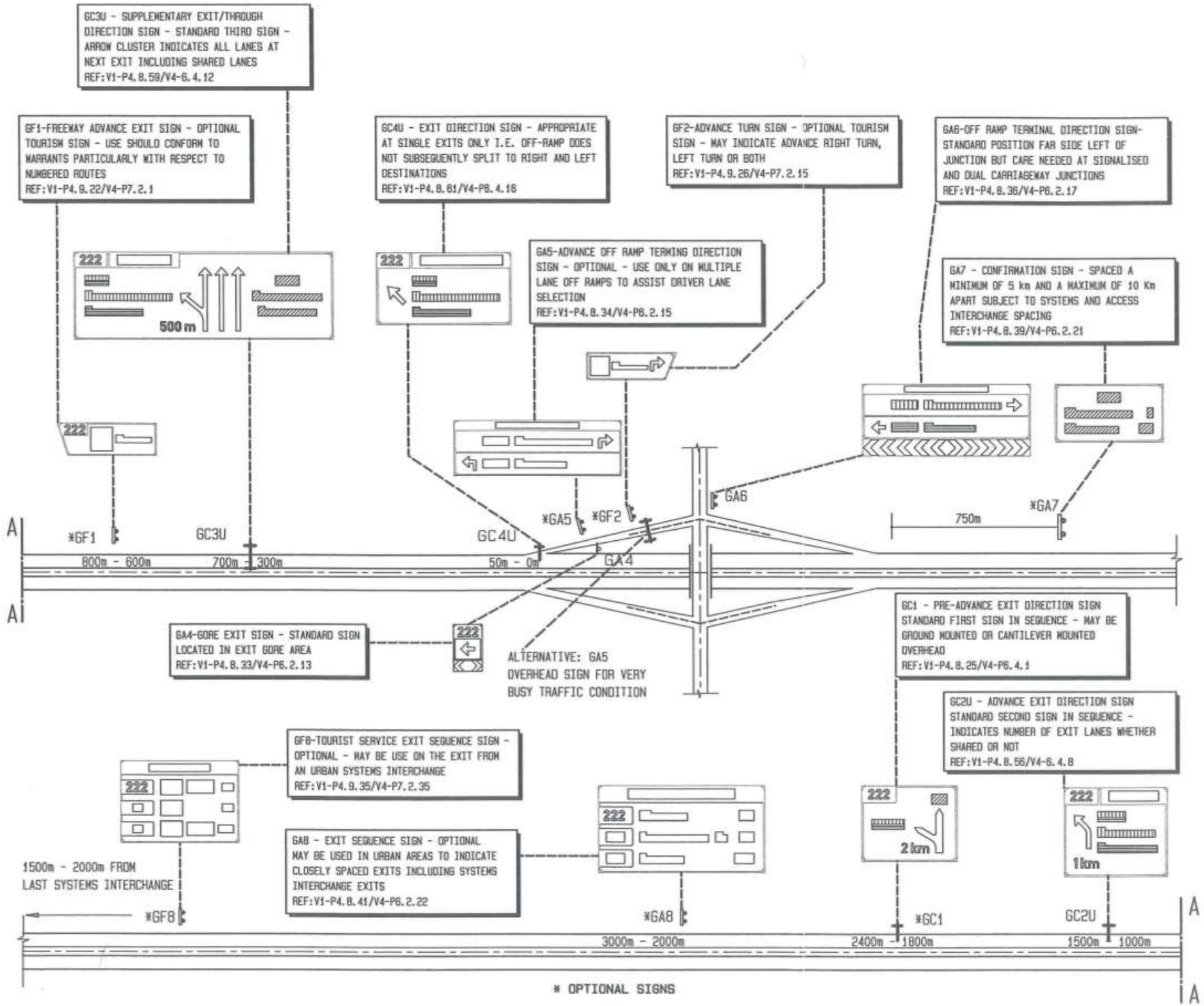

9.6.10 Notes on Figure 9.45

Numbers of Signs Required for Freeway Approach

Quantity	Type	Typical Area (m^2)
1	GC2U	25
1	GC3U	30
1	GC4U	20
1	GA4	5
1	GA6	7

The areas given should be considered as guidelines for general estimating only. They are based on the following very general parameters:

- overhead signs d = 60mm (letter size 420mm/300mm)
- ground-mounted signs d = 30mm (letter size 210mm/150mm)
- longest place name = 10 letters
- 3 lines of text for sign GC2U
- 2 lines of text for signs GC34 and GC4U
- single orientation destinations (sign GA6).

Checklist

One or more of the following factors or questions may require the re-evaluation of the standard signing sequence listed above:

- ❑ heavy traffic volumes (with significant percentages of heavy vehicles or other slow moving traffic)
- ❑ position of other structures not specifically related to the interchange
- ❑ horizontal and vertical alignment on the freeway and ramps
- ❑ provision of additional lanes - particularly between closely spaced interchanges
- ❑ unusual ramp configurations
- ❑ lane drop, merge or weave situations may require diagrammatic signs
- ❑ steep cut or fill conditions making ground-mounted signs difficult to locate
- ❑ signs too closely spaced for readability or for total message transfer - in particular optional signs GF1 and GF2
- ❑ the availability of direct access rest and service areas, either within an interchange or between access interchanges

Fig. 9.45
Urban Signing Level 0A-A
Class "A" Access Interchange
Overhead Signs

9.6.11 Urban Signing Level 1A-A Class "A" Access Interchange Ground-Mounted Signs

1 General

An access interchange is where a freeway system and the rest of an urban street network interface or connect with each other. The connecting street will commonly be a Class "B" numbered route. Ground-mounted signs will normally be specified for two lane sections of freeway. The example given in Figure 9.46 depicts standard ground-mounted freeway signs supplemented by optional guidance signs (see paragraph 9.6.9.1 for details of warrants for overhead signs).

2 Standard Sign Sequence

The following is the basic sign sequence which extends to the end of the off-ramp and which will commonly be supplemented by optional signs (see below):

- GA2 - ADVANCE EXIT DIRECTION sign
- GA3 - EXIT DIRECTION sign
- GA4 - GORE EXIT DIRECTION sign
- GA6 - OFF-RAMP TERMINAL DIRECTION sign.

3 Sign Positions

The positions recommended for the standard signs in the sequence (with the acceptable range of positions given in brackets) are:

- GA2 - 1000 m (1300 m - 900 m)
- GA3 - within 50 m of the exit point
- GA4 - within the exit gore
- GA6 - at the ramp terminal - normally on the far side of the cross street.

4 Optional Signs

The following optional signs may be used to supplement the basic sign sequence (see above):

- GF8 - SERVICE EXIT SEQUENCE sign to indicate available primary service at the nearest point beyond a systems interchange - should be located 1000 m to 2000 m beyond the end of an adjacent systems interchange on-ramp but should be no closer than 300 m to any other sign.
- GA8 - EXIT SEQUENCE sign to indicate closely spaced interchanges in an urban area - this should indicate the next two or three interchanges and if there are several closely spaced interchanges (under 5 km spacing) sign GA8 should be used in a Aroll-over@ manner where one interchange is dropped from the sign and the "new" second or third interchange is added - use of the sign GA8 may remove the need for CONFIRMATION sign GA7 or TOWN NAME sign GL3 on urban freeway by-passes - located between 3000 m and 1500 m from the exit point subject to the provision of other optional signs.
- GC1 - PRE ADVANCE EXIT DIRECTION sign to give early guidance of an exit ahead - appropriate on multi-lane freeways with high traffic volumes and adequate interchange spacing - may not be appropriate if GA8 signs are used.
- GA 2/3 - SUPPLEMENTARY EXIT DIRECTION sign to give supplementary guidance when road alignment, vertical or horizontal, or both, makes sight distance to the exit point and sign GA3 difficult - locate at 700 m - 400 m.
- GF1 - FREEWAY ADVANCE EXIT (Tourist) sign to give supplementary direction for tourist facilities, service or recreational, **although such applications are limited on freeways, and particularly in urban areas due to the nearest numbered route warrant (see paragraph 9.5.10.3)** - located between 800 m and 600 m from the exit point.
- GA5 - ADVANCE OFF-RAMP TERMINAL DIRECTION sign to give advance guidance to left and right-turn (orientation) destinations - in an urban signing environment these destinations are introduced only on the GA5 or GA6 signs - sign GA5 is appropriate for multi-lane off-ramps but may be replaced by an overhead sign - located 250 m to 200 m from the ramp terminal.
- GF2 - ADVANCE TURN (Tourist) sign to continue a message previously displayed on a GF1 sign (new destination information shall not be introduced by means of sign GF2) - the sign may comprise a left stack or a right stack, or both stacks - if space is limited sign GF2 may be combined with sign GDL1 subject to the signface rules given in Volumes 1 and 4 - located 180 m to 140 m from the ramp terminal.
- GA7 - CONFIRMATION sign to indicate distances to control or familiar destinations on the freeway route - in an urban environment sign GA7 should be provided on a systematic basis at strategic interchanges - located 750 m beyond the end of the on-ramp (range 250 m - 1000 m).
- GF9 - REST AND SERVICE SEQUENCE sign to indicate the availability of Class III rest and service facilities accessible from the freeway and the distance between successive facilities - sign GF9 may become relevant on urban freeways as the provision of high standard rest and service areas develops (see Chapter 4 for further details).

For details of additional signs or variations in signface detail for toll routes see Chapter 6: *Toll Route Signing*.

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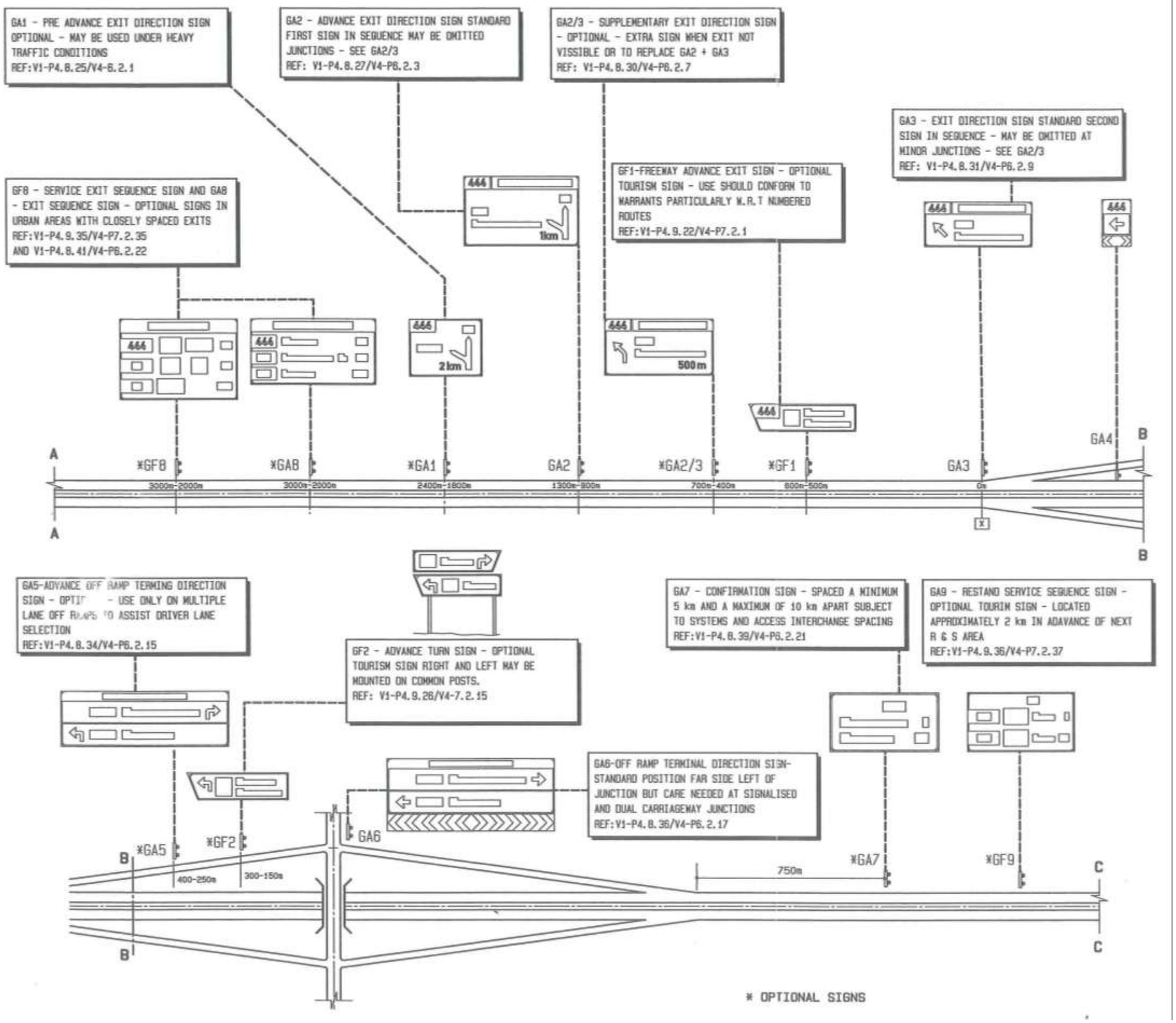

9.6.12 Notes on Figure 9.46

Numbers of Signs Required for Freeway Approach

Quantity	Type	Typical Area (m^2)
1	GA2	16
1	GA3	10
1	GA4	5
1	GA6	7

The areas given should be considered as guidelines for general estimating only. They are based on the following very general parameters:

- d = 50 mm (letter size 350 mm/250 mm) for signs GA2 and GA3
- d = 30 mm (letter size 210 mm/150 mm) for sign GA6
- longest place name = 10 letters
- 2 lines of text
- single orientation destinations (sign GA6).

Checklist

One or more of the following factors or questions may require the re-evaluation of the standard signing sequence listed above:

- ❑ more than three lanes on the freeway
- ❑ position of other structures not specifically related to the interchange
- ❑ horizontal and vertical alignment on the freeway and ramps
- ❑ the provision of additional lanes - particularly between closely spaced interchanges
- ❑ unusual ramp configuration
- ❑ lane drop, merge or weave situations may require diagrammatic signs
- ❑ steep cut or fill conditions making ground-mounted signs difficult to locate
- ❑ signs too closely spaced for readability or for total message transfer - in particular optional signs GF1 and GF2
- ❑ the availability of direct access rest and service facilities, either within an interchange or between access interchanges

Fig. 9.46
Urban Signing Level 1A-A
Class "A" Access Interchange
Ground Mounted Signs

9.6.13 Urban Signing Level 1A-C Freeway Class "A" – Crossroad Preferred Level

1 General

Crossroad signing on the approach to an access interchange provides the "other side" of the urban street network interface with a freeway system. The signs used in Figure 9.47 are typical of any Class "B" preferred level of guidance signing (see Figure 9.49) but exhibit a number of significant differences. The signs have a mixed colour code to "trailblaze" the freeway and are detailed separately in Volumes 1 and 4. **It should be noted that if the freeway is a Class "A2" facility, blue background signs are not used on the freeway, and therefore the use of the blue colour coding on the crossroad signs shall fall away.** It is a general rule that direction sign stacks directing drivers onto the freeway shall display only one destination name. This destination name is normally the route terminal familiar destination, or, if the distance to this destination is considerable (e.g. Cape Town from Johannesburg) some other equally familiar intermediate destination (e.g. Bloemfontein).

Tourist direction and local direction signs shall not be used to direct drivers onto a freeway.

2 Standard Sign Sequence

The following is the basic sign sequence which should be provided on an intersecting cross street on the approach to a freeway access interchange, irrespective of the class of intersecting street (freeways excluded):

- GB1 - CROSS-ROAD ADVANCE DIRECTION sign
- GB2 - NEAR-SIDE ON-RAMP DIRECTION sign
- GB3 - FAR-SIDE ON-RAMP ADVANCE DIRECTION sign
- GB4 - FAR-SIDE ON-RAMP DIRECTION sign.

3 Sign Positions

The positions recommended for certain signs in the standard signs sequence vary according to the speed limit (or preferably the operating speed) on the intersecting street. Positions are given below for 60 km/h and 80 km/h. Positions for other approach speeds may be interpolated from the values given or they may be obtained by consulting Figure 4.43 in Volume 1, Chapter 4:

- GB1 - 150 m to 180 m (80 km/h) - 100 m (60 km/h)
- GB2 - on the far side of the on-ramp for diamond interchanges, or opposite the turn onto the on-ramp for parclo-interchanges
- GB3 - between the left and right turn on-ramps and before the main bridge structure (see "Optional Signs" below)
- GB4 - opposite the right turn on-ramp for diamond interchanges, or on the far side of the on-ramp for parclo-interchanges.

4 Optional Signs

The following are the only optional signs which should be considered for display in addition to the standard sign sequence, unless the freeway is a toll route, and they represent alternatives for each other:

- GD3 - CONFIRMATION sign indicating the cross street route number and the distance to one or more control or familiar destinations - use of sign GD3 is not commonly warranted in urban areas but may be appropriate outward-bound from the urban area or inward-bound to indicate the distance to the town or city centre - located 60 m to 100 m beyond the interchange far-side ramps
- GE12 - ROUTE MARKER CONFIRMATION (METROPOLITAN) sign indicating the number and class of the intersecting route when this is a numbered route (other variations include GE13 (REGIONAL), GE14 (PROVINCIAL) and GE15 (NATIONAL)) - located 60 m to 100 m beyond the far-side ramps.

A further option exists in that sign GB4 may be varied to include a straight-on destination stack above the freeway on-ramp indication. This variation of sign GB4 and sign GD3 should not normally be used together.

Space limitations may make it necessary to omit sign GB3. If the sign is omitted consideration should be given to increasing the letter size used on sign GB4 to increase its legibility distance.

For details of additional signs or variations in signface detail for toll routes see Chapter 6: *Toll Route Signing*.

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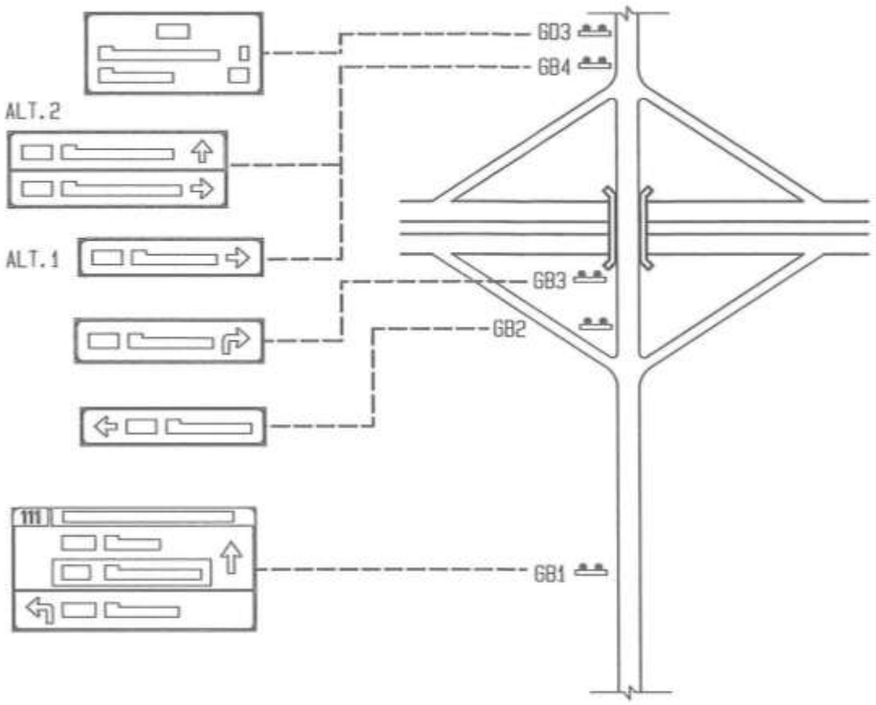

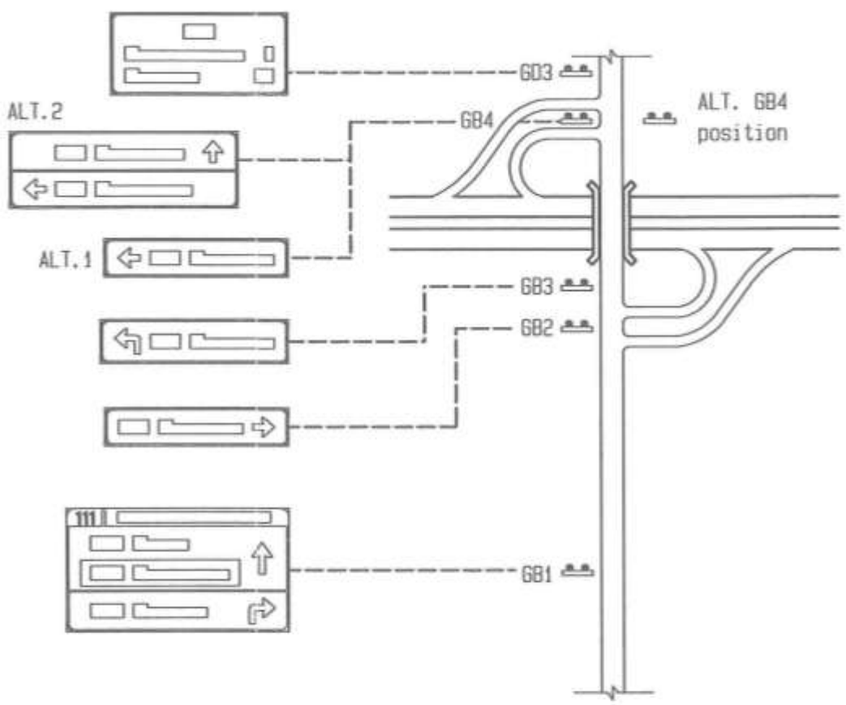

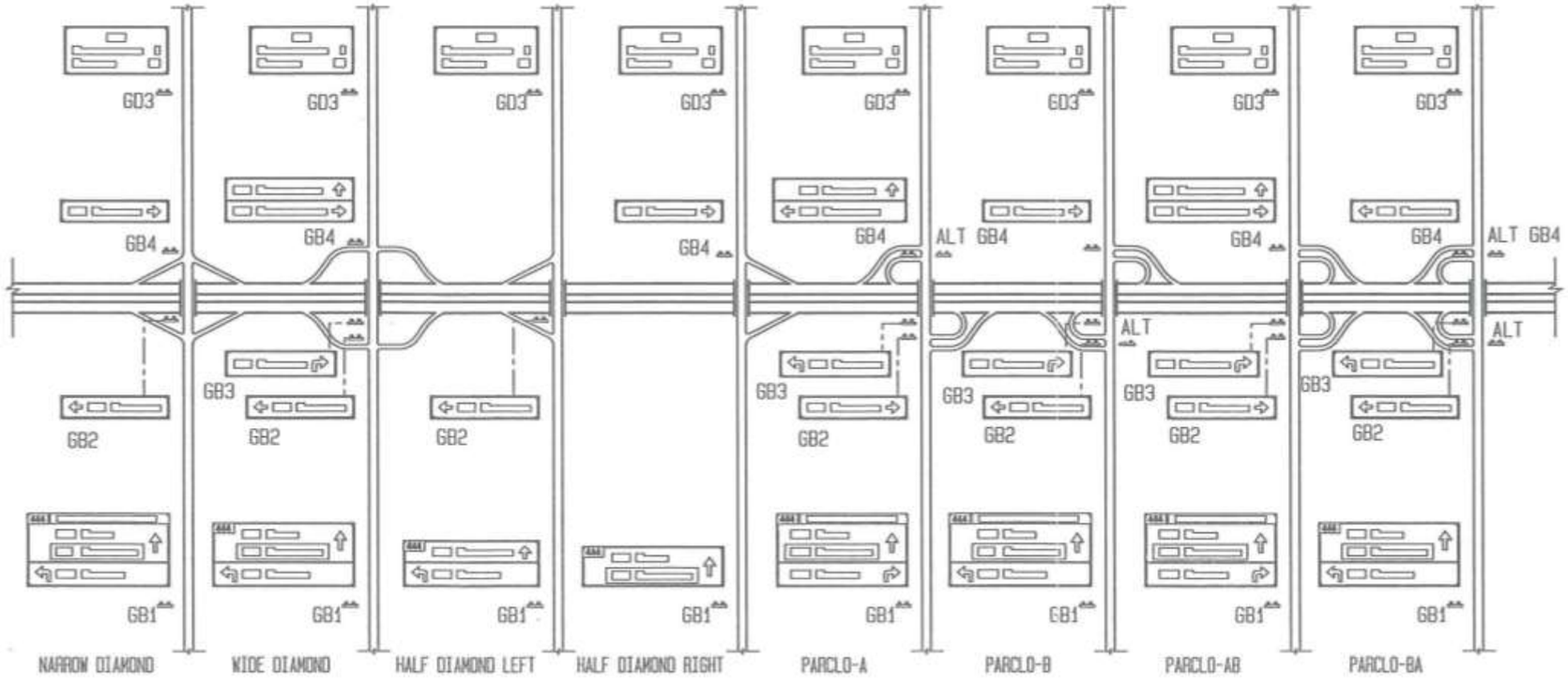

9.6.14 Notes on Figure 9.47

Numbers of Signs Required per Approach

Quantity	Type	Typical Area (m^2)
1	GB1	12_{80} 7_{60}
1	GB2	4_{80} $2{,}25_{60}$
1	GB3	4_{80} $2{,}25_{60}$
1	GB4	4_{80} $2{,}25_{60}$

The areas given should be considered as guidelines for general estimating only. They are based on the following very general parameters:

- d = 40 mm (letter size 280 mm/200 mm) - 80 km/h (see suffix "80")
- d = 30 mm (letter size 210 mm/150 mm) - 60 km/h (see suffix "60")
- one destination per direction
- longest place name = 10 letters.

Checklist

One or more of the following factors or questions may require the re-evaluation of the standard signing sequence listed above:

- ❑ more than four lanes on the cross-street (consider overhead signs)
- ❑ non-standard ramp configurations
- ❑ dual-carriageway cross street
- ❑ ramp terminal junction geometry (particularly the provision of channelizing islands)
- ❑ high fills or steep cuts which limit sign locating options (see Figure 9.48)
- ❑ limited longitudinal space to accommodate signs.

Fig. 9.47
Urban Signing Level 1A-C
Freeway Class "A" Crossroad
Preferred Level

9.6.15 Urban Signing Level 2A – C Freeway Class "A" – Crossroad Minimum level

1 General

The signing illustrated in this example should only be considered when access interchange crossroad approaches offer very limited space for direction signs. Such situations will most commonly occur when the freeway is located within a central business district environment.

The orientational guidance given by the signs illustrated is obtained solely from the cardinal directions displayed i.e. north, south, east or west. The use of a vertically formatted map -type sign as an advance sign allows the ramp configuration to be clearly indicated for diamond and parclo-interchanges and the sign shape should commonly be able to be accommodated spanning the sidewalk with sufficient clearance for pedestrians to walk under the sign.

Tourist direction and local direction signs shall not be used to direct drivers onto a freeway.

2 Standard Sign Sequence

The following the basic sign sequence is the minimum level of signing which should be provided on an intersecting cross street, on the approach to an access interchange, in an urban environment:

- GD7 - MAP-TYPE DIRECTION sign (variation of a STAGGERED JUNCTION map)
- GE15.2 - DIRECTION ROUTE MARKER (NATIONAL) sign (other variations include GE14.2 (PROVINCIAL), GE13.2 (REGIONAL) and GE12.2 (METROPOLITAN)) - left turn
- GE15.1 - DIRECTION ROUTE MARKER (NATIONAL) sign (variations as for sign GE15.2) - right turn.

3 Sign Positions

Positions given below refer to 60 km/h approach speeds:

- GD7 - 60 m to 100 m
- GE15.2 - on the far side of the on-ramp for diamond interchanges, or opposite the turn onto the on-ramp for parclo-interchanges
- GE15.1 - opposite the right turn on-ramp for diamond interchanges, or on the far side of the on-ramp for parclo-interchanges.

4 Optional Signs

The following is the only optional sign which may be considered for display in addition to the minimum level sign sequence, unless the freeway is a toll route (see Chapter 6):

- GE12 - ROUTE MARKER CONFIRMATION (METROPOLITAN) sign indicating the number and class of the intersecting route when this is a numbered route (other variations include GE13 (REGIONAL), GE14 (PROVINCIAL) and GE15 (NATIONAL) - located 60 m to 100 m beyond the far-side ramps.

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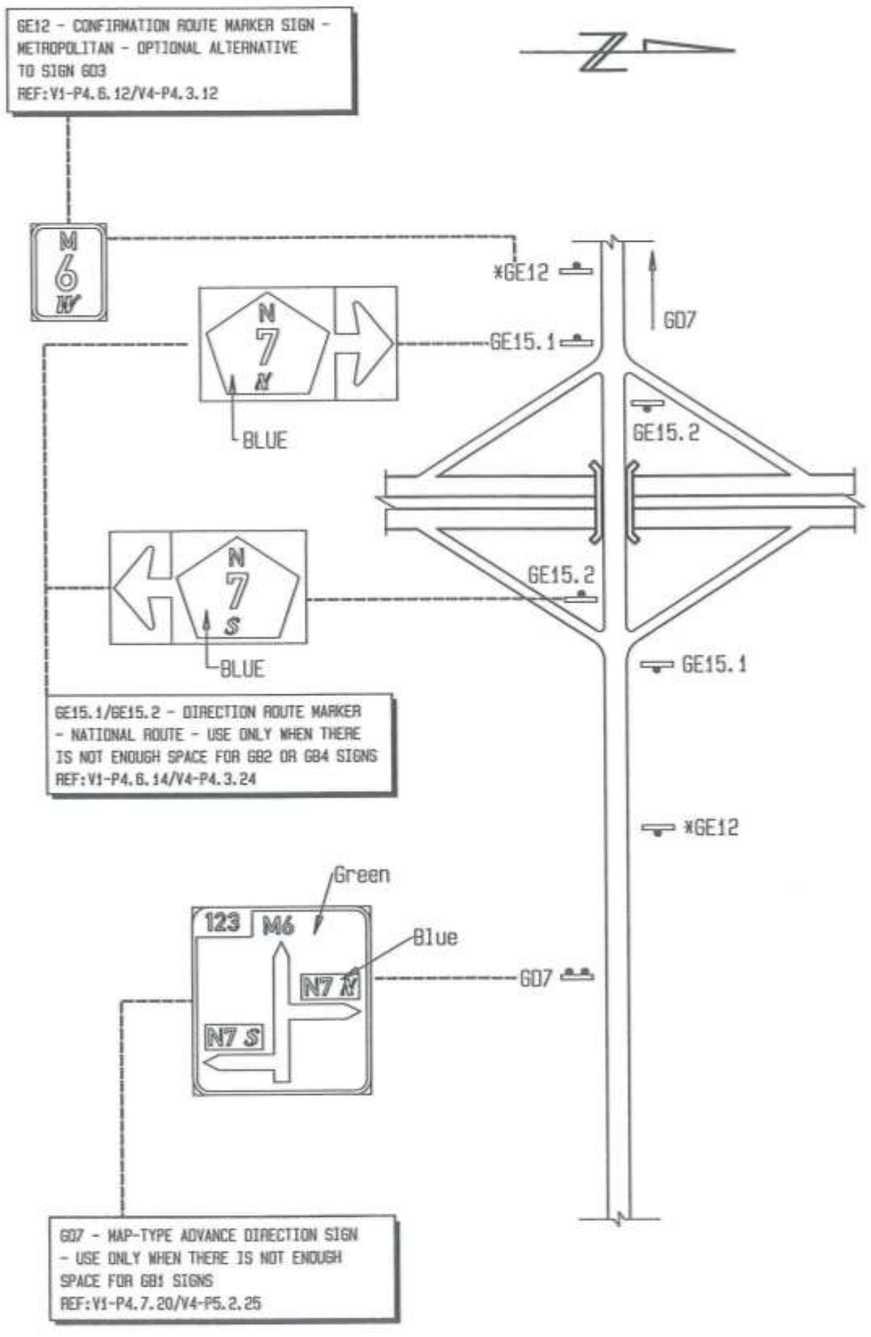

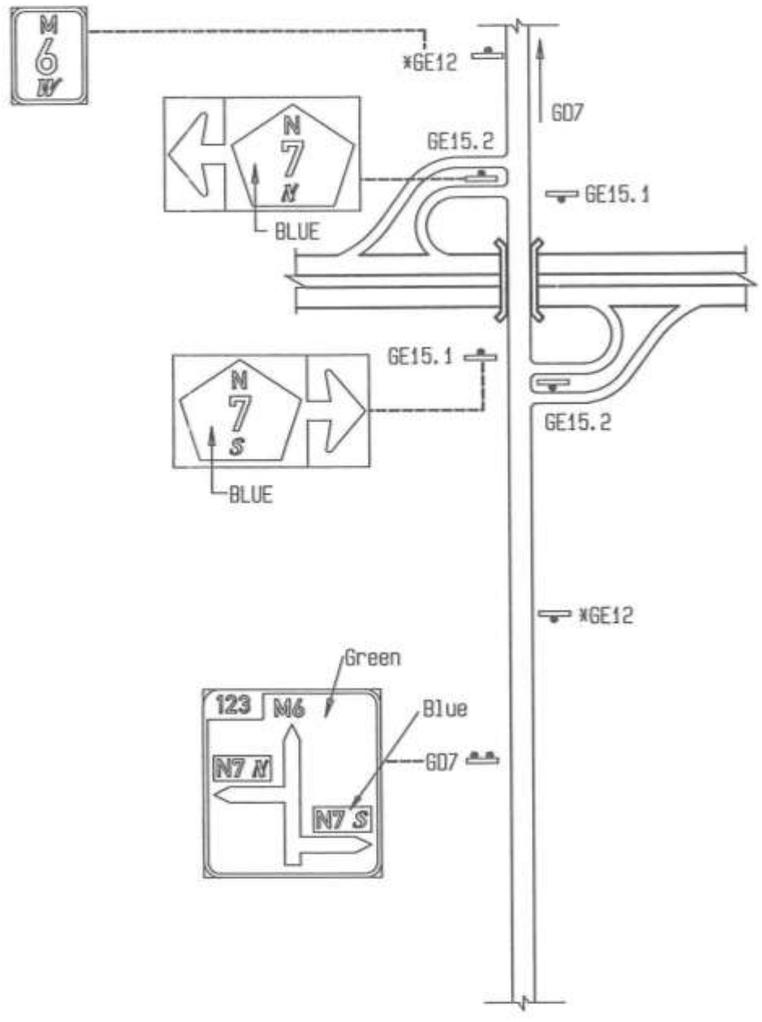

* OPTIONAL SIGNS

9.6.16 Notes on Figure 9.48

Numbers of Signs Required per Approach

Quantity	Type	Typical Area (m^2)
1	GD7	5
1	GE15.2	0,6
1	GE15.1	0,6

The areas given are based on the following general parameters:

- d = 30 mm for GD7
- signs GE15.2 and GE15.1 are a fixed size although it is optional to increase these sizes by a factor of 4 over 3 (see Volume 4, Chapter 4).

Checklist

One or more of the following factors or questions may require the re-evaluation of the standard signing sequence listed above:

- ❑ more than four lanes on the cross street (consider overhead signs)
- ❑ non-standard ramp configurations
- ❑ adequate space to accommodate the standard sign sequence illustrated in Figure 9.47.

Fig. 9.48
Urban Signing Level 2A-C
Freeway Class "A" Crossroad
Minimum Level

9.6.17 Urban Signing Level 1B Class "B" Junctions Preferred Level

1 General

Class "B" urban roads are numbered routes and can be sub-classified into Class "B1" Primary Arterial and Class "B2" Secondary Arterial routes. The preferred level of guidance signing illustrated in Figure 9.49 may be applied to both Class "B1" and Class "B2" routes because the decision on signing level is related to a range of physical characteristics of the route concerned. These parameters are covered in Section 9.4 and a decision flow chart is given in Figure 9.15. The ultimate factor in deciding on Class "B" route guidance signing is likely to be affordability. Class "B" junctions must be signed at least to the minimum level illustrated in Figure 9.52. The signing level of Class "B" junctions is thus independent of the sub-class of a given approach to a junction. **Therefore, if a Class "B1" and a Class "B2" route intersect the signing levels on the different approaches may all be the same, or each may be different according to the physical characteristics of the approaches** (the four levels of signing available are covered in Figures 9.49 to 9.52.) **However, it is very important that message continuity be maintained along specific routes. It is not recommended that the signing level be altered frequently through successive junctions on a route.** If orientational destinations have been used at a particular junction these should continue to be displayed along a route until the destination is reached. **The decision to display destination names should therefore not be taken in isolation but with a full knowledge of the ability to provide a common level of signing at subsequent junctions.**

Signing levels appropriate to junctions between Class "C" and Class "D" streets and Class "B" routes are covered by Figures 9.53 and 9.54.

In Figure 9.49 all signs which might be provided on approaches to a typical cross road or T-junction between Class "B" routes are indicated on the plan. A representative selection only of the signface layouts of typical signs is illustrated. **The names of the intersecting streets are incorporated into the direction signs at this level of signing. It is therefore not necessary to provide separate STREET NAME signs GL1. If the street name changes at a junction the manner of display of the street names on the direction signs is different.** Examples of both are illustrated.

Figures 9.49 to 9.52 do not include SUBURB NAME sign GL2 or TOWN or CITY NAME sign GL3. Examples are given in Figure 9.14.

2 Standard Sign Sequence

The following is the basic sign sequence which comprises the Preferred Level of Class AB@ route direction signing:

- GD1 - STACK-TYPE ADVANCE DIRECTION sign
- GD2 - STACK-TYPE DIRECTION sign.

3 Sign Positions

The position of sign GD1 should be related to the speed limit or preferably the operating speed. Positions are given for 80 km/h and 60 km/h. Positions for other approach speeds may be obtained from Figure 4.43 in Volume 1, Chapter 4.

The position of sign GD1 should always precede the start of an exclusive right and/or left turn lane:

- GD1 - 150 m to 180 m (80 km/h) - 100 m (60 km/h)
- GD2 - in the far side left corner of the junction (this may be varied for roadways with sliproads or dual carriageways - see Figure 9.56).

4 Optional Signs

The following optional signs may be used to supplement the basic sign sequence (see above), **subject to compliance with warrants and design criteria relating to the total amount of information, letter sizes, spacing between signs in a sequence and the reading time available (where practical signs GF2 and GDL1 should be displayed as a composite sign):**

- GE12 - ROUTE MARKER CONFIRMATION (METROPOLITAN) sign indicating the number and class of the intersecting route (other variations include GE13 (REGIONAL), GE14 (PROVINCIAL) and GE15 (NATIONAL) - located 60 m to 100 m beyond the junction.
- GDL1 - ADVANCE LOCAL DIRECTION sign - **subject to compliance with warrants this sign may be introduced on a class "B" route** (see Section 9.4), - the sign may comprise a left stack or a right stack, or both stacks (see GF2 above) - located 50 m to 60 m (80 km/h) or 40 m (60 km/h) in advance of the junction.
- GF2 - ADVANCE TURN (Tourist) sign - **subject to compliance with warrants this sign may be introduced on a class "B" route** or it may continue a message previously displayed on a freeway (or another numbered route subject to the relaxation of the nearest numbered route rule **see Section 9.5 and Chapter 4**), - the sign may comprise a left stack or a right stack, or both stacks - sign GF2 may be combined with sign GDL1 either by providing a single composite sign or by mounting the signs on common supports, subject to the signface rules given in Volumes 1 and 4 - and located 100 m to 120 m (80 km/h) or 70 m (60 km/h) in advance of the junction.
- GL2 - SUBURB NAME sign - to indicate passage from one suburb to another along a numbered route - its role should be considered as secondary to the other signs listed above particularly with regard to allocation of position - preferably located on the exit from a junction within 30 m to 60 m of the suburb boundary.
- GL3 - TOWN NAME sign - to indicate entry into a specific town or city - it should be located so as not to conflict with other guidance signs (accurate location at the town boundary should be considered secondary to avoiding conflict with other signs).

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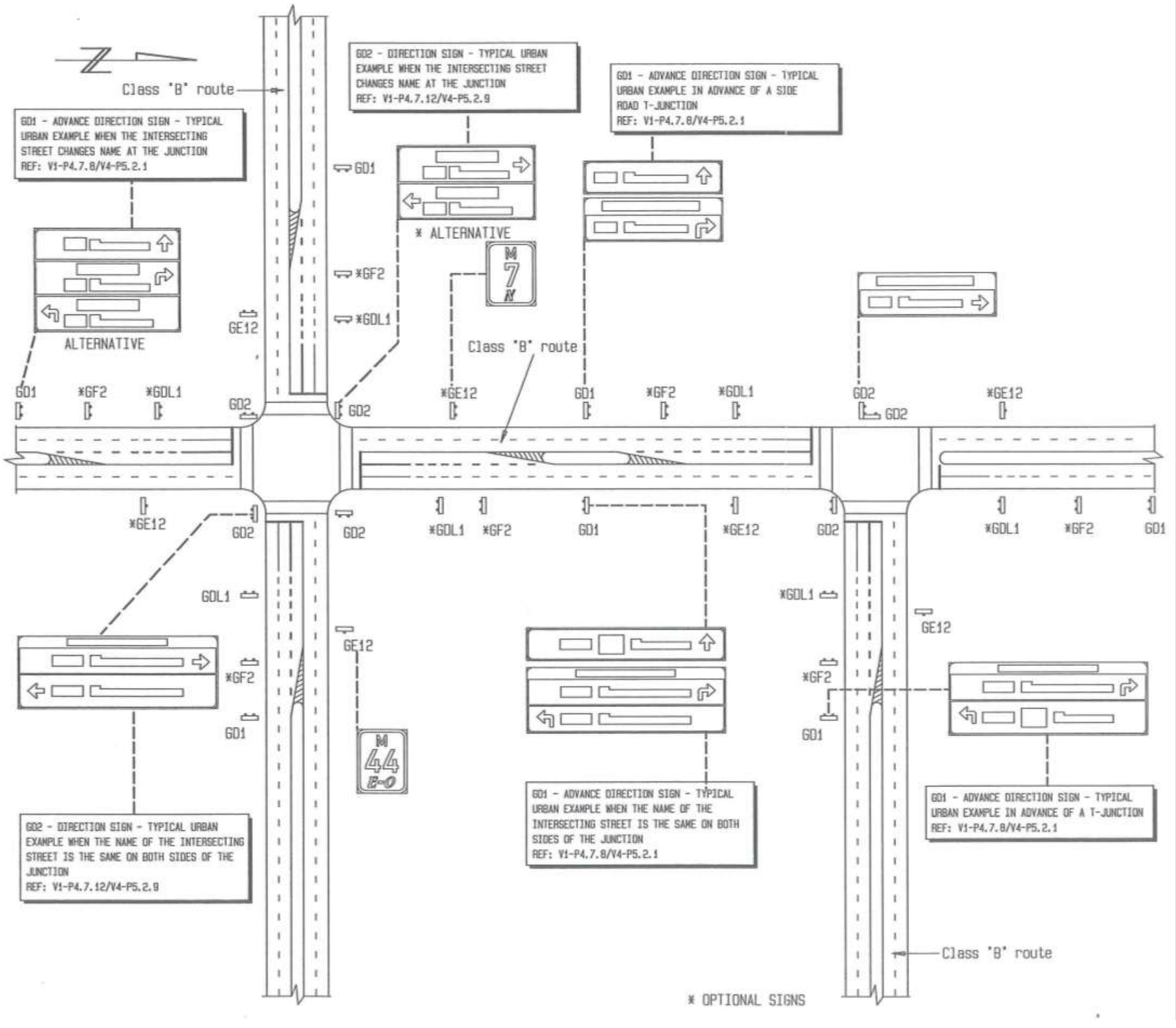

9.6.18 Notes on Figure 9.49

Numbers of Signs Required per Approach

Quantity	Type	Typical Area (m^2)
	for a single street name	
1	GD1	15_{80} $8{,}5_{60}$
1	GD2	8_{80} $4{,}75_{60}$
	for two street names	
1	GD1	18_{80} 10_{60}
1	GD2	11_{80} 6_{60}

The areas given should be considered as guidelines for general estimating only. They are based on the following very general parameters:

- d = 40 mm (letter size 280 mm/200 mm) for 80 km/h (see suffix "80")
- d = 30 mm (letter size 210 mm/150 mm) for 60 km/h (see suffix "60")
- longest place name = 10 letters
- single orientation destinations in all stacks
- signface design to full justification of arrows, route numbers and destinations.

Checklist

One or more of the following factors or questions may require the re-evaluation of the signs provided at an urban junction between two Class "B" routes:

- ❑ is sign message continuity being maintained?
- ❑ is there adequate space for direction signs displaying the intended destination names at a correct letter size to ensure legibility?
- ❑ are existing GD1 and/or GD2 signs in place?
- ❑ **is a relaxation of the nearest numbered route warrant justified for the display of GF2 and/or GDL1 signs?**
- ❑ is there sufficient space to accommodate additional GF2 and/or GDL1 signs if warranted?
- ❑ is there sufficient reading time to allow for the addition of GF2 and/or GDL1 signs if warranted?
- ❑ can a combination GF2/GDL1 sign be used?
- ❑ should the whole sign sequence be revised?
- ❑ is there conflict with other street furniture?
- ❑ is there competition from advertising signs?

Fig. 9.49
Urban Signing Level 1B
Class "B" Junctions
Preferred Level

9.6.19 Urban Signing Level 2B Class "B" Junctions Intermediate Level 1

1 General

The Intermediate Level 1 of guidance signing for Class "B" routes is the second highest level of signing and **is dependent on there being sufficient space within the junction to locate GD2 signs.** Intermediate Level 1 guidance signing illustrated in Figure 9.50 may be applied to both Class "B1" and Class "B2" routes because the decision on signing level is related to a range of physical characteristics of the route concerned. These parameters are covered in Section 9.3 and a decision flow chart is given in Figure 9.15. **If a Class "B1" and a Class "B2" route intersect the signing levels on the different approaches may all be the same, or each may be different according to the physical characteristics of the approaches** (a total of four levels of signing are available and are covered in Figures 9.49 to 9.52). **It is very important that message continuity be maintained along specific routes. It is not recommended that signing levels be altered frequently through successive junctions on a route. Class "B" junctions must be signed at least to the Minimum Level illustrated in Figure 9.52** (see Subsection 9.6.23).

In Figure 9.50 all standard signs and optional signs which might be provided on approaches to a typical cross road and a typical T-junction between Class "B" routes are indicated on the plan of the junctions. A representative selection only of the signface layouts of typical signs is illustrated. It should be noted that the street names of the intersecting streets are incorporated into the direction signs at this level of signing. It is therefore not necessary to provide separate STREET NAME signs GL1. **It should also be noted that if the street name changes through the junction the manner of display of the street names on the direction signs is different.** See Figure 9.49 for examples of both types of display.

Figures 9.49 to 9.52 do not include SUBURB NAME sign GL2 or TOWN or CITY NAME sign GL3. Examples are given in Figure 9.14.

2 Standard Sign Sequence

The following is the basic sign sequence which comprises the Intermediate Level 1 of Class AB@ route direction signing:

- GE12.3 - (over GE12.4) ADVANCE DIRECTION ROUTE MARKER (METROPOLITAN) signs (mounted RIGHT over LEFT) (other variations include GE13.3/GE13.4 (REGIONAL), GE14.3/GE14.4 (PROVINCIAL) or GE15.3/GE15.4 (NATIONAL) - on the through leg of a T-junction only one sign is required)
- GD2 - STACK-TYPE DIRECTION sign.

3 Sign Positions

The position of signs GE12.3/GE12.4 should be determined in terms of the speed limit (or preferably the operating speed) on the approach. Positions are given below for 80 km/h and 60 km/h. Positions for other approach speeds may be interpolated from the values given or they may be obtained from Figure 4.43 in Volume 1, Chapter 4.

The position of signs GE12.3/GE12.4 should preferably precede the start of an exclusive right and/or left turn lane.

- GE12.3 - (and GE12.4) 150 m to 180 m (80 km/h) - 100 m (60 km/h)
- GD2 - in the far side left corner of the junction (this may be varied for roadways with slip roads or dual carriageways - see Figure 9.56).

4 Optional Signs

The following optional signs may be used to supplement the basic sign sequence (see above) provided adequate longitudinal space is available between signs in a sequence:

- GE12 - ROUTE MARKER CONFIRMATION (METROPOLITAN) sign indicating the number and class of the intersecting route (other variations include GE13 (REGIONAL), GE14 (PROVINCIAL) and GE15 (NATIONAL) - located 60 m to 100 m beyond the junction.
- GDL1 - ADVANCE LOCAL DIRECTION sign - **subject to compliance with warrants this sign may be introduced on a class "B" route** (see Section 9.4), - the sign may comprise a left stack or a right stack, or both stacks (see GF2 above) - located 50 m to 60 m (80 km/h) or 40 m (60 km/h) in advance of the junction.
- GF2 - ADVANCE TURN (Tourist) sign - **subject to compliance with warrants this sign may be introduced on a class "B" route** or it may continue a message previously displayed on a freeway (or another numbered route subject to the relaxation of the nearest numbered route rule **see Section 9.5 and Chapter 4**), - the sign may comprise a left stack or a right stack, or both stacks - sign GF2 may be combined with sign GDL1 either by providing a single composite sign or by mounting the signs on common supports, subject to the signface rules given in Volumes 1 and 4 - and located 100 m to 120 m (80 km/h) or 70 m (60 km/h) in advance of the junction.
- GL2 - SUBURB NAME sign - to indicate passage from one suburb to another along a numbered route - its role should be considered as secondary to the other standard and optional signs listed above particularly with regard to allocation of position - preferably located on the exit from a junction within 30 m to 60 m of the suburb boundary.
- GL3 - TOWN NAME sign - to indicate entry into a specific town or city - it should be located so as not to conflict with other guidance sign (accurate location at the town boundary should be considered secondary to avoiding conflict with other signs).

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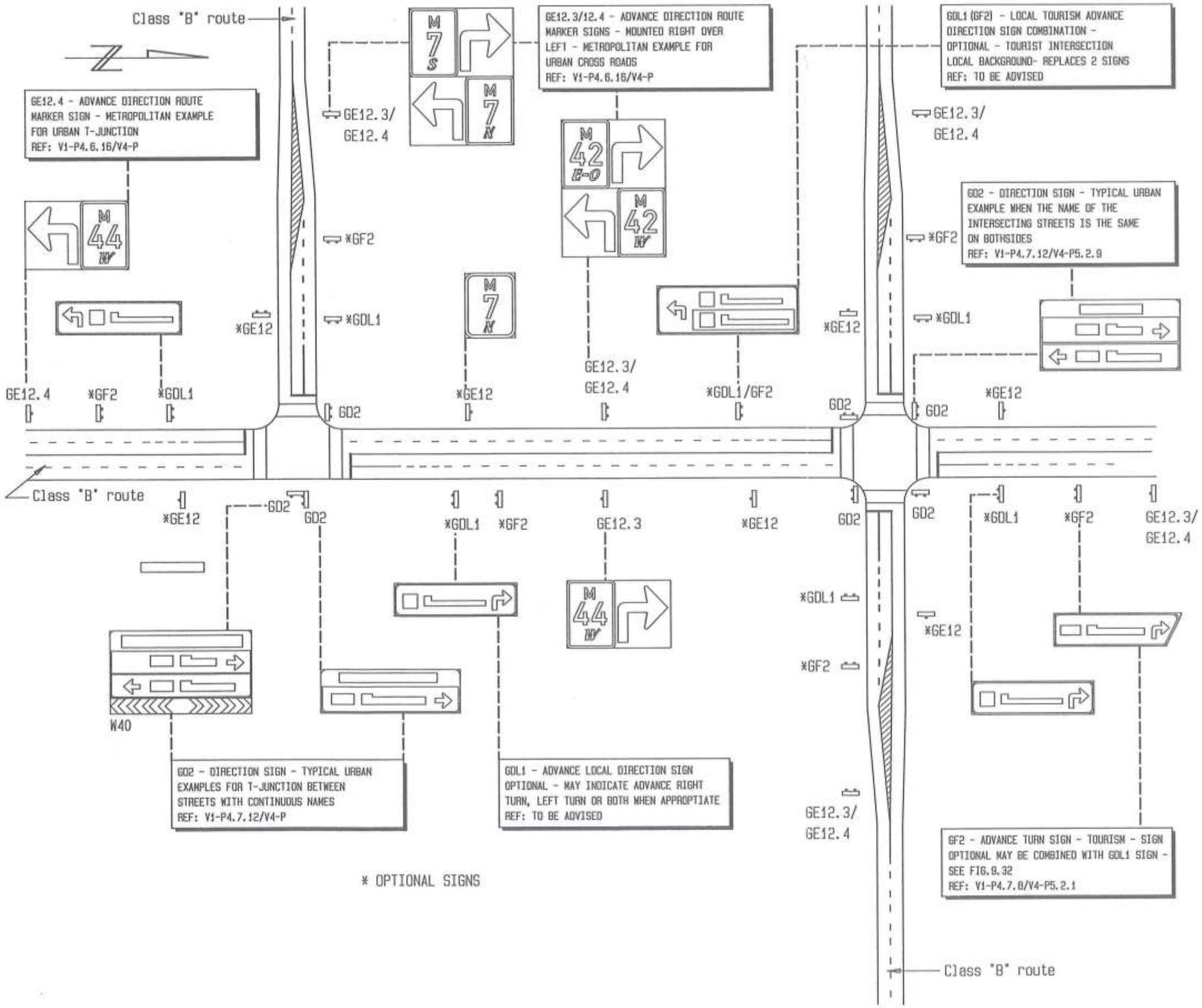

9.6.20 Notes on Figure 9.50

Numbers of Signs Required per Approach

Quantity	Type	Typical Area (m^2)
	for a single street name	
1	GE12*	$1\text{-}1.4_{\text{(by route type)}}$
1	GD2	8_{80} $4{,}75_{60}$
	for two street names	
1	GE12*	$1\text{-}1{,}4_{\text{(by route type)}}$
1	GD2	11_{80} 6_{60}

NOTE: * Optional signs

The areas given are based on the following parameters:

- d = 40 mm (letter size 280 mm/200 mm) for 80 km/h (see suffix "80")
- d = 30 mm (letter size 210 mm/150 mm) for 60 km/h (see suffix "60")
- longest place name = 10 letters
- single orientation destinations in all stacks
- signface design to full justification of arrows, route numbers and destinations.

Checklist

One or more of the following factors or questions may require the re-evaluation of the signs provided at an urban junction between two Class "B" routes:

- ❑ is sign message continuity being maintained?
- ❑ is there space within the junction for GD2 signs?
- ❑ **is a relaxation of the nearest numbered route warrant justified for the display of GF2 and/or GDL1 signs?**
- ❑ is there sufficient space to accommodate additional GF2 and/or GDL1 signs if warranted?
- ❑ can a combination GF2/GDL1 sign be used?
- ❑ is there competition from advertising signs?

Fig. 9.50
Urban Signing Level 2B
Class "B" Junctions
Intermediate Level 1

9.6.21 Urban Signing Level 3B Class "B" Junctions Intermediate Level 2

1 General

The Intermediate Level 2 of guidance signing for Class "B" routes is the second lowest level of signing and **is dependent on there being sufficient space within the approach side space to locate GD1 signs.** Intermediate Level 2 guidance signing illustrated in Figure 9.51 may be applied to both Class "B1" and Class "B2" routes because the decision on signing level is related to a range of physical characteristics of the route concerned. These parameters are covered in Section 9.3 and a decision flow chart is given in Figure 9.15. If a Class "B1" and a Class "B2" route intersect the signing levels on the different approaches may all be the same, or each may be different according to the physical characteristics of the approaches (a total of four levels of signing are available and are covered in Figures 9.49 to 9.52). It is very important that message continuity be maintained along specific routes. It is not recommended that signing levels be altered frequently through successive junctions on a route. Class "B" junctions must be signed at least to the Minimum Level illustrated in Figure 9.52 (see Subsection 9.6.23).

In Figure 9.51 all standard signs and optional signs which might be provided on approaches to a typical cross road and a typical T-junction between Class "B" routes are indicated on the plan of the junctions. A representative selection only of the signface layouts of typical signs is illustrated. It should be noted that the street names of the intersecting streets are incorporated into the advance direction signs at this level of signing. It should also be noted that if the street name changes through the junction the manner of display of the street names on the advance direction signs is different (see Figure 9.49 for examples of both type of display). Separate STREET NAME signs GL1 are provided at the junction.

Figures 9.49 to 9.52 do not include SUBURB NAME sign GL2 or TOWN or CITY NAME sign GL3. Examples are given in Figure 9.14.

2 Standard Sign Sequence

The following is the basic sign sequence which comprises the Intermediate Level 2 of Class "B" route direction signing:

- GD1 - STACK-TYPE ADVANCE DIRECTION sign
- GE12.1 - (over GE12.2) DIRECTION ROUTE MARKER (METROPOLITAN) signs (mounted RIGHT over LEFT) (other variations include GE13.1/GE13.2 (REGIONAL), GE14.1/GE14.2 (PROVINCIAL) or GE15.1/GE15.2 (NATIONAL) - on the through leg of a T-junction only one sign is required)
- GL1 - STREET NAME sign.

3 Sign Positions

The position of sign GD1 should be determined in terms of the speed limit (or preferably the operating speed) on the approach. Positions are given below for 80 km/h and 60 km/h. Positions for other approach speeds may be interpolated from the values given or they may be obtained from Figure 4.43 in Volume 1, Chapter 4.

The position of sign GD1 should preferably precede the start of an exclusive right or left turn lane:

- GD1 - 150 m to 180 m (80 km/h) - 100 m (60 km/h)
- GE12.1 - (and GE12.2 and GL1) in the far left corner of the junction.

4 Optional Signs

The following optional signs may be used to supplement the basic sign sequence (see above) provided adequate longitudinal space is available between signs in a sequence:

- GE12 - ROUTE MARKER CONFIRMATION (METROPOLITAN) sign indicating the number and class of the intersecting route (other variations include GE13 (REGIONAL), GE14 (PROVINCIAL) and GE15 (NATIONAL) - located 60 m to 100 m beyond the junction.
- GDL1 - ADVANCE LOCAL DIRECTION sign - **subject to compliance with warrants this sign may be introduced on a class "B" route** (see Section 9.4), - the sign may comprise a left stack or a right stack, or both stacks (see GF2 above) - located 50 m to 60 m (80 km/h) or 40 m (60 km/h) in advance of the junction.
- GF2 - ADVANCE TURN (Tourist) sign - **subject to compliance with warrants this sign may be introduced on a class "B" route** or it may continue a message previously displayed on a freeway (or another numbered route subject to the relaxation of the nearest numbered route rule **see Section 9.5 and Chapter 4**), - the sign may comprise a left stack or a right stack, or both stacks - sign GF2 may be combined with sign GDL1 either by providing a single composite sign or by mounting the signs on common supports, subject to the signface rules given in Volumes 1 and 4 - and located 100 m to 120 m (80 km/h) or 70 m (60 km/h) in advance of the junction.
- GL2 - SUBURB NAME sign - to indicate passage from one suburb to another along a numbered route - its role should be considered as secondary to the other standard and optional signs listed above particularly with regard to allocation of position -preferably located on the exit from a junction within 30 m to 60 m of the suburb boundary.
- GL3 - TOWN NAME sign - to indicate entry into a specific town or city - it should be located so as not to conflict with other guidance signs (accurate location at the town boundary should be considered secondary to avoiding conflict with other signs).

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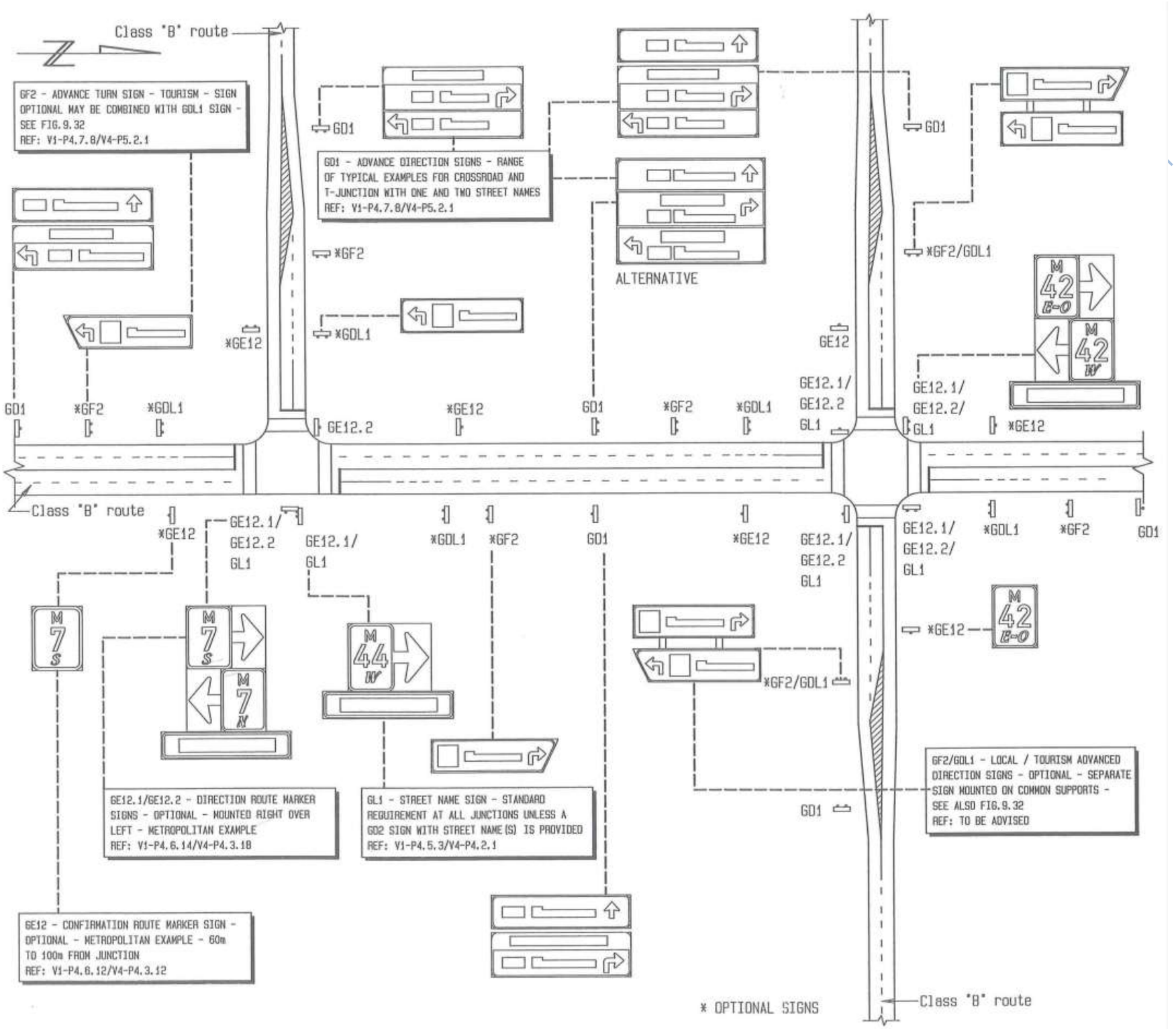

9.6.22 Notes on Figure 9.51

Numbers of Signs Required per Approach

Quantity	Type	Typical Area (m^2)
	for a single street name	
1	GD1	15_{80} $8{,}5_{60}$
1	GE12*	1-1,4(by route type)
	for two street names	
1	GD1	18_{80} 10_{60}
1	GE12*	1-1,4(by route type)

NOTE: * Optional signs

The areas given are based on the following parameters:

- d = 40 mm (letter size 280 mm/200 mm) for 80 km/h (see suffix "80")
- d = 30 mm (letter size 210 mm/150 mm) for 60 km/h (see suffix "60")
- longest place name = 10 letters
- single orientation destinations in all stacks
- signface design to full justification of arrows, route numbers and destinations.

Checklist

One or more of the following factors or questions may require the re-evaluation of the signs provided at an urban Class "B" junction:

- ❑ is sign message continuity being maintained?
- ❑ is there space on the approach for the GD1 sign?
- ❑ are other types of street furniture a problem - service poles and trees?
- ❑ **is a relaxation of the nearest numbered route warrant justified for the display of GF2 and/or GDL1 signs?**
- ❑ is there sufficient space to accommodate additional GF2 and/or GDL1 signs if warranted?
- ❑ can a combination GF2/GDL1 sign be used?
- ❑ is there competition from advertising signs.

Fig. 9.51
Urban Signing Level 3B
Class "B" Junctions
Intermediate Level 2

9.6.23 Urban Signing Level 4B Class "B" Junctions Minimum Level

1 General

The guidance signing level indicated in Figure 9.49 is the Minimum Level acceptable for urban Class "B" routes. The effect of this minimum level of signing over a length of such a route is illustrated in Figure 9.15. This minimum level of signing may be applied to any Class "B1" or Class "B2" route due to the physical characteristics of the route concerned or as the economic implementation of a system wide signing of all numbered routes in an urban area. Due to the high capital cost of implementing a higher level of signing it is recommended that all towns and cities plan to have in place a minimum level system within the shortest possible time. If it is determined that higher levels are justified, an affordable implementation plan (Urban Guidance Signing Plan) can be drawn up to gradually achieve this objective. A total of four levels of signing are available and are covered in Figures 9.49 to 9.52. It is not recommended that signing levels be altered frequently through successive junctions on a route however. This aspect should be taken into account when formulating the plan.

Figures 9.49 to 9.52 do not include the display of other optional guidance signs such as SUBURB NAME sign GL2 or TOWN or CITY NAME sign GL3. The use of these signs is illustrated in Figure 9.14.

2 Standard Sign Sequence

The following is the basic sign sequence which comprises the Minimum Level of Class AB@ route direction signing:

- GE12.1 - (over GE12.2) DIRECTION ROUTE MARKER (METROPOLITAN) signs (mounted RIGHT over LEFT) (other variations include GE13.1/GE13.2 (REGIONAL), GE14.1/GE14.2 (PROVINCIAL) or GE15.1/GE15.2 (NATIONAL) - on the through leg of a T-junction only one sign is required)
- GL1 - STREET NAME sign
- GE12 - CONFIRMATION ROUTE MARKER (METROPOLITAN) sign (other variations include GE13 (REGIONAL), GE14 (PROVINCIAL) and GE15 (NATIONAL).

3 Sign Positions

The positions recommended for the standard signs in the sequence are:

- GE12.1 - (and GE12.2) in the far left corner of the junction
- GL1 - in the far left corner of the junction closely associated with signs GE12.1 and GE12.2
- GE12 - 60 m to 100 m beyond the junction.

At very wide junctions signs GE12.1 and GE12.2 may be separated to improve their position in terms of the likely driver cones of vision.

4 Optional Signs

The following optional signs may be used to supplement the basic sign sequence (see above):

- GDL1 - ADVANCE LOCAL DIRECTION sign - **subject to compliance with warrants this sign may be introduced on a class "B" route** (see Section 9.4), - the sign may comprise a left stack or a right stack, or both stacks (see GF2 above) - located 50 m to 60 m (80 km/h) or 40 m (60 km/h) in advance of the junction.
- GF2 - ADVANCE TURN (Tourist) sign - **subject to compliance with warrants this sign may be introduced on a class "B" route** or it may continue a message previously displayed on a freeway (or another numbered route subject to the relaxation of the nearest numbered route rule **see Section 9.5 and Chapter 4**), - the sign may comprise a left stack or a right stack, or both stacks - sign GF2 may be combined with sign GDL1 either by providing a single composite sign or by mounting the signs on common supports, subject to the signface rules given in Volumes 1 and 4 - and located 100 m to 120 m (80 km/h) or 70 m (60 km/h) in advance of the junction.
- GL2 - SUBURB NAME sign - to indicate passage from one suburb to another along a numbered route - its role should be considered as secondary to the other standard and optional signs listed above particularly on the exit from a junction within 30 m to 60 m of the suburb boundary.
- GL3 - TOWN NAME sign - to indicate entry into a specific town or city - it should be located so as not to conflict with other guidance signs (accurate location at the town boundary should be considered secondary to avoiding conflict with other signs).

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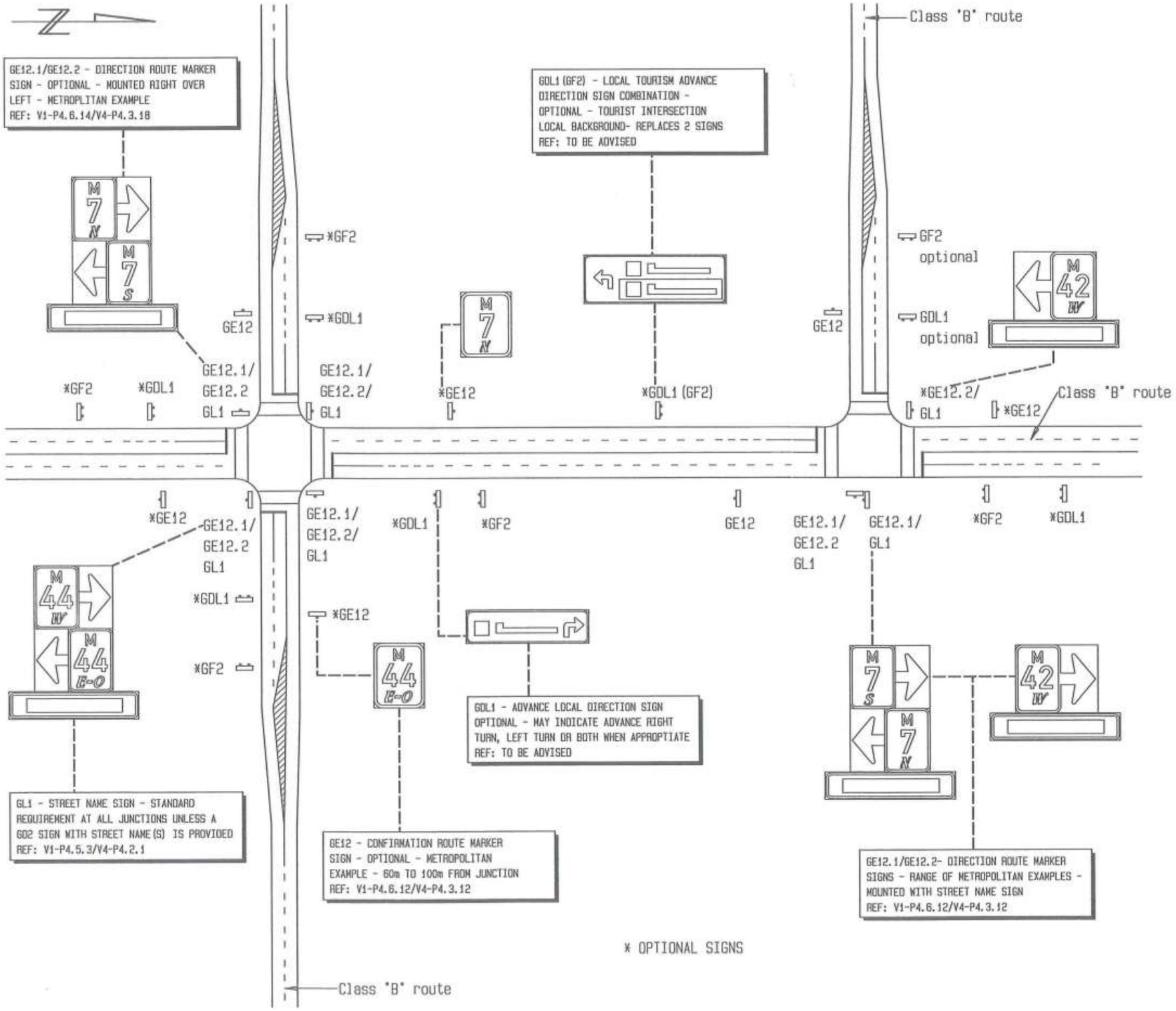

9.6.24 Notes on Figure 9.52

Number of Signs per Approach

Quantity	Type	Typical Area (m^2)
2	GE12*	1-1,4(by route type)
1	GE12	0,6

NOTE: * Optional signs

The areas given are based on fixed sign sizes although it is optional to increase these sizes by a factor of 4 over 3 (see Volume 4, Chapter 4).

Checklist

One or more of the following factors or questions may require the re-evaluation of the standard signing sequence listed above:

- ❑ will message continuity with an earlier junction be satisfied?
- ❑ are the signs adequate in terms of the size of the junction?
- ❑ can they be positioned accurately within the driver's cone of vision?
- ❑ **is a relaxation of the nearest numbered route warrant justified for the display of GF2 and/or GDL1 signs?**
- ❑ is there competition from advertising signs?

Fig. 9.52
Urban Signing Level 4B
Class "B" Junctions
Minimum Level

9.6.25 Urban Signing Levels 1C and 2C Class "C" Junctions Enhanced and Minimum Levels

1 General

Figure 9.53 shows two sections of Class "C" street. The upper detail shows a Class "C" street intersecting a Class "B" route. These junctions are shown as signalised but may commonly be unsignalised. The Class "B" route will almost always have priority over the Class "C" route unless a 4-way or 3-way stop control, or a traffic circle, is used. If the Class "C" route is operating as a collector-distributor an enhanced level of signing, which includes the display of the intersecting route number, may be considered. The minimum level of signing comprising only STREET NAME signs GL1 should otherwise be specified for all Class "C" streets. The size of lettering used on sign GL1 on Class "B" approaches should be maintained at the recommended size of 140 mm.

2 Sign Position

STREET NAME signs GL1, and any DIRECTION ROUTE MARKER signs specified should be located in the far left corner of the priority approach unless optional signs are used (see below). On a Class "B" route approach to a Class "C" junction this means that the preferred treatment is to provide two GL1 signs particularly if the priority route has 3 or more lanes.

3 Optional Signs

At this local level optional signs as follows may be warranted:

- GE12.1 - (and GE12.2) DIRECTION ROUTE MARKER (METROPOLITAN) sign (other variations include GE13.1/GE13.2 (REGIONAL), GE14.1/GE14.2 (PROVINCIAL) or GE15.1/GE15.2 (NATIONAL)) - located in the far left corner of the junction for the Class "C" (non-priority) approach.
- GE12 - ROUTE MARKER CONFIRMATION (METROPOLITAN) sign indicating the number and class of the intersecting route (other variations include GE13 (REGIONAL), GE14 (PROVINCIAL) and GE15 (NATIONAL) - located 60 m to 100 m beyond the junction on the Class "B" route.
- GDL1 - ADVANCE LOCAL DIRECTION sign OR GDL2 - LOCAL DIRECTION sign - one of these signs may introduce a local destination for the first time on this class of route (see GF2) - located 40m to 70 m from the junction in the case of sign GDL1, subject to the presence of other supplementary direction signs, or in the far left corner in the case of sign GDL2.
- GF2 - ADVANCE TURN (Tourism) sign OR GF3 - FINAL TURN (Tourism) sign - one of these signs may introduce a tourist destination for the first time on this class of route - signs GF2 or GF3 may be combined with signs GDL1 or GDL2 respectively, either by providing a single composite sign subject to the signface rules given in Volumes 1 and 4 or by mounting the signs on common supports - located 70 m to 100 m from the junction in the case of sign GF2 or in the far left corner in the case of sign GF3.
- GL2 - SUBURB NAME sign - to indicate passage from one suburb to another - located within 30 m to 60 m of the suburb boundary subject to any conflict with other signs.

NOTE: it is at this level that supplementary tourism and local destination signs are most commonly likely to be used in an urban area in the terms of the "nearest numbered route" warrant (see paragraph 9.5.10.5).

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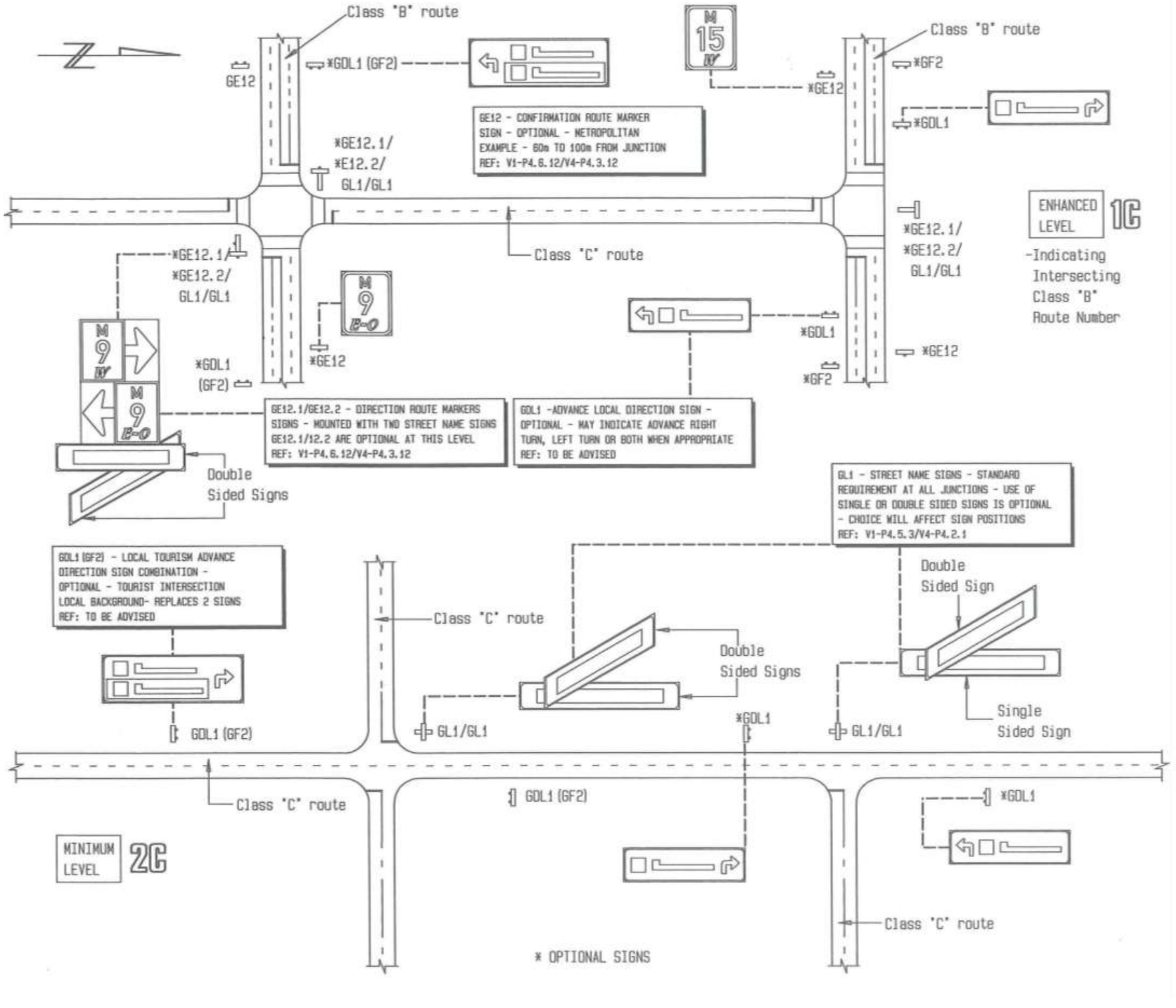

9.6.26 Notes on Figure 9.53

Numbers of Signs Required per Approach

Quantity	Type	Typical Area (m^2)
1	GL1	$0,2_{(average)}$

The area of STREET NAME sign GL1 can vary widely. The area given represents a sign with a total of 12 letters of 112 mm height in DIN 1451, Style "A". A similar sign using 140 mm high Style "A" letters will be approximately 40% larger.

Checklist

One or more of the following factors may affect the signing treatment of a Class "C" junction:

- ❑ will the sign be clearly visible in the standard position - if not, can the sign be better located?
- ❑ does the volume of traffic using the street warrant the use of optional route marker signs?
- ❑ if tourist or local direction signs are warranted should these –
  - be provided in a single composite sign, OR
  - be mounted together on common supports, OR
  - be mounted separately
- ❑ should the sign letter size be increased due to traffic speed or street width.

Fig. 9.53
Urban Signing Level 1C & 2C
Class "C" Junctions
Enhanced and Minimum Levels

9.6.27 Urban Signing Levels 1D and 2D Class "D" Junctions Enhanced and Minimum Levels

1 General

Figure 9.54 shows two sections of Class "D" street. One detail shows a Class "D" street intersecting a Class "B" route. The minimum level of signing comprising only STREET NAME signs GL1 should be provided at all Class "D" street junctions. Subject to the speed limit on an intersecting Class "B" route the size of lettering on signs GL1 on the Class "B" approaches should be maintained at the recommended 140 mm letter size.

2 Sign Positioning

STREET NAME signs GL1 should be located in the far left corner of the priority approach. It is therefore recommended that on Class "B" approaches to a Class "D" junction GL1 signs be provided for both directions of approach.

3 Optional Signs

Although other guidance signs may be provided at Class "D" junctions, by virtue of the number of such junctions, the number at which additional signs will be required will be relatively small. For possible optional signs refer to earlier subsections.

The use of GE12 signs on a Class "B" route exit from a junction with a Class "D" route is an option which may be exercised.

Tourism signs GF2 and GF3 may well be specified under the conditions of the application illustrated. Similarly local destination signs GDL1, GDL2 or GDL3 may also be used. These signs may be used on intersecting Class "B" or "C" streets or, particularly as final turn signs if warranted, on Class "D" streets.

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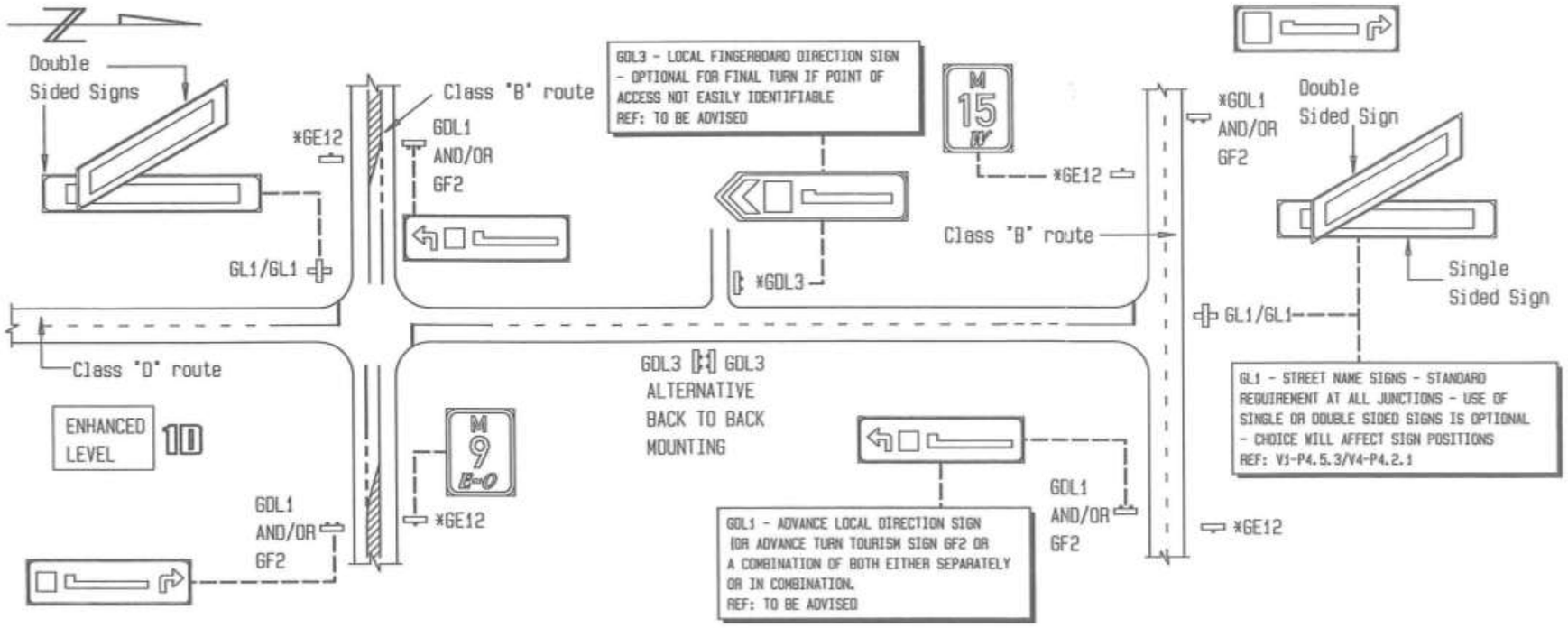

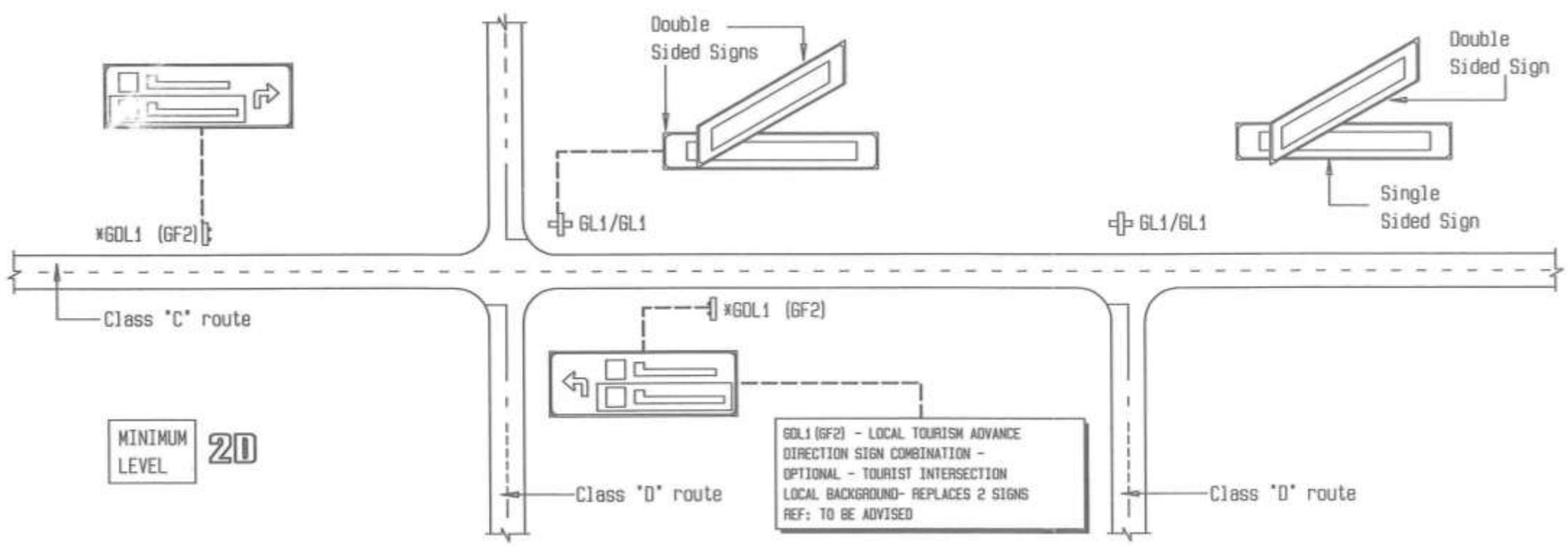

9.6.28 Notes on Figure 9.54

Numbers of Signs Required on Priority Approaches

Quantity	Type	Typical Area (m^2)
1	GL1	$0,2_{(average)}$

The area of STREET NAME sign GL1 can vary widely. The area given represents a sign with a total of 12 letters of 112 mm height in DIN 1451, Style "A". A similar sign using 140 mm high Style "A" letters will be approximately 40% larger.

Checklist

One or more of the following factors may affect the signing treatment of a Class "D" junction:

- ❑ if tourist or local direction signs are warranted should these –
  - be mounted separately, OR
  - be mounted together on common supports, OR
  - be provided in a single composite sign
- ❑ will the sign be clearly visible in the standard position - if not, can the sign be better located?
- ❑ should the sign letter size be increased due to traffic speed or street width.

Fig. 9.54
Urban Signing Level 1D & 2D
Class "D" Junctions
Enhanced and Minimum Levels

9.6.29 Urban Guidance Signing Dual Carriageway Junction with Sliproads

1 General

The general principles for Class "B" route signing also apply to urban dual carriageway streets (see Figures 9.49 to 9.52). Due to the significantly increased road space as a result of the multiple lanes and the dividing median, but particularly due to the increased size of junction created, the use of the Preferred Level of Class "B" route signing (Figure 9.49) is recommended for dual carriageway streets.

A dual carriageway street offers a wider range of options to position signs. These are illustrated in Figure 9.55. The figure shows different options for the same sign in some instances. These options should be exercised on a site specific basis according to the following criteria:

- ❑ is correct lane selection (for exclusive right or left lanes) likely to be achieved due to adequate advance signing (GD1)? - if it is considered this will be the case then separate right and left turn GD2 signs may be provided - these signs should then be positioned to suit the most obvious cone of vision of approaching drivers who should have already selected a right or left "biased" lane as a result of sign GDI.
- ❑ are left turning slip roads provided? - if they are the GD2 sign should be split and the left turn portion repositioned in relation to the slip road.
- ❑ if the central median is very wide it may be beneficial to locate direction signs on the median island (see Figure 9.56 also) subject to there being no worsening of direct sight distances around the signs.

2 Standard Sign Sequence

The basic sign sequence should be the same as is illustrated in Figure 9.49 for urban Level 1B signing.

3 Sign Positions

The positions of sign GD1 should be in advance of the start of any exclusive turn lane. Sign GD1 should also be positioned far enough from the junction to permit the addition of either or both of signs GF2 and GDL1 subject to compliance with the relevant warrants. If these signs indicate a right turn they should also preferably be in advance of the start of any exclusive right turn lane. The separation between such signs should preferably be of the order of 50 m to 60 m. When all signs are provided in separate positions, this may result in sign GD1 being positioned within the range of 240 m to 300 m from the junction.

Subject to the actual junction geometry, and with the objective of obtaining the best possible target value for the GD2 signs, these may be separated if necessary and located in one of the following positions:

- the left turn GD2 at the exit point of a left turn slip road - such a GD2 sign should use a Type 1 arrow inclined 45^{o} to the left of vertical
- the right turn GD2 either in the far right corner of the junction, OR if the junction and median are wide, on the central median opposite the right turn lane(s).

These positions assume that the junction will be controlled by traffic signals.

4 Optional Signs

Additional signs may be provided on a dual carriageway street as indicated in Subsection 9.6.17 for Class "B" junctions **subject to compliance with design criteria relating to the total amount of information placed before drivers, letter sizes used on signs, the spacing between signs and the reading time available in terms of these factors.**

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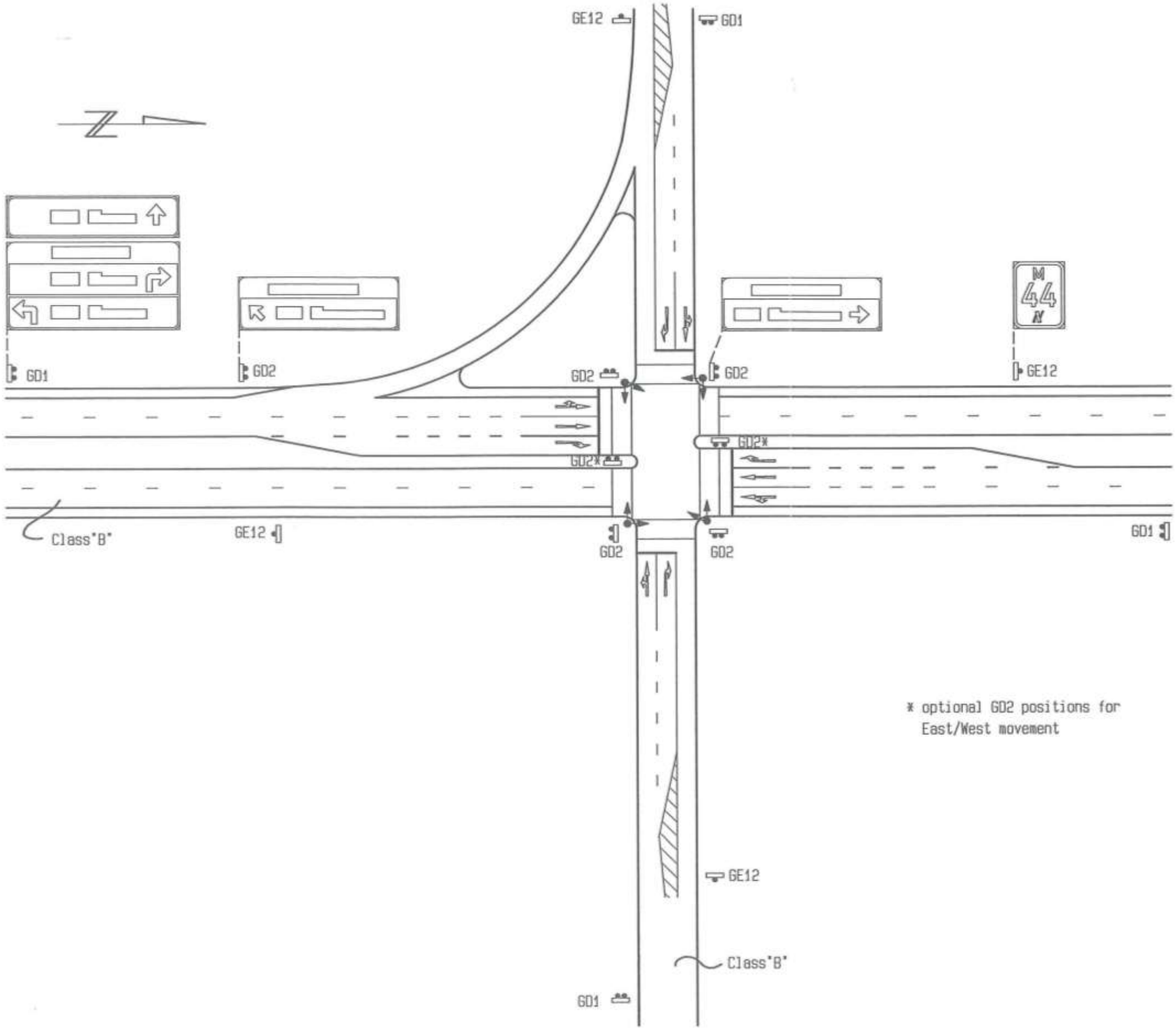

9.6.30 Notes on Figure 9.55

Numbers of Signs Required per Approach

Quantity	Type	Typical Area (m^2)
1	GD1	15_{80} $8{,}5_{60}$
2	GD2	4_{80} $2{,}25_{60}$

The areas given should be considered as guidelines for general estimating only. They are based on the following very general parameters:

- d = 40 mm for 80 km/h (see suffix "80")
- d = 30 mm for 60 km/h (see suffix "60")
- longest place name = 10 letters
- single orientation destination in all stacks
- signface design to full justification of arrows, route numbers and destinations.

Checklist

One or more of the following factors or questions may require the re-evaluation of the standard display of guidance signs when a Class "B" junction involves dual carriageway roadways:

- ❑ does the junction have slip roads?
- ❑ does the junction have exclusive left and/or right turn lanes?
- ❑ can the central median be considered to be "wide" (greater than 6 m width)
- ❑ if signs are positioned within the junction on a median, or on the right side, will sight distance be significantly affected (signalization may reduce the likelihood of a problem occurring due to separation of conflicting movements by signal phasing).

Fig. 9.55
Urban Guidance Signing
Dual Carriageway Junction
with Sliproads

9.6.31 Urban Guidance Signing Dual Carriageway Junction with a Freeway

1 General

The general principles for Class "B" and freeway crossroad signing also apply to urban dual carriageway streets which intersect with freeways at access interchanges (see Figures 9.47 and 9.49).

The geometric treatment of freeway off-ramp terminals can vary quite widely and particularly when the intersection cross street is a dual carriageway. Figure 9.56 illustrates some of the options which may be exercised at such junctions when considering the provision of guidance signs. The nature of the options available is likely to be dictated by the geometric detail of the junctions and all of the options illustrated are unlikely to occur at any one site, however, different options may be used on different ramp approaches or on different cross street approaches.

2 Standard Sign Sequence

The basic sign sequences should be as illustrated in Figures 9.46 and 9.47.

3 Sign Positions

This example indicates a number of circumstances as a result of which sign positions may be varied. When not affected by these circumstances sign positions should remain as indicated in other examples. A description of the standard sign positions is therefore not appropriate to this example.

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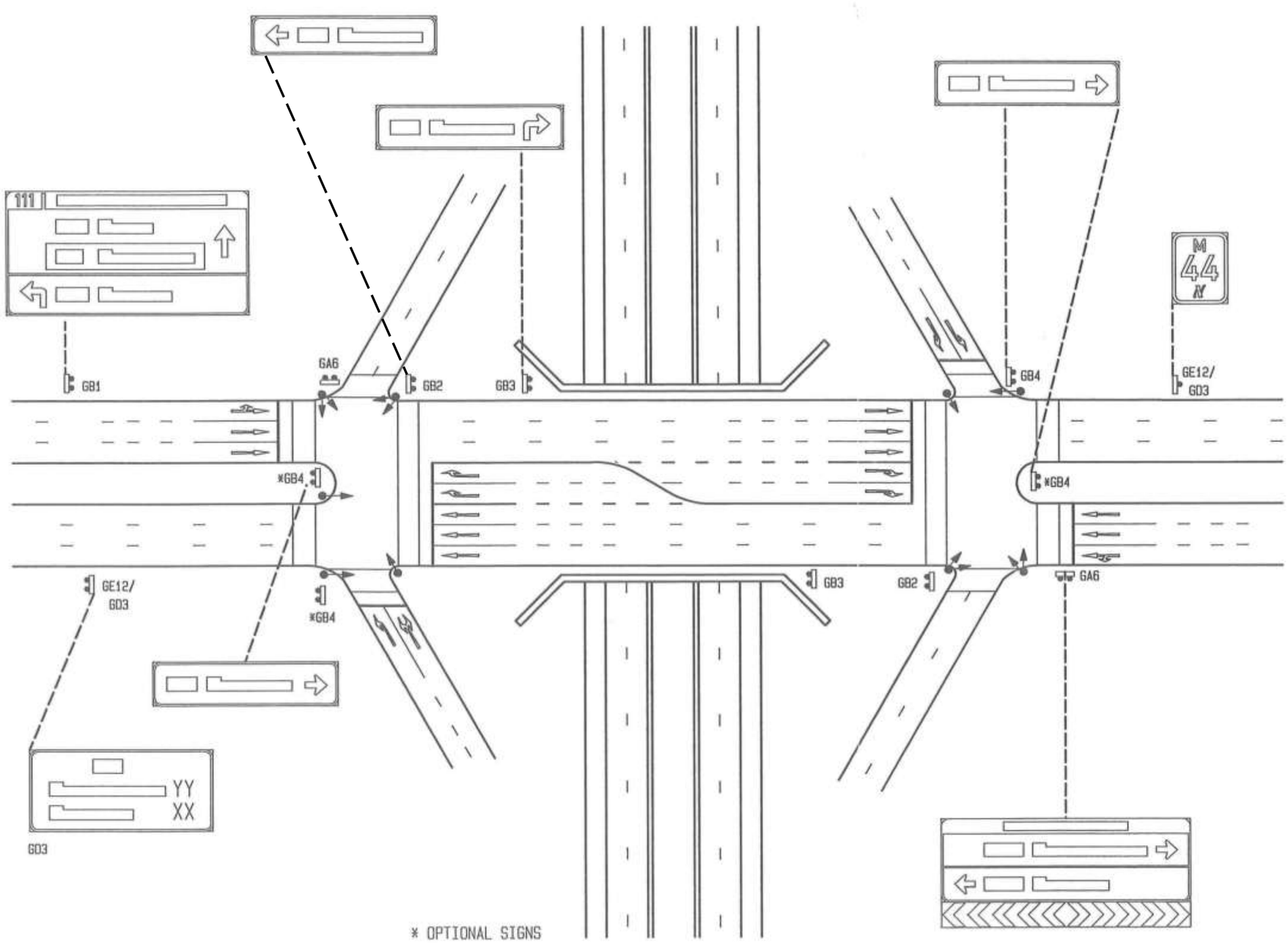

9.6.32 Notes on Figure 9.56

This figure illustrates what are essentially non-standard options to the provision of guidance signs at a freeway crossroad. It is therefore not appropriate to quote a standard sign sequence or average sign areas.

Checklist

One or more of the following factors or questions may require the re-evaluation of the standard display of guidance signs when a Class "A"/Class "B" access interchange involves a dual carriageway cross street;

- ❑ does the junction geometry require a non-standard signing treatment?
- ❑ if signs are placed in non-standard positions can drivers be expected to see them?
- ❑ if signs are placed in non-standard positions can they obstruct a driver's line of sight?
- ❑ does the complexity of the geometry warrant consideration of overhead direction signs?

Fig. 9.56
Urban Guidance Signing
Dual Carriageway Junction
with a Freeway

9.6.33 Urban Guidance Signing Diagrammatic Signs Lane Drop Examples

1 General

One of the most common applications of permanent Diagrammatic signs is the indication of a lane drop situation on a multi-lane street. Justification for the use of the Diagrammatic LANE DROP signs GS101 to 106 in an urban environment is not likely to occur frequently. Factors such as higher speeds, high traffic volumes and a broad traffic mix, or limited sight distance may commonly justify the use of LANE DROP signs GS101 to 106. Two examples in Figure 9.57 illustrate typical situations as follows:

- a lane drop from 3 lanes to 2 lanes on a section of dual carriageway
- when making a rearrangement of lane function which cannot reasonably be anticipated by drivers (in this case to generate an exclusive turn lane at the next junction - see Subsection 9.6.37).

When used in advance of a position to which the diagram on the sign refers, a Diagrammatic sign shall only be displayed together with a SUPPLEMENTARY PLATE sign IN11. Sign IN11 shall be placed below the sign and normally will indicate the distance to the point referred to.

The appropriate use of temporary Diagrammatic signs is highly recommended in urban areas when such signs can be accommodated. Temporary applications are covered in Chapter 13: *Roadworks Signing*.

2 Standard Sign Sequence

A typical basic sign sequence which comprises the application of Diagrammatic Lane Drop type signs is as follows:

- GS103 - (plus IN11.3) LANE DROP sign (3 lanes to 2 lanes from the left)
- GS103 - LANE DROP sign (3 lanes to 2 lanes).

3 Sign Positions

In an urban area the distance between an advance sign and the sign marking the point of the lane drop can vary widely. Under free flowing traffic conditions the advance sign should be positioned in the range of 100 m to 300 m in advance of the point at which the lane is dropped. The second sign in the sequence should be within 20 m to 25 m of the lane drop position (defined by the start of the taper). Positions should be adjusted to take into account vertical and horizontal curves and other obstructions to sight distance (e.g. trees).

4 Signing Options

Space considerations may preclude the provision of two signs in a sequence. Either an advance sign on its own or a single sign at the "action" point may be provided if the improved target value of one sign is required in preference to a standard warning sign.

On high speed streets two advance signs may be used. Such signs should normally be positioned at distances such as 100 m AND 300 m in advance of the "action" point. In terms of this type of treatment the sign at the "action" point may be dispensed with.

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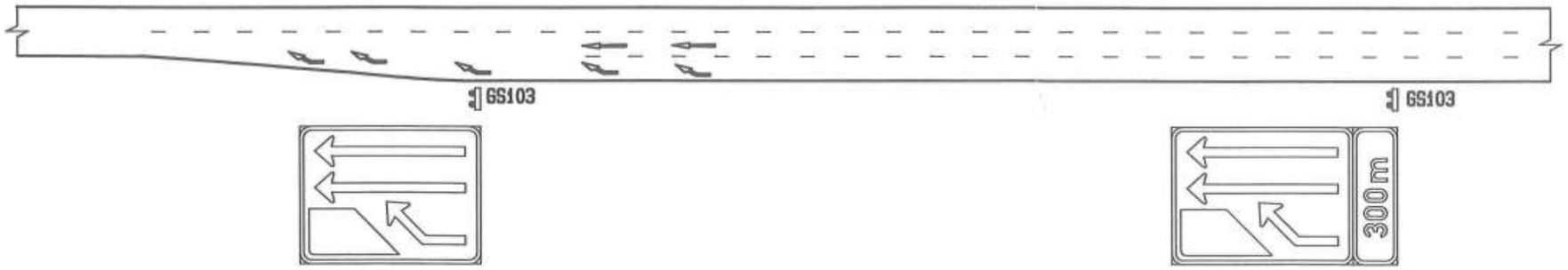
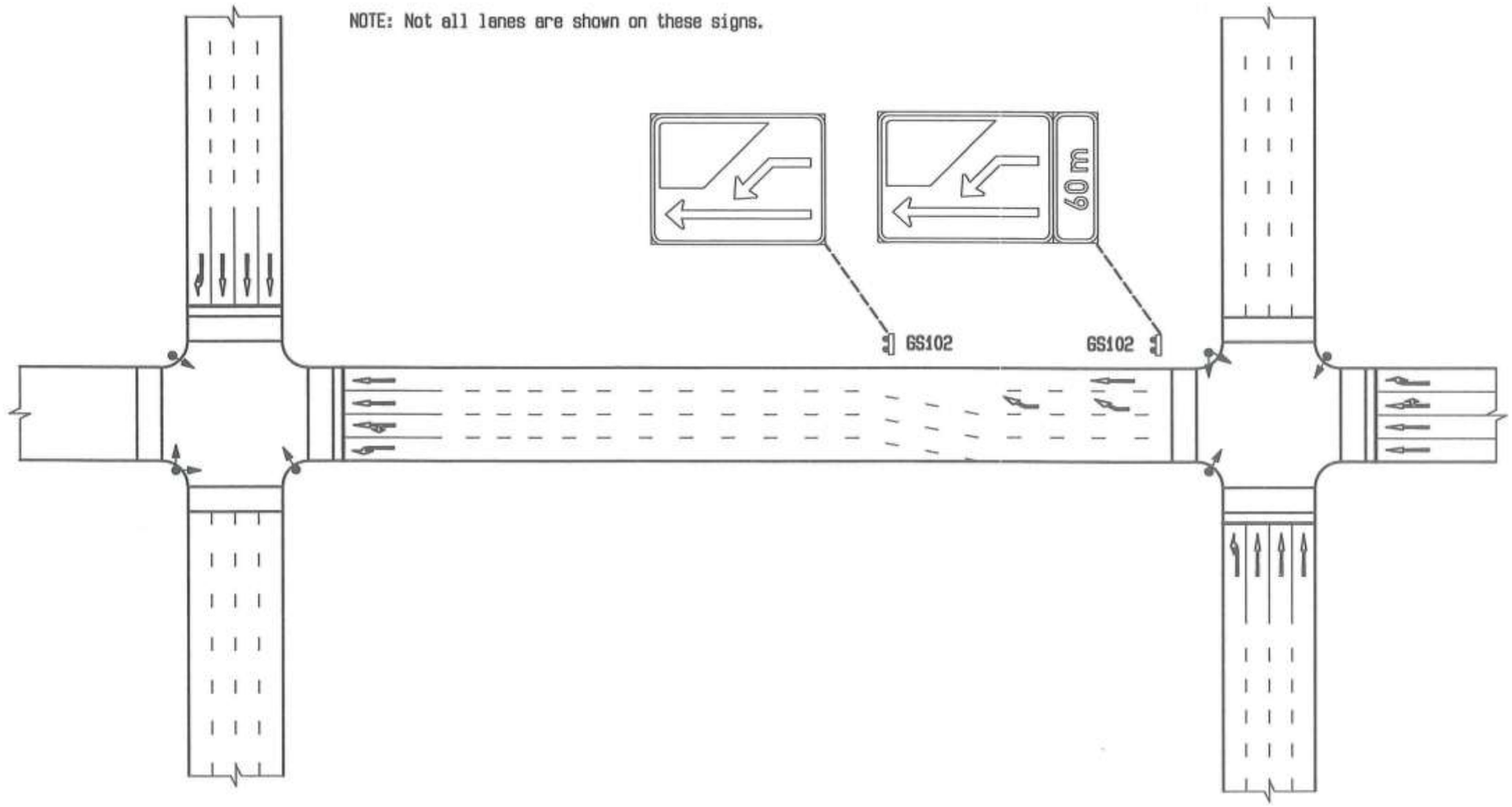


Detail 9.57.1 Lane Drop on Dual Carriageway.



Detail 9.57.2 Lane Drop on a One Way Road (CBD)

9.6.34 Notes on Figure 9.57

Numbers of Signs Required

Quantity	Type	Typical Area (m^2)
	minimum size	
2	GS101	2,5 (or similar) (including IN11.3)
	Standard size	
2	GS101	4,25 (or similar) (including IN11.3)

Checklist

The following factors should be taken into account when considering the application of urban Diagrammatic signs of the Lane Drop type (any sign indicating a traffic "obstruction" of some sort):

- ❑ is the condition being signed clearly visible to drivers? - if yes, are signs really necessary?
- ❑ do traffic volumes make visibility of the lane drop condition difficult?
- ❑ will warning signs be adequate given their smaller target area but specific Awarning@ message?
- ❑ the provision of Diagrammatic signs may not only benefit the safe operation of the site but may improve traffic flow due to the improvement in information displayed
- ❑ should the geometry of the site ultimately be revised to remove the need for the signs?

Fig 9.57
Urban Guidance Signing
Diagrammatic Signs
Lane Drop Examples

9.6.35 Urban Guidance Signing Diagrammatic Signs Various Examples

1 General

Figure 9.58 shows a limited selection of typical applications of Diagrammatic signs which may be appropriate in urban areas. In the majority of instances a Diagrammatic sign is shown where a smaller warning sign might otherwise have been appropriate, but for some reason has proved ineffective, or, due to the signface limitations of a warning sign which cannot depict the full message required. If an appropriate warning sign is available its target value can be increased to that of a diagrammatic sign by means of a high visibility background. This may be more effective than using a diagrammatic sign.

The types of situation illustrated will tend to be best served by a sign located at or very close to the "action" point although a second sign, in advance, may still be used if space permits.

The availability of Diagrammatic signs should not be used as an excuse for providing sub-standard road geometry

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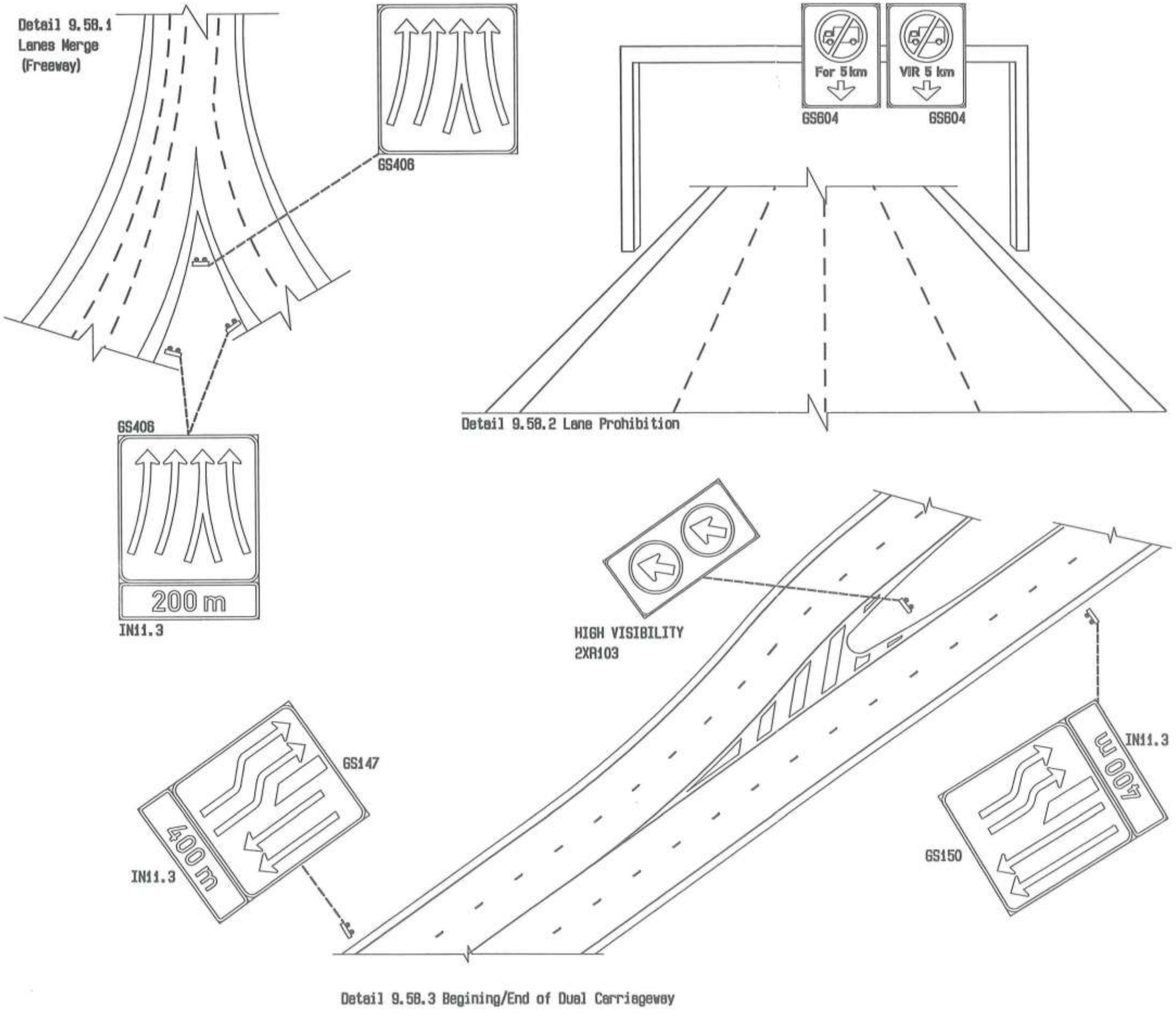

9.6.36 Notes on Figure 9.58

The approximate areas of a single standard sized Diagrammatic sign are as follows:

1200 mm(H) x 900 mm(W) 1 m^2 (0,3 m^2)

1600 mm(H) x 1200 mm(W) 2 m^2 (0,5 m^2)

2400 mm(H) x 1800 mm(W) 4,3 m^2 (1 m^2)

These sizes will be increased by up to 20% if the number of lanes depicted exceeds 3 lanes. The approximate area of an additional SUPPLEMENTARY PLATE sign IN11 is indicated in brackets.

Checklist

The following factors should be taken into account when considering the application of urban Diagrammatic signs of the Lane Drop type (any sign indicating a traffic "obstruction" of some sort):

- ❑ is the condition being signed clearly visible to drivers? - if yes, are signs really necessary?
- ❑ do traffic volumes make visibility of the condition difficult?
- ❑ will warning signs be adequate given their smaller target area but specific "warning" message?
- ❑ the provision of Diagrammatic signs may not only benefit the safe operation of the site but may improve traffic flow due to the improvement in information displayed
- ❑ should the geometry of the site ultimately be revised to remove the need for the signs?

Fig. 9.58
Urban Guidance Signing
Diagrammatic Signs
Various Examples

9.6.37 Urban Guidance Signing Diagrammatic Signs Exclusive Turn Lane Examples

1 General

In common with other applications of Diagrammatic signs in urban areas the signs from a group indicating exclusive lane situations, examples of which are illustrated in Figure 9.59, may occasionally be warranted.

The provision of signs indicating Exclusive Turn Lanes may be warranted under one or more of the following circumstances:

- when the lane configuration is unexpected
- when the lane configuration cannot be clearly seen by drivers at a reasonable distance to permit correct lane selection
- when the road markings provided are also often not able to be seen (under heavy traffic conditions)
- when a lane which has continued for some distance becomes an exclusive turn lane at the junction ahead.

Exclusive Turn Lane signs should conform to the normal range of standard sizes although the smallest size (1200 mm(H) x 900 mm(W)) will commonly be appropriate due to side space considerations.

The signs, which are used in advance of a junction, shall indicate all lanes at the junction.

Other techniques, including applications of road markings (see Chapter 2) and specific geometric treatment, may also be used to alleviate problems and driving offences common to situations similar to those illustrated in Detail 9.59.1.

2 Standard Sign Sequence

Since the objective of the signs is to improve correct lane selection prior to arrival at the junction an advance sign, including a SUPPLEMENTARY PLATE sign IN11.3 giving the distance to the STOP line is recommended. There will rarely be much value to be gained by indicating the distance to the "action" point (where the turn actually occurs).

3 Sign Positions

The options for positioning Exclusive Turn signs in advance of a junction are likely to be limited by block length in a one-way street environment where their use may occasionally be warranted.

In more free flowing situations where, for instance, a lane is added between two intersections, but exists for several hundred metres, the normal advance positioning range for Diagrammatic signs of 100 m to 300 m should apply. All advance signs should include an appropriate SUPPLEMENTARY PLATE sign IN11.3 indicating the distance to the "action" point beyond which drivers are committed to a turn.

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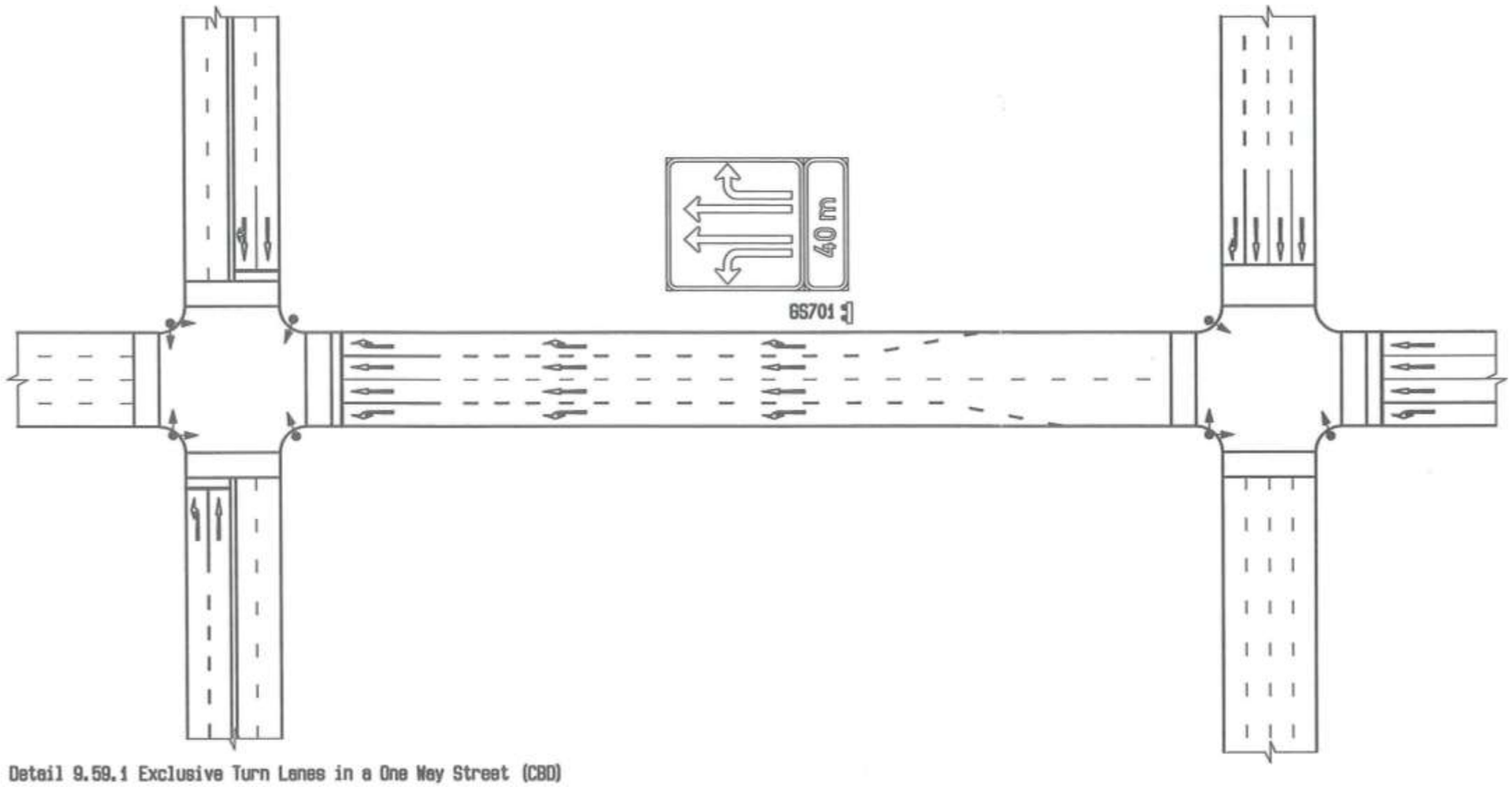

Detail 9.59.1 Exclusive Turn Lanes in a One Way Street (CBD)

Detail 9.59.2 Exclusive Turn Lanes:
(i) Typical Dual Carriageway Class "B" Route
(ii) Weaving Section

9.6.38 Notes on Figure 9.59

Numbers of Signs Required

Quantity	Type	Typical Area (m^2)
	minimum size	
2	GS701	1,35 (or similar) (including IN11.3)
	Standard size	
2	GS701	2,4 (or similar) (including IN11.3)

These sizes will increase by up to 20% if the number of lanes depicted exceeds 3 lanes.

Checklist

The following factors should be taken into account when considering applications of urban Diagrammatic signs of the Exclusive Turn Lane type;

- ❑ are drivers making vary late lane changes on the approach to the junction?
- ❑ are drivers making illegal movements in terms of the MANDATORY TURN ARROW markings RM8 at the junction?
- ❑ does traffic regularly cover road markings which would otherwise clarify the situation?
- ❑ can the sign be positioned effectively and be of an effective size?

Fig. 9.59
Urban Guidance Signing
Diagrammatic Signs
Exclusive Turn Lane Examples

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9.7 PROPERTY IDENTIFICATION

9.7.1 General

1 Throughout this chapter reference has been made to the need for effective property identification or numbering. ASigns@ or other devices displaying property numbers are not road traffic signs. They are, however, from the point of view of the unfamiliar visitor to a property, the ultimate ALOCATION@ sign since their message states, in effect, AYou are here - you have reached your destination@. This section has been added to this chapter to give local authorities a limited guide to the provision of effective property identification.

2 The ability to identify a specific property quickly is of primary importance in minimising the response time of emergency services such as police, fire and hospital services. If these services are called it could be crucial to the saving of life that they do not drive around searching for the correct property.

3 Occupiers of properties should therefore be encouraged to display the street number of their property in a legible and consistent manner. When appropriate, this should be in addition to any aesthetic numbering treatment used as part of the building architecture. The identification of properties in this way should apply irrespective of the land use to which the property is put i.e. residential, commercial, local authority, local destinations and tourist destinations, and it should apply throughout urban and peri-urban areas.

4 It is most unlikely that a local authority will be prepared to provide the means to identify individual properties without passing on the costs to property owners or occupiers. However, as has been noted, it is desirable that this identification be provided. Local authorities are recommended to adopt one of the following options:

(a) create by-laws relating to the mandatory provision of a standard method (or methods) of property identification by all property occupiers; AND

(b) prepare a tender for the installation of standardised property numbers (practically such a tender may require to run for some years to cater for larger towns and cities) - recover the cost from each property occupant through a small monthly surcharge to the rates and services account over a period of 6 to 12 months; OR

(c) allow private enterprise to contract with individual property owners to provide property identification in accordance with by-laws.

5 Two basic methods of providing property identification are described in subsequent subsections. It is recommended that the principles of these methods be adhered to i.e. letter sizes, but that reasonable freedom be permitted to vary the other physical aspects of design or manufacture, subject to adequate quality and performance being achieved. A local authority, in preparing by-laws and/or contract specifications should decide whether it wishes to permit only one or the other, or both methods of numbering. If both are to be permitted it is recommended that the manner in which the two methods may be mixed, or not, should be made very clear. The two basic methods of identification can be classified as follows:

(a) ground surface display (adjacent to vehicle entrance);

(b) property boundary display.

9.7.2 Ground Surface Property Identification

1 Figure 9.60 illustrates the basic parameters of this type of property identification device and typical applications of the device. The device should have the following characteristics:

(a) block:

(i) height = 50 mm;

(ii) width = 110 mm;

(iii) length = 200 mm;

(iv) side slopes = 45^{o} (all four sides of the block should slope in towards the top);

(v) shaping - all intersecting faces to be rounded to eliminate sharp edges and corners;

(b) lettering:

(i) font - a non-serif font such as that used on road signs (DIN 1451 Part2, Styles AA@, AB@, or AB MOD@) or Helvetica should be used;

(ii) height = 50 mm;

(iii) width = +/- 30 mm subject to the numeral/letter/font;

(c) colours:

(i) block - black semi-matt (non-retroreflective);

(ii) lettering - white retroreflective in accordance with SANS 1519-1:2006 and 1519-2:2004 - Classes I, II or III material may be specified;

(d) positioning:

(i) at the vehicle entrance - the block should be located on the top of kerbing - on the side of the entrance furthest from the nearest erf boundary;

(ii) when no kerbing is present - on the road surface - the block should be located in the centre of the vehicle entrance or driveway to the property as near to the channel as practical.

2 It should be noted that before specifying the use of this type of device a local authority should satisfy itself with regard to the possibility of it being classified as an Aobstruction@ within the road reserve. The legal aspects of placing this type of device within a road reserve are not clear, but test installations of devices to the dimensions given above have not identified any specific hazard related to their use on the road surface. Notwithstanding this, care should be exercised in the vicinity of cycle paths and sidewalks.

9.7.3 Property Boundary Display

1 Figure 9.61 illustrates dimensional details and typical applications of this type of property identification device. The installation of this type of identification device is intended to be

(continued on page 9.7.4)

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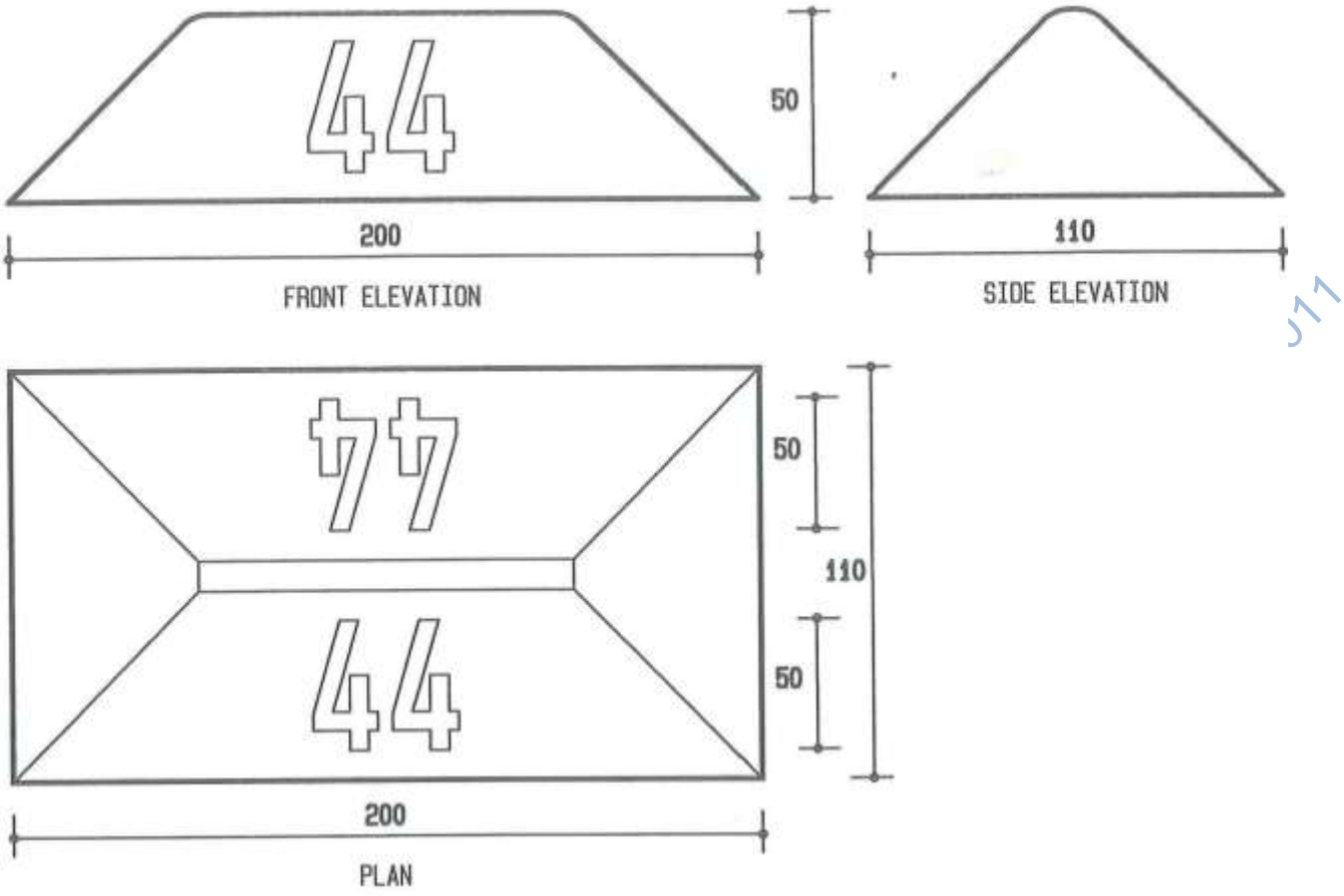
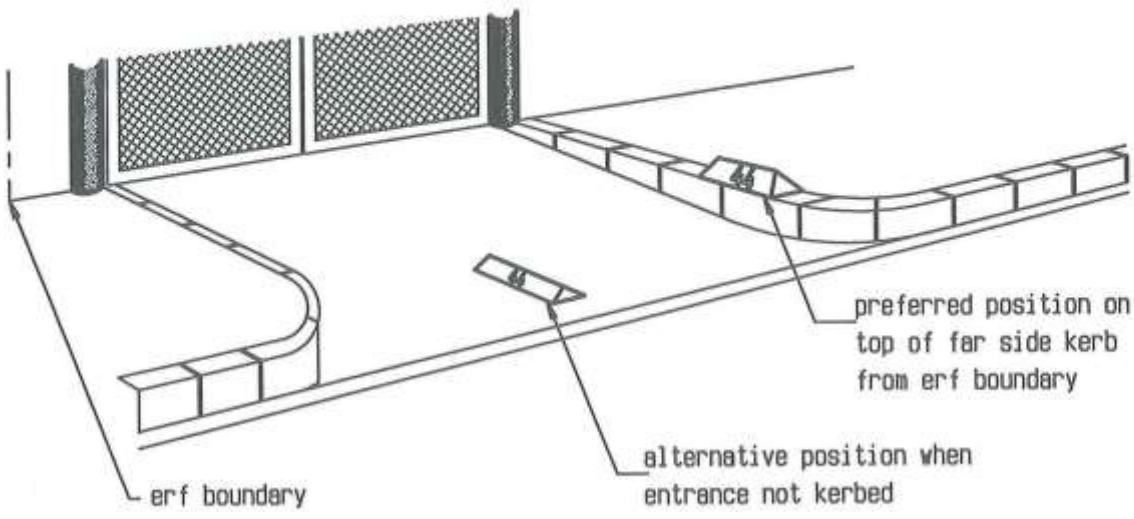
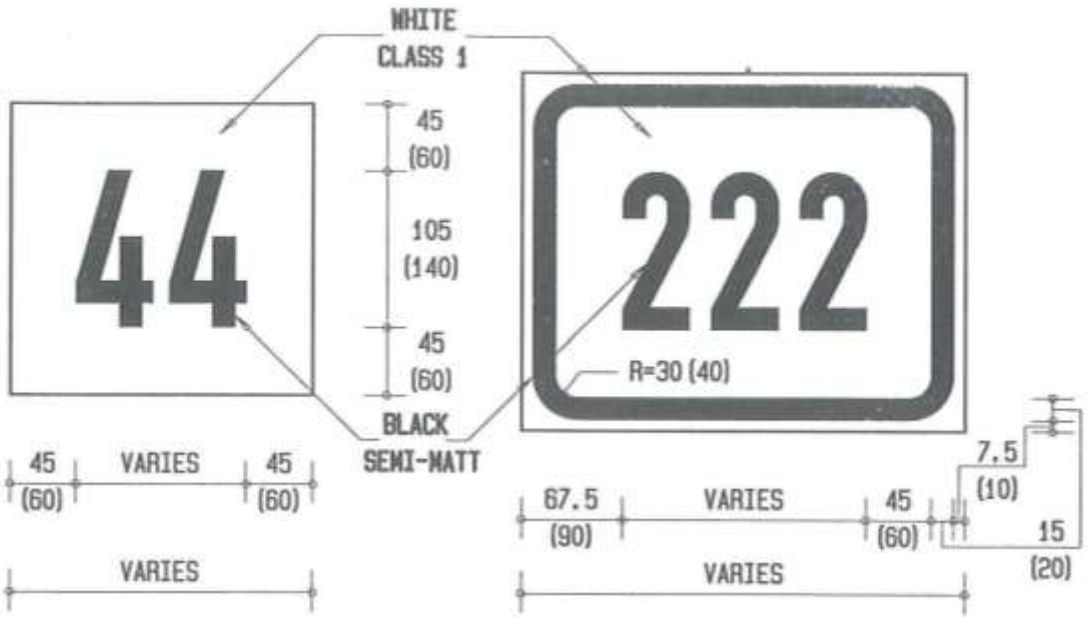


Detail 9.60.1 Recommended Dimensions



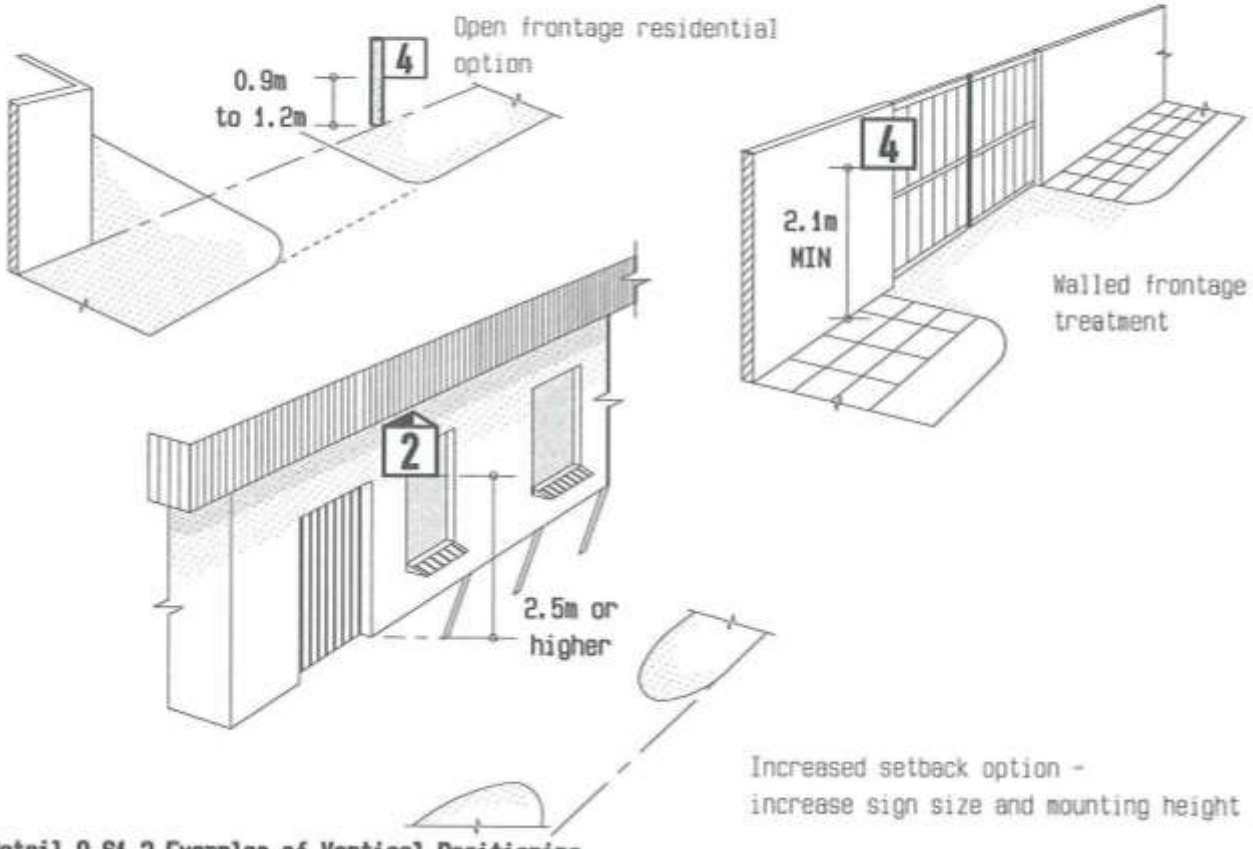
Detail 9.60.2 Positioning of Property Numbers

Fig 9.60 Ground Surface Property Identification



NOTES :
1. Examples show DIN A numerals - DIN B signs will be +/- 20% longer.
2. Numbers in brackets are minimum for 10m to 25m setback from edge of road.

Detail 9.61.1 Recommended Dimensions



Detail 9.61.2 Examples of Vertical Positioning

Fig 9.61 Property Boundary Identification Display

(continued from page 9.7.1)

on, or very close to, the property boundary. The number display should be at 90° to the property line and should be double sided.

2 Due to the position above ground level, it is recommended that normal road sign design principles should apply, namely:

(a) letter size:

(i) 105 mm minimum when the wall fence or boundary line is 3 m to 10 m back from the edge of roadway;

(ii) 140 mm minimum if the number is displayed on a building face set back a further 5 m to 16 m;

(b) colours:

(i) background - white or other light retroreflective colour (the choice of colour should be co-ordinated for a street);

(i) letters/numbers - black or other dark semi-matt colour (the choice of colour should preferably be co-ordinated for a street).

3 The identification device may be located at a number of different heights above ground level. Ideally the device should be in the range 0,9 m to 2,5 m. Attention to the following details is relevant:

(a) if the device projects over a sidewalk it should be mounted at a height in excess of 2,1 m;

(b) if there is a low fence or no fence to the property a height of 0,9 m to 2,1 m is preferable;

(c) the higher the device is mounted the larger it should be sized for adequate night time vision;

(d) the further back from the road the device is mounted the larger it should be sized;

(e) if the device is to be mounted flush with the property boundary, and cannot for some reason be mounted at 90° to the boundary, it should be mounted between 1 m and 2 m above ground level.

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RURAL JUNCTION SIGNING

SECTIONS

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10.1 Introduction

10.2 Range of Applicable Signs and Markings

10.3 Rural Junction Signing Applications

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RURAL JUNCTION SIGNING

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Tables 10.1, 10.2 and 10.3 are repeated on pages 10.3.2, 10.3.8, 10.3.18 and 10.3.23 for convenience

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CHAPTER 10:
RURAL JUNCTION SIGNING

10.1 INTRODUCTION

10.1.1 General

1 The purpose of this chapter is to give guidelines on, and illustrate how, rural road junctions should be signed. The primary aspect dealt with is that of guidance signing, although, in order to indicate the comprehensive signing requirement at various junction types, the regulatory, warning and tourism signs are also considered.

2 This chapter should be read in conjunction with various chapters of Volume 1, "Uniform Traffic Control Devices", which deals with signing policies and design principles together with specific information on the meaning and individual application of all traffic control devices. The following should particularly be referred to:

(a) Chapter 2 - Regulatory Signs;

(b) Chapter 3 - Warning Signs;

(c) Chapter 4 - Guidance Signs;

(d) Chapter 5 - Information Signs;

(e) Chapter 7 - Road Markings;

(f) Chapter 8 - Navigational Aids.

3 Numerous supplementary aspects relating to the application of these various traffic signs are dealt with in Volume 2 and the following chapters should be referred to:

(a) Chapter 2 - Road Markings Applications;
(b) Chapter 3 - Regulatory and Warning Signs and Marking Applications;

(c) Chapter 4 - Tourism Signing.

10.1.2 Road Classification for Road Signing Purposes

1 If signing is to be effective in a rural environment, at all levels of the road network, for local drivers and for drivers unfamiliar with the area in which they are travelling, it is essential that there shall be a good measure of uniformity of signing practices throughout the country. The requirement for an accurate road classification is essential as there are definite limits to the number of ways in which GUIDANCE signs in particular, and specifically DIRECTION signs, can be made to indicate, with sufficient immediate recognition potential, the different classes into which the road network is divided for signing purposes.

2 The road network of the country has therefore been classified for different functional purposes. In order to meet the objective of signing uniformity, the various existing classifications were assessed and in general terms were found to offer too wide a range of categories for the purpose of adequate signing and specifically that of GUIDANCE signing. A **road classification for signing purposes** was therefore developed as shown in Figure 10.1, Detail 10.1.1.

3 Roads have been broadly classified as URBAN and RURAL. The class of RURAL roads has been further subdivided into five groups, namely CLASSES A, B, C, D and E as indicated in Figure 10.1. This chapter deals only with Class B and lower order roads. When two roads of the same class intersect, the road with priority has been indicated by a postscript of an "h", e.g. Bh, and the lower order road by a postscript of "l", e.g. Bl.

4 A typical procedure for enabling the classification of rural roads is also given in Figure 10.1, Detail 10.1.2.

5 It is considered necessary to treat the signing of different classes of road in recognisably different ways so that road users may be readily aware of the class of road on which they are travelling, or which they are about to enter. Such a state of awareness is necessary to achieve the attention levels appropriate to the complexity of the driving task likely to be experienced on a given class of road, and thereby to the navigational requirements appropriate to the road class. In such a way drivers are likely to develop an appropriate level of expectation with respect to the minimum level of provision of GUIDANCE signs on different classes of road. **It is the duty of the road authorities to satisfy such expectations.**

6 It is also a motivating factor to provide information to drivers on a cost-effective basis. This generally means more information (or signs) on higher order roads (numbered routes) than on lower order roads (un-numbered roads). In all of the examples in this chapter a recommended minimum level of signing is shown. In all instances, however, subject to the availability of funds, additional warning signs and/or guidance signs may be provided, either in terms of a standard policy to do so, or according to specific warrants, adopted by a road authority. For example a road authority may opt to provide a Class B level of signing on all or some Class C roads - in such a case the main differences between the signs provided will be that the Class B route signs will normally include route numbers whereas the Class C road signs will not, and the destinations on the Class B route will generally be of a higher level of familiarity than those displayed on Class C roads.

7 The class of road may be indicated directly, through differences in the guidance sign colour code, e.g. by the use of blue, green or other background colours. It may also be made obvious by the use of signs with visibly different appearances, e.g. FINGERBOARD signs. Alternatively a more subtle difference may be indicated by the provision of a greater or lesser amount of guidance signage. The overall objective, however, should remain that of obtaining an adequate state of awareness in drivers to changes in the levels of the road hierarchy.

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8 The signing of roads in peri-urban areas requires particularly careful attention, as the operational boundary between URBAN and RURAL classes is rarely as clear-cut as a line on a map. It is recommended that, as soon as development in an area is recognised as peri-urban rather than rural, urban guidance signing practices should be followed. Details of urban guidance signing are covered in Chapter 9.

10.1.3 Fundamental Principles and Requirements for an Effective Guidance Sign System

1 Guidance signs form an integral part of the navigational system provided for road users, to assist them in undertaking their journey in safety from its initial stages, through the main part of the trip, until they reach their final destination. Since a primary aspect of this chapter is that of guidance signs, a summary of the basic principles of applying an effective guidance sign system is given hereafter.

2 Guidance signing should be provided in a safe and efficient manner to complement a complex and developing road network, and to satisfy the expectations of the users of the network. It is important that road users travelling to different parts of the country receive a clear message from road traffic signs, and guidance signs in particular, in a uniform and consistent manner throughout the country. In order to achieve the necessary levels of uniformity, guidance signs should conform to the requirements of policies and practices covered in relevant chapters of the various volumes of the Manual. These are cross-referenced where necessary.

3 Increasing complexities in the road network, and in the geometric treatment used to design the various parts of the network, increase the pressures on drivers when they negotiate the network. As the network expands so does the demand for information needed to travel safely and successfully from one point to another. Policies and practices have therefore been evolved with the express purpose of containing the information explosion to manageable proportions. The fact that there are very definite limits to the ability of any guidance signing system to offer, and transfer, information to road users, must be recognised by the road designers in their determination of geometric design solutions to complex road junction requirements. No geometric design should be finalised without a draft design being prepared of the required guidance signs. This draft design should include the selection of destinations and the testing of intended positioning of the signs for adequate visibility, legibility and reading time, in terms of the decisions required of drivers, by the geometric design.

4 One of the basic principles of effective navigation is to provide "positive guidance." This is a road safety philosophy that advocates the creation and maintenance of a public road environment which will provide road users with the optimum amount of visual information which is:

(a) useful - the limitation is that non-useful or non-pertinent information takes time to process - thus reducing human performance for necessary information processing and reaction;

(b) prioritised for importance - as the performance limitation again applies to human reaction;

(c) uniform (and without surprises namely - expectancy) - as drivers develop response habits as a defence mechanism, and driver expectancy results in automatic, and time saving, responses to standard stimuli (this being the ultimate objective of positive guidance techniques); and

(d) easily visible under the widest range of conditions as standards used must be as close to the ideal as possible.

For more detail refer to Volume 1, Chapter 1, Section 1.8 which deals with Positive Guidance and to Volume 1 Chapter 8 which deals with Navigational Aids.

5 It is a fundamental principle that the amount of information given at one time on a guidance sign should be kept to the minimum consistent with the actions required of drivers at a specific point in the road network. Basic factors which therefore need to be considered are:

(a) recommended minimum signing levels for rural road junctions related to the class of intersecting roads;

(b) limits on the amount of legend or "bits" of information displayed (see Volume 1, Chapter 4, Section 4.3);

(c) the development of principles of "navigational aids" allowing a consistent approach to the selection of destinations, graded as familiar, control or service, nation-wide (see Volume 1, Chapter 8);

(d) the recognition of the need for adequate orientation at decision points, including the use of cardinal directions when space precludes the display of destination names;

(e) the decision-making process of drivers, particularly when on high speed roads (see Volume 1, Chapter 4, Section 4.8).

6 It is also a fundamental objective of the guidance signing system that the chances that drivers may make navigational errors be reduced to an absolute minimum. In order to perform their task, guidance signs shall:

(a) be conspicuous and legible;

(b) be classified by colour code for rapid class recognition;

(c) simplify a driver's search for information by consistent positioning of this information;

(d) simplify a driver's reading process by limiting legend display to the minimum.

7 To achieve these objectives effective guidance signs should incorporate the following functional requirements:

(a) conformity involving disciplined compliance with nation-wide policies, so that road users may be assured of the same signing principles and standards wherever they may be in the system;

(b) accuracy of signface display to eliminate confusion which may be experienced by road users if sign messages do not relate to what can, or will be seen on the road ahead;

(c) uniformity of signface layout, colour code and sign display sequence to enhance road users' abilities to get the best from the system by reducing reading times;

(d) consistency of signing practice, so that like situations are signed in a like manner;

(e) continuity of message display until the information is no longer relevant.

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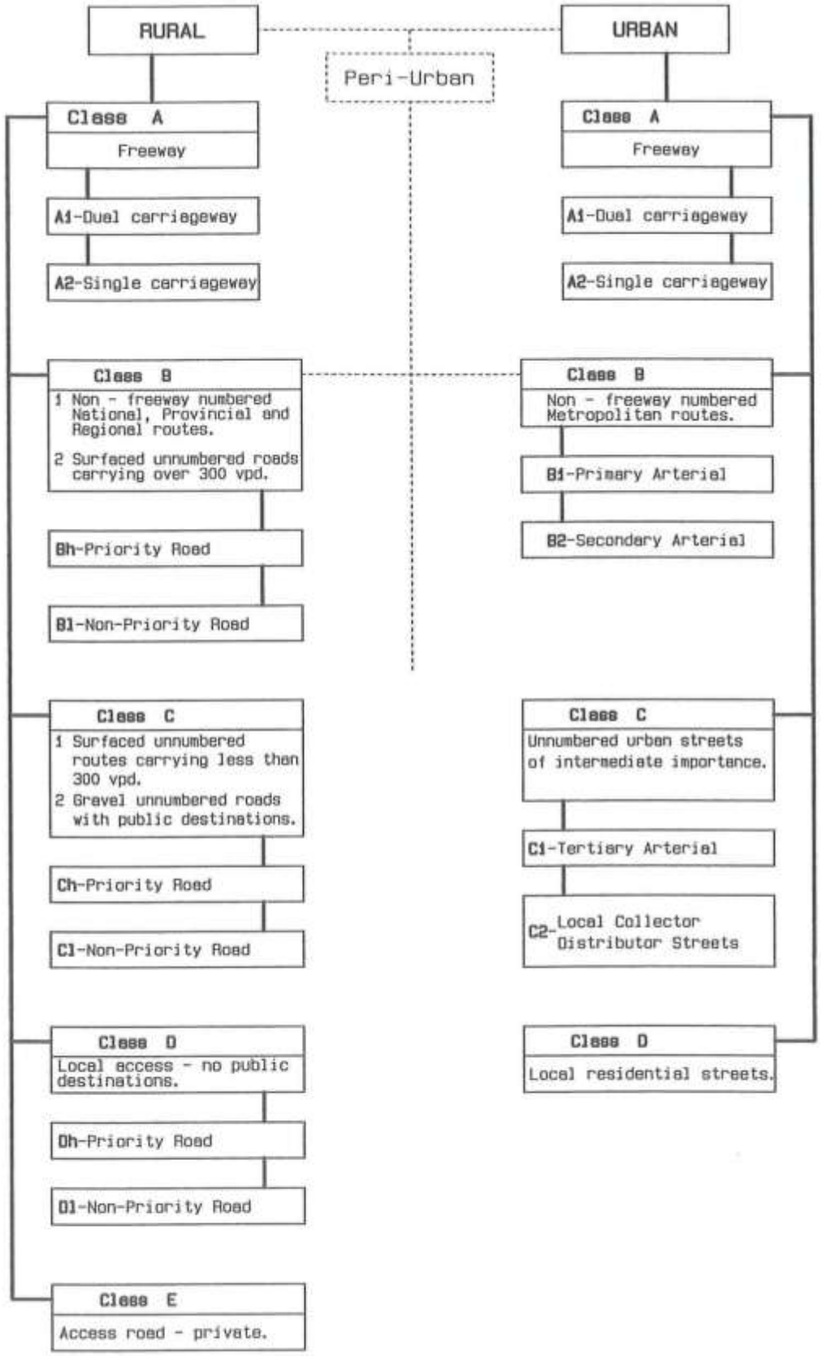
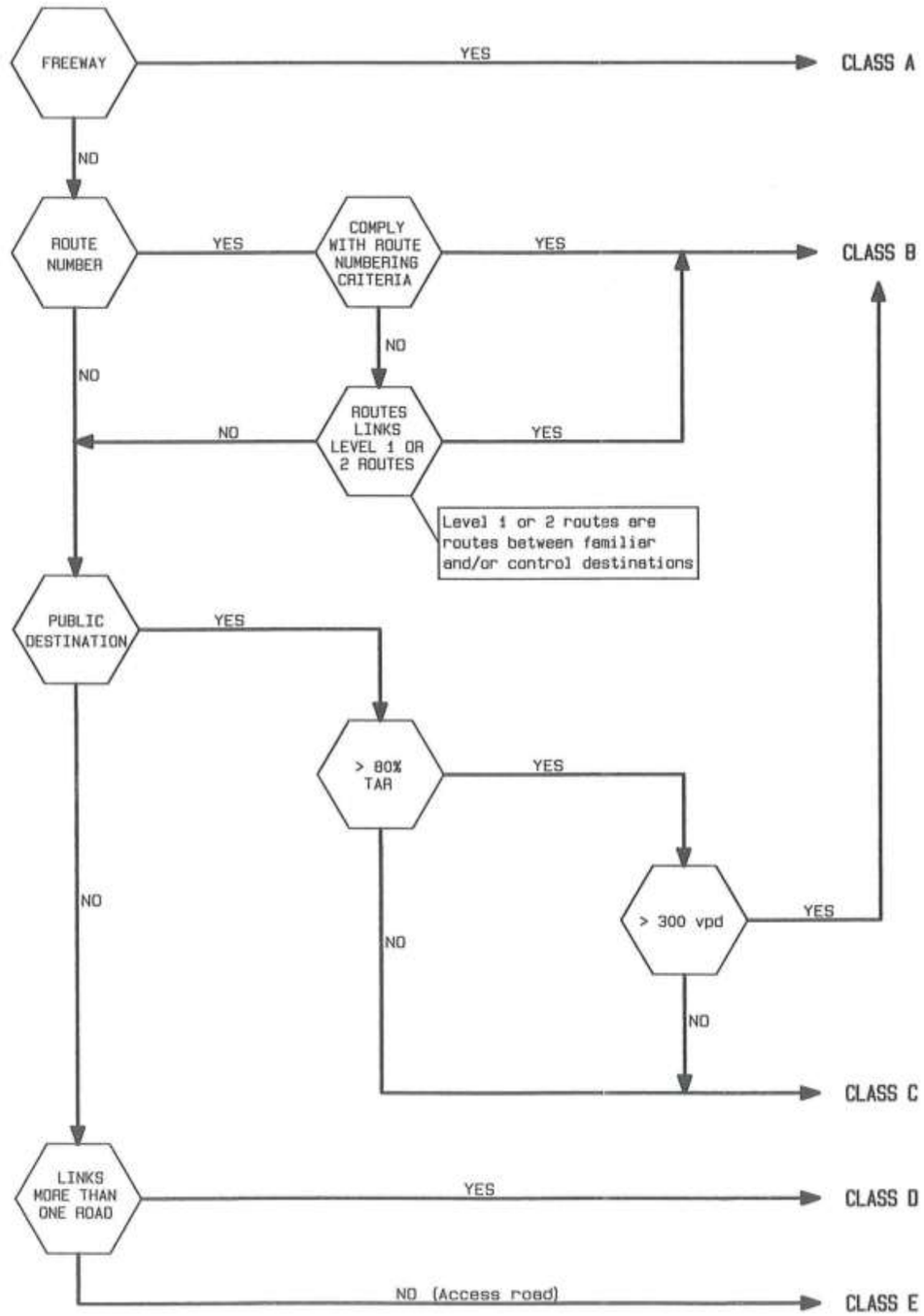


Detail 10.1.1
Basic Road Classification for Signing Purposes



Detail 10.1.2
Typical Method of Rural Road Classification
(See Chapter 9 for method of urban road classification)

Fig 10.1
Road Classification for Signing Purposes

8 The message given by guidance signs should enable drivers to make the correct decision regarding their next driving action on the journey towards their final destination. In simple terms this action is likely to be one of the following:

(a) to continue on the route on which they are travelling;

(b) to turn onto an intersecting route (either numbered or un-numbered);

(c) to stop for rest and/or service.

The minimum navigational information that drivers, not familiar with the area, require to ensure a correct and safe driving action at a decision point, varies according to the road geometry of the situation. The first decision required when a change in direction is possible can be made on the basis of as little information as the straight-on route number and the route number of the crossing route. This minimum information may be complemented by destinations, and when necessary, by other guidance signs such as TOURISM signs. Such treatment will become more appropriate at junctions with un-numbered routes at the lower levels of the route hierarchy.

9 The destination part of the message should orientate drivers. It is therefore essential that the destinations displayed to drivers, when they make a change of direction, are familiar to them, or are obvious from road maps.

10 The orientation message displayed (destination), should correlate with what are familiar orientation points for drivers, whether this is as a result of information gained from pre-trip planning, or general knowledge. The objective of destination selection is therefore to display familiar orientation points needed by drivers to follow the optimum route to reach their final destinations.

11 The selection of the destination to be displayed on any direction or confirmation sign may often seem to be a simple task. However, the increasing complexity of the modern road network demands that a systematic and consistent approach be adopted by road authorities whenever a destination is selected for permanent display on guidance signs. Refer to Volume 1, Chapter 8, "Navigational Aids" and specifically to Section 8.5 on "Selection of Destinations."

12 Circumstances are likely to occur, particularly from rural to peri-urban areas, whereby the guidance signing of a particular route may require changes in standard, from a minimum level to a preferred level, and back again. This may occur a number of times along a route. In such circumstances, care shall be exercised to ensure a minimum level of basic message continuity by, for instance, the consistent display of a route number through all sign sequences.

10.1.4 Physical Requirements for an Effective Guidance Sign System

1 In addition to the principles and requirements stated in Subsection 10.1.3 for an effective guidance sign system there are many physical aspects of the signface design and sign positioning which

relate to the effectiveness of a guidance sign system, or any sign system. Many road authorities have interpreted the guidelines given in Volumes 1 and 4 into specific policies on signface design and placement criteria. Such policies, and the details given in this chapter are based on norms. This should not preclude a good designer or sign installation unit from questioning absolute adherence to policy or norms, when conditions are clearly not within normal parameters. For instance it is an unacceptably common occurrence that one sign installation unit will place a new or additional sign, according to a norm, right in front of another sign erected by a different unit, without involving the norm for the distance separating successive signs.

2 It is not the purpose of this chapter to cover signface design or sign installation parameters. This is covered in Volume 1, Chapters 1 to 4. However, basic relevant details are provided in Tables 10.1 to 10.3 for the convenience of users. It must be stressed that this information, in itself, should not replace a proper assessment of signface design criteria such as letter sizes, or sign positioning in relation to junctions and other signs. The information given in Tables 10.1 to 10.3 is repeated through Section 10.3 each time a table condensing the minimum signing requirements is provided.

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TABLE 10.1 JUNCTION SIGN LOCATION CRITERIA TABLE 10.1

Operating Speed (km/h)	Clear Visibility Distance to Sign (m)	Distance of Single Advance Guidance or Warning Sign from Junction (m)	Recommended Side Length – Warning Sign (mm)
120	120	330(400)	1500
100	100	240(320)	1500
80	80	160(220)	1200
60	60	120(160)	900

NOTES:

(1) Refer to Volume 1, Chapters 1, 3 and 4 for fully detailed design criteria.
(2) The figures given in brackets represent extended location positions recommended for advance signs but, as yet, not supported by research.
(3) Distances in brackets should be used on gravel road approaches.
(4) See Table 10.2 for spacing between signs if more than one is located in advance of a junction.

TABLE 10.2 SIGN CLEAR SIGHT AND SPACING DISTANCES TABLE 10.2

Operating Speed (km/h)	Letter Sizes (mm)	Clear Sight Distance (m)	Spacing Between Signs (m)	
			Minimum	Recommended
120	280/200	260	100	200
100	280/200	260	80	150
80	210/150	220	60	100
60	210/150	220	50	90
	140/150	180	40	75

NOTES:

(1) "Clear Sight Distance" values are made up of the legibility distance PLUS an allowance of 100 m to 120 m for observation of the sign prior to reading.
(2) Successive signs must be spaced apart so that each can be read and understood. The minimum values given may be used when successive signs are Warning and Guidance, or *vice versa*. The recommended values should be used between successive Guidance signs.

TABLE 10.3 RECOMMENDED LETTER SIZES – RURAL SIGNS TABLE 10.3

Road Class	Operating Speed (km/h)	Sign Displacement To Left (X m)	Letter Sizes (mm)	
			Direction Signs	Tourism Signs
B, C	120	8 (1 lane)	280/200	210/150
B, C, D	100	8 (1 lane)	280/200	175/125
B, C, D	80	8 (1 lane)	210/150	175/125

NOTES:

(1) The lettering sizes given here for guidance signs are for specific values of parameters "D", "N" and "X" as follows:

D = 1,0: N = 8 (Direction): X = 8: N = 5 (Tourism)

Consult the nomograms in Volume 1, Chapter 4, for different values and for an explanation of "D", "N" and "X".

(2) Guidance sign design for complex traffic environments shall include a review of the letter sizes for adequate reading time (see Volume 1, Chapter 4).

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10.2 RANGE OF APPLICABLE SIGNS AND MARKINGS

10.2.1 Regulatory Signs

1 The main regulatory signs required for intersection control, with their Volume 1 references, are:

(a) STOP sign R1 (see Chapter 2, Subsection 2.2.1);

(b) YIELD sign R2 (see Chapter 2, Subsection 2.2.2);

See Figure 10.2.

2 Command and prohibition signs may also be necessary in the vicinity of intersections where special circumstances exist. These aspects are dealt with in other chapters of Volume 2, namely:

(a) Chapter 3: Regulatory and Warning Signs and Markings Applications;

(b) Chapter 11: Signing for Heavy Vehicles.

Any of these additional signs required must be appropriately positioned on the approach to the intersection making allowance for the primary signing requirements (see Table 10.2).

3 The warrants for and placement of these regulatory signs are dealt with in detail in Volume 1, Chapter 1, Section 1.6 and in the individual subsections in Volume 1, Chapter 2.

4 The shape, size and colour of regulatory signs is dealt with in detail in Volume 1, Chapter 1, Section 1.4 and Chapter 2, Section 2.1. Specific details of the control, command and prohibition signs themselves are provided in the respective individual subsections of Volume 1, Chapter 2.

10.2.2 Warning Signs

1 The main warning signs which may be required in the vicinity of a rural junction, with their Volume 1 references, are:

(a) CROSSROAD sign W101, W102 and W103 (see Chapter 3, Subsection 3.2.1);

(b) T- and SKEW T-JUNCTION signs W104, W105 and W106 (see Chapter 3, Subsection 3.2.2);

(c) SIDE-ROAD JUNCTION signs W107 and W108 (see Chapter 3, Subsection 3.2.3);

(d) STAGGERED JUNCTION signs W109 and W110 (see Chapter 3, Subsection 3.2.4);

(e) TRAFFIC CONTROL STOP AHEAD sign W302 (see Chapter 3, Subsection 3.4.2);

(f) TRAFFIC CONTROL YIELD AHEAD sign W303 (see Chapter 3, Subsection 3.4.3);

(g) T-JUNCTION CHEVRON sign W409 (see Chapter 3, Subsection 3.5.4).

See Figure 10.2.

2 Other warning signs may also be necessary in the vicinity of the intersection, where special circumstances prevail. These aspects are dealt with in other chapters of Volume 2, namely:

(a) Chapter 3: Regulatory and Warning Signs and Markings Applications;

(b) Chapter 11: Signing for Heavy Vehicles.

Any of these additional signs required must be appropriately positioned on the approach to the intersection making allowance for the primary signing requirements (see Table 10.2).

3 The warrants for and placement of these warning signs are dealt with in detail in Volume 1, Chapter 1, Section 1.6 and Chapter 3, Section 3.1, and in the subsections of Chapter 3.

4 The shape, size and colour is dealt with in Volume 1, Chapter 1, Section 1.4 and Chapter 3, Section 3.1. Specific details of the signs themselves are dealt with in the respective individual subsections of Volume 1, Chapter 3.

5 A number of the warning signs may have a SUPPLEMENTARY PLATE sign IN11.3 indicating the distance to the intersection. This will be required on the higher order type road approach to a stop or yield condition (i.e. a Bh or Bl class road approach).

10.2.3 Guidance Signs

1 The main guidance signs related to rural road junction signing are the direction signs, although certain location signs, route marker signs and tourism signs may be required on the approach to the intersection.

2 The main direction signs which apply to rural road junctions, with their Volume 1 references, are:

(a) STACK-TYPE ADVANCE DIRECTION sign GD1 - see Chapter 4, Subsection 4.8.5;

(b) STACK-TYPE DIRECTION sign GD2 - see Chapter 4, Subsection 4.8.6;

(c) STACK-TYPE COMPOSITE DIRECTION sign GD1/GD2 - see Chapter 4, Subsection 4.8.7;

(d) CONFIRMATION sign GD3 - see Chapter 4, Subsection 4.8.8;

(e) FINGERBOARD sign GD4 - see Chapter 4, Subsection 4.8.9;

(f) MAP-TYPE ADVANCE DIRECTION sign GD9 - see Chapter 4, Subsection 4.8.10 (these are to be used on Class B roads only).

See Figure 10.2.

3 The main location signs which may be required on an approach to or at a rural road junction, with their Volume 1 references, are:

(a) STREET NAME sign GL1 - see Chapter 4, Subsection 4.6.4;

(b) TOWN NAME sign GL3 - see Chapter 4, Subsection 4.6.6;

(c) RIVER NAME sign GL4 - see Chapter 4, Subsection 4.6.7;

(d) PROVINCIAL or TERRITORIAL BORDER sign GL5 - see Chapter 4, Subsection 4.6.8.

4 Certain route marker signs may be erected in the vicinity of a rural road junction although in general the direction signs indicated in paragraph 10.2.3.2 should be adequate to provide all the necessary guidance information. Refer to Volume 1, Chapter 4, Section 4.7.

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5 Tourism signs may often be necessary on the approach to a rural road intersection in order to provide adequate guidance to relevant tourist facilities. This aspect is dealt with in detail in Chapter 4 of Volume 2 and Volume 1, Section 4.10. The signs which may be required on the approach to or beyond the junction, with their Volume 1 references, are:

(a) ADVANCE TURN sign GF2 - see Chapter 4, Subsection 4.10.18;

(b) FINAL TURN sign GF3 - see Chapter 4, Subsection 4.10.19;

(c) CONFIRMATION sign GF7 - see Chapter 4, Subsection 4.10.22.

See Figure 10.3.

6 The warrants for and placement of the guidance signs are dealt with in detail in Volume 1, Chapter 1, Section 1.6 and in the individual subsections in Volume 1, Chapter 4.

10.2.4 Information Signs

1 The only standard information sign which may be required on the approach to a rural road junction is the SUPPLEMENTARY PLATE sign IN11.3, which indicates the distance to the intersection, and which may be used in conjunction with certain of the warning signs on B class roads as discussed in paragraph 10.2.2.5.

10.2.5 Road Markings

1 Road marking details are dealt with in Volume 1, Chapter 7 and specific aspects of their application are dealt with in Chapters 2 and 3 of Volume 2.

2 The following regulatory and warning road markings, with their Volume 1 references, may be applicable in the vicinity of a rural road junction:

(a) STOP LINE marking RTM1 - see Chapter 7, Subsection 7.2.1;

(b) YIELD LINE marking RTM2 - see Chapter 7, Subsection 7.2.2;

(c) NO OVERTAKING LINE marking RM1 - see Chapter 7, Subsection 7.2.5;

(d) NO CROSSING LINES marking RM2 - see Chapter 7, Subsection 7.2.6;

(e) CHANNELISING LINE marking RM3 - see Chapter 7, Subsection 7.2.7;

(f) CONTINUITY LINE marking WM2 - see Chapter 7, Subsection 7.3.2;

(g) DIVIDING LINE marking WM3 - see Chapter 7, Section 7.3.3;

(h) YIELD CONTROL AHEAD marking WM5 - see Chapter 7, Subsection 7.3.5;

(i) WORD MARKINGS GM7 (STOP) - see Chapter 7, Subsection 7.4.7;

(j) KERBFACE marking GM8 - see Chapter 7, Subsection 7.4.8.

3 The warrants for and layout of these markings are dealt with in the respective individual sub-sections of Volume 1, Chapter 7.

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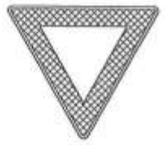
REGULATORY SIGNS

R1



R2

WARNING SIGNS

W101

W102

W103

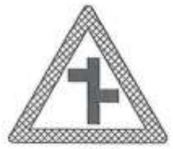
W104

W105

W106

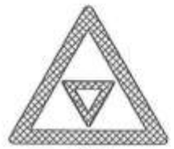
W107

W108



W109

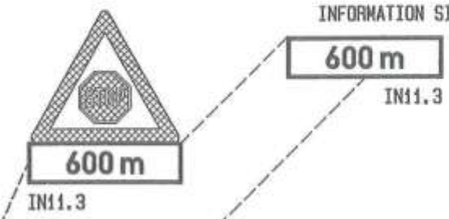
W110

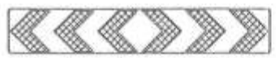


W303

W302

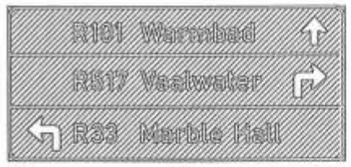
INFORMATION SIGNS



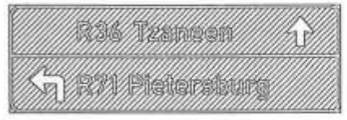


W409 Hazard Marker Chevron

DIRECTION SIGNS



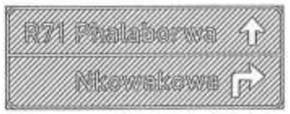
GD1 Advance Cross Road



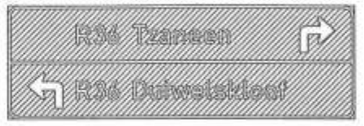
GD1 Advance T-Junction

GD1/GD2 Minor Cross Road

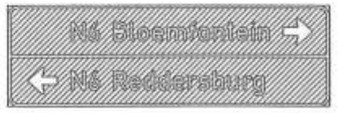
GD2 Sliproad



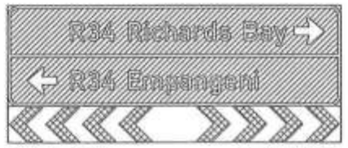
GD1 Advance T-Junction



GD1 Advance T-Junction



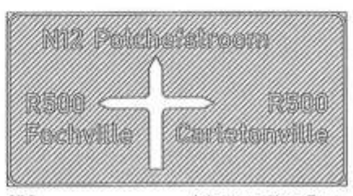
GD2 Cross Road



GD2 + W409 T-Junction

GD3 Confirmation

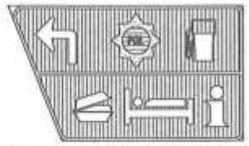
GD4 Fingerboard



GD9 Advance Map-Type

TOURIST SIGNS

GF2 Advance Tourist Attraction



GF2 Advance Tourist Services

GF2 Advance Tourist Attraction

GF3 Final Turn Accommodation

GF7 Tourist Confirmation

LOCATION SIGNS

GL1 Street Name

GL4 River Name

GL5 Province Boundary

Fig 10.2
Range of Applicable Signs

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10.3 APPLICATION OF SIGNING

10.3.1 General

1 **The required minimum signing** at the various possible rural road junction types is illustrated in Figures 10.3 to 10.33 and a summary of the signing requirements on each intersection approach is given in complementary tables in Subsection 10.3.2.

2 Since the figures in this section represent **minimum** signing levels considered necessary to achieve an effective guidance sign system, a road authority may provide a higher level of signing, either as a matter of policy, or when specific circumstances at individual intersections warrant extra signing. Common enhancements or upgrades in signing level include:

(a) the provision of an advance direction sign GD1, in place of a relevant warning sign shown in one of the figures;

(b) the provision of a relevant warning sign in ADDITION to an advance direction sign GD1 (in this instance the criteria given in Tables 10.1 and 10.2 should be reviewed and the warning sign **should be placed further from the intersection to allow for an adequate spacing between signs - see Table 10.2, note (2)).**

3 It should be noted that CROSSROAD advance warning signs W102 and W103 are shown in the figures. Some road authorities have adopted a policy to use only sign W101. **Manufacturers and designers should check on the policy of road authorities before ordering or manufacturing CROSSROAD signs.**

4 It is a generally accepted principle that all classes of road, B, C, D and E should be identified by a road sign. In a rural environment it is often difficult to allocate meaningful destination names to Class D and E roads. For this reason the use of STREET NAME sign GL1 has been accepted, in principle, for use at such rural road junctions, and particularly for dead-end roads.

5 The following nomenclature is used to describe the various types of junctions:

(a) the letters B, C, D, and E are used to describe the class of road, classified as per Figure 10.1;

(b) where two routes of the same class intersect the higher order of the two is described by means of an "h" postscript, e.g. Bh, while the lower order road is described by an "l" postscript, e.g. Bl;

(c) a four-legged road junction is described by firstly the intersecting roads (e.g Bl + D) followed by the main route class (e.g. Bl + D x Bh);

(d) a T-junction is described by firstly the intersecting road and then by the class of the through route e.g. C x B.

10.3.2 Minimum Signing Requirements

1 **The minimum signing requirements** for junctions where the main road (road with priority) is a Class D road, are given in the following figures:

(a) T-junctions:

(i) Figure 10.3 - Road Class E x D Junction;

(ii) Figure 10.4 - Road Class Dl x Dh Junction;

(b) Four-legged Junctions (Crossroads):

(i) Figure 10.5 - Road Class E + E x D Junction;

(ii) Figure 10.6 - Road Class E + Dl x Dh Junction;

(iii) Figure 10.7 - Road Class Dl + Dl x Dh Junction.

A summary of the signs for these junctions is given in Table 10.4.

2 **The minimum signing requirements** for junctions where the main road (road with priority) is a Class C road, are given in the following figures:

(a) T-junctions:

(i) Figure 10.8 - Road Class E x C Junction;

(ii) Figure 10.9 - Road Class D x C Junction;

(iii) Figure 10.10 - Road Class Cl x Ch Junction;

(b) Four-legged Junction (Crossroads):

(i) Figure 10.11 - Road Class E + E x C Junction;

(ii) Figure 10.12 - Road Class E + D x C Junction;

(iii) Figure 10.13 - Road Class D + D x C Junction;

(iv) Figure 10.14 - Road Class E + Cl x Ch Junction;

(v) Figure 10.15 - Road Class D + Cl x Ch Junction;

(vi) Figure 10.16 - Road Class Cl +Cl x Ch Junction.

A summary of the signs for these junctions is given in Table 10.5.

3 **The minimum signing requirements** for junctions where the main road (road with priority) is a Class B road, are given in the following figures:

(a) T-junction:

(i) Figure 10.17 - Road Class E x B Junction;

(ii) Figure 10.18 - Road Class D x B Junction;

(iii) Figure 10.19 - Road Class C x B Junction;

(iv) Figure 10.20 - Road Class Bl x Bh Junction;

A summary of the signs for these junctions is given in Table 10.6 and Table 10.7.

(b) Four-legged Junction (Crossroads):

(i) Figure 10.21 - Road Class E + E x B Junction;

(ii) Figure 10.22 - Road Class D + E x B Junction;

(iii) Figure 10.23 - Road Class D + D x B Junction;

(iv) Figure 10.24 - Road Class C + E x B Junction;

(v) Figure 10.25 - Road Class C + D x B Junction;

(vi) Figure 10.26 - Road Class C + C x B Junction;

(vii) Figure 10.27 - Road Class E + Bl x Bh Junction;

(viii) Figure 10.28 - Road Class D + Bl x Bh Junction;

(ix) Figure 10.29 - Road Class C + Bl x Bh Junction;

(x) Figure 10.30 - Road Class Bl + Bl x Bh Junction;

A summary of the signs for these junctions is given in Table 10.8 and Table 10.9.

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(c) T-junction with Slip Road:
  (i) Figure 10.31 - Road Class Bl x Bh Junction (with Slip Road from Bh to Bl);
  (ii) Figure 10.32 - Road Class Bl x Bh Junction with Slip Road from Bl to Bh);
(d) Four-legged Dual Carriageway Junction:
  (i) Figure 10.33 - Road Class B x B Junction with three slip roads and 4-way STOP control.

4 Tables 10.4 to 10.9 have been provided in a fold out format to allow a table and figure to be viewed simultaneously. The information covered by Tables 10.1 to 10.3 is also repeated with Tables 10.4 to 10.9 for convenience.

TABLE 10.4 MINIMUM SIGNING REQUIREMENTS FOR JUNCTIONS ONTO "D" CLASS ROADS TABLE 10.4

Junction Type (Fig ref.)	Approach	Required Signs: R1 or R2	W102	W103	W104	W107 or W108	W409	GD2	GL1 ?
E x D (Fig 10.3)	E	Y	o	o	Y	o	Y	o	o
	D	o	o	o	o	Y	o	o	Y
Dl x Dh (Fig 10.4)	Dl	Y	o	o	Y	o	Y	2 STK	o
	Dh	o	o	o	o	Y	o	1 STK	o
E + E x D (Fig 10.5)	E	o	o	Y	o	o	o	o	o
	D	o	Y	o	o	o	o	o	Y
E + Dl x Dh (Fig 10.6)	E	Y	o	Y	o	o	o	o	o
	Dl	Y	o	Y	o	o	o	2 STK	o
	Dh	o	Y	o	o	o	o	1 STK	Y
Dl + Dl x Dh (Fig 10.7)	Dl	Y	o	Y	o	o	o	2 STK	o
	Dh	o	Y	o	o	o	o	2 STK	o

KEY: Y = Sign required; o = Sign not required; 1 STK = 1 stack type required; 2 STK = 2 stack type required; 3 STK = 3 stack type required

NOTES:
(1) See Tables 10.1 to 10.3, repeated to the right, for basic dimensional criteria. Refer to Volume 1, Chapters 1, 3 and 4 for full design requirements.
(2) Warrants for warning and guidance signs, and road markings are given in the individual subsections of Volume 1, Chapters 2,3 and 7.
(3) If warning and/or guidance signs are provided on gravel roads the distances given in brackets in Table 10.1 are recommended.
(4) Road markings shown in the figures are nominal (see Chapters 2 and 3 for full details). Class C, D and E roads will commonly be un-surfaced.
(5) The use of STREET NAME sign GL1 is acceptable to identify a lower class rural road if no appropriate destination name is available.
(6) The criteria given in the Manual are open to interpretation. Road authorities may have specific policies within these guidelines, which designers, manufacturers and contractors must be aware of.

TABLE 10.1 JUNCTION SIGN LOCATION CRITERIA TABLE 10.1

Operating Speed (km/h)	Clear Visibility Distance to Sign (m)	Distance of Single Advance Guidance or Warning Sign from Junction (m)	Recommended Side Length – Warning Sign (mm)
120	120	330(400)	1500
100	100	240(320)	1500
80	80	160(220)	1200
60	60	120(160)	900

NOTES:
(1) Refer to Volume 1, Chapters 1, 3 and 4 for fully detailed design criteria.
(2) The figures given in brackets represent extended location positions recommended for advance signs but, as yet, not supported by research.
(3) Distances in brackets should be used on gravel road approaches.
(4) See Table 10.2 for spacing between signs if more than one is located in advance of a junction.

TABLE 10.2 SIGN CLEAR SIGHT AND SPACING DISTANCES TABLE 10.2

Operating Speed (km/h)	Letter Sizes (mm)	Clear Sight Distance (m)	Spacing Between Signs (m): Minimum	Spacing Between Signs (m): Recommended
120	280/200	260	100	200
100	280/200	260	80	150
80	210/150	220	60	100
60	210/150	220	50	90
	140/150	180	40	75

NOTES:
(1) "Clear Sight Distance" values are made up of the legibility distance PLUS an allowance of 100 m to 120 m for observation of the sign prior to reading.
(2) Successive signs must be spaced apart so that each can be read and understood. The minimum values given may be used when successive signs are Warning and Guidance, or *vice versa*. The recommended values should be used between successive Guidance signs.

TABLE 10.3 RECOMMENDED LETTER SIZES – RURAL SIGNS TABLE 10.3

Road Class	Operating Speed (km/h)	Sign Displacement To Left (X m)	Letter Sizes (mm): Direction Signs	Letter Sizes (mm): Tourism Signs
B, C	120	8 (1 lane)	280/200	210/150
B, C, D	100	8 (1 lane)	280/200	175/125
B, C, D	80	8 (1 lane)	210/150	175/125

NOTES:
(1) The lettering sizes given here for guidance signs are for specific values of parameters "D", "N" and "X" as follows:
D = 1,0: N = 8 (Direction): X = 8: N = 5 (Tourism)
Consult the nomograms in Volume 1, Chapter 4, for different values and for an explanation of "D", "N" and "X".
(2) Guidance sign design for complex traffic environments shall include a review of the letter sizes for adequate reading time (see Volume 1, Chapter 4).

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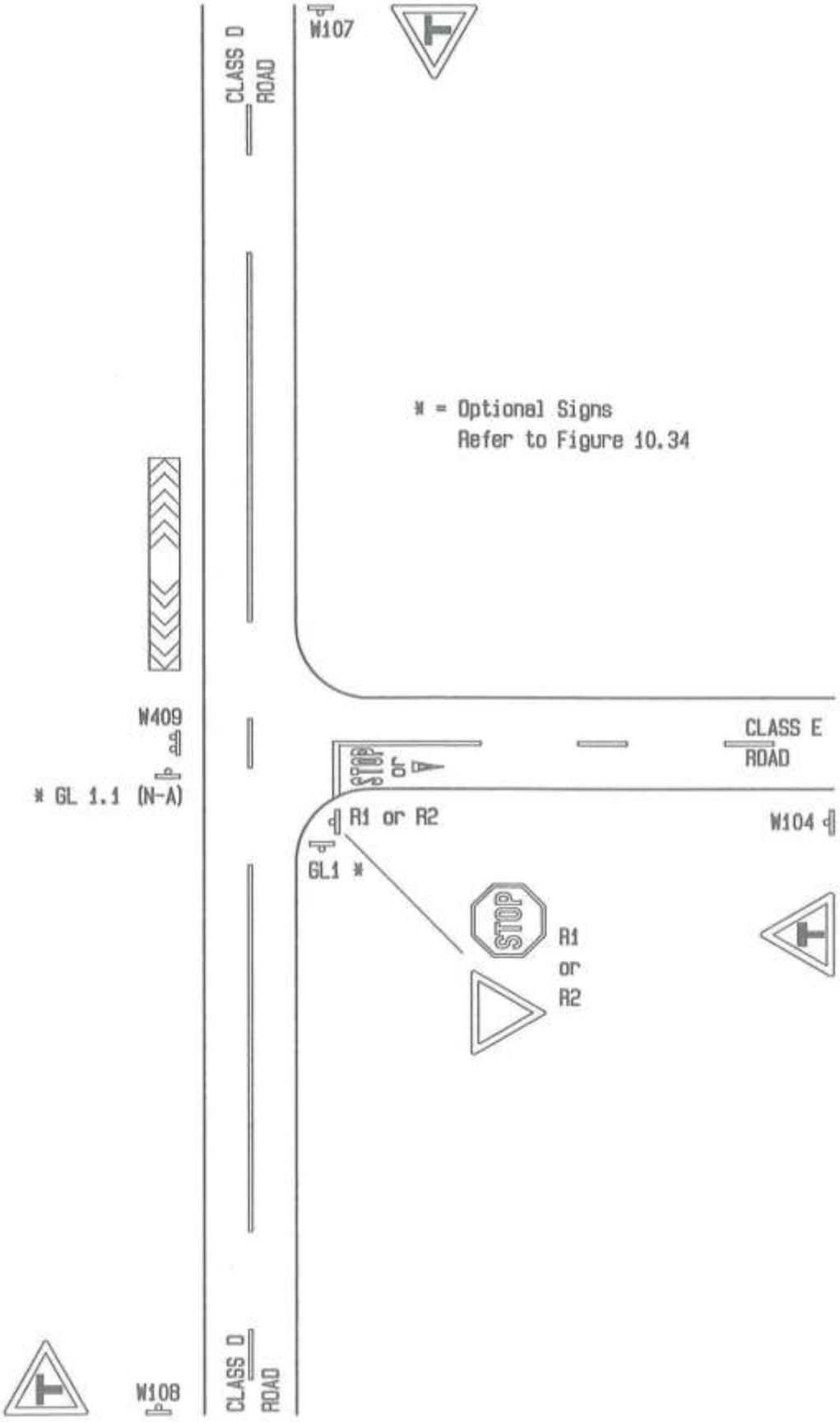

Fig 10.3 **Road Class E x D Junction**

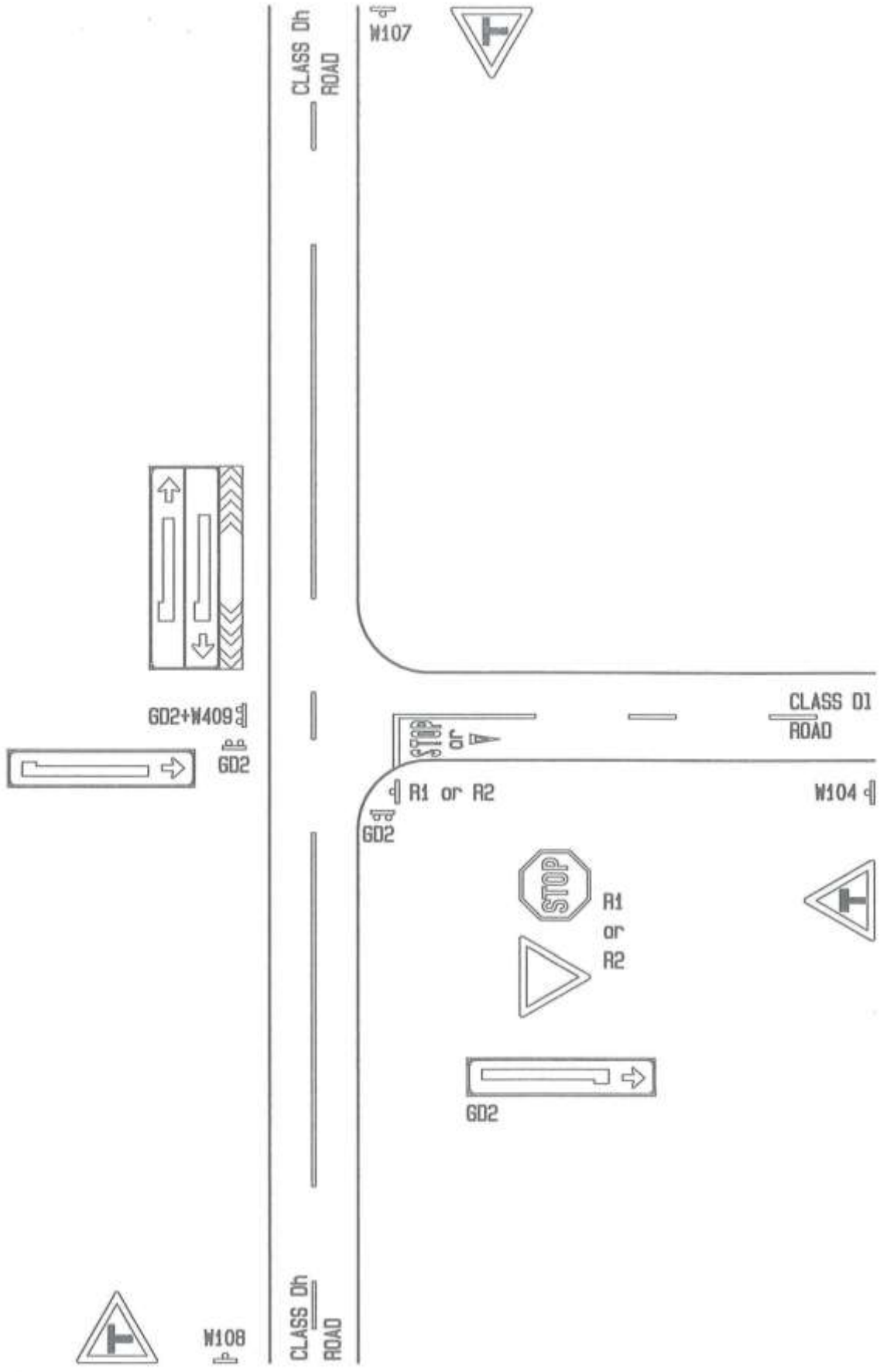

Fig 10.4 **Road Class Dl x Dh Junction**

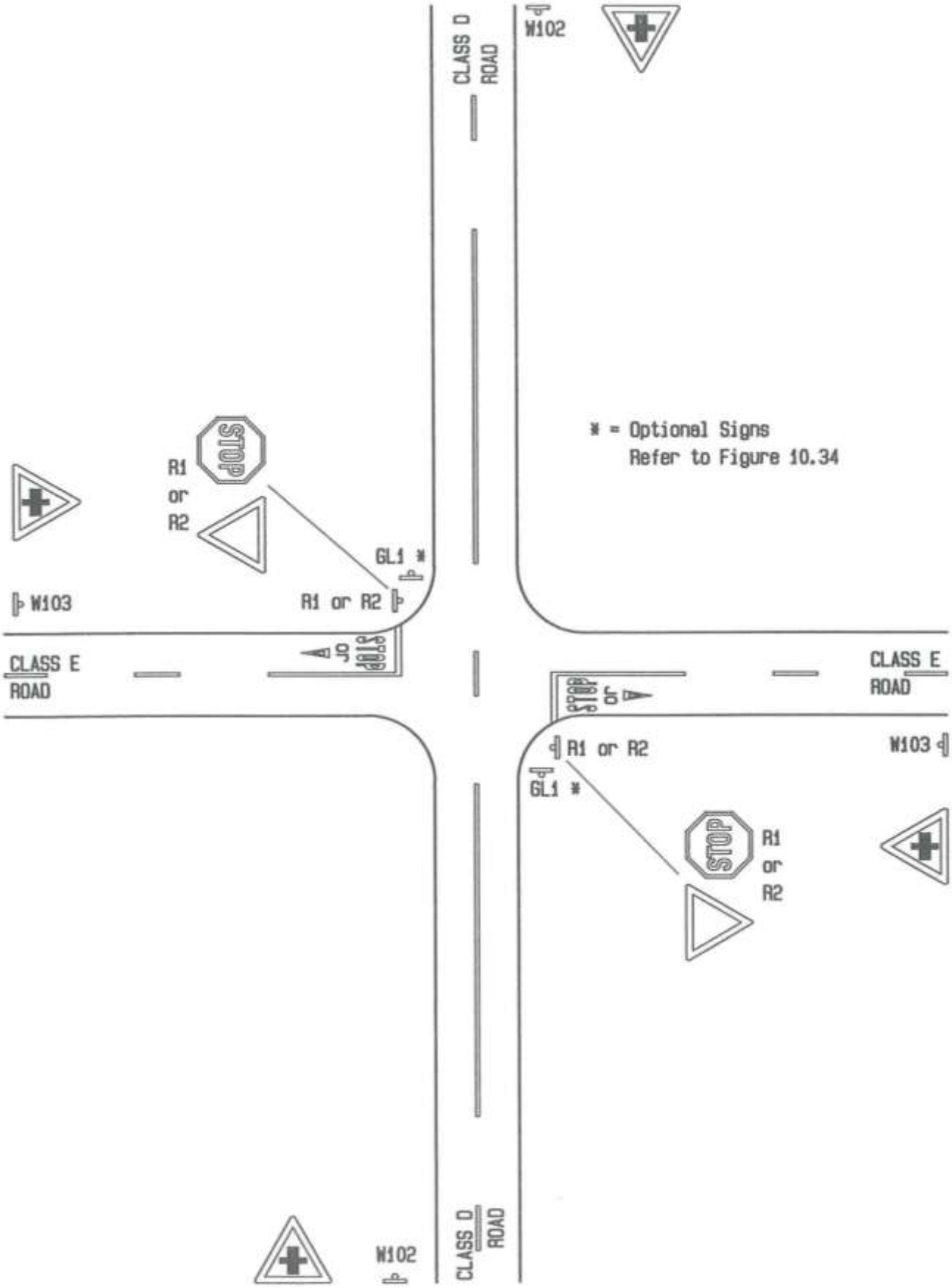

Fig 10.5 **Road Class E + E x D Junction**

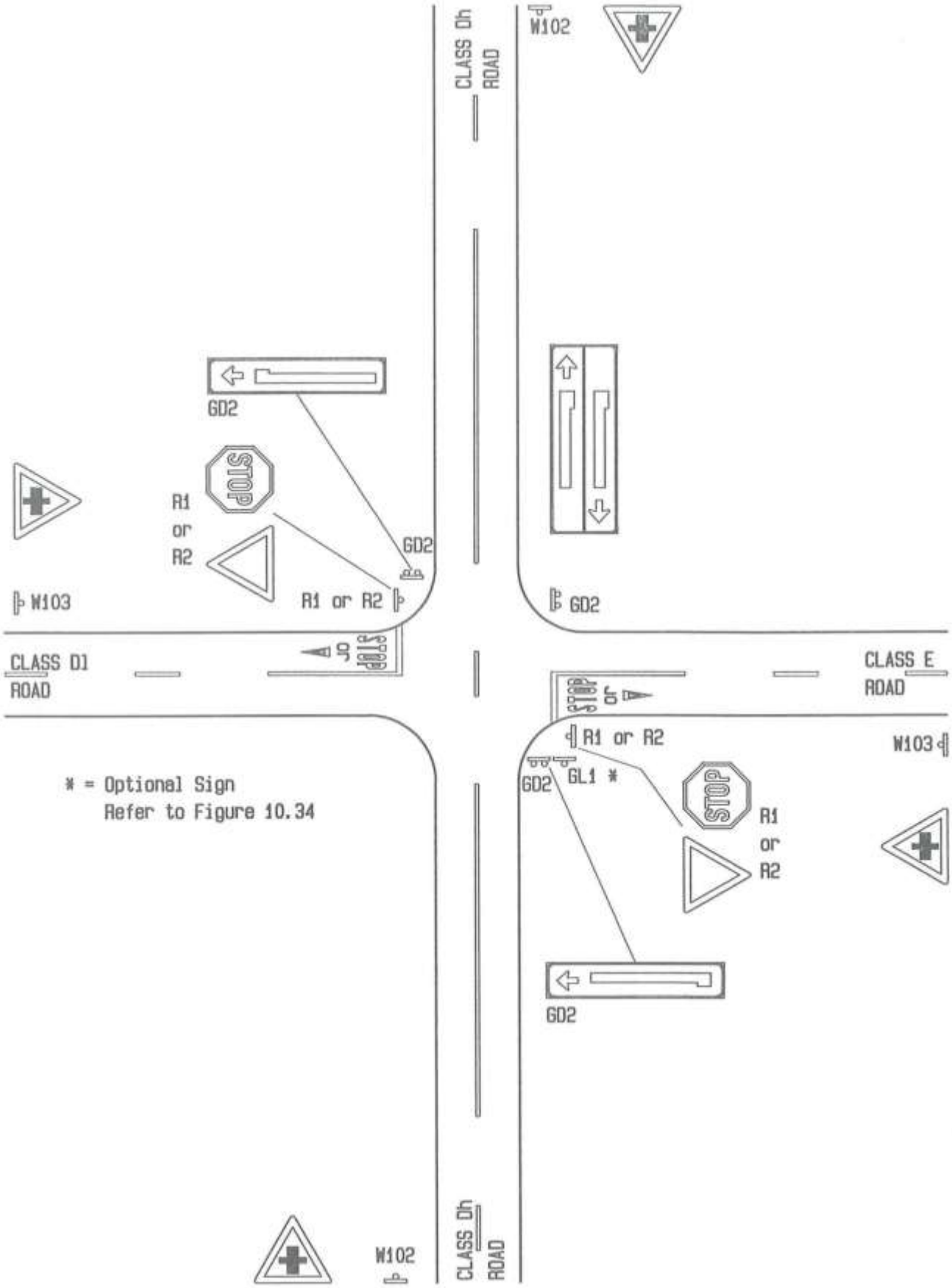

Fig 10.6 **Road Class E + Dl x Dh Junction**

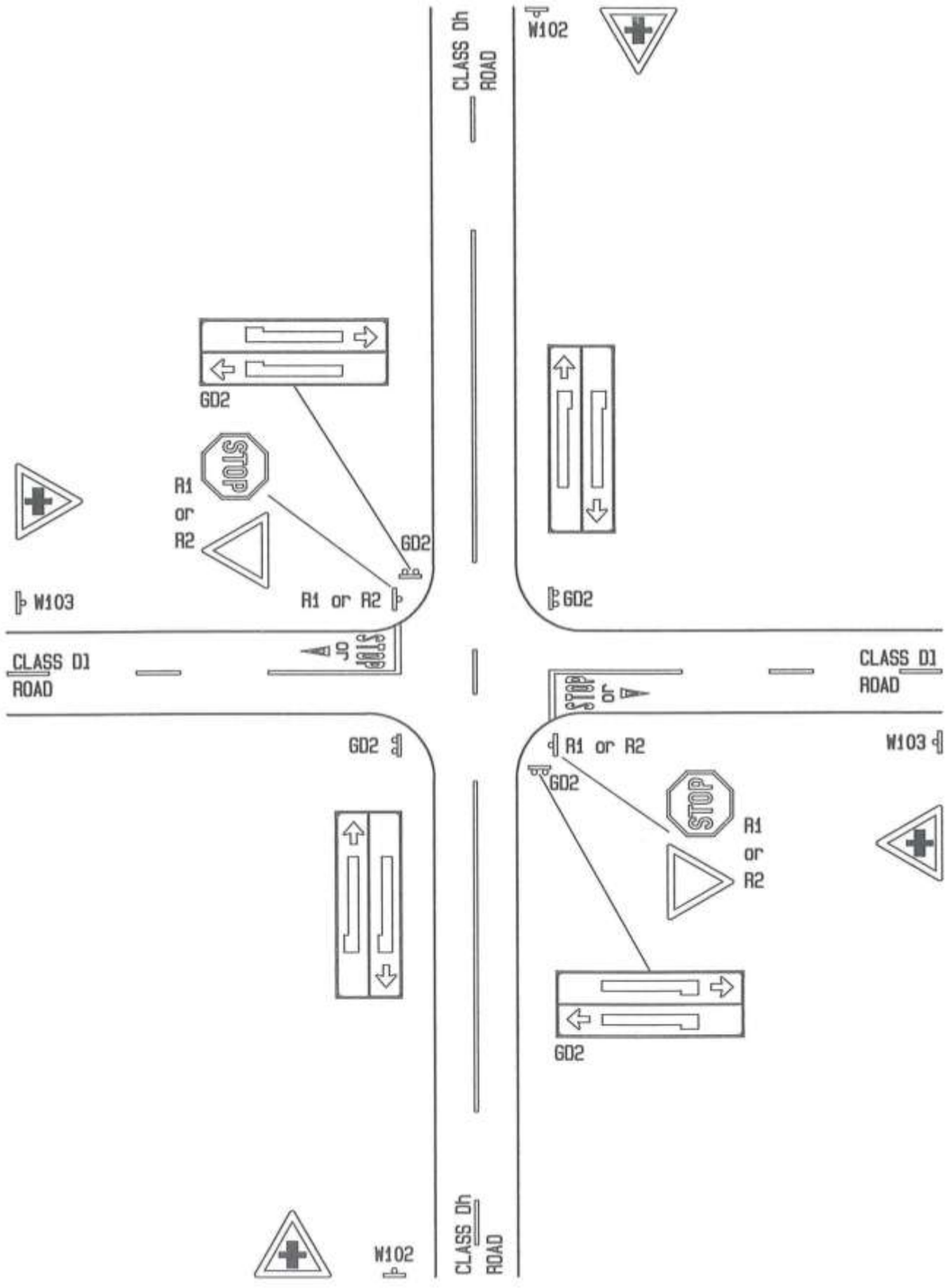

Fig 10.7 Road Class Dl + Dl x Dh Junction

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TABLE 10.5 MINIMUM SIGNING REQUIREMENTS FOR JUNCTIONS ONTO "C" CLASS ROADS TABLE 10.5

Junction Type (Fig ref.)	Approach	Required Signs: R1 or R2	W102	W103	W104	W107 or W108	W409	GD2	GL1
E x C (Fig 10.8)	E	Y	o	o	Y	o	Y	o	o
	C	o	o	o	o	Y	o	o	Y
D x C (Fig 10.9)	D	Y	o	o	Y	o	Y	2 STK	o
	C	o	o	o	o	Y	o	1 STK	o
Cl x Ch (Fig 10.10)	Cl	Y	o	o	Y	o	Y	2 STK	o
	Ch	o	o	o	o	Y	o	2 STK	o
E + E x C (Fig 10.11)	E	Y	o	Y	o	o	o	o	o
	C	o	o	o	o	o	o	o	Y
E + D x C (Fig 10.12)	E	Y	o	Y	o	o	o	o	o
	D	Y	o	Y	o	o	o	2 STK	o
	C	o	Y	o	o	o	o	1 STK	Y
D + D x C (Fig 10.13)	D	Y	o	Y	o	o	o	2 STK	o
	C	o	Y	o	o	o	o	2 STK	o
E + Cl x Ch (Fig 10.14)	E	Y	o	Y	o	o	o	o	o
	Cl	Y	o	Y	o	o	o	2 STK	o
	Ch	o	Y	o	o	o	o	2 STK	Y
D + Cl x Ch (Fig 10.15)	D	Y	o	Y	o	o	o	2 STK	o
	Cl	Y	o	Y	o	o	o	2 STK	o
	Ch	o	Y	o	o	o	o	2 STK	o
Cl + Cl x Ch (Fig 10.16)	Cl	Y	o	Y	o	o	o	3 STK	o
	Ch	o	Y	o	o	o	o	3 STK	o

KEY: Y = Sign required; o = Sign not required; 1 STK = 1 stack type required; 2 STK = 2 stack type required; 3 STK = 3 stack type required

NOTES:

(1) See Tables 10.1 to 10.3, repeated to the right, for basic dimensional criteria. Refer to Volume 1, Chapters 1, 3 and 4 for full design requirements.

(2) Warrants for warning and guidance signs, and road markings are given in the individual subsections of Volume 1, Chapters 2,3 and 7.

(3) If warning and/or guidance signs are provided on gravel roads the distances given in brackets in Table 10.1 are recommended.

(4) Road markings shown in the figures are nominal (see Chapters 2 and 3 for full details). Class C, D and E roads will commonly be un-surfaced.

(5) The use of STREET NAME sign GL1 is acceptable to identify a lower class rural road if no appropriate destination name is available.

(6) The criteria given in the Manual are open to interpretation. Road authorities may have specific policies within these guidelines, which designers, manufacturers and contractors must be aware of.

TABLE 10.1 JUNCTION SIGN LOCATION CRITERIA TABLE 10.1

Operating Speed (km/h)	Clear Visibility Distance to Sign (m)	Distance of Single Advance Guidance or Warning Sign from Junction (m)	Recommended Side Length – Warning Sign (mm)
120	120	330(400)	1500
100	100	240(320)	1500
80	80	160(220)	1200
60	60	120(160)	900

NOTES:

(1) Refer to Volume 1, Chapters 1, 3 and 4 for fully detailed design criteria.

(2) The figures given in brackets represent extended location positions recommended for advance signs but, as yet, not supported by research.

(3) Distances in brackets should be used on gravel road approaches.

(4) See Table 10.2 for spacing between signs if more than one is located in advance of a junction.

TABLE 10.2 SIGN CLEAR SIGHT AND SPACING DISTANCES TABLE 10.2

Operating Speed (km/h)	Letter Sizes (mm)	Clear Sight Distance (m)	Spacing Between Signs (m): Minimum	Spacing Between Signs (m): Recommended
120	280/200	260	100	200
100	280/200	260	80	150
80	210/150	220	60	100
60	210/150	220	50	90
	140/150	180	40	75

NOTES:

(1) "Clear Sight Distance" values are made up of the legibility distance PLUS an allowance of 100 m to 120 m for observation of the sign prior to reading.

(2) Successive signs must be spaced apart so that each can be read and understood. The minimum values given may be used when successive signs are Warning and Guidance, or *vice versa*. The recommended values should be used between successive Guidance signs.

TABLE 10.3 RECOMMENDED LETTER SIZES – RURAL SIGNS TABLE 10.3

Road Class	Operating Speed (km/h)	Sign Displacement To Left (X m)	Letter Sizes (mm): Direction Signs	Letter Sizes (mm): Tourism Signs
B, C	120	8 (1 lane)	280/200	210/150
B, C, D	100	8 (1 lane)	280/200	175/125
B, C, D	80	8 (1 lane)	210/150	175/125

NOTES:

(1) The lettering sizes given here for guidance signs are for specific values of parameters "D", "N" and "X" as follows:

D = 1,0: N = 8 (Direction): X = 8: N = 5 (Tourism)

Consult the nomograms in Volume 1, Chapter 4, for different values and for an explanation of "D", "N" and "X".

(2) Guidance sign design for complex traffic environments shall include a review of the letter sizes for adequate reading time (see Volume 1, Chapter 4).

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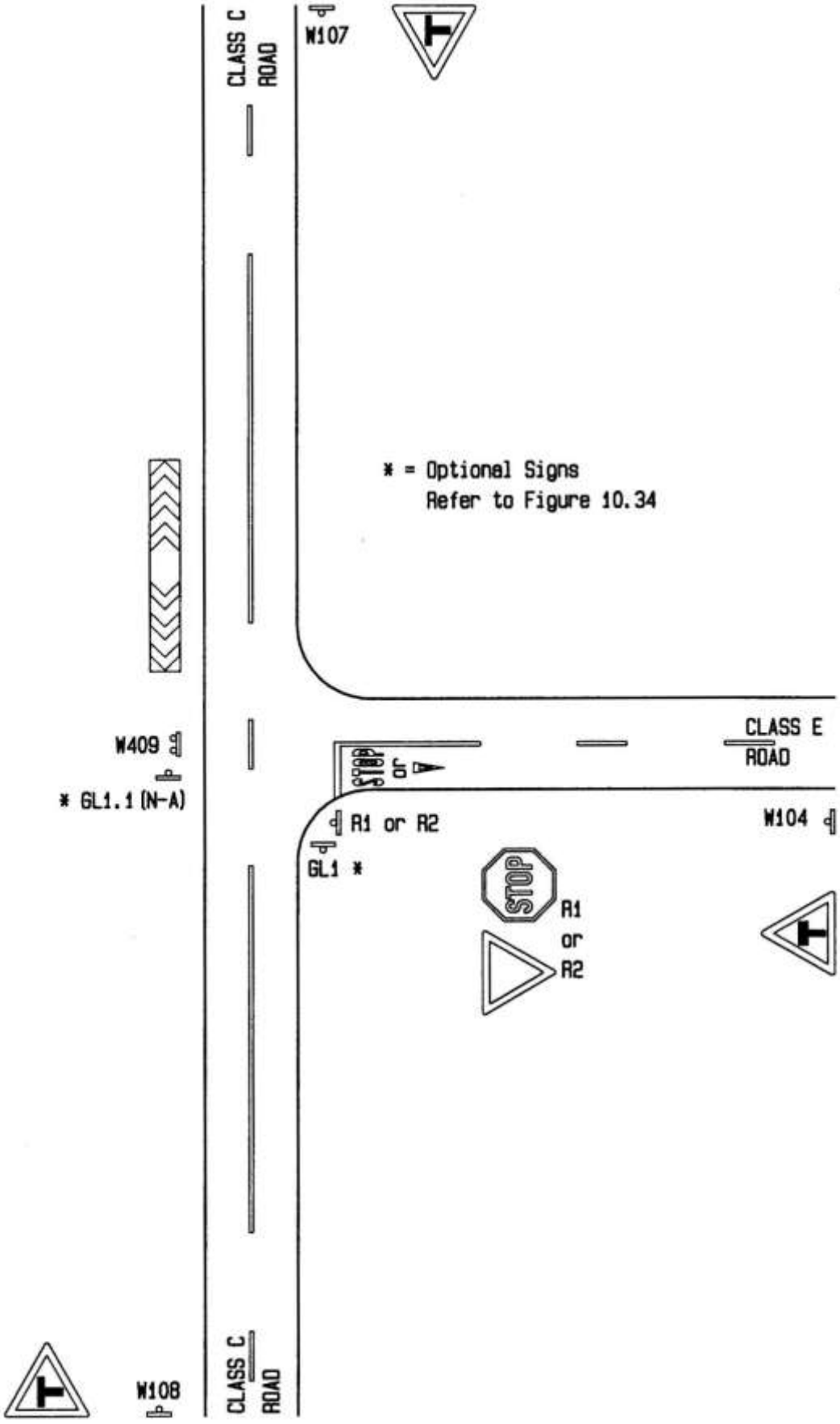

Fig 10.8 **Road Class E x C Junction**

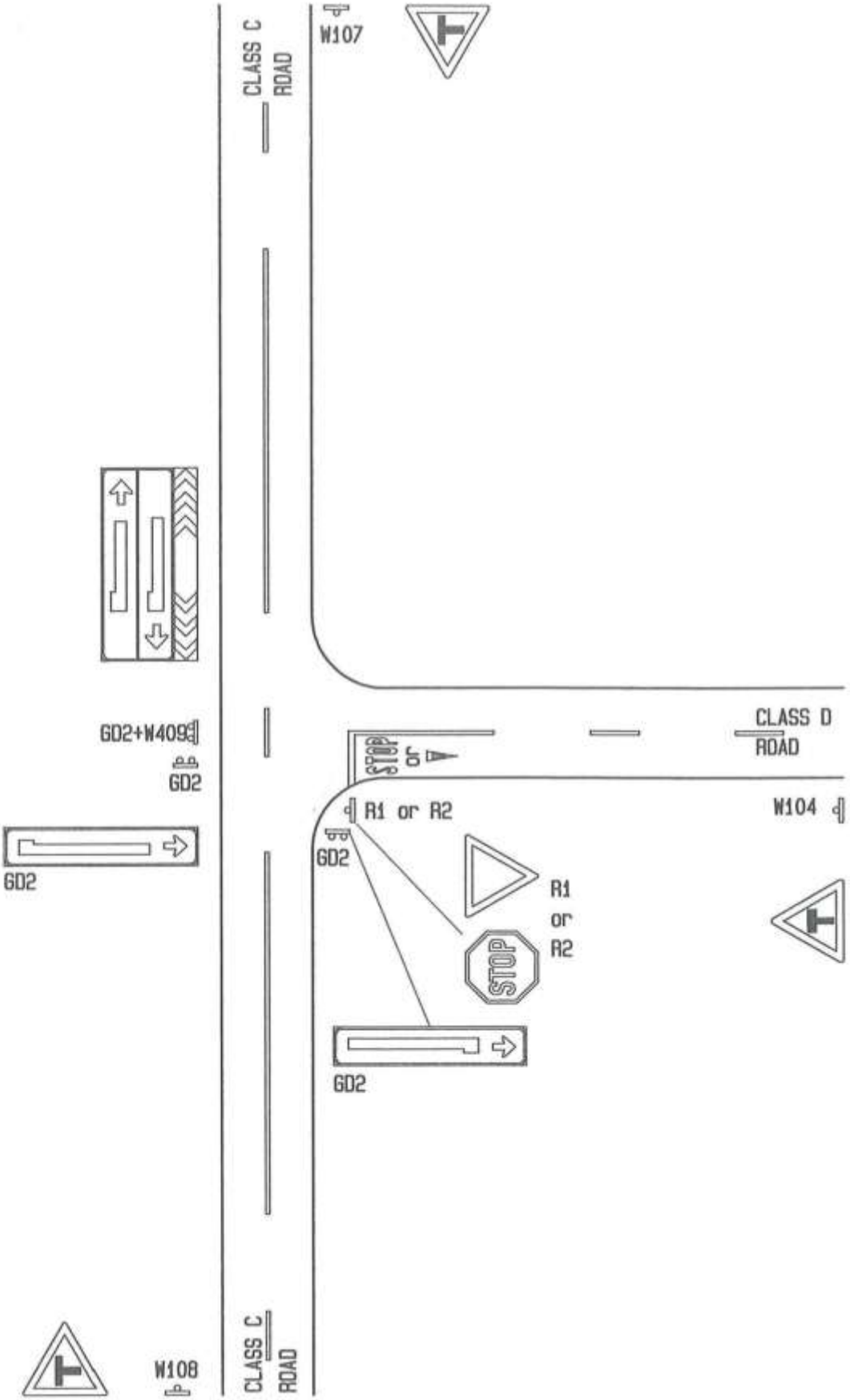

Fig 10.9 **Road Class D x C Junction**

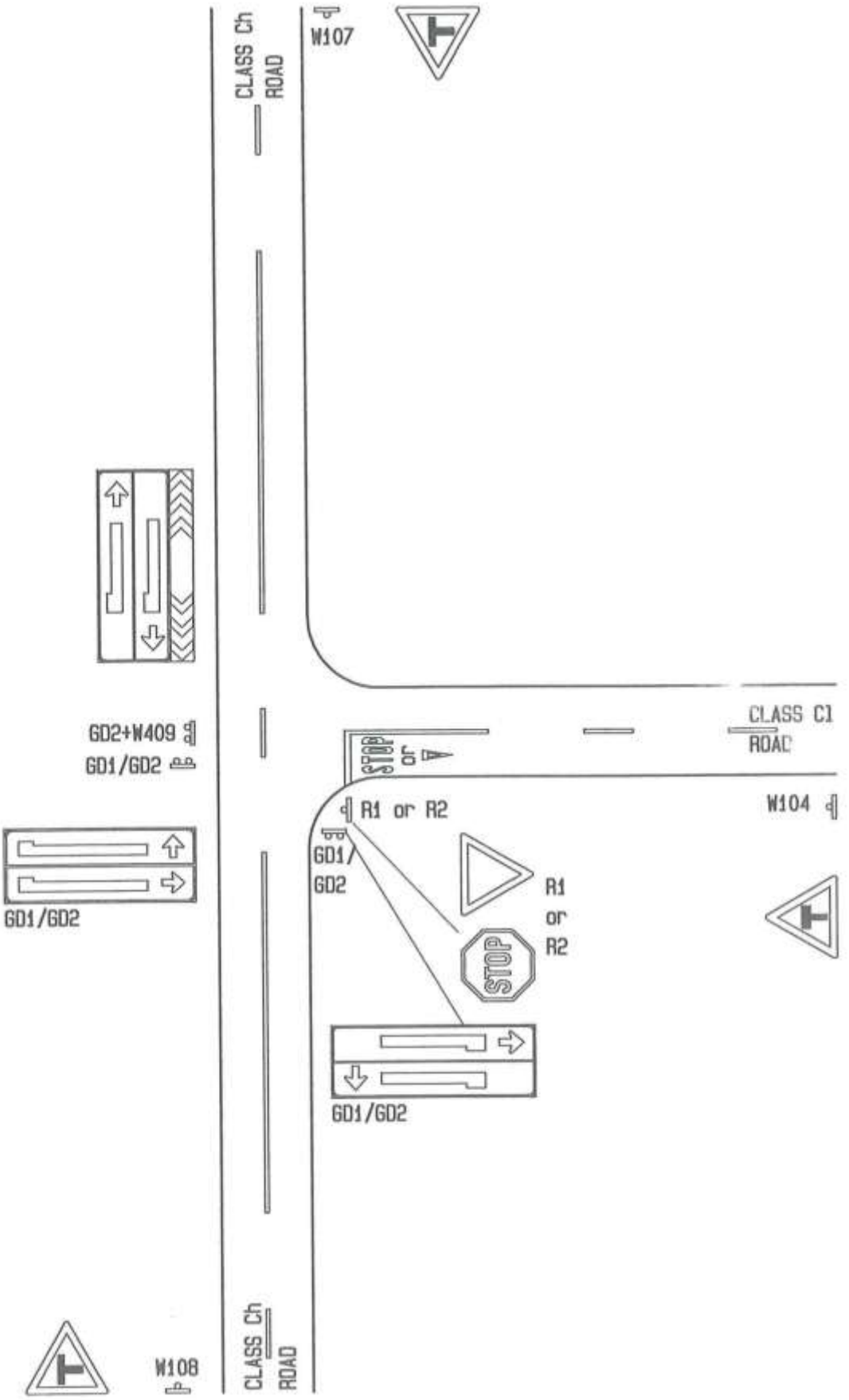

Fig 10.10 **Road Class Cl x Ch Junction**

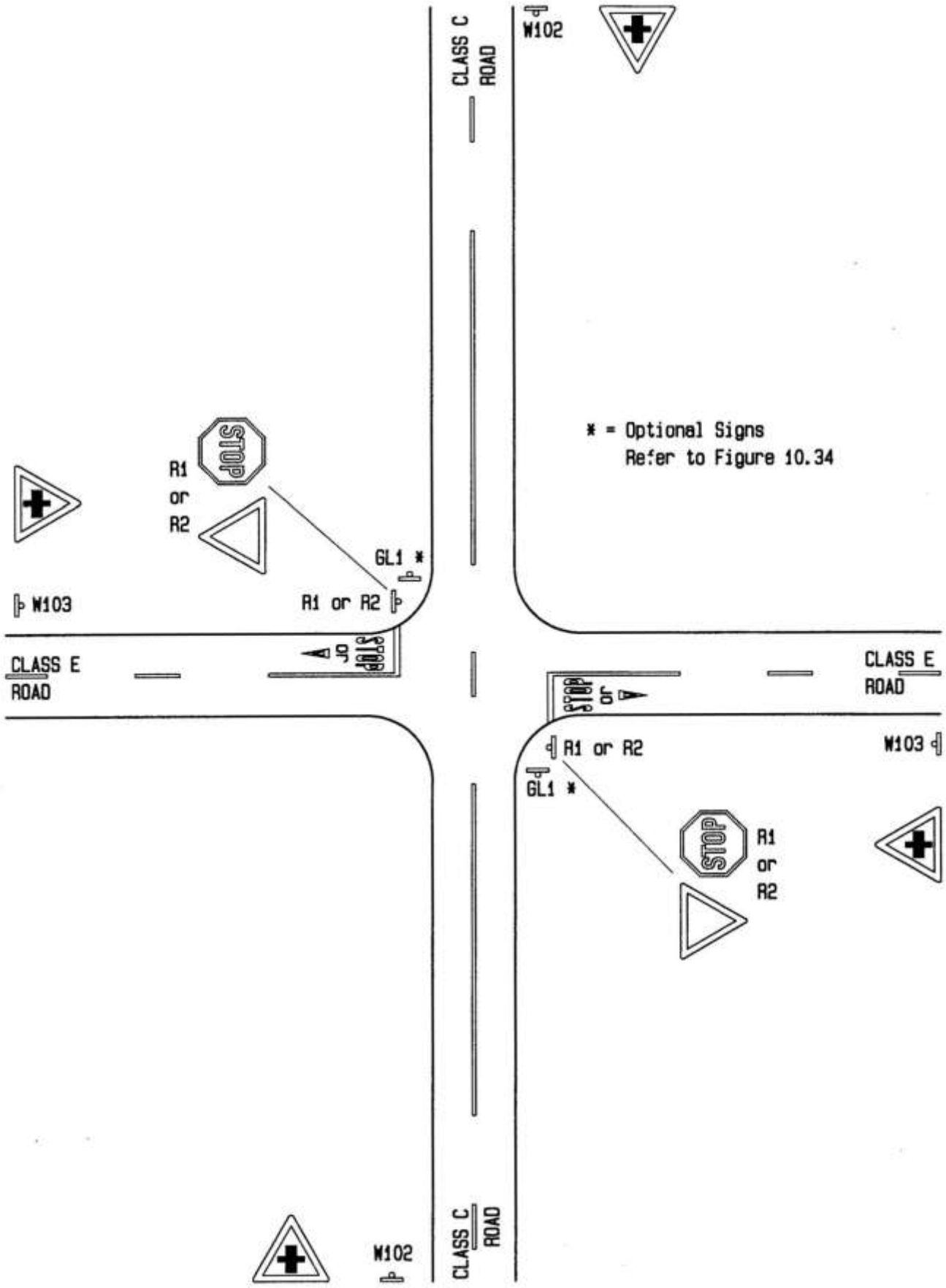

Fig 10.11 **Road Class E + E x C Junction**

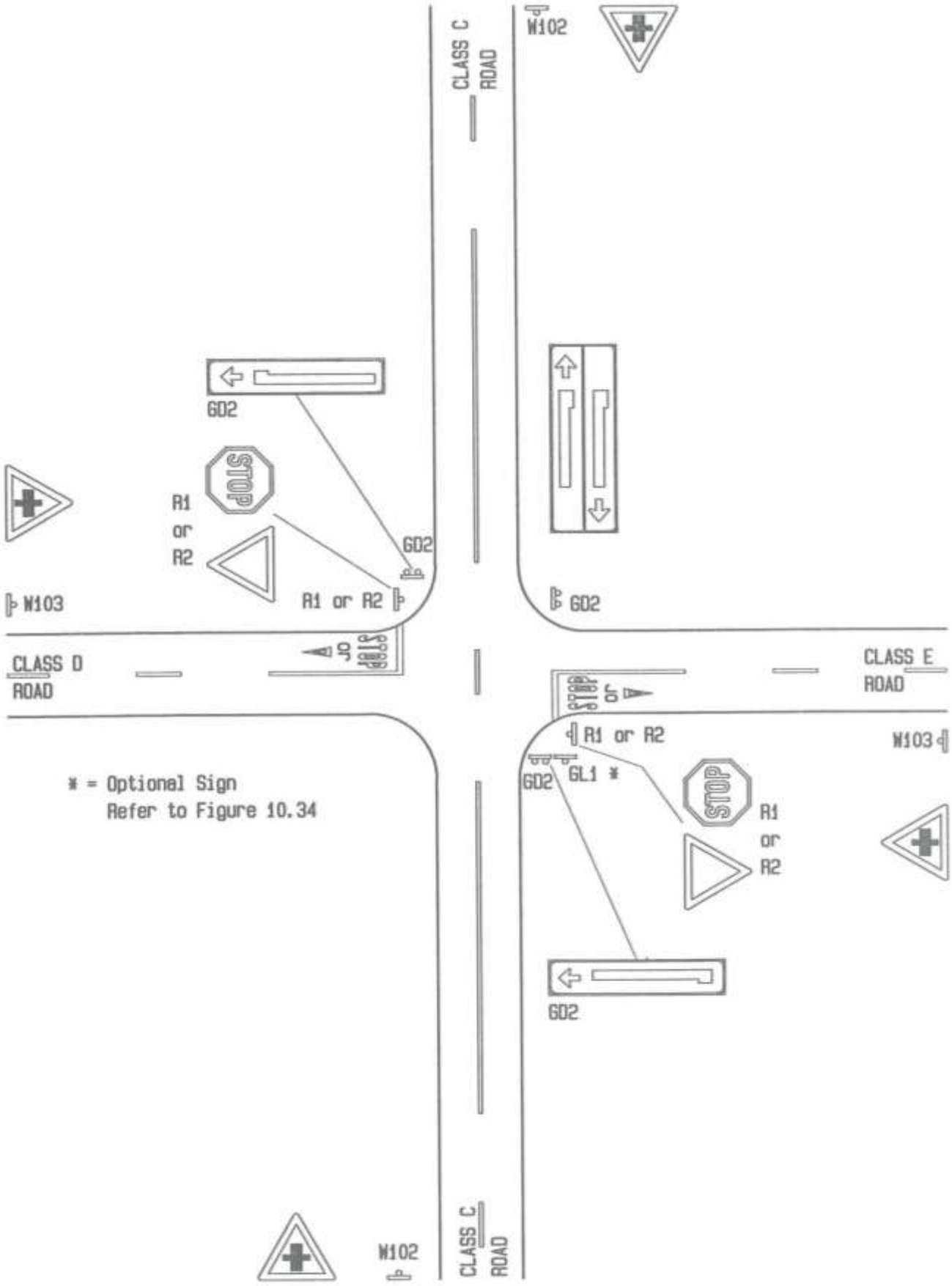

Fig 10.12 **Road Class E + D x C Junction**

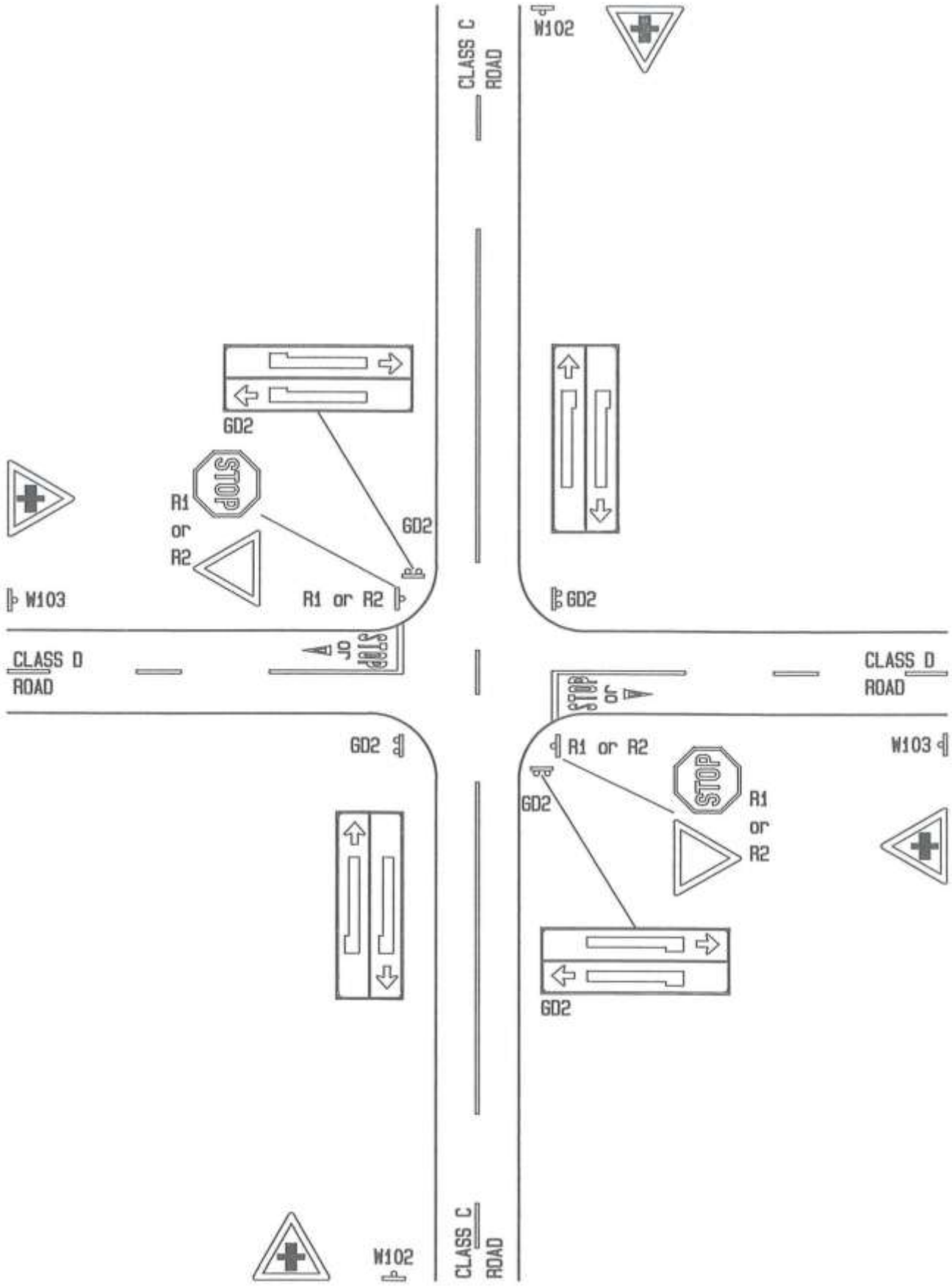

Fig 10.13 **Road Class D + D x C Junction**

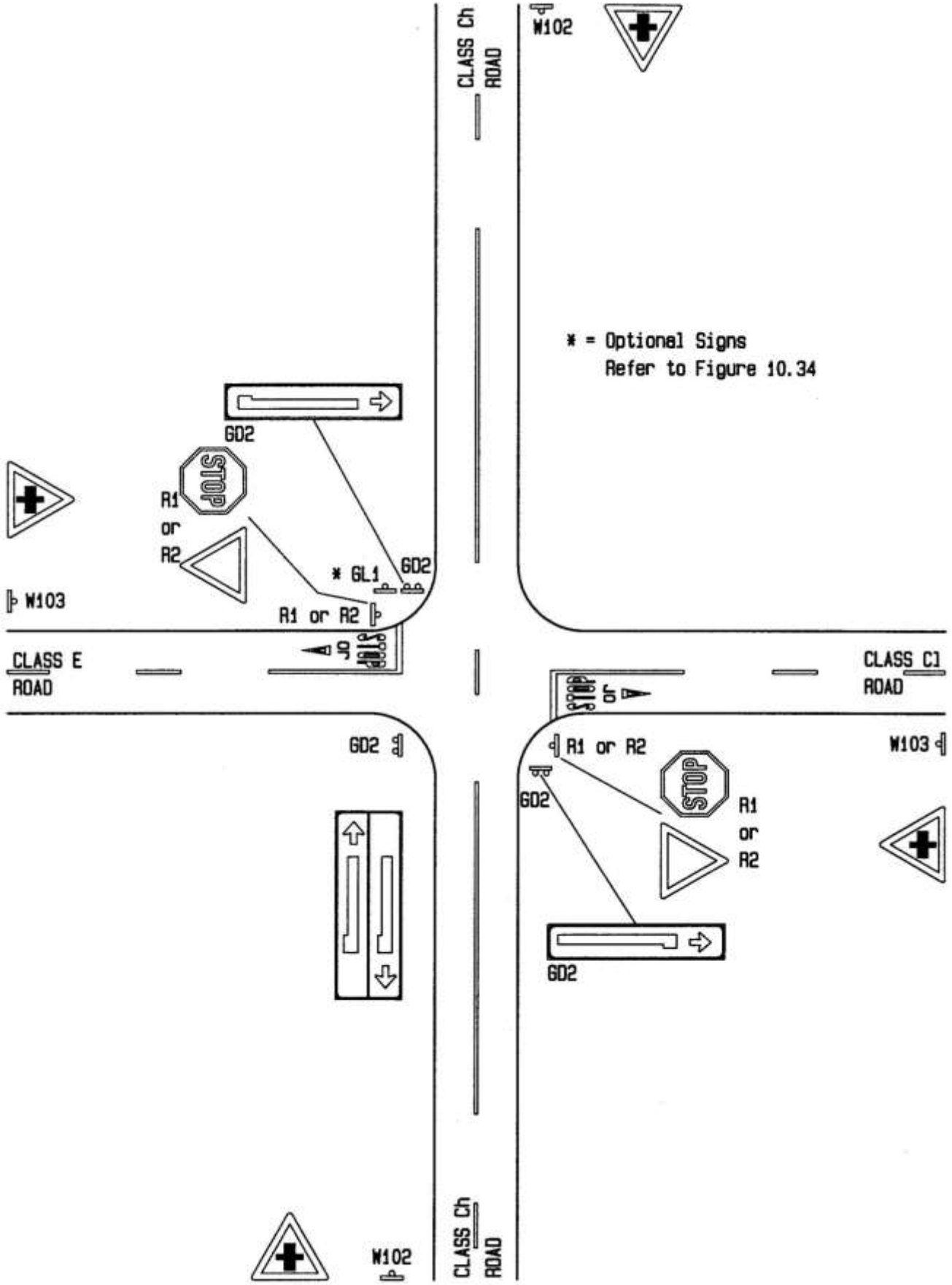

Fig 10.14 **Road Class E + Cl x Ch Junction**

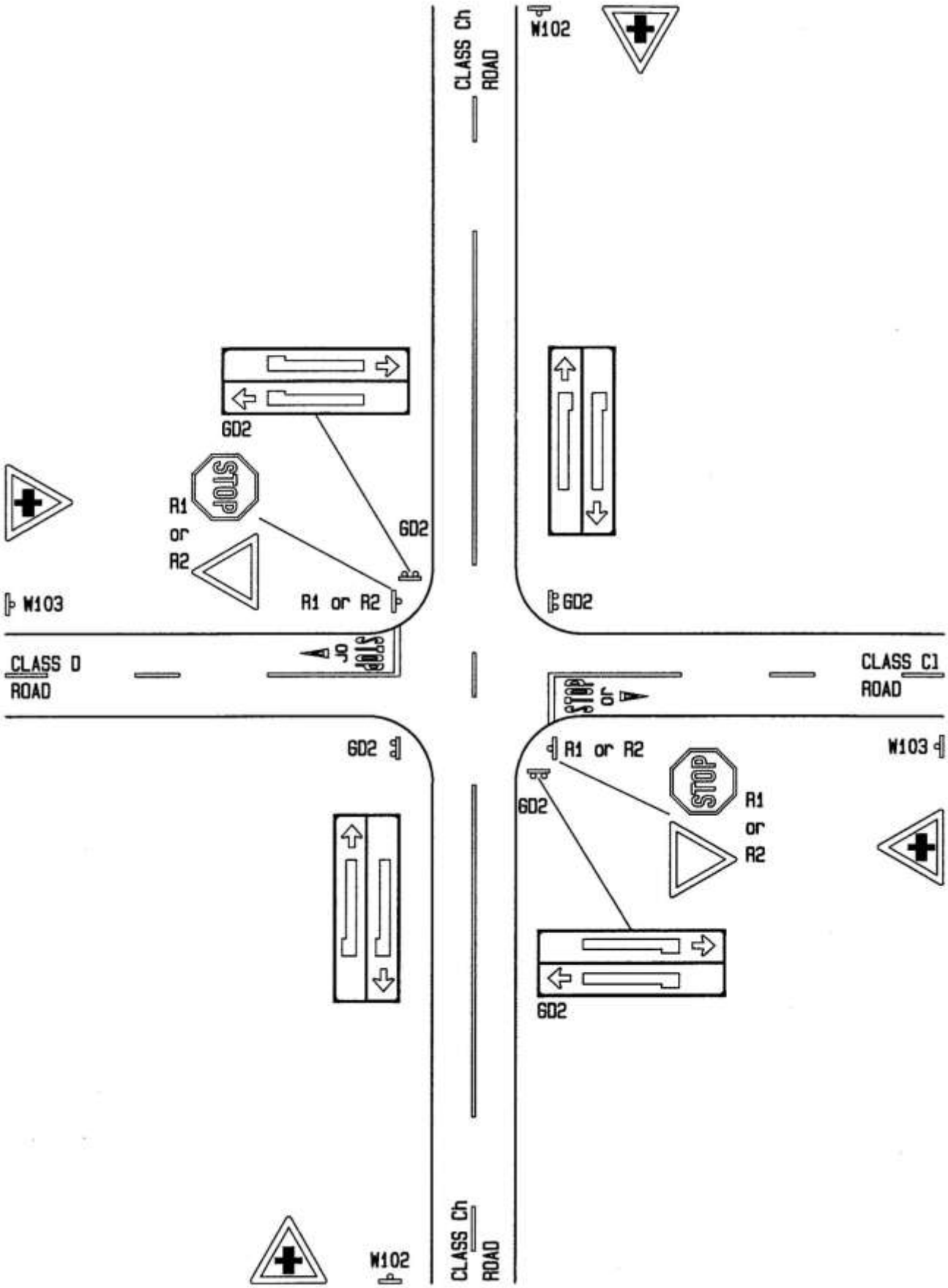

Fig 10.15 **Road Class D + Cl x Ch Junction**

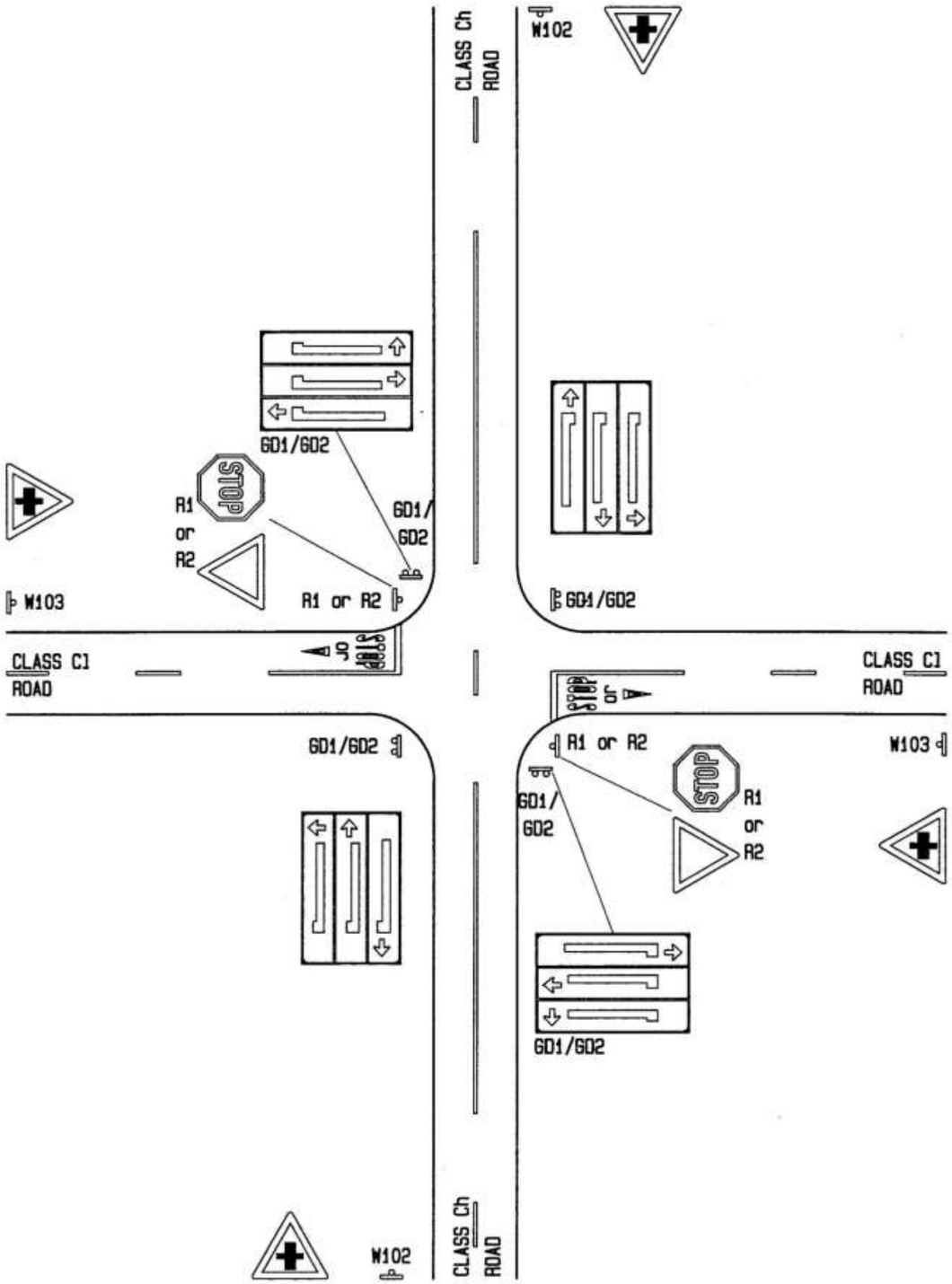

Fig 10.16 Road Class Cl + Cl x C Junction

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TABLE 10.6 MINIMUM SIGNING REQUIREMENTS FOR JUNCTIONS ONTO "B" CLASS ROADS (T-Junction) TABLE 10.6

Junction Type (Fig ref.)	Approach	Required Signs: R1 or R2	W104	W107 or W108	W409	GD2	GL1
E x B	E	Y	Y	o	Y	o	o
(Fig 10.17)	B	o	o	Y	o	o	Y
D x B	D	Y	Y	o	Y	2 STK	o
(Fig 10.18)	B	o	o	Y	o	1 STK	o
C x B	C	Y	Y	o	Y	2 STK	o
(Fig 10.19)	B	o	o	Y	o	2 STK	o
KEY:	Y	=	Sign required	1 STK	=	1 stack type required	
	o	=	Sign not required	2 STK	=	2 stack type required	
				3 STK	=	3 stack type required	

TABLE 10.7 MINIMUM SIGNING REQUIREMENTS FOR JUNCTIONS ONTO "B" CLASS ROADS (Bl x Bh-Junction) TABLE 10.7

Junction Type (Fig ref.)	Approach	Required Signs: R1 or R2	W104	W302 or W303	W409	GD1	GD2	GD3
Bl x Bh	Bl	Y	IN11.3	IN11.3	Y	o	2 STK	o
(Fig 10.20)	Bh	o	o	o	o	2 STK	1 STK	Y
KEY:	Y	=	Sign required	1 STK	=	1 stack type required		
	o	=	Sign not required	2 STK	=	2 stack type required		
	IN11.3	=	Sign required in combination with IN11.3	3 STK	=	3 stack type required		

NOTES:

(1) See Tables 10.1 to 10.3, repeated to the right, for basic dimensional criteria. Refer to Volume 1, Chapters 1, 3 and 4 for full design requirements.

(2) Warrants for warning and guidance signs, and road markings are given in the individual subsections of Volume 1, Chapters 2,3 and 7.

(3) If warning and/or guidance signs are provided on gravel roads the distances given in brackets in Table 10.1 are recommended.

(4) Road markings shown in the figures are nominal (see Chapters 2 and 3 for full details). Class C, D and E roads will commonly be un-surfaced.

(5) The use of STREET NAME sign GL1 is acceptable to identify a lower class rural road if no appropriate destination name is available.

(6) The criteria given in the Manual are open to interpretation. Road authorities may have specific policies within these guidelines, which designers, manufacturers and contractors must be aware of.

TABLE 10.1 JUNCTION SIGN LOCATION CRITERIA TABLE 10.1

Operating Speed (km/h)	Clear Visibility Distance to Sign (m)	Distance of Single Advance Guidance or Warning Sign from Junction (m)	Recommended Side Length – Warning Sign (mm)
120	120	330(400)	1500
100	100	240(320)	1500
80	80	160(220)	1200
60	60	120(160)	900

NOTES:

(1) Refer to Volume 1, Chapters 1, 3 and 4 for fully detailed design criteria.

(2) The figures given in brackets represent extended location positions recommended for advance signs but, as yet, not supported by research.

(3) Distances in brackets should be used on gravel road approaches.

(4) See Table 10.2 for spacing between signs if more than one is located in advance of a junction.

TABLE 10.2 SIGN CLEAR SIGHT AND SPACING DISTANCES TABLE 10.2

Operating Speed (km/h)	Letter Sizes (mm)	Clear Sight Distance (m)	Spacing Between Signs (m): Minimum	Spacing Between Signs (m): Recommended
120	280/200	260	100	200
100	280/200	260	80	150
80	210/150	220	60	100
60	210/150	220	50	90
	140/150	180	40	75

NOTES:

(1) "Clear Sight Distance" values are made up of the legibility distance PLUS an allowance of 100 m to 120 m for observation of the sign prior to reading.

(2) Successive signs must be spaced apart so that each can be read and understood. The minimum values given may be used when successive signs are Warning and Guidance, or *vice versa*. The recommended values should be used between successive Guidance signs.

TABLE 10.3 RECOMMENDED LETTER SIZES – RURAL SIGNS TABLE 10.3

Road Class	Operating Speed (km/h)	Sign Displacement To Left (X m)	Letter Sizes (mm): Direction Signs	Letter Sizes (mm): Tourism Signs
B, C	120	8 (1 lane)	280/200	210/150
B, C, D	100	8 (1 lane)	280/200	175/125
B, C, D	80	8 (1 lane)	210/150	175/125

NOTES:

(1) The lettering sizes given here for guidance signs are for specific values of parameters "D", "N" and "X" as follows:

D = 1,0: N = 8 (Direction): X = 8: N = 5 (Tourism)

Consult the nomograms in Volume 1, Chapter 4, for different values and for an explanation of "D", "N" and "X".

(2) Guidance sign design for complex traffic environments shall include a review of the letter sizes for adequate reading time (see Volume 1, Chapter 4).

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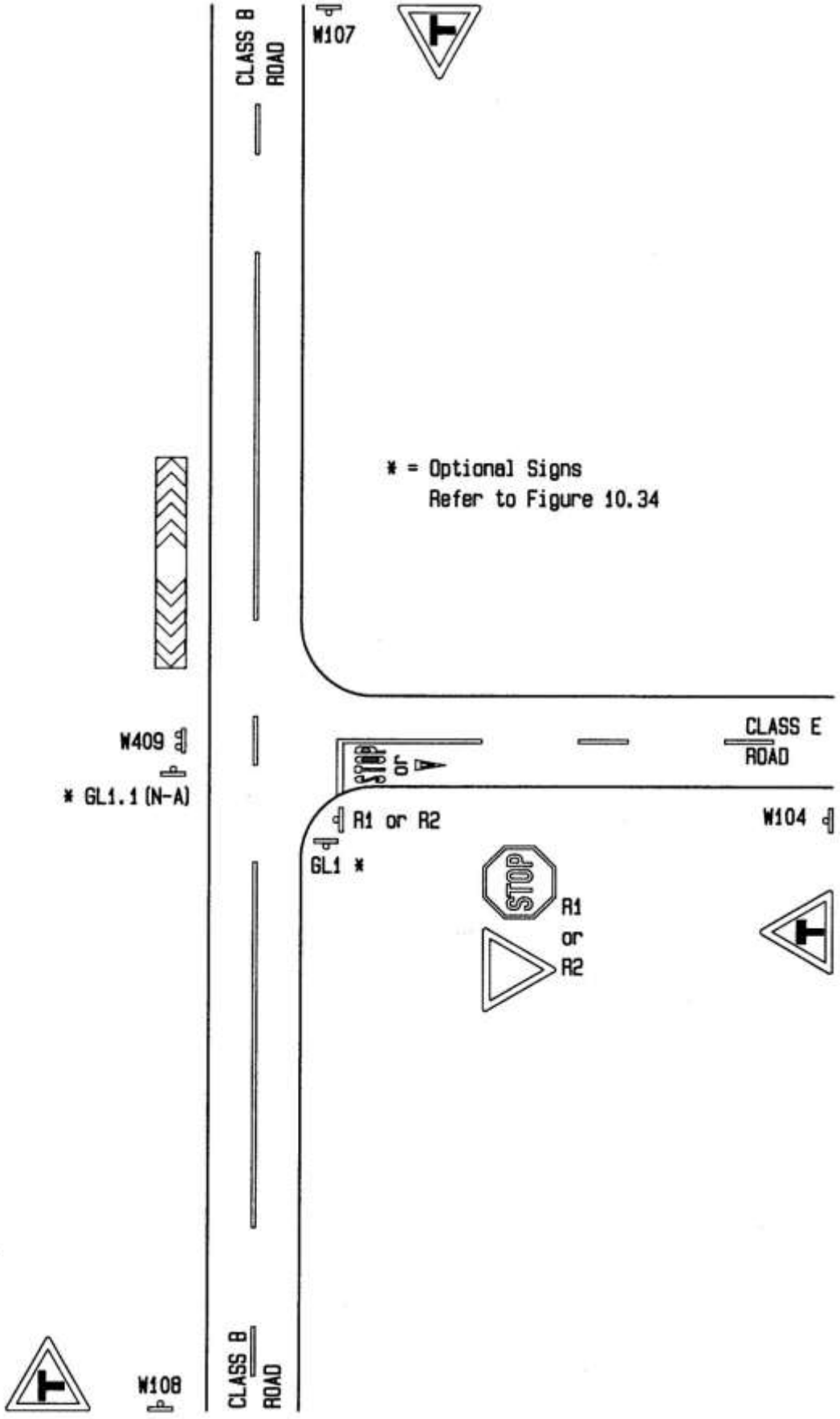


Fig 10.17 **Road Class E x B Junction**

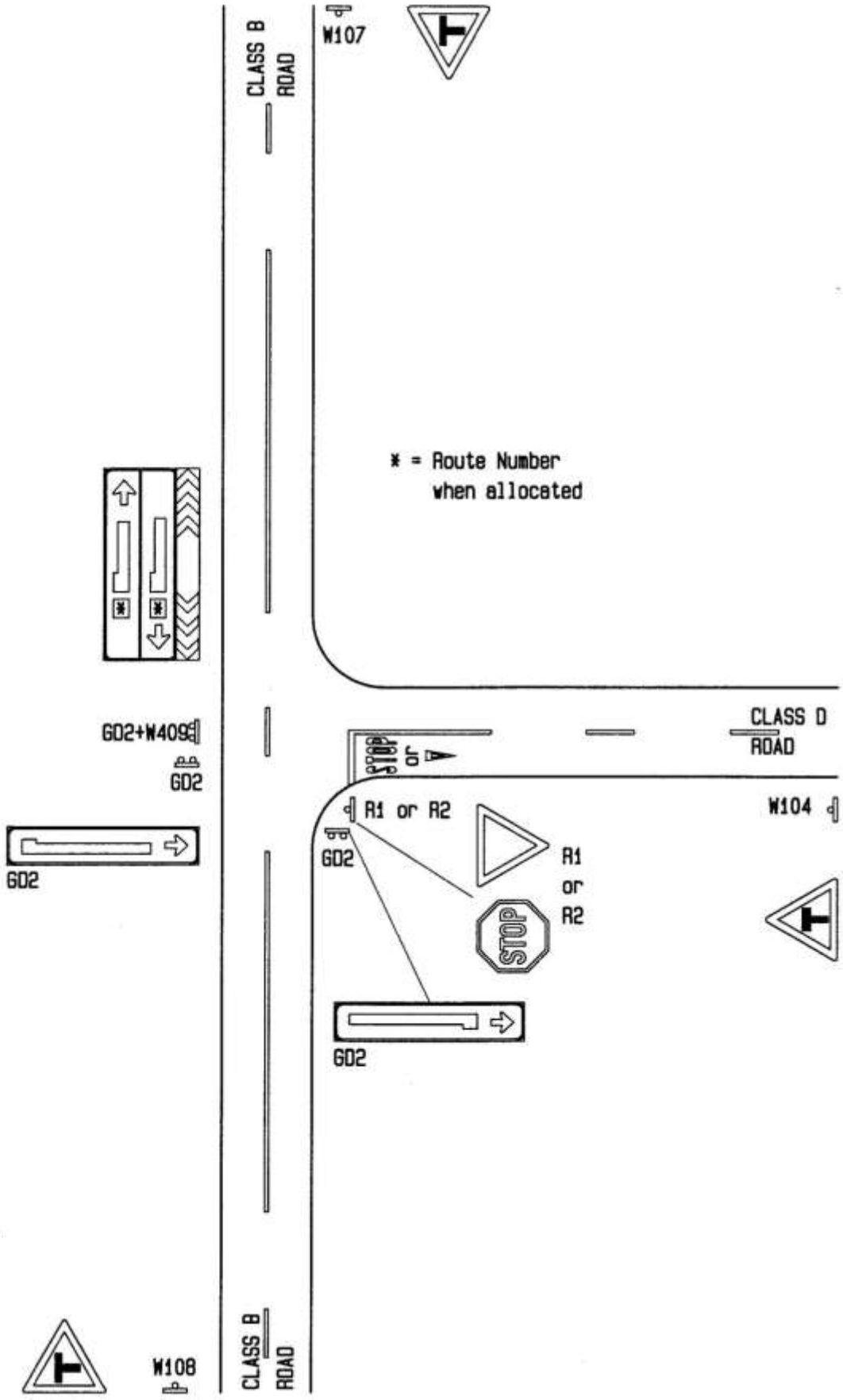


Fig 10.18 **Road Class D x B Junction**

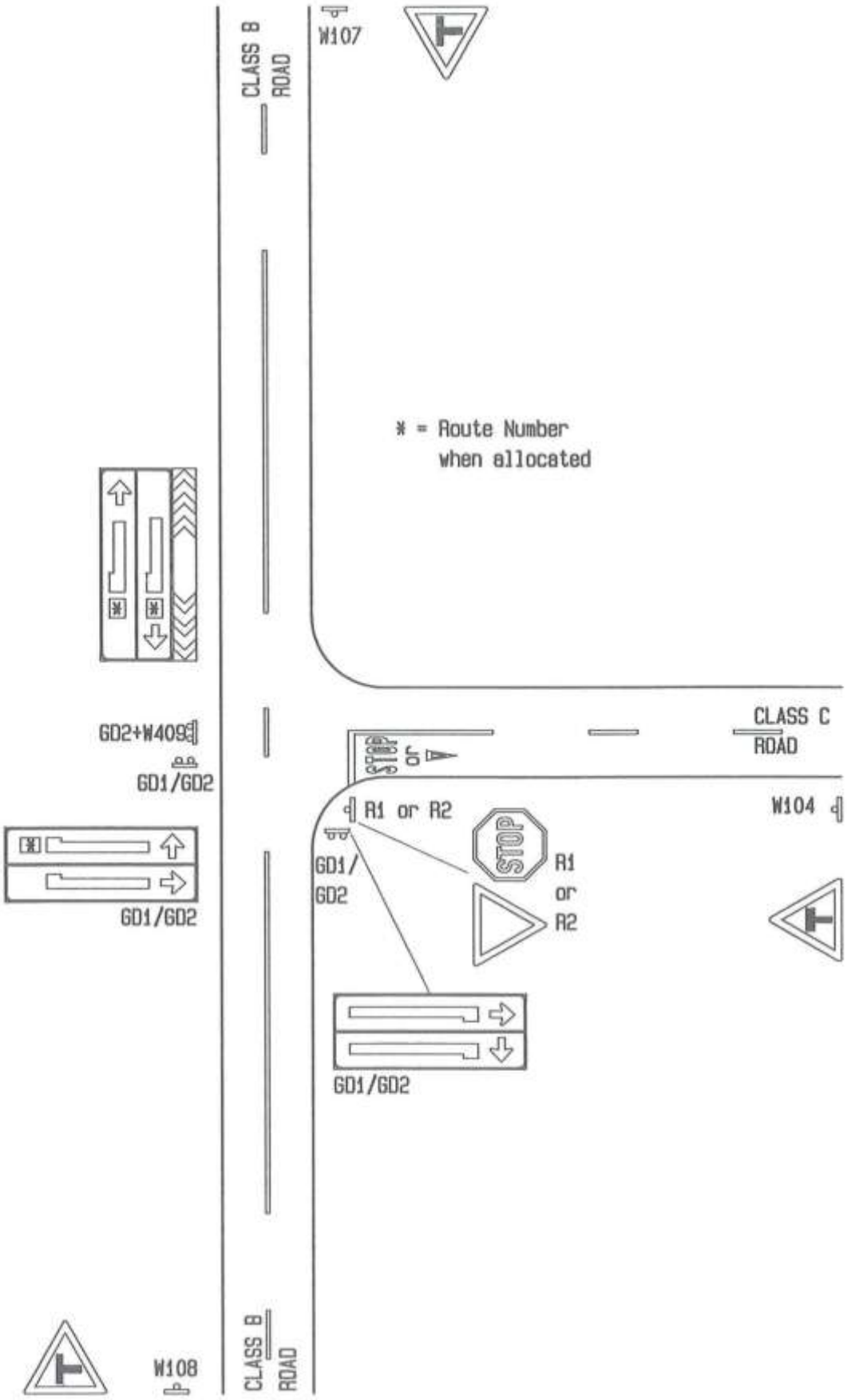
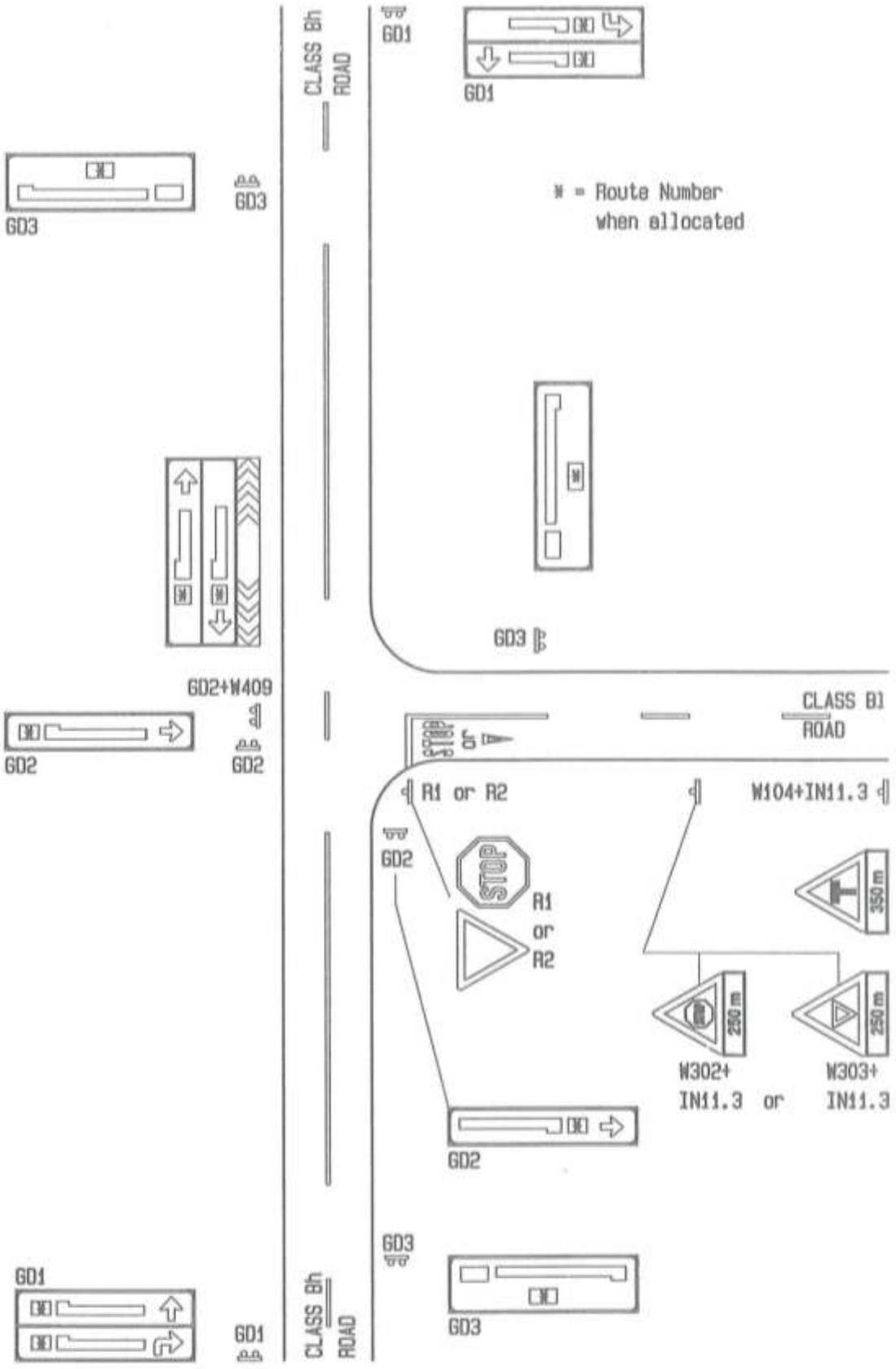


Fig 10.19 **Road Class C x B Junction**



NOTES FOR FIGURE 10.20

(1) If it is considered necessary to provide additional information to drivers a GD1 sign may be included on the Class BI road approach. According to individual road authority policies such a GD1 sign should either replace sign W104, or lie between sign W104 and the junction so that sign GD1 is correctly positioned, and sign W104 is moved further from the junction (the distance on sign IN11.3 must reflect the correct W104 position).

Fig 10.20 Road Class BI x Bh Junction

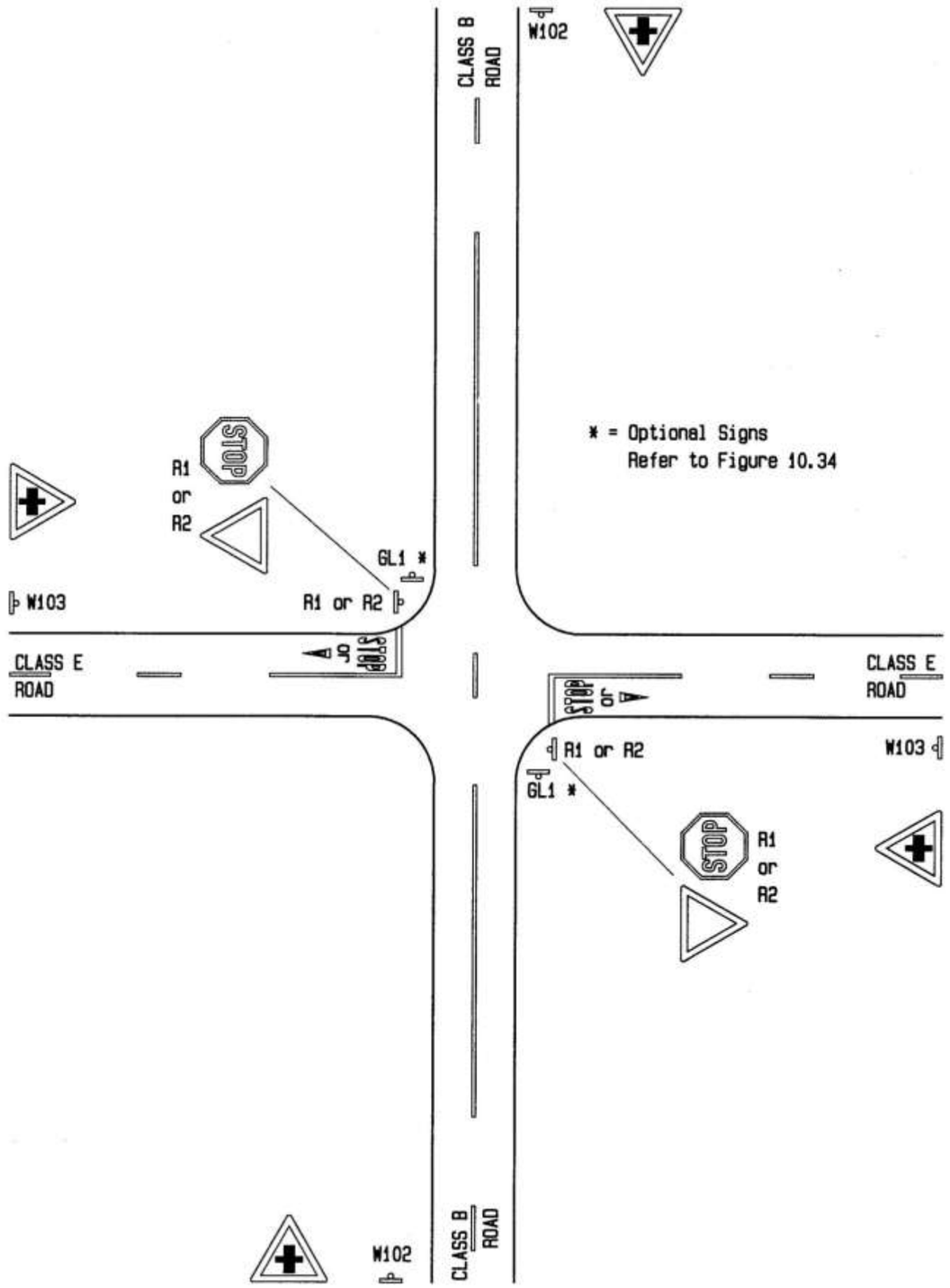


Fig 10.21 Road Class E + E x B Junction

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TABLE 10.8 MINIMUM SIGNING REQUIREMENTS FOR JUNCTIONS ONTO "B" CLASS ROADS (Four-Legged Junction E, D and C Class Roads onto B Class Road) TABLE 10.8

Junction Type (Fig ref.)	Approach	Required Signs: R1 or R2	W102	W103	GD2	GL1
E + E x B	E	Y	o	Y	o	o
(Fig 10.21)	B	o	Y	o	o	Y
D + E x B	E	Y	o	Y	o	o
(Fig 10.22)	D	Y	o	Y	2 STK	o
	B	o	Y	o	1 STK	Y
D + D x B	D	Y		Y	2 STK	o
(Fig 10.23)	B	o	Y	o	2 STK	o
C + E x B	E	Y	o	Y	o	o
(Fig 10.24)	C	Y	o	Y	2 STK	o
	B	o	Y	o	1 STK	Y
C + D x B	D	Y	o	Y	3 STK	o
(Fig 10.25)	C	Y	o	Y	2 STK	o
	B	o	Y	o	2 STK	o
C + C x B	C	Y	o	Y	3 STK	o
(Fig 10.26)	B	o	Y	o	3 STK	o

TABLE 10.9 MINIMUM SIGNING REQUIREMENTS FOR JUNCTIONS ONTO "B" CLASS ROADS (Four-Legged Junction of E, D, C and Bl Class Roads onto Bh Class Road) TABLE 10.9

Junction Type (Fig ref.)	Approach	Required Signs: R1 or R2	W103	W302 or W303	GD1	GD2	GD3	GL1
E + Bl x Bh	E	Y	Y	o	o	o	o	o
(Fig 10.27)	Bl	Y	IN11.3	IN11.3	o	2 STK	o	o
	Bh						Y	Y
D + Bl x Bh	D	Y	Y	o	o	o	o	o
(Fig 10.28)	Bl	Y	IN11.3	IN11.3	o	2 STK	o	o
	Bh	o	o	o	3 STK	2 STK	Y	o
C + Bl x Bh	C	Y	Y	o	o	3 STK	Y	o
(Fig 10.29)	Bl	Y	IN11.3	IN11.3	o	3 STK	o	o
	Bh	o	o	o	3 STK	2 STK	Y	o
Bl + Bl x Bh	Bl	Y	IN11.3	IN11.3	3 STK	3 STK	Y	o
(Fig 10.30)	Bh	o	o	o	2 STK	2 STK	Y	o

KEY: Y = Sign required; o = Sign not required; IN11.3 = Sign required in Combination with LN11.3; 1 STK = 1 stack type required; 2 STK = 2 stack type required; 3 STK = 3 stack type required

NOTES:

(1) See Tables 10.1 to 10.3, repeated to the right, for basic dimensional criteria. Refer to Volume 1, Chapters 1, 3 and 4 for full design requirements.

(2) Warrants for warning and guidance signs, and road markings are given in the individual subsections of Volume 1, Chapters 2,3 and 7.

(3) If warning and/or guidance signs are provided on gravel roads the distances given in brackets in Table 10.1 are recommended.

(4) Road markings shown in the figures are nominal (see Chapters 2 and 3 for full details). Class C, D and E roads will commonly be un-surfaced.

(5) The use of STREET NAME sign GL1 is acceptable to identify a lower class rural road if no appropriate destination name is available.

(6) The criteria given in the Manual are open to interpretation. Road authorities may have specific policies within these guidelines, which designers, manufacturers and contractors must be aware of.

TABLE 10.1 JUNCTION SIGN LOCATION CRITERIA TABLE 10.1

Operating Speed (km/h)	Clear Visibility Distance to Sign (m)	Distance of Single Advance Guidance or Warning Sign from Junction (m)	Recommended Side Length – Warning Sign (mm)
120	120	330(400)	1500
100	100	240(320)	1500
80	80	160(220)	1200
60	60	120(160)	900

NOTES:

(1) Refer to Volume 1, Chapters 1, 3 and 4 for fully detailed design criteria.

(2) The figures given in brackets represent extended location positions recommended for advance signs but, as yet, not supported by research.

(3) Distances in brackets should be used on gravel road approaches.

(4) See Table 10.2 for spacing between signs if more than one is located in advance of a junction.

TABLE 10.2 SIGN CLEAR SIGHT AND SPACING DISTANCES TABLE 10.2

Operating Speed (km/h)	Letter Sizes (mm)	Clear Sight Distance (m)	Spacing Between Signs (m): Minimum	Spacing Between Signs (m): Recommended
120	280/200	260	100	200
100	280/200	260	80	150
80	210/150	220	60	100
60	210/150	220	50	90
	140/150	180	40	75

NOTES:

(1) "Clear Sight Distance" values are made up of the legibility distance PLUS an allowance of 100 m to 120 m for observation of the sign prior to reading.

(2) Successive signs must be spaced apart so that each can be read and understood. The minimum values given may be used when successive signs are Warning and Guidance, or *vice versa*. The recommended values should be used between successive Guidance signs.

TABLE 10.3 RECOMMENDED LETTER SIZES – RURAL SIGNS TABLE 10.3

Road Class	Operating Speed (km/h)	Sign Displacement To Left (X m)	Letter Sizes (mm): Direction Signs	Letter Sizes (mm): Tourism Signs
B, C	120	8 (1 lane)	280/200	210/150
B, C, D	100	8 (1 lane)	280/200	175/125
B, C, D	80	8 (1 lane)	210/150	175/125

NOTES:

(1) The lettering sizes given here for guidance signs are for specific values of parameters "D", "N" and "X" as follows:

D = 1,0: N = 8 (Direction): X = 8: N = 5 (Tourism)

Consult the nomograms in Volume 1, Chapter 4, for different values and for an explanation of "D", "N" and "X".

(2) Guidance sign design for complex traffic environments shall include a review of the letter sizes for adequate reading time (see Volume 1, Chapter 4).

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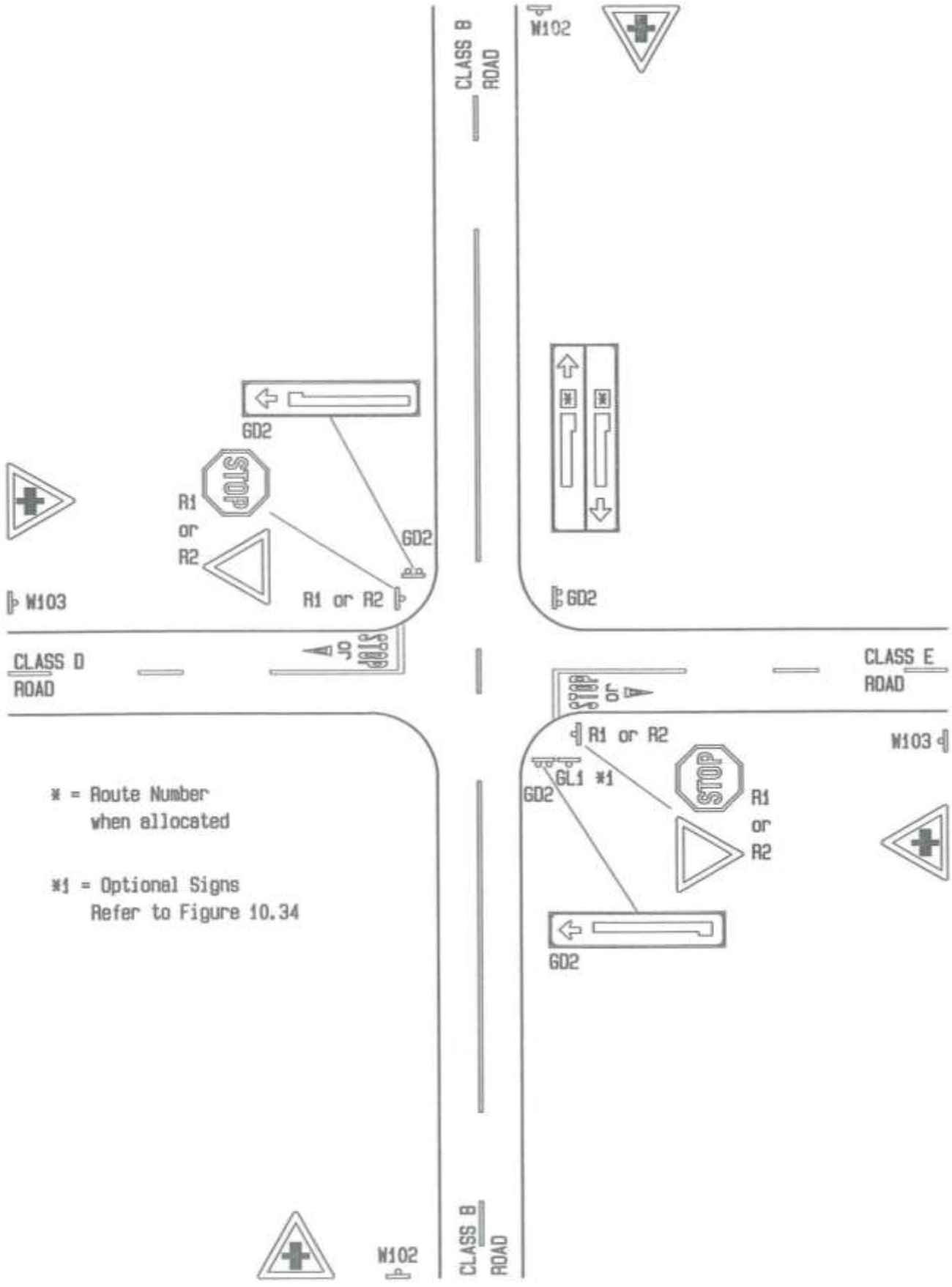


Fig 10.22 **Road Class D + E x B Junction**

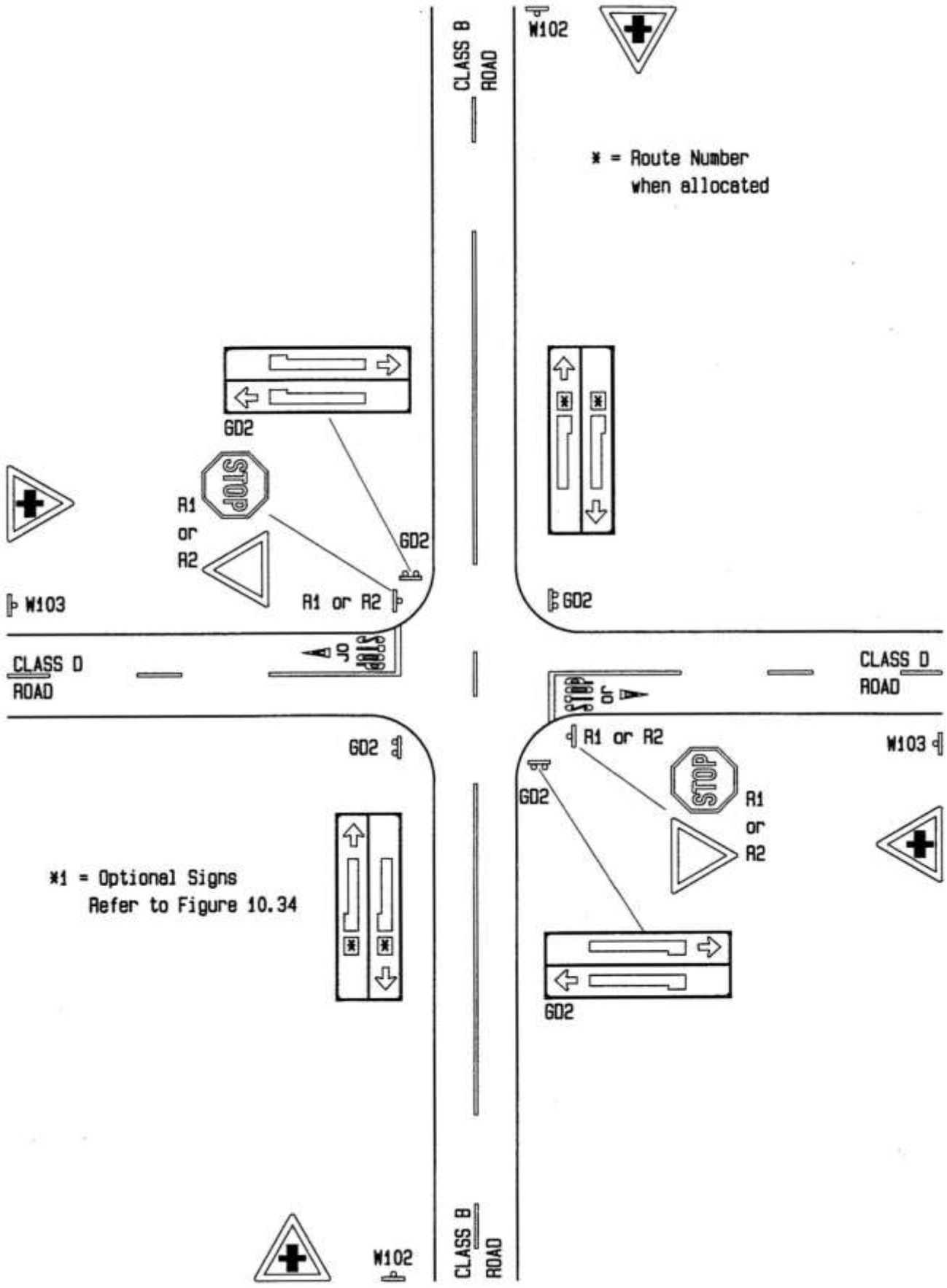


Fig 10.23 **Road Class D + D x B Junction**

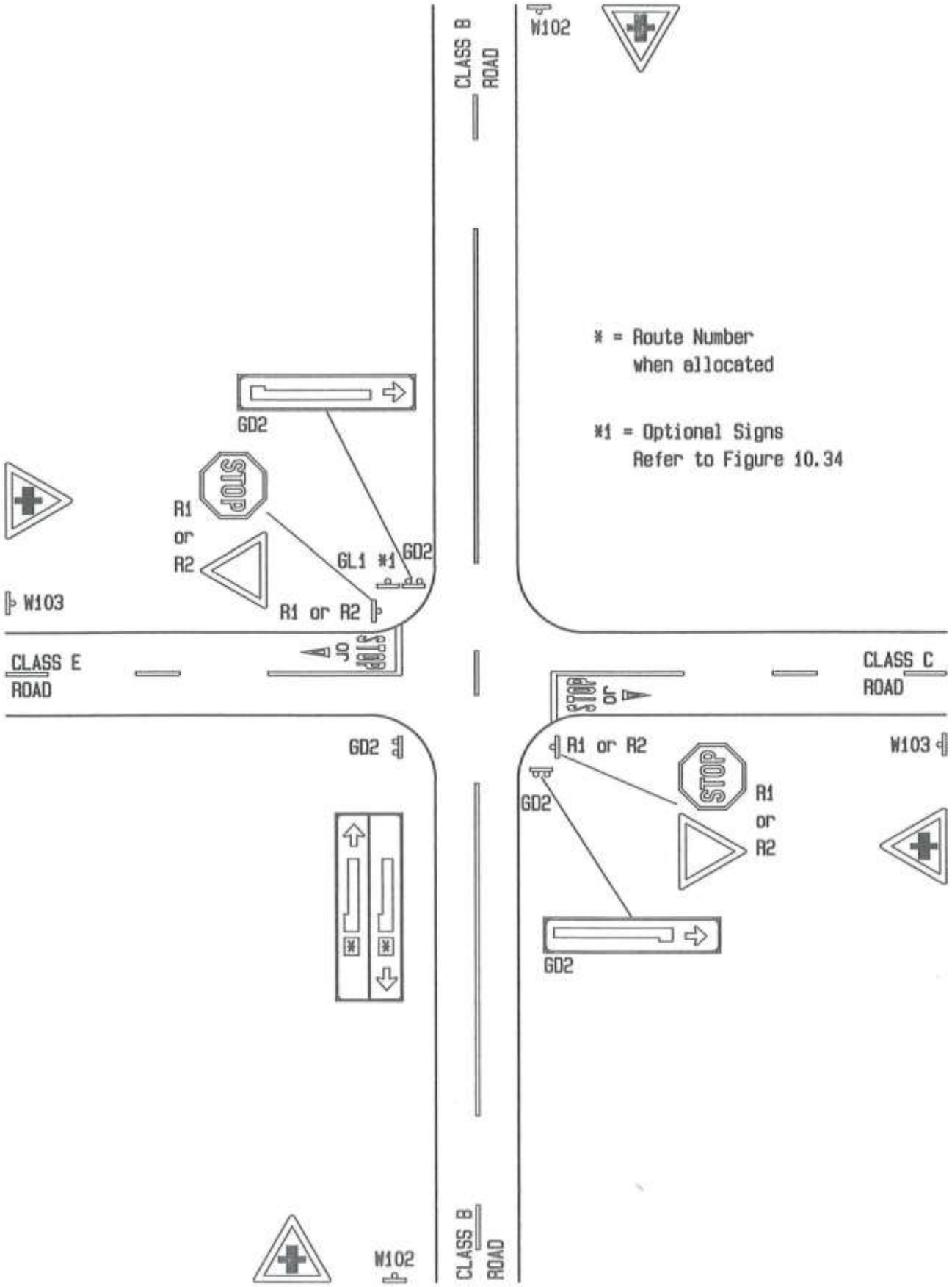


Fig 10.24 **Road Class C + E x B Junction**

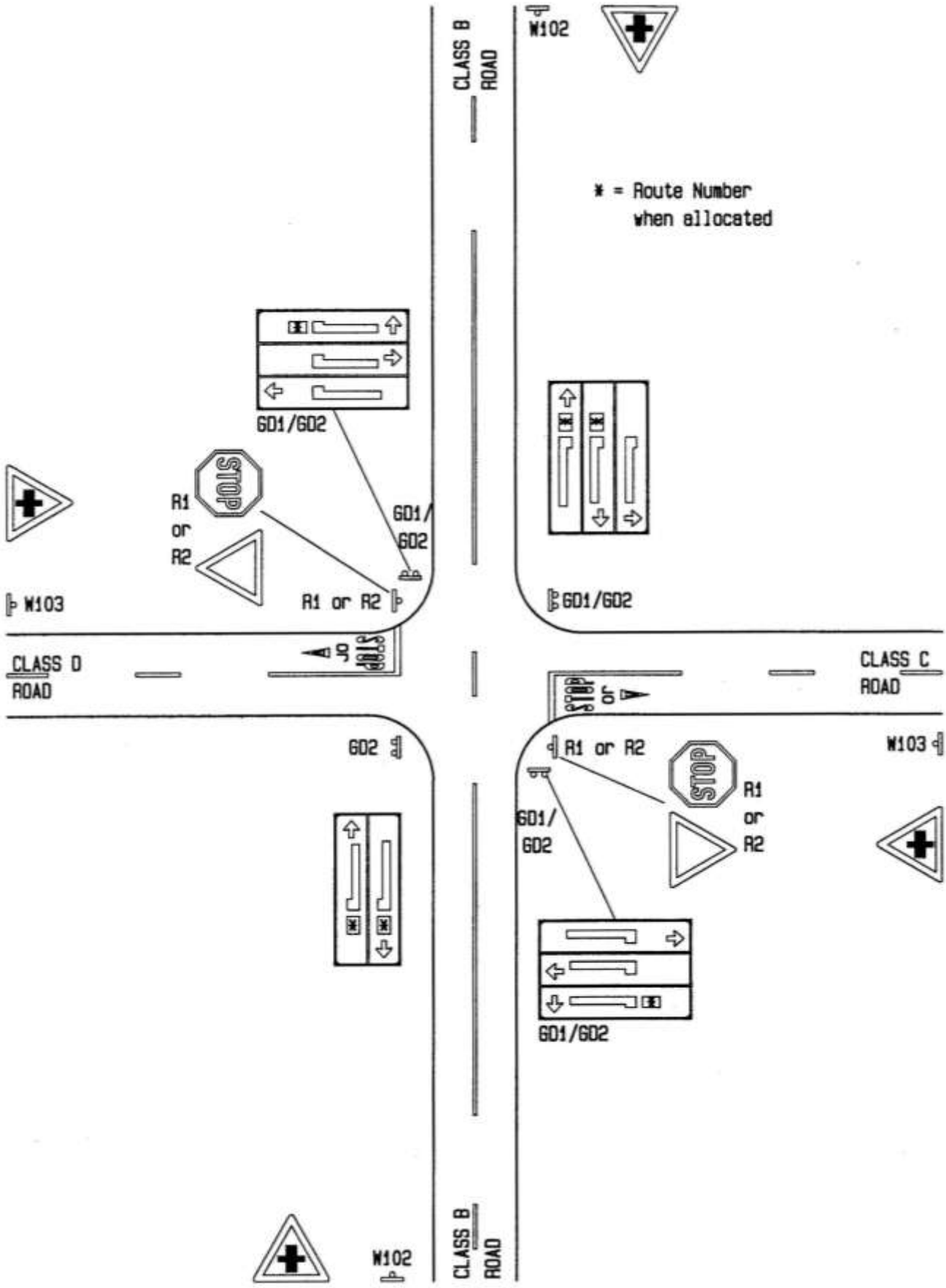


Fig 10.25 **Road Class C + D x B Junction**

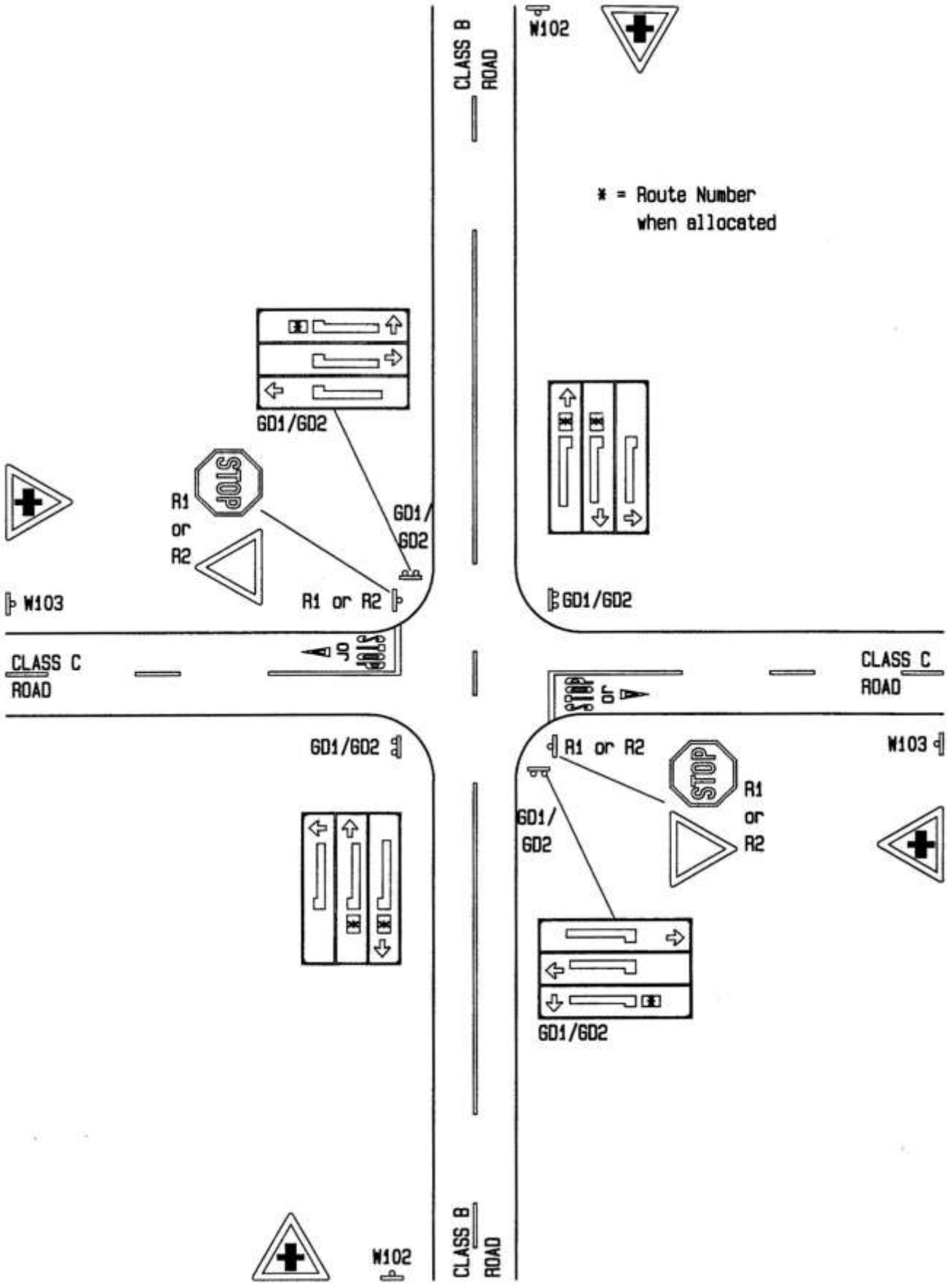
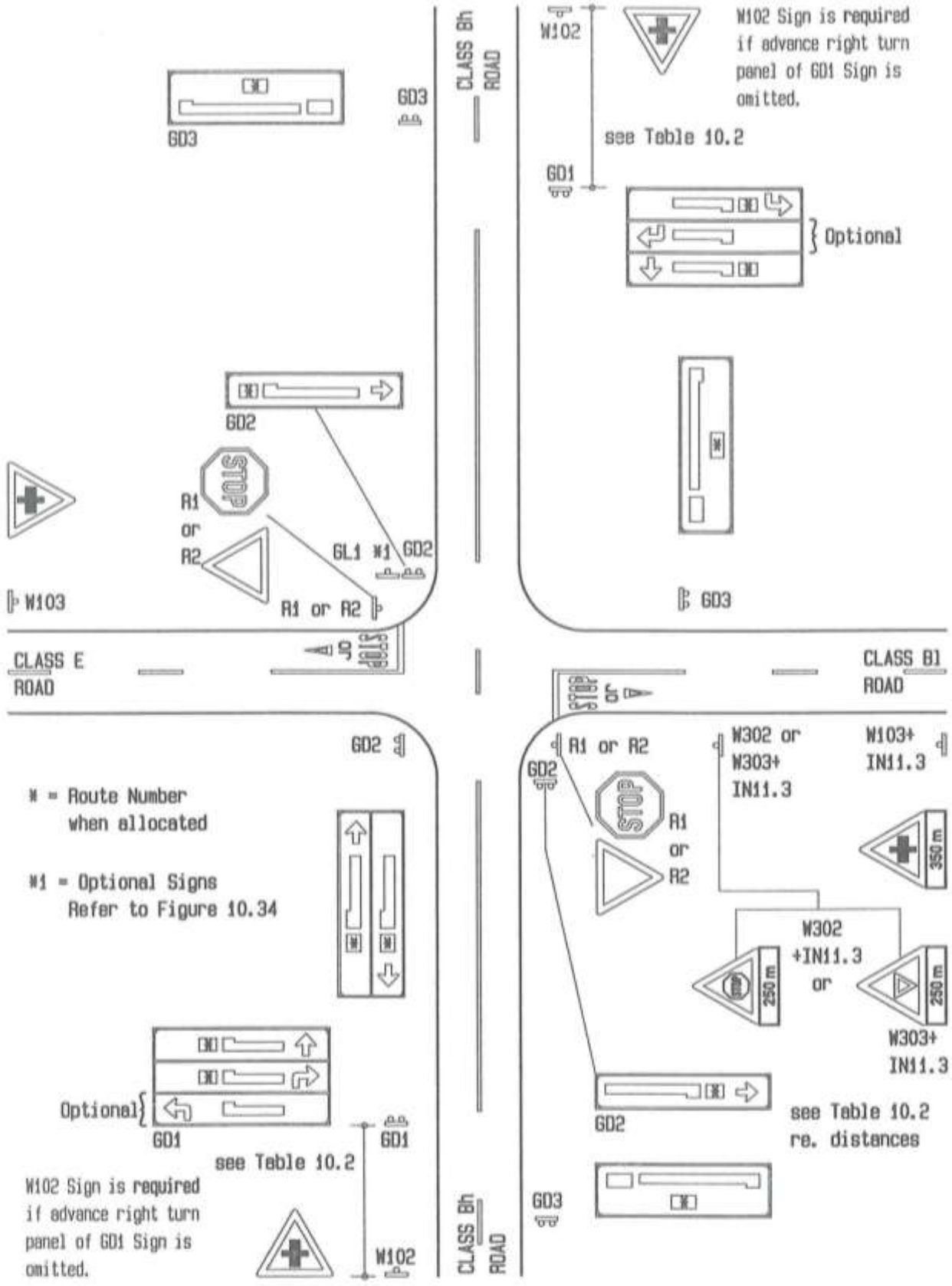


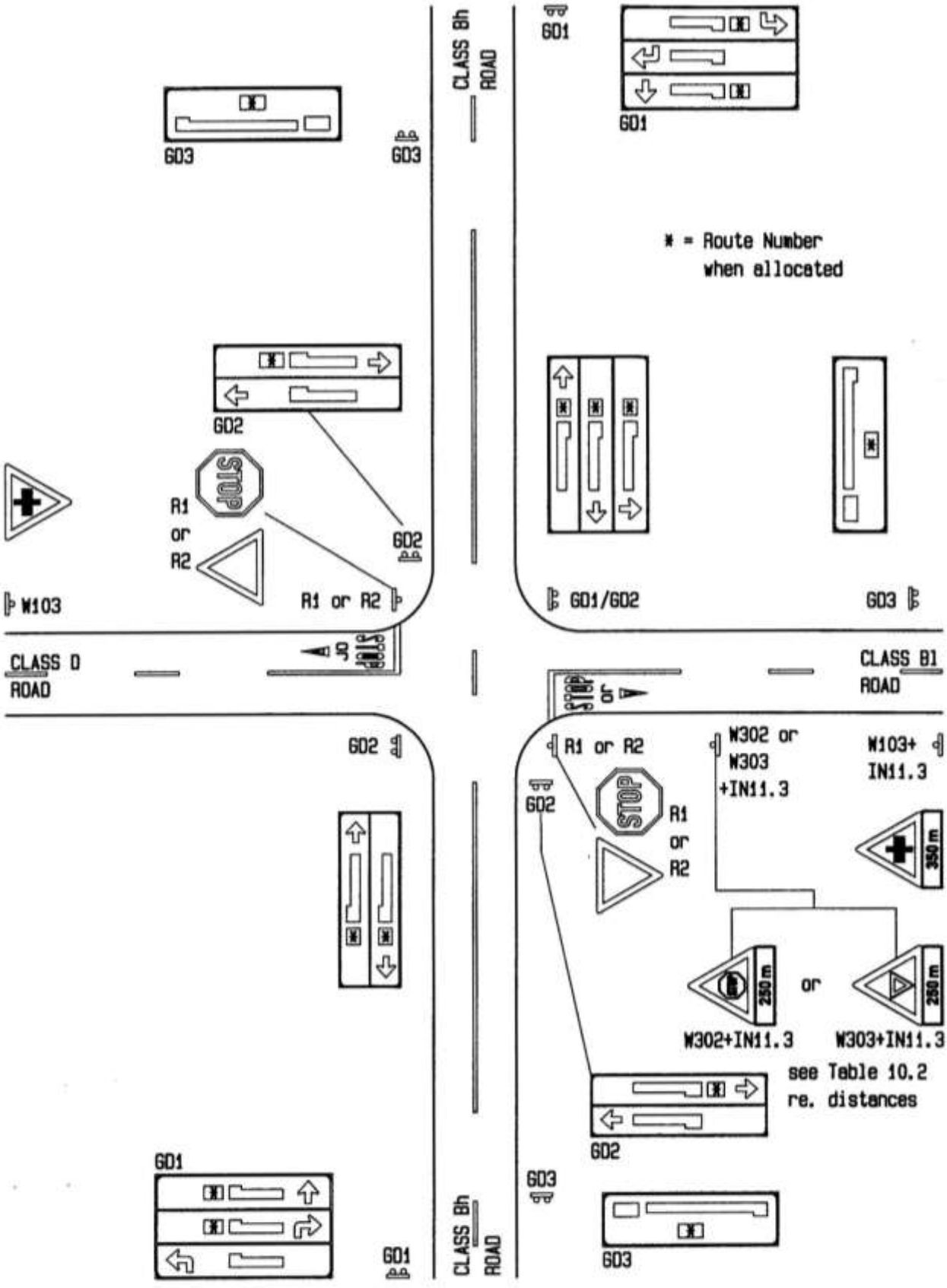
Fig 10.26 **Road Class C + C x B Junction**



NOTES FOR FIGURE 10.27

(1) If it is considered necessary to provide additional information to drivers, a GD1 sign may be included on the Class B1 road approach. According to individual road authority policies such a GD1 sign should either replace sign W104, or lie between sign W104 and the junction so that sign GD1 is correctly positioned, and sign W104 is moved further from the junction (the distance on sign IN11.3 must reflect the correct W104 position).

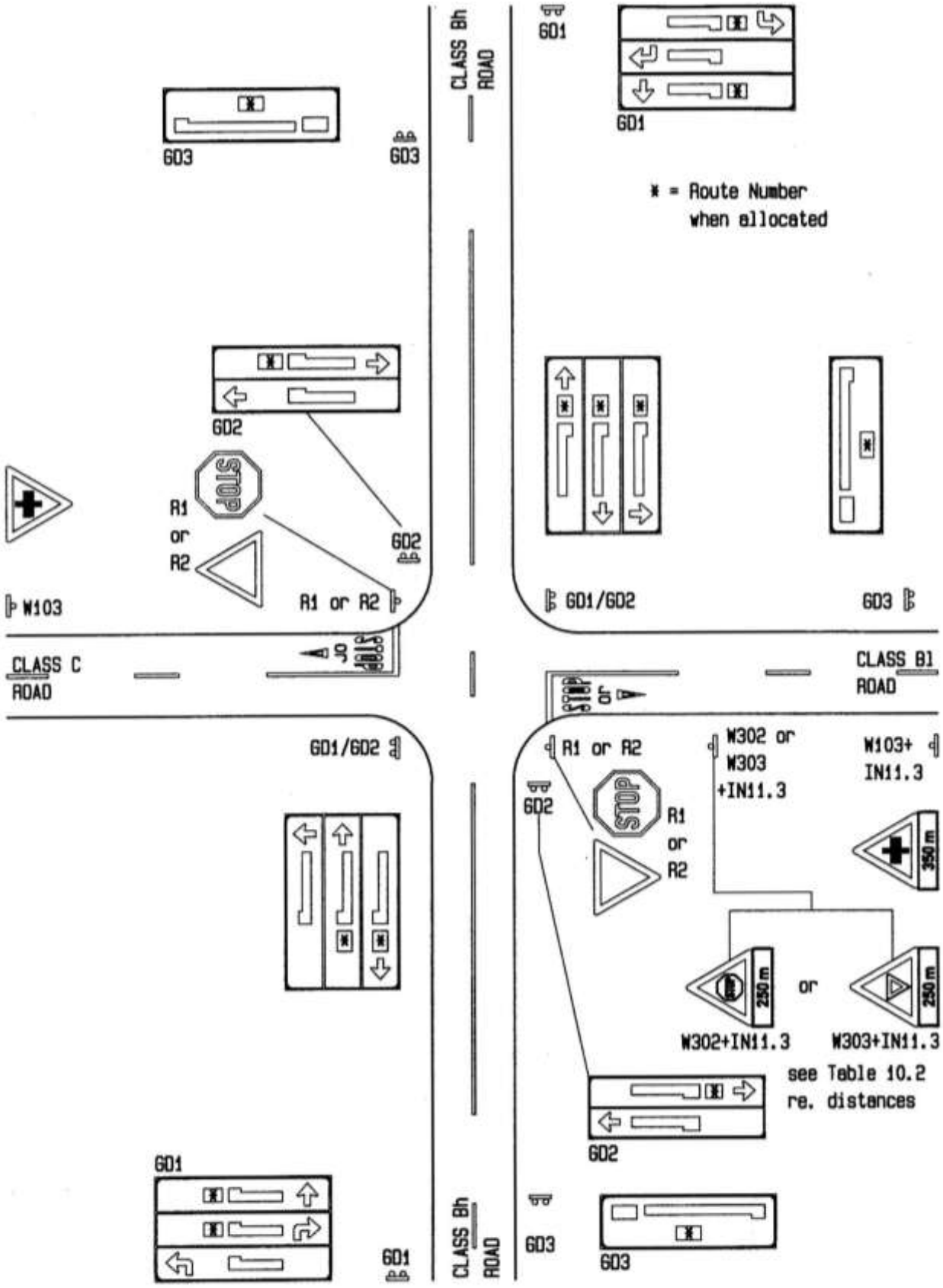
Fig 10.27 Road Class E + B1 x Bh Junction



NOTES FOR FIGURE 10.28

(1) If it is considered necessary to provide additional information to drivers, a GD1 sign may be included on the Class BI road approach. According to individual road authority policies such a GD1 sign should either replace sign W104, or lie between sign W104 and the junction so that sign GD1 is correctly positioned, and sign W104 is moved further from the junction (the distance on sign IN11.3 must reflect the correct W104 position).

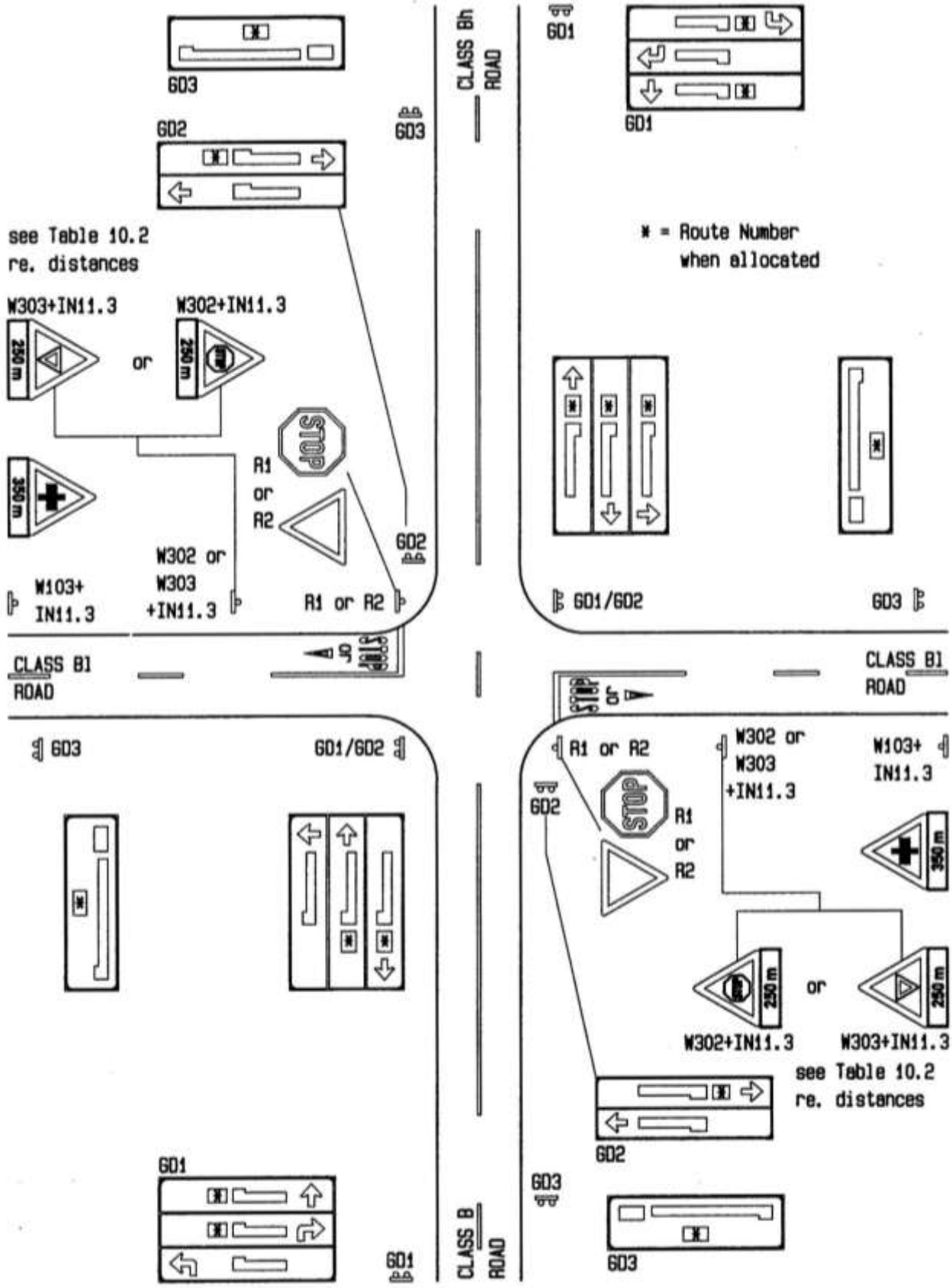
Fig 10.28 Road Class D + BI x Bh Junction



NOTES FOR FIGURE 10.29

(1) If it is considered necessary to provide additional information to drivers, a GD1 sign may be included on the Class BI road approach. According to individual road authority policies such a GD1 sign should either replace sign W104, or lie between sign W104 and the junction so that sign GD1 is correctly positioned, and sign W104 is moved further from the junction (the distance on sign IN11.3 must reflect the correct W104 position).

Fig 10.29 Road Class C + BI x Bh Junction



NOTES FOR FIGURE 10.30

(1) If it is considered necessary to provide additional information to drivers, a GD1 sign may be included on the Class BI road approaches. According to individual road authority policies such a GD1 sign should either replace sign W104, or lie between sign W104 and the junction so that sign GD1 is correctly positioned, and sign W104 is moved further from the junction (the distance on sign IN11.3 must reflect the correct W104 position).

Fig 10.30 Road Class BI + BI x Bh Junction

10.3.3 Rare or Non-Standard Junction and/or Signing Applications

1 If two roads which carry significant volumes of traffic, or have been developed to cater for significant future growth in traffic, intersect in a rural environment certain geometric and/or traffic control features, whilst rare on rural roads, become fairly frequent at such junctions. These features include:

(a) the provision of sliproads or turning roadways;

(b) the use of 4-WAY STOP control.

2 The fact that the rural roads in question are carrying significant volumes of traffic is, in itself, a reason for using higher than minimum levels of guidance signing. It is also likely, although not invariably so, that the roads are in fact numbered Class B routes. When the types of additional junction features noted above are also present, it is recommended that the highest levels of guidance signing available be specified. Figures 10.31 to 10.33 illustrate typical examples of signing for the type of features discussed.

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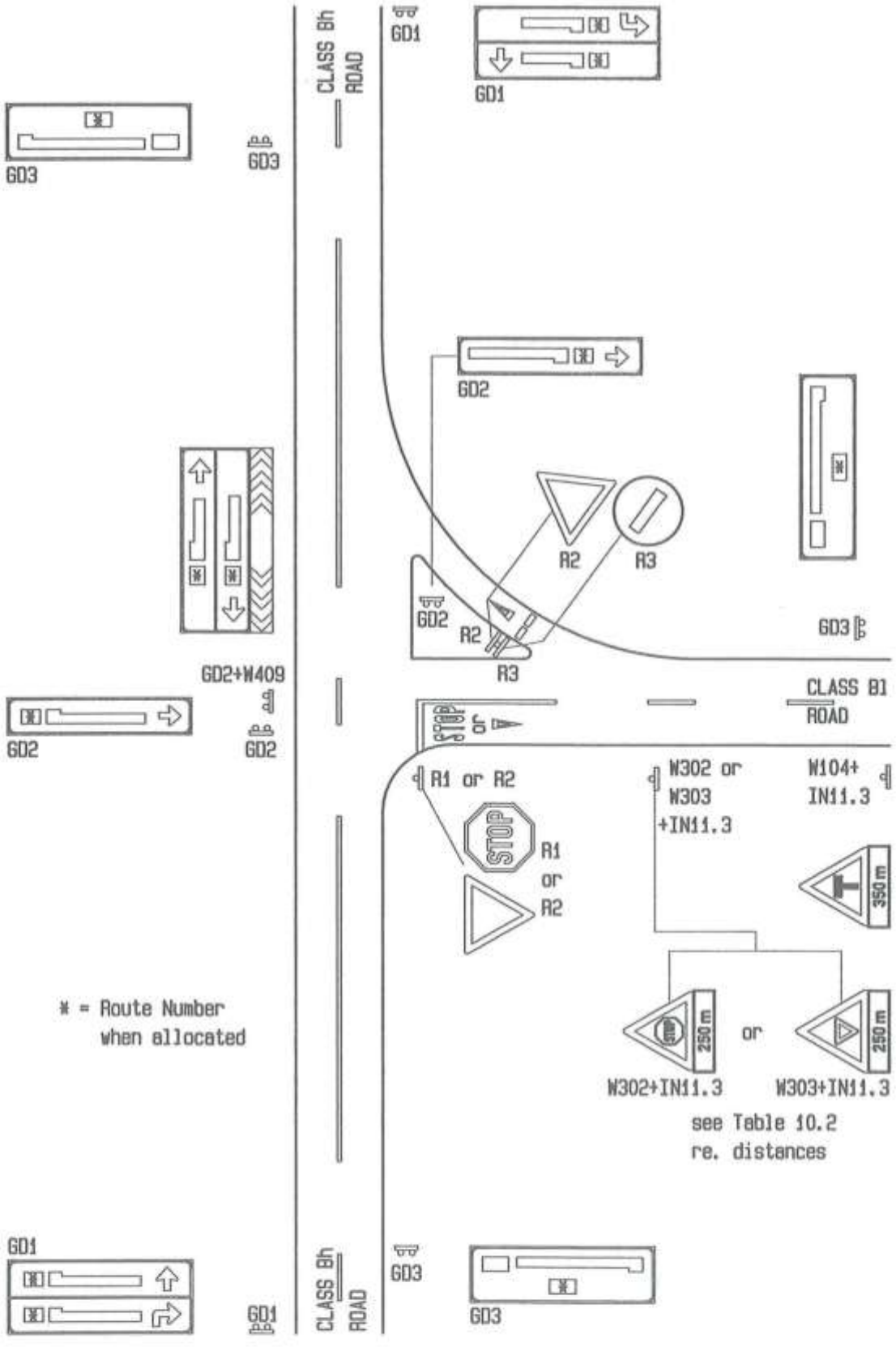
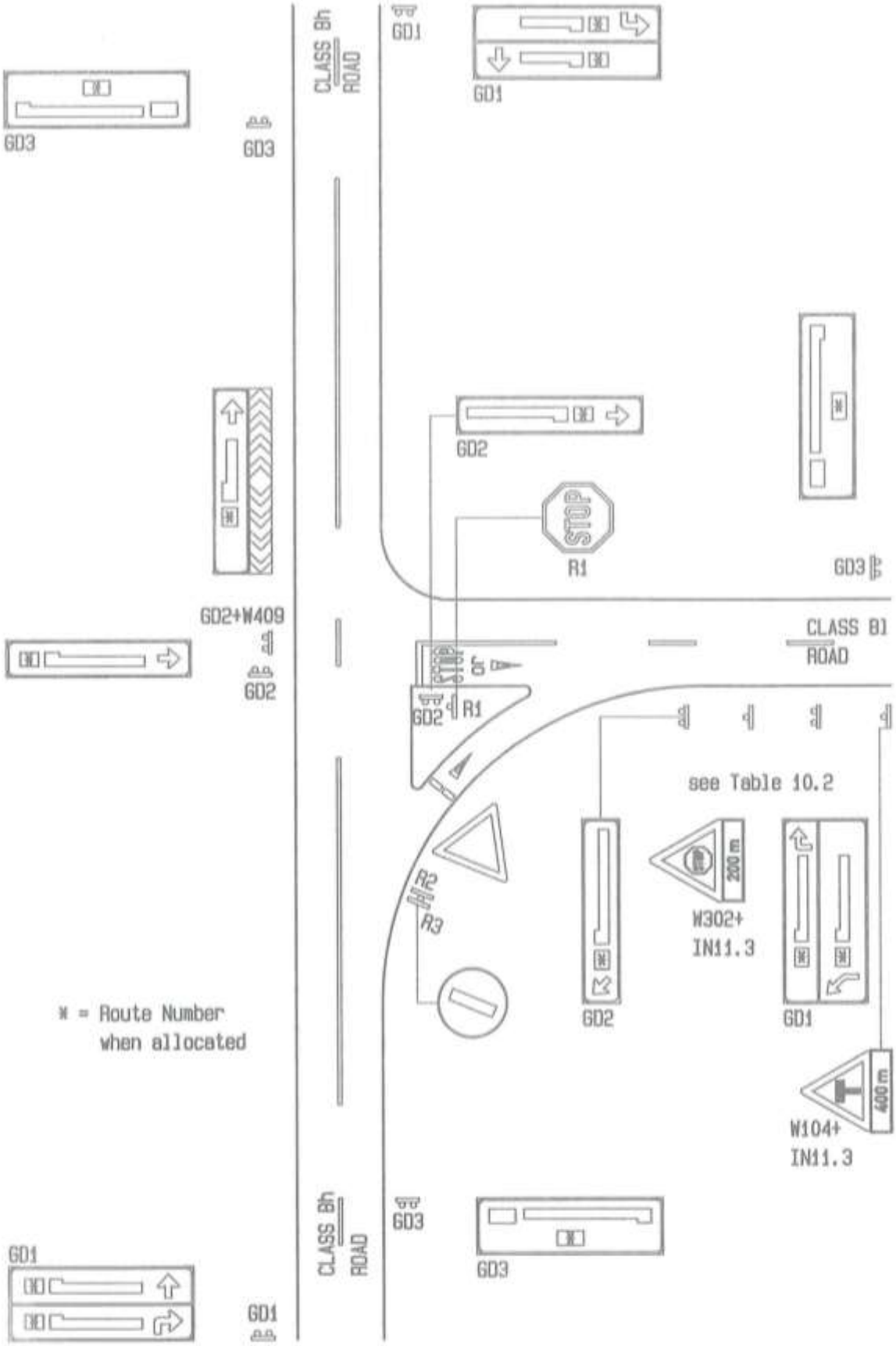


NOTES FOR FIGURE 10.31

(1) If it is considered necessary to provide additional information to drivers, a GD1 sign may be included on the Class Bl road approach. According to individual road authority policies such a GD1 sign should either replace sign W104, or lie between sign W104 and the junction so that sign GD1 is correctly positioned, and sign W104 is moved further from the junction (the distance on sign IN11.3 must reflect the correct W104 position).

Fig 10.31 Road Class Bl x Bh Junction (with Sliproad from Bh to Bl)



NOTES FOR FIGURE 10.32

(1) When the slip road configuration is such and the island large enough and raised above road level, the GD2 sign on the Class Bl road approach to the intersection may be placed on the island itself. There may also be a need for a Gore Chevron (W414) or Gore Plate sign (W413) at the start of the island.

Fig 10.32 Road Class Bl x Bh Junction (with Sliproad from Bl to Bh)

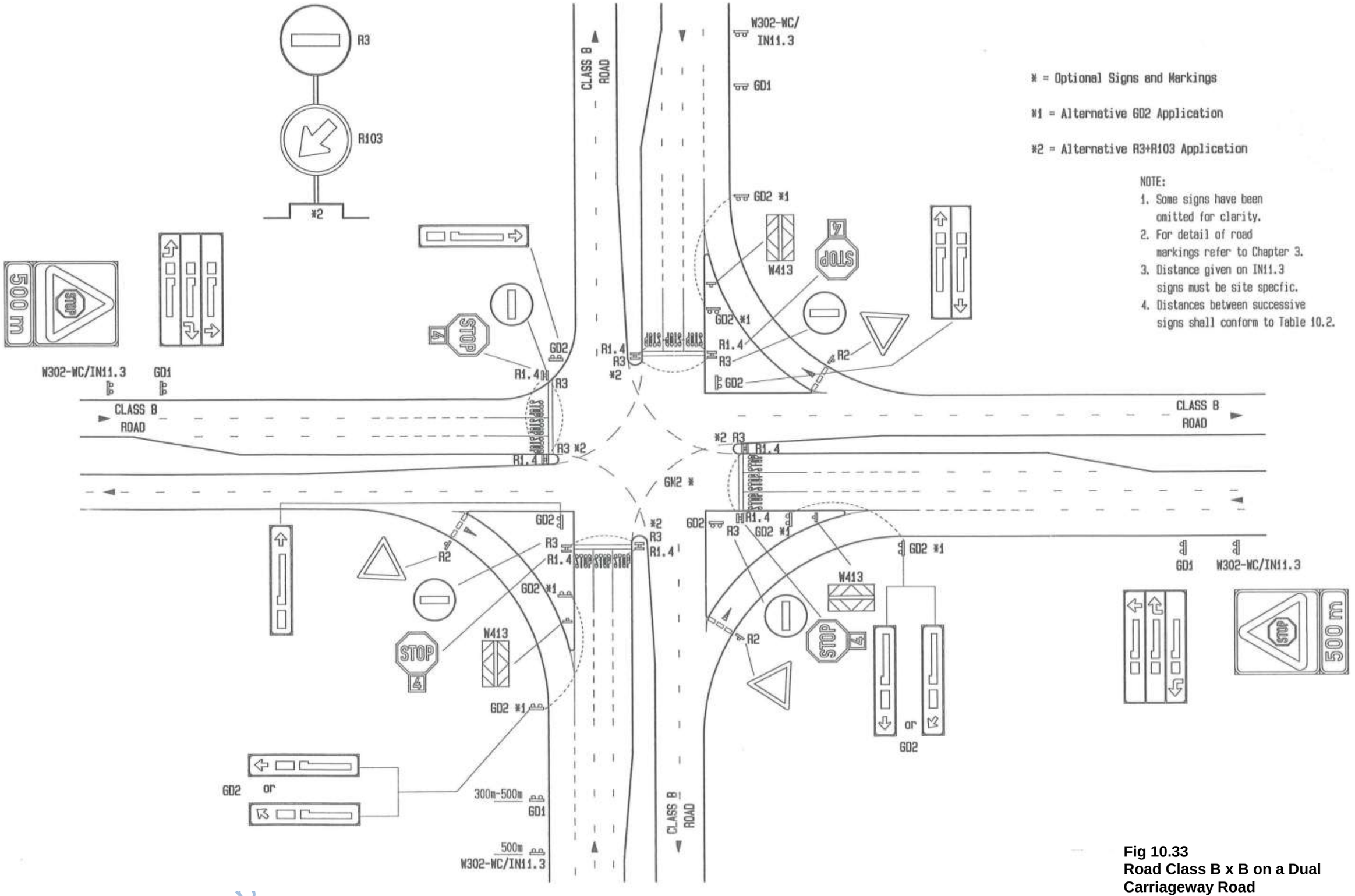


Fig 10.33
Road Class B x B on a Dual Carriageway Road

10.3.4 Street Names at Class E Junctions

1 Where a Class E road joins a higher order road, it is recommended that the Class E road be identified by a road name. The road name is to be displayed as indicated in Figure 10.34 so as to assist in clearly identifying the junction.

2 Standard STREET NAME signs of the GL1 type are to be used. For details of size, letter type, colour and other related details, refer to Volume 1, Chapter 4, Section 4.6.4. The position and height of these signs are detailed in Volume 1, Section 1.6, Fig 1.24.

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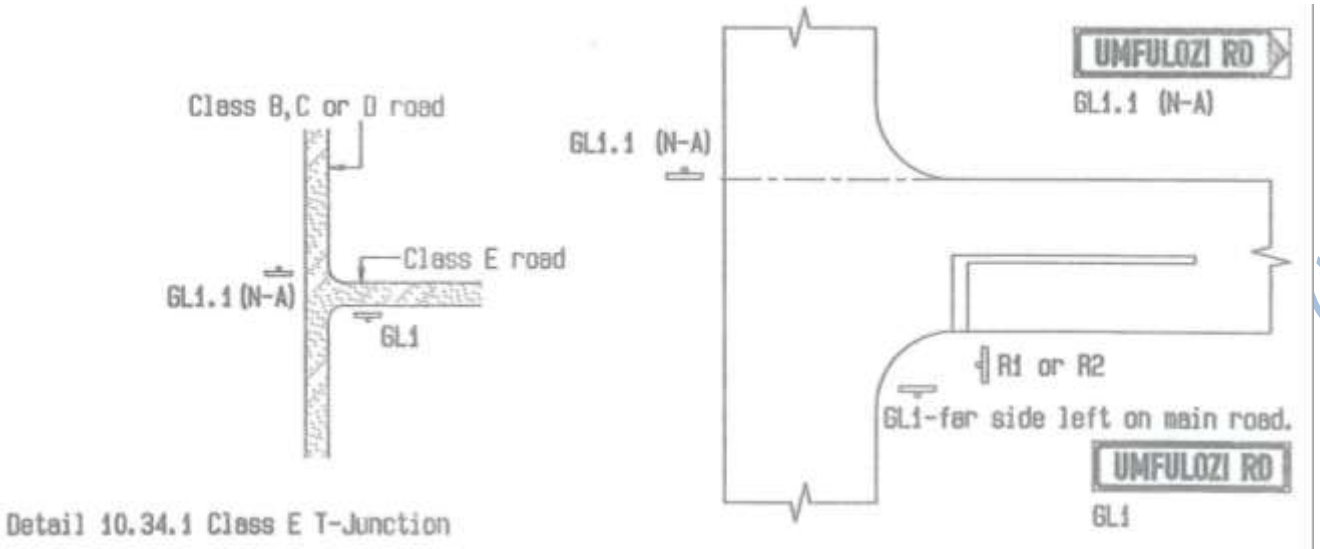
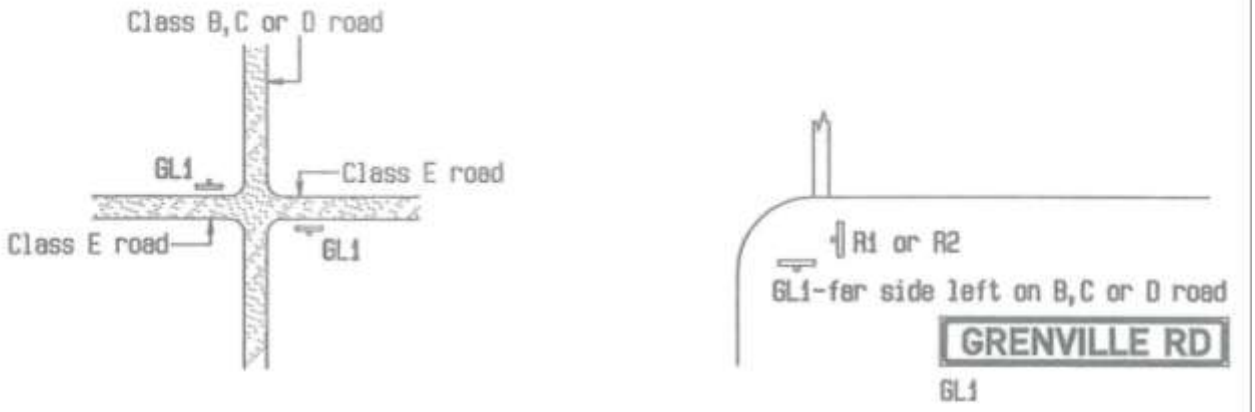
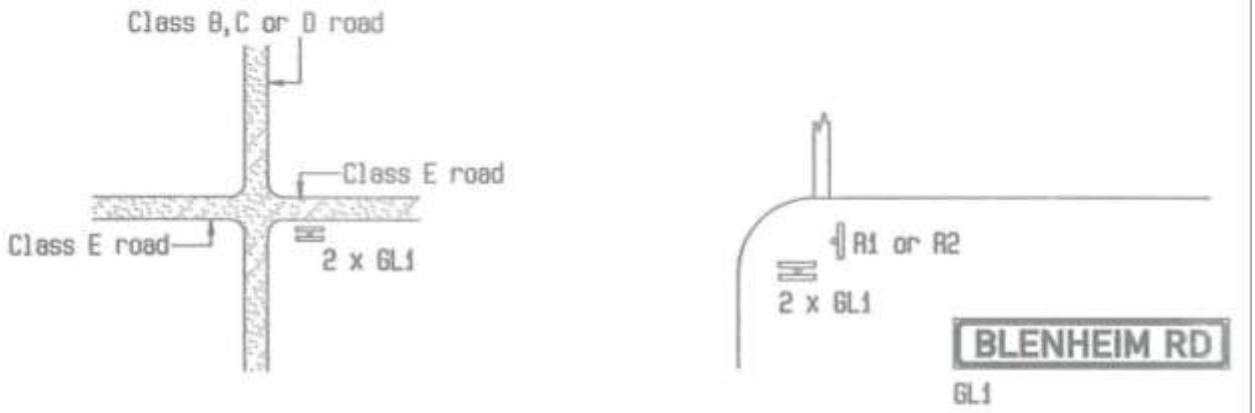


Detail 10.34.1 Class E T-Junction



Detail 10.34.2 Class E Crossroad-Option: 2 Separate Signs GL1



Detail 10.34.3 Class E Crossroad-Option: 2 Signs GL1 on Common Support

NOTES FOR FIGURE 10.34

(1) Where Class E roads are named it is desirable to erect the street name sign as shown.

(2) Name signs to be mounted as indicated in Volume 1, Chapter 1, Section 1.6, Figure 1.18.

Fig 10.34 Treatment of Street Names at Class E Road Junctions

10.3.5 Signing for Minor Destinations and Special Cases

1 In rural areas it is often necessary to provide guidance information related to minor destinations such as:

(a) schools;

(b) rural clinics;

(c) grain silos;

(d) rural police stations;

(e) small airfields.

2 When there is no orientational destination at a minor junction these minor types of destination should be displayed on a FINGERBOARD sign GD4. These destinations may alternatively be included in one panel of a GD2 sign if there is no orientational destination to be indicated along the route to be signed (see Figure 10.35). If it is considered necessary to display an orientational destination, AND a minor destination of the type listed, in one direction, both destinations should be displayed in a common GD2 sign panel.

3 The sign or sign panel should include the symbol for the type of destination, the name of the facility and where necessary the distance. The following symbols are applicable:

(a) rural clinics - GFS B1-3;

(b) grain silo - the word "Silo" after the name;

(c) rural police station - GFS B1-3 (tourism sign);

(d) small airfields - GDS-3;

(e) shops or general store - GDS-14.

4 A tourism stack destination sign may be included with a GD2 direction stack **provided that the tourist destination is the only public destination in the direction indicated**. See example in Figure 10.35 and a typical junction situation in Figure 10.36. Since holiday peak tourist traffic could exceed the Class B 300 vpd criterion on occasions, the signing treatment shown is as for a Class Bl minor road. The example in Figure 10.36 could apply at almost any of the intersecting classes of road illustrated in Figures 10.3 to 10.32 - with the exception of B x B junctions.

5 The examples of typical junction signing covered by Figures 10.3 to 10.32 illustrate single junction situations. The general rules on destination display require that one orientational destination be displayed on GD1, GD1/GD2 and GD2 signs for each exit path from the junction, as appropriate. This rule is relaxed in the case of junctions where one of the minor approaches is a Class E road. In such instances, if the junction is a crossroad, the appropriate W101, W102 or W103 advance warning sign must be displayed even if this is in addition to a GD1 sign.

6 Destinations have not been indicated in the various junction figures to make the diagrams more generally applicable. However, Figure 10.37 shows situations involving staggered T-junctions. In this case an indication of destinations is included to illustrate the recommended treatment in such cases.

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Crossroad

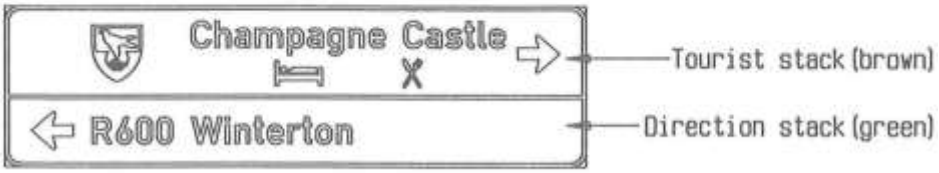
T-Junction

GDS-1 Railway Station Symbol

GD2-Typical Examples of Minor Destination GD2 Direction Signs

GDS-3 Airfield symbol

GD4-Typical Fingerboard GD4 Direction Sign



GD2/GF3-Combination Stack Sign

Optional distance to Emergency facility

GF2 (Advance)

GF3

GF2 and GF3-Typical Rural Minor Tourist Service and Attraction Signs

Fig 10.35 **Signing of Minor Destinations**

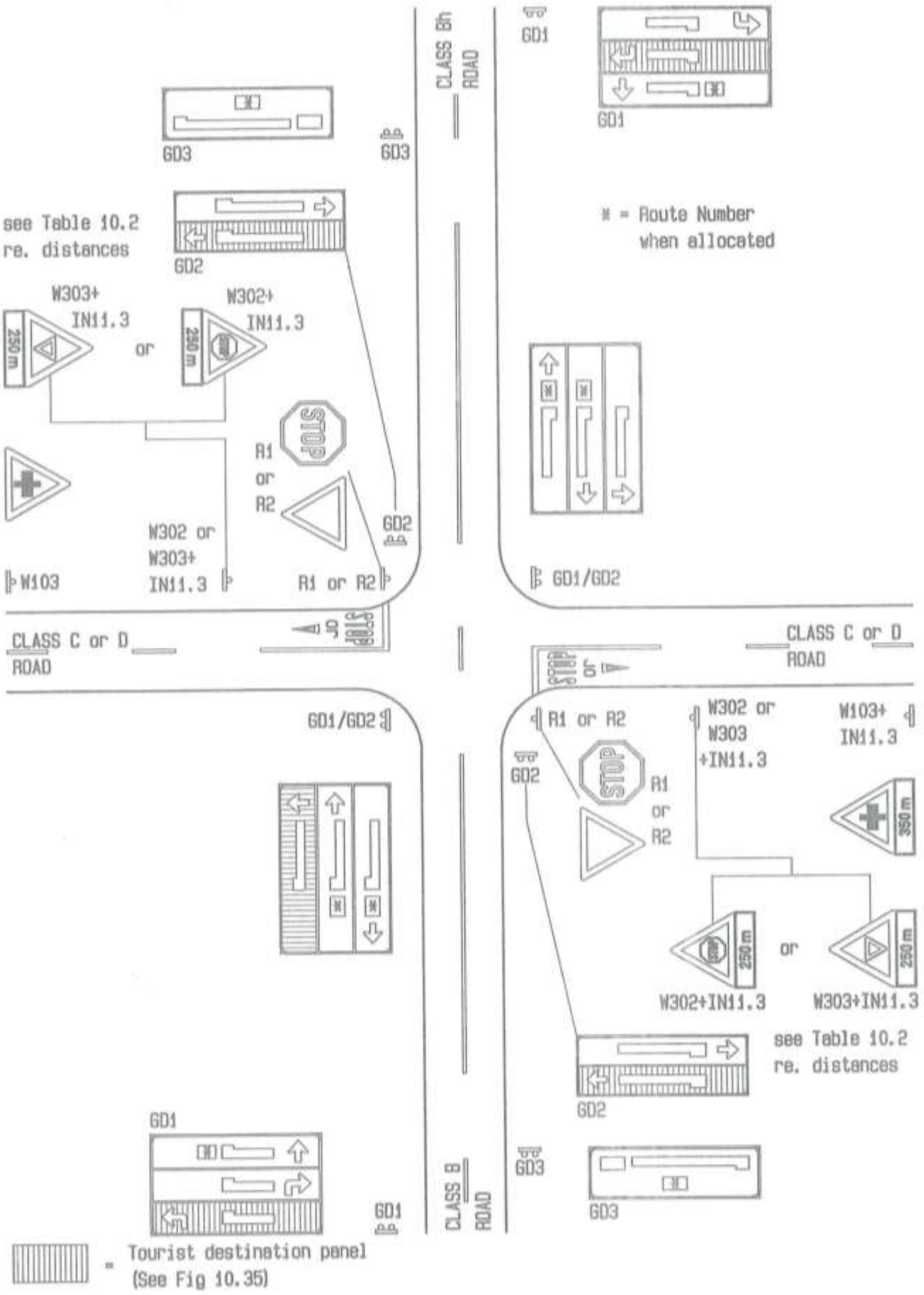
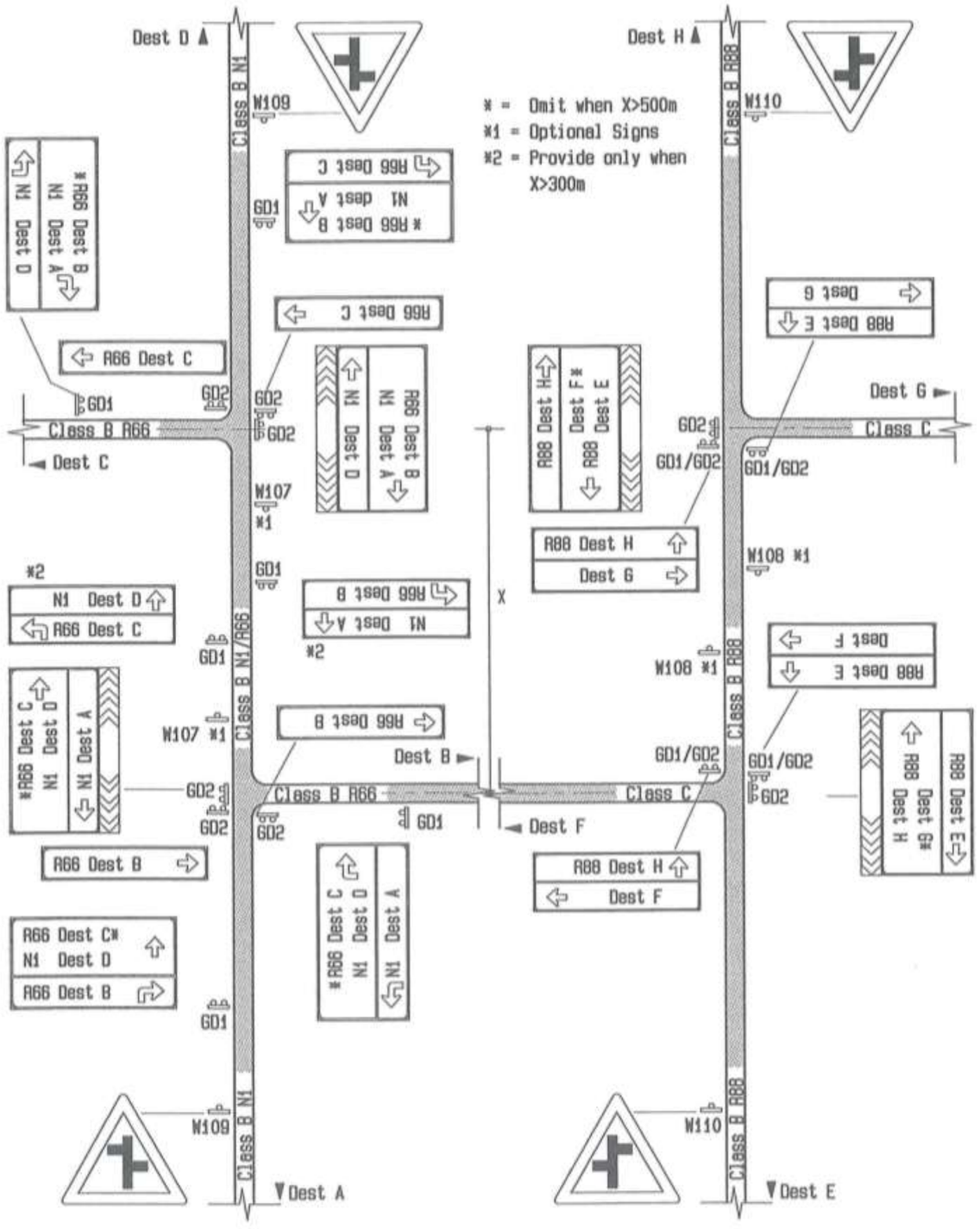


Fig 10.36 Combination of Minor Destination/Tourism Destination



Detail 10.37.1 Overlapping Class B Numbered Routes

Detail 10.37.2 Intersecting Class C x B Staggered Junctions

Detail 10.37.3 Intersecting Class B Numbered Routes

Notes for Figure 10.37

(1) Figure 10.37 illustrates three typical staggered T-junction situations. Each situation involves one or more numbered Class B routes. The purpose of the figure is to show how route numbers and destination names are recommended to be displayed under different circumstances. Other variations may occur. The treatment of these can be evolved from the examples given in Figure 10.37 by correlation with the appropriate **minimum** signing standards illustrated in the other figures for the various classes of intersecting road.

(2) The recommended information display treatment varies according to the value of **"X"** and the classes of road involved. **"X"** is the distance in metres between the two intersecting side roads. (The principles involved are also appropriate for two closely spaced side roads intersecting from the same side of the main or through road.)

(3) If **"X"** is greater than 500 m the two junctions should be signed as "isolated" or separate junctions and the information marked ✱ may be omitted. The information displayed would normally be as indicated in the relevant figures for Bl x Bh T-junctions (see Figure 10.20). However, if there is a well-defined traffic movement from one side road to the other, the destination displays given in Details 10.37.1 and 10.37.3 may be worthy of consideration.

(4) If **"X"** is between 300 m and 500 m signs shown by ✱**2** may be retained in addition to the information marked ✱. The information marked ✱ in Detail 10.37.1 shows that there are two overlapping Class B routes between the closely spaced junctions. In Detail 10.37.3 the display is different because the routes do not overlap but the further side road destination still warrants display because of the close spacing of the intersections.

(5) When **"X"** is under 300 m it is recommended that signs shown by ✱**2** be omitted and that the information marked by ✱ be retained (see Details 10.37.1 and 10.37.3).

(6) Detail 10.37.2 shows a lower order situation requiring fewer signs. It is, however, recommended that on the GD2 signs facing side road traffic the destination for the other closely spaced side road be displayed.

(7) In Detail 10.37.3 signs marked ✱**3**, which are optional for **"X"** between 300 m and 500 m, have been omitted for clarity.

(8) MAP type signs GD8 may be used in place of signs W109/W110.

Fig 10.37
Signing of Staggered Rural Junctions

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SIGNING FOR HEAVY VEHICLES

SECTIONS

11.0 Contents

11.1 Introduction

11.2 Range of Applicable Signs and Markings

11.3 Heavy Vehicle Signing Applications

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SIGNING FOR HEAVY VEHICLES

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Table 11.2	Applicable Warning Signs	11.2.6
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CHAPTER 11:
SIGNING FOR HEAVY VEHICLES

11.1 INTRODUCTION

11.1.1 General

1 The purpose of this chapter is to provide guidelines on, and illustrate how, under various circumstances, specific signing related to heavy vehicles and abnormal vehicles should be provided.

2 This chapter should be read in conjunction with various chapters of Volume 1, "Uniform Traffic Control Devices", which deal with signing policies and design principles, together with specific information in the meaning of, and individual application of, all traffic control devices. Specifically the following should be referred to:

(a) Chapter 2 - Regulatory Signs;

(b) Chapter 3 - Warning Signs;

(c) Chapter 4 - Guidance Signs;

(d) Chapter 7 - Road Markings.

3 Numerous supplementary aspects relating to the application of these various road signs are dealt with in Volume 2, and the following chapters should be referred to:

(a) Chapter 2 - Road Marking Applications;

(b) Chapter 3 - Regulatory and Warning Sign Applications;

(c) Chapter 5 - Freeway Signing.

11.1.2 Summary of Typical Heavy Vehicle Problem Areas

1 Heavy and abnormal vehicles create numerous problems and are subject to limitations due to their size, mass, freight and/or operational characteristics. These problems must be addressed in order to provide safe and efficient traffic operation, and *inter alia*, specific signing to assist heavy vehicle drivers should be provided.

2 The typical problem areas are:

(a) steep down-grades;

(b) steep up-grades;

(c) routes, particularly in urban areas where the presence of heavy vehicles creates or increases congestion problems;

(d) routes with physical limitations which do not allow for passage of vehicles with certain characteristics;

(e) routes with environmental limitations along which passage of certain freight is undesirable or along which noise, vibration or air pollution limits are required;

(f) delivery sites where there is inadequate off-street parking for the delivery vehicles.

3 Signing measures to address the problems related to steep down-grades shall include:

(a) adequate warning of the down-grade and, where necessary, details of the down-grade inclusive of slope, bends and distance;

(b) enforcement of measures to be taken such as engaging of low gear and speed restrictions;

(c) adequate advance warning of arrestor beds and escape lanes;

(d) lane use control.

4 Signing measures to address steep up-grade problems include:

(a) adequate warning of the up-grade;

(b) lane use control.

5 Signing measures to address routing problems include:

(a) indication of mandatory routing;

(b) prohibition of use of certain routes.

6 In all situations the agreed signing for heavy vehicles should be provided an adequate distance before the beginning of the condition requiring special signing.

11.1.3 Terminology

1 The term "heavy vehicle" is used throughout this chapter. **The term does not, however, have specific legal significance with regard to road traffic signs.** It refers generally to vehicles over 3500 kg gross vehicle mass (GVM) or gross combination mass (GCM).

2 For signing purposes the term "heavy vehicles" commonly applies to vehicles over a specified GVM or GCM which is considered "heavy" in the environment to which it is related, and is therefore somewhat subjective.

3 "Heavy vehicles" over 10 tonnes GVM or GCM refers to **all such vehicles**, including any buses, tractors, construction vehicles etc. To sign such a collective group of vehicles would require the use of signs such as R102 or R202. If it is required to sign only for a single class of vehicle, such as goods heavy vehicles, signs such as R123 to R127 and R229 to R233 are appropriate (see Section 11.2).

4 It should be noted that "command" regulatory signs such as R102 and R123 to R127 have two functions. The one is to "command" that, in the context of heavy vehicles, a specific class of vehicle proceeds only in a particular lane or a part of a roadway. The other "command" function is to reserve that lane or part of a roadway **for the indicated class of vehicle only,** therefore, **no other class of vehicle shall use such a portion of the roadway.**

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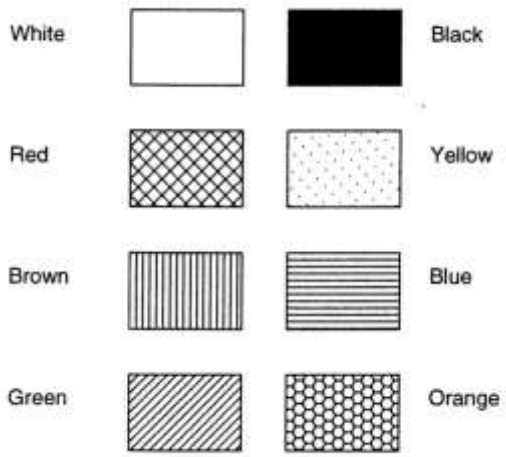
11.1.2 Road Traffic Sign Colour Indication

1 The chapters of Volume 2 of the South African Road Traffic Signs Manual (SARTSM) are not prepared in colour. Relevant examples used to illustrate appropriate signs, signals and markings are shaded in a black and white coding which is illustrated below.

2 The basic principles of the road traffic sign colour coding system are shown, in colour, in the SADC-RTSM Volume 1, Chapter 1, Section 1.4, and in the Contents sections of relevant Volume 1 and 4 Chapters.



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11.2 RANGE OF APPLICABLE SIGNS AND MARKINGS

11.2.1 General

1 This section provides firstly an indication of the symbols related to heavy vehicle regulation, and then relates these to the specific signs used for this purpose. It also indicates the range of signs and markings necessary for adequate control and guidance of heavy vehicles.

11.2.2 Basic Symbols

1 There are a number of basic symbols which are used in various signs, and as road markings for regulating heavy and abnormal vehicles. The symbols which are illustrated in Figure 11.1 relate to aspects such as:

(a) indication of type or class of vehicle;

(b) controlling physical characteristics of vehicles such as mass, width, length and height which may restrict the use of a particular route or facility;

(c) specification of specific action such as engaging a lower gear;

(d) demarcation of a specific feature such as an arrestor bed.

2 These symbols are used in regulatory, warning and guidance signs.

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11.2.3 Regulatory Signs

1 The range of regulatory signs applicable specifically to heavy and abnormal vehicles is given in Table 11.1 and illustrated in Figure 11.2.

2 The details of the warrants for, and the placement requirements of, individual signs, are provided in the respective sub-sections of Volume 1, Chapter 2 while their application is dealt with in Section 11.3. General applications of regulatory signs are also covered in Volume 2, Chapter 3.

3 The specific size and colour of regulatory signs is dealt with in Volume 1, Chapter 1, Section 1.4 and Chapter 2, Section 2.0.

11.2.4 Warning Signs

1 The range of warning signs applicable specifically to heavy and abnormal vehicles is given in Table 11.2 and illustrated in Figure 11.3.

2 The details of the warrants for, and the placement requirements of, individual signs are dealt with in detail in Volume 1, Chapter 1, Section 1.6 and Chapter 3, and their application is dealt with in Section 11.3. General applications of warning signs are also covered in Volume 2, Chapter 3.

3 The shape, size and colour of the warning signs is dealt with in Volume 1, Chapter 1, Section 1.4 and Chapter 3, Section 3.1.

11.2.5 Guidance Signs

1 The guidance signs which are primarily related to heavy vehicle application are those of the diagrammatic type and these are listed in Table 11.3 and illustrated in Figure 11.4.

2 The details of the warrants for, and the placement requirements of, individual diagrammatic signs, are dealt with in detail in Volume 1, Chapter 1, Section 1.6 and Chapter 4, Section 4.12. Their shape, size and colour are also dealt with in Section 4.12.

3 When it is required to create a preferred route for heavy vehicles, or even a route prohibition, it may become necessary to provide versions of MAP-TYPE DIRECTION sign GD9. These signs may include appropriate command and/or prohibition signs and/or vehicle class symbols. An example of such signing is illustrated in Figure 11.24.

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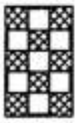
SYMBOL	DESCRIPTION	USED ON CLASS OF SIGN
	MASS LIMIT (tonnes)	Regulatory
	HEIGHT LIMIT (m) (2 decimal places)	Regulatory/Warning
	DIMENSION LIMIT (m) (Width -1 decimal places Length-to nearest metre)	Regulatory/Warning
	AXLE MASS LOAD LIMIT (tonnes)	Regulatory
	GOODS VEHICLES	Regulatory
	DELIVERY VEHICLES	Regulatory
	GOODS VEHICLES OVER A SPECIFIED GROSS VEHICLE MASS (GVM) ("X" tonnes)	Regulatory
	ABNORMAL VEHICLES	Regulatory
	CONSTRUCTION VEHICLES	Regulatory/Warning
	VEHICLES CONVEYING DANGEROUS GOODS	Regulatory
	AGRICULTURAL VEHICLES	Regulatory/Warning
	CHANGE TO LOWER GEAR	Guidance
	ARRESTOR BED	Guidance

Fig 11.1 Applicable Symbols

TABLE 11.1 APPLICABLE REGULATORY SIGNS TABLE 11.1

Sign Category Description	Sign Number	Reference Page	
		Volume 1	Volume 4
COMMAND SIGNS			
Vehicles exceeding mass only	R102	2.3.2	2.3.2
Delivery vehicles only	R122	2.3.11	2.3.22
Goods vehicles only	R123	2.3.11	2.3.23
Goods vehicles over indicated GVM only	R124	2.3.12	2.3.24
Construction vehicles only	R125	2.3.12	2.3.25
Vehicles conveying dangerous goods only	R126	2.3.12	2.3.26
Abnormal vehicles only	R127	2.3.12	2.3.27
Agricultural vehicles only	R130	2.3.13	2.3.30
PROHIBITION SIGNS			
Mass limit	R202	2.4.2	2.4.3
Axle massload limit	R203	2.4.3	2.4.5
Height limit	R204	2.4.4	2.4.6
Length limit	R205	2.4.5	2.4.7
No overtaking goods vehicles by goods vehicles	R215	2.4.10	2.4.17
No delivery vehicles	R228	2.4.18	2.4.29
No goods vehicles	R229	2.4.18	2.4.30
No goods vehicles over indicated GVM	R230	2.4.19	2.4.31
No construction vehicles	R231	2.4.19	2.4.32
No vehicles conveying dangerous goods	R232	2.4.19	2.4.33
No abnormal vehicles	R233	2.4.19	2.4.34
No agricultural vehicles	R236	2.4.20	2.4.37
Width limit	R239	2.4.21	2.4.40
RESERVATION SIGNS			
Delivery vehicle reservation	R312	2.5.7	2.5.12
Delivery vehicle parking reservation	R312-P	2.5.7	2.5.12
Goods vehicle reservation	R313	2.5.7	2.5.13
Goods vehicle parking reservation	R313-P	2.5.7	2.5.13
Goods vehicles over indicated GVM reservation	R314	2.5.8	2.5.14
Goods vehicles over indicated GVM parking reservation	R314-P	2.5.8	2.5.14
Construction vehicles reservation	R315	2.5.8	2.5.15
Construction vehicles parking reservation	R315-P	2.5.8	2.5.15
Vehicles conveying dangerous goods reservation	R316	2.5.8	2.5.16
Vehicles conveying dangerous goods parking reservation	R316-P	2.5.8	2.5.16
Abnormal vehicles reservation	R317	2.5.8	2.5.17
Abnormal vehicles parking reservation	R317-P	2.5.8	2.5.17

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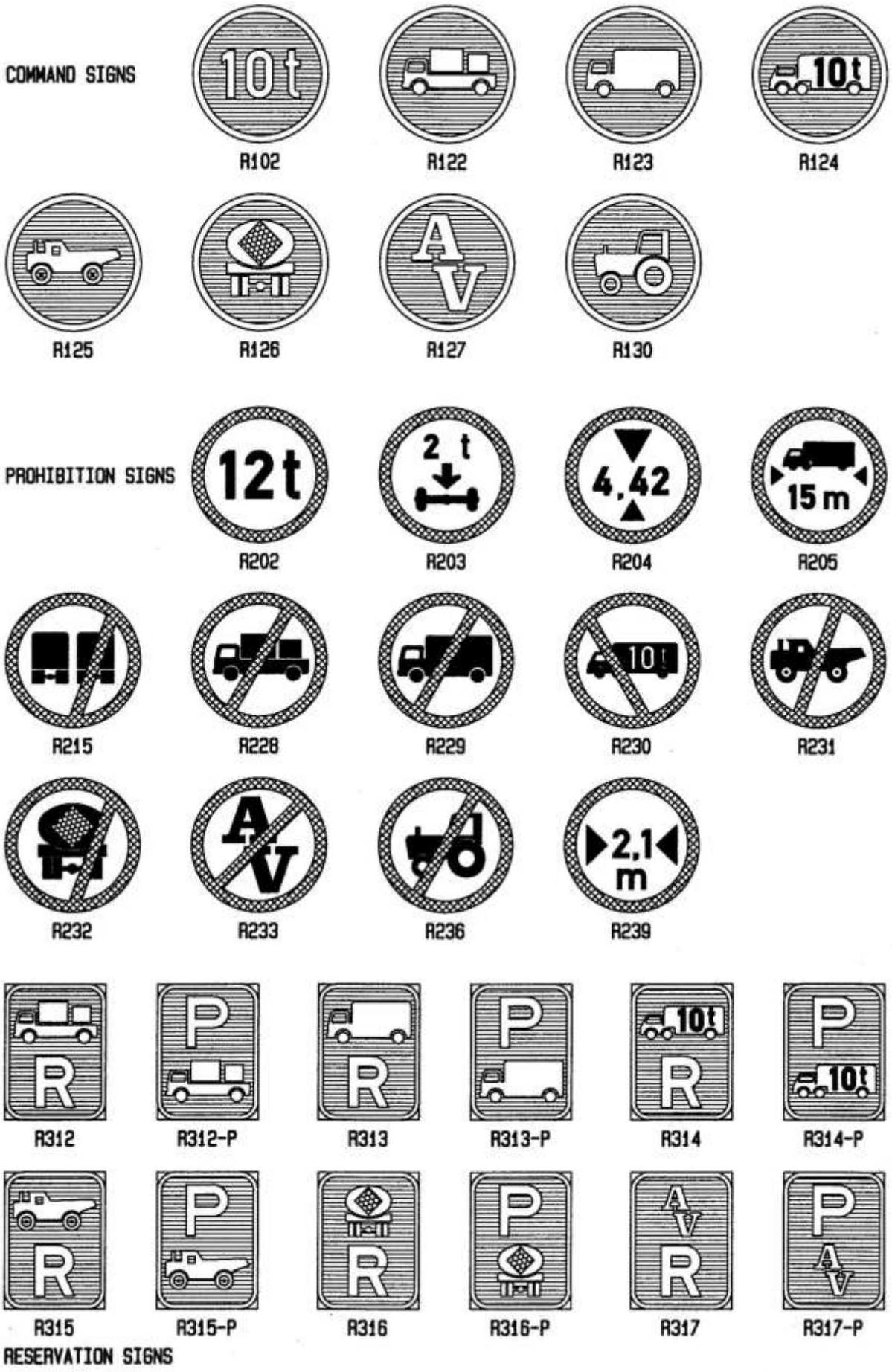

Fig 11.2 **Applicable Regulatory Signs**

W320

W321

W322

W323

W324

W344

W345

W352

W360

Fig 11.3 Applicable Warning Signs

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TABLE 11.2 APPLICABLE WARNING SIGNS TABLE 11.2

Sign Category Description	Sign Number	Reference Page	
		Volume 1	Volume 4
Height restricted	W320	3.4.8	3.4.20
Length restricted	W321	3.4.9	3.4.21
Steep descent	W322	3.4.10	3.4.22
Steep ascent	W323	3.4.10	3.4.23
Slow moving heavy vehicles	W324	3.4.11	3.4.24
Construction vehicles crossing/left	W344	3.4.20	3.4.44
Construction vehicles crossing/right	W345	3.4.20	3.4.45
Agricultural vehicles	W352	3.4.24	3.4.52
Width restricted	W360	3.4.26	3.4.60

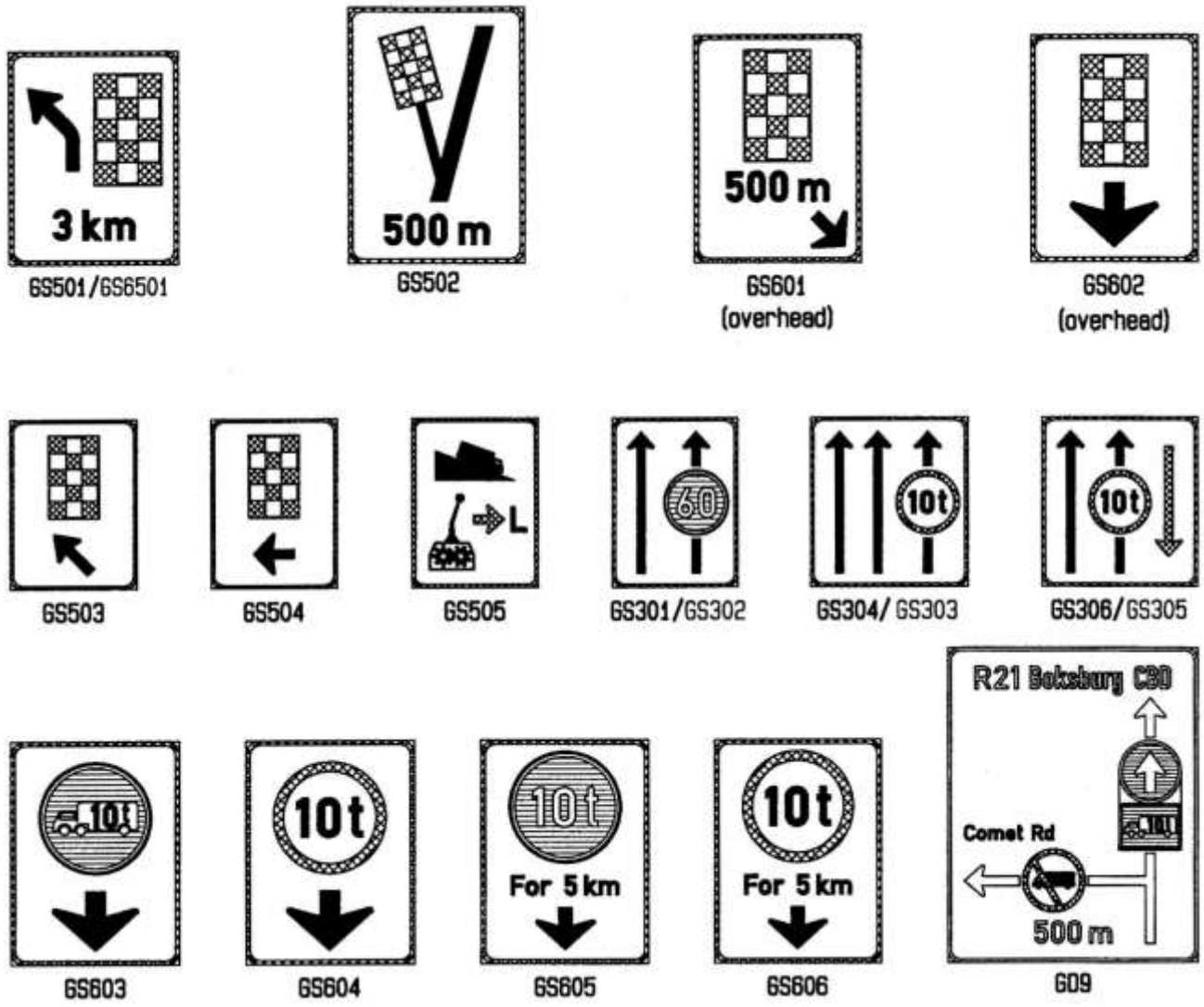

Fig 11.4 Applicable Diagrammatic Type Guidance Signs

TABLE 11.3 APPLICABLE GUIDANCE SIGNS TABLE 11.3

Sign Category Description	Sign Number	Reference Page	
		Volume 1	Volume 4
DIAGRAMMATIC			
Arrestor bed pre-advance exit	GS501	4.12.24	8.7.1
Arrestor bed advance exit	GS502	4.12.24	8.7.2
Arrestor bed exit	GS503	4.12.24	8.7.3
Arrestor bed gore exit	GS504	4.12.24	8.7.3
Low gear engagement	GS505	4.12.24	8.7.4
Overhead: arrestor bed advance exit	GS601	4.12.26	8.8.1
Overhead: arrestor bed exit	GS602	4.12.26	8.8.2
Overhead: lane use control (command)	GS603	4.12.26	8.8.3
Overhead: lane use control (prohibition)	GS604	4.12.26	8.8.3
Overhead: lane use control – with distance (command)	GS605	4.12.26	8.8.4
Overhead: lane use control – with distance (prohibition)	GS606	4.12.26	8.8.4
Overhead: arrestor bed pre-advance exit sign	GS6501	4.12.28	8.8.16
DIRECTION			
Map-type direction	GD9	4.8.17	5.3.32

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11.2.6 Combination Signs

1 There are numerous combinations of signs which relate to the regulation of heavy and abnormal vehicles, a few examples of which are given in Figure 11.5.

There are four relevant types of sign combination:

(a) regulatory selective restriction combining primary and secondary messages (these messages are classified into LIMIT, ACTION, OBJECT messages in combination) - selective restriction signs may also be combined with an information class SUPPLEMENTARY PLATE sign IN11 (see Details 11.5.1 and 11.5.4);

(b) guidance/regulatory signs in combination in one of two forms:

(i) a regulatory sign placed on the face of a DIRECTION sign (such applications are not common except for toll routes and will usually require a specifically designed sign) (see Detail 11.5.2);

(ii) one or more regulatory signs placed on a DIAGRAMMATIC sign (see Detail 11.5.3);

(c) advance warning/information sign combinations involving one or more information SUPPLEMENTARY PLATE signs IN11 (see Detail 11.5.5);

(d) regulatory and/or warning signs on high visibility backgrounds - with or without information signs (see Detail 11.5.5).

2 LIMIT-LIMIT type of SELECTIVE RESTRICTION regulatory signs comprise primary and secondary message signs both of which relate to limits of one type or another. The addition of the secondary limit message to the primary limit message qualifies the applicability of the primary limit (see Volume 1, Chapter 2, Subsection 2.7.15). Typical examples are:

(a) a PROHIBITION sign indicating that vehicles exceeding a MASS LIMIT of 5 tonnes shall not proceed beyond the sign within the TIME LIMIT of 18:00 to 08:00 - see Detail 11.5.1;

(b) a PROHIBITION sign indicating a SPEED LIMIT of 40km/h for all vehicles with a GVM exceeding a MASS LIMIT of 10 tonnes - see Detail 11.5.1.

3 LIMIT-OBJECT types of SELECTIVE RESTRICTION regulatory signs comprise primary message signs relating to limits, the applicability of which are qualified by secondary message signs relating to an object being regulated, (see Volume 1, Chapter 2, Subsection 2.7.16). A typical example is:

(a) a COMMAND sign indicating a MINIMUM SPEED of 30 km/h applies to all GOODS VEHICLES - see Detail 11.5.1.

4 ACTION-LIMIT types of SELECTIVE RESTRICTION regulatory signs comprise primary message signs relating to actions, which include movements or turns, the applicability of which are qualified by secondary message signs relating to a limit (see Volume 1, Chapter 2, Subsection 2.7.17). A typical example is:

(a) a COMMAND sign indicating a mandatory requirement to PROCEED STRAIGHT ON ONLY applying only to GOODS VEHICLES of the GVM or GCM MASS INDICATED (on the symbol) - see Detail 11.5.1.

5 ACTION-OBJECT types of SELECTIVE RESTRICTION regulatory signs comprise primary message signs relating to actions, which include movements or turns, the applicability of which are qualified by secondary message signs relating to an object being regulated, (see Volume 1, Chapter 2, Subsection 2.7.18). Typical examples are:

(a) a COMMAND sign indicating the mandatory requirement to TURN LEFT ahead, applying to DELIVERY VEHICLES only - see Detail 11.5.1;

(b) a PROHIBITION sign indicating that a prohibition exists on the OVERTAKING of GOODS VEHICLES by VEHICLES CONVEYING HAZARDOUS SUBSTANCES - see Detail 11.5.1.

6 OBJECT-LIMIT types of SELECTIVE RESTRICTION regulatory signs comprise primary message signs relating to objects, the applicability of which are qualified by secondary message signs relating to a limit. Applications of this type of SELECTIVE RESTRICTION SIGN should be restricted to secondary message TIME LIMITS. **Speed or mass limits should not be used,** (see Volume 1, Chapter 2, Subsection 2.7.19). A typical example is:

(a) a TEMPORARY RESERVATION sign indicates a TEMPORARY reservation on the use of a roadway or area by CONSTRUCTION VEHICLES within the TIME LIMIT 06:30 to 20:00 - see Detail 11.5.1.

7 A LIMIT-OBJECT type of SELECTIVE RESTRICTION sign (see paragraph 11.2.6.3) which may be particularly relevant in urban areas relates to a parking restriction specific to a class of heavy vehicle. A typical example is:

(a) a (TIME) LIMITED PARKING RESERVATION sign indicating a maximum stay limit of 120 minutes for DELIVERY VEHICLES - see Detail 11.5.1.

8 These types of combination selective restriction regulatory signs may also include a supplementary information plate as indicated in Detail 11.5.4.

9 Prior advice of a limiting factor which may affect heavy vehicles at some point on the road ahead should be given well in advance of the limiting point as indicated in Detail 11.5.4. In this example, early indication is given of a height restriction ahead enabling the affected vehicles to take an alternative route.

10 Various heavy vehicle and abnormal vehicle related advance warning signs may be used in combination as indicated in the following examples:

(a) a steep down-grade sign (W323) combined with an information sign (IN11.2) indicating the length of the down-grade - see Detail 11.5.5;

(b) the combination of the steep down-grade sign (W322) with a warning of a winding road ahead sign (W209) on a high visibility background and an indication of the length of the down-grade (IN11.2 information sign) is shown in Detail 11.5.5;

(c) various combinations of warning of a steep down-grade or compulsory stop on a high visibility background with details of the nature of the downgrade, and including the option of flashing warning lights, are illustrated in Detail 11.5.5

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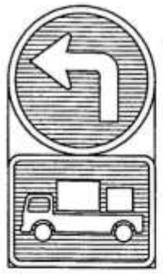
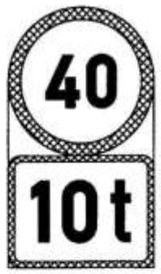
R101-568
Minimum Speed - Goods Vehicles

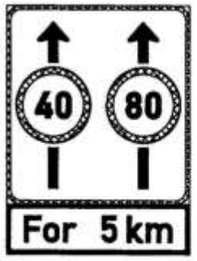
R107-569
Proceed Straight On Only Goods Vehicles Over GVM or GCM Indicated



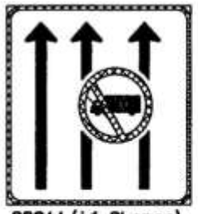
R108-567
Turn Left Ahead - Delivery Vehicles



R201-532
Speed Limit-Mass Limit (GVM or GCM)



GS310-IN11.2



GS311 (if 3Lanes)

W322+IN11.2

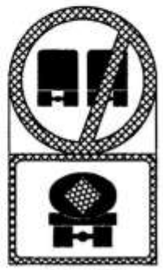
W322+IN11.3

Inclusion of regulatory sign messages in diagrammatic sign backgrounds to give lane specific prohibition

W323-WC+IN11.3

W323-WA + IN11.2
plus Flashing Yellow Lights

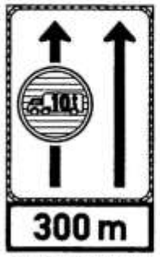
R202-501
Mass Limit (GVM or GCM)-Time Limit



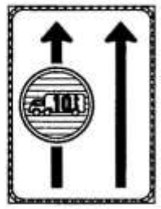
R215-571
No Overtaking Goods Vehicles By Vehicles Conveying Dangerous Goods

TR315-501
Construction Vehicles - Time Limit (Temporary)

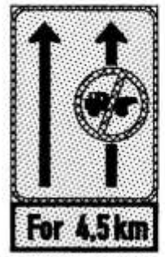
R306-P-567
Limited Parking - Delivery Vehicles



GS301+IN11.3 with R124



GS301



TGS302+TIN11.2 with TR231 temporary variant

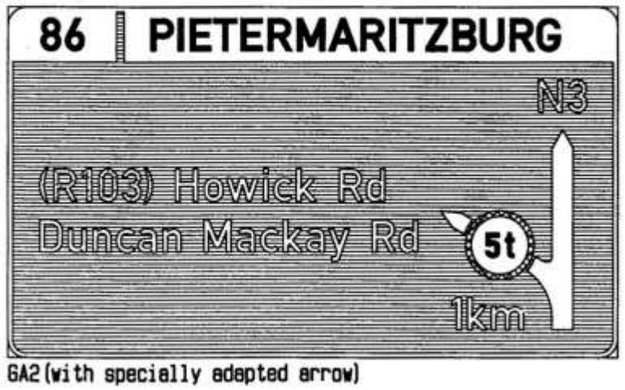
Sign sequence - advance sign with IN11.3 followed by GS301 'action' sign - after which ONLY 10t goods vehicles shall use the lane

Detail 11.5.3
Diagrammatic/Regulatory/Information Sign Combinations

W302-WC+IN11.569+IN11.3

W209+W322-WD + IN11.2

Examples show progressive options for increasing sign target value using high visibility backgrounds and/or flashing yellow lights



GA2 (with specially adapted arrow)

Sign indicates a prohibition on goods vehicles leaving the freeway at the exit 1km ahead. R229 signs must be located on the Howick Road off ramp to effect the prohibition. This application is NOT appropriate for COMMAND signs UNLESS the exit is for the indicated class of vehicles ONLY. Application could be used with TEMPORARY prohibition signs such as TR229 if required.

Detail 11.5.2
Guidance Sign/Regulatory Combination - Includes a Distance

TR108-569 + TIN11.3

R204 + IN11.4

Detail 11.5.4
Regulatory (incl. Selective Restriction)/ Information Sign Combinations

Detail 11.5.5
Advance Warning/Information Sign Combinations - incl. High Visibility Applications

Fig 11.5
Examples of Typical Sign Combinations

11.2.7 Relative Placement of Signs at Road Junctions

1 At road junctions numerous signs in addition to the heavy vehicle related signs have to be accommodated, namely:

(a) regulatory signs such as stop and yield signs;

(b) advance warning and hazard marker signs;

(c) direction signs;

(d) tourism and/or local direction signs.

2 The basic requirement for the placement of signs is dealt with in the following chapters/sections of the Manual:

(a) regulatory signs - Volume 1, Chapter 2 and Volume 2, Chapter 3;

(b) warning signs - Volume 1, Chapter 3 and Volume 2, Chapter 3;

(c) direction signs - Volume 1, Chapter 4, Section 4.8 (see specifically Figures 4.56, 4.57 and 4.58);

(d) tourism signs - Volume 1, Chapter 4, Section 4.10 and Volume 2, Chapter 4;

(e) local direction signs - Volume 1, Chapter 4, Section 4.11 and Volume 2, Chapter 9.

3 The distance which an advance warning sign must be placed ahead of the hazard, and its size, are dependent on the operating speed of the road, as indicated in Table 11.4.

4 In all cases of signing where several sign types are required close to each other, as on the immediate approach to a junction, priority should be given firstly to the regulatory signs, then the warning signs, the direction signs and finally the tourism signs. Signing for heavy vehicle control on the approach to an intersection is likely to require signs in addition to a standard sequence of signs. Care must be exercised regarding the proximity of one sign to another. In addition sign spacings must always be adjusted to take account of the total sign display and the road geometry, both horizontal and vertical (see Volume 1, Section 1.6). Guidelines for sign spacing are given in Table 11.5.

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TABLE 11.4 ADVANCE WARNING SIGN LOCATION AND SIZE TABLE 11.4

Operating Speed (km/h)	Location Distance from Hazard (m)	Recommended Size (mm)
120	330 (400)	1500
100	240 (320)	1500
80	160 (220)	1200
60	120 (160)	900

NOTE:

(1) Figures in brackets represent extended location positions for advance signs.

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TABLE 11.5 SPACING BETWEEN CONSECUTIVE SIGNS TABLE 11.5

Operating Speed (km/h)	Minimum Separation (m)		Preferred Separation (m)	
	Freeway	Other Roads	Freeway	Other Roads
120	150	100	225	200
100	90	80	175	150
80	120	60	135	100
60	n/a	50	n/a	90

NOTE:

(1) Separations indicated apply between any two consecutive signs irrespective of class.

(2) Legibility of text must also be taken into account when deciding which sign should come first of a closely reparated pair of signs.

(3) The sign sequences in this chapter should not be erected without due attention to sign spacing – there is no point in putting up signs that cannot be seen.

(4) If a section of road is “busy” in terms of driver workload preferred sign separations, or better, should be specified.

11.3 HEAVY VEHICLE SIGNING APPLICATIONS

11.3.1 General

1 The problem areas identified in Subsection 11.1.2 of this chapter are looked at in detail in this section and the signing requirements for the following situations are addressed:

(a) heavy vehicle routing based on vehicle physical characteristics for rural and urban situations;

(b) heavy vehicle routing based on vehicle or freight classification;

(c) prohibition of vehicles on certain routes;

(d) lane control in relation to steep up-grades;

(e) lane control in relation to down-grades, inclusive of mandatory stopping points;

(f) requirements at arrestor beds;

(g) requirements at mass measuring stations.

2 In the following sections the figures detailing the signing requirements focus specifically on the heavy vehicle/abnormal vehicle aspects, but where necessary other signing is indicated although not detailed.

11.3.2 Routing Based on Vehicle Characteristics

1 Under various limiting circumstances it will be necessary to divert heavy or abnormal vehicles from a route which has certain physical restrictions and will thus not permit passage of certain vehicles. Thus drivers of vehicles which exceed a specified mass, height, width or length must be provided with clear signing as to what alternatives are open to them.

2 Principles which should be borne in mind are:

(a) positive guidance for such vehicles must be given to the alternative route(s), that is, there must not merely be a prohibition of a specific route but the alternative(s) must be clearly and continuously signed until the original route can be joined again; where appropriate a MAP TYPE ADVANCE DIRECTION sign GD9 indicating the extent of the detour should be considered (see Figure 11.24);

(b) adequate warning of a restriction ahead must be given.

3 The signing requirements for routing heavy vehicles are given in Figure 11.6 for rural application and in Figure 11.7 for urban application. The examples indicate a requirement for all goods vehicles over 10 tonnes to follow the route indicated. The instruction could also be based on the height restriction, width restriction, length restriction or axle mass restriction. Other routing specifications may be used where appropriate and as shown in the respective figures. The route to be taken by heavy vehicles is shaded in the figures for additional emphasis.

4 Mandatory command signs such as R108-569 or R109-569 must be used with care. The primary regulatory message used in selective restriction signs of this sort must be chosen so as to achieve the intended purpose. **As a general rule the use of an ACTION- OBJECT selective restriction combination is recommended. The use of a primary OBJECT message is NOT recommended unless the route is exclusively for the class of vehicles concerned** (see paragraph 11.1.3.4).

5 An additional example of routing control is given in Figure 11.24. Refer also to Figure 3.9 and Figure 3.42 in Chapter 3 of Volume 2.

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Notes for Figure 11.6

(1) Other routing specifications may be used in place of the "goods vehicle over specified tonnage". The appropriate symbols indicating the restriction would be used in the command and prohibition signs and the following are applicable:

Description	Symbol for Mandatory Sign (Command or Prohibition)	Prohibition Sign
i. Vehicles Exceeding Given Mass (GVM-X tonnes)	X t	12t R202
ii. Axle Mass Load Limit X tonnes	X t	2 t R203
iii. Height Limit (X metres to 2 decimal places)	X,YZ	4,42 R204
iv. Length Limit (X metres to nearest metre)	X m	15 m R205
v. Goods Vehicles Exceeding Given Mass (GVM-X tonnes)	X t	10t R230
vi. Abnormal Vehicles	AV	AV R233
vii. Width Limit (X metres to 1 decimal place)	X,Y m	2,1 m R239

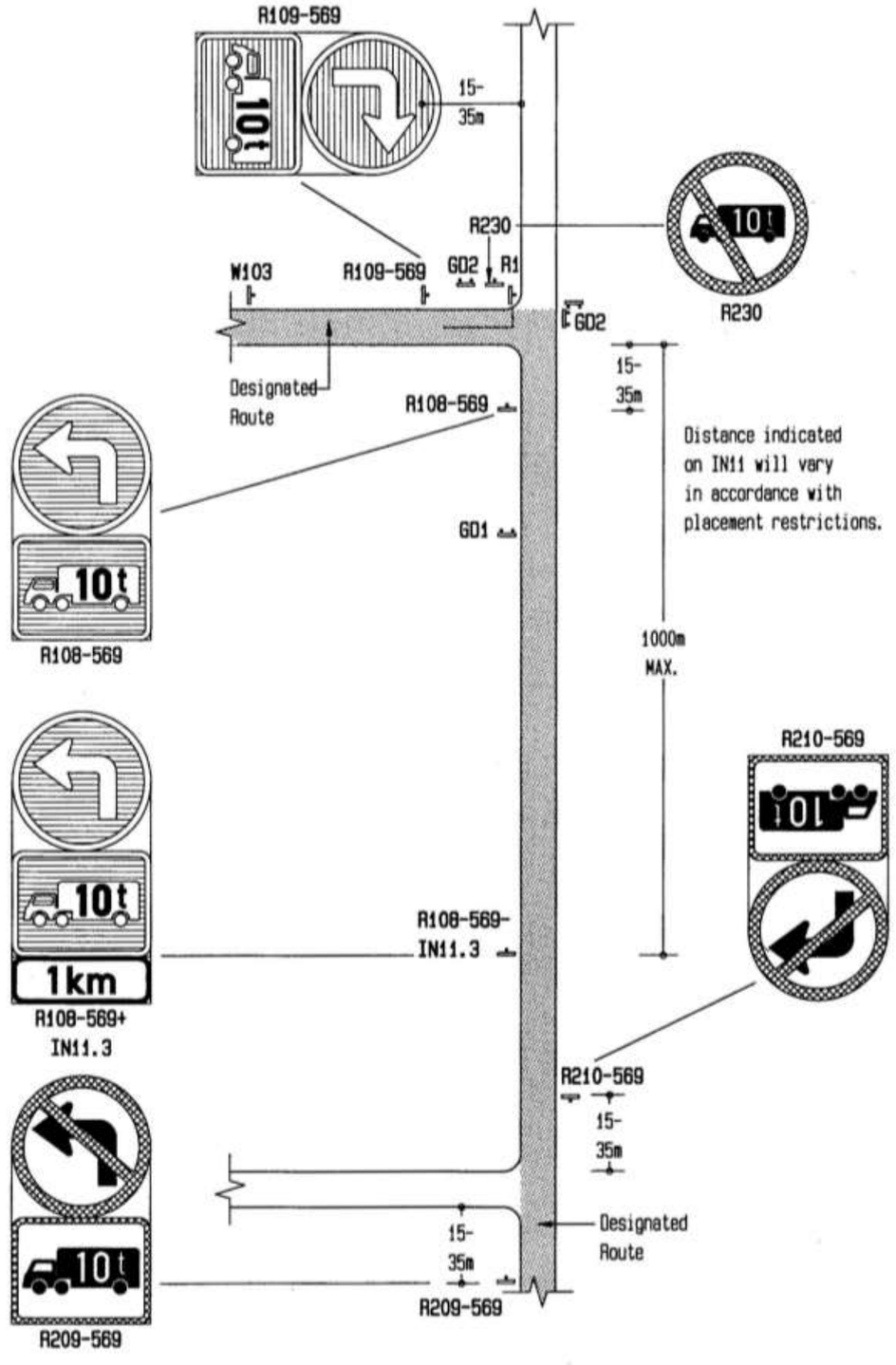
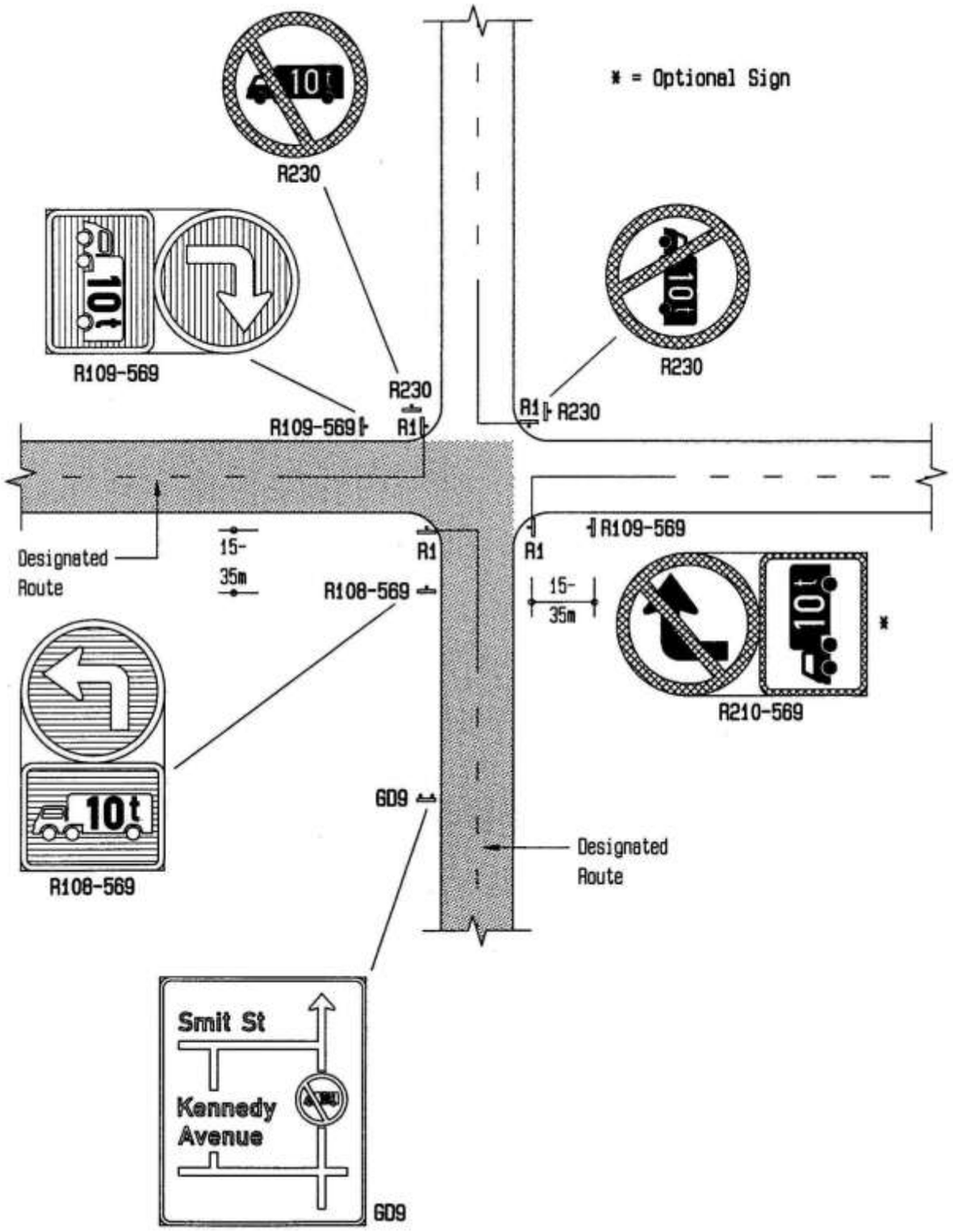


Fig 11.6
Heavy Vehicle Routing Based on Vehicle Characteristics - Rural



Notes for Figure 11.7

(1) Other routing specifications may be used in place of the "goods vehicle over specified tonnage". The appropriate symbols indicating the restriction would be used in the command and prohibition signs and the following are applicable:

(2) Where appropriate a map type advance sign (GD9) should be used to guide vehicles through a complicated routing. See also Figure 11.24 as an additional example.

Description	Symbol for Mandatory Sign (Command or Prohibition)	Prohibition Sign
i. Vehicles Exceeding Given Mass (GVM-X tonnes)	X t	12t R202
ii. Axle Mass Load Limit X tonnes	X t	2 t R203
iii. Height Limit (X metres to 2 decimal places)	X,YZ	4,42 R204
iv. Length Limit (X metres to nearest metre)	X m	15 m R205
v. Goods Vehicles Exceeding Given Mass (GVM-X tonnes)	X t	10t R230
vii. Width Limit (X metres to 1 decimal place)	X,Y m	2,1 m R239

Fig 11.7
Heavy Vehicle Routing Based on Vehicle Characteristics - Urban

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11.3.3 Routing Based on Vehicle and/or Freight Classification

1 Under certain circumstances it may be necessary to re-route certain types of vehicles and/or vehicles carrying certain types of freight, such as various toxic materials, away from certain areas. Drivers of these vehicles must be provided with clear signing as to what alternatives are open to them.

2 For the principles applicable here, see paragraph 11.3.2.2.

3 The example given in Figure 11.8 illustrates the required signing for rerouting vehicles carrying hazardous materials. Other routing specifications may be used where appropriate as shown in this figure. The route to be taken by heavy vehicles is shaded in the figures for additional emphasis.

4 Mandatory command signs such as R108-569 or R109-569 must be used with care. The primary regulatory message used in selective restriction signs of this sort must be chosen so as to achieve the intended purpose. **As a general rule the use of an ACTION- OBJECT selective restriction combination is recommended. The use of a primary OBJECT message is NOT recommended unless the route is exclusively for the class of vehicles concerned** (see paragraph 11.1.3.4).

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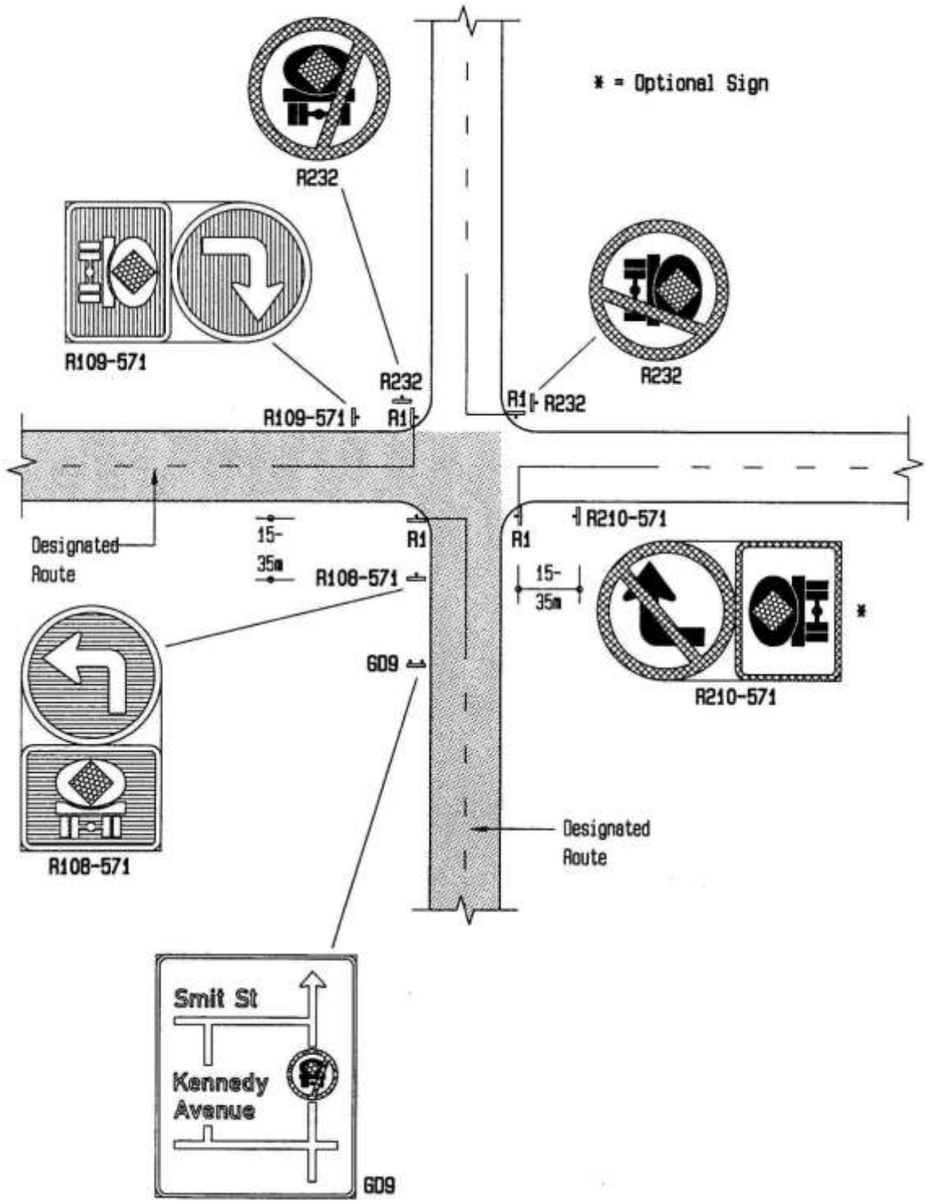

Notes for Figure 11.8

(1) Other routing specifications may be used in place of the "vehicle carrying hazardous substances" symbol. The appropriate symbols indicating the restriction would be used in the command and prohibition signs and those listed below are applicable.

(2) Where appropriate a MAP TYPE ADVANCE DIRECTION sign GD9 should be used to guide vehicles through a complicated routing (see also Figure 11.24).

Description	Symbol for Mandatory Sign (Command or Prohibition)
i. Vehicles Exceeding Given Mass (GVM-X tonnes)	X t
ii. Delivery Vehicles	
iii. Goods Vehicles	
iv. Goods Vehicles Exceeding Given Mass (GVM-X tonnes)	X t
v. Construction Vehicles	
vi. Abnormal Vehicles	A V
vii. Agricultural Vehicles	

Prohibition Signs

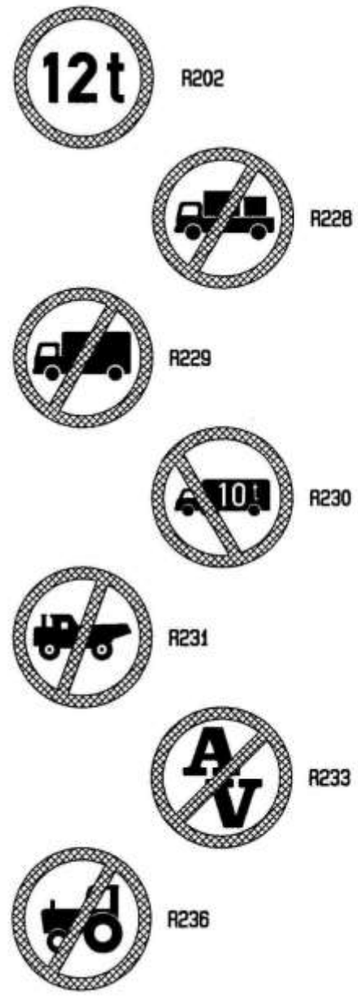

Fig 11.8
Heavy Vehicle Routing Based on Vehicle and/or Freight Classification

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11.3.4 Heavy Vehicle Route Prohibition

1 Specific circumstances may necessitate the prohibition of certain vehicles or types of freight along certain routes. Aspects of using prohibition signs have been indicated in Subsections 11.3.2 and 11.3.3 where the signs have been used in conjunction with a system of positive guidance through command signs. There are instances, however, where only prohibition signs are used, namely:

(a) prohibited exit from a freeway at a specific interchange;

(b) prohibition of access onto a minor side road;

(c) prohibition of access into a private entrance to a development such as an office park, shopping centre, townhouse complex, etc.

2 The signing for prohibiting of certain vehicles from exiting a freeway at a particular interchange is illustrated in Figure 11.9 where a ground-mounted sign system is used, and in Figure 11.10 where an overhead upward pointing arrow sign system is used. The means of indicating the prohibition is by incorporating the appropriate prohibition sign into the section of the arrow indicating the off-ramp in each of the direction signs in the sequence leading up to the off-ramp. In order to make the prohibition legally effective a ground-mounted prohibition sign shall be placed at the entrance to, and on the left side of the off-ramp as shown in the figures. A second sign on the right of the off-ramp is recommended (see Figure 11.12).

3 Where a downward pointing arrow system is used in the direction signs in advance of an interchange, the incorporation of the prohibition sign in the arrows is not possible. In such a sequence this is only possible in the arrow of the GC1 pre-advance exit direction sign. Another approach must be taken to indicate the exit prohibition as illustrated in Figure 11.11. For the example shown, this is achieved by:

(a) including a R107-569-RA sign with the GC2 sign one kilometre from the exit and with and between the GC2 and GC3 signs 500 metres from the exit;

(b) including a GS604 sign (incorporating the R230 sign) next to the GC4D sign as shown.

The example illustrated in Figure 11.11 indicates a prohibition for all goods vehicles over 10 tonnes but other alternatives for other vehicle restrictions, as indicated, are also possible. The appropriate prohibition sign shall also be ground-mounted on the left-hand side of the exit ramp. A second sign on the right of the off-ramp is recommended. The display of a ground-mounted version of a command sign such as R107-569 on the left of the through carriageway of the freeway, just beyond the GORE-EXIT sign GA4, is optional (see Figure 11.12).

4 At a minor side street junction or private access to a development where heavy vehicle access is prohibited, a selective restriction R209 sign in combination with the symbol of the prohibited vehicle should be placed immediately ahead of the entrance while a similar R210 combination sign for right-turning vehicles should be placed on the far side approach as indicated in Figure 11.12. In this example a prohibition on goods vehicles exceeding 10 tonnes is indicated. If advance indication is considered necessary, signs such as R209-569 and R210-569 can be located up to 120 m in advance of the junction or access, subject to the operating speed of the road. These signs should then be followed by signs R211-569 and R212-569 at the point of turn, as illustrated in Detail 11.12.2 in Figure 11.12.

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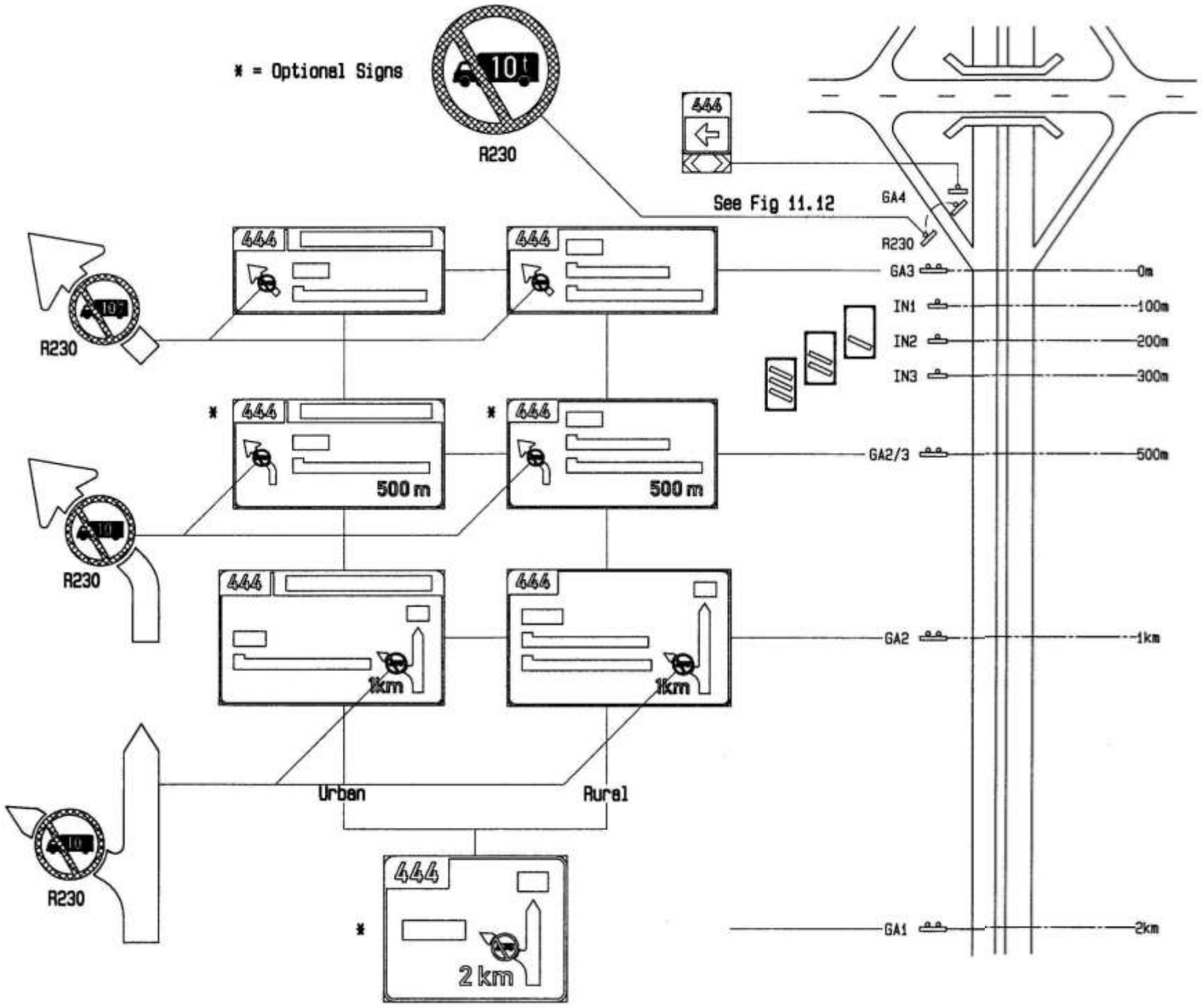

1 No Vehicles Exceeding Given MASS LIMIT (GVM)

2 No Vehicles Exceeding HEIGHT LIMIT Indicated

3 No Vehicles Exceeding LENGTH LIMIT Indicated

4 NO GOODS VEHICLES

5 NO GOODS VEHICLES OVER INDICATED GVM

6 NO VEHICLES CONVEYING DANGEROUS GOODS

7 ABNORMAL VEHICLES

8 No Vehicles Exceeding WIDTH LIMIT Indicated

Notes for Figure 11.9

(1) The example given indicates a prohibition for goods vehicles exceeding 10 tonnes to exit at the next interchange.

(2) Other prohibitions may be used where appropriate. The following signs are applicable for incorporation into the direction signs in advance of the interchange.

Fig 11.9
Heavy Vehicle Prohibition at a Freeway Offramp – Ground Mounted Sign Sequence

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Notes for Figure 11.10

(1) The example given indicates a prohibition for goods vehicles exceeding 10 tonnes to exit at the next interchange.

(2) Other prohibitions may be used where appropriate. The following signs are applicable for incorporation into the direction signs in advance of the interchange.

1 No Vehicles Exceeding Given MASS LIMIT (GVM)

2 No Vehicles Exceeding HEIGHT LIMIT Indicated

3 No Vehicles Exceeding LENGTH LIMIT Indicated

4 NO GOODS VEHICLES

5 NO GOODS VEHICLES OVER INDICATED GVM

6 NO VEHICLES CONVEYING DANGEROUS GOODS

7 ABNORMAL VEHICLES

8 No Vehicles Exceeding WIDTH LIMIT Indicated

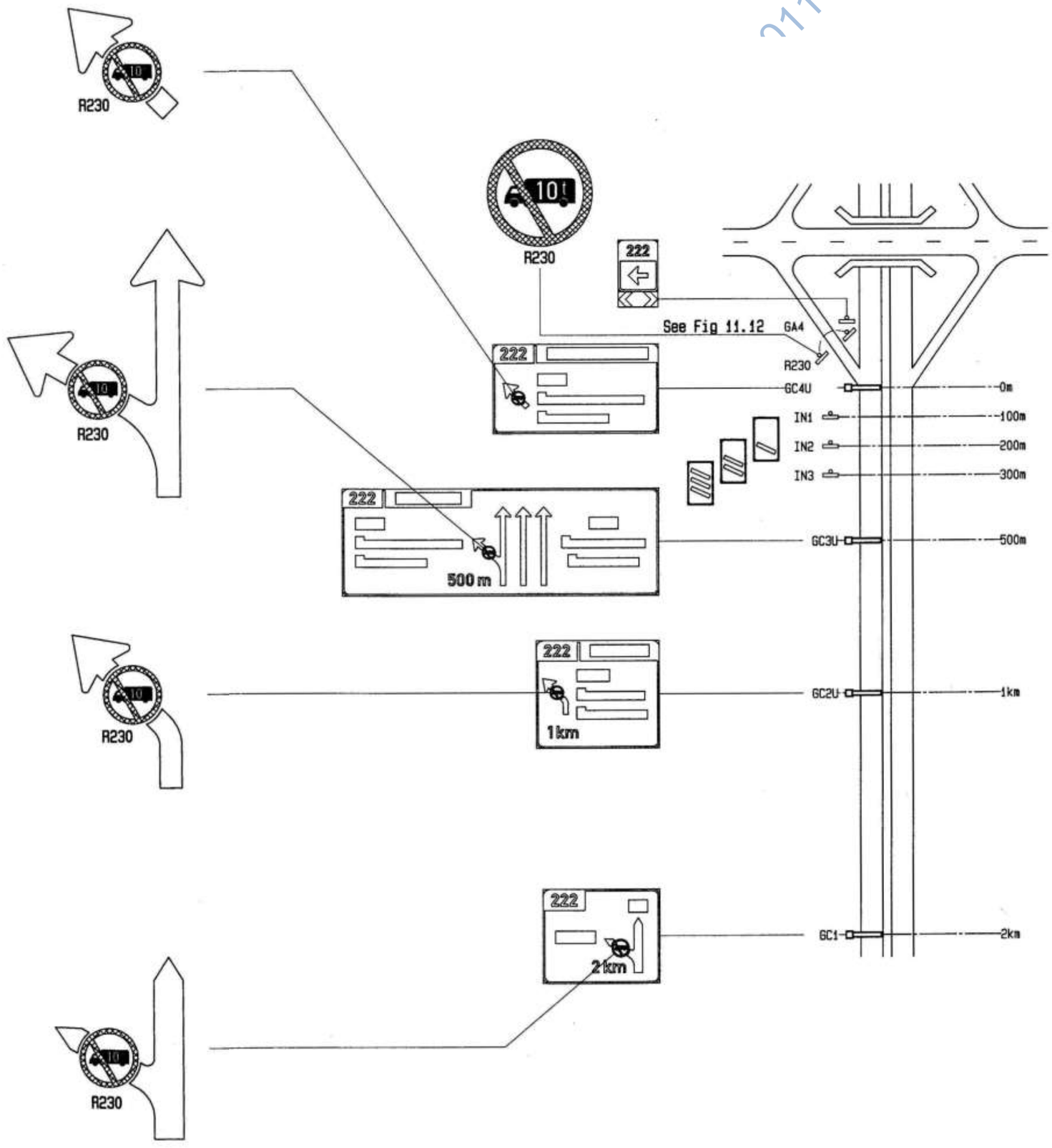
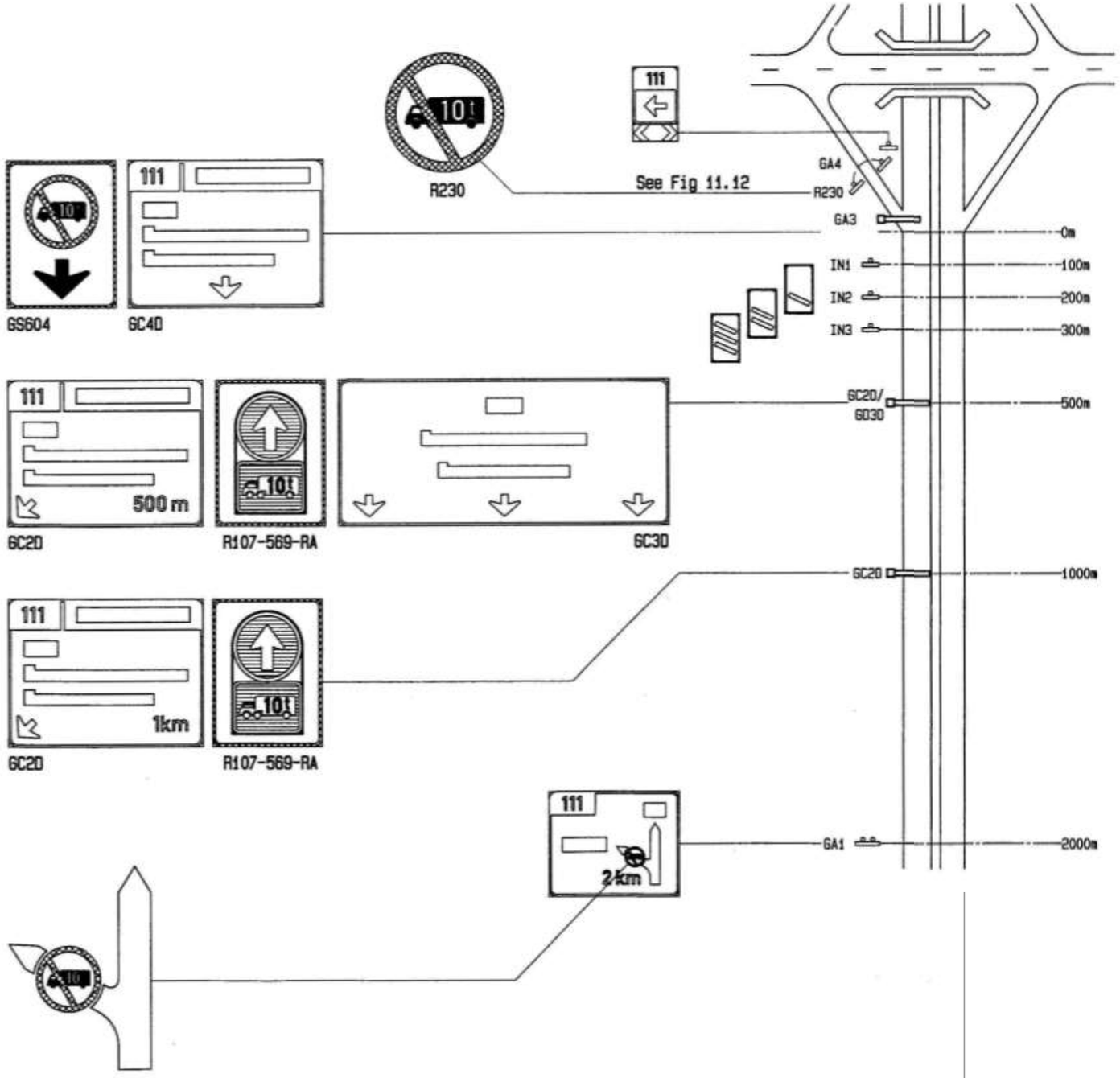


Fig 11.10
Heavy Vehicle Prohibition at a Freeway Offramp – Overhead Signs: Upward Pointing Arrows



1 No Vehicles Exceeding Given MASS LIMIT (GVM)

2 No Vehicles Exceeding HEIGHT LIMIT Indicated

3 No Vehicles Exceeding LENGTH LIMIT Indicated

4 NO GOODS VEHICLES

5 NO GOODS VEHICLES OVER INDICATED GVM

6 NO VEHICLES CONVEYING DANGEROUS GOODS

7 ABNORMAL VEHICLES

Notes for Figure 11.11

(1) The example given indicates a prohibition for goods vehicles exceeding 10 tonnes to exit at the next interchange.

(2) Other prohibitions may be used where appropriate. The following signs are applicable for incorporation into the direction signs in advance of the interchange.

Fig 11.11
Heavy Vehicle Prohibition at a Freeway Offramp – Overhead Signs: Downward Pointing Arrows

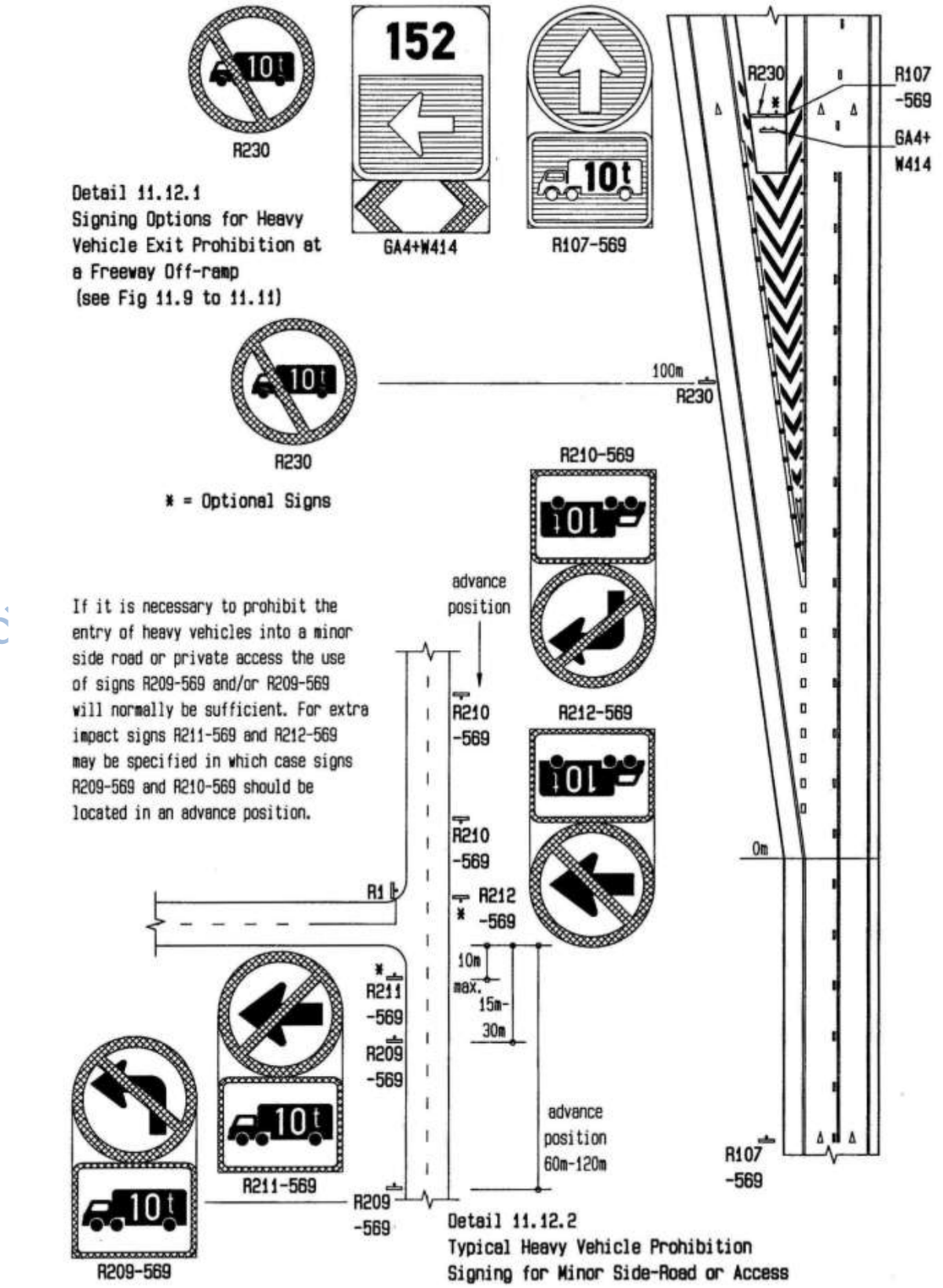


Fig 11.12 Local Details of Heavy Vehicle Prohibitions

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11.3.5 Lane Use Control in Relation to Steep Up-grades

1 Long up-grades tend to slow down vehicles, especially heavy vehicles, and in order to maintain high levels of service, it is generally expedient in such areas to separate the slower and fast moving traffic. An integral part of effectively separating the slow traffic is achieved through signing.

2 The separation of traffic may be accomplished in one of the following two ways:

(a) the prohibition of use of certain lanes by heavy vehicles;

(b) the mandatory use of certain lanes by a specific class of vehicle (which prohibits their use by other classes of vehicle).

3 The signing required is illustrated as follows:

(a) Figure 11.13 indicates the requirements for lane use control on multilane undivided roads using ground-mounted signs;

(b) Figure 11.14 indicates the requirements for lane use control on freeways and multilane divided roads using ground-mounted signs.

(c) Figure 11.15 indicates the requirements for lane use control on freeways using overhead signs.

4 Command signs incorporated into the diagrammatic sign **shall only be used when the lane so designated is for the exclusive use of the vehicle type indicated.**

5 If the exclusive use of a lane by the class of vehicle to be controlled is not practical due to the mix of traffic using the road, effective control may be achieved by specifying an appropriate MINIMUM SPEED in the right side lane (or centre and right side lanes on a 3-lane roadway). To achieve such control, command MINIMUM SPEED sign R101 can be placed in a diagrammatic sign GS303 or GS305, as appropriate. The value of minimum speed to be displayed should be determined as a result of an engineering assessment of the specific site, but it is likely to be higher than normally used on sign R101, typically in the range of 60 km/h to 80 km/h.

6 Signs are required as follows:

(a) at a minimum distance of 5 km apart where the affected distance is longer than 5 km; and

(b) in the case of freeways, immediately after every interchange.

7 With regard to construction vehicles, where relevant, temporary signing may be used during the construction period.

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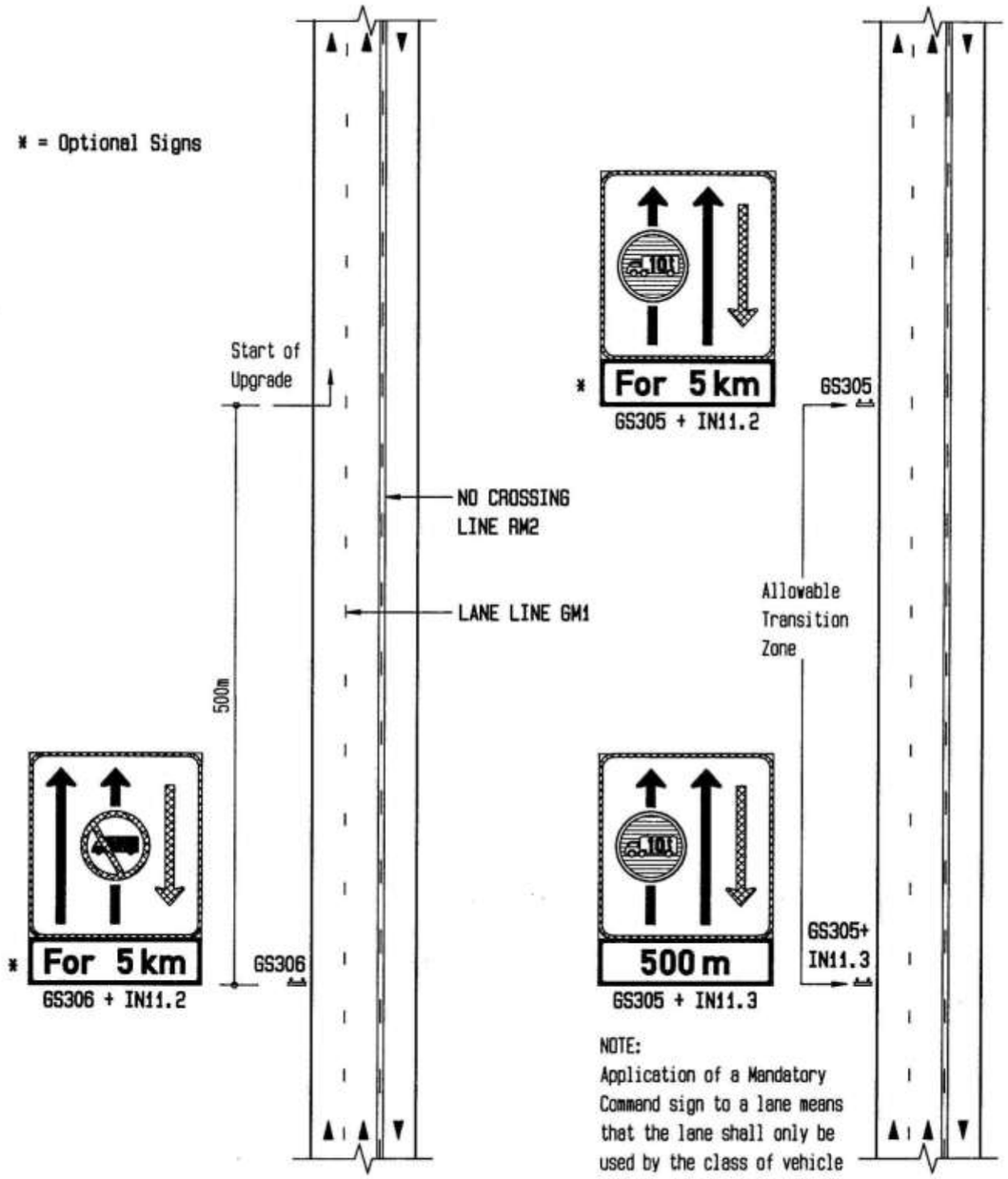
Notes for Figure 11.13

(1) The examples illustrated in this figure are related to "goods" vehicles over a mass of 10 tonnes.

(2) Other command and prohibition signs may be used where relevant in the diagrammatic signs and the range of these is as follows:

Description	Command Sign	Prohibition Sign
i. Vehicles Exceeding Given Mass	R102	R202
ii. Goods Vehicles	R123	R229
iii. Goods Vehicles Exceeding Given Mass	R124	R230
iv. Vehicles Carrying Dangerous Goods	R126	R232
v. Abnormal Vehicles	R127	R233
vi. Construction Vehicles	TR125	TR231

Detail 11.13.1 Typical Lane Use Control Regulatory Signs



Detail 11.13.2 Lane Use Prohibition (Prohibition Sign)

Detail 11.13.3 Mandatory Use of Lane (Command Sign)

Fig 11.13
Lane Use Control on Multi-lane Undivided Roads – Ground Mounted Signs

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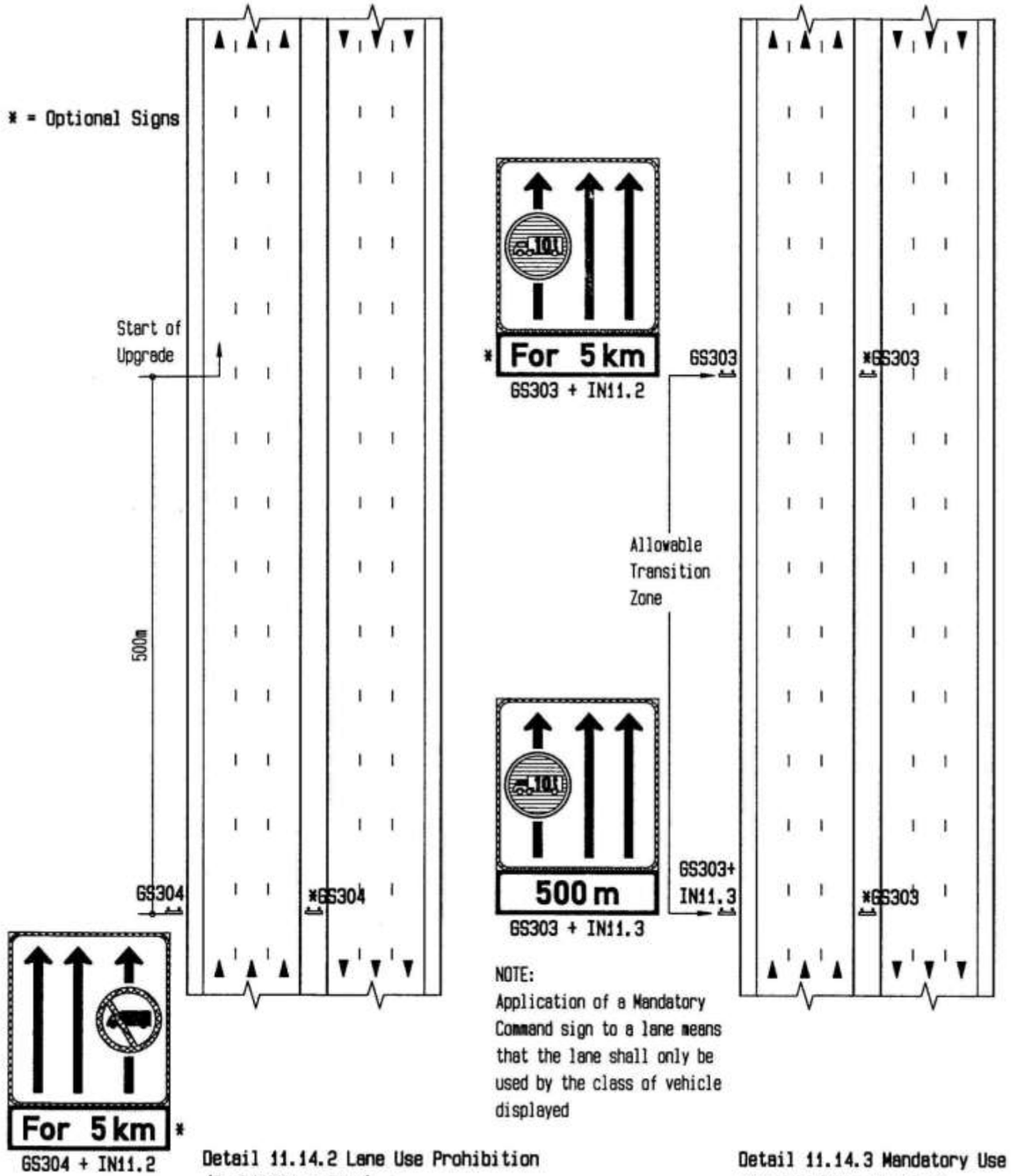


Detail 11.14.2 Lane Use Prohibition (Prohibition Sign)

Detail 11.14.3 Mandatory Use of Lane (Command Sign)

Notes for Figure 11.14

(1) The examples illustrated in this figure are related to "goods" vehicles over a mass of 10 tonnes.

(2) Other command and prohibition signs may be used where relevant in the diagrammatic signs and the range of these is as follows:

Description	Command Sign	Prohibition Sign
i. Vehicles Exceeding Given Mass	R102	R202
ii. Goods Vehicles	R123	R229
iii. Goods Vehicles Exceeding Given Mass	R124	R230
iv. Vehicles Carrying Dangerous Goods	R126	R232
v. Abnormal Vehicles	R127	R233
vi. Construction Vehicles	TR125	TR231

Detail 11.14.1 Typical Lane Use Control Regulatory Signs

Fig 11.14
Lane Use Control on Freeways and Divided Multi-lane Roads – Ground Mounted Signs

Reproduced

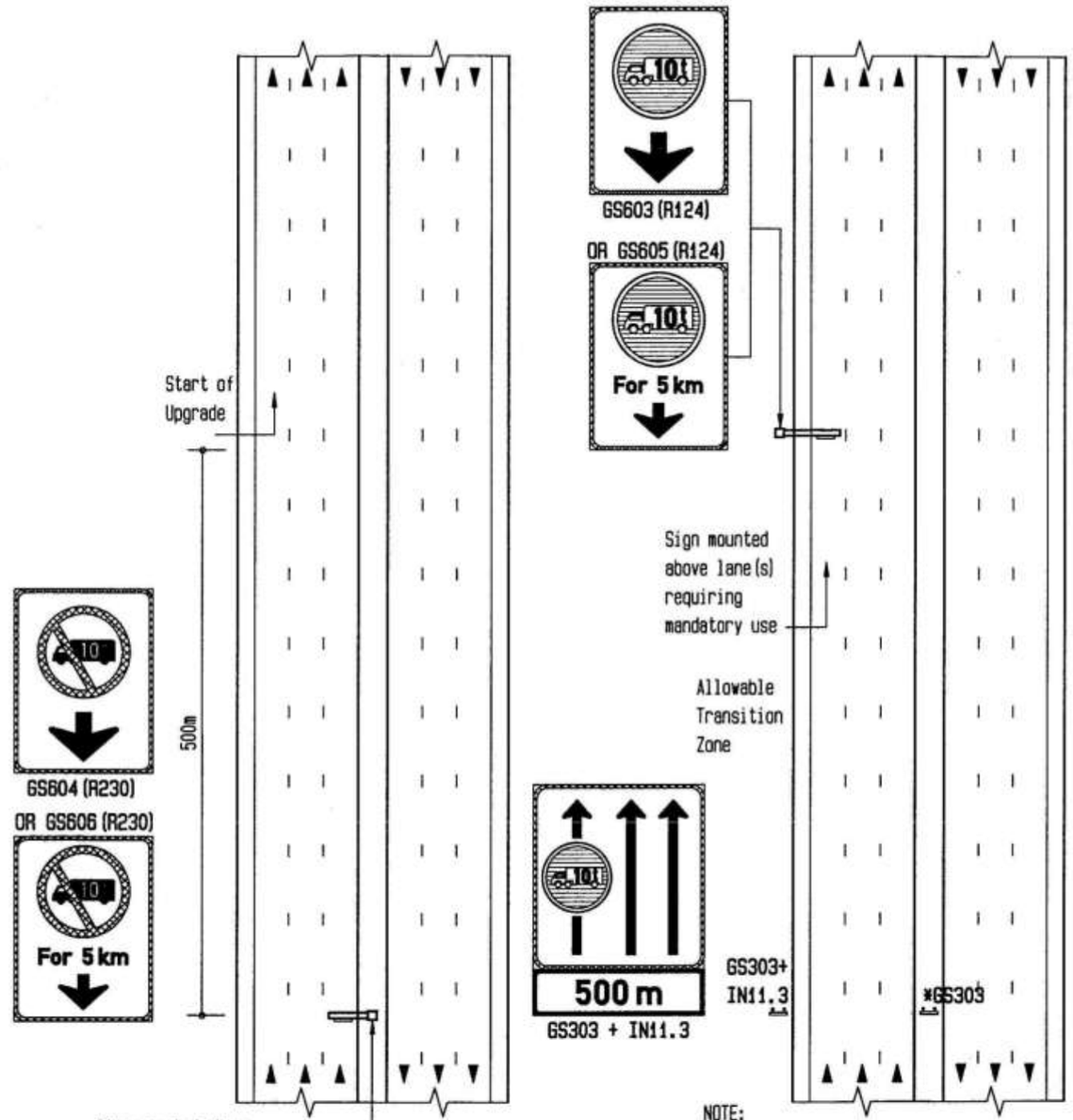
Notes for Figure 11.15

(1) The examples illustrated in this figure are related to "goods" vehicles over a mass of 10 tonnes.

(2) Other command and prohibition signs may be used where relevant in the diagrammatic signs and the range of these is as follows:

Description	Command Sign	Prohibition Sign
i. Vehicles Exceeding Given Mass	R102	R202
ii. Goods Vehicles	R123	R229
iii. Goods Vehicles Exceeding Given Mass	R124	R230
iv. Vehicles Carrying Hazardous Substances	R126	R232
v. Abnormal Vehicles	R127	R233
vi. Construction Vehicles	TR125	TR231

Detail 11.15.1 Typical Lane Use Control Regulatory Signs



Detail 11.15.2 Lane Use Prohibition (Prohibition Sign)

Detail 11.15.3 Mandatory Use of Lane (Command Sign)

Fig 11.15
Lane Use Control on Freeways - Overhead Signs

11.3.6 Lane and Vehicle Control in Relation to Steep Down-grades

1 A potentially dangerous situation exists for heavy vehicles on steep and/or long down-grades and effective warning of the approach of such down-grades in order to slow down the vehicles timeously to enable the engaging of a low gear is essential.

2 The following figures illustrate various aspects related to the signing in advance of a steep down-grade:

(a) Figure 11.16 indicates typical requirements for a two-lane two-way roadway;

(b) Figure 11.17 indicates typical requirements for a freeway or multilane divided road;

(c) Figure 11.18 indicates typical requirements where there is a compulsory heavy vehicle stop ahead, in advance of the start of the down-grade on a freeway or multilane divided road, using ground-mounted signs;

(d) Figure 11.19 indicates typical requirements where there is a compulsory heavy vehicle stop ahead, in advance of the start of the down-grade on a freeway or multilane divided road, using overhead signs.

3 Figure 11.16 illustrates the situation where no special provisions are made for the heavy vehicles in the way of an exclusive crawler lane, and thus it is advisable to provide the SLOW MOVING TRAFFIC advance warning sign W324 at the start of the down-grade rather than the advance warning of a STEEP DESCENT sign W322. The maximum speed allowable will be dictated by the horizontal geometric design of the down-grade. On long down-grades the W324 and the R201 signs should be repeated at regular intervals of not more than 2 km.

4 Figure 11.17 illustrates the situation where an exclusive crawler lane is provided for the heavy vehicles. For a situation where heavy vehicles are prohibited from the right-hand lane but all vehicles may use the left-hand lane, then the GS301 or GS303 sign incorporating the R124 sign located at 500 m and 800 m from the start of the steep descent should be omitted.

5 Figure 11.18 illustrates the situation where a mandatory heavy vehicle stop is provided in advance of the steep down-grade, and heavy vehicles are required to use an exclusive crawler lane on the down-grade. The provision of a stop is desirable in advance of long and/or steep down-grades and this situation is preferable to that indicated in Figure 11.17.

6 Figure 11.19 illustrates the situation on a multilane freeway where a mandatory heavy vehicle stop is provided in advance of the steep down-grade, and an exclusive crawler lane for heavy vehicles is provided.

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* THE BASIC MINIMUM
Advance Warning of a Steep Descent

* OTHER POSSIBLE SIGNS ARE:

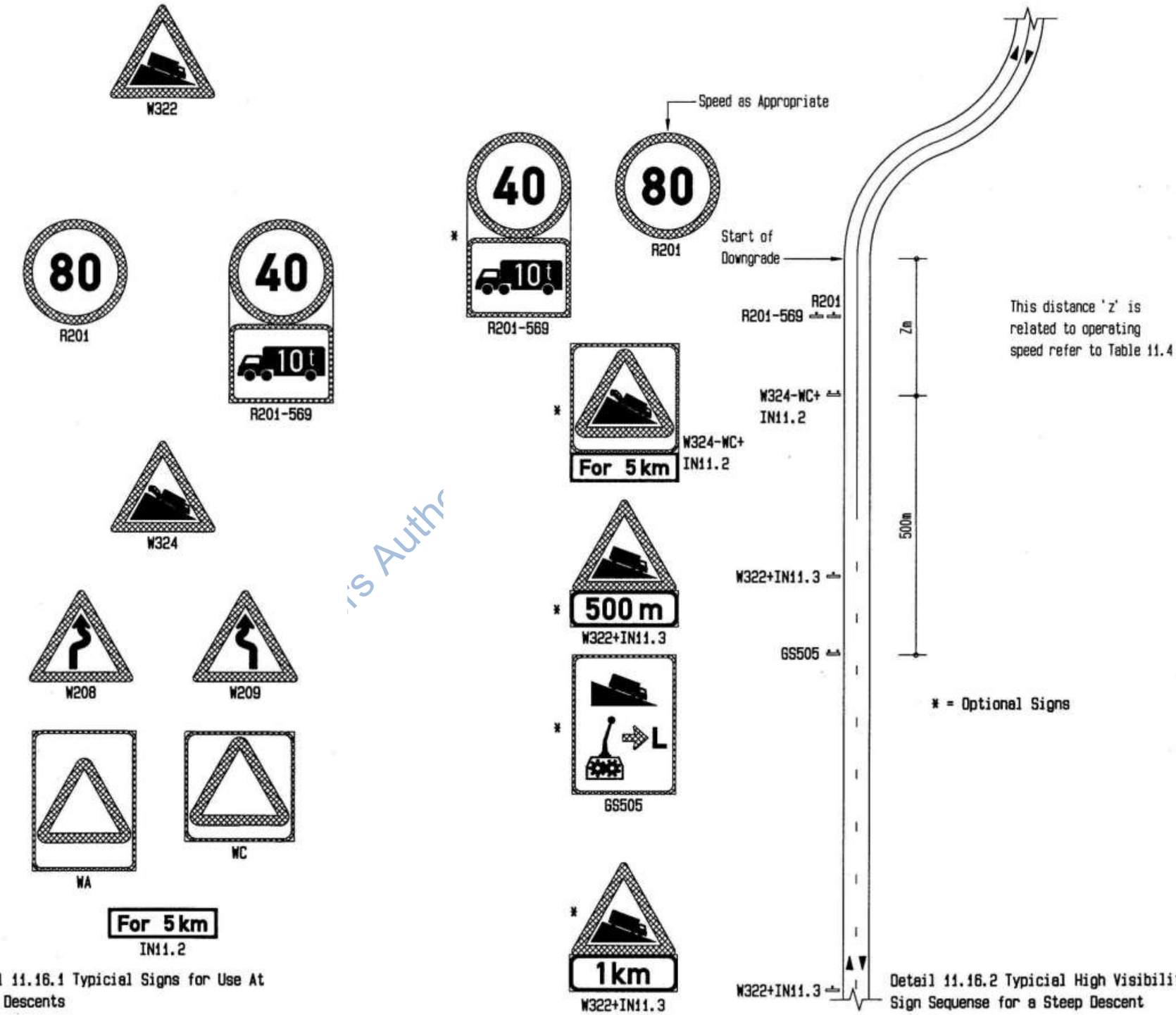
i. Maximum Speed (regulatory)
R201 for General Traffic
R201-314 for Specific Class of Traffic
(Selective Restriction Sign)

ii. Slow Moving Vehicles (Advance Warning)

iii. Winding Road (Advance Warning)

iv. High Visibility Background Sign

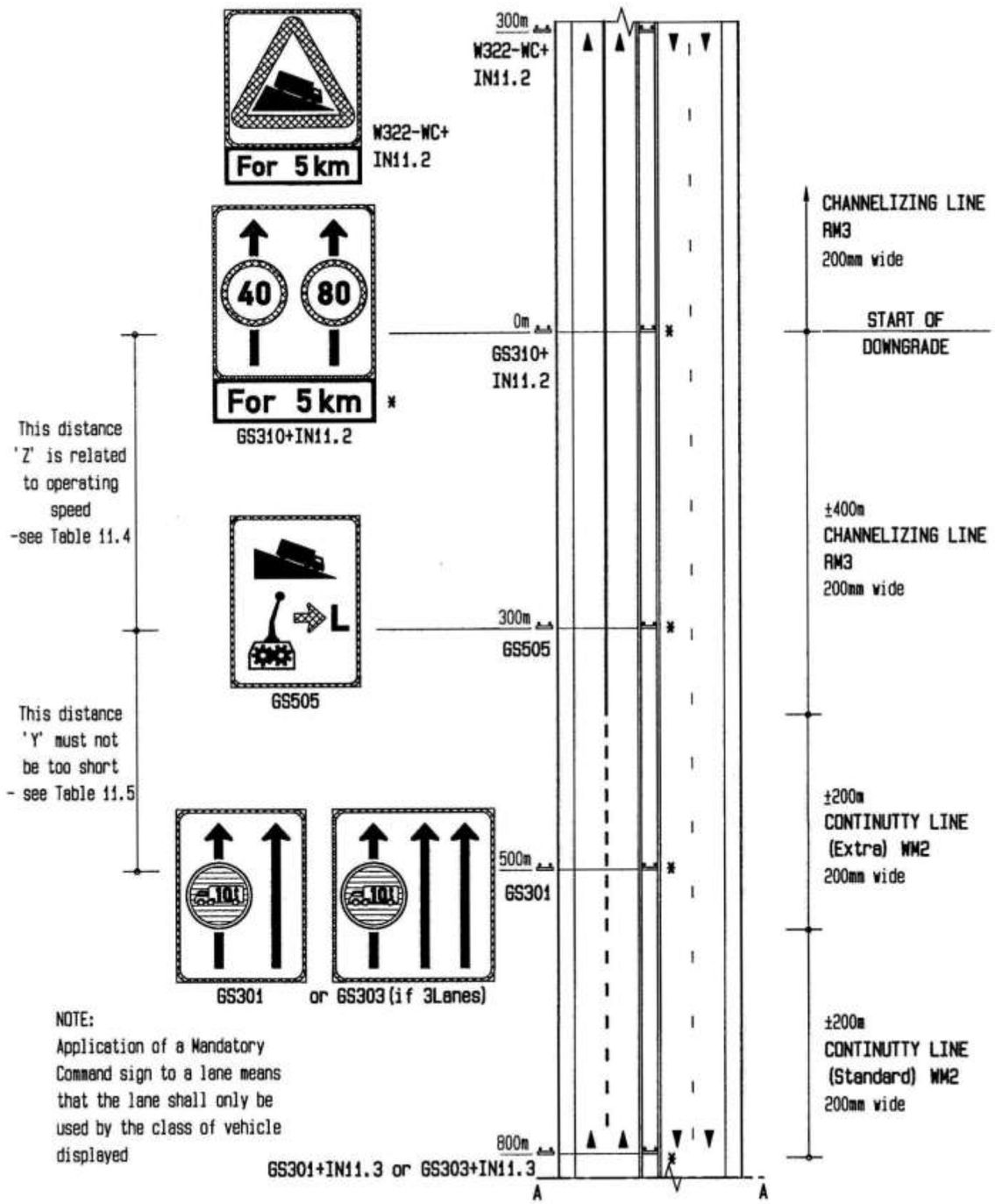
v. Supplementary (nformation) Plates
- 'For Distance Y'



Detail 11.16.1 Typicial Signs for Use At Steep Descents

Detail 11.16.2 Typicial High Visibility Sign Sequense for a Steep Descent

Fig 11.16
Steep Downgrades – Two Lane/Two-way Roads



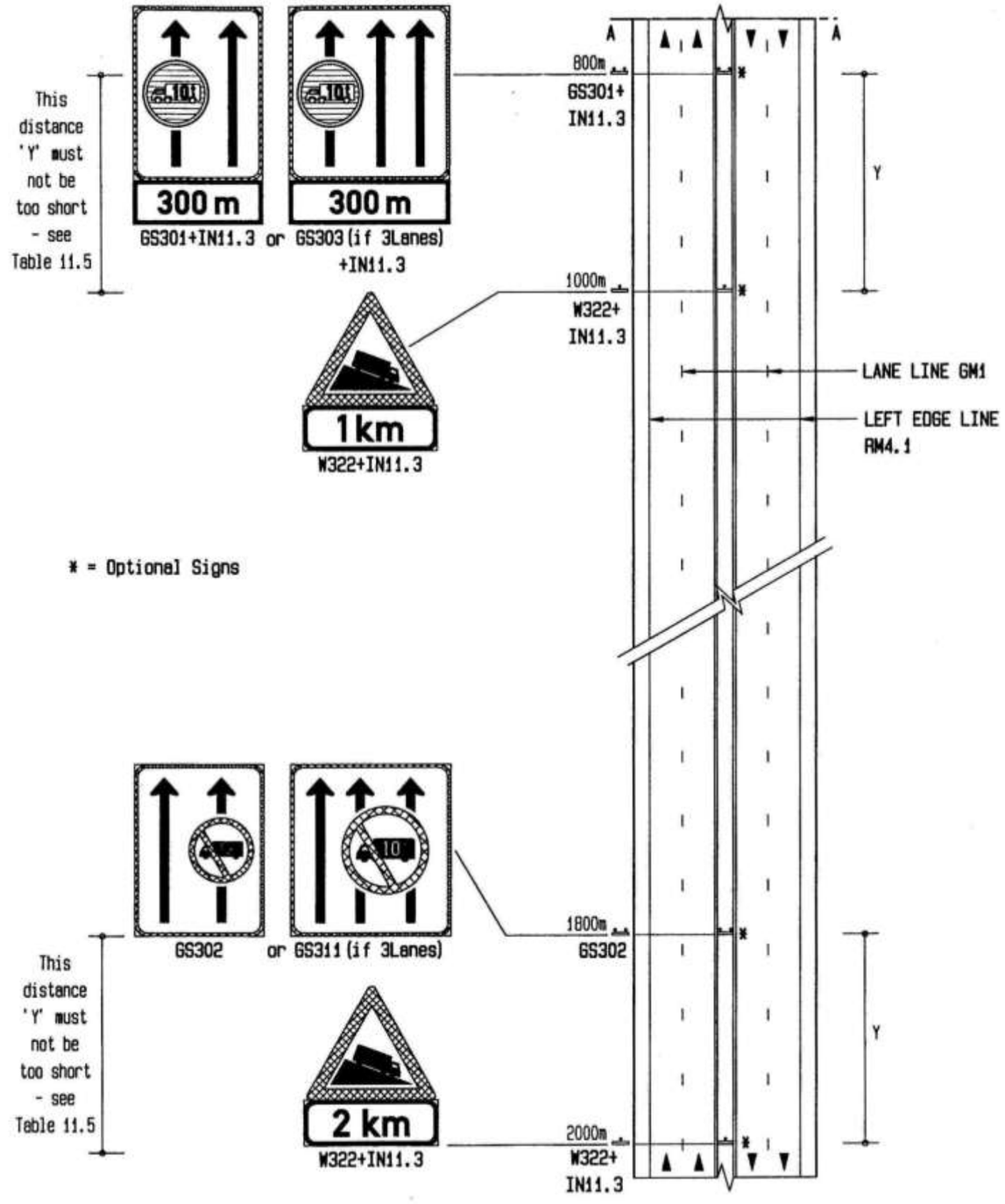


Fig 11.17
Steep Downgrades – Freeway and Multilane Divided Roads

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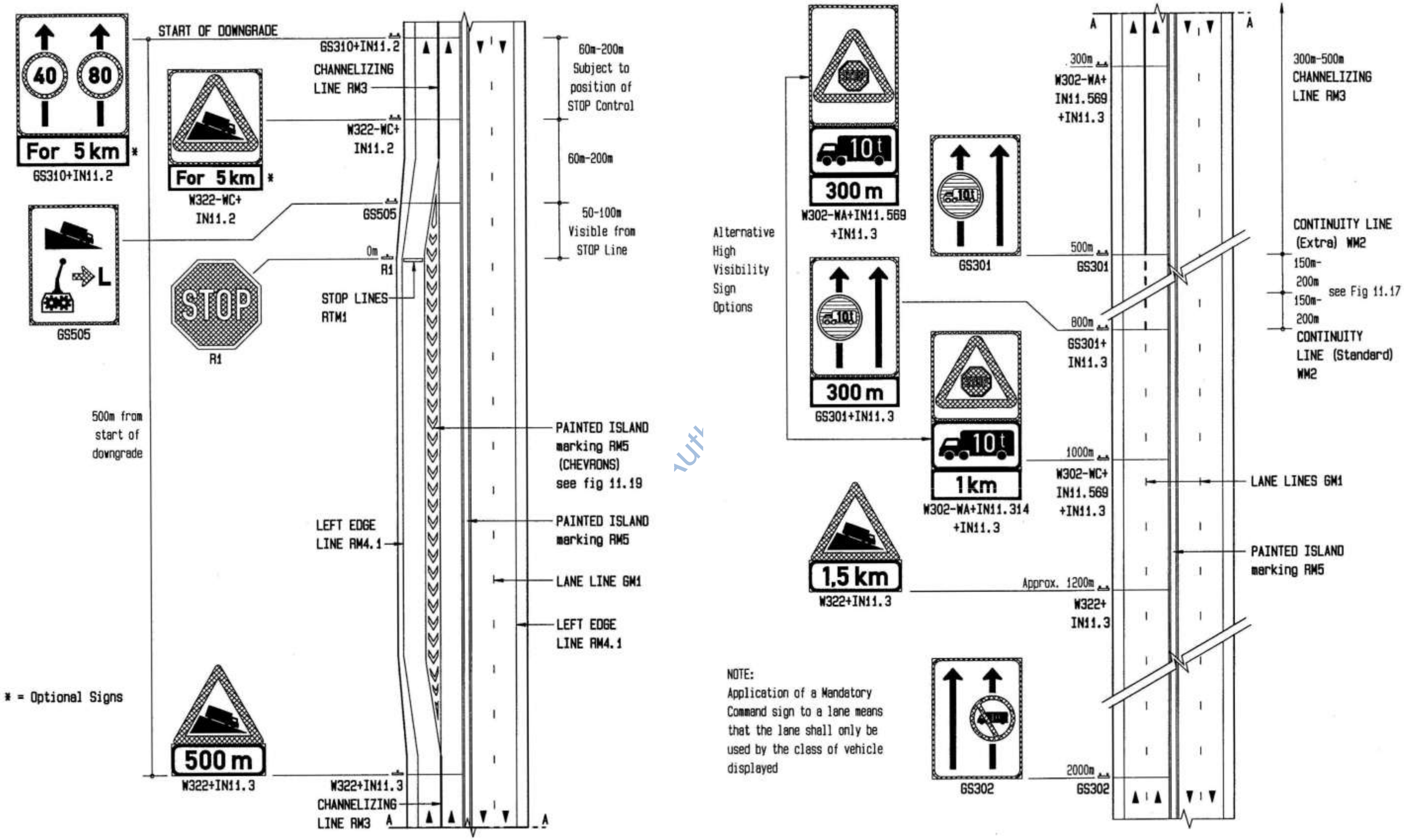

Fig 11.18
Compulsory Stopping Area in Advance of Steep Downgrade – Ground Mounted Signs

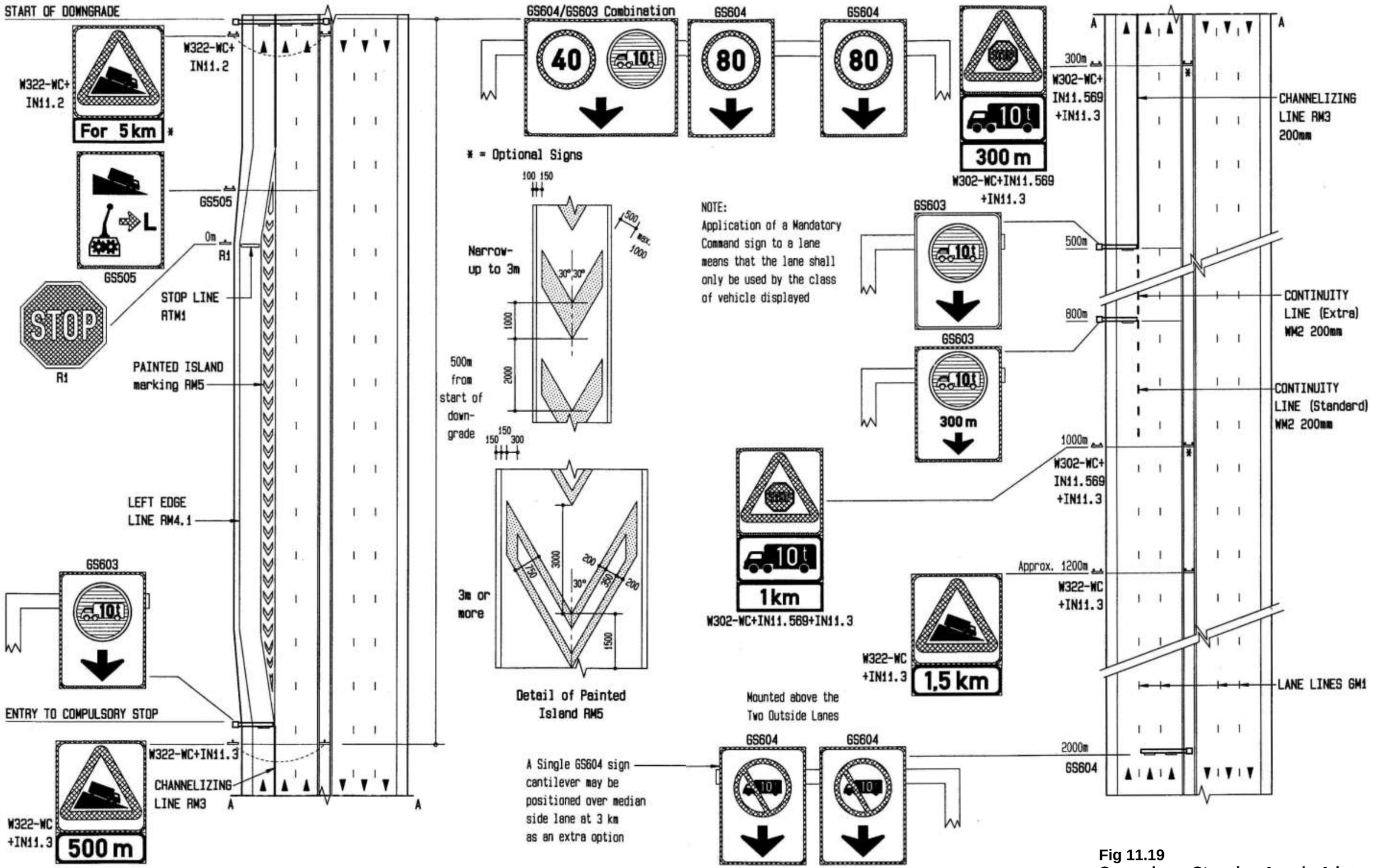

Fig 11.19
Compulsory Stopping Area in Advance of Steep Downgrade – Overhead Signs

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11.3.7 Arrestor Beds/Escape Roads

1 On long and/or steep down-grades, arrestor beds or escape roads should be provided as a safe escape device for out of control heavy vehicles. The signing to advise drivers of heavy vehicles of the approach of an arrestor bed or escape road is as illustrated in Figure 11.20 and Figure 11.21.

2 Figure 11.20 illustrates the signing requirements on an arrestor bed approach using ground-mounted signs while Figure 11.21 illustrates the signing requirements on the approach to an arrestor bed on a freeway using overhead signs. Similar signing may be used on the approach to an escape road (see paragraph 11.3.7.5).

3 On two-way single lane roads the arrestor bed should have a left-hand exit unless the lanes are split as indicated in Figure 11.20.

4 Figure 11.22 illustrates the special markings required at an arrestor bed. In addition to the paint markings, white roadstuds are to be placed along the outside edge of the arrestor bed apron for clear demarcation of the arrestor bed at night or in misty weather.

5 Figure 11.23 shows the special markings required when an escape road is provided. The function of an escape road is to provide an unobstructed path through what would otherwise be a physical barrier across a roadway, on, or at the end of, a long and/or steep downgrade. The most likely application is at a toll plaza spanning the full width of the plaza apron. The route of the escape road, and its position through the plaza should be as direct as possible so that a heavy vehicle driver is not required to significantly change direction of a runaway vehicle on the approach to the plaza. The purpose of road marking WM9.2 is to make this direct path obvious.

6 Subject to expected weather conditions at an arrestor bed i.e. mist or fog, the reduced area of coverage of marking WM9.2 may be considered at arrestor beds.

7 Due to the relatively small size of ARRESTOR BED symbol GSS1 on signs GS501 to GS504 it is recommended that the same symbol be used for signs provided for both arrestor beds and escape routes.

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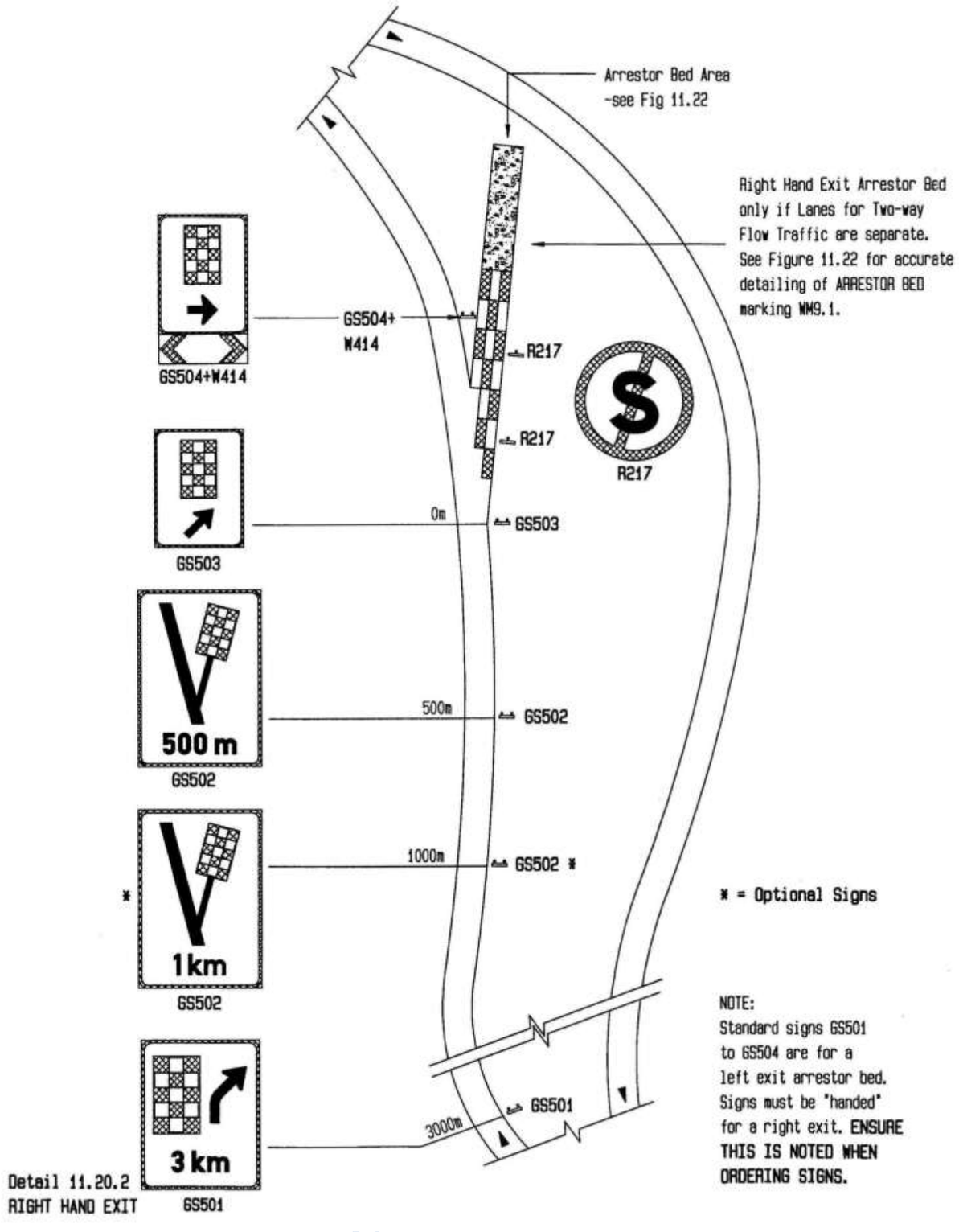
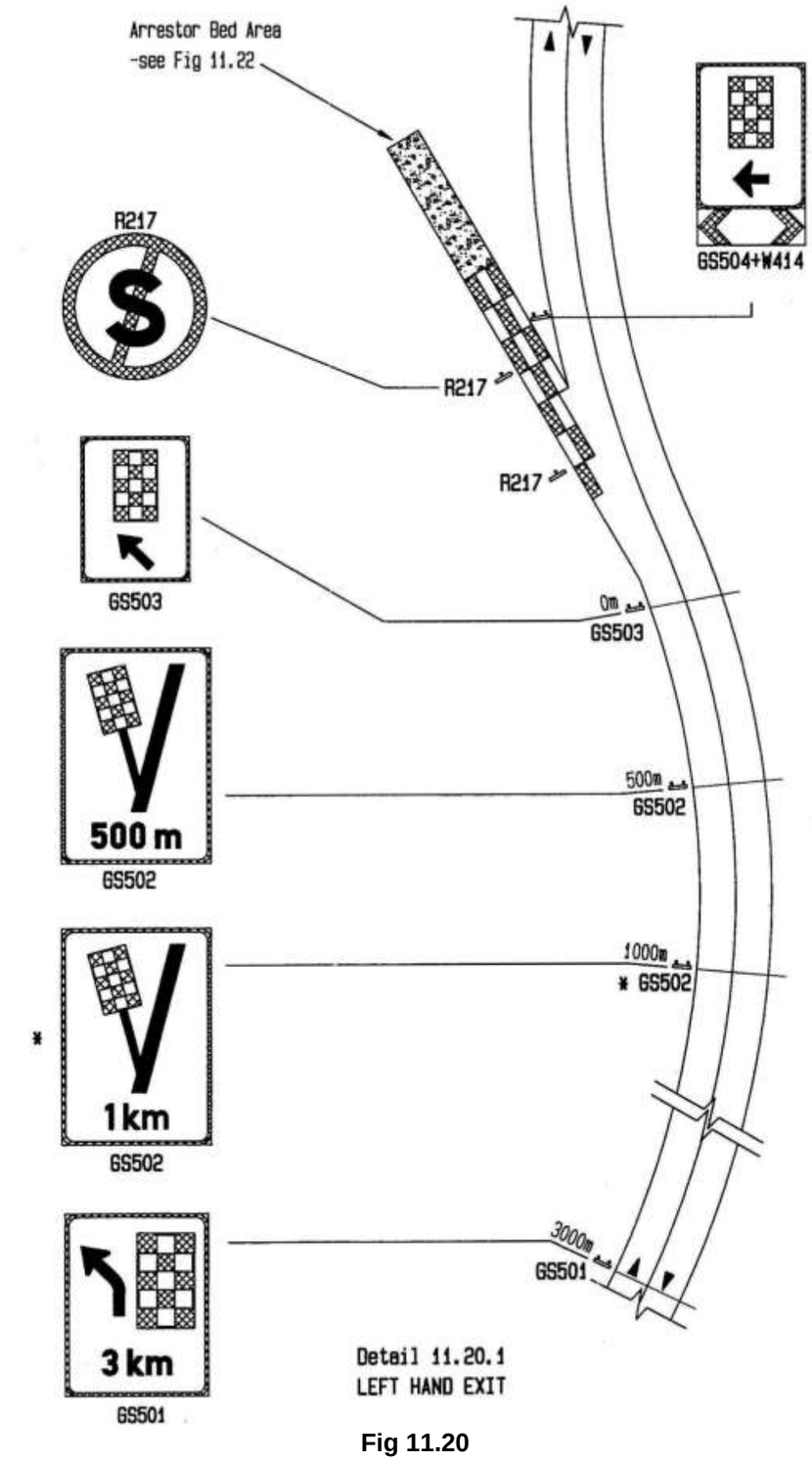


Detail 11.20.2
RIGHT HAND EXIT



Detail 11.20.1
LEFT HAND EXIT

Fig 11.20
Signing for Arrestor Beds – Ground Mounted Signs

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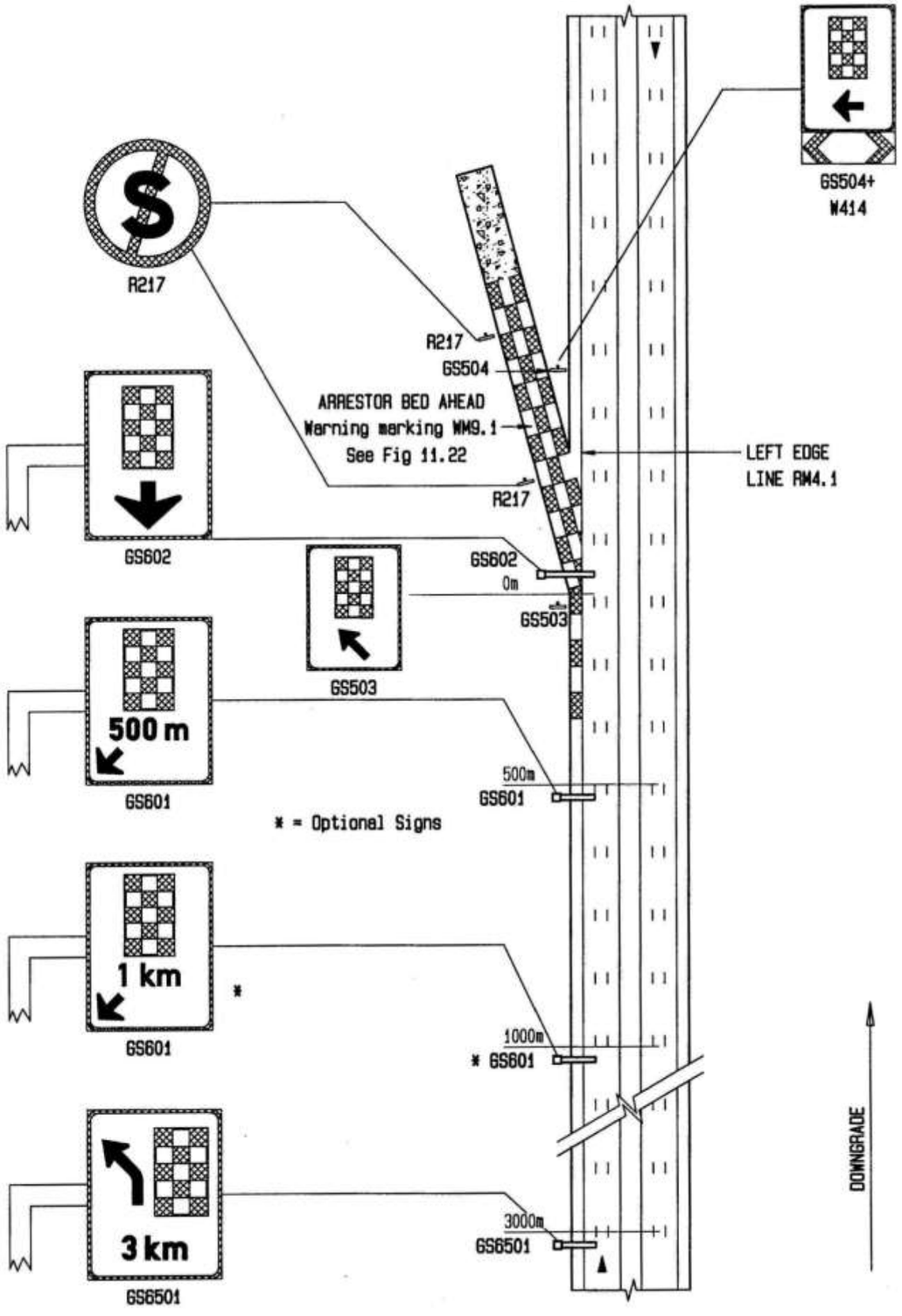

Fog 11.21 **Signing for Arrestor Bed – Overhead Signs**

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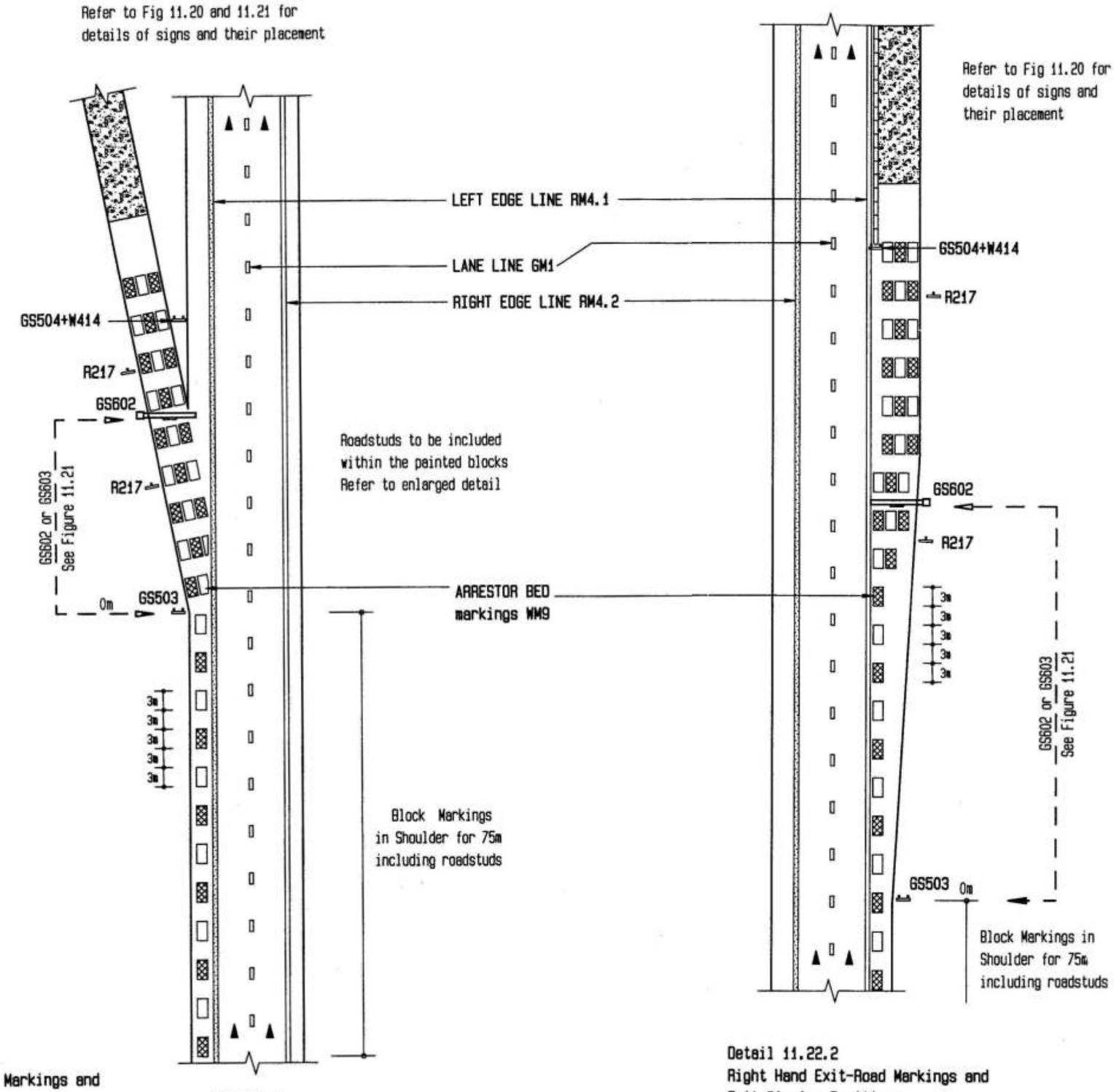
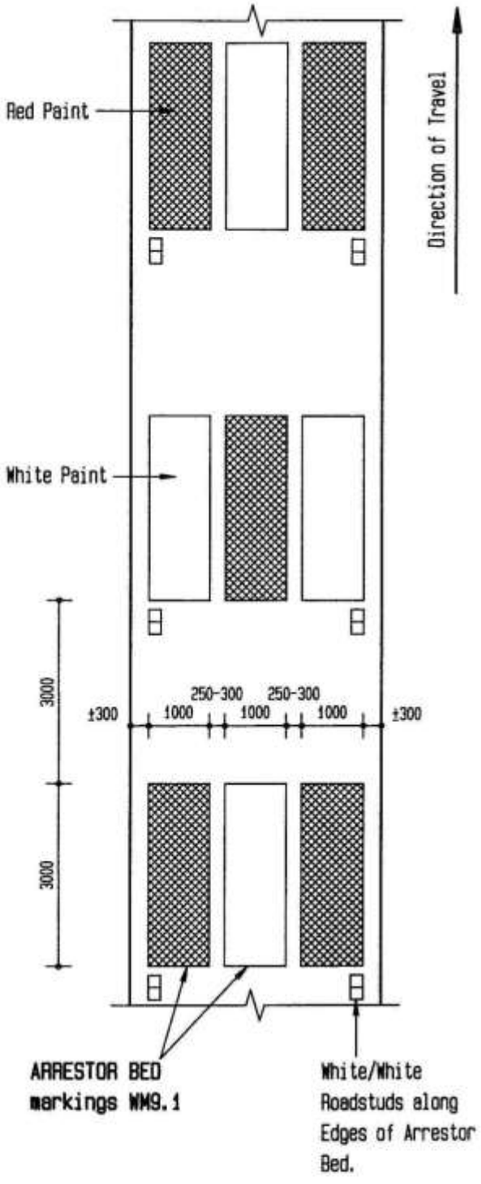


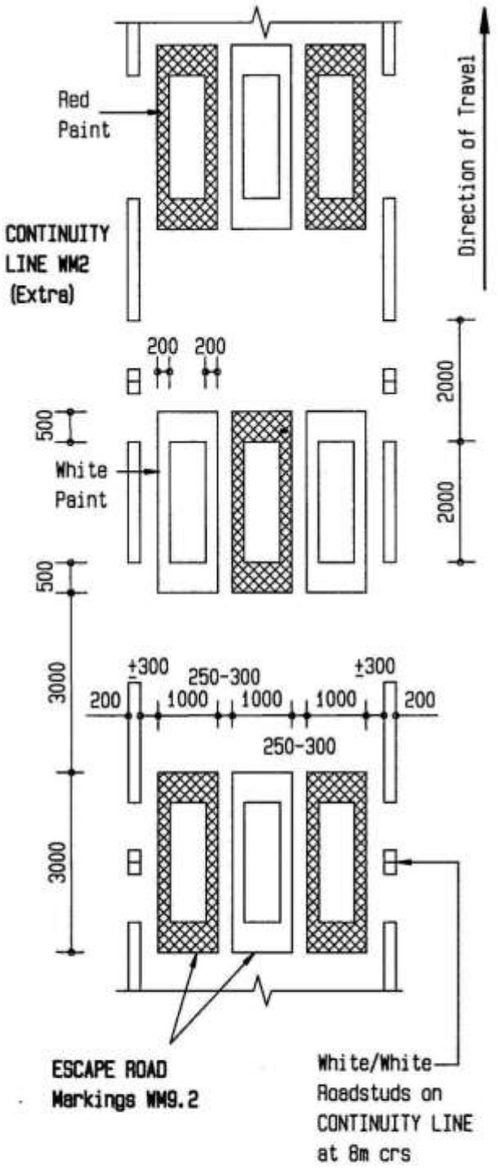
Detail 11.22.1
Left Hand Exit-Road Markings and Exit Signing Positions

Detail 11.22.2
Right Hand Exit-Road Markings and Exit Signing Positions



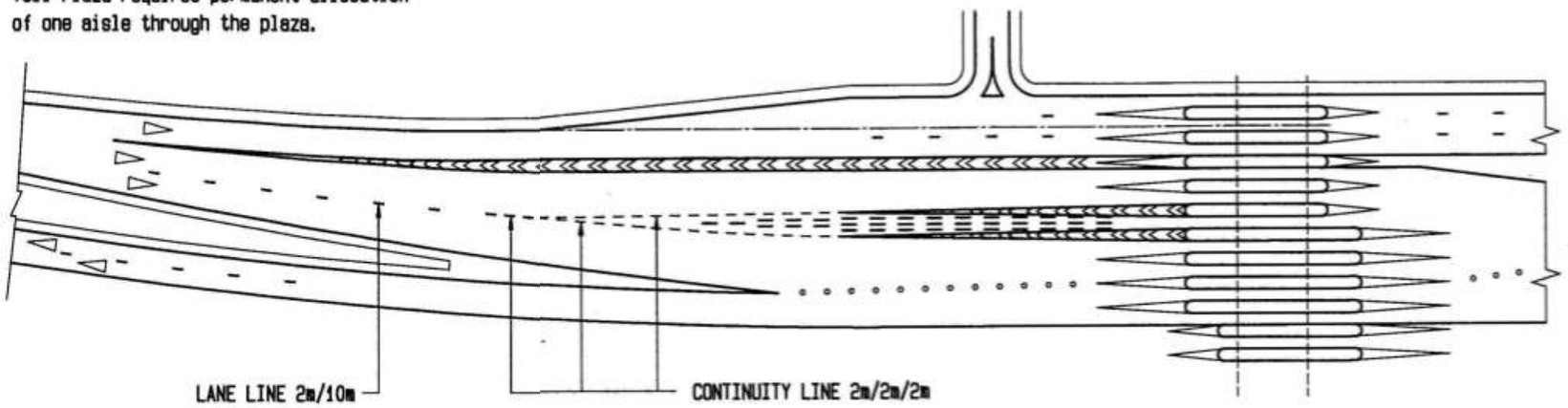
Detail 11.22.3
Arrestor Bed Block Road Markings and Roadstuds

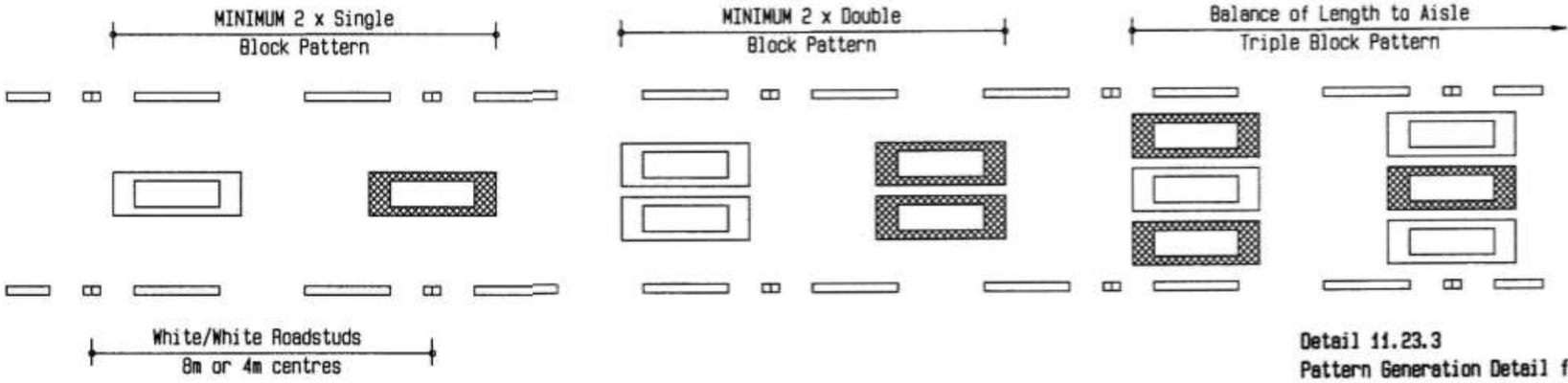
Fig 11.22
Arrestor Bed Road Markings



Detail 11.23.1
Escape Road
Markings and Roadstuds

Detail 11.23.2
Typical Escape Road Treatment at a
Toll Plaza-requires permanent allocation
of one aisle through the plaza.





Detail 11.23.3
Pattern Generation Detail for
Escape Road Marking WM9.2

Detail 11.23.4
Optional use of Marking WM9.2
at an Arrestor Bed (reduced
area of paint coverage)

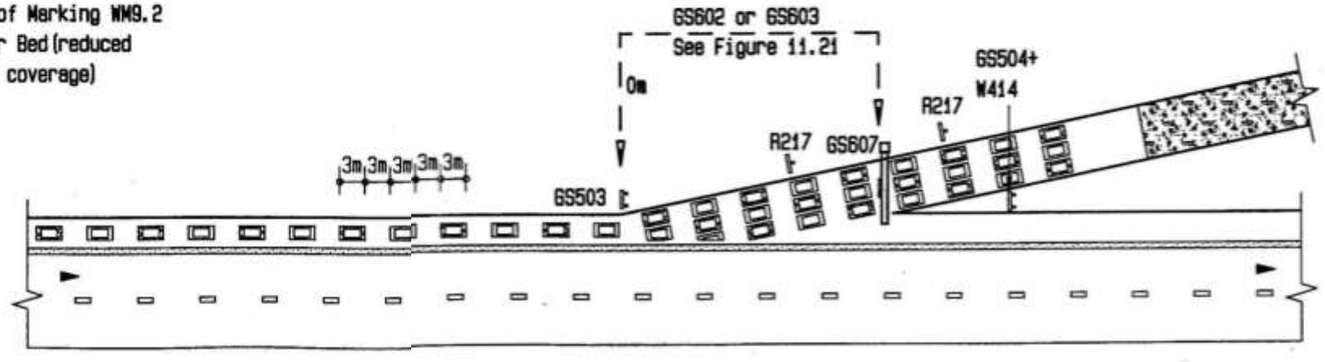


Fig 11.23
Escape Road Markings

11.3.8 Compulsory Use of a Mass Measuring Station

1 The approach to a mass measuring station should be signed as illustrated in Figure 11.24. If the mass measuring station is not permanently manned, allowance should be made for signs to be covered up or removed when the mass measuring station is not operational.

2 On single lane two-way traffic roads carrying heavy volumes of traffic an additional deceleration lane, at least 300 metres long, should be provided on the approach to the mass measuring station entrance for the heavy vehicles (see Detail 11.24.2).

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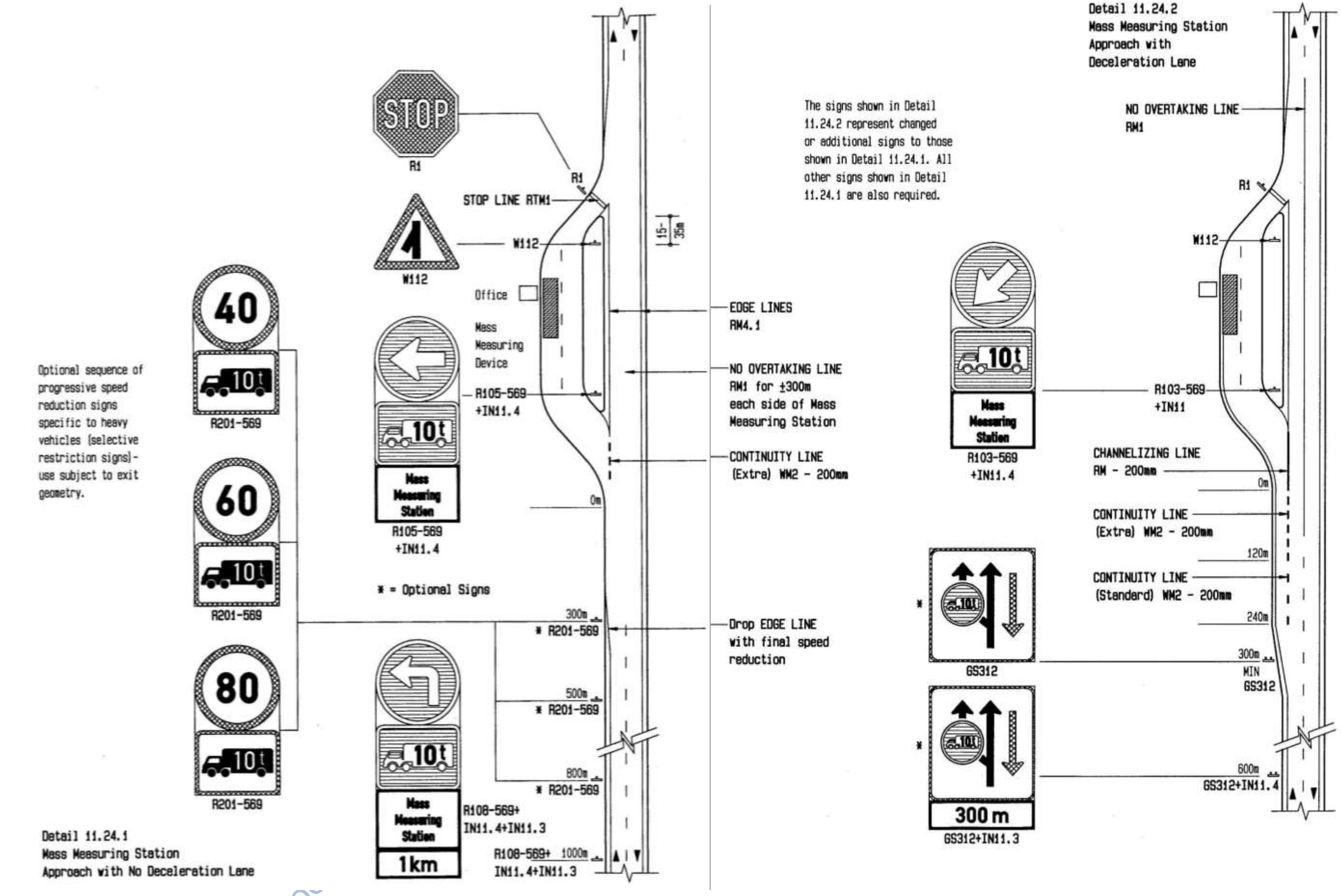

Fig 11.24
Mass Measuring Station

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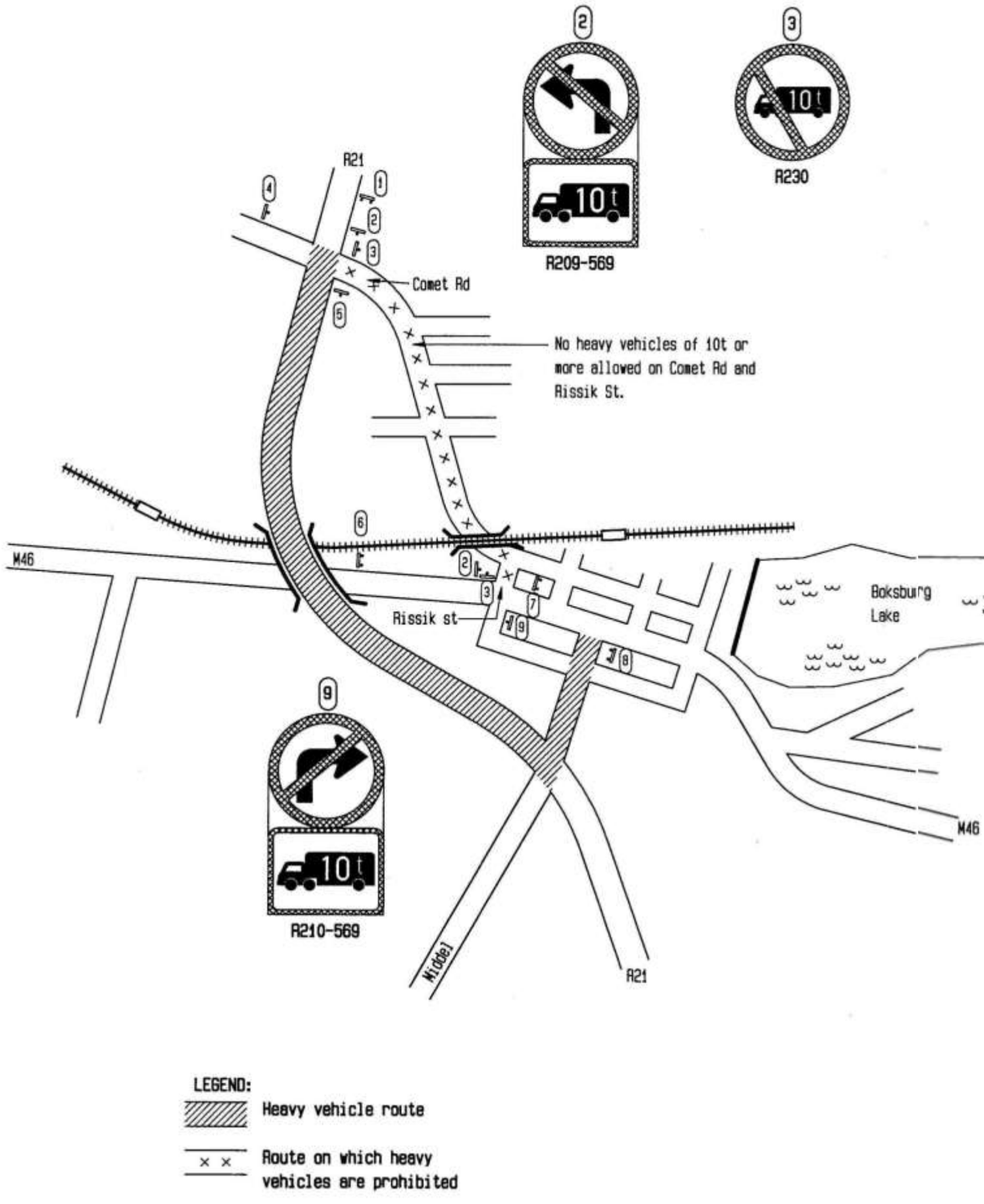

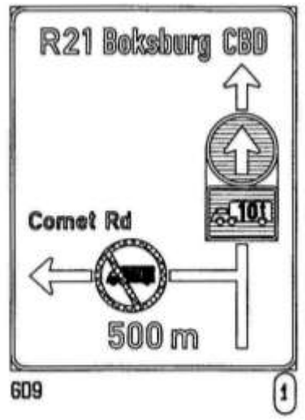

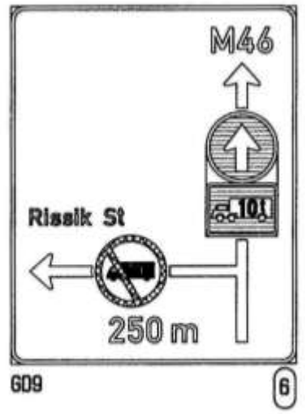

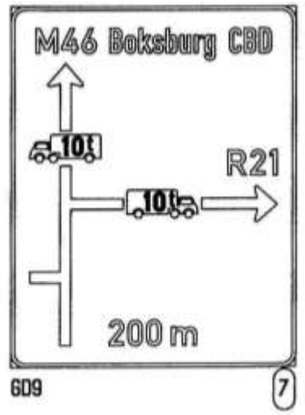

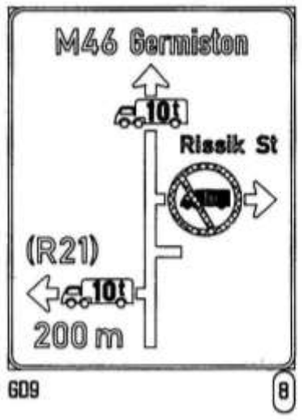

Fig 11.25
Example of Signing for Heavy Vehicle Routing Through an Urban Area

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SIGNING FOR TRAFFIC CALMING

SECTIONS

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12.1 Introduction

12.2 Types of Traffic Calming Measures

12.3 Planning for Traffic Calming

12.4 Traffic Calming Signing Applications

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SARTSM – VOL 2

CHAPTER 12

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Chapter 2	R	Chapter 12	R
Chapter 3	R	Chapter 13	R
Chapter 4	R	Chapter 14	R
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Chapter 7	R	Chapter 17	R
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Chapter 9	R	Chapter 19	R
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CHAPTER 12:
SIGNING FOR TRAFFIC CALMING

12.1 INTRODUCTION

12.1.1 General

1 The objective of traffic calming is to improve traffic safety and the living environment by moderating traffic behaviour through physical and legislative measures aimed at reducing vehicle speeds and/or traffic volumes whilst giving due regard to mobility and accessibility requirements.

2 The objective of this chapter is to provide guidance regarding the application of road traffic signs for Traffic Calming Measures. In this context this guidance consists of providing information on the road signs and markings to be used when implementing traffic calming measures and providing examples of road signing and road marking layouts.

3 Prior to formulating any decision on the implementation of traffic calming measures, it is important to be aware of the large number of traffic calming measures that do exist and which can be incorporated into a traffic calming concept. A section of this chapter is therefore devoted to defining different types of traffic calming measures.

4 Since the concept of traffic calming is relatively new to South Africa, viewpoints on the merits of traffic calming can vary substantially. **This Chapter should not be seen as a guideline for or against the implementation of traffic calming measures *per se*.** However, the Chapter does address the issue of planning for traffic calming. This is deemed necessary because, although committees have been established with the objective of developing "Traffic Calming Guidelines", there are presently no generally accepted policies at a national, regional or local authority level nor has it yet been ascertained whether this need exists at all three levels. At this point in time it should therefore be recognised that the implementation of traffic calming measures should not be brought about by, for example, an automatic and instantaneous decision by a road authority. On the contrary, it should be acknowledged that the traffic calming concept is a very complex one and that the implementation of traffic calming can have far reaching implications. Hence there is a vital need to ensure that appropriate and extensive study work has been undertaken, and is available prior to the decision making process, and it is therefore the required elements of this study work that are addressed herein.

5 Since it was only in the last quarter of 1993 that certain signs and markings relevant to traffic calming measures were prescribed in the Road Traffic Act, Volumes 1 and 4 of the South African Road Traffic Signs Manual only address the concept in a limited manner (refer to paragraph 12.1.1.6). Nevertheless, in regard to road traffic sign design, and by way of general comment, it can be stated that the signs required in terms of implementing traffic calming measures generally fall into the regulatory, warning and information classifications, and examples of such signs are provided herein. In addition, and since the objective of traffic calming is to "calm" traffic which in turn can infer a lowering of vehicle speed, the size of such signs is usually governed by the dimensions provided in Volume 4 for a speed limit of less than or equal to 60 km/h. Since the number of signs prescribed in the Manual which directly relate to traffic calming measures are limited, there are many other regulatory, warning and information signs which can be used in conjunction with the provision of traffic calming measures (see Figures 12.1 and 12.2). Nevertheless, as more measures come to the fore, and the need to implement these measures gains general approval, there may well be the need to prescribe additional traffic calming signs both in the Road Traffic Act, and in the South African Road Traffic Signs Manual.

6 Relevant references in Volume 1, which will not be repeated in this chapter, are as follows:

(a) requirements of traffic control devices (Subsection 1.1.5);

(b) uniformity of traffic control devices (Subsection 1.1.6);

(c) placement of traffic control devices (Subsection 1.1.7);

(d) principles of signing (Subsection 1.1.9);

(e) environmental impact (Subsection 1.1.20);

(f) legal aspects (Subsection 1.1.22);

(g) road traffic sign classification (Section 1.3);

(h) shape, size and colour (Section 1.4);

(i) sign placement (Section 1.6);

(j) all of Chapter 2: Regulatory Signs, but specifically:

  (i) Section 2.1 Introduction;

  (ii) Section 2.2 Control signs;

  (iii) Section 2.3 Command signs;

  (iv) Section 2.4 Prohibition signs;

  (v) Subsection 2.6.3 Woonerf;

(k) all of Chapter 3: Warning Signs, but specifically:

  (i) Section 3.1 Introduction;

  (ii) Section 3.3 Direction of Movement signs;

  (iii) Section 3.4 Symbolic signs;

  (iv) Section 3.5 Hazard Marker signs;

  (v) Section 3.6 Combinations;

(l) all of Chapter 5: Information Signs, but specifically:

  (i) Section 5.1 Introduction;

  (ii) Subsection 5.2.2 Cul-de-sac;

  (iii) Subsection 5.2.5 Supplementary Plates;

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R2.1 YIELD TO PEDESTRIANS
Ref. Vol 1 2-2-7 Vol 4 2-2-6

R2.2 YIELD AT TRAFFIC CIRCLE
Ref. Vol 1 2-2-8 Vol 4 2-2-7

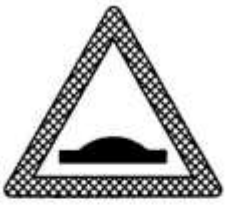
R403 WOONERF
Ref. Vol 1 2-6-3 Vol 4 2-6-3

W201 TRAFFIC CIRCLE
Ref. Vol 1 3-3-1 Vol 4 3-3-1

W306 PEDESTRIAN CROSSING
Ref. Vol 1 3-4-3 Vol 4 3-4-7

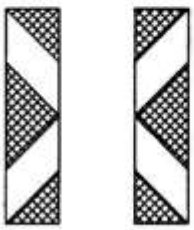
W307 PEDESTRIANS
Ref. Vol 1 3-4-4 Vol 4 3-4-7

W308 CHILDREN
Ref. Vol 1 3-4-4 Vol 4 3-4-8

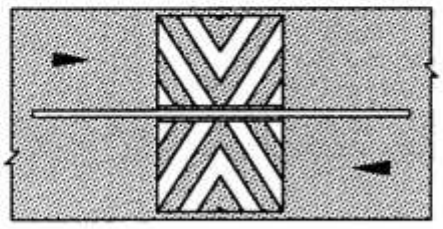


W332 SPEED HUMPS
Ref. Vol 1 3-4-14 Vol 4 3-4-32

W339 GENERAL WARNING
Ref. Vol 1 3-4-18 Vol 4 3-4-39



W401 W402
DANGER PLATES
Ref. Vol 1 3-5-1 Vol 4 3-5-1



WM10 SPEED HUMP
Ref. Vol 1 7-3-9 Vol 4 12-2-16

Fig 12.1 Signs and Markings Used for Traffic Calming Measures - 1

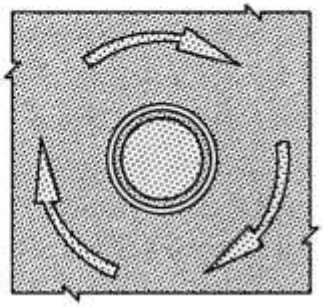
R6 YIELD TO
ONCOMING TRAFFIC
Ref Vol 1 2-2-12 Vol 4 2-2-11

R403-600 WOONERF
DE-RESTRICTION
Ref Vol 1 2-9-1 Vol 2-8-9

W327 ONE VEHICLE
WIDTH RESTRICTION
Ref Vol 1 3-4-12 Vol 4 3-4-27

W330 W328 W329
ROAD NARROWS
Ref Vol 1 3-4-13 Vol 4 3-4-28 to 3-4-30

W302 W303
TRAFFIC CONTROL AHEAD
Ref Vol 1 3-4-1/3-4-2 Vol 4 3-4-2/3-4-3



RM15 TRAFFIC CIRCLE
MANDATORY DIRECTION ARROWS
Ref Vol 1 7-2-29 Vol 4 12-3-5/6

OPTIONS FOR GENERAL WARNING ENTERING A TRAFFIC
CALMING ZONE - W201-W8+IN11.1 (or IN11.2)
Ref Vol 1 3-6-4 Vol 4 3-1-5

SPEED LIMIT OPTION FOR
ZONE ENDS - R201-R8
Ref Vol 1 2-8-4 Vol 4 2-1-20

Fig 12.2 Signs and Markings Used for Traffic Calming Measures - 2

(m) all of Chapter 7: Road Markings, but specifically:

(i) Section 7.1 Introduction;

(ii) Section 7.2 Regulatory markings;

(iii) Section 7.3 Warning markings;

(iv) Section 7.4 Guidance markings

(v) Section 7.5 Roadstuds.

7 The following references to relevant parts of Volume 4 will also not be repeated elsewhere in this chapter:

(a) road traffic sign sizes (Section 1.2);

(b) dimensional details (Section 1.3);

(c) arrows and letters on road signs (Section 1.4);

(d) all of Chapter 2: Regulatory Signs but specifically:

(i) Section 2.1 Introduction;

(ii) Section 2.2 Control signs;

(iii) Section 2.3 Command signs;

(iv) Section 2.4 Prohibition signs;

(v) Subsection 2.6.3 Woonerf;

(e) all of Chapter 3: Warning Signs but specifically:

(i) Section 3.1 Introduction;

(ii) Section 3.3 Direction of Movement signs;

(iii) Section 3.4 Symbolic signs;

(iv) Section 3.5 Hazard Marker signs;

(f) all of Chapter 9: Information Signs but specifically:

(i) Section 9.1 Introduction;

(ii) Section 9.2, pages 9.2.2 to 9.2.5, Cul-de-sac;

(iii) Section 9.2, pages 9.2.8 to 9.2.13, Supplementary Plates;

(iv) Section 9.3 Symbols;

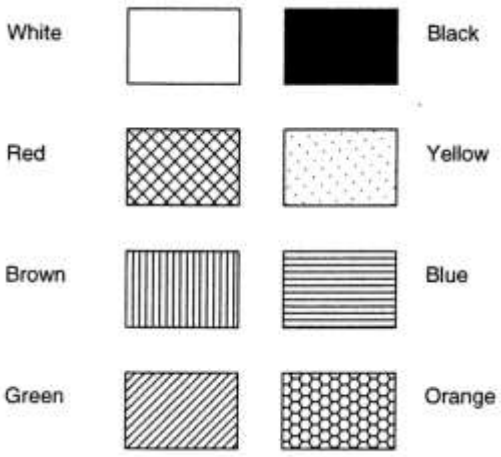
(g) all of Chapter 11: Lettering for Road Traffic Signs;

(h) all of Chapter 12: Road Markings.

12.1.2 Road Traffic Sign Colour Indication

1 The chapters of Volume 2 of the South African Road Traffic Signs Manual (SARTSM) are not prepared in colour. Relevant examples used to illustrate appropriate signs, signals and markings are shaded in a black and white coding which is illustrated below.

2 The basic principles of the road traffic sign colour coding system are shown, in colour, in the SADC-RTSM Volume 1, Chapter 1, Section 1.4, and in the Contents sections of relevant Volume 1 and 4 Chapters.



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12.2 TYPES OF TRAFFIC CALMING MEASURES

12.2.1 General

1 Different types of traffic calming measures are categorised below in terms of those measures normally located at intersections, those located between intersections, and area-wide measures.

2 The measures are described in terms of their traffic calming objective, however, this is not to say that the use of such measures is restricted solely to traffic calming schemes. On the contrary, several of these measures are, under appropriate circumstances, excellent traffic control devices. Examples in this regard would be the use of mini-circles as a traffic management/control device at intersections, or the use of rumble strips not to calm urban traffic but to warn traffic, say on a rural road, to reduce speed because of a sharp curve ahead.

3 The descriptions of the traffic calming measures given in Subsections 12.2.2 to 12.2.14 should be read in conjunction with the individual sketches given in Figures 12.3 and 12.4.

4 The different types of traffic calming measures can be broadly classified in terms of where they are used within the road network as follows:

(a) measures used at intersections (see Subsections 12.2.2 to 12.2.6);

(b) measures used between intersections (see Subsections 12.2.7 to 12.2.12); and

(c) area wide measures (see Subsections 12.2.13 and 12.2.14).

5 Traffic calming measures applied at intersections are primarily aimed at reducing speed into the road or limiting or removing access movements. The more common traffic calming measures applied at intersections are:

(a) mini-circles;

(b) raised intersections;

(c) intersection diverters;

(d) street closures;

(e) intersection narrowing.

6 The main objective of traffic calming measures applied between intersections is to reduce vehicle speeds. These measures may be used in conjunction with landscaping, using physical elements such as trees, posts or bollards to emphasise the site and to improve the street environment. Traffic calming measures commonly applied between intersections include:

(a) speed humps;

(b) chicanes, pinch points or chokers;

(c) rumble strips;

(d) carriageway narrowing;

(e) pedestrian crossing/table;

(f) semi-spheres.

7 Area-wide measures include the following holistic applications of traffic calming:

(a) "Woonerf";

(b) more traditional general treatments such as one-way systems.

12.2.2 Mini-circles

1 Mini-circles have evolved from the conventional traffic circle (i.e. a traffic circle normally with a large physical inner island) with the objective of endeavouring to develop a traffic control device which will induce correct usage, and which is inherently self-regulating, and which can also be used as a traffic calming measure. They are widely used to reduce vehicle speed and to minimise vehicle stops at intersections. Their major advantage is that they do not stop traffic to the same extent as traffic signals and STOP signs. For mini-circles, raised central islands are a better option than painted central islands as the latter are unsightly and are not as effective in reducing the speed of motor vehicles.

2 The use of mini-circles, has, to some extent, led to confusion amongst motorists regarding the correct behaviour at a mini-circle. For this reason guidelines for motorists to follow when approaching a mini-circle, are included in Subsection 12.4.2 (see also Chapters 2 and 3 on general elements of junction control).

12.2.3 Raised Intersections

1 Raised intersections are design features intended to make drivers aware of the presence of a junction. In residential areas greater pedestrian movements can be expected at junction, and the raised junction area therefore introduces a greater pedestrian safety element. Because it is raised, normally to a height of 50 mm to 100 mm above normal road surface, it is more visible and it thus produces a reduction in speed. It is also a useful measure to use on the perimeter of the traffic calming area as a means of informing the motorist that such an area is being approached.

2 A potential problem with raised intersections is that they can interfere with the traffic flow priorities at intersections. At a major/minor road intersection, for example, the traffic on the major road will slow down as it approaches the raised intersection (either because of its raised nature or because of pedestrians crossing the road), and this can often be viewed by the traffic on the minor road, which under normal circumstances would be under stop or yield control, as an opportunity to proceed either across the intersection or into the main road. This tendency for raised intersections to equalise priority can, to a large degree, be overcome by appropriate signing. Nevertheless, prior to introducing this type of traffic calming measure, it should be ensured that the benefits of the measure, in traffic calming terms, outweigh any dis-benefits resulting from poorer traffic control/management, and a mix-up of traffic flow priorities.

12.2.4 Intersection Diverters

1 There are three primary types of diverters which are, the diagonal, partial and star diverters. Their main objective is to make the trip length through the local residential area longer by creating a "maze" type of system. They can be used in isolation

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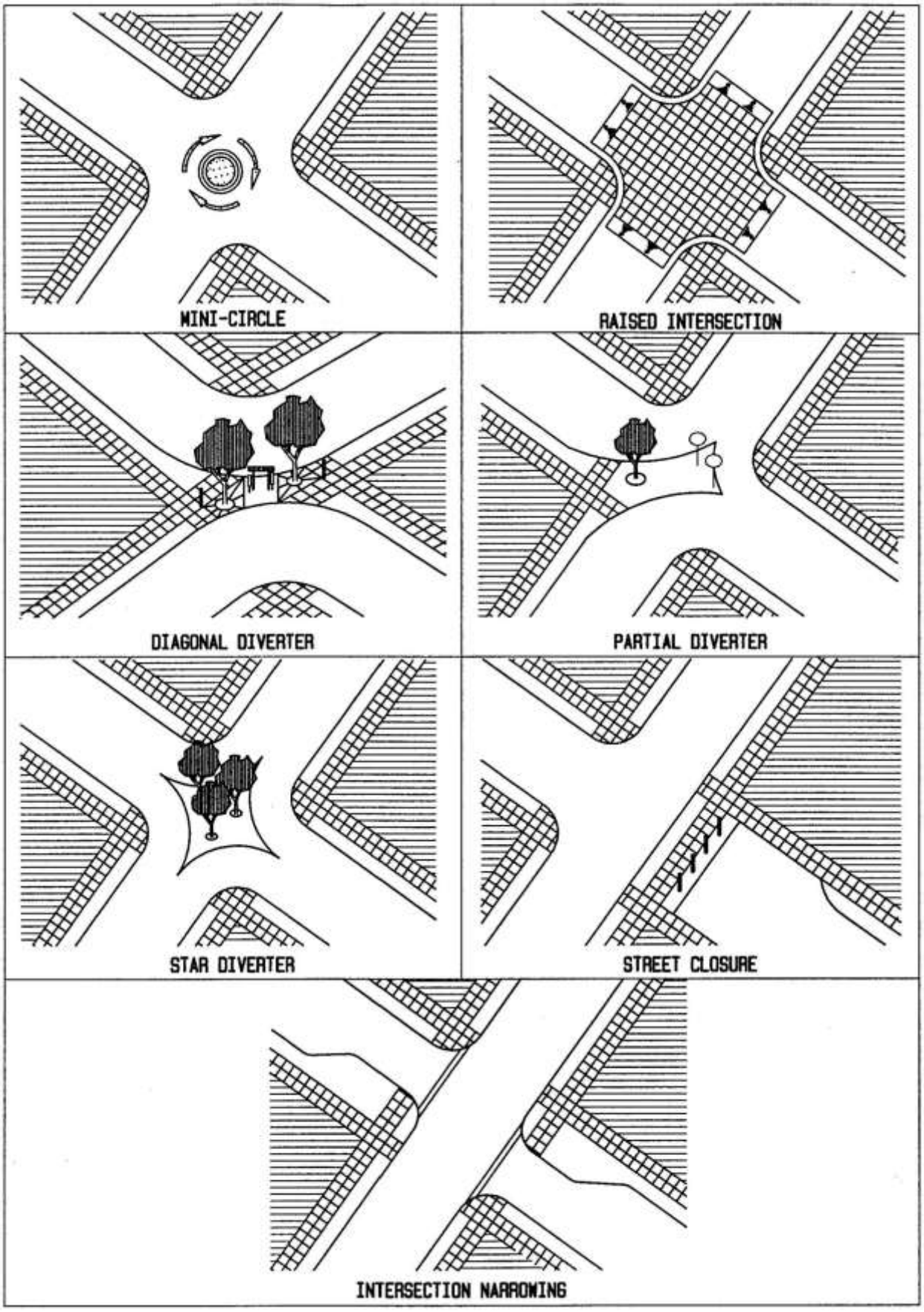
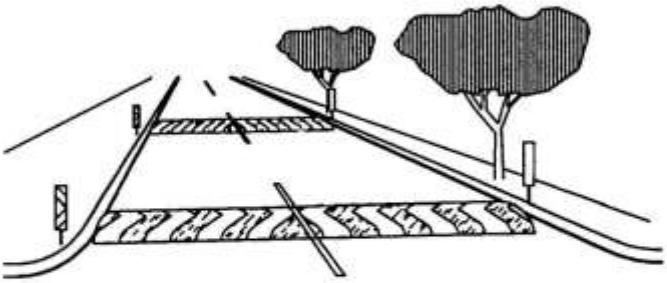
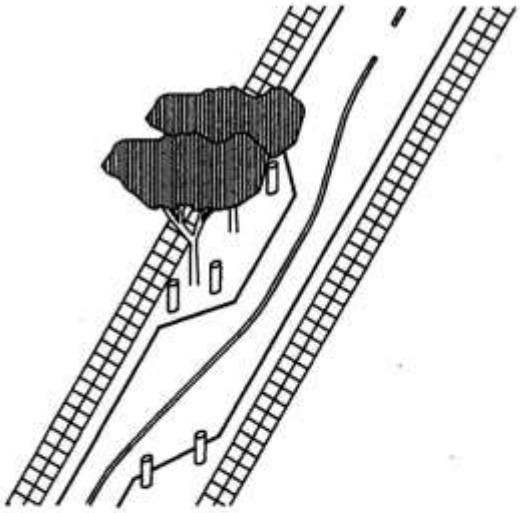


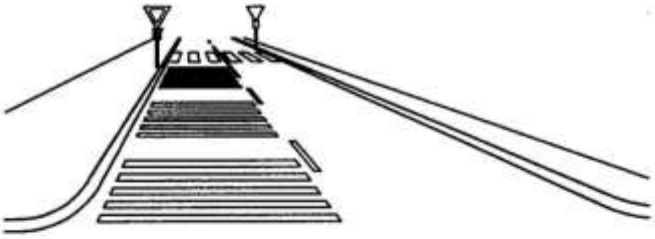
Fig 12.3 Traffic Calming Measures Used at Intersections



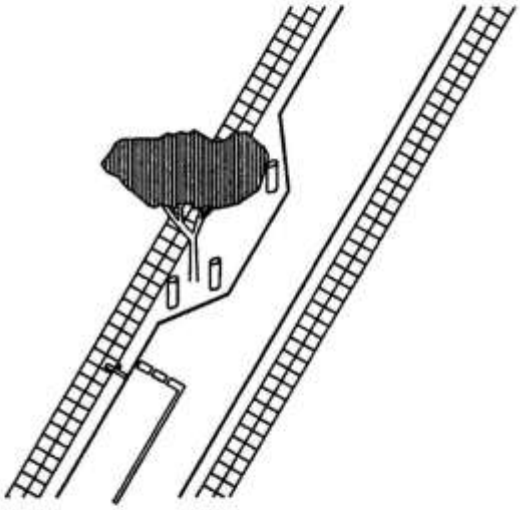
Detail 12.4.1 Speed Humps



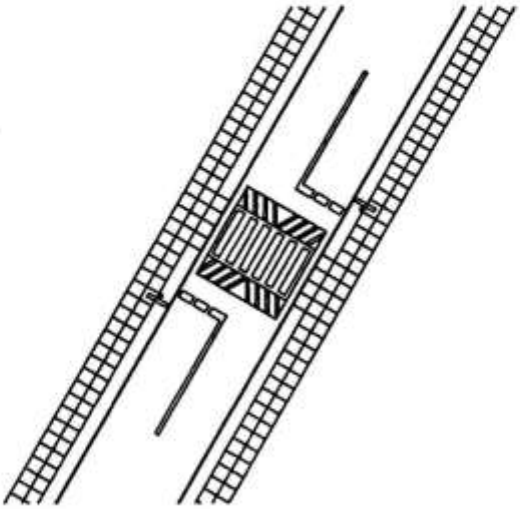
Detail 12.4.2 Chicanes (Two-Way)



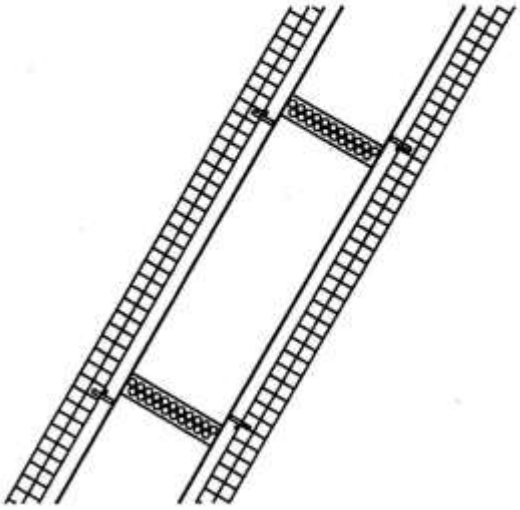
Detail 12.4.3 Rumble Strips



Detail 12.4.4 Pinch Point/Chocker (One-Way)



Detail 12.4.5 Pedestrian Table



Detail 12.4.6 Semi-Spheres

Fig 12.4 Traffic Calming Measures Used Between Intersections

with no other supplementary traffic measures, and are very effective.

2 They do, however, create access restrictions for the local residents and emergency vehicles. The diagonal diverter is a barrier placed diagonally across a four-leg intersection which converts the roadway into separate streets and prevents through traffic movements at the intersection. The semi-diverter is a barrier placed diagonally across a four-leg intersection which limits some but not all movements at the intersection. The star-diverter basically consists of a central star-shaped island which only allows left turning movements at the intersection (see Figure 12.3).

12.2.5 Street Closures

1 Street closures completely remove all vehicular traffic from the road, and can be accomplished by creating a cul-de-sac at a junction. However, street closures cannot be introduced until alternative routes for the displaced traffic have been identified.

2 In addition, any decision to close a street as a traffic calming measure, should include in the assessment process, planning for the ultimate visual closure of the road by means of landscaping measures. Due consideration must be given also to the likely need for vehicles to turn around in the cul-de-sac.

12.2.6 Intersection Narrowing

1 Intersection narrowing a measure to restrict access and can be designed to operate either as a one-way or two-way access system. When used as a two-way access system it essentially acts as a "pinch point" (see Subsection 12.3.2) located at an intersection.

12.2.7 Speed Humps

1 Speed humps are an extremely effective means of reducing vehicle speeds. Speed humps are most suitable for local collectors and access roads, and overseas experience shows that they are most commonly used in residential streets with traffic flows of up to 500 vehicles/hour. Both round and flat top (raised plateau) speed humps are acceptable. A major advantage of flat topped road humps is that they can be used as pedestrian crossings. Speed humps must be located along a road such that they are always preceded by a speed reducing feature, such as another speed hump (in a series), and by road markings. A hump may be of any height between 50 mm and 100 mm to suit particular cases. The length of the hump is greater than that of a motor vehicle's wheelbase, yet it constrains the speed of cars. It is acceptable to use a variety of heights and profiles in a series of speed humps but the length, (the dimension parallel to the road centreline) should be in the order of 3,5 m to 4,0 m.

2 **The use of speed bumps (i.e. humps of minimal length) is not supported since they can, if not seen by oncoming drivers, result in drivers losing control of their vehicles.** There is no restriction on the number of humps in a series but it is recommended that not more than 20 be used.

12.2.8 Chicane - Pinch Points/Chokers

1 A chicane is formed by developing two adjacently located pinch points/chokers on opposite sides of the road. These measures reduce the carriageway width at either one location, or two adjacent locations on opposite sides of the road. The width reduction can vary to allow two cars to pass each other slowly, but where it would be difficult for a car and a bus or heavy vehicle to pass "comfortably". The most common form allows for the passage of one vehicle, in one direction only, at a time.

2.2.9 Rumble Strips

1 Rumble Strips are rough surface areas or transverse strips commonly provided in sets, at progressively decreasing spacings between sets. Rumble strips introduce a type of noise and vibration that contrasts with an asphalt, concrete or paved surface, and therefore give a clear indication to drivers that they should reduce their speed. It is generally accepted that rumble strips can be a useful speed reducing instrument, but in residential areas their usefulness is limited as a result of the noise and vibration effects. For this reason their use in urban areas is, in general, not recommended.

12.2.10 Carriageway Narrowing

1 Carriageway narrowing has been widely used in town centres and residential areas. It is used over the total section of road that requires traffic calming. It can be accomplished in a number of ways, which include planting trees/widening the pavement; providing a central reservation; providing multi-purpose side strips/providing bus lanes and providing cycle lanes. Whilst planting trees on the side of the carriageway can be a cheap option, it can cause problems with underground utility services. In isolation the use of hatched areas has almost no influence on vehicle speeds but does seem more effective when combined with other measures. The provision of bus lanes and cycle lanes reduces road capacity, but has a minimal effect on motor vehicle speed.

12.2.11 Pedestrian Crossing/Table

1 Pedestrian crossings/tables basically consist of a wide speed hump (see Subsection 12.2.7) with a flattened mid-section to facilitate a pedestrian crossing. They are typically used where motorists need to be made aware of the presence of pedestrians. They can be used on access roads to schools, hospitals, pedestrian malls, etc.

12.2.12 Semi-spheres

1 Semi-spheres are designed to have the same effect as speed humps, namely to reduce vehicle speeds. They can be made from a variety of materials but one of the most common form consists of individual compressible plastic spheres aligned in two or three rows across the road. Since it is generally only possible to travel over the spheres at very low speeds and since they can constitute a danger to traffic, especially motorcycles, they should only be used downstream of another speed reducing measure or where vehicles speeds are very low (5 km/h to 10 km/h). For this reason their use on public streets is generally not favoured, although where the intention is to keep all vehicle speeds low (e.g. in car parks and/or on circulatory roads to and from car parks), they can be effective.

12.2.13 The "Woonerf"

1 "Woonerf", meaning "shared space", is a concept rather than a specific traffic calming measure. The primary aim of the woonerf concept is to create an environment in which human activities have priority. Features inherent in the woonerf concept and/or area, may include the discouragement of traffic by formulating designs which only permit low vehicle speeds, reducing vehicle speeds by signing or specific traffic calming

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measures, utilizing hard and soft landscaping, different surface treatments and street furniture, and even laying down codes of driver behaviour to be adhered to when travelling within the woonerf.

12.2.14 Area-wide Measures

1 These include one-way street systems, maze or limited entry systems. The systems are applied where access and/or egress is to be limited either totally (no-entry or no-exit), or partially (turn prohibitions, time restrictions etc.). The systems are applied to eliminate through traffic movements and to reduce vehicle speeds.

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12.3 PLANNING FOR TRAFFIC CALMING

12.3.1 Traffic Calming Objectives and Planning Overview

1 The principle goal of traffic calming is to improve or reinstate the social and environmental attributes of residential neighbourhoods. In terms of this goal, and as defined in overseas literature, the principle objective should not be to exclude traffic, but rather to manage and moderate its behaviour, whereby accessibility and mobility for residents, shoppers, workers or visitors is not significantly reduced.

2 In a South African context, the demand for the introduction of traffic calming measures has emerged because, in the eyes of some road users, the operating conditions on routes through residential areas are simply better than those on the primary (arterial) road network. This has led to the increased use of residential roads/streets for "through" trips. This characteristic, commonly referred to as "rat-running", is illustrated in Figure 12.5. Recent studies have shown that in certain local authorities, the increase in "rat-running" has been quite dramatic.

3 The potential to "rat-run" has, to a large degree, been augmented by the land-use structure prevalent in South Africa's urban areas. By way of general description these areas utilize a rather "open" transport/ land-use structure which as a rule takes minimal cognisance of the principle of separate residential and traffic zones first expounded by Buchanan in the early sixties and which has general acceptance worldwide. The "open" land-use structure also makes it difficult to successfully fulfil the objectives of traffic calming. This can be concluded since, although the introduction of traffic calming measures in one particular area can create benefits for that area, the "rat-run" traffic can all too easily circumnavigate the traffic calmed area, and hence reintroduce the initial problem in adjacent or other residential neighbourhoods.

4 In order to address the problems outlined above, there is a need to identify those planning aspects which need to be considered when contemplating the introduction of the traffic calming concept and to ensure that appropriate study work is undertaken prior to considering the introduction of these concepts. In this regard special cognisance should therefore be taken of:

(a) what can be achieved, in global transportation and land-use terms, by adopting a residential zone/traffic zone development process in future planning, which can reduce the conflict between residents and through traffic movements;

(b) the fundamental need to define roads and streets into a proper hierarchical structure, identifying those roads in the traffic zone which must not be subject to traffic calming (the primary network), and those which fall within the residential zone (see Volume 1, Chapter 4 and Volume 2, Chapter 9); subsequent to defining the primary network, there is an additional need to ensure that the roads incorporated in this network can adequately accommodate the traffic demands (including the traffic displaced from the residential streets), because if they cannot, rat-running in the residential neighbourhoods will continue unabated;

(c) the need to continually strive for and support development related to minimising vehicle pollution, and to attain improved driver behaviour through education, because such efforts can reduce conflict and can create additional social and environmental benefits;

(d) the need to undertake traffic calming studies in a responsible and comprehensive manner (see Subsection 12.3.2);

(e) the need for accord on the legality of traffic calming measures, which can be accomplished by means of national co-ordination and by prescribing these measures in the Road Traffic Act.

12.3.2 Traffic Calming Study Requirements

1 It can be anticipated that on-going requests from residential groups for the implementation of traffic calming measures will continue. There is therefore an urgent need to establish the means whereby such requests can be properly evaluated and subsequently concluded to be either justified or unjustified. As traffic calming is a traffic/transport issue, it seems logical to conclude that the most appropriate means of determining justification **is to ensure that a proper and sufficiently comprehensive traffic/transport study is undertaken**. Although this statement appears obvious, it should be acknowledged that many past traffic calming studies in South Africa have not incorporated sufficient information on detailed aspects, and they have not addressed the "bigger picture" issues, and hence they have been somewhat lacking. In making this comment no criticism of those responsible for these studies is intended, for it is concluded that the primary reason for this outcome is that traffic calming is seen as something local, something small and hence funds directed to its study tend to be limited. As it is also the norm for traffic calming studies to incorporate public involvement, and public involvement is generally expensive, this has further limited the amount of funds available for technical traffic/transport work.

2 In order to address the issue of traffic calming warrants, the following subsections focus on highlighting the study work requirements deemed necessary for a traffic calming study. Obviously in practice the size of, and the issues involved in, these studies, will vary and therefore not all these study requirements will be needed in every study. However, the availability of a detailed study requirement listing, does provide a checklist which can be referred to at the outset of each traffic calming study.

12.3.3 Public Involvement

1 Public involvement should always be viewed as being a very beneficial exercise, and this is particularly the case in traffic calming studies, since residents of the neighbourhood can directly relay their concerns and their first hand knowledge of their area, in terms of its traffic issues (e.g. its bad points and its good points), to the study team. Such information generally assists in ensuring that the study is comprehensive, and often the nature of this information is such that without the residents input, it may have been overlooked. When identifying the

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requirements of the public involvement programme and particularly if adopting a group representation approach, it must be assured that a representative cross section of opinion is obtained. In this regard it should be noted that opinions can differ within a neighbourhood itself, and from one neighbourhood to another, and hence without wide representation the study outcome can be heavily biased. Past experience has also shown that residents who are promoting traffic calming in their neighbourhood can often themselves be "rat-runners" in adjacent or other neighbourhoods. In the promotion of traffic calming measures, it must therefore be acknowledged that one rule must apply to all, and hence the right to traffic calm in one neighbourhood can be transferred to all residential neighbourhoods. Residents must therefore not expect to keep "through" traffic out of their neighbourhood, but to continue themselves to impact others. Rather they must accept that they too, will be diverted back to the arterial network and accommodated at the "correct location". This particular point provides one example of why traffic calming studies cannot be undertaken in isolation, and in an *ad-hoc* manner, for arterial network needs must be examined from the point of view of the "ripple affect" of traffic calming, and the potential diversion of traffic from many and not just one residential neighbourhood.

2 Formulating an exact "shopping list" of the authorities, groups and associations who should be included in the public involvement process is difficult, since these will vary from study to study, but the following list should assist in the identification of potential role players:

(a) neighbourhood resident groups/associations;

(b) adjacent resident groups/associations;

(c) Local Authority within which the neighbourhood is situated;

(d) adjacent Local Authorities;

(e) Metropolitan, Provincial and National Road Authorities when applicable;

(f) representation from Emergency Services;

(g) representation from the business sector, commerce and industry etc. when applicable;

(h) representation from the private transport sector and from the authorities, operators and users of other transport modes if applicable.

12.3.4 Study Area Definition

1 Although the definition of the appropriate study area is often viewed as being one of the easier tasks, this is often not the case. Definition of the study area requires specific information on the extent of the problem, and, more often than not, this can only be ascertained when detailed traffic survey work has been undertaken. Conducting traffic surveys, and defining the study area, therefore often requires an interactive process until both requirements are fully satisfied.

12.3.5 Survey Requirements

1 Preliminary discussions with residents in a neighbourhood will reveal their concerns. The traffic engineer/transportation planner can then "brainstorm" these concerns and in so doing also identify external related issues and hence design an appropriate overall survey package. Survey requirements and study requirements are of course interlinked. More information on survey requirements is given in Subsection 12.3.6.

2.3.6 Study Requirements

1 From the outset it must be acknowledged that although the development of traffic calming measures is relatively small in terms of road capital expenditure, it is not a small budgetary issue in transport planning terms, and hence adequate funds for its study should be allocated. In clarifying this statement it must be remembered that many forms of traffic calming involve traffic diversion or may be designed to motivate a change in transport mode, and that the upgrading of roads and the provision of more public transport to accommodate such diversion is not a cheap business. Traffic calming schemes that have gone wrong can therefore have very expensive consequences, and hence this must be duly recognised when setting traffic calming study budgets.

2 Before entertaining the introduction of traffic calming measures, proper investigations/studies must be undertaken. These studies must address, and where applicable, collect reliable information on:

(a) the precise concerns of residents (through traffic, speed, noise, accidents etc.);

(b) the magnitude of the problem, and in particular the magnitudes of the "internal" traffic (residential) and the external traffic;

(c) the origins and destinations of the external traffic, thereby ensuring that the reasons for using the residential streets in question are known;

(d) an examination and analysis of the roads at the "correct" location, thereby ensuring that the reasons why these streets are not used are known, and hence ensuring that problems in this regard can be rectified;

(e) travel times through the residential neighbourhood (this is vitally important since if incorrectly designed, the time taken to travel through the local residential area after implementation can remain quicker than the arterial route option, hence making the newly implemented measures obsolete);

(f) the identification of other routes/roads which have the potential to be impacted should traffic calming measures be introduced;

(g) the implications on residents should traffic calming measures be introduced (especially when considering the introduction of street closures, diverters etc.);

(h) the implications beyond the bounds of one neighbourhood, in terms of the "ripple" effect from one area to another, if roads at the "correct" location require upgrading/improvement (these implications to be known in traffic, economic and cost terms);

(i) emergency vehicle access requirements;

(j) public transport implications.

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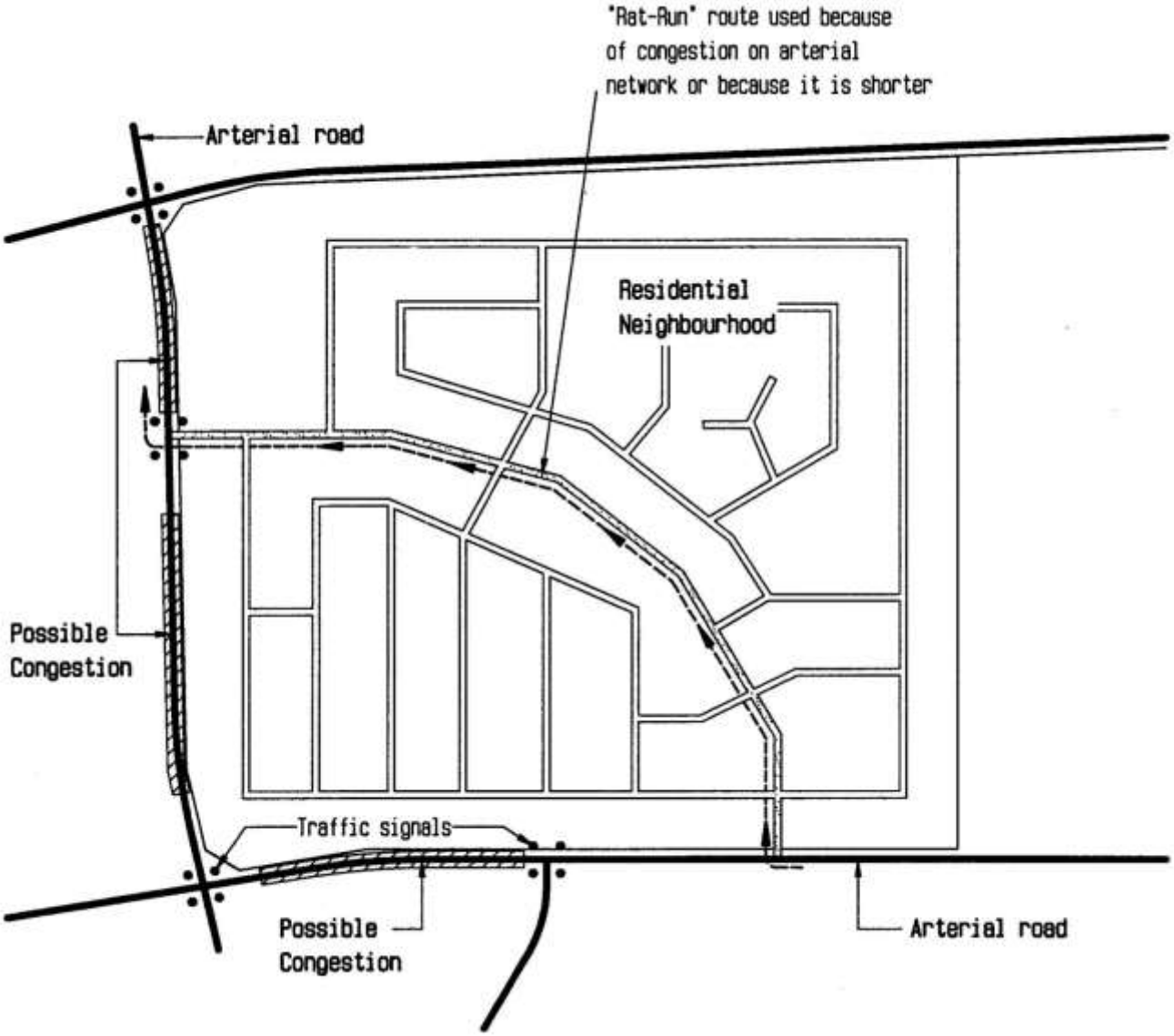

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Fig 12.5 Typical Environment Appropriate to Traffic Calming

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12.4 TRAFFIC CALMING SIGN APPLICATIONS

12.4.1 General

1 Certain road traffic signs specifically related to traffic calming (e.g. speed hump), are prescribed in the Road Traffic Act and many other regulatory, warning and information signs and markings can be utilised when implementing a traffic calming concept. However, with the passage of time, there is a good possibility that additional traffic calming related signs will need to be prescribed in the Road Traffic Act. This seems logical since in those overseas countries where the traffic calming concept is much more entrenched/established, there are a larger array of traffic calming related signs prescribed. Regardless of this fact, there is a variety of signs and markings prescribed in terms of present legislation, which can be used at traffic calming locations. Examples of these signs are shown in Figures 12.1 and 12.2.

2 A further point to acknowledge in regard to traffic calming signing is that at the present time no overall consensus has been attained and hence there is an on-going debate, regarding aspects of the legality of traffic calming measures. Whilst this is obviously of concern, there is however total agreement on the fact that the success of any legal claim for liability arising from the introduction of such measures, will be much reduced if appropriate road traffic signs have been erected at, and in advance of, these measures. It should therefore be assured that this requirement is strictly adhered to.

3 The following section provides information on, and/or examples of, typical traffic calming signing layouts in respect of implementing traffic circles, speed humps, chicanes / pinch points and raised intersections.

4 The sequence of the signs (i.e. where regulatory, warning and information signs should be placed) required in terms of implementing other traffic calming measures, such as pedestrian tables, diverters etc. will be similar, however, it should be noted that whilst there are "generic" signing options, at present the Manual does not incorporate **specific** signs for these measures.

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12.4.2 Mini-circles

1 A typical traffic calming signing layout for a traffic circle is shown in Figure 12.6. Other aspects with respect to the implementation of mini-circles are outlined below.

2 Raised central islands are a better option than painted islands because the latter are unsightly, and may also not reduce the speed of motor vehicles sufficiently. Wholly painted central islands are also a maintenance burden on the local authority, due to the relatively large areas of paint involved.

3 The traffic circle should preferably have an outer radius not less than 10,5 metres to allow most vehicles to circumnavigate the centre island.

4 The provision of flared entries and the deflection of through movements will increase the effectiveness of traffic circles.

5 The very efficiency of traffic circles tends to make them not suitable when located within a signalised system for they can overload downstream signals. They also tend not to be suitable when heavy "tidal" flows are present.

6 The continuous traffic flow promoted by the efficiency of traffic circles can also cause problems for pedestrians and cyclists, hence the needs of these road users must not be overlooked.

7 Installing speed humps on the approaches to the mini traffic circles with the aim of reducing approach speeds is deemed beneficial, particularly when both types of measure are used within an area.

8 Advance signs to warn of the presence of a mini-circle is obligatory. In this regard road sign W201 should feature prominently.

9 Traffic regulations in regard to negotiating mini-circles are governed by the YIELD AT MINI CIRCLE sign R2.2. The regulation pertaining to this sign, as defined in the Road Traffic Regulations, reads essentially as follows:

"This sign indicates to the driver of a vehicle approaching a mini circle that the driver shall yield right of way to any vehicle which will cross any yield line at such junction before him and which, in the normal course of events, will cross the path of such driver's vehicle."

10 Whilst the above regulation suggests a "first come, first served" situation it is important that this not be interpreted as a right to demand "right of way". In this regard it must be noted that road traffic rules do not allocate "rights" but only pass an obligation onto the driver of a vehicle to act in a prescribed manner. Bearing this in mind and because many motorists are confused regarding the proper use of mini-circles, the following guidelines are recommended:

(a) if not passing straight through the mini-circle, use your indicators well in advance to give clear notice of your intended movement through the mini-circle;

(b) when approaching a mini-circle controlled by traffic circle yield signs, reduce speed to less than 30 km/h, depending on circumstances, and observe your position in relation to other vehicles already in the mini-circle area or vehicles approaching the mini-circle;

(c) allow vehicles already in the mini-circle, and which may cross your path of entry, to pass through the mini-circle;

(d) enter the mini-circle (i.e. cross the yield line) if your manoeuvre is not in direct conflict with any other vehicle already in the mini-circle.

11 Pedestrians always have right of way and this should be kept in mind at all times. Some mini-circles include pedestrian crossings which are slightly removed from the circle itself. This is done to separate the interaction between vehicles and vehicles, from the interaction between vehicles and pedestrians. Always act correctly at pedestrian crossings, even if they are part of the mini-circle.

12 Cycles share the roadway with other motor vehicles and are also vehicles which have right-of-way. Cycles at mini-circles must be regarded the same as any other vehicle but with much more consideration for the safety of the cyclist. Do not enter the mini-circles at the same time as the cyclist if there is any chance of conflict. Care should however always be exercised where pedestrians and cyclists are involved.

13 Because of the limited geometry of mini-circles, heavy vehicles in most cases need to cross over at least some part of the centre island of the mini-circle and go through the mini-circle at very slow speeds. Always allow the heavy vehicle all the space needed to complete its movement through the mini-circle.

14 In Figure 12.6 the "deflector" islands shown in the entry/exit paths are not detailed because their function is geometric. If these are mountable or semi-mountable they should be marked with PAINTED ISLAND markings RM5 to enhance their visibility. The "geometry" of the circle area may also be enhanced by means of marking RM5 when appropriate. An example of this is illustrated in Detail 12.6.1 which depicts a three-legged mini-circle constructed at a T-junction. Since mini-circles may have little vertical dimension road markings play an important role in enhancing visibility of the circle area when intersection and road profile may combine to "hide" the island. Designers must acquaint themselves with specific site conditions and should carefully consider the combination of island height, road markings and optional road studs in such situations.

15 It should be noted that options for the signing treatment of medium to large sized traffic circles are greater than for mini-circles. This relates primarily to the wording of the rule of the road pertaining to drivers actions at traffic circles, and to the common size constraint of mini-circles, used as traffic calming measures, in this context. For further details refer to Chapter 3, Subsection 3.3.3.

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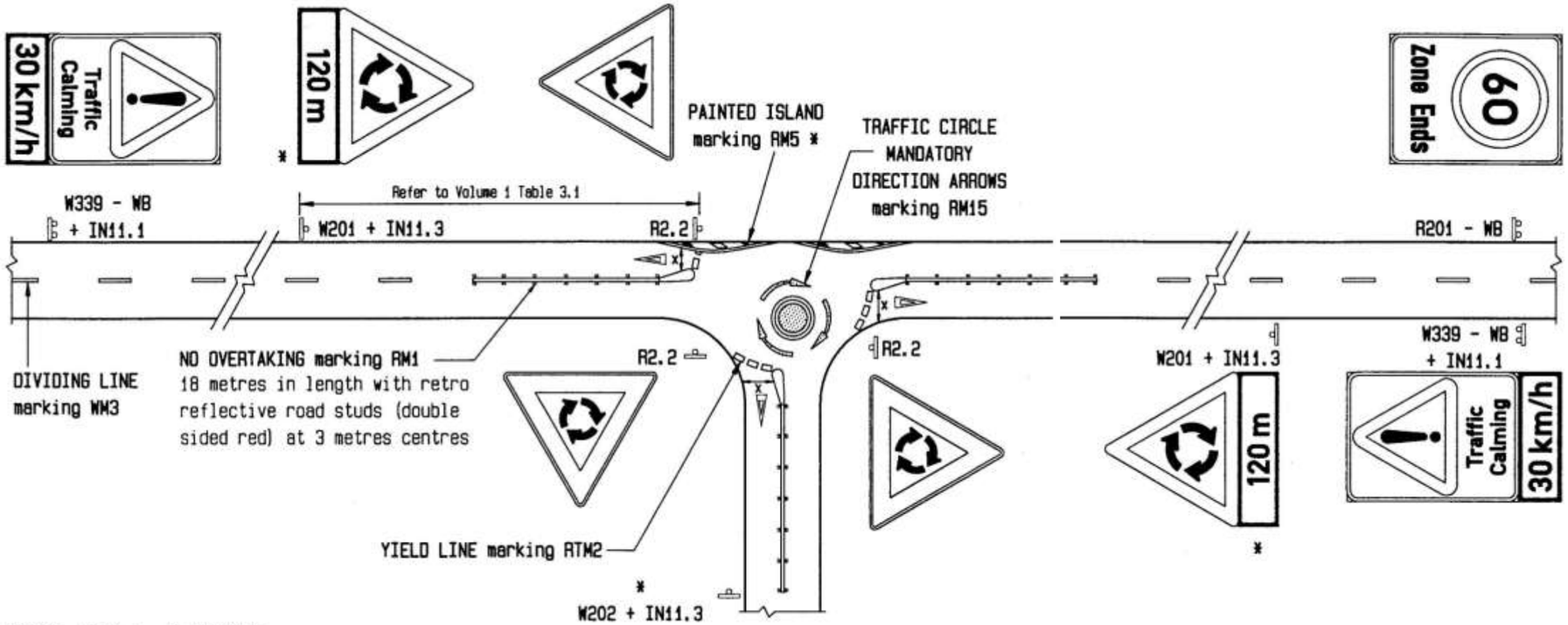

12.4.3 Notes on Figure 12.6

(1) **Signs and Markings per Approach**

Quantity	Type	Min. External Dimension (mm)
1	R2.2	900 side
1	W201	900 side
1*	IN11.3	900 wide
1	RTM2	200 wide
1	WM5	2500 or 1250
1	RM1	18 metres
1*	RM5	varies
14*	Red roadstuds	-
PLUS per mini-circle		
1	RM15	varies

* = optional signs

(2) When several mini-circles comprise an area traffic calming treatment, the use of high visibility signs W201-WB+IN11.1 at the main entry points to the area is recommended. The normal size of such signs is 1600 mm x 1200 mm but 1200 mm x 900 mm may be specified. If a reduced speed limit is imposed within such an area the use of high visibility "Zone Ends" R201-WB signs may be warranted on leaving the area.

(3) If the area is subject to a variety of traffic calming measures sign W201-WB+IN11.2 may be replaced by one of signs W339-WB+IN11.2 or W332-WB+IN11.1 as appropriate (see Figure 12.2).

(4) **Checklist**

The following factors should be checked when considering signing for traffic calming measures which include speed humps:

- ❑ are any mini-circles in the area difficult to see, either by day or by night?
- ❑ is the use of retroreflective roadstuds advisable?
- ❑ are SUPPLEMENTARY PLATE signs IN11.3 required with sign W201 or is the entry point to the circle, and therefore sign R2-2, clearly visible?
- ❑ is the mini-circle one of several? if yes, is use of sign W201-WB+IN11.1 advisable?
- ❑ is the mini-circle one of several types of traffic calming measure in the area? - if yes, is the use of sign W339-WB+IN11.1 appropriate?

Fig. 12.6
Typical Road Sign Layout For Mini-Circles

12.4.4 Speed Humps

1 A typical traffic calming signing layout for a speed hump is shown on Figure 12.7. Other aspects with respect to the implementation of speed humps are outlined below.

2 Speed humps may be used on single carriageway roads provided there is a 60 km/h speed limit and the road is not an arterial road. It must be ensured that local street lighting is sufficient and if this is not the case, lighting must be specially provided.

3 Speed humps should be located along a road so that they are always preceded by a speed reducing feature. Examples of speed reducing features are:

(a) controlled intersection;

(b) road bend (which will reduce vehicle operating speed to an appropriate level);

(c) another speed hump within a series;

(d) another appropriate traffic calming measure.

4 There is no restriction on the number of humps within a series but it is recommended that not more than 20 be used. Distances between speed humps and other features should be as follows:

(a) distance between speed humps not less than 20 m nor greater than 150 m;

(b) distance from a pedestrian crossing not less than 30 m;

(c) distance from an intersection not greater than 40 m;

(d) distance after bend not greater than 40 m.

5 Speed humps may be coincident with pedestrian crossings, subject to the necessary speed reducing features being present. Humps should not be located within 30 m of the crossing. It can also be an advantage to site a speed hump at an uncontrolled crossing place. Where speed humps coincide with any crossing it is strongly recommended that only flat top humps are used.

6 Visually impaired people can have great difficulty in distinguishing between the carriageway and the footway at both controlled and uncontrolled crossings coincident with a road hump. Consideration should be given to the use of suitable tactile surfaces to indicate the edge of the footway.

7 Providing the necessary speed reducing features are present, there are no restrictions as to how close speed humps may be placed to intersections. However, to help avoid any stability problems arising for two wheeled vehicles, the hump could be set back from the intersection by 5 m - 8 m, depending on site conditions.

8 Humps must not be constructed on any bridge or other structure such as a subway, inside a tunnel, or within 25 m of such a structure or tunnel. The reason for these restrictions is the risk of structural damage caused by vehicle impact, or increases in impact loading.

9 Although the use of full 100 mm high humps is not excluded along bus routes, it may be appropriate, in order to minimise any detrimental effects on buses and their passengers to consider the use of lower height humps. The type and frequency of bus should be taken into account when determining this, as smaller buses or a low frequency of services should not normally require a lower height of hump.

10 There have been fears raised about the possible dangers of tapered humps to riders of two wheeled vehicles who might attempt to ride in the channel between the hump and the kerb or who might slip off the edge of the hump into the channel. Painted LEFT EDGE LINE markings RM 4.1 should therefore be provided as these will serve as a guide to encourage cyclists and motorcyclists to keep clear of the edge of the taper.

11 The provision of advance traffic signs to warn of the presence of a speed hump or a series of humps is obligatory. In this regard road sign W332 should feature prominently. In addition to the provision of warning signs, information signs (e.g. indicating the distance to the first hump, the distance over which the humps extend etc.), should also be displayed.

12 **The actual position of each hump should be marked by placing DANGER PLATE signs W401 and W402 in the verges to each side of the hump on both approach.**

13 Details 12.7.2 to 12.7.4 illustrate specific details of the marking and construction of speed humps.

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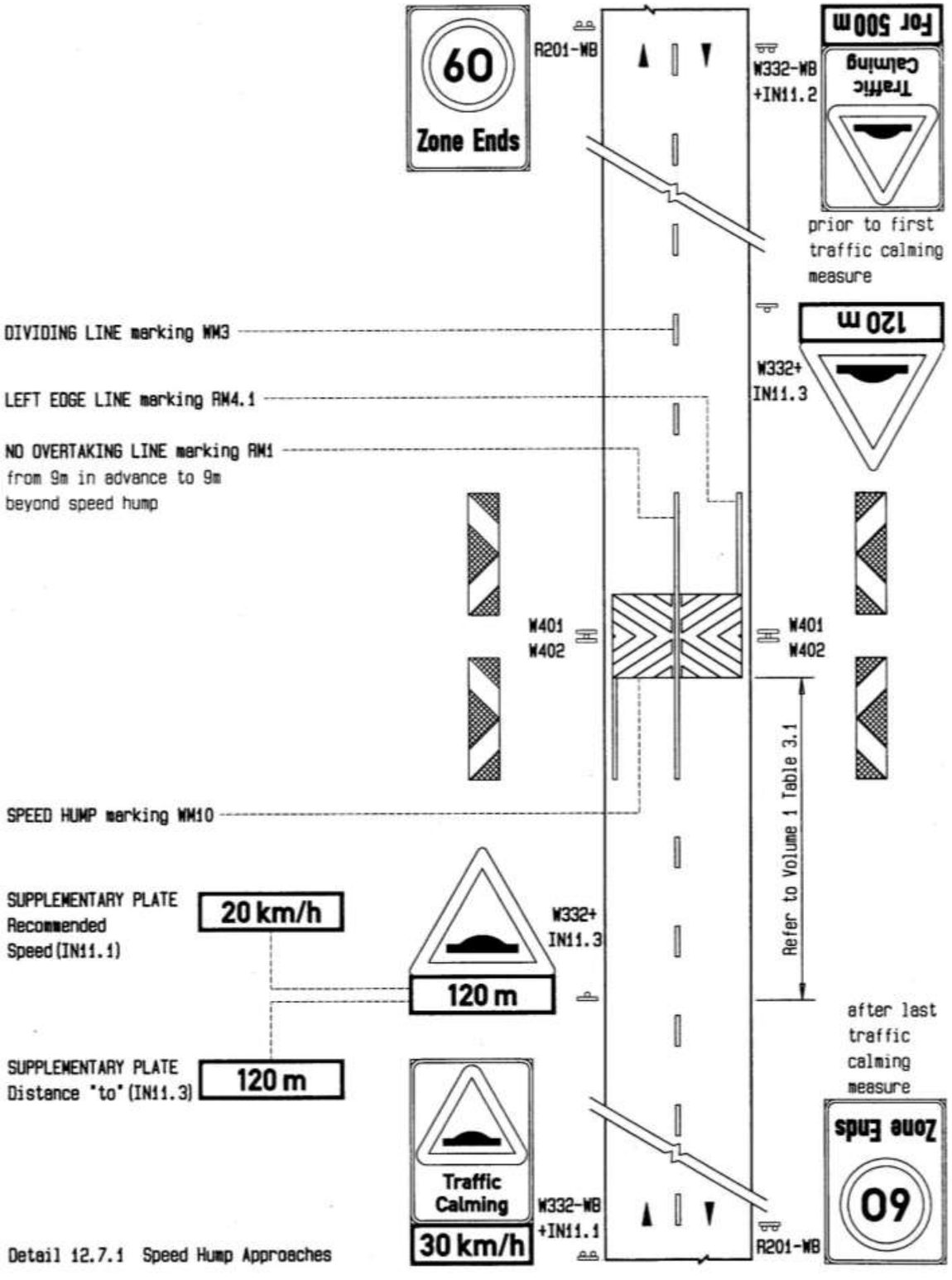
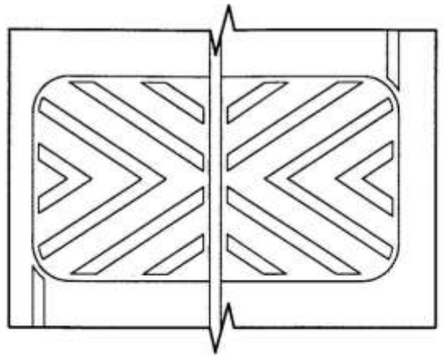
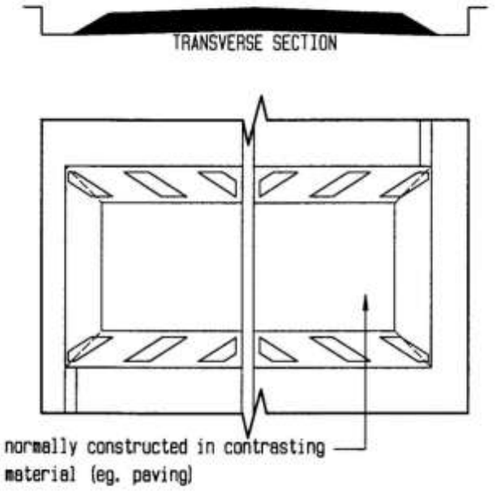


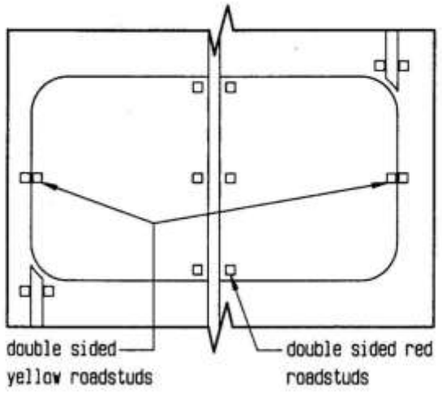
Detail 12.7.1 Speed Hump Approaches



Detail 12.7.2 Round Top Speed Hump with Tapered Sides - PLAN VIEW



Detail 12.7.3 Flat Top Speed Hump with Tapered Sides - PLAN AND SECTION



Detail 12.7.4 Roadstud Detail - Round or Flat Top Speed Hump - PLANVIEW

12.4.5 Notes on Figure 12.7

(1) **Signs and Markings per Approach**

Quantity	Type	Min. External Dimension (mm)
1	W401	600 x 150
1	W402	600 x 150
1	W332	900 side
1*	IN11.1	900 wide
1*	IN11.3	900 wide
1	RM1	-
1	RM4.1	-
PLUS per speed hump		
1	WM10	200 stripes
3	Red roadstuds	-
4	Yellow roadstuds	-

* = optional signs

(2) When several speed humps comprise an area traffic calming treatment the use of high visibility signs W332-WB+IN11.1 at the main entry points to the area is recommended. The normal size of such signs is 1600mm x 1200mm but 1200mm x 900mm may be specified. If a reduced speed limit is imposed within such an area the use of high visibility "Zone Ends" R201-WB signs may be warranted on leaving the area.

(3) If the area is subject to a variety of traffic calming measures sign W201-WB+IN11.2 may be replaced by one of signs W339-WB+IN11.2 or W332-WB+IN11.1 as appropriate (see Figure 12.2).

(4) **Checklist**

The following factors should be checked when considering signing for traffic calming measures which include speed humps:

- ❑ does street lighting exist in the area?
- ❑ is the speed hump an isolated one or part of an area traffic calming treatment?
- ❑ is the speed hump part of a traffic calming treatment involving a range of different traffic calming measures?
- ❑ is the speed hump a flat top hump which is used as a pedestrian crossing?

Fig. 12.7
Typical Road Sign Layout For Speed Humps

12.4.6 Chicanes or Pinch Points

1 Typical traffic calming signing layouts for a chicane are shown in Figure 12.8. Other aspects with respect to the implementation of chicanes/pinch points are outlined below.

2 Pinch points reduce the carriageway width on opposite sides at a specific part of the road. It is also possible to have a single pinch point on one side of the carriageway (see Detail 12.8.3). A useful width restriction is to allow for a carriageway width where two cars can pass each other slowly (carriageway width 4.2 m to 4.4 m) but one car and a bus or heavy goods vehicle together would have difficulties in passing. More commonly used are pinch points that only one vehicle can negotiate at a time (carriageway width 2.75 m to 3.2 m).

3 The form and shapes of pinch points vary considerably. Often they are constructed as pavement peninsulas or as small planted areas combined with trees. This type of pinch point may be designed in such a way that the existing road drainage is unaffected. It is also possible to use pinch points in combination with cycle facilities. Such pinch points are used as separators between the carriageway and the cycle lane.

4 In order to maintain a low speed over a longer stretch of road, pinch points, for one-or two-way traffic, should be placed not more than 50 m apart (30 m to 40 m spacings are, in fact, advisable).

5 In regard to the suitability of pinch points for one-way and two-way traffic flows, the following should be noted:

(a) One-Way Traffic:

pinch points reducing the carriageway to one lane are not suitable for main roads with high traffic flows. The Dutch traffic calming manual only recommends pinch points for flows of 400 to 600 vehicles per peak hour (maximum 4,000 to 6,000 vehicles per 12 hours); according to the Danish manual, pinch points that reduce the carriageway width to one lane are advised only for traffic flows of up to 3,000 motor vehicles per day.

(b) Two-Way Flow:

pinch points reducing the carriageway width to 4.2 m to 4.4 m could be used on roads with higher motor vehicle flows than recommended in the Dutch manual, but only if the heavy goods vehicle and bus proportions are low (about 5% and less).

6 Pinch points with a high frequency of buses and/or HGV's need a wider carriageway width (4.6 m to 4.8 m). The Dutch manual suggests a carriageway width for two-way traffic of 5 m to 6 m when there is a high portion of bus and heavy goods vehicle traffic. However, the speed-reducing effect will then be minimal unless other traffic calming measures are added.

7 Pinch points appear to be ideal for low-frequency bus routes when neither road humps nor speed cushions are acceptable to bus operators.

8 Pinch points need enough light to be seen well in advance by motor vehicle drivers during the hours of darkness. This will also apply for chicanes.

9 As with all traffic calming measures, chicanes and pinch points need to be complemented by traffic control devices of various sorts to ensure that drivers are made aware of the presence of the "obstruction" in their anticipated or normal path. The extent of this marking for visibility is likely to depend on whether the measures have been installed as part of an initial development, complete with landscaping, or as an after measure with little attention to landscaping. The least that is likely to be required is the use of retroreflective panels on decorative bollards placed on the chicanes or pinch points and the possible use of KERBFACE marking GM8.

10 For a one-way pinch point some form of control over the passage of vehicles in one direction is required. Depending on the geometry of the pinch point, **AND whether if forms part of an intersection**, conventional STOP signs R1 or YIELD signs R2 may be used. However, pinch points are commonly located in a mid-block position and the use of YIELD TO ONCOMING TRAFFIC sign R6 in one direction, and either RIGHT OF WAY sign IN7 or an appropriate DIAGRAMMATIC sign in the other direction. If sight distance to the pinch point is limited, advance versions of signs R6, IN7 or a DIAGRAMMATIC sign may be used with SUPPLEMENTARY PLATE signs IN11.3. A YIELD LINE marking shall be provided on the approach which loses priority (see Detail 12.8.3).

11 The signing of a chicane or double pinch point will vary according to whether it is intended to operate on a one-way or two-way basis. Detail 12.8.1 shows controlled use by means of YIELD TO ONCOMING TRAFFIC signs R6. In such a situation the operation involves a "first-come/first-served" approach, whereby the vehicle arriving at a yield line whilst another is within the chicane area, shall yield to that vehicle, and so on (keeping in mind that this form of traffic calming is only appropriate for low orders of traffic volume - see paragraph 12.4.6.5). If the chicane is to work in a two-way manner there is no yield control involved and warning of the restriction in width should be given by ROAD NARROWS advance warning signs W328, W329 or W330 or by advance warning WIDTH RESTRICTION sign W360 and TWO-WAY TRAFFIC sign W212 (see Detail 12.8.2). In all cases the option exists to indicate the distance to the pinch point using SUPPLEMENTARY PLATE signs IN11.3 or to provide the "warning" message in a high visibility or diagrammatic sign form.

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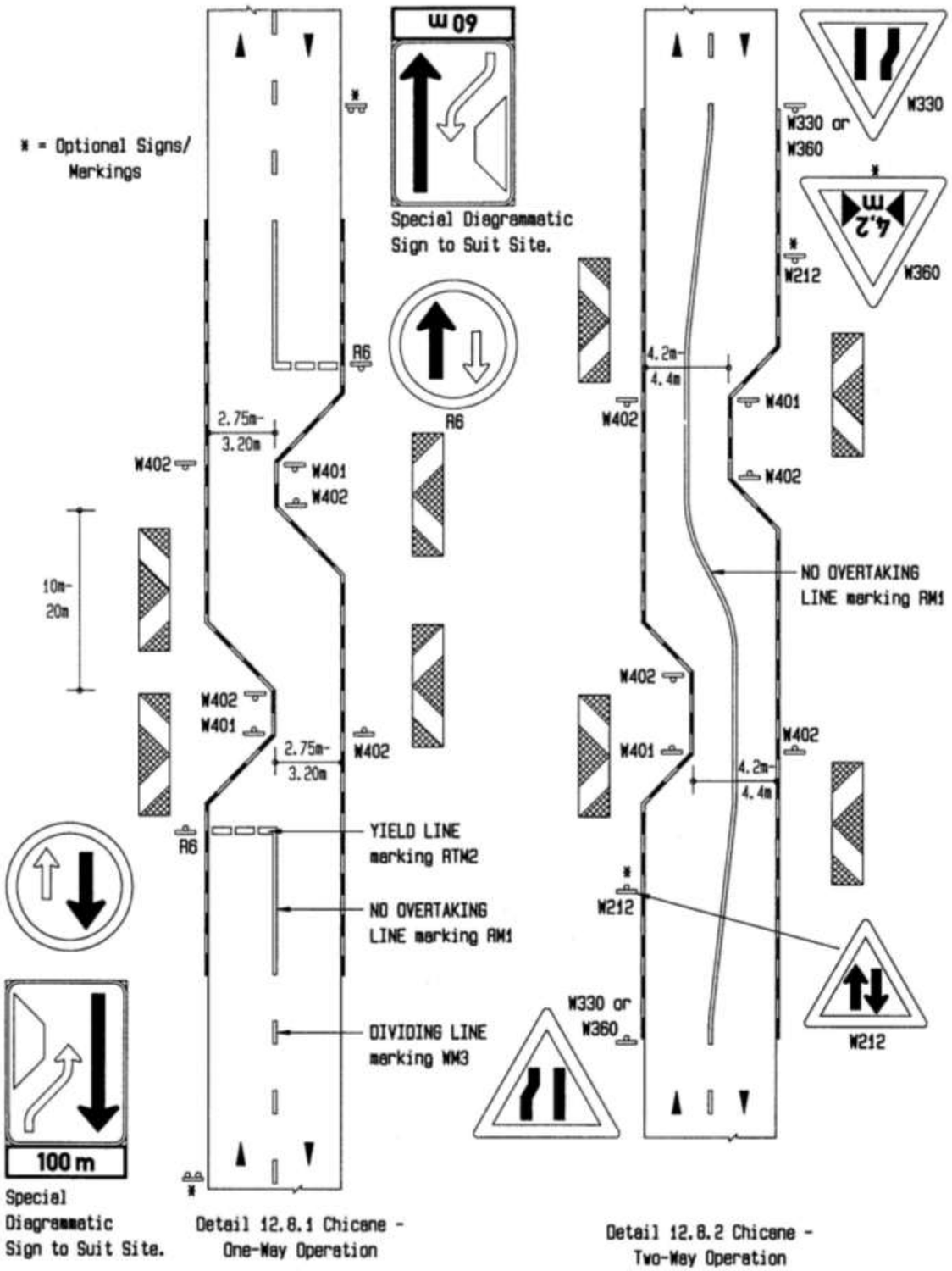

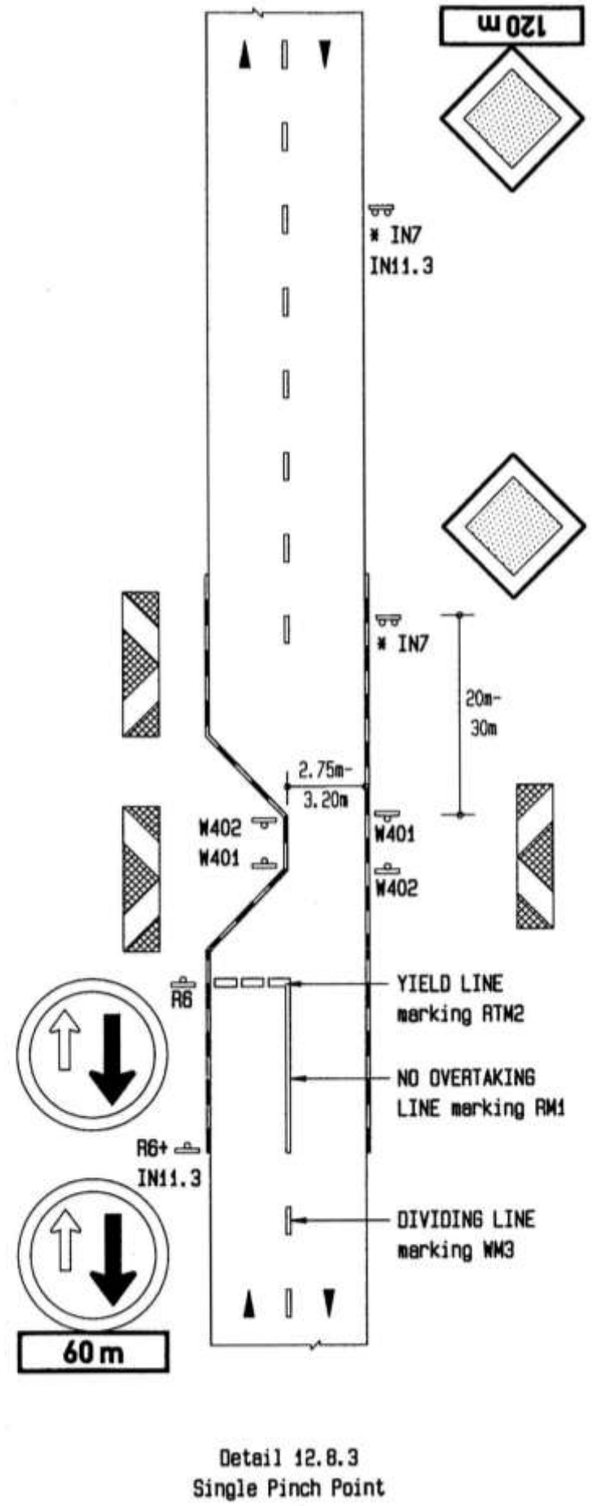

12.4.7 Notes on Figure 12.8

(1) **Signs and Markings per Approach**

Quantity	Type	Min. External Dimension (mm)
CHICANE		
(i) Yield Approach – Detail 12.8.1		
1	R6	600
1	W360	900 side
1	W401	600 x 150
2	W402	600 x 150
1*	IN11.3	900 wide
1	RTMs	200 wide
1	RM1	9 metres
1	GM8	length of chicane
(ii) Non-Yield Operation – Detail 12.8.2		
1	W330 or W360	900 side
1*	W212	900 side
1	W401	600 x 150
2	W402	600 x 150
1	RM1	half length
1	GM8	length of chicane
PINCH POINT		
Yield Operation – Detail 12.8.3		
2*	R6	600
1*	IN11.3	600 wide
2	W401	600 x 150
1	W402	600 x 150
1	RTM2	200 wide
1	RM1	9 metres

* = optional signs

(2) **Checklist**

The following factors should be checked when considering signing for traffic calming measures which include speed humps:

- ❑ are peak hour traffic volumes under 600 vehicles per hour?
- ❑ is the area adequately illuminated?
- ❑ is the road used by public transport vehicles or a significant percentage (5% or more) of heavy goods vehicles?
- ❑ is operation to be one-way or two-way?
- ❑ are chicanes to be landscaped - if yes, W401/W402 signs may be omitted?
- ❑ are diagrammatic signs required to assist awareness?

Fig. 12.8
Typical Road Sign Layout
For Chicanes/Pinch Points

12.4.8 Raised Junctions

1 A typical signing layout for a raised junction is shown on Figure 12.9. Other aspects with respect to the implementation of raised junctions are outlined below.

2 The plateau height should be of the order of 100 mm and the plateau should be paved in block-paving with a distinctive colour and a textured finish.

3 The adjacent sidewalk should preferably be 10 mm to 20 mm higher than the plateau in order to assist people with a visual handicap.

4 Ramps on the approaches to the junction should be a minimum length of 600 mm.

5 It should be ensured that roadway lighting at the junction is extremely good.

6 A raised junction may be provided at a signalised junction or a non-signalised junction. If the provision of the raised junction is intended to specifically improve the priority of crossing pedestrians (rather than the presence of pedestrians being incidental - as at any urban junction) care must be taken with the selection of road traffic signs. **The use of block paving or textured surfaces must not be seen as an argument for not providing recognised pedestrian crossing markings.**

7 It should be noted that if a pedestrian crossing point is not indicated by road markings, the area in which pedestrians may have the right of way to cross a road in terms of the "Rules of the Road" may be significantly larger than would otherwise normally be allocated by markings (see Chapter 3, Figure 3.1).

8 There are three recognised ways in which pedestrian crossings may be marked, namely:

(a) PEDESTRIAN CROSSING LINES marking RTM3 (appropriate at traffic signals); or

(b) BLOCK PEDESTRIAN CROSSING marking RTM4 (appropriate at non-signalised crossing points); or

(c) GUIDE LINES marking GM2 (appropriate if no form of priority other than the rule of the road is applicable).

9 It has been the general practice in South Africa not to use BLOCK PEDESTRIAN CROSSINGS marking RTM4 at junctions. Given that traffic calming measures, in certain situations, are specifically provided to improve pedestrian safety and freedom of movement, the wider use of marking RTM4 may be beneficial. In terms of the provisions of the Road Traffic Act, Act 93 of 1996 and its Regulations the use of marking RTM4 at a junction **is not precluded**.

10 Figure 12.9 shows a non-signalised junction with a raised plateau junction area. The figure illustrates the option to use markings RTM3 AND RTM4 at such a junction. From the illustration used it can be assumed that in this example pedestrian movements are greatest crossing the priority road.

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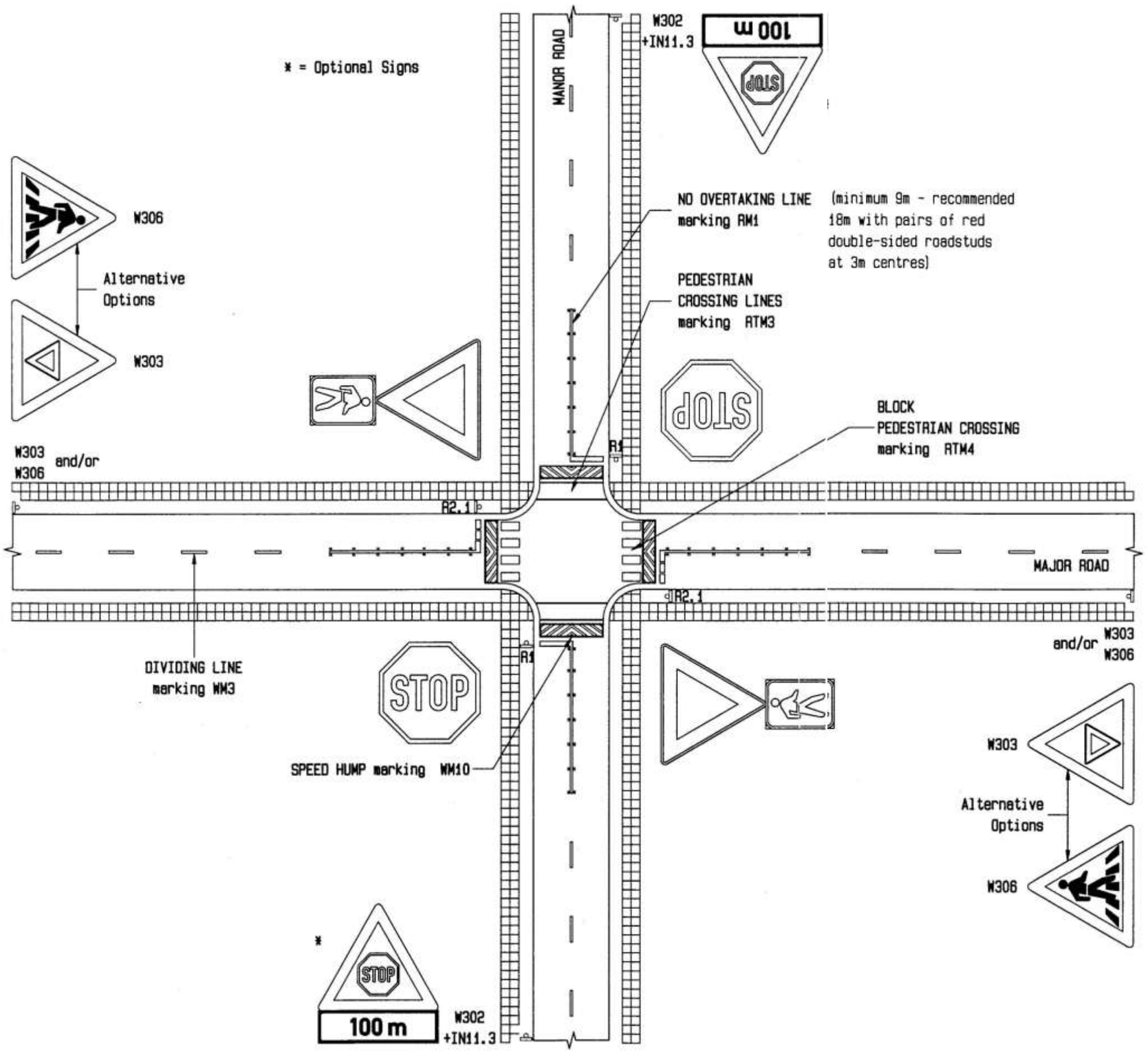

12.4.9 Notes on Figure 12.9

(1) **Signs and Markings per Approach**

Quantity	Type	Min. External Dimension (mm)
MAJOR ROAD		
1	R2.1	900 side
1	W303	900 side
1	W306	900 side
1	In11.3	
1	Wm10	200 stripes
1	RTM4	3000 x 600
1	RTM2	200
MINOR ROAD		
1	R1	600
1	W302	900 side
1	WM10	200 stripes
1	RTM3	100 x 3000 apart
1	RTM1	300

✱ = optional signs

(2) **Checklist**

The following factors should be checked when considering signing for traffic calming measures which include speed humps:

- ❑ is the junction signalised or not?
- ❑ are additional measures necessary to control pedestrians?
- ❑ can the vertical height of the plateau be made clearly visible to drivers?

Fig. 12.9
Typical Road Sign Layout
For Raised Intersection

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ROADWORKS SIGNING

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13.3 Traffic Management

13.4 Setting of Speed Limits

13.5 Temporary Delineation

13.6 Contract Specification

13.7 Other Site Factors

13.8 Signing Applications for Short Term Works

13.9 Signing Applications for Rural Roads

13.10 Signing Applications for Urban Streets

13.11 Signing Applications for Freeway and Dual Carriageway Roads

13.12 Enlarged Standard Details – All Applications

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CHAPTER 13

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CHAPTER 13:
ROADWORKS SIGNING

13.1 INTRODUCTION

13.1.1 General

1 The temporary and continually variable nature of road construction and maintenance operations on roadways which are open to traffic makes such sites potentially more dangerous than a permanent hazard since even a driver familiar with the route cannot rely on his previous knowledge to predict conditions. In order to clearly identify these temporary conditions from permanent ones, exclusive signs with a yellow background are used.

2 As part of an holistic approach to roadworks signing, a significant increase in the use of symbols is recommended. In this context, the meaning of the "ROAD WORKMAN" symbol has been broadened to encompass the general meaning of "ROADWORKS", whether or not manual labour is in progress and whatever the scale of roadwork activity. In this way, the use of advance signs displaying text messages, such a "ROADWORKS AHEAD", is avoided.

3 Any work activity which results in a reduction in the road space available to drivers should be preceded, where space permits, by an adequate number of temporary road signs. The number and spacing of these signs is dependent on the site conditions and the design speed of the roadway.

4 All appropriate temporary road signs should be in position prior to the commencement of work. The crew placing the signs should use a vehicle which has been specially designed to make it highly visible to approaching drivers.

5 Great care should be taken that only those temporary signs appropriate to the current work activity are displayed. **All actions required of a driver should appear obviously realistic to him. When work conditions are variable, the temporary signing must be maintained so that the signs correctly represent the conditions applicable the given time.** Signs which only apply during daylight or only to specific circumstances should be removed or concealed when their significance does not apply. Nothing encourages a disregard of signs more than regulatory or warning signs displayed for non-existent conditions or hazards.

6 Only temporary road signs covered by the South African Road Traffic Signs Manual should be used. The use of signs not covered by the manual negates on-going efforts to achieve a high degree of standardisation of temporary signing practices. This high degree of standardisation is in the interest of the general safety of road users and site staff and failure to achieve it can result in the actual creation of hazards and confusion on the part of drivers.

7 Where a roadway is closed, partially closed, or diverted, or where an obstruction exists in the roadway, the alignment to be followed by vehicles should be delineated by delineators, cones, barricades, barriers, roadstuds or road markings, or an appropriate combination of these devices. Delineation should be created in such a manner as to give an impression of continuity, both by day and night. The delineation devices used should be kept free of anything which could create a hazard should the device be struck by a passing vehicle.

8 The manner in which a roadway may be affected by construction or maintenance operations varies considerably. Complete standardisation of practices for signing and delineating such sites is impractical. However, it is important that design and site staff adopt a disciplined approach to the traffic management of roadworks sites. A systematic approach should be used to present the driver with changes in conditions, one change at a time, by the use of standardised sub-components. In this way the action or reaction of the driver can be anticipated and provided for with an acceptable degree of certainty and effectiveness.

13.1.2 Objectives of Roadworks Signing

1 In order to achieve the safest possible operating environment the following objectives should be sought with disciplined attention to detail:

(a) to establish, as far as possible, a standard pattern of traffic control devices for typical road construction and maintenance operations which is simple and clear to understand;

(b) to develop in drivers, by means of exclusive signs which are visible and have a simple and easily understood message, a high level of awareness that a reduced standard of roadway exists ahead of them, **and the knowledge that this requires their increased vigilance;**

(c) to generate a high level of driver respect and familiarity for the efficiency and adequacy of the traffic management used at roadworks;

(d) to maintain roadway capacity and traffic flow at the highest possible levels, particularly on the higher class routes, where large traffic volumes would otherwise result in congestion, delay and accident potential;

(e) to keep roadwork related accident levels at a minimum;

(f) to provide adequate information to redirect drivers *via* alternative routes when detours are implemented;

(g) to provide designers of traffic management systems, and the site staff who implement them, with adequate tools with which to accomplish the above objectives;

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(h) to make designers and site staff aware of the need for a very high degree of discipline in the management of their sites on a day to day basis.

13.1.3 Norms to be Applied to Roadworks Signing

1 The norms listed below comprise the principles, criteria or standards by which the signing of roadworks sites should be developed:

(a) all temporary signs shall conform to the exclusive colour code except for regulatory control signs e.g. STOP, YIELD and NO ENTRY, and existing direction signs which can be easily re-positioned at traffic deviations (see paragraph 13.2.2.2);

(b) signs from the regulatory, warning or guidance (direction and diagrammatic) classes may all be used, either individually or in combination, as appropriate, in the exclusive colour code with the exceptions noted in paragraph 13.1.3.1(a) above B in this respect regulatory signs must always conform to the size requirements specified for various roadworks applications (see also paragraph 13.1.3.1(i));

(c) all signs should have retroreflective backgrounds and regulatory and warning signs should have retroreflective borders;

(d) diagrammatic guidance signs should generally use a vertical rectangular format and display a pictorial representation of the road condition immediately ahead;

(e) the design of temporary diagrammatic guidance signs embodies the following principles:

(i) red retroreflective areas shall be used to indicate an obstruction in the road ahead;

(ii) one arrow shall be used per lane of traffic in the direction of travel to which the sign applies;

(iii) unless necessary for effectiveness of the sign message, one or more lanes of opposing traffic shall be indicated by one arrow;

(f) when red areas of retroreflective material are applied to yellow retroreflective background materials the reflective index of the yellow material should be at least 3,5 times that of the red material;

(g) distance information plates shall be used wherever possible to:

(i) indicate the length of a site (only appropriate to sites over 2 km in length - distances given in kilometres only e.g.. "6 km");

(ii) indicate the distance to a change in road conditions (transition area - normally 100 m, 200 m, 300 m or 400 m, up to 1 km);

(iii) indicate the distance for which a particular traffic configuration applies (can be used to "countdown" a long site to reassure motorists e.g. "For 14 km");

(h) speed limits should be applied realistically and should, where appropriate, be capable of being altered to suit changing local conditions and/or time of day;

(i) regulatory and warning sign sizes should be increased for rural applications to a minimum size equivalent to that applicable to a 100 km/h design speed, irrespective of the speed limit within the roadworks; the same principle should be applied in urban areas wherever possible using a minimum sign appropriate to an 80 km/h design speed;

(j) when high approach speeds and/or large traffic volumes pertain, sign messages should be repeated along the length of a roadway, and, in the case of dual carriageway roadways should be displayed on both sides of the roadway (see paragraph 13.1.4.6),

(k) the **minimum** spacing between repeated signs along the length of a roadway should be 100 metres on high speed roads and 60 metres on lower speed roads where space permits;

(l) the spacing of delineation devices should be related to the rate of change of direction, using closer spacings for sharper changes of direction;

(m) the lateral and vertical positioning of temporary signs at roadworks should, wherever possible, adhere to the norms applicable to permanent signs - see Volume 1, Chapter 1, Table 1.4 - however, it will often not be possible to adhere to these norms - recommended norms for the positioning of temporary signs in such instances are given in Table 13.1;

(n) temporary direction signs used to redirect traffic to alternative routes should use the exclusive colour code and comply with all other design parameters of permanent direction signs; the use of DIN 1451 Style "A" compressed lettering is recommended for temporary direction signs to minimise sign area;

(o) standard road markings , which may cause confusion, particularly at changes of direction, should be obliterated; temporary road markings should be used to emphasise the new alignment;

(p) to maintain the capacity of the roadway, taper and crossover design should be directly related to the design speed of the temporary change of alignment;

(q) a lane reduction taper should **never** extend over a width of more than one lane (or at the most a lane plus a shoulder); if the required reduction in width amounts to two lanes or more, two or more tapers should be used, each to extend over a maximum of one lane at a time and be separated along the roadway by a stabilising area;

(r) to achieve a major change in alignment, without significant or further reduction in roadway width, a reverse curve should be used;

(s) to reduce complex traffic management conditions to an acceptable level of simplicity, complex changes in width and alignment should be undertaken one stage at a time i.e.. a lane drop and a reverse curve should not occur at the same place.

13.1.4 Placement of Temporary Signs at Roadworks

1 Several of the norms listed in Subsection 13.1.3 relate to the correct placement of temporary roadworks signs. In particular

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paragraphs 13.1.3.1 (k) to 13.1.3.1 (m) state the general norms applicable to sign positioning at roadworks.

2 The position of a temporary sign can be specified in three ways, namely:

(a) longitudinally in relation to the roadway alignment;

(b) laterally in relation to the roadway cross section;

(c) vertically.

3 The longitudinal positioning of temporary signs at roadworks is specified for each of the typical layouts covered in Sections 13.8 to 13.12. One of the most important aspects of longitudinal positioning of roadworks signs is the separation longitudinally between successive signs. **This separation should not become less than recommended in paragraph 13.1.3.1 (k).** If provision of such separations is difficult to achieve, consideration should be given to reducing number of signs because closer spacings will render the signs ineffective in any case. Certain signs, such as DELINEATOR signs TW401 and TW402, should be positioned at close longitudinal spacings to achieve their intended effect. The longitudinal spacing requirements for such signs are covered in Section 13.5 and Table 13.4.

4 The lateral positioning of temporary signs at roadworks is often constrained by site conditions. Wherever possible the lateral clearances applicable to permanent signs should be achieved. These are covered in Volume 1, Chapter 1, in Figures 1.23 and 1.24. The basic requirements of these figures are repeated in Figure 13.19 together with recommended absolute minimum values for roadworks situations.

5 Due to the temporary or portable method of mounting signs at roadworks it is not practical to position signs vertically to conform to the norms for permanent sign installations. If a temporary sign is to be mounted on a pole support which is placed in the ground, the mounting height should be as for a permanent sign. Guidelines are given in Table 13.1 and illustrated in Figure 13.19 for the vertical mounting of temporary or portable signs on stands placed on the road or verge surface. Such stands may be ballasted to limit accidental movement but are generally not other-wised fixed to the road surface.

6 Throughout this chapter it is recommended that temporary signs be repeated on the right side of one way roadways such as carriageways of dual carriageways. The placing of any temporary sign at the roadside in itself represents a hazard. This is one of the factors which must be taken into account when deciding on the reduction in speed limit appropriate to a roadworks site. It can be argued that the placing of temporary signs on the right side of the roadway is more hazardous than on the left side. (However, this argument is dependent on the design standards of the median separating the two carriageways i.e. a wide grass median versus a concrete barrier.) The following factors should be considered before deciding whether to use right side temporary signs, and the signs could be considered likely to be effective if a positive answer can be given to any of the questions:

(a) is traffic likely to be so dense that the numbers of vehicles, and particularly large vehicles, is likely to significantly obscure left side signs to drivers in a second or third lane from the signs?

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TABLE 13.1 RECOMMENDED MINIMUM VERTICAL CLEARANCE (mm) FOR TEMPORARY TRAFFIC CONTROL DEVICES (1) **TABLE 13.1**

Sign Class or Type	85%ile Approach Speed		
	<60 km/h	60 km/h – 80 km/h	> 80 km/h
Short term (4)	200	200	200
Cluster stand	200	N/A	N/A
Delineators	200	200	200
Barricades	600	750	750
Chevrons	600	750	1200
Regulatory (2)	200	750	1500
Advance warning (2)	200	750	1500
Diagrammatic	800	800	1200
High visibility	800	800	1200
Traffic signals (5)	2300	2300	2300

NOTE:

(1) The recommended minimum vertical clearance given is between the underside of the sign and the edge of the travelled way.

(2) Wherever possible a greater than minimum vertical clearance should be provided.

(3) Signs should preferably not be mounted in the vertical clearance range 1500 mm to 2000 mm to avoid the risk of signs hitting vehicle windscreens during collisions.

(4) Short term work should be limited to work of duration of 24 hours or less.

(5) The vertical clearance of a traffic signal is specified as being between the centre of the lowest lens and the edge travelled way.

(b) is there a change of roadway conditions ahead on the right side of the carriageway?

(c) is traffic from left being diverted towards the right?

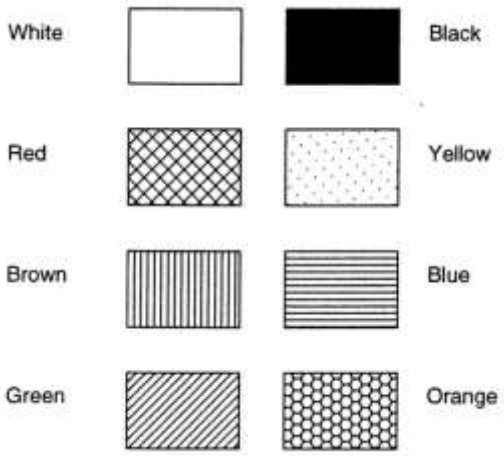
(d) is the work load of drivers on the right side of the carriageway so much greater than the normal workload for such an environment that drivers' concentration on traffic is likely to result in them missing left side temporary signs?

(e) will right side signs be a no greater a hazard than left side signs?

13.1.5 Road Traffic Sign Colour Indication

1 The chapters of Volume 2 of the South African Road Traffic Signs Manual (SARTSM) are not prepared in colour. Relevant examples used to illustrate appropriate signs, signals and markings are shaded in a black and white coding which is illustrated below.

2 The basic principles of the road traffic sign colour coding system are shown, in colour, in the SADC-RTSM Volume 1, Chapter 1, Section 1.4, and in the Contents sections of relevant Volume 1 and 4 Chapters.



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13.10 SIGNING APPLICATIONS FOR URBAN STREETS

13.10.1 General

1 The applications of temporary signing for roadworks covered in Sections 13.8 to 13.12 have been subdivided into categories for ease of reference. These categories are:

(a) short term works (Section 13.8);

(b) rural roads (Section 13.9);

(c) urban roads (Section 13.10);

(d) freeways and dual carriageway roads (Section 13.11).

Section 13.12 provides enlarged details of elements covered in other sections, and may be appropriate to any or all of the categories listed above.

2 The categorisation of applications used should only be considered to be general in nature. Many applications may be appropriate in several or all categories. Such applications are only detailed once to avoid duplication. Practitioners who do not find the application they are seeking in their first choice of category should therefore check other categories. If their required application is not covered, it will be necessary to determine a similar situation and to adapt it, with care, to their needs.

3 Section 13.9 and this section deal with rural and urban situations respectively. These terms also should be considered as general and if a "rural" application is appropriate within an urban area, the application details should be used with appropriate adjustments to sign spacing and sizes. The signing of roadworks in peri-urban areas will most likely be catered for by rural category applications.

4 In the various figures the following rules or conventions apply:

(a) all signs are correctly oriented for the direction of travel to which they apply;

(b) to avoid confusion with any arrows on road signs or markings, the direction of travel of traffic is, where relevant, indicated thus ► ;

(c) all details are given in metres **but all may be directly used as "paces" in practice.**

5 Signs should be sized as recommended in Volume 1. As a rule of thumb the following sizes are appropriate for regulatory, warning and diagrammatic signs:

(a) Gravel roads:

(i) circular signs - 1200 mm diameter;

(ii) triangular signs - 1200 mm side length;

(iii) diagrammatic signs - 1200 mm x 1600 mm;

(b) Bituminous, concrete or brick surfaced roads:

(i) circular signs - 1200 mm diameter;

(ii) triangular signs - 1500 mm side length;

(iii) diagrammatic signs - 1200 mm x 1600mm.

(c) Urban streets:

(i) circular signs - 900 mm/1200 mm diameter;

(ii) triangular signs - 900 mm/1200 mm side length;

(iii) diagrammatic signs - 1200 mm x 1600 mm.

13.10.2 Urban Roadworks

1 The temporary signing of urban roadworks situations is commonly influenced by the following factors, either separately, or in combination:

(a) limited space to accommodate signs and traffic;

(b) high traffic volumes (even moderate urban traffic flows are high by rural standards);

(c) the presence of pedestrians;

(d) the need to maintain access to many properties.

2 Roadworks situations in urban areas vary widely in their signing requirements and operational characteristics including, as they do, such environments as:

(a) quiet residential streets;

(b) high capacity arterial streets;

(c) congested central business districts

3 Factors which commonly mitigate against the effectiveness of temporary road signs in urban areas, and which must be recognised and taken into account, include:

(a) street lighting - which may not, as might be expected, improve signing at night, due to stray reflections and reduced luminance contrast so that signs need to be positioned with care;

(b) obscuration of signs by trees, street furniture and by large vehicles;

(c) limited sight distances.

4 The examples covered in this section illustrate individual situations. In practice a large urban roadworks site may include several such situations within the one site. The signing treatment must therefore take into account the individual situations and the collective effect of all situations from a driver's perspective.

5 Many roadworks tasks in urban areas will be of short term duration, commonly undertaken between morning and evening peak traffic. Those examples within an obviously urban environment are included in this section, but many of the examples given in Section 13.8 are also relevant to urban areas.

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13.10.3 Temporary Traffic Signals

1 Temporary traffic signals are an alternative form of temporary traffic control for use on two-way roads which are reduced to one-way operation during roadworks. The use of temporary traffic signals is appropriate at any time, subject to cost effectiveness, as an alternative to the manual STOP/RY-GO operation. However, their use is recommended when such restricted conditions have to be maintained during the hours of darkness.

2 The arrangement of light aspects of temporary traffic signals shall conform to the prescribed arrangements for permanent signals as illustrated in Volume 1. All component dimensions and installation dimensional criteria for temporary traffic signals shall conform to details given in Volumes 3 and 4.

3 The operation of temporary traffic signals may utilize any appropriate, proven, electrical/electronic control system, either linked by cable or not, **provided adequate fail-safe back-up systems are included.**

4 Ideally, the timing of temporary traffic signals should be closely related to actual vehicle arrivals (vehicle actuation) rather than by means of fixed time cycles. Where necessary, detection devices should include the ability to detect the presence of vehicles at the STOP LINE and give an indication of queue length. Due to the dual direction, alternating one-way operation associated with traffic signals in a roadworks installation, it is necessary that a long, specifically calculated, clearance all-red period be provided. This will allow the last vehicle to enter the section sufficient time to leave it, before opposing traffic is released.

5 In a similar manner to STOP/RY-GO operation, temporary traffic signals may be operated in isolation at a localised site or as part of the overall traffic control signing of a major roadworks site.

6 Figure 13.57 shows a typical urban traffic signal application with short advance warning distances. Provided a power source is available, temporary traffic signals may be used in rural situations. When used on a road with high vehicle approach speeds, all advance warning signs should be located at distances consistent with rural roadworks sign sequences (see Section 13.9).

Checklist

- ❑ will the need for one-way operation extend into dusk and night time?
- ❑ is a power supply available?
- ❑ are traffic volumes known in order to set up cycle limit criteria under vehicle actuated operation?
- ❑ what are the fail-safe characteristics of the equipment?
- ❑ are the advance warning signs correctly located for appropriate vehicle approach speeds?
- ❑ will the end of a queue always be visible to approaching vehicles within stopping sight distance requirements?

TYPICAL SIGN REQUIREMENTS

Sign	No	Size (mm)	Quantity
	TR103 TR104	900	1 1
	TW301	900 (1)	2
	TW329 TW330	900 (1)	1 of each
	TD4	450	Taper 24 plus 10 per 100m
	TIN 11.3	900 (1)	2

(1) Sizes indicated for 60km/h. Increase to 1200mm for over 60km/h or for rural use.

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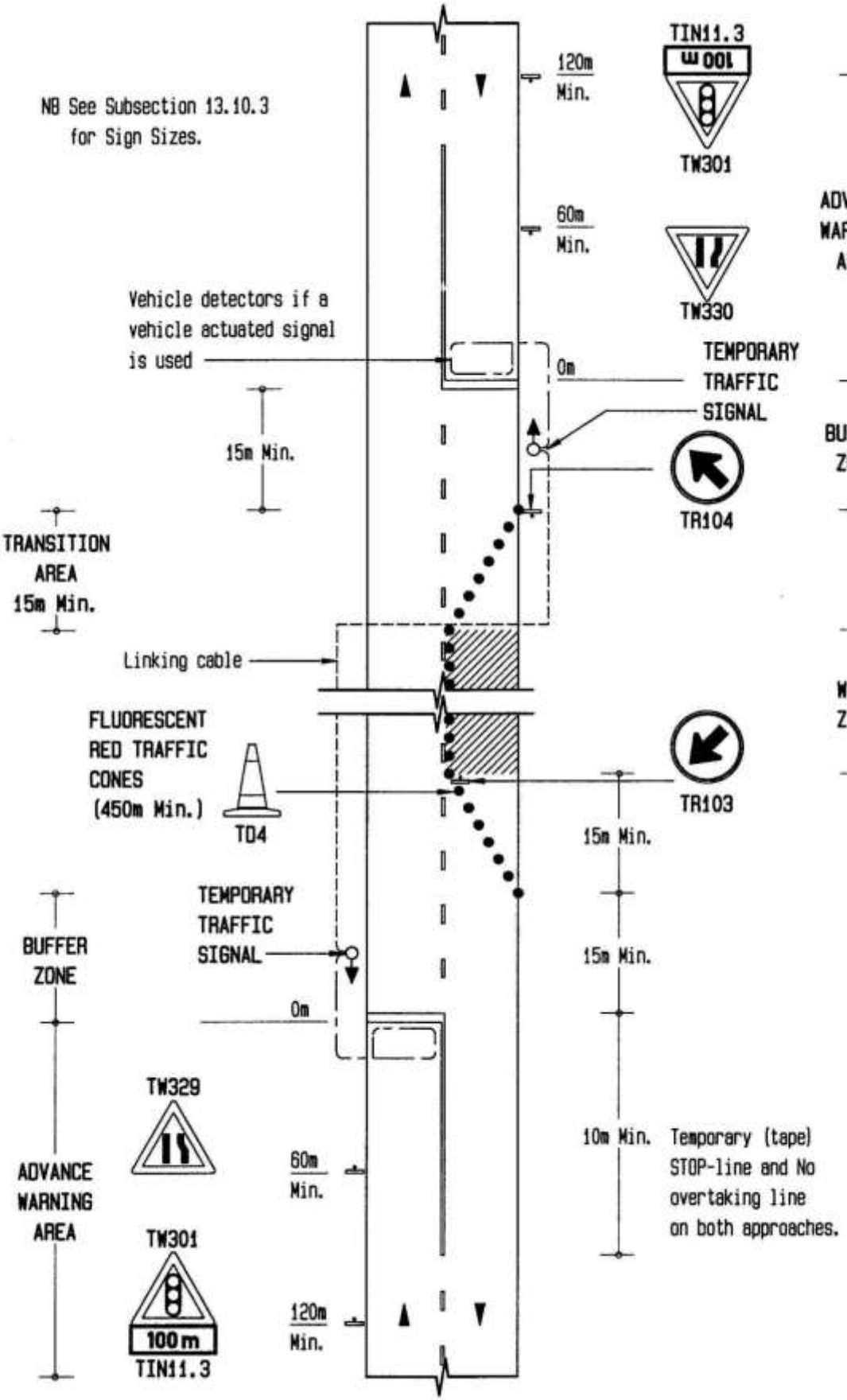

Fig 13.57 **Temporary Traffic Signals**

13.10.4 Sidewalk Deviation

1 It is an important aspect of the safety arrangements of urban (and other) roadworks sites that specific accommodation shall be made for pedestrians. It is too common an occurrence that pedestrians are left to their own devices and expected to just disappear, or to walk within reduced spaces provided for vehicles, totally without protection. Given the numbers of pedestrians on our roads at all times of day and night, it is quite unreasonable that, if the exclusion of pedestrians should be required, or advisable, adequate provisions are not made to redirect the pedestrians to an alternative route. Any authority or contractor not making adequate provision for pedestrians could, in the event of an accident, find themselves facing serious litigation.

2 Figure 13.58 shows a typical arrangement for the accommodation of pedestrians due to the temporary, and localised, excavation of the sidewalk. Such a situation may be an isolated excavation, with no other associated roadworks, such as a local repair to a water main, sewer, electrical cable or other underground service, or similar excavations may be required at one or more places within a larger site. In the latter case the signs provided within the ADVANCE WARNING AREA may be modified according to specific site requirements. It should be noted that the table of signs opposite is a typical listing only, and is not intended to be a definitive inventory.

3 Figure 13.58 shows the option to use modular PEDESRIAN DIRECTION signs (see Volume 1, Chapter 4). The manufacture of temporary arrow signs TGP1, TGP2, TGP3 and TGP4 is, due to the square shape, identical. It is recommended that contractors order "left-" and "right-handed" versions of sign TGP9. These signs should only be used when the revised pathway available to pedestrians may not be obvious to them. Night-time conditions should be borne in mind when assessing this need. These pedestrian direction sign are particularly important to emphasise to pedestrians the need to NOT take a route within the roadway, either with, or in the face of, on-coming traffic. If a normally available path is completely cut-off to pedestrians, this should be indicated by means of NO PEDESTRIANS sign TR218 (or NO CYCLISTS OR PEDESTRIANS sign TR220).

4 The figure shows the use of TEMPORARY BARRICADE signs TW411. These may be replaced by a local authority if it has a custom made device. However, these need to have retroreflective properties and should not simply be painted. Any traffic cones shall be provided with retroreflective sleeves if left in place during times of poor visibility.

TYPICAL SIGN REQUIREMENTS

Sign	No	Size (mm)	Quantity
	TW336	900	2
	TW329 TW330	900	1 1
	TR104	900	2
	TW411	300 X 1800	10 Min
	TD4	450	Tapers 24 plus 10 per 100m
	TR217 Optional	900	1
	TGP4 plus TGP9	900 X 675	1 (1)
	TGP3 plus TGP9	900 X 675	1 (1)
	TGP1 plus TGP9	900 X 675	1 (1)

(1) Due to the modular nature of PEDESTRIAN DIRECTION signs, arrow signs may be used to point in any of four directions.

Checklist

- ❑ is pedestrian deviation within the roadway?
- ❑ are cones and barricades retroreflective?
- ❑ are PEDESTRIAN DIRECTION signs required for the safety of pedestrians?
- ❑ are pedestrian prohibition signs required?

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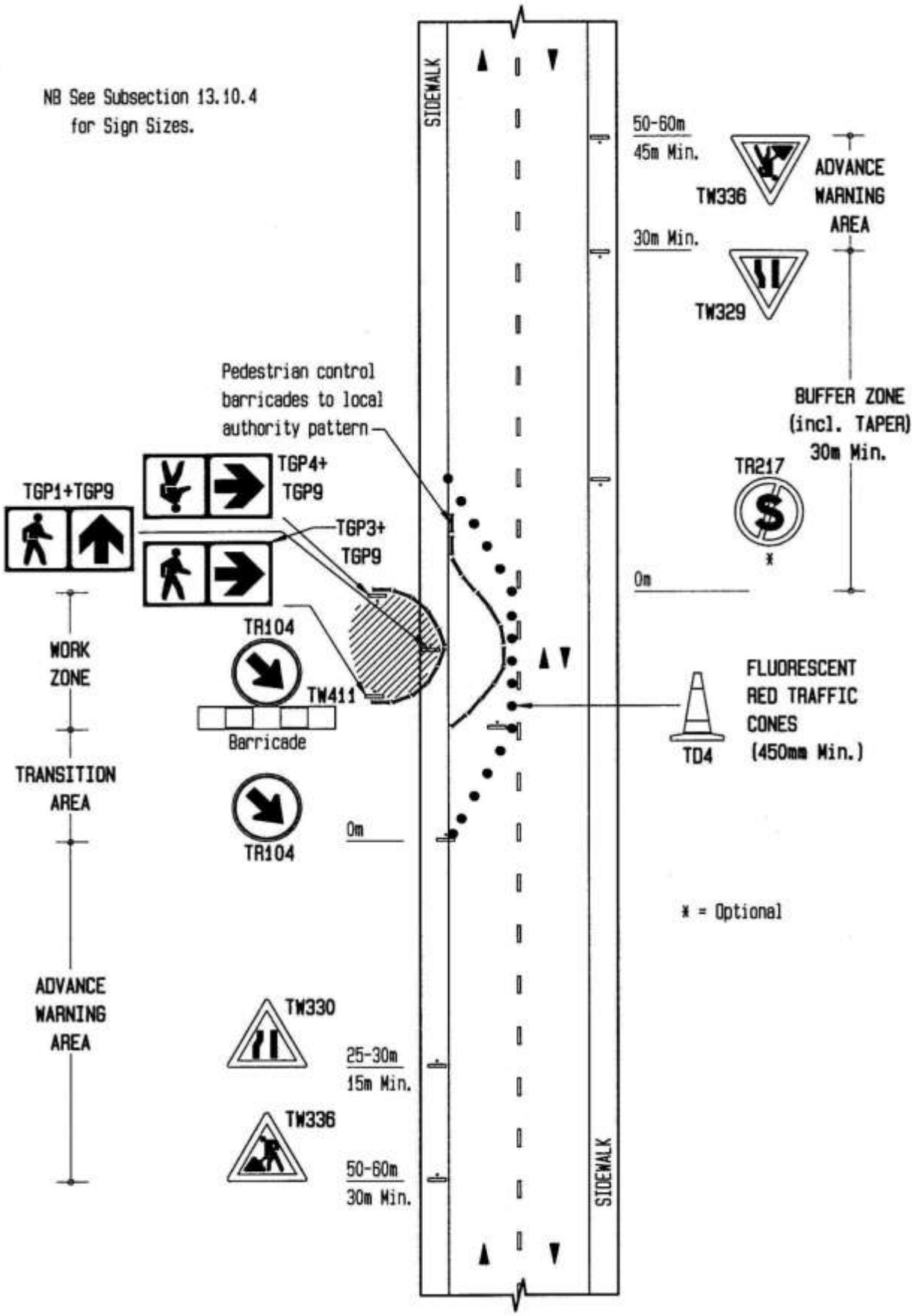

Fig 13.58 **Footway Deviation**

13.10.5 Localised Work Site - Good Visibility

1 Figure 13.59 illustrates a very common work site in urban areas. The fact that the type of site occurs frequently and is often only in position for a short time, tends to result in very poor control of correct signing practices. The fact that the site is small and likely to be of short duration, is no excuse for not thinking through the requirements for correct signing practices and for not carrying them out.

2 The sign inventory and application has been kept to a minimum to facilitate ease of use. This in itself is a reason for paying attention to localised details. Since the signing effectively comprises one "cluster" of three signs and a number of TRAFFIC CONES TD4, it is essential that the signs are visible and do not become hidden by other street clutter. The visibility of the signs is, for example, of higher priority than sticking faithfully to the distances noted in the figure. A particularly important local detail could be the presence of a crest in the road, in which case, the sign "cluster" may need to be moved a greater distance from the work site in order for it to be visible to approaching drivers. If such an action is taken, the TRANSITION AREA and longitudinal BUFFER ZONE should be extended so that vehicles cannot get between the cluster and the WORK AREA. This signing application is only appropriate for situations where sufficient space remains for two-way traffic. If two-way traffic is not possible, or a lane drop is required on a multi-lane road, then STOP/RY-GO control (Figure 13.37), temporary traffic signals (Figure 13.57), or one of the several lane-drop details (Figures 13.35, 13.36 or 13.37), should be considered.

3 The service unit vehicle is shown parked on the "downstream" side of the WORK AREA to make the vehicle less vulnerable and make it easier to drive away from the site when necessary. However, under certain circumstances the vulnerability of the vehicle may be secondary to the safety of the workers, and it may be beneficial in fact to park the vehicle "upstream" of the WORK AREA, particularly if the vehicle is equipped with FLASHING YELLOW WARNING LIGHTS SS3.

Checklist

- ❑ is the sign cluster clearly visible to approaching drivers?
- ❑ is there a crest in the road or a curve or sharp bend on the approach to the site?
- ❑ is there sufficient space available for two-way traffic to pass the WORK AREA?
- ❑ should the service vehicle be parked on the upstream side of the site?
- ❑ does the service vehicle have flashing yellow warning lights?

TYPICAL SIGN REQUIREMENTS

Sign	No	Size (mm)	Quantity
	TW336	900	2
	TR103 or TR104	900	1
	TW401	800 X 200	1
	TD4	450	Taper 12 plus 10 per 100m
	Maintenance Stand		1

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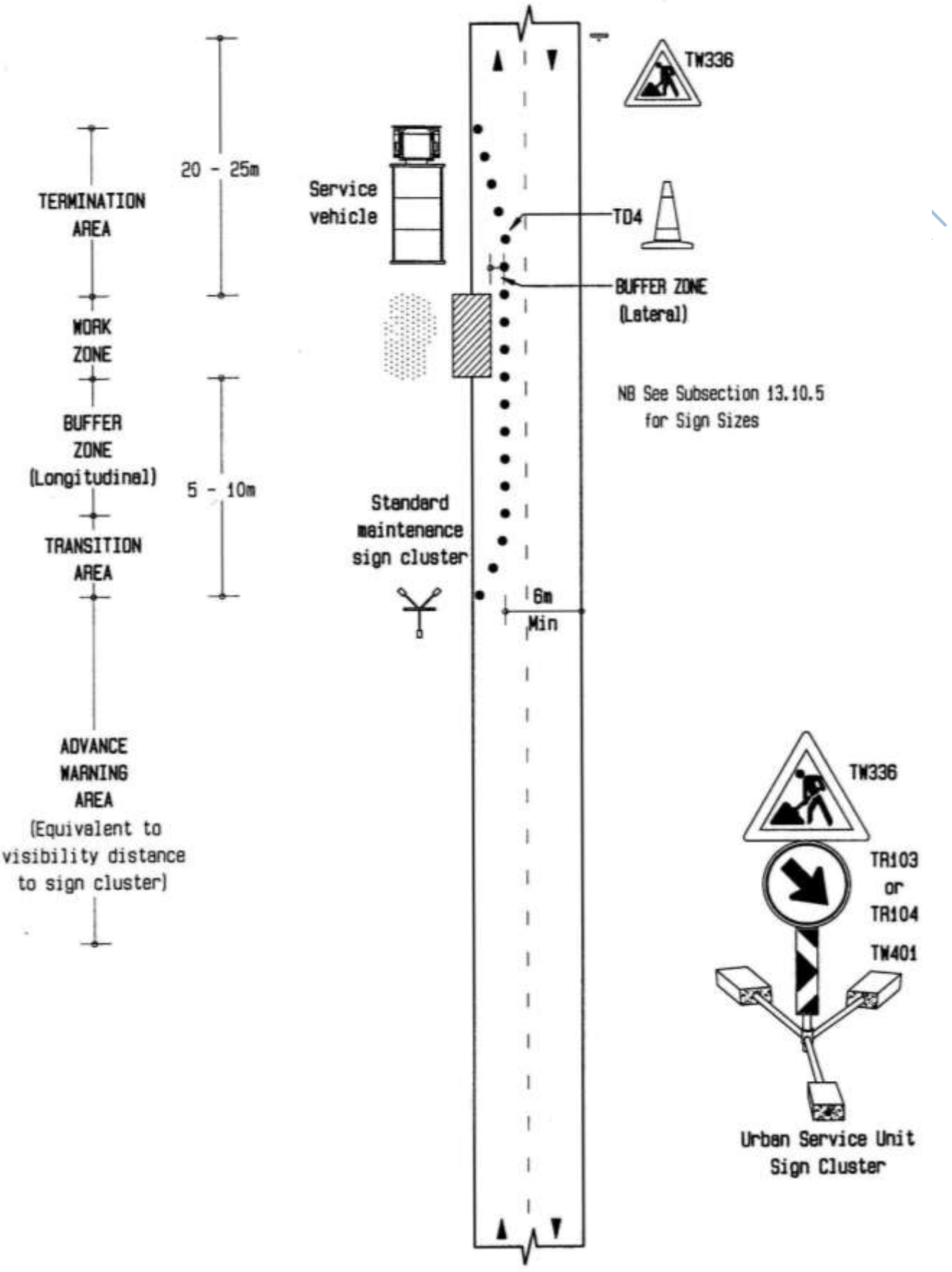

Fig 13.59 **Localised Work Site – Good Visibility**

13.10.6 Lane Closed Beyond a Junction

1 It is a common feature of urban roadworks that it is often necessary to work close to the corner of a junction, and often on the far side. It is also common that such junctions will be signalised. In order to avoid a merging movement within the junction, which has a real potential to "lock up" and affect the operation of the junction for other traffic flows, it is recommended that traffic be directed into the adjacent lane on the approach side of the junction, as shown in Figure 13.60, to correctly align vehicles to cross the junction and avoid the work site. The detail of Figure 13.60 should be considered as representative of appropriate signing principles. Individual sites will vary significantly, but can be dealt with safely, if the principles are adhered to and modified in detail as necessary.

2 Depending on the lane configuration at the junction, and the directions of flow of traffic, it may be possible to set the narrowing taper sufficiently far back from the STOP line to permit one or two left turning vehicles to enter the closed lane after having first gone round the tapered "island".

3 Since the roadworks may also affect turning traffic on the intersecting crossroad, it is recommended that ROADWORKS advance warning signs TW336 be placed conspicuously on the relevant approaches.

Checklist

- ❑ is there space to accommodate a coned-off island on the approach side of the junction?
- ❑ can such an island be set back to permit left turning traffic the use of the lane?
- ❑ have TW336 signs been placed on the intersecting side road?

TYPICAL SIGN REQUIREMENTS			
Sign	No	Size (mm)	Quantity
	TW336	900	3
	TR104	900	3
	TW330	900	1
	TW411	300 X 1800	2
	TD4	450	Taper 20 plus 10 per 100m

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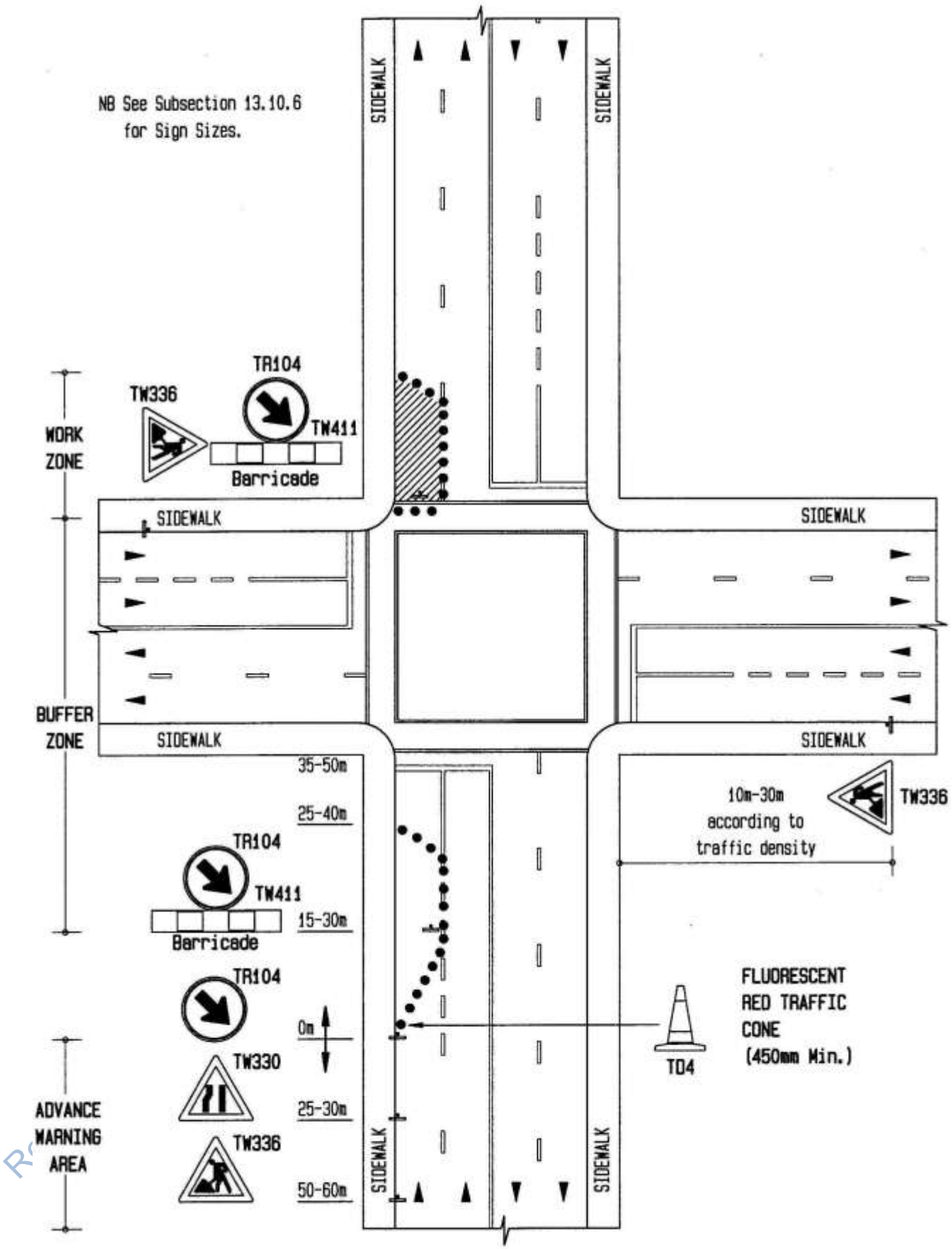

Fig 13.60 **Lane Closed Beyond a Junction**

13.10.7 Work within a Junction

1 Figure 13.61 shows two details covering aspects of work within a junction. As with all similar cases (see Figure 13.60), there are a great many possible variables which may have an effect on the detail of such temporary signing applications. Details 13.61.1 and 13.61.2 should be considered as indicative of the appropriate basic signing concepts for such situations which are subject to detail refinement according to local circumstances.

2 Detail 13.61.1 shows work in the centre of one side of the junction between two one-way roadways. The effect on traffic is different for each of the intersecting approaches. In the one case, traffic can be diverted to both sides of the site. This will generally result in the merging of four lanes down to two. Such a traffic manoeuvre will only be practical during off-peak periods. The tapers on the approach side "island" shall be in accordance with the provisions of Table 13.5 and cone or delineator spacings should conform to Table 13.4. Traffic on the intersecting roadway also has to reduce from four lanes to two. Subject to the block length available, this should be accomplished in two parts - each part reducing by one lane at a time (see Figure 13.62). If necessary, one lane should be dropped on the previous block.

3 Detail 13.61.2 shows work in the centre of the junction area of intersecting two-lane, two-way roadways. Each approach is treated in the same way so that, on entry and exit paths, the normal two lanes are reduced to one lane. In this case the taper lengths making up the coned-off "islands" shall also conform to Table 13.5 and cone spacings should be according to Table 13.4.

4 If work in these types of environment cannot be confined to off-peak periods, then serious consideration should be given to a partial or complete road closure with the attendant need to redirect traffic using appropriate temporary ROUTE MARKER signs or DIRECTION signs.

Checklist

- ❑ is work scheduled for a short period only?
- ❑ if work is to include peak traffic times will there be sufficient road capacity for traffic?
- ❑ will limited advance warning signing be adequate or should DIAGRAMMATIC signs be considered?
- ❑ will it be necessary to consider partial or full road closure?
- ❑ will temporary signs be required to redirect traffic by alternative routes?

TYPICAL SIGN REQUIREMENTS

Sign	No	Size (mm)	Quantity
	TW336	900	5
	TW329 TW330	900	1 1
	TR103 TR104	900	2 (1) or 8 (2) 1 (1)
	TW401 TW402	800 X 200	1 (1) 2 (1) or 4 (2)
	TD4	450	26 (1) or 45 (2)
	TW411 Pedestrian Barricades	300 X 1800	(3) 14
	TW405/ TW406 or TW414	400	(1) 1
	Maintenance Stand		4

(1) Number required for 4 lane, one-way operation junctions.
(2) Number required for 4 lane, two-way operation junctions.
(3) The number of pedestrian barricades required depends on the size of the work area.

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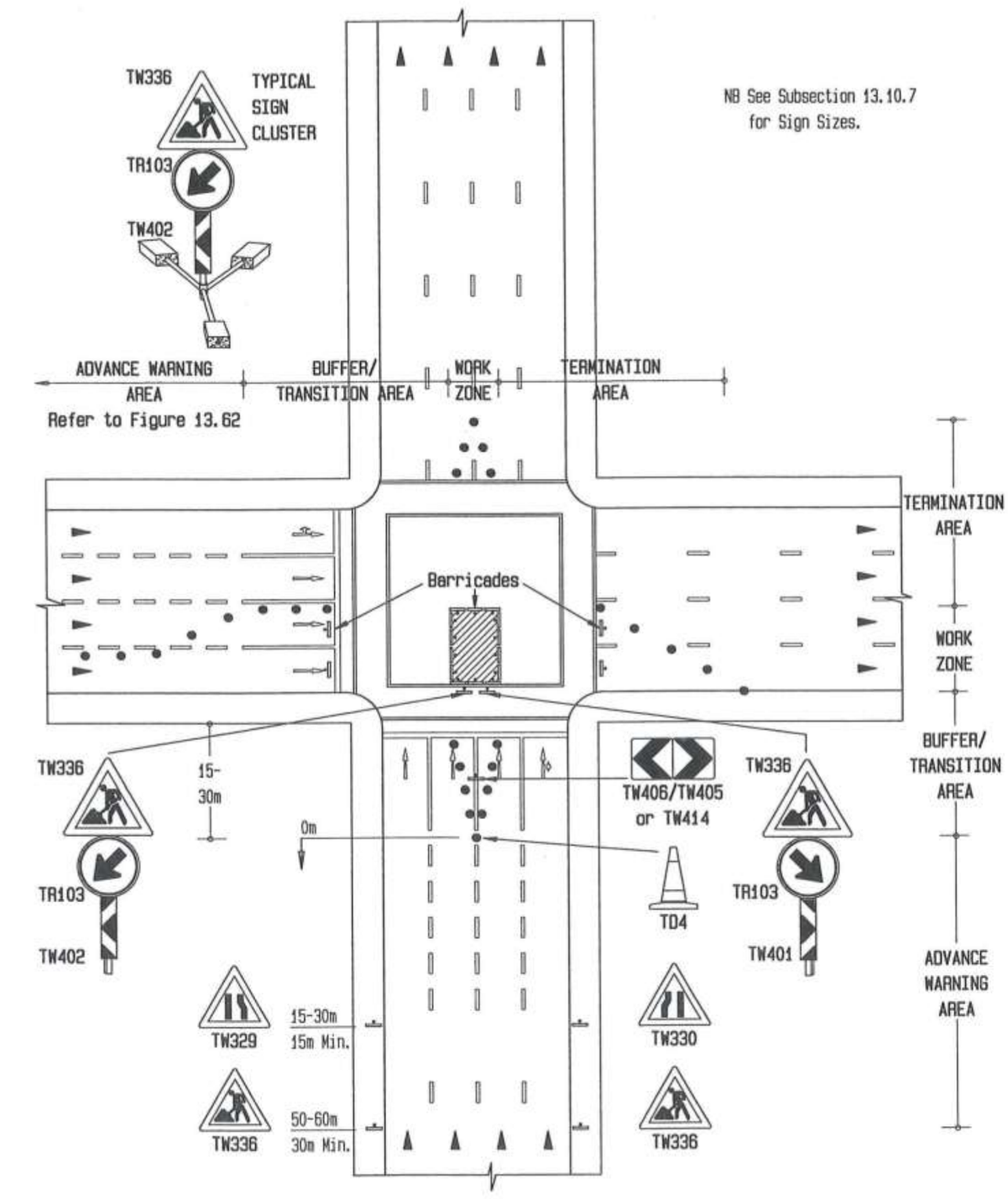
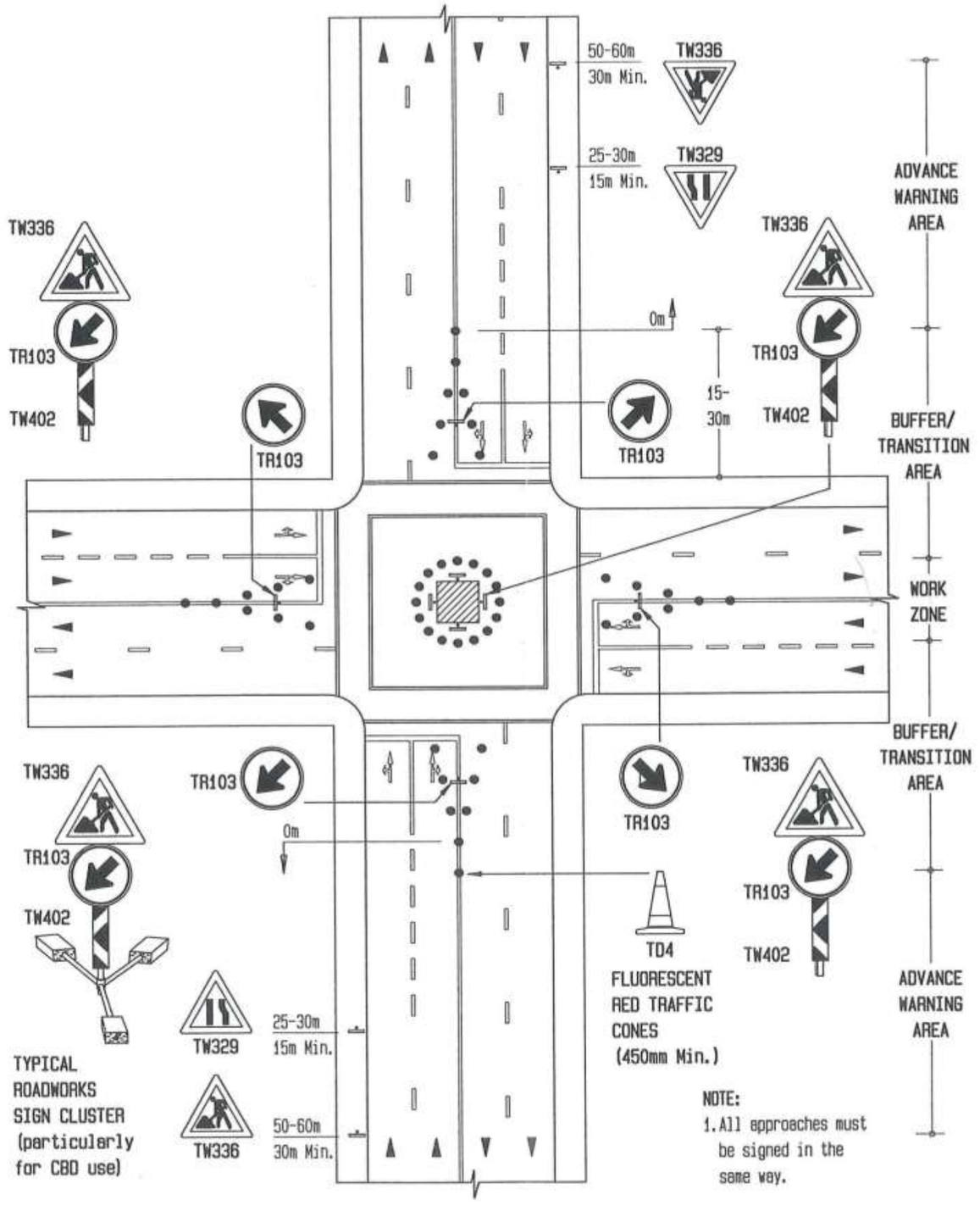


Detail 13.61.1



Detail 13.61.2

Fig 13.61
Work Within a Junction

13.10.8 Work in a One-Way Street

1 In an urban context the signing application illustrated in Figure 13.62 could apply to a multi-lane one-way street in a central business district (CBD) environment, or to one carriageway of a dual carriageway roadway. The signing depicted recognises the likely shortage of space to accommodate signs, common in a CBD. As a result, LANE DROP advance warning signs TW214 (or TW215) are specified. If this specification is used, then the TW214/TW215 signs shall be mounted at an adequate height, likely to be well above the minimum recommended in Table 13.1, to ensure their visibility.

2 When space is available, as would be more likely on a dual carriageway roadway, it is recommended that the appropriate DIAGRAMMATIC signs be used in place of signs TW214/TW215. For details of such an application see Figure 13.80.

3 The specific application shows two out of four lanes dropped to create a work area. When two lanes are dropped, they shall be dropped one lane at a time with a suitable STABILIZING AREA between the two lane drop TRANSITION AREAS. If necessary, one lane shall be dropped within the preceding city block or section of road. Adequate longitudinal and lateral BUFFER ZONES must be provided. For medium to long term sites, road markings shall be removed over the lengths of the tapers.

4 Due to the proximity of pedestrians to the WORK AREA, it is essential that this area be well barricaded.

5 For full details of the setting out of signs on tapers see Tables 13.4 and 13.5, and Figures 13.77 and 13.78.

Checklist

- ❑ is there sufficient space for DIAGRAMMATIC signs?
- ❑ are the advance warning signs mounted high enough for good visibility?
- ❑ if traffic cones are used do they have clean retroreflective sleeves?

TYPICAL SIGN REQUIREMENTS

Sign	No	Size (mm)	Quantity
	TW336	900	2
	TW214	900	2
	TR103	900	5
	TW411	300 X 1800	13 Min (2)
	TD4	450	Taper 30 (1) plus 10 per 100m
	TW402	800 X 200	Taper 30 plus 10 per 100m

(1) TD4 and TW402 are alternatives.

(2) The number of pedestrian barricades required depends on the size of the work area.

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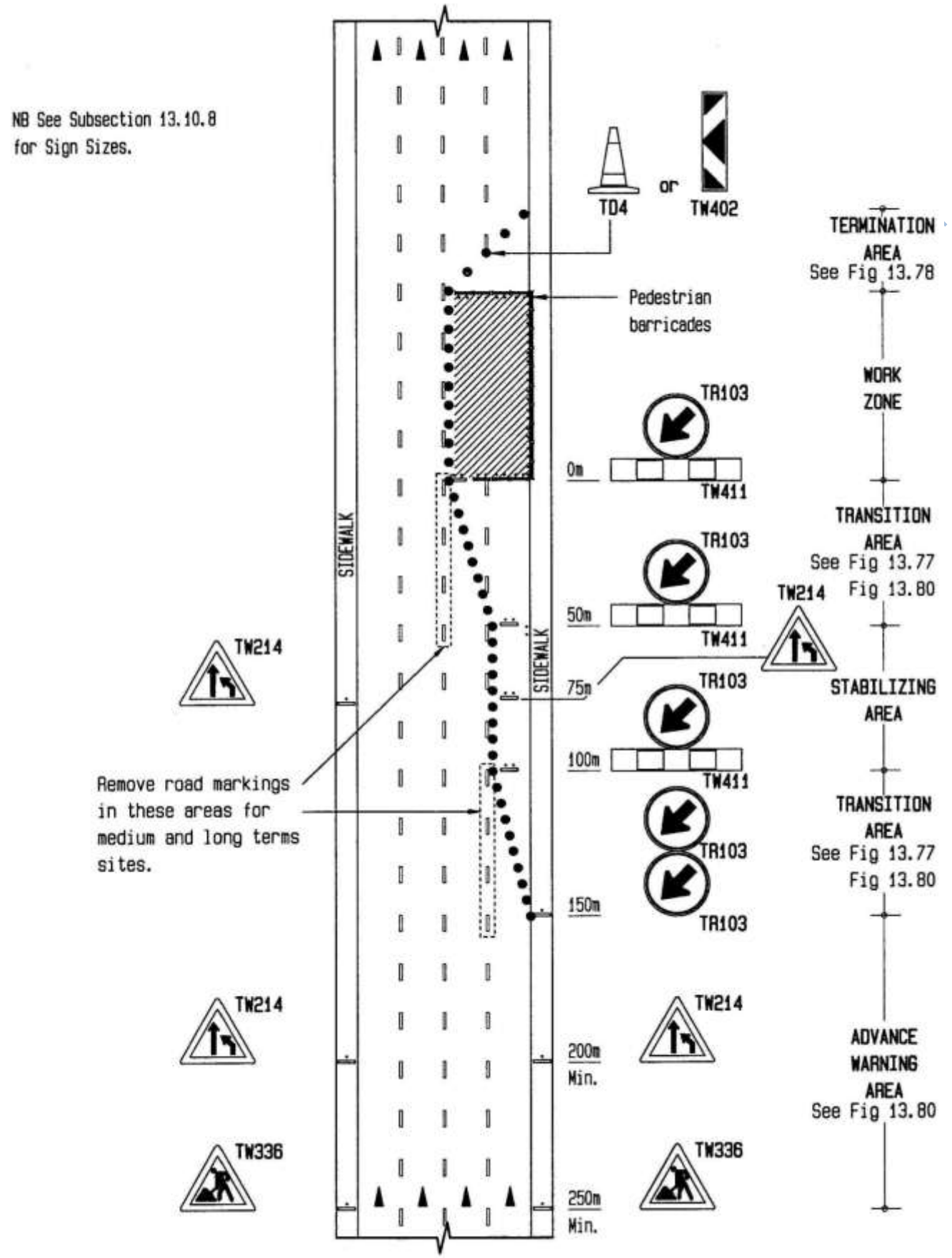


Fig 13.62 **Work in a One-Way Street**

13.10.9 Road Closure - CBD

1 The examples given in Figure 13.63 should not be considered as prescriptive to all road closure situations within typical central business district environments. They are representative of the sort of provisions which need to be dealt with, but the actual combination of circumstances is likely to vary widely. The two examples show a total road closure. This may be varied to accommodate construction traffic or local access. Typical signs used for such purposes are shown in Figures 13.18, 13.87 and 13.88.

2 The temporary regulatory and warning sign requirements for this type of closure will largely depend on the directional configuration of the intersecting streets and the need to make local lane use adjustments. In Detail 13.63.2, the traffic in the road that is closed is forced, due to the one-way system, to make a right turn. It is likely to be operationally very difficult to turn four lanes of traffic in parallel. In such a situation, it would likely improve operation to drop the inside lane in advance of the junction.

3 The examples portray a metropolitan CBD with numbered metropolitan routes. When a road closure of this nature is implemented, it is important to simultaneously provide temporary ROUTE MAKER ADVANCE DIRECTION and DIRECTION signs to lead drivers through the detour and back to their intended direction of travel. It may be advisable to give drivers entering the detour reassurance by means of a MAP-TYPE ADVANCE DIRECTION sign TGD9 which should show them, in a simple way, that they will be able to return to the route beyond the roadworks.

4 The principles indicated in the details and described in the previous paragraph are equally appropriate to smaller towns. When the roads concerned are provincial or regional numbered routes, the use of temporary ROUTE MARKER signs is recommended as an inexpensive solution to directing drivers through the detour.

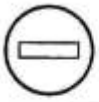
5 Detours as significant as those illustrated here, should not be implemented without widespread advance publicity.

6 An inventory box is included to indicate the types of signs which will commonly be required, but quantities are a guideline only.

Checklist

- ❑ has a public information campaign been implemented?
- ❑ is the detour able to handle the re-directed traffic without major delays?
- ❑ should some wider ranging form of detour be considered?
- ❑ does local access to the site area need to be maintained - and if so can it be maintained?

TYPICAL SIGN REQUIREMENTS

Sign	No	Size (mm)	Quantity
	R3	900	1
	TR105 TR106	900	1 (2)
	TR209 TR210	900	1 1
	TW336-WB	1200 X 1600	(1) (2) 1 or 2
	TW336	1200	(1) (2) 2 or 1
	TW407 TW408	1200 X 400	(1) (2) 2 or 7 (1) (2) 2 or 7
	TGE12.3 TGE12.4	900 X 600	1
	TGE12.1 TGE12.2	725 X 600	1
	TGE12.5	400 X 600	1 (1)
	TGD9	1800 X 2400	1
	TW409	2400 X 400	1 (1)

(1) Number of signs required for two-way road junctions.
(2) Number of signs required for one-way road junctions.

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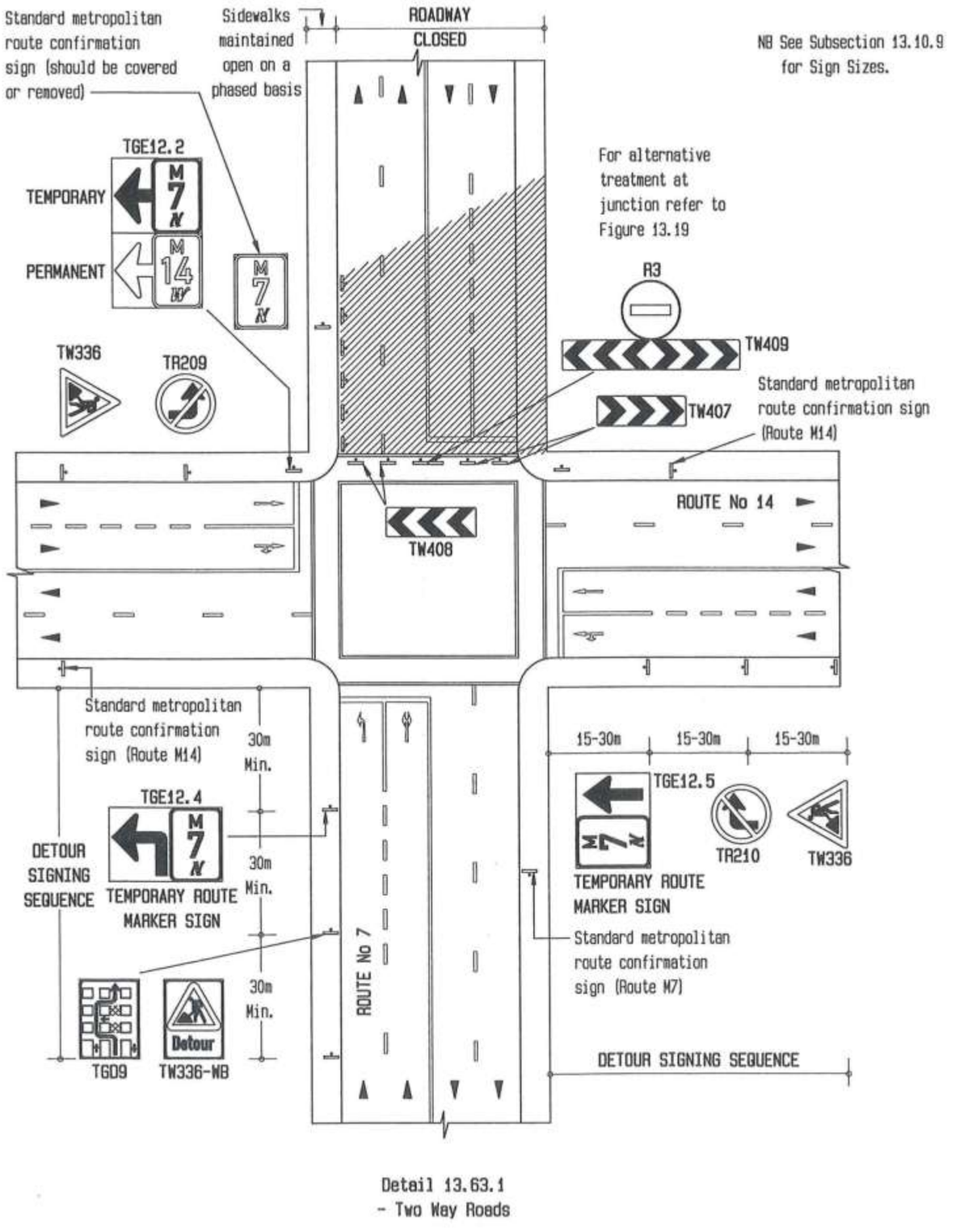
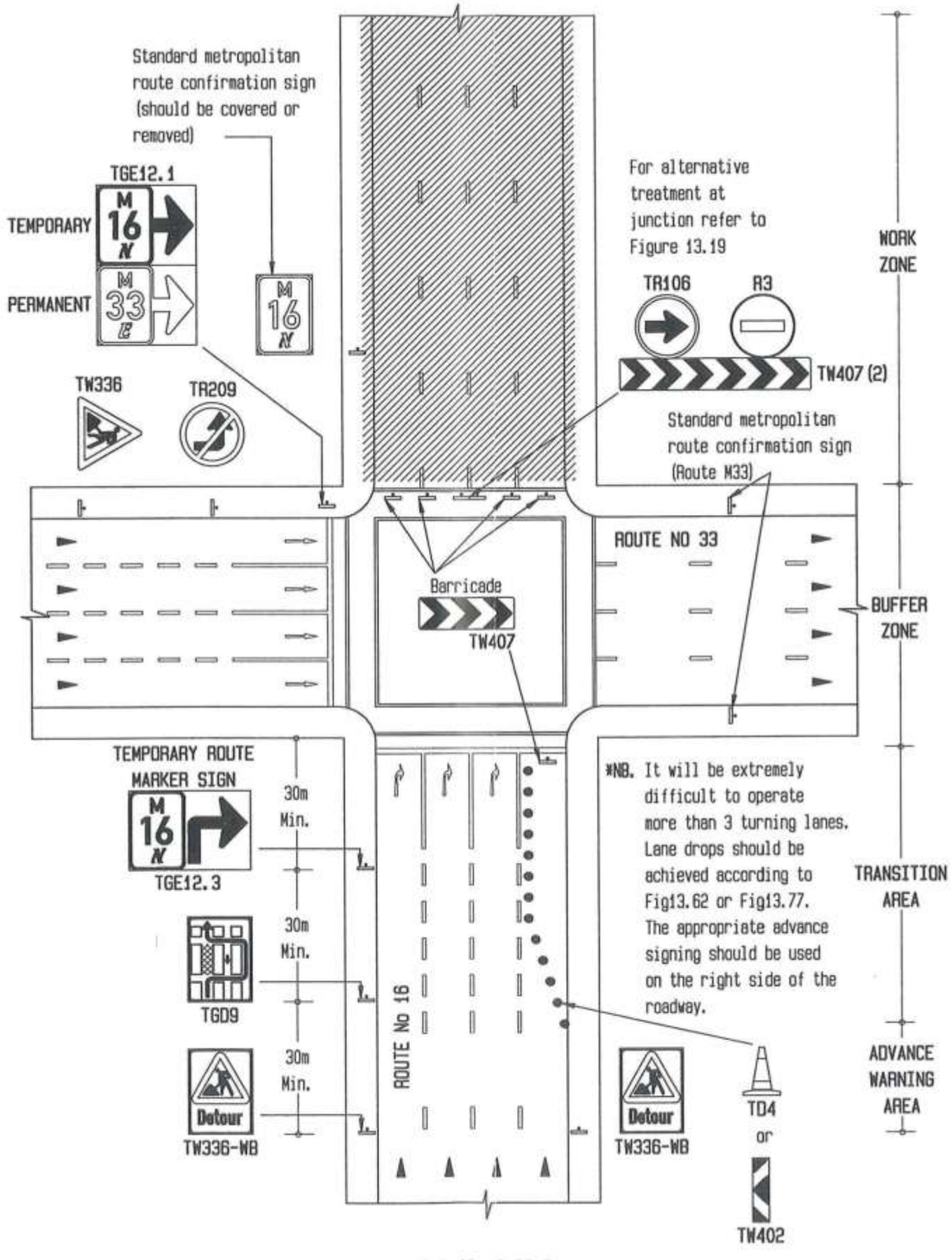


Detail 13.63.1
- Two Way Roads



Detail 13.63.2
- One Way Roads.

Fig 13.63
Road Closure - CBD

13.10.10 Road Closure - Dual Carriageway Street

1 The detail given in Figure 13.64 is somewhat simplistic for urban circumstances, representative of a typical dual carriageway roadway. No parking or property accesses are shown for instance. The signing and traffic management shown should therefore be considered as conceptual only. Significant additional signing may be required to cater for specific local circumstances.

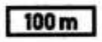
2 The lane reduction on the approach side to the junction is signed using a ROAD NARROWS sign TW330 on the basis that the lane is reintroduced to permit left turning traffic to make use of a short section. If the intersecting street is a one-way street (from left to right), the use of a left turn lane will not be necessary and a LANE DROP sign TW215 is recommended in place of sign TW330. Alternatively, if there is a need to permit a right turn, the lane drop arrangement can be mirrored.

3 Subject to the time that the traffic management arrangement is in place, attention should be paid to the detail of no longer relevant, or incorrect road markings. Particularly under light traffic conditions drivers familiar with the deviation, may, for instance, react instinctively to a remaining mandatory arrow facing (now) the wrong way in the lane they are supposed to use.

Checklist

- ❑ should sign TW215 (or TW214) be used in place of sign TW330 (or TW329)?
- ❑ what direction and lane configuration does the cross street have?
- ❑ should this configuration affect the approach lane treatment?
- ❑ is the deviation through the junction sufficient to require the part-time or full-time use of a pointsman?

TYPICAL SIGN REQUIREMENTS

Sign	No	Size (mm)	Quantity
	TW336	900	1
	TW330	900	1
	TW407	1200 X 400	1
	TR103 TR104	900	2 2
	R3	900	2
	TW411	300 X 1800	2
	TW211	900	(1) 1
	TGS109	1200 X 1600	(1) 1
	TIN 11.3	1200	1
	TD4	450	Taper 8 (2) plus 10 per 100m
	TW401	800 X 200	Taper 8 (2) plus 10 per 100m

(1) TW211 and TGS109 are alternatives.
(2) TD4 and TW401 are alternatives.

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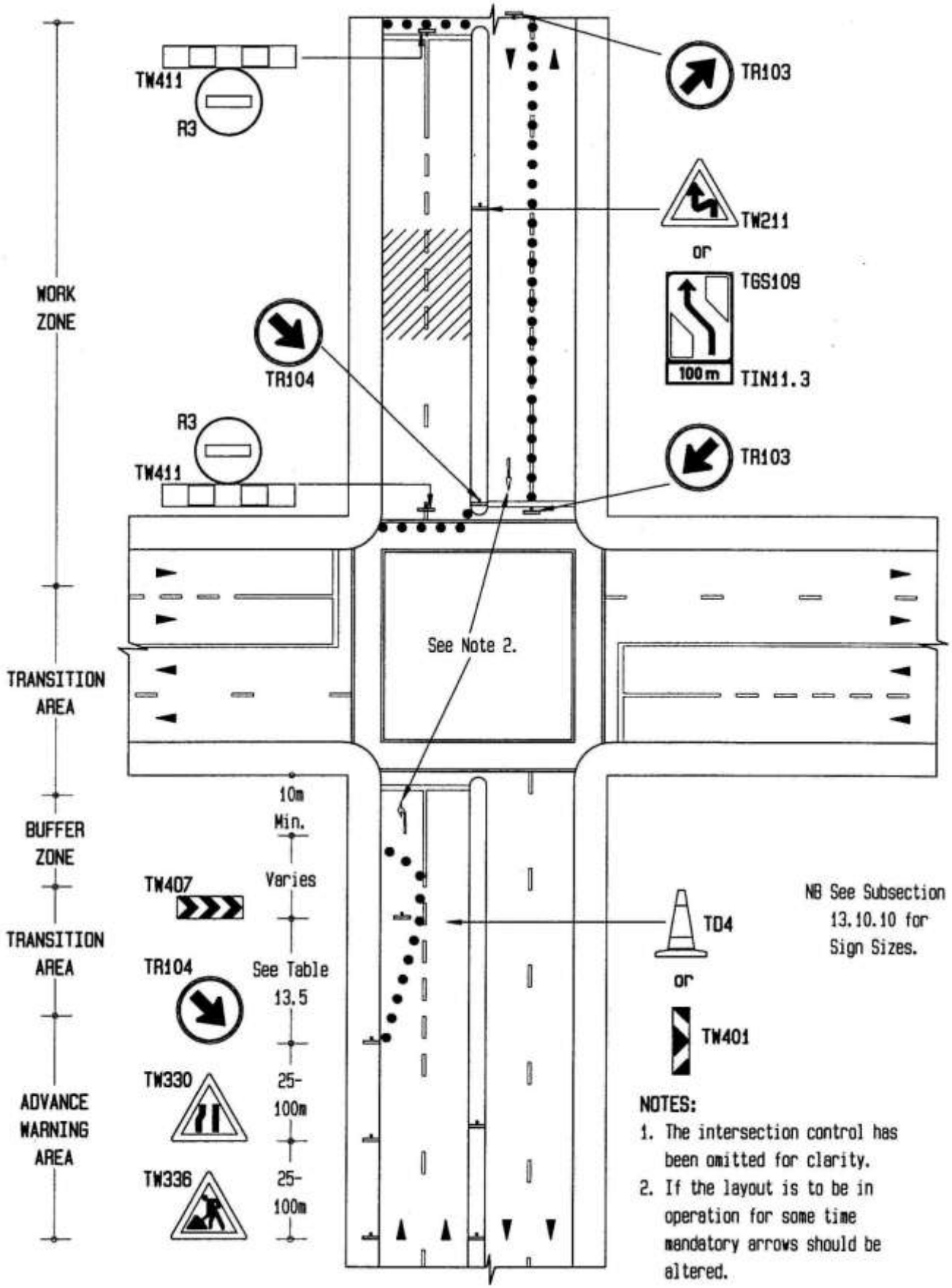

Fig 13.64 **Road Closure – Dual Carriageway Street**

13.10.11 Road Closure - Detour

1 The need to close a road may occur in an urban area for very similar reasons to those which may arise in a rural area (see Subsection 13.9.9). The details in Figure 13.65 illustrate various aspects of a possible urban road closure necessitated by work at a stream culvert or river bridge. A typical sign inventory is not included with this subsection because there are many variables which will affect a real-life situation that make the listing of an inventory inappropriate.

2 Detail 13.65.1 shows a section of suburban road network cut by a small river. "Road C" is closed at the river crossing. The signing elements which such a situation may require are shown in the other details and are referred to typical points in Detail 13.65.1. The site itself will require a road closure barrier for safety reasons. An appropriate sign arrangement is shown in detail 13.65.2. Alternative barrier arrangements are covered in Figures 13.87 and 13.88.

3 In a road network such as that illustrated, there will be certain junctions which will be strategically relevant when redirecting traffic around the closed section of "Road C". Such junctions are between "Roads C and E" and "Roads C and G". Detail 13.65.3 shows a simple signing treatment appropriate for non-arterial streets. Typical signing for more highly classified streets is illustrated in Figures 13.52 and 13.88.

4 It is relevant to indicate to drivers approaching "Road C" on intersecting side streets within the area affected by the detour that "Road C" is closed. This can be achieved simply by the use of special examples of NO THROUGH ROAD signs TIN20 to TIN23 as shown in Details 13.65.4 and 13.65 5.

Checklist

- ❑ can the street be closed to all traffic or will local access be required?
- ❑ are there suitable streets available on which to establish a detour?
- ❑ are temporary ROUTE MARKER signs or DIRECTION signs required?
- ❑ are there any missing STREET NAME signs within the area affected by the road closure and the detour?

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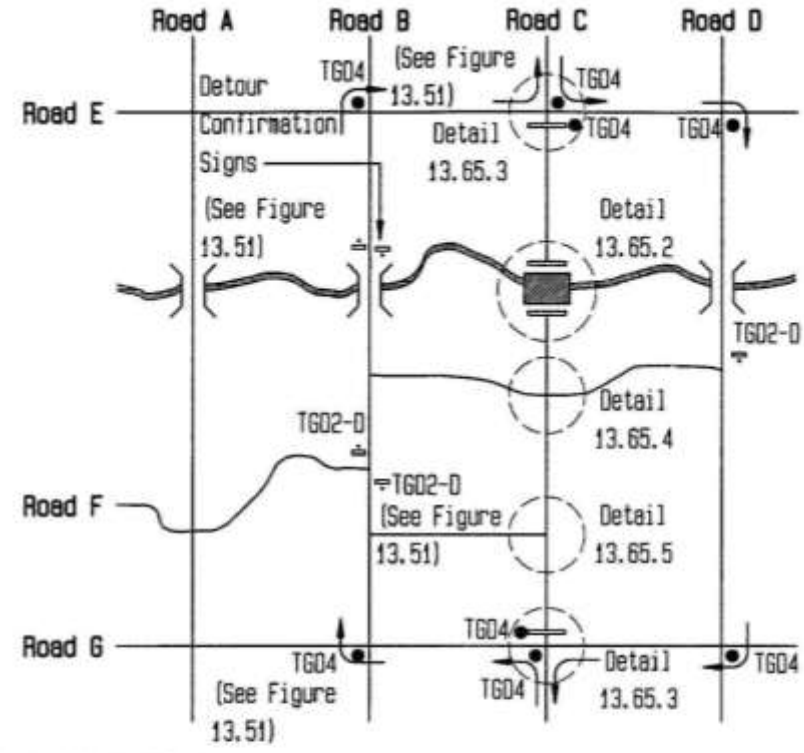
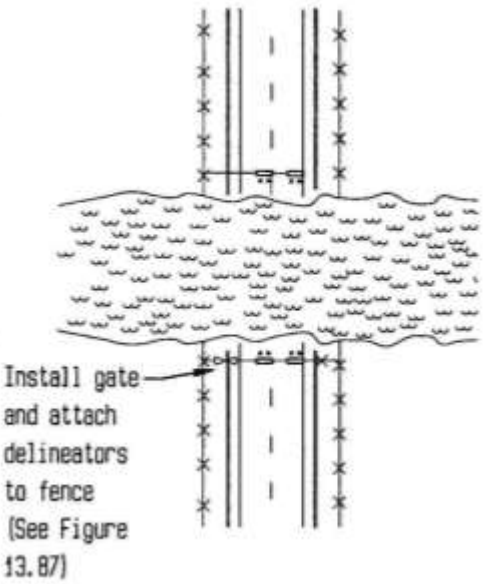
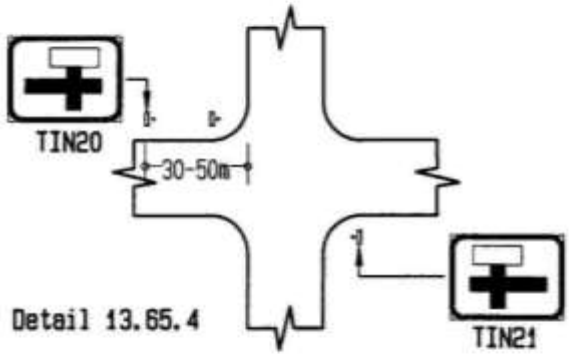


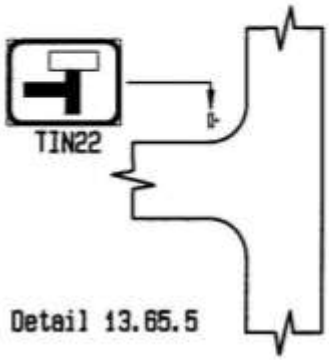
Detail 13.65.1



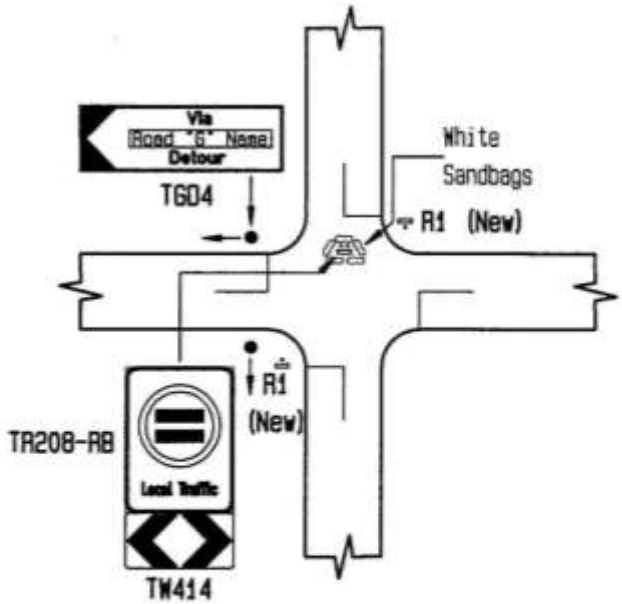
Detail 13.65.2



Detail 13.65.4



Detail 13.65.5



Detail 13.65.3

Fig 13.65 Road Closure - Detour

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13.11 SIGNING APPLICATIONS FOR FREEWAYS AND DUAL CARRIAGEWAY ROADS

13.11.1 General

1 The applications of temporary signing for roadworks covered in Sections 13.8 to 13.12 have been subdivided into categories for ease of reference. These categories are:

(a) short term works (Section 13.8)

(b) rural roads (Section 13.9)

(c) urban roads (Section 13.10)

(d) freeways and dual carriageway roads (Section 13.11).

Section 13.12 provides enlarged details of elements covered in other sections and may be appropriate to any or all of the categories listed above.

2 The categorisation of applications used should only be considered to be general in nature. Many applications may be appropriate in several or all categories. Such applications are only detailed once to avoid duplication. Practitioners who do not find the application they are seeking in their first choice of category should therefore check other categories. If their required application is not covered, it will be necessary to determine a similar situation and to adapt it, with care, to their needs.

3 Sections 13.9 and 13.10 deal with rural and urban situations respectively. These terms also should be considered as general, and if a "rural" application is appropriate within an urban area, the application details should be used with appropriate adjustments to sign spacing and sizes. The signing of roadworks in peri-urban areas will most likely be catered for by rural category applications.

4 In the various figures the following rules or conventions apply:

(a) all signs are correctly oriented for the direction of travel to which they apply;

(b) to avoid confusion with any arrows on road signs or marking, the direction of travel of traffic is, where relevant, indicated thus ► ;

(c) all details are given in metres **but all may be directly used as "paces" in practice.**

5 Signs should be sized as recommended in Volume 1. As a rule of thumb the following sizes are appropriate for regulatory, warning and diagrammatic signs:

(a) Gravel roads:

(i) circular signs - 1200 mm diameter;

(ii) triangular signs - 1200 mm side length;

(iii) diagrammatic signs - 1200 mm x 1600 mm;

(b) Bituminous, concrete or brick surfaced roads:

(i) circular signs - 1200 mm diameter;

(ii) triangular signs - 1500 mm side length;

(iii) diagrammatic signs - 1200 mm x 1600mm.

(c) Urban streets:

(i) circular signs - 900 mm/1200 mm diameter;

(ii) triangular signs - 900 mm/1200 mm side length;

(iii) diagrammatic signs - 1200 mm x 1600 mm.

13.11.2 Freeway / Dual Carriageway Roadworks

1 Freeways and dual carriageway roads carry large volumes of traffic at the highest possible level of service. It is therefore imperative that the traffic management and temporary signing of such roads during roadworks be of the highest possible standard. The traffic management and signing techniques illustrated in the examples in this section have been used widely, and, when correctly operated, have proven to be very effective.

2 Due to widely varying operating characteristics during a single 24-hour period, one freeway roadworks traffic management solution normally has to be effective for conditions ranging from severe congestion, to high speed free-flowing traffic. Under these circumstances, accident levels are almost certain to be higher than those pertaining prior to the roadworks. **Careful attention to detail and frequent monitoring of signs and conditions will ensure that any increase in the accident rate will be kept to a minimum.**

3 The examples in this section include situations dealing with alterations to the normal lane configuration which commonly require a lengthy sequence of many signs as well as more localised situations which occur within interchanges where space for traffic accommodation measures may be severely limited.

4 The figures and texts in this section cover mainly the ADVANCE WARNING AREA(S) of the applications being discussed. All of these applications will require one or more TRANSITION AREA, BUFFER ZONE/STABILIZING AREA and TRANSITION AREA. **The sign inventories given in each subsection apply in principle to the advance warning area signing. To obtain a total inventory for a site designers will have to identify all components and add together the inventory requirements.** This will commonly involve adding the requirements for an application in Section 13.11 to one or more enlarged detail requirements from Section 13.12.

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13.11.3 Lane Closure - Day Time Only

1 The application of temporary signing shown in Figure 13.66 is similar to other figures illustrating lane drop situations. The principle differences are that this example shows a lane drop on a two-lane, one-way roadway (normally part of a dual carriageway) and it assumes high approach speeds. If the situation is not isolated but occurs within a larger roadworks site, the signing level should be adjusted in accordance with the operating speed prevailing (see Section 13.4).

2 Since the lane drop is short term, and during daytime only, delineation may be provided by means of TRAFFIC CONES TD4. Signing in the taper area is very limited compared to long term installations so that 700 mm TRAFFIC CONES, preferably made more conspicuous with white retroreflective sleeves, are recommended. Although signing within the transition and work area is kept to a minimum, the advance signing indicated must be provided otherwise traffic will arrive at the lane drop travelling too fast for safe merging to occur. Apart from the hazard this represents, congestion will occur as a result, making the installation very inefficient in its operation.

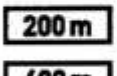
3 Detail 13.66.1 shows dropping of the "Slow" lane. **This application is not recommended for roadways with high volumes and/or a significant percentage of heavy vehicles.** The dropping of the "Fast" lane as shown in Detail 13.66.2 is generally preferred. If necessary, this can be followed by a lane shift to the right (see Figures 13.77 to 13.79). **The sign inventories for all taper details must be added to that given in this subsection.**

4 If advance signing has to be reduced due to time or space considerations, it is recommended that a full set of signs on one side of the road be omitted, rather than by decreasing in the length of the sequence. Which set may be omitted is likely to be site specific due to space or visibility conditions. The side offering the best visibility to all traffic should be retained with a preference for the "fast" side of the carriageway. In this event the start of the taper must be clearly identified to all traffic. **The reduction in signing referred to is not recommended on three or more lane cross sections.** According to experience, signs TGS101 (or TGS102) may be replaced by signs TW214 (or TW215) of an adequate size.

Checklist

- ❑ how many lanes are there on the section of road on which the lane is to be closed?
- ❑ what is the anticipated traffic approach speed during the period of lane closure?
- ❑ can lane closure during peak traffic periods be avoided?
- ❑ can the required level of signing be accommodated within the space available?
- ❑ will the lane closure cross off and on ramps - or can this be avoided?

INSTALLATION INVENTORY

Sign	No	Size (mm)	Quantity
	TR103 TR104	1200	2 or 3 (1)
	TR201-60 TR201-80 TR201-100	1200	3 2 2
	R201-120	1200	2
	TW336	1500	4
	TW214 TW215	1500	2 (2) of each
	TW411	300 X 1800	1
	TGS101 TGS102	1200 X 1600	2 (2) of each
	TD4	750	35 Min plus 10 per 100m closed
	TIN 11.3 TIN 11.3	1200 1500	2 2
	FLAGS	450 X 450	4

(1) If possible provide 2 x TR103/TR104 signs at the start of the taper.
(2) TW214/TW215 may be used instead of TGS101/TGS102.

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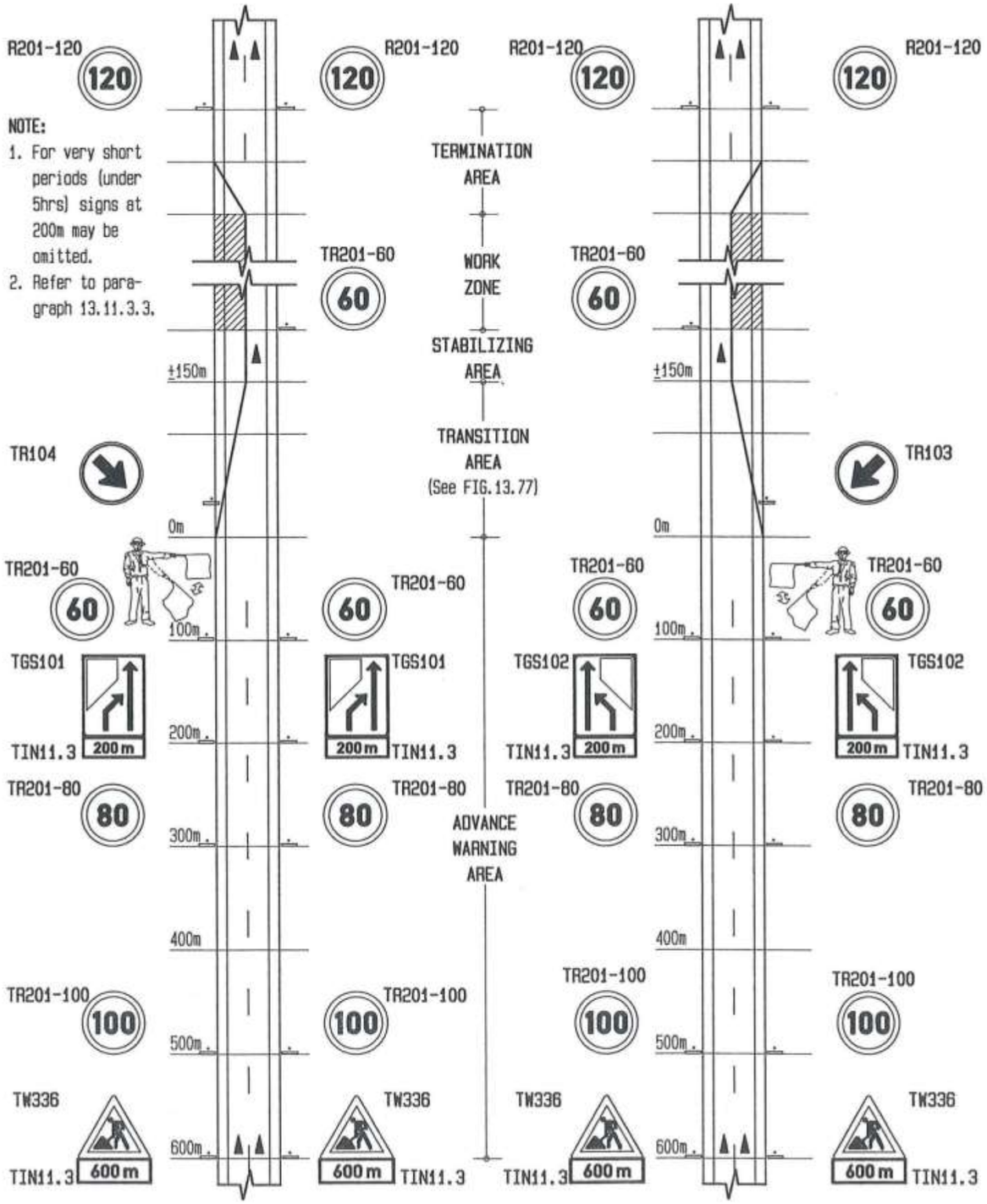
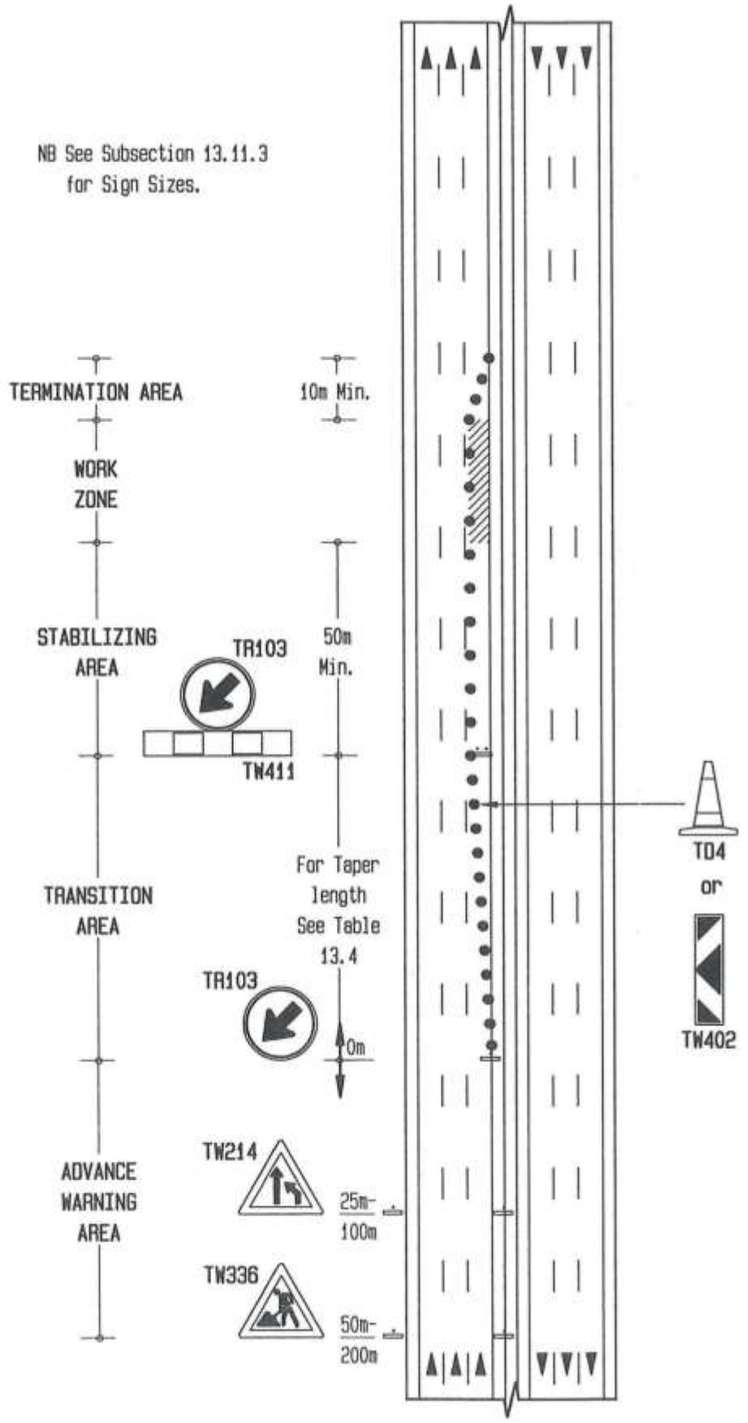


Detail 13.66.1
4-Lane Road-Drop Slow Lane

Detail 13.66.2
4-Lane Road-Drop Fast Lane



Detail 13.66.3
6-Lane Road-Drop Fast Lane

Fig 13.66
Lane Closure – Daytime Only

13.11.4 Lane Closure - Right Lane Long Term

1 The signing application illustrated in Figure 13.67 achieves the same purpose as that in Detail 13.66.2 but the signing in the ADVANCE WARNING AREA is significantly more extensive to allow for long term use.

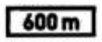
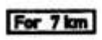
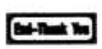
2 All tapers and the WORK AREA shall be delineated by DELINEATOR PLATE signs TW401 and TW402. If the depth of excavation exceeds 600 mm, serious consideration should be given to the provision of a temporary barrier. Such a barrier shall be made adequately visible by means of DELINEATOR PLATE signs mounted on top of the barrier (although the effectiveness of this is limited due to the right side profile of dipped headlamps), or by GUARDRAIL DELINEATORS TD1 (see Volume 1, Chapter 7). The end treatment of any such barrier must be carefully detailed (see Figure 13.28).

3 For full details of the signing treatment of the TRANSITION AREA and TERMINATION AREA see Figures 13.77 and 13.78. **The inventories required for these details must be added to that given with this subsection.**

4 Designers preparing specifications and drawings for this type of long term roadworks signing application should familiarise themselves with Section 13.3 - "Traffic Management", in particular the details on BUFFER ZONES (see Figure 13.20), with Section 13.4 - "Setting of Speed Limits at Roadworks", and with Section 13.5 - "Temporary Delineation". If one or more interchanges fall within the section of road under construction, see Figure 13.74.

Checklist

- ❑ can the ADVANCE WARNING AREA safely be shortened ?
- ❑ should a public relations message be placed ahead of the first sign (see Figure 13.18)?
- ❑ is there more than one TRANSITION AREA?
- ❑ have all required sign inventories been added together?
- ❑ are there any interchanges within the WORK AREA?

INSTALLATION INVENTORY			
Sign	No	Size (mm)	Quantity
	TW336-WA	1200 X 1600	2
	TR201-60 TR201-80 TR201-100	1200	2 3 Min (1) 2
	R201-120	1200	2
	TGS102	1200 X 1600	4
	TR214	1200	1
	TW336	1500	5 Min (1)
	TIN 11.3	1200 1500	6 2
	TIN 11.2	1500	1 Min (1)
	TIN 11.4	1500	2
(1) The number of signs required will depend on the length of the work area.			

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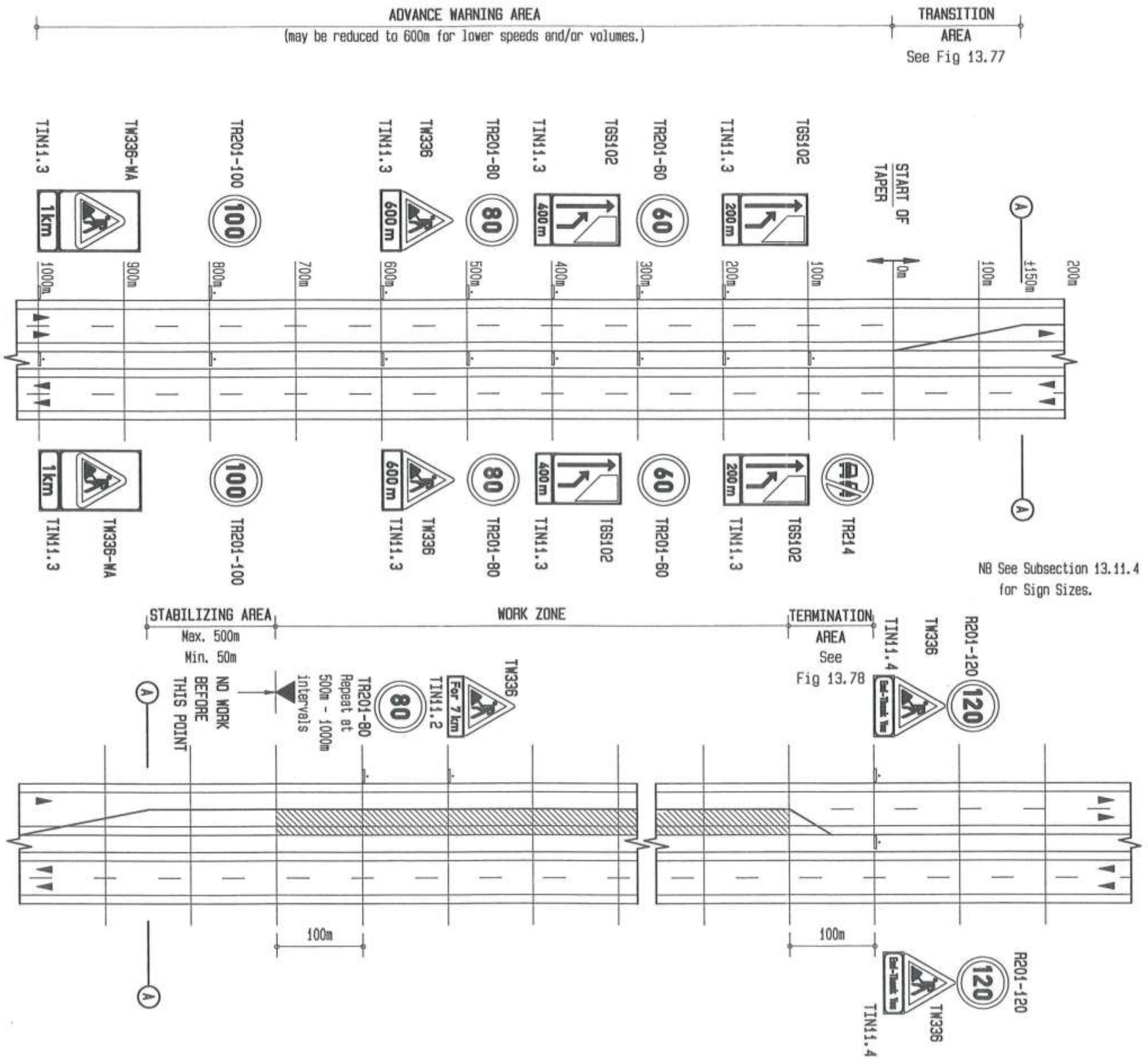


Fig 13.67
Lane Closure – Right Lane
Long Term

13.11.5 Lane Closure - Left Lane Long Term

1 Figure 13.68 shows a signing application for a long term roadworks site which is similar to the short term site covered by Detail 13.66.1. Figure 13.68 gives the preferred treatment for a WORK AREA over the "Slow" lane. The traffic management technique used requires that the "Fast" lane is dropped first. This uses a sign sequence which is the same as shown in Figure 13.67 (so that one sign inventory will cover both types of application up to the end of the first TRANSITION AREA (1) - in fact, if dropping of the "Fast" lane first is adopted as a basic principle, it will mean that this is always the case, and drivers will become familiar with a standardised initial approach treatment to all major sites). After this transition traffic flow must be allowed to settle down within the STABILIZING AREA before the next TRANSITION AREA (2) where traffic is transferred from the "Slow" lane back to the "Fast" lane. This stabilizing area also serves as an ADVANCE WARNING AREA (2) for the second transition.

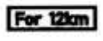
2 All tapers and the WORK AREA shall be delineated by DELINEATOR PLATE signs TW401 and TW402. If the depth of excavation exceeds 600 mm, serious consideration should be given to the provision of a temporary barrier. Such a barrier shall be made adequately visible by means of DELINEATOR PLATE signs mounted on top of the barrier (although the effectiveness of this is limited due to the right side profile of dipped headlamps), or by GUARDRAIL DELINEATORS TD1 (see Volume 1, Chapter 7). The end treatment of any such barrier must be carefully detailed (see Figure 13.28).

3 For full details of the signing treatment of the TRANSITION AREA and TERMINATION AREA see Figures 13.77 and 13.78. **The inventories required for these details must be added to that given with this subsection.**

4 Designers preparing specifications and drawings for this type of long term roadworks signing application, should familiarise themselves with Section 13.3 - "Traffic Management", in particular the details on BUFFER ZONES (see Figure 13.20), with Section 13.4 - "Setting of Speed Limits at Roadworks", and with Section 13.5 - "Temporary Delineation". If one or more interchanges fall within the section of road under construction, see Figure 13.74.

Checklist

- ❑ can the ADVANCE WARNING AREA safely be shortened ?
- ❑ should a public relations message be placed ahead of the first sign (see Figure 13.18)?
- ❑ have all required sign inventories been added together?
- ❑ are there any interchanges within the WORK AREA?

INSTALLATION INVENTORY			
Sign	No	Size (mm)	Quantity
	TW336-WA	1200 X 1600	2
	TR201-60 TR201-80 TR201-100	1200	2 3 2
	R201-120	1200	2
	TGS102	1200 X 1600	4
	TGS107	1200 X 1600	1
	TR214	1200	1
	TW336	1500	5
	TIN 11.3	1200 1500	7 2
	TIN 11.2	1500	1
	TIN 11.4	1500	2

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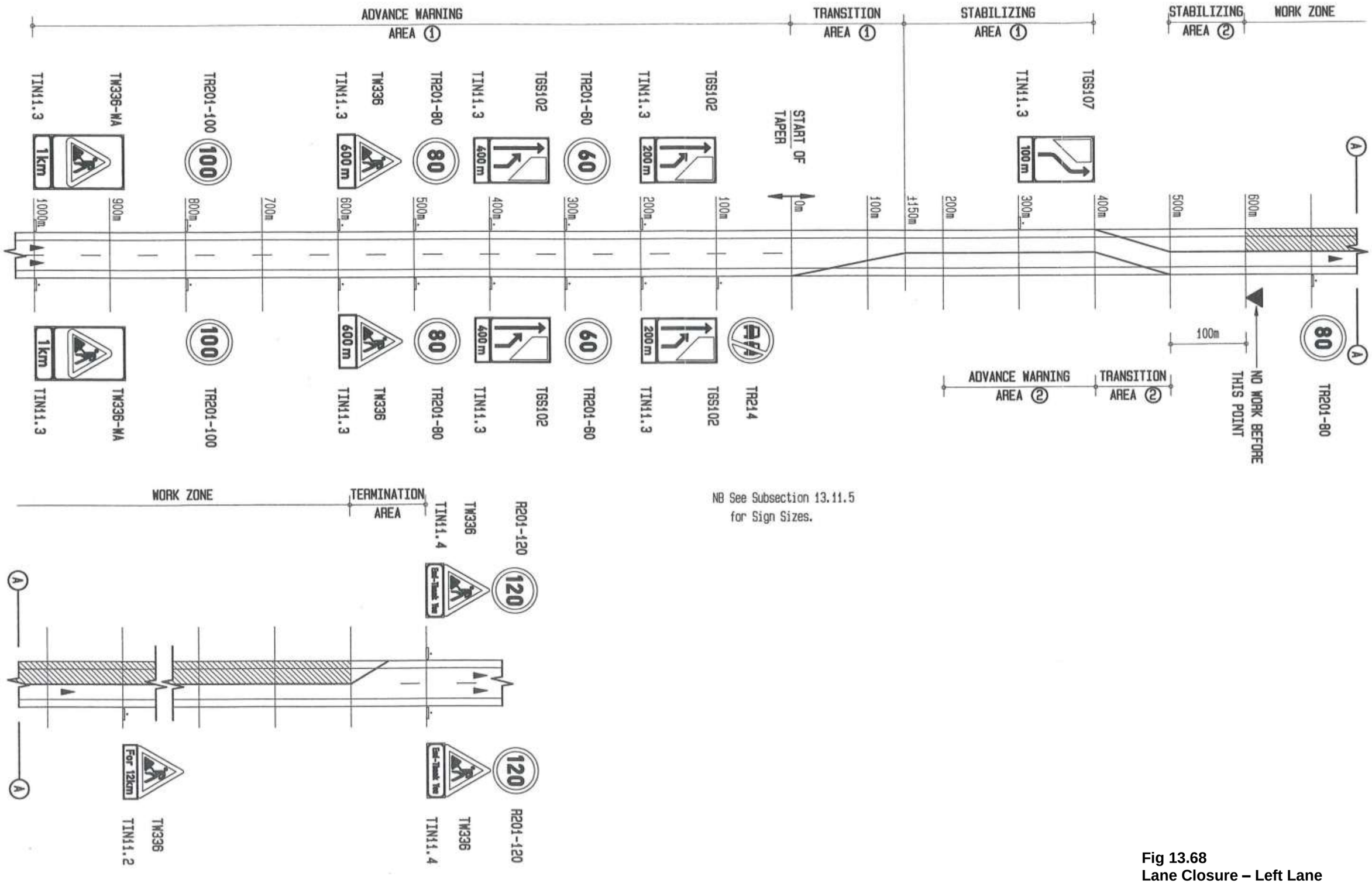


NB See Subsection 13.11.5 for Sign Sizes.

Fig 13.68
Lane Closure – Left Lane
Long Term

13.11.6 Carriageway Closure – Contraflow 2 Lane/2 Way

1 The application covered by Figure 13.69 (over two pages) is a very common application when a freeway or at-grade dual carriageway is in need of major rehabilitation or up-grading. Provided they are well managed, applications using the techniques illustrated have worked successfully under heavy traffic conditions.

2 The procedure requires three major TRANSITION AREAS, in the one direction of travel, as follows:

(a) the first transition drops the "Fast" lane;

(b) the second transition involves a median crossover from the left side of the one carriageway to the left side of the other carriageway;

(c) the third transition is the reverse of that described in (b).

3 The signing and detail for the lane drop is identical to that used in Figures 13.67 and 13.68 (see also Figure 13.77). Detail of a typical single lane median crossover is covered in Figure 13.81. This figure is also relevant, in principle, for the return crossing through the median (third transition).

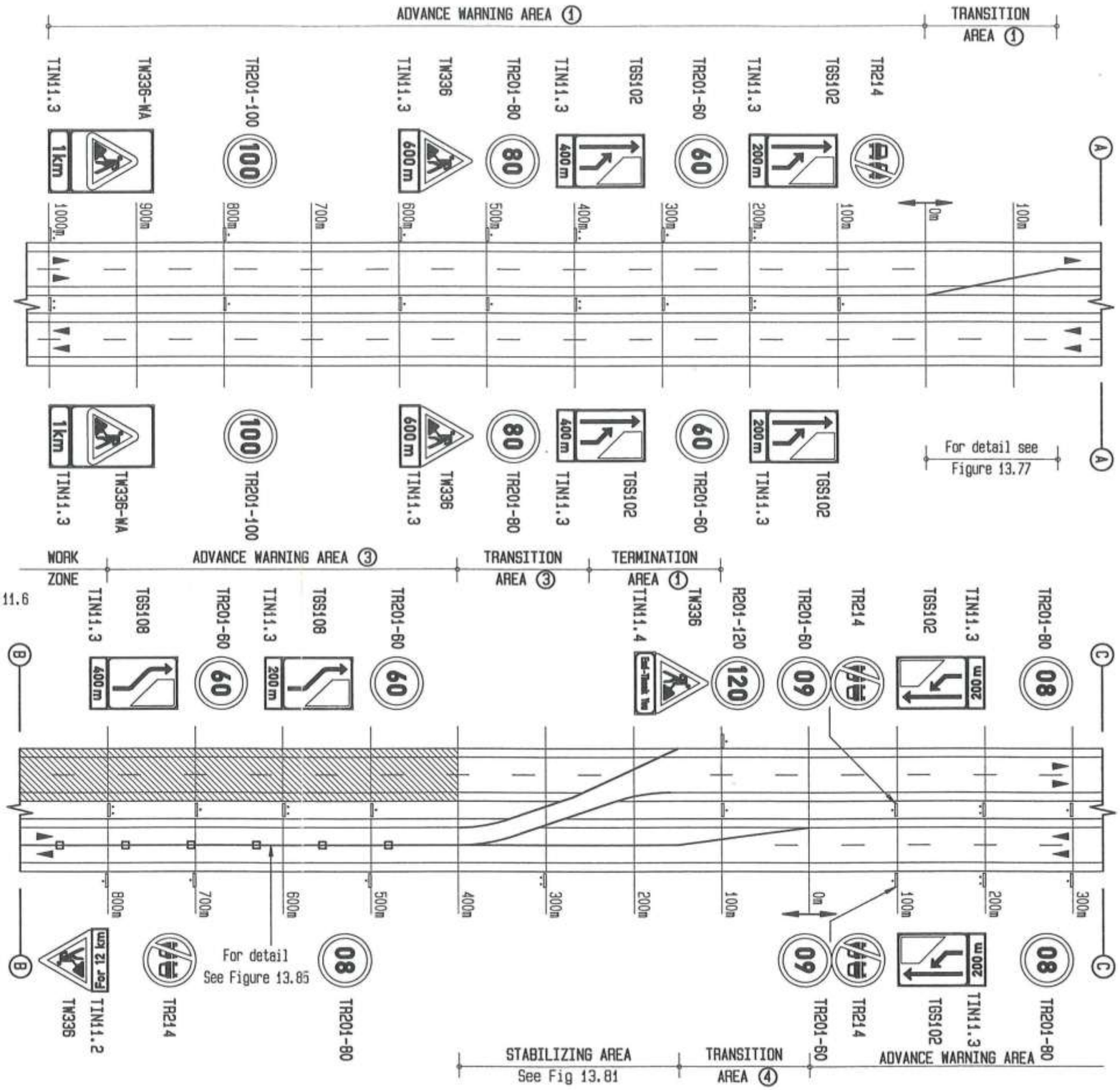
4 Figure 13.69 shows the deviation carriageway operating in a 2 lane/2 way configuration. **This arrangement does not permit overtaking opportunities, and for this reason, is not recommended for distances of more than 2 km. Failure to adhere to this recommendation could have significant adverse effects on the safety of the site.** Figure 13.70 shows a preferred lane configuration on the deviation which gives overtaking opportunities.

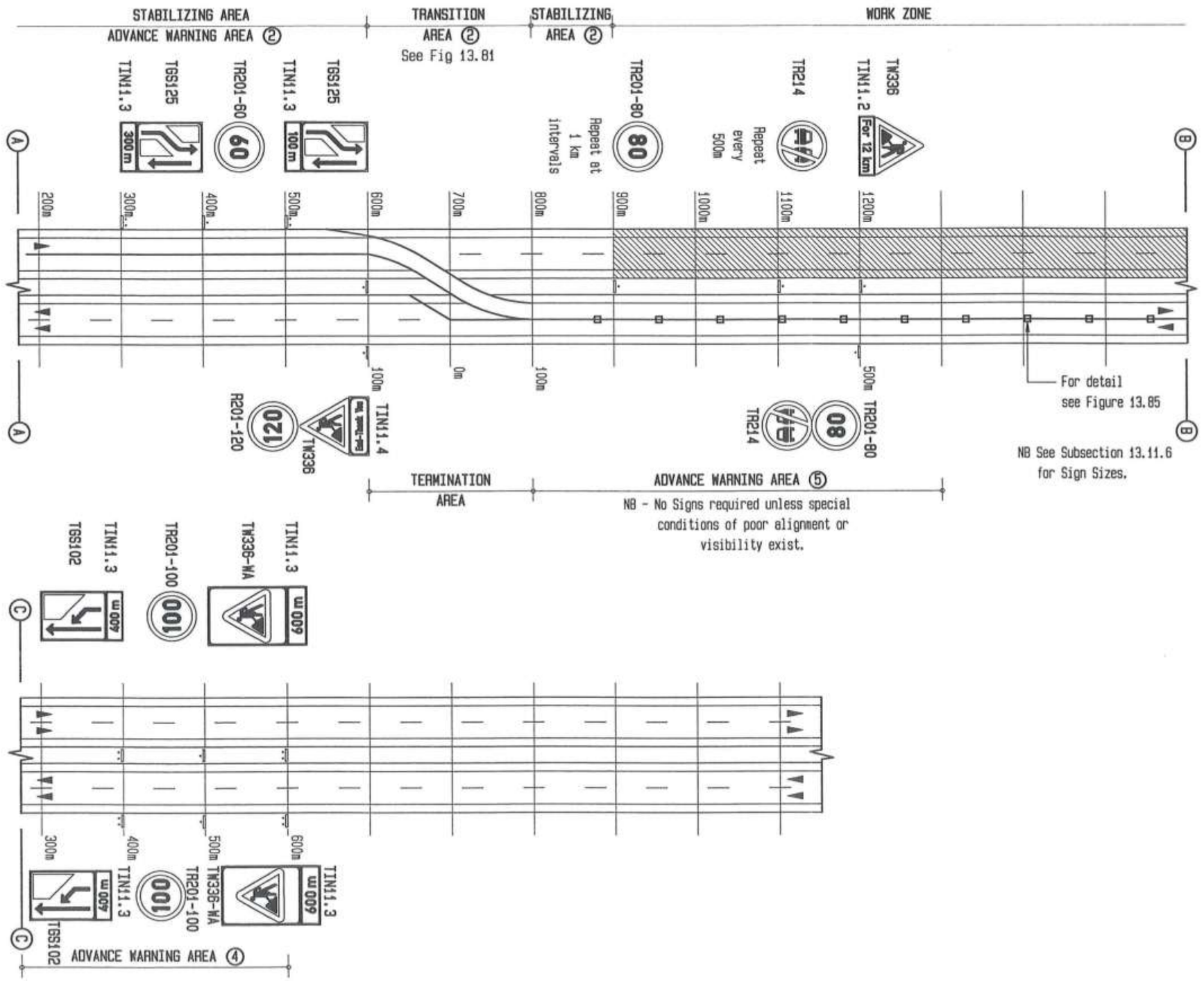
5 Traffic flowing in the opposite direction, to that described so far, is also subject to a "Fast" lane drop TRANSITION AREA (4). Both directions utilize TERMINATION AREAS.

6 Designers are recommended to also read paragraphs 13.11.5.2 to 13.11.5.4.

Checklist

- ❑ is the site under 2 km in length?
- ❑ can the carriageway carrying the deviation operate with three lanes (see Figure 13.70)?





INSTALLATION INVENTORY			
Sign	No	Size (mm)	Quantity
	TW336-WA	1200 X 1600	4
80	TR201-60 TR201-80 TR201-100	1200	7 (1) 7 Min 4
120	R201-120	1200	2
	TGS102	1200 X 1600	8
	TGS125	1200 X 1600	2
	TR214	1200	6 Min (1)
	TGS108	1200 X 1600	2
	TW336	1500	6
600 m	TIN 11.3	1200 1500	16 2
For 12km End-Thank You	TIN 11.2 TIN 11.4	1500	2 2

(1) The number of signs required depends on the length of the work area.

Fig 13.69
Carriageway Closure – Contraflow
2 Lane/2 Way

13.11.7 Carriageway Closure – Contraflow 3 Lane/2 Way

1 Figures 13.69 and 13.70 are similar except for the lane configuration on the deviation. In Figure 13.70 traffic is subjected to a "Fast" lane drop, stabilized, then diverted through a median crossover to the opposing carriageway. On the deviation, traffic is operating in a 3 lane cross-section, initially in a 1-2 lane configuration. After some distance, the configuration is changed to a 2-1 lane layout. This type of treatment permits regular overtaking opportunities in both directions (see Figure 13.86).

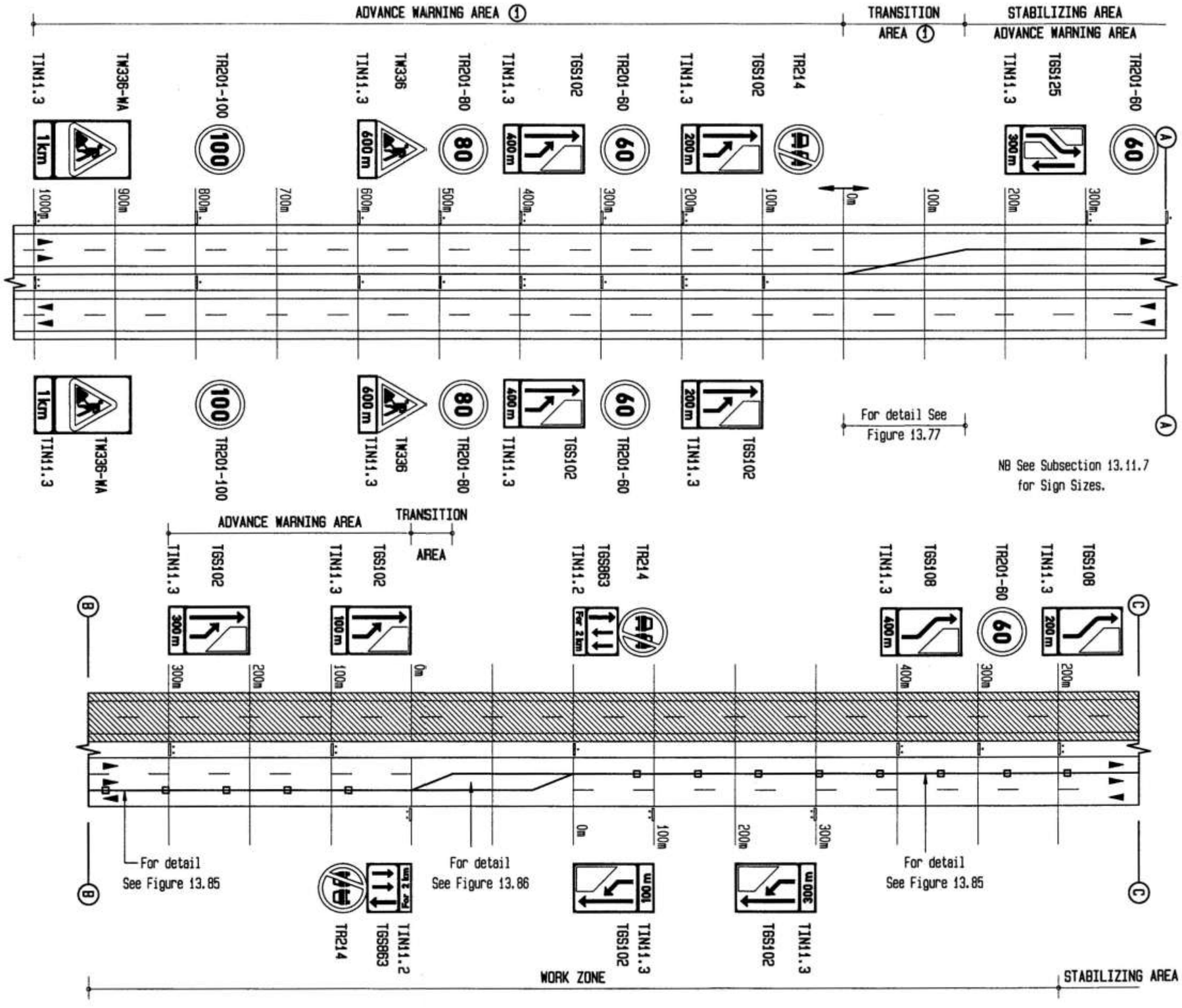
2 This type of application is appropriate if there is no option but to work on a long section of roadway at one time. However, the alterations in lane configuration should be made as frequently as is practical. It is recommended that such changes occur at spacings of 1 km to 2 km. When planning the positions of changes in configuration account should be taken of the vertical profile of the road. It may be desirable to provide two lanes on uphill sections of the road, although, if the hills are steep, there may also be safety advantages to two lane downhill sections if these permit heavy vehicles to "crawl" in the "Slow" lane. It should be noted that these changes in configuration require signing in their ADVANCE WARNING AREAS.

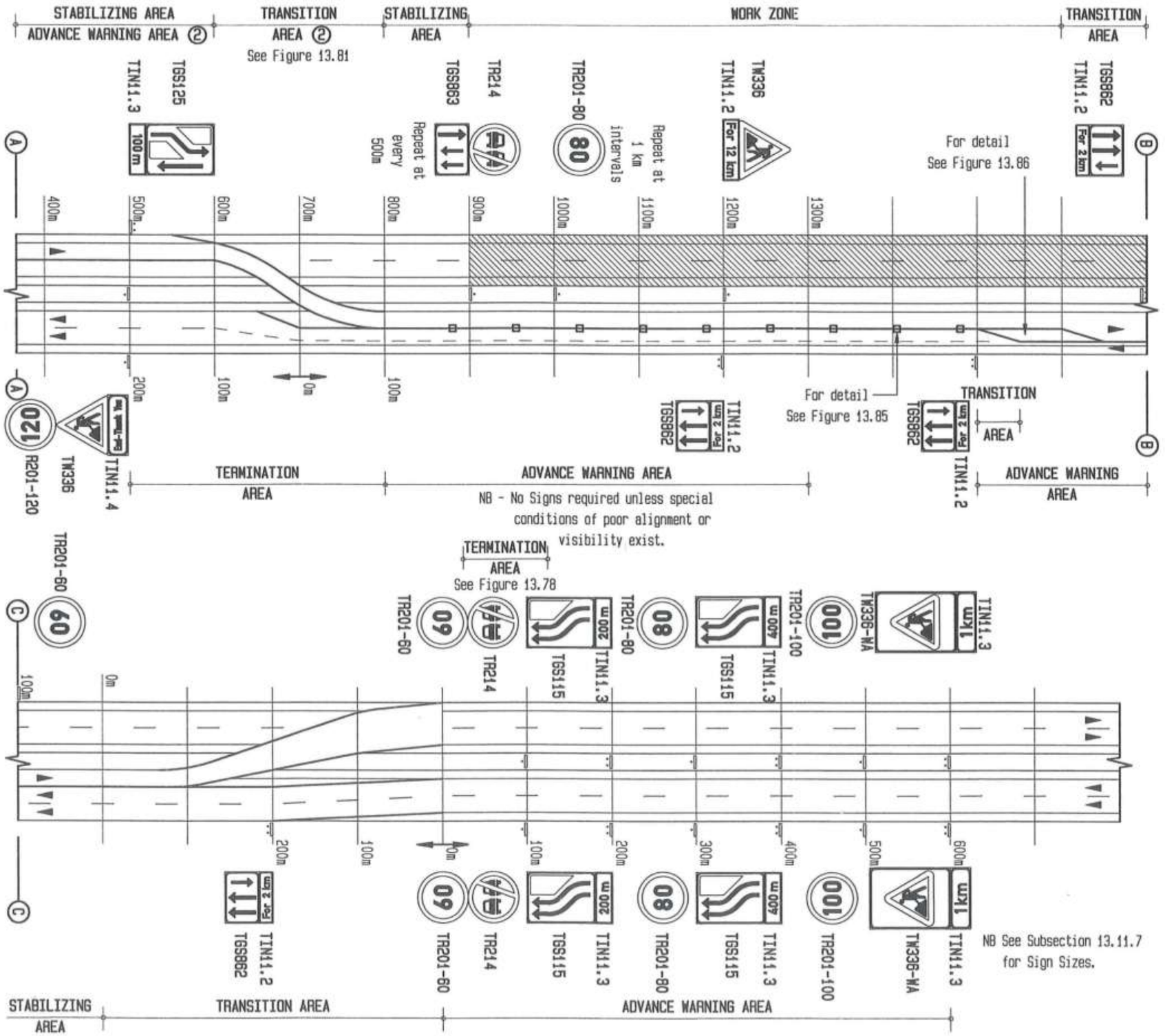
3 It is recommended that the dividing line between opposing streams of traffic be treated as illustrated in Figure 13.85, and that NO OVERTAKING signs TW214 be displayed at regular intervals. The use of temporary LANE CONFIGURATION signs TGS861, TGS862 and TGS863, with SUPPLEMENTARY PLATE signs TIN11.2 giving the distance for which the configuration continues, may be of advantage (see Figure 13.18).

4 Designers are recommended to also read Subsection 13.11.6.

Checklist

- ❑ is the site longer than 2 km?
- ❑ is the deviation set out in a 3 lane cross-section?
- ❑ are there regular alterations in lane configuration within the deviation?





INSTALLATION INVENTORY			
Sign	No	Size (mm)	Quantity
	TW336-WA	1200 X 1600	4
80	TR201-60 TR201-80 TR201-100	1200	7 5 Min (1) 4
120	R201-120	1200	1
	TGS102	1200 X 1600	8
	TGS125	1200 X 1600	2
	TR214	1200	6 Min (1)
	TGS108	1200 X 1600	2
	TGS115	1200 X 1600	4
	TGS863	1200 X 800	3 Min (1)
	TW336	1500	4
600 m	TIN 11.3	1200 1500	20 2
For 12km End-Thank You	TIN 11.2 TIN 11.4	1500 1500	7 1
	TGS862	1200 X 800	4

(1) The number of signs required depends on the length of the work area.

Fig 13.70
Carriageway Closure – Contraflow
3 Lane/2 Way

13.11.8 Carriageway Closure -Contraflow 4 Lane/2 Way

1 Figure 13.71 shows a similar basic roadworks situation to those shown in Figures 13.69 and 13.70, except that the lane configuration in the deviation consists of 4 lanes operating with 2 lanes in each direction. Such a lane configuration will be warranted for the heaviest of traffic volumes, when no significant reduction in capacity is acceptable. To achieve this, it may be necessary to construct temporary widening of the carriageway carrying the deviation.

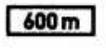
2 In this application there is only one TRANSITION AREA at the beginning of the deviation and another at the end, through both of which traffic is diverted without a lane drop through a median crossover (for detail see Figure 13.82). **The geometry of the reverse curve should be of a high standard so that traffic is not unduly impeded through the curves.** For details of different options for the design of reverse curves refer to Figure 13.24, and to Section 13.4 for details regarding the setting of temporary speed limits, and therefore the design standards for reverse curves.

3 The dividing line between the two streams of traffic should be treated as illustrated in Figure 13.85. When traffic volumes are high and it is required to keep traffic flowing at a relatively high speed, the use of a barrier on the dividing line may be warranted.

4 The sign inventories for the median crossovers must be added to that listed for this application.

Checklist

- ❑ **are the lanes through the reverse curves wide enough for heavy vehicles?**
- ❑ is a physical barrier required on the dividing line within the deviation?

INSTALLATION INVENTORY			
Sign	No	Size (mm)	Quantity
	TW336-WA	1200 X 1600	4
	TR201-60 TR201-80 TR201-100	1200	6 6 4
	R201-120	1200	3
	TGS115 TGS116	1200 X 1600	4 2
	TGS120	1200 X 1600	2
	TGS126	1200 X 1600	4
	TW336	1500	7
	TR214	1200	3
	TGS861	1500 X 800	2
	TW212-WA	1200 X 1600	1
	TIN 11.3	1200 1500	16 2
	TIN 11.2 TIN 11.4	1500 1500	2 3

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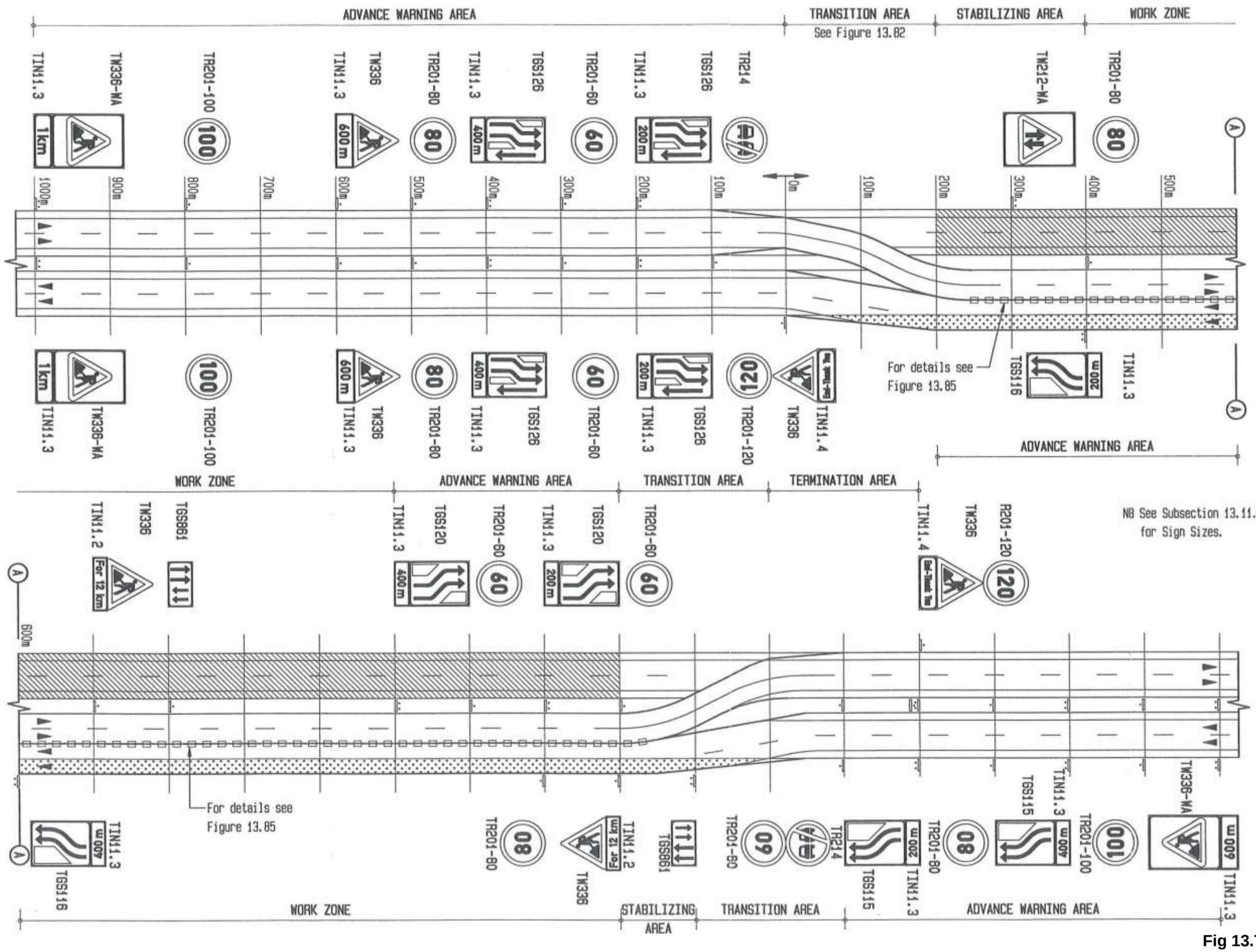


Fig 13.71
Carriageway Closure – Contraflow
4 Lane/2 Way

13.11.9 Work in Median

1 This application of temporary traffic signing is very specific to a work situation in a dual carriageway road during which the road is being widened within the median. The main purpose of the signing is to control the entry and egress of construction traffic from the median and to warn the general public that the movements are likely to occur with the attendant need for higher levels of concentration.

2 Since this type of situation is likely to be only part of a larger roadworks operation, the required signing has to be added to whatever is needed by the overall signing plan. If necessary, the more general signing level should be reduced somewhat in order to make sure the exit and entry signing will be clearly visible. Subject to prevailing visibility conditions this is a typical situation where the use of special grades of high luminance fluorescent/retroreflective material for the median access control signs may be worthy of consideration.

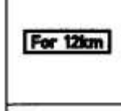
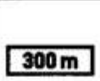
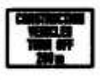
3 If there are early indications that the driving public is not observing the hazard represented by the reduction in speed of construction vehicles prior to leaving the roadway (from the "fast" lane), it is recommended that the signing be supplemented by a flagman instructed to operate only when an exiting truck is approaching. Temporary speed limits should preferably be related to the general conditions prevailing, and **NOT** to the localised requirements of the construction vehicle movements. Flagmen may also be effective to warn the public when a construction vehicle is re-entering the road.

4 A major roadworks site may have a number of such median access points. It has proven effective in such cases to identify each access by a number associated with the TW344 sign. Construction vehicle drivers can then be advised which of the several accesses they are to use on a trip-by-trip basis.

Checklist

- ❑ can access points be sited where visibility is good even if this means that construction traffic may travel some distance on the median?
- ❑ can exit points from the median be sited so that construction vehicle drivers have clear sight in order to judge gaps in traffic?
- ❑ if gaps in traffic are likely to be very limited can traffic be effectively slowed by a flagman to allow construction vehicles entry?
- ❑ is the use of special grades of high luminance fluorescent/retroreflective material warranted to assist identification of entry/exit points?
- ❑ are there several entry points and will it be of assistance to number these?

INSTALLATION INVENTORY

Sign	No	Size (mm)	Quantity
	TR201-60 TR201-80	1200	4 4 (2)
	R201-120	1200	(2) 2
	TW344 TW345	1500	3 3
	TGS131	1200 X 1600	4 to 6
	TW402	150 X 600 200 X 800 300 X 1200	60 plus 4 per 100m site length
	TIN 11.2	1200	2
	TIN 11.3	1200	4
	TIN 11.4	1500	(3) 4
	TIN 11.5	1500	2
	FLAGS	450 X 450	6

(1) This installation is for use within a roadworks site. Extra advance signs will be required if used on its own.
(2) Speeds according to site.
(3) Special text supplementary plates.

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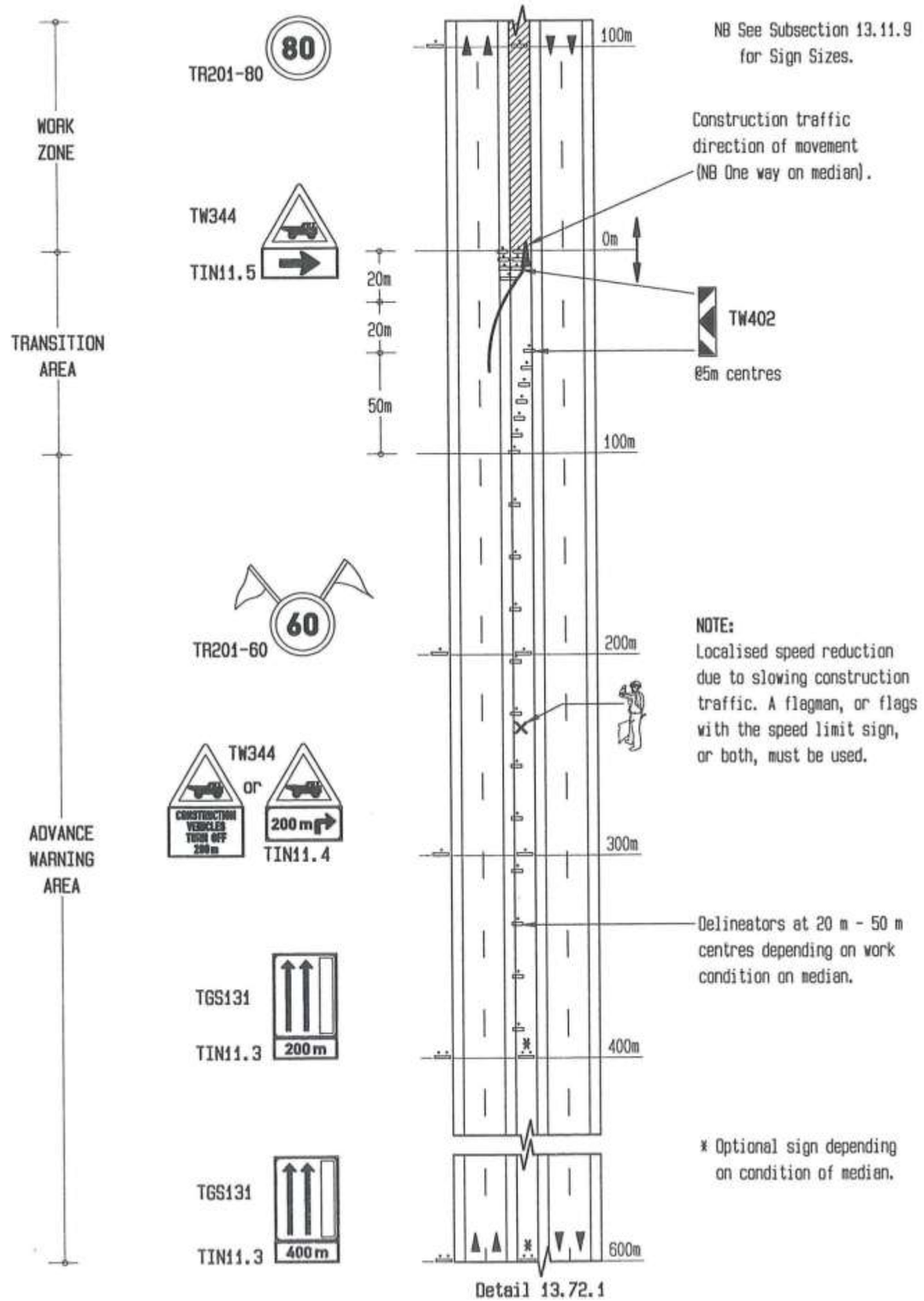


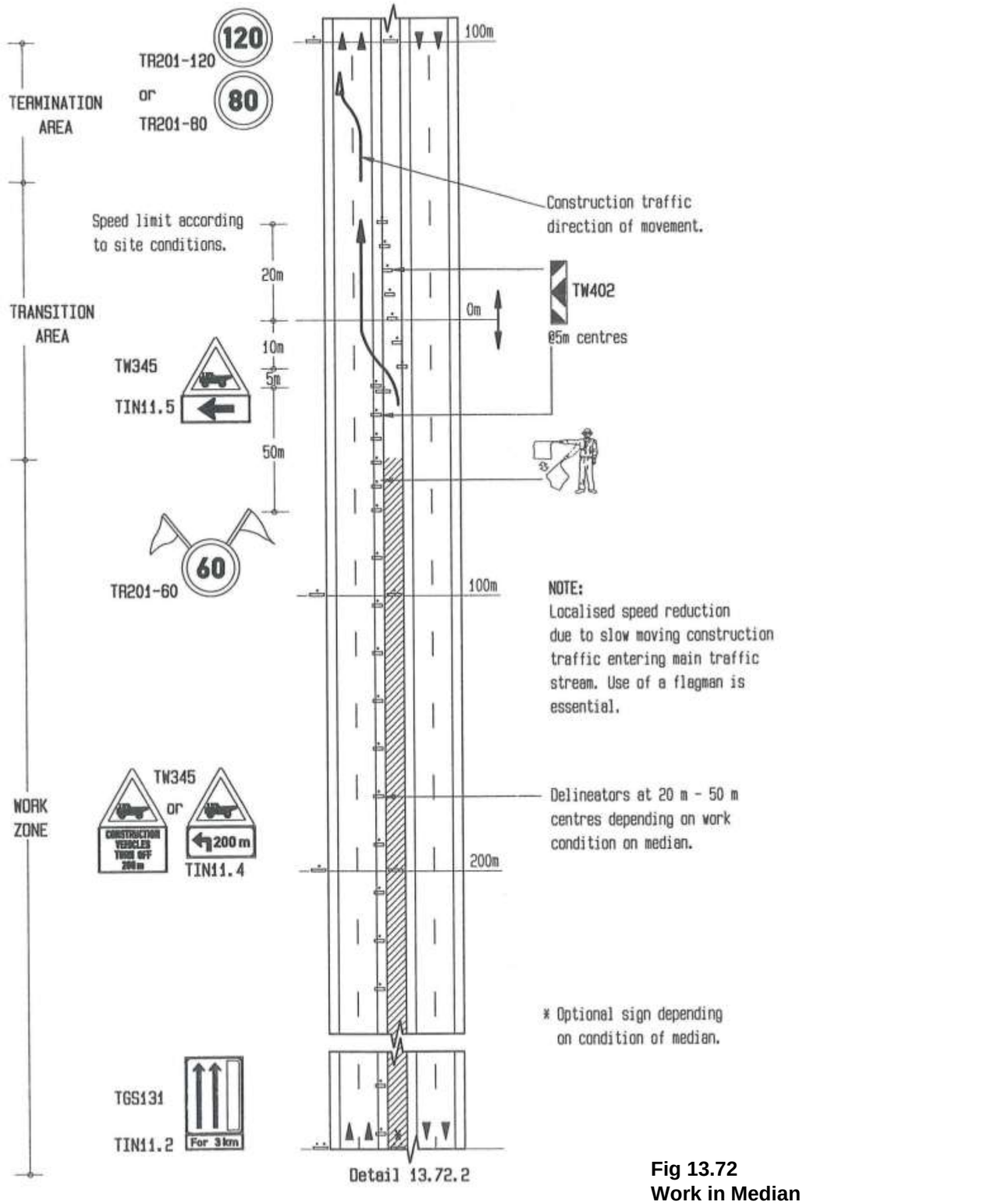


Fig 13.72
Work in Median

13.11.10 2 Lanes Closed

1 If a carriageway has more than three lanes in one direction, it may be acceptable to close two lanes in order to make reconstruction more efficient. Figure 13.73 shows the signing required in advance of such a double lane drop. As with other lane drops which have been detailed, it is recommended that the "Fast" lanes be dropped "first", irrespective of which lanes ultimately have to be worked on. **It is NOT recommended to work on one or more lanes with traffic flowing past on the left AND the right.**

2 The DIAGRAMMATIC signs used on a road of this importance should accurately reflect the number of lanes. The two lane drop TRANSITION AREAS must be sufficiently far apart that:

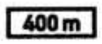
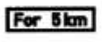
(a) traffic flow can stabilize after negotiating the lane drop; AND

(b) there is sufficient distance to accommodate the signs for the second lane drop.

3 Full details of the lane drop tapers are covered in Figure 13.80 (although the figure illustrates a three lane carriageway). Details of delineator spacings and tapers are given in Tables 13.4 and 13.5, and Figure 13.29.

Checklist

- ❑ can two lanes adequately accommodate all the traffic?
- ❑ is there sufficient space to provide the required STABILIZING AREA?

INSTALLATION INVENTORY			
Sign	No	Size (mm)	Quantity
	TW336-WA	1200 X 1600	2
	TR201-80 TR201-100	1200	9 2
	R201-120	1200	2
	TGS106	1500 X 1600	6
	TGS104	1200 X 1600	4
	TGS131	1200 X 1600	2
	TW336	1500	2
	TIN 11.3	1200 1500	4 6
	TIN 11.2	1200	2
	TIN 11.4	1500	2

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NB See Subsection 13.11.10
for Sign Sizes.

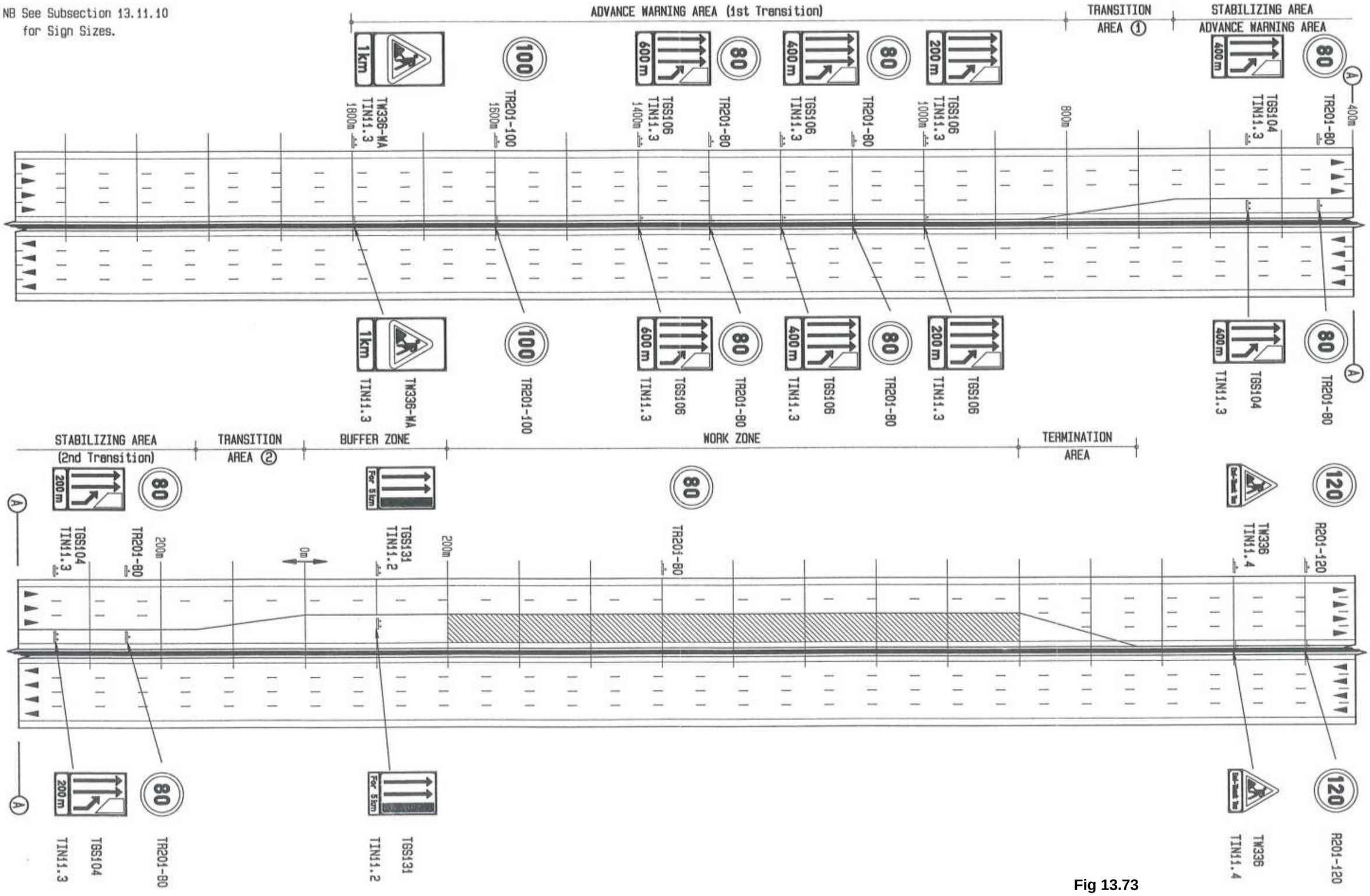


Fig 13.73
2 Lanes Closed

13.11.11 On-Ramp/Off Ramp - Amended Configuration

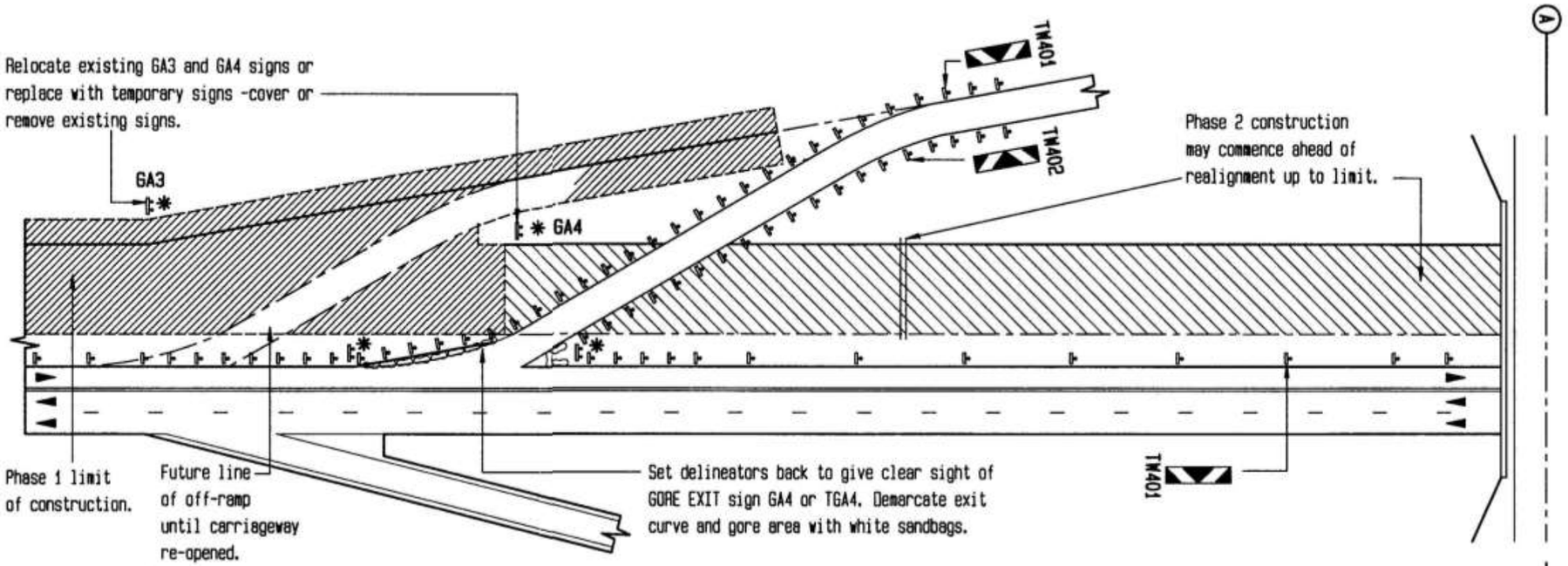
1 The various roadworks applications covered in Figures 13.67 to 13.73 may all include one or more interchanges within the WORK AREA. Subject to the relationship between the diverted traffic and the on- and off-ramps it will be necessary to provide temporary connections across the carriageway under construction. The geometry of these connections will commonly be to low standards due to space constraints. These low standards may contribute to slow exit speeds or indecision on the part of drivers. Every effort must therefore be made to limit such effects.

2 Detail 13.74.1 shows a typical arrangement of temporary on-ramps and off-ramps. The detail allows for the relocation of the ramps when the area over which they were first positioned needs to be reconstructed (or vice versa). The temporary alignments of the ramps are defined by DELINEATOR PLATE signs TW401 and TW402. These signs should be positioned carefully. Figures 13.90 and 13.91 give more details on the treatment of these areas.

3 If it is necessary to provide good on-ramp capacity, Details 13.74.2 and 13.74.3 offer two options to permit relatively free-flow entry. Detail 13.74.2 shows one of the two through lanes being dropped to accommodate an acceleration lane for traffic which otherwise will have to enter the roadway slowly due to the sharp curvature at the entry point. Detail 13.74.3 shows localised widening through the on-ramp gore area to permit two lanes of traffic and hence an opportunity for entering traffic to accelerate. Which, of these options may be exercised, if any, is dependent on the NET benefit to traffic? The options are likely to have a net benefit if through traffic is light and on-ramp traffic is heavy.

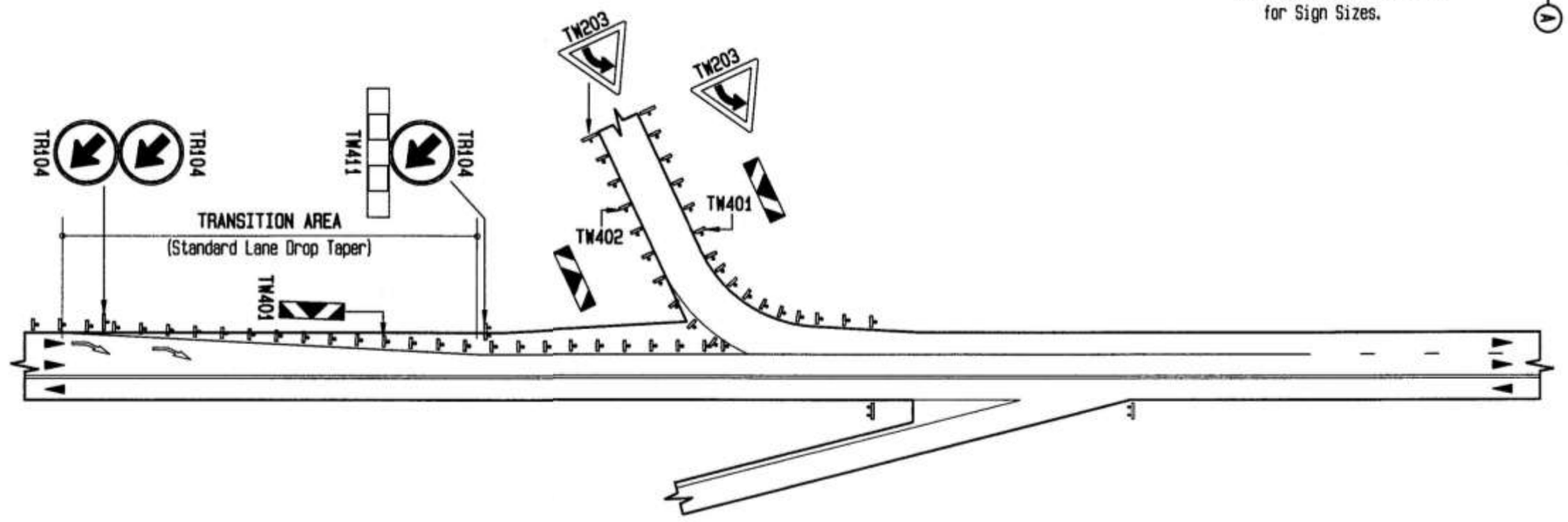
Checklist

- ❑ may be exercised is off-ramp capacity acceptable in terms of the reductions in curve radius?
- ❑ may be exercised can the on-ramp configuration be arranged to allow entering traffic to accelerate effectively and merge with freeway traffic?

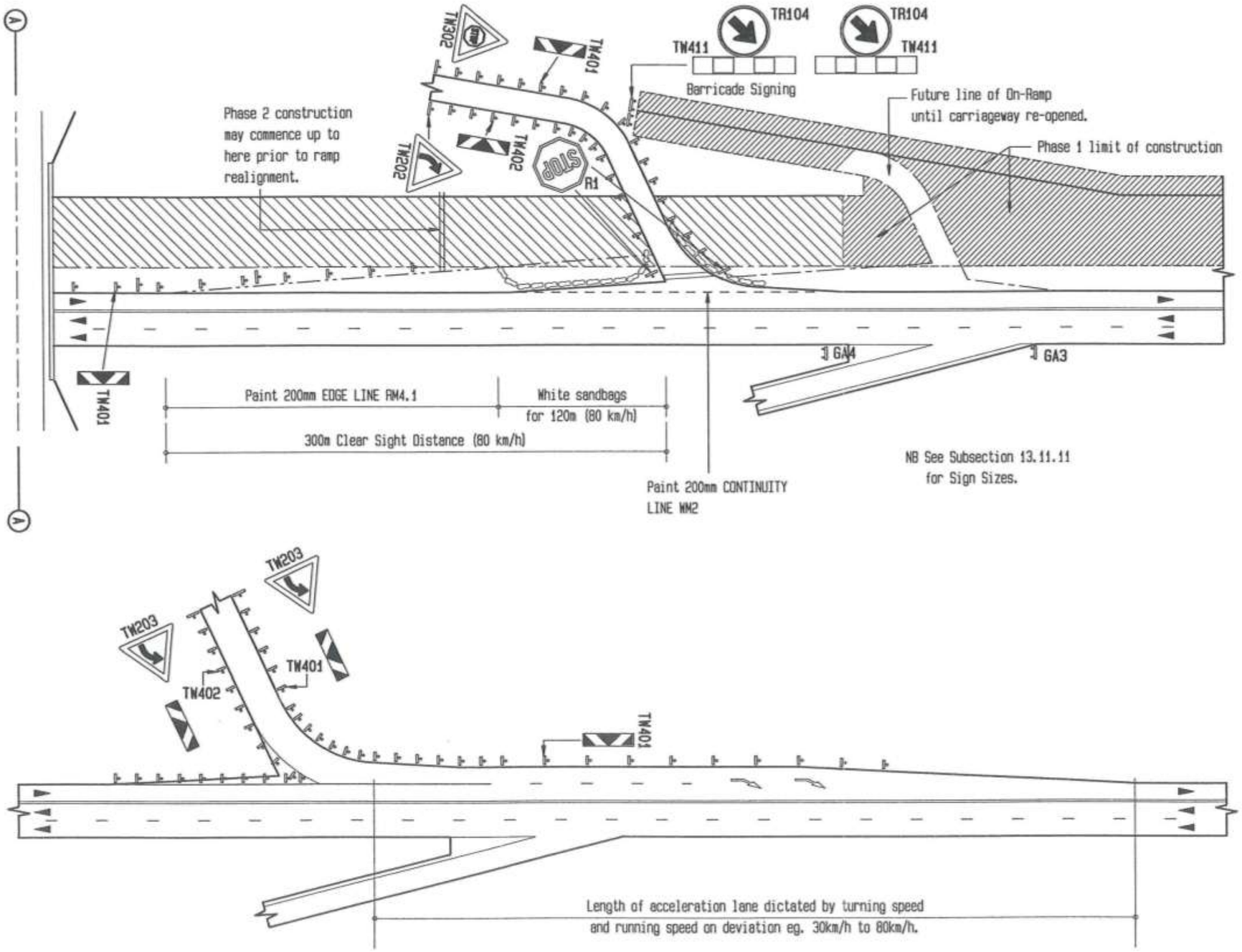


Detail 13.74.1

NB See Subsection 13.11.11 for Sign Sizes.



Detail 13.74.2 Alternative Treatment if 3 Lane Configuration Permits. On-Ramp Slow but Free-Flowing - Through Traffic Reduced to One Lane (Only Practical with Moderate Volumes).



Detail 13.74.3 Alternative Treatment to Improve On-Ramp Capacity Provided Space is Available for Temporary Acceleration

INSTALLATION INVENTORY			
Sign	No	Size (mm)	Quantity
	TW401 TW402	800 X 200	
	TR104	1200	
	TW203	1500	
	TW411	300 X 1800	
	TW202	1500	
STOP	R1	1200	
	TW302	1500	
	WHITE SANDBAGS		

Fig 13.74
On-Ramp/Off-Ramp – Amended Configuration

13.11.12 Resurfacing – Freeway Interchange Ramps - Diamond

1 Due to the limited width of many off-ramps and on-ramps, resurfacing or reconstruction operations may require complete closure for a short period of time, or that the work be undertaken in half widths of the ramp. Figure 13.75 shows a variety of details as to how this may be achieved.

2 Details 13.75.1 and 13.75.2 indicate a two stage approach at the exit point to an off-ramp. Construction can be continued for the full length of the ramp in this manner. Due to the restricted width on the ramp and the revised treatment at the point of exit, the use of a flagman to warn drivers at this point is recommended.

3 Details 13.75.3 and 13.75.4 show a similar arrangement in respect of an on-ramp. In this case, the function of a flagman can be to warn straight through traffic of entering traffic at lower speeds than normal due to the ramp configuration.

4 When necessary, STOP or YIELD control may be implemented at the on-ramp junction with the main carriageway. It has to be accepted, however, that such control will result in delays to both entering traffic and to main carriageway traffic.

5 Construction of the sort shown in Figures 13.75 and 13.76 may require special plant to operate in the confined space available. In each of the cases illustrated, the inventory of signs should be added to that required for the full work site. Careful planning should result in the inventory for one ramp only being required.

Checklist

- ❑ can the ramps be worked on in half sections?
- ❑ can work on ramps be organised to minimise the effects on traffic without serious cost implications?
- ❑ is suitable plant available to work in the limited space?
- ❑ if the ramps have to be closed can traffic be accommodated at adjacent ramps?

TYPICAL INVENTORY			
Sign	No	Size (mm)	Quantity
	TR201-40 TR201-60 TR201-80 TR201-100	1200	2 2 2 2
	R201-120	1200	2
	TIN 1	1200 X 700	1
	TIN 2	1200 X 700	1
	TIN 3	1200 X 700	1
	TW336	1500	2
	R2	1500	2
	TW401 TW402	800 X 200	40-50 per ramp
	FLAGS	450 X 450	4
	TGA4-D	800 X 1280	1

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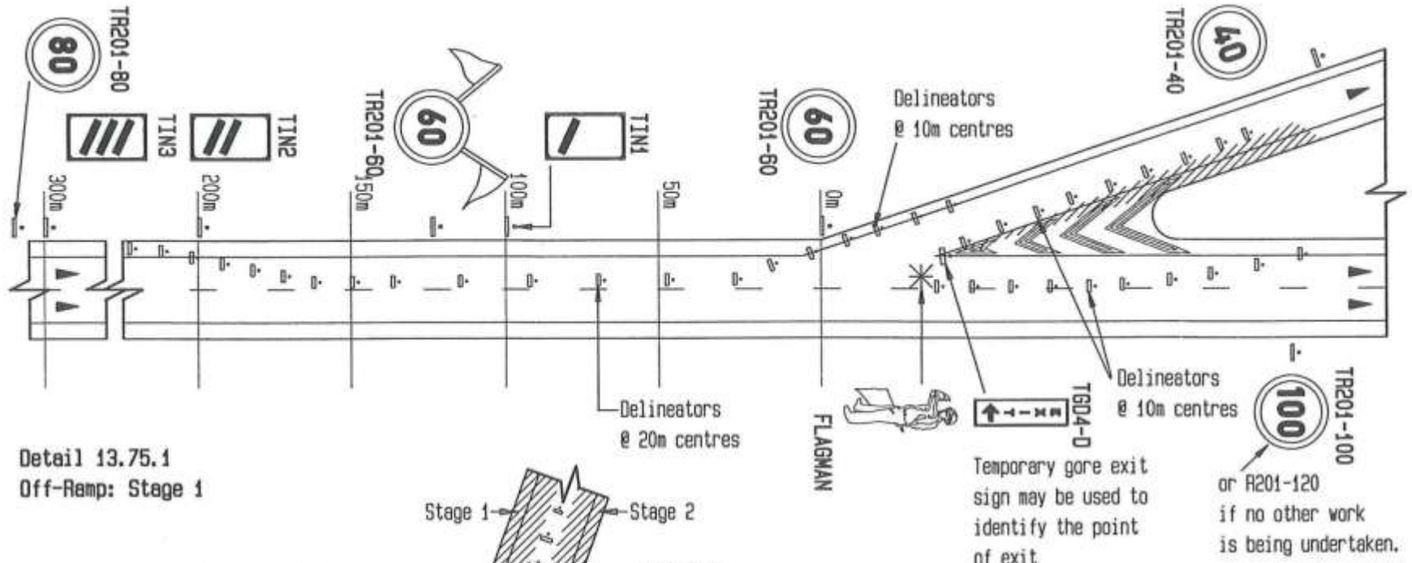
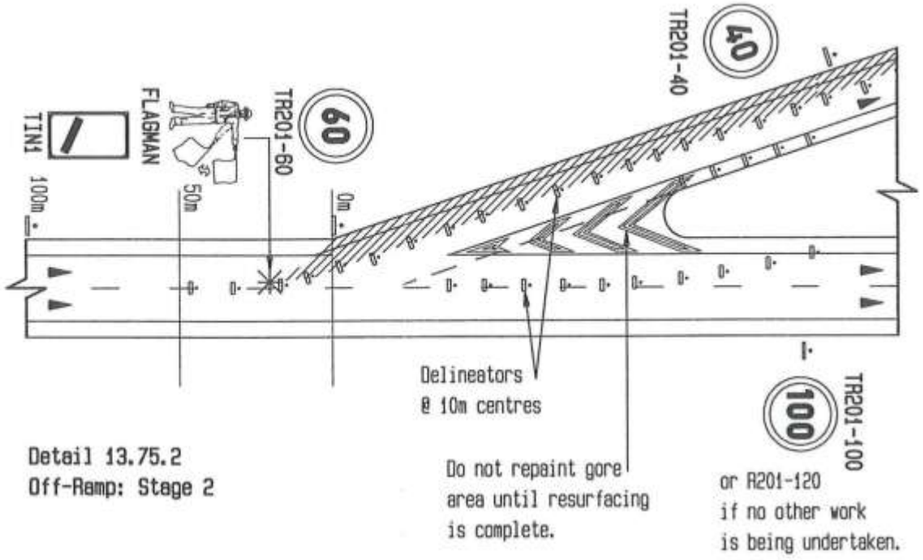
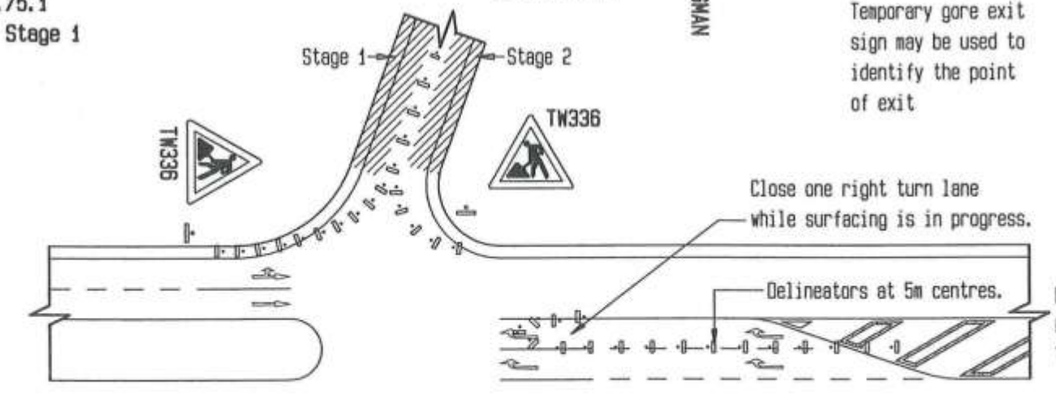


Detail 13.75.1
Off-Ramp: Stage 1

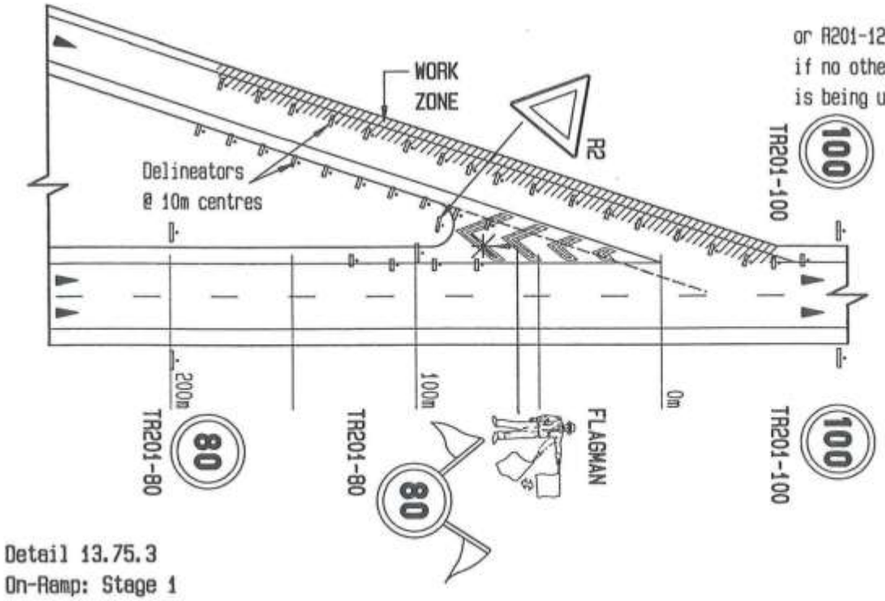


Detail 13.75.2
Off-Ramp: Stage 2

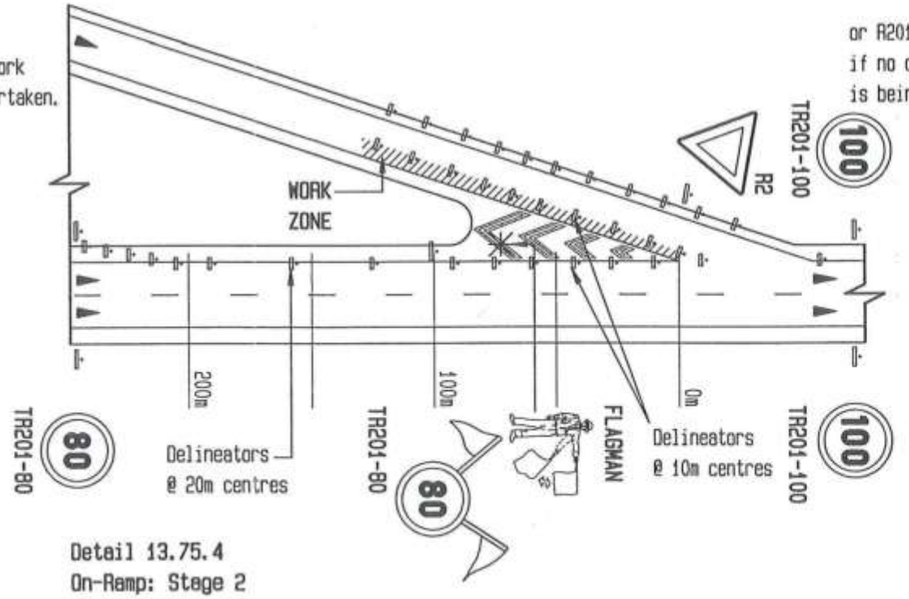
NB See Subsection 13.11.12
for Sign Sizes.



Detail 13.75.5
Cross Road to On-Ramp
Treatment



Detail 13.75.3
On-Ramp: Stage 1



Detail 13.75.4
On-Ramp: Stage 2

NOTES:

1. It is assumed that ramps are wide enough to be surfaced in two parts while maintaining traffic flow.
2. It is recommended that gore areas be resurfaced first to eliminate road markings which will assist Stage 2 traffic management.
3. When the gore areas are being resurfaced it may be necessary to close the adjacent through lane. See Figure 13.77

Fig 13.75
Resurfacing – Freeway Interchange Diamond Ramps

13.11.13 Resurfacing – Freeway Interchange Ramps – 360° Loop

1 Figure 13.76 indicates a similar half width construction plan to that shown in Figure 13.75 suitable for circular ramps used at parclo and systems interchanges. It will be very difficult to redirect traffic at a systems interchange to permit full closure of a ramp.

2 Construction of the sort shown in Figures 13.75 and 13.76 may require special plant to operate in the confined space available. In each of the cases illustrated, the inventory of signs should be added to that required for the full work site. Careful planning should result in the inventory for one ramp only being required.

Checklist

- ❑ can the ramps be worked on in half sections?
- ❑ can work on ramps be organised to minimise the effects on traffic without serious cost implications?
- ❑ is suitable plant available to work in the limited space?
- ❑ if the ramps have to be closed can traffic be accommodated at adjacent ramps?

TYPICAL INVENTORY			
Sign	No	Size (mm)	Quantity
	TR201-40 TR201-60 TR201-80 TR201-100	1200	2 4 4 4
	R201-120	1200	4
	R2	1500	1
	TW401 TW402	800 X 200	20m centres on straight 10m centres on loop
	TGA4-D	800 X 1280	1

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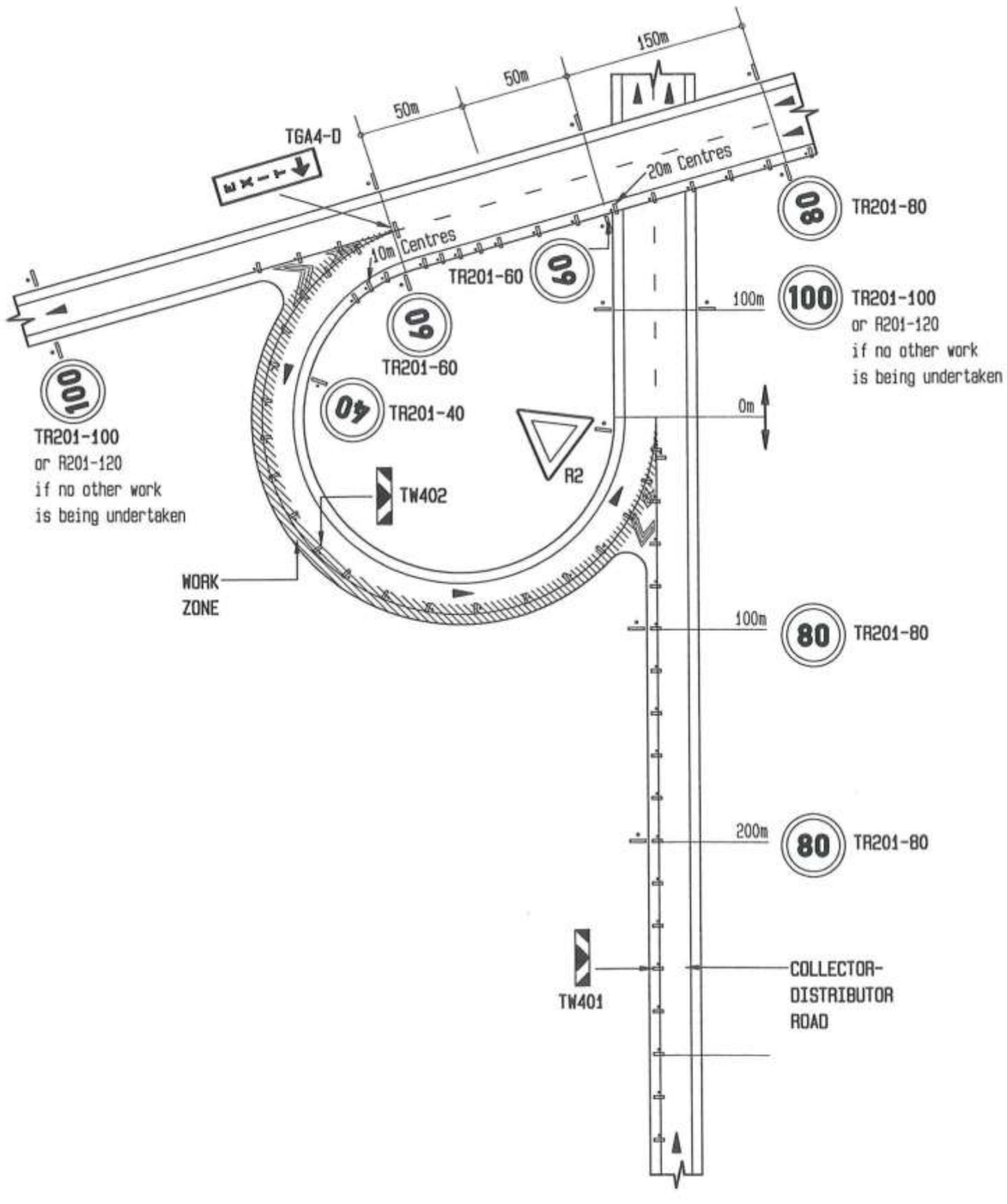
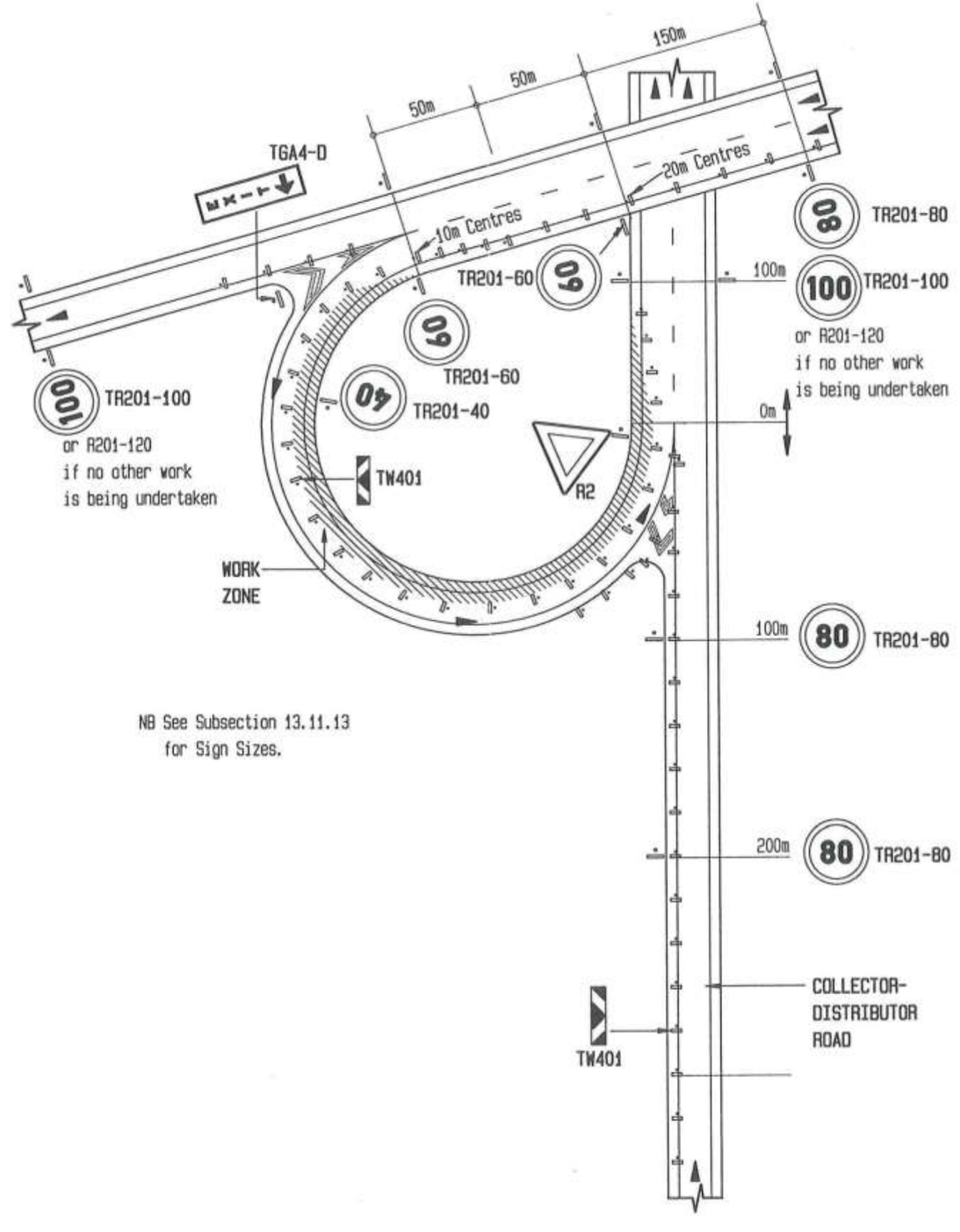


Detail 13.76.1
Stage 1



NB See Subsection 13.11.13
for Sign Sizes.

Detail 13.76.2
Stage 2

Fig 13.76
Resurfacing – Freeway Interchange
360° Loop Ramps

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13.12 ENLARGED STANDARD DETAILS – ALL APPLICATIONS

13.12.1 General

1 The details in this section are individual elements from many of the examples given in Sections 9.8 to 9.11. They are depicted to a larger scale than has been possible in the more general figures so that the specific details of their arrangement, or setting out on the roadway, may be clearer.

2 Many of these enlarged standard details refer to elements which comprise components of temporary traffic control zones as described in Figure 13.20 including:

(a) TRANSITION AREA elements:

(i) tapers;

(ii) crossovers;

(b) TERMINATION AREA taper.

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13.12.2 Lane Drop Taper - Upstream Transition Area

1 Figure 13.77 illustrates a typical lane drop taper in greater detail than depicted in individual traffic control figures given in other sections of this chapter.

2 The detail given here must be considered as additional to the signing indicated in sign sequence examples unless noted otherwise e.g. Figure 13.66.

3 The number of DELINEATOR PLATE signs TW401 or TW402, or of TRAFFIC CONES TD4, which are required for a specific taper is dependant on the shift absorbed by the taper and the rate of shift. For further details see Section 13.5 - "Temporary Delineation" and specifically Tables 13.4 and 13.5. As a general rule, for a 3.5 m wide lane, an upstream lane drop transition taper should consist of 12 to 15 delineators or cones equally spaced along the taper.

4 It is recommended that when a shoulder exists, the taper be extended across the shoulder, since this is also dropped. It may increase the conspicuity at the start of the taper if the taper rate across the shoulder is made half that used on the taper, i.e. 1 in 10 rather than 1 in 20.

5 In a similar way, it is recommended that the delineator or cone spacing used on the taper be retained for the length of the longitudinal BUFFER ZONE or STABILIZING AREA following the taper, and that the spacing only be increased once the work area is reached.

6 The use of shift and taper rates (i.e. 1 in 20) is appropriate for design purposes, however, if traffic accommodation drawings are being provided, it is better that the start and end points of the required taper be identified on the road chainage, or that the length in metres (and paces) be stated rather than the rate.

Checklist

❑ has the number of delineators or cones required for each taper been included in the sign quantities derived from the appropriate figure or figures being used to design the traffic accommodation?

TAPER ONLY INVENTORY			
Sign	No	Size (mm)	Quantity
	TW401 TW402	150 X 600 200 X 800 250 X 1000 300 X 1200	12 to 15 for 3,5m lane plus 5 for shoulder
	TD4	450 750	As above
	TR103 TR104	900 (urban) 1200 (rural)	2 to 5
	TW411	300 X 1800 (urban) 400 X 2400 (rural)	1 to 3

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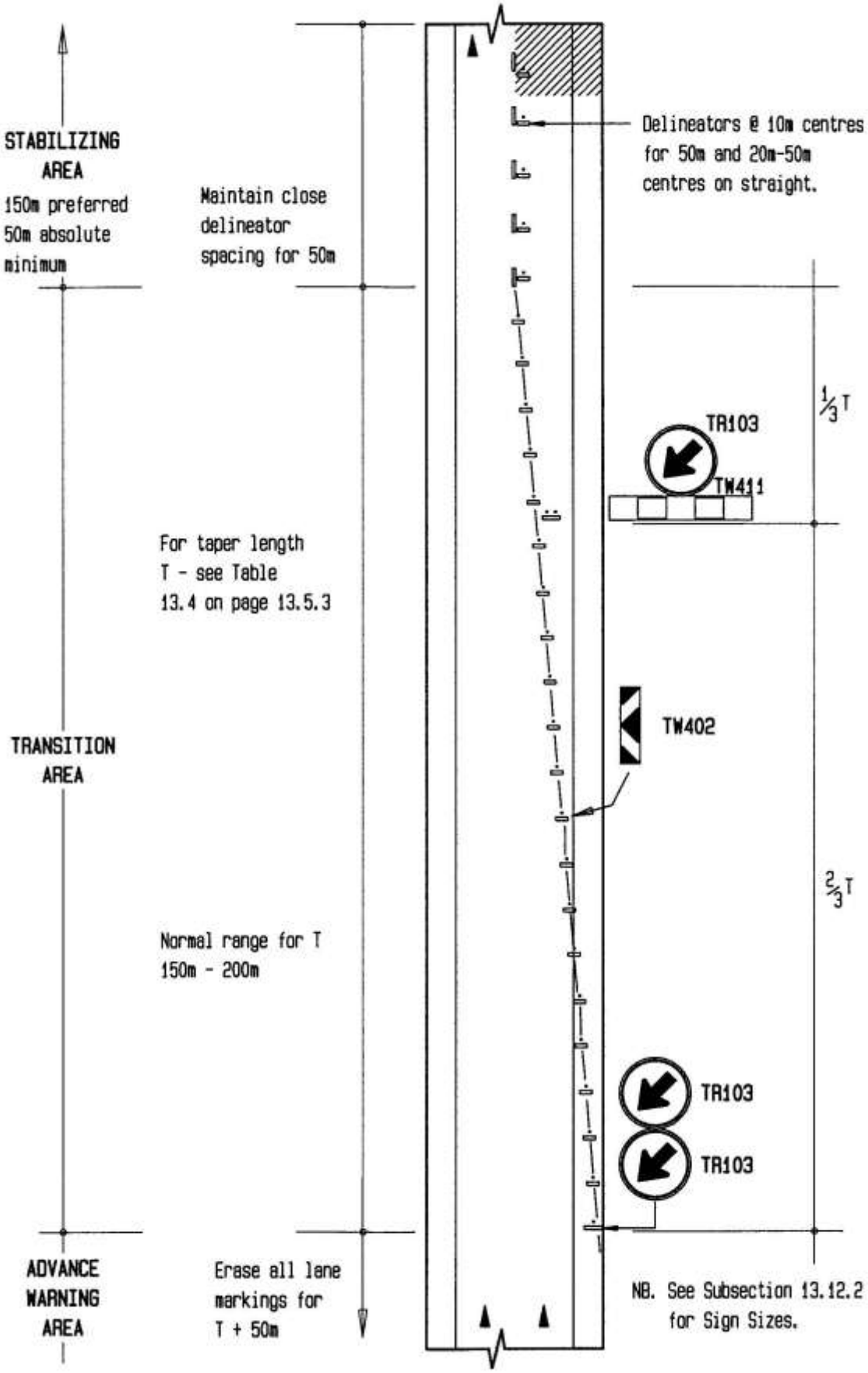

Fig 13.77 **Lane Drop Taper – Upstream Transition Area**

13.12.3 Taper - Downstream Termination Area

1 The TERMINATION AREA is one of the standard components of a roadworks site as set out in Figure 13.20. In this respect, the function of site termination must be considered and understood, but, because this is the point where a restricted road cross-section is returned to a normal cross-section, the standards applied are relatively low. Since the taper operates in a Adownstream@ manner, drivers will adopt a flatter line for comfort. Figure 13.78 shows a typical arrangement with a rapid 1 in 5 to 1 in 10 taper beyond the end of the work area. For details of delineator or cone spacings, and acceptable taper rates, refer to Tables 13.4 and 13.5 respectively.

2 Figure 13.78 also illustrates signs normally provided beyond the end of the TERMINATION AREA. If a temporarily reduced speed limit has been posted within the roadworks site, it is strongly recommended that drivers be reminded of the prevailing speed limit on their return to normal conditions. It is also recommended to associate this message with a final display of the ARoadworks@ sign TW336 together with a brief public relations message such as AEnd - Thank You@ on a TIN11.4 SUPPLEMENTARY PLATE sign.

3 Whilst less essential than on the approach side of a taper, it is recommended that a section of lane line from the start of the taper be erased to open up the full road cross-section.

Checklist

- ❑ is the termination area at the end of the roadworks site or is it simply at a change from one restricted state to a less restricted state?
- ❑ has there been a reduction of speed limit within the site?
- ❑ is it advisable to remove 60 m to 100 m of lane line from the start of the taper?

TYPICAL SIGN REQUIREMENTS

Sign	No	Size (mm)	Quantity
	TW401 TW402	150 X 600 200 X 800 250 X 1000 300 X 1200	5 for taper plus 5 for shoulder
	R201-120	900 (urban) 1200 (rural)	2
	TW336	900 (urban) 1200 (rural)	2
	TIN 11.4	900 (urban) 1200 (rural)	2

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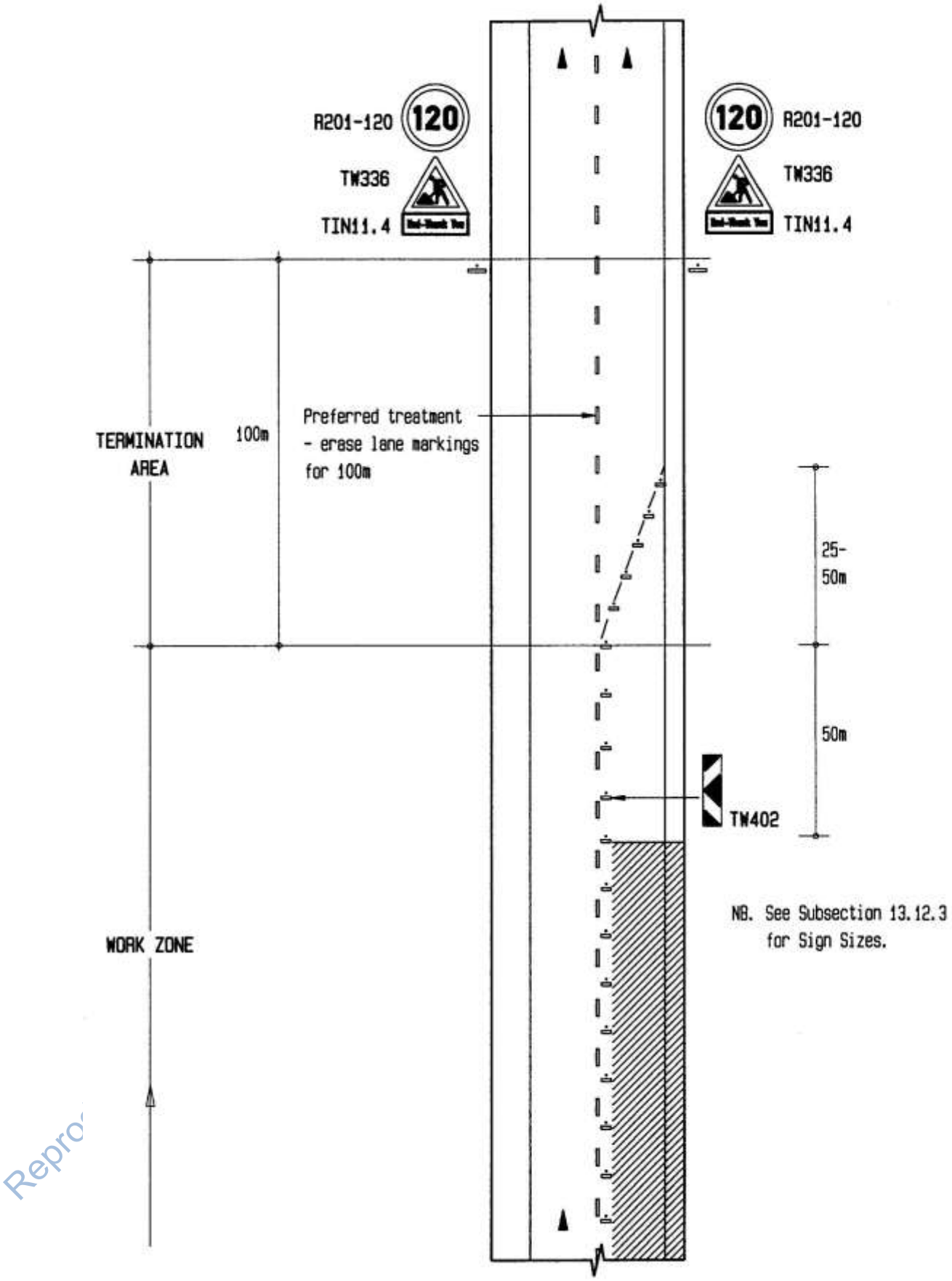

Fig 13.78 **Taper –Downstream Termination Area**

13.12.4 Lane Shift Taper - Transition Area

1 The detail covered by Figure 13.79 is appropriate when policy dictates that the Afast@ lane be dropped approaching a restricted roadway width at a roadworks site, but where the work area lies in the path of the "slow" lane. The TRANSITION AREA shown is therefore commonly likely to be the second transition before reaching the BUFFER ZONE and WORK AREA. The first transition will be the taper dropping the "fast" or median side lane.

2 A shift from the left lane to right lane may be necessitated by the need for work ahead in the left lane or the shift may precede another transition created by a median crossover to the far side carriageway. The rate of shift (taper rate) and cone/delineator spacing shall be in accordance with Tables 13.4 and 13.5.

3 Since the shifting roadway is defined by the physical presence of cones or delineators, it is recommended that the width of roadway be not less than 4 metres. All standard road markings shall be erased along the length of the lane shift. To enhance the alignment edges, temporary LEFT and RIGHT EDGE LINE markings are recommended. These lines should be retroreflective and they may be further supplemented by yellow (left) and white (right) roadstuds.

4 The signing inventory is additional to that derived for any roadworks traffic management situation illustrated in other sections.

Checklist

- ❑ are traffic cones provided with retroreflective sleeves?
- ❑ are delineators more appropriate than cones?
- ❑ have road markings been erased within the shifted lane?
- ❑ are temporary edge line markings and/or roadstuds warranted?

TYPICAL SIGN REQUIREMENTS			
Sign	No	Size (mm)	Quantity
	TW401 TW402	150 X 600 200 X 800 250 X 1000 300 X 1200	
	TR104	900 (urban) 1200 (rural)	3
	TW411	300 X 1800 (urban) 400 X 2400 (rural)	1

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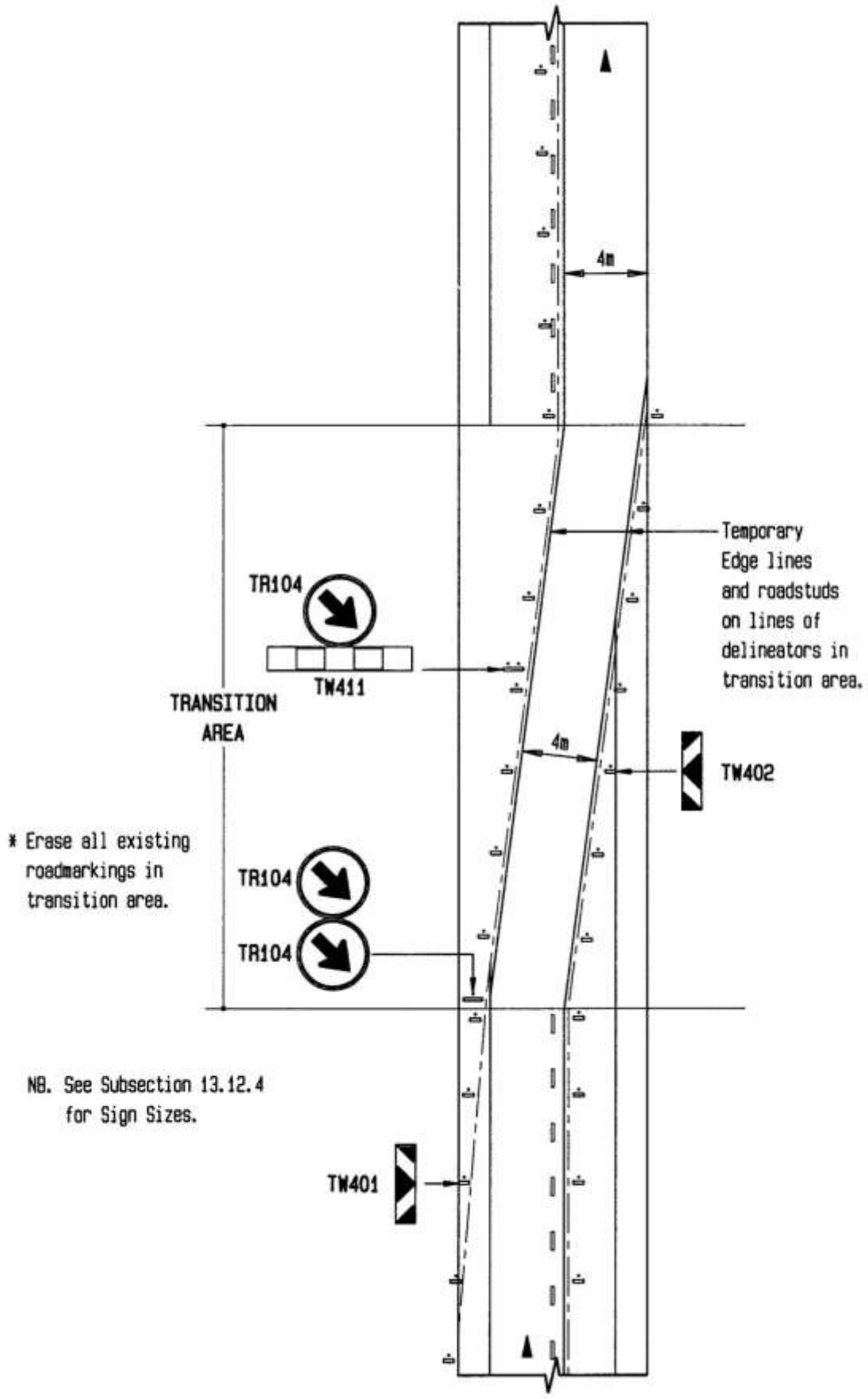

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Fig 13.79 **Lane Shift Taper – Transition Area**

13.12.5 Double Lane Drop Tapers - Upstream Transition Area

1 The purpose of Figure 13.80 is to illustrate the overall effect of two tapers required by a double lane drop. Any roadway with three lanes in one direction will likely carry significant volumes of traffic. The dropping of two out of three lanes should therefore be undertaken with care.

2 In Figure 13.80, the various standard function traffic management areas are numbered to show the succeeding components of the double lane drop. Due to the expected high traffic volumes, DIAGRAMMATIC signs are recommended.

3 In order to assist the merging operation, it is recommended that road markings be omitted within the taper areas. The dictating factors in determining the length of STABILIZING AREA (1) are:

(a) sufficient longitudinal space to locate a sequence of a pair of diagrammatic signs;

(b) sufficient length of roadway to allow traffic flow, affected by the tapers, to merge safely and proceed in the remaining lane(s)?

Checklist

- ❑ check to see that the sign inventory is not duplicated in the main application inventory?
- ❑ can the single remaining lane adequately accommodate traffic?
- ❑ is the site a short term one or a medium to long-term one?

TYPICAL SIGN REQUIREMENTS			
Sign	No	Size (mm)	Quantity
	TGS104	1200 X 1600	4
	TGS102	1200 X 1600	4
	TR201-60	1200	2
	TR103	1200	6
	TR214	1200	1
	TW411	300 X 1800 (urban) 400 X 2400 (rural)	2
	TW402	800 X 200	30 taper plus 5 per 100m
	TIN 11.3	1200	8

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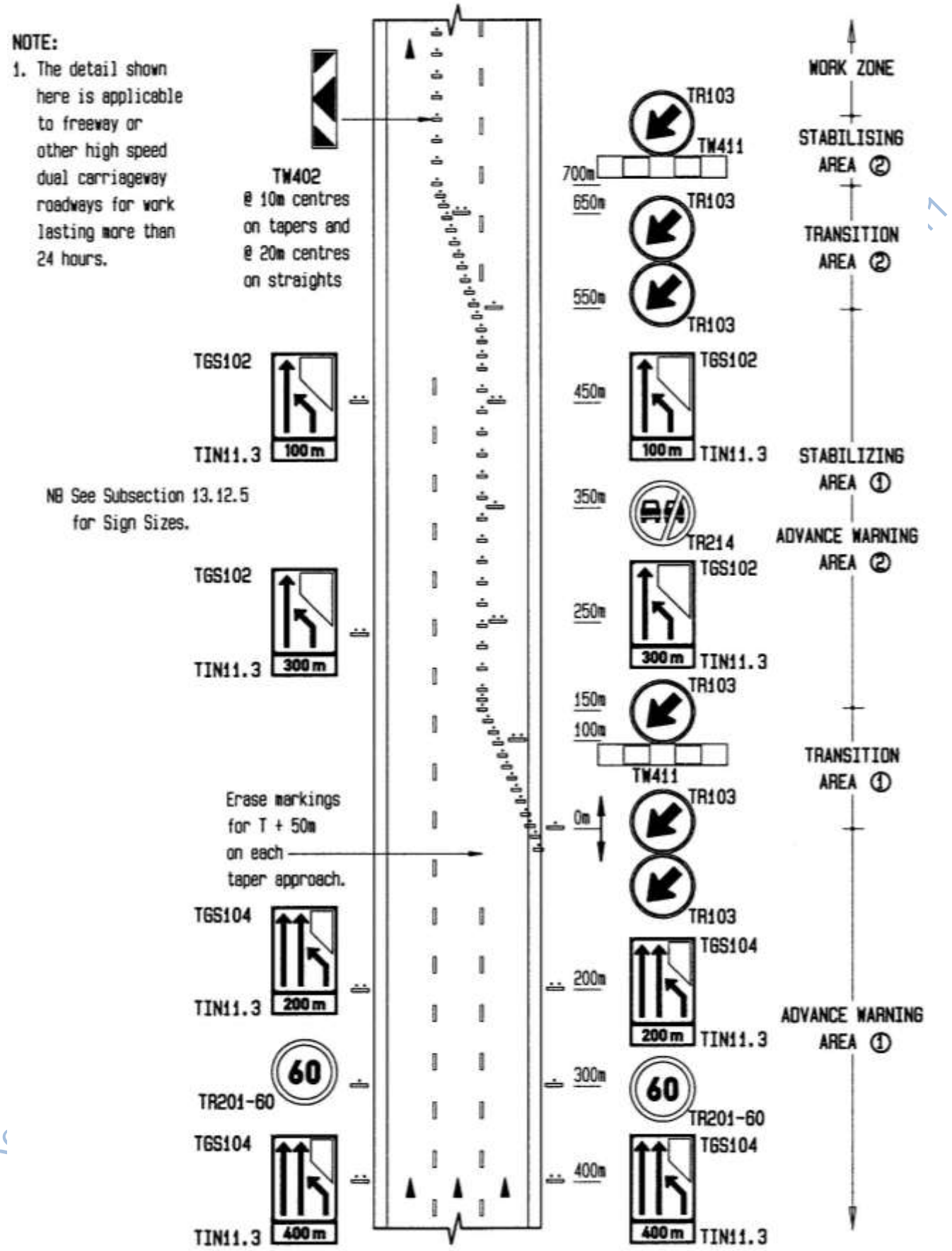


Fig 13.80 **Double Lane Drop Taper – Upstream Transition Area**

13.12.6 Crossover Reverse Curve – Single Lane Transition Area

1 Figure 13.81 shows the signing detail for a single lane crossover of a central median island of a dual carriageway roadway. This type of TRANSITION AREA will commonly be the second or even third in an approach sequence to the WORK AREA which comprises one carriageway of the dual carriageway roadway (see Figure 13.70 in Section 13.11). The preceding traffic control sequence will most likely be a lane drop TRANSITION AREA followed by a STABILIZING AREA which will accommodate the advance signing (DIAGRAMMATIC signs) for the crossover. In this case the crossover leads into a three lane cross-section (see Figures 13.20 and 13.86).

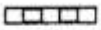
2 The horizontal alignment of the crossover should be designed to the highest standard consistent with space constraints. A minimum lane width within the crossover of 4 metres is recommended. This should be increased for designs which incorporate minimum horizontal reverse curve design (see Figure 13.81 for a two-lane crossover detail). For full details of crossover alignment design options, refer to Section 13.4 and Figures 13.24 to 13.26.

3 An installation of this size will warrant the use of DELINEATOR PLATE signs TW401 and TW402. The use of TR104/TW411 barricade signing above and behind the delineators is recommended. A formal ARoad Closure@ barricade should be established at the beginning of the BUFFER ZONE. The signing of the barricade should conform to one of the options illustrated in Figures 13.18, 13.19 and 13.87.

4 The sign inventory listed for this type of crossover should be added to the basic sign requirements listed under the application with which it is to be used e.g. Figure 13.70, plus any other inventory items for additional transition details to be used within the site.

Checklist

- ❑ is the crossover wide enough and free-flowing enough for heavy vehicles and the set speed limit?
- ❑ are TR104/TW411 barricades in place?
- ❑ is the alignment of the crossover demarcated by retroreflective edge line markings and/or roadstuds?
- ❑ is the length of STABILIZING AREA preceding the crossover adequate to achieve stable traffic flow?

TYPICAL SIGN REQUIREMENTS			
Sign	No	Size (mm)	Quantity
	TR103 TR104	900 (urban) 1700 (rural)	2 4
	TW401 TW402	150 X 600 200 X 800 250 X 1000 300 X 1200	20 Min 30 Min
	Road closed barricade	1200 X 2400	2
	TW411	300 X 1800 (urban) 400 X 2400 (rural)	1
	TW407 TW408	400 X 1200	2 2

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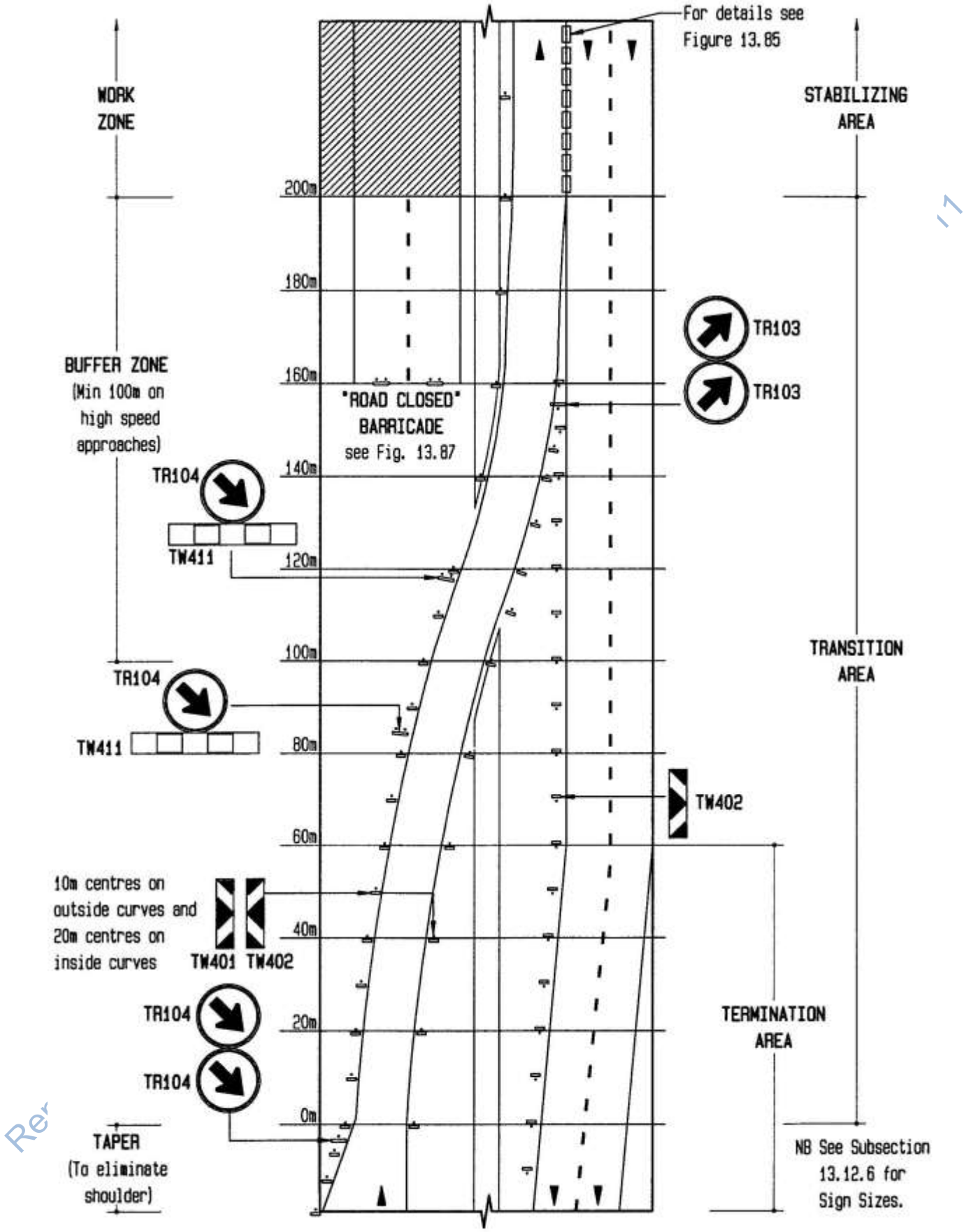


Fig 13.81 **Crossover Reverse Curve – Single Lane - Transition Area**

13.12.7 Crossover Reverse Curve - 2 Lane Transition Area

1 The detail covered by Figure 13.82 is similar to that given in Figure 13.81 with the exception that two lanes are taken through the crossover into a 4-lane, 2-way section of deviation on the opposite carriageway of a dual carriageway (see Figure 13.71).

2 All the design and signing statements given in Subsection 13.12.6 are appropriate to the signing application illustrated in Figure 13.82 and these should also be read.

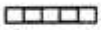
3 In addition to the details covered in Subsection 13.12.6 it is important that lane changing movements through the crossover be inhibited to promote stable traffic flow through this TRANSITION AREA. It is recommended that a CHANNELIZING LINE marking RM3 (between traffic streams travelling in the same direction - this has the same function as a NO OVERTAKING LINE marking RM1). Because of the specification of this marking, it is further recommended that the edges of the crossover roadway be defined on the left by a yellow LEFT EDGE LINE marking RM4.1 and on the right by a white RIGHT EDGE LINE marking RM4.2. These edge lines may be supplemented by roadstuds.

4 The sign inventory listed for this type of crossover should be added to the basic sign requirements listed under the application with which it is to be used e.g. Figure 13.71, plus any other inventory items for additional transition details to be used within the site.

Checklist

- ❑ are the lanes through the crossover wide enough for heavy vehicles and the set speed limit?
- ❑ should heavy vehicles be prohibited from the right side lane?
- ❑ should roadstuds be provided for the edge lines (and the central channelizing line)?
- ❑ should INFORMATION ARROW GM4.1 be applied strategically to both lanes within the crossover?

TYPICAL SIGN REQUIREMENTS

Sign	No	Size (mm)	Quantity
	TR103 TR104	900 (urban) 1200 (rural)	2 6
	TW401 TW402	200 X 800 250 X 1000	28 Min 25 Min
	Road closed barricade	1200 X 2400	2
	TW411	300 X 1800 (urban) 400 X 2400 (rural)	2
	TW407 TW408	400 X 1200	2 2

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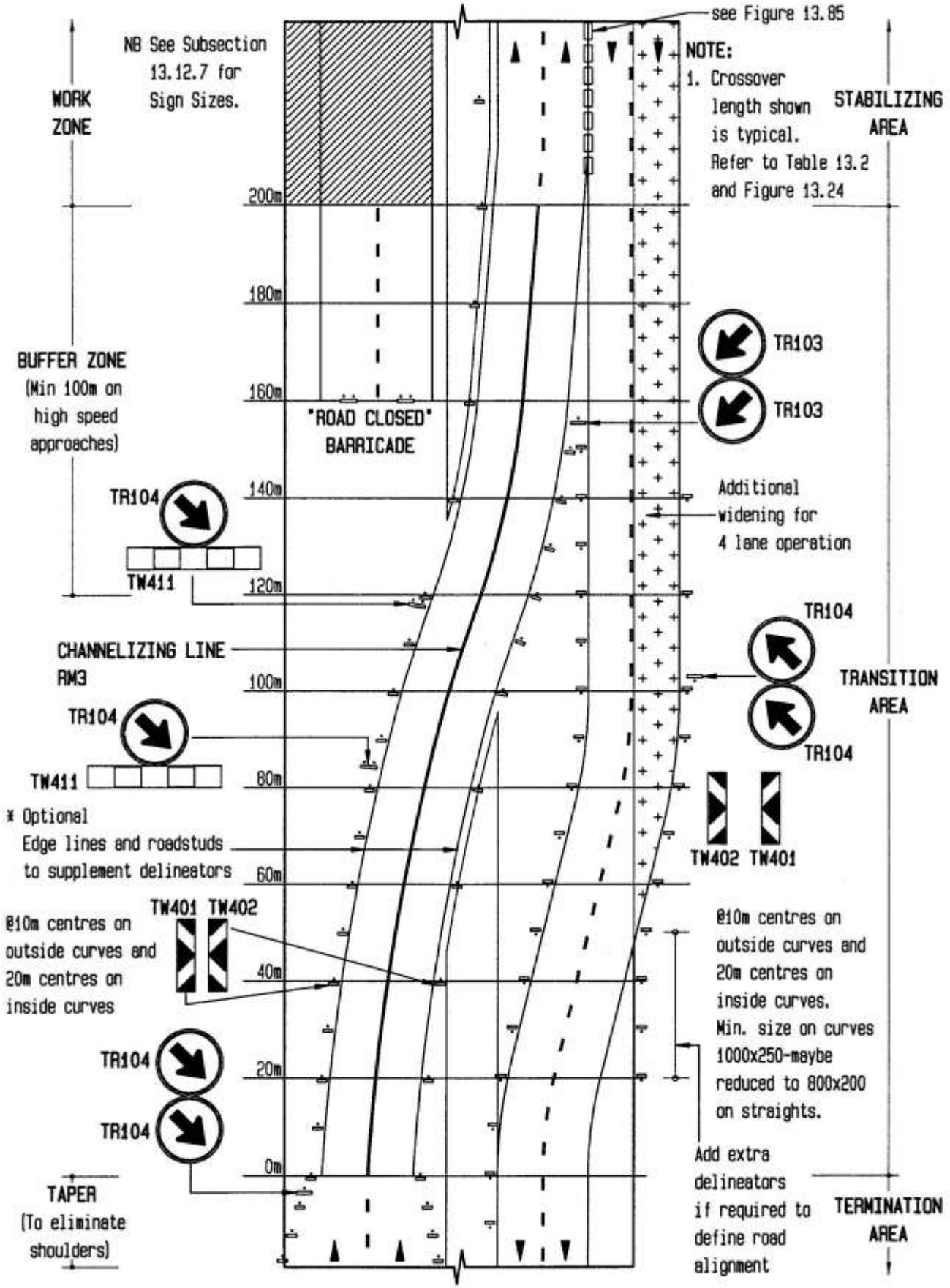

Fig 13.82 **Crossover Reverse Curve – 2 Lane Transition Area**

13.12.8 Start of Deviation Reverse Curve - Upstream Transition Area

1 The detail in Figure 13.83 should be read in conjunction with Figures 13.54 and 13.55 and Subsections 13.9.13 and 13.9.14. The sign inventory for the reverse curve TRANSITION AREA illustrated in Figure 13.83 should be added to that specified for the appropriate deviation detail being applied.

2 The similarity between Figures 13.83 and 13.82, particularly within the crossover, should be noted. The crossover in Figure 13.82 operates in a one-way mode, whereas, that in Figure 13.83 works in a two-way mode. If there is any risk of confusion to drivers, additional NO OVERTAKING signs TR214 (see Figure 13.55) and/or advance warning signs TW212 should be considered.

3 A formal ARoad Closure@ barricade should be established at the beginning of the BUFFER ZONE. The signing of the barricade should conform to one of the options illustrated in Figures 13.18, 13.19 and 13.87.

4 The horizontal alignment of the reverse curve into and out of the deviation should be designed to the highest standard consistent with space and cost constraints. A minimum lane width within the reverse curve section of 4 metres is recommended. If there is a significant percentage of heavy vehicles in either, or both, directions this width should be further increased. For full details of reverse curve design options refer to Section 13.4 and Figures 13.24 to 13.26.

Checklist

- ❑ is there a vertical curve coincident with the reverse horizontal curve?
- ❑ are delineators mounted high enough, or are they large enough to define both horizontal and vertical curvature if required?
- ❑ are lane widths wide enough to accommodate heavy vehicles simultaneously in both directions?
- ❑ are TR104/TW411 barricades in place?
- ❑ if the reverse curve geometry is to minimum standards have approaching traffic speeds been satisfactorily reduced?

TYPICAL SIGN REQUIREMENTS

Sign	No	Size (mm)	Quantity
	TR104	900 (urban) 1200 (rural)	8
	TW401 TW402	150 X 600 200 X 800	27 Min plus 8 for shoulders
	Road closed barricade	1200 X 2400	2
	TW411	300 X 1800 (urban) 400 X 2400 (rural)	4
	TW407 TW408	400 X 1200	2 2

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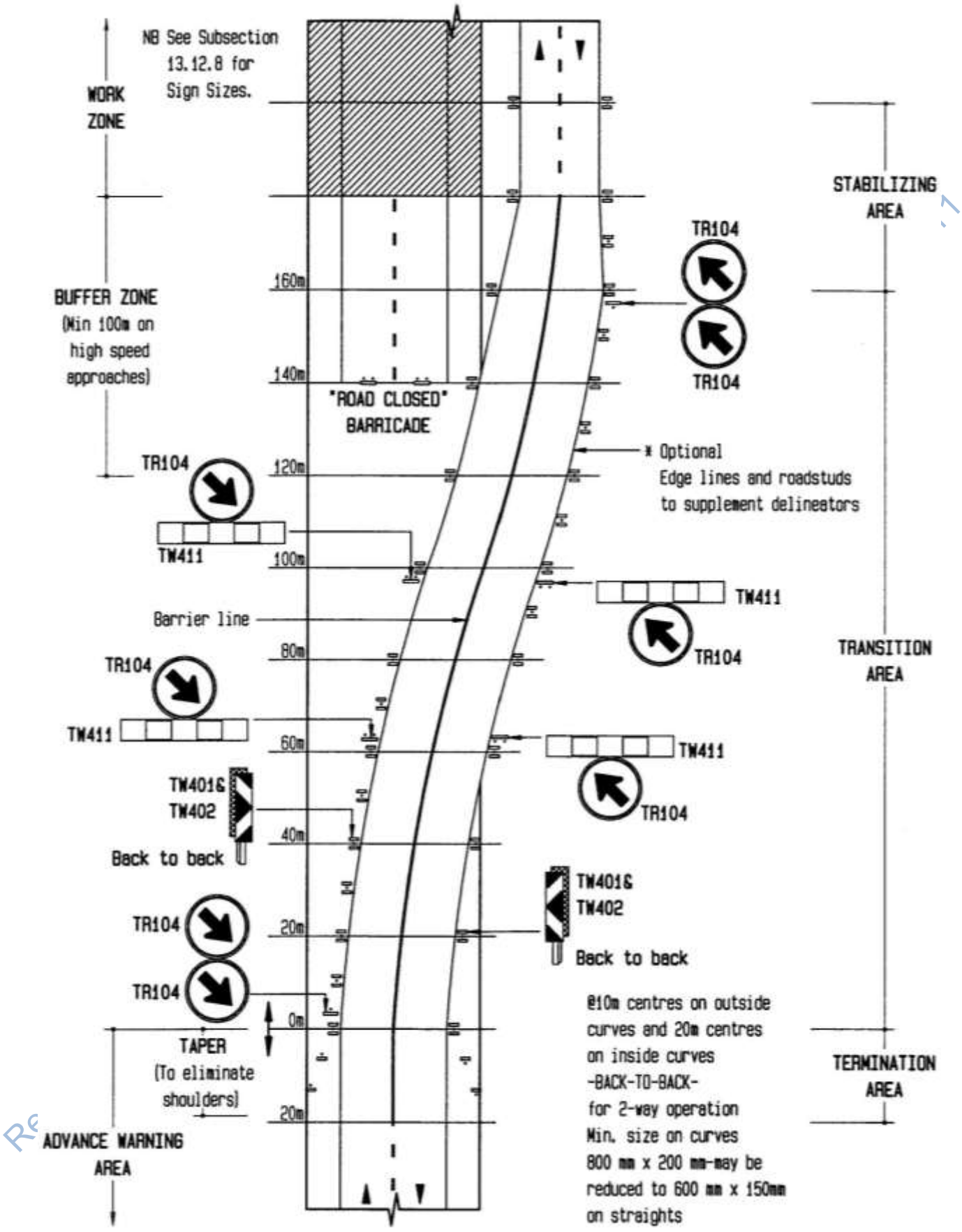


Fig 13.83 Start of Deviation Reverse Curve – Upstream Transition Area

13.12.9 Deviation Crossover Reverse Curve - Transition Area

1 The terms Adeviation@ and Adetour@ are described in Subsection 13.9.14. A deviation tends to be fitted into available space parallel to the road under construction. In a rural environment, it may be necessary on occasions to move the deviation from one side of the WORK AREA to the other, and *vice versa*. Figure 13.84 shows a typical example of such a deviation crossover of the WORK AREA. This form of crossover is a form of TRANSITION AREA, and shall be preceded by appropriate signs in ADVANCE WARNING AREAS (see Figure 13.55).

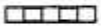
2 As with all reverse curves of this nature, they should be designed to the highest standard possible in terms of available space. The details given in Section 13.4 and Figures 13.24 to 13.26 are relevant to the design of such a reverse curve. It has been fairly common practise in the past to make this type of crossover to very low geometric standards because it is preferred to keep the section of the main roadway affected by the crossover to a minimum. Care should be exercised so that if this is done, a hazardous and unreasonable situation is not created for drivers.

3 Formal ARoad Closed@ barricades should be established at the limits of the section of roadway being crossed. These barricades should be positioned safely, with an effective buffer zone between them and traffic. The signing of the barricade should conform to one of the options illustrated in Figures 13.18, 13.19 and 13.87.

4 The sign inventory for this form of crossover TRANSITION AREA should be added to that specified for the appropriate deviation detail being applied e.g. Figure 13.54 and Figure 13.55.

Checklist

- ❑ can drivers accurately determine the severity of the reverse curve?
- ❑ if there is a vertical curvature of significance associated with the crossover (rising and falling over the established road construction for example) and is it clearly discernible?
- ❑ are effective ARoad Closed@ barricades in place?
- ❑ will construction traffic have to enter the WORK AREA at the ARoad Closed@ barricades - if so, will a flagman be required to control traffic and construction vehicles?

TYPICAL SIGN REQUIREMENTS			
Sign	No	Size (mm)	Quantity
	TR103	900 (urban) 1200 (rural)	8
	TW401 TW402	150 X 600 200 X 800	50 Min plus 5 per 100m
	Road closed barricade	1200 X 2400	4
	TW411	300 X 1800 (urban) 400 X 2400 (rural)	4
	TW407 TW408	400 X 1200	4 4

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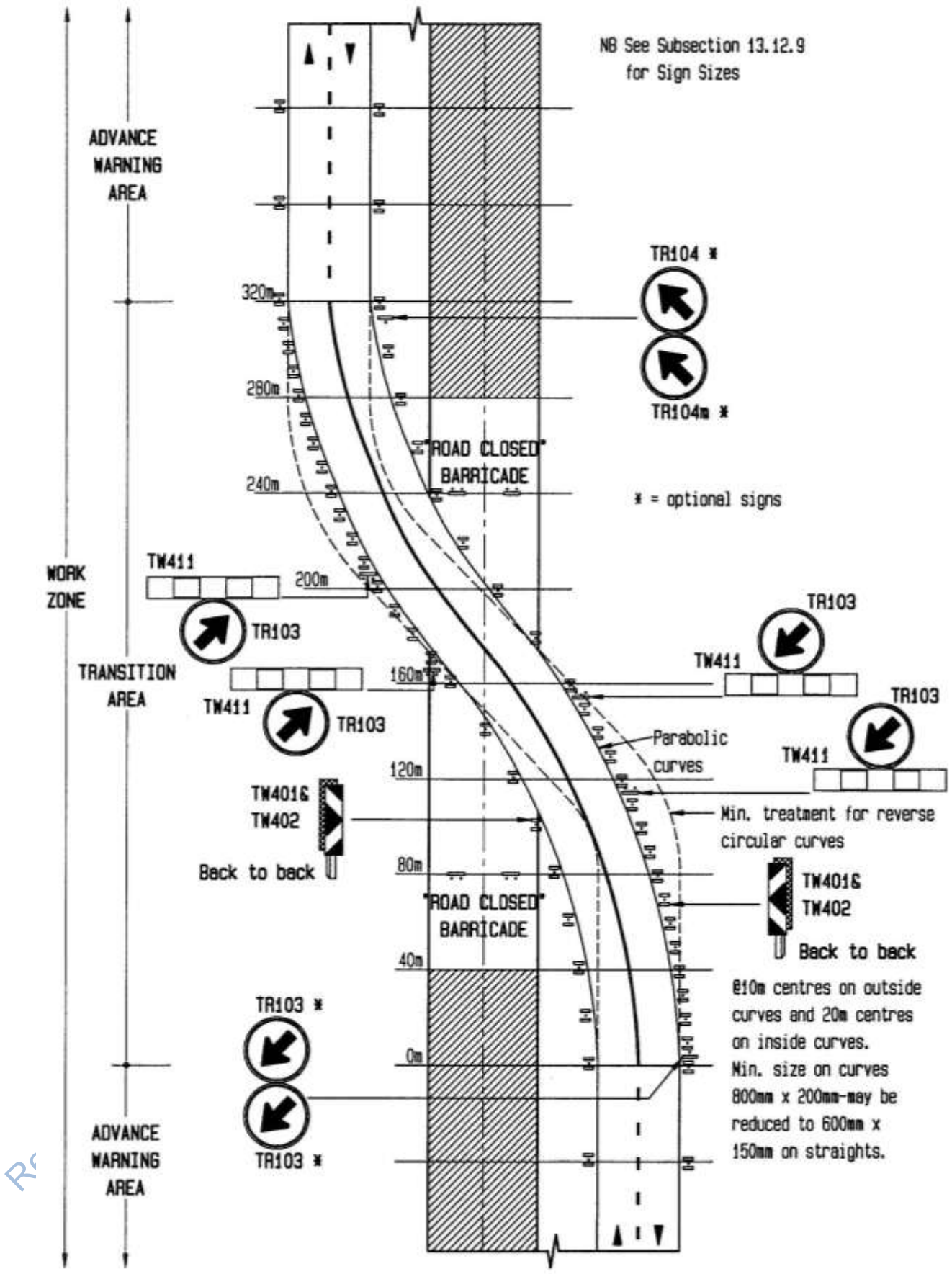

Fig 13.84 Deviation Crossover Reverse Curve - Transition Area

13.12.10 Contraflow Operation - Road Markings

1 Experience of major deviations for freeway, or dual carriageway rehabilitation, has shown that special attention often needs to be paid to the marking of the division between two-way streams of traffic under such circumstances. The basic need for this special effort generally arises from one or both of two factors:

(a) long sections of deviation without overtaking opportunities; and/or

(b) a wide mix of traffic types, including large/slow-moving vehicles.

2 The common operational feature of deviations requiring special consideration is that one carriageway of a dual carriageway roadway is temporarily used to carry two-way traffic. One of the resultant risks, is that eventually drivers forget this, and assume that they can use the Aother@ lane, with potentially disastrous results. Two-way operation of one carriageway can occur in a number of configurations. Figure 13.85 illustrates three options, namely:

(a) 2-lane 2-way;

(b) 3-lane 2-way;

(c) 4-lane 2-way.

3 When a 2-lane carriageway, with shoulders, is converted to 2-way operation, it is recommended that a form of PAINTED ISLAND marking RM5 be used as shown in Details 13.85.1 to 13.85.3. This marking comprises a central yellow continuous line flanked by NO CROSSING LINE marking RM2. Red bidirectional roadstuds may be specified and, in addition, it may prove effective to provide one of the proprietary AFlap-Markers@ as illustrated in Detail 13.85.7. The use of flap-markers is particularly appropriate if there is a history of overtaking related accidents. The markers are, however, costly and have a high rate of attrition. A carefully monitored field trial is recommended before purchasing large numbers of such delineation devices.

4 Detail 13.85.1 shows a 3-lane, 2-way cross-section. This offers overtaking opportunities in one direction which is an improvement over that offered by the cross-section in Detail 13.85.2. However, it is necessary to reverse the configuration of lanes at regular intervals in a long deviation (see Figures 13.70 and 13.86 for examples and more details).

5 Details 13.85.3 and 13.85.4 show two options for the separation of 2-way traffic on a 4-lane cross-section. Details 13.85.3 and 13.85.8 are essentially the same as used for Details 13.85.1 and 13.85.2. Detail 13.85.4 shows a portable barrier between opposing traffic streams. This treatment is warranted when the deviation is carrying very high traffic volumes. The use of concrete ANew Jersey@ style barriers is costly but may still be cost effective if head-on accidents are prevented. This cost may be significantly offset if the barriers are ultimately intended to form part of the final construction of the road. Detail 13.85.6 shows ways in which concrete barriers can be made more visible at night. When concrete barriers are used it is important to treat the ends, where traffic is first exposed to the barrier, with great care. Figure 13.28 details various aspects of barrier specification.

Checklist

- ❑ are there safe overtaking opportunities within the deviation?
- ❑ how long is the deviation?
- ❑ what is the distance between overtaking opportunities?
- ❑ is the accident rate between entry and exit points significantly above what experience shows would be likely?
- ❑ can the dividing line be further enhanced using audio-tactile devices such as AFlap-Markers@?

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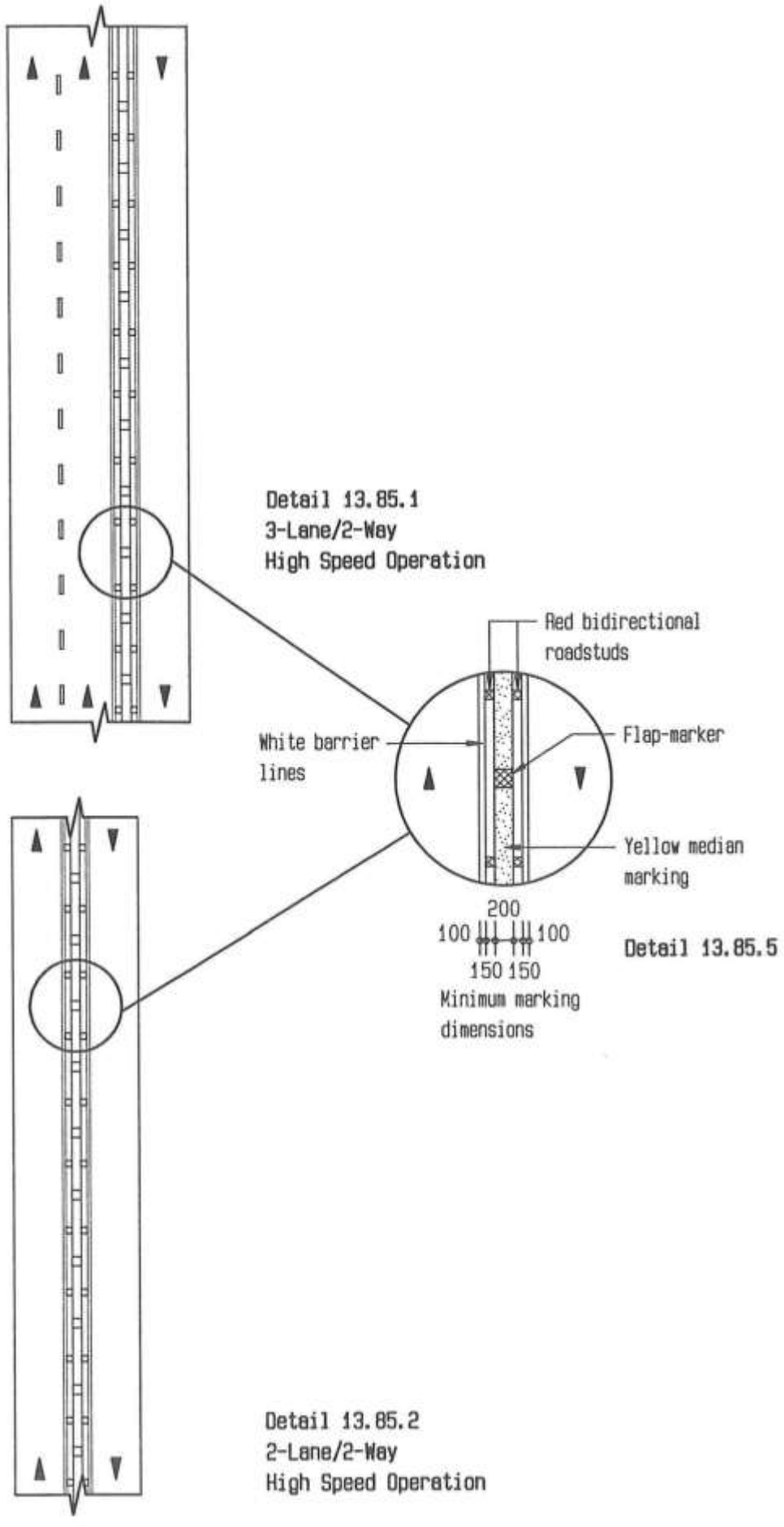
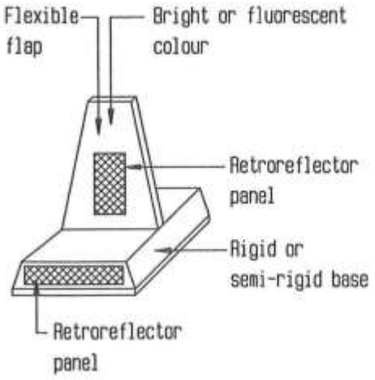


Detail 13.85.1
3-Lane/2-Way
High Speed Operation

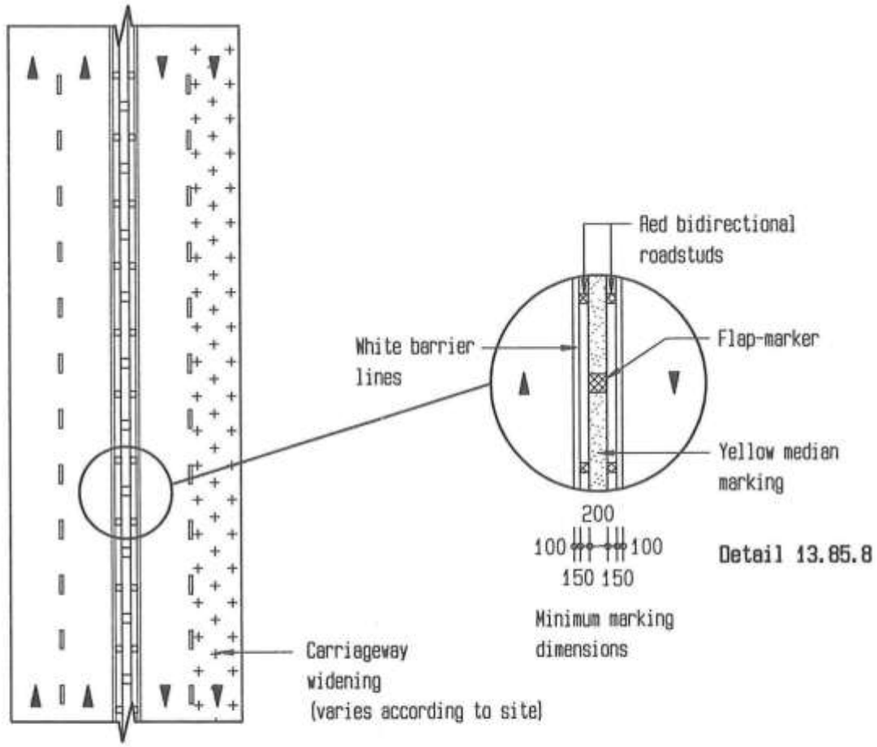
Detail 13.85.5

Detail 13.85.2
2-Lane/2-Way
High Speed Operation



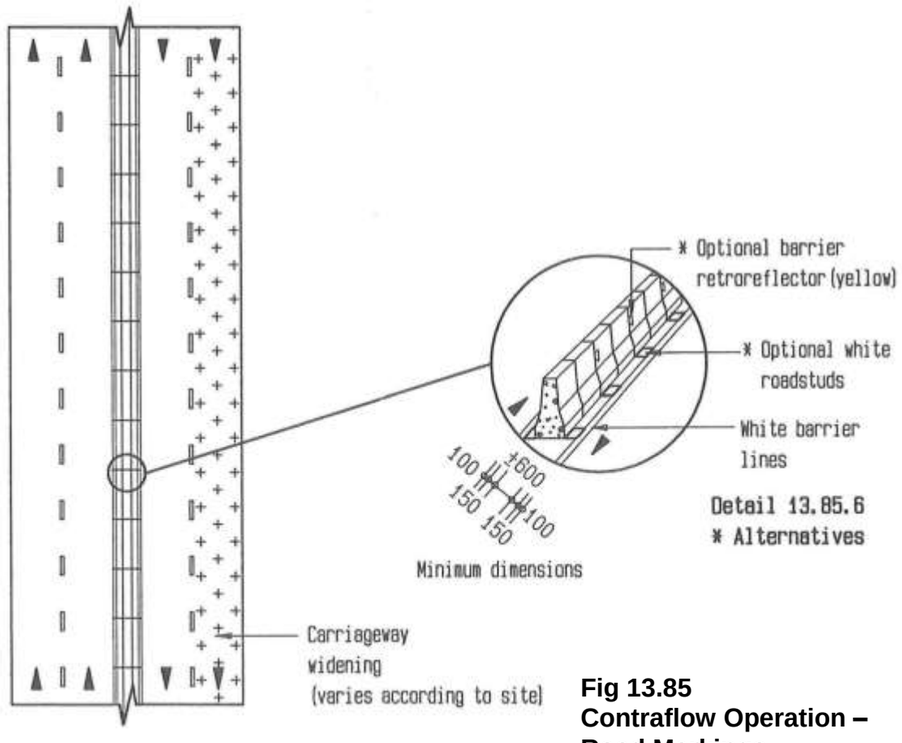
Detail 13.85.7
Typical Flap-Marker
* NB Use should be subject to satisfactory field trial

Detail 13.85.3
4-Lane/2-Way
Operation with
Road Markings



Detail 13.85.8

Detail 13.85.4
4-Lane/2-Way
Operation with
Portable Concrete
Barrier (or Other
Portable Barrier)



Detail 13.85.6
* Alternatives

Fig 13.85
Contraflow Operation – Road Markings

13.12.11 Contraflow Operation - 3 Lane Change Over Buffer Zone

1 The detail given in Figure 13.86 is of an intermediate nature. Taper rates and numbers of delineation devices should be consistent with the detail in Figures 13.77 to 13.80. In addition the information given in Section 13.5 - "Temporary Delineation" is relevant with particular reference to Figure 13.29 and Tables 13.4 and 13.5.

2 The provision of 3-lane/2-way operation of traffic on one carriageway of a dual carriageway during construction or reconstruction of the other carriageway has become a fairly common practice. A disadvantage of such a configuration, particularly over long distances, is that in one direction, overtaking opportunities are denied by the provision of only one lane. It is therefore good practice to change over the configuration at regular intervals from 1-2 to 2-1 to give fair overtaking opportunities in both directions. In hilly country, the two lane sections should, if possible, be located on the uphill sections.

3 Figure 13.86 shows examples of the BUFFER ZONE or STABILIZING AREA consistent with a lane drop situation at the change-over of lanes. It should be noted that the lane drop taper is a Merge Taper, and must be significantly longer than the Termination Taper beyond which traffic will quickly accommodate itself within the two lanes available. The function of the BUFFER ZONE is to offer a run-off area within which vehicles can be stopped if the merge action is aborted for some reason. The worst case scenario, which should determine the overall length of the parallel section of the BUFFER ZONE, is if two vehicles travelling in opposite directions were to abort their merging manoeuvres at the same time. Typical stopping distance values are given below.

STOPPING DISTANCE ON LEVEL ROADS

Design Speed (km/h)	Stopping Distance (m)
40	45
50	65
60	85
80	140
100	205
120	285

Checklist

- ❑ is sufficient longitudinal space available to accommodate a "worst case" BUFFER ZONE?
- ❑ if not how can the maximum length feasible be achieved?
- ❑ can the BUFFER ZONE be located so that the merge areas are clearly visible?
- ❑ is there adequate space in advance of the BUFFER ZONE from the merge approach to accommodate a full advance warning sign sequence?

TYPICAL SIGN REQUIREMENTS

Sign	No	Size (mm)	Quantity
	TR103 TR104	900 (urban) 1700 (rural)	2 6
	TW401 TW402	200 X 800 250 X 1000	28 Min 25 Min
	Road closed barricade	1200 X 2400	2
	TW411	300 X 1800 (urban) 400 X 2400 (rural)	2
	TW407 TW408	400 X 1200	2 2

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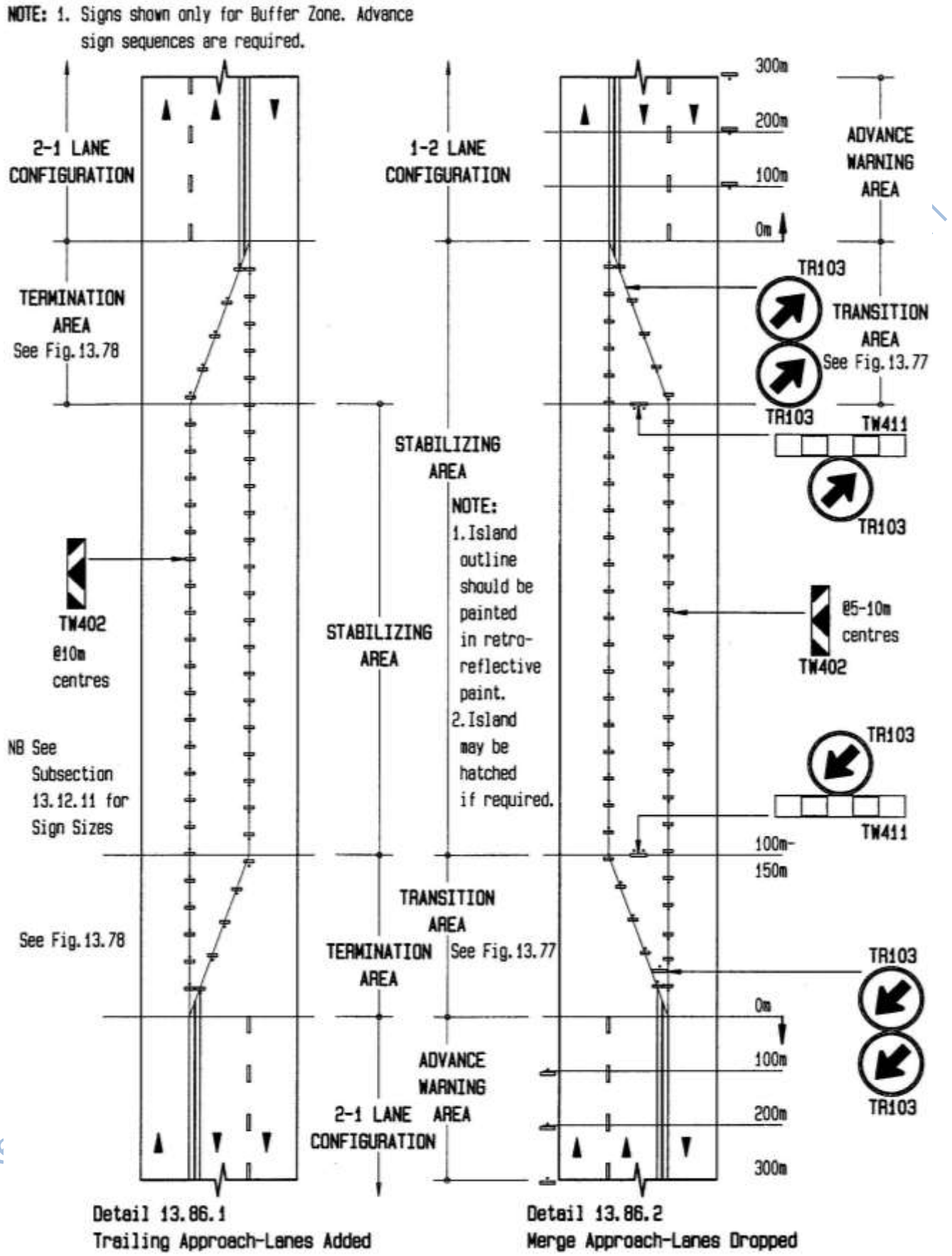

Fig 13.86 Contraflow Operation – 3 Lane Change Over Buffer Zone

13.12.12 Road Closed Barrier / Barricades

1 For the purposes of categorising temporary road traffic signing and related traffic control devices at roadworks, the following descriptions of terms commonly used in this chapter are relevant:

A**barricade**: is a temporary and portable device used to demarcate a restricted area set aside for a special use, such as roadworks or traffic surveys - **a barricade is not capable of withstanding vehicular impact**@; **and**

A**barrier**: is a permanent or temporary device erected on, or adjacent to, the roadway at hazardous locations which **is capable of physically preventing vehicles from leaving the roadway,** or from entering an area temporarily closed to traffic for roadworks or other special operations.@

2 Detail 13.87.1 in Figure 13.87 shows a section of road approaching a flooded river/washed-away bridge. As an initial precaution, once detours have been established, the barricade at Y-Y could be established closing the road to all traffic (see Detail 13.87.5). In due course, once work has commenced to repair flood damage a work site may be established. In order to provide room for the contractor's equipment, the barricade may be relocated further from the river, or a second barricade (Detail 13.87.3) or a barrier (Detail 13.87.4) may be established at X-X.

3 Figure 13.87 gives three representative examples of HIGH VISIBILITY signs suitable for such barricades or barriers. The sign examples all incorporate what amount to double CHEVRON signs TW407 and TW408. When mounted side-by-side as AA@/@B@, AC@/@D@ or AE@/@F@ the combination represents a variation of ROAD CLOSED CHEVRON hazard marker TW410.

4 For a total road closure use of NO ENTRY sign R3 is recommended. It should be noted that as a CONTROL regulatory sign, there is no temporary version of sign R3.

5 If limited access is to be permitted beyond the barricades, such as to contractor's vehicles or even local residents, the use of NO UNAUTHORISED TRAFFIC sign TR208 is appropriate.

6 Any fencing or guardrails forming part of the barricade or barrier must be made visible both by day and night to avoid drivers mistakenly thinking that they can drive round the signs. The simplest way to achieve acceptable visibility is by using DELINEATOR PLATE signs TW401 and TW402 on either side of the larger signs. Barriers and barricades of the type illustrated will of course be preceded by a full set of advance warning signs within the ADVANCE WARNING AREA (see Figure 13.50). The use of a STOP control immediately in front of the barricade is recommended so that access may be granted, under control, to authorised visitors.

7 Figure 13.88 gives details of the sort of barricades which can form part of the detour treatment at the closest junctions to the site. Figures 13.52 and 13.65 cover the more general aspects of the establishment of detours in rural and urban environments respectively.

Checklist

- ❑ has a detour been established?
- ❑ should initial temporary signs be replaced by a semi-permanent ARoad Closed@ barrier pending the start of repair work?
- ❑ is it appropriate to create a contractors Ayard@ on the road itself, either beyond the barrier, or between the barrier and a secondary barricade?

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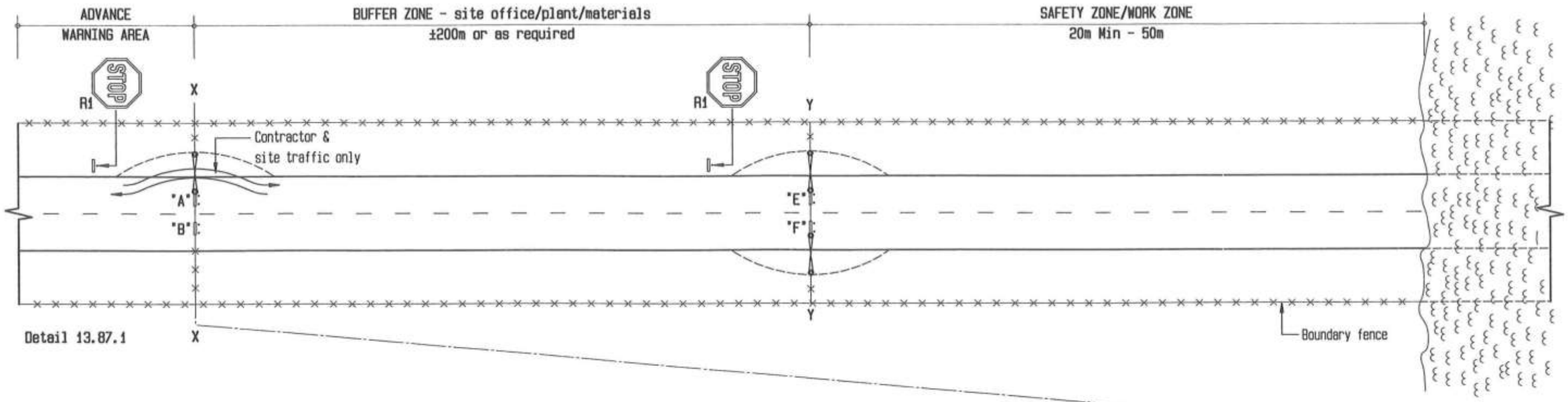
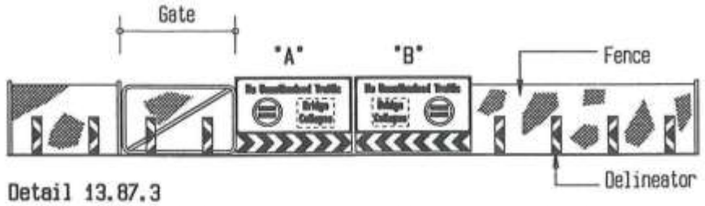
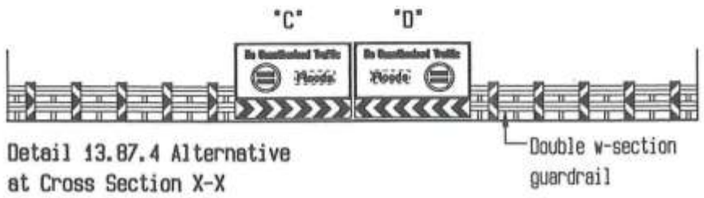


Detail 13.87.1

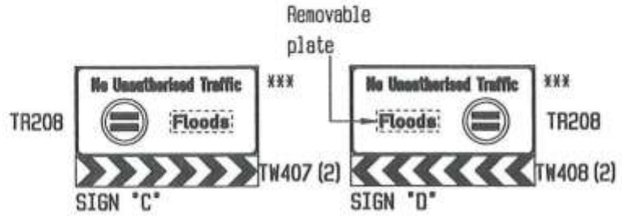


Detail 13.87.3
at Cross Section X-X

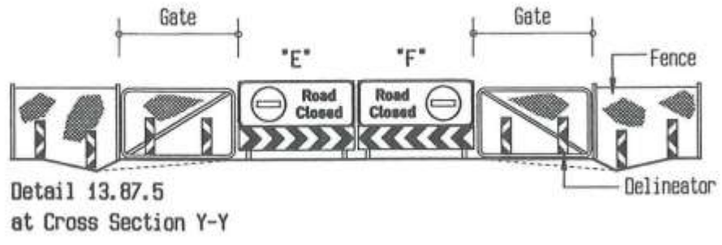
Sign Options at X-X



Detail 13.87.4 Alternative
at Cross Section X-X



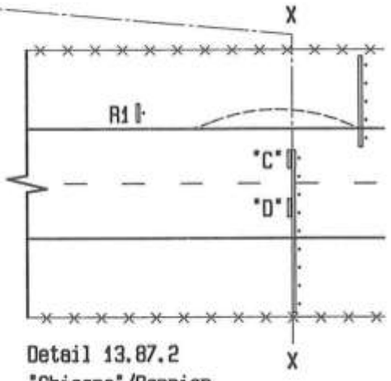
Sign Options at X-X



Detail 13.87.5
at Cross Section Y-Y

Sign Options at Y-Y

*** = Optional message



Detail 13.87.2
"Chicane"/Barrier
Treatment at X-X
as Alternative to
Gate.

Fig 13.87
Road Closed Barrier/Barricade

13.12.13 No Through Road Barricades

1 Figure 13.88 should be read in conjunction with Figures 13.50, 13.52 and 13.87, which all relate to the signing of a temporary road closure due to some major incident or event, and to the detour which needs to be established to avoid the site. The signing shown presumes an incident site a long way from the junction e.g. 34 km and 47 km, but the treatments will be just as appropriate for much shorter distances.

2 Detail 13.88.1 shows what amounts to a Achicane@ barricade using two horizontal HIGH VISIBILITY signs AA@ and AB@. The junction concerned, which may have had straight through priority towards the site, has been converted into a 4-Way STOP controlled junction. Signs AA@ and AB@ are temporary information signs relying largely on text messages, but including variations on the NO THROUGH ROAD symbol. If provision of a text message is a problem due to multiple language requirements, then it is recommended that the sign message be limited to a larger NO THROUGH ROAD symbol with a distance indicated or the Aclosed@ leg of the junction.

3 Detail 13.88.2 also shows conversion of the junction to 4-Way STOP control but with a triangular sandbag island to inhibit straight-on movements into the closed road. This island carries three horizontal style HIGH VISIBILITY signs in the pattern of AC@ and AD@. Once again these signs utilize text but the option to use the NO THROUGH ROAD symbol is also available. This detail also illustrates what is often a common need at such junctions, namely the ability to turn vehicles around with, if possible, one single point turn.

4 Appropriate advance signing should be placed on all three approaches to indicate the direction of the detour (see Figure 13.52). Similar details are illustrated in an urban environment in Figure 13.65.

Checklist

- ❑ have all STOP signs been converted to 4-WAY STOP signs R1.4?
- ❑ are text signs acceptable?
- ❑ does space exist for vehicles, including large heavy vehicles to turn round (is the junction large enough to be converted into a temporary traffic circle)?

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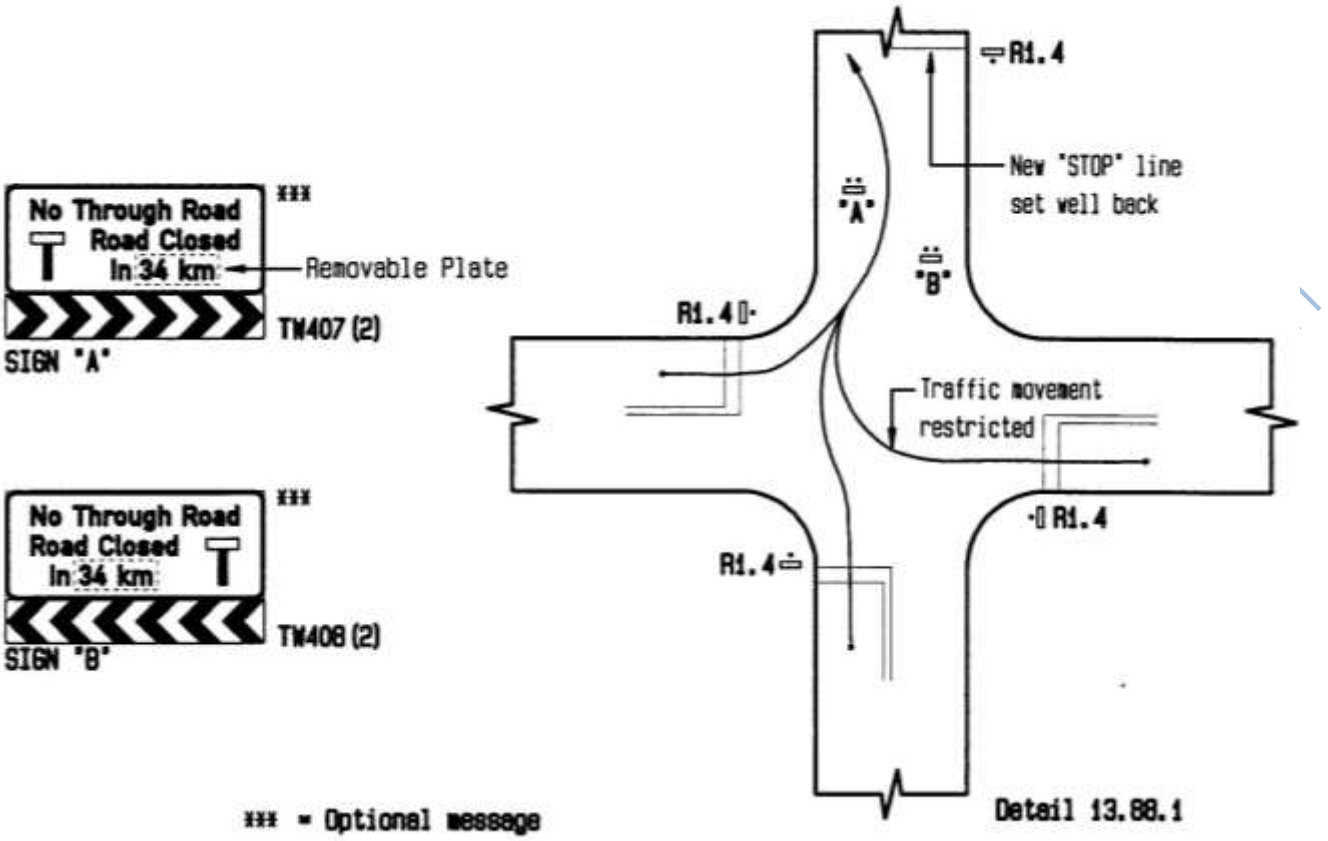

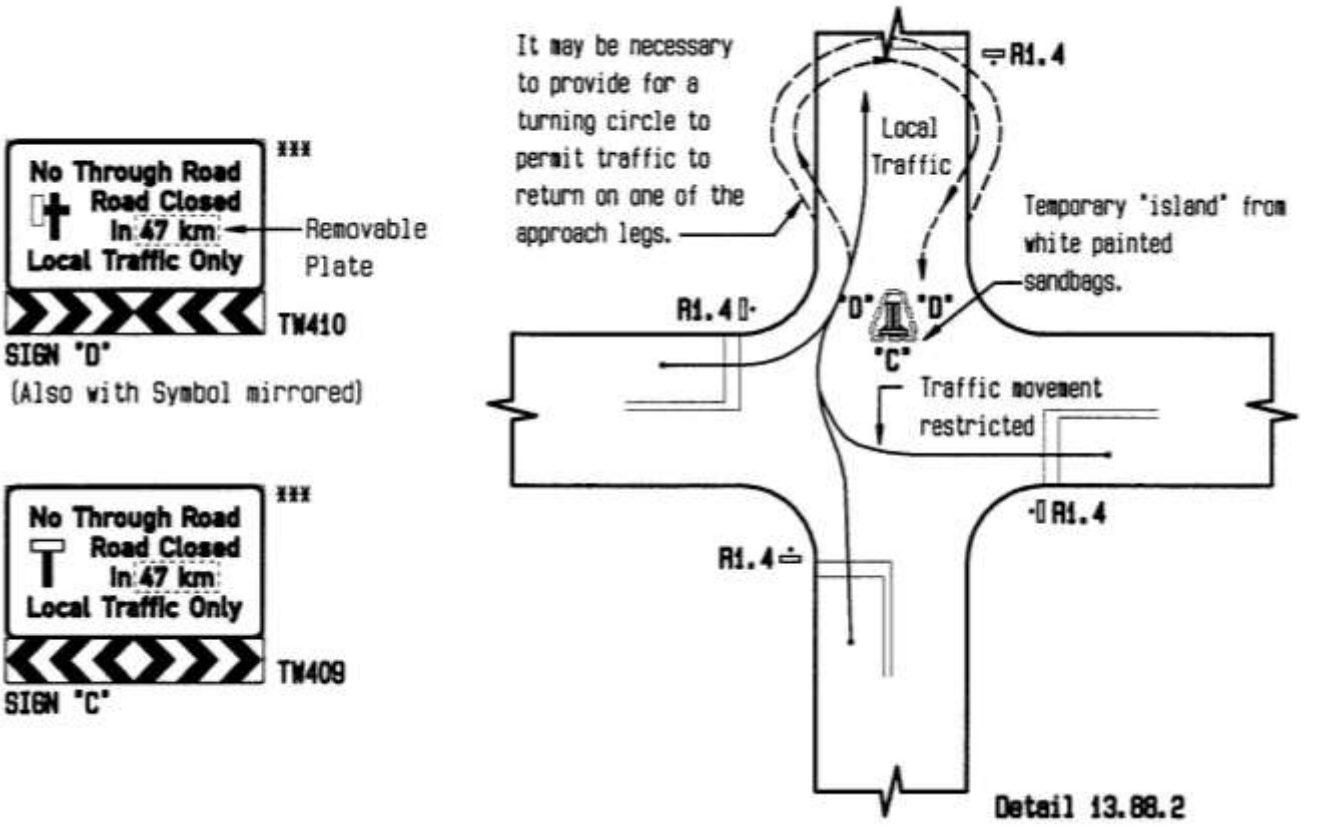

Fig 13.88 **No Through Road - Barricades**

13.12.14 Freeway Off-Ramp - Amended Alignment - 1

1 The temporary treatment of freeway off ramps and on ramps present roadworks traffic management difficulties. Figures 13.89 to 13.91 illustrate a number of techniques which may assist designers to resolve such difficulties. The details in Figure 13.89 are relevant to many of the applications covered in Section 13.11 but are particularly relevant to Figures 13.74 to 13.76, and to long term conditions.

2 Detail 13.89.1 shows one carriageway of a freeway dual carriageway carrying two-way traffic where work is required to be undertaken in the area of the gore which necessitates the closure of the lane approaching the gore. In these circumstances, the simplest solution is likely to be to divert all traffic to the off ramp, across the intersecting road and back onto the freeway via the on ramp. The assistance of a pointsman or flagman is likely to be required at the ramp/intersecting street junction. In the event that the lane adjacent to the gore has to be closed to traffic beyond the subsequent on ramp, traffic will have to be redirected on the lower hierarchy road network towards the freeway destination. To reduce the risk of driver confusion it is recommended that a temporary EXIT DIRECTION sign TSD2 be mounted with the standard GA2 sign, or as close to the exit point as possible, if the GA2 sign is some distance in advance of this point. This signing treatment will also be appropriate for a 2-lane, 2-way single carriageway freeway, when one lane has to be closed.

3 Detail 13.89.2 shows a more conventional situation on a 2-lane, one-way carriageway where the median side lane is closed. The main effort here is to provide reassurance to drivers wishing to reach the straight-on destination that they should not exit the freeway. A temporary straight-on TGD1 sign may be strategically located within the WORK AREA if possible.

4 All TRANSITION AREA and WORK AREA delineation should be provided by DELINEATOR PLATE signs TW401 and TW402, as appropriate. The use of KEEP LEFT signs TR103 and BARRICADE sign TW411 across the closed lane in Detail 13.89.1 is strongly recommended.

Checklist

- ❑ will lane be closed for some time?
- ❑ can traffic volumes be handled adequately by means of the off ramp and on ramp?
- ❑ will pointsmen/flagmen be required on the cross road?
- ❑ will drivers need reassurance that they can still reach their intended destination in a straight-on direction?

TYPICAL SIGN REQUIREMENTS

Sign	No	Size (mm)	Quantity
	TR103	1200	4
	TW402	800 X 200	10 per 100m
	TW411	300 X 1800	2
	TGD2	Varies	1
	TGD1	Varies	1

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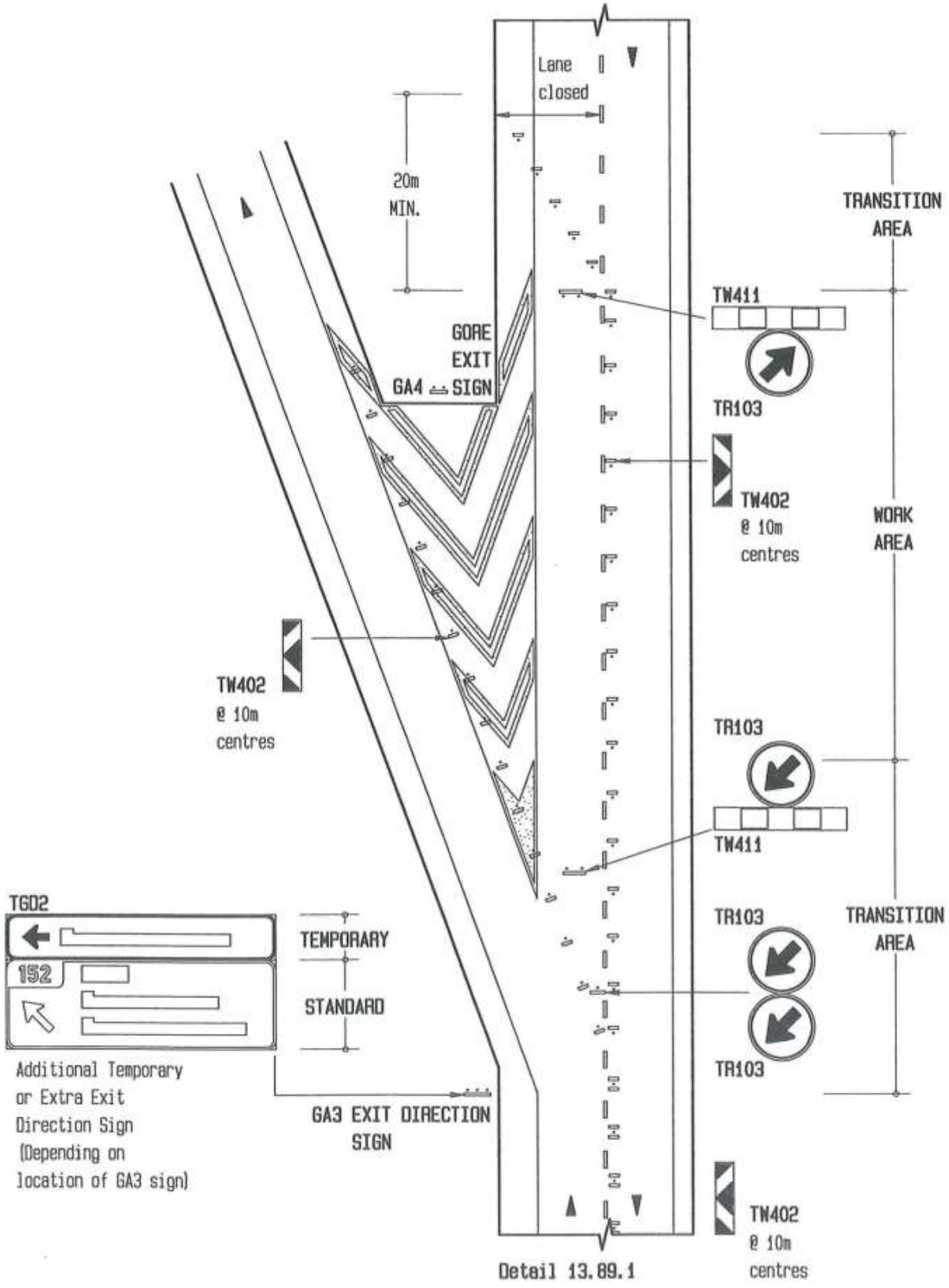

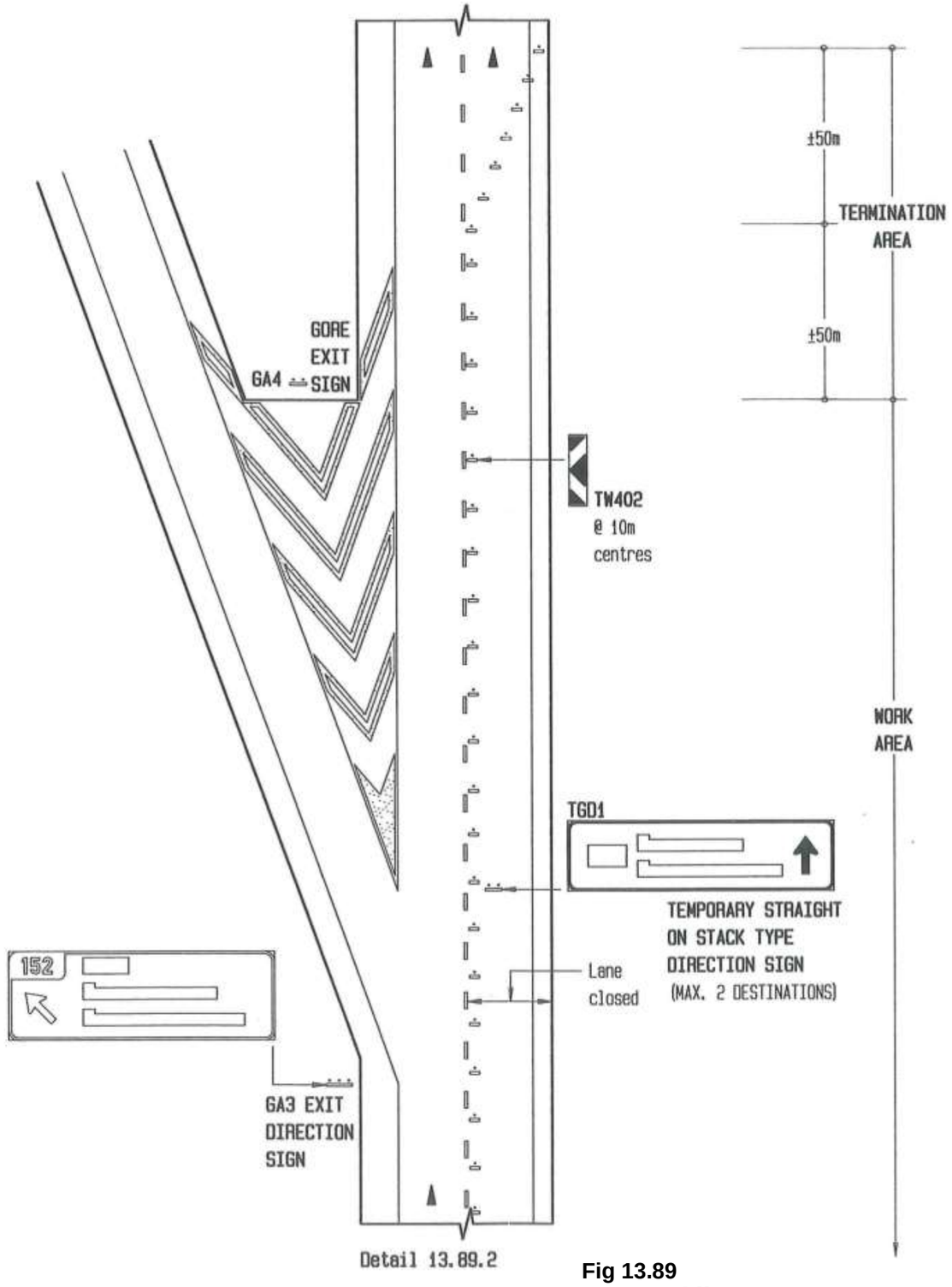

Fig 13.89
Freeway Off-Ramp
Amended Alignment - 1

13.12.15 Freeway Off-Ramp - Amended Alignment - 2

1 Figure 13.90 gives detailed information for the treatment of a temporary off ramp alignment. The example shown in Detail 13.90.1 shows an off ramp extended to meet the single open lane which is on the median side of the carriageway. Detail 13.90.2 shows an amended off ramp/freeway junction at which the angle of departure is much sharper than normal (see also Figures 13.74, 13.75 and 13.76).

2 The principle illustrated in these details is intended to improve drivers' perception of the alignment of the exit roadway. A disadvantage of DELINEATOR PLATE signs in this type of situation is that it becomes very difficult, particularly at night, to identify the Agap@ through which drivers are intended to exit the freeway. This is because delineators on the near side and far side of the off ramp are superimposed visually on each other, and effectively, the visual gaps between them can become reduced. It is possible that this effect could be reduced by placing delineators so close together that the gaps are so small that the line appears continuous. This concept is likely to be costly and should be subjected to a field trial before being adopted.

3 On the basis that vehicle lights are brightest on the left and close to ground level, it is recommended that the alignment of the ramp exit be clearly defined at and/or close to ground level - even below delineator level. To achieve this, a wider than normal LEFT EDGE LINE marking RM4.1, should be provided, with yellow roadstuds at close intervals of 6 metres. The roadstuds may even be doubled up for additional visual impact.

4 Since such areas are prone to accidents due to driver misjudgement, the line of the off ramp could be defined by white sandbags which should have a retroreflective property. Behind the sandbags the delineators can be more openly spaced, which should reduce the problem of determining the appropriate Agap@ to drive through.

5 When the gore is shifted significantly from its normal position, a temporary GORE EXIT DIRECTION sign TGA4 may be specified. This can be relocated as the alignment of the off ramp is varied during construction. (See Figure 13.74.)

Checklist

- ❑ is there a risk that the exit path to the off ramp may be visually confused?
- ❑ have extra wide edge lines been specified?
- ❑ are closely spaced roadstuds warranted?
- ❑ could a continuous line of brightly marked white sandbags provide the visual continuity required to identify the exit path?

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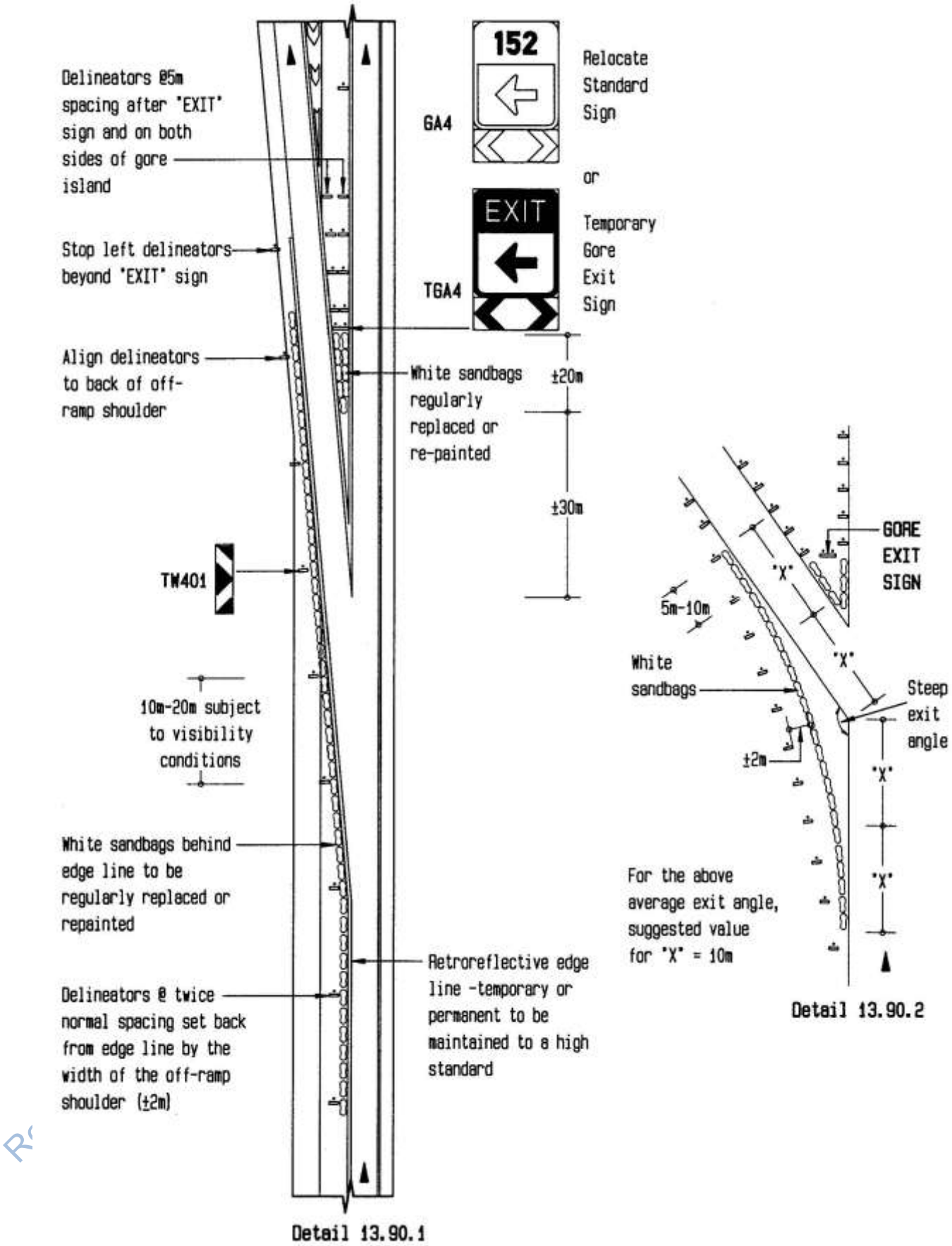

Fig 13.90 **Freeway Off-Ramp – Amended Alignment - 2**

13.12.16 Freeway On-Ramp - Amended Alignment

1 Treatment of revised on ramp alignment is generally much simpler than treatment of off ramps. Since drivers are tending to accelerate into a merge situation, it is relatively easy to reduce speed smoothly to avoid conflict situations. The detail in Figure 13.91 comprises a lateral shift of all road markings to the right to accommodate the closure of the near side lane (as in Figure 13.90). In order to accommodate the design acceleration length required, the road markings are extended in the line of the carriageway for an appropriate distance.

2 An alternative treatment, bringing the on ramp in to meet the through carriageway at a coarser angle, will almost certainly require the imposition of a STOP or YIELD control at the point of entry (see Figure 13.74). This type of treatment should be used with care since it will reduce on ramp capacity significantly, and the resultant slow moving entry of vehicles into the only free flowing lane will cause significant friction in this lane and reduced capacity.

Checklist

- ❑ can a free flowing merging on ramp be accommodated?
- ❑ are traffic volumes low enough that the friction caused by STOP or YIELD control will not represent a problem?

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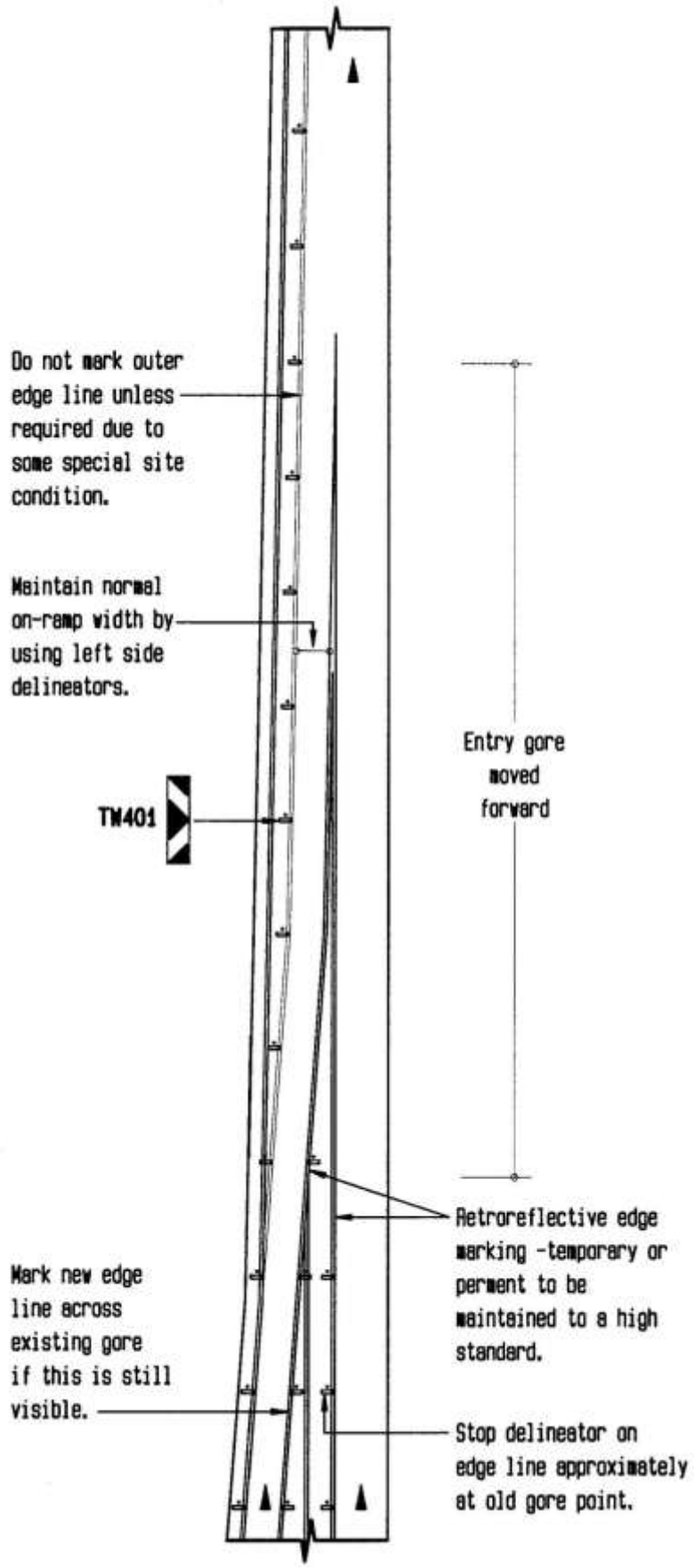

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Fig 13.91 **Freeway On-Ramp – Amended Alignment**

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13.2 TYPES OF TEMPORARY SIGNS

13.2.1 General

1 Almost any type of standard or permanent sign may be produced as a temporary type of sign by using the exclusive colour code of a black symbol, letter or border on a yellow background in place of the standard white symbol, letter or border on a white, blue or green background. When used with temporary signs, all forms of supplementary, distance or information plates shall also conform to the temporary sign colour code. Details of the relevant signs in each of the major sign categories are given in subsequent sections.

2 There are certain exceptions to the use of the temporary colour code. Those relating to regulatory signs are covered in Subsection 13.2.2.

3 The contents of this chapter deal with the use of temporary signs at roadworks. The signs may also be used for other temporary signing activities such as:

(a) general maintenance (e.g. tree cutting);

(b) police or other roadblocks;

(c) interview traffic surveys;

(d) sports events;

(e) school activities.

4 Details of the manner in which temporary road traffic signs should be applied are given in later sections.

13.2.2 Temporary Regulatory Signs

1 Regulatory signs are necessary to inform users of traffic laws or regulations and to indicate the applicability of these legal requirements. As a result of the restrictions in roadway width common to roadworks sites the modification of permanent regulatory signs to temporary regulatory signs and the use of additional temporary regulatory signs are commonly required.

2 Regulatory signs related to traffic control DO NOT adopt the temporary sign colour code. These are:

(a) the STOP sign R1;

(b) the YIELD sign R2;

(c) the NO ENTRY sign R3;

(d) the ONE WAY sign R4;

(e) YIELD TO ONCOMING TRAFFIC sign R6.

3 In order to maintain driver respect for standard and temporary regulatory signs these should not be used without a commitment from the road authority to enforce the relevant regulations as and when necessary. Failure to do so will result in an increased lack of compliance with regulations, not just at the site in question, but generally.

4 If a speed limit is reduced at roadworks by the use of a **TEMPORARY** SPEED LIMIT sign TR201, a return to the normal speed limit shall be indicated by the appropriate standard **PERMANENT** SPEED LIMIT sign R201.

5 When localised reductions in speed limit are deemed necessary, it is recommended that the temporary SPEED LIMIT sign TR201 be combined with a relevant temporary warning sign, which indicates the reason for the speed limit reduction, such that the regulatory sign sits above the warning sign.

6 The shape, proportions and dimensions of all temporary regulatory signs and the dimensions of all symbols used on temporary regulatory signs remain the same as used on standard regulatory signs. Examples are given in Figures 13.1 to 13.3.

13.2.3 Temporary Warning Signs

1 Temporary advance warning signs may be used in sequences of signs approaching a change of direction or transition area at roadworks sites, or they may be used individually to warn of specific local temporary hazards within sections of roadway, detours or temporary roadways.

2 The shape, proportions and dimensions of temporary warning signs and the dimensions of all symbols used on temporary warning signs remain the same as used on permanent warning signs.

3 In order to improve the target value of the basic triangular temporary warning sign the conspicuity of the sign may be increased by incorporating it into a rectangular background sign with a retroreflective yellow colour and a black border. The triangular border used within such temporary HIGH VISIBILITY warning signs has been modified to improve the proportions of these signs. Examples of typical temporary HIGH VISIBILITY warning signs are given in Figures 13.4 and 13.10.

4 HIGH VISIBILITY signs may be square or rectangular in shape. They should only be manufactured in one of the following standard sizes (width x height):

(a) square:

(i) 900 mm x 900 mm;

(ii) 1200 mm x 1200 mm;

(iii) 1800 mm x 1800 mm;

(b) standard rectangle (one included sign):

(i) 900 mm x 1200 mm;

(ii) 1200 mm x 1600 mm;

(iii) 1800 mm x 2400 mm;

(c) large rectangle (two included signs):

(i) 900 mm x 1800 mm;

(ii) 1200 mm x 2400 mm;

(iii) 1800 mm x 3400 mm

For further details see Volume 4, Chapters 2 and 3.

5 Due to the often confusing nature of the approach to certain temporary hazards, it is recommended that distance plates be used in conjunction with temporary advance warning signs. It is also recommended that temporary advance warning signs used on their own on high speed approaches, be specified one size larger than would be used for a permanent installation.

6 It may be advisable, when the situation being signed is particularly hazardous, to repeat the warning message using a second sign.

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13.2.4 Temporary Guidance Signs

1 A number of temporary guidance signs are available for use at roadworks. These fall into the following sub-categories:

(a) Diagrammatic;

(b) Direction.

2 Temporary guidance signs are particularly effective at the more complex roadworks site where drivers need the highest possible level of positive guidance in order that they may proceed through the site safely and with the minimum of delay and disruption.

3 DIAGRAMMATIC guidance signs have been developed to give drivers a pictorial representation of changes in conditions on the road ahead. This need has arisen from major rehabilitation work which has become necessary on the higher class roads in the country. Their application is of greatest effect on dual carriageway roads but they are equally applicable to less complex sites to give a clear and simple message to the driver.

4 **The diagram on each sign must represent only one simple change in road conditions.** If the roadworks site requires more than one basic transition or change of circumstances, then each transition should be signed separately, using the appropriate sequence of signs according to the degree of change involved, the traffic speed, and/or volume.

5 The number of diagrammatic sign designs is limited to those which represent the more common single traffic management techniques available to control traffic. These represent sub-systems within the overall traffic management system for a given roadworks site. It is recommended that the traffic management of a site be designed around these standardised sub-systems and signs, rather than by creating new and unnecessarily complex systems and signs. The following are the standard categories of DIAGRAMMATIC guidance sign based on the type of roadworks circumstance they represent:

(a) Traffic Movement Affected by an Obstruction (or apparent obstruction) - TGS101 series;

(b) Lane Use Control by Regulation - TGS301 series;

(c) Lanes Merge/Converge - TGS401 series;

(d) Heavy Vehicle Guidance and Control - TGS501 series;

(e) Unique Overhead Signs - TGS600 series;

(f) Overhead versions of other sign types - TGS6000 series

Available DIAGRAMMATIC guidance signs are illustrated in Figures 13.11 to 13.15. For further details see Volume 1, Chapter 4.

6 As indicated in paragraph 13.2.4.5 by the category description DIAGRAMMATIC guidance signs commonly indicate some aspect relating to a change in condition of a lane of a roadway. The lane may be the only lane for traffic travelling in one direction (commonly on a two-way road), or it may be one of several on a carriageway (commonly one carriageway of a dual carriageway road). Hazards represented by physical obstructions, or apparent obstructions at a sudden change in direction for instance, are represented on DIAGRAMMATIC guidance signs by large red blocks.

7 DIAGRAMMATIC guidance signs are rectangular in shape. The basic sizes match those of standard rectangular HIGH VISIBILITY signs as follows (width x height):

(a) 900 mm x 1200 mm;

(b) 1200 mm x 1600 mm;

(c) 1800 mm x 2400 mm.

When a multiple lane layout requires a wider format, the basic width may be increased in regular increments as follows (width x height):

(d) 900 mm to 1125 mm or 1350 mm x 1200 mm;

(e) 1200 mm to 1500 mm or 1800 mm x 1600 mm;

(f) 1800 mm to 2250 mm or 2700 mm x 2400 mm.

For further dimensional details see Volume 4, Chapter 8.

8 DIRECTION guidance signs may be manufactured using black symbols, letters or borders on a yellow retroreflective background to guide drivers to destinations by temporary alternative routes. The signs may be used in any of the following typical situations:

(a) when dual carriageway traffic has been diverted to one carriageway under contraflow conditions and original permanent signs on the closed carriageway are too remote for adequate visibility by day and night;

(b) when a route is completely closed to all through traffic and an alternative route is available;

(c) when the capacity of a route is severely restricted by major roadworks such as a bridge site and an alternative route with adequate capacity is available;

(d) when partial closures of routes, street networks or freeway interchanges become essential to the efficient progress of a roadworks site.

9 A modified, temporary GORE EXIT direction sign TGA 4(V) has been developed which occupies a minimum side space. This is particularly appropriate to temporary alignments of freeway off-ramps. Alternatively, for better visual impact, a black and yellow version of the standard GA4 GORE EXIT sign numbered TGA4 may be used if space permits (see Figure 13.18).

10 Temporary DIRECTION guidance signs should be manufactured according to the appropriate standards as covered by the Volume 4. Attention should be paid to the approach speed of traffic as this may permit a reduction in sign sizes. Typical examples of temporary direction signs are given in Figure 13.16. The use of DIN 1451 Style "A" compressed lettering is recommended in order to minimise sign sizes.

13.2.5 Temporary Information Signs

1 Temporary INFORMATION signs play an important support role to temporary regulatory, warning and guidance signs at roadworks. INFORMATION signs are commonly used in temporary circumstances to supplement other signs by giving additional information to improve driver awareness of circumstances ahead. The most commonly used types of

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temporary INFORMATION signs which are illustrated in Figure 13.17 are:

(a) COUNTDOWN signs TIN1, TIN2 and TIN3;

(b) CUL-DE-SAC signs TIN4, TIN5 and TIN6 (used mainly in urban areas);

(c) SUPPLEMENTARY PLATE signs TIN11.

2 Countdown signs may be used in advance of temporary freeway off-ramps which are often, of necessity, sited in such a manner that standard visibility distances cannot be realised. The generally confused environment common to a busy roadworks site may also make the use of such signs, with distance plates, of value.

3 SUPPLEMENTARY PLATE signs are recommended for use with all classes of sign in temporary signing situations because standard siting may not be possible for various reasons. The use of distance supplementary plates also offers the opportunity to countdown the distance to an obstruction in the roadway or change of direction, particularly on higher speed approaches. Distance plates should match the width of the sign which they supplement.

13.2.6 Other Forms of Temporary Road Traffic Signs

1 In terms of the statement made in paragraph 13.2.1.1, road markings and traffic signals may be used in temporary situations. However, there are no specific colour code or other visible variations of road markings or traffic signals for temporary use. If road markings or traffic signals are required to be used for a temporary period, **they shall be used according to the normal visual and size requirements and specifications for permanent use.**

2 It should, however, be remembered that the removal of road markings is often difficult and can result in confusing visual messages to drivers, particularly on wet surfaces and at night-time or when the angle of the sun is low. The use of removable adhesive retroreflective tapes is recommended for short lengths of temporary road marking, but tests should be carried out to ensure that the materials perform as manufacturers say they will. Alternatively innovative use of high rate of wear paints, such as water-based paints, may be appropriate for short term applications depending on the nature of the road surface.

3 The needs of roadworks, in terms of temporary signs, can be many and varied. The wide range of signs illustrated in this section provides for most situations. **Indeed an effort should always be made to try to design the temporary traffic management configuration within this range of signs.** There are, however, times when this cannot be done or an extra effort is needed. Very short term work also often requires that signs be portable, light weight, and/or collapsible. Figure 13.18 illustrates a collection of less commonly used signs, variations on standard signs for particular applications, and non-standard signs which are occasionally used, but which are not currently detailed in Volumes 1 or 4. In some instances the variation from more common practice is due to the combination of signs displayed. In other instances it may be the use of different materials which is relevant. The use of such signs should conform to the positional requirements for temporary signs given in Figure 13.19 and Table 13.1.

4 If temporary traffic signals are required at a roadworks site they may be manufactured to be moveable, but they shall conform to the requirements of legislation, in terms of size, number, position and modes of operation (see Volume 1, Chapter 6).

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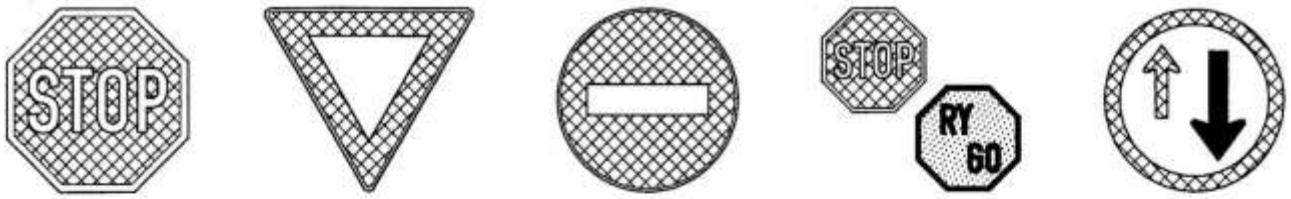


R1 R2 R3 R1.5A R1.5B R6

Ref:Vol1-2.2.1 Vol4-2.2.1 | Ref:Vol1-2.2.10 Vol4-2.2.5 | Ref:Vol1-2.2.15 Vol4-2.2.8 | Ref:Vol1-2.2.2 Vol4-2.2.4 | Ref:Vol1-2.2.12 Vol4-2.2.11

Detail 13.1.1 Control Regulatory Signs

R201-120 R201-100 R201-80 R201-60

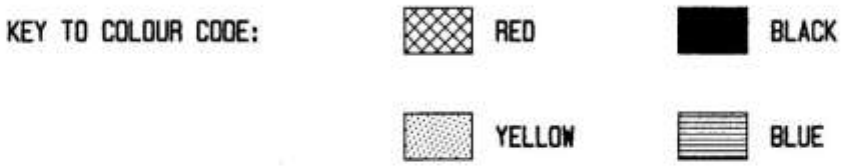
Ref Vol1-2.4.1 Vol4-2.4.1/2.4.2

Detail 13.1.2 Permanent Regulatory Signs

TR201-100 TR201-80 TR201-60 TR201-40

Ref Vol1-2.4.1 Vol4-2.4.1/2.4.2

Detail 13.1.3 Commonly Used Temporary Regulatory Signs



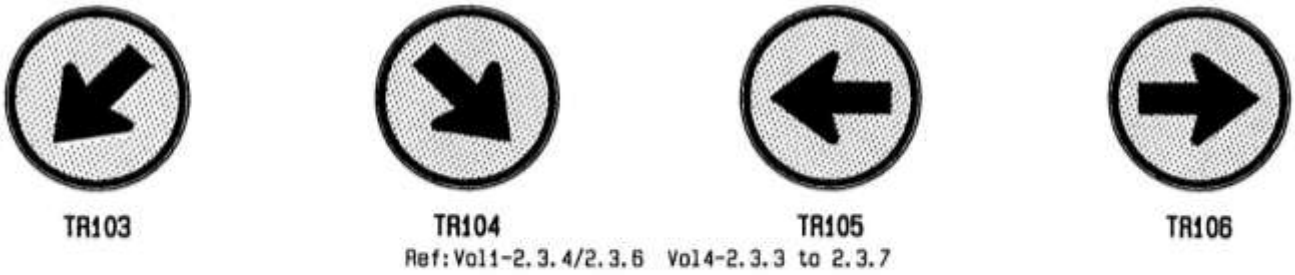
NOTE:

(1) The signs in Detail 13.1.1 do not have a temporary form, number or colour code. When used temporarily they shall have their permanent colours and numbers.

(2) A mixture of permanent and temporary signs, with the exception of the CONTROL signs in Detail 13.1.1, is not recommended at roadworks sites. The temporary sign colour code shall be used for all signs on the approach to, and within roadworks sites whether these occur for short, medium or long durations. The permanent SPEED LIMIT signs R201 illustrated in Detail 13.1.2 shall be displayed after the end of a roadworks site at which the relevant general or other speed limit has been reduced due to the roadworks. All other SPEED LIMIT signs used shall be temporary TR201 signs - see Detail 13.1.3.

(3) The temporary regulatory signs indicated in Details 13.1.3 and 13.2.1 are commonly used at roadworks sites. Their use is covered by Sections 408(3), 409(5)(b), 409(5)(c), 410(2), 410(5)(a),410(9)(b)(ii) and Schedule 3 of the Road Traffic Regulations to the Road Traffic Act, Act 29 of 1989. Other temporary regulatory signs are illustrated in Figures 13.2 and 13.3.

Fig 13.1 Regulatory Signs for Use at Roadworks - 1



TR103 TR104 TR105 TR106

Ref: Vol1-2.3.4/2.3.6 Vol4-2.3.3 to 2.3.7

TR208 TR209 TR210 TR214

Ref: Vol1-2.4.11 Vol4-2.4.10 Ref: Vol1-2.4.12 Vol4-2.4.11/2.4.12 Ref: Vol1-2.4.16 Vol4-2.4.16

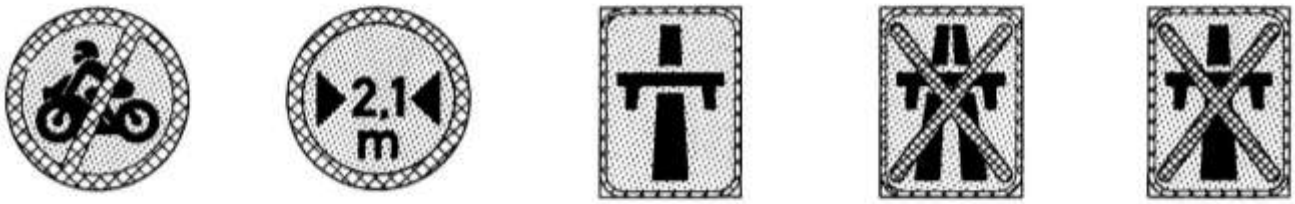
TR215 TR216 TR217 TR218

Ref: Vol1-2.4.16 Vol4-2.4.17 Ref: Vol1-2.4.18 Vol4-2.4.18 Ref: Vol1-2.4.21 Vol4-2.3.19 Ref: Vol1-2.4.24 Vol4-2.4.20

Detail 13.2.1 Commonly Used Temporary Regulatory Signs

TR125 TR133 TR202-5 TR204

Ref: Vol1-2.3.19 Vol4-2.3.25 Ref: Vol1-2.3.25 Vol4-2.3.33 Ref: Vol1-2.4.3 Vol4-2.4.3/2.4.4 Ref: Vol1-2.4.6 Vol4-2.4.6



TR222 TR239 TR402 TR401-600 TR402-600

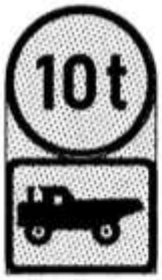
Ref: Vol1-2.4.28 Vol4-2.4.24 Ref: Vol1-2.4.21 Vol4-2.4.40 Ref: Vol1-2.6.4 Vol4-2.6.2 Ref: Vol1-2.6.4 Vol4-2.6.1/2.6.2

Detail 13.2.2 Other Temporary Regulatory Signs

NOTE:

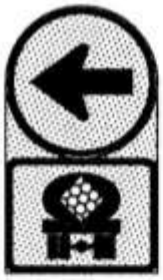
(1) The regulatory signs illustrated in Detail 13.2.2 are likely to be used only in special circumstances. A wide range of PROHIBITION signs applicable to specific classes of vehicle is also available. Temporary RESERVATION signs may also be appropriate particularly at urban roadworks sites. See Volume 1 and 4 for further signs.

Fig 13.2 Regulatory Signs for Use at Roadworks - 2



TR102-570

TR103-562



TR105-571

TR201-569

TR217-502

TR210-560

TR201-570

TR218-501

Detail 13.3.1 Typical Temporary Selective Restriction Regulatory Signs

(Ref:Vol1-Section2.7 Vol4-Section2.7)

TR217-TIN11.502

TR214-TIN11.2

TR216-TIN11.4

TR217-502-TIN11.501

TR402-TIN11.2

TR402-TIN11.3

(Ref:Vol1-Section2.8 Vol4-Chapter9)

Detail 13.3.2 Typical Temporary Regulatory/Information Sign Combinations

NOTE:

(1) Regulatory signs may be combined to create temporary SELECTIVE RESTRICTION Regulatory signs. See Detail 13.3.1. The function of such signs is that the lower secondary regulatory message modifies the applicability of the upper primary regulatory message. This modification may make the primary regulatory message applicable only for a certain period of time, to a particular action or by a particular class of vehicle. Temporary SELECTIVE RESTRICTION signs must not be confused with information combination signs - see Detail 13.3.2.

(2) Information may be added below a temporary regulatory sign as shown in Detail 13.3.2 by means of a SUPPLEMENTARY PLATE Information sign to clarify when the regulation to which it refers starts or for how long it lasts, by means of a text or symbolic message. Regulatory / Information combination signs must not be confused with SELECTIVE RESTRICTION Regulatory signs - see Detail 13.3.1. The principle physical difference between the two types is that the SUPPLEMENTARY PLATE always has a black border and the SELECTIVE RESTRICTION secondary message sign has a border the same colour as that of the primary message sign.

Fig 13.3 Regulatory Signs for Use at Roadworks - 3

TW336

TW336-WA

TW336-WB

TW336-WA/TIN11.3

Ref:Vol1-3.4.30 Vol4-3.4.36

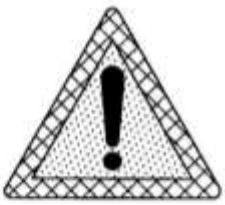
Ref:Vol1-3.6.4 Vol4-3.1.6 to 3.1.9

Detail 13.4.1 Roadsworks Ahead

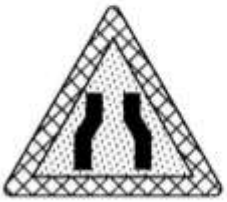
TW336
Ref:Vol1-3.4.30 Vol4-3.4.36

TW337
Ref:Vol1-3.4.31 Vol4-3.4.37

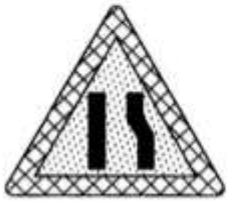
TW338
Ref:Vol1-3.4.32 Vol4-3.4.38



TW339
Ref:Vol1-3.4.33 Vol4-3.4.39

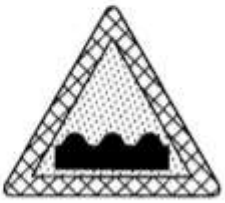


TW328



TW329

TW330



TW331

Ref:Vol1-3.4.24/3.4.25 Vol4-3.4.28 to 3.4.30

Ref:Vol1-3.4.26 Vol4-3.4.31

Detail 13.4.2 Commonly Used Temporary Advance Warning Signs

NOTE:

(1) Warning of ROADWORKS AHEAD has traditionally been given using Information sign G36A at larger work sites and WORKMEN AHEAD warning sign W40 at minor work sites. The function of sign W40 has been changed to that of a general warning of ROADWORKS AHEAD. In terms of the revision to the signing system the sign is re-numbered TW336. For larger work sites the message "ROADWORKS AHEAD" should be given by incorporating sign TW336 into a high visibility background with or without supplementary distance plates - see Detail 13.4.1. **Such signs replace sign G36A which is no longer a road traffic sign.**

(2) ONLY temporary versions of warning signs shall be used at roadworks sites and other temporary conditions requiring warning signs such as accident sites, traffic survey sites etc. The signs illustrated in Detail 13.4.2 relate principally to roadworks use and many do not have permanent versions. The signs are not listed exclusively in numerical order. Additional temporary warning signs are illustrated in Detail 13.5.1 and hazard marker signs in Detail 13.8.1.

Fig 13.4 Warning Signs for Use at Roadworks - 1

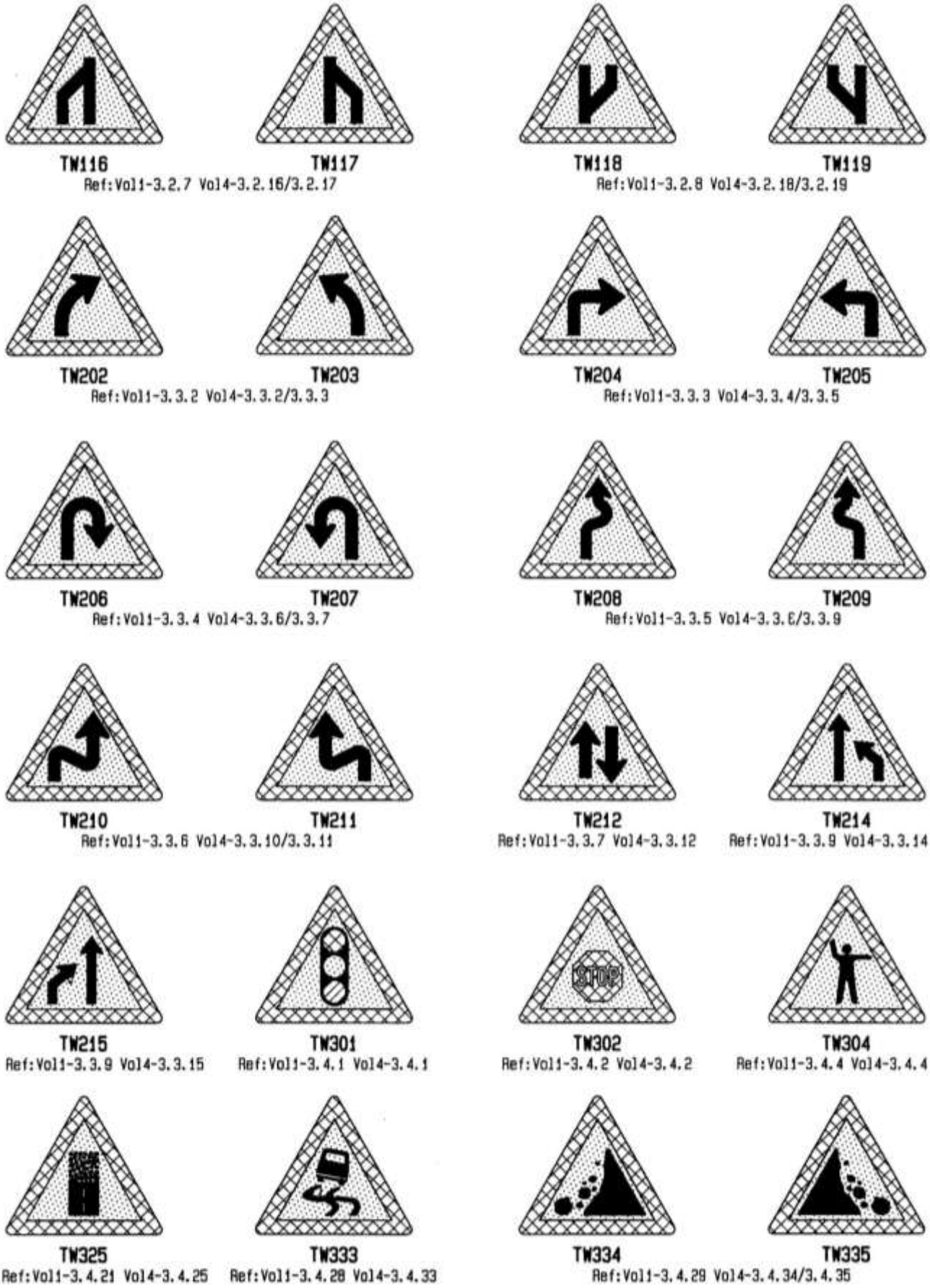
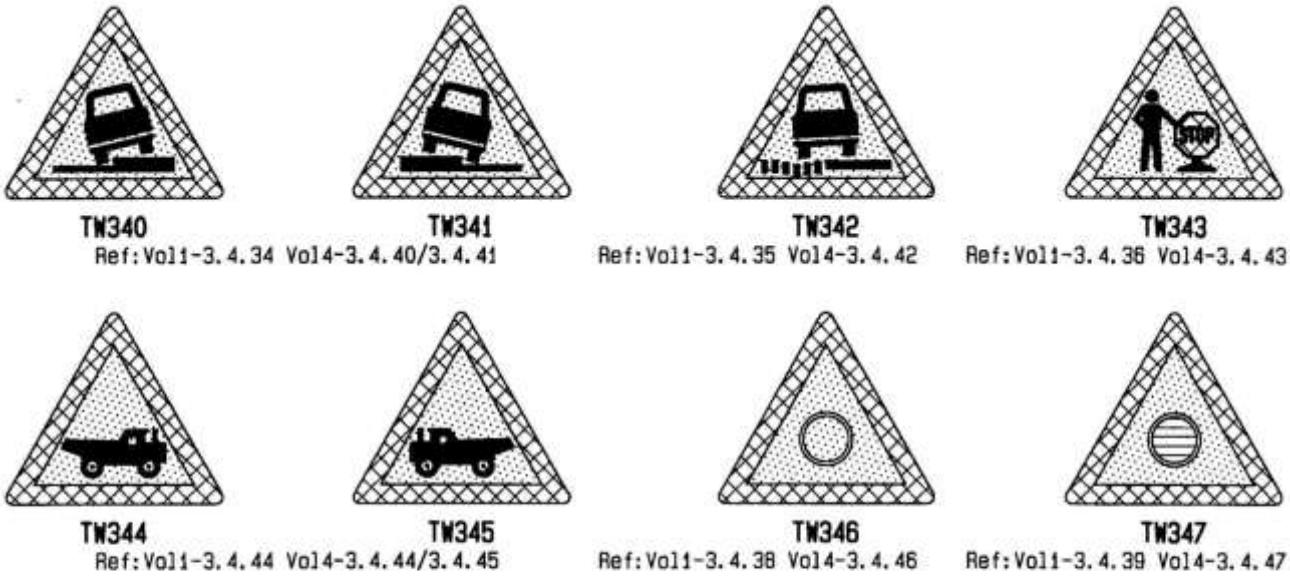
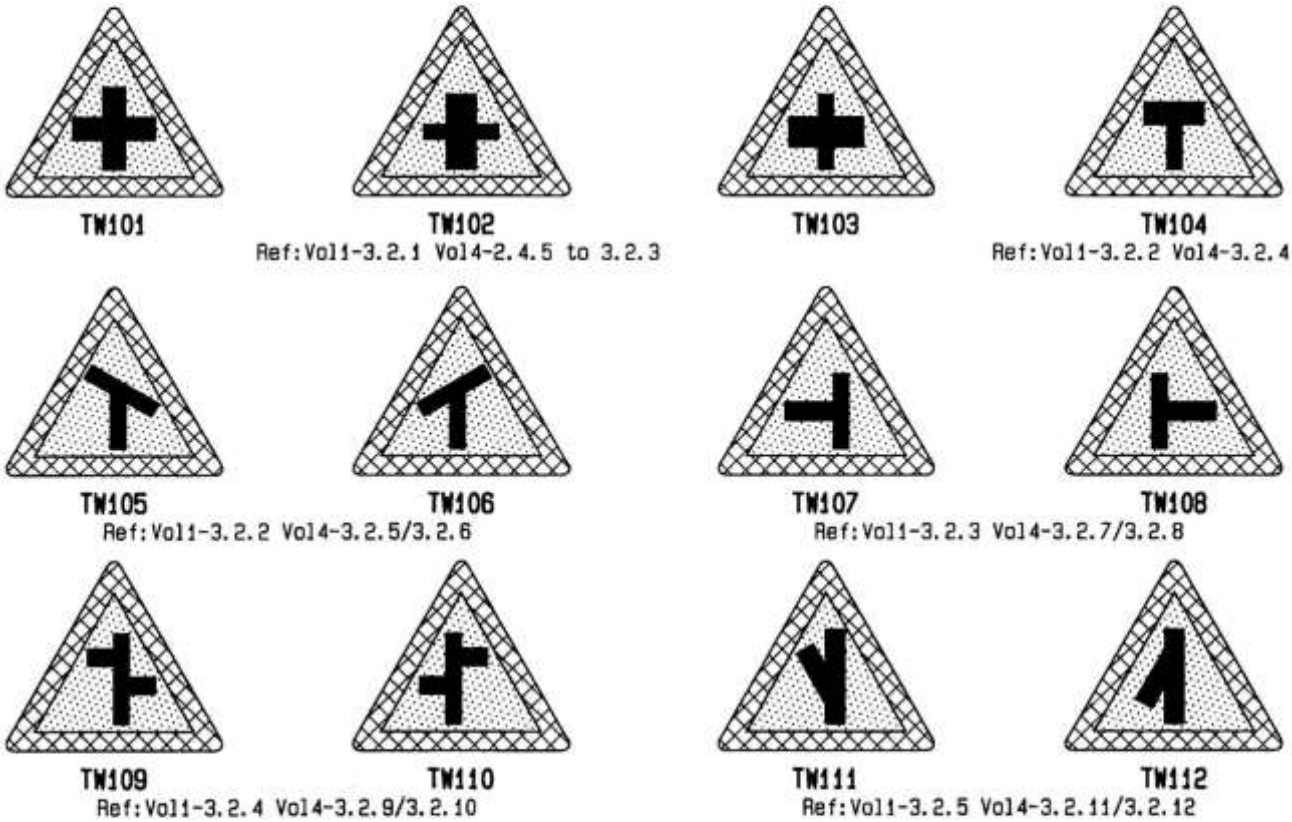


Fig 13.5 Warning Signs for Use at Roadworks - 2



Detail 13.6.1 Commonly Used Temporary Advance Warning Signs (Continued in Fig 13.5)

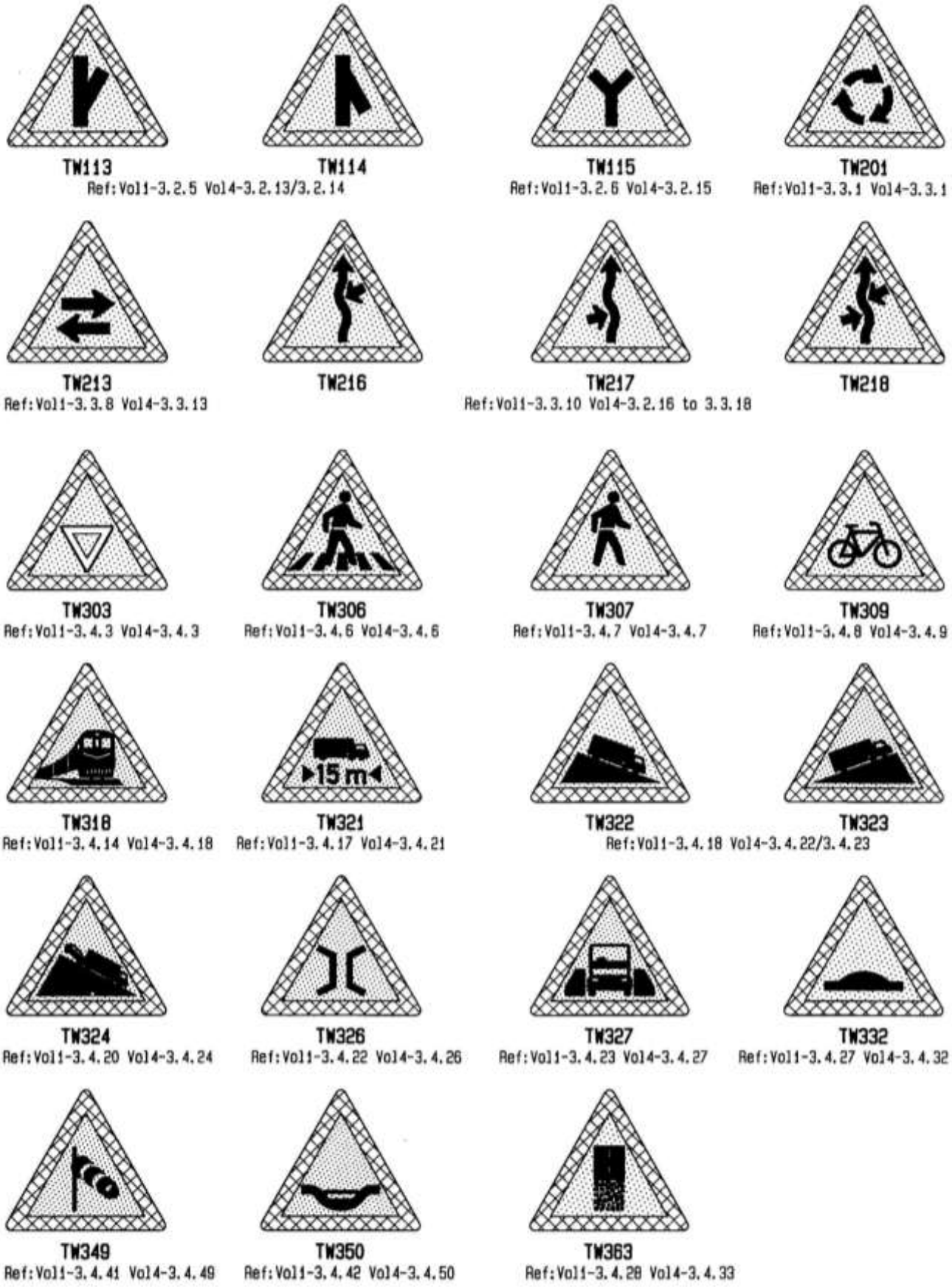


Detail 13.6.2 Other Temporary Advance Warning Signs (Continued in Fig 13.7)

NOTE:

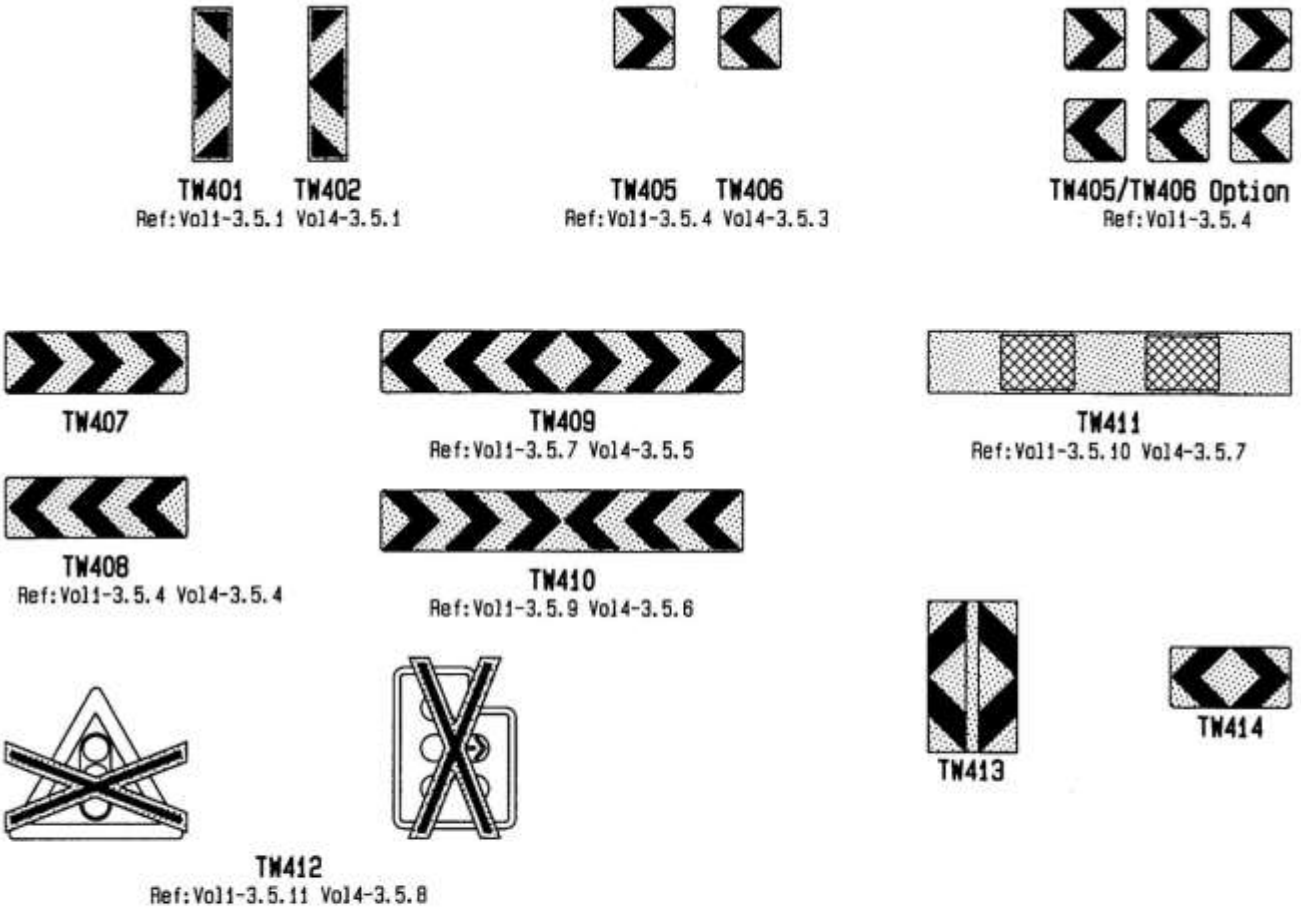
(1) The warning signs in Detail 13.6.2 may be required at roadworls under certain circumstances but their use is not likely to be common. The signs are not listed exclusively in numerical order due to the previous listing in Details 13.4.2, 13.5.1 and 13.6.1 of the more commonly used warning signs. SCHOLAR PATROL sign and FARM ANIMALS signs TW310, TR311 and TW312 have not been illustrated as they are unlikley to be required at roadworks sites.

Fig 13.6 Warning Signs for Use at Roadworks - 3

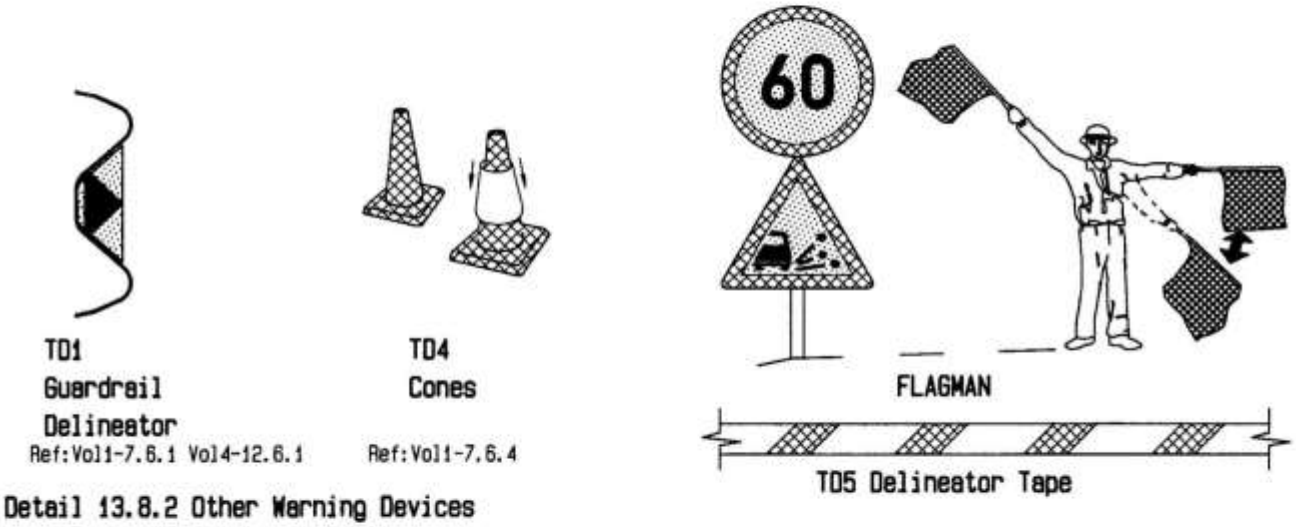


Detail 13.7.1 Other Temporary Advance Warning Signs (Continued from Fig13.6)

Fig 13.7 Warning Signs for Use at Roadworks - 4



Detail 13.8.1 Temporary Hazard Marker Warning Signs



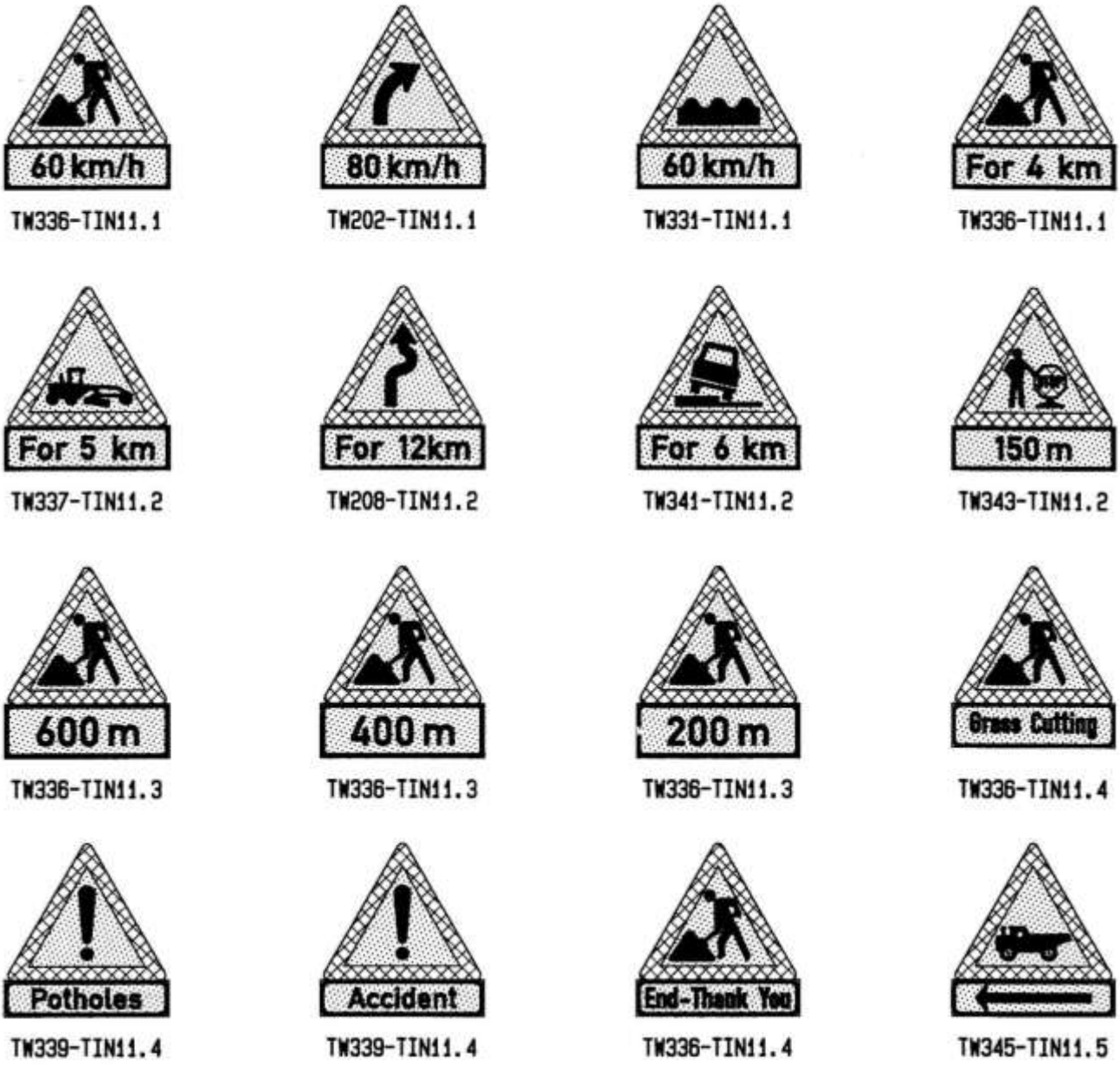
Detail 13.8.2 Other Warning Devices

NOTE:

(1) The HAZARD MARKER warning signs indicated in Detail 13.8.1 are commonly used to identify specific hazards or obstructions at roadworks sites. Signs TW401 and TW402, and TW405 are also commonly used in multiples to delineate temporary roadway alignments. TW405 and TW406 should only be used in multiples of three (3) except in gore areas.

(2) GUARDRAIL DELINEATORS and TRAFFIC CONES may be used temporarily to warn drivers of altered roadway alignment. Well trained FLAGMEN may also be used to good effect to direct traffic or to draw attention to specific hazard in the roadway.

Fig 13.8 Warning Signs for Use at Roadworks - 5



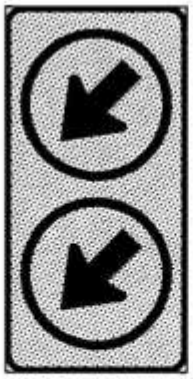
Detail 13.9.1 Typical Advance Warning / Information Sign Combination
(Ref:Vol1-Section3.6 Vol4-Chapter9)

NOTE:

(1) Information may be added below a temporary warning sign by means of a SUPPLEMENTARY PLATE Information sign to give further information in regard to the warning being given. The information given on a SUPPLEMENTARY PLATE will fall into one of the following categories - an advisory speed: TIN11.1; a distance "for": TIN11.2 (the distance for which the warning is appropriate); a distance "to": TIN11.3 (the distance to where the warning takes effect to allow speeds to be reduced); a text message: TIN11.4; or a symbol: TIN11.5.

Fig 13.9 Warning Signs for Use at Roadworks - 6

TR104-RC



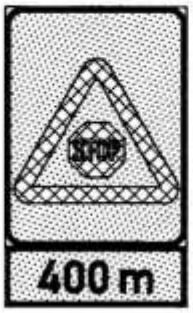
TR103+TR103-RD

TR601-RA-B-
TIN11.3

TR201-RC+TW208-
WC-TIN11.2

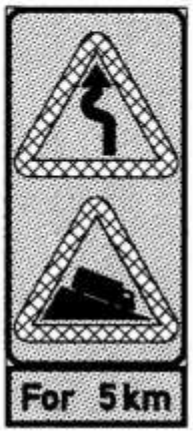
Ref:Vol1-Section3.6 Vol4-2.1.16 to 2.1.21 and 3.1.6 to 3.1.9

TW336-WB-
TIN11.3



TW302-WA-
TIN11.3

TW345-WB-
TIN11.5



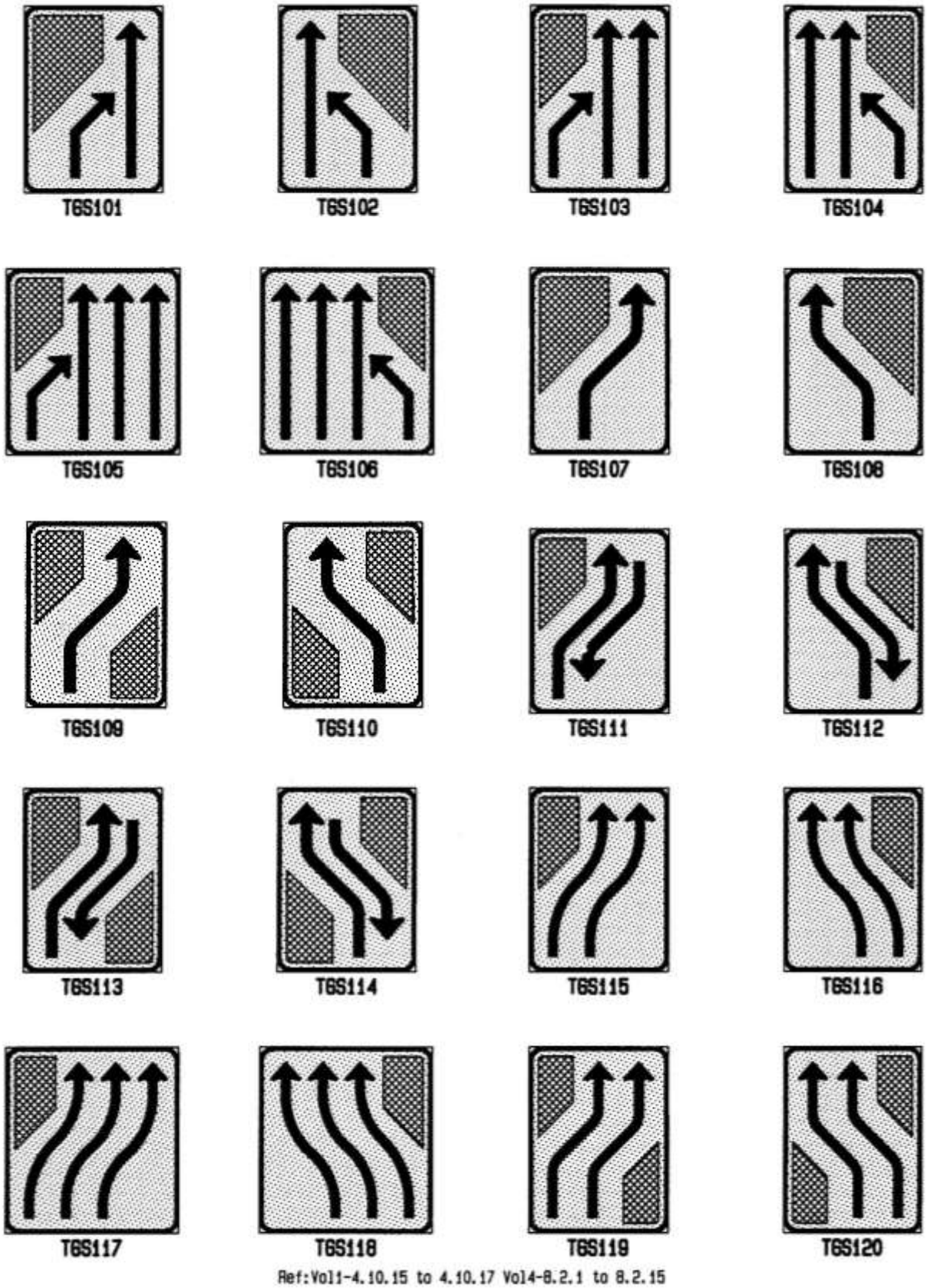
TW209-TW324
-WD-TIN11.2

Detail 13.10.1 Examples of High Visibility Application of Regulatory and/or Warning Signs

NOTE:

(1) Any regulatory or warning sign may be displayed on a HIGH VISIBILITY background sign to increase conspicuity. This practice is recommended at major roadworks sites where driver information processing is commonly under considerable pressure. Two regulatory OR two warning messages may be included on one HIGH VISIBILITY sign. **If it is required to combine a regulatory and a warning sign message these must be included on separate background signs but may be mounted together with the regulatory message above the warning message.** SUPPLEMENTARY PLATES are also recommended (see also examples in Figures 13.4).

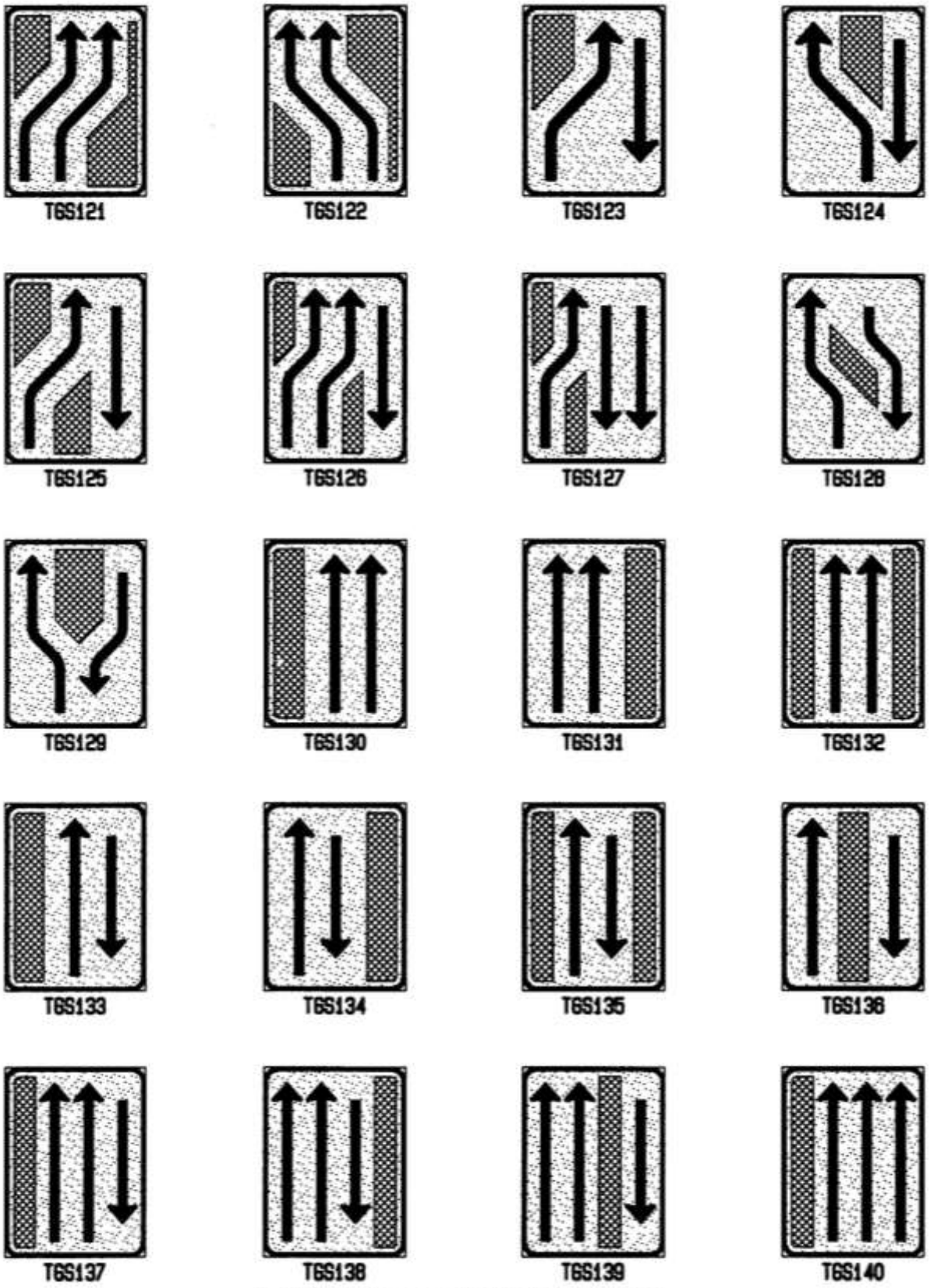
Fig 13.10 High Visibility Signs for Use at Roadworks



Ref:Vol1-4.10.15 to 4.10.17 Vol4-8.2.1 to 8.2.15

Detail 13.11.1 Traffic Movement Affected by an Obstruction (continued in Figure 13.12)

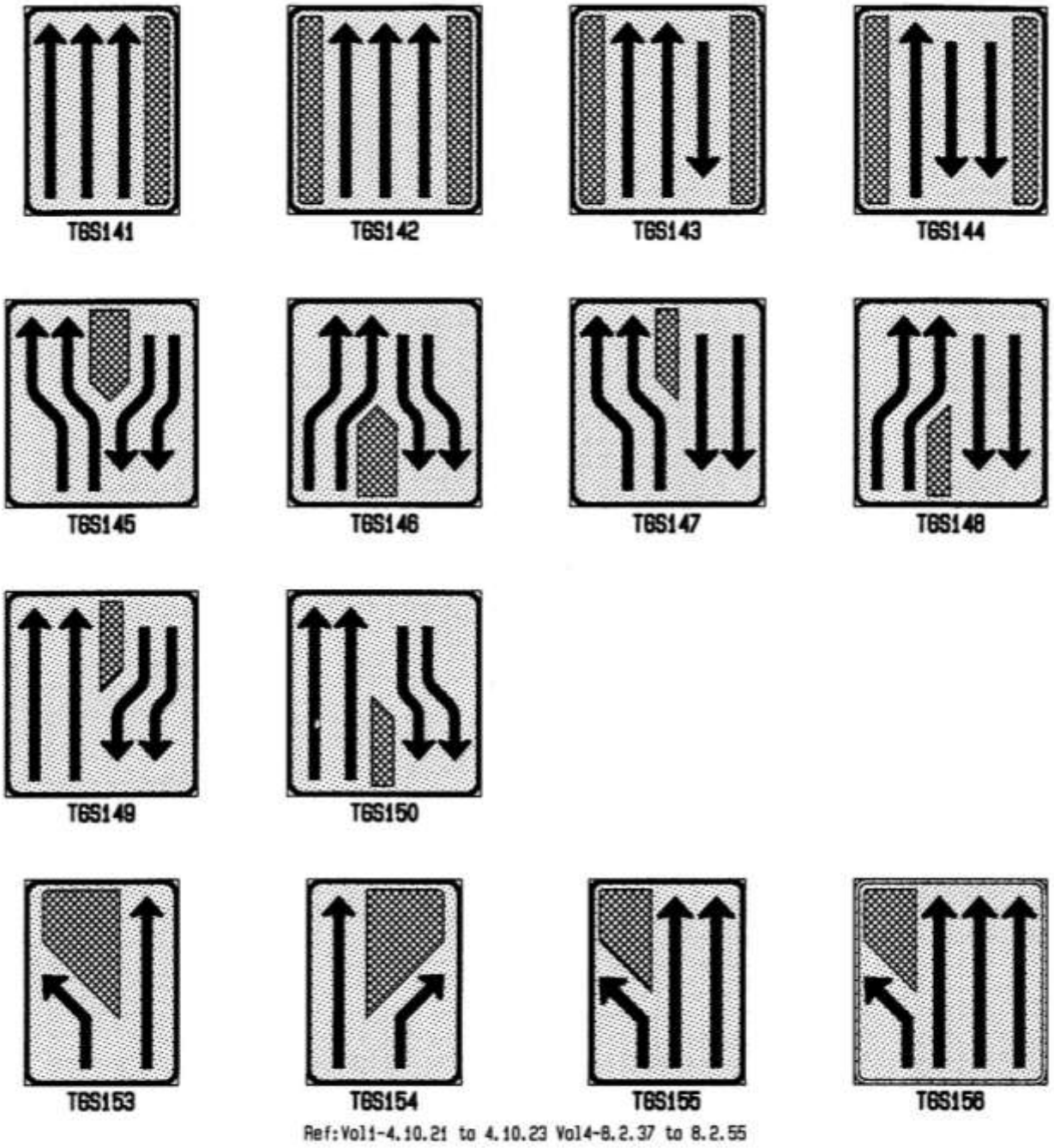
Fig 13.11 Diagrammatic Guidance Signs for Use at Roadworks - 1



Ref: Vol1-4.10.17 to 4.10.21 Vol4-8.2.15 to 8.2.37

Detail 13.12.1 Traffic Movement Affected by an Obstruction (continued in Figure 13.13)

Fig 13.12 Diagrammatic Guidance Signs for Use at Roadworks - 2

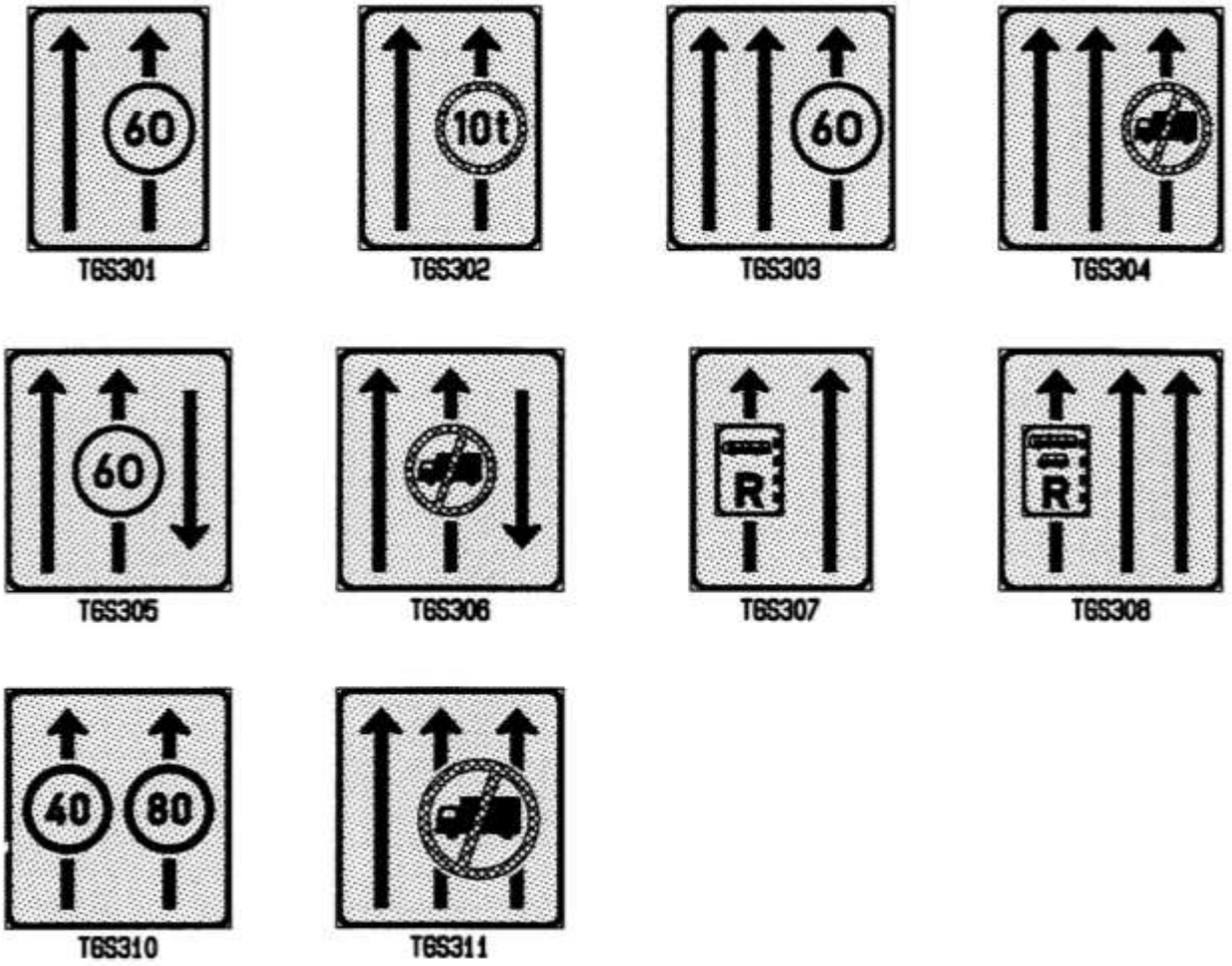


Ref:Vol1-4.10.21 to 4.10.23 Vol4-8.2.37 to 8.2.55

Detail 13.13.1 Traffic Movement Affected by an Obstruction (continued from Figure 13.12)

Reproduce

Fig 13.13 Diagrammatic Guidance Signs for Use at Roadworks - 3

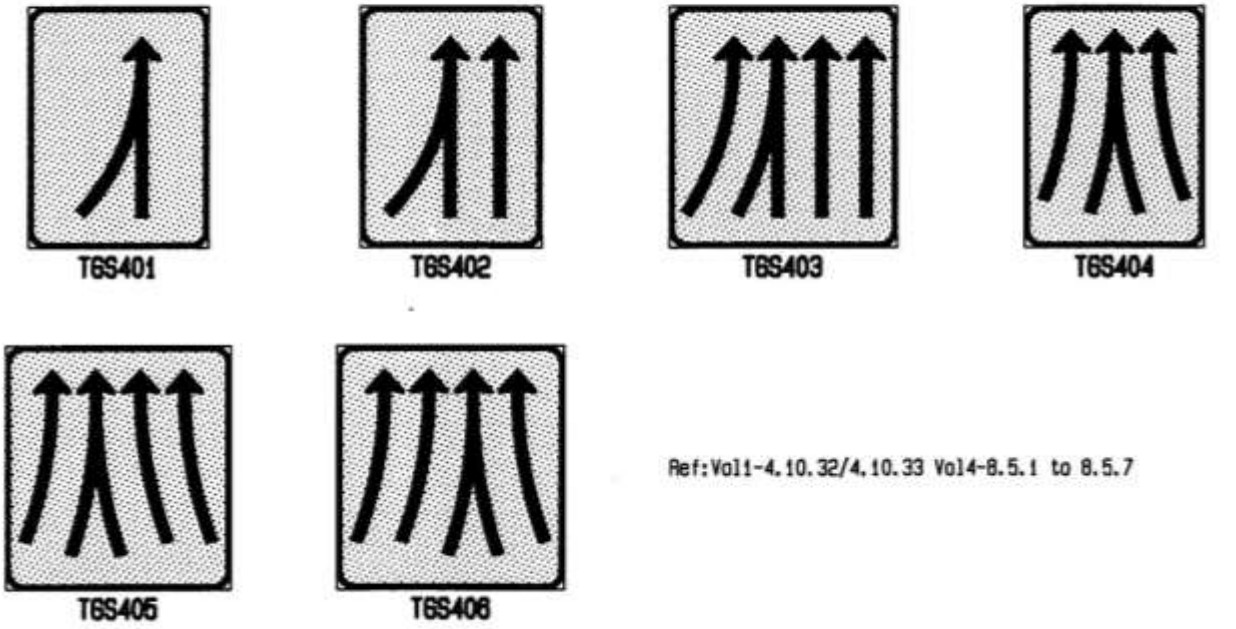


T6S301 T6S302 T6S303 T6S304

T6S305 T6S306 T6S307 T6S308

T6S310 T6S311

Detail 13.14.1 Lane Use Control by Regulation Ref:Vol1-4.10.29 Vol4-8.4.1 to 8.4.4



T6S401 T6S402 T6S403 T6S404

T6S405 T6S406

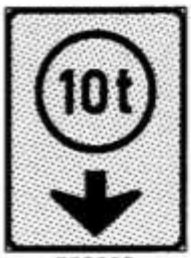
Ref:Vol1-4.10.32/4.10.33 Vol4-8.5.1 to 8.5.7

Detail 13.14.2 Lanes Merge

Fig 13.14 Diagrammatic Guidance Signs for Use at Roadworks - 4

TGS505

Detail 13.15.1 Heavy Vehicle Guidance and Control (Ref:Vol1-4.10.39 Vol4-8.7.4 and 8.9.2)



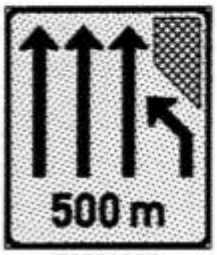
TGS603

TGS604

TGS605

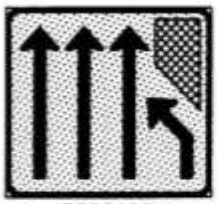
TGS606

Detail 13.15.2 Overhead Signs (Ref:Vol1-4.10.41 Vol4-8.8.3/8.8.4)

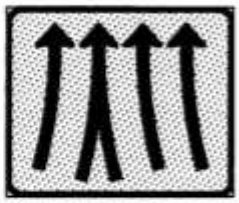


TGS81060

TGS84060



TGS6106



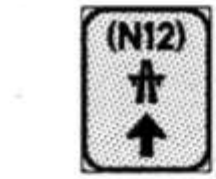
TGS6406

Detail 13.15.3 Overhead Versions of Other Diagrammatic Sign Types (Ref:Vol1-4.10.42 Vol4-8.8.5/8.8.10)

NB. See also Figures 13.18 and 13.19

Repr

Fig 13.15 Diagrammatic Guidance Signs for Use at Roadworks - 5



TGE1

TGE2

TGE3

TGE4

TGE12

TGE13

TGE14

TGE15

TGE12.1

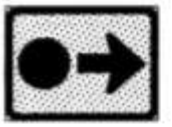
TGE12.2

TGE12.3

TGE12.4

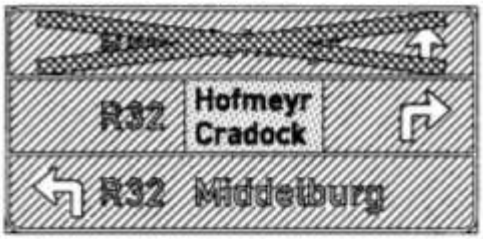
TGE12.5

Detail 13.16.1 Temporary Route Marker Signs



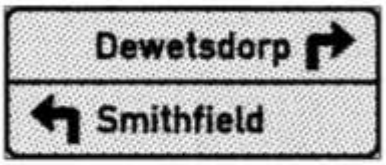
TGD2-D

TGD3-D



Amended GD1/TGD1

TGD4



TGD1

TGD2

TGP9+TGP1

TGP9+TGP3

TGP4+TGP9

Detail 13.16.2 Temporary Direction Signs

NOTE:

(1) GUIDANCE signs comprise LOCATION, TRAILBLAZERS, ROUTE MARKER, DIRECTION, FREEWAY DIRECTION and DIAGRAMMATIC signs. All except LOCATION signs may be used in temporary form. Use is likely to be limited to longer duration work. An urgent detour may be established using standard format signs TGD2-D and TGD3 which are designed to be deployed quickly. These may then be replaced in time by larger temporary TRAILBLAZER, ROUTE MARKER or DIRECTION signs. Only a limited range of examples is illustrated.

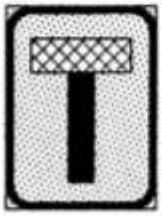
Fig 13.16 Guidance Signs for Use at Roadworks

TIN1

TIN2

TIN3

Detail 13.17.1 Countdown Signs



TIN4

TIN5

TIN6

Detail 13.17.2 Cul-de-sac Signs

TIN11.1

TIN11.2

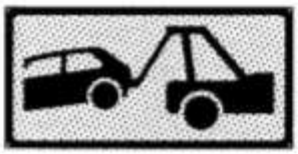
TIN11.3

TIN11.4

TIN11.4

TIN11.4

TIN11.503



TIN11.501

Combination TIN11.3/11.4

Detail 13.17.3 Temporary Supplementary Plates

NOTE:

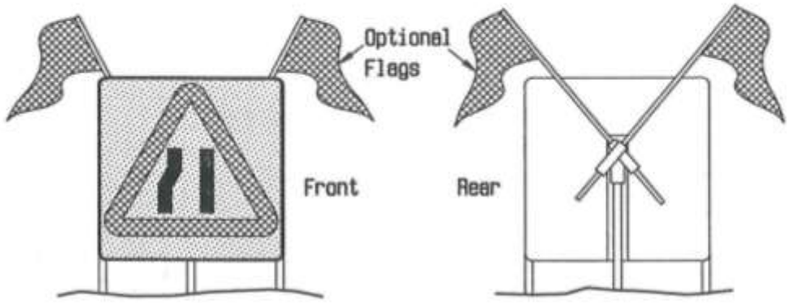
(1) The illustrated temporary INFORMATION signs will commonly be required at roadworks sites. At freeway roadworks sites temporary COUNTDOWN signs TIN1, TIN2 and TIN3 indicating relocated off-ramp exit points are often required. Temporary CUL-DE-SAC signs TIN4, TIN5 and TIN6 are effective and compact signs which may be used to inform drivers of the temporary closure of a normally through route. Such a temporary closure could result from such diverse situations as the replacement of a washed away culvert or bridge, which may require a closure for weeks or months, to a temporary closure for a few hours due to resurfacing, trenching, tree felling or other short duration works. Temporary SUPPLEMENTARY PLATES may be used with a wide range of regulatory or warning signs. Their use should not be confused with SELECTIVE RESTRICTION Regulatory signs - see Figure 13.3. Variations of signs TIN4, TIN5 and TIN6 to cover the temporary closure of one approach to a crossroad or other type of junction are permitted - see examples in Section 13.10.

Fig 13.17 Information Signs for Use at Roadworks

Regulatory
R3-R6

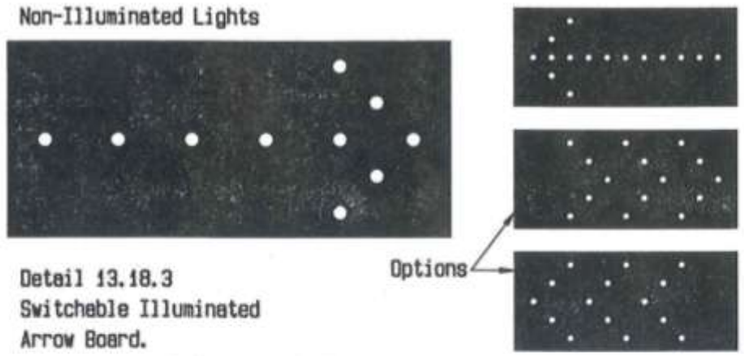
Warning
TW336-WG

Detail 13.18.1 Horizonally Formatted High Visibility Temporary Signs.

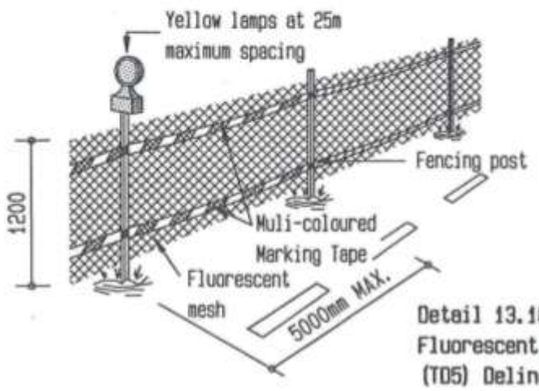


Detail 13.18.2 Slip-Over"Cloth" Signs on a Portable Frame.

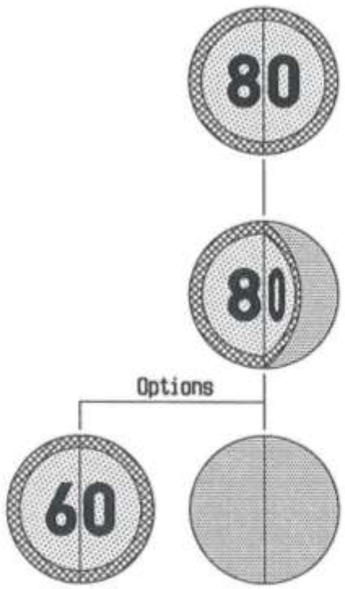
Detail 13.18.5
Example of Typical
Temporary "Text"
Warning Sign.



Detail 13.18.3
Switchable Illuminated
Arrow Board.

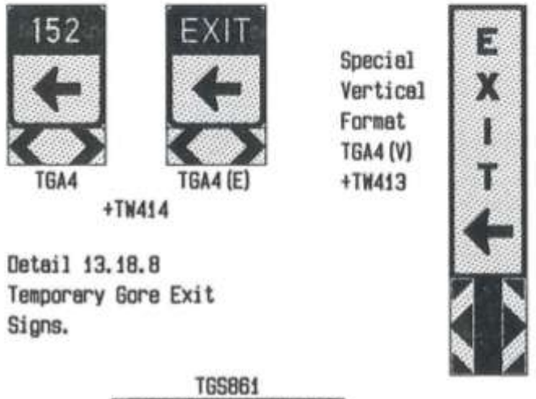


Detail 13.18.4
Fluorescent Mesh and
(TD5) Delineation Tape

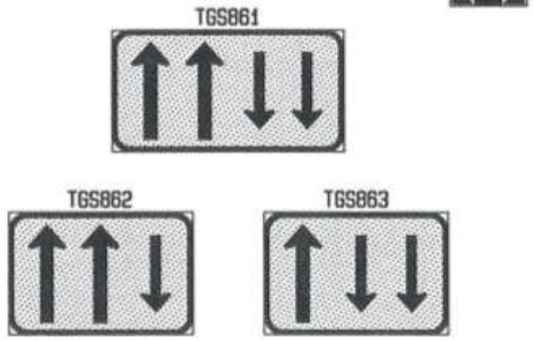


Detail 13.18.6
Changeable Speed Limit
Signs.

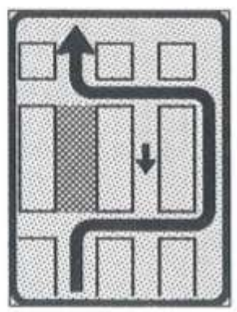
Detail 13.18.7
Reverse Side of Portable Signs.



Detail 13.18.8
Temporary Gore Exit
Signs.



Detail 13.18.9
Temporary Lane Configuration Signs



Detail 13.18.10
Custom Designed
TGD9 Map Type Sign
(Typically for CBD)

13.2.7 Notes on Figure 13.18

(1) Figure 13.18 shows a selection of temporary signs which are used occasionally at roadworks, not all of which are specified in detail in the Manual.

(2) Detail 13.18.1 illustrates two examples of a horizontally formatted type of HIGH VISIBILITY sign. The size of this sign type is not standardised because of the variety of text messages which can be displayed. Dimensional details are included in Volume 4, Chapters 2 and 3.

(3) Detail 13.18.2 shows a lightweight form of collapsible sign which can be useful for short term operations, particularly on multi-lane roads. Typical operations for which such signs might be used include installing and servicing traffic measuring devices, and localised repairs to roadstuds or road markings.

(4) Detail 13.18.3 gives an example of a typical arrow board made up of light sources mounted on a backing board. A variety of light positional patterns may be specified. The example shown may be switched to display a single shaft arrow to the left or right, or a set of three "chevron" arrows, also to left and right.

(5) Detail 13.18.4 illustrates a typical lightweight barricade made of fencing posts, DELINEATION TAPE TD5, and a highly visible fencing mesh. A number of suitable bright fluorescent meshes are on the market.

(6) When no suitable symbol is available for a warning message, the message may be given as text on a warning sign as shown in Detail 13.18.5.

(7) Detail 13.18.6 shows the principle of a changeable temporary SPEED LIMIT sign TR201. The sign comprises an extra hinged plate which can be "flipped" over to change the value of the speed limit, or to remove the temporary speed limit by displaying a blank face.

(8) It is recommended that portable regulatory and warning signs, particularly those which are on stands which place the signs only 200 mm above the road surface, be marked on the reverse side with alternating 150 mm wide black and yellow stripes as shown in Detail 13.18.7.

(9) Detail 13.18.8 gives the range of temporary GORE EXIT signs TGA4, available for use at temporarily relocated freeway exits.

(10) Detail 13.18.9 illustrates a range of arrow-based lane configuration signs which are occasionally seen at roadworks. These signs, which are appropriate during temporary contra-flow traffic operation, are compact in size.

(11) It is sometimes necessary to close a section of road over a full city block for maintenance. When this occurs in a CBD environment with one-way roads a special type of MAP TYPE sign TGD9, as shown in Detail 13.18.10, may be warranted.

Fig 13.18
Other Temporary Signs Used At Roadworks

13.2.8 Notes on Figure 13.19

(1) Temporary signs of all classes may be provided at roadworks mounted in one of two ways:

(a) pole-mounted and buried in the ground as for a permanent sign, and therefore not portable: or

(b) frame and/or stand mounted, and therefore portable or movable.

(2) Detail 13.19.1 illustrates basic pole-mounted clearance criteria which should conform to the provisions of Volume 1, Chapter 1, Table 1.4. The basic minimum clearances should be:

(a) lateral - A: 1200 mm;

(b) vertical - B: 750 mm;

(c) vertical - C: 800 mm (small signs up to 2 m^2) to 1600 mm (larger signs).

The lateral clearances should be maintained if the signs are mounted behind barricades, but may be reduced to be flush with the rear of a barrier.

(3) Detail 13.19.2 shows two types of delineators. All sizes of delineator should be mounted with a minimum vertical clearance of 200 mm.

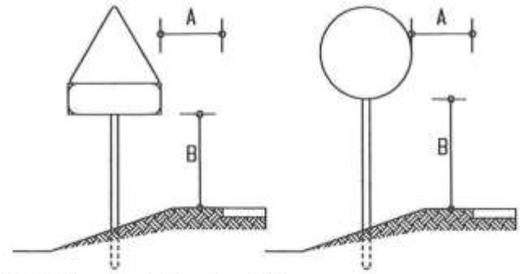
(4) Detail 13.19.3 shows typical portable sign frames for single signs and a single vertical cluster of signs. Such portable signs are used for all types of short term work. Whilst the mode of operation requires easy portability, operators must be aware that signs placed only 200 mm above the road or verge surface can very easily become ineffective. Care has to be exercised over longitudinal positioning to ensure that the signs are in fact visible to drivers. Failure to achieve adequate visibility of signs could result in legal action against the responsible road authority or contractor.

(5) Detail 13.19.4 illustrates two typical movable barricades which display road signs. Whilst general dimensions are given for information these are not obligatory, although size will be dictated to a certain extent by the signs to be displayed. The height of sign indicated should be considered as a minimum.

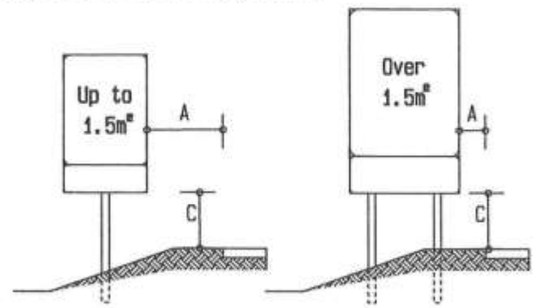
(6) Detail 13.19.5 also illustrates typical larger movable sign supports and frames. Again the dimensions given are representative and may be varied within the constraints of the sizes of the signs to be displayed and the stability of the overall frame.

(7) Ballast sandbags are shown in the examples. These sandbags should have a mass of around 30 kg each and must be maintained and replaced as necessary to ensure the stability of the signs and their supports.

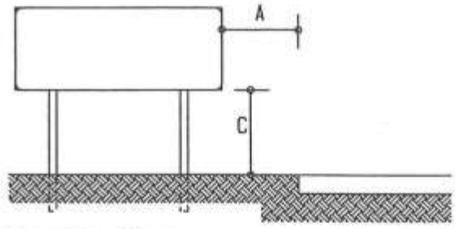
(8) Minimum vertical clearance requirements are recorded in Table 13.1 in Section 13.1.



Regulatory and Warning Signs.

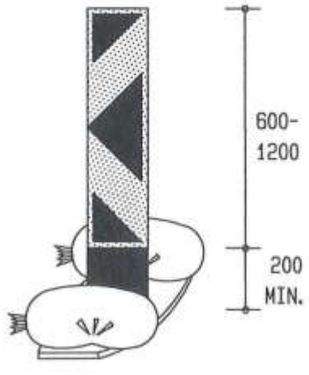


Diagrammatic Signs.

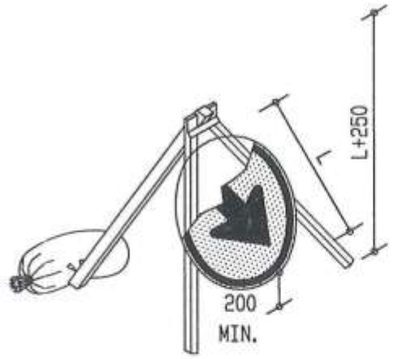


Direction Signs.

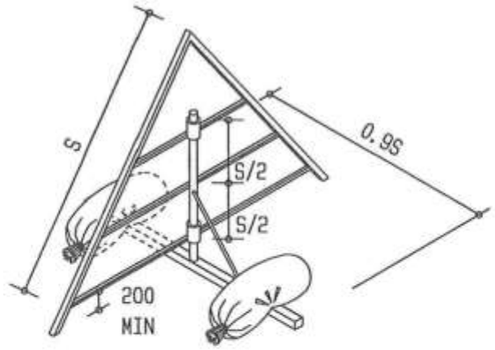
Detail 13.19.1
Clearances for Pole Mounted Signs.



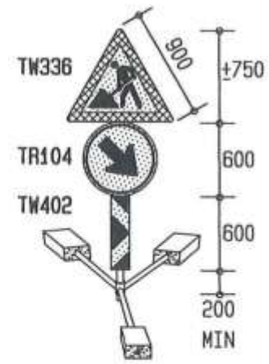
Detail 13.19.2
Delineator Vertical Clearance.



Pivot/Folding Frame

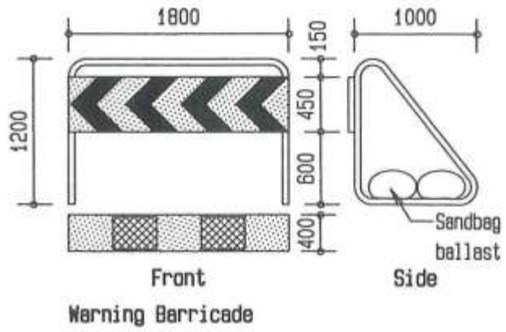


Fixed Frame

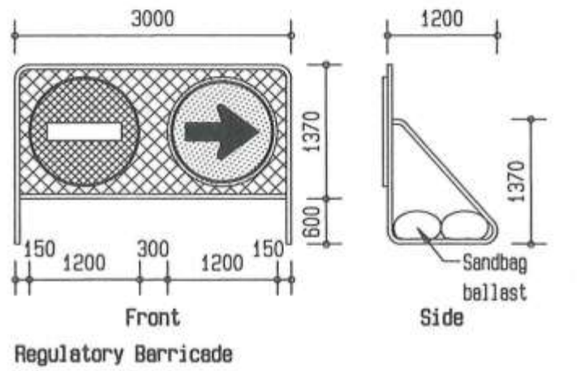


Sign Cluster (CBD)

Detail 13.19.3 Dimensional Criteria for Portable/Movable Regulatory and Warning Signs.

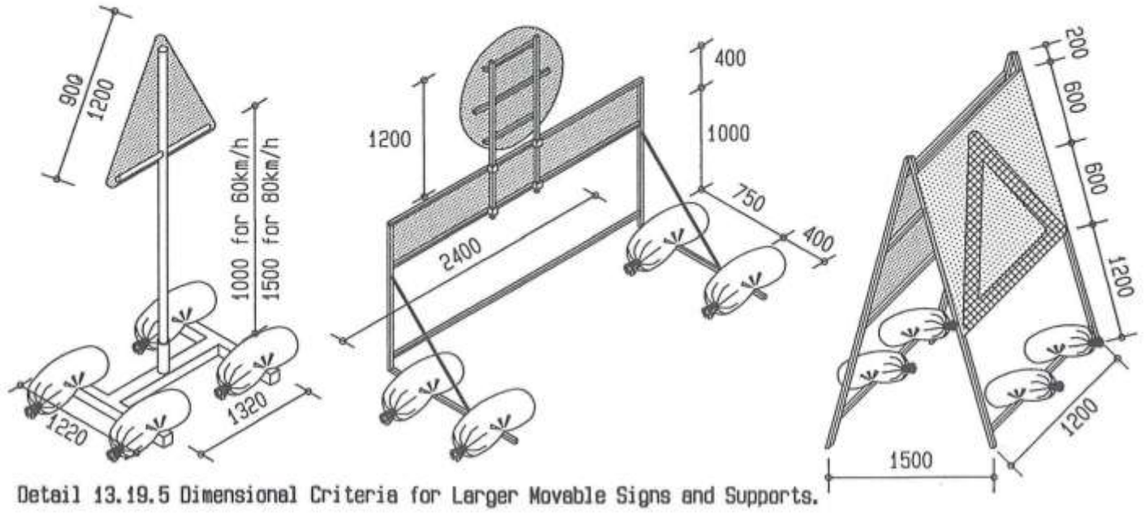


Warning Barricade



Regulatory Barricade

Detail 13.19.4 Dimensional Criteria for Movable Barricade Mounted Signs.



Detail 13.19.5 Dimensional Criteria for Larger Movable Signs and Supports.

Fig 13.19
Mounting of Temporary Signs – Options and Minimum Clearances

13.3 TRAFFIC MANAGEMENT

13.3.1 General

1 In order to adequately deal with the needs of manual or handbook users, it is necessary to go beyond the specification of sign face designs and sequences. It is necessary to develop a standardised approach to the traffic management of roadworks sites. This applies particularly to the more complex conditions. Ideally it should be possible for almost any site condition to be simplified to a number of standard treatments and, therefore, traffic should be accommodated within the range of signs detailed in this Chapter. According to this principle, the motorist should then have to deal only with familiar situations and preferably with only one at a time.

2 The layouts provided in later sections have therefore been prepared with these objectives in mind. Each condition has been subdivided into standard components or sections as shown in Figure 13.20. In some cases, one or more of the area or zone subdivisions may be repeated. **The primary reason for this approach is the ultimate safety of drivers and workers**. It is not an uncommon practice to complicate the situation presented to drivers by superimposing changing conditions such as road width reductions or carriageway crossovers upon each other and/or by locating them at interchanges. This results in drivers trying to negotiate these changes in condition and interpret their directional needs at the same time. Wherever possible this situation should be avoided. There will, however, always be circumstances where, for reasons of cost or physical conditions, such a superimposing of activities is unavoidable. In this event carefully prepared special signing techniques will have to be employed.

3 In the interests of safety these principles should be carried through to the preparation of less complex traffic management situations. A systematic breakdown of any site into standardised sub-components is likely to result in more efficient and safe site operation because it will allow the site supervisor to clearly understand the traffic operation of the site.

4 In certain instances it will be necessary to create, within sections of a roadworks site, conditions where traffic is reduced to one-way operation. In this event the passage of traffic will have to be controlled manually or automatically. Three methods of traffic control available are:

(a) flagmen;

(b) STOP/RY-GO signs;

(c) temporary traffic signals.

Details of these traffic control methods are given in Subsection 13.3.9.

5 As part of the general traffic management effort at a roadworks site, the resident engineer AND the contractors' representative dealing with temporary signing and delineation should institute a regular programme of checking the site for compliance with specifications, including sign cleanliness. This inspection programme should occur as frequently as necessary to keep the site correctly signed and delineated. This may need several inspections a day. The inspection programme should pay particular attention to the effectiveness of the signs and delineation under adverse weather conditions, at dusk, and at night. In extreme cases, the illumination of critical signs may be justified by a combination of such conditions and high traffic volumes. Care should be exercised not to create running lanes which are too wide for one traffic stream but not quite wide enough for two traffic streams (see paragraph 13.4.3.2(c)).

13.3.2 The Advance Warning Area

1 This area is used to advise motorists that there are temporary conditions ahead of them which require particular care. Almost invariably, a stepped reduction in the speed will be required within this area. These speed reductions should be indicated at reasonable intervals (200 m minimum), and occur in 20 km/h steps until the speed for which the traffic control has been designed is indicated. It is good practice to repeat the final speed limit at least once. It should be noted that, depending on the nature of the change ahead, any of the DIAGRAMMATIC guidance sign layouts given in Figures 13.11 to 13.15 may be used, but the use of non-standardised sign layouts should be avoided.

2 The length of the Advance Warning Area should relate directly to measured approach speeds. A realistic distance must be allowed for speed reduction. High traffic volumes will be better handled if the standard length of this area is generous, since more time is needed to take in the sign messages and react to them under heavy traffic conditions. For approach speeds of around 120 km/h and moderately high to high volumes, a base length for the Advance Warning Area of 1000 m is required. If traffic volumes are low and/or approach speeds in the region of 80 km/h, this length may be reduced to 600 m. This reduction applies particularly when changes in road conditions, such as alignment or width, occur within the main site.

e.g. a section of 16 kilometres of rural road may be under repair or reconstruction - the effects of work on traffic will vary widely through the site - assuming a 120-100 km/h approach speed and high traffic volumes, a full Advance Warning Area sign sequence covering 1000 m should be used - speed within the site is likely to be controlled at 80-60 km/h - at these approach speeds the secondary Advance Warning Area sign sequence for local deviations can be reduced to 600 m in length, or, for simple cases, even to 400 m.

3 Urban sites will commonly have limited space for Advanced Warning Area signs. However, every attempt should be made to provide adequate advance signing. High speed arterials should normally have sufficiently long block lengths to allow Advance Warning Areas in the range of 600-300 m. On lesser roads or in busy business areas, shorter Advance Warning Areas in the range of 150-75 m should be used. In the latter cases, consideration should be given to taking lane closures and the relevant signing into the preceding block.

13.3.3 The Transition Area

1 This is the area in which drivers are required to **take an action,** such as:

(a) shift position on the roadway without reduction in the number of lanes;

(b) merge two lanes into one (lane drop);

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(c) cross the central median (crossover);

(d) enter a detour completely separate from the road under construction.

2 The transition area must be clearly defined using delineator plates and should conform to the layout depicted on the guidance signs preceding it. The more complex roadworks sites should be broken down into a number of standard transition situations. No signing for subsequent transition conditions should be included within a transition area.

3 The transitionary action required of traffic can be achieved in a limited number of ways, e.g.:

(a) a taper;

(b) a crossover;

(c) a deviation (normally reserved for complete re-routing).

4 The length of a transition area will depend on the approach speed of traffic and the amount of shift in alignment involved by the transition. Details of the length of tapers and crossovers are given in Subsections 13.5.5. and 13.5.6.

13.3.4 The Stabilising Area

1 The purpose of this area is to allow traffic flow to stabilise after negotiating a transition area before reaching another change of condition. If more than one transition area is required to achieve the final traffic configuration, the signing for second or subsequent transitions should be located within the stabilising area(s). The stabilising area is normally defined by delineator plates.

13.3.5 The Buffer Zone

1 This is the limiting form of stabilising area. It is normally used between a transition area and the work area. In a situation involving more than one transition area the buffer zone will occur after the transition area closest to the work area. The principal function of the buffer zone in such situations is to separate the traffic from the workers at the site in the interests of worker safety. It can be a relatively short distance but never less than 50 m. Provision of a longitudinal buffer zone, and indeed a lateral buffer zone within the work area, must be considered as fundamental to effective worker safety.

13.3.6 The Work Area

1 This area must be adequately defined by delineators in the less complex conditions. Where there is a risk to traffic or workers of vehicles entering the work area, temporary barriers of a standard sufficient to prevent vehicle penetration are recommended (see Subsection 13.5.3).

2 When traffic is relocated well away from the work area, little action is required along the length of the work area other than to protect contractors' vehicles and employees. If such a re-location results in two-way traffic flow then special attention should be paid to the definition of the line separating the two traffic flows. Under normal conditions, the minimum treatment should involve the marking of a temporary DIVIDING or NO OVERTAKING line where appropriate. This line should be supplemented by temporary roadstuds.

3 If the section of detour running parallel to the work area uses asymmetrical lane configurations, drivers should be reminded of this situation by using lane arrangement signs as shown in Figure 13.70. If the condition exists for considerable distances, it is recommended that these signs be repeated at regular intervals and that a distance plate indicating the remaining extent of the condition be added to the signs.

4 Where an asymmetrical lane configuration is varied to permit overtaking through a long site for instance, then the signing and marking of this treatment should follow the principles laid down for transition and stabilising areas. An example is given in Figure 13.70.

5 Experiences with major road rehabilitation contracts have shown a tendency towards increasingly long road sections under construction. There may be very valid economic reasons for such a practice. However, if a site is going to be long, extra care must be taken to ensure adequate overtaking opportunities. In addition, great care must be taken to control the manner in which work phases are completed and reopened to traffic. The random mixture of full construction, with and without road markings, and short incomplete sections of work should be avoided at all costs. The resultant confusion on the part of drivers is to be expected, and can be extremely hazardous.

13.3.7 The Termination Area

1 This area involves the return of traffic to normal flow conditions. In simple cases this can be achieved by a relatively rapid taper of delineator signs. In more complex conditions a reverse crossover may be required. This should follow the same principles given for such conditions at the start of a site and dealt with under Subsections 13.3.3 and 13.3.4.

2 Courtesy signs and permanent speed limit signs restoring the normal speed limit conditions should be erected adjacent to each other as soon as possible after the end of the Termination Area.

13.3.8 Traffic Management Planning

1 It is not possible to predetermine how all construction sites shall be managed because there are too many variables. As has been mentioned earlier, however, it is considered very important to plan, and work, in a systematic manner and in standardised steps. The objective of such an approach is to optimize site efficiency, traffic flow and all aspects of safety.

2 The temporary road signing system covered by the typical applications in this chapter have been documented and in use for several years. However well developed the system may be, there will always be scope for improvement and refinement. It is therefore important that practitioners develop their utilization of the system along disciplined lines and include feedback at all phases of the process. Detail 13.21.1, in Figure 13.21, illustrates a breakdown of a structured planning process.

3 At a more detailed level planners should identify the component parts of a site long before ordering signs or transporting them to site. Detail 13.21.2 shows an arrangement of typical site components. Almost every road construction or maintenance site, however small, can be broken down into the basic system components. At a major site each of these may be several hundred metres in length, whereas, for a small urban

(continued on page 13.3.6)

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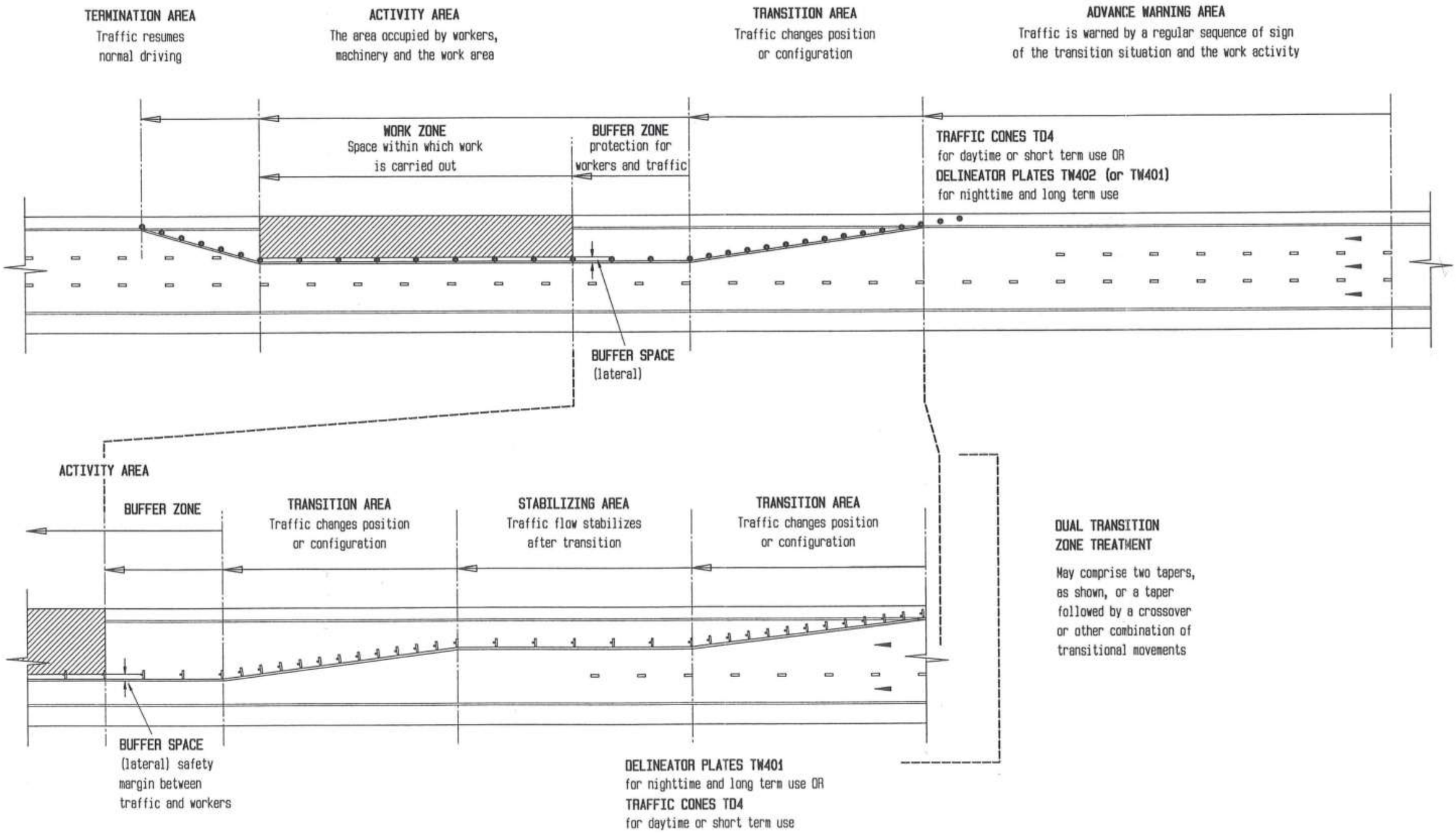
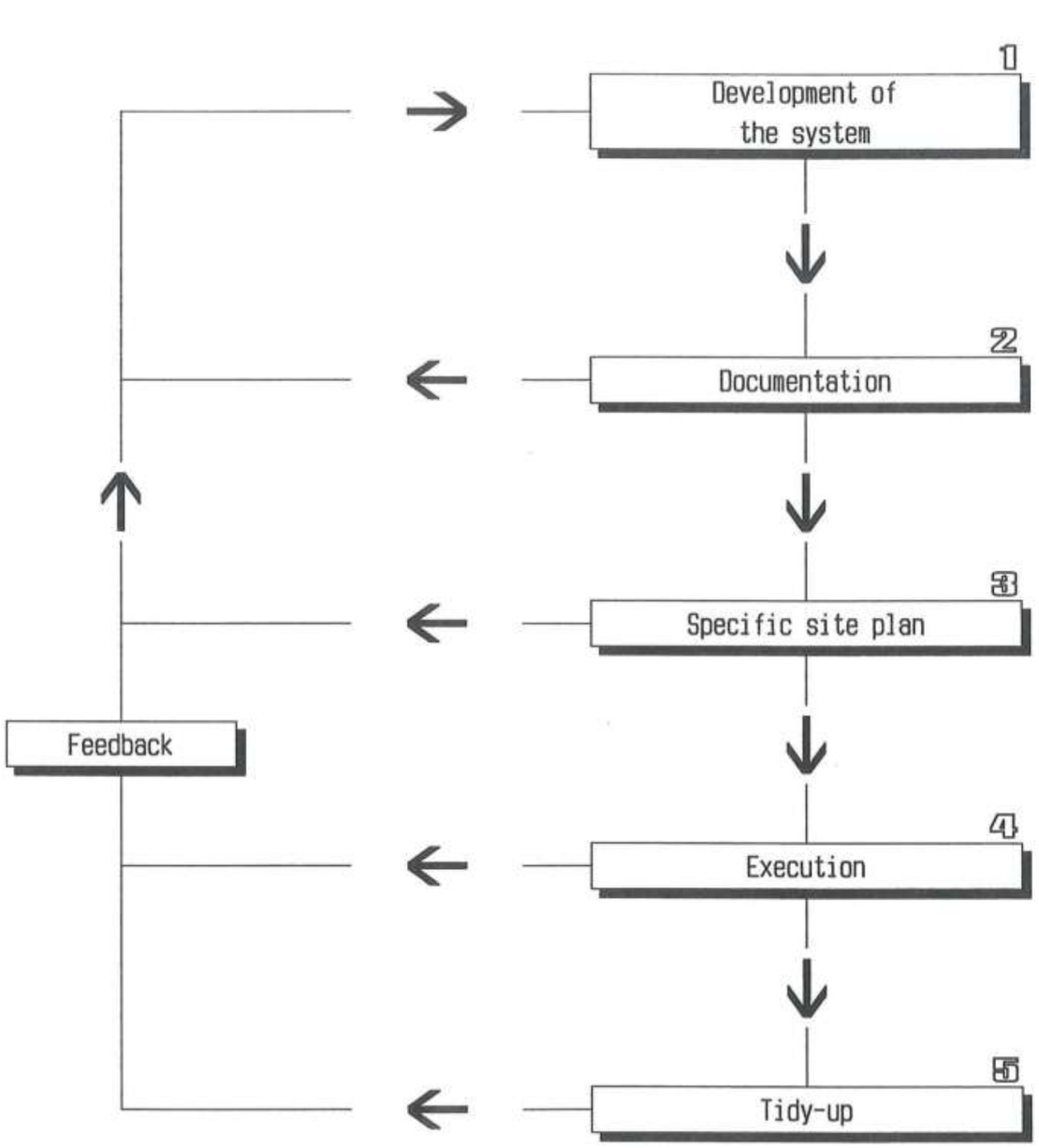
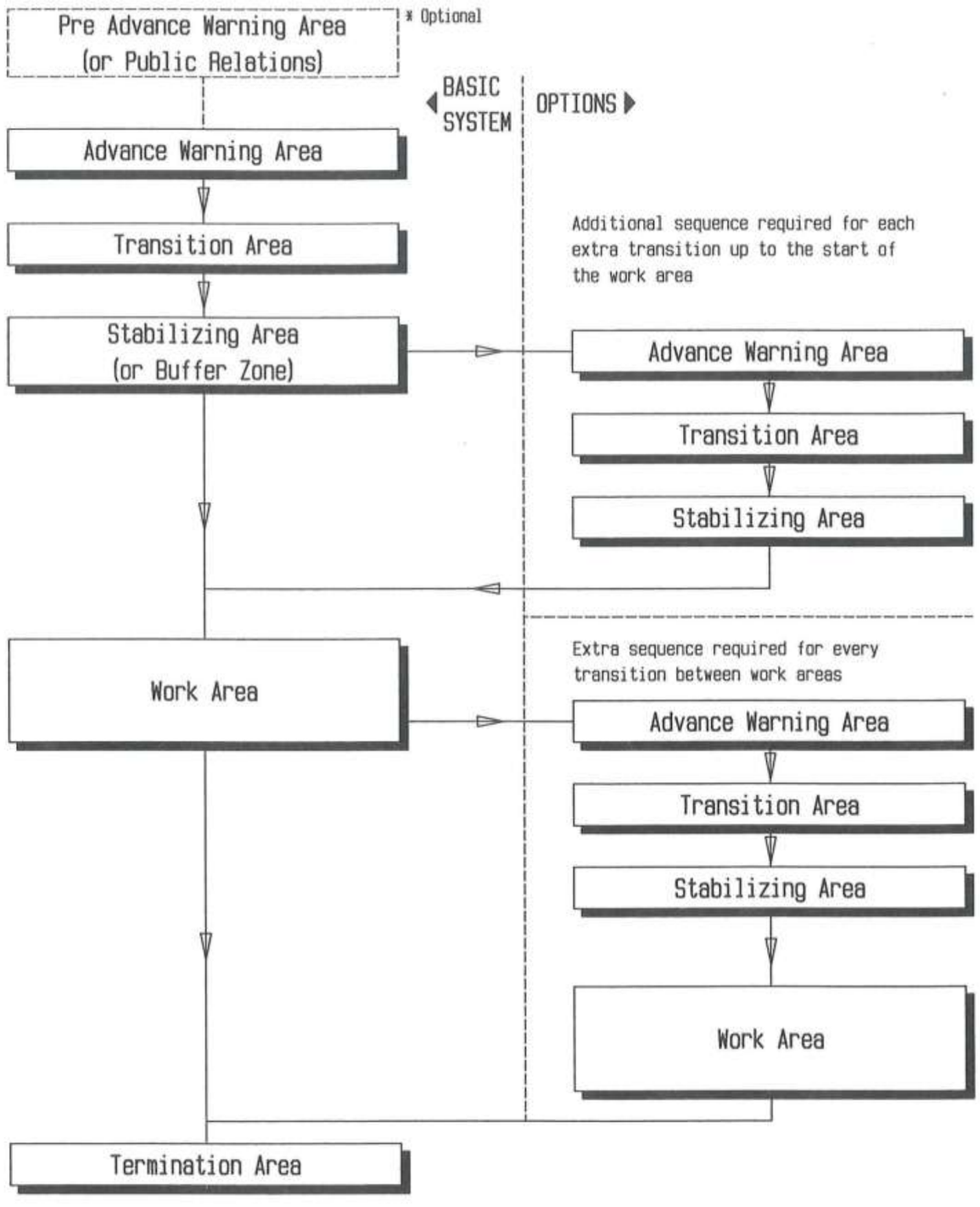


Fig 13.20
Component Parts of a Temporary Traffic Control Zone

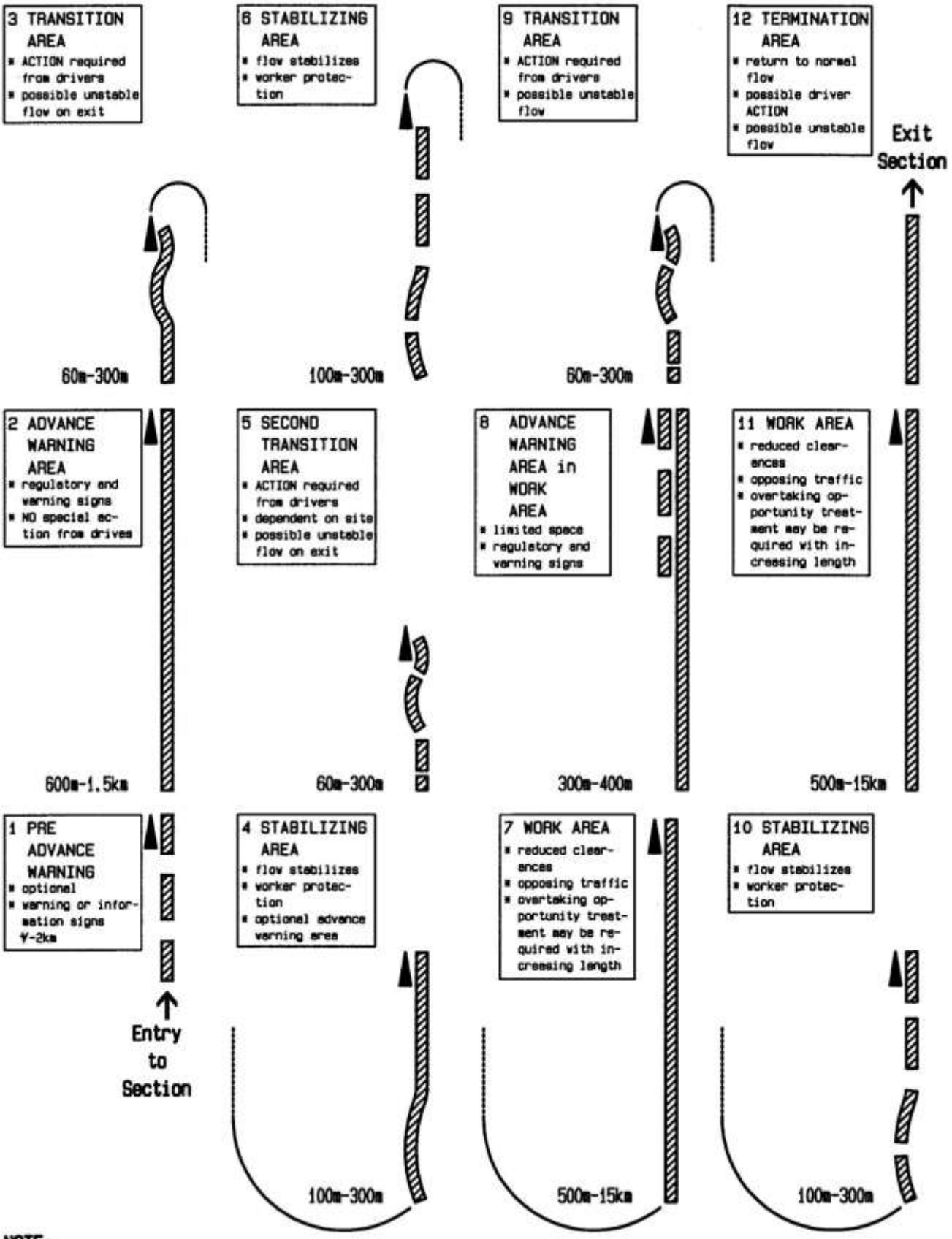


Detail 13.21.1 Planning System.



Detail 13.21.2 Systematic Arrangement of Typical Site Components.

Fig 13.21
Components of a Systematically Deceloped Site



NOTE:
This diagram represents a typical work site with two main areas of work.

Fig 13.22 Schematic Arrangement of System Sections

(continued from page 13.3.2)

maintenance exercise they may each be only a few metres in length. At a training level it is important that maintenance crews "think" out all the components, even if all that is placed on the road is a set of delineators or traffic cones.

4 Figure 13.22 shows a similar arrangement to that given in Detail 13.21.2 but gives more detail on the function of each component of the site and illustrates how the different components form a cohesive and flowing site.

13.3.9 Traffic Control Methods - One Way Traffic

1 The choice of the traffic control method to be used will depend on the speed and volume of traffic, and on the length of, and visibility on, the section of roadway subject to control.

2 **Flagmen** are a simple and flexible method of traffic control suitable for use when traffic volumes are less than 200 vehicles per hour. The flagmen at each end of the one-way traffic section must be clearly visible to each other and the section should not exceed 100 m in length. If the obstruction is intermittent the need for flagmen may be occasional.

3 **Flags** should be at least 450 mmx450 mm and should be made of a durable fluorescent red-orange or red cloth fastened to a staff at least 1 metre long. The free edge of the flag should be weighted to ensure a vertical position during windy weather. A diagonal stiffener may also be used for the same purpose.

4 **Flagmen stations** should be located far enough from the roadworks to ensure that drivers have sufficient distance to slow down before entering the work-site but not so far away that the drivers will tend to increase speed before passing the work-site. The flagmen should stand either on the shoulder adjacent to the lane of traffic they are controlling or in the barricaded lane. Under no circumstances should they stand in the traffic lane. In rural areas flagmen should be clearly visible to the traffic they are controlling from a distance of at least 150 m. For this reason they should stand alone, never permitting a group of workmen to congregate around them.

5 **Distinctive clothing** should be worn by flagmen on duty so that the public will recognise them and respect indications given by them. They should be issued with fluorescent-coloured helmets and safety jackets as illustrated in Figure 13.30.

6 The **careful selection and training** of flagmen before making them responsible for the flow of traffic is essential. The efficiency of flagging control is often dependent on the intelligence of the flagmen. Flagmen should have good eyesight and hearing, and be mentally alert.

7 **Flagging procedures** are prescribed in the Road Traffic Act and must be standardised so that the travelling public throughout South Africa can expect to be given the same signals by flagmen controlling traffic. Details are illustrated in Figure 13.23. The purpose of flagging procedures and STOP/GO control is to regulate and control traffic flow, and to warn drivers of a potential danger ahead. Regulation and control of traffic by flagmen will normally be undertaken to allow access by construction vehicles or to operate one-way traffic flow. Such interruptions in an already restricted traffic flow should be kept to a minimum. Drivers will become irritated by delays in excess of two minutes. Irate, impatient drivers will be inclined to disobey traffic control measures and speed limits at roadworks, to the risk of site staff and themselves. Flagging procedures can be very effective in drawing attention to hazardous features of a roadworks site because of the flag movement involved. The basic flagging procedures are described briefly below and in full detail in Figure 13.23. Detail 13.23.3 illustrates some innovative flagging techniques.

To stop traffic flagmen shall face approaching traffic and extend the flag horizontally, at right-angles to the traffic lane, in a stationary position so that the full area of the flag is visible hanging below the staff. The free arm should be raised with the palm towards the approaching traffic (see Detail 13.23.1).

The **signal to proceed** may be given when it is safe for traffic to proceed. The flagmen shall stand parallel to the flow of traffic and, with flag and arm removed from the view of the driver, shall signal traffic with his free arm to proceed. **The red flag shall not be used to signal traffic to proceed.**

To slow traffic down flagmen shall stand in the position for stopping traffic as set out above and move the flag up and down at a steady pace. When the approaching vehicle has slowed down sufficiently, the flagman shall change his stance and give the signal for traffic to proceed.

8 **STOP/RY-GO R1.5A and R1.5B** portable sign should be used when traffic volumes exceed 200 vehicles per hour and one-way traffic operation is essential for safe passage through a work section greater than 100 m in length. The signs should be controlled by a responsible person who should have at least the qualities referred to in paragraph 13.3.9.6. The sign should be positioned so that it is readily visible to the approaching driver (see Detail 13.23.2). A typical advance sign sequence which should be set up ahead of the STOP and GO/RY signs R1.5A and R1.5B is shown in Figures 13.40 and 13.44. The workers controlling the signs should be visible to each other, or be in radio contact, and the most responsible employees should be detailed for the purpose of co-ordinating traffic flow.

9 **Temporary Traffic Signals** should be used if one lane one-way traffic is required to operate at night. Temporary traffic signals should also be used if flagmen/STOP-RY/GO/radio operation of a one-way section without inter-visibility is not satisfactory for whatever reason. As traffic volumes increase above 500 vehicles per hour, the use of temporary traffic signals to minimise delay to traffic is recommended at all one lane one-way sites (see also paragraph 13.3.9.3).

Temporary traffic signals should always be used with the appropriate warning signs. The temporary marking of a stop line is recommended.

The cycle of a fixed time traffic control signal should be carefully adapted to the specific work area. The green signal face should be illuminated for a period which would be sufficient to permit a group of vehicles to pass through the area followed by an all-red period for both directions to allow complete clearance of the section by the vehicle group.

Depending on the anticipated traffic pattern, a vehicle actuated traffic control signal with temporary actuation loops is likely to be more efficient in the handling of traffic.

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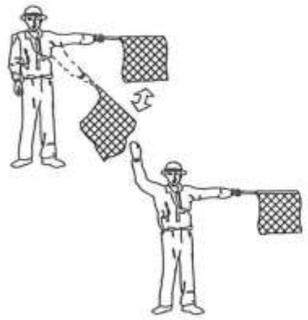
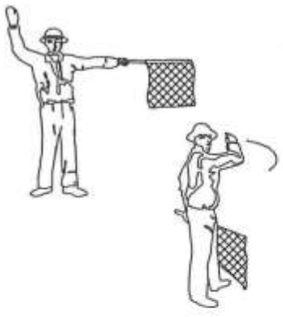
Warning Traffic
Stand facing traffic looking directly at the driver - Flag in left hand - move flag up and down from side of leg to shoulder height continuously - For added effect move right arm up and down as well.

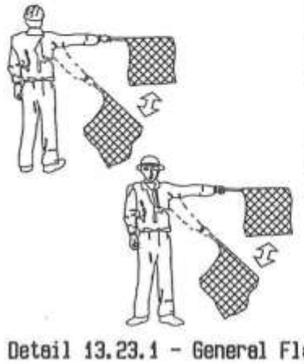


To Stop Traffic
Stand facing traffic looking directly at the driver - Flag in left hand - move flag up and down from side of leg to shoulder until vehicle is 100 paces away - Looking at driver directly - hold flag at shoulder height with outstretched arm - Raise right hand with palm to face traffic - This procedure is for short-term use only.

Vehicles To Proceed
Turn right hand side of body towards oncoming traffic - lower flag behind left leg and indicate with horizontal swinging movement of the right arm that vehicles may proceed.



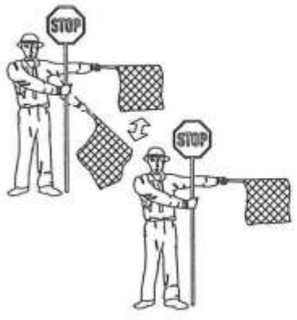
To Slow Traffic Down
Stand facing traffic looking directly at the driver - Keep flag at shoulder height with out-stretched arm and raise right hand - palm facing traffic - As soon as traffic has slowed enough turn right hand side of body to oncoming traffic - Lower flag behind left leg and indicate with horizontal swinging movement of the arm that vehicles may proceed.



Warning of Slow-Moving Vehicles
Walk 300 paces in front of moving vehicle while raising and lowering flag continuously from side of leg to shoulder height - At sharp curves or when visibility of vehicles is reduced, stand still, facing and visible to oncoming traffic, and continue to raise and lower flag to warn traffic - use flag in arm nearest to road.

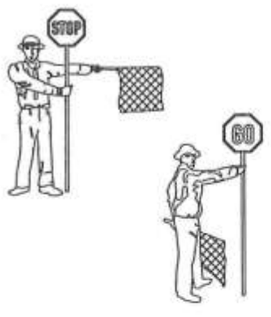
Detail 13.23.1 - General Flag Procedures

Warning Traffic
Stand with right hand side of body towards oncoming traffic - hold STOP/GO sign with GO turned to traffic with right hand - Move flag up and down continuously, behind sign, from side of left leg to shoulder height while vehicles are approaching.



To Stop Traffic
Stand with right hand side of body towards oncoming traffic - hold STOP/GO sign with the STOP side facing traffic - Move flag up and down continuously from side of left leg to shoulder height, behind sign, until traffic is 100 paces away then keep flag at shoulder height pointing towards road centre.

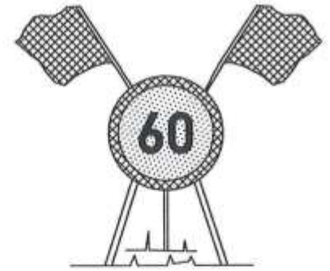
Vehicles To Proceed
Make sure that all vehicles from the other side have passed through and that the flagman at the opposite end has closed the road - Turn STOP/GO sign to GO and lower flag behind left leg behind the sign.

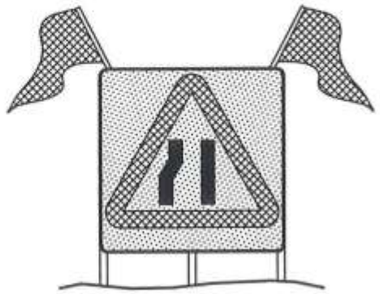


To Slow Traffic Down
Stand with right hand side of body towards oncoming traffic - hold STOP/GO sign with right hand with STOP facing traffic - Hold flag at shoulder height with left hand pointing towards road centre - When oncoming vehicle has slowed, turn sign to GO and lower flag behind left leg behind sign.

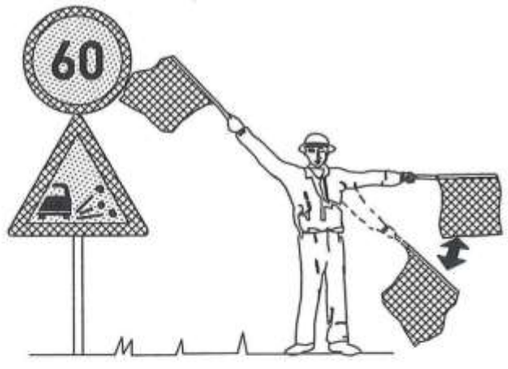
Detail 13.23.2

STOP/GO Procedures





Flags may be attached to sign frames so that the flag movement and visual impact draws attention to the sign.



To enhance the 'Warning Traffic' message a flagman may use two flags and drew attention to signs.

Detail 13.23.3
Innovative Procedures

Fig 13.23
Flag Procedures

The installation of temporary traffic control signals together with the proposed timings sequence should receive the prior approval of the road authority concerned.

A typical traffic management layout for temporary traffic control signals is shown in Figure 13.57.

10 One-way operation of long sites is not generally recommended. If no other alternative exists, then such a site must be provided with adequate passing places. The passing places must be located so that they are inter-visible. This will allow approaching drivers to exercise a yield procedure. One direction of traffic should be given priority over the other through the full length of the site unless some specific condition of the site makes such a control arrangement unsatisfactory. The direction of travel which must yield right of way shall be indicated by appropriate signs. Each passing place layby shall be signed to indicate the right of way priority. It is recommended that on sites over 1 km in length, reassurance signs be located to advise drivers of the extent of the site remaining.

13.3.10 Traffic Control Methods - Slow-moving Work

1 Many general maintenance operations on roadways normally require some form of lane closure. Typical of such tasks are the following:

(a) road marking;

(b) road surface condition surveys;

(c) alignment surveys;

(d) deflectograph surveys;

(e) grass cutting;

(f) street lighting maintenance;

(g) gardening/weed spraying;

(h) roadstud application;

(i) service installation.

These operations all require a slow-moving, or stop-start operation on the roadway, and due to the nature of the task this will normally extend over many kilometres. This has traditionally involved dropping one lane over such a distance, much to the disadvantage of traffic. The number of traffic cones required and the time needed to place them can be saved by carrying out such operations from, or in front of, a vehicle or vehicles equipped with high visibility rear treatment or towing trailers with such equipment.

2 Vehicles used for slow-moving maintenance operations or survey work should be painted in conspicuous colours and be equipped with one or more yellow flashing lights. If the vehicle (or tractor) is used in a contra-flow operation, such as grass cutting on a central median, it must be equipped with a flashing light on each side of the vehicle.

3 In addition, it is recommended that slow-moving vehicles used for mobile or stop-start work be provided with high visibility rear treatment. This treatment may include a road traffic sign appropriate to the operation, similar to the example illustrated in Figure 13.31. If the vehicle itself is not suitable for such treatment, it should tow a trailer suitably provided with a high visibility rear treatment. The use of a trailer is particularly relevant to operations which can be carried out from a conventional motor car, such as road surface condition surveys. Such a vehicle cannot be easily differentiated from normal traffic and it may be travelling at 10 km/h instead of 100 km/h, an extremely hazardous operation. In this event a trailer with high visibility treatment will offer a simple safety device together with a convenient way of carrying test equipment.

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13.4 SETTING OF SPEED LIMITS AT ROADWORKS

13.4.1 General

1 Excessive vehicle speed is a major contributor to accidents at roadwork sites. **The purpose of speed limits is therefore to reduce the number and severity of accidents to minimum levels consistent with the provision of smooth and efficient traffic flow.** At roadworks sites the normal, or anticipated, road environment is changed. The driver, on his first encounter with the roadworks, has difficulty in determining a safe speed through the changed road environment. In addition, detail changes may be made to long term sites so that even the regular user may find his judgement of circumstances inadequate.

2 **It is essential that speed limits are realistic and that the public can learn to respect and rely on them.** In deciding on speed limits for a site the following factors should be taken into consideration:

(a) the design speed of the geometric components of the site;

(b) the applicability of advisory speeds;

(c) the proximity of works and machinery;

(d) traffic volumes and the effects of loss of road capacity;

(e) the likelihood of adequate enforcement of speed limits;

(f) the length of the site.

3 It is important that designs of traffic accommodation measures take these factors into account. **In planning the traffic management and work phases the need for unrealistically low speed limits, over excessive distances, must be avoided.** If a site is long and there is a localised need for a low speed, the speed limit for the whole site should not be dictated by such localised conditions. Speed limits should rather be reduced locally where necessary, with a recommended minimum length of operation within long sites of 300 m to 500 m. Alternatively the use of localised advisory maximum speeds should be considered.

13.4.2 Design Speeds

1 The basic safety principles governing the design speed of permanent roadways should also govern the design speed(s)at roadworks sites. Geometric standards and traffic control should be kept at the highest levels possible. The traffic control plan should be designed on the assumption that drivers will reduce their speed only if they clearly perceive a need to do so.

2 The following factors should be taken into account when deciding on design speeds and these speeds applied to Table 13.3 as potential speed limits:

(a) **Geometry of Travelled Way**

A most important factor in relation to temporary alignment is the horizontal curvature. Figure 13.24 gives details of reverse curve treatment and Table 13.2 covers a range of minimum radii in relation to design speed, superelevation and side friction factor. Since road surface conditions vary widely at changes of direction and at detours, and correct levels of superelevation are rarely provided (reverse cambers or superelevations may even occur), the design engineer should relate his temporary road geometry to the anticipated road conditions, bearing in mind the need for realistic speed limits. Likely values for "e", "i" and "R" for a site can be applied to Table 13.2 to determine an appropriate design speed/speed limit.

In the context of roadworks situations the treatment of tapers in roadway width is also an important aspect of the horizontal alignment presented to drivers. Design criteria for tapers are covered in Section 13.5.

The vertical profile of a road is also a critical geometric element particularly when low standards are applied to temporary elements such as deviations or detours. In the past, poor attention to the combination of temporary vertical and horizontal alignment has often created hazardous conditions within roadworks sites. The effects of low standard vertical alignment must be analysed as part of the traffic accommodation planning process including adjustments to standard positions for signs relating to a subsequent hazard.

(b) **Stopping Sight Distance**

The stopping sight distance is the distance a driver must be able to see ahead in order to stop in safety as illustrated in Figure 13.25. This is normally based on the vertical or horizontal sight line between a driver's eye located 1,05 m above ground level to an object on the roadway ahead which is 0,15 m in height. If altered road markings are a particular feature of the site, consideration should be given to reducing the object height to zero so that the driver can observe the road markings at an adequate distance. Once stopping sight distances have been determined relevant design speeds can be obtained from graphs in Figure 13.25.

(c) **Width of Roadway**

The travelled way is commonly reduced in width at roadworks sites. Particular attention should be paid to conditions when parallel reduced width lanes pass through reverse curves so that sufficient space is available for large vehicles. The following recommended speeds may be related to Table 13.3:

(i)	Rural	3,6 m-3,1 m	-100 km/h
		3,1 m and lower	- 80 km/h
(ii)	Urban	3,6 m and higher	- prevailing speed limit
		3,6 m-3,1	- prevailing speed limit
		3,1 m and lower	- 60 km/h.

If more than one lane width of roadway is available, but insufficient width for two, even narrow, marked lanes, it is recommended that the lane be delineated at a standard width. This will discourage attempts to overtake when insufficient lane width is available.

(continued on page 13.4.4)

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TABLE 13.2 MINIMUM RADII OF HORIZONTAL CURVATURE TABLE 13.2

Anticipated 85% ile Speed (km/h)	R_1(1) (m)	R_2(1) (m)	R_3(1) (m)	R_4(1) (m)
50	80	124	189	248
60	110	186	280	372
70	160	264	393	528
80	210	360	531	720
90	270	477	694	954
100	350	618	887	1236
110	430	786	1113	1572
120	530	986	1375	1972

NOTES:

(1) The figures in Table 13.2 are derived using the formulae:

$$e + f = \frac{v2}{127R} \quad \text{and} \quad R = \frac{v2}{127\,(e + f)}$$

where e is the superelevation rate (m/m)
f is the side friction factor
v is vehicle speed (km/h)
R is the curve radius (m)

and where
- for R_1 e = 0,1 (1 in 10) and f = fmax
- for R_2 e = 0 and f = fmax
- for R_3 e = 0,025 (1 in 40) and f = 0,5 fmax
- for R_4 e = 0 and f = 0,5 fmax

and $f_{max} = 0{,}19 - \frac{v}{1600}$ (ie 0.16 at 50 km/h to 0,10 at 100 km/h for GOOD road surface)

(2) For practical purposes a minimum 85% ile/design speed of 50 km/h is considered realistic. (If significant delays are acceptable this minimum may be reduced 30 km/h in urban areas.)

(3) Values of "e" and "f" have been chosen to cover a normal design range with respect to roadworks deviations. It should be borne in mind that "f" values could be very much lower than 0.5 fmax due to poor road surface conditions (mud, bleeding surface or loose gravel or chippings).

(4) Table 13.2 is not a design table. It is intended as a guideline to demonstrate the effects of sub-standard superelevation and/or side friction factor, to assist designers in their choice of curve radius and/or speed according to anticipated conditions. If values of "e" and "f" can reasonably be assumed, radii can be interpolated, from the table. Since there is a wide daily variation in site conditions this method of selection is likely to be adequate provided the designer assumes the worst likely conditions.

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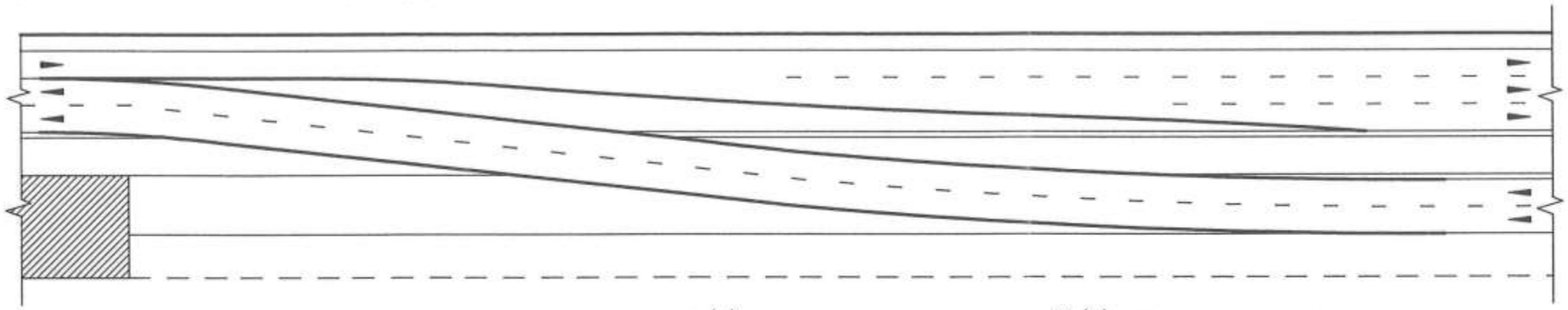
Detail 13.24.1
REVERSE CURVE DESIGN-METHOD 1 - HIGH STANDARD

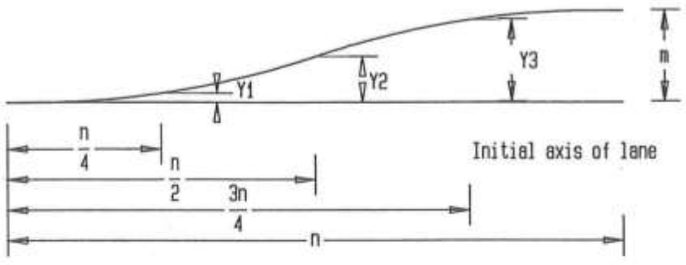
In this method reverse circular curves are designed according to normal geometric standards with a design speed no less than 15% lower than normal operating speed.

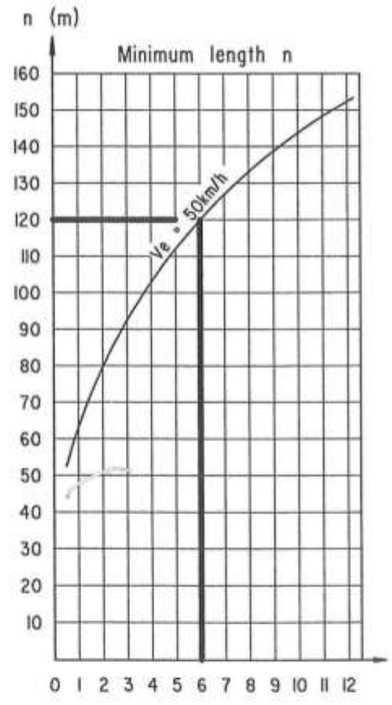


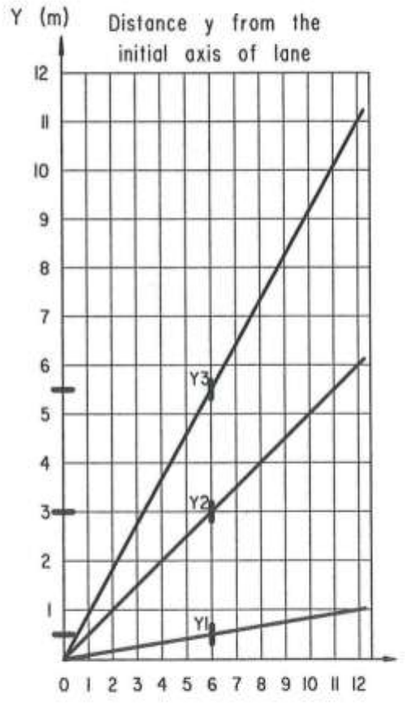
Detail 13.24.2
REVERSE CURVE DESIGN-METHOD 2 - QUICK DESIGN

This method allows rapid site calculation and setting out of reverse curves based on a design speed of 50 km/h.

EXAMPLE : Shift = 6 m Offset Y1 = 0.5 m
L = 120 m Y2 = 3.0 m
Y3 = 5.5 m







Detail 13.24.3
REVERSE CURVE DESIGN-METHOD 3 - PARABOLIC CURVES

This method allows flexibility for quick curve design and is adequate for smaller work areas particularly in urban streets.

$Y1 = X.\frac{1^2}{L^2}$

Where S = total shift

$X = \frac{S}{2}$

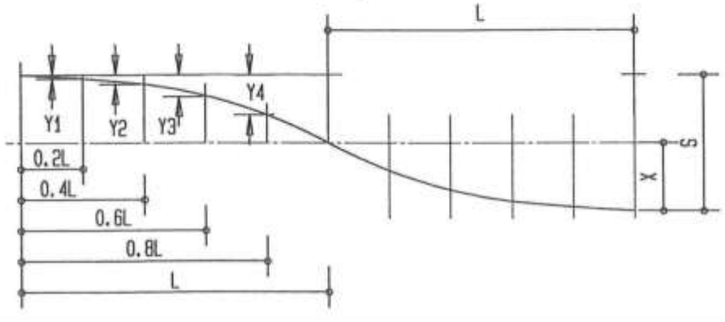


Fig 13.24
Geometry of Travelled Way at Roadworks

(continued from page 13.4.1)

(d) **Workmen Near or Crossing Travelled Way**

Pedestrians and workers are very vulnerable when involved in an accident with a motor vehicle. Special efforts must therefore be made to ensure their safety. As a guide the following speed limits are appropriate when workers are on site (refer to Table 13.3):

(i) 3 m or less from the travelled way - 50 km/h

(ii) more than 3 m from travelled way - 60 km/h(urban)

and no need to cross travelled way - 80 km/h(rural).

(e) **Construction Vehicles Near, Entering or Leaving Roadway**

Large slow-moving construction vehicles are a hazard. When such vehicles are present and active, temporary speed limits as given below should be considered, and referred to Table 13.3:

(i) stationary within 2 m - 60 km/h(urban)

- 80 km/h(rural)

(ii) stationary + 2 m -prevailing speed limit(urban)

- 100 km/h(rural)

(iii) entering or leaving the travelled - 50 km/h(urban)

- 60 km/h(rural)

(provided construction vehicle access is not otherwise controlled i.e. by STOP-GO control, flagman or temporary traffic signals).

(f) **Proximity of Fixed Objects or Excavation**

Fixed objects or excavation close to the roadway have an influence on the severity of accidents. As a guide the following speed limits should be considered, and referred to Table 13.3:

(i) urban area with more than 20 fixed objects per km

- less than 1 m from edge or road - 60 km/h
- between 1 m and 2 m - 70 km/h
- between 2 m and 3 m - 80 km/h

(ii) rural area with more than 10 fixed objects per km

- less than 1 m from edge of road - 70km/h
- between 1 m and 3 m - 80 km/h
- more than 3 m - 100 km/h
- more than 5 m - 120 km/h

(iii) excavation greater than 300 mm - 60 km/h

- 70 km/h.

3 **In the case of high traffic volumes, it is essential that the design speed of the roadworks site be kept as close to the normal design speed of the roadway as possible to reduce congestion, delay and accident potential to a minimum.**

4 If drivers have to travel for long distances at slow speeds, they are likely to become frustrated and make errors of judgement. The length of a section of roadworks should not be used as an argument for increasing the design speed of the whole section above that applicable to localised areas. Rather the length of the site should be limited to avoid widely ranging design speeds within one section.

13.4.3 Summary - Temporary Speed Limits

1 Once the various factors have been considered, and the design speed/limits appropriate to those factors which are relevant have been selected according to the prevailing circumstances, the minimum speed limit can be selected with the help of Table 13.3. If this speed limit is considered unrealistically low, the factor which determined it should be re-examined with a view to upgrading the relevant standards to the requirements for at least a speed limit equal to that determined by the next lowest factor, or the use of a localised advisory maximum speed should be considered.

13.4.4 Speed Limit Enforcement

1 The traditional methods of speed measurement and enforcement can all be used at roadworks sites. However, stopping motorists is rarely safe and causes considerable congestion. There is also rarely adequate space to pull offenders out of the traffic stream. The use of speed enforcement by camera, or other similar means, is therefore considered to be the most effective way of apprehending offenders. The objective, nevertheless, is to get all motorists to reduce speed. It is important, therefore, to make motorists aware that such enforcement is in progress by the use of very visible and repeated signs.

2 If the need for speed limit enforcement has been identified in the planning stage, traffic control plans and contract documents should be flexible enough to be easily modified to include provision for the use of speed control methods such as extra flagmen, traffic officers and enforcement equipment. A unit item approach for the relevant traffic safety items would allow for all contingencies. State, provincial and local authorities are encouraged to make special contractual provisions for the inclusion of the employment of traffic officers in the traffic control plan.

13.4.5 Speed Reductions

1 The need for speed reduction can be effectively indicated by one of two methods:

(a) warning of an advisory maximum speed; or

(b) reducing the regulatory speed limit.

2 An advisory speed supplementary plate may be used in conjunction with an appropriate warning sign to recommend the maximum speed at which a local potentially hazardous section of roadway should be negotiated. The advisory speed should be determined by the resident engineer and the site safety officer after field trials.

3 The specification of a reduced regulatory speed limit is appropriate to long-term and longer distance sites. It is important that the selected speed be not significantly lower than that which drivers would reasonably expect, or that they will tolerate. In determining the speed limit various design speed factors should be taken into account.

4 Motorists may well be reluctant to reduce speed sufficiently. The presence of law enforcement officers, or the use of flagmen in selected locations, are two positive steps which can be taken to achieve more effective speed control.

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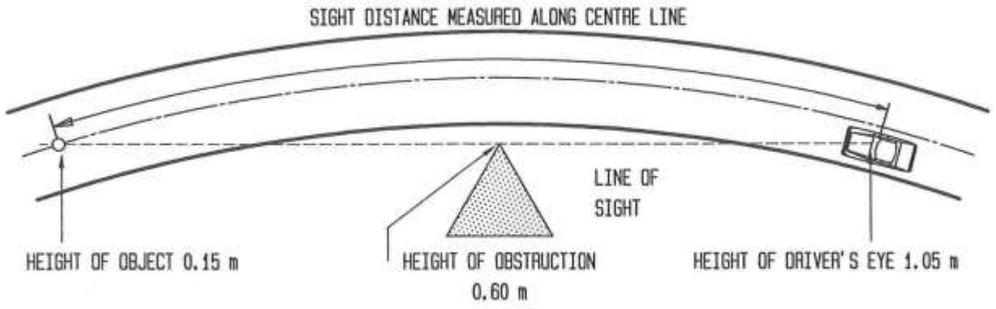
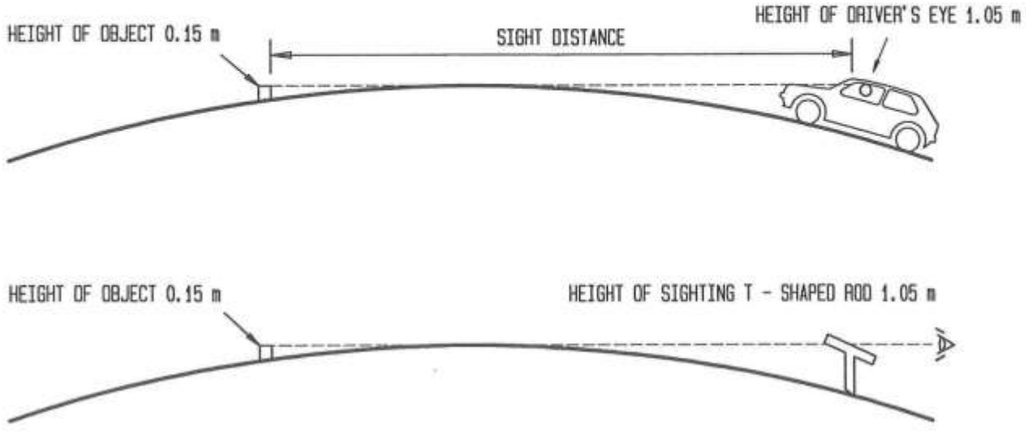
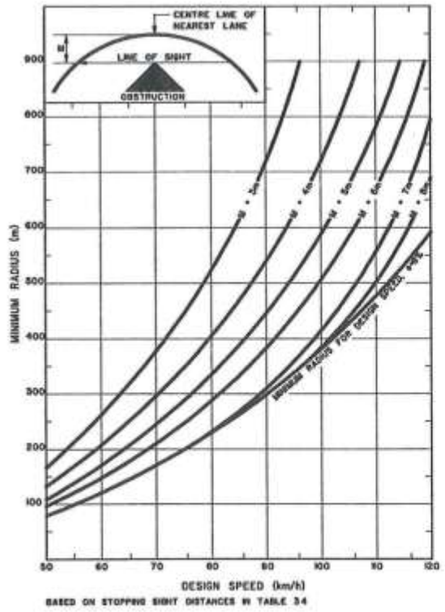
Detail 13.25.1
HORIZONAL STOPPING SIGHT DISTANCE
This sight distance factor is determined by physical obstructions, particularly on road curves.

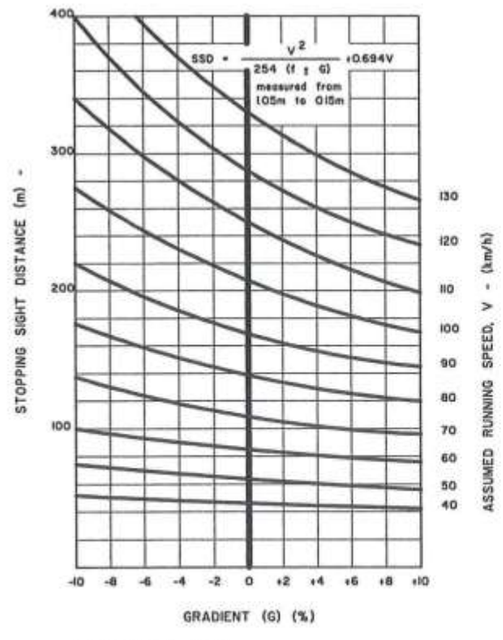


Detail 13.25.2
VERTICAL STOPPING SIGHT DISTANCE
This sight distance factor is determined based on assumptions of driver's eye height above ground and a minimum object height.





Detail 13.25.3
HORIZONAL RADIUS FOR STOPPING SIGHT DISTANCE



Detail 13.25.4
STOPPING SIGHT DISTANCE ON GRADE

Source : TRH17

NOTES ON SIGHT DISTANCE

Stopping Sight Distance is used in this section as a factor in deciding on speed limits. Sight distance has an impact on many other aspects of road design including temporary alignments such as deviations. The following types of sight distance are relevant:

(a) Stopping Sight Distance - SSD

(b) Barrier Sight Distance - BSD

(c) Decision Sight Distance - DSD

(d) Passing Sight Distance - PSD

SSD is expressed as $S = 0{,}694V + V^2/254f$

where S = total distance travelled (m)
V = speed (km/h)
f = brake force coefficient

Barrier Sight Distance (BSD) is the limit below which overtaking should be legally prohibited by NO OVERTAKING LINE marking RM1 (approx. 2 x SSD).

Decision Sight Distance (DSD) should be considered in complex decision situations when the information given to a driver may require a resultant series of actions eg. a lane change before turning or exit (freeway). DSD assumes an object height of 0m.

Passing Sight Distance (PSD) is relevant for long deviations but may be difficult to design for. High degrees of driver frustration are likely to occur in long deviations without PSD when heavy and slow moving traffic occurs.

SSD & BSD ON LEVEL ROADS

Design Speed (km/h)	SSD (m)	BSD (m)
40	50	115
50	65	150
60	80	180
80	115	250
100	155	300
120	210	400

DSD & PSD ON LEVEL ROADS

Design Speed (km/h)	DSD (m)	PSD (m)
40	130	290
50	160	335
60	190	420
80	240	560
100	300	680
120	350	800

Fig 13.25
Stopping Sight Distance – Vertical and Horizontal Curves

5 A flagman may be used to bring greater emphasis to bear on the posted advisory or regulatory speed. The flagman can use his flag to indicate to the traffic to slow down whilst pointing to the speed sign or warning sign with his other hand (see Figure 13.23). Flagmen should be alert and well trained in flagging techniques. They should be clearly visible from at least 60 m to 100 m and should wear high visibility clothing. They should stand so that they contrast well with their background.

Law enforcement officers may be employed effectively in either, or both, of two ways:

(a) a highly visible patrol car can be parked adjacent to the roadway;

(b) the traffic officer, alternatively, may perform a similar function to the flagman, by actively directing traffic to slow down.

6 Figure 13.26 shows a selection of typical roadworks environments in which speed reduction is achieved by a progressive reduction. **A reduction in a posted speed limit should preferably not exceed 15% of the approach speed if it is to be successful in actually reducing operating speeds.** For practical purposes it may be necessary to reduce speed limits by more than one such increment due to site limitations. In the majority of figures detailed in Sections 13.8 to 13.12 this latter approach is illustrated because it represents the greater space and signing requirement. **This should not be interpreted as over-riding the preferred 15% maximum reduction in the speed limit.** For further details refer to the notes with Figure 13.26.

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TABLE 13.3 SELECTION OF SPEED LIMIT TABLE 13.3

	Factor	Selected Speed Limit						
(i)	Geometry	50	60	70	80	90	100	120
(ii)	Stopping sight distance	50	60	70	80	90	100	120
(iii)	Width of roadway		60	70	80		100	
(iv)	Workmen near	50	60		80		100	
(v)	Construction vehicles	50	60	70	80		100	
(vi)	Proximity of fixed objects		60	70	80		100	120

NOTES:

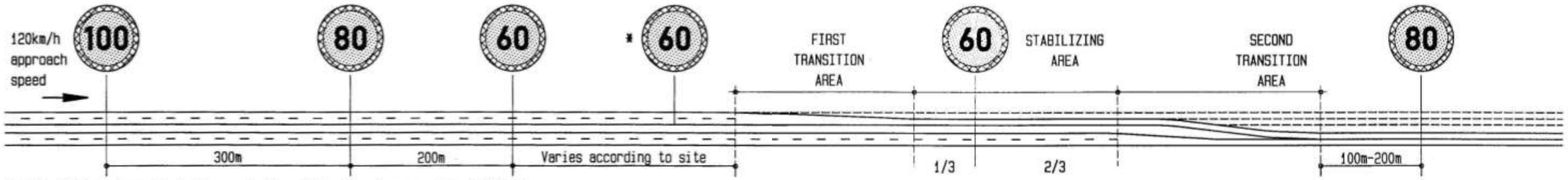
(1) It is presumed that the road surface of a detour or deviation is maintained in a condition which is safe at a speed limit selected from Table 13.3.

(2) In deciding on the speed limit for the "geometry" factor other secondary factors may be used to "weight" the speed limit chosen (either up or down).
Such factors are:-
- quality of delineation;
- traffic volumes;
- class/standard of roadway (single/dual carriageway).

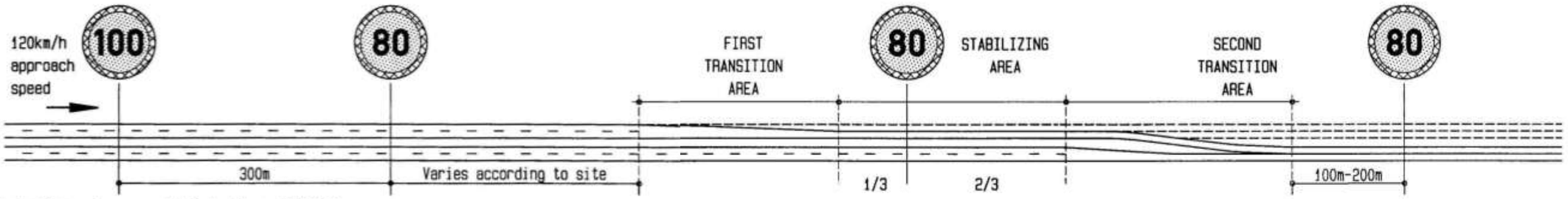
(3) The "width of roadway" factor may be adjusted according to the following secondary factors:-
- number of lanes per direction;
- availability of shoulders;

(4) • passing opportunity.

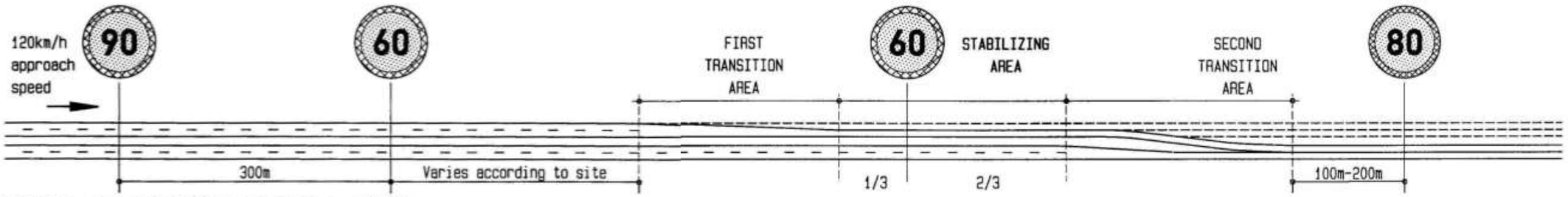
(5) Every effort should be made to keep the length of a long construction site to a minimum consistent with the design speed of the roadworks deviation and the acceptability of a similar speed limit to motorists.



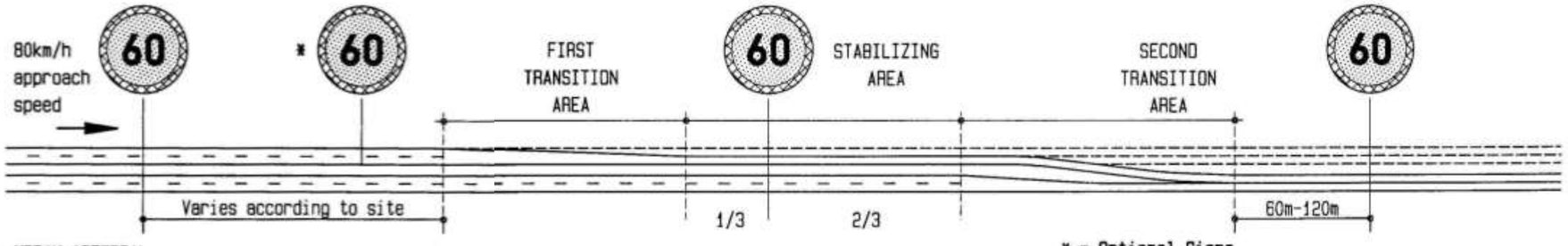
Detail 13.26.1 Speed Reduction - Maximum Reduction Recommended - FREEWAY



Detail 13.26.2 Speed Reduction - Recommended Reduction - FREEWAY



Detail 13.26.3 Speed Reduction - Optional with Space Limitation - FREEWAY



Detail 13.26.4 Speed Reduction - Recommended Treatment - URBAN ARTERIAL

* = Optional Signs

NOTES:

1 The above details show temporary SPEED LIMIT signs TR201 only. For details of all other signs see figures in Sections 13.8 to 13.12.

2 In each detail there is a section marked "varies according to site". The length of this section should be in the range of 100 m to 200 m for a free-flowing site. If a site is subject to regular congestion this length should be increased accordingly so that traffic approaching in the previous speed reduction section can either:

(a) see and recognise the end of a stationary queue; or

(b) judge that traffic is flowing at a speed lower than the posted 60 km/h.

3 **Notwithstanding the fact that the figure shows reductions from 120 km/h to 60 km/h it is strongly recommended that roadworks site geometry, for intended free-flowing situations, be designed so that the speed through any transition area can be set at a maximum of 15% below the operating approach speed (see Detail 13.26.2).**

4 When it is not possible to design the site geometry to a free-flow standard, speed reduction should be signed in steps so that each is approximately a 15% reduction on the speed previously posted (see Details 13.26 1 and 13.26.4).

5 In situations where recommended speed reduction distances given in Details 13.26.1 and 13.26.3 cannot be accommodated, larger speed reduction steps of up to 25% may be considered. **However, such a treatment should be considered when congestion is not likely to occur and it must be realised that such reductions in speed may require actual vehicle braking rather than a more comfortable rate of deceleration.**

Fig 13.26
Recommended Speed Limit Signing for Speed Reduction Within an Advance Warning Area

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13.5 TEMPORARY DELINEATION

13.5.1 General

1 A change of alignment at roadworks generally occurs within transition areas (see Subsection 13.3.3), or on detours completely separated from the road under construction. The details given in this section refer mainly to conditions where such changes of alignment require particular attention and action on the part of the driver. They do not cover normal, and sometimes sub-standard, changes of alignment required by the topography of the countryside through which a detour has been built. Such situations should be signed in the normal way using warning signs conforming to the temporary road traffic sign colour code.

2 The channelisation required at change of alignment is achieved using techniques and delineation devices as detailed in the following sub-sections.

13.5.2 Delineation

1 The traditional device used to provide delineation in South African has been the 200 litre drum. **The use of drums should be phased out and they should no longer be specified in contracts or used by road authorities.** Drums should be replaced by DELINEATOR PLATES which should be manufactured to the requirements given in Volume 4 from the safest possible materials. **Plastic delineators and bases are available and are recommended. The specification of plastic delineators may have cost implications from time to time but additional initial purchase costs may well be offset due to re-usability and reduced claims for damages from the public.**

2 **DELINEATOR PLATE signs TW401 and TW402** have been developed to provide a safer, more visible (by day and night) device with which to indicate to drivers changes in alignment or areas of work. The plate may be used in combination with other delineation devices such as temporary barricades, barriers, roadstuds and road markings.

Four sizes of plate are available and their use is recommended as follows:

(a) 150 mm x 600 mm
- intermediate use on long rural sites with straight sections of roadway;
- minor urban works;

(b) 200 mm x 800 mm
- short rural sites and localised sections of above average hazard potential at rural sites;
- urban class "B" (arterial) streets and other complex sites;

(c) 250 mm x 1000 mm
- higher speed rural and urban sites, in particular freeway sites.

(d) 300 mm x 1200 mm
- special applications where extra emphasis is required.

Examples of the plates are given in Figure 13.27 and dimensional details in Volume 4. The delineator stands should be designed not to overturn when subjected to wind gusts of 60 km/h and to collapse under impact in the safest possible manner. Specific examples of how and where delineators should be used are given in the Sections 13.8 to 13.12.

3 **TRAFFIC CONES TD4** manufactured in a fluorescent red-orange or fluorescent red plastic material should be used only at minor short-term roadworks sites during daylight. They may also be used in connection with mobile maintenance operations such as grass cutting, sign cleaning, road marking, street light repair, etc. Cones used in urban areas with low speed traffic should be a minimum of 450 mm high. For higher speed applications a minimum height cone of 750 mm should be used. If work at sites where traffic cones are in use is forced to continue into dusk and/or night time, all cones must be fitted with white retroreflective sleeves or they must be replaced with DELINEATOR PLATE signs TW401 or TW402. The sleeves may be removable.

4 **GUARDRAIL DELINEATORS TDI,** or similar delineation devices, should be used to demarcate the line of any temporary barrier provided at a roadworks site in terms of Subsection 13.5.4. Device TDI is designed for use with a W-Section Guardrail. If a similar device is required to demarcate some other form of barrier, such as a portable shaped concrete barrier, the shape and mounting may have to be adapted.

5 **Temporary ROADSTUDS** are recommended at changes of alignment on all Class A and B roads and other hazardous locations. They may be used to supplement DELINEATOR PLATES and/or temporary NO OVERTAKING line. Temporary roadstuds should only be used strictly in accordance with the standard roadstud colour code given in Volume 1, Chapter 7.

6 **Temporary ROADMARKINGS** should be retroreflective and are essential at any position where the temporary roadway is diverted from the normal roadway, such as at tapers, crossovers and detours. It is equally important that in these situations the existing standard road markings be erased or covered by temporary black tape or by painting out with a matt (non-reflective) paint. The painting of temporary road markings should be carefully planned and co-ordinated on major roadworks sites to minimise the need to change or erase these temporary markings. Constant erasing and variation in longitudinal road markings can produce a situation which, under adverse light conditions, makes it impossible for drivers to tell which lines are correct. Temporary retroreflective road marking tape is best suited to temporary markings which are going to be in position unchanged, for a long period of time, or for a very short period of time. On high class roads, the erasure of markings by wet (or dry if traffic permits) grit blasting or high pressure water jet is recommended.

7 **Plastic DELINEATOR TAPE TD5**, Is widely used for delineation purposes. however, the capability of the tape to provide effective delineation, as opposed to hazard identification, should not be over-estimated. It is recommended that the use of TD5 tape be reserved for low speed urban environments, or the identification of specific hazards, obstacles or excavations at the roadside, or within the work area, **in addition to the other necessary delineation devices.**

(continued on page 13.5.4)

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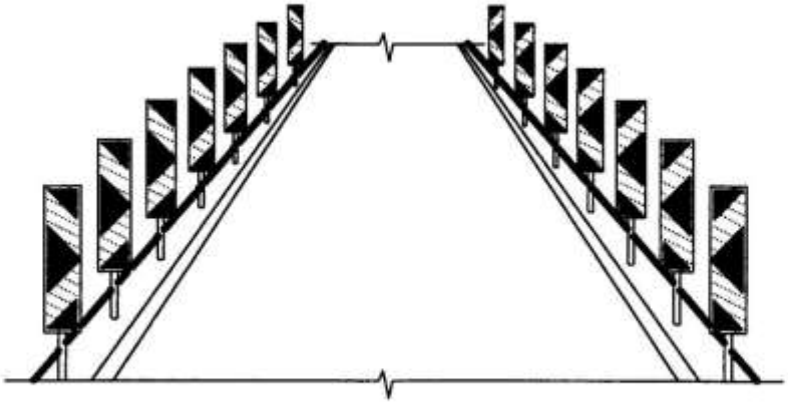
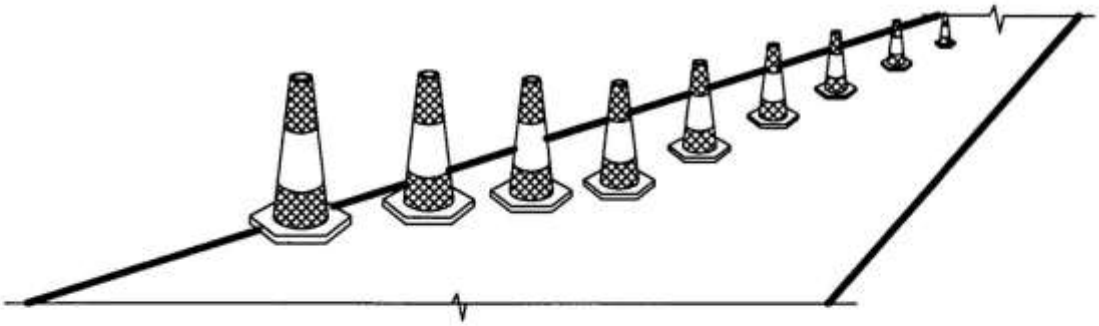
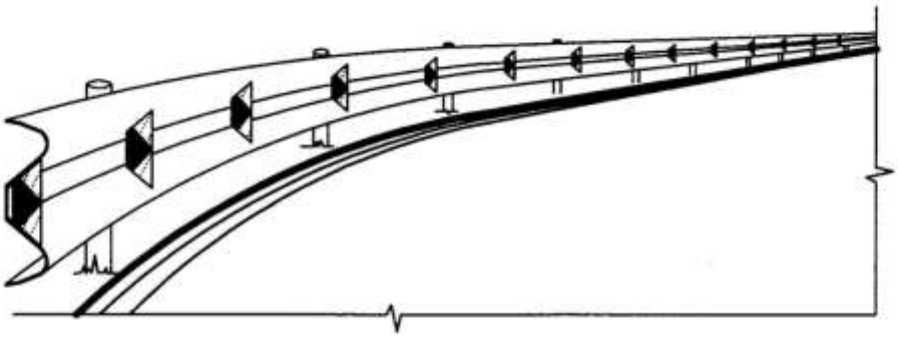
Detail 13.27.1 - DELINEATOR PLATES TW401/TW402



Detail 13.27.2 - TRAFFIC CONES TD4



Detail 13.27.3 - GUARD RAIL DELINEATORS TD1



Detail 13.27.4 - BARRICADE TW411/KEEP RIGHT TR104 COMBINATION (Typical Example)

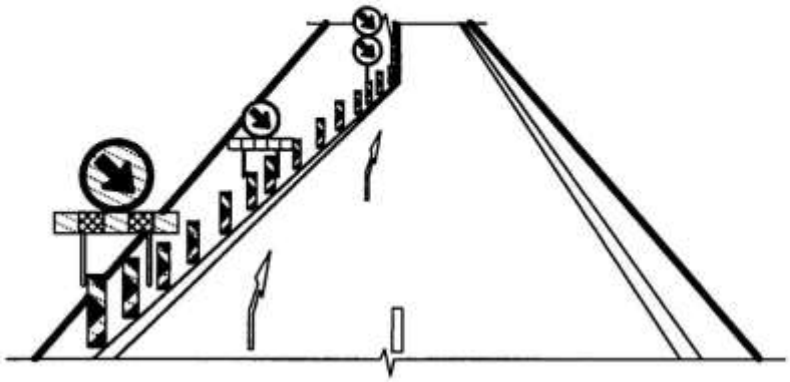


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Fig 13.27 **Typical Delineation Devices**

TABLE 13.4 DELINEATOR, CONE AND ROADSTUD SPACING AT ROADWORKS TABLE 13.4

Temporary Condition		Delineator or Cone Spacing (m)	Roadstud Spacing (m)
Transition taper	- 1 in 10	3	1-2 (4)
	- 1 in 20	5	5 or 6 (1)
	- 1 in 30	7	5 or 6 (1)
	- 1 in 40	10	5 or 6 (1)
Transition crossover	- curve (2)	5 to 10	1-2 (4)
	- straight (3)	10	12
Stabilising of work area (according to site conditions)		10 to 15	12
		20 to 50	24
Termination taper	- 1 in 5	5	12 or 24
	- 1 in 10	7	12 or 24
Straights	- short	10	12
	- long rural (5)	200 max	(6)
	- freeway or high speed road (7)	50 max	(6)

NOTES:

(1) Choose spacing to best fit with adjacent sections. Different spacing should be used on adjacent sections,according to the table, **to achieve the necessary visual impact on the sections of greatest hazard.**

(2) The figures given apply to outer curves at crossovers; the spacing may be increased to 10m to 20 m on inner curves or the delineators omitted altogether.

(3) This spacing refers for straights between reverse curves, if used.

(4) In urban areas or where the curve radius is 60 m or less a 1 m spacing is recommended.

(5) On long rural straights the delineator size may be reduced to 600 mm x 150 mm as well.

(6) Temporary roadstuds need only be used on straights if conditions required by the warrants given in Volume 1, Chapter 7 are applicable i.e. standing water, construction dirt, fog etc.

(7) Experience has shown that spacings greater than 50 m on freeways may encourage drivers to move onto the work area.

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(continued from page 13.5.1)

8 Delineator spacing depends on the speed and volume of traffic, and the vertical and horizontal alignment at the change of direction. Table 13.4 gives guidance on spacings. Site engineers should be prepared to adjust their delineator plates to best advantage by visual inspection on site. For rural sites it is recommended that the standard spacings given in the table be adhered to at all changes of alignment and areas of concentrated work activity. It is characteristic of such sites, however, that long sections of often straight road will stand for periods of time between phases of construction. In this event the spacing and size of delineators may be increased and reduced respectively. It should be noted, however, that any spacing greater than 50 m makes it relatively easy for vehicles to pass between the delineators, to the wrong side, and at speed.

13.5.3 Barricades

1 Barricades can take many forms, but **should always be visible and portable**. The objective of a barricade is to demarcate the work area or an area restricted to site vehicles only. If delineators have been used then it will rarely be necessary except at the beginning of a site or in transition areas to use barricades. For small amounts of shift in alignment one barricade sign combination should be used. If the shift in alignment is one lane width or more, two or more barricade sign combinations should be used. Details of a typical barricade sign combination are given in Figure 13.27.

2 Barricades may commonly be used on their own in urban areas to redirect pedestrians or to indicate trenching, particularly by service agencies which have to carry out excavations in the roadway or footpath. Where these are used with vehicular traffic, they shall have a night time visibility capability.

13.5.4 Barriers

1 Barriers must be sufficiently fixed to give physical protection to traffic and workers alike. Typical barriers are W-section steel or portable shaped concrete (New Jersey) section mounted in accordance with prevailing South African Bureau of Standards requirements. The alignment of barriers shall be defined for night time visibility by GUARDRAIL DELINEATORS or similar devices. Special effort should be taken to make the face of concrete section barriers visible, particularly at night and under conditions of bad visibility.

2 When portable concrete barriers are used, particular attention should be paid to the end treatment of the barrier. On low speed approaches a minimum of three sections should be tapered away from the line of traffic flow and a loose sand bag or open graded stone heap should be placed at the end facing on-coming traffic. (Note: the specification for open-graded stone should be as for use in arrestor beds). This treatment should always be used on high speed approaches unless a full standard taper or curve of portable barriers is used to offset the end from the path of approaching traffic (see Figure 13.28).

3 Barriers should be installed in the following cases:

(a) where the fill is more than 4 m with no recovery area;

(b) where water next to the road formation is deeper than 1,5 m;

(c) at all bridges;

(d) where obstructions appear to be more dangerous than a guardrail would be;

(e) in restricted areas between opposing flows of high volumes of traffic.

4 Brief details relating to barriers and their use are given in Figures 13.28.

13.5.5 Tapers

1 Tapers are used in transition areas on the approach to a work area to achieve a reduction in road width or to drop a lane altogether, and in termination areas at the end of the work area or deviation, to restore the normal roadway width to traffic. It is extremely difficult to predict actual traffic running speeds in roadworks sites. Even with clear signing and regular enforcement, speeds are likely to vary widely. It is therefore recommended that taper lengths (or rates) be specified which are appropriate to the top of the likely speed range. Table 13.5 and Figures 13.20 and 13.29 give details of different types of taper.

2 Tapers are used in a number of different ways even within, for example, a transition area. The function of the taper has an effect on its recommended length. The following types of taper may be specified as illustrated in Figure 13.20, and their relative lengths, as a "rule of thumb," are indicated as a function of L (as given in Table 13.5):

(a) merging taper - L m;

(b) shift taper - 0,5L m;

(c) shoulder taper - 0,3L m;

(d) termination taper - 0,3L m.

13.5.6 Crossovers

1 When a crossover is provided, it should allow traffic to transfer smoothly from its normal roadway position to a temporary position. The treatment of such a crossover must take into account the likely conventional reverse curve standards for the anticipated speed and, if lane widths have been reduced on the approaches, extra widening should be provided through the reverse curve to allow for the swept path of heavy vehicles and their trailers. This refers to side by side lane layouts in either opposing directions or the same direction. An example of this treatment is given in Figure 13.24.

2 For shorter term installations, the use of parabolic reverse curves set out using offsets is recommended. The design of these should take into account speed and shift. An example is given in Figure 13.24. On wide carriageways of three lanes or more, when a shift of more than one lane is required, the use of reverse curves in preference to a taper is recommended.

13.5.7 Flashing Lights

1 Yellow flashing lights may be used to give added emphasis to the signing or delineation of a potentially hazardous location. Their application could be appropriate either singly, in pairs or in sets, to the following temporary conditions:

(continued on page 13.5.7)

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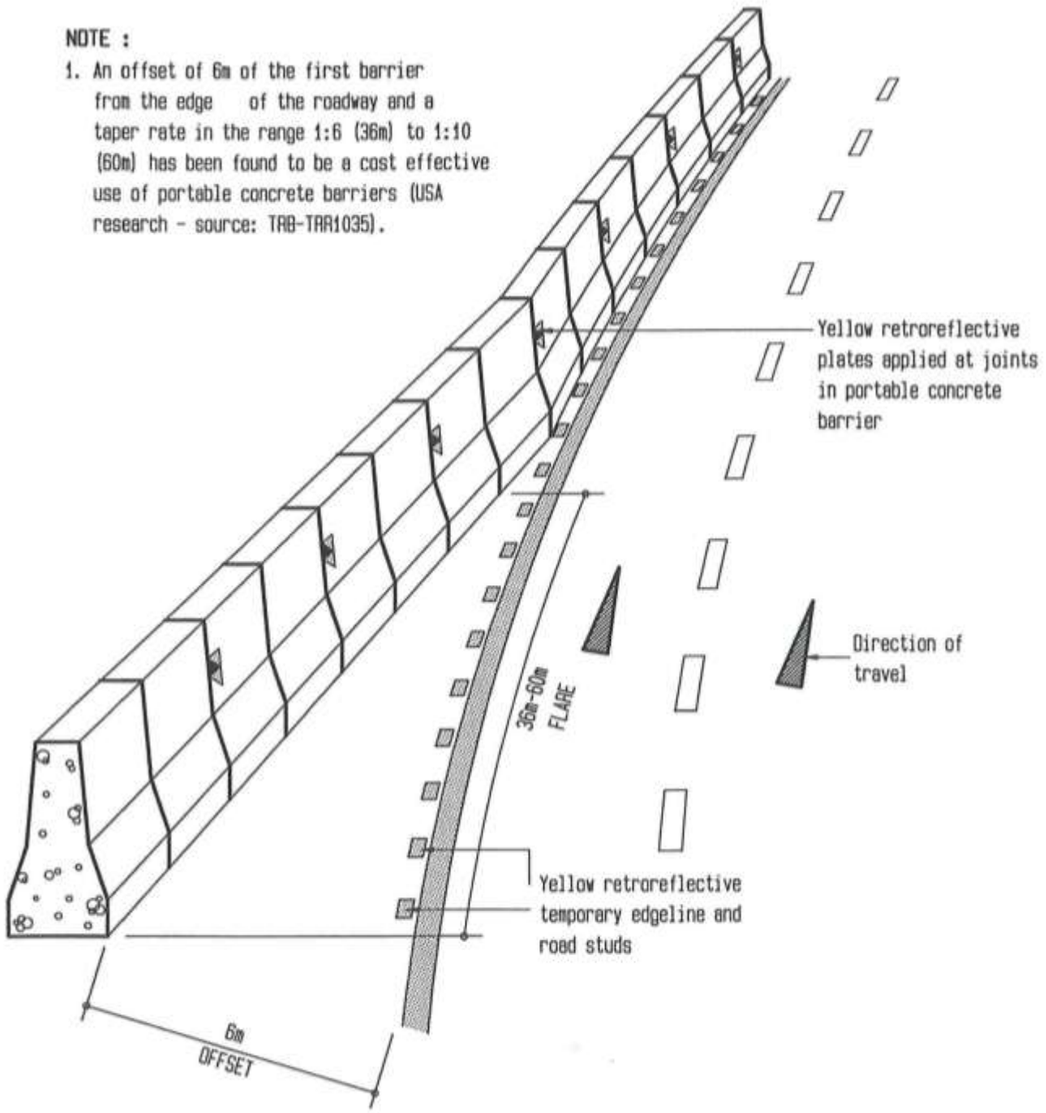
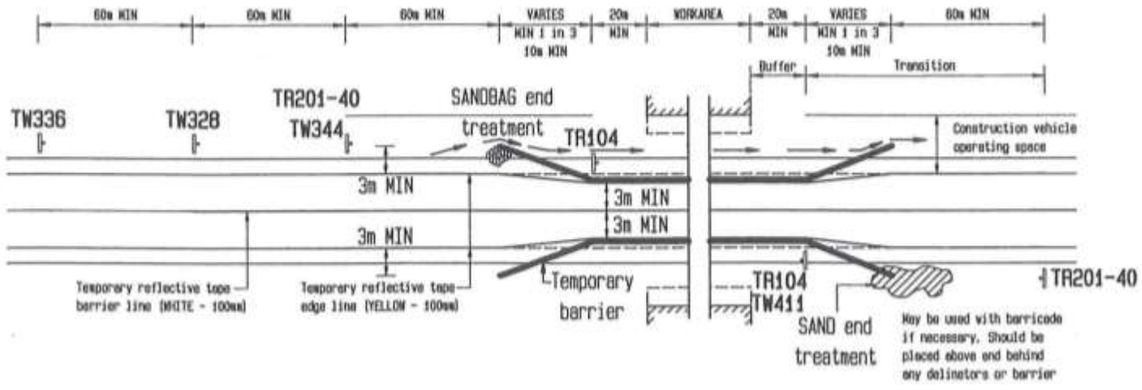
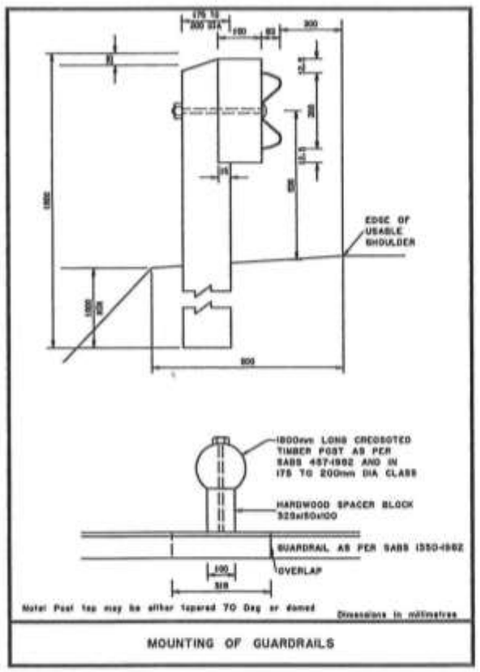
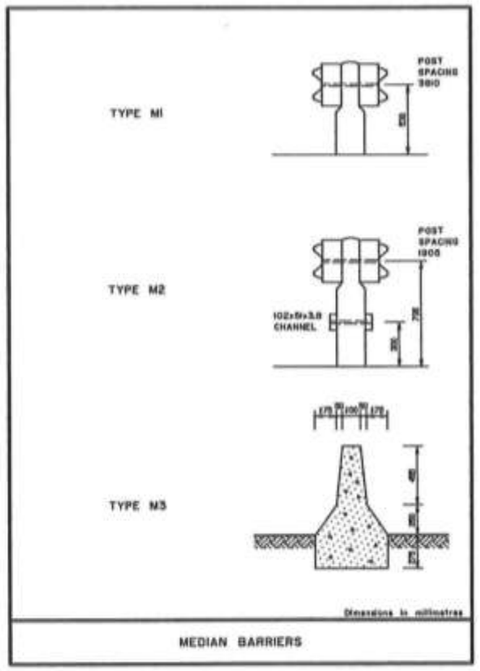
NOTE :

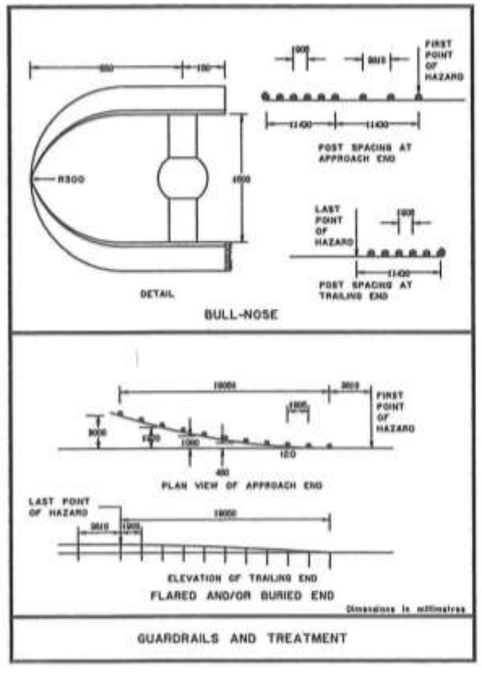
1. An offset of 6m of the first barrier from the edge of the roadway and a taper rate in the range 1:6 (36m) to 1:10 (60m) has been found to be a cost effective use of portable concrete barriers (USA research - source: TRB-TRR1035).

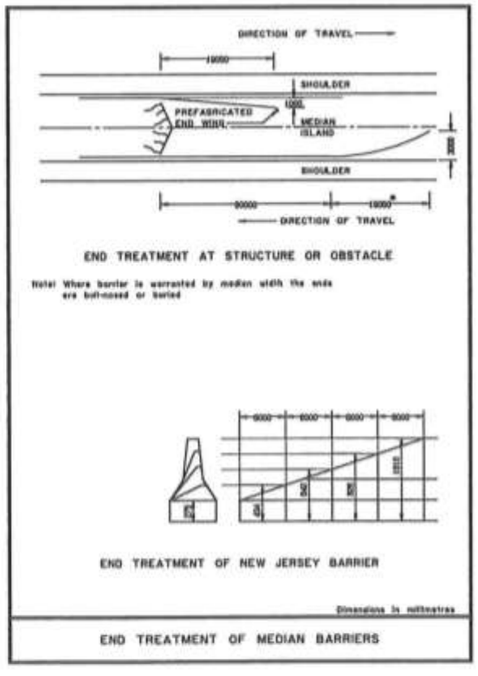












Source: TRH17

Fig 13.28
Barrier Details

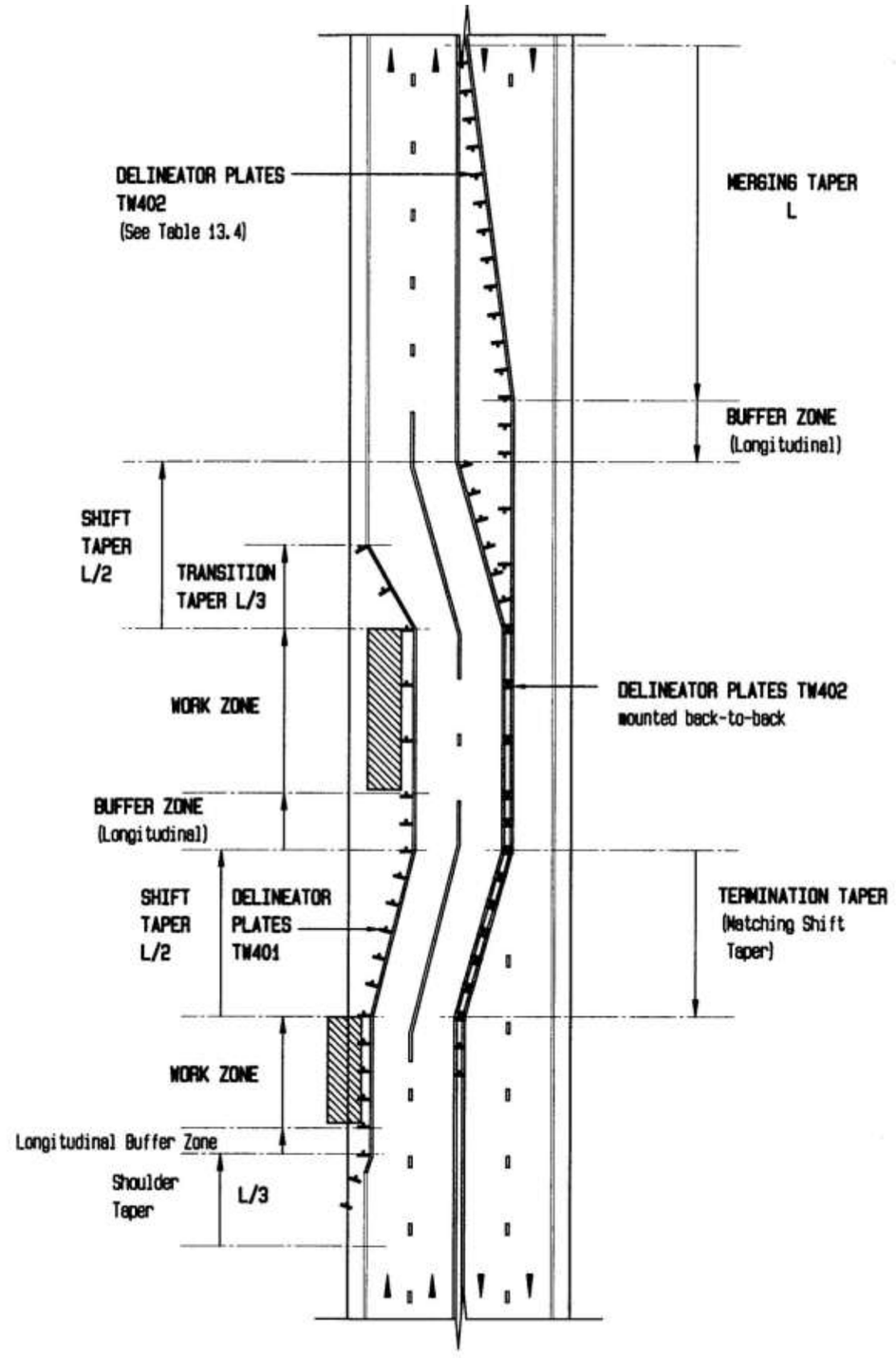


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Fig 13.29 **Taper Details**

(a) lane drop tapers and crossovers with restricted visibility or potentially high approach speeds;

(b) at barricades or barriers particularly at road closures;

(c) at deep excavations in front of or to the side of the travelled way;

(d) to warn in advance of limited vertical clearance at a structure (the use of red flashing lights, representing a STOP condition, should be considered at the structure; these should be capable of being triggered by an advance height sensing device);

(e) urban service trenching with a limited lateral buffer space to the travelled way;

(f) with individual warning signs.

2 When flashing lights are to be installed, the following factors should be considered:

(a) mounting height;

(b) frequency of flash;

(c) brightness(light intensity)-with different day and night settings;

(d) maintenance.

There are no South African specifications for flashing lights as used at roadworks. For details refer to British Standards or Australian Standard 1165-1982 - "Traffic Hazard Warning Lamps".

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TABLE 13.5 TAPER TREATMENT AT ROADWORKS TABLE 13.5

Condition		Taper Rate (2)	Rounded Length (L) for 4 m shift (nominal lane width 3,7 m) (3)
A.	Transition Tapers (1)		
	120 km/h - 80 km/h approach speed	1 in 50 to 1 in 40	200 m to 150 m
	80 km/h - 60 km/h approach speed	1 in 30 to 1 in 20	120 m to 60 m (3)
	60 km/h - 40 km/h approach speed	1 in 20 to 1 in 10	80 m to 30 m (3)
	under 40 km/h approach speed	1 in 10 to 1 in 5	40 m to 20 m (3)
B.	Termination Tapers		
	All (4)	1 in 10 to 1 in 5	40 m to 20 m (4)

NOTES:

(1) Refer to Volume 1, Glossary of Terms. Other tapers may be used to close off shoulders on high class roadways. These may be much shorter than transition and termination tapers. (1 in 5).

(2) When writing specifications for tapers on plans or in documents **it is preferable to give pre-determined overall lengths rather than taper rates.**

(3) Urban lane widths will normally be less than 3,7 m. The shorter lengths given equate to a 3,0 m lane width.

(4) Depending on the side on which a lane may be re-developed, the added lane side should develop at 1 in 10 and the shoulder side at 1 in 5 (Termination tapers).

(5) The lengths given may be increased or reduced proportionally for tapers over more or less than a lane width subject to an overall minimum taper length of 10 m (and three delineation devices).

(6) A taper should never be extended continuously over two lanes. If it is required that two lanes be dropped this should be achieved by dropping each lane one at a time separated by a stabilizing area.

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13.6 CONTRACT SPECIFICATION

13.6.1 General

1 It is important that the specification and control of roadworks sites be significantly improved. In order to improve safety and efficiency new traffic management and signing techniques are available. These "tools" must be used well to simplify the tasks of the engineer in charge, and of the contractor, and to make site conditions more predictable and credible to drivers.

2 A traditional method of contract payment for traffic accommodation, namely that of "lump sum" payment, results in an inability of an engineer in charge to adequately ensure that the contractor pays attention to the necessary detail. The complexity of major sites requires a flexible approach to signing and management. This has to be carried through into contract specifications to enable fair payment to the contractor and effective control by road authorities and their agents. Traffic management techniques recommended in this chapter encourage a systematic approach to signing and management which should make tender pricing more simple for contractors, and installation and reaction to change on site, easier once the job is underway.

3 It is recommended that contract specifications call for tenders based on itemised pricing. This approach may be used in combination with "provisional sums" to cover unplanned changes in traffic accommodation which will always occur. However, the "provisional sums" should be used more as contingency items instead of being paid out on a proportional basis through the contract period.

4 Temporary items which should be covered by individual rates are:

(a) temporary signs (rate per sign area including direction signs);

(b) delineator plates and stands;

(c) traffic cones;

(d) barricades;

(e) barriers (guardrail, portable concrete etc);

(f) flashing lights;

(g) road marking (rate per width, colour, type of temporary marking);

(h) roadstuds;

(i) sandbags;

(j) cleaning of road traffic signs.

5 Care must be taken in specifying how the temporary signs should be provided on the site. This can be done in a number of ways:

(a) supply only - with separate rates for erection and relocation;

(b) supply, erect and maintain for contract period;

(c) supply and erect with a daily or weekly maintenance extra rate (to be ordered by the engineer in charge - maintenance rates may include for cleaning, inspection, relocation or put into storage).

6 Major contracts have, in the past, included severe penalties in an effort to keep tight control of the temporary signing and to get the support needed for the contractor to achieve this objective. These penalties can be specified by the hour, for failure to supply listed signs within a specified time period (a number of hours), or a non-listed sign within a reasonable number of days (5 days has been used and should be adequate close to major centres). These same contracts have also included an ultimate penalty of closing down all work if the contractor has failed to take necessary precautions for the safety and convenience of public traffic.

7 Such drastic measures should never need to be implemented. It is, therefore, recommended that contract specifications require that a member of the contractors staff be nominated as the "Site Safety Officer" with specific responsibilities to keep the temporary traffic accommodation requirements up to specification.

8 The correct application and enforcement of speed limits may have an effect on the way in which a contract is specified (see Section 13.4).

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13.7 OTHER SITE FACTORS

13.7.1 General

1 Whilst the main objective of this Chapter is to provide for as standardised an approach to the analysis of the traffic management and temporary signing of roadworks situations as is practical, it is also necessary to draw the attention of practitioners to aspects which can easily be forgotten or taken for granted. In fact they may require additional thought and attention. The following factors should therefore be considered during the planning stage of a project, or even once a project has started, if certain hazardous areas have been identified.

(a) are retroreflective materials according to specifications?

(b) would replacement of an existing sign with one with a higher grade of material help solve an identified problem?

(c) should additional high visibility techniques be used?

(d) are signs and markings being properly maintained?

2 No site should therefore be considered to be, in fact, "standard". Site staff responsible for traffic management should develop an awareness for whatever unique or peculiar factors a site may have, and should be prepared to compensate for these in their traffic management design and signing solutions.

3 The most insignificant maintenance operation could result in the death of a worker if a high level of awareness of prevailing conditions is not maintained by all on site. The factors covered in the following subsections are all important in ensuring that all roadworks sites operate safely and efficiently.

13.7.2 Materials for Temporary Signs

1 When ordering signs for temporary roadworks use, the rough handling which these signs are commonly subjected to should be borne in mind. It is not generally cost-effective to specify long-life materials for temporary signs. Since many signs need to be erected and removed several times during the time-span of a job, the use of light-weight materials should be considered.

2 The retroreflective and other materials recommended for use on temporary roadworks signs are as follows:

(a) black - semi-matt finish;

(b) yellow background - Class I;

(c) red - Class I.

3 Those responsible for accepting signs onto a site, or for ensuring their effectiveness, must make certain that the retroreflective materials conform to specifications. **Materials of a grade lower than Class 1 may well not perform acceptably even from new, and should not be used.** It must also be remembered that although covered with a retroreflective material all signs also have to perform effectively during daytime. The daytime luminance of certain retroreflective materials, or worn or dirty signs, may be inadequate particularly when displayed against a wintery bush veld background.

4 If it is required to draw special attention to a particular part of a roadworks site the use of special grade or even development of grade yellow retroreflective sheeting, available from some suppliers, is recommended. **This material has very high quality retroreflective properties and excellent daytime luminance.**

5 Although not recommended, as an absolute economy, signs which will **only** be used during daylight hours may have a paint finish, **unless otherwise required in terms of the Road Traffic Act** (generally regulatory signs). However, care must be taken to avoid their use under adverse visibility conditions, at dusk or at night. All signface materials used should conform to the requirements of SANS 1519-1:2006 and 1519-2:2004.

13.7.3 High Visibility Treatment

1 The signs comprising the temporary roadworks signing system have been developed around a specification for high conspicuity. There are times, however, when an even greater effort is needed to improve the conspicuity of parts of the roadworks scene. Such an effort is particularly appropriate when the object concerned is small (a worker), or on its own (a single vehicle), in amongst the confused backdrop of a typical construction area.

2 Special high visibility treatment is therefore recommended for:

(a) workers clothing;

(b) construction vehicles, plant and machinery;

(c) slow-moving maintenance and survey vehicles;

(d) any vehicle used to travel in the opposite direction to on-coming traffic e.g. median grass cutting on a freeway.

3 All workers at roadworks sites should wear conspicuously coloured clothing. Overalls and "hard" hats should be red-orange, orange or yellow in colour.

4 Any worker, or official, involved in traffic control operations or in work which requires him to regularly operate close to the travelled way, or to cross the travelled way, should wear a high visibility waistcoat or vest of the sort illustrated in Figure 13.30. This clothing should include fluorescent materials for best performance during dusk or in mist, and retroreflective materials for night time visibility.

5 All site vehicles should be equipped with one or more yellow flashing lights which shall be maintained in working order. Flashing lights fitted must be in use at any time when a site vehicle or any vehicle delivering materials is parked or operated close to traffic.

6 All vehicles should be regularly cleaned and should be painted in light, and preferably bright, colours. The use of additional boards or rear panels, covered in highly visible fluorescent and/or retroreflective materials, is very effective in improving the conspicuity of construction vehicles, plant and machinery.

7 If certain vehicles are regularly used for specific tasks in close proximity to traffic it is recommended that the rear of the vehicles be specially treated to make them highly visible. Such high visibility treatment may include an appropriate temporary road traffic sign (see Figure 13.31).

13.7.4 Maintenance of Temporary Signs

1 The nature of roadworks sites is such that dust or mud is deposited on the retroreflective surface of signs, delineators and barriers. This will lead to a very rapid reduction in the daytime

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conspicuity of the signs. DELINEATOR PLATES, which are mounted very close to the road surface, will be particularly subject to this problem. Dirty retroreflective signs will also rapidly lose a significant proportion of their night-time effectiveness. A regular cleaning programme must therefore be undertaken. Signs must be replaced once they are no longer effective. Site safety personnel must agree on an inspection procedure to identify signs that should be replaced.

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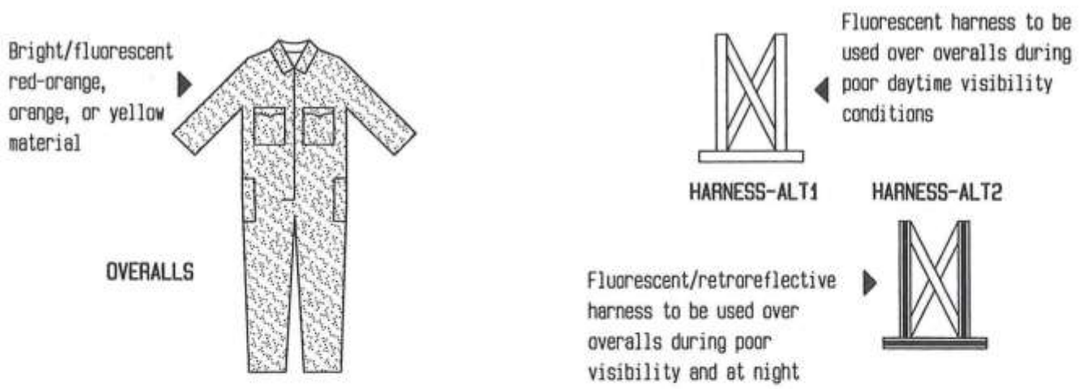
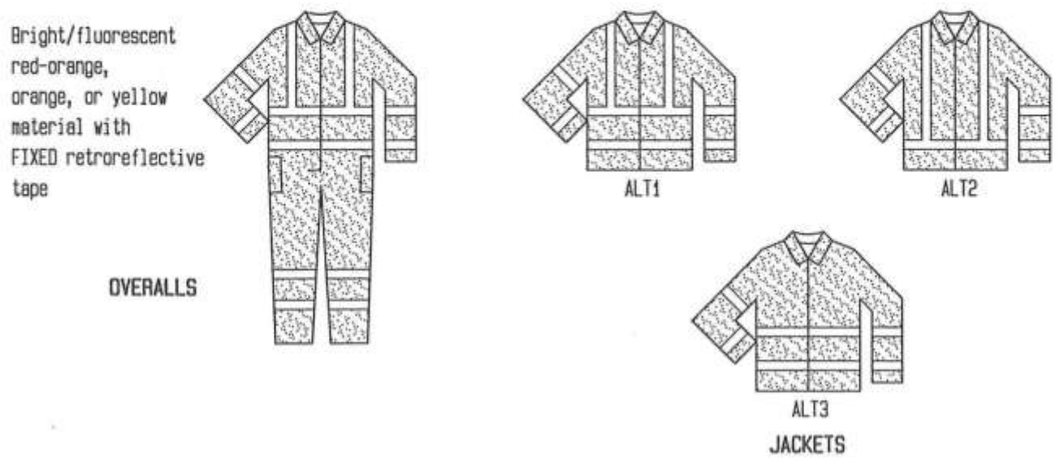
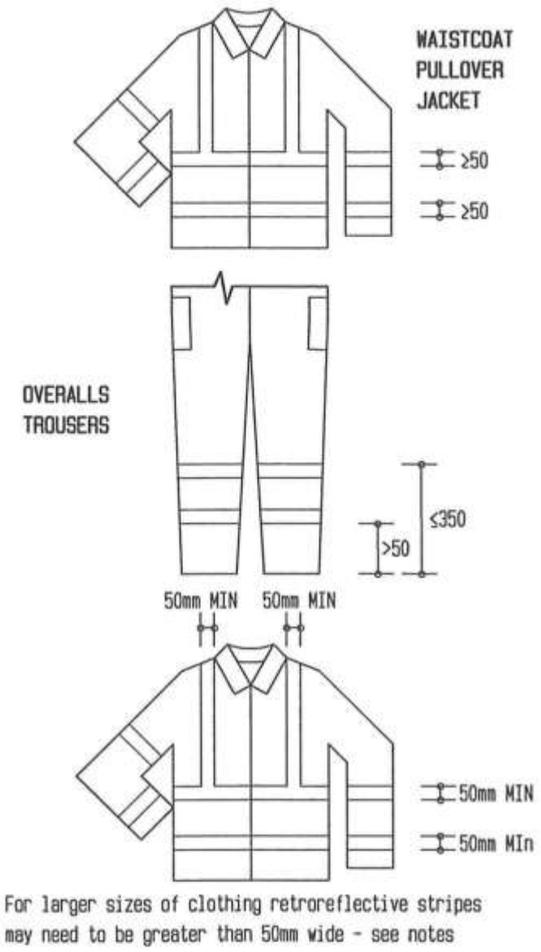


Detail 13.30.1 Level 1 Clothing - Minimum Requirement

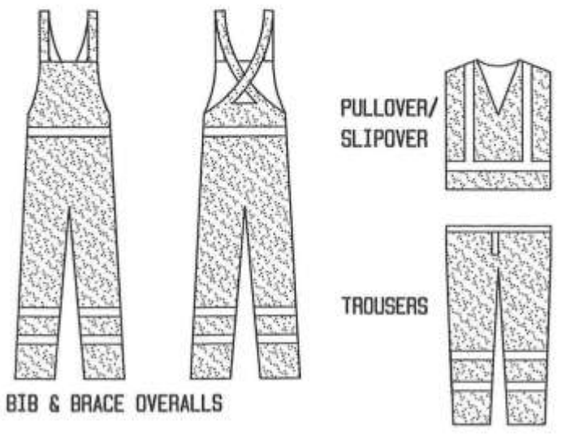
Detail 13.30.2 Level 2 Clothing



Detail 13.30.3 Level 3 Clothing



Detail 13.30.4 Minimum Dimensions



Detail 13.30.5 Alternative Clothing Items

13.7.5 Notes on Figure 13.30

(1) Standard specifications are not fully developed for high visibility workers clothing for use at roadworks sties. The details given in Figure 13.30 represent guidelines for good practice. The specific style or type of article of clothing is not prescribed to permit flexibility of choice. The following categories of work require that all workers involved in them be dressed in the most visible possible clothing:

(a) any function involving direction or control of traffic, including functions related to accidents;

(b) any function involving the placing of signs, traffic cones or road markings;

(c) all work carried out under reduced visibility conditions such as in mist or fog, at dawn or dusk, during any type of fire, and at night.

(2) Whilst emphasis is always on night-time visibility the difficulty in achieving high visibility during daytime must be recognised. The use of fluorescent and retroreflective materials is therefore recommended.

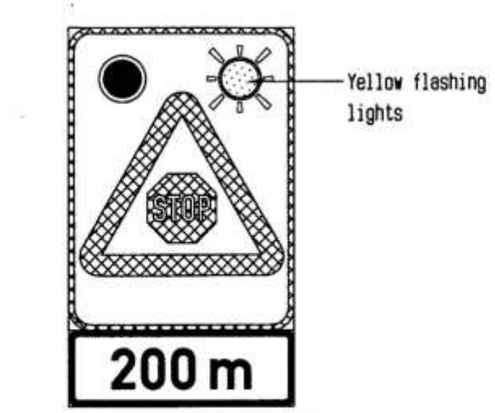
(3) Three levels of clothing are illustrated:

(a) **Level 1** clothing is appropriate for daytime use only - the possible need to supplement the above articles of clothing with fluorescent harnesses or vests must be considered - if a work function is likely to carry over into darkness then the work unit must carry adequate supplies of removable retroreflective vests or harnesses;

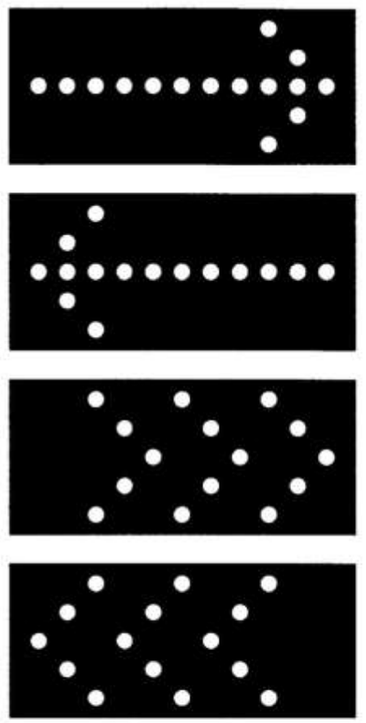
(b) **Level 2** clothing is appropriate for use at night (or at other times of reduced visibility) at roadworks sites where vehicle speeds are under 50 km/h - Level 2 clothing should incorporate a visible minimum of 0,50 m^2 of background material and 0,13 m^2 of Class 3 retroreflective material - the retroreflective materials should be in bands of not less than 50 mm width - for larger sizes of clothing to conform to these requirements the retroreflective material bands will need to exceed 50 mm (i.e. for a 107 mm chest the bands will need to be 62 mm wide);

(c) **Level 3** clothing is appropriate for use at night (or at other times of reduced visibility) at roadworks sites where vehicle speeds are over 50 km/h - Level 3 clothing should incorporate a visible minimum of 0,80 m^2 of background material and 0,20 m^2 of retroreflective material - the retroreflective materials should be in bands of not less than 50 mm width - for larger sizes of clothing to conform to these requirements the retroreflective material bands will need to exceed 50 mm (i.e. for a 107 mm chest the bands will need to be 62 mm wide).

Fig 13.30
High Visibility Treatment Techniques



HIGH VISIBILITY WARNING SIGN
PLUS FLASHING YELLOW LIGHTS



SWITCHABLE ILLUMINATED
ARROW BOARD

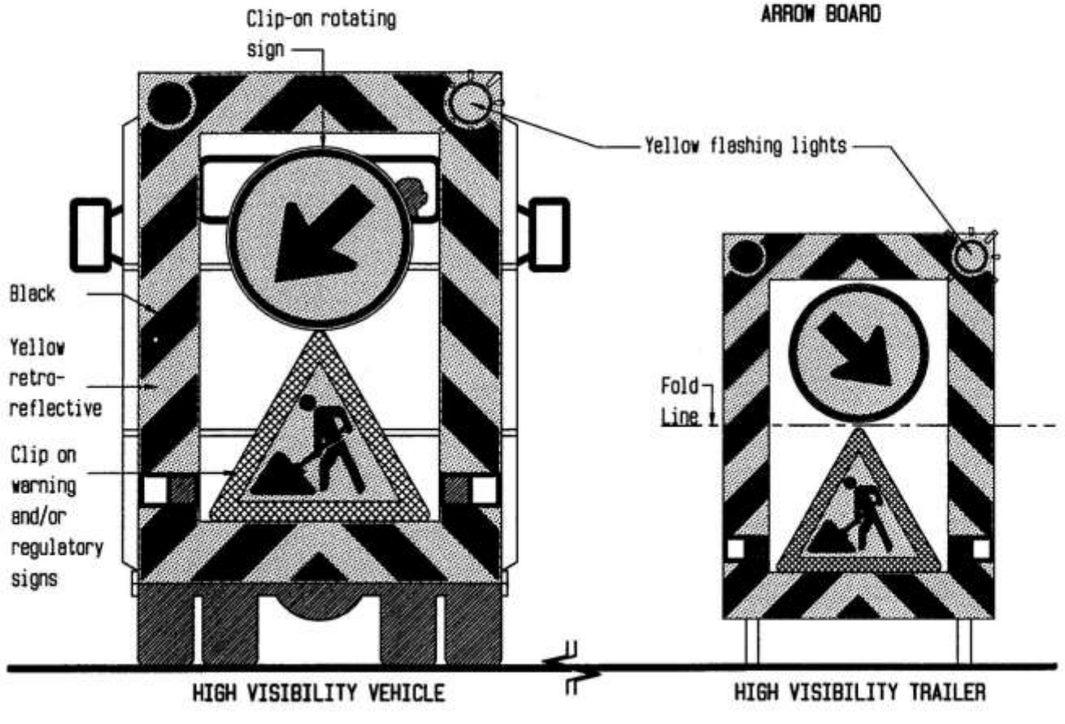


Fig 13.31 **Other High Visibility Treatment Techniques**

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13.8 SIGNING APPLICATIONS FOR SHORT TERM WORKS

13.8.1 General

1 The applications of temporary signing for roadworks covered in Sections 13.8.to 13.12 have been subdivided into categories for ease of reference. These categories are:

(a) short term works (Section 13.8);

(b) rural roads (Section 13.9);

(c) urban roads (Section 13.10);

(d) freeways and dual carriageway roads (Section 13.11).

Section 13.12 provides enlarged details of elements covered in other sections and may be appropriate to any or all of the categories listed above.

2 The categorisation of applications used should only be considered to be general in nature. Many applications may be appropriate in several or all categories. Such applications are only detailed once to avoid duplication. Practitioners who do not find the application they are seeking in their first choice of category should therefore check other categories. If their required application is not covered, it will be necessary to determine a similar situation and to adapt it, with care, to their needs.

3 Sections 13.9 and 13.10 deal with rural and urban situations respectively. These terms also should be considered as general and if a "rural" application is appropriate within an urban area the application details should be used with appropriate adjustments to sign spacing and sizes. The signing of roadworks in peri-urban areas will most likely be catered for by rural category applications.

4 In the various figures the following rules or conventions apply:

(a) all signs are correctly oriented for the direction of travel to which they apply;

(b) to avoid confusion with any arrows on road signs or markings, the direction of travel of traffic is, where relevant, indicated thus ►

(c) all details are given in metres **but all may be directly used as "paces" in practice.**

5 Signs should be sized as recommended in Volume 1. As a rule of thumb the following sizes are appropriate for regulatory, warning and diagrammatic signs:

(a) Gravel roads:

(i) circular signs - 1200 mm diameter;

(ii) triangular signs - 200 mm side length;

(iii) diagrammatic signs - 1200 mm x 1600 mm;

(b) Bituminous concrete or brick surfaced roads:

(i) circular signs - 1200 mm diameter;

(ii) triangular signs - 1500 mm side length;

(iii) diagrammatic signs - 1200 mm x 1600 mm.

(c) Urban streets:

(i) circular signs - 900 mm /1200 mm diameter;

(ii) triangular signs - 900 mm /1200 mm side length;

(iii) diagrammatic signs - 1200 mm x 1600 mm.

13.8.2 Short Term Works

1 "Short term work" is generally defined for the purposes of this chapter as work during which the "site" is affected by the work being undertaken for a duration of up to 24-hours.

2 Most light to medium maintenance work is therefore included by "short term work". Maintenance operations which are:

(a) mobile (or move along the road at a steady rate); or

(b) such that at the end of the days work the roadway is returned to full use by traffic until maintenance recommences the next day (or after a weekend);

are therefore classified as short term work. Conversely, any maintenance work during which road traffic signs are kept in place for periods longer than 24-hours should be treated in terms of application details given in Sections 13.9 to 13.11.

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13.8.3 Maintenance in Road Reserve

1 This application represents the lowest signing level covered in this Chapter. This signing level is appropriate ONLY when the work concerned does not encroach nearer to the edge of the roadway than the shoulder break point. Typical activities which might warrant this low level of signing are:

(a) verge grass-cutting;

(b) cleaning of side drains or cross drain inlets and outlets;

(c) fence repairs;

(d) kilometre post repair/maintenance/replacement.

2 As soon as workers are required to move closer to the travelled way, additional signing consistent with Figures 13.35, 13.36 or 13.41 to 13.43 should be used.

3 If the maintenance work gradually progresses along the road reserve, the TW336 signs should be moved forward with the work so that they are never more than 600 m from the work.

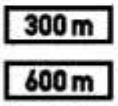
4 All workers should still be provided with the recommended bright clothing, even when working off the road edge (see Figure 13.30).

5 The sign inventory indicated is a minimum for the type of work concerned. Any work unit undertaking this type of work is likely to be a general maintenance unit and will probably have a minimum sign inventory consistent with most tasks in this section.

Checklist

- ❑ is the site set up with adequately safe Buffer Zones (see Figure 13.20)?
- ❑ are workers likely to get within 3 m of passing vehicles?
- ❑ is the maintenance unit vehicle and equipment well off the road?
- ❑ can signs be clearly seen by approaching drivers - if not move them further out?
- ❑ is a higher level of signing appropriate to ensure worker and public safety?

MAINTENANCE UNIT INVENTORY

Sign	No	Size (mm)	Quantity
	TW336	1200	2
	TIN 11.3	1200	4
	FLAGS	450 X 450	2

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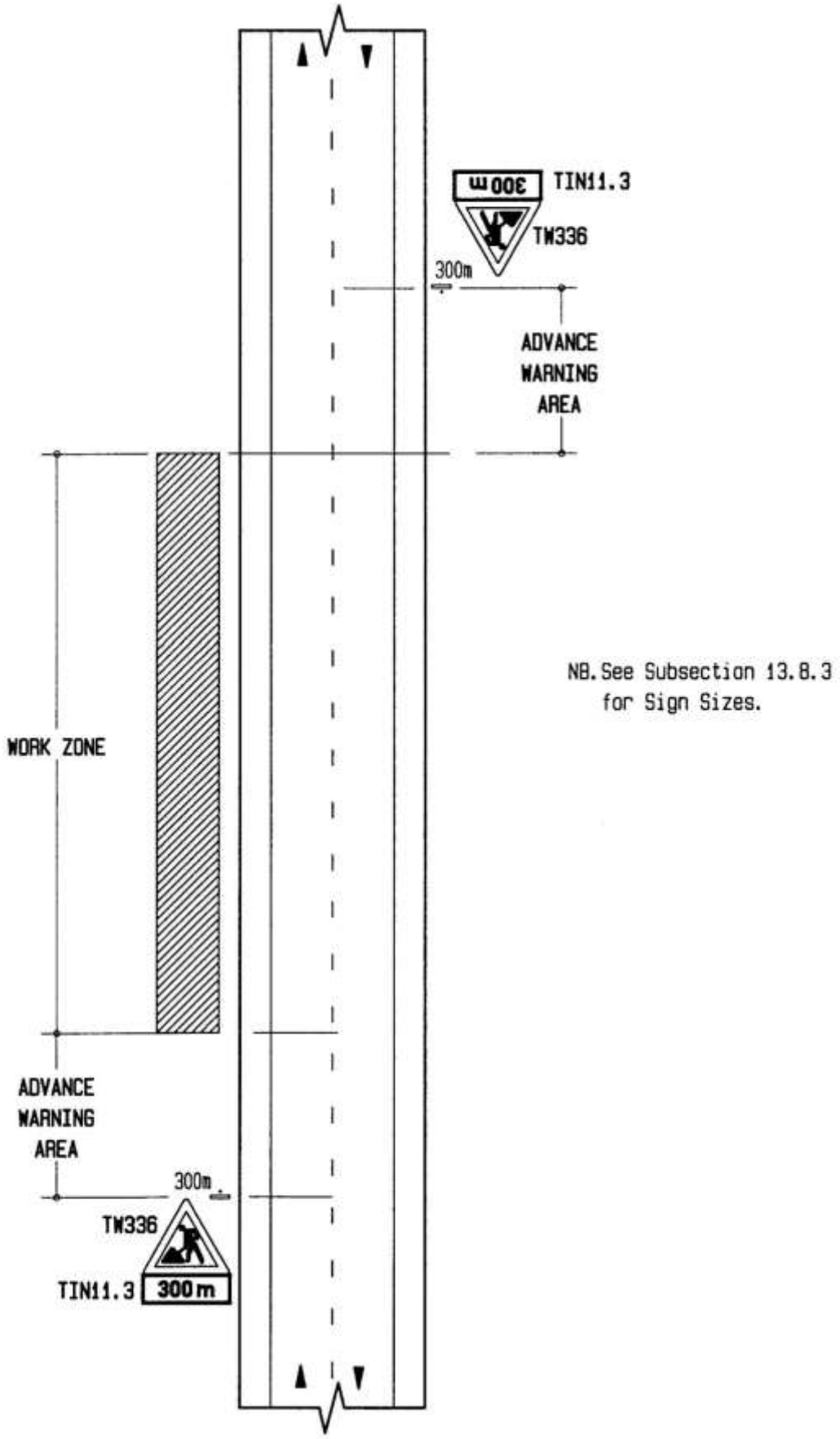

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Fig 13.32 **Maintenance in Road Reserve (off the roadway)**

13.8.4 Firebreak Maintenance

1 Detail 13.33.1 shows a minimum level of signing treatment which may be used if smoke is not likely to represent a hazard. Activities which may be dealt with in this manner are grass cutting of a firebreak, including work within the public road reserve, and controlled burning of grass within the verge or close to the roadway, with a low risk of smoke being carried over the roadway due to the prevailing wind direction.

2 Detail 13.33.2 is appropriate when smoke, or the fire itself, represents a hazard or risk to traffic. The most significant difference between the two details is that when the smoke is a hazard, the flagmen must be prepared to exercise discretion and stop traffic. Under extreme circumstances **all traffic** may have to be halted. On other occasions one-way operation may offer adequate levels of safety. As with any STOP-GO operation queues of waiting traffic will form. Advance warning signs TW343 - TIN11.3 and TW339 - TIN11.4 should be moved away from the standard position so that they are located appropriately for the likely end of the traffic queue. **The signing requirement of Detail 13.33.2 is recommended for all accidental fires.**

3 **Flagmen operations as required for Details 13.33.1 and 13.33.2 shall be in accordance with the provisions of Figure 13.23.** Any unit which is working according to Detail 13.33.1 must be trained and equipped to be in a state of readiness to upgrade its operation to that shown in Detail 13.33.2.

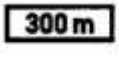
4 Equipment for operation to Detail 13.33.2 shall include two-way radios for the STOP/GO flagmen, who, by virtue of the warrant for their operation, will not be able to see each other to co-ordinate traffic control. If all traffic has been stopped, and if a decision is taken to implement alternating one-way traffic it is recommended that each "entry" flagman counts all vehicles passing his control point and relays this information to the "exit" flagman, who should then count the vehicles out of the section.

5 If the fire or firebreak is on a dual carriageway roadway, advance warning signs must be placed on both the left and right sides of the carriageway.

Checklist

- ❑ do workers have effective high visibility clothing?
- ❑ are the flagmen correctly trained for their task?
- ❑ are radios in working order?
- ❑ can signs be clearly seen by approaching drivers?
- ❑ is the unit ready to upgrade to STOP/GO control?
- ❑ should consideration be given to a traffic detour?

MAINTENANCE UNIT INVENTORY

Sign	No	Size (mm)	Quantity
	TW339	1200	2
	TW343	1200	2
	R1.5A/ R1.5B	750	2
	FLAGS	450 X 450	2
	TIN 11.3	1200	2
	TIN 11.4	1200	2 Optional

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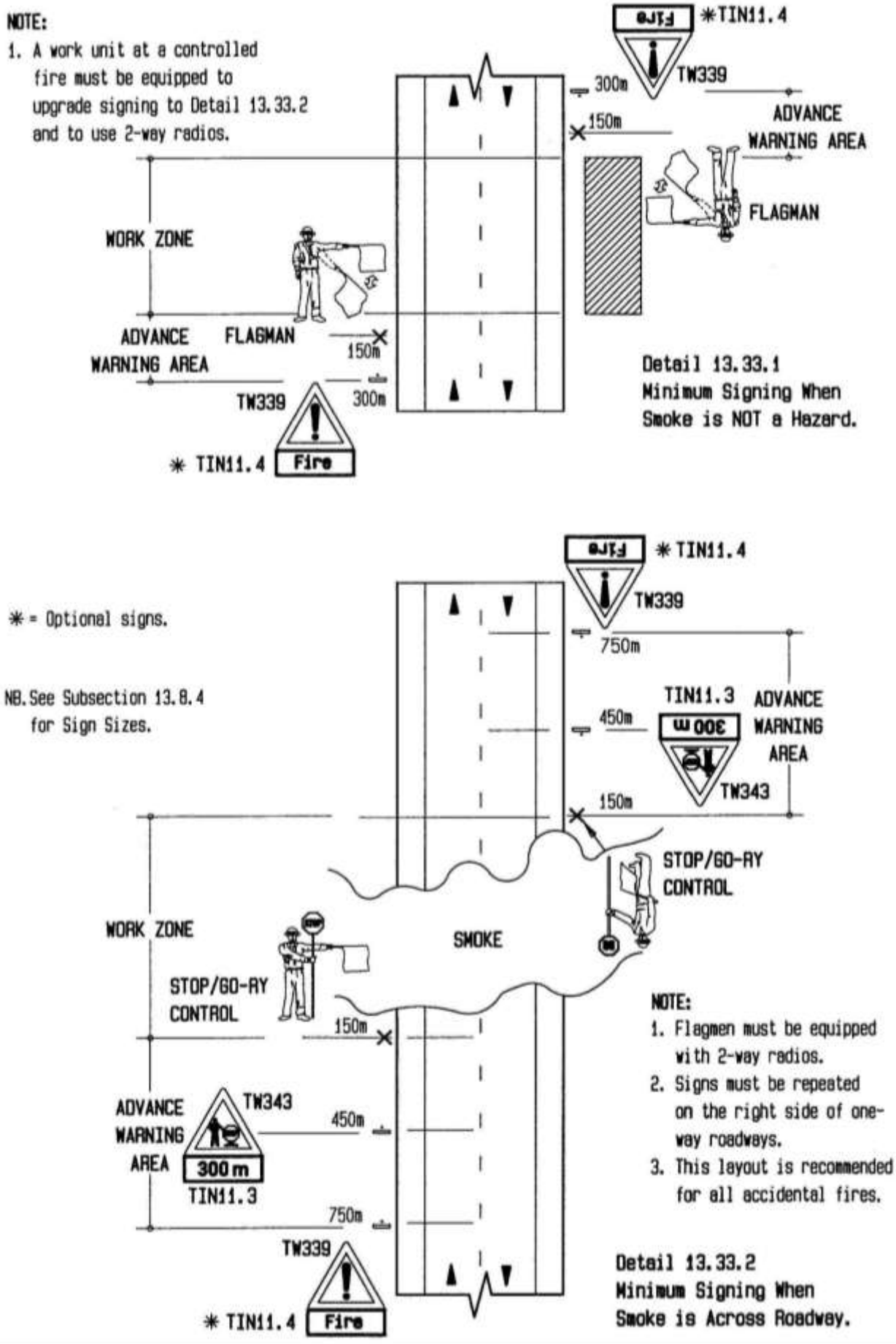


Fig 13.33 **Firebreak Maintenance**

13.8.5 Weedspray Maintenance

1 Weedspraying may be a mechanised operation or it may be a manual operation with a team of workers, working on the ground, either with or without a support vehicle present. The signing requirements for such maintenance are given in Figure 13.34.

2 Figure 13.34 includes two signing details. Detail 13.34.1 is appropriate for maintenance operations on one side of a two-way roadway, whereas Detail 13.34.2 applies for maintenance on a multi-lane one-way roadway (normally part of a dual carriageway road). The main differences between the two requirements is that a two-way road requires the placing of a ROADWORKS sign TW336 facing the opposing stream of traffic, and the one-way operation requires advance signs on both the left and right sides of the carriageway. This latter requirement is applicable whether the work is being undertaken on the left side or on the right side.

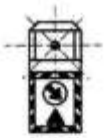
3 When weedspraying is supported by a vehicle, the work can be considered as "mobile". Subject to the proximity of the work to the roadway and the rate of movement of the work, the requirements of Subsection 13.8.12 and Figure 13.41 may be relevant.

4 The vehicle carrying out the spraying or supporting the manual team should occupy the far left side of the roadway or shoulder (or the far right side in the case of a median spraying operation). The vehicle shall be provided with a HIGH VISIBILITY REAR PANEL of the type illustrated in Figure 13.31.

5 The vehicle shall also have two FLASHING YELLOW WARNING LIGHTS, SS3, of which, at least one shall be visible from the front, and one shall be visible from the rear. In practical terms, if a vehicle is likely to work on the right side of a roadway, the two flashing lights should also define the vehicle width to approaching drivers so that, wherever it is working, the near side is identified by at least one flashing light. The contractor or road supervisor shall be responsible for ensuring that the flashing light requirement is functioning during day and night, at all times whilst the vehicle is working or within 2 metres of the roadway.

Checklist

- ❑ do workers have adequate high visibility clothing?
- ❑ is there a support vehicle?
- ❑ does the support vehicle have a high visibility rear panel?
- ❑ are the signs on the rear panel correctly set?
- ❑ will the advance warning signs need to be moved to follow the work (see Subsection 13.8.12)?
- ❑ will work encroach into the roadway significantly (see Subsections 13.8.11 and 13.9.8)?

MAINTENANCE UNIT INVENTORY			
Sign	No	Size (mm)	Quantity
	TW336	1200	2
	TW330	1200	2
	TIN 11.3	1200	2
	Vehicle High Visibility Rear Panel TR103/TR104 plus TW336	To suit Vehicle 900 1200	1 1 1
	Yellow Flash Light		2 Per Vehicle

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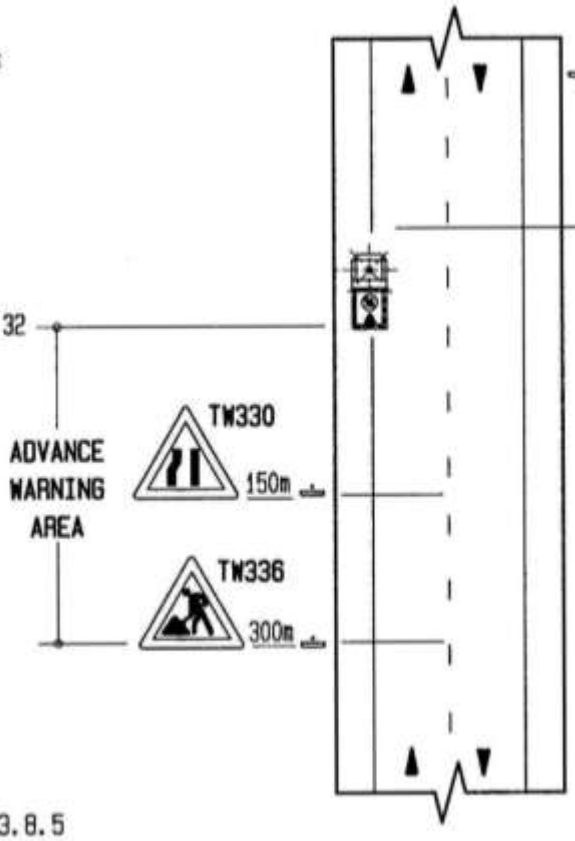
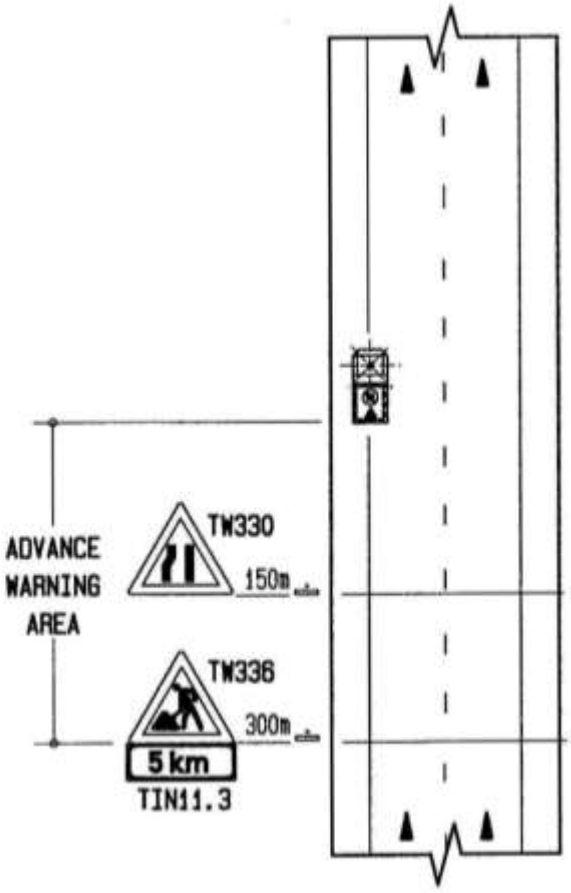
NOTES:
1. Yellow flashing lights must be visible to front and rear in all situations.
2. Maintenance vehicle equipped with HIGH VISIBILITY REAR PANEL (See Figures 13.32 and 13.41).



Detail 13.34.1
Single Carriageway 2-Way Roads.

NB. See Subsection 13.8.5 for Sign Sizes.



Detail 13.34.2
Dual Carriageway Roads.

Fig 13.34 **Weedspray Maintenance**

13.8.6 Fixed Site - Work on Shoulder

1 The temporary signing treatment illustrated in Figure 13.35 is intended for short term work located on the shoulder of a public road, either in the sense that the work is actually on the shoulder, or is immediately adjacent but outside the shoulder, but requires occupation of the shoulder by the work unit. In situations such as this, if the work unit's support vehicle is equipped with flashing yellow warning lights, it may benefit the safety of the workers for the vehicle to be parked on the shoulder, at the end of the Buffer Zone, between the workers and approaching traffic.

2 If the work is carried over into darkness, the TRAFFIC CONE delineation devices TD4 shall be provided with retroreflective sleeves or they shall be replaced by DELINEATOR PLATE hazard marker signs TW401/TW402. Cones used on high speed roads shall have a height of at least 700 mm. For details of delineator and cone spacings refers to table 13.4.

3 Tapers used for this type of work site treatment should be in accordance with Table 13.5.

4 Advance warning signs should be located up to 600 m in advance of the start of the taper for sites with operating speeds in excess of 80 km/h. In addition, because the signing levels are minimised, extreme care must be taken to note any features of each specific work site which may reduce the effectiveness of the signs. In particular, vertical curvature and overhanging vegetation should be assessed. If there are adverse conditions and operating speeds are in excess of 80 km/h, or even 60 km/h signs, should be displayed in accordance with Figure 13.26. The requirements of Table 13.1 should be adhered to with regard to the minimum mounting height of temporary signs.

Checklist

- ❑ are operating speeds in excess of 80 km/h?
- ❑ does the unit have enough cones/delineators for correct spacings?
- ❑ does the unit have delineators or retroreflective sleeves for cones for night time use?
- ❑ is the site set up with adequately safe Buffer Zones (see Figure 13.20)?
- ❑ is there adverse vertical or horizontal curvature on the approach to the site?
- ❑ can signs be mounted higher to improve early warning of the site if required?

MAINTENANCE UNIT INVENTORY			
Sign	No	Size (mm)	Quantity
	TW336	1200	2
	TW330	1200	1
	TR104	1200	1
	TD4	450 750	15 Min. plus 10 per 100m site length
	TR201-80 TR201-60	1200	2 2

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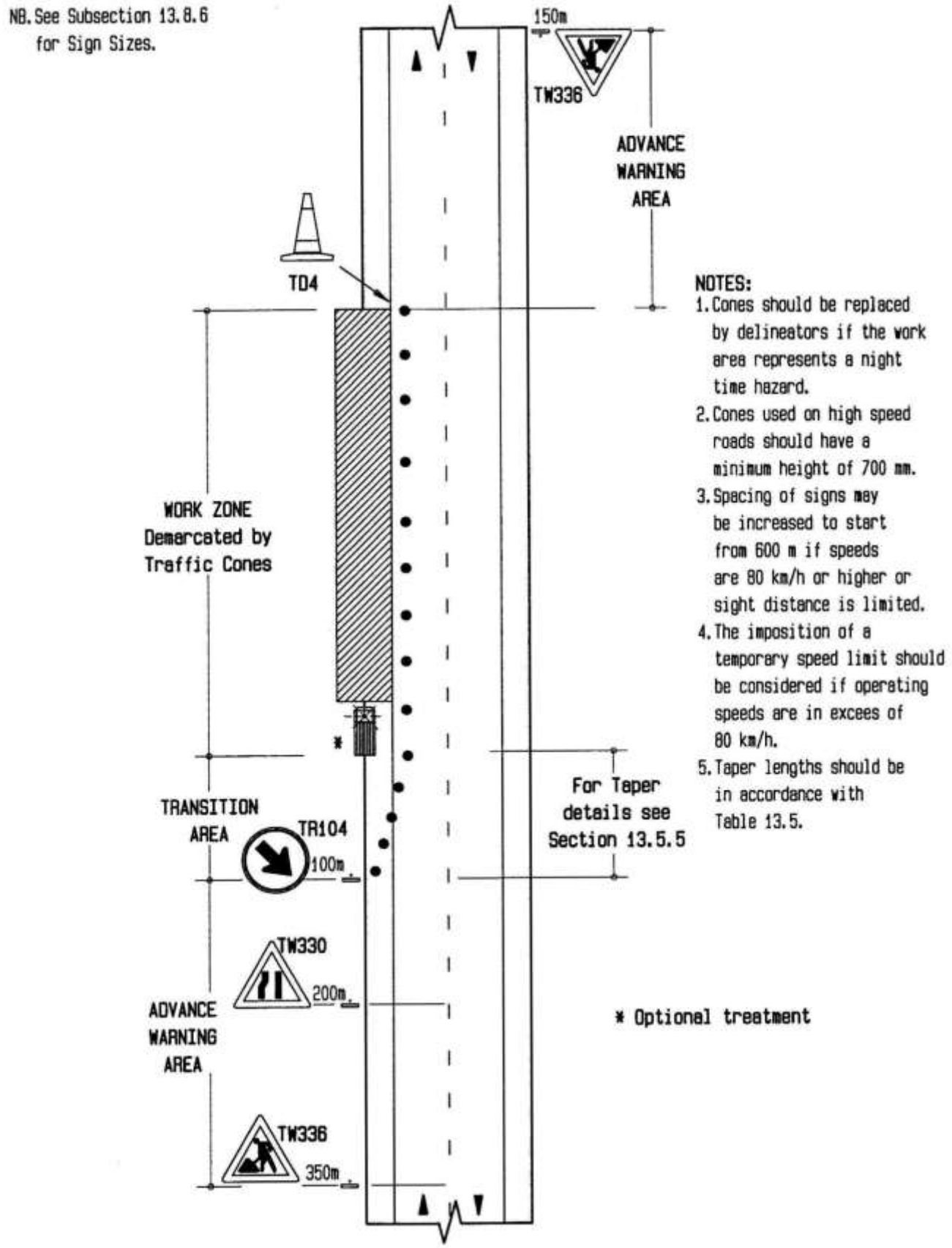

Fig 13.35 **Fixed Site – Work on Shoulder**

13.8.7 Localised Small Site

1 This application is similar to that illustrated in Figure 13.36 but is for an even shorter, more localised work area, which may encroach into the roadway but still permit two-way traffic flow. The criterion for two-way traffic operation under moderate traffic volumes is an available running width of 6 metres, provided speeds can be reduced so that such operation is safe. This width may include localised use of the opposite side shoulder.

2 The sign spacings given are for low traffic approach speeds appropriate to low speed urban environments. For higher speeds the sign spacings as illustrated in Figure 13.35 should be used, and the reduction of the operating speed in 20 km/h increments (see Figure 13.26), by means of temporary speed limit signs TR201, should be considered.

3 If traffic volumes are such that two-way operation will present unacceptable risk levels to workers and/or vehicles then STOP/GO or temporary traffic signal control should be considered (see Subsections 13.8.11, 13.9.3 and 13.10.3). Safety "Buffer Zone" spacing must be provided in accordance with Figure 13.20.

4 TRAFFIC CONE delineation devices TD4 and DELINEATOR PLATE hazard marker signs TW401/TW402 shall be spaced in accordance with Table 13.4 and all tapers shall conform to the provisions of Table 13.5. When cones are to be used during adverse light conditions, they shall be fitted with retroreflective sleeves. The mounting height of all signs shall be at least that given in Table 13.1 or higher. If the work unit's support vehicle is equipped with flashing yellow warning lights, it may benefit the safety of workers for the vehicle to be parked on the shoulder, at the work end of the approach Buffer Zone, between the workers and approaching traffic.

Checklist

- ❑ are operating speeds in excess of 80 km/h?
- ❑ does the unit have enough cones/delineators for correct spacings?
- ❑ does unit have delineators, or retroreflective sleeves for cones?
- ❑ is the site set up with adequately safe Buffer Zones (see Figure 13.20)?
- ❑ is there adverse vertical or horizontal curvature on the approach to the site?
- ❑ is there safe operating width for two-way traffic operation?
- ❑ should the use of STOP/GO control or temporary traffic signals be considered?

MAINTENANCE UNIT INVENTORY

Sign	No	Size (mm)	Quantity
	TW336	1200	2
	TW329 TW330	1200	1 1
	TR104	1200	2
	TW411	300 X 1800	1
	TD4	450 750	20 Min. plus 10 per 100m site length
	TR201-80 TR201-60	1200	2 2

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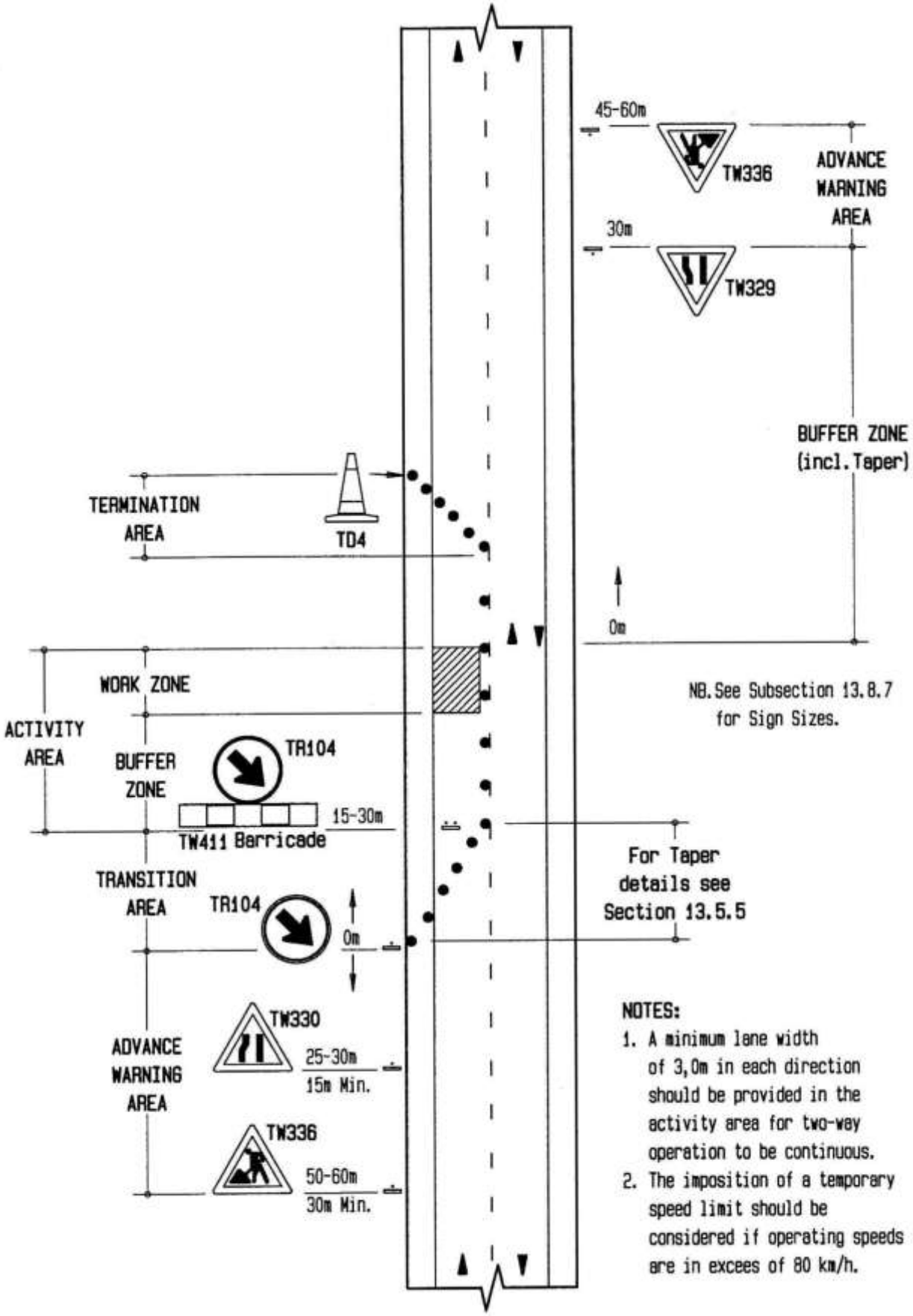


Fig 13.36 **Localised Small Work Site**

13.8.8 Short Term Lane Closure

1 Figure 13.37 illustrates two **short term** conditions which can commonly occur on any rural or urban two-lane/two-way roadway. Refer to Subsection 13.8.2 for a description of "short term". Longer term applications are covered in Sections 13.9 and 13.10. (Multi-lane situations are generally covered in Section 13.11). Both applications of temporary signing require roughly the same signing but are quite different operationally. Any general maintenance unit should carry a sign inventory capable of sustaining either type of operation.

2 Detail 13.37.1 shows a typical situation where the work needs to encroach into one lane but not fully occupy it. Two-way traffic operation through restricted width lanes is still possible. Due to the reduced lane width, it is desirable that vehicle speeds be reduced to a legal but cautious level I e. reduced speed limit is not considered necessary. Under these circumstances the use of a flagman to slow traffic is recommended. TRAFFIC CONES TD4 may be used for short term work but if this situation occurs on a high speed road or freeway, the cones must be 700 mm or more in height.

3 Detail 13.37.2 deals with a similar situation where a full lane is needed to undertake the work and two-way traffic is no longer possible. STOP/RY-GO operation signs R1.5A/R1.5B must be added to those required for Detail 13.37.1. This mode of operation should not be used into dusk or darkness. If it is necessary to work outside daylight hours, the site must either be adjusted to allow it to operate as shown in Detail 13.37.1, or temporary traffic signals should be used (see Figure 13.57).

4 If operating speeds are in excess of 80 km/h additional speed limit signs TR201 should be displayed to reduce speed by a maximum of 20 km/h, or in 20 km/h increments to 80 km/h or 60 km/h as appropriate (see Section 13.4).

5 Flagmen must be well trained and shall operate in accordance with Figure 13.23.

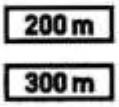
6 If the site has to be maintained in operation into dusk or night-time, or for more than 24 hours, all traffic cones should be replaced by delineators. If work is of an emergency or response nature (rather than planned), the site supervisor must assess the likely duration of the work within the first two to three hours and, if necessary, call for additional signing if these are not being carried.

7 In all cases suitable longitudinal and lateral Buffer Zones must be created to ensure worker and public safety (see Figures 13.20 and 13.29). If approaches are subject to high vehicle speeds or visibility limitations, sign spacings may be increased out to 600 m.

Checklist

- ❑ are operating speeds in excess of 80 km/h?
- ❑ are enough cones available for the length of site?
- ❑ is the site set up with adequately safe Buffer Zones (see Figure 13.20)?
- ❑ will the work extend beyond the balance of the working day?
- ❑ is visibility to the work area or the first sign in any way limited?
- ❑ does the control of the site need to be upgraded to a higher order?

MAINTENANCE UNIT INVENTORY

Sign	No	Size (mm)	Quantity
	TW336	1200	2
	TW329 TW330	1200	1 1
	TW343	1200	2
	TR103 TR104	1200	2
	R1.5A/ R1.5B	750	2
	TD4	450	50 Min. plus 20 per 100m site length
	FLAGS	450 X 450	6
	TIN 11.3 TIN 11.3	1200	2 2
	TR201-80 TR201-60	1200	2 2

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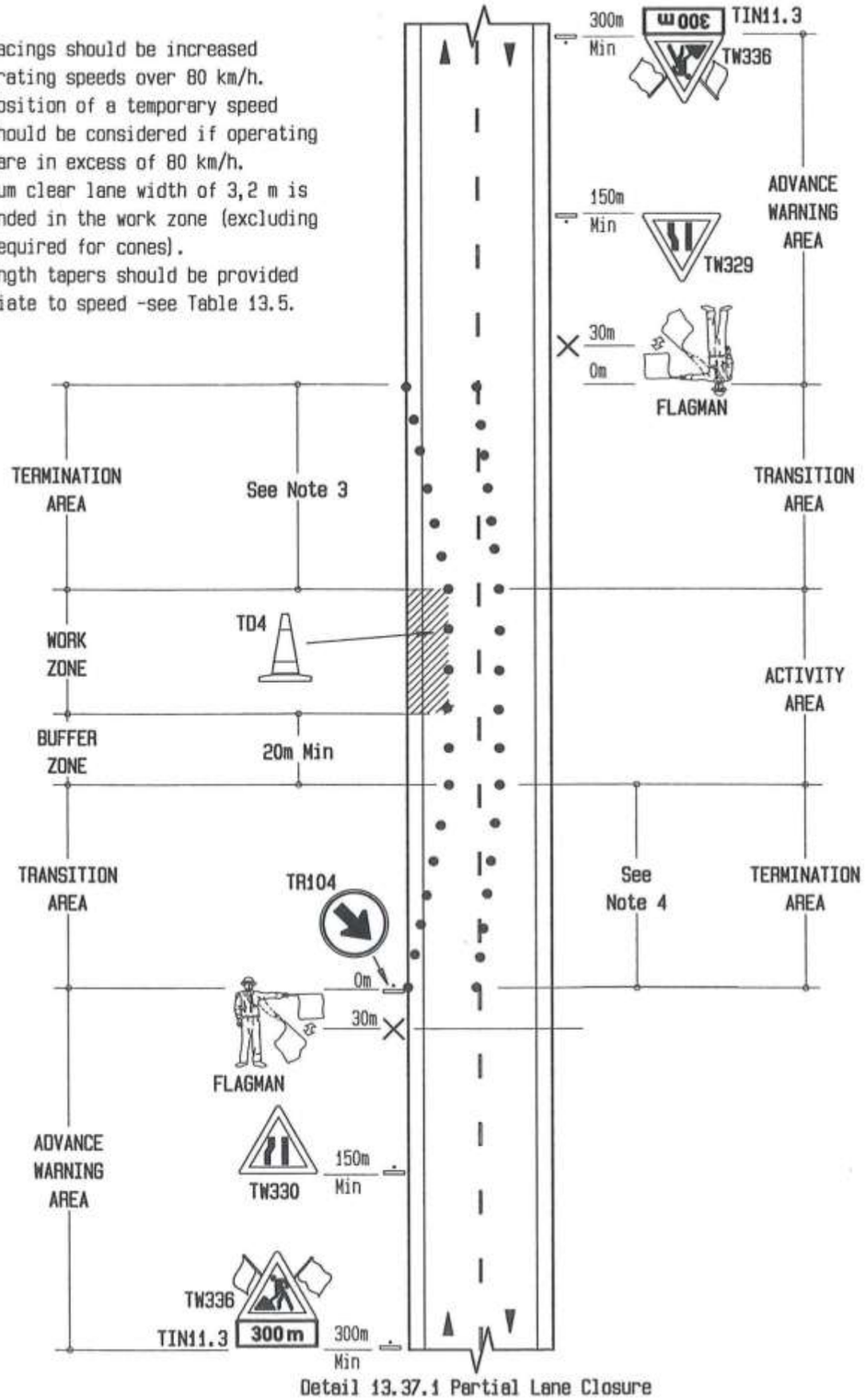
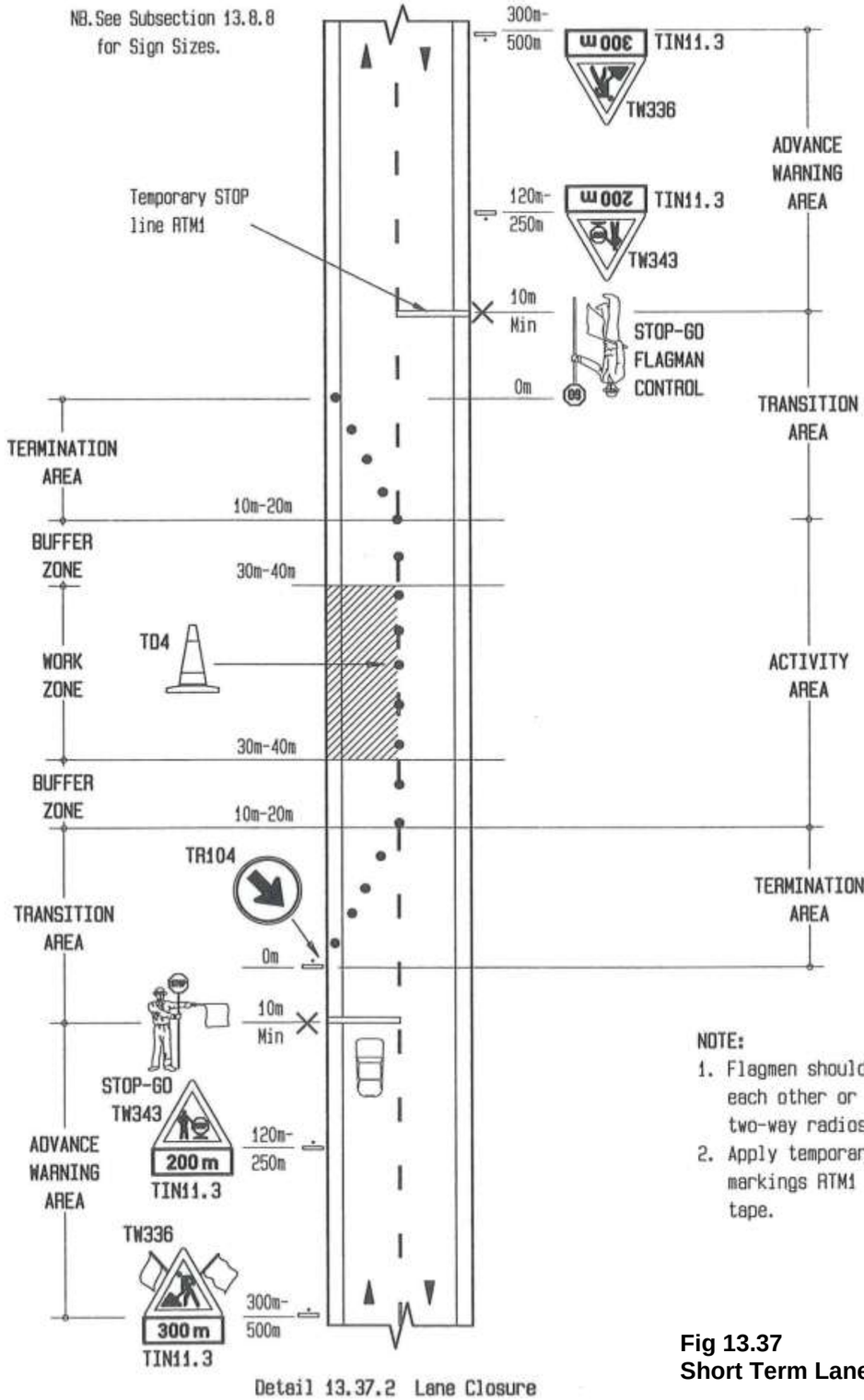
NOTES:

1. Sign spacings should be increased for operating speeds over 80 km/h.
2. The imposition of a temporary speed limit should be considered if operating speeds are in excess of 80 km/h.
3. A minimum clear lane width of 3,2 m is recommended in the work zone (excluding space required for cones).
4. Full length tapers should be provided appropriate to speed -see Table 13.5.



Detail 13.37.1 Partial Lane Closure

NB. See Subsection 13.8.8 for Sign Sizes.



Detail 13.37.2 Lane Closure

NOTE:

1. Flagmen should be able to see each other or be issued with two-way radios.
2. Apply temporary STOP line markings RTM1 using removable tape.

Fig 13.37
Short Term Lane Closure

13.8.9 Short Term Lane Drop within Deviations

1 Figure 13.38 shows two details for short term work within a multi-lane deviation which involves the temporary closure of one of the lanes. The treatments shown are only appropriate on deviations on one of the carriageways of a dual carriageway roadway (commonly a freeway) where traffic is operating within a three lane cross-section. Since these applications represent "roadworks-within-roadworks" situations, their use should be reserved for very short term needs and should only be considered during off-peak traffic times.

2 Detail 13.38.1 depicts a work zone within the single lane in one direction. To accommodate traffic one of the two lanes operating in the opposite direction has to be dropped. The signs shown represent minimum requirements for maximum portability. LANE DROP sign TW214 may be replaced by diagrammatic sign TGS102 if time, space and convenience permit. The advance signs may be located further from the site if deemed necessary due to visibility requirements or traffic speeds.

3 Detail 13.38.2 shows a similar arrangement when it is one of the two lanes in one direction which needs to be closed. In this case also sign TW215 may be replaced by diagrammatic sign TGS101.

4 If operating speeds are in excess of 80 km/h additional speed limit signs TR201 should be displayed to reduce speed by a maximum of 20 km/h, or in 20 km/h increments to 80 km/h or 60 km/h as appropriate (see Section 13.4).

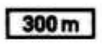
5 Flagmen must be well trained and shall operate in accordance with Figure 13.23.

6 TRAFFIC CONE delineation devices TD4 and DELINEATOR PLATE hazard marker signs TW401/TW402 shall be spaced in accordance with Table 13.4 and all tapers shall conform to the provisions of Table 13.5. When cones are to be used during adverse light conditions, they shall be fitted with retroreflective sleeves. The mounting height of all signs shall be at least that given in Table 13.1 or higher. If the work unit's support vehicle is equipped with flashing yellow warning lights, it may benefit the safety of workers for the vehicle to be parked on the shoulder, at the work end of the approach Buffer Zone, between the workers and approaching traffic.

Checklist

- ❑ are operating speeds in excess of 80 km/h?
- ❑ can traffic speeds be reduced effectively to allow these applications to work safely?
- ❑ is the site set up with adequately safe Buffer Zones (see Figure 13.20)?
- ❑ can signs be displayed at a greater than minimum mounting height?
- ❑ are flagmen alert and well-motivated?
- ❑ would flags on the first sign in each direction assist driver awareness?

MAINTENANCE UNIT INVENTORY

Sign	No	Size (mm)	Quantity
	TW336	1500	2
	TW330	1500	1
	TR103 TR104	1200	1 1
	TIN 11.3	1500	2
	FLAGS	450 X 450	6
	TD4	750	60 Min. plus 20 per 100m site length
	TW214 TW215	1500 1500	1 1
	TR201-80 TR201-60	1200	2 2

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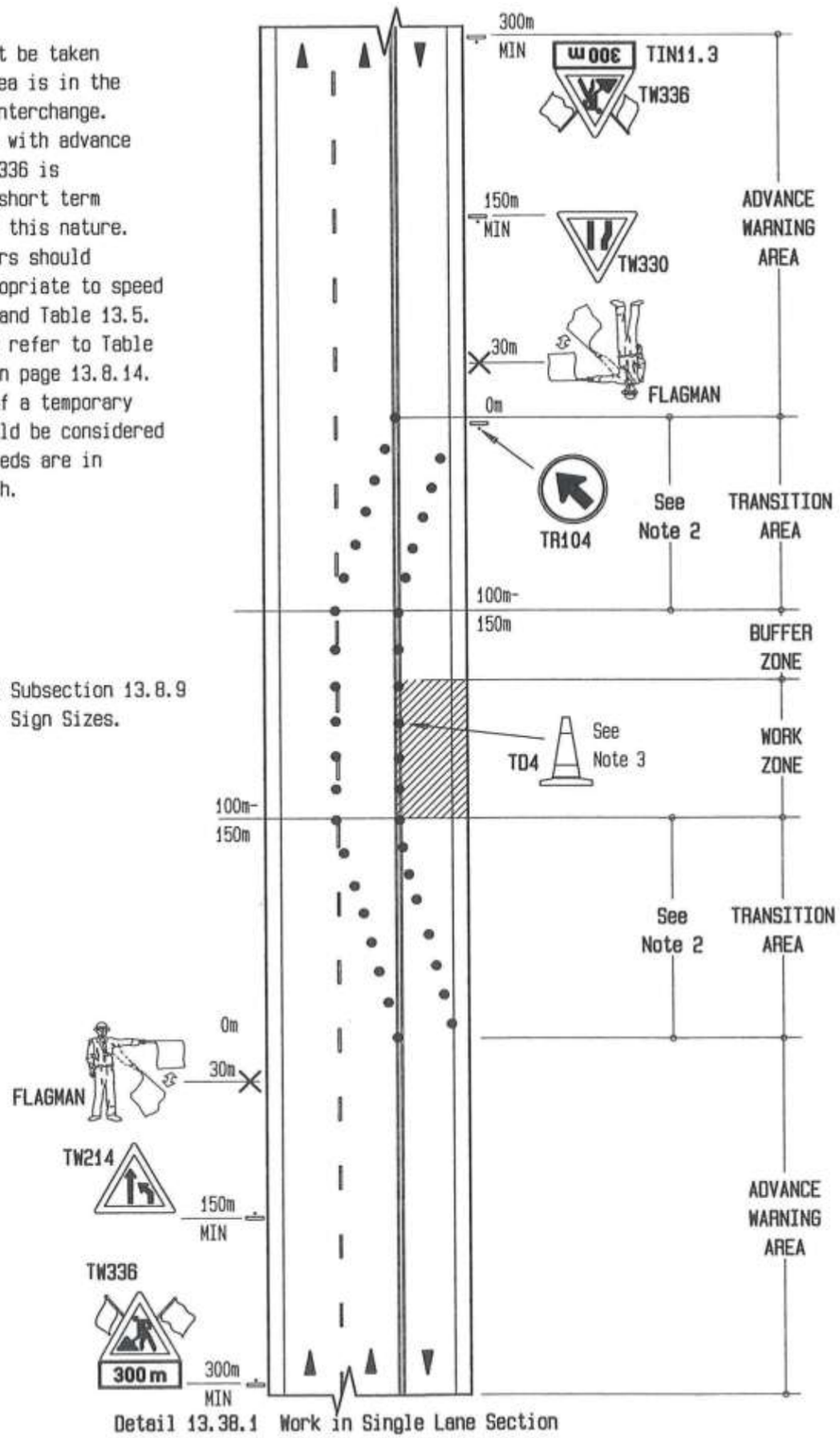
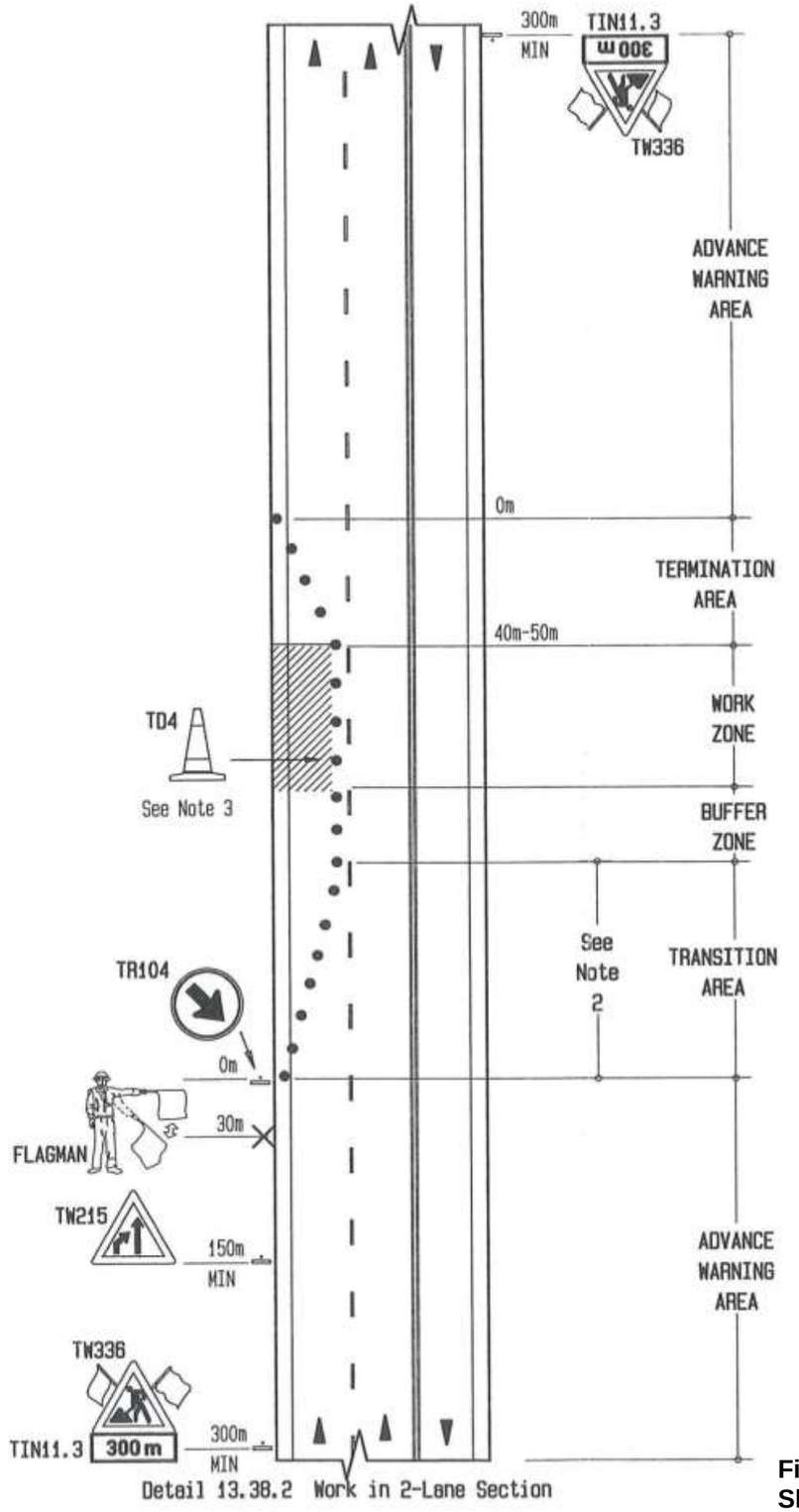
NOTES:

1. Extreme care must be taken when the work area is in the environs of an interchange. The use of flags with advance warning signs TW336 is recommended for short term installations of this nature.
2. Full length tapers should be provided appropriate to speed - See Fig.13.29 and Table 13.5.
3. For cone spacing refer to Table 13.4 and table on page 13.8.14.
4. The imposition of a temporary speed limit should be considered if operating speeds are in excess of 80 km/h.

NB. See Subsection 13.8.9 for Sign Sizes.



Detail 13.38.1 Work in Single Lane Section



Detail 13.38.2 Work in 2-Lane Section

Fig 13.38
Short Term Lane Drop Within Deviation

13.8.10 Installation/Removal of Traffic Data Logger

1 Figure 13.39 illustrates recommended signing for the installation, servicing or removal of traffic data logging loops on the road surface of a multi-lane, one-way roadway. The signs shown are lightweight portable/collapsible signs made from a durable flexible and foldable material for ease of quick placing and removal. Conventional signs may alternatively be used. Since the "work" being undertaken has very little visual impact in itself, it is very important that special attention be paid to high visibility treatment of the area. The use of a HIGH VISIBILITY REAR TREATMENT on the work unit support vehicle, and/or the use of a HIGH VISIBILITY TRAILER, and the highest visibility clothing for workers is recommended (see Figures 13.30 and 13.31).

2 If it is required to install, service or remove data logging loops on a two-way roadway, STOP/GO control should be used (see Figure 13.40).

3 If flagmen are used, they must be well trained and shall operate in accordance with Figure 13.23.

4 TRAFFIC CONE delineation devices TD4 and DELINEATOR PLATE hazard marker signs TW401/TW402 shall be spaced in accordance with Table 13.4 and all tapers shall conform to the provisions of Table 13.5. When cones are to be used during adverse light conditions, they shall be fitted with retroreflective sleeves. The mounting height of all signs shall be at least that given in Table 13.1 or higher. If the work unit's support vehicle is equipped with flashing yellow warning lights, it may benefit the safety of workers for the vehicle to be parked on the shoulder, at the work end of the approach Buffer Zone, between the workers and approaching traffic.

5 Since an operation of this type is only likely to be undertaken during daylight the use of appropriate high luminance fluorescent colours on the road signs should be considered.

Checklist

- ❑ is the roadway one-way or two-way?
- ❑ is a STOP/GO sign inventory carried by the unit?
- ❑ does the unit have trained flagmen?
- ❑ is a high visibility vehicle or trailer available?

MAINTENANCE UNIT INVENTORY			
Sign	No	Size (mm)	Quantity
	TW336	1200	2
	TW214 TW215	1200	2
	TR104	1200	1
	TD4	750	30 Min plus 5-10 per 100m
	Vehicle High Visibility Rear Panel TR103/TR104 plus TW336	To suit Vehicle 900 1200	1 1 1
	Yellow Flash Light		2 Per Vehicle

C

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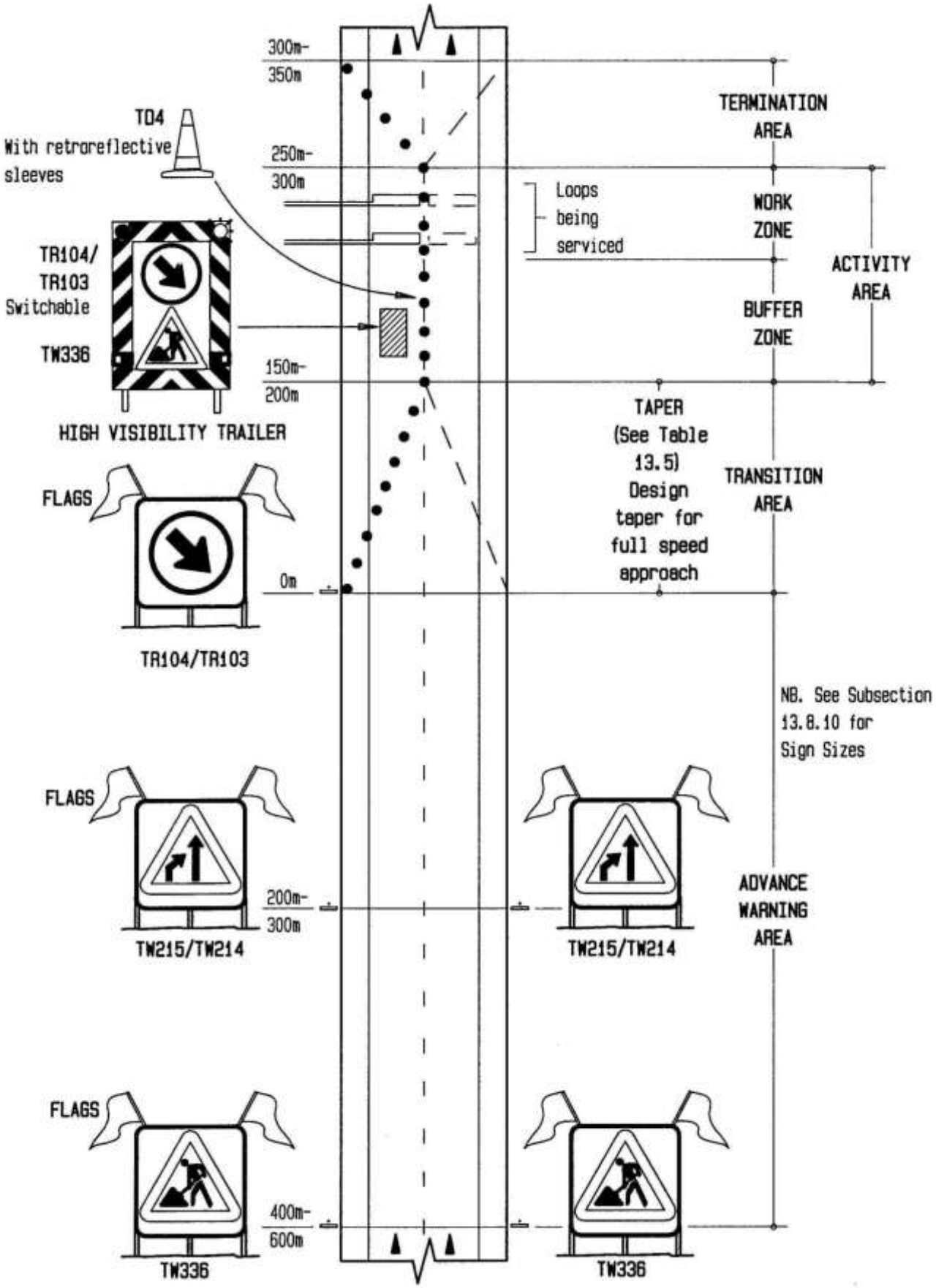

Fig 13.39 **Installation/Removal of Traffic Data Logger**

13.8.11 STOP/RY-GO Traffic Control-Minor Works

1 STOP/RY-GO operation may be required to control traffic at a variety of short term roadworks sites where the remaining roadway is reduced to less than two lanes in width, for whatever reason. As such, STOP/RY-GO traffic control is effectively a temporary signing sub-system. It may be used on its own or it may be used locally, in more than one place, for short periods within a long roadworks site. The detail in Figure 13.40 may therefore be incorporated with other short term applications and is particularly appropriate for urban areas.

2 The signing given in this detail is a minimised treatment for a very short term application lasting only one or two hours. For longer applications the signing should be upgraded to that covered by Subsection 13.9.3 and Figure 13.44. It should be considered as a daytime operation unless the site is very well illuminated at night. NO OVERTAKING signs TR214 should be carried by the maintenance unit and added to the illustrated sign sequence if required.

3 If operating speeds are in excess of 80 km/h additional speed limit signs TR201 should be displayed to reduce speed by a maximum of 20 km/h, or in 20 km/h increments to 80 km/h or 60 km/h as appropriate (see Section 13.4).

4 Flagmen must be well trained and shall operate in accordance with Figure 13.23. Whilst short term sites are likely to be short in length, if inter-visibility between flagmen cannot be guaranteed the flagmen should be equipped with two-way radios.

5 TRAFFIC CONE delineation devices TD4 and DELINEATOR PLATE hazard marker signs TW401/TW402 shall be spaced in accordance with Table 13.4 and all tapers shall conform to the provisions of Table 13.5. When cones are to be used during adverse light conditions, they shall be fitted with retroreflective sleeves. The mounting height of all signs shall be at least that given in Table 13.1 or higher. If the work unit's support vehicle is equipped with flashing yellow warning lights, it may benefit the safety of workers for the vehicle to be parked on the shoulder, at the work end of the approach Buffer Zone, between the workers and approaching traffic.

Checklist

- ❑ are operating speeds in excess of 80 km/h?
- ❑ do advance signs for the STOP/RY-GO control clash with other roadworks signs within the site?
- ❑ are the flagmen alert and well trained for their task?
- ❑ are the flagmen fully visible to oncoming traffic?
- ❑ are the flagmen standing in a safe position?
- ❑ can the restriction be eliminated to permit two-way traffic by dusk?

MAINTENANCE UNIT INVENTORY			
Sign	No	Size (mm)	Quantity
	TW336	1200	2
	TW343	1200	2
	R1.5A/ R1.5B	750	2
	TR103 TR104	1200	1 2
	TW411	300 X 1800	2
	FLAGS	450 X 450	2
	TD4	450 Min	20 Min. plus 10 per 100m site length
	TR214	1200	2
	TR201-80 AND TR201-60	1200	2 2

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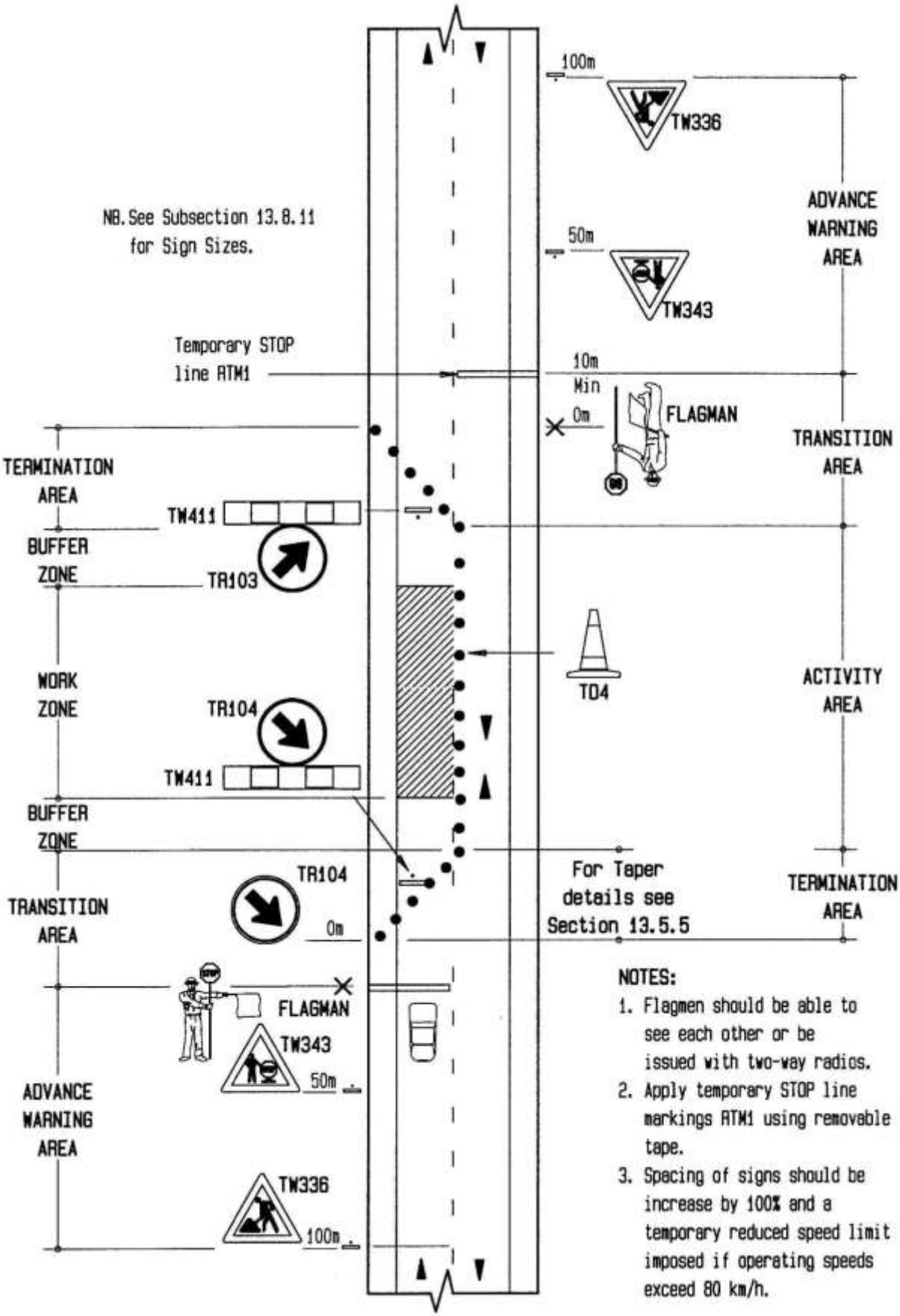


Fig 13.40 **STOP/RY-GO Traffic Control – Minor Works**

13.8.12 Mobile Maintenance of Road Shoulder

1 Figure 13.41 includes two details of typical short term or mobile work involving slow-moving vehicles occupying the shoulder of the public road. Detail 13.41.1 shows mobile work occurring ahead of a support vehicle which should maintain a close following distance behind the workers (of the order of 20 m to 50 m). In Detail 13.41.2 a single vehicle is performing a mechanised maintenance function.

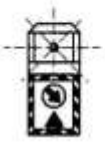
2 In each case the vehicles should be supported by an alert, well trained flagman, who shall operate in accordance with Figure 13.23.

3 Detail 13.41.1 shows a support vehicle equipped with a HIGH VISIBILITY REAR PANEL and two FLASHING YELLOW WARNING LIGHTS, SS3, whereas the tractor used for grass-cutting operations in Detail 13.41.2 only carries the two FLASHING YELLOW WARNING LIGHTS. For the safety of workers and road users, it is essential that these visibility requirements are adhered to and are functional at all times. The contractor or road supervisor, as appropriate, shall be responsible for ensuring the functionality of all flashing lights.

4 It is recommended that the tractor, which may operate on the left or the right side of a one-way roadway, always works in the direction of traffic flow so that its flashing lights, which are likely to be on the rear, are as effective as possible. Every effort should be made to enhance the visibility of tractors used for road maintenance purposes. The tractors should be kept clean and freshly painted in a bright colour which will contrast with the grass background within which it is working.

Checklist

- ❑ are workers equipped with high visibility clothing?
- ❑ are flagmen alert and well trained?
- ❑ are all flags clean and bright?
- ❑ are the signs on the HIGH VISIBILITY REAR PANEL correctly set?
- ❑ are all flashing lights working?
- ❑ is the tractor clean and brightly painted?

MAINTENANCE UNIT INVENTORY			
Sign	No	Size (mm)	Quantity
	FLAGS	450 X 450	1
	Vehicle High Visibility Rear Panel TR103/TR104 plus TW336	To suit Vehicle 900 1200	1 1 1
	Yellow Flash Light		2 Per Vehicle

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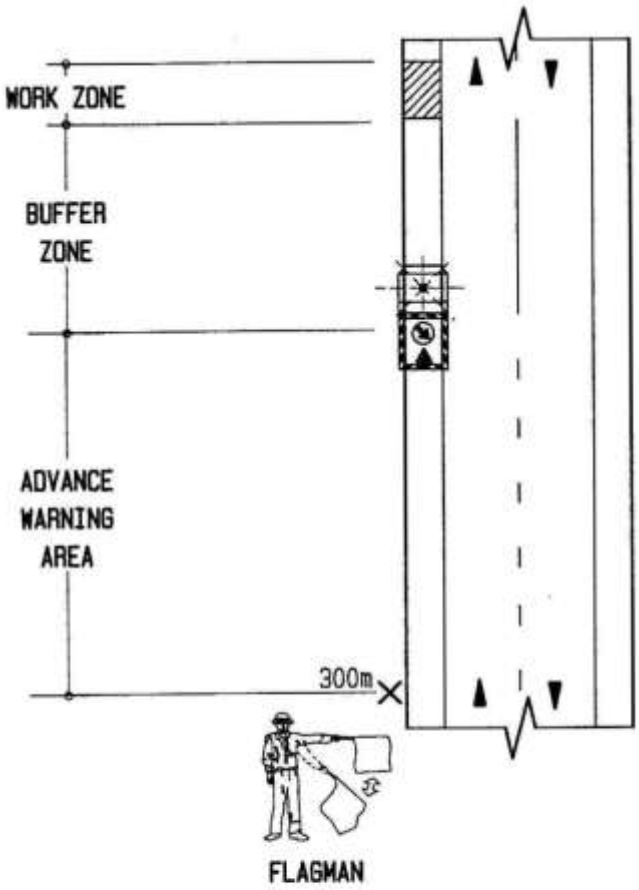
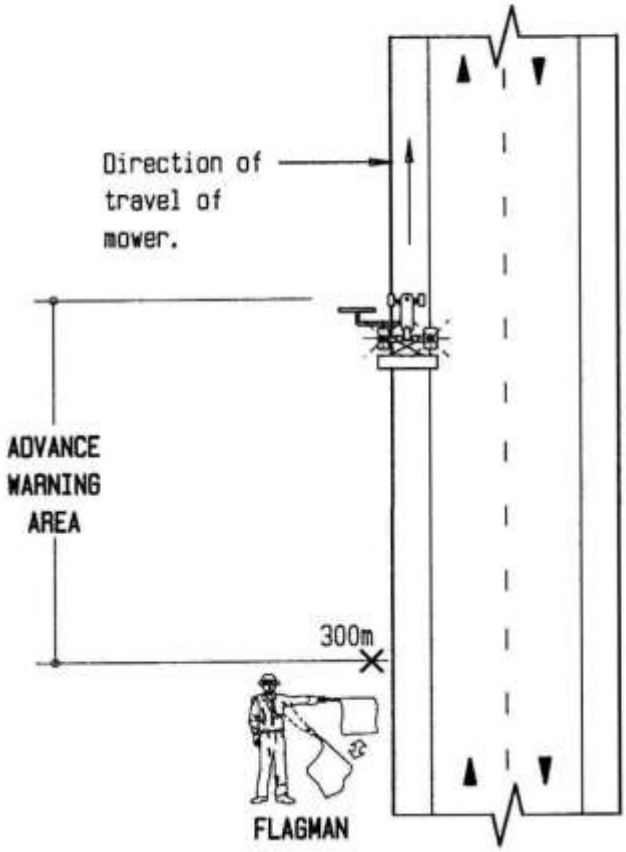


NOTE:
1. Maintenance support vehicle shall be equipped with a HIGH VISIBILITY REAR PANEL including two flashing yellow lights (See Fig. 13.31).
2. See Subsection 13.8.12 for Sign Sizes.

Detail 13.41.1
Mobile Work on the Shoulder.



NOTES:
1. Mower to travel ONLY in the direction of travel of the adjacent lane.
2. Mower shall be equipped with two operational flashing yellow lights -one on the left and one on the right.

Detail 13.41.2
Tractor Mowing from Shoulder.

Fig 13.41 Mobile Maintenance on Road Shoulder

13.8.13 Mobile Maintenance in Centre of Carriageway

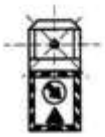
1 Mobile maintenance in the centre of the roadway or carriageway is always likely to be a hazardous operation, particularly on high speed rural roads. Detail 13.42.1 shows such an operation on a two-lane two-way roadway and Detail 13.42.2 a similar operation on a two-lane one-way carriageway.

2 The operation on a two-way roadway is particularly hazardous and requires the services of three flagmen as illustrated. The vehicle carrying out the work, or in direct support of it, shall be provided with a HIGH VISIBILITY REAR PANEL and at least two FLASHING YELLOW WARNING LIGHTS, SS3. The two flashing lights shall be positioned so that they define the front and rear of the vehicle, and , if practical for this type of work, the width of the vehicle as well, since it will be passed by traffic on both sides.

3 In Detail 13.42.2 two high visibility treated vehicles are specified and traffic is controlled to pass only to one side of the two vehicles. The rear most vehicle effectively closes one lane (it could be the left lane or the right lane subject to the nature of the work and local traffic conditions). The second vehicle travels some 150 m in front, either undertaking the work, or in support of it if the work is being done manually.

4 In each case the vehicles should be supported by alert, well trained flagmen, who shall operate in accordance with Figure 13.23.

5 When traffic speeds are high, it is recommended that at least one advance sign be placed to warn drivers of the activity ahead. A "public relations" type of message and/or flashing lights should be considered for such signs (see Figure 13.18).

MAINTENANCE UNIT INVENTORY			
Sign	No	Size (mm)	Quantity
	FLAGS	450 X 450	3
	TR103	1200	1
	Vehicle High Visibility Rear Panel TR103/TR104 plus TM336	To suit Vehicle 900 1200	2 2 2
	Yellow Flash Light		2 Per Vehicle

Checklist

- ❑ are workers equipped with high visibility clothing?
- ❑ are flagmen alert and well trained?
- ❑ are all flags clean and bright?
- ❑ are the signs on the HIGH VISIBILITY REAR PANEL correctly set?
- ❑ are all flashing lights working?

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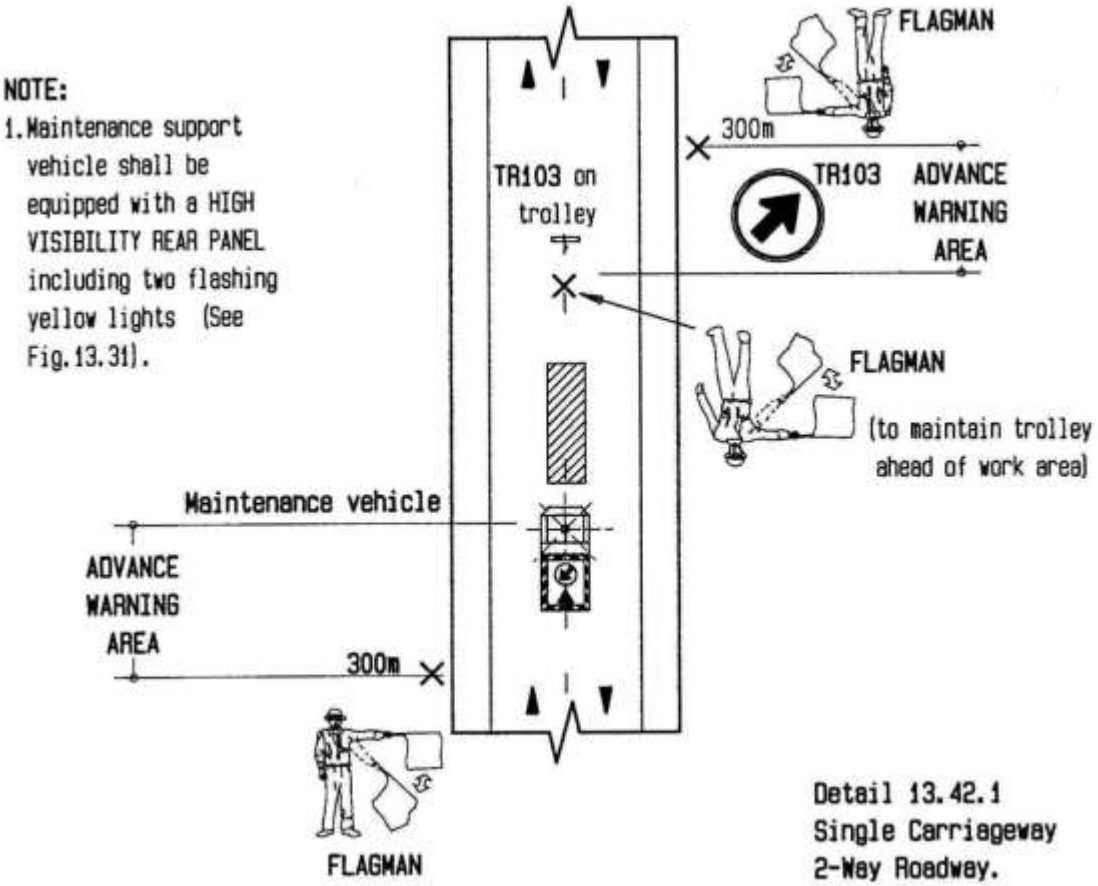
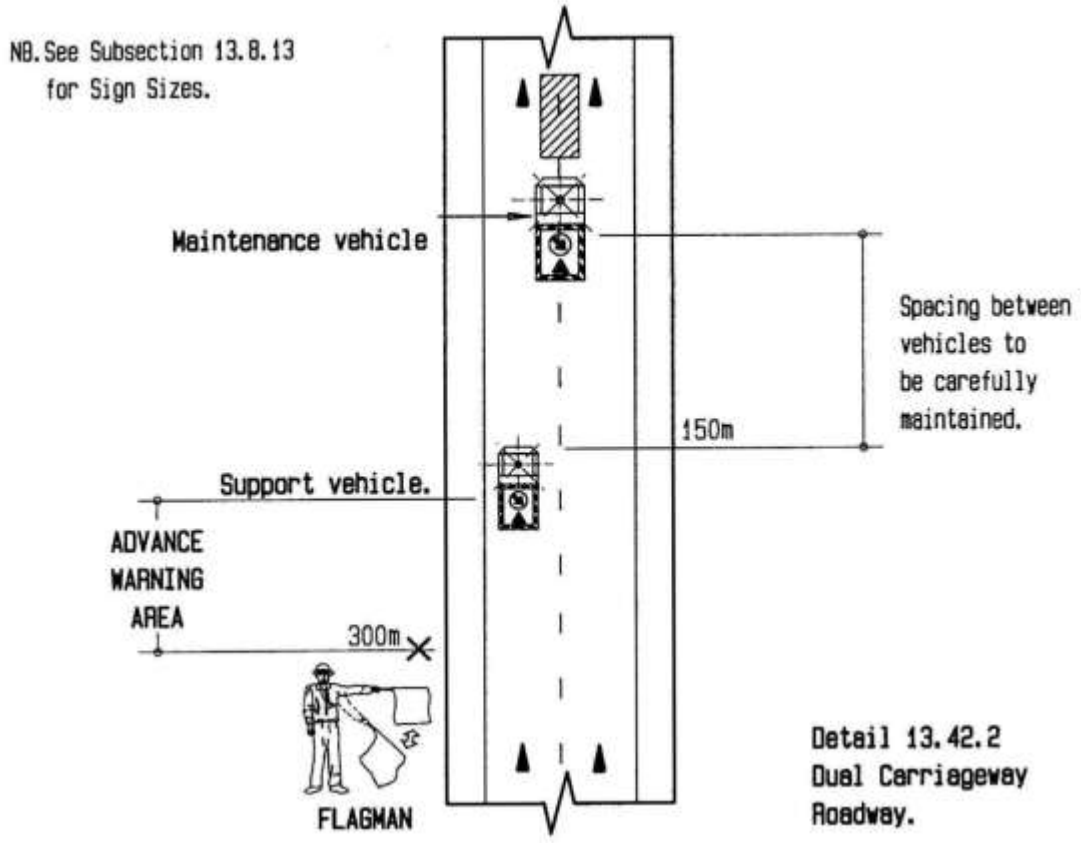


Detail 13.42.1
Single Carriageway
2-Way Roadway.



Detail 13.42.2
Dual Carriageway
Roadway.

Fig 13.42 **Mobile Maintenance in Centre of Roadway)**

13.8.14 Mobile Maintenance of Dual Carriageway Roads

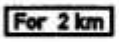
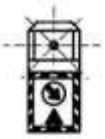
1 Figure 13.43 shows similar treatments to those in Details 13.41.1 and 13.42.2, but refers to shoulder area work, or work within the left lane up to, but excluding the lane line. For shoulder work, the support vehicle at the rear shall be equipped with a HIGH VISIBILITY REAR PANEL and two FLASHING YELLOW WARNING LIGHTS SS3, whereas the lead vehicle need only be provided with two flashing lights, unless it may also be used for the role depicted in Detail 14.42.2.

2 The advance signing used in support of the vehicles is kept to a minimum because these should be moved forward periodically as work progresses. To maximise their effectiveness, it is recommended that they be displayed with one or more flags.

3 The detail given is applicable to one-way roadways, normally forming part of a dual carriageway. It is not applicable to two-way traffic operation (see Figure 13.42).

Checklist

- ❑ are flags clean and visible?
- ❑ are the signs on the HIGH VISIBILITY REAR PANELS correctly set?
- ❑ are all flashing lights working?

MAINTENANCE UNIT INVENTORY			
Sign	No	Size (mm)	Quantity
	TW336	1200	2
	FLAGS	450 X 450	4
	TIN 11.2	1200	1
	Vehicle High Visibility Rear Panel TR103/TR104 plus TW336	To suit Vehicle 900 1200	1 1 1
	Yellow Flash Light		2 Per Vehicle

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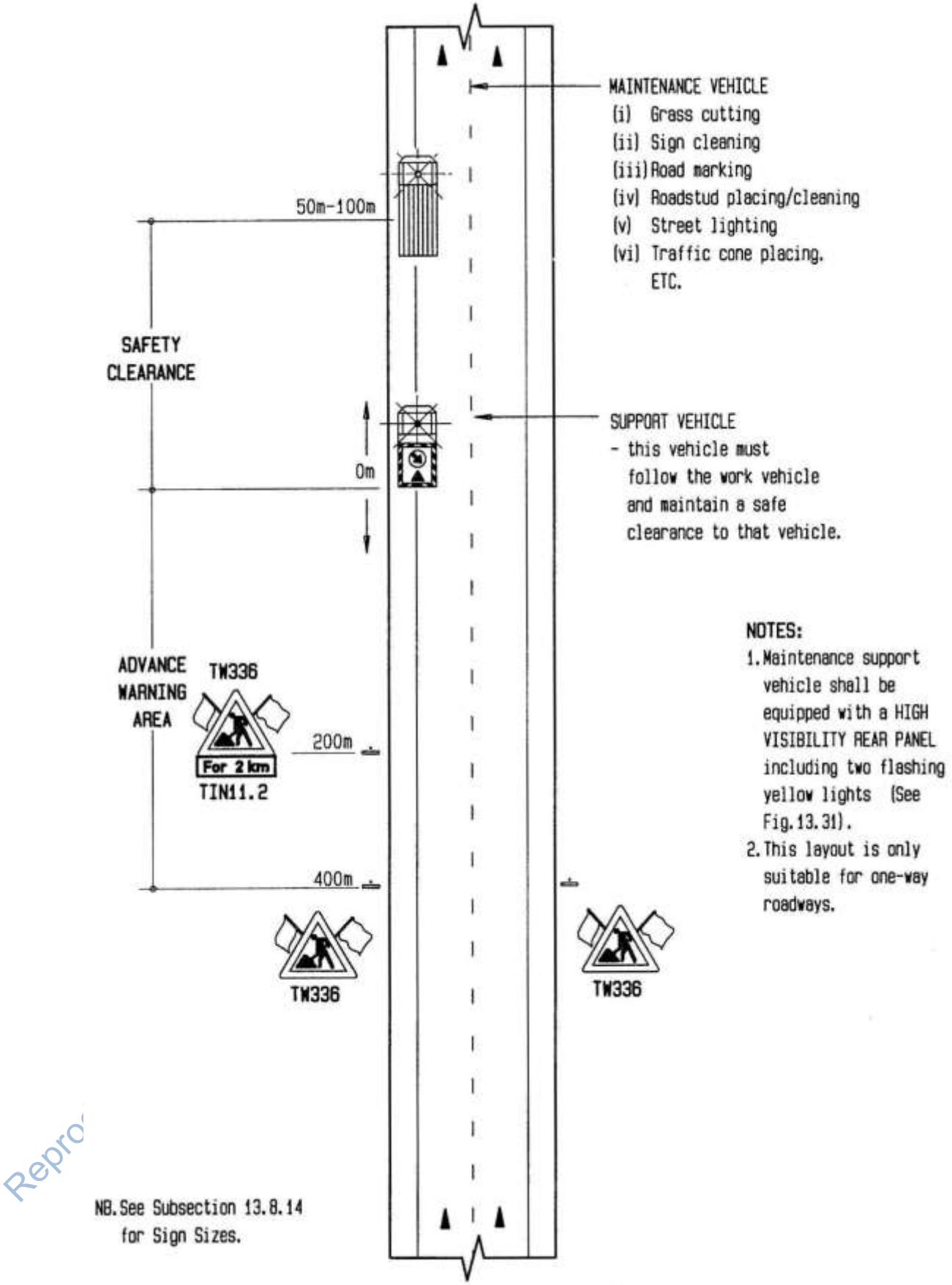

Fig 13.43 **Mobile Maintenance of Dual Carriageway Roads**

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13.9 SIGNING APPLICATIONS FOR RURAL ROADS

13.9.1 General

1 The applications of temporary signing for roadworks covered in Sections 13.8.to 13.12 have been subdivided into categories for ease of reference. These categories are:

(a) short term works (Section 13.8);

(b) rural roads (Section 13.9);

(c) urban roads (Section 13.10);

(d) freeways and dual carriageway roads (Section 13.11).

Section 13.12 provides enlarged details of elements covered in other sections, and may be appropriate to any or all of the categories listed above.

2 The categorisation of applications used should only be considered to be general in nature. Many applications may be appropriate in several or all categories. Such applications are only detailed once to avoid duplication. Practitioners who do not find the application they are seeking in their first choice of category should therefore check other categories. If their required application is not covered, it will be necessary to determine a similar situation and to adapt it, with care, to their needs.

3 This section and Section 13.10 deal with rural and urban situations respectively. These terms also should be considered as general and if a "rural" application is appropriate within an urban area the application details should be used with appropriate adjustments to sign spacing and sizes. The signing of roadworks in peri-urban areas will most likely be catered for by rural category applications.

4 In the various figures the following rules or conventions apply:

(a) all signs are correctly oriented for the direction of travel to which they apply;

(b) to avoid confusion with any arrows on road signs or markings, the direction of travel of traffic is, where relevant, indicated thus ;

(c) all details are given in metres **but all may be directly used as "paces" in practice.**

5 Signs should be sized as recommended in Volume 1. As a rule of thumb the following sizes are appropriate for regulatory, warning and diagrammatic signs:

(a) Gravel roads:

(i) circular signs - 1200 mm diameter;

(ii) triangular signs - 1200 mm side length;

(iii) diagrammatic signs - 1200 mm x 1600 mm;

(b) Bituminous or concrete surfaced roads:

(i) circular signs - 1200 mm diameter;

(ii) triangular signs - 1500 mm side length;

(iii) diagrammatic signs - 1200 mm x 1600 mm.

13.9.2 Rural Roadworks

1 The examples of temporary signing given in this section deal with applications which are most typical of rural roads such as:

(a) gravel road construction including re-gravelling;

(b) reseal/chip-and-spray type surfacing operations;

(c) partial road closure/reduced width operations;

(d) separately constructed deviations around the work site.

2 Although common to rural roads, the conditions listed in (a), (b) and (c) above may also occur in urban areas where similar signing principles to those illustrated should be used. These principles are not repeated in Section 13.10.

3 Temporary signing applications appropriate to multi-lane and dual carriageway roads are covered in Section 13.11.

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13.9.3 STOP/RY-GO Operation

1 STOP/RY-GO operation may be required to control traffic at a wide variety of roadworks sites where the remaining roadway is reduced to less than two lanes in width, for whatever reason. As such, STOP/RY-GO traffic control is effectively a temporary signing sub-system. It may be used on its own or it may be used locally, in more than one place, within a long roadworks site. The detail in Figure 13.44 may therefore be incorporated into other layouts in this Chapter.

2 If a daytime STOP/RY-GO operation cannot be opened to traffic by dusk, temporary traffic signals must be provided for night time operation. A portable power source may be required in order to operate the signals, and such an installation will need to be well secured.

3 All obstructions close to a one-way site of this nature must be marked adequately by DELINEATOR PLATE signs TW401 and/or TW402 and/or flashing yellow lights. This includes any working or parked construction vehicles.

4 The STOP/RY-GO operators must also be equipped with flags and must be well trained/experienced flagmen (see Subsection 13.3.9 and Figure 13.23).

Checklist

- ❑ do the advance signs for the STOP/RY-GO control clash with other roadworks signing within the site?
- ❑ is the flagman fully visible to oncoming traffic?
- ❑ are all signs fully visible to oncoming traffic?
- ❑ is the flagman standing in a safe position?
- ❑ is the lateral Buffer Zone within the site adequate for worker and public safety?
- ❑ can the restriction be eliminated to permit two-way traffic by dusk?

MAINTENANCE UNIT INVENTORY

Sign	No	Size (mm)	Quantity
	TR201-60 TR201-80	1200	2 2
	R201-100	1200	2
	TW336-WA	1200 X 1600	2 or 0 (1)
	TW336	1200	2 or 4 (1)
	TW343	1200	2
	TW344	1200	2 (2)
	TW337	1200	2 (2)
	TW331	1200	2 (2)
	TW339	1200	2 (2)
	TIN 11.3	1200	4

(1) TW336 may be specified for TW336-WA on low volume roads.
(2) Only one pair of these signs may be needed. A large unit may need one pair of each.

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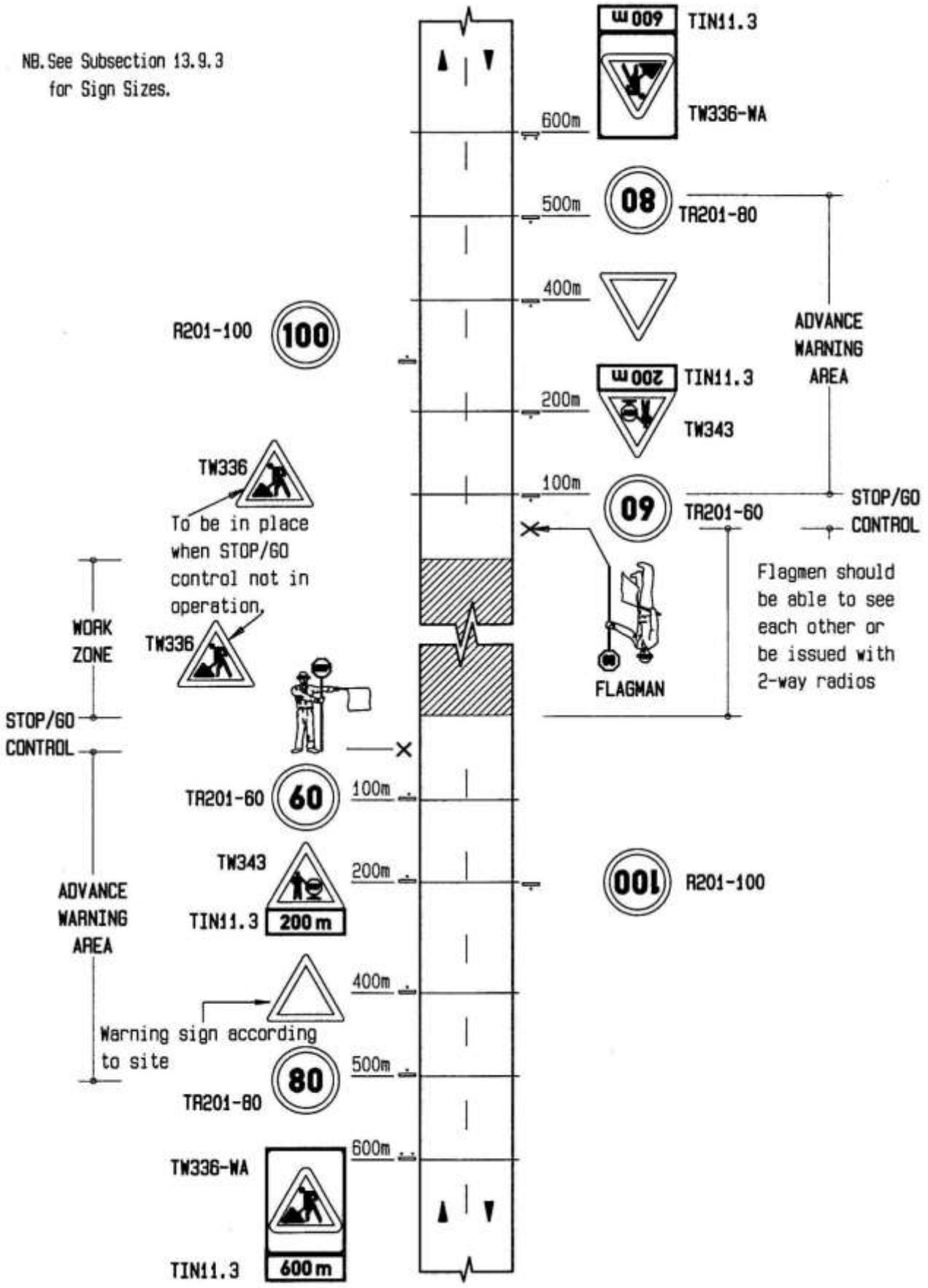

Fig 13.44 **STOP/RY-GO Operation**

13.9.4 Gravel Road Blading/Re-Shaping

1 Figure 13.45 illustrates the signing for grader operations involving the blading and reshaping of gravel roads in rural areas. It is recommended that the signs required to cover a section of road of about 10 km in length, or approximating a days work, be set out at the beginning of the day. On this basis TW337 signs should be placed at 2 km to 3 km intervals through the section on both sides of the road. Typically a grader will run four or five blade widths over such a 10 km section in a day. This signing application is also appropriate when a grader is being used for cleaning and reshaping of side drains.

2 The grader shall be fitted with at least one FLASHING YELLOW WARNING LIGHT SS3 to assist visibility of the vehicle. This light shall be switched on at all times whilst the grader is working or stopped in the roadway, or it is within 3 metres of the edge of roadway. In hilly terrain the use of a high mounted flag (located on a 3 metre aerial or similar device mounted above the cab) is recommended to further enhance the warning given to approaching drivers.

3 The grader inventory may include two or more flags which the grader operator's assistants can use to mark problem areas in the road surface exposed by the blading operation.

4 It is possible that labourers may be working within a typical 10 km section undergoing blading and reshaping. When this occurs, the labour gang should be provided with at least a pair of TW336 signs. It is likely that such gangs of workers will move from place to place, in which case any of the short term sign applications given in Section 13.8 (Figures 13.32 to 13.37) may be appropriate within the overall section.

5 If sight conditions are particularly poor, or a section of road is has fairly high traffic volumes, flagmen may be used to slow oncoming vehicles. The flagmen shall be familiar with the standard flagging procedures given in Figure 13.23.

Checklist

- ❑ is the grader's flashing light operational?
- ❑ is the grader working in hilly terrain and/or on winding roads?
- ❑ are labourers also present in the section?
- ❑ are flagmen required?

MAINTENANCE UNIT INVENTORY

Sign	No	Size (mm)	Quantity
	TW337	1200	(1) 6
	TIN 11.2	1200	2
	FLAGS	450 X 450	(2) 2
	MARKER FLAG	500 On 3000 Aerial	(3) 1 Per Grader
	TW336	1200	4

(1) Add TW337 at 3km intervals if a 10km section is bleded.
(2) Flags to mark problem spots in the road surface exposed by blading.
(3) Marker flag to indicate presence of grader in undulating or rolling topography.

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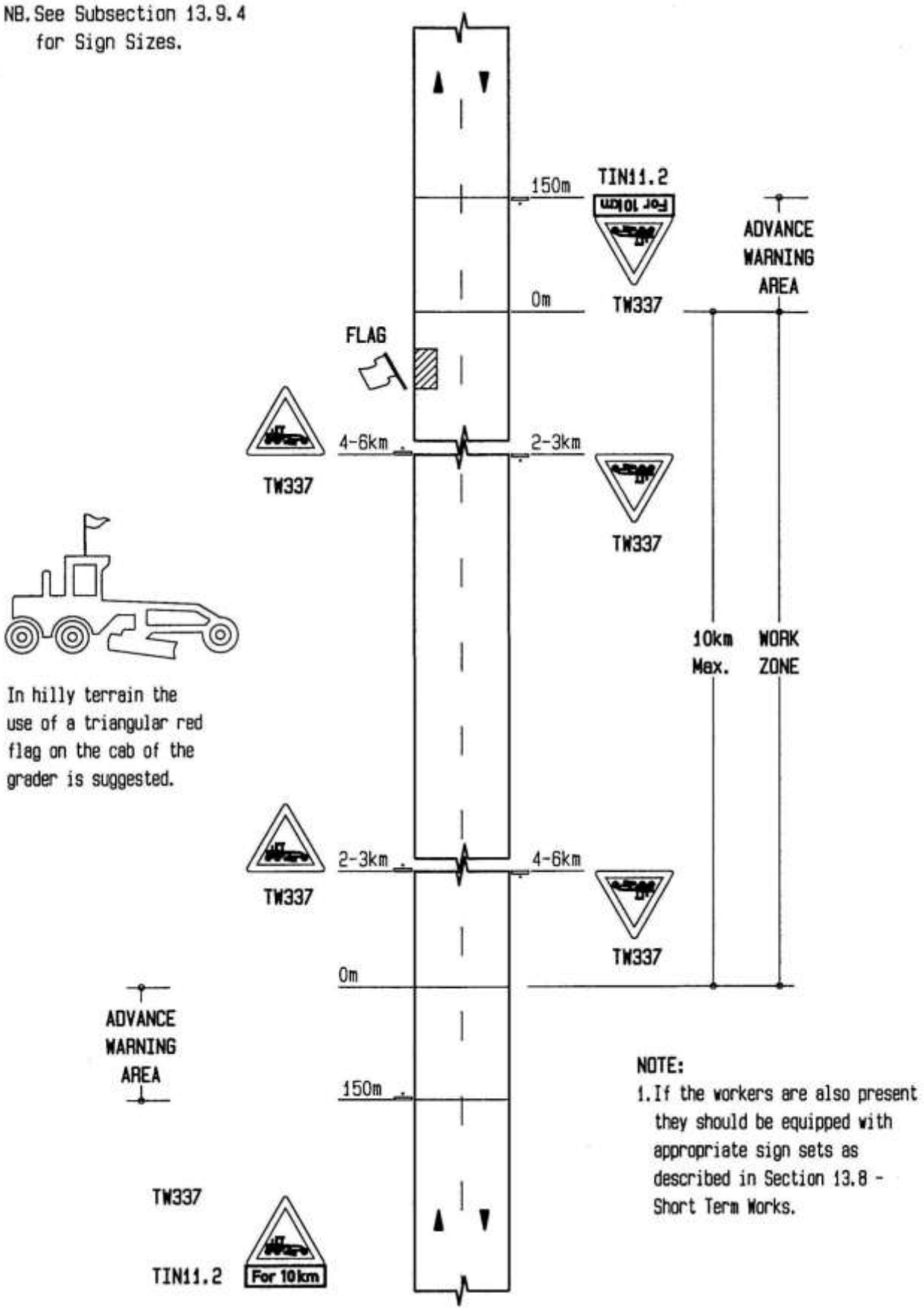

Fig 13.45 **Gravel Road Blading/Re-Shaping**

13.9.5 Gravel Roads - Gravel Heaps

1 In constructing gravel roads it is normal practice to stockpile gravel heaps on the section of roadway being worked, as shown in Figure 13.46. Whenever possible, gravel heaps must be spread before the end of the day's activities and should not be left in place overnight. If it is not possible to achieve this, there must be sufficient width for two-way traffic and adequate signing must be in place for drivers to determine that:

(a) there is an obstruction in the roadway; and

(b) there is limited space for two-way traffic.

2 Figure 13.46 shows signing appropriate to a working period and to a situation when gravel heaps may have to be left in place overnight. Double sided DELINEATOR hazard marker signs TW401/TW402 should be provided at 50 metre centres along the full length of any heaps which will remain in place overnight. At least three delineators shall be visible in each direction to establish the horizontal and vertical alignment of the road. Where possible, a reduction in speed limit should not exceed 15% of the operating speed (or 20 km/h).

3 This type of roadwork activity is traditionally very hard on road signs. Given the possible nature of the hazard, particularly at night, it is essential that the signs be maintained in good condition and that they are regularly inspected for the quality of their retroreflectivity.

4 Subject to the size of the maintenance unit, the length of a section of road being gravelled should be kept within the limits of good management and control. A maximum length of 2 km is recommended whilst work is in progress, but this should be significantly reduced, if at all possible, if gravel heaps are to be left in place overnight.

Checklist

- ❑ are gravel heaps to be left in place overnight?
- ❑ do all signs have good retroreflective properties?
- ❑ what is a safe manageable length of site for the size of work unit and likely traffic?

MAINTENANCE UNIT INVENTORY			
Sign	No	Size (mm)	Quantity
	TW336-WA	1200 X 1600	2
	TR201-60 TR201-80	1200	2 2
	TW329 TW330	1200	1 1
	TR103 TR104	1200	1 1
	TW212	1200	2
	TW401 TW402	150 X 600	10m per 100m site length
	R201-100	1200	2
	TIN 11.3	1200	2
	TIN 11.4	1200	2

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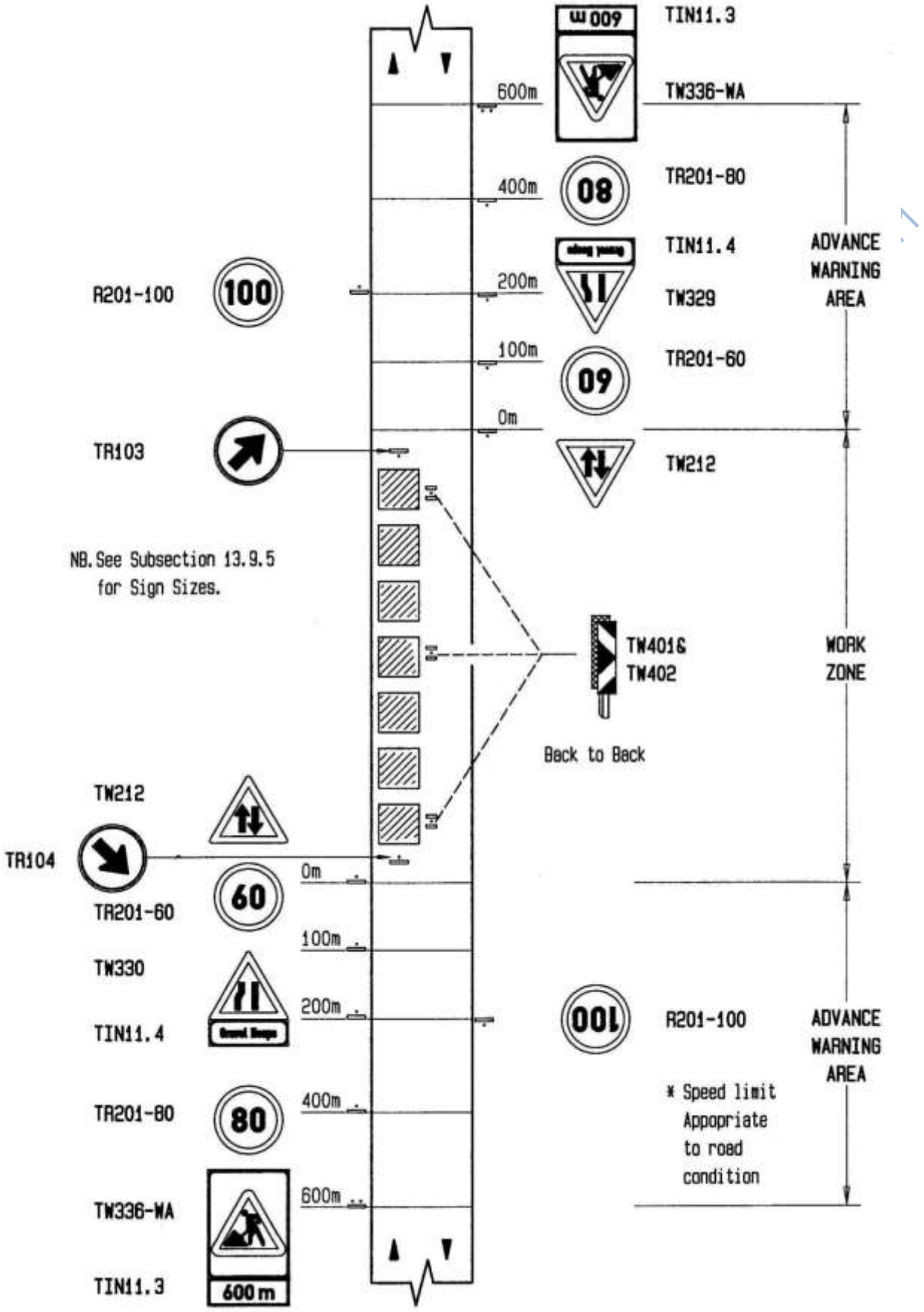


Fig 13.46 **Gravel Roads – Gravel Heaps**

13.9.6 Gravel Road Reconstruction

1 Figure 13.47 includes two typical details which may occur during gravel road construction. These details are similar to those in Figures 13.44 and 13.46 but are shown together here to illustrate the likely need to cater for both types of activity at one site. Detail 13.47.1 shows a typical STOP/RY-GO traffic control situation (for further details see Subsections 13.3.9, 13.9.3, and Figure 13.23). STOP/RY-GO control is likely to be required regularly as follows:

(a) whilst material is being delivered to the site;

(b) whilst gravel is being spread and worked;

(c) whilst heavy of plant or equipment is being moved.

2 Detail 13.47.2 shows the signing arrangement once traffic is able to pass the working area. Subject to the expected nature of the work, advance signing may be arranged according to either detail. However, if STOP/RY-GO control is expected, the greater distances shown in Detail 13.47.1 should be used throughout the working period. The size and position of the first sign in the sequence may be varied according to known local conditions. If speeds are known to be low, sign TW336-WA may be replaced by a TW336 sign or omitted all together. However, if approach speeds are likely to be high, it may be appropriate to move the TW336-WA sign further out to 800 m or 1000 m and adjust the spacing of the other advance signs accordingly.

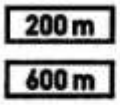
3 If the pattern of work is such that a relatively short section of road is being actively worked on at a time, but that the effects of work are evident over some greater distance, this should be indicated at the beginning of the site by means of a SUPPLEMENTARY PLATE sign TIN11.2 displayed with sign TW336.

4 If the extent of work and traffic is such that the occurrence of unacceptable delays to traffic and disruption to the smooth progress of the work are likely, a deviation or detour of the types illustrated in Figures 13.53 to 13.56 may need to be considered.

Checklist

- ❑ are gravel heaps to be left in place overnight?
- ❑ do all signs have good retroreflective properties?
- ❑ is a deviation or detour likely to be required?
- ❑ what is a safe manageable length of site for the size of work unit and likely traffic?
- ❑ is the unit equipped for STOP/RY-GO operation?

MAINTENANCE UNIT INVENTORY

Sign	No	Size (mm)	Quantity
	TW336-WA	1200 X 1600	2
	TR201-60 TR201-80	1200	2 2
	TW329 TW330	1200	1 1
	R1.5A/ R1.5B	750	2
	TR103 TR104	1200	1 1
	TW212 Optional	1200	2
	TW401 TW402	150 X 600	10m per 100m site length
	R201-100	1200	2
	TIN 11.3 TIN 11.3	1200	2 2
	TW344	1200	(1) 2
	TW343	1200	2

(1) Signs TW337 may be used as an alternative.

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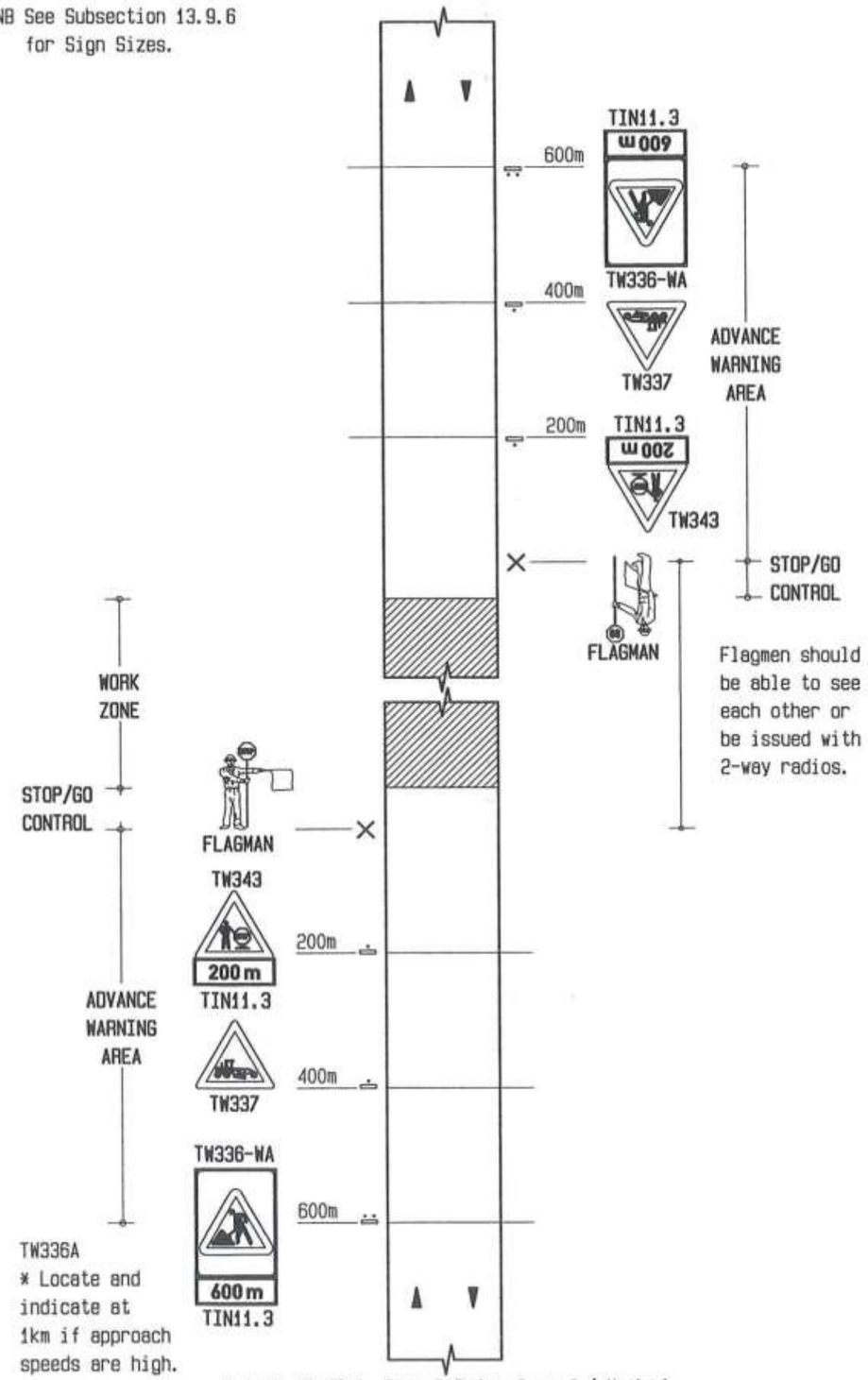
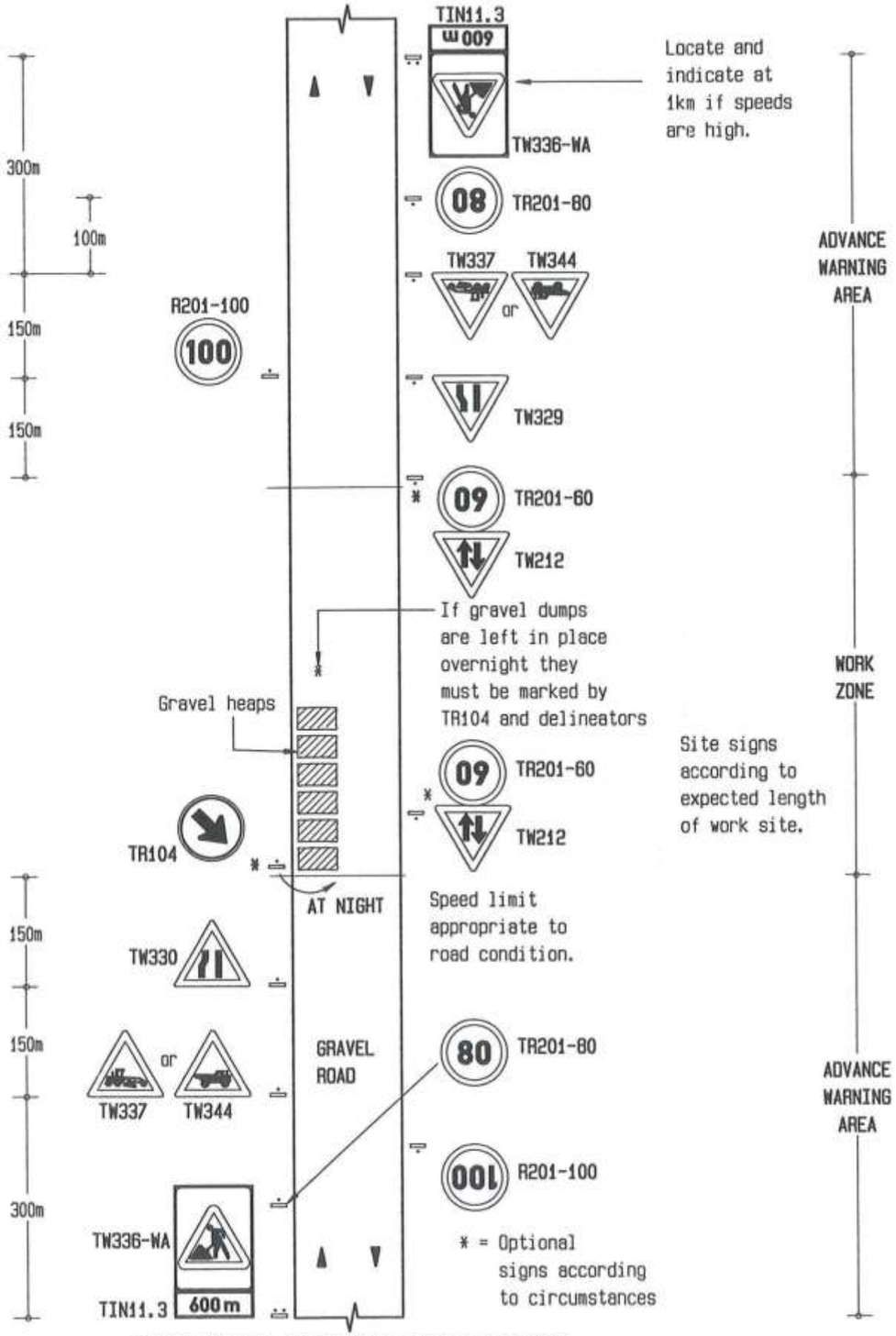
NB See Subsection 13.9.6 for Sign Sizes.



Detail 13.47.1 Gravel Being Spread / Worked



Detail 13.47.2 Gravel Heaps Before Spreading

Fig 13.47
Gravel Road Construction

13.9.7 Reseal/Resurfacing Work – Just Completed

1 Figure 13.48 illustrates recommended signing levels where work on resealing of a section of roadway has just been completed. This work activity may occur on sections of roadway within a larger site and may occur in more than one place at a time within such a site. When this is the case, the signing should be adjusted to suit the overall signing requirements of the site. Any temporary speed limit should relate to that operating within the rest of the site and should be as high as is practical and safe (see Section 13.4).

2 Sign TW333 and sign TW338 should be considered when there is significant horizontal road curvature and/or the road crossfall or superelevation is also significant, as in hilly country, since the combination of loose stone chippings or dust on the road surface together with this type of road profile can lead to slippery conditions. Alternatively, sign TW333 may be used instead of sign TW338 if the condition of the road surface is considered to be a greater hazard than the risk of stone chippings being thrown up.

3 The sign sequence shown should be repeated at approximately three kilometre intervals and, if the road is one carriageway of a dual carriageway road, the signs shall be repeated on the right, on the median island.

4 A similar level of signing is appropriate if an asphalt overlay or concrete surface has just been laid and traffic is using it for the first time. With this type of surfacing the use of SURFACE STEP advance warning signs TW340 and TW341 may also be appropriate.

5 If road markings are not likely to be re-marked shortly after re-opening the road to traffic, NO LINES advance warning signs should also be provided (see Volume 4, Chapter 3, Section 3.1).

Checklist

- ❑ is a 3 km spacing of sign sets adequate?
- ❑ is the road surface slippery?
- ❑ is there a temporary step in the road surface?
- ❑ will road markings be re-marked shortly after re-opening the road?

MAINTENANCE UNIT INVENTORY			
Sign	No	Size (mm)	Quantity
	TR201-60	1200	2 Plus 2 Every 3km
	TW338	1200	2 Plus 2 Every 3km
	R201-100	1200	2
	TW333	1200	2 Plus 2 Every 3km (1)
	TW340 TW341	1200	2 Plus 2 Every 3km (2)
		1200	2 Plus 2 Every 3km (3)

(1) Add signs TW333 at 3km intervals if many sharp curves exist especially in mountain passes where loose gravel and crusher dust are located on the road surface.
(2) Use signs TW340 / TW341 as appropriate in place of TW333 or TW338 when re-surfacing with asphalt overlay or concrete if a surface step is present.
(3) Use text warning sign if repainting is not immediate.

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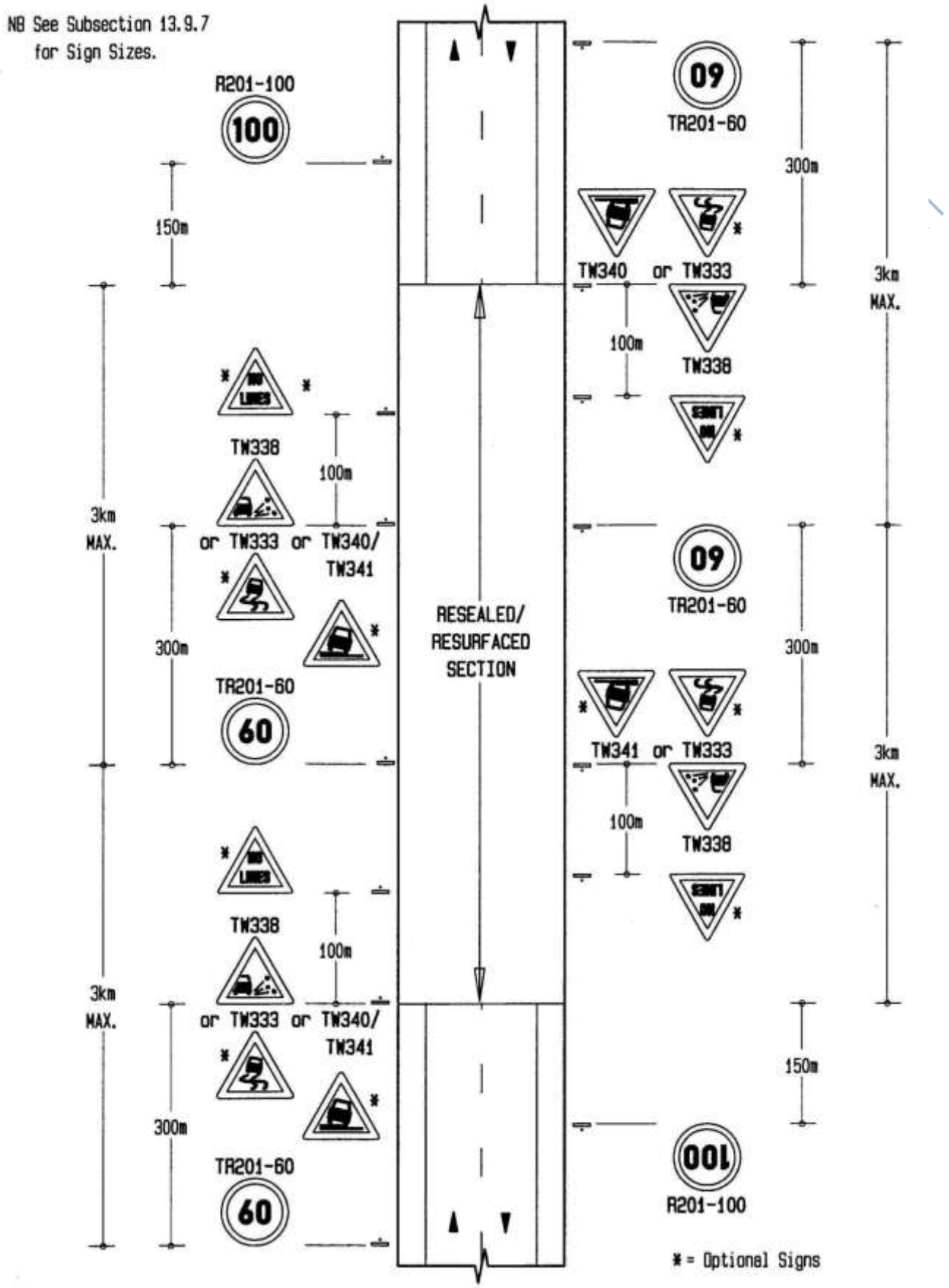


Fig 13.48 **Reseal/Resurfacing Work – Just Completed**

13.9.8 Reduced Width Operation - 2-Way Traffic

1 Figure 13.49 should be read with Figures 13.78 and 13.79.

2 The detail given in Figure 13.49 is suitable for general use when a rural 2-lane 2-way road is being resurfaced or reconstructed. The layout is based on a road cross-section which is wide enough to permit approximately half of the road to be resurfaced or reconstructed whilst traffic is diverted to run on the other half of the road. Such operation will require that the cross-section of the road includes useable shoulders, or that temporary shoulders are created for the duration of the deviation. Any temporary speed limit should preferably be within15% (or 20 km/h) of that existing prior to the work starting. Cross section design standards should take this into account (see Section 13.4).

3 Figure 13.49 represents the main signing requirements **for the ADVANCE WARNING AREAS to the deviation.** The signs indicated in the "Maintenance Unit Inventory" opposite are for this purpose. **To determine a full signing inventory, further signs will have to be added** for the TRANSITION AREAS, the WORK AREA, and the TERMINATION AREAS. The majority of signs in these areas will be DELINEATOR PLATE signs TW401/TW402. For details of the signs inventories for these areas, refer to Section 13.12 - Enlarged Standard Details and particularly to Figures 13.78 and 13.79.

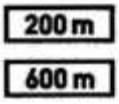
4 Particular attention should be paid to the transition area treatment. Tapers should be sized and delineated in accordance with Section 13.5, and in particular with Tables 13.4 and 13.5 and Figures 13.20 and 13.29. Retroreflective temporary road markings should be applied in the transition areas and should be kept in good condition for the duration of work.

5 If flagmen should be deemed necessary due to specific hazards at the approaches to the transitions, or as a result of a poor accident history in these positions, they shall operate in accordance with the provisions of Subsection 13.3.9 and Figure 13.23.

Checklist

- ❑ does the maintenance unit have sufficient DELINEATOR PLATES for its task?
- ❑ are there vertical and/or horizontal curves on the approaches which should be taken into account when positioning signs?
- ❑ are flagmen required?
- ❑ if flagmen are required are they well trained and alert?

MAINTENANCE UNIT INVENTORY

Sign	No	Size (mm)	Quantity
	TW336	1200	2
	TR201-100	1200	2 Optional
	TR201-60 TR201-80	1200	4 2
	TGS111 TGS112	1200 X 1600	1 1
	TIN 11.3 TIN 11.3	1200	2 2
	TR104	1200	1
	FLAGS	450 X 450	2
	TR214	1200	2
	TGS107 TGS108	1200 X 1600	1 1
	R201-120	1200	2

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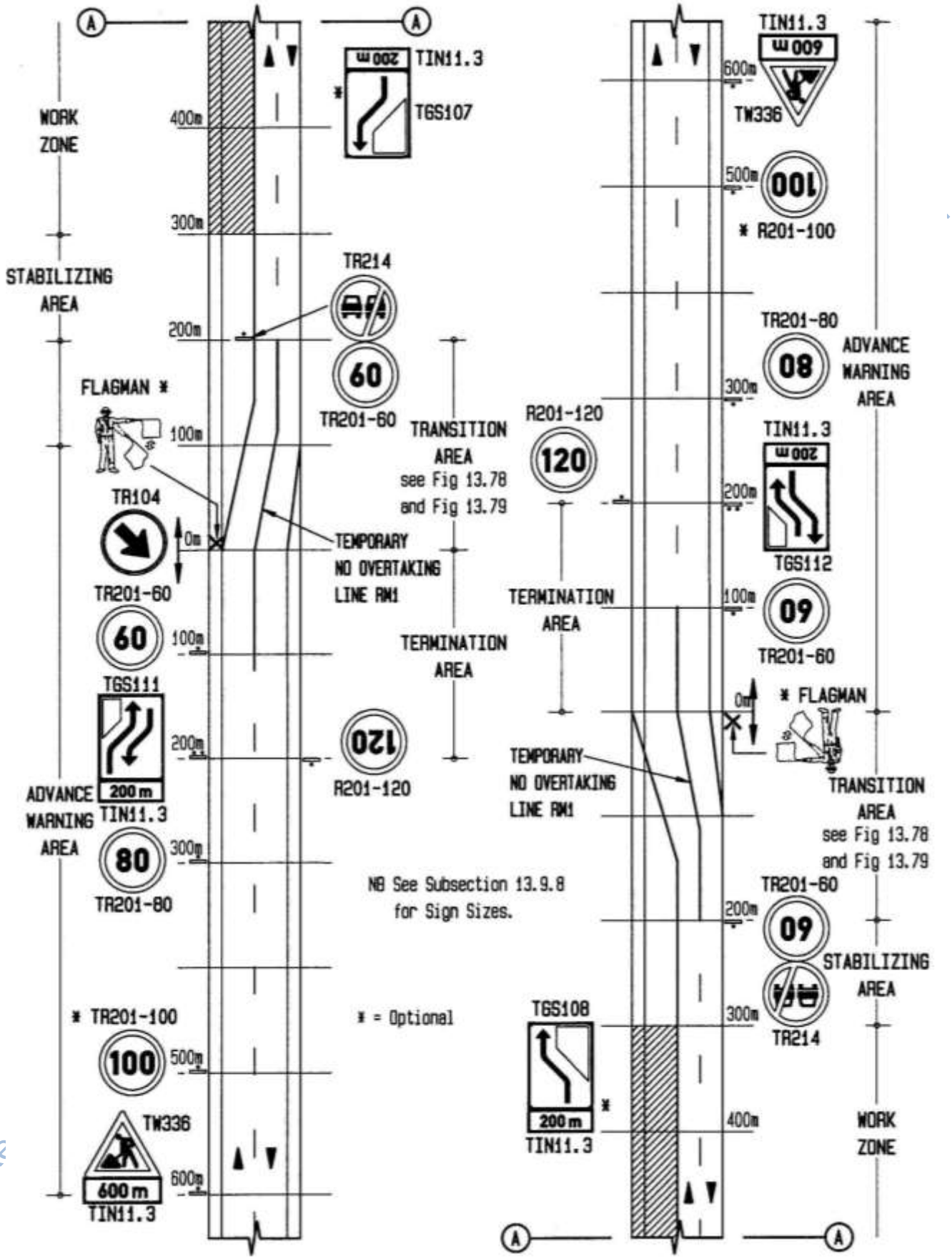

Fig 13.49 **Reduced Width Operation – 2-Way Traffic**

13.9.9 Total Road Closure Ahead

1 Figure 13.50 shows the approach signing to a total STOP condition such as might be required at a bridge wash-away or other flooding, or at the site of a road collapse. A situation such as this should be preceded by one of the types of signing arrangements given in the details of Figure 13.52. The purpose of the signing given in Figure 13.52 is to reduce the number of drivers who might end up approaching the site of the road closure and to provide them with a detour round the site.

2 When an event requiring this type of signing occurs the likelihood is that signing will be placed in a number of "steps". The first will be an "immediate action" signing provision put in place by the incident response team. This could well take the form of the signing given in Detail 13.52.1 together with a minimum level road closure at the site. This latter may well have to be attended by workers or a flagman in the first instance. If the incident is going to be a long term one the next step will be to implement the signing given in Figure 13.50 together with a ROAD CLOSURE BARRIER (see Figure 13.87), in order to make the site safe. This should be closely followed by more informative detour signing as illustrated in Details 13.52.2 and 13.52.3. Once work commences at the site to carry out repairs a work site will be required. This can be created by providing another barrier an appropriate distance in advance of the road closure barrier, which can be considered to be a NO UNAUTHORISED TRAFFIC BARRIER (see Figure 13.87), through which only contractors and road authority vehicles should be permitted.

3 Remote from the actual road closure site it will commonly be necessary to provide NO THROUGH ROAD BARRICADES, as detailed in Figure 13.88, at one or more junctions.

4 Subject to the time that the road is going to be closed to traffic a "public relations" message high visibility sign of the type illustrated in Figures 13.18 and 13.50 may be specified.

Checklist

- ❑ are the optional signs shown, warranted due to high traffic approach speeds?
- ❑ has an effective detour been put in place?
- ❑ will the site require major reconstruction when the effects of the incident are over?

MAINTENANCE UNIT INVENTORY

Sign	No	Size (mm)	Quantity
	TW302-WA	1200 X 1600	2
	TR201-100	1200	2 Optional
	TR201-60 TR201-80	1200	2 2
	FIG. 13.87	Size to Suit	2 for major roads
		1200	2 for minor roads
	TW302-WA Flashing lights Optional	1200 X 1600	2 for major roads
	TW302 Flash light Optional	1500	2 for minor roads
	R1	1200	2
	TIN 11.3 TIN 11.3 TIN 11.3	1200	2 2 2

(1) Refer to Figures 13.87 and 13.88 for traffic barriers for unauthorised vehicles or road closures.

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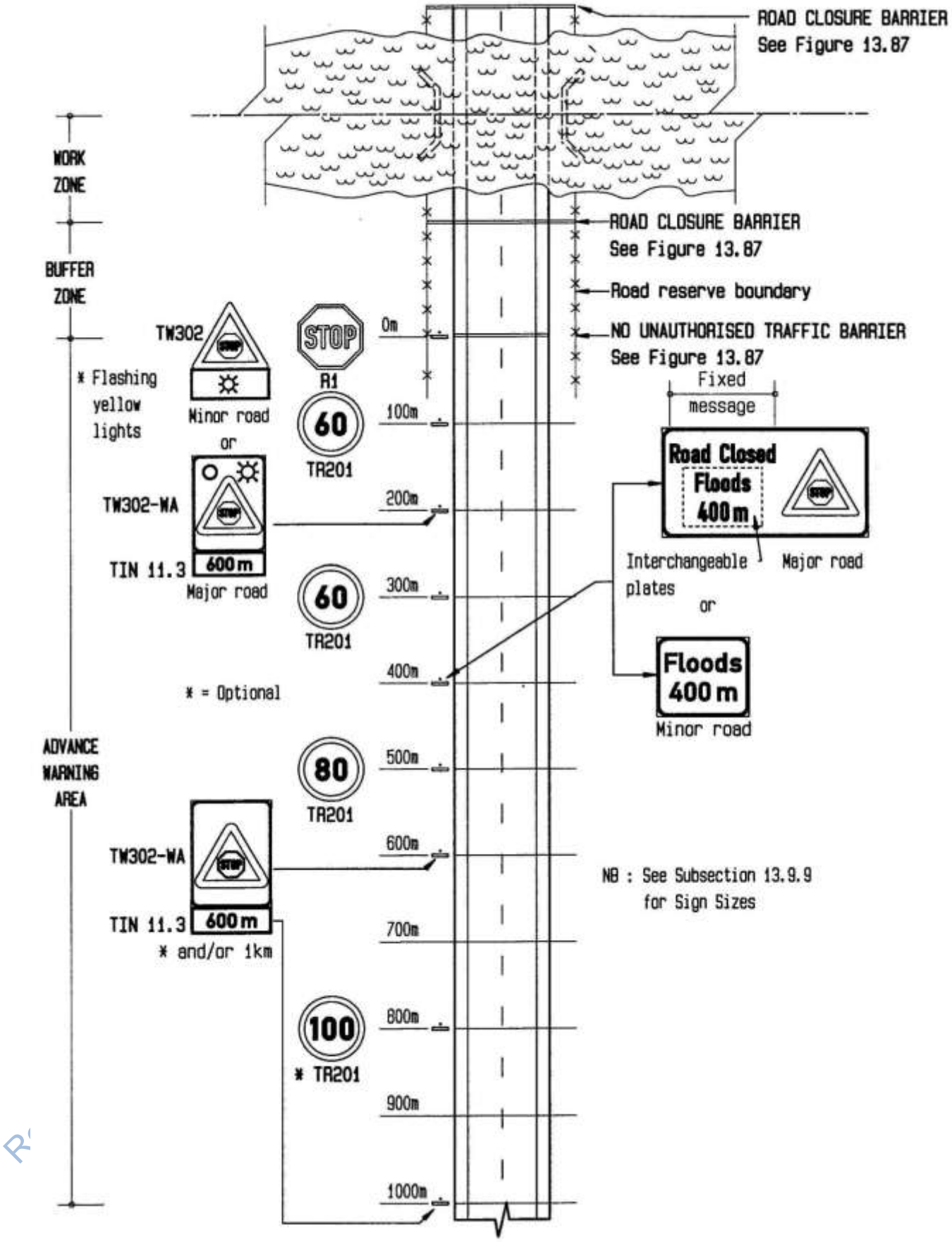

Fig 13.50 **Total Road Closure Ahead**

13.9.10 Detour Signing

1 For the purposes of categorising temporary road traffic signing at roadworks, the following descriptions of terms commonly used in this chapter are relevant:

"**deviation**: involves the local redirection of traffic onto a roadway normally used only by traffic travelling in the opposite direction, **or** onto a specially constructed more-or-less parallel temporary roadway; existing direction signs can commonly be re-located to suit the temporary road alignment"; **and**

"**detour**: involves the redirection of traffic **to other parts of the road network** and will normally require the use of temporary direction signs to assist road users to reach their intended destination by alternative routes".

2 Figure 13.51 shows a selection of signs suitable for use at detours required either as a result of major road rehabilitation, or as a result of some incident such as a hazchem spill, a major accident or flooding. These signs are additional to the many temporary regulatory, warning and guidance signs illustrated in Section 13.2 which may also be required in such circumstances.

3 The signs shown in Figure 13.51 are appropriate at the types of situations given in Figures 13.50 and 13.52. The temporary DETOUR DIRECTION signs TGD2-D shown in Detail 13.51.3 are intended to be a rapid response tool to be put in place immediately the need for a detour arises. The TGD2-D sign is a universal sign in that it can be held in stock in some quantity and can be used to point in any direction to indicate the course of the detour. When these signs are put in place initially, it is recommended that they be placed on, or adjacent to, the relevant panel of an appropriate ADVANCE DIRECTION sign GD1 or DIRECTION sign GD2 on which the affected/closed direction panel has been temporarily been covered, pending a more effective modification of the signs (see Figure 13.16).

4 Once it becomes possible to upgrade the temporary signing of an "immediate action" detour, temporary FINGERBOARD DIRECTION signs TGD4 in Detail 13.51.2, which again can be standard items (with "left" and "right" examples), may be used to replace some or all of the TGD2-D signs. Although they are still small signs, the TGD4 signs have a significantly bigger target value.

5 Ultimately, once the length of time is known for which the detour may have to be operational, larger more informative signs such as those shown in Detail 13.51.1 may be warranted due to the number of drivers who are effectively strangers to the area.

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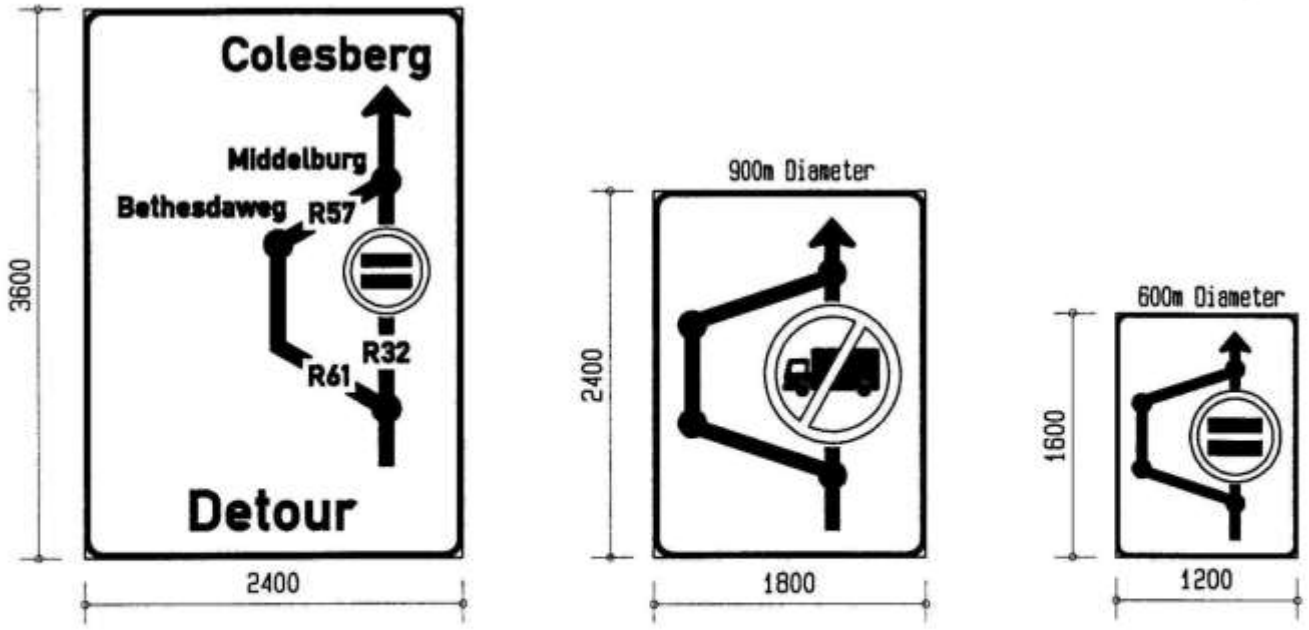
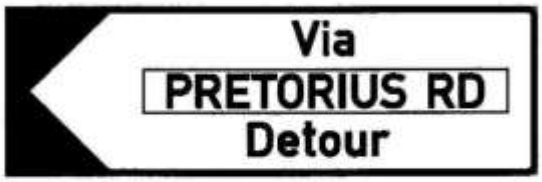


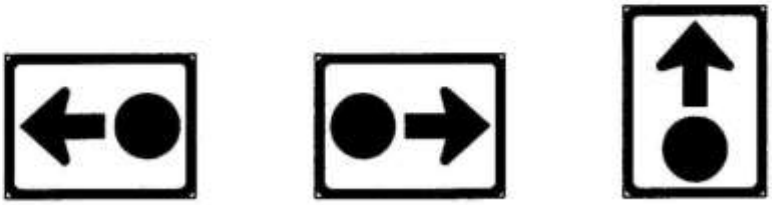
Detail 13.51.1 EXAMPLES OF TEMPORARY MAP-TYPE DIRECTION SIGNS

Typical Sizing for 140mm and 210mm Lettering



Urban Example

Detail 13.51.2 TEMPORARY FINGERBOARD SIGNS - TG04



Detail 13.51.3 TEMPORARY DETOUR DIRECTION SIGN - TG02-D

Fig 13.51 **Detour Signing**

13.9.11 Detour at a Road Junction

1 The situations illustrated in Figure 13.52 are relevant to major detours, either urban or rural, necessitated by the closure of a road link due to same event, such as a hazchem spill, a major accident, a flood or subsidence. The actual site of the incident may be remote from the junction concerned, but on a network basis the junction is the best one from which to provide a detour to the cut-off destination.

2 The first action, in such circumstances, will normally be the provision of a barricade on the entry to the closed section, and the effective conversion of the junction to a 4-way STOP control. Details of barricade treatment are given in Figures 13.87 and 13.88.

3 Figure 13.51 shows a range of specialised detour signs, some of which may be useful in situations similar to those illustrated. The need to provide for the sort of detour illustrated is likely to be an unplanned event. It will therefore commonly be necessary to react quickly to establish a detour. TEMPORARY DIRECTION sign TGD2-D can be utilised for this purpose. Sign TGD2-D is a compact sign which can be pre-manufactured because this one sign may be pointed left, right or straight on. Detail 13.52.1 shows a typical example of the use of TGD2-D signs. Standard left and right TEMPORARY FINGER BOARD signs TGD4 may also be pre-manufactured and quickly deployed to identify a detour.

4 Apart from the regulatory and warning signs associated with the modified junction control, alterations will be needed to existing direction signs if the detour is to be in place for some time. Details 13.52.2 and 13.52.3 give examples of such alterations for a minor, but priority road and similarly for a major road, respectively. In Detail 13.52.2 the junction is provided only with DIRECTION signs GD2. These have been altered to display the new direction to destination "A". The major junction in Detail 13.52.3 has, in addition, ADVANCE DIRECTION signs GD1. The GD1 and GD2 signs for two approaches are shown suitably modified to cater for the new routing to destination "A".

5 Drivers faced with an unexpected detour may be reluctant to follow temporary directions without confirmation that the new routing will lead to their intended destination. A version of temporary MAPTYPE ADVANCE DIRECTION sign TGD9 may be considered if such circumstances become evident.

6 No checklist or sign inventory is given for this example of temporary signing applications because each site is likely to be unique.

MAINTENANCE UNIT INVENTORY

Sign	No	Size (mm)	Quantity
	TW104-WB	1200 X 1600	1
	TW302	1500	1
	TW104	1200	1
	R1	1200	1
	TIN 20 TIN 21	450 X 600 (urban) 675 X 900 (rural)	2 2
	TGD2-D	384 X 288 (urban) 600 X 450 (rural)	10-20 in Store
	TIN 11.3 TIN 11.3	1500 1200	2 2

(1) Add temporary panels and 'crosses' to existing direction signs where necessary and when required.
(2) For the placement of 'No Through Road' Barriers refer to Figure 13.88 .

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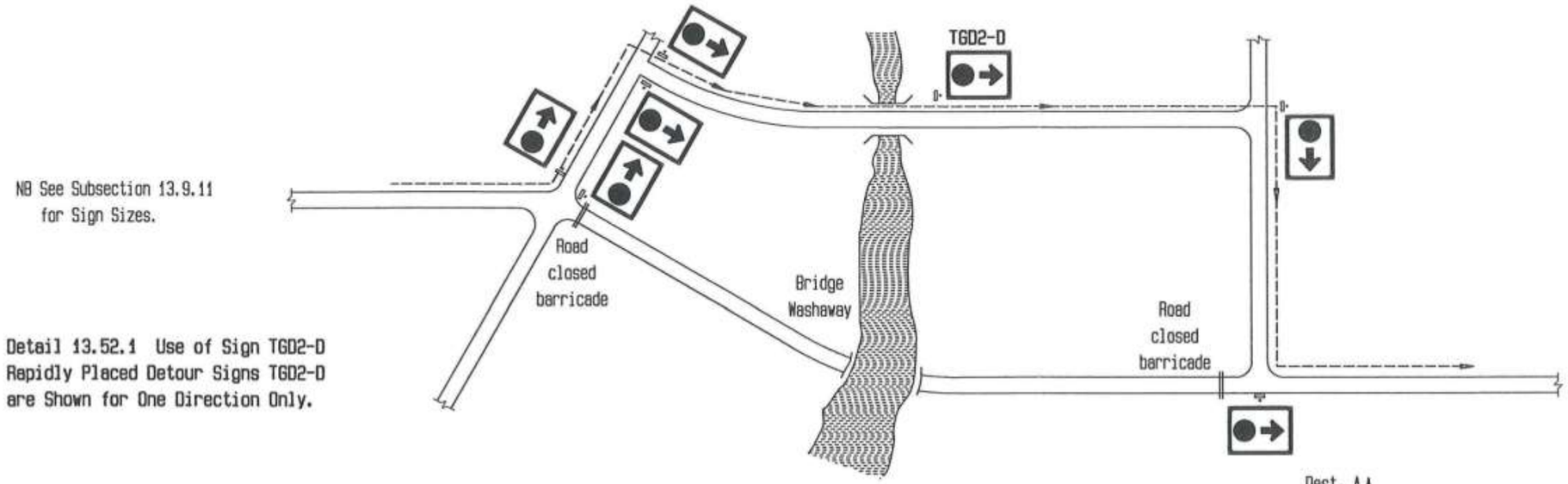
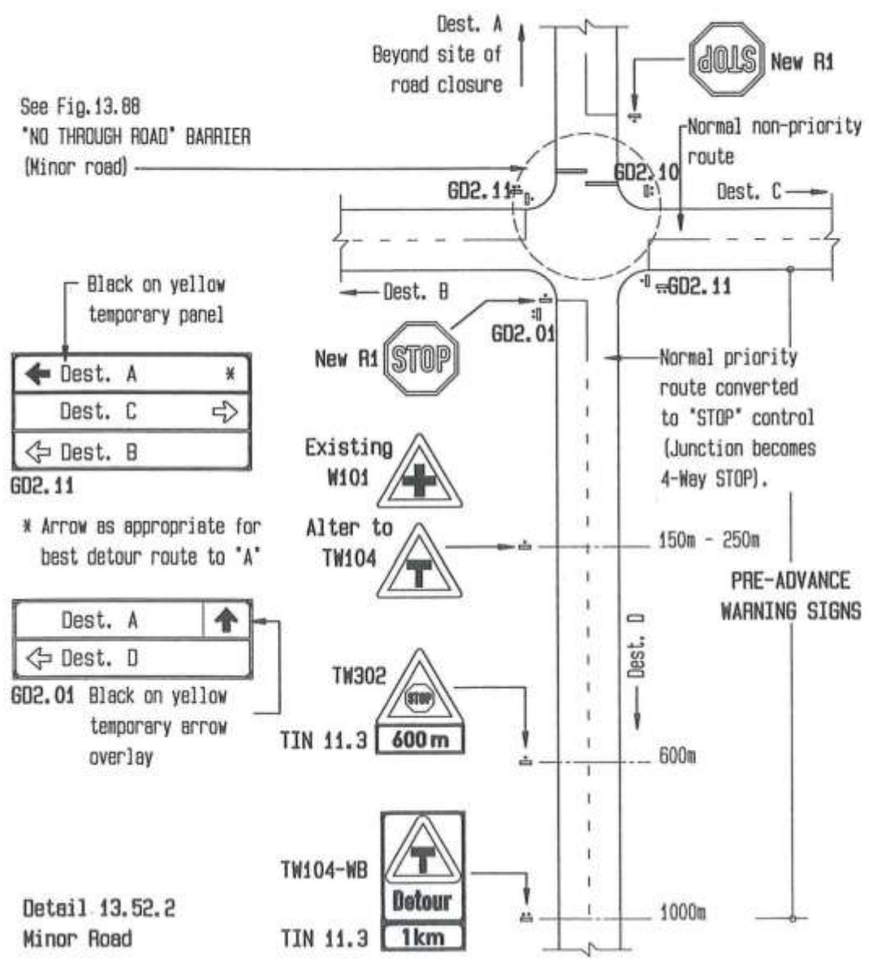
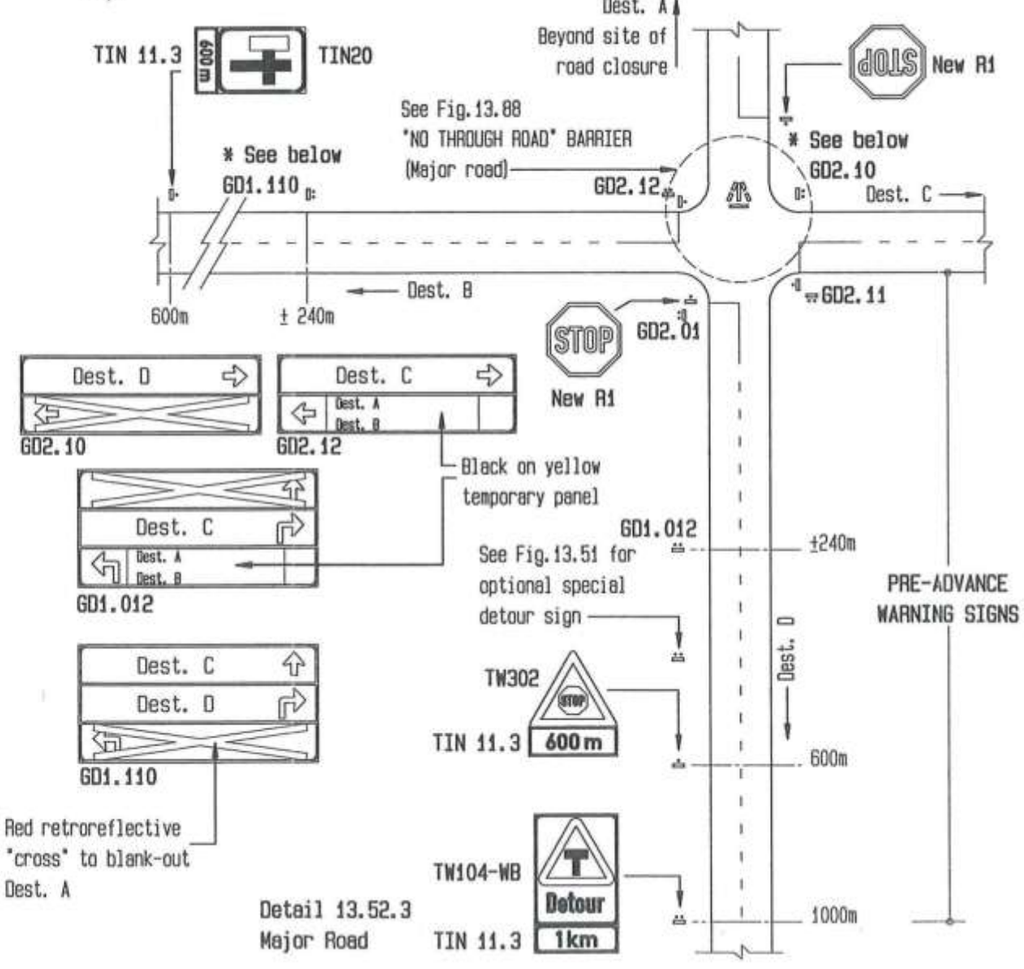


Detail 13.52.1 Use of Sign TGD2-D
Rapidly Placed Detour Signs TGD2-D are Shown for One Direction Only.



Detail 13.52.2
Minor Road



Detail 13.52.3
Major Road

Fig 13.52
Detour at a Road Junction

13.9.12 Deviation at a Bridge Site

1 Figure 13.53 shows a typical signing arrangement for a short localised deviation round a bridge construction site. Such deviations are generally kept as short as possible and commonly have a steep and tortuous descent and ascent down to, and away from, a low level river crossing. The road geometry of the deviation will often be designed to minimum standards and it is, therefore, particularly important that the quality of the temporary sign installation is of the highest. **The quality control involved should include the maintenance of the signs in a clean and effective condition.**

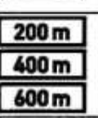
2 If approach speeds are known to be high and/or if the site is in any way hidden from direct view, consideration should be given to positioning the ADVANCE WARNING AREA signs over 800 m to 1000 m. Any temporary speed limit should preferably be within15% (or 20 km/h) of that existing prior to the work starting, consistent with what is safe and practical. Design standards should take this into account (see Section 13.4).

3 At the road closure barricades, the use of the strongly directional TW407 and TW408 CHEVRON signs is recommended in place of TEMPORARY BARRICADE sign TW411 when the alignment of the deviation is of minimum standards. If construction vehicles need to have access beyond these barricades, on one or both side of the bridge, then NO ENTRY sign R3 should be replaced by NO UNAUTHORISED VEHICLES sign TR208.

Checklist

- ❑ is the deviation alignment to minimum standards?
- ❑ are the signs clean and is the retroreflective material to specification and in good condition?
- ❑ do construction vehicles need to have access from the deviation to the closed portion of the site?

MAINTENANCE UNIT INVENTORY

Sign	No	Size (mm)	Quantity
	TW336-WA	1200 X 1600	2
	R201-100 or R201-120	1200	2
	TGS 111 TGS 112	1200 X 1600	2 2
	TR201-60 TR201-80 TR201-100	1200	2 2 2
	TW401 TW402	150 X 600	At 10-20m intervals
	TR214	1200	2
	TR103 TR104	1200	3 3
	TW407 TW408	2400 X 400	2 2
	R3	1200	2
	TW202 TW203	1500	1 1
	TW326	1500	2
	TIN 11.4	1500	2
	TW336	1500	2
	TIN 11.3	1200	2 2 2

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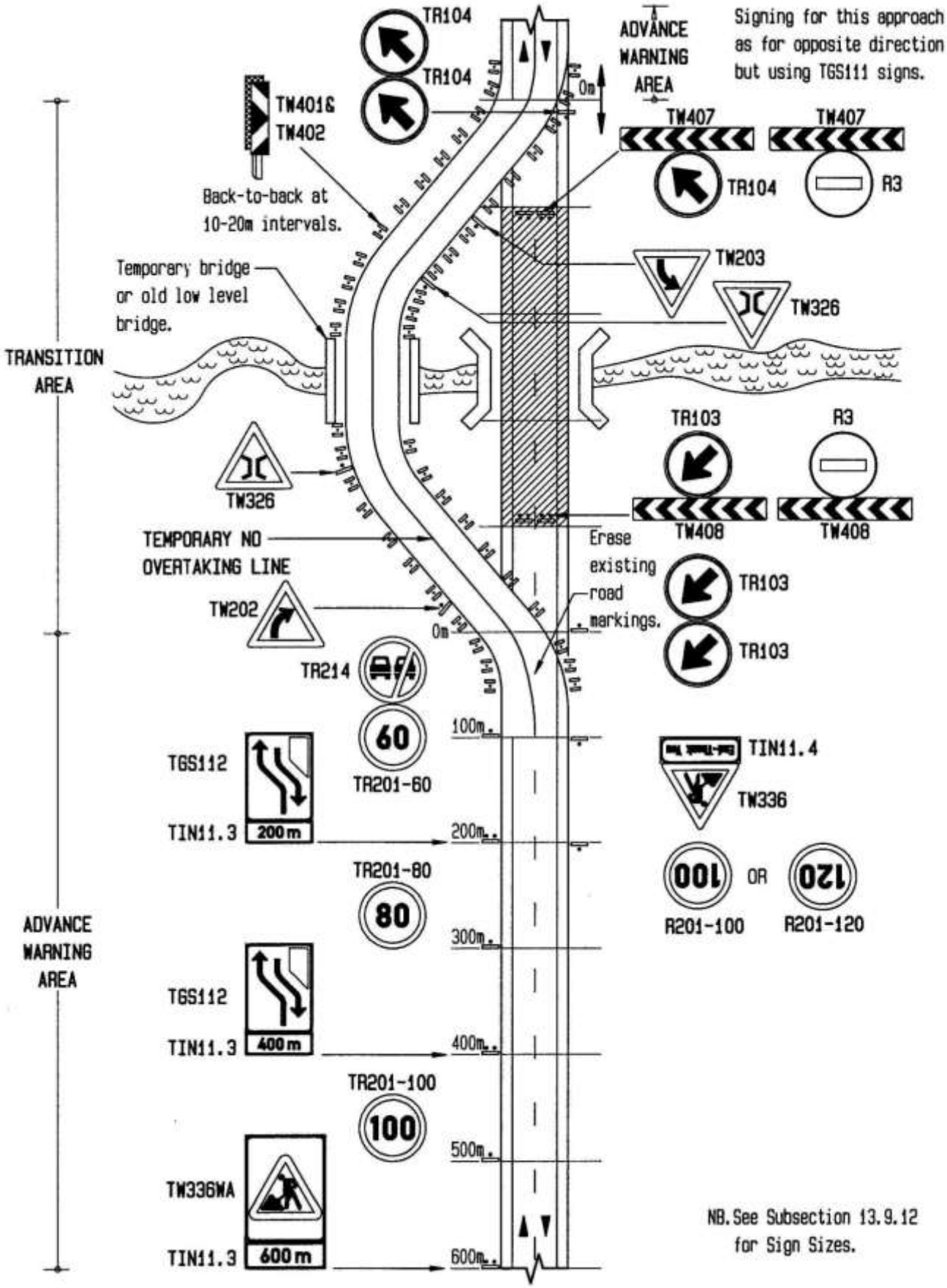


Fig 13.53 **Deviation at a Bridge Site**

13.9.13 Deviation - Low Traffic Volumes

1 For the purposes of categorising temporary road traffic signing at roadworks the following descriptions of terms commonly used in this chapter are relevant:

"**deviation**: involves the local redirection of traffic onto a roadway normally used only by traffic travelling in the opposite direction, **or** onto a specially constructed more-or-less parallel temporary roadway; existing direction signs can commonly be re-located to suit the temporary road alignment"; **and**

"**detour**: involves the redirection of traffic **to other parts of the road network** and will normally require the use of temporary direction signs to assist road users to reach their intended destination by alternative routes".

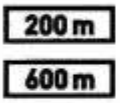
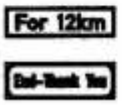
2 Figure 13.54 shows the signing requirements for the ADVANCE WARNING AREAS on the approaches to the start (and end - in the opposite direction) of a deviation at lengthy road construction or rehabilitation site. The concept of such signing is very similar to that depicted in Figure 13.53 but in this example is designed for low traffic volumes (see Figure 13.55 for appropriate details for a deviation for higher traffic volumes). Any temporary speed limit through the change of alignment should preferably be within15% (or 20 km/h) of that existing on the approaches. Design standards should take this into account (see Section 13.4).

3 Once the deviation alignment is established it may closely parallel the road under construction or it may change its position according to the terrain and available space, but it will remain in relatively close proximity to the main road alignment. According to the space available the deviation may cross the road construction in one or several places. details of the signing for such situations are given in Figure 13.55.

4 Signing of the TRANSITION AREA depicted in Figure 13.54, and any others required within the deviation, should be in accordance with figures in Section 13.12:"Enlarged Standard Details" (see Figures 13.81 to 13.84 in particular).

Checklist

- ❑ are traffic volumes sufficiently low for this level of signing?
- ❑ is the geometry and road condition of the entry to the deviation suitable for the indicated speed limit?
- ❑ is there sufficient width through the curves of the entry to the deviation to accommodate large vehicles in both directions at the same time?

MAINTENANCE UNIT INVENTORY			
Sign	No	Size (mm)	Quantity
	TW336	1500	3
	TR214	1200	2
	TR201-60 TR201-80	1200	2 2
	TW208	1500	2
	TIN 11.3 TIN 11.3	1500	2 1
	TR104	1200	4
	TW411	2400 X 400	2
	TW401 TW402	150 X 600	5m-10m Centres
	TW333	1500	1
	R201-100	1200	1
	TIN11.2 TIN11.4	1500	2 1

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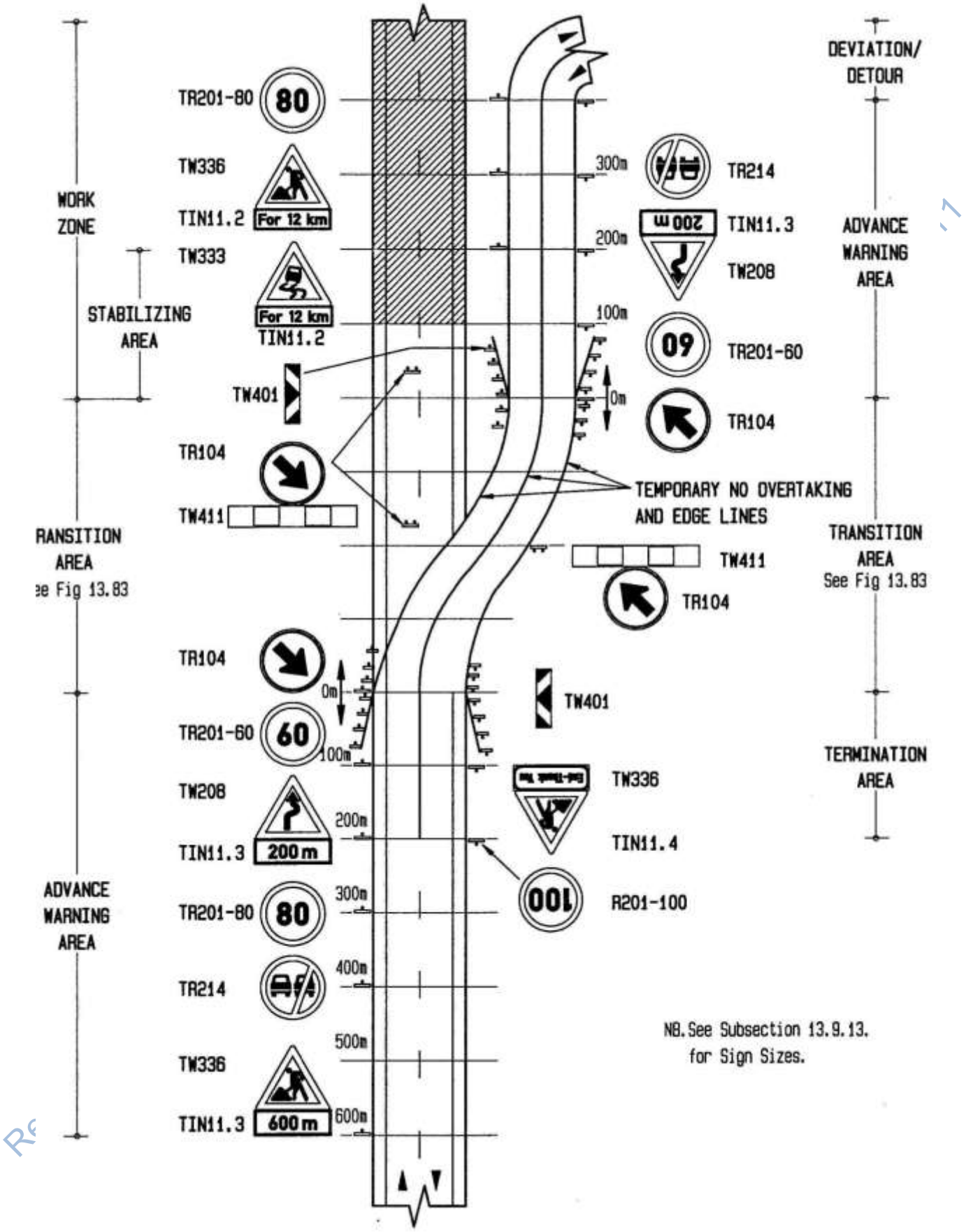


Fig 13.54 **Deviation – Low Traffic Volumes**

13.9.14 Deviation - High Traffic Volumes

1 For the purposes of categorising temporary road traffic signing at roadworks the following descriptions of terms commonly used in this chapter are relevant:

"**deviation**: involves the local redirection of traffic onto a roadway normally used only by traffic travelling in the opposite direction, **or** onto a specially constructed more-or-less parallel temporary roadway; existing direction signs can commonly be re-located to suit the temporary road alignment"; **and**

"**detour**: involves the redirection of traffic **to other parts of the road network** and will normally require the use of temporary direction signs to assist road users to reach their intended destination by alternative routes".

2 Detail 13.55.1 in Figure 13.55 is appropriate for the start (and end - in the opposite direction) of a deviation to be used by medium to high traffic volumes. The detail shows a similar signing to that given in Figure 13.54 but with DIAGRAMMATIC signs in the ADVANCE WARNING AREA instead of the advance warning signs depicted in Figure 13.54.

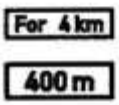
3 Once the deviation alignment is established, it may closely parallel the road under construction or it may change its position according to the terrain and available space, but it will remain in relatively close proximity to the main road alignment. According to the space available, the deviation may cross the road construction in one or several places as shown in a typical example in Detail 13.55.2. Detail 13.55.3 shows the sort of situation detail which may require specific signing attention within a deviation, and Detail 13.55.4 illustrates how a deviation may be connected to a section of existing road network to save on deviation construction.

4 Signing of the TRANSITION AREAS depicted in Figure 13.55, and any others required within the deviation, should be in accordance with figures in Section 13.12: "Enlarged Standard Details" (see Figures 13.81 to 13.84 in particular).

5 Formal "Road Closed" barricades should be established at the limits of each Work Area (see Figures 13.18 and 13.87).

Checklist

- ❑ is the geometry and road condition of the entry to the deviation suitable for the indicated speed limit?
- ❑ is there sufficient width through the curves at changes in direction in the deviation to accommodate large vehicles in both directions at the same time?
- ❑ can the deviation be satisfactorily connected to adjacent roads to limit construction costs?

MAINTENANCE UNIT INVENTORY			
Sign	No	Size (mm)	Quantity
	TW336-WB	1200 X 1600	2
	TR201-60 TR201-80 TR201-100	1200	2 2 2
	R201-120	1200	1
	TR214	1200	2
	TW336	1500	2
	TW411	2400 X 400	5
	TR104	1200	7
	TW202 TW203	1500	2 2
	TGS 113 TGS 114	1200 X 1600	4 4
	TGS 111 TGS 112	1200 X 1600	2 2
	TW401 TW402	150 X 600	10m-20m centres
	TIN 11.2 various TIN 11.3 various	1500 1200	4 10

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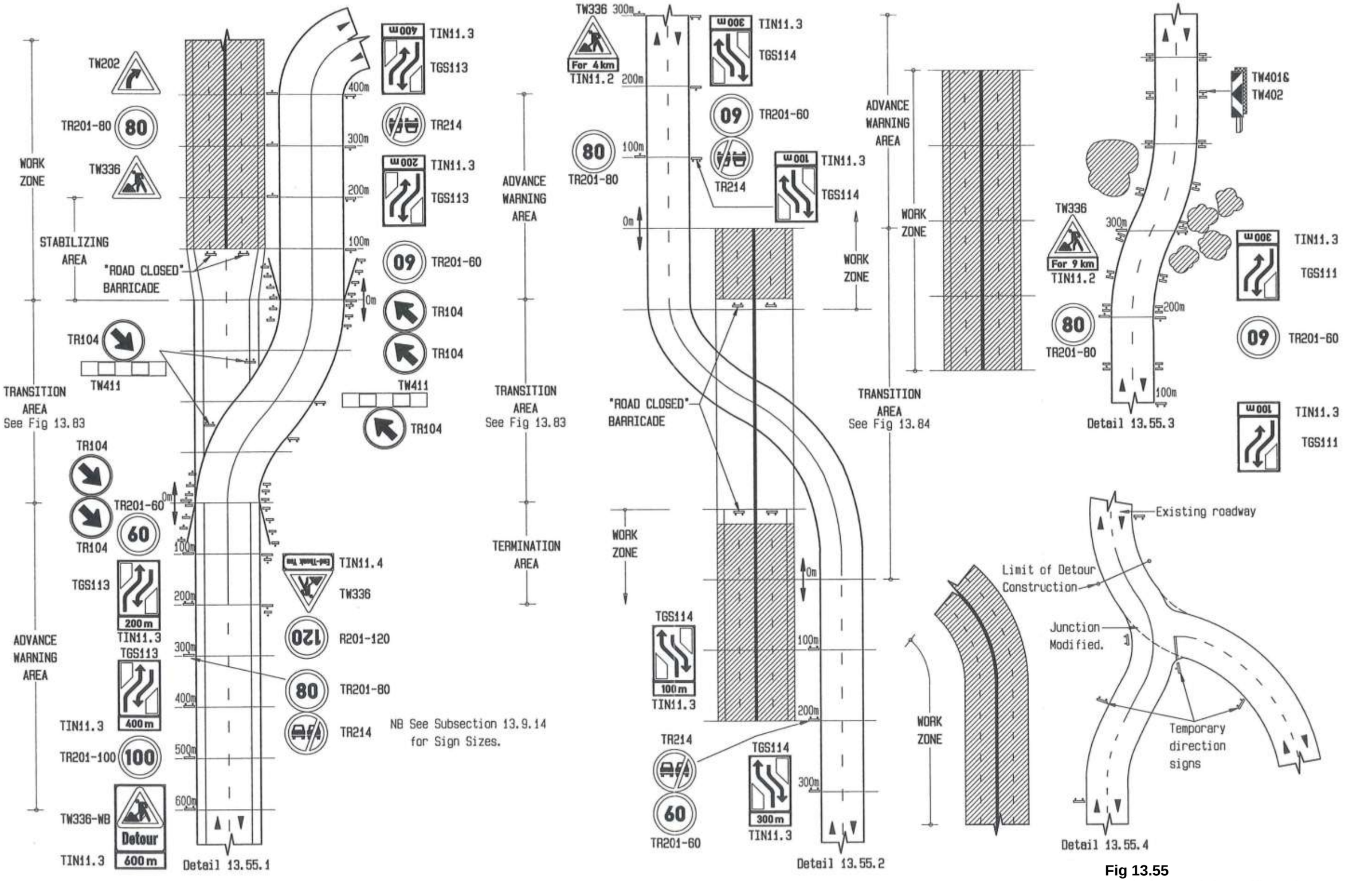


Fig 13.55
Deviation – High Traffic Volumes

13.9.15 Deviation - 4 Lane Undivided Road

1 Figure 13.56 shows the reduction in width of a 4 lane undivided road into a 2 lane deviation. The detail conforms to the description of a deviation given in Subsection 13.9.14, and will warrant the level of signing appropriate to high traffic volumes likely to be using its 4 lane cross-section.

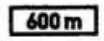
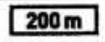
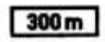
2 Because of the two lanes approaching the deviation, it will normally be desirable, on a cost and operational basis, to configure the entry to the deviation as a two-lane two-way section of roadway. This configuration requires the dropping of one of the approach lanes, and it is recommended that the lane nearest the centre of the road be dropped, particularly if the road carries even moderate volumes of slow moving vehicles. This arrangement also improves the ability to provide a smoother, longer curve through the entry to the deviation within the limits of the existing roadway width. Should there be circumstances which make the dropping of the lane nearest the edge of the roadway necessary, this may be achieved using DIAGRAMMATIC sign TGS101in place of sign TGS102. Any temporary speed limit through the change of alignment should preferably be within15% (or 20 km/h) of that existing on the approaches. Design standards should take this into account (see Section 13.4).

3 Once the deviation alignment is established, it may closely parallel the road under construction, or it may change its position according to the terrain and available space, but it will remain in relatively close proximity to the main road alignment. Figure 13.55 shows the sort of situations which may require specific signing attention within a deviation.

4 Signing of the TRANSITION AREA depicted in Figure 13.56, and any others required within the deviation, should be in accordance with figures in Section 13.12: "Enlarged Standard Details" (see Figures 13.77 to 13.84 in particular).

Checklist

- ❑ is it appropriate to drop the "fast" lane under the conditions prevailing on the approaches?
- ❑ is the geometry and road condition of the entry to the deviation suitable for the indicated speed limit?
- ❑ is there sufficient width through the curves at changes in direction in the deviation to accommodate large vehicles in both directions at the same time?

MAINTENANCE UNIT INVENTORY			
Sign	No	Size (mm)	Quantity
	TW336-WA	1200 X 1600	2 2 2
	TR201-60 TR201-80 TR201-100	1200	2 2 2
	TW336	1500	2
	TR214	1200	1
	TGS101 TGS102	1200 X 1600	2 2
	TGS125	1200 X 1600	2
	TIN 11.3	1500	2
	TIN 11.3 TIN 11.3 TIN 11.3	1200 1200 1200	2 2 2
	TIN 11.3 TIN 11.3	1500 1500	2 2

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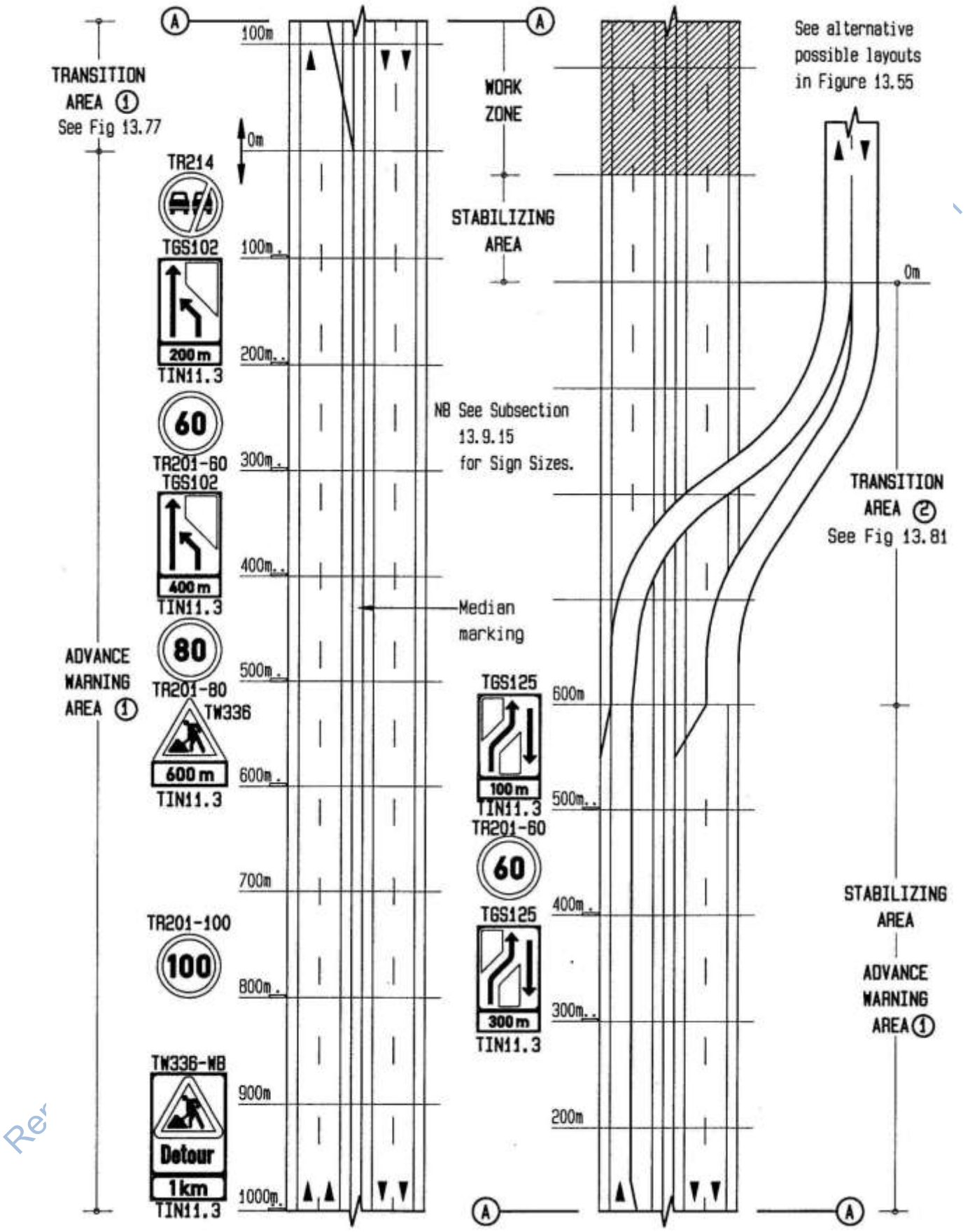

Fig 13.56 **Deviation – 4 Lane Undivided Road**

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SIGNING FOR PEDESTRIAN ENVIRONMENTS

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14.6 Signing Applications at Pedestrian/ Public Transport Interfaces

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SIGNING FOR PEDESTRIAN ENVIRONMENTS

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CHAPTER 14:
SIGNING FOR PEDESTRIAN ENVIRONMENTS

14.1 INTRODUCTION

14.1.1 General

1 The purpose of this chapter is to provide guidelines on, and illustrate how, under various circumstances, specific signing related to pedestrian environments should be provided. Portions of the roadway normally set aside for pedestrian use are, in fact, commonly shared with cyclists and/or disabled persons. The proximity of these modes of movement, or their segregation from one another, will vary considerably, but an interfaces with pedestrians must be taken into account. Likewise there is also an interface between pedestrian and public transport, as well as with hawkers which must be considered. The exclusive pedestrian environment is large and complex and therefore only the following pedestrian circumstances are dealt with in this Chapter:

(a) the pedestrian/motor vehicle interface;

(b) the pedestrian/cyclist interface;

(c) aspects related to the pedestrian/public transport interface;

(d) aspects related to disabled persons; and

(e) aspects related to hawkers.

2 This chapter should be read in conjunction with various chapters of Volume 1: Uniform Traffic Control Devices which deals with signing policies and design principles, and gives specific information on the meaning of, and individual application of, all traffic control devices. Specifically the following should be referred to:

(a) Chapter 2 B *Regulatory Signs*;

(b) Chapter 3 B *Warning Signs*;

(c) Chapter 4 B *Guidance Signs*;

(d) Chapter 5 B *Information Signs*;

(e) Chapter 6 B *Traffic Signals*; and

(f) Chapter 7 B *Road Markings*.

3 Numerous complimentary aspects relating to the application of these road traffic signs are covered in Volume 2 and the following chapters should be referred to:

(a) Chapter 2 B *Road Marking Applications*;

(b) Chapter 3 B *Regulatory and Warning Sign Applications*; and

(c) Chapter 13 B *Roadworks Signing*.

4 Authorities responsible for the planning, provision, maintenance and signing of pedestrian facilities should refer to the *Pedestrian and Bicycle Facility Guideline* or *NMT Guideline*.

5 Authorities responsible for the planning, provision, maintenance and signing of bicycle facilities should refer to the *Pedestrian and Bicycle Facility Guideline* or *NMT Guideline*.

14.1.2 General Legal Requirements

1 There are many legal requirements which relate to the display of road traffic signs, and in particular, of regulatory signs. These requirements are contained in the Road Traffic Act, Act 93 of 1996 and the Regulations to the Act, as amended from time to time.

2 Sections of the Act and Regulations of particular relevance, and their coverage, are as follows:

(a) Act: Chapter IX B Road Traffic Signs and General Speed Limits B Sections 56 to 60;

(b) Regulations: Chapter X B Rules of the Road B Sections 296 to 323;

(c) Regulations: Chapter IX B Matters Relating to Road Traffic Signs and General Speed Limits B Sections 284 to 295;

(d) Regulations: Schedule 3; and

(e) Definitions:

(i) in Section 1 of the Act;

(ii) in Section 1 of the Regulations; and

(iii) in Section 284 of the Regulations (only valid in respect of road traffic signs).

3 It is strongly recommended that anyone specialising in the provision of regulatory and warning signs and markings, or who requires to provide for such signs or markings for a situation which they have not previously had to deal with, should become familiar with all sections of the legislation noted above.

14.1.3 Basic Implications of the Act and Regulations

1 There are aspects in the Road Traffic Act, Act 93 of 1996, and its Regulations which apply specifically to pedestrians and cyclists, and there are others which are implicit. It is essential that those practitioners responsible for signing are aware of, and understand, the basic effects of the Act and the Regulations. The reality is that the relevant aspects of the Act and the Regulations most commonly have their effects before the application of road traffic signs. They therefore represent the base upon which the use of particularly regulatory signs and markings is built. Many definitions of terms, and the Rules of the Road, are important in this regard. A good understanding

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of the Act and Regulations also has the potential to minimise the cost of signing and marking.

2 In the description of the various details, quotations of definitions of terms and sections of the Act and Regulations are frequently given. These are sometimes only quoted in part. For full information readers should consult the Act. Terms which are defined in the Act or regulations are highlighted in bold letters both when a definition is quoted and again if they form part of another definition. The latter is done to highlight the interdependence of certain terms.

3 "Road traffic signs" is a legal term and includes within its definition road signs, road markings and traffic signals. Only road traffic signs are permitted to be erected within a road reserve. The only signs, markings or signals recognised as road traffic signs are prescribed by the Minister of Transport by inclusion in Schedule 3 to the Regulations and the Act. ARoad traffic signs@ are classified in a hierarchical manner. Signs, markings and signals may be used to regulate, to warn or to guide or inform. Regulatory signs, markings and signals carry the force of law, and clearly are the most important. Warning signs, markings and signals have a different importance because of the responsibility on road authorities to see that they are used meaningfully, and when necessary, in the interests of road safety.

4 In order to understand better the interaction of various parts of a public road, knowledge of the definitions of the parts is important. These are illustrated in Figure 14.1. The more relevant definitions are listed below and can be correlated with Detail 14.1.1. Definitions include:

"**public road**: means any road, street or thoroughfare, or except for the purposes of Section 88, any other place (whether a thoroughfare of not) which is commonly used by the public or any section thereof or to which the public or any section thereof has a right of access, and includes:

(a) the **verge** of any such road, street or thoroughfare;

(b) any bridge, ferry or drift traversed by such road, street or thoroughfare; and

(c) any other work or object forming part of or connected with or belonging to such road, street or thoroughfare;"

"roadway: means that portion of a road, street, or thoroughfare improved, constructed or intended for vehicular traffic which is between the **edges of the roadway**;"

"edge of roadway: means the boundary between the **roadway** and the **shoulder**, which in indicated by appropriate **road traffic sign**, or in the absence of such sign :

(a) in the case of a road with a bituminous or concrete surface, the edge of such surface; or

(b) in the case of any other road, the edge of the improved part of the road intended for vehicular use;"

"kerb line: means the boundary between the **shoulder** and the **verge**;"

"shoulder: means that portion of a road, street or thoroughfare between the **edge of roadway** and the **kerb line**;"

"**verge**: means that portion of a road, street or thoroughfare, including the **sidewalk**, which is not the **roadway** or the **shoulder**;"

"**sidewalk**: means that portion of a **verge** intended for the exclusive use of pedestrians."

5 Two important terms which have particular relevance on pedestrian rights of way are intersection and junction. Detail 14.1.2 in Figure 14.1 illustrates the extent of an intersection and a junction. It should be noted that a junction is always likely to be within an intersection. The term intersection is defined in the Act and as such has an important bearing on many aspects of traffic legislation. Intersection is defined as follows:

"**intersection**: means the area embraced within the prolongation of the lateral boundary lines of two or more **public roads**, open to vehicular traffic, that join one another at any angle, whether or not one such **public road** crosses the other;"

"junction" is defined for signing purposes only in Regulation 407 as follows:

"junction: means that portion of an **intersection** contained within the prolongation of the lateral limits of the intersecting **roadways** and such junctions shall include any portion of the roadway between such lateral limits, and any stop or yield line marking which is painted at such **intersection**."

6 In the Act a pedestrian crossing is defined as follows:

"pedestrian crossing means:

(a) that portion of a **public road** at an **intersection** included within the prolongation or connection of the **kerb line** and adjacent boundary line of such road, whether such portion is marked or not; or

(b) any other portion of a **public road** designated as a **pedestrian crossing** by appropriate road traffic signs."

Detail 14.1.3 illustrates the provisions of the definition paragraph (a). It should be noted that, technically, with a relatively narrow roadway within a wide road reserve (public road) the legal pedestrian crossings, within which pedestrians have certain rights, are potentially very wide.

7 Guidelines which indicate appropriate signing related to the requirements of paragraph 14.1.3.6(b) are given in Section 14.3.

8 The rights of pedestrians are covered by Sections 109 and 110 of the Act. Section 109 states that:

"(1)Where a **pedestrian crossing** is situated in conjunction with a robot (traffic signal), a pedestrian shall not enter such crossing except in accordance with the indications of such robot as prescribed;

(2)In circumstances not referred to in subsection (1), the driver of a vehicle shall yield the right of way, slowing down or stopping if need be to so yield to a pedestrian crossing the **roadway** within a **pedestrian crossing** when the pedestrian is upon that half of the **roadway** upon which the vehicle is travelling, or when the pedestrian is approaching so closely from the opposite half of the roadway as to be in danger;...."

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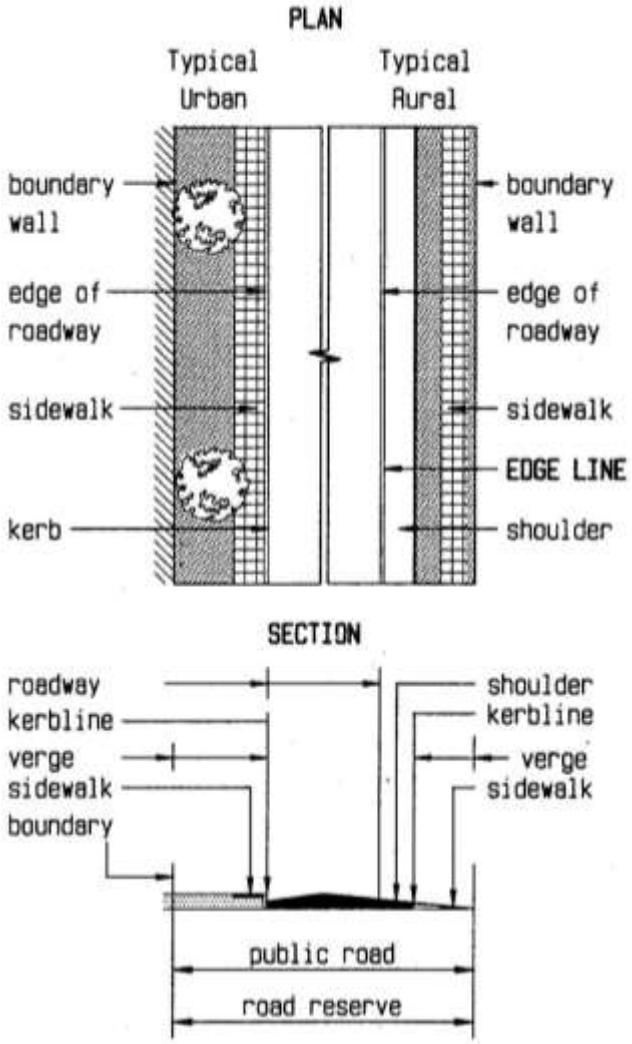
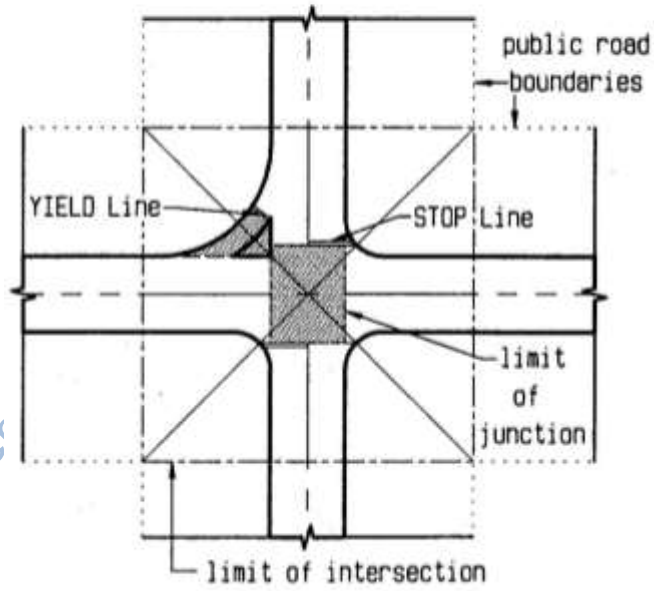
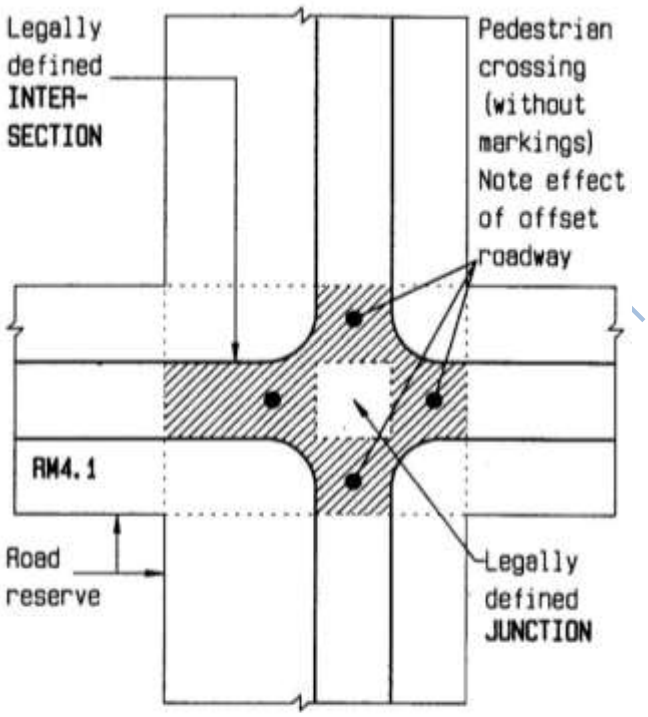


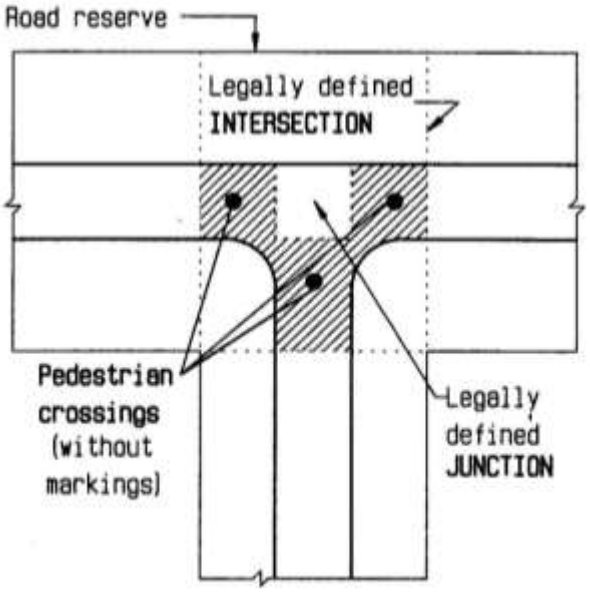
Detail 14.1.1
Anatomy of a Public Road



Detail 14.1.2
Limits of Intersection and Junction



Typical 'Legal' Cross Road Pedestrian Crossing



Typical 'Legal' T-Junction Pedestrian Crossing

This Detail illustrates the areas legally defined as pedestrian crossings if no markings (or signs) are provided. In theory pedestrians have right of way at these points

Detail 14.1.3
Legally Defined Pedestrian Crossings

Fig 14.1 Basic Road Features and Pedestrian Crossing Area Definitions

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14.2 RANGE OF APPLICABLE SIGNS AND MARKINGS

14.2.1 General

1 This section provides firstly an indication of the symbols related generally to the pedestrian environment, and then relates these to the specific signs used for this purpose. It also indicates the range of signs and markings necessary for adequate control and guidance of pedestrians, cyclists and disabled persons.

2 It should be noted that many of the signs and markings dealt with are directed at drivers and not specifically at pedestrians. These signs, however, should enhance the awareness of pedestrians to potential risks, as well as to facilities provided for them.

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14.2.2 Basic Symbols

1 There are a number of basic symbols which are used in various signs and as road markings for the pedestrian environment. The symbols, which are illustrated in Figure 14.2, are for:

(a) pedestrians;

(b) children;

(c) disabled persons;

(d) woonerf precinct;

(e) scholar patrol;

(f) hitch-hiker;

(g) cyclist; and

(h) hawkers.

14.2.3 Regulatory Signs

1 The range of regulatory signs applicable specifically to pedestrian environments is given in Table 14.1 and illustrated in Figure 14.3.

2 The details of the warrants for, and the placement requirements of individual signs, are provided in the respective subsections of Volume 1, Chapter 2 while their application is dealt with in Section 14.3. General applications of regulatory signs and markings are also covered in Chapter 3.

3 The specific size and colour of regulatory signs is dealt with in Volume 1, Section 1.4 and Section 2.1.

14.2.4 Warning Signs

1 The range of warning signs applicable specifically to pedestrian environments is given in Table 14.2 and illustrated in Figure 14.4

2 The details of the warrants for, and the placement requirements of, individual signs are dealt with in detail in Volume 1, Section 1.6 and Chapter 3 and their application is dealt with in Section 14.3. General application of warning signs and markings are also covered in Chapter 3.

3 The shape, size and colour of the warning signs is dealt with in Volume 1, Section 1.4 and Section 3.1.

14.2.5 Guidance Signs

1 The guidance signs which are primarily related to pedestrian environments are listed in Table 14.3 and illustrated in Figure 14.5.

2 The details of the placement requirements of individual signs are dealt with in detail in Volume 1, Section 1.6 and in Chapter 4. Their shape, size and colour are also dealt with in Section 4.0. General applications of guidance signing related to pedestrians is also covered in Chapter 4, Section 4.13.

3 The majority of PEDESTRIAN GUIDANCE signs are square in shape. The signs have been designed on a modular basis to facilitate the combination of individual square modules into specific sign messages, with the potential for a wide variation in these messages. This method of application is similar to that used for TOURISM DIRECTION ATotem@ signs GF10.

4 PEDESTRIAN GUIDANCE signs, because of their modular development, may be used in true guidance function as:

(a) LOCATION guidance signs, whereby individual signs may be used to identify (the location of) specific pedestrian facilities;

(b) DIRECTION guidance sign clusters whereby one or more signs may be combined in a cluster with an appropriate arrow module to indicate the direction to pedestrian facilities.

5 TEMPORARY versions of PEDESTRIAN DIRECTION signs may be required if pedestrians have to be temporarily redirected by a less than obvious route towards their intended destination. This approach can have important safety implications in preventing pedestrians from walking in the roadway in amongst traffic during roadworks.

6 PEDESTRIAN GUIDANCE signs may also be appropriate in other pedestrian environments, not covered in this chapter, such as sports facilities, streets converted to malls (which may also abut transport terminal facilities), entertainment areas generally, or showgrounds.

14.2.6 Information Signs

1 The range of information signs applicable specifically to pedestrian environments is given in Table 14.4 and illustrated in Figure 14.6

2 The details of the placement requirement of individual signs are provided in the respective subsections of Volume 1, Chapter 5 while their application is dealt with in Section 14.3

3 The shape, size and colour of information signs is dealt with in Volume 1, Chapter 5, Section 5.1.

14.2.7 Combination Signs

1 There are applications in the pedestrian environment where a combination of signs is permissible and necessary, for example:

(a) warning signs with supplementary plates;

(b) combinations of direction signs.

Refer to Figure 14.7 for typical examples.

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SYMBOL	DESCRIPTION	USED ON CLASS OF SIGN
	PEDESTRIANS	Regulatory/Warning/ Direction
	CHILDREN	Warning
	DISABLED PERSONS	Regulatory/Direction
	WOONERF PRECINCT	Regulatory
	SCHOLAR PATROL	Warning
	HITCH-HIKER	Regulatory
	CYCLIST	Regulatory/Warning/ Direction
	HAWKER	Regulatory

Fig 14.2 **Applicable Symbols**

TABLE 14.1 APPLICABLE REGULATORY SIGNS TABLE 14.1

Sign Category Description	Sign No.	Reference Section	
		Volume 1	Volume 4
Control Signs			
Stop	R1	2.2.1	2.2.1
Yield	R2	2.2.6	2.2.5
Yield to pedestrians	R2.1	2.2.7	2.2.6
Pedestrian priority	R5	2.2.11	2.2.10
Command Signs			
Pedestrian only	R110	2.3.6	2.3.10
Cyclists only	R111	2.3.7	2.3.11
Cyclists and pedestrians only	R112	2.3.8	2.3.12
Cyclists and pedestrians only with barrier	R113	2.3.8	2.3.13
Cyclists and pedestrian only	R114	2.3.8	2.3.14
Cyclists and pedestrians only with barrier	R115	2.3.8	2.3.15
Prohibition Signs			
No hitch-hiking	R207	2.4.6	2.4.9
No pedestrians	R218	2.4.13	2.4.20
No cyclists	R219	2.4.14	2.4.21
No cyclists and pedestrians	R220	2.4.15	2.4.22
No hawkers	R241	2.4.21	2.4.42
Reservation Signs			
Bicycle lane	R304	2.5.3	2.5.4
Bicycle parking	R304-P	2.5.3	2.5.4
Disabled persons vehicle	R323	2.5.9	2.5.23
Disabled persons parking	R323-P	2.5.9	2.5.23
Comprehensive Signs			
Woonerf	R403	2.6.3	2.6.3
Symbol Message			
Bicycle	(R)561	2.7.7	2.7.21
Disabled persons vehicle	(R)578	2.7.8	2.7.38
Derestriction Signs			
End of bicycle lane	R304-600	2.9.1	2.8.5
End of Woonerf	R403-600	2.9.1	2.8.9

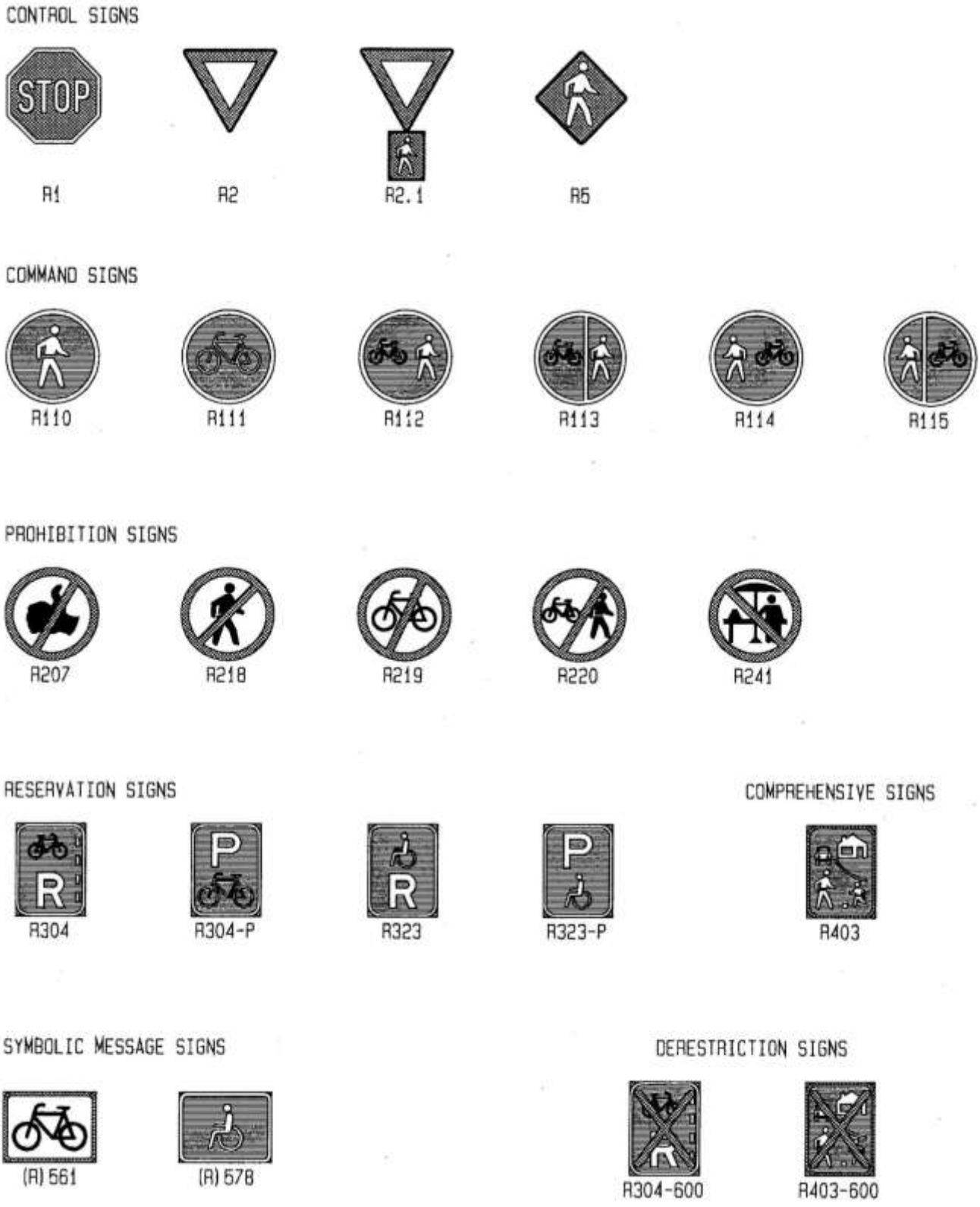

Fig 14.3 **Applicable Regulatory Signs**

TABLE 14.2 APPLICABLE WARNING SIGNS TABLE 14.2

Sign Category Description	Sign No.	Reference Section	
		Volume 1	Volume 4
Scholar patrol ahead	TW305	3.4.3	3.4.5
Pedestrian crossing	W306	3.4.3	3.4.6
Pedestrians	W307	3.4.4	3.4.7
Children	W308	3.4.4	3.4.8
Cyclists	W309	3.4.5	3.4.9

TABLE 14.3 APPLICABLE GUIDANCE SIGNS TABLE 14.3

Sign Category Description	Sign No.	Reference Section	
		Volume 1	Volume 4
Arrow - straight up	GP1	4.13.6	14.2.1
Arrow - down	GP2	4.13.6	14.2.1
Arrow - right	GP3	4.13.6	14.2.1
Arrow - left	GP4	4.13.6	14.2.1
Arrow - half right	GP5	4.13.6	14.2.2
Arrow - half right	GP6	4.13.6	14.2.2
Arrow - half left	GP7	4.13.6	14.2.2
Arrow - half left	GP8	4.13.6	14.2.2
Pedestrian(s)	GP9	4.13.8	14.2.3
Disabled	GP13	4.13.8	14.2.7
Hawkers	GP23	4.13.8	14.2.17
Hawkers (Permit)	GP24	4.13.8	14.2.18

Fig 14.4 Applicable Warning Signs

542 dated 7th

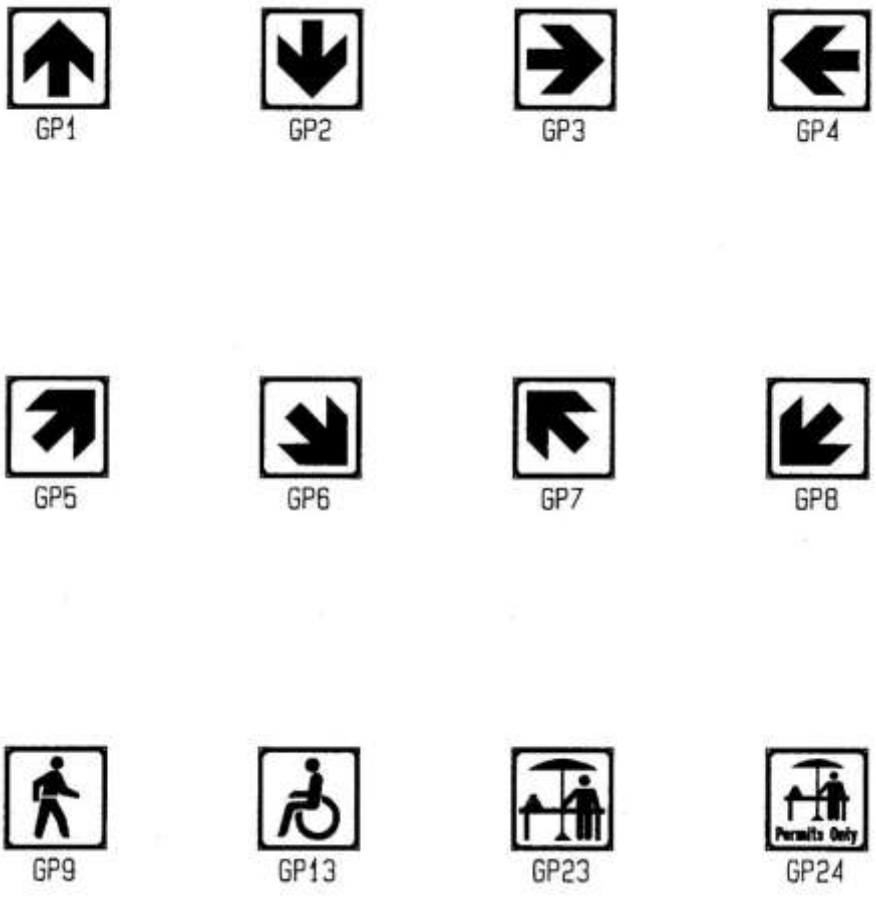

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Fig 14.5 Applicable Guidance Signs

TABLE 14.4 APPLICABLE INFORMATION SIGNS TABLE 14.4

Sign Category Description	Sign No.	Reference Section	
		Volume 1	Volume 4
Supplementary Plates - Distance to	IN11.3	5.2.4	9.2.8 - 13
Supplementary Plates - Text Message	IN11.4	5.2.4	9.2.8 - 13
Symbolic Supplementary Plates - Bicycle	IN11.561	5.2.4	9.3.10/9.3.20
Symbolic Supplementary Plates - Disabled Persons Vehicle	IN11.578	5.2.4	9.3.10/9.3.29
Modal Transfer Car - Train	IN17	5.2.8	9.2.21
Modal Transfer Car, Train, Minibus	IN18	5.2.8	9.2.21
Modal Transfer All Modes	IN19	5.2.8	9.2.21

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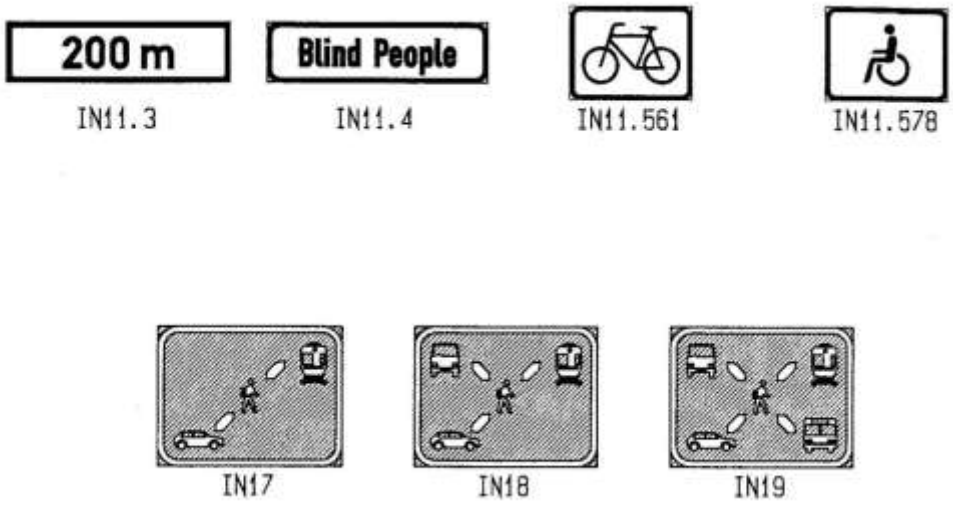

Fig 14.6 **Applicable Information Signs**

Fig 14.7 **Examples of Pedestrian Related Combination Signs**

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14.2.8 Road Markings

1 The range of road markings applicable both specifically and implicitly to pedestrians, disabled persons and cyclists is given in Table 14.5 and these are illustrated in Figure 14.8.

2 The details of the warrants for, and the placement requirements of, the individual pedestrian related road markings and combinations thereof are provided in the respective subsections of Volume 1, Chapter 7, while their application is dealt with in Section 14.3. The General Principles of road marking as well as applications are also dealt with in Volume 2, Chapter 2.

TABLE 14.5 APPLICABLE ROAD MARKINGS TABLE 14.5

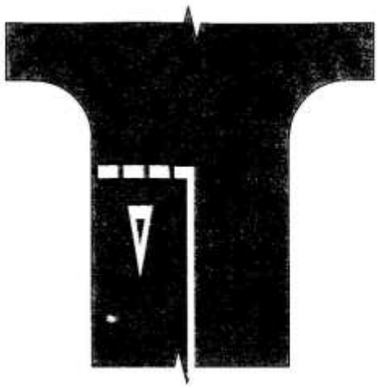
Sign Category Description	Sign No.	Reference Section	
		Volume 1	Volume 4
Regulatory			
Stop line	RTM1	7.2.1	12.1.2(1)
Yield Line	RTM2	7.2.2	12.1.2(1)
Pedestrian Crossing Line	RTM3	7.2.3	12.1.2(1)
Block Pedestrian Crossing Marking	RTM4	7.2.4	12.1.2(1)
Exclusive Use Lane Line	RTM9	7.2.21	
Zig Zag Zone Lines	RM11	7.2.25	12.2.13
Disabled Persons Parking Bay	RM16	7.2.30	12.1.2(1) and 12.4.5(2)
Word and Symbol Markings	RM17	7.2.31	
Guidance			
Pedestrian Guidelines	GM3	7.4.2	12.1.6(1)
Bicycle Guidelines	GM5	7.4.4	12.1.7(1)
Road Marking Symbols	GM6	7.4.5	12.4.3/12.4.5
Word Markings	GM7	7.4.6	12.5.1-12.5.9

NOTES:

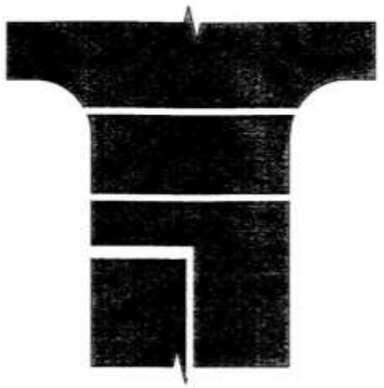
(1) Table 12.1 in Volume 4, Chapter 12 and Table 2.3 in Volume 2, Chapter 2 give typical details of road marking dimensions and areas.

(2) Volume 2, Chapter 2 gives dimensional details of the use of Parking Bay marking RM6 and Disabled Persons Parking Bay RM16.

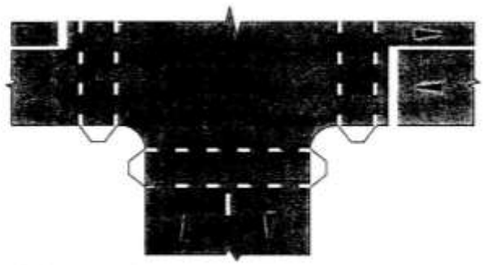
RTM1 - STOP LINE



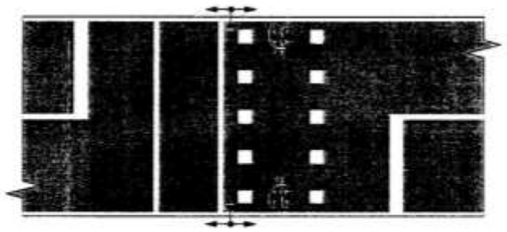
RTM2 - YIELD LINE



RTM3 - PEDESTRIAN CROSSING LINES

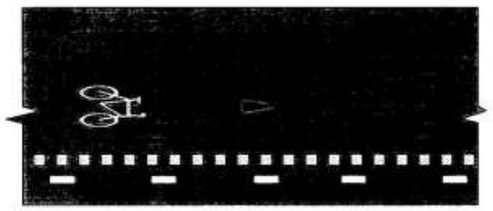


GM2 - PEDESTRIAN GUIDE LINES



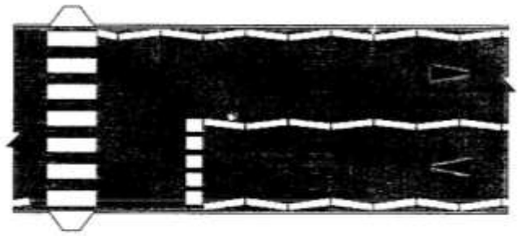
GM5 - BICYCLE GUIDE LINES

RTM4-BLOCK PEDESTRIAN CROSSING MARKINGS



RM9 -Plus Symbol Marking RM17.1

RM9 - EXCLUSIVE USE LANE LINE



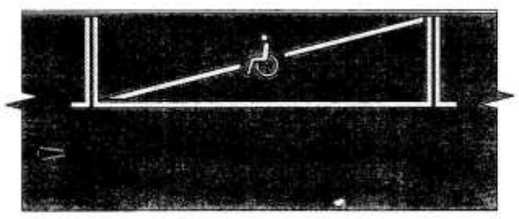
RM11 - ZIG ZAG ZONE LINES

GM6.1-Cycle Facility

GM6.3 Disabled Persons Facility

GM7 - WORD MARKINGS

Detail 14.8.2 Guidance Road Markings



RM16-DISABLED PERSONS PARKING BAY

RM17.1-Cycle Lane

RM17.3-Disabled Persons Parking Bay

Detail 14.8.1 Regulatory Road Markings

Fig 14.8
Applicable Road Markings

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14.3 SIGNING APPLICATIONS AT PEDESTRIAN/MOTOR VEHICLE INTERFACES

14.3.1 General

1 The following application situations for the pedestrian/motor vehicle interface are dealt with in this section:

(a) at road junctions;

(b) mid-block crossings;

(c) scholar patrol crossings;

(d) urban roadworks sidewalk deviations;

(e) pedestrian priority areas;

(f) woonerf areas;

(g) freeway interface;

(h) hitch-hikers;

(i) specific use of the PEDESTRIANS ONLY sign;

(j) specific use of the NO PEDESTRIANS sign.

14.3.2 Road Junctions

1 As already indicated in Section 14.2.1, it should be noted that many of the signs and markings are directed at drivers and not specifically at pedestrians. These signs and markings, however, should enhance the awareness of pedestrians to potential risks as well as to facilities provided for them.

2 Pedestrian crossings are defined in legislation. For full details of the legal aspects refer to Chapter 3: Regulatory and Warning signs and Markings Applications, in particular Section 3.1.9. Section 14.1.3, Figure 14.1, shows the areas legally defined as pedestrian crossings if no markings or signs are provided, and pedestrians technically have right of way under defined circumstances at these points.

3 Under the following road signing and road marking conditions, at road junction, the driver of a vehicle shall yield the right of way, slowing down or stopping if need be, to so yield to a pedestrian who is crossing that so controlled leg of the crossing, and when the pedestrian is upon that half of the roadway upon which the vehicle is travelling, or when the pedestrian is approaching so closely from the opposite half of the roadway as to be in danger:

(a) STOP sign R1 and stop line road marking RTM1 with word marking stop GM7 (see Figure 14.8);

(b) YIELD sign R2 and YIELD LINE road marking RTM2 with yield ahead marking sign WM5 (see Figure 14.8).

4 Generally at road junctions in rural areas no specific pedestrian road markings, such as the PEDESTRIAN CROSSING LINES RTM3 or GUIDELINES GM2, need be considered, unless specific conditions related to special pedestrian activities apply.

5 In urban areas more specific measures in the way of road signs and markings must be taken to accommodate pedestrians at road junctions.

6 At all signalised junctions the PEDESTRIAN CROSSING LINE marking RTM3, as shown in Detail 14.9.1 of Figure 14.9, shall be used. The application of a PEDESTRIAN CROSSING LINES regulatory marking RTM3 imposes a mandatory requirement that pedestrians shall only cross the roadway within the crossing, defined by the markings and the edges of the roadway and/or median or other traffic island (if such are provided).

7 Detail 14.9.2 of Figure 14.9 shows other options for marking pedestrian crossing at a signalized junction. The separation of the lines comprising marking RTM3 may be increased to allow for large pedestrian volumes. Another option which is rarely exercised, but which could be considered for sites with poor observance of pedestrians by drivers, is the use of BLOCK PEDESTRIAN CROSSING marking RTM4 (more commonly used in mid-block locations). The mandatory requirements of the RTM4 marking on the pedestrian are as for the PEDESTRIAN CROSSING LINES marking RTM3.

8 Another example of the use of BLOCK PEDESTRIAN CROSSING markings RTM4 at an intersection, but offset in the lanes, separated from each other by a median/pedestrian refuge island is given in Detail 14.9.3.

9 Pedestrians also need to be accommodated at slip roads at major intersections which use channelisation islands to split and direct left-turning traffic. Detail 14.10.2 of Figure 14.10 indicates the recommended practice for various lengths of slip road and various sizes of channelisation island. As standard practice the BLOCK PEDESTRIAN CROSSING marking RTM4 is to be used for the crossing of the slip road rather than the RTM3 marking unless the latter is combined with a traffic signal.

10 The situation at a sign controlled junction or on the uncontrolled legs of a junction in an urban area is variable and the most appropriate road markings, based on the controlling conditions must be applied. Factors which need to be taken into consideration are:

(a) area in which the junction is located, namely CBD, suburban, industrial, etc;

(b) class of road;

(c) pedestrian volumes to be catered for;

(d) special conditions such as crossings close to schools, major routes to and close to public transport facilities, major shopping centres, etc.

11 The following basic road marking guidelines are recommended for road junctions, other than signalised junctions in urban areas:

(a) in central business districts (CBD) sign controlled legs of junctions should be provided with PEDESTRIAN CROSSING LINES marking RTM3, in conjunction with the required STOP LINE marking RTM1 or YIELD LINE marking RTM2 (see Detail 14.10.1 in Figure 14.10);

(b) on uncontrolled legs of a junction in the CBD, generally the higher order road, GUIDE LINE markings GM2 should be considered (see Detail 14.10.2 in Figure 14.10); the purpose of this parallel pair of guidelines is to indicate to pedestrians the preferred point of crossing when a formal pedestrian crossing is not warranted; these GUIDE LINE

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markings should line up with any footpath (when GUIDE LINE markings are used in the manner indicated there is a risk, as there is with all forms of pedestrian crossing, whether controlled or uncontrolled, that pedestrians may infer a false sense of security from the marking - it should therefore be understood that the principle employed in the use of such markings is one of guidance only; this guidance is directed mainly at pedestrians but is also of value in warning drivers without resorting to marking RTM3, which also carries a risk, at this type of junction, of being misinterpreted by drivers as a STOP condition).

(c) in suburban areas where Class B2 and Class C1 roads intersect with a higher order road and are sign controlled, and where pedestrians are a major factor, a PEDESTRIAN CROSSING LINE marking RTM3 should be considered on the controlled legs of the junction; for lower order road junctions generally no specific consideration need be given to pedestrians; special circumstances, however, must be taken into consideration when analysing the pedestrian needs at any junction;

(d) in industrial areas the main pedestrian movement between the workplace and the main passenger transport nodes in the area should be supported; where the situation thus warrants it, all the sign controlled legs of the junction should have a PEDESTRIAN CROSSING LINES marking RTM3 in conjunction with the STOP LINE marking RTM1 or YIELD LINE marking RTM2; the uncontrolled legs of the junction may be treated as in the CBD (refer to paragraph 14.3.2.5(b));

(e) similar practices should be considered when catering for larger than usual pedestrian volumes which may be encountered at junctions in suburban areas near schools, public transport nodes and shopping centres;

(f) in suburban areas and on lower order roads (low traffic volume and low speed roads) use may be made of GUIDE LINE markings GM2 in conjunction with the STOP LINE marking RTM1 or YIELD LINE marking RTM2 as indicated in Figure 14.11; the BLOCK PEDESTRIAN CROSSING marking RTM4 may also be used as shown in Detail 14.11.2 in Figure 14.11; in the latter example the YIELD TO PEDESTRIAN signs R2.1, the YIELD LINE marking RTM2 and the PEDESTRIAN CROSSING warning sign must be included in the system; in practice it is generally not recommended that pedestrian crossing controlled by YIELD TO PEDESTRIANS signs R2.1 be provided on the priority approach to a junction controlled on the intersecting approaches by STOP signs R1 or YIELD signs R2; this is because of the risk of confusion in the minds of motorists, on any approach, as to who actually has priority; such markings are, however, used and Detail 14.11.2 gives guidance on preferred practice.

12 The situation for pedestrians at freeway on-ramp and off-ramp intersections with the crossing road should be treated like any other junction in an urban area (see Details 14.12.1 and 14.12.2 in Figure 14.12. Detail 14.12.3 provides an alternative to the treatment when there is channelisation of traffic and where there are large pedestrian volumes.

14.3.3 Mid-block Crossings

1 Pedestrian crossings of roads may, under certain circumstances, be necessary or desirable at mid-block locations. The term mid-block pedestrian crossing refers to a variety of pedestrian facilities, provided to assist the pedestrian to cross at some location between junctions, and normally where these junctions are relatively far apart.

2 Generally the warrants for installing a formal mid-block pedestrian crossing are based on pedestrian movement desire lines and volumes, and the vehicular volumes on the road needing to be crossed. The need for such crossings shall, however, be subject to a comprehensive traffic engineering analysis. Refer to Volume 1, Chapter 6 and to the *Pedestrian and Bicycle Facility Guideline* or *NMT Guideline* for details of warrants.

3 Formal mid-block pedestrian crossings may be considered under the following circumstances, but all must be subject to engineering analysis:

(a) where road junctions are relatively far apart;

(b) where a road divides a large and integrated community;

(c) adjacent to community centres and homes for the elderly, infirm or blind;

(d) adjacent to hospitals and clinics;

(e) adjacent to major public transport termini;

(f) in and adjacent to busy shopping areas;

(g) where pedestrian malls are intersected by streets (interrupted malls);

(h) outside school entrances;

(i) in industrial areas.

4 There are a number of possible treatments for signing and marking a mid-block pedestrian crossing:

(a) the basic treatment for a sign controlled crossing is given in Detail 14.13.1 in Figure 14.13; the BLOCK PEDESTRIAN CROSSING marking RTM4 demarcates the crossing point; YIELD LINE markings RTM2 are required across all approach lanes to the crossing and YIELD markings WM5 may be provided in all such lanes in advance of the YIELD LINE marking; the following signs are required:

(i) YIELD TO PEDESTRIANS sign R2.1 placed at the YIELD LINE marking;

(ii) PEDESTRIAN CROSSING signs W306 placed between 90 m and 180 m in advance of the crossing;

(b) the requirements for a signalised mid-block pedestrian crossing are given in Detail 14.13.2 of Figure 14.13; the PEDESTRIAN CROSSING LINES marking RTM3 demarcates the crossing point; STOP LINE markings RTM1 are required across all approach lanes to the crossing; PEDESTRIAN CROSSING signs W306 are required and should be placed 90 m to 180 m in advance of the crossing; if the signalization is an upgrade in control level of a crossing already marked with BLOCK PEDESTRIAN CROSSING marking RTM4 it is not

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recommended that any attempt be made to remove the large area of marking RTM4; a combination of markings RTM3 and RTM4, should rather be considered as indicated in Detail 14.13.3; a further example of a mid-block crossing is given in Detail 14.13.4 of Figure 14.13 which indicates a typical design for a continuous pedestrian mall connection across an intervening street.

5 ZIG-ZAG lines RM11 are regulatory markings which may be used on the approach to a pedestrian crossing to highlight, to a driver, the fact that his vehicle is entering the immediate vicinity of the crossing. It is recommended that RM11 markings be used in all situations which are considered potentially dangerous for pedestrians, and particularly where there are pedestrian visibility problems. The following aspects should be noted:

(a) the total area on both approaches contained within the zig-zag marking shall be known as the **zig-zag zone**;

(b) RM11 markings may be used on the approaches to a pedestrian crossing, irrespective of the level of control in use at the crossing;

(c) RM11 markings impose a mandatory requirement that drivers of vehicles shall not bring their vehicles to a stop, within the **zig-zag zone** marked by such lines, except to yield right-of-way to pedestrians on the crossing, or to stop behind a vehicle which itself has stopped for a crossing pedestrian;

(d) vehicles shall not change lanes within the zig-zag zone i.e. drivers shall not cross such markings;

(e) RM11 markings impose a mandatory requirement that pedestrians shall not cross the roadway within a zig-zag zone except at a crossing demarcated by a PEDESTRIAN CROSSING LINES marking RTM3 or a BLOCK PEDESTRIAN CROSSING marking RTM4.

The various applications of the ZIG-ZAG ZONE LINES marking RM11 are illustrated in Figure 14.14 which indicates the fundamental principles and in Figure 14.15 which indicates details more of specific applications.

6 ZIG-ZAG ZONE LINE marking RM11 shall replace LEFT EDGE LINE marking RM4.1, LANE LINE marking GM1, and DIVIDING LINE marking WM3, or NO OVERTAKING LINE markings RM1 as appropriate, on both approaches to a non-signal controlled mid-block pedestrian crossing, provided that for reasons of safety, road curve delineation etc, a NON OVERTAKING or NO CROSSING LINE marking may be retained in addition to marking RM11, as indicated in Detail 14.15.4 of Figure 14.15. ZIG-ZAG ZONE LINES should extend 15m to 30 m back from the STOP LINE marking RTM1 or the YIELD LINE marking RTM2 on each approach.

7 Parking bays should not normally be allowed within 30 m of a non-signalised mid-block pedestrian crossing. They may, however, be provided within 30 m of the crossing if they are marked on an area that is fully recessed to the left of the normal edge of roadway. If parking bays are provided in this manner the ZIG-ZAG ZONE LINE marking RM11 shall be retained between the travelled lane and the parking bays as shown in Detail 14.15.6 of Figure 14.15. Ideally the closest recessed parking bay on the approach to the crossing should be a minimum of 9 m from the YIELD LINE RTM2 or STOP LINE RTM1, as appropriate.

8 It is often also desirable to make provision for a pedestrian safety refuge in the middle of a busy roadway on which total control of pedestrians is just not practical, but where numbers of pedestrians are sufficiently high to warrant such a safety measure. This treatment could be particularly appropriate on a busy industrial road or in rural areas in the vicinity of schools, stores or farm buildings. Application of such a treatment is also particularly recommended when a crossing is known to be used by significant numbers of elderly or handicapped people or by children. Some examples of refuge islands, correct practice and details of adequate marking and signing are given in Figure 14.16 and Figure 14.17. The following details are covered:

(a) Detail 14.16.1 - Layout of a raised refuge island with preceding painted island;

(b) Detail 14.16.2 - Required road markings for a raised refuge island with preceding painted island;

(c) Detail 14.16.3 - Correct practice for the implementation of a pedestrian refuge island at an unsignalised junction;

(d) Detail 14.17.1 - Examples of a painted median refuge island;

(e) Detail 14.17.2 - Small painted refuge island in a one-way traffic environment.

14.3.4 Scholar Patrol Crossings

1 There are a number of options for pedestrian crossings operated by Scholar Patrols and these are illustrated in Figure 14.18. The two basic options are:

(a) permanent sign controlled crossing;

(b) part-time operation.

2 In the one case, as illustrated in Detail 14.18.1, a Scholar Patrol control is superimposed upon a full time crossing normally controlled by signs R2.1 and marking RTM4. Since the Scholar Patrol uses STOP signs R1, these signs over-ride the R2.1 signs whilst the Scholar Patrol is in operation. The real effect of this is that drivers who have stopped (which includes the action of yielding), can no longer choose when to proceed, they are compelled to wait until the Scholar Patrol operator releases them by removing the STOP signs R1.

3 Some school and road authorities, however, prefer that the crossing operated by the Scholar Patrol only becomes operationally functional when the Scholar Patrol is present. This approach stems largely from the belief that children should not be encouraged to use an unattended crossing (outside the hours of operation of the Scholar Patrol). This is due to unreliable observance by drivers of such a crossing, resulting in an unacceptable level of safety for the children. To cater for this, the second option is illustrated in Detail 14.18.2 where the permanent markings and signs are limited to GUIDE LINE markings GM3 and central sections of NO OVERTAKING LINE marking RM1 on the approaches. What these markings serve to do is to identify for the Scholar Patrol and the children, the location of the crossing. During operation the Scholar Patrol is identified by temporary SCHOLAR PATROL warning signs

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TW305 in advance of the crossing, and drivers are controlled by the STOP signs R1 used by the members of the Scholar Patrol. Although the markings do not represent a controlled crossing when the Scholar Patrol is not present, it is recommended that permanent CHILDREN warning signs W308, or PEDESTRIAN warning signs W307, be provided on each approach.

4 ZIG-ZAG ZONE LINE markings RM11 may also be used on the approaches to a crossing at which a Scholar Patrol operates. This is illustrated in Detail 14.18.3.

14.3.5 Urban Roadworks Sidewalk Deviations

1 The temporary signing of urban roadworks situations is commonly influenced by the following factors, either separately, or in combination:

(a) limited space to accommodate signs and traffic;

(b) high traffic volumes (even moderate urban traffic flows are high by rural standards);

(c) the presence of pedestrians;

(d) the need to maintain access to many properties.

2 Roadworks situations in urban areas vary widely in their signing requirements and operational characteristics including, as they do, such environments as:

(a) quiet residential streets;

(b) high capacity arterial streets;

(c) congested central business districts.

3 Factors which commonly mitigate against the effectiveness of temporary road signs in urban areas, and which must be recognised and taken into account, include:

(a) street lighting - which may not, as might be expected, improve signing at night, due to stray reflections and reduced luminance contrast so that signs need to be positioned with care:

(b) obscuration of signs by trees, street furniture and by large vehicles;

(c) limited sight distance.

4 It is an important aspect of the safety arrangements of urban (and other) roadworks sites that specific accommodation shall be made for pedestrians. It is too common an occurrence that pedestrians are left to their own devices and expected to just disappear, or to walk within reduced spaces provided for vehicles, totally without protection. Given the numbers of pedestrians on our roads at all times of day and night, it is quite unreasonable that, if the exclusion of pedestrians should be required, or advisable, adequate provisions are not made to redirect the pedestrians to an alternative route. **Any authority or contractor not making adequate provision for pedestrians could, in the event of an accident, find themselves facing serious litigation.**

5 Figure 14.19 shows a typical arrangement for the accommodation of pedestrians due to the temporary, and localised, excavation of the sidewalk. Such a situation may be an isolated excavation, with no other associated roadworks, such as a local repair to a water main, sewer, electrical cable or other underground service, or similar excavations may be required at one or more places within a larger site. In the latter case the signs provided within the ADVANCE WARNING AREA may be modified according to specific site requirements. It should be noted that the table of signs opposite is a typical listing only, and is not intended to be a definitive inventory.

6 Figure 14.19 shows the option to use modular PEDESTRIAN DIRECTION signs (see Volume 1, Chapter 4). The manufacture of temporary arrow signs TGP1, TGP2, TGP3 and TGP4 is, due to the square shape, identical. It is recommended that contractors order left- and right-handed versions of sign TGP9. These signs should only be used when the revised pathway available to pedestrians may not be obvious to them. Night-time conditions should be borne in mind when assessing this need. These pedestrian direction sign are particularly important to emphasise to pedestrians the need to NOT take a route within the roadway, either with, or in the face of, on-coming traffic. If a normally available path is completely cut-off to pedestrians, this should be indicated by means of NO PEDESTRIANS sign TR218 (or NO CYCLISTS OR PEDESTRIANS sign TR220).

7 The figure shows the use of TEMPORARY BARRICADE signs TW411. These may be replaced by a local authority if it has a custom made device. However, these need to have retroreflective properties and should not simply be painted. Any traffic cones shall be provided with retroreflective sleeves if left in place during times of poor visibility.

14.3.6 Pedestrian Priority Areas

1 There are areas, such as pedestrian malls, where pedestrians have priority but where, for various reasons, certain vehicles may be allowed access. The PEDESTRIAN PRIORITY sign R5 should be displayed at all possible vehicular points of entry to a pedestrian precinct where full access control is not exercised.

2 The PEDESTRIAN PRIORITY sign R5 is used to indicate to divers of vehicles that only a vehicle for the purpose of delivering or loading goods, a vehicle used in connection with maintenance, or an emergency vehicle, shall be permitted in an area set aside as a pedestrian precinct marked by such signs. Sign R5 may be used in conjunction with an appropriate RESERVATION sign if access to the area is required to be given to a specific class of vehicle such as those used by hotel residents or post office officials.

3 All vehicles allowed into the pedestrian precinct area shall yield right-of-way to all pedestrians who are in, or who are crossing or about to cross their path, observe a maximum speed of 15 km/h, and if they are delivering or loading goods, shall only do so in places marked for such purpose in such area by a road traffic sign.

4 In some cases traffic regulations will prohibit access to all vehicles and/or motor vehicles at all times. In such cases the use of sign R5 is not required, however, depending on circumstances it may be necessary to permit access to emergency or maintenance vehicles. Such provision is best made by having movable or demountable barriers, of an aesthetic design, with provision for access by such vehicles being covered by by-law rather than signs.

5 The design of pedestrian precincts which permit vehicular access should ensure the points of entry or exit of vehicles are clearly identifiable to pedestrians within the precinct.

(continued on page 14.3.17)

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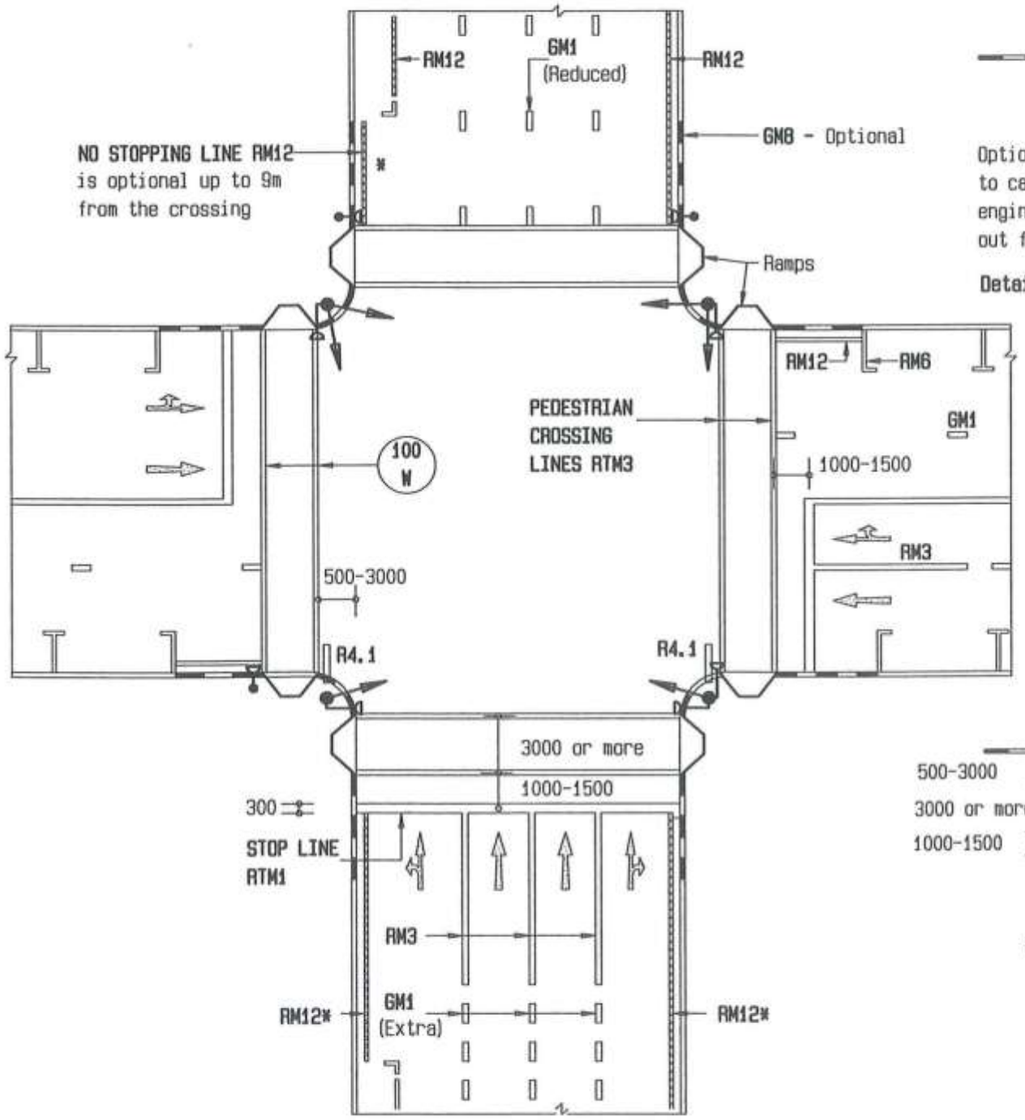
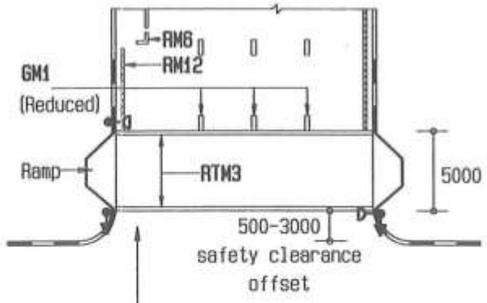
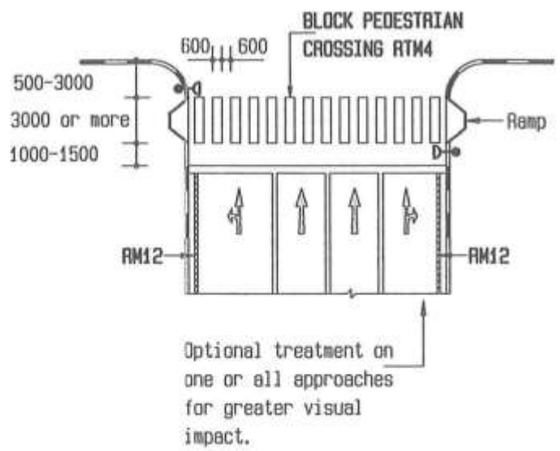


Detail 14.9.1 Typical Signalized Junction with Full Crossing Markings RTM3

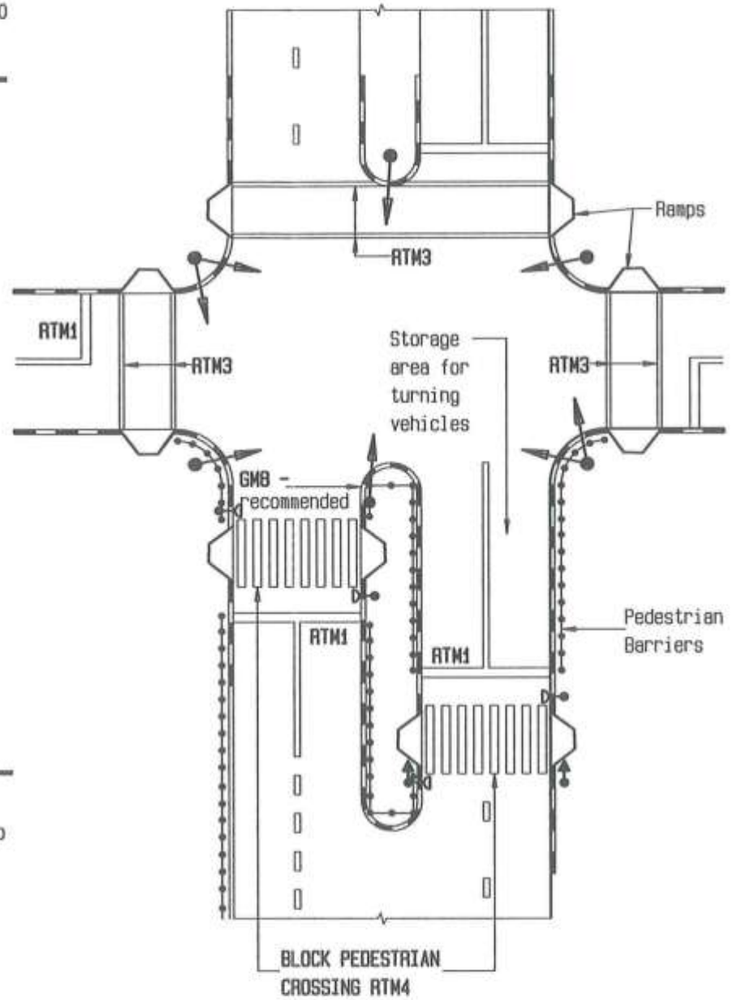


Optional treatment on one or all approaches to cater for pedestrian demand. An engineering assessment should be carried out for widths over 3000mm

Detail 14.9.2 Optional Treatment - 1

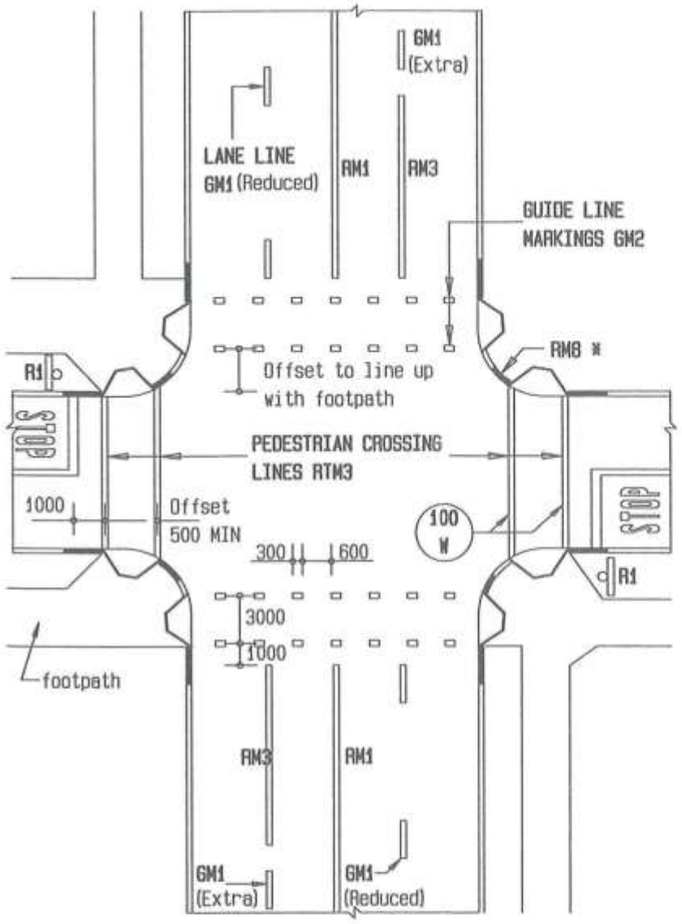


Detail 14.9.3 Optional Treatment - 2

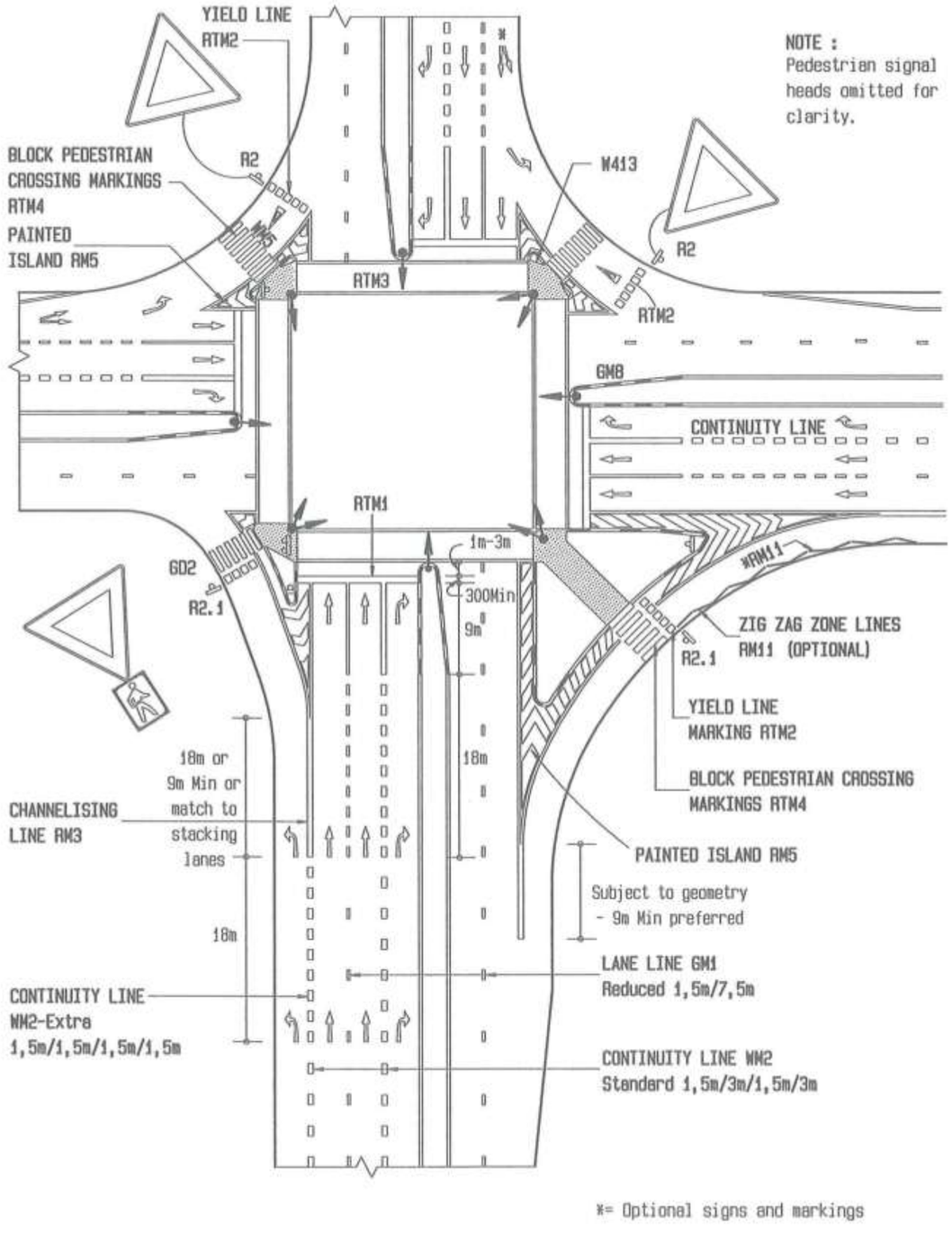


Detail 14.9.4 Staggered Pedestrian Crossing

Fig 14.9
Pedestrian Crossings at Junctions (Urban Areas) - 1

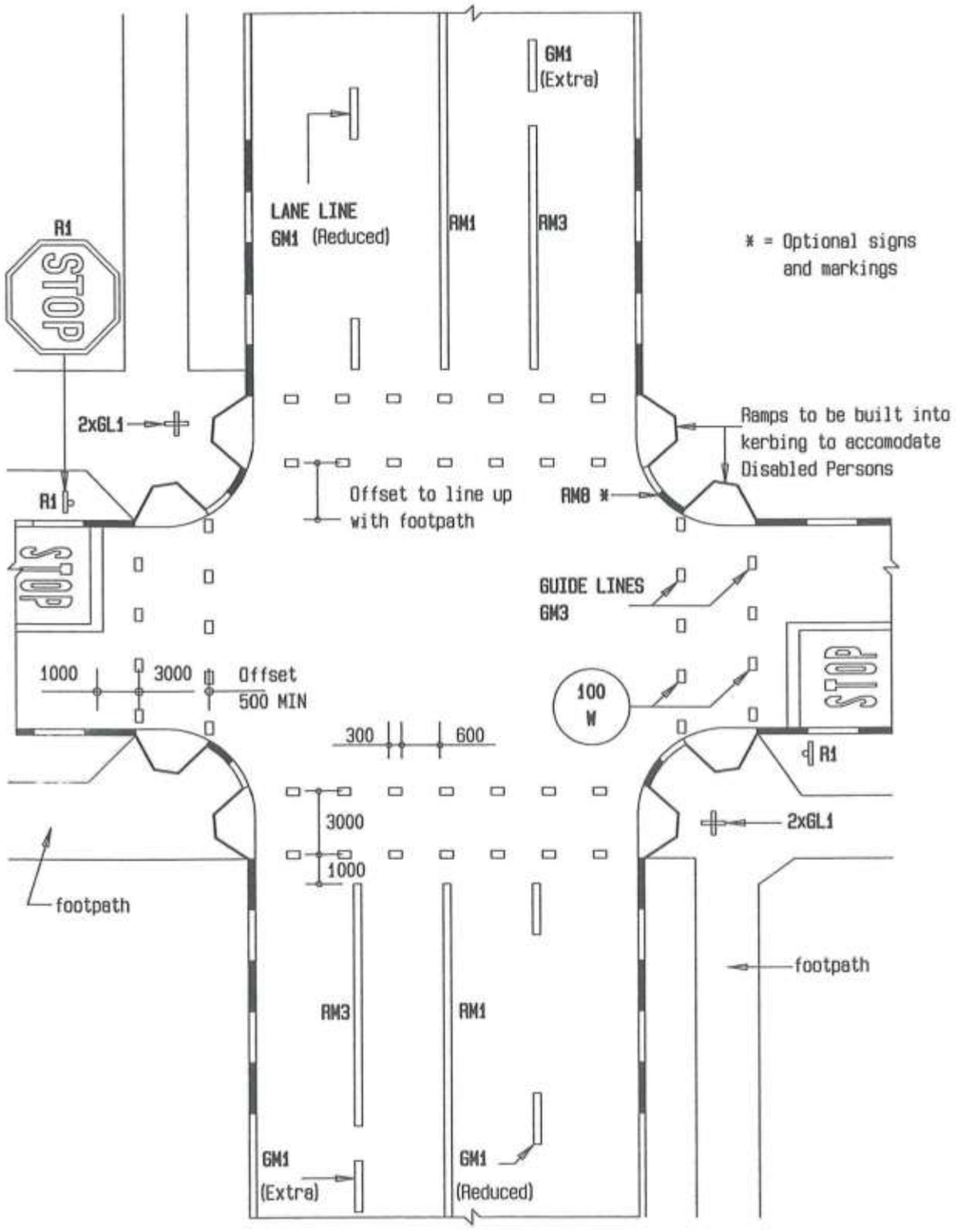


Detail 14.10.1 Typical Road Markings for Junctions with Sign Control (CBD, Industrial Areas and High Pedestrian Flow Conditions)

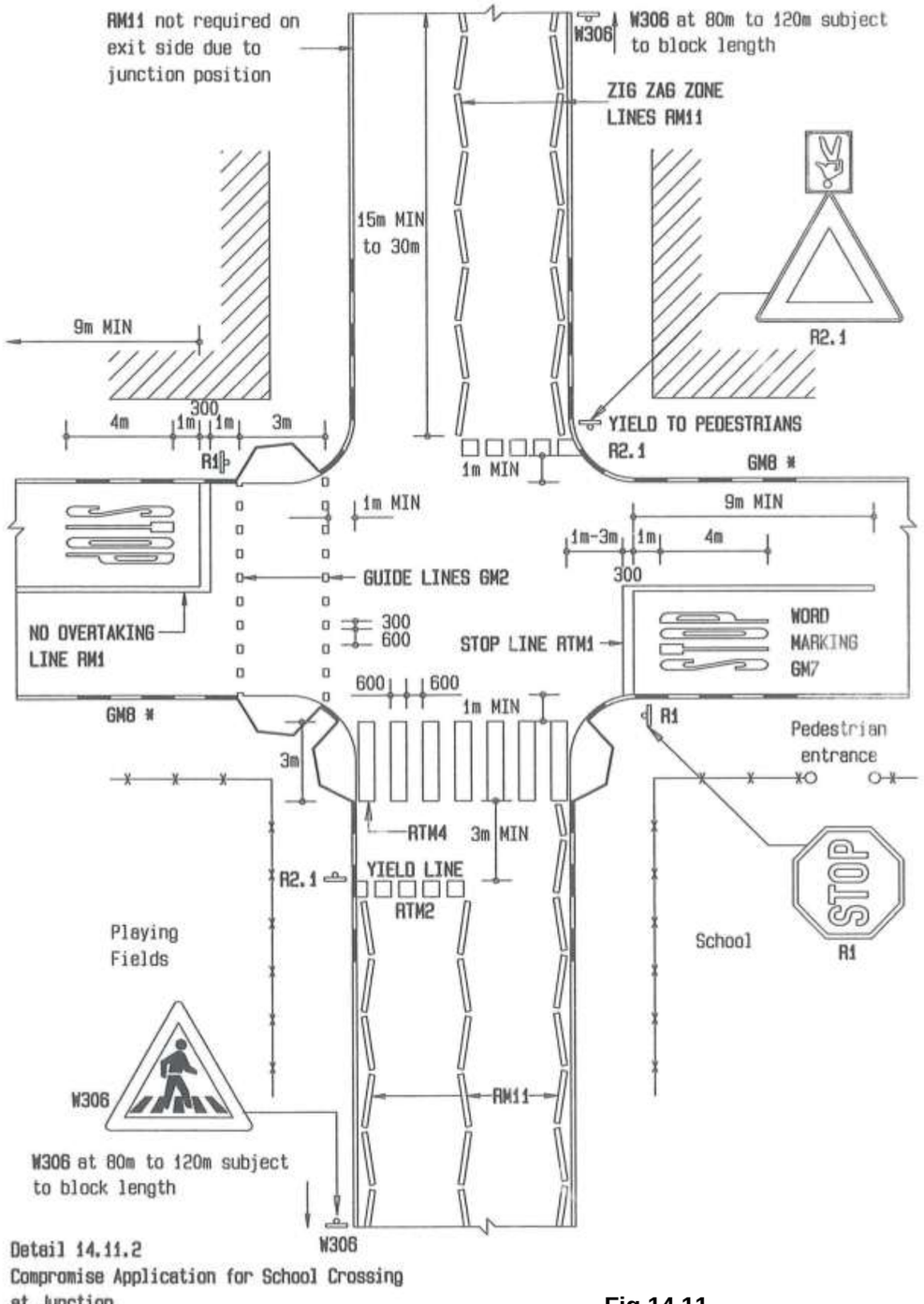


Detail 14.10.2 Pedestrian Crossings at Slip Road at Major Junctions

Fig 14.10
Pedestrian Crossings at Junctions (Urban Areas) - 2

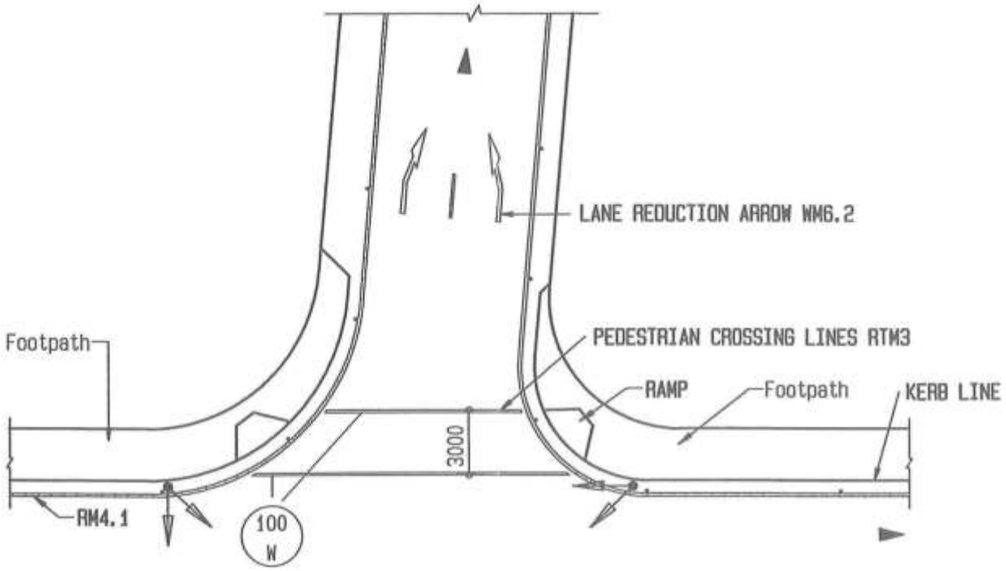


Detail 14.11.1
Guidelines Advising Pedestrians Where to Cross
At an Un-signalized Junction (Low Order Roads)

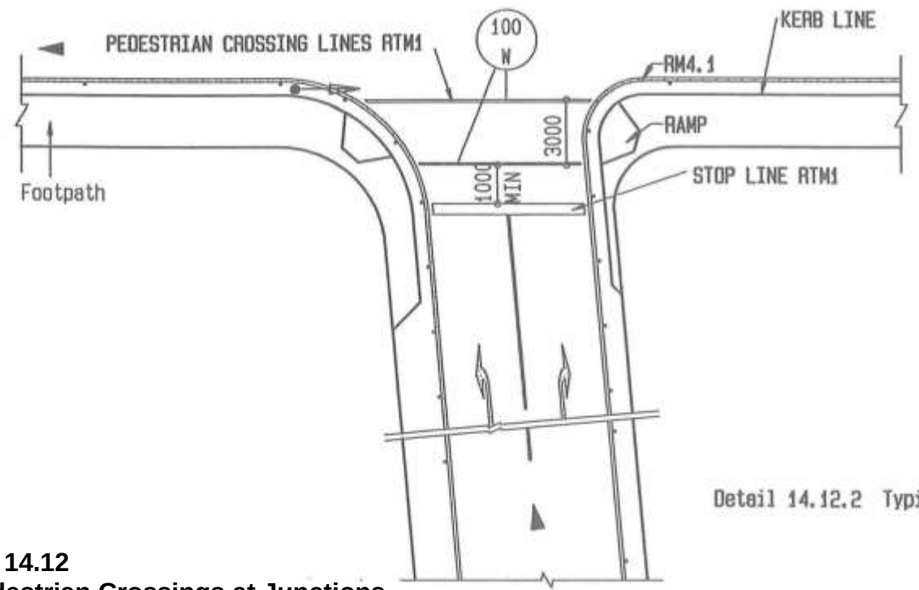


Detail 14.11.2
Compromise Application for School Crossing
at Junction

Fig 14.11
Pedestrian Crossings at Junctions (Urban Areas) – 3: Examples of Variations

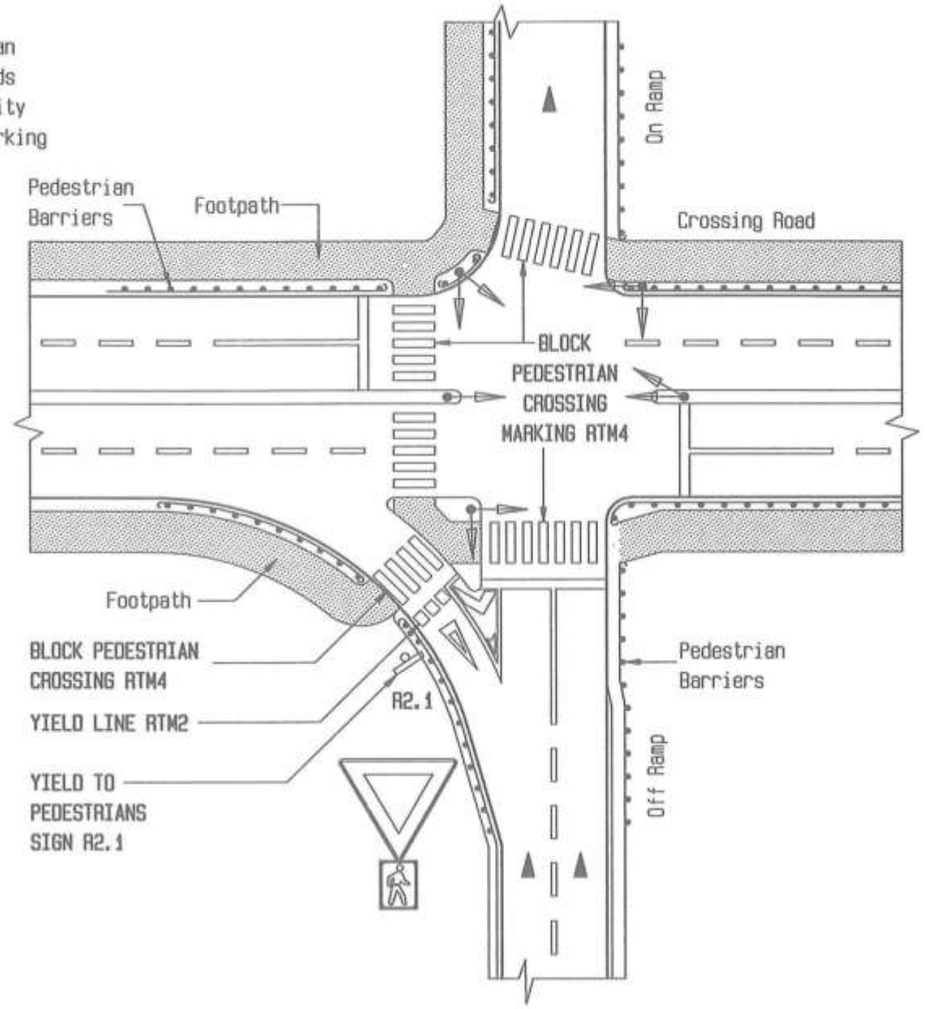


Detail 14.12.1 Typical On - Ramp Terminal



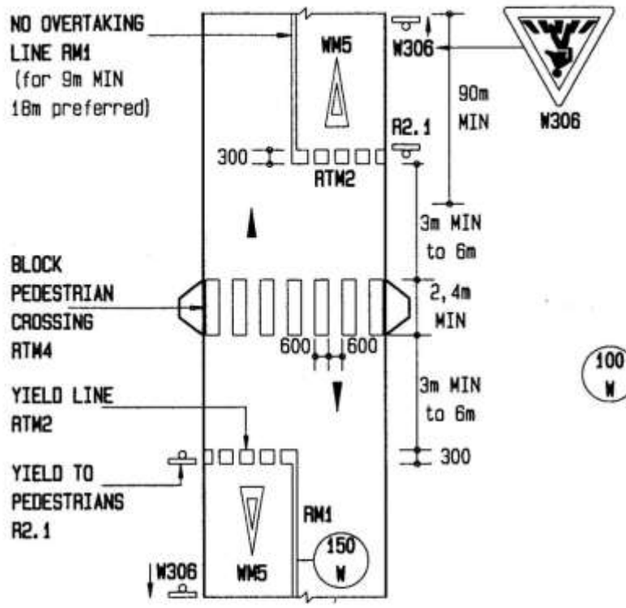
Detail 14.12.2 Typical Off - Ramp Terminal

NOTE :
1, Ramps and pedestrian traffic signal heads not shown for clarity
2. Use of KERBLINE marking GM8 is optional

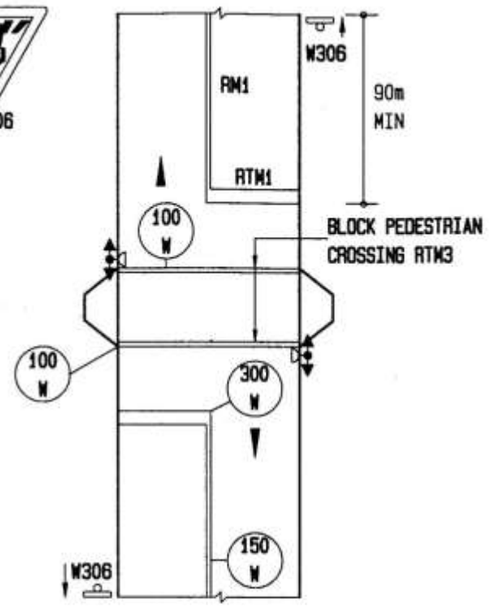


Detail 14.12.3 Alternative Treatment with High Pedestrian Volumes

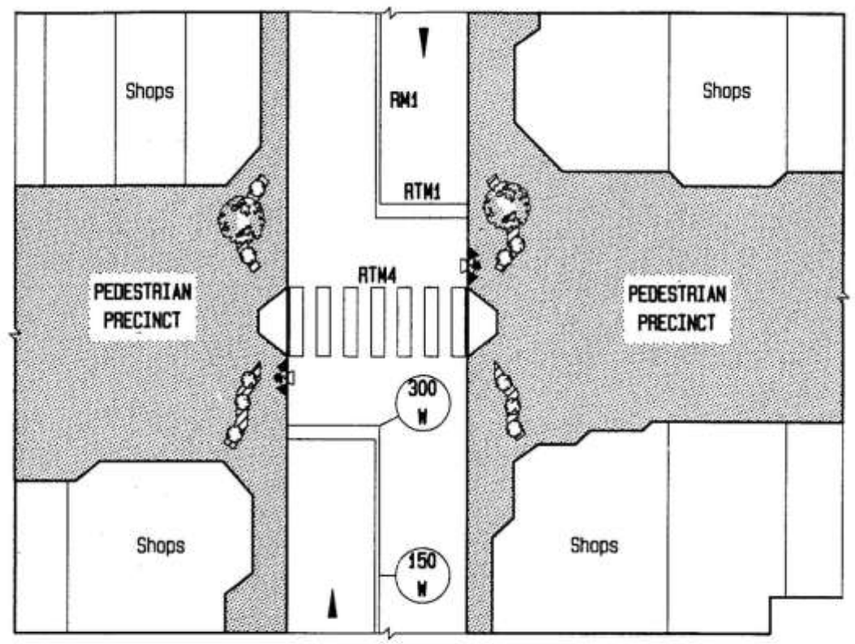
Fig 14.12
Pedestrian Crossings at Junctions (Urban Areas) – 4: Freeway Interchange Ramp Terminals



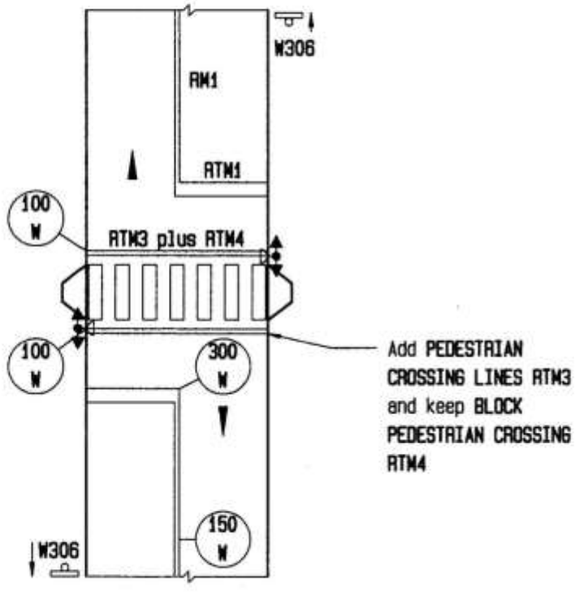
Detail 14.13.1 Basic Mid-Block Pedestrian Crossing



Detail 14.13.2 Mid-Block Signalized Pedestrian Crossing

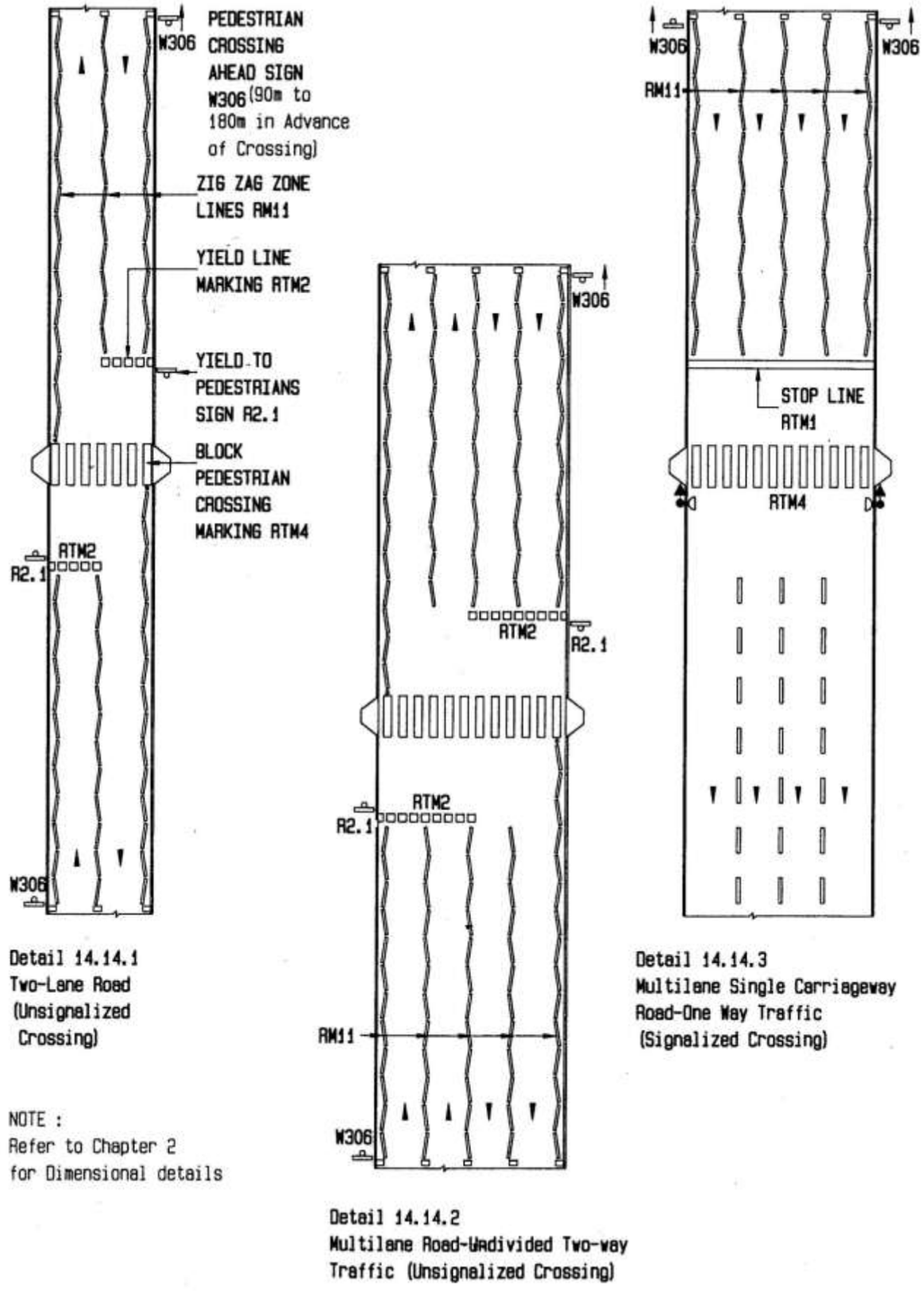


Detail 14.13.4 Typical Layout of Crossing Connecting a Continious Pedestrian Mall



Detail 14.13.3 Upgrading of Basic Mid-Block Pedestrian Crossing to a Signalized Pedestrian Crossing

Fig 14.13
Mid-Block Pedestrian Crossings - 1



Detail 14.14.1
Two-Lane Road
(Unsignalized Crossing)

NOTE :
Refer to Chapter 2
for Dimensional details

Detail 14.14.2
Multilane Road-Undivided Two-way Traffic (Unsignalized Crossing)

Detail 14.14.3
Multilane Single Carriageway Road-One Way Traffic
(Signalized Crossing)

Fig 14.14 Mid-Block Pedestrian Crossings – 2: Fundamental Principles of ZIG-ZAG ZONE Marking RM11

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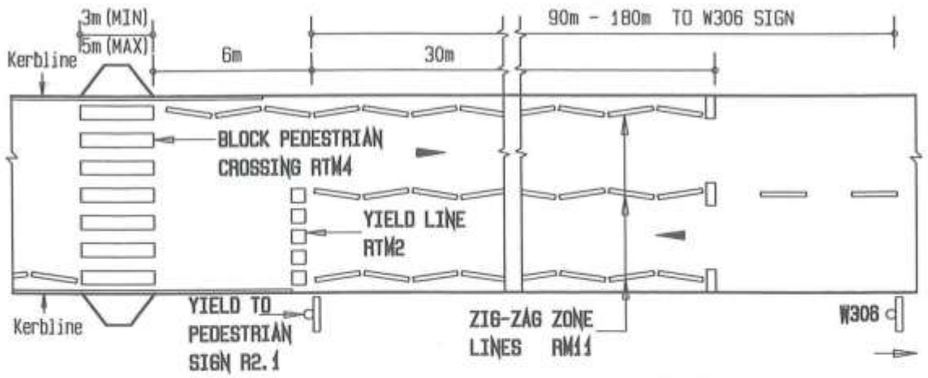
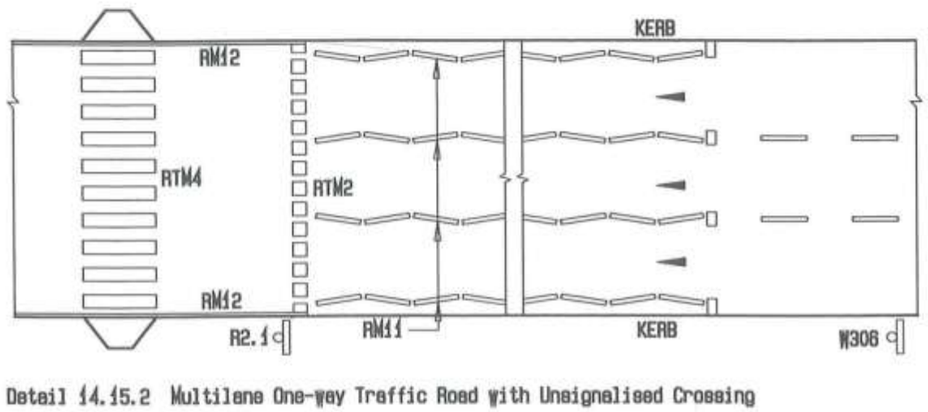
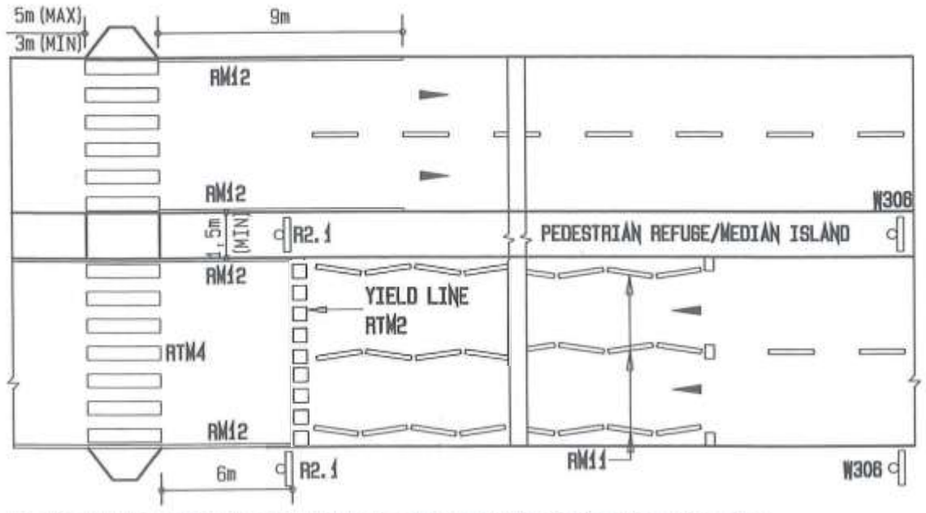


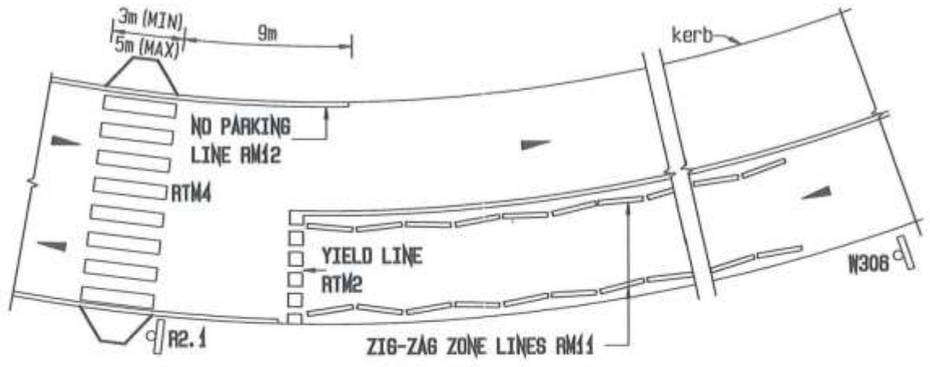
Detail 14.15.1 Two - Lane Road with Unsignalised Crossing (No RM12 Markings)



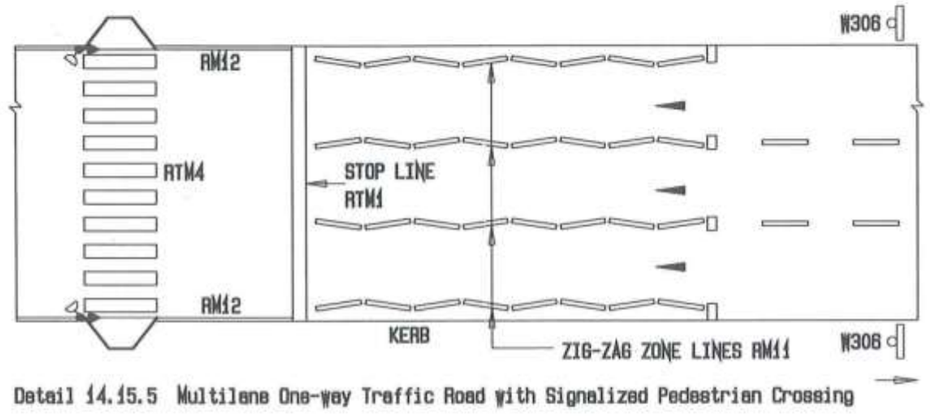
Detail 14.15.2 Multilane One-way Traffic Road with Unsignalised Crossing



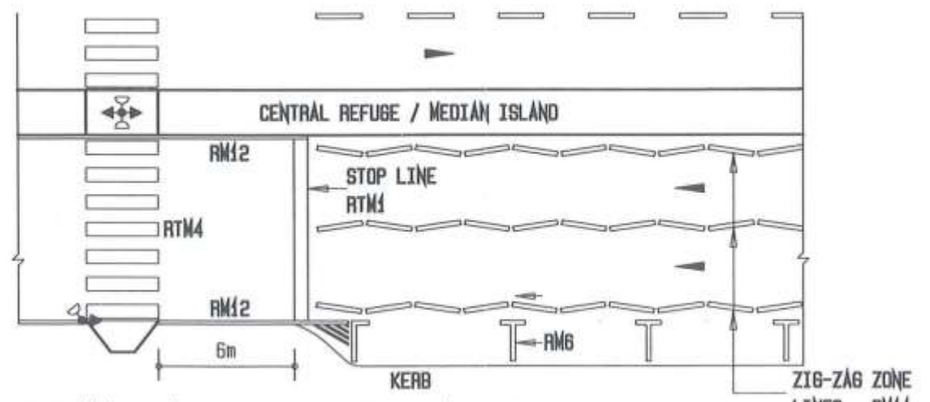
Detail 14.15.3 Multilane Dual Carriageway Road with Unsignalised Crossing



Detail 14.15.4 Two Lane Road with No-Passing Line Retained

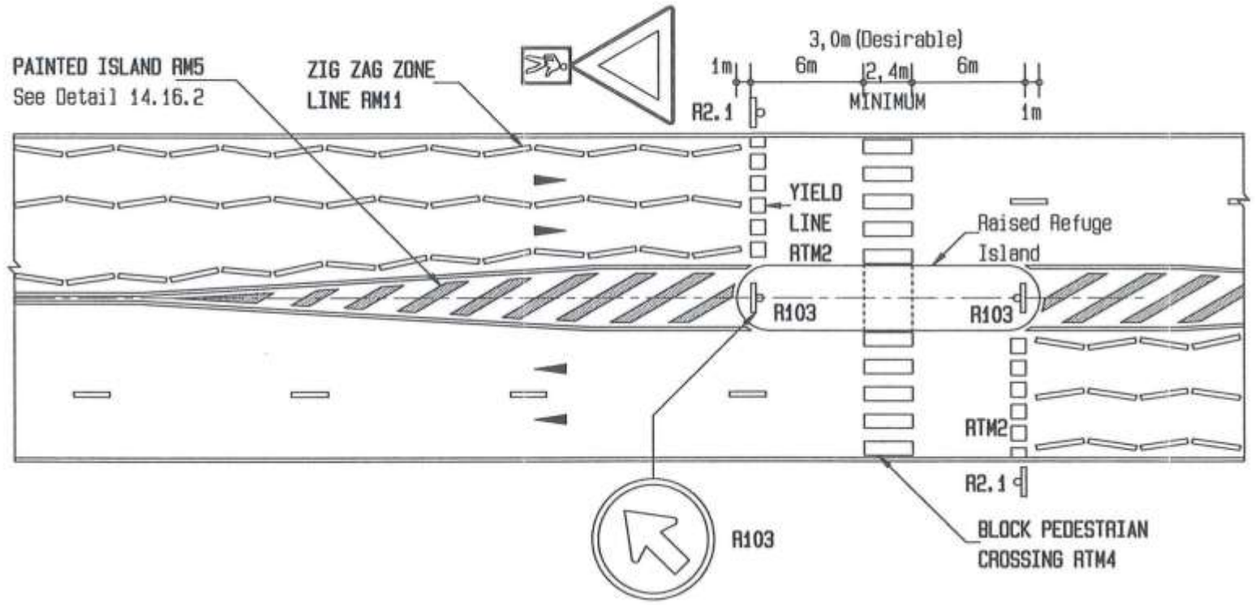


Detail 14.15.5 Multilane One-way Traffic Road with Signalized Pedestrian Crossing

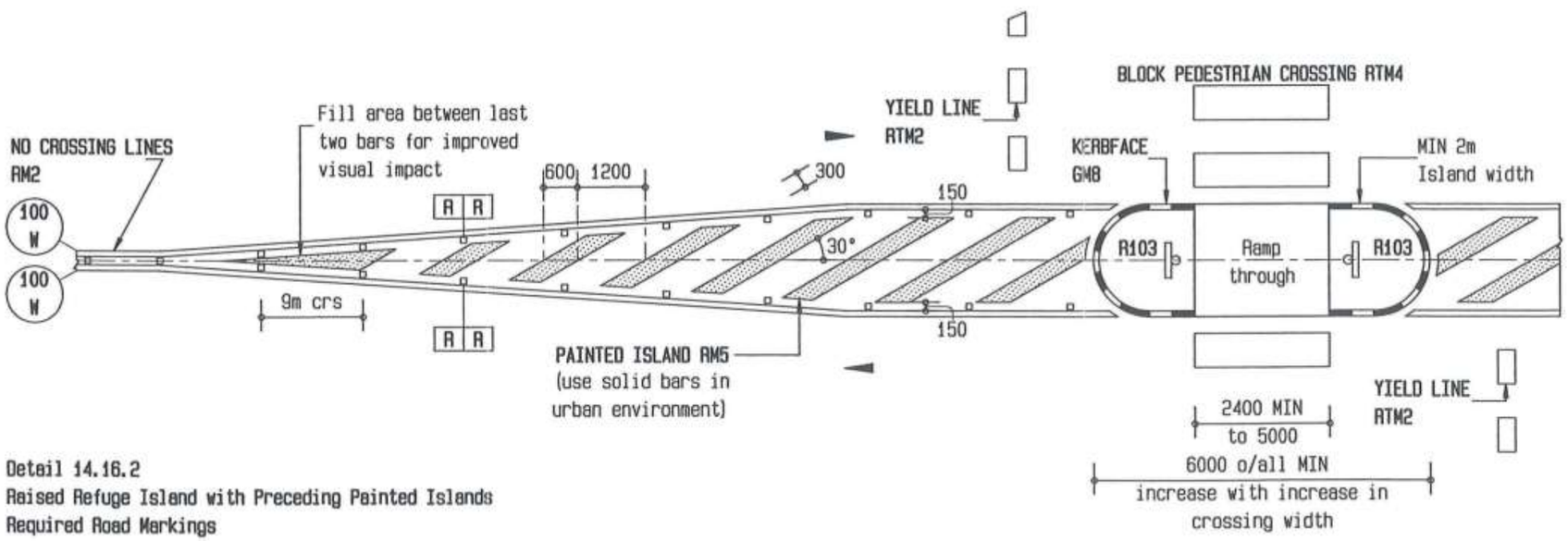


Detail 14.15.6 Accomodation of Parking on Approaches to Signalized Pedestrian Crossing

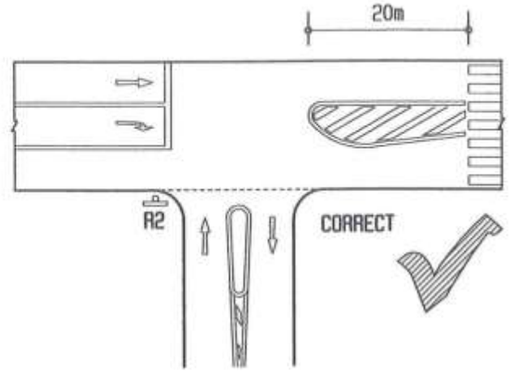
Fig 14.15
Mid-Block Pedestrian Crossings – 3:
ZIG-ZAG ZONE Marking Applications

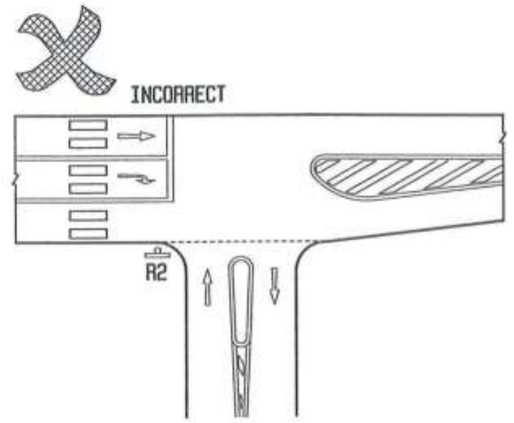


Detail 14.16.1
Layout of Raised Refuge Island with Preceding Painted Islands



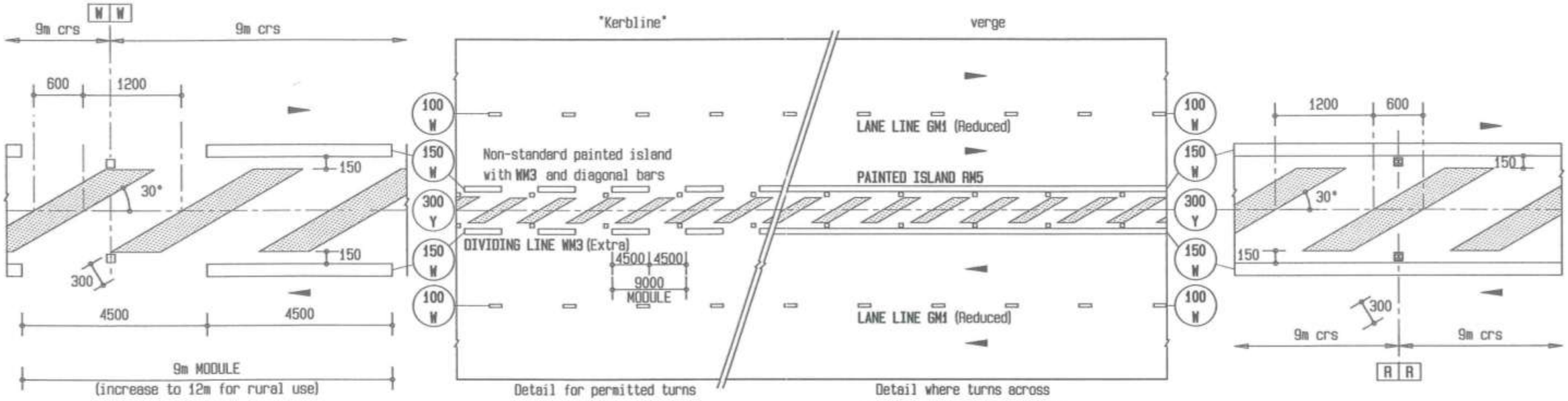
Detail 14.16.2
Raised Refuge Island with Preceding Painted Islands
Required Road Markings





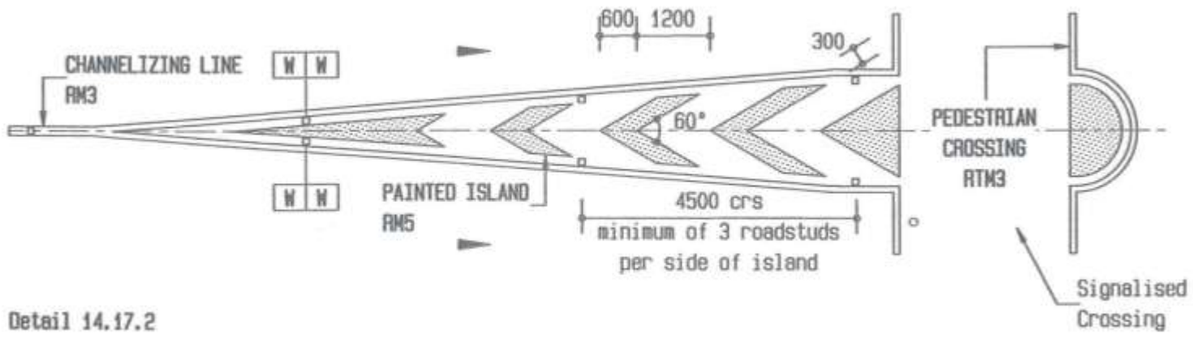
Detail 14.16.3
Pedestrian Refuge Island at Unsignalized Junction

Fig 14.16
Pedestrian Refuge Islands - 1



Detail 14.17

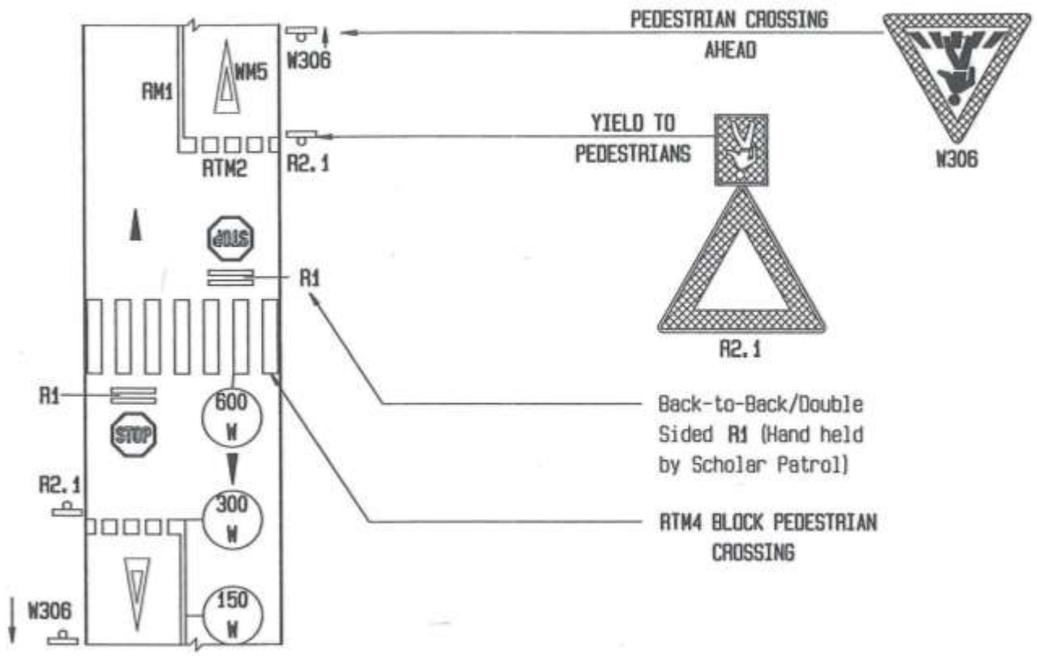
Examples of a Painted Median Refuge Island (Applicable for example on a busy industrial road)



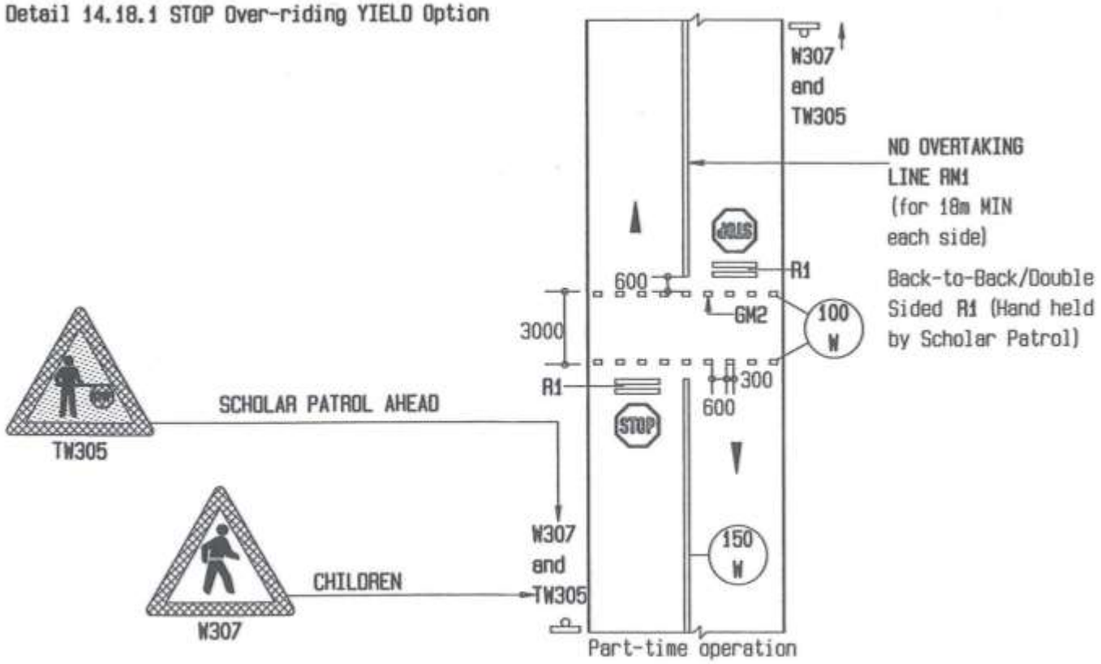
Detail 14.17.2

Small Painted Refuge Island in One-way Traffic Environment (Signalized Crossing)

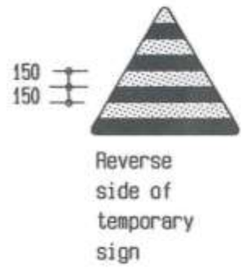
Fig 14.17
Pedestrian Refuge Islands - 2

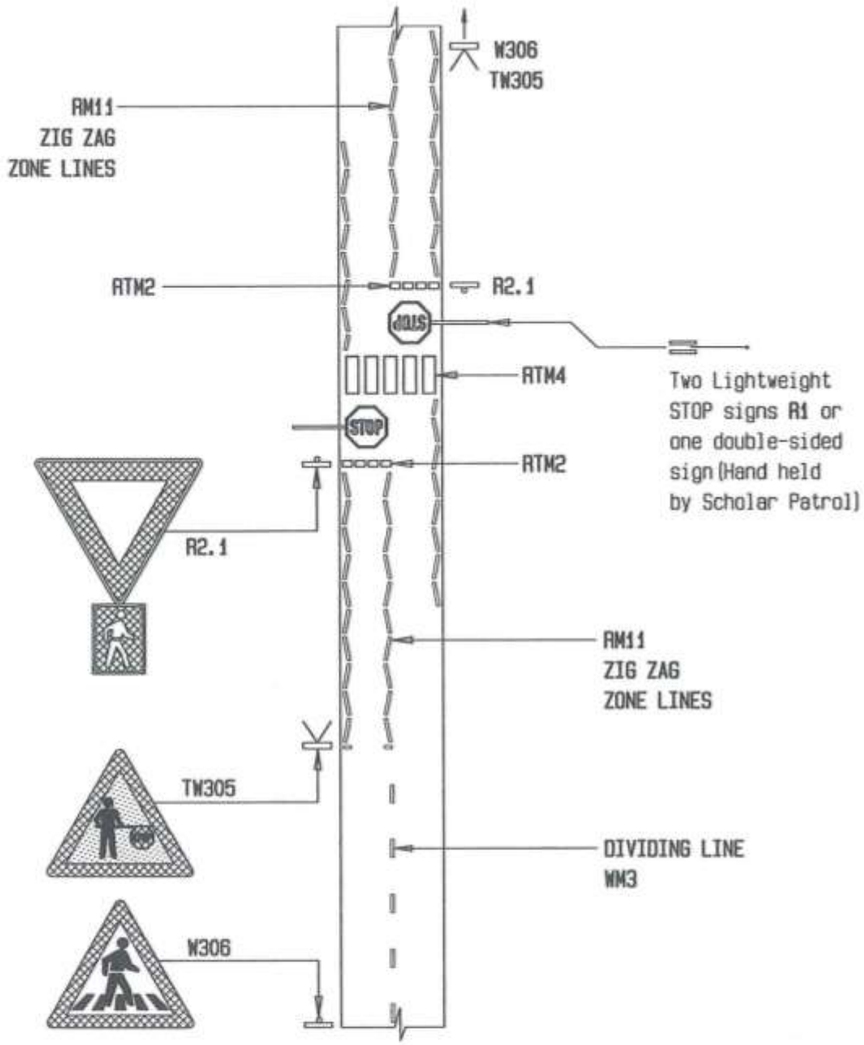


Detail 14.18.1 STOP Over-riding YIELD Option



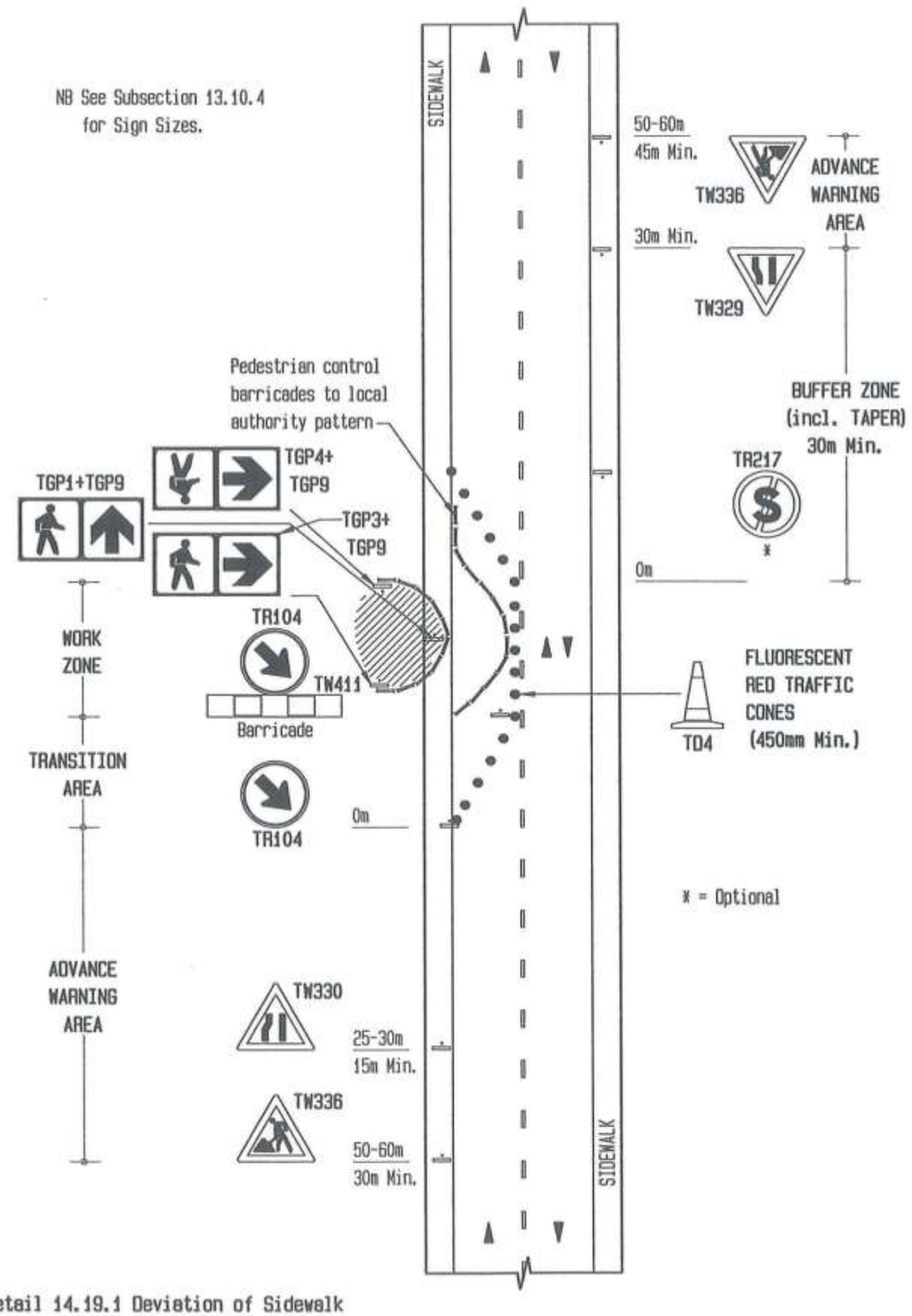
Detail 14.18.2 Part Time Operation Option





Detail 14.18.3 Permanent Crossing Used by Scholar Patrol (Use of Temporary Signs)

Fig 14.18
Scholar Patrol Crossings



Detail 14.19.1 Deviation of Sidewalk

TYPICAL SIGN REQUIREMENTS			
Sign	No	Size (mm)	Quantity
	TW336	900	2
	TW329 TW330	900	1 1
	TR104	900	2
	TW411	300 X 1800	10 Min
	TD4	450	Tapers 24 plus 10 per 100m
	TR217 Optional	900	1
	TGP4 plus TGP9	900 X 675	1 (1)
	TGP3 plus TGP9	900 X 675	1 (1)
	TGP1 plus TGP9	900 X 675	1 (1)
(1) Due to the modular nature of PEDESTRIAN DIRECTION signs, arrow signs may be used to point in any of four directions.			

Detail 14.19.2
Typical Temporary Siign Inventory

Fig 14.19
Roadworks Applications – Deviation of Pedestrian Sidewalk

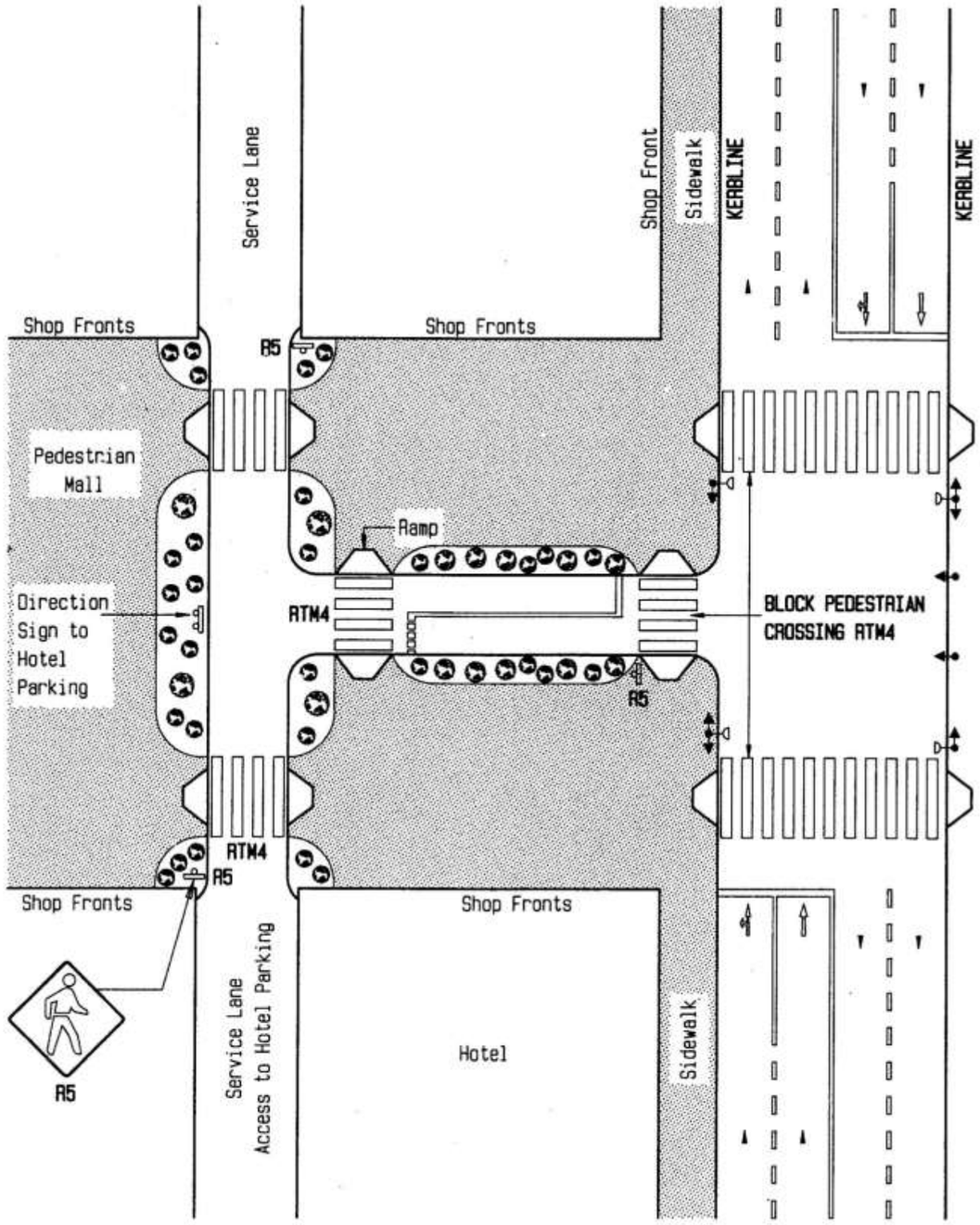


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Fig 14.20 **Example of Pedestrian Precinct**

(continued from page 14.3.4)

6 Where a relatively high frequency of vehicle access has been deemed acceptable it may be necessary to introduce signs to guide pedestrians.

7 All signs used to control the movements or actions of vehicles permitted access to a pedestrian precinct may be of minimum size and may be specially mounted to blend harmoniously with the environmental treatment of the area.

8 A typical example of such a pedestrian precinct with pedestrian priority is illustrated in Figure 14.20.

14.3.7 Woonerf Areas

1 "Woonerf" is the term used for the street serving a residential area, normally a cul-de-sac or access controlled Class 5 road serving a limited number of homes. Such streets should carry no through traffic and essentially serve as extended play areas from the erven for children and general pedestrian areas as well as local access for residents cars.

2 Since service vehicles, delivery vehicles and emergency vehicles, and vehicles of visitors to residents living in the woonerf, are allowed access to the area, the drivers of all such vehicles need to be warned that it is a woonerf, and thereby of the potential presence of children and other pedestrians on the street. Therefore, WOONERF regulatory sign R403 should be displayed on the left side of all points of access to all residential areas declared, for the purpose of traffic control, as WOONERF as shown in Figure 14.21.

3 *Inter alia* the R403 sign indicates that drivers shall yield right of way to pedestrians, and children who may be in the roadway, observe a general speed limit of 30 km/h within the area, and not enter the area by vehicle and drive through the area to exit at another point or the same point without breaking their journey.

4 The WOONERF DERESTRICTION sign R403-600 should be displayed on the left side of all points of exit from an area designated as a woonerf as illustrated in Figure 14.21.

14.3.8 Freeway Interface

1 No pedestrians are allowed anywhere within the reserve of a freeway, either walking along the roadway or crossing the freeway at grade. The concept of a freeway as a vehicle exclusive domain must be preserved. Thus grade separated crossings and adequate fencing to prevent pedestrian access along the freeway must be provided.

2 The only pedestrian related road traffic sign which may possibly be necessary within a freeway environment would be NO PEDESTRIANS sign R208. Where there is a situation at freeway access interchange ramp terminals where pedestrians may try to access the freeway, the R208 sign should be displayed on any relevant, or all, on- and off-ramp entrances facing the crossing as indicated in Figure 14.22.

3 NO PEDESTRIANS regulatory sign R128 imposes a mandatory requirement that pedestrians shall NOT proceed beyond such sign.

14.3.9 Hitch-hikers

1 Along stretches of road where there is a need for a prohibition of vehicles stopping for hitch-hikers, a NO HITCH-HIKING sign R207 is recommended. Sign R207 should be displayed on the left-hand side of the roadway to indicate the point from which the prohibition on hitch-hiking shall apply.

2 NO HITCH-HIKING regulatory sign R207 imposes a mandatory requirement that pedestrians shall NOT attempt to secure a lift from a passing vehicle, as well as imposing a mandatory requirement that drivers of vehicles shall NOT pick up passengers. The prohibition on hitch-hiking is effective for a distance of 500 m beyond such sign.

3 If the section of roadway subject to a prohibition on hitch-hiking is known to have points of pedestrian activity care should be taken to ensure that R207 signs are placed in such a manner that pedestrians can reasonably be expected to see them as well as drivers. This may require signs at closer spacing than 500 m.

4 The use of freeways by persons on foot is prohibited by the Road Traffic Act, Act No 93 of 1996. Sign R207 should not normally to be required.

14.3.10 Specific Use of the PEDESTRIANS ONLY Sign

1 This subsection gives an indication of the use of the PEDESTRIANS ONLY regulatory sign R110. This sign indicates that public road or portion or public road is set aside for pedestrians only and imposes a mandatory requirement that pedestrians shall only sue such public road or such portion of public road indicated by the sign.

2 Sign R110 should be displayed at the beginning of a path, route or lane which has been specifically provided for pedestrians only. It is, however, not required that the normal sidewalk or footpath provided for pedestrian movement in urban business districts or residential areas be so signed unless there is a particular problem of control which requires such a sign. It may be necessary to repeat the sign at intervals along the pedestrian path.

3 The sign should be located on the left side of the pedestrians only facility, provided that when a physical separator exists between the path or route and an adjacent roadway it may be more effective to locate the sign on the right side of the pedestrians only facility. A NO PEDESTRIANS sign R218 should not be displayed on the traffic side of a PEDESTRIANS ONLY sign R110.

4 Sign R110 should not be used as a pedestrian direction sign in combination with an arrow. If there is a need to guide pedestrians, appropriate guidance signs in the GP series should be provided.

5 Temporary regulatory PEDESTRIAN ONLY signs are unlikely to be required. However, it is possible that at complex urban roadworks sites or at building construction in city centres the use of temporary PEDESTRIAN ONLY signs TR110 may be appropriate.

14.3.11 Specific Use of the NO PEDESTRIANS Sign

1 This subsection gives and an indication of the use of NO PEDESTRIANS regulatory sign R218. This sign imposes a mandatory requirement that pedestrians shall NOT proceed beyond such sign.

(continued on page 14.3 20)

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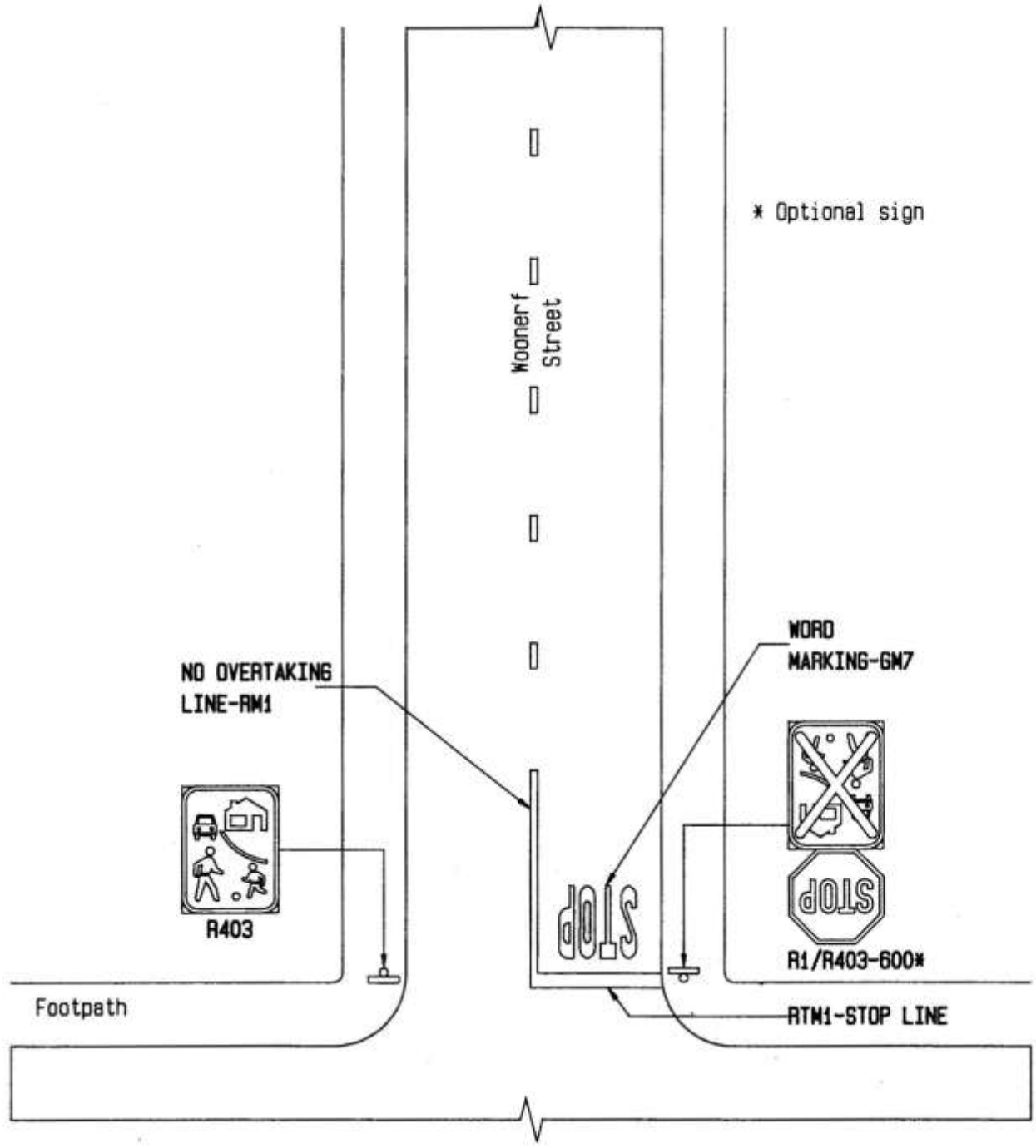

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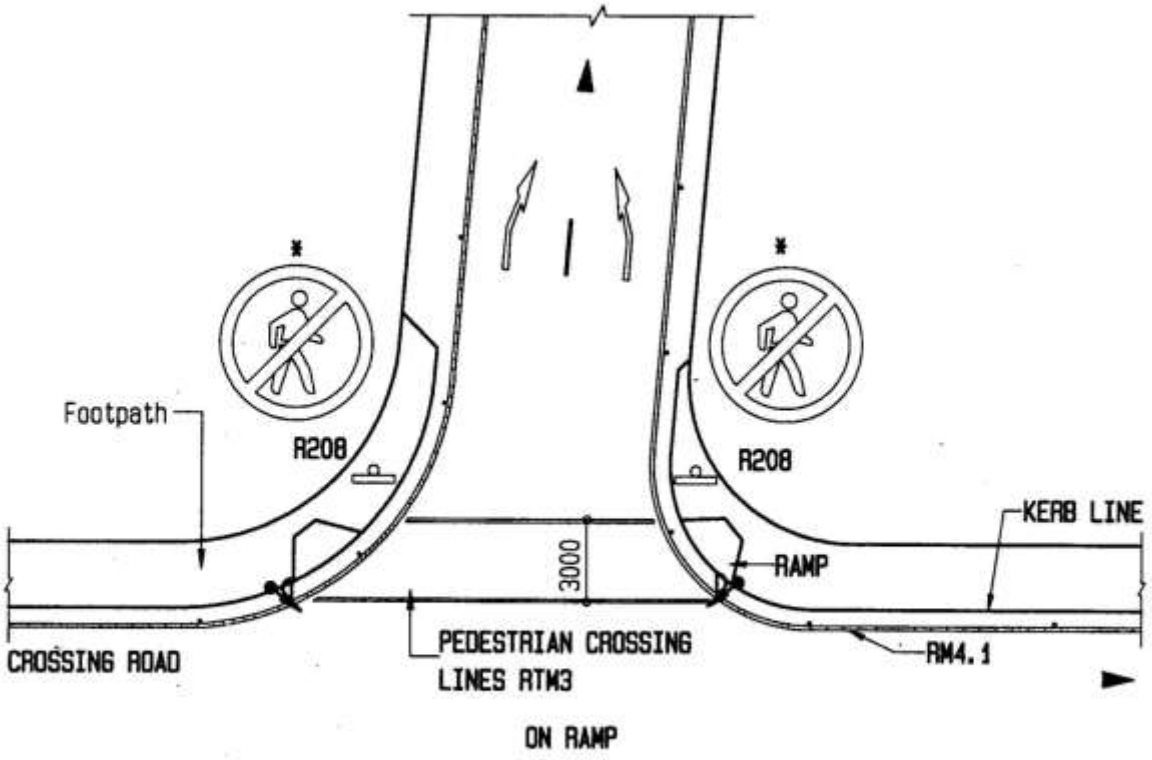
Fig 14.21 **Signing for "Woonerf"**



* = Optional signs

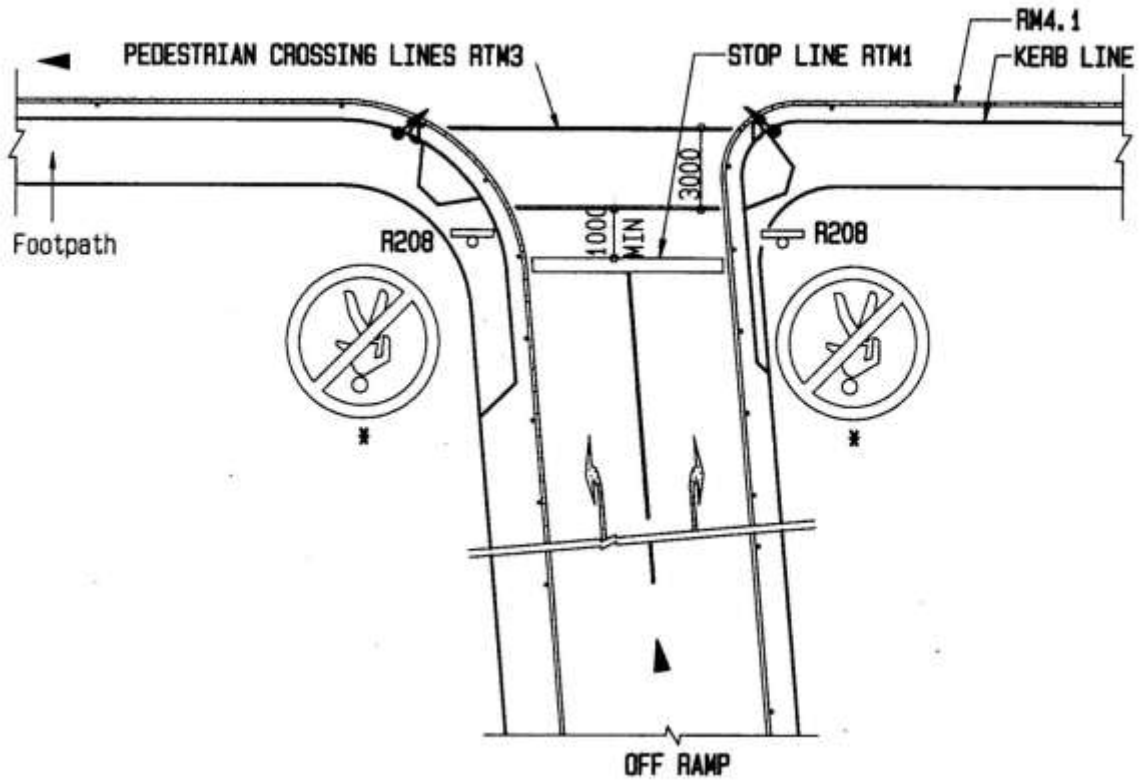


Fig 14.22 **Optional Signing for Pedestrian Control at Freeway interchange Ramp Junctions**

(continued from page 14.3.17)

2 Sign R218 should be displayed at the beginning of, and at entrances to, a roadway, lane or path to indicate that pedestrians are prohibited from using that roadway, lane or path. Sign R218 may be used to indicate to pedestrians that they should not cross a roadway at the point indicated by the sign. In the latter case it is recommended that guidance signs in the GP series signs be displayed to guide pedestrians to a safe crossing point. If sign R218 is used in this manner at a junction, the junction should not be marked with PEDESTRIAN CROSSING LINE marking RTM3 at that point.

3 A NO PEDESTRIANS sign shall not be displayed between a roadway and a pedestrian way at the commencement of a pedestrian way when such a point is signed with PEDESTRIANS ONLY sign R110 or one of the CYCLISTS AND PEDESTRIANS ONLY signs R112 to R115.

4 A NO PEDESTRIANS signs shall not be displayed at the beginning of a cyclists only facility which is already signed with a CYCLISTS ONLY sign R111.

5 Temporary regulatory sign TR218 may be used under the same circumstances as a permanent NO PEDESTRIANS regulatory sign when temporary roadworks or other conditions require that a roadway, lane or path normally available to pedestrians is temporarily not available.

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14.4 SIGNING APPLICATIONS AT THE PEDESTRIAN/CYCLIST INTERFACE

14.4.1 General

1 Some of the potential signing and marking requirements at pedestrian/cyclist interfaces are indicated in this Section, but specific planning and design aspects of cycle paths are not dealt with. The *Pedestrian and Bicycle Facility Guideline* or *NMT Guideline* should be referred to for design details.

2 The following situations with regard to pedestrian and cyclist facilities may occur:

(a) pedestrians and cyclists may share a facility;

(b) pedestrians may use a sidewalk footpath with a cycle path adjacent and physically separated;

(c) the cycle path may be on its own alignment away from the pedestrian way.

3 In the case of the former situation there is a direct interface between the pedestrians and the cyclists along the whole length of the shared facility while in the case of the two latter situations there will be interfaces at cross-over points and possibly at road crossings.

14.4.2 Typical Situations

1 The main regulatory signs used in the pedestrian/cyclist interface are as follows:

(a) signs R112 and R114 which indicate a shared facility;

(b) signs R113 and R115 which indicate a separated (segregated) facility.

All these signs indicate the relative sides of the path to be used by pedestrians and cyclists.

2 The CYCLISTS AND PEDESTRIANS ONLY regulatory signs R112, R113, R114 and R115 indicate that the public road, or portion of public road, is set aside for cyclists and pedestrians only, and imposes a mandatory requirement that cyclists and pedestrians shall only use such public road or portion of public road. This has the effect that no other class of road user shall use the public road, or portion of public road, indicated by the relevant sign.

3 Signs R112 and R114 should be displayed to indicate that the shared facility is an INTEGRATED one as indicated in Detail 14.23.1 of Figure 14.23. Cyclists and pedestrians utilise the same path which may or may not be divided longitudinally by a white DIVIDING LINE road marking WM3. If the path is sub-divided by such a marking it is recommended that symbols indicating which portion should be used by cyclists and which by pedestrians should be marked on the roadway surface in appropriate positions. The divided situation is illustrated Detail 14.23.2.

4 Signs R113 and R115 should be displayed to indicate that the shared facility is a SEGREGATED one. Cyclists and pedestrians utilise separate but parallel paths. The division between paths may be a physical separator or a single continuous white CHANNELIZING LINE marking. Painted symbols depicting a cyclist and a pedestrian should be applied to the surface of the roadway to indicate which portions each should use. These situations are illustrated in Detail 14.23.4 of Figure 14.23.

5 The correctly handed versions of the CYCLISTS AND PEDESTRIANS ONLY signs should be used for integrated and segregated facilities. The decision as to which sign is most appropriate is likely to be subjective based on local conditions. If in doubt, arrange signs so that pedestrians are furthest from passing vehicular traffic. Signs R112 and R113 will then be used in one direction and signs R114 or R115 in the opposite direction.

6 Signs R112, R113, R114 or R115 should be displayed, as appropriate, at the beginning of the shared path which has been specifically provided for cyclists and pedestrians only. They should be repeated at regular intervals along the path to indicate to other crossing traffic that it is a cyclist and pedestrian only facility.

7 The signs should be located on the left side of the path provided that if a physical separator exists between the path(s) and the adjacent roadway it may be more effective to locate the sign on the right side of the path.

8 A NO CYCLISTS AND PEDESTRIANS sign R220, should not be displayed on the traffic side of CYCLISTS AND PEDESTRIANS ONLY signs R112, R113, R114 or R115.

9 Temporary regulatory signs CYCLISTS AND PEDESTRIANS ONLY are unlikely to be required. If they should be required they should be numbered TR112, TR113, TR114 or TR115 as appropriate.

10 Figure 14.24 illustrates the use of the CYCLIST AND PEDESTRIAN ONLY regulatory signs including:

(a) shared pedestrian and bicycle paths, separated from the roadway;

(b) a bicycle lane;

(c) parallel pedestrian and bicycle crossings at a signalised junction; and

(d) parallel pedestrian and bicycle mid-block signalised crossing.

11 Figure 14.25 gives a higher level of detail for the combined pedestrian/bicycle crossings. It should be noted that BICYCLE GUIDE LINES GM5 are guidance markings and do not have the same legal force as PEDESTRIAN CROSSINGS LINES RTM3. It is therefore recommended that where practical both crossing markings be used.

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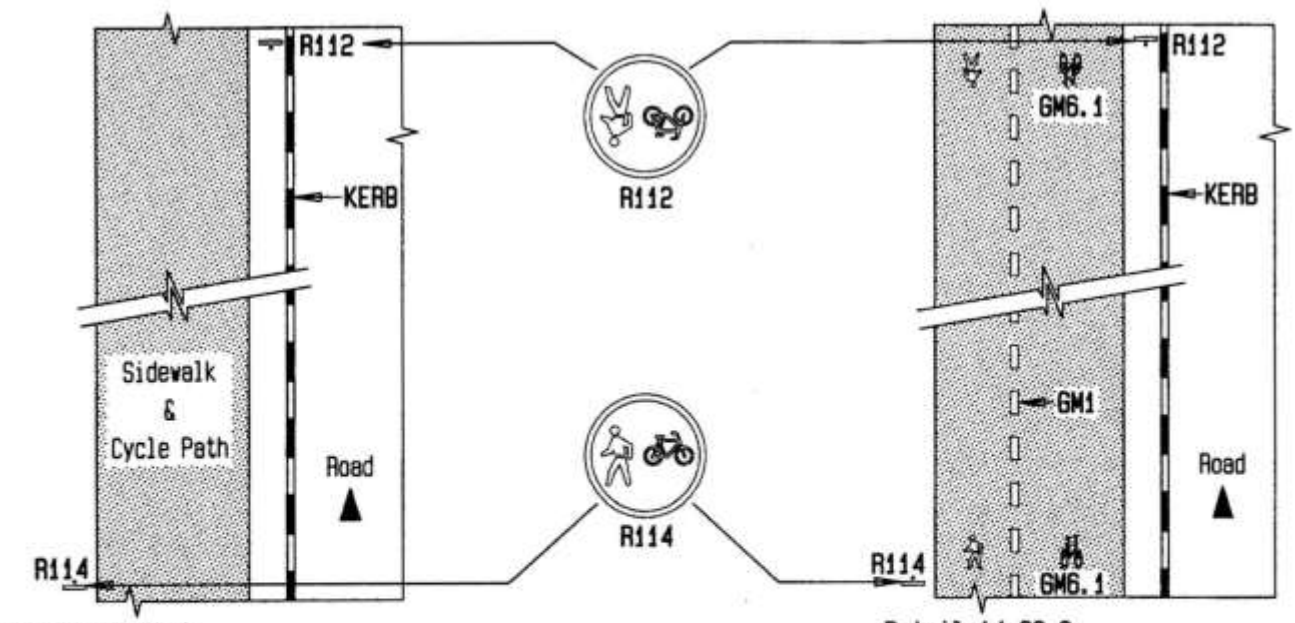
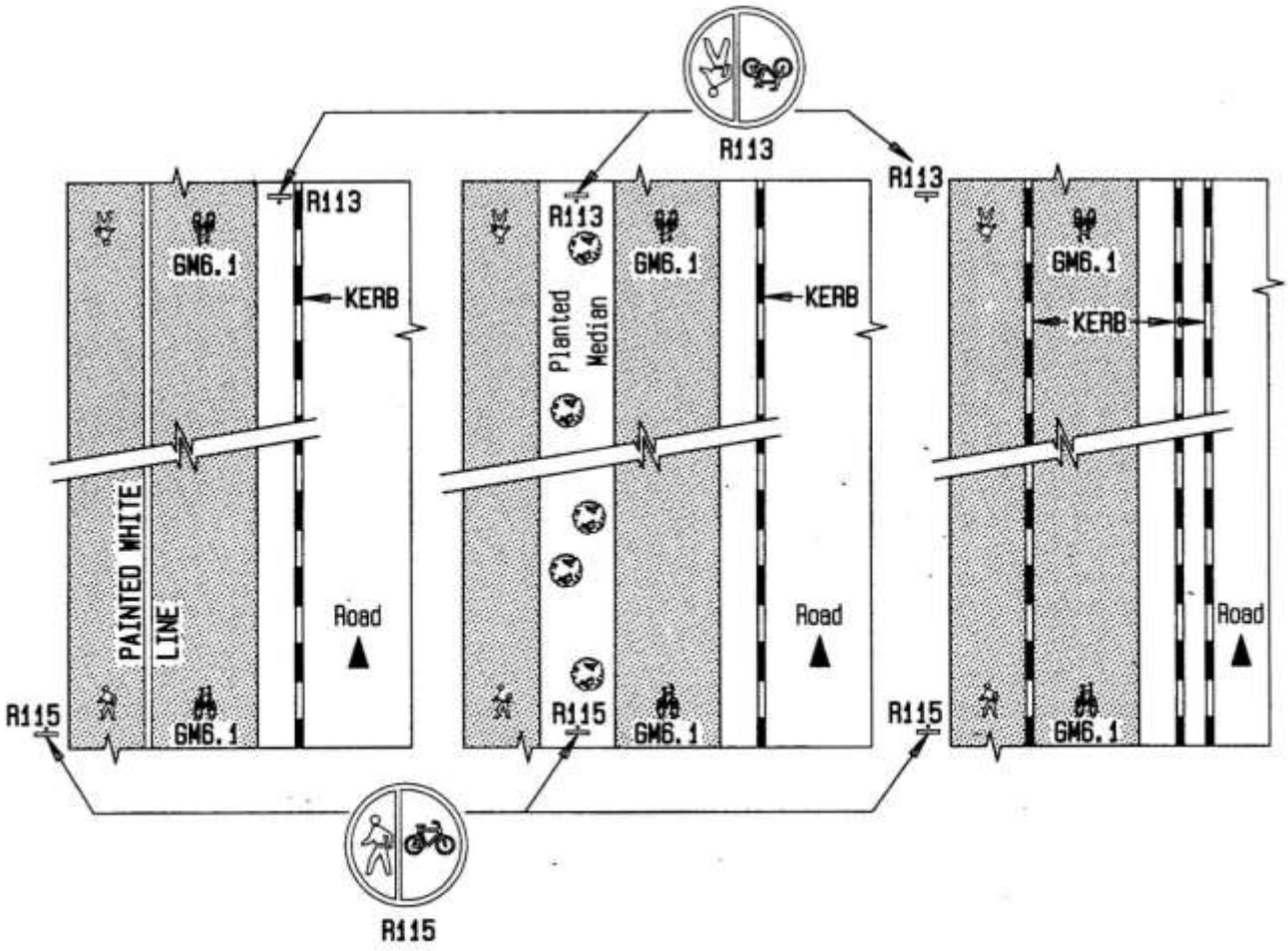


Detail 14.23.1
Integrated Situation with Separation
Only Indicated Generally

Detail 14.23.2
Integrated Situation with
an Indication of Separation



Detail 14.23.3 Separated Facility Situation

Fig 14.23 **Pedestrian/Cyclist Interface - 1**

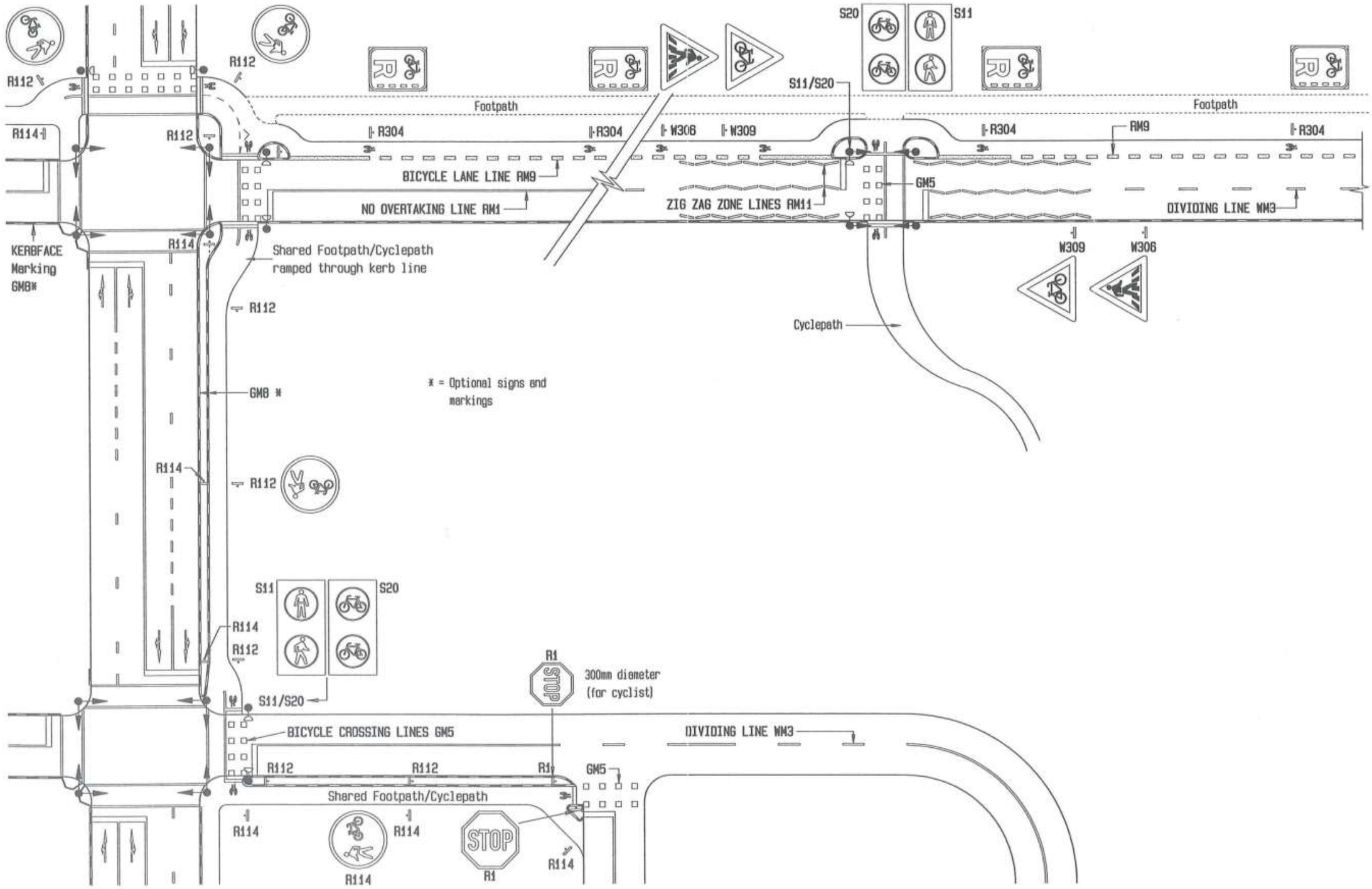
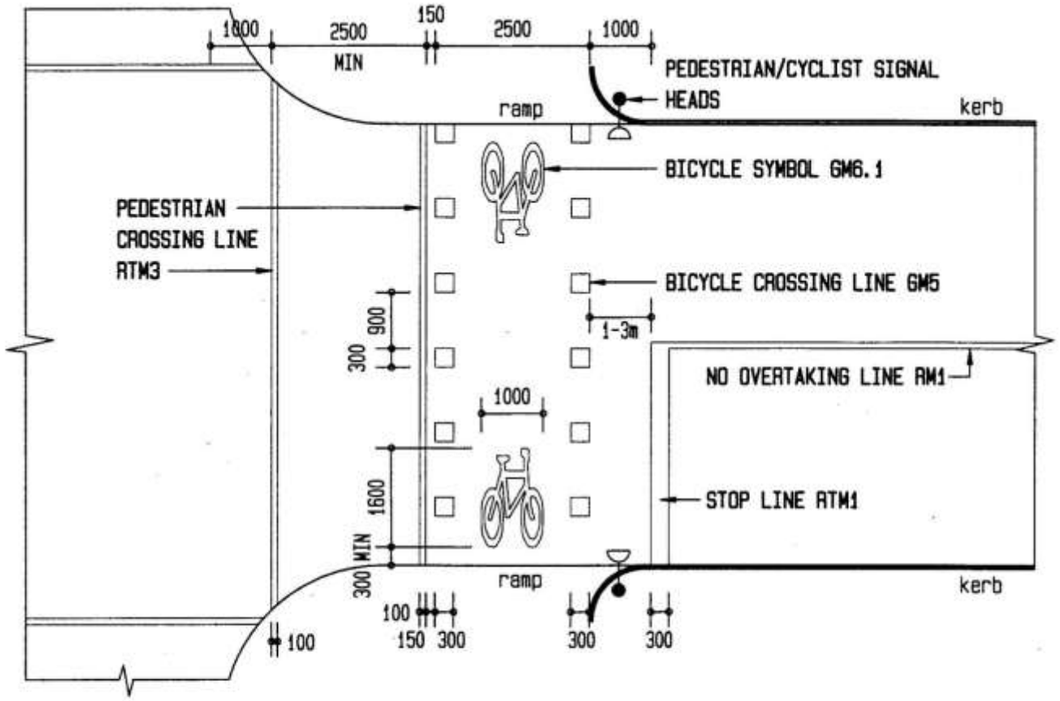
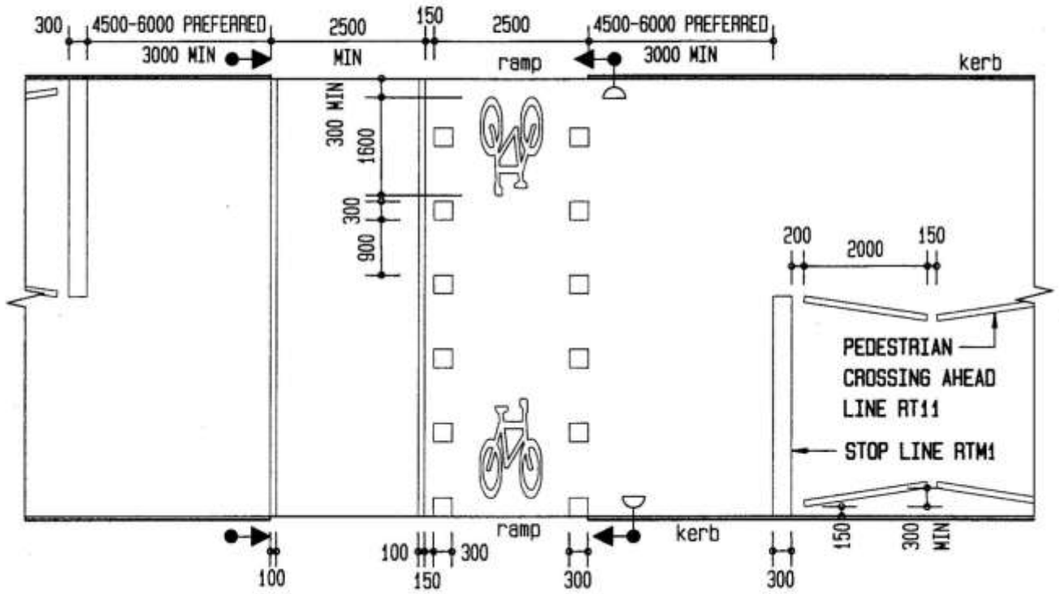


Fig 14.24
Pedestrian/Cyclist Interface - 2



Detail 14.25.1 Bicycle Crossing at a Signalized Junction



Detail 14.25.2 Mid-Block Signalized Bicycle Crossing

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Fig 14.25 **Pedestrian/Cyclist Interface - 3**

14.5 SIGNING APPLICATIONS FOR DISABLED PERSONS

14.5.1 General

1 Disabled persons (in wheelchairs) will generally be required to follow normal pedestrian routes and the facility to enable the passage of their wheelchairs must be incorporated into the physical fabric of the sidewalk and roadway. Adequate ramps to negotiate physical height barriers are required. Where it is required that disabled persons take an alternative route to pedestrians, this will need to be indicated by means of guidance direction signs in the GP series. This Section deals specifically with signing applications at the parking interface.

14.5.2 Parking Applications

1 The correct marking and signing of parking for disabled persons is of particular importance. Details 14.26.1, 14.26.2 and 14.26.3 of Figure 14.26 illustrate examples of the use of DISABLED PERSONS PARKING BAY marking RM16 in parallel, angled and 90^{o} parking bay situations respectively. The size of the parking bays for disabled persons shown in these examples have all been enlarged to permit the manoeuvring of wheelchairs when necessary. Care should be exercised in providing a left side parallel bay for disabled persons, as shown in the example, since disabled drivers will have to get into a wheelchair in a traffic lane. Each of the examples also shows the need to provide for a ramp from road level to footpath level. Marking RM16 is enforceable on its own since it is a regulatory marking, however, the optional additional use of PARKING FOR DISABLED PERSONS RESERVATION sign R323-P may be considered. Detail 14.26.3 gives an example of the use of PAINTED ISLAND marking RM5 between bays to provide manoeuvring space for wheelchairs between parked vehicles.

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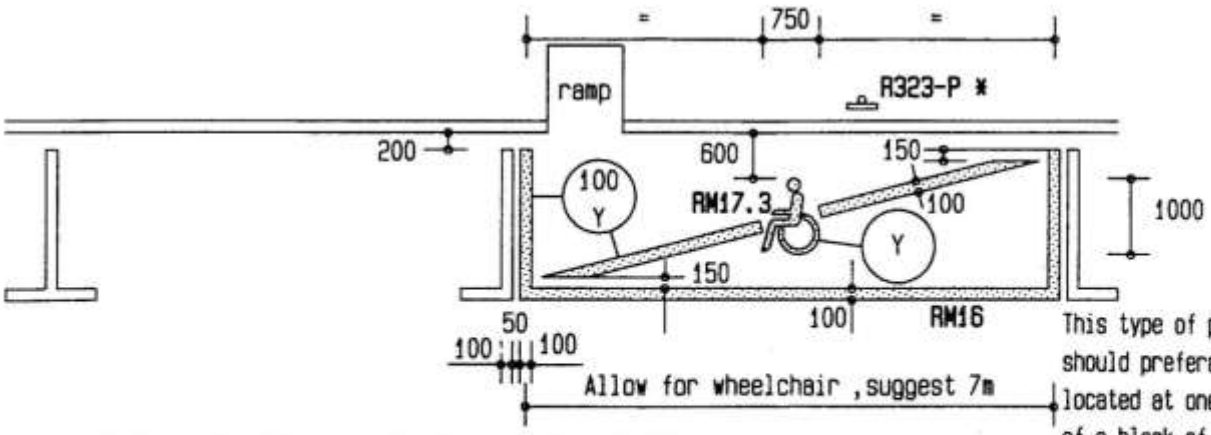
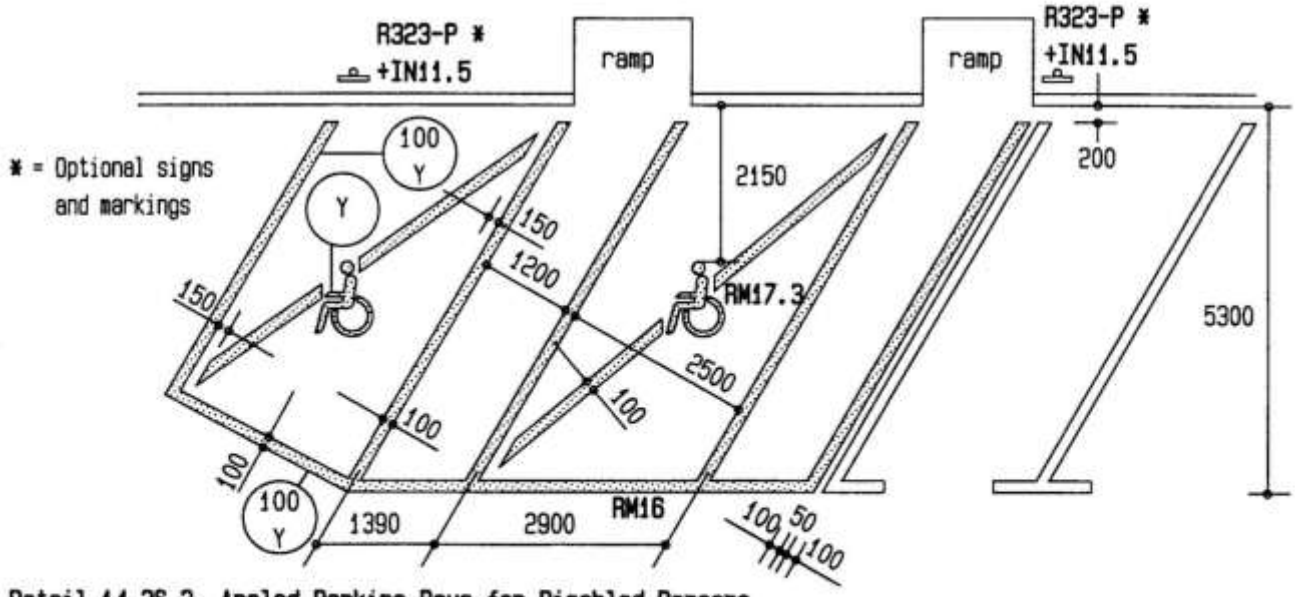
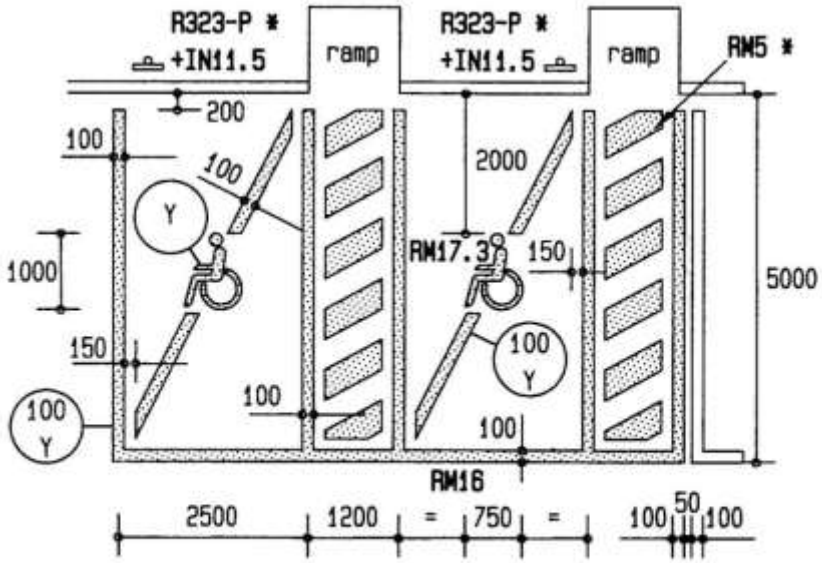


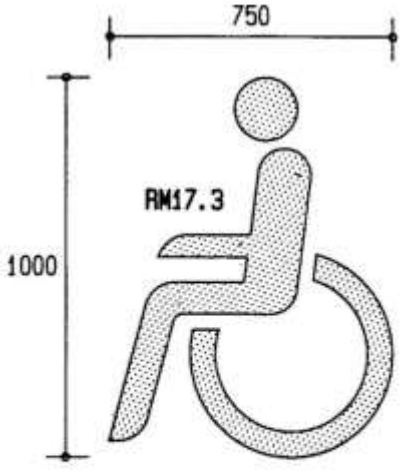
Detail 14.26.1 Parallel Parking Bay for Disabled Persons



Detail 14.26.2 Angled Parking Bays for Disabled Persons



Detail 14.26.3 90° Parking Bays for Disabled Persons



Detail 14.26.4
Symbol for Use in Disabled Persons Parking Bays RM16

Fig 14.26 Disabled Persons Parking Bays

14.6 SIGNING APPLICATIONS FOR PEDESTRIAN/PUBLIC TRANSPORT INTERFACES

14.6.1 General

1 Signing and markings for use within public transport precincts such as bus or minibus ranks/termini are not specifically dealt with in this Chapter except to indicate that an adequate layout, ensuring measures, inclusive of appropriate signs and road markings, for the safe movement of pedestrians to and from public transport vehicles must be provided. This Section looks rather at the interface between pedestrians in the normal road reserve and public transport.

14.6.2 Basic Considerations

1 Special measures may be desirable at:

(a) entrances and exits to public transport ranks/termini which conflict with heavy pedestrian movements along the sidewalk, for example, in the CBD or at major shopping centres; a typical treatment of this type of situation is illustrated in Detail 14.27.1 of Figure 14.27.

(b) bus/minibus stops, where adjacent crossing facilities are necessary for commuters such as when the stops are mid-block, or at an intersection on a heavily trafficked road which is subject to stop or yield control on the side road; it is essential to cater for this type of situation, particularly near schools; Detail 14.27.2 illustrates some basic requirements of such a crossing near a public transport stop, while Detail 14.27.3 illustrates a situation at a school adjacent to a bus route on a main road.

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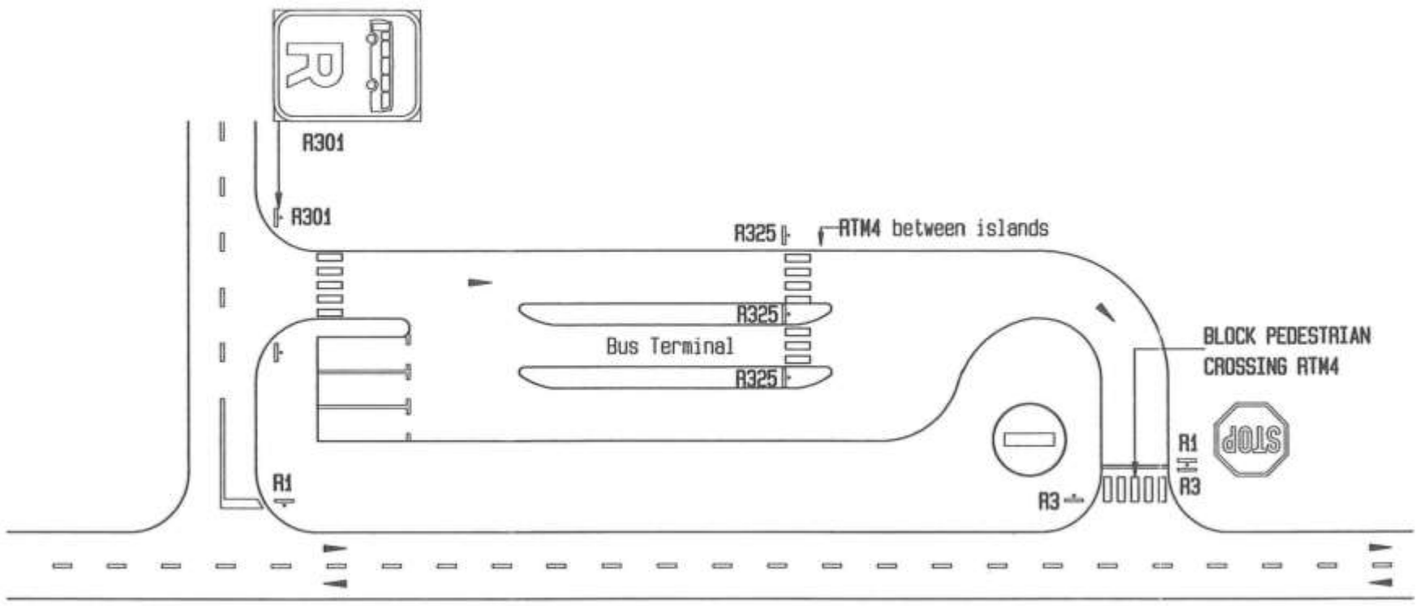
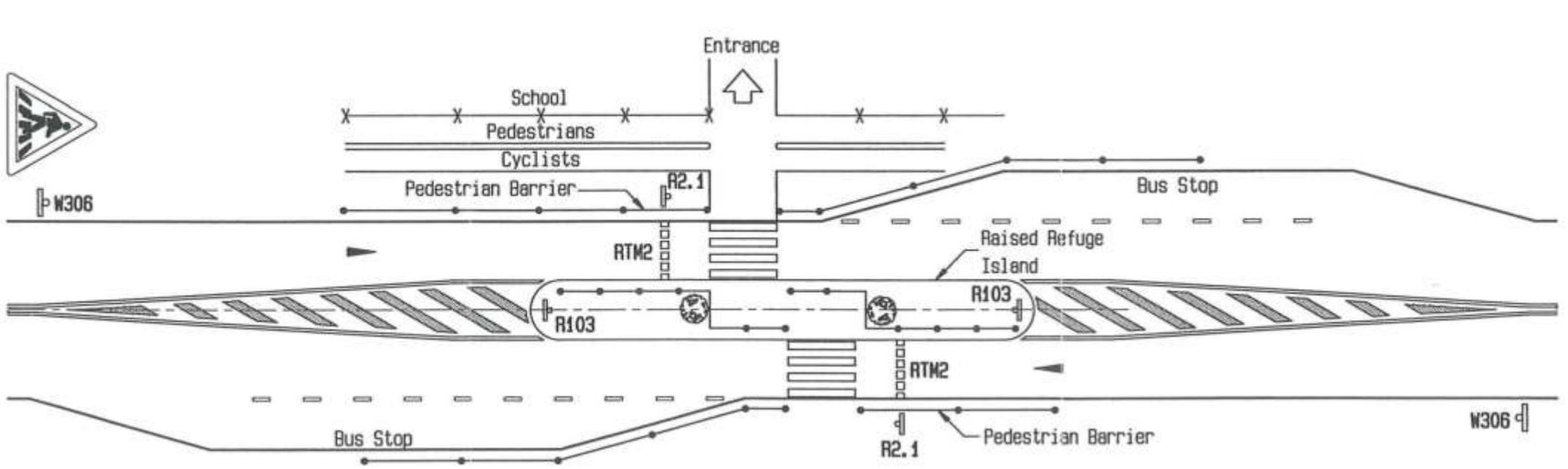
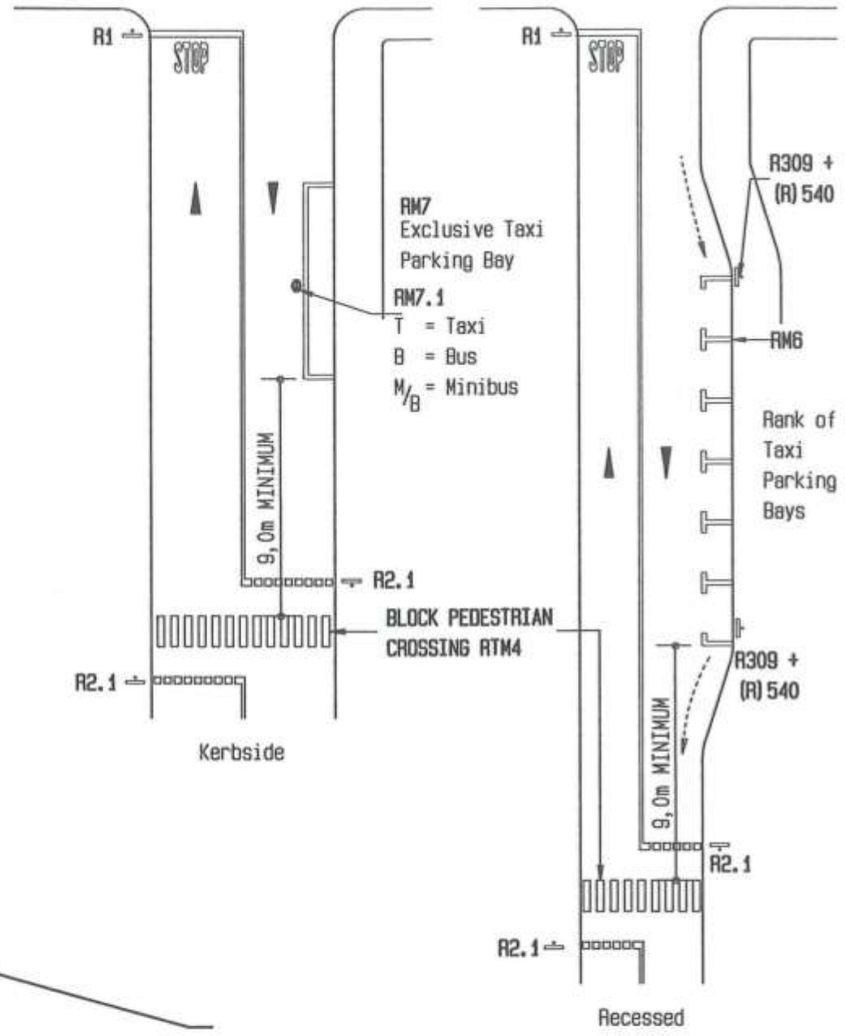


Detail 14.27.1 Pedestrian Crossings at Entrance to Bus / Taxi Terminals



Detail 14.27.3 Recommended Application of a Pedestrian Crossing on a Busy Road With Bus Stops Near School



Detail 14.27.2 Pedestrian Crossing in Relation to a Public Transport Stop

Fig 14.27
Signs and Markings at Pedestrian/ Public Transport Interfaces

14.7 PEDESTRIAN TRAFFIC SIGNALS

14.7.1 General

1 Traffic signals will normally be provided where a significant number of pedestrians experience difficulty and/or delay in crossing a road at certain times during the day. Situations in which pedestrian signals may be used are:

(a) at signalised road junctions;

(b) at signalised mid-block pedestrian crossings.

2 Pedestrian signals shall be operated only in conjunction with vehicular traffic signals as described in Volume 1, Chapter 6, Section 6.3.

3 Warrants for the provision of pedestrian signal heads at a junction are given in Volume 3. Pedestrian signal faces shall be provided at road junctions in any one or more of the following circumstances:

(a) when the product of the pedestrian flow multiplied by the sum of the conflicting turning traffic flows exceeds 10×10^3 in any one hour, or 5×10^3 for each of any four hours;

(b) where a turning phase is operated at any time as signalled by a flashing green arrow (left or right);

(c) on a crossing parallel to a one-way approach at a road junction, i.e. where there is no vehicular signal face facing the crossing pedestrians.

4 Warrants for the installation and operation of pedestrian signals at signalized mid-block pedestrian crossings are given in the SARTSM Volume 3, *Traffic Signal Design*.

5 The general provisions for vehicular traffic signals given in Volume 1, Chapter 6, Part B, Section 6.2B shall apply to pedestrian signals and to vehicular traffic signals used in conjunction with pedestrian signals.

14.7.2 Installation

1 A pedestrian signal face shall comprise two aspects, one depicting a red standing man and the other depicting a green walking man. The standard signal face Type S11P shown in Detail 14.28.1 of Figure 14.28 shall be used. The RED MAN shall be located in line directly above the GREEN MAN.

2 Pedestrian signal lights shall conform to standard specification SANS 1459:2004, *Traffic Lights*. Aspects may be 210 mm or 300 mm nominal diameter. The larger diameter aspect may be used for improved visibility or conspicuity.

3 A pedestrian signal face Type S11P shall be located on each side of the road, facing as near as possible in line with the crossing, at a height of 2,1 m to 2,6 m from sidewalk level to the centre of the green aspect as indicated in Figure 14.28. Pedestrian signal faces shall not be located in line vertically with any vehicular signal aspects facing the same direction and shall be offset to the right or left of any adjacent vehicular aspect as indicated in Detail 14.28.2 of Figure 14.28.

4 At signalised mid-block pedestrian crossings, Type S1 signal faces, incorporating a green disc aspect shall be used to control vehicular traffic. There shall be at least two Type S1 signal faces for each approach and these shall be located within the extension of the edges of the crossing. Vehicular signal faces shall be not more than 2 m beyond the kerb line or edge of carriageway and shall be not more than 20 m apart. Overhead mounted signal faces should be provided if necessary and on a divided carriageway road the right-hand vehicular signal face, Type S1, shall be located on the median or refuge island.

5 In practice, the arrangement and layout of signals at a particular site should be designed to meet the specific characteristics of the junction and the needs of both vehicular and pedestrian traffic. The exact location of poles and signal heads should always be finalised on site, taking into account road alignment, sight distance, lines of site, parking, obstructions to vision, background etc. A number of examples of the typical layout for pedestrian signals at road junctions and in mid-block are illustrated in Figure 14.29. These are:

(a) Detail 14.29 - 4-Way single-carriageway junction with a right-turn phase on one axis;

(b) Detail 14.29.2 - 3-Way single-carriageway junction with a left-turn;

(c) Detail 14.29.3 - Typical mid-block pedestrian crossing on a 2-lane single-carriageway road;

(d) Detail 14.29.4 - Typical staggered mid-block pedestrian crossing on a divided-carriageway road, to be crossed in two stages;

(e) Detail 14.29.5 - Typical mid-block pedestrian crossing with a local median island refuge on a 4-lane single-carriageway road.

14.7.3 Pedestrian Signal Indications

1 Pedestrian signal indications shall comprise:

(a) a STEADY GREEN MAN, followed by

(b) a FLASHING RED MAN, followed by

(c) a STEADY RED MAN.

2 Pedestrian signal indications shall have the significance assigned to them in the current Road Traffic Act Regulations.

3 A STEADY GREEN MAN INDICATION shall be displayed to indicate to pedestrians that they may use the pedestrian crossing within the PEDESTRIAN CROSSING marking RTM3 or RTM4, as appropriate, and that drivers of vehicles shall yield right of way to such a pedestrian. Its function is to provide a limited initial step off or launching interval for pedestrians. It shall always be followed immediately by a flashing red man indication.

4 A FLASHING RED MAN INDICATION shall always be displayed immediately following a steady green man indication to indicate to pedestrians:

(a) who have not yet commenced crossing the roadway that they shall not cross the roadway until a steady green man indication is again displayed; or

(b) who are within a pedestrian crossing that the steady red man indication will follow shortly.

5 A STEAD RED MAN INDICATION shall be displayed at all other times, to indicate to pedestrians that they shall not cross the roadway until the steady green man indication is displayed. Pedestrians should have had sufficient time to have safely

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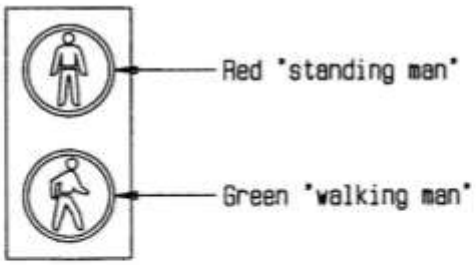
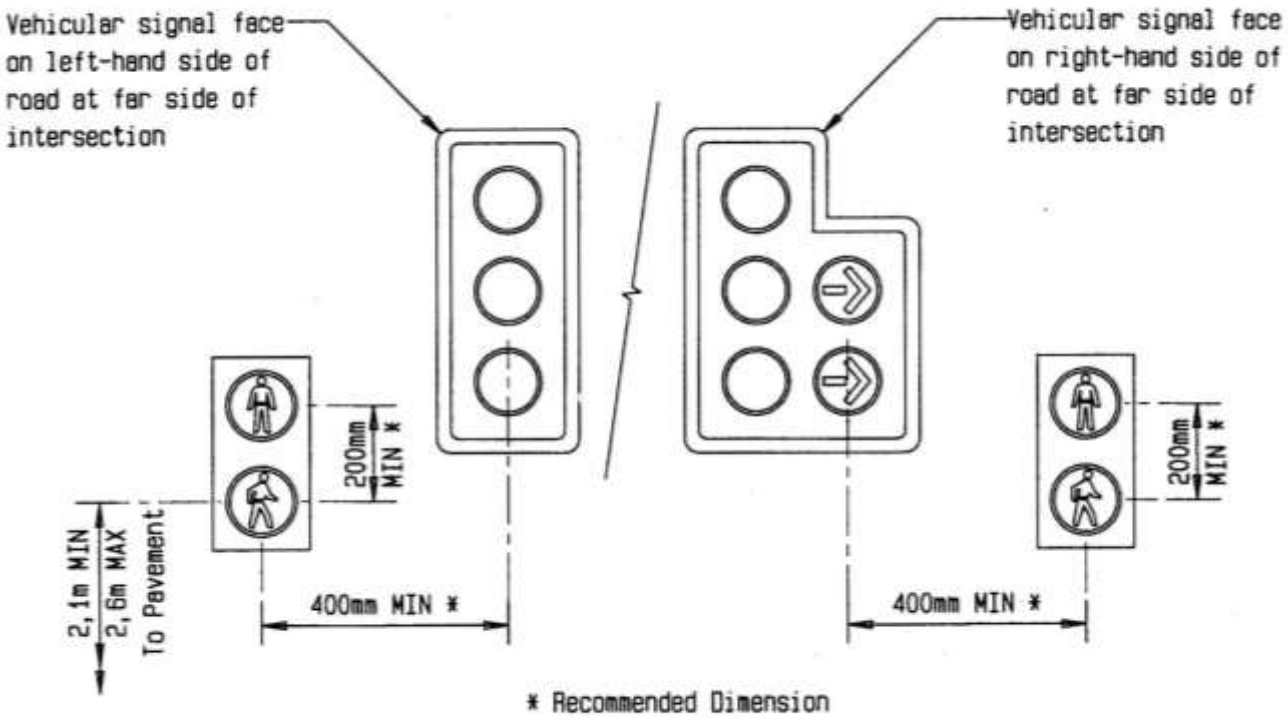


Detail 14.28.1 Standard Signal Face Type S11P, for the Control of Pedestrian Traffic



Detail 14.28.2 Standard Pole Mounting for Pedestrian Signal Heads

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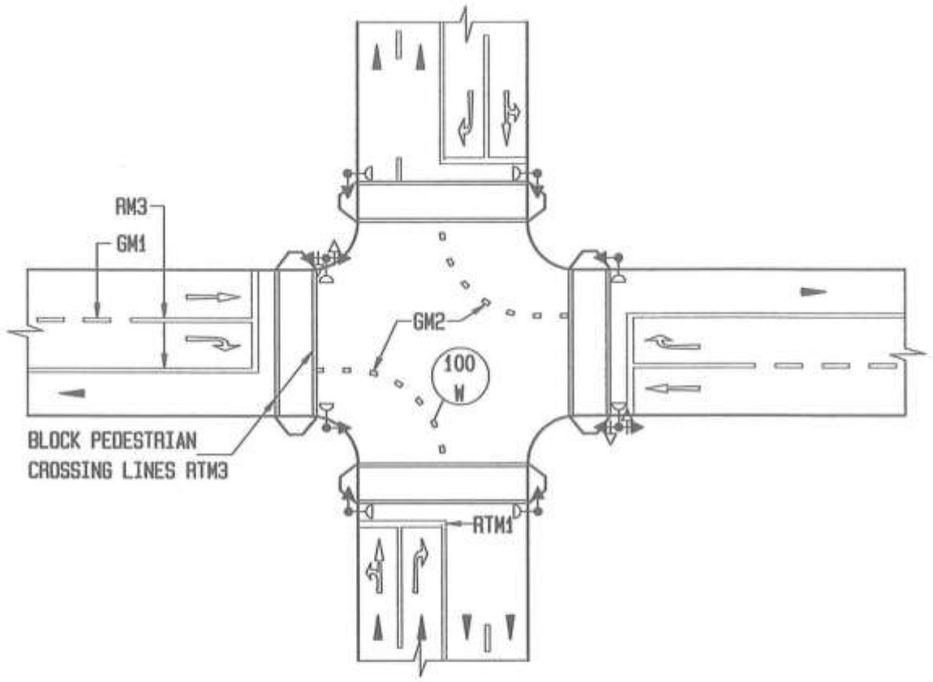
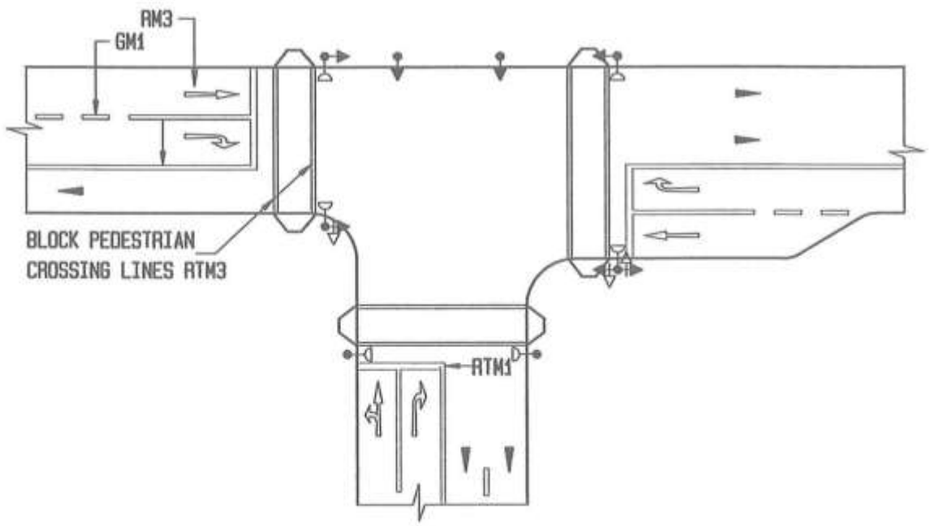
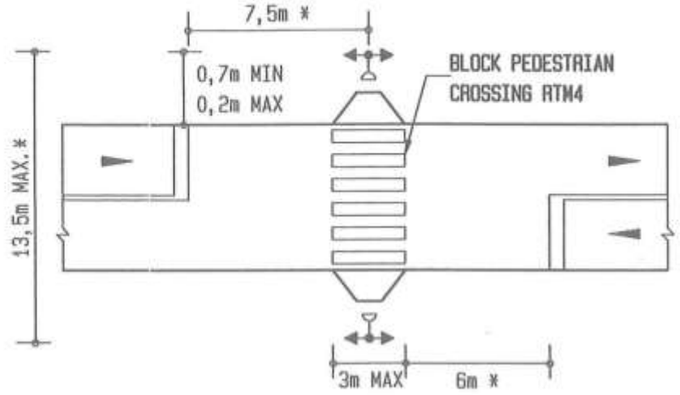
Fig 14.28 Pedestrian Traffic Signal Details



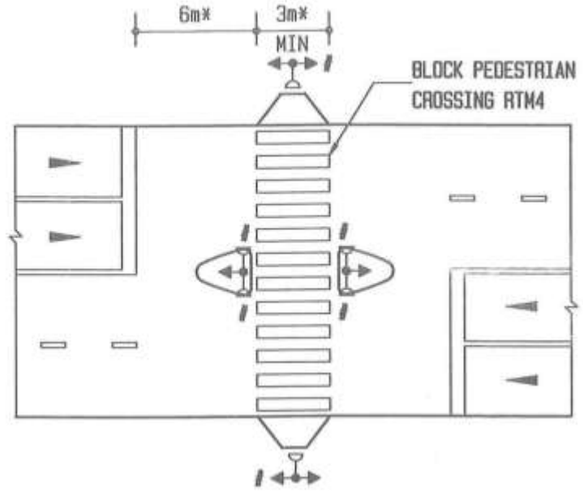
Detail 14.29.1 4-Way Single-Carriageway Junction with a Right Turn Phase on one Axis



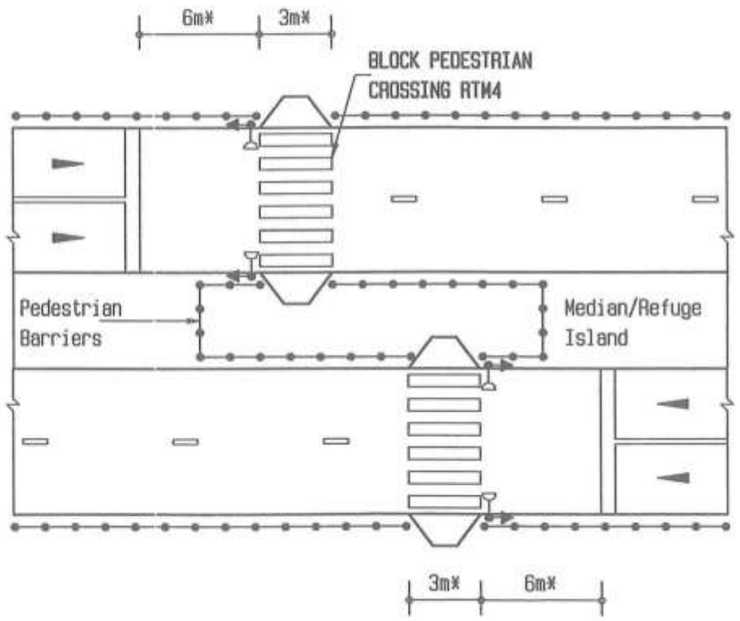
Detail 14.29.2 3-Way Single-Carriageway Junction with a Left Turn Filter Phase



Detail 14.29.3 Typical Mid-Block Pedestrian Crossing on a 2-Lane Single Carriageway Road



Detail 14.29.5 Typical Mid-Block Pedestrian Crossing with a Local Median Island on a 4-Lane Single Carriageway Road



Detail 14.29.4 Typical Staggered Mid-Block Pedestrian Crossing on a Divided-Carriageway Road, to be crossed in Two Stages

LEGEND :

- Traffic signal heads
- Pedestrian signal heads
- Optional signal heads
- * Recommended dimensions

Fig 14.29
Schematic Examples of Pedestrian Traffic Signal Layouts and Positioning

cleared the crossing by the time this indication is displayed.

6 A GREEN MAN indication shall not be displayed at the same time as a FLASHING or STEADY RED MAN indication.

14.7.4 Operation of Pedestrian Signals

1 The steady GREEN MAN INDICATION shall be displayed for an interval calculated to suit the particular pedestrian and traffic conditions and shall be not less that 4 seconds. Longer intervals than necessary should not be used where pedestrians conflict with turning vehicles, reducing vehicular capacity.

2 The FLASHING RED MAN INDICATION shall be displayed for a clearance interval equal to the time required for a pedestrian to walk across the roadway or carriageway (if there is a central refuge and the crossings are staggered or otherwise clearly intended to be crossed separately) at an average walking speed of between 1,2 m/s and 1,5 m/s for pedestrians or at a slower speed, if required, for elderly or infirm people. The FLASHING RED MAN INTERVAL should not be extended beyond the calculated period.

3 At a road junction the pedestrian phase may run concurrently with a non-conflicting parallel vehicular phase. Both may start at the same time, or the VEHICULAR GREEN INDICATION may be delayed by up to 3 seconds to allow pedestrians to enter the roadway ahead of the vehicles. The termination of the parallel vehicular yellow indication shall not occur before the termination of the flashing red man interval.

4 At a mid-block pedestrian crossing, other than a Pelican crossing described in paragraph 14.7.4.5 a RED DISC INDICATION shall be given at least for the full duration of the GREEN MAN AND FLASHING RED MAN INTERVALS. During the vehicular GREEN DISC INDICATION and the YELLOW DISC INDICATION preceding the vehicular RED DISC INDICATION, a STEADY RED MAN INDICATION shall be given. In some cases it may be necessary to introduce an all red period during which the vehicular RED DISC INDICATION and the STEADY RED MAN INDICATION run concurrently.

5 At Pelican crossings, a vehicular FLASHING YELLOW DISC INDICATION shall be given, which shall not terminate before the FLASHING RED MAN DISC INDICATION terminates. Vehicles facing a FLASHING YELLOW DISC INDICATION should give right of way to pedestrians crossing during the pedestrian clearance (FLASHING RED MAN) interval.

6 If pedestrian traffic signals are added to vehicular signals, at some time after their original installation, care should be exercised to see that no operational conflict exists with existing signal phases, such as a Left Turn On Red After Stop FLASHING RED ARROW INDICATION.

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ORIGINAL AUTHOR

J S Schrade
D Bain

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CHAPTER 15:
STRUCTURAL DETAILS OF ROAD SIGNS

15.1 INTRODUCTION

15.1.1 General

1 This chapter provides guidelines for the adequate and safe provision of road signs and their support structures, including the fastenings required to hold the component parts of the signs together as an integrated structure, able to withstand various environmental conditions such as the climate, loadings and vandalism.

2 A range of environmental conditions may affect the type of sign and support structure recommended for a certain location. The most relevant factors are:

(a) climatic/weather conditions normally pertaining in environments such as - coastal, desert, forest, pollution, snow/ice, and wind;

(b) the complexity of the immediate environment i.e. urban, suburban, rural, nature conservation area;

(c) road factors i.e. road class, speed limit, lane configuration, geometry;

(d) road side conditions such as cut or fill, soil types, sidewalks (paved or otherwise) illumination;

(e) clearances available for ground-mounted or overhead signs (longitudinal, lateral and vertical);

(f) safety considerations for the road user in terms of visibility, retroreflectivity, frangibility.

3 Desirable characteristics of complete sign structures are also:

(a) limited material, installation and maintenance costs;

(b) ease of installation in terms of manpower and equipment requirements;

(c) readily available materials;

(d) an acceptable level of safety compromise, in that the sign structure is sufficiently frangible to limit impact hazard but is strong enough to limit vandalism.

4 The environmental, location, and safety considerations are discussed further in Section 15.2 in terms of their influence on the choice of materials. Sections 15.3 to 15.6 deal with the choices of materials for each of the main component parts which make up the whole sign structure.

15.1.2 Scope of Coverage

1 The chapter contains detail relevant to the smallest and largest road signs according to classified types, and according to their two most common mounting positions, namely ground mounted, to the side of the roadway, and overhead, above the roadway.

2 The size and shape of signs, determined by their function and operating environment, dictates the type of support structure required. The function and location also determines the signface colours, and whether the signface is retroreflective, semi-matt or even illuminated.

3 The main thrust of the contents of the chapter is to discuss the available methodologies for the planning, design, construction and implementation of new road signs of all types.

4 REGULATORY and WARNING signs comprise what are normally considered small signs, although there are other small sign types. The functional details of these classes of sign are covered in Volume 1, in Chapters 2 and 3 respectively, and their signface dimensional details are covered in the same chapters in Volume 4. The application of Regulatory and Warning signs is covered in Volume 2, Chapter 3. Single Regulatory and Warning signs are normally ground mounted, requiring only one SUPPORT POLE. This could be a FREE-STANDING POLE specific to the sign, or a HOST SUPPORT POLE like an existing street light pole. Signs such as these, with an area of 1,5 m^2 or less, do not require extensive BACK PLATE stiffening, often having only two horizontal struts at the rear. (Signs with an area in the region of 1,5 m^2 may occasionally require two supports depending on the type of support being used and the prevailing wind levels.)

5 Small GUIDANCE signs such as some LOCATION (STREET NAME sign GL1) signs, ROUTE MARKER signs, and TRAILBLAZER signs may also only require a single support pole. The more common medium sized LOCATION, DIRECTION, TOURISM, LOCAL DIRECTION and DIAGRAMMATIC signs will normally require two supports, and occasionally three, without diagonal bracing poles. These signs will be sized in the range 1,5 m^2 to 8 m^2 and will require more extensive BACK PLATE stiffening in the form of framing and reinforcing. Because of this the weight increases and wind load, impact load and imposed loads must be recognised and planned for. Details of the functions of individual Guidance sign types are covered in Volume 1, Chapter 4, and their dimensions are given in Volume 4, Chapters 4 to 8.

6 Large ground mounted GUIDANCE signs are occasionally specified and these are likely to require three or even four SUPPORTING POLES which may well need to be braced if the sign height dictates. These signs, which may range in area from 8 m^2 to over 20 m^2, require extensive framing and reinforcing to the BACK PLATE, to resist wind and other loads. The mass and size of the sign dictate bigger and heavier support structures, impact safety concepts such as breakaway bases, and stronger, and heavier, fastening brackets for

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connecting the component parts of the sign together.

7 Any of the sign types mentioned above could be mounted on overhead support structures if the location and environment warrant such mounting. Overhead signs are generally used on roads carrying heavy volumes of traffic, with more than two lanes in each direction, for the following reasons, either singly or in combination:

(a) when a message is applicable to one or more specific lanes, but not necessarily all lanes;

(b) where traffic, due to its sheer numbers or the frequency of large vehicles, or both, will result in ground mounted signs being regularly obscured for many drivers;

(c) when there is no space for signs at the side of the road;

(d) where the positioning of a ground mounted sign may represent an unacceptable hazard.

8 The support structure for overhead signs, being more complex in form and design, requires extensive planning and design of the signboard BACK PLATE, the STRUCTURE, the FIXINGS, and the FOUNDATION for the supports. Support structures may be any of the following types:

(a) simple to heavy portal structures;

(b) simple to heavy cantilever structures;

(c) host structures such as existing bridges.

Portal and cantilever structures can be manufactured to a number of basic structure types, such as sections, trusses, trestles and cable, or cable-stayed structures.

9 VARIABLE MESSAGE signs are likely to play an increasing safety and traffic management role, on freeways and other strategically important roads, particularly in metropolitan areas, and areas subject to severe weather patterns. These signs perform a critical function by providing drivers with real-time information. VARIABLE MESSAGE signs may be supported in the same way as any other form of sign and they can be relatively small in size or fairly large. Due to the nature of their manufacture they are always likely to be heavier that conventional signs and their construction is likely to be specialised. As such, aspects of their construction is illustrated in this chapter, but is not covered in depth. Due to the fact that they are most commonly warranted when traffic volumes are high they are likely to be most commonly supported on overhead structures. A common prerequisite for the provision of VARIABLE MESSAGE signs is an electricity supply. VARIABLE MESSAGE signs are dealt with in detail in Volume 1, Chapter 9 and their application is covered in Volume 2, Chapter 19.

10 Whilst most of the above-mentioned sign types and structures are for new sign applications, certain structural changes may be necessary to existing signs. The most likely modifications to existing signs are:

(a) fixing cover plates, either blank or containing revised text, over existing incorrect text;

(b) fixing of adhesive "stickers", either blank or containing revised text, over existing incorrect text;

(c) adding or removing of one or more panels to correct messages on signfaces;

(d) replacing damaged or updated parts of signs and structures;

(e) recycling and re-erecting complete signs.

11 Figures 15.1 to 15.3 illustrate the basic sign types discussed above.

12 Signs may be mounted in the two basic positions, ground mounted or overhead, on supports of the following material types:

(a) timber poles;

(b) steel tubes or rolled sections;

(c) aluminium tubes or rolled sections;

(d) fabricated steel supports.

13 These support materials may have the following types of cross-section:

(a) circular (or approximately so in the case of timber poles);

(b) square section;

(c) D-section;

(d) I or U channel section;

(e) welded lattice frame;

(g) welded box sections.

14 The more commonly used sign support structure types are shown in Figures 15.4 and 15.5, and the structural design process is illustrated in a flow chart form in Figure 15.6.

15.1.3 Objectives

1 The primary objective of this chapter is to assist those involved with the design of signs and sign structures. The chapter thus provides guidelines for the adequate and safe design of road signs and their support structures, including the fastening of the component parts together into an integrated structure able to withstand wind, impact and other loads. Since vandalism is a significant problem, it has also been an objective to provide measures to safeguard signs from vandalism.

2 It has been a particular objective to include the widest possible coverage of the various materials which may be chosen to manufacture the components such as the back plates, fasteners supports, and foundations, and to identify their advantages and disadvantages. This approach, coupled with various methods of design, should enable the best solution to be found for a particular problem.

3 Although coverage of the chapter is extensive, to the extent that some materials and methods used in other countries are included, there will always be a place for the purpose designed sign structure to suit specific requirements or environments.

15.1.4 The Component Parts of a Sign Structure

1 A road sign structure consists of the following parts:

(a) the SIGNFACE;

(b) the BACK PLATE or SIGN BOARD;

(c) the SIGN SUPPORTS;

(d) the SUPPORT FOUNDATIONS;

(e) the FASTENINGS or MOUNTING BRACKETS.

(continued on page 15.1.8)

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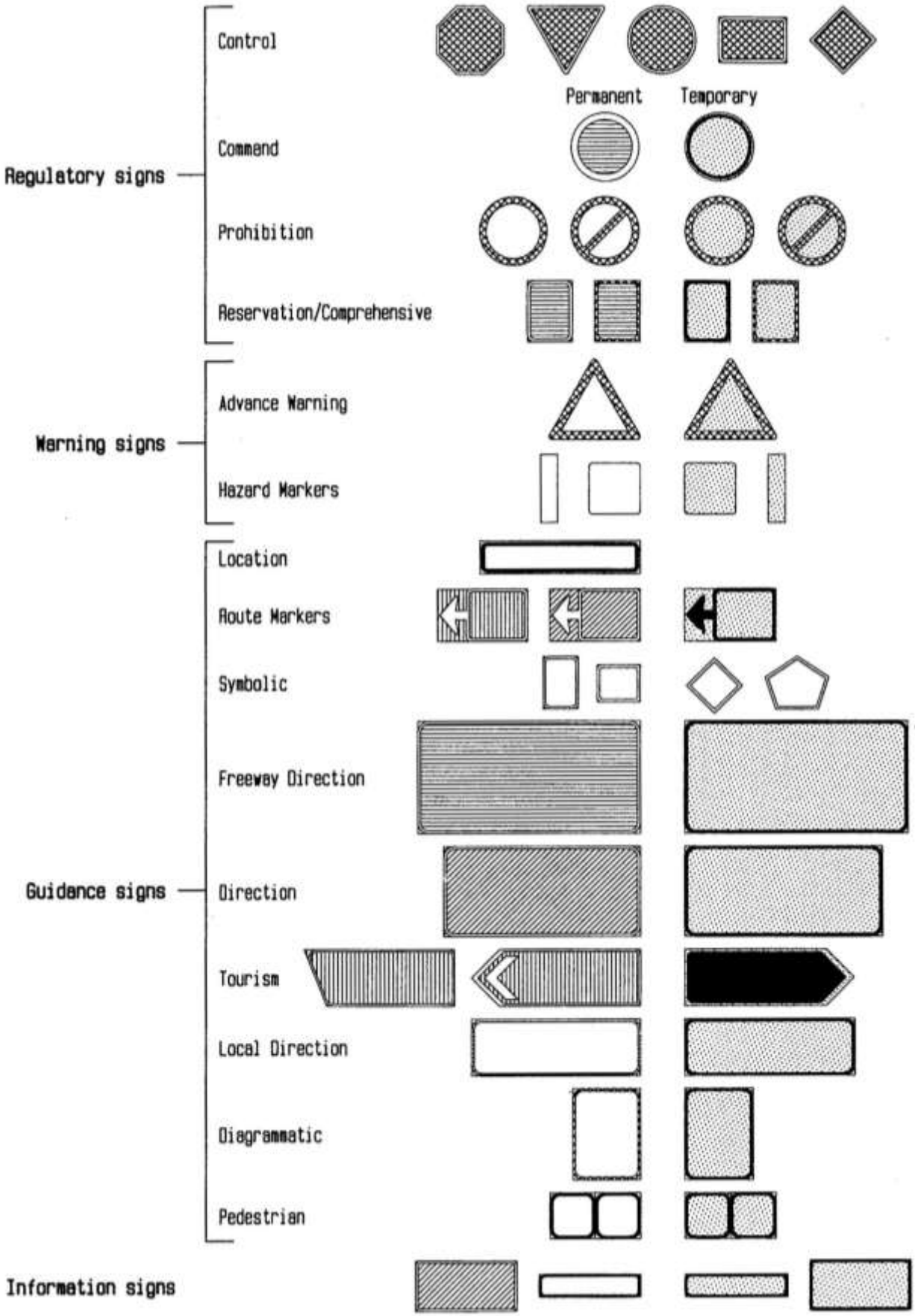
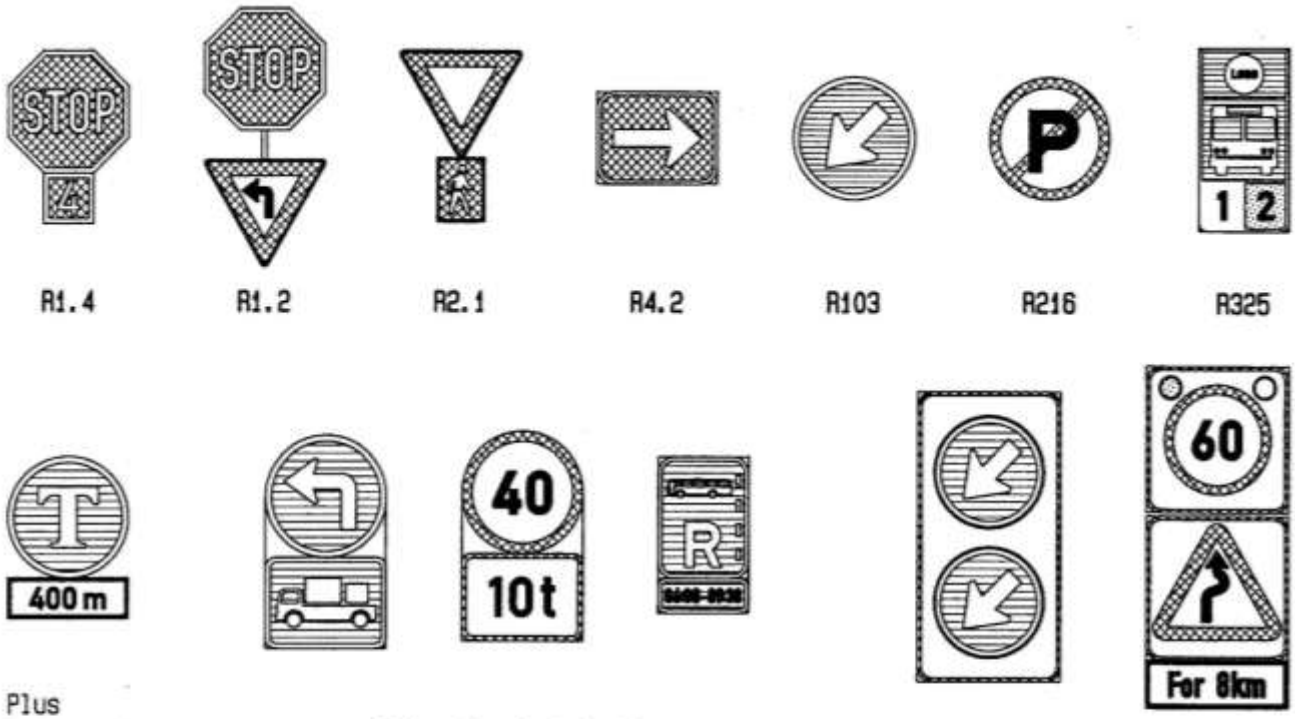


Fig 15.1 **Road Sign Shape, Size and Colour Classification**



R1.4 R1.2 R2.1 R4.2 R103 R216 R325

Plus Information | Selective Restriction | High Visibility

Detail 15.3.1 Regulatory Signs - Typical (and not so Typical)

W318 TW409 W409 Plus Information High Visibility

Detail 15.2.2 Warning Signs

Trailblazer | Route Marker | Tourist Route Marker | Pedestrian

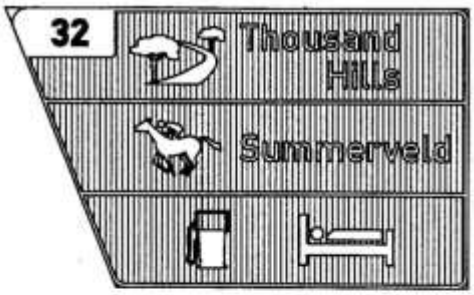
Detail 15.2.3 Guidance - Small Format - Signs

NB Examples have been chosen to demonstrate range of shapes and sizes

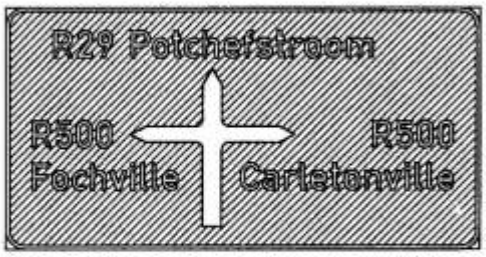
Fig 15.2 Typical Road Sign Types - 1

Typical Direction Sign

Diagrammatic Signs

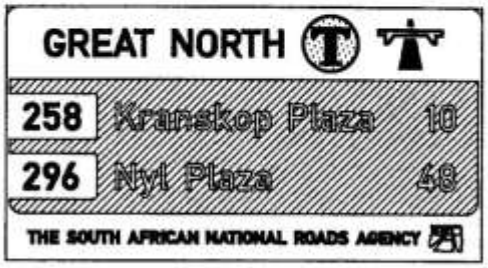


Large Tourism Sign



Large Direction Sign

Local Direction Sign



Toll Route Sign

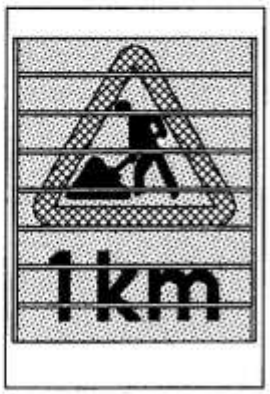
Ground Mounted Signs

Overhead Signs

Two Overhead Freeway Direction Signs Mounted Side-by-Side

Detail 15.3.1 Guidance Signs - Typical Medium to Large Format Signs

Slide Alternative



Rotating Plank

LED or Fibre Optic

Detail 15.3.2 Variable Message Signs

Fig 15.3 Typical Road Sign Types - 2

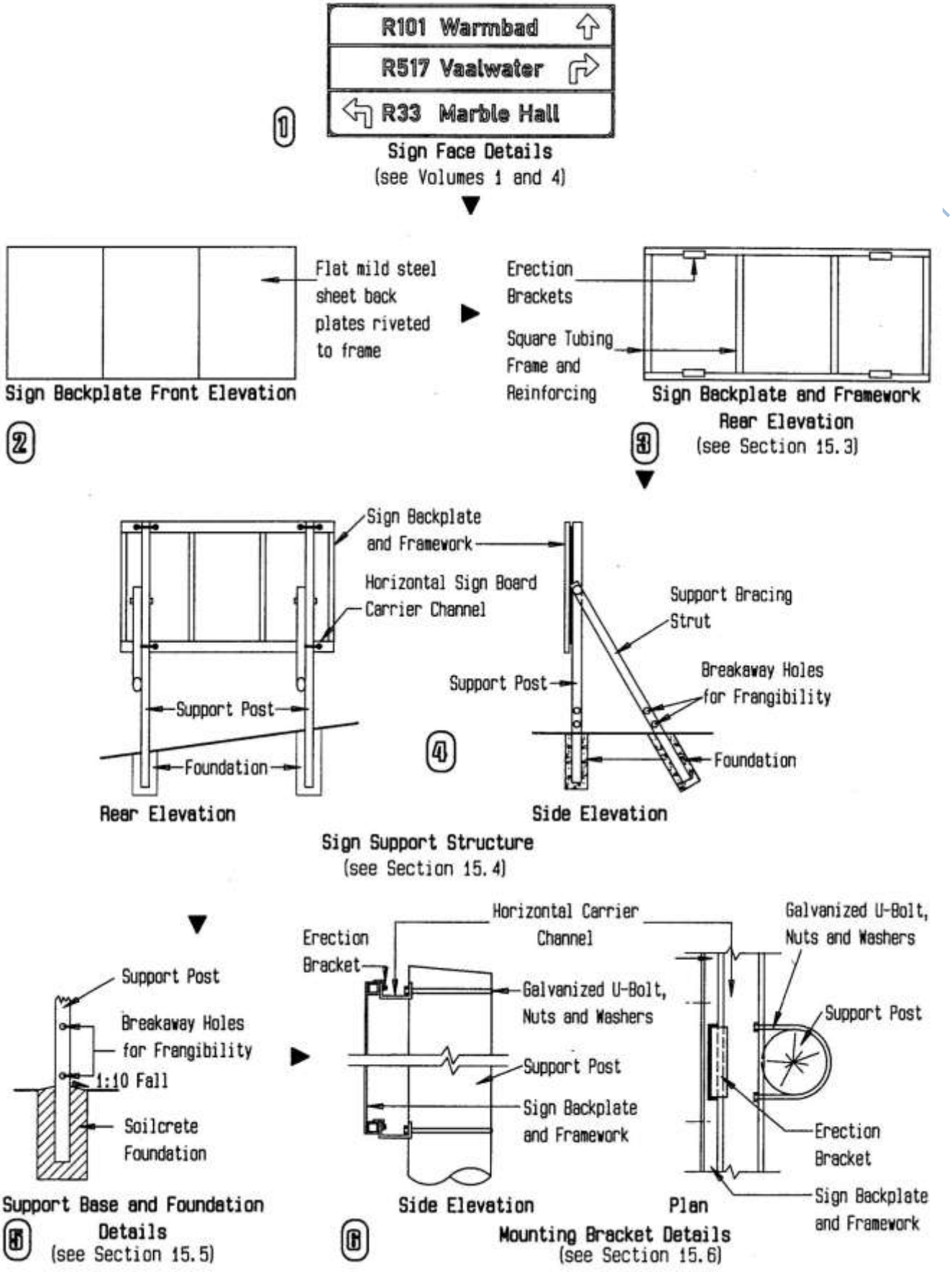


Fig 15.4 **Key to Ground Mounted Sign Component Parts**

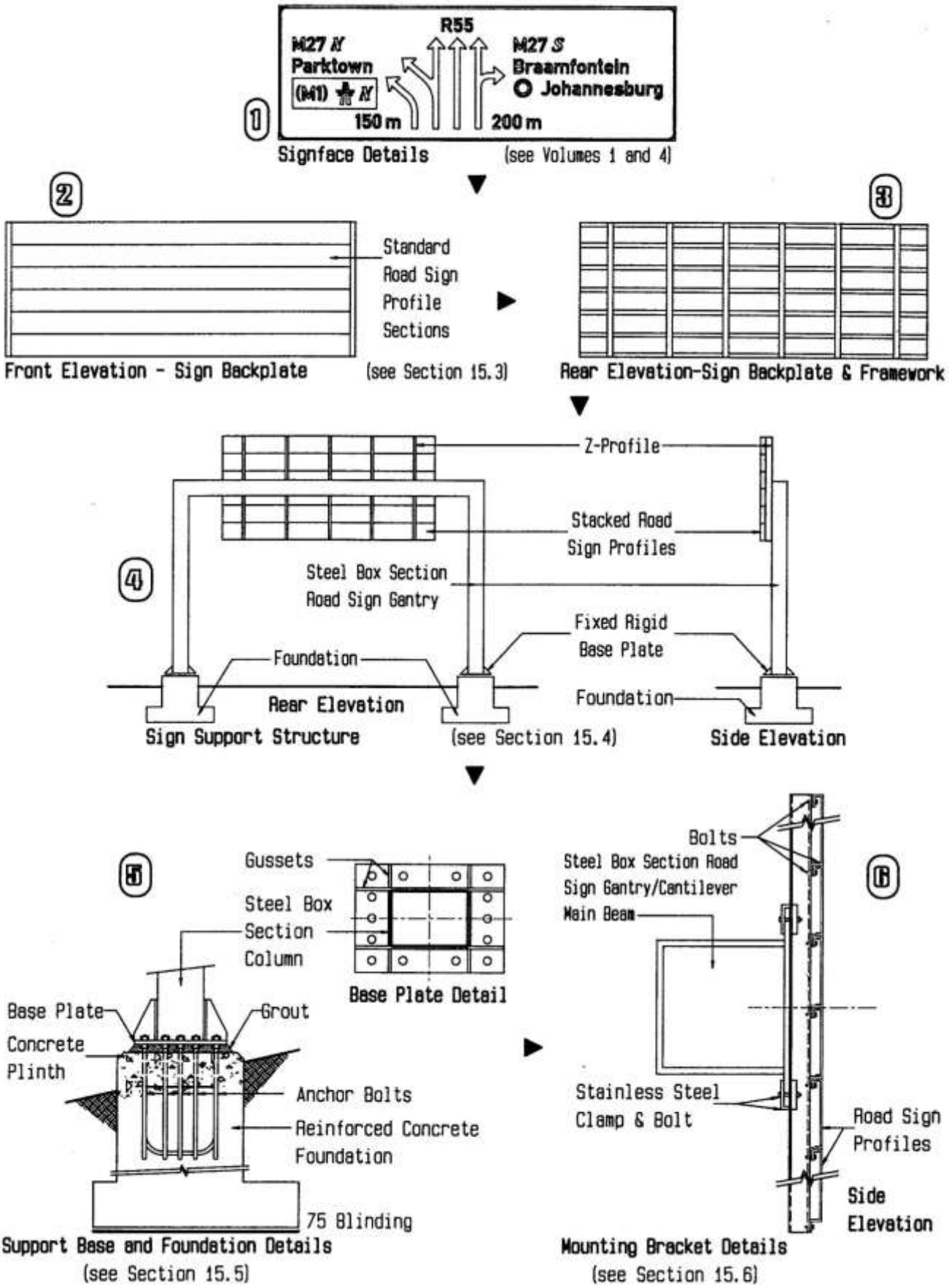


Fig 15.5 **Key to Overhead Sign Component Parts**

(continued from page 15.1.2)

2 The SIGNFACE is the front face of the sign board and contains the message the sign has been provided to communicate to drivers. In effect the Signface consists of everything such as arrows, border, symbols, route numbers and destination names applied to the BACK PLATE, either by painting, or by sticking retroreflective and/or semi-matt materials to it. The principles and design criteria for Signface design are covered in depth in Volumes 1 and 4, and will not be dealt with in this chapter. The Signface design determines the shape, size and height of the overall sign.

3 The BACK PLATE or Sign Board is the board, made up of sheets or panels of timber-board, steel, aluminium or in certain instances fibreglass or plastic that the Signface detail is applied to. The Back Plate's shape, size and height above ground level determines the wind loading, which in turn determines the layout of the parts from which the Back Plate is manufactured, including framing and reinforcing to resist the wind load and any resultant distortion moments or vibration. The Back Plate's mass or dead load, including the framing and reinforcing, together with the anticipated wind loading, determines the number, size, type and length of supports necessary to hold the sign in place, and whether these supports need to be further braced or not.

4 SIGN SUPPORTS for ground mounted signs are vertical poles/structures consisting of single, multiple, braced, compound, timber, steel or concrete poles. The poles may have a circular cross section, or D-section, I-section or ladder section. Sign Supports for ground mounted signs erected close to the travelled way without protective guardrails, should be frangible i.e. of yielding or breakaway construction in order to reduce the degree of vehicle damage and the risk of injury to occupants during impact. The Sign Support's size, type, length and horizontal clearance from the edge of the road determines its frangibility, whether created by means of drilled breakaway holes (timber), slip base, frangible or hinged joints (designed into a structure), or by small diameter thin-walled mild steel pipe that will bend on impact. The size, type, number and base frangibility detail of supports in conjunction with the size, mass and height of the sign board above ground level, determines the FOUNDATION treatment for the supports. A critical issue in the structural design of ground mounted signs is the type of support to be used.

5 The SIGN SUPPORTS for overhead signs will normally comprise a structure fabricated from rolled or welded steel and will consist of columns and a beam. Existing street furniture, bridges or structural walls can also be host Sign Support systems. The heavier rigid support structures used for overhead signs should be protected from impact by continuous or strategically placed sections of guardrail.

6 The FOUNDATION of a sign support system can vary from simply the existing soil bearing capacity to a large reinforced concrete footing. Installation of the sign supports can be accomplished by driving them into the soil, by placing the pole in a concrete footing, or by placing a sleeve, base plate stirrup, or hold-down bolts in a concrete or reinforced concrete Foundation. The size depth and reinforcement design of a Foundation is determined by the soil type and the size, type, number and base detail of the supports. The bigger the sign and its support structure, the more complex/specialised the Foundation design i.e. the Foundations for cantilevered or portal structures for overhead signs require to be of a significant size and have extensive reinforcing.

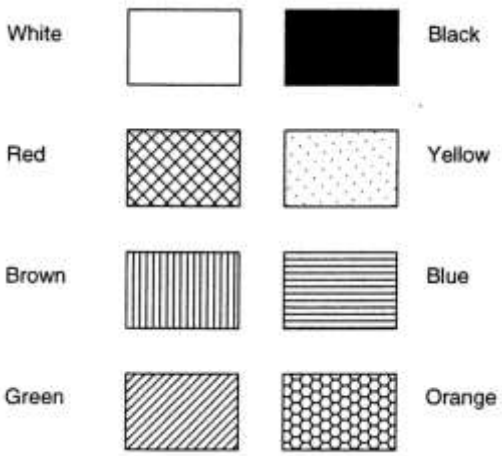
7 FASTENINGS or Mounting Brackets are the hardware (nuts, bolts, straps and brackets) used for connecting the sign board to the supports. The type, number and positioning of the Fasteners depends on the sign board frame and reinforcing used in its design and on the size and type of supports used. Certain types of Back Plate design will involve the use of specific types of Fastening in the assembly of the Back Plate itself. Fastenings can be stainless steel straps, mild steel U-clamps or aluminium special purpose brackets. There are many types of bracket on the market for different mounting methods. Some of these are custom designed for particular types of sign board manufacture and may require special tools in their application.

8 The component parts of ground mounted and overhead signs are shown in Figures 15.4 and 15.5. The different component parts of the sign structure, with the exception of the Signface, are covered in detail in subsequent sections. The structural design process is illustrated in a flow chart form in Figure 15.6.

15.1.15 Road Traffic Sign Colour Indication

1 The chapters of Volume 2 of the South African Road Traffic Signs Manual (SARTSM) are not prepared in colour. Relevant examples used to illustrate appropriate signs, signals and markings are shaded in a black and white coding which is illustrated below.

2 The basic principles of the road traffic sign colour coding system are shown, in colour, in the SADC-RTSM Volume 1, Chapter 1, Section 1.4, and in the Contents sections of relevant Volume 1 and 4 Chapters.



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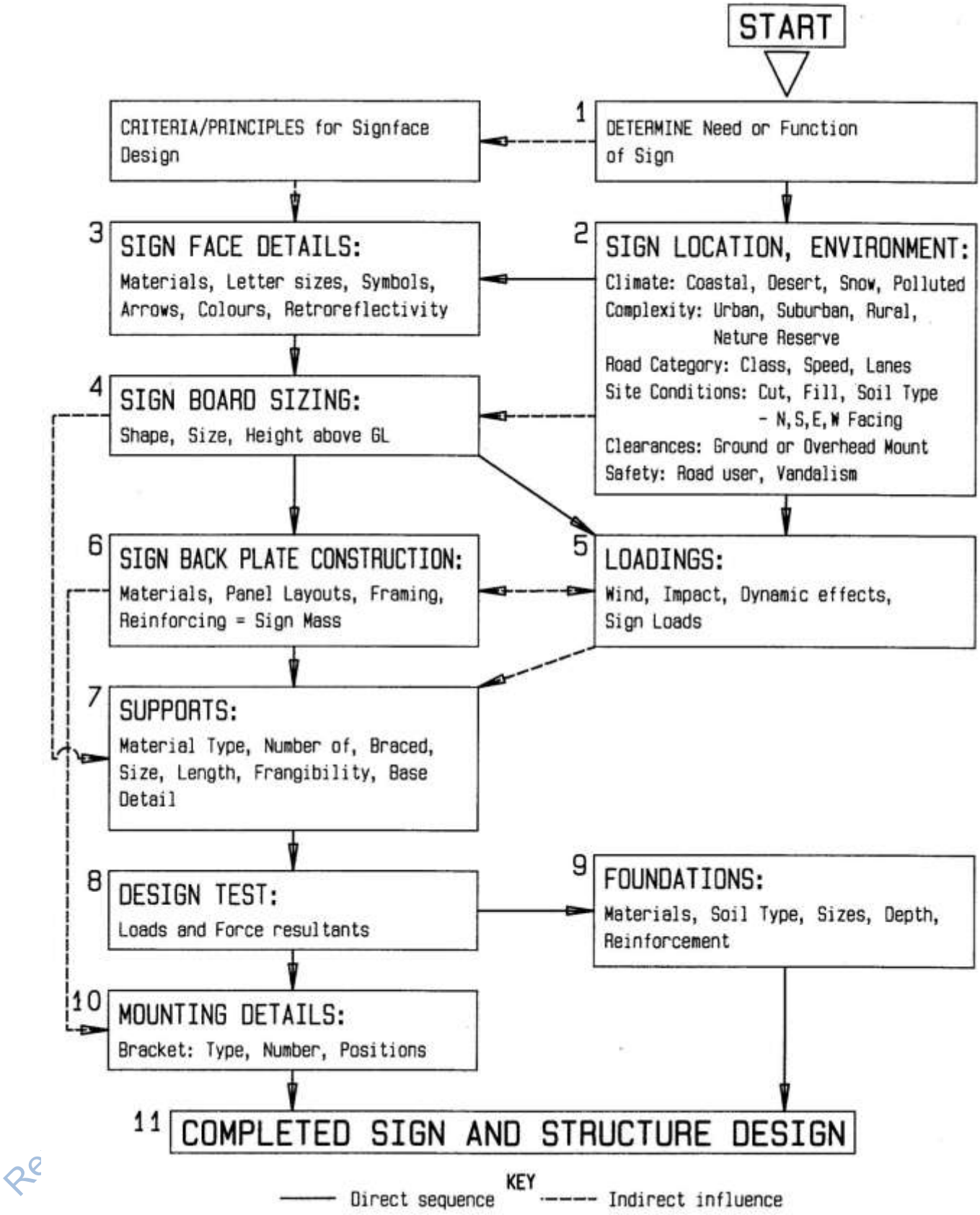

Fig 15.6 Flowchart Indicating the Structural Design Process for Road Signs

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15.2 SIGN LOCATION ENVIRONMENT

15.2.1 General

1 The Sign Location Environment, or immediate surroundings and approach to the sign, has a direct influence on the design of the sign and of its support structure. The most relevant environmental conditions are:

(a) climatic/weather conditions;

(b) complexity of the surroundings and approach;

(c) road factors;

(d) roadside conditions;

(e) clearances;

(f) safety considerations.

15.2.2 Climatic or Atmospheric Conditions

1 The choice of sign structure components should be influenced by climatic conditions because of the possible corrosive action, above average wind loads, sand-blasting, snow/ice loads and excessive temperature extremes and ranges associated with prevailing or worst-case weather in various areas or regions. In this context the component materials making up signs should be compatible so that deterioration or failure owing to electrolytic action and/or differential thermal expansion does not occur. Component materials must also be manufactured to such quality and dimensional tolerances, and be correctly treated so that they perform as required under specific climatic and atmospheric conditions.

2 Certain climatic or atmospheric conditions have a direct effect on the strength of the sign structural components, for example:

(a) wind loads in coastal, desert or semi-desert and mountain areas;

(b) ice or snow loads, mainly in very cold mountain areas.

3 The strength of the sign structure i.e. the size of the elements, their profiles and types of material, should thus be designed to suit the specific climatic or atmospheric effects in addition to allowing for the sign structure's own total mass, or dead load (as well as potential impact loads, if required).

4 Other climatic or atmospheric conditions which can have a more indirect effect on the treatment required and expected life of the sign structural components, and on design details of specific sign installations include:

(a) abrasive or sand-blasting effect in desert or semi-desert areas;

(b) corrosion, rust or rotting caused by standing water, dampness or salt fog/spray;

(c) cracking, blistering, wrinkling, flaking or fading brought about by excessive temperatures and by changes in temperature, mainly in desert and semi-desert areas;

(d) scratching, rotting and pestilences occurring in dense areas of vegetation in sub-tropical and Mediterranean areas;

(e) dry season veld fires;

(f) corrosion, rusting or rotting effects which occur as a result of air, soil and water pollution in aggressively and chemically polluted areas.

5 It is therefore important to allow for such climatic and/or atmospheric effects when choosing sign structure components. For example the following choices may reduce or eliminate the described effects:

(a) aluminium will perform better in coastal or polluted areas but care should be taken not to mix aluminium and steel in direct contact situations;

(b) steel is better suited to a desert area than timber;

(c) plastics or fibreglass can withstand corrosion, rot and rust and are therefore suited to wet areas, however, plastic materials which are to be faced with retroreflective sheeting have to be carefully chosen to avoid the effects of the release of chemicals and oils used in the plastic manufacturing process; plastics are also desirable for safety reasons for temporary signs used at roadworks sites, where lateral clearances are likely to be at a minimum and impacts may occur frequently; under the latter conditions plastic materials are available which can "recover" after a number of impacts which can have cost benefits in roadworks situations;

(d) timber is commonly used, but treatment is important for the resistance to rot and termites, however, such treatment may have a detrimental effect if the sign is subjected to fire.

6 Specific types of prevailing weather conditions, such as fog or mist, which result in significantly reduced visibility, can warrant the installation of variable message signs (see Chapter 19).

TABLE 15.1 CLIMATIC OR ATMOSPHERIC CONDITIONS TABLE 15.1

Environment	Condition	Effects on Sign
Coastal	Salty/wet/windy	Corrosion, rust, wind load
Desert or semi-desert	Hot/cold – dry/windy	Temperature differences, wind speed/load, dust/sand blast (incl. signface)
Mountain	Cold/wet	Snow/ice in winter, low temps, rust, wind
Sub-tropical/ Mediterranean	Wet/high humidity	Corrosion, rot, rust, vegetation growth
Pollution	Chemical in air/soil/water	Corrosion, discolouration (signface)

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15.2.3 Road Environment Complexity in Sign Vicinity

1 Road signs are normally provided according to specific requirements of road class hierarchy. The classes of roads joining or crossing one another, and whether such junctions lie in urban, peri-urban or rural areas, affect the number, size, type and specific location of signs to be provided at the junctions, or on the approaches to the junctions. These factors also have an effect on the choice of sign structure design.

2 Table 15.2 and Figure 15.7 indicate typical descriptions of urban, peri-urban and rural areas in relation to road class, and type of environment, in terms of various relevant factors. Table 15.3 also identifies these descriptions for certain special areas which can be considered as being essentially tourist areas.

3 This attention to the environment in which signs are to be placed is intended to create an awareness that even the materials used in sign structures can be made environmentally suitable. In a nature conservation area, for example, it is appropriate to choose natural materials that might not normally be specified i.e. timber for the back plate and the sign supports. Similarly the choice of materials for the component parts of signs in an urban area should recognise the risk of vandalism and accidental damage, and should cater for minimising the effects of these risks.

15.2.4 Road Factors

1 As mentioned in Subsection 15.2.3 the road classes of roads joining or crossing each other influences the choice of type, number and location of signs at such junctions. This is because different levels of class of intersecting road require different levels of signing, i.e. there is a road signing hierarchy. The road classes and their relationship with different environments are shown in Figure 15.7.

2 The geometric layout of a junction may also have an influence on the choice of type, number and location of signs and, therefore, on the choice of sign structure component. Factors which may affect such choices are sight distances, and lateral and vertical clearances to the sign supports and back plate. Road geometry may range from intersecting dual carriageway roads down to intersecting single, 2-lane 2-way, roadways. Between these limits are a wide selection of roadway and lane configurations, and in some instances the junction may include one or more turning roadways or slip roads. Junction control may by STOP sign R1, YIELD sign R2 or by traffic signals.

3 The road class, geometric layout, number of lanes, slip roads, together with the traffic density and speed, determines whether the sign installation should be a ground mounted structure or an overhead structure, or whether variable message signs or some other special application is necessary. For example it is a standard warrant that if there are three or more lanes overhead signs are required. This requirement almost automatically means that traffic volumes are high, however, if very high volumes exist on a two lane road it may still be advisable to install overhead signs. The presence of multiple lanes and higher speeds will also dictate the positioning of signs, in order that sufficient time exists for drivers to read the sign, and then to react and change lanes as necessary to carry out their required action, and this in turn will influence sign sizes and mounting requirements and thereby, the structured design of the signs. Figure 15.6 illustrates the relationship between the road factors and other factors, in the sign structure design process.

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TABLE 15.2 VICINITY COMPLEXITY TABLE 15.2

Vicinity	Space Problems	Traffic Volumes	Average Speeds (km/h)	Lanes	Advertising	Vandalism	Pedestrian Volumes
Urban	High	High	40-60	3-7	High	Medium	High
Suburban	Medium	Medium	60-80	2-5	Medium	High	Medium
Peri-urban	Low	Low-Medium	80-100	2-3	Low-Medium	Medium	Medium
Rural	Nil	Low	80-120	2-3	Low	Low	Low
Nature Conservation	Nil	Low	40-60	2	Nil	Low	Low

TABLE 15.3	ROAD ENVIRONMENT IDENTIFICATION			TABLE 15.3
Items	Urban	Peri-Urban	Rural	Special Area
Environment Description	Built up areas: CBD areas, Suburbs, residential or commercial stands	On fingers of built up areas:Small holdings, Industrual plots, Nature reserves, Recreation places	Open areas: Farms, Small Towns / Communities	Open areas: Natural, Conservation, Rest Camps, Service areas, Tourist areas
Boundaries	Within Municipal Boundaries	On fringes of Municipal Boundaries or just outside them	Outside Municipal Boundaries	Specific to the special area
Route / Road Identification	Road/Street Names (M-Route Numbers)	Road / Street Names Route Numbers	Route Numbers (N, R or T)	Route Numbers (T)
Junction Identification	Road/Street Names I/C Numbers (freeways)	Road / Street Names I/C Numbers (freeways)	I/C Numbers (freeways) Farm Names + Junction Numbers	Route Markers
Access Spacing (in general Access Spacing increase with Mobility increase)	Decreased spacing due to direct access for smaller stands	Limited access due to larger plots	Greater spacing because of intermittent farm accesses	Intermittent
Mobility: Decrease	Due to traffic volumes, accesses	Due to development	Due to changing Road surfaces & standards	Due to animals or road surfaces, Due to better road surfaces and fenced off
Increase	Due to provision of more lanes + limited access	Due to provision of more lanes + limited access	Due to better Road surfaces & standards	
Average Speeds on Roads	60-80	80-100	100-120	Less than 60
Traffic Volumes	High	Medium	Low	Low
Pedestrian Volumes	High	Medium	Low	Very low
Traffic Control	Mostly Traffic Lights Traffic Officers	Stop signs or traffic Lights	Stop sign mostly	Stop signs
Advertising signs	Too many	Many	Few	No
Street Lights	Yes	Possible	No	No
Space Problems for signing	Many	Better	Few	Nil
Road Classification for Signing	Urban	Urban or Rural	Rural	Tourist Routes

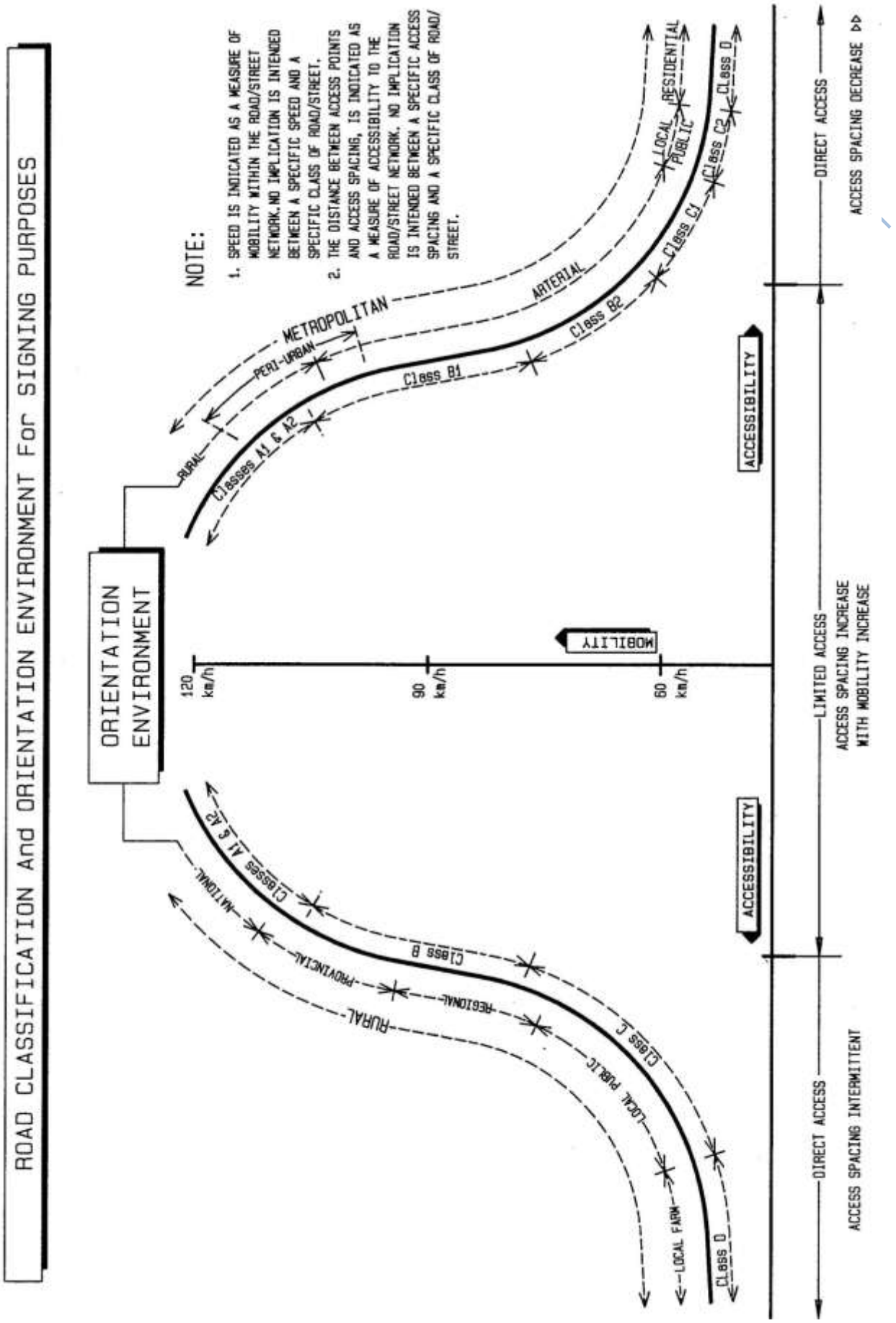

Fig 15.7 Road Classification and Orientation Environment for Signing Purposes

15.2.5 Road Side Conditions

1 Road Side Conditions influence sign structure design, particularly aspects of the design of the support poles and their foundation. Typical road side circumstances that will have an influence on the selection and design of supports and foundations include:

(a) cut or fill earthworks;

(b) marshy ground or other problematic soil types;

(c) other adjacent fixed structures which may cause the sign to have a special mounting or support design;

(d) a pedestrian sidewalk.

2 When a road sign has to be positioned on a section of road that is in either cut or fill earthworks the support pole lengths will be unequal to the extent that one support may be considerably longer than normal and one considerably shorter. Under such circumstances consideration may be given to locating the sign in a position which reduces the effects of the side slope, within limits covered in the following relevant chapters - Chapter 5: *Freeway Signing,* Chapter 6 : *Toll Route Signing,* Chapter 9 : *Urban Guidance Signing* and Chapter 10 : *Rural Signing*. When a sign is located in a cut the sign must remain clearly visible from the appropriate distance and should have a clearance to the cut slope of at least 1200 mm. This requirement may result in a need to modify the cut slope, and possibly over some distance, to effectively "skylight" the sign for approaching drivers. The need for this type of treatment should particularly be assessed when rehabilitating the signs on a section of road, and when a new sign differs significantly in length from the one that it replaces.

3 Marshy road side conditions, if they exist for any significant distance along a road, will require special foundation treatment which could be costly. However, this cost is likely to be relative since the design of the road itself is likely to need special, and costly treatment.

4 Reference is made in a number of places in the chapter to the possible need for special sign mounting requirements when another structure coincides with the desired location of a road sign. Such situations are likely to have unique features which will not lend themselves to a standardised solution. However, certain aspects are covered in Subsection 15.4.

5 Signs located over a pedestrian sidewalk have to be mounted at a safe vertical clearance of at least 2500 mm. A greater height may even be desirable to inhibit vandalism. Medium to large signs, such as direction signs will commonly need two support poles, even in an urban environment. It is recommended that these poles be located sufficiently far apart to not create an unnecessary obstruction for pedestrians, even if this sometimes requires a longer sign than is strictly necessary to carry the required message. The lateral clearance from a kerbface is also important, since a vehicle impact on a sign over a sidewalk could have serious consequences for pedestrians on the sidewalk at the time.

6 In urban areas sign positions have to be carefully coordinated with those of street lighting poles since the latter can have a detrimental effect on the legibility and readability of the sign. The solution to this problem could involve an adjustment in the vertical, lateral and/or longitudinal position of the sign, or even some special type of support arrangement if options to reposition are limited.

7 The type of soil present at the proposed sign site will affect the foundation design and possibly the number of supports required. An appropriate soil classification is given in Tables 15.5 and 15.6 and a chart in Figure 15.8. Some of the engineering problems associated with various soil types are covered in Table 15.4. A further detailed discussion on soil materials appears in Section 15.5 where the choices of foundation and anchor types are indicated.

15.2.6 Sign Positioning

1 The basic mounting positions of signs are either overhead, above or over the centre of the road lane/s, or ground mounted adjacent to and on the left of the road. Duplicate signs may also be used on the right side of the road for extra emphasis particularly on one-way roadways. See Figure 15.9 for the sign face display area distinction between the two mounting positions.

(continued on page 15.2.8)

TABLE 15.4 RESIDUAL SOILS AND POSSIBLE ENGINEERING PROBLEMS TABLE 15.4

Residual Soil Category	Common Example	Soil Texture	Problems to Anticipate
Residual acid crystaline rock	Residual Granite	Clay sand	Collapsible grain structure; high erodibility
Residual basic igneous rock	Residual diabase	Clay	Heave compressibility
Residual calcareous rock	Residual dolomite	Chert rubble	Sinkhole development; doline development
Residual argillaceous rock	Residual mudrock	Silt or siltclay	Heave; slope instability
Residual arenaceous rock	Residual sandstone	Sand	Problems not common, but collapsible grain structure may develop from highly felspathic sandstone

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TABLE 15.5	UNIFIED SOIL CLASSIFICATION SYSTEM COARSE-GRAINED SOILS	TABLE 15.5
Group Symbols	Typical Names	
ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity	
CL	Inorganic clays of low to medium plasticity, gravel clays, sandy clays, silty clays, lean clays	
OL	Organic silts and organic silty clays of low plasticity	
MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	
CH	Inorganic clays of high plasticity, fat clays	
OH	Organic clays of medium to high plasticity, organic silts	
PT	Peat and other highly organic soils	

TABLE 15.6	UNIFIED SOIL CLASSIFICATION SYSTEM FINE-GRAINED SOILS	TABLE 15.6
Group Symbols	Typical Names	
GW	Well-graded gravels, gravel-sand mixtures, little or no fines	
GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines	
GM	Silty gravels, gravel-sand-silt miztures	
GC	Clayey gravels, gravel-sand-clay mixtures	
SW	Well-graded sands, gravelly sands, little or no fines	
SP	Poorly-graded sands, gravelly sands, little or no fines	
SM	Silty sands, sand-silt mixtures	
SC	Clayey sands, sand-clay mixtures	

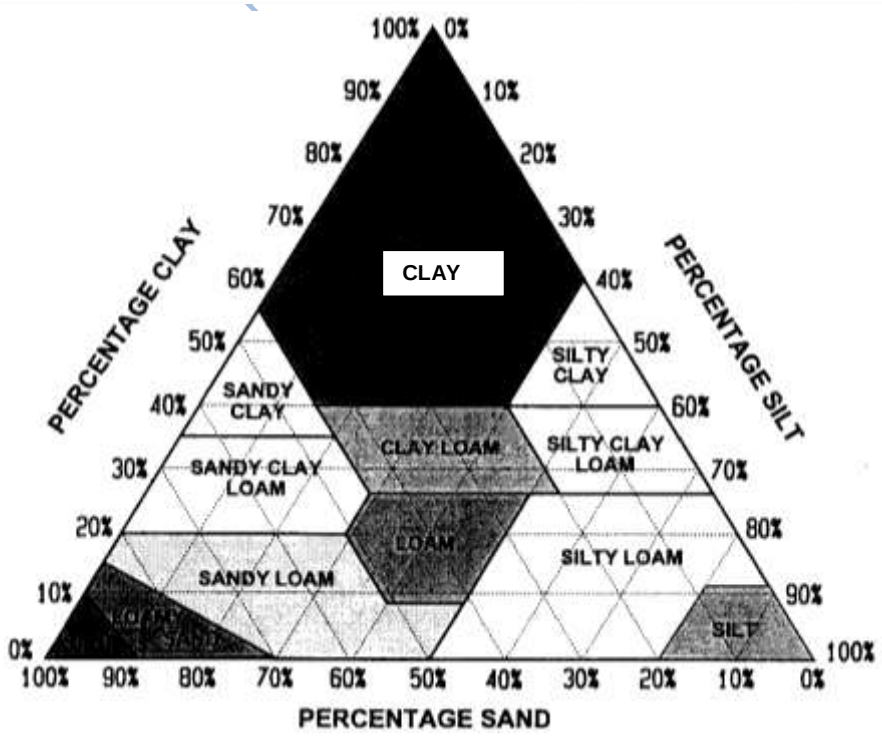

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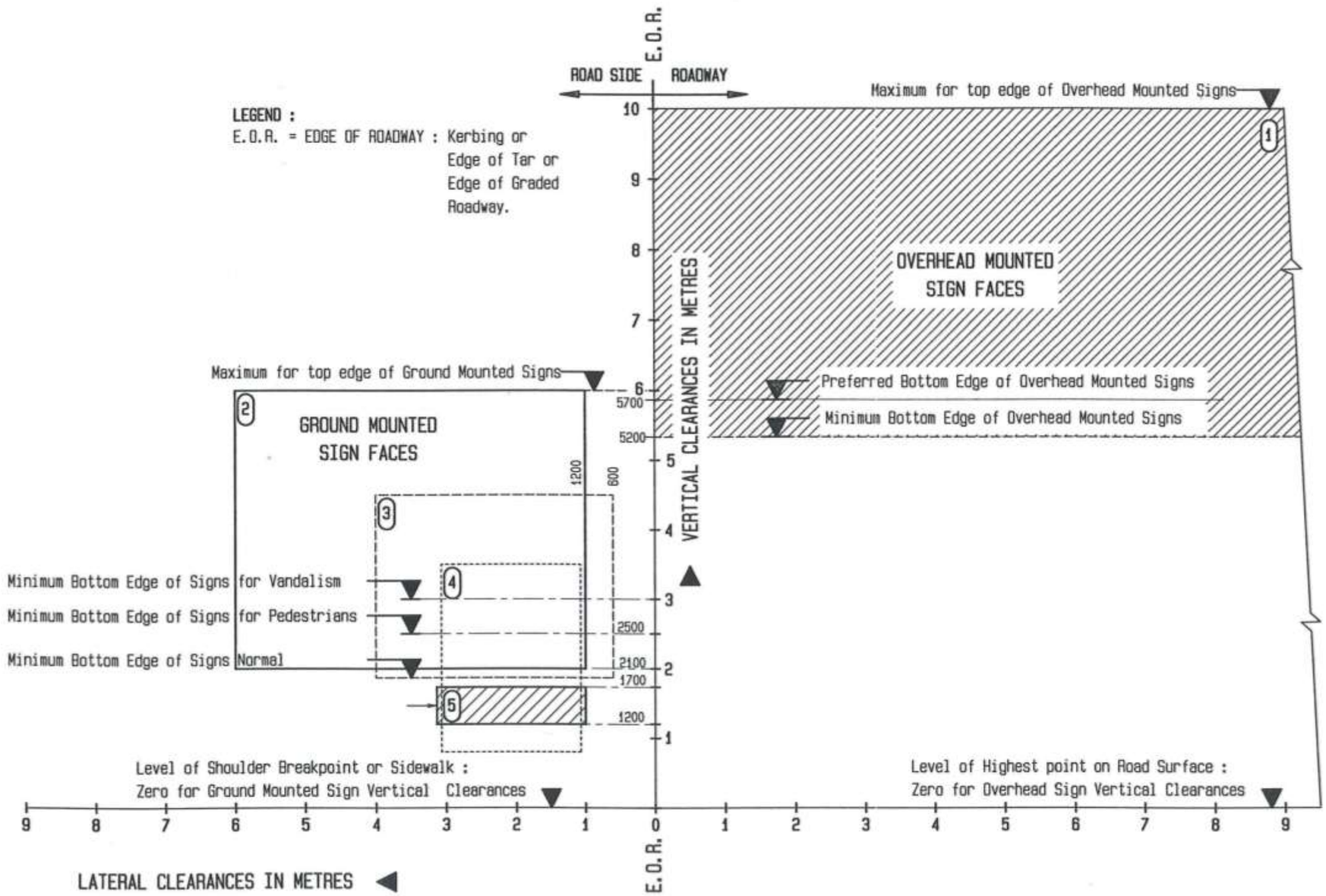
Fig 15.8 **Soil Texture Classification Chart**



NOTES:

Elevation Area in which sign types will be displayed/located:

(1) Overhead signs on Cantilevers or Gantries.

(2) Ground Mounted Direction, Tourism, Local Direction and Location signs on single or multiple supports (sign face areas > 1.5 m^2).

(3) Ground Mounted Street Name, Warning, Regulatory, Route Markers and small Information signs on single supports mostly (sign face areas <=1.5 m^2).

(4) Ground Mounted Diagrammatic, Chevron, Countdown and Gore signs on single or multiple supports (sign face areas <=4.5 m^2).

(5) The total height of smaller signs should preferably not be in this hatched parameter area due to danger of contact with car windscreens on impact, subject to support failure mechanism.

Fig.15.9
Elevation Signface Display Area

(continued from page 15.2.5)

All signs displayed within the elevation area parameters on the left hand side of the Edge of Road (EOR) line will be taken as ground mounted. All signs displayed above a road within the elevation area parameters on the right hand side of the Edge of Road line will be taken as overhead mounted signs.

2 Figure 15.9 also indicates four sign face display areas where four different sign groups may appear according to their sizes and approximate vertical and lateral clearance positions. The sign types appearing in each sign face display area are the following:

(a) overhead mounted signs in display area 1;

(b) larger, sign face areas > 1,5 m^2, ground mounted direction, tourism, local direction and location signs in display area 2;

(c) smaller, sign face areas <= 1,5 m^2, ground mounted street name, warning, regulatory, route marker and information sign types in display area 3; and

(d) specialised, sign face areas <= 4,5 m^2, ground mounted diagrammatic, chevron, countdown and gore sign types in display area 4.

3 The position of all road sign structures are normally specified in terms of three parameters, namely:

(a) longitudinally in relation to the roadway alignment;

(b) laterally in relation to the road cross-section;

(c) vertically in relation to different height levels i.e. shoulder breakpoint/sidewalk surface for ground mounted signs and highest point on road surface for overhead mounted signs.

4 According to their function road signs are located longitudinally, either at the point to which the sign refers, or in advance of the point to which they refer, with longitudinal distances between signs appropriate to the speed on the road.

5 As a general rule a road sign should be visible from a distance in metres numerically equal to the operating speed of the road in kilometres per hour.

6 If some longitudinal obstruction exists which impairs sight distance to a sign, or the location of the sign itself, the tendency should always be to move the sign further from the junction rather than closer to it (see Figure 15.10). Particular care must be taken when erecting advance direction signs to avoid confusion with minor junctions or driveways.

7 Guidance signs located at a junction should, where possible, be positioned so that turning traffic passes in front of the sign rather than behind it, particularly if the approach is subject to control by a STOP or YIELD sign or traffic signals.

8 Details of sign distances and longitudinal positioning of signs are also given in Figures 15.13 to 15.17.

9 Signs are located laterally according to their functions /types, at clearances appropriate to the following road cross-sectional types:

(a) roads with kerbing or guardrails;

(b) surfaced roads with surfaced shoulders (no kerbing or guardrails);

(c) surfaced roads with gravel shoulders (no kerbing or guardrails);

(d) gravel roads (no kerbing or guardrails).

10 The minimum lateral clearance is related to the function and size of the sign and whether the sign support post/s is/are frangible or not. In general signs in the smaller warning or regulatory group are located nearest to the edge of the road, while signs in the larger guidance group, having heavier and larger support posts, are positioned a bit further away from the edge of the road. The edge of the road could be one of the following: the kerb, the edge of tar or the edge of a graded roadway where there is no kerbing. The rigid, heavy, non frangible support posts for overhead cantilever or gantry signs are positioned at a much greater lateral clearance than both the ground mounted signs groups mentioned above. See Figures 15.11 to 15.19.

11 Any rigid or heavy sign support structure (i.e. those support posts with no frangibility treatment) that is laterally located closer to the roadway than the minimum allowed for the road cross-sectional type should be safeguarded by guardrails because sign supports may represent significant hazards to road users.

12 Signs and their supports should also be positioned so as not to obstruct sidewalks and consideration must be given to modifying the side slope to permit effective reading of a sign if it is located in a cut which may obscure the sign.

13 It is not recommended that signs be placed significantly further from the edge of road or shoulder than indicated in the figures because this will reduce sign conspicuity and therefore driver's chances of seeing the signs.

14 Details of minimum lateral offsets are given in Figure 15.11, and lateral clearances specific to sign types in Figures 15.12 to 15.17.

15 Vertically signs are located according to their functions/types as overhead mounted or ground mounted. For overhead mounted signs the minimum and maximum vertical heights are measured from the highest point on the roadway and for ground mounted signs from either the shoulder breakpoint or sidewalk level. While there is a recommended height for the top edge of ground mounted signs the minimum clearances to the bottom edge of these signs will be appropriate to one of the following circumstances:

(a) a normal minimum clearance above shoulder break point;

(b) a minimum clearance above the sidewalk to allow for pedestrians;

(c) a minimum clearance to safeguard the sign against vandalism.

16 Research has shown that there is a risk, when a single support carrying a small sign like a regulatory or warning sign at a total sign height of between 1600 mm to 2000 mm is impacted by a motor car, that the sign may be flung forward by the collapse of the support through the vehicle windscreen. This risk is greatest for signs mounted on frangible steel supports.

(continued on page 15.2.11)

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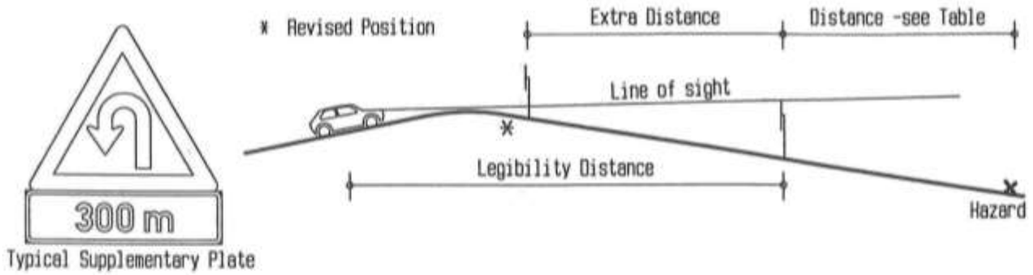
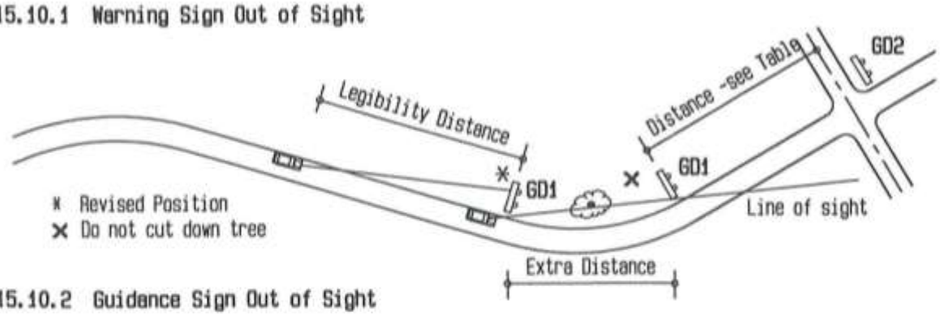
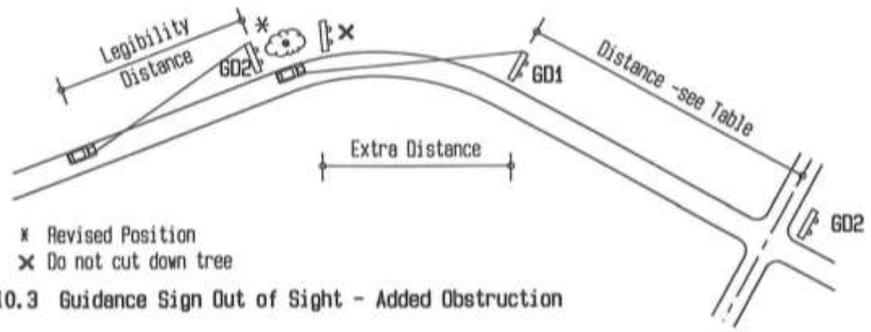


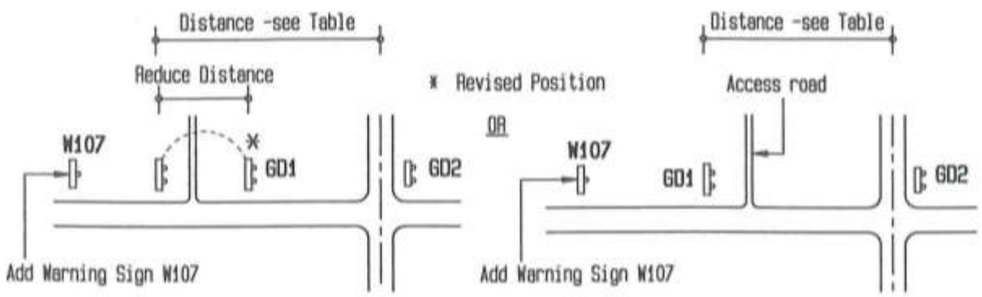
Detail 15.10.1 Warning Sign Out of Sight



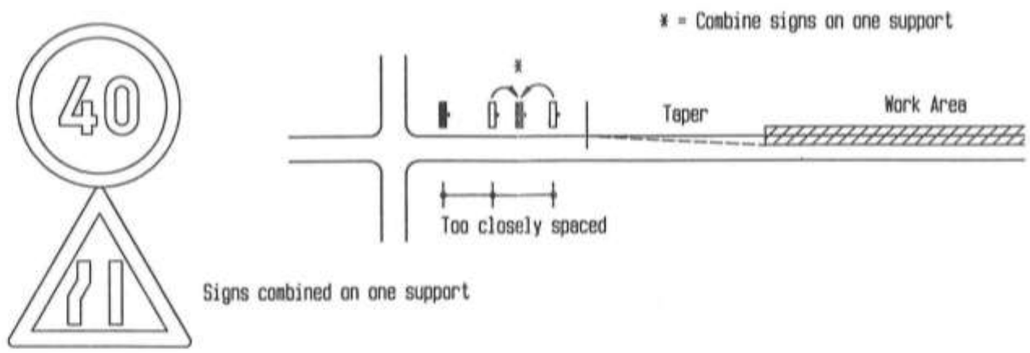
Detail 15.10.2 Guidance Sign Out of Sight



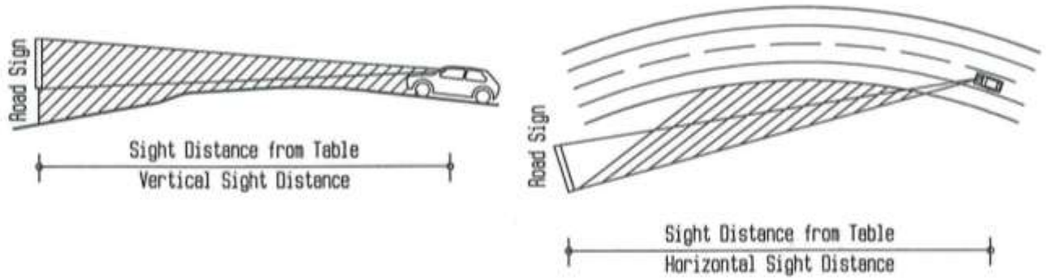
Detail 15.10.3 Guidance Sign Out of Sight - Added Obstruction



Detail 15.10.4 Closely Spaced Junctions



Detail 15.10.5 Insufficient Longitudinal Space for Several Signs



Detail 15.10.6 Clear Line of Sight to Larger Guidance Signs

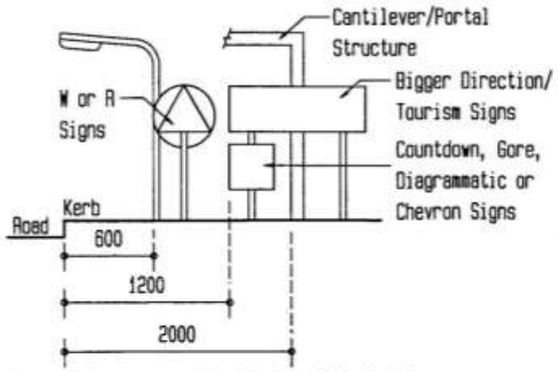
CLEAR SIGHT DISTANCE REQUIREMENTS	
Letter Size (mm)	Sight Distance (m)
490	380
420	340
350	300
280	260
210	220
140	180
112	160

NOTES:

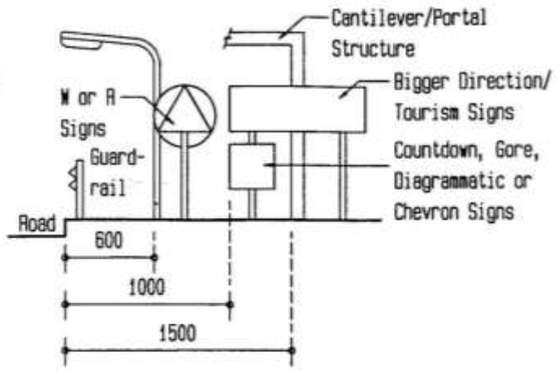
1 As an alternative to respositioning signs the shaded area may be clered of obstructions.

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.

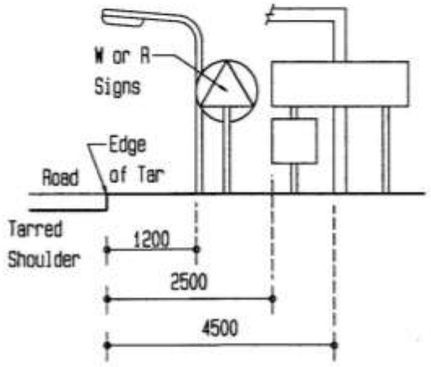
Fig 15.10
Typical Problems and Aspects of Longitudinal Positioning of Road Signs



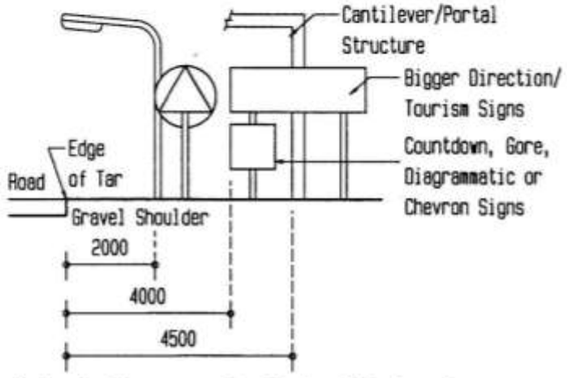
Lateral Clearances for Roads with Kerbing



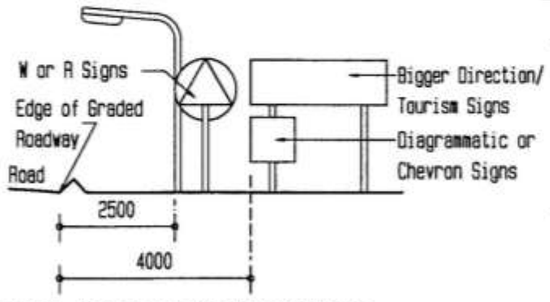
Lateral Clearances for Roads with Guardrails



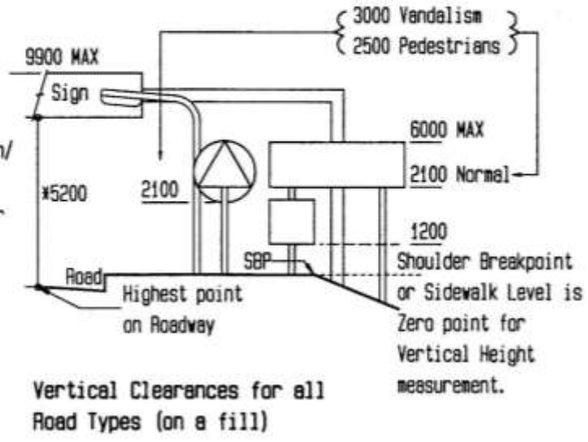
Lateral Clearances for Roads with Tarred Shoulders Only



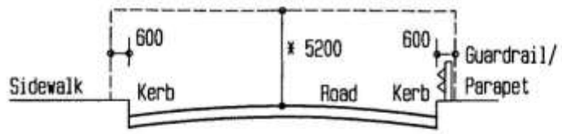
Lateral Clearances for Roads with Gravel Shoulders Only



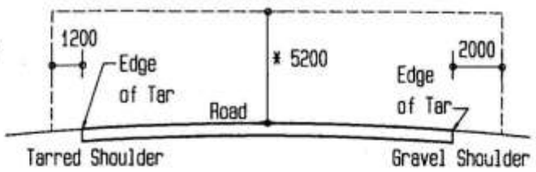
Lateral Clearances for Gravel Roads



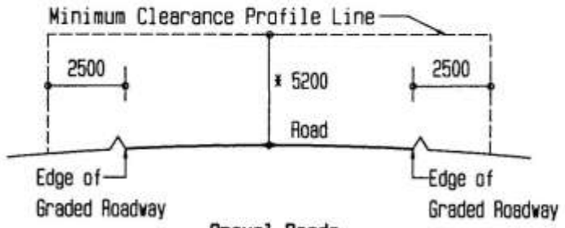
Vertical Clearances for all Road Types (on a fill)



Surfaced Roads with Kerbing/Guardrails

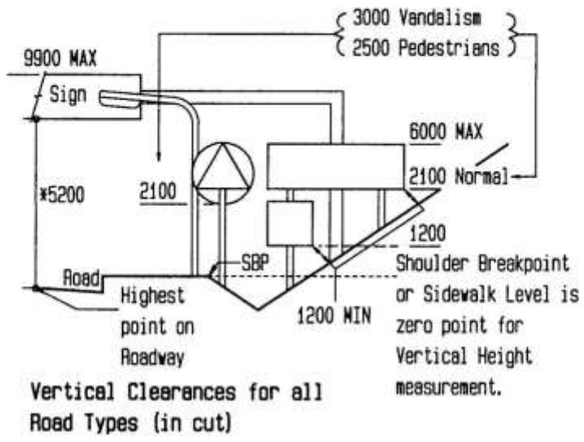


Surfaced Roads with No Kerbing/Guardrails



Gravel Roads

Detail 15.11.2: Minimum Clearance Diagrams for Different Road Types



Vertical Clearances for all Road Types (in cut)

NOTES :

1. * Height measured from highest point on Roadway.
2. Minimum Clearance Profile line is the absolute minimum and no structure/tree/ cable whatsoever should infringe there upon.
3. Note that the minimum lateral clearances for larger signs or structures are preferred bigger than the minimum clearance profile line shown in Detail 2.
4. Refer to SARTSM for more details on longitudinal positioning and clearances.
5. Minimum lateral clearances indicated are also applicable to medians in dual carriageway situations
6. Note that the lateral clearances are always measured from the edge of the sign and not from the support except for overhead sign structures.

Detail 15.11.1 : Minimum Lateral and Vertical Clearances for Different Sign Types

Fig 15.11
Minimum Clearances for Different Road and Sign Types

(continued from page 15.2.8)

17 Signs which are mounted very low are liable to become easily obscured and will collect dirt as well as being susceptible to damage in the event of veld fires and roadside maintenance work. However, some signs need to be mounted lower, see Figure 15.13 and 15.14, to be effective e.g. hazard markers.

18 Signs which are mounted very high, including overhead signs, are difficult to see at night, particularly if headlamps are dipped due to oncoming traffic.

19 Details of minimum vertical clearances are given in Figure 15.11, and vertical clearances specific to sign types in Figures 15.12 to 15.16.

20 When existing signs are modified by adding panels the sign edges of the modifications should not encroach into the minimum clearances.

21 The clearances for variable message signs must adhere to the minima of the specific sign types and their mounting position, as if they were normal signs.

22 Further details on sign positioning are covered in Volume 1, Chapter 1: *General Principles,* and various other chapters in Volume 2 of the SARTSM.

15.2.7 Safety Considerations

1 Safety considerations related to sign structures are basically those that involve:

(a) the sign structure loadings i.e., the effect that wind, ice, live and impact loads, in excess of the structure's own dead load or total mass, have on the structure's ability to withstand these and still be of service to the motorist;

(b) the sign and structure's ability to withstand vandalism and still be serviceable to the motorist (discussed in more detail in Subsection 15.2.8).

2 Sign support structures should be designed to resist vibration in wind, which may result in failure due to fatigue of the material. A wind load illustration is given in Figure 15.19 indicating distortion moment lines compared with the collision performance of a sign structure. The wind load deflects the back plate reinforcing profiles, and causes the moment lines. If the distances of two posts is optimised, both the negative and positive moments are equal (this is true if the distance from the outer edge of frame is 1/5 of L and the distance between the posts is 3/5 of L). If these moments are equal, the tensions are minimized.

3 Wind load = W, shall be the load produced by pressure of wind on the signs and the support structures corresponding to an appropriate wind speed for the area. Wind pressure shall be calculated from the relationship,

Pm = 0,0000473 (Cg Vm)2 x Cs x Ch kPa

where Pm = wind pressure in kilopascal

Vm = wind speed in kilometres per hour (km/h) (50 year mean recurrence interval)

Cg = wind gust factor = 1,3

Cs = shape coefficient for structural member (Table 15.7)

Ch = height coefficient for height above ground level measured to the centroid of the loaded area

kPa = kilopascal

4 Wind pressure will usually be calculated for the 5 m -10 m level. For site conditions elevated considerably above the surrounding terrain, where the influence of ground surface friction on the wind is reduced, consideration should be given to using height coefficients for higher levels. See SANS 10160:2010 Tables 16 and 17 for detail of force coefficients regarding walls and hoardings, and Table 15.7 for wind load coefficients hereafter.

5 In the absence of detailed information on wind speeds, the minimum wind design loads shall be taken as:

(a) for ground mounted signs at least 0,75 kPa or 0,75 kN/m^2 (75 kg/m^2) because their total height is generally less than 6 m;

(b) for overhead mounted signs at least 1,25 kPa or 1,25 kN/m^2 (125 kg/m^2) with a total height less than 10 m (1,5 kPa or 1,5 kN/m^2 preferred for South African conditions in general).

6 Sign and sign structures should also be proportioned to avoid resonance at critical wind speeds by limiting their vertical deflection. This will generally be accomplished by using the value $d^2/122$ (in metres) as a limit for dead load deflection where "d" is the sign depth in metres. Additional to this dead load camber a permanent camber equal to L/1000 should be provided for sign bridges/portals, butterfly and cantilever structures, where L is the distance from the support post.

7 The dead load = D, shall consist of the total mass (self-weight) of the sign and supporting structure, including appurtenances/fittings or attachments.

8 A live load = L, should be allowed for walkways and will be a single load of 230 kg distributed over 600 mm transversely applied to walkways, and located so as to produce maximum stress in the supporting parts of the structure.

9 The collision or vehicle impact load that a structure must cater for should be a 100 kN static load acting in any direction on any one column at a height of 1,2 m above ground level. In order to be deemed acceptable, posts should thus comply with the following requirements:

(a) the post should sustain a moment of 1,05 R (i.e. 1,05 x the theoretical moment of resistance) at its critical section (usually the connection to the base plate or the frangible joint) with

(i) failure at the joint, or

(ii) deflection at the point of application of the load exceeding 0,05h, where h is the height of the point of application above the plane of the bottom of the base plate.

10 When the wind load and collision load act simultaneously on the support 25% over-stresses are accepted.

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TABLE 15.7 WIND LOAD COEFFICIENTS TABLE 15.7

Type of Member	Shape of Coefficient (C_s)		Height Coefficient (C_h)	
	Shape of Member			
	Flat or Angular	Cylindrical	Height above ground level	C_h
Single member or truss	1,69	1,08	0-5 m	0,8
Two members or trusses, one in front of the other	2,86	1,86	5-10 m	1,0
Three trusses forming a triangular cross section	2,60	1,73	10-15 m	1,1
			15-30 m	1,25
Sign panel (by ratio of width to depth)			30-90 m	1,5
1:1	1,12			
2:1	1,19			
5:1	1,20			
10:1	1,23			
15:1	1,30			

11 The allowable stresses for various materials shall be in accordance with SABS or BSS specifications. Members subject to combined stress due to bending, axial compression and torque shall be designed so that the quantity

$fa/Fa + fb/Fb + (fs)^2/(Fs)^2$, shall not exceed unity,

where
- fa = average compression stress
- Fa = allowable compressive stress for concentrically loaded member determined for maximum slenderess ratio
- fb = maximum compressive stress due to bending
- Fb = allowable compressive bending stress for member with no axial load
- fs = maximum torsional shear stress
- Fs = allowable shear stress = 0,33 Fy
- Fy = guaranteed yield strength.

12 Figure 15.19 indicates the different design loads as to where they are acting or required on a sign structure.

13 There are certain aspects of the crashworthiness of sign structures that may help to maintain continued performance after being damaged, but which will minimise collision damage to vehicles and possible loss of life. The measures to increase crashworthiness or safeguard the sign structure may be any of, or a combination of, the following features:

(a) lateral and vertical clearance increases;

(b) the use of various frangible base, breakaway, methods for the supports;

(c) the use of deformable support materials;

(d) the provision of kerbing and guardrails.

14 The lateral clearances for positioning sign structures increase with an increase in sign back plate size which dictates an increase in support sizes. Thus signs that are smaller, < 1,5 m^2, will often be mounted on bendable or breakable single supports nearest to the edge of the road. Signs that are larger, > 1,5 m^2, are normally mounted on heavier multiple, frangible base, supports about double the lateral distances of smaller signs from the edge of the road, while the rigid and heavy upright supports for overhead signs are placed at about double the lateral distance for signs > 1,5 m^2, from the edge of the road.

15 The provision of kerbing and/or guardrails protects sign structures to a degree that allows the structures to be located roughly half the normal lateral clearance nearer to the edge of the road. The minimum lateral clearances are indicated in Figure 15.11.

16 Sign supports erected close to the travelled roadway without guardrails, should be of a yielding or breakaway construction in order to reduce vehicle damage and injury to occupants in the event of vehicles colliding with the supports. The basic concept of a breakaway sign support is that of a structure which possesses sufficient moment of resistance to withstand wind loads, yet offers low shear resistance at the base to a colliding vehicle. In the event of a collision the structure should yield or break away. Failure should occur in such a way that:

(a) serious secondary collision of the sign or support with the vehicle is avoided;

(b) energy absorbed from the impacting vehicle is kept to a minimum (a maximum reduction of 17 km/h in the speed of the impacting vehicle is considered acceptable), and damage to the vehicle is low.

17 The treatment of supports with various frangible base methods basically has two breakaway results namely:

(a) allowing the vehicle to pass over the sign and structure;

(b) allowing the vehicle to pass under the sign.

These results are indicated in Figure 15.18.

18 A breakaway resulting in the vehicle passing over the sign and structure is mostly applicable to the smaller sign types, < 4,5 m^2,

(continued on page 5.2.17)

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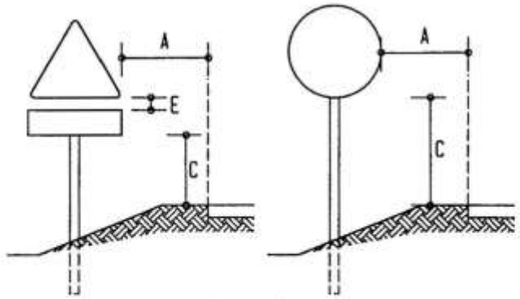
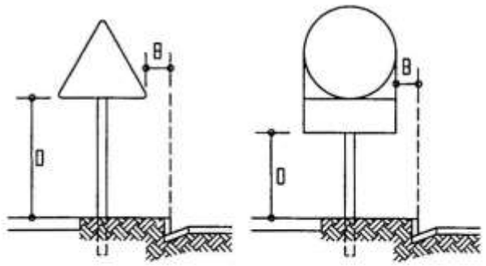
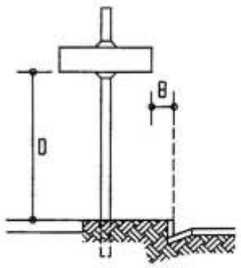


Shoulder (no kerb)

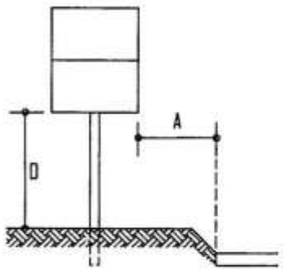


with Kerb and Sidewalk

Detail 15.12.1 Regulatory and Warning Signs

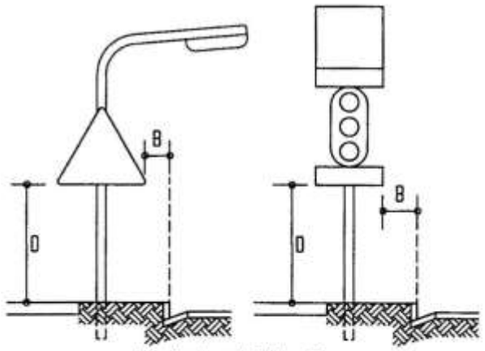


with Kerb and Sidewalk



Shoulder (no kerb)

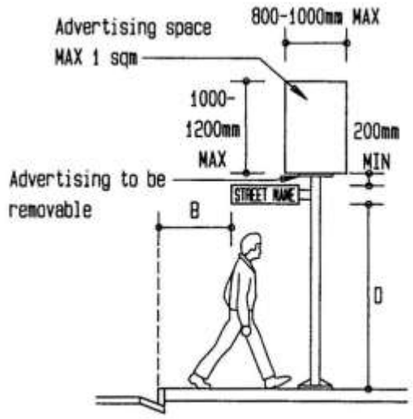
Detail 15.12.2 Location and Route Marker Signs



with Kerb and Sidewalk

Detail 15.12.3 Small Signs on Host Supports

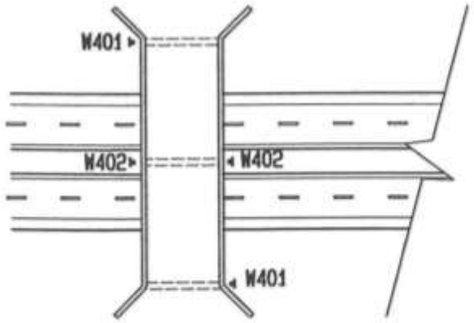
TABLE PERMANENT SIGN PLACEMENT DIMENSIONS			
Dimension	Minimum (mm)	Preferred (mm)	Maximum (mm)
A	1200	1500	2000
B	500	750	-
C	600	2100	2500
D	2100	2500	3000
E	0	0	200



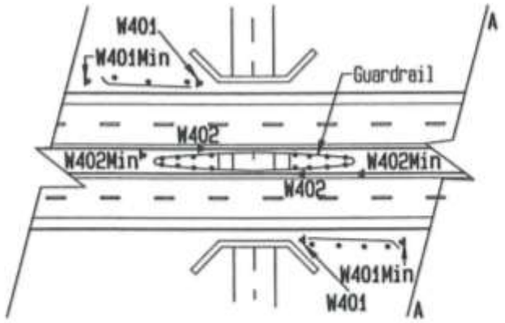
Detail 15.12.4 Advertising with STREET NAME

Fig 15.12 Lateral and Vertical Clearances for Small Single Support Signs

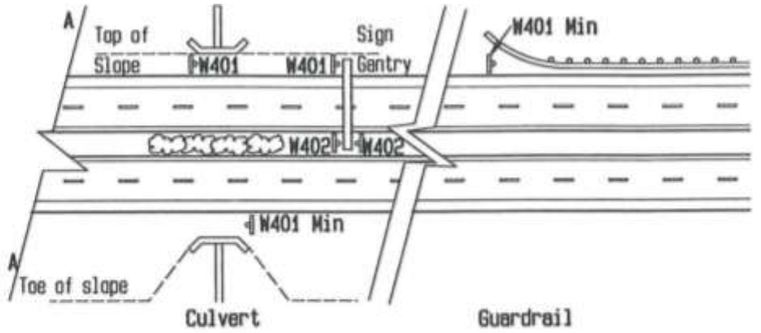
...ers Authorization No. 11542 dated 7th July 2011

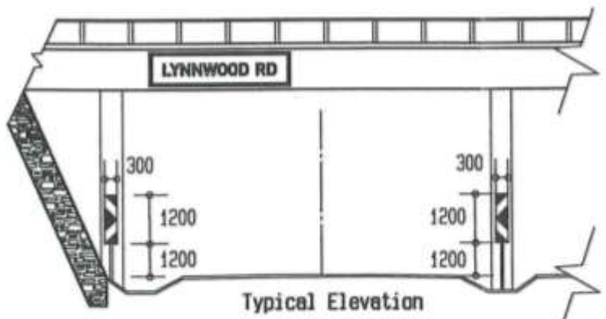


Overpass or Gantry

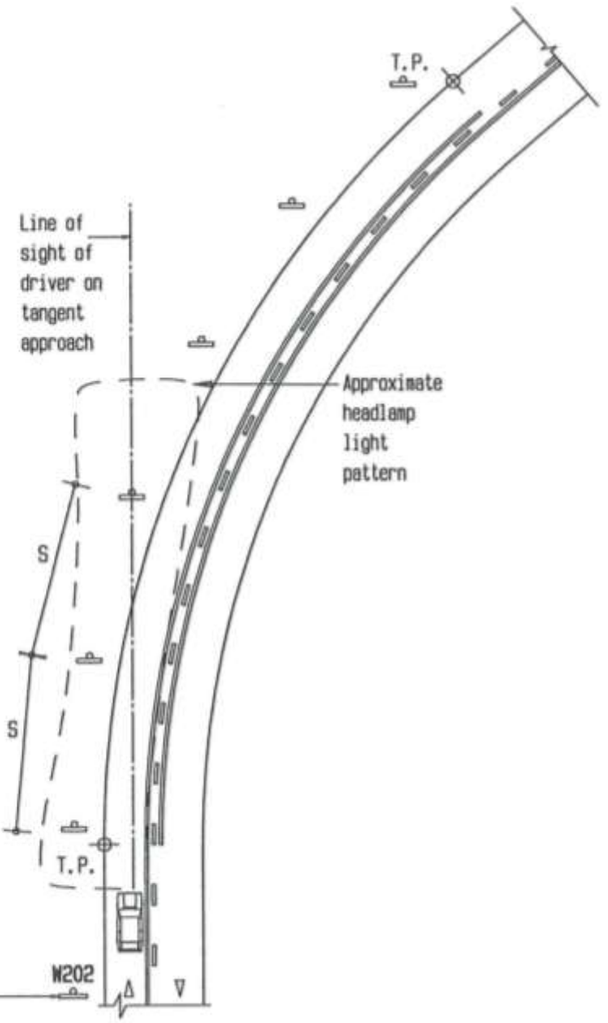


Underpass

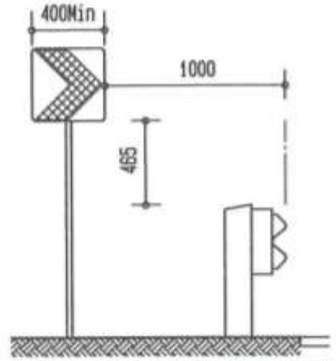




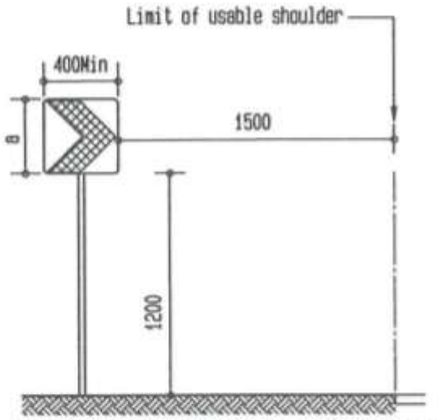
Detail 15.13.1 Typical Use of Hazard Markers at Roadside Structures



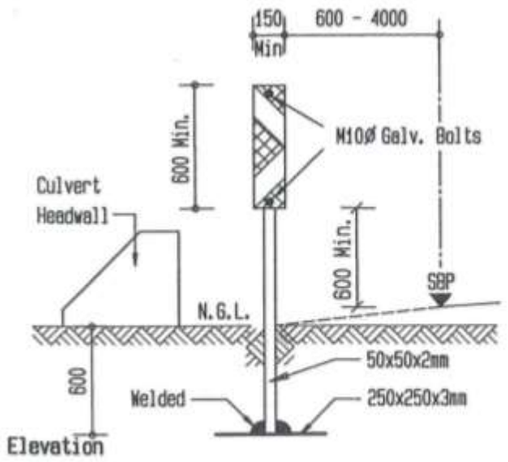
Detail 15.13.3
Sharp Curve Chevron Specing based on Tangent approach



Detail 15.13.4 W405 Sharp Curve Chevron With Guardrail

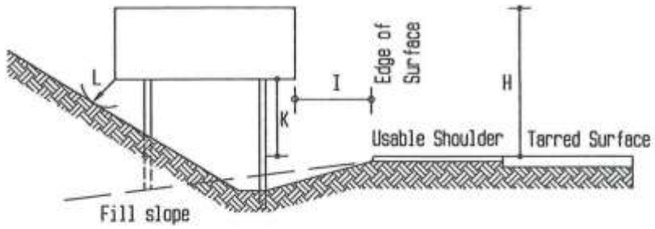


Detail 15.13.5 W405 Sharp Curve Chevron Without Guardrail

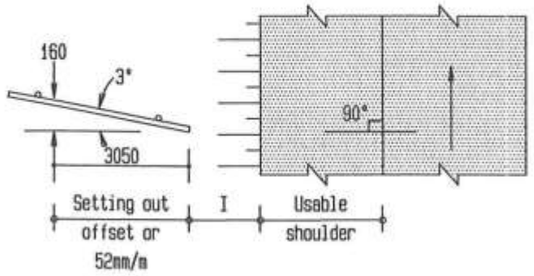


Detail 15.13.2 Typical Installation-Minimum Size W401/W402

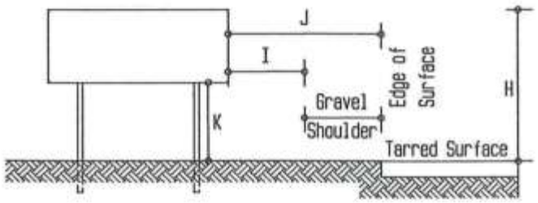
Fig 15.13
Positioning of Hazard Markers



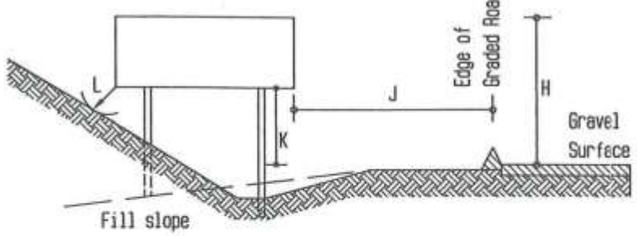
Beyond a Usable Shoulder



Sign Offset to Avoid Specular Reflection



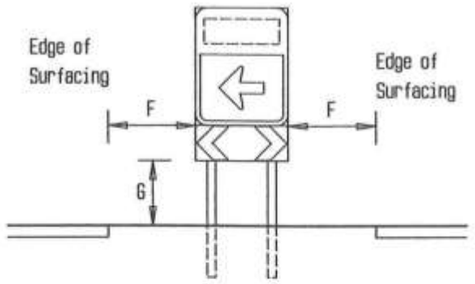
Ground Mounted Direction Signs - Class A and Class B Roads



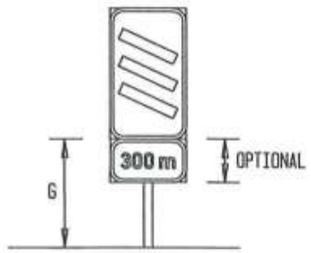
Ground Mounted Direction Sign - Class C Roads

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	-	-

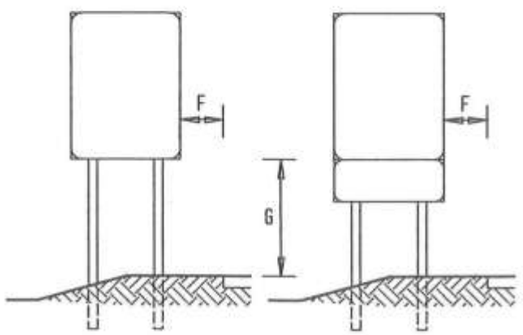
Detail 15.14.4 Direction Signs



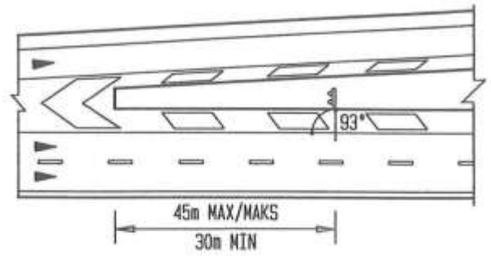
Detail 15.14.2 Gore Sign

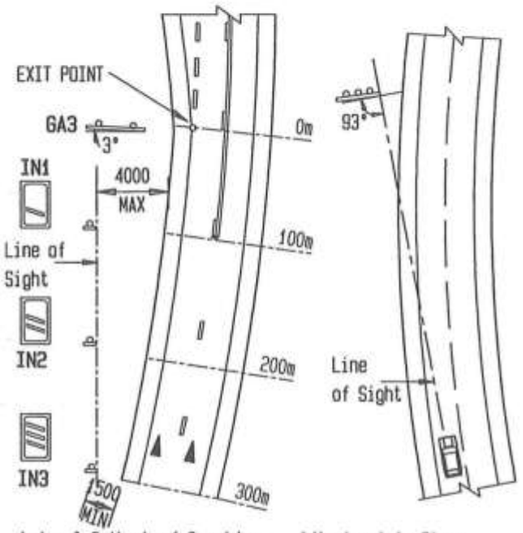


Detail 15.14.3 Countdown Signs



Detail 15.14.4 Diagrammatic Sign





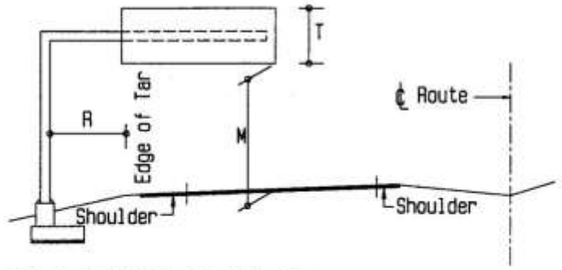
Lateral Setback of Countdown Signs to Avoid Obscuring of Exit Sign - GA3

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

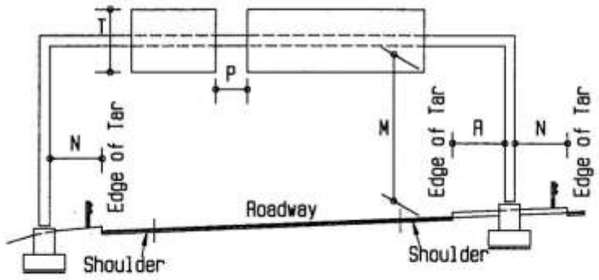
(Details 15.14.1 to 15.14.3)

Fig 15.14
Lateral and Vertical Clearances for Larger Multiple Support Signs

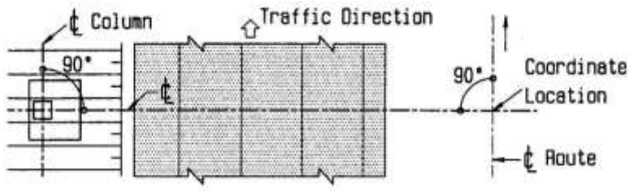


Detail 15.15.1 Typical Cantilever

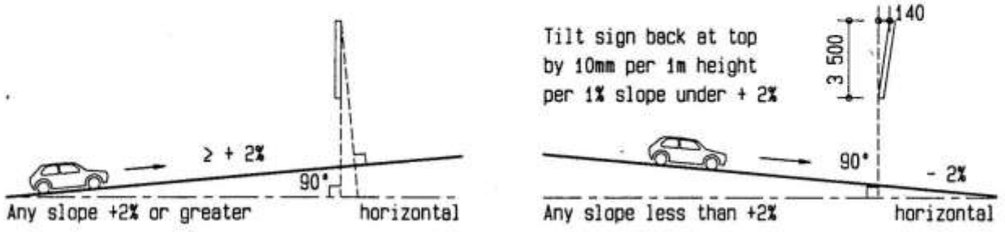
PERMANENT SIGN PLACEMENT DIMENSIONS			
Dimension	Minimum (mm)	Preferred (mm)	Maximum (mm)
M	5200	5700	6200
N	1500	2000	-
P	50	1000	-
R	4000	4500	-
T	1800	-	4200



Detail 15.15.2 Typical Gantry



Detail 15.15.3 Overhead Sign Positioning



Detail 15.15.4 Adjustment of Signface to Avoid Specular Reflection

Fig 15.14 Lateral and Vertical Clearances for Overhead Sign Structures

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(continued from page 5.2.12)

mounted on single supports. These supports should either be:

(a) of a diameter < 76 mm and, if a steel tube type, of wall thickness less than 3 mm allowing for a fracture or bending breakaway; or

(b) a larger diameter, deformable tube type support with a split base socket allowing for initial yield by bending followed by a split and release of the base socket.

Both these methods are used all over the world because of minimum damage to vehicles and easy repair or replacement of a damaged sign.

19 Breakaways resulting in the vehicle passing under the sign are applicable to the larger sign types > 1,5 m^2, mostly mounted on multiple supports. Because of the width of larger signs, and the multiple supports, vehicles mostly crash through only one of the supports, passing under the sign, and leaving the sign intact for service to other motorists. There are basically three breakaway methods which can result in vehicles passing under the sign namely:

(a) fracture at breakaway holes drilled in timber or steel tube type supports at their bases;

(b) fracture at welded-on base plates where small diameter, thin walled tube, ladder type supports shear at the welded on base plate;

(c) fracture at inclined or horizontal slip bases, allowing for the sign to either be forced upwards and over the vehicle, if it is a smaller single support sign, or for the support to hinge just below the sign to allow the vehicle to pass under it, for larger signs; Figure 15.18 illustrates these breakaway actions.

20 Because there is no breakaway allowance for the heavier and rigid upright supports of cantilever or gantry structures for overhead mounting of signs these supports should be located at least 4 m - 4.5 m from the edge of the road if no kerbing or guardrails are provided. These support structures are a hazard to vehicles and should be safeguarded with guardrails if they are located nearer to the edge of road than the minimum distance allowed for the road cross sectional type.

21 It is also important that modifications to existing signs do not alter or negate the affect of the breakaway method used for the supports.

22 Figure 15.17 indicates the minimum lateral distances, from the edge of the road, for positioning the different support frangibility types according to the level of frangibility offered by each.

15.2.8 Anti-Vandalism Measures

1 Anti-vandalism measures are actually part of the safety considerations related to sign structures, discussed in Section 15.2.7 previously, or their ability to withstand vandalism and still be serviceable to the motorist.

2 Vandalism in some areas, especially metropolitan areas, can create a significant problem. Wilful defacement and destruction of road signs includes graffiti, gun blasts, splashes or sprays of paint, stickers or posters stuck on sign faces, and outright theft.

3 Some forms of vandalism can have serious consequences, e.g. the alteration of a speed limit sign, the theft of a stop sign, or the reorientation of directional signs/arrows to point along a hazardous path. All such malicious mischief should be corrected as soon as it is discovered and the public should be encouraged to report occurrences of this nature.

4 To combat acts of vandalism and to minimise their effects, the following measures are frequently effective:

(a) the use of sign materials that will continue to perform even though damaged;

(b) the use of temporary materials or easily replaceable materials or facings;

(c) the use of commercially available vandal-resistant hardware/fasteners;

(d) the use of anchor rods, cleats or locking pins to prevent rotation or removal of the sign or its support posts;

(e) the installation of signs high enough to be out of reach;

(f) the placement of signs away from the edge of road at the maximum lateral offset allowed for the sign types;

(g) the use of a warning sticker or plaque on the back of a sign or on the sign post below the sign to identify it as an official device subject to criminal prosecution against acts of vandalism;

(h) the use of special cleaning materials for the removal of paint and stickers from sign faces;

(i) the use of gravel filled tube supports to prevent theft;

(j) use of stiffeners or reinforcing on the backs of smaller signs to prevent bending;

5 Figure 15.20 indicates some of the anti-vandalism measures mentioned above:

(a) Detail 15.20.1 - locating clearances to allow for vandalism;

(b) Detail 15.20.2 - sign structures to prevent sign bending, rotation or removal;

(c) Detail 15.20.3 - commercially available anti-vandal fasteners;

(d) Detail 15.20.4 - warning sticker or plaque.

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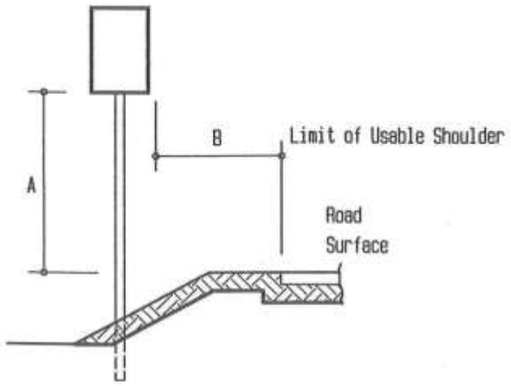
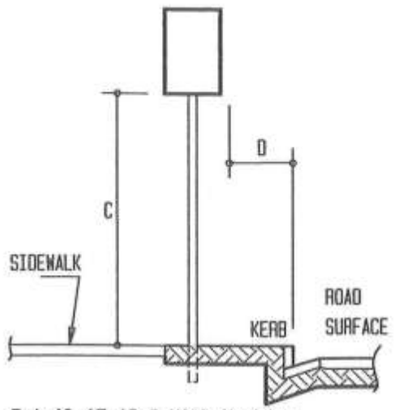


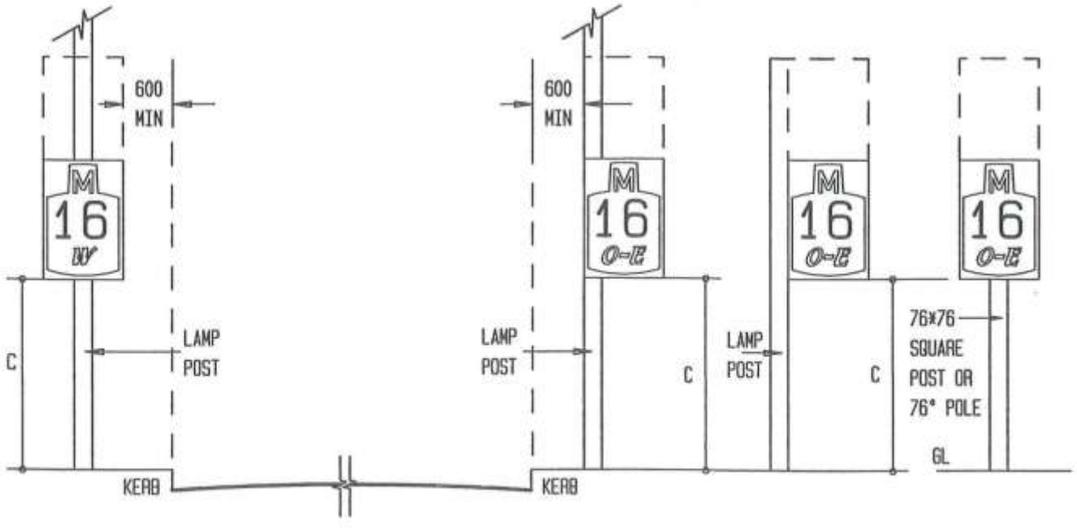
Detail 15.16.1 Shoulder (no Kerb Line)



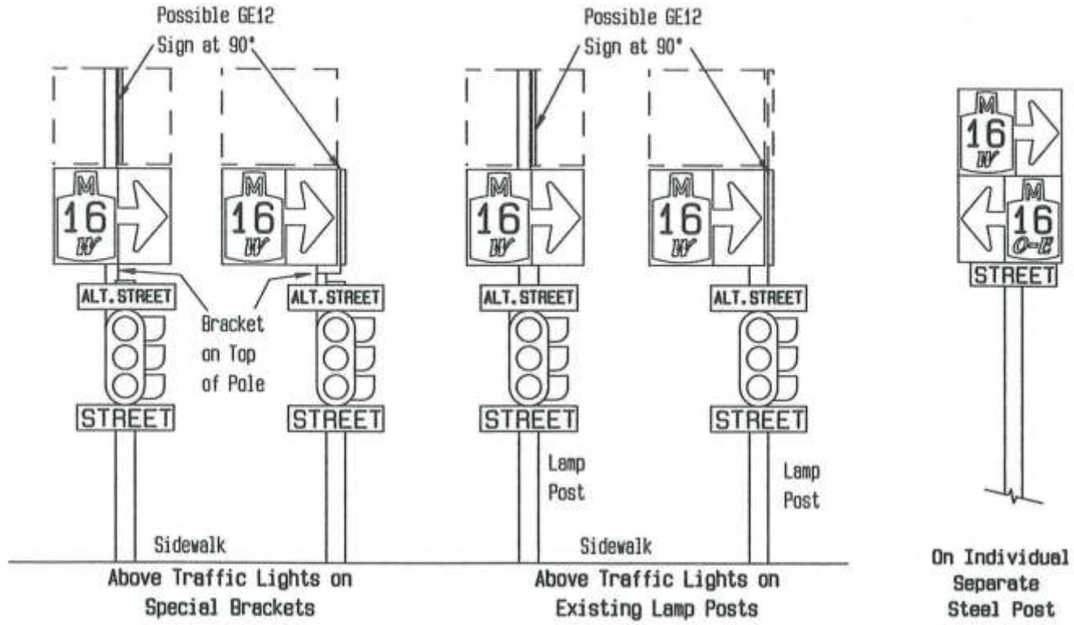
Detail 15.16.2 With Kerbing

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

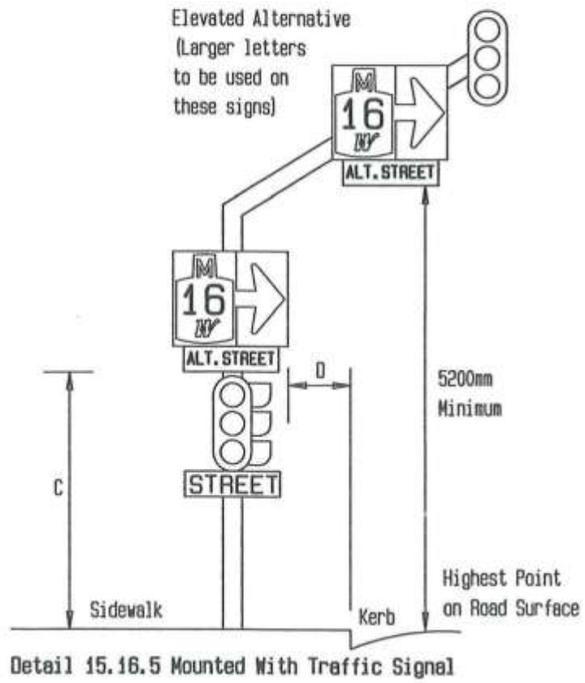
Confirmation signs should be located on existing street furniture wherever possible. Signs may be mounted centrally on poles, or cantilevered left or right according to pole positions in relation to a kerb line. Signs may be mounted on the right side of one-way roadways.



Detail 15.16.3 Route Marker Mounting Between Junctions (Confirmation Signs)



Detail 15.16.4
Route Marker Mounting in Relation to other Road Traffic Signs at Intersections/Junctions

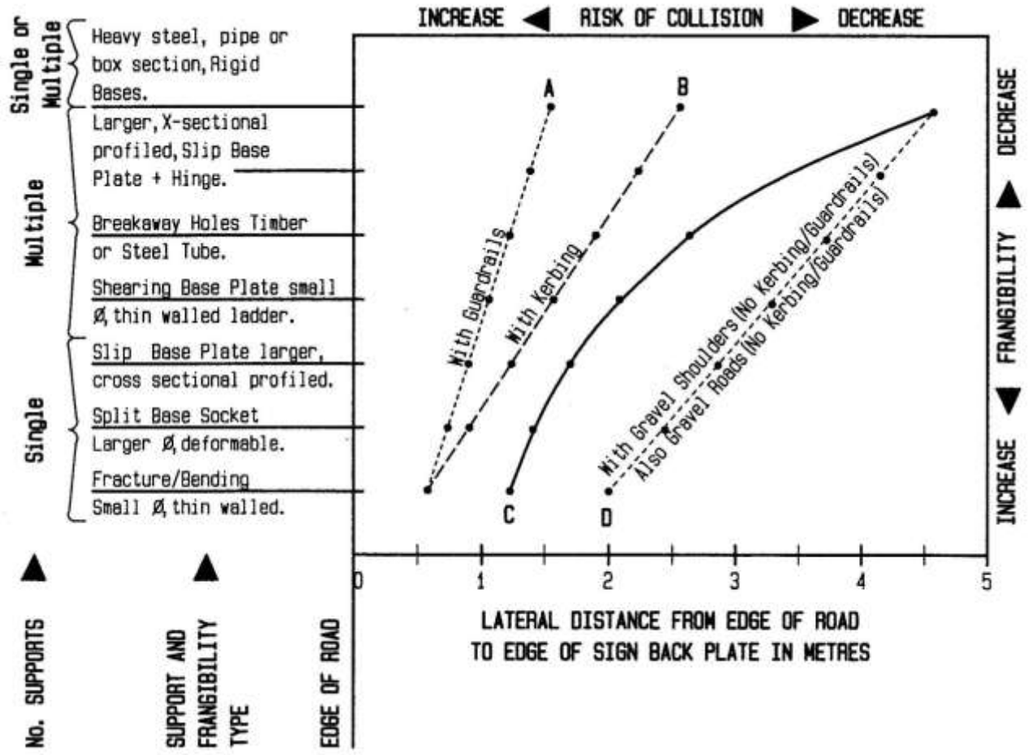


Detail 15.16.5 Mounted With Traffic Signal

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.

Fig 15.16
Positioning of Hazard Markers



NOTES:

(1) The lateral distance will always be measured from the edge of the road to the sign back plate edge nearest to the road and not to the supports except in the case of overhead sign cantilever or gantry structures where it will be measured to the support face.

(2) The edge of road for the graph lines shown above will be:
- the kerb for roads with quadrails or kerbing - lines A and B,
- the edge of surfacing for roads with/without surfaced shoulders - lines C and D,
- the edge of graded roadway for gravel roads - line D.

(3) The lateral distances that can be determined from the graph are the minimums. For details specific to the different sign and road types refer to Figures 15.11 to 15.20.

(4) The graph is only an attempt to indicate the relationship between the support frangibility type and the lateral positioning thereof regarding the safety considerations applicable, and does not indicate the lateral positioning distances for different sign types as such.

Fig 15.17 Safety Level Offered by Different Frangibility Types

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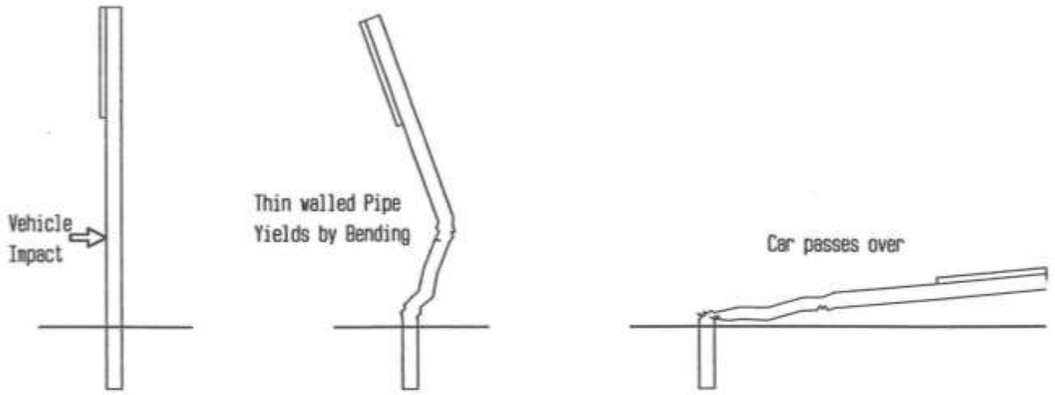
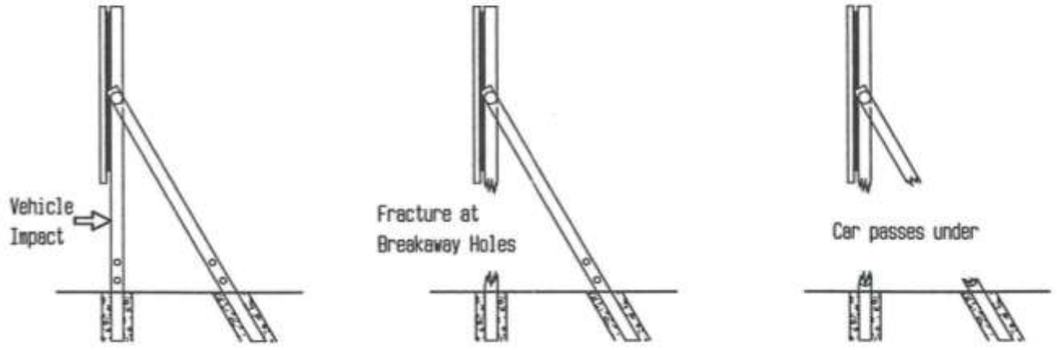
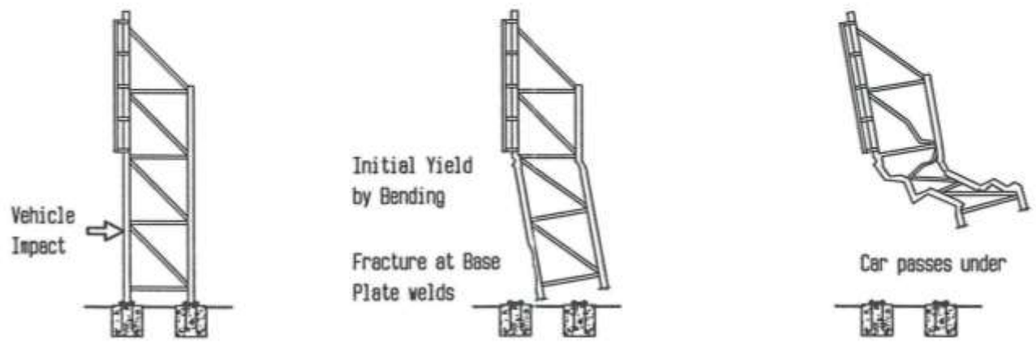


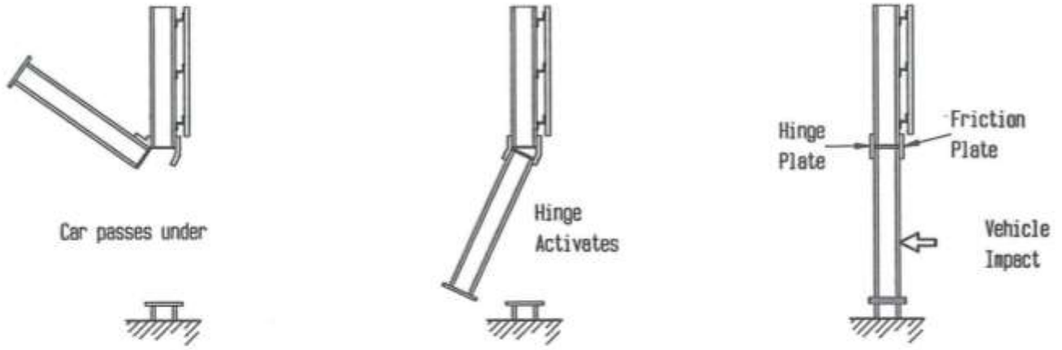
Detail 15.18.1 Breakaway Action - Bending Note: For use with Single Post Sign Systems



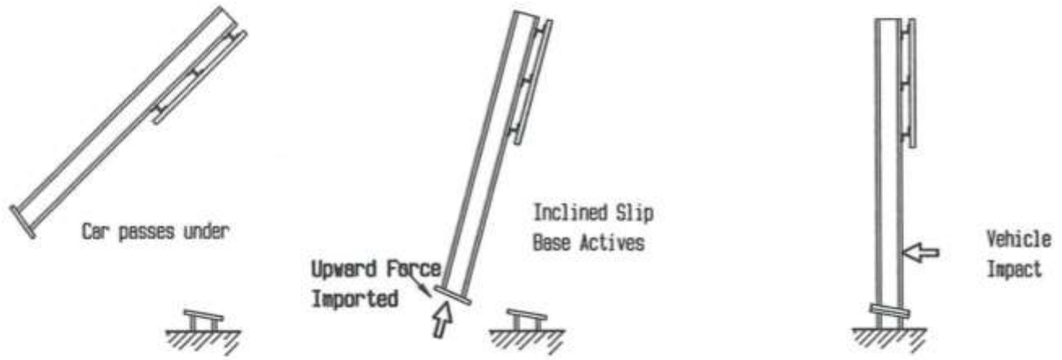
Detail 15.18.2 Breakaway Action - Fractures Note: This device is used for signs with two or more posts



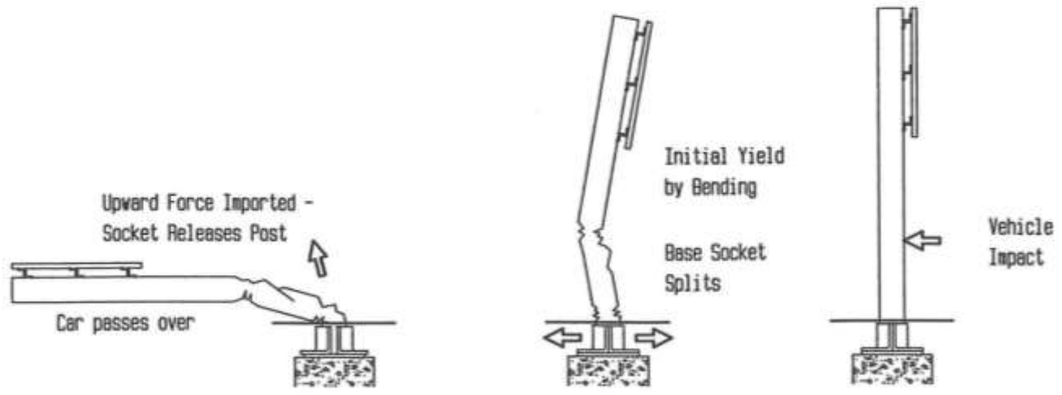
Detail 15.18.3 Breakaway Action - Shearing Base Plate Note: This device is used for signs with two or more posts



Detail 15.18.4 Breakaway Action - Horizontal Slip Base
Note: This device is used for signs with two or more posts

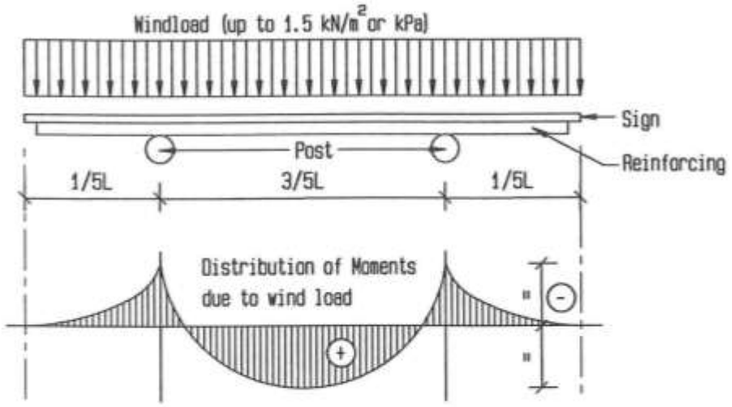


Detail 15.18.5 Breakaway Action - Inclined Slip Base Note: For use with Single Post Sign Systems

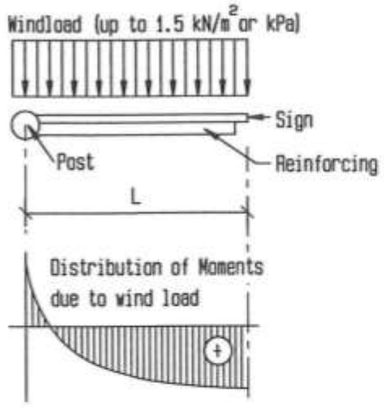


Detail 15.18.6 Breakaway Action - Split Base Socket Note: For use with Single Post Sign Systems

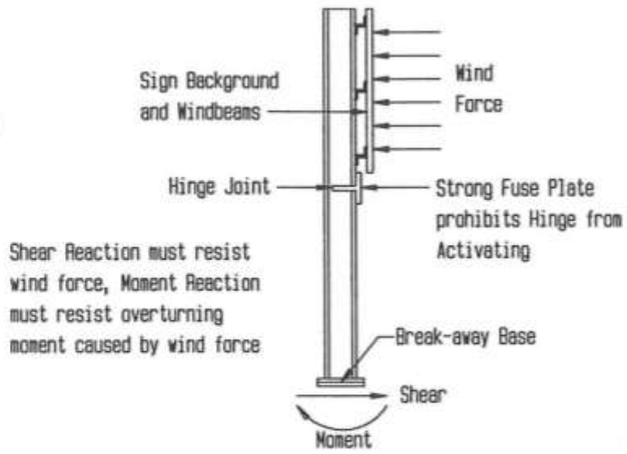
Fig 15.18
Breakaway Actions of Different Sign Support Structure Types



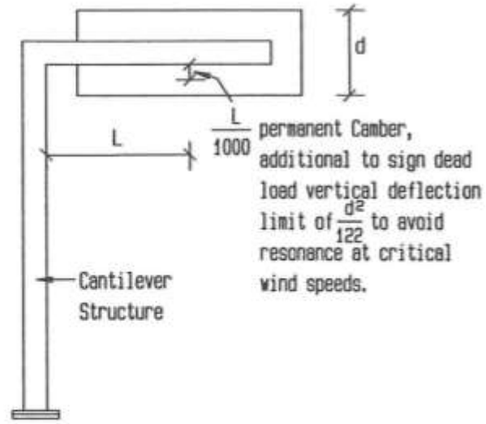
Detail 15.19.1 Distortion Momentline for Dual Posts



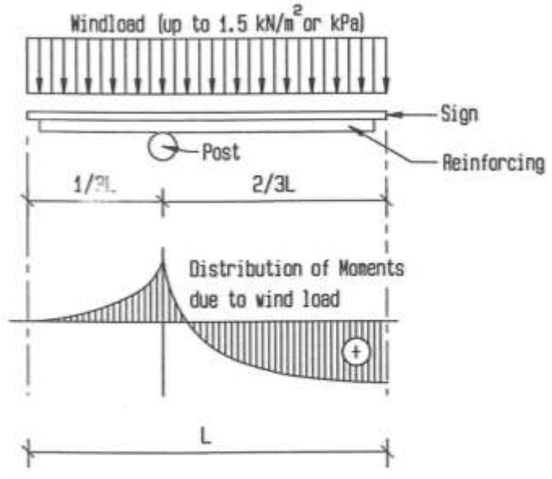
Detail 15.19.2
Distortion Momentline for Sign Post on Sign Edge



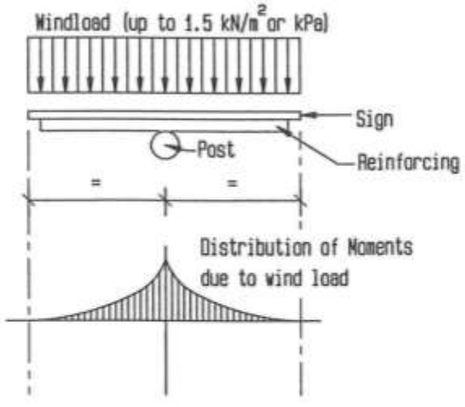
Detail 15.19.5 Wind Load Condition



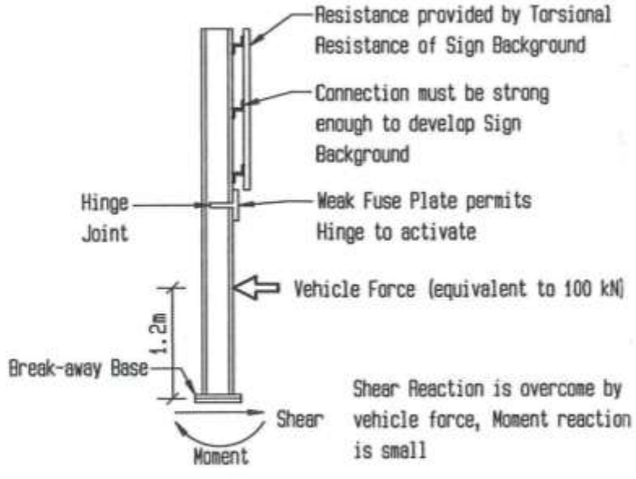
Detail 15.19.6
Dead Load Vertical Deflection and Permanent Camber



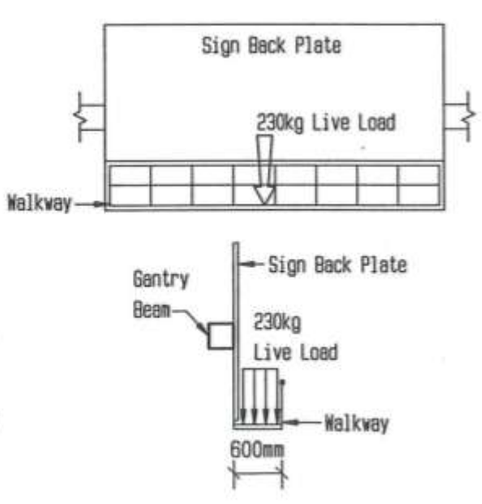
Detail 15.19.3
Distortion Momentline for off centred Single Post



Detail 15.19.4
Distortion Momentline for centred Single Post

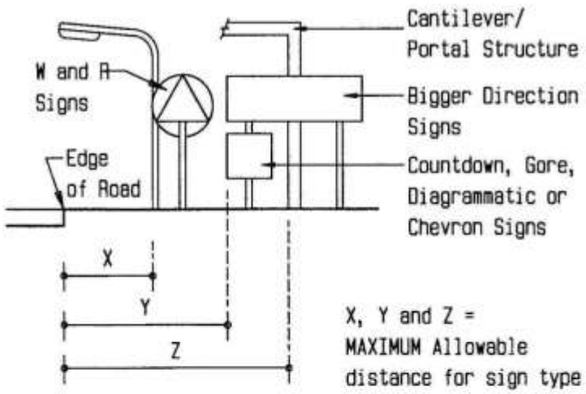


Detail 15.19.7 Collision Condition

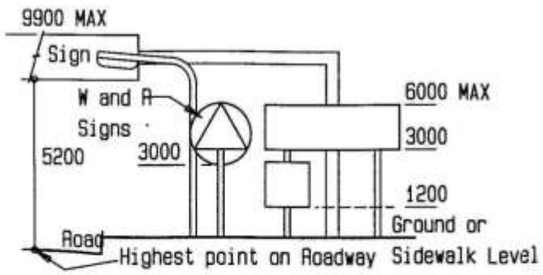


Detail 15.19.8 Live Load Application

Fig 15.19
Loads and Conditions Acting on Sign Structures

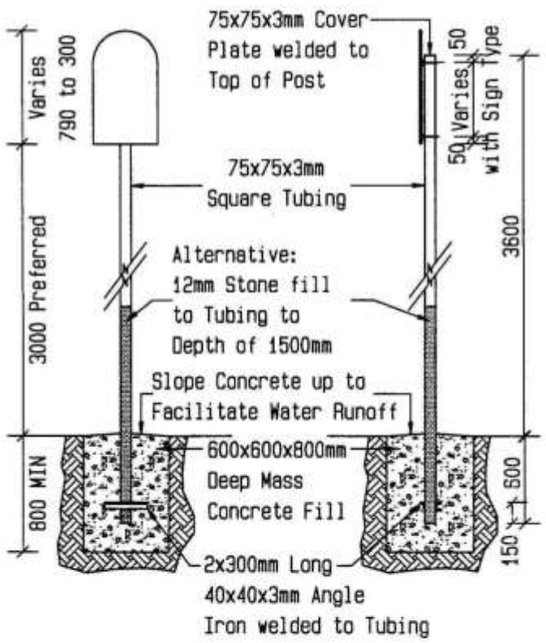


Lateral Clearances for all Road Types

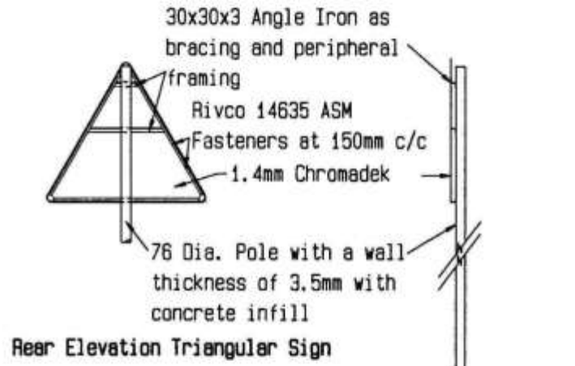


Vertical Clearances for all Road Types

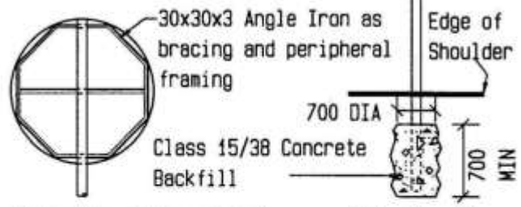
Detail 15.20.1 Clearances to allow for Vandalism



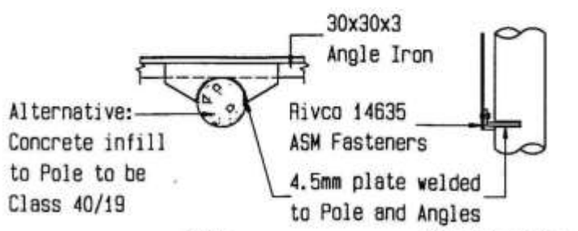
Detail 15.20.2
Sign Structures to prevent Sign bending, rotation or removal



Rear Elevation Triangular Sign



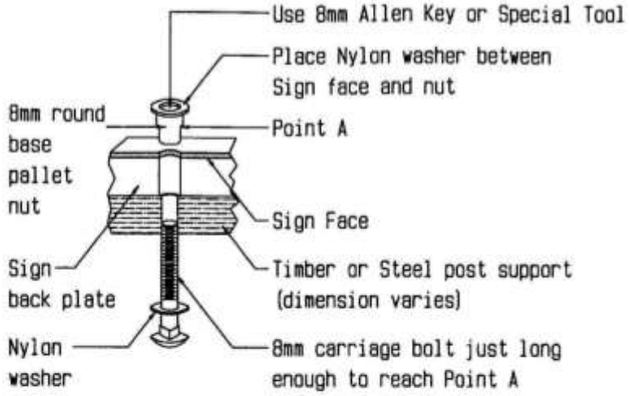
Rear Elevation Octagonal and Circular Sign **Side Elevation**



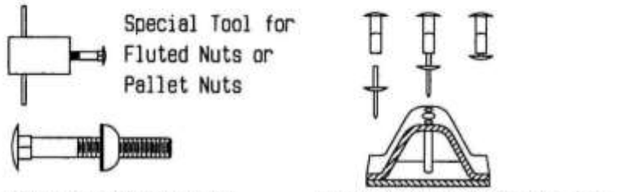
Plan **Side Elevation**

Pole Attachment Detail

Fig 15.20
Typical Anti-Vandalism Measures



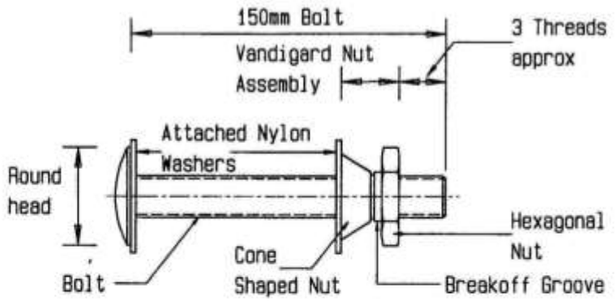
(a) "Teenut" or Pallet Fastener



Aluminium Fluted Nuts (For aluminium delineators and signs on "U" channel posts)

Blind Aluminium Rivets (for aluminium and plywood signs on "U" channel posts)

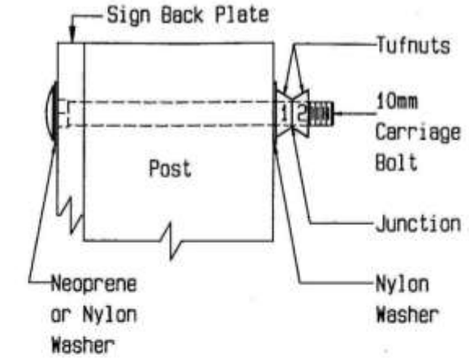
(b) General Theft Resistant Sign Fasteners



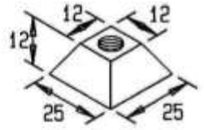
Typical Installation Procedure
Step 1: Install Nut assembly finger tight as shown.
Step 2: Tighten Nut assembly with a spanner until the Cone shaped and Hexagonal parts separate by breaking at the Breakoff Groove.
Step 3: Remove Hexagonal part of the Nut and installation is complete.

(c) "Vandigard Nut" Fastener

Detail 15.20.3 Anti-vandal Fasteners



Typical Installation Procedure
Step 1: Install first Tufnut (No 1) finger tight as shown.
Step 2: Install second Tufnut (No 2) finger tight as shown.
Step 3: Insert wrench at junction to tighten (or loosen) as necessary.
Step 4: Remove Tufnut NO 2, then installation is complete.



Single Tufnut is difficult to remove because of its shape. Always use (4) Tufnuts for each sign installation.

(d) "Tufnut" Fastener

WILLFUL DEFACING, DAMAGING OR ALTERING OF ANY ROAD SIGN OR ITS STRUCTURE IS AN OFFENCE SUBJECT TO CRIMINAL PROSECUTION WHICH MAY RESULT IN A FINE AND OR IMPRISONMENT
(LAW ? No. ? DATE)

Warning Sticker/Plaque to apppear on the back of Signs or Sign Posts at a height of ±1.5m above Ground Level.

Detail 15.20.4 Warning Stickers

15.3 CHOICE OF MATERIALS FOR AND COMPOSITION OF SIGN BACK PLATES

15.3.1 General

1 Sections 15.3-15.6 cover the choices between various types of materials, their physical properties, effectiveness and use in making up each of the components of a sign structure. A wide range of materials and structure examples are indicated with a list of advantages and disadvantages for each of the different types of component. The information is not intended to dictate actions or to endorse specific products, but rather to assist those designing sign structures to choose carefully from the many materials and fabrication methods available.

2 In general the materials for the component parts of signs should be chosen in relation to their advantages or disadvantages regarding the following:

(a) the costs for the initial material manufacture, installation and maintenance;

(b) the manpower and equipment required to manufacture, install and maintain;

(c) the safety considerations regarding passive safety (frangibility) and deformability, but the sign must be crashworthy for continued performance after an accident;

(d) the material's resistance to various forms of vandalism;

(e) the durability or performance of the material in different weather or climate conditions, or environments, that it might be located in;

(f) the difficulty and expense required to change or modify signs or the signing system in future;

(g) a standardised system versus an individual purpose made unit;

(h) compatibility of materials when different material types are to be joined or fixed together, due to the possibility of electrolytic action or differential thermal expansion that may result in failure or deterioration.

3 From the above it is clear that there are three main considerations when choosing a sign structural system, namely that the system should be:

(a) functional;

(b) flexible;

(c) economic.

4 In a constantly changing environment, it is important that changes or modifications to the sign system be made at minimum expense. A structural system may appear to be economical when installed, but may actually be costly due to the expense of making changes. Conversely, a flexible structural system with a some-what higher initial cost, may prove to be more cost-effective over time.

5 The largest cost factor in any sign structure system is determined by the individual sign units, rather than the surface or sign face graphics. A sign system based upon a standardised system is usually less expensive over its life than individually fabricated units, because of ease of erection and maintenance as well as component parts' availability. The cost of signing a new facility, or replacing an old sign, can be minimized by using standard sign units.

6 The external illumination of signs can be very costly. The need to provide such illumination should be kept to a minimum by carefully controlled design techniques.

7 Protection of the sign and structure from vandalism, pests and other environmental hazards like veld fires is a serious design, fabrication and location concern. Some compromise regarding design and cost may be necessary when environmental hazards are present.

8 Materials for signs should be compatible so that failure or deterioration owing to electrolytic action or differential thermal expansion does not occur. Alloys containing copper should not be used in contact with aluminium alloys, for example. Where two different and incompatible materials, for instance if aluminium alloy overhead sign back plates and a steel or stainless steel gantry have to be bolted together, the contact areas should be shielded from each other with adhesive PVC tape and aluminium backed "Bostik" tape, or other similar means of insulation.

9 All sign component materials should thus be chosen for their compatibility with each other, and be of such quality and size that the sign complies with all the required performance levels.

15.3.2 Back Plate Materials

1 The most widely used sign back plate materials are wood; (usually plywood or particle board), plastic (perspex, polycarbonate or GRP) and metal (aluminium or steel). All these material types are available in flat board or sheet format in various thicknesses, and the plastic and metal materials are also available in extruded format as slats, road sign profiles and other profiles. See Figure 15.21.

2 Wood or timber sign boards should be moisture, fire and termite resistant, exterior grade of the following types:

(a) laminated timber complying with the requirements of SANS 1460:1988, treated in accordance with the requirements of SANS 1288;

(b) marine type plywood or blackboard complying with the requirements of SANS 929;

(c) exterior type plywood complying with the requirements of SANS 50312:1996 and of thickness of at least 16 mm;

(d) exterior type moisture resistant particle board complying with the requirements of SANS 50312:1996.

3 Typical South African wood/timber boards, for sign back plates, available in the above grades are:

(a) "Sisondura";

(b) "Novoclad V100" particle board; and

(c) "Uniply" MR/WSP graded plywood.

4 Plastic sign boards should be exterior grade, UV resistant, clear to solid coloured, resistant to corrosion and chemicals, impact resistant, flexible but hard surfaced to be scratch resistant and finally fire resistant.

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5 The plastics or acrylics that can be used for sign back plates are normally from the thermoplastic, glass reinforced polyester and perspex types as follows:

(a) acrylic polycarbonate, flat or profiled, sheeting complying with the requirements of SABS;
(b) glass reinforced polyester (GRP), flat or profiled, sheeting complying with the requirements of SANS 1150;
(c) perspex flat or profiled, sheeting complying with the requirements of SABS.

6 Typical South African plastic/acrylic boards, usable for sign back plates, are:

(a) "Ampagard";
(b) "Lexan" acrylic polycarbonate flat or profiled sheeting;
(c) "Robertson-Dekex" glass reinforced polyester flat or profiled sheeting;

and various perspex and uPVC products.

7 Metal back plates should be at least 1,2 mm thick and made from one of the following materials:

(a) aluminium alloy sheet complying with the requirements of BS 1470 and condition codes SK-HA, HS30-TF, NS3-H6, or NS4-H6;
(b) aluminium alloy extrusion complying with the requirements of BS 1474 and condition codes HE9-TF, HE9-TE or HE30-TF;
(c) galvanised steel sheet complying with the requirements of BS2989;
(d) steel sheet other than (c), coated with zinc applied by a continuous process (the coating having an average mass of at least 185 g/m^2 for both sides, a single spot measurement of at least 152 g/m^2, and a percentage of zinc, in any one side of the blank, of at least 40% of the total) followed by a suitable chemical preparation of the zinc surface, for example a double painted system (Chromadek);
(e) other kinds of metal, treated sheeting i.e. stainless steel and 3CR12 sheeting (costly}.

8 Various metals are rolled into a special road sign profile section, which is commonly used to make up a sign back plate in a manner similar to that used for extruded aluminium plate sections. In both of these cases a retroreflective facing, when specified, is added to the plate section before it is assembled into a back plate.

15.3.3 Composition of Sign Back Plates

1 When deciding which type of sign back plate sheeting or profile to use the advantages and disadvantages of each type should be considered. For example, aluminium is light weight and will not rust, but is initially more expensive than steel or wood and not very vandal resistant. It requires cross bracing for the larger sized signs. Galvanised steel is heavier and usually more rigid and will not rust if the zinc coating is not damaged and also is more economical than aluminium. Wood is of medium strength, does not normally require cross bracing and is the least expensive of the materials but is porous and susceptible to weathering, rot and pest if not treated against these. Polycarbonate is a light weight, very strong, corrosion and chemical resistant, clear or solid colour, and vandal resistant material but it is very expensive, not compatible with PVC and while it may resist fire it will get soft and deformed with continuous exposure to intense heat.

2 Where back plates need framing, bracing or stiffening the stiffening should be one of the following:

(a) flanges forming an integral part of the sign plate material;
(b) some form of frame and bracing design which may be integral with and/or secured to the sign back plate sheet or profile;
(c) a cabinet or boxed frame and internal bracing design where the sign back plate sheet or profile will be secured in or to the cabinet.

3 Examples of the different types of sign back plate framing and bracing are indicated in Figures 15.22 to 15.28 as follows:

(a) back plate and framework for signs < 1,5 m^2;
(b) back plate and framework for panelled signs 1,5 m^2,
(c) back plate and framework for stacked South African road sign profiles;
(d) back plate and framework for stacked European road sign profiles;
(e) back plate and framework for boxed, internally illuminated, or VMS signs or cabinets.

4 Back plate frames and bracing (framework) should be made from a mild steel that is hot dipped galvanized in accordance with the requirements of SANS 121:1999, or painted/powder-coated in accordance with the requirements of CKS 193, or manufactured from a non-corrodible material. The quality of the materials and the size of the members of the framework should be such that the sign back plate complies with the appropriate performance requirements.

15.3.4 Materials Comparison Tables

1 In this and subsequent sections various component types are listed with their basic advantages and/or disadvantages in a number of tables.

2 Some of the properties referred to as advantages or disadvantages, such as material costs or ease of manufacture, installation and/or maintenance, are graded by statements such as "low" or "minimum" up to "high" or "complex". In this way a particular property of a component may be assessed through a table for different types of component materials. Within each table the materials are generally listed in an order from "low" to "high" cost, or "low" to high" manpower requirements. A "low" cost or manpower requirement will be an advantage, whereas a "high" cost manpower requirement will be recorded as a disadvantage.

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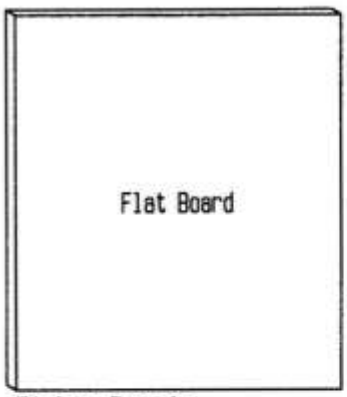
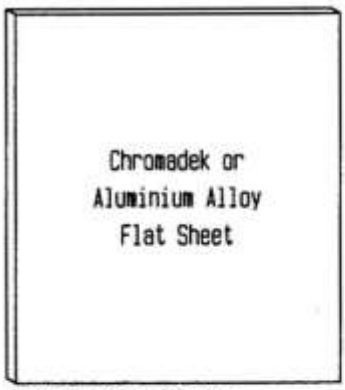


Timber Boards

Timber Material Types:
Moisture Resistant, Exterior Grade;
* Bisondura Particle Board
* Novocland V100 Particle Board
* Uniply MR/WBP Graded plywood

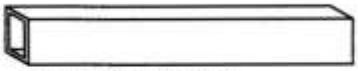
Plastic Boards

Plastic Material Types:
Clear to Opaque or Coloured;
* Perspex
* Polycarbonate
* Glass Reinforced Polyester
* Fibre Glass
* PVC



Metal Sign Plates

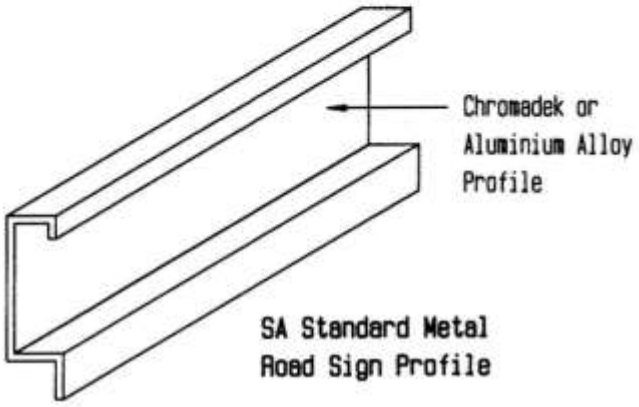
Chromadek or Aluminium Strips



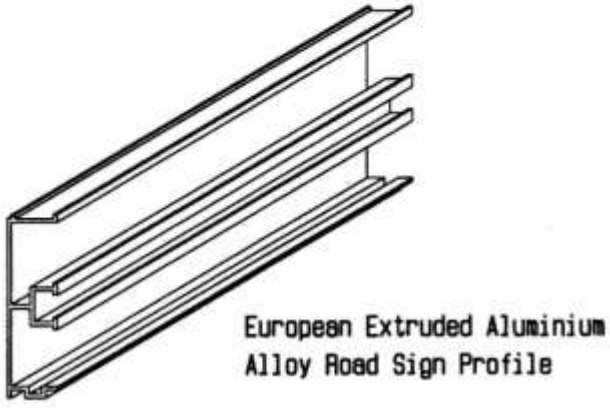
Aluminium Alloy Slats or Laths

Metal Material Types:

* Galvanized Steel
* Stainless Steel
* 3 CR12
* Chromadek
* Aluminium Alloy



SA Standard Metal Road Sign Profile



European Extruded Aluminium Alloy Road Sign Profile

Fig 15.21 **Sign Back Plate Material Types**

TABLE 15.8 BACK PLATE MATERIAL TYPES TABLE 15.8

Material Type	Advantages	Disadvantages
Timber Board	• Good for most climate/ weather types	• Not applicable to aggressive / polluted areas
	• Urban or Conservation area applications	• Veld fires can damage
	• Material thickness requires less bracing thus fairly rigid	• Pest resistance average performance if treated
	• Manufacture costs are lower because less framework / bracing required	• Material cost is expensive due to moisture resistance treatment
	• Installation costs low because timber easy to work with i.e.. drill, saw...	• Maintenance more expensive because of re-treatment to back plate
	• Manpower and equipment requirements for manufacture, installation and maintenance a minimum	• Vandal resistance average due to sign theft
		• Not very durable or crashworthy because of breaking and splintering
Plastic Sheet	• Excellent for use in climate / weather types where corrosion is a problem, and polluted areas. Can withstand rust and rot, even salt	• Not so good for use in desert area where temperature differences and sand-blasting is prevalent
	• Excellent pest resistance	• Veld fires can damage
	• Light weight is easy on handling	• Not recommended for conservation or rural areas
	• Clear plastics excellent for internally illuminated signs	• Requires extensive bracing and framing
	• Initial material costs average depending on plastic type used	
	• Manpower and equipment requirements for manufacture, installation and management a minimum	
	• Excellent vandal resistance, durability and crash worthiness depending on type of plastic used	
Chromadek Sheet	• Good for use in most climate / weather types	• Not recommended for use in aggressive or severely polluted areas
	• Excellent for general urban, rural, conservation area use	• Can rust if not correctly treated
	• Excellent pest resistance and good fire resistance	
	• Costs for material, manufacture, and maintenance are average	
	• Vandal resistance average	
	• Durability and crash worthiness good	
	• Manpower and equipment requirements for manufacture, installation and maintenance are below average	

TABLE 15.8 BACK PLATE MATERIAL TYPES TABLE 15.8

Material Type	Advantages	Disadvantages
Chromadek Profiles	• Good for use in most climate or weather types • Good for general urban, rural use. • Excellent pest resistance and good fire resistance • Vandal resistance good • Manpower and equipment requirements for manufacture, installation and maintenance are below average • Durability and crash worthiness good	• Not recommended for use in aggressive or severely polluted areas • Can rust if not correctly treated • Costs for material, manufacture and maintenance are above average
Aluminium Sheets	• Excellent for all climate or weather types • Excellent for urban or rural use • Good fire and pest resistance • Cost, manpower and equipment requirement for maintenance less than average • Durability and crash worthiness excellent	• Not an environmentally friendly material • Initial material expensive • Costs for manufacture and installation above average • Manpower and equipment requirements more than average for manufacture and installation • Prone to theft due to high scrap value
Aluminium Profiles	• Excellent for all climate or weather types • Excellent for urban or rural use • Good fire and pest resistance • Cost, manpower and equipment requirement for maintenance less than average • Durability and crash worthiness excellent	• Not an environmentally friendly material • Initial material expensive • Cost for manufacture and installation expensive • Manpower and equipment requirements above average for manufacture and installation • Prone to theft due to high scrap value

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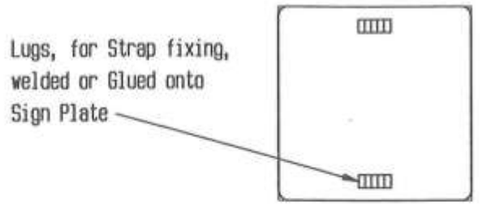
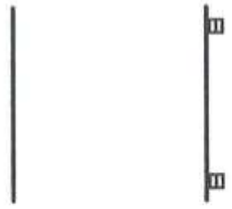
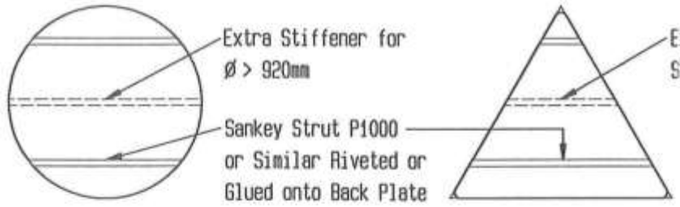
Detail 15.22.1 No Frame or Bracing (Signs < 0.36m^2)

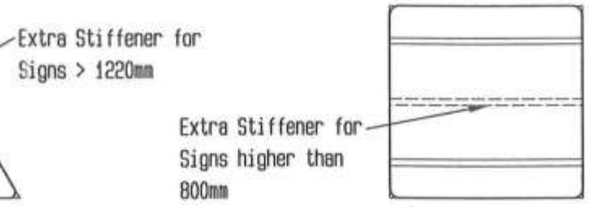




Sectional Side Elevation

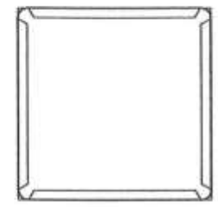


Detail 15.22.2 Simple Horizontal Bracing Only

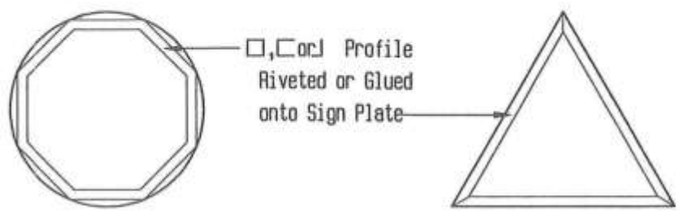


Sectional Side Elevation

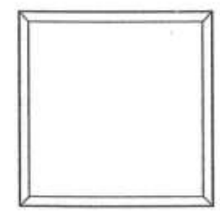
Detail 15.22.3 Formed/Pressed Edges as Bracing

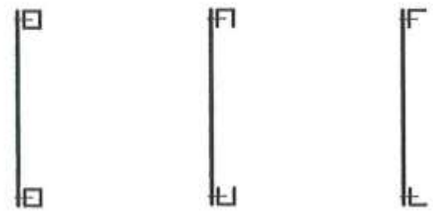


Sectional Side Elevation



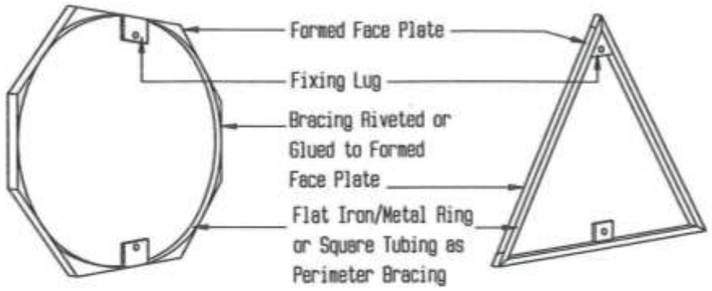
Detail 15.22.4 Perimeter Bracing Only



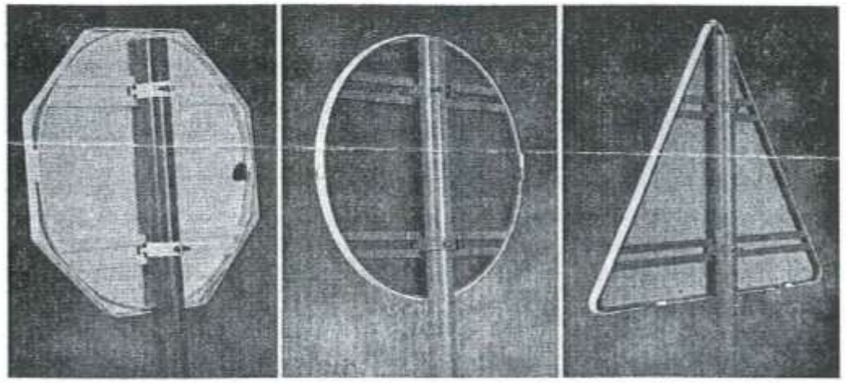


Sectional Side Elevation

Fig 15.22
Simple Sign Back Plate and Bracing for Flat Sheet Road Signs Smaller Than 1.5 m^2



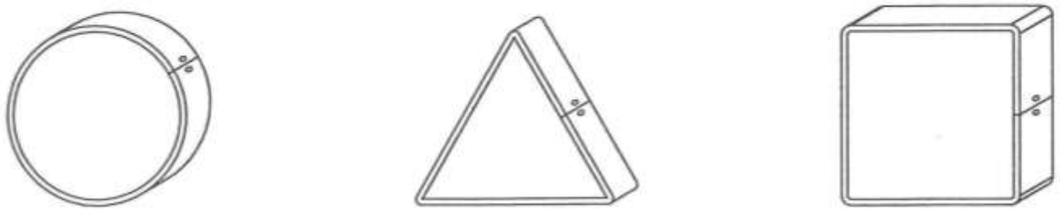
Detail 15.23.1 Formed Edges with Perimeter Bracing (SA Example)



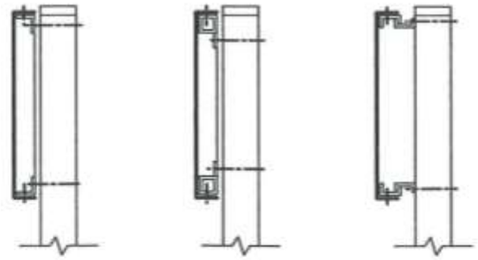
Detail 15.23.2 Hinged Frame with Perimeter Bracing (S.A.) Signfit Quickly)

The smallest ALFORM version, the ALFORM 1 - system, is used for highway signs only: circular, triangular, octangular, rectangular types, less than 1.5m^2 in sign area. There is a frame profile only. No stiffening profile and no field splice is necessary.

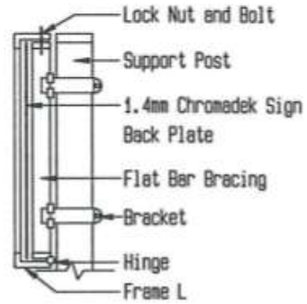
Detail 15.23.3 Profiled Frame only (German Alform System)



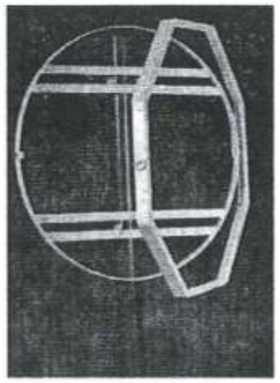
Detail 15.23.4 Framed Sandwiched Bracing (European System)



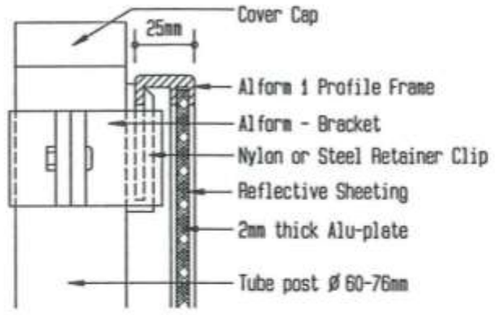
Sectional Side Elevation of 3 Examples



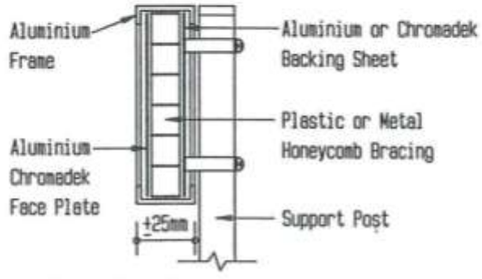
Sectional Side Elevation



Open Hinged Frame



Sectional Side Elevation



Sectional Side Elevation

Fig 15.23
Sign Back Plate and Edge Bracing for Flat Sheet Road Signs Smaller Than 1.5 m^2

TABLE 15.9	BACK PLATE FRAMEWORK FOR SIGNS <1.5m^2	TABLE 15.9
Framework Type	Advantages	Disadvantages
No Frame or Bracing	• Good for most climate/weather types • Good for most environments • Costs for material, manufacture, installation and maintenance very low • Manpower and equipment requirements for manufacture, installation and maintenance a minimum	• Only for smaller signs with sizes less than 0,36 m^2 or else the material needs to be thicker than 1,4 mm which is costly • No vandal resistance. Can be bent, damaged or stolen, easily • Average durability because it can be bent back to original form
Simple Horizontal Bracing	• Good for most climate/weather types • Good for most environments • Costs for material, manufacture, installation and maintenance low • Manpower and Equipment requirements for manufacture, installation and maintenance low • Sign stiffer because of bracing and cannot be bent as easily thus more vandal resistance • Larger sizes possible because of bracing	• Somewhat more expensive than the above sign because of horizontal stiffeners and fasteners
Formed/pressed edges as bracing	• Good for most climate/weather types • Good for most environments • Costs for material, manufacture, installation and maintenance still low • Manpower and equipment a bit more sophisticated for manufacture but low • Thinner material can be used because pressed edges provide rigidity • Vandal resistance still good, cannot bend easily • Signface looks neat, can avoid drilling of holes	• More expensive than signs with horizontal stiffeners because of specialised machines needed to press edges • Pressed edges only appropriate for smaller signs
Perimeter Bracing (commonly a separate frame)	• Good for most climate/weather types • Good for most environments especially vandal prone areas • Very rigid sign • Larger signs can be made • Vandal resistance excellent	• Expensive to manufacture because of more material, labour and equipment required • Sign heavier than above mentioned sign types • Treatment of welded joints must be correctly done to rust

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TABLE 15.9 **BACK PLATE FRAMEWORK FOR SIGNS <1.5m²** **TABLE 15.9**

Framework Type	Advantages	Disadvantages
Formed edges with Perimeter Bracing	• Same advantages as for signs with only formed edges or perimeter Bracing but more rigid and better looking	• More expensive to manufacture than signs with only formed edges or perimeter bracing • Possible rust traps between bracing and pressed edges
SA Signfit Quicky	• Same advantages as for signs with formed edges or perimeter bracing • Easy to install and maintain	• Expensive to manufacture • Possible rust traps between frame and sign back plate • Vandal resistance average because of hinge and locking nut
German Alform System	• All Aluminium construction easy and long lasting • Good for all weather and environment types • Very neat looking • System can be used for larger signs as well • Weight savings • Easy to install and maintain	• Vandal resistence low due to aluminium theft • Expensive because of formed, profiled frame and thicker Back Plate
European Framed Sandwich	• Very neat looking • Good for most weather and environment types • Mostly aluminium construction	• Vandal resistance low because of aluminium theft • Expensive to manufacture because of aluminium parts and labour involved

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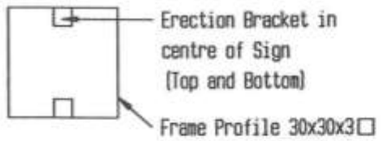
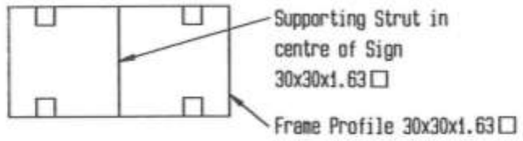
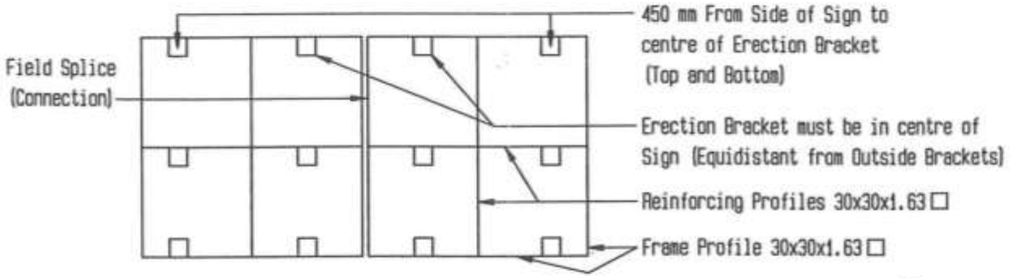


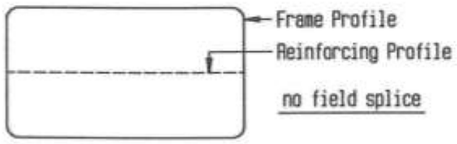
Detail 15.24.1 SA Square Tubing Frame for Signs of ±1.5 m² with a Single Support Post



Detail 15.24.2 SA Square Tubing Frame and Reinforcing for Sign of 1.5 m² to 8 m² with 2 or 3 Support Posts



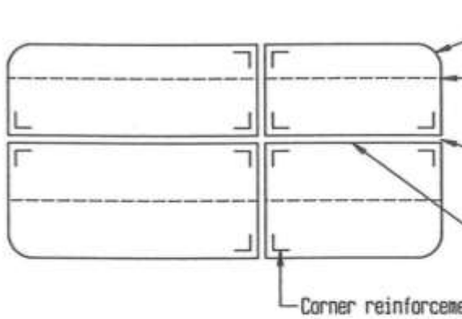
Detail 15.24.3 SA Flat Sheet Chromadek Panels and Square Tubing Frame for Signs > 8 m²



The medium sized version of ALFORM 2-system is used for signs ranging between 1.5 m² and 4.5 m² only. The system consists of two profile-types:

- frame profile with a depth of 40 mm
- a stiffening profile to reinforce the back of the sign, if the height exceeds 750 mm

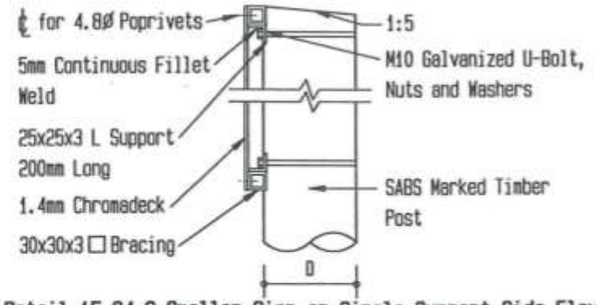
Detail 15.24.4 German Alform 2 System: Aluminium Flat Sheet Panels for Signss > 1.5 m² up to 4.5 m²



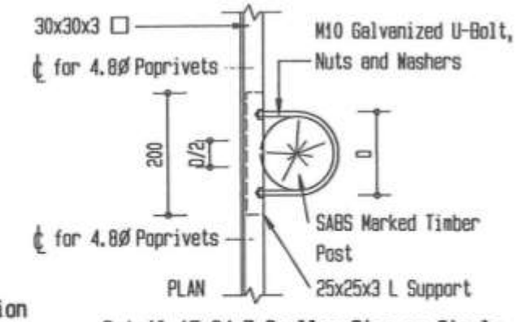
The ALFORM 3-system is used for all signs larger than 4.5 m² up to approx. 60 m². The system consist of 5 different profiles:

- frame profile, with a depth of 60 mm
- reinforcing profile
- connecting profile for field splices
- corner profile to connect frame with reinforcing profile
- connecting profile to connect frame profile with rounded corner profile

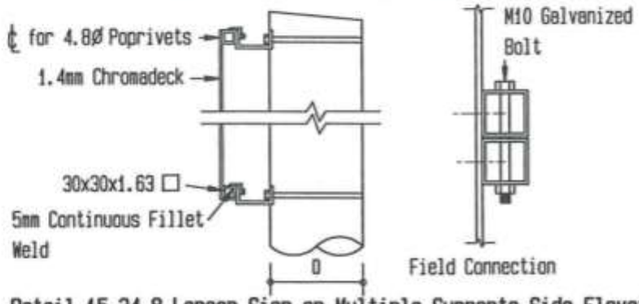
Detail 15.24.5 German Alform 3 System: Aluminium Flat Sheet Panels for Signs > 4.5 m²



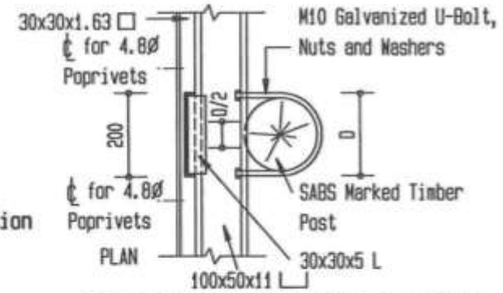
Detail 15.24.6 Smaller Sign on Single Support Side Elevation



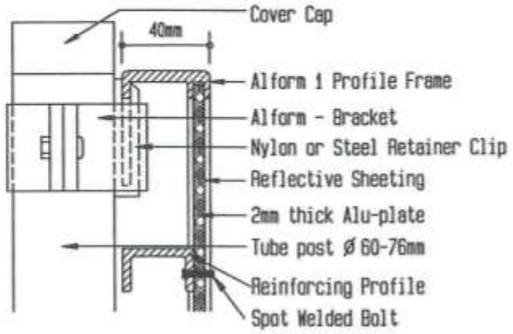
Detail 15.24.7 Smaller Sign on Single Support Plan



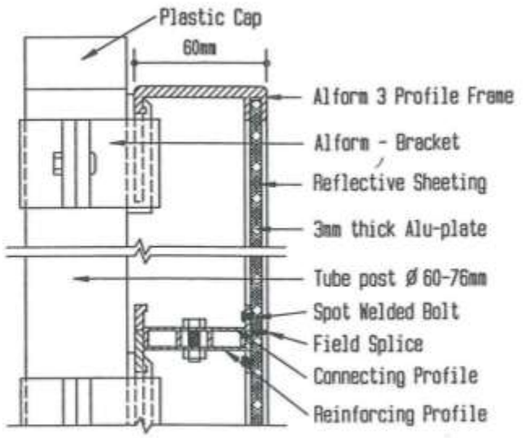
Detail 15.24.8 Larger Sign on Multiple Supports Side Elevation



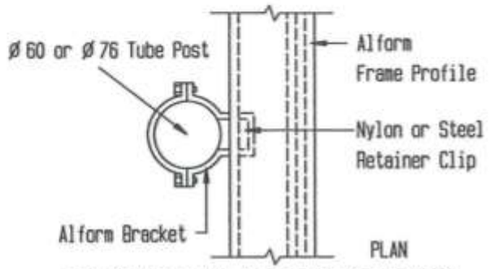
Detail 15.24.9 Larger Sign on Multiple Supports Plan



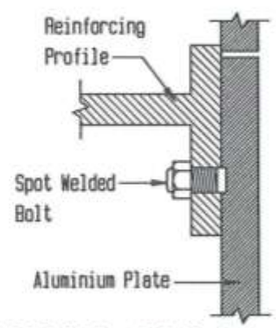
Detail 15.24.10 Alform 2 System for Medium Size Signs



Detail 15.24.12 Alform 3 System for Larger Signs

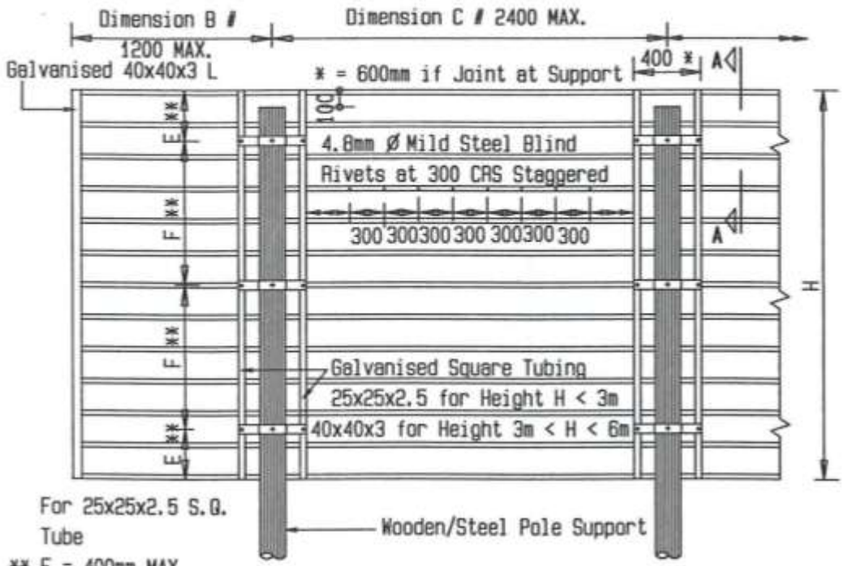


Detail 15.24.11 Alform Fixing Detail

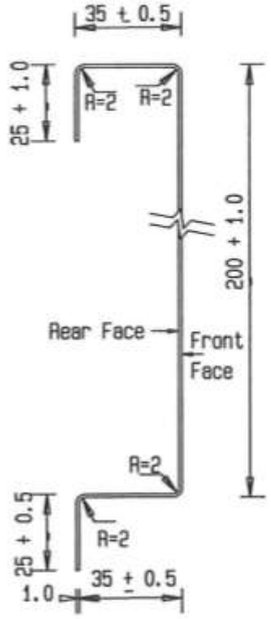


Detail 15.24.3 Fixing Detail for Reinforcing Profile

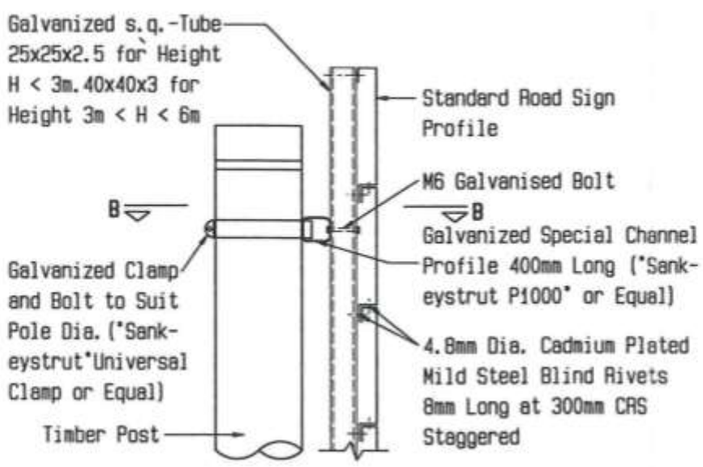
Fig 15.24
Sign Back Plate and Framework for Flat Sheet Panelled Road Signs >=1.5 m²



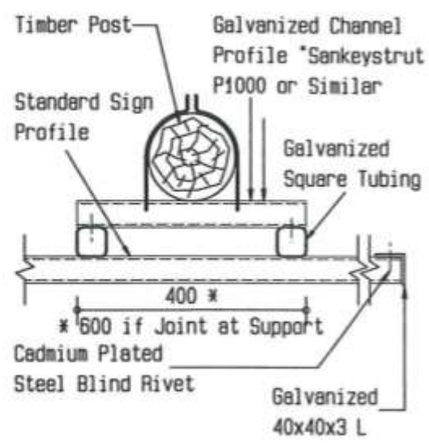
Detail 15.25.1 Ground Mounted Road Sign Back Plate consisting of Stacked Chromadek Road Sign Profiles



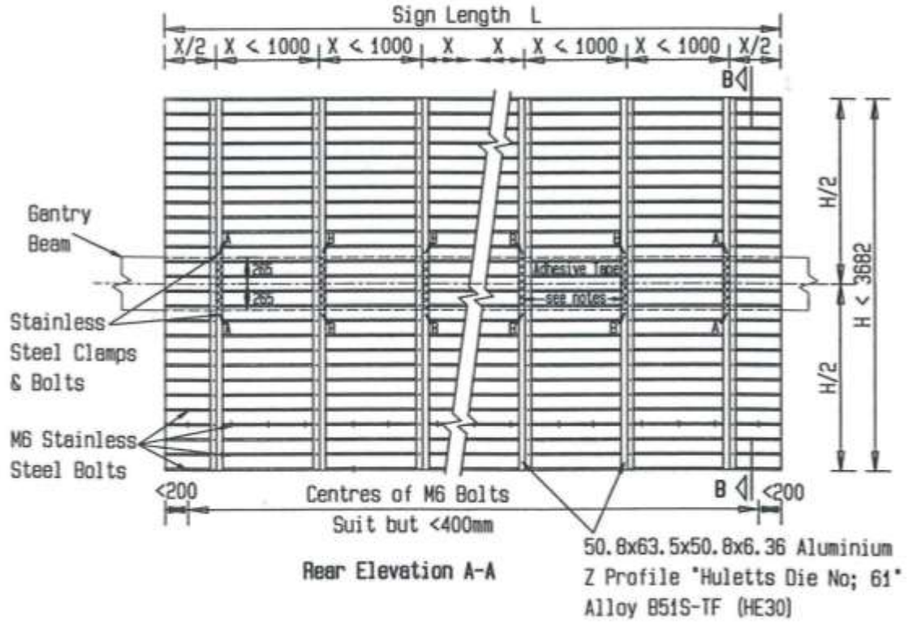
Detail 15.25.2
South African Chromadek/
Aluminium Road Sign Profile



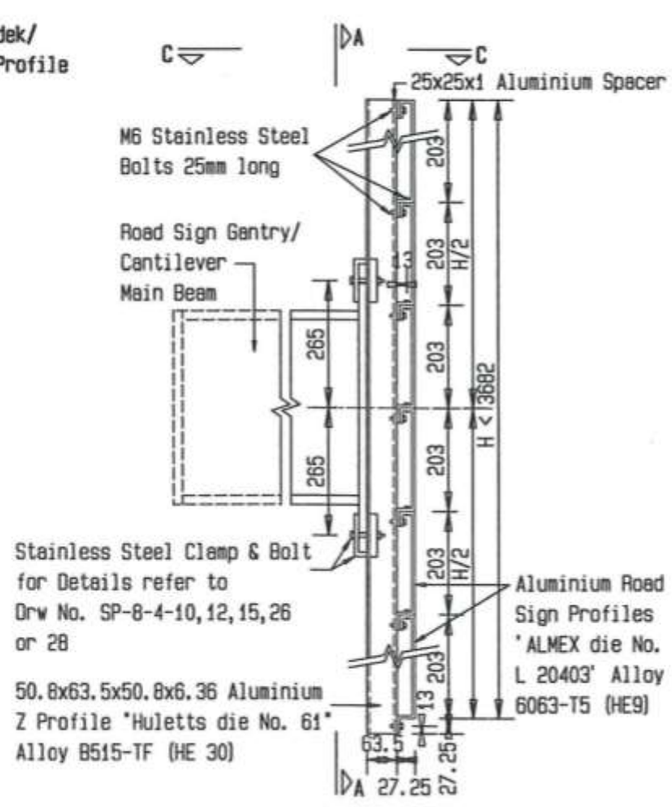
Detail 15.25.3 Part Sectional Side Elevation A-A



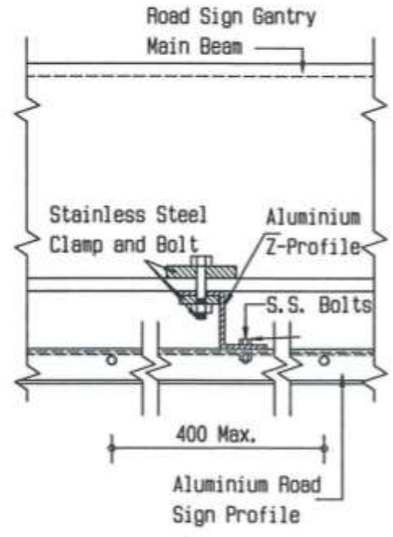
Detail 15.25.4 Part Sectional Plan B-B



Detail 15.25.5 Overhead Mounted Road Sign Back Plate consisting of Stacked Aluminium Alloy Road Sign Profiles



Detail 15.25.6 Sectional Side Elevation B-B



Detail 15.25.7 Part Sectional Plan C-C

Fig 15.25
Sign Back Plate and Framework for Stacked SA Road Sign Profiles

TABLE 15.10 BACK PLATE FRAMEWORK FOR FLAT SHEET PANELLED SIGNS >=1.5m^2 **TABLE 15.10**

Framework Type	Advantages	Disadvantages
SA Chromadek Sheets and Square Tubing Frame	• Well known existing system • System appropriate to signs of 1.5 m^2 and up to 20 m^2 • System appropriate to most climate/weather types • System good for most environments • Material costs low for bigger signs • Manufacture and installation costs low because of separate panels • Maintenance easy because of separate panels • Manpower and equipment requirements not many and not very sophisticated • Materials freely available • Vandal resistance above average • Can be mounted in many positions ie. ground and overhead • Versatile application • Durability good if properly maintained	• Welding of frame to be of good quality and must be treated for rust • Many rivets necessary to fix sheet to frame • Rivet heads on sign back plate a problem for signface material application • Heavier than German Alform System
German Alform System	• Not well known in SA • System appropriate to all sign sizes • System appropriate to all climate/weather types • Very neat looking and light weight • All aluminium construction easy and long lasting • Weight savings Easy to install and maintain because of less parts and separate panels • Manpower and equipment requirements minimum for manufacture, installation and maintenance • Less bolting and riveting together than SA panels	• Vandal resistance low because of aluminium theft • More expensive because of formed profile frame and thicker back plate • Sophisticated equipment needed to manufacture formed framework

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TABLE 15.11 BACK PLATE FRAMEWORK FOR STACKED SIGN PROFILES TABLE 15.11

Framework Type	Advantages	Disadvantages
SA Chromadek Profiles	• Well known existing system	• Lots of bolting and riveting between profiles required in manufacture
	• System appropriate to any sign size	• Rust, snow and sand traps because of profile form
	• System appropriate to most climate/weather types	• Material, manufacture, installation costs higher than for flat sheet signs
	• System appropriate to most environments	• Manpower and equipment required for manufacture and installation more intensive
	• No rivets on backplate face	• Durability average due to rust and if bent or dented parts must be replaced
	• Less framing or bracing on the back because of profiled panels provides horizontal stiffness	• Joints on back plate face presents a problem for signface message application
	• Signs can be ground mounted or overhead mounted	
	• Maintenance easy because profiles can be replaced easily	
	• Vandal resistance excellent	
	• Crashworthyness excellent, does not bend easily	
SA Aluminium Profiles	• Well known existing system	• Vandal resistance low because of aluminium theft
	• System appropriate to any sign size	• Lots of bolting and riveting between profiles required in manufacture
	• No rivets on backplate face	• Extruded profiles more expensive between profiles
	• System excellent for all climate/weather types	
	• System appropriate to most environment	• Snow and sand traps because of profile form
	• Less framing or bracing on the back because of profiled panels provedes horizontal stiffness	• Costlier than flat sheet signs
	• Signs can be ground mounted or overhead mounted	• Manpower and equipment required in manufacture and installation more intensive
	• Maintenance easy because profiles can be replaced easily	
	• Durability excellent - no rust	
European Aluminium Profiles	• Not well known in SA	• More sophisticated and expensive profile form
	• Easier attachment brackets for mounting	
	• Other advantages as for SA aluminium profiles	• Other disadvantages as for SA aluminium profiles

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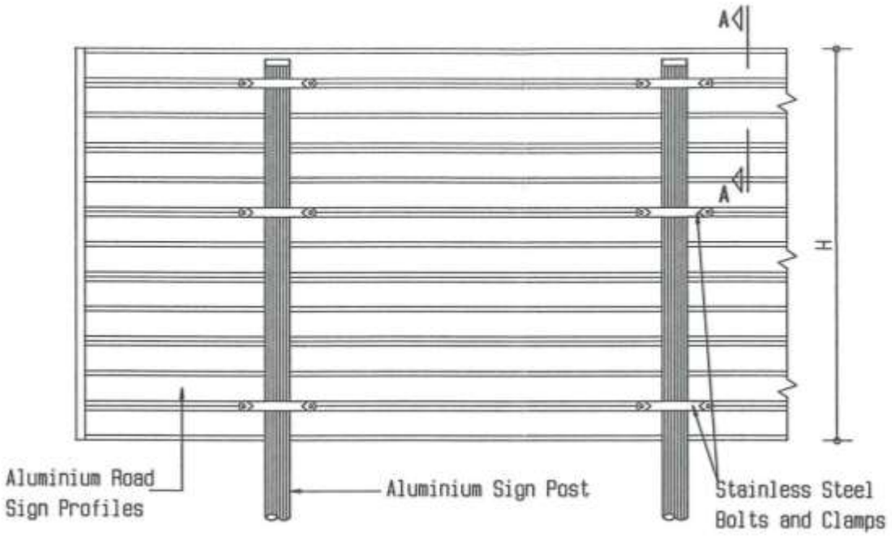
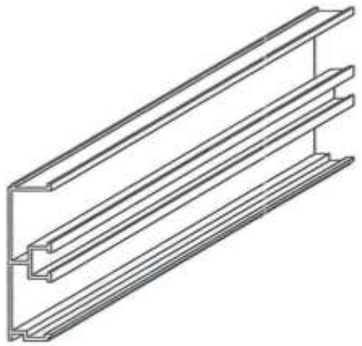
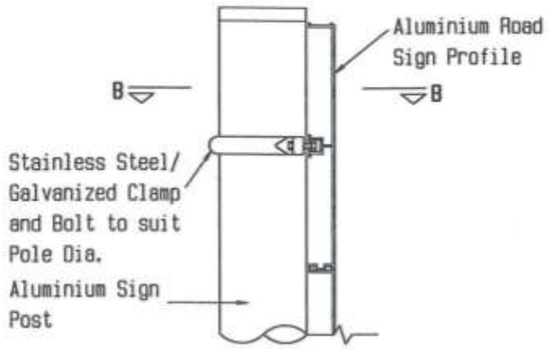


Rear Elevation

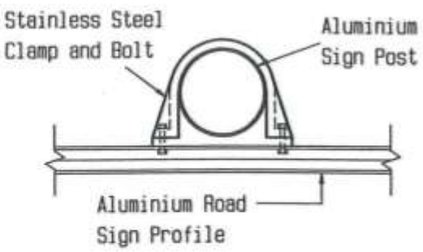
Detail 15.26.1
Ground Mounted Road Sign Back Plate consisting of Stacked European Aluminium Road Sign Profiles



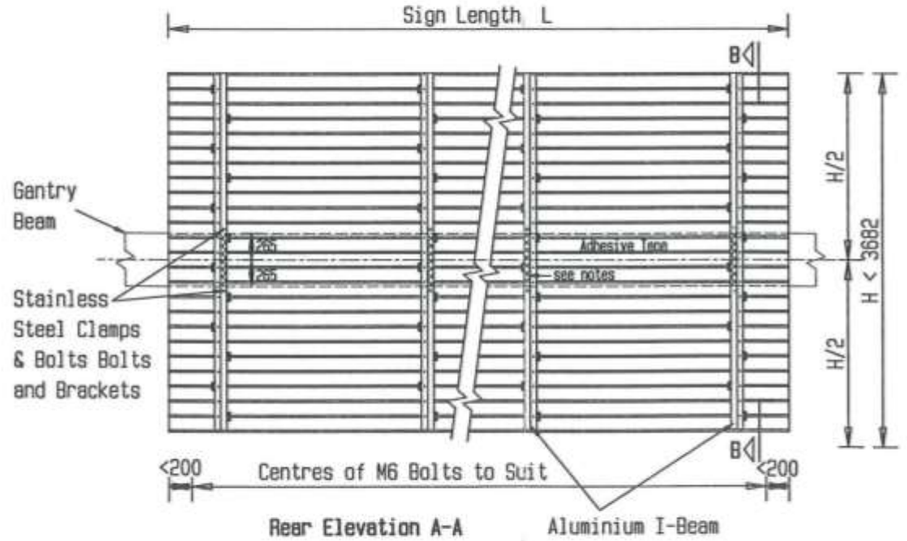
Detail 15.26.2
European Aluminium Road Sign Profile



Detail 15.26.3
Part Sectional Side Elevation A-A

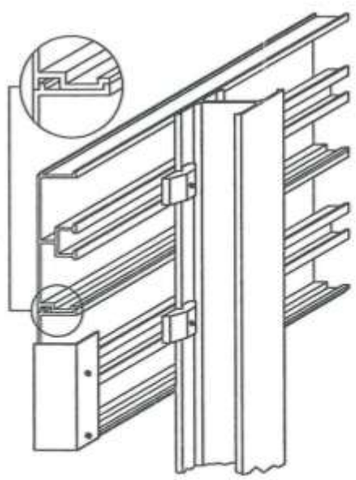


Detail 15.26.4
Part Sectional Plan B-B

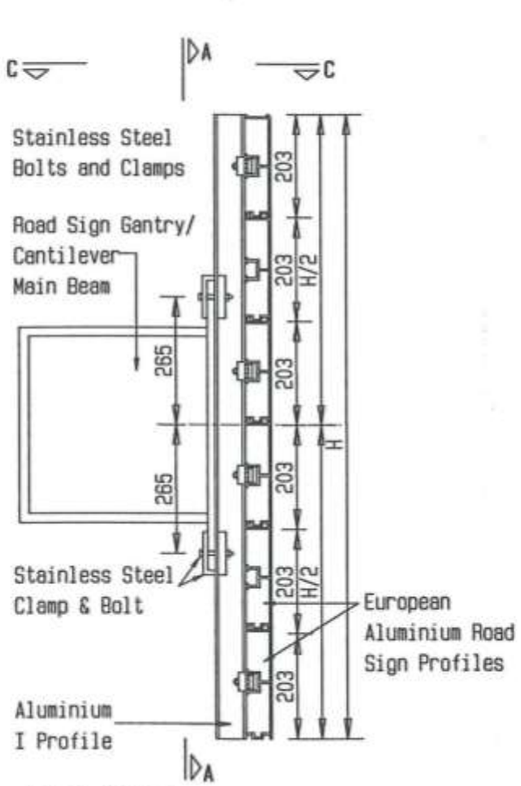


Rear Elevation A-A

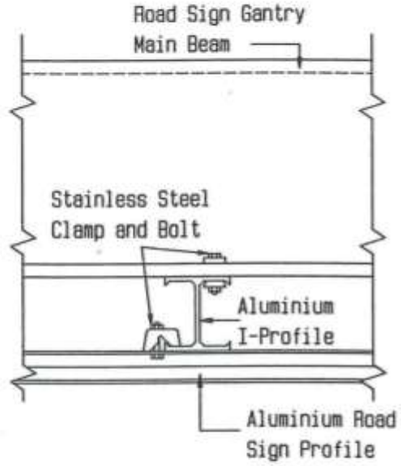
Detail 15.26.5
Overhead Mounted Road Sign Back Plate consisting of Stacked European Aluminium Road Sign Profiles



Detail 15.26.6
Detail of I-Beam Bracing

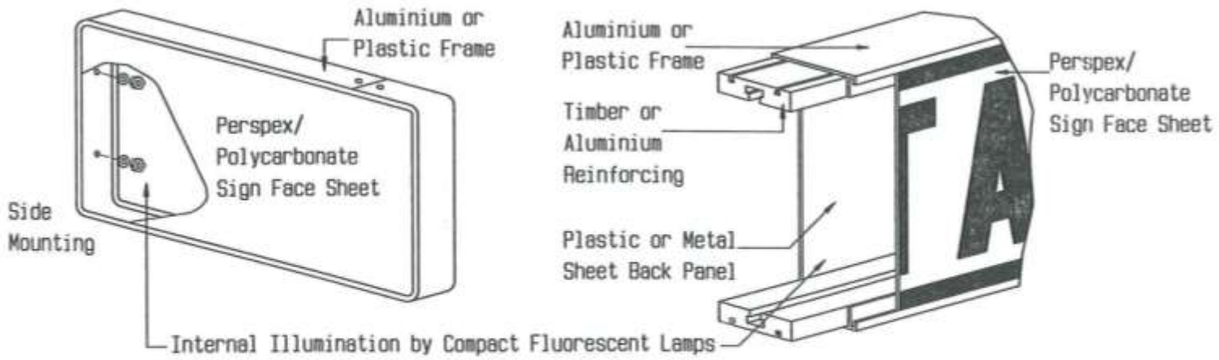


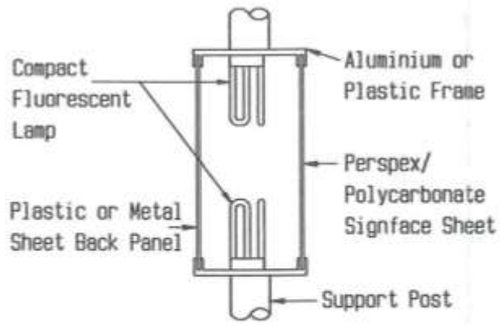
Detail 15.26.6
Sectional Side Elevation B-B



Detail 15.26.8
Part Sectional Plan C-C

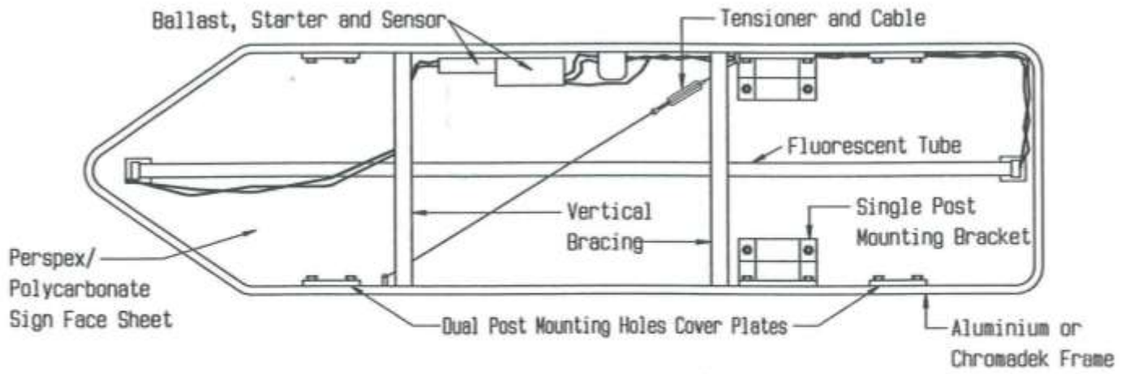
Fig 15.26
Sign Back Plate and Framework for Stacked European Road Sign Profiles

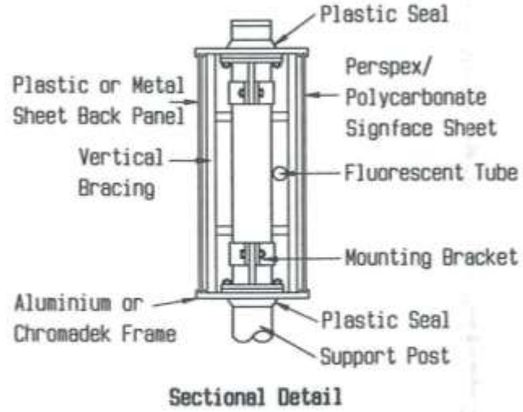




Sectional Detail

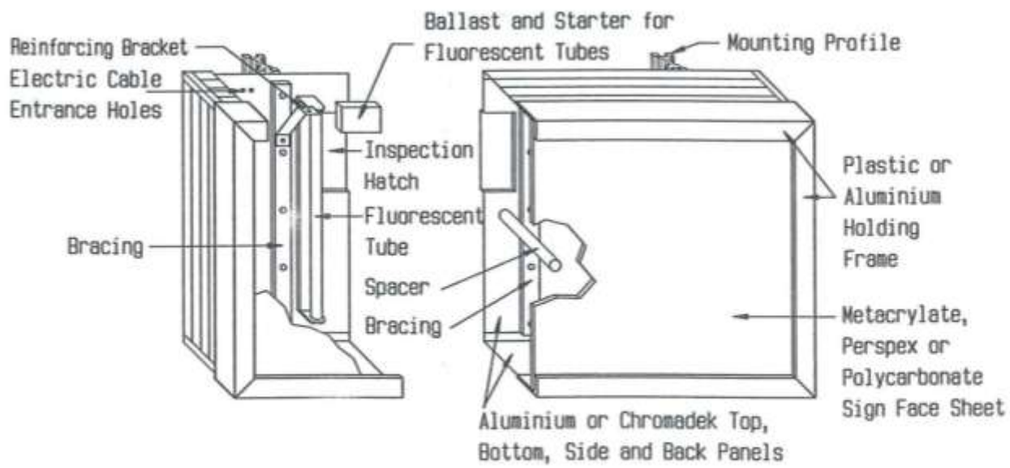
Detail 15.27.1 Small Simply Boxed and Illuminated Signs

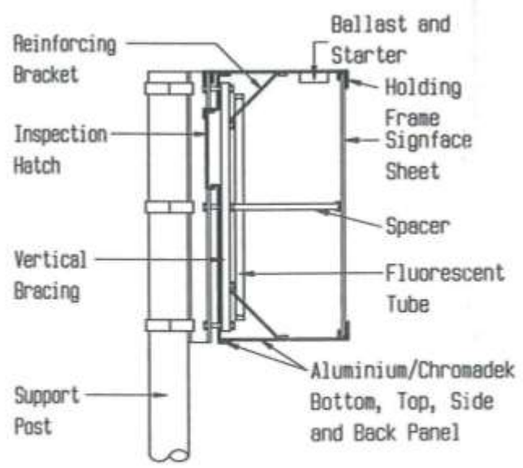




Sectional Detail

Detail 15.27.2 Medium sized, internally braced/tensioned Boxed Signs





Sectional Detail

Detail 15.27.3 Large Complex, internally braced/reinforced Boxed Signs

Fig 15.27
Sign Back Plate and Framework for Internally Illuminated Boxed Road Signs

TABLE 15.12 BACK PLATE FRAMEWORK FOR BOXED SIGNS **TABLE 15.12**

Framework Type	Advantages	Disadvantages
Small Simply Boxed	• Ideal for small internally illuminated boxed sign applications	• Compact fluorescent lamps not as effective as tubes
	• Suitable for urban environments	• Not vandal resistant because of material types used
	• Material, manufacture, installation costs average	• Not for use in polluted area
	• Manpower and equipment requirement low for manufacture, installation and maintenance	• Electrical connection needed
	• Durability average	• Not fire resistant
	• Light weight	• Not very crashworthy - will break
	• No special mounting brackets necessary for mounting	• Only for small boxed signs < 1.5 m^2
Internally Braced/ Tensioned Boxed	• Suitable for small to medium <=4,5 m^2 sign sizes	• Vandal resistence better than for simply boxed because of hidden brackets but materials still a liability
	• More rigid than simply boxed sign	• Not for use in a highly polluted area
	• Suitable for urban environments	• Electrical connection needed
	• Very neat looking - no visible brackets	• Not fire resistant
	• Very versatile mounting options either one or two posts	• Not very crashworthy - will break
	• Material, manufacture, installation costs average	• Special brackets and tensioner with cable needed for mounting
	• Light weight	• Trained labour and special equipment needed to manufacture, install and maintain
	• Can be swivelled around post for any direction if single post mounted	
	• Durability better than simply boxed because of more bracing	
Large Internally Bráced Boxed	• For internally illuminated boxed signs larger than 4,5 m^2	• Expensive to manufacture, install and maintain because of size
	• Suitable for urban areas	• Trained labour and special equipment needed to manufacture, install and maintain
	• Fire resistance above average because of higher mounting levels	• Electrical connection needed
	• Vandal resistance above average	• Heavy construction
	• Durability average	• Heavy supports needed with heavy carrier beams and brackets for mounting
	• Crash worthyness good because of heavy supports	

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TABLE 15.12 **BACK PLATE FRAMEWORK FOR BOXED SIGNS** **TABLE 15.12**

Framework Type	Advantages	Disadvantages
Matrix of Rotating Discs	• Versatile because of more than one message	• Specialised applications
	• Higher visibility because of movement	• Electrical connection necessary
		• Expensive to manufacture, install and maintain
		• Trained labour and special equipment needed to manufacture, install and maintain
		• Not for use in polluted areas
		• Electro-mechanical system needs more maintenance - many moving parts
		• Purpose made boxes and illumination for signs
		• Needs illumination
Rotating Cylinders	• Versatile because of multiple message display	• Same disadvantages as for Rotating Discs
	• Higher visibility because of movement	• Specialised applications
Fibre Optic	• Versatile because of multiple message display	• Sophistication makes for expensive manufacture, installation and maintenance
	• High visibility because of halogen illumination	• Trained labour and special equipment needed to manufacture, install and maintain
	• No electrical motors or gears for maintenance	• Specialised applications

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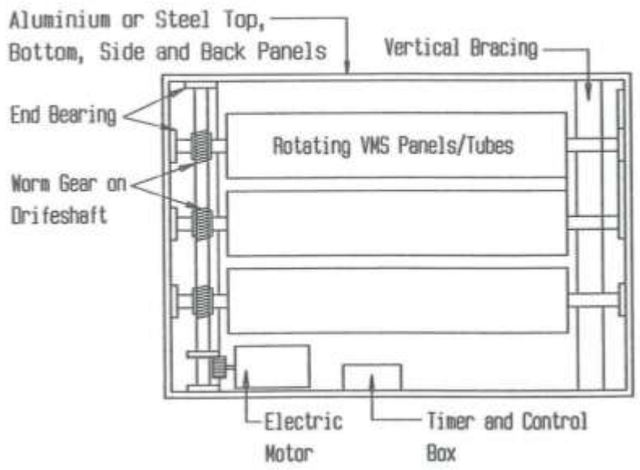
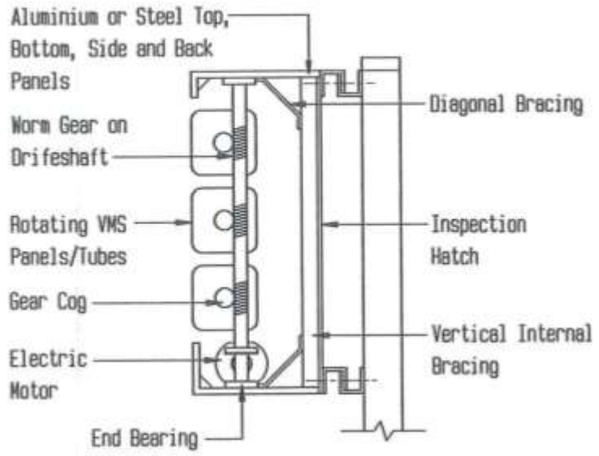
Detail 15.28.1 Boxed Motorised Rotating VMS Panels Composition

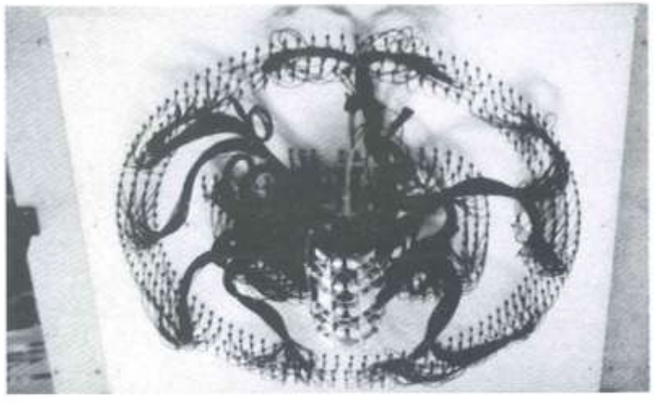


Internal Layout (Front Panel Removed)

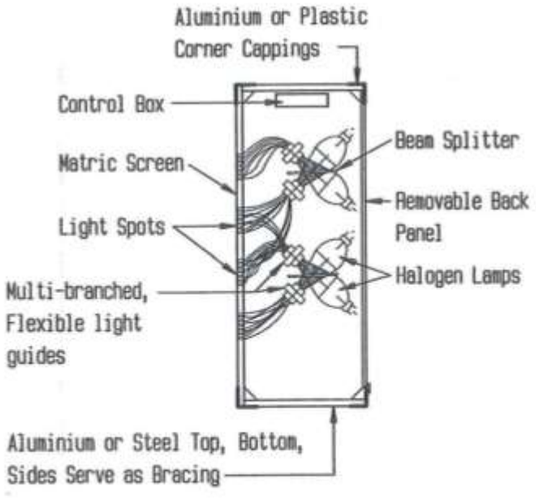


Sectional Side Elevation

Detail 15.28.2 Boxed Fibre Optic VMS Composition



Back Plate View (Fibre Optic Cables Layout)



Sectional Side Elevation

Fig 15.28
Sign Back Plate and Framework for Variable Message Road Signs

15.4 CHOICE OF MATERIALS FOR AND COMPOSITION OF SIGN SUPPORT STRUCTURES

15.4.1 General

1 The general considerations, mentioned in Section 15.3.1, regarding the selection of materials for the component parts of signs, are also applicable to this section for choosing materials for sign supports and structures.

15.4.2 Sign Support Materials

1 The most widely used sign support materials are timber poles (usually treated circular poles), steel or aluminium pipes or tubes (different cross sectional profiles) and steel or aluminium rolled or extruded sections (different cross sectional profiles). Infrequent use of reinforced concrete posts (solid pole or pipe), asbestos cement pipes and glass reinforced polyester (GRP) poles or pipes also takes place. The material types are indicated in Figure 15.29.

2 Wooden or timber posts should be moisture, fire and termite resistant exterior grade complying with the requirements of SANS 457:2000 and with a cross section of at least 100 mm x 100 mm or peeled poles of nominal diameter 120 mm. They should be creosote impregnated in accordance with SANS 673:2008, with creosote complying with the requirements of SANS 538:2007 or SANS 539:2007. Hard pinewood poles are preferred because of their fracture properties, and suitability for post peeling and preservative treatment.

3 Steel supports complying with the requirements for Grade 43C of BS 4360, of outside diameter at least 50 mm, wall thickness of at least 3,5 mm and hot-dip galvanized in accordance with the requirements of SANS 121:1999, or painted/powder coated in accordance with the requirements of CKS 193. Cross sectional profiles in steel could be any of the pipes, tubes and rolled or extruded profiles. Welding of steel work should be carried out as per the standards prescribed in BS1856 or BS693, whichever is applicable. Steel tubular structures fabricated by welding, and to be painted, shall have sealed joints for members inaccessible for inside painting after fabrication.

4 Aluminium alloy supports should be of drawn tube format complying with the requirements of BS1471 and condition codes HT30-TF or HT9-TF, or of extrusion profiles complying with the requirements of BS 1474 and condition codes HE9-TF or HE30-TF.

5 When reinforced or prestressed concrete posts are used as supports they should be complying with the requirements of SANS 470 and SANS 676.

6 Asbestos cement pipes used as sign supports should comply with the requirements of SANS 819.

7 Glass reinforced polyester (GRP) poles or pipes used as sign supports should comply with the requirements of SANS 141.

8 Another consideration when choosing support materials is the breakaway method to be used for signs placed in locations where there is the risk of vehicle impact i.e. the posts of the structure should be of frangible construction. There are various methods of achieving frangibility for instance the use of breakaway holes drilled in the supports at their bases or the use of base plates. In the case of parts with base plates, usually steel or aluminium supports, the base plates should be made from a material similar to that from which the posts were made and the base plate should be protected against corrosion by the same method as that applied to the parent posts. The quality of the finish of the base plate should be such that it complies with the appropriate requirements, similar to that of the parent post.

15.4.3 Composition of Sign Support Structures

1 The critical issue in selecting and installing signs is the type of support structure used for ground mounted or for overhead mounted signs, and the advantages and disadvantages of the different types and materials should be considered. Tables 15.13 and 15.16 indicate the advantages and disadvantages. Road signs in general vary considerably in size. For high speed traffic on freeways larger signs are required than for traffic on urban streets. Larger signs are also necessary where traffic volumes are heavy or background activities compete for the driver's attention. The sign size, location and safety requirements determine the size and type of sign supports required. Single posts are frequently used for regulatory, warning and smaller information signs. For larger signs two or more supports may be required. The basic structures for ground mounted signs are the following:

(a) single support;

(b) multiple supports;

(c) multiple braced supports;

(d) multiple compound supports (ladder or lattice);

(e) host support.

2 Sign supports are generally made of mild steel, aluminium or wood. In deciding which type of material to use the advantages and disadvantages of each type should be considered. The shapes of mild steel supports are tubular, box section or rolled steel joists. Aluminium is used for smaller sign supports and for overhead sign bridges. Wooden or timber sign supports are generally either dressed wood of rectangular section, or `post peeled' poles treated with creosote.

3 Larger ground mounted signs often require heavier rolled I-beam or tube type supports. These sections should only be used with a breakaway mechanism when they may be hit by an errant vehicle. Legs of the larger overhead sign mounting cantilever or gantry structures, however, are more rigid and should be protected by either a lateral distance from the roadway or with guardrails. The basic support structures for overhead mounted signs are:

(a) cantilever structure;

(b) portal or gantry structures : cable, trestle, truss or lattice, box section;

(c) host structure.

4 A sign support structure must be durable and structurally adequate for given wind and ice loads. Multiple supports should be used where design wind loads indicate that a single support would be inadequate. Vertical supports for sign bridges

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designed to transfer stress or moment to the bridge through the joints should be connected so as to make the transfer effective. Sometimes small signs must be mounted overhead using a span wire or cable as a support structure. Span wire sign installations must be anchored at both the top and the bottom to avoid excessive swinging in the wind. To save installation costs and minimise sidewalk obstructions, signs could be placed on supports existing for other purposes, such as traffic signals, street lights, new jersey barriers, walls and overhead bridge structures.

5 Sign supports erected close to the travelled roadway without guardrails, should be of a yielding, bending, fracture or breakaway construction in order to reduce vehicle damage and injury to occupants in the event of vehicles colliding with them. The basic concept of a breakaway sign support is that of a structure which possesses sufficient moment of resistance to withstand wind loads, yet offers low shear resistance at the base to a colliding vehicle. In the event of a collision the structure should yield or breakaway. Failure should occur in such a way that:

(a) serious secondary collision of the sign or support with the vehicle is avoided;

(b) energy absorbed from the impacting vehicle is kept to a minimum (a maximum reduction of 17 km/h in the speed of the impacting vehicle is considered acceptable), and damage to the vehicle is low.

6 Thus a major consideration in the choice of support for a sign structure is its frangibility, also referred to in Section 15.2.7, in case of impact by a vehicle. Frangibility for single support ground mounted signs can be obtained by one of the following methods:

(a) fracture or bending for simple timber or small diameter, thin walled pipe or tube supports;

(b) breakaway sleeve or threaded coupling for pipe or tube supports;

(c) breakaway slip base plates for pipe, tube or other profiled supports for small to large signs;

(d) bending and breakaway for large diameter, deformable, pipe with sub-surface split base sockets.

7 Frangibility for multiple support ground mounted signs can be obtained by one of the following methods:

(a) bending for small diameter thin walled pipes or tubes;

(b) breakaway holes drilled through timber or steel support posts or pipes, and bracing supports, just above their bases;

(c) shearing base plates for ladder supports consisting of small diameter thin walled pipes;

(d) breakaway slip base and hinged below sign sections, for pipe, tube or other profiled supports;

8 Because of the size of supports needed for overhead sign structures no frangibility treatment is possible and these supports, being heavy steel pipe or box sections, are normally mounted on rigid base plates. These rigid structures present a hazard to vehicles and should be protected by either a lateral distance displacement or a guardrail. See Section 15.2.7 for more details.

9 Table 15.16 indicates the different frangibility types as they relate to the different support structures while Figures 15.32 to 15.35 indicates the different frangibility methods graphically.

10 Welding of steel work should be carried out according to the standards prescribed in BS 1856, BS 693 or BS 938, whichever is applicable. Also important in cases where aluminium plate or sections will be in contact with steel work, the contact surface should be painted with a bituminous paint. Where bolts and nuts are used to secure different metals, they should be cadmium plated or stainless steel.

11 The trend towards subcompact and mini sized vehicles continues throughout the world today. **Sign support structures' criteria and design should allow for these smaller vehicles, especially since many of the structures that used to be considered adequate will not meet current criteria.** New installations should meet current AASHTO criteria and where possible, existing installations should be upgraded to current criteria. The paragraphs hereafter summarises some of the application requirements for the different support structures.

12 Wooden sign supports have certain advantages. They are not subject to corrosion and are not likely to require much maintenance. If wooden poles are `post-peeled' the appearance should be acceptable. Wooden poles should be treated with creosote under pressure to give a long expected life. This means that the poles would not normally be painted. Breakaway properties, for supports with 100 mm Ø, are obtained simply and inexpensively by drilling the required holes, preferably prior to creosote treatment. Note that the size of the breakaway holes, to be drilled, is related to the diameter of the support. If necessary, drilling and cutting can be done on site and the exposed portions dipped in hot creosote. Hard pinewood poles are preferred because of their fracture properties, and suitability for post-peeling and preservative treatment. Wooden supports are also appropriate for use as single support or multiple supports for larger signs. If larger signs require multiple supports with bracing diagonal supports the bracing supports should have breakaway holes similar in size to the vertical supports. Breakaway holes are drilled, through supports, at right angles to the direction of traffic on the roadway.

13 Single small diameter, 32 mm to 76 mm nominal diameter, yielding (wall thickness less than 3 mm) mild steel posts driven into the soil or set into concrete, bend over if impacted by a vehicle and are unlikely to cause injury to unrestrained occupants. In a collision with a 76 mm nominal diameter steel post some injury to an unrestrained occupant is probable, while the correct use of seatbelts would almost certainly prevent injury. Single 50 mm to more than 65 mm nominal diameter, wall thickness more than 3 mm, steel posts can be made breakaway by incorporating a standard pipe coupling (threaded socket) located just above ground level. Under impact the pipe pulls out of the socket or shears across the threads. This system works satisfactorily when the clearance to the underside of the sign exceeds

(continued on page 15.4.7)

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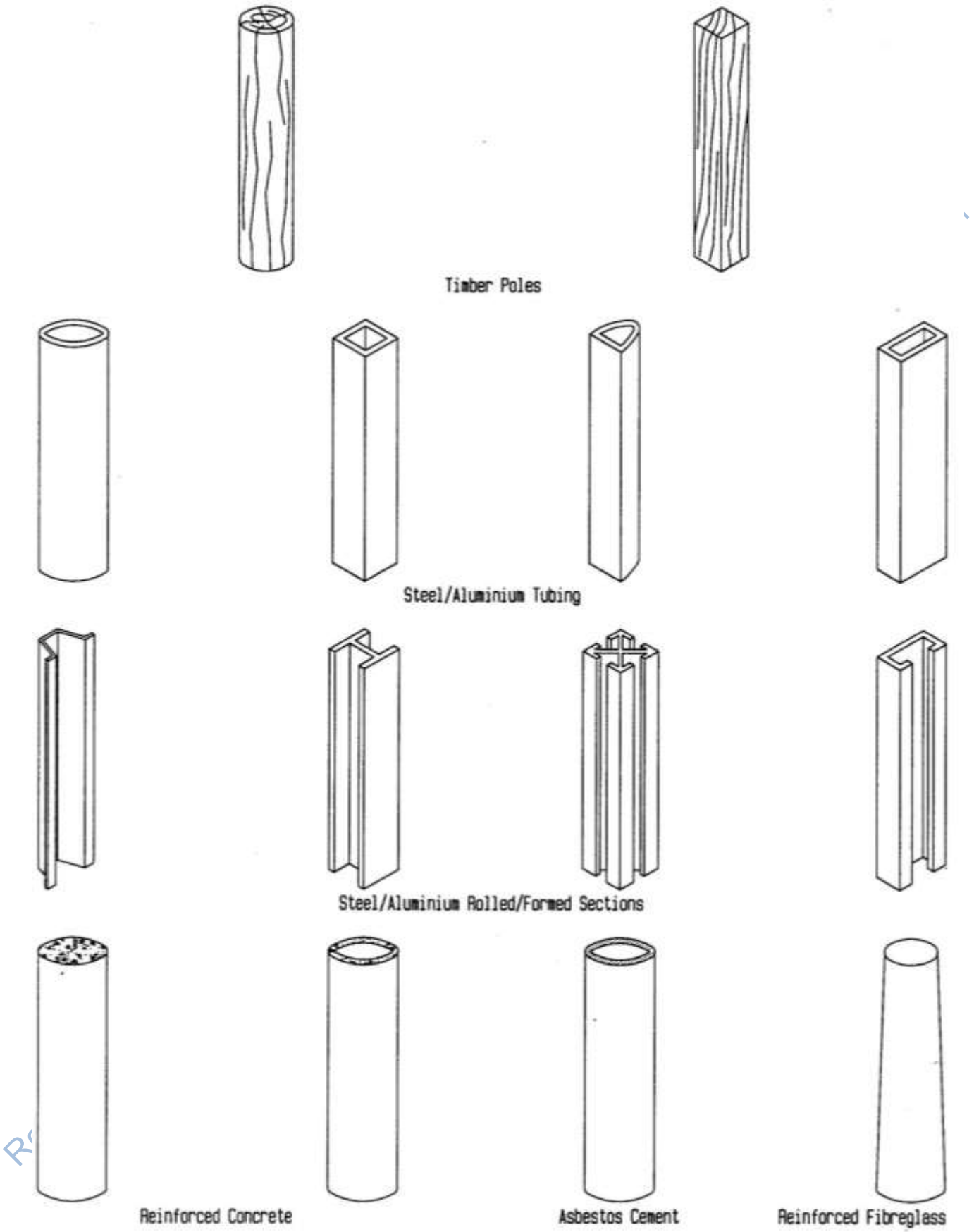

Fig 15.29 **Typical Sign Support Material Types**

TABLE 15.13 SIGN SUPPORT MATERIAL TYPES TABLE 15.13

Material Type	Advantages	Disadvantages
Timber	• Low cost/cheaper than steel	• Veld fires may damage
	• Frangibility - fracture properties better than for steel (breakaway holes near base)	• Termite food
	• Drilling and cutting on site	• Must be treated properly with chemicals against pests and rot
	• Allows strap fixing of signs	• Shorter life span than steel
	• Cannot rust	• Prone to rotting at base if not treated correctly
	• Suitable for use in urban, rural and conservation areas	• Top ends need capping/binding
	• Material and installation costs low	• Not suitable for use in desert areas, because of sand-blast effect, or polluted areas because of rot
	• Manpower and equipment requirements low for installation and maintenance	• Vandal resistance below average due to ease of theft
Steel Tubing	• Widely used for sign supports	• Posts of sizes ϕ> 76 mm (> 3 mm wall thickness) needs frangible treatment i.e.. break away holes, slip bases, etc.
	• Fragibility - bends if ϕ < 76 mm and wall thickness < 3 mm	• Drilling and cutting not so easy on site
	• Allows for internal illuminated sign - cables inside tube - vandal resistant and safe	• Needs galvanising, plasticising treatment against corrosion and rust
	• Many profiles to choose from i.e. pipe, square, D-section, rectangular	• Top ends need caps
	• Used in most climate/weather types	• Painted support need maintenance more frequently than galvanised
	• Veld fire and pest resistant	• Not really suited for polluted or very wet areas without treatment
	• Can be used in urban and rural areas	
	• Costs for material, manufacture, installation and maintenance low	
	• Durability better than for timber	
Aluminium Tubing	• Especially suited for coastal and polluted areas	• Vandal resistance low due to theft
	• Easier to cut and drill	• Veld fires might damage
	• Lightweight	• Top ends need caps
	• Pest resistant	
	• Particularly suitable for urban use	
	• Bending or fracture properties better than for steel(frangibility)	
	• Tubing allows for internally illuminated signs	

TABLE 15.13 SIGN SUPPORT MATERIAL TYPES TABLE 15.13

Material Type	Advantages	Disadvantages
Steel Rolled Sections	• Mounting of signs can be easier due to available flanges	• Generally more expensive than tubing
	• Cross sectional profile may make it easier for sliding in panels	• Needs specialised fragibility treatment due to cross sections
	• Some of the other properties mentioned under steel tubing are also applicable to sections	• Some of the disadvantages mentioned under steel tubing are also applicable to sections
Aluminium Rolled Sections	• Some of the advantages of aluminium tubing also applicable to rolled sections	• Similar disadvantages to aluminium tubing
	• Mounting of signs easier due to available flanges	• Generally more expensive than tubing
	• Many different cross sectional profiles available	• Needs specialised frangibility treatment due to cross sections
Reinforced Concrete	• Long lasting	• Too rigid, poor frangibility
	• Pest resistant	• Heavy
	• Rigid	• Not crashworthy
	• Vandal Resistant	• Not easy to manufacture, install and maintain
Asbestos Cement	• Good frangibility properties	• Asbestos dangerous for health when drilling or sawing
	• Long lasting	• Not easy to work with
	• Better for handling than concrete	• Not crashworthy
	• Fire, theft, rust, pest, corrosion resistant	
Reinforced Fibreglass	• Excellent frangibility properties	• Fire may damage
	• Rust and corrosion resistant	• Expensive
	• Pest resistant	• Not crashworthy
	• Easy to work with - sawing and drilling	
	• Light weight	

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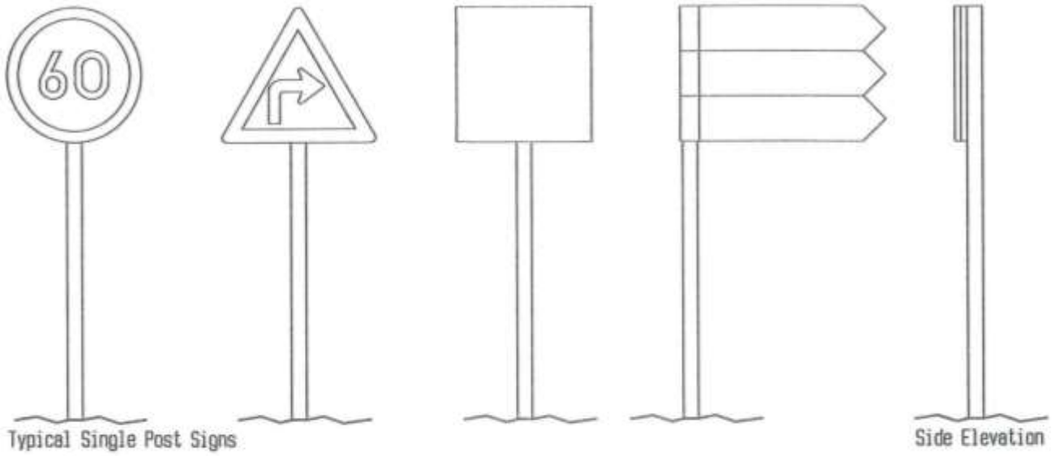
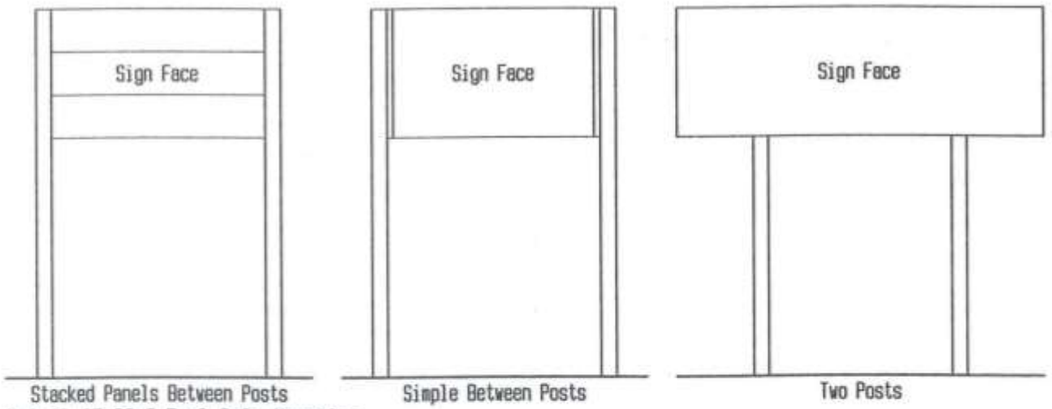
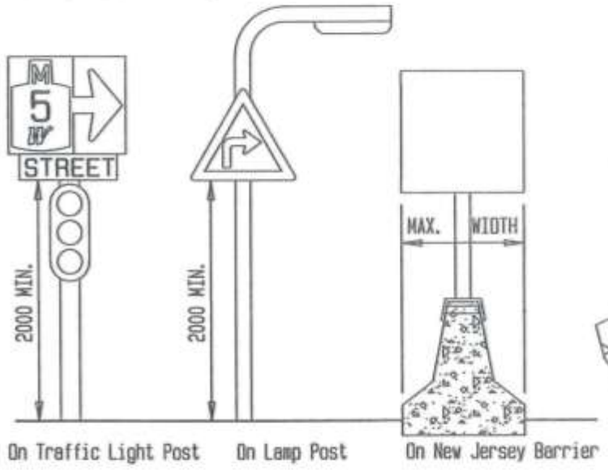
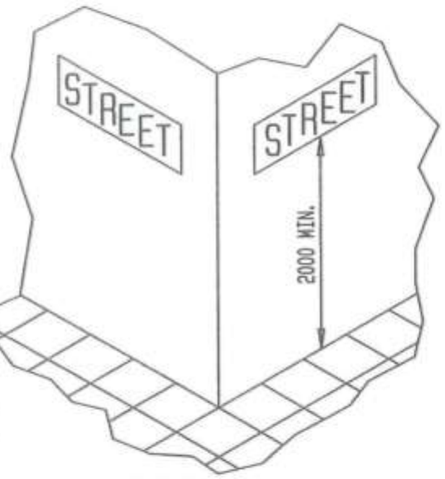
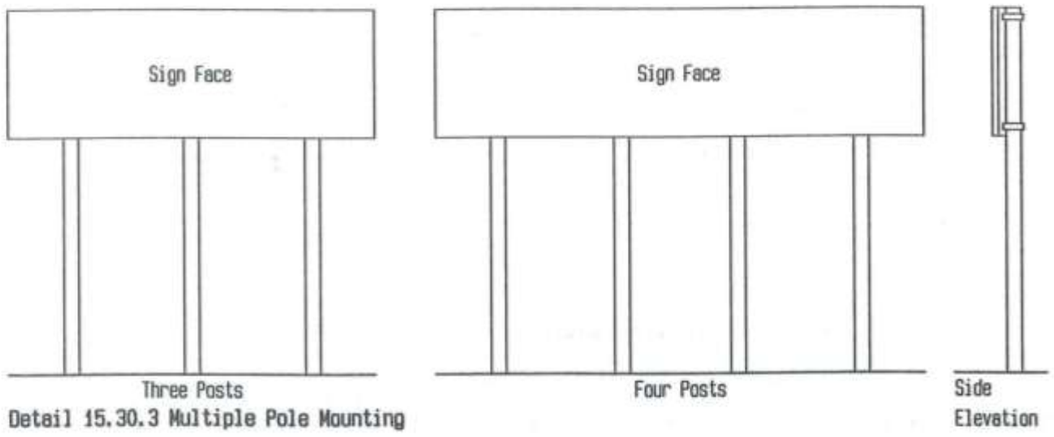




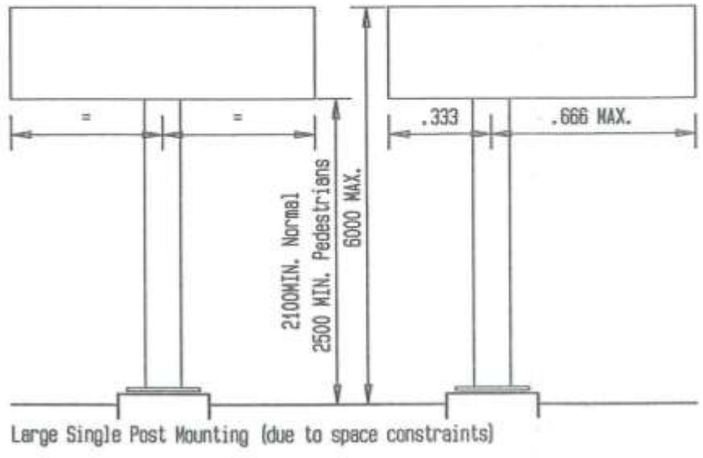
Detail 15.30.2 Dual Pole Mounting



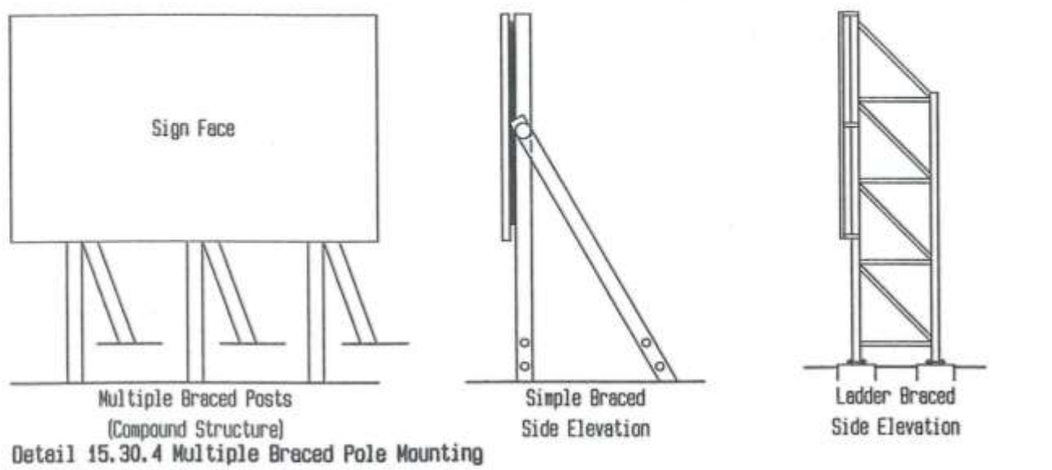




Detail 15.30.3 Multiple Pole Mounting



Detail 15.30.1
Single Post Types of Mounting



Detail 15.30.4 Multiple Braced Pole Mounting

Fig 15.30
Sign Support Structure Types for
Ground Mounted Signs

(continued from page 15.4.2)

2,1 m. If the clearance is less then 2,1 m some secondary collisions with the windshields of the impacting vehicle may occur. Small diameter, thin walled pipe supports could also be used for the mounting of smaller signs between two posts.

14 The breakaway type of single post mounted in a slip base is frequently used to support small signs. The base plate, for single support signs, is mounted at an angle of 20^{o} for smaller signs, 10^{o} for larger signs, to the horizontal, facing upwards and away from approaching traffic. In the event of a vehicle striking the post the holding down bolts release, allowing the inclined base to slip up and off the base stub post. The post and sign rotate over the vehicle as it passes underneath without the sign hitting the top of the vehicle. Tubular posts larger than 65 mm diameter, wall thickness more than 3 mm, box-section posts or rolled steel joists can be mounted on slip bases. The slip base design is not suited to lightweight thin-walled pipe supports which may be liable to crushing at the point of impact. This may delay the release of the base and cause the sign to strike the top of the vehicle. Nor is this type of support suited to installation on narrow medians or traffic islands separating traffic flowing in opposite directions. In the event of an impact from the opposite direction the inclined slip base may tend to bring the sign down through the windscreen. Where the impact may be from either direction the slip base should be set horizontally instead of being inclined. Where a tubular steel post of 76 mm Ø is required, the use of multi-directional slip base is an option. This type of base incorporate a series of riser plates to impart an upward velocity component to the sign support on vehicle impact. The upward movement of the support causes it to go over the top of the vehicle and so reduces the danger of secondary collision.

15 The sub-surface split base socket is used extensively in Europe for the mounting of small to medium sized ground mounted signs on single supports. The supports are normally larger than or equal to 76 mm diameter, wall thickness more than 3 mm, deformable steel/aluminium pipes, the bases of which are held in place by special, 150 mm split sockets below ground/sidewalk surface level. The split of the sockets are at right angles to the direction of traffic on the roadway. The philosophy behind this type of support structure, normally located on the sidewalk, is that the support will yield initially by bending in the case of a vehicle impact. The split base socket will then split apart and release the support base allowing the vehicle to pass over the sign structure. In Europe a few standardised support sizes and split socket sizes are in use having the advantage of quick and easy installation or maintenance. The sub-surface socket and base fixing methods makes for a very neat installation, especially in paved sidewalk areas. Making good after an accident is especially easy and quick, by just replacing the support, the socket bolts and making good the paving.

16 The mounting of what should be normally multiple support ground mounted signs, on single supports frequently occurs in urban areas. This type of support is usually dictated by space constraints, for example pedestrian walkways or bicycles paths, or even under-ground cables or pipes not allowing for a second or third post footing. The single support post size will be larger than for multiple supports with diameters or cross sectional sizes more than 150 mm, wall thicknesses more than 6 mm, in order to cater for the wind load and size of sign. This makes for a rigid structure that will be mounted on a rigid base plate allowing no frangibility. The lateral clearance from the roadway should be increased or the structure should be protected by kerbing or guardrails. The main advantage is that one post requires one foundation only and the structure allows free movement around and under it.

17 The hinged joint and slip base breakaway type of steel support has also been used on freeways and urban arterial roads for multiple support ground mounted signs. Mild steel box-section posts, rolled steel joists or other sections are used. In the event of a vehicle striking a support the holding down bolts allow it to split off the horizontal lower base plate. The support then rotates about the hinged joint, just below the sign's lower edge, formed by the uncut face of the section, clearing the vehicle as it passes under the sign (see Fig 15.33). Due to fatigue failure resulting from vibrations set up by the wind, the use of brittle cast iron fracture plates at the hinged joint has been changed to the slotted steel friction fuse plate (notched slip plate) shown. Windy conditions have also been known to cause holding down bolts of the slip-base to vibrate out. This can be overcome by inserting a thin non-slotted bolt-keeper gasket between the slip base plates. The base stub post is generally set in concrete and should project sufficiently to be kept clear of the surrounding ground level, but not high enough to snag the underside of an impacting vehicle. Slip bases require continual maintenance to ensure that they do not become covered over by soil and vegetation which may result in corrosion and subsequent failure to respond satisfactorily under impact conditions. Correct tensioning of the connecting bolts at the hinged-joint and slip-base is essential to proper functioning of breakaway sign supports.

18 Steel pipes with breakaway holes drilled near the bases could also be used for multiple support ground mounted signs, instead of timber poles. The sizes of the breakaway holes, in a similar manner to timber posts, are related to the diameter and the wall thickness of the support pipe. If bracing supports are required these should have similar sized breakaway holes to the upright supports. Steel pipes with diameters of 100 mm - 150 mm, and wall thicknesses of 2 mm - 3,5 mm, are often used. A disadvantage of non-galvanised pipes is that they should be painted, whereas treated timber supports need no painting.

19 Two to four ladder supports, consisting of small diameter (50 mm - 76 mm) thin walled (less than 3 mm) steel pipes welded into a ladder or lattice structure, with welded on base plates, could be used for multiple support ground mounted signs. The important issues to the composition of each ladder support are the size, and wall thickness, of the steel pipes and the requirement that the base plate should be welded to the pipe and without additional stiffeners/gussets. This is important for the shear function of the base plate because the weld is the friction point of the structure. The advantages of using ladder supports are numerous:

(continued on page 15.4.10)

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TABLE 15.14 SIGN SUPPORT STRUCTURE TYPES FOR GROUND MOUNTED SIGNS **TABLE 15.14**

Structure Type	Advantages	Disadvantages
Free Standing Single Post for Minor Signs	• Cheap • Easy and quick to erect • Minimum mounting brackets • Good frangibility • Many material types can be used	• Problem to erect tidily (vertical/plumb)
On Existing Single Traffic Signal Post	• Most conspicuous position • No extra support needed	• Only street name, route marker, one way, no entry, left or right turn or prohibition signs allowed • Special mounting brackets or extension support needed
On Existing Single Lamp Post	• No extra support needed • Easy and quick to mount	• Only recommended for smaller warning, regulatory, street name or route marker signs
Single Post On New Jersey Barrier	• Useful for display of smaller warning and regulatory signs - better visibility	• Not recommended for larger signs because of width restriction • Special mounting brackets and extension support needed
Single Post Mounting for Multiple Post Signs	• Ideal for areas with vertical or lateral space constraints i.e. pedestrian or parking area allowance	• Support post can be very big and heavy if the signs are too large i.e. > 10 m^2 • Not easy and very time consuming to erect • Sign back plate width and height constraints • Frangibility or safeguarding measures a necessity
Two, Three or Four Posts Only	• Generally used for medium to large signs but with backplate height < 1,2 m • Width of sign prescribes multiple posts • Timber or variety of cross sectional steel / aluminium supports possible • Manufacture and installation costs and resource requirements low and unsophisticated • Easy to maintain	• Frangibility or safeguarding measures a necessity i.e. provide breakaway holes • If timber supports treat against pests and rot • If steel supports treat against rust and corrosion • Signs back plate height less than 1.2 m
Multiple Braced Posts	• Generally used for medium to large signs where sign back plate height > 1.2 m • Height of sign prescribes diagonal support bracing/struts • Timber or steel tube supports • Material costs low	• Frangibility by breakaway holes • If timber support treat against pests and rot • If steel supports treat against rust and corrosion

TABLE 15.14 SIGN SUPPORT STRUCTURE TYPES FOR GROUND MOUNTED SIGNS **TABLE 15.14**

Structure Type	Advantages	Disadvantages
	• Manufacture and installation cost and resource requirements low and unsophisticated • Easy to maintain	
Multiple Ladder Braced Posts	• Horizontals can be used for scaffolding for sign mounting • Frangibility excellent i.e. ϕ60 mm or ϕ76 mm posts - 3 mm wall thickness forms ladder • Welded-on base plate will provide shear function (weld is friction point) • 2 tube diameters will allow for the mounting of 95% of sign sizes using only one or two bracket types • Very strong and rigid but lightweight • Suited for any sign type and width - just add more ladders • Widely used in Europe and America • Easy to assemble and maintain • Pest and fire resistant	• Must be manufactured in a proper workshop by skilled labour • Must be treated against rust and corrosion • Measures needed against vandalism because ladder affords easy access to sign • Expensive to manufacture

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(continued from page 15.4.7)

(a) the size and wall thickness of the pipes is within the range allowed for bending frangibility for ground mounted sign supports, without additional protection by kerbing or guardrails;
(b) 90% of all signs could be mounted on ladders of one common size; the number and length of ladders will just increase but the size of pipes will be the same throughout (standardisation);
(c) crashworthiness is very good because vehicles will just move through the sign structure on impact, the ladder will shear at the base plate and yield by bending;
(d) because only two pipe sizes are used all sign sizes can be mounted using two bracket types only;
(e) the horizontal welded tubes in the ladders allows for scaffolding for easy mounting of signs.

20 The major disadvantages of ladder or lattice supports are that thin walled tubing is difficult to weld, maintenance is complicated, and ladders are not suited for erection on the slopes of steep cut or fill road cross-sections. All the welds should be properly executed and pipe ends capped to guard against rust and corrosion.

21 Another structure type that can be used for multiple support ground mounted signs is the A-frame or trestle. The A-frame for ground mounted signs is not suited to erection on steep side slopes and the appearance is less pleasing than other types of support. Lightweight tubular steel members or perforated aluminium U-sections may be used. The A-frame sign support structure could be made up of tubular steel members connected by pins through frangible joint connectors. On impact the joints fracture and the pins shear. The support is designed to buckle in the area of high bending moment near the upper connection point, allowing the support to clear the vehicle as it passes under the sign. The thin-walled tubing used for the A-frame is difficult to weld and maintenance is complicated. The A-frame support structure could also be made up of lightweight perforated U-section aluminium members. The connections are made by means of bolted angle-section connectors. The support is so designed that the lightweight members will buckle and the bolted connections will shear upon impact by a vehicle.

22 Some of the ground mounted sign support structures are indicated in Figure 15.30 while the support structures for overhead mounted signs are indicated in Figure 15.31.

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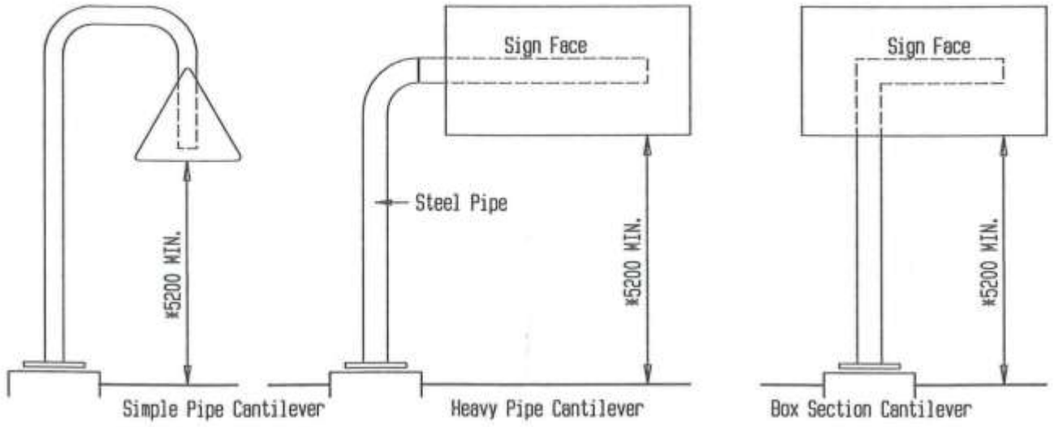
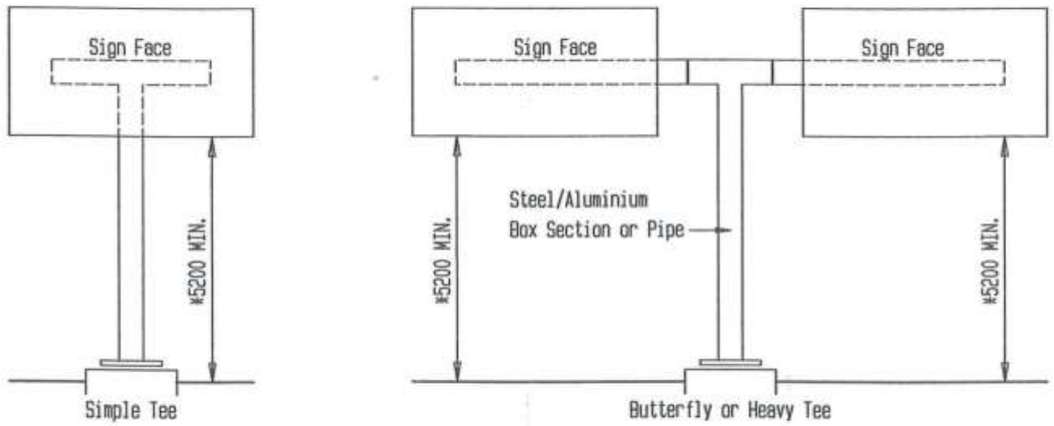
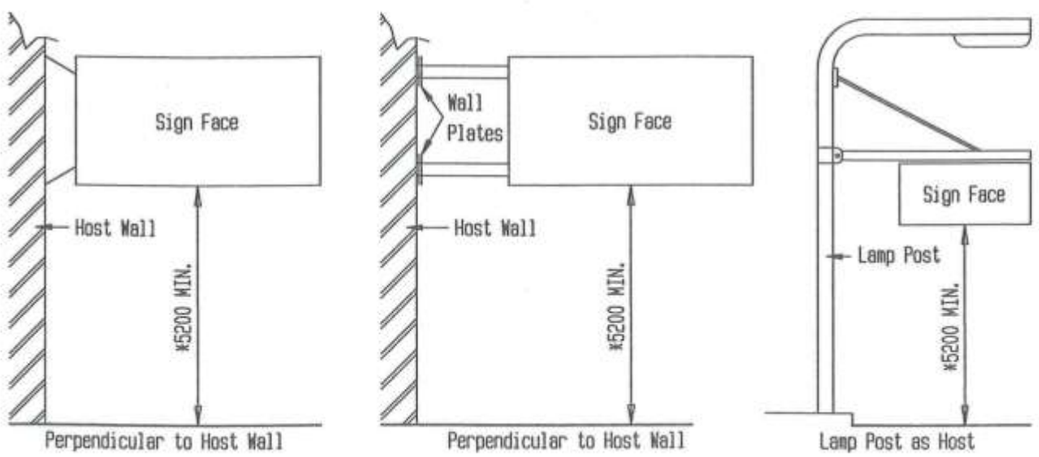


Detail 15.31.1 Simple Cantilever

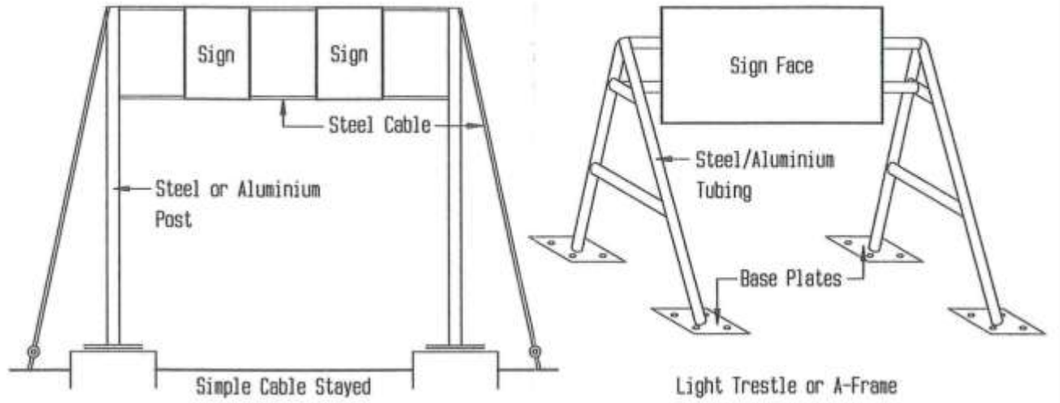


Detail 15.31.2 Multiple Cantilever

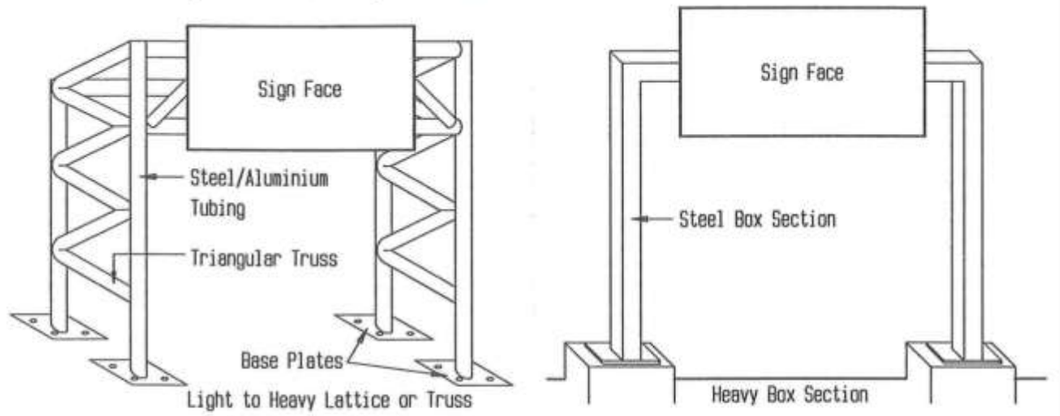
* Vertical clearance from highest point on roadway



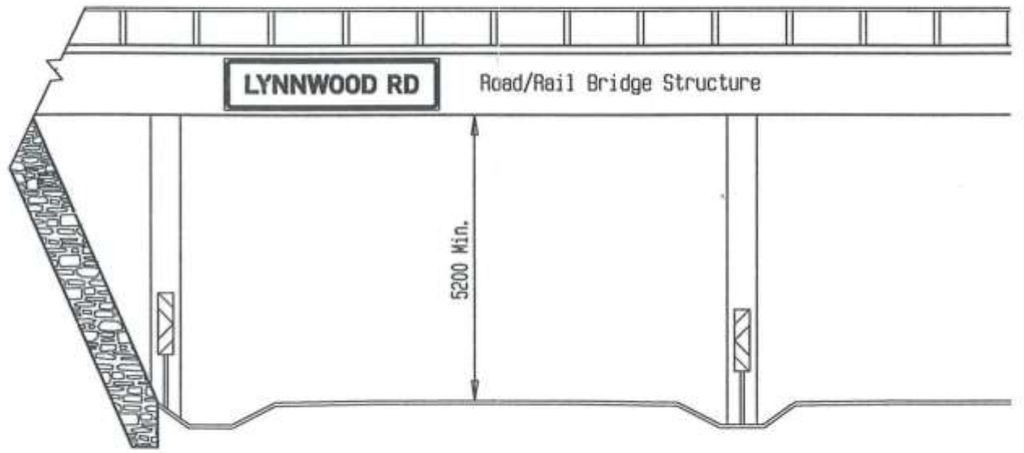
Detail 15.31.3 Host Support Cantilever



Detail 15.31.4 Light Portal /Gantry Structures



Detail 15.31.5 Heavy Portal /Gantry Structures



Detail 15.31.6 Host Overhead Structures

Fig 15.31
Sign Support Structure Types for Overhead Mounted Signs

TABLE 15.15 SIGN SUPPORT STRUCTURE TYPES FOR OVERHEAD MOUNTED SIGNS **TABLE 15.15**

Structure Type	Advantages	Disadvantages
Simple Pipe Cantilever	• Light weight • For roads with vertical and or lateral space constraints • Visually pleasing looks • Mostly for use in urban areas • Costs for material, manufacture, installation and maintenance low • Excellent vandal resistance and durability • Pest and fire resistant	• Only for smaller (<=1.5 m^2) signs • Should be treated against rust and corrosion • Pipe bending machine required to bend cantilever post • Frangibility could be a problem because of more rigid construction
Heavy Pipe or Box Section Cantilever	• For the mounting of larger signs • For use in urban areas mostly • Excellent vandal resistance and durability • Pest and fire resistant • For roads with vertical and/or lateral space constraints or freeways	• Heavy and rigid / large footing • No frangibility • Should be treated against rust and corrosion • Specialised welding and equipment needed to manufacture • Skilled labour needed to manufacture and install • Expensive to manufacture, install and maintain
Simple Tee	• For location in a gore or on an island • Excellent vandal resistance and durability • Pest and fire resistant	• No frangibility protect with guardrails • Should be treated against rust and corrosion
Butterfly or Heavy Tee	• For use in a gore area or median where there are space constraints • Excellent vandal resistance and durability • Pest and fire resistant • Mostly used in urban areas	• Not a very stable structure • No frangibility - must be protected with guardrails • Heavy structure / footing • Should be treated against rust and corrosion • Specialised equipment and skilled labour needed to manufacture/erect
Perpendicular to Host Wall	• For use where lateral space constraints No upright support posts • Excellent vandal resistance and durability • Pest and fire resistant • No frangibility problems	• Not recommended for larger signs • Special purpose-made structure needed • Should be treated against rust and corrosion • Host wall must be able to cary the sign mass and mounting structure

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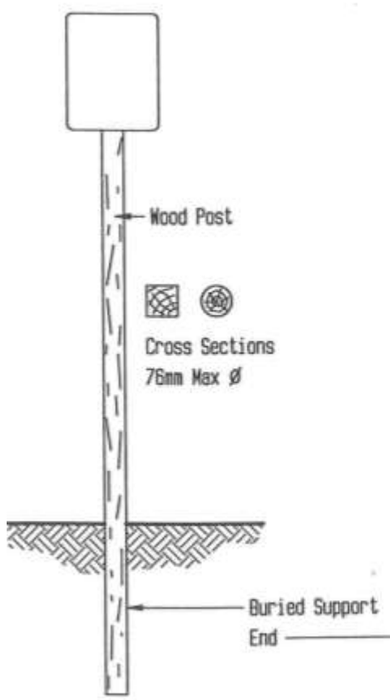
TABLE 15.15 SIGN SUPPORT STRUCTURE TYPES FOR OVERHEAD MOUNTED SIGNS **TABLE 15.15**

Structure Type	Advantages	Disadvantages
Lamp Post Cantilever	• For use in high density CBD area • Light weight • Excellent vandal resistance	• Not recommended for larger signs • Special purpose made mounting structure needed • Should be treated against rust and corrosion
Simple Cable Portal	• Lightweight and cheap • Easy to erect and maintain • Can be designed to be frangible	• Not recommended for larger signs • High wind speeds should influence use • Cables are a theft risk
Trestle or A-Frame Portal	• Horizontals can be used for scaffolding for sign mounting • Pest and fire resistant • Light trestle ideal for urban use because of stability	• Proper welding by skilled labour to manufacture • Must be treated against rust and corrosion • Measures needed against vandalism because structure affords easy access to sign
Lattice or Truss Portal	• Horizontals can be used for scaffolding for sign mounting • Pest and fire resistant • Durable and stable structure	• Same as above for A-frame
Heavy Pipe or Box Section Portal	• Excellent vandal resistance and durability • Excellent pest and fire resistance • Urban areas mostly • For roads with more than 3 lanes	• No frangibility - heavy and rigid • Should be treated against rust and corrosion • Specialised welding and equipment needed to manufacture • Skilled labour needed to manufacture • Expensive to manufacture, install and maintain
Over - bridge Host Structure	• No upright support posts needed • Pest and fire resistant • No frangibility problems	• Special purpose made mounting structure needed • Mounting structure should be treated against rust and corrosion • Host structure must be able to cary sign mass and mounting structure • Vandal resistance dependent on whether sign can be reached from top of bridge

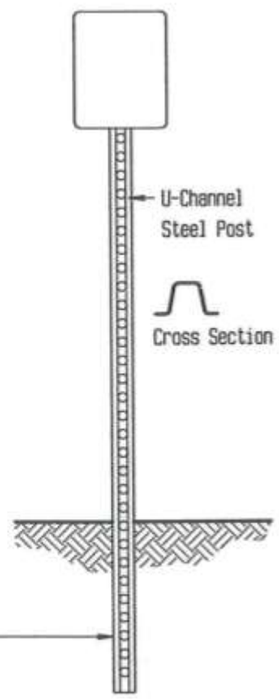
TABLE 15.16 **SUMMARY OF SUPPORT STRUCTURES, FRANGIBILITY TYPES AND FOUNDATIONS** TABLE 15.16

Sign Mounting Position	Number of Support Posts	Support Structure Type	SUPPORT SIZE		Support Frangibility Type	FOUNDATIONS		
			Ø or Profile Section	Wall Thickness		Anchor Type	Foundation Material	Top Level
Ground Mounted	Single	Simple Timber	76 mm MAX	-	Fracture, no Base Treatment	Buried or Knocked in Support End	Natural	GL
		Small Diameter Thin Walled Pipe/Tube	76 mm MAX	3 mm Max	Bending, no Base Treatment			
		Heavier Pipe/Tube Thicker walled	> 65 mm	>3 mm	Breakaway-Sleeve or Threaded Coupling at Base of Support	Sleeve or Stub Post	Soilcrete	GL
		Larger Diameter, Deformable Pipe for larger signs	>=76 mm	> 3 mm	Bending and Breakaway-Initial Bending, then Release by Sub-surface Split Base Socket	Anchor Hook Bolts	Mass Concrete	GL -150mm MIN
		Pipe/Tube or other profiled steel or aluminium support for small to medium sized signs	>=76 mm	> 3,5 mm	Breakwawy- 20°, 10° and Horizontal Slip Base Plates depending on Small or Large Sign and direction of traffic	Base Stub Post	Soilcrete	GL
		Large diameter heavy pipe/tube or profiled support for multiple post sign mounted on single post	> 150 mm	> 5 mm	No Frangibility-Rigid Base Plate	Anchor Bolt Group	Reinforced Concrete	GL +50 mm MAX
	Multiple	Simple between Small Diameter, thin walled pipe/tube	76 mm MAX	3 mm MAX	Bending, no Base Treatment	Support End	Optional Soilcrete	GL
		Two to four Supports, Braced or Not, Timber or Pipe	TIMBER >= 100 mm STEEL PIPE > 76 mm	- 2-3,5 mm	Breakaway holes. Sizes appropriate to support diameter at base	Support End	Soilcrete	GL
		Two to four Ladder Support, Small Diameter, Thin Walled Pipes	50-76 mm MAX	< 3 mm	Shearing Base Plate	Anchor Hook Bolts	Mass Concrete	GL +50 mm MAX
		Two to Four Supports, not Braced, Heavier Pipe or Tube or other Profiled Steel Posts	>= 76 mm	> 3,5 mm	Breakaway-horizontal Slip Base Plate at Base, and Hinge just below sign	Base Stub Post	Soilcrete	GL
Overhead Mounted	Single Cantilever	Simple Pipe or Tube for Small Sign	> 150 mm	> 6 mm	No Frangibility-Rigid Base Plate bolted to Hook bolts set in Concrete Foundation, for all Cantilever Support Types	Anchor Bolt Group	Reinforced Concrete	GL +50 mm MAX
		Simple Pipe, Tube or other Profile Tee						
		Butterfly						
		Heavy Pipe or Box Selection						
		Perpendicular to Host						
	Portal or Gantry with two legs	Simple Cable Stayed	> 150 mm	> 6 mm	No Frangibility-Rigid Base Plate bolted to Hook bolts set in Concrete Foundation, for all Cantilever Support Types	Anchor Bolt Group	Reinforced Concrete	GL +50 mm MAX
		A-frame or Trestle						
		Heavy Ladder and Truss						
		Heavy Pipe or Box Section						

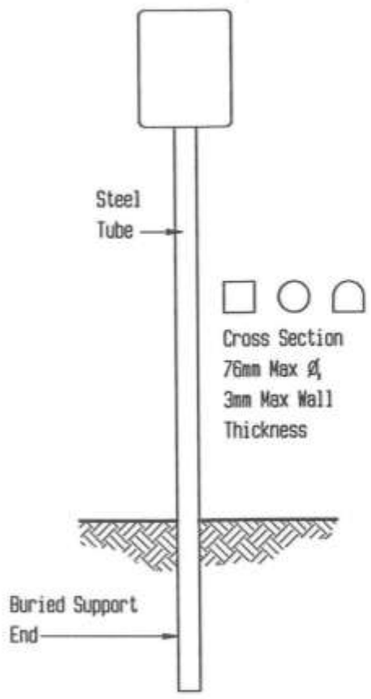
Note: Table 15.16 is applicable to Sections 15.4 and 15.5.



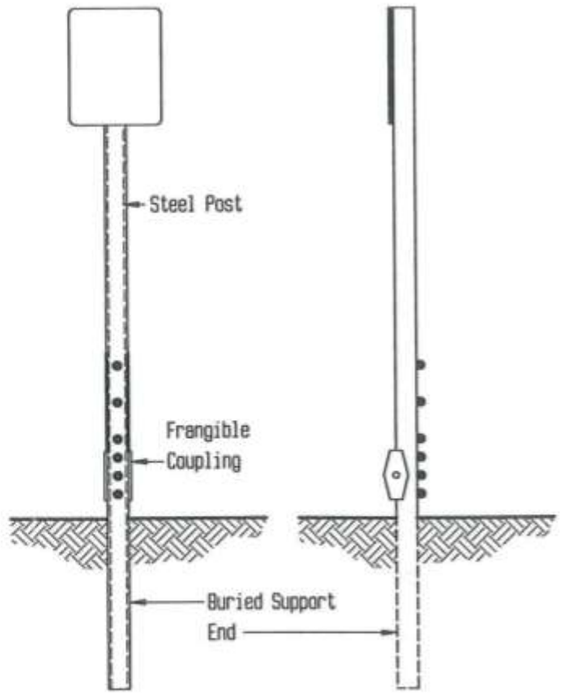
Detail 15.32.1 Fracture Breakaway



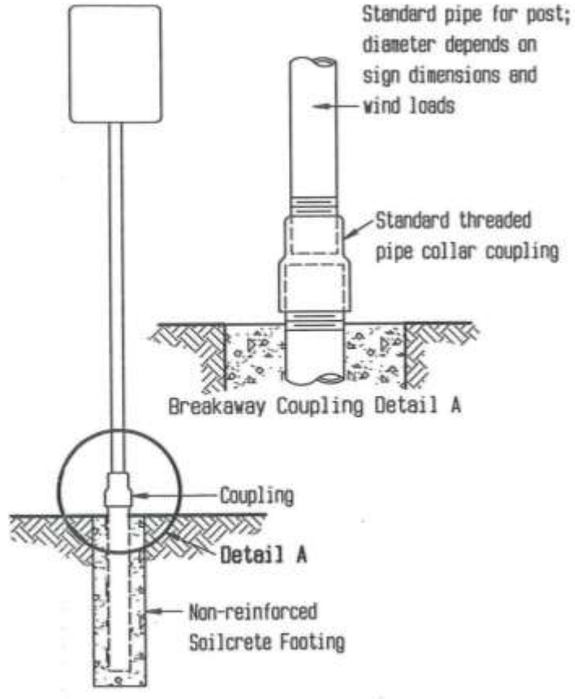
Detail 15.32.2 Bending Breakaway



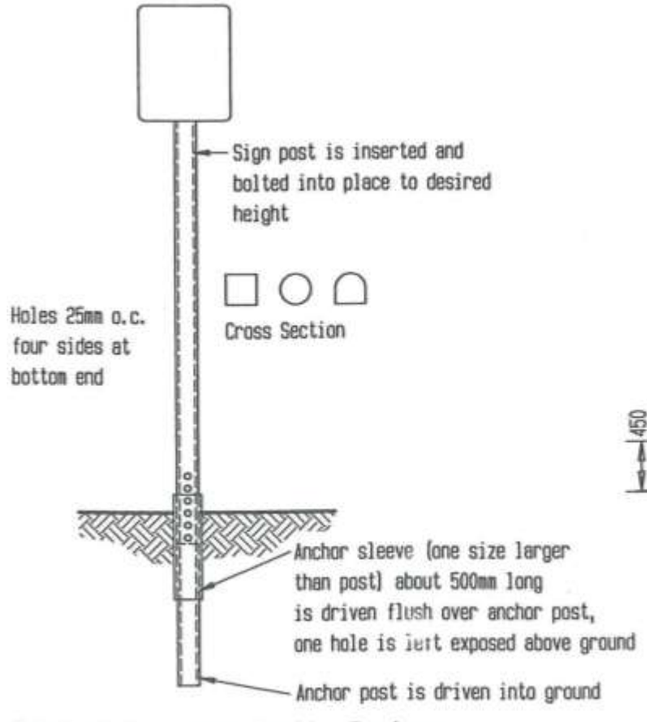
Detail 15.32.3 Bending Breakaway



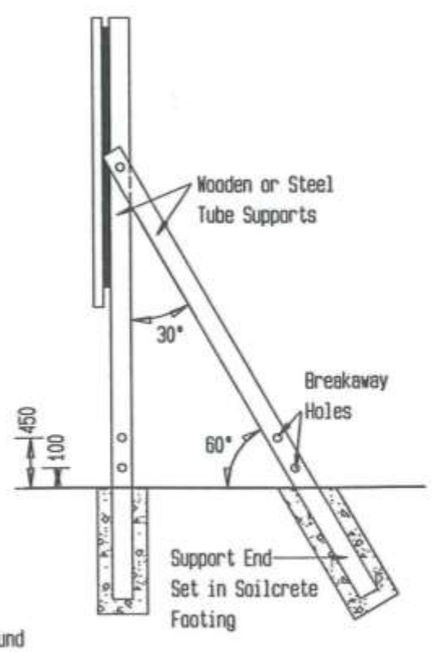
Detail 15.32.4 Frangible Coupling Breakaway



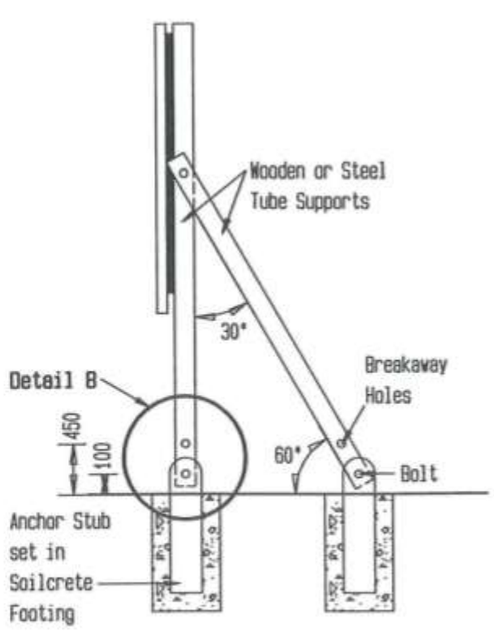
Detail 15.23.5 Threaded Coupling Breakaway



Detail 15.32.6 Sleeve Coupling Breakaway



Detail 15.23.7 Fracturing at Breakaway Holes, for Multiple Support Sign Structures



Detail 15.32.8 Fracture at Coupling and Breakaway Holes, for Multiple Support Sign Structures

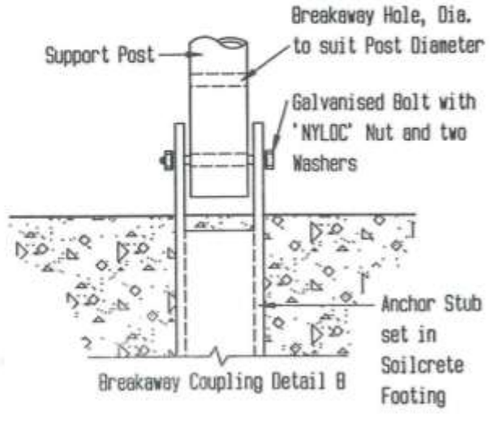
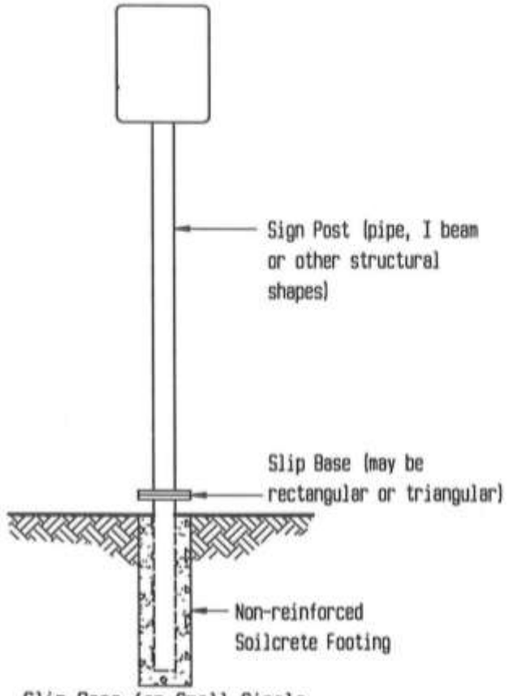
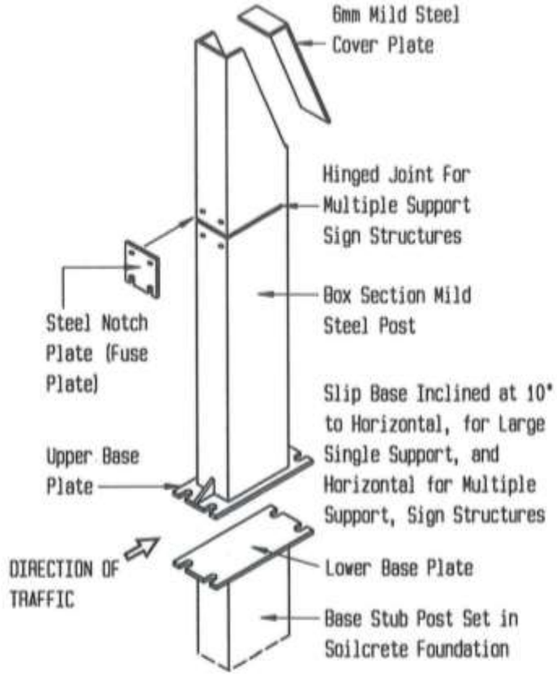


Fig 15.32
Support Frangibility:
Fracture or Bending Breakaway Types for Structures without Base Plates

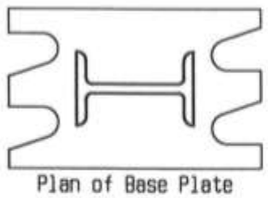


Slip Base for Small Single Support Sign Structures



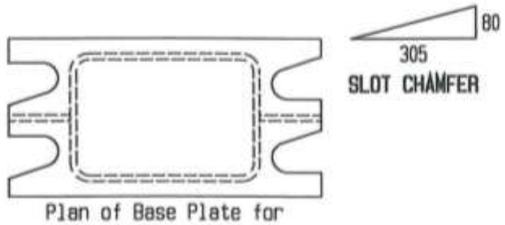
Slip Base for Large Single Support or Multiple Support Sign Structures

Plan of Triangular Base Plate for Small Pipe Support

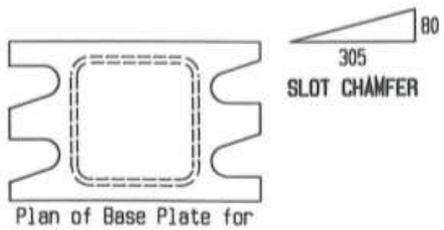


Plan of Base Plate for I-Beam Support

Detail 15.33.1 Small Slip Base

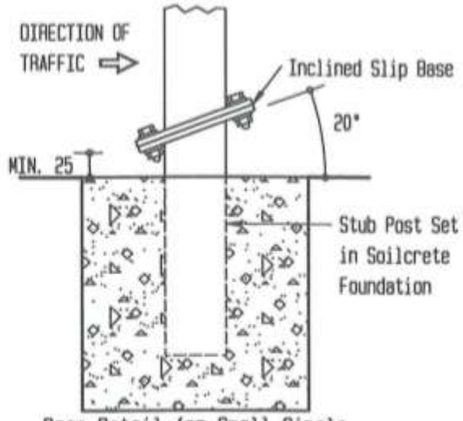


Plan of Base Plate for Rectangular Box Section Support

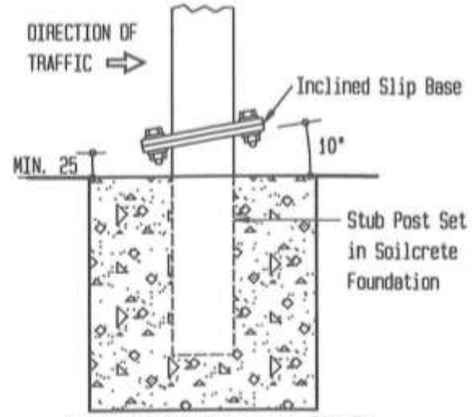


Plan of Base Plate for Square Box Section Support

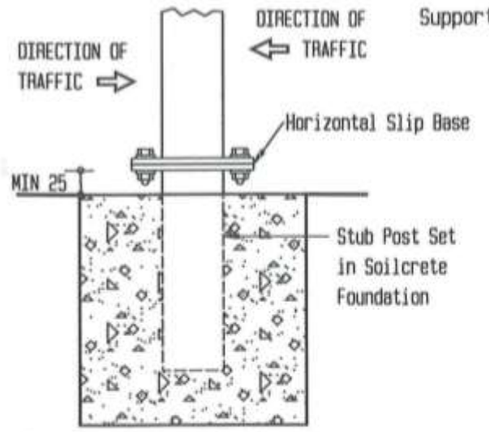
Detail 15.33.2 Large Multiple Slip Bases



Base Detail for Small Single Support Sign Structures

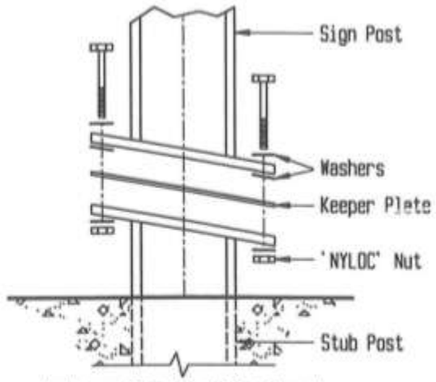


Base Detail for Large Single Support Sign Structures

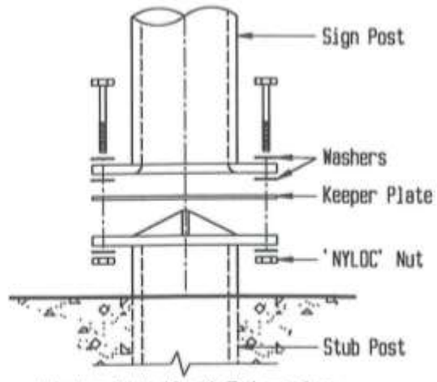


Base Detail for Multiple Support or Single Support (Bi-directional Traffic) Sign Structures

Detail 15.33.3 Installation Requirements



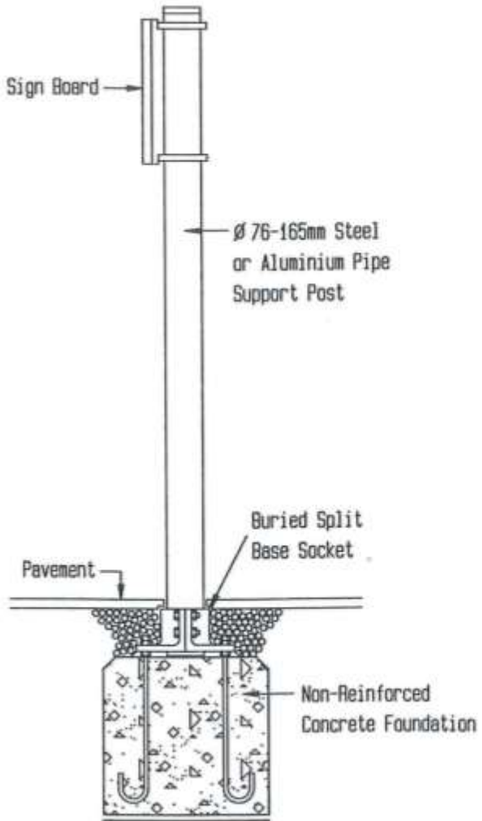
Joining Detail of Inclined Rectangular Base Plates



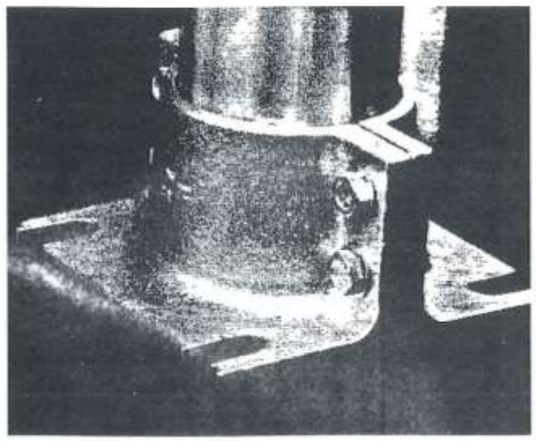
Joining Detail of Triangular Base Plates

Detail 15.33.4 Assembly Requirements

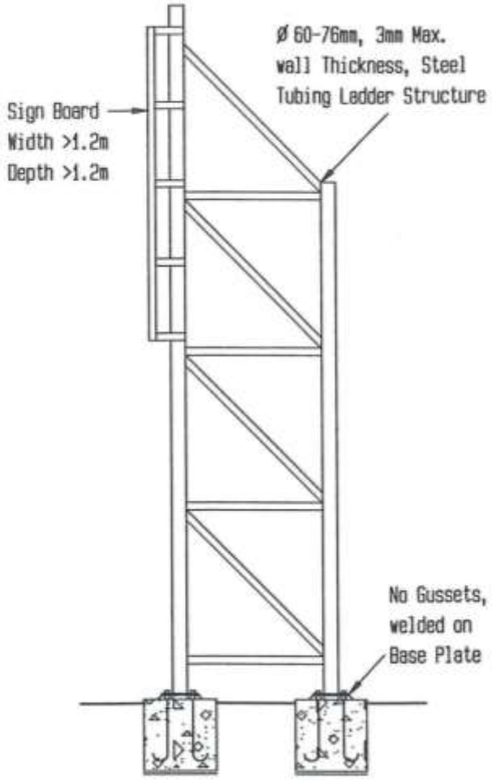
Fig 15.33
Support Frangibility:
Structures with Slip Base Plates



Detail 15.34.1
Split Base Socket for Medium to Large,
Single Support, Sign Structures

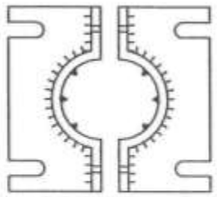


Detail 15.34.2
Isometric View of Typical
Split Base Socket



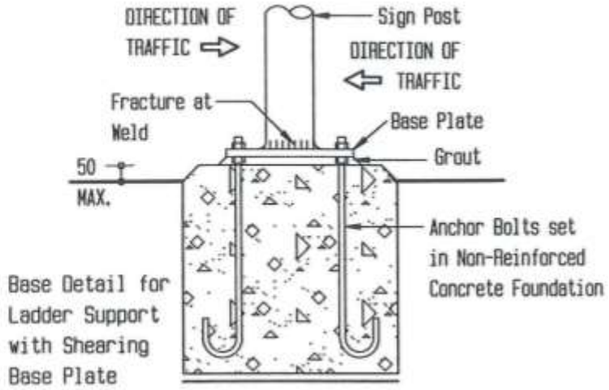
Shearing Base Plate for Ladder
Support Sign Structure

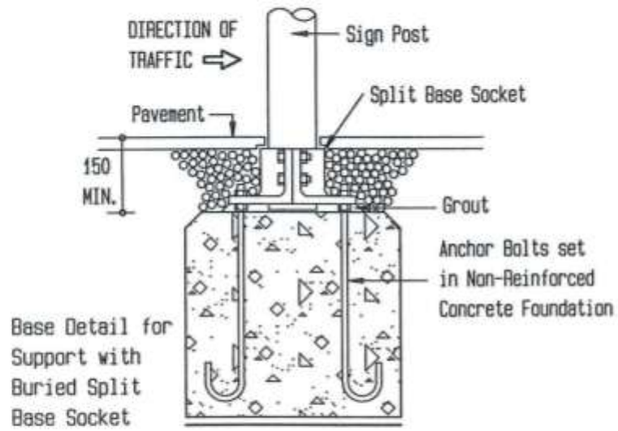
Plan of Shearing Base Plate

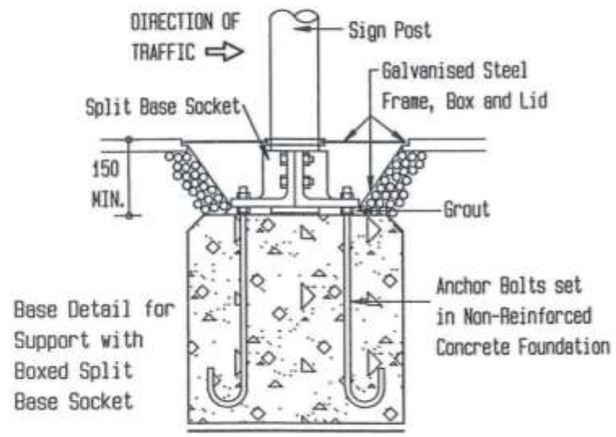


Plan of Split Base Socket

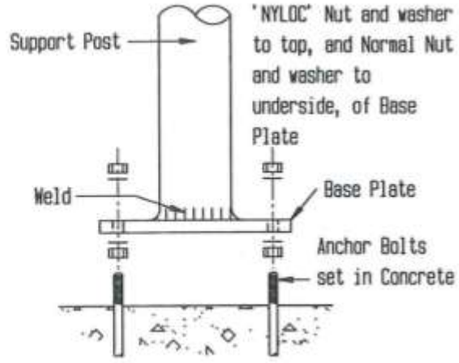
Detail 15.34.3
Dual Base Support for Medium to Large
Multiple Support Sign Structures



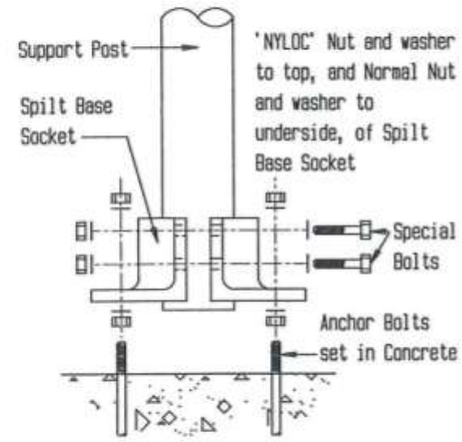




Detail 15.34.4 Base Details

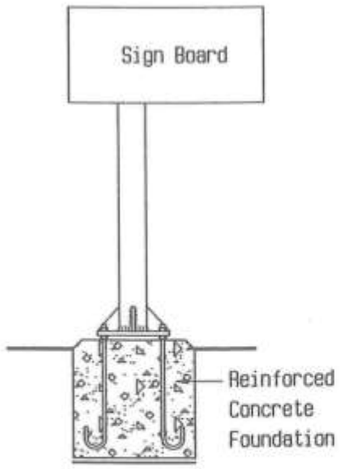


Detail 15.34.5
Mounting Detail for Support
with Shearing Base Plate

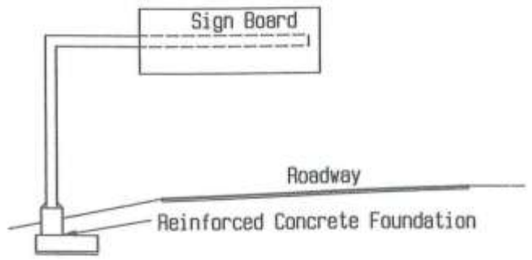


Detail 15.34.6
Mounting Detail for Support
with Spilt Base Socket

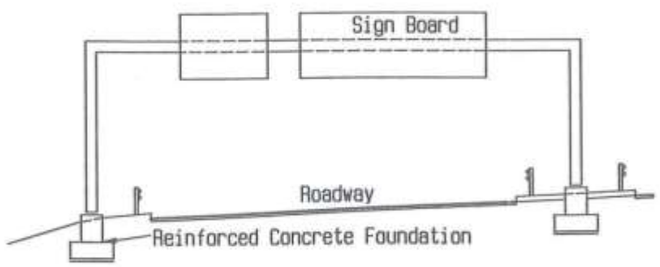
Fig 15.34
Support Frangibility:
Structures with Shearing Base Plates and Splitting Base Sockets



Fixed Base for Lighter Single Support Sign Structure



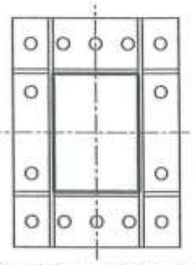
Fixed Base Plate for Heavy Box Section Cantilever Support Structure



Fixed Base Plate for Heavy Box Section Portal Support Structure

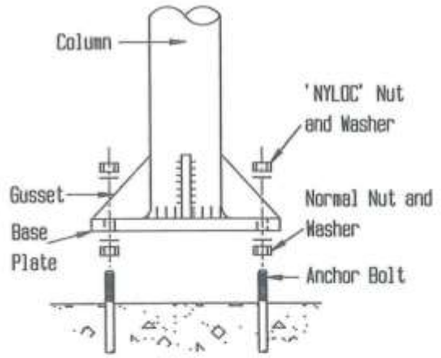
Detail 15.35.1 Basic Rigid Structure Types

Plan of Fixed Base Plate for Lighter Single Support Structures

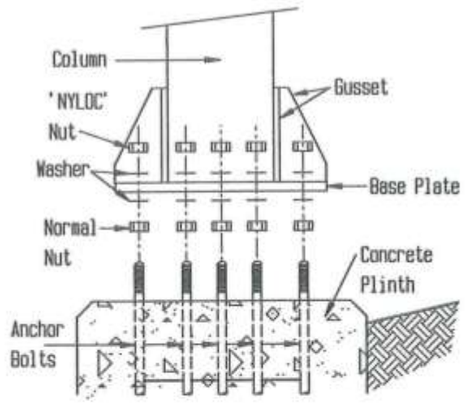


Plan of Fixed Base Plate for Heavier Box Section Support Structures

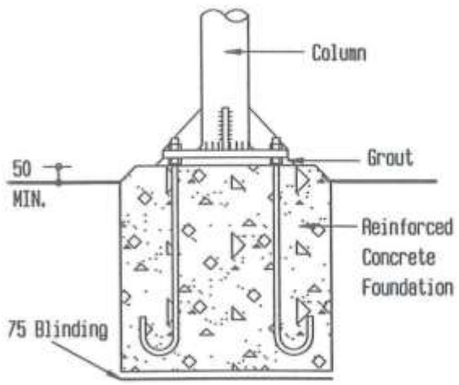
Detail 15.32.2 Base Plates



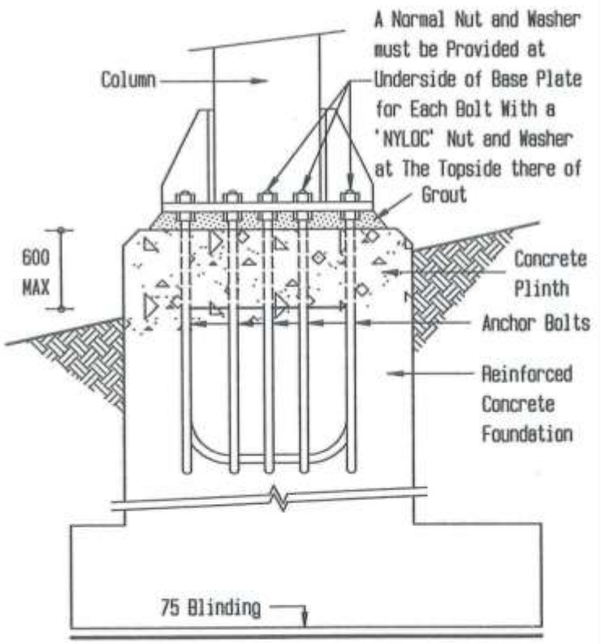
Detail 15.35.3 Mounting Detail for Light Single Support Structure with Fixed Base Plate



Detail 15.35.4 Mounting Detail for Heavy Box Section Support with Fixed Base plate



Detail 15.35.5 Base Detail for Lighter Single Support Structures with Fixed Base Plate



Detail 15.35.6 Base Detail for Heavier Box Section Support Structures with Fixed Base Plates

Fig 15.35
Support Frangibility:
Rigid Structures with Fixed Base Plates

15.5 CHOICE OF SUPPORT FOUNDATIONS AND ANCHOR TYPES

15.5.1 General

1 Some of the general considerations, mentioned in Section 15.3.1, regarding the selection of materials for the component parts of signs, are also applicable to this section for choosing support foundations and anchor types.

2 Installation of sign supports is often accomplished by either driving the post into the soil, drilling and backfilling after placement of the post, or by placing the post in a concrete footing.

3 The smaller type sign posts are usually driven into the ground with a hammer or pneumatic hammer. If a rectangular sleeve or anchor stub post is placed in the ground or sidewalk, then the sign post can simply be slipped into the sleeve and bolted down.

4 Multiple support post installation for ground mounted roadside or freeway signs must be sunk well into the ground, with soilcrete foundations. For larger overhead sign structures reinforced concrete footings are commonly used. To erect these larger ground mounted and overhead mounted signs, heavy equipment such as cranes will be required.

5 It is thus clear that there are different foundation types to suit the different support base anchor types/means for the different sign sizes. To complicate matters further the depth and size of foundations are dictated by the founding material or soil types.

15.5.2 Soil Materials

1 The type of soil material present at a proposed sign site will affect the foundation design and possibly the number of supports required. Good soil information can lead to substantial savings and tighter foundation design because the design parameters are well defined. The more comprehensive the information, the more economically can a good structure be built.

2 If in doubt regarding the characteristics of the soil, an engineer should be consulted or soil samples taken from a test hole to a soil laboratory for analysis. Based on the results of this analysis, a recommendation can be made regarding the best foundation structure to use. One or two test holes should be dug on the site or the engineer's instructions should be followed.

3 There are various types of clay and not all of them should be regarded as bad. Some are soft but are still stable. Collapsible soils are usually not very dense because of the high proportion of voids present. Heaving or active clays contain minerals which cause the soil mass to react strongly to changes regarding moisture content. These clays will swell when more moisture is added and will shrink as they dry out.

4 The treatment of soft soils is usually to make the foundations wider to reduce the pressure to an acceptable level so that the soil will be able to withstand the load with little or no settlement. Should the soil prove to be too soft or wet then a raft foundation or piling is recommended. A pile is a concrete column driven into the earth which either carries the load down to a stronger, more stable, soil below or by hanging in friction on the soil around its shank.

5 The consistency of cohesive and granular soils as well as the hardness of rocks is indicated in Tables 15.17 to 15.19 in this section. In Subsection 15.2.5, soil texture classifications appear as Tables 15.5 and 15.6 and a chart as Figure 15.8, while the typical engineering problems, usually related to residual soils, are also indicated in Table 15.4.

6 The founding materials in general terms, and the means of excavation commonly exercised, are:

(a) marshy or waterlogged soils - excavation by dredger or in coffer dams;

(b) mud and clay - excavation by dredger and shovel;

(c) sand excavation by shovel;

(d) medium hard ground - pick and shovel to excavate;

(e) hard ground - pick and jackhammer occasionally;

(f) rock or granite - drilling and blasting.

7 Where the founding material is man-made, i.e. on concrete or steel structures, or in aggressive or polluted soils, special engineering solutions for sign supporting foundations or structures are required. Problem locations should however be avoided, being uneconomical. Subject to road and sign class, sign structures can be moved to a location with better founding materials. Founding materials which do not normally present foundation problems, or require major engineering input, are: sand, medium hard ground and hard ground.

8 While the depth of a foundation is mostly determined by the total length of the support(s) above ground level, in turn the support length is determined by the depth of the sign back plate. The foundation horizontal size (length and width or diameter) is determined by the soil materials as well as the sign back plate area. The foundation for a support base located in a soft sand material is much larger in size, and therefore volume, than a foundation for the same support and sign located in medium hard to hard soil materials. Thus poor soil conditions will always require larger or better anchoring of sign supports, and therefore larger foundations. This sometimes applies even for smaller sign supports that would normally have been driven in or buried, had the soil material been medium hard to hard.

9 Some support bases, however, require non-reinforced to reinforced concrete foundations, no matter what the soil material type is. These supports are normally for the larger signs with frangibility treatment to their bases i.e. those with anchor stub posts or base plates/sockets and those with breakaway holes drilled through the supports.

15.5.3 Composition of Anchor and Foundations

1 There are basically three foundation types according to the sign structure types from small to large ground mounted sign structures, to even larger overhead mounted sign structures. The three basic foundation types, with derivatives, according to sign structure sizes are:

(continued on page 15.5.4)

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TABLE 15.17 CONSISTENCY OF COHESIVE SOILS TABLE 15.17

		Silts and clays and combinations of silts and clays with sand, generally slow draining	Unconfined compressive strength (kN/m2)
S1	Very soft	Pick head can easily be pushed into the shaft of handle. Easily moulded by fingers.	25 - 35
S2	Soft	Easily penetrated by thumb; sharp end of pick can be pushed in 30 mm to 40 mm; moulded by fingers with some pressure.	35 - 70
S3	Firm	Indented by thumb with effort; sharp end of pick can be pushed in up to 10 mm; very difficult to mould with fingers. Can just be penetrated with an ordinary hand spade.	70 - 100
S4	Stiff	Penetrated by thumb-nail; slight indentation produced by pushing pick point into soil; cannot be moulded with fingers. Requires hand pick for excavation.	100 - 300
S5	Very stiff	Indented by thumb-nail with difficulty; slight indentation produced by blow of pick point. Requires power tools for excavation.	300 and more.

NOTES ON SOIL TYPES (See Figure 15.8):

(1) Sand consists of discrete particles between 2,5 mm to 0,074 mm (No. 200BS sieve) in size and normally visible to the naked eye.
Sand is clearly distinguishable by the presence of gritty particles which do not break down when rubbed on the palm of the hand.

(2) Silt consists of fine particles, smaller than 0,074 mm and larger than 0,002 mm. In general silt particles are barely felt when rubbed with water on the palm.
When this wetted soil is placed on the tongue, the particles can be felt grating against the enamel of the teeth.

(3) Clay consists of very fine particles less than 0,002 mm. The particles are flaky and when rubbed on the palm with water has a soapy or greasy feeling. No sensation of grittiness can be detected when tasted.

(4) Gravel consists of fragments of rock between 2,5 mm and 200 mm (No. 7HS sieve). The shape of the particles should be described as follows:
(a) rounded shape
(b) oval shape
(c) rounded corners
(d) corners slightly bevelled
(e) corners sharp or irregular.

(5) Boulders are fragments of rock larger than 200 mm. Rock types and range of size should be recorded also whether there is a matrix in the voids and does it fill the voids or not.

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TABLE 15.18	HARDNESS OF ROCKS	TABLE 15.18
	Description of Hardness	Unconfined Compressive Strength (MPa)
R1 Very soft rock	Material crumbles under firm (moderate) blows with the sharp end of a geological pick and can be peeled off with a knife: it is too hard to cut a triaxial sample by hand	0,7 to 3,0
R2 Soft Rock	Can just be scraped and peeled with a knife: indentations 1 mm to 3 mm show in the speciman with firm (moderate) blows of the pick point	3,0 to 10,0
R3 Hard Rock	Cannot be scraped or peeled with a knife; hand-held speciman can be broken with a hammer end of the geological pick and a single firm (moderate) blow	10,0 to 20,0
R4 Very hard rock	Hand-held speciman breaks with hammer end of geological pick under more than one blow	20,0 to 70,0
R5 Extremely hard rock	Speciman requires many blows with a geological pick to break through intact material	More than 70,0

TABLE 15.19	CONSISTENCY OF GRANULAR SOILS	TABLE 15.19
	Gravels and clean sands, generally free draining	Typical dry density (kg/m^3)
Very loose	Crumbles very easily when scraped with a geological pick	Less than 1450
Loose	Small resistance to penetration by sharp end of geologial pick	1450 to 1600
Medium dense	Considerable resistance to penetration by sharp end of geologial pick	1600 to 1750
Dense	Very high resistance to penetration by sharp end of geologial pick; requires many blows of pick for excavation	1750 to 1925
Very dense	High resistance to repeated blows by sharp end of geologial pick; requires power tools for excavation	More than 1925

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(continued from page 15.5.1)

(a) no foundations for small single support signs;

(b) non-reinforced foundations consisting of: soilcrete foundations for drilled breakaway hole supports and anchor/base stub posts for threaded pipe and slip base plate couplings; and mass concrete foundations for supports with split base sockets or shearing base plates;

(c) reinforced concrete foundations for the large ground mounted or overhead mounted sign structures with rigid base plates.

2 The anchor types employed with the foundation types are the following:

(a) buried or driven support ends in soil, no foundation;

(b) support end or anchor/base stub post set in soilcrete foundation;

(c) anchor hook bolts set in mass concrete foundation;

(d) anchor bolt groups in reinforced concrete foundation;

3 The support ends and anchor stub posts are for supports with no base plates while all the other anchor types allow for supports with base plates or split base sockets.

4 Soilcrete foundations normally comprise of a mixture of 50% crushed stone, 40% selected granular material from the excavation or imported, and 5% Portland Cement, compacted into the hole at optimum moisture content to a density of 95% MAASHTO. The advantages of soilcrete foundations are that it is economical and easy to use and in the event of an impact on a sign support it is easy to demolish and to cast a new foundation using materials mainly from the site.

5 Non-reinforced mass concrete foundations are used for sign supports that are fixed to the foundation with anchor bolts through base plates or split base sockets. This method of using hooked anchor bolts to anchor the support requires more rigid and heavier foundation to allow the breakaway of the base plate or socket effectively without damaging or lifting the foundation. This is especially applicable to support structures utilising shearing base plates and split base sockets. Often, after an impact, a new support with new base plate can be reinstated using the original foundation and anchor bolts.

6 Large and heavy reinforced concrete foundations are required for single supported large ground mounted signs and support legs for cantilever/gantry structures for overhead mounted signs. These foundations and their reinforcing are normally specifically designed, for the size and weight of the sign and support structure. The rigid structure is attached to the foundation with multiple anchor bolts through a rigid gusseted base plate. Engineering input will be required on the design for these larger footings.

7 The casting and finishing of foundations require a measure of exactness in the alignment of the anchor bolts, so that these eventually will fit into the holes of the support base plate, and the top levels of the foundations which allows for the type of base plate/socket or stub and its height above/below the ground level according to the shoulder break point or highest point on the road level. A casting jig is often used to set and keep the anchor bolts in position during casting. Where the top levels of foundations are at or above ground level these should be finished off with a sufficient fall to allow proper drainage of water away from the support and base plate.

8 The required foundation top levels in relation to the ground level for the different support structure types are:

(a) maximum 500 mm above Ground Level (GL) for fixed base plates of cantilever and gantry structures;

(b) maximum 50 mm above GL for shearing and other fixed base plates;

(c) 0 mm, at GL for breakaway holes or slip base plates;

(d) minimum 150 mm below GL for split base sockets.

9 Figures 15.36 to 15.39 indicate examples of the different anchor and foundation types discussed.

10 Figure 15.40 indicates special foundations or founding materials which may occur. These situations require special measures, specific to the materials present, to be designed by an engineer.

11 Table 15.16, in Section 15.4, indicates a summary of the different anchor and foundation types tabulated with the different support and frangibility types.

12 Table 15.20 illustrates the advantages and disadvantages of different support base frangibility and foundation

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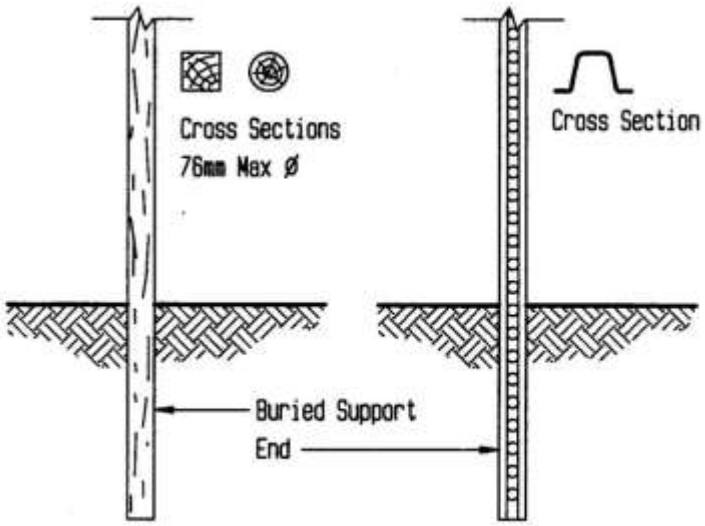
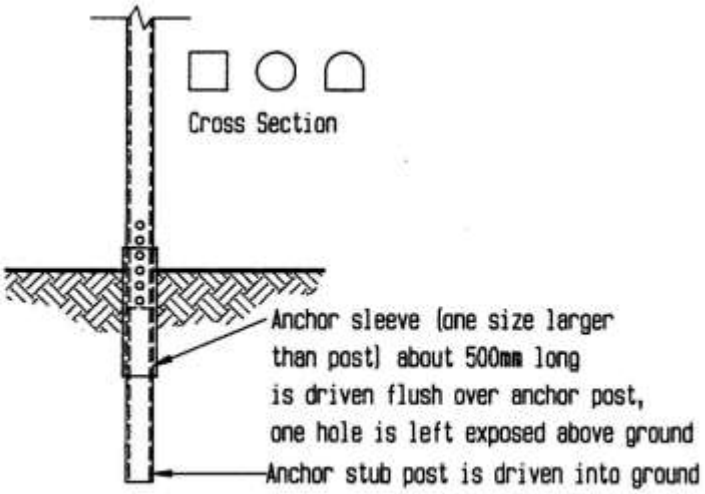
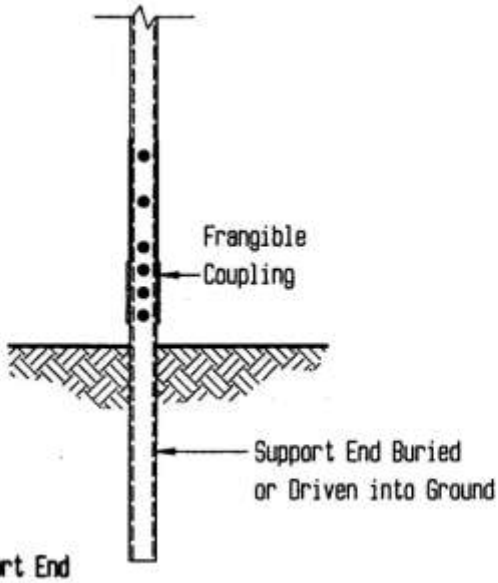


Detail 15.36.1 Buried Support Ends

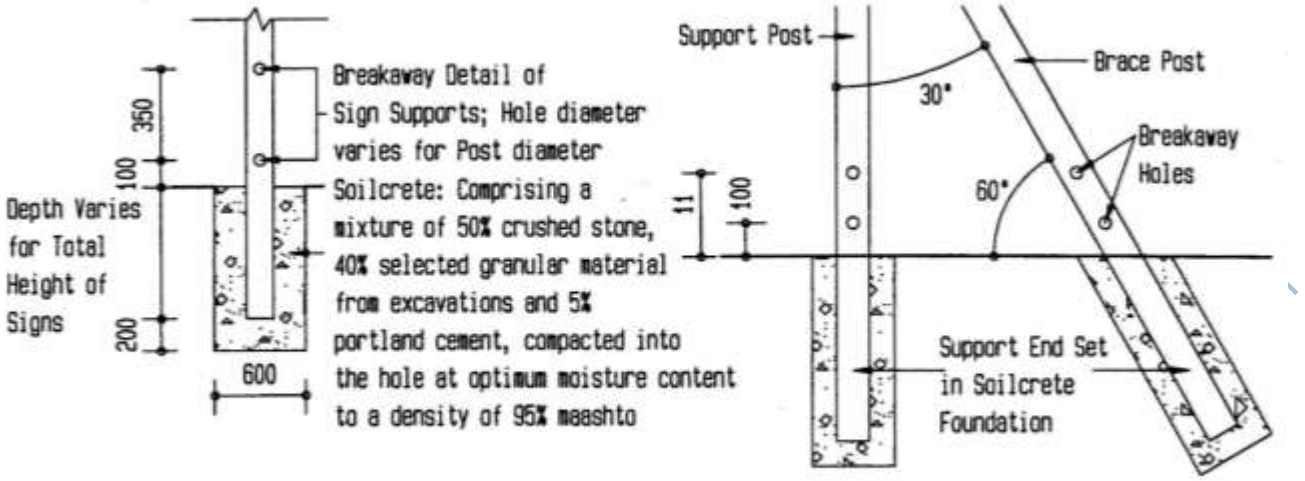


Detail 15.36.2 Driven Support End with Anchor Sleeve

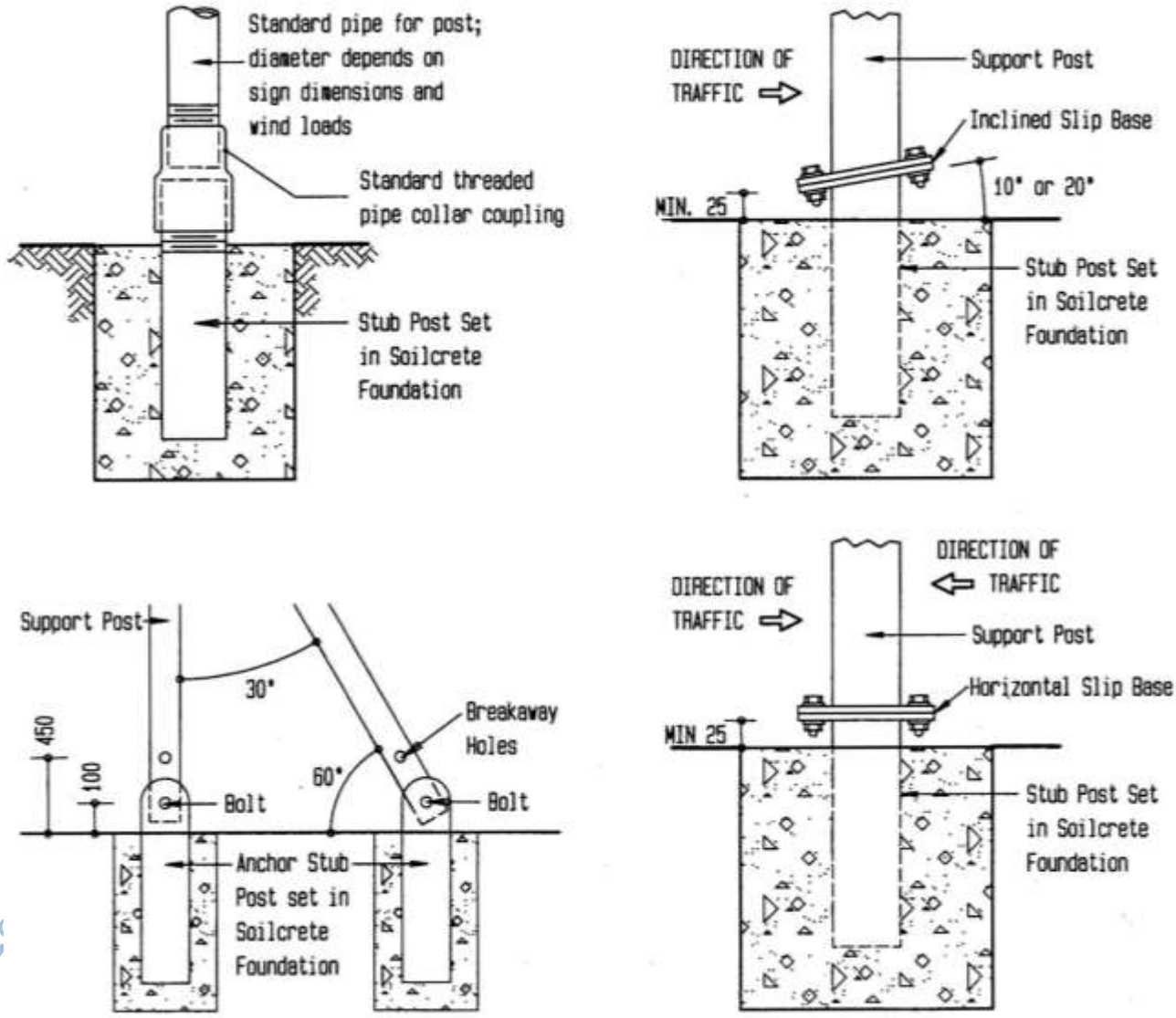


Detail 15.36.3 Driven Support End

Fig 15.36 Buried or Driven Support Ends with No Foundations

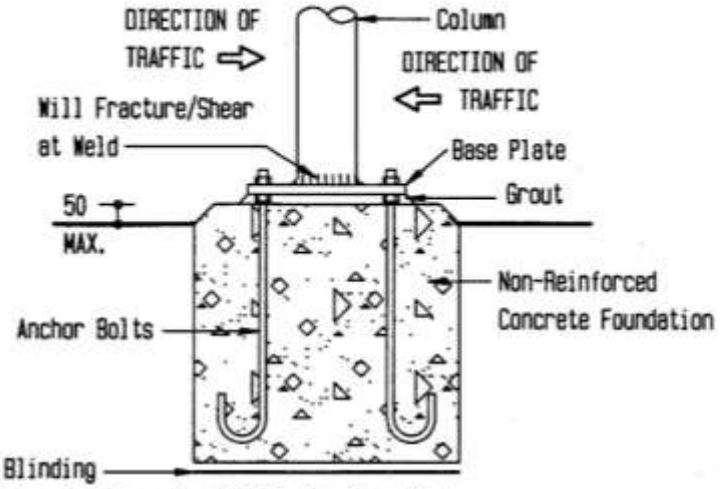


Detail 15.37.1 Cylindrical Foundations for Supports Breakaway Hole Bases

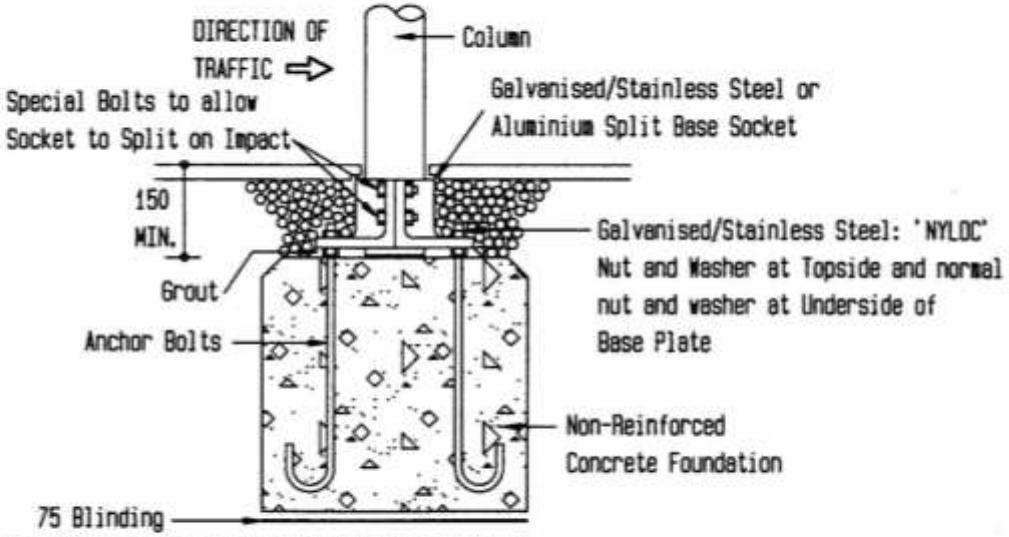


Detail 15.37.2 Cylindrical Foundations for support Stub Posts

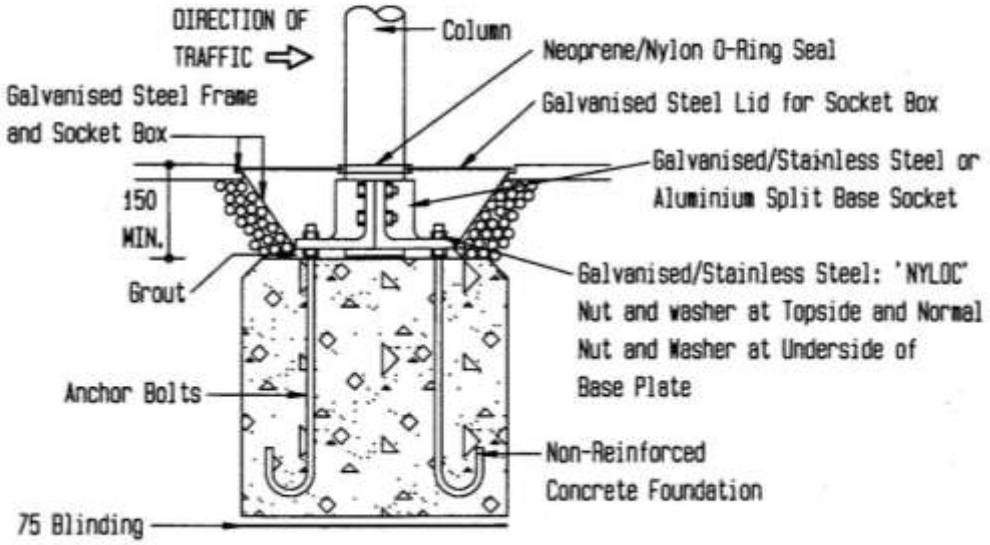
Fig 15.37 Non-Reinforced Foundations: Support End/Base Stub Post Set in Soilcrete



Detail 15.38.1 Block Foundation for Supports with Shering Base Plates



Detail 15.38.2 Block Foundation for Supports with Split Base Sockets



Detail 15.38.3 Block Foundation for Supports with Boxed Split Base Sockets

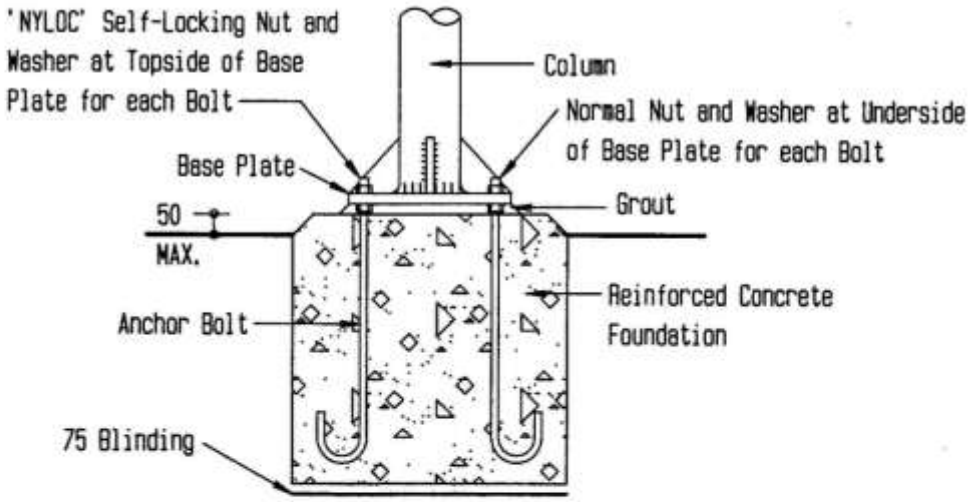
Fig 15.38 Non-Reinforced Foundations: Anchor Bolts Set in Concrete

TABLE 15.20 SUPPORT BASE FRANGIBILITY AND FOUNDATION TYPES **TABLE 15.20**

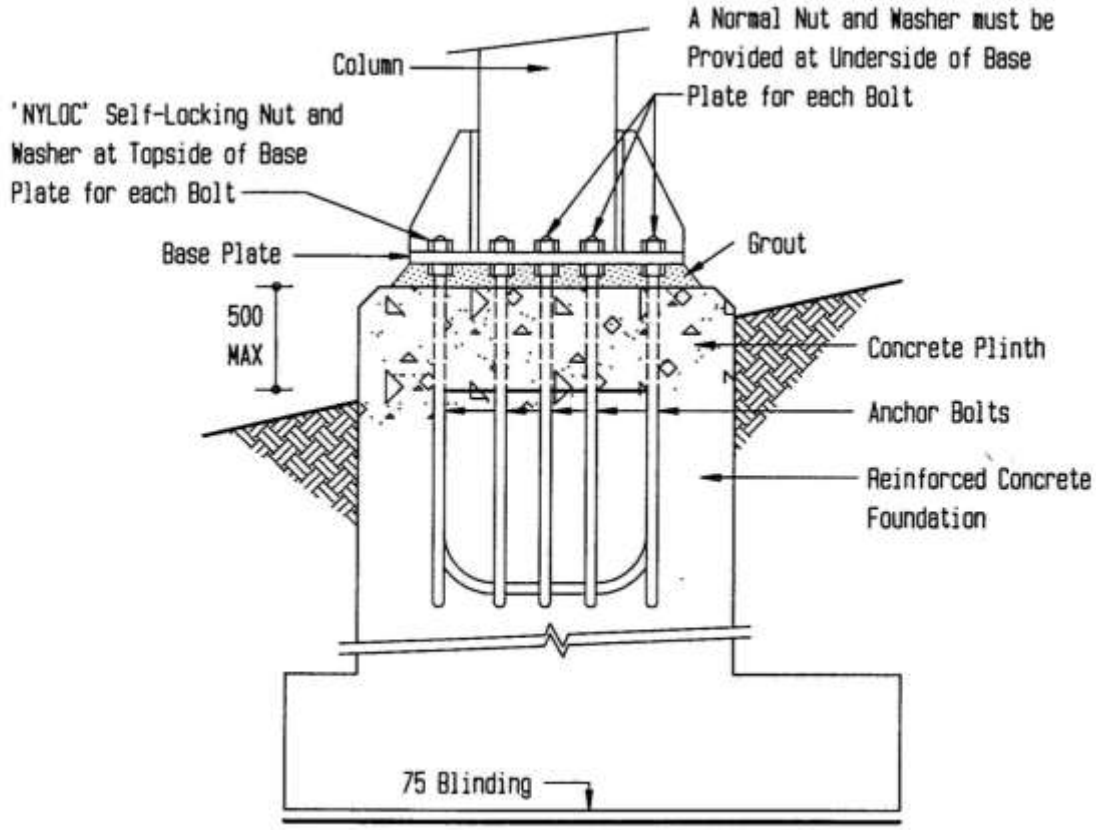
Footing Type	Advantages	Disadvantages
Fracture Breakaway. No Foundation.	• Buried or knocked in support end • Frangibility good • Cheap installation and maintenance	• Only applicable to single supported, smaller signs • <= 76 mm ϕ timber supports only • Timber must be treated against pests, rotting • Veldfires will damage • Vandal resistance low due to theft
Bending Breakaway. No Foundation.	• Same as above • Excellent pest and fire resistance • Durability and crashworthiness good • Cheap installation and maintenance	• Only applivable to single supported, smaller signs • 76 mm ϕ MAX, 3 mm MAX wall thickness tubing • If steel treat against rust and corrosion • Vandal resistance low due to theft
Sleeve/Frangible Coupling Breakaway. No Foundation.	• Same as above for bending...	• Same as above for bending...
Threaded Pipe Coupling Breakaway. Soilcrete Foundation.	• Same as above for bending...	• Same as above for bending...
Fracture at Breakaway Holes. Soilcrete Foundations	• For multiple support sign structures • Timber or steel pipe supports • Cater for a wide range of sign sizes - generally used • Good frangibility • Good durability and crashworthiness • If steel pipes - pest and fire resistant • Soilcrete foundations instead of mass or reinforced concrete foundations	• Steel pipes must be treated against rust and corrosion • Timber supports must be treated against pests and rot • Veldfires may damage timber supports
Slip Base Plates Breakaway. Soilcrete Foundations.	• Variety of signs catered for - small-to-large single support or multiple supported signs • Variety of cross sectional formats of support can be used • Excellent pest and fire resistance • Good durability and crashworthiness • Good frangibility • Soilcrete foundations instead of mass concrete or reinforced concrete foundations	• Inclined slip base plates for single supports and horizontal slip base plates for multiple supports - inclination an issue • Keeper plate needed to keep baseplates in place but to allow sliding if vehicle impacts • Hinged joint, higher up support, necessary for multiple supported signs using slip base plates • Steel needs treatment against rust and corrosion • Skilled labour and specialised equipment needed to manufacture and erect

TABLE 15.20 SUPPORT BASE FRANGIBILITY AND FOUNDATION TYPES TABLE 15.20

Footing Type	Advantages	Disadvantages
Shearing Base Plate Breakaway. Concrete Foundation with Anchor Bolts.	• Weld at base plate is friction point for structure • Widely used in Europe • Durability and crashworthiness good • No reinforcing necessary for foundation • Smaller foundations because of lighter structure	• Structure must be able to bend and deform i.e. ϕ <= 76 mm, wall thickness < 3 mm pipes • Skilled labour and specialised equipment to manufacture ladder support structure • Only applicable to multiple ladder support structures • Anchor bolts in mass concrete need to be set in correct position before casting • Mass concrete foundations needed • Steel need to be treated against rust and corrosion
Split Base Socket Breakaway. Concrete Foundation with Anchor Bolts.	• Support breakaway due to base socket splitting and releasing it • Widely used in urban areas in Europe - normally on side walks • Durability and crashworthiness good • Maintenance very easy • No reinforcing necessary for foundation	• Only applicable to single support structures for small to medium sized signs i.e. <= 10 m^2 signs • Support must be deformable to yield initially before disengagement of the base socket • Skilled labour and special equipment needed to manufacture base socket and to install it • Anchor bolts in mass concrete need to be set in correct position before casting • Mass concrete foundations needed • Steel need to be treated against rust and corrosion • Support Φ's standardised to only about 5 sizes because of split base sockets to match
Rigid, Fixed Base Plate. Reinforced Concrete Foundations with Anchor Bolts	• Excellent pest and fire resistance • Durable and vandal resistant • Only four anchor bolts necessary makes for easy positioning of slotted base plate • Normally used for multiple support signs mounted on a single support due to space constraints	• Applicable to lighter single support sign structures • No frangibility - structure must be protected • Reinforced concrete foundation needed • Steel need to be treated against rust and corrosion
Rigid, Fixed Base Plate for Overhead Cantilever or Gantry Structures. Reinforced Concrete Foundations with Anchor Bolts	• Excellent pest resistance • Durable and vandal resistant • Stable in all conditions	• Heavy structure - No frangibility - structure must be protected with guardrails or clearances • Large reinforced concrete foundation needed • Steel need to be treated against rust an corrosion • Skilled labour and special equipment needed to manufacture and erect • Expensive to manufacture and erect

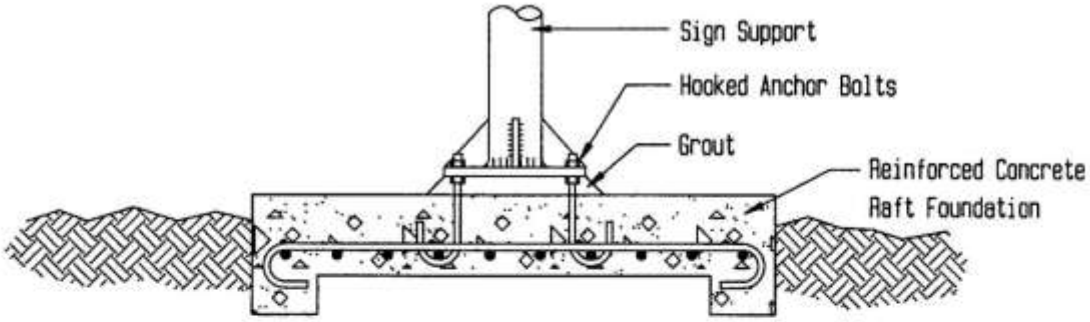


Detail 15.39.1 Block Foundation for Heavier Steel Tube or Box Section Supports

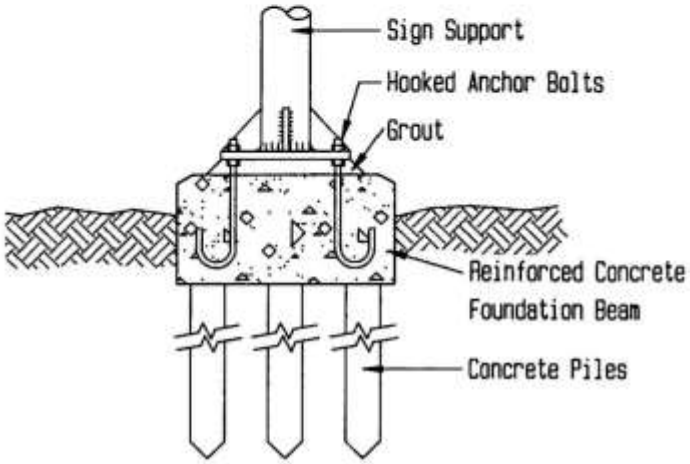


Detail 15.39.2 Plinth and Slab Foundation for Overhead Sign Gantries

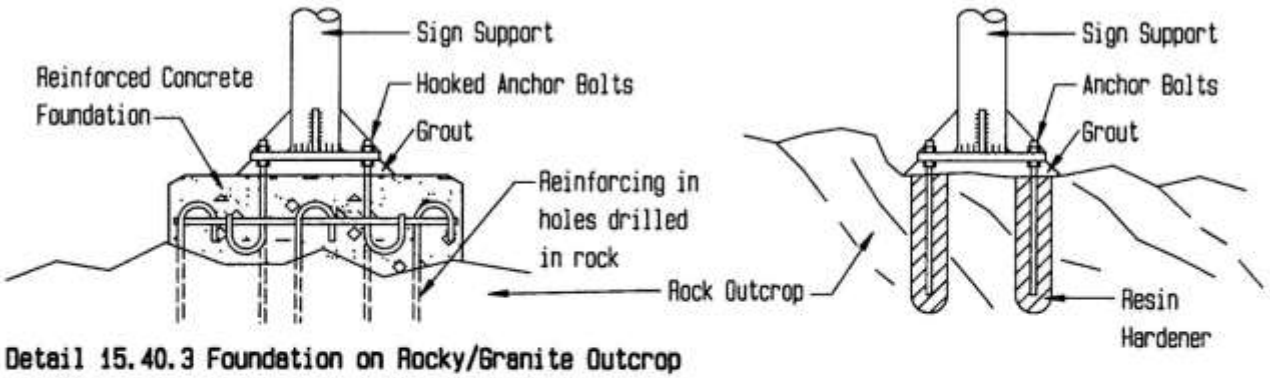
Fig 15.39 Reinforced Foundations: Anchor Bolts and Reinforcing Set in Concrete



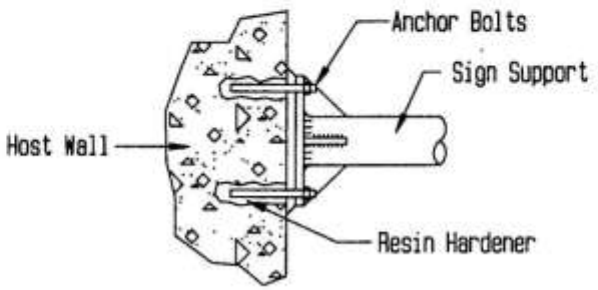
Detail 15.40.1 Raft Foundation in soft sand



Detail 15.40-2 Piled Foundation for waterlogged or marshy soils



Detail 15.40.3 Foundation on Rocky/Granite Outcrop



Detail 15.40.4 Host: Conc/Steel Bridge/Wall as Foundation/Footing

Fig 15.40 **Special Foundations**

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15.6 CHOICE OF FASTENERS FOR MOUNTING SIGN BACK PLATES

15.6.1 General

1 Some of the general considerations, mentioned in Section 15.3.1, regarding the selection of materials for the component parts of signs, are also applicable to this section for choosing the fasteners to fix the sign back plates to the support structures.

2 The basic hardware used to erect signs consists of bolts, washers, clamps, fittings and brackets. These fasten the sign to the post and solidify the connection so that wind, vandals, or impact by outside forces do not destroy or degrade the intended use of the sign. These fasteners are usually made of steel or aluminium, plated or galvanised for protection from the elements. Braces, U-bolts and clamps of aluminium or steel are used when multiple sign installations, large signs, or wind conditions necessitate stronger attachment to the post than a single or double bolt. For circular timber, aluminium or steel posts or pipes, the sign may be clamped or strapped/banded to the support.

3 Fasteners and braces should be designed to insure that signs will remain attached to the post throughout the impact sequence should they be impacted by an errant vehicle.

4 In cases where clamps, bolts and nuts are to be used to secure different metals, they should be cadmium plated or stainless steel. In cases where aluminium plate or sections will be in contact with steel, the contact surfaces should be painted with a bituminous paint or protected by the application of adhesive PVC tape or Aluminium backed `Bostic' tape to shield the different materials from each other.

5 Attachments or carriers for signs, providing the means for connecting the sign back plate to the structure, should be made from mild steel that is hot-dip galvanized in accordance with the requirements of SABS 763 or from a stainless steel complying with the requirements of Part IV of BS 970 or from other non-corrodible materials. The quality of the materials and the size of the members for an attachment should be such that the sign complies with the appropriate performance requirements. Typical attachments are horizontal carrier channels and vertical, Z-or I-profile, carriers.

15.6.2 Composition of Mounting Hardware

1 When deciding which type of mounting fasteners and attachments to use the advantages and disadvantages of each type should be considered. This is a very important decision because the mounting method is the deciding factor in the quantity of resources (financial, labour and equipment) needed for the erection and future maintenance of the sign. Certain fasteners are specialised, and specific to a certain sign or mounting method, which may be very expensive, but very simple and quick to install. Sometimes the back plate construction or the mounting position will enforce the use of a certain fastener type. The advantages and disadvantages of the mounting types are indicated in Tables 15.22 and 15.23.

2 The sign back plate types are normally of two derivatives:

(a) those that are not framed or reinforced or only simply braced, usually for sign sizes smaller than 1,5m^2;

(b) and those that are framed and reinforced for sign sizes larger than, but including 1,5m^2.

3 The back plate types under the not framed/reinforced or simply braced group are the following:

(a) signs smaller than 0,5m^2 with no reinforcing;

(b) signs smaller than 1,5m^2 with simple horizontal stiffeners, usually "Sankey" struts or "O-line" channels;

(c) signs smaller than 1,5m^2 with pressed/formed edges.

4 The sign back plate types with frames and bracing can be any of the following:

(a) signs larger than, but including 1,5m^2, with perimeter frames and intermediate reinforcing, usually consisting of square tubing;

(b) signs larger than, but including 1,5m^2, made of stacked aluminium or Chromadek road sign profiles or planks;

(c) signs that are boxed into cabinets, usually internally illuminated or variable message signs (VMS).

5 There are two basic mounting positions, ground and overhead, for the sign types mentioned above. These mounting positions could be on single, multiple, cantilever, gantry, and other support structures. Sign back plates may be fixed to the support structure by using one of the following mounting or installation methods:

(a) direct riveting or bolting through the sign sheet, lugs or bracing framework;

(b) indirect fixing by means of brackets, saddles or clamps;

(c) indirect fixing to vertical or horizontal carrier beams or channels fixed to the support structure.

6 The final fastener is almost always a rivet, bolt or strap, however, modern adhesives are now commonly being used in place of these conventional fasteners. The use of adhesives has the added benefit of reducing or eliminating the need to have rivet or bolt heads on the front surface of the back plate.

7 Table 15.21 indicates the different fastener types as they relate to the different sign back plate types while Figures 15.41 to 15.49 indicate different mounting methods and fasteners.

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TABLE 15.21 **FASTENER TYPES** **TABLE 15.21**

Sign Back Plate Type	Mounting			
	Position	Support Structure	Carrier	Fastener
Not braced < 0.5 m^2	GM	Single Support	Nil	Rivet or bolt directly to support
	GM	Single Support	Nil	Strapped through welded/glued on lug
Simply braced horizontally < 1.5 m^2	GM	Single Support	"O-line" or "Sankey" Channel	"O-line" clamp and bolt
	GM	Single Support	Upper and lower T-bar	Bracket and bolts or saddle clamps and strap
Simply braced - pressed / formed edges < 1.5 m^2	GM	Single Support	Pressed edges	Bolted through lugs or bracket
Perimeter frame and bracing >= 1.5 m^2	GM	Single Support	Perimeter Frame and Bracing	Bolted through lugs or brackets
	GM	Multiple Supports	Perimeter Frame	Bolted through frame directly
	GM	Multiple Supports	Perimeter Frame	Bolted through lugs or L-brackets
	GM	Multiple Supports	"O-line" or "Sankey" Channel	"O-line" clamp and bolt or bracket and strap
	GM	Multiple Supports	Heavy horizontal Carrier Channel	L-backets and bolts
	GM	Large Single Support for Multiple Support Sign	Heavy horizontal Carrier Channel	L-backets and bolts
	OH	Cantilever or Gantry Support Structure	Z-profile vertical carrier	Stainless steel clamps and bolts
	GM	Single Support	German "Alform" profiled frame	"Alform" bracket, spring clip and bolt
	GM	Multiple Supports	German "Alform" profiled frame and reinforcing	Nil. Clip in planks
Stacked Profiles >= 1.5 m2 single sided planks	GM Wall	Between Posts or against wall	Vertical "Multiclip" retainer strip and frame	Hidden internal bracket and bolts
Double sided planks	GM	Between Posts	Planks profile	
SA Road Sign Profiles - Aluminium or Chromadek	GM	Multiple Supports	Vertical square tubing carriers with horizontal "Sankey/O-line" strut	"Sankey" clamp and bolt
SA Road Sign Profiles - Aluminium or Chromadek	GM	Large Single Support for Multiple Support Sign	Horizontal channel carrier	Clamps and bolts

TABLE 15.21 **FASTENER TYPES** **TABLE 15.21**

Sign Back Plate Type	Mounting			
	Position	Support Structure	Carrier	Fastener
SA Road Sign Profiles - Aluminium or Chromadek	OH	Cantilever or Gantry	Vertical Z-profile carrier	Stainless steel - clamps and bolts
Cabinets: Simple Double Sided or Boxed	GM	Single or Multiple Supports	Perimeter Frame	Bolt directly through frame or welded on L-brackets
Small to Medium Sized Double sided or Boxed	GM	Single or Multiple Supports	Perimeter Profiled Frame	Internal "Lindapter" cavity fixing bolts directly through frame or square tube bracket
Internal illuminated boxed signs sliding over post/s	GM	Single or Multiple Supports	Profiled frame and internal bracing and tensioner cables	Internal pipe clamps, brackets and bolts
VMS Boxes	GM or OH	Single or Multiple or Cantilever or Gantry	Vertical Profile and/or Horizontal Channel Carriers	Clamps and bolts
Large Boxed Signs	GM or OH	Single or Multiple or Cantilever or Gantry	Vertical Profile and/or Horizontal Channel Carriers	Purpose made clamps and bolts or permanently fixed

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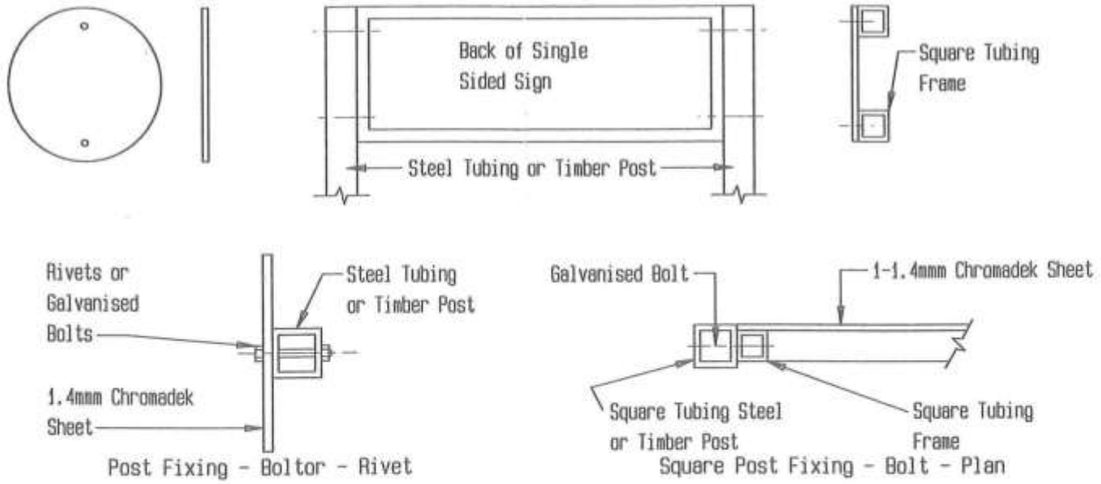
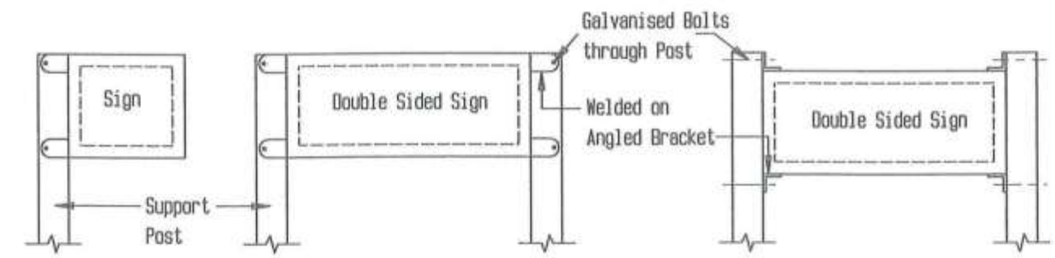
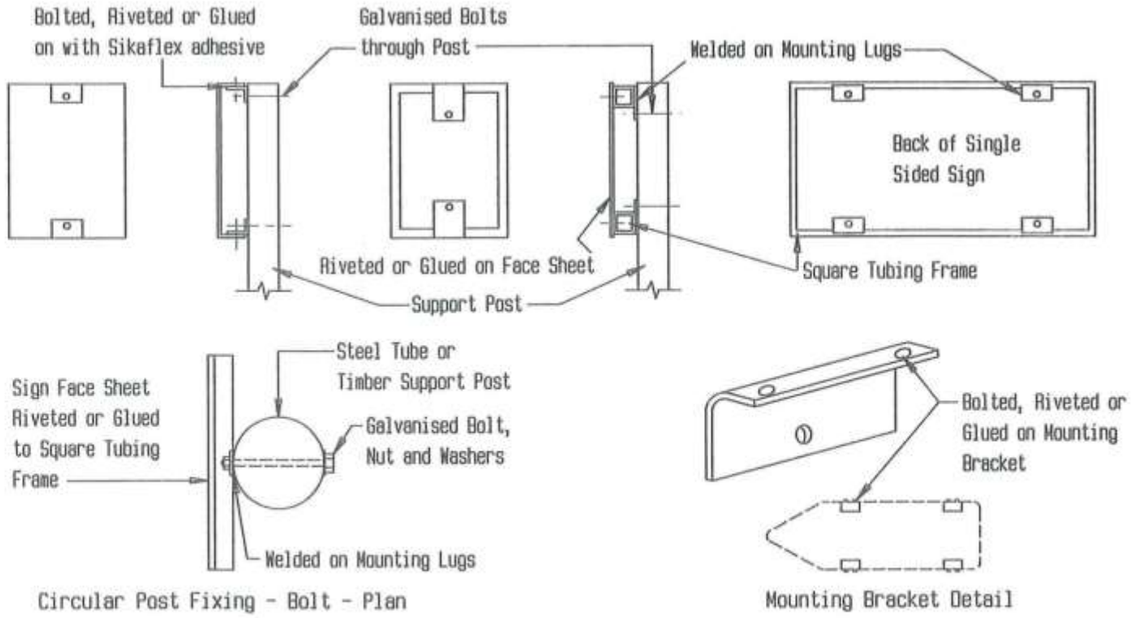


Detail 15.41.1 Direct Bolting through Sign Backplate or Framing

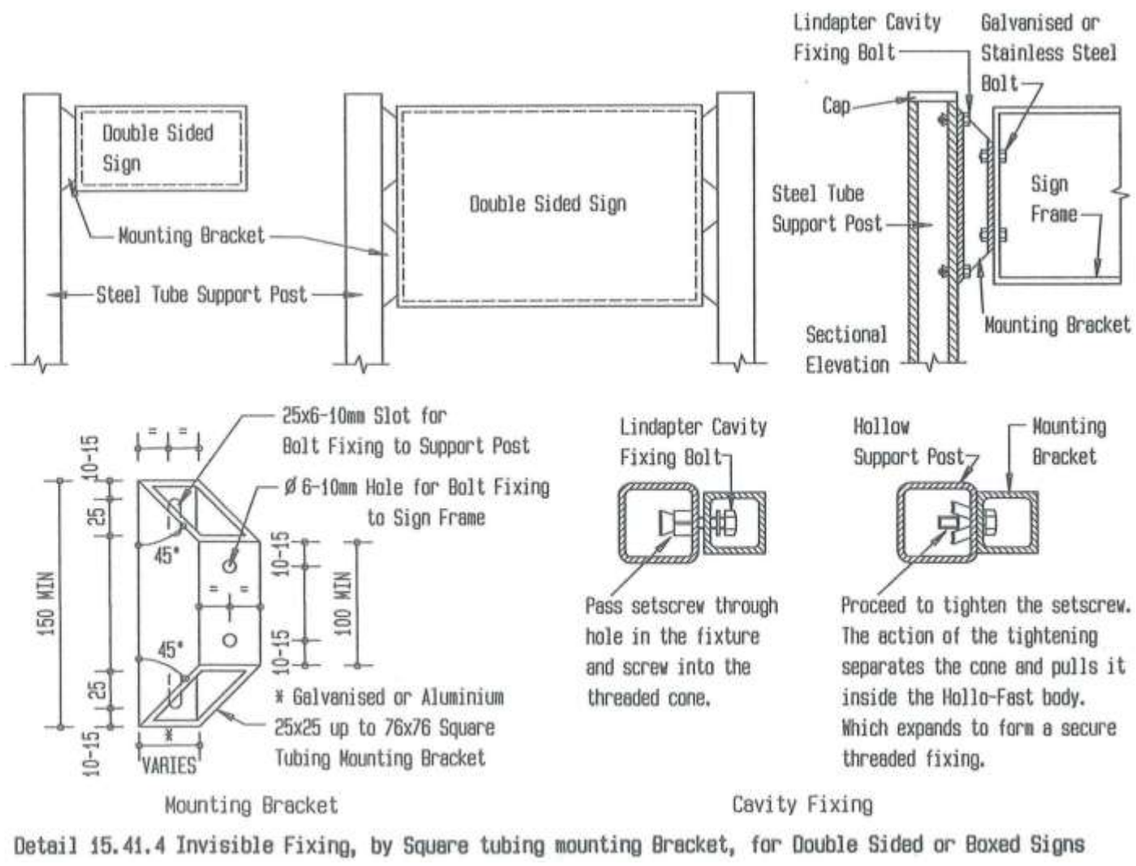


Detail 15.42.2 Direct Bolting through, welded on, Angled Bracket for Double Sided or Boxed Signs

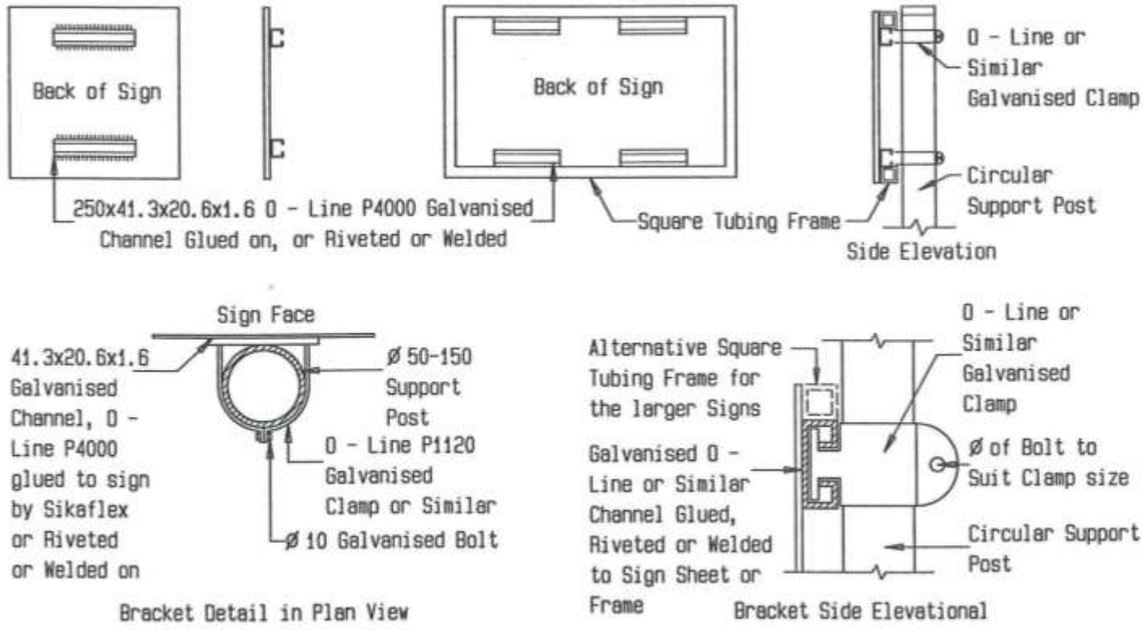
Fig 15.41
Mounting for Small or Medium Sized Signs:
Riveting, Bolting and Lugs



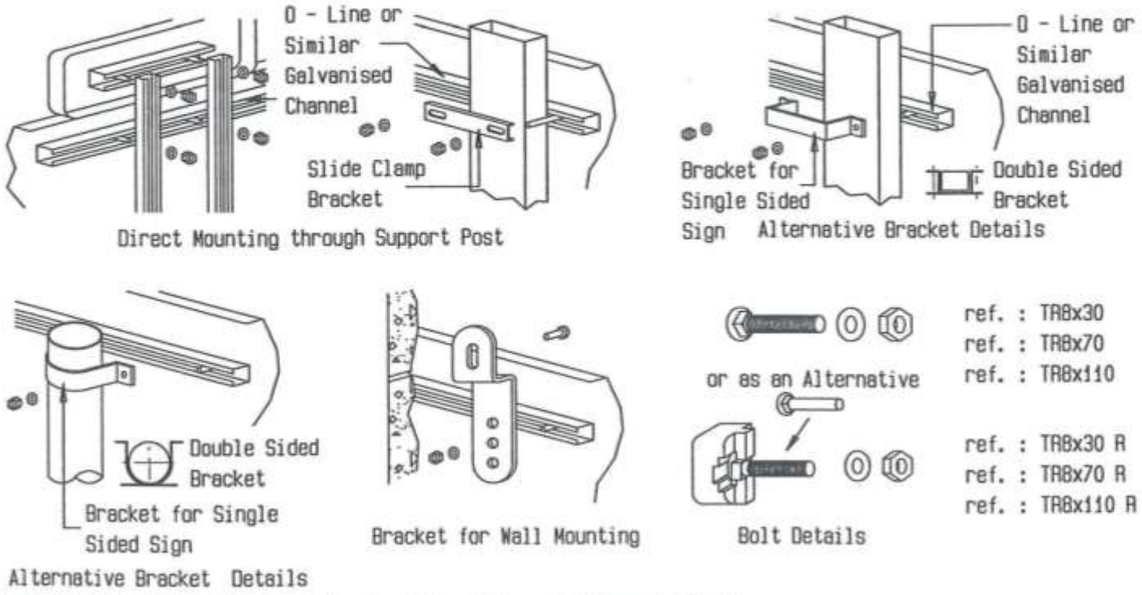
Detail 15.41.3 Direct Bolting through Lugs for Single Sided Signs



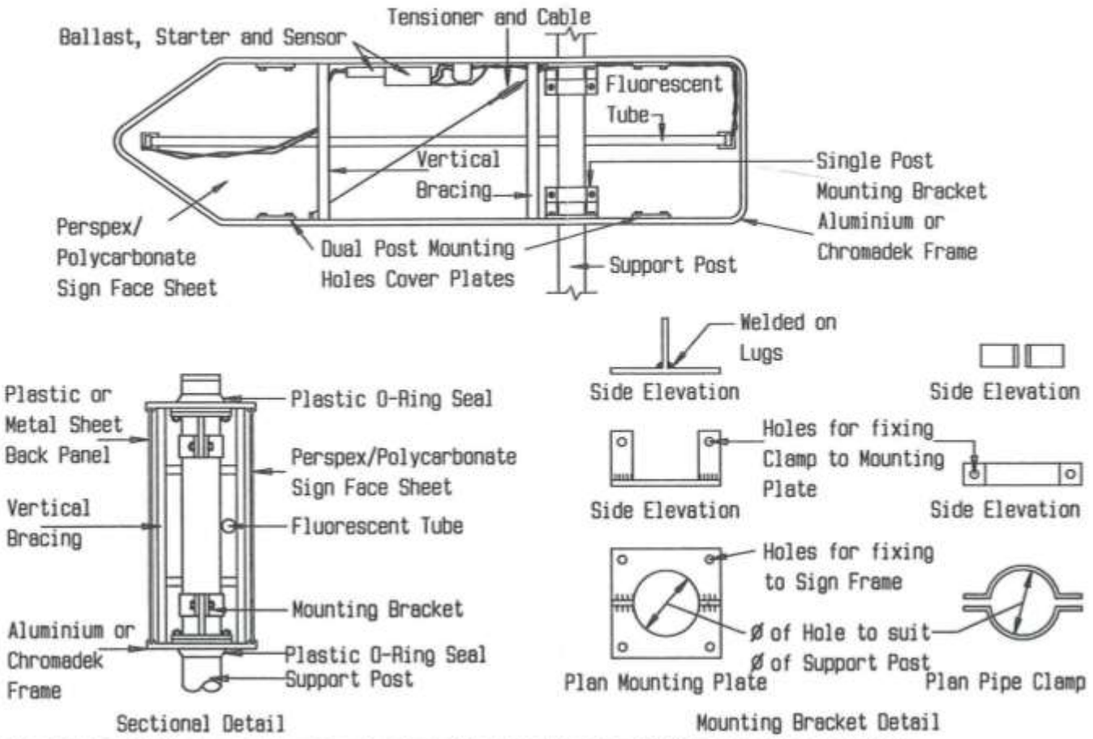
Detail 15.41.4 Invisible Fixing, by Square tubing mounting Bracket, for Double Sided or Boxed Signs



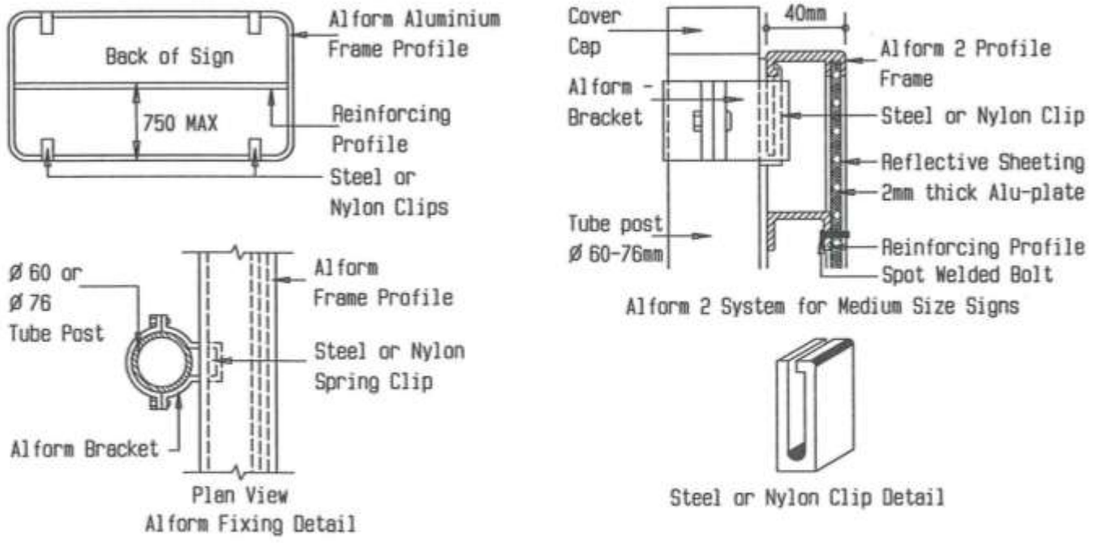
Detail 15.42.1 Mounting Brackets for fixing Signs with Channels/Rails



Detail 15.42.2 Mounting Brackets for fixing Signs with Channels/Rails



Detail 15.42.3 Internal Mounting Brackets for Boxed Signs sliding over Suppport Posts



Detail 15.42.4 German Alform 2 System for Mounting Medium Size Signs

Fig 15.42
Mounting for Small or Medium Sized Signs: Channels and Clamps

TABLE 15.22	MOUNTING BRACKETS FOR SMALL TO MEDIUM SIZED SIGNS	TABLE 15.22
Mounting Type	Advantages	Disadvantages
Rivets Direct	• Quick and easy to install smaller signs • Unskilled labour, with a rivet gun and drill as tools, can install	• Only appropriate to signs < 0,36 m^2 • Vandals can easily remove or bend signs • Can only be riveted to a pipe or tube-type support • Not recommended for long term installation
Bolts Direct or through Frame	• Can bolt through any material • Quick and easy to install smaller signs • Unskilled labour, with drill and spanners as tools, can install • Most prevalent method for installing small to medium sized signs with a perimeter frame • If bolted through a frame the sign cannot be bent by vandals and is more rigid and durable	• Vandals can easily remove • Bolts must be stainless steel or galvanised against rust • If only bolted through sign sheet vandals can easily remove or bend • This method appropriate to one sided signs mostly • More labour involved if frame provided for back plate
Lugs and Bolting	• Variety of mounting options possible i.e. between posts • Double sided or boxed signs installation possible • Can bolt through any material • Quick and easy to install by unskilled labour with a drill and spanners • Rigid and durable mounting	• Lugs must be welded, bolted, riveted or glued onto sign frame or back plate if no frame • More labour involved when manufacturing sign back plate
Invisible Hardware Mounting Bracket	• Very neat installation • Fixing nuts and bolts hidden within bracket • Variety of mounting options possible i.e. single/multiple brackets • Double sided or boxed signs installation possible • Rigid and durable installation	• Only Lindapter Cavity fixing bolts, to fix to tube type supports, to be used • More labour involved when mounting sign because of more drilling and bolting than usual
Channels and Clamps	• Well known, prevalent method of mounting signs in SA • O-line channels and clamps freely available in different sizes • Variety of other types of brackets and channels also available	• Clamps, channels and bolts should be galvanised against rust • More labour involved to glue, rivet, bolt channels to back plates

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TABLE 15.22 MOUNTING BRACKETS FOR SMALL TO MEDIUM SIZED SIGNS **TABLE 15.22**

Mounting Type	Advantages	Disadvantages
	• Levelling and alignment of signs easy when mounting	
Internal Mounting Brackets	• Very neat installation	• More labour and equipment involved in manufacture and mounting
	• Ideal for boxed/internally illuminated signs	• Mounting brackets purpose made for sign and post
	• Single or dual support mounting	
	• Sign can swivel around post to point in any direction and will need locking pins or bolts to keep in position	
	• Electric cables can safely be hidden	
German Alform Spring Clip Bracket	• Neat installation	• Only appropriate to German Alform sign frame profiles or modifications thereon
	• Used all over Europe	
	• No drilling needed to mount any sized sign	
	• Unskilled labour can install easily and quickly	
Straps and Brackets	• Variety of brackets for strap mounting available	• Straps must be stainless steel
	• No drilling needed to mount signs	• Appropriate to smaller up to medium (4.5 m^2) signs only
	• Unskilled labour can install easily and quickly	
Saddle Clamps	• Bracket provide some rigidity to signs	• Older type of mounting method
		• Appropriate to smaller signs only
		• Drilling necessary
Multi Clip Retained Slats	• Ideal for wall mounted slat type signs of many sizes	• Specialised, purpose made frames , corners, slats and retainers needed for installation
	• Easy to install and maintain	• Expensive to manufacture because of all aluminium construction
	• Vandal resistant in that slats cannot be removed without special key	• Theft due to aluminium construction
Slide-in Stacked Slats	• Normally used for advertising signs or internal feature signing of buildings	• Specialised, purpose made frames, slats, retainer lugs and support posts
	• Easy to install, change and maintain	• Expensive to manufacture because of all aluminium construction
	• Neat installation	• Theft due to aluminium construction

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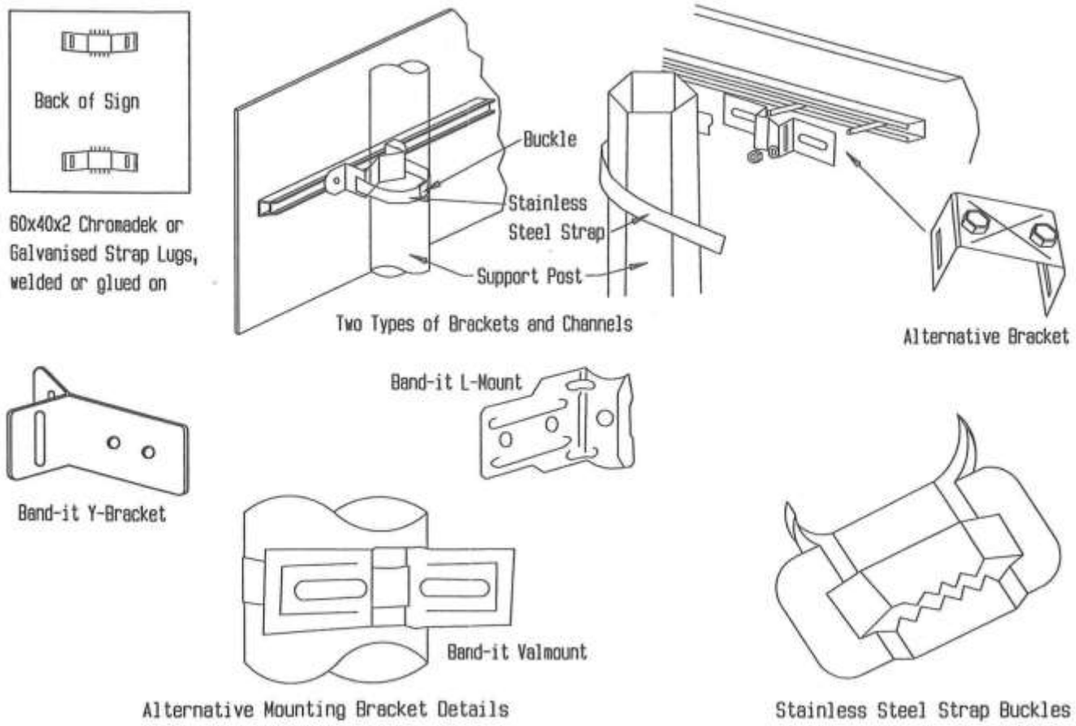
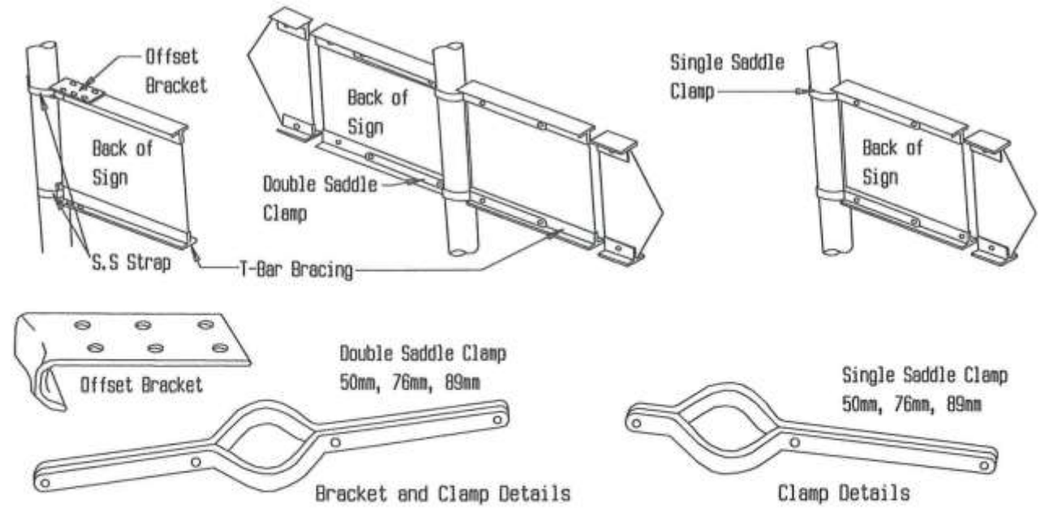
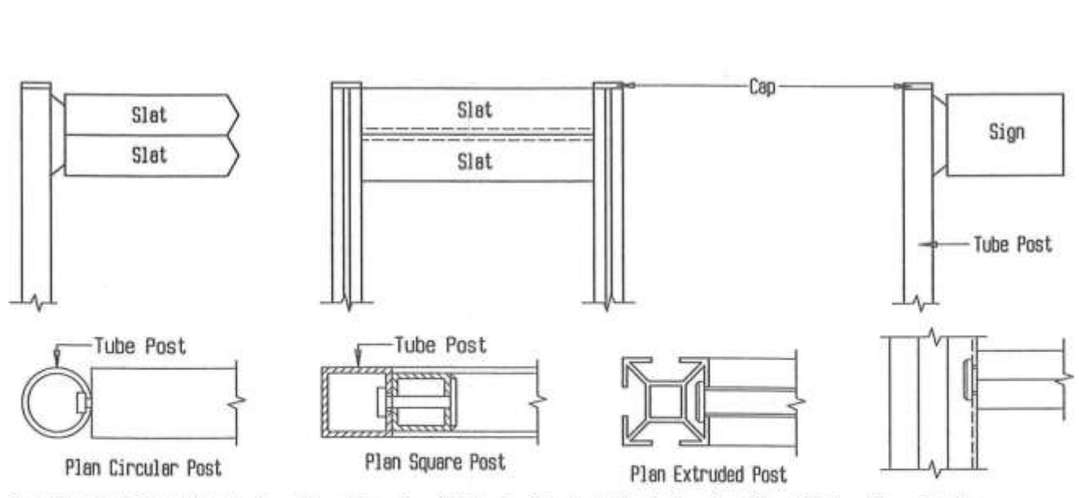


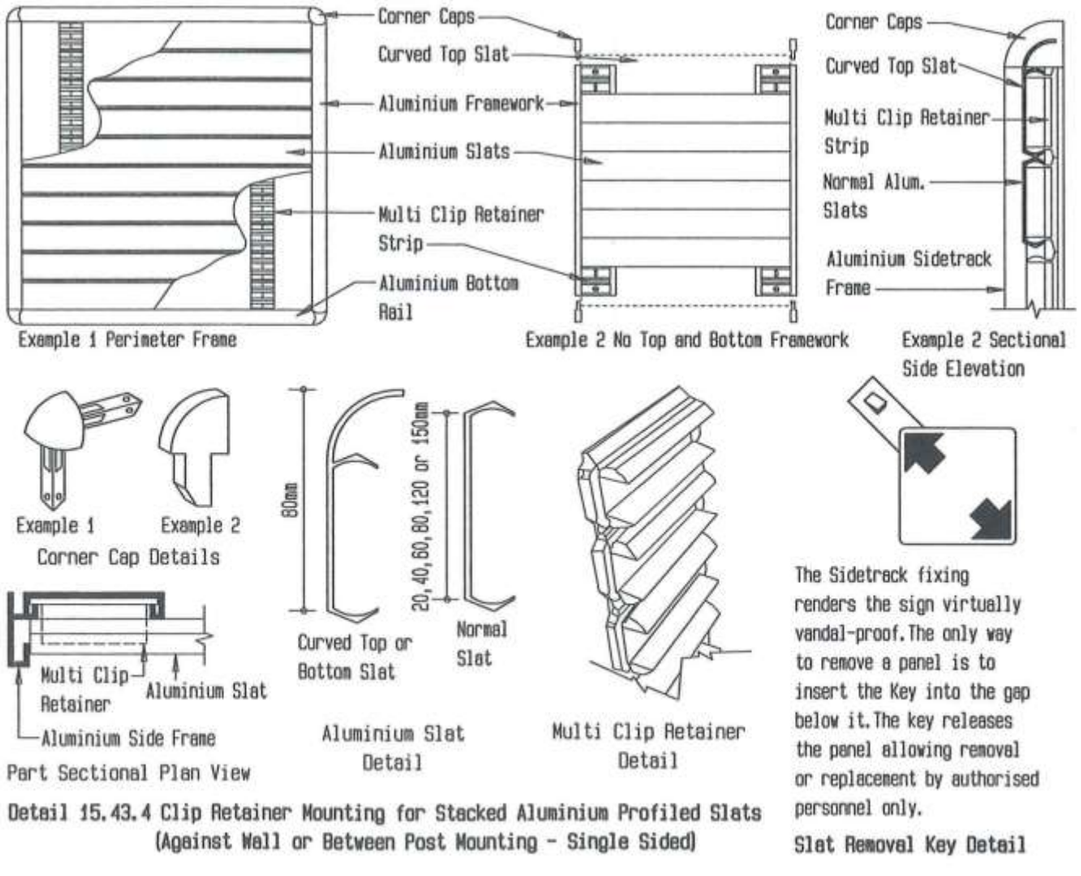
Detail 15.43.1 Strap and Lug/Bracket,Channel Mounting of Smaller Signs



Detail 15.43.3 2Strap and Saddle Clamp Mounting of Smaller Signs

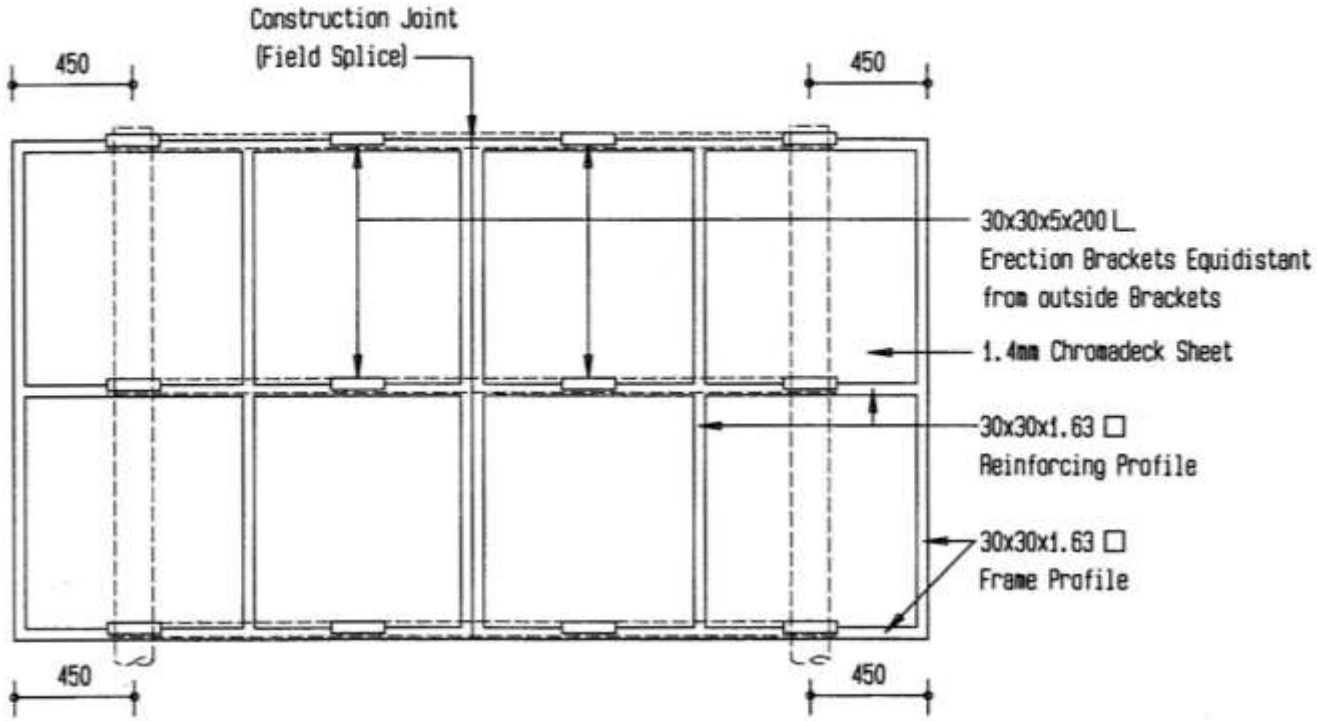


Detail 15.43.2 Bolt Retainer Mounting for Slide in Stacked Aluminium Profiled Slats (Two Sided)

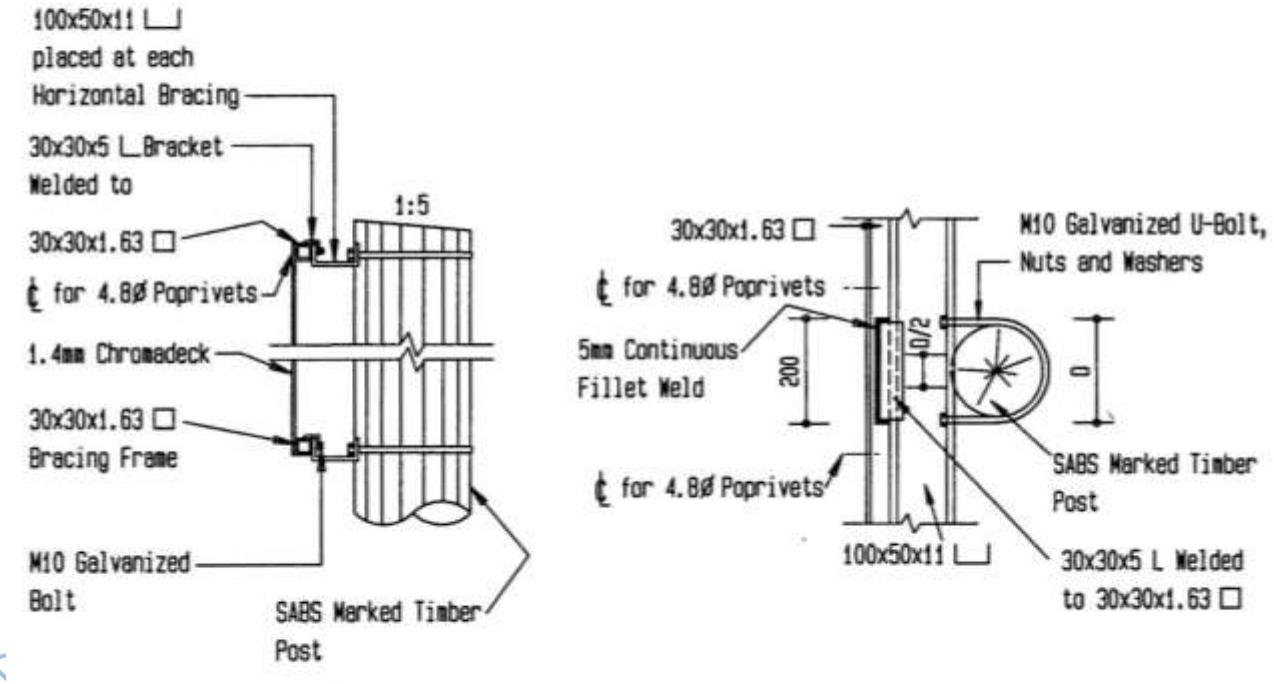


Detail 15.43.4 Clip Retainer Mounting for Stacked Aluminium Profiled Slats (Against Wall or Between Post Mounting - Single Sided)

Fig 15.43
Mounting for Small or Medium Sized Signs: Straps, Saddles, Retainer Clips or Slide In



Detail 15.44.1
Rear Elevation of Back Plate for Ground Mounting on Multiple Supports



Sectional Side Elevation

Sectional Plan

Detail 15.44.2
Fixing Details for Large Road Sign Boards to Two or More Supports

Fig 15.44 Ground Mounting of Larger Signs: Flat Sheet Chromadek Signs

TABLE 15.23 MOUNTING BRACKETS FOR LARGER SIGNS TABLE 15.23

Mounting Type	Advantages	Disadvantages
Ground Mounting of Flat Sheet Chromadek Sign on Multiple Supports	• Most prevalent method in S.A. for Ground Mounted Signs • Normal mounting position for this type of sign • Welded-on erection brackets make mounting easy • Easy to mount, hang and tighten bolts	• Heavy horizontal carrier channels necessary between supports • Alignment problems with carrier channels when erecting and tightening U-bolts • Skilled labour and special equipment needed to install
Ground Mounting of Flat Sheet Chromadek Sign on Single Support	• Optional mounting position for this type of sign • Welded on erection brackets will suffice for mounting in this position • Easy to mount i.e. hang and tighten bolts • Uses same method for mounting than for multiple supports above	• Heavy horizontal carrier channels, welded to support and gusset plates, needed • Alignment and levelling problems when installing • Skilled labour and special equipment needed to install
Overhead Mounting of Flat Sheet Chromadek Sign on Cantilever or Gantry	• Optional mounting position for this type of sign • Uses standard method for overhead mounting	• Vertical carrier Z-profiles replace erection brackets and horizontal carrier channels • More bolting and riveting than for ground mounting • Alignment and levelling problems when installing • Skilled labour and special equipment needed to install
Ground Mounting of Stacked Chromadek Sign Profiles on Multiple Supports	• Generally used method in S.A. • Normal mounting position for this type of sign	• Lots of bolting and riveting before mounting of sign • Skilled labour and special equipment needed to instal
Ground Mounting of Stacked Chromadek Sign Profiles on Single Support	• Optional mounting position for this type of sign • Uses similar method to overhead mounting of signs	• Vertical carrier Z-profiles needed for erection • More bolting and riveting than for ground mounting • Alignment and levelling problems when installing • Skilled labour and special equipment needed to install
Overhead Mounting of Stacked Chromadek Sign Profiles on Cantilever or Gantry	• Optional mounting position for this type of sign • Uses standard method to overhead mounting of signs	• Vertical carrier Z-profiles needed for erection • More bolting and riveting than for ground mounting • Alignment and levelling problems when installing • Skilled labour and special equipment needed to install

TABLE 15.23 MOUNTING BRACKETS FOR LARGER SIGNS TABLE 15.23

Mounting Type	Advantages	Disadvantages
Ground Mounting of Stacked Aluminium Sign Profiles on Multiple Supports	• Optional mounting position for this type of sign in S.A. • Light weight • Uses same method for ground mounting as for Chromadek profiles	• Lots of bolting and riveting before mounting sign • Skilled labour and special equipment needed to install
Ground Mounting of Stacked Aluminium Signs Profiles on Single Supports	• Optional mounting position for this type of sign in S.A. • Light weight • Uses similar method to overhead mounting of signs	• Vertical carrier Z-profiles needed for erection • More bolting and riveting than for ground mounting • Alignment and levelling problems when installing • Skilled labour and special equipment needed to install
Overhead Mounting of Stacked Aluminium Signs Profiles on Cantilever or Gantry	• Normal mounting position for this type of sign in S.A. • Standard method for overhead mounting of signs • Light weight • Uses standard method to overhead mounting of signs	• Vertical carrier Z-profiles needed for erection • More bolting and riveting than for ground mounting • Alignment and levelling problems when installing • Skilled labour and special equipment needed to install

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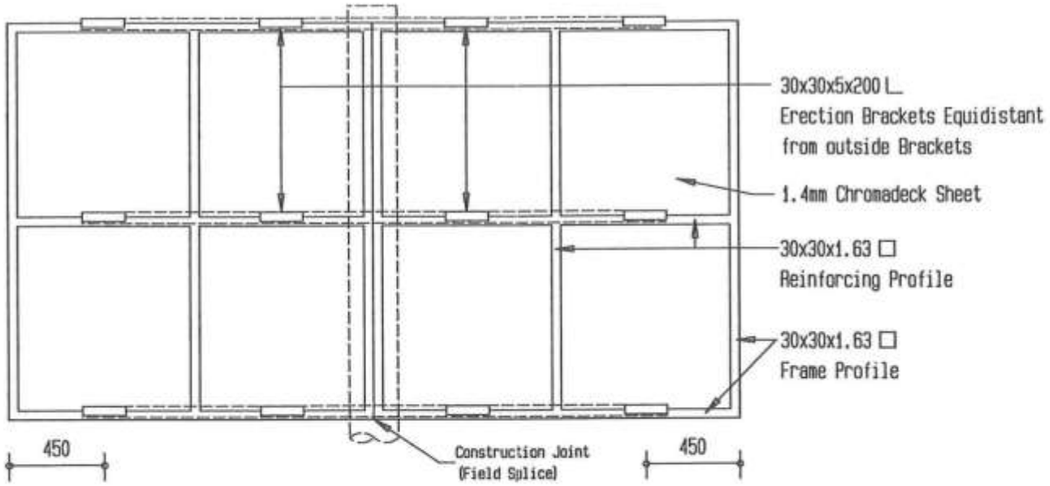
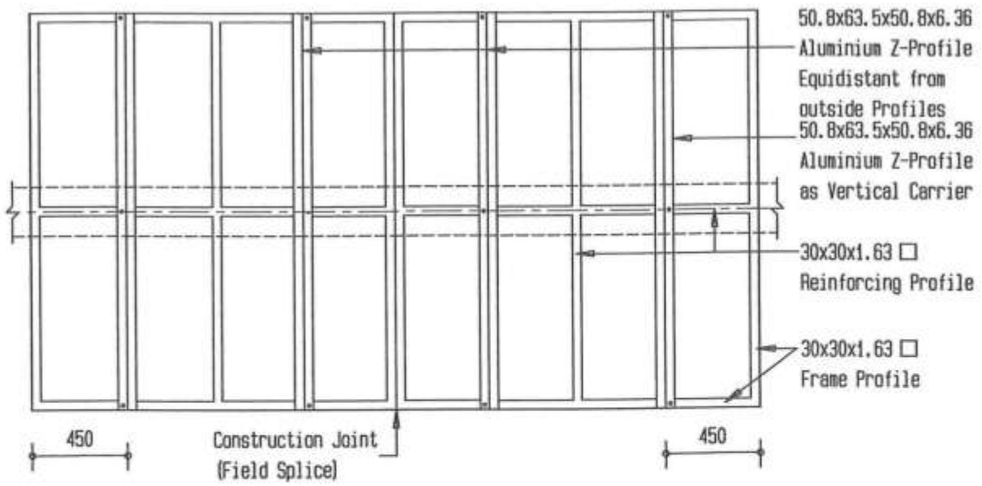
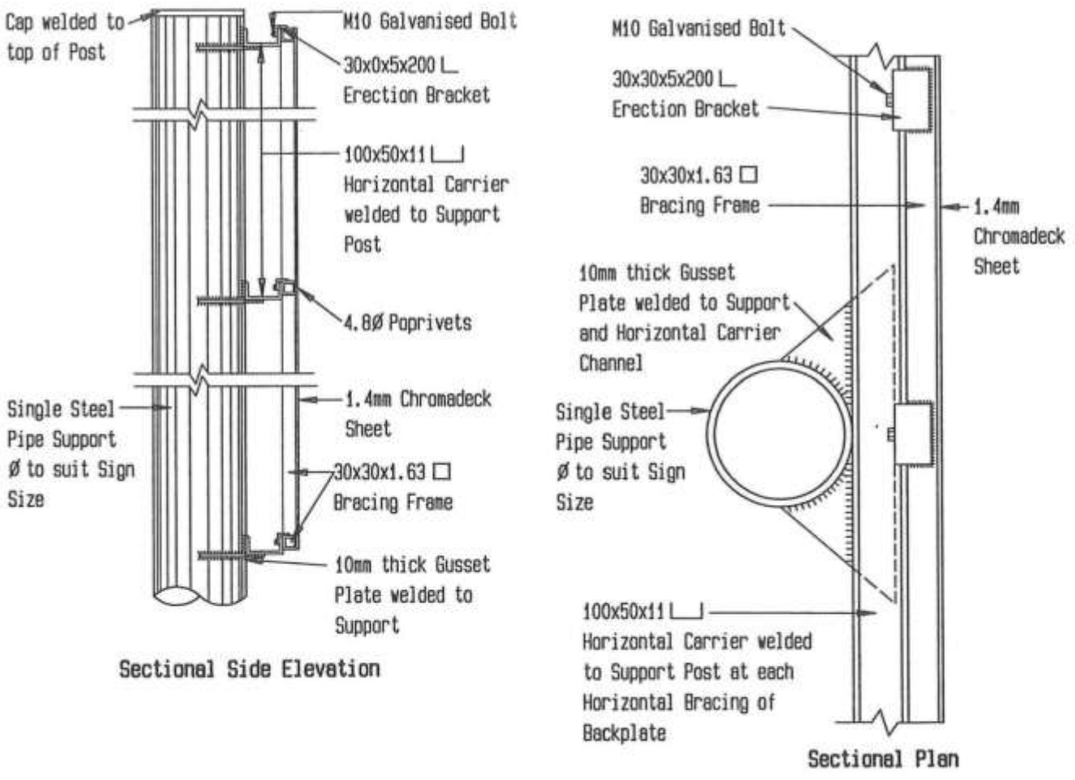
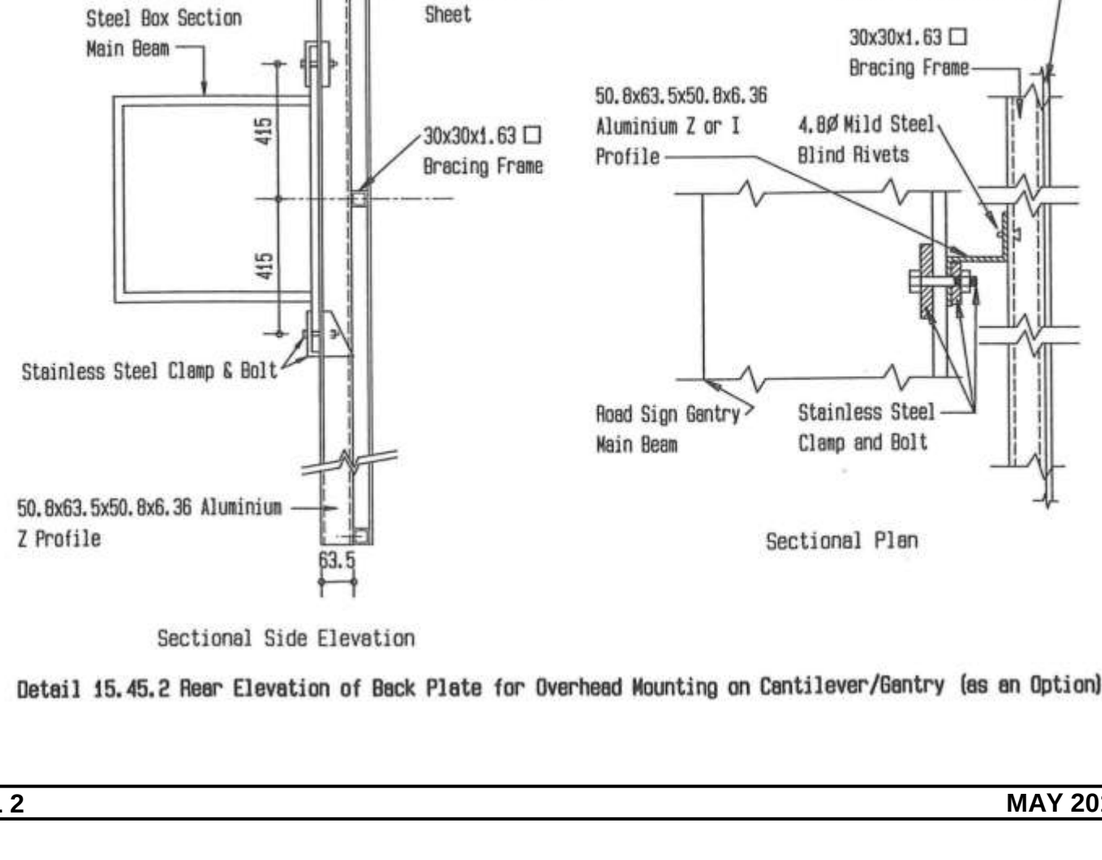




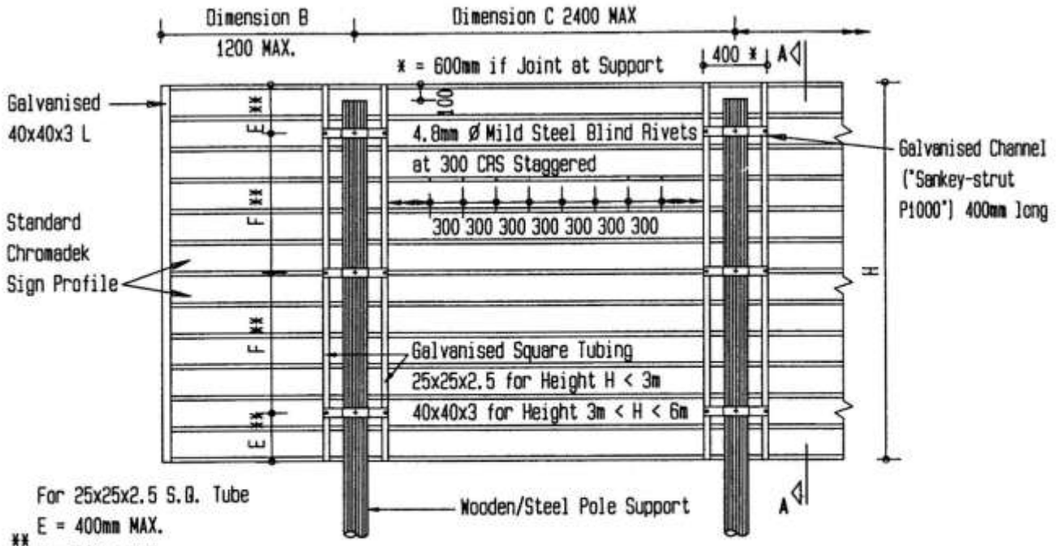


Detail 15.45.1 Rear Elevation of Back Plate for Ground Mounting on Single Support (as an Option)

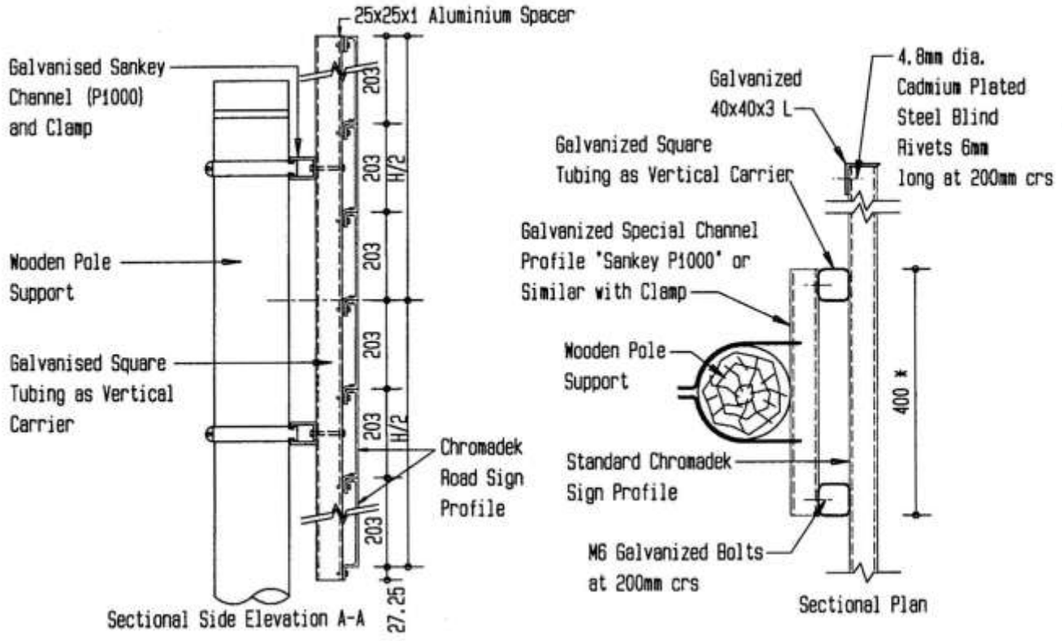


Detail 15.45.2 Rear Elevation of Back Plate for Overhead Mounting on Cantilever/Gantry (as an Option)

Fig 15.45
Mounting for Larger Signs:
Sheet Chromadek Signs



Detail 15.46.1 Rear Elevation of Back Plate for Ground Mounting on Multiple Supports



Detail 15.46.2 Fixing Details for Backplate to Two or More Supports

Fig 15.46 Ground Mounting of Larger Signs: Stacked Chromadek Profile Signs

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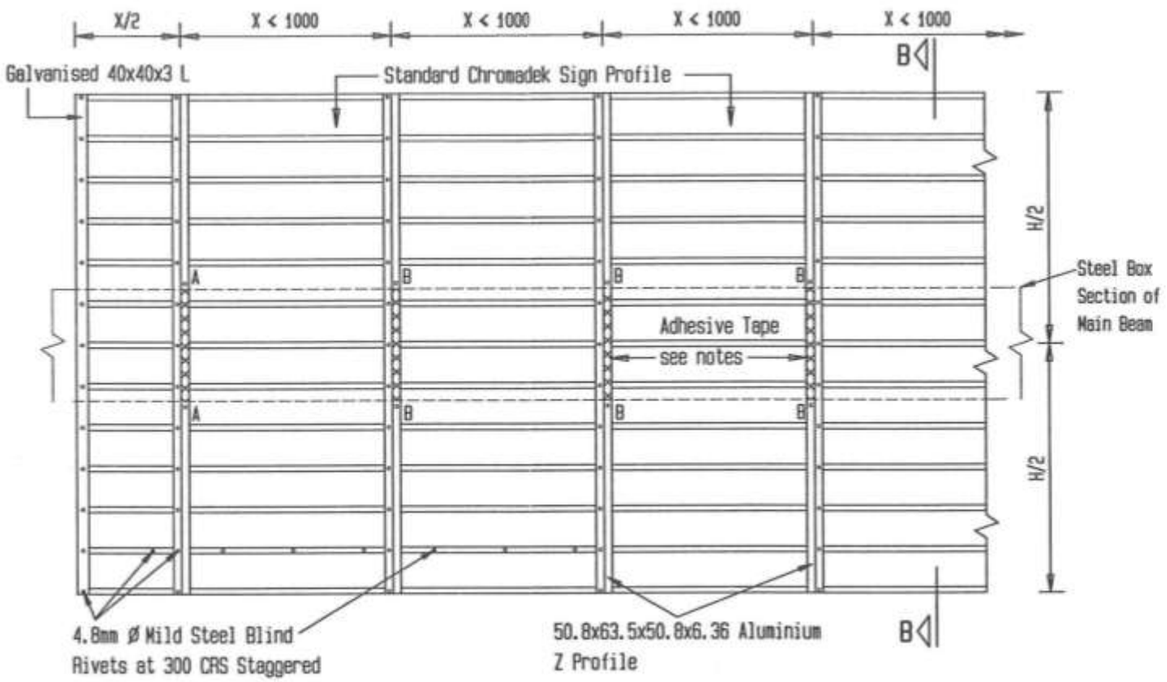
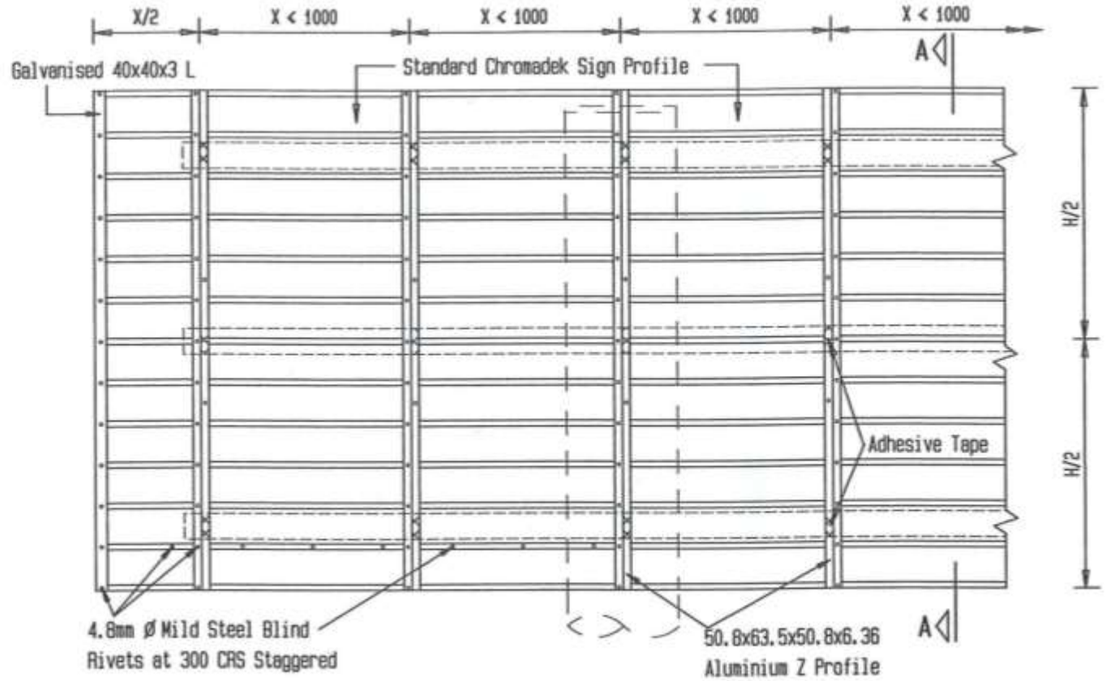
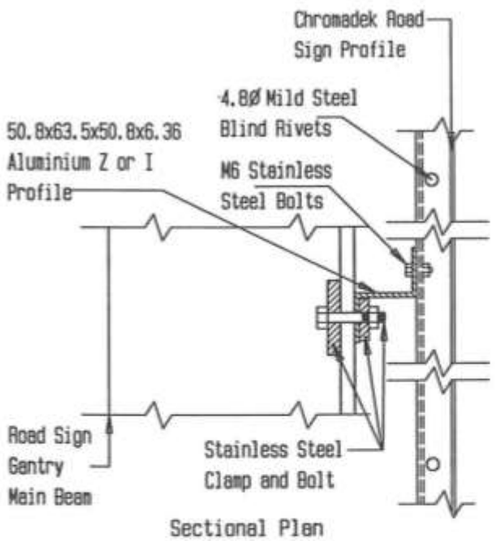
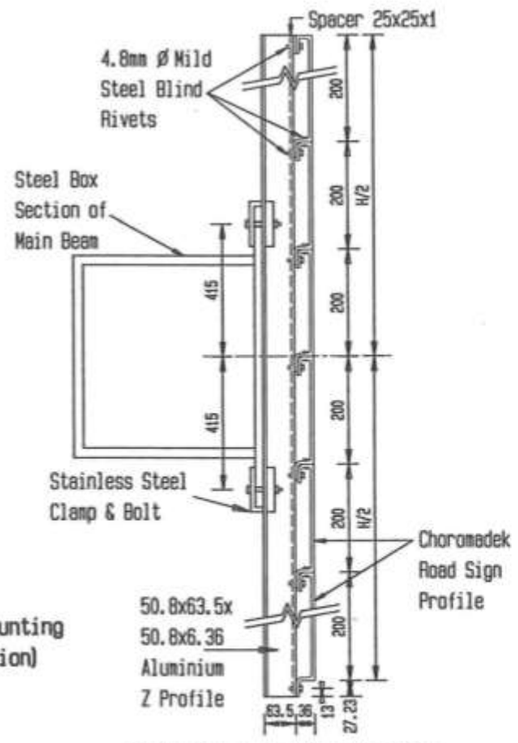
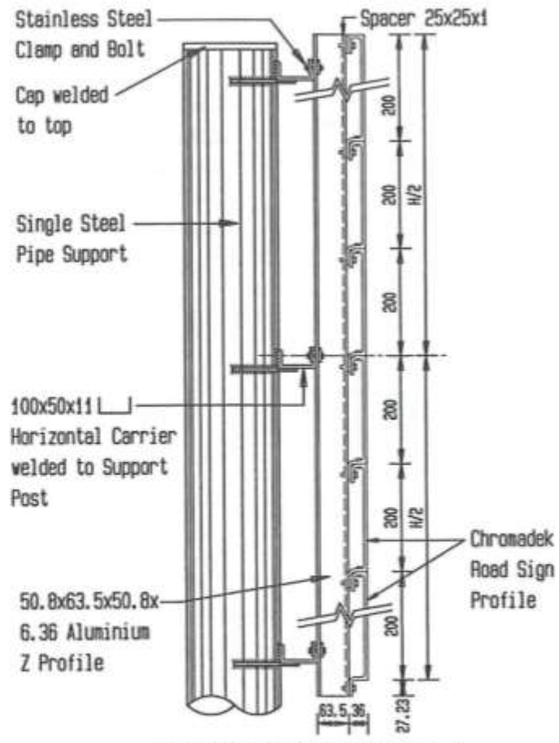


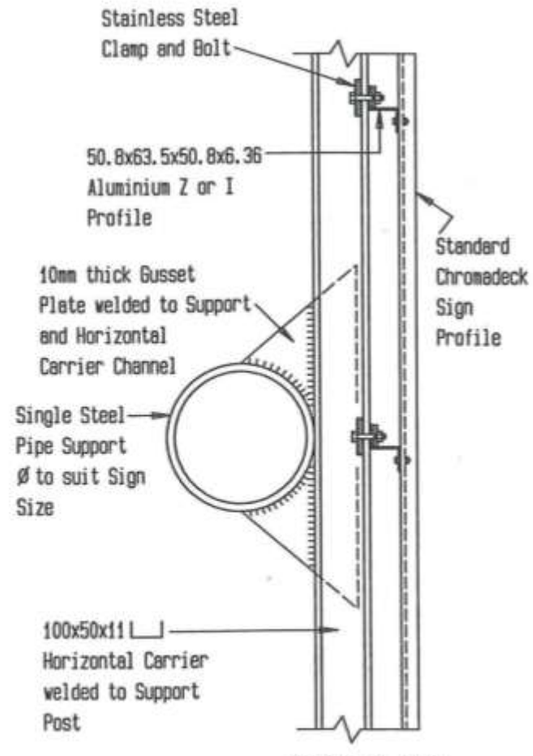






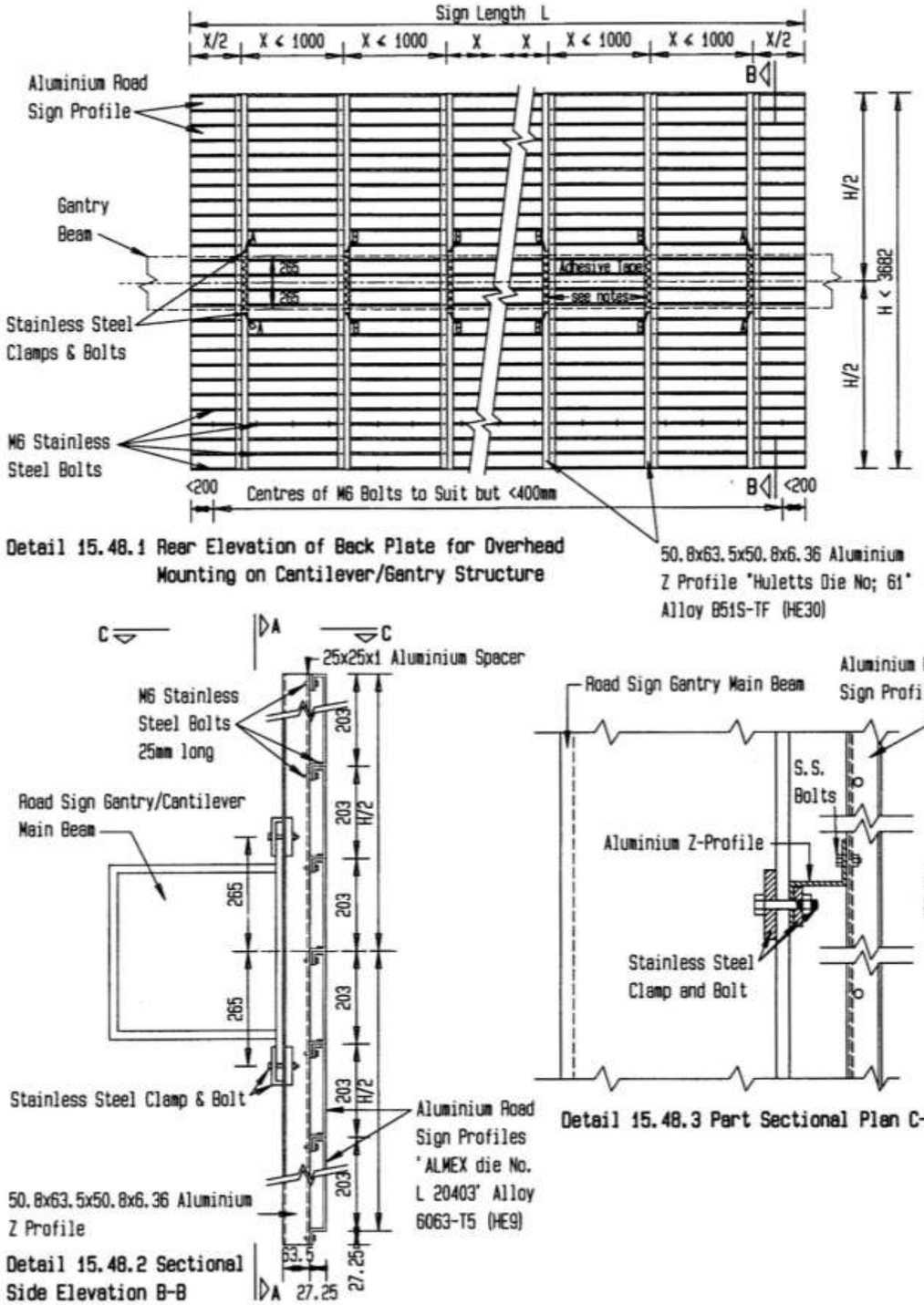
Detail 15.47.1 Rear Elevation of Back Plate for Overhead Mounting on Cantilever or Portal Structure (as an option)





Detail 15.47.2 Rear Elevation of Back Plate for Ground Kounting on Single Post (as an option)

Fig 15.47
Mounting for Larger Signs:
Stacked Chromadek Profile Signs



Detail 15.48.1 Rear Elevation of Back Plate for Overhead Mounting on Cantilever/Gantry Structure

Detail 15.48.2 Sectional Side Elevation B-B

Detail 15.48.3 Part Sectional Plan C-C

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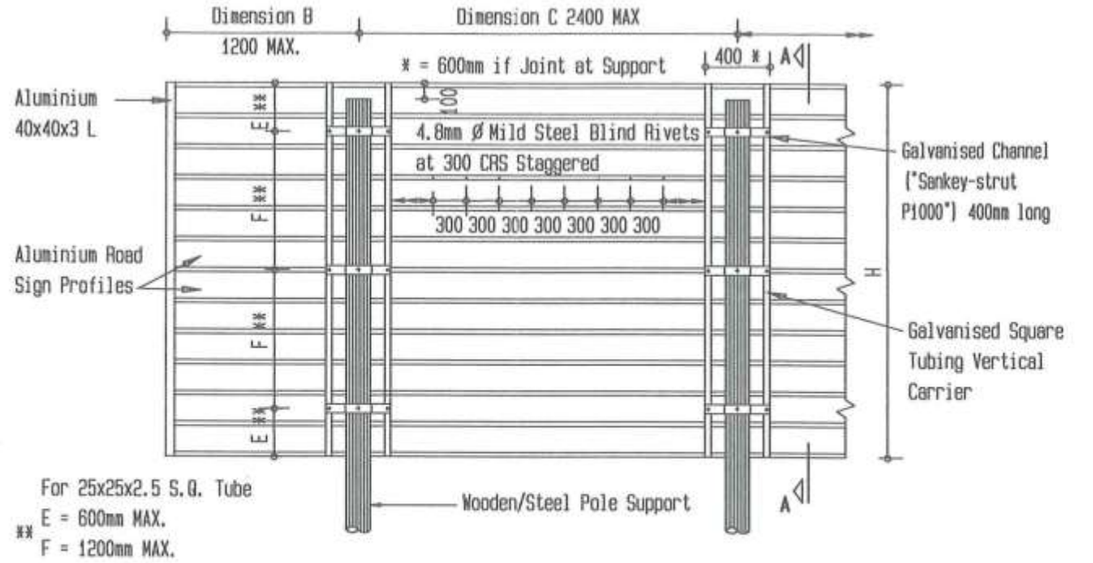
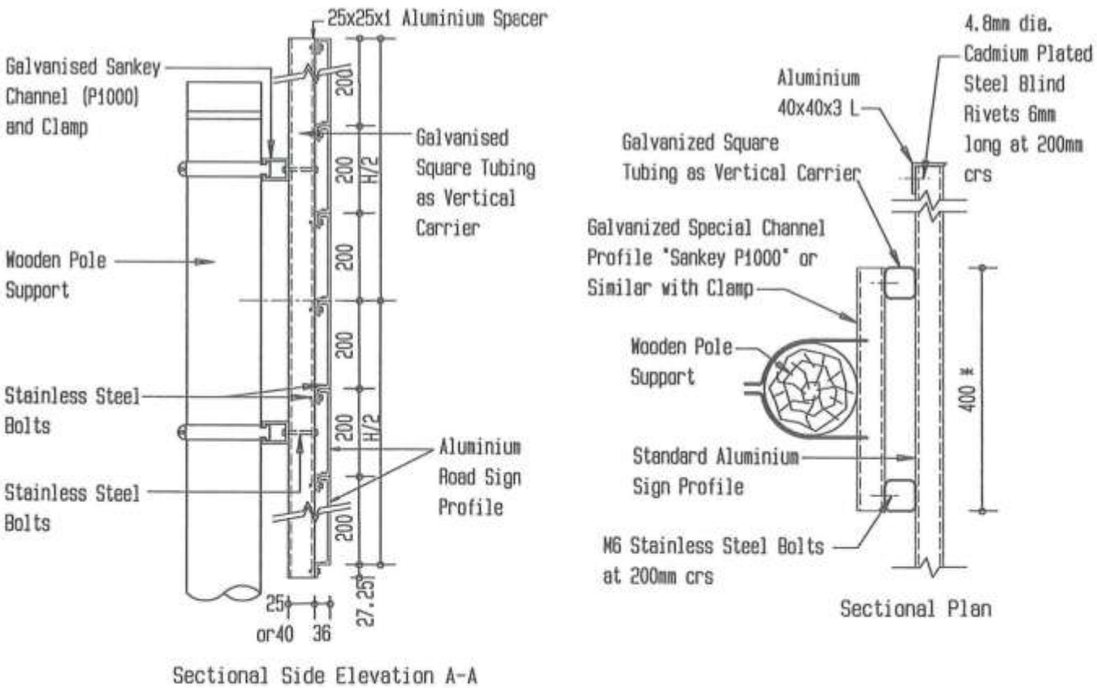
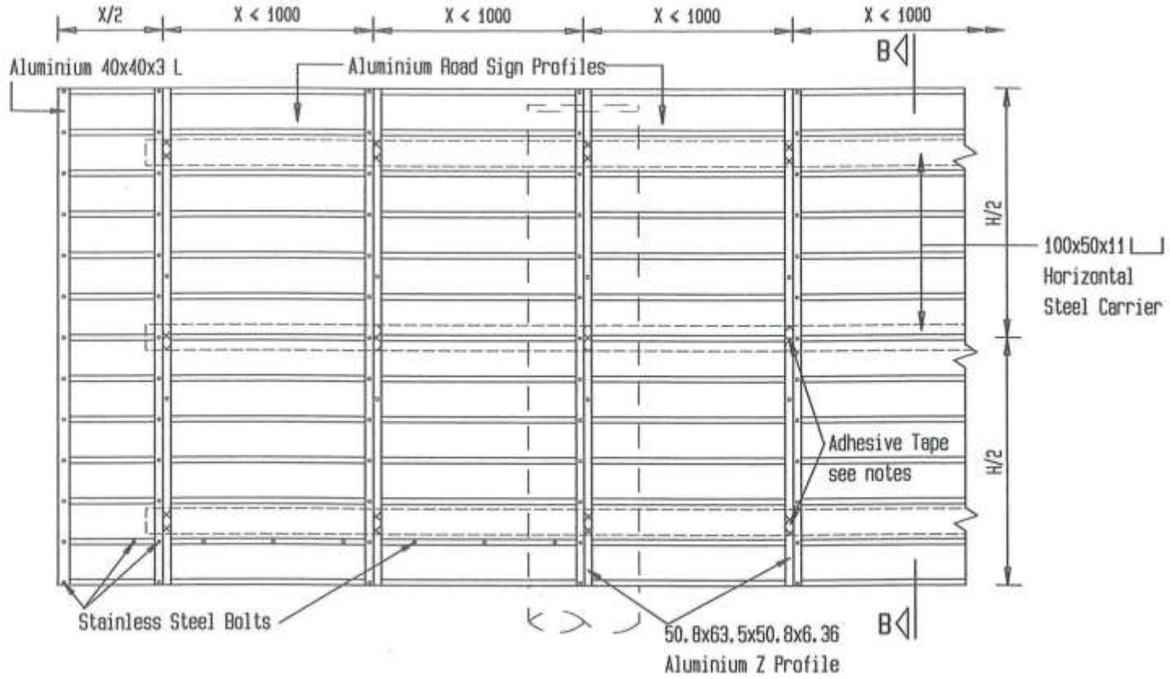
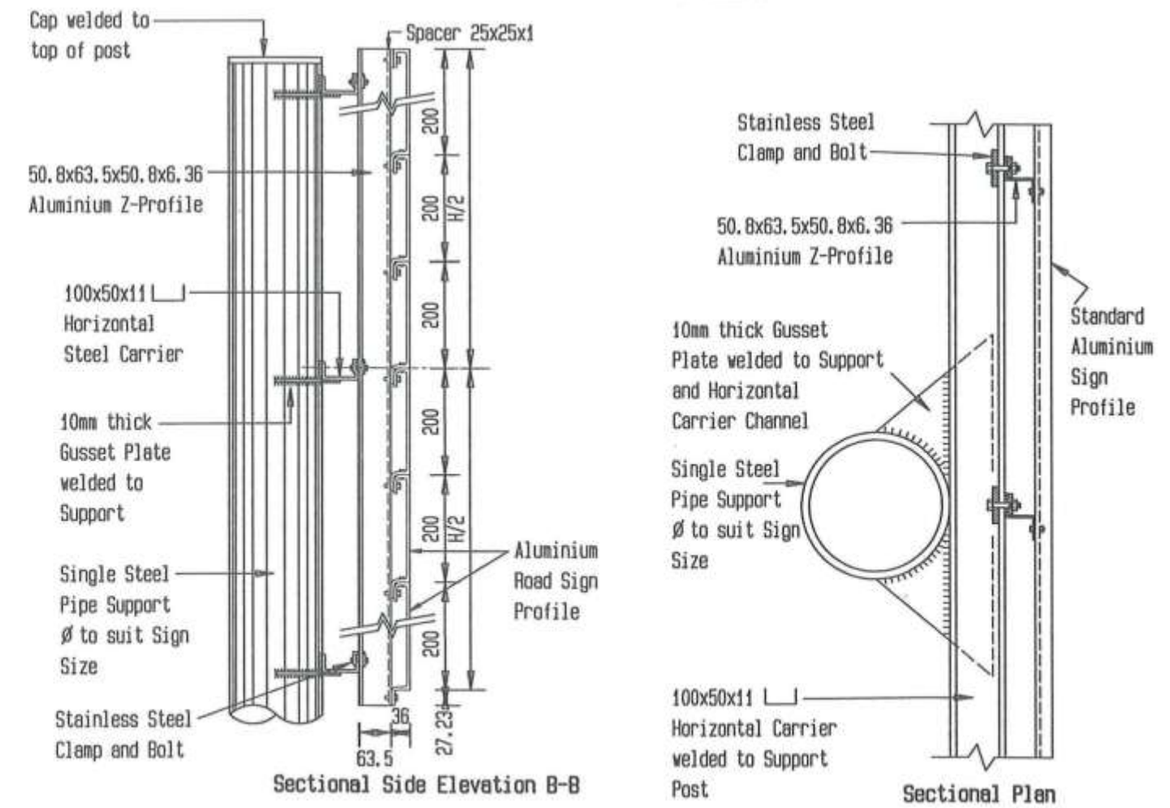
Fig 15.48 Overhead Mounting of Larger Signs: Stacked Aluminium Profile Signs





Detail 15.49.1 Rear Elevation of Back Plate for Ground Mounting on Multiple Posts (as an option)





Detail 15.49.2 Rear Elevation of Back Plate for Ground Mounting on Single Post (as an option)

Fig 15.49
Mounting for Larger Signs:
Stacked Aluminium Profile Signs

15.7 DESIGN AND IMPLEMENTATION - GROUND MOUNTED SIGNS

15.7.1 General

1 In general the design of Road Sign Structures has to do with the choosing of sign structural components that should be functional, flexible and economic. All their component materials should also be chosen for their compatibility with each other, and be of such quality and size that the sign complies with all the appropriate requirements of the regulations and performance levels stated for a specific environment.

2 The materials for the component parts of signs should be chosen with due regard to their advantages or disadvantages regarding the following:

(a) the costs for the initial material, manufacture, installation and maintenance;

(b) the manpower and equipment required to manufacture, install and maintain;

(c) the safety considerations regarding passive safety (frangibility) and deformability, but with crash-worthiness for continued performance after an accident;

(d) the material's resistance to various forms of vandalism;

(e) the durability or performance of the material in different weather or climate conditions, or the environment that it might be located in;

(f) the difficulty and expense required to change or modify signs or the signing system in future;

(g) a standardised system or an individual purpose made unit;

(h) compatibility of materials when different material types are to be joined or fixed together because of possible electrolytic action or differential thermal expansion that may result in failure or deterioration.

3 Section 15.2 discussed the sign location environment as to the influence that it has on the sign material and structure choices.

4 Sections 15.3-15.6 cover the choices between various types of materials, their physical properties, effective- ness and use in making up the components of a sign structure. A wide range of materials and structure examples are indicated with a list of advantages and disadvantages for each of the different components making up a sign structure. The information is not intended to dictate actions or to endorse specific products, but rather to assist those designing sign structures in determining the materials and fabrication methods to use from the many choices available. Fabrication methods and processes commonly used in the industry are presented.

5 The need for, or function of a sign, determines the signface type, its location and clearances for placement. The sign environment dictates the mounting position either overhead or ground mounting, the materials to be used, the support structure and details, the base and foundation type with regard to road user safety as well as treatment against vandalism.

6 The typical Design Procedure consists of the following actions:

(a) survey proposed sign environment;

(b) determine sign back plate type and size;

(c) determine number of supports;

(d) calculate wind load, bending moments and other loads as to effective signface area and total height above ground level;

(e) determine support structure type and sizes;

(f) is support bracing necessary ?

(g) decide on support structure frangibility method, i.e. the base breakaway means and support anchor type;

(h) determine foundation type and size applicable to soil type;

(i) decide on mounting and fastening details of the back plate.

7 The following types of ground mounted sign support structures are catered for in this section:

(a) single supports	- freestanding for signs $\leq$1.5 m^2
	- freestanding for normally multiple support signs $\geq$ 1.5 m^2
(b) multiple supports	- freestanding
	- braced

8 Five breakaway methods and three foundation types are indicated for use with the above support structures:

(a) simple fracture or bending with natural soil foundation;

(b) breakaway holes at support base with soilcrete foundation;

(c) slip base plates with soilcrete foundation;

(d) split base socket with non-reinforced mass concrete foundation;

(e) rigid fixed base plate with non-reinforced mass concrete foundation.

9 The following back plate, bracing and mounting details are included:

(a) back plates $\leq$ 1,5m^2 with no frames, and five mounting methods;

(b) back plates $\leq$ 1,5m^2, with frames, and five mounting methods;

(c) back plates $\geq$ 1,5m^2, flat sheet chromadek signs, with three mounting options;

(d) back plates $\geq$ 1,5m^2, stacked chromadek profile signs, with three mounting options;

(e) back plates $\geq$ 1,5m^2, stacked aluminium profile signs, with three mounting options.

10 For each type of structure complete sets of drawings and notes have been prepared which cover:

(a) minimum clearances;

(b) design;

(c) detail drawings.

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15.7.2 Clearances

1 The minimum lateral and vertical clearances for different road and sign types are indicated in Figure 15.50. This figure also indicates some of the considerations for longitudinal positioning of signs.

2 It must be noted that the clearances indicated in Figure 15.50 are minimum clearances. For preferred and maximum clearances, specific to sign types and road types, designers should refer to Subsections 15.2.6 to 15.2.8 and Figures 15.10 to 15.20.

3 In general the vertical clearance, shoulder breakpoint to underside of sign, parameters are:

(a) normal height = 2 100 mm;

(b) clearance allowing for pedestrians passing under sign = 2 500 mm;

(c) clearance inhibiting vandalism= 3 000 mm;

(d) the recommended maximum top of sign back plate height above shoulder breakpoint = 6 000 mm.

4 Lateral clearances are specific to road cross-section types, sign support structure frangibility types and also to allow for vandalism. The sign's function will also influence its lateral positioning. Figure 15.50 indicates the lateral minimum clearances as well as three minimum clearance profiles for quick reference. The minimum clearance profile is the absolute minimum and no structure/tree/cable or sign should infringe this clearance.

15.7.3 Design

1 The structures must be designed in accordance with the provisions of the National Building Regulations with particular reference to the latest version of the following SABS Design Codes:

(a) SANS 0160: The General Procedures and Loading to be adopted in the Design of Buildings
(b) SANS 0162: Code of Practice for the Structural Use of Steel
(c) SANS 0100: Code of Practice for the Structural Use of Concrete
(d) SANS 0163: Code of Practice for the Design of Timber Structures

2 The structures must be designed for the following loads:

(a) mass of the structure and sign;

(b) the appropriate wind loads as specified in SANS 0160. The standard design methods and design charts are based on a wind loading of 0,75 kN/m^2 acting on the vertical surfaces of signs and structures with a total height of 6 m and less. The derivation of the wind load is covered in Section 15.2.7. Also included in Section 15.2.7 is the calculation of the wind forces in accordance with the latest edition of SANS 0160 for 40 m/sec and 45 m/sec winds, with wind load coefficients indicated in Table 15.7;

(c) a horizontal collision load equivalent to static load of 100 kNm acting 1,2 m above the base plate.

3 In order to be deemed acceptable, posts should thus comply with the following requirements:

(a) the post should sustain a moment of 1,05 A (i.e.1,05 x the theoretical moment of resistance) at its critical section (usually the connection to the base plate or the frangible joint) with:

(i) failure at the joint, or

(ii) deflection at the point of application of the impact load exceeding 0,05h, where "h" is the height of the point of application above the plane of the bottom of the base plate, measured in millimetres.

4 Sign supports erected close to the travelled roadway without guardrails should be of a yielding or breakaway construction in order to reduce vehicle damage and injury to occupants in the event of vehicles colliding with them. The basic concept of a breakaway sign support is that of a structure which possesses sufficient moment of resistance to withstand wind loads, yet offers low shear resistance at the base to a colliding vehicle. In the event of a collision the structure should yield or break away. Failure should occur in such a way that:

(a) serious secondary collision of the sign or support with the vehicle is avoided;

(b) energy absorbed from the impacting vehicle is kept to a minimum (a maximum reduction of 17 km/h in the speed of the impacting vehicle is considered acceptable), and damage to the vehicle is low.

5 The treatment of supports with various frangible base methods basically has two breakaway results namely:

(a) allowing the vehicle to pass over the sign and structure, normally used for single support signs;

(b) allowing the vehicle to pass under the sign, usually used for multiple supported signs.

These results are indicated in Figure 15.18.

6 Because there is no breakaway allowance for supports with rigid, fixed base plates, normally used on support structures for the mounting of larger signs, these supports should be located at least 4 m - 4,5 m from the edge of the road if no kerbing or guardrails are provided. These support structures are a hazard to vehicles, and should be safeguarded by guardrails if they are located nearer to the edge of road than the minimum distance allowed for the road cross sectional type.

7 The design loads must be combined in accordance with paragraph 4.4.2 of SANS 0160 in accordance with the limit states design codes. When a wind load and collision load act simultaneously on the support, 25% over-stresses are accepted. The allowable stresses for various materials shall be in accordance with SABS or BSS specifications.

8 Allowable deflections for freestanding single support structures are:

(a) the horizontal displacement of the end of the sign is limited to 1/75th of the length/width of the sign back plate;

(b) the horizontal displacement of the support junction is limited to 1/100th of the support height.

9 Allowable deflections for Multiple Support Structures are:

(a) the vertical deflection of the sign back plate must be compensated for by fabricating the carrier member with a

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continuous camber to a value approximately twice the deflection under mass loads only;

(b) the horizontal deflection of the sign back plate is limited to 1/200th of the span;

(c) the horizontal deflection of the supports measured at the support and sign junction is limited to 1/100th of the support height under wind loading only. The horizontal deflection as a result of frame action under mass loads is limited to 1/350th of the support height.

15.7.4 Analysis and Design Charts

1 The design graphs which are included as Figures 15.53 and 15.55 provide design solutions to a wide range of structures, support heights and sign areas to be supported on the structures.

2 Although the wind loadings do not influence signs with a total height of less than 6 m to the same degree as for overhead mounted signs, at a total height between 6 m -10m, the graphs are necessarily arbitrary in terms of the wind loadings and allowance are not made for varying wind speeds, height above sea level and shielding factors depending on terrain category for signs less than 6 m in height. It should be noted that the designs procedure and charts have most probably been based on a "permissible stress" design code while the current code is based on a "limit states" method. Allowance is not made for the use of different grades of structural steel. These factors can affect the design and economy of the structure significantly. A rigorous purpose made design where the above factors can be properly assessed is therefore recommended. The methodology of the design charts, and the range and limit of the structures which can be designed by using the charts, are nevertheless given below.

3 The charts have been prepared for the design of single and multiple supported sign structures described in Subsection 15.7.5. The charts are based on the use of standard steel tube sections and timber poles.

4 The variables accommodated by the charts are:

(a) number of supports;

(b) support total height above ground level;

(c) area of sign face;

(d) foundation size.

5 The following information for the fabrication of the structure are obtained from the design charts Figures 15.53 and 15.55 (examples of use of the charts are illustrated):

(a) the size and number of supports required;

(b) the minimum sign height required to prevent aerodynamic oscillation;

(c) the wall thickness, diameter and mass/lineal meter of the steel tube or timber supports;

(d) the plate thickness and mass of the base plate and gusset plates;

(e) the diameter of the anchor bolts and mass of the anchor bolts groups;

(f) the minimum foundation, diameter/length and width, and height that could possibly be used, the maximum bearing pressure developed and the support anchor required in the actual foundation used.

15.7.5 Range and Limits of Standard Designs

1 The following ranges and limits are covered in the Figures 15.51 to 15.53 for freestanding single support sign structures:

(a) area of road sign face varying between 0,5 m^2 and 10,5 m^2, with the sign back plate positioned either equally or up to one third/two thirds its width over the support, and maximum sign width $\leq$3,5 m;

(b) support total height/length above GL up to 6 m maximum to cover most conditions encountered where:

(i) maximum height/depth of sign back plate 3,0 m;

(ii) fill slope is 1:3 or flatter;

(iii) cut slope does not exceed 1:1;

(iv) allowance for space restricted areas i.e. pedestrians, and vandalism.

(c) six support base frangibility methods are included:

(i) simple fracture or bending at base;

(ii) drilled breakaway holes;

(iii) sleeve or threaded pipe coupling breakaway;

(iv) inclined or horizontal slip base plates;

(v) split base sockets;

(vi) fixed, rigid base plates.

(d) three standard foundations with plinth top heights varying from 50 mm above GL, at GL and 150 mm below GL are indicated for two soil types being sand or soft clay and medium hard ground, for any of the following footings:

(i) driven in or buried support end in natural soil;

(ii) support end or support base plate stub post set in soilcrete;

(iii) support base plate stub post or hooked anchor bolts set in non-reinforced mass concrete.

2 The following ranges and limits are covered in Figures15.54 and 15.55 for freestanding and braced multiple support sign structures:

(a) area of road sign face varying between 1 m^2 and 26 m^2, with the sign back plate positioned, equally divided, over freestanding or braced multiple sup- ports, and minimum sign width >1,2 m to a maximum 6 m;

(b) support total height/length above GL up to 10 m maximum to cover most conditions encountered where:

(i) maximum height/depth of sign back plate < 1,2 m, support total length above GL < 3,5m, for freestanding multiple supports;

(ii) minimum height/depth of sign back plate ≥ 1,2 m, support total length above GL ≥ 3,5m up to 10 m, for diagonally braced multiple supports;

(iii) fill slope is 1:3 or flatter;

(iv) cut slope does not exceed 1:1;

(v) allowance for special clearance for pedestrians or vandalism.

(c) drilled breakaway holes included as support base frangibility method;

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(d) one standard foundation with plinth top at GL are indicated for two soil types being sand or soft clay and medium hard ground for support ends set in soilcrete foundations as follows:

(i) 0,9 m to 1,5 m buried support end, for support length above GL from 3 m to 10 m, set in soilcrete foundation of diameter 0,9 m for sand or soft clay and 0,6 m for medium hard ground.

15.7.6 Structural Timber or Steelwork

1 Wooden or timber posts should be of moisture, fire and termite resistant exterior grade, complying with the requirements of SANS 457 and SANS marked. They should be creosote impregnated in accordance with SANS 05, with creosote complying with the requirements of SANS 538 or SANS 539 or the poles should be treated with a mixture of copper-chromium-arsenic compounds complying with the requirements of Type II of SANS 673 (Hicksons Tanalith C or equal). Hard pinewood poles are preferred because of their fracture properties, and suitability for post peeling and preservative treatment. All cuts and breakaway holes should be treated and support tops should be banded as per SANS 457.

2 Standard diameter timber poles commonly specified are the following (measured as pole top diameters):

(a) freestanding single supports – Φ 76 mm up to Φ 175 mm;

(b) freestanding or braced multiple supports - Φ 100 mm up to Φ 175 mm.

3 Steel supports complying with the requirements for Grade 43C of BS 4360, of outside diameter at least 50 mm and a, wall thickness of at least 3,5 mm, and hot-dip galvanized in accordance with the requirements of SANS 763, or painted/powder coated in accordance with the requirements of CKS 193. Cross sectional profiles in steel could be any of the pipes, tubes and rolled or extruded profiles. Welding of steel work should be carried out in terms of the standards pre- scribed in BS1856, BS693 or BSS938, whichever is applicable. Steel tubular structures fabricated by welding, which are to be painted, shall have sealed joints for members inaccessible for inside painting after fabrication. All steel tubes to be SANS marked.

4 Standard pipe sections and sizes commonly specified are the following:

(a) freestanding single supports - Φ 50 mm x 2 mm wall thickness up to Φ 165 mm x 14 mm wall thickness;

(b) freestanding or braced multiple supports- Φ 60 mm x 2 mm wall thickness up to Φ 114 mm x 3,5 mm wall thickness.

5 A consideration when choosing support materials is the breakaway method (as indicated in Sections 15.7.5 and 15.7.7) to be used for signs placed in locations where there is the risk of vehicle impact i.e. the posts of the structure should be of frangible construction. There are various methods of achieving frangibility for instance the use of breakaway holes drilled in the supports at their bases or the use of base plates. In the case of parts with base plates, usually steel or aluminium supports, the base plates should be made from a material similar to that from which the posts are made, and the base plate should be protected against corrosion by the same method as that applied to the parent posts. The quality of the finish of the base plate should be such that it complies with the appropriate requirements specified for the parent post.

15.7.7 Foundations

1 The Foundations consisting of blocks or cylinders of soilcrete or concrete are designed to support the loads to which the structural frames are subjected, including collision loads. The factors of safety for overturning of foundations are:

(a) 2,0 when subjected to wind loads only;

(b) 1,5 when subjected to wind and collision loads.

2 Design details are available for a number of standard footings. The footings are:

(a) freestanding single support sign structures - three standard cylindrical or block foundations with plinth top heights varying from 50 mm above GL, at GL and 150 mm below GL are indicated for two soil types being sand or soft clay and medium hard ground for any of the following footings:

(i) driven in or buried support end in natural soil;

(ii) support end or support base plate stub post set in soilcrete cylinders;

(iii) support base plate stub post or hooked anchor bolts set in non-reinforced mass concrete blocks.

(b) freestanding or braced multiple support sign structures - one standard cylindrical foundation type with plinth top at GL are indicated for two soil types, being sand or soft clay and medium hard ground, for support ends set in non-reinforced soilcrete foundations as follows:

(i) 0,9 m to 1,5 m buried support end, for support length above GL from 3 m to 10 m, set in soilcrete foundation of diameter 0,9 m for sand or soft clay and 0,6 m for medium hard ground.

15.7.8 Anchor Bolts

1 Details for two types of standard anchor bolts are available:

(a) Type A - hooked holding down anchor bolts in the foundation;

(b) Type B - special bolts for bolting together slip base plates and split base sockets

2 Grade 4.8 steel is specified for the hooked anchor bolts and nuts in preference to a higher grade steel (i.e. grade 8.8) for the following reasons:

(a) welding during manufacture and construction can be tolerated on grade 4.8 steel;

(b) the error is not as serious if an anchor bolt group of lower strength, (e.g. grade 4.6) is erroneously supplied and installed.

3 A template is specified to be locked in position with each hooked anchor bolt group supplied resulting in the following advantages:

(a) it will ensure that the anchor bolt group is not mis-aligned during transportation to the site;

(b) it will ensure that the centres of the anchor bolt group match the centres of the holes in the base plate.

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4 Special bolts that will break apart under an impact load of ≥100 kN are specified for bolting together slip base plates and split base sockets.

15.7.9 Road Sign Back Plates

1 Structural details given on these drawings are applicable only for sign back plates having a height not exceeding 3,6 m. For details related to the text, symbols and legend, reference should be made to the relevant road sign working drawings.

2 All sheets or profiles are standard, made from pre-pained galvanised mild steel substrate (CHROMADEK or equal approved), presently available from manufacturers referred to. Preparation and painting shall be carried out in accordance with CKS 193-1977 and the paint system shall be as follows, as indicated on the drawings or directed by the Engineer:

(a) Type A back plate (all cases other than Type B below) - Silicone polyester system having a nominal 20 micron dry film thickness on the front face and a standard half-coat polyester as a backing coat; where the sign is to be covered with retrore- flective material, the front face may be finished with a primer coat (CHROMAPREP or equal);

(b) Type B back plate (signfaces to be erected in marine or chemically polluted corrosive environments) - PVC plastisol system having a 150 micron min. dry film thickness on each side of the sheet; the coat on the back face of the sign profile shall be grey in colour, G29 to SANS 1091 or similar.

3 Structural steel sections shall be of mild steel conforming to the requirements of Section 7100 of the standard specifications. Rectangular hollow sections and spe- cial channel profiles may be cold formed or commercial quality mild steel. All steel sections shall be hot-dip galvanized in accordance with clause 7105 (1) of the standard specifications after manufacture. Bolts, washers and nuts shall be as follows:

(a) Type A back plate: Galvanized steel bolts complying with the requirements of clause 5602 (b) of the standard specifications;

(b) Type B back plate: Stainless steel bolts grade 304 manufactured to SANS 136;

(c) nuts for both type A and B back plate shall be self locking "Nyloc" or equal approved;

(d) blind rivets shall be 4,8 mm Φ cadmium plated mild steel.

4 All aluminium sections and profiles used are standard profiles presently available from the manufacturers referred to. Stainless steel bolts and washers with "Nyloc" self-locking nuts or similar are specified and no insulation need be provided where these bolts are in contact with the aluminium members.

5 Corrosive resistant brackets and bolts are used to secure the sign face to the structure and in order to ensure proper alignment and securing of the sign face an erection procedure is specified.

6 As in the case of the other detail drawings, a table is provided where the length and height of each separate sign face is to be reflected without adding and/or alter- ing any figures on the actual details.

15.7.10 Detail Drawings

1 A set of detail drawings have been prepared for the two types of ground mounted sign structures as follows:

(a) minimum clearance Fig 15.50;

(b) detail drawings:

- Freestanding Single Support, Base and Foundation
  - ❖ for signs ≤ 1,5 m^2 Fig 15.51
  - ❖ for signs ≥ 1,5 m^2 Fig 15.52
  - ❖ design graphs Fig 15.53
- Multiple Support, Base and Foundation
  - ❖ freestanding supports Fig 15.54
  - ❖ braced supports Fig 15.54
  - ❖ design graphs Fig 15.55
- Back Plates and Mounting Details for Signs ≤ 1,5 m^2
  - ❖ with no frames Fig 15.56
  - ❖ with frames Fig 15.57
- Back Plates and Bracing Details for Signs ≥ 1,5 m^2
  - ❖ flat sheet chromadek signs Fig 15.58
  - ❖ stacked chromadek profiles Fig 15.60
  - ❖ stacked aluminium profiles Fig 15.62
- Mounting Details and Options for Signs ≥ 1,5 m^2
  - ❖ flat sheet chromadek signs Fig 15.59
  - ❖ stacked chromadek profiles Fig 15.61
  - ❖ stacked aluminium profiles Fig 15.63

2 Detail drawings for other types of ground mounted sign support structures for example ladder multiple supports with shearing base plates and hinged multiple supports with slip bases, may be added subject to demand.

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TABLE 15.50.1

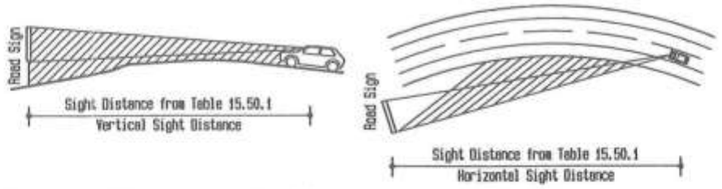
CLEAR SIGHT DISTANCE REQUIREMENTS	
Letter Size (mm)	Sight Distance (m)
490	380
420	340
350	300
280	260
210	220
140	180
112	160

TABLE 15.50.2

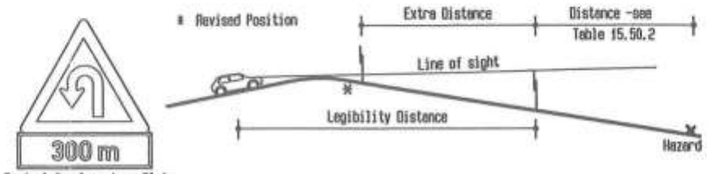
LONGITUDINAL POSITIONING	
Speed (km/h)	Distance (m)
60	120
80	160
100	240
120	330
Not Applicable to signs on Freeways	

NOTES:

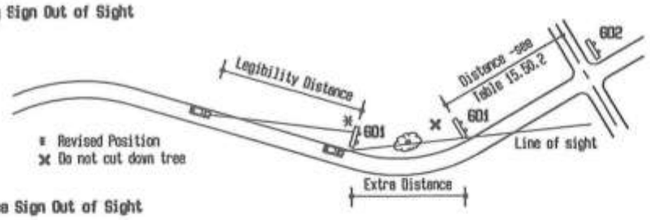
1. As an alternative to repositioning signs the shaded area may be cleared of obstructions.
2. The 'Clear Sight Distance' values include the legibility distance for the letter size PLUS 100m to allow for observation of the sign prior to reading.
3. The Minimum Clearance Profile line is the absolute minimum and no structure/tree/cable whatsoever should infringe this profile.
4. Note that the minimum lateral clearances for larger signs or structures are preferred to be greater than the minimum clearance profile line shown in the Quick Reference.
5. Refer to SARTSM for more details on longitudinal positioning and clearances.
6. Minimum lateral clearances indicated are also applicable to medians in dual carriageway situations
7. Note that the lateral clearances are always measured from the edge of the sign and not from the support except for overhead sign structures.
8. * Height measured from highest point on Roadway.
9. The Letter Size in Table 15.50.1 refers to the size of the largest upper-case letter on the sign.
10. For the longitudinal positioning of ground mounted signs on freeways refer to Chapter 5.



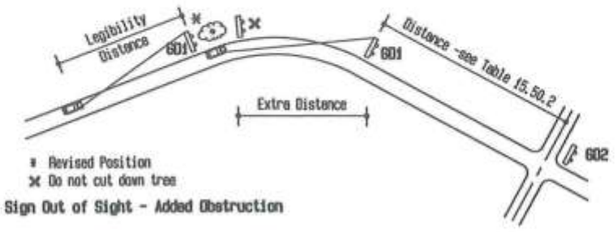
Clear Line of Sight to Larger Guidance Signs



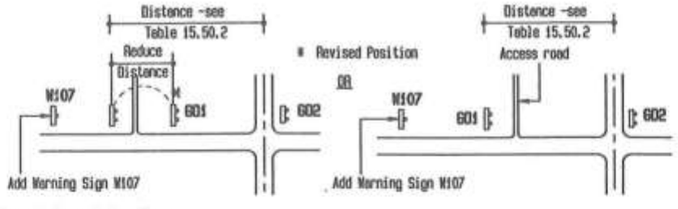
Warning Sign Out of Sight



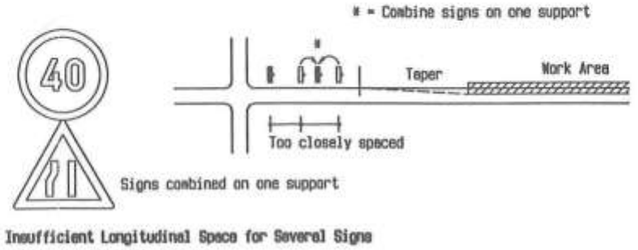
Guidence Sign Out of Sight



Guidance Sign Out of Sight - Added Obstruction

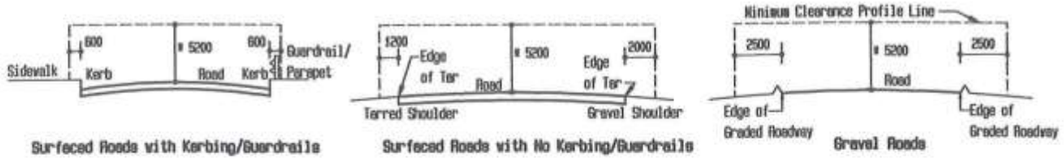


Closely Spaced Junctions



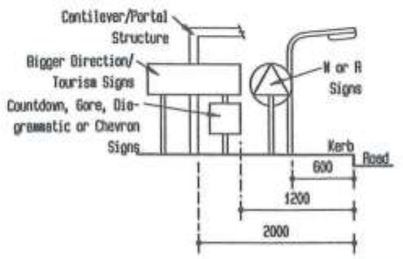
Insufficient Longitudinal Space for Several Signs

LONGITUDIINALAL POSITIONING

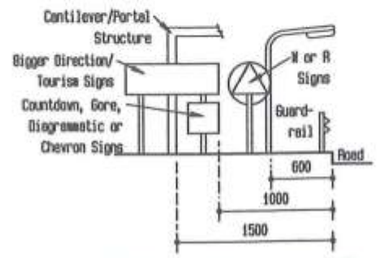


Surfaced Roads with Kerbing/Guardrails — Surfaced Roads with No Kerbing/Guardrails — Gravel Roads

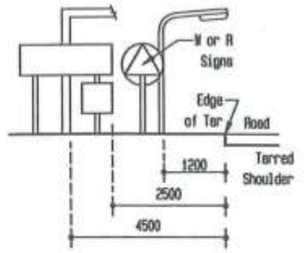
QUICK REFERENCE MINIMUM CLEARANCE PROFILES



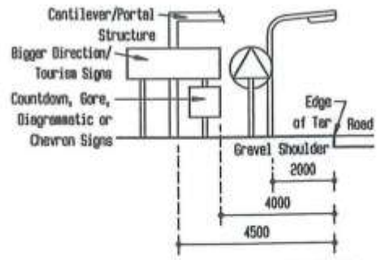
Lateral Clearances for Roads with Kerbing



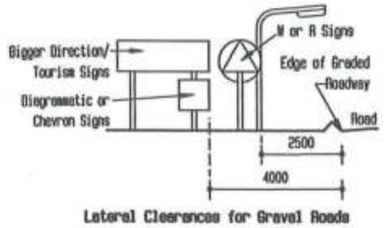
Lateral Clearances for Roads with Guardrails



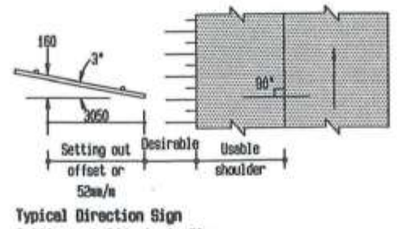
Lateral Clearances for Roads with Tarred Shoulders Only



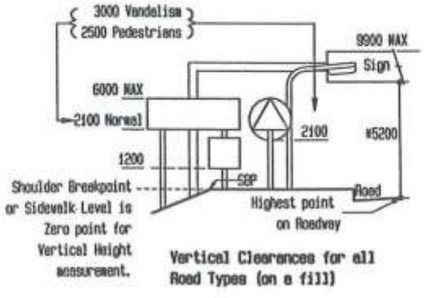
Lateral Clearances for Roads with Gravel Shoulders Only



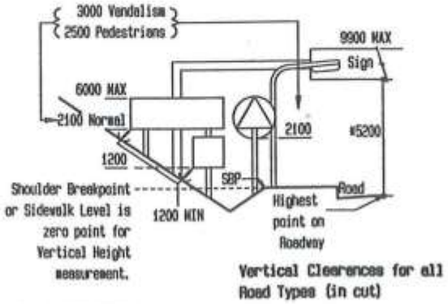
Lateral Clearances for Gravel Roads



Typical Direction Sign Setting out Offset, in Plan



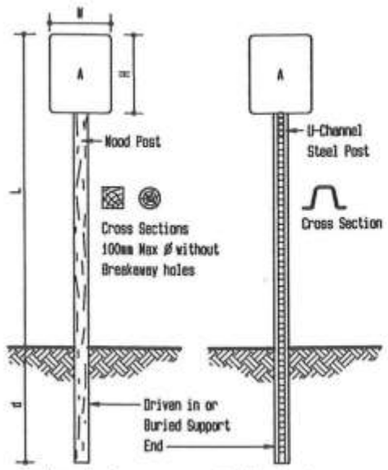
Vertical Clearances for all Road Types (on a fill)



Vertical Clearances for all Road Types (in cut)

LATERAL AND VERTICAL POSITIONING

Fig 15.50
Road Traffic Signs – Minimum Clearances



Buried or Driven Support Posts for Signs < 0.5m²

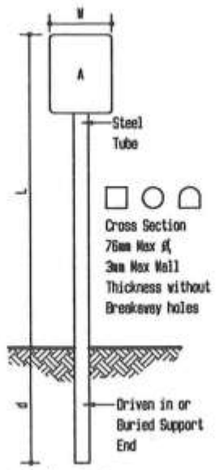


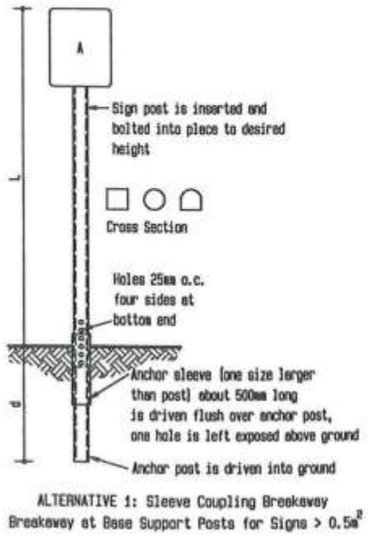
TABLE : 15.51.1	SUPPORT SIZES (mm)					
Support total length above GL	L up to 1m		L = 2m to 3m		L = 3m to 4m	
Signface Area (m^2)	Timber top ø	Steel ø x wall	Timber top ø	Steel ø x wall	Timber top ø	Steel ø x wall
Up to 0.5	76	50 x 2.0	100	60 x 2.5	125	76 x 3.0
0.5 - 1.0	-	-	125	76 x 3.0	150	102 x 3.0
1.0 - 1.5	-	-	150	102 x 3.0	175	114 x 3.5
A support total length (L) above ground of between 1.2m and 1.7m is not recommended ... see Note 5.						

TABLE 15.51.2: BREAKAWAY DETAILS					
TIMBER		STEEL			
top ø	breakaway hole ø	ø x wall	breakaway hole ø	pipe coupling	slip base
76	0	50 x 2	0	0	0
100	0	60 x 2.5	0	0	0
125	32	76 x 3.0	0	OPTION	OPTION
150	40	102 x 3.0	25	OPTION	OPTION
175	50	114 x 3.5	35	OPTION	OPTION

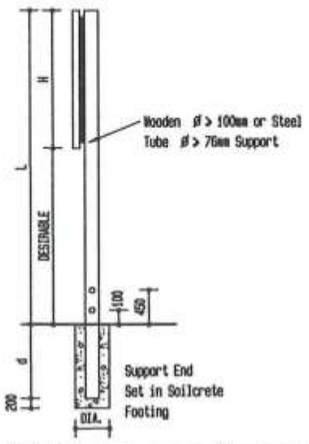
TABLE 15.51.3:	FOUNDATION SIZES					
Support Total Length above GL (m) L	DEPTH (m)		FOUNDATION SIZE			
	Support/Stub Buried End d	Foundation Total	Sand/Soft Clay		Medium Hard Ground	
			Dia. (m)	Volume (m^3)	Dia. (m)	Volume (m^3)
up to 1m	0.6	* 0.8	0.6	0.22	* 0.4	0.10
2 - 3	0.6	* 0.8	0.9	0.51	* 0.6	0.22
3 - 4	0.9	1.1	0.9	0.69	0.6	0.31
* Foundation provision may be optional - see Note 8						

GENERAL NOTES:

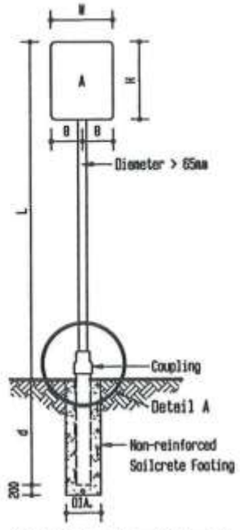
1. Timber to be SABS marked, and Cuts and Breakaway Holes to be treated (Ref. Clause 5602(b)).
2. Steel Tubes to be SABS marked.
3. These details apply to signs with a total signface area (A) < 1.5m^2, sign width (W) < 1.2m and support total length above ground level (L) < 4m.
4. Methodology to determine support, base and foundation details:
   (i) Effective Sign Area (A) = Sign Width x Sign Height = WxH
   (ii) Support Total Length (L) above ground level, from sign site location
   (iii) Support size according to Support total length (L) - Table 15.51.1
   (iv) Is Breakaway Base necessary - A > 1m or L > 3m, and support ø > 76mm, Wall thickness > 3mm.
   (v) Support diameter and breakaway hole diameter - Table 15.51.2.
   (vi) Foundation necessary? Size diameter and depth - Table 15.51.3.
5. A support total length above ground between 1.2m and 1.7m is not recommended because of the danger of a secondary collision with the windshield of an impacting vehicle.
6. The threaded pipe coupling and slip base coupling are only applicable to steel tube type supports with ø > 65mm because smaller diameter tubular posts are liable to crushing at the point of impact, which delays the release of the base causing the sign to strike the top of the vehicle.
7. Where the impact may be from either direction a horizontal slip base should be used instead of the 20° inclined one.
8. Foundation provision is optional for signs with A < 1m^2 and total height above Ground L < 3m except in poor soil conditions. In medium to hard soils the support end might be driven into the ground or buried (maybe with attached footplate). The support anchor stubs for threaded pipe and slip base couplings must be set in foundations.
9. The Soilcrete foundations consist of a mixture of 50% crushed stone, 40% selected granular material from excavations and 5% portland cement, compacted into the hole at optimum moisture content to a density of 95% MAASHTO.
10. A 200mm long peg through the buried timber support end or a 200mm long 40x40x3 angle welded to the buried steel tube support end will inhibit rotation or removal of single supports.
11. For larger ground mounted signs on multiple supports refer to Figure 15.54.
    (i) For larger ground mounted sign on single supports, due to space restrictions, refer to to Figure 15.52.
    (ii) Refer to Figure 15.53 for Graphs for single supported signs.



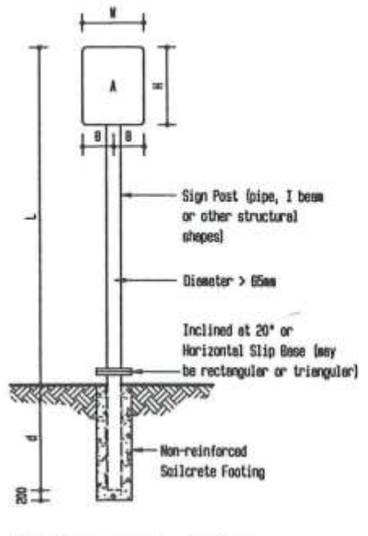
ALTERNATIVE 1: Sleeve Coupling Breakaway
Breakaway at Base Support Posts for Signs > 0.5m^2



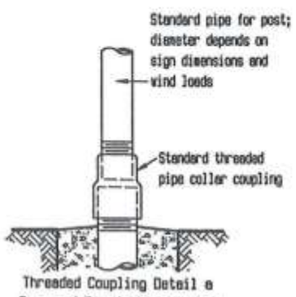
ALTERNATIVE 2: Fracturing at Breakaway Holes



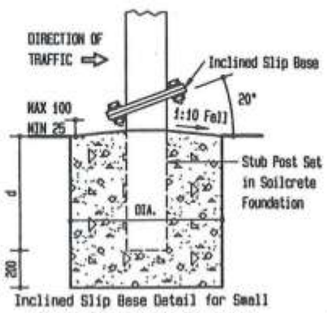
ALTERNATIVE 3: Threaded Coupling Breakaway



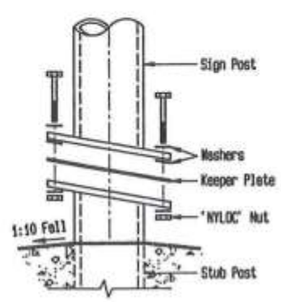
ALTERNATIVE 4: Slip Base Breakaway



Threaded Coupling Detail e
Base end Foundation Details



Inclined Slip Base Detail for Small
Single Support Sign Structures



Joining Detail of Inclined Base Plates

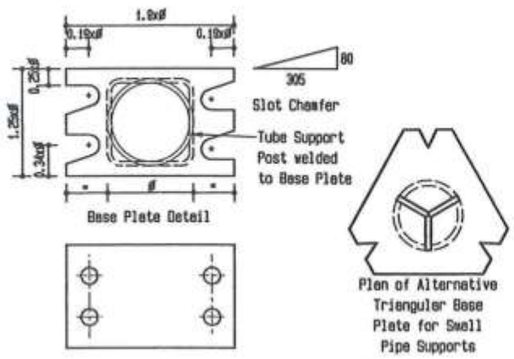


Fig 15.51
Road Traffic Signs <= 1,5 m^2 - Single Support, Base and Foundation Detail

TABLE 15.52.1 : DETERMINATION OF BACK PLATE CARRIER AND SUPPORT SIZES

BACK PLATE SIZE TYPE	BACK PLATE MAX. AREA (m^2)	BACK PLATE SIZE (mm) MAX. W	BACK PLATE SIZE (mm) max. H	CARRIER CHANNEL (x thkness) (No.)	SUPPORT TOTAL LENGTH above GL (mm)	SUPPORT TYPE	SUPPORT BENDING MOMENT Max. Ada. (kN.m)	SUPPORT PIPE CROSS SECTION SIZES (mm) ø x thk
B	0.715	1300	550	100x50x11 (2 Carriers)	3000	MB	250	76x3
C	1.58	2200	720		3400	MC	500	89x5
D	2.90	3500	830		3400	MD	1000	114x3.5
E	3.88	3500	1110		3800	ME	1600	114x6
F	5.68	3500	1680		4300	MF	2600	140x8
G	7.32	3500	2090	125x75x11 (3 Carriers)	4500	MG	3500	140x12
H	10.5	3500	3000		5400	MH	5000	165x14

NOTE: Length of Carrier Channels depends on length of sign Back Plate to be mounted

TABLE 15.52.2: DETERMINATION OF BASE SOCKET / PLATE AND BOLT SIZES

BACK PLATE SIZE TYPE	SUPPORT TYPE	BASE SOCKET / PLATE SIZES: SPLIT SOCKET l/b x t x h (mm)	SLIP BASE l x b x t (mm)	RIGID BASE l/b x t (mm)	SOCKET/PLATE BOLT SIZES: HOOKED ANCHOR BOLTS ø (mm)	HOOKED ANCHOR BOLTS Cut Length (mm)	CLAMPING BOLTS ø (mm)	CLAMPING BOLTS Length (mm)
B	MB	142x10x150	142x95x6	142x10	12		12	30
C	MC	166x10x150	166x111x6	166x10	14		14	35
D	MD	212x10x150	212x142x6	212x10	16		16	45
E	ME	212x10x150	212x142x6	212x10	16		16	45
F	MF	261x15x150	261x174x8	261x15	20		20	55
G	MG	261x15x150	261x174x8	261x15	20		20	55
H	MH	307x20x150	307x205x8	307x15	25		25	60

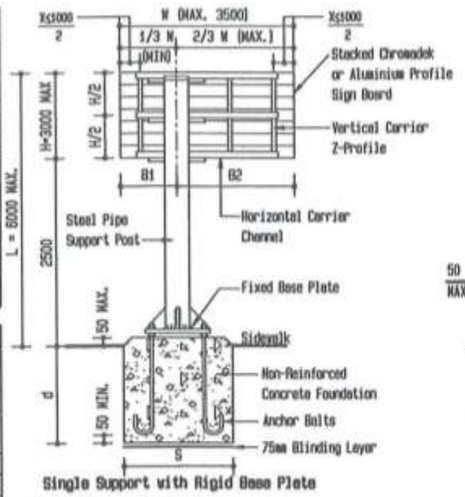
TABLE 15.52.3 : DETERMINATION OF FOUNDATION SIZES

BACK PLATE SIZE TYPE	SUPPORT TYPE	SOIL TYPE	FOUNDATION SIZES FOR BASE TYPES: SPLIT SOCKET a x d(m)	SPLIT SOCKET Volume (m^3)	SLIP BASE PLATE a x d(m)	SLIP BASE PLATE Volume (m^3)	RIGID BASE PLATE a x d(m)	RIGID BASE PLATE Volume (m^3)
B	MB	S/SC	0.5x0.5	0.125	0.5x0.6	0.150	0.5x0.6	0.150
		MHG	0.4x0.4	0.064	0.4x0.6	0.096	0.4x0.6	0.096
C	MC	S/SC	0.6x0.65	0.234	0.6x0.6	0.216	0.6x0.6	0.216
		MHG	0.4x0.5	0.08	0.4x0.6	0.096	0.4x0.6	0.096
D	MD	S/SC	0.8x0.8	0.512	0.6x0.6	0.512	0.8x0.8	0.512
		MHG	0.5x0.65	0.163	0.6x0.6	0.216	0.6x0.6	0.216
E	ME	S/SC	0.8x0.9	0.729	0.9x0.9	0.729	0.9x0.9	0.729
		MHG	0.65x0.7	0.296	0.7x0.7	0.343	0.7x0.7	0.343
F	MF	S/SC	1.0x1.0	1.0	1.0x1.0	1.0	1.0x1.0	1.0
		MHG	0.75x0.8	0.45	0.8x0.8	0.512	0.8x0.8	0.512
G	MG	S/SC	1.1x1.2	1.452	1.1x1.2	1.452	1.1x1.2	1.452
		MHG	0.8x0.9	0.578	0.9x0.9	0.729	0.8x0.8	0.729
H	MH	S/SC	1.25x1.3	2.03	1.25x1.3	2.03	1.25x1.3	2.03
		MHG	1.0x1.0	1.0	1.0x1.0	1.0	1.0x1.0	1.0

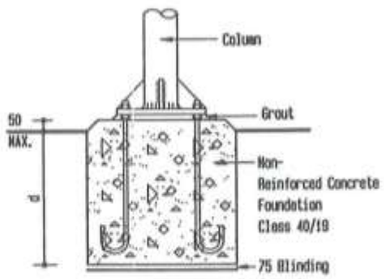
NOTE: S/SC = Sand or Soft Clay , MHG = Medium Hard Ground

NOTES:

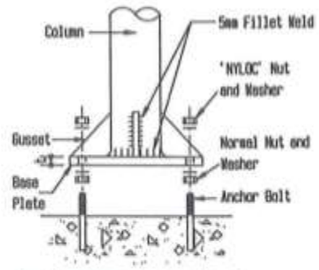
1. These signs are seen as ground mounted because the sign face display area falls within the 6m MAX height limit as required for ground mounted signs.
2. The methods of sign mounting indicated on this drawing are used where space restrictions due to pedestrian movement, car parking bays and cable or pipe positions dictate it instead of the normally multiple support signs.
3. Although the standard 2.5m vertical clearance between the sign's bottom edge and the ground level allows for pedestrains it does not allow for vehicles,except for cars, to pass under.
4. Where the impact may be from either direction a slip base plate should be set horizontally instead of being inclined at 10°.
5. A split socket allows for impact from either direction but the bolting sides of the two halves should always be positioned at right angles to the direction of travel.
6. A support with a rigid base plate must be safeguarded against impact by either a guardrail, when closer to the roadway edge of surfacing/kerbing than required, or by increasing the lateral clearance as required.
7. All steel components to be SABS marked.
8. These details apply to signs with a total area (A) ≤ 10.5m^2, sign back plate height MAX. 3m and width MAX. 3.5m and a support total length above ground level (L) < 6m.
9. Refer to Figure 15.53 for Graphs for Single Supported Signs.



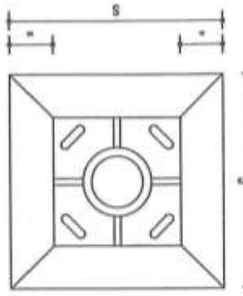
Single Support with Rigid Base Plate



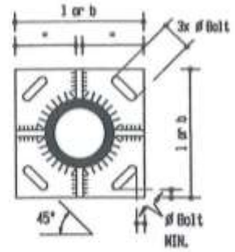
Base Detail for Lighter Single Support Structures with Fixed Base Plate



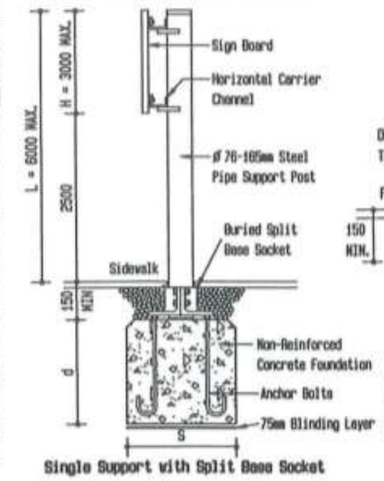
Mounting Detail for Light Single Support Structure with Fixed Base Plate



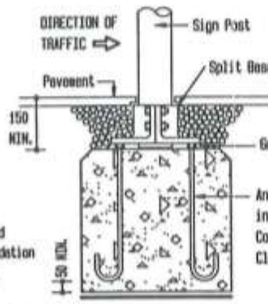
Foundation Plan



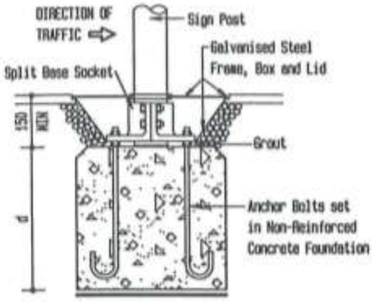
Plan of Fixed Base Plate for Lighter Single Support Structures



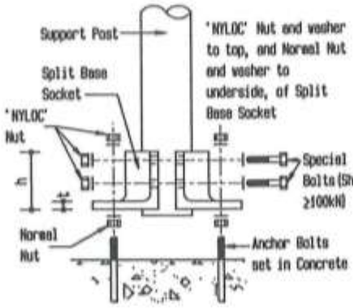
Single Support with Split Base Socket



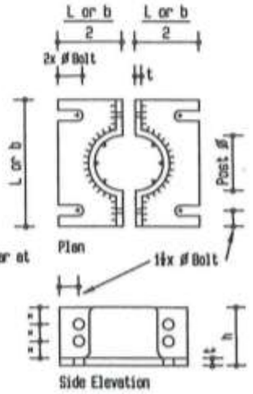
Base Detail for Support with Buried Split Base Socket



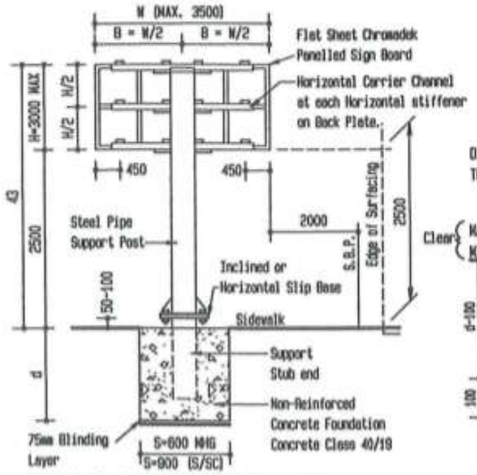
Base Detail for Support with Boxed Split Base Socket



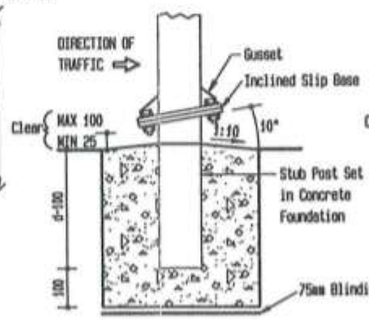
Mounting Detail for Support with Split Base Socket



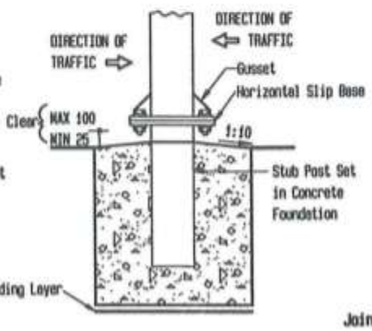
Split Base Socket Detail



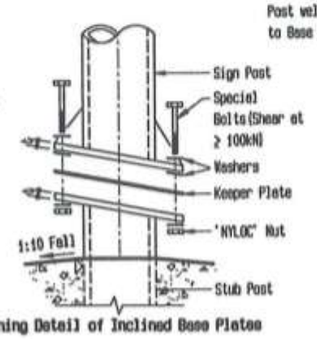
Single Support with Slip Base Plate



Base Detail for Single Support (One-direction Traffic)



Base Detail for Single Support (Bi-directional Traffic)



Joining Detail of Inclined Base Plates

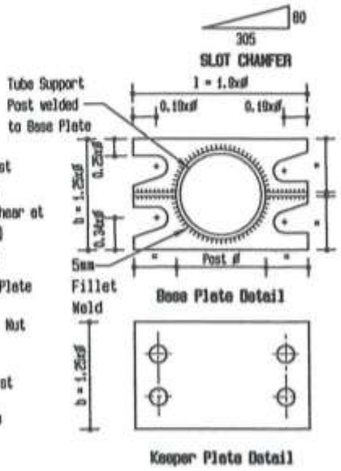


Fig 15.52
Road Traffic Signs >= 1,5 m^2 - Single Support, Base and Foundation Details (Restricted Spaces)

NOTE:

1. REFERENCE PLANS:

   THIS PLAN FORMS PART AND MUST BE READ IN CONJUNCTION WITH FIGURES 15.51 AND 15.52.

2. DESIGN LOADING:

   NOMINAL WIND LOAD ACTING ON THE SIGN FACE HAS BEEN ASSUMED AS FOLLOWS:-
   TOTAL SUPPORT LENGTH/HEIGHT (L) ≤ 2m ABOVE G.L : 0.75 kPa
   TOTAL SUPPORT LENGTH/HEIGHT (L) ≥ 6m ABOVE G.L : 1.25 kPa
   WIND LOADING IS ASSUMED TO VARY LINEARLY FOR AVERAGE SIGN HEIGHTS FALLING BETWEEN THE ABOVE LIMITS.

3. FOUNDING MATERIAL:

   FOUNDATIONS FOR FREE STANDING SUPPORTS DEPEND ON SOIL TYPE ENCOUNTERED. THE GRAPHS FOR "MEDIUM HARD GROUND" ARE APPLICABLE FOR ANY MATERIAL WHICH REQUIRES A PICK FOR EXCAVATION. FOR SOFTER FOUNDING MATERIAL THE GRAPH FOR "SAND OR SOFT CLAY" MUST BE USED. FOUNDATIONS FOR SIGNS LOCATED ON HARD ROCK MAY REQUIRE SPECIAL DESIGNS.

4. DESIGN PROCEDURE:

a) FROM FIGURES 15.51 OR 15.52 DETERMINE DIMENSIONS (B) OR (B1) AND (B2) FOR SIGN WIDTH (W) AND NUMBER OF SUPPORTS (N) = 1.

b) CALCULATE THE EFFECTIVE SIGN AREA A $\frac{W \times H}{N}$ (m^2) FOR SIGN DEPTH/HEIGHT (H) (m) AND DETERMINE TOTAL SUPPORT LENGTH/HEIGHT (L) (m) ABOVE G.L.

c) FROM DESIGN CHART (1) OR (2) (SINGLE SUPPORT), DETERMINE THE FOLLOWING:-
   - THE DIAMETER OF THE SUPPORT.
   - THE FOUNDATION DIAMETER (CHART 1), OR SQUARE SIDE (CHART 2), AND DEPTH FOR THE APPLICABLE FOUNDING MATERIAL (SEE NOTE 3).

d) WHERE THE EFFECTIVE SIGN AREA EXCEEDS 1,5 m^2 OR WHERE NECESSARY AS INDICATED ON DESIGN CHART (1), CHART (2) FOR LARGER SINGLE SUPPORTS MUST BE USED.

e) DETERMINE FROM TABLE 15.51.2 OR TABLE 15.52.2 THE FRANGIBILITY METHOD AND SIZES, EG THE DIAMETER OF BREAKAWAY HOLES TO BE DRILLED IN THE POLES, OR IF SLIP BASE PLATES ARE TO BE USED THE SIZE THEREOF.

5. EXAMPLE 1 : FOR SINGLE SUPPORTED SIGN ≤ 1.5m^2

   FOR (W) = 1.0m AND (N) = 1:
   (B) = 0.5m (EQUALLY POSITIONED OVER SUPPORT)

   FOR (W) = 1.0m (H) = 1.2m AND (N) = 1:
   EFFECTIVE SIGN AREA (A) = $\frac{1.0 \times 1.2}{1}$ = 1.2m^2

   FROM DESIGN CHART (1)

   FOR (A) = 1.2m^2 AND (L) = 3.5m:
   SUPPORT POST Ø = 175mm (TIMBER TOP Ø
   = 114mm x 3.5mm WALL (STEEL ALTERNATIVE)

   FOUNDATION TYPE = SOILCRETE
   FOUNDATION SIZE = 0.6mm DIA x 1.1m DEEP (MEDIUM HARD GROUND)
   OR 0.9mm DIA x 1.1m DEEP (SAND OR SOFT CLAY)

   FROM TABLE 15.52.2 (FIGURE 15.51)

   FOR FRANGIBILITY METHOD = BREAKAWAY HOLES, WITH TIMBER POST TOP Ø = 175mm:
   BREAKAWAY HOLES TO BE DRILLED = 50mm DIA. SUPPORT BURIED END = 0.9m DEEP.

EXAMPLE 2 : FOR SINGLE SUPPORTED SIGN ≥ 1.5m^2

FOR (W) = 3.5m AND (N) = 1:
(B) = 1.75m (EQUALLY POSITIONED OVER SUPPORT)

FOR (W) = 3.5m (H) = 1.8m AND (N) = 1:
EFFECTIVE SIGN AREA (A) = $\frac{3.5 \times 1.8}{1}$ = 6.3m^2

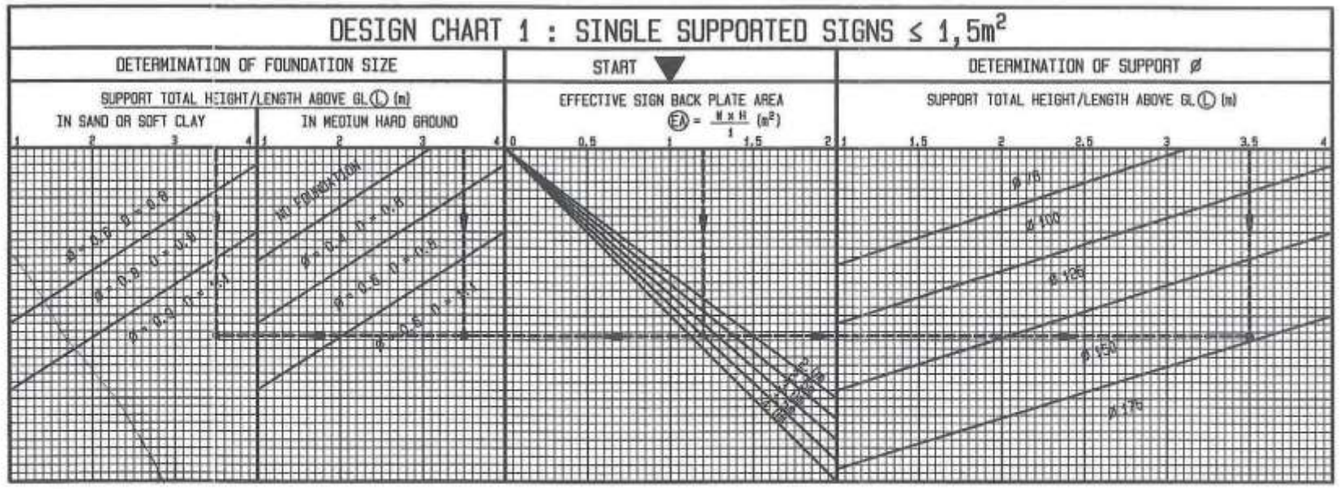
FROM DESIGN CHART (2)

FOR (A) = 6.3m^2 AND L = 4.3m:
SUPPORT POST Ø = 140mm (STEEL TUBE)
WALL THICKNESS = 8mm

FOUNDATION TYPE = NON REINFORCED CONCRETE
FOUNDATION SIZE = 0.65m SQUARE x 0.7m DEEP (MEDIUM HARD GROUND)
OR 0.9m SQUARE x 0.9m DEEP (SAND OR SOFT CLAY)

FROM TABLE 15.52.2 (FIGURE 15.52)

FOR FRANGIBILITY METHOD = NONE (RIGID BASE PLATE), WITH POST Ø = 140mm AND (L) = 4.3m:
RIGID BASE PLATE SIZE - 1 OR b = 261mm
t = 15mm
HOOKED ANCHOR BOLTS - BOLT Ø = 20mm
CUT LENGTH =



(PRELIMANARY)

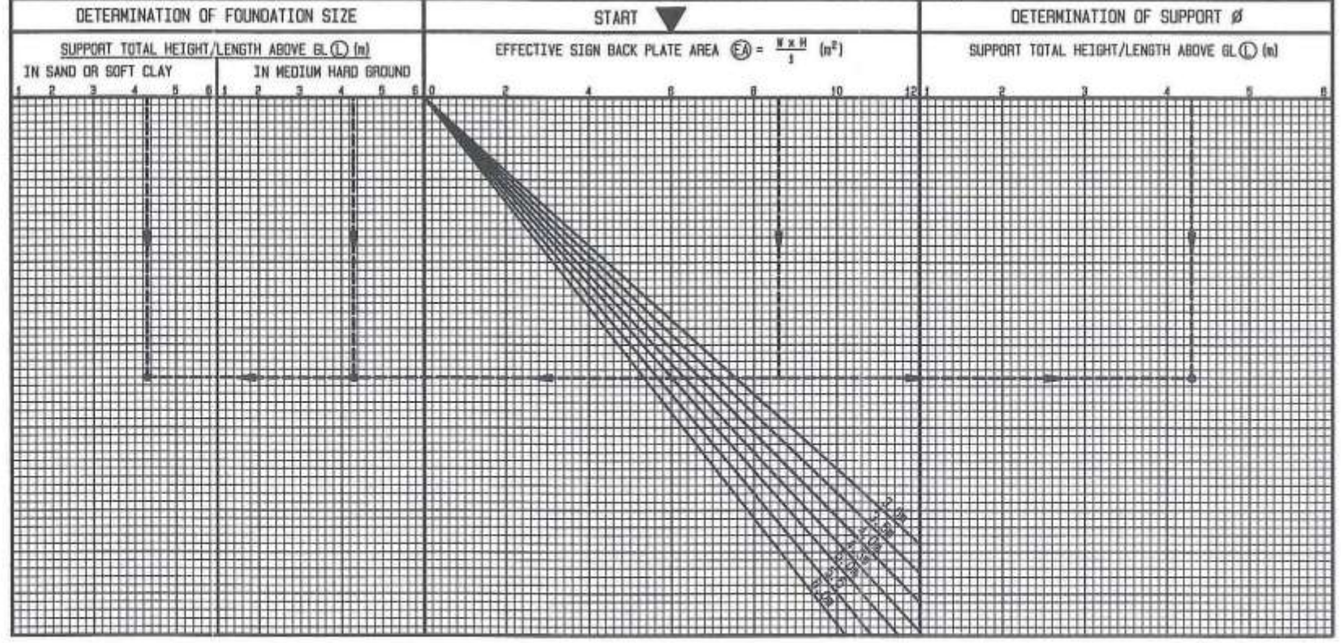


Fig 15.53
Road Traffic Signs – Design Graphs For Single Support Signs

FOR STACKED PROFILE SIGNS

TABLE 15.54.1 SIGN WIDTH & NO. OF SUPPORTS

WIDTH OF SIGN W	No. OF SUPPORTS N	SPACING OF SUPPORTS B	C
1.2m	1	$W/2$	-
1.2m - 4,0m	2	$W/5$	$3W/5$
4,0m - 7,2m	3	$W/2N$	W/N
7,2m - 9,6m	4		
9,6 - 12,0m	5		

FOR FLAT SHEET SIGNS

TABLE 15.54.2 NUMBER AND SPACING OF SUPPORTS

WIDTH OF SIGN W	No. OF SUPPORTS N	SPACING OF SUPPORTS B	C
1.2 - 1.5m	1	400 -450	400 - 600
1.5 - 3.0m	2	450	W - 900
3,0 - 4,5m	3	450	$\frac{W-900}{2}$
4,5 - 6,0m	4	450	$\frac{W-900}{3}$

TABLE 15.54.3 SUPPORT DETAILS

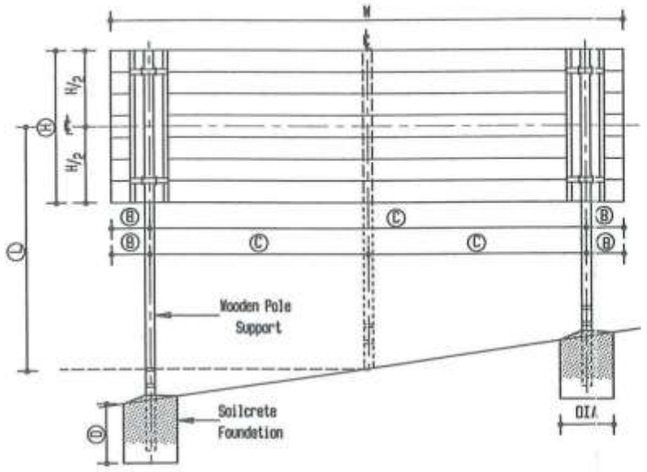
SUPPORT STRUCTURE TYPE	SUPPORT TOTAL LENGTH (L) ABOVE GROUND LEVEL (m)	SUPPORT (AND BRACE) SIZES (mm) TIMBER TOP ø	TIMBER BREAKAWAY HOLE ø	STEEL ø x WALL	STEEL BREAKAWAY HOLE ø
FREE STANDING SUPPORTS Sign Width W≤ 0m	2.5 - 3	150	40	102x2	25
Sign Depth H≤ 1.2m	3 - 3.5	175	50	114x3.5	35
BRACED SUPPORTS* Sign Width W≤ 0m	3.5 - 5	100	25	60x2	15
Sign Depth H≤ 1.2m	5 - 7	150	40	102x2	25
	7 - 10	175	50	114x3.5	35

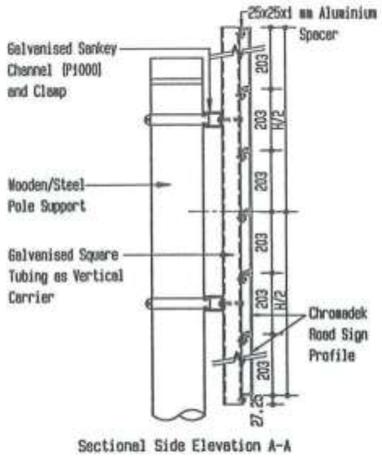
NOTE : * Braced supports must be used for signs with a sign Depth H≥ 1.2m where the total support length above ground level L≥ 3.5m.
* The Support and Breakaway hole diameters shown are applicable to both the uprights and diagonal brace members where supports are braced, with the breakaway hole diameter indicated for the nominal/minimum diameter of the support at ground level.

TABLE 15.54.4 FOUNDATION SIZES

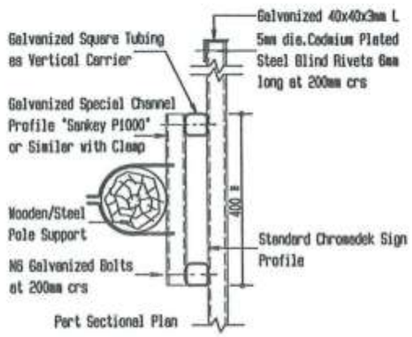
SUPPORT TOTAL LENGTH (L) ABOVE GROUND LEVEL (m)	DEPTH (m) SUPPORT/STUB BURIED END (d)	FOUNDATION TOTAL	FOUNDATION SIZES SAND/SOFT CLAY ø (m)	SAND/SOFT CLAY VOL ± (m^3)	MEDIUM HARD GROUND ø (m)	MEDIUM HARD GROUND VOL ± (m^3)
3	0.9	1.1	0.9	0.69	0.6	0.31
4	0.9	1.1		0.69		0.31
5	1.0	1.2		0.75		0.33
6	1.1	1.3		0.82		0.36
7	1.2	1.4		0.89		0.39
8	1.3	1.5		0.95		0.42
9	1.4	1.6		1.01		0.45
10	1.5	1.7		1.08		0.48

NOTE : * Where the foundation depth is 1.5m or greater, excavations must be suitably shored for the protection of workmen.

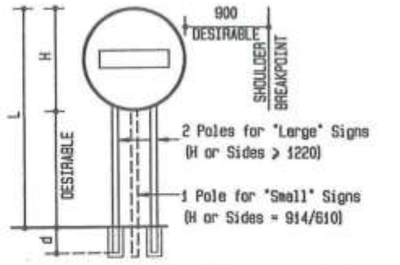




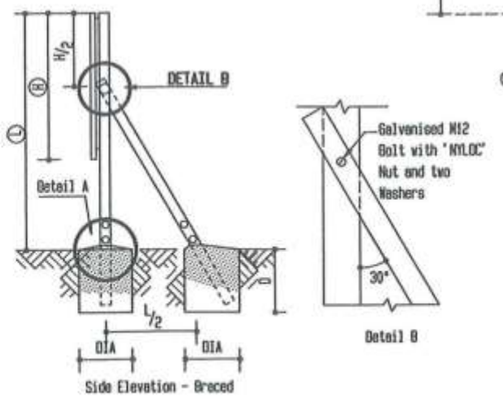
Sectional Side Elevation A-A



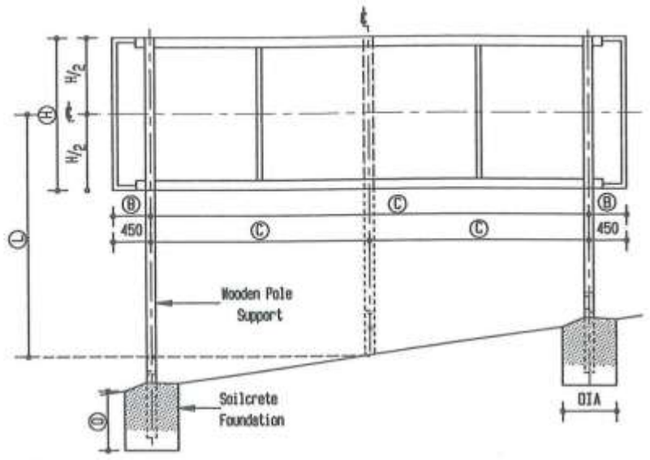
Detail 15.54.1 Sign Manufactured from Road Sign Profiles

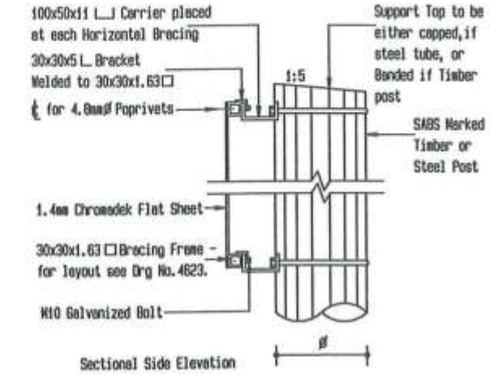


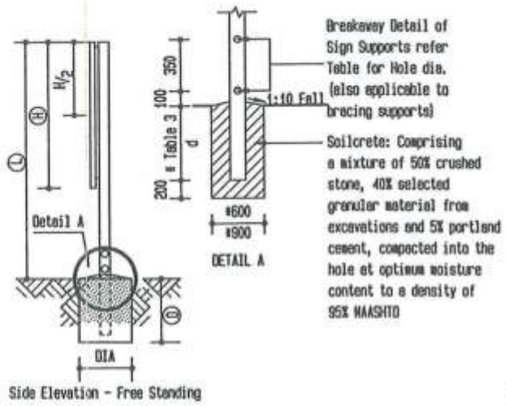
Detail 15.54.3 Mounting of Regulatory, Warning and other Minor Signs on Multiple Posts



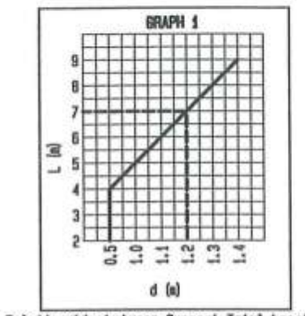
Detail 15.54.4 Bracing Supports



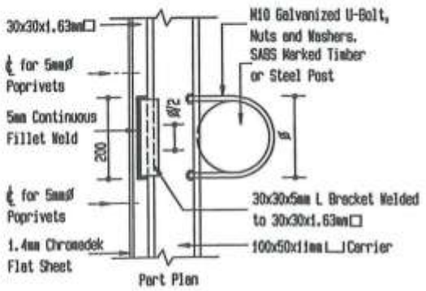




Detail 15.54.5 Breakaway Holes and Foundations



Relationship between Support Total Length Above Ground Level and Buried Depth



Detail 15.54.2 Sign Manufactured from Flat Sheet and Frame

Notes:
1. Some means of preventing the U-bolts or "Sankey" cleap from sliding down the support post by : either cutting a slot or hammering in a nail for timber posts or welding a lug/pin unto a steel pipe support, should preferably be provided. This action should be taken for all timber poles, even if cleap is tight on installation to allow for ultimate shrinkage of the timber post.
2. Timber to be SABS marked, and Cuts and Breakaway Holes to be treated (Ref. Clause 5602(b)).
3. Steel Tubes to be SABS marked; cuts and breakaway holes to be treated.
4. These details apply to signs with board lenght/width (W) ≤ 6.0m and Total length of Support (L) ≤ 10.0m. Larger signs must be referred to an Engineer.
5. Methodology to determine support, base and foundation details:
(i) Number of supports for sign width - Table 15.54.1/2
(ii) Effective Sign Area-(A) = $\frac{\text{Sign Width x Sign Depth}}{\text{No. of Supports}} = \frac{WxH}{N}$
(iii) Support Total Length (L) from sign site location
(iv) Is bracing of supports necessary - H≥ 1.2m or L≥ 3.5m or A≥ $2m^2$
(v) Support diameter and breakaway hole diameter- Table 15.54.3.
(vi) Foundation diameter and depth - Table 15.54.4.
6. For Sign Back Plate panel layouts and Bracing details see Fiures 15.58 to 15.63.

Fig 15.54
Road Traffic Signs >= 1,5 m^2 - Multiple Support, Base and Foundation Details

NOTE:

1. REFERENCE PLANS:

   THIS PLAN FORMS PART OF AND MUST BE READ IN CONJUNCTION WITH FIGURE 15.54

2. DESIGN LOADING:

   NOMINAL WIND LOAD ACTING ON THE SIGN FACE HAS BEEN ASSUMED AS FOLLOWS:-
   AVERAGE SUPPORT LENGTH/HEIGHT Ⓛ (ABOVE G.L.) ≤ 2m : 0.75 kPa
   AVERAGE SUPPORT LENGTH/HEIGHT Ⓛ (ABOVE G.L.) ≥ 6m : 1.25 kPa
   WIND LOADING IS ASSUMED TO VARY LINEARLY FOR AVERAGE SIGN HEIGHTS FALLING BETWEEN THE ABOVE LIMITS.

3. FOUNDING MATERIAL:

   FOUNDATIONS FOR FREE STANDING SUPPORTS DEPEND ON SOIL TYPE ENCOUNTERED. THE GRAPHS FOR "MEDIUM HARD GROUND" ARE APPLICABLE FOR ANY MATERIAL WHICH REQUIRES A PICK FOR EXCAVATION. FOR SOFTER FOUNDING MATERIAL THE GRAPH FOR "SAND OR SOFT CLAY" MUST BE USED. FOUNDATIONS FOR SIGNS USING BRACED SUPPORTS ARE INDEPENDENT OF FOUNDING MATERIAL TYPE. FOUNDATIONS FOR SIGNS LOCATED ON HARD ROCK MAY REQUIRE SPECIAL DESIGNS.

4. DESIGN PROCEDURE:

a) FROM TABLE 15.54.1 ON FIGURE 15.54 DETERMINE FOR SIGN WIDTH Ⓦ THE NUMBER OF SUPPORTS Ⓝ AND DIMENSIONS Ⓑ AND Ⓒ

b) CALCULATE THE EFFECTIVE SIGN AREA $Ⓐ = \frac{W \times H}{N}$ (m²) FOR SIGN DEPTH/HEIGHT Ⓗ (m) AND DETERMINE AVERAGE SUPPORT LENGTH/HEIGHT Ⓛ (m) ABOVE G.L.

c) FROM DESIGN CHART ③ (FREE STANDING SUPPORT), DETERMINE THE FOLLOWING:-
   - THE TOP DIAMETER OF THE POLE.
   - THE FOUNDATION DIAMETER AND DEPTH FOR THE APPLICABLE FOUNDING MATERIAL (SEE NOTE 3).

d) WHERE THE EFFECTIVE SIGN AREA EXCEEDS 6m² OR WHERE NECESSARY AS INDICATED ON DESIGN CHART ③, CHART ④ FOR BRACED SUPPORTS MUST BE USED. IN THIS CASE THE POLE TOP DIAMETER AND FOUNDATION SIZES OBTAINED ARE APPLICABLE TO BOTH THE UPRIGHT AND DIAGONAL BRACE MEMBERS.

e) DETERMINE FROM TABLE 15.54.3 THE DIAMETER OF HOLES TO BE DRILLED IN THE POLES SHOWN IN DETAIL "A".

5. EXAMPLE 1: (FREE STANDING MULTIPLE SUPPORTS)

   FOR Ⓦ = 5m Ⓗ = 1,8m Ⓛ = 2,7m:

   FROM TABLE 15.54.1

   Ⓝ = 3 Ⓑ = 0,830m Ⓒ = 1,670m

   $Ⓐ = \frac{5 \times 1,8}{3} = 3,0m^2$

   FROM DESIGN CHART ③

   FOR Ⓐ = 3,0m² AND Ⓛ = 2,7m:
   POLE TOP DIA. = 175mm
   FOUNDATION SIZE = 1,2m DIA. 0,9m DEEP (MEDIUM HARD GROUND)
   OR 1,2m DIA. 1,5m DEEP (SAND OR SOFT CLAY)

   FROM TABLE 15.54.3

   HOLES TO BE DRILLED = 50mm DIAMETER.

EXAMPLE 2: (BRACED MULTIPLE SUPPORTS)

FOR Ⓦ = 9,2m Ⓗ = 4,6m Ⓛ = 4,8m:

FROM TABLE 15.54.1,

Ⓝ = 4 Ⓑ = 1,15m Ⓒ = 2,3m

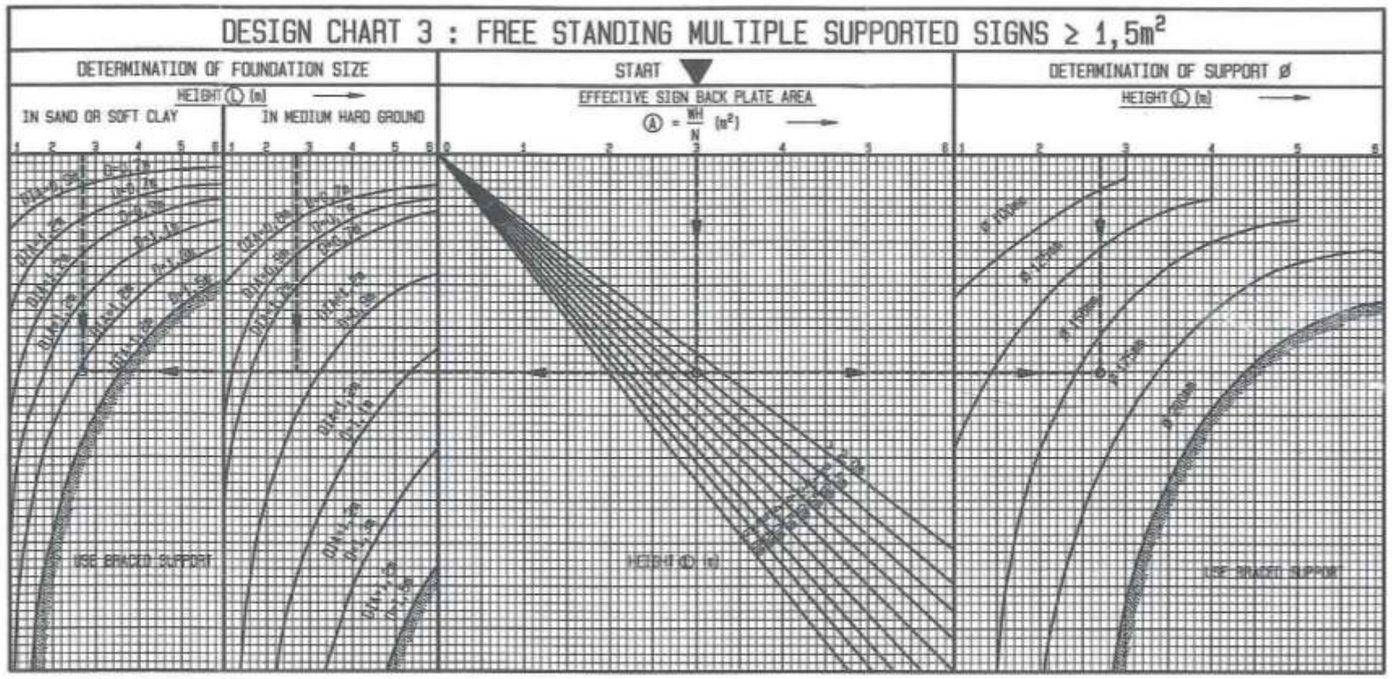
$Ⓐ = \frac{9,2 \times 4,6}{4} = 10,58m^2$

FROM DESIGN CHART ④

FOR Ⓐ = 10,58m² AND Ⓛ = 4,8m:
POLE TOP DIA. = 150mm
FOUNDATION SIZE = 1,2m DIA. 1,6m DEEP
(MEDIUM HARD GROUND OR SAND/SOFT CLAY)

FROM TABLE 15.54.3

HOLES TO BE DRILLED = 40mm DIAMETER.



(PRELIMINARY)

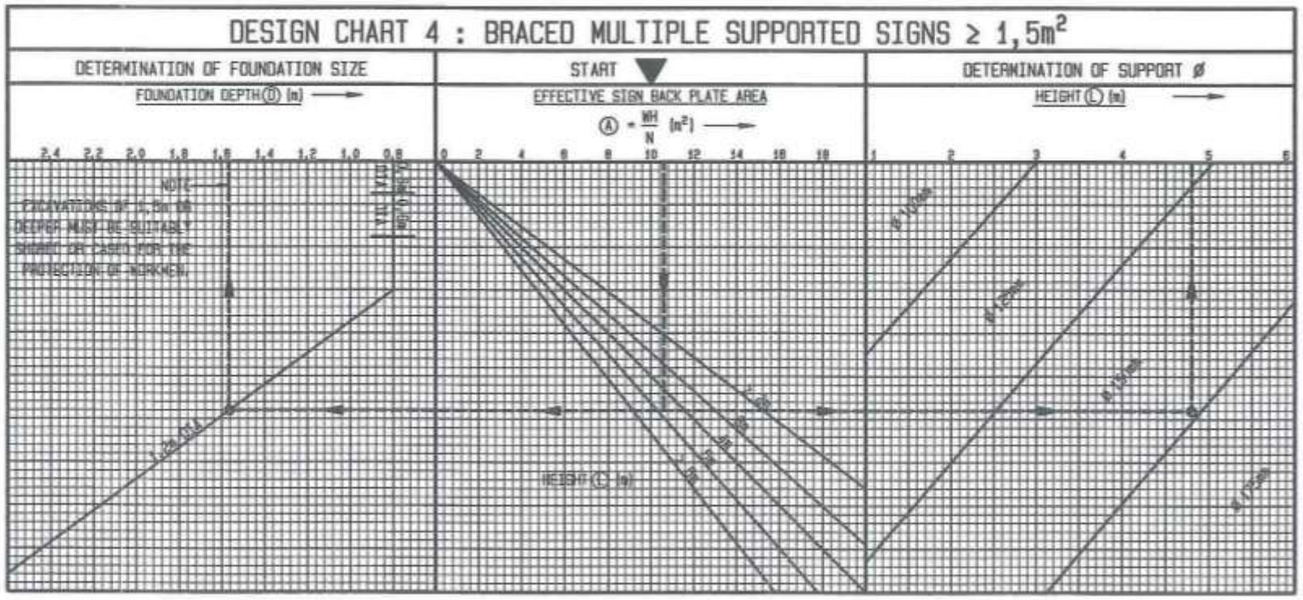
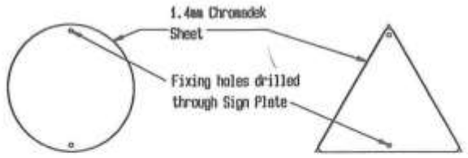
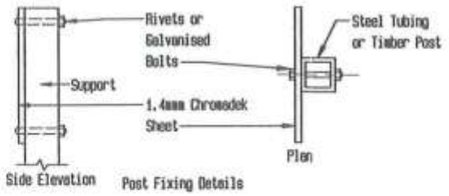


Fig 15.55
Road Traffic Signs – Design Graphs For Multiple Support Signs



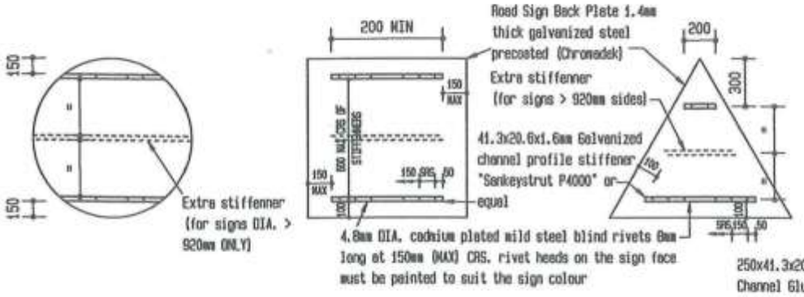
No Frame or Bracing (Signs < 0.36m²)



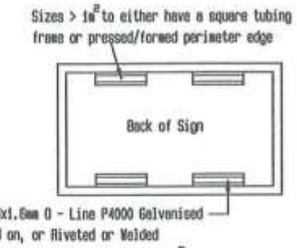
Post Fixing Details

TABLE 15.56.1: SIGN BRACING AND MOUNTING OPTIONS

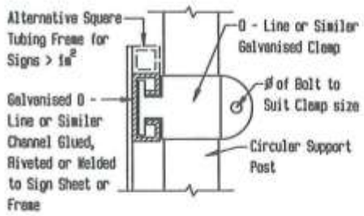
Sign Back Plate		Mounting			
Type	Area	Position	Support Structure	Carrier	Fastener
Not braced	< 0.5m²	GN	Single Support	Nil	Rivet or Bolt directly to support
		GN	Single Support	Nil	Strapped through welded/glued on Lug
Simply Channel braced horizontally	< 1.5m²	GN	Single Support, or Double Support for signs wider than 1.2m	"O-line" or "Sankey" Channel	"O-line" clamps bracket and bolts or brackets and straps
Simply braced - pressed/formed edges	< 1.5m²	GN	Single Support	Pressed edges	Bolted through lugs or bracket



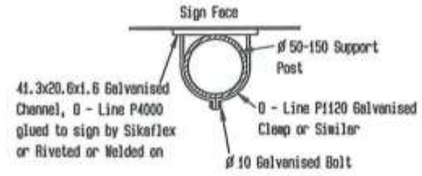
Channel Bracing for Regulatory and Warning Signs from 610mm up to 1524mm Sides or Diameters



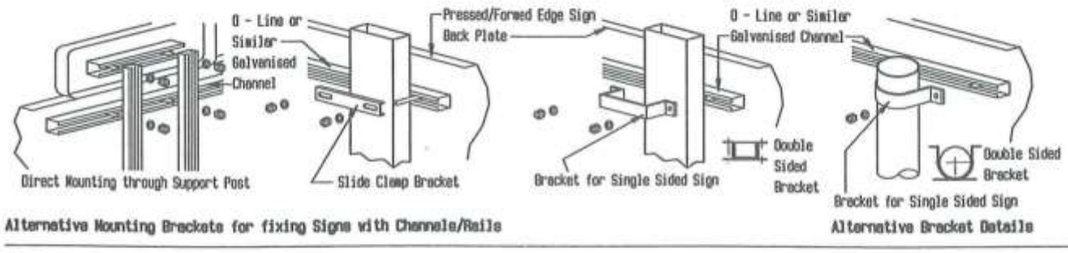
Channel Bracing for Signs > 1m² Double Supports



Bracket side Elevational Detail

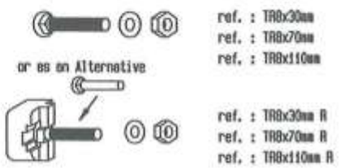


Bracket Detail in Plan View

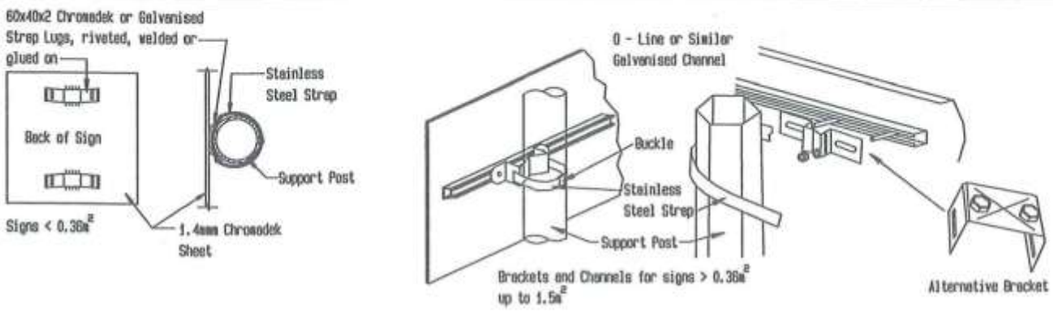


Alternative Mounting Brackets for fixing Signs with Channels/Rails

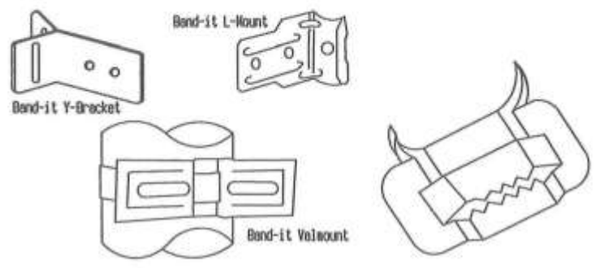
Alternative Bracket Details



Bolt Details



Strap and Lug/Bracket and Channel Mounting Alternatives

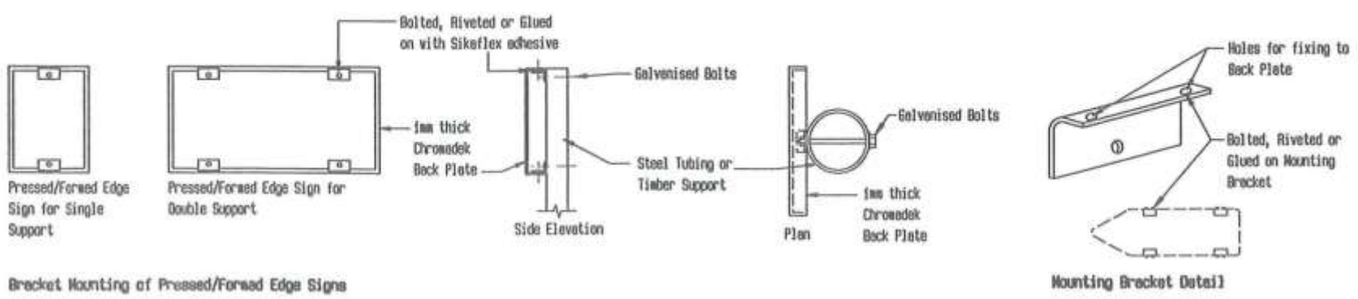


Alternative Mounting Bracket Details

Stainless Steel Strap Buckles

NOTES :

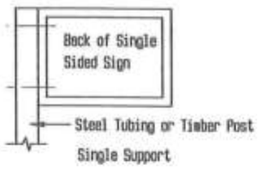
1. Direct bolting through sign back plate or strap and welded or glued on lug mounting, are only applicable to signs < 0.5m² and the sign back plate material should at least be 1.4mm thick Chromadek to provide some rigidity.
2. 1mm Chromadek material could be used for signs > 0.5m² but the back plate should be braced with either O-line or "Sankey strut" channels or a perimeter formed/pressed edge lip.
3. A wide range of brackets with either bolts or stainless steel straps could be used to mount the two types of back plate mentioned in note 2.
4. Refer to Figures 15.51 - 15.54 for support, base and foundation details

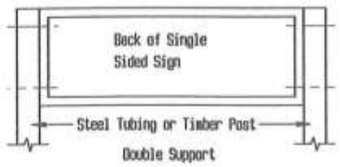


Bracket Mounting of Pressed/Formed Edge Signs

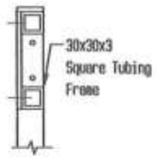
Mounting Bracket Detail

Fig 15.56
Road Traffic Signs <= 1,5 m² -
Back Plates and Mounting Details
(Signs with No Frames)

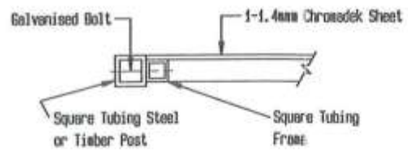




Direct Bolting through Sign Backplate Framing

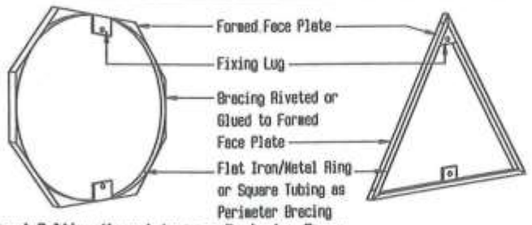


Sectional Side Elevation

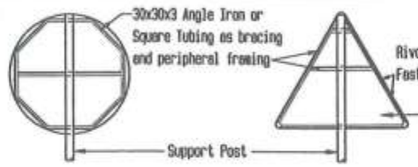


Post Fixing Details Plan

TABLE 15.57.1: SIGN BRACING AND MOUNTING OPTIONS					
Sign Back Plate		Mounting			
Type	Area	Position	Support Structure	Carrier	Fastener
Perimeter frame and bracing	> 0.5m² up to 4.5m²	GN	Single Support	Perimeter Frame and Bracing	Bolted through lugs or brackets
		GN	Single Support or Multiple Supports	Perimeter Frame □ or L	Bolted through frame directly
		GN	Single Support or Multiple Supports	Perimeter Frame	Bolted through lugs or L-brackets
Small to Medium Sized Double Sided or Boxed	> 0.5m² up to 4.5m²	GN	Single Support or Multiple Supports	Perimeter Profiled Frame	Internal: Lindapter* Cavity fixing bolts directly through frame or square tube bracket

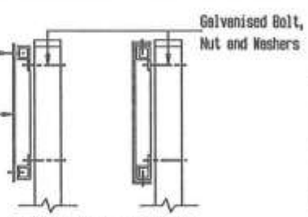


Direct Bolting through Lugs on Perimeter Frame

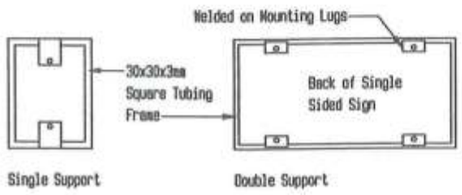


Rear Elevation Octagonal and Circular Sign

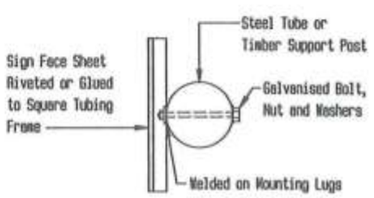
Rear Elevation Triangular Sign



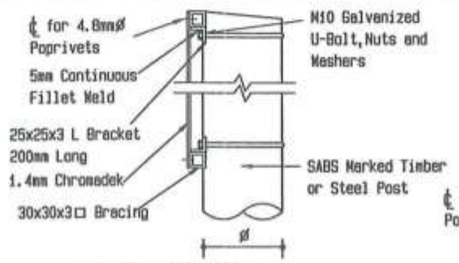
Sectional Side Elevation Lug and Bolt Mounting



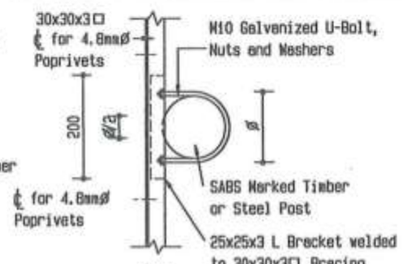
Direct Bolting through Lugs for Single Sided Signs



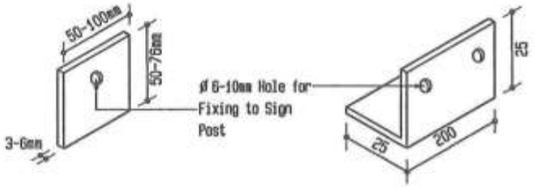
Plan-Lug and Bolt Mounting



Sectional Side Elevtion

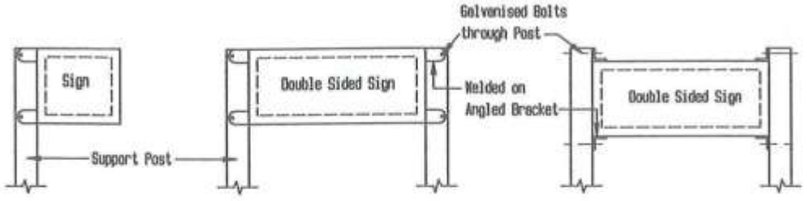


Plan

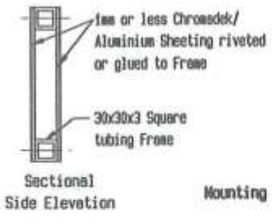


Mounting Lug/Bracket Detail

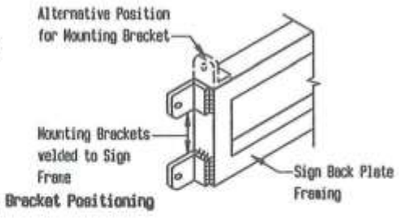
Alternative L-Bracket and U-bolt Mounting



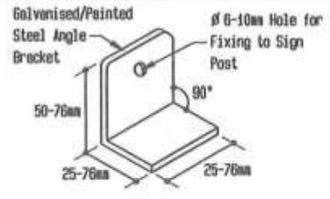
Direct Bolting through, welded on, Angled Bracket for Double Sided or Boxed Signs



Sectional Side Elevation



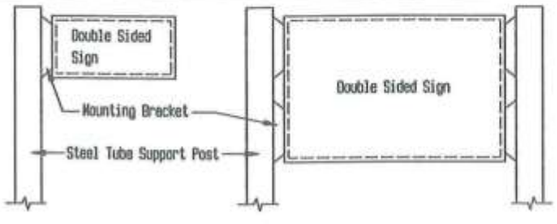
Mounting Bracket Positioning



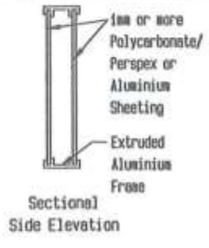
Mounting Bracket Detail

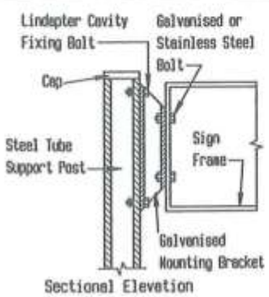
NOTES :

1. Some of the construction and mounting details, indicated on this drawing, are also applicable to signs > 1.5m², with an increase in part sizes.
2. Ideally, the frames, lugs, brackets and bolts should be of corrosive resistant materials or treated as such.
3. Corrosion protection tape to become so. applied to all contact surfaces, between steel and aluminium or as instructed by the engineer.
4. Refer to Figures 15.51 - 15.54 for support, base and foundation details.

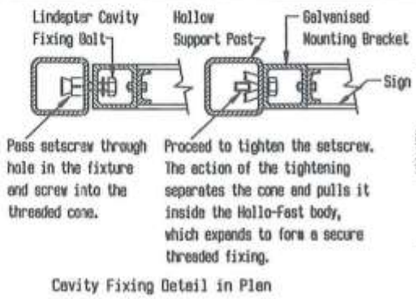


Invisible Fixing, by Square tubing mounting Bracket, for Double Sided or Boxed Signs

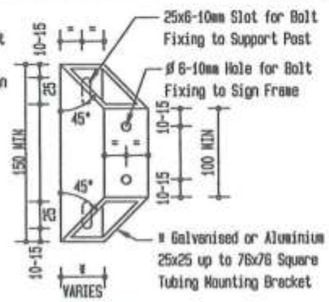




Sectional Elevation

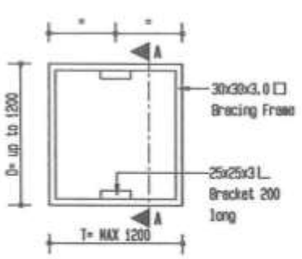


Cavity Fixing Detail in Plan

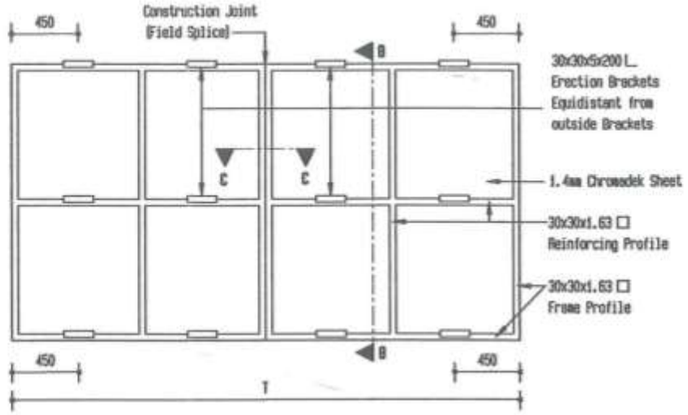


Mounting Bracket Detail

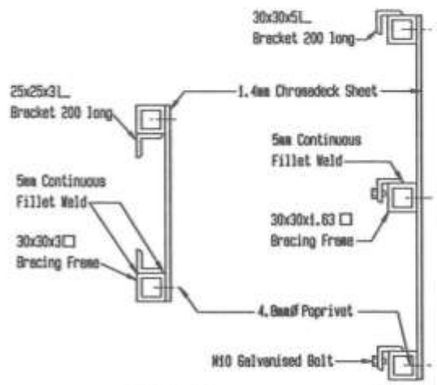
Fig 15.57
Road Traffic Signs <= 1,5 m² - Back Plates and Mounting Details (Signs with Frames)



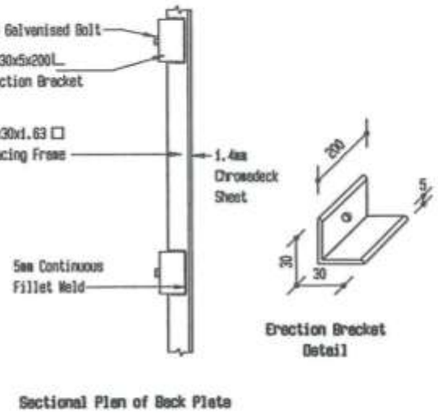
Typical Bracing of Signs from 0.5m² up to 1.5m² for Ground Mounting on a Single Support



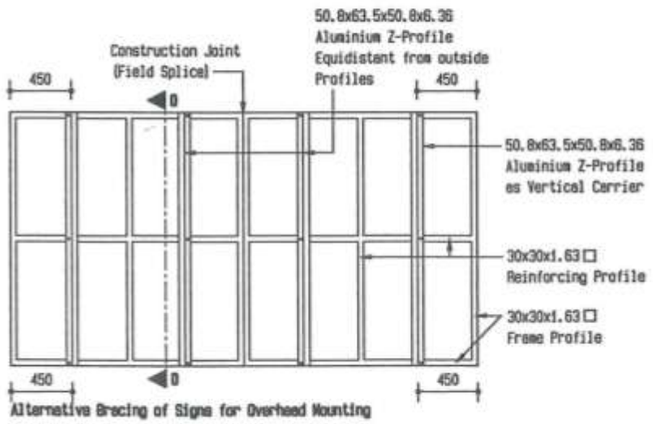
Typical Bracing of Signs from 1.5m² up to +20m² for Ground Mounting on Multiple Supports



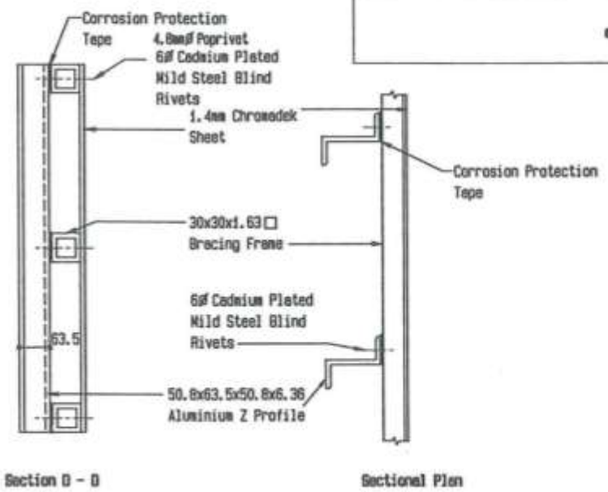
Section A-A Section B-B



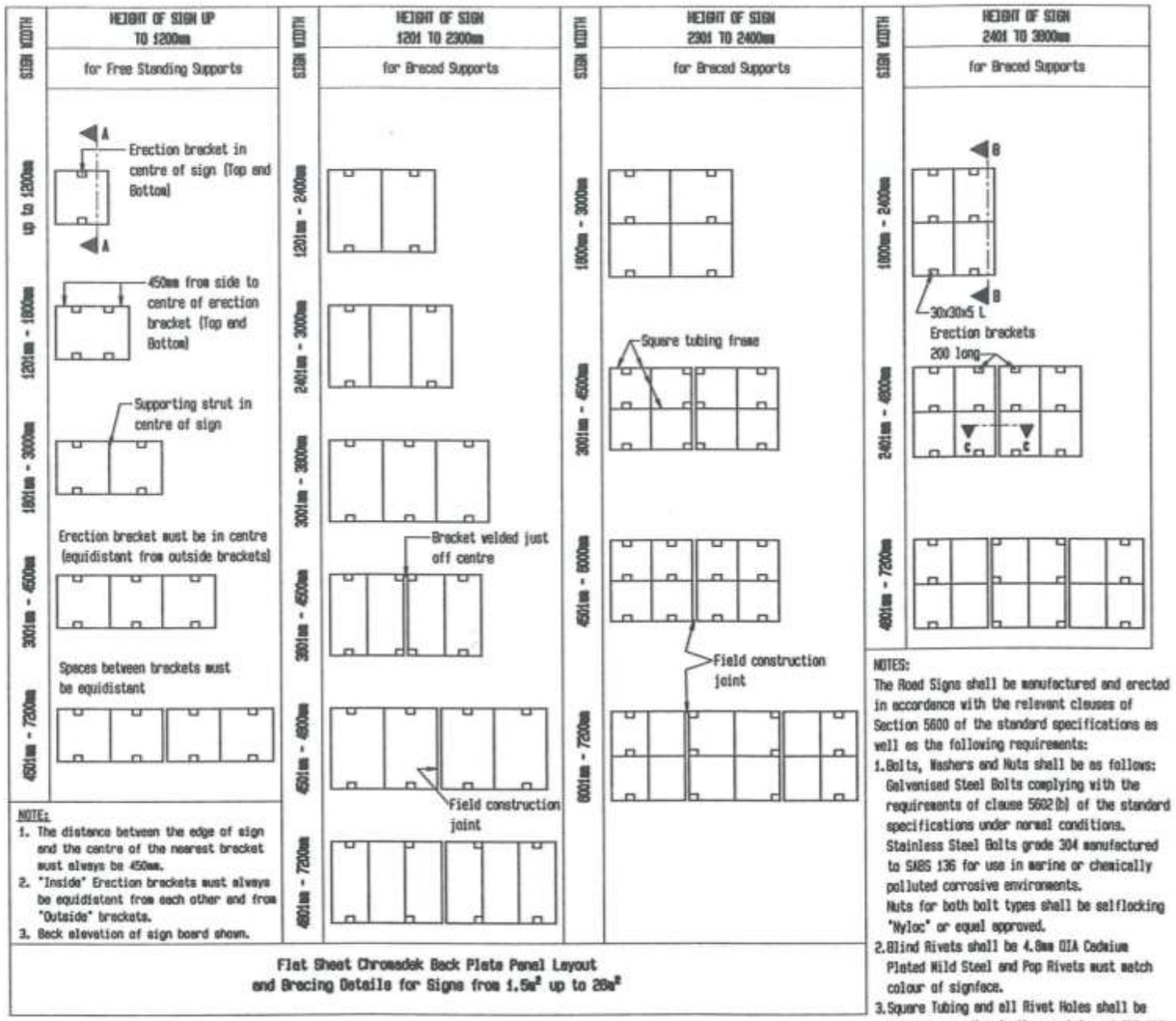
Sectional Plan of Back Plate



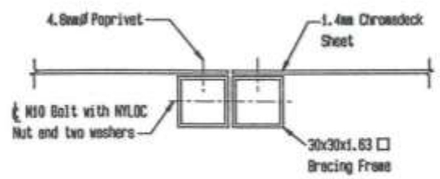
Alternative Bracing of Signs for Overhead Mounting



Section D - D Sectional Plan



Flat Sheet Chromadek Back Plate Panel Layout and Bracing Details for Signs from 1.5m² up to 20m²



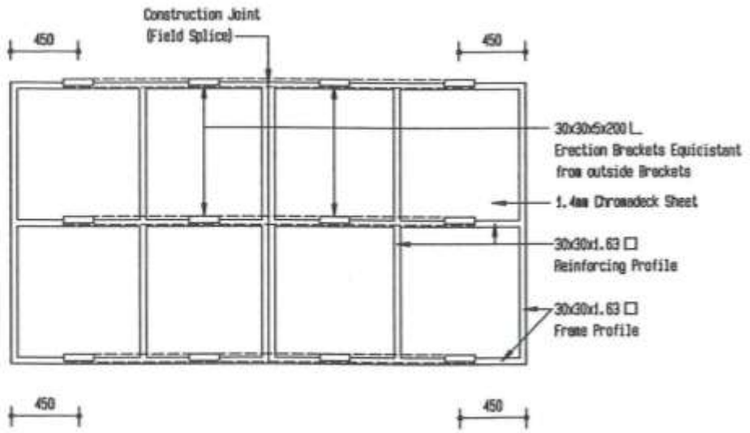
Section C-C Field Construction Joint

NOTES:
The Road Signs shall be manufactured and erected in accordance with the relevant clauses of Section 5600 of the standard specifications as well as the following requirements:
1. Bolts, Washers and Nuts shall be as follows:
   Galvanised Steel Bolts complying with the requirements of clause 5602(b) of the standard specifications under normal conditions.
   Stainless Steel Bolts grade 304 manufactured to SABS 136 for use in marine or chemically polluted corrosive environments.
   Nuts for both bolt types shall be selflocking "Nyloc" or equal approved.
2. Blind Rivets shall be 4.8mm DIA Cadmium Plated Mild Steel and Pop Rivets must match colour of signface.
3. Square Tubing and all Rivet Holes shall be painted according to the provision of CKS 193.
4. Reference must be made to the relevant road signface detail drawings for details of the symbols and legend for each individual signface.
5. Signs manufactured in two sections must be bolted together in the middle with 10mm bolts, nuts and washers.
6. Corrosion Protection Tape to be applied to all contact surfaces between steel and aluminium or as instructed by the Engineer.
7. For Overhead Mounting on Cantilever or Portal Structures the erection brackets should be replaced with vertical aluminium Z-profiles, in the exact positions of the erection brackets.
8. For Mounting details and options see Figure 15.59.

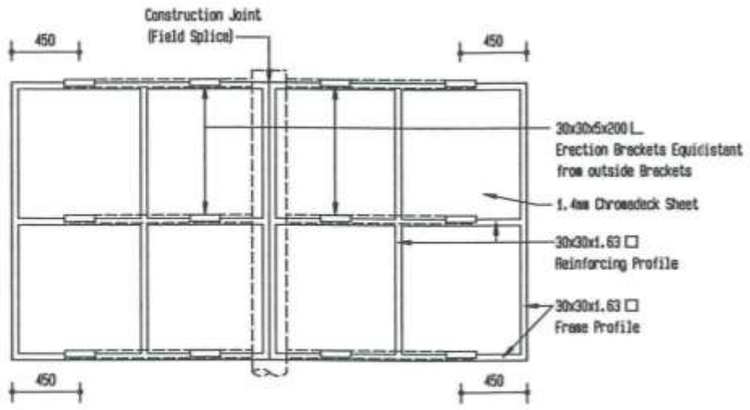
Fig 15.58
Road Traffic Signs >= 1,5 m² - Back Plate and Bracing Details (Flat Sheet Chromadek)

NOTES:
The Road Signs shall be manufactured and erected in accordance with the relevant clauses of Section 5600 of the standard specifications as well as the following requirements:

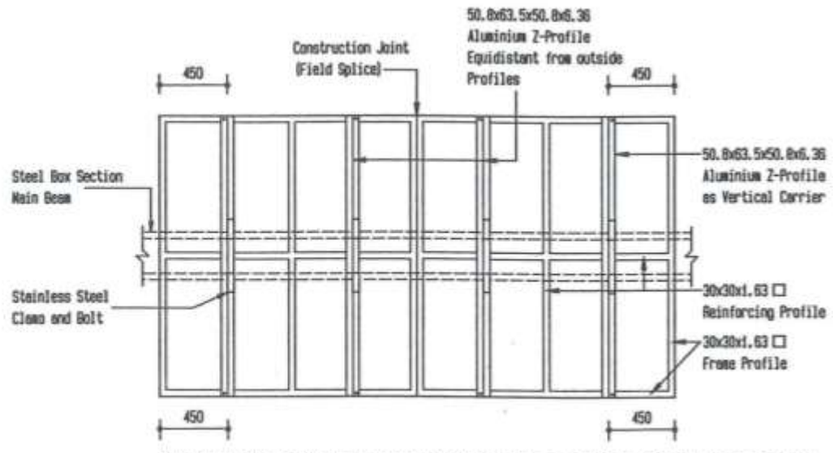
1. Bolts, Washers and Nuts shall be as follows:
   Galvanised Steel Bolts complying with the requirements of clause 5602(b) of the standard specifications under normal conditions.
   Stainless Steel Bolts grade 304 manufactured to SABS 136 for use in marine or chemically polluted corrosive environments.
   Nuts for both bolt types shall be selflocking "Nyloc" or equal approved.
2. Blind Rivets shall be 4.8mm DIA Cadmium Plated Mild Steel and Pop Rivets must match colour of signface.
3. Square Tubing and all Rivet Holes shall be painted according to the provision of CKS 193.
4. Reference must be made to the relevant road signface detail drawings for details of the symbols and legend for each individual signface.
5. Signs manufactured in two sections must be bolted together in the middle with 10mm bolts, nuts and washers.
6. Corrosion Protection Tape to be applied to all mating surfaces between steel and aluminium or as instructed by the Engineer.
7. For Overhead Mounting on Cantilever or Portal Structures the erection brackets should be replaced with vertical aluminium Z-profiles, in the exact positions of the erection brackets.
8. For back plate and bracing details see figure 15.58. For support, base and foundation details see Figure 15.54.



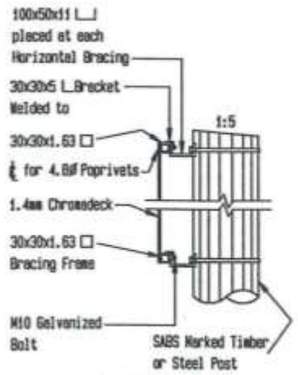
Rear Elevation of Back Plate for Ground Mounting on Multiple Supports



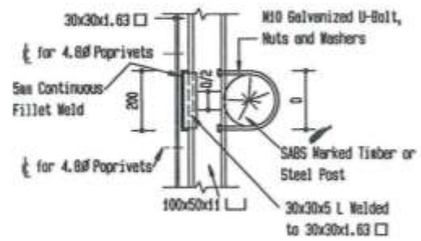
Rear Elevation of Back Plate for Ground Mounting on Single Support (as an Option)



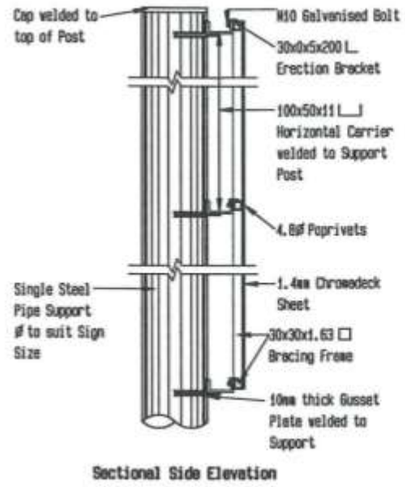
Rear Elevation of Back Plate for Overhead Mounting on Cantilever/Gantry (as an Option)



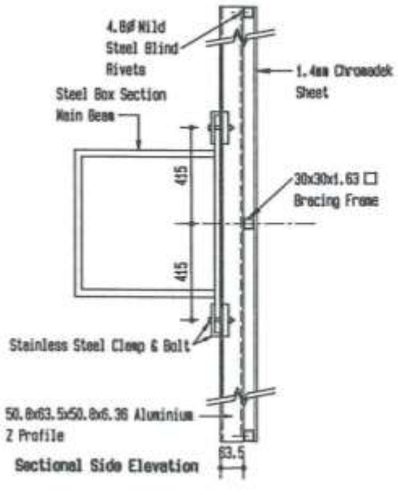
Sectional Side Elevation



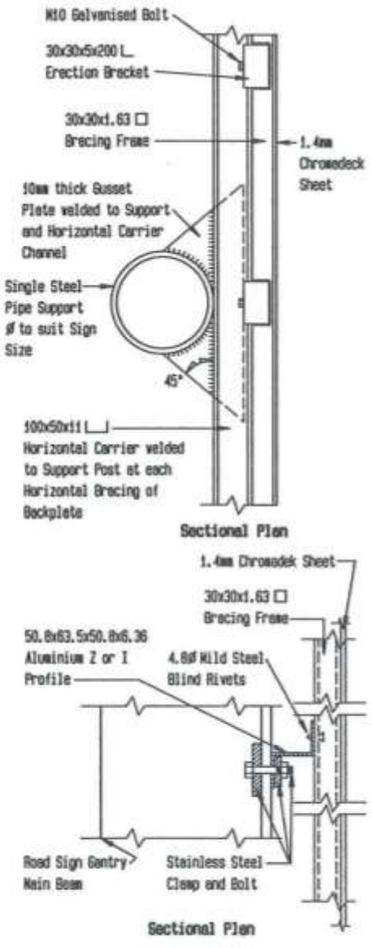
Sectional Plan



Sectional Side Elevation

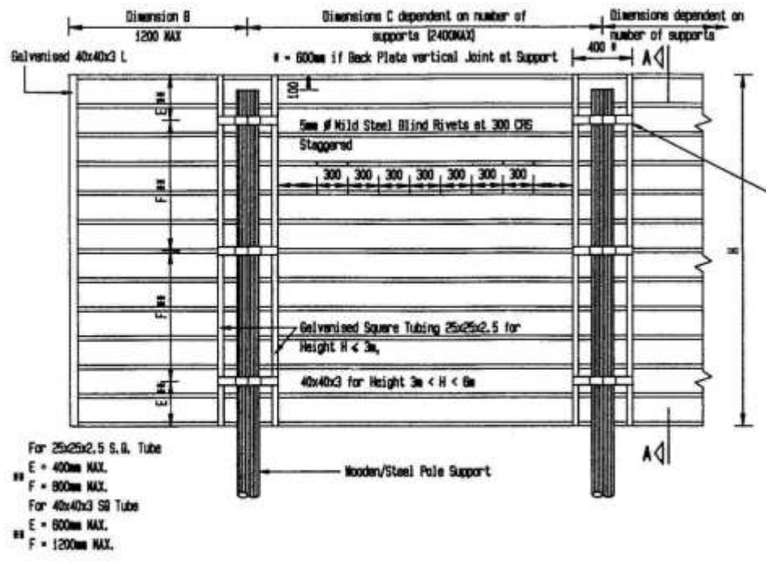


Sectional Side Elevation

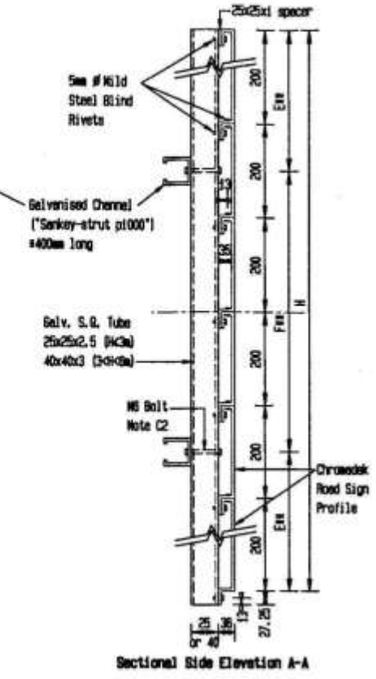


Sectional Plan

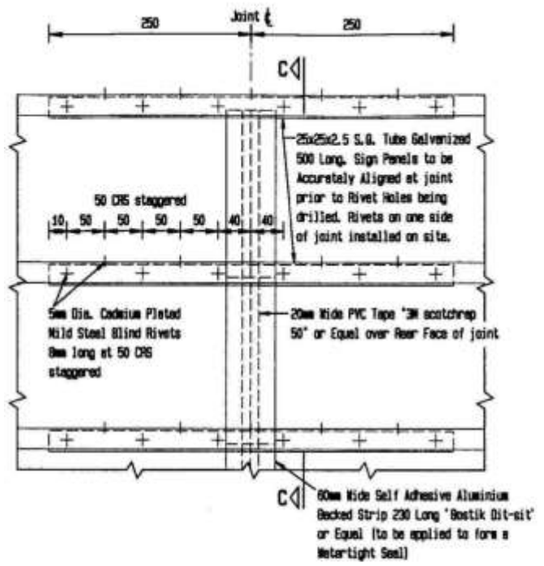
Fig 15.59
Road Traffic Signs >= 1,5 m^2 - Mounting Details and Options (Flat Sheet Chromadek)



Rear Elevation of Back Plate for Ground Mounting



Sectional Side Elevation A-A



Rear Elevation of Vertical Joining Detail

NOTES:

A. STANDARD SIGN PROFILE

1. The Standard Sign Profile shall be made from 1mm thick prepainted galvanized mild steel substrate ("Chromadek" or equal approved).
2. Preparation and painting shall be carried out in accordance with CKS 193-1977 and the paint system shall be as follows, as indicated on the drawings or directed by the engineer :-
(i) Type "A" back plates (all cases other than type "B" below):-
Silicone polyester system having a nominal 20 micron dry film thickness on the front face and a standard half-cost polyester as a backing coat. Where the sign is to be covered with retro-reflective material. The front face may be finished with a primer coat ("Chromaprep" or equal)
(ii) Type "B" back plates (signfaces to be erected in marine or chemically polluted corrosive environments):-
PVC plastisol system having a 150 micron min. dry film thickness on each side of the sheet. The coat on the back face of the sign profile shall be grey in colour, 629 to SABS 1091 or similar.
3. The prepainted sheet shall be cut to length to a tolerance of + 2mm prior to profiling.
4. Where standard sign profiles are to be faced with retroreflective background material, application shall be carried out as for aluminium extrusions as specified in clause 5603(d) of the standard specifications.
5. Reference must be made to the relevant road sign detail drawings for details of the symbols and legend for each individual sign.
6. Measurement and payment of the backplates shall be in accordance with clause 5609 of the standard specifications. An "Extra over" rate shall be applicable for type "B" back plates.
7. A sign which exceeds 6m in length may be manufactured in two sections. The joint shall be made in accordance with details shown for vertical joining.

B. JOINT

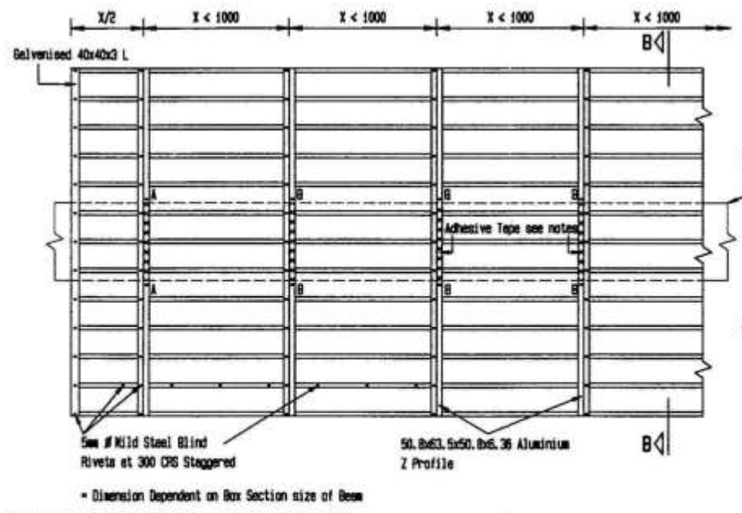
1. The joint shall be accurately aligned prior to drilling of rivet holes.
2. The gap between the adjoining halves of the sign shall at no point exceed 2mm.
3. The completed sections shall be assembled in the factory prior to delivery to site to ensure that all sections fit together properly and that legends are properly spaced and aligned.
4. At site the two sections shall again be aligned and fastened together by means of rivets placed in the pre-drilled holes.

C. STRUCTURAL STEEL SECTIONS

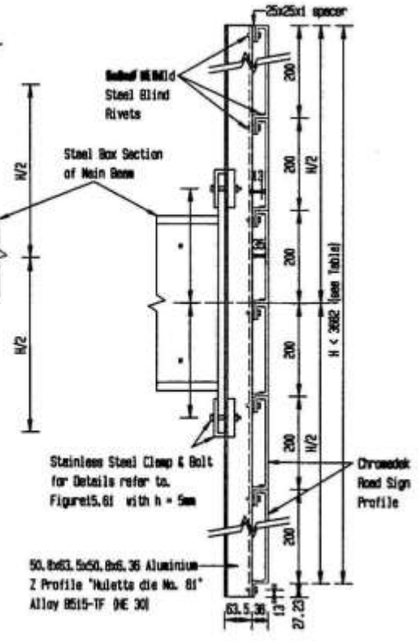
1. Shall be of mild steel conforming to the requirements of section 7100 of the standard specifications. Rectangular hollow sections and special channel profiles may be cold formed of commercial quality mild steel.
2. Bolts, Washers and nuts shall be as follows:-
Type "A" sign back plates: Galvanized steel bolts complying with the requirements of clause 5602 (b) of the standard specifications.
Type "B" sign back plates: Stainless steel bolts grade 304 manufactured to SABS 136. Nuts for both type "A" and type "B" sign back plates shall be selflocking "Nyloc" or equal approved.
3. Blind rivets shall be 5mm dia. cadmium plated mild steel.
4. All steel sections shall be hot dip galvanized in accordance with clause 7105 (i) of the standard specifications after manufacture.

D. SUPPORT, BASE AND FOUNDATIONS

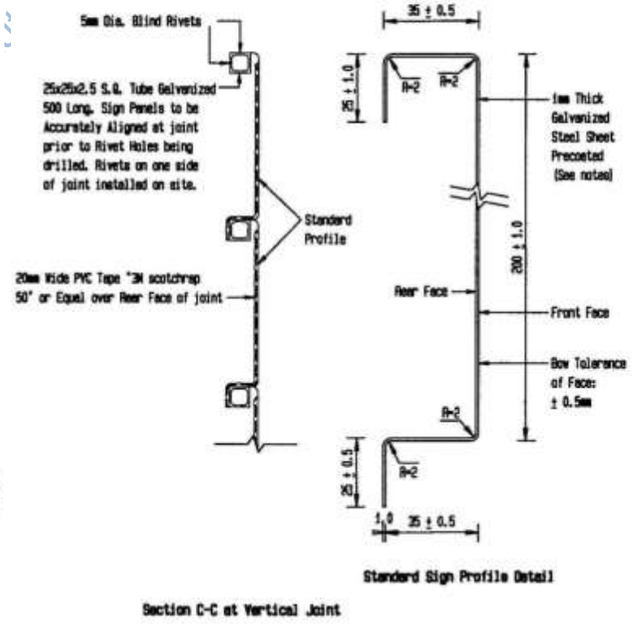
1. For Single Support, base and foundation details see Figure 15.22.
2. For Multiple support, base and foundation details see Figure 15.54.
3. For overhead gantries see NDOT standard design details.



Rear Elevation of Back Plate for Overhead Mounting (as an option)



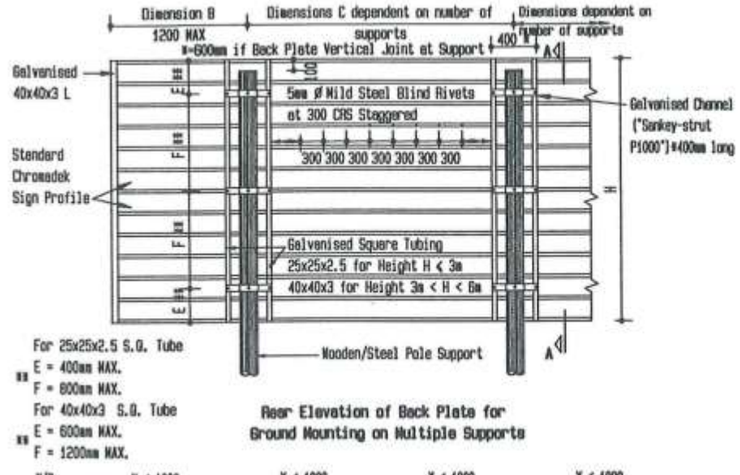
Sectional Side Elevation B-B



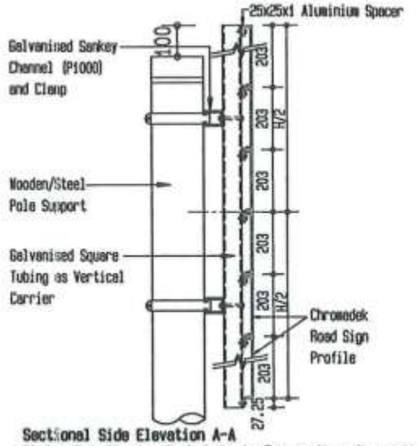
Standard Sign Profile Detail

Section C-C at Vertical Joint

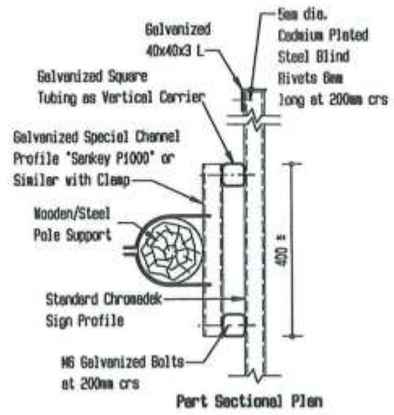
Fig 15.60
Road Traffic Signs >= 1,5 m^2 -
Back Plate and Bracing Details
(Stacked Chromadek Profiles)



Rear Elevation of Back Plate for Ground Mounting on Multiple Supports



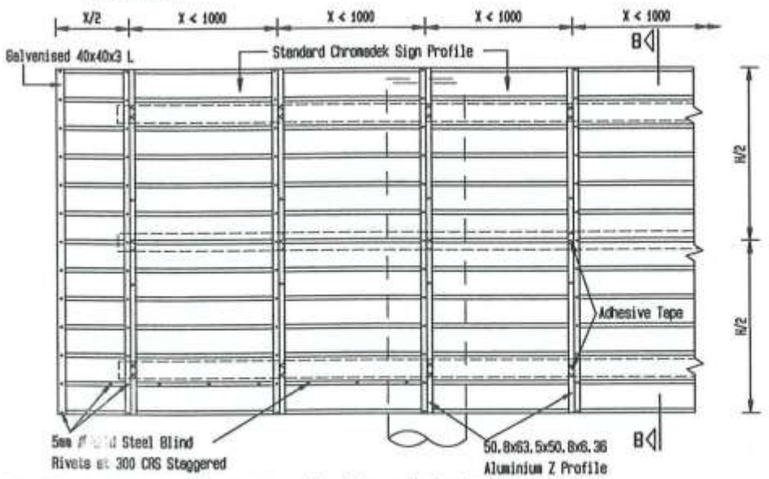
Sectional Side Elevation A-A
Fixing Details for Backplate to Two or More Supports



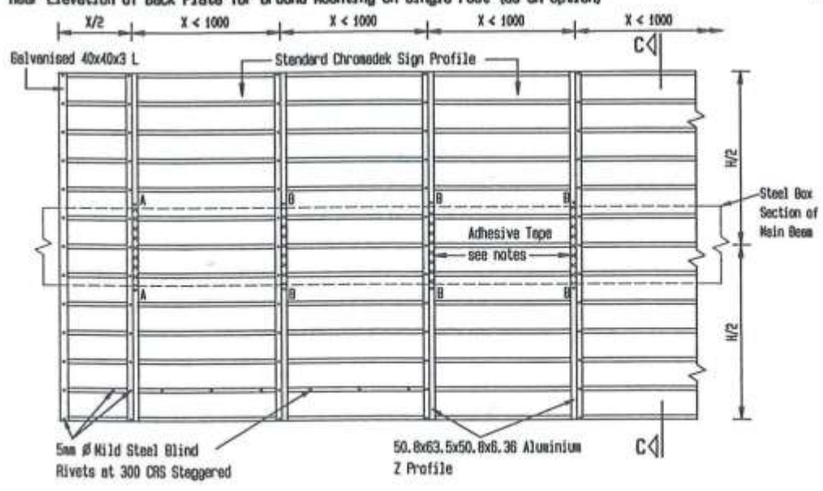
Part Sectional Plan

NOTES:
The Road Signs shall be manufactured and erected in accordance with the relevant clauses of Section 5600 of the standard specifications as well as the following requirements:

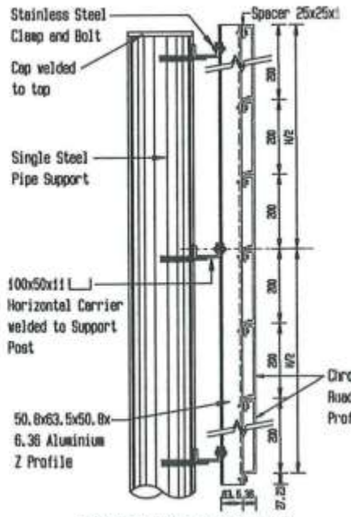
1. Bolts, Washers and Nuts shall be as follows:
   Galvanised Steel Bolts complying with the requirements of clause 5602(b) of the standard specifications under normal conditions.
   Stainless Steel Bolts grade 304 manufactured to SABS 136 for use in marine or chemically polluted corrosive environments.
   Nuts for both bolt types shall be selflocking "Nyloc" or equal approved.
2. Blind Rivets shall be 5mm DIA Cadmium Plated Mild Steel and Pop Rivets must match colour of Sign Face.
3. Corrosion Protection Tape to be applied to all mating surfaces between steel and aluminium or as instructed by the Engineer.
4. For Sign Back Plate and Bracing Details see Figure 15.60.



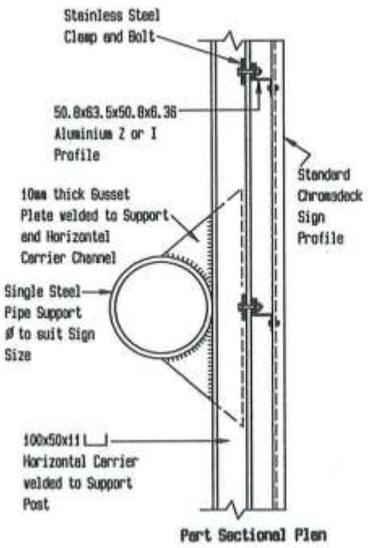
Rear Elevation of Back Plate for Ground Mounting on Single Post (as an option)



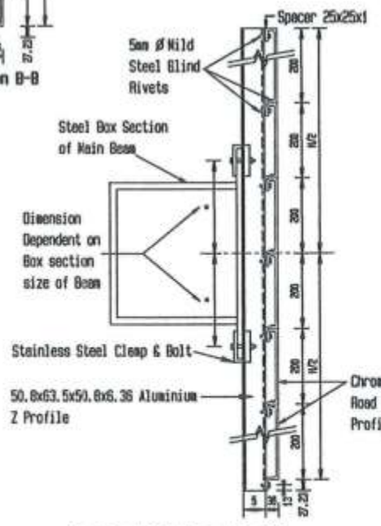
Rear Elevation of Back Plate for Overhead Mounting on Cantilever or Portal Structure (as an option)



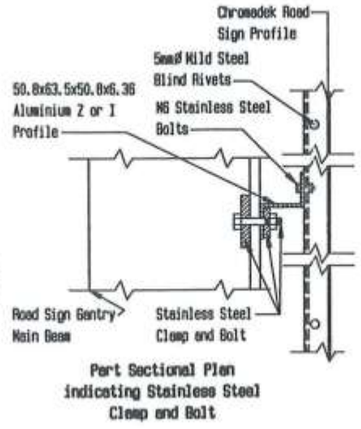
Sectional Side Elevation B-B



Part Sectional Plan

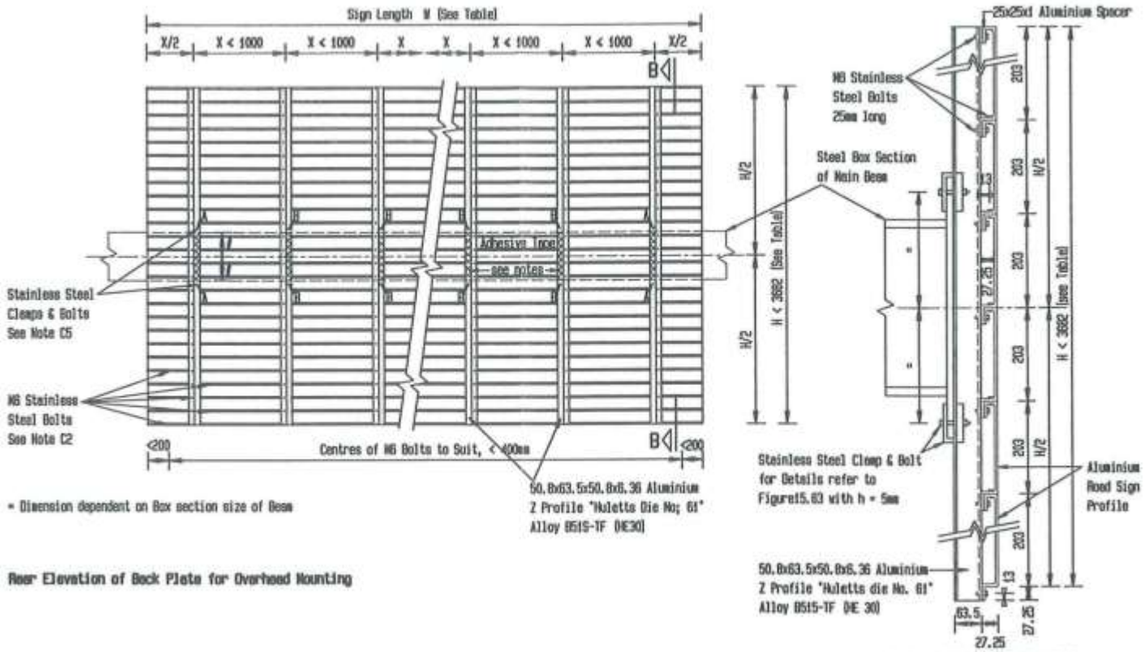


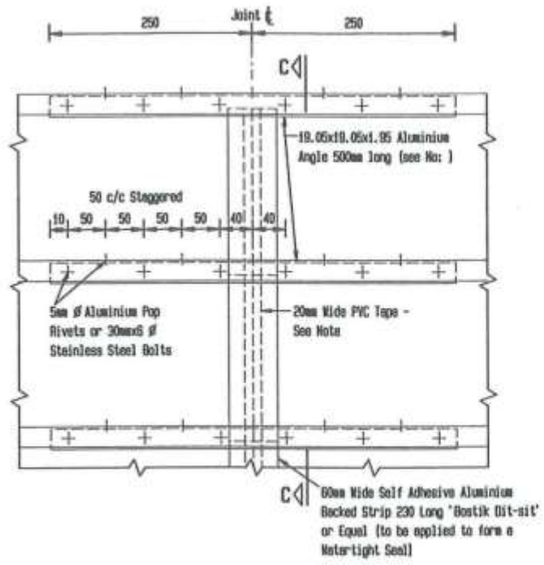
Sectional Side Elevation C-C

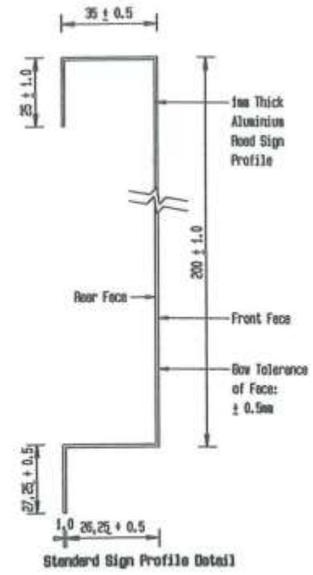


Part Sectional Plan indicating Stainless Steel Clamp and Bolt

Fig 15.61
Road Traffic Signs >= 1,5 m^2 - Mounting Details and Options (Stacked Chromadek Profiles)







NOTES:

A. STANDARD SIGN PROFILE

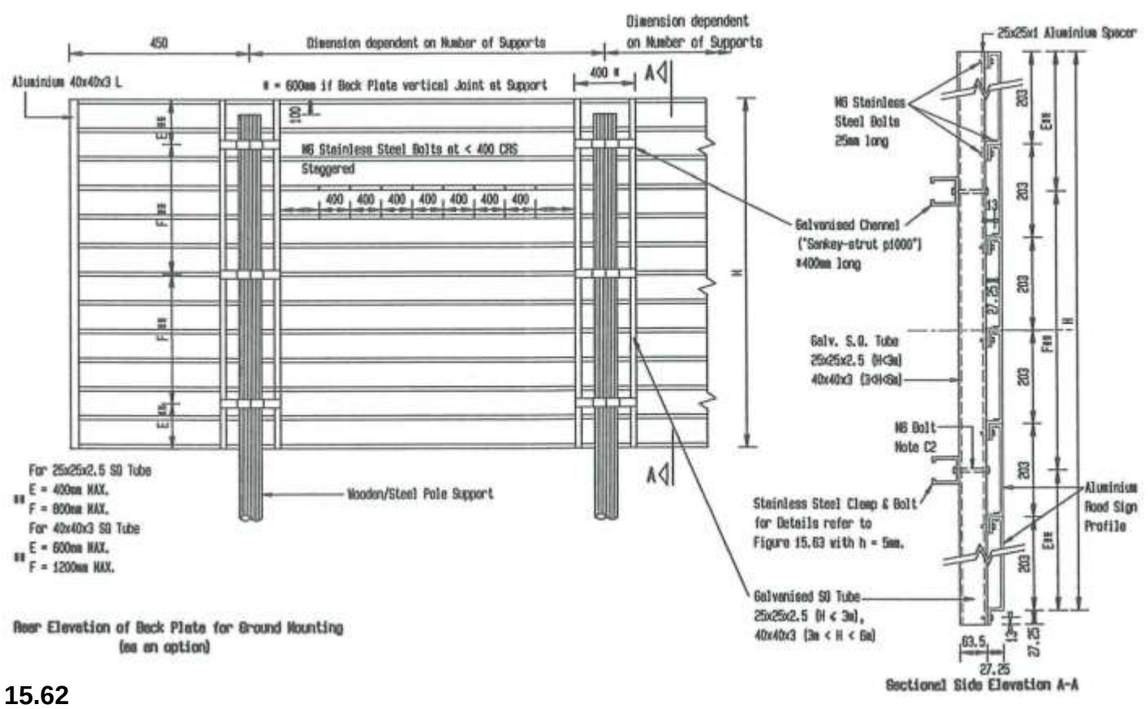
1. The Standard Sign Profile shall be made from Grade 6063 Aluminium Alloy to BS1474 (NE9) standards, "ALNEX DIE No. L20403".
2. Where standard sign profiles are to be faced with retroreflective background material, application shall be carried out as for aluminium extrusions as specified in clause 5603 (d) of the standard specifications.
3. Reference must be made to the relevant road sign detail drawings for details of the symbols and legend for each individual sign.
4. Measurement and payment of the sign faces shall be in accordance with clause 5509 items 56.01 (b) and 56.02 of the standard specifications.
5. A sign which exceeds 5m in length may be manufactured in two sections. The joint shall be made in accordance with details shown on the drawing.

B. JOINT

1. The joint shall be accurately aligned prior to drilling of rivet or bolt holes.
2. The gap between the adjoining halves of the sign shall at no point exceed 2mm.
3. The completed sections shall be assembled in the shop prior to delivery to site to ensure that all sections fit together properly and that legends are properly spaced and aligned.
4. At site the two sections shall again be aligned and fastened together by means of rivets placed in the pre-drilled holes.
5. "3M SCOTCHRAP 50" PVC TAPE or equal covered by "BOSTIK DIT SIT" aluminium backed adhesive tape over rear face of joint.

C. STRUCTURAL SECTIONS

1. Aluminium Z Extrusions shall be of Grade B51S-TF Alloy to BS 1474 (NE30), "HULETTS DIE No. 61".
2. Bolts, washers and nuts shall be as follows:-
   Stainless steel bolts grade 304 manufactured to SABS 136.
   Nuts shall be selflocking "Nylon" or equal approved.
3. Blind rivets shall be 5mm dia. Aluminium.
4. Aluminium faces in contact with gantry faces shall be covered with a double layer black Polyvinyl Chloride plastic adhesive tape "3M SCHOTCHRAP 50" or equal. Width of tape x 50mm and total thickness x 500mm.
5. Each individual overhead sign shall be erected and secured in position by means of the 4 cleats marked A the holes for cleats marked B shall be marked off and drilled once the sign boards have been erected and secured in position.



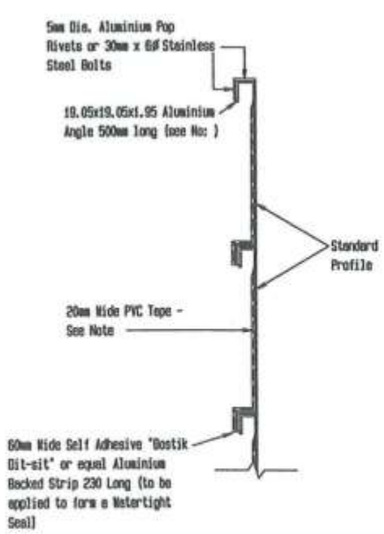
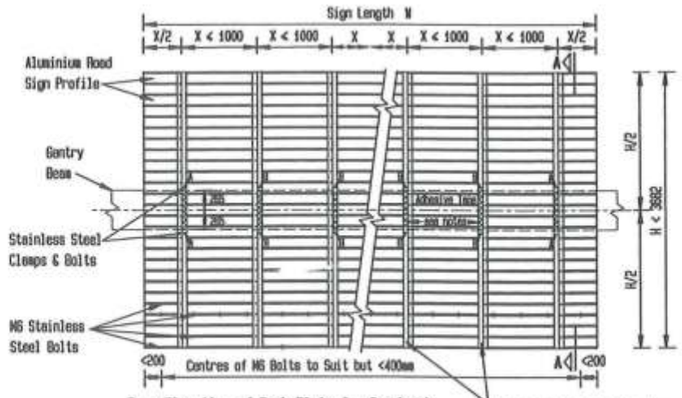


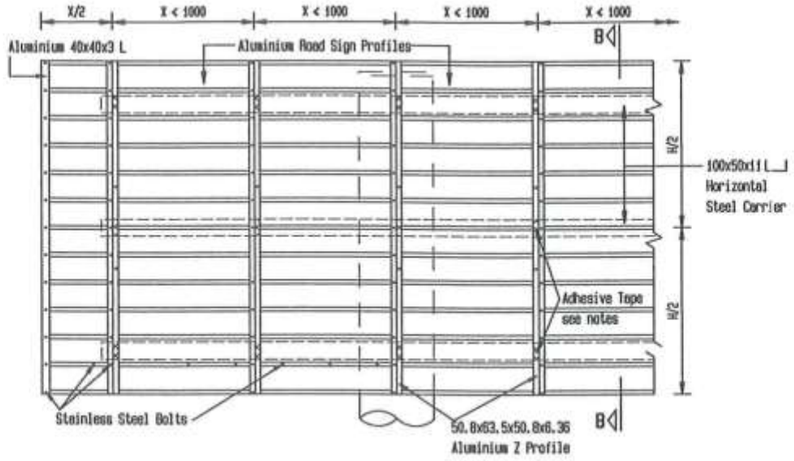
Fig 15.62
Road Traffic Signs >= 1,5 m² - Back Plate and Bracing Details (Stacked Aluminium Profiles)

NOTES:
The Road Signs shall be manufactured and erected in accordance with the relevant clauses of Section 5600 of the standard specifications as well as the following requirements:

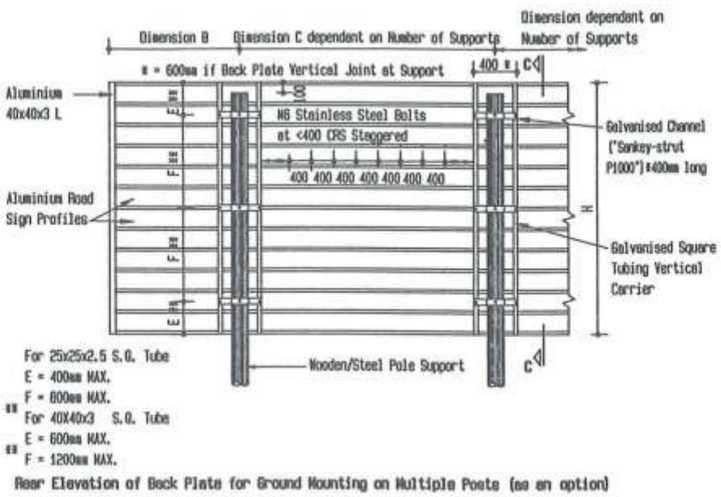
1. Bolts, Washers and Nuts shall be as follows:
   Galvanised Steel Bolts complying with the requirements of clause 5602(b) of the standard specifications under normal conditions.
   Stainless Steel Bolts grade 304 manufactured to SABS 136 for use in marine or chemically polluted corrosive environments.
   Nuts for both bolt types shall be selflocking 'Nyloc' or equal approved.
2. Blind Rivets shall be 5mm DIA Cadmium Plated Mild Steel and Pop Rivets must match colour of Signface.
3. Reference must be made to the relevant road signface detail drawings for details of the symbols and legend for each individual signface.
4. Corrosion Protection Tape to be applied to all mating surfaces between steel and aluminium or as instructed by the Engineer.
5. For Back Plate and Bracing details see Figure 15.62.
6. For single, support, base and foundation details see Figure 15.22.
   For multiple support, base and foundation details see Figure 15.54
   For overhead gantry details see NDOT standard design details.



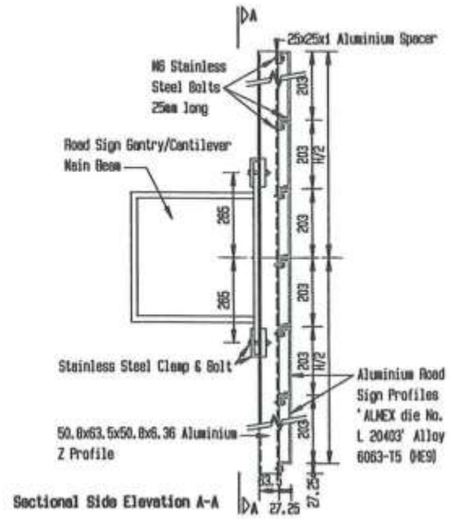
Rear Elevation of Back Plate for Overhead Mounting on Cantilever/Gantry Structure



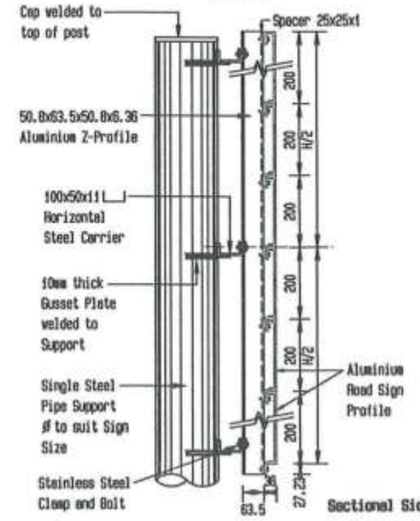
Rear Elevation of Back Plate for Ground Mounting on Single Post (as an option)



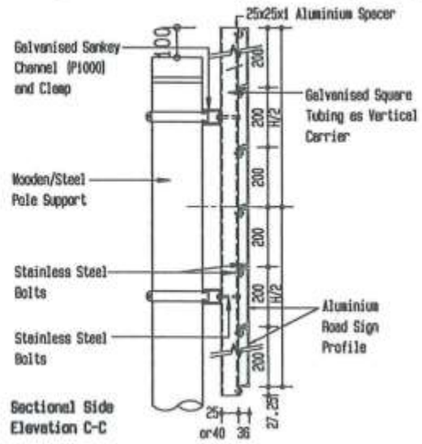
Rear Elevation of Back Plate for Ground Mounting on Multiple Posts (as an option)



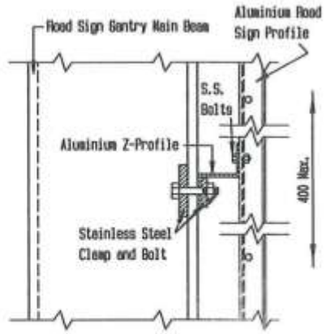
Sectional Side Elevation A-A



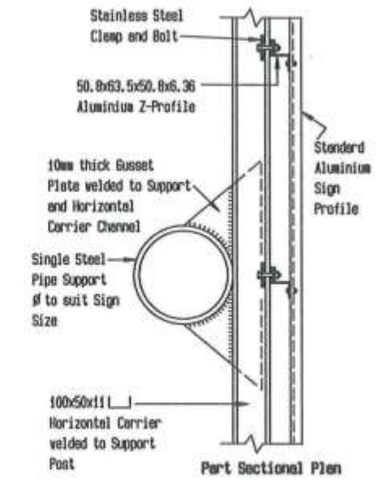
Sectional Side Elevation B-B



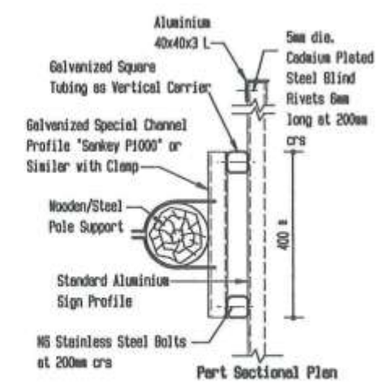
Sectional Side Elevation C-C



Part Sectional Plan indicating Stainless Steel Cleap and Bolt



Part Sectional Plan



Part Sectional Plan

Fig 15.61
Road Traffic Signs >= 1,5 m^2 - Mounting Details and Options (Stacked Aluminium Profiles)

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15.8 DESIGN AND IMPLEMENTATION – OVERHEAD MOUNTED SIGNS

15.8.1 General

1 The design of structures for supporting overhead signs should normally be carried out by a structural engineer. Some roads department have, however, standardised the design procedure within specified ranges of parameters. The National Department of Transport has been using a booklet entitled *"Standard Designs for Overhead Sign Structures"* for some time.

2 This section summarises certain of the information contained in this booklet. Although a number of the design codes used in the booklet are somewhat dated, the design procedure described is perfectly adequate for most standard requirements. For more details designers should consult the material in the booklet.

3 The Department of Transport also has, in support of the booklet, a set of standard plans in their SP-B series which facilitate the design of the more common overhead sign support structures used in South Africa. Extracts from two of these drawings are included in this section, namely:

(a) drawing SP-B-4-1, as Figure 15.64,indicating clearances and Table 15.24 giving a list of applicable drawings for Portal Type Sign Gantries;

(b) drawing SP-B-4-21,as Figure 15.65, indicating clearances and Table 15.25 giving a list of applicable drawings for Cantilever Type Sign Gantries;

4 The following types of overhead sign structures are used to support road signs:

(a) portal structures consisting of vertical columns and horizontal beams;

(b) cantilever structures with vertical column and a cantilever beam extending over the traffic lanes.

5 The Department of Transport's set of drawings covers all of the following aspects:

(a) clearance distances;

(b) design loads and appropriate SABS codes;

(c) design aids and charts;

(d) detail drawings;

(e) examples to illustrate the use of design chart.

15.8.2 Clearances

1 The minimum overhead clearance measured to the underside of the sign face shall be 5,7 m. Possible future lanes must be taken into consideration when establishing the position of the minimum clearance point. It is recommended that the pre-camber of the main beam should not be included in the calculation of the overhead clearance.

2 The required horizontal clearance to the face of the left column measured from shoulder breakpoint is, for both types of structure, as follows:

(a) when guardrails are provided: 1,2 m;

(b) at collector-distributor lanes: 2,0 m;

(c) all other cases: 4,5 m.

3 On single carriageway roads the required horizontal clearance to the right column of a portal type structure is identical to that for the left column.

4 For dual carriageway roads the right column is normally located at the centre-line of the median with the following provisions:

(a) at narrow medians (median island < 8,6 m) where the clearance measured from the shoulder breakpoint to the face of the column < 4,1 m guardrails shall be provided;

(b) at wide medians (median island ≥ 9,4 m) the horizontal clearance to the face of the column shall be ≥ 4,5 m;

(c) where guardrails are provided the clearance to the face of the column shall still be a minimum of 1,2 m.

5 The location of the columns on outside shoulders present no geometric problems for normal cut or fill conditions. For cut slopes ranging between 1:1 and 4:1 the footings should be specially designed and positioned to suit local conditions and requirements.

15.8.3 Design

1 The structures must be designed in accordance with the provisions of the National Building Regulations with particular reference to the latest version of the following SABS Design Codes:

(a) SANS 10160: The General Procedures and Loading to be adopted in the Design of Buildings
(b) SANS 10162: Code of Practice for the Structural Use of Steel
(c) SANS 10100: Code of Practice for the Structural Use of Concrete
(d) SANS 10163: Code of Practice for the Design of Timber Structures

2 The structures must be designed for the following loads:

(a) mass of the structure and sign;

(b) the appropriate wind loads as specified in SANS 10160; the standard design methods and design charts are based on a wind loading of the 1,5 kN/m^2 acting on the vertical surfaces of signs and gantries; the derivation of the wind load is expounded upon in Appendix A of the booklet *"Standard Designs for Overhead Sign Structures"*; also included in this Appendix A is the calculation of the wind forces in accordance with the latest edition of SANS 10160 for 40 m/sec and 45 m/sec winds;

(c) a horizontal collision load equivalent to a static load of 100 kNm acting 1.2 m above the base plate.

3 The design loads must be combined as described in paragraph 4.4.2 of SANS 10160 in accordance with the limit states design codes.

4 Allowable deflections for portal type structures are:

(a) the vertical deflection of the main beam must be compensated for by fabricating the member with a

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continuous camber to a value approximately twice the deflection under mass loads only;

(b) the horizontal deflection of the main beam is limited to 1/200th of the span;

(c) the horizontal deflection of the columns measured at the column beam junction is limited to 1/100th of the column height under wind loading only. The horizontal deflection as a result of frame action under mass loads is limited to 1/350th of the column height.

5 Allowable deflections for cantilever type structures are:

(a) the horizontal displacement of the end of the beam is limited to 1/75th of the length of the cantilever;

(b) the horizontal displacement of the column beam junction is limited to 1/100th of the column height.

15.8.4 Analysis and Design Charts

1 The design graphs which are included in Appendix B of the booklet "*Standard Designs for Overhead Sign Structures*", provide design solutions to a wide range of spans, column heights, and sign areas to be supported on the structures.

2 The graphs in the booklet are necessarily arbitrary in terms of the wind loadings and allowance are not made for varying wind speeds, height above sea level and shielding factors depending on terrain category. It should be noted also that the design procedure and charts are most likely based on a permissible stress design code, while the current design code is based on a limit states method. Allowance is not made for example for the use of different grades of structural steel. These various factors can affect the design and economy of the structure significantly. For ultimate economy of design a rigorous purpose made design, where the above factors can be properly assessed can be recommended. The methodology of the design charts, and the range and limit of the structures which can be designed by using them still provide a very adequate standardised approach to structure design. For this reason the basic aspects covered by the booklet are repeated below. The various design details given in the booklet allow for designs to be carried out on blank copies of the drawings, on which the designer enters specific details relevant to the structure being designed. Some of these details, such as the signface dimensions come from outside the design procedure, whilst others are read from the various charts provided.

3 Charts are available for the design of portals and cantilever structures described in Subsection 15.8.5. The charts are based on the use of standard box steel sections.

4 The variables accommodated by the charts are:

(a) span;

(b) column height;

(c) area of signface (or sign length and position in the case of portal type structures);

(d) foundation size.

5 The following information for the fabrication of the structure is obtained from design charts SP-B-4-2, 4-4 or 4-6. (Examples in which the use of the charts is illustrated are reflected in Appendix B of the booklet):

(a) the section required;

(b) the minimum sign height required to prevent aerodynamic oscillation;

(c) the plate thickness and mass/lineal meter of the main beam and columns;

(d) the pre-camber to which the beam must be manufactured;

(e) the plate thickness and mass of the base plate and gusset plates;

(f) the diameter of the anchor bolts and mass of the anchor bolts groups;

(g) the minimum foundation width and height that could possibly be used, the maximum bearing pressure developed and the reinforcement required in the foundation slab and plinth of the actual foundation used.

15.8.5 Range and Limits of Standard Designs

1 The following ranges and limits are covered for portal type sign structures:

(a) spans varying between 16 m and 38 m to cover from a 2-lane to a 6-lane carriageway (where reduced horizontal clearances are applicable more lanes may be catered for);

(b) column heights varying between 6 m and 11 m to cover all conditions encountered where:

(i) height of sign face ≤ 3,6 m;

(ii) fill slope is 1:3 or flatter;

(iii) cut slope does not exceed 1:1;

(iv) super elevation = 6% when considered with the most adverse conditions defined above;

(c) signfaces located in any position on the structure within the following limits:

(i) height of the signface ≤ 3,6 m;

(ii) length of the signface ranges between 6 m minimum and a maximum equal to the length of the span less 4 m but not exceeding 22 m. (refer to Appendix B of the booklet for limits imposed by aerodynamic oscillation);

(d) three standard foundations with plinth heights varying between 0,8 m and 2,2 m on any one of the following foundation slabs:

(i) 6 m x 3,0 m x 0,8 m;

(ii) 6 m x 2,5 m x 0,8 m;

(iii) 6 m x 2,0 m x 0,8 m.

2 The following ranges and limits are covered for cantilever type sign structures:

(a) beam length varying between 5,67 m and 12,45 m;

(b) column height varying between 6 m and 9 m to cover all conditions encountered where:

(i) height of signface ≤ 3,6 m;

(ii) fill slope is 1:3 or flatter;

(iii) cut slope does not exceed 1:1;

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(iv) super elevation = 6% when considered with the most adverse conditions defined above.

(c) area of road signface varying between 6 m^2 and 32 m^2 with the end of the signface positioned > 0,35 m beyond the end of the beam;

(d) two standard foundations with plinth heights varying between 0,8 m and 2,2 m on any one of the following foundation slabs:

(i) 5 m x 3,0 m x 0,8 m;

(ii) 5 m x 2,5 m x 0,8 m.

15.8.6 Detail Drawings

1 General arrangement drawings and a set of detail drawings are available in the booklet for the two types of overhead sign structures.

2 On the general arrangement, attention is drawn to:

(a) the stage at which the site welds shall be executed i.e.:

(i) before erection for cantilever type structures and;

(ii) after the structure has been erected and finally aligned for portal type structures.

(b) the required corrosion protection with chlorinated rubber paint system.

15.8.7 Structural Steelwork

1 The columns and beams of the portal and cantilever structures are manufactured from flat sheet of standard plate thickness. The end plates vary in thickness in accordance with the design requirements while the side plates remain constant.

2 Standard box sections used are the following:

(a) portal structures:

(i) 400 mm x 400 mm Square Hollow Section-Plate Thickness 6 mm -20 mm;

(ii) 500 mm x 400 mm Rectangular Hollow Section - Plate Thickness 8 mm -25 mm

(iii) 600 mm x 400 mm Rectangular Hollow Section - Plate Thickness 10 mm -25 mm;

(b) cantilever structures:

(i) 500 mm x 500 mm Square Hollow Section - Plate Thickness 8 mm -20 mm;

(ii) 600 mm x 500 mm Rectangular Hollow Section - Plate Thickness 10 mm -30 mm.

15.8.8 Foundations

1 The foundations consisting of plinths and bases are designed to support the loads to which the structural frames may subjected, including collision loads. **The factors of safety for overturning of foundations are:**

(a) ≤ 2,0 when subjected to wind loads only;

(b) ≤ **1,5 when subjected to wind and collision loads.**

2 Design details in the booklet drawings and reinforcement schedules are available for a number of standard bases. The bases are:

(a) portal structures:

(i) 6 m x 3,0 m x 0,8 m;

(ii) 6 m x 2,5 m x 0,8 m;

(iii) 6 m x 2,0 m x 0,8 m.

(b) cantilever structures:

(i) 5 m x 3,0 m x 0,8 m;

(ii) 5 m x 2,5 m x 0,8 m.

3 These foundations are detailed to accommodate plinth heights varying from 0,8 m minimum to 2,2 m maximum

4 The stability of the structure, when subjected to the maximum load conditions is dependent on the backfill on top of the foundation. It is therefore recommended that, if any doubt exists as to the true profile of the road prism, a foundation height greater than that reflected along line X - X on the design graphs be used. To eliminate errors and confusion during construction it is recommended that as far as practical the foundations for portal type structures should be made identical in width and height.

5 In the event that the plinth heights vary with the same width of foundation specified for both foundations in portal type structures, separate detail drawings will have to be prepared for the foundations since no allowance has been made in the bending schedule in the booklet for this arrangement.

6 A bending schedule is given in each foundation plan and the diameters of 4 bars are required (from the design graphs) before the schedule can be completed).

7 In addition, in the booklet a table is provided where the specific levels, foundation heights and bearing pressures can be indicated without adding to/or altering the actual details (see paragraph 15.8.4.2).

15.8.9 Anchor Bolts

1 Details for three types of standard anchor bolts are available. Types A and B are used with portal structures and Type C with cantilever structures.

2 Grade 4.8 steel is specified for the anchor bolts and nuts in preference to a higher grade steel (i.e. grade 8.8 for example) for the following reasons:

(a) welding during manufacture and construction can be tolerated on grade 4.8 steel;

(b) the error is not as serious if an anchor bolt group of lower strength, (e.g. grade 4.6) is erroneously supplied and installed.

3 A template is specified to be locked in position with each anchor bolt group supplied resulting in the following advantages:

(a) it will ensure that the anchor bolt group is not misaligned during transportation to the site;

(b) it will ensure that the centres of the anchor bolt group match the centres of the holes in the base plate.

15.8.10 Road Signfaces

1 Structural details given on the drawings in the booklet are

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applicable only for signfaces having a height not exceeding 3,6 m. For details related to the signface symbols and legend reference is made to the relevant road drawings.

2 All aluminium sections and profiles used are standard profiles presently available from the manufacturers. Stainless steel bolts and washers with "nyloc" self-locking nuts are specified and no insulation need be provided where these bolts are in contact with the aluminium members.

3 Corrosive resistant brackets and bolts are used to secure the signface to the structure and in order to ensure proper alignment and securing of the signface an erection procedure is specified.

4 As in the case of other detail drawings in the booklet, a table is provided where the specific length and height of each separate signface can be indicated without adding to/or altering any figures.

TABLE 15.24 PORTAL TYPE SIGN GANTRIES TABLE 15.24

Subject		DoT Drawing Number
Clearances:		Drg. SP – B – 4 - 1
Design graphs:		
400 x 400 section	- structural steelwork	Drg. SP – B – 4 - 2
	- foundations	Drg. SP – B – 4 - 3
500 x 400 section	- structural steelwork	Drg. SP – B – 4 - 4
	- foundations	Drg. SP – B – 4 - 5
600 x 400 section	- structural steelwork	Drg. SP – B – 4 - 6
	- foundations	Drg. SP – B – 4 - 7
Examples of the use of design graphs		Drg. SP – B – 4 - 8
Detail Drawings:		
General Arrangement		Drg. SP – B – 4 - 9
Structural Steelwork		
400 x 400 section	- general details	Drg. SP – B – 4 – 10
	- sections and notes	Drg. SP – B – 4 – 11
500 x 400 section	- general details	Drg. SP – B – 4 – 12
	- sections and notes	Drg. SP – B – 4 – 13
600 x 400 section	- general details	Drg. SP – B – 4 – 14
	- sections and notes	Drg. SP – B – 4 – 15
Details of Anchor Bolts:		
Type “A” (400 x 400 section)		Drg. SP – B – 4 – 16
Type “B” (500 x 400 and 600 x 400 sections)		Drg. SP – B – 4 - 17
Details of Foundations:		
6 m x 3,0 m x 0,8 m		Drg. SP – B – 4 – 18
6 m x 2,5 m x 0,8 m		Drg. SP – B – 4 – 19
6 m x 2,0 m x 0,8 m		Drg. SP – B – 4 – 20
Detail of Road Signface (height ≤ 3600)		Drg. SP – B – 4 - 33

TABLE 15.25 CANTILEVER TYPE SIGN GANTRIES TABLE 15.25

Subject		DoT Drawing Number
Clearances:		Drg. SP – B – 4 – 21
Design graphs:		
500 x 500 section		Drg. SP – B – 4 – 22
600 x 500 section		Drg. SP – B – 4 – 23
Examples of the use of design graphs		Drg. SP – B – 4 - 24
Detail Drawings:		
General Arrangement		Drg. SP – B – 4 - 25
Structural Steelwork		
500 x 500 section	- general details	Drg. SP – B – 4 – 26
	- sections and notes	Drg. SP – B – 4 – 27
600 x 500 section	- general details	Drg. SP – B – 4 – 28
	- sections and notes	Drg. SP – B – 4 – 29
Details of Anchor Bolts:		
Type “C”		Drg. SP – B – 4 – 30
Details of Foundations:		
5 m x 3,0 m x 0,8 m		Drg. SP – B – 4 – 31
5 m x 2,5 m x 0,8 m		Drg. SP – B – 4 – 32
Detail of Road Signface (height ≤ 3600)		Drg. SP – B – 4 - 33

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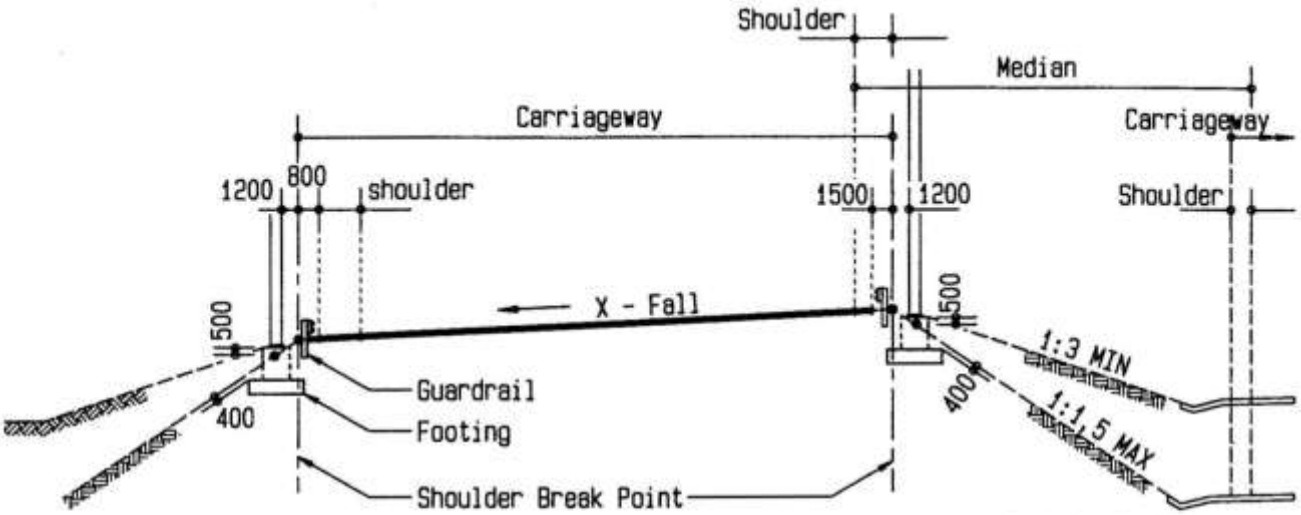
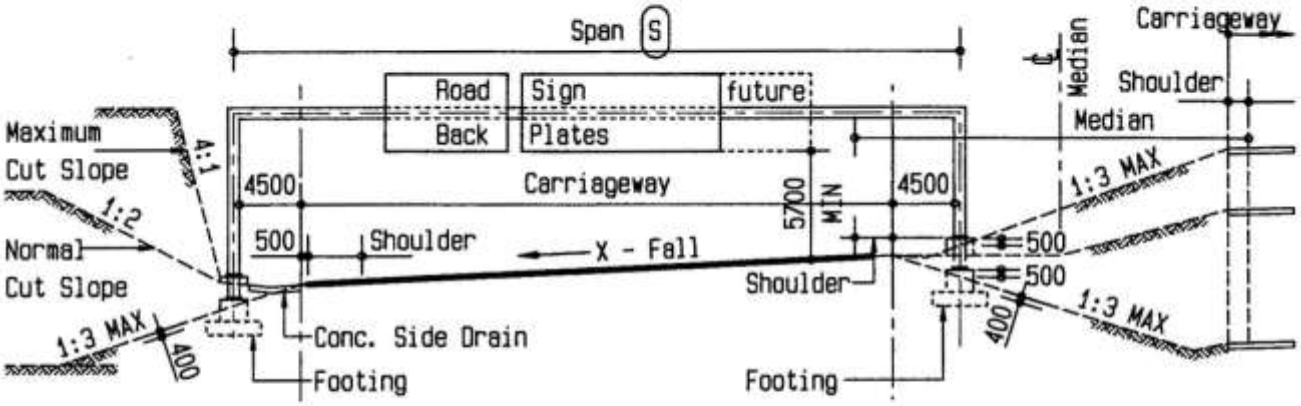


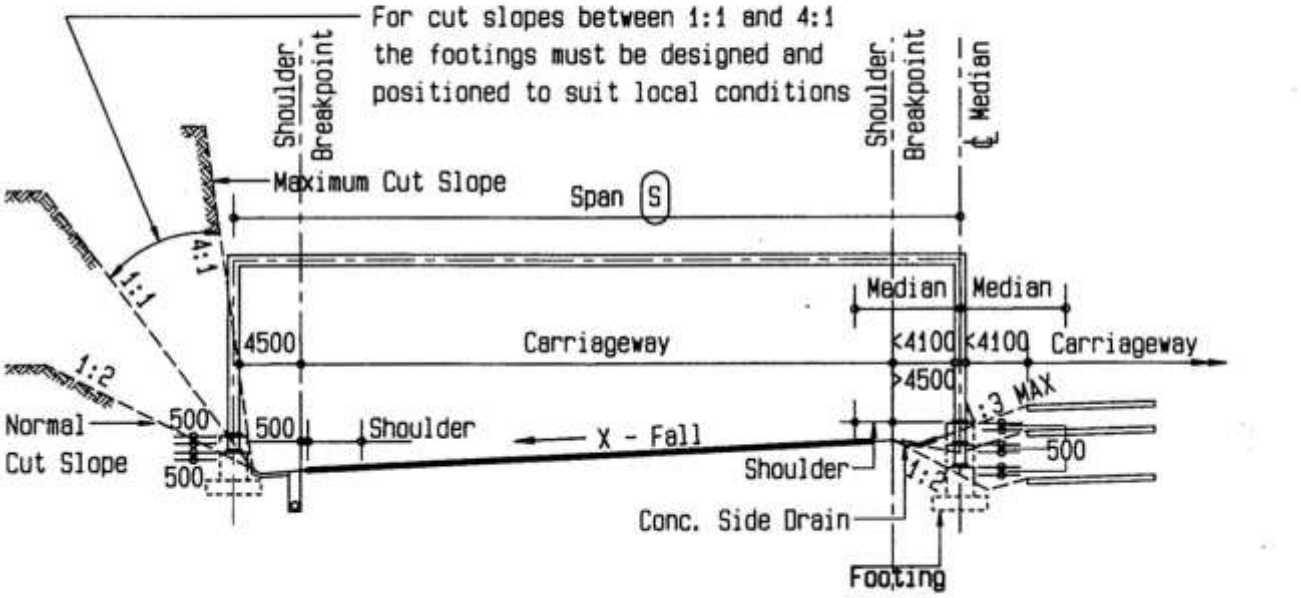
Detail 15.64.1
High Fill with Guardrail

Detail 15.64.2
Median With Guardrail



Detail 15.64.3
Outer Shoulder - No Guardrail

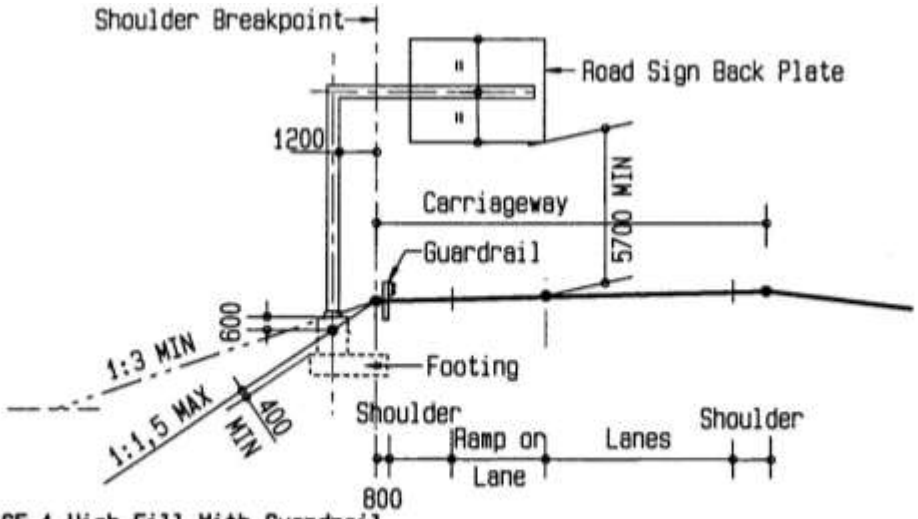
Detail 15.64.4
Wide Median - No Guardrail



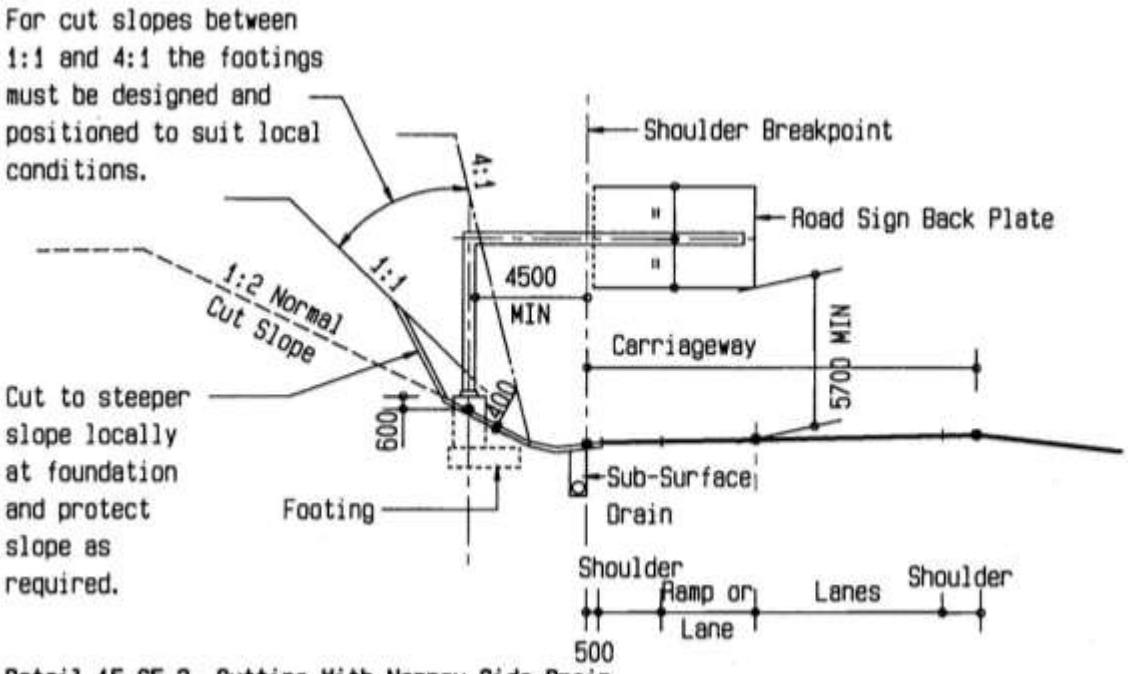
Detail 15.64.5
Cutting with Narrow Side Drain

Detail 15.64.6
Narrow Median - No Guardrail

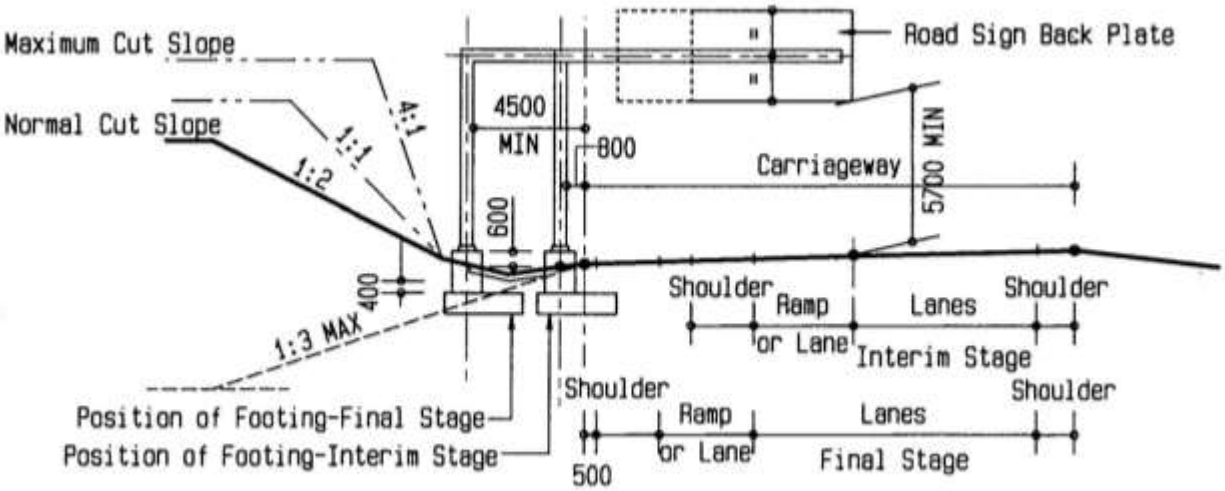
Fig 15.64 Overhead Portal Road Sign Structure Clearances



Detail 15.65.1 High Fill With Guardrail



Detail 15.65.2 Cutting With Narrow Side Drain



Detail 15.65.3 Normal Batter Slopes, Wide Side Drain and Allowance for Future Lane

Fig 15.65 Overhead Cantilever Road Sign Structure Clearances

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Chapter 5	R	Chapter 15	R
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CHAPTER 16:
ROAD SIGNS MANAGEMENT

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CHAPTER 16:
ROAD SIGNS MANAGEMENT

16.1 INTRODUCTION

16.1.1 General

1 The purpose of this chapter is to give guidance to road authorities on the development of a Road Signs Management System. By maintaining road signs and markings cost-effectively, it ensures the functionality of these traffic control devices and protects them as a valuable asset. It also ensures that the increasing delictual claims against road authorities as a result of unserviceable road signs and markings are kept to a minimum.

2 When referred to, road signs in this chapter generally include road markings, however, specific issues with respect to road markings are addressed separately (see Chapter 18).

16.1.2 Road Management Systems

1 Road Management Systems (RMS) are formalised procedures used to assist the authority in assessing the current and future needs for maintenance, rehabilitation, upgrading and geometric improvements of the road system under the authority's jurisdiction. Road management comprises a number of diverse activities and in order to undertake the planning, organisation and control of these functions, some road authorities have developed a number of management systems to deal with these activities individually. The management system also forms the technical base for budgeting and application for funding.

2 A Road Signs Management System (RSMS) can be defined as a subsystem of a RMS which ensures the availability of accurate information concerning road signs on the road network.

3 The importance of a RSMS in this context has been acknowledged by the majority of the metropolitan and provincial road authorities in South Africa.

16.1.3 *Status Quo* of Road Signs Management

1 The road authorities in South Africa can be divided into different levels related to the institutional responsibilities of the different governmental levels, name:

(a) the Department of Transport / South African National Roads Agency - national and strategic roads;

(b) Provincial Road Authorities - provincial roads (nine provinces);

(c) Metropolitan Councils;

(d) Local Authorities.

2 The ability of these authorities to adequately manage and maintain the thousands of road signs on the road network depends on a systematic approach to the establishment of a RSMS.

3 The cost-effectiveness of a RSMS can only be tested when the ratio between resources (input) and output of benefits of existing systems are compared with those of a proposed effective RSMS, i.e. the implementation of an effective RSMS will ensure improvement in cost-effectiveness, not only for road users, but also for maintenance activities related to road signs.

4 Such a system is necessary to avoid deficiencies in the **planning, design, implementation and maintenance** stages of each road sign.

5 Deficiencies during any of these stages can result in a reduction in safety for motorists and increased liability exposure for road authorities. The timeous detection of these deficiencies is therefore essential and requires a committed effort, i.e. manpower and resources, from road authorities to fulfil the activities related to the implementation of a RSMS.

16.1.4 Motivation for a Road Signs Management System (RSMS)

1 The collection of relevant data, through prescribed procedures and methods, by authorised personnel, and the storage, processing and communication of the resulting information to the responsible people, can be described as an Information System.

2 With regard to road signs, data needs to be captured in a sign inventory and processed by an operational system to form the operational system. This information can then be extracted for use in the management of the road sign system through effective procedures.

3 The development of a RSMS is founded on the fact that, when a road authority knows:

(a) **what** it has invested in its road sign system;

(b) **when** it did so;

(c) **where** such investments are located;

(d) **what** is the **present condition** and expected **future condition** of each sign on the road network; and

(e) **what** is the **cost of maintenance** or rehabilitation of the road sign system;

it can more efficiently and effectively manage current and future investments in the system.

4 Through an effective RSMS it will then be possible to determine whether the road sign system:

(a) is incomplete;

(b) conforms or does not conform to the existing requirements;

(c) should be replaced; and

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(d) performs according to acceptable norms.

5 In addition to the obvious advantages derived from the establishment of a RSMS, it is well known that road authorities at all levels are being affected by an upward trend in liability claims and insurance costs. The implementation of an effective RSMS will enable road authorities to act timeously in:

(a) identifying deficiencies in the road sign system;

(b) giving priority to corrective measures; and

(c) budgeting for and correcting the deficiencies.

16.1.5 Elements of a RSMS

1 Although the approach towards the development of a RSMS may differ for urban, provincial and national road networks, the elements and principles in applying such a system are the same. These elements are (see also Table 16.1):

(a) **Planning and Policy Formulation** which describes the necessary steps to firstly, establish a road signs system according to the standards and requirements in Volume 1, and secondly, to form a basis of information for the implementation of an effective RSMS - these steps are:

(i) definition of the road network within the boundaries of the road authority;

(ii) classification of roads on the network, i.e. the road hierarchy with respect to road signing;

(iii) classification of intersections according to intersecting road classes;

(iv) development of a route and guidance sign system for national, provincial and metropolitan road networks; this includes a route numbering system and the selection of destinations;

(v) the level of road sign information provision at different classes of intersections and on road links;

(vi) choice of road sign material to be applied on different classes of roads and intersections and in areas of different ambient lighting (refer to Volume 2, Chapter 17);

(vii) the standards of the substructure of road signs, i.e. footings, poles and framework (refer to Volume 2, Chapter 15);

(viii) installation guidelines for road signs;

(ix) the formulation of a policy which includes all the above mentioned aspects as they pertain to the appropriate road authority;

(b) **System Design** of road signs according to the requirements and guidelines provided in Volumes 1, and 2; this gives the layout of signs at intersections and the destination names in all directions as well as the type of road signs along road links; it normally consists of the diagrammatic layout of existing signs at an intersection on a road link and the proposed layout, should this differ;

(c) **Detail Design** of road signs, taking into account the actual conditions of the site where they will be erected (see Volume 4 for details of road sign signface detail design);

(d) **Implementation** of the road signs according to standard specifications and special conditions, normally handled as part of the Tender phase;

(e) the continuous **Maintenance and Rehabilitation** of road signs;

(f) **Schedule and Programme** for replacement of signs - cost control and budgeting from part of this element.

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TABLE 16.1 STEPS TO IMPLEMENT AN RSMS TABLE 16.1

Step	Description of Activities	Deliverable
STEP 1: Formulate road sign policy	• Network definition • Road classification • Route and Guide Sign System - route optimisation - route numbering - route description • Selection of orientation names • Tourism/Facility signs policy • Level of road sign provision (primary and secondary) • Choice of road sign materials • Substructure details • RTA/SADC-RTSM code numbers • Map, diagram or GIS • Letter types and sizes • Maintenance policy for road signs	A policy document that can be used as a manual to communicate policies from the management team through to the labourers in the field and back (vertical) and also to other departments and road authorities (horizontal). INPUT TO LIBRARY MODULE
STEP 2: System design of road signs	• Reference system for road signs • System information - existing signs (use information from step 4) • Application of policy guidelines • Site layouts, lane confirgurations and special conditions • Prepare system design systematically • Link system design to GIS if available	A system design document that describes the function, positioning, type and layout of road signs at each site along the road network. INPUT TO LIBRARY MODULE
STEP 3: Detail design of road signs	• Use policy guidelines and system design to prepare detail design of road signs • Link detail design through CAD to GIS if available Note: It is normally only necessary to prepare detail designs for guidance signs, as regulatory and warning signs can be described in detail by code numbers	A detailed design of all road signs on the road network - CAD drawings. INPUT TO INVENTORY MODULE
STEP 4: Inventory of road signs	• Capturing of data as described • Link to GIS database if available	INVENTORY MODULE
STEP 5: Maintaining of road sign performance and maintenance procedures	• Note: It is normally only necessary to prepare detail designs for guidance signs, as regulatory and warning signs can be described in detail by code numbers • Capturing of maintenance data through the maintenance procedures • Update information to inventory module • Link data to GIS database	MAINTENANCE / MONITORING MODULE
STEP 6: Management of road sign system	• Extract information from database and GIS • Enquiries through computerised system • Prepare reports as requested to support decision-making	EXECUTION MODULE

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16.2 IMPORTANCE OF ROAD SIGNS MANAGEMENT (RSM)

16.2.1 General

1 Road signs play an essential part in **regulating** traffic, **warning** traffic of hazardous situations ahead, and providing **guidance** and general **information**.

2 Management of this asset on the road system is of utmost importance, but perhaps it is most clearly emphasised in court decisions in the United States of America [(1)] in the late 1980's which made it clear that:

(a) failure to be aware that a traffic control device is defective will not protect the transportation agency from tort liability - unless the agency can show that it has an on-going programme to discover and correct ineffective devices - this task should be clearly stated in job descriptions;

(b) a detailed log should be kept for every traffic sign - this information is necessary for legal purposes and for planning replacements - the log will also be useful in determining which products and materials are most cost effective - a good record system will list the sign type, date of installation, type of support and maintenance or replacement activities.

The benefits in the field with regard to road traffic accidents are obvious. In the US Department of Transportation 1998 Annual Report on Highway Safety Improvement Programs [(4)], a report on the highway environment as it relates to safety, improvements in traffic signing are reported as having the highest benefit-cost (B/C) ratio of any type of highway safety improvement. From data received from 50 states, road signs achieved a top ranking with a B/C of 20,9 out of 20 different improvement types, as shown in Table 16.2.

3 If road signs are incorrect, or incorrectly placed, and cannot convey the proper message, the traffic rules cannot be enforced. The direct consequence could be an increase of traffic hazards and an increase in the number and severity of accidents.

4 An effective RSMS will improve the productivity in the fields of planning, design, implementation and maintenance operations of the personnel involved with these tasks. Maintenance teams, for example, can be supplied with full details of the maintenance task to enable them to execute the task with maximum efficiency.

5 In view of the afore-mentioned benefits, it becomes clear that the role of a RSMS within a RMS cannot be ignored, and every road manager should strive to capitalise on the proven advantages of a RSMS.

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TABLE 16.2 TOP 20 TYPES OF HIGHWAY SAFETY IMPROVEMENTS TABLE 16.2

Rank	Improvement Type	Benefit Cost Ratio
1	Trafic Signs	20.9
2	Illumination	10.3
3	Upgraded Guardrail	8.1
4	Upgraded Median Barrier	7.0
5	Upgraded Bridge Rail	6.5
6	Obstacle Removal	6.4
7	Bridge-Guardrail Transition	6.3
8	New Median Barrier	5.4
9	New Traffic Signals	5.1
10	Minor Structure Improvement	4.5
11	Impact Attenuators	4.0
12	Upgrade Traffic Signals	4.0
13	Pavement grooving	3.8
14	Sight Distance Improvements	3.6
15	Median Strip	3.3
16	Railway Crossing – New Gates	2.8
17	Channelisation	2.8
18	Shoulder Widening/Improvements	2.6
19	Railway Crossing – New Lights	2.2
20	Railway Crossing – New Lights and Gates	2.1

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16.3 MAINTENANCE

16.3.1 General

1 The efficient maintenance or rehabilitation of road signs is an important element of a RSMS which will not only ensure the continuous functionality of the road sign system, but will also contribute to the protection of this valuable asset of the road system.

2 Suitable maintenance policies and procedures need to be established by road authorities to ensure:

(a) safety of the road users;

(b) control and setting of priorities for maintenance activities;

(c) up to date information on the condition of road signs;

(d) an acceptable maintenance level of service for road signs.

3 The maintenance level of service (MLOS) for road signs set by road authorities depends on the importance/classification of a road section. The selected MLOS will directly affect the maintenance activities and decisions on where, when and how much maintenance is required and how available resources should be utilised.

4 The maintenance policy set by road authorities needs to be spelled out and forms part of the road signs policy document. Examples of policy statements in this regard are:

(a) minimum standards for the retroreflectivity, colour and luminance factor of signs;

(b) immediate replacement criteria for certain types of damaged signs, while others can be replaced as soon as practical or according to a maintenance programme;

(c) record keeping of accurate maintenance actions and costs;

(d) cleaning of and clearing around road signs;

(e) painting/maintenance of substructures to prevent rusting;

(f) handling of signs during transportation from factory to store to site;

(g) procedures to order, purchase and keep records of road signs;

(h) handling of complaints regarding road signs from road users.

5 A wide variety of documentation on the subject of how to maintain road signs is available locally and abroad, which can be used by road authorities to assist in formulating their maintenance policies for road signs.

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16.4 DEVELOPMENT OF A ROAD SIGNS MANAGEMENT SYSTEM

16.4.1 General

1 The function of a road signs information system which forms part of the RSMS is to provide information on each road sign on the total road network with regard to the different aspects of planning, implementation, monitoring, maintenance and replacement of road signs. This information can then be utilised to establish tendencies for different characteristics of road signs to enable managers of the system to take decisions for management actions. After identifying the proposed prerequisite elements of a RSMS in Section 16.1.5, this section concentrates on the step by step development of a proposed RSMS.

16.4.2 Typical Components of a RSMS

1 The following requirements for an information system have been identified to ensure efficiency of the system, namely:

(a) a dedicated team to manage the road sign system on the roads within the authority's boundary;

(b) a map of the area and classification of the road network (available on either hard copy or GIS);

(c) the position of each road sign indicated on the map or as per system design (diagrammatic layout per intersection or road link);

(d) an inventory of the characteristics, attributes and history of each road sign (computerised database); and

(e) description and layout of the road sign face (sketch, photograph or detailed drawing).

2 The information system should be supported by:

(a) prescribed procedures for the processing/updating of data;

(b) a computerised database of sign information (linked to a GIS if available);

(c) computer equipment (hardware) to process the data;

(d) computer software programs to assist in the running of the RSMS;

(e) the operational system.

3 The afore-mentioned components form part of a typical computerised RSMS which could be divided into the following modules for implementation purposes:

(a) Inventory module;

(b) Library module;

(c) Maintenance/Monitoring module;

(d) Execution module.

16.4.3 Inventory Module

1 This module consists of the database of relevant data for each sign and it has to be designed properly to ensure that:

(a) information can be easily captured, maintained and extracted;

(b) priorities/weights can be allocated to certain attributes of road signs and set criteria for the extraction and evaluation of information;

(c) the data is compatible with other management systems such as a maintenance cost system;

(d) alpha-numeric data can easily be connected to a geographic information system (GIS) - Table 16.3 shows the typical information that needs to be included in a road sign inventory database - a more detailed description of some of the above-mentioned information, to be captured into an inventory's database, is given in Section16.6.

2 The inventory module can be described as the core of the RSMS, as all the information needed to effectively manage a sign system is captured in this module, and road authorities need to maintain it to ensure a high level of road safety for motorists. To provide this information, road authorities need to take steps to maintain some form of road sign inventory, ranging from paper files, maps, drawings, photo files to photo loggers. Sophisticated systems, such as combinations of computerised databases, video digital photo capturing databases, or mobile vehicles equipped with computers to capture sign data whilst moving, are available.

3 To date most South African road authorities concentrate mainly on the manual capturing of data through as-built drawings, or data collection forms and a manual filing system of road sign information. This valuable information can easily be transported into a computerised system and some road authorities have already embarked on such a system.

4 The advantages of a computerised sign inventory are somewhat obvious, namely:

(a) it can easily be connected to existing manual systems and existing information forms in use;

(b) it is a fast and efficient method of data management;

(c) it can handle record-keeping for the large number of road signs on the road network;

(d) reports on maintenance, condition, inspections, costs, type and quantity of road signs can easily be extracted from the system.

5 Data capturing is normally one of the most costly stages of a project. Research, however, has shown that sophisticated methods of road sign data capturing through computerised systems for large road authorities are more cost effective than traditional manual methods.

16.4.4 Library Module

1 The typical data which needs to be captured in this module to support the operations of the RSMS can be summarised as follows:

(a) the base information of the road network, be it a map, diagram or GIS;

(b) the level of road sign provision at different classes of intersections prescribed in the policy;

(c) prescribed letter sizes and letter types for all types of road signs;

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TABLE 16.3 TYPICAL DATA STRUCTURE FOR A ROAD SIGN INVENTORY MODULE **TABLE 16.3**

Section	No	Description	Minimum Recommended Input
A. Position	1.	Reference system to allocate an identification number to each individual road sign	•
	2.	Urban and Metropolitan areas: Suburb, street name, between street A and street B, next to stand no. xx, etc.	•
	3.	Rural areas: Road number, chainage, distance	•
	4.	Route number	•
	5.	Direction of travel and direction of road sign face (N, S, W, E)	
	6.	Left or right side of road or at an intersection or on the median	
	7.	Does the road sign exist (is it planned or has it already been erected)?	•
	8.	Distance from centre line or exact position on the GIS	
	9.	Road function class (classification of road and intersection)	•
	10.	Description of environment (forest, coast line, wet, dry, etc.) through the GIS	
B. Characteristics	1.	RTA/SADC-RTSM code (code number allocated according to Volume 1)	•
	2.	Functional classification of road sign (linked to road class)	•
	3.	Sign face size (height, length, area)	•
	4.	Letter type and size	
	5.	Post (quality, size, profile, material)	
	6.	Sign board material (chromadek, wood, steel, other)	•
	7.	Signface material (background and script - class 1, 2 or 3)	•
	8.	Ground-mounted or overhead sign	•
	9.	More than one sign on one post	
	10.	Substructure and fastening details (fastening type)	
	11.	Legend of sign - message	•
C. Dates	1.	Manufactured	
	2.	Installed/Erected (motivation for erection)	•
	3.	Last maintained (actions taken and reason for maintenance)	•
	4.	Cancelled/Replaced (motivation)	•
	5.	Inspected (recorded information)	•
	6.	All dates and relevant information are captured in a history file	
D. Condition Evaluation	1.	Sign face natural weathering (SFNW) - scale 1-5	•
	2.	Sign face human damage (SFHD) - scale 1-5	•
	3.	Post natural weathering - scale 1-5	
	4.	Post human damage - scale 1-5	
	5.	Retroreflectivity measured by retroreflectometer or visually observed (sample measurement of color and luminance)	
	6.	Specific intensity per unit area (SIA) - Retroreflectivity available and required based on guidelines in Volume 2, Chapter 17	
E. General	1.	Sight distance of sign (horizontal or vertical curves)	
	2.	Complexity (urban, rural, industrial)	
	3.	Speed limit	
	4.	Lanes per direction of travel	
	5.	Flow - two-way or one-way	
	6.	Control - local authority, provincial authority, or contractor	•
	7.	CAD reference or photo ID	•
	8.	Comments - additional information (maximum 80 characters)	
	9.	Cost of different materials, manufacturing and erection of road signs	•
	10.	Maintenance cost (labour, material, equipment, transport)	•

(d) prescribed procedures to apply for the provision of a road sign (mostly applicable for tourism or local direction signs);

(e) code numbers of all types of signs as indicated in Volume 1, and a description thereof with respect to function, standard dimensions, cost parameters and materials description;

(f) guidelines set out in Volumes 1 and 4 or in the policy document of the road authority;

(g) description of numbered routes along the streets (street names) and roads (road numbers) on the road network.

16.4.5 Maintenance/Monitoring Module

1 The information in the maintenance or monitoring module consists of the updated actions and costs in relation to the day to day erection, maintenance and inspection of road signs. This information is normally extracted from job cards, work orders or inspection forms by maintenance teams as described in Section 16.7 as an example.

2 The important components of this module are:

(a) updating of information after erection, inspection or maintenance has been executed;

(b) preparation of tasks on job cards;

(c) dealing with complaints and capturing data related to road signs.

(d) inspection frequency;

(e) reason for maintenance (accidents, fire, vandalism, etc.);

(f) cost of maintenance per activity (labour, material, transport);

(g) details of claims where road signs are involved;

(h) set maintenance criteria linked to maintenance priorities, for example:

(i) If Sign Face Natural Weathering (SFNW) + Sign Face Human Damage (SFHD) is rated 2 - No maintenance;

(ii) If (SFNW) + (SFHD) is rated 5 - Urgent maintenance;

(iii) Criteria can also be set for other attributes such as minimum retroreflection levels of road sign material.

(i) after maintenance criteria have been established it is possible to list maintenance priorities according to the importance of the road (road class) or functional class of road signs;

NOTE:SFNW and SFHD are visual judgements of the condition of the sign, say on a 5 point scale where 1 means excellent condition and 5 means totally unacceptable, i.e. the road sign must be replaced immediately - see Section 16.6 for more details;

(j) maintenance action codes are selected to assist in the maintenance updating procedures and to link maintenance actions to a costing system;

(k) the cost of labour, materials, equipment and transport needs to be captured for every work order.

3 The maintenance of road signs normally forms part of a specific department at road authorities and in many cases the maintenance of road signs is only one aspect of road maintenance procedures. Section 16.7 summarises the proposed procedures related to the maintenance of road signs for road authorities.

16.4.6 Execution Module

1 The execution module serves as the management tool of the RSMS and consists mainly of reports and extraction of information in a prescribed or selected format. The process is indicated schematically in Figure 16-1.

2 The extraction of management information of road signs will vary from basic enquiries to more sophisticated enquiries as indicated in Figure 16-2. This information will enable road authorities to respond to, for example, the following questions:

(a) How many of what type of road signs are where?

(b) What is the condition of road signs?

(c) What are the rehabilitation or replacement costs of road signs?

(d) What are the budget requirements for the next five years with respect to road signs on certain routes? (This should be attended to more effectively in order to provide sufficient funds timeously.)

(e) What are the rates of deterioration of different road sign materials?

3 A computerised database and GIS will make the aforementioned extractions and updating of information very easy. Such computerised databases have been developed locally and abroad and can also be bought "off the shelf". Examples of extractions from such a database are shown in Figures 16.3 to 16.5 and in Table 16.4.

16.4.7 Personnel and Equipment Requirements

1 The personnel and equipment requirements to implement and operate a RSMS depends on the size of road network and density and distribution of road signs on the authority's road network.

2 The largest cities in South Africa may need to have dedicated Road Traffic Sign Teams who will handle all road signs and markings work. Smaller cities and larger towns could divide their areas into wards or suburbs, and personnel from the Town Engineer's Department could then fulfil these tasks as part of other maintenance duties.

3 Rural and national road authorities can spread these tasks amongst their regional or district offices to form part of an overall maintenance effort of a RMS.

4 Personnel and equipment requirements can be met using existing resources. By clearly defining procedures and ensure computerisation, road authorities can efficiently implement a RSMS.

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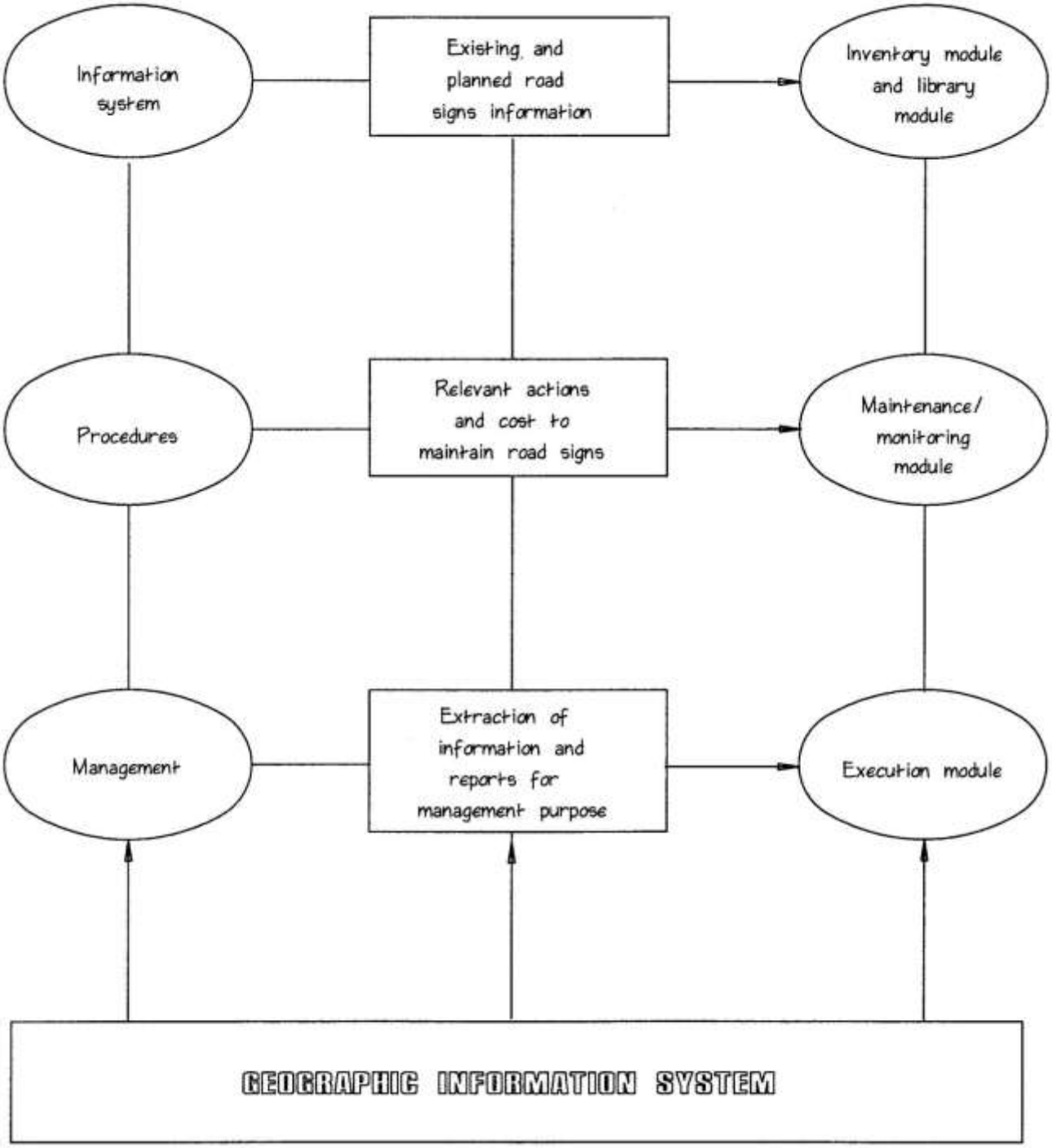

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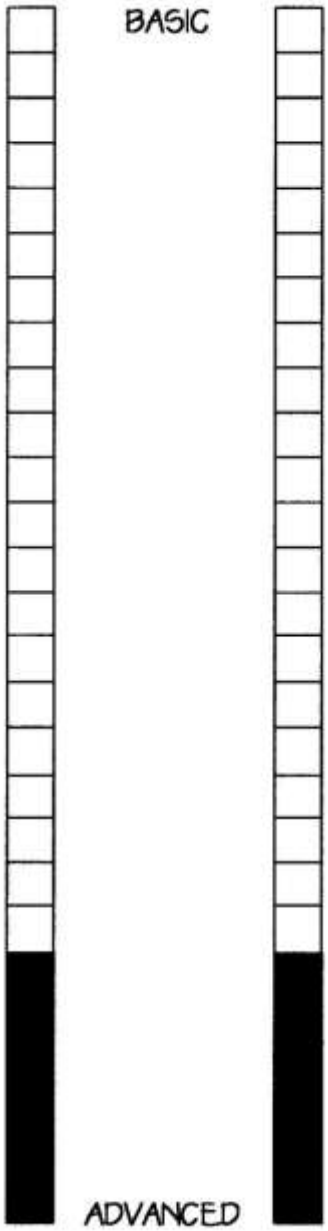
Fig 16.1 **Process of Executing an RSMS**



- Position of a road sign (GIS)
- Type of signs
- Materials used to manufacture a sign
- Dimension of signs
- Sketch or drawing of sign
- Condition of sign
- History of sign (maintenance, inspection)
- Dates of manufacture, erection, maintenance, etc.
- Reason for rehabilitation or maintenance
- Cost of maintenance or replacement
- Retroreflectivity of signs
-
-
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-
- Average life of different sheeting
- Influence of orientation on the life of a road sign
- Tendencies related to reasons for sign damages
- Implementation cost for different levels of signage
- Cost savings after implementation of a RSMS
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Fig 16.2 Hierarchy of Management Enquiries on Road Signs Through an RSMS

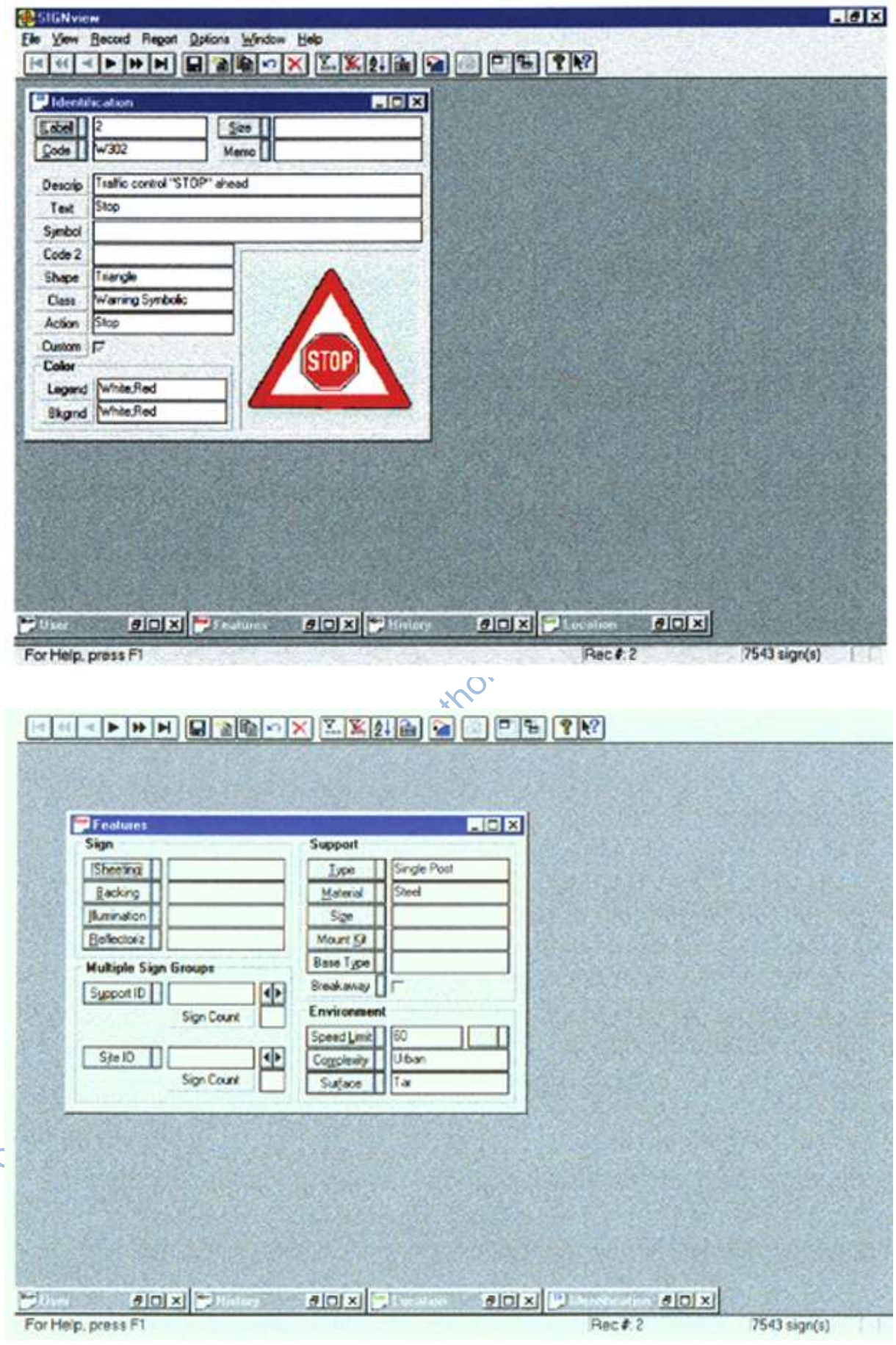
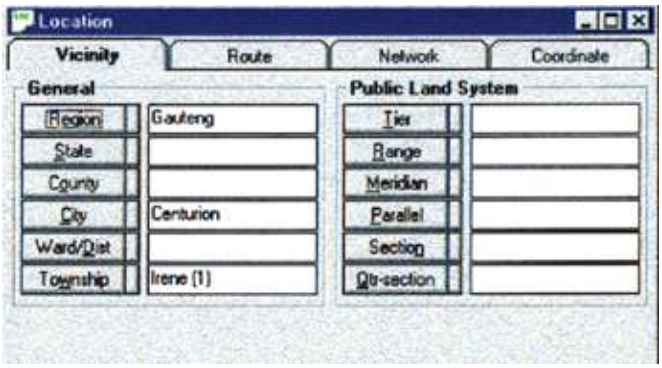
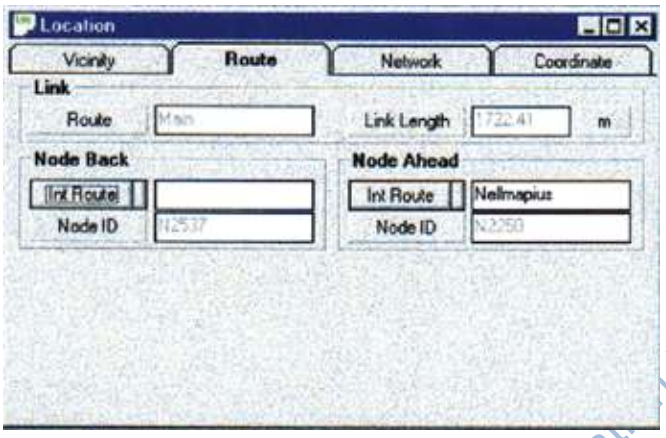
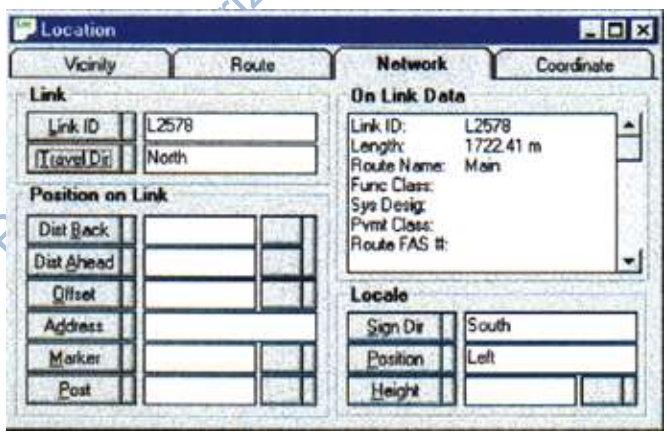


Fig 16.3 Examples of Typical RSMS Data Entry Screens - 1







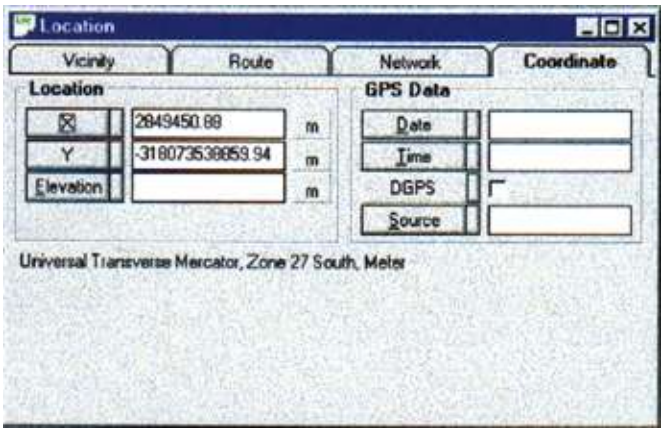


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Fig 16.4 **Examples of Typical RSMS Data Entry Screens – 2**
Sign Location Data Entry Fields

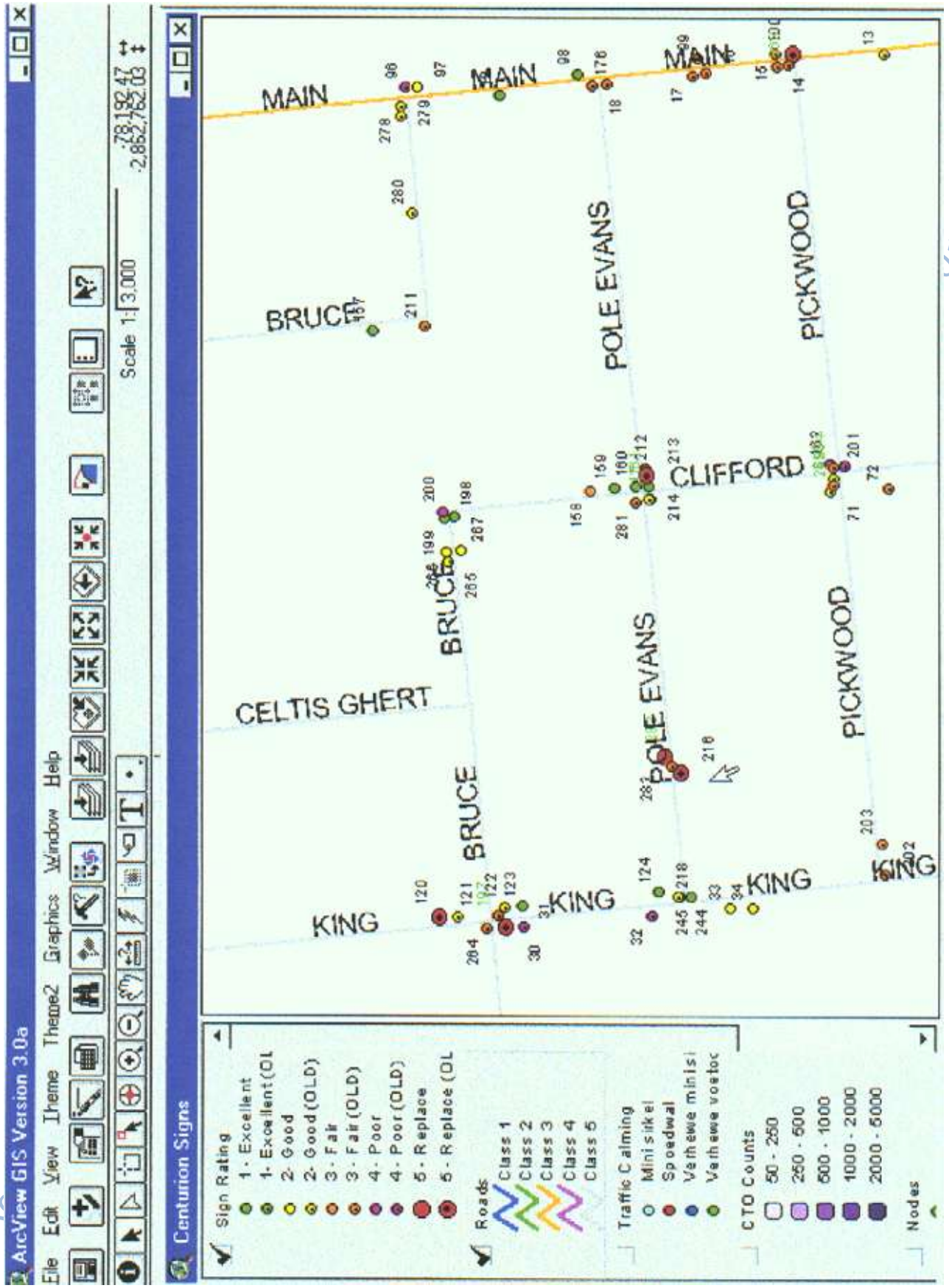

Fig 16.5 **Typical GIS Representation of RSMS Sign Rating Status**

TABLE 16.4 EXAMPLE OF RSMS SIGN REPLACEMENT PRINTOUT TABLE 16.4

Road Signs to be Replaced – 06/29/97

Label	Code	Sign Rating	Link ID	Route Name	Township	Position	Sign Direction
282	W402	5 - Replace	L2289	Pole Evans	Irene (1)	Road Surface	West
30	R1	5 - Replace (OLD)	L2479	King	Irene (1)	Left	South
303	W107	5 - Replace (OLD)	L2299	Nellmapius	Irene (1)	Left	West
262	R1	5 - Replace (OLD)	L2312	Verbena	Irene (1)	Left	West
216	W401	5 - Replace (OLD)	L2289	Pole Evans	Irene (1)	Road Surface	East
213	R210	5 - Replace (OLD)	L2289	Pole Evans	Irene (1)	Left	East
173	W406	5 - Replace (OLD)	L2581	Main	Irene (1)	Left Parallel	East
120	TW305	5 - Replace (OLD)	L2481	King	Irene (1)	Left	North
119	R1	5 - Replace (OLD)	L2542	King	Irene (1)	Left	North
106	R217	5 - Replace (OLD)	L2581	Main	Irene (1)	Left	North
102	R217	5 - Replace (OLD)	L2582	Main	Irene (1)	Left	North
100	R217	5 - Replace (OLD)	L2583	Main	Irene (1)	Left	North
101	W301	5 - Replace (OLD)	L2583	Main	Irene (1)	Left	North
134	R1	5 - Replace (OLD)	L2512	Krige	Irene (1)	Left	North
337	R1	5 - Replace (OLD)	L1179	Ewald	Celtisdal	Left	West
336	R2	5 - Replace (OLD)	L1179	Ewald	Celtisdal	Left	North
529	R1	5 - Replace (OLD)	L1126	Lenchen	Clubview	Left	West
423	W405	5 - Replace (OLD)	L1123	Hendrik Verwoerd	Clubview	Left	North
487	IN4	5 - Replace (OLD)	L1146	Kilkenny	Clubview	Left	West
488	R201	5 - Replace (OLD)	L1136	R28-WEST	Clubview	Left	West
489	R1	5 - Replace (OLD)	L1147	Limerick	Clubview	Left	West
528	R3	5 - Replace (OLD)	L1126	Lenchen	Clubview	Left	West
418	W406	5 - Replace (OLD)	L1121	Hendrik Verwoerd	Clubview	Right	North
408	R4_3	5 - Replace (OLD)	L1136	R28-WEST	Clubview	Right Parallel	North
525	R201	5 - Replace (OLD)	L1162	Die Uitsig	Clubview	Left	West
419	W405	5 - Replace (OLD)	L1121	Hendrik Verwoerd	Clubview	Left	North
406	R3	5 - Replace (OLD)	L1136	R28-WEST	Clubview	Right Parallel	North
397	R4_3	5 - Replace (OLD)	L1109	Jean	Clubview	Left	North
394	R1	5 - Replace (OLD)	L1130	M1-NORTH	Clubview	Left	North
392	W405	5 - Replace (OLD)	L1107	Von Willlich	Clubview	Left	North
391	W405	5 - Replace (OLD)	L1107	Von Willlich	Clubview	Left	North
365	R2	5 - Replace (OLD)	L1116	Aspen	Clubview	Left	South
349	R530	5 - Replace (OLD)	L1107	Von Willlich	Clubview	Left	South
348	W311	5 - Replace (OLD)	L1107	Von Willlich	Clubview	Left	South
340	R216	5 - Replace (OLD)	L1101	M1-SOUTH	Clubview	Cul de Sac	South
407	R3	5 - Replace (OLD)	L1136	R28-WEST	Clubview	Left	North
574	R1	5 - Replace (OLD)	L1199	Jan Kemp	Bronberri	Left	West
581	R1	5 - Replace (OLD)	L1202	Suikerbekkie	Bronberri	Left	West
557	R208	5 - Replace (OLD)	L1190	Jacobus	Bronberri	Left	East
535	R1	5 - Replace (OLD)	L1188	N1-SOUTH	Bronberri	Left	South
583	R208	5 - Replace (OLD)	L1204	Suikerbekkie	Cranbroo	Left	South
Etc.							

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16.5 IMPLEMENTATION OF AN RSMS

16.5.1 General

1 The implementation of a comprehensive RSMS will, to a great extent, depend on the motivation of the road signs managers and their teams to cost-effectively maintain and operate the system.

2 The data capturing and evaluation of road signs information is a task that has to be undertaken on a continuous basis. This task can be started by firstly including new signs that are erected or existing signs that require maintenance until the complete system has been covered.

3 The expected average life-span of signs varies between five and ten years. It is therefore clear that the RSMS has to be operational for at least five years before the complete benefits can be obtained from the system. However, it can be expected that the effective implementation of maintenance procedures will have an immediate positive effect on the system.

4 The estimated cost to implement a RSMS will differ from one road authority to another but it was calculated that for the metropolitan areas the cost of implementation over a five-year period varies between 5% and 10% of the budget for maintenance/replacement of road signs. The initial cost will be relatively high but the benefits in the long-run will be worthwhile and the system could save maintenance cost, but are also cost-related to road safety and legal claims.

5 Road signs are implemented according to the new SARTSM and the implementation of a RSMS will ensure continuity of the road signs system and should be promoted as such amongst all road authorities in South Africa.

16.5.2 Bibliography for Road Sign Management Systems

1 The following references are recommended as a reading list for those wishing more detail on the development of Road Sign Management Systems (RSMS):

1. U.S. Department of Transportation: Federal Highway Administration, Sign Management System, October 1990.
2. U.S. Department of Transportation: Federal Highway Administration, Guide to Safety Features for Local Roads and Streets, 1991.
3. U.S. Department of Transportation, The 1988 Annual Report on Highway Safety Improvement Programs, Report of the Secretary of Transportation to the United States Congress, Report No. FWHA - SA-88-003.
4. South African Roads Board; Research and Development Advisory Committee, Guidelines for the Development and Implementation of a Traffic Signs and Markings Management System, Project Report PR 88/004/3, March 1991.
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8. Barton-Aschman Associates Inc., Traffic Control Device Inventory, City of Pasadena, January 1984.
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10. Sator, W.H.J., Durability of Road Signs: Field Survey, CSIR Roads and Transport Technology, Research Report DPVT 78, 1989.
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12. Freeway Guide Sign: Replacement: Policies and Criteria, FWHA Transportation Research Board, National Research Council Report 155, April 1991.

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16.6 A DETAILED DESCRIPTION OF A TYPICAL DATA STRUCTURE FOR A ROAD SIGN INVENTORY MODULE

16.6.1 General

1 The description of data items to be included in the proposed data structure of the Road Signs Inventory Module of the RSMS, is given in more detail in this appendix. Refer to Table 16.3 for a summary of these data items.

16.6.2 Position

1 Data is linked to a specific position of the road sign, firstly to road sign data and secondly to road link data. The ID number of a road sign is therefore linked to its position and to the link number. The following are examples of a reference system to allocate ID numbers:

(a) Urban areas:

Grid system
- Block number in grid;
- Intersection number in block or link/node number;
- Link number at intersection;
- Road sign number on link.

(b) Rural areas:

Road number and chainage along road from starting point; a link will then be described between two points (normally intersections) on the chainage along the road.

2 Other data items in Section A of Table 16.3 are self-explanatory.

16.6.3 Characteristics

1 The RTA/SADC-RTSM code for a road sign explains its exact function. The functional classification of the road sign is, however, linked to the road classification indicated in Section A of Table 16.3 and is important for prioritisation of management actions. This functional classification can indicate the importance of the road sign for example, with regard to:

(a) the classification of the road on which the sign is located, i.e. road hierarchy;

(b) traffic volumes and lanes;

(c) the cost of the specific sign.

2 The maintenance priorities set in the maintenance module, for instance, depend on the functional classification of the road signs.

3 The different types of sign face materials can generally be classified as class 1, 2, 3. Cognisance needs to be taken of the characteristics of each class, and the cost and guarantee given by suppliers, before decisions are made on what type of material should be used. See Chapter 17 for a proposed selection criteria for sign materials.

4 The other items in Section B of Table 16.3 are self-explanatory.

16.6.4 Dates

1 The capturing of dates into the database is important to establish a record of events within the life-span of a road sign, giving the reason for erection and the reason for cancellation. This information will help to determine the performance of the road signs with respect to aging, effect on orientation, inspection frequency, rate of vandalism, etc.

16.6.5 Condition Evaluation

1 Condition evaluation can be conducted in various ways. A method used by road authorities to ensure consistent evaluations is to prepare photographs displaying different conditions that relate to the evaluation process. This is then linked to a detailed description or drawing. A scale that can be used for the condition evaluation of road signs can be described as follows.

2 The sign face natural weathering (SFNW) and sign face human damage (SFHD) can be visually evaluated on a five point scale namely:

(a) 1 - Excellent condition; new;

(b) 2 - Good condition; few signs of aging;

(c) 3 - Fair condition; shows some sign of deterioration but will be serviceable for more than three years;

(d) 4 - Poor condition; should be replaced within one to two year period; and

(e) 5 - Replace road sign immediately as it is unserviceable.

The same evaluation can be done for sign posts.

3 Research was done on the durability of road signs in South Africa [(2)] and the following are the main problems related to durability:

(a) the discolouration of the sign face;

(b) the reduction of the retroreflective value of the sign face;

(c) corrosion of the sign backing board, stiffening structures and fixing bolts.

4 The high ultra-violet content of sun rays in South Africa is responsible for (a) and (b) related to durability, whilst poor specifications are the main reason for corrosion (c).

5 Minimum standards for retroreflective values are given in Volume 2, Chapter 17. The deterioration rate of retroreflectivity values on road signs during their life-span and the influencing factors contributing to the rate of deterioration should be built into the models to allow the prediction of the condition of road signs in advance.

16.6.6 Other

1 The items under Section E of Table 16.3 are self-explanatory and provide useful information for a comprehensive database.

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16.7 TYPICAL PROCEDURES FOR THE MAINTENANCE AND MONITORING OF ROAD SIGNS

16.7.1 General

1 The procedures involved in the maintenance and/or monitoring module of a RSMS are important for the following reasons:

(a) improved productivity of maintenance teams;

(b) better control of resources;

(c) objective performance measurement is possible;

(d) better control of maintenance budgets and exact cost allocation for jobs.

These procedures should be implemented by means of computerisation of a RSMS.

2 The procedures are normally fulfilled at one of two levels of detail, namely:

(a) Level 1 (see Figure 16.6):

A comprehensive set of procedures, where all maintenance, rehabilitation and inspection activities with respect to every road sign on the network, is linked to the allocation and availability of personnel, materials, equipment and transport; this level is also linked to a costing system for labour costs, machine costs, material costs and transport costs; this procedure is based on a pre-planning process of tasks on job cards;

(b) Level 2:

The afore-mentioned procedures are normally executed on a less comprehensive scale by maintenance teams - road signs maintenance is only one of their various maintenance duties and is often neglected - rehabilitation and maintenance on road signs is normally done after routine inspections and urgent requests - a few important aspects of signs are recorded on forms as input to a database.

3 Different types of forms can be used by the system to capture or transfer maintenance/monitoring information. These forms are not discussed in detail as each road authority will have its own design and form layout. However, some typical examples are:

(a) defect report or list;

(b) inspection form or list;

(c) job card for internal team;

(d) job card for contractor.

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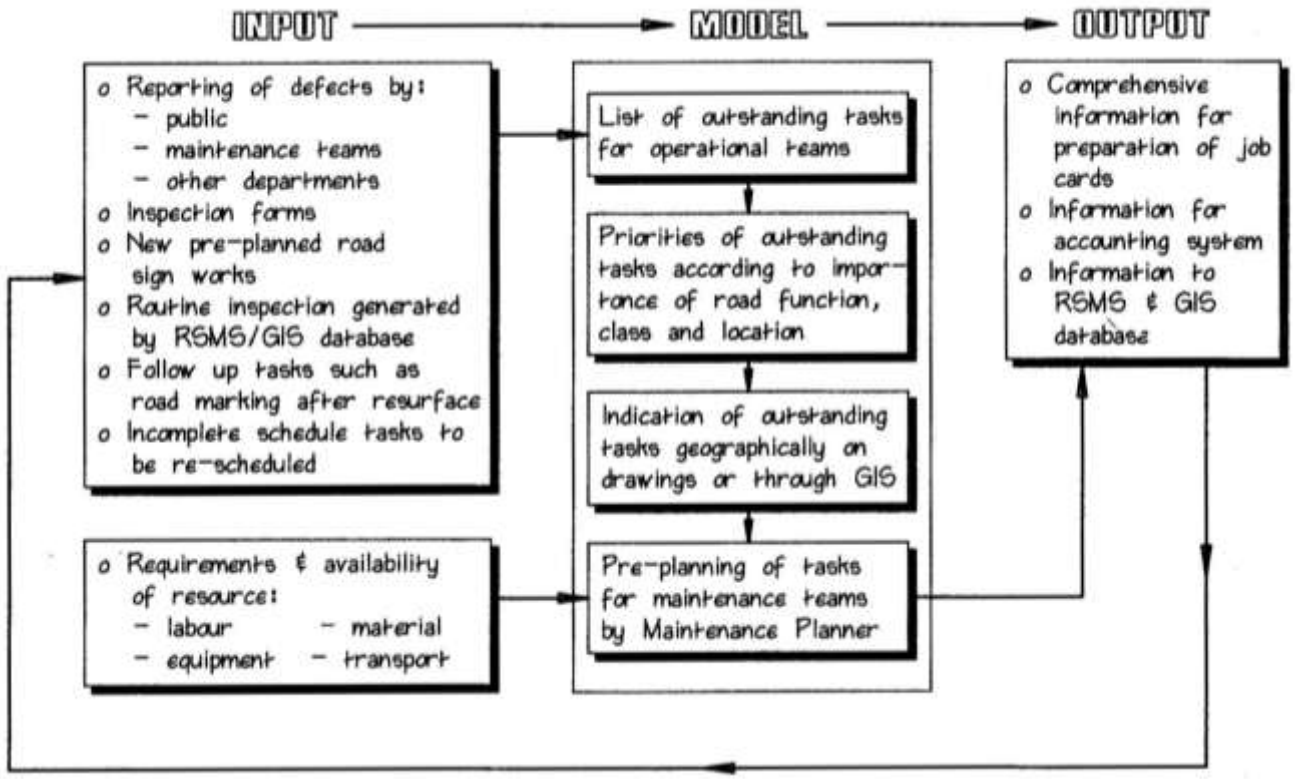

Fig 16.6 Maintenance Procedure Model

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SIGNFACE MATERIALS

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CHAPTER 17

TITLE

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Department of Transport
Infrastructure Network Management
Private Bag X193
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KEYWORDS

ROAD SIGN, ROAD MARKING, REGULATORY, WARNING

COST: VOLUME 2

VOLUME SET	R		
Chapter 1	R	Chapter 11	R
Chapter 2	R	Chapter 12	R
Chapter 3	R	Chapter 13	R
Chapter 4	R	Chapter 14	R
Chapter 5	R	Chapter 15	R
Chapter 6	R	Chapter 16	R
Chapter 7	R	Chapter 17	R
Chapter 8	R	Chapter 18	R
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CHAPTER 17:
SIGNFACE MATERIALS

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CHAPTER 17:
SIGNFACE MATERIALS

17.1 INTRODUCTION

17.1.1 General

1 Traffic signs are an essential component of streets and roads. They help motorists find their way in a safe manner by providing for the orderly and predictable movement of traffic. For signs to accomplish their needed purpose, they must be visible to the motorists. Although sign visibility is generally not a problem during daylight, signs with inadequate retroreflectivity may not be sufficiently visible at night and can contribute to accidents.

2 Road signs also have to be conspicuous and legible from a reasonable distance. To ensure good conspicuity and legibility there has to be a high colour and luminance contrast between, firstly, the sign and the background that it is viewed against (external contrast) and secondly, the sign legend or symbol and the background of the signface (internal contrast). To maintain a high colour and luminance contrast at night, signs have to be partly or fully reflective. New signs normally comply to these requirements but as time passes, colours and retroreflectivity deteriorate. This deterioration is not constant but is influenced by factors such as ultra-violet radiation, temperature, humidity and material characteristics.

3 While visibility can be accomplished through external illumination of the signs, retroreflection is the most commonly used means of making signs visible to the driver at night. Retroreflection is where light is reflected back towards its source. In the case of retroreflection from road signs, the source of light is commonly the headlights of vehicles during night-time.

4 Those responsible for designing, constructing and maintaining roads need to be familiar with the many aspects of sign retroreflection, of which some are:

(a) the types, specifications and properties of retroreflective materials for signs;

(b) retroreflective sheeting application guidelines;

(c) sign fabrication;

(d) handling, stockpiling and installation of retroreflective signs.

5 Better understanding of these aspects can ensure that motorists will be provided with adequate visibility of roadway signs for safe navigation. The purpose of this chapter is to explain relevant principles of sign retroreflection and to:

(a) give guidance on the selection of retroreflective sheeting for new signs;

(b) discuss the minimum retroreflective values and colour limits for replacement purposes;

(c) recommend retroreflective values for different road signs used in different circumstances.

It is intended to aid those who apply the specifications found in SANS 1519-1 and SANS 159-2.

6 Certain of the good practices and detailed information related to signing are not discussed in this chapter. Therefore, readers should be familiar with the key publications listed in Section 17.10.

7 This chapter concentrates on **materials for vertical road signs** whilst Volume 2, Chapter 18 deals with materials for horizontal road sign material

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17.10.1 General

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17.11 RETROREFLECTION - LITERATURE REVIEW

17.11.1 General

1 The following three topics are focused on in this review of literature:

(a) principles of retroreflection and retroreflective sheeting materials;

(b) specifications for retroreflective sheeting materials;

(c) sign luminance requirements, feasibility of performance standards and sign maintenance practices.

17.11.2 Principles of Retroreflection

1 Nearly all road signs have to be legible and colour distinguishable at night as well as during the day. While this can be accomplished through external illumination of the signs, retroreflection is the most commonly used means of making signs visible to the driver at night. Three reports, "Retroreflectivity of Roadway Signs for Adequate Visibility: A Guide" (8), "Maintenance Management of Street and Highway Signs" (3) and "Guide to the Properties and Users of Retroreflectors at Night" (9) are the primary sources of the background information (see Section 17.10).

2 Retroreflection occurs when light rays strike a surface and are reflected back to the sources of light. Two principles followed to achieve retroreflectivity for road signs are prismatic and spherical lens retroreflection. Prismatic, also known as cube-corner, retroreflection is achieved through total internal reflection. As shown in Detail 17.1.1, incoming light hits the first surface and reflects to the rear surface, which reflects it to the last surface, which then reflects the light rays back to the source. Typically, the prismatic device reflects light off these surfaces at 90 degrees to each other, i.e. the corner of the cube. In the second type, spherical lens retroreflection is achieved through a combination of a glass sphere (bead) and a reflecting (mirror type) surface placed at the focal point. As shown in Detail 17.1.2 an incoming ray is bent and directed inside towards the back of the sphere, reflecting off the reflective surface, and after being bent at the exterior of the sphere.

17.11.3 Types of Retroreflective Sheeting

1 Retroreflective sheeting consists of micro cube-corners or spheres enclosed in a weather resistant transparent plastic film. To reflect colour, pigment or dye is inserted into the film or onto the reflecting surface. Figure 17.4 shows a typical construction of cube-corner retroreflective sheeting. This type of sheeting is typically manufactured with an air cushion behind the cubes. A unique property of this sheeting is its high co-efficient or retroreflection at low entrance angles, which means it appears bright at long distance if the device is not too far laterally removed from the light source.

2 There are three types of spherical lens (bead) retroreflective sheeting:

(a) exposed glass bead;

(b) enclosed glass bead;

(c) encapsulated glass bead.

These are shown in Detail 17.4.2.

3 In the exposed lens sheeting the front half of the glass beads are exposed to the outside air. Glass beads work best when exposed to the air. However, because of the small size of the beads, a film of water can cover the beads when it rains and can greatly reduce the retroreflectivity of the beads. Hence, this type of sheeting is not recommended for road signs, and generally is not included in specifications. Nonetheless, exposed lens sheeting is still found on road signs on some low-volume rural roads controlled by local jurisdictions.

4 Enclosed lens sheeting material consists of a layer of transparent plastic of appropriate colour in which glass beads are imbedded. A metallic reflection shield is provided behind the plastic, with a layer of adhesive at the rear, which is covered by a protective liner that is removed during sign manufacture. The plastic covering enables the sheeting to be equally bright under dry and wet weather conditions.

5 With encapsulated lens sheeting the glass beads are also protected by a transparent material that is supported slightly above the beads by walls creating an air filled compartment. The back of the beads are covered with a reflective surface. The resulting airspace in front of the beads makes this type of sheeting more highly retroreflective, and is hence known as high performance sheeting.

17.11.4 Properties of Retroreflective Sheeting

1 One of the most important properties of retroreflective sheeting is the ability to return light which is commonly described by a variety of terms including brightness, retroreflectivity, luminance or candlepower. The International Commission of Illumination (SIE) (6) uses the term co-efficient of luminous intensity, which is defined as the ratio of luminous intensity of reflector in the direction of the observation to the illumination at the retroreflector on a plane perpendicular to the light. In the International System of Units (SI), i.e. the metric system, it is expressed as candelas (cd) per lux (lx). It is a measure of efficiency of the retroreflector, because it describes the amount of luminance (candelas) that emerge from the retroreflector per amount of light (lux) entering from the light source, i.e. the vehicle headlights. This definition treats the retroreflector as a point source. But because signs have a relatively large area they are treated as an extended light source which may be thought of as consisting of many point sources each with a luminance intensity of one candela. To account for this term, co-efficient (R) of retroreflection has been adopted by the CIE. It is merely the co-efficient of luminous intensity divided by the area and expressed in SI units as candelas per lux per square metre. (The English equivalency is candelas per foot-candle per square foot and is described as specific intensity per nit are (SIA). The conversion from English to metric (SI) is unity; hence, a value expressed in SIA terms is the same value in R terms).

2 The retroreflectivity of sheeting material is described in the context of another important property, namely angularity. Angularity is defined by the entrance (of the light) and the observation (of the motorist) angles. The entrance angle is the angle formed between a light beam striking the surface of a

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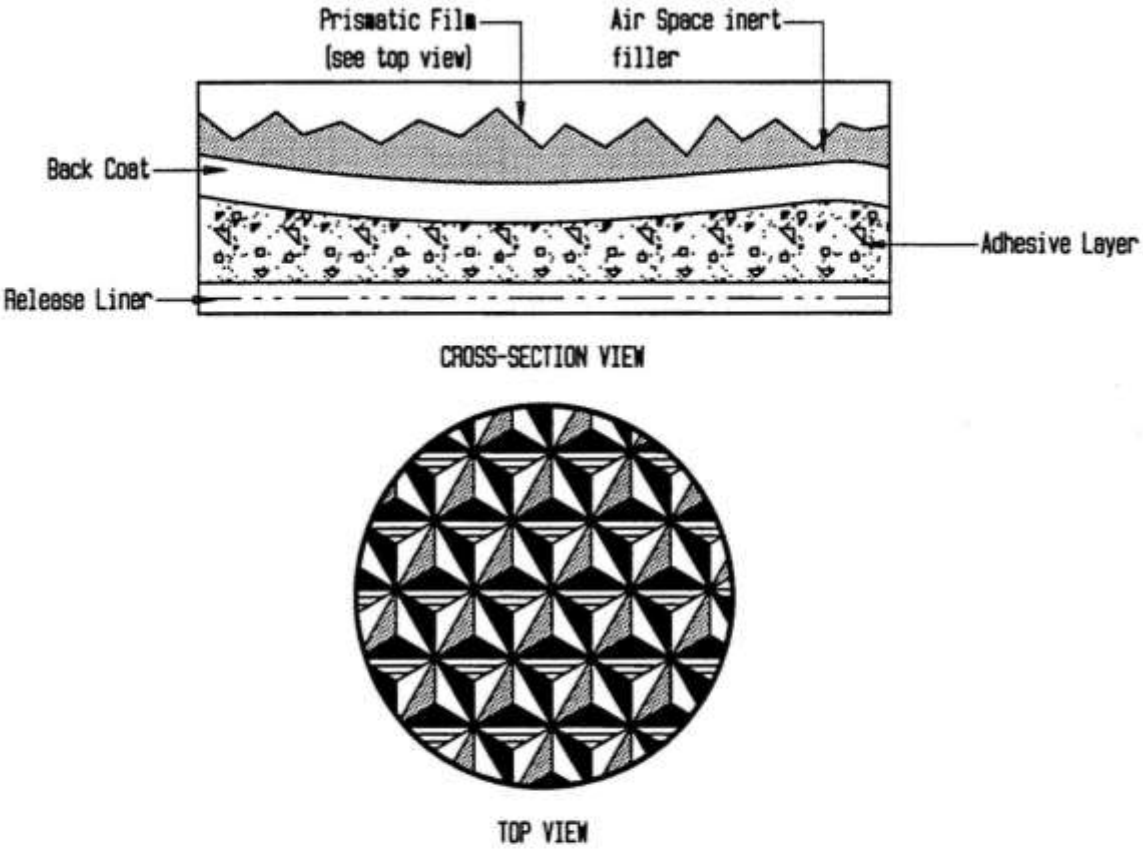
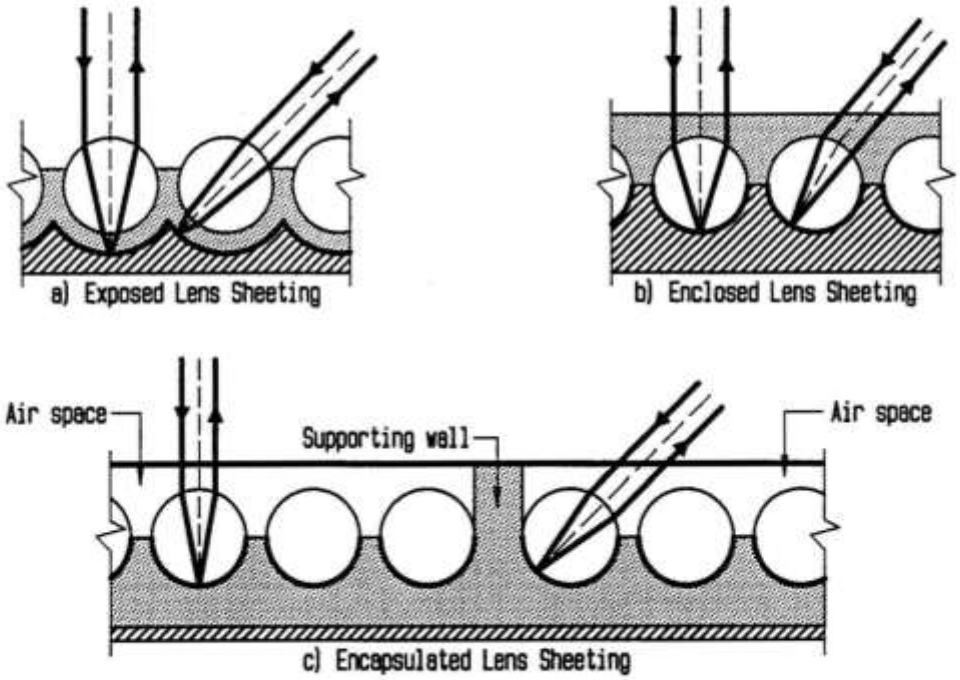
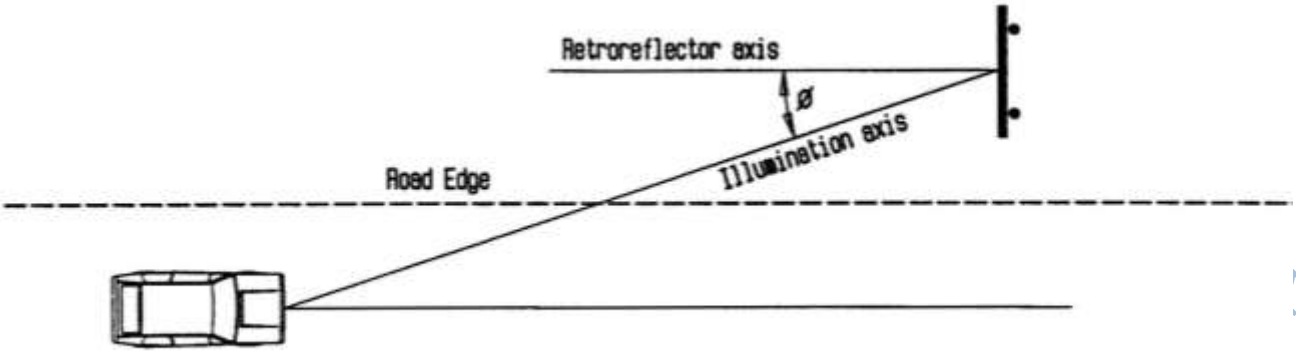


Detail 17.4.1 Cross-Section and Top View of Cube-Corner Retroreflective Sheeting

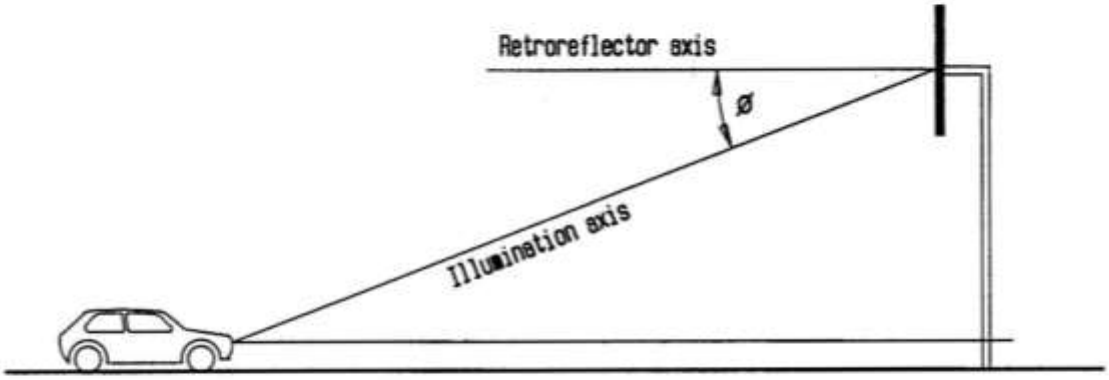


Detail 17.4.2 Cross-Section View of Three Types of Spherical Lens Retroreflective Sheeting

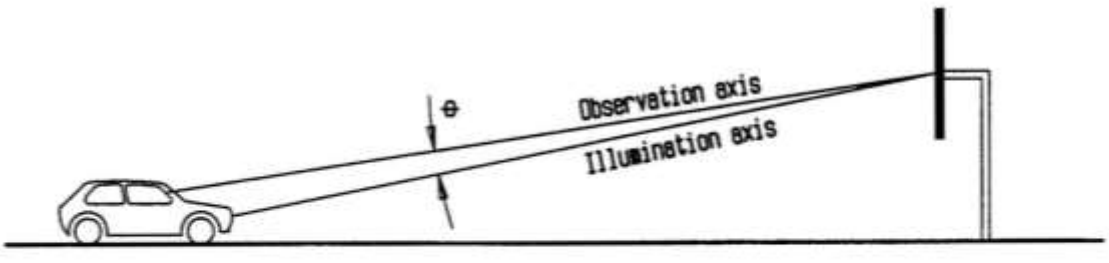
Fig 17.4 Sections Through Types of Retroreflective Sheeting



Detail 17.5.1 Entrance Angle (ø) For Roadside Sign



Detail 17.5.2 Entrance Angle (ø) For Overhead Sign



Detail 17.5.3 Observation Angle (θ), Either Type Sign

Fig 17.5 Entrance and Observation Angles

sign and a line emerging perpendicular to the surface. The entrance angle changes with distance between the vehicle and is a function of the location of the sign and the vehicle. An entrance angle of 30 degrees is considered wide for highway signing. The observation angle is the angle between the incoming light beam, and the reflected light beam, and is a function of the height of the driver's eye with respect to the vehicle headlamps. Figure 17.5 illustrates the entrance and observation angles.

3 Since a retroreflective material is supposed to reflect most of the light directly back to the source, the optimum observation angle should be zero. However, in reality this is not the case since the driver's eye is higher than the vehicle headlight and can range from 530 mm for small cars to as much as 1625 mm for large trucks. A wide observation angle is anything over 2 degrees. For purchase specifications, minimum SIA is prescribed for each type of sheeting for two observations angles, two entrance angles, and the different colours.

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17.12 LITERATURE SURVEY

17.12.1 General

1 It is clear from Section 17.3 that most of the visual problems concerning signs are related to the hours of darkness. For this reason many studies have concentrated on the retroreflectivity of signs. Relatively few studies have been conducted on the daylight visibility of signs (see Section 17.10 for relevant authors and studies).

17.12.2 Night-time Visibility of Retroreflective Road Signs

1 The CIE has produced a technical report on the night-time visibility of road signs. All the major research studies carried out internationally have been incorporated into this report. Two major reports on the minimum retroreflectivity requirements for traffic signs have also been produced, one in the USA and the other in Australia. Also of interest are two reports prepared in the USA on the minimum retroreflective requirements for STOP, warning and direction signs by Morales.

2 Morales conducted research into the minimum retroreflective values for STOP signs. A field test is used to obtain a relationship between the retroreflectivity and the recognition distance. He concludes that retroreflectivity is important but that the contrast ratio between the red and white for stop signs is not that important, because the stop sign is recognised by its unique shape, and does not necessarily have to be read to be understood.

3 Table 17.9 gives the minimum overall co-efficient of retroreflection for various approach speeds under ideal conditions as shown by Morales. He assumes a deceleration of 2,44 m/sec^2 and a perception-reaction time of 1,5 sec, with the overall co-efficient of retroreflection (cd/lx/m^2) = 0,76 x Red co-efficient of retroreflection + 0,24 white co-efficient of retroreflection.

4 Olson investigated the conspicuity of signs at night. He found that background complexity, age of driver and colour of sign had a significant effect on the conspicuity of signs.

5 Table 17.10 gives the minimum values for red retroreflective values for STOP signs for the area complexity as found by Olson. These values apply to a 750 mm (USA 30 inch) STOP sign and are corrected for driver expectancy.

6 A major study on the terminal values of road signs has been conducted in Australia. The study carried out by Jenkins *et al*, was divided into five parts, namely literature review, daytime survey, night-time survey, laboratory experiment, to determine the terminal value of signs, and model for the determination of the terminal value of signs. The findings of this study are given below.

7 Literature review - Different studies determined the luminance of signs at different distances using two types of headlight beams (SAE and ECE). Figure 17.6 shows the luminance of overhead and shoulder mounted signs from 40 m to 500 m using ECE low beam headlights (Schmidt - Clausen 1983).

8 The night-time legibility of a sign as a function of its luminance has been studied over many years. Sivch and Olson reviewed 18 experiments and found that the geometric mean of these studies was 2,4 cd/m^2.

9 Furthermore, a number of studies into the night-time legibility of a sign as a function of its retroreflectivity have been conducted. It has been found that differences between the studies are significant. This is partly due to high legibility distances which had been chosen. Several studies have been conducted to determine the range of distances at which signs are used. A range of 50 m - 120 m was proposed.

10 The degradation of white Class I retroreflective sheeting has been studied in a number of countries. The regression lines found in Germany, Australia and South Africa are as follows:

(a) CIL/m^2 = 83 - (3,30) (Age);
(b) CIL/m^2 = 106 - (3,30) (Age);
(c) CIL/m^2 = 82 - (3,30) (Age).

TABLE 17.9 MINIMUM OVERALL RETROREFLECTIVE VALUES FOR SIGNS (SAE TYPE HEADLIGHTS) OF TWO SIZES (760 mm AND 610 mm) TABLE 17.9

Speed	Stopping Distances	Overall Coefficient of Retroreflection	
		760 mm in 30 m	610 mm in 24 m
40 km/h	42 m	3	4
48 km/h	57 m	4	7
56 km/h	74 m	5	11
64 km/h	92 m	7	35
72 km/h	113 m	10	40
80 km/h	135 m	18	40
89 km/h	161 m	40	40
97 km/h	188 m	40	40

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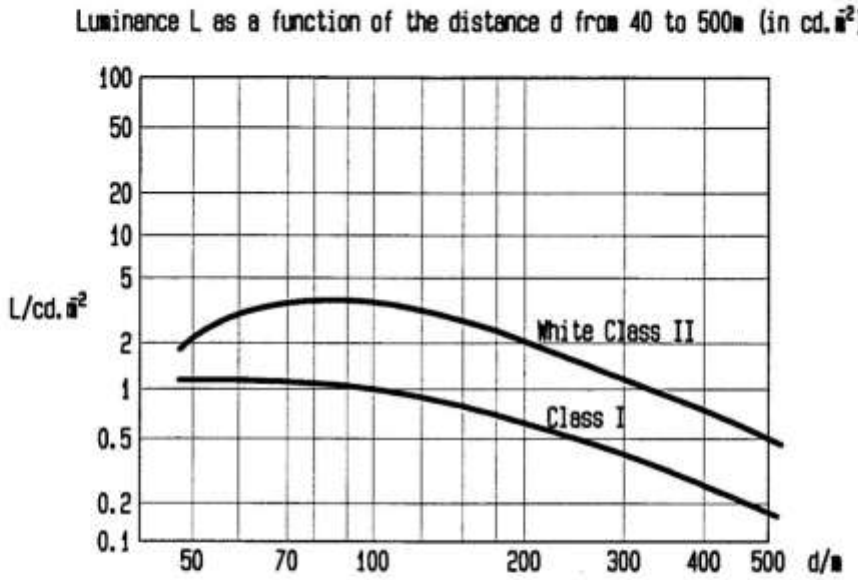
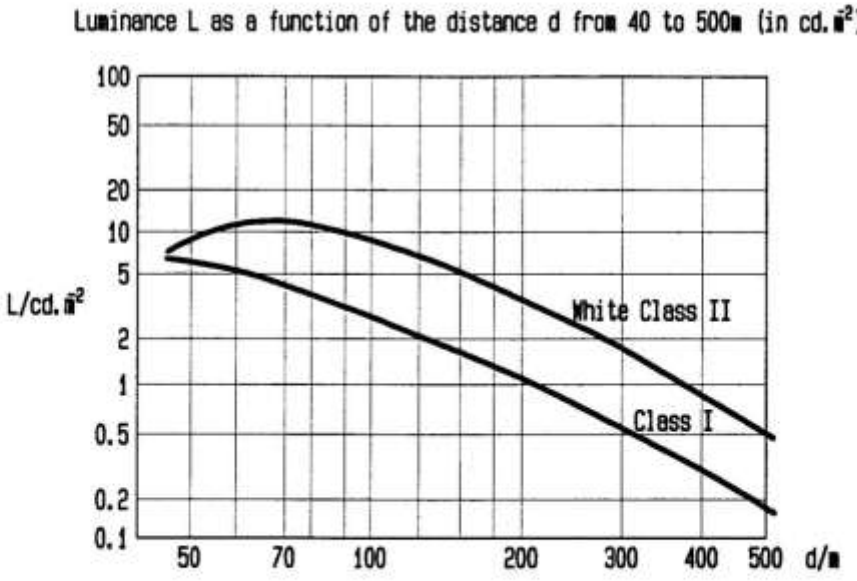
Luminance of white retroflective material of Class I and II on an overhead sign illuminated by European asymmetrical H4 passing headlights (low beam)



Detail 17.6.1 Luminance of an Overhead Sign by Direct Illumination

Luminance of white retroflective material of Class I and II on a shoulder mounted sign illuminated by European asymmetrical H4 passing headlights (low beam)



Detail 17.6.2 Luminance of a Shoulder Mounted Sign by Direct Illumination

Fig 17.6 Luminance if Road Signs as a Function of the Distance from the Sign

TABLE 17.10 MINIMUM RED RETROREFLECTIVE VALUES FOR STOP SIGNS (cd/lx/m^2) TABLE 17.10

Speed	Area Complexity		
	High	Medium	Low
48 km/h	8	3	2
56 km/h	26	5	3
64 km/h	30	11	4
72 km/h	70	25	8
80 km/h	170	63	14
89 km/h	✸	155	30
97 km/h	✸	✸	70
105 km/h	✸	✸	150

✸ The use of supplementary warning signs is recommended

11 Daytime survey - 2 661 signs were measured in the field. The retroreflectivity of the symbol and background was measured with a field retroreflectometer (the entrance angle was -4^o and the observation angle was 0,2^o). The ages of 2 441 signs were recorded, these varied from 1 to 18 years. The deterioration of the retroreflectivity (CIL/m^2) can be presented by the following linear regression for the different classes and colours:

(a) White Class III CIL/m^2 = 294 - (4,05) (Age);

(b) White Class I CIL/m^2 = 116 - (5,62) (Age);

(c) Yellow Class I CIL/m^2 = 96 - (5,07) (Age);

(d) Red Screened Class III CIL/m^2 = 16 + (3,1) (Age);

(e) Green Class I CIL/m^2 = 22 - (1,02) (Age).

12 From data in North Queensland it was found that degradation was higher than average due to the higher UV. The regression equations were:

(a) White Class I CIL/m2 = 111 - (8,6) (Age);

(b) Yellow Class I CIL/m2 = 96 - (7,1) (Age).

13 The above results showed that white Class III material fell to 80% of its CIL/m^2 after about 14 years, and for Class I material the CL/m^2 fell to 50% after 10 years for white, yellow and green. The red screened signs showed that the colour faded to white and the CIL/m^2 increased with time.

14 The study also looked at the internal contrast between the sign legend and the sign background (recommended to be 7:1). For most signs (except STOP signs) the internal contrast could be considered to remain over the life of the sign. Due to the colour fading of the red on STOP signs the contrast is reduced with age. Class III STOP signs degraded below this value (7:1) after 8 years and class I after 4 years.

15 Night-time survey - the purpose of the night-time survey was to obtain photometric values of signs that were subject rated as being close to their effective life. Two hundred and ten retroreflective signs were judged. The results showed the following mean values:

(a) 11 cd/lx/m^2 for White;

(b) 4 cd/lx/m^2 for Red (screened);

(c) 6 cd/lx/m^2 for Yellow;

(d) 2 cd/lx/m^2 for Green.

There was a wide spread of results due to the difficulty of the subjective rating.

16 Laboratory experiment - the purpose of this experiment was to determine the minimum luminance and internal contrast of signs to ensure that they are conspicuous and legible.

17 Slides were used of traffic scenes which fell into three (low, medium and high) visual complexity categories. On the slides, warning and guidance signs were superimposed. For the conspicuity experiment the test person had to detect the sign in the traffic scene in a short time. For the legibility experiment the test person had to determine in which direction the gap in a Landolt C, which was marked on the signs, was pointing.

18 It was found that the average luminance for guidance signs should be 3,2cd/m^2 with the legend luminance of 16,2 cd/m2 and a background luminance of 2,3 cd/m^2. For warning signs luminance should be 9,7 cd/m2. It was also found that the contrast should be greater than 3.

17.12.3 Durability of Road Signs with Regard to Retroreflectivity

1 Transportek has been investigating the durability of road signs in South Africa since 1981. These investigations concentrated on the changes of retroreflective value and colour over time. A number of surveys have been carried out on public roads, mostly in the then Transvaal because the date of manufacture of signs was recorded on the back. From this the age of the sign could be determined, which made it possible to determine a relationship between the change in retroreflectivity and the sign's age.

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2 It was found that the regression lines were as follows:

(a) White Class I retroreflection = 82 - (3,06) (Age);

(b) Red Class I (pigmented) retroreflection = 21 -0,97) (Age).

For the other coloured sheeting an adequate relationship could not be found.

3 These regression lines show that the durability with regard to retroreflectivity for white and red sheeting is very good. For the white sheeting to deteriorate to the SANS value specified for weathered samples (40 cd/lx/m^2) would take 13,7 years while red (8 cd/lx/m^2) would take 13,2 years.

4 The main problems found with the durability was the fading of the red colour, especially if the colour was screened. When SANS colour boundaries were used, approximately 59% of the pigmented and 96% of the screened signs failed.

5 Transportek has also conducted accelerated natural weathering tests on sign materials since 1987. Similar results were obtained as in the field surveys. The regression equation for white Class I was found to be retroreflection = 73 - (3,38) (Age).

6 The literature study shows that these equations are similar to relationships found in Australia and Germany. The accelerated natural weathering test also showed that the fading of the red screen colour is the main problem. Recently, new red screened samples have been tested and are showing an improved result.

7 Green, blue and yellow road sign materials did not prove to be a problem with regard to durability.

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17.2 PRINCIPLES OF RETROREFLECTION

17.2.1 General

1 Retroreflection occurs when light rays strike a surface and are reflected back towards the source of light. Two principles followed to achieve retroreflectivity for road signs are prismatic and spherical lens retroreflection. Prismatic, also known as cube-corner retroreflection, is achieved through total internal reflection.

2 Incoming light hits the first surface and reflects to the rear surface, which reflects it to the last surface which then reflects the light rays back towards the light source. In the second type, spherical lens retroreflection is achieved through a combination of a glass sphere (bead) and a reflecting (mirror type) surface placed at the focal point. The incoming ray is refracted and directed inwards towards the back of the sphere, reflecting off the reflective surface, and after being refracted at the exterior of the sphere, redirected towards the light source. These two principles for achieving retroreflection are illustrated in Figure 17.1 and further described in Section 17.11. Three references (3, 8, 9) are suggested for thorough discussion of the principles of sign retroreflectivity (see Section 17.10).

3 Retroreflective sheeting consists of micro cube-corners or spheres enclosed in weather resistant, transparent plastic film. To reflect a colour, a pigment or dye is inserted into the film, or onto the reflecting surface.

There are three types of spherical lens (bead) retroreflective sheeting:

(a) exposed glass bead;

(b) enclosed glass bead; and

(c) encapsulated glass bead (see Section 17.11 for more detail).

4 In the exposed lens sheeting the front half of the glass beads are exposed to the outside air. Because of the small size of the beads, a film of water can cover the beads when it rains and can greatly reduce the retroreflectivity of the beads. Hence, this type of sheeting is not recommended for traffic signs and is not included in specifications.

5 Enclosed lens sheeting material consists of a layer of transparent plastic of appropriate colour in which glass beads are embedded. A metallic reflection shield is provided behind the plastic together with a layer of adhesive, and with a protective liner that is removed during sign fabrication. The plastic covering enables the sheeting to be equally bright under dry and wet weather conditions.

6 With encapsulated lens sheeting the glass beads are protected by a transparent material that is supported slightly above the beads by a wall creating an air-filled compartment. The back of the beads are covered with a reflective surface. The resulting airspace in front of the beads enhances the quality of the retroreflection and this type of sheeting is therefore known as **high intensity** sheeting.

7 One of the most important properties of retroreflective sheeting is the ability to return light that is commonly described by a variety of terms including brightness, retroreflectivity, luminance and candlepower. The International Commission of Illumination (CIE) uses the term **co-efficient of luminous intensity** which is defined as:

$$\text{ratio} = \frac{\text{Luminous intensity of reflector in the direction of observation}}{\text{Illumination at the retroreflector on a plane perpendicular to the light}}$$

In the metric system, designated as the International System of Units (SI), the co-efficient of luminous intensity is expressed as candelas (cd) per lux (lx). **The co-efficient of luminous intensity is a measure of efficiency of the retroreflector because it describes the amount of luminance (candelas) that emerges from the retroreflector per amount of light (lux) entering from the light source, i.e.. the vehicle headlights.** This definition treats the retroreflector as a point source. Because signs have a relatively large area, they are treated as an extended light source which may be thought to consist of many point sources, each with a luminance intensity of one candela. The co-efficient of luminous intensity divided by the area is expressed in SI units as candelas per lux per square metre and identified as the **co-efficient of retroreflection, R.** This can also be described as specific intensity per unit area (SIA). The SIA designation will be used throughout this chapter.

8 The retroreflectivity of sheeting material is described in the context of another important property, namely its **angularity**, which is defined by the entrance (of the light) and the observation (of the motorist) angles (see Section 17.11). The entrance angle is the angle formed between a light beam striking the surface of a sign and a line emerging perpendicular to the surface. The observation angle is the angle between the incoming light beam and the reflected light beam, and is a function of the height of the driver's eye with respect to the vehicle headlamps. In SANS 1519 and other specifications, minimum specific intensity per unit area (SIA) are prescribed for each different type of sheeting for two observation angles, two entrance angles, and for different colours.

9 Retroreflective materials are supplied according to the CSRA Standard Specifications, in the following classes and should comply with the requirements of SANS 1519:

(a) Class I - Engineering grade retroreflective material (medium intensity sheeting); generally an enclosed lens glass bead material;

(b) Class II - Super-engineering grade retroreflective material; generally an enclosed glass bead or prismatic material;

(c) Class III - High intensity grade retroreflective material; generally an enclosed glass bead or prismatic material.

The durability of these materials is normally guaranteed for 7 years or 10 years.

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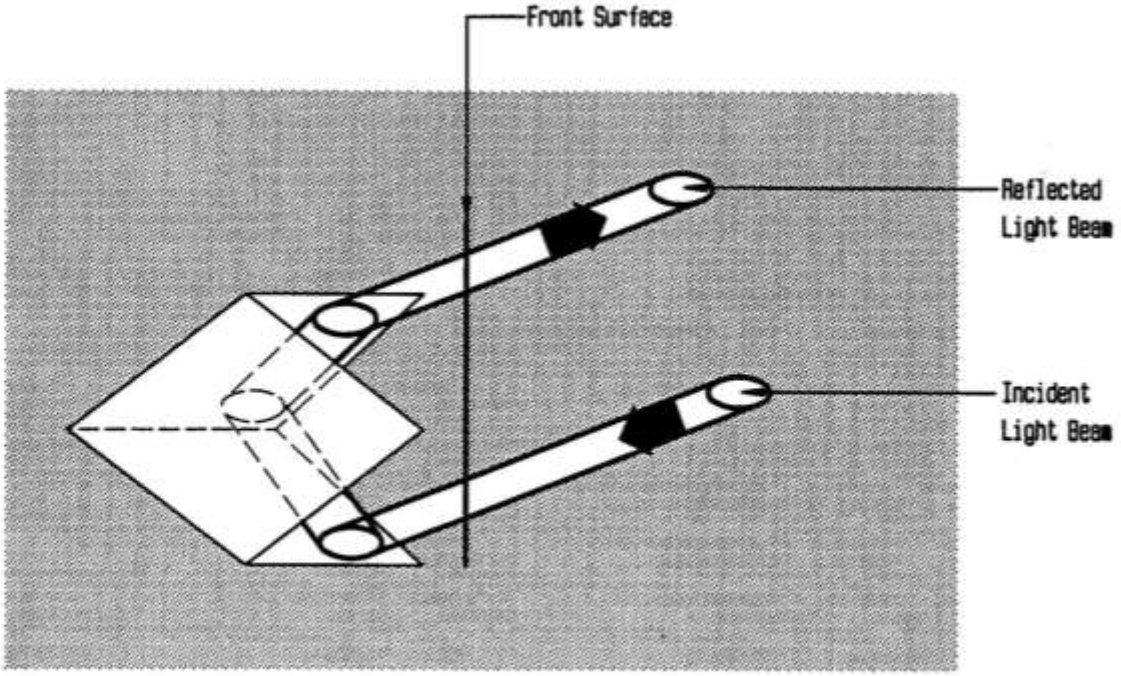
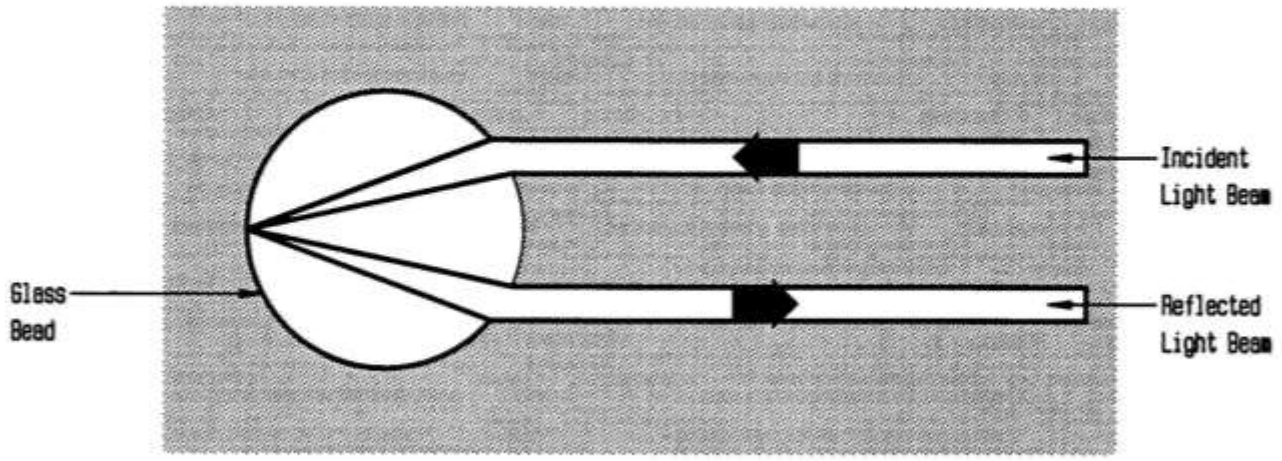


Detail 17.1.1 Corner Cube Retroreflection



Detail 17.1.2 Spherical Lens Retroreflection

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Fig 17.1 **Principles of Retroreflection**

17.3 FACTORS THAT AFFECT THE VISUAL EFFECTIVENESS OF ROAD SIGNS

17.3.1 General

1 There are a number of inter-related factors that affect the visual effectiveness of road signs. The relationship between these factors is complex since each factor, listed below, is in itself multi-faceted:

(a) the driver;

(b) the sign;

(c) the vehicle;

(d) the roadway; and

(e) the environment.

17.3.2 Driver Factors

1 Visual acuity - is the ability of a driver to resolve small detail and primarily affects the legibility of a sign. Visual acuity is reduced by old age of the driver and at low luminance values.

2 Colour vision - is the driver's ability to discriminate between colours. Approximately 8% of men and 0,6% of women have a visual colour deficiency.

3 Glare sensitivity - this is the reduction in a driver's visual ability due to glare (mostly from oncoming vehicle headlights at night). Old age increases this problem.

4 Reaction time - this is the ability of a driver to react quickly to a sensory input. The reaction time varies from person to person and is increased by alcohol and drugs. Further deteriorating factors are fatigue and old age.

5 Expectation - depends on the alertness of the driver and attention given to the driving task. The driver's experience and education in relation to traffic matters are also important by a driver.

6 Reading ability - the speed at which words can be read on signs by a driver is important.

17.3.3 Sign Factors

1 Luminance - the luminance and luminance contrast between the sign and the background that it is viewed against, **and** the sign legend or symbol and the background of the signface, have a major effect on the visual effectiveness of a sign.

2 Colour - the colour coding and therefore the colour contrast of the sign affect the visibility.

3 Age of the sign - exposure to the weather reduces the retroreflectivity and colours fade towards white. Different signface materials have different deterioration rates.

4 Sign and shape - larger sizes of sign are more effective. Certain shapes are easily recognised and increase effectiveness.

5 Class of retroreflective sheeting - the retroreflectivity of the various classes of sheeting differs. This has an effect on the night-time visibility.

17.3.4 Vehicle Factors

1 Headlight beam - the beam shape and light intensity in the direction of a road sign have an effect on the night-time. visibility Most headlights comply with the United Nations Economic Commission for Europe (ECE) regulation while some older vehicles and replacement lights are of the Society of Automotive Engineers of the USA (SAE) type.

2 Headlight beam aim - for headlights to be effective they have to be correctly adjusted according to the Road Traffic Act.

3 Type of Vehicle - a car and a large commercial vehicle have different stopping abilities and also distances between the lights and driver's eyes are different which affect the observation angle to the sign.

4 Speed of vehicle - this affects the amount of attention given to signs and affects the stopping distance.

5 Transmission of windscreen - this affects the luminance of the sign as seen by the driver. A transmission factor for the windscreen is stipulated in the Road Traffic Act. Dirt will decrease the transmission factor of a windscreen.

17.3.5 Roadway Factors

1 Horizontal and vertical curvature - these curvatures affect the amount of light which falls on the signs from the vehicle headlights. The headlight beam is optimum when the road is straight and level.

2 Roadway width - this also affects the amount of light which falls on the sign from the vehicle's headlights. On multi-lane roads large vehicles can block the view of the sign.

3 Sign position - signs are normally placed on the left hand side of the road. On freeways some signs are applied overhead and on curves some signs are placed on the right hand side of the road. The headlight beam produces different illumination values in these positions.

17.3.6 Environmental Factors

1 Background - seen against uncluttered backgrounds (i.e. on a dark road) the conspicuity of signs is increased, while complex backgrounds with relatively high ambient light levels, which are found in the CBDs at night, can reduce the conspicuity.

2 Fog and rain - reduce the transmission of light in the atmosphere so that less light is received by the sign and the driver. The light is also scattered by the water droplets which reduces the visibility.

3 Dew - in certain atmospheric conditions dew droplets are formed on retroreflective signs which reduces their visibility at night.

17.3.7 Principle Factors

1 As has been noted, there are many factors which affect the visibility of a sign. The above-mentioned factors can have an accumulative effect on the effectiveness of a sign. An older driver with poor visual acuity, in an old un-roadworthy vehicle on a rainy night, will require signs of high quality to enable him to perform his driving task safely. It would be difficult to determine an exact minimum standard, taking all the above factors into consideration, but an attempt must be made to

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accommodate most circumstances encountered on the road.

2 It is therefore difficult to provide prescriptive recommendations on the selection of different types of retroreflective sheeting for different applications. The above-mentioned factors affect the decisions to be taken by road authorities who may give different priorities to these factors depending upon their policy, location and method of operation.

3 It is, however, important to focus on the principle factors when considering the selection of retroreflective sheeting, namely:

(a) driver visibility needs;

(b) durability and the economics of signface material;

(c) practical considerations.

17.3.8 Driver Visibility Needs

1 Certainly an important criterion for selecting the type of sheeting is the driver's visibility requirements. The ability of a driver to see and read a sign is dependent upon many factors including those that relate directly to the sign, namely:

(a) brightness;

(b) contrast;

(c) conspicuity; and

(d) legibility.

17.3.9 Brightness

1 Brightness refers to the amount of light reflected from the sign that reaches the driver's eye. Brightness varies for each colour and type of retroreflective material. In general, the brighter the sign, the more conspicuous it will be. However, high brightness letters or symbols mounted on a low brightness background may reduce legibility because of a halo effect of the brighter characters, commonly known as overglow.

2 In addition to the type of material, colour, and specific intensity per unit area, sign brightness will be determined by the following factors:

(a) headlamp type, aiming, high or low beam;

(b) driver's eye height;

(c) windshield filtering;

(d) weather (frost, dew, rain);

(e) surrounding ambient light;

(f) road curvature;

(g) mounting height and orientation angle;

(h) placement of sign: left shoulder, overhead, median, right mounted, etc.;

(i) viewing distance from sign.

3 Of these factors affecting sign brightness, the first five are beyond the control of the traffic engineer. Road curvature, mounting height and orientation angle of the road sign are discussed in Volume 1, Chapter 1, Section 1.6. Placement and viewing distance and how they influence sign brightness are discussed below.

4 **Placement** - Sign placement is an important factor in the consideration of sheeting selection. In general, signs mounted overhead or on the right shoulder of undivided roads require higher degrees of retroreflectivity to appear equally as bright as signs on the left shoulder. Therefore, generally speaking, overhead signs and right shoulder signs should have significantly higher levels of retroreflectivity than signs placed on the left shoulder.

5 **Distance** - A major consideration in the choice of retroreflective material is the distance at which motorists must be able to detect a device so that, if necessary, they will be able to take any action required, in a safe and timely manner. The distance from the sign where this must occur is the distance which provides adequate time at the operating speed to allow for the following to occur:

(a) detection of a traffic control device (TCD) critical to the driving task;

(b) recognition of the message contained on the TCD;

(c) decision making regarding the alternative actions to be taken;

(d) initiation of the appropriate response;

(e) implementation and completion of the vehicle manoeuvre in a safe manner.

6 Not all signs require all of these actions to occur and therefore not all signs must be visible at equal distances. Many signs do not require a vehicle manoeuvre, and of those that do, many do not require the movement to be completed prior to the sign. Signs which require lane changes with merging activity and those which require a complete stop, must be detected and read at considerable distances from the sign. At 120 km/h, for example, the required distances are of the order of 250 m to 330 m. At a speed of 60 km/h, or when the sign does not require a driver decision or vehicle manoeuvre, the distance may be as little as 60 m to 70 m.

7 The visibility distance of signs at night cannot be increased indefinitely simply by increasing the level of retroreflectivity. There is an optimum level above which signs become more difficult to read. To accommodate long detection and legibility distances, larger signs with larger letters may be needed.

8 Volume 1, Chapter 4, Section 4.2 gives details on the determination of adequate height of letters on signs.

17.3.10 Contrast

1 When specifying the manufacture of a road sign which requires the superimposition of one colour of retroreflective material on another, contrast ratios are achieved from the sign for the message to be legible. The minimum co-efficient of retroreflection for the three standard classes of material for each colour is given in SANS 1519. The actual co-efficient of retroreflection for a given sample and colour may vary widely from the minimum, and for new materials, these values are commonly higher than the value given in SANS 1519. Colour contrast and therefore legibility, is normally sought by placing a dark letter on a light background, or vice versa. The contrast between the luminance of the sign legend and the luminance of the sign background is a key measure that has been related to sign brightness. For signs with a black legend on colour background the legibility is determined by the luminance of the colour portion of the sign. As a general rule a contrast ratio of the

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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 (arrow or blocks) - a minimum ratio of 3,5 to 1, with a preference for 5 to 1.

17.3.11 Conspicuity

1 Conspicuity refers to the probability that a sign located in the visual periphery will be seen at a given distance. The level of conspicuity for any sign depends upon the following factors:

(a) peripheral to line of sight;

(b) degree to which sign is expected and/or being looked for;

(c) visual complexity of the surrounding area;

(d) external contrast;

(e) size of sign.

2 **"Peripheral to line of sight"** refers to the fact that the further the sign is located from the driver's line of sight, the less likely it is that it will be seen. Signs mounted on the right of a multi-lane road or on the left side of roads with unusually wide shoulders or parking/turning lanes may be less conspicuous. Eccentricity is generally not a problem for conspicuity at the long distances where detection generally occurs. However, eccentricity may be a problem when a sign is used with an unusually short sight distance (e.g. after a turn or a merge area). Hence, for these situations it is advisable to use sheeting that maintains its retroreflectivity thorough wide angles.

3 Signs are more conspicuous to drivers who are **looking for them**. On this basis alone guidance signs are more likely to be seen than regulatory or warning signs. Also any sign following another sign that alerted the driver to its presence (e.g. STOP AHEAD), will be more conspicuous because of the advance warning.

4 **Visual complexity** refers to the presence of both reflected and direct light sources in the driver's field of view. Signs located in areas of low visual complexity are more likely to be seen than signs in high complexity areas. Rural roads with just a few point sources of light are definitely not complex. However not all roads with many light sources are visually complex. In general, lights or reflective sources in the area where signs are located add to complexity, while such distractions away from the sign (i.e. right side of road) do not. Roads with activity which complicates the driving task (e.g. traffic signals and intersections) are visually more complex.

5 Conspicuity is most easily improved by increasing size and/or **external contrast**. Larger signs provide greater conspicuity than small signs. Brighter signs are generally more conspicuous than dimmer signs. For practical reasons, **sign size** may not be increased beyond certain limits. Likewise, brightness is limited both by the availability of materials and by the fact that excessive luminance may degrade legibility and/or produce overglow discomfort. Since sign brightness improves conspicuity by increasing its external contrast, it may be possible to increase conspicuity by placement of the sign so that it is seen against a darker background.

17.3.12 Legibility

1 Volume 1, Chapter 4, Section 4.2 describes the design factors for legibility in detail. One of these factors is the luminance of the signface. For any given driver, the letter size, contrast and surrounding luminance interact to determine dual legibility distance. With letter size and stroke width remaining constant, the legibility index of partially retroreflective signs is primarily determined by the luminance of the retroreflective material, and the surrounding luminance. The legibility index of fully retroreflectorised signs is determined by the internal contrast of the brighter reflective components to the other portions of the sign.

2 The luminance of the reflective component of partially retroreflectorised signs should be at least 2 cd/m^2, but 10 cd/m^2 is a far safer specification. In general the contrast ratio of fully retroreflectorised signs should be 5 to 1 as described in Subsection 17.3.10.

3 Different letter stroke widths and symbols have different legibility indices. Symbols vary in legibility in ways that cannot be formally specified; however, symbols are typically larger than letters for the same size of sign, which generally gives them a greater legibility distance.

4 A major factor concerning the legibility of a sign is the visual acuity of the road user population. The visual acuity is the ability to resolve small detail. The Human Science Research Council conducted a study to determine the visual acuity of South African motorists. Table 17.1 gives the results. In the same table results of studies conducted in the USA and UK are given as well. The Snellen notation 6/6 indicates the ability to resolve an angle of one minute of arc. South African law requires that applicants for drivers' licences have a visual acuity of 6/12 (two minutes of arc).

TABLE 17.1 COMPARISON OF THE VISUAL ACUITIES OF UK, US AND SA DRIVERS TABLE 17.1

Criterion	UK (Davison & Irving) N = 1368	US (Burg) N = 3848	SA (Present Study) N = 2045
6/6 or better	90.7	85.8	75.2
6/9 or better	97.0	86.1	95.3
6/12 or better	99.0	99.0	98.8
6/18 or better	99.6	99.8	99.5
Worse than 6/18	0.4	0.2	0.5

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17.4 SPECIFICATION SANS 1519: ROAD SIGNS

17.4.1 General

1 Specification SANS 1519 on road signs was re-published during 2004 (Part 2) and 2006 (Part 1). The purpose of this specification is to ensure that road signs are effective over a relatively long time span (+/- seven years in the field). The co-efficient of retroreflection is given for the three classes of sheeting. The minimum coefficients of retroreflection for these three classes when the samples are new, are given in Table 17.2. After a weathering test the minimum values should be 80% of the values given in the table. The values given in Table 17.2 are based on international practice. The coefficient of retroreflection of Class 1, Class 2 and Class 3 has a ratio of magnitude of 1:2:3 (Red is 10 for Class 1, 20 for Class 2 and 30 for Class 3).

2 The observation angle of 0,33^{o} and an entrance angle of 5^{o} are relevant for motor cars at approximately 200 m while the observation angle of 2^{o} and an entrance angle of 30^{o} are relevant at approximately 30 m. These distances are somewhat short for heavy vehicles where the distances between the lights and drivers' eyes are larger.

3 Table 17.3 gives the chromaticity coordinates for daylight colours of new sign materials and Table 17.4 gives the required values of the co-ordinates after samples have been subjected to a weathering test. Figure 17.2 gives the chromaticity diagram for daylight surface colours and Figure 17.3 gives the proposed colour boundaries for red, yellow, green and blue. Table 17.5 gives the luminance factor for the different ordinary colours (paints, plastic film or opaque inks) and for the three classes of retroreflective sheeting after weathering. These values are based on international practices.

4 The colour specifications are only for daylight. During the hours of darkness, ordinary colours will appear black, while retroreflective sheeting will show similar colours to those shown in daylight. At present there is no specification for retroreflective colours, but a CIE committee is looking at this problem. A number of materials are imported from the USA which comply to their specification, but fail the SANS specification regarding the Red colour.

TABLE 17.2 MINIMUM COEFFICIENTS OF RETROREFLECTION FOR NEW SIGNFACE MATERIALS OF DIFFERENT COLOURS SPECIFICATIONS SANS 1519-1:2006 and 1519-2:2004 TABLE 17.2

Class	Observation Angle (Degrees)	Entrance Angle (Degrees)	Coefficient of Retroreflection for Different Colours of Material When Measured With Standard Illuminant A* cd/lx/m^2, Minimum							
			Red	Orange	Yellow	Green	Blue	Purple	White	Brown
1	0.33	5	10	20	35	7	3	2	50	3
	2	30	0.4	0.8	1.5	0.3	0.1	0.1	2.5	0.1
2	0.33	5	20	40	70	14	6	4	100	6
	2	30	0.4	0.8	1.5	0.3	0.1	0.1	2.5	0.1
3	0.33	5	30	60	105	21	9	6	150	9
	2	30	0.4	0.8	1.5	0.3	0.1	0.1	2.5	0.1
	0.22	40	13	22	64	11	7.0	3.2	95	0.5

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TABLE 17.3 CHROMATICITY CO-ORDINATES FOR DAYLIGHT COLOURS OF NEW SIGNS TABLE17.3

Colour	Type*	Chromaticity Co-ordinates of the Corners of the Region on the Chromaticity Diagram (Illuminant D65, 45/0 Geometry)				
		Co-ordinates	1	2	3	4
Yellow	O + R	x	0.690	0.640	0.606	0.655
		y	0.310	0.312	0.342	0.345
Orange	O + R	x	0.610	0.570	0.536	0.570
		y	0.390	0.381	0.416	0.429
Yellow	O	x	0.529	0.500	0.470	0.494
		y	0.467	0.450	0.480	0.505
Yellow	R	x	0.545	0.513	0.470	0.494
		y	0.454	0.437	0.480	0.505
Green	R	x	0.170	0.110	0.110	0.170
		y	0.415	0.415	0.500	0.500
Green	O	x	0.270	0.230	0.230	0.270
		y	0.480	0.480	0.520	0.520
Blue	O	x	0.190	0.150	0.150	0.190
		y	0.120	0.120	0.160	0.160
Blue	R	x	0.160	0.130	0.130	0.160
		y	0.086	0.086	0.140	0.140
Purple	O + R	x	0.302	0.307	0.374	0.457
		y	0.064	0.203	0.247	0.136
White	O + R	x	0.335	0.305	0.295	0.325
		y	0.345	0.315	0.325	0.355
Grey	O	x	0.335	0.305	0.295	0.325
		y	0.345	0.315	0.325	0.355
Black	O	x	0.385	0.300	0.260	0.345
		y	0.355	0.270	0.310	0.395
Brown	O	x	0.470	0.445	0.445	0.470
		y	0.350	0.350	0.390	0.390
Brown	R	x	0.550	0.500	0.460	0.505
		y	0.380	0.368	0.406	0.425

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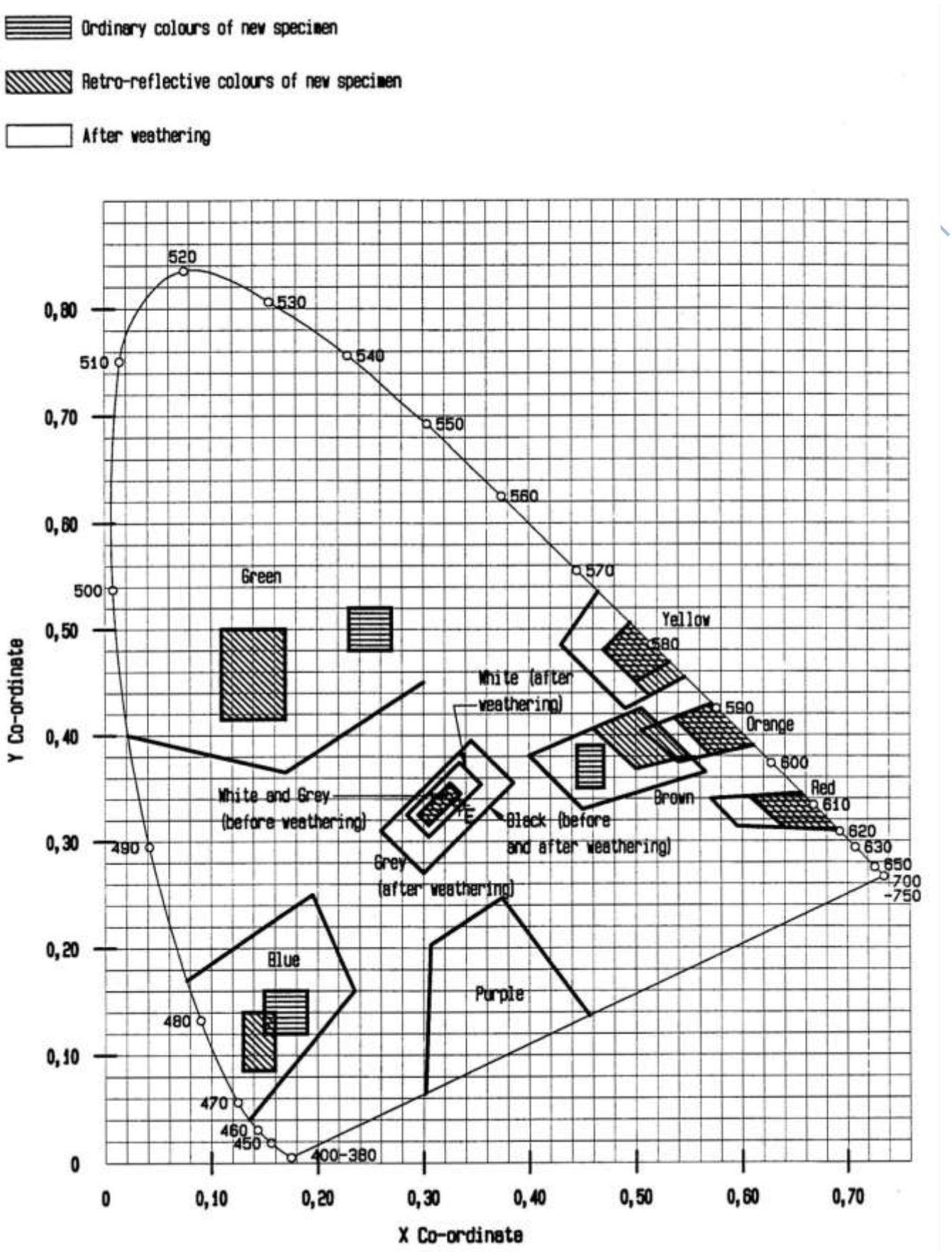

Fig 17.2 Chromaticity Chart: Boundaries for Daylight Surface Colours

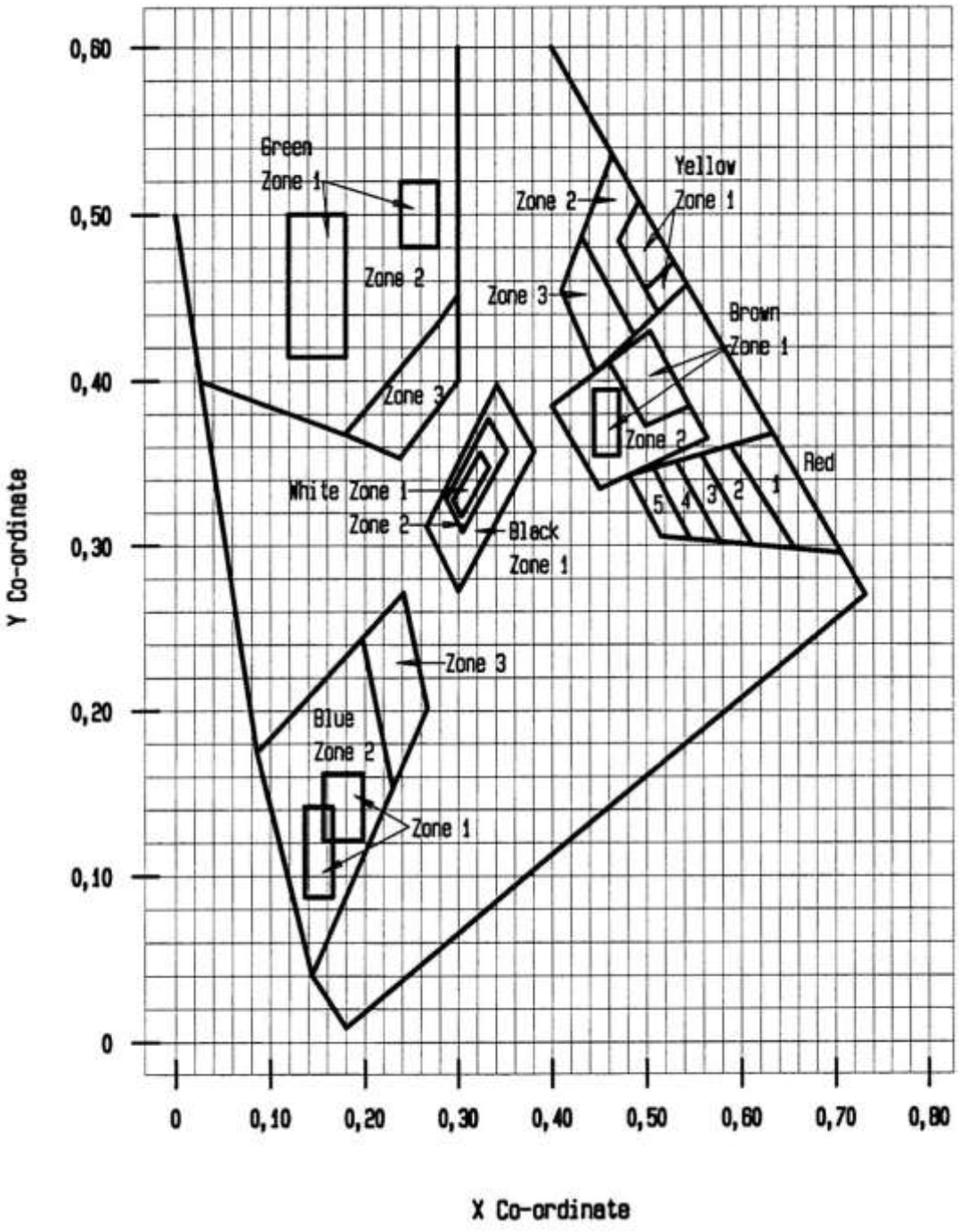

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Fig 17.3 Proposed Boundaries for Red, Yellow, Green and Blue

TABLE 17.4 CHROMATICITY CO-ORDINATES FOR DAYLIGHT COLOURS OF WEATHERED SIGNS TABLE 17.4

Colour	Type*	Chromaticity Co-ordinates of the Corners of the Region on the Chromaticity Diagram (Illuminant D65, 45/0 Geometry)				
		Co-ordinates	1	2	3	4
Red	O + R	x	0.690	0.595	0.569	0.655
		y	0.310	0.315	0.341	0.345
Orange	O + R	x	0.610	0.535	0.506	0.570
		y	0.390	0.375	0.404	0.429
Yellow	O + R	x	0.545	0.487	0.427	0.465
		y	0.454	0.423	0.483	0.534
Green	O + R	x	0.300	0.300	0.170	0.026
		y	0.690	0.450	0.364	0.399
Blue	O + R	x	0.078	0.196	0.023	0.137
		y	0.171	0.250	0.160	0.038
Purple	O + R	x	0.302	0.307	0.374	0.457
		y	0.064	0.203	0.247	0.136
White	O + R	x	0.355	0.305	0.285	0.335
		y	0.355	0.305	0.325	0.375
Grey	O	x	0.385	0.300	0.260	0.345
		y	0.355	0.270	0.310	0.395
Black	O	x	0.385	0.300	0.260	0.345
		y	0.355	0.270	0.310	0.395
Brown	O + R	x	0.565	0.450	0.400	0.505
		y	0.360	0.330	0.380	0.425

* O = Ordinary colours, R = retroreflective colours

TABLE 17.5 LUMINANCE FACTOR TABLE 17.5

Colour	Luminance Factor, Min			
	Ordinary	Retroreflective Class		
		I	II	III
Red	0.07	0.05	0.04	0.03
Orange	0.20	0.17	0.15	0.14
Yellow	0.45	0.27	0.21	0.16
Green	0.10	0.04	0.03	0.03
Blue	0.05	0.01	0.01	0.01
Purple	0.05	0.03	0.02	0.02
White	0.75	0.35	0.31	0.27
Grey*	0.10	—	—	—
Black +	—	—	—	—
Brown #	0.03	0.03	0.03	0.03

* Max. = 0.24

+ Max. = 0.03

Max. = 0.09

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17.5 REPLACEMENT CRITERIA FOR SIGNFACE MATERIALS

17.5.1 General

1 It is clear from the previous sections that most of the visual problems concerning signs are related to the hours of darkness. For this reason many studies have concentrated on the retroreflectivity of signs. A literature survey review is set out in Section 17.12 which highlights the "Night Time Visibility of Retroreflective Road Signs." Relatively few studies have been conducted on the daylight visibility of signs.

2 Based on the research done overseas and by the National Department of Transport locally, guidelines for the replacement of road sign materials in this chapter deal with minimum requirements for retroreflective sheeting for night-time visibility, and minimum requirements for retroreflective sheeting for night-time visibility and minimum requirements for sign colours for daylight visibility.

17.5.2 Retroreflective Sheeting

1 The CIE has produced international recommendations for the minimum retroreflective values for various signs at which the sign should be placed (see Section 17.11). It has been recommended that these minimum retroreflective values be adopted as a basis for developing a system for South Africa.

2 A model has been developed to calculate the terminal retroreflective value for road sign based on three components:
(a) the minimum luminance required from the sign;
(b) the distance from which the sign needs to be seen;
(c) the geometry of the situation.

3 The following factors are taken into consideration when the minimum distance the sign needed to be seen, is determined:

(a) the legibility distance should be about 1,5 times the "minimum required distance";

(b) the time to correctly read a sign having N words is taken as t = 0.32 N - 0.2;

(c) symbolic signs (including STOP signs) are taken as equivalent to two words to read;

(d) the distance to read signs is = V x t where V is speed of vehicle;

(e) drivers will not read signs at lateral angles of 10^o or higher (for overhead signs a limiting vertical angle is taken as 5^o);

(f) for lane changes the lateral speed of 1m/sec is used;

(g) for stopping distance a mean deceleration rate of 0.45 m/s^2 is used;

(h) the deceleration rate for slowing down is 0.259 m/s^2.

4 Once the minimum distance has been determined, the level of illumination on the sign may be found. The geometry of the site is required. For this model the ECE low beam headlight intensity distribution is used. From the illumination values and the minimum luminance (determined by laboratory experiment) the retroreflective values can be calculated.

5 Road signs are located in different road environments on different classes of roads. These environments are critical to the ambient luminance and the visual complexity around the sign location.

6 It should be recognised that the development of minimum retroreflectivity values is not an exact process. This complex problem involves many driver, vehicle, roadway and sign factors. The values given in Tables 17.2 and 17.5 should provide road authorities with objective values that can be used in deciding what type of new sign sheeting should be applied. Subsequent to these tables, Table 17.6 gives further guidance on the selection of retroreflective sheeting for different road signs in different environments.

7 It is believed that the luminance values balance the desire to satisfy all drivers in all situations and the need to provide practical, implementable values. Based on current knowledge the recommended replacement values provide an acceptable level of driver accommodation, while not putting an undue burden on road authorities in terms of percentage of signs to be replaced at any point in time.

17.5.3 Recommended Criteria

1 The night-time visibility and the colour limits of signs have been researched by a number of organisations and the CIE has published an international recommendation. It is proposed that the CIE recommendation should form the basis for the criteria to replace road signs in South Africa.

2 Tables 17.7 gives the colour limits for urban streets. The four different types of street, as well as the different types of signs, are classified according to Volume 1. The retroreflective value is $cd/lx/m^2$ measured at an observation angle of 0.333^o and an entrance angle of 5^o is given for the symbol, background and border for each sign group. The colour limits are given in zones as indicated by Figure 17.2 for the symbol, background and border. Table 17.8 gives the same information for rural roads. The minimum contrast for night-time conditions is 5:1. For daytime conditions a minimum contrast of 5:1 should also be maintained, but this is not always possible with certain colour and material combinations.

3 These recommendations should be incorporated into a signs management system, as explained in Chapter 16, which will ensure a cost effective sign replacement policy.

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TABLE 17.6 **GUIDANCE ON SELECTION OF RETROREFLECTIVE SHEETING** **TABLE 17.6**

	Sign Type	Road Environment Category	* Road Class	Signface Background	Text (including arrows, borders and symbols)
GUIDANCE SIGNS	Location Signs (GL Series)	Rural Urban	All Classes	White: Class I	Black: Semi-matt (coloured symbols in Class I material)
	Route Marker Signs (including trailblazer signs) (GE Series)	Rural Urban	A1	Blue, Green or Brown : Class I	Route Number: Yellow: Class III (including brackets and cardinal directions) All others: White: Class I
	Direction Signs (see below for Class A1 freeway) (GD Series)	Rural Urban	B & C1 B & C	Ground-mounted: Green: semi-matt or Class I Ground-mounted and Overhead signs: Green: Class I	Route Number: Yellow: Class III (including brackets and cardinal directions) All others: Ground-mounted White: Class I All others: Overhead White: Class III
	Freeway Direction Signs (GA and Toll Series) Cross Road approach signs	Rural Urban Rural Rural and Urban	A1 A1 A2 B	Blue: Class I Blue: Class III Green : Class I Blue and Green: Class I	Route Number Yellow: Class III (including brackets and cardinal directions) Interchange Number / Local Authority Name Black: semi-matt All others: ground-mounted White: Class I All other: Overhead White: Class III
	Tourist Direction Signs (GF series) Local Directions Signs (GDL Series)	Rural and Urban	A1 + A2 (**NO** GDL signs on freeways) B, C1 + C2	Tourist Direction : Brown: Class I Tourist Direction : Brown: semi-matt or Class I Local Direction : White: Class I	Tourist Direction : All legend (except route numbers which shall be Yellow : Class III) White: Class I Local Direction : All legend Black : Semi-matt (coloured symbols in Class I material) Local Direction: Border: Blue: Class I
	Diagrammatic Signs (GS Series)	Rural and Urban	All Classes	White: Class I (including IN11 signs)	Border and Blocks Red: Class I All other (including IN11 signs) Black: Semi-matt
WARNING SIGNS	All permanent and temporary warning signs shall have a fully retroreflective background and border and shall be manufactured using at least Class I retroreflective materials. The symbol on permanent and temporary warning signs shall be provided in a durable semi-matt material or finish.				
REGULATORY SIGNS	All permanent and temporary signs shall have a fully retroreflective background. Control signs shall be fully retroreflective, with the exception of those areas which are black, which shall be provided in a durable semi-matt material or finish. In addition, the symbol and border on permanent command, reservation and comprehensive signs, and the border on all permanent and temporary prohibition signs shall be fully retroreflective. The symbol on permanent and temporary prohibition signs and the symbol and border on temporary command, reservation and comprehensive signs shall be provided in a durable semi-matt material or finish. Regulatory signs manufactured using any form of silkscreening process shall only be used after strict manufacturing control and with a guarantee from the manufacturer. Any retroreflective materials used to manufacture signs shall be of at least Class I quality.				

* See Volume 2, Chapter 9, Subsection 9.2.2 for classification of urban roads and Volume 1, Chapter 1, Subsection 1.2.2 for other roads.

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TABLE 17.7 GUIDELINES ON MINIMUM ACCEPTABLE CO-EFFICIENTS OF RETROREFLECTION AND COLOUR LIMITS FOR THE REPLACEMENT OF SIGNS ON URBAN ROADS TABLE 17.7

Type of Sign		Colour (1)(2)	Type of Street																							
			Freeway Class A						Arterials Class B						Collector-distributor Class C						Residential Class D					
			CIL/m² cd/lx/m²			Colour limits (3)			CIL/m² cd/lx/m²			Colour limits (3)			CIL/m² cd/lx/m²			Colour limits (3)			CIL/m² cd/lx/m²			Colour limits (3)		
			Symbol/ Legend	Back- ground	Border	Symbol/ Legend	Back- ground	Border	Symbol/ Legend	Back- ground	Border	Symbol/ Legend	Back- ground	Border	Symbol/ Legend	Back- ground	Border	Symbol/ Legend	Back- ground	Border	Symbol/ Legend	Back- ground	Border	Symbol/ Legend	Back- ground	Border
Regulatory Control	R1	W R W BA W R	40 0	8 40	40 8	WZ2 BAZ1	RZ2 WZ2	WZ2 RZ2	35 0	6 35	35 6	WZ2 BAZ1	RZ3 WZ2	WZ2 RZ3	35 0	6 35	35 6	WZ2 BAZ1	RZ4 WZ2	WZ2 RZ4	30 0	4 30	30 4	WZ2 BAZ1	RZ5 WZ2	WZ2 RZ5
Command	R101	W BU W	40	2	40	WZ2	BUZ2	WZ2	35	2	35	WZ2	BUZ2	WZ2	30	2	30	WZ2	BUZ3	WZ2	30	2	30	WZ2	BUZ3	WZ2
	TR101	BA Y BA	0	30	0	BAZ1	YZ2	BAZ1	0	30	0	BAZ1	YZ2	BAZ2	0	30	0	BAZ1	YZ2	BAZ1	0	30	0	BAZ1	YZ3	BAZ1
Prohibition	R201	BA W R	0	40	8	BAZ1	WZ2	RZ2	0	35	6	BAZ1	WZ3	RZ3	0	30	4	BAZ1	WZ2	RZ4	0	30	4	BAZ1	WZ2	RZ5
	TR201	BA Y R	0	5	8	BAZ1	YZ2	RZ2	0	30	6	BAZ1	YZ2	RZ3	0	30	4	BAZ1	YZ2	RZ4	0	30	4	BAZ1	YZ3	RZ5
Reservation	R301	W BU W	40	2	40	WZ2	BUZ2	WZ2	30	2	30	WZ2	BUZ3	WZ2	30	2	30	WZ2	BUZ3	WZ2	30	2	30	WZ2	BZ3	WZ2
	TR301	BA Y BA	0	30	0	BAZ1	YZ2	BAZ1	0	25	0	BAZ1	YZ3	BAZ1	0	20	0	BAZ1	YZ3	BAZ1	0	20	0	BAZ1	YZ3	BAZ1
Other(4) R401-(R)501-R601		W BU R	40	2	8	WZ2	BUZ2	RZ2	35	2	6	WZ2	BUZ3	RZ3	30	2	4	WZ2	BUZ3	RZ4	30	2	4	WZ2	BUZ3	RZ4
TR401-(TR)501-TR601		BA Y R	0	35	8	BAZ1	YZ2	RZ2	0	25	6	BAZ1	YZ3	RZ3	0	20	4	BAZ1	YZ3	RZ4	0	20	4	BAZ1	YZ3	RZ4
Warning Road Layout	W101	BA W R	0	40	8	BAZ1	WZ2	RZ2	0	40	8	BAZ1	WZ2	RZ3	0	35	6	BAZ1	WZ2	RZ4	0	30	4	BAZ1	WZ2	RZ5
	TW101	BA Y R	0	35	8	BAZ1	YZ2	RZ2	0	35	8	BAZ1	YZ3	RZ3	0	30	6	BAZ1	YZ3	RZ4	0	30	4	BAZ1	YZ3	RZ5
Movement	W201	BA W R	0	40	8	BAZ1	WZ2	RZ2	0	40	8	BAZ1	WZ2	RZ3	0	30	6	BAZ1	WZ2	RZ4	0	30	4	BAZ1	WZ2	RZ5
	TW201	BA Y R	0	35	8	BAZ1	YZ2	RZ2	0	35	8	BAZ1	YZ3	RZ3	0	35	6	BAZ1	YZ3	RZ4	0	30	4	BAZ1	YZ3	RZ5
Symbolic	W301	BA W R	0	40	8	BAZ1	WZ2	RZ2	0	40	8	BAZ1	WZ2	RZ3	0	35	6	BAZ1	WZ2	RZ4	0	30	4	BAZ1	WZ2	RZ5
	TW301	BA Y R	0	35	8	BAZ1	YZ2	RZ2	0	35	8	BAZ1	YZ3	RZ3	0	30	6	BAZ1	YZ3	RZ4	0	30	4	BAZ1	YZ3	RZ5
Hazard Marker	W401	R W —	8	40	—	RZ2	WZ2	—	8	40	—	RZ2	WZ2	—	8	40	—	RZ3	WZ3	—	8	40	—	RZ4	WZ2	—
	TW401	BA Y Y	0	30	30	BAZ1	YZ2	YZ2	0	30	30	BAZ1	YZ3	YZ3	0	30	30	BAZ1	YZ3	YZ3	0	30	30	BAZ1	YZ3	BAZ1
Guidance Location	GL1	BA W BA	0	40	0	BAZ1	WZ2	BAZ1	0	40	0	BAZ1	WZ2	BAZ1	0	30	0	BAZ1	WZ2	BAZ1	0	30	0	BAZ1	WZ2	BAZ1
Route Marker(5)(6)	GE1	Y/W G W	30/40	6	40	YZ2/WZ2	GZ2	WZ2	30/40	4	40	YZ2/WZ2	GZ2	WZ2	30/35	4	35	YZ3/WZ2	GZ3	WZ2	30/30	2	30	YZ3/WZ2	GZ3	WZ2
	TGE1	BA Y BA	0	30	0	BAZ1	YZ2	BAZ1	0	30	0	BAZ1	YZ2	BAZ1	0	30	0	BAZ1	YZ2	BAZ1	0	30	0	BAZ1	YZ2	BAZ1
Direction(5)	GD1	Y/W G W	30/40	6	40	YZ2/WZ2	GZ2	WZ2	30/40	6	40	YZ2/WZ2	GZ2	WZ2	30/35	4	35	YZ3/WZ2	GZ3	WZ2	30/30	2	30	YZ3/WZ2	GZ3	WZ2
	TGD1	BA Y BA	0	30	0	BAZ1	YZ2	BAZ1	0	30	0	BAZ1	YZ2	BAZ1	0	30	0	BAZ1	YZ2	BAZ1	0	30	0	BAZ1	YZ3	BAZ1
Freeway(5)	GA1	Y/W BU W	30/40	2	40	YZ2/WZ2	BUZ2	WZ2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	TGA1	BA Y BA	0	30	0	BAZ1	YZ2	BAZ1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Freeway Overheads		Y/W BU W	80/120	2	120	YZ2/WZ2	BUZ2	WZ2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Tourist Direction	GF1	W B W	40	2	40	WZ2	BZ2	WZ2	40	2	40	WZ2	BZ2	WZ2	35	2	35	WZ2	BZ2	WZ2	30	2	30	WZ2	BZ2	WZ2
Local Direction	GDL1	BA W BU	—	—	—	—	—	—	0	40	2	BAZ1	WZ2•	BUZ2	0	35	2	BAZ1	WZ2	BUZ2	0	30	2	BAZ1	WZ2	BUZ2
Diagrammatic	GS1	BA W R	0	40	8	BAZ1	WZ2	RZ2	0	40	8	BAZ1	WZ2	RZ2	0	35	6	BAZ1	WZ2	RZ3	0	30	4	BAZ1	WZ2	RZ4
	TGS1	BA Y R	0	35	8	BAZ1	YZ2	RZ2	0	35	8	BAZ1	YZ2	RZ2	0	30	6	BAZ1	YZ2	RZ3	0	25	4	BAZ1	YZ2	RZ4

NOTE:

(1) COLOURS: W=White; BA=Black; R=Red; BU=Blue; Y=Yellow; B=Brown.

(2) Colour coding is shown thus - BA Y BA - Symbol/Background/Border.

(3) COLOUR LIMITS: WZ2=White Zone 2; RZ3= Red Zone 3; YZ2 = Yellow Zone 2; BAZ1 = Black Zone 1; BUZ2= Blue Zone 2; GZ2=Green Zone 2.

(4) R401 series shown - (R)501 and R601 should comply with the requirements for the sign series with which they are used.

(5) Y/W corresponds to yellow route marker legend with all other legend in white.

(6) Route Marker (incl. Trailblazer) sign background can also be blue or brown. Use values for Freeway and Tourist Direction signs respectively.

(7) For temporary signs used at roadworks the contrast between yellow and red surfaces should be more than 4:1. For signs using semi-matt backgrounds the value of "retroreflectivity" should be taken to be 0.

TABLE 17.8 GUIDELINES ON MINIMUM ACCEPTABLE CO-EFFICIENTS OF RETROREFLECTION AND COLOUR LIMITS FOR THE REPLACEMENT OF SIGNS ON RURAL ROADS TABLE 17.8

Type of Sign		Colour[1][2]	Type of Street																							
			Freeway Class A						Arterials Class B						Collector-distributor Class C						Residential Class D					
			CIL/m^2 cd/lx/m^2			Colour limits [3]			CIL/m^2 cd/lx/m^2			Colour limits (3)			CIL/m2 cd/lx/m^2			Colour limits (3)			CIL/m2 cd/lx/m^2			Colour limits (3)		
			Symbol/ Legeng	Back-ground	Border	Symbol	Back-ground	Border	Symbol	Back-ground	Border	Symbol	Back-ground	Border	Symbol	Back-ground	Border	Symbol	Back-ground	Border	Symbol	Back-ground	Border	Symbol	Back-ground	Border
Regulatory Control	R1	W R W BA W R	40 0	8 40	40 8	WZ2 BAZ1	RZ2 WZ2	WZ2 RZ2	35 0	6 35	35 6	WZ2 BAZ1	RZ3 WZ2	WZ2 RZ3	35 0	6 35	35 6	WZ2 BAZ1	RZ4 WZ2	WZ2 RZ4	30 30	4 4	30 —	WZ2 BAZ1	RZ5 WZ2	WZ2 RZ5
Command	R101 TR101	W BU W BA Y BA	40 0	2 30	40 0	WZ2 BAZ1	BUZ2 YZ2	WZ2 BAZ1	35 0	2 30	35 0	WZ2 BAZ1	BUZ2 YZ2	WZ2 BAZ2	30 0	2 30	30 0	WZ2 BAZ1	BUZ3 YZ2	WZ2 BAZ1	30 0	2 30	30 0	WZ2 BAZ1	BUZ3 YZ2	WZ2 BAZ1
Prohibition	R201 TR201	BA W R BA Y R	0 0	50 35	10 8	BAZ1 BAZ1	WZ2 YZ2	RZ2 RZ2	0 0	40 35	8 8	BAZ1 BAZ1	WZ3 YZ2	RZ3 RZ3	0 0	35 30	6 6	BAZ1 BAZ1	WZ2 YZ2	RZ4 RZ4	0 0	30 30	4 4	BAZ1 BAZ1	WZ2 YZ3	RZ5 RZ5
Reservation	R301 TR301	W BU W BA Y BA	40 0	2 30	40 0	WZ2 BAZ1	BUZ2 YZ2	WZ2 BAZ1	35 0	2 30	35 0	WZ2 BAZ1	BUZ3 YZ3	WZ2 BAZ1	30 0	2 25	30 0	WZ2 BAZ1	BUZ3 YZ3	WZ2 BAZ1	30 0	2 25	30 0	WZ2 BAZ1	BZ3 YZ3	WZ2 BAZ1
Other[4] R401-(R)501-R601 TR401-(TR)501-TR601		W BU R BA Y R	40 0	2 35	8 8	WZ2 BAZ1	BUZ2 YZ2	RZ2 RZ2	35 0	2 25	6 6	WZ2 BAZ1	BUZ3 YZ3	RZ3 RZ3	30 0	2 20	4 4	WZ2 BAZ1	BUZ3 YZ3	RZ4 RZ4	30 0	2 20	4 4	WZ2 BAZ1	BUZ3 YZ3	RZ4 RZ4
Warning Road Layout	W101 TW101	BA W R BA Y R	0 0	50 35	10 8	BAZ1 BAZ1	WZ2 YZ2	RZ2 RZ2	0 0	50 35	10 8	BAZ1 BAZ1	WZ2 YZ3	RZ3 RZ3	0 0	40 30	8 6	BAZ1 BAZ1	WZ2 YZ3	RZ4 RZ4	0 0	35 30	6 6	BAZ1 BAZ1	WZ2 YZ3	RZ5 RZ5
Movement	W201 TW201	BA W R BA Y R	0 0	50 35	10 8	BAZ1 BAZ1	WZ2 YZ2	RZ2 RZ2	0 0	50 35	10 8	BAZ1 BAZ1	WZ2 YZ3	RZ3 RZ3	0 0	40 30	8 6	BAZ1 BAZ1	WZ2 YZ3	RZ4 RZ4	0 0	35 30	6 6	BAZ1 BAZ1	WZ2 YZ3	RZ5 RZ5
Symbolic	W301 TW301	BA W R BA Y R	0 0	50 35	10 8	BAZ1 BAZ1	WZ2 YZ2	RZ2 RZ2	0 0	50 35	10 8	BAZ1 BAZ1	WZ2 YZ3	RZ3 RZ3	0 0	40 30	8 6	BAZ1 BAZ1	WZ2 YZ3	RZ4 RZ4	0 0	35 30	0 6	BAZ1 BAZ1	WZ2 YZ3	RZ5 RZ5
Hazard Marker	W401 TW401	R W — BA Y Y	10 0	50 35	— 35	RZ2 BAZ1	WZ2 YZ2	— YZ2	10 0	50 35	— 35	RZ2 BAZ1	WZ2 YZ3	— YZ3	10 0	50 35	— 35	RZ3 BAZ1	WZ3 YZ3	— YZ3	10 0	50 35	— 35	RZ4 BAZ1	WZ2 YZ3	— YZ3
Guidance Locaion	GL1	BA W BA	0	50	0	BAZ1	WZ2	BAZ1	0	40	0	BAZ1	WZ2	BAZ1	0	30	0	BAZ1	WZ2	BAZ1	0	30	0	BAZ1	WZ2	BAZ1
Route Marker[5][6]	GE1 TGE1	Y/W G W BA Y BA	35/50 0	7 35	50 0	YZ2/WZ2 BAZ1	GZ2 YZ2	WZ2 BAZ1	30/40 0	6 35	40 0	YZ2/WZ2 BAZ1	GZ2 YZ2	WZ2 BAZ1	30/40 0	6 30	40 0	YZ3/WZ2 BAZ1	GZ3 YZ2	WZ2 BAZ1	30/30 0	4 30	30 0	YZ3/WZ2 BAZ1	GZ3 YZ2	WZ2 BAZ1
Direction[5]	GD1 TGD1	Y/W G W BA Y BA	35/50 0	7 35	50 0	YZ2/WZ2 BAZ1	GZ2 YZ2	WZ2 BAZ1	30/40 0	6 30	40 0	YZ2/WZ2 BAZ1	GZ2 YZ2	WZ2 BAZ1	30/40 0	6 30	40 0	YZ3/WZ2 BAZ1	GZ3 YZ2	WZ2 BAZ1	30/30 0	2 30	30 0	YZ3WZ2 BAZ1	GZ3 YZ3	WZ2 BAZ1
Freeway[5]	GA1 TGA1	Y/W BU W BA Y BA	35/50 0	2 35	50 0	YZ2/WZ2 BAZ1	BUZ2 YZ2	WZ2 BAZ1	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —
Freeway Overheads		Y/W BU W	80/120	2	120	YZ2/WZ2	BUZ2	WZ2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Tourist Direction	GF1	W B W	40	2	40	WZ2	BZ2	WZ2	40	2	40	WZ2	BZ2	WZ2	35	2	35	WZ2	BZ2	WZ2	30	2	30	WZ2	BZ2	WZ2
Diagrammatic	GS1 TGS1	BA W R BA Y R	0 0	50 35	10 8	BAZ1 BAZ1	WZ2 YZ2	RZ2 RZ3	0 0	50 35	10 8	BAZ1 BAZ1	WZ2 YZ2	RZ2 RZ3	0 0	40 35	8 8	BAZ1 BAZ1	WZ2 YZ2	RZ3 RZ3	0 0	30 25	4 4	BAZ1 BAZ1	WZ2 YZ2	RZ4 RZ4

NOTE:

(1) COLOURS: W=White; BA=Black; R=Red; BU=Blue; Y=Yellow; B=Brown.

(2) Colour coding is shown thus - BA Y BA - Symbol/Background/Border.

(3) COLOUR LIMITS: WZ2=White Zone 2; RZ3= Red Zone 3; YZ2 = Yellow Zone 2; BAZ1 = Black Zone 1; BUZ2= Blue Zone 2; GZ2=Green Zone 2.

(4) R401 series shown - (R)501 and R601 should comply with the requirements for the sign series with which they are used.

(5) Y/W corresponds to yellow route marker legend with all other legend in white.

(6) Route Marker (incl. Trailblazer) sign background can also be blue or brown. Use values for Freeway and Tourist Direction signs respectively.

(7) For temporary signs used at roadworks the contrast between yellow and red surfaces should be more than 4:1. For signs using semi-matt backgrounds the value of "retroreflectivity" should be taken to be 0.

17.6 DURABILITY AND ECONOMICS

17.6.1 General

1 Another consideration in the selection of the type of retroreflective sheeting is the relative durability and service life of the different types of sheeting and any economic implications. If a more expensive sheeting has a longer life, it may prove to be economically advantageous to use that sheeting especially if it provides a higher level of reflectivity over the life of the sign. A life-cycle cost analysis using the road authority's experience, will identify any cost benefits.

2 In preparing a life-cycle cost analysis several factors should be taken into consideration:

(a) cost of the sheeting and exchange rates;

(b) cost of the sign in-place, including the substrate material, posts and installation;

(c) cost of signs against total cost of road project;

(d) service life;

(e) benefits.

3 A simple procedure for making the comparative cost analysis is to divide the total cost by the performance life. This can be expressed as:

$$C = \frac{TC}{PL}$$

Where:

C	=	Cost per year of useful life
TC	=	Total cost of material and the sign during the life of the sign
PL	=	Performance life, which can be the service life of the sheeting or the sign or the manufacturer's guarantee

4 Some road authorities believe that cost of the sign in-place should be used rather than just the sheeting cost. These cost elements include the substrate, manufacture, posts and installation expenses.

5 A critical determinant in the economic analysis is the selected performance life. Service lives of the various types of retroreflective sheeting are highly variable and dependent upon environmental conditions. Enclosed material sheeting has a reported maximum service life of 7 - 10 years and encapsulated sheeting is reported to have a 10 - 15 year service life. Instead of using an estimated service life, the manufacturer's performance life guarantee could be used.

6 However, the service life of the sign is as important as the service life of the sheeting itself. In areas of frequent vandalism, signs may have a short life span. Also, a sign may become obsolete because it was installed for a temporary situation or a new standard sign may necessitate its removal.

7 In selecting the appropriate performance life the road authorities should draw on their own experience where possible.

8 Although the economic analysis could be carried out on life-cycle costs alone, benefits derived by using a sheeting that maintains a higher level of reflectivity over its useful life could be included. One way to do this is to include a factor for the average luminance provided over the service life. This could be done by using the following equation:

$$C = \frac{TC}{\frac{L_n \times L_o}{2} \times PL}$$

Where:

C, TC and PL are as defined above

L_n = Luminance (SIA of new material), and

L_o = Luminance (SIA of worn material) at end of useful life.

However, this requires amassing data on the sign reflectivity at the end of the service life or guarantee or warranty period.

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17.7 PRACTICAL CONSIDERATIONS

17.7.1 General

1 Some practical considerations may influence the decision concerning which type sheeting to use. These are:

(a) if the signs are frequently vandalised (i.e. gun shots), which may be the case for a very low volume (i.e. rural locations), the apparent economic benefit of high performance sheeting would not be realised and the decision concerning which type sheeting to use would be based solely on driver requirements without regard to durability;

(b) having to stockpile and possibly manufacture signs using different sheeting may not be efficient.

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17.8 SIGN FABRICATION

17.8.1 Application of Sheeting for Substrates

1 The sign manufacturing process typically starts with applying the blank or background retroreflective sheeting onto a rigid backing, known as the substrate, in one of two ways:

(a) pressure sensitive adhesive; or

(b) heat-activated adhesive.

For many small signs, pre-screened signfaces can be purchased and applied to the substrate.

2 If the pressure-sensitive adhesive is used, the sheeting is applied using either a manually driven squeeze roller or a larger power driven squeeze roller. If heat-activated adhesive is used, the sheeting shall be applied by heat lamp vacuum application method. The material manufacturer's specifications shall be adhered to.

3 One advantage of the pressure-sensitive adhesive method is that it can be applied much faster than the heat activated method. This is of particular concern for manufacturers producing a large volume of signs. However, many small volume sign manufacturers purchase per-screened sign faces for their smaller signs such as STOP, YIELD and warning signs. These are more easily applied using the heat activated vacuum applicator method because the dry adhesive allows for proper positioning of the sign face on the pre-cut substrate. This is particularly advantageous for small guidance signs where individual letters are placed on the sheeting backing.

17.8.2 Application of Legend

1 The sign message or legend, which can consist of letters, numbers or symbols with borders, is applied by one of four methods:

(a) screen process;

(b) direct applied legend;

(c) demountable legend.

2 During the screening method the message and borders are printed on the retroreflective sheeting using either a direct or reverse screen process. In both cases the message and border is photo-stencilled onto a screen film. This screen is set into a frame which is placed over the sheeting. The process colour is then poured over the screen and squeezed over the entire screen.

3 In the direct screen process, the process colour is printed through the message and border portions of the screen onto the sheeting. A typical example of this process is the application of black opaque ink to yellow sheeting for some construction signs. In the reverse screen process the process colour is printed through the background allowing the base sheeting to provide the message. A STOP or YIELD sign is made by the reverse screen process, with red transparent ink applied to white sheeting.

4 With the screening process, the quality of the colour dye or ink is crucial as early failure of the sign can occur when using the wrong ink. Sign manufacturers should follow the sheeting manufacturer's recommendations concerning inks or use a suitable substitute. Purchasers of pre-screened signfaces should obtain certification that the appropriate ink has been used.

5 In the direct application process, the message and borders are cut out of sheeting and this sheeting is placed directly on the background sheeting in the appropriate locations. This legend sheeting is attached by adhesive using either the pressure or vacuum application method. This method could be employed for guidance signs that are mounted at the side of the roadway, and for STREET NAME signs.

6 For alterations to larger side-mounted and overhead guidance signs, the legend is prepared as individual cut-outs of retroreflective sheeting applied to a thin metal substrate and attached to the background sign panel with screws, bolts or rivets.

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17.9 HANDLING, STOCKPILING AND INSTALLATION

17.9.1 Handling and Stockpiling

1 The proper handling and stockpiling of retroreflective sheeting and fabricated signs are important to avoid premature failure. In all cases, follow the instructions and cautions of the manufacturer or suppliers. In general, good practices consist of the following;

(a) rolls of unapplied sheeting should be stored horizontally in the shipping carton or from a rod or pipe in a cool, dry area; unprocessed sheets should be stored flat;

(b) keep all finished signs dry; should signs become wet, dry off immediately;

(c) stack finished signs in racks with separations between faces.

(d) excessive pressure on signfaces can affect the sign's brightness;

(e) outdoor storage is not recommended but if necessary:

(i) place signs upright on edge on blocks to keep them off the ground;

(ii) provide space between signs to allow air circulation and moisture evaporation;

(iii) avoid signface contact with treated wood posts.

(f) when signs are transported for field installation they should be secured vertically in racks to prevent signs from rubbing against one another;

(g) packaging tape on the front of the sign should be avoided.

17.9.2 Sign Installation

1 The effectiveness of a new reflectorised sign can be comprised if not installed correctly. Several aspects of sign installation influence the sign's visibility and effectiveness. These include:

(a) location and position;

(b) longitudinal location along the highway;

(c) lateral clearance;

(d) height above ground;

(e) orientation angle.

Standards and guidelines on these aspects are provided in Volume 1, Chapter 1, Section 6.

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ROAD MARKING MATERIALS

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ORIGINAL AUTHORS

J J Prinsloo
S E Grosskopf
F J J Labuschagne
D Bain

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ROAD MARKING MATERIALS

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CHAPTER 18:
ROAD MARKING MATERIALS

18.1 INTRODUCTION

18.1.1 General

1 Road markings, as we know them, first appeared at the beginning of this century as painted, unbroken, white centre lines to denote dangerous bends and the brows of hills. Today they are used extensively and universally, and come in a variety of configurations and materials. The two major materials are paint and thermoplastic.

2 Road markings, particularly longitudinal markings, play a valuable role in maintaining the continuity of visual information to drivers. The provision of continuous road markings along a road is practical, whereas the provision of continuous visual information by means of road signs is not. Such road markings are thus important to the driving task and in particular the task of vehicle control in terms of the disciplined use of road space (see Volume 1, Chapter 1, Sections 1.7 and 1.8).

3 As with most technologies, the development of road marking materials went through several stages in an endeavour to find the road marking material with the lowest cost which also provides the safest operating environment. In this context, it is necessary to consider road marking materials with:

(a) low initial cost;

(b) good day-time and night-time visibility in dry and wet conditions;

(c) adequate skid resistance;

(d) application methods with minimum traffic interference.

4 The application of road markings is more than a matter of painting lines. It is, In effect, the installation of a traffic regulating system on a highway. As with all other traffic control devices, road markings must be readily recognised and understood, and this goal can only be achieved by using a uniform system of road markings, and only when they are desired and warranted. Motorists should be confronted with the same type and quality of road markings whenever they travel by road, and these road markings should convey exactly the same meaning wherever they are encountered.

18.1.2 Objectives

1 The objectives to be aimed for in providing road markings are:

(a) road safety;

(b) conformity of practice;

(c) good traffic management leading to optimum road capacity;

(d) provision of the correct marking first time.

2 The application of road markings to the road surface, and the subsequent maintenance of them represents an on-going budgetary problem for all road authorities. It is therefore the objective of this chapter (together with Chapter 2: *Road Marking Applications*) to provide sufficient information and guidance to those involved with road markings to create an awareness of the need to ensure the effectiveness of the markings they provide as well as good quality road marking materials.

18.1.3 Coverage of this Chapter

1 Individual road markings and their functions and basic dimensions are detailed in Volume 1, Chapter 7. Detailed dimensions of individual road markings, such as arrows and symbols, previously included in Volume 4, Chapter 12, have been incorporated into Chapter 2 of this volume of the manual to enhance the completeness of that chapter. The specification of road markings and the materials from which they are created is limited. Details of the specifications are given in Chapters 1 and 7 of Volume 1.

2 Typical examples of road marking applications are given in Chapter 2, and concentrate on combinations of road markings, and where appropriate, their dimensional relationship.

3 The major part of this chapter is based on the ARoadway Delineation Practices Handbook@ of the USA Federal Highway Administration. There is little published specific to South African road marking practices and materials, and it remains necessary that on-going attention be given to the development of the local road marking materials and their application.

4 The coverage of this chapter focuses on the following aspects:

(a) drivers needs and delineation characteristics (Section 18.2 and 18.3);

(b) painted markings (Section 18.4);

(c) thermoplastics and other durable markings (Section 18.5):

(d) raised pavement markings (Section 18.6).

18.1.4 SABS Standards

1 A few SABS Standards are applicable to road markings specifically. These standards are listed below for reference purposes and although very important in terms of the application of road marking materials, this chapter does not cover their technicalities:

(a) SANS 731 - 1: 2006 - *Road Marking Paints*:

(i) Types:

- solvent-borne paints;
- water-borne paints;
- skid-resistant paints;
- obliterating paints;

(ii) Retroreflectivity:

(iii) Practical aspects:

- conditions in container;
- storage stability;
- application properties;
- colour and luminance factors;
- drying time;
- skid resistance;

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(iv) Laboratory Aspects

- sagging;
- hiding powers;
- loss;
- resistance to bleeding;
- resistance to artificial weathering;
- resistance to abrasion;
- alkali resistance;

(v) Maintenance Aspects:

- resistance to traffic wear:
  - ~ Wear Index;
  - ~ retroreflectivity;
  - ~ skid resistance;

(vi) Packaging and Working Requirement:

- brand name;
- type of paint (typical application and number);
- colour;
- suitability for drop-on beads;
- drying time classification;
- batch identification;
- directions for use;

(vii) Tender Specifications:

- paint type;
- site description;
- road surface type;
- retroreflectivity requirements;
- drying time classification;
- colour;
- resistance to traffic wear;

(b) SANS 731 - 2: 2006 *Hot-melt Thermoplastics*:

based on BS3262, namely:

(i) Part 1: Materials and Mixtures;

(ii) Part 2: Road Performance;

(iii) Part 3: Application;

- application types:
  - ~ screeded lines (2 mm to 5 mm);
  - ~ sprayed lines (0.8 mm to 1,5 mm);
  - ~ extruded lines (2,5 mm to 3,5 mm);

(c) SANS 1442: 2008 - *Roadstuds*:

(i) Classification:

- A: corner cube reflectors;
- B: biconvex reflectors;
- C: omnidirectional reflectors;

(ii) Physical Attributes:

- construction;
- height;
- colour;
- retroreflectivity;
- resistance requirements to penetration by water, heat fuel, lubricating oil, corrosion.

18.1.5 Road Marking Classification

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.

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 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 the GM7 markings also be applied in yellow. Approved legal road marking styles, patterns, and symbols are illustrated in Chapter 2, Section 2.0.

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.

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

(a) broken longitudinal lines are permissive;

(b) continuous longitudinal lines are restrictive;

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

(d) an increase in the width of a line and/or in the Adensity@ of a broken line, is an indication of increased emphasis in the message given by the marking;

(e) no road marking shall be less than 100 mm in width.

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 (see Chapter 2).

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18.2 DRIVER'S NEEDS AND ROAD MARKING CHARACTERISTICS

18.2.1 General

1 The primary purpose of a roadway delineation system is to provide the visual information needed by the driver to steer a vehicle safely in a variety of situations. The delineation technique used must define the field of safe travel, must be visible in daylight and darkness, and in periods of adverse weather such as rain and fog.

2 There are several key variables that should be considered in determining the most appropriate delineation treatment and technique. These include the geometry of the roadway, the climatic characteristics, traffic volumes and composition, and the type of pavement surface. A brief review of the significant effects of these variables is given in subsequent subsections.

18.2.2 Roadway Geometry

1 Roadway geometry has more effect on the delineation Atreatment@ than on the various delineation techniques. In this context, Atreatment@ refers to such issues as the installation of dividing lines, edge lines, etc, as well as width, spacing, colours etc. ATechniques@ involve the various delineation devices, materials and application procedures.

2 The following geometric situations are the most important:

(a) tangent sections;

(b) horizontal curves;

(c) no overtaking zones;

(d) pavement width transitions;

(e) merging/diverging areas;

(f) turns;

(g) turns with deceleration and/or storage lanes;

(h) STOP approaches;

(i) railway crossings, pedestrian crossings etc.

Each of these situations has a unique set of driver information needs and associated delineation requirements.

18.2.3 Climatic Characteristics

1 The prevailing climate and weather conditions greatly influence the effectiveness of delineation techniques from the standpoint of a driver's visual ability. Durability of materials and installation activities are also influenced by weather.

2 Rain, at any time, reduces the ability of the drivers to visualise their surroundings. At night, glare from the headlights of on-coming vehicles, windscreen wiper action, and the slippery pavement surface coupled with degraded reflectivity of painted markings make the driving task on rainy nights particularly hazardous and difficult. Retroreflective raised pavement roadstuds and post delineators are much more effective than painted markings which lose their reflectivity due to the film of surface water. During daytime rainy periods, the roadstuds do little to improve visibility, but the audible effect of passing over the roadstuds serves to alert the driver to a potential inadvertent encroachment into an adjacent lane.

3 Fog creates an extremely hazardous situation by seriously reducing driver's visual ability. There are no really cost-effective delineation techniques that will provide adequate roadway delineation although experiments overseas with various types of surface highway lighting have been undertaken.

4 Blowing sand, like fog, can seriously reduce driver's visual ability. It can also collect on the roadway and obscure pavement markings. It may damage paint and thermoplastic by the abrasive and sandpaper effect of tyre action on the sand over the marking. Because of the hazards inherent in blind driving through fog or blowing sands, some road authorities close the highway or provide escorts for platoons of vehicles through the affected areas.

5 In addition to the physical presence of rain, snow, fog or blowing sands, weather in terms of extremely hot or cold climates can influence delineation. For example, some materials such as thermoplastics or paint are specially formulated to withstand extreme temperatures. The effects of a freeze-thaw cycle on the pavement surface as well as the delineation materials can induce early failure by weakening the bond with the pavement surface.

6 In summary, the climatic and weather conditions must be considered to determine not only the most appropriate delineation treatment (spacing etc.), but to assure that the delineation techniques and materials are compatible with the site specific conditions. The reduced visibility associated with the effects of weather such as rain, snow, fog, etc, make driving extremely hazardous. Consequently, the safety aspects of providing the best possible guidance to the driver in such situations, transcends the traditional cost effectiveness concerns.

18.2.4 Traffic Characteristics

1 Traffic conditions can effect the choice of delineation treatments and techniques from two stand-points:

(a) traffic volumes;

(b) traffic composition.

2 Traffic volumes are important in that the average annual daily traffic (AADT) is often the major criterion used to select specific types of delineation techniques. For example, high density roadways may be better served by the installation of high durability devices such as roadstuds, hot laid thermoplastic, or epoxy. These will not only provide long-term delineation, but will avoid the necessity of frequent re-marking. Hence the exposure of maintenance crews and traffic disruption can be significantly reduced. Higher initial cost can be balanced against the safety and long-term economic benefits of the more durable materials.

3 Low AADT may indicate that painted markings alone, or in combination with roadstuds or post delineators are adequate and may last one or more years without re-marking. It may be found that markings for very low density roadways can be served by reduced thickness or line width depending on the site characteristics.

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4 Traffic composition can affect the effective life of various delineation materials. Trucks, buses and other heavy equipment constituting the majority of traffic can damage or wear out roadway markings much faster than traffic composed of passenger vehicles. Rural farm-to-market low traffic density roads or industrial access roads, for example, may therefore require heavier or more durable applications than would be indicated strictly on the basis of the AADT.

5 As a general rule, however, AADT is most often correlated with service life as shown in the example in Figure 18.1. Some agencies have developed more complex correlations. For example, the District of Columbia, in USA, uses the number of wheels crossing as an indicator rather than the simple AADT. The reasoning being that traffic abrasion occurs only when the wheels of a vehicle pass over a marking. Edge lines or heavily travelled freeway lane lines may not experience the same wear as lower AADT areas in which crisscrossing or encroachment is more pronounced.

6 A technique used for calculating the life expectancy as a function of traffic flow is based on the following functions and definitions:

(a) wear of road marking materials is a function of the second power of the number of vehicles per lane passing over the materials laid normal to the direction of traffic flow;

(b) **Life Expectancy** is defined as measured by the total number of vehicles per lane that have passed over the marking when it is worn completely from the wheel paths;

(c) **Service Life** is a measure of the number of vehicles per lane that have passed over the material when the marking is no longer serviceable on account of having lost its lustre or its retroreflectivity (night visibility) of having been worn completely from the surface in the wheel paths;

(d) road markings on conventional traffic paint and instant setting materials lost their lustre and beads lose their retroreflectivity to the extent to which they should be renewed when material in the wheel paths has been worn away to half its original area;

(e) thermoplastic markings retain brightness and beads are retroreflective until all of the material in the wheel paths has been worn away from the road surface;

(f) **Cost Effectiveness** is the ratio of the cost per linear metre of marking to the service life expressed in millions of vehicles per lane of traffic.

This technique appears to work well for high density facilities. Whether general or sophisticated correlations are developed depends on the types and functions of the specific site. **The point of emphasis is that the traffic characteristics of a given site can become an important consideration especially in evaluating cost effectiveness of the more durable delineation techniques.**

18.2.5 Effect of Road Surface

1 Variations in type and condition of the pavement determines to a large extent, the durability and visibility of the materials used in road markings. It is therefore appropriate to review the basic characteristics of the two most widely used pavement surfaces. Basically, the road surfaces upon which road markings are applied fall into two general categories:

(a) asphalt; and

(b) concrete.

2 Asphalt denotes a dense graded road surface made of hot mineral aggregates plant-mixed with hot asphalt. The coarse aggregate is generally crushed stone, crushed slag, or crushed gravel to which is added sand, or sand and filler.

3 Another form of asphalt concrete is referred to as Aopen-graded@. In this form, only coarse aggregate is used. When applied as a surface course, it has a high porosity and permeability as well as a rough surface texture. The porous characteristics minimise the potential for hydroplaning by allowing numerous escape channels for water beneath a moving tyre. Of importance to delineation, water ponding on the pavement surface is reduced, thereby minimising the time in which pavement markings are made ineffective as reflective devices.

4 Concrete road surfacing consists of a relatively rich mixture of cement, sand, coarse aggregate and water laid as a single course. When properly designed and constructed, it has a long life and relatively low maintenance requirements. A minimum of five to seven days curing time is required before the pavement is ready for use.

5 As the service life of asphalt pavements is dependent on so many variables (type of aggregate, type of base, traffic density, climate conditions etc) and Aaverage@ life expectancy is of little value. It is, however, a general Arule of thumb@ that concrete pavements outlast asphalt ones by about 2:1. Another major difference is that concrete pavements are much smoother than asphalt pavements and are often Ascored@ or treated to increase skid resistance.

6 The life of the pavement is particularly significant when considering the application of highly desirable delineation treatments. For example, roadstuds or thermoplastic markings, under certain circumstances could out last an aging asphalt surface. The relatively high initial cost of these treatments is justifiable on the basis of durability and longevity. Since imminent resurfacing or reconditioning of asphalt pavements would cancel out one of the major advantages of such long term application techniques, alternate methods should be considered for the interim period.

7 Greater quantities of paint or hot-applied thermoplastic materials are required for the open-graded pavement surface because of its porous nature. It does, however, provide better wet-night visibility. With raised markers, the problem in obtaining a secure bond with the rough surface results in a high percentage of dislodged markers.

8 These properties and characteristics have a profound effect on the performance of various delineation materials and devices. Accordingly, the type and condition of the pavement surface should be carefully considered in the selection of the most appropriate delineation system.

18.2.6 Implications of Variables

1 The ideal form of delineation is that which provides the best overall return as measured by informed driver behaviour, safety, free movement of traffic, and cost. There are various marking and delineation techniques which may be used individually or collectively, as appropriate.

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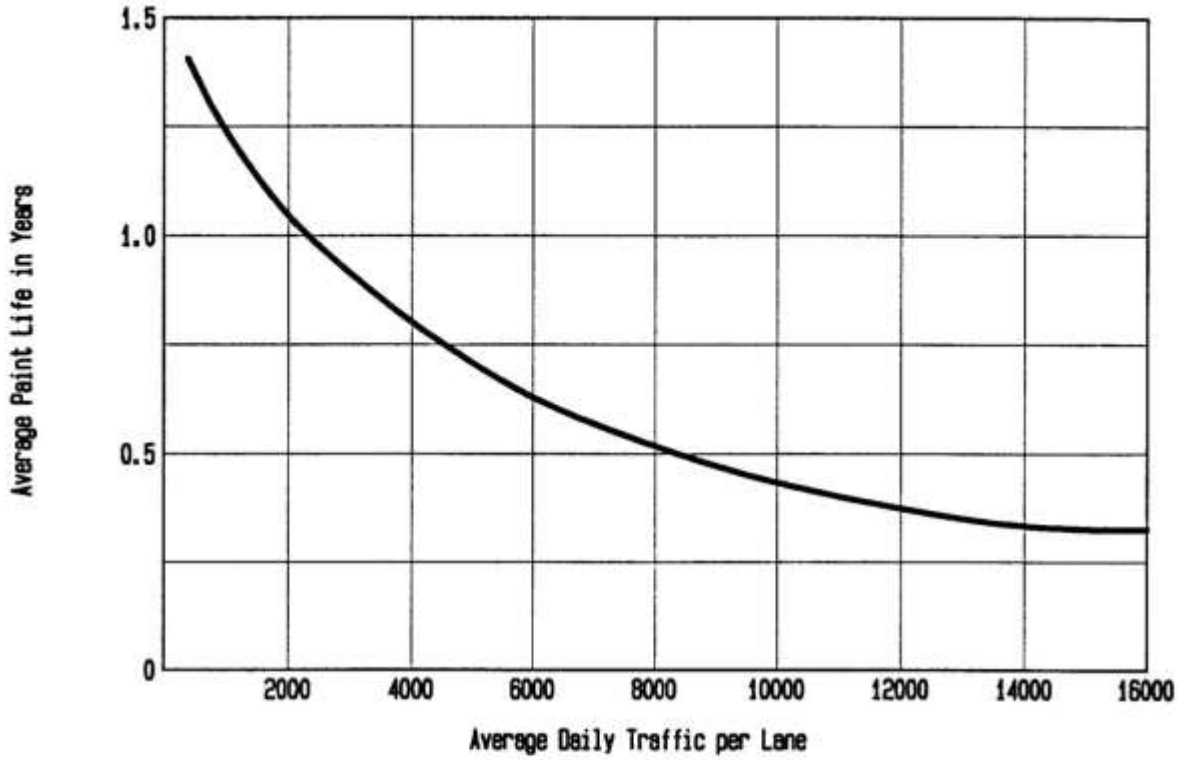
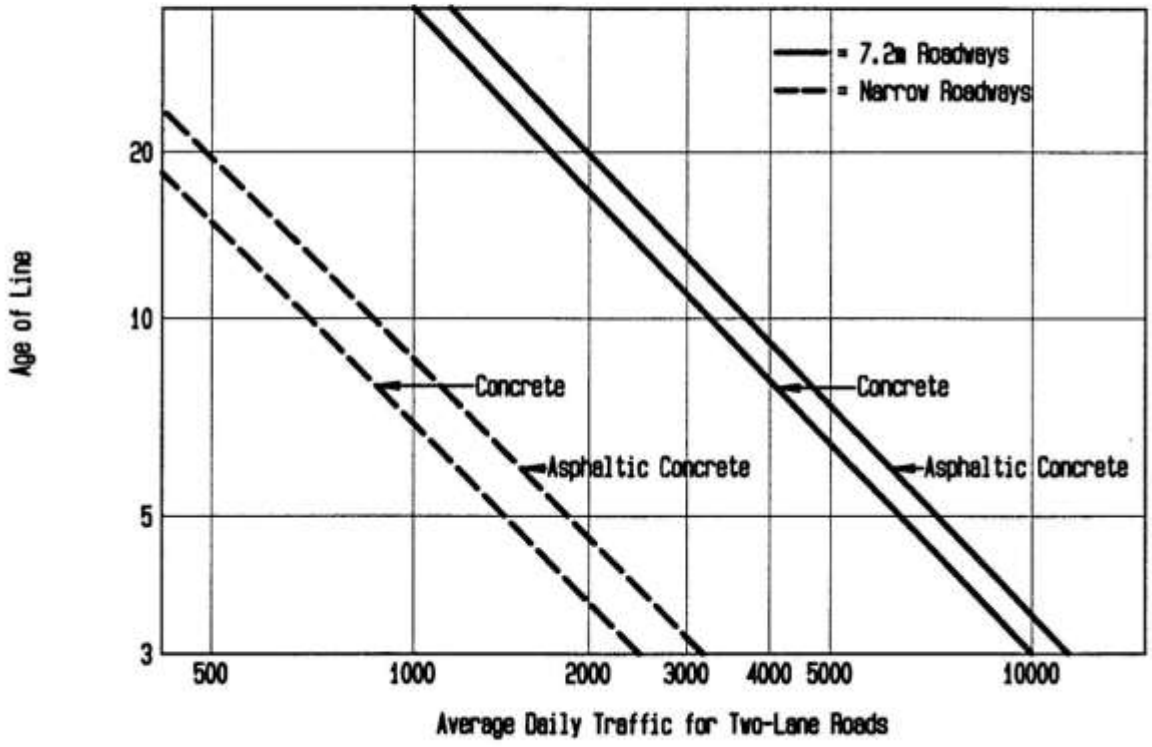


Detail 18.1.1 Paint Marking as Affected by Traffic Density for Both Bituminous and Concrete Pavement



Detail 18.1.2 Conditions for Noticeable Traffic Line Wear (White Traffic Paint Placed at 0.38mm Wet with 0.81kg of Beads per litre)

Fig 18.1 Representative Plots of Service Life v AADT

2 The particular advantages or drawbacks of each of these techniques and their general characteristics are described in the following sections. In order that best use be made of the funds available for marking devices, it is necessary to choose delineation techniques that meet the requirements of a specific site economically and adequately.

3 The selection of delineation techniques and materials purchase is a recurring activity for road authorities. There is no universal configuration that serves all needs equally well. To achieve the best balance among driver requirements, safety aspects, and economic considerations, each of the variables discussed above must be assessed to determine their impact on effectiveness. The following sections seek to place in perspective current practices and rationale used in the decision process.

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18.3 RETROREFLECTIVITY FOR NIGHT VISIBILITY

18.3.1 General

1 According to Volume 1, Chapter 7, A...markings which must be visible at night shall be reflectorised unless ambient illumination assures adequate visibility@. There are so few roads within a road authority's jurisdiction that are typically well illuminated that the trend amongst road authorities is to reflectorise all road markings, with the possible exception of painted kerbs and parking bays.

2 Glass beads are mixed with, or dropped on, the paint, thermoplastic, polyester, and epoxy road markings to provide the necessary reflectivity. The characteristics, typical usage, and the major factors influencing the application of glass beads are discussed in the following subsections. The corner cube reflectivity technique used in raised roadstuds is discussed in Section 18.6.

18.3.2 Reflective Properties of Glass Beads

1 The amount of light reflected by glass beads is a function of three factors, namely:

(a) index of refraction;

(b) bead shape, size and surface characteristics; and

(c) the number of beads present and exposed to light rays.

2 The scientific principle involved in the use of glass beads to reflectorise road markings is based on retroreflection. That is, the light is reflected back to the light source. Typically, the major source of light available during night driving is provided by vehicle headlights. As shown in Figure 18.2, Detail 18.2.1 the light rays from headlight beams shining on an unbeaded (non-retroreflective) road marking is reflected in all directions; thus, only a small portion of the light is reflected back towards the vehicle light source. In the case of a beaded line, much more light is reflected back towards the vehicle light source, and the line is therefore much more visible to the driver.

3 For the beads to refract and redirect light two properties are necessary:

(a) transparency; and

(b) roundness.

Glass beads meat both of these requirements. Early experiments in the use of crushed glass and aluminium or brass beads proved unacceptable because these materials failed to meet the above criteria.

4 The need for transparency and roundness can be explained by examining the path of light as it enters a single bead in a painted line. First, the glass bead must be transparent so that the light can pass through into the sphere. The light beam, as it enters the bead is bent (refracted) downwards by the rounded surface of the bead to a point below where the bead is embedded in the paint. Light striking the back of the paint-coated bead surface is refracted back towards the path of entry much like a mirror (Figure 18.2, Detail 18.2.2). If the paint were not present, the light would continue through the bead and scatter in many directions.

18.3.3 Refractive Index

1 When a headlight beam strikes thousands of these small spherical beads, the visibility of the line is greatly enhanced in terms of brightness. The degree of brightness depends on the Refractive Index (RI) which in turn, is a function of the chemical make-up of the beads. Commonly, beads used in road marking paint have an RI of 1.50. There are beads with an RI of 65, which are used in thermoplastic, and an RI of 1.90 for airport markings.

2 Each glass sphere works like a light-focusing lens and has a definite focal point outside the back of the bead. The closer the focal point is to the back surface of the sphere, the brighter the light return. For example, as shown in Figure 18.3, the 1.5 RI bead has a focal point further behind the back of the bead than the 1.65 RI bead. The focal point of the 1.90 RI bead is very close to the bead's back surface. Consequently, a painted line retroreflectorised with 1.90 RI beads will be brighter than those using 1.65 RI or 1.50 RI beads.

3 The chemical composition of glass beads differs for each reflective index. The 1.50 RI bead is a hard soda lime glass made from crushed scrap window pane glass, called cullet. This glass has a high silica content, which results in a chemically stable glass. Beads made from this glass will remain optically clear when exposed to strong acids, alkalies, moisture and salts for long periods.

4 Both 1.65 RI and 1.90 RI beads are produced from basic raw materials in a glass manufacturing tank. The 1.65 RI has 50% less silica, by weight, and an increase in weight per cent of calcium oxide, and consequently is less acid stable than 1.50 RI beads. The 1.90 RI glass beads have no silica or calcium as part of their formulation. The formulation is proprietary, but the major components, barium and titanium, are very stable so that the 1.90 RI beads are more acid resistant than the 1.65 RI beads.

5 The difference in acid resistance may not seem significant since reflectorised lines would not come into contact with concentrated acids. However, in the normal atmospheric environment, carbon dioxide and water vapour are present, forming a mild carbonic acid.

6 In industrialised areas, sulphur dioxide and moisture in the air combine to form a mild sulphuric acid which is even more corrosive. Thus, the 1.65 RI glass beads are potentially less durable than the 1.50 RI or 1.90 RI beads.

7 Because glass beads are purchased and used by weight, density becomes an important factor. Each RI category of bead has a different density; the higher the RI the higher the density. For example, to obtain the same bead population, the relationship of beads per litre for the three RI categories of bead is:

(a) 1.50 RI - 0,61 kg/litre;

(b) 1.65 RI - 0,74 kg/litre;

(c) 1.90 RI - 1.11 kg/litre.

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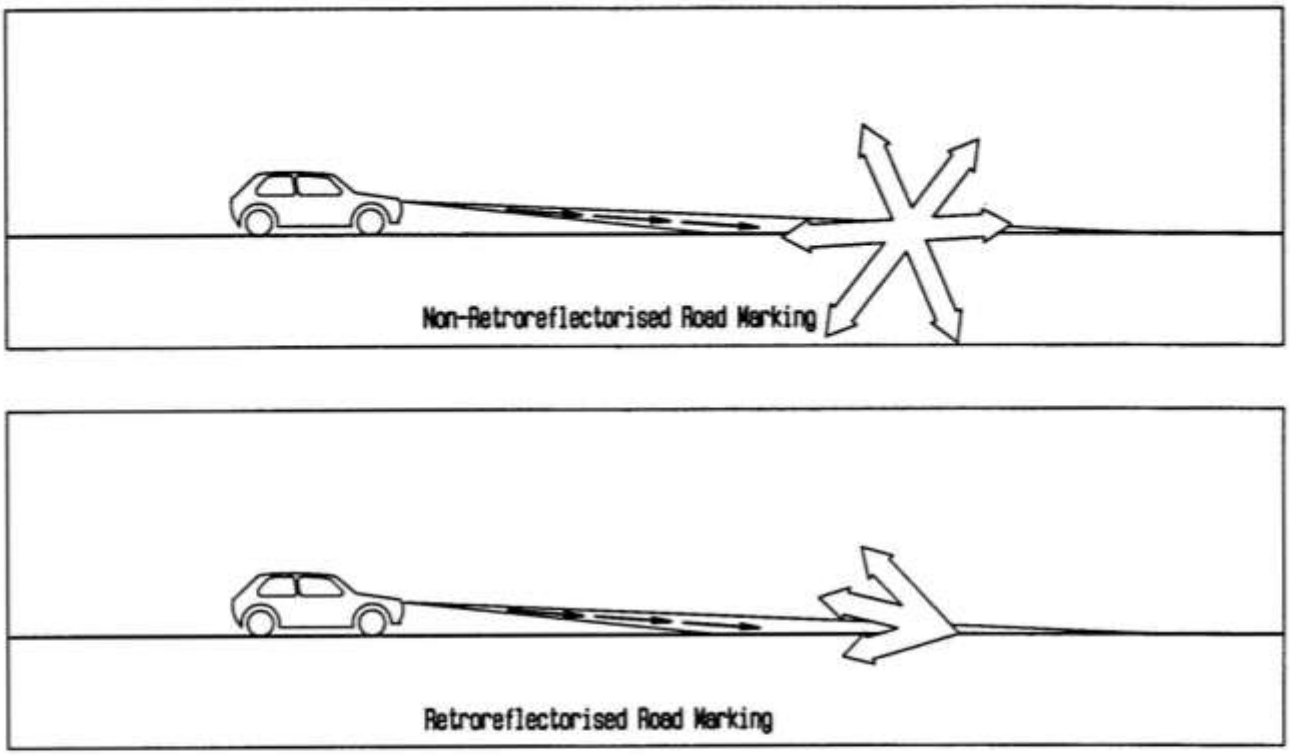
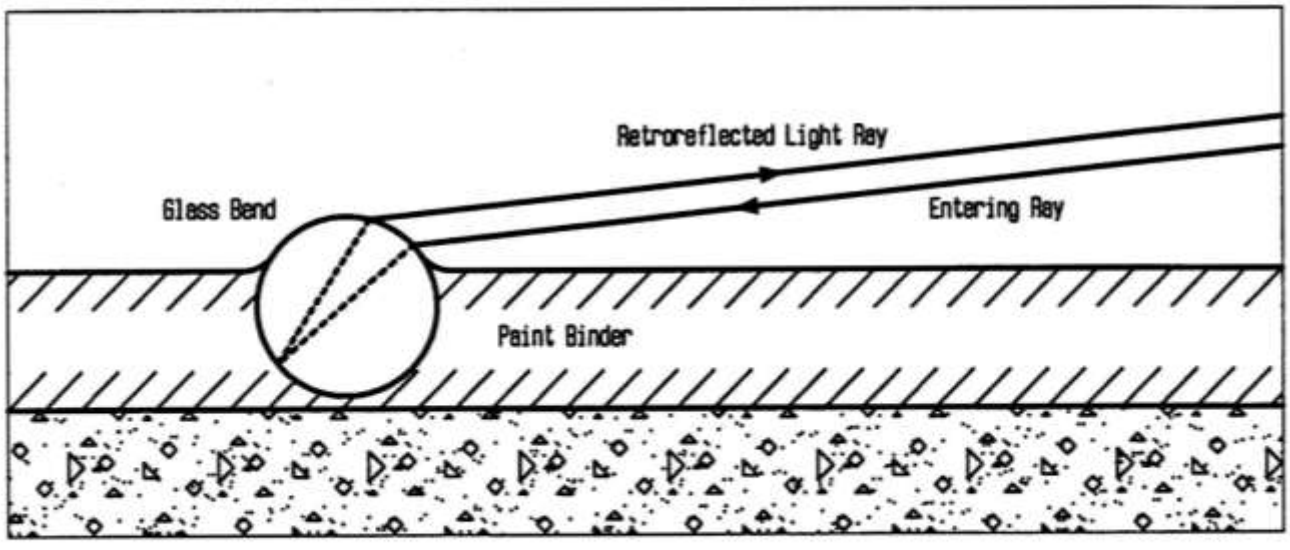


Detail 18.2.1 Light Retroreflection/Reflection Characteristics



Detail 18.2.2 Glass Bead Retroreflection

Fig 18.2 Retroreflection and Reflection

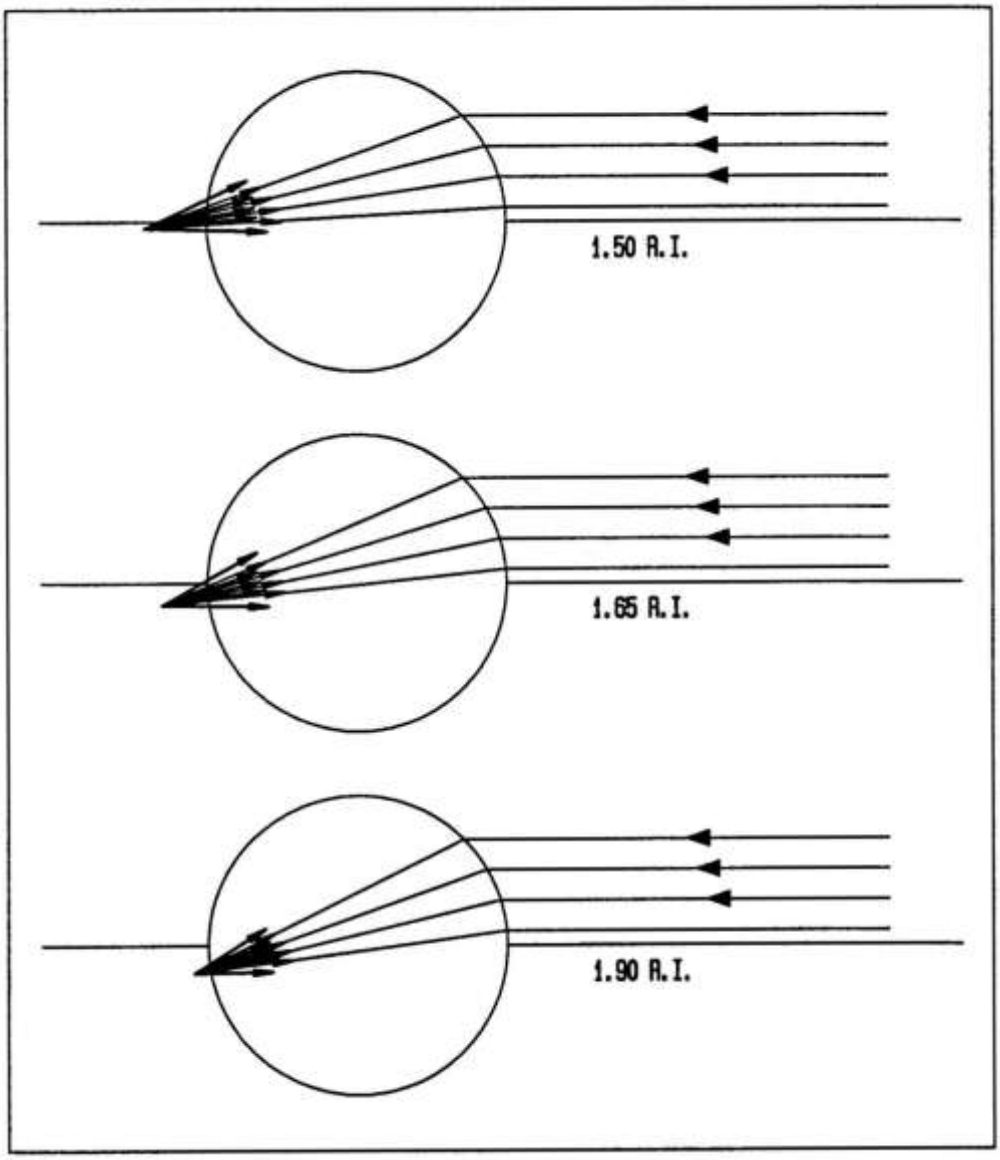


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Fig 18.3 **Focal Point for Commonly Used Glass Beads**

18.3.4 Bead Size or Gradation

1 Glass beads are supplied in a range of sizes from the very small size of about 60 microns to larger sizes of 850 microns. The sizes of beads are usually expressed as a Standard Sieve Number, i.e. the size of a mesh that the bead will just pass through. For example, Standard Sieve 20 will permit all beads with a diameter of 840 microns or less to pass through the mesh. A 200 mesh will only allow beads of 74 microns diameter or less to pass through.

2 The size range or gradation is a variable that has a direct influence on both immediate and long term retroreflectivity. Maximum retroreflectivity occurs when approximately 50% of the bead diameter is embedded in the paint binder. Accordingly, larger beads with a diameter twice the dry paint thickness will provide excellent retroreflectivity as soon as they are dropped in the marking material. Since these beads are only partially anchored in the binder, they will be dislodged by traffic action within a relatively short period. As these larger beads disappear, the smaller spheres become effective as the paint film wears away. Figure 18.4, Detail 18.4.1, illustrates this principle.

3 The theoretical considerations of marking materials and bead size must be adapted to the reality of marking application operations and to the uncertainties of weather and control of materials. In addition, the drying time of the marking material affects the settlement of the beads into the binder.

4 The application rate (e.g. paint thickness), service life of the material, and the amount of beads applied must also be considered. For example, a paint-bead system based on wet paint thickness of 0,38 mm with a relatively long service life and a bead application rate of 0,6 kg/litre would probably call for a wide range of bead gradation. Conversely, for a system based on an 0,28 mm wet thickness and bead application of 0,4 kg/litre that is re-marked frequently, a narrower range of sizes would be indicated.

18.3.5 Flotation Beads

1 In seeking to improve the performance of conventional glass beads, manufacturers have developed a Aflotation@ bead. Flotation beads are standard glass beads treated with a special chemical substance that causes all beads, large and small to float to their diameter in wet paint rather than sinking completely into the paint film (see Figure 18.4, Detail 18.4.2). Since all beads are exposed, a brighter line or marking is obtained.

2 The two major advantages associated with flotation beads involve application and performance. Flotation beads will provide a more consistent level of brightness, regardless of large variations in film thickness, because all beads will float so that half the bead is exposed. With standard beads, a heavy application of paint will submerge a large proportion of the beads, thereby reducing initial brightness.

18.3.6 Application Techniques

1 Road markings can be retroreflectorised in three basic ways:

(a) the beads can be dropped on;

(b) the beads can be pre-mixed in paint or other marking materials before application; or

(c) a proportion of the beads can be dropped on pre-mixed materials.

2 The most commonly used technique is that of spraying (under pressure) or dropping (by gravity) a quantity of beads onto the wet material. The bead nozzle is located immediately behind the paint nozzle or extrusion shoe so that the beads are dropped almost simultaneously with the paint application.

3 One of the often cited problems in the application of drop-on glass beads is that in areas of high humidity, the beads tend to absorb moisture and lose their free flowing characteristics. This is due to the enormous surface area of the beads. When the beads agglomerate, they fall as a mass rather than as individual beads and create clumps on the marking film. It is not uncommon for beads to clog the dispensing equipment which must be cleared before marking can continue. To avoid this problem. Beads can be moisture-proofed by adding small amounts of moisture absorbing powders such as china clay or by coating with proprietary silicone-based material which effectively resists moisture.

18.3.7 Pre-mixed Marking Materials

1 To obtain greater durability and better distribution of beads, fine gradation beads (60 to 200 mesh) can be added to the paint formulation to produce a Aretroreflective@ paint. The initial reflectivity of pre-mix paint is subjected to traffic, the thin coating covering the beads is worn away and retroreflectivity results in improved visibility and this brightness is retained for a significantly long period of time. Initial retroreflectivity can be achieved by dropping coarser gradation beads on the applied pre-mixed material.

18.3.8 Volume of Beads Applied

1 As with the gradation of beads, the rate of beads applied for a given quantity of marking material is a matter of some controversy. It is generally agreed, however, that such factors as the size of beads, the thickness of the binder, the type of bead (flotation or non-flotation), and the service life expectancy of the retroreflective line or marking all exert an undeniable influence on optimum rate of application. Numerous research studies involving both field and laboratory tests have addressed the effect of each of these factors in terms of durability and cost effectiveness.

2 Traditionally, the paint-bead combination most often utilized has ranged from 0,38 mm to 0,43 mm wet paint thickness, with 0,6 kg/litre to 0,8 kg/litre of beads within 20 to 200 mesh sizes. In seeking to provide an equally efficient, but more cost effective retroreflectorised painted line, it has been demonstrated that 0,25 mm to 0,28 mm wet paint thickness, with 0,5 kg/litre of 40 to 80 mesh beads performs quite adequately.

18.3.9 Summary of Glass Bead Usage

1 The use of glass beads to provide night visibility of road markings is intimately related to the characteristics of the marking material (binder) used. The painted markings should be considered as an entity rather than as a combination of independent materials. For example, bead durability is tied in

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with the life expectancy of the binder, which, in the case of paint is relatively short, but is relatively long for thermoplastic and other durable materials.

2 Current research findings, practices, and policies related to selecting the glass bead component of the road marking for typical delineation situations are summarised below:

(a) optical characteristics:

(i) although higher index of refraction beads (RI 1,65 and 1,90) initially retroreflect more light, the difference is hardly visible to the human eye, although it can be measured with a photometer; these beads are also chemically and mechanically more unstable than beads with an RI of 1,50;

(ii) the RI 1,65 and 1,90 beads have a higher density than the RI 1,50 bead; consequently, they must be applied at a higher weight rate to obtain the same bead population;

(iii) for most situations, soda-lime based glass beads, with an RI of 1,50, provide adequate retroreflective properties, are extremely durable, and are more economical than the higher RI beads;

(iv) beads with an RI of 1,65 or higher may be justified in situations requiring increased brightness, especially at long distances; one must consider, however, their inherent chemical and mechanical instabilities compared to beads with an RI of 1,50;

(b) bead gradation:

(i) some evidence suggests that uniform smaller sized beads (40 to 80 mesh) produce a brighter, more durable marking; this is not true in wet conditions;

(c) flotation beads:

(i) flotation beads are preferred by a number of road authorities because of their superior embedment;

(ii) flotation beads are especially effective with a smaller, more uniform bead gradation and paint wet thickness of 0,28 mm ; this may require, however, more frequent re-marking and a lower wet night visibility;

(iii) in the smaller gradations, flotation beads provide more retroreflective surfaces per kilogram than standard beads; consequently, fewer kilograms are required, thus off-setting the additional cost of these specially treated beads at the expense of reduced wet night visibility;

(d) application techniques:

(i) the drop-on application of glass beads is the most widely used technique for combining the beads with the paint film;

(ii) beads pre-mixed in the paint provide poorer initial retroreflectivity but good long term brightness, where no drop-on beads are applied;

(iii) smaller size beads are generally used in pre-mix paint to avoid the bead-settling problem in paint storage and wear and tear on the paint nozzle;

(iv) road authorities using pre-mix paint apply drop-on beads (0,1 or 0.2 kg/litre) to provide immediate retroreflectivity;

(v) moisture proof beads for drop-on applications are frequently specified for areas of high humidity and where beads are stored for long periods of time; moisture-proofing protects the free-flowing properties and provides for a more even dispersion when spray applied;

(e) volume of beads used:

(i) optimum amount of beads to be applied depends on paint thickness, size of beads, expected service life of marking and the type of application and equipment;

(ii) normal application is 0,7 kg/litre but 0,5 kg/litre has been reported to be effective.

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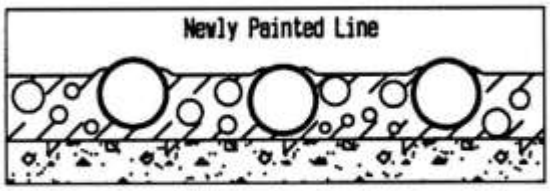
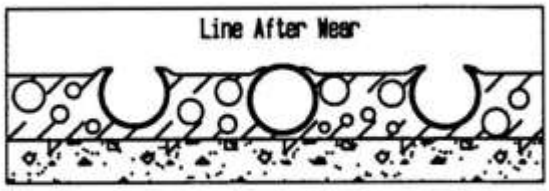
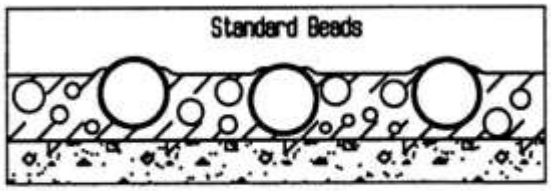
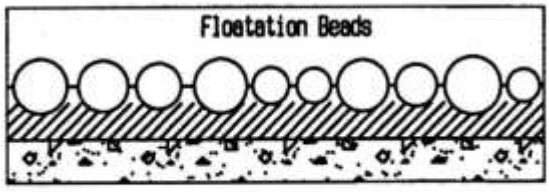




Detail 18.4.1 Effect of Wear on Beaded Painted Line





Detail 18.4.2 Standard and Floatation-Type Beads

Fig 18.4 Retroreflective Beads for Road Markings

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18.4 PAINTED MARKINGS

18.4.1 General

1 The use of painted lines on the road surface to divide the traffic stream and provide guidance to the driver has existed since the dirt roadway gave way to paved surfaces. Today, painted markings used alone or in combination with other devices comprise the most commonly used delineation technique. This section covers the various uses, materials, equipment, and installation procedures associated with painted road markings.

18.4.2 Uses

1 Basically, painted markings can be classified as either transverse markings or longitudinal lines which serve to provide Apositive@ guidance by defining the limits of a driver's field of safe travel (such as lane lines, dividing lines, edge lines or pedestrian crossings, STOP lines etc.). They are also used for Anegative@ guidance, namely to inform the driver where it is not safe (or permitted) to travel (e.g. gore areas, islands painted medians etc.).

2 The specific types of road markings are defined in Volume 1, Chapter 7: *Road Markings*, in terms of standard colour, widths, patterns and meaning or function. Chapter 2 of this volume gives in depth details of a wide range of road marking applications, and particularly how different types of marking may be used in conjunction with each other. Basic delineation concepts are provided here for convenience but the other references should be used for more precise information. (These application standards also govern the installation of other forms of pavement marking such as thermoplastic and raised pavement markers.)

3 Longitudinal lines generally include dividing lines, lane lines and edge lines and shall conform to the standard colours set down in the regulations. Standard colours include yellow, white and red. The use of black paint is permitted in combination with the three standard colours when the pavement surface itself is too light coloured to provide sufficient contrast.

18.4.3 Materials

1 Any discussion of the materials used in painted markings must consider the three interactive elements of the paint system, namely:

(a) the paint itself (pigment and binder);

(b) beads (retroreflecting glass spheres); and

(c) the pavement surface (substrate).

For example, different paints react differently on asphalt and concrete pavements. Glass beads reflect differently depending on the binder and its thickness.

2 Continual improvements have been made in paint composition and application techniques to provide increased cost-effectiveness. There are a number of interacting factors that affect the performance of the various types of traffic paint.

3 The following discussion provides a background for the subsequent discussion of the major factors influencing the selection of the most appropriate paint for a given situation. It includes a review of the categories of paint, essential properties and performance criteria.

18.4.4 Classification of Paint

1 There are several ways of classifying paint. The first basic description involves the retroreflectivity, i.e. whether or not glass beads have been added for night time visibility. ARetroreflective Paint@ contains glass beads of specific size and volume, either inter-mixed, dropped on, or in combination. Paint without beads is generally used for markings not requiring night visibility such as parking bays, certain kerbs, etc.

2 Paint can also be classified by whether it is cold applied or hot applied. The temperature at which paint is applied has a direct relationship to the third area of classification, drying time. Drying time is influenced by the chemical composition, the temperature of the paint and of the pavement during application, wind velocity, and paint thickness. The categories of paint based on drying time are generally defined as follows:

(a) **Conventional**: cold applied paint of normal viscosity requiring over 7 minutes to dry, can require several hours depending on thickness of coat, atmosphere and road condition;

(b) **Fast Dry**: hot applied paint which will dry to no-track conditions within 2 to 7 minutes;

(c) **Quick Dry**: hot applied paint drying to no-track conditions within 30 to 120 seconds;

(d) **Instant Dry**: hot applied, heavily bodied paints which dry within 30 seconds.

3 Finally, paint can be classified according to the type or family of base material used in the paint composition. Some of the commonly used bases include:

(a) oil base (alkyd resin);

(b) rubber base (chlorinated rubber);

(c) oleoresinous (drying oil (dispersion) varnish, modified alkyd);

(d) water base.

18.4.5 Essential Properties of Paint

1 In general there are two basic criteria by which paint performance is judged:

(a) durability; and

(b) visibility.

Durability involves service life of the pained marking as a function of the material remaining on the pavement surface over time. Visibility concerns the brightness of the material, particularly at night.

2 Drying time is also a major performance consideration since the faster drying paints have the following benefits :

(a) they do not require coning off of the area for an extended drying period;

(b) they decrease the exposure of the paint crew to traffic;

(c) they lessen the disruption to traffic.

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3 Other properties that are typically included when specifying traffic paint can be defined in terms of:

(a) Requirements before application:

(i) the paint should be chemically stable with an adequate storage life;

(ii) the paint should maintain a constant viscosity, resist caking, settling, gelling, skinning or colour changes;

(b) Requirements during application:

(i) the paint should be adaptable to application by commercial marking equipment;

(ii) the paint should permit uniform and easy spray application with economical and easy clean-up characteristics;

(iii) the paint should have a strong wetting action to permit penetration of a contaminated substrate (dirt, oil, sand etc.) And thereby provide good adhesion;

(c) Requirements after application:

(i) the paint should not bleed nor discolour on bituminous surfaces;

(ii) the paint should resist chemical action of alkalines characteristic of concrete road surfaces (i.e. Portland Cement Concrete (PCC));

(iii) the paint must withstand the abrasive action of sand and gravel;

(iv) the paint must be flexible enough to expand and contract with day and night temperature changes;

(v) the paint should be tough enough to resist the effects of traffic abrasion;

(vi) the paint should be sunlight and water resistant but sufficiently permeable to allow moisture to escape from the pavement surface.

4 The importance of these requirements and the form of their inclusion in the paint composition specification may vary among road authorities. Some of the site-specific considerations that may influence the essential properties built into a particular paint formulation include:

(a) Pavement surface: certain formulations perform differently on asphalt and concrete surfaces;

(b) Climate and weather: the range of temperatures to be expected during application and during the service life of the paint, as well as climatic conditions (rainfall, snow, blowing sand, extensive sun) create different requirements;

(c) Travel characteristics: the traffic abrasion that a painted line must withstand is a function of AADT, the mix of vehicles (passenger cars, trucks etc.) And the type of marking (that is longitudinal lines last longer than transverse lines, and edge lines last longer than lane line because of fewer cross over traffic movements).

18.4.6 Paint Formulation

1 The major constituents of paint are:

(a) the base vehicle (binder);

(b) pigment;

(c) solvent.

The vehicle is the film former made up of drying oils, resins, or plasticisers in a formula which provides adhesion to the pavement surface and cohesion to hold the paint together. It also provides most of the resistance properties. The pigments give opacity, colour, hardness, and special weathering properties. Optimum pigment volume concentration for good durability lies in the 42% to 59% range. Solvents dissolve the film former, regulate the rate of film setting (drying) by controlling the rate of evaporation. It is also associated with adjusting film solids and with the ease of application.

18.4.7 Performance

1 A great deal of emphasis has been placed on the properties of traffic paint and on developing an optimum paint formulation that will produce increased durability, appearance and visibility. Such emphasis has resulted in a number of paint families that effectively meet specifications.

2 There are three basic reasons for the interest in evaluating the performance of paint. Firstly, it is necessary to assess the cost effectiveness of using painted markings rather than other forms of delineation. Next, if paint is indicated as the appropriate delineation medium, it is necessary to evaluate paint samples to determine the best product to purchase. Ultimately, it is necessary to determine how long a painted marking can be expected to provide adequate delineation so that re-marking operations can be planned and scheduled.

3 Research indicates that the precise composition of paint in use today has a relatively minor impact on the performance of the in-place road markings. It has been suggested that Aa poor plate properly applied will out-perform a good paint improperly applied@. It is also well documented that 90% of all paint failures are due to the type of pavement surface and the condition of the surface.

4 A number of terms are used by various road authorities to describe paint performance. Some of these terms such as Aservice life@, Aexpected life@, Alife-span or useful life@, Apaint failure@, etc., often have different meanings and care should be exercised in using these terms interchangeably. It is difficult to define these descriptors in quantitative terms as subjective judgement is frequently the sole determinant.

5 As mentioned earlier, the determination of service life is used in evaluating painted test lines and in computing the economic aspects of various materials. It is based on appearance, durability, and night visibility of sample materials placed on test sections. Each of these three characteristics is rated numerically on a scale from 0 to 10, where 10 indicates a perfect condition and 0 a complete failure i.e. no appreciable amount of paint remaining.

6 A factor of major significance is that performance is a function of numerous variables, not just the paint itself. That is, the performance of identical materials will vary as a result of:

(a) traffic volumes;

(b) traffic characteristics;

(c) geographic and climatic conditions;

(d) type of pavement surface;

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(e) condition of pavement surface;

(f) method and circumstances of application.

18.4.8 Causes of Failure

1 The integrity of a road marking can suffer from at least three mechanisms, singly or in combination:

(a) loss of substance by abrasive wear on the upper surface;

(b) cohesive failure of the paint (i.e. failure within the paint layer); or

(c) adhesive failure at the interface with the road surface.

Another possible cause of failure, often overlooked, is failure within the concrete or asphalt region immediately below the paint-pavement interface. The stresses causing such failures arise from the reaction of the road surface to the forward forces of vehicles and the forces of the weight of vehicles.

2 Since single stresses apparently do not cause failure, failure may involve fatigue. Factors contributing to loss of strength of the paint, the interface, and the pavement may include temperature and humidity cycling, light radiation damage, chemical attack by salt and/or acids (from nitrogen and sulphur oxides in the air), and physical attack by solvents (including all those in petrol and oil).

3 With so many possible failure mechanisms and cause-and-effects relationships, it is not surprising that there is a great variation in the reported performance of the various types of materials. It is also the reason that abrasion tests have not been completely successful in predicting the useful life of painted markings.

18.4.9 Range of Service Life

1 Although the estimated life of painted markings is a function of numerous site-specific variables, AADT is the most commonly used variable in defining service life. Most road authorities consider a reasonable target to be 6 to 12 months under Anormal@ conditions. Three months service may be acceptable for roadways with very high density traffic, while some paints may last well over a year on roads with low AADT's. It should also be noted that paint wear is especially high in cold weather, therefore painted markings applied in the winter will have a shorter life expectancy than those painted in the spring.

2 In summary, the service life of paint depends primarily on:

(a) traffic density and type;

(b) position of marking (dividing line, edge line, lane lines, transverse markings);

(c) composition of material and pavement surface;

(d) thickness of paint film; and

(e) season of the year when paint is applied.

The position of the marking will determine the amount of traffic that usually passes over the marking. For example, longitudinal lines in general have a longer life that transverse markings and edge lines last longer than lane lines.

3 Some paints are formulated to be more durable than normal, but tend to be more costly. The type and condition of the pavement surface also affect service life. That is paint normally lasts longer on asphalt than on concrete. On average, dividing lines placed on concrete may require re-painting each year, whereas dividing lines painted on asphalt may require re-painting only every two years. It has also been found that paint laid over paint will perform better than on new installations, provided that the base layer of paint is in moderately fair condition on a stable pavement.

4 Thicker paint films on stable pavement surfaces will usually provide increased durability. This is not however, a linear relationship. The additional life of a line thicker than 0,4 mm is nor in direct proportion to the additional thickness used.

5 Because of the great variations in the parameters associated with the service life of paint, each road authority should develop its own estimated service life based on local conditions and experience. An Aaverage@ service life based on a compilation of nationwide experience has little meaning from an operational standpoint.

18.4.10 Application

1 The equipment, procedures and policies involved in the application of the paint have a profound influence on the ultimate performance. This is equally true for all forms of road delineation treatments. Among the major concerns is compatibility of materials and equipment, size and capabilities of crew, protection of crew, and traffic control during the application process.

2 While it may be assumed that the preferred material will dictate the type of equipment, in actual practice, the opposite is usually true. That is, the material used is frequently based on the capabilities of available equipment. For example, it may be determined from laboratory and field tests and from economic analysis that a rapid dry hot-laid paint will provide the necessary durability and is economic from the standpoint of crew safety and traffic disruption. If the road authority's equipment is compatible only with cold-laid paint, most authorities will opt to use the cold-laid materials. Capital expenditure for new equipment for the use of the contractor are often beyond the available budget.

18.4.1 Equipment

1 Painted markings can be applied with a variety of equipment. Selection of the proper equipment will depend on the size of the community, kilometres of roadway, geographic characteristics, pavement surfaces, and the types of markings.

2 Equipment basically falls within two broad categories. The first is a small, self-propelled, manually-controlled low capacity paint marker and the other is the heavy duty, multi-lane truck-mounted unit. The smaller applicator is generally used for marking pedestrian crossings and other transverse markings, symbols, arrows and legends. Commercially developed units may have several unique characteristics. One type may be self-contained including a small engine to propel and operate air-compressors, paint and bean tanks, spray gun, and bead dispenser. In other types, the compressor may be an auxiliary unit with a connecting hose to the spray unit.

3 The larger truck mounted unit is almost always used for longitudinal markings. These units are available commercially or can be customised based on specifications. While the specifications may differ, heavy-duty units typically have the

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following characteristics:

(a) the truck bed must be large enough to carry all of the necessary marking equipment;

(b) the truck should have enough power to maintain speed up grades so that the spray equipment can continue to produce a uniform line marking;

(c) the truck should be protected by special warning lights, or should be preceded and followed by support trucks;

(d) arrow signs should be provided to warn traffic and to direct passing movements;

(e) the front of the truck should be equipped with a device that will enable the driver to follow a target on the roadway (Acat tracks@), or to follow a previously placed line (this device should be retractable so that it can be lifted free of the roadway when the marking operation is discontinued or the device is not in use).

4 Two different methods are used to supply the traffic paint to the spray guns. In one, the paint drums are lifted from the supply truck to the paint truck by a hoist and the paint is then pumped directly from the drums to the paint guns. A valved T in the hose may be used to permit pumping from either of the two drums. In the other method, paint tanks are located on the paint truck. These may be filled from drums or tankers by either mechanical pumps or air pressure. In either method, the paint screens that must be used in the lines must be freely accessible so that they may be cleaned frequently. Additional screens should be located close to the paint spray guns. The hoses that connect fixed parts of the paint spray equipment to the movable parts must be resistant to the cleaning solvent being used and to the solvent used in the paint. The painting truck should be equipped with an accurate speedometer so that the truck speed is known. A volume meter for each paint supply is a valuable addition to monitor the quantity of paint supplied.

5 An air pressure system transports the paint to the spray guns at a pressure determined by the quantity of paint to be delivered. It also supplies air at a lower pressure to an air-jet at the paint nozzle to atomise the paint. Air also moves the glass beads from the bead tank to the gravity-type bead dispensers. (When hot paint is used, the glass beads are pneumatically applied.) Air is again used in the control valves for the paint guns, etc. Some road authorities use an air blast just ahead of the paint gun to blow loose paint chips and other debris from the area being sprayed.

6 The air supply comes from an air compressor driven by a petrol or diesel engine, which is mounted on a skid frame bolted to the truck bed. Controls should be provided so that the engine power matches the load of the compressor. Protective devices are desirable to shut down the engine in the event of a malfunction.

7 The air pressure is also connected to the cleaning system, which consists of a tank of paint solvent that can be connected to the paint lines and nozzles by suitable valves. The lines, nozzles, and screens must be cleaned daily after use. The cleaning solvent is returned to a drum on the painting truck.

8 The paint spray guns and bead dispensers are mounted on carriages underneath the truck bed just behind the rear axle. The carriages can be moved laterally by the spray gun operator. A positive placement of the carriage is required. If edge lining is done at the same time as dividing lining, two carriages are needed.

9 The paint spray guns and bead applicators are synchronised so that the bead applicators start at the appropriate time after the paint spray gun starts. All spray guns and bead applicators are controlled by an intermittent timer containing a timing mechanism driven by a ground contact wheel.

10 Heating the paint prior to application has proved effective in terms of achieving more uniform consistency under changing temperature conditions and in reducing drying time. Low heat (up to about 49^{o}C) can be obtained by using a heat exchanger in the paint supply tank. This uses hot water from the truck radiator or from the compressor radiator. If higher temperatures are required, it is necessary to jacket the paint supply lines and to supply hot water to the jackets.

11 Temperatures above 82^{o}C generally require an external heating system to supply heated liquid (a coolant or special fluid) to the heat exchanger and to the paint lines. Some road marking truck for quick drying heated paint have a compressor located behind the driver and a heat exchanger mounted on the truck bed.

18.4.12 Line Protection and Safety

1 Although heated paints and a few quick drying cold applied paints do not require protection of the freshly applied painted line from traffic, there are still a number of slower drying paint materials that require some form of protection. The type of protection required dictates the size of the crew.

2 The most common form of protection is traffic cones. The road marking truck may be equipped with an apparatus that sets the cones or with a platform at the rear or side of the vehicle to accommodate a crew member who sets the cones manually. In other operations, the cones are placed from a following truck equipped with an illuminated arrow board.

3 For the most part, the cones are placed in the skip protection of the broken line or are offset to the side of, or on alternating sides of, a continuous line. Machines for picking up cones have been developed by some road authorities in the USA. Most road authorities pick up cones manually.

4 On well-travelled roads, some road authorities may use one or more following trucks equipped with arrow boards for directing traffic away from the crew and equipment, and to protect the line from traffic. Extreme care and caution in these situations are required to protect the working crew.

18.4.13 Crew Size

1 The size of the crew depends on the nature of the operation and on road authority policy. If edge lines are applied at the same time as dividing lines and no overtaking lines, two spray gun operators are needed. Thus, considering that the road marking truck has a driver and an assistant, a crew of four is required. A supply truck and operator is also generally required for most operations. If cones are needed, another crew-member is required. The crew foreman co-ordinates the operation and generally follows the road marking truck. The cones must be retrieved by another truck with two or three crew. The trucks supporting the road marking truck are used for the protection of

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the line if cones are not needed, and generally follow at about 150 m intervals.

2 The simplest marking operation requires a crew of about five and two trucks plus the road marking truck. Considerable planning and co-ordination is needed to attain an efficient and low-cost operation. Because the marking operation is often seasonal, it is necessary that the crew should place markings as early in the morning as possible, but not before conditions are suitable. Because of rigid working hours, marking is often started in the morning before the road surface has dried.

3 Good workmanship is often sacrificed because of the constant push for increased production. Short cuts in application are seldom cost-effective. Materials can be wasted, machinery clogged, and the quality of the line jeopardised if proper attention to detail is abandoned in favour of a few added kilometres of marking.

18.4.14 Maintenance

1 In the case of painted markings, maintenance involves repainting when the markings lose their contrast, base film and/or retroreflectivity. The decision to repaint and the scheduling of the activity is usually based on established policy and is a function of the road authority's maintenance superintendent. The availability of materials, equipment, and crews are also important considerations from a maintenance standpoint. Materials must be selected, purchased, and stored. Equipment must be serviced and maintained to assure proper operations and to prevent on-the-road breakdowns. Trained crews must be available and appropriately scheduled.

18.4.15 Scheduling of Re-marking Activities

1 Some road authorities have predetermined schedules which identify sections of the roadway to be periodically re-marked. Such re-marking programmes involving a large number of streets and highways can be computerised to assure a cost-effective allocation of equipment, crew, and materials. When a smaller road length is involved, a manual scheduling process is commonly used. In either case, past experience and road authority policies define which roadways must be re-marked once, twice or three or more times a year.

2 Other road authorities may prefer to schedule re-marking based on night inspection of the various facilities. In some cases, residential streets and other low ADT facilities are scheduled on an Aas needed@ basis.

3 Determining when to replace painted markings is, at best, an inexact science vulnerable to subjective judgement and budgetary expedience. Several road authorities have reported that overtime costs for night inspection cannot be justified, especially since the resulting evaluation is based on the individual's opinion without a precise scientific technique. Local knowledge of traffic and climatic conditions, coupled with experience with the various delineation materials is considered an equally effective technique for scheduling these activities.

4 Another factor that should be considered in scheduling repainting activities is co-ordinated with major improvement programmes and with other maintenance activities. Resurfacing, realignment, or changes in traffic patterns which would require new or repainted markings may render previously scheduled re-marking unnecessary. If these activities are not adequately co-ordinated, significant expense of removing a newly marked line could be incurred. While road authorities hesitate to report such lapses, it is a relatively common occurrence.

5 This is not to suggest that re-marking should be indefinitely postponed because of planned changes or improvements, particularly if the markings are significantly degraded in a hazardous location. The type of paint, the thickness laid, or the use of temporary markings should be carefully considered when changes are anticipated. The option to postpone re-marking must be balanced against the possible cost of removal and the potential safety and legal ramifications should the lack of adequate delineation create an unsafe condition.

18.4.16 Spotting

1 it is generally necessary to spot or cat track the road surface before applying a new road line marking. The customary method of spotting is to use a rope and make spots approximately every 1 m to 2 m. When working in traffic, the workers applying cat tracks must be protected by signs, flagmen and lane closures as required. Another procedure is to mark the pavement with a dribble line using a striping machine. It permits rapid placing of a guide line with a minimum number of control points.

2 Another method frequently used for resurfacing jobs is to place a temporary offset line on the shoulder beyond the paved area before the overlay is placed. After the new surface has been placed, the marking machine then paints the line using the offset line as a guide on the new surface directly over the old line. This method has proved very satisfactory.

3 Where a traffic lane has been obliterated by re-surfacing, re-marking should be in place before the roadway is opened to traffic. The practice of placing heavy cat tracks or dribble lines to serve traffic until the surface has cured and the standard marking can be painted is used by some road authorities, but should be discouraged. However, when cat tracks are used they should not be applied more than 75 mm in width, so that they can be completely covered when the line is painted.

18.4.17 Pre-treatment of the Surface

1 Earlier experience with traffic paints suggested that better adhesion with the pavement might be achieved by some form of pre-treatment. It was fairly well documented that re-painted lines performed better than the initial application on a bare pavement. It was therefore hypothesized that pre-treatment, particularly on concrete surfaces would lengthen the life of the paint.

2 Several forms of pre-treatment have been used without significantly increasing durability. Some states in the USA, however, have followed the practice of applying a light coating of paint without beads as a sealer on the new surface. This first or primer coating, laid at 9,4 l/km to 11,8 l/km dries rapidly and seals the pavement. This eliminates the de-colouration which sometimes occurs from the solvent action of the traffic paint on asphalt pavement, and provides better adhesion on concrete surfaces.

3 One of the major concerns has been that paint is most frequently applied to a dirty road surface. Laboratory tests have indicated that cleaning of the surface prior to application substantially improves adhesion. A field study was undertaken in the USA to assess the effectiveness and economic feasibility

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of various types of surface preparation techniques. The techniques that could be used for this purpose include air-blasting, sand-blasting, grinding, burning, washing (hydro-blasting), acid etching and wire brushing.

4 Of the different methods wire brushing appeared best suited to the subject application. It was easy to use, worked well over irregular surfaces, did not damage the surface, had no logistics or time lapse problems, and removed the road film. The methodology involves a wire brush assembly which is mounted forward of the dividing line spray gun, and is controlled by the same circuit that operates the gun thus activating and de-activating simultaneously.

18.4.18 Removal of Paint Markings

1 Every road authority maintenance facility needs to provide a capability for removing existing markings that no longer define the safe path of travel. The difficulties involved in the removal of markings have been compounded by the increasingly successful effort to improve paint durability and adhesion.

2 Traditionally, methods of removal include grinding, burning, chipping, appropriate chemical treatment, and sand-blasting. Over-painting of markings with black paint and bituminous solutions is no longer appropriate, and is specifically disallowed. This treatment has proved unsatisfactory as the original line eventually reappears as the overlying material wears away under traffic. In addition, lines which have been covered in this way are still visible under certain conditions (i.e. low angles of illumination) due to the preferential reflection from two contrasting surfaces - the painted line and the adjacent road surface.

3 A prime requisite in determining the best method for line removal is that the treatment should have a minimum effect on the roadway surface i.e. it will not materially damage the pavement surface or texture. Chemical treatment may cause damage to the pavement surface, drainage channels or pipes, and is consequently is seldom considered satisfactory. Removal of markings by grinding is not considered totally successful as some remnants of the marking usually remain. Generally, sand-blasting has been the preferred method of treatment.

4 Sand-blasting is particularly effective when the surface is rough and porous. This technique will do little damage to asphalt and the resulting scar will barely be noticeable. Sand deposited on the pavement accumulates and might interfere with drainage, and should therefore be removed. Hydro-blasting has also been used successfully under certain conditions.

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18.5 THERMOPLASTICS AND OTHER DURABLE MARKINGS

18.5.1 General

1 The use of thermoplastic and other highly durable marking materials as an alternative to conventional traffic paint has been under study for over 15 years in the USA and Europe, but there has been limited application in South Africa mainly due to the perception of high cost. The growing popularity of thermoplastic, epoxy, or polyester installation has been attributed to readiness for immediate use, superior durability, and the potential for long term economy and traffic safety. While the initial cost of these highly durable markings can range as high as five to fifteen times the cost of paint markings, their long service life and improved visibility makes an attractive alternative in many situations.

18.5.2 Uses

1 Thermoplastic and other durable markings have the same uses as traffic paint. Specifically, thermoplastic can be used as dividing lines, lane lines, edge lines, pedestrian crossings, stop lines, gore markings, no overtaking lines, parking lines, and on-street regulatory, warning and directional arrows, symbols and legend.

2 Field tests and operating experience have shown that the characteristics of various types of highly durable markings serve some uses better than others. Moreover, as with most delineation techniques, the most effective usage in terms of cost and safety is a function of a particular combination of site-dependent variables. Consequently, the decision whether to use plastic-based markings in a given installation must be weighed-up in terms of the advantages and disadvantages associated with the site characteristics, as well as those of the materials *per se*.

18.5.3 Materials

1 Hot extruded and cold laid thermoplastic materials have been in use for many years and are considered a cost-effective alternative to conventional paint markings when durability is a prime criterion.

18.5.4 Properties of Thermoplastic

1 Hot-laid thermoplastic are generally defined as synthetic resins which can be heated and then harden without changing the inherent properties of the material. The formulation of thermoplastic road markings includes three basic components:

(a) plastic and plasticisers (binder);

(b) pigment and fillers; and

(c) glass spheres.

2 The exact chemical composition varies considerably. Formulae of commercially available materials are proprietary and continually change as the price of chemical components fluctuates. For this reason, composition is usually specified in terms of minimum percentage weight of each basic component.

3 Although the percentage by weight of the components varies from one specification to another, a typical range may be as follows:

(a) binder 15% to 35%;

(b) glass beads 14% to 33%;

(c) titanium dioxide (TiO^2) 8% to 12%;

(d) calcium carbonate 48% to 50%;

(e) other inert filler to 100%.

4 Formulations differ for materials to be applied by the extrusion or hot spray process. They also differ for use in hot or cold climates. For example, one manufacturer supplies an alkyd base (synthetic resin) material for use in areas subject to harsh winter temperatures, and applied by extrusion. A hydrocarbon base (organic compound) material is recommended for applications in areas with warmer climates. Most material suppliers will formulate the thermoplastic compound in response to road authority specifications, although they may recommend some minor variations.

18.5.5 Use and Properties of Cold-Applied Thermoplastics

1 The discussion to this point has centred around hot melt thermoplastic materials. The temperature necessary to achieve a molten state for application requires expensive installation equipment and experienced operators. Cold plastic lining material eliminates this requirement, requires no hardening time, and under certain circumstances exhibits a high level of durability.

2 These materials are most frequently used for pedestrian crossings, stop lines, arrows, symbols and words, and other specialised markings. Some road authorities have also indicated a preference for the cold-applied tape for dividing lines and lane lines in areas of low traffic density. As with the hot-applied thermoplastics, these plastics are reported to perform better on bituminous asphalt surfaces than on concrete surfaces.

3 There are two basic forms of cold-applied plastic materials. The first range of materials are extruded cold flow plastic tape with embedded glass beads, with or without a top surface dressing of beads. This material is generally used in thicknesses of 2,3 mm or 1,5 mm, and is either pre-coated with pressure sensitive adhesive for self-bonding or an adhesive for application to the road surface can be supplied. The second range of materials include preformed plastics that can be somewhat more pliant than the cold extruded type. A top dressing of beads is recommended for areas where immediate retroreflectivity is required. Standard thicknesses of these films are 0,76 mm and 1,5 mm, and they can be supplied pre-coated for self-bonding or can be supplied with a contact adhesive cement.

4 A special type of the preformed plastic has been recently introduced for use as temporary road markings in roadworks zones. The major advantage of this material is easy removability. The markings can be removed intact (or in large pieces) from either asphalt or concrete pavements manually or in a roll-up device without the use of heat, solvents, grinding or sand-blasting.

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18.5.6 Application

1 The various categories of thermoplastic installations require very different application techniques. In selecting the most appropriate thermoplastic materials the application procedure for each category should be carefully considered from the standpoint of the physical requirement to achieve a proper bond, as well as the equipment and manpower requirements.

2 The type of road marking (transverse or longitudinal), type of facility (urban/rural etc.), type of pavement, magnitude of the installation, and other project characteristics will influence the method of application. For example, a small intersection project to install pedestrian crossings or stop lines will differ from a major improvement project in which delineation markings are a line item in the construction contract.

3 In almost all cases, thermoplastic, hot or cold laid, can be applied with small manually operated equipment, or can be applied mechanically with large, fully automated equipment. The exception is the application of cold preformed arrows, symbols or legend, which must be applied by hand. This is however, a relatively simple operation. The major characteristics of the basic application procedure are reviewed in the following subsections.

18.5.7 Application Thickness

1 The matter of application thickness is the subject of some controversy. If durability is a function of thickness, the thicker markings would naturally have a longer life, but would require more materials, and would therefore cost more. It can be argued that this extended life may outlast the retroreflective properties, and in some cases, the roadway surface itself. Therefore, the value of the expected life of six to ten years could be meaningless if the pavement is subject to re-surfacing, or if the bead loss (retroreflectivity) renders the markings ineffective at night.

2 The thicker markings, in the range 2,3 mm to 3,1 mm, provide better wet night visibility when the beads are still in place. In practice, the thicker application continues to be specified so that either the extrusion or spray process can be used. The extrusion process is more compatible to thick applications, especially if 3,1 mm is desired. The spray is best suited to applications of 2,3 mm or less. These lighter coatings have generally performed well and are more cost effective.

3 Proponents of thinner applications, 1,0 mm to 1,8 mm, report acceptable durability and retroreflectivity over a 3 to 4 year life span, with lower material costs and faster application. The average wear of thermoplastic materials as a result of traffic abrasion has been estimated at 0,25 mm loss per year. Thus, a line of 1,0 mm thickness could be expected to survive three to four years. Even these thinner applications provide limited wet night visibility since a moderate surface water film does not cover the marking and therefore does not completely inhibit retroreflectivity.

18.5.8 Installation of Hot Applied Thermoplastics

1 Molten thermoplastic can be extruded or sprayed on the pavement surface by means of a manually operated device for small runs, or by large automated equipment for major construction projects. Typically, 907 kg of thermoplastic materials, supplied in granular or block form, will yield approximately 2110 metres of line with a width of 100 mm and a thickness of 2,3 mm.

18.5.9 Application Equipment

1 The manual applicator usually consists of a melting pot holding a manual mixing paddle to keep the plastics from segregating or scorching, the extrusion spigot and die, and a bead hopper and dispenser. In one design, the machine is equipped with a propane tank and regulator to fuel the burner under the melting pot. Another type of equipment utilizes an auxiliary unit for heating the materials which are then transferred to the dispensing unit. An infra-red burner over the extension die can be used to maintain the temperatures during application. For hot-spray manual application, the road marking unit draws its compressed air supply through a long hose from a small truck mounted machine.

2 Truck or skid mounted thermoplastic road markers are self-contained units consisting of large melters with automatic agitators, heaters, electronic controls, intermittent interconnected timers to control the flow or spray to form continuous or broken lines, materials dispensing unit (extrusion die or spray nozzle), and bead hoppers and bead dispensers.

3 Applications utilizing these large machines are frequently contracted out. The equipment costs can exceed R 1 000 000 and local staff are seldom experienced in the operation of such complex machines.. Some authorities maintain a small mobile unit for maintenance jobs or small installations such as new pedestrian crossings or stop lines. Large installations are either bid separately (for existing pavements) or are included as part of a new construction or re-surfacing contract. There are, however, a number of authorities who prefer to purchase medium sized equipment and carry out their own road marking activities, often with assistance from the materials supplier. Crew sizes range from two men for manual application to up to five for the largest equipment (excluding following vehicles or other protection and traffic control personnel).

18.5.10 Storing and Field-Handling of Materials

1 Hot melt thermoplastic materials are available in block and granular form. These are packaged in cardboard containers or heavy duty bags with weights of from 9 kg to 23 kg. The containers (or bags) should be stacked flat and stored on pallets in a dry place. Water or dampness will not harm the materials, may weaken or otherwise damage the cardboard containers. The manufacturers suggest that cardboard containers should be stacked not more than 13 boxes high. In periods of extremely hot weather, it is suggested that stacks be limited to 10 containers.

2 Dirt residue from the cardboard or the polyethylene liner will contaminate the material. Consequently, care should be exercised to protect the materials so that none of these pollutants are inadvertently loaded into the melting kettle.

18.5.11 Conditioning the Road Surface

1 The operational procedures for the application of hot melt thermoplastic markings is quite similar to the application of paint.

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Where no previous markings exist, the roadway must be marked with guidelines (cat tracks) using the same method as has been described for paint markings (see Subsection 18.4.16). The roadway should be dry with no surface dampness, dew or subsurface wetness. The ambient temperature should be above 10°C or the temperature recommended by the manufacturer.

2 The type and condition of the road surface during installation is a critical factor in ensuring the best possible bond between the thermoplastic film and the roadway. Experience to date, shows that better adhesion, is generally achieved on asphalt surfaces than on concrete. (It has been suggested that the improved bond results from the bituminous surface softening due to the heat emitted from the road marking equipment and the molten material, thus fusing more completely with it.) Preparation of the surface may involve cleaning and/or the application of a primer-sealer to promote adhesion.

3 Although practices amongst road departments differ, most call for applications on dry and clean pavement surfaces. The appropriate degree of dryness is usually a subjective judgment of the engineer in charge. Early morning dampness is suspected as being the cause of early failures.

4 The techniques for removing dirt, old paint, oils etc., to provide the required clean surface include sandblasting, air-blasting, hydro-blasting, brooming, acid etching or grinding. Some authorities report no pre-cleaning requirements for bituminous pavements. The appropriate technique depends on the condition of the surface and whether any residual paint must be removed. Sandblasting and acid etching are usually restricted to concrete. Better adhesion is reported for installations in which the concrete was subjected to light grinding before application.

5 There appears to be clear cut consensus on the pre-treatment by primer or by cleaning of the pavement surface prior to application. There is also little agreement on the optimum application rate of primer. Basically, the relevant factors are the age, porosity, and texture of the pavement as well as the active solid contents of the epoxy solution used. The wet film thickness of primers ranges from 0,3 mm to 0,13 mm, and is normally based on manufacturer's recommendations. Recent studies, however, indicate that 0,5 mm is adequate.

6 The proper handling and application of rapid-dry epoxy primer coatings is necessary for good bonding. For example, evidence suggests that the thermoplastic materials should be applied when the primer is still tacky. Failures have been reported when the primer has been either too dry or too wet. One specification requires that the spray-applied primer should be of a type that remains tacky for at least 10 minutes at 23°C. One form of epoxy (with linseed oil) requires 24 hours of curing time.

7 Similarly, there is little agreement on whether thermoplastic should or should not be applied over paint. There is evidence to suggest that a better bond is achieved on bare pavements. Those road authorities that maintain their own equipment and use their own labour for day-to-day applications appear to have evolved methods compatible to their unique requirements. In some instances, neither concrete nor asphalt surfaces are primed or cleaned despite recommendations from suppliers. Yet the authority will confidently estimate an 8 to 10 year life expectancy based on experience.

8 The documented differences in opinions, procedures, and experiences tend to reinforce the assumption that the performance and life expectancy of thermoplastic markings is directly tied in with a multitude of site-dependant variables. This reinforces the frequently repeated caution that findings, conclusions, and recommendations emerging from research projects be tempered by judgement and local experiences of local personnel.

18.5.12 Installation of Cold-Laid Plastics

1 Cold-laid plastic road markings are supplied in continuous rolls of various lengths and widths for yellow and white markings, and in pre-cut shapes to form standard lengths of arrows and symbols. They are also provided in sheets from which special shapes, forms or letters can be customised.

2 Line markings can be installed by an inlay method or the overlay method, depending on the condition of the pavement. With either of these methods, the markings are ready to receive traffic immediately after installation.

3 The inlay method is used with new construction or re-surfacing of asphalt concrete surfaces. While the asphalt is still warm (at least 54°C) the pressure sensitive, self-bonding tape is positioned in place and is tamped firmly into the asphalt during the final compaction. For longitudinal markings, a tape applicator device is available which follows the breakdown rollers and lays broken lines, double white lines, and continuous yellow edge lines. This applicator is powered by a 12 volt battery with a compressed air cut-off mechanism. The tape, when in position, is securely bonded to the pavement by the finish roller following behind. Pre-cut shapes and letters must be positioned manually before compaction. The rolling tends to bevel the plastic strip into the pavement, thus enhancing the bond and sealing out moisture.

4 The overlay method is employed on existing pavements. Pressure sensitive film works well on good asphalt surfaces. Better bond is achieved on concrete pavement or old asphalt when contact adhesive cement is applied prior to the installation. In such instances, manufacturers may recommend two coats on the pavement and one on the film, particularly for intersection markings subjected to heavy turning movements. The markings can be tamped by simply stepping on them, but most authorities prefer to use a light hand roller to ensure good placement until the continuous tyre pressure of traffic can securely bond the film to the pavement.

5 For construction or maintenance jobs which require temporary delineation of new or altered travel lanes through the work zone, a thinner, self-adhesive tape can be applied directly to the pavement. Two forms of temporary marking tape are available. One form is intended for use in those types of construction projects where removable markings will not be required. The other form is designed for easy removability. Major advantages of the latter type of material are that it is highly retroreflective, it is quickly installed by a two-man crew, and can be removed easily when the construction project changes configuration or is completed, and traffic flow changes to a new or original configuration.

18.5.13 Service Life

1 Although thermoplastic markings have been in use for a number of years, there is little agreement on their service like.

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The longevity and durability of the plastic film, *per se*, has been fairly well established. The problem arises in attempting to establish an expected service life of a particular material as installed on a given roadway. There are too many factors influencing performance to permit an average life to be predicted with any confidence.

2 The remaining thickness and/or the percentage of longitudinal area retained are the most common measures of service life. For example, it is assumed that the line is no longer effective when the thickness falls below 0,25 mm to 0,38 mm. The longitudinal loss of thermoplastic is most often used to determine terminal service life.

18.5.14 Maintenance

1 One of the advantages of thermoplastic markings is its durability. Depending on the material used and the roadway characteristics, thermoplastics can provide virtually maintenance free delineation for a number of years. Some of the maintenance concerns related to thermoplastics are discussed in subsequent subsections.

18.5.15 Staining

1 In very hot climates, thermoplastic markings can become discoloured or badly stained by tyre tracks, particularly on bituminous pavements. This degrades the day-time contrast and visibility. Thermoplastics are, however, somewhat self-cleaning during rainy weather as a result of tyre action on the wet markings. In hot dry areas it may be beneficial to consider cleaning markings with a mild detergent.

18.5.16 Patching

1 The nature of thermoplastic, especially the thicker extruded installations, is such that pieces of the markings can be chipped away if the bond to the pavement is faulty, or if the internal cohesion of the pavement itself is unstable. Almost all of the thermoplastic materials, hot and cold applied, can be patched by placing a thin overlay of compatible material over that portion of the old marking. This is usually accomplished with a manual applicator.

18.5.17 Replacement

1 When the thermoplastic markings are no longer effective and must be replaced for safe operations, it is common practice to renew the lines with overlays of compatible material. This can be treated as a scheduled maintenance activity, a separate project, or as part of a larger improvements programme. Depending on the size of the installation, or road authority policy, the work can be undertaken by road authority staff or can be contracted out.

2 In some cases, thermoplastic markings outlive their retroreflective properties. One road authority in USA has experimented with the overlaying of the thermoplastic with paint and retroreflective beads to obtain night-time visibility. The paint was used as a binder to retain the beads since much of the thermoplastic material was still in place. If the paint adheres to the thermoplastic and if the thermoplastic base is securely bonded to the pavement, this could represent an inexpensive method of upgrading markings with inadequate retroreflectivity. However, there is no available information on the performance of this combination.

18.5.18 Removal

1 Thermoplastic markings are intended for life-long installations. As such, they are relatively difficult to remove. Those properties which enhance durability (thickness, integral bond with pavement) serve as deterrents to easy removal.

2 On either bituminous or concrete surfaces, the removal of a thermoplastic marking will leave some degree of scaring of the pavement surface. The extent of the scar will depend on the method of removal employed. Sand-blasting is frequently used for large removal jobs. One operation features a high-pressure water jet used in conjunction with sand-blasting. This minimises the residual sand left on the pavement and enhances the effects of the sand-blasting

3 The excessive oxygen paint removal equipment described in Section 18.4 has also been used to remove hot-spray applied thermoplastic. In this case, the hot flame melts the plastic which is then removed with a straight spade. Subsequently the residual marking is re-burned and the burned residue is brushed away leaving only a slight indication of where the marking had been. This will disappear with traffic wear.

4 For smaller jobs, an air hammer and chipping blade may be used, although on asphalt surfaces this requires extreme care to prevent inordinate damage to the road surface. To remove an occasional arrow, symbol or legend, a hand hammer and chisel can do a satisfactory job.

5 Because of the long life and inherent difficulty in removing permanent thermoplastic markings, care should be exercised in their application to ensure that changes in marking patterns are kept to a minimum. Road maintenance programmes, future permit work and utility repair programmes should also be considered to avoid installing thermoplastic on a roadway that will be resurfaced during the early life of these markings.

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18.6 RAISED PAVEMENT MARKERS – ROADSTUDS (RPM's)

18.6.1 General

1 The use of glass beads in paint was the first breakthrough in providing low-cost day and night visibility. Unfortunately, these retroreflective painted markings disappear from view when the surface of the roadway becomes wet. This loss of visibility occurs when visibility is most needed - during adverse weather conditions, particularly on rainy or foggy night.

2 During the past several decades, a significant emphasis has been placed on continuing research to develop a durable marking device that could provide both day and night visibility under adverse conditions. Raised pavement markers (RPM's), retroreflective and non-retroreflective, have emerged from this research as highly effective delineation devices.

18.6.2 Uses

1 Essentially, raised pavement markers can be used in place of, or as a supplement to painted road markings, in particular, longitudinal markings. RPM's are covered in Volume 1, Chapter 7, Section 7.5.

2 In effect, the same general principles governing the use of painted markings apply to RPM's in terms of colour, configuration and application. Chapter 2: *Road Marking Applications*, addresses RPM or roadstud application location and patterns.

18.6.3 Functional Applications

1 There are several different types of RPM. The characteristics of the particular categories of RPM are directly related to their functional application. Non-retroreflective markers are used in some installations to completely replace painted longitudinal line markings (dividing and lane lines). Retroreflective markers are most commonly interspersed with painted markings to enhance night-time visibility where there is no overhead lighting. The higher initial cost of a complete raised pavement marker system is justified on the basis of the long service life and increased wet weather visibility. More frequently, road authorities tend to use retroreflective RPM's in conjunction with pained lines for a general improvement in longitudinal delineation. Because RPM's provide increased visibility at night, especially during rainy conditions, retroreflective RPM's are particularly desirable at high hazard locations such as freeway exit ramps, bridge approaches, lane transitions, horizontal curves, and in roadworks environments.

2 There are three basic colours of markers in use:

(a) white;

(b) yellow; and

(c) red.

The white and yellow markers are used alone or in combination with painted lines to convey the same messages as the painted lines. Red retroreflective markers are used to convey the message Awrong way@. Blue markers are being used on an individual basis by some authorities to indicate the presence of fire hydrants/water valves.

18.6.4 Considerations for Application

1 Raised pavement markers have certain advantages over painted markings:

(a) retroreflective RPM's provide increased retroreflectivity under wet weather conditions;

(b) both retroreflective and non-retroreflective RPM's have a durability and life much greater than painted lines; therefore replacement is much less frequent than for paint lines and hazardous re-painting under heavy traffic conditions can often be avoided;

(c) the vehicle vibration and audible tone produced by vehicles when running over or crossing the markers creates a secondary warning;

(d) the capability of providing directional control of retroreflective colour permits their use in conveying Awrong way@ messages;

(e) non-retroreflective RPM's can be used as transverse Arumble strips@.

2 A principle disadvantage of RPM's is the high initial cost. In order to recover the high initial investment and realise the full benefit of the durable long life materials in raised pavement markers, their application tends to be limited to more important roadways, hazardous locations, and roadways having a surface that will not soon be subject to major repair, replacement, or excavation activity.

18.6.5 Materials

1 A number of concepts have been applied to developing a low cost, durable raised pavement marker. A primary goal has been to produce a RPM that will:

(a) provide both day and night visibility at least equal to that of a retroreflective painted line; and

(b) be highly visible under wet night conditions.

2 Commercially available RPM's are quite varied and provide a wide range of capabilities. No one type of marker satisfies all of the capabilities mentioned above. The size, shape, retroreflective properties and materials used are selected to fulfil the widest range of delineation requirements at the lowest cost. While there is a trade-off between higher visibility at higher cost and lower visibility at lower cost, this is not a linear relationship, and RPM's should be selected on the basis of site requirements.

3 In addition to the several types of off-the-shelf markers in general use, there are a number of experimental configurations still under development, and others which have been investigated and abandoned. The following subsections cover highlights of:

(a) the more commonly used markers;

(b) special-use markers; and

(c) markers in the planning stage.

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18.6.6 Physical Characteristics of RPM's

1 The fore-runner of the raised pavement marker was a convex button with glass beads suspended in a flexible polyester resin. Referred to as ABotts Dots@ after the name of the developer, these markers were introduced in California in 1954. These retroreflective markers were cemented to the road surface with an epoxy adhesive, one each in the centre of the 4,5 metre gap in the broken painted Acentre@ line marking.. In theory, these elevated markers Ashed the water@ and were not readily submerged. They were used as auxiliary devices to provide delineation during darkness and wet weather. The service life of the markers was estimated to be 20 years on concrete pavements.

2 A number of variations of this round-headed button have been developed, but the original convex configuration has been maintained. For example, a non-retroreflective ceramic button is used today for day visibility as a low-cost alternative to painted lines. In this case, the buttons should be used in combination with retroreflective markers to provide both day and night visibility. Another variation of the convex configuration in general use is the ceramic button with a glass or plastic retroreflective insert utilising glass beads.

3 The rectangular wedge shaped marker was developed shortly after the ABotts Dot@, around 1955, to improve durability on asphalt surfaces. These early wedges utilised the same concept, that is polyester resin base with glass beads as the retroreflective element. The wedge shed water and extended above the water film usually encountered during wet weather. This configuration also allowed one - and two-way delineation.

4 Subsequent advances in precision moulding technology made possible the application of a trihedral angled mirror retroreflection (corner cube) principle to the wedge shaped marker. In this system, three mirrored surfaces are arranged at a proper angle to receive the light rays from headlights on one of the three mirrors. From there the rays are reflected to a second mirrored surface, and then to a third, and finally outwards on a line parallel the path of entry. These tiny tri-mirrored surfaces are arranged as shown in Figure 18.5 to provide the retroreflective unit for use in RPM's. Approximately 360 retroreflective corner cubes are contained in the face of a marker measuring 91,4 mm by 25,4 mm.

5 Prismatic corner cube retroreflective markers are available in a combination of colours:

(a) silver (white);

(b) yellow; and

(c) red.

They come in one-way and two-way configurations combining any of the three standard colours. Generally, these retroreflective units are encased in a plastic shell. In one version, the retroreflective surface covers the entire sloping face of the wedge. In another version, the face is divided into two retroreflective surfaces bounded by the base material.

6 The basic difference between these two variations involves daytime visibility. The full face retroreflective element, usually encased in a silver grey housing, produces brilliant delineation on both clear and rainy night conditions, but is almost invisible in daylight. The dual element retroreflectors cover a smaller area of the face and are encased in white or yellow plastic thereby being somewhat visible in daylight.

18.6.7 Adhesion Characteristics

1 The service life of any roadway delineation material is a direct function of the bond or adhesion between the delineation material and the road surface. Ideally, the bond strength between the two should be equal to, or greater than, the strength of the pavement itself. The physical strengths of the epoxy resins used today far surpass the internal physical strength of either concrete or asphalt pavements. Since road films, laitance in concrete, and other conditions encountered in the field often interfere with the direct access of the epoxy resin bonding material to the main structure of the pavement surface, it is often necessary to undertake some form of surface preparation to achieve a proper bond.

2 Good adhesion is particularly critical in the use of RPM's as roadway delineation devices. The major factors that impact on good adhesion between the marker and the pavement surface are:

(a) the properties of the bonding agent;

(b) the design of the marker's bonding surface:

(c) the type of pavement;

(d) the temperature: and

(e) the care exercised in application.

3 In general practice, RPM epoxy adhesives are proportioned, mixed and extruded by automatic mixing equipment. Flow properties of the adhesive (i.e. its viscosity) at various temperatures are important not only for the proportioning, mixing and extruding, but also to prevent excessive flow of the extruded adhesive from the marker when placed in position.

4 There are numerous formulations of epoxy bonding agents used to fix RPM's to the pavement surface. These formulations generally fall into two classifications:

(a) **Standard Set** - which may take up to several hours to cure: and

(b) **Rapid Set** - which may be ready to receive traffic in 10 to 15 minutes.

Manufacturers of RPM devices recommend and supply epoxy adhesives compatible to their individual product.

5 There are some forms of RPM's that are pressure sensitive and do not require a special epoxy adhesive. They do require that a primer be applied to the pavement surface and be allowed to dry before placing the marker. The marker is then immediately ready for traffic. This type of RPM is generally used by smaller municipalities and for roadworks zones and detours, and other applications.

6 The adhesion characteristics of RPM devices differ as a function of the base material. That is, ceramic materials do not bond as well as the acrylic shell. For this reason California, USA, specifies that their ceramic markers have a textured surface to increase the bond with the pavement, as follows:

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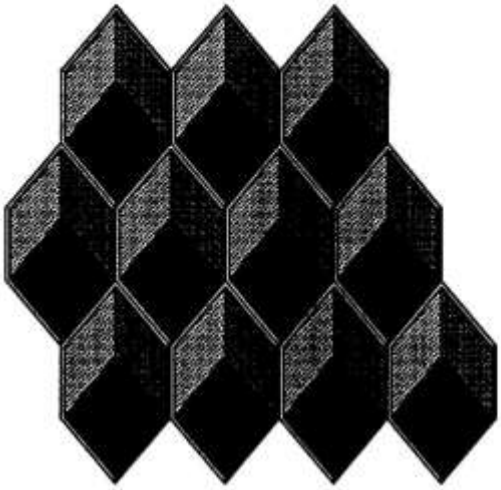
Detail 18.5.1 Light Path for Trihedral Surface (Corner-Cube)



Detail 18.5.2 Structural Arrangement

Detail 18.5.3 Magnified View of Precision Molded Corner-Cube Reflex Elements

Fig 18.5 Principle and Structure of Corner-Cube Retroreflector

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(a) the bottoms of the ceramic markers shall be free from gloss or glaze and shall have a number of integrally formed protrusions approximately 1,27 mm projecting from the surface on a uniform pattern of parallel rows;

(b) each protrusion shall have a flat surface parallel to the bottom of the marker; the area of each parallel face shall be between 65,2 mm^2 and 41,9 mm^2, and the combined areas of these faces shall be between 1419 mm^2 and 2581 mm^2;

(c) the protrusions shall be circular in section;

(d) the number of protrusions should be not less than 50 nor more than 200;

(e) to facilitate forming and mould release, the sides of each protrusion may be tapered; this taper shall not exceed 15^o from the perpendicular to the marker bottom; markers manufactured with protrusions whose diameter is less than 3,8 mm may have an additional taper not exceeding 30^o from the perpendicular to the marker bottom and extending no more than one-half the total height of the protrusion;

(f) the overall height of the marker shall be between 17.2 mm and 20.3 mm.

7 There is some considerable difference in some physical characteristics of asphalt materials made from various crude stocks which still meet specifications for paving asphalt. Some of these properties can be expected to affect the ability of a fresh asphalt or concrete mix to retain raised pavement markers. Consequently, some road authorities may adopt a waiting period before placing markers. Similarly, it is clear that some agents soften asphalt so that good marker retention cannot be expected. The softened asphalt will, however, harden again with time. It is, therefore, recommended that no installation of RPM's be made for one year after the application of a rejuvenating agent.

18.6.8 Temporary Delineation Using RPM's

1 The problem of safely carrying traffic through construction and maintenance zones, especially on high-speed, high-volume roadways, requires that the contractor maintain normal traffic flow and provide positive guidance so that potential accident situations are kept to a minimum. To maintain safe traffic flow, the contractor has several alternatives, depending on the number of factors such as:

(a) normal traffic;

(b) peak traffic;

(c) percentages of trucks;

(d) speed;

(e) geometry;

(f) seasonal aspects;

(g) urgency etc.

2 A system of RPM's is one alternative that will provide effective day and night delineation. RPM's are easy to install and remove, and, after removal, do not leave a misleading indication to confuse drivers. Despite the apparent safety benefits, the relatively high cost of these devices has retarded their use. Accordingly, the Federal Highways Administration, in the USA, conducted a comprehensive study of the use of RPM's for roadworks delineation. Specifically, the objective was to evaluate the costs, spacing, case of application and removal, and the ability of the markers to guide traffic and produce public acceptance.

3 The major findings and recommendations based on the experience in 9 states in USA are that the markers are effective and provide positive day-time and night-time guidance through both wet and dry periods. The additional safety, improved operations, reduced vandalism, and unanimous favour of the public, government and construction personnel justify their expanded use. On an economic basis, the cost of the markers and paint was equal to or less than the cost of paint marking and removal. Most significantly, the study found that the use of retroreflective RPM's on roadworks detours tended to reduce the number of accidents.

18.6.9 Application of Self-Adhesive Markers

1 The Aself-adhesive@ marker with a pressure sensitive butyl backing provides a satisfactory bond with the pavement. These retroreflective devices are well suited to detour-type applications. They are easy to install and maintain since no epoxy formulation or special application equipment is necessary. These markers are far less labour intensive in terms of actual installation time as well as time required for traffic control since they are virtually ready for traffic as soon as they are installed.

2 The Aself-adhesive@ markers have proved to be surprisingly durable under normal traffic conditions. There is no significant difference in the loss rate between markers placed with epoxy and those placed with butyl pads in this type of usage. It should be noted, however, that the butyl padded ceramic marker does not perform as well as the acrylic shell marker. It should also be noted that lower temperatures (below 9.4^oC) seem to reduce the bonding capability of the butyl pads. The basic installation procedure is to mark and sweep the location of the marker. Using a marker-sized cardboard template, an adhesive primer is applied with a paint brush to each pre-marked location. The paper backing is removed from the marker and the marker is placed on the cured primer. A following car then sets the marker by slowly driving over it. An applied mass of 700 kg for 6 seconds is required.

18.6.10 Performance

1 As with other forms of delineation, the performance of RPM's is usually expressed in terms of durability and visibility. The various types of markers provide different forms of visibility. Foe example, non-retroreflective ceramic markers are used to provide day-time visibility and to supplement retroreflective markers in providing night-time visibility. The corner-cube retroreflective marker provides excellent night-time visibility (especially in adverse weather conditions), but is virtually ineffective in daylight. These conventional markers, when combined for day and night visibility, perform exceptionally well.

18.6.11 Conventional Markers

1 The experience of authorities who use RPM's will vary widely, depending on the roadway characteristics and conditions. Findings and observations compiled from experience of these authorities are included below for non-retroreflective ceramic markers and for conventional

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retroreflective RPM's:

(a) raised ceramic markers :

(i) white and yellow ceramic markers may be expected to last in excess of 10 years;

(ii) the ceramic marker system gives good day-time visibility when clean, and when wet it supplements the corner cube retroreflective marker in producing good night-time delineation; alone, the white ceramic marker provides night delineation only in dry weather;

(iii) in hot dry months, considerable road film can accumulate on the ceramic markers and the visual delineation is less than desired in daytime and almost non-existent at night; this condition is usually reversed after periods of wet weather; it can also be controlled in urban environments where mechanical street cleaning in used;

(iv) poor bonding accounts for most marker losses; the use of a textured base creates a better adhesion with the pavement surface;

(b) raised retroreflective markers;

(i) within a few months, the retroreflectivity of the corner cube marker is reduced to 80% to 50% of its original value due to surface abrasion of the retroreflective element; this retroreflectivity however, is adequate and tends to remain fairly constant for the life of the marker ;

(ii) expected service life for retroreflective markers varies from 2 years under severe conditions to up to 8 years on most freeway locations and up to 10 years on rural low density roads.

The high retroreflectivity corner cube lens, even when partially obscured or damaged will still provide some level of retroreflective performance unless the lens face has been completely destroyed.

18.6.12 Installation Procedures

1 Although the installation of RPM's is not a difficult procedure requiring neither special complex equipment nor specialised staff capabilities, new installations are commonly part of a construction or improvement contract. Maintenance (replacement), on the other hand, is usually performed by road authority work crews. General practice and individual procedures related to the various types of markers are covered in following subsections.

18.6.13 General Practice

1 On two-way roads, RPM's should be installed within traffic control conditions like any other operation on the travelled way.

2 Cleaning the surface of concrete and old asphalt pavements should be undertaken prior to the application of the devices. Clean, newly placed asphalt need not be blast cleaned unless the surface contains an abnormal amount of asphalt or the surface is contaminated with dirt, grease, paint, oil, or any other material which would adversely affect the bond of the adhesive.

3 The adhesive should be placed uniformly on the cleaned pavement surface or on the bottom of the marker in a quantity sufficient to result in complete coverage of the area of contact of the marker, with no voids present and with a slight excess after the marker has been pressed into place. The marker should be placed in position and pressure applied until firm contact is made with the pavement.

4 Excess adhesive around the edge of the marker, on the pavement, or on the retroreflective surface of the markers should be removed. A soft rag moistened with mineral spirits or kerosene can be used, if necessary, to remove any excess adhesive. The marker must be protected against traffic impact until the adhesive has hardened. Traffic control and protection of the markers is similar to other road marking operations.

5 Retroreflective markers should be placed so that the retroreflective face of the marker is perpendicular to a line parallel to the roadway centre line. No pavement markers should be placed over longitudinal or transverse joints in the pavement.

6 When the RPM's are used to supplement a continuous painted or thermoplastic road marking they are generally offset 50 mm from the edge of the line. This permits repainting the line without degrading the retroreflective properties of the markers. Some special road marking patterns, commonly those used in high risk potential conflict areas (merges and diverges) may require that the RPM's be located within the road marking. Special attention must then be paid to protecting the RPM's when such lines are being re-marked. For example, when a 300 mm channelising line is used such an arrangement is normally specified.

18.6.14 Using Epoxy Adhesives

1 As described in Subsection 18.6.7, there are numerous formulations of epoxy bonding agents. The proper proportioning, mixing, extruding and handling, are, in general, the most critical parts of the application procedure.

2 Essentially, all two-part epoxies require that the mixing operation and the placement of the marker on the pavement be carried out quickly. Whether hand mixing or machine mixing is used, most standard types of epoxy require that the marker be coated, aligned, and pressed into place within minutes after mixing is started. Consequently, no more than a litre of adhesive should be hand mixed at one time.

3 Rapid set adhesive is usually mixed by a two component automatic mixing and extrusion apparatus. For a typical large scale installation, a crew member is positioned on a platform located low on the side of the truck between the front and rear axles. The mixing and extruding apparatus is installed nearby. A predetermined amount of the mixed epoxy is expelled onto the bottom surface of the marker which the operator then positions on the pavement well within the 40 to 60 seconds allowed.

4 To achieve a proper bond, care should be exercised to ensure that the adhesive is used in accordance with the manufacturer's instructions. For example, some standard set type adhesives require that the pavement and air temperatures be above 10^{o}C. Rapid set can usually be applied at temperatures as low as 1^{o}C. Normally, no marker should be set if the relative humidity is over 80% or if the pavement surface is not dry.

18.6.15 Maintenance

1 The routine maintenance of RPM's is almost always a function of the road authorities maintenance teams. No complex equipment or special crew capabilities are needed for the replacement of conventional RPM's. The only critical element

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involves the proportioning and mixing of two-component epoxy as discussed in Subsection 18.6.14. Contractors will normally install such markers as part of resurfacing or other types of rehabilitation or construction contract that requires the replacement or new installation of RPM's. The following subsection address some RPM maintenance practices and developments that have proved effective or show promise for future use.

18.6.16 Routine Maintenance Levels

1 As in maintenance functions, there are two basic categories of maintenance:

(a) periodic or preventative maintenance (routine); and

(b) immediate or emergency repairs (as-and-when needed).

In the context of delineation, the former is performed to maintain the system at a safe operational level commensurate with established policy or standards. The latter function usually involves returning a hazardous condition to a safe condition shortly after it occurs or is identified.

2 The approach to routine maintenance varies among road authorities. If expected service life is adopted as the primary determinant for routinely scheduling marker replacement, the history of brand name marker performance and the traffic characteristics of individual roadway sections must be known. For example, if experience or field tests have indicated that a particular type of lane line marker can be expected to remain effective for 6 years on long sections of high speed multi-lane freeway, and 3 years in areas of heavy turning movements such as near ramps and merge and diverge areas, then replacements of markers can be scheduled accordingly. This is not always a cost effective procedure even though the practice does not require night inspection. The number of markers that must be replaced, may not warrant he effort, or the marker system may have deteriorated below safe levels.

3 A more commonly used criterion for replacement is based on the number of missing markers that can be tolerated without seriously degrading driver's visibility, particularly under adverse weather conditions. For example, it can be specified that markers should be replaced when 8 or more non-retroreflective markers are missing in a 30 m section, and when 2 or more successive retroreflective markers are missing.

4 The determination of the acceptable level of missing or damaged markers is based on the spacing, pattern, whether painted markings are present, and the roadway geometry. Once the level is specified, inspections must be conducted, usually at night, to identify areas where missing markers exceed the acceptable level. Such night inspections are usually scheduled near the end of the expected service life. In some cases, spot checks are conducted annually prior to the onset of adverse weather cycles. Inspection of roadway markings may also be included as part of regularly scheduled traffic control device inventories.

18.6.17 AAs Needed@ Maintenance

1 This form of immediate maintenance is important from the standpoint of legal responsibility. Although not a frequent occurrence under normal circumstances, care must be exercised to ensure that appropriate delineation in not interrupted by major accidents or natural disasters, which may have damaged or removed RPM's.

2 This type of maintenance is most commonly associated with roadworks zones and unexpected storms. In areas accustomed to heavy seasonal rainfall with the possible coverage of the road surface by mud or gravel inspection and maintenance of the markers after the rainy season is usually considered routine maintenance.

3 When self-adhesive markers are used for temporary delineation on roadways through, or adjacent to, roadworks zones, inspection and maintenance are critical safety considerations. In particular, areas of heavy truck or construction traffic should be carefully monitored and missing markers replaced to ensure that the temporary travelled way is clearly delineated. This is often either a shared responsibility with the contractor, or the sole responsibility of the contractor.

4 Whilst not applicable to all situations, authorities could develop several interesting shortcuts in marker replacement. For example, on some freeways where two successive retroreflective markers are badly damaged another retroreflective marker could be placed immediately in front of the defective marker. This can be achieved quickly since time is not spent removing the damaged marker.

5 Replacement on long sections over several kilometres of freeway is often scheduled for early Saturday or Sunday morning when coning will not be too disruptive to traffic. Whenever possible other site maintenance should be scheduled for the same period, in order to take advantage of the lane closure and other protective measures. The simplest form of operation consists of a crew member walking along-side the epoxy dispensing truck and indicating which markers are to be replaced. The Aapplicator@, who is located in the well of the truck, activates the epoxy dispenser which extrudes a measured quantity of the mixed epoxy onto the bottom of the new marker which is then firmly placed next to the damaged marker or near the location of where a missing marker used to be. A following crew member removes the old marker by hammer and chisel with one or two taps and disposes of it in a hopper in the back of the truck. Cones and following vehicles are used as needed to protect the crew and the markers from traffic. This operation can move at from 2 km/h to 5 km/h depending on the number of markers to be removed and/or replaced.

6 Semi-annual night inspection of sections containing markers nearing the end of their expected service life are conducted by the maintenance engineer and staff to determine the scheduling priority. This type of replacement operation is normally scheduled when 50% or more of the markers are defective or missing.

18.6.18 Cleaning RPM's

1 It has been noted that during hot dry periods, road film, oil, grease and other debris will seriously degrade the retroreflective performance of markers. It is also noted, that tyre marks can stain non-retroreflective ceramic markers to the point that they are no longer visible, either by day or night. Most of the commonly used markers are self-cleaning to some extent when wet. Loss of delineation from staining is not a critical problem in geographic areas that normally experience summer rains. It can become significant in hot dry areas. The cleaning of stained markers is not easily accomplished using any of the more common organic solvents, but can be achieved with a cleanser containing a fine abrasive.

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VARIABLE MESSAGE SIGNS

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CHAPTER 19

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CHAPTER 19:
VARIABLE MESSAGE SIGNS

19.1 INTRODUCTION

19.1.1 Background

1 Developments in the field of electronics over the last few years have been dramatic compared with any similar preceding period. It is evident that we are experiencing an electronic revolution similar to or even greater than the industrial revolution at the turn of the nineteenth century.

2 The provision of information today is a major industry. The more information one has at one's disposal, the better decisions one can take in managing people, a business, a vehicle or a road network.

3 With the ever growing congestion on our roads and the decline in the availability of land, it is becoming more and more important to make maximum use of the existing road network capacity.

4 Variable Message Signs (VMS) provide road authorities with an instrument to supply up-to-date information to the road user making use of all the latest electronic equipment in this field. A variety of types of VMS are available ranging from the simplest folding type sign to the fully remote controllable matrix display type sign.

5 This chapter introduces the concepts, functions and criteria related to VMS and basic warrants for their provision (see also Volume 1, Chapter 9).

19.1.2 Objectives of VMS

1 The introduction of Variable Message Signs should be aimed at achieving one or more of the objectives in the following paragraphs. The primary objective should be to strive for greater safety by:

(a) reducing the risk of primary accidents;

(b) giving advance warning of conditions which may result in traffic queues so that the increased likelihood of secondary accidents is reduced.

2 The next important objective should be to promote the improved utilisation of road capacity and subsequent reduction in congestion by:

(a) preventing bottle-necks by better distribution of traffic;

(b) achieving stable traffic flow conditions.

3 A further objective is to assist road and law enforcement authorities to fulfil their respective duties, with a minimum delay to road traffic, by:

(a) providing the means for rapid and effective action for incident management;

(b) assist in enabling roadworks to be carried out more safely, quickly, efficiently and with minimal disruption to traffic.

4 Provision should be made during the design of the system to collect traffic data by:

(a) facilitating an assessment of the current state of the system;

(b) using the data to assist decision-making for the optimisation of the system;

(c) developing new or revised strategies to be used to improve the system in the future.

5 The achievement of these objectives could be furthered by one or more of the following:

(a) advising road users on speed requirements under adverse conditions (e.g. mist, fog, smoke, wet, accidents);
(b) detection and interpretation of disruptions in traffic flow;
(c) adequate advance warning of road and traffic conditions;
(d) deviation of traffic around incidents or congested road sections;
(e) the design and implementation of a flexible, expandable system able to accommodate technological upgrades.

19.1.3 What is a VMS System?

1 A VMS system is a traffic control aid to relieve congestion, enhance traffic safety, improve mobility and collect and display traffic related information. It consists of a number of building blocks which will be dealt with later in this chapter.

2 The most important building blocks for a VMS system are the following:

(a) variable message display signs;

(b) traffic condition detection system;

(c) a control centre;

(d) a communications network.

19.1.4 Typical Applications of VMS

1 VMS has already been applied in a variety of fields and this list is growing every day. The following are some of the better-known applications which will be discussed in more detail in Subsection 19.3.3 with examples of some of the VMS provided in Section 19.7:

(a) traffic management:

(i) roadway information;

(ii) roadway incident management;

(iii) special events;

(iv) adverse road and weather conditions;

(v) variable speed control;

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(vi) following distance control;

(vii) lane control/ management;

(viii) safety management;

(ix) construction/maintenance management;

(x) ramp metering;

(xi) demand management;

(xii) priority access control;

(xiii) ride sharing control;

(xiv) high occupancy vehicle (HOV) control;

(b) control at crossings:

(i) bridge management;

(ii) tunnel management;

(iii) toll gate management;

(iv) mountain pass management;

(v) weigh bridge control;

(c) other applications:

(i) parking control/management;

(ii) public transport management;

(iii) intelligent vehicle highway systems (IVHS);

(iv) road navigational systems;

(v) park-and-ride.

19.1.5 References

The following documents represent a limited additional reading list. Many have further reference listings.

1 International Commission on Illumination. Variable Message Signs. Technical Report CIE 111 - 1994.

2 Dudek, Conrad L. Guidelines on the Use of Changeable Message Signs. Federal Highway Administration. U.S. Department of Transport. Publication No. FHWA-TS-90-043, July 1991.

3 Service d'Etudes Techniques des Routes et Autoroutes. Panneaux de signalisation à messages variables. Guide technique. Centre de la Sécurité et des Techniques Routières. December 1994.

4 Bundesanstalt für Strassenwesen. Richtlinien für Wechselverkehrszeichen-anlagen an Bundesfernstrassen (RWVA). April 1994.

5 Department of Transport. Optical Performance Functional Specification for Discontinuous Variable Message Signs (Draft 6). Report TR2136. Traffic Control and Communications Division, Department of Transport. United Kingdom. October 1993.

6 Department of Transport. Road Sign Note No. 10 - Variable Message Signs (VMS) - Draft. South Africa.

7 Automobile Association of South Africa. Relief Measures for Urban Traffic Congestion. World Traffic and Safety Foundation Research Report. 1993.

8 Stanway Edwards Associates Inc. Traffic Operations Management System : Masterplan for Johannesburg. Johannesburg City Council. March 1994.

9 McCormick Rankin Consulting Engineers. Technology Evaluation for Changeable Message Signs. Ontario Ministry of Transport. May 1989.

10 Jenkins S.E. Optical and Photometric Standards for Variable Message Signs. Research Report ARR 216. Australian Road Research Board - Vicroads.

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19.10 TESTING AND MEASUREMENT

19.10.1 General

1 A great deal can be done in the design of a variable message sign to ensure optimum performance. It is hoped the guidelines, contained in this report, will ease the design process and ensure that neither time nor money are invested in inappropriate sign designs. However comprehensive the guidelines, it is unlikely that they will be exhaustive and yet be sufficiently flexible to cope with changes in technology and approach. Since variable message signs are a relatively new means of passing information to vehicle drivers, some of the benefits remain uncertain. Hence there is a requirement for testing and evaluating the performance of variable message signs, both prior to and after installation. If the performance and effectiveness of a sign or signing system cannot be measured the value of the sign or system cannot be assessed.

2 Variable message signs may be evaluated both before and after installation employing both subjective and objective measures of performance. Before the sign is installed, a sign might be subjectively assessed by trained observers or by an experimental procedure using typical users or objectively by physical measures of performance. After the sign is in place it's performance might be assessed by evaluating the user's subjective opinion or by observing user behaviour. At least some aspects of manufacture, and of testing and measurement, in particular the physical aspects, are likely to be covered, in time, by SABS standards.

19.10.2 Subjective Measures of Performance

1 Subjective evaluations of sign performance prior to installation can be criticised for inducing bias and for being unscientific. However, such evaluations are convenient to conduct and can indicate some weaknesses in a signs design before further time and money is invested. Such a technique is particularly of value where observers are making relative, rather than absolute, judgements about performance. An appropriate approach might be to erect the sign (including any screens or covers) outside and allow observers to view the sign from a distance towards the limits of the sign's legibility distance. The observers are then asked to make subjective judgements as to the relative performance of the sign in terms of legibility, readability and conspicuity. This method has been used casually, and with some success, within the United Kingdom's Department of Transport for a number of years, and has been found to become more effective as observers gain experience. The approach can be criticised for being both subjective and qualitative. At least some aspects of manufacture, and of testing and measurement, in particular the physical aspects, are likely to be covered, in time, by SABS Standards.

19.10.3 Objective Measures of Performance

1 The use of human observers might be considered to be appropriate in determining sign performance and a suitable experimental method might eliminate the problems of subject bias and the qualitative nature of the data. While the earlier method of evaluation was quite a rapid procedure a carefully designed experiment would naturally require more time and energy. The principle factor of interest in sign design is often legibility distance and this has been measured using a variety of methods. However an appropriate model for measuring the legibility distance of signs might be Forbes' (1939) experimental method for measuring pure legibility. Standardised methods of subject selection and analysis might be used to allow for a direct comparison of results between signs. Other experimental methods would be required to measure other parameters of sign performance such as readability and conspicuity. However, these experiments could also employ driver subjects as was suggested by Forbes (1939). Objective measures of sign performance could also be based on physical measures of various characteristics of the sign.

2 Such measures might have the advantage of being more easily and rapidly made than a measure of actual sign performance. Objective physical measures might then be related to tables of sign performance to estimate how a sign might perform in a real driving situation.

3 The luminance, and thence the contrast of reflecting variable messages signs, can be measured directly. The measurement of luminance for emitting variable message signs, however, is complicated by the need to average the luminous intensity of individual elements over the area of the characters or message. Padmos *et al* (1988) determine the luminance of the message by means of the formula below:

$$L_{mes} = \frac{I_{mes}}{A} = \frac{I_{pix}}{d^2}$$ Formula - ❶

where:

L_{mes} is the luminance of the message, in cd m^{-2};

I_{mes} is the light intensity of the message, in cd;

A is the area of the message, in m^2;

I_{pix} is the light intensity of pixel, in cd;

d is the square root of the product of the vertical and horizontal separation between the elements.

4 Implicit in the equation is an allowance for irradiance around the message of d/2. Padmos *et al* use message luminance as their basic physical measure. Colomb and Hubert (1991) point out that contrast perhaps approximates the human visual response more effectively and provide a formula for sign contrast which is given below:

$$C = UL_F = \frac{(L_i + L_F)}{L_F}$$ Formula - ❷

where:

C is the contrast ratio;

L is the luminance of the character, in cd m^{-2};

L_F is the background luminance, , in cd m^{-2};

Li is (Ip x 35)/S which is the internal luminance of the sign, in cd m^{-2};

Ip is the intensity per element and S is the area of the 35 element matrix.

The calculation makes no allowance for irradiance in the calculation of area S.

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5 Some technologies, such as liquid crystal displays, when Aoff@ still emit some light which will apparently reduce contrast. Therefore caution is required when using physical measures so that it should be ensured that the human performance is still adequate.

19.10.4 Actual Performance

1 Determining actual performance once a sign has been installed might seem to be too late but it would allow for remedial action to be taken and to gain further insight into the placement and use of variable message signs. If the objective of a variable message sign is to divert a certain proportion of the traffic the number of vehicles diverted by the use of particular messages could be logged via, for example, a traffic control system.

19.10.5 Evaluation and Testing of Optical Characteristics

1 Variable message signs designed for use on public roads can be subjected to a number of tests to establish their suitability for the environment in which they are being used. It is anticipated that most countries will be able to determine the environmental testing but may not have sufficient knowledge of the variable message sign technologies, or the way they are used, to make a meaningful assessment of how to test the optical characteristics of the sign.

2 The following subsections are included to give some guidance on the testing issues. The contents will enable a purchaser to define some basic testing which is relevant to the application of the technology being used. It is anticipated that as the technologies become more refined and we gather more experience in the method of testing variable message signs, the guidance given will be improved. It is, therefore, very important that anyone using the information contained in this document ensure that it is reviewed periodically and, if necessary, updated to reflect the level of testing appropriate for the day. Feedback on specific experience is therefore welcomed.

19.10.6 Test Modules

1 Variable message signs can in many instances be extremely large. It is therefore, not generally possible to perform laboratory tests on such signs. It is suggested that the manufacturers should submit for evaluation a suitable test module(s) which is fully representative of the production unit. For optical testing control equipment may be external in order to make the modules less bulky. It may be necessary to test more than one module.

19.10.7 General Optical Test Requirements

1 The optical tests shall be conducted by a skilled photometrist at an optical test house having been accredited under an agreed accreditation scheme, or alternatively undertaken by a test house which can demonstrate the traceability of its optical standards to National Calibration Standards. Measurement equipment shall be within the calibrated period stated for that equipment and adequate precautions shall be taken to eliminate the effects of stray light from all other sources when conducting light and colour measurements. The module under test shall be complete in respect of the fitment of all optical components, which include all screens, louvres and hoods where these are employed. All components of the optical system shall be in their correct physical position and orientation. Material surfaces shall be finished to the standards that will be achieved within the production equipment. It should be emphasized to the suppliers that measurements can only achieve a meaningful result if all optical components are fitted and assembled in the correct position.

2 It is suggested that each type of sign submitted for testing should contain a minimum of one hundred elements or three complete matrixes. Tests can then be carried out on each sign type and colour. Test modules may be provided which cause problems in fitting to the optical equipment in the normal vertical position. Signs may therefore, be inverted or be operated on their side, subject to the recommendations of the supplier. In these cases consideration should be given to the correct optical orientation of components and services with that of the test and measurement equipment to ensure a representative assessment. Some optical assemblies must be suitably aged so that their electrical and optical characteristics are stable at the time of testing. This is considered satisfactory when two measurements of luminous intensity being made at an interval of fifteen minutes in a given direction do not differ by more than plus or minus 3%. The measurement of any retroreflective components must not be undertaken until the luminous source has been in operation for a sufficient period of time so as to be stabilised.

19.10.8 Luminance Ratio Measurement - General

1 The measurement configuration of the sign, solar simulator source and the photometer shall be arranged in accordance with that shown in Figure 19.26.

2 The solar simulator shall have a spectral content close to that of natural daylight and a colour temperature of at least 5 000 K. The solar simulator source, in conjunction with optical attenuation device, shall be capable of achieving a level of illuminance up to 40 000 lux, which shall be uniform (10%) over the area of measurement. Or if a solar simulator is not capable of 40 000 lux its effect may be calculated. The test module must be fitted with a control mechanism which will simulate the dimming control. It is recommended that full instructions shall be provided by the supplier to enable the module to be tested at the correct level for the luminance ratio tests.

19.10. Luminance Ratio Measurement – Test Area

1 It is recommended that the test area shall meet criteria given below:

(a) consist at minimum of a 5 by 5 matrix of elements (see Figure 19.27 - Detail 19.27.1);

(b) if a square which has just enclosed a 5 by 5 matrix of elements would have a side of less than 100 millimetres then the test matrix shall include further elements, of the same type and pitch, to fill a square of side equal to, or greater than 100 millimetres (see Figure 19.27 - Detail 19.27.2);

(c) matrix elements may consist of more than one light emitter;

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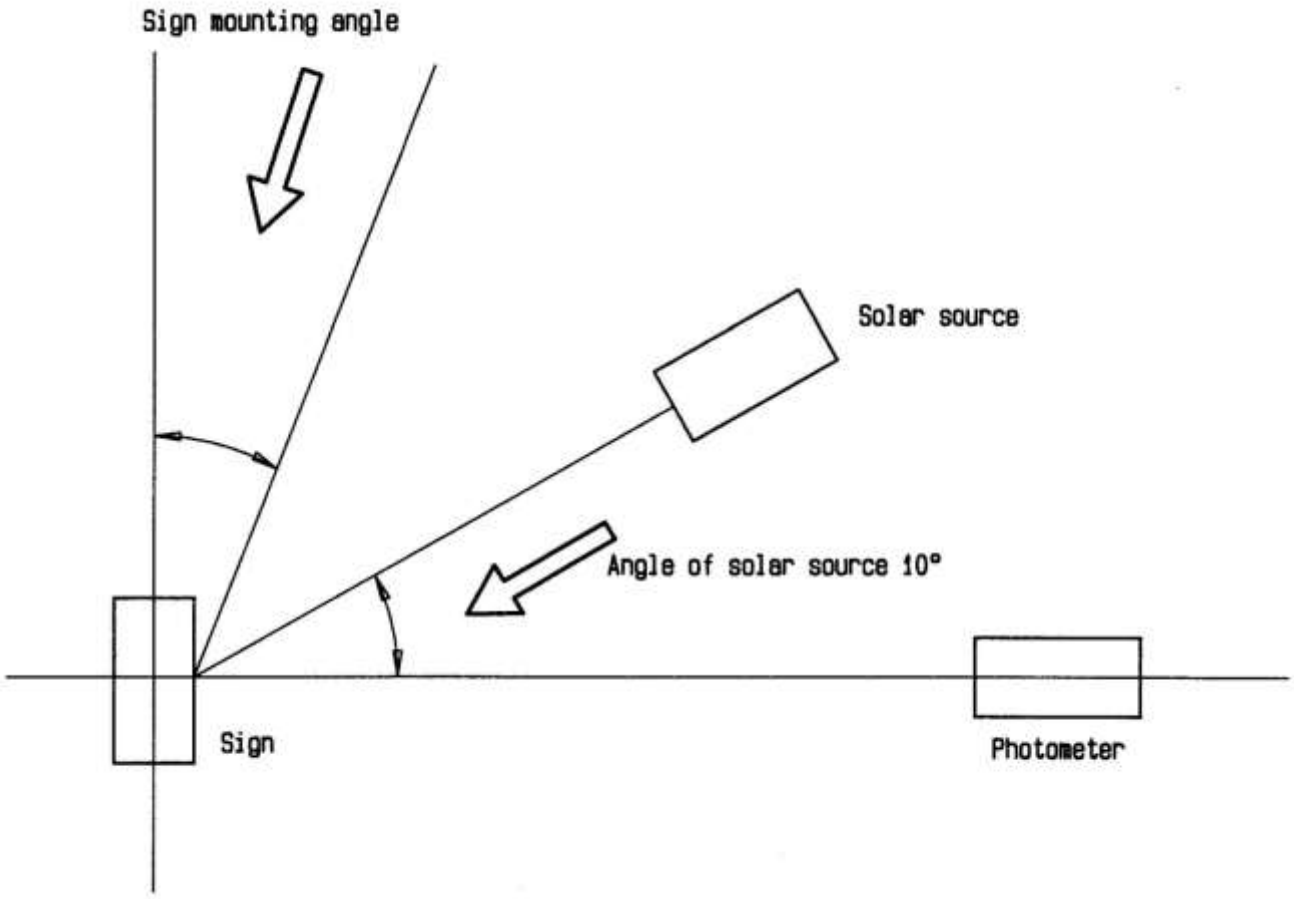

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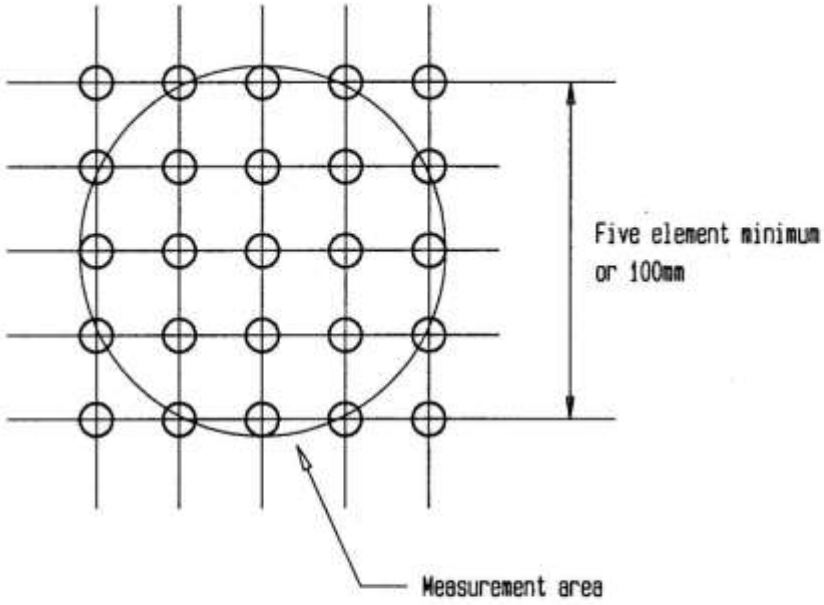
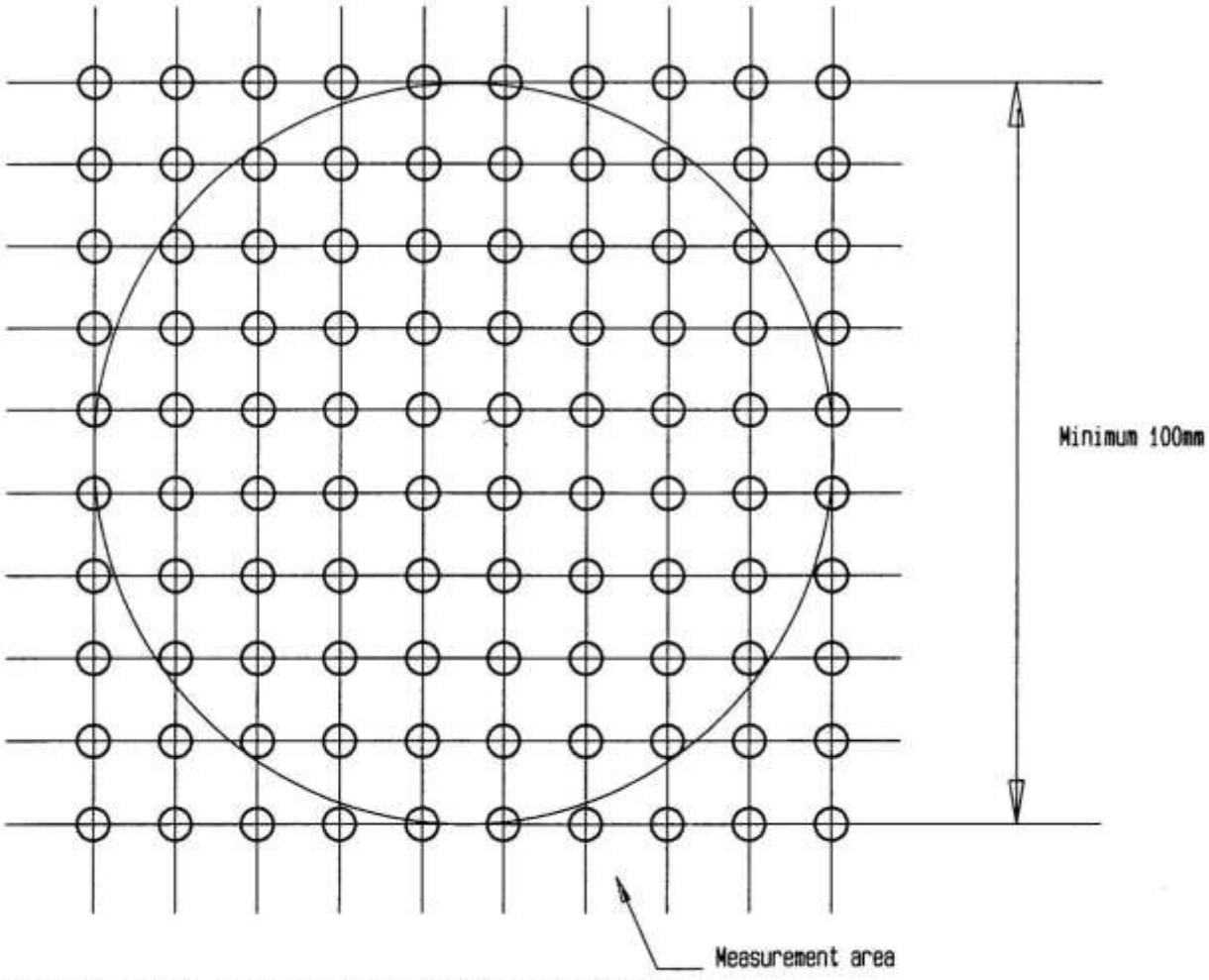
Fig 19.26 **Measurement of Luminance Ratio**



Detail 19.27.1 Measurement of 5x5 Matrix



Detail 19.27.2 Measurement using 100mm Diameter Area

Fig 19.27 Measurement Test Area - 1

(d) where fixed characters or symbols are formed by the physical arrangements of equally spaced single light elements, the test area shall meet the overall matrix size and dimensions of (a) and (b) above; the test matrix shall be made up of elements forming a matrix where the separation of elements is equal to the pitch of the single elements forming the character of symbol (see Figure 19.28 - Detail 19.28.1);

(e) where fixed characters or symbols are formed by the physical arrangements of equally spaced groups of light emitters, the test area shall meet the overall matrix size and dimensions of (a) and (b); the test matrix shall be made up of similar groups of elements forming a matrix, where the separation of emitter groups in the test area shall be the same as that of the emitter groups forming the character (see Figure 19.28 - Detail 19.28.2).

2 Signs shall be measured over a circular area bounded by the square test area of emitters as detailed in Figures 19.27 and 19.28 as appropriate. The sign's luminance over the test area shall be measured, for the following level of illumination from the external solar source, 40 000, 4 000, 400, 40 and 4 lux. An additional measurement shall be taken with a random illuminance 40 000 lux and 400 lux. The measurements shall be taken with the sign in the following states:

(a) all elements of the sign test area shall be active;

(b) all elements of the sign test area shall be inactive.

3 Luminance contrast shall be calculated as follows:

$$\text{Contrast} = \frac{L_a - L_i}{L_i}$$ Formula - ❸

where:

L_a is luminance resulting from the active sign under external illumination, in cd m^{-2};

L_i is luminance resulting from the inactive sign under external illumination, in cd m^{-2}.

19.10.10 Luminance Ratio Measurement – Multiple Light Sources

1 Signs incorporating multiple light sources for illuminating elements shall be tested in accordance with the above, under normal operating conditions as specified by the supplier. This may involve the illumination by more than one light source in order to comply with the performance requirements for higher levels of external illumination (40 000 lux).

19.10.11 Luminous Intensity (or Luminance) Half Angle

1 It is recommended that the minimum half angle for an optical category A sign shall be 5^o and the minimum half angle for a category B or C sign shall be 10^o.

TABLE 19.1 LIMITS OF CONTRAST TABLE 19.1

External Illumination	Sign Group A	Sign Group B	Sign Group C
40 000 lux	7 to 50	7 to 50	3 to 50
4 000 lux	7 to 50	7 to 50	3 to 50
400 lux	3 to 25	3 to 25	3 to 50
40 lux	3 to 25	3 to 25	0,5 to 25
4 lux	3 to 25	0,5 to 25	0,5 to 25
Fog setting	3 to 25	0,5 to 25	0,5 to 25

where:

(1) Group A comprises regulatory signs and warning signs, including signs conveying an enforceable speed limit or other prohibition, and signs warning of an impending hazard.

Group B comprises motorway operational control signs such as advisory speeds.

Group C comprises directional signs, other information signs, information complementing Group A or Group B signs, and signs for car parks.

(2) Several formulae exist for the calculation of contrast and contrast ratio, it is therefore important that to achieve the results detailed in the above table, only the above formulae be used for the assessment of equipment to this specification.

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2 The nominal half angle for a sign shall be determined by the measurement of a sign luminance or luminous intensity (without external illuminance from solar source), with sign rotation in the horizontal and vertical plane. Measurements shall be carried out with the sign at full brightness and then repeated with the sign fully dimmed.

3 The luminance or luminous intensity shall reduce evenly to 50% within a specified angle as the sign is rotated. Measurement shall continue to 16^{o} on each axis. The measurements shall be carried out in steps of 1^{o}. The horizontal half angle shall be determined as the mean of the rotations in both directions from the normal. Vertical rotation shall only be carried out below the central axis.

19.10.12 Luminance or Luminous Intensity Uniformity

1 The luminance or luminous intensity of elements shall be measured on axis and without external illuminance from the solar source. Ten areas each containing ten adjacent elements shall be measured. Each area may be overlapping. Each element within these areas shall be measured and the output of any two individual adjacent elements shall not vary by more than a ratio of 5:1.

2 To take into account the overall effect of the optical performance the information obtained form the one hundred measurements shall be used to calculate the uniformity ratio, this is as follows:

$$\text{Uniformity ratio} = \frac{L_m}{L_h}$$ Formula - ❹

where:

L_m is the mean luminance or luminous intensity of all elements, in cd m^{-2};

L_h is the luminance or luminous intensity of an individual element, in cd m^{-2}.

This ratio should be maintained in the range of 0,74 to 1,53.

19.10.13 Colour

1 The measurement of colour required by this document may be made by any method which gives results of required accuracy. Colour measurement shall be in terms of CIE x, y chromaticity co-ordinates.

2 Care should always be taken to ensure that only the chromaticity of the emitted coloured light is measured and that adequate precautions are taken to eliminate stray light from other sources. The sign equipment shall operate under the conditions specified by the supplier.

3 To determine the chromaticity of the sign, light may be received directed by the measuring instrument or reflected via a white diffusing screen, care being taken to ensure that the light is received in a suitable direction from the sign and that the part of the beam of light which enters the instrument is representative of the light being used for the test purposes. For measurements in a particular direction from the sign, a white diffusion screen is placed to receive the light normally at a sufficient distance to ensure that the apparent colour of the screen is uniform and that it is receiving substantially equal light from all parts of the light emitting aperture of the equipment. The screen may be coated with any recognised standard reflecting material, preferably barium sulphate, recommended by the CIE (1986). The measuring instrument is set to receive light from the screen at an angle of 45^{o}. It is possible to illuminate the white screen at 45^{o} to view it normally (45/0 degree method).

4 The chromaticity co-ordinates shall also be achieved at the luminance of luminous intensity half angles.

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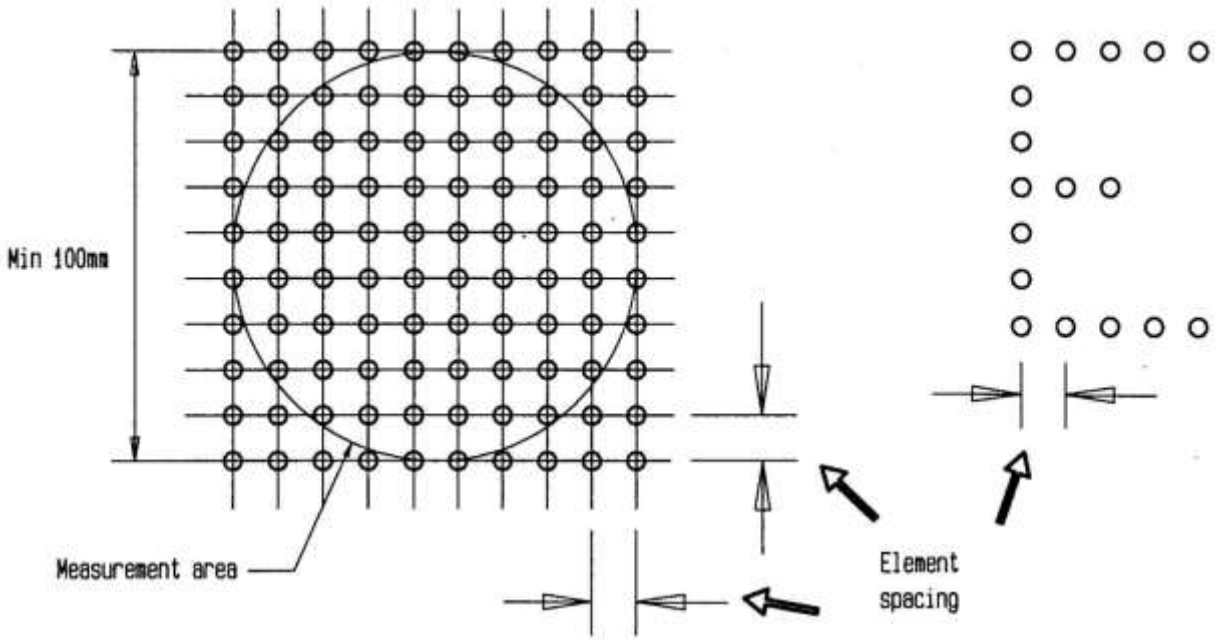
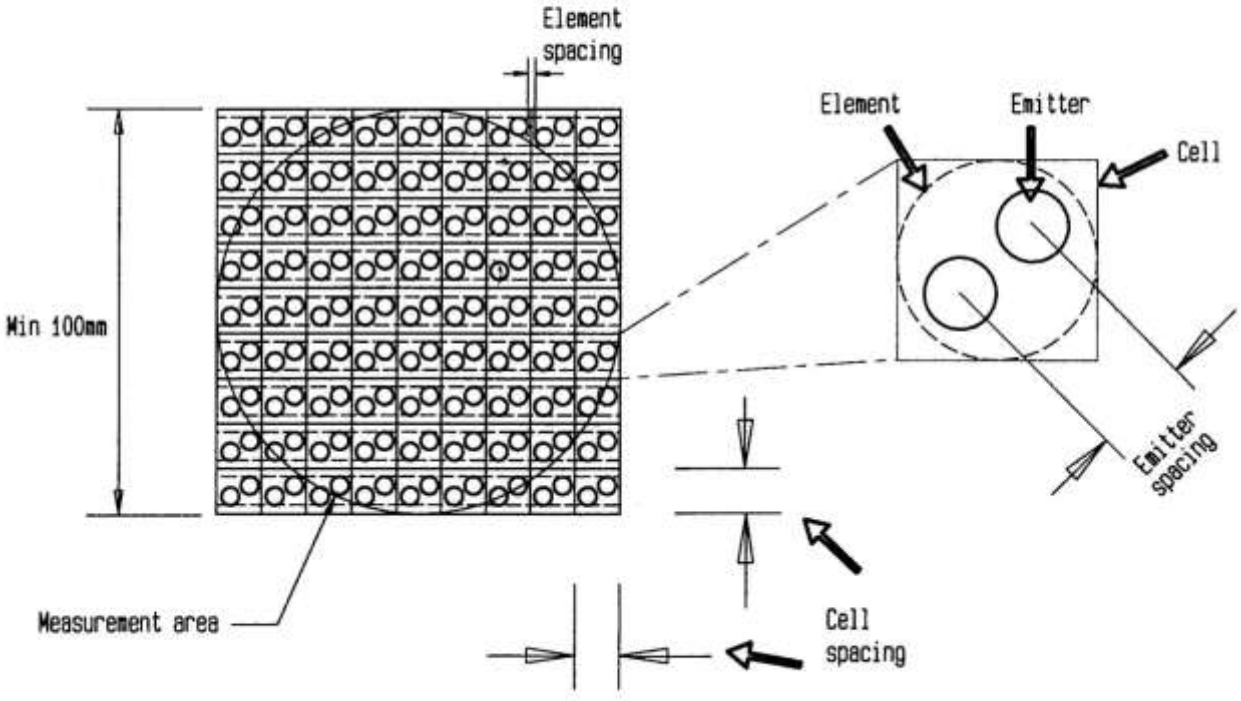


Detail 19.28.1 Measurement of Text Matrix



Detail 19.28.2 Measurement of Text Matrix Made of Emitter Groups

Fig 19.28 Measurement Test Area (Text Matrix) - 1

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19.2 TERMINOLOGY

19.2.1 General

1 The following terms are relevant to any discussion on Variable Message Signs. They are included here to assist readers. A more complete road traffic sign "Glossary of Terms" is given in Volume 1, Chapter 10.

"Pixel - the smallest dot-like unit of a graphic display unit providing a light emitting or reflective source".

"Reflective sign - a sign whose legend(s) and/or legend background is made visible by reflective light from daylight or other sources" (see Volume 1, Chapter 10 for descriptions of the terms "retroreflective" and "reflective").

"Special event - an irregular event (usually associated with large concentration of people) involving a large amount of traffic (vehicular or pedestrian) affecting the normal flow of traffic on a road network".

"Light emitting sign - a sign using light emitting devices in the display surface, with the purpose of displaying a legend(s) and/or a legend background(s)".

"Toll gate control - the regulation of traffic at or in the vicinity of a toll gate with the purpose of improving the performance of the toll gate".

"Sign background - the part of environmental scenery which immediately surrounds the face of a sign".

"High occupancy vehicle (HOV) - vehicles carrying more than a preset number of occupants; such vehicles often include buses and taxis, but can also include motor cars".

"V/C ratio - the ratio of the demand flow rate to the capacity of a traffic facility".

"Matrix - a reference grid whose intersections may hold the centre of the elements used in a sign or in a legend background or in a legend; a matrix may be extended to a whole display surface or to part of it".

"Freeway - a multi-lane divided highway having a minimum of two lanes for exclusive use of traffic in each direction and full control of access and egress".

"Level of service (LOS) - a qualitative measure describing operational conditions within a traffic stream, generally described in terms of factors such as speed and travel time, freedom to manoeuvre, traffic interruptions, comfort and convenience, and safety".

"Variable message sign (VMS) - a sign for the purpose of displaying one of a number of legends that may be changed or switched off, either manually or automatically at the site or remotely, as required".

"Tunnel/bridge control - the regulation of traffic in/on or in the vicinity of a tunnel/bridge with the purpose of improving the throughput of traffic through the facility".

"Public transport management - the preparation and management of a transport management plan covering all aspects of the available and possible future public transport systems".

"Transport demand management - a process for the modification of the trip-making behaviour and habits of the motoring public to reduce the use of single occupant modes of travel and at the same time encourage the use of multi-occupant modes of travel to enhance transport efficiency and minimise the negative effects of congestion".

"Ramp monitoring/control - a system through which the entry of vehicles onto a limited access facility (usually a freeway) from a ramp is metered by manual or automatic traffic control devices, which can allow traffic onto the facility at intervals, or the closing off of on-ramps, dependent on traffic conditions on the facility".

"Ride-sharing management - the development of methods of increasing the number of high occupancy vehicles (HOV) on the urban freeway and arterial network by providing cost effective incentives for using such modes of travel".

"Safety management - consists of a process of timeous identification, investigation, setting of priorities and correction of hazardous or potentially hazardous roadway locations and features".

"Incident management - a pre-planned set of procedures to deal with any incident with the main aim of restoring traffic to normal operation. The procedure consists of six steps i.e. detection, response, on-site management, clearance, follow-up and driver information".

"Motorist/driver information system - the collection and analysis of road and traffic information followed by the interpretation thereof, to supply the road user with the necessary information to take timeous action to avoid congested areas, and thereby reduce driver frustration and secondary congestion levels".

"Parking information system - the collection and analysis of parking facility occupancy levels to establish the availability of parking and the supply of such information to the road user to minimise unnecessary parking-seeking trips, thereby reducing driver frustration road user costs".

"Parking control - the regulation of vehicle movements at parking facilities through a variety of activities to maximise the utilisation of parking facilities and at the same time optimise the flow of traffic in and out of such facilities".

"Parking guidance - the timeous provision of information to the road user on the availability of parking spaces with the main purpose of minimising unnecessary parking seeking trips".

"Route planning systems - the timeous provision of information to the road user to assist in the decision-making process in reaching the destination in the shortest length of time or along the least congested route".

"Incident - the occurrence of any extraordinary condition or event which results in the reduction in road capacity, or creates a hazard for the road users for a sustained period of time".

"Construction management - a set of pre-planned procedures complemented by the scheduling of activities to minimise the effect of construction and scheduled maintenance".

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19.3 PLANNING

19.3.1 VMS: Part of an Overall System

1 VMS forms part of what is termed a Traffic Operations Management System (TOMS). A TOMS is the total operational system whereby the co-ordinated and pre-planned use of human, electrical and electronic resources are applied to manage and improve traffic flow and safety conditions on the road network. All the elements identified in Subsection 19.1.4 apply to a TOMS and are shown in Figure 19.1.

2 A vast amount of transportation, traffic and environmental information is required for a fully operational TOMS since it comprises a wide variety of control parameters. The TOMS elements can be grouped into two major focus areas, namely Congestion Management and Vehicle Highway Systems.

3 Congestion Management deals mainly with the identification of locations of congestion and the improvement of congestion levels on the road network. The following components are included in a Congestion Management System:

(a) incident management;

(b) construction management;

(c) safety management;

(d) ride-sharing management;

(e) demand management.

4 On the other hand Vehicle Highway Systems provide the means for real-time traffic management which has proved to be very cost effective. The components which are included in such systems are the following:

(a) freeway and arterial management systems;

(b) motorist/driver information systems;

(c) other advanced technologies, e.g. intelligent vehicle highway systems (IVHS).

19.3.2 Types of Display

1 Three types of displays are being used for VMS:

(a) light reflecting;

(b) light emitting;

(c) hybrid.

2 The application of the various types varies in level of sophistication of all types. The lowest level of sophistication is found with light reflective displays (ordinary road signs used as VMS). The light reflective as well as light emitting displays also represent the opposite side of the scale with regard to the highest level of sophistication. Hybrid displays are a mixture of both these technologies at any level of sophistication. Examples of the different types of displays are shown in Figures 19.2 to 19.5 (see also Volume 1, Chapter 9).

19.3.3 Light Reflecting Displays

1 The following are the various types of light reflecting displays in order of increasing cost and level of sophistication, many of which may be retroreflective:

(a) fixed with flashing beacons;

(b) cloth;

(c) removable panels;

(d) blank-out;

(e) fold-out;

(f) scroll;

(g) rotating drum (prism);

(h) rotating triangle;

(i) electromagnetic flip disk;

(j) electromechanical flap matrix;

(k) electrostatic vane matrix.

19.3.4 Light Emitting Displays

1 The various types of light emitting displays are listed below in order of increasing cost and level of sophistication:

(a) flashing beacons;

(b) neon;

(c) fibre optics;

(d) incandescent lamp matrix;

(e) electromagnetic shutter;

(f) liquid crystal display (LCD) shutter matrix;

(g) light emitting diode (LED) matrix;

(h) liquid crystal display (LCD) matrix (back-lit);

(i) cathode ray tube (CRT) signs (colour video).

19.3.5 Hybrid Types

1 The following are the various types of hybrid displays:

(a) static sign combined with VMS;

(b) electromagnetic flip disk with light source.

19.3.6 Control Systems

1 Control systems are used to manage VMS networks consisting of non-manual types of VMS. Apart from allowing for the change of messages, the management of a VMS network also requires a message from the sign to the control centre confirming the message that has been sent to the sign.

2 For any network to operate efficiently, knowledge of the status of the network is of paramount importance. The selection of messages can be achieved through:

(a) fixed message selection - a matrix of message elements is set up from which the operator can select elements to build up an applicable message to be displayed; similarly pictograms can be selected from a data bank of pre-prepared pictograms; this control system has a number of access levels which are all password-controlled to ensure security of the system; change to, or addition of, message elements should only be done by the systems manager; or

(b) variable message selection - with this type of control system messages can be created freely by the operator using appropriately developed software.

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19.3.7 Surveillance Systems

1 Surveillance forms the backbone of the system. The better the surveillance network, the better the service provided to the road user through the VMS will be.

2 Surveillance, however, consists not only of the detection and reporting of incidents, but also of the validation of such information. False or invalid information is one aspect which can bring a VMS network into discredit very rapidly. The following represent the more important detection, reporting and validation systems available:

(a) detection and reporting:

(i) public response;

(ii) radio broadcast monitoring;

(iii) regular ground patrols;

(iv) aerial patrols;

(v) loop detectors;

(vi) environmental detectors;

(vii) video imaging detection (CCTV);

(b) validation - information has little value if it has not been validated; for VMS networks the following methods of data-validation are used:

(i) visual/manual;

(ii) electronic/automatic.

19.3.8 Communication Systems

1 A VMS network, however simple or sophisticated, is useless without a communication system. Manually operated VMS networks have to rely on verbal messages sent between the control centre and the operator (person who changes messages on signs) via radio (general broadcast or two-way), telephone or visually.

2 Automated systems require a higher level of communication systems. Cable and radio provide such communication as follows:

(a) cable: cable communication of the following types has proved, over the years, to be the most popular:

(i) owned cable network;

(ii) leased utility telephone cable;

(iii) leased utility private data cable;

(b) radio:

(i) owned radio frequency;

(ii) FastNet (Telkom);

(iii) radio paging systems;

(iv) cellular telephone.

19.3.9 Fields of Application of VMS

1 VMS, due to its versatility, can be applied in a very wide variety of fields ranging from freeway management to parking control and public transport information systems, as follows:

(a) freeway traffic management:

(i) congestion management;

(ii) incident management;

(iii) construction management;

(iv) safety management;

(v) transport demand management;

(vi) ride-sharing management;

(vii) ramp monitoring/control;

(b) lane control - information applicable to a specific lane is presented on an overhead sign above each individual lane; displays are either simple, showing an arrow or a cross, or compact but more complex, showing an appropriate pictogram;

(c) driver information:

(i) motorist information system;

(ii) parking information system;

(iii) route planning systems;

(d) parking management:

(i) parking guidance;

(ii) parking control;

(e) other:

(i) public transport management system;

(ii) tunnel/bridge control;

(iii) environmental information;

(iv) toll gate control;

(v) special event.

19.3.10 Classification of VMS

1 The four major classes of VMS -Regulatory, Warning, Guidance and Information - are similar to those of standard fixed signs. Depending on the type of VMS, light reflecting or light emitting, the signs shall have a similar appearance to their standard counterparts or there may be a slight variation in colour code to accommodate the technology used (see Subsection 19.4.6).

2 The function of the different classes of VMS are as follows:

(a) **Regulatory Sign** - the function of these signs is to inform road users of the regulation applicable on the facility they are using; such signs are legally enforceable by the relevant authorities;

(b) **Warning Signs** - the purpose of these signs is to warn road users of dangerous situations or conditions ahead;

(c) **Guidance Signs** - the role of guidance signs is to provide the road user with information to assist in navigation to reach a specific destination;

(d) **Information Signs** - information signs are used to provide the road user with important information to make the journey safer, more relaxing and more efficient.

19.3.11 Positioning of VMS

1 The placing of VMS is very important for the success of VMS systems and their level of efficiency. A number of factors play an important role in the establishment of the preferred location of VMS. These factors can only

(continued on page 19.3.8)

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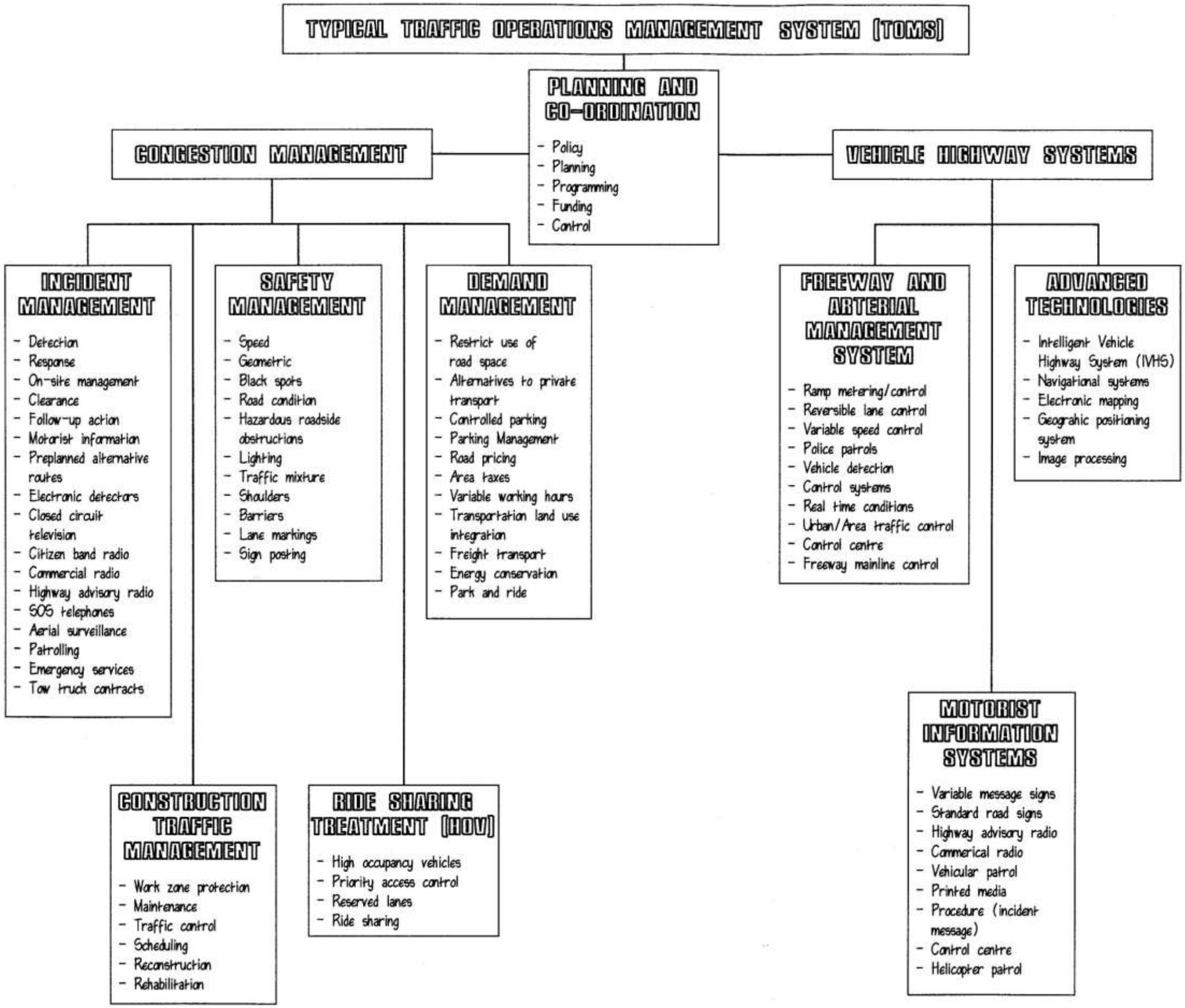
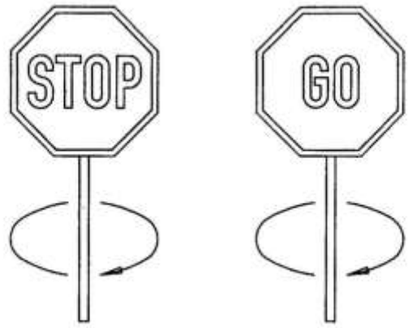


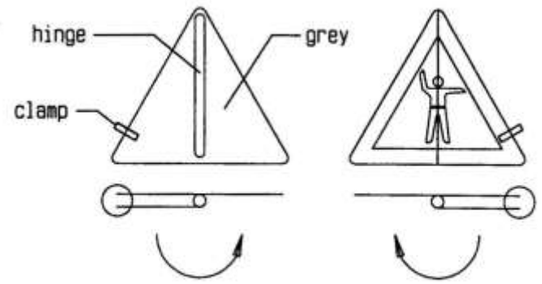
Fig 19.1
Elements of a TOMS



R1.5A R1.5B

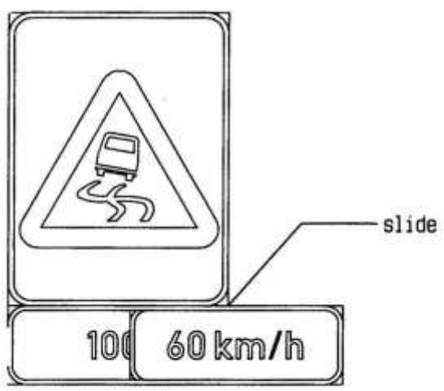
Detail 19.2.1

Back - to - Back Rotating Signs

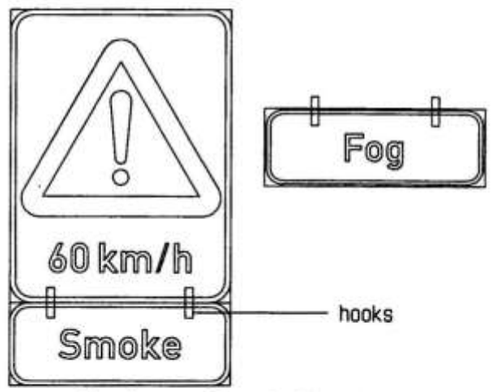


Blank TW304

Detail 19.2.2 Flip Sign



Slide Alternative



Hanging or Clamped Alternative

Detail 19.2.3 Options to Vary High Visibility Warning Signs

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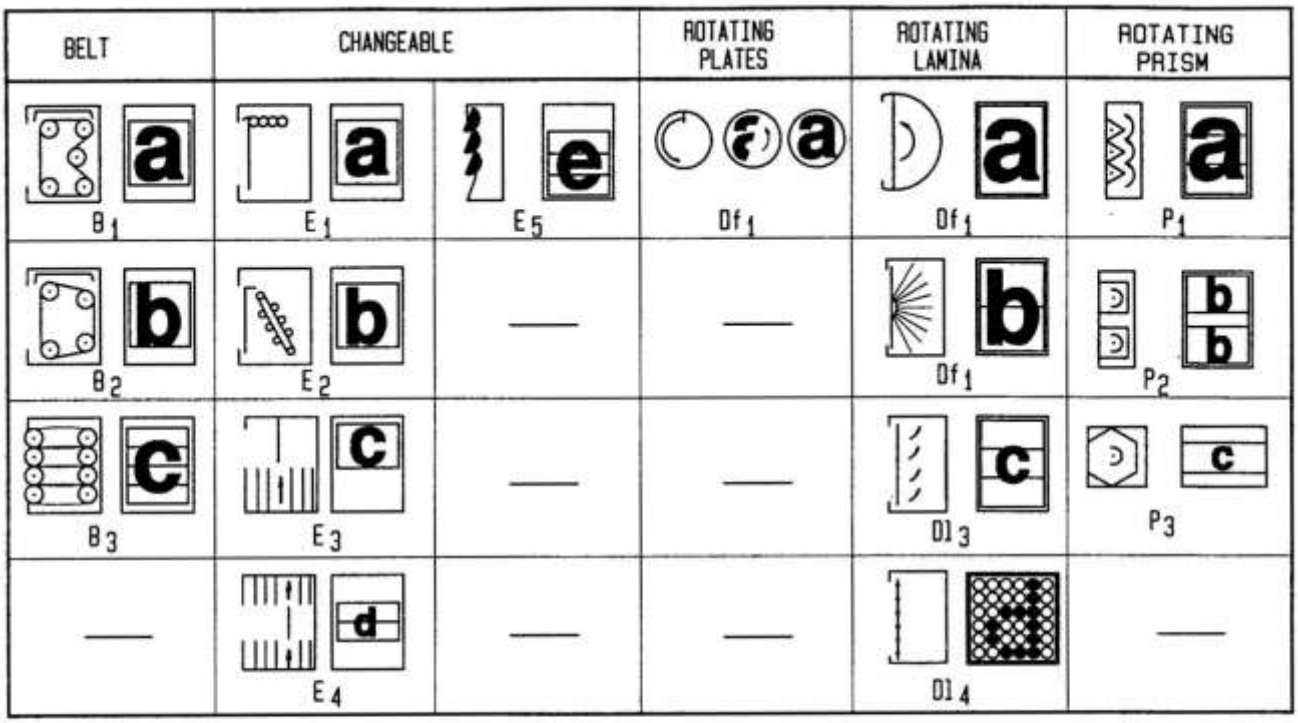
Fig 19.2 Types of Mechanical VMS



B_1 Continuous belt
B_2 Roller
B_3 Multiple continuous belts
E_1 Single roller
E_2 Continuous belt roller
E_3 Simple plate
E_4 Spilt plate
E_5 Lamina plates

Of_1 Rotating shutter
Dl_1 Single flip-over plank
Dl_2 Multiple flip-over plank
Dl_3 Rotating planks
Dl_4 Matrix sign
P_1 Three-sided rotating prism
P_2 Four-sided rotating prism
P_3 Multi-sided rotating prism

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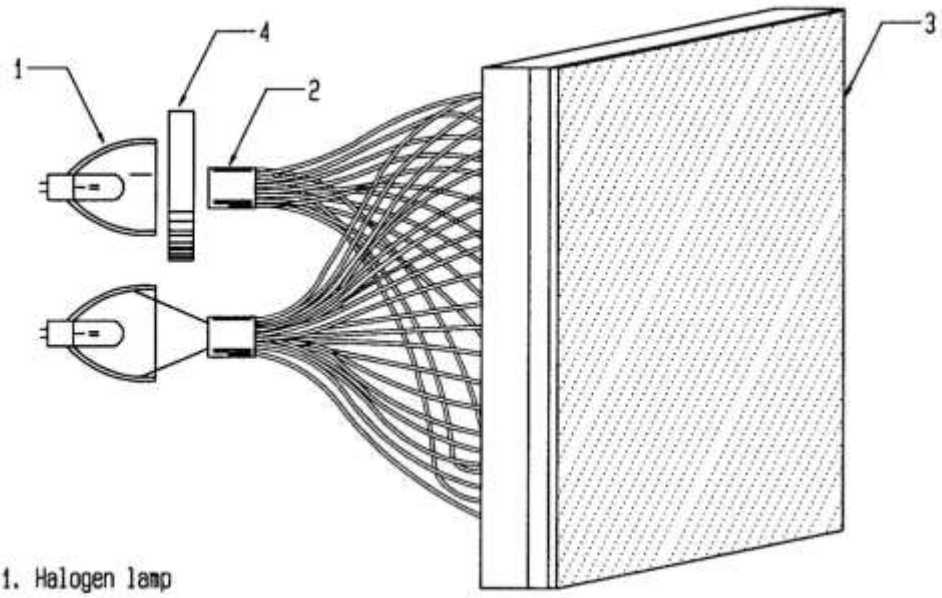
Fig 19.3 Types of Electro-Mechanical VMS



1. Halogen lamp
2. Multi-branched, flexible light guides
3. Screen
4. Filter

Fig. 19.4.1
Fixed Grid Fibre Optic Module

1. Halogen lamp 1
2. Halogen lamp 2
3. Beam splitter
4. Multi-branched, flexible light guides
5. Matric screen
6. Light spots

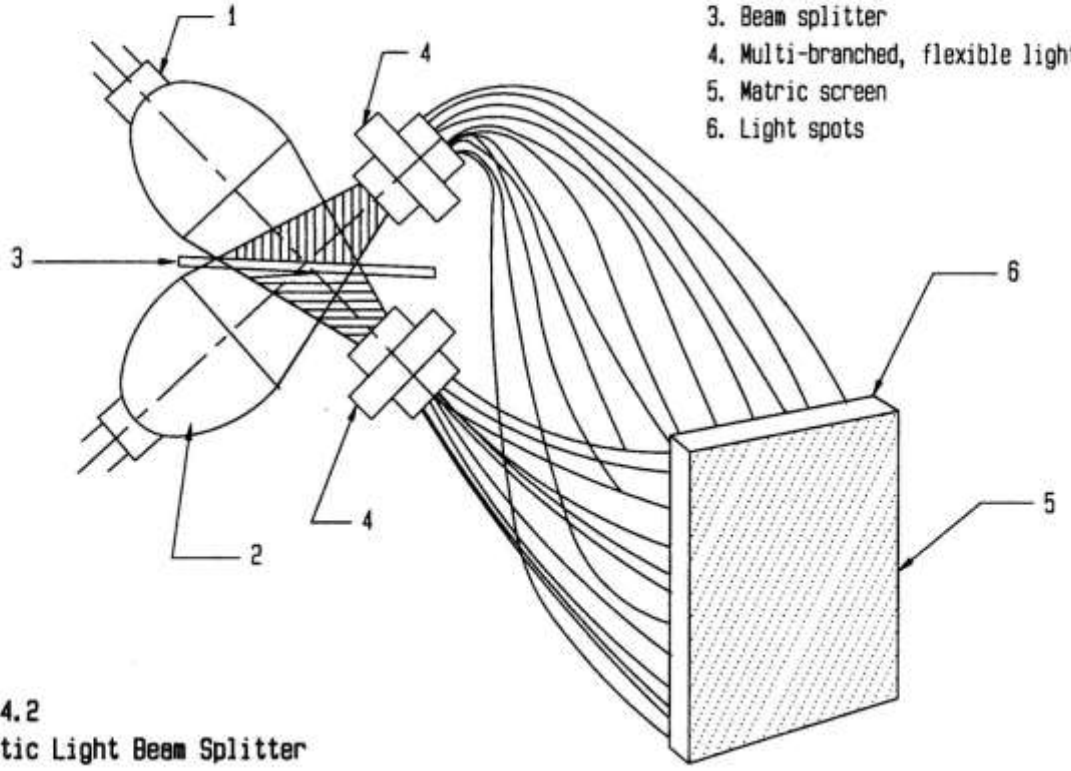
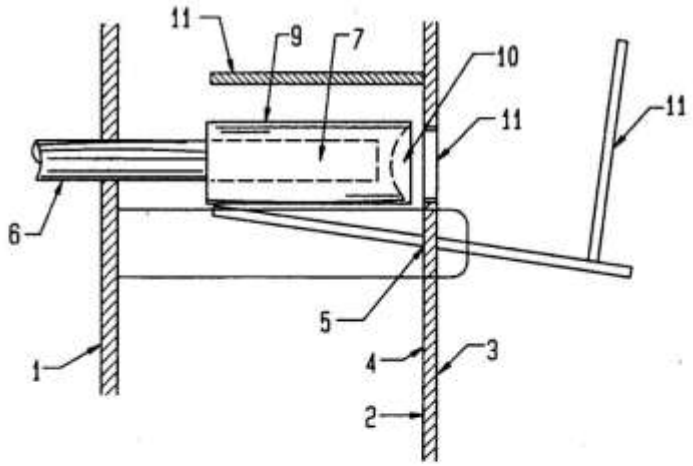


Fig. 19.4.2
Fibre Optic Light Beam Splitter

Fig 19.4 Types of Electric and Electronic VMS



1. Back plate
2. Reflective disk, black side (off position)
3. Reflective disk, reflective side (on position)
4. Disk
5. Disk pivot point
6. Fibre optic cable
7. Fibre optic bundle
8. Fibre optic lens
9. Supporting socket
10. Aperture (through disk)
11. Shroud

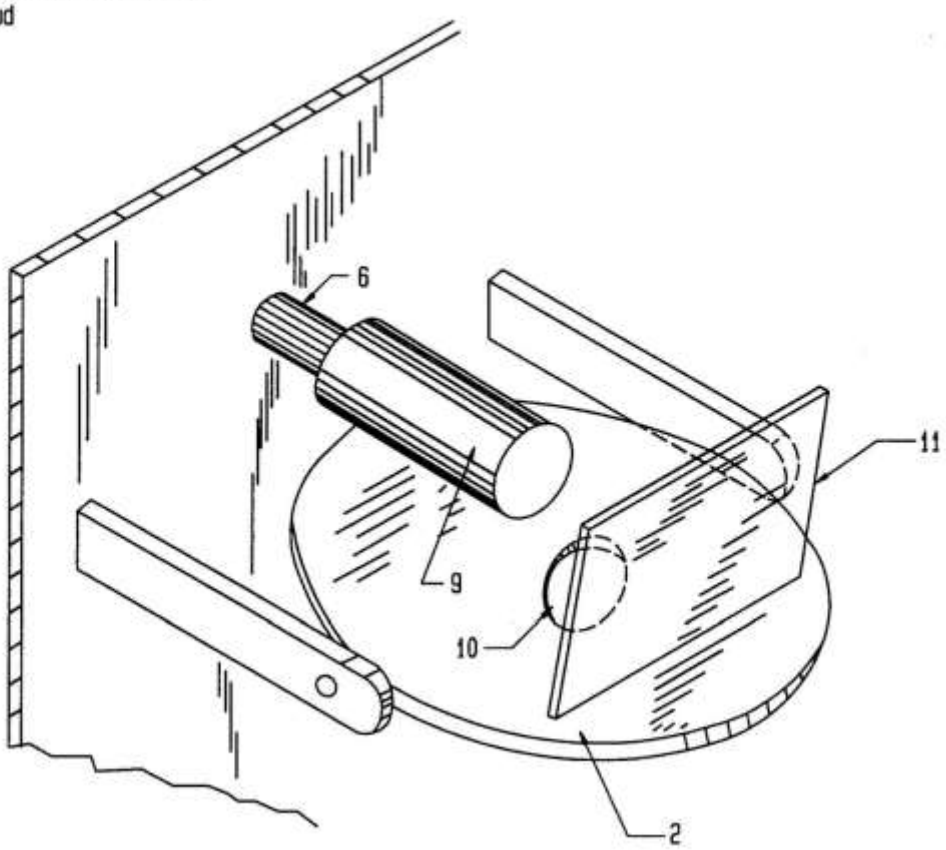


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Fig 19.5 **Hybrid VMS**

(continued from page 19.3.2)

be applied with a sound knowledge of the relevant environment. The following information about the traffic in the area where implementation will take place is required:

(a) traffic volumes;

(b) traffic accident statistics;

(c) location of congested road sections;

(d) road sign inventory;

(e) future road improvements;

(f) area-specific traffic policies;

(g) incident detection procedures.

2 Typical locations of where VMS should be positioned, or should be expected to be positioned, are shown in Figure 19.6.

19.3.12 Flow of Data Through Control Centre

1 The flow of data throughout the system should be well co-ordinated and well-structured to ensure accuracy and security (prevention of conflicting, non- applicable or unauthorised messages).

2 The procedure from the moment an incident occurs until the moment the message is displayed on the VMS, is as follows:

(a) receive data through available relevant detection process;

(b) verification of data for authenticity;

(c) design the message/s to be displayed;

(d) select VMS to be utilised;

(e) convert data into electronic format;

(f) send data to VMS and/or Emergency Reaction Units (ERU's);

(g) monitoring of the sign and system (has message been displayed and is system performing correctly);

(h) discontinuation of message display when no longer required.

3 A flow diagram of the flow of data through the control centre is shown in Figure 19.7.

19.3.13 Checklist

1 The questions listed below provide a checking process designed to assist planners:

- ❑ do displayed messages vary according to time-of-day, road and environmental conditions and/or traffic conditions?
- ❑ what funds will be available for VMS?
- ❑ is power available in the vicinity of the VMS locations?
- ❑ what power consumption can be handled by the available power distribution network?
- ❑ what technology is available in a reasonable distance from the location of installation?
- ❑ how many messages need to be displayed?
- ❑ is a VMS system required (central control) or will stand-alone VMS suffice?
- ❑ how will surveillance or detection of conditions be done?
- ❑ how will the validation of detected or reported conditions be undertaken?
- ❑ what data communication network will suit the local conditions best?
- ❑ how extensively will the system be used?
- ❑ is the necessary information available for locating VMS?
- ❑ will VMS improve the safety conditions where it is intended to be used?

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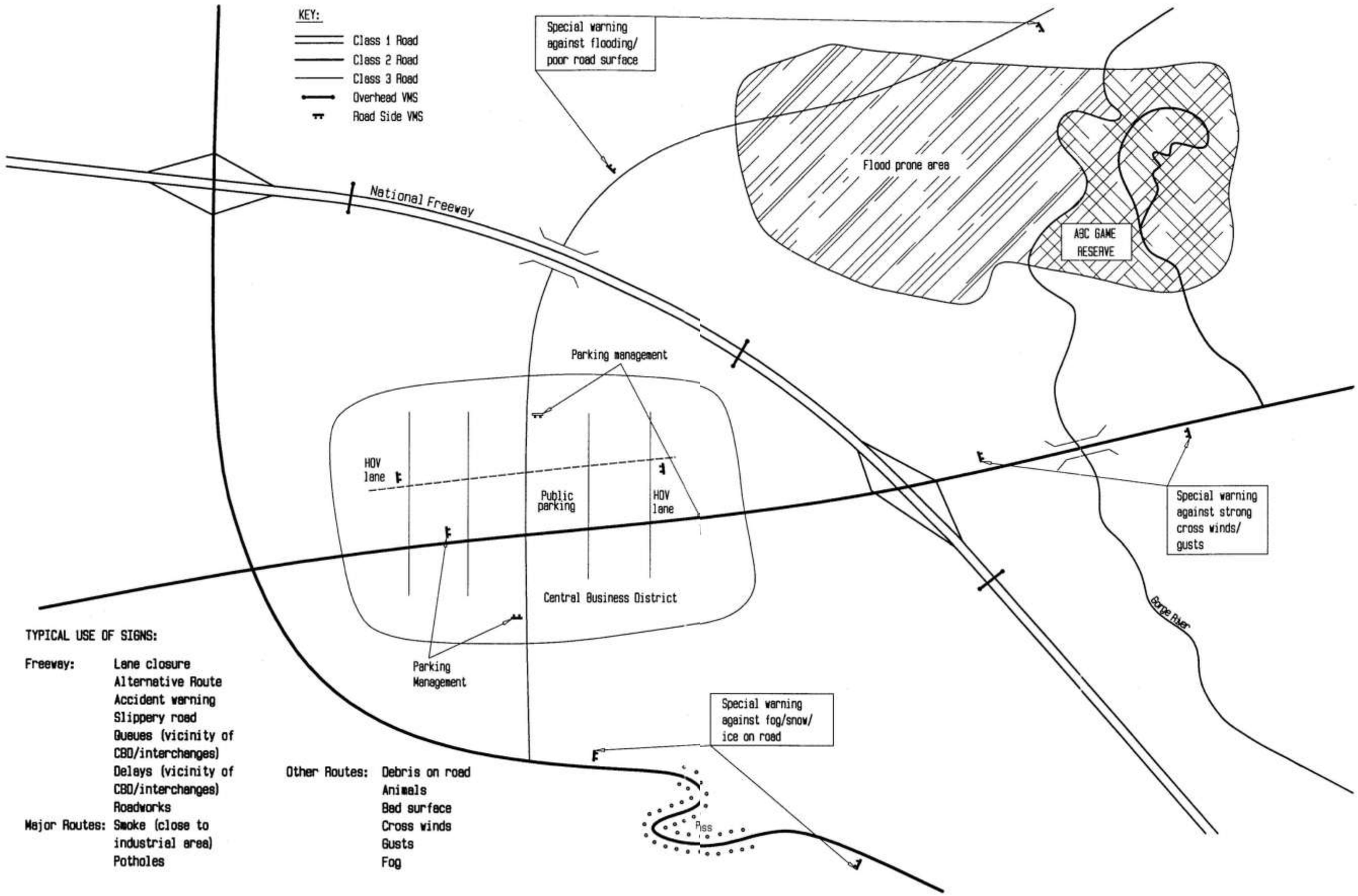

Fig 19.6
Typical Locations of VMS

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19.4 WARRANTS

19.4.1 General

1 As with any other system, the feasibility of the system depends on a number of warrants. These warrants define the minimum standards applicable which will make the implementation of a VMS system feasible and affordable in terms of savings on decreases in accidents, delays and congestion levels. **A VMS system is warranted if any one of the four warrants discussed below is met.**

19.4.2 Warrant 1 - Traffic Volumes

1 When the traffic volume on any road exceeds 1600 passenger car units per hour per lane (pcuphpl) for more than five hours per day, or when traffic densities exceed 30 passenger car units per kilometre per lane (pcupkmpl), VMS should be considered as a traffic management measure.

19.4.3 Warrant 2 - Traffic Accident Statistics

1 VMS should be considered on roads where the accident rate is in excess of one accident per million kilometres travelled or 15 accidents per kilometres of road length per year.

19.4.4 Warrant 3 - Level of Congestion

1 VMS should be considered on roads when the volume-capacity (V/C) ratio exceeds 0,90 or when a level of service (LOS) "D" is experienced on more than 70% of the road or for more than four hours during a 12-hour period.

19.4.5 Warrant 4 - Other

1 Under special circumstances when unfavourable weather conditions are a major problem causing regular traffic congestion or accidents, and when a proper incident management system is operational or is to be installed.

19.4.6 Checklist

1 The questions listed below provide a checking process designed to assist planners and designers:

- ❑ has the necessary allowance been made on the budget for a VMS system?
- ❑ have the necessary feasibility studies been undertaken?
- ❑ are the necessary traffic volumes available on the selected routes?
- ❑ are accident statistics available?
- ❑ are there any specific prevailing environmental conditions against which motorists need to be warned?

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19.5 DESIGN CONSIDERATIONS

19.5.1 General

1 The photometric and geometric (dimensional) requirements for VMS are based on a number of functional requirements which are covered in more detail below. These requirements, which are as follows, are relevant to all road traffic sign design:

(a) conspicuity;

(b) legibility and readability;

(c) comprehensibility;

(d) credibility.

These aspects can be expressed in values of the required visibility distance, provided details of the observer population are known.

19.5.2 Conspicuity

1 Conspicuity of a sign is the extent to which the sign stands out from its background regardless of the location of the sign in relation to the point of fixation. This is also referred to as the target value of the sign. The priority value of a sign relates to certain attributes which determine the order in which signs of equal target value are noticed.

2 The following are the most important factors affecting conspicuity of a sign:

(a) luminance contrast;

(b) size of the sign;

(c) luminance of the sign;

(d) flashing lights on sign corners;

(e) colour of the sign;

(f) placement of the sign;

(g) standardisation of signs.

3 Contrast between the foreground and background is the major determining factor for target value or conspicuity. A further contributing factor to improve conspicuity of a sign is to use beacons on, or near, the sign face. Beacons used in this regard should emit a yellow light and be located at, or near, each of the four corners of the sign face or part of the sign to which they relate. The minimum separation of any such beacons from the edge of the display area (text or graphics) should be twice the character height.

4 Although the flashing of a sign or part of it may improve the conspicuity of a sign, it has a detrimental effect on the legibility of a sign at distance, and should therefore be applied with caution.

5 The conspicuity of a sign can be significantly improved by using a border around the outside of the sign, especially if retroreflective material or a light emitting source is used. The width of such a border has to relate to the spacing between the characters and the edge of the sign face which should be approximately 1,1 times the character height.

6 Various signs have various levels of conspicuity, depending on the position in the hierarchy of signs. Thus regulatory and warning signs will have a higher conspicuity than guidance or information signs.

19.5.3 Legibility and Readability

1 Various factors affect the legibility or "the ease with which something may be read" of a message. Of these the most important factors, in no specific order, are:

(a) visual acuity of driver;

(b) reading time available;

(c) number of other simultaneous driver tasks;

(d) character size;

(e) character width to height ratio;

(f) dot size (matrix-type messages);

(g) spacing between characters.

2 Legibility is usually measured in the threshold distance at which the sign becomes legible. In a comparative study done by the Human Sciences Research Council (HSRC), it was found that the visual acuity of South African drivers is lower than that of drivers in the United States or the United Kingdom. For this reason, standards with regard to factors affecting legibility should allow for this.

3 Readability is the reading and recognition of what was observed. The measuring unit is time related and can be applied to the road sign environment as the time required to read and understand a displayed message. The following factors have been found to affect readability:

(a) extent of message;

(b) character size;

(c) character width to height ratio;

(d) spacing between characters.

19.5.4 Comprehensibility

1 The comprehensibility of a sign is the extent to which the sign is understood and responded to by all drivers.

2 South Africa is a multi-lingual country with many of its people not conversant in English, Afrikaans, Zulu or Xhosa (the more widely spoken languages). It will be confusing and not viable to have a message displayed in all four languages simultaneously or one after the other. A single language, English, should be used for the sake of getting drivers used to a less confusing terminology (instead of using more than one language) and because a substantial portion of the South African population has an understanding of English.

3 The use of pictograms (graphical signs) will overcome this problem to a large extent. It may not, in all cases, be possible to display the same sign as the static sign and the colour coding might not be the same due to technological and financial constraints, but this should not pose too serious a problem.

19.5.5 Credibility

1 The credibility of a sign is the value the message displayed on the sign has to the driver. Factors that influence the credibility of a sign are as follows:

(a) information accuracy;

(b) information reliability;

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(c) information not up-to-date;

(d) information/sign pollution;

(e) legality of sign.

2 A speed limit set at roadworks, experienced by road users to be too low, will often be disregarded. If this happens frequently at roadworks, even valid speed restrictions in future at such locations will also be regarded as having a low, or no credibility at all.

19.5.6 Colours

1 The colours displayed on VMS should conform to the colour coding as prescribed in the Road Traffic Act, Act 93 of 1996. If this is not practised, law enforcement will not be possible based on the road traffic signs or information displayed on VMS.

2 The colour code for standard fixed signs as specified in Volume 1, Chapter 1, Subsection 1.4.4 will, due to the limitation of certain technologies and the cost involved with others, not always be possible to adhere to. Light reflecting VMS shall conform to the colour code of standard fixed road signs. In cases where it is financially not viable to reproduce the standard colours for light emitting VMS, the sign face colours of the symbol and its background may be reversed. This has the effect that the background, which is by far the largest area on road signs, need not be illuminated, hence reducing running costs. The border of regulatory and warning VMS shall be illuminated and shall be of the same colour as used for a standard fixed sign. These colour requirements are covered by Regulation 409(11) of the Road Traffic Act, Act 93 of 1996 so that any sign complying with them will be enforceable.

19.5.7 Sign Display Mounting

1 The types of sign mounting which proved to be most effective and popular are roadside and overhead mounting (see Figure 19.8). Roadside mounting is not recommended for three, four and other multi-lane roads and should be avoided at all times for dual carriageway roads.

2 The lateral and vertical displacements of signs are shown in Figure 4.26 of Volume 1, Chapter 4. The positioning of the signs in relation to the road user, is shown in Figures 19.9 and 19.10. Signs should always face the oncoming traffic directly. Depending on the technology used for sign displays, slight vertical and horizontal deviations could be necessary to accommodate geometric road layouts and signface materials, but a thorough assessment will be required before implementation.

3 Overhead signs could be mounted on overpass bridges if structurally possible. Mounting on decks of bridges not crossing the road at right angles, requires thorough assessment of moments and torsion created by forces acting on the sign.

4 Interference by the sun (shining from behind the sign) should be avoided as far as possible. In Figure 19.10 the sun interference zone is shown as being 20° on either side of the sign. VMS facing east or west could experience interference from the sun all year round and while these conditions usually coincide with the morning and afternoon peak hours, special care should be taken to address this problem.

5 VMS facing the south will experience similar problems during the winter months. This is due to the sun being behind or facing the VMS. Special provision should be made depending on the type of VMS technology used to accommodate interference from the sun (e.g. variable illuminance levels, larger back-boards, front illumination by day and horizontal and/or vertical deviations).

19.5.8 Checklist

1 The questions listed below provide a checking process designed to assist designers.

- ❑ will the sign stand out clearly against the background during day and night time?
- ❑ does the sign need front illumination?
- ❑ is the sign intended for law enforcement?
- ❑ are the sign characteristics standard?
- ❑ are any additional measures required to make the sign more legible at any time?
- ❑ what is the educational background of the average road user?
- ❑ can the message be kept as short as possible?
- ❑ beware of sign pollution - can the amount of information on the sign be read and understood by drivers?
- ❑ can the message be enhanced through the use of pictograms?
- ❑ are the messages important enough to distract the attention of the motorist from the road?
- ❑ if the sign is to be mounted with the sun behind, have the necessary precautions been taken to ensure that the message can still be read?

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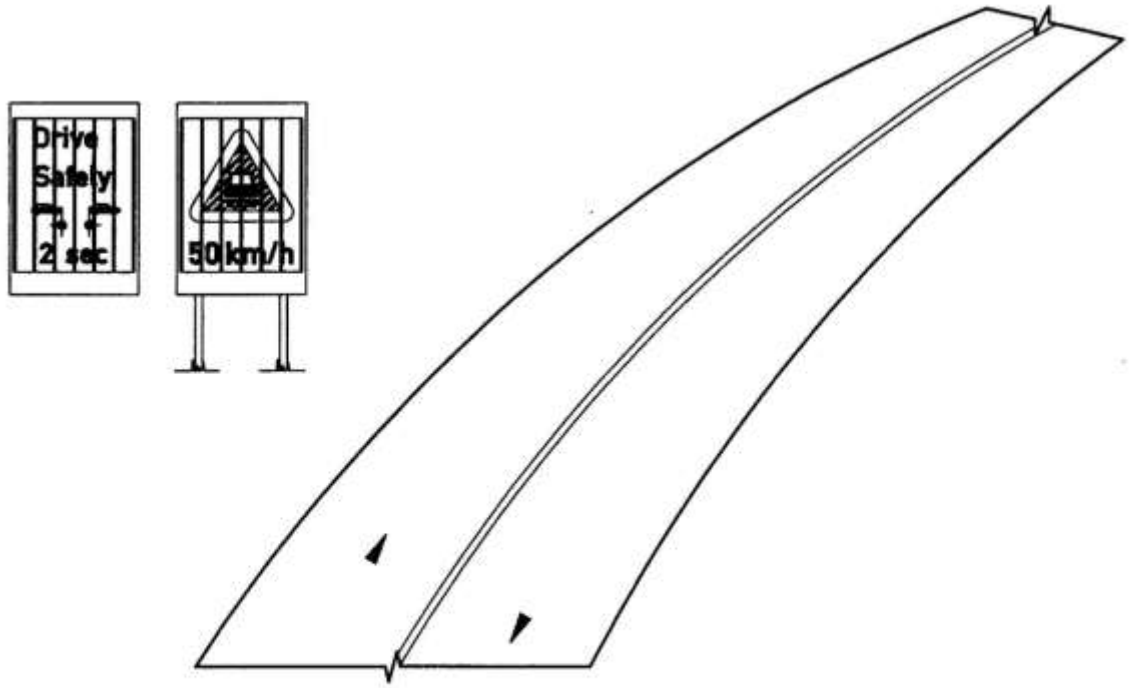
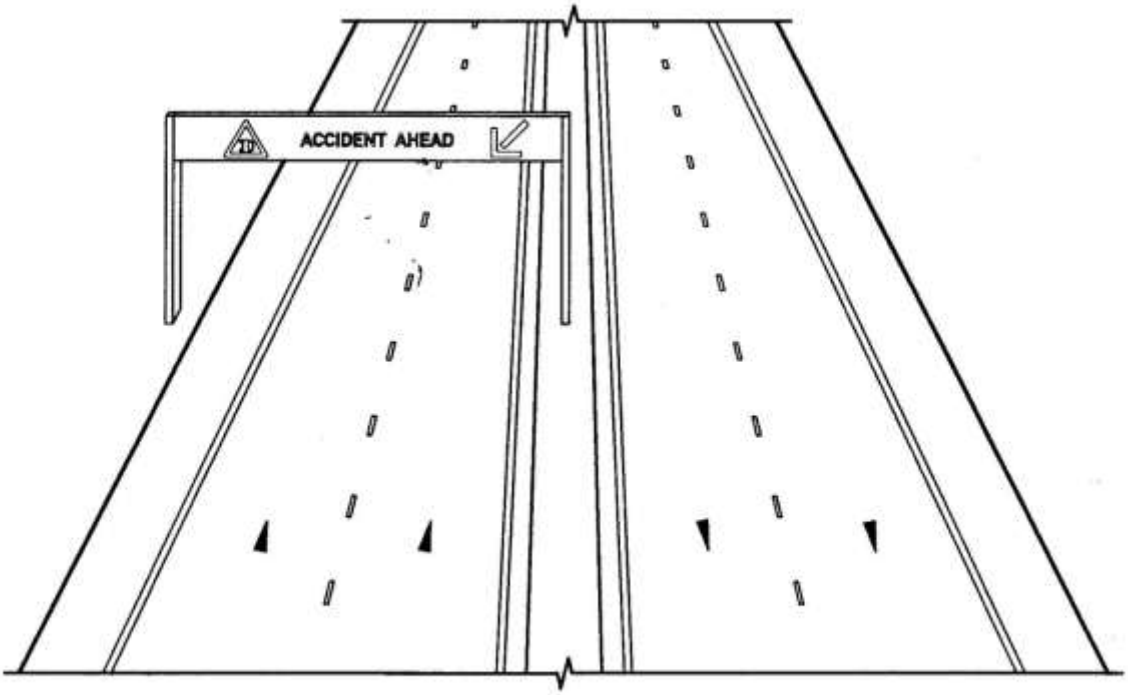


Detail 19.8.1 Side Mounting



Detail 19.8.2 Overhead Mounting

Fig 19.8 Sign Mounting

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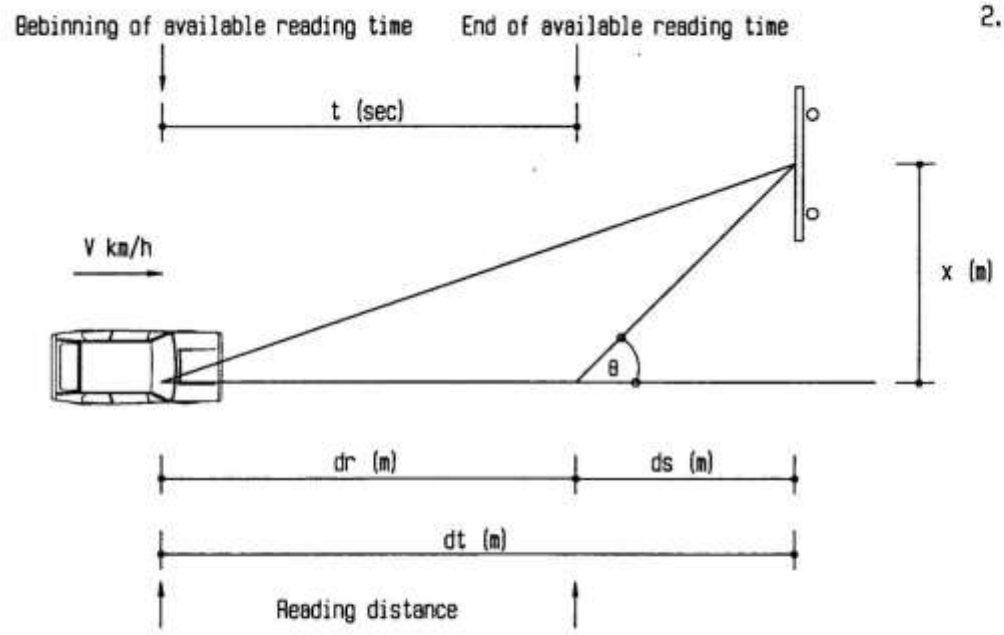
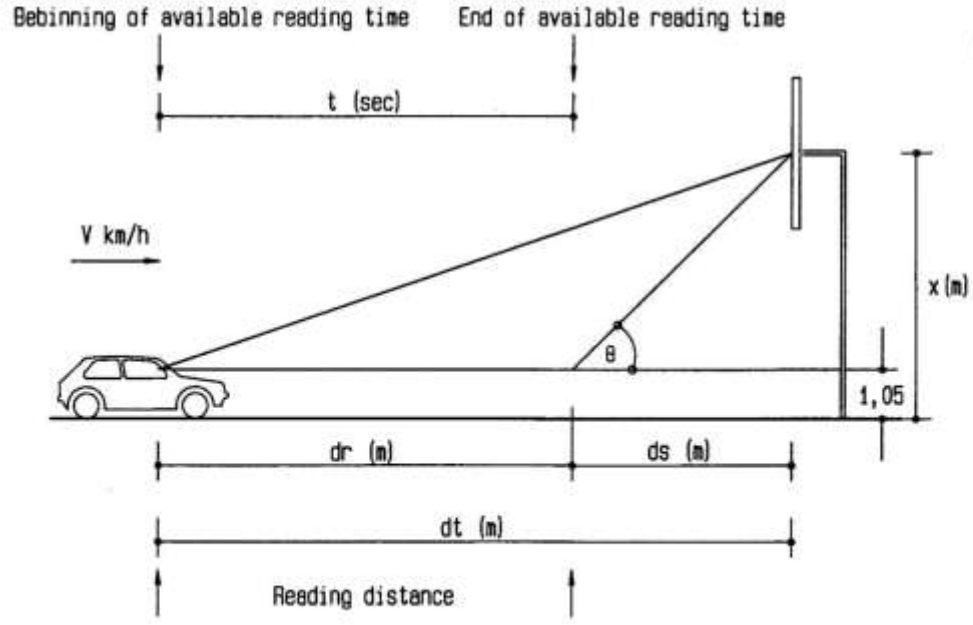


Notes
1. Display angle
see Section 1.6.5,
Vol 1, Part 1
2. Verticle displacememt

h_{min} = 1,60m
h_{pref} = 2,00m
h_{max} = 2,40m

Detail 19.9.1 Oblique Positioning (Side - Ground - Mounted) of Signs



Notes
1. Display angle
see Section 1.6.5,
Vol 1, Part 1
2. Verticle displacememt

h_{min} = 5,20m
h_{pref} = 5,70m
h_{max} = 6,20m

Detail 19.9.2 Positioning for Overhead Signs

Fig 19.9 **Positioning of VMS**

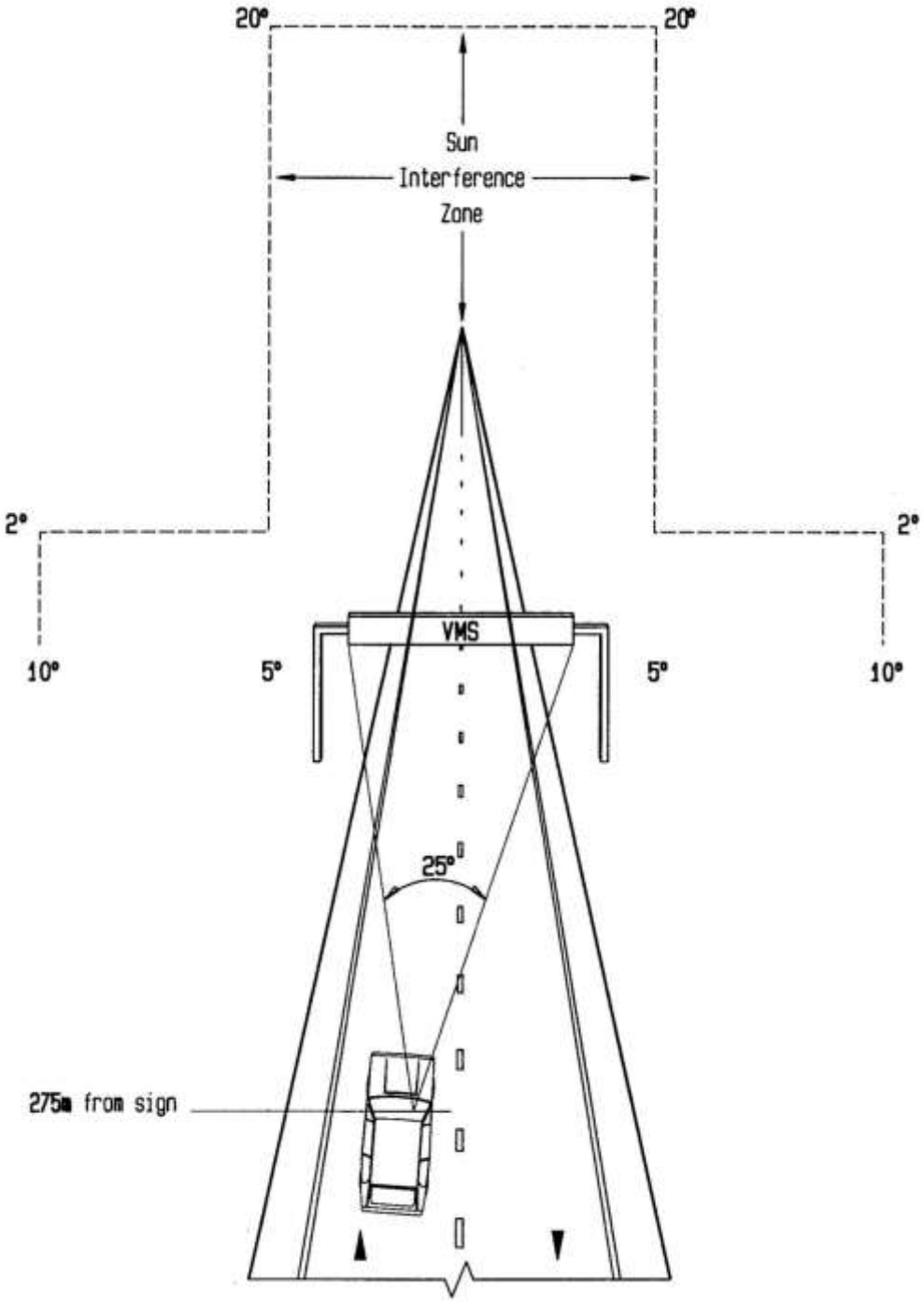


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Fig 19.10 **Effect of Interference from the Sun (Ref.9)**

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19.6 VMS ELEMENTS

19.6.1 General

1 VMS graphic displays are commonly arranged in a modular manner, particularly those that are of the light emitting type. This modular approach helps to standardise design, manufacturing and maintenance procedures. The design of a graphic display is affected by:

(a) pixel characteristics;

(b) module characteristics.

2 The message in a VMS graphic display can be given as:

(a) a text message;

(b) a symbolic or pictogram message; or

(c) a combination of symbol and text.

19.6.2 Pixel Characteristics

1 In the case of light reflecting displays the shape of the pixel (smallest unit forming a light emitting or reflective source) should be round. The reflective material used on the pixel should comply with the relevant SABS specifications.

2 Pixel sizes of light emitting displays will affect the spacing between characters. The minimum spacing between characters should be the width of one column. More than one light source can be used to produce a pixel, however, care should be taken to ensure that glare and irradiation caused by a combination of light source strength, number of light sources and pixel spacing do not cause characters to become illegible.

19.6.3 Module Characteristics

1 Modules can be characterised in terms of size, form and spacing. These factors are comparatively simple to define for text messages, but may require extra care if the truest possible representation of a regulatory or advance warning sign is to be incorporated into the range of displays which a specific VMS is designed to cover (see Subsection 19.6.5 and Figure 19.11 for details of standard pictograms).

2 The size of a module which accommodates a single character should be made up of seven pixels vertically by five pixels horizontally (7 x 5 module). The minimum physical size of the module depends on the size of the character required. This is mainly dependent on the operating speed of the traffic in the vicinity of the sign location. The size of characters, based on operating speed alone, varies between 90 mm and 500 mm for speeds between 60 km/h and 120 km/h respectively. The factors affecting module/letter size are as follows:

(a) traffic operating speed;

(b) sign environmental background;

(c) sign position (roadside/overhead);

(d) length of message displayed.

3 The form and spacing of modules should be such that they are rectangular, consisting of 7 x 5 matrices. No slanting of characters is permitted. Characters should be separated by at least one blank column of pixels. The spacing of words should be a minimum of two columns of blank pixels. For continuous displays at least three rows of blank pixels should separate text lines.

19.6.4 Text Display

1 Text can be displayed on a VMS in a number of ways. Factors such as policies of road authorities, traffic condition requirements or financial constraints will have an influence on the display layout.

2 Displays can be in the form of continuous arrays or modular arrays (rectangular 7 x 5 modules) as can be seen in Figure 19.12. Figure 19.13 provides typical display layouts for various applications.

3 The layouts which are used vary in size and composition and could be in the form of the following:

(a) block layout;

(b) separate lines (continuous or block);

(c) continuous display (able to display text as well as graphics);

(d) text combined with graphics section;

(e) graphics section alone.

4 The font to be used on all VMS, is shown in Figure 19.14. Only upper case characters should be used on VMS since lower case characters cannot be properly displayed on a 7 x 5 matrix.

5 The minimum spacing between characters should be equivalent to a single column of inactive elements (pixels) or 15% of the letter height.

6 To distinguish clearly between word and letter separation, words should be separated by a minimum of two columns of inactive elements (pixels).

7 The minimum vertical line separation should be three lines of inactive elements (pixels).

8 The character height is dependent on the nominal legibility distance, and the operating speed of the relevant road. The following table allowing for all applicable factors, should be used to establish the applicable character heights:

(a) 60 km/h - 250 mm;

(b) 60 km/h - 80 km/h - 330 mm;

(c) 80 km/h - 100 km/h - 420mm;

(d) 100 km/h - 500 mm.

19.6.5 Symbolic Display

1 If pictograms (Figure 19.11 provides typical examples) are displayed either on a separate graphics display area or in the main display area (continuous matrix displays) the minimum size of such an area should be 40x40 pixels, however, a 64 x 64 graphic display is preferable.

19.6.6 Symbols to be Used on Non-Matrix VMS

1 All signs used on non-matrix displays should be in accordance with the standard fixed road signs as provided in the SARTSM and current Road Traffic Act.

19.6.7 Symbols to be Used on Matrix VMS

1 Symbols (examples shown in Figure 19.11) used on matrix-type displays could differ slightly from their standard fixed counterparts due to certain hardware and other technological

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constraints. These constraints should not be permitted to over-rule the symbol size guidelines given in Subsection 19.6.5.

19.6.8 Characteristics of Messages

1 To keep in line with international standards only messages in English should be used. This will furthermore have a positive effect on the cost involved with VMS and will also accommodate the problems associated with the multi-language situation existing in South Africa.

2 The length of a message is limited to the amount of information which could be read and understand by drivers in a maximum of eight (8) seconds (see Figure 19.15). The maximum number of bits of information allowed per message can be calculated (one bit equals one word of less than eight letters see Volume 1, Chapter 4, Figure 4.27).

3 In overseas studies it has been found that the length of lines should not be longer than 18 characters and with a maximum of eight words. It has been found that longer lines on signs cause reading and interpretation problems, thus causing signs to lose their impact and effectiveness. Messages longer than 18 characters should be accommodated by using a multi-line display (not more than three lines), vertical scrolling of data or by alternating pages (maximum two pages per message). The maximum of eight words should under no circumstances be exceeded. It is important that information should be displayed long enough to be read and understood. This has been found in studies to be at least one second per word (see Figure 19.15).

19.6.9 Type of Information Displayed

1 Information displayed should only be of a traffic related nature. Traffic slogans (e.g. buckle up, drive safely, etc.) should not be displayed as these are recognised by drivers as advertising. Any message not in line with this specification will lead to VMS losing their credibility. Typical words/messages which are permitted on VMS are shown in Figure 19.16. No advertising of any kind should be displayed on VMS. This includes the display of logos, etc. Advertising on VMS of any kind reduces the credibility of road signs.

19.6.10 Deviation from Standards

1 Deviation from the standards set in this chapter could only be allowed if adequate proof of the need for, or effectiveness of, the proposed deviation can be supplied.

19.6.11 Checklist

1 The questions listed below provide a useful checking process:

- ❑ how many messages need to be displayed?
- ❑ what is the operational speed in the vicinity of the sign location?
- ❑ do the symbols used on VMS conform to the laid down specifications?
- ❑ where possible, is text only being used to enhance the message conveyed by pictograms?
- ❑ are messages being kept short?
- ❑ have messages which could be perceived as advertisements or logos been used - remember, deviation from standards causes confusion which creates a hazard?
- ❑ will the message be legible, specific and understood?
- ❑ will motorist be able to take the required action safely and timeously?

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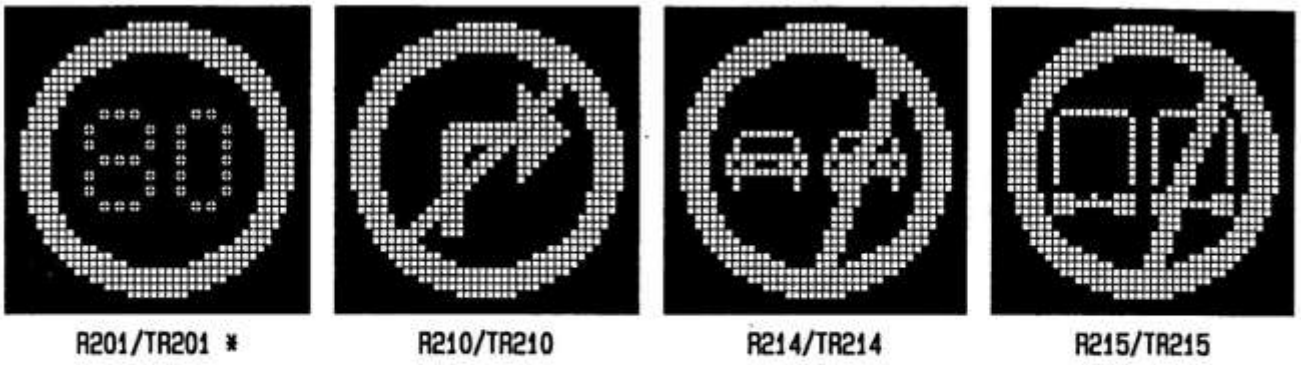
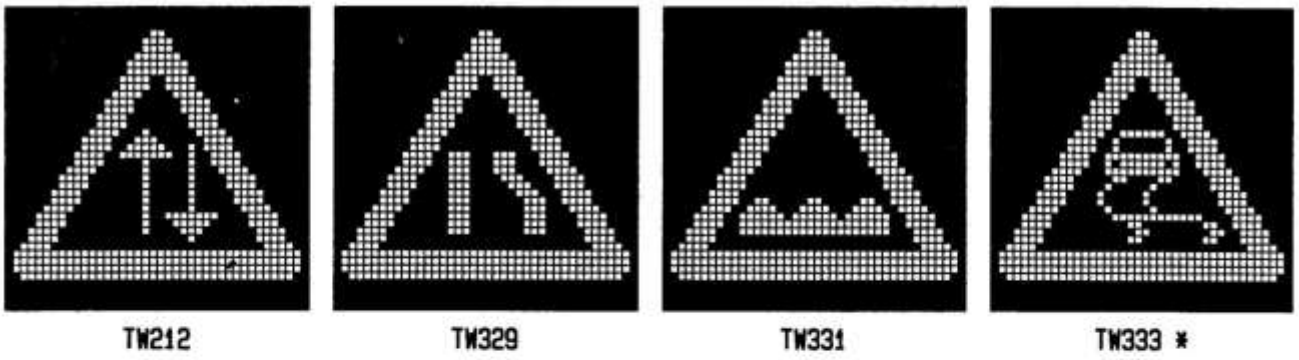
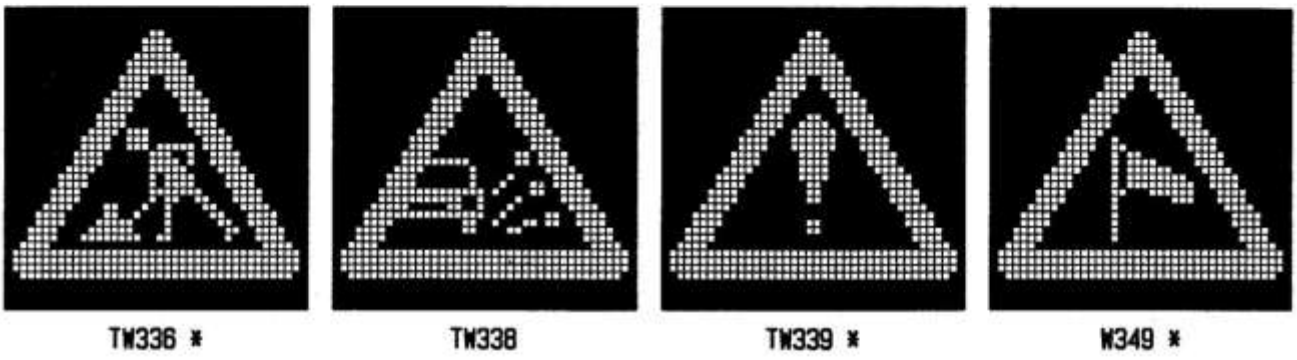


R201/TR201 * R210/TR210 R214/TR214 R215/TR215

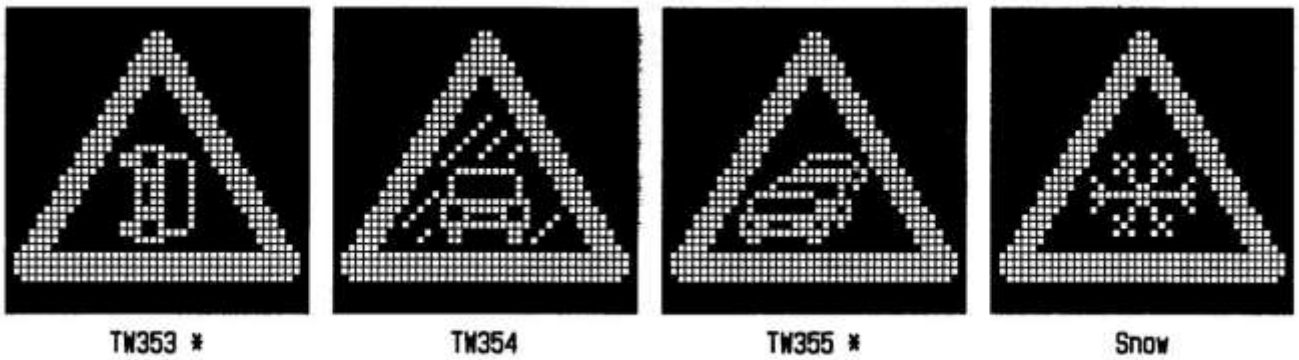
Detail 19.4.1 Regulatory Sign Symbols (Prohibition)



TW212 TW329 TW331 TW333 *



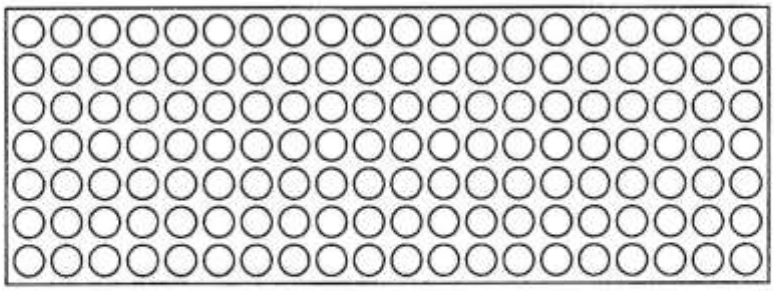
TW336 * TW338 TW339 * W349 *



TW353 * TW354 TW355 * Snow

Detail 19.4.2 Advance Warning Sign Symbols * = International

Fig 19.11 Typical Symbols for Pictograms



Detail 19.12.1 Continuous Array

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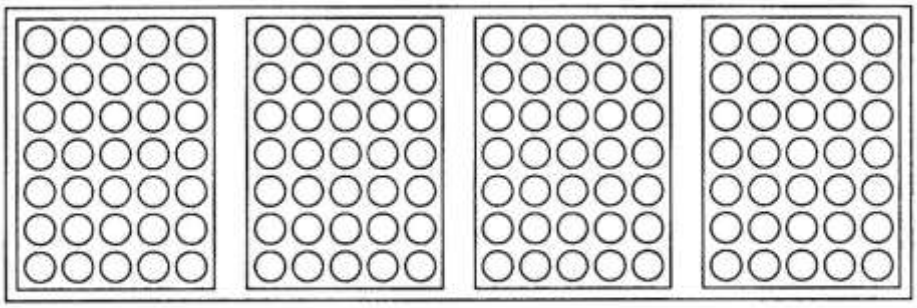
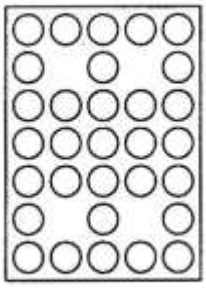


Detail 19.12.2 Modular Array (5x7 Rectangular Modules)



Detail 19.12.3 31-Bulb Figuregram

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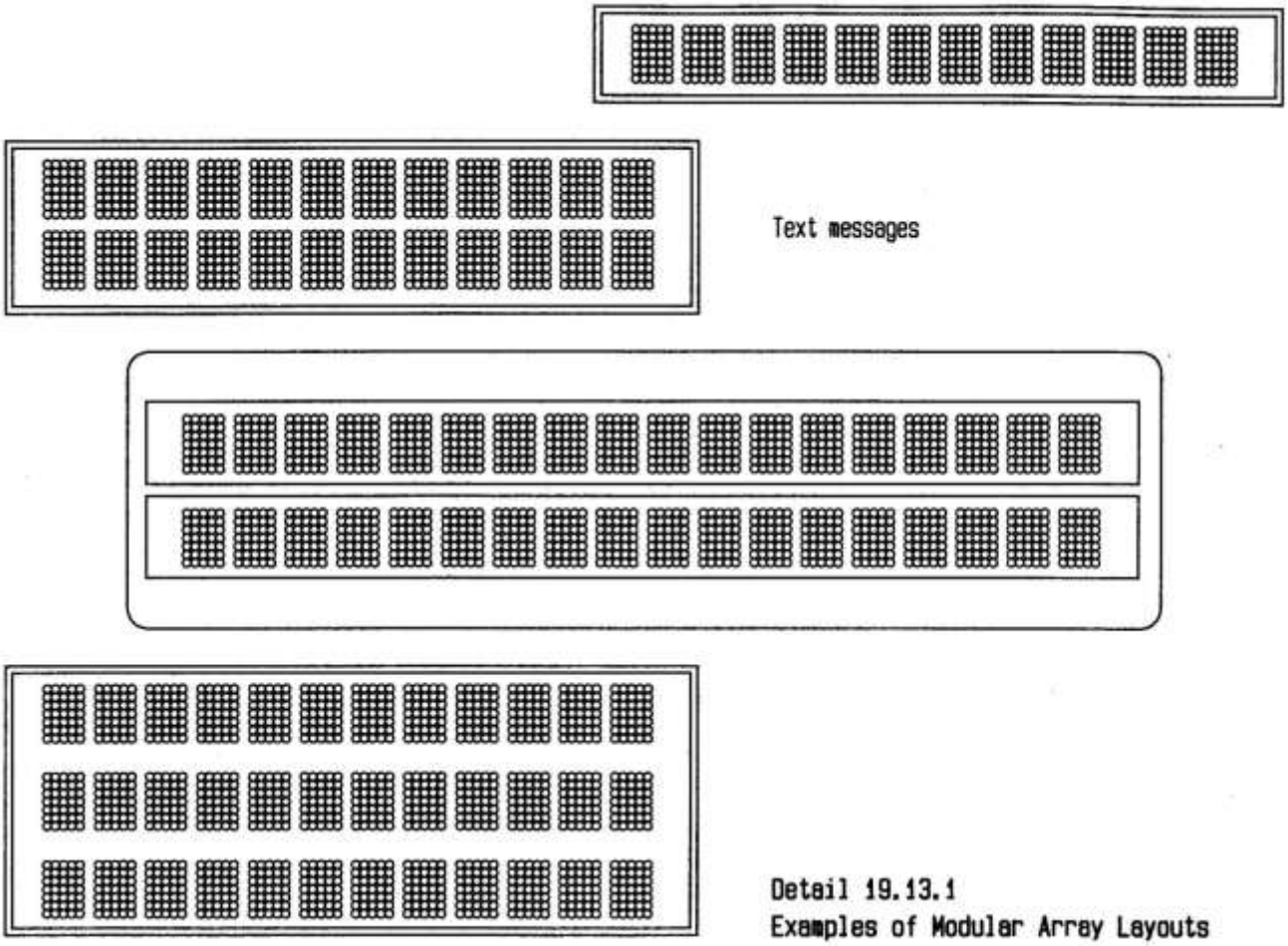
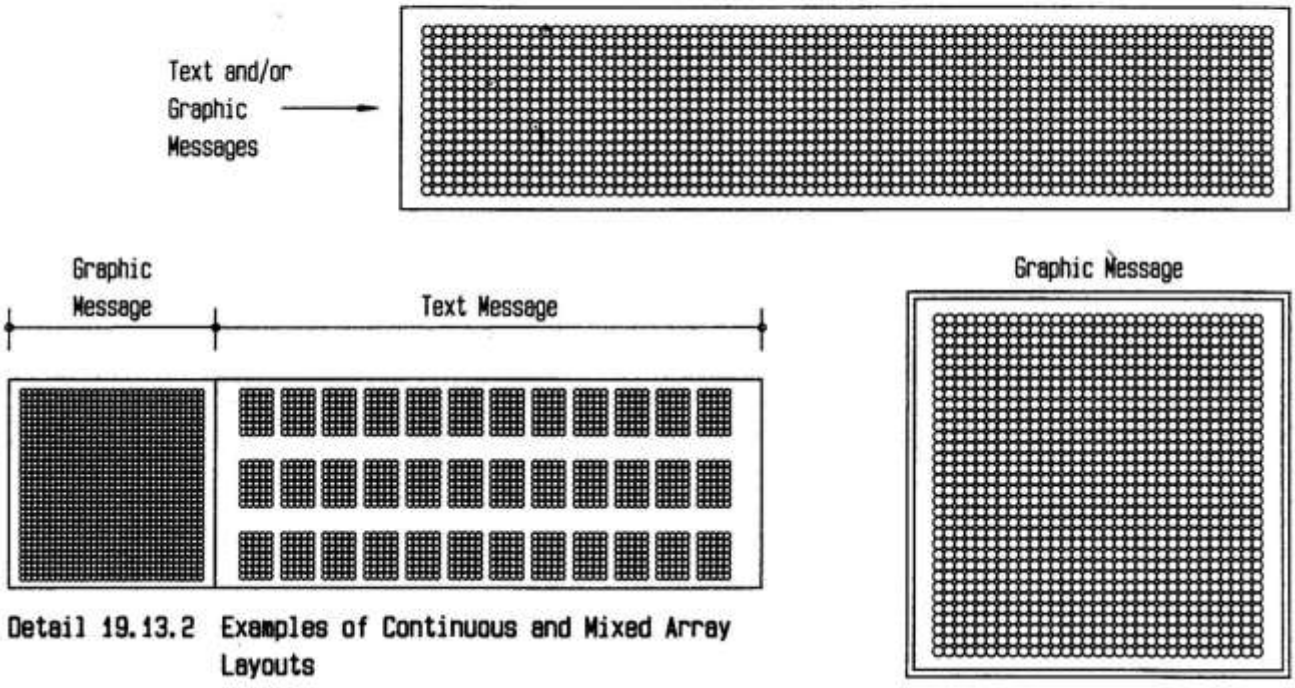
Fig 19.12 **Module Layout – Matrix Arrays**



Detail 19.13.1
Examples of Modular Array Layouts



Detail 19.13.2 Examples of Continuous and Mixed Array Layouts

Fig 19.13 **Display Layouts**

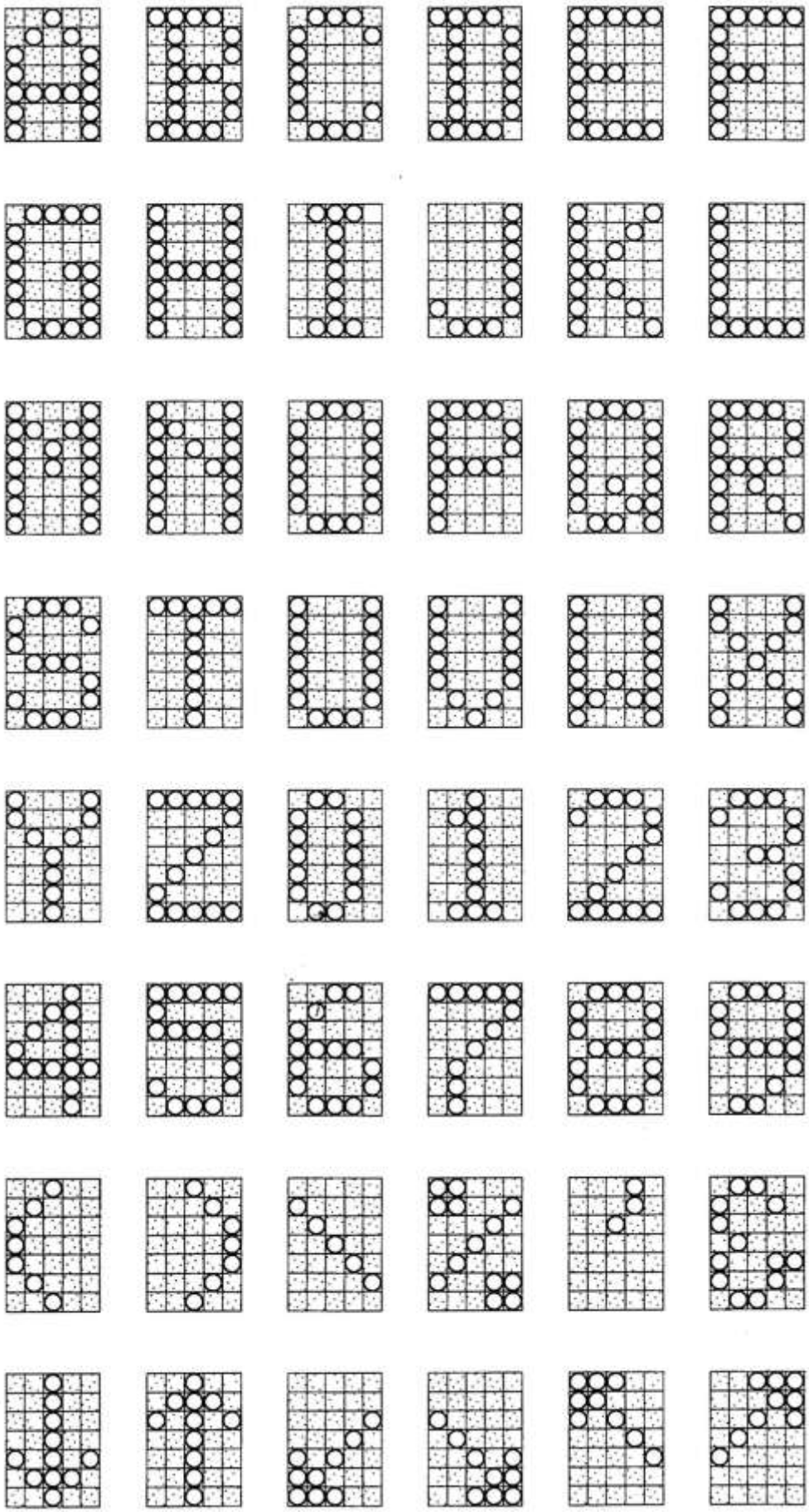


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Fig 19.14 **Font for a 7 x 5 dot Module**

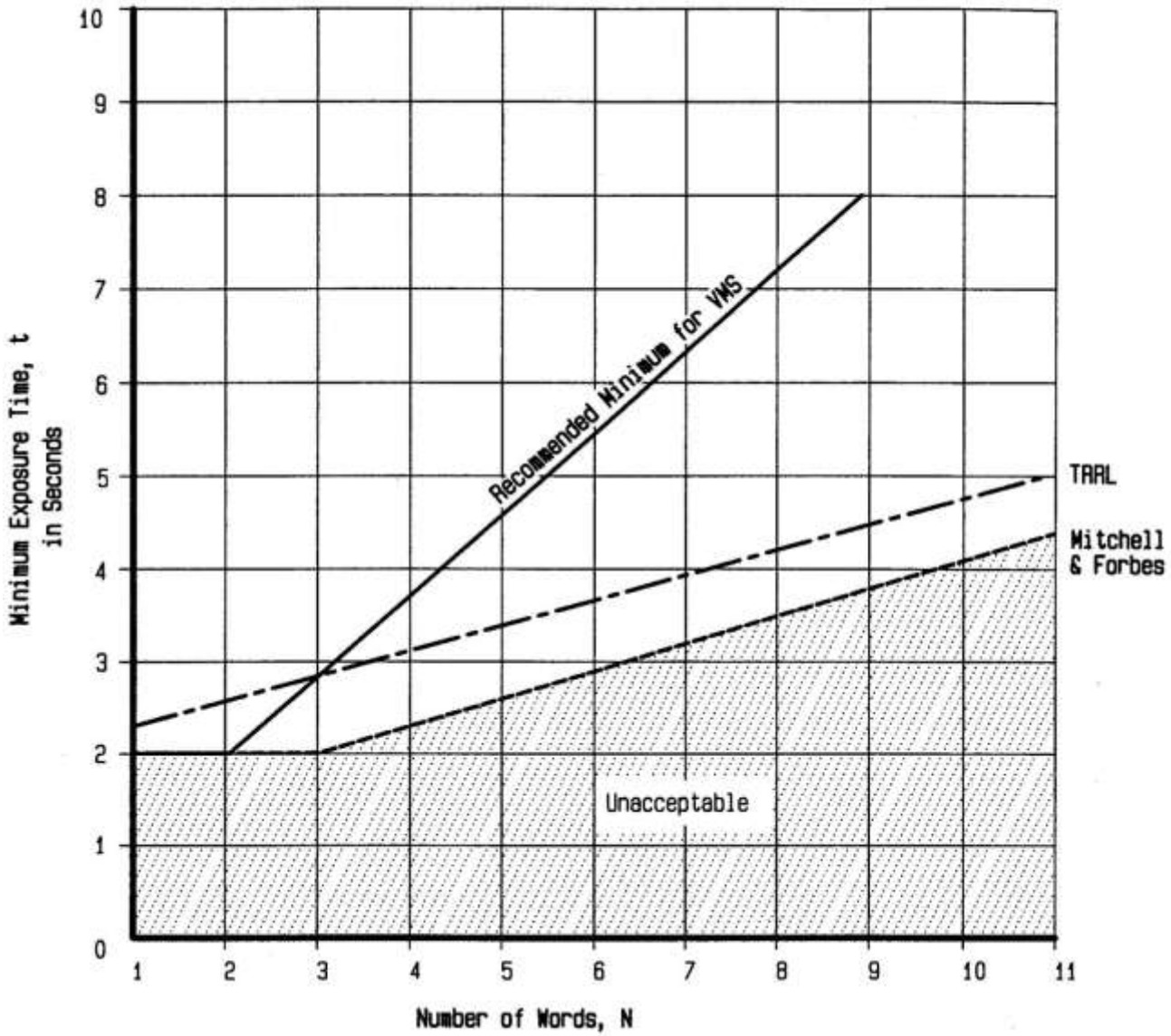

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Fig 19.15 **Minimum Reading Times for Short Word Messages**

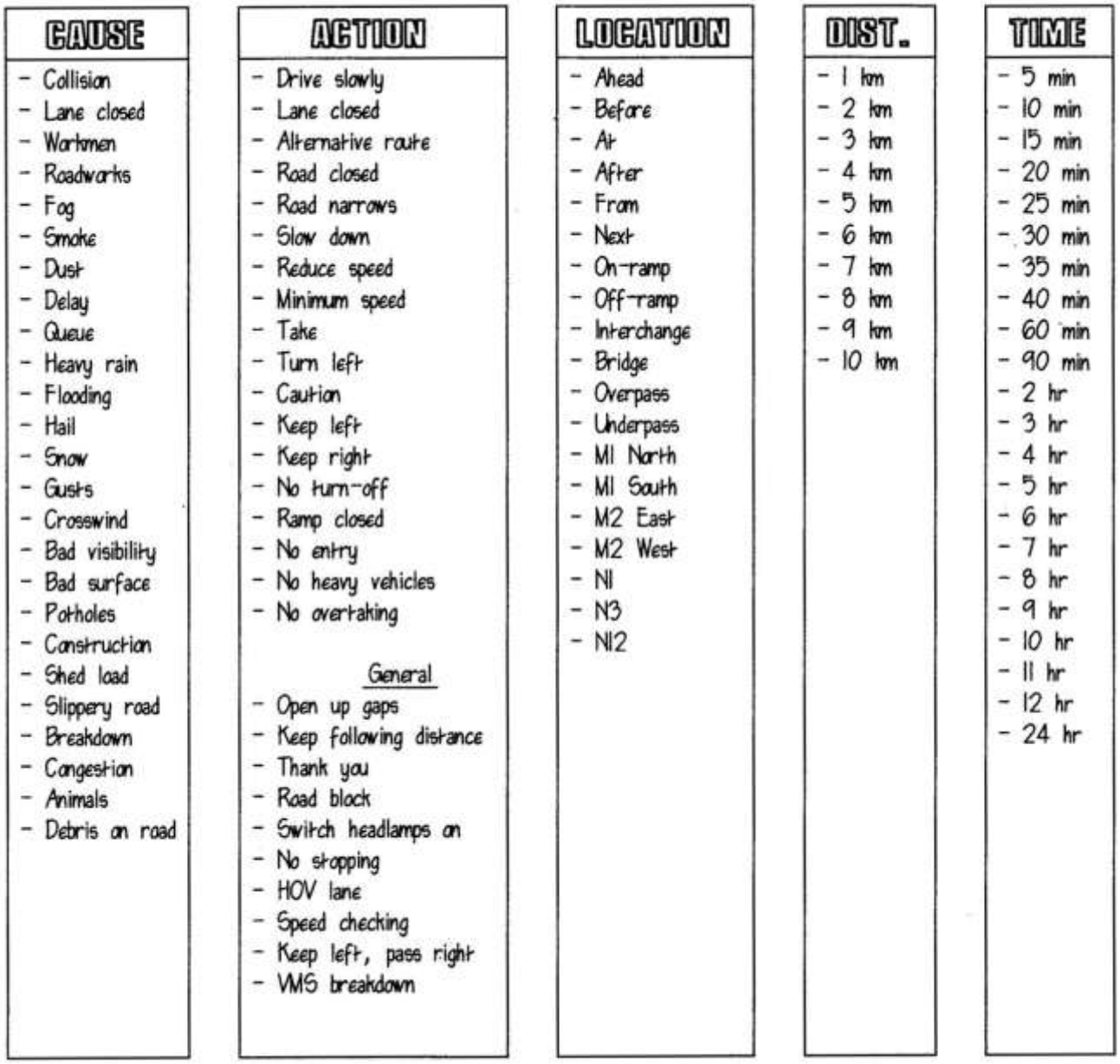

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Fig 19.16 **Typical Messages to be Displayed**

19.7 TYPICAL EXAMPLES OF VMS

19.7.1 General

1 VMS applied in traffic related situations is still rare in South Africa with limited local examples available. However, examples of typical VMS and VMS-applications from Europe and the United States of America are given in Figure 19.17 to Figure 19.22, as follows:

(a) Figure 19.17 Example of Fibre Optic VMS (limited message);

(b) Figure 19.18 Example of Overhead-mounted LED VMS (multi-message);

(c) Figure 19.19 Example of Overhead-mounted Fibre Optic Lane VMS (limited message);

(d) Figure 19.20 Example of Horizontal Rotating Prism VMS (limited message);

(e) Figure 19.21 Example of Vertical Rotating Prism VMS (limited message);

(f) Figure 19.22 Example of Overhead-mounted Text/Graphics LED VMS (multi-message).

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Fig 19.17 **Example of Fibre Optic VMS (Limited Message)**

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Fig 19.18 **Example of Overhead-mounted LED VMS (Multi-Message)**

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Fig 19.19 **Example of Overhead-mounted Fibre Optic Lane VMS (Limited Message)**

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Fig 19.20 **Example of Horizontal Rotating Prism VMS (Limited Message)**

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Fig 19.21 Example of Vertical Rotating Prism VMS (Limited Message)

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Fig 19.22 **Example of Overhead-mounted Text/Graphics LED VMS (Limited Message)**

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19.8 SPECIFICATIONS

19.8.1 General

1 SANS Standard Specification 1519-1: 2006 Road Signs - Part 1: Retroreflective Sheeting Material is relevant for all light reflecting VMS. There is no specific Code of Practice for light emitting VMS in South Africa. For this purpose the standards set out in the CIE-report CIE 111 - 1994, will be applicable.

19.8.2 Photometric Performance of VMS

1 All VMS displays fall into one of two categories:

(a) light reflecting signs; or

(b) light emitting signs.

2 Light reflecting signs use an external light source to make the sign visible, whereas light emitting signs operate by using an internal light source to make the sign visible. With regard to the photometric characteristics, VMS shall comply with certain specifications which are discussed briefly below and in depth in Section 19.10.

19.8.3 Light Reflecting VMS

1 Retroreflective properties of these signs shall comply with SANS 1519 - 1: 2006 Part 1. The colour boundaries for normal and retroreflective colours when new, and after weathering, are shown in Figure 19.23. This is covered in more detail in Volume 1, Chapter 1, Subsection 1.5.7.

2 The luminous intensity during night time hours should be decreased by a factor of ten to prevent glare and irradiation.

19.8.4 Light Emitting VMS

1 The specifications for light emitting signs as set out in Technical Report CIE 111 - 1994: Variable Message Signs, shall be applicable to all light emitting signs used in South Africa (Testing and Evaluation is covered in Section 19.10).

2 Luminance and irradiation compensation values are given in Figure 19.24 and the luminous intensity distribution in Figure 19.25. More detail on the contrast measurement is provided in Section 19.10.

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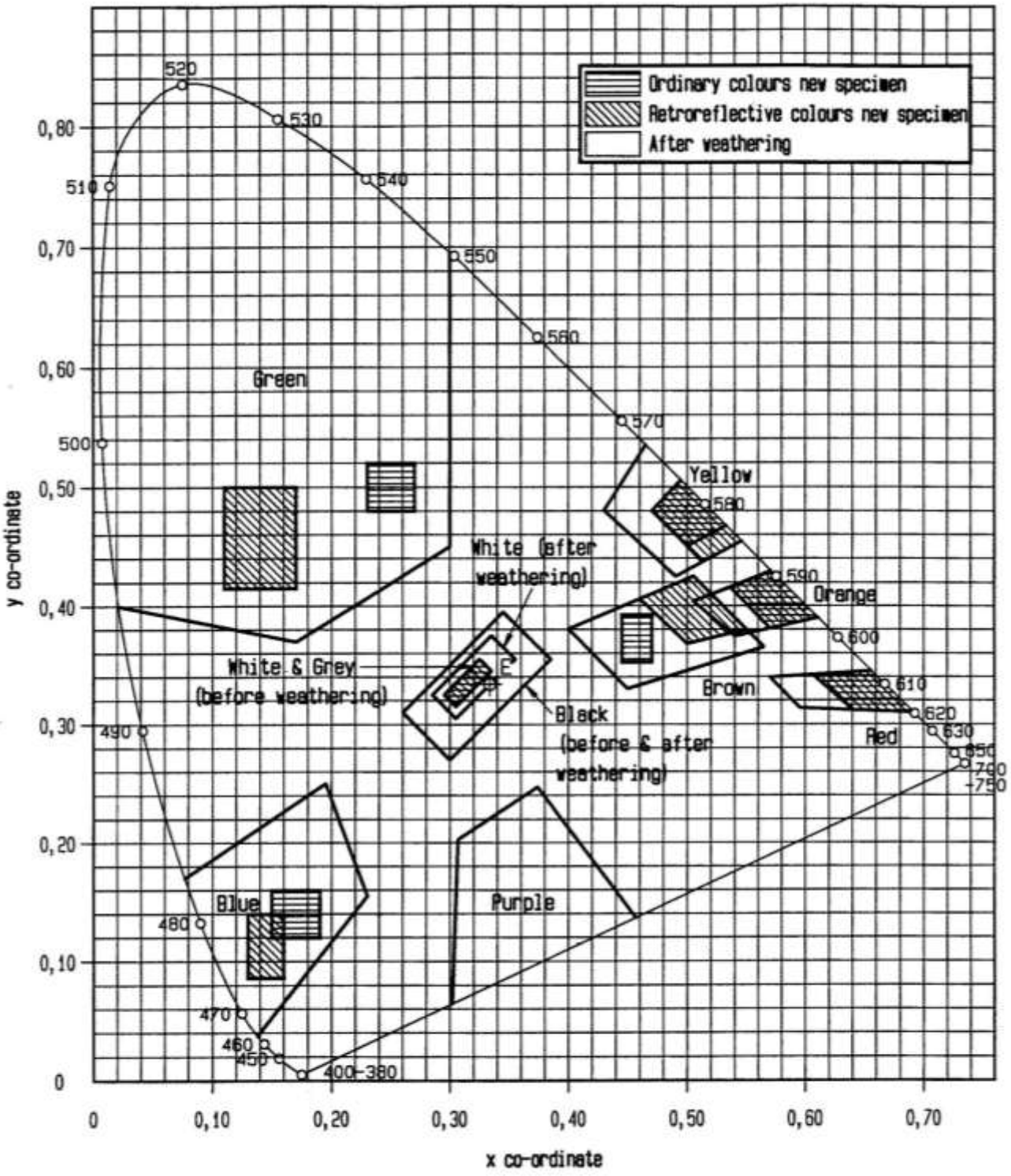
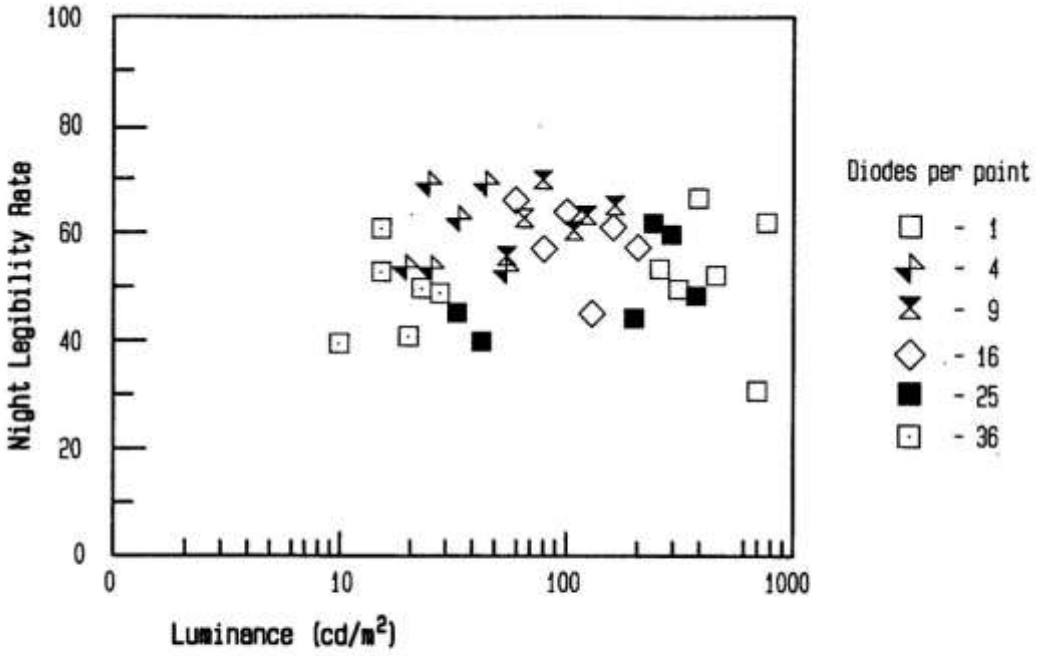
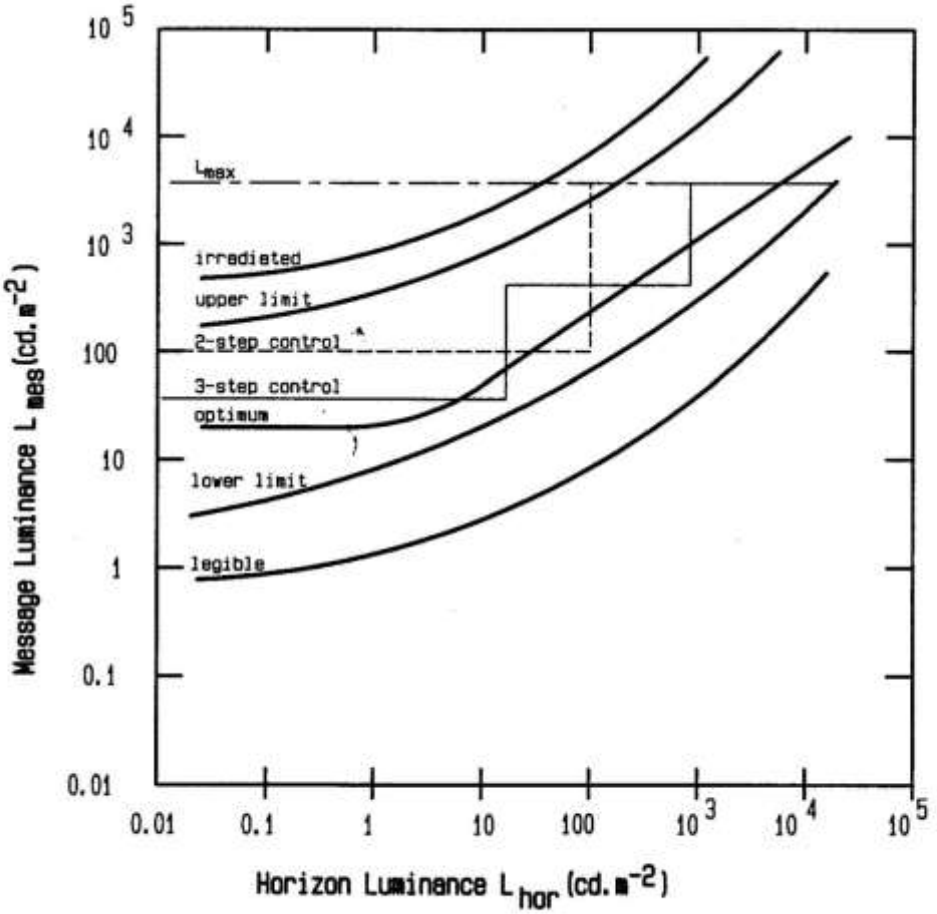


Refer to SANS 1519-1: 2006 and SANS 1519-2: 2004 for specifications and colour co-ordinates

Fig 19.23 Chromaticity Chart for Light Reflecting Displays

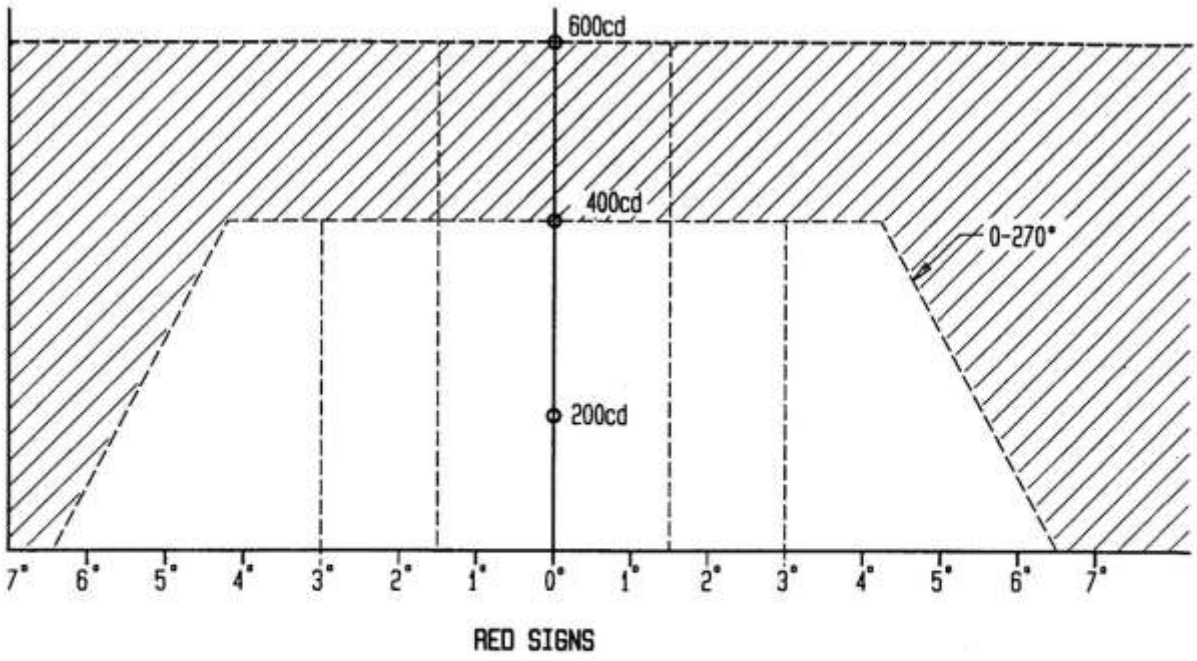


Detail 19.24.1 Percentage of Letters Correctly Read at Night Versus Contrast

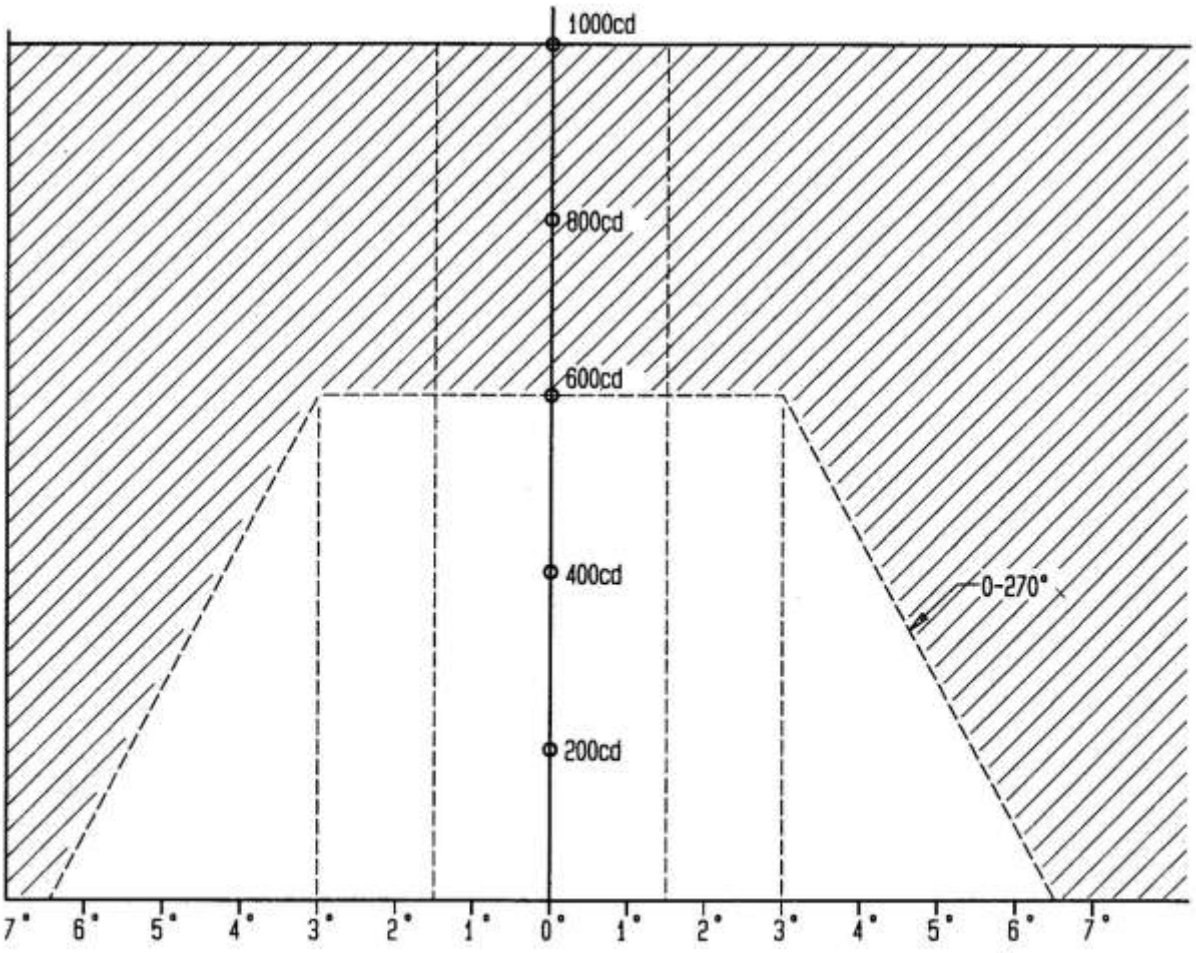


Detail 19.24.2 Step-Control Schemes to Compensate for Irradiation

Fig 19.24 **Luminance and Irradiation Compensation for Light Emitting Displays**



RED SIGNS



WHITE SIGNS

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Fig 19.25 Luminous Intensity Distribution for VMS

19.9 MAINTENANCE OF VMS

19.9.1 General

1 Since VMS are usually mounted on overhead gantries, provision should be made in the design of the supporting framework to allow access to the signs for maintenance. The design of the VMS should be such that the average component failure rate will be less than once per year.

19.9.2 Typical Maintenance

1 For the proper operation of a VMS system, the following important maintenance features should be kept in mind:

(a) VMS housing should be moisture and dust free;

(b) provision should be made to prevent extreme temperatures in the housing and to maintain temperatures within the component limits;

(c) all doors should be tamper free and vandal resistant;

(d) the design of the housing should be such as to allow easy access to all components, assemblies and parts requiring routine maintenance;

(e) all moving parts (5% annual disk pivot "locking" on reflective disk displays) should be maintained on a regular basis;

(f) provision should be made in the design to prevent any panels, doors, or other objects falling onto the road during maintenance;

(g) light sources on VMS (incandescent displays, fibre optic displays and sign face illumination) have a limited life and require regular checking and replacement;

(h) inoperative pixels (LEDs, bulbs, disks, etc.) should be kept to less than 2%;

(i) sufficient spares should be carried by the maintenance authority for components with a high failure rate to speed up replacement.

19.9.3 Checklist

1 The questions listed below provide a checking process designed to assist maintenance units:

- ❑ are the resources available for the maintenance of the VMS to be undertaken in-house?
- ❑ has provision been made to carry adequate spares?
- ❑ what has been done to safeguard installations from lightning and electrical surges?
- ❑ are there any special protection precautions with regard to environmental conditions that need to be considered?
- ❑ will the materials used for the signs and housing withstand the elements?
- ❑ will it be safe to do maintenance on the signs once erected?
- ❑ have the necessary precautions been taken to allow the safe and unobstructed flow of traffic while maintenance is in progress?
- ❑ has a proper maintenance programme been prepared?

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