ROAD MARKING APPLICATIONS

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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 “road 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 ongoing 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, Chapter 12, 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.
2.1.2 INTRODUCTION

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)
Fig 2.1  Regulatory Road Markings - 1
Fig 2.2  Regulatory Road Markings - 2
INTRODUCTION

2.1.5

Fig 2.3  Regulatory Road Markings - 3
Fig 2.4  Regulatory Road Markings - 4
INTRODUCTION

2.1.7

Fig 2.5

Regulatory Road Markings - 5
Fig 2.6  Warning Road Markings - 1
Warning Road Markings - 2
INTRODUCTION

Fig 2.8  Guidance Road Markings - 1
INTRODUCTION

2.1.11

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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2.1.13

Fig 2.10  Figure Conventions

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
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.
9 Dimensions for the majority of symbols, arrows and letters allow for the following general range of standard sizes (lengths):

\[ 1.25 \, \text{m} : 2.5 \, \text{m} : 4.0 \, \text{m} : 5.0 \, \text{m} : 7.5 \, \text{m}. \]

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 (ballotin), 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)
Fig 2.11  Typical Modules for Broken Line Markings
2.2.4 GENERAL PRINCIPLES

Fig 2.12 Lateral Alignment of Road Marking Modules

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
STOP and YIELD Sight Distance Considerations

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

Details 2.13.2 Position of Stop or Yield Signs and Markings

Fig 2.13

STOP and YIELD Sight Distance Considerations
GENERAL PRINCIPLES

2.2.6 ROAD MARKINGS

(continued from page 2.2.2)

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

(a) STOP LINE marking RTM1 or YIELD LINE marking RTM2;
(b) the marking of DIVIDING LINE WM3, NO OVERTAKING LINE RM1 and NO CROSSING LINES RM2 in relation to each other.

10  Figure 2.13 gives details of the sight distance considerations appropriate to the decision to mark a STOP LINE marking RTM1 or a YIELD LINE marking RTM2 at an intersecting side road. The position of markings RTM1 and RTM2 are very much related to the positions of STOP sign R1 and YIELD sign R2 respectively. However, when lines RTM1 or RTM2 are marked it is the marking at which drivers have to stop or yield (not the sign). The markings in particular, must therefore be positioned with adequate sight distance in mind. The minimum width requirements specified for markings RTM1 and RTM2 in Table 2.3 should be noted.

11  The marking of a line between streams of traffic travelling in opposite directions is perhaps the most commonly used road marking on our roads. Which line should be used is dependent on the need to control overtaking manoeuvres. When traffic volumes are low, operating speed is acceptable, and visibility is good, the "centre" of the road may be demarcated by a DIVIDING LINE marking WM3 which permits overtaking (with due regard to safety) in both directions of travel. A DIVIDING LINE shall be marked on all permanently surfaced rural roads with a running surface width of 5,5 m or more. A DIVIDING LINE may be marked on rural or urban roads of lesser width in the interests of safety, subject to engineering assessment. Marking WM3 may be used economically for relatively short distances on roads under 5,5 m width. When traffic volumes are low, likely situations for such use include sharp horizontal and/or vertical alignment, the approaches to road junctions, railway crossings, or bridges and culverts, in order to warn drivers to pay particular attention to possible on-coming traffic. Traffic volumes above the very lowest levels will warrant road widths in excess of 5,5 m, in which case the use of a NO OVERTAKING line will most likely be warranted in the types of situation described above.

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 2.2.17)
NOTES:

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

(2) Details 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 without LEFT EDGE LINE marking RM4.1, or on a multi-lane road they may be used with LANE LINE marking GM1.
### Table 2.3
**Summary of Road Marking Dimensions**

<table>
<thead>
<tr>
<th>Marking Number</th>
<th>Description</th>
<th>Dimensions (mm)</th>
<th>Area (m²) or (m²/distance)</th>
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</thead>
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<tr>
<td></td>
<td></td>
<td>Rural</td>
<td>Urban</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rural</td>
<td>Urban</td>
</tr>
</tbody>
</table>

**Regulatory Markings (continued):**

**RM7** (Yellow)
- **Exclusive Parking Bay**
  - Width: 100
  - Length: 1000
  - Variable
  - Variable

**RM7.1** (Yellow)
- **Exclusive Parking Bay Symbol**
  - Length: 1000
  - Width: 680
  - 0.25 m²
  - 0.25 m²

**RM8** (Yellow)
- **Mandatory Direction Arrows**
  - RM8.1/RM8.4
  - CBD 50-90 km/h: Length 4000, Width 2500
    - 1.14 m²
    - 1.14 m²
  - 100-120 km/h: Length 5000, Width 2500
    - 1.45 m²
    - 1.45 m²
  - Special: Length 7500, Width 2500
    - 2.23 m²
    - 2.23 m²

**RM20** (Yellow)
- **Exclusive Use Lane**
  - Width: 150
  - Line-Gap: 750-1500
  - 7.5 m²/100 m
  - 7.5 m²/100 m

**RM10** (Yellow)
- **Box Junction**
  - 10 m x 10 m
  - Line Width: 150
  - N/A
  - 150 mm border
  - 100 mm diags.
  - 15.72 m²

**RM11** (White)
- **Zig Zag Zone Lines**
  - Width: 100
  - Line-Gap: 2000-1500
  - 9.2 m²/50 m
  - 9.2 m²/50 m

**RM12** (Red)
- **No Stopping Line**
  - Width: 1240
  - Line: 100
  - 10 m²/100 m
  - 10 m²/100 m

**RM13** (Yellow)
- **No Parking Line**
  - Width: 100
  - Line: 150
  - 10 m²/100 m
  - 10 m²/100 m

**RM14** (Yellow)
- **No Motorcycles**
  - Length: 4000
  - Width: 4000
  - 1.92 m²
  - 1.92 m²

(Continued on page 2.2.10)

---

**MARRIAGE FOR NO OVERTAKING LINE**

Applicable for Vertical Curves (Fig 2.15) and Horizontal Curves (Fig 2.18)

<table>
<thead>
<tr>
<th>Design speed (km/h)</th>
<th>Minimum Barrier Sight Distance (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td>60</td>
<td>160</td>
</tr>
<tr>
<td>80</td>
<td>250</td>
</tr>
<tr>
<td>100</td>
<td>300</td>
</tr>
<tr>
<td>120</td>
<td>400</td>
</tr>
</tbody>
</table>

**MINIMUM LENGTH OF NO OVERTAKING LINE**

<table>
<thead>
<tr>
<th>Road Condition</th>
<th>Recommended Minimum Length (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rolling terrain/driving roadway</td>
<td>150</td>
</tr>
<tr>
<td>Mountainous terrain</td>
<td>60</td>
</tr>
</tbody>
</table>

**Fig 2.15**

No Overtaking Lines for Vertical Curves
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 distance between successive lengths of markings RM1 or RM2 of 120 m is recommended, whether the lines are in the same direction or in opposite directions. Such overtaking lengths should be checked for adequacy by engineering assessment.
(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
TABLE 2.3  SUMMARY OF ROAD MARKING DIMENSIONS

<table>
<thead>
<tr>
<th>Regulatory Markings (continued):</th>
<th>Dimensions</th>
<th>Area</th>
<th>Regulatory Markings (continued):</th>
</tr>
</thead>
<tbody>
<tr>
<td>RM15 (Yellow and White) Traffic Circle Mandatory Direction Arrows</td>
<td>N/A</td>
<td>Length</td>
<td>4000</td>
</tr>
<tr>
<td></td>
<td>N/A</td>
<td>5000</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>7500</td>
<td>N/A</td>
<td>2.09 m²X3</td>
</tr>
<tr>
<td>Circle Diameter 2000 Border</td>
<td>N/A</td>
<td>300</td>
<td>N/A</td>
</tr>
<tr>
<td>Centre</td>
<td>N/A</td>
<td>300</td>
<td>N/A</td>
</tr>
<tr>
<td>Circle Diameter 6000 Border</td>
<td>N/A</td>
<td>500</td>
<td>N/A</td>
</tr>
<tr>
<td>Innercircle</td>
<td>N/A</td>
<td>500</td>
<td>N/A</td>
</tr>
<tr>
<td>RM 16 (Yellow) Disabled Persons Parking Bay</td>
<td>N/A</td>
<td>Width</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Symbol</td>
<td>1200</td>
<td>N/A</td>
</tr>
<tr>
<td>RM 17 (Yellow) Exclusive Use Lane/ Bay Symbols Cycle Lane RM 17.1</td>
<td>N/A</td>
<td>Length</td>
<td>1600</td>
</tr>
<tr>
<td>Bus Lane (Word) RM 17.2</td>
<td>N/A</td>
<td>4000</td>
<td>N/A</td>
</tr>
<tr>
<td>Disabled Persons RM 17.3</td>
<td>N/A</td>
<td>1000</td>
<td>N/A</td>
</tr>
<tr>
<td>Parking Bay High Occupancy Vehicle Lane RM 17.4</td>
<td>N/A</td>
<td>4000</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>8000</td>
<td>N/A</td>
<td>8.24 m²</td>
</tr>
</tbody>
</table>

| Warning Markings: | | | | |
|---------------------------------|------------|------|---------------------------------|
| WM1 (White) Railway Crossing Ahead | Line Width | Line Width | 400 + | 200 |
| | Line Width | 7500 | 6.00 m² | 1.84 m² |
| WM2 (White) Continuity Line Recommended | Width | Width | 100 + | 100 |
| | 300 | 200 |
| | Module | 1200 | 9000 |
| Reduced Line/Gap 2m/10m | Line/Gap | Using recomm. | 5 m²/100m | 3.39 m²/100m |
| | 1.5m/7.5m | Using recomm. |
| Standard Line/Gap 2m/4m | Line/Gap | Using recomm. | 10 m²/100m | 6.67 m²/100m |
| | 1.5m/3m | Using recomm. |
| Extra Line/Gap 2m/2m | Line/Gap | Using recomm. | 15 m²/100m | 10 m²/100m |
| | 1.5m/1.5m |
| WM3 (White) Dividing Line Recommended | Width | Width | 100 + | 100 |
| | 150 | 150 |
| | Module | 1200 | 9000 |
| Standard Line/Gap 4m/8m | Line/Gap | Using recomm. | 50 m²/80m | 50 m²/80m |
| | 4m/6m | Using recomm. |
| Extra Line/Gap 6m/9m | Line/Gap | Using recomm. | 75 m²/90m | 75 m²/90m |
| | 4.5m/4.5m |

(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 1.36 m high (equivalent to eye height) and a point 1.36 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 should it 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 Reflectorsed 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 any authority wishing to carry out testing.

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

(a) colour;
(b) luminance factor
(c) coefficient of retrorefleciton;
(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;

(d) 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;

(e) poor surface water drainage
(d) hazardous sites, with documented accident records, involving:
(i) T-junctions;
(ii) wrong-way travel;
(iii) complex lane layouts;
(iv) sharp curves;
(v) at-grade railway crossings;
(e) roadworks sites of significant time duration to demarcate:
(i) temporary road alignments;
(ii) temporary lane arrangements;
(iii) rapid lane indication after resurfacing;
(f) on all freeways.

4 It is essential that the meaning imparted by roadstuds, and the guidance given by them, is consistent and predictable. Only three colours of roadstuds 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 roadstuds 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. Bi-directional 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 |
|-----------------------------------------------|-----------------------|-----------------------|
| 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  |

MAY 2012
SARTSM – VOL 2
ROAD MARKINGS
TABLE 2.3 SUMMARY OF ROAD MARKING DIMENSIONS

<table>
<thead>
<tr>
<th>Marking Number</th>
<th>Descriptions</th>
<th>Dimensions (mm)</th>
<th>Area (m²) or (m²/distance)</th>
<th>Rural</th>
<th>Urban</th>
<th>Rural</th>
<th>Urban</th>
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<td></td>
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<td>Width</td>
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<td>WM4</td>
<td>Reversible Lane (White)</td>
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<td>2 x 100</td>
<td>Module</td>
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<td>15m/3m</td>
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<td>6,67 m²/100 m</td>
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<td>WM5</td>
<td>Yield Control Ahead (White)</td>
<td>Length</td>
<td>Length</td>
<td>1250</td>
<td>0,2 m²</td>
<td>2500</td>
<td>0,83 m²</td>
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<td>WM6</td>
<td>Lane Reduction Arrows (White)</td>
<td>Length</td>
<td>Length</td>
<td>4000</td>
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<td>2,15 m²</td>
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<td>WM7</td>
<td>Mandatory Direction Arrow Ahead (White)</td>
<td>Length</td>
<td>Length</td>
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<td>0,67 m²</td>
<td>WM7.5</td>
<td>0,67 m²</td>
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<tr>
<td>WM8</td>
<td>No Overtaking Line Ahead (White)</td>
<td>Width</td>
<td>Width</td>
<td>WM6.1</td>
<td>0,62 m²</td>
<td>WM6.2</td>
<td>0,62 m²</td>
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<tr>
<td>WM9</td>
<td>Arrester Bed Ahead (Red and White)</td>
<td>Length</td>
<td>Length</td>
<td>1000</td>
<td>3 m² per block</td>
<td>3000</td>
<td>3 m² per block</td>
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</tbody>
</table>

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

(Continued on page 2.2.14)
Fig 2.18
Roadstuds on Multi-Lane Roads
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, as well as the effectiveness of the application, and therefore the life of the markings, should be assessed from time to time for cost effectiveness.

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. Thinner applications, 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 skill 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 applied (Continued on page 2.2.16).
GENERAL PRINCIPLES

2.2.15

(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.
### TABLE 2.3

#### SUMMARY OF ROAD MARKING DIMENSIONS

<table>
<thead>
<tr>
<th>Marking Number (Colour)</th>
<th>Descriptions</th>
<th>Dimensions (mm)</th>
<th>Area (m²) or (m²/distance)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Rural</td>
<td>Urban</td>
</tr>
<tr>
<td><strong>Guidance Markings (continued):</strong></td>
<td></td>
<td></td>
<td></td>
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<td>High Occupancy GM6.4</td>
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<td>GM7 (White or Yellow)</td>
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<td></td>
<td>Word “BUS”</td>
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<td>Kerbface Marking</td>
<td>Black/White</td>
<td>Black/White</td>
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<td></td>
<td>1200/1200</td>
<td>1200/1200</td>
</tr>
</tbody>
</table>
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 m², or for longitudinal markings by an appropriate length i.e. m²/100 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.
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 to 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).
Fig 2.19 Rural Broken Line Module Characteristics
Fig 2.20
Longitudinal Line Combinations - 1
Fig 2.21 Longitudinal Line Combinations - 2
Fig 2.22
Access Across No Overtaking/No Crossing Lines
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.
NOTE:
(1) Warning signs to be positioned according to approach speed - see Table 2.4.

Fig 2.23 Basic Junction Marking - 1
Fig 2.24  Basic Junction Marking - 2
Fig 2.25 Basic Junction Marking - 3

NOTE:  
1) For STOP marking details see Fig 2.29.  
2) Warning signs to be positioned as per Table 2.4.
Fig 2.26
Basic Junction Marking - 4
Fig 2.27
Multi-Lane Junction
Marking - 1

NOTE:
(1) For roadstead key
see Figure 2.28
Spacing between RM6 arrows and RM7 arrows
(or between successive RM7 arrows) should be
in the range 2,4000 MIN to 4,00000

NOTE:
1. Use of road studs is optional
2. Road studs with "Extra" markings
are out of "phase" with normal installation

ROAD STUD KEY

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<tr>
<th>Code</th>
<th>Description</th>
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<td>W</td>
<td>Unidirectional White</td>
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<tr>
<td>WM</td>
<td>Unidirectional White/White</td>
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<td>Bidirectional Yellow/Red</td>
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<tr>
<td>FR</td>
<td>Bidirectional Red/Red</td>
</tr>
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</table>

Fig 2.28
Multi-Lane Junction
Marking - 2
2.3.14 RURAL

Fig 2.29
Multi-Lane Junction Special Aspects

Detail 2.29.1
STOP Line

Detail 2.29.2
YIELD Line Treatment

Legend:
Minimum setback
Corner setback
Extra setback

Detail 2.29.3
STOP Word Marking

Legend:
Optional Signs and Markings

Detail 2.29.4
YIELD Line / GUIDE LINE within Junction

Legend:
Line of edge of opposing through line
600 to NCL clearance

Detail 2.29.5
Typical Acceleration/Left Turn Lane Treatment

Legend:
EDGELINE (Standard)
LENGTH (m) (see Table 2.1)
See Figures 2.37 and 2.101

Detail 2.29.6
Typical Treatment of the End of an Acceleration Lane

Legend:
GUIDE LINE ending Xa

Detail 2.29.7
Median Opening Treatment

Legend:
STOP Line setback to suit junction geometry
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.
Fig 2.30
Beginning/End of Dual Carriageway - 1

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

**Length for Recovery Area (see Manual 62)**

Taper 1 in 40 to 1 in 50 Total Length 500m to 600m

A Recovery Area

B
Fig 2.31
Beginning/End of Dual Carriageway - 2

NOTE:
(i) For typical sign examples see Figures 2.30 in which signs GS102, W17 and W19 would replace signs GS01, W18 and GS19 respectively.
Fig 2.32
Beginning/End of Dual Carriageway - 3

NOTE (i) LANE REDUCTION ARROWS MM8.1x9

Reverse curve - geometry subject to speed and shift

Recovery Area

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NOTE:

(1) For examples of typical signs
see Figure 2.30.

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.
Fig 2.34
Climbing Lane – Drop Fast Lane
Fig 2.35
Climbing Lane –
Drop Slow Lane

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MAY 2012
Fig 2.36
3 Lane/2 Way - Overtaking Opportunity
Fig 2.37 Application of LANE REDUCTION ARROWS WM6

NOTE:

1. The details given relate to approach speeds in the range 80km/h to 120km/h.

2. Markings should be used in conjunction with appropriate advance diagramatic signs of the GS101 - GS106 series with IN1.1 distance supplementary plates. These should be followed at the start of taper by repeat GS101 - GS106 signs without the distance plates as illustrated by GS103.

* = Optional signs and markings
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.
Detail 2.36.1
Typical Median Painted Island
(Protecting Opposed Right Turn Lane)

FORMULA for offsets $x_1, x_2$ etc.

$x_i = \frac{Y_i}{Y} \times 500$ etc.

Detail 2.36.2
Parabolic End Treatment
of Painted Island

Detail 2.36.3
Island End Treatment with
Full Turning Path Set-Back

* see Detail 2.36.4 for
"bar"dimension detail

Detail 2.36.4 Alternative Parabolic End Treatment
Shaped to Vehicle Turning Envelope

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

Fig 2.38
Painted Island -
Rural Applications - 1

Detail 2.38.7
Alternative Treatment
(Reduced Island Area)
Fig 2.39
Painted Island - Rural Applications - 2

Detail 2.39.1 Pre-Taper Shoulder Marking

First painted island "bar" on shoulder

48000 (recommended)

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
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) 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 m², or for longitudinal markings by an appropriate length i.e. m²/100 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.
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).
Fig 2.40 Urban Broken Line Module Characteristics
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.
Fig 2.44
Basic Intersection
Marking - 2

Fig 2.44.1
Typical Mid-Traffic Circle

Fig 2.44.2
Typical One-Way Street Junction

Fig 2.44.3
Typical Dual Carriageway/Minor Road Junction

Fig 2.44.4
Typical Signalized Multi-Lane Road
Fig 2.46
Multi-Lane Junction Marking – 2
Signalised Junction
Fig 2.47
Turning Guide Line GM2
Details - 1

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

Detail 2.47.3
Typical T-Junction

Detail 2.47.4
Y-Junction

Detail 2.47.5
With Small Median Island

Detail 2.47.6
Typical Multi-Lane Signalized Junction

Detail 2.47.7
Indication of Curvature or Skew Through a Junction

Detail 2.47.8
Pedestrian Guidelines at Crossroad
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

Fig 2.48
Turning Guide Line GM2
Details - 2
NOTE:

1. Refer to Fig. 2.93 for full dimensional details of box marking. Note that "boxes", nor their internal "boxes", do not have to be square.

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.)
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
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
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 marking 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.
Fig 2.54
Pedestrian Crossings - 1
At Junctions

Typical 'Legal' Cross Road Pedestrian Crossing

Typical 'Legal' T-Junction Pedestrian Crossing

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

[Diagram showing pedestrian crossings at junctions with relevant details and guidelines]

Optional treatment on one or all approaches to cater for pedestrian demand. An engineering assessment should be carried out for widths over 3000mm.
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
Fig 2.57 Pedestrian Refuge Islands
Fig 2.58 Specific Details of Pedestrian Related Applications of Road Markings
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.
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 ongoing 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.
Fig 2.60
Less Common Applications - 1

Detail 2.60.1
Closely Spaced and Skewed Junctions

Detail 2.60.2
Slew Junction onto Curve

Detail 2.60.3
Road Markings at Very Wide Median Junction

Detail 2.60.4
Road Markings Channelization - C and D Roads
Detail 2.8.1.3
Treatment of Symmetrical
Increase from 2 to 3 Lanes
on a Dual Carriageway

Detail of typical
kerbed splitter
island markings

LANE LINE GM-Extra
1.5m/3m, 3m/3m
LANE LINE GM-Reduced
1.5m, 3m

Detail 2.8.1.4
Large Traffic Circle
- Marking Options
- No Overtaking
- Continuous Line
- Zig Zag Lines

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.
Fig 2.62
Road Marking Do's and Don'ts

Detail 2.62.3
Don't use STOP lines inside a (signalized) junction

Detail 2.62.2
Don't use WM7.4 or WM7.2 to indicate an added lane
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 2.3 indicates 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.
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 2.67 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.
Fig 2.63  Freeway Broken Line Module Characteristics

Detail 2.63.1 Freeway Continuity Line Marking WH2

Detail 2.63.2 Freeway Lane Line Marking GM1
Fig 2.65
Longitudinal Line
Combinations - 2
Fig 2.66
Exclusive Exit Lanes

Detail 2.66.1
Single Exclusive Exit Lane

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

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

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Detail 2.67.1 Typical Weaving Section of an Auxiliary Lane Between Interchanges

Exit from 360° Loop Ramp

Channelizing Line RM3 Continuity Line WM2 (Reduced) Continuity Line WM2 (Standard) Channelizing Line RM3

Entry to 360° Loop Ramp

Medial island

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

Fig 2.67

Weaving Lanes

NOTE:
(i) 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.
Fig 2.68
Crawler Lane - Heavy Vehicles

Detail 2.68.1
Approach Markings to Beginning of Crawler Lane

Detail 2.68.2
Typical Compulsory STOP Control

NOTE:
1) Specialised signs will be required in addition to markings shown.
   (See Chapter 11 - Subsection 11.3.8)

ROAD MARKINGS
Lane Drop – Inner or "Fast" Lane

* = optional markings details

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° 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.
Section 2.70: Typical Off-Ramp

- **Fig 2.70**: Overall Off-Ramp/Gore Treatment
- **Detail 2.70.1**: Location of Exit Point
- **Detail 2.70.2**: Gore Exit Sign
- **Detail 2.70.3**: Gore Island
- **Detail 2.70.4**: Chevron Bars
- **Detail 2.70.5**: Start of Gore Island

**CONTINUITY LINE Rw2 (Standard)**

**_wf 2000 Rw3**

**Lf 2000**

**Lf 2000**

**Lf 2000**
Fig 2.71
Typical On-Ramp
Fig 2.73
Special Ramp
Configurations - 1

Detail 2.73.2
Two-Lane On-Ramp Treatment

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

X = Optional signs and markings

Taper at 1 in 50 to 1 in 74

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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.
Fig 2.75
Crossroad / Ramp Terminal
Treatment - 1
Det3 2.77.1 Typical Rural Crossroad Lane Treatment (see Figure 2.76)

Det3 2.77.2 Typical Urban Crossroad Lane Treatment (see Figure 2.76)

Det3 2.77.3 Approach to Right Turn On-Ramp (Urban)

Det3 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.
Detail 2.78.1
Fully Painted Block Arrestor Bed Marking
On Freeway or Dual Carriageway Roads

Block Markings & road studs for 75m MIN.

Left Exit Marking △
Right Exit Marking ▽

Block Markings & road studs for 5m MIN on Shoulder

Length (not to scale subject to site - in the range 150m to 240m)

Detail 2.78.2
Hollow Block Escape Road Marking at a Toll Plaza

See Detail 2.78.3

ARRESTER BED
marks at Exit Point to Arrestor Bed

Detail 2.78.3
Markings at Exit Point to Arrestor Bed

ARRESTER BED
marking WNS.1

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.
Fig 2.79
SOS Telephone
Shoulder Layout
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.
Fig 2.80  
90° Parking – including Motor Cycle Parking
Fig 2.81

60° 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 2.82  45° Parking – including Motor Cycle Parking
Fig 2.83
Parallel Parking
Fig 2.84
Parallel "Envelope" Parking

Detail 2.84.1 Typical Example of "Envelope" Parallel Parking

Detail 2.84.2 Optional Sidewalk Projection into Parking Area

- Parking Envelope
- Kerbline
- Sidewalk
- Parking Envelope Line
- Catchpit
- 2m
- 1m
- 2m
- 1m
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° 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.
Fig 2.85
Disabled Persons and Exclusive Parking Bays

PARKING

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Fig 2.86
Loading Bays and
Exclusive Parking Bays
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° 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° 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° for the first two or three bars.

(continued on page 2.7.8)
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 elements should be less than 150 mm in width.
Fig 2.88   RM5 – Painted Islands – 2 – Basic “Dividing” Island/Chevron Bar and Hollow Bar Details
Fig 2.89: RM5 – Painted Islands – 3: Types/Applications of Painted Island Markings
Diagonal Bars
2-Way

Chevron Bars
1-Way

500m Bars - 80km/h
Larger size (min 3m wide o/a list)

200mm Bares - 60km/h
(MINIMUM) Size (min 2m wide o/a list)

500m Bars - 80km/h
Larger size (min 3m wide o/a list)

1000mm Bars - 120km/h
OR Large size (3m or more o/a list width)

1000mm Bars - 100km/h
OR Large size (3m or more o/a list width)

Application only as part of a dividing
Line between opposing streams of
traffic

Fig 2.90
RM5 - Painted Islands - 4

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

Median

No Bars - 60km/h or Less
Small Size - 8m² or Less

Dividing Line

Shoulder

Detail 2.90.1
Simplest Form of Painted Island
Fig 2.91
RM5 - Painted Islands - 5

2.7.6
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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 acting out.

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.

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).

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 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.

This detail simply shows the visual appearance of a wider island using the same START POINT.

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

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

Detail 2.91.1
Painted Island ONLY on Side Road Approach

Detail 2.91.2
Painted Island ONLY on Through Road Approach

Detail 2.91.3
Painted Island ONLY on Turning Roadway

Detail 2.91.4
Painted Island on 2 or ALL Sides Triangular Channelizing Approach
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 $30^\circ$ or less - $10^\circ$ 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 $90^\circ$ 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.
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) Mark diagonals 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.
Fig 2.94  
RM11 – Zig-Zag Zone Lines

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.
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.
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.
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 are 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:

<table>
<thead>
<tr>
<th>Arrow length (mm)</th>
<th>Grid block length (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2500</td>
<td>50</td>
</tr>
<tr>
<td>4000</td>
<td>80</td>
</tr>
<tr>
<td>5000</td>
<td>100</td>
</tr>
<tr>
<td>7500</td>
<td>120</td>
</tr>
</tbody>
</table>

Fig 2.96
RM8 – Mandatory Direction Arrows – 1
WM7 - Mandatory Direction Arrows Ahead – 1
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
Fig 2.99  
RM15 – Traffic Circle Mandatory Arrows – 1

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 for the traffic circle.  
3 The circle portion of the marking shall comprise a white outer ring marking and a yellow central marking. For small circles (4 m diameter or less) the central marking should be solid. For larger circles the marking may be an inner yellow ring. See Figure 2.100, Detail 2.100.1.
Fig 2.100 RM15 – Traffic Circle Mandatory Arrows – 2
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.

Fig 2.101 WM6 – Lane Reduction Arrows – 1
Fig 2.102  
WM6 – Lane Reduction Arrows – 2
Fig 2.103

WM8 – No Overtaking Ahead Arrows – 1

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.
Fig 2.104  WM8 – No Overtaking Ahead Arrows – 2

SCALE 1:25
Fig 2.105  WM11.1 – End of Exclusive Use Lane Arrows – Option to Turn

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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.
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 should be noted that the grid width of 50 mm remains constant irrespective of changes in length.
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 should be noted that the grid width of 50 mm remains constant irrespective of changes in length.
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:

<table>
<thead>
<tr>
<th>“a” (arrow length)</th>
<th>grid block length</th>
</tr>
</thead>
<tbody>
<tr>
<td>2500 mm</td>
<td>50 mm</td>
</tr>
<tr>
<td>4000 mm</td>
<td>80 mm</td>
</tr>
<tr>
<td>5000 mm</td>
<td>100 mm</td>
</tr>
<tr>
<td>7500 mm</td>
<td>120 mm</td>
</tr>
</tbody>
</table>

Fig 2.107  GM3 – Bifurcation Arrows - 1
Fig 2.108  
GM3 – Bifurcation Arrows - 2
Fig 2.109  GM4 – Information Arrows

GM4

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.
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).
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 m².
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.
Fig 2.111

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 m².
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:

<table>
<thead>
<tr>
<th>symbol length</th>
<th>symbol length</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 mm</td>
<td>600 mm</td>
</tr>
<tr>
<td>120 mm</td>
<td>1200 mm</td>
</tr>
<tr>
<td>180 mm</td>
<td>1800 mm</td>
</tr>
</tbody>
</table>

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.

Fig 2.113  
RM17.4 – High Occupancy Vehicle Lane Symbol  
GM6.4 – High Occupancy Vehicle (HOV) Symbol
Fig 2.114  
RM7.1 – Details of Oval Symbol for Use with EXCLUSIVE PARKING BAY Marking RM7
Fig 2.115  
RM7.1 – Letter Details - 1
Fig 2.116  
RM7.1 – Letter Details - 2
Fig 2.117

RM7.1 – Letter Details - 3
Fig 2.118

RM7.1 – Letter Details - 4
Fig 2.119  
RM7.1 – Letter Details - 5
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 m².
   (b) For a = 7500 mm area = 6.00 m².
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 m².
   (b) For a = 850 mm area = 0.83 m².
   (c) For a = 1350 mm area = 2.15 m².

<table>
<thead>
<tr>
<th>Operating speed km/h</th>
<th>Typical applications</th>
<th>Distance from yield line</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 – 40</td>
<td>City centre</td>
<td>90m</td>
<td>450</td>
<td>250</td>
<td>100</td>
<td>1250</td>
</tr>
<tr>
<td>50 – 60</td>
<td>Urban</td>
<td>120m</td>
<td>850</td>
<td>450</td>
<td>150</td>
<td>2500</td>
</tr>
<tr>
<td>70 – 120</td>
<td>Rural</td>
<td>155m</td>
<td>1350</td>
<td>700</td>
<td>250</td>
<td>4000</td>
</tr>
</tbody>
</table>

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.
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:

<table>
<thead>
<tr>
<th>‘H’ (letter height)</th>
<th>grid block length</th>
</tr>
</thead>
<tbody>
<tr>
<td>1250 mm</td>
<td>22.7 mm</td>
</tr>
<tr>
<td>2500 mm</td>
<td>45.5 mm</td>
</tr>
<tr>
<td>4000 mm</td>
<td>72.7 mm</td>
</tr>
<tr>
<td>5500 mm</td>
<td>100.0 mm</td>
</tr>
<tr>
<td>7500 mm</td>
<td>136.4 mm</td>
</tr>
</tbody>
</table>

Fig 2.122  GM7 – STOP Marking - 1
Fig 2.123  
RM7 – STOP Marking - 2
Fig 2.125

GM7 – Letters - 2

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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
Fig 2.128  
GM7 – Letters - 5