INTRODUCTION

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.
INTRODUCTION

2.1.13

Fig 2.10  Figure Conventions

MAY 2012  SARTSM – VOL 2  ROAD MARKINGS
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 m : 2.5 m : 4.0 m : 5.0 m : 7.5 m.

It should be noted that certain arrows are not appropriate in all the sizes indicated and others may be occasionally used in a size outside the range. This information is given in Table 2.3.

10 WORD marking GM7, with a letter size of 5.5 m, has been established for a very long time and many organisations have this size of letter stencil or mask. The dimension of 5.5 m has therefore been retained for GM7 letters in preference to a 5.0 m size.

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

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

2.2.4 Basic Design Principles

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

(a) good visibility by day and night;
(b) good skid resistance;
(c) durability;
(d) clarity of message;
(e) where appropriate, symbolic markings should be elongated in the direction of movement of traffic;
(f) elongated markings should be sized (length) in relation to the operating speed of traffic;
(g) short drying or application times to keep traffic disruption to a minimum;
(h) low environmental impact (products shall not contain substances banned under national or international law).

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

3 To improve contrast it is generally recommended that road markings which have a night-time significance be made retroreflective by the means of glass beads (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 construction, 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)
2.2.3

**Detail 2.11.1 Lane Line Marking GM1**

```
Reduced 200mm
Standard 200mm
Extra 200mm
```

**Detail 2.11.2 Continuity Line Marking WM2**

```
Reduced 200mm
Standard 200mm
Extra 200mm
```

**Fig 2.11**  Typical Modules for Broken Line Markings
**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
Fig 2.13 STOP and YIELD Sight Distance Considerations

Detail 2.13.2 Position of Stop or Yield Signs and Markings

Detail 2.13.1 Basic Sight Distance Criteria (Ref: Volume 1 - Chapter 2)
2.2.6

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TABLE 2.1

<table>
<thead>
<tr>
<th>Operating Speed (km/h)</th>
<th>Taper Rate for Line Shift Without Kerbed Island</th>
<th>Taper Rate for Line Shift Proceeding Kerbed Island</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width of Kerbed Island</td>
<td>1 m **</td>
<td>2 m **</td>
</tr>
<tr>
<td>600 mm – 1.25 m</td>
<td>50</td>
<td>20</td>
</tr>
<tr>
<td>1.75 m – 2.5 m</td>
<td>35</td>
<td>25</td>
</tr>
<tr>
<td>3 m or more</td>
<td>50</td>
<td>30</td>
</tr>
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TABLE 2.3

<table>
<thead>
<tr>
<th>Regulatory Transverse Markings:</th>
<th>Dimensions (mm)</th>
<th>Area (m²) or (m²/distance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTM1 STOP Line</td>
<td>500</td>
<td>3 m²/m, 6 m</td>
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<tr>
<td>RTM2 YIELD LINE</td>
<td>200</td>
<td>1.17 m²/m, 8 m²/m</td>
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TABLE 2.4

<table>
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<th>Taper Rate for Line Shift Without Kerbed Island</th>
<th>Taper Rate for Line Shift Proceeding Kerbed Island</th>
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TABLE 2.5

<table>
<thead>
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<th>Regulatory Markings:</th>
<th>Dimensions (mm)</th>
<th>Area (m²) or (m²/distance)</th>
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</thead>
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<tr>
<td>RTM1 No Overtaking Line</td>
<td>100</td>
<td>100 m²/km, 100 m²/km</td>
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<tr>
<td>RM2 No Crossing Lines</td>
<td>200</td>
<td>200 m²/km, 200 m²/km</td>
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</table>

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<td>RTM3 Pedestrian Crossing Lines</td>
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<td>100 m²/km, 100 m²/km</td>
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<td>RTM4 Block Pedestrian Crossing Marking</td>
<td>2400</td>
<td>2400 m²/km, 2400 m²/km</td>
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<th>Dimensions (mm)</th>
<th>Area (m²) or (m²/distance)</th>
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</thead>
<tbody>
<tr>
<td>RM4 Left Edge Line</td>
<td>100</td>
<td>100 m²/km, 100 m²/km</td>
</tr>
<tr>
<td>RM5 Right Edge Line</td>
<td>100</td>
<td>100 m²/km, 100 m²/km</td>
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<td>25</td>
</tr>
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<td>50</td>
<td>35</td>
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</table>

TABLE 2.5

<table>
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<tr>
<th>Regulatory Markings:</th>
<th>Dimensions (mm)</th>
<th>Area (m²) or (m²/distance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RM6 Painted Islands</td>
<td>100</td>
<td>100 m²/km, 100 m²/km</td>
</tr>
<tr>
<td>RM7 Parking Bays</td>
<td>100</td>
<td>100 m²/km, 100 m²/km</td>
</tr>
</tbody>
</table>
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>
<thead>
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<th>Regulatory Markings (continued):</th>
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<tr>
<td>RM7 (Yellow) Exclusive Parking Bay</td>
<td>Width</td>
<td>Width</td>
<td>Variable</td>
<td>Variable</td>
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<tr>
<td>RM7.1 (Yellow) Symbol Exclusive Parking Bay</td>
<td>Length</td>
<td>Length</td>
<td>0.25 m²</td>
<td>0.25 m²</td>
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<tr>
<td>RM8 (Yellow) Mandatory Direction Arrows</td>
<td>Length</td>
<td>Length</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RM8.1/RM8.5 CBD 50-90 km/h</td>
<td>4000</td>
<td>2500</td>
<td>0.67 m²</td>
<td></td>
</tr>
<tr>
<td>100-120 km/h</td>
<td>5000</td>
<td>5000</td>
<td>1.14 m²</td>
<td></td>
</tr>
<tr>
<td>Special</td>
<td>7500</td>
<td>7500</td>
<td>1.43 m²</td>
<td></td>
</tr>
<tr>
<td>RM8.2/RM8.4 CBD 50-90 km/h</td>
<td>4000</td>
<td>2500</td>
<td>0.67 m²</td>
<td></td>
</tr>
<tr>
<td>100-120 km/h</td>
<td>5000</td>
<td>5000</td>
<td>1.14 m²</td>
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<td>Special</td>
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<td>7500</td>
<td>1.43 m²</td>
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<tr>
<td>RM8.3 CBD 50-90 km/h</td>
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<td>2500</td>
<td>0.67 m²</td>
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<td>100-120 km/h</td>
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<td>7500</td>
<td>1.43 m²</td>
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<td>RM8.6 CBD 50-90 km/h</td>
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<td>0.67 m²</td>
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<td>100-120 km/h</td>
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<td>5000</td>
<td>1.14 m²</td>
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<tr>
<td>Special</td>
<td>7500</td>
<td>7500</td>
<td>1.43 m²</td>
<td></td>
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<td>RM9 (Yellow) Exclusive Use Lane Line</td>
<td>Width</td>
<td>Width</td>
<td></td>
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<tr>
<td>Line</td>
<td>150</td>
<td>150</td>
<td>7.5 m²/100 m</td>
<td>7.5 m²/100 m</td>
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<tr>
<td>Line-Gap</td>
<td>750-750</td>
<td>750-750</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RM10 (Yellow) Box Junction N/A</td>
<td>Line Width</td>
<td>N/A</td>
<td>150 mm border</td>
<td></td>
</tr>
<tr>
<td>10 m x 10 m</td>
<td>100</td>
<td>100 mm diags.</td>
<td>15.72 m²</td>
<td></td>
</tr>
<tr>
<td>RM11 (White) Zig Zag Zone Lines</td>
<td>Width</td>
<td>Width</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line</td>
<td>100</td>
<td>100</td>
<td>2 lines</td>
<td></td>
</tr>
<tr>
<td>Line-Gap</td>
<td>2000-150</td>
<td>2000-150</td>
<td>9.2 m²/50 m</td>
<td></td>
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<tr>
<td>RM12 (Red) No Stopping Line Width</td>
<td>Width</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>24 hr.</td>
<td>100</td>
<td>100</td>
<td>10 m²/100 m</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>150</td>
<td>4000</td>
<td>4000</td>
<td>1.92 m²</td>
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<td>RM13 (Yellow) No Parking Line Width</td>
<td>Width</td>
<td></td>
<td></td>
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<tr>
<td>24 hr.</td>
<td>100</td>
<td>100</td>
<td>10 m²/100 m</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>150</td>
<td>4000</td>
<td>4000</td>
<td>1.92 m²</td>
</tr>
<tr>
<td>RM14 (Yellow) No Motorcycles Length</td>
<td>Length</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2400</td>
<td>4000</td>
<td>4000</td>
<td>1.92 m²</td>
<td></td>
</tr>
</tbody>
</table>

(Continued on page 2.2.10)

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
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 3.50 m high (equivalent to eye height) and a point 1.30 m high (equivalent to vehicle height) on vertical or horizontal curves is less than the value given in Figure 2.15. The Barrier Sight Distance allows sufficient time for two vehicles approaching each other in a head-on situation to stop if such policy were adopted 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 road safety, or 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 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 a number of important properties of road marking paints, nor do they cover other road marking materials, nor any application specifications.

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

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

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

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

2.2.6 Roadstuds

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

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

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) the speed 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) the 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 roadstud are permitted to supplement road markings. The meanings to be conveyed by the three colours, in conjunction with relevant road markings, are:
   (a) RED shall mean PROHIBITION;
   (b) YELLOW shall mean WARNING;
   (c) WHITE shall offer GUIDANCE.

5 The functions of these permitted colours of roadstud are:
   (a) RED:
      (i) to supplement any road marking to indicate potential "wrong way" driving situations;
      (ii) in conjunction with a white NO OVERTAKING LINE marking RM1;
      (iii) in conjunction with a white NO CROSSING LINE marking RM2;
      (iv) in conjunction with a white RIGHT EDGE LINE marking RM4.2;
   (b) YELLOW:
      (i) in conjunction with yellow road markings with the exception of any application covered by sub-paragraph 2.2.6.5 (a) (i);
      (c) WHITE (or clear):
      (i) in conjunction with white road markings with the exception of any application covered by sub-paragraph 2.2.6.5 (a) (i).

6 It is recommended that only roadstuds which comply with the requirements of the South African Standard Specification SANS 1442:2008 Roadstuds be used. Roadstuds may be omnidirectional, uni-directional or bi-directional.

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>
<thead>
<tr>
<th>TABLE 2.2</th>
<th>RECOMMENDED LONGITUDINAL ROADSTUD SPACING</th>
<th>TABLE 2.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td>Normal (m) Centre - Centre</td>
<td>Intermediate (m) Centre - Centre</td>
</tr>
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<td></td>
<td>24</td>
<td>12</td>
</tr>
<tr>
<td>Urban</td>
<td>18</td>
<td>9</td>
</tr>
<tr>
<td>Temporary</td>
<td>12</td>
<td>6</td>
</tr>
</tbody>
</table>

---

MAY 2012
SARTSM – VOL 2
ROAD MARKINGS
### 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><em>Warning Markings (continued):</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WM4 (White)</td>
<td>Reversible Lane Lines</td>
<td>N/A Width</td>
<td>2 x 100 Module, 9000 Line/Gap, 1.5m/3m N/A</td>
</tr>
<tr>
<td>WM5 (White)</td>
<td>Yield Control Ahead</td>
<td>Length CBD 1500 1200</td>
<td>0.2 m² 0.2 m²</td>
</tr>
<tr>
<td></td>
<td>Lane Reduction Arrows</td>
<td>Length CBD 50-60 km/h 70-90 km/h</td>
<td>0.83 m² 0.83 m²</td>
</tr>
<tr>
<td>WM6 (White)</td>
<td>Lane Reduction Length</td>
<td>WM6.1/WM6.3 4000</td>
<td>2.08 m² 3.92 m²</td>
</tr>
<tr>
<td></td>
<td>(White)</td>
<td></td>
<td>7500</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12000</td>
</tr>
<tr>
<td>WM7 (White)</td>
<td>Mandatory Direction Length</td>
<td>WM7.1/WM7.5 4000</td>
<td>0.67 m² 1.14 m²</td>
</tr>
<tr>
<td></td>
<td>(White)</td>
<td></td>
<td>5000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7500</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12000</td>
</tr>
<tr>
<td>WM8 (White)</td>
<td>No Overtaking Line Length</td>
<td>WM8.1 4000</td>
<td>0.82 m² 3 m²</td>
</tr>
<tr>
<td></td>
<td>(White)</td>
<td></td>
<td>3000</td>
</tr>
<tr>
<td>WM9 (White)</td>
<td>Arrester Bed Ahead</td>
<td>Width 1000</td>
<td>3 m² per block</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Length 3000</td>
<td>per block</td>
</tr>
</tbody>
</table>

*(Continued on page 2.2.14)*

---

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

- **Detail 2.17.1 2 Lane/2 Way – No Surfaced Shoulders**
  - Module
  - 2x Module

- **Detail 2.17.2 2 Lane/2 Way – With Surfaced Shoulders**
  - R1 Y T Y R

- **Detail 2.17.3 2 Lane/2 Way – No Overtaking Line**

- **Detail 2.17.4 2 Lane/2 Way – No Overtaking/No Crossing Lines**
Fig 2.18
Roadstuds on Multi-Lane Roads
### Table 2.2

<table>
<thead>
<tr>
<th>Marking Number (Colour)</th>
<th>Description</th>
<th>Dimensions (mm)</th>
<th>Area (m²) per block</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Rural</td>
<td>Urban</td>
</tr>
<tr>
<td>GM1 (White)</td>
<td>Line Lane</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>Width</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td></td>
<td>Line/Gap</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>Line/Gap</td>
<td>200/400</td>
<td>200/400</td>
</tr>
<tr>
<td>GM3 (White)</td>
<td>Guide Line</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>Width</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td></td>
<td>Line/Gap</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>Line/Gap</td>
<td>200/400</td>
<td>200/400</td>
</tr>
</tbody>
</table>

### 2.2.8 Temporary Markings

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

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

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

4. Road marking 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)
(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 all-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 road 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 WM8;

(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</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>
</tr>
<tr>
<td>GM6 (White or Yellow)</td>
<td>Symbol</td>
<td>Length</td>
<td>Length</td>
</tr>
<tr>
<td></td>
<td>Cycle Facility GM6.1</td>
<td>N/A</td>
<td>1600</td>
</tr>
<tr>
<td></td>
<td>Airport GM6.2</td>
<td>N/A</td>
<td>5000</td>
</tr>
<tr>
<td></td>
<td>7500</td>
<td>7500</td>
<td>4.77 m²</td>
</tr>
<tr>
<td></td>
<td>12000</td>
<td>12000</td>
<td>7.83 m²</td>
</tr>
<tr>
<td>Disabled Person GM6.3</td>
<td>N/A</td>
<td>600</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>1000</td>
<td>1000</td>
<td>0.22 m²</td>
</tr>
<tr>
<td></td>
<td>1200</td>
<td>1200</td>
<td>0.31 m²</td>
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<tr>
<td></td>
<td>1800</td>
<td>1800</td>
<td>0.70 m²</td>
</tr>
<tr>
<td>High Occupancy GM6.4</td>
<td>N/A</td>
<td>4000</td>
<td>N/A</td>
</tr>
<tr>
<td>GM7 (White or Yellow)</td>
<td>Word Markings</td>
<td>Length</td>
<td>Length</td>
</tr>
<tr>
<td></td>
<td>4000</td>
<td>4000</td>
<td>1.40 m²</td>
</tr>
<tr>
<td></td>
<td>5500</td>
<td>5500</td>
<td>1.95 m²</td>
</tr>
<tr>
<td>Word &quot;STOP&quot;</td>
<td>4000</td>
<td>4000</td>
<td>4.95 m²</td>
</tr>
<tr>
<td></td>
<td>5500</td>
<td>5500</td>
<td>6.88 m²</td>
</tr>
<tr>
<td>Word &quot;BUS&quot;</td>
<td>N/A</td>
<td>4000</td>
<td>N/A</td>
</tr>
<tr>
<td>GM8 (Black and White)</td>
<td>Kerbface Marking</td>
<td>Black/White</td>
<td>Black/White</td>
</tr>
<tr>
<td></td>
<td>600/600</td>
<td>600/600</td>
<td>1.8 m²/10 m</td>
</tr>
<tr>
<td></td>
<td>1000/1000</td>
<td>1000/1000</td>
<td>1.8 m²/10 m</td>
</tr>
<tr>
<td></td>
<td>1200/1200</td>
<td>1200/1200</td>
<td>1.8 m²/10 m</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
Detail 2.21.1
3 Line NO OVERTAKING/
NO CROSSING System

NO OVERTAKING/NO CROSSING/DIVIDING LINE
COMBINATION (on crest vertical curve)

NO OVERTAKING LINE RM1
plus DIVIDING LINE WM3

Detail 2.21.2
2 Line NO OVERTAKING
System

DIVIDING LINE WM3

NO OVERTAKING LINE RM1

DIVIDING LINE WM3

Detail 2.21.3
1 Line NO OVERTAKING
System

NO OVERTAKING LINE AHEAD ARROWS WM8

4 Modules or 48m
(urban 36m)
3 Modules or 36m
(urban 27m)
2 Modules or 24m
(urban 18m)

Fig 2.21
Longitudinal Line Combinations - 2
Fig 2.22  Access Across No Overtaking/No Crossing Lines

Detail 2.22.1  Typical Road Markings

Dividing Line Treatment
Section A - B
3 Line NO CROSSING marking RM2
Section B - C
2 Line NO CROSSING marking RM2
Section C - D
1 Line NO OVERTAKING marking RM1

Mark as Detail 2.22.2

"Standard" LANE LINE
GM due to alignment of road

EDGE LINE
RM4, 1

Mark as Detail 2.22.3

Detail 2.22.2  Recommended Marking Treatment At Access
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 SARTSM and 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.

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
Fig 2.26  Basic Junction Marking - 4
Fig 2.27
Multi-Lane Junction
Marking - 1

NOTE:
(1) For road stud key
see Figure 2.26
Spacing between RH6 arrows and RH7 arrows (or between successive RH7 arrows) should be in the range 24000 MIN to 400000.

NOTE:
1. Use of roadstuds is optional.
2. Roadstuds with “Extra” markings are out of “phase” with normal installation.

ROADSTUD KEY
- Omnidirectional White
- Unidirectional White
- Bidirectional White/White
- Bidirectional White/Red
- Bidirectional Yellow/Red
- Bidirectional Red/Red

Fig 2.28
Multi-Lane Junction
Marking - 2
Fig 2.29
Multi-Lane Junction Special Aspects
2.3.6 Dual Carriageway Road Marking

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

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

3. Variables which may be combined in a number of ways include:
   (a) slow lane drop;
   (b) fast lane drop;
   (c) symmetrical reduction in width of both carriageways;
   (d) asymmetrical reduction in carriageway and roadway width.

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

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

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

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

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

9. Further details of lane drop markings are illustrated in Figure 2.37.
Fig 2.30
Beginning/End of Dual Carriageway - 1

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

- 1 km
- 600 m
- 400 m
- 250 m
- 200 m
- 150 m
- 100 m
- 50 m
**NOTE:** (i) LANE REDUCTION ARROWS WM6.3x3

**NOTE:** (ii) See Manual 82

**NOTE:** (iii) For typical sign examples see Figure 2.30 in which signs GS102, W117 and W119 would replace signs GS105, W116 and GS129 respectively.
Fig 2.32
Beginning/End of Dual Carriageway - 3
Fig 2.33
Beginning/End of Dual Carriageway - 4
2.3.7 Three Lane Cross-Sections

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

2. A topographical situation which will commonly warrant the provision of a third lane is an uphill section of roadway. An additional climbing lane will permit uphill overtaking opportunities for faster moving traffic. When such a lane is provided it can be developed one of two ways, namely:
   (a) by widening the roadway onto existing shoulders (with these becoming reduced in width);
   (b) by providing extra roadway width and maintaining the shoulder through the three lane section (this width may be generated symmetrically about the dividing line, or asymmetrically).

3. Irrespective of the manner of development of the third lane, it may be dropped either by dropping the "fast" lane or the "slow" lane. Figure 2.34 illustrates a fast lane drop operation and Figure 2.35 a slow lane drop. The details of these figures presume the provision of adequate safety features for the termination of a climbing lane, such as:
   (a) run-off areas;
   (b) effective taper rates or lengths (see Table 2.1);
   (c) the adequate continuation of the climbing lane until slow-moving vehicles can pick-up speed to within 85% of the norm for the section of road.

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

5. An enlarged detail of typical lane drop markings, with recommended spacings, is given in Figure 2.37. This is appropriate to any lane drop situation, whether a fast lane drop or a slow lane drop.
Fig 2.34
Climbing Lane – Drop Fast Lane
Fig 2.35
Climbing Lane –
Drop Slow Lane
Fig 2.36
3 Lane/2 Way - Overtaking Opportunity
Fig 2.37  Application of LANE REDUCTION ARROWS WM6

NOTE:
(1) The details given relate to approach speeds in the range 100km/h to 120km/h.
(2) Markings should be used in conjunction with appropriate advance diagrammatic signs of the GS101 - GS106 series with IMM1.3 distance supplementary plates. These should be followed at the start of taper by repeat GS101 - GS105 signs without the distance plates as illustrated by GS103.

# – Optional signs and markings

LEFT EDGE LINE RM4.1

RIGHT EDGE LINE RM4.2

LANE LINE GM1 (Reduced)

GS103

Taper 1 in 40 to 1 in 50

Rural Module

2m

2m

12m

12m

10m

10m

SWSL 4

SWSL 2

SWSL 1

SWSL 2

SWSL 4

SWSL 2

SWSL 1

SWSL 2

SWSL 4

SWSL 2

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SWSL 2

SWSL 4

SWSL 2

SWSL 1

SWSL 2

SWSL 4
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.
Fig 2.38
Painted Island - Rural Applications - 1
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 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 2.40 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).