ROADS AND MARITIME SERVICES (RMS)

QA SPECIFICATION R145

PAVEMENT MARKING (PERFORMANCE BASED)

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Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 1/Rev 0		First issued.	GM, IC	30.01.08
Ed 2/Rev 0	1.4	Figures 1 to 8 replaced by Appendices 1 to 4.	GM, IC	13.11.09
	2	Preclusion of the use of solvent borne paints revoked. Requirement for pavement marking materials to comply with recommended temperatures added. Reference to RTA G34 removed.	(P Wellings)	
	Table R145.1	Reference to Figures 1 to 7 changed to Appendices 1 to 2.		
	3.8	Title – Type D glass bead changed to Type D/D-HR. Reference to AS 2009 removed.		
	4.4	Reworded to clarify grey scaling rating requirement.		
	5	Reference to "continuous" and "discontinuous" profile line types included. Reference to Annexure R145/E removed. Requirement for recording line joining profile sections included. Requirement for measuring and reporting skid resistance for continuous profile line type included.		
	Pay Item R145P2	Reference to "paint" changed to "line or marking".		
	Annex D, item (a)	Reworded to make types of pavement markings applied generic.		
	Annex E	Title - Type D glass bead changed to Type D/D-HR.		
	Annex M	Referenced documents updated.		

REVISION REGISTER

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 2/Rev 0 (cont'd)	Attachment	Figures 1 to 8 replaced by Appendices 1 to 4.		
Ed 2/Rev 1	1.3	Previous clauses 1.2.4 "Planning Documents" and 1.5 "Information to be Supplied" consolidated into clause 1.3.	GM, IC	23.07.10
	Annex B	Table R145/B.1 - Figure Type for turn arrow (No 10) corrected to RA2 (previously shown as RA3).		
	Annex M	Referenced documents updated.		
	Appendix 1	Section references to RTA Delineation Manual updated.		
	Appendix 4	Figure 10 – Figure type for turn arrow corrected to RA2.		
Ed 2/Rev 2	Guide Notes	Exclusions to scope of spec added. "Painting Contractors Certification Program" (PCCP) accreditation requirement added.	GM, IC	15.06.11
	Global	Clauses rearranged and reworded. New subclause headings added.		
	1.1	Exclusions to scope of spec added.		
	1.4	New clause added on "Painting Contractors Certification Program" (PCCP) accreditation requirement. Subsequent clause renumbered.		
	2	New headings for subclauses 2.1, 2.2, 2.3 and 2.4 added.		
	3.2	New clause with heading "Position and Tolerances", incorporating previous subclauses 3.2 and 3.4, added.		
	3.3	Previously subclause 3.7.		
	3.4.4	New subclause on time limits for removal of redundant pavement markings added.		
	3.5	Previously clause 3.8.		
	3.6	Previously clause 5.		
	4.3	New subclause heading 4.3.1 added. Subsequent subclauses renumbered.		
	5	Previously clause 7.		
	6	New clause titled "Nonconforming Work".		
	Annex M	Referenced documents updated.		
	Appendices 1, 2 and 3	Line marking lengths, widths and spacings amended.		
	Appendix 4	Deleted, as line types C2 and C3 shown in Appendix 1.		

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 2/Rev 2 (cont'd)	Appendix 5	New appendix providing details of pavement markings at roundabouts.		
	Figures 14, 15 and 16	Dimensions of markings for chevrons, medians and left turn island amended.		
Ed 2/Rev 3	Appendix 2	Additional dimensions added to transverse pavement marking drawings to improve clarity.	GM, IC (M Andrew)	09.11.11
	Figure 16	Dimension added to infill length in chevron.		
Ed 2/Rev 4	Appendix 2	Figure for Transverse lines at traffic signals updated (Page 31).	GM, IC	21.05.12
Ed 2/Rev 5	1.4	Relevant pavement marking classes under PCCP accreditation added.	GM, IC	26.06.13
Ed 3/Rev 0	Global	Clauses rearranged and reworded to improve clarity.	GM, CPS	02.10.14
	Guide Notes	Contents rearranged and reworded; new sub- headings added.		
		Reference to withdrawn spec R146 deleted.		
		Added that R145 to be used for all contracts involving longitudinal linemarking, while R141 may be used for contracts involving only transverse and other pavement markings.		
		Added notes on minimum testing requirements.		
	1.5	Titles of Figures 9 to 12 in list updated.		
	2.1	Heading title changed.		
	2.4	Requirement for glass beads to comply with APAS AP-S0042 for heavy metal content added.		
	3.2	Heading title broadened to include dimensions.		
	3.2.2	Table 1 columns and rows rearranged; errors corrected. Notes to table reworded to clarify intent.		
	3.3	Heading added to form new sub-clause 3.3.1.		
	3.3.2, Annex E	Suggested method to achieve conformity for dry retroreflectivity by a single stage application added.		
	3.4.1	Black non-reflective masking tapes as suitable temporary masking material added.		
	3.4.2	Heading title changed.		
	3.4.5	New sub-clause moved here from clause 2.4. Subsequent clause renumbered.		

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 3/Rev 0	3.6	Clauses reworded to improve clarity.		
(cont'd)	4	Statement on statistical sampling plan moved to clause 5.		
	4.1.1	New sub-clause combining existing clause with statement in clause 5 on test method for retroreflectivity. Subsequent sub-clauses renumbered.		
	4.2	Statement on skid resistance measurement on profile sections moved here from clause 3.6.		
	5	Headings added to form clauses 5.1 and 5.2.		
	5.1	Testing requirements clarified and distinguished between new construction and Period Contract of Works.		
		Time limit for submission of test results to Principal added.		
	Annex A	Table amended.		
	Annex B	Table B.1 – Figure 12 deleted. Names of Figure types and areas of markings for Figures 9 to 11 updated.		
	Annex D	Planning documents amended.		
	Annex E	New annexure on suggested method to achieve conformity for dry retroreflectivity by a single stage application.		
	Annex M	Referenced documents updated.		
	Appendix 2	Figure for "Arrows - types, uses and shapes" amended.		
	Figs 9 & 10	Titles and details of figures amended.		
	Fig 11	Combining previous Figures 11 and 12.		
	Fig 12	Deleted. Incorporated into Figure 11.		
Ed 3/Rev 1	1.5, Annex B Table B.1, Figures 9, 10 and 11	Pavement arrow labelling nomenclature introduced.	GM, CB	08.12.15
Ed 4/Rev 0	Global	Clauses rearranged and reworded to improve clarity. New subclause headings added.	GM, CB	11.02.16
		Type D-HR specified for all large glass beads.		
	Guide Notes	Guide Notes edited.		
	1.3	Definition of "road marking" deleted.		
	2.1	Heading title changed.		

Ed/Rev Number	Clause Number	Description of Revision	Authorised By	Date
Ed 4/Rev 0 (cont'd)	3.1	Headings added to form new sub-clauses 3.1.1 to 3.1.5.		
	3.2	Previously clause 3.5. Heading added to form new sub-clause 3.2.1.		
	3.2.2	New sub-clause moved here from sub-clause 3.3.2.		
	3.3	Previously clause 3.6. Headings added to form new sub-clauses 3.3.1 to 3.3.3.		
	3.5.2	Heading added to form new sub-clause 3.5.2.		
	3.6	Individual sub-clauses rearranged. Headings added to form new sub-clauses 3.6.2, 3.6.4, 3.6.5 and 3.6.7.		
	4.3.1	Reference colour "Green G16" deleted.		
	5	Heading title changed. Sub-clause titled "General" deleted.		
	6	New clause titled "Conformity" added. Previous clauses 5.2 and 5.3 changed to clauses 6.2 and 6.3.		
	6.1	New clause on shape and appearance of completed pavement markings added.		
	6.2	Heading title changed.		
	Annex C2	Schedule of Identified Records items amended.		
	Annex D	Planning documents amended.		

GUIDE NOTES

(Not Part of Contract Document)

USING SPECIFICATION RMS R145

1. Introduction

Specification RMS R145 is a performance type specification, containing the requirements for the initial, medium term and long term performance of the pavement markings.

Under R145, the Contractor is responsible for choosing the pavement marking material appropriate for the particular application for any particular section of road in order to ensure that the performance requirements are satisfied. R145 will not specify which materials or application methods are to be used; this will be a matter for the Contractor and their material supplier(s) to decide.

2. Accredited Contractors

All work carried out under R145 must be by pavement marking organisations accredited to the "Painting Contractors Certification Program" (PCCP) administered by CSIRO.

3. Information to Be Supplied

Prior to commencement of work, the Contractor will be required to submit to RMS (for reference) a list of materials that they propose to use under the Contract. A list of the limitations on their use, such as seasonal constraints and incompatibility with other materials, will also need to be submitted.

The Contractor must also provide evidence that the work will be carried out by a pavement marking organisation holding PCCP accreditation.

4. Performance Requirements

The performance requirements in R145 are for dry and wet retroreflectivity, skid resistance, colour, colour change, luminance factor and degree of wear. Special performance requirements may be developed for markings that require different considerations; e.g. markings that contain mixed colourings, or profile longitudinal pavement marking, which are required to address particular safety concerns.

The Contractor, in consultation with their material supplier(s), will still need to assure themselves that material issues, such as compatibility, have been resolved and that the application will satisfy the long term performance requirements.

5. Testing

As a minimum, the Contractor is to perform field testing for dry retroreflectivity within the first 20 days after opening to traffic. For a Period Contract of Works, the Contractor must also perform field testing for dry retroreflectivity at between 310 and 340 days after opening to traffic, and thereafter at least once every 12 months, unless specified otherwise in the Contract documents.

RMS may carry out its own field testing of the pavement marking for any or all of the performance criteria specified in RMS R145. The results of this testing will be used by RMS to decide if any pavement marking needs to be remarked.

6. Innovation and Research & Development

Pavement marking material manufacturers or contractors proposing new materials or products designed to enhance pavement marking performance, road delineation and road safety generally may in the first instance contact the RMS Signs and Delineation Manager, who will examine the proposals submitted and can arrange access to the road network for field testing if required.

7. Measurement and Payment

Where R145 is used for new pavement marking installation, or reinstatement after road works under a roadworks contract, the method of measurement and payment is detailed in Annexure R145/B.

Where R145 forms part of a Period Contract of Works for pavement marking maintenance, the method of measurement and payment will be detailed in the specific contract documents. In such instances, the Project Manager will need to make such project-specific changes to Annexure R145/B with cross references to those other contract documents.

8. Contact Persons for Technical Enquiries

Enquiries regarding R145 may be referred to one of the following persons:

Signs and Delineation Manager Telephone: (02) 8588 5628

Contracts Quality Manager Telephone: (02) 8588 5794



QA Specification R145

PAVEMENT MARKING (Performance Based)

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VERSION FOR: DATE:

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FOREWORD

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REVISIONS TO PREVIOUS VERSION

This document has been revised from Specification RMS R145 Edition 3 Revision 1.

All revisions to the previous version (other than minor editorial and project specific changes) are indicated by a vertical line in the margin as shown here, except when it is a new edition and the text has been extensively rewritten.

PROJECT SPECIFIC CHANGES

Any project specific changes are indicated in the following manner:

- (a) Text which is additional to the base document and which is included in the Specification is shown in bold italics e.g. *Additional Text*.
- (b) Text which has been deleted from the base document and which is not included in the Specification is shown struck out e.g. Deleted Text.

RMS QA SPECIFICATION R145

PAVEMENT MARKING (PERFORMANCE BASED)

1 GENERAL

1.1 SCOPE

This Specification sets out the requirements for the supply and application of pavement markings for works such as:

- (i) installation of markings on new roads and for revised traffic schemes;
- (ii) reinstatement of markings after road works;
- (iii) maintenance of markings (e.g. marking over existing markings),

using any pavement marking material of your choice which meets the required performance criteria, with the exception of solvent-borne paint which require the approval of the Principal for its use.

This Specification does not cover all the requirements for markings for School Zones. For School Zones markings not covered by this Specification, contact the RMS Centre for Road Safety. For details of "Dragon's Teeth" pavement markings at School Zones, refer to the RMS Centre for Road Safety Technical Direction TD 2009/SR02.

This Specification includes the requirements for Bus Lane and Bicycle Lane markings. For requirements for Bus Lane and Bicycle Lane surface coatings, refer to Specification RMS R110 "Coloured Surface Coatings for Bus Lanes and Cycleways".

1.2 STRUCTURE OF SPECIFICATION

This Specification includes a series of annexures and appendices that detail additional requirements.

1.2.1 Project Specific Requirements

Project specific details of work are shown in Annexure R145/A.

1.2.2 Measurement and Payment

The method of measurement and payment is detailed in Annexure R145/B.

1.2.3 Schedules of HOLD POINTS and Identified Records

The schedules in Annexure R145/C list the **HOLD POINTS** that must be observed. Refer to Specification RMS Q for the definition of **HOLD POINTS**.

The records listed in Annexure R145/C are **Identified Records** for the purposes of RMS Q Annexure Q/E.

1.2.4 Planning Documents

The PROJECT QUALITY PLAN must include each of the documents and requirements listed in Annexure R145/D and must be implemented.

In all cases where this Specification refers to the manufacturer's recommendations, these must be included in the PROJECT QUALITY PLAN.

Notify the Principal of any proposed changes prior to their introduction. Any such information provided does not restrict you from introducing new technologies and materials.

1.2.5 (Not Used)

1.2.6 Referenced Documents

Unless specified otherwise or is specifically supplied by the Principal, the applicable issue of a referenced document, is the issue current at the date one week before the closing date for tenders, or where no issue is current at that date, the most recent issue.

Standards, specifications and test methods are referred to in abbreviated form (e.g. AS 1234). For convenience, the full titles are given in Annexure R145/M.

1.3 DEFINITIONS

The terms "you" and "your" mean "the Contractor" and "the Contractor's" respectively.

The following definitions apply to this Specification:

Stripe	That part of longitudinal linemarking comprising pavement marking material.
Longitudinal linemarking	All lines that are generally parallel to the traffic flow, such as centre, lane, edge, turn, continuity and transition lines and outline markings.
Transverse lines	All lines that are marked at right angles to the general traffic flow, such as "Stop/Give Way" lines and pedestrian crosswalk lines.
Other markings	All diagonal and chevron markings, messages on the pavement including symbols, words, numerals and arrows, kerb markings and markings for parking.
Pavement marking	All longitudinal linemarking, transverse lines and other markings used on the road pavement and kerbs for the purpose of guiding traffic, but excluding raised pavement markers, which are covered in Specification RMS R142.
Performance criteria	A series of subjective assessments and objective values of the colour, skid resistance, retention and day and night visibility of pavement markings by which the standard of pavement markings can be evaluated.
Skid resistance	An estimation of the adherence quality of a wet road surface measured by the friction at a low speed of a rubber slider upon this surface. The measure BPN applies.

1.4 ACCREDITATION TO PAINTING CONTRACTORS CERTIFICATION PROGRAM

All works carried out using this Specification must be by pavement marking organisations accredited to the "Painting Contractors Certification Program" (PCCP), administered by CSIRO, under the appropriate classes from Category B "Pavement markings", as follows:

Class	Description
20	Long-run longitudinal pavement marking on major roads
21	Short to medium-run longitudinal pavement marking on minor roads
22	Audio tactile markings
24	Transverse pavement marking including intersection markings and messages
26	High friction surfacings
27	Pavement marking: removal

Provide evidence to the Principal that the work is carried out by a pavement marking organisation holding the appropriate PCCP accreditation.

1.5 Types of Markings

Details of the various types of pavement markings are shown on the following Appendices and Figures which are included at the back of this Specification:

Appendix 1	Longitudinal Pavement Markings
Appendix 2	Transverse Pavement Markings
Appendix 3	Pavement Markings and Symbols for Bicycle Facilities
Appendix 4	(Not Used)
Appendix 5	Pavement Markings at Roundabouts
(Figures 1 to 8	are not used)
Figure 9	Pavement Arrows at Intersections – Common Types (AR1, AR3(R), AR4(R))
Figure 10	Pavement Arrows at Intersections – Special Types (AR2, AR7, AR8, AR9)
Figure 11	Lane Change Arrows – Urban and Rural (ARU5, ARR5)
Figure 12	(Not Used)
Figure 13	Pavement Arrow for Use in One Way Roads
Figure 14	Chevron Layout
Figure 15	Pavement Marking – Median
Figure 16	Pavement Marking – Left Turn Island
Figure 17	Pavement Marking in Advance of Open Level Crossings
Figure 18	Pavement Alphabet and Numerals
Figure 19	Speed Numeral Pavement Patch
Figure 20	E-TAG Pavement Marking

2 MATERIALS

2.1 CHOICE OF MATERIALS

The formulation of the pavement marking material and its application to the road pavement is your responsibility, and you may use any pavement marking material of your choice, with the exception of solvent-borne paint which may be used only with the written approval of the Principal.

The proposed pavement marking materials must be appropriate for the pavement and traffic conditions under which they are applied and used, and must satisfy the performance criteria detailed in Clause 4 of this Specification. Solvent-borne paint must also conform to the requirements of Specification RMS 3351.

Provide to the Principal a list of materials which you propose to use, and their limitations under the conditions for which they will be used under the Contract, such as seasonal constraints and potential or known incompatibility with other materials.

The materials must be compatible with the other materials which they are in contact with.

2.2 COLOUR

All pavement markings must be in white colour, unless otherwise detailed in the Drawings or relevant RMS specifications or directed by the Principal.

2.3 HANDLING, STORAGE AND MIXING

The pavement marking materials must be handled, stored, combined with other products and used in accordance with each individual manufacturer's recommendations, such as the recommended application temperatures.

2.4 HEAVY METAL CONTENT

Glass beads used must comply with Australian Paint Approval Scheme (APAS) Specification AP-S0042 Clause 6.2 "Heavy metal content". The Principal may request evidence of compliance at any time.

3 APPLICATION OF PAVEMENT MARKINGS

3.1 SURFACE PREPARATION

3.1.1 Responsibility for Surface Preparation

Surface preparation is, at all times, your responsibility.

3.1.2 Surface Condition

The surface area to be marked must be dry and free of dirt, gravel and other loose or foreign material.

The area around the marking must also be free of dirt, gravel and other loose or foreign material to avoid tracking of such material on to newly applied markings.

Do not carry out the pavement marking work until the above conditions have been met.

3.1.3 Condition of Existing Marking

When marking over existing markings, and the existing marking material is flaking or chipping, is of a type or is in such a condition that adhesion of the new marking to the road surface cannot be guaranteed for its required life, obtain the agreement of the Principal to the proposed method of surface preparation and its extent.

3.1.4 Compatibility with Existing Surface

Where a pavement marking material to be applied may be incompatible with the existing marking or surface, prepare the marking or surface suitably before applying the pavement marking material.

3.1.5 Existing Curing Compound Film

Where a curing compound has been applied to a new rigid concrete pavement surface, remove the curing compound by physical abrasive means such as grinding or blasting, from the areas where the pavement marking material is to be applied.

3.2 APPLICATION OF WATERBORNE PAINT WITH LARGE GLASS BEADS (TYPE D-HR)

3.2.1 Recommended Conditions for Application of Waterborne Paint

Recommended conditions for application of waterborne paints with large glass beads (Type D-HR) to produce markings with optimum long term performance are given in Annexure R145/F as a guide.

3.2.2 Painted Markings on New or Resurfaced Sprayed Seal Pavements

Under Specification RMS R141, application of painted markings on new or resurfaced sprayed seals require a two stage process.

For a single stage application which meets the performance criteria, the method described in Annexure R145/E may be suitable for use.

3.3 APPLICATION OF PROFILE (OR AUDIO TACTILE) LONGITUDINAL PAVEMENT MARKING

3.3.1 Types

Profile (or audio tactile) longitudinal pavement marking may be either:

- (i) raised ribs applied at a regular interval over a base strip layer of the same material (**continuous type**), or
- (ii) raised ribs only, placed directly on the road surface (**discontinuous type**).

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3.3.2 Assessment of Pavement Surface

Prior to the application of the marking material, carry out an assessment of the pavement surface, particularly concrete or smooth or polished pavement surfaces, to determine the need for surface or other preparation such as grinding and/or the application of a tack coat to facilitate adhesion.

3.3.3 Profile Pattern Dimensions

The profile pattern must conform to the dimensions shown in Table R145.1.

Table R145.1 – Profile Longitudinal Pavement Marking Dimensions

Description	Requirement
Height of raised ribs, proud of pavement surface (excluding surface applied beads)	$10 \pm 2 \text{ mm}$
Thickness of strip in between raised rib sections (if applied)	$\leq 2 \text{ mm}$
Clear spacing of raised ribs (in longitudinal direction)	$250\pm50~\text{mm}$
Length of raised ribs (in longitudinal direction)	$60 \pm 10 \text{ mm}$
Slope angle of raised rib lead and trail faces	45° (approximately)

Measure and record the height of the raised ribs, and the thickness of the strip in between the raised rib sections (if applied), of the profile pavement marking material applied to the road pavement with a vernier or a suitable dry film thickness gauge.

3.4 **POSITION, DIMENSIONS AND TOLERANCES**

HOLD POINT	
Process Held:	Application of pavement markings.
Submission Details:	Notification that set out is complete.
Release of Hold Point:	The Principal may inspect the set out prior to authorising the release of the Hold Point.

3.4.1 **Position of Markings**

3.4.1.1 New Installation

New installation refers to the installation of markings on new roads and for revised traffic schemes.

Set out the work such that the markings are placed in accordance with the Drawings and/or the Figures at the back of this Specification and within the tolerances listed in Table R145.2.

3.4.1.2 Reinstatement After Road Works

Where the markings require reinstatement following pavement works carried out by others, such as reseals, apply the reinstated markings to the set out placed by others and within the tolerances listed in Table R145.2.

3.4.1.3 Maintenance

Apply markings directly over the existing markings within the tolerances listed in Table R145.2.

At locations where the existing markings are so badly worn that installation of new markings is required, set these out to achieve the correct shape and position of the markings within the tolerances listed in Table R145.2.

3.4.2 Tolerances

Comply with the tolerances shown in Table R145.2 when installing the pavement markings.

		Position or Dimension	New Installation or Reinstatement ^(3, 4)	Maintenance ⁽⁵⁾
1.	Lor	ngitudinal linemarking		
	(a)	Distance between centreline of new and old linemarking	N.A.	< 15 mm
	(b)	Start of new stripe relative to start of old stripe	N.A.	Lesser of: ± 5% of stripe length or ± 100 mm
	(c)	Position of centreline of new linemarking	< 50 mm from positions shown on Drawings	N.A.
	(d)	Length of new stripe (and for maintenance: total length of new and old stripe, unless otherwise directed)	Lengths shown in Appendix 1 ± 50 mm	Old stripe length ± lesser of: 5% of old stripe length or 100 mm
	(e)	Width of new linemarking (and for maintenance: total width of new and old linemarking, unless otherwise directed)	Widths shown in Appendix 1 ± 5 mm	Width of old linemarking ± 10 mm
	(f)	Gap between double lines	Gap shown in Appendix 1 ± 10 mm	Gap shown in Appendix 1 ± 10 mm
2.	Tra	nsverse and other markings		
	(a)	Position of centreline of transverse marking	< 50 mm from positions shown on Drawings	N.A.
	(b)	Length of new marking	Lengths shown in Appendices 2, 3 and 5, \pm 10 mm	Length of old marking $\pm 10 \text{ mm}^{(1)}$
	(c)	Width of new marking	Widths shown in Appendices 2, 3 and 5, \pm 10 mm	Width of old marking $\pm 10 \text{ mm}^{(1)}$
3.	Ma cro	rkings in advance of open level ssings		

 Table R145.2 – Pavement Marking Positions, Dimensions and Tolerances

	Position or Dimension	New Installation or Reinstatement ^(3, 4)	Maintenance ⁽⁵⁾
	(a) Length of new marking	Length shown in Figure 17 ± 50 mm	Length of old marking $\pm 10 \text{ mm}^{(1)}$
	(b) Width of new marking	Width shown in Figure 17 ± 10 mm	Width of old marking $\pm 10 \text{ mm}^{(1)}$
4.	Arrows, chevrons, marked medians, marked left turn islands, speed markings ⁽²⁾		
	(a) Each dimension	Dimensions shown in Figures 9 to 11, 13 to 16, and 18 to $20, \pm 50 \text{ mm}$	Dimensions of old marking \pm 50 mm ⁽¹⁾
5.	Thickness of all pavement markings, other than profile pavement marking	≤ 6 mm (unless directed otherwise by the Principal)	≤ 6 mm (unless directed otherwise by the Principal)

Notes:

⁽¹⁾ Where the dimensions of existing markings exceed the dimensions permitted for Reinstatement, the dimensions and tolerances applicable to Reinstatement also apply to the new Maintenance markings, unless otherwise directed by the Principal.

- ⁽²⁾ Place arrows and speed markings square to the direction of travel.
- ⁽³⁾ For Reinstatement markings done to set out placed by others, follow the set out as much as practicable but minimising any disruption to the marking pattern to which it links.
- ⁽⁴⁾ For New Installation markings, set out the markings such that, at the ends, any disruption to the marking pattern to which it links is minimised.
- ⁽⁵⁾ The alignment of longitudinal linemarking must be a smooth and continuous apparent line when viewed in the direction of the line.

3.5 REINSTATEMENT OF PAVEMENT MARKINGS AFTER ROAD WORKS

3.5.1 Time Limits for Reinstatement

Reinstate the pavement markings as soon as possible after road works where the pavement markings have been removed or damaged, to maintain the delineation for road safety purposes.

3.5.2 Use of Temporary Raised Pavement Markers

You may use temporary raised pavement markers for delineation for up to 10 days after opening to traffic, after which the pavement markings must be reinstated.

3.6 REDUNDANT PAVEMENT MARKINGS

Redundant pavement markings usually arise:

- as part of traffic switches during road construction or reconstruction (involving temporary removal or masking of the markings). In most cases, a final pavement surface will be re-laid, over which permanent markings are installed.
- as a result of a pavement marking/delineation scheme being changed due to traffic and road safety considerations (involving permanent removal of the markings).

3.6.1 General

Remove or mask pavement markings which are no longer required, and leave behind a clean and undamaged pavement with surface texture, reflectivity characteristics and colour comparable to the adjacent pavement surface.

3.6.2 Use of Temporary Masking Materials

You may use black non-reflective pavement marking tapes, specially designed for the purpose, as temporary masking materials. Remove the tapes to expose the masked marking when the marking is once again required.

3.6.3 Methods of Pavement Marking Removal

Remove pavement markings in a manner that will not damage the pavement structure, surface or texture. After removal of the markings, the condition of the resulting pavement surface must be suitable for bonding of new markings.

Remove pavement markings over expansion joints on concrete pavements by methods acceptable to the Principal.

3.6.4 Extent of Removal or Masking

When removing or masking longitudinal and transverse lines such as edge lines, centre lines, lane lines, holding lines, or other lines, the removal or masking must cover a minimum of 200% of the total area of existing lines; i.e. minimum 50% extra coverage on both sides of the existing lines.

When removing or masking pavement markings such as arrows, numerals, letters, or other pavement markings, the removal or masking must take the form of a rectangular area or block around such markings.

3.6.5 Repair of Damage Caused by Markings Removal

Repair, by methods acceptable to the Principal and at your own cost, any damage to the pavement structure, pavement surface or pavement joint caused by the markings removal.

3.6.6 Time Limits for Removal of Redundant Pavement Markings

Remove, within 48 hours of application, any painted "blackout" or overlay that is applied as a temporary measure.

Remove, within 6 months of application, any pavement marking tape that is applied over existing markings as a temporary masking measure, unless directed otherwise by the Principal. Renew the marking tapes where they are to remain longer than 6 months after application.

3.6.7 Sequence of Removal

Where existing pavement markings are to be removed and replaced by other pavement markings, do not remove the pavement markings until adequate provision has been made to complete the installation of the replacement markings.

Remove pavement markings in such order that the markings remaining in place at any time will not be in a pattern that will mislead or misdirect road users.

3.6.8 Disposal of Removed Marking Material

Promptly remove any material deposited on the pavement resulting from the markings removal by the methods stated in the PROJECT QUALITY PLAN. On completion of the markings removal, clear the pavement surface of any residue or debris.

Do not leave any marking material that has been removed from the pavement on the Site. Dispose of marking material removed in accordance with current EPA guidelines.

3.6.9 Measurement of Quantity

Before removal of pavement markings, determine the face area of the pavement markings to be removed. Obtain the Principal's agreement to the face area of the pavement markings to be removed, prior to their removal.

4 **PERFORMANCE CRITERIA**

4.1 **RETROREFLECTIVITY**

4.1.1 General

The dry and wet retroreflectivity of any pavement marking, when measured in accordance with AS 4049.4 Appendix K, using the MX30 instrument or an equivalent retro-reflectometer that uses 30 m geometry, must comply with the performance criteria in Clauses 4.1.2 and 4.1.3 respectively.

4.1.2 Dry Retroreflectivity

The dry retroreflectivity must be a minimum of:

- (i) 250 mcd/lux/m^2 , within the first 20 days after opening to traffic;
- (ii) 200 mcd/lux/m^2 , at between 310 and 340 days after opening to traffic;
- (iii) 150 mcd/lux/m^2 before re-marking is required this is the intervention level.

4.1.3 Wet Retroreflectivity

The wet retroreflectivity must be a minimum of 80 mcd/lux/ m^2 at any time after application.

4.2 SKID RESISTANCE

The skid resistance of any pavement marking must be a minimum of 40 BPN when tested in accordance with AS 4049.4 Appendix J at any time after application.

For profile pavement markings, measure and report the skid resistance only when the profile pavement marking is of the continuous type. The skid resistance is to be measured on the flat strip in between the raised ribs.

4.3 COLOUR

4.3.1 Colour Match

When requested by the Principal, prepare a sample pavement marking material panel in accordance with AS 4049.4 Appendix F.

The colour of the sample must be at least an "approximate match", as determined by unaided visual inspection in accordance with AS/NZS 1580.601.1, against the reference colours in AS 2700S, as follows:

White:Y35Yellow:Y14Red:R62

4.3.2 Mixed Colour Markings

Where mixed colour markings are used, with different colours providing different daytime colour contrasts to deliver a message, assess each individual colour for compliance with the colour specified, and clarity of definition of the markings, both between the different colours, and between the coloured marking and the pavement, as well as the retention of the message.

4.3.3 Colour Change

When non-white colour pavement markings in the wheel path are assessed for colour change against a reference sample in accordance with AS 4049.4 Appendix G, the grey scale rating must be 3 or greater.

4.4 LUMINANCE FACTOR

When white pavement markings in the wheel path are tested for the luminance factor in accordance with AS 4049.4 Appendix H, Method 2, the test marking must be lighter than Natural Colour System (NCS) swatch S 2500-N (see SS 01 91 02).

4.5 **DEGREE OF WEAR**

When pavement markings are tested for the degree of wear in accordance with AS 4049.4 Appendix L, the pavement marking tested must be "70% of area intact" or better, in accordance with AS 4049.4 Appendix M.

4.6 THICKNESS

The thickness of any non-profile pavement marking must not exceed 6 mm.

5 SAMPLING AND TESTING

Develop and provide to the Principal a robust statistical sampling plan for assessing the dry retroreflectivity performance of pavement markings, in accordance with AS 4049.5 Appendix D.

Sample and test the pavement markings for their dry retroreflectivity performance in accordance with AS 4049.5 Clause 8, within the first 20 days of opening to traffic.

The Principal will carry out its own sampling and testing at subsequent times (i.e. after the first 20 days) for retroreflectivity and other performance criteria to verify conformity with the requirements of this Specification.

For a Period Contract of Works, sample and test the pavement markings for their dry retroreflectivity performance within the first 20 days, and at between 310 and 340 days, after opening to traffic, and thereafter at least once every 12 months, unless specified otherwise in the Contract documents.

Provide the results of your testing to the Principal within 10 working days of carrying out the test.

Locations where performance is regularly found to be below specification requirements may require more frequent inspections and field testing to enable more frequent maintenance, or alternative solutions provided to achieve a better performance.

6 **CONFORMITY**

6.1 SHAPE AND APPEARANCE

Completed markings must be uniform in appearance, texture, width and thickness and the surface must be free from unbeaded areas, traffic damage or other defects.

Markings must be straight or with smooth even curves where intended. All edges must have a clean sharp cut off.

Remove at your cost any marking material beyond the defined marking, leaving a neat marking on the wearing surface of the pavement.

6.2 PAVEMENT MARKINGS REMOVAL

Inspect areas where removal of redundant markings has been carried out, to verify that:

- (i) redundant markings have been completely removed;
- (ii) pavement area has been cleaned up and waste material removed from the Site;
- (iii) any damage to the pavement caused by the marking removal has been repaired;
- (iv) guidance provided by the delineation to road users is clear and not misleading.

Pavement Marking (Performance Based)

6.3 NONCONFORMITY

Pavement markings which are not in accordance with this Specification and Drawings are nonconforming and must be dealt with in accordance with the quality management system requirements and/or your PROJECT QUALITY PLAN.

ANNEXURE R145/A – PROJECT SPECIFIC REQUIREMENTS

Refer to Clause 1.2.1.

NOTES TO TENDER DOCUMENTER: (Delete this boxed text after customising Annexure R145/A)

Nominate below the type of pavement marking work required (whether New Installation/Reinstatement or Maintenance) by deleting whichever is not applicable.

Clause	Description	Requirement
3.4.1	The pavement marking work is:	New Installation or Reinstatement/ Maintenance

ANNEXURE R145/B – MEASUREMENT AND PAYMENT

Where this Specification forms part of a Period Contract of Works for pavement marking maintenance, the method of measurement and payment will be detailed in the Contract documents and the clauses below on Measurement and Payment do not apply.

Pavement markings provided as a temporary measure in accordance with Specification RMS G10 will be made under the appropriate pay items in RMS G10.

Payment will be made for all costs associated with completing the work detailed in this Specification in accordance with the following Pay Items.

Where no specific pay items are provided for a particular item of work, the costs associated with that item of work are deemed to be included in the rates and prices generally for the Work Under the Contract.

Unless specified otherwise, a lump sum price for any of these items will not be accepted.

The costs of provision for traffic and protection of work are included in the pay items for pavement markings.

Calculate the areas of markings applied in accordance with Figures 9, 10, 11 and 13 from the areas shown in Table R145/B.1.

Figure No	Figure Type	Area (m ²)
9	Straight ahead arrow (AR1)	1.4
9	Combination – straight ahead and turn arrow (AR4)	2.5
9	Exclusive turn arrow (AR3)	1.8
10	Double turn arrow (AR2)	2.8
10	U-turn arrow (AR7)	3.0
10	45° turn arrow (AR9)	1.5
10	Sequential turns arrow (AR8)	3.0
11	Lane change arrows	
	Urban (ARU5)	1.72
	Rural (ARR5)	3.42
13	SA1 (painted area only)	3.11

Table R145/B.1 – Areas of Other Markings - Figures 9, 10, 11 and 13

Calculate the areas of markings applied in accordance with Figure 18 from the areas shown in Table R145/B.2.

The areas are based on letter and numeral characters 4000 mm high, that is, X = 100 mm. For characters other than 4000 mm high, adjust the areas shown in Table R145/B.2 by the factor: (Actual height of character, in mm) / 4000. Round off the area of each character to the nearest 0.01 m².

Character	А	В	C	D	Е	F	G	Н	Ι	J
Area (m ²)	0.91	1.29	0.80	1.06	1.02	0.78	0.89	1.01	0.40	0.64
Character	Κ	L	М	Ν	0	Р	Q	R	S	Т
Area (m ²)	0.90	0.61	1.34	1.07	1.08	0.96	1.23	1.13	1.00	0.64
Character	U	V	W	Х	Y	Ζ				
Area (m ²)	0.94	0.84	1.52	0.76	0.64	1.08				
Character	1	2	3	4	5	6	7	8	9	0
Area (m ²)	0.71	1.71	1.54	1.78	1.73	1.61	1.08	2.20	1.61	1.46

 Table R145/B.2 – Areas of Other Markings - Figure 18

Pay Item R145P1 - Longitudinal Lines

The unit of measurement is the linear metre for each line type as shown on the relevant Figures.

The length must be measured along the centreline of the longitudinal line(s) that constitute a line type. Where the line type is comprised of multiple lines, only one line must be measured. The length includes any longitudinal spaces between the lines, as required by the line type.

Pay Item R145P2 - Transverse Lines and Other Markings

The unit of measurement is the square metre.

The face area of the line or marking applied is determined from the dimensions shown on relevant figures and Drawings unless otherwise directed by the Principal.

Pay Item R145P3 - Profile Longitudinal Pavement Markings

The unit of measurement is the linear metre for each line pattern calculated from the actual length including spaces between lines measured along the centre line of the longitudinal line.

Pay Item R145P4 - Removal of Pavement Markings

The unit of measurement is the square metre.

The face area of the pavement markings removed must be determined in accordance with Clause 3.6.9.

ANNEXURE R145/C – SCHEDULES OF HOLD POINTS AND Identified Records

Refer to Clause 1.2.3.

C1 SCHEDULE OF HOLD POINTS

Clause	Description	
3.4	Set out of pavement markings.	

C2 SCHEDULE OF IDENTIFIED RECORDS

The records listed below are Identified Records for the purposes of RMS Q Annexure Q/E.

Clause	Description of Identified Record
5	Test results of dry retroreflectivity performance.

ANNEXURE R145/D – PLANNING DOCUMENTS

Refer to Clause 1.2.4.

The following documents are a summary of documents that must be included in the PROJECT QUALITY PLAN. The requirements of this Specification and others included in the Contract must be reviewed to determine additional documentation requirements.

Clause	Description
1.4	Evidence of accreditation to the "Painting Contractors Certification Program".
2.1	List of materials proposed for use, and details of their limitations under the conditions for which they will be used, such as seasonal restrictions and compatibility with other materials.
3.6	Details of materials and methods for masking or removal of redundant pavement markings.

ANNEXURE R145/E – SINGLE STAGE DOUBLE COAT APPLICATION OF PAINTED MARKINGS ON NEW OR RESURFACED SPRAYED SEALS

The critical performance criterion for painted marking is a dry retroreflectivity of 200 mcd/lx/m² at between 310 days to 340 days after opening to traffic. To be able to meet this requirement, an initial (within 20 days after opening) dry retroreflectivity level of not less than 350 mcd/lx/m² is required. Using the method stated below, it has been shown that this initial dry retroreflectivity level can consistently be achieved.

Apply an initial primer or base coat of paint and glass beads. On the same visit, and after the primer coat is at least touch dry, apply a secondary coat of paint and glass beads directly over the primer coat. This double coat assist in overcoming some of the inherent difficulties of painted markings on new or resurfaced sprayed seals, due to its high surface texture, and the presence of aggregate precoating chemicals and volatile binder additives, and provide durability for the marking.

Based on the results of trials, a double coat of painted marking with large Type D-HR glass beads, applied through low pressure (less than 500 psi) double angled spray guns and a static bead drop system, can achieve the performance criteria. As a guide, for 14 mm sprayed seals, a wet film paint thicknesses of 600 μ m and a bead drop rate of 600 g/m² may be required.

ANNEXURE R145/F – RECOMMENDED CONDITIONS FOR Application of Waterborne Paint with Large Glass Beads

To achieve optimum long term performance, apply waterborne paint incorporating glass beads under the following conditions:

- (a) air temperature and pavement temperature $> 15^{\circ}$ C;
- (b) relative humidity < 70 %;
- (c) air movement > 10 km/hr (reasonable air movement);
- (d) adequate protection of lines from traffic during the drying process.

Do not apply waterborne paint when relative humidity is above 85% or when air or road temperatures are below 10° C.

ANNEXURES R145/G TO R145/L – (NOT USED)

ANNEXURE R145/M – REFERENCED DOCUMENTS

Refer to Clause 1.2.6.

R	MS Specifications
RMS G10	Traffic Management
RMS Q	Quality Management System
RMS R110	Coloured Surface Coatings for Bus Lanes and Cycleways
RMS R142	Retroreflective Raised Pavement Markers
RMS 3351	Road Marking Paint
R	MS Technical Documents
	RMS Delineation Manual
TD 2009/SR02	Dragon's Teeth at School Zones (RMS Centre for Road Safety)
Α	ustralian Standards
AS/NZS 1580.601.1	Paints and related materials – Methods of test – Colour – Visual comparison
AS 1742.2	Manual of uniform traffic control devices – Traffic control devices for general use
AS 2700S	Colour standards for general purposes – Swatches
AS 4049	Paints and related materials – Pavement marking materials
AS 4049.4	High performance pavement marking systems
AS 4049.5	Performance assessment of pavement markings
Α	ustralian Paint Approval Scheme (APAS) Specifications
AP-S0042	Glass Beads for Pavement Marking Paint
Na	atural Colour System (NCS) Colour Swatches

NCS SS 01 91 02

APPENDICES 1 TO 5

APPENDIX 1 – LONGITUDINAL PAVEMENT MARKINGS

Line	Туре	Pattern and Dimensions	Reference Section*
DIVIDING LINES			
Dividing (Separation) line on 2 lane road	S1		4.2
	S2	NO LONGER USED	
Dividing (Separation) line on multi lane road	S6		4.2
Dividing (Barrier) lines (Restricted overtaking in one direction)	BS		4.4
Dividing (Barrier) lines	BB	0.10	4.4

Notes:

(all dimensions in m unless stated otherwise)

* Section in RMS Delineation Manual

Line	Туре	Pattern and Dimensions	Reference Section*
ENHANCED DIVIDING LINES #			
Dividing (Separation) line on 2 lane road	S3		5.2.2
Dividing (Barrier) lines (Restricted overtaking in one direction)	BS1		5.2.3
Dividing (Barrier) lines	BB1	0.150	5.2.3
Dividing (Barrier) lines	BB2	0.200 0.600 0.200 0.200	5.2.3

Notes:

(all dimensions in m unless stated otherwise)

* Section in RMS Delineation Manual

[#] Use of enhanced dividing lines requires approval of GM, Traffic Management

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Pavement Marking (Performance Based)

Line	Туре	Pattern and Dimensions	Reference Section*
LANE LINES			
Lane line on multi lane roads including motorways and dual- carriageways	L1		4.6
Enhanced lane line (profile) on motorways, dual carriageways or on special locations such as bridges [#]	L2		4.6, 5.2.5
Lane line on multi lane road	L3		4.6
Exit lane line on multilane roundabouts	L4		4.6
Defines the edge of a Bus Lane and Bus Only lane adjacent to general traffic lane	L6		4.6
Defines the edge of a Bicycle Lane adjacent to general traffic lane	L7		4.6
Enhanced lane line	L5	0.200	4.6, 5.2.4

Notes:

(all dimensions in m unless stated otherwise)

* Section in RMS Delineation Manual

[#] Use of enhanced dividing lines requires approval of GM, Traffic Management

Line	Туре	Pattern and Dimensions	Reference Section*
EDGE LINES			
Left hand edge line on general purpose road	E1	0.15	4.7
Left hand edge line on Motorway	E2	0.15	4.7
Right hand edge on divided carriageway	E3	0.15	4.7
Outline of traffic island or freeway ramp gore	E4		4.7
Outline of painted median	E5	0.15	4.7
Line applied to incline face of median kerb	E6		4.7

Line	Туре	Pattern and Dimensions	Reference Section*
PROFILE LINES (Edge line, lane line and dividing lines)			5.2.6
Continuity line	C1		4.8
Turning line	T1	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	4.9

Line	Туре	Pattern and Dimensions	Reference Section*	
KERBSIDE PARKING RESTRICTION LINES				
Clearway line	C2	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	13.2	
No Stopping line	C3		13.3	

Notes:

(all dimensions in m unless stated otherwise)

* Section in RMS Delineation Manual

Line	Туре	Pattern and Dimensions	Reference Section*
BICYCLE LINES			
Bicycle lane line	L7		4.10
Bicycle lane continuity line	C4		4.10
Bicycle separation line for off-road bike path (with restricted visibility)	S4		4.10
Bicycle lane separation line for off- road bike path (Straight sections)	S5		4.10
Bicycle edge line for off-road bike paths & shared paths	E7		4.10

Notes:

(all dimensions in m unless stated otherwise)

* Section in RMS Delineation Manual

APPENDIX 2 – TRANSVERSE PAVEMENT MARKINGS

Line Type	Use	Dimensions (m)	Colour
TF	Stop line	0:30	White
TF1		NO LONGER USED	
TF2		NO LONGER USED	
тв	Give Way Line (Used with signs)		White
TB1	Give Way Line (Used on right side of road)		White
PCW	Pedestrian Cross Walk Lines	1.0 1.0 1.0 1.0 1.0 0.30 0.30 0.30 0.30 0.30 0.30 0.30 0.30	White
РХ	Pedestrian Crossing	0.60 May be increased where warranted by high pedestrian volumes 0.60	White

Dimensions in mm unless stated otherwise

Transverse line at a stop sign

(all dimensions in mm unless stated otherwise)



Transverse line at a stop sign with pedestrian crossing

(all dimensions in mm unless stated otherwise)



Transverse line at a give way sign



Transverse lines at traffic signals

(all dimensions in mm unless stated otherwise)



Transverse lines at a stop & give way sign at a junction with gravel road.



Transverse lines at a stop & give way sign at a junction with sealed road



Transverse line at a stop & give way sign connecting road on a dual carriageways.



Transverse lines for other applications

 Ferry Approach Opening Bridge One Lane Bridge Level Crossing with Signals and/or Gate 	* 5 - 10m Ferry Gate or Signals 3m Gate other than Ferry	Gate or Signal Gate or Signa
 Level Crossing With Stop Sign 	+++++ 	TF ▲ ₹300
 Open Level Crossing One Lane Bridge without Stop Signs or Signals 	Give Way Sign or RLC - B Assembly	$\begin{array}{c c} & & \downarrow \\ & & \downarrow \\ \hline & & & \downarrow \\ \hline & & & & \downarrow \\ \hline & & & & \downarrow \\ \hline & & & & & \\ \hline & & & & & \downarrow \\ \hline & & & & & \downarrow \\ \hline & & & & & \downarrow \\ \hline \\ \hline & & & & & \downarrow \\ \hline \\ \hline & & & & & \downarrow \\ \hline \\ \hline & & & & & \downarrow \\ \hline \\ \hline & & & & & \downarrow \\ \hline \\ \hline \\ \hline \\ \hline & & & & & \downarrow \\ \hline \\ \hline \\ \hline \\ \hline \end{array} \\ \hline \hline \\ \hline \\ \hline \hline \\ \hline \hline \\ \hline \\$

Typical pedestrian crosswalk lines at an intersection with a marked foot crossing

(all dimensions in mm unless stated otherwise)



Typical pedestrian crosswalk lines at mid block marked foot crossing



Transverse lines for scramble crossing

(all dimensions in mm unless stated otherwise)



Zig Zag Markings



Arrows - types, uses and shapes

No	Description of requirements	Two lane	Three lane	Four lane
-	Legal manoeuvres if lane unmarked	+		
N	Legal manoeuvres if left lane only marked			
ю	Legal manoeuvres it right lane only marked	*		
4	Markings for two exclusive left turn lanes			
5	Markings for two exclusive right turn lanes	x x		
9	Markings for shared left turn and through from lane adjacent to left turn lane \slash	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		
7	Markings for shared right turn and through from lane adjacent to right turn lane	a at		
8	Markings for shared left turn and through from lane adjacent to two exclusive left turn lanes	NOT APPLICABLE		
თ	Markings for shared right turn and through from lane adjacent to two exclusive right turn lanes	NOT APPLICABLE	a a at	
10	Markings to indicate left turn prohibition (signing also required, see Clause 2.8.2)	****	↓ ↓ ↓ ·/~~	* +
÷	Markings to indicate right turn prohibition (signing also required, see Clause 2.8.2)	← ←	← + *	+ + +

NOTES:

1 Full lines indicate arrows to be marked.

2 Dotted lines indicate manoeuvres which are permitted by regulations but which need not be marked.

3 On some intersection approaches, it may be necessary to combine two or more of the marking methods shown.

(Ref. AS 1742.2 Fig. 5.8)

APPENDIX 3 – PAVEMENT MARKINGS AND SYMBOLS FOR BICYCLE FACILITIES



APPENDIX 4 - (NOT USED)

APPENDIX 5 – PAVEMENT MARKINGS AT ROUNDABOUTS

Line Type	Use	Dimensions (m) (for dimensions shown * see marker spacing column)	Colour
L4	Exit lane line on multilane roundabouts		White
тв	Holding Line		White

Roundabout Pavement Markings, four 2 lane entry/exits



Edge line (E4) Edge line (E4) Exit line (L4) Exit line (L4) Holding line (TB)

Roundabout pavement markings, two 2 lane entry/exits with two 1 lane entry/exits

Roundabout pavement markings, four 2 lane entry/exit with one exclusive left turn lane



Roundabout pavement markings, T junction with two 2 lane and one 1 lane entry/exit



Roundabout pavement markings, dual right turn on one approach



FIGURES 9 TO 20





Notes:

- 1. Minimum length of arrow:
 - (a) Straight ahead arrow and combined arrow = 6 m.
 - (b) Turn arrow = 4 m.
- 2. The width of grid squares is constant at 100 mm. The height of the grid is 100 mm minimum.

Figure 9 – Intersection Arrows (Ref. AS 1742.2 Fig. 5.9)





Notes:

- 1. Minimum length of arrow:
 - (a) Double turn arrow = 4 m.
 - (b) U-turn arrow = 5 m.
 - (c) Sequential turns and 45° turn arrows = 6 m.
- 2. The width of grid squares is constant at 100 mm. The height of the grid is 100 mm minimum.

Figure 10 – Intersection Arrows (Ref. AS 1742.2 Fig. 5.10)



Figure 11 – Lane Change Arrows (Ref. AS 1742.2 Fig. 5.11)

Figure 12 – (Not Used)

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Measurements are in mm, unless otherwise stated

PAVEMENT ARROW FOR USE ON ONE WAY ROADS

(For Restraint of Wrong Way Movements)

SA1

Figure 13



Figure 14





R145

Pavement Marking (Performance Based)



Measurements are in mm, unless otherwise stated



Figure 17

Pavement Marking (Performance Based)



Figure 18

R145

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Measurements are in mm, unless otherwise stated

SCHOOL ZONE AND SCHOOL BUS STOP ZONE SPEED NUMERAL PAVEMENT PATCH

Figure 19





Measurements are in mm, unless otherwise stated

E-TAG PAVEMENT MARKING

FIGURE 20