

PART M16**APPLICATION OF PAVEMENT MARKING****CONTENTS**

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1. GENERAL

This Part specifies the requirements for the application of pavement marking.

Where reference is made to the “DPTI Pavement Marking Manual”, this is available from: <https://www.dpti.sa.gov.au/?a=40257>

Pavement marking means the supply and application of Line Marking, Road Marking, pavement bars and retroreflective raised pavement markers, where Line Marking means all longitudinal lines and Road Marking means transverse lines, arrows, symbols, chevrons, diagonals, messages and traffic island and median kerbing.

2. QUALITY REQUIREMENTS

The Contractor shall prepare and implement a Quality Management Plan vide Part PC-QA1 “Quality Management Requirements” that includes detailed procedures, documentation and Work Instructions for pavement marking activities and ensuring required Performance Standards are met including the below:

- a) ensuring that the plant, processes and Staff used to apply pavement marking comply with the specified certification requirements and are capable of delivering the quality of marking required;
- b) controlling the quality of materials used;
- c) verifying that materials have been applied as specified; and
- d) verifying that the field performance meets specified requirements.

If not submitted beforehand, the Quality Management Plan including the above procedures must be submitted at least 28 days prior to the commencement of Works. Submission of the Quality Management Plan constitutes a **HOLD POINT**.

3. CONTRACTOR ACCREDITATION

“PCCP” means Painting Contractors Certification Program (refer www.apas.gov.au/pccp).

The Works must be undertaken by a company that has PCCP accreditation appropriate for the type of work being undertaken in accordance with Table M16.3.

TABLE M16.3 PCCP ACCREDITATION			
Class	Accreditation Class Description	Materials	Sub-class
20	Long-run longitudinal pavement marking on major roads	Paint	Class 20-1
21	Short to medium-run longitudinal pavement marking on minor roads	Paint	Class 21-1
23	Pavement marking: Car park	Paint	Class 23-1
24	Transverse pavement marking including intersections & messaging	Thermoplastic	Class 24-2
		Multi-component/CAP	Class 24-3
		Non-skid Paint	Class 24-4
25	Retroreflective Raised Pavement Marker/Pavement Bar Installation		Class 25-1
26	High Friction Surfacing	Coloured Bus/Cycle Lanes	Class 26-2
27	Pavement marking: Removal		Class 27-1

The Contractor must supply evidence of PCCP accreditation to the Superintendent. This shall constitute a **HOLD POINT**.

4. MATERIALS

The Contractor is responsible for the selection of and supply of all pavement marking materials required to ensure that the Performance Standards specified within this Contract are met.

All pavement marking paints and materials must be approved under the Australian Paint Approval Scheme (APAS).

Permanent and temporary retroreflective raised pavement markers must comply with the requirements of AS 1906.3.

5. APPLICATION OF PAVEMENT MARKING

5.1 General

Unless specified otherwise the Contractor is responsible for:

- a) the application process and application rates of the paints, beads and other additives to provide the specified colour, luminance, retroreflectivity and skid resistance;
- b) selection of the directions of spraying and the number of coats of paint, beads and other additives required to meet the requirements of this specification;
- c) selection of the appropriate thermoplastics, cold applied plastics (CAP) or other where high performance pavement marking is required;
- d) all preparation works to ensure that all of the manufacturer's instructions have been met and the pavement is properly prepared and cleaned prior to the application of materials; and
- e) obtaining the traffic volumes of the roads from <http://location.sa.gov.au/viewer/>, to ensure the appropriate materials and application of pavement marking paint is used to meet the required Performance Standards.

The Contractor must allow traffic growth of 10% per year.

Hand spraying with the use of rigid templates to control the pattern and shape must be used for transverse lines, chevrons, diagonals, pavement messages, symbols and traffic island and median kerbing. Where two coats of paint are to be applied, the first coat must be adequately cured prior to the application of the second coat. All paint and beads must be evenly applied to the markings.

The time and date of installation of regulatory lines must be recorded and the Contractor must forward this information to the Superintendent within 5 working days.

Pavement markings must be as detailed on any supplied drawings and in accordance with the DPTI Pavement Marking Manual.

The application of pavement marking to the road surface must only take place when the surface is dry and free from foreign matter (e.g. oil, loose material, sealing aggregate etc.). If this cannot be achieved by the use of surface cleaning apparatus incorporated in the pavement marking machine, the Contractor must undertake mechanical or hand brooming.

5.2 Paint Application

All Works must meet the Performance Standards outlined in Clause 6 of this Specification.

5.2.1 New Work

New Work means the supply and application of pavement marking to an unmarked surface or the modification of existing markings.

For new or resurfaced spray seals or asphalt roads, the following minimum requirements shall be met:

- a) newly laid spray seal must be left to cure for minimum of 7 days prior to application of the first coat of paint (primer/ base coat) and temporary retroreflective raised pavement markers (TRRPM) must be installed to provide temporary line marking. The Contractor must leave TRRPM in place until the final coats of paint or permanent RRPMS are installed;
- b) at the final visit, the Contractor shall apply a minimum two coats of paint to ensure that all new works meet the performance criteria of this specification. The retroreflectivity requirements must be met in both directions of traffic flow on all separation lines;
- c) traffic speed restrictions can be removed once the first coat of paint (primer/ base coat) has been placed for all line markings and the retroreflectivity readings are above the minimum intervention level of 125 mcd; and
- d) until installation of the separation line, the Contractor must maintain appropriate signage in accordance with AS 1742 (e.g. T3-12 "No lines do not overtake unless safe") and Part PC-SM1 "Traffic and Pedestrian Management".

For New Work, the Contractor must carry out spotting prior to the application of all pavement markings.

Following spotting, the Contractor must give 3 working days notice before any pavement marking is applied.

Provision of the above notice shall constitute a **HOLD POINT**.

5.2.2 Maintenance Repainting

Maintenance Repainting means the supply and application of paint to a previously painted surface.

5.3 High Performance Pavement Marking Application (CAP and Thermoplastic)

High performance markings must be used when specified by the Superintendent. All Cold Applied Plastic (CAP) and Thermoplastic systems to be used must meet the requirements of APAS.

Newly laid bitumen, asphalt or spray seal must be left to cure for 8 weeks prior to placing CAP or thermoplastic transverse pavement marking. Until Works can be completed, temporary pavement marking must be provided.

The installation of high performance CAP and Thermoplastic pavement marking must be undertaken as per the manufacturer's instructions.

CAP must be a minimum of 2.0 mm thick and Thermoplastic must be a minimum of 2.5 mm thick

All New Works and Maintenance Repainting using CAP and Thermoplastic must meet the Performance Standards outlined in Clause 6 of this specification.

Any testing for retroreflectivity, skid resistance or luminance on CAP and thermoplastic pavement markings must be undertaken as specified in Clause 6 of this specification.

5.4 Permanent and Temporary Retroreflective Raised Pavement Markers

Installation of retroreflective raised pavement markers (RRPM) must be in accordance with the DPTI Pavement Marking Manual and AS 1906.3 if there are no drawings applicable. Markers must be placed to a tolerance of ± 25 mm.

Adhesion shall be in accordance with the manufacturer's instructions relative to the road surface.

If removal of RRPMs is required, the Contractor must remove the marker and adhesive in such a way that minimum damage is caused to the road surface. Any damage to a wearing surface must be repaired by an approved method.

Markers removed from the road must be collected and disposed of in accordance with M8 Clause 10 "Waste Management".

Temporary RRPMs must be sufficiently robust to survive the existing traffic conditions until permanent markings are installed.

The Contractor must reinstate any dislodged RRPMs during the Defects Liability Period at the Contractor's cost.

The Contractor must supply a copy of RRPMs Compliance Certificates.

5.5 Coloured Pavement Surfacing Application

Coloured pavement surfacings for use on pavement designated areas such as bus or cycle lanes must be in accordance with DPTI Pavement Marking Manual.

Installation must be undertaken as per the manufacturer's instructions and meet the Performance Standards in Clause 6 of this specification.

5.6 Glass Bead and Glass Bead/Anti-Skid Application

All beads and bead/antiskid mix must be applied using a method that ensures uniform coverage and retention to the surface of the marking and meets the retroreflectivity and skid resistance requirements of this specification as set out in Clause 6.

The Contractor must ensure excessive application of material, which may present a hazard for road users, does not occur.

5.7 Kerb Treatment

The painting of kerbs for different Road Classifications must meet the Performance Standard for retroreflectivity, luminance and colour as defined for Access roads in the Performance Standards in Clause 6 of this specification.

The Contractor must remove and dispose of any lifting or flaking paint coatings, rubbish, grass and vegetation to achieve a sound surface prior to the application of paint. The Contractor must ensure that "over-spray" does not cause paint contamination to adjacent surfaces.

5.8 No Overtaking Zones

The Contractor must accurately locate the extent of no overtaking zones and ensure the placement of no overtaking zone line markings meet the tolerances specified in Table M16.5.

5.9 Pavement Bars

Installation must be carried out such that the pavement bars are placed true to the locations indicated on the drawings and in accordance with DPTI Pavement Marking Manual. Bars must be placed to a tolerance of ± 25 mm.

Pavement bars must be treated with a paint/bead application in one or more coats to achieve the required Performance Standards in Clause 6.

Adhesion must be in accordance with manufacturer's instructions and applied evenly over the whole contact surface area of the bar.

Where removal of pavement bars is required, the Contractor must remove the bar and adhesive in such a way that minimum damage is caused to the road surface. Remaining adhesive deposits must be removed to surface level to give a textured surface finish.

Where Maintenance Repainting of pavement bars is required, bars must be treated with a paint/bead application to achieve the specified performance criteria as per Clause 6. Precautions must be taken to avoid "overspray".

Pavement bars must be sufficiently robust to survive existing traffic conditions.

The Contractor must reinstate any dislodged pavement bar during the Defects Liability Period at the Contractor's cost.

5.10 Placement Tolerances of Markings

For Maintenance Repainting, the existing road markings must be repainted to restore the original size, shape and line pattern.

Pavement marking must be placed on the road surface in correct position within the following tolerances specified in Table M16.5.

TABLE M16.5 PLACEMENT OF MARKINGS		
	NEW WORK	MAINTENANCE REPAINTING
SPOTTING		
Line marking	± 50 mm of pavement/ seal centre or to surveyed design strings	-
Road marking	± 50 mm of drawing dimensions and control lines	-
ROAD MARKING	± 25 mm in relation to "spotting"	Areas must not be less than existing shape and size and not more than 10 mm greater than the existing all round (i.e. 0, + 10 mm).
LINE MARKING		
Edgeline distance from centreline	± 25 mm	-
Resultant lane width	± 50 mm	-
Lateral deviation from "spotting"	± 25 mm	-
Stripe width	+ 10, - 0 mm	+ 10, - 0 mm
Stripe length, less than 12 m	+ 150, - 0 mm	+ 150, - 0 mm
Stripe length, greater than 12 m	+ 300, - 0 mm	+ 300, - 0 mm
Module length, 12 m	+ 150, - 0 mm	+ 150, - 0 mm
Module length, greater than 12 m	+ 300, - 0 mm	+ 300, - 0 mm
"New over old" line placement (lateral)	-	< 10 mm
"New over old" line placement (longitudinal)	-	+ 150, - 0 mm

5.11 Protection of Work

Until full curing of the pavement marking has been achieved, the Contractor must ensure that all work is protected from traffic damage by the use of cones and signs in accordance with AS 1742.3, Clause 3.9.1.

If 'pick-up' is evident the Contractor must completely remove any re-distributed material caused by vehicles passing over uncured Work.

The Contractor must reapply pavement marking damaged by vehicles passing over uncured work.

Pavement marking must be considered damaged where the initial retroreflectivity measured within 10 to 20 days of application is below the values shown for the 10 – 20 days in Clause 6 of this specification.

5.12 **Removal of Pavement Markings**

Removal of pavement marking must be undertaken so as to not adversely affect the skid resistance, texture depth, susceptibility to ponding and appearance of the road surface.

The Contractor must obtain approval of the proposed removal method prior to undertaking the removal.

Any materials produced by removal activity must be immediately collected and removed from site and disposed of in accordance with M8 Clause 10 “Waste Management”.

Blacking out of pavement marking by the use of paint is not permitted. The order of precedence for pavement marking removal methods is:

- a) Emulsion and Chips (for spray seals only);
- b) Grinding (for asphalt only); and
- c) Water blasting.

The Contractor must use the highest order whenever possible.

6. **PERFORMANCE AND TESTING REQUIREMENTS FOR NEW WORKS AND MAINTENANCE REPAINTING**

New Works and Maintenance Repainting include the painting of all forms of pavement marking on the sealed road network.

Sealed roads are divided into six Road Classifications; Motorways (M); Urban Arterials (UA); Urban Connectors (UC); Rural Arterials (RA); Rural Connectors (RC); and Access roads (A).

The Performance Standards for the Road Classifications for all New Works and Maintenance Repainting are specified as follows.

6.1 **Retroreflectivity Performance Standards**

Retroreflective Performance Standards for pavement markings are defined in Table M16.6.1.

TABLE M16.6.1 RETROREFLECTIVITY PERFORMANCE STANDARDS FOR ALL LONGITUDINAL AND TRANSVERSE PAVEMENT MARKINGS FOR ALL ROAD CLASSIFICATIONS (in mcd/lux/m²)				
ROAD CLASS	10-20 DAYS	160-180 DAYS	700-720 DAYS	1000-1060 DAYS
Motorway	350	275	125	N/A
Urban Arterial	350	275	125	N/A
Urban Connector	300	200	125	N/A
Rural Arterial	350	275	125	N/A
Rural Connector	300	200	125	N/A
Access	300	200	N/A	125

Retroreflective Performance Standards for high performance CAP and Thermoplastics are as per Table M16.6.1 for the first 2 years but must also meet or exceed minimum 125mcd for 5 years (1800 days).

The wet retroreflectivity for all pavement marking must be a minimum of 80 mcd/lux/m² at any time after application for 2 years for M, UA, UC, RA and RC Road Classifications and 3 years for Access roads.

6.2 **Retroreflectivity Testing Requirements**

The Contractor shall conduct retroreflectivity testing of pavement markings in accordance with AS 4049.4, Appendix K to demonstrate compliance with the Performance Standards in 6.1 – Retroreflectivity Performance Standards.

The Contractor shall:

- a) mark test sites on the pavement to allow repeat testing;
- b) reference all test sites' GPS coordinates in WGS84 equivalent format; and
- c) forward a report to the Superintendent in tabular form on a monthly basis or as requested.

6.2.1 Frequency of Testing

The Contractor shall conduct testing at the same locations at the intervals specified in Table M16.6.2

TABLE M16.6.2 PAVEMENT MARKING TESTING INTERVALS	
Longitudinal Pavement Marking Testing Intervals	
Length of Road (km)	Minimum No. of Test Sites
< 0.5	1
0.5 – 5	2
5 – 50	Every 5 km, minimum 2 test sites
> 50	Every 10 km
Transverse and Other Pavement Marking Testing Intervals	
No. of Transverse and Other Markings	Minimum No. of Test Sites
Sites with < 4* transverse markings	2
Small Intersections (>12*)	4
Large Intersections (>20*)	6
Give Way and Stop Bars	1 at each site
All other markings (turn lines, chevrons, arrows etc.)	25% of overall No. of markings

Note: “<4*”, “>12*” and “>20*” refers to the number of transverse and other pavement markings existing at a given intersection.

6.2.2 Number of Measurements

At each test site the Contractor shall take the following minimum number of measurements of longitudinal lines:

- a) 3 readings on all edge lines, outlines or lane lines taken in the viewing direction of road users; and
- b) 6 readings on all dividing lines (3 readings in each direction);

Readings at each test site shall be a minimum of 1 m apart. Both individual and averaged tests results shall be presented as part of the Contractor's test report.

At each test site the Contractor shall measure reflectorised transverse pavement marking as follows:

- a) 2 readings on each reflectorised transverse pavement marking taking in the viewing direction of road users.

Readings at each test site shall be a minimum of 1 m apart. Both individual and averaged tests results shall be presented as part of the Contractor's test report.

6.2.3 Failure of Test Results

In the event of retroreflectivity test results result failing to comply with the Performance Standard, the Contractor shall raise a non-conformance in accordance with Part PC-QA1 “Quality Management Requirements” and arrange rectification as soon as practicable.

6.3 Skid Resistance Performance Standards

Skid Resistance Performance Standards for pavement marking are defined in Table M16.6.3.

ROAD CLASS	10-20 DAYS	160-180 DAYS	700-720 DAYS	1000-1060 DAYS
Motorway	55	55	45	N/A
Urban Arterial	45	45	45	N/A
Urban Connector	45	45	45	N/A
Rural Arterial	45	45	45	N/A
Rural Connector	45	45	45	N/A
Access	45	45	45	45

Skid resistance Performance Standards for high performance CAP and Thermoplastics are as per Table M16.6.3 for the first 2 years but must also meet or exceed 45bpn for 5 years (1800 days).

6.4 Skid Resistance Testing Requirements

When requested by the Superintendent the Contractor shall conduct skid resistance testing of pavement marking in accordance with AS 4049.4 Appendix J or approved equivalent (e.g. grip-tester) to demonstrate compliance with the Performance Standards in Clause 6.3 “Skid Resistance Performance Standards” and shall submit a copy of the test results to the Superintendent.

6.4.1 Failure of Test Results

In the event of skid resistance test results failing to comply with the Performance Standards additional testing may be requested by the Superintendent. The cost of the test that produced the failed results and all associated subsequent testing shall be borne by the Contractor.

The Contractor shall raise a non-conformance in accordance with Part PC-QA1 “Quality Management Requirements” and arrange rectification as soon as practicable.

6.5 Luminance and Colour Performance Standards

Pavement marking luminance and colours shall comply with the requirements outlined in Table M16.6.5:

White:	luminance factor of >80%: colour of Y35
Black:	luminance factor of <5%: colour close match to road surface
Yellow:	luminance factor of 45 - 50%, Colour of Y14
Blue:	luminance factor of 12 -15%, colour of B21
Other Coloured Pavement Surfacing	Refer to DPTI Pavement Marking Manual

All coloured pavement areas shall be treated with skid resistance material as per requirements of Clause 6.3.

6.6 Luminance Testing Requirements

When requested by the Superintendent the Contractor shall conduct luminance testing of pavement marking in accordance with AS 4049.4 Appendix H, to demonstrate compliance with the Performance Standards in Clause 6.5 and shall submit a copy of the test results to the Superintendent.

6.6.1 Failure of Test Results

In the event of luminance test results failing to comply with the Performance Standards, additional testing may be requested by the Superintendent. The cost of the test that produced the failed results and all associated subsequent testing shall be borne by the Contractor.

The Contractor shall raise a non-conformance in accordance with Part PC-QA1 “Quality Management Requirements” and arrange rectification as soon as practicable.

6.7 Colour Testing Requirements

When requested by the Superintendent the Contractor shall conduct colour testing of pavement marking in accordance with AS 4049.4 Appendix G, to demonstrate compliance with the Performance Standards in Clause 6.5 "Luminance and Colour Requirements" and shall submit a copy of the test results to the Superintendent.

The colour of the samples 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.

6.7.1 Failure of Test Results

In the event of colour test results failing to comply with the Performance Standards, additional testing may be requested by the Superintendent. The cost of the test that produced the failed results and all associated subsequent testing shall be borne by the Contractor.

The Contractor shall raise a non-conformance in accordance with Part PC-QA1 "Quality Management Requirements" and arrange rectification as soon as practicable.

6.8 Measurement

A line pattern shall be measured as though it is a continuous line (i.e. the measurement will be the sum of the painted and unpainted dimensions).

A Barrier Line shall be measured as though it is a single line.

Pavement marking which involves a 2 coat paint system shall be measured as though it is a single coat (i.e. the quantity shown in any schedule is the actual measurement of the marking on the pavement surface).

7. HOLD POINTS

The following is a summary of the Hold Points, vide Part PC-QA1 "Quality Management Requirements", referenced in this Part:

CLAUSE REF.	HOLD POINT	RESPONSE TIME
2	Submission of the Quality Management Plan	14 days
3	Provision of Contractor's PCCP Accreditation	1 working day
5.2.1	Following spotting and prior to application of pavement marking paint	3 working days

8. VERIFICATION REQUIREMENTS AND RECORDS

The Contractor shall supply the following documentation to demonstrate that the requirements of this Part have been complied with.

CLAUSE REF.	RECORD TO BE PROVIDED	FREQUENCY
6.2	Submission of Retroreflectivity Test Reports	Monthly or as requested
6.4	Submission of Skid Resistance Test Results	As requested
6.6	Submission of Colour Test Results	As requested
6.7	Submission of Luminance Test Results	As requested
5.1	Time and date of installation of regulatory lines	As required
5.4	Submission of RRPM compliance certificate	As required