SPECIFICATION AP-S0041/5

PAVEMENT MARKING MATERIAL – WATER-BORNE PAINT

1 SCOPE

a) This specification applies to water-borne paint for use as a pavement marking material.
b) This document is prepared in a manner compliant with the requirements of AS/NZS ISO/IEC 17065.
c) This type of pavement marking material is applied to the following types of surfaces and areas, both in on-road and off-road applications, in order to increase their safe use:
   i. Bituminous – Asphalt or Spray Seal roads
   ii. Concrete roads
   iii. Paved surfaces
   iv. Car parks
   v. Bus lanes, cycle lanes and pedestrian crossings
d) Safe use of these pavement surfaces is facilitated through:
   i. Brighter lines to separate traffic on both minor and major roads
   ii. Introduced order in carparks and public spaces
   iii. Delineation of roads
e) APAS® is a trademark registered with IP Australia, owned by CSIRO, the Scheme Owner, and protected under applicable laws. Use of the trademark or the Certification Scheme is prohibited unless prior approval in writing is obtained from CSIRO via the APAS Secretariat.

2 BACKGROUND

a) To obtain a broad overview of the Australian Paint Approval Scheme (APAS), refer to APAS document AP-D001.
b) To obtain an overview of restricted ingredients in APAS certified products, refer to APAS document AP-D123.
c) To obtain the current list of APAS participating manufacturers (and suppliers) and resellers, refer to APAS document AP-D152.
d) To obtain an overview of how to participate in the APAS, refer to APAS document AP-D177.
e) APAS approval to this specification may be gained by compliance with the requirements detailed in this specification and those in APAS document AP-D192.

3 DESCRIPTION AND GUIDE FOR USERS

3.1 General Requirements

a) Pavement marking materials are used by road authorities to:
   i. Improve road safety and other surfaces used to carry all types of traffic including cars, trucks, pedestrians, cyclists, busses and aircraft.
   ii. Provide delineation, acting as a guide to drivers to maintain their respective lane position, deterring accidents and providing direction.
b) Because of these functions, pavement marking materials must withstand many different types of wear and still perform as required.
c) When selecting a pavement marking material, several performance factors should be considered including, but not limited to, the roadway surface i.e., smooth or rough, heat sensitivity, porosity, traffic volume, and environmental conditions.
d) Pavement marking material durability is dependent on many factors including, but not limited to, traffic volume, location of the lines, application rates, retroreflectivity, performance of the material under various traffic conditions, location of the line and individual product durability. Depending on the circumstances, centre and lane lines can be painted yearly, and edge lines two-yearly but in high traffic volume areas, such lines can require repainting up to four times a year.
e) Water-borne paints are typically, but not limited to, acrylic emulsions. These types of material have excellent adhesion properties to substrates, are easy to apply, dry quickly (in ideal conditions, can be less than 5 minutes), are non-flammable and not dangerous, are relatively inexpensive, UV resistant, provide no-pick-up properties and are environmentally friendly.
f) Water-borne paints replaced solventborne paints back in the 1990s because of their low VOC content, less waste caused from packaging, better glass bead retention, higher performance, lower cost for the life of the product and for the improved health conditions for the application operators.
g) Water-borne paints are considered durable, long-life pavement marking materials. When compared to thermoplastic pavement marking materials and solventborne paint of the same application thickness, they are typically 2-3 times more durable.
h) Water-borne paints are used for longitudinal line marking, such as road edges and centre lines, and transverse and other types of line marking. They are used on trafficked roads (highways, general roads) but also used in carparks, wharves and non-touch down areas of aerodromes. Use in short term applications such as road construction operation is very common due to its ability to be applied quickly, dries quickly and is much lower in costs than other materials.

NOTE: General water-borne pavement marking paint should not be confused with aerodrome/airfield runway marking paint. Aerodrome/airfield runway marking paint is typically used only for runway touch down areas and although water-borne, is designed to be ablative and self-cleaning to reduce marking build up surfaces (poor durability) and has poor bead retention making this type of paint unsuitable for general road marking applications. Refer to APAS specification 0041/6 (Pavement Marking Material – Airport Runway Markings) for further information.

i) Water-borne pavement marking paint is typically spray applied. Application by roller or brush is not recommended due to this material type drying too rapidly and needing the controlled application achieved by spray application.
j) Water-borne paint, depending on the end use and circumstances, can be used with anti-skid media that consists of quartz, crushed glass, calcite bauxite aggregate or other approved materials that are

angular, polishing-resistant and coloured to match the markings. Anti-skid media are used to improve skid resistance.

k) Surface applied glass beads, such as B, B-HR, C, C-HR, D and D-HR, are also used in conjunction with water-borne paints to provide retroreflectivity under all conditions. Water-borne paint has excellent adhesion to glass beads. The HR glass bead types have been adopted by the majority of road authorities for use in main road production and maintenance due to their superior retroreflectivity for only a small cost increase. Standard glass beads are generally used in car parking applications.

NOTE: Glass beads are certified by APAS under specification AP-S0042.

l) Water-borne pavement marking paint can be applied to most road surfaces and generally adhere well. Some substrates use with water-borne paint is better than others:
   i. **Asphalt:** Can be marked straight away after it is dry with water-borne paint.
   ii. **Concrete:** Must be allowed to cure for 30 days prior to application of water-borne paint. The concrete surface must be adequately prepared prior to paint application (water or shot blasting) and the application of a suitable primer may also be recommended (refer to the manufacturers recommendations).
   iii. **Pavers:** The paved surface must be adequately prepared prior to paint application (water or shot blasting) and the application of a suitable primer may also be recommended (refer to the manufacturers recommendations).
   iv. **Spray Seal:** Water-borne paint adheres well to spray sealed surfaces.

m) Application surfaces must be clean and dry prior to application. If there is any moisture present, this may lead to the resin being washed out (material bleeding) which affects the adhesion, dry time, durability and sharpness of the pavement marking. Any loose materials on the substrate surface prior to application could interfere with the bonding of the paint to the surface.

n) Although white and yellow are the most commonly used colours, other colours such as red and green are seen for use in conjunction with bus and cycle lanes.

3.2 Sub-Classes

a) This specification does not incorporate any sub-classes.

3.3 Basis of this Specification

a) This specification is based on AS 4049.3, industry standards and specifications, and road authority standards and specifications.

4 DEFINITIONS AND ACRONYMS

4.1 Definitions

The definition of terms used in this document and in the Certification Scheme can be found in APAS document AP-D001. In addition, the following definitions within this document shall apply:

a) **Agency for Conformity Assessment**: An organisation or testing authority, recognised by APAS, that is either part of the Clients Recognised Manufacturing Unit (RMU) and perform all of the required tests, or a specialist laboratory contracted either by the APAS Secretariat or by the Client, to carry out specific tests that are beyond the capability of the Client RMU.

b) **Certification Scheme:** The Certification system related to specified products (Paint, Surface Coating Materials and Non-Paint Products) to which the same specified requirements, specific rules and procedures apply. APAS is the applicable Certification Scheme.

c) **Longitudinal Line Markings:** All lines that are generally parallel to the traffic flow, such as dividing, barrier, lane, edge, turn, continuity and transition lines and outline markings.

d) **Pavement Markings:** All longitudinal line markings, transverse line markings and pavement messages for the purpose of guiding traffic.

e) **Retroreflectivity:** The value of reflected light measured in millicandela / square metre / incident lux ($mcd/m^2/lx$) using a retroreflectometer.

f) **Scheme Owner:** The organisation responsible for developing and maintaining the certification scheme. CSIRO is the APAS Scheme Owner.

g) **Secretariat:** The organisation that provides administrative support and other resources necessary to keep the Certification Scheme functioning. The Secretariat is vested in CSIRO.

h) **Transverse Line Markings:** All lines and markings that are marked at right angles to the traffic flow such as stop and give way lines, turn lines, markings at stop and give way signs, pedestrian crossway lines, diagonal and chevron markings, arrows, shapes, symbols, numerals, parking areas and kerb markings.

4.2 Acronyms

ACE	Agency for Conformity Assessment
APAS	Australian Paint Approval Scheme
CRCL	CSIRO Recognised Competent Laboratory
CSIRO	Commonwealth Scientific and Industrial Research Organisation
EO	Executive Officer, APAS
PDS	Product Data Sheet
RMU	Recognised Manufacturing Unit
SDS	Safety Data Sheet
SUSMP	Standard for the Uniform Scheduling of Medicines and Poisons
TDS	Technical Data Sheet

VOC Volatile organic compounds
WHS Workplace Health and Safety

5 REFERENCED DOCUMENTS

a) The following standards are referenced in this document:

i. **AS 1152** – Specification for test sieves (withdrawn)
ii. **AS/NZS 1580** – Paints and related materials: Methods of test.
iii. **AS/NZS 2009** – Glass beads for pavement-marking materials
iv. **AS 2700** – Colour standards for general purpose
v. **AS 4049.3** – Paints and related materials - Pavement marking materials – Part 3: Waterborne paint - For use with surface applied glass beads
vi. **AS 4049.4** – Paints and related materials – Pavement marking materials – Part 4: High performance pavement marking systems
vii. **AS 4049.5** – Paints and related materials – Pavement marking materials – Part 5: Performance assessment of pavement markings
viii. **AS 4663** – Slip resistance measurement of existing pedestrian surfaces
ix. **AS ISO/IEC 17025** – General requirements for the competence of testing and calibration laboratories
x. **AS/NZS ISO/IEC 17065** – Conformity assessment: Requirements for bodies certifying products, processes and services

These documents may be purchased through the Reference Standards Australia website:
https://www.standards.org.au/

xi. **The Poisons Standard June 2022:** Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) No. 36, Part 2: Control on Medicines and Poisons, Section Seven / Appendix I Paint or Tinters

This document is available from the Australian Government Federal Register of Legislation web site at:
https://www.legislation.gov.au/Details/F2022L00730

xii. **Test Method TP343 – Determination of Skid Resistance with the Micro Griptester** DPTI (Department of Planning, Transport & Infrastructure), Technical Services Group Procedures

This document is available from the DPTI website:
https://www.dpti.sa.gov.au/materials_technology_documents/test_procedures2

b) The following documents were utilised in the creation of this document:

i. Austroads Technical Specification ATS 4110: Longitudinal Pavement Marking
ii. NZTA P30: Specification for High Performance Roadmarking
iii. QA Specification R145 Pavement Marking (Performance Based), Transport for NSW (TfNSW)
iv. QA Specification 3351 Road Marking Paint, Transport for NSW (TfNSW)
v. QA Specification 3356 Waterborne Road Marking Paint, Transport for NSW (TfNSW)
vi. RIAA Industry Guide: Series 1 – Facilities Pavement Marking, 1.1 Off Street Parking Facilities Marking Guide
vii. RIAA Industry Guide: Series 2 – Materials; 2.3 Waterborne Paints
viii. Section 721 – Pavement Markings, VicRoads
ix. Section 971 – Traffic Marking Materials, Florida Department of Transport
x. Specification 604: Pavement Marking, Main Roads QA
xi. SWA-0-QA-SPE-0610 Pavement Marking (All Lane Running Section), SmartWays Alliance
xii. Transport and Main Roads Specifications MRTS45 Road Surface Delineation

c) The following APAS documents are referenced in this document:

i. AP-D001 Rules Governing How APAS® Operates
ii. AP-D114 Rules Governing APAS® Recognition as a Testing Authority
iii. AP-D123 Restrictions on Ingredients in Product Formulations
iv. AP-D152 APAS® Participating Manufacturers and Resellers
v. AP-D177 Rules Governing How Product Manufacturers participate in APAS®
vi. AP-D181 Volatile Organic Compounds (VOC) Limits
vii. AP-D192 Rules Governing APAS® Product Certification Scheme
viii. AP-S0041/6 Pavement Marking Material – Airport Runway Markings
ix. AP-S0042 Glass beads for use in Pavement Marking Paints

All APAS documents and specifications are available for download from the APAS website:
https://vs.csiro.au/apas/documents/
https://vs.csiro.au/apas/specifications/

6 COMPOSITIONAL AND GENERAL REQUIREMENTS

6.1 Binder

a) There are no restrictions placed on the type of binder used in water-borne pavement marking paints.
b) Primary importance is placed on the ability of the binder to be compliant with the technical requirements clause 8, Table 1 below.

6.2 Volatiles

a) The volatile portion shall principally be comprised of non-volatile aqueous solvents, such as water.
b) For VOC content restrictions, refer to APAS document AP-D181.

6.3 Pigmentation

a) Pigments used shall be non-toxic, non-corrosive, lead-free and either organic or inorganic in nature (for coloured products), complying with the requirements of the SUSMP.
b) Primary importance is placed on the ability of the pigmentation to be compliant with the technical requirements clause 8, Table 1 below.

6.4 Colour

a) Longitudinal and transverse pavement markings are typically white and yellow.
b) Transverse (and other pavement markings) can also be a variety of colours, typically but not limited to white, yellow, red (bus lanes), green (cycle lanes), blue, grey and black. Refer to the manufacturer's Technical Data Sheet (TDS) or Product Data Sheet (PDS) for further information.

7 PRODUCT APPROVAL REQUIREMENTS

7.1 General Requirements

a) The product and its application for approval shall comply with the relevant requirements of this specification and of APAS document AP-D192 during the life of the approval.
b) Upon successful assessment of the laboratory component of this specification, CLASS II (interim) certification may be awarded in order to undertake the field testing component. Three (3) years from date of certificate issue is the timeframe given in order to undertake this work.
c) After successful assessment of the field testing component of this specification, CLASS I (full) certification may be awarded for the balance of the standard seven (7) year certification period i.e., 4 years.

7.2 Technical Requirements

a) **Current Requirements**: All laboratory testing must be completed as per the requirements of clause 8, Table 1 by an ACE. All performance based field testing must be carried out by a CRCL (refer to Note B) within the CLASS II certification period.
b) **Future Requirements:** All laboratory testing and field testing requirements stated in clause 8, Table 1 must be undertaken by an AS ISO/IEC 17025 accredited laboratory with all applicable test methods included in their Scope of Accreditation. A grace period will exist in order for all testing facilities to achieve AS ISO/IEC 17025 accreditation. This Grace period will end on **31st July 2023**.
c) AS ISO/IEC 17025 accreditation shall be provided by an organisation accredited by an ILAC Mutual Recognition Arrangement signatory and having a Scope of Accreditation covering AS ISO/IEC 17025 requirements. In Australia, NATA provides AS ISO/IEC 17025 accreditation. A list of international ILAC accreditation bodies can be found on the ISO website.
d) Performance based testing is typically to be undertaken on the **white** product only due to coloured materials representing lower market volumes, making them exempt from field testing. This exemption only exists **provided that** coloured materials are based on the same formulation (specifically the binder system) as the white product. Yellow products of the same formulation can be substituted in the absence of white.
e) If a coloured material is the only product seeking certification, then it must also undertake the performance-based testing requirements of clause 8, Table 1.

7.3 Health and Safety Requirements

a) The product shall comply with all requirements of clause 6.3 and 6.4 of APAS document AP-D192.
b) The manufacturer's Safety Data Sheet (SDS) must be studied closely prior to using the product and complied with during use of the product.
c) Products intended for sale in Australia shall comply with all the requirements of the SUSMP. Products intended for sale in other countries shall comply with all local WHS and environmental requirements.

8 TABLE 1: PERFORMANCE PROPERTIES

TEST:	APPLICABLE STANDARD / TEST REFERENCE:	REQUIREMENTS:
Laboratory Testing Requirements [A]		
Condition in the Container	AS 4049.3 (clause 6.1.1) AS/NZS 1580.103.1 AS/NZS 1580.211.1	Tested at 4 weeks from the date of product manufacture, the Settling Rate is to be not less than 8 and material to be free from skin, lumps, gel and coarse particles - report results.
Fineness of Paint	AS 4049.3 (clause 6.1.2 and Appendix E) AS 1152	Not more than 0.1% paint remaining - report results.
Consistency	AS 4049.3 (clause 6.1.3) AS/NZS 1580.214.1	Within ± 5% of manufacturers specification - report results.
Application Properties – Spray Application	AS 4049.3 (clause 6.1.4) AS/NZS 1580.205.2 AS/NZS 1580.205.4	Smooth and uniform film, with even edges. When spray applied, there should be no objectionable splatter and the gun does not clog under normal requirements - report results.
No-Pick-Up Time	AS 4049.3 (clause 6.1.5) AS/NZS 1580.401.8	≤ 20 minutes - report results.
Early Washout Resistance	AS 4049.3 (clause 6.1.6 and Appendix F)	≤ 120 minutes - report results.
Colour	AS 4049.3 (clause 6.1.7 and Appendix G) AS/NZS 1580.601.1 AS 2700	**White:** Approximate match to N14 White. Alternative colour is whiter than Y35 Off white. **Yellow:** Approximate match to Y14 Golden Yellow. Alternative colours are Y12 Wattle, Y13 Vivid Yellow or Y15 Sunflower. **Red:** Approximate match to R13 Signal Red. Alternative colours are R53 Redgum, R54 Raspberry or R62 Venetian Red. **Blue:** Approximate match to B21 Ultramarine. Alternative colours are B12 Royal Blue, B23 Bright Blue, B24 Harbour Blue or B41 Bluebell. **Green:** Approximate match to G13 Emerald Green. Alternative colours are G16 Traffic Green, G23 Shamrock or G35 Lime Green. **Black:** Approximate match to B64 Charcoal. Alternative colour is N61 Black. **NOTE:** • Alternative colours (i.e., grey) may also be tested as per requirements of road authorities. • Colours must be compared to and equivalent to a known AS 2700 colour. State colour designation and results. • No glass beads (surface applied) are to be included with grey and black coloured materials. • Report all results.

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TEST:	APPLICABLE STANDARD / TEST REFERENCE:	REQUIREMENTS:
Laboratory Testing Requirements [A] (Cont.,)		
Specular Gloss	AS 4049.3 (clause 6.1.8 and Appendix G) AS/NZS 1580.602.2	≤ 20 gloss units (using a 60 degree head) - report results. **NOTE:** Alternative gloss levels will be considered on a case by case basis by the APAS EO as any new product innovations develop.
Luminance Factor	AS 4049.3 (clause 6.1.9, Appendix H, Method 1)	**White:** ≥ 80 % - report results. **Yellow:** ≥ 45 – ≤ 50 % - report results. **Red:** ≥ 5 – ≤ 15 % - report results. **Blue:** ≥ 5 – ≤ 15 % - report results. **Green:** ≥ 5 – ≤ 15 % - report results. **Black:** ≤ 5 % - report results. **Grey:** ≥ 5 – ≤ 15 % - report results. **Other Colours:** ≥ 5 – ≤ 15 % - report results. **NOTE:** Exceptions to the above luminance range values will be assessed on a case by case basis depending on end user requirements within the AS 2700 colour range.
Storage Properties	AS 4049.3 (clauses 6.1.10, 6.1.4 and Appendix C and D) AS/NZS 1580.214.1 AS/NZS 1580.103.1 AS/NZS 1580.211.1 AS/NZS 1580.211.2	• Change does not exceed ± 5 Krebs Units from initial value. Report Initial and storage values. • No skinning. • Settling rate > 4. • Readily reincorporated. Report all results.
Volatile Organic Content (VOC)	APAS AP-D181	≤ 60 g/L Report results.

PAVEMENT MARKING MATERIAL – WATER-BORNE PAINT

TEST:	APPLICABLE STANDARD / TEST REFERENCE:	REQUIREMENTS:
Performance Based Testing Requirements (Field Testing) [A, B]		

<u>Setting up Performance Based Testing</u>: Applicable Standard / Test Reference and Requirements

- Refer to AS 4049.3 (clause 6.2 and Appendix I)
- Products applied with the following parameters*:
  1. 375 µm ± 25 µm WFT (or manufacturer's specified wet/dry film thickness) using B-HR beads at 300 g/m^2 ± 25 g/m^2 bead rate, **<u>or</u>**
  2. > 500 µm but < 600 µm WFT (or manufacturer's specified wet/dry film thickness) using Type D-HR beads at 450 g/m^2 ± 25 g/m^2 bead rate.

NOTE: * It is up to the manufacturer which of the above applications they choose to so as to achieve the required results. Product application chose needs to be specified in the field testing submission.

Measurements are to be taken at three intervals as specified below and all values reported:

Substrate Type:	Initial Measurement Point (IMP):	Interim Measurement Point (INMP):	Final Measurement Point (FMP):
Asphalt (or other substrate types)	After application / cure	2,000,000 vehicle passes	4,000,000 vehicle passes^
Spray Seal	After application / cure	500,000 vehicle passes	1,000,000 vehicle passes^

NOTE: ^ Substrates must be subjected to specified number of vehicle passes in a 3 to 18 month period post application.

Degree of Wear	AS 4049.3 (clause 6.2.2 and Appendix K)	**Asphalt:** ≥ 85% paint remaining intact at FMP **Spray Seal:** ≥ 80% paint remaining intact at FMP Report all results.
Luminance	AS 4049.3 (clause 6.2.4, Appendix H Method 2)	**White:** Lighter than Natural Colour System (NCS) swatch S 2500-N - report results. **Yellow:** Approximate match to Natural Colour System (NCS) swatch S 1070-Y20R - report results. **NOTE***:* This is applicable to white and yellow materials only, refer to Colour Change for all other colours.
Colour Change	AS 4049.4 (clause 6.3.8 and Appendix G)	All colours assessed at IMP, INMP, FMP testing points must have results ≥ 3 on grey scale - report results. **NOTE***:* Only colours are assessed in this method, refer to Luminance for white and yellow material testing.
Dry Retroreflectivity	AS 4049.3 (clause 6.2.3 and Appendix J)	Longitudinal and Transverse (and other markings)

Substrate Type:	IMP, mcd/m^2/lx	INMP, mcd/m^2/lx	FMP, mcd/m^2/lx
All substrate types	White ≥ 350 Yellow ≥ 300	White ≥ 300 Yellow ≥ 250	White ≥ 150 Yellow ≥ 150

Report all results.

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TEST:	APPLICABLE STANDARD / TEST REFERENCE:	REQUIREMENTS:
Performance Based Testing Requirements (Field Testing) [A, B] (Cont.,)		
Wet Retroreflectivity	AS 4049.4 (clause 6.3.3, Table 4, Appendix K Method 2)	**Applicable to all substrate types and all colours (except grey and black):** ≥ 80 mcd/m^2/lx at all times; measurements to be taken at IMP, INMP, FMP and results reported.
Skid Resistance	AS 4049.4 (clause 6.3.5 and Appendix J) and/or TP343	≥ 45 BPN or ≥ 0.55 Grip Number - report results. **NOTE:** Must be tested at two pre-determined locations within the field testing area and locations reported.
Slip Resistance	AS 4049.4 (clause 6.3.6) AS 4663 Appendix A and Table A1	≥ 35 BPN - report results.
Visibility	AS 4049.5 (clause 8.3.1 and Appendix C)	Markings must be easily recognisable and clearly visible and must meet the minimum visual performance levels for Transverse (and other) markings (Table C1) or Longitudinal markings (Table C2), whichever is applicable. A minimum of 5 testing locations over the length of a road must be assessed; record and report all measurements, the weather, on-road and lighting conditions. Report all results.

NOTE:

A: Laboratory Testing must be conducted by an ACE and field testing by a CRCL. From **31st July 2023**, all laboratory and field testing must be carried out by an AS ISO/IEC 17025 accredited facility with all applicable testing under its Scope of Accreditation. The NATA website can assist in identifying an appropriate testing facility https://www.nata.com.au/

B: Performance Based Testing (Field Testing) can be conducted by the following CRCLs:

Australian Road Research Board (ARRB)
David Milling
Team Leader, Transport Safety
21 McLachlan Street, Fortitude Valley, QLD, 4006
Phone: +61 438 859 779
Email: david.milling@arrb.com.au

Department for Infrastructure & Transport – South Australia
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APPENDIX A

Document History

Status: Current
Version: 2
Date Published: 06-09-2022

Document Version No.:	Date Published:	Summary of Changes:
2 AP-S0041/5	06-09-2022	• Updated SUSMP information. • Review of Luminance Factor requirements (Laboratory Testing) in line with Y values for AS 2700 colours and variation with swatches and equipment used: Yellow amended to ≥ 45 – ≤ 50 % (from ≥ 50 %); Grey amended to ≥ 5 – ≤ 15 % (from > 5 % - < 15 %) and Other Colours amended to ≥ 5 – ≤ 15 % (from ≥ 15 %); addition of Red, Blue and Green values (≥ 5 – ≤ 15 %). Addition of NOTE to Luminance requirement - Exceptions to the above luminance range values will be assessed on a case by case basis depending on end user requirements within the AS 2700 colour range.
1 AP-S0041/5	26-08-2021	• Updated No Pick Up test requirements to be more applicable to all water-borne paints in the current market.
0 AP-S0041/5	29-07-2021	• Full Technical document review of APAS specification 0041. • Separation of original specification (AP-S0041 V11) into pavement marking material types (Solvent-borne, CAP, Thermoplastics, Water-borne and Airport Pavement Markings); this document is now referenced as AP-S0041/5 Pavement Marking Material – Water-Borne Paint. • Document brought in line with requirements of AS/NZS ISO/IEC 17065. • General formatting update. • Inclusion of clause 4 Definitions and Acronyms. • Inclusion of clause 5 b) Reference material. • Inclusion of clause 7.1 b) & c) regarding CLASS I & II requirements. • Inclusion of 7.2 a), b) & c) regarding testing requirements. • Revision of laboratory based testing parameters for Colour, Specular Gloss, Luminance Factor and VOC. • Expansion and revision of performance based testing parameters (field testing) relating to increased number of minimum vehicle passes, dry and wet retroreflectivity, colour change, slip and skid resistance and visibility. • Inclusion of alternative CRCL for Field Testing – ARRB.
11 AP-S0041	10-11-2020	• Addition of Appendix A Document History and removal of the Editorial Note previously used in specification versions. • Updated document to the current format. • Updated internal and external document references . • Inclusion of VOC Content requirement to Table 1 Performance Properties. • Updated Note C contact information. • Addition of “People + Product = Protection” to Footer.
10	16-10-2015	• Clarified requirements for runway, apron and taxiway markings for sub-class 0041/6.
9	23-03-2015	• Underwent a major revision with the inclusion of requirements for sub-class 0041/3 cold applied products and 0041/6 airport marking.
8	10-01-2013	• Added sub-class 6, underwent a general update and the field-testing details in Table 1 were updated.
7	03-05-2007	• Aligned the specification with the revised AS 4049 – 2005.
6	13-02-2001	• Initiated the second stage of the move to new specification numbering with prominence given to the new number (previously GPC-P-41).