

POLYURETHANE COATING FOR THE PROTECTION OF STEEL IN ATMOSPHERE

1 SCOPE

This specification applies to two-pack solvent-borne polyurethane coatings, for application as part of a coating system to steel structures, on which optimum surface preparation can be achieved.

2 BACKGROUND

- To obtain a broad overview of the Australian Paint Approval Scheme (APAS), refer to APAS document AP-D001.
- To obtain an overview of restricted ingredients in APAS certified products, refer to APAS document APD123.
- To obtain the current list of APAS participating manufacturers and resellers, refer to APAS document AP-D152.
- To obtain an overview of how to participate in the APAS, refer to APAS document AP-D177.

3 DEFINITIONS AND ACRONYMS

3.1 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 definition shall apply:

- Polyurethane:** A coating that comprises polyol resins and isocyanate hardeners (or alternative curing agents).

3.2 Acronyms

The following acronyms appear in this document:

ACA	Australasian Corrosion Association
APAS	Australian Paint Approval Scheme
AS	Australian Standard
AS/NZS	Australian Standard / New Zealand Standard
CSIRO	Commonwealth Scientific and Industrial Research Organisation
PDS	Product Data Sheet
SCAA	Surface Coatings Association Australia
SDS	Safety Data Sheet
TDS	Technical Data Sheet
WHS	Workplace Health and Safety

4 DESCRIPTION AND GUIDE FOR USERS

4.1 General Requirements

- This specification applies to two-pack solvent-borne polyurethane coatings, for application as part of a coating system to steel structures, on which optimum surface preparation can be achieved.
- Polyurethanes are used in both automotive and industrial applications to provide a long-term protective, durable, UV and chemical resistant and decorative finish.
- Two-pack polyurethanes are available in a wide range of colours and finishes and exhibit excellent colour and gloss retention on weathering.

- Polyurethane systems are intended to provide a service life in excess of 10 years under Category C3 (Medium) atmospheric corrosivity conditions (refer to AS/NZS 2312.1) or in situations where frequent maintenance is impractical.
- Two-pack polyurethanes are typically used as topcoats over epoxy-based primers or high build epoxy and are applied by either brush, roller, or spray application.
- Where the decorative properties of these coatings are considered important, it is crucial that the appearance of the coating be maintained throughout the life of the coating. Purchasers should obtain the manufacturer's written assurance that the selected colour will have acceptable colour stability for the intended purpose.
- The manufacturer's product data sheet (PDS) and/or technical data sheet (TDS) should confirm that the exposure conditions to which the coating system is to be exposed is within the capabilities of that system.
- Where surface preparation is likely to be marginal and surface tolerant coatings are required, reference should be made to APAS specification AP-S0156.

4.2 Sub-Classes

- This specification incorporates the following subclasses:
 - 2911/1:** Standard isocyanate-cured polyurethanes
 - 2911/2:** High durability organically modified polyurethanes
 - 2911/3:** High durability polyurethanes incorporating a fluoropolymer, or other type, of modified binder

4.3 Basis of this Specification

- Paints complying to sub-class AP-S2911/1 of this specification are based on AS/NZS 3750.6 with the following modifications:
 - All gloss finishes allowed, and
 - Minimum volume solids set, and
 - Increase in exterior durability requirements.
- There are no known equivalent or near-equivalent specifications or standards for sub-classes AP-S2911/2 and AP-S2911/3 product types.
- Products approved under AP-2911/1 specification sub-class comply with Paint Reference Number (PRN) C26 of AS 2312.1.

5 REFERENCED DOCUMENTS

- The following standards are referenced in this document:
 - AS/NZS 1580** – Paints and related materials: Methods of test
 - AS 2312.1** – Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings – Part 1: Paint Coatings
 - AS/NZS 3750.6** – Paints for steel structures – Full gloss polyurethane (two-pack)
 - ASTM G154-16** – Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Non-metallic Materials



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These documents may be purchased through the Reference Standards Australia website:

<https://www.standards.org.au/>

- v. **The Therapeutic Goods (Poisons Standard - July 2023) Instrument 2023**: Part 2: Controls on Substances, Division 9 - Paint or Tinters

This document is available from the Australian Government Federal Register of Legislation website at:

[Therapeutic Goods \(Poisons Standard—July 2023\) Instrument 2023 \(legislation.gov.au\)](https://www.legislation.gov.au/Therapeutic%20Goods%20(Poisons%20Standard%20July%202023)Instrument%202023)

- b) The following APAS documents and specification are referenced in this document:
- AP-D001 Rules Governing How APAS® Operates
 - AP-D123 Restrictions on Ingredients in Product Formulations
 - AP-D152 APAS® Participating Manufacturers and Resellers
 - AP-D177 Rules Governing How Product Manufacturers participate in APAS®
 - AP-D181 Volatile Organic Compounds (VOC) Limits
 - AP-D192 Rules Governing APAS® Product Certification Scheme
 - AP-S0156 Epoxy Mastic High Build Two-Pack Coating for Rusted Steel

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

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

6 COMPOSITIONAL REQUIREMENTS

6.1 Binder

- Sub-class AP-S2911/1**: The binder shall typically be comprised of a polyester, polyacrylate or other type of polyol base cured with an aliphatic isocyanate hardener.
- Sub-class AP-S2911/2**: The polyol compound shall incorporate an organic modifier, such as (but not limited to) a fluoropolymer, to provide durability properties.
- Sub-class AP-S2911/3**: The binder in the polyol compound shall be directly modified by a polymer such as (but not limited to) a fluoropolymer so that the binder itself is fluorinated, to provide high durability properties.

6.2 Volatiles

- The volatile portion shall typically be comprised of oxygenated solvents, such as ketones, esters and glycol ether esters, and chlorinated solvents.
- For VOC content restrictions, refer to APAS document AP-D181.

6.3 Pigmentation

- There is no restriction on the types of pigments that can be used, however the pigmentation shall comply with the requirements of Therapeutic Goods (Poisons Standard - July 2023), APAS document AP-D123 and be chosen to impart the properties detailed in clause 8, Table 1 below.

6.4 Colour

- Products approved under this specification are normally available in a wide range of colours, known as the Manufacturer's Colour Range (MCR). Refer to the manufacturer's product data sheet (PDS) or technical data sheet (TDS) for more information.

7 PRODUCT APPROVAL REQUIREMENTS

7.1 General Requirements

- The product and its application for approval shall comply with the relevant requirements of APAS document AP-D192 and this specification during the life of the approval.
- CLASS II certification shall be granted for a period of 6 years upon demonstrating conformance to the requirements noted in clause 8, Table 1 specific to its sub-class (with the exceptions of Application Properties of Aged Sample, Accelerated Weathering (4000 hrs) and Resistance to Natural Weathering). Application Properties of Aged Sample and Accelerated Weathering (4000 hrs) testing to the requirements noted in clause 8, Table 1 shall be undertaken and reported to APAS during the CLASS II certification period. Resistance to Natural Weathering testing to the requirements noted in clause 8, Table 1 shall be undertaken during the CLASS II certification period and reported at the end of CLASS II certification for consideration of certification conversion from CLASS II to CLASS I.
- CLASS I certification shall be granted to products for a period of 7 years maximum, having demonstrated conformance to **all** of the requirements noted in clause 8, Table 1 **specific to its sub-class** including Application Properties of Aged Sample, Accelerated Weathering and Resistance to Natural Weathering.

7.2 Technical Requirements

- The product shall comply with **all** the requirements of clause 8, Table 1 below that are specific to its sub-class, throughout the certification period.

7.3 Health and Safety Requirements

- The manufacturer's Safety Data Sheet (SDS) must be studied closely prior to using the product and complied with during use of the product.
- As products covered by this specification typically contain solvents, the paint is considered flammable and should be stored away from all sources of heat or ignition.



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- c) Containers should be resealed immediately after use and good ventilation provided during use to minimise the risk of fire or explosion and the long-term toxic effects of absorption of the vapour into the lungs.
- d) Care should be taken to avoid contact with the skin using protective clothing and barrier cream. All pumping equipment should be adequately earthed. A full-face air fed respirator should be used when spraying.
- e) In higher concentrations, monomeric isocyanates in these products can cause throat irritation and in severe instances, asthmatic symptoms. Some workers are sensitised at airborne concentrations well below the normal hygiene standards. This precludes persons with a history of respiratory problems from using these products.
- f) It is anticipated that most of these products would be applied by operators in well ventilated spray booths or in the field by operators with adequate safety equipment.
- g) Products intended for sale in Australia shall comply with all the requirements of the Therapeutic Goods (Poisons Standard - July 2023). Products intended for sale in other countries shall comply with all local WHS and environmental requirements.
- h) The product shall comply with all requirements of clause 6.3 and 6.4 of APAS document AP-D192.



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8 TABLE 1: PERFORMANCE PROPERTIES

TEST	AS/NZS 1580 METHOD	REQUIREMENTS
Laboratory Testing – ALL Sub-classes		
General Requirements	AS/NZS 3750.6	Shall comply with all the requirements of clause 2 Material Requirements , except clause 2.5.4 (Gloss) which is modified as per below. All results shall be reported.
Gloss	601.2	High Gloss: ≥ 51 GU measured with a 20° head. Medium Gloss: 20 – 50 GU measured with a 60° head. Low Gloss: ≤ 19 GU measured with an 85° head. All results shall be reported.
Non-Volatile Content by Volume	301.2	Minimum 50% Note: Theoretical calculations using raw material data is permissible. All results shall be reported.
Thinning or Mixing Properties	208.1	Using 10% of manufacturers recommended thinner, there shall be no signs of incompatibility. All results shall be reported.
Application of Aged Sample	205.1 205.3 205.2 or 205.4 AS/NZS 3750.6 2.4.5 & 2.5.3	A sample of the product which has been stored at routine conditions for 12 months , shall exhibit satisfactory application properties when applied by brushing, rolling, and spraying. The product shall also comply with the requirements of: The cured film shall be free from defects. The cured film shall withstand a load of > 1.5 Kg. All results shall be reported.
Colour – Visual Comparison	601.1 AS 2700	Approximate match to the equivalent AS 2700 colour. Report equivalent AS 2700 colour and all results.
VOC Content	APAS AP-D181	Refer to APAS document AP-D181 for method and limits. If the APAS specification is not listed on AP-D181, a declaration of VOC content is still required and shall be reported.



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8 TABLE 1: PERFORMANCE PROPERTIES

TEST	AS/NZS 1580 METHOD	REQUIREMENTS										
Durability Testing – ALL Sub-classes												
Accelerated Weathering Testing – Interim (ASTM G154)	AS/NZS 3750.6 2.5.13 481.1.2 481.1.5 481.1.7 481.1.8 481.1.9 481.1.10 481.3	<p>FOR ALL SUB-CLASSES:</p> <p>After 1000 hours, the ratings shall be:</p> <p>Discolouration: Rating 0 Percentage Change in Gloss: ≤ 20% of initial gloss measurement. Measurements are to be taken using a head applicable to their gloss level.</p> <table> <tr><td>Checking</td><td>0</td></tr> <tr><td>Cracking</td><td>0</td></tr> <tr><td>Blistering</td><td>0</td></tr> <tr><td>Flaking and Peeling</td><td>0</td></tr> <tr><td>Corrosion</td><td>0</td></tr> </table> <p>All results shall be reported.</p>	Checking	0	Cracking	0	Blistering	0	Flaking and Peeling	0	Corrosion	0
Checking	0											
Cracking	0											
Blistering	0											
Flaking and Peeling	0											
Corrosion	0											
Resistance to Weathering	457.1 (Cat 1) 481.1.7 481.1.8 481.1.9 481.1.10 481.3	<p>FOR ALL SUB-CLASSES:</p> <p>After 72 months exposure at all three exterior atmospheric exposure sites (listed in APAS document AP-D192, clause 12), the coating shall show no integrity failure i.e., at the end of 6 years, the ratings shall be:</p> <table> <tr><td>Checking</td><td>0</td></tr> <tr><td>Cracking</td><td>0</td></tr> <tr><td>Blistering</td><td>0</td></tr> <tr><td>Flaking and Peeling</td><td>0</td></tr> <tr><td>Corrosion</td><td>0</td></tr> </table> <p>All results shall be reported.</p>	Checking	0	Cracking	0	Blistering	0	Flaking and Peeling	0	Corrosion	0
Checking	0											
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8 TABLE 1: PERFORMANCE PROPERTIES

TEST	AS/NZS 1580 METHOD	REQUIREMENTS
Durability Testing – Sub-classes <u>AP-S2911/2 & AP-S2911/3 ONLY</u>		
Accelerated Weathering Testing – Final (ASTM G154)	AS/NZS 3750.6 2.5.13 481.1.2 481.1.5 481.1.7 481.1.8 481.1.9 481.1.10 481.3	<u>For sub-classes AP-S2911/2 & AP-S2911/3 ONLY.</u> After 4000 hours, the ratings shall be: Discolouration: Rating 0 or 1 Percentage Change in Gloss: ≤ 25% of initial gloss measurement. Measurements are to be taken using a head applicable to their gloss level. Checking 0 Cracking 0 Blistering 0 Flaking and Peeling 0 Corrosion 0 All results shall be reported.



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APPENDIX A

Document History

Status: Current
Version: 12
Date Published: 25-09-2023

Document Version No.:	Date Published:	Summary of Changes:
12	25-09-2023	<ul style="list-style-type: none">• Full technical review of specification by ACA, SCAA and APAS• Review included:<ul style="list-style-type: none">- Addition of a new sub-class AP-S2911/3- Increase of non-volatile content from 35% to 50% in line with industry standards- Introduction of accelerated weathering testing for all sub-classes to obtain CLASS II conformity;- Inclusion and defining of gloss requirements depending on gloss level of product (low, medium, and high)- Update of Colour to include the AS 2700 colour product is assessed against• Inclusion of clause 3.1 Definitions and 3.2 Acronyms• Removed clause number from Appendix A• Minor formatting updates
11	14-09-2021	<ul style="list-style-type: none">• General format changes• Updated background information in clause 2• Updated SUSMP information• Updated APAS website information
10	14-12-2020	<ul style="list-style-type: none">• 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• Addition of "People + Product = Protection" to Footer
9	06-09-2017	<ul style="list-style-type: none">• Updated format• Updated current reference to the Poisons Schedule• Modified sub-class 2911/1 to allow for all gloss finishes• Added Colour test requirement to Table 1
8	05-05-2005	<ul style="list-style-type: none">• Expanded the range of coatings to include high durability (modified PU) versions
7	27-11-2003	<ul style="list-style-type: none">• Deleted reference to GPC numbering and incorporated a general format update
6	11-04-2001	<ul style="list-style-type: none">• Initiated the second stage of the move to new specification numbering with prominence given to the new number (previously GPC-C-29/11)