

## ANTI-CORROSIVE TAPE BASED SYSTEMS FOR THE LONG-TERM PROTECTION OF STRUCTURES

### 1 SCOPE

This specification applies to anti-corrosive tape systems intended for the long term protection of steel, concrete and other structural materials, in severe atmospheric and immersion service.

### 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) This specification applies to anti-corrosive tape systems intended for the long term protection of steel, concrete and other structural materials, in severe atmospheric and immersion service.
- b) Systems may incorporate primers, tape wrapping systems, coatings and protective jacket components. The systems are suitable for application to surfaces with low levels of contamination and residual sound corrosion products and are intended to provide a maintenance free service life in excess of 10 years in many exposure environments.

#### 3.2 Sub-Classes

- a) This specification incorporates the following sub-classes:
  - i. **2978**: For atmospheric exposure
  - ii. **2978F**: For fresh water immersion
  - iii. **2978S**: For sea water immersion
  - iv. **2978RS**: For sea water immersion, heavy sea conditions
  - v. **2978SW**: For sewage and/or sludge
  - vi. **2978U**: For underground exposure

#### 3.3 Basis of this Specification

- a) This specification is not based on any known standard or specification.
- b) Paints approved under this specification do not comply with any Paint Reference Number (PRN) of AS 2312.1.

### 4 REFERENCED DOCUMENTS

- a) The following standards are referenced in this document:
  - i. **AS 1627.4** – Metal finishing – Preparation and pre-treatment of surfaces – Abrasive blast cleaning of steel
  - ii. **AS 2312.1** – Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings – Part 1: Paint Coatings
  - iii. **AS 3894.5** – Site testing of protective coatings – Determination of surface profile
  - iv. **AS/NZS ISO 9001** – Quality Management Systems – Requirements
  - v. **ISO 21809-3** – Petroleum and natural gas industries – External coatings for buried or submerged pipelines used in pipeline transportation systems – Part 3: Field joint coatings

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

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

- vi. **The Poisons Standard June 2021**: Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) No. 33, 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 website at: <https://www.legislation.gov.au/Details/F2021L00650>

- b) The following APAS documents are referenced in this document:
  - i. AP-D001 Rules Governing How APAS® Operates
  - ii. AP-D123 Restrictions on Ingredients in Product Formulations
  - iii. AP-D152 APAS® Participating Manufacturers and Resellers
  - iv. AP-D114 Rules Governing APAS® Recognition as a Testing Authority
  - 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

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

### 5 EVIDENTIARY REQUIREMENTS

- a) The approval of systems to this specification is largely based on evidence of performance. Whilst systems approved to this specification will usually contain petrolatum, butyl or bituminous materials, any liquid, gel or solid material which provides the necessary performance is acceptable under this specification.

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Similarly, tapes can be manufactured from natural or synthetic materials and are not closely specified.

- b) As with all products approved to APAS specifications, manufacturers will be required to provide evidence of control of Quality of manufacture for all components in a system.

### 6 PRODUCT APPROVAL REQUIREMENTS

#### 6.1 General Requirements

- a) The product and its application shall comply with all requirements of APAS document AP-D192 during the application process and the life of the approval.
- b) Tape systems shall only be approved on the basis of evidence-based field performance. Laboratory test data in itself shall not be sufficient to support an application for approval of a system under this specification.

#### 6.2 Product Realisation

- a) All tape systems shall be subject to a development process which satisfies the requirements of AS/NZS ISO 9001 Clause 7.1 Planning of product realisation.

#### 6.3 Technical Requirements

##### 6.3.1 General

- a) The test methods and requirements detailed in the following paragraphs are based on the requirements of ISO 21809-3.
- b) Agencies carrying out testing to the requirements of clause 9, Tables 1 and/or 2 below shall comply with the criteria detailed in APAS document AP-D114.
- c) Applications for certification shall demonstrate compliance with all elements of clause 6 of this document, as summarised in clause 9, Tables 1 and 2 below as appropriate.

##### 6.3.2 Test Panel Preparation

- a) All test panels or other substrates shall be prepared in accordance with clause 7, Appendix A below.

##### 6.3.3 Test Requirements – Petrolatum Tapes

Petrolatum tape systems consist of a primer and single or multiple layers of petrolatum tapes, meeting the requirements of ISO 21809-3 Type 1B.

###### 6.3.3.1 Thickness

The thickness used, where relevant for laboratory testing, shall be the manufacturer's nominal thickness for that product.

###### 6.3.3.2 Mass per Unit Area

When measured in accordance with clause 8, Appendix B below, the mass per unit area shall be at least 85% of that specified by the manufacturer.

###### 6.3.3.3 Cathodic Disbondment

Cathodic disbondment shall be measured in accordance with ISO 21809-3, Annex F. The cathodic disbondment

after 28 days at 23°C shall meet the requirements of clause 9, Table 1 below.

###### 6.3.3.4 Peel Strength

- a) Test panels shall be prepared in accordance with clause 6.3.2. Peel strength shall be deemed to be satisfactory when a film of compound remains on at least 75% of the test area after peeling.
- b) Peel strength shall also be assessed after 28 days hot water immersion, as per ISO 21809-3, Annex I. Peel strength shall be deemed to be satisfactory when a film of compound remains on at least 75% of the test area after peeling.

###### 6.3.3.5 Drip Resistance

No dripping of the compound shall occur when the tape is tested in accordance with ISO 21809-3, Annex J.

##### 6.3.4 Test Requirements – Polymeric Tapes

Polymeric tape systems (cold-applied) consist of a primer and single or multiple layers of polymeric tape, meeting the requirement of ISO 21809-3 Type 1D.

###### 6.3.4.1 Thickness

The thickness shall be measured in accordance with ISO 21809-3, Annex A. The measured thickness shall be  $\geq$  90% of the manufacturer's specified value.

###### 6.3.4.2 Mass per Unit Area

When measured in accordance with clause 8, Appendix B, the mass per unit area shall be  $\geq$  85% of the manufacturer's specified value.

###### 6.3.4.3 Holiday Detection

Where specified, holiday detection shall be carried out on test pieces at a voltage of 5KV/mm + 5KV at a maximum 15KV in accordance with the procedure described in ISO 21809-3, Annex B. The result shall comply with the requirements of clause 9, Table 2 below.

###### 6.3.4.4 Impact Resistance

Impact resistance shall be measured in accordance with ISO 21809-3, Annex G. The result shall comply with the requirements of clause 9, Table 2 below.

###### 6.3.4.5 Cathodic Disbondment

Cathodic disbondment shall be measured in accordance with ISO 21809-3, Annex F. The cathodic disbondment after 28 days at 23°C shall meet the requirements of clause 9, Table 2 below.

###### 6.3.4.6 Peel Strength

- a) Peel strength between tape layers (inner/outer only) shall be determined in accordance with ISO 21809-3, Annex M. The peel strength shall meet the requirements of clause 9, Table 2 below.
- b) Peel strength to the substrate shall be determined in accordance with ISO 21809-3, Annex D. The peel strength shall meet the requirements of clause 9, Table 2 below.
- c) Peel strength to the substrate shall be measured in accordance with ISO 21809-3, Annex D, after immersion of the test piece in accordance with Annex I, at the maximum design temperature for the material

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under test. The peel strength shall meet the requirements of clause 9, Table 2 below.

### 6.3.4.7 Lap Shear Strength

The lap shear strength shall be measured in accordance with ISO 21809-3, Annex L and shall meet the requirements of clause 9, Table 2 below.

### 6.3.4.8 Thermal Aging Resistance

The thermal aging resistance shall be measured in accordance with ISO 21809-3, Annex N and shall meet the requirements of clause 9, Table 2 below.

### 6.3.5 Quality Control

- a) For the purposes of demonstrating control of Quality of production, the manufacturer shall provide evidence of a statistically sound sampling and testing regime for all components within a system.
- b) A sufficient array of laboratory tests shall be carried out to ensure that products will provide the required performance in use.

## 6.4 Approval via Case Histories

- a) The nature and complexity of systems covered by this specification is very broad and laboratory testing in itself will not provide total confidence in the ability of a system to provide the required performance. Many of the systems in the marketplace have been in use for many years, possibly decades, and it is probable that case history data supporting approval will be available.
- b) Product approval will only be available where case history data is available, regardless of the nature of laboratory data provided.

### 6.4.1 General Guidelines for Case History Submissions

The following are guidelines to manufacturers and suppliers intending to submit products for approval against this specification:

- a) The case histories utilised shall be **technical case histories**, not marketing case histories i.e. there must be a high level of accurate technical information contained in the case history.
- b) Evidence must be provided that, at the conclusion of the test period which constitutes the case history:
  1. No active corrosion is present.
  2. Adhesion of systems to the substrate and, where relevant, to themselves, is sound.
  3. Jackets are in sound water-tight condition.
  4. Coatings continue to provide protection to the tape system.

### 6.4.2 Durability Data Guidelines for Case History Submissions

- a) The case history durability data supplied must:
  1. Be from projects of a similar type to the APAS specification end use i.e. if the APAS specification applies to a fresh water immersion

application, then the case histories must cover fresh water immersion.

2. Be of a duration not less than that specified in clause 9, Table 1 or 2 below, as appropriate.
  3. Demonstrate the integrity of the system in the defined exposure condition.
  4. Be obtained by a person technically qualified to assess the performance of the system. Qualifications from the ACA, NACE or other recognised corrosion-related organisations shall be required.
- b) The formulation of batches of materials relevant to the case history shall be traceable and shall be essentially the same as the formulation for the contemporary product for which approval is sought.
  - c) The system represented by the case history shall have been applied in the same or comparable manner and under the same conditions as specified in the manufacturer's currently published recommendations.
  - d) The application rates and sequence of application of products in a system shall be the same as that for which approval is sought.
  - e) The case history must be accessible for independent confirmation of performance and supported by appropriate application documentation which shall include method and timing of surface preparation and applications, site application rates and any other data which could be relevant to fair appraisal of the data.
  - f) The technical case histories shall be submitted to APAS who will decide on their relevance as support evidence for the product approval application.
  - g) If the guidelines of this specification are invoked, CLASS II (Interim) Approval (see 6.4.3 below) shall be conditional upon the immediate initiation of an exposure series complying with the durability requirements of this specification.
  - h) All classes - with the exception of AP-S2978SW - shall have a durability requirement of 10 years. Class SW shall have a durability requirement of 3 years in sewage and sludge.

### 6.4.3 Class II (Interim) Approvals

CLASS II (Interim) approval of an APAS anti-corrosion tape system may be given **provided that** evidence of satisfactory performance in actual field situations (case study) can be provided for a period of not less than 1 year for Class SW and not less than 3 years for all other classes.

## 6.5 Health and Safety Requirements

- a) The manufacturer's Safety Data Sheet (SDS) must be studied closely prior to using the product and complied with during use of the product.
- b) Materials which are flammable, or which contain flammable solvents, shall be stored away from sources of heat or ignition.
- 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.

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- d) The product shall comply with all requirements of clause 6.3 and 6.4 of APAS document AP-D192.

### 7 APPENDIX A

#### Panel Preparation

##### 7.1 Scope

- This Appendix applies to test panels prepared for the purposes of demonstrating compliance with the requirements of this specification.
- This Appendix applies to both petrolatum and polymeric tape systems.

##### 7.2 Sampling and Sample Preparation

- Sample preparation shall be in accordance with the specified ISO 21809-3 Annex.
- Unless otherwise specified in the relevant Annex, the full coating system, as specified by the manufacturer, shall be applied to the test substrate.
- Unless otherwise specified in the relevant Annex, the metal substrate shall be dry abrasive blast-cleaned in accordance with AS 1627.4 to a Class Sa 2½ finish, to produce a minimum surface profile of 45µm, when measured using replicate tape in accordance with AS 3894.5
- All test pieces shall be conditioned and cured in accordance with the manufacturer's instructions.

### 8 APPENDIX B

#### Mass per Unit Area

##### 8.1 Scope

This procedure applies to all anti-corrosive tape materials, including petrolatum and polymeric tapes

##### 8.2 Apparatus

- Balance, minimum capacity 600 g, readable and accurate to at least 0.1 g
- Steel rule, minimum length 500 mm, readable and accurate to 0.5 mm
- Straight edge
- Sharp knife

##### 8.3 Sampling and Sample Preparation

- Three samples shall be cut from rolls of production material.
- The sample area shall be a minimum of 0.09 m<sup>2</sup> (typically 30 cm x 30 cm) and shall be cut to a square or rectangular shape using a straight edge and a sharp knife.
- Any backing film shall be removed immediately prior to weighing.

##### 8.4 Procedure

- Condition samples by placing them on a bench at a controlled temperature of 20 to 25°C for a minimum of 24 hours.
- Make three measurements of the length and width of each sample and record to the nearest 0.5 mm.

- Place each sample in turn on the balance and record the mass to the nearest 0.1 g (m<sub>1</sub>).

##### 8.5 Calculation

- Determine the average of length and width for each sample, and then calculate the area to the nearest 0.001 m<sup>2</sup> (A).
- Calculate the mass per unit area as follows:

$$M \text{ (g/m}^2\text{)} = \frac{m_1}{A}$$

##### 8.6 Report

The report shall contain all of the following elements:

- Name and address of the testing authority.
- Identity of the person carrying out the test.
- Date of test, report number and page x of y.
- Test method used to achieve the reported result.
- Result in g/m<sup>2</sup>.



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## ANTI-CORROSIVE TAPE BASED SYSTEMS FOR THE LONG-TERM PROTECTION OF STRUCTURES

9 TABLE 1: PETROLATUM TAPE PROPERTIES

Property	Test Temperature, °C	Requirements	Test Method ISO 21809-3
Mass per unit area	23°C	≥ 87.5% of manufacturer's specified value	Clause 8, Appendix B of AP-S2978
Cathodic disbondment	23°C	≤ 20mm	Annex F
Peel strength to test substrate	23°C	Film of compound to ≥ 75% of substrate	NA
Peel strength to test substrate after 28 days immersion in 30°C water	23°C		Annex I
Drip resistance	45°C	No dripping of compound	Annex J
Durability	--	10 years, except for AP-S2978SW – 3 years	Clause 6.4, AP-S2978



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## ANTI-CORROSIVE TAPE BASED SYSTEMS FOR THE LONG-TERM PROTECTION OF STRUCTURES

**9 TABLE 2: POLYMERIC TAPE PROPERTIES**

Property	Test Temperature	Unit	Requirement	Test Method
Thickness	NA	mm	$\geq 0.9 \times$ nominal thickness	ISO 21809-3 Annex A
Mass per unit area	23°C	g/m <sup>2</sup>	$\geq 0.85 \times$ nominal thickness	Clause 8, Appendix B of AP-S2978
Holiday Detection at 5KV/mm + 5KV	NA	NA	No holiday	ISO 21809-3 Annex B
Impact resistance	23°C	J/mm	No holidays at 4J/mm	ISO 21809-3 Annex G
Cathodic disbondment resistance at 28 days	23°C	mm	$\leq 15$	ISO 21809-3 Annex F
Peel strength between tape layers, inner/ outer	23°C	N/mm	$\geq 1.5$	ISO 21809-3 Annex M
	T <sub>max op</sub>		$\geq 0.30$	
Peel strength to substrate	23°C	N/mm	$\geq 1$	ISO 21809-3 Annex D
	T <sub>max to 50°C</sub>		$\geq 0.1$	
	Water immersion at 50°C		$\geq 0.4$	ISO 21809-3 Annex I
Lap shear strength	23°C	N/mm <sup>2</sup>	$\geq 0.05$	ISO 21809-3 Annex L
	T <sub>max op</sub>		$\geq 0.05$	
Thermal ageing resistance Elongation at break	23°C	Ratio	$1.25 \geq E_{100}/E_0 \geq 0.75$ $E_{100}/E_{70} \geq 0.8$	ISO 21809-3 Annex N
Peel strength between tape layers			$P_{100}/P_0 \geq 0.75$ $P_{100}/P_{70} \geq 0.8$	
Peel strength to substrate			$A_{100}/A_0 \geq 0.75$ $A_{100}/A_{70} \geq 0.8$	
Durability	--		10 years, except for 2978SW – 3 years.	Clause 6.4, AP-S2978





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### 10 APPENDIX C

#### Document History

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Document Version No.:	Date Published:	Summary of Changes:
2	02-09-2021	<ul style="list-style-type: none"><li>• General format changes</li><li>• Updated background information in clause 2</li><li>• Updated SUSMP information</li><li>• Updated APAS website information</li></ul>
1	24-12-2020	<ul style="list-style-type: none"><li>• Addition of Appendix C Document History and removal of the Editorial Note previously used in specification versions</li><li>• Updated document to the current format</li><li>• Updated internal and external document references</li><li>• Addition of "People + Product = Protection" to Footer</li></ul>
0	28-01-2013	<ul style="list-style-type: none"><li>• Original version</li></ul>