SPECIFICATION AP-S0040

EPOXY ADHESIVES FOR INSTALLATION OF RAISED PAVEMENT MARKERS

1 SCOPE

a) This specification applies to epoxy adhesives used in the adhesion of raised pavement markers (permanent and temporary) to bituminous, spray seal and concrete road surfaces.
b) This document has been prepared in a manner compliant with the requirements of AS/NZS ISO/IEC 17065.
c) 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.

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 definitions shall apply:

a) **Adhesive:** a material that is applied to one or both surfaces of a raised pavement marker and the substrate that bonds them together and resists their separation.

3.2 Acronyms

The following acronyms appear in this document:

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
RPM Raised Pavement Marker
SDS Safety Data Sheet
TDS Technical Data Sheet
WHS Workplace Health and Safety

4 DESCRIPTION AND GUIDE FOR USERS

4.1 General Information

a) This specification applies to epoxy adhesives used in the adhesion of raised pavement markers (permanent and temporary) to bituminous, spray seal and concrete road surfaces.
b) Raised pavement markers (RPMs) are used on roads to provide delineation in both day and night-time conditions, particularly in poor weather conditions and where insufficient retroreflectivity exists in pavement marking materials.
c) Poor quality and performance of adhesives used to bond raised pavement markers to road surfaces can lead to:
   - Adhesion loss between the adhesive and the RPM and/or between the adhesive and the road surface.
   - High maintenance costs due to the premature failure of RPMs.
   - Lack of uniformity and consistency in adhesives.
   - WHS issues arising due to RPMs becoming dislodged.
d) Standardised and regulated RPM adhesives allows for:
   - Better retention of RPMs to the road surface and reliability in their use, enabling better visibility even in difficult conditions, improving road safety thereby decreasing road accidents and fatalities.
   - Less maintenance (and associated costs) with premature adhesive failures.
   - Less chance of RPMs becoming projectiles and potentially endangering pedestrians and motorists if adhesives prematurely fail.
   - Less roadside pollution of the dislodged RPMs.
e) Three types of epoxy adhesives are considered within this specification:
   1. **Slow Set:** Adhesives that are hand or machine mixed and dispensed; applied where ambient or road surface temperature is above 15-20 °C; and are for use where markers are not laid under traffic or where means of protecting markers from traffic are to be employed.
   2. **Standard Set:** Adhesives that are also hand or machine mixed and dispensed; applied where ambient or road surface temperature is above 10-15 °C; and are for use where markers are to be laid under traffic or where means of protecting markers from traffic are employed.
   3. **Rapid Set:** Adhesives that are machine mixed and dispensed only; applied where ambient or road surface temperature is as low as 0°C; and are for use where markers are to be laid under traffic.
f) The manufacturer's Technical Data Sheet (TDS) and/or Product Data Sheet (PDS) should be consulted to confirm that the exposure conditions to which the adhesive is to be exposed is within the capabilities of that material.

4.2 Sub-Classes

a) This specification incorporates the following sub-classes:
   i. **0040/1:** Slow set adhesive.
   ii. **0040/2:** Standard set adhesive.
   iii. **0040/3:** Rapid set adhesive.

4.3 Basis of this Specification

a) This specification is based on AS 3554.

5 REFERENCED DOCUMENTS

a) The following standards are referenced in this document:

   i. **AS 3554:** Adhesives – Epoxy – For raised pavement marker installation
   ii. **AS 1580.301.1:** Paints and related materials – Methods of test, Non-volatile content by mass

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

   iii. **The Therapeutic Goods (Poisons Standard - February 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: https://www.legislation.gov.au/Details/F2023L00067

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-D177 Rules Governing How Product Manufacturers Participate in APAS®
   v. AP-D181 Volatile Organic Compounds (VOC) Limits
   vi. 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/

6 PRODUCT APPROVAL REQUIREMENTS

6.1 General Requirements

a) The adhesive shall comply with this specification and the relevant requirements of APAS document AP-D192 during the life of the approval.

6.2 Technical Requirements

a) The adhesive shall comply with **all** the requirements of clause 7, Table 1 below.
b) The Product and/or Technical Data Sheet (PDS or TDS) supplied with the product(s) shall contain all necessary information on bonding procedures including mixing proportions and mixing tolerances, spreading and pot life, shelf life, relative density, non-volatile content, and cleaning instructions.

6.3 Health and Safety Requirements

a) The manufacturer's Safety Data Sheet (SDS), product data sheet (PDS) and/or technical data sheet (TDS) must be studied closely prior to using the adhesive and must be complied with during use of the product(s) and system.
b) As adhesives covered by this specification may contain solvents, the product(s) may be considered flammable and should be stored away from all sources of heat or ignition.
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 equipment should be adequately earthed.
e) Products intended for sale in Australia shall comply with all the requirements of the Therapeutic Goods (Poisons Standard - February 2023). Products intended for sale in other countries shall comply with all local WHS and environmental requirements.
f) The product shall comply with all requirements of clause 6.3 and 6.4 of APAS document AP-D192.

7 TABLE 1: PERFORMANCE PROPERTIES

<table>
<tr><th>PROPERTY REQUIREMENT</th><th>TEST METHOD</th><th>RESULTS REQUIREMENTS</th></tr>
<tr><td colspan="3">PHYSICAL PROPERTIES – Freshly mixed uncured adhesive</td></tr>
<tr><td>Non-Volatile Content by Mass</td><td>AS 1580.301.1</td><td>Within ± 5% of the PDS and/or TDS recommendations.
Report all results.</td></tr>
<tr><td>Gelation Time</td><td>AS 3554 clause 6.1.2
Table 1 and Appendix A</td><td>
<table>
<tr><th></th><th>Components conditioned at 23 ± 2°C</th><th>Components conditioned at 30 ± 2°C</th></tr>
<tr><td>0040/1:</td><td>> 20 minutes</td><td>≥ 20 minutes</td></tr>
<tr><td>0040/2:</td><td>> 9 to 20 minutes</td><td>≥ 10 minutes</td></tr>
<tr><td>0040/3:</td><td>6 to 9 minutes</td><td>≥ 6 minutes</td></tr>
</table>
State gelation times at both component conditioning temperature ranges.
</td></tr>
<tr><td>Sag Flow</td><td>AS 3554 clause 6.1.3
Table 2 and Appendix B</td><td>≤ 1mm.
<table>
<tr><th></th><th>Determined at 23 ± 2°C</th><th>Determined at 30 ± 2°C</th></tr>
<tr><td>0040/1:</td><td>10 minutes</td><td>3 minutes</td></tr>
<tr><td>0040/2:</td><td>7 minutes</td><td>2 minutes</td></tr>
<tr><td>0040/3:</td><td>4 minutes</td><td>1 minute</td></tr>
</table>
State sag flow (mm) and times (minutes) results at both temperature ranges.
</td></tr>
<tr><td>Volatile Organic Compounds (VOC) Content</td><td>APAS document AP-D181</td><td>If the APAS specification is not listed on AP-D181, a declaration of VOC content is still required.
Report all results.</td></tr>
<tr><td>Storage Stability</td><td>AS 3554 clause 5.3</td><td>Adhesives stored in accordance with the PDS and/or TDS recommended storage conditions for ≥ 12 months shall also conform to the above requirements for:
Non-Volatile Content by Mass.
Gelation Time.
Sag Flow.
Volatile Organic Compounds.
Report All results.</td></tr>
</table>

7 TABLE 1: PERFORMANCE PROPERTIES (Cont.,)

PROPERTY REQUIREMENT	TEST METHOD	RESULTS REQUIREMENTS
PHYSICAL PROPERTIES – Cured adhesive		
Bond Strength Development	AS 3554 clause 6.2.1 Table 3 and Appendix C	≥ 1.4 MPa State all results applicable to the sub-class, bond curing temperatures and times specified in Table 3 of AS 3554.
Bond Strength in Slant Sheer	AS 3554 clause 6.2.2 Table 4 and Appendix D	State all results (minimum slant sheer stress, MPa) for each substrate type and condition specified in Table 4 of AS 3554.
Bond Strength in Sheer	AS 3554 clause 6.2.3 Table 5 and Appendix E	≥ 4.0 MPa State all results.
Bond Behaviour under Impact Sheer	AS 3554 clause 6.2.4 and Appendix F	No relative displacement of a slant shear block assembly when subjected to a drop impact energy of 150 J. State all results.
Storage Stability	AS 3554 clause 5.3	Adhesives stored in accordance with the PDS and/or TDS recommended storage conditions for ≥ 12 months shall also conform to the above requirements for: • Bond Strength Development. • Bond Strength in Slant Sheer. • Bond Strength in Sheer. • Bond behaviour under Impact Sheer. Report All results.

EPOXY ADHESIVES FOR INSTALLATION OF RAISED PAVEMENT MARKERS

APPENDIX A

Document History

Status: Current
Version: 0
Date Published: 24-03-2023

Document Version No.:	Date Published:	Summary of Changes:
0	24-03-2023	• Initial specification version based on AS 3554:2023