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AUSTROADS TECHNICAL SPECIFICATION ATS 5620
Cold Applied Sealant Joints

Austroads

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1. Scope

1.1 Austroads Technical Specification ATS 5620 sets out the requirements for cold applied sealant joints in bridges, including sealant selection and installation. These may also be referred to as flexible plug joints. It excludes joints with an elastomeric concrete nosing.

2. Referenced Documents

2.1 The following documents are referenced in this specification:

Australian / New Zealand Standards	
AS 5100.4	Bridge design – Bearings and deck joints
AS/NZS ISO 9001	Quality management systems – Requirements
Waka Kotahi NZ Transport Agency	
SP/M/022	Bridge Manual
ASTM International	
ASTM C639	Standard Test Method for Rheological (Flow) Properties of Elastomeric Sealants
ASTM C661	Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer
ASTM C679	Standard Test Method for Tack-Free Time of Elastomeric Sealants
ASTM C719	Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants under Cyclic Movement (Hockman Cycle)
ASTM C793	Standard Test Method for Effects of Laboratory Accelerated Weathering on Elastomeric Joint Sealants
ASTM C794	Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants
ASTM C1183	Standard Test Method for Extrusion Rate of Elastomeric Sealants
ASTM D412	Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers— Tension
ASTM D882	Standard Test Method for Tensile Properties of Thin Plastic Sheeting
ASTM D1475	Standard Test Method for Density of Liquid Coatings, Inks, and Related Products
Transport for New South Wales	
B0600	Standard Drawings: Bridge joint - Small movement joint link. Refer: https://roads-waterways.transport.nsw.gov.au/business-industry/partners-suppliers/documents/standard-drawings/b0600.pdf

3. Definitions

3.1 The following definitions apply to this specification.

Asphalt bridging layer: An arrangement for bridging deck joint gaps, comprising a single layer or multiple layers of one or more materials effectively supporting the asphalt layer over the underlying joint gap.

Elastomeric sealant: Elastomer for sealing gaps comprising a macromolecular material that rapidly regains its approximate original dimensions after the release of a weak stress that has caused its substantial deformation.

Joint gap: Joint width at sealant location irrespective of the width of the joint below or above the sealant.

Maximum joint gap:	The joint opening at Ultimate Limit State in accordance with AS 5100.4.
Movement capability:	Cyclic strain of a magnitude that can be accommodated by a sealant without damage when tested according to ASTM C719 with cement mortar substrate.
Non-sag sealant:	Sealant that does not flow in vertical or inverted joints when applied at a temperature between 5°C and 50°C.
Principal's Registration Scheme:	Any scheme for the prequalification, registration or approval of products, manufacturers, suppliers and/or Professional Engineers in operation in the jurisdiction where the sealant joint is to be installed.
Rapid curing sealant:	Sealant with tack-free time and adhesion-in-peel conforming to Table 6.9.
Self-levelling sealant:	Sealant that flows sufficiently under gravity at a temperature not less than 5°C to become level when applied in a horizontal joint or to become smooth when applied to a joint on a crossfall.
Standard test conditions:	A temperature of 23 ± 2°C and a relative humidity of 50 ± 5%.

4. Quality System Requirements

4.1 The Contractor must prepare and implement a Quality Plan that includes the documentation in Table 4.1.

Table 4.1 Quality Plan

Clause	Description of document
5	Details and properties of the proposed sealant and joint.
7	Laboratory test certificates
8.1	Details and / or procedures for installation
9.1	The wording of the proposed warranty

4.2 The sealant joint must be manufactured under a Quality Management System which is certified as complying with AS/NZS ISO 9001 by a JAS-ANZ accredited organisation.

4.3 Where a Principal's Registration Scheme is in place for the supply of sealant / joint, the products must be approved under that scheme and a certificate of compliance must be submitted with the Quality Plan. For work carried in New South Wales, refer to https://roads-waterways.transport.nsw.gov.au/business-industry/partners-suppliers/documents/tenders-contracts/listofapprovedbridgecomponentssystems.pdf.

4.4 If a Principal's Registration Scheme does not apply, documentary evidence of the proven performance of the sealant / joint and compliance with this Specification, including certification to AS/NZS ISO 9001, must be submitted to the Principal.

HOLD POINT 1.	
Process Held	Installation of the Sealant Joint
Submission Details	The Quality Plan and the documentation required under Clause 4.3 or 4.4 must be submitted to the Principal at least 15 working days prior to the commencement of the installation of the Sealant Joint.

5. Sealant Selection

General

5.1 The sealant must be selected in accordance with AS 5100.4 (in Australia) or SP/M/022 (in New Zealand) and as amended by this Specification. The sealants must satisfy all joint design and performance requirements, including strains in the sealant at maximum and minimum joint opening.

5.2 Calculations verifying that the strains in the sealants at the Ultimate Limit State are within the limits specified in AS 5100.4 or SP/M/022 must be submitted to the Principal.

6. Materials

Sealant – Classification

6.1 Sealants for use under this Specification are classified as shown in Table 6.1.

Table 6.1 – Sealant Classification

Classification	Application
Type 1 (1)	Joints sawn in asphalt road surface.
Type 2 (2)	Joints in concrete decks, as follows: • Joints in concrete bridge decks underneath asphalt, with gaps at installation ≤ 15 mm but with maximum joint gap ≤ 25 mm. • Joints in concrete bridge decks without asphalt overlay, with gaps at installation ≤ 25 mm but with maximum joint gap ≤ 38 mm. • Joints in concrete components not subject to traffic, such as kerbs and barriers, with gaps at installation ≤ 40 mm but with maximum joint gap ≤ 50 mm.
Type 3 (3)	Joints in concrete decks, as follows: • Joints in concrete bridge decks underneath asphalt, with gaps at installation > 15 mm but with maximum joint gap ≤ 35 mm. • Joints in concrete bridge decks without asphalt overlay, with gaps at installation > 25 mm but with maximum joint gap ≤ 45 mm. • Joints in concrete components not subject to traffic, such as kerbs and barriers, with gaps at installation > 40 mm but with maximum joint gap ≤ 50 mm.

Notes:

(1) Sealants may qualify for more than one classification.

(2) Refer to Clause 8 for specified joint gaps for new bridge decks.

(3) Type 3 sealants are used in rehabilitation works only.

Sealant – General Properties

6.2 Sealants must be elastomeric and rapid curing, and cure chemically through moisture activation and/or by the use of crosslinking agents or promoters.

6.3 Sealants may be single or multi-component formulations.

6.4 Sealants used in horizontal joints may be either self-levelling or non-sag. Sealants used in vertical joints must be non-sag.

6.5 Sealant used in joints under traffic must be capable of resisting punching from debris and particles accumulated over the joints.

6.6 Sealant used in joints sawn in asphalt road surface (Type 1) must be compatible with asphalt.

6.7 If specified, the colour of the sealant after 21 days of curing must be as shown on the Drawings unless otherwise accepted by the Principal.

6.8 The sealant after installation and curing must not pick up dirt, be watertight and accommodate the required movements.

Sealant – General Performance Requirements

6.9 Sealants of all Types for use under this Specification must conform to the requirements shown in Table 6.9.

Table 6.9 Sealant - General Performance Requirements

Test reference	Test method (astm)	Requirement	Notes
Flow	C639	Smooth level surface	Only for self-levelling sealants.
Non-sagging	C639	Vertical sag ≤ 5 mm No horizontal deformation	Only for non-sag sealants.
Extrudability	C1183 Procedure A	Extrusion rate ≥ 10 mL/min	Test multi-component sealants immediately after mixing. Test single component sealants as specified in ASTM C1183.
Tack-free Time	C679	≤ 4 hours	Film pulls off with no sealant adhering to it.
Adhesion-in-Peel	C794	Average peel force ≥ 30 N for standard mortar substrate	Cure for one day and test at the end of the curing, i.e., at an age of one day, with all being done under standard test conditions.
Adhesion / Cohesion and Movement Capability	C719	No debonding at substrate and no sealant failure	Test movement to be equal to the movement capability nominated by the manufacturer. Use only cement mortar substrates.
Indentation Hardness - Heat Aging	C661	Refer to Table 6.10 for “Shore A Hardness”	Age at 70°C ± 2°C for 6 weeks after curing as specified in the relevant standard.
Durability (Accelerated Weathering)	C793	No cracks greater than those in Example 2 of Figure 1 and Figure 2 in C793	
Specific Gravity	D1475	As nominated by manufacturer	Test multi-component sealants immediately after mixing.

Sealant – Specific Performance Requirements

6.10 Sealants for use under this Specification must conform to the requirements shown in Table 6.10 for the appropriate Types.

Table 6.10 Sealant Type Specific Performance Requirements

Property	Test method (astm)	Requirement		
		Type 1	Type 2	Type 3
Shore A Hardness	C661	5 to 15	10 to 30	25 to 40
Minimum Movement Capability (1) (%)	C719	+100, –50	+100, –50	+25, –25
Tensile Modulus at 100% Strain (MPa)	D412	< 0.1	< 0.6	< 0.6

Note:
(1) Positive and negative values are the movement capability under tension and compression, respectively

7. Sealant Testing

Testing Laboratories

7.1 Unless approved otherwise by the Principal, testing must be performed by a laboratory which is accredited by a body that is a signatory to the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement (ILAC MRA). The National Association of Testing Authorities (NATA) and International Accreditation New Zealand (IANZ) are signatories to ILAC MRA.

7.2 If no such facilities are available for a test, the test must be carried out in a laboratory approved by the Principal with results reported in a format acceptable to the Principal. For any such approval, details of the testing facilities must be submitted to the Principal, prior to carrying out the testing.

7.3 The Principal may request full access to audit the laboratory at any time. The Contractor must make available for inspection all test procedures, equipment calibration certificates and test results associated with both type testing and production testing.

Type Testing and Product Approval

7.4 Type testing must be carried out to verify conformity of sealants with the general performance requirements specified in Table 6.9 and the specific requirements in Table 6.10.

7.5 Unless Clause 4.3 applies, the Contractor must submit the type test report (not more than 2 years old) to the Principal.

7.6 All individual packages of sealant components and primers must be clearly identified and labelled on site, including sealant classifications specified in Clause 6.1. A production testing report must be provided to the Principal with each batch of sealant delivered.

HOLD POINT 2.	
Process Held	Delivery of sealants to site
Submission Details	At least 5 working days prior to delivery, a type test report must be submitted to the Principal which is not more than two years old verifying conformity to Clause 7.4, together with a production test report.

Production Testing

7.7 Testing of every batch must be carried out during production to verify consistency in the production process and demonstrate conformity of each batch with the specified requirements.

7.8 Production testing must comprise testing for the following properties as a minimum:

a) extrudability.

b) tack-free time.

c) adhesion-in-peel.

d) Shore A hardness.

e) specific gravity.

7.9 All properties listed above must comply with Table 6.9, except for Shore A hardness which must comply with Table 6.10.

8. Installation

General

8.1 The Quality Plan must include a procedure for installation of the sealant / joint.

8.2 Sealant components must have at least six months of shelf life remaining from the date of delivery under the storage conditions specified by the manufacturer.

WITNESS POINT 1.	
Process	Installation of sealant
Notification	Notification must be provided at least 2 working days prior to the commencement of sealant joint installation

8.3 The sealant must be installed in accordance with the manufacturer's instructions and the Drawings. The details in Standard Drawing No. B0600 apply, unless specified otherwise on the Drawings.

8.4 In joint gaps exposed to traffic, the top of the sealant at maximum compression must be:

a) 2mm lower than the road surface where Type 1 sealant joint is used, and

b) between 5mm to 10mm lower than the road surface where Type 2 and Type 3 sealant joint is used.

Joint Gap

8.5 In new bridge works, the joint gap at the time of sealant installation (at the nominated temperature on the Drawings) must be 15 mm in concrete bridge decks underneath asphalt and 25 mm in concrete bridge decks without asphalt overlay, unless otherwise specified on the Drawings and approved by the Principal.

8.6 The actual gap and temperature must be measured at the time of sealant installation and the actual joint gap width at the assumed temperature shown on the Drawings must be deduced.

8.7 Where the joint gap width at the time of sealant installation does not accord with that assumed in the design, the Contractor must submit either of the following to the Principal:

a) evidence that the sealant is suitable for the actual gap width; or

b) a proposal to use an alternative sealant which is suitable for the actual gap width.

Substrate Strength

8.8 The compressive strength of the concrete forming the joint gap at the time of sealant installation must be more than 30 MPa for sealant Types 2 and 3, to avoid concrete breaking out as the sealant cures. The Principal may approve installation of these sealants at concrete compressive strengths ranging from 20 to 30 MPa if the sealant modulus is low and has been proven not to damage the concrete in similar situations.

Preparatory Work

8.9 Prior to sealant installation:

a) any joint fillers, coatings, dirt, grit, loose particles or materials incompatible with the sealant must be removed.

b) the joint gap must be thoroughly cleaned and dried; and

c) where specified, the specified primer must be applied in conformity to the manufacturer's instructions to improve bonding to the substrate.

Method of Application

8.10 Multi-component sealants must be mixed or extruded using suitable power driven or mechanical mixers in conformity to the manufacturer's instructions, unless otherwise approved by the Principal. The sealant components must not be mixed manually.

8.11 The sealant must be uniformly mixed in accordance with the manufacturer's instructions to obtain a consistency suitable for installation.

8.12 All sealants must be applied using applicators or guns suitable for the purpose.

8.13 Sealants in concrete joints overlaid by asphalt or bituminous surfacing must be isolated from the overlay using a suitable HDPE bond breaker tape overlaid with a preformed membrane to form an asphalt bridging layer. The preformed membrane must:

a) comprise of moisture and water-resistant rubberised asphalt with puncture and heat-resistant polypropylene reinforcing mesh, such as Bituthene 5000 or Emer-Proof HD.

b) have a minimum thickness of 1.5 mm and a minimum mesh tensile strength of 10 N/mm^2 when tested in accordance with ASTM D882: and

c) be adequately bonded to the substrate at each side of the joint gap

8.14 Where heating and pressing the membrane is recommended by the manufacturer to obtain the bonding, the reinforcement embedded in the membrane must not be damaged by the procedure.

8.15 Sealants in asphalt joints must not be applied before the asphalt has cooled to less than 40°C. The cellular polystyrene sheet and a backing rod must be placed at the bottom of the asphalt joint gap before applying the sealant to prevent the sealant adhering to the bottom of the gap.

Curing

8.16 Single component sealants used in concrete joints underneath asphalt must be fully cured prior to placing the asphalt overlay. Where a non-sag sealant is used, it must be finished with a depressor or other suitable tool.

8.17 For joint rehabilitation projects, for operational reasons, the Principal may approve the placement of the asphalt bridging layer and asphalt overlay just after the sealant has become tack free, or at a later time, if it is proven to be satisfactory in similar situations.

Warranty

8.18 The sealant joint must be supplied with a manufacturer's warranty in the name of the Principal. The warranty must:

a) cover defective workmanship, material and serviceability (which includes watertightness of the joint).

b) fully cover the replacement / rectification of defective sealant; and

c) apply for a minimum period of 5 years (in Australia) or 10 years (in New Zealand) from the date of installation.

Annexure A: Summary of Hold Points, Witness Points and Records

The following is a summary of the Witness Points / Hold Points that apply to this Specification and the Records that the Contractor must submit to the Principal to demonstrate compliance with this Specification.

Clause	Hold point	Witness point	Record
4	Delivery and Installation of the sealant.		Quality Plan and other documentation listed.
5.2			Strain calculations
7.5	Delivery of sealant		Type test and product test reports
8.3		1. Installation of sealant	
9.1			Warranty

Amendment Record

Amendment no.	Clauses amended	Action	Date
-	New specification	New	December 2022

Key

Format	Change in format
Substitution	Old clause removed and replaced with new clause
New	Insertion of new clause
Removed	Old clauses removed