

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

Sealing Compound, Low Adhesion, for Removable Panels and Fuel Tank Inspection Plates

1. SCOPE:

1.1 Form:

This specification covers a polysulfide sealing compound with low adhesive strength. This elastomeric compound shall be supplied as a two-component system which cures at room temperature.

1.2 Application:

This compound has been used typically for sealing aircraft access doors and accessories where gaskets are required, but usage is not limited to such applications. The sealing compounds are resistant to jet fuels and high aromatic aviation gasolines and are usable from -67 to 250 °F (-54 to 120 °C).

1.3 Classification:

The sealing compound covered by this specification is classified by corrosion inhibiting or non-corrosion inhibiting, method of application and application time as follows:

Type 1: Non-corrosion inhibiting.

Type 2: Corrosion inhibiting (Non-chromated)

Class A - Suitable for brush application, available with the following application times:

Class A-1/2

Class A-2

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1.3 (Continued):

Class B - Suitable for application by extrusion gun or spatula, available with the following application times:

Class B-1/2
Class B-2

1.4 Safety - Hazardous Materials:

While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2471	Anodic Treatment of Aluminum Alloys, Sulfuric Acid Process, Undyed Coating
AMS 2629	Fluid, Jet Reference
AMS 3166	Solvents Cleaning, for Cleaning Prior to Application of Sealing Compounds
AMS 3819	Cloths, Cleaning for Aircraft Primary and Secondary Structural Surfaces
AMS 4045	Aluminum Alloy Sheet and Plate, 5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr, (7075; -T6 Sheet, -T651 Plate), Solution and Precipitation Heat Treated
AMS 4049	Aluminum Alloy Sheet and Plate, Alclad, 5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr, (Alclad 7075; -T6 Sheet, -T651 Plate), Solution and Precipitation Heat Treated
AMS 4901	Titanium Sheet, Strip, and Plate, Commercially Pure Annealed, 70.0 ksi (485 MPa) Yield Strength
AMS 5516	Steel Sheet, Strip, and Plate, Corrosion Resistant, 18Cr - 9.0Ni (SAE 30302), Solution Heat Treated
AS5127	Methods for Testing Aerospace Sealings (May 1997, See 4.5.4)
AS5127/1	Methods for Testing Aerospace Sealants, Two-component Synthetic Rubber Compounds (May 1997, See 4.5.4)
AS7001	National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Program Description
AS7002	National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Rules for Implementation

2.1 (Continued):

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| AS7200/1 | National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Audit and Inspection Procedures and Checklists for the Sealant Manufacturers Accreditation Program |
| AS7201 | National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Requirements for Accreditation of Pass-Thru Distributors |
| AS7002 | National Aerospace and Defense Contractors Accreditation Program (NADCAP) - Requirements for Accreditation of Value Added Distributors |

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM D 1974 Methods for Closing, Sealing, and Reinforcing Fiberboard Boxes

2.3 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

- | | |
|---------------|---|
| PPP-C-96 | Can, Metal, 28 Gage and Lighter |
| MIL-PRF-27725 | Coating, Corrosion Preventive, for Aircraft Integral Fuel Tanks |
| MIL-C-38736 | Compound, Solvent, for Use in Integral Fuel Tanks |
| MIL-PRF-23377 | Primer Coating: Epoxy, High Solids |
| MIL-P-38714 | Sealant Cartridge for Two Component Materials - Inactive for new design |

3. TECHNICAL REQUIREMENTS:

3.1 Materials:

The basic ingredient shall be polysulfide type synthetic rubber. The sealing compound shall cure by the addition of a curing agent to the base compound, and shall not depend on solvent evaporation for curing. The material shall be corrosion inhibiting and non-corrosion inhibiting types but neither shall contain lead or chromium compounds. The curing agent shall possess sufficient color contrast to the base compound to permit easy identification of an unmixed or incompletely mixed sealing compound. The cured sealant shall be red or pink in color. The base compound and the curing agent shall be of uniform blend and shall be free of skins, lumps, and gelled or coarse particles.

3.2 Properties:

The sealing compound, when mixed in accordance with the manufacturer's instructions and cured as specified in 4.5.3.3, shall conform to the requirements shown in Table 1, and, determined in accordance with test methods as defined in Table 1.

TABLE 1 - Properties

Paragraph	Property	Requirement	AS5127/1 Standard Test Method (paragraph)
3.2.1	Color	Reddish	Visual Examination
3.2.2	Specific Gravity, max	1.65	(6.1)
3.2.3	Nonvolatile Content By weight, min.		(5.1)
	Class A	84%	
	Class B	97%	
3.2.4	Viscosity of Base Compound		(5.3)
	Class A	100 to 500 poises (10 to 50 Pa·S)	
	Class B	(9000 to 14000 poises) (900 to 1400 Pa·S)	
3.2.5	Flow (Class B only)		(5.5.1)
	Class B	0.10 to 0.75 inch (2.5 to 19.0 mm)	
3.2.6	Application Time, min		
	Class A	2500 poises (250 Pa·S) max	(5.6.1) Use No. 7 spindle at 10 rpm
	Class B	15 grams/minute, min	(5.6.2)
3.2.7	Tack-Free Time (Measured from the beginning of mixing), max		(5.8)
	Class A-1/2	10 hours	
	Class A-2	24 hours	
	Class B-1/2	10 hours	
	Class B-2	24 hours	

TABLE 1 - Properties (Continued)

Paragraph	Property	Requirement	AS5127/1 Standard Test Method (paragraph)
3.2.8	Standard Cure Time, Durometer A Hardness, min		(5.9)
	Class A-1/2	30 @ 24 hours	
	Class A-2	30 @ 72 hours	
	Class B-1/2	30 @ 24 hours	
	Class B-2	30 @ 72 hours	
3.2.9	Low Temperature Flexibility	No cracking or checking	(7.6)
3.2.10	Peel Adhesion, max	4 pounds force/inch (lbf) (720 N/m), 98% adhesive failure, min	4.5.4.1
3.2.11	Resistance to Heat	No visual evidence of softening, sponging, checking, or cracking.	4.5.4.2
3.2.12	Resistance to Salt Water and Hydrocarbons	No visual evidence of softening, blistering or evidence of corrosion	4.5.4.3
3.2.13	Accelerated Storage Stability	Must pass Viscosity, Tack Free Time, and Application Time	(9.1) and Table 3
3.2.14	Weight Loss and Flexibility, max	8% Weight Loss. No cracking or checking.	(7.4)
3.2.15	Corrosion, Mixed-Metal Assemblies (Type 2, only)	No evidence of corrosion	(7.10.2)

3.3 Quality:

The sealing compound, as received by purchaser, shall be uniform in quality and condition, as free from foreign materials as commercially practical and free from imperfections detrimental to the usage of the compound. There shall be no separation of ingredients that cannot be readily dispersed.

3.4 Shelf Life:

Packaged material shall have a minimum shelf life of 9 months from Date of Packaging when stored unopened at 80 °F (27 °C) or lower.

- 3.4.1 Date of Packaging: Date of Packaging is defined as the date finished material is assembled from its components, base compound and curing compound, into a package, labelled kit or unit by the manufacturer or re-packager. Date of Packaging shall be no more than 90 days from the last day of full acceptance testing in accordance with 4.2.2. Material may be re-tested by the manufacturer at any time to determine conformance to full acceptance testing in accordance with 4.2.2.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The manufacturer of the product shall supply all samples and shall be responsible for performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the requirements of this specification.

- 4.1.1 Source Inspection: Material procured under this specification shall be third party approved prior to shipment, to ensure that material meets acceptance tests (4.2.2). Third party approval shall be by a third party accreditation process in accordance with AS7001, AS7002, AS7003, and AS7200/1. Sealant shall be from a manufacturer that currently holds a third party accreditation and shall be from a batch of material that has been third party source inspected in accordance with AS7200/1. Distributors supplying sealant shall supply material from an accredited manufacturer and from a batch of material that has been third party source inspected. Distributors shall also be third party accredited in accordance with AS7201 or AS7202, whichever is applicable.

4.1.2 Shelf-Life Surveillance and Updating:

- 4.1.2.1 Sampling: The minimum number of samples to be tested during shelf-life surveillance and updating is shown in Table 2.

TABLE 2 - Shelf-Life Surveillance Samples

Items in Stock	Samples to be Tested
Up to 100, excl	3
100 to 500, incl	5
Over 500	7

- 4.1.2.2 Testing: The following inspections are to be conducted for shelf-life surveillance and updating:

Condition of container
Application time
Tack-free time
Standard cure time

4.1.2.2.1 Tests are to be conducted in accordance with test methods outlined in this specification for acceptance tests. If the tests are being performed at the end of the stated shelf-life to update the shelf-life of the sealing compound, and all tests are passed, the shelf-life will be extended an additional three months. Up to three updates will be allowed.

4.2 Classification of Tests:

4.2.1 Preproduction Tests: All technical requirements are pre-production tests and shall be performed prior to or on the initial shipment of sealing compound to a purchaser and when a change in ingredients and/or processing requires re-approval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.2.2 Acceptance Tests: Tests for the following requirements are acceptance tests and shall be performed on each batch:

- Color
- Nonvolatile content
- Viscosity of the base compound
- Flow
- Application time
- Tack-free time
- Standard cure time, hardness
- Peel adhesion on MIL-PRF-23377

4.3 Sampling and Testing:

4.3.1 For Preproduction Tests: As agreed upon by purchaser and vendor.

4.3.2 For Acceptance Tests: Sufficient sealing compound shall be taken at random from each batch to perform all the required tests. The number of determinations for each requirement shall be as specified in the applicable test procedure or, if not specified herein, not less than three. Multiple testing is not required for viscosity, application time, flow and tack-free time.

4.3.2.1 A batch shall be the quantity of material run through a mill or mixer at one time.

4.3.2.2 Material for testing shall be mixed, as much as practical in the same containers in which the sealing compounds were procured. Sealant shall be either hand-mixed or machine mixed.

4.3.2.3 A statistical sampling plan, acceptable to the purchaser, may be used in lieu of sampling as in 4.3.2.

4.4 Approval:

4.4.1 Sealing compound shall be approved by purchaser before sealing compound for production use is supplied, unless such approval is waived by purchaser. Results of all tests shall be reported. Results of tests on production sealing compound shall be essentially equivalent to those on the preproduction sample.

- 4.4.2 Manufacturer shall use ingredients, manufacturing procedures, processes, and methods of inspection on production product which are essentially the same as those used on the approved (qualified) sample. If necessary to make any change in ingredients, in type of equipment for processing, or in manufacturing procedures, manufacturer shall submit for reapproval a statement of the proposed changes in ingredients and/or processing and, when requested, sample product. Production product made by the revised procedure shall not be shipped prior to receipt of reapproval.
- 4.5 Test Methods:
- 4.5.1 Standard Conditions: Standard laboratory conditions shall be $77^{\circ}\text{F} \pm 2$ ($25^{\circ}\text{C} \pm 1$) and $50\% \pm 5$ relative humidity. Except as otherwise specified herein, all test specimens shall be cured under these conditions. Test specimens shall be prepared at $77^{\circ}\text{F} \pm 5$ ($25^{\circ}\text{C} \pm 3$) and immediately upon completion of preparation, shall be placed into standard conditions for cure. Except as otherwise specified herein, tests shall be performed at $77^{\circ}\text{F} \pm 5$ ($25^{\circ}\text{C} \pm 3$).
- 4.5.2 Standard Tolerances: Unless otherwise specified herein, standard tolerances of AS5127 under (3.1) "Standard Tolerances" shall apply.
- 4.5.3 Preparation of Test Specimens:
- 4.5.3.1 Cleaning of Test Panels: All test panels shall be cleaned by scrubbing and rinsing using AMS 3166 solvent and AMS 3819 Class 1 or 2 Grade A cloths. The panels shall be wiped dry with AMS 3819 Class 1 or 2 Grade A cloths.
- 4.5.3.2 Application of Sealing Compound: Unless otherwise specified herein, test panels shall be given an application of sealing compound to produce a coating having a total thickness of $1/8$ inch $\pm 1/64$ (3.2 mm ± 0.4) when cured.
- 4.5.3.3 Cure of Sealing Compound: For preproduction testing, the sealing compound shall be cured 14 days at standard conditions. For acceptance testing, the sealing compound shall be given an accelerated cure of 48 hours at standard conditions followed by 24 hours at 140°F (60°C).
- 4.5.3.4 When organic coating is specified for the test panels, the coating shall be fully cured as defined by the applicable coating specification before cleaning. The applied coatings shall be at least 14 days, but not more than six months old when stored at ambient indoor temperatures.
- 4.5.4 Standard Test Methods: Standard test methods as shown in Table 3 shall be used. Standard test methods are in accordance with AS5127/1. In the event of a conflict between the test of this document and AS5127 and/or AS5127/1, the text of this document takes precedence. Use of a specific issue of AS5127 and of AS5127/1 is for clarity. Future revisions of AS5127 and AS5127/1, when published, may be used providing test methods correspond in kind to those of the issues listed in 2.1.

TABLE 3 - Standard Test Methods

Test Methods	AS5127/1
Specific Gravity	(6.1) "Specific Gravity"
Nonvolatile Content	(5.1) "Nonvolatile Content"
Viscosity of Base Compound	(5.3) "Viscosity of Base Compound"
Flow (Class B only)	(5.5.1) "Flow (Classes B and D)"
Application Time (Class A)	(5.6.1) "Application Time, Class A material"
Application Time (Class B)	(5.6.2) "Application Time, Class B and C material"
Tack-Free-Time	(5.8) "Tack-Free-Time"
Standard Cure Time	(5.9) "Standard Curing"
Low Temperature Flexibility	(7.6) "Low Temperature Flexibility", use two panels, no fuel or heat aging
Accelerated Storage Stability	(9.) "Accelerated Storage Stability", test in accordance with AS5127/1, (5.3), (5.6), and (5.8) only.
Weight Loss and Flexibility	(7.4) "Weight Loss and Flexibility"
Corrosion (Type II)	(7.10.2) "Corrosion, Mixed-Metal Assemblies"

- 4.5.4.1 Peel Adhesion: The panels listed in Table 4 shall be used for evaluation of peel adhesion. The panels shall be prepared in accordance with AS5127/1 under (8.) "Peel Strength Properties" and (8.1) "Peel Strength Testing" and as in (Figure 22) "Five-Inch Peel Specimen Configuration". Two panels shall be used for each substrate and after sealant cure, the panels shall be immersed for 48 hours at 77 °F (25 °C) in AMS 2629 Type I jet reference fluid. The MIL-P-23377 panels shall be immersed in distilled water for 48 hours at 77 °F (25 °C). After removal from the fluids, a 1-inch (25 mm) wide strip shall be cut through the sealant and fabric to the metal and extended the full length of the fabric. The specimens shall be stripped back at an angle of 180 degrees to the metal panel in a suitable tensile testing machine having a jaw separation rate of 2 inches (51 mm) per minute.
- 4.5.4.2 Resistance to Heat: A 0.040 x 2.75 x 6 inch (1.0 x 70 x 152 mm) AMS 4049 aluminum alloy panel shall be cleaned in accordance with 4.5.3.1. Sealing compound shall cover one side of the panel to a depth of 1/8 inch $\pm$ 1/64 (3.2 $\pm$ 0.4 mm). At the end of sealant cure (See 4.5.3.3), the panel shall be immersed vertically in AMS 2629 Type I jet reference fluid for 48 hours at 140 °F (60 °C) in a closed container with one-half of the sealant above the liquid level. The panel shall then be removed, air dried at 77 °F (25 °C) for 24 hours, and baked at 250 °F (121 °C) for 72 hours.
- 4.5.4.3 Resistance to Salt Water and Hydrocarbons: A 0.040 x 2.75 x 6 inch (1.0 x 70 x 152 mm) AMS 4049 aluminum alloy panel shall be cleaned in accordance with 4.5.3.1. Sealing compound shall cover one side of the panel to a depth of 1/8 inch $\pm$ 1/64 (3.2 $\pm$ 0.4 mm). At the end of sealant cure (See 4.5.3.3), the panel shall be immersed vertically in a covered glass vessel so that one-third of the sealant is exposed to a 3% aqueous solution containing sodium chloride, one-third is exposed to AMS 2629 Type I jet reference fluid, and one-third is exposed to vapor. Immersion shall be for seven days at 140 °F (60 °C).

TABLE 4 - Peel Adhesion Panels

Panel Material
AMS 4049 Aluminum Alloy, Alclad
AMS 5516 Stainless Steel
AMS 4901 Titanium Alloy
AMS 4045 Aluminum Alloy, Sulfuric Acid Anodized in accordance with AMS 2471
AMS 4045 Aluminum Alloy, Sulfuric Acid Anodized in accordance with AMS 2471, coated with material conforming to MIL-PRF-27725
AMS 4045 Aluminum Alloy, Sulfuric Acid Anodized in accordance with AMS 2471, coated with material conforming to MIL-PRF-23377

4.6 Reports:

The supplier of sealing compound shall furnish with each shipment a report showing the results of tests to determine conformance to the acceptance test requirements, and stating that the sealing compound conforms to the other technical requirements. This report shall include the purchase order number, batch number, AMS 3284, manufacturer's identification, and quantity.

4.7 Resampling and Retesting:

If any specimen used in the above tests fails to meet the specified requirements, disposition of the sealing compound may be based on the results of testing three additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the sealing compound represented. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Packaging:

Unless otherwise specified, sealing compound shall be furnished in individual containers (for the base compound and the curing compound) or sectional-type containers. The ratio of the quantity contained in the base container to the quantity contained in the curing agent container shall be the same as the recommended mixing ratio of the base compound and curing agent.

- 5.1.1 Individual Containers: The base compound shall be furnished in 1/2 pint (235 mL), 1 pint (475 mL), 1 quart (945 mL), or 1 gallon (3.75 L) metal cans, or as specified in the purchase order. Metal cans shall conform to PPP-C-96, Type 5, Class 2. Tin plate cans with paper labels may be used, unless specifically prohibited by purchaser. The base compound contained in each size container shall be as follows: