

AEROSPACE MATERIAL SPECIFICATION



AMS 3263A

Issued MAR 1997
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Superseding AMS 3263

Sealing Compound, Polythioether, Ambient Cure or Immediate Heat Cure
For Aircraft Structures, Fuel Resistant With Intermittent Use To
400 °F (204 °C)

CANCELLATION NOTICE

This specification has been "CANCELLED" by the Aerospace Materials Division, SAE, as of December 2002, without supersedure. The requirements of the latest issue of AMS 3263A shall be fulfilled whenever reference is made to the cancelled AMS 3263. By this action, this document will remain listed in the Numerical Section of the Index of Aerospace Material Specifications.

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1. SCOPE:

1.1 Form:

This specification covers two classes of a fuel resistant polythioether sealing compound supplied as a two-component system.

1.2 Application:

These products have been used typically for manufacture and repair of metal and composite aircraft structures where autoclave co-cure or adhesive bonding procedures are used and concurrent sealant application is advantageous, but usage is not limited to such applications. The sealant can be cured at temperatures up to 350 °F (177 °C) immediately after application and is suitable for sealing seams, joints, fasteners, and faying surfaces. Also, for rapid field repair direct heat can be applied by hand held heat gun or heat blanket immediately after sealant application. Sealant will also cure rapidly at ambient and low temperatures down to 20 °F (-7 °C). The sealing compound can be used in fuel tank and non-fuel tank areas. An adhesion primer is supplied with the sealing compound and must be applied prior to sealing compound. The sealing compound is useable from -67 to 320 °F (-55 to 160 °C), with short term (up to six hours) exposures up to 400 °F (204 °C). Periodic spike temperatures at 420 °F (216 °C) totaling two hours can be tolerated.

1.2.1 Notice: This material is mix-ratio sensitive and also will cure at very low temperatures. Normal mix freeze operations that are used with polysulfide sealants are not adequate for this material.

1.3 Classification:

The sealing compounds shall be of the following classes:

Class A - None

Class B - Suitable for application by extrusion gun or spatula; available in Class B-2 with a normal application time of two hours.

Class C - Suitable for application by extrusion gun, spatula, brush or roller and used for faying surface sealing only; available in Class C-4 with a normal application time of four hours.

1.3.1 Product supplied shall be the class ordered.

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 3021	Fluid, Reference, for Testing Di-Ester (Polyol) Resistant Material
AMS 3276	Sealing Compound, Integral Fuel Tanks and General Purpose, Intermittent Use to 360 °F (182 °C)
AMS 3819	Cloths, Cleaning, for Aircraft Primary and Secondary Structural Surfaces
AMS 4037	Aluminum Alloy Sheet and Plate, 4.4Cu - 1.5Mg - 0.60Mn (2024 -T3 Flat Sheet, -T351 Plate), Solution Heat Treated
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, Annealed, 70 ksi (485 MPa) Yield Strength
AMS 5516	Steel Sheet, Strip, and Plate, Corrosion Resistant, 18Cr - 9.0Ni (SAE 30302), Solution Heat Treated
AS7001	National Aerospace and Defense Contractors Accreditation Program (NADCAP) Program Description
AS7002	National Aerospace and Defense Contractors Accreditation Program (NADCAP) Rules for Implementation
AS7003	National Aerospace and Defense Contractors Accreditation Program (NADCAP) Program Operation
AS7201	National Aerospace and Defense Contractors Accreditation Program (NADCAP) Requirements for Accreditation of Pass-Thru Distributors
AS7202	National Aerospace and Defense Contractors Accreditation Program (NADCAP) Requirements for Accreditation of Value Added Distributors
AS7200/1	National Aerospace and Defense Contractors Accreditation Program - Audit and Inspection Checklists for the Sealant Manufacturers Accreditation Program

2.2 ASTM Publications:

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

ASTM D 412	Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension
ASTM D 792	Specific Gravity (Relative Density) and Density of Plastics by Displacement
ASTM D 2240	Rubber Property - Durometer Hardness

2.3 U.S. Government Publications:

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

L-P-390	Plastic, Molding and Extrusion Material, Polyethylene and Copolymers (Low, Medium, and High Density)
CCC-C-419	Cloth, Duck, Unbleached, Plied-yarns, Army and Numbered
PPP-B-636	Box, Shipping Fiberboard
PPP-C-96	Can, Metal, 28 Gage and Lighter
PPP-D-729	Drums, Shipping and Storage, Steel, 55 Gallon (209 Liters)
PPP-P-704	Pail, Metal (Shipping Steel, 1 through 12 gallon)
MIL-A-9962	Abrasive Mats, Non-woven, Non-metallic
MIL-P-23377	Primer Coating, Epoxy Polyamide, Chemical and Solvent Resistant
MIL-C-27725	Coating, Corrosion Preventive, for Aircraft Integral Fuel Tanks
MIL-C-38334	Corrosion Removing Compound, Prepaint, For Aircraft Aluminum Surfaces
MIL-S-38714	Sealant Cartridge for Two Component Materials
MIL-C-38736	Compound, Solvent, for Use in Integral Fuel Tanks
MIL-C-81706	Chemical Conversion Materials for Coating Aluminum and Aluminum Alloys
MIL-H-83282	Hydraulic Fluid, Fire Resistant, Synthetic Hydrocarbon Base, Aircraft
MIL-C-87936	Cleaning Compounds, Aircraft Exterior Surfaces, Water Dilutable
MIL-STD-453	Inspection and Radiographic
MIL-STD-2073-1	DOD Materiel, Procedures for Development and Application of Packaging Requirements
AN 4	Bolt and Machine, Aircraft

2.4 AIAA Publications:

Available from National Standards Association, Inc., 1321 14th Street, NW, Washington, DC 20005.

NAS 679	Nut, Self-locking, Hexagon - Low Height
NAS 1154	Screw, Machine - Flat 100 Deg Head, Close Tolerance, Short Thread, Torque Set

3. TECHNICAL REQUIREMENTS:

3.1 Materials:

The basic ingredient shall be polythioether polymer. 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 compound shall contain no lead compounds. The curing agent shall possess sufficient color contrast to the base compounds to permit easy identification of an unmixed or incompletely mixed sealing compound. Neither the base compound nor the cured sealant shall be red or pink in color. A primer, as recommended by the manufacturer, is required and shall be included as part of the package.

3.2 Properties:

The sealing compound, when mixed in accordance with the manufacturer's instructions and cured as in 4.5.2.8 and 4.5.2.8.1 shall conform to the requirements shown in Table 1, determined in accordance with the indicated test methods:

TABLE 1 - Properties

Paragraph	Property	Requirement	Test Method
3.2.1	Specific Gravity, max	1.50	4.5.4
3.2.2	Hardness, Shore Durometer A Scale, Instantaneous, min	40	4.5.5
3.2.3	Nonvolatile Content (% by weight), min		4.5.6
	Class B	97%	
	Class C	97%	
3.2.4	Viscosity of Base Compound		4.5.7
	Class B	9000 to 18,000 poises (900 to 1800 Pa·s)	
	Class C	1000 to 4000 poises (100 to 400 Pa·s)	
3.2.5	Viscosity of Curing Agent	700 to 1600 poises (70 to 160 Pa·s)	4.5.8
3.2.6	Flow		4.5.9
	Class B	0.10 to 0.75 inches (2.5 to 19.05 mm)	
	Class C, minimum	0.010 inch (0.25 mm)	
3.2.7	Application Time, minimum		4.5.10
3.2.7.1	Class B - From the beginning of mixing, not less than 15 grams per minute shall be extruded		
	B-2	2 hours	

TABLE 1 - Properties (Continued)

Paragraph	Property	Requirement	Test Method
3.2.7.2	Class C - From the beginning of mixing, not less than 30 grams per minute shall be extruded		
	C-4	4 hours	
3.2.8	Assembly Time, min		4.5.11
	Class C-4	6 hours	
3.2.9	Tack-Free Time (from the beginning of mixing), max		4.5.12
	B-2	9 hours	
	C-4	24 hours	
3.2.10	Cure Time, max (to obtain Shore A 30, min)		4.5.13
3.2.10.1	Standard Cure Time		
	Class B-2	18 hours	
	C-4	30 hours	
3.2.11	Peel Strength, minimum	20 pounds force per inch (3503 N/m) with 100% cohesive failure	4.5.14
3.2.12	Chalking	None	4.5.15
3.2.13	Shear Strength, min Class C only		
	Standard cure in accordance with 4.5.2.8	200 psi (1379 kPa) average 100% cohesive failure	
	Standard Cure plus Heat Aged two hours at 400 °F (204 °C)	10 psi (689 kPa) average with 75% cohesive failure, minimum	
	Heat cure in accordance with 4.5.2.8.1	200 psi (1379 kPa) average with 100% cohesive failure	

TABLE 1 - Properties (Continued)

Paragraph	Property	Requirement	Test Method
3.2.14	Air Content, max	4%	4.5.17
3.2.15	Weight Loss, max	4%	4.5.18
3.2.15.1	Flexibility	No cracking or checking	4.5.18
3.2.15.2	Swell	5% to 25%	4.5.18
3.2.16	Resistance to Thermal Rupture	No blistering or sponging, 5/32 inch (3.96 mm) deformation, max	4.5.19
3.2.17	Resistance to Thermal Expansion	Sealant flush with groove within +0.010 and -0.003 inch (+0.25 and -0.08 mm) at the wide end of the test block and within +0.005 and -0.003 inch (+0.13 and -0.08 mm) at the narrow end.	4.5.20
3.2.18	Heat Reversion Resistance	The sealant shall not revert to a liquid or paste-like consistency, nor shall it become brittle or lose adhesion.	4.5.21
3.2.19	Tensile Strength and Elongation, min		4.5.22
	Standard Cure in accordance with 4.5.2.8	250 psi (1724 kPa)/250% elongation	
	Heat Cure in accordance with 4.5.2.8.1	250 psi (1724 kPa)/250% elongation	
	Standard Cure + 12 days at 140 °F (60 °C) + 60 hours at 160 °F (71 °C) + six hours at 180 °F (82 °C) All in JRF	125 psi (862 kPa)/100% elongation	

TABLE 1 - Properties (Continued)

Paragraph	Property	Requirement	Test Method
	Standard Cure + 12 days at 140 °F (60 °C) + 60 hours at 160 °F (71 °C) + six hours at 180 °F (82 °C) All in JRF 24 hours at 120 °F (49 °C) + Standard Heat Cycle in accordance with 4.5.1.2	150 psi (1034 kPa)/100% elongation	4.5.22
	Standard Heat Cycle in accordance with 4.5.1.2	150 psi (1034 kPa)/50% elongation	
	Standard Cure + two hours at 420 °F (216 °C)	150 psi (1034 kPa)/100% elongation	
3.2.20	Sponging	No visible evidence of chemical sponging, non-cutting or other degradation	4.5.22
3.2.21	Low Temperature Flexibility	No visible evidence of cracking or loss of adhesion	4.5.24
3.2.22	Hydrolytic Stability, min	Shore A durometer 80% of original	4.5.25
3.2.23	Corrosion	No corrosion under sealant or signs of sealant deterioration	4.5.26
3.2.24	Repairability, min	10 pounds force per inch (1751 N/m), 100% cohesive failure	4.5.27
3.2.25	Radiographic Density		4.5.28
	Difference between plate and plate plus sealant, max	1.00	
	Through sealant in the slot, approximately	3.00	
3.2.26	Storage Stability		4.5.29

TABLE 1 - Properties (Continued)

Paragraph	Property	Requirement	Test Method
3.2.26.1	Accelerated Storage		4.5.29.1
	Viscosity of Base Compound	Same as 3.2.4	4.5.7
	Viscosity of Curing Agent	Same as 3.2.5	4.5.8
	Flow	Same as 3.2.6	4.5.9
	Application Time, min	Same as 3.2.7	4.5.10
	Assembly Time, min	Same as 3.2.8	4.5.11
	Cure Time, max	Same as 3.2.10	4.5.13.1
	Peel Strength, min	Same as 3.2.11	4.5.14.5
3.2.26.2	Long Term Storage		
	Application Time, min	Same as 3.2.7	4.5.10
	Assembly Time, min	Same as 3.2.8	4.5.11
	Cure Time, max	Class B-2 - 24 hours	4.5.13.1.1
	(to obtain Shore A 30, min)	Class C-4 - 40 hours	
	Peel Strength, min	Same as 3.2.11	4.5.14.5

3.3 Shelf Life:

The unmixed sealing compound shall have a minimum of nine months shelf life from the date of packaging.

3.4 Quality:

The base compound and the curing agent as received by purchaser shall each be of uniform blend and shall be free of excessive air, skins, lumps, and gelled or coarse particles. There shall be no separation of ingredients which cannot be readily dispersed

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

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

4.1.1 Source Inspection: Sealing compound shall be third party approved prior to shipment, to ensure that the material meets the acceptance tests. The 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 to this specification 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.

- a. Condition of Container
- b. Application Time
- c. Standard Cure Time
- d. Assembly Time (Class C)
- e. Viscosity of Base Compound (not possible with sectional-type containers)
- f. Viscosity of curing agent (not possible with sectional-type containers)
- g. Peel Strength - two aluminum panels sulfuric acid anodized in accordance with AMS 2471, coated with material conforming to MIL-C-27725 cured at standard conditions (4.5.1.1) for seven days. After the sealant is applied and cured, age in JRF for seven days at 140 °F (60 °C).

4.1.2.2.1 Tests are to be conducted in accordance with the test methods outlined herein 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 datings will be allowed.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Requirements shown in Table 3 are acceptance tests and shall be performed on each batch. A batch shall be the quantity of material run through a mill or mixer at one time.

TABLE 3 - Acceptance Tests

Requirement	Paragraph Reference
Hardness	3.2.2
Nonvolatile content	3.2.3
Viscosity of the base compound ¹	3.2.4
Viscosity of the curing compound ¹	3.2.5
Flow	3.2.6
Application time	3.2.7
Assembly time (C-4 only)	3.2.8
Tack-free time	3.2.9
Standard cure time	3.2.10
Peel strength ²	3.2.11
Shear strength (Class C only)	3.2.13
Air content	3.2.14
Weight loss, flexibility and swell	3.2.15

¹ Testing need not be performed on material packaged in sectionalized containers or small size containers of less than eight ounces (237 mL).

² Test in accordance with 4.5.14.5.

4.2.2 Qualification Tests: All technical requirements are qualification tests and shall be performed prior to the initial shipment of sealing compound to a purchaser, when a change in ingredients and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required (See 8.1).

4.2.2.1 The first material that a manufacturer must qualify is Class B-2. That material must meet all the requirements of this specification with the exception of those requirements that are for other classes. Once qualification for Class B-2 is obtained, Class C may be qualified. The formulation shall be the same as that for the Class B-2, except for minor variations necessary for the viscosity and application life. It will not always be necessary for the qualifying agency to conduct all tests on the other class. In general, the acceptance tests plus any tests specific to that class of material will be sufficient, although additional tests can be required. The manufacturer shall show proof that all requirements are met prior to requesting qualification approval for any class. This includes assurance that the material will cure at standard conditions. After the compound has been accepted for qualification, approval will be granted and the material will be identified by reference to the manufacturer's identification.

4.2.2.2 For direct U.S. Military procurement and for procurement on U.S. Military contracts, the sealant shall be a product that has been tested, has passed the qualification tests of 4.2.2 and has been listed or approved for listing on applicable U.S. Military qualified products list.

4.3 Sampling and Testing:

Shall be as follows:

- 4.3.1 For Acceptance Tests: Sufficient sealing compound shall be taken at random from each lot or 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 therein, not less than three. Multiple testing is not required for viscosity, application time, flow, tack-free time and hardness.
- 4.3.1.1 Materials for testing shall be mixed, as much as possible, in the same containers in which the sealing compounds were procured.
- 4.3.1.2 If the material is being procured in plastic injection kits, such as those conforming to MIL-S-38714, all the tests shall be conducted on material that has been packaged and mixed in the initial sample injection kits except for viscosity of base compound and viscosity of curing agent. During filling of the initial sample injection kits, base compound and curing agent shall be placed in 1-quart (1-L) cans for viscosity tests. If more than one size of injection kits are to be packaged from a particular batch, it is necessary to test material from only one size kit.
- 4.3.1.3 If the material is being procured in cans, pails, or drums, the batch shall be tested on the material placed in 1-quart (1-L) cans.
- 4.3.1.4 If the material is being procured in both type containers, the quality conformance tests shall be conducted on the material packaged in plastic injection kits (See 4.3.1.2).
- 4.3.1.5 A statistical sample plan, acceptable to the purchaser, may be used in lieu of sampling as in 4.3.1.
- 4.3.1.6 U.S. Government Procurement: Each batch shall be subjected to both initial and final acceptance testing. Sufficient material for initial acceptance testing shall be packaged in the same type containers that are being procured. Initial acceptance tests are those listed in Table 3. Final acceptance testing shall be conducted on the final packaged product and consists of application time, tack-free time, standard cure time, and air content (Class B only). After successful completion of the initial quality conformance tests, the batch shall be released for final packaging. During packaging, test kits shall be picked at random to perform final acceptance tests as shown in Table 4.

TABLE 4 - Final Acceptance Tests

Property	Value
Application Time	3.2.7
Tack-Free Time	3.2.9
Standard Cure Time	3.2.10
Air Content	3.2.14