

(R) Sealing Compound, Topcoat, Fuel Tank Buna-N Type

RATIONALE

AMS-S-4383A is a complete revision. SAE and industry publications added and substituted for Government documents whenever possible. Document revised technically and editorially configured to conform to AMS practices. PRI QPL requirements added.

1. SCOPE

1.1 Form

This specification covers one type of one-component, air drying protective coating which cures at room temperature. The topcoat compound covered by this specification shall be formulated from butadiene acrylonitrile copolymer and shall be colored red by the use of an oil soluble dye.

1.2 Application

This material is a one part compound designed as topcoat or barrier coating for integral fuel tank sealants and coatings but usage is not limited to such applications. It may also be used for temporary repair of aircraft fuel tanks using a "fill-and-drain" technique. It may also be used as a bonding agent for materials such as synthetic rubber metals, glass, and many plastics.

1.2.1 Notice

The cured coating is resistant to exposure from both jet fuel and aviation gas; it is not suitable for use with motor fuels containing alcohols.

1.3 Safety – Hazardous Materials

Shall be in accordance with AS5502 (1.1)

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2. APPLICABLE DOCUMENTS

Shall be in accordance with AS5502 (2.).

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

- AMS4049 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
- AS5127 Methods for Testing Aerospace Sealants
- AS5127/1 Aerospace Standard Test Methods for Aerospace Sealants, Two-Component Synthetic Rubber Compounds
- AS5502 Standard Requirements for Aerospace Sealants
- SAE J1966 Lubricating Oils, Aircraft Piston Engine (Non-Dispersant Mineral Oil)

2.2 PRI Publications

Available from Performance Review Institute, 161 Thorn Hill Road, Warrendale, PA 15086-7527, Tel: 724-772-1616, www.pri-network.org.

- PD 2000 Procedures for an Industry Qualified Product Management Process
- PRI-QPL- AMS-S-4383 Products Qualified Under AMS4383

2.3 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

- ASTM B 36 Brass, Leaded and Nonleaded: Rod, Shapes, Forgings, and Flat Products with Finished Edges (Bar and Strip)
- ASTM D 471 Standard Test Fluids: Hydrocarbons
- ASTM D 130 Detection of Copper Corrosion from Petroleum Products by the Copper Strip Tarnish Test
- ASTM D 381 Existent Gum in Fuels by Jet Evaporation
- ASTM D 4976 Standard Specification for Polyethylene Plastics Molding and Extrusion Materials
- ASTM D 1005 Standard Test Method for Measurement of Dry-Film Thickness of Organic Coatings Using Micrometers

2.4 U.S. Government Publications

Available from the Document Automation and Production Service (DAPS), Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6257, <http://assist.daps.dla.mil/quicksearch/>.

- CCC-C-432 Cloth, Sheeting, Cotton, (Unbleached, Bleached, and Dyed)
- MIL-PRF-23699 Lubricating Oil, Aircraft Turbine Engine, Synthetic Base, NATO Code Number O-156

3. TECHNICAL REQUIREMENTS

3.1 Materials

The compound covered by this specification shall be formulated from butadiene acrylonitrile copolymer and shall be colored red by the use of an oil soluble dye.

3.1.1 Qualification

All products sold to this specification shall be listed, or approved for listing, on the qualified product list, PRI-QPL-AMS-S-4383. The qualified products list shall be in accordance with PD 2000.

3.2 Date of Packaging

Shall be in accordance with AS5502 (3.1).

3.3 Toxicological Formulations

Shall be in accordance with AS5502 (3.2)

3.4 Quality

Shall be in accordance with AS5502 (3.3)

3.5 Shelf Life

Shall be a minimum of 1 year from date of packaging when stored below 80 °F (27 °C). Material may be tested for shelf life extension per 4.3.3.

3.6 Properties

The compound shall conform to the requirements shown in Table 1 when determined in accordance with the specified test methods.

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TABLE 1 - PROPERTIES

Paragraph	Property	Requirement	Test Method
3.6.1	Nonvolatile Content, (% by weight)	17 to 22%	AS5127/1 (5.1)
3.6.2	Viscosity	400 to 2000 Centipoise (0.4 to 2.0 Pa-S)	AS5127/1 (5.3) Use No.2 spindle at 10 rpm
3.6.3	Tack Free Time, max	4 hours	AMS-S-4383 (4.6.1)
3.6.4	Accelerated Storage Stability	No greater than ± 10 percent viscosity change from original viscosity per 3.6.2. Topcoat material shall not separate or gel.	AS5127/1 (9.1)
3.6.5	Working properties		AMS-S-4383 (4.5.4)
3.6.5.1	Film Quality	Brush and dip coats of the topcoat compound, shall be smooth, uniform, and free of sagging, bubbles, pinholes, cracks, and other film irregularities.	
3.6.5.2	Film Thickness	0.0005 to 0.0015 inch (0.013 to 0.04 mm)	ASTM D 1005, Procedure C and AMS-S-4383 (4.6.9)
3.6.5.3	Recoating	A dip coat of the topcoat compound when applied over a freshly dried film of topcoat compound and over a cured film of polysulfide sealing compound qualified to AMS-S-8802 shall show satisfactory bonding and no lifting, cracking, blistering, or loss of adhesion.	
3.6.6	Peel Strength, min	5 pounds force/inch (875 N/m) on AMS4049 10 pounds force/inch (1750 N/m) on AMS-S-8802	AMS-S-4383, (4.6.8) and AS5127/1 (8.1)
3.6.7	Low Temperature Flexibility	No visual evidence of cracking, checking, or loss of adhesion.	AMS-S-4383 (4.6.2) and AS5127/1 (7.6)
3.6.8	Resistance to Heat	No evidence of hardening, blistering, checking, cracking, shrinkage, loss of adhesion, or loss of flexibility	AMS-S-4383 (4.6.3)
3.6.11	Resistance to Salt Water and Hydrocarbons	No evidence of softening, blistering, leaching, corrosion, or loss of adhesion.	AMS-S-4383 (4.6.4)
3.6.12	Resistance to Hot Oil	No evidence of cracking, flaking, or loss of adhesion.	AMS-S-4383 (4.6.5)
3.6.13	Fuel Contamination	20 milligrams per 100 milliliters, max. No more than slight discoloration shall be present on a freshly polished copper strip.	AMS-S-4383 (4.6.6)
3.6.14	Sealing Compound Protection	No evidence of appreciable leaching, change in hardness, flexibility, or signs of cracking in sealing compound. No evidence of cracking, checking, or loss of adhesion of topcoat compound.	AMS-S-4383 (4.6.7)

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

Shall be in accordance with AS5502 (4.1)

4.1.1 Sampling

Shall be in accordance with AS5502 (4.1.2)

4.2 Classification of Tests

Shall be in accordance with AS5502 (4.2)

4.2.1 Qualification Tests

All technical requirements listed in Table 1 are qualification tests (See 8.2) and shall be performed on the initial production batch of the coating compound prior to shipment to a purchaser, when a change in ingredients and/or processing requires reapproval, or when purchaser deems confirmatory testing to be required.

4.2.1.1 Qualification

All products sold to this specification shall be listed, or approved for listing, on the Qualified Products List, PRI-QPL-AMS-S-4383. The qualified products list shall be in accordance with PD 2000. The coating compound shall be tested for and shall meet all technical requirements of this specification.

4.2.2 Initial Acceptance Tests

Requirements shown in Table 2 are initial acceptance tests and shall be performed on each batch.

TABLE 2 - INITIAL ACCEPTANCE TESTS

Test	Requirement Paragraph
Nonvolatile content	3.6.1
Viscosity	3.6.2
Tack Free Time	3.6.3
Film Quality	3.6.5.1
Peel Strength	3.6.6

4.2.3 Final Acceptance Tests

Requirements shown in Table 3 are final acceptance tests and shall be performed on each lot. Acceptance tests of the final packaged product shall consist of the following:

TABLE 3 - FINAL ACCEPTANCE TESTS

Test	Requirement Paragraph
Viscosity	3.6.2
Tack Free Time	3.6.3
Film Quality	3.6.5.1

4.3 Sampling and Testing

Sampling shall be in accordance with AS5502 (4.3)

4.3.1 Qualification Tests

Samples shall be identified as:

SEALING COMPOUND, TOPCOAT, FUEL TANK, BUNA-N TYPE

AMS-S-4383A

MANUFACTURER'S IDENTIFICATION _____

NAME OF MANUFACTURER _____

BATCH/LOT NUMBER _____

DATE OF PACKAGING _____

SHELF LIFE EXPIRATION DATE _____

STORE BELOW 80 °F (27 °C)

4.3.2 Acceptance Tests

Shall be in accordance with AS5502 (4.3.1).

4.3.2.1 Batch and Lot

4.3.2.1.1 Lot Formation

A lot shall consist of all the topcoat compound produced by one supplier, at one plant, from the same materials, under essentially the same manufacturing conditions. When the process is considered a batch operation, each batch shall constitute a lot.

4.3.2.2 Initial and Final Acceptance Tests

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 2. After successful completion of the initial acceptance tests, the batch shall be released for final packaging. During packaging, test kits shall be selected at random for final acceptance testing. Final acceptance testing is to be conducted on the final packaged product and consist of those tests outlined in Table 3.

If the batch is being packaged in different types and/or size containers, the final acceptance tests shall be conducted on each type and/or each size containers. If the topcoat compound is being procured under different purchase orders, but the purchase orders call for the same type and size containers, it is only necessary to conduct the final acceptance tests one time.

4.3.2.3 Cans, Pails, and Drums

Shall be in accordance with AS5502 (4.3.1.4 and 4.3.1.5)

4.3.3 Shelf-Life Surveillance and Updating

4.3.3.1 Sampling

Shall be in accordance with AS5502 (4.1.2).

4.3.3.2 Shelf-Life Testing

The inspections to be conducted for shelf-life surveillance and updating are listed in Table 4.

TABLE 4 - SHELF-LIFE TESTING

Test	Requirement Paragraph
Nonvolatile Content	3.6.1
Viscosity	3.6.2
Tack Free Time	3.6.3
Film Quality	3.6.5.1
Peel Strength	3.6.6

4.3.3.3 Shelf-Life Extension

Tests are to be conducted in accordance with test methods outlined herein for acceptance tests. If tests are being performed at the end of the stated shelf life to update the shelf-life of the topcoat compound and all tests are passed the shelf-life will be extended an additional four months. A maximum of three extensions are allowed.

4.4 Approval

Shall be in accordance with AS5502 (4.4)

4.5 Test Methods

4.5.1 Standard Tolerances

Unless otherwise specified herein, standard tolerances of AS5127 (3.1) "Standard Tolerances" shall apply.

4.5.2 Standard Test Conditions

Standard laboratory conditions shall be as specified in AS5127 (4). Test specimens shall be prepared and immediately after completion of preparation, shall be placed under 77 °F (25 °C) and 50 percent relative humidity to cure. Except as otherwise directed herein, tests shall be performed at conditions in accordance with AS5127 (4).

4.5.3 Preparation and Cleaning of Test Panels

Test panels shall be prepared and cleaned in accordance with AS5127 (6).

4.5.4 Application and Curing of Topcoat Compound

Unless otherwise specified, the test panels shall be given a single dipcoat of the topcoat compound to produce a film having a thickness of not less than 0.0005 or more than 0.0015 inch (0.012 to 0.038 mm) when cured. The solids content of the topcoat compound shall be within the range of 17 to 22 percent. The coated panels shall be cured by suspending or placing vertically for a period of 48 hours at standard conditions in a draft-free enclosure such as a ventilated laboratory oven to reduce the tendency of blister formation.

4.6 Test Procedures

Standard Test methods are in accordance with AS5127 and AS5127/1. In the event of a conflict between the text of this document and AS5127 and/or AS5127/1, the text of this document takes precedence.

4.6.1 Tack Free Time

A dipcoat of the topcoat compound shall be applied to a 0.032 x 1 x 6 inch (0.8 x 25 x 152 mm) bare metal panel conforming to AMS4049 and to a panel which has been coated and cured with a polysulfide sealing compound qualified to AMS-S-8802. The coated panels shall then be suspended from a suitable rack at standard conditions for 4 hours. A 1 x 7 inch (25 x 178 mm) strip of ASTM D 4976 low density polyethylene film 0.005 inch \pm 0.002 (0.10 mm \pm 0.05) thick shall be applied to the topcoat compound and held in place at a pressure of approximately 0.5 ounce per square inch (0.0002 N/mm²) for 2 minutes \pm 10 seconds. The strips shall then be slowly and evenly peeled back at right angles to the topcoat compound surface. The polyethylene film shall come away clean and free of topcoat compound.

4.6.2 Low Temperature Flexibility

Six AMS4049 aluminum panels, measuring 0.020 x 1 x 6 inch (0.51 x 25 x 152 mm), shall be used for this test. Four of the panels shall be coated with a polysulfide sealant compound qualified to AMS-S-8802 and cured in accordance with manufacturer instructions. The cured thickness of the polysulfide sealing compound shall be 0.125 inch (3.17 mm). Two of these coated panels and the two bare panels shall be coated with the topcoat compound and cured in accordance with 4.5.4. All six panels shall then be immersed for 48 hours at 120 °F (49 °C) in test fluid conforming to ASTM D 471, Reference Fuel B. After conditioning, the panels shall be tested in accordance with AS5127/1 (7.6). The two panels coated with polysulfide sealant, which were not topcoated, shall be considered as control panels to insure that any failure is not due to failure in the polysulfide sealing compound.

4.6.3 Resistance to Heat

Six AMS4049 aluminum panels, measuring 0.032 x 1 x 6 inch (0.8 x 25 x 152 mm), shall be used for this test. Four parallel fillets, measuring 0.19 x 0.5 x 2 inch (4.8 x 13 x 51 mm), of polysulfide sealant compound qualified to AMS-S-8802 shall be applied to four of the panels. Two of these panels and the two bare panels shall be coated with the topcoat compound and cured in accordance with 4.5.4. All six panels shall then be immersed for 48 hours at 120 °F (49 °C) in test fluid conforming to ASTM D 471, Reference Fuel B, such that one-half of all materials on the panels (sealant and topcoat) are above the liquid level. The panels shall be removed and air-dried at standard conditions for 72 hours followed by heating at 180 °F (82 °C) for 72 hours. The panels shall be examined for changes in film properties. The two panels coated with polysulfide which were not topcoated shall be considered as control panels to insure that any failure is not due to failure in the polysulfide sealing compound.

4.6.4 Resistance to Salt Water and Hydrocarbons

Two AMS4049 aluminum panels, measuring 0.032 x 3 x 6 inch (0.8 x 75 x 152 mm), shall be coated with the topcoat compound and cured in accordance with 4.5.4. The panels shall be immersed vertically for 20 days in a covered glass vessel containing a 2-layer liquid, consisting of a 3 percent by weight aqueous solution of sodium chloride and test fluid conforming to ASTM D 471, Reference Fuel B, such that 2 inches of the panels are exposed to the salt solution, 2 inches of the panels exposed to the test fluid, and the balance of the panels exposed to the air-vapor mixture. The temperature during the test shall be maintained at 120 °F (49 °C). Immediately upon removal from the liquid, panels shall be examined.

4.6.5 Resistance to Hot Oil

Four AMS4049 aluminum panels, measuring 0.032 x 1 x 6 inch (0.8 x 25 x 152 mm), shall be dipcoated with the topcoat compound. After drying 1 hour at standard conditions, a second dipcoat of the topcoat material shall be applied and cured in accordance with 4.5.4. Two of the panels shall be immersed for 14 days in oil conforming to SAE J1966 and two shall be immersed in oil conforming to MIL-PRF-23699 at a temperature of 250 °F (121 °C). The four panels shall then be removed from the oils, cleaned, cooled to room temperature, and bent swiftly 180 degrees around a 0.125 inch (3.2 mm) mandrel and examined.