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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS-3378

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Submitted for recognition as an American National Standard

SEALANT, SILICONE, TWO-PART, GENERAL PURPOSE
Room Temperature Vulcanizing
Non-Fuel Resistant

1. Scope:

1.1 Form: This specification covers a two-component silicone rubber sealant and compatible primers.

1.2 Application: Primarily for sealing aircraft structures within a temperature range of -65° to +450°F (-54° to +232°C). The sealant is also compatible with MIL-H-19457 phosphate ester fire resistant hydraulic fluids.

1.3 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 insure 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.

2.1.1 Aerospace Material Specifications:

AMS-2471 - Anodic Treatment of Aluminum Alloys, Sulfuric Acid Process, Undyed Coating
AMS-2473 - Chemical Treatment for Aluminum Alloys, General Purpose Coating
AMS-2825 - Material Safety Data Sheets
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, Annealed, 70,000 psi (485 MPa) Yield Strength
AMS-5516 - Steel Sheet, Strip, and Plate, Corrosion Resistant, 18Cr - 9.0Ni (SAE 30302), Solution Heat Treated

2.2 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19120-1187.

ASTM D 297 - Rubber Products - Chemical Analysis
ASTM D 412 - Rubber Properties in Tension
ASTM D 1193 - Reagent Water
ASTM D 2240 - Rubber Property - Durometer Hardness

2.3 U.S. Government Publications: Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

2.3.1 Federal Specifications:

L-P-390 - Plastic, Molding and Extrusion Material, Polyethylene and Copolymers (Low, Medium, and High Density)
QQ-Q-250/8 - Aluminum Alloy, 5052, Plate and Sheet
PPP-C-96 - Cans, Metal, 28 Gage and Lighter

2.3.2 Military Specifications:

MIL-H-19457 - Hydraulic Fluid, Fire Resistant, Non Neurotoxic
MIL-P-23377 - Primer Coating, Epoxy Polyamide, Chemical and Solvent Resistant
MIL-C-27725 - Coating, Corrosion Preventive, for Aircraft Integral Fuel Tanks
MIL-C-38736 - Compound, Solvent, For Use in Integral Fuel Tanks

2.3.3 Military Standards:

MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

3. TECHNICAL REQUIREMENTS:

3.1 Materials: The basic ingredient shall be a silicone liquid polymer that when catalyzed will convert to an elastomeric material. The sealant base shall contain the basic polymer, the sealant catalyst mixture shall contain the catalyst plus whatever inert ingredients will be necessary for the catalyst to be one-tenth the mass of the base. The sealant shall cure upon addition of the catalyst to the base and shall not depend on solvent evaporation as a part of the curing system.

3.1.1 Toxicity: The sealant shall not contain any constituents that would prove toxicologically hazardous during the normal course of handling, mixing, or final application. The manufacturer shall supply all necessary toxicological data to the procuring activity.

3.1.2 Color: The catalyst shall possess sufficient color contrast to the base compound to permit easy identification of unmixed or incompletely mixed sealant.

3.1.3 Storage Life: The sealant shall meet the requirements of 3.2.1 and 3.2.2 after storage at 90°F + 10 - 0 (32°C + 6 - 0) for 12 months from date of manufacture (date of last acceptance test conducted by manufacturer). Premixed-frozen material shall meet the requirements of 3.2.4 after 5 days storage at -65°F ± 2 (-54°C ± 1).

3.1.3.1 Storage Life Updating: At the expiration of the storage life time, sealant meeting the requirements of 3.2.1.2, 3.2.1.3, 3.2.1.4, 3.2.1.5, and 3.2.1.6 may have its storage life extended for a period not to exceed one-half of the previous storage life time.

3.1.4 Primer: The sealant requires the use of a one-part primer on most substrates to ensure acceptable adhesion. Such a primer shall be supplied by the sealant vendor and it shall be the same primer used to qualify the sealant to this specification. The primer shall be clear and free of particulate matter and shall impart a readily visible stain to the applied surface. Primer shall be supplied in an amount compatible with the amount of sealant furnished (See 5.1.1), and instructions for its proper storage, handling, and use shall also be included.

3.2 Properties: The sealant shall conform to the following requirements; tests shall be performed on the sealant supplied and in accordance with specified test methods, insofar as practicable.

3.2.1 Uncured Properties: Shall be as follows:

3.2.1.1 Nonvolatile Content, minimum	95%	4.5.5
3.2.1.2 Viscosity of Base Compound (except mixed frozen material)	6000 - 12000 poises (600 - 1200 Pa.s)	4.5.6
3.2.1.3 Flow, maximum	0.75 inch (19 mm)	4.5.7

3.2.1.4 Application Time	2 hours after the beginning of mixing, 15 grams/minute, minimum shall be extruded	4.5.8
3.2.1.5 Tack Free Time, maximum	24 hours measured from the beginning of mixing	4.5.9
3.2.1.6 Cure Rate (time to attain a 40 Durometer A Hardness) maximum	48 hours	4.5.10

3.2.2 Cured Properties: Shall be as follows, determined in accordance with specified test procedures after the material has cured for not less than 14 days at standard conditions (See 4.5.1).

3.2.2.1 Specific Gravity, maximum	1.50	ASTM D 297 Hydrostatic method
3.2.2.2 Resistance to Thermal Rupture	The sealant shall not blister nor sponge and shall retain a pressure of 10 psi (69 kPa) with no more than 0.125 inch (3.18 mm) deformation	4.5.11
3.2.2.3 Low-Temperature Flexibility	No visual evidence of cracking, checking, or loss of adhesion	4.5.12
3.2.2.4 Peel Strength		4.5.13
3.2.2.4.1 Resistance to Water, minimum	4 pounds force/inch (701 N/m) of width, 100% cohesive failure	4.5.13.1
3.2.2.4.2 Resistance to Heat, minimum	50% of value obtained when tested as in 4.5.13.1, with no value less than 2 pounds force/inch width (350 N/m) of width, 100% cohesive failure. Tackiness or sponging, if found, shall noticeably diminish in specimens exposed 168 hours ± 1 and tackiness shall disappear.	4.5.13.2

3.2.2.5 Corrosion	No evidence of corrosion under or adjacent to sealant. No deterioration of sealant.	4.5.14
3.2.2.6 Tensile Strength and Elongation, minimum	Table I	4.5.15
3.2.2.7 Repairability, minimum	4 pounds force/inch (701 N/m) of width, 100% cohesive	4.5.16
3.2.2.8 Hydrolytic Stability	Maximum of 5 Durometer points hardness change	4.5.17
3.2.3 Accelerated Storage Stability		4.5.18
3.2.3.1 Viscosity of Base Compound	6000 - 1200 poises (600 - 1200 Pa.s)	4.5.6
3.2.3.2 Flow, maximum	0.75 inch (19 mm)	4.5.7
3.2.3.3 Application Time	2 hours after beginning of mixing 15 grams/minute, minimum shall be extruded	4.5.8
3.2.3.4 Tack Free Time, maximum	24 hours, measured from the beginning of mixing	4.5.9
3.2.3.5 Cure Rate (time to attain a 40 Durometer A Hardness), maximum	48 hours	4.5.10
3.2.4 Mixed-Frozen Stability		4.5.19
3.2.4.1 Flow, maximum	0.75 inch (19 mm)	4.5.7
3.2.4.2 Application Time	2 hours after thawing, 15 grams/minute, minimum shall be extruded	4.5.8
3.2.4.3 Tack Free Time, maximum	24 hours after thawing of sealant	4.5.9
3.2.4.4 Cure Rate (time to attain a 40 Durometer A Hardness after thawing), maximum	48 hours	4.5.10

3.3 Quality: The base and catalyst, as received by purchaser, shall be uniform in quality and consistency and free of agglomerates, foreign particles, or entrapped air. There shall be no separation of materials which cannot be readily dispersed. The cured compound shall present an appearance of smooth homogeneity.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of sealant shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the sealant conforms to the requirements of this specification,

4.2 Classification of Tests:

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

Requirement	Reference Paragraph
Viscosity of Base Compound (except mixed frozen material)	3.2.1.2
Flow	3.2.1.3
Application Time	3.2.1.4
Tack Free Time	3.2.1.5
Cure Rate	3.2.1.6
Peel Strength, Water Immersion Using Substrates 4.5.3.2 and 4.5.3.5 Only	3.2.2.4.1

4.2.2 Preproduction Tests: Tests for all technical requirements are preproduction tests and shall be performed prior to or on the initial shipment of sealant 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.

4.2.2.1 For direct U.S. Military procurement, substantiating test data and, when requested, preproduction test material shall be submitted to the cognizant agency as directed by the procuring activity, contracting officer, or request for procurement.

4.3 Sampling and Testing: Shall be as follows:

4.3.1 For Acceptance Tests: Sufficient sealant shall be taken at random from each lot to perform all 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.

4.3.1.1 A lot shall be all sealant produced in a single production run from the same batch of raw materials under the same fixed conditions and presented by the vendor's inspection at one time. An inspection lot shall not exceed 1000 pounds (454 kg) and may be packaged in smaller quantities and delivered under the basic lot approval provided lot identification is maintained.

4.3.1.2 When a statistical sampling plan has been agreed upon by purchaser and vendor, sampling shall be in accordance with such plan in lieu of sampling as in 4.3.1 and the report of 4.6 shall state that such plan was used.

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

4.4 Approval:

4.4.1 Sample sealant shall be approved by purchaser before sealant for production use is supplied, unless such approval by waived by purchaser. Results of tests on production sealant shall be essentially equivalent to those on the approved sample.

4.4.2 Vendor shall use ingredients, manufacturing procedures, processes, and methods of inspection on production sealant which are essentially the same as those used on the approved sample sealant. If necessary to make any change in ingredients, in type of equipment for processing, or in manufacturing procedures, vendor shall submit for reapproval a statement of the proposed changes in ingredients and/or processing and, when requested, sample sealant. Production sealant made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Test Methods:

4.5. Standard Conditions: Standard laboratory conditions are 77°F ± 2 (25°C ± 1) and 50% ± 5 relative humidity. All test specimens shall be prepared and cured under these conditions. In addition, all uncured property tests shall be conducted under these conditions. Other tests may be conducted at 77°F ± 5 (25°C ± 3) with no control on humidity.

4.5.2 Standard Cure: Except as otherwise specified herein, all reference in this specification to a standard cure shall be a 14-day period under the standard conditions specified in 4.5.1.

4.5.3 Test Panels: Shall be follows; sizes are specified in the applicable test method:

4.5.3.1 Bare Aluminum: AMS-4045 aluminum alloy.

4.5.3.2 Chemical Film Treated Aluminum: AMS-4049 aluminum alloy with chemical film applied in accordance with AMS-2473.

4.5.3.3 Anodized Aluminum: AMS-4049 aluminum alloy panels anodized in accordance with AMS-2471.

4.5.3.4 MIL-C-27725 Coating: Aluminum alloy panels as in 4.5.3.2 shall be coated with MIL-C 27725 corrosion preventive coating, in accordance with manufacturer's instructions, to produce a dry film thickness of 0.0008 - 0.0015 inch (20 - 38 µm) and cured for not less than 14 days at standard conditions (4.5.1).

4.5.3.5 MIL-P-23377 Primer: Aluminum alloy panels as in 4.5.3.2 shall be coated with MIL-P-23377 epoxy primer, in accordance with manufacturer's instructions, to produce a dry film thickness of 0.0006 - 0.0009 inch (15 - 23 µm) and cured for not less than 14 days at standard conditions (4.5.1).

4.5.3.6 Titanium: AMS-4901 titanium.

4.5.3.7 Steel: AMS-5516 corrosion resistant steel.

4.5.4 Cleaning and Priming of Panels: Prior to application of sealant, all test panels shall be cleaned by scrubbing and rinsing with MIL-C-38736 solvent using AMS-3819 cleaning cloths. Apply primer supplied by vendor using AMS-3819 cloth and allow to dry for not less than 60 minutes at standard conditions (4.5.1). If the primer is allowed to dry for more than four hours prior to sealant application, the panels shall be cleaned and the primer re-applied.

4.5.5 Nonvolatile Content: Weigh a cup, approximately 3 inches (76 mm) in diameter and 0.75 inch (19.0 mm) deep, with a fitted cover to the nearest milligram. Transfer 12 grams ± 1 of the sealant to the cup as rapidly as possible, install the cover, and weigh immediately to the nearest milligram. Remove the cover and heat the sealant and cup to 158°F ± 2 (70°C ± 1) for 24 hours ± 1. Cool to room temperature in a desiccator, install the cover, and weigh to the nearest milligram. Subtract the weight of the cup and cover from the weights of the cup, cover, and sealant before and after heating. Calculate the percentage of nonvolatile content as follows:

$$\text{Nonvolatile Content, \%} = \frac{\text{Final Weight}}{\text{Initial Weight}} \times 100$$

4.5.6 Viscosity of Base Compound: A standard 1/2 pint (237 mL) can, 2-7/8 inches (73 mm) in diameter by 2-7/8 inches (73 mm) in height, shall be filled with base compound to within 1/2 inch (13 mm) of the top, covered, and stored at standard conditions (4.5.1) for not less than 8 hours, Then the compound shall be thoroughly mixed by stirring slowly for not less than 3 minutes. The container shall then be closed and the material allowed to stand for not less than 1 hour. A Brookfield Model RVF viscometer with a No. 7 spindle at 2 RPM, or equivalent, shall be used. The highest reading shall be taken after the instrument has run in the compound for not less than 1 minute.

4.5.7 Flow: The base compound and catalyst, the sealant application gun, and the flow-test jig (Figure 1) shall be stabilized at standard conditions (4.5.1) for at least 8 hours before a 250-gram lot of base compound is mixed with a proper amount of catalyst. A standard 6-fluid ounce (177-mL) polyethylene sealant gun cartridge, having a standard 0.125-inch (3.18-mm) nozzle (Figure 4), shall be filled with the mixed compound and maintained at standard conditions (4.5.1) throughout the test. The test shall be conducted with a flow-test jig shown in Figure 1. Depth of plunger tolerance is-critical and shall be controlled within the tolerance during all tests.

4.5.7.1 The flow-test jig shall be placed on a table with the front face upward and the plunger depressed to the limit of its travel. Within 15 minutes after the beginning of mixing, enough of the mixed sealing compound shall be extruded from the application gun to fill the recessed cavity of the jig and leveled off even with the block. Within 10 seconds after the leveling operation, the jig shall be placed on its end and the plunger immediately advanced to the limit of its forward travel. The flow measurement shall be taken 30 minutes ± 1 after the sealing compound has been applied to the test jig. The flow shall be measured from tangent to the lower edge of the plunger to the farthest point to which flow has advanced.

4.5.7.2 If the mixed sealant is frozen for storage, the beginning of mixing time shall be the time at which the thawed sealant has reached 70°F ± 5 (21°C ± 3).

4.5.8 Application Time: The base compound, catalyst, and application gun shall be stabilized at standard conditions for not less than 8 hours before not less than 250 grams of base sealing compound is mixed with the proper amount of curing compound. A standard 6-fluid ounce (177-mL) polyethylene sealing compound cartridge, having a nozzle (Figure 4) with an orifice diameter of 0.125 inch ± 0.004 (3.18 mm ± 0.10), shall be filled with the mixed compound and maintained at standard conditions throughout the test. The gun shall be attached to a constant air supply of 90 psi ± 5 (621 kPa ± 34).

4.5.8.1 From 2 to 3 inches (51 to 76 mm) of sealing compound shall be extruded initially to clear any entrapped air. At the end of 2 hours, measured from the beginning of the mixing period, the sealant compound shall be extruded onto a suitable receptacle for 1 minute and the amount of extruded sealing compound shall be determined and reported.

4.5.8.2 If mixed sealant is frozen for storage, the beginning of mixing time shall be the time at which the thawed sealant has reached 70°F ± 5 (21°C ± 3).

4.5.9 Tack-Free Time: A metal panel, 0.040 x 2.75 x 6 inches (1.02 x 69.8 x 152 mm) conforming to 4.5.3.1, shall be cleaned in accordance with 4.5.4. Apply a 0.125 inch ± 0.063 (3.18 mm ± 1.60) thickness of the sealant to the cleaned metal panel. After no more than 24 hours at standard conditions (4.5.1), place two pieces of polyethylene film, approximately 0.004 x 1 x 6 inches (0.10 x 25 x 152 mm), on the sealant and hold in place with a pressure not exceeding 0.5 ounce per square inch (215 Pa) for 120 seconds ± 10. Slowly withdraw the strips of polyethylene film at a right angle to the sealant surface. There shall be no sealant adhering to the film.

4.5.10 Cure Rate: A specimen of sealing compound, approximately 0.25 x 1 x 2 inches (6.4 x 25 x 51 mm) after curing for no more than 48 hours at standard conditions (4.5.1), shall be tested for instantaneous durometer hardness as specified in ASTM D 2240.

4.5.11 Resistance Thermal Rupture: Two panels conforming to 4.5.3.4 and two panels conforming to 4.5.3.5 shall be cleaned in accordance with 4.5.4. The panels shall be 0.040 x 3.5 x 3.5 inches (1.02 x 89 x 89 mm) in size with a hole 0.25 inch (6.4 mm) in diameter in the center of the panel. A fillet of sealant, 0.125 inch (3.18 mm) thick by 2 inches (51 mm) in diameter, shall be applied to the center of each panel. After curing for 14 days at standard conditions (4.5.1), one panel of each configuration shall be placed in MIL-H-19457 fire resistant hydraulic fluid at 140°F ± 2 (60°C ± 1) for 168 hours ± 4.

4.5.11.1 The panels shall be removed from the fluid and immediately applied, using a suitable gasket, to the jig shown in Figure 2. The panel shall be so positioned on the jig that the sealing compound is within the jig chamber. The jig shall be placed in an oven at 450°F ± 2 (232°C ± 1). An air pressure of 10 psi (69 kPa) shall then be applied using an air regulator. The jig shall be maintained in the oven for 60 minutes ± 2 after the pressure is applied. Deformation shall be measured from the surface of the test panel not exposed to pressure, to the point of maximum deformation of the sealant compound. The test shall be repeated on the panels not immersed in the hydraulic fluid.

4.5.12 Low-Temperature Flexibility: Eight test panels (four conforming to 4.5.3.4 and four conforming to 4.5.3.5), 0.040 x 2.75 x 6 inches (1.02 x 69.8 x 152 mm), shall be cleaned in accordance with 4.5.4. A coating of the sealing compound, 0.094 inch ± 0.005 (2.39 mm ± 0.13) thick by 1.5 inches (38 mm) wide by 4 inches (102 mm) long, shall be applied to the center of each panel. Care shall be taken to maintain an accurate sample thickness of 0.094 inch (2.39 mm). After standard cure (4.5.2), two of each panel configuration shall be conditioned at 160°F ± 2 (71°C ± 1) for 7 -days ±. 4 hours. All panels shall immediately be placed in a low temperature flexibility jig consisting of a clamp support that will grip both sides of both 6-inch (152-mm) edges of the panel for a distance of 3 inches (76 mm) from one end without touching the sealant (Figure 3). The jig shall be capable of flexing the panel through a 30-degree arc (15 degrees each side of the center) at a constant speed of 1 cycle per 5 seconds. The temperature shall be reduced to -65°F ± 2 (-54°C ± l), stabilized at this temperature for 2 hours, and the panels flexed through 130 consecutive cycles.

4.5.13 Peel Strength: Substrate test panels, 0.040 x 2 x 5 inches (1.02 x 51 x 127 mm) shall be cleaned in accordance with 4.5.4. Also, aluminum alloy foil 0.005 x 1 x 12 inches (0.13 x 25 x 305 mm) conforming to QQ-A-250/8, temper H38, (one strip for each substrate test panel) shall be cleaned as in 4.5.4. Mask the top one inch (25 mm) of the substrate panel and apply sealant approximately 0.040 inch (1.02 mm) thick along the length of the panel. Place a shim 0.020 inch thick by 0.25 inch wide (0.51 x 6.4 mm) across the panel adjacent to the maskant. Lightly place one strip of the aluminum alloy foil lengthwise on the sealant leaving 6 inches (152 mm) extending beyond the top of the substrate panel. Place a straight edge vertically against the longitudinal center line of each foil strip and press down against the shim until such time as sealant ceases to extrude from under the sides of the foil. The resulting sealant thickness should vary from 0 to 0.020 inch (0 to 0.51 mm). Lift the straight edge and press on each side of the centerline in the same manner. After partial cure, pare the excess sealant off the edges of the foil strip with a scalpel and cut through to the substrate along the edges of the foil. Allow specimens to cure a total of 14 days at standard conditions (4.5.1). Remove shims and maskant prior to environmental conditioning.

4.5.13.1 Resistance to Water: Substrate test panels conforming to 4.5.3.1, 4.5.3.2, 4.5.3.3, 4.5.3.4, 4.5.3.5, 4.5.3.6, and 4.5.3.7 shall be prepared as in 4.5.13. Within two days after sealant cure, completely immerse three peel specimens of each configuration in ASTM D 1193 Type IV water for 7 days ± 4 hours at 140°F ± 2 (60°C ± 1) A ratio of three specimens per quart (L) of distilled water shall be used. After conditioning, allow the specimens to cool, while immersed in the water, for 24 hours at standard conditions (4.5.1) prior to testing. The peel strength shall be measured within 10 minutes after removal from the water. The metal foil shall be stripped back at an angle of 180 degrees to the substrate panel using a suitable tensile testing machine having a jaw separation rate of 2 inches (51 mm) per minute. During peel strength testing, three cuts at approximately l-inch (25 mm) intervals shall be made through the sealant to the panel in an attempt to promote adhesive failure. Peel strength results shall be a numerical average of the peak loads. The sealant shall exhibit 100% cohesive failure, except for bubbles, knife cuts, and other causes that are obviously not the fault of the sealant.

4.5.13.2 Resistance to Heat: Substrate test panels conforming to 4.5.3.4 and 4.5.3.5 shall be prepared as in 4.5.13. Tightly clamp eight peel specimens of each configuration together and place in circulating-air oven at 450°F ± 2 (232°C ± 1). At intervals of 1, 2, 4, 8, 24, 48, 96, and 168 hours ± 5 minutes, remove one specimen of each configuration from the oven and allow to cool at room temperature. Within one hour following removal from the oven, perform peel testing by stripping back the aluminum foil at an angle of 180 degrees to the substrate panel using a suitable tensile testing machine having a jaw separation rate of 2 inches (51 mm) per minute. During peel strength testing, three cuts at approximately l-inch (25-mm) intervals shall be made through the sealant to the panel in an attempt to promote adhesive failure. Peel strength results shall be a numerical average of the peak loads, The sealant shall exhibit 100% cohesive failure, except for bubbles, knife cuts, and other causes that are obviously not the fault of the sealant. After completion of the 168-hour exposure test, all specimens shall be compared and examined for tackiness and sponging.

4.5.14 Corrosion: One AMS-4045 aluminum alloy panel, 0.040 x 2.75 x 6 inches (1.02 x 69.8 x 152 mm), shall be cleaned as in 4.5.4 and be prepared with 2 parallel sealant fillets approximately 1 inch (25 mm) apart. The fillets shall be applied 0.06 inch (1.5 mm) thick by 0.75 inch (19 mm) wide by 5 inches (127 mm) long and shall extend to within 0.5 inch (13 mm) of the edges of the panel. After curing 14 days at standard conditions (4.5.1), the panel shall be immersed vertically for 20 days ± 4 hours at 140°F ± 2 (60°C ± 1) in a covered glass vessel containing a 3% aqueous sodium chloride solution with 3 inches (76 mm) of the panel exposed to the salt water and the remainder of the panel exposed to the air vapor mixture. Immediately after removal from the liquid, the panel shall be examined for corrosion adjacent to and under the sealant and for deterioration of the sealant.

4.5.15 Tensile Strength and Elongation: Mixed sealing compound shall be molded into a sheet 0.125 inch ± 0.015 (3.18 mm ± 0.38) and cured 30 days at standard conditions (4.5.1). Tensile specimens shall be cut from the sheet using Die C as specified in ASTM D 412. Five specimens each shall be subjected to the conditions shown in Table I. Following conditioning, tensile and elongation test shall be conducted in accordance with ASTM D 412 using a jaw separation rate of 20 inches (508 mm) per minute. Specimens exposed to temperature shall be allowed to cool for 16 to 48 hours at standard conditions prior to testing and specimens exposed to fluid shall be tested within 30 minutes of removal from the fluid.

4.5.16 Repairability: Three test panels, 0.040 x 2 x 5 inches (1.02 x 51 x 127 mm) conforming to 4.5.3.4, shall be cleaned as in 4.5.4. Mask the top 1 inch (25 mm) of the panel and apply a 0.125 inch (3.18 mm) thick layer of sealant lengthwise along the panel. Allow the sealant to cure 14 days at standard conditions (4.5.1). Clean the sealant surface using a clean cloth conforming to AMS-3819 dampened, but not dripping, with isopropyl alcohol. Wipe dry with clean cloth and allow the panels to dry at standard conditions for 1 hour. Apply a fresh layer of sealant, approximately 0.040 inch (1.02 mm) thick, over the cured sealant. Place aluminum alloy foil strips, 0.005 x 1 x 12 inches (0.13 x 25 x 305 mm) conforming to QQ-A-250/8, temper H38, cleaned as in 4.5.4 onto the fresh sealant leaving 6 inches (152 mm) extending beyond the top of the substrate panel. Place a straight edge vertically against the longitudinal center line of each foil strip and press down until such time as sealant ceases to extrude from under the sides of foil. Lift the straight edge and press on each side of the centerline in the same manner; After partial cure, pare the excess sealant off the edgesof the foil strip with a scalpel and cut through to the substrate along the edges of the foil. Allow specimens to cure a total of 14 days at standard conditions.

4.5.16.1 After cure, perform peel testing by stripping back the aluminum foil at an angle of 180 degrees to the substrate panel using a suitable tensile testing machine having a jaw separation rate of 2 inches (51 mm) per minute. Peel strength results shall be a numerical average of the peak loads. The sealant shall exhibit 100% cohesive failure, except for bubbles, knife cuts, and other causes that are obviously not the fault of the sealant.

4.5.17 Hydrolytic Stability: Mixed sealing compound shall be molded into a specimen 0.50 inch (13 mm) thick by 3 inches (76 mm) in diameter and cured 14 days at standard conditions (4.5.1). Durometer hardness shall be determined as specified in ASTM D 2240 and the specimen then exposed for 120 days ± 4 hours in an environment of 160°F ± 2 (71°C ± 1) and 95% ± 1 relative humidity. The environment shall be obtained by placing the specimen on a suitable tray in a 250-mm glass desiccator. The bottom of the desiccator shall be filled with a saturated solution of potassium sulfate which will produce 95% relative humidity at the test temperature. The desiccator shall be closed and placed in an circulating-air oven for the duration of the test. At the end of the exposure period, remove the desiccator from the oven, cool to 77°F ± 2 (25°C ± 1) and hold at temperature for 16 to 24 hours before removing the specimen from the desiccator. Determine durometer hardness as specified in ASTM D 2240,

4.5.18 Accelerated Storage Stability: An original, unopened one-quart (1-L) container of base compound and an original, unopened container of the curing compound shall be stored for 14 days ± 4 hours at 120°F ± 2 (49°C ± 1) in a suitably ventilated oven. After cooling at standard conditions (4.5.1) for at least 24 hours, tests shall be conducted in accordance with 4.5.6, 4.5.7, 4.5.8, 4.5.9, and 4.5.10.

4.5.19 Mixed-Frozen Stability: Standard 6-fluid ounce (177-mL) polyethylene sealing compound cartridges shall be filled with mixed sealing compound and quick frozen at -85°F ± 2 (-65°C ± 1) for 15 minutes ± 1. After 5 days ± 4 hours storage at -65°F ± 2 (-54°C ± 1), the sealing compound shall be thawed to 70°F ± 5 (21°C ± 3) and tests conducted in accordance with 4.5.7, 4.5.8, 4.5.9, and 4.5.10.

4.6 Reports: The vendor of the product shall furnish with each shipment a report showing the results of tests to determine conformance to the acceptance test requirements and stating that the product conforms to the other technical requirements. This report shall include the purchase order number, lot number, AMS-3378, vendor's name and product designation, date of manufacture, and quantity.

4.6.1 A material safety data sheet conforming to AMS-2825, or equivalent, shall be supplied to each purchaser prior to, or concurrent with, the report of preproduction test results or, if preproduction testing be waived by purchaser, concurrent with the first shipment of the product for production use. Each request for modification of product formulation shall be accompanied by a revised data sheet for the proposed formulation.

4.7 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the product 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 product represented. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Packaging:

5.1.1 Sealing compound shall be furnished in individual containers (for the base sealing compound and the curing compound) or premixed and frozen in polyethylene containers. The ratio of the quantity contained in the curing compound container shall be the same as the recommended mixing ratio of the base sealant compound and the curing compound. Sufficient primer in a glass container shall be provided with each kit or each frozen container.

5.1.2 The base sealing compound shall be furnished in 1 pint (473 mL), 1 quart (946 mL), or 1 gallon (3.78 L) metal cans or as specified in the purchase order.

5.1.2.1 For direct U.S. Military procurement, metal cans shall conform to PPP-C-96, Type V, Class 2.

5.1.3 The curing compound shall be furnished in glass jars or in suitable containers acceptable to purchaser. The glass jars shall have vertical smooth inside walls and no internal projections or internal lips exceeding 1/16 inch (1.6 mm). The glass jars shall be closed with enameled metal or plastic continuous thread screw caps having a nonabsorbent lining material. Caps shall be tightened adequately and further sealed with cellulose bands, or equivalent. The primer shall be furnished in suitable small mouth glass jars.

5.1.4 One container each of the base sealant compound, the curing compound, and the primer, individually packaged in accordance with the foregoing, shall be enclosed in a container and shall constitute a complete kit.

5.1.5 Premixed and frozen product shall be packaged in 6-fluid ounce (177-mL) standard polyethylene sealing compound cartridges. Each cartridge shall include a self-contained plastic nozzle, the tip of which is designed to be cut off to allow extrusion of the sealant. Exterior containers shall be sufficiently insulated and otherwise protected so that the product will be maintained at -65°F (-54°C) or below during transit to the receiver.

5.1.6 Containers of compound shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to handling, packaging, and transportation of the compound to ensure carrier acceptance and safe delivery.

5.1.7 For direct U.S. Military procurement, packaging shall be in accordance with MIL-STD-794, Commercial Level, unless Level A is specified in the request for procurement,

5.2 Identification: Each container and each shipping container shall be permanently and legibly marked or labeled with not less than the following information:

SILICONE SEALANT, TWO PART, GENERAL PURPOSE
AMS-3378
QUANTITY _____
PURCHASE ORDER NUMBER _____
MANUFACTURER'S IDENTIFICATION _____
LOT NUMBER _____
DATE OF MANUFACTURE _____
APPROPRIATE WARNINGS AND PRECAUTIONARY NOTICES

NOTE: DATE OF MANUFACTURE SHALL BE THE DATE AT WHICH THE LAST ACCEPTANCE TEST WAS COMPLETED BY THE MANUFACTURER.

6. ACKNOWLEDGMENT: A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.

7. REJECTIONS: Sealant not conforming to this specification, or to modifications authorized by purchaser, will be subject to rejection.

8. NOTES:

8.1 Dimensions and properties in inch/pound units and the Fahrenheit temperatures are primary; dimensions and properties in SI units and the Celsius temperatures are shown as the approximate equivalents of the primary units and are presented only for information.

8.2 For direct U.S. Military procurement, purchase documents should specify not less than the following:

Title, number, and date of this specification
Quantity of sealant desired
Type and size of containers desired
Level A packaging, if required (5.1.7).

8.3 Products meeting the requirements of this specification have been classified under Federal Supply Classification (FSC) 8040.

This specification is under the jurisdiction of AMS Committee "G-9".