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Superseding AMS3101A

Adhesion Promoter
For Polysulfide Sealants, Non-crazing of Acrylic and Polycarbonate

RATIONALE

This document has been determined to contain basic and stable technology which is not dynamic in nature.

STABILIZED NOTICE

This document has been declared "Stabilized" by SAE G-9, Aerospace Sealing Committee, and will no longer be subjected to periodic reviews for currency. Users are responsible for verifying references and continued suitability of technical requirements. Newer technology may exist.

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1. SCOPE:

1.1 Form:

This specification covers adhesion promoters in liquid form.

1.2 Application:

This product has been used typically for use in enhancing the adhesion of polysulfide adhesives of sealing compounds to acrylic and polycarbonate windshield materials, but usage is not limited to such applications.

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 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, Aluminum Alloys, Sulfuric Acid Process, Undyed Coating
AMS 2820	Packaging, Aerosol
AMS 2825	Material Safety Data Sheets
AMS 3333	Sealing Compound, Polysulfide for Aircraft Windshields and Canopies, For Use Up to 250 °F (121 °C)
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 4901	Titanium Sheet, Strip and Plate, Annealed, 70,000 psi (485 Mpa) Yield
AMS 5516	Steel, Corrosion Resistant, Sheet, Strip and Plate, 18Cr - 9.0Ni (SAE 30302), Solution Heat Treated
AS 5127	Methods for Testing Aerospace Sealants
AS 5127/1	Methods for Testing Aerospace Sealants, Two-Component Synthetic Rubber Compounds

2.2 U.S. Government Publications:

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

MIL-P-5425	Plastic, Sheet, Acrylic, Heat Resistant
MIL-P-8184	Plastic, Sheet, Acrylic, Modified
MIL-P-23377	Primer Coatings: Epoxy, High Solids
MIL-G-25667	Glass, Monolithic, Aircraft Glazing
MIL-P-25690	Plastic, Sheets and Formed Parts, Modified Acrylic Base, Monolithic, Crack Propagation Resistant
MIL-P-83310	Plastic, Sheet, Polycarbonate, Transparent
MIL-P-85285	Coating, Polyurethane, High Solids
MIL-P-85582	Primer Coatings: Epoxy, Waterborne

3. TECHNICAL REQUIREMENTS:

3.1 Material:

The adhesion promoter shall be an un-dyed liquid, formulated to meet the requirements of 3.2.

3.2 Properties:

The adhesion promoter shall conform to the following requirements as determined by the test methods of 4.5.

3.2.1 Color: The adhesion promoter shall be not be intentionally tinted.

3.2.2 Peel Strength: Qualification tests shall be all tests specified in Table 1. Acceptance tests shall consist of Tests 6, 7, and 8.

TABLE 1 - Peel Strength Tests

Test No.	Panel Material and Preparation (See 4.5.2)	Adhesion Promoter Applied	Immersion Medium	Peel Strength, min, lbf/in (N/m)	Cohesive Failure, Percent	Test Method Paragraph
1	MIL-P-5425 Acrylic	Yes	None	15 (3500)	100	4.5.5
2	MIL-P-25690 Stretched acrylic	Yes	None	15 (3500)	100	4.5.5
3	MIL-P-88310 Polycarbonate	Yes	None	15 (3500)	100	4.5.5
4	AMS 4045 Al alloy anodized AMS 2471	Yes	(1)	15 (3500)	100	4.5.5
5	AMS 4901 Titanium alloy	Yes	(1)	15 (3500)	100	4.5.5
6	MIL-P-5425 Acrylic	Yes	(1)	15 (3500)	100	4.5.5
7	MIL-P-25690 Stretched acrylic	Yes	(1)	15 (3500)	100	4.5.5
8	MIL-P-83310 Polycarbonate	Yes	(1)	15 (3500)	100	4.5.5
9	Al alloy, MIL-P-23377 Primer	Yes	(1)	15 (3500)	100	4.5.5
10	Al alloy, MIL-P-85582 Primer	Yes	(1)	15 (3500)	100	4.5.5
11	MIL-G-25667 Type 1 Glass	Yes	(1)	15 (3500)	100	4.5.5

NOTE: (1) Seven days immersion in distilled water.

3.2.3 Storage Stability:

3.2.3.1 Long-Term Stability: Shall be as specified in Table 1, Test 6, and shall conform to 3.2.1, 3.2.2, and 3.2.6 when tested in accordance with 4.5.6.1.

3.2.3.2 Short-Term Stability: Shall be as specified in Table 1, Test 7, 8, and 11 when tested in accordance with 4.5.6.2.

3.2.4 Aging After Application: Shall be as specified in Table 1, Tests 7, and 8 when tested in accordance with 4.5.7.

3.2.5 Chemical Control: Infrared spectrogram shall agree with that obtained on the preproduction sample. Any variance from the originally approved sample may be cause for rejection.

3.2.6 Crazing: Adhesion Promoter shall not craze the substrate when tested in accordance with AS5127/1 under (7.11) “Crazing”.

3.3 Quality:

Adhesion promoter, as received by purchaser, shall be uniform in quality and condition, as free from sedimentation or turbidity, and free from foreign materials as commercially practical and free from imperfections detrimental to usage of the promoter.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The manufacturer of the adhesion promoter shall supply all samples for manufacturer’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 adhesion promoter conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Qualification Tests: All technical requirements are qualification tests and shall be performed prior to or on the initial shipment of adhesion promoter 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.

4.2.1.1 Qualification: For direct U.S. Military procurement, and for procurement on U.S. Military contracts, the adhesion promoter shall be a product that has been tested, has passed the qualification tests of 4.2.1, and has been listed or approved for listing on the applicable U.S. Military qualified products list.

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

Color:	3.2.1
Peel Strength:	3.2.2
Chemical Control:	3.2.5
Crazing:	3.2.6

4.3 Sampling and Testing:

4.3.1 For Acceptance Tests: Sufficient adhesion promoter 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 adhesion promoter produced in a single production run from the same batches of raw materials under the same fixed conditions and presented for the manufacturer's inspection at one time. An inspection lot shall not exceed 500 gallons (1893 L) and may be packaged and delivered in smaller quantities under the basic lot approval lot identification is maintained.

4.3.1.2 A statistical sampling plan, acceptable to the purchaser, may be used in lieu of sampling as in 4.3.1.

4.3.2 For Qualification Tests: Samples shall consist of three aerosol containers or three brown glass smallmouth bottles (see 5.1.1), each containing a minimum net weight of 16 ounces (454 g) of adhesion promoter. Samples shall be identified as specified below and forwarded to the activity responsible for qualification testing as designated in the letter of authorization from that activity (See 8.2). Samples shall be identified as follows:

ADHESION PROMOTER For Polysulfide Sealants, Non-crazing of Acrylic and Polycarbonate
AMS XXXX
Manufacturer's Identification
Lot Number
Date of Manufacture
Submitted by (name) (date) for qualification tests in accordance with AMS XXXX under authorization (reference authoring letter).

4.4 Approval:

4.4.1 Adhesion promoter shall be approved by purchaser before sealing compound for production use is supplied, unless such approval be waived by purchaser. For direct U.S. Military procurement and for procurement for use on U.S. Military contracts, the adhesion promoter shall be listed, or approved on the applicable U.S. Military qualified products list. Results of tests on the production sealing compound shall be essentially the equivalent to those on the approved (qualified) 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 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:

4.5.1.1 Standard laboratory conditions shall be 77 °F ± 2 (25 °C ± 1) and 50% ± 5 relative humidity. Except as otherwise specified herein, all test specimens shall be cured under these conditions. Test specimens shall be prepared at 77 °F ± 5 (25 °C ± 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 °F ± 5 (25 °C ± 3).

4.5.1.2 Standard Tolerances: Unless otherwise specified herein, standard tolerances of AS5127 under (3.1) “Standard Tolerances” shall apply.

4.5.1.3 Standard Test Methods: Standard Test Methods in accordance with AS5127 and AS5127/1 shall be used. 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.

4.5.1.4 Future Revisions of AS5127 and AS5127/1: 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.

4.5.2 Preparation of Test Specimens: Test panel configuration shall be as defined in AS5127/1 under (8). “Peel Strength Properties” and (8.1) “Peel Strength Testing” and as in figures for either (Figure 23) “Four-Inch Peel Specimen Configuration” or (Figure 22) “Five-Inch Peel Specimen Configuration”.

4.5.2.1 Cleaning of Test Panels: Test panels shall be cleaned in accordance with Table 3 and methods in accordance with AS5127.

NOTE—When organic coatings are specified for the test panels, the coatings shall be fully cured as defined by the applicable coating specification before cleaning. The applied coatings shall be at least 14 days old and a maximum of 6 months old stored at ambient indoor temperatures.

TABLE 2 - Peel Strength Panels

Panel Thickness, Inch (nominal)	Panel Thickness, mm (nominal)	Panel Material
0.040	1.02	Al alloy AMS 4045 sulfuric acid anodized per AMS 2471.
0.040	1.02	Al alloy AMS 4045 sulfuric acid anodized per AMS 2471 0.001 inch (0.025 mm) overcoat of MIL-P-23377 primer.
0.040	1.02	Al alloy AMS 4045 sulfuric acid anodized per AMS 2471, 0.001 inch (0.025 mm) overcoat of MIL-P-23377 primer, 0.001 inch (0.025 mm) overcoat of MIL-C-85285 top coat.
0.040	1.02	Al alloy AMS 4045 sulfuric acid anodized per AMS 2471, 0.001 inch (0.025 mm) overcoat of MIL-P-85582 primer.
0.040	1.02	AMS 5516 Stainless steel
0.020	0.51	AMS 4901 Titanium alloy
0.25	6.35	MIL-P-5425 Acrylic
0.25	6.35	MIL-P-25690 Acrylic
0.25	6.35	MIL-P-83310 Polycarbonate
0.25	6.35	MIL-G-25667 Glass, Type I
0.25	6.35	MIL-P-8184 Craze Resistant Acrylic

TABLE 3 - Cleaning of Test Panels

Panel Material	Cleaning Method, AS5127 (Paragraph)
Aluminum alloy, sulfuric acid anodized per AMS 2471	(6.1.1) "Preparation of Aluminum Test Panel Surfaces"
Aluminum alloy, MIL-P-23377 test surface	(6.2.2.1) "Cleaning of MIL-P-23377 Surface for Sealing"
Aluminum alloy, MIL-C-85285 test surface	(6.2.3.1) "Cleaning of MIL-C-83286 Surface for Sealing"
Aluminum alloy, MIL-P-85582 test surface	(6.2.4.1) "Cleaning of MIL-P-85582 Surface for Sealing"
AMS 5516 Stainless steel	(6.3) "Preparation of AMS 5516 Stainless Steel Panel Test Surfaces"
AMS 4901 Titanium alloy	(6.4) "Preparation of AMS 4901 Titanium Panel Test Surfaces"
Transparent surfaces: (prior to applying adhesion promoter) MIL-P-5425 MIL-P-25690 MIL-P-83310 MIL-G-25667 MIL-P-8184	(6.6) "Preparation of Aircraft Transparent Surfaces"

4.5.2.2 Application of Adhesion Promoter: When specified, adhesion promoter shall be applied according to the manufacturer's instructions to the cleaned surfaces immediately after cleaning in accordance with 4.5.2.1. The adhesion promoter shall be allowed to air dry at 25 °C ± 1 (77 °F ± 2) and 50% ± 5 relative humidity for not less than 30 minutes but not more than two hours before applying the sealant. If more than two hours has elapsed, reclean and reapply the adhesion promoter.

4.5.3 Sealant: Sealant for use in preparing peel test specimens shall be in accordance with AMS 3333 Type II Class B-2. Sealants shall be within their specified shelf life when used.

4.5.4 Color: Adhesion promoter shall be applied in accordance with 4.5.2.2 to test panels, aluminum alloy AMS 4045, sulfuric acid anodized per AMS 2471, allowed to air dry 25 °C ± 1 (77 °F ± 2) and 50% ± 5 relative humidity for not less than 15 minutes, and visually inspected for color.