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AEROSPACE MATERIAL SPECIFICATION

SAE AMS 3687B

Issued 1 MAR 1974
Revised 1 JAN 1993

Superseding AMS 3687A

Submitted for recognition as an American National Standard

ADHESIVE FILM, HUMIDITY-RESISTANT, EPOXY
For Sandwich Panels, -55 to +95 °C (65 to +200 °F)

This specification has been declared "NONCURRENT" by the Aerospace Materials Division, SAE, as of July, 1992. It is recommended, therefore, that this specification not be specified for new designs.

This cover sheet should be attached to revision "A" of the subject specification.

"NONCURRENT" refers to those materials which have previously been widely used and which may be required on some existing designs in the future. The Aerospace Materials Division, however, does not recommend these as standard materials for future use in new designs. Each of these "NONCURRENT" specifications is available from SAE upon request.

PREPARED UNDER THE JURISDICTION OF AMS COMMITTEE "CP".

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SAE AMS 3687A

Issued 3-1-74
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Superseding AMS 3687

ADHESIVE FILM, HUMIDITY-RESISTANT, EPOXY
For Sandwich Panels, -55° To +95°C (-65° To +200°F)

1. SCOPE:

1.1 Form: This specification covers a high-humidity-resistant, modified epoxy adhesive in the form of film supplied as rolls or sheets.

1.2 Application: Primarily for bonding aluminum-faced sandwich panels in the construction of light weight, portable shelters. The adhesive is useful over the temperature range -55° to +95°C (-65° to +200°F).

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods
AMS 2825 - Material Safety Data Sheets
AMS 3106 - Primer, Adhesive, Corrosion-Inhibiting, -55° to +95°C (-67° to +203°F)
AMS 3911 - Fabrication of Sandwich Panels for Light Weight Portable Shelters
AMS 4037 - Aluminum Alloy Sheet and Plate, 4.4Cu - 1.5Mg - 0.60Mn (2024; -T3 Flat Sheet, -T351 Plate)

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19120.

ASTM C297 - Tension Test of Flat Sandwich Constructions in Flatwise Plane
ASTM C393 - Flexure Test of Flat Sandwich Constructions
ASTM C480 - Flexure Creep of Sandwich Constructions
ASTM D1002 - Strength Properties of Adhesives in Shear by Tension Loading (Metal-to-Metal)
ASTM D1780 - Conducting Creep Tests of Metal-to-Metal Adhesives
ASTM D1781 - Climbing Drum Peel Test for Adhesives
ASTM D3166 - Fatigue Properties of Adhesives in Shear by Tension Loading (Metal/Metal)

2.3 U.S. Government Publications: Available from Commanding Office, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Federal Specification:

QQ-A-250/4 - Aluminum Alloy 2024, Plate and Sheet

2.3.2 Military Standards:

MIL-STD-794 - Parts and Equipment, Procedures for Packing and Packaging of
MIL-STD-1472 - Human Engineering Design Criteria for Military Systems, Equipment, and Facilities

3. TECHNICAL REQUIREMENTS:

3.1 Material: Shall be modified epoxy film supplied in sheets or rolls, consisting either entirely of adhesive material or of a carrier impregnated with adhesive, with a suitable nonadhering separator film on both surfaces. The adhesive film shall possess high-humidity resistance, shall be compatible with AMS 3106 corrosion-inhibiting primer, and shall not have a deleterious effect on the surfaces of materials being bonded.

3.1.1 Storage Life: Film shall meet the requirements of 3.2 when tested at any time up to 6 months from date of manufacture when stored at not higher than 7°C (45°F) and conditioned at 30°C ±2 (86°F ±4) for not less than 120 hr before being cured.

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

3.2.1 Uncured Adhesive:

3.2.1.1 Tack: The adhesive shall be of moderate tack such that, when applied to a vertical surface of clean aluminum alloy sheet at 18° - 30°C (65° - 86°F), the film shall not sag or separate from the surface in less than 72 hours.

3.2.1.2 Volatile Content: Shall be not greater than 1% of the total weight of adhesive, including the carrier or scrim if used.

3.2.1.3 Color: Shall be as ordered. Variations of color shall not affect any adhesive property specified herein.

3.2.2 Curing Procedure: Time, temperature, and pressure used to cure the adhesive shall be as follows:

Time, max	2 hr
Bond Line Temperature, max	175°C (345°F)
Pressure, max	20 psig (140 kPag)

3.2.2.1 An adhesive not producing acceptable bonds under the curing conditions of 3.2.2 may be acceptable at the option of the purchaser provided the adhesive meets the strength requirements specified herein when bonded under other curing conditions; such adhesives shall be identified with the curing conditions required to produce satisfactory bonds.

3.2.3 Cured Adhesive: The adhesive shall conform to the requirements specified in Table I, determined on specimens prepared as in 4.5.2.

3.2.4 Toxicity and Safety: The product, uncured, during cure, and fully cured shall be nontoxic and shall not be classed as a safety hazard under the definitions in ML-STD-1472.

3.3 Qua1ity: Adhesive, as received by purchaser, shall be uniform in quality and condition, clean, smooth (wrinkle or distortion free), homogeneous, and free from foreign materials and from imperfections detrimental to usage of the adhesive.

3.4 Sizes and Tolerances: Film thickness and corresponding weight and width, up to 48 in. (1200 mm), shall be as ordered. Individual rolls shall contain not over 600 sq ft (55 m^2). The following to1erances shall apply:

3.4.1 Thickness: ±10% to the nearest mil (0.025 mm).

3.4.2 Weight: ±10% in lb per sq ft (kg/m^2) to the nearest 0.010 lb (5 g).

3.4.3 Width: ±0.25 in. (±6 mm).

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of film shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.6. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the film conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for Ø thickness (3.4.1), weight (3.4.2), and tensile shear strength at 25°C (77°F) (Table I, Test 1) and at 95°C (200°F) (Table I, Test 2) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Preproduction Tests: Tests to determine conformance to all technical Ø requirements of this specification are classified as preproduction tests and shall be performed prior to or on the inital shipment of film to a purchaser, when a change in material, processing, or both, 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 Ø requested, preproduction test material shall be submitted to the cognizant agency as directed by the procuring activity, the contracting officer, or the request for procurement.

4.3 Sampling: Shall be as follows:
Ø

4.3.1 For Acceptance Tests: Sufficient film 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 Table I or, if not specified therein, not less than three.

4.3.1.1 A lot shall be all film produced in a single production run from the Ø same batches of raw materials and presented for vendor's inspection at one time. An inspection lot shall not exceed 500 lb (225 kg) and may be packaged and delivered in smaller quantities under the basic lot approval provided lot identification is maintained.

4.3.1.2 When a statistical sampling plan and acceptance quality level (AQL) have Ø 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 4.6.1 shall state that such plan was used.

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

4.4 Approval:

4.4.1 Sample film shall be approved by purchaser before film for production use is supplied, unless such approval be waived by purchaser. Results of tests on production film 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 adhesive film which are essentially the same as those used on the approved sample adhesive film. 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 material, processing, or both and, when requested, sample adhesive film. Production adhesive film made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Test Methods: Shall be as follows:

4.5.1 Uncured Adhesive Tests: Each roll or sheet to be sampled shall be allowed Ø to warm to above the dew point before opening the sealed package for sampling. Immediately after sampling, the roll or sheet shall be resealed and returned to refrigerated storage. Specimens shall be cut from the test material and tested immediately after sampling.

4.5.2 Cured Adhesive Tests: Metal for test specimens shall be AMS 4037 or QQ-A-250/4, Temper -T3, aluminum alloy sheet. Panel components shall be cleaned, treated, and primed in accordance with adhesive manufacturer's instructions or by procedures specified in AMS 3911, as applicable. Adhesive film, selected as in 4.5.1, shall be applied and the panels defined in the applicable test procedure shall be cured in accordance with manufacturer's instructions.

4.6 Reports:

4.6.1 The vendor of adhesive film 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 of this specification. This report shall include the purchase order number, AMS 3687A, vendor's compound number, lot number, part number, and quantity. Instruction sheets including the recommended curing time, temperatures, and pressures for each lot of adhesive film in the shipment shall also be supplied.

4.6.1.1 A material safety data sheet conforming to AMS 2825, or equivalent, Ø 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 adhesive film for production use. Each request for modification of adhesive film formulation shall be accompanied by a revised data sheet for the proposed formulation.

4.6.2 The vendor of-finished or semi-finished parts shall furnish with each shipment a report showing the purchase order number, AMS 3687A, contractor or other direct supplier of adhesive film, supplier's material designation, part number, and quantity. When adhesive film for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of adhesive film to determine conformance to the requirements of this specification and shall include in the report either a statement that the adhesive film conforms or copies of laboratory reports showing the results of tests to determine conformance.

4.7 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the adhesive film may be based on the results of testing three additional specimens for each original noncomforming specimen. Specimens for cured adhesive tests shall be cut from additional or newly prepared panels using the same procedures and curing cycles as used on the original panels. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the adhesive film represented and no additional testing shall be permitted. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Packaging and Identification:

5.1.1 Adhesive-film in each roll or sheet shall be protected on both sides by nonadherent separator film. Rolls and sheets shall be packaged individually, or as specified, in sealed bags of suitable nonadherent material to prevent penetration of moisture or loss of volatiles.

5.1.2 Each roll or sheet shall be identified with a tag attached to the roll or sheet, marked with characters of such size as to be legible and which will not be obliterated by normal handling. Each tag shall show not less than the following information:

ADHESIVE FILM, HUMDITY-RESISTANT, EPOXY, For Sandwich Panels
AMS 3687A
MNUFACTURER'S MATERIAL DESIGNATION _____
PURCHASE ORDER NUMBER _____
DATE OF MANUFACTURE _____
LOT NUMBER _____ ROLL NUMBER _____
THICKNESS _____ WEIGHT _____
QUANTITY (AREA) _____

5.1.3 The protected rolls or sheets shall be packed in an exterior container capable of protecting the adhesive film adequately during shipment and storage below the specified temperature.

5.1.4 Each exterior shipping container shall be legibly marked with not less than the following information in such a manner that the markings will not smear or be obliterated during normal handling or use:

ADHESIVE FILM, HUMIDITY-RESISTANT, EPOXY, For Sandwich Panels
AMS 3687A
PURCHASE ORDER NUMBER _____
MANUFACTURER'S MATERIAL DESIGNATION _____
DATE OF MANUFACTURE _____
LOT NUMBER _____
QUANTITY _____
PERISHABLE - STORE BELOW 7°C (45°F) _____

5.1.5 Ø Containers of adhesive film shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the adhesive film to ensure carrier acceptance and safe delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.

5.1.6 Ø For direct U.S. Military procurement, packaging shall be in accordance with MIL-STD-794, Level A or Level C, as specified in the request for procurement. Commercial packaging as in 5.1.1, 5.1.3, and 5.1.5 will be acceptable if it meets the requirements of Level C.

6. ACKNOWLEDGEMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

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

8. NOTES:

8.1 Marginal Indicia: The phi (Ø) symbol is used to indicate technical changes from the previous issue of this specification.

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

Title, number, and date of this specification
Form (sheets or rolls) of adhesive film desired
Thickness of weight per unit area of adhesive film desired
Quantity of adhesive film desired
Applicable level of packaging (See 5.1.6)

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

8.4 Adhesive film meeting the requirements of this specification has been classified under Federal Supply Classification (FSC) 8040,