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400 COMMONWEALTH DRIVE WARRENDALE PA 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 3693B
Superseding AMS 3693A

Issued 5-1-68
Revised 7-1-83

ADHESIVE, MODIFIED EPOXY
Moderate Heat Resistant, 120°C (250°F) Curing, Film Type

1. SCOPE:

1.1 Form: This specification covers a modified epoxy adhesive in the form of supported film supplied in rolls or sheets.

1.2 Application: Primarily for structural bonding of metallic alloys and rigid nonmetallic surfaces to themselves and to each other and for bonding of internal and external structural honeycomb components operating in the range -55° to +80°C (-65° to +180°F). A liquid primer suitable for spray or brush application may be required for use with the adhesive.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) 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

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Printed in U.S.A.

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM B117 - Salt Spray (Fog) Testing
ASTM C297 - Tension Test of Flat Sandwich Constructions in Flatwise Plane
ASTM C393 - Flexure Test of Flat Sandwich Constructions
ASTM D471 - Rubber Property - Effect of Liquids
ASTM D1002 - Strength Properties of Adhesives in Shear by Tension Loading (Metal-to-Metal)
ASTM D1655 - Aviation Turbine Fuels
ASTM D1781 - Climbing Drum Peel Test for Adhesives
ASTM D1876 - Peel Resistance of Adhesives (T-Peel Test)
ASTM D2247 - Testing Coated Metal Specimens at 100 Percent Relative Humidity
ASTM D2294 - Creep Properties of Adhesives in Shear by Tension Loading (Metal-to-Metal)

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

2.3.1 Federal Specifications:

MMM-A-132 - Adhesive, Heat Resistant, Airframe Structural, Metal to Metal

2.3.2 Military Specifications:

MIL-A-25463 - Adhesive, Film Form, Metallic Structural Sandwich Construction

2.3.3 Military Standards:

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

3. TECHNICAL REQUIREMENTS:

3.1 Material: Shall consist of a supported film adhesive with protective liners; uniformly dispersed fillers may be included in the film.

3.1.1 Resin: The resin shall conform to MMM-A-132, Type 1, Class 2, and Ø MIL-A-25463, Type 1, Class 2.

3.1.2 Description: The weight or caliper, or both, of the supported film adhesive shall be as specified on the drawing or purchase order.

3.1.3 Shelf Life: The adhesive, stored in airtight or suitable vapor barrier containers, shall meet the requirements of 3.2 after storage for any time up to six months at not higher than -18°C (0°F).

3.2 Properties: The product, cured in accordance with manufacturer's recommendations, shall conform to the following requirements; tests shall be performed on the product supplied and in accordance with specified ASTM methods, insofar as practicable. Reported values shall be the averages of five or more specimens.

3.2.1 Tensile Shear Strength, min:		ASTM D1002
3.2.1.1 As Cured:		
At 24°C ± 3 (75°F ± 5)	2500 psi (17.0 MPa)	
At -55°C ± 3 (-65°F ± 5)	2500 psi (17.0 MPa)	
At 80°C ± 3 (180°F ± 5)	1250 psi (8.5 MPa)	
3.2.1.2 After Salt Spray Exposure:		ASTM B117 Time: 30 days
At 24°C ± 3 (75°F ± 5)	2250 psi (15.5 MPa)	
3.2.1.3 After Humidity Exposure:		ASTM D2247 Temperature: 50°C ± 3 (120°F ± 5) Time: 30 days
At 24°C ± 3 (75°F ± 5)	2250 psi (15.5 MPa)	
3.2.1.4 After Fuel Immersion:		ASTM D471 Medium: ASTM D1655, Jet A Fuel Temperature: 20° - 30°C (68° - 86°F) Time: 30 days
At 24°C ± 3 (75°F ± 5)	2250 psi (15.5 MPa)	
3.2.2 Flatwise Tensile Strength, min:		ASTM C297
At 24°C ± 3 (75°F ± 5)	450 psi (3.0 MPa)	
At -55°C ± 3 (-65°F ± 5)	350 psi (2.5 MPa)	
At 80°C ± 3 (180°F ± 5)	270 psi (2.0 MPa)	
3.2.3 Flexural Strength, min:		ASTM C393
At 24°C ± 3 (75°F ± 5)	1750 psi (12.0 MPa)	
At -55°C ± 3 (-65°F ± 5)	1750 psi (12.0 MPa)	
At 80°C ± 3 (180°F ± 5)	1200 psi (8.5 MPa)	
At 24°C ± 3 (75°F ± 5) after 192 hr ± 1 in air at 80°C ± 3 (180°F ± 5)	1000 psi (7.0 MPa)	
3.2.4 T Peel Strength; min:		ASTM D1876
At 24°C ± 3 (75°F ± 5)	15 psi (0.1 MPa)	

3.2.5 Sandwich Peel Strength, min: ASTM D1781

At 24°C ± 3 (75°F ± 5)	25.5 in.-lb (2.9 N·m)
At -55°C ± 3 (-65°F ± 5)	6 in.-lb (0.7 N·m)
At 80°C ± 3 (180°F ± 5)	15 in.-lb (1.7 N·m)

3.2.6 Creep Deformation: Shall not exceed 0.015 in. (0.38 mm) at either test temperature, determined in accordance with ASTM D2294 on specimens stressed for 192 hr ± 1 under the following combinations of stress and temperature:

1600 psi (11 MPa) at 24°C ± 3 (75°F ± 5)
800 psi (5.5 MPa) at 80°C ± 3 (180°F ± 5)

3.2.7 Corrosion: The product shall not have a corrosive effect on adherent surfaces when exposed to conditions normally encountered in service, determined by a procedure agreed upon by purchaser and vendor. Discoloration of metals shall not be considered objectionable.

3.3 Quality: The product, as received by purchaser, shall be uniform in quality and condition, clean, and free from foreign materials and from imperfections detrimental to usage of the product.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product 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 4.5. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for tensile shear strength, as cured, at 24°C ± 3 (75°F ± 5) (3.2.1.1) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Preproduction Tests: Tests to determine conformance to all technical requirements of this specification are classified as preproduction tests and shall be performed on the first-article shipment of a product to a purchaser, when a change in material or 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 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:

4.3.1 For Acceptance Tests: Sufficient adhesive shall be taken at random from Ø each lot to permit performing all required tests. The number of tests for each requirement shall be as specified in 3.2.

4.3.1.1 A lot shall be all adhesive produced in a single production run from the same batches of raw materials and presented for vendor's inspection at Ø one time. An inspection lot shall not exceed 500 lb (225 kg) and may be packaged and delivered in small quantities under the basic lot approval provided the 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 4.5.1 shall state that such plan was used.

4.4 Approval:

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

4.5 Reports:

4.5.1 The vendor of adhesive shall furnish with each shipment three copies of a report showing the results of tests to determine conformance to the Ø acceptance test requirements and stating that the adhesive conforms to theother technical requirements of this specification. This report shall include the purchase order number, AMS 3693B, vendor's material designation, lot number, date of manufacture, thickness, and quantity.

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