

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 3708

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ADHESIVE, EPOXY PASTE, FOR STRUCTURAL WELDBOND For 80°C (180°F) Service

1. SCOPE:

- 1.1 Form: This specification covers a one-part modified epoxy adhesive in the form of paste.
- 1.2 Application: Primarily for use in structural weldbonding of metallic alloys operating in the range -55° to 80°C (-65° to 180°F).
- 1.3 Precautions: Adhesive covered by this specification may contain curing agents whose vapors can cause allergic sensitization of personnel. Safety requirements mandate ventilated work areas, protective clothing, and a chemical absorbent face mask.

2. APPLICABLE DOCUMENTS: The following documents form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications and Aerospace Recommended Practices 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 3755/2 - Powder, Fumed Silicon Dioxide, Thickening Efficiency 90
- AMS 4037 - Aluminum Alloy Sheet and Plate, 4.4Cu - 1.5Mg - 0.60Mn (2024; -T3 Flat Sheet, -T351 Plate), Solution Heat Treated
- 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

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2.1.2 Aerospace Recommended Practices:

- ARP 1610 - Physical-Chemical Characterization Techniques, Epoxy Adhesive and Prepreg Resin Systems
 ARP 1675 - Structural Weldbonding

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

- ASTM D1002 - Strength Properties of Adhesives in Shear by Tension Loading (Metal-to-Metal)
 ASTM D1876 - Peel Resistance of Adhesives (T-Peel Test)
 ASTM D2393 - Viscosity of Epoxy Resins and Related Components
 ASTM E537 - Assessing the Thermal Stability of Chemicals by Methods of Differential Thermal Analysis

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

2.3.1 Military Specifications:

- MIL-P-17667 - Paper, Wrapping, Chemically Neutral (Non Corrosive)
 MIL-T-81533 - Trichloroethane 1,1,1 (Methyl Chloroform) Inhibited, Vapor Degreasing

2.3.2 Military Standards:

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

3. TECHNICAL REQUIREMENTS:

3.1 Material: The product shall be a one-part adhesive system, pigmented to provide corrosion resistance and opacity to X-radiation, with a filler material selected for viscosity and adhesive flow control. The adhesive shall be suitable for structural weldbonding. Weldbond assemblies can be nondestructively examined for bondline voids by X-radiography.

3.2 Properties of Uncured Adhesive: Adhesive, as received, shall conform to the following requirements; tests shall be performed on the adhesive supplied and in accordance with test procedures specified herein:

3.2.1 Composition: Shall be as follows:

Constituent	Weight, %
Base Epoxy Resin (1-part system)	90.0 $\pm$ 0.8
Strontium Chromate (pigment)	3.0 $\pm$ 0.3
AMS 3755/2 Fumed Silicon Dioxide (filler)	7.0 $\pm$ 0.5
Volatiles, max	0.2 $\overline{\hspace{0.5cm}}$

3.2.2 Viscosity: Shall be 5000 to 20,000 poises (500 to 2000 Pa·s) at 20°C $\pm$ 1 (65°F $\pm$ 2), determined in accordance with 4.5.1.

3.2.3 Storage Life: Adhesive, packaged as specified herein, shall meet the requirements of 3.4 after storage at a maximum temperature of -18°C (0°F) for up to three months from date of receipt by purchaser.

3.2.4 Working Life: The maximum allowable adhesive out-time, at various temperatures to ensure weldability, shall be as follows:

<u>Temperature</u>		<u>Out Time</u>
$^{\circ}\text{C}$	$^{\circ}\text{F}$	Hours
27	80	168
29	85	132
32	90	96
35	95	79
38	100	72

3.3 Curing: The adhesive shall be fully cured when heated to $125^{\circ}\text{C} \pm 3$ ($255^{\circ}\text{F} \pm 5$) for 60 min. ± 5 in accordance with 4.5.2.

3.4 Properties of Cured Adhesive: Shall be determined on specimens processed as in 4.5.3.

3.4.1 Lap Shear Strength: Shall be not less than 6000 psi (41.5 MPa), determined on specimens shown in Fig. 1 and tested in accordance with ASTM D1002.

3.4.2 T-Peel Strength: Shall not be less than 20 lb per in. (3500 N/m) width, determined in accordance with ASTM D1876.

3.4.3 Durability of Adhesive: Specimen surface preparation, fabrication, and testing shall be in accordance with Table I, Fig. 2, and ARP 1675. The maximum wedge crack extension acceptable shall be 0.05 in. (1.2 mm) cohesive failure when exposed to 95 to 100% relative humidity at $50^{\circ}\text{C} \pm 1$ ($120^{\circ}\text{F} \pm 2$) for 1.0 hr ± 0.1 . Any adhesive failure is unacceptable.

3.5 Quality: The adhesive, 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 adhesive.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the adhesive 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 adhesive conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for viscosity (3.2.2), lap shear strength (3.4.1), T-Peel strength (3.4.2), and quality (3.5) 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 prior to or on the initial shipment of adhesive 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 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:

4.3.1 For Acceptance Tests: Sufficient adhesive 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 adhesive produced in a single production run from the same batches of raw materials under the same fixed conditions, or all materials subjected to the same unit chemical or physical processes intended to make the final product homogeneous, 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 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 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.