

AEROSPACE
MATERIAL
SPECIFICATION

AMS 3704

Issued 7-1-85
Revised

ADHESIVE, CONTACT
Chloroprene, Resin Modified

1. SCOPE:

1.1 Form: This specification covers a polychloroprene (CR) rubber, resin-modified, solvent-type contact adhesive in the form of a liquid.

1.2 Application: Primarily as an adhesive for bonding leather or polyurethane foam liners in pilots' flight helmets. Other uses include bonding of fabric, plastic laminate, and wood surfaces to themselves or to each other.

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 3570 - Foam, Flexible Polyurethane, Open Cell, Medium Flexibility

AMS 3607 - Plastic Sheet, Cotton Fabric Reinforced Phenol-Formaldehyde

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10/9/93 May 93

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

ASTM D297 - Rubber Products - Chemical Analysis
ASTM D618 - Conditioning Plastics and Electrical Insulating Materials
for Testing
ASTM D816 - Testing Rubber Cements
ASTM D1002 - Strength Properties of Adhesives in Shear by Tension
Loading (Metal-to-Metal)
ASTM D1084 - Viscosity of Adhesives
ASTM D1183 - Resistance of Adhesive to Cyclic Laboratory Aging Conditions
ASTM D1337 - Storage Life of Adhesives by Consistency and Bond Strength
ASTM D1875 - Density of Adhesives in Fluid Form

- 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 Standards:

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

3. TECHNICAL REQUIREMENTS:

- 3.1 Material: Shall consist of a polychloroprene (CR) rubber compound and a suitable resin dissolved in a solvent or solvent mixture. The product shall be free of ketones, halogenated hydrocarbons, benzene, and other solvents which have a deleterious effect on foamed polyurethanes.

- 3.1.1 Shelf Life: The adhesive, stored in airtight containers, shall meet the requirements of 3.2 after storage at not higher than 27°C (80°F) for up to 12 months from date of manufacture except that viscosity changes of $\pm 10\%$ shall be acceptable.

- 3.2 Properties: Adhesive shall conform to the following requirements:

- | | | |
|--------------------------------------|---|--|
| 3.2.1 <u>Density:</u> | 6.5 - 7.5 lb per gal
(0.78 - 0.90 kg/L)) | ASTM D1875 |
| 3.2.2 <u>Viscosity:</u> | 400 - 1500 centipoises
(0.4 - 1.5 Pa·s) | ASTM D1084,
Method B,
No. 2 Spindle
at 20 rpm |
| 3.2.3 <u>Ash Content, by Weight:</u> | 3.0 - 20% | ASTM D297,
Referee
Ash Method |
| 3.2.4 <u>Tensile Shear Strength:</u> | | |
| 3.2.4.1 <u>Before Aging, min:</u> | 150 psi (1.0 MPa) | 4.5.1 |

3.2.4.2	<u>After Aging, min:</u>	200 psi (1.4 MPa)	4.5.2
3.2.5	<u>Bonding Range, min:</u>	60 min.	4.5.3
3.2.6	<u>Accelerated Aging:</u> Permissible Viscosity Change	<u>+10%</u>	4.5.4
3.2.7	<u>Freeze-Thaw Resistance:</u> Permissible Viscosity Change	<u>+10%</u>	4.5.5
3.2.8	<u>Nonvolatile Content, by weight:</u>	18 - 25%	4.5.6
3.2.9	<u>Polyurethane Foam Compatability:</u>	No attack	4.5.7

3.3 Quality: The adhesive, as received by purchaser, shall be uniform in quality and condition, clean, and free from foreign materials and other contaminants 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 4.6. 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 before aging (3.2.4.1) 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 prior to or on the first-article shipment of a product 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 and presented for vendor's inspection at one time. An inspection lot shall not exceed 1000 gal (3785 L) and may be packaged and delivered in small 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 4.6.1 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.

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 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. Production adhesive made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Test Methods: Tests to determine conformance to requirements of this specification shall be conducted as specified in 3.2 and as follows:

4.5.1 Tensile Shear Strength, Before Aging: Shall be determined in accordance with ASTM D1002 using specimens prepared from adherends cut from 1/4 in. (6 mm) nominal thickness, commercial grade A fir plywood, and 0.062 in. (1.5 mm) nominal thickness plastic laminate conforming to AMS 3607. Specimens shall be preconditioned in accordance with ASTM D618. The value reported shall be the average shear value of not less than five specimens.

4.5.2 Tensile Shear Strength, After Aging: Not less than five specimens prepared in accordance with 4.5.1 shall be exposed to aging conditions specified in ASTM D1183, Procedure A. After conditioning, the specimens shall be tested in accordance with ASTM D1002. The average shear value of the specimens shall be reported.

- 4.5.3 Bonding Range: Shall be determined in accordance with ASTM D816 except that specimens shall be Type 1 prepared from 1/4 in. (6 mm) nominal thickness, commercial grade A fir plywood and 0.062 in. (1.5 mm) nominal thickness plastic laminate conforming to AMS 3607. Report the open drying time which provides maximum strength.
- 4.5.4 Accelerated Aging: Test in accordance with ASTM D1337, Procedure A. Maintain the adhesive in the original container or in a pint size wide-mouth aluminum or steel container which can be securely sealed. Store the specimens in accordance with ASTM D618, condition 360/60 + 24/23/50:T-23/50. Determine viscosity in accordance with ASTM D1084, Method B, using a No. 2 spindle at a speed of 20 rpm. Report viscosity change in percent from original viscosity.
- 4.5.5 Freeze-Thaw Stability: Maintain the adhesive in the original container or in a pint size wide-mouth aluminum or steel container which can be securely sealed. Cool the specimen to $-23^{\circ}\text{C} + 3$ ($-10^{\circ}\text{F} + 5$), hold at temperature for $12 \text{ hr} + 0.5$, heat to $50^{\circ}\text{C} + 3$ ($122^{\circ}\text{F} + 5$), hold at heat for $12 \text{ hr} + 0.5$. After three complete cycles, return the specimens to room temperature and determine the viscosity in accordance with ASTM D1084, Method B, using a No. 2 spindle at a speed of 20 rpm. Report viscosity change in percent from original viscosity.
- 4.5.6 Nonvolatile Content: Weigh and record the weight of three aluminum foil dishes with suitable covers in place. Pour approximately 10 g of the thoroughly mixed adhesive into each tared dish. Cover immediately and reweigh. Remove the covers and place the open dishes containing the adhesive in a vented, circulating-air oven for $24 \text{ hr} + 1$ at $70^{\circ}\text{C} + 3$ ($160^{\circ}\text{F} + 5$). Remove the dishes from the oven, replace the covers, allow to cool in a desiccator for not less than of 1 hr, and reweigh. All weighings shall be to the nearest milligram. Calculate the percent nonvolatiles and report as the average of three determinations.
- 4.5.7 Polyurethane Foam Compatibility: Prepare a specimen approximately 4 x 6 x 1 in. (100 x 150 x 25 mm) from nominal 2 lb per cu ft (32 kg/m³) density polyether-based polyurethane foam conforming to AMS 3570. Apply a uniform adhesive coating on one surface of the specimen. After drying for not less than 1 hr, visually inspect the coated surface for indications of attack by the adhesive. Wrinkling, surface sinking, or other evidence of solvent attack is not acceptable.
- 4.6 Reports:
- 4.6.1 The vendor of adhesive shall furnish with each shipment a report showing the results of tests to determine conformance to requirements for tensile shear strength before aging of each lot and stating that the adhesive conforms to the other technical requirements of this specification. This report shall include the purchase order number, AMS 3704, vendor's material designation, lot number, date of manufacture, and quantity.