



Engineering Material Specification

Material Name

ADHESIVE, THERMOSETTING - FOR FRICTION MATERIALS

Specification Number

ESA-M2G146-A

1. SCOPE

This specification defines a thermosetting nitrile-phenolic structural adhesive.

2. APPLICATION

This specification was released originally for an adhesive used for bonding friction materials such as brake lining to metal shoes. The adhesive may be applied by the spreader coat method or by brushing.

3. REQUIREMENTS

3.1 VISCOSITY 25,000 - 75,000 cP (mPa·s)
(Brookfield RVF at $25 \pm 1^\circ\text{C}$ with #6 spindle at 10 rpm)

3.2 SOLIDS, min 39%
(ASTM D 553 except heat 2 g for 4 h at $104 - 110^\circ\text{C}$)

3.3 SHEAR STRENGTH, psi (MPa), min
(Test procedure for shear samples per para 3.4)

3.3.1 Initial Shear Adhesion 1600 (11.0)

3.3.2 High Temperature Adhesion

When shear test assemblies are prepared per para 3.4 and aged 1 h at 149°C and 204°C and tested in shear at these temperatures, the min shear strength shall be:

149°C - 950 (6.6) psi

204°C - 800 (5.5) psi

260°C - 650 (4.5) psi

316°C - 400 (3.8) psi

3.4 TEST PROCEDURE FOR SHEAR

Panels of SAE AA 2024-T4 Alclad Aluminum 4 x 6 x 0.064 in (100 x 150 x 1.63 mm) are cleaned by placing them in the hot vapor portion of a trichloroethylene vapor degreaser bath for 10 min or by washing with methyl ethyl ketone solvent. The panels are then scribed along the 6 in (150 mm) dimension 1/2 in (13 mm) from the edge and acid etched 5 min at 60°C to 71°C in the following solution:

1 part by weight $\text{Na}_2\text{Cr}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$

10 parts by weight H_2SO_4 (sp gr 1.84)

30 parts by weight distilled water

Date	Para. No.	Revisions	Approval
1979 01 10		Metricated, Renumbered and Retyped CAH2-823385	J.W. King 11/20/79
1965 11 12		Released AU2-330	E.P. Francis 11-2-78

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The panels are thoroughly rinsed with cold water and then with hot water and dried. The panels must be coated within 4 h after etching or the cleaning process must be repeated. The bonding area is masked off along the previously scribed line to give an area 1/2 x 6 in (13 x 150 mm). The adhesive is knife coated into place using the tape 0.008 in (0.20 mm) as a film thickness guide. The coated panels are then given the following treatment prior to bonding to remove the adhesive solvent.

- . One h air dry at 27°C
- . 20 min at 82°C in an air circulating oven

After the panels have cooled to room temperature, they are assembled to produce a bond area of 1/2 x 6 in (13 x 150 mm). A pressure of 200 psi (1.4 mPa) at 182°C is applied to the assembly for a 15 min period. Pressure distribution must be uniform.

The panels are then scribed and cut to produce strips approximately 1 in (25 mm) wide. Upon measuring the bond area to the nearest 1/32 in (0.79 mm) the strips are sheared using a tensile testing machine at a constant rate of 0.5 in (13 mm) per min.

Shear in psi is computed by dividing failure load obtained when samples are tested in the tensile tester by the bond area. An average of at least 5 samples is required.

3.5 STORAGE

This adhesive when stored in a closed container for 60 days or less at temperatures below 27°C shall not increase more than the max allowable viscosity.

3.6 SUPPLIER'S RESPONSIBILITY

Material supplied to this specification must be equivalent to that originally approved. Changes in formulation or processing shall not be made without prior approval as described in Supplier Procedure I-A.

4. APPROVAL OF SUPPLIERS

Suppliers to this specification must be approved by the affected product engineering office. Procedure for gaining approval of a specific material to a new/existing ES-M specification is contained in Supplier Procedure I-A. Approved new suppliers will be added to the Engineering Materials Approved Source List.

5. GENERAL INFORMATION

The material data included herein is for information only and is not a requirement for the supplier.

5.1 SHELF LIFE

Precemented frictional material having undergone a 2 year storage prior to bonding must pass specified bonding requirements.

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