Ford Engineering Material Specification

Material Name

ADHESIVE, EPOXY - MICROENCAPSULATED

Specification Number

ESA-M2G200-A

1. SCOPE

The material defined by this specification is a microencapsulated epoxy adhesive that develops a prevailing torque between mating threaded fasteners after assembly. Prevailing torques are developed on all fastener coatings and finishes, and are redeveloped with only a moderate loss after removal and reinstallation.

2. APPLICATION

This specification was released originally as a material for use on strut to crossmember attachment.

3. REQUIREMENTS

3.1	APPEARANCE	Blue, opaque, viscous liquid
3.2	WEIGHT PER VOLUME (ASTM D 891, Method "A")	8.6 ± 0.2 lb/gal (1.03 ± 0.02 kg/L)
3.3	VISCOSITY (Brookfield RVF, number 4 spindle at 20 rpm, at 23 ± 2°C)	
3.3.1	As received	1600 - 2400 cP (mPa·s)
3.3.2	Aged - 7 days at 50 ± 2°C, max	3000 cP (mPa·s)
3.4	SOLIDS	59.5 ± 2.5%

Test Method: Heat 1 - 2 g weighed sample in a vacuum oven (10 mm Hg (1.3 kPa) or less) at 54 ± 2°C for 4 h. Allow sample to cool and determine weight loss in percent. Report percent solid as 100-% weight loss.

3.5 TORQUE

Test Method: Eight grade 5 cap screws (3/8-16 x 1-1/4) are weighed to 2 decimal places and then dipped into a freshly mixed, homogeneous batch of adhesive so that all of the thread area is covered with adhesive. The screws are removed and held at a 45° angle to the horizontal with the head up, while the excess adhesive drains for about 10 s, then the lower edge of the screw is scraped on the top of the adhesive container to remove the excess drop of adhesive. The screws are arranged vertically, standing on the head of the screw in a 71 ± 2°C oven for 4 h to remove solvent. After this period, they are removed from the oven and cooled to room temperature, then reweighed to determine the weight of adhesive. A minimum of 0.15 g of adhesive and a maximum of 0.25 g should be on each of the screws.

Date	Para. No.	Revisions	Approval
1979 01 10		Metricated and Retyped CHH2 823385	
1973 05 24		Released AC2-52	E.P. Francis 1-27-78

1978 11 30
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The screws are inserted through a hardened washer and then a spacer made by drilling a 0.375 -0 + 0.015 in (9.53 -0 + 0.38 mm) hole in a 1/2 in (13 mm) thick steel plate. After inserting a second washer over the exposed thread area, a Grade 5 nut is fitted to the screw and the maximum prevailing in torque (the torque required to drive the screw into the nut), is measured with a torque wrench. This torque wrench should have a sensitivity of 2 lb-in (0.23 N·m). The screw is then seated to the nut with 31 lb-ft (42.0 N·m) using a larger torque wrench which has a sensitivity of 2 lb-ft (2.7 N·m). The assembly is allowed to stand for 24 h at room temperature, then the breakloose torque is measured by placing the head of the screw in a vise and measuring the amount of torque necessary to loosen the nut with a torque wrench. The torque wrench should be pulled smoothly at a rate of about one revolution in 2 s. After the nut has been turned off 1/4 turn from the seated position, the amount of torque necessary to keep the nut coming off for the next full revolution is read. The minimum torque reading noted during this first revolution off when the wrench is operated smoothly at this one revolution/2 s rate is the prevailing out torque.

(1) All torque measurements are made by clamping the head of the screw in the vise and using the torque wrench on the nut.

3.5.1	Prevailing in Torque, max	25 lb-in (2.8 N·m)
3.5.2	Break Loose, Torque, min	40 lb-ft (54.2 N·m)
3.5.3	Prevailing Out Torque, min	7 lb-ft (9.5 N·m)

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 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

This information is for direction of the user and is not a requirement for the supplier.

Prevailing torques vary significantly with coating weight, therefore,

- Specific requirements for a particular application should be incorporated in an ES-specification and/or performance specification. These requirements should include parameters measured under para 3.5 with desired coating weight. This adhesive should not be used for applications that require exposure to elevated temperatures above 120°C without laboratory evaluation.

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