Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 3858A
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ASBESTOS FELTING, "B" STAGE PHENOLIC RESIN IMPREGNATED
Low Pressure Molding

1. SCOPE:

1.1 Form: This specification covers asbestos felting impregnated with phenolic resin, the resin being processed to a "B" stage condition, and furnished in continuous rolls.

1.2 Application: Primarily for molding into flat sheets and contoured laminates requiring resistance to continuous exposure at temperatures up to 500°F (260°C) or short time (i.e., 1/2 hr or less) exposure at temperatures up to 600°F (316°C).

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 Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods

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

ASTM C177 - Thermal Conductivity of Materials by Means of the Guarded Hot Plate
ASTM D229 - Testing Rigid Sheet and Plate Materials Used for Electrical Insulation
ASTM D256 - Impact Resistance of Plastics and Electrical Insulating Materials
ASTM D635 - Flammability of Self Supporting Plastics
ASTM D638 - Tensile Properties of Plastics
ASTM D695 - Compressive Properties of Rigid Plastics
ASTM D790 - Flexural Properties of Plastics

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

2.3.1 Military Specifications:

MIL-R-9299 - Resin, Phenolic, Laminating

2.3.2 Military Standards:

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

3. TECHNICAL REQUIREMENTS:

Printed in U.S.A.

3.1 Material: Shall be an asbestos felting impregnated with a phenolic resin, partially processed to a "B" stage condition, which will yield a fully cured product by molding under 12 - 15 psi (83 - 103 kPa) pressure at a temperature within the range 300° - 350°F (148.9° - 176.7°C).

3.1.1 Reinforcement: Shall be made from long-staple, nonferrous asbestos fibers containing not less than 99.0% asbestos.

3.1.2 Resin: Shall be a heat-resistant phenolic resin conforming to MIL-R-9299, Type II, Class 1.

3.2 Shelf Life: The preimpregnated material shall have a shelf life of not less than three months from date of impregnation when stored at a temperature not higher than 45°F (7°C). It may be tested at any time during this period for conformance to this specification.

3.3 Properties:

3.3.1 Uncured Properties of Impregnated Product: The product, as supplied, shall conform to the following requirements:

Resin Content, by weight, average	40 - 50%	4.5.1
Volatile Content, by weight, mas	10%	4.5.2
Resin Flow, by weight, min	10%	4.5.3

3.3.2 Properties of Cured Product: The product shall conform to the following requirements, determined on fully-cured laminates prepared in accordance with the manufacturer's recommendations and tested in accordance with the specified test methods:

3.3.2.1 Tensile Strength, min	20,000 psi (138 MPa)	ASTM D638
3.3.2.2 Compressive Strength, min		ASTM D695
Flatwise	30,000 psi (207 MPa)	
Edgewise	7,000 psi (48.3 MPa)	
3.3.2.3 Flexural Strength, Flatwise, min	25,000 psi (172 MPa)	
3.3.2.4 Charpy Impact Resistance, min	3.5 ft-lb per in. of notch (187N·m/m of notch)	ASTM D256
3.3.2.5 Self Extinguishing Time, max	3 sec	ASTM D635
3.3.2.6 Thermal Conductivity, max		ASTM C177, 0.125 in. (3.18 mm) thick specimens

At Temperature of	Btu per in. per hr per sq ft per deg F	(W/m·C)
100°F (37.8°C)	3.0	(0.433)
200°F (93.3°C)	3.2	(0.461)
300°F (148.9°C)	3.4	(0.490)
400°F (204.4°C)	3.6	(0.519)
500°F (260°C)	3.8	(0.548)

3.3.2.7 Dielectric Strength, perpendicular to laminations, min ASTM D229

Specimen Thickness Inch	(mm)	V per mil	V/mm
0.0625	(1.588)	100	3940
0.125	(3.18)	70	2760
0.500	(12.70)	35	1380

3.3.2.8 Weathering: When specified, the product shall have weather resistance acceptable to the purchaser, determined by a procedure agreed upon by purchaser and vendor.

3.3.2.9 Corrosion: The product shall not have a corrosive effect on other materials when exposed to conditions normally encountered in service. Discoloration of metal shall not be considered objectionable.

3.4 Quality: The product shall be uniform in quality and condition, clean, sound, and free from foreign materials and from imperfections detrimental to fabrication, appearance, or performance of parts.

3.5 Tolerances: Unless otherwise specified, the following tolerances shall apply:

	Tolerance on Roll, % plus	minus
Width	10	5
Weight	10	10
Thickness, for nominal thicknesses:		
Up to 0.125 in. (3.18 mm), incl	10	10
Over 0.125 in. (3.18 mm)	15	10

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product shall supply all samples 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 perform such confirmatory testing as he deems 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 uncured properties of impregnated product (3.3.1) and compressive strength (3.3.2.2), flexural strength (3.3.2.3), Charpy impact resistance (3.3.2.4), thermal conductivity at 300°F (148.0°C) (3.3.2.6), and dielectric strength (3.3.2.7) of cured product are classified as acceptance or routine control tests.

4.2.2 Qualification Tests: Tests to determine conformance to all technical requirements of this specification are classified as qualification or periodic control tests.

4.2.2.1 For direct U.S. Military procurement, qualification test material and supporting test data shall be submitted to the cognizant qualification agency as directed by the request for procurement, the procuring activity, or the contracting officer.

4.3 Sampling: Sufficient product shall be selected from each lot of product to perform all required Ø tests as follows; a lot shall be all product produced in a single production run from the same batch of raw materials under the same fixed conditions and submitted for vendor's inspection at one time.

Property	Paragraph Reference	Number of Tests
Resin Content	3.3.1	3
Volatile Content	3.3.1	3
Resin Flow	3.3.1	1
Tensile Strength	3.3.2.1	1
Compressive Strength	3.3.2.2	2
Flexural Strength	3.3.2.3	1
Impact Resistance	3.3.2.4	1
Self-Extinguishing Time	3.3.2.5	1
Thermal Conductivity	3.3.2.6	5
Dielectric Strength	3.3.2.7	3

4.4 Approval:

4.4.1 Sample material shall be approved by purchaser before material for production use is supplied, unless such approval be waived. Results of tests on production material shall be essentially equivalent to those on the approved sample.

4.4.2 Vendor shall use ingredients, manufacturing procedures, processes, and methods of inspection Ø on production material which are essentially the same as those used on the approved sample material. If any change is necessary 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 and processing and, when requested, sample revised material. No production material made by the revised procedure shall be shipped prior to receipt of reapproval.

4.5 Test Methods:

4.5.1 Resin Content: Shall be determined on three specimens cut from the product, each specimen being approximately 1 in. or 25 mm square. Place each specimen in a dried and weighed crucible, dry at 350° - 400°F (176.7° - 204.4°C) in a circulating-air oven for not less than 5 min., cool in a desiccator, and determine original weight of each specimen. Heat to 900°F ± 5 or 482°C ± 3, hold at temperature for 4 hr ± 0.1 (to prevent the resin from carbonizing), and heat for not less than 1 hr at 1500°F ± 10 or 816°C ± 6 (to eliminate the water of crystallization of the asbestos). Cool in a desiccator and determine the weight of the ash or residue from each specimen. Calculate resin content as follows:

$$\text{Resin content, } \% = 100 - \frac{\text{Ash Wt} \times 100}{\text{Original Wt} \times 0.86}$$

(The 0.86 in the above formula is the correction factor for the water of crystallization of the asbestos.)

4.5.2 Volatile Content: Shall be determined as the average of three specimens cut from the product. The specimens shall be accurately weighed, dried in an oven at 250°F ± 2 or 121°C ± 1 for not less than 15 min., cooled to room temperature in a desiccator, and weighed accurately. Calculate volatile content as follows:

$$\text{Volatile content, } \% = \frac{\text{Wt Loss} \times 100}{\text{Original Wt}}$$