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AEROSPACE MATERIAL SPECIFICATION

SAE AMS 3642D

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Submitted for recognition as an American National Standard

Superseding AMS 3642C

Plastic Moldings, Laminated, Thermosetting Resin Glass Cloth Reinforced Heat Resistant

1. SCOPE:

1.1 Form:

This specification covers a glass-cloth-reinforced thermosetting resin in the form of laminated, pressure-bag or matched-die moldings.

1.2 Application:

These moldings have been used typically for parts requiring thermal stability consistent with good mechanical properties when exposed to temperatures up to 260 °C (500 °F) continuously or up to 315 °C (599 °F) intermittently, but usage is not limited to such applications.

1.3 Safety - Hazardous Materials:

While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The applicable issue of referenced publications shall be the issue in effect on the date of the purchase order.

QUESTIONS REGARDING THIS DOCUMENT: (724) 772-7154 FAX: (724) 776-0243
TO PLACE A DOCUMENT ORDER: (724) 776-4970 FAX: (724) 776-0790
SAE WEB ADDRESS: http://www.sae.org

2.1 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM D 149	Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies
ASTM D 150	A-C Loss Characteristics and Permittivity (Dielectric Constant) of Solid Electrical Insulating Materials
ASTM D 256	Impact Resistance of Plastics and Electrical Insulating Materials
ASTM D 570	Water Absorption of Plastics
ASTM D 635	Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
ASTM D 638	Tensile Properties of Plastics
ASTM D 638M	Tensile Properties of Plastics (Metric)
ASTM D 695	Compressive Properties of Rigid Plastics
ASTM D 695M	Compressive Properties of Rigid Plastics (Metric)
ASTM D 790	Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D 790M	Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials (Metric)
ASTM D 792	Specific Gravity (Relative Density) and Density of Plastics by Displacement

2.2 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-STD-2073-1	DOD Material, Procedures for Development and Application of Packaging Requirements

3. TECHNICAL REQUIREMENTS:

3.1 Material and Fabrication:

The product shall consist of layers of woven glass cloth impregnated with a thermosetting resin and molded to the required shape by pressure-bag or matched-die techniques.

3.1.1 Glass Cloth Reinforcement: Shall be a continuous-filament woven cloth. Prior to being impregnated with the resin, the cloth shall have been heat-cleaned followed by chemical treatment with a suitable glass cloth finish such as hydrolyzed aminotriethoxysilane. Mat or unidirectional (nonwoven) fabrics suitably treated may be used in noncritical areas, as required, for bosses, fill-ins, and corner reinforcements or as thickening agents.

3.1.2 Impregnating Resin: Shall be a heat-resistant, thermosetting resin formulated to meet the requirements of this specification.

3.1.3 Gel Coat: Integrally-molded resin gel-coats, overlays, or other surfacing materials shall not be used.

3.1.4 Gaps: There shall be no gaps between pieces of glass cloth. Lap widths shall be not less than 0.5 inch (13 mm).

3.2 Appearance:

The product shall be furnished in its natural color and condition.

3.3 Properties:

The product, in areas having a parallel layup, shall conform to the requirements shown in Table 1, 3.3.3, and 3.3.4; tests shall be performed on the product supplied and in accordance with specified test methods, insofar as practicable.

TABLE 1 - Properties

Paragraph	Property	Requirement	Test Method
3.3.1	As Received:		
3.3.1.1	Tensile Strength, minimum	40.0 ksi (276 MPa)	ASTM D 638 or ASTM D 638M
3.3.1.2	Compressive Strength, minimum (Edgewise)	35.0 ksi (241 MPa)	ASTM D 695 or ASTM D 695M
3.3.1.3	Flexural Strength, minimum	35.0 ksi (241 MPa)	ASTM D 790 or ASTM D 790M
3.3.1.4	Impact Resistance, minimum per unit of notch	10 foot-pounds per inch (534 J/m)	ASTM D 256, Method A
3.3.1.5	Water Absorption (24 hours immersion), maximum	0.3%	ASTM D 570
3.3.1.6	Specific Gravity, minimum at 23/23 °C (73/73 °F)	1.9	ASTM D 792 Method A
3.3.1.7	Flammability, maximum Burn length after flame removal	1 inch (25.4 mm)	ASTM D 635 (See 8.2)

TABLE 1 - Properties (Continued)

Paragraph	Property	Requirement	Test Method
3.3.1.8	Dielectric Constant, Dry, maximum at 10^6 Hz	6.0	ASTM D 150
3.3.1.9	Dissipation Factor, Dry, maximum at 10^6 Hz	0.03	ASTM D 150
3.3.10	Dielectric Strength, Short Time Test, parallel to laminations, minimum	10 kV	ASTM D 149
3.3.2	Dry Heat Resistance:		
3.3.2.1	Compressive Strength, minimum (Edgewise) at 260 °C (500 °F) after 1000 hours at 260 °C (500 °F)	10.0 ksi (68.9 MPa)	ASTM D 695 or ASTM D 695M
3.3.2.2	Flexural Strength at 260 °C (500 °F) after 30 minutes ± 2 at 260 °C (500 °F), % retained, minimum	75%	ASTM D 790 or ASTM D 790M
3.3.2.3	Impact Resistance at 260 °C (500 °F) after 1000 hours at 260 °C (500 °F), minimum per unit of notch	5 foot-pounds per inch 267 J/m	ASTM D 257 Method A

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

3.3.4 Corrosion: The product shall not have a corrosive effect on other materials when exposed to conditions normally encountered in service, determined by a procedure agreed upon by purchaser and vendor. Discoloration of metal shall not be considered objectionable.

3.4 Quality:

The product, as received by purchaser, shall be uniform in quality and condition, and free from foreign materials and from imperfections 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. 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: Test for requirements shown in Table 2 are acceptance tests and shall be performed on each lot.

TABLE 2 - Acceptance Tests

Requirement	Paragraph Reference
Flexural Strength	3.3.1.3
Water Absorption	3.3.1.5
Specific Gravity	3.3.1.6
Dielectric Strength	3.3.1.10
Flexural Strength at 260 °C (500 °F) after exposure to 260 °C (500 °F)	3.3.2.2

4.2.2 Preproduction Tests: Tests for all technical requirements are preproduction tests and shall be performed prior to or on the initial shipment of moldings to a purchaser, when a change in ingredients and/or processing 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, contracting officer, or request for procurement.

4.3 Sampling and Testing:

Shall be as follows:

4.3.1 For Acceptance Tests: Sufficient product 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 If test specimens cannot be prepared from the product, a separate laminated test specimen shall be prepared upon request of purchaser. This laminated test sample shall be 0.125 inch ± 0.010 (3.18 mm ± 0.25) thick, having parallel layup, and having the same ingredients and processing as used for the moldings represented; the specific gravity of the test panel shall be within ±0.05 of that of the moldings.

4.3.1.2 A lot shall be all moldings of the same configuration made from the same batches of ingredients in one production run and presented for vendor's inspection at one time.

4.3.1.3 An inspection lot shall be not more than 400 moldings or 200 pounds (91 kg), whichever is the lesser mass.

4.3.1.4 When a statistical sampling plan has 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 4.5 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 moldings shall be approved by purchaser before moldings for production use are supplied, unless such approval be waived by purchaser. Results of tests on production moldings 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 moldings which are essentially the same as those used on the approved sample moldings. 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 ingredients and/or processing and, when requested, sample moldings. Production moldings made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Reports:

The vendor of moldings shall furnish with each shipment a report showing the results of tests to determine conformance to the acceptance test requirements and stating that the moldings conform to the other technical requirements. This report shall include the purchase order number, lot number, AMS 3642D, vendor's compound number, form and size or part number, and quantity.

4.6 Resampling and Retesting:

If any specimen used in the above tests fails to meet the specified requirements, disposition of the moldings may be based on the results of testing three additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the moldings represented. Results of all tests shall be reported.