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AEROSPACE MATERIAL SPECIFICATION

AMS 3845A
Superseding AMS 3845

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CLOTH, TYPE "E" GLASS
"B" Stage Addition Cure Polyimide-Resin-Impregnated

1. SCOPE:

1.1 Form: This specification and its supplementary detail specifications cover glass cloth impregnated with a heat-reactive, thermosetting, addition-cure polyimide resin system, the resin to be supplied in a "B" stage condition.

1.2 Application: Primarily for laminated structural parts requiring high strength and long-term heat resistance up to 230°C (450°F) and short-term exposure up to 290°C (555°F).

1.3 Classification: Cloth shall be as specified in the applicable detail specification, wherein each cloth is defined by form and property characteristics.

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 3619 - Resin, Polyimide, Laminating, High Temperature Resistant, 315°C (600°F)
AMS 3824 - Cloth, Type "E" Glass, Finished for Resin Laminates

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

ASTM D638 - Tensile Properties of Plastics
ASTM D790 - Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D2344 - Apparent Interlaminar Shear Strength of Parallel Fiber Composites by Short Beam Method
ASTM D2734 - Void Content of Reinforced Plastics

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 Detail Specifications: The requirements for a specific cloth shall consist of all requirements specified herein in addition to the requirements specified in the applicable detail specification. In case of conflict between the requirements of this basic specification and an applicable detail specification, requirements of the detail specification shall govern.

3.2 Material:

3.2.1 Reinforcement: Shall conform to AMS 3824, unless otherwise specified in the applicable detail specification.

3.2.2 Resin: Shall conform to AMS 3619, unless otherwise specified in the applicable detail specification.

3.2.3 Storage Life: Shall be as specified in the applicable detail specification.

3.3 Properties:

3.3.1 Uncured Properties of Impregnated Cloth: Cloth, as received, shall conform to the requirements of this specification and the applicable detail specification.

3.3.2 Properties of Cured Product: Cloth shall conform to the requirements of the applicable detail specification for tests at 25°C ± 3 (77°F ± 5), at 230°C ± 5 (450°F ± 9), and at 290°C ± 5 (555°F ± 9), determined on laminates prepared as in 4.5.1. Properties of laminates of constructions other than as specified in 4.5.1 shall be as agreed upon by purchaser and vendor. The resin content, molding pressure, and cure cycle for each panel shall be reported.

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3.4 Quality: Cloth, as received by purchaser, shall be uniform in quality and Ø condition, clean, smooth, and free from foreign materials and from imperfections detrimental to usage of the cloth.

3.5 Tolerances: Width shall not vary more than +1/2 in. (+12.5 mm), -0 from the width ordered.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of cloth shall supply all samples for vendor's tests and shall be responsible for performing all required Ø 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 cloth conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for Ø uncured properties (3.3.1) and properties of the cured product at 25°C (77°F) 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 Ø and shall be performed prior to or on the initial shipment of impregnated cloth 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 Ø 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 cloth shall be taken at random from each Ø lot to permit performing 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 shown in 4.3.1.1.

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4.3.1.1 Frequency of Sampling: Shall be according to the following schedule:

Requirement		Minimum Number of Determinations per Requirement	Test Procedure
Resin Solids	Each roll	2	4.5.2
Volatile Content	Each roll	1	4.5.2
Gel Time	Each roll	1	4.5.3
Resin Flow	Each roll	1	4.5.4
Tensile Strength	Lot basis	4	4.5.5
Short Beam Shear Strength	Lot basis	4	4.5.6
Flexural Strength	Lot basis	4	ASTM D790
Flexural Modulus	Lot basis	4	ASTM D790
Void Content	Lot basis	3	ASTM D2734

4.3.1.2 A roll is the basic unit and shall not exceed 250 yd (230 m) in length. It shall be the full width of the broadgoods.

4.3.1.3 A lot shall be all cloth treated at one time without significant changes in treater settings using a single batch of resin and reinforcement and presented for vendor's inspection at one time. An inspection lot shall not exceed 2000 yd (1830 m).

4.3.1.4 When a statistical sampling plan and acceptance quality level (AQL) have been agreed upon by purchaser and vendor, sampling shall be in accordance ø 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 cloth shall be approved by purchaser before cloth for production use is supplied, unless such approval be waived by purchaser. Results of tests on production cloth 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 cloth which are essentially the same as those used on the approved sample cloth. 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 cloth. Production cloth made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Test Methods:

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4.5.1 Preparation of Test Laminates: All test laminates shall be layed up with the warp parallel and unnested so that the satin shafts of the warp always face the top of the layup and shall be molded under appropriate pressure and cured in accordance with resin manufacturer's recommendation. Laminates from which tensile specimens are cut shall be composed of eight plies and shall be not less than 14 in. (350 mm) in the warp direction. Laminates from which specimens for all other tests are cut shall be composed of twelve plies and shall be not less than 12 in. (300 mm) square.

4.5.2 Volatile Content and Resin Solids: Accurately weigh to the nearest 0.01 g (W_1) each of four samples 4-in. (100-mm) square cut on the bias of the product. Using porcelain crucibles previously brought to constant weight by igniting at 565°C ± 25 (1050°F ± 45), dry samples in a circulating air oven at 315°C ± 5 (600°F ± 9) for 10 min. ± 0.5, cool in a desiccator, and reweigh (W_2). Burn out resin in muffle furnace for not less than 180 min. at 565°C ± 25 (1050°F ± 45) until fabric is white. Cool in a desiccator and reweigh. Repeat the burn out as necessary to obtain constant weight (W_3).

$$\text{Volatile Content, \%} = \frac{(W_1 - W_2)}{W_1} \times 100$$

$$\text{Resin Solids (Volatile Free), \%} = \frac{(W_2 - W_3)}{W_2} \times 100$$

where, W_1 = original weight of sample
W_2 = weight of specimen after drying
W_3 = weight of ash

4.5.3 Gel Time: Cut sufficient 2-in. (50-mm) square pieces across the roll width to make a sample approximately 0.200 in. (5.00 mm) thick. Place the sample between sheets of cellophane or other suitable film and insert between the platens of a press which has been stabilized at the temperature specified in the applicable detail specification. Apply sufficient pressure to form a bead of resin around the sample. Timing shall begin as soon as pressure is applied. The resin bead shall be probed at intervals with a wire. Gelling will be preceded by the appearance, during probing, of long strands of resin. Probing shall be continued until these long strands of resin no longer occur; the elapsed time shall be recorded as gel time.

4.5.4 Wet Resin Flow: Cut four 4-in. (100-mm) square pieces on the bias of the weave and weigh to the nearest 0.01 g (W_4). Stack samples between separator sheets approximately 6 x 8 in. (150 x 200 mm) of aluminum foil or equivalent. If the sample tends to stick to the separator sheets after curing, it is permissible to use a nonvolatile mold release agent. Such agents may be used only under conditions such that they do not undergo a

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4.5.4 (Continued):

weight loss greater than 0.005 g during cure. Place samples and separator sheets between press platens preheated to the temperature specified in the applicable detail specification, taking care that the edges of all pieces remain properly aligned. Apply pressure of 15 psi ± 5 (105 kPa ± 35) on the sample and hold at heat for 5 min. ± 0.5, taking care that the edges of all pieces remain properly aligned. Remove sample and cool in desiccator. Remove separators and resin flash by trimming sample to original 4-in. (100-mm) square size, taking care not to remove any reinforcing fibers. Weigh sample to nearest 0.01 g (W_5).

$$\text{Resin flow, \%} = 100 \times \frac{W_4 - W_5}{W_4}$$

where, W_4 = original weight of sample
W_5 = weight of sample after trimming

4.5.5 Tensile Strength: Shall be determined in accordance with ASTM D638, except that the specimen in Fig. 1 shall be used.

4.5.6 Short Beam Shear Strength: Shall be determined in accordance with ASTM D2344, except that a flat specimen shown in Fig. 2 shall be used.

4.6 Reports:

4.6.1 The vendor of cloth shall furnish with each shipment a report showing the results of tests to determine conformance to the acceptance test requirements and stating that the cloth conforms to the other technical requirements of this specification and the applicable detail specification. This report shall include the purchase order number, AMS 3845A and the applicable detail specification number and its revision letter if any, vendor's material designation, cure cycle for each test panel, quantity, lot number, and roll number.

4.6.1.1 A material safety data sheet conforming to AMS 2825, or equivalent, shall be supplied to each purchaser prior to, or concurrent with, the Ø report of preproduction test results or, if preproduction testing be waived by purchaser, concurrent with the first shipment of impregnated cloth for production use. Each request for modification of formulation shall be accompanied by a revised data sheet for the proposed formulation.

4.6.2 The vendor of finished or semi-finished parts shall furnish with each shipment a report showing the purchase order number, AMS 3845A and the applicable detail specification number and its revision letter if any, contractor or other direct supplier of cloth, supplier's material

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4.6.2 (Continued):

designation, part number, and quantity. When cloth for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of cloth to determine conformance to the requirements of this specification and shall include in the report either a statement that the cloth conforms or copies of laboratory reports showing the results of tests to determine conformance.

4.7 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the cloth may be based on the results of testing three additional specimens, cut from the same panel or a newly prepared panel, for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the cloth represented and no additional testing shall be permitted. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Packaging and Identification:

5.1.1 Cloth shall be shipped in rolls with 3 in. (75 mm) nominal ID.

5.1.2 Cloth shall be interleaved with a colored separator in a manner to provide an outer wrapping with not less than 2 in. (50 mm) overlap.

5.1.3 Each roll shall be identified by attached removable tags using characters of such size as to be legible and which will not be obliterated by normal handling. Each tag shall show not less than the following information:

CLOTH, TYPE "E" GLASS, "B" STAGE ADDITION CURE POLYMIDE RESIN IMPREGNATED
AMS 3845/ ___*___
PURCHASE ORDER NUMBER _____
MANUFACTURER'S DESIGNATION _____
DATE OF MANUFACTURE _____
ROLL NUMBER, SEQUENTIAL _____
DATE OF SHIPMENT _____
LOT NUMBER _____
QUANTITY _____

*Insert applicable detail specification number and revision letter

5.1.4 Each roll shall be shipped in sealed, vapor-barrier bags and packaged in outer cartons in such a manner as to ensure that the cloth, during shipment and storage, will not be permanently distorted and will be protected against damage from exposure to weather or any other normal hazard. Each roll shall be shipped in a separate container. The rolls shall be supported by the core.

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5.1.5 Each container shall be legibly marked with not less than the following information, except storage temperature may be as agreed upon by purchaser and vendor.

CLOTH, TYPE "E" GLASS, "B" STAGE POLYIMIDE RESIN IMPREGNATED, STYLE 181 SERIES FABRIC
AMS 3845/ ___ *
DATE OF IMPREGNATION _____
PURCHASE ORDER NUMBER _____
DATE OF SHIPMENT _____
LOT NUMBER _____
MANUFACTURER'S NAME _____
PERISHABLE - STORE BELOW (See applicable detail specification)
QUANTITY _____

*Insert applicable detail specification number and revision letter

5.1.6 Ø Cloth shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the cloth to ensure carrier acceptance and safe delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.

5.1.7 Ø For direct U.S. Military procurement, packaging shall be in accordance with MIL-STD-794, Level A or Level C, as specified in the request for procurement. Commercial packaging as in 5.1.1, 5.1.2, 5.1.4, and 5.1.6 will be acceptable if it meets the requirements of Level C.

6. ACKNOWLEDGMENT: A vendor shall mention this specification number and the applicable detail specification number and its revision letter, if any, in all quotations and when acknowledging purchase orders.

7. REJECTIONS: Cloth not conforming to this specification and the applicable detail specification or to modifications authorized by purchaser will be subject to rejection.

8. NOTES:

8.1 Marginal Indicia: The phi (Ø) symbol is used to indicate technical changes from the previous issue of this specification.

8.2 Dimensions and properties in inch/pound units and the Celsius temperatures are primary; dimensions and properties in SI units and the Fahrenheit temperatures are shown as the approximate equivalents of the primary units and are presented only for information.

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