

**AEROSPACE
MATERIAL
SPECIFICATION**

AMS 3822

Issued 5-1-69
Revised 1-1-83

**CLOTH, TYPE "E" GLASS
"B" Stage Epoxy Resin Impregnated Style 181 - 75DE**

This specification was declared "NONCURRENT" by the Aerospace Materials Division of SAE, as of January 1, 1983. It is recommended, therefore, that this specification not be specified for new designs. Style 181 cloth is no longer manufactured. The following specification should be considered for application where the AMS 3822 material would have been suitable:

AMS 3821 CLOTH, GLASS, STYLE 7781 FABRIC, Epoxy Resin Impregnated,
Flame Resistant

AMS 3831 CLOTH, GLASS, STYLE 7781 FABRIC, Epoxy Resin Impregnated, 175 (350)

This cover sheet should be attached to the "No Change" issue of the subject specification.

This specification is under the jurisdiction of AMS Committee "C", NOMETCOM.

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AEROSPACE MATERIAL

Society of Automotive Engineers, Inc.
TWO PENNSYLVANIA PLAZA, NEW YORK, N.Y. 1000

SPECIFICATION

AMS 3822

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Revised

CLOTH, TYPE "E" GLASS
"B" Stage Epoxy Resin Impregnated, Style 181 - 75DE

1. **ACKNOWLEDGMENT:** A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.
2. **FORM:** Rolls of glass cloth impregnated with epoxy resin and partially processed to a "B" stage condition.
3. **APPLICATION:** Primarily for laminates requiring high strength and long term heat resistance at temperatures up to 175 C (347 F) and fabricated by autoclave, press, or vacuum bag techniques.
4. **TECHNICAL REQUIREMENTS:** When ASTM methods are specified for determining conformance to the following requirements, tests shall be conducted in accordance with the issue of the ASTM method listed in the latest issue of AMS 2350.
 - 4.1 **General:**
 - 4.1.1 **Reinforcement:** Shall conform to AMS 3823.
 - 4.1.2 **Resin:** Shall be an epoxy resin modified as necessary to meet the requirements of this specification.
 - 4.1.3 **Shelf Life:** The preimpregnated material shall have a shelf life of not less than 3 months from time of shipment when stored at a temperature not higher than 7 C (44.6 F). It may be tested at any time during this period for conformance to this specification.
 - 4.2 **Uncured Properties of Impregnated Cloth:** The material product, as received, shall conform to the following requirements:

Resin Solids (Volatile Free), % by wt	33 - 37 See Note 1
Volatiles, % by wt	1 - 4 See Note 1
Gel Time, min.	1 - 4 See Note 2
Resin Flow, %	5 - 15 See Note 3

REAFFIRMED

Note 1. Volatile and resin content shall be determined by accurately weighing (W_1) 4 x 4 in. samples (or equivalent area) cut from the product. Using porcelain crucibles previously brought to constant weight by igniting at $845\text{ C} \pm 25$ ($1553\text{ F} \pm 45$), dry samples in an air circulating oven at $165\text{ C} \pm 5$ ($329\text{ F} \pm 9$) for 20 min., cool in a desiccator, and reweigh (W_2).

Burn out resin in muffle furnace for 3 hr at $565\text{ C} \pm 25$ ($1049\text{ F} \pm 45$). Cool in a desiccator and reweigh. Repeat the 565 C (1049 F) burn out as necessary to obtain constant weight (W_3).

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

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

where, W_1 = Original Weight of specimen

W_2 = Weight of specimen After 20 min.
at 165 C (329 F).

W_3 = Weight of Ash

Note 2. Cut sufficient 2 x 2 in. pieces across the roll width to make a sample approximately 0.200 in. 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 $165\text{ C} \pm 3$ ($329\text{ F} \pm 5.4$). 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.

Note 3. Cut four 4 x 4 in. pieces and weigh to the nearest 0.01 g (W_1). Stack pieces between 2 separator sheets, approximately 6 x 8 in., of aluminum foil or equivalent and reweigh pieces and foil to nearest 0.01 g (W_2).

Note. 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 weight loss of greater than 0.005 g during curing.

Place samples and separator sheets between press platens preheated to $165\text{ C} \pm 3$ ($329\text{ F} \pm 5.4$), taking care that the edges of all pieces remain properly aligned. Apply pressure of $800\text{ lb} \pm 20$ ($50\text{ psi} \pm 1.25$ on sample) and hold for 10 min. while maintaining press platens at $165\text{ C} \pm 3$ ($329\text{ F} \pm 5.4$). Remove sample and cool in desiccator. Weigh sample with separators to nearest 0.1 g (W_3). Remove separators and resin flash, trimming sample to original 4 x 4 in. size, taking care not to remove any reinforcing fibers. Weigh sample to nearest 0.01 g (W_4).

$$\text{Resin Flow, \%} = 100 \times \frac{W_1 - (W_2 - W_3) - W_4}{W_1 - (W_2 - W_3)}$$

- 4.3 **Cured Properties:** Unless otherwise specified, panels no less than 12 by 12 in. consisting of 8 - 13 plies, when molded at 50 psi into a flat laminate, cured at $170\text{ C} \pm 5$ ($338\text{ F} \pm 9$) for 1 - 2 hr, and post-cured for 1 hr at $150\text{ C} \pm 5$ ($302\text{ F} \pm 9$) plus 2 hr at $175\text{ C} \pm 5$ ($347\text{ F} \pm 9$) plus 2 hr at $205\text{ C} \pm 10$ ($401\text{ F} \pm 18$) shall conform to the following requirements:

Tensile Strength, psi, min	50,000	ASTM D638
Compressive Strength, psi, min	50,000	ASTM D695 (See Note 4)
Flexural Ultimate, psi, min	80,000	ASTM D790
Flexural Modulus, psi, min	3.3×10^6	ASTM D790

Note 4. Compressive properties shall be determined in accordance with ASTM D695 except that the specimen supporting jig shall be modified to incorporate specimen end clamps. An example of a suitable supporting jig with end clamps is shown in Fig. 1. In addition, the specimen configuration shall be modified to conform to Fig. 2.

5. **TESTING FREQUENCY:** Unless otherwise specified, the vendor shall test the product according to the following schedule:

Resin Solids	Every master roll
Volatiles	Every master roll
Gel Time	Every master roll
Resin Flow	Every master roll
Tensile Strength	Lot basis
Compressive Strength	Lot basis
Flexural Strength	Lot basis
Flexural Modulus	Lot basis

- 5.1 The basic unit offered for acceptance shall not exceed 60 yards in length.
- 5.2 A lot shall consist of all material treated at one time without significant changes in treater settings of a single batch of resin and reinforcement and offered for acceptance at one time. Unless otherwise specified, a lot shall not exceed 2000 pounds.

6. **QUALITY:** The product shall be uniform in quality and condition, and free from foreign materials and from internal and external imperfections detrimental to fabrication, appearance, or performance of parts.

7. **REPORTS:**

- 7.1 Unless otherwise specified, the vendor of the product shall furnish with each shipment three copies of a report of the results of tests to determine conformance to the technical requirements of this specification. This report shall include the purchase order number, material specification number, vendor's material designation, and quantity.
- 7.2 Unless otherwise specified, the vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, material specification number, contractor or other direct supplier of material, supplier's material designation, and quantity. When material for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification, and shall include in the report a statement that the material conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.

8. **IDENTIFICATION:**

- 8.1 Unless otherwise specified, each roll shall be identified by attached removable tags using characters not less than 3/8 in. in height which will not be obliterated by normal handling.

- 8.2 Each tag shall be legibly marked to give the following information:

CLOTH, TYPE "E" GLASS, "B" STAGE EPOXY RESIN IMPREGNATED
AMS 3822

PURCHASE ORDER NUMBER _____

MANUFACTURER'S DESIGNATION _____

DATE OF MANUFACTURE _____

9. PACKAGING:

- 9.1 All material shall be shipped on reels or spools with 3 in. inside diameter; width shall be as specified by the purchaser, $\pm 1/2$ inch.
- 9.2 All material shall be interleaved with non-embossed, colored polyethylene in a manner to provide an outer wrapping with a minimum of 2 in. overlap.
- 9.3 All material shall be shipped in sealed polyethylene bags and packaged in outer cartons in such a manner as to insure that the product, during shipment and storage, will not be permanently distorted and will be protected against damage from exposure to weather or any normal hazard.
- 9.4 Each container shall be legibly marked with the following information:

CLOTH, TYPE "E" GLASS, "B" STAGE EPOXY RESIN IMPREGNATED
AMS 3822

DATE OF IMPREGNATION _____

PURCHASE ORDER NUMBER _____

DATE OF SHIPMENT _____

LOT NUMBER _____

MANUFACTURER'S NAME _____

PERISHABLE - STORE BELOW 7 C (45 F)

10. APPROVAL:

- 10.1 To assure adequate performance characteristics, 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.
- 10.2 Vendor shall use ingredients, manufacturing procedures, processes, and methods of inspection on production material which are essentially the same as those used on the approved sample material. If any change in ingredients, in type of equipment for processing, or in manufacturing procedures is necessary, vendor shall submit samples for reapproval unless purchaser grants written approval after review of a detailed statement of materials and processing used on the approved sample and those proposed. No production material made by the revised procedure shall be shipped prior to receipt of approval of such procedure.

11. REJECTIONS: Material not conforming to this specification or to authorized modifications will be subject to rejection.

Note. For definition of terms, refer to ASTM D123.