



AEROSPACE MATERIAL SPECIFICATIONS

SOCIETY OF AUTOMOTIVE ENGINEERS, Inc.

485 Lexington Ave., New York, N. Y. 10017

AMS 3830

Issued 11-1-67

Revised

SILICA CLOTH

"B" Stage Phenolic Resin Impregnated High Pressure Molding

1. **ACKNOWLEDGMENT:** A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.
2. **FORM:** Rolls of silica cloth or tape impregnated with phenolic resin and partially processed to a "B" stage condition.
3. **APPLICATION:** Primarily for tape wrapping into contoured laminates for use as thermal insulators and ablative components.
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 **Material:** Unless otherwise specified, the product shall be furnished in rolls of resin impregnated silica cloth partially processed to a "B" stage condition capable of being wrapped, or otherwise assembled, and fully processed by molding at 1000 psi pressure and 300 - 350 F (148.9 - 176.7 C) temperature.
 - 4.1.1.1 The silica cloth shall contain not less than 98.5% silica and shall be produced from glass cloth conforming to the latest issue of MIL-Y-1140, cloth number 184-150.
 - 4.1.1.2 The resin used for impregnating the silica cloth shall be a heat resistant phenolic resin formulated to meet the requirements of the latest issue of MIL-R-9299, Type II, Class 2.
 - 4.1.1.2.1 Unless otherwise specified, the vendor shall further define the properties of the "A" resin by establishing procurement limits for the following characteristics: viscosity, non-volatile matter, pH, specific gravity, water, formaldehyde, and gel time. The purchaser shall be advised of these limits and they shall become a part of this specification as applicable to that specific vendor.
 - 4.1.1.3 The resin as employed for impregnating shall contain no solid fillers or catalysts unless approved by purchaser.
 - 4.1.2 **Shelf Life:** The preimpregnated material shall have a shelf life of not less than 3 months when stored at a temperature not higher than 45 F (7.2 C). It may be tested at any time during this period for conformance to this specification.
 - 4.2 **Uncured Properties of Impregnated Cloth:** Unless otherwise specified, the material, when received by the purchaser, shall conform to the following requirements:

Resin Solids (Volatile Free), % by wt	27 - 33	See Note 2
Volatiles, % by wt	4 - 6	See Note 2
Resin Flow, %	3 - 15	See Note 3
Chang Index	28 - 32	See Notes 1 and 4
Advancement Index	0.87 - 0.93	See Notes 1 and 5
Tack, lb, min	2	See Note 6
Drape	Pass	See Note 7

Note 1. Values outside the specified range shall not be cause for rejection if all other requirements of this specification are met.

Note 2. Volatile and resin content shall be determined by accurately weighing (W_1) 4 x 4 in. specimens (or equivalent area) cut from the product. Using porcelain crucibles previously brought to constant weight by igniting at $1550\text{ F} \pm 50$ ($843.3\text{ C} \pm 28$), dry specimens in an air circulating oven at $325\text{ F} \pm 10$ ($162.8\text{ C} \pm 5.6$) for 20 min., cool in a desiccator, and reweigh (W_2).

Burn out resin in muffle furnace for 3 hr at $1550\text{ F} \pm 50$ ($843.3\text{ C} \pm 28$). Cool in a desiccator and reweigh. Repeat 1550 F (843.3 C) 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

W_2 = Weight of Material After 20 min. at 325 F (162.8 C).

W_3 = Weight of Ash.

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

Note. If the sample tends to stick to the separator after curing, it is permissible to use a non-volatile 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 panels and separator sheets between press platens preheated to $300\text{ F} \pm 5$ ($148.9\text{ C} \pm 2.8$) taking care that the edges of all panels remain properly aligned. Apply pressure of $3200\text{ lbs} \pm 80$ ($200\text{ psi} \pm 5$ on panels) and hold for 10 min. while maintaining press platens at $300\text{ F} \pm 5$ ($148.9\text{ C} \pm 2.8$). Remove sample and cool in desiccator. Weigh sample with separators to nearest 0.01 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 laminate to nearest 0.01 g (W_4).

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

Note 4. Mix $15 \pm 1\text{ g}$ of material with 50 ml of acetone and agitate thoroughly for approximately 10 minutes. Then decant to a 125 ml glass stoppered Erlenmeyer Flask which has been tared to the nearest 0.1 g. (If the liquid shows suspended particles or cloudiness, it will be necessary to filter through filter paper.) Stopper the flask as soon as all the liquid is decanted or filtered into it. Weigh the flask and contents to the nearest 0.001 g (W_1). Obtain the tare weight of an aluminum drying dish (or equivalent) to 0.0001 g (W_2) and carefully pour about 1 g of the solution into the dish. Restopper the flask immediately and re-weigh (W_3). Evaporate most of the acetone from the aluminum dish on an electric hot plate and then place in an oven at $275\text{ F} \pm 15$ ($135\text{ C} \pm 8.3$) for 5 minutes. Cool the dish in a desiccator and reweigh to 0.0001 g (W_4). The resin solids content of the solution is then:

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

If the resin solid content of the solution is less than 4%, discard the solution and prepare another solution by mixing a larger sample for a longer time. Place the flask containing the remaining solution on the pan of a triple beam balance capable of weighing to the nearest 0.1 gram. Add acetone from a squeeze bottle until:

$$\frac{\% \text{ Resin Solids} \times (\text{Weight Original Solution})}{4} = \text{Weight Final Solution}$$

