AERONAUTICAL MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.
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AMS 3605C

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PLASTIC SHEET, POST-FORMING
Cotton Fabric Reinforced Phenol-Formaldehyde

1. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

2. APPLICATION: Primarily for drawing and bending, by the post-forming method, into parts where good mechanical properties are important but electrical properties are of secondary importance.

3. MATERIAL AND FABRICATION: Flat sheets, consisting of laminations of cotton fabric which have been impregnated with a thermosetting, phenolic type of synthetic resin, and properly cured.

4. TECHNICAL REQUIREMENTS:

4.1 General:

4.1.1 Color: Unless otherwise specified, the color shall be natural. Supplementary coloring, when specified, shall be substantially uniform throughout the sheets. The faces of the sheets shall be substantially free from streaks or stains.

4.1.2 Finish: Semi-gloss, unless otherwise specified.

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

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

4.1.5 Machinability: Sheet, at room temperature, shall not split, crack, chip or delaminate when punched in thicknesses 1/8 in. and under, or when drilled, sawed or machined in any thickness.

4.2 Properties: Unless otherwise specified, the product shall conform to the following requirements in both warp and fill directions; tests shall be performed on the product supplied and in accordance with listed ASTM methods, or as otherwise specified.

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4.2.1	Tensile Strength, psi, min	7,500	ASTM D638-52T
4.2.2	Ultimate Compressive Strength, Flatwise, psi, min	30,000	ASTM D695-52T
4.2.3	Flexural Strength, Flatwise, psi, min	16,000	ASTM D790-49T
4.2.4	Impact Strength, Edgewise (Notched Izod), ft-lb per in. of notch, min	1.5	ASTM D256-47T
4.2.5	Bend Radius, Room Temp.	4OT	See 4.3.1
4.2.6 Ø	Afterglow (as received), sec, max	4	See 4.3.2
4.2.7	Afterglow, Subsequent to Conditioning 168 hr at 225 F ± 5, sec, max	15	See 4.3.2

4.2.7.1 Material shall be capable of meeting the requirement of 4.2.7 but Ø individual lots need not be tested.

Nominal Thickness (See Note 1)	4.2.8 Water Absorption (24 hr immersion) % gain, max	4.2.9 Post Forming Heating Time Range Limits sec	4.2.9 Post Forming Inside Radius Inch	4.2.10 Dimensional Stability Springback degrees, max	4.2.11 Drawing Depth of Draw, Inches
	ASTM D570-42	See 4.3.3 and Notes 2, 3 & 4		See 4.3.4	See 4.3.5
1/32	7.5	20 to 35	1/32	32	1-3/8
Ø 3/64	5.2	30 to 50	1/16	27	1-3/8
1/16	4.4	40 to 70	3/32	25	1-1/4
3/32	3.2	60 to 95	3/16	20	1-1/8
1/8	2.5	80 to 120	5/16	15	3/4
5/32	2.2	100 to 160	7/16	12	---
3/16	1.9	130 to 200	9/16	9	---
7/32	1.8	160 to 240	13/16	7	---
1/4	1.6	180 to 260	1	6	---

Note 1. For intermediate thicknesses not listed in the table, the values of heating time, bend radius and draw ring for the next larger thickness shall be used.

Note 2. The optimum heating time for each acceptable material shall have at least a fisec spread within the acceptable time range limits. The manufacturer shall record the optimum time for his material in the report specified in 7.1.

Note 3. Small blisters up to 1/4 in. in diameter are permissible after heating but prior to forming provided they do not exceed 4 per sq ft per side, and are ø not gathered together in clusters. After forming, specimens shall show no signs of splitting or delamination which causes a break in the fabric reinforcement. Small checks not exceeding 1/8 in. long are permissible.

Note 4. After removal from the forms the specimens shall retain an angle of not over 93 degrees.

4.3 Test Methods:

4.3.1 Bending: A 1 in. wide specimen cut from any direction of sheet shall not split, crack, craze or delaminate when bent at room temperature, through an angle of 180 deg around the radius given in 4.2.5. Permanent set of the specimen is permissible.

4.3.2 Afterglow: Three specimens, 6 x 1/2 in., shall be placed in a shielded area of subdued light, such as an unlighted fume hood, mounted horizontally as in ø ASTM D635-44, except that the screen need not be used. A Meker or similar large top burner with a flame 1 in. long shall be placed so that the tip of the flame contacts the plastic, and 1 in. of the plastic is covered by the flame. The specimens shall be heated 15 sec for each 1/32 in. of thickness and fraction thereof. At the end of the ignition period the burner shall be removed and the flame on the specimen shall be blown out. The duration of visible glow shall then be noted.

4.3.3 Post-Forming: Six 2 x 6 in. specimens, three longitudinal and three transverse, shall be tested. The specimens shall be heated in a forced-circulation type air oven at 475-525 F for the optimum time given in 4.2.9. Immediately (within 10 sec) after heating, the specimens shall be bent through an angle of 90 deg between wooden or cast resin forms and allowed to cool in the forms. The male form shall have a radius as specified and the female shall have a radius equal to the male plus the sheet thickness.

4.3.4 Dimensional Stability: The specimens successfully formed in 4.3.3 shall be heated by immersing in water at 180 F ± 2 for 1 hour. After removing from the water and cooling unrestrained, the amount of springback shall not exceed the values shown in 4.2.10.

4.3.5 Drawing: Specimens 6 in. in diameter shall be heated as specified in 4.2.9. Immediately (within 10 sec) after the heating, the specimens shall be drawn in a suitable jig having a steel mandrel and draw ring. The mandrel (male die) shall be a 3 in. diameter cylinder with a 1.5 in. spherical radius on the contact end. The draw ring (female die) shall have a cylindrical hole (diameter equal to 3 in. + 2.5 times the thickness of sheet) through which the mandrel travels in making the draw, and shall be maintained at 275-300 F. A draw radius of 0.125 in. shall be provided on the inside of the draw ring. The specimen shall be clamped at 20 psi against the draw ring before the draw begins. Under those conditions, the sheet shall produce satisfactory draws as given in 4.2.11.

5. QUALITY: The product shall be uniform in quality and condition, free from blisters, wrinkles, cracks, crazing and surface roughness, and reasonably free from other small defects such as scratches and dents.

6. SIZES AND TOLERANCES: Unless otherwise specified, the following shall apply:

6.1 Length and Width: Shall not vary more than ± 1 in. from the nominal dimensions except in cases where test specimens have been removed to ensure compliance with this specification. In the event that these tests are necessary, no more than 4 sq ft should be cut from a given batch. In these cases the size of the portion of material removed must be noted by legibly marking on the outside of the package.

6.2 Thickness: Standard thicknesses and tolerances shall be as follows:

Nominal Thickness Inch	Tolerance, Inch	
	Plus	Minus
1/32	0.0065	0.0065
3/64	0.0075	0.0075
1/16	0.0075	0.0075
3/32	0.009	0.009
1/8	0.010	0.010
5/32	0.011	0.011
3/16	0.0125	0.0125
7/32	0.014	0.014
1/4	0.030	0.000

6.3 Warp and Twist: Shall not exceed 1% based on a 36 in. length, and shall be determined in accordance with ASTM D709-52T.

7. REPORTS:

7.1 Unless otherwise specified, the vendor of the product shall furnish with each shipment three copies of a report stating that the product meets the requirements of this specification. This report shall include the purchase order number, material specification number, vendor's compound number, optimum heating time, form or part number, 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, part number, 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.