AERONAUTICAL MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.
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AMS 3605A

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

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

2. APPLICATION: Primarily intended 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 sheet. The faces of the sheets shall be substantially free from streaks or stains.

4.1.2 Finish: Semi-gloss.

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 or other deleterious effect on other materials when exposed to conditions normally encountered in service. Discoloration of metals shall not be considered objectionable.

4.2 Properties: Unless otherwise specified, the product shall conform to the following requirements; tests shall be performed on the product supplied and in accordance with listed ASTM methods, insofar as practicable:

Property	Warp, min	Filling min	Test Method
Tensile Strength, psi	7,500	7,500	ASTM D229-46
Modulus of Elasticity in Tension, psi	910,000	940,000	ASTM D638-46T
Ultimate Compressive Strength Flatwise, psi	30,000	30,000	ASTM D229-46
Flexural Strength, Flatwise, psi	16,000	16,000	ASTM D790-45T

Property	Warp, min	Filling min	Test Method
Impact Strength, Edgewise, (Notched Izod) ft-lb per in. of notch	1.5	1.5	ASTM D256-47T

Property	Value	Test Method
Density, g per cc	1.35 ± 0.05	ASTM D634-44
Water Absorption, (24 hr immersion) % gain, max		ASTM D570-42
1/32 in. thickness	7.5	
1/16	4.4	
3/32	3.2	
1/8	2.5	
3/16	1.9	
1/4	1.6	

Note: For intermediate thicknesses not given in the table, the value for the next smaller thickness applies.

4.3 Bending: A one inch 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 a diameter equal to eighty times the nominal thickness of the sheet. Permanent set of the specimen is permissible.

4.4 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 within the limits given below. Immediately (within 10 sec) after heating, the specimens shall be bent through an angle of 90 degrees between wooden or cast resin forms having an inside radius as specified, and allowed to cool in the forms:

Nominal Thickness, Inch	Heating Time Range Limits, Seconds	Inside Radius, Inch
1/32	20 to 30	1/32
1/16	40 to 60	3/32
3/32	60 to 90	3/16
1/8	80 to 120	5/16
3/16	130 to 200	9/16
1/4	180 to 260	1

Note 1: The optimum heating time for each acceptable material shall have at least a five-second spread within the acceptable time range limits. The manufacturer shall record the optimum time for his material as specified in 7.1.

Note 2: For intermediate thicknesses not listed in the table, the values of heating time for the next smaller thickness applies.

After removal from the forms, the specimens shall show no signs of splitting, cracking, crazing, blistering, or delamination, and shall retain an angle of not over 93 degrees.

4.5 Dimensional Stability: The specimens successfully formed in 4.4 shall be heated by immersing in water at 180 F for one hour. After removing from the water and cooling unrestrained, the amount of springback shall not exceed the following values:

Nominal Thickness, Inch	Springback Degrees, max
1/32	30
3/64	27
1/16	25
3/32	20
1/8	15
5/32	12
3/16	9
7/32	7
1/4	6

4.6 Drawing: Specimens 6 in. in diameter shall be heated as specified in 4.4. Immediately (within ten seconds) 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 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 these conditions, the sheet shall produce satisfactory draws as follows:

Nominal Thickness Inch	Depth of Draw, Inch
1/16	1
3/32	13/16
1/8	5/8

4.7 Machinability: Sheet, at room temperature, shall not split, crack, chip or delaminate when punched in thickness up to an including 1/8 in. or when drilled, sawed or machined in any thickness.

5. QUALITY: The sheet 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.

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

Nominal Thickness Inch	Tolerance Inch
1/32	± 0.0065
3/64	± 0.0075
1/16	± 0.0075
3/32	± 0.009
1/8	± 0.010
5/32	± 0.011
3/16	± 0.0125
7/32	± 0.014
1/4	+ 0.030 - 0.000

6.3 Warp and Twist: The warp and twist are determined by suspending the sheet in a vertical position against a horizontal straight edge at least 36 in. long and measuring the greatest deviation. The deviation from the straight edge shall not exceed 1%. Warp or twist shall be stated as a percentage of the 36-in. length in the direction measured.

7. REPORTS:

7.1 Unless otherwise specified, the vendor of sheet shall furnish with each shipment three copies of a notarized report stating that the sheet conforms to the requirements of this specification. This report shall include the purchase order number, material specification number, vendor's material number, optimum heating time, size, thickness, and quantity.

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

8. IDENTIFICATION: Unless otherwise specified, each sheet shall be marked on one corner with the manufacturer's identification, month and year of manufacture, and AMS 3605A. The characters shall be not less than 3/8 in. in height, shall be applied using a suitable marking fluid, and shall not be obliterated by normal handling.

9. PACKAGING:

9.1 Packaging shall be accomplished in such a manner as to insure that the sheet or parts, during shipment and storage, will not be permanently distorted, and will be protected against exposure to undue weathering or harmful agents of any kind.