AERONAUTICAL MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.
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AMS 3535

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MOISTURE-VAPOR RESISTANT SHEET

1. ACKNOWLEDGMENT: Vendor shall mention this specification number in all quotations and when acknowledging purchase orders.

2. MATERIAL: The material shall be an opaque, flexible, moisture resistant sheet constructed of one or more plies. Its use is intended for envelopes or bags for enclosing aircraft components and/or spare parts, preparatory to shipment or storage.

3. REQUIREMENTS: (a) Moisture Vapor Transmission Rate.- The moisture vapor transmission rate of the sheet shall not exceed .09 grams of water/100 square inches/24 hours when tested as directed in paragraph 4(a).

(b) Heat Sealability and Seal Strength.- Material shall be capable of being heat sealed at 325-375°F (162.8-190.6°C) to form a seal as resistant to moisture vapor transmission as material having no seam. The seal shall be capable of withstanding static load of not less than 4 pounds per inch length of seam when tested in accordance with paragraph 4(b). Separation shall occur only between the sealed surfaces.

(c) Bursting Strength.- The bursting strength shall not be less than 55 points determined in accordance with procedure specified in paragraph 4(c).

(d) Heat Seal Coating.- The heat seal coating shall be colored to provide visual indication of a uniform coating and have a softening temperature of not less than 175°F (79.4°C).

(e) Water Resistance.- The outside surface of the material shall repel water and shall not disintegrate or delaminate when submerged in water for 24 hours.

(f) Oil Resistance.- The heat sealing surface of the material shall not be soluble or delaminate in engine lubricating oil of any viscosity.

(g) Handling.- The properties of the sheet shall not be impaired by operations such as converting, folding, creasing and heat sealing.

(h) Resistance to Blocking.- The adhesion between the heat-sealable surfaces of two sheets of material, when tested as directed in paragraph 4(d) shall not be sufficient to adversely affect the Moisture Vapor Transmission Rate and Bursting Strength of the material.

4. TEST PROCEDURES: (a) Moisture Vapor Transmission Rate.-

(1) Humidity Cabinet.- The humidity cabinet for this test shall be the General Foods Moisture Vapor Transmission Cabinet or the equivalent. The cabinet shall provide a relative humidity of 90-95 percent at a temperature of 100°F ± 0.5° (37.8°C ± 0.3°), with no condensation on the test dishes or in the space in which the dishes are placed. Circulation over the test dishes shall be negligible.

(2) Desiccator.- The desiccator shall be of such size as to permit 12 dishes to be racked vertically with a large dish of anhydrous calcium chloride, on the top shelf. Sufficient space shall be provided between the shelves and sides to allow ample opportunity for air circulation.

(3) Test Dishes and Brass Templates.- The test dish, preferably of glass, and brass template shall be made as shown in Figure I, or be the equivalent.

(4) Procedure.- A representative sample of the sheet about 6 inches square shall be selected. Four equidistant parallel folds shall be placed in the square by alternating the direction of folding on each successive fold so that the apex of each successive fold is facing an opposite side of the sheet in accordion style. The sample shall be creased by placing it between two 6 by 10-inch flat rigid plates and applying a total weight of 36 pounds (6 pounds per inch length of fold) for one minute on the sample. The center of gravity of the weight shall be over the center of the sample. The sample shall then be opened and the folding and creasing-under-weight process repeated making the second series of four folds perpendicular to the original folds. A circular sample shall then be cut from the center of the creased square.

A 50-ml beaker shall be filled with 8-mesh anhydrous calcium chloride (min 96 percent as $CaCl_2$) and then emptied into a test dish which has been cleaned with solvent to remove all traces of wax, dirt, etc. The calcium chloride shall be spread evenly over the bottom surface of the dish and the sample placed over the calcium chloride concentric with the rim of the dish. The brass template shall be carefully placed over the sample, care being taken to have the template centralized with respect to the dish top before allowing it to come into contact with the sample being tested.

A wax mixture consisting of 60-percent amorphous wax and 40-percent paraffin wax shall be heated in a porcelain crucible to at least 212°F (100°C). It shall then be poured through a 20-mesh screen to remove any large pieces of foreign matter that may be in the wax. The wax mixture shall be poured into the annular space between the template and the rim of the test dish, filling up this space to approximately flush with the top of the template. The dish shall then be placed in a refrigerator or maintained at a low temperature for about 5 minutes in order to harden the wax sufficiently so that the template can be removed. Care shall be taken to prevent the wax from becoming hard and brittle by exposure to a low temperature for too long a period. The template shall be removed by inserting a screw-driver under an ear of the template and giving a slight twist, tending to press the wax against the dish and at the same time raising the template. This shall be done on the 3 ears of the template. Any difficulty experienced in removing the template from the dish can be overcome by first rubbing the edge of the template with vaseline before pouring the wax.

4. TEST PROCEDURES: (a) (cont'd)

(4) (cont'd)

After the template has been removed, the dish and sample assembly shall be inspected for loose pieces of wax, etc., and examined for flaws in the seal. To prevent condensation the test dish and sample shall be placed in an oven at room temperature, the oven turned on and set at 100°F. When the oven is up to temperature, the test dish and samples shall then be placed in the humidity cabinet under the conditions specified in paragraph 4a(1) for a period of 40-48 hours. Afterwards it shall be dried in a desiccator for four hours and weighed on an analytical balance. The dish shall then be returned to the humidity cabinet for a period of 140 hours, dried in the desiccator for four hours, and reweighed.

The moisture vapor transmission rate shall be calculated as follows:

$$.84\ (B-A) = \text{grams of water/100 sq. in./24 hours}$$

where

A = Weight of dish before 140 hours humidity test
B = Weight of dish after 140 hour humidity test and four hours in desiccator.

Two samples of each piece of sheet to be tested shall be used and the results from the two dishes then averaged for the final result. In case of a variance of more than 10 percent a duplicate set of tests shall be run to determine whether this difference is due to an error in the procedure or to determine whether the sheet is of a non-uniform variety.

(b) Seal Strength.- Each specimen shall be prepared by heat sealing two 1 inch wide strips with a lap of approximately 1 inch, the seal being across width of specimen and in a plane perpendicular to the plane of remainder of specimen. Specimens shall be allowed to rest, after formation of heat seals, for not less than 24 hours at room temperature before being tested. Specimens shall be clamped in the jaws of testing apparatus with seal midway between jaws and line of seal perpendicular to direction of load. Each seal shall withstand, without separation of more than 1/4 inch occurring at seam line, a load of 4 pounds for one hour at 77°F ± 5° (25°C ± 2.8°). Failure of one or more of six specimens to withstand such loading shall be cause for rejection of material.

(c) Bursting Strength.- The bursting strength shall be determined in accordance with the procedure described by TAPPI-T403m.

(d) Resistance to Blocking.- Two specimens of material with their heat sealable surfaces facing each other shall be placed on a smooth, hard, plane surface, and on top of these plies shall be placed a resilient pad pressed down with such a weight as to produce a pressure of three pounds per square inch. This assembly shall be stored in an oven maintained at a constant temperature of 150°F ± 3° (65.6°C ± 1.7°), and shall be removed at the end of 24 hours and allowed to cool to room temperature. The weight and pad shall then be removed and an attempt made to separate the two plies. In case the two plies separate readily, no further test is necessary. If there is visual evidence of damage to either or both sheets, moisture vapor transmission rate and bursting strength tests shall be made on specimens subjected to blocking test.

5. QUALITY: Material shall be of uniform quality and condition, clean and free from defects detrimental to fabrication and to performance of material and parts in service.

6. REPORTS: Unless otherwise specified, the vendor shall furnish with each shipment three copies of a notarized report of the results of tests to determine conformance to this specification. This report shall include the purchase order number, material specification number, vendor's identification, quantity, and date of shipment.

7. PACKAGING: Unless otherwise specified in the purchase order the material shall be supplied on rolls to the specified width. When specified as flat, cut stock it shall be wrapped completely in clean paper. Each layer of material shall be interleaved with a sheet of paper if required to prevent blocking. All rolls and flat stock shall be packed in exterior containers of suitable strength and rigidity to prevent damage to edges of the materials.

8. MARKING: The following marking shall appear on the top and on one end or side of each shipping container:

MOISTURE VAPOR RESISTANT SHEET.
Specification AMS 3535
Width _____
Length (if flat, sheets are furnished) _____
Gross Weight
Manufacturer's name or trade mark
Purchase Order Number _____
Date of Manufacture _____

9. APPROVAL: A manufacturer shall not supply material to this specification until samples have been approved by the purchaser. After approval the constituents and methods of manufacture shall not be changed without permission from the purchaser. Results of tests on incoming shipments shall be as good as, or better than, those on approved samples.

10. REJECTIONS: Material not conforming to this specification, or to modifications specified on the drawing or purchase order, is subject to rejection. If samples for verification are desired by the vendor, they must be claimed within three weeks. Rejected material or parts will be held a reasonable time, at vendor's expense, unless purchaser receives, within three weeks of notification of rejection, other instructions for disposition.