

AERONAUTICAL MATERIAL SPECIFICATION

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Revised

FLAME RESISTANCE TREATMENT OF INTERIOR FABRICS

1. **ACKNOWLEDGMENT:** A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.
2. **APPLICATION:** Primarily intended to apply to uncoated interior fabrics for applications requiring more than normal flame resistance in commercial transport aircraft.
3. **TECHNICAL REQUIREMENTS:** The treating agent, and the fabric after being treated to resist combustion, shall be capable of meeting the following requirements:
 - 3.1 **Color and Finish:** The treating agent shall be colorless and not more than slightly turbid. The overall treating process shall not affect the surface finish or color of the fabric. A refinishing operation to restore the original finish is permissible. Observations shall be made under north light.
 - 3.2 **Neutrality and Corrosion:** The pH of the treating agent shall be 6.0 to 8.0 when determined on a suitable pH measuring instrument, and if the active ingredients are solids, a solution of recommended strength shall show no more than 0.5 pH units change after standing 24 hours at 150 F $\pm$ 5. Samples, 4 x 6 in., of treated fabric shall show no more serious discoloration than untreated fabric when held in contact with polished panels of copper and of aluminum and exposed for 40 hours in a standard weathering unit such as an Atlas Weather-Ometer, using a 17-3 cycle.
 - 3.3 **Flexibility:** A specimen 1 x 15 in. shall be cut from the untreated fabric and its flexibility determined by placing it flat on a horizontal support, such as a glass plate, and moving it forward along its lengthwise axis until its free end hangs vertical under its own weight. The position of the fixed end on the plate shall then be noted, and the vertical distance from the plane of the glass plate to the free end of the specimen shall be measured and recorded as initial overhang. A 1 x 15 in. specimen of treated fabric shall then be placed on the glass plate with the fixed end at the same point as noted for the untreated specimen, and the vertical distance between the glass plate and the free end measured and recorded as the treated overhang. The treated overhang shall be at least 90% of the initial overhang. Tests shall be made at a temperature of 65 to 75 F.
 - 3.4 **Tensile Strength (Grab Method):** The average tensile strength of treated fabric shall be not less than that of untreated fabric which has undergone similar processing using water. Tests shall be conducted according to ASTM D39-39, using three specimens instead of five.

- 3.5 Dry Heat Aging: The tensile strength of treated fabric shall be not less than 90% of that of untreated fabric after samples of both conditions have been exposed to dry heat at a temperature of $180\text{ F} \pm 2$ for 10 days in a mechanical convection oven, removed from the oven, and cooled to room temperature and tested. Preparation of samples, conditioning after exposure, and tensile test procedure shall be in accordance with ASTM D39-39, except that three samples, instead of five, shall be tested from each condition and direction of the fabric.
- 3.6 Moist Heat Aging: The tensile strength of the treated fabric shall not be less than 90% of the untreated fabric after samples in both conditions have been exposed to moist heat and tested as follows:
- 3.6.1 Specimens shall be suspended, with their short dimension vertical, in a suitable closed container containing water to a depth of one inch, taking care that the specimens do not come in contact with the liquid water. A small orifice shall be provided in the cover to release any pressure developed during the test. The container shall be maintained at a temperature of $180\text{ F} \pm 2$ for ten days, during which period observations shall be made periodically to insure the presence of water. Specimens shall then be removed from the container, cooled to room temperature and tested. Preparation of samples, conditioning after exposure, and tensile test procedure shall be in accordance with ASTM D39-39, except that three samples, instead of five, shall be tested from each condition and direction of the fabric. Samples of treated fabric shall also be examined for efflorescence, as noted in 3.9.
- 3.7 Fading Test: Treated fabric shall not exhibit color changes greater than untreated samples, after samples in both conditions have been exposed to two dry 24-hour cycles in a standard weathering and fading unit such as an Atlas Weather-Ometer or an FDA Fade-Ometer.
- 3.8 Dry Cleaning: The flame resistance of the treated fabric shall not be reduced beyond the permissible limits of paragraph 3.13 by four dry cleanings. Two dry cleanings are to be performed with Stoddards Solvent and two with either carbon tetrachloride or trichlorethylene. Tests shall be conducted in an Atlas Launder-Ometer as specified by the AATCC Handbook.
- 3.9 Efflorescence, Spotting and Dusting: Treated fabric shall show no evidence of efflorescence, spotting and dusting when examined under a magnification of 30 diameters after moist heat aging, 3.6, fading test, 3.7, and the following moisture test:
- 3.9.1 Dampen a five-gram cotton pad with water and squeeze out the excess by hand until approximately 15 grams of water remain. Place the pad on a four-inch glass mandrel and completely cover the cotton by spirally wrapping with a 1 x 12 in. treated specimen. Allow to stand at room temperature for 12 hours, remove the fabric and allow to dry.
- 3.10 Odor: There shall be no noticeable odor after 24 hours exposure to still air at room temperature.

- 3.11 Toxicity: The treated fabric shall not have harmful effects on the skin. Vapors released by the treated fabric while burning shall not be more toxic than vapors released by burning the untreated fabric. Certification must be furnished from an approved biological or equivalent laboratory indicating the absence of toxic vapors in the products formed during decomposition of the treating agent by burning and/or at smoldering temperatures.
- 3.12 Weight:
- 3.12.2 The gain in weight resulting from the treatment shall not exceed 15% on fabrics weighing 5 oz or less per square yard, 12% on fabrics weighing 6 - 8 oz inclusive, and 8% on fabrics weighing more than 8 oz.
- 3.12.2 The increase in weight of the treated fabric after 24 hours exposure in a humidity cabinet (90% minimum relative humidity at 65 - 80 F) shall not exceed the increase in weight of an untreated sample, similarly exposed, by more than 5%. Both treated and untreated specimens shall be conditioned in dry air at 180 ± 2 F for five hours immediately before the humidity exposure.
- 3.13 Flame Resistance: After removal of the igniting source the duration of flaming shall be one second or less, and the afterglow shall be five seconds or less when tested as follows:
- 3.13.1 A total of 18 specimens $2 \times 12\frac{1}{2}$ in., six in the treated condition as received, six after exposure to the dry heat aging as in paragraph 3.5, and six after moist heat aging as in 3.6, shall be subjected to the fire test. One-half of each set of specimens shall be cut with the long dimension in the direction of the warp, and the other half with the long dimension in the direction of the filling. The specimens shall be suspended vertically from a clamp covering the upper $\frac{1}{2}$ inch of the length. To protect the specimens from drafts, the apparatus shall be enclosed in a shield of suitable material 12 in. wide, 12 in. deep, and 30 in. high, open at the top, and provided with a vertical sliding glass front. Sufficient room shall be left at the bottom of the front to allow manipulation of the gas burner used in igniting the specimens. The specimens shall be suspended with their lower end $\frac{3}{4}$ in. above the top of a $\frac{3}{8}$ in. Bunsen or Tirrill gas burner, and with the air supply shut off, the burner shall be adjusted to give a luminous flame $1\frac{1}{2}$ in. long. The flame shall be applied vertically at the center of the width of the lower end of the specimens for 12 seconds, then withdrawn, and the duration of flaming and glowing in the specimens after withdrawal of the burner noted.
- 3.14 Char Length: The length of char of the specimens tested in paragraph 3.13 shall not be more than $4\frac{1}{2}$ inches for fabrics weighing 5 oz or less per square yard, 3 in. for fabrics weighing 6 - 8 oz inclusive, and 2 in. for fabrics weighing over 8 oz, when measured as follows: