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SAE The Engineering Society For Advancing Mobility Land Sea Air and Space

400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 3819

Issued 7-1-87

CLOTHS, CLEANING
For Aircraft Primary and Secondary Structural Surfaces

1. SCOPE:

1.1 Form: This specification covers both woven and nonwoven absorbent materials supplied in the form of cloths.

1.2 Application: Primarily for use in cleaning smooth or textured, metallic and nonmetallic surfaces preparatory to processing operations which are sensitive to residual surface contamination. Cloths are not intended for use on transparencies.

1.3 Classification: Cloths covered by this specification are classified as follows:

Type 1 - Virgin cloth, composed of 100% cotton fibers.
Type 2 - Virgin cloth, composed of 100% synthetic or blended synthetic/natural fibers.
Grade A - For use in cleaning operations where residual surface contamination levels are exceptionally critical.
Grade B - For use in cleaning operations where low residual surface contamination levels are required.

1.3.1 Grade A cloths may be substituted for Grade B at any time for processing operations.

1.3.2 Unless a specific type cloth is specified by purchaser, either type may be supplied.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM D1117 - Testing Nonwoven Fabrics
ASTM D1193 - Reagent Water
ASTM D1776 - Conditioning Textiles For Testing
ASTM D2257 - Extractable Matter In Yarn
ASTM D3776 - Mass per Unit Area (Weight) of Woven Fabric
ASTM E70 - pH of Aqueous Solutions With The Glass Electrode
ASTM E168 - General Techniques of Infrared Quantitative Analysis

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Federal Specifications:

TT-M-261 - Methyl Ethyl Ketone, Technical

2.3.2 Military Specifications:

MIL-D-6998 - Dichloromethane, Technical
MIL-C-38736 - Compound, Solvent, For Use In Integral Fuel Tanks
MIL-T-81533 - Trichloroethane 1,1,1 (Methyl Chloroform), Inhibited, Vapor Degreasing

3. TECHNICAL REQUIREMENTS:

3.1 Composition:

3.1.1 Type 1 cloths shall be composed of 100% virgin cotton fibers, with or without added binders.

3.1.2 Type 2 cloths shall be composed of 100% synthetic or blended synthetic, cotton, or cellulosic materials with or without added binders, which remain relatively stable up to 400°F (205°C).

3.2 Construction: Cloths shall be orientated into a planar assembly by woven or nonwoven techniques to yield a dry cloth weight of 1.8 to 6.0 oz per sq yd (50 to 170 g/m^2). Sizing shall be as specified by purchaser.

3.3 Binder: Binding materials shall be water insoluble and shall not exceed 5% of the dry cloth weight.

3.4 Color: Shall be unbleached white.

3.5 Cleanliness: Cloths shall be visibly clean and free of discolorations, embedded particles, oils, greases, and other nonspecification materials, determined in accordance with 4.5.2.

3.6 Workmanship: Cloths shall be manufactured by the best available commercial practices and shall meet all technical requirements of this specification.

3.6.1 Cloths shall be free of broken, starched, stiffened, or napped fibers, and free of uneven, ragged, or frayed edges. Type 1 cloths shall be scoured to remove natural oils.

3.6.2 Cloths shall be free of silicone oils and residues, determined in accordance with ASTM E168. The infrared analysis shall be made on samples prepared from either the TT-M-261 or MIL-D-6998 extracts of 3.7.7.

3.7 Properties: Cloths shall conform to the following requirements; tests shall be performed on the cloths supplied and in accordance with specified test methods, insofar as practicable:

3.7.1 Weight: Shall be within ±10% of the preproduction cloth weight, determined in accordance with ASTM D3776.

3.7.2 Water Absorption: Cloths shall absorb not less than 400% of the dry cloth weight, determined in accordance with ASTM D1117 (large samples).

3.7.3 Water Absorption Rate: Shall be not more than 45 sec, determined in accordance with 4.5.3.

3.7.4 Linting: Cloths shall not lint more than 10 mg per sq ft, determined in accordance with 4.5.4.

3.7.5 Cloth Integrity: Specimens tested for linting properties as in 3.7.4 shall not tear on the screen wires after 25 circumferential strokes.

3.7.6 Fiber/Binder Integrity: Cloths shall leave no visible residue on the glass surface, determined in accordance with 4.5.5.

3.7.7 Extractable Matter: Cloths shall meet the requirements of Table I, determined in accordance with ASTM D2257.

TABLE I

Extractant	Extractable Matter % of Dry Cloth Weight, max	
	Grade A	Grade B
ASTM D1193, Type IV	0.25	0.50
TT-M-261	0.25	0.50
MIL-T-81533	0.10	0.20
MIL-D-6998	0.25	0.40
MIL-C-38736	0.25	0.45

3.7.8 pH: The pH of the water extract shall be 6.0 to 7.5, determined in accordance with ASTM E70.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the cloths shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.6. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the cloths conform to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for weight (3.7.1), linting (3.7.4), cloth integrity (3.7.5), ASTM D1193 and MIl-C-38736 extractable matter (3.7.7), and pH (3.7.8) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Preproduction Tests: Tests to determine conformance to all technical requirements of this specification are classified as preproduction tests and shall be performed prior to or on the initial shipment of cloths to a purchaser, when a change in material, processing, or both requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.2.2.1 For direct U.S. Military procurement, substantiating test data and, when requested, preproduction test material shall be submitted to the cognizant agency as directed by the procuring activity, the contracting officer, or the request for procurement.

4.3 Sampling: Shall be as follows:

4.3.1 For Acceptance Tests: Sufficient cloths shall be taken at random from each lot to perform all required tests. The number of determinations for each requirement shall be as specified in the applicable test procedure or, if not specified therein, not less than three.

4.3.1.1 A lot shall be all cloths of the same type and grade produced in one continuous production run and presented for vendor's inspection at one time. An inspection lot shall not exceed 5000 lb (2275 kg) and may be packaged and delivered in smaller quantities under the basic lot approval provided lot identification is maintained.

4.3.1.2 When a statistical sampling plan and acceptance quality level (AQL) have been agreed upon by purchaser and vendor, sampling shall be in accordance with such plan in lieu of sampling as in 4.3.1 and the report of 4.6 shall state that such plan was used.

4.3.2 For Preproduction Tests: As agreed upon by purchaser and vendor.

4.4 Approval:

4.4.1 Sample cloths shall be approved by purchaser before cloths for production use are supplied, unless such approval be waived by purchaser. Results of tests on production cloths shall be essentially equivalent to those on the approved sample.

4.4.2 Vendor shall use materials, manufacturing procedures, and methods of inspection on production cloths which are essentially the same as those used on the approved sample cloths. If necessary to make any change in materials, in type of equipment for processing, or in manufacturing procedures, vendor shall submit for reapproval a statement of the proposed changes in materials, processing, or both and, when requested, sample cloths. Production cloths made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Test Methods: Tests to determine conformance to requirements of this specification shall be conducted as follows:

4.5.1 Test Conditions: Except where otherwise specified herein, all cloths shall be preconditioned in accordance with ASTM D1776 prior to testing. Where an environmental chamber is utilized for preconditioning, the test area environment shall be maintained at 65° to 85°F (20° to 30°C) and a relative humidity of 50 to 70%.

4.5.2 Cleanliness: Not less than ten cloths shall be examined under 5X magnification and an impinging light source with an illuminance of 750 to 850 ft-candles (8075 to 9150 lx), measured at a distance of 6 in. (150 mm). Acceptability of all ten cloths shall be reported as pass or fail.

4.5.3 Water Absorption Rate: A full-size cloth, up to 10 in. (250 mm) square, shall be marked in 1 in. (25 mm) increments along the centerline of its width and parallel with the fabric or fiber axis. The ends parallel with the width shall be suitably restrained by metal tabs sized to cover approximately 0.25 in. (6 mm) of the cloth along the width. By grasping one of the restrained ends, lower the cloth in a free hanging (vertical) state into a suitable receptacle filled with approximately 0.50 in. (12.5 mm) of tap water up to a point below the 1-in. (25-mm) marker. Begin timing the rate of water rise when the water level reaches the 2-in. (50-mm) marker. Report the rate of water rise between the 2-in. and 3-in. (50-mm and 75-mm) markers as the average of five samples.

4.5.3.1 If desired, a suitable coloring agent may be added to the water to impart contrast on the cloth to assist in determination.

4.5.4 Linting:

4.5.4.1 Equipment: Shall be one 8 in. (200 mm), No. 40 (425 µm) U.S. Standard sieve with drop pan which has been solvent washed and dried to constant weight at 150°F + 2 (65°C + 1) for 1 hr; one analytical balance with a rated sensitivity of 0.1 mg; one 8 to 9 in. (200 to 225 mm) diameter, medium texture, prepleated filter paper; and one cylindrical bar weighing 450 to 470 g with a contact surface diameter of 2.0 in. + 0.01 (50 mm ± 0.25) and all corner transitions radiused at 0.50 in. (12.5 mm).

4.5.4.2 Procedure: Weigh the filter paper on the analytical balance to the nearest 0.1 mg (W1), place it within the drop pan and install the sieve. Wrap two cloth plies securely around the bar so as to prevent wrinkles and folds at the contact surface. Place the wrapped bar on the sieve and while keeping the bar in a fixed orientation, move the bar around the circumference of the sieve for 25 complete motions. Remove the cloth plies and examine for tears. Without disassembling the sieve, repeat procedure nine additional times using new cloth plies on each repetition. Upon completion, carefully remove filter paper from sieve assembly and weigh on the analytical balance to the nearest 0.1 mg (W2). Calculate linting as follows:

$$(14.4/A) \times (W2 - W1) = \text{Linting in mg/sq ft}$$

where:

A = contact surface area of bar in sq in.

4.5.5 Fiber/Binder Integrity: Cut a 4 in. (100 mm) square sample and place between two clear pieces of 0.25 in. (6.2 mm) high temperature glass plates (i.e. Pyrex or equivalent) which have been solvent washed and dried to constant weight at 150°F + 2 (65°C + 1) for 60 min. + 5. Place sandwiched cloth in a circulating-air oven which has been preheated to 400°F + 10° (205°C + 5°). Hold sample at temperature for not less than two hours. Allow sandwiched cloth to cool below 120°F (50°C) before removal from the oven. Separate and view the contacting surfaces of the glass for visible indications of deposited residue. Browning or discoloration of the cloth is acceptable. Obvious charring of the cloth is not acceptable. Observations shall be reported as "pass" or "fail".

4.6 Reports: The vendor of cloths shall furnish with each shipment a report showing the results of tests to determine conformance to the acceptance test requirements and stating that the cloths conform to the other technical requirements of this specification. This report shall include the purchase order number, AMS 3819, lot number, type and grade, vendor's material designation, and quantity.