

Cloth, Airplane, Mercerized Cotton
80 Pounds Force (356 N) Breaking Strength

RATIONALE

This standard has been revised as a result of the normal 5 year review process. The revisions made update some of the test methods and reference documents for more specific detail and methodology.

1. SCOPE

1.1 Form

This specification covers one strength and one weave of mercerized cotton cloth known as "airplane cloth."

1.2 Application

This cloth has been used typically for covering aircraft surfaces, such as wings, fuselage, ailerons, elevators, and other airfoil surfaces, but usage is not limited to such applications.

1.3 Safety-Hazardous Materials

While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

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2.1 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM D 629	Quantitative Analysis of Textiles
ASTM D 3775	Standard Test Method for Warp (End) and Filling (Pick) Count of Woven Fabrics
ASTM D 3776/D3776M	Mass per Unit Area (Weight) of Woven Fabric
ASTM D 5034	Breaking Force and Elongation of Textile Fabrics (Grab Test)
ASTM D 5035	Breaking Force and Elongation of Textile Fabrics (Strip Test)

2.2 U.S. Government Publications

Available from the Document Automation and Production Service (DAPS), Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6257, <http://quicksearch.dla.mil/>.

MIL-STD-2073-1	DOD Materiel, Procedures for Development and Application of Packaging Requirements
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3. TECHNICAL REQUIREMENTS

3.1 Material

3.1.1 Mercerization

The cloth shall be piece mercerized, or the yarn may be mercerized under tension.

3.1.2 Yarn

The cloth shall be woven from 2-ply, combed cotton yarn.

3.1.3 Weave

The weave shall be plain (one up and one down).

3.1.4 Finishing

The cloth shall be uniformly finished in accordance with the best practice for high-grade airplane cloth. Finishing shall consist of washing, framing, and calendering. The calendering shall be sufficient to lay any nap present and shall provide a smooth, even surface. Nap may be removed by singeing.

3.2 Properties

The cloth shall conform to requirements shown in Table 1; tests shall be performed on the cloth supplied and in accordance with specified test methods.

TABLE 1 - PROPERTIES

Paragraph	Property	Requirement	Test Method
3.2.1	Weight:		ASTM D 3776/D3776M
3.2.1.1	Ounces per square yard, maximum		
	Nominal width: 36 inches	4.0	
	42 inches	4.0	
	60 inches and over	4.5	
3.2.1.2	g/m ² , maximum		
	Nominal width: 914 mm	136	
	1067 mm	136	
	1524 mm and over	153	
3.2.2	Thread Count, ends per inch (25.4 mm):		ASTM D 3775
	Warp and Fill, each	80 to 84	
3.2.3	Breaking Strength, each direction:		ASTM D 5035,
	Pounds force per inch width, minimum	80	
	(kN/m width), minimum	(14.0)	
3.2.4	Elongation:	Warp	Fill
	At 70 pounds force (311 N) load, (All Widths), maximum	16%	11%
3.2.5	Burst Strength: Mullen, minimum	170 points	4.5.2
3.2.6	Sizing, Finishing, and Other Non-Fibrous Materials, maximum	3.5%	ASTM D 629, Equation 3
3.2.6.1	A desizing operation may be performed to reduce the sizing content to the maximum specified.		

3.3 Quality

The cotton fibers shall be evenly spun into yarns of proper and uniform yarn count, twist, and diameter to produce the texture and weight required. The yarn shall be reasonably free from nap breaks, broken ends, uneven threads, and knots. Yarns shall be closely woven into fabric, uniform in body and appearance, and which shall be reasonably free from striations due to variable weaving operations.

3.4 Tolerances

Shall be as shown in Table 2.

3.4.1 Width

TABLE 2A - WIDTH TOLERANCES,
INCH/POUND UNITS

Nominal Width Inches	Tolerances plus and minus Inches
36	1/2
42	5/8
60	1
69	1
90	1-1/2

TABLE 2B - WIDTH TOLERANCES,
SI UNITS

Nominal Width Millimeters	Tolerances plus and minus Millimeters
914	12.7
1067	15.9
1524	25.4
1753	25.4
2286	38.1

3.4.2 Length of Cut

The length of a single cut shall be not less than 40 yards (36.6 m) except that 10% of the total yardage of one width under any contract or order may be in short lengths of 10 to 25 yards (9 to 23 m). However, short lengths shall be rolled together and the roll properly labeled to indicate that it is composed of short lengths.

3.4.3 Length of Roll

The cloth shall be furnished on rolls containing the lengths shown in Table 3.

TABLE 3A - ROLL LENGTHS
INCH/POUND UNITS

Nominal Width Inches	Roll Length Yards
36 and 42	500 to 600
60 and 69	250 to 300
90	175 to 200

TABLE 3B - ROLL LENGTHS
SI UNITS

Nominal Width Millimeters	Roll Length Meters
914 and 1067	457 to 549
1524 and 1753	229 to 274
2286	160 to 183

4. QUALITY ASSURANCE PROVISIONS

4.1 The vendor of cloth shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the cloth conforms to the requirements of this specification.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Tests for weight (3.2.1), thread count (3.2.2), breaking strength (3.2.3), elongation (3.2.4), quality (3.3), and tolerances (3.4) are acceptance tests and shall be performed on each lot.

4.2.2 Preproduction Tests

Tests for all technical requirements are preproduction tests and shall be performed prior to or on the initial shipment of cloth to a purchaser, when a change in ingredients and/or processing 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, contracting officer, or request for procurement.

4.3 Sampling and Testing

Shall be as follows:

4.3.1 For Acceptance Tests

Each lot of cloth shall be 100% examined visually for quality (3.3). Sufficient cloth shall be taken at random from each lot to perform all other 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, taken from the full width of cloth.

4.3.1.1 A lot shall be all cloth produced in a single production run under the same fixed conditions and presented for vendor's inspection at one time. A lot shall not exceed 5000 yards (4572 m).

4.3.1.2 When a statistical sampling plan has 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 cloth shall be approved by purchaser before cloth for production use is supplied, unless such approval be waived by purchaser. Results of tests on production cloth shall be essentially equivalent to those on the approved sample.

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

4.5 Test Methods

4.5.1 Elongation

Shall be determined in accordance with ASTM D 5035, at 70 pounds force (311 N) with elongation measured from a base line on the chart to a point at which the curve intersects 70 pounds force (311 N) load ordinate with the base line passing through the point where the curve leaves the zero ordinate.

4.5.2 Bursting Strength

Shall be determined with a hydraulic-type machine in which the cloth is firmly clamped against a rubber diaphragm, through which the pressure is applied to a circular area of approximately 1 square inch (645 mm²). The pressure required to burst the cloth is registered on an accurate Bourdon tube-type gage, calibrated in pounds per square inch (kPa), the readings of which are designated as points. The bursting strength shall be ascertained by taking the average of not less than 10 tests. No less than 20 tests shall be made before a delivery of cloth is rejected.

4.6 Reports

The vendor of cloth shall furnish with each shipment a report showing the results of tests to determine conformance to the acceptance test requirements and stating that the cloth conforms to the other technical requirements. This report shall include the purchase order number, lot number, AMS3806F, vendor's material designation, width, and quantity.

4.7 Resampling and Retesting

If any specimen used in the above tests fails to meet the specified requirements, disposition of the cloth may be based on the results of testing three additional specimens for each original nonconforming specimen. Except as specified in 4.5.2, failure of any retest specimen to meet the specified requirements shall be cause for rejection of the cloth represented. Results of all tests shall be reported.