

Cloth, Parachute - Meta-Aramid, Low Modulus

RATIONALE

AMS 3801B results from a Five Year Review and update of this specification.

1. SCOPE

1.1 Form

This specification covers a low modulus meta-aramid in the form of cloth.

1.2 Application

This products has been used typically for use in construction of parachutes, but usage is not limited to such applications.

1.3 Classification

Low modulus meta-aramid parachute cloth shall be as specified in the applicable detail specification, classified by weight and weave. An example is shown in 8.2. The cloth covered by each detail specification appears as part of the title.

1.4 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 737	Air Permeability of Textile Fabrics
ASTM D 1388	Stiffness of Fabrics
ASTM D 1777	Measuring Thickness of Textile Materials
ASTM D 2261	Tearing Strength of Woven Fabrics by the Tongue (Single Rip) Method (Constant-Rate-of-Extension Tensile Testing Machine)
ASTM D 3776	Mass per Unit Area (Weight) of Woven Fabrics

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://assist.daps.dla.mil/quicksearch/>.

FED-STD-4	Glossary of Fabric Imperfections
FED-STD-191	Textile Test Methods
FED-STD-595	Colors

2.3 Federal Trade Commission Publications

Available from the Federal Trade Commission, 600 Pennsylvania Avenue, N.W., Washington, DC 20580, Tel: 202-326-2222 or www.ftc.gov.

Rules and Regulations under the Textile Fiber Products Identification Act

3. TECHNICAL REQUIREMENTS

3.1 Detail Specifications

The requirements for a specific cloth shall consist of all requirements specified herein in addition to requirements specified in the applicable detail specification. In case of conflict between requirements of this specification and an applicable detail specification, requirements of the detail specification shall govern.

3.2 Material

Cloth shall be woven from low modulus meta-aramid fibers, which shall not char at a temperature lower than 671 °F (355 °C), determined in accordance with 4.5.1.2. The yarn shall be of the filament count, denier, twist, and color, and the weave shall be as specified in the applicable detail specification.

3.3 Properties of Yarn

Shall be as specified in Table 1, determined in accordance with the following test methods:

Property	Test Method
Denier	4.5.1.1
Twist	FED-STD-191, Method 4054
Carbonization	4.5.1.2 (See 3.3.1)

3.3.1 Carbonization

The yarn manufacturer's statement of conformance may be used in lieu of actual test; however, if testing is performed after weaving, the sample for test shall be obtained by unraveling the woven cloth.

3.4 Properties of Cloth

Shall be as specified in Table 2, determined in accordance with the following test methods:

TABLE 2 - CLOTH PROPERTIES

Property	Test Method
Thread Count (3.4.1)	FED-STD-191, Method 5050
Thickness (3.4.1)	ASTM D 1777 (3.4.2)
Weight (3.4.1)	ASTM D 3776
Breaking Strength (3.4.1)	4.5.2.1
Elongation (3.4.1)	4.5.2.1
Tear Strength (3.4.1)	ASTM D 2261
Air Permeability	4.5.2.2
Weave	Visual
Stiffness (3.4.3)	ASTM D 1388
pH	FED-STD-191, Method 2811

3.4.1 For resin treated cloth, these tests shall be performed on the cloth prior to the resin treatment.

3.4.2 A load of 6 ounces force (1.7 N) shall be applied and the presser foot diameter shall be 3/8 inch (9.5 mm).

3.4.3 Applicable to resin treated cloth only.

3.5 Quality

Cloth, as received by purchaser, shall be evenly woven and free from foreign materials and from imperfections detrimental to usage of the cloth.

3.5.1 Imperfections

Acceptability of each lot of cloth shall be based on imperfections defined in FED-STD-4.

3.5.2 Yard-by-Yard Examination

Each roll in the sample shall be examined on the face side only. When the total length in the roll does not exceed 100 yards (91 m), the entire length of the roll shall be examined. When the total length in the roll exceeds 100 yards (91 m), only 100 yards (91 m) shall be examined. All imperfections as defined in FED-STD-4, which are clearly noticeable at normal inspection distance of 1 yard (1 m) shall be scored and assigned demerit points as listed in 4.3.1.2.2. No linear yard (m), increments of 1 yard (1 m) on the measuring machine), from any one roll within the sample shall be penalized more than 4 points. The lot shall be unacceptable if the points per 100 square yards (84 m²) of the total length examined exceeds 50 points. The lot shall be unacceptable if the points per 100 square yards (84 m²) of two or more individual rolls exceeds 60 points. If no individual roll exceeds the point level, the lot shall be acceptable with respect to this characteristic. If one roll exceeds the point level, a second sample equal in size to the first, shall be examined only for individual roll quality examination. The lot shall be unacceptable if one or more rolls in the second sample exceeds the point level. Point computation for lot quality and individual roll quality shall be as follows:

3.5.2.1 Using Inch/Pound Units

$$\frac{\text{Total points scored in sample} \times 3600}{\text{Width of cloth, inches,} \times \text{total length, yards, inspected}} = \frac{\text{Points}}{\text{per 100 square yards}}$$

3.5.2.2 Using SI Units

$$\frac{\text{Total points scored in sample} \times 100.00}{\text{Width of cloth, mm,} \times \text{total length, m, inspected}} = \frac{\text{Points}}{\text{per 100 m}^2}$$

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

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

4.2 Classification of Tests

All technical requirements of this specification and the applicable detail specification are acceptance tests and preproduction tests and shall be performed prior to or on the initial shipment of cloth to purchaser, on each lot, when a change in ingredients and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.3 Sampling and Testing

Shall be as follows:

4.3.1 For Acceptance Tests

Each lot of cloth shall be visually examined as required below for quality (3.5) and sampled at random for all other 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 Yarn Tests

Prior to weaving the cloth, the yarn shall be sampled for tests as specified below. The lot size shall be expressed in pounds (kg) and the sample unit shall be 500 yards (457 m) of the yarn. The lot shall be unacceptable if one or more sample units fail to meet any test requirements specified. The sample size shall be as shown in Table 3:

TABLE 3 - YARN TEST

Lot Size		Sample Size (Number of Units)
Pounds	Kilograms	
Up to 1000, incl	Up to 454, incl	3
Over 1000 to 5000, incl	Over 454 to 2268, incl	5
Over 5000	Over 2268	7

4.3.1.2 Yard-by-Yard Examination of Cloth

The unit of cloth for this examination shall be 1 square yard (1 m²). The sample size shall be in accordance with Table 4:

TABLE 4 - CLOTH EXAMINATION

Lot Size		Sample Size (Number of Rolls)
Yards	Meters	
Up to 3,200, incl	Up to 2926, incl	8
Over 3,200 to 10,000, incl	Over 2926 to 9144, incl	13
Over 10,000	Over 9144	20

4.3.1.2.1 No more than one roll shall be taken from any shipping container unless the number of shipping containers in the lot is less than the required number of rolls, in which case, all shipping containers shall be included in the sample.

4.3.1.2.2 Demerit Points

Demerit points shall be assigned in the yard-by-yard examination as shown in Table 5:

TABLE 5 - DEMERIT POINT ASSIGNMENT

Examination Results	Demerit Point Assignment
Imperfections up to 3 inches (76 mm), incl, in any dimension	1 demerit point
Imperfections over 3 to 6 inches (76 to 152 mm), incl, in any dimension	2 demerit points
Imperfections over 6 to 9 inches (152 to 229 mm), incl, in any dimension	3 demerit points
Imperfections over 9 inches (229 mm) in any dimension	4 demerit points

4.3.1.2.2.1 The following imperfections, when present, shall be scored 4 points for each linear yard (linear meter) in which they occur:

Color other than as specified in the applicable detail specification
 Baggy, ridgy, or wavy cloth
 Objectionable odor
 Width less than specified

4.3.1.3 Properties of Cloth

The unit of cloth for property determination shall be not less than specified below; the sample size shall be as specified in 4.3.1.2:

4.3.1.3.1 Cloth Not Containing a Resin Treatment

2 linear yards (1.8 linear m), continuous piece, full width

4.3.1.3.2 Cloth Containing a Resin Treatment

1.5 linear yards (1.4 linear m), continuous piece, full width

4.3.1.4 A lot shall be all cloth of a single weight produced in a single production run under the same fixed conditions and presented for vendor's inspection at one time.

4.3.1.5 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 cloth. If necessary to make any change in ingredients, in type of equipment for processing, or in manufacturing procedures, vendor shall submit for reapproval 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 reapproval.

4.5 Test Methods

4.5.1 Yarn Tests

4.5.1.1 Denier

Shall be determined as follows:

4.5.1.1.1 Measure a 900-mm length of yarn to the nearest millimeter.

4.5.1.1.2 Weigh the yarn sample in grams to the nearest 10 milligrams.

4.5.1.1.3 Calculate the denier (weight per length) as follows:

$$\text{Denier} = \text{wt in grams of } 900 \text{ m} = \text{wt of } 900\text{-m sample} \times 10,000$$

4.5.1.2 Carbonization

Shall be determined in accordance with FED-STD-191, Method 1534, and as follows:

4.5.1.2.1 Apparatus

A suitable melting point apparatus shall be used to determine the carbonization point of the yarn.

4.5.1.2.2 Procedure

A sufficient number of fibers shall be removed from the yarn sample for observation of carbonization. The temperature at which the yarn begins to stiffen or char shall be considered the end point of the test.

4.5.2 Cloth Tests

4.5.2.1 Breaking Strength

Shall be determined in accordance with FED-STD-191, Method 5104, for cloth without resin coating and Method 5100 for resin treated cloth. The test specimens for both unaged and oven aged determinations shall be prepared so that the warp direction specimens contain the same warp yarns and the filling specimens contain the same filling yarns. Acceptance shall be based on the average of five specimens from each sample.

4.5.2.1.1 Breaking Strength After Aging

The specimen size shall be the same as in the unaged breaking strength determination. The specimens shall be aged in an oven at $482 \text{ }^\circ\text{F} \pm 92$ ($50 \text{ }^\circ\text{C} \pm 5$) for 24 hours ± 0.1 , removed from the oven, and conditioned at standard conditions for 4 hours ± 0.1 prior to testing.

4.5.2.2 Air Permeability

Shall be determined in accordance with ASTM D 737 using a 2-yard (1.8-m) sample from each roll to be tested. Failure of the specimen to meet the air permeability requirement shall be cause for rejection of the roll represented.

4.5.2.3 Examination for Length

4.5.2.3.1 Individual Rolls

During the yard-by-yard examination, each roll in the sample shall be examined for length. Any length found to be less than the minimum or more than the maximum specified, or more than 2 yards (1.8 m) below the length marked on the ticket, or any roll found to contain more than the specified number of pieces, or any one piece less than 40 yards (37 m) shall be considered an imperfection with respect to length. The lot shall be unacceptable if two or more rolls in the sample are defective in respect to length.

4.5.2.3.2 Total Length in Sample

The lot shall be unacceptable if the total of the actual length of the rolls in the sample is less than the total of the gross lengths marked on the ticket.

4.5.2.4 Examination of Compliance with Textile Fiber Products Identification Act

During the examination of individual rolls for length, each roll in the sample shall be examined for conformance to the Textile Fiber Products Identification Act. Each roll not labeled in accordance with this act shall be an imperfection. The lot shall be unacceptable if two or more of these imperfections occur.

4.5.2.5 Examination of Preparation for Delivery

An examination shall be made to determine conformance to the packaging requirements of PPP-P-1133. The lot size shall be the number of containers in the inspection lot.

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 tests and stating that the cloth conforms to the other technical requirements. This report shall include the purchase order number, lot number, AMS 3801B, vendor's material designation, quantity, and specified cloth weight.

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. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the cloth represented and no additional testing shall be permitted. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY

5.1 Packaging and Identification

5.1.1 Cloth shall be supplied in rolls of the size specified in the applicable detail specification.

5.1.2 The face side of the cloth shall be identified by stamping on that side the word "Face" at each end of the roll.