

AEROSPACE
MATERIAL
SPECIFICATION

AMS 3789

Issued
Revised

7-1-85

CLOTH, TWILL
Nylon Warp, Rayon Filling

1. SCOPE:

- 1.1 Form: This specification covers two types of a twill nylon/rayon in the form of cloth.
- 1.2 Application: Primarily for use in the fabrication of functional clothing (Air Police) by the Department of Defense.
- 1.3 Classification: Cloth shall be of the following types:

Type I - Durable water-repellant finish
Type II - Durable water-repellant finish with a polyurethane coating on the reverse side

2. APPLICABLE DOCUMENTS: The following documents 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 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120, except as specified in 2.2.4.

- 2.2.1 Federal Specifications:

PPP-P-1133 - Packaging and Packing of Synthetic Fiber Fabrics

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2.2.2 Federal Standards:

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

2.2.3 Military Standards:

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes

2.2.4 Other Publications: Available from Federal Trade Commission, Washington, DC 20580.

Textile Fiber Products Identification Act, Rules and Regulations

3. TECHNICAL REQUIREMENTS:

3.1 Material: The warp yarn shall be 200 denier trilobal nylon. The filling yarn shall be 14/2s spun viscose rayon.

3.2 Properties: Finished cloth shall conform to the requirements of Table I and the following; tests shall be performed on the product supplied and in accordance with specified test methods insofar as practicable:

3.2.1 Color: Shall be Air Force Blue 1157 in accordance with FED-STD-595.

3.2.1.1 Matching: The color of the finished cloth shall match the standard sample under natural daylight or artificial daylight having a color temperature of 7500° K and shall be a good approximation to the standard sample under incandescent lamplight at 2800° K.

3.2.1.2 Colorfastness: The finished cloth shall show fastness to wet dry cleaning, crocking, perspiration, and light equal to or better than the standard sample. When no standard sample has been established or designated as applicable to colorfastness, the finished cloth shall show "good" fastness to wet dry cleaning, perspiration, and light and shall show a Munsell Value for crocking not less than 8.5.

3.2.2 Weight: Shall be not less than 8.3 oz per sq yd (280 g/m²), determined in accordance with FED-STD-191, Method 5041.

3.2.3 Width: Shall be not less than 45 in. (1140 mm) exclusive of selvage.

3.2.4 Weave: Shall be a 3 up and 1 down, 4 harness left twill.

3.2.5 Finish: Both Types I and II shall be given a durable fluorocarbon type antisoiling treatment. Type II cloth shall be given a 3/4 oz per sq yd (23 g/m²) polyurethane coating on the reverse side.

3.2.6 Nonfibrous Materials: The total chloroform-soluble and water-soluble material content of the finished cloth shall not exceed 4%, determined in accordance with FED-STD-191, Method 2611.

3.2.7 pH: The pH value of the finished cloth shall be 5.0 - 8.5, determined in accordance with FED-STD-191, Method 2811.

3.2.8 Visual Yard-by-Yard Examination: Each roll in the inspection sample shall be examined on the face side only for defects defined in FED-STD-4. All defects visible at a normal inspection distance of 3 ft (1 m) shall be scored and assigned demerit points (See 3.2.8.1). No linear yard (linear metre) from any one roll within the sample shall be penalized more than 4 points. The lot shall be unacceptable if the points per 100 sq yd (85 m²) of the total yardage exceeds 75 points. The lot shall be unacceptable if the points per 100 sq yd (85 m²) of two or more individual rolls exceeds 15.0 points. If one roll exceeds 15.0 points per 100 sq yd (85 m²), a second sample shall be examined only for individual roll quality. The lot shall be unacceptable if one or more rolls in the second sample exceeds 15.0 points per 100 sq yd (85 m²). Point computation shall be as follows:

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

$$\frac{\text{Total points scored in sample} \times 100,000}{\text{Width of cloth, mm} \times \text{total length, m, inspected}} = \text{Points per 100 m}^2$$

3.2.8.1 Demerit Points: Shall be assigned as follows:

Defects up to 3 in. (75 mm) in any dimension	1 point
Defects over 3 to 6 in. (75 to 150 mm), incl, in any dimension	2 points
Defects over 6 to 9 in. (150 to 225 mm), incl, in any dimension	3 points
Defects over 9 in. (225 mm) in any dimension	4 points

3.2.8.1.1 The following defects, when present, shall be scored 4 points for each yard (m) in which they occur:

Bowed or bias filling exceeding 2-in. (50-mm) deviation from normal alignment
 Baggy, ridgy, or wavy cloth
 Objectionable odor
 Width less than specified
 Uneven weaving
 Tight selvage
 Tight warp end

3.3 Quality: Cloth, as received by purchaser, shall be clean, evenly woven, as free from foreign materials as commercially practicable, and free from imperfections detrimental to usage of the cloth.

3.3.1 Acceptance quality levels (AQL) for the cloth shall be as specified by purchaser.

- 3.3.2 The demerit points, when calculated as specified in 3.2.8.1, shall not exceed the maximum point value.
- 3.3.3 Each defect shall be marked with a 1 to 1-1/2 in. (25 to 38 mm) long string. The string shall be sewn into the selvage near the defect. A red string shall represent a 3 or 4 point defect; a white string, a 1 or 2 point defect.

4. QUALITY ASSURANCE PROVISIONS:

- 4.1 Responsibility for Inspection: The vendor of the cloth 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 4.5. 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: Tests to determine conformance to all technical requirements of this specification are classified as acceptance tests and as preproduction tests and shall be performed prior to or on the initial shipment of cloth to a purchaser, on each lot, when a change in material, processing, or both requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.
- 4.2.1 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:
- 4.3.1 For Acceptance Tests: Each lot of cloth shall be visually examined as required for quality (3.3) 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 A lot shall be all cloth made under essentially the same conditions, produced in a single production run, and presented for vendor's inspection at one time. An inspection lot shall not exceed 1000 lb (450 kg).
- 4.3.1.2 When a statistical sampling plan and acceptance quality level (AQL) in accordance with MIL-STD-105 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 4.5.1 shall state that such plan was used.

- 4.3.1.3 Yard-by-Yard Examination: Sample unit for this examination shall be one roll. Sample size shall be in accordance with the following:

Lot Size		Sample Size (No. of Rolls)
Yards	Metres	
Up to 3,200, incl	Up to 2925, incl	8
Over 3,200 to 10,000, incl	Over 2925 to 9140, incl	13
Over 10,000	Over 9140	20

- 4.3.1.3.1 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 present in the sample.

- 4.3.1.4 Examination for Length:

- 4.3.1.4.1 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 specified or more than two yards (2 m) less than the length marked on the ticket shall be considered a defect with respect to length. The lot shall be unacceptable if two or more rolls in the sample are defective with respect to length.

- 4.3.1.4.2 Total Yardage in Sample: The lot shall be unacceptable if the total of the actual lengths of rolls in the sample is less than the total of the lengths marked on the tickets.

- 4.3.1.5 Examination for Face Identification and Compliance with Textile Fiber Products Identification Act: During the yard-by-yard examination, each roll in the sample shall be examined for the defects listed below. The lot shall be unacceptable if two or more of the following defects are present:

Face identification missing from either or both ends

Face identification on wrong side

Not labeled or ticketed in accordance with the rules and regulations under the Textile Fiber Products Identification Act

- 4.3.1.6 Examination for Shade and Finish: Each roll in the lot shall be examined visually for shade match and finish. A roll shall be unacceptable if it fails to meet the requirement for shade match and finish. The sample unit shall be a 4 x 20 in. (100 x 500 mm) swatch of the cloth. A sample unit shall be drawn from each roll in the lot.

4.3.1.7 Examination for Defect Marking: During the yard-by-yard examination, each roll in the sample shall be examined for defect marking. Any roll having more than two or 3- or 4-point fabric defects (red string) not strung or more than five fabric defects (red or white strings) not strung shall be classified as a defective roll in regard to this requirement. The lot shall be unacceptable if more than two rolls in the sample are defective in regard to the defect marking requirement or if there are more than ten 3- or 4-point defects (red strings) not strung in the sample.

4.3.1.8 Tests: Requirements specified in Section 3 apply to the results of the determinations made on the sample unit for test purposes as specified by the applicable test methods. The sample unit shall be 3.5 continuous yd (3.2 m) full width of the finished cloth. The lot size shall be expressed in units of 1 yd (1 m). The lot shall be unacceptable if one or more sample units fail to meet any test requirement specified. Sample size (number of sample units) shall be in accordance with the following:

Lot Size		Sample Size (No. of Rolls)
Yards	Metres	
Up to 800, incl	Up to 730, incl	2
Over 800 to 22,000, incl	Over 730 to 20,100, incl	3
Over 22,000	Over 20,100	5

4.3.2 For Preproduction Tests: Shall be 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 cloth.

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 material, processing, or both and, when requested, sample cloth. Production cloth made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Reports:

4.5.1 The vendor of cloth shall furnish with each shipment a report showing the results of tests to determine conformance to the technical requirements of this specification. This report shall include the purchase order number, AMS 3789, vendor's material designation, lot number, and quantity.

4.5.2 The vendor of finished or semi-finished parts shall furnish with each shipment a report showing the purchase order number, AMS 3789, contractor or other direct supplier of cloth, supplier's material designation, part number, and quantity. When cloth for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of cloth to determine conformance to the requirements of this specification and shall include in the report either a statement that the cloth conforms or copies of laboratory reports showing the results of tests to determine conformance.

4.6 Resampling and Retesting: Except as specified in 4.3.1, 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, from the same lot, 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.

5. PREPARATION FOR DELIVERY:

5.1 Packaging and Identification:

5.1.1 The cloth shall be furnished in continuous lengths, each not less than 50 yd (45 m), put up on full width rolls.

5.1.2 Each roll shall have a label or tag legibly marked with not less than the following information and attached in such a manner as to remain in place until all cloth has been removed from the roll:

CLOTH, TWILL, NYLON WARP, RAYON FILLING

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WIDTH _____

WEIGHT PER YARD (METRE) _____

MANUFACTURER'S DESIGNATION _____

QUANTITY _____

LOT NUMBER _____

ROLL NUMBER (If used) _____

DATE OF MANUFACTURE _____

5.1.2.1 The back of the cloth shall be legibly marked "Back" at both ends of each roll with letters not less than 0.5 in. (12 mm) in height. A suitable indelible marking fluid shall be used.

5.1.3 Individual rolls shall be wrapped in a suitable protective film and packaged in an exterior shipping container in such a manner that rolls, during shipment and storage, will be protected from exposure to moisture, weather, or any other normal hazard.

- 5.1.4 Each exterior shipping container shall be legibly marked with not less than the following information in such a manner that the markings will not smear or be obliterated during normal handling or use:

CLOTH, TWILL, NYLON WARP, RAYON FILLING

AMS 3789

PURCHASE ORDER NUMBER _____

MANUFACTURER'S NAME _____

MANUFACTURER'S MATERIAL DESIGNATION _____

DESCRIPTION _____

LOT NUMBER _____

NET WEIGHT _____

- 5.1.5 Containers shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the cloth to ensure carrier acceptance and safe delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.
- 5.1.6 For direct U.S. Military procurement, packaging, packing, and marking shall be in accordance with PPP-P-1133, Level A, B, or C, as specified in the request for procurement. Commercial packaging as in 5.1.1, 5.1.4, and 5.1.5 will be acceptable if it meets the requirements of Level C.

6. ACKNOWLEDGMENT: A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.

7. REJECTIONS: Cloth not conforming to this specification or to modifications authorized by purchaser will be subject to rejection.

8. NOTES:

- 8.1 Dimensions and properties in inch/pound units are primary; dimensions and properties in SI units are shown as the approximate equivalents of the primary units and are presented only for information.

- 8.2 For direct U.S. Military procurement, purchase documents should specify not less than the following:

Title, number, and date of this specification

Type of cloth required

Width of cloth required

Minimum length if other than specified

Color of cloth desired if other than as in 3.2.1

Applicable level of packaging (See 5.1.6)