

MIL-C-3953E
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SUPERSEDING
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MILITARY SPECIFICATION

CLOTH, DUCK, NYLON

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers 20.5 ounce nylon duck cloth.

1.2 Classification. The nylon duck cloth shall be of the following classes, as specified (see 6.2).

Class 1 - Dyed, untreated

Class 2 - Dyed, melamine resin treated

2. APPLICABLE DOCUMENTS

2.1 Issues of documents. The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

SPECIFICATIONS

FEDERAL

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

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: US Army Natick Research and Development Laboratories, Natick, MA 01760 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC 8305

MIL-C-3953E

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MIL-C-7020 - Cloth, Parachute, Nylon

STANDARDS

FEDERAL

FED-STD-4 - Glossary of Fabric Imperfections

FED-STD-191 - Textile Test Methods

MILITARY

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

(Copies of specifications, standards and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

LAWS AND REGULATIONS

Rules and Regulations Under the Textile Fiber Products Identification Act

(Copies may be obtained without charge from the Federal Trade Commission, Washington, DC 20580.)

3. REQUIREMENTS

3.1 Standard sample. The cloth shall match the standard sample for shade and shall be equal to or better than the standard sample with respect to all characteristics for which the standard sample is referenced (see 6.3).

* 3.2 Material (see 6.5).

3.2.1 Nylon. The nylon shall be a high tenacity bright nylon polyamide. The nylon shall be prepared from hexamethylene diamine and adipic acid or its derivatives, and shall have a minimum melting point of 482°F (250°C) when tested as specified in 4.2.3.

* 3.2.2 Yarn. The warp and filling yarns shall consist of either; five plies of 210 nominal denier (23 Tex), 34 filament nylon, twisted together using 2 to 6 turns per inch (79 to 263 tpm) or 1050 nominal denier (117 Tex) nylon twisted 2 to 4 turns per inch (79 to 158 tpm) when tested as specified in 4.2.3.

3.3 Color. The color shall be as specified (see 6.2 and 6.4).

* 3.3.1 Matching. The color shall match the standard sample under artificial daylight having a color temperature of 7000 + 500 kelvin and shall be a good approximation to the standard sample under incandescent lamplight at 2850 + 100 kelvin.

3.3.2 Colorfastness. The dyed and finished cloth shall show fastness to laundering and light equal to or better than the standard sample when tested as specified in 4.2.3. When a standard sample is not referenced for colorfastness, the dyed cloth shall show good fastness to laundering and light when tested as specified in 4.2.3.

3.4 Physical requirements. The cloth shall conform to the minimum requirements specified in table I when tested as specified in 4.2.3.

* TABLE I. Physical requirements 1/

Weight oz/sq. yd. (g/m ²)	Yarns per inch (cm)		Breaking strength pounds (N)		Ultimate elongation percent		Tearing strength pounds (N)	
	Warp	Filling	Warp	Filling	Warp	Filling	Warp	Filling
20.5 + 1 (695 + 34)	62 (24)	60 (24)	1100 (4893)	1100 (4893)	30	20	135 (600)	135 (600)

1/ Class 2 cloth shall meet the requirements of table I prior to the resin treatment.

- * 3.4.1 Width. The minimum width of the cloth shall be 36 inches (914 mm). The minimum acceptable width shall be inclusive of the woven selvage when fly-shuttle looms are used and exclusive of the lock in selvage when shutterless looms are used. Raw edges shall not be permitted.
- 3.4.2 Weave. The weave shall be 3 by 4 basket (3 ends weaving as 1, 4 picks per shed).
- * 3.5 Finish. The cloth shall be dyed and shall not be bleached in any manner or process.
- * 3.5.1 Resin treatment, class 2. The cloth shall be impregnated with a suitable type of melamine resin and the finished cloth shall have a stiffness of 0.45 to 0.65 inch pounds (51 to 73 mN.m) in the warp and 0.65 to 0.85 inch pounds (73 to 96 mN.m) in the filling when tested as specified in 4.2.3.
- 3.5.2 pH. The pH value of the water extract of the finished cloth shall be no less than 5.5 nor more than 8.5 when tested as specified in 4.2.3.
- * 3.6 Dimensional stability. The cloth shall have no more than 2.0 percent dimensional change in either warp or filling direction when tested as specified in 4.2.3.
- * 3.7 Length and put-up. The cloth shall be put-up in rolls in accordance with PPP-P-1193. Each roll shall contain not less than 80 yards (73 m) nor more than 120 yards (110 m). Each roll shall contain not more than two pieces and each piece shall contain not less than 40 yards (37 m).

MIL-C-3953E

3.8 Fiber identification. Each roll shall be labeled and ticketed, for fiber content in accordance with the Textile Fiber Products Identification Act.

3.9 Face identification. The face side of the cloth shall be identified by applying a stamping on that side of the cloth with the word "face" at each end of the roll.

3.10 Workmanship. The finished cloth shall conform to the quality established by this specification. The demerit points per 100 square yards (84 m^2) when calculated as specified in section 4 shall not exceed the established maximum point value.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Certificate of compliance. Where certificates of compliance are submitted, the Government reserves the right to check test such items to determine the validity of the certification.

4.2 Quality conformance inspection. Unless otherwise specified, sampling for inspection shall be performed in accordance with MIL-STD-105.

4.2.1 Component and material inspection. In accordance with 4.1, components and materials shall be inspected in accordance with all the requirements of referenced specifications, drawings, and standards unless otherwise excluded, amended, modified, or qualified in this specification or applicable purchase document.

4.2.2 End item examination. Examination of the end item shall be in accordance with the provisions of 4.2.2.1 through 4.2.2.4.

4.2.2.1 Yard-by-yard examination. Each roll in the sample shall be examined on the face side only. When the total yardage in the roll does not exceed 100 yards, the entire yardage in the roll shall be examined. When the total yardage in the roll exceeds 100 yards, only 100 yards shall be examined. All defects, as defined in Section III of FED-STD-4, which are clearly noticeable at normal inspection distance (3 feet) shall be scored and assigned demerit points as listed in 4.2.2.1.1. No linear yard (increments of 1 yard on the measuring device of the inspection machine) from any one roll within the sample shall be penalized more than 4 points. The sample size shall be 20 rolls selected from 20 containers. The lot shall be unacceptable if the points per 100 square yards of the total yardage examined exceeds 35 points. The lot shall be unacceptable if the points per 100 square yards or two or more individual rolls exceeds 53 points. If one roll exceeds

MIL-C-3953E

53 points per 100 square yards, a second sample of 20 rolls shall be examined only for individual roll quality examination. The lot shall be unacceptable if one or more rolls in the second sample exceeds 53 points per 100 square yards. Point computation for lot quality and individual roll quality shall be as follows:

$$\frac{\text{Total points scored in sample size X 3600}}{\text{Contracted width of cloth (inches) X total yards inspected}} = \text{Points per 100 square yards}$$

4.2.2.1.1 Demerit points. Demerit points shall be assigned as follows:

For defects up to 3 inches in any dimension	- one point
For defects exceeding 3 inches, but not exceeding 6 inches in any dimension	- two points
For defects exceeding 6 inches, but not exceeding 9 inches in any dimension	- three points
For defects exceeding 9 inches in any dimension	- four points

NOTE: The following defects, when present, shall be scored four points for each yard in which they occur:

Baggy, ridgy or wavy cloth.
Width less than specified.
Raw edge.
Poor dye penetration, mottle, streaky or cloudy.
Overall uncleanliness.

4.2.2.2 Examination for length.

4.2.2.2.1 Individual rolls. During the yard-by-yard examination, each roll in the sample shall be examined for length and put-up. The lot shall be unacceptable if two or more rolls are defective for length and put-up. The following defects, when present, shall be scored:

The length of any roll less than 80 yards or more than 120 yards.
More than 2 pieces per roll.
Any piece less than 40 yards.
The length of any roll 2 yards less than the length marked on the ticket.

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

4.2.2.3 Examination for shade. During the yard-by-yard examination each roll in the sample shall be examined for shade. Any roll in the sample off shade, shaded side to side, side to center, or end to end, shall be cause for rejection of the entire lot represented by the sample.

MIL-C-3953E

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

Not labeled or ticketed in accordance with the Textile Fiber Product Identification Act.

Face marking missing from either or both ends.

Face marking on wrong side.

4.2.3 End item testing. The methods of testing specified in FED-STD-191 wherever applicable, and as listed in table III shall be followed. The physical and chemical values specified in section 3 apply to the average of the determinations made on a sample unit for test purposes as specified in the applicable test method. The sample unit for class 1 cloth shall be 2 continuous yards, full width, of the finished cloth. The sample unit for class 2 cloth shall be 1-1/2 continuous yards, full width, of the cloth prior to the resin treatment, and 1/2 yard full width of the treated cloth. The lot size shall be expressed in terms of 1 yard each. The lot shall be unacceptable if one or more units fail to meet any of the requirements specified. The sample size shall be in accordance with table II. All test reports shall contain the individual values utilized in expressing the final results.

TABLE II. Sample size

Lot size	Sample size
800 or less	2
801 up to and including 22,000	3
22,001 and over	5

TABLE III. Test methods

Characteristic	Requirement	Test method
Nylon:		
Identification	3.2.1	1530 1/
Melting point	3.2.1	1534 <u>1/</u>
Tenacity	3.2.1	1/
Luster	3.2.1	<u>1/</u>
Denier	3.2.2	4021
Number of filaments	3.2.2	Visual <u>2/</u>
Yarn Ply	3.2.2	Visual <u>2/</u>
Twist (turns per inch)	3.2.2	4054

TABLE III. Test methods (cont'd)

Characteristic	Requirement	Test method
Colorfastness to:		
Laundering	3.3.2	5614 <u>3/</u>
Light	3.3.2	5660
Weight	3.4	5041 <u>4/</u>
Yarns per inch	3.4	5050 <u>4/</u>
Breaking strength	3.4	5100 <u>4/</u>
Elongation	3.4	5100 <u>4/</u>
Tearing strength	3.4	5134 <u>4/</u>
Weave	3.4.2	Visual <u>2/</u>
*Finish	3.5	Visual <u>2/</u>
Absence of bleaching	3.5	<u>1/</u>
Resin treatment (class 2)	3.5.1	<u>1/</u>
Stiffness:		
Warp	3.5.1	5202
Filling	3.5.1	5202
pH	3.5.2	2811
*Dimensional stability	3.6	5556

1/ Unless otherwise specified, a certificate of compliance shall be submitted and will be acceptable for the stated requirement.

2/ One determination shall be made from each sample unit and the result reported as "pass" or "fail".

3/ Except that the white color transfer cloth shall be material conforming to type I of MIL-C-7020.

4/ Class 2 cloth shall be tested for these characteristics prior to the resin treatment.

4.2.4 Packaging inspection. An examination shall be made in accordance with the requirements of PPP-P-1133 to determine that packaging, packing, and marking comply with the section 5 requirements.

MIL-C-3953E

5. PREPARATION FOR DELIVERY

5.1 Put-up and packaging. Put-up and packaging shall be level A or C as specified (see 6.2).

- * 5.1.1 Levels A and C. The cloth, put-up as specified in 3.6, shall be packaged in accordance with the applicable requirements of PPP-P-1133.

5.2 Packing. Packing shall be level A, B, or C as specified (see 6.2).

- * 5.2.1 Levels A, B, and C. The cloth shall be packed in accordance with the applicable requirements of PPP-P-1133.
- * 5.3 Marking. In addition to any special marking required by the contract, shipments shall be marked in accordance with the applicable requirements of PPP-P-1133.

6. NOTES

6.1 Intended use. The cloth is intended for use in the manufacture of parachute equipment.

6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Class of cloth required (see 1.2).
- (c) Color of cloth required (see 3.3).
- (d) Selection of applicable levels of put-up, packaging, and packing (see 5.1 and 5.2).

6.3 Standard sample. For access to standard sample, address the procuring activity issuing the invitation for bids.

6.4 Dyestuff formulation. A suggested but not mandatory dye formulation for OD-7 is as follows: Acid Green 58, Acid Green 70, and Acid Orange 85.

6.5 Recycled material. It is encouraged that recycled material be used when practical as long as it meets the requirements of the specification (see 3.2).

6.6 Metric equivalents. Metric equivalents, indicated in parentheses throughout section 3 of this specification are based on practices, conversion factors, and symbols specified in ASTM E 380 Standard for Metric Practice and are for information only. In each instance, the value stated in US customary units shall be controlling.

6.7 Changes from previous issue. The margins of this specification are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

MIL-C-3953E

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Army - GL
Navy - NU
Air Force - 11

Review activities:

Army - MD, MI
Navy - AS
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User activities:

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Preparing activity:

Army - GL

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