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SUPERSEDING
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MILITARY SPECIFICATION

CLOTH, TWILL, POLYESTER AND COTTON

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

1. SCOPE

1.1 Scope. This specification covers the requirements for a cotton and polyester fabric of one type only.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. Unless otherwise specified, the following specifications, standards, and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified.

SPECIFICATIONS

FEDERAL

PPP-P-1134	- Packaging of Cotton and Cotton-Synthetic Fiber Blend Fabrics (Excluding Duck Fabrics)
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STANDARDS

FEDERAL

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

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Officer in Charge, Navy Clothing and Textile Research Facility, 21 Strathmore Road, 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-21851D

MILITARY

MIL-STD-105

- Sampling Procedures and Tables for Inspection by Attributes

(Copies of specifications, standards, drawings, 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.)

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this specification to the extent specified herein.

LAWS AND REGULATIONS

RULES AND REGULATIONS UNDER THE TEXTILE FIBER PRODUCTS IDENTIFICATION ACT

(Copies may be obtained from the Federal Trade Commission, Washington, D.C. 20580.)

2.1.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 Standard sample. The finished 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 First article. When specified (see 6.2), the contractor shall furnish sample unit(s) for first article inspection and approval (see 4.3).

3.3 Material.3.3.1 Fibers.

3.3.1.1 Polyester fibers. The fiber shall be polyethylene glycol terephthalate when tested as specified in 4.4.1.

3.3.1.2 Cotton fibers. The cotton shall be carded and combed when tested as specified in 4.4.1.

3.3.2 Yarns. The yarns shall be a blend of polyester and cotton drawn and evenly spun into singles yarn for both warp and the filling when tested as specified in 4.5.

3.3.3 Fiber content. The finished cloth shall contain 65 percent, plus or minus 5 percent polyester fiber and not less than 32 percent cotton based on the dry weight of the desized specimens when tested as specified in 4.5.

MIL-C-21851D

3.4 Physical requirements. The finished cloth shall conform to the requirements as shown in Table I when tested as specified in 4.5.

Table I - Physical requirements

Weight oz/sq yd (g/m ²) (min.)	Yarns per inch (cm) (min.)		Breaking Strength lbs. (newtons) (min)	
	Warp	Filling	Warp	Filling
5.5 + .5 (186 + 17)	125(49.2)	54(21.3)	165(734.3)	65(289.3)

3.4.1 Weave. The weave shall be a 2 up, 1 down, right or left hand twill.

*3.4.2 Width. The width of the cloth shall be as specified (see 6.2) and shall be the minimum acceptable width inclusive of selvages when fly shuttle looms are used and exclusive of selvages and fringe when shuttleless weaving machines are used.

*3.5 Color. The color shall be as specified (see 6.2.).

3.5.1 Sulfur content. The use of sulfur dyes or dyes containing elementary sulfur or sulfur compounds capable of oxidation to sulfuric acid is prohibited. The finished cloth shall contain no more labile sulfur than shown by the standard sample when tested as specified in 4.5. When a standard sample is not available, the dyed cloth shall show no more than a slight trace of labile sulfur as defined in the test method specified in 4.5.

*3.5.2 Matching. The color of the finished cloth shall match the standard sample under artificial daylight having a color temperature of 7500 (+ 500) Kelvin and shall be a good approximation to the standard sample under incandescent lamplight at 2850 (+ 100) Kelvin.

3.5.3 Colorfastness. The finished cloth shall show fastness to laundering, light, crocking and perspiration equal to or better than the standard sample when tested as specified in 4.5. When no standard sample is available, the finished cloth shall show a minimum of "good" fastness to laundering, light and perspiration and a Munsell value not lower than 8.5 for dry crocking and 7.0 for wet crocking when tested as specified in 4.5.

3.6 Nonfibrous materials. The nonfibrous material of the finished cloth shall not exceed 6.0 percent starch and protein content including acid hydrolyzable material when tested as specified in 4.5.

3.7 Length and put up. Unless otherwise specified (see 6.2 and 5.1.1), the cloth shall be in continuous pieces each not less than 40 yards (36.6m) in length and shall be put up in rolls, full width, as specified in PPP-P-1134.

3.8 Fiber identification. Each roll of cloth shall be labeled or ticketed for fiber content in accordance with the Rules and Regulations of the Textile Fiber Products Identification Act.

MIL-C-21851D

3.9 Dimensional stability. The finished cloth shall not shrink nor elongate more than 2.0 percent in either the warp or the filling when tested as specified in 4.5. The pre-shrinking process used shall not be identified by name or by trademark, either on the cloth, ticket or package.

3.10 Finish. The cloth shall be singed, desized, scoured, dyed, heat set and treated with a resin to provide a crease-resistant finish and hand equal in characteristic to that of the standard sample. Testing shall be in accordance with 4.5.

3.11 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 4.5.

3.12 Marking. 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 piece.

3.13 Workmanship. The finished cloth shall conform to the quality established by this specification. The demerit points per 100 square yards (83.6m²), 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 (see 4.4.1). Except as otherwise specified in the contract or order, the contractor may use his own or any other facilities suitable for 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 Classification of inspection. The inspection requirements specified herein are classified as follows:

1. First article inspection (see 4.3).
2. Quality conformance inspection (see 4.4).

4.3 First article inspection. When required (see 3.2 and 4.2), the first article of finished cloth shall be visually inspected for uniformity of shade, color, finished appearance and shall be tested for chemical and physical properties in accordance with the applicable methods specified in 4.5.

4.4 Quality conformance inspection. (see 4.2) Inspection shall be performed in accordance with MIL-STD-105, except where otherwise indicated.

MIL-C-21851D

4.4.1 Component and material inspection. In accordance with 4.1 above, components and materials shall be inspected and tested 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 documents. In addition, the contractor shall furnish a certificate of compliance for the cotton and polyester requirement of 3.3.1.1 and 3.3.1.2.

4.4.2 Examination of the end item. Examination of the end item shall be in accordance with 4.4.2.1 through 4.4.2.4.

4.4.2.1 Yard-by-yard examination. (see 4.4.2) Each roll in the sample shall be examined on face side only. When the total yardage in the roll does not exceed 100 yards, (91.4m) the entire yardage in the roll shall be examined. When the total yardage in the roll exceeds 100 yards (91.4m), only 100 yards (91.4m) shall be examined. All defects as defined in Section I of FED-STD-4, which are clearly visible at normal inspection distance (3 feet) (0.9m) shall be scored and assigned demerit points as listed in 4.4.2.1.1, except that only those slubs and knots which exceed the limits shown on Sears Fabric Defect Scale (see 6.4), "D" for slubs and "C" for knots, shall be scored. No linear yard (increments of 1 yard (0.9m) 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 (83.6m²) of the total yardage examined exceeds 30.0 points. The lot shall be unacceptable if the point per 100 square yards (83.6m²) of two or more individual rolls exceed 45.0 points. If one roll exceeds the point level, a second sample of 20 rolls shall be examined only for individual roll quality examination. If one or more rolls in the second sample of 20 exceeds the individual point value, the lot shall be rejected. Point computation for lot quality and individual roll quality shall be as follows:

$$\frac{\text{Total points scored in sample size} \times 3600}{\text{Contracted width of cloth (inches)} \times \text{Total yards inspected}} = \text{Points per 100 sq yards (83.6m}^2\text{)}$$

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

For defects up to and including 3 inches (7.62cm) in any dimension	- one point
For defects exceeding 3 inches (7.62cm) but not exceeding 6 inches (15.24cm) in any dimension	- two points
For defects exceeding 6 inches (15.24cm) but not exceeding 9 inches (22.86cm) in any dimension	- three points
For defects exceeding 9 inches (22.86cm) in any dimension	- four points

NOTE: The following defects, when present, shall be scored 4 points for each yard (0.91m) in which they occur:

Baggy, ridgy or wavy cloth
Width less than specified
Non-uniformity of shade (poor dye penetration, mottled, streaky or (cloudy)
Excessive neppiness

4.4.2.2 Examination for length.

4.4.2.2.1 Individual rolls. During the yard-by-yard examinations, 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 (1.8m) 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 in respect to length.

4.4.2.2.2 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 ticket. The rolls examined shall be those selected for the examination of individual rolls.

4.4.2.3 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.

4.4.2.4 Examination for face identification, identification of pre-shrinking process and non-conformance with the Textile Fiber Products Identification Act. (See 4.4.2)

During the yard-by-yard examination, each roll in the sample shall be examined for these defects. The lot shall be unacceptable if two or more rolls in the sample have face identification missing from either or both ends, two or more rolls in the sample contain identification of the pre-shrinking process by name or trademark on the cloth or ticket, or two or more rolls in the sample are not labeled or ticketed in accordance with the Textile Fiber Products Identification Act.

4.4.3 Examination of packaging requirements. An examination shall be made in accordance with the provisions of PPP-P-1134 to determine that packaging, packing and marking comply with the Section 5 requirements of this specification.

4.5 Testing of the end item. The methods of testing specified in FED-STD 191, wherever applicable and as listed in Table II shall be followed. The physical and chemical values specified in Section 3, except where otherwise indicated, apply to the results of the determinations made on a sample unit for test purposes as specified in the applicable test methods. All test reports shall contain the individual values utilized in expressing the final result. The sample unit shall be 3-1/2 yards (3.2m), full width of the finished cloth. The lot size shall be expressed in units of one yard. The sample size shall be as follows and the lot shall be unacceptable if one or more sample units fail to meet any requirements specified.

<u>Lot size (yards)</u>	<u>Sample size (units)</u>
800 or less	2
801 up to and including 22,000	3
22,001 and over	5

MIL-C-21851D

Table II - Test Methods

Characteristic	Requirement Paragraph	Test Method
Fiber content		
Polyester (percent)	3.3.3	2100, 4.5.1
Cotton (percent)	3.3.3	2100, 4.5.1
Yarn (singles)		
Warp	3.3.2	Visual <u>1/</u>
Filling	3.3.2	Visual <u>1/</u>
Weight	3.4	5041
Yarns per inch		
Warp	3.4	5050
Filling	3.4	5050
Breaking strength		
Warp	3.4	5100
Filling	3.4	5100
Weave	3.4.1	Visual <u>1/</u>
Sulfur content	3.5.1	2020
Colorfastness to:		
Croaking	3.5.3	5651
Perspiration	3.5.3	5680
Laundering	3.5.3	5610 <u>2/</u>
Light	3.5.3	5660
Finish	3.10	<u>3/</u>
pH	3.11	2811
Nonfibrous materials	3.6	2610
Dimensional stability	3.9	5556 <u>4/</u>

1/ One determination per sample unit and the result reported as "pass" or "fail."

2/ On the color transfer cloth evaluation, only the stain on the cotton and polyester fibers of the color transfer cloth shall be evaluated.

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

4/ Cotton procedure shall be used.

4.5.1 Fiber content. The general procedure of method 2100 shall be followed and the fiber content percentages calculated as follows:

$$\frac{\text{Weight of dry residual fiber} \times 100}{\text{Weight of dry desized specimen}} = \text{percent polyester}$$

$$100 - \text{percent polyester} = \text{percent cotton}$$

4.5.1.1 Report. Two specimens shall be tested from each sample unit and the average percent polyester and the average percent cotton of the two specimens reported to the nearest 1.0 percent.

5. PACKAGING

5.1 Preservation-packaging. Packaging shall be level A or Commercial, as specified (see 6.2).

5.1.1 Levels A and Ccommercial. The cloth, put up and preserved as specified (see 3.7), shall be packaged in accordance with the applicable requirements of PPP-P-1134.

5.2 Packing. Packing shall be level A, B, or Commercial (see 6.2).

5.2.1 Levels A, B, and Commercial. The cloth shall be packed in accordance with the applicable requirements of PPP-P-1134.

5.3 Marking. In addition to any special marking required by the contract or order, shipments shall be marked in accordance with the requirements of PPP-P-1134.

6. NOTES

6.1 Intended use. The cloth covered by this specification is intended for use in clothing worn by Department of Defense Personnel.

6.2 Ordering data. Procurement documents should specify the following:

- a. Title, number and date of this specification
- b. Width of cloth as specified (see 3.4.2)
- c. First article When a first article inspection is required (see 3.2), the item will be tested and should be a first article sample. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations, quantity, and testing and approval of the first article.
- d. Minimum and Maximum lengths for cloth (see 3.7).
- e. Selection of applicable levels of packaging and packing (see 5.1 and 5.2).
- f. Color of cloth required (see 3.5).

6.3 Standard sample. For access to standard sample, address the procuring activity issuing the invitation for bids (see 3.1).

*6.4 Sears Fabric Defect Scales are available from Sears, Roebuck and Company, Department 817 (ATTN: BSC 23-29), Sears Tower, Chicago, Illinois 60684.

* 6.5 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-21851D

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