

MIL-C-24939

30 SEP 1988

MILITARY SPECIFICATION

CLOTH, RIPSTOP, PARA-ARAMID/PBI, WATER REPELLENT

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 plain 2 x 2 ripstop, 60% para-aramid and 40% PBI, cloth that is water repellent treated.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

SPECIFICATIONS

FEDERAL

PPP-P-1133 - Packaging of Sythetic Fiber Fabrics

MILITARY

MIL-T-43548 - Thread, Polyester Core: Cotton-, Rayon-, or Polyester Covered

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 01760-2490 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 8305

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STANDARDS

FEDERAL

- FED-STD-4 - Glossary of Fabric Imperfections (Sections 1, 1i, and 1ii)
- FED-STD-191 - Textile Test Methods

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. Unless otherwise specified, the issues shall be those in effect on the date of the solicitation.

LAWS AND REGULATIONS

Rules and Regulations Under the Textile Fiber Products Identification Act

(Application for copies should be addressed to the Federal Trade Commission, Washington, DC 20580.)

2.2 Other publications. The following document(s) form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS shall be the issue of the nongovernment documents which is current on the date of the solicitation.

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TECHNICAL MANUAL OF THE AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

Test Method 135 - Dimensional Changes in Automatic Home Laundering of Durable Press Woven or Knit Fabric

(Application for copies should be addressed to the AATCC National Headquarters, P.O. Box 12215, Research Triangle Park, NC 27709.)

(Technical society and technical association documents are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

2.3 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. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Standard sample. When a standard sample is available, the finished cloth 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, the contractor shall furnish sample unit(s) for first article inspection and approval (see 4.3 and 6.2).

3.3 Material.

3.3.1 Fiber. The fiber content shall be a 60/40% blend of para-aramid and PBI (polybenzimidazole). The use of fiber other than the approved is prohibited (see 6.5). The fiber shall be tested as specified in 4.5.

3.3.2 Yarn. The yarn for the warp and filling shall be 16/2 c.c. when tested as specified in 4.5.

3.4 Color. The color shall be natural.

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

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TABLE I. Physical requirements

Characteristics	Requirement
Weight	
unfinished (min)	7.1 oz/yd ² (240.7 g/m ²)
finished (max)	8.1 oz/yd ² (274.6 g/m ²)
Yarns per inch (2.54 cm) (min)	
Warp	43
Filling	31
Tearing strength (Elmendorf) - lb (min)	
Warp	43 (191.5 N)
Filling	43 (191.5 N)
Break strength - lb (min)	
Warp	240 (1068.0 N)
Filling	160 (712.5 N)
Dimensional stability, - 5 launderings	
% (max)	
Warp	3
Filling	3
Water spray resistance - (min)	
Initial	100
After 5 launderings	70
Water absorption resistance - % (max)	
Initial	10
After 5 launderings	10
Non-fibrous - % (max)	2
pH	4.0 - 8.5
Char resistance	No char
	No discoloration
Flame resistance - vertical	
Char length - inch (2.54 cm) (max)	
Warp	1.0
Filling	1.0
After flame - sec. (max)	0.0
After glow - sec. (max)	25.0
Flame resistance - high heat	
After flame -sec.	0.0
% Consumption - (max)	10.0
Air permeability - ft ³ /min/ft ²	
(cm ³ /sec/cm ²) (max)	40 (20.3)

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3.6 Weave. The weave shall be a plain 2 x 2 ripstop pattern with every 10th and 11th warp end weaving together and every 8th and 9th filling end weaving together. The weave shall be tested as specified in 4.5.

3.7 Width. The width of the finished cloth shall be as specified (see 6.2) and shall be the minimum acceptable width, inclusive of selvages when fly shuttle looms or shuttleless with tuck-in selvage looms are used. For all other shuttleless looms the width measurement shall be made between the last warp yarn on each side excluding the protruding fringe.

3.8 Finish. The cloth shall given an approved water repellent treatment (see 4.5 and 6.6).

3.8.1 Nonfibrous material. Prior to the application of the water repellent treatment, the cloth shall contain no more than 2 percent starch and protein content including chloroform-soluble and water-soluble material, when tested as specified in 4.5.

3.9 Seam efficiency. The cloth shall have a seam efficiency of not less than 85 percent when tested as specified in 4.5.

3.10 Length and put-up. Unless otherwise specified (see 6.2), the finished cloth shall be furnished in continuous lengths, each not less than 40 yards (36.4 m). Each length shall be put-up on full width rolls as specified in PPP-P-1133.

3.11 Fiber identification. Each piece shall be labeled, or ticketed for fiber content in accordance with the Rules and Regulations Under the Textile Fiber Products Identification Act (see 2.1.2).

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

3.13 Workmanship. The finished cloth shall conform to the quality established by this document. The occurrence of defects shall not exceed the applicable point level specified (see 4.4.2.1 and 4.4.2.1.1).

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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 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 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.1.2 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 6.2), the first article shall be visually examined for appearance, color and finish, and shall be tested for physical and chemical properties in accordance with methods specified in 4.5.

4.4 Quality conformance inspection. Sampling for inspection shall be performed in accordance with MIL-STD-105, except where otherwise indicated.

4.4.1 Component and material inspection. In accordance with 4.1 above, components and materials shall be 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 procurement documents.

4.4.2 Examination of the end item. Examination of the end item shall be in accordance with 4.4.2.1 through 4.4.2.3.

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4.4.2.1 Yard-by-yard examination. The required yardage of 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 (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 III of FED-STD-4, which are clearly noticeable at normal inspection distance (3 feet) (0.91m) 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), "F or 2" for slubs and "D" for knots, shall be scored.

Point computation for lot quality and individual roll quality shall be as follows:

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

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

- For defects up to and including 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

4.4.2.2 Examination for length.

4.4.2.2.1 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 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 length 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.

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4.4.2.3 Examination for face identification and non-conformance with the Textile Fiber Products Identification Act. 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, or two or more rolls in the sample are not labeled or ticketed in accordance with the Textile Fiber Products Identification Act (see 2.1.2.).

4.4.3 Examination of packaging requirements. An examination shall be made in accordance with the provisions of PPP-P-1133 to determine that preservation, packaging, packing, and marking comply with section 5 requirements.

4.5 Tests. 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 specified, apply to the results of the determinations made on the sample unit for test purposes as specified in the applicable test method. The sample unit shall be five continuous yards (4.55m) full width of the finished cloth, plus 1/4 yard (.23m) full width of the cloth prior to the application of the finish for determination of nonfibrous materials and 1/2 yard (.46m) of the finished cloth carefully wrapped on a tube for the air permeability test. The lot size shall be expressed in units of one yard (0.91m) each. The lot shall be unacceptable if one or more sample units fail to meet any test requirements specified. All test reports shall contain the individual values utilized in expressing the final result. The sample size shall be in accordance with the following:

<u>Lot size (yards) (0.91m)</u>	<u>Sample size (sample units)</u>
800 or less	2
801 up to and including 22,000	3
22,001 and over	5

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TABLE II. - Test Methods

Characteristic	Requirement Paragraph	Test Method
Fiber content	3.3.1	1/
Yarn count	3.3.2	1/
Weight	3.5	5041
Yarns per inch		
Warp	3.5	5050
Filling	3.5	5050
Tear strength		
Warp	3.5	5132
Filling	3.5	5132
Break strength		
Warp	3.5	5100
Filling	3.5	5100
Dimensional stability		
Warp	3.5	AATCC 135 2/
Filling	3.5	AATCC 135 <u>2</u> /
Water spray resistance		
Initial	3.5	5526
After 5 launderings	3.5	5526 <u>2</u> /
Water absorption resistance		
Initial	3.5	5504
After 5 launderings	3.5	5504 <u>2</u> /
Non-fibrous	3.5 and 3.8.1	2611
pH	3.5	2811
Char resistance	3.5	<u>3</u> /
Flame resistance - vertical		
Char length		
Warp	3.5	5903
Filling	3.5	5903
After flame	3.5	5903
After glow	3.5	5903
Flame resistance - high heat		
After flame	3.5	5905
% Consumption	3.5	5905
Air permeability	3.5	5450
Weave	3.6	Visual
Finish (water repellent treatment)	3.8	1/
Seam efficiency	3.9	5110 <u>4</u> /

1/ A certificate of compliance shall be submitted and will be acceptable for the stated requirements.

2/ Testing shall be in accordance with AATCC test 135, 1, III, B.

3/ Fabric shall not char or discolor when placed in a 260°C forced air oven for 5 minutes.

4/ The thread shall be polyester core, cotton or rayon covered, size 50, 2 or 3 ply for the needle thread, and size 70, 2 or 3 ply for the looper thread of MIL-T-43548. The needle size shall be 0.040 (+ 0.001) inch.

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5. PACKAGING

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

5.1.1 Levels A and Commercial. The cloth shall be put-up and packaged in accordance with the applicable requirements of PPP-P-1133.

5.2 Packing. Packing shall be level A, B or Commercial as specified (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-1133.

5.3 Marking. In addition to any special marking required by the contract or order, shipments shall be marked in accordance with the applicable requirements of PPP-P-1133.

6. NOTES

6.1 Intended use. The cloth covered by this specification is intended for use in firefighters clothing.

6.2 Ordering data. Procurement documents should specify the following:

- a. Title, number and date of this document.
- b. When a first article is required (see 3.2 and 4.3). The item will be tested and should be a first article sample. The contracting officer should include specific instruction in acquisition documents regarding arrangements for examinations, quantity, testing, and approval of the first article.
- c. Width required (see 3.7).
- d. Length required if other than specified (see 3.10).
- e. Levels of put-up and preservation, and packing (see 5.1 and 5.2).

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

6.4 Sears defect scales. Sears Fabric Defect Scales are available from Sears, Roebuck and company, Department 817, (Attn: 23-29), Sears Tower, Chicago, IL 60684 (see 4.4.2.1).

6.5 Fiber type. The fiber requirements of this document can be met with "Kevlar 29" manufactured by E.I. DuPont DeNemour Company, Wilmington, DE; and "PBI" manufactured by Hoechst Celanese Corporation, Charlotte, NC.

6.6 Water repellent treatment. Only those approved fluorocarbon water repellent treatments listed in the invitation to bids or request for proposal shall be considered acceptable for the related procurement. Information on currently approved material may be obtained from Defense Personnel Support Center, Philadelphia, PA 19101 (see 3.8).

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6.7 Subject term (key word) listing.

Cloth, flame resistant

Cloth, ripstop

Fiber, para-aramid/PBI blend

Finish, water repellant

Custodian:

Navy - NU

Air Force - 99

Preparing Activity:

Navy - NU

Review Activities:

DLA - CT

Air Force - 50, 82

Navy - AS, MC, SH

Project No.

8305-0210

User Activities:

Air Force - 45

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER MIL-C-24939		2. DOCUMENT TITLE CLOTH, RIPSTOP, PARA-ARAMID/PBI, WATER REPELLENT	
3a. NAME OF SUBMITTING ORGANIZATION		4. TYPE OF ORGANIZATION (Mark one) <input type="checkbox"/> VENDOR <input type="checkbox"/> USER <input type="checkbox"/> MANUFACTURER <input type="checkbox"/> OTHER (Specify) _____	
b. ADDRESS (Street, City, State, ZIP Code)			
5. PROBLEM AREAS			
a. Paragraph Number and Wording			
b. Recommended Wording			
c. Reason/Rationale for Recommendation			
6. REMARKS			
7a. NAME OF SUBMITTER (Last, First, MI) - Optional		b. WORK TELEPHONE NUMBER (Include Area Code) - Optional	
c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional		8. DATE OF SUBMISSION (YYMMDD)	

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NOTE: This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

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