

INCH-POUND

MIL-C-43774C
20 April 1989
SUPERSEDING
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31 March 1986

MILITARY SPECIFICATION

CLOTH, PLAIN OR PAJAMA CHECK WEAVE, ARAMID

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

1. SCOPE

1.1 Scope. This specification covers aramid, plain or pajama check weave, cloth.

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 document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: U.S. Army Natick Research, Development, and Engineering Center, Natick, MA 01760-5014 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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SPECIFICATION

FEDERAL

PPP-P-1133 - Packaging of Synthetic Fiber Fabrics

MILITARY

MIL-T-43636 - Thread, Aramid

STANDARDS

FED-STD-4 - Glossary of Fabric Imperfections

FED-STD-191 - Textile Test Methods

- * (Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Naval Publications and Forms Center, (ATTN: NPODS), 5801 Tabor Avenue, Philadelphia, PA 19120-5099.)
- * 2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

FEDERAL TRADE COMMISSION

Rules and Regulations Under the Textile Fiber Products Identification Act

(Copies are available from the Federal Trade Commission, Washington, DC 20580-0001.)

- * 2.2 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

- * 3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection (see 6.3), in accordance with 4.3.
- 3.2 Standard sample. The dyed and finished cloth shall match the standard sample for shade and appearance and shall be equal to or better than the standard sample with respect to all characteristics for which the standard sample is referenced (see 6.4).

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- * 3.3 Material. It is encouraged that recycled material be used when practical as long as it meets the requirements of this specification.

3.3.1 Fiber. The fiber shall be an approved aramid (see 6.9), 1.5 or 2 denier per filament, cut to a staple length of 1 1/2 to 2 inches. The fiber shall not char at a temperature less than 675°F when tested as specified in 4.4.3. The use of fiber other than the approved is prohibited.

3.3.2 Yarn. The yarn shall be spun into singles for both the warp and filling (see 6.5).

3.4 Color. The color of the cloth shall be as specified (see 6.2) and shall match the standard sample. The color shall be obtained by the use of dry spun solution dyed fibers.

- * 3.4.1 Matching. The color of the finished cloth shall match the standard sample when viewed under filtered tungsten lamps that approximate artificial daylight having a correlated color temperature of 7500 ± 200 K, with illumination of 100 ± 20 foot candles, and shall be a good match to the standard sample under incandescent lamplight at 2300 ± 200 K.

- * 3.4.2 Colorfastness. The dyed and finished cloth shall show fastness to light and to laundering equal to or better than the standard sample or equal to or better than a rating of "good". Testing shall be as specified in 4.4.3.

3.5 Physical requirements. The physical requirements of the finished cloth shall be as specified in table I when tested as specified in 4.4.3.

* TABLE I. Physical requirements

Characteristic	Requirement
Weight per sq yd, minimum (ounces)	3.0
Yarns per inch, minimum:	
Warp	80
Filling	69
Breaking strength, minimum (pounds):	
Warp	95
Filling	80
Flame resistance:	
Flaming time, maximum (seconds)	2.0
Glow time, maximum (seconds)	25.0
Char length, maximum average (inches)	4.0

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3.5.1 Weave. The weave shall be plain or pajama check. The pajama check weave shall form a uniform corded check pattern. The weave shall repeat on 12 ends and 12 picks. The warp repeat shall be 2 ends weaving as 1 (in an oxford manner), followed by 4 ends weaving in plain weave order. The filling repeat shall be the same order as the warp repeat.

3.5.1.1 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.

3.5.2 Width. The width of the cloth shall be as specified (see 6.2) and shall be the minimum acceptable width inclusive of selvage when fly shuttle looms or shuttleless looms with tuck-in selvage 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(s).

* 3.5.3 Fabric break open. The flame from a meker burner shall not pass from the flame contact side to the other side of the fabric due to the fabric breaking open, when tested as specified in 4.4.3. This requirement shall not apply to natural color, undyed aramid fabric.

3.6 Finishing. The cloth shall be desized, scoured, heat set, and given a durable antistatic finish (see 3.6.1). The cloth shall be heat set to meet the requirements of 3.6.3 and 3.8 (see 6.8).

3.6.1 Antistatic finish. The cloth shall be given a durable antistatic finish (see 6.6 and 6.7) so that the maximum surface resistivity of any one specimen before laundering shall be 3.0×10^{11} ohms per square, and the maximum surface resistivity of any one specimen after five launderings shall be 8×10^{11} ohms per square when tested as specified in 4.4.3. Only those chemical treatments already approved by the appropriate medical service and so listed herein (see 6.7), or in the invitation for bids or request for proposal, shall be considered acceptable for the related acquisition.

3.6.2 Nonfibrous material. Prior to the application of the finish, the cloth shall contain no more than 1.0 percent starch and protein including chloroform-soluble and water-soluble material when tested as specified in 4.4.3.

3.6.3 Curling. The finished cloth shall lie flat, without distortion, and shall show no evidence of curling when tested as specified in 4.4.3.

3.7 pH. The pH value of the water extract of the finished cloth shall be not less than 4.0 nor more than 8.0 when tested as specified in 4.4.3.

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3.8 Dimensional stability. The shrinkage or elongation both in the warp and in the filling shall not be greater than 3.5 percent for the individual sample unit and not greater than 3.0 percent for the lot average when tested as specified in 4.4.3. The preshrinkage process used shall not be identified by name or trademark on either the cloth, the ticket, or the package.

3.9 Seam efficiency. The finished cloth shall have a seam efficiency of not less than 80 percent when tested as specified in 4.4.3.

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. The cloth shall be put up in full width rolls as specified in 5.1.

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

3.12 Workmanship. The finished cloth shall conform to the quality of product established by this document and the demerit points per 100 square yards shall not exceed the specified point values.

4. QUALITY ASSURANCE PROVISIONS

* 4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, 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 this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

* 4.1.1 Responsibility for compliance. All items shall 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 ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.1.2 Certificates of compliance. When certificates of compliance are submitted, the Government reserves the right to inspect such items to determine the validity of the certification.

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* 4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.3)
- b. Quality conformance inspection (see 4.4)

* 4.3 First article inspection. When a first article is required (see 3.1 and 6.2), it shall be examined for the defects specified in 4.4.2.1 through 4.4.2.4 and tested as specified in 4.4.3.

4.4 Quality conformance inspection.

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

4.4.2 End item visual examination.

4.4.2.1 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 on the face side only. All defects as defined in section III of FED-STD-4 that are clearly noticeable at normal inspection distance (3 feet) shall be scored and assigned demerit points as listed in 4.4.2.1.1 except as follows:

- a. Only coarse yarns that exceed twice the normal yarn diameter shall be scored.
- b. Mixed filling (shade bar) shall be scored only resulting from wrong ply, variation of twist in the yarn or off shade yarn.
- c. Only knots and slubs that exceed limits shown in figure 1 of FED-STD-4 shall be scored.

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 four 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 50 points. The lot shall be unacceptable if the points per 100 square yards of two or more individual rolls exceeds 75 points. If one roll exceeds 75 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 75 points per 100 square yards. Point computation for lot quality and individual roll quality shall be as follows:

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

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

For defects 3 inches or less 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

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

Uneven weaving

4.4.2.2 Length examination. 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 2 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 or if the total of the actual lengths of rolls in the sample is less than the total of the lengths marked on the ticket.

4.4.2.3 Roll identification examination. During the yard-by-yard examination, each roll in the sample shall be examined for identification defects. The lot shall be unacceptable if two or more rolls in the sample are not labeled or ticketed in accordance with the Textile Fiber Products Identification Act, or if the face stamping is missing from either or both ends, or if the face stamping is on the wrong side.

4.4.2.4 Shade and appearance examination. During the yard-by-yard examination, each roll in the sample shall be examined for shade and appearance. If any roll in the sample is off shade, shaded side to side, shaded side to center, or shaded end to end, or if any roll does not have the same appearance as the standard sample, it shall be cause for rejection of the entire lot represented by the sample.

4.4.3 End item testing. The cloth shall be tested for the characteristics listed in table II. The methods of testing specified in FED-STD-191, wherever

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applicable, and as listed in table II shall be followed. All test reports shall contain the individual values utilized in expressing the final results. The sample unit shall be 1/4 yard full width of the dyed cloth (prior to treatment) for determination of nonfibrous material content and 5 continuous yards full width for all other physical and chemical tests. The lot shall be unacceptable if one or more sample units or the lot average for dimensional stability fail to meet any test requirement specified. The sample size shall be in accordance with the following:

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

TABLE II. End item tests

<u>Characteristic</u>	<u>Requirement paragraph</u>	<u>Test method</u>
Fiber identification	3.3.1	1/
Fiber charring	3.3.1	1/
Staple:		
Denier	3.3.1	1/
Length	3.3.1	Visual 1/
Yarn:		
Singles	3.3.2	Visual 2/
Colorfastness to (dyed only):		
Light	3.4.2	5660 3/
Laundering	3.4.2	5610
Weight	3.5	5041
Yarns per inch:		
Warp	3.5	5050
Filling	3.5	5050
Breaking strength:		
Warp	3.5	5100
Filling	3.5	5100
Flame resistance	3.5	5903 4/
Weave	3.5.1	Visual 2/
* Fabric break open	3.5.3	4.5.2 2/
Desized	3.6	1/
Scoured	3.6	1/
Antistatic finish:		
Before laundering	3.6.1	5930 5/
After five launderings	3.6.1	5556 6/ and 5930 5/

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TABLE II. End item tests (cont'd)

Characteristic	Requirement paragraph	Test method
Nonfibrous material	3.6.2	2611
Curling	3.6.3	4.5.1
pH	3.7	2811
Dimensional stability after 15 launderings	3.8	5556 6/
Seam efficiency	3.9	5110 <u>7/</u>

- 1/ Unless otherwise specified, a certificate of compliance shall be submitted and will be acceptable for the stated requirements.
- 2/ One determination shall be made from each sample unit and the results reported as "pass" or "fail".
- 3/ Except that the contractor's submission shall be compared with the standard sample after 6 hours and evaluation made at this point.
- 4/ Warp direction test results shall be reported separately from filling direction test results.
- 5/ If the apparatus incorporates a circular test fixture, three specimens shall be cut. If the apparatus incorporates a parallel plate test fixture, six specimens shall be cut: three in the warp direction and three in the filling direction. Both surfaces of each specimen shall be tested, and the average results for each specimen shall be reported in ohms per square. This procedure shall be repeated for each sample unit.
- 6/ Cotton laundering procedures.
- 7/ The needle shall measure 0.040 inch \pm 0.001 inch across the blade at the eye. The thread for both the needle and looper shall be size B, type I of MIL-T-43636.

* 4.4.4 Packaging inspection. The sampling and inspection of the preservation, packaging, and container marking shall be in accordance with the requirements of PPP-P-1133.

4.5 Methods of inspection.

4.5.1 Curling. Two specimens of cloth, 1 1/2 inches wide by 6 inches long shall be cut, one having the long dimension parallel to the warp and the other with the long dimension parallel to the filling. Both specimens shall be placed on a flat surface for at least 5 minutes and then visually examined for evidence of curling.

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- * 4.5.2 Fabric break open test. The specimen shall be rigidly held in a horizontal position between two metal plates with a 6-inch diameter fabric exposure. One side of the fabric shall be exposed to a meker burner in the center at a 90 degree angle using natural gas (2 liters per minute flow rate) for 30 seconds with 2-inches distance between fabric and burner top. This test procedure shall not apply to natural color, unayed aramid fabric.

5. PACKAGING

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

5.1.1 Levels A and Commercial. The cloth shall be put-up on rolls and preserved 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 purchase order, shipments shall be marked in accordance with the applicable requirements of PPP-P-1133.

6. NOTES

- * (This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The cloth is intended for use as a cover fabric for quilted batting, linings, and for facings and bindings.

- * 6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1).
- c. When a first article is required (see 3.1, 4.3, and 6.3).
- d. Color required (see 3.4).
- e. Width of cloth required (see 3.5.2).
- f. Length required, if other than specified (see 3.10).
- g. Selection of applicable levels of put-up, preservation, and packing (see 5.1 and 5.2).

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* 6.3 First article. When a first article is required, it shall be inspected and approved under the appropriate provisions of FAR 52.209. The first article should be a preproduction sample. The contracting officer should specify the appropriate type of first article and the number of units to be furnished. The contracting officer should include specific instructions in acquisition documents regarding arrangements for selection, inspection, and approval of the first article.

6.4 Sample. For access to samples, address the contracting activity issuing the invitation for bids.

6.5 Yarn size. The cloth requirements were based on a construction using 37/1 warp and filling yarn.

6.6 Add-on. The add-on of treatments shall be the minimum that will adequately meet the requirements of this document. Care should be exercised in controlling the add-on because excessive add-ons tend to impair the flammability characteristics of the material.

6.7 Treatment. The requirements for the durable antistatic treatment can be met with Aston 123, Onyx Chemical Co., 190 Warren St., Jersey City, NJ 07302 and Stanax (not Stanax 1166), Standard Chemical Products, Inc., Hoboken, NJ 07030. Other products considered for this use must have the prior approval of the contracting officer.

6.8 Heat setting. A heat setting procedure that has given satisfactory results is as follows: Autoclave with steam at 30 pounds per square inch (psi) minimum for at least 40 minutes. The steam shall be drawn through the cloth by the application of a vacuum for a period of 5 minutes in order to adequately saturate the cloth with steam. The steam pressure shall be held at 30 psi minimum for approximately 20 minutes, after which the steam is cut off and a vacuum placed on the material for 5 minutes. The steam shall then be reapplied for the remaining time of the autoclaving period followed by a vacuum for 5 minutes, to remove all moisture from the cloth. Care must be taken to avoid the presence of creases in the cloth and roll deformation since autoclaving will permanently set the cloth.

6.9 Fiber identification. The requirements of the fabric can be met with "Nomex Type 456 or 457" aramid fiber manufactured by E.I. DuPont de Nemours & Company, Wilmington, DE. Approval of other fiber is the responsibility of the U.S. Army Natick Research, Development, and Engineering Center, Natick, MA 01760-5014, and is based on more extensive tests, including those for toxicity, which are not set forth in this document.

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* 6.10 Subject term (key word) listing.

Fabric, cover
Facing
Lining

6.11 Changes from previous issue. The margins of this specification are marked with asterisks 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 previous issue.

Custodians:

Army - GL
Navy - NU
Air Force - 11

Preparing activity:

Army - GL

Review activities:

Army - MD
DLA - CT

(Project 8305-0282)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER MIL-C-43774C		2. DOCUMENT TITLE Cloth, Plain or Pajama Check Weave, Aramid	
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) _____	
3b. 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		7b. 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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