

MIL-C-823J

21 December 1983

SUPERSEDING

MIL-C-823H

12 February 1976

## MILITARY SPECIFICATION

## CLOTH, SERGE; WOOL, WOOL AND NYLON, POLYESTER AND WOOL

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

## 1. SCOPE

1.1 Scope. This document covers wool, wool and nylon, and polyester and wool serge cloth.

\* 1.2 Classification. The cloth shall be of the following types and classes as specified (see 6.2 and 6.4):

Type I	-	Wool
Class 1	-	18 ounce
Class 2	-	16 ounce
Class 3	-	16 ounce
Class 5	-	15 ounce
Class 7	-	12 ounce
Class 8	-	12 ounce
Type II	-	Wool and nylon
Class 1	-	18 ounce
Class 2	-	16 ounce
Type III	-	Polyester and wool
Class 1	-	14 ounce
Class 2	-	12 ounce
Class 3	-	11.3 ounce

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 Center, 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.

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2. APPLICABLE DOCUMENTS

- \* 2.1 Government documents. Unless otherwise specified, the following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this document to the extent specified herein.

SPECIFICATIONS

FEDERAL

PPP-P-1132 - Packaging of Woolen, Worsted and Wool Blend  
(Synthetic Fiber; Cotton) Fabrics

MILITARY

MIL-C-43665 - Cloth Wool: Mothproofing Treatment of

STANDARDS

FEDERAL

FED-STD-191 - Textile Test Methods

MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection  
by Attributes  
MIL-STD-655 - Provision for Evaluating Quality of Cloth,  
Wool, Worsted and Wool Blends

(Copies of documents required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

OTHER GOVERNMENT DOCUMENTS

U.S. DEPARTMENT OF AGRICULTURE (USDA)

CFR 7 - Part 31 - Wool Standards

Methods for Determining Grade of Wool Top

(Application for copies should be addressed to the U.S. Department of Agriculture, Agricultural Marketing Service, Washington, DC 20250.)

Laws and Regulations

Rules and Regulations Under the Wool Products Labeling Act

(Application for copies should be addressed to the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.)

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- \* 2.2 Other publications. Unless otherwise specified, the following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this document to the extent specified herein.

## AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

## Chromatic Transference Scale

(Application for copies should be addressed to the American Association of Textile Chemists and Colorists, 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 document and the references cited herein, the text of this document shall take precedence.

## 3. REQUIREMENTS

- \* 3.1 Standard sample. The finished cloth shall match the standard sample for shade, finish 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 6.3).
- \* 3.2 First article. When specified, a sample shall be subjected to first article inspection (see 4.3, 6.2 and 6.7).

3.3 Material.

- \* 3.3.1 Wool. The wool component of the cloth shall be not lower than the grades specified below:

Types I and II

Class 1 (18 oz.) - 60's U.S. Standard  
 Class 2 (16 oz.) - 60's U.S. Standard  
 Class 3 (16 oz.) - 64's U.S. Standard  
 Class 5 (15 oz.) - 62's U.S. Standard  
 Class 7 (12 oz.) - 64's U.S. Standard  
 Class 8 (12 oz.) - 64's U.S. Standard

Type III

Class 1 (14 oz.) - 64's U.S. Standard  
 Class 2 (12 oz.) - 64's U.S. Standard  
 Class 3 (11.3 oz.) - 64's U.S. Standard

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3.3.1.1 Type I. The wool top for type I shall be fleece wool, pulled wool, or any combination thereof not lower in grade than specified in 3.3.1 and shall be of suitable staple length to meet the requirements of this document. The use of laps, noils, or any other wool manufacturing by-products is prohibited (see 4.4.2).

\* 3.3.1.2 Type II. The blend for type II shall consist of fleece wool, pulled wool, or any combination thereof not lower in grade than specified in 3.3.1 and nylon top or cut tow (see 6.2). Unless otherwise specified (see 6.2), the blend shall be in such proportion that the finished cloth shall contain between 80 to 85 percent wool with the remaining percentage of nylon fiber, based on the oven-dry weight when tested as specified in 4.4.4. The nylon fibers shall be of suitable denier and the wool and nylon fibers of suitable length to meet the requirements of this document. The use of laps, noils, or any other wool manufacturing by-products and nylon fiber waste is prohibited (see 4.4.2).

\* 3.3.1.3 Type III. The blend for type III shall consist of fleece wool, pulled wool, or any combination thereof not lower in grade than specified in 3.3.1 and polyester top or cut tow (see 6.2). The polyester stock shall be semi-dull polyester fiber made from polyethylene glycol terephthalate either a homopolymer or modified polymer as appropriate. The minimum average fiber length shall be 3 inches. The denier shall be suitable to blend adequately with the specified wool grade and meet the requirements of this document. The use of laps, noils, or any other wool manufacturing by-products and polyester fiber waste is prohibited (see 4.4.2). The finished cloth shall consist of the following fiber percentages based on the oven dry weight when tested as specified in 4.4.4:

	<u>Percentage</u>	
	<u>Minimum</u>	<u>Maximum</u>
Polyester fiber	55	60
Wool fiber	40	--

\* 3.3.2 Yarn. The yarn for the warp and the filling shall be spun from combed top. The yarn ply shall be as specified in table I.

NOTE: Selvage yarns. To prevent edges of all types of cloth from building up when rolled, 2-ply yarns used in the selvage may be made of a finer count than those used in the body of the cloth.

3.4 Color. The color shall be as specified (see 6.2). The color of the finished cloth shall match the standard sample (see 6.3 and 6.5.1). The color shall be applied in stock or top form. Speck dyeing is prohibited. When Army Green 44 is specified, the color shall be produced by blending dyed wool top (see 6.5). When Army Green 344 is specified, the color shall be produced by blending dyed wool top and dyed polyester fiber (see 6.5).

3.4.1 Mothproofing. Mothproofing of the wool material in accordance with MIL-C-43665 shall be accomplished during stock or top dyeing, as applicable (see 4.4.4).

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- \* 3.4.2 Matching. The color and shade of the finished cloth shall match the standard sample (see 6.3) under artificial daylight having a color temperature of 7000 + 500 K and shall be a good approximation to the standard sample under incandescent lamplight at 2850 + 100 K.
- \* 3.4.3 Colorfastness. The finished cloth shall show fastness to wet drycleaning, 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 drycleaning, perspiration and light and shall show an AATCC Chromatic Transference Scale rating for crocking not lower than 3.5. In the case of type I, class 5, Navy Shade Blue 3346, when no standard sample has been established or designated as applicable to colorfastness to light, the finished cloth shall show "good" fastness to light after 80 standard fading hours. Testing shall be as specified in 4.4.4.

3.5 Physical requirements. The finished cloth shall conform to the requirements specified in table I when tested as specified in 4.4.4.

TABLE I. Physical requirements

Type	Class	Weight per linear yard on a 56 inch width basis (minimum) Ounces	Yarn ply		Yarns per inch (minimum) Warp Filling		Breaking strength (minimum) Warp Filling		Shrinkage (maximum) Warp Filling	
			Warp	Filling	Warp	Filling	Lbs.	Lbs.	Pct.	Pct.
I	1	18.0	2	2	68	54	110	100	4.0	2.5
I	2	16.0	2	1	70	54	100	80	4.0	2.5
I	3	16.0	2	2	68	64	100	90	4.0	3.0
I	5	15.0	2	2	70	58	100	80	5.0	3.0
I	7	12.0	2	2	74	70	80	70	5.0	3.0
I	8	12.0	2	2	70	62	80	70	5.0	3.0
II	1	18.0	2	1	66	52	135	120	4.0	2.5
II	2	16.0	2	1	70	54	120	110	4.0	2.5
III	1	14.0	2	1	78	55	175	130	4.0	3.0
III	2	12.0	2	2	74	68	150	125	4.0	3.0
III	3	11.3 12.3 (max.)	2	2	78	68	140	125	3.0	2.5

3.5.1 Width. The width of all types and classes of finished cloth shall be a minimum of 60 inches exclusive of selvage or exclusive of tuck-in, when woven on Sulzer-type looms.

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3.5.2 Weave. The weave for all types and classes of finished cloth shall be a 2 up and 2 down, 4 harness right twill (see 4.4.4).

3.6 Finish. The cloth shall be fulled and sheared and shall be otherwise finished so as to provide stability of both color and finish (see 6.6). The type and character of finish shall conform to that shown by the standard sample.

3.6.1 Pilling. The type III cloth shall be finished to show no more pilling than the standard sample when tested as specified in 4.4.4.

3.6.2 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 4.4.4.

3.7 Length and put-up. Unless otherwise specified (see 6.2), the cloth shall be furnished in continuous lengths, each not less than 50 yards. Each length shall be put-up on full width rolls as specified in 5.1.

3.8 Wool content. The finished type I cloth shall contain no less than 95 percent wool based on the dry weight of the specimen when tested as specified in 4.4.4.

3.9 Wool content label. The cloth shall be labeled in accordance with the Wool Products Labeling Act (see 2.1).

3.10 Marking. The back of the cloth shall be marked "BACK" at both ends of each roll with letters not less than 1/2 inch in height (see 4.4.3.3). The marking shall be clearly legible in any indelible marking medium used commercially.

3.11 Workmanship. The finished cloth shall conform to the quality of product established by this document. The demerit points per 100 square yards, when calculated as specified in section 4, shall not exceed the established maximum acceptable point value. Each defect shall be marked with a 1 to 1-1/2 inch long string. The string shall be sewn into the selvage near the defect. A red string shall represent a three or four-point defect and a white string shall represent a one or two-point defect (see 4.4.3.5).

#### 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 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 the document where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

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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 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 6.2), it shall be examined for appearance, color, and finish defects and shall be tested for the characteristics specified in table II. The presence of any defect or failure of any test shall be cause for rejection of the first article.

\* 4.4 Quality conformance inspection. Unless otherwise specified, sampling for inspection shall be performed in accordance with MIL-STD-105.

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 document or applicable purchase document.

\* 4.4.1.1 Wool grade examination. The wool shall be visually examined for grade (see 3.3.1) in undyed top form by comparison with the applicable U.S. Standard (see 2.1). In the event of a dispute, the wool grade shall be determined by the width method (wedge). The sample unit shall be 1 yard of undyed top prior to blending with nylon or polyester fibers. The sample size (number of sample units) shall be as shown below. The result from each sample unit shall be reported separately. The lot shall be unacceptable if one or more sample units fail to meet the required grade.

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

\* 4.4.1.2 Polyester fiber certification. Polyester fiber shall be accepted on the basis of a contractor's certificate of compliance with the requirements specified in 3.3.1.3.

\* 4.4.2 In-process inspection. Inspection shall be made at any point or during any phase of the manufacturing process to assure that no laps, noils or any other wool manufacturing by-products are used (see 3.3.1.1, 3.3.1.2 and 3.3.1.3), and that the dyeing requirements have been adhered to (see 3.4). The Government reserves the right to exclude from consideration for acceptance any material for which the in-process inspection has indicated nonconformance.

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4.4.3 End item examination.

4.4.3.1 Yard-by-yard examination. The yard-by-yard examination shall be as specified in MIL-STD-655. The fabric quality for all shades shall be quality level 10.

\* 4.4.3.1.1 Limits of slubs and knots. Only slubs and knots which exceed "D" for slubs and "C" for knots on the Sears Fabric Defect Scale (see 6.8) shall be scored.

\* 4.4.3.2 Examination for length. The examination for length shall be as specified in MIL-STD-655.

\* 4.4.3.3 Examination for back marking and compliance with the Wool Products Labeling Act. The examination for back marking and compliance with the Wool Products Labeling Act shall be as specified in MIL-STD-655.

4.4.3.4 Examination for shade match and finish, individual rolls. A sample from each roll in the lot shall be examined visually for shade (see 3.4.2), finish and appearance (see 3.6). A roll shall be unacceptable if it fails to meet the requirements for shade, finish or appearance. The sample shall be a 4-inch by 20-inch swatch of the cloth. A sample shall be drawn from each roll in the lot.

\* 4.4.3.5 Examination for defect marking (stringing of defects). The examination for defect marking (stringing of defects) shall be as specified in MIL-STD-655.

\* 4.4.4 End item testing. The cloth shall be tested for the applicable characteristics indicated in table II. 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 apply to the results of the determinations made on a sample unit for test purposes as specified in the applicable test method. The sample unit shall be 3-1/2 continuous yards full width of the finished cloth. The lot shall be unacceptable if one or more sample units fail to meet any test requirement specified. All test reports shall contain the individual values utilized in expressing the final results. 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



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TABLE II. End item tests

Characteristic	Requirement paragraph	Test method
Fiber content (finished cloth):		
Wool (type I)	3.8	2101
Nylon and wool (type II)	3.3.1.2	2530 <u>1/</u>
Polyester and wool (type III)	3.3.1.3	2102
Mothproofing	3.4.1	<u>2/</u>
Colorfastness to:		
Wet drycleaning	3.4.3	5622
Crocking	3.4.3	5651
Perspiration	3.4.3	5680
Light	3.4.3	5660
Weight	3.5	5041
Yarn ply:		
Warp	3.5	Visual <u>3/</u>
Filling	3.5	Visual <u>3/</u>
Yarns per inch	3.5	5050
Breaking strength	3.5	5100
Shrinkage	3.5	5558
Weave	3.5.2	Visual <u>3/</u>
Pilling (type III)	3.6.1	5320 <u>4/</u>
pH	3.6.2	2811

$$\underline{1/} \text{ Nylon percent} = \frac{S - R}{S} \times 100$$

Where: S = Weight of dry chloroform extracted specimen  
R = Weight of residual fiber

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- 2/ The test for percent mothproofing compound shall be as specified in MIL-C-43665. For type II cloth, the percent mothproofing compound shall be determined and calculated using the procedure for specimens containing all wool.
- 3/ One determination per sample unit and the results reported as "pass" or "fail".
- 4/ The pilling test shall be conducted in accordance with Method 5320, except that five specimens of the test cloth and one specimen of the standard sample shall be used concurrently.
- \* 4.4.5 Packaging inspection. The inspection shall be in accordance with the quality assurance provisions of PPP-P-1132.

## 5. PACKAGING

- \* 5.1 Put-up and preservation. Put-up and 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 and preserved in accordance with the applicable requirements of PPP-P-1132.
- 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-1132.
- 5.3 Marking. In addition to any special marking required in the contract or purchase order, shipments shall be marked in accordance with the applicable requirements of PPP-P-1132.

## 6. NOTES

- 6.1 Intended use. The cloths covered by this document are for use in service, semi-dress, dress uniforms and functional clothing used by the Department of Defense.
- \* 6.2 Ordering data. Acquisition documents should specify the following:
- a. Title, number, and date of this document.
  - b. Type, class, and nomenclature of cloth required (see 1.2).
  - c. When a first article is required (see 3.2, 4.3 and 6.7).
  - d. Whether polyester top or cut tow is required for type II cloth (see 3.3.1.2).
  - e. Nylon blend when type II cloth is required (if other than specified in 3.3.1.2).
  - f. Whether polyester top or cut tow is required for type III cloth (see 3.3.1.3).
  - g. Color required (see 3.4).
  - h. Minimum length if other than specified (see 3.7).
  - i. Selection of applicable levels of put-up, preservation, and packing (see 5.1 and 5.2).

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

\* 6.4 Colors, types and classes of cloth used by the Services. The colors of cloth required by the Services are as follows:

Service	Color	Type	Class	Weight (ounces)
Army	Olive Green 108	I	1	18
	Army Green 44	I or II	2	16
	Army Green 44	I	5	15
	Army Green 44	I	7	12
	Army Green 44	I	8	12
	Army Green 344	III	1	14
	Army Green 344	III	2	12
	Army Green 344	III	3	11.3
Navy	Blue 3346	I	3	16
	Blue 3346	I	5	15
	Blue 3346	I	7	12
Coast Guard	Blue 3362	III	3	11.3
Marine Corps	Green 2234	I	5	15
	Green 2207 and			
	Blue 2305	I	8	12

6.5 Suggested dyestuff formulations. Suggested but not mandatory, dyestuff formulations for Army Green 44, Army Green 344, Olive Green 108, Marine Corps Green 2234 and Navy shade Blue 3346 are as listed herein. The standard shade samples have been dyed with these formulations.

Wool component for Army Green 44 and Army Green 344:

Acid Green 70  
 Acid Green 58  
 Acid Orange 85  
 Acid Orange 86

The ratio of Acid Green 70 to the Acid Green 58 shall be 1:1 for equal strengths of the two dyes. The formulation has been shown to provide optimum colorfastness properties when dyed with either ammonium sulfate or ammonium acetate.

NOTE: Since Army Green 44 is essentially a solid shade, no specific blends of primaries are recommended; however, if a system of blending primaries is used, shade difference between primaries should be kept at a minimum in order to avoid a two-tone or heathery effect which is not acceptable.

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## Polyester component for Army Green 344:

Disperse Blue 62		Disperse Blue 27, CI 60767
Disperse Yellow 23 CI 26070		Disperse Yellow 23, CI 26070
Disperse Red 59	or	Disperse Red 4, CI 60755
Disperse Violet 18		Disperse Yellow 42, CI 10338

## Olive Green 108:

Acid Orange 85
Acid Blue 165
Acid Green 70
Acid Green 58
Acid Orange 86

## Marine Corps Green 2234:

The standard sample for Marine Corps Green 2234 was blended with approximately 13 percent white wool and 87 percent green wool dyed with a formulation of neutral premetallized dyes as follows:

Neutral Premetallized Grey RLX (no index number)
Acid Yellow 128
Acid Brown 45

Other premetallized dyes or combinations of premetallized dyes producing the required shade and colorfastness properties will be acceptable.

## Navy Shade Blue 3346:

Mordant Black 9, CI 16500
Mordant Red 27
Mordant Blue 7, CI 17940

6.5.1 Shade control. Shade control of those shades dyed on fabrics in the 16-ounce and lighter weight constructions is critical and the contractor is accordingly cautioned to exercise special care in color matching such shades (see 3.4).

6.6 Finish The finish of this cloth is critical and the contractor is accordingly cautioned to insure that the amount of twist in the yarns and the subsequent setting and dry finishing of the fabric are adequately controlled to preclude the possibility of movement of the fiber to the fabric surface during wear, thus increasing the degree of cover beyond that shown by the standard sample (see 3.6).

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6.7 First article. When a first article is required, it shall be inspected and approved under the appropriate provisions of DAR 7-104.55. The first article should be a preproduction sample consisting of 3-1/2 yards of the finished cloth. The contracting officer should include specific instructions in all acquisition documents regarding arrangements for inspection and approval of the first article.

\* 6.8 Fabric defect scales. Sears Fabric Defect Replica Kits are available from:

Sears Roebuck and Company  
Department 817, (ATTN: BSC 23-29)  
Sears Tower  
Chicago, IL 60684

6.9 Changes from previous issue. The margins of this document 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.

## Custodians:

Army - GL  
Navy - NU  
Air Force - 11

## Preparing activity:

Army - GL  
Project No. 8305-0879

## Review activities:

Army - MD  
Air Force - 82, 99  
DLA - CT

## User activities:

Navy - MC, CG



**INSTRUCTIONS:** In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge (*DO NOT STAPLE*), and mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

**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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