

INCH-POUND  
MIL-DTL-44436C  
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SUPERSEDING  
MIL-DTL-44436B  
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## DETAIL SPECIFICATION

### CLOTH, WIND RESISTANT POPLIN, NYLON/COTTON BLEND

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

#### 1. SCOPE

1.1 Scope. This specification covers wind resistant poplin nylon/cotton cloth, dyed and overprinted with the specified camouflage pattern.

1.2 Classification. The following classes are covered in this document.

- Class 1 - Woodland Camouflage Pattern
- Class 2 - Woodland Camouflage Pattern, Water Repellent Treated
- Class 3 - Desert Camouflage Pattern
- Class 4 - DELETED
- Class 5 - Black 357
- Class 6 - Universal Camouflage Pattern, (UCP)
- Class 7 - Universal Camouflage Pattern, (UCP) Water Repellent Treated
- Class 8 - Universal Camouflage Pattern, (UCP) Wrinkle Free Finish
- Class 9 - DELETED
- Class 10 - DELETED
- Class 11 - DELETED
- Class 12 - Operational Camouflage Pattern, (OCP)
- Class 13 - Operational Camouflage Pattern, (OCP) Water Repellent Treated
- Class 14 - Operational Camouflage Pattern, (OCP) Wrinkle Free Finish

Comments, suggestions, or questions on this document should be addressed to: Attn: DLA Troop Support Standardization Team, 700 Robbins Avenue, Philadelphia, PA 19111-5096. Since contact information can change, you may want to verify the currency of the address information using Acquisition Streamlining and Standardization Information System (ASSIST) online database <https://assist.dla.mil/>.

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### 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3 and 4 of this specification, whether or not they are listed.

#### 2.2 Government documents.

2.2.1 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 cited in the solicitation or contract.

2.2.2 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 or contract.

### DRAWINGS

#### U.S. ARMY RESEARCH, DEVELOPMENT, AND ENGINEERING COMMAND

- 2-1-1516 - Woodland Camouflage Pattern
- 2-1-2240 - Desert Camouflage Pattern
- 2-1-2519 - Universal Camouflage Pattern (UCP)
- 2-1-2592 - Operational Camouflage Pattern (OCP)

(Copies of drawings are available from the U.S. Army Natick Soldier Research, Development and Engineering Center, ATTN: RDNS-SES-WC, 10 General Greene Avenue, Natick, MA 01760-5019.)

#### FEDERAL TRADE COMMISSION

Rules and Regulations under the Textile Fiber Products Identification Act

(Copies are available online at <http://www.ftc.gov>.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

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

- AATCC Evaluation Procedure 1, Gray Scale for Color Change
- AATCC Evaluation Procedure 2, Gray Scale for Staining

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AATCC Evaluation Procedure 5, Fabric Hand: Guidelines for the Subjective Evaluation of  
AATCC Evaluation Procedure 8, AATCC 9-Step Chromatic Transference Scale  
AATCC Evaluation Procedure 9, Visual Assessment of Color Difference of Textiles  
AATCC Test Method 8 - Colorfastness to Crocking: Crockmeter Method  
AATCC Test Method 15 - Colorfastness to Perspiration  
AATCC Test Method 16.3 - Colorfastness to Light: Xenon Arc  
AATCC Test Method 20 - Fiber Analysis: Qualitative  
AATCC Test Method 20A - Fiber Analysis: Quantitative  
AATCC Test Method 22 - Water Repellency: Spray Test  
AATCC Test Method 61 - Colorfastness to Laundering: Accelerated  
AATCC Test Method 70 - Water Repellency: Tumble Jar Dynamic Absorption Test  
AATCC Test Method 81 - pH of the Water-Extract from Wet Processed Textiles  
AATCC Test Method 118 - Oil Repellency: Hydrocarbon Resistance Test  
AATCC Test Method 127 - Water Resistance: Hydrostatic Pressure Test  
AATCC Test Method 135 - Dimensional Changes of Fabrics after Home Laundering

(Copies are available on line at <http://www.aatcc.org>.)

## AMERICAN SOCIETY FOR QUALITY (ASQ)

ANSI/ASQ Z1.4 - Sampling Procedures and Tables for Inspection of Attributes

(Copies are available online at <http://www.asq.org>.)

## ASTM INTERNATIONAL

ASTM D737 - Standard Test Method for Air Permeability of Textile Fabrics  
ASTM D1424 - Standard Test Method for Tear Resistance of Woven Fabrics by  
Falling-Pendulum (Elmendorf-Type) Apparatus  
ASTM D1907/D1907M - Standard Test Method for Linear Density of Yarn (Yarn Number)  
by the Skein Method  
ASTM D3775 - Standard Test Method for End (Warp) and Pick (Filling) Count of  
Woven Fabrics  
ASTM D3776/D3776M - Standard Test Method for Mass per Unit Area (Weight) of Fabric  
ASTM D3990 - Standard Terminology Relating to fabric Defects  
ASTM D5034 - Standard Test Method for Breaking Force and Elongation of  
Textile Fabrics (Grab Test)  
ASTM D5430 - Standard Test Method for Visually Inspecting and Grading Fabrics

(Copies are available online at <http://www.astm.org>.)

## OTHER PUBLICATIONS

### SDL ATLAS

Fabric Defect Replica Scales are available online at <http://www.sdatlas.com>.

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## INFORMA HEALTHCARE

Repeat Insult Patch Test – Modified Draize Procedure  
Principles and Methods of Toxicology, A Wallace Hayes (editor).

(Copies are available online at <https://www.crcpress.com>.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, 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 4.2).

3.2 Standard sample. The finished cloth shall match the standard sample for shade and appearance, and shall, unless otherwise indicated, be equal to or better than the standard sample with respect to all characteristics for which the standard sample is referenced (see 6.4).

3.3 Recycled, recovered, or environmentally preferable or biobased materials. Recycled, recovered, or environmentally preferable, or biobased materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

#### 3.4 Materials.

3.4.1 Cotton. The cotton shall be carded and combed.

3.4.2 Nylon. The nylon shall be first quality, high tenacity, semi-dull staple having a nominal cut length of 1-1/2-inches and a round cross-section with a nominal denier of 1.6 to 1.8. The use of any form of nylon waste is prohibited. Testing shall be as specified in 4.4.1.

3.4.3 Yarn. The warp and filling yarn shall be made from a blend of 50 ( $\pm$  5) percent nylon with the remaining percentage cotton based on the dry weight of the desized cloth. The warp yarn shall be 2-ply and the filling yarn shall be either 2-ply or singles.

#### 3.5 Color.

3.5.1 Visual shade matching (all Classes). The color and appearance of the dyed and camouflage printed cloth(s) shall match the standard sample when tested as specified in 4.4.1.

3.5.1.1 Class 1 and 2, Woodland Camouflage Pattern. The cloth shall be either dyed to a ground shade matching Light Green 354 and then overprinting with the remaining three (3) colors for the Dark Green 355, Brown 356, and Black 357 areas of the camouflage pattern or

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when the ground shade is not dyed to match Light Green 354, all four (4) colors of the camouflage pattern shall be printed to match all four (4) colors of the pattern.

3.5.1.2 Class 3, Desert Camouflage Pattern. The finished cloth shall be either dyed to a ground shade matching Light Tan 492 and then overprinted with the remaining two (2) colors for the Light Brown 493 and Light Khaki 494 areas of the camouflage pattern or when the ground shade is not dyed to match Light Tan 492, then all three (3) colors of the camouflage pattern shall be printed to match all three (3) colors of the pattern.

3.5.1.3 Class 5, Black 357. The cloth shall be dyed to match Black 357 in the Class 1 and 2 Woodland Camouflage print.

3.5.1.4 Class 6, 7 and 8, Universal Camouflage Pattern (UCP). The finished cloth shall be either dyed to a ground shade matching Desert Sand 500 and then overprinted with the remaining two (2) colors for the Urban Gray 501 and Foliage Green 502 areas of the camouflage pattern or when the ground shade is not dyed to Desert Sand 500, all three (3) colors of the camouflage pattern shall be printed to match all three (3) colors of the pattern.

3.5.1.5 Class 12, 13 and 14, Operational Camouflage Pattern (OCP). The finished cloth shall be either dyed to a ground shade matching Dark Cream 559 and then overprinted with the remaining six (6) colors Tan 525, Light Sage 560, Olive 527, Dark Green 528, Brown 529, and Bark Brown 561 areas of the camouflage pattern or when the ground shade is not dyed to Dark Cream 559 all seven (7) colors of the camouflage pattern shall be printed to match all seven (7) colors of the pattern.

3.5.2 Colorfastness (all Classes). The finished cloth(s) shall conform to the colorfastness requirements listed below in Table I when tested as specified in 4.4.1 and 4.5.2.

TABLE I. Colorfastness requirements (all classes).

Colors Evaluation	Laundering Color Change and Staining (4 cycles) (min.)	Light (40 AFU or 170 kJ/(m <sup>2</sup> nm)@420 nm) <u>1</u> , (min.)	Perspiration (acid and alkaline) (min.)	Crocking (wet and dry) (min.)
All colors	--	--	3-4	--
All except Black 357	3-4	--	--	--
Black 357	3	--	--	1.0
Dark Green 355, Brown 356, Black 357, Dark Green 528, Brown 529, and Bark Brown 561	--	3-4	--	3.0
Light Green 354, Light Tan 492, Light Brown 493, Light Khaki 494, Desert Sand 500, Urban Gray 501, Foliage Green 502 Tan 525, Olive 527, Dark Cream 559 and Light Sage 560	--	3	--	3.5

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1/AFU- AATCC Fading Units

3.5.3 Labile sulfur. Dyes and compounds containing elementary sulfur capable of oxidation to sulfuric acid shall not be used. The dyed cloth shall be “Free” of labile sulfur when tested as specified in 4.4.1.

3.5.4 Pattern execution (all classes except class 5). The pattern on the printed finished cloth(s) shall match the standard sample in respect to design, colors and registration of the respective areas. The various areas of the pattern shall be properly registered in relation to each other and shall present definite sharp demarcations with a minimum of feathering or spew. Each pattern area shall show solid coverage; skitteriness, feathering, haloing or trapping and off register exceeding that shown on the standard sample in any of the printed areas will not be acceptable. When the standard sample is not available for pattern execution, a pattern drawing will be provided (see 6.3) and the pattern on the finished cloth shall match that of the drawing (see 2.2.2 and 6.3) when tested as specified in 4.4.1.

The pattern repeat for each class shall be as follows:

Class 1 and 2 Woodland Camouflage Pattern	- 27.25 (+1.25, -2.50) inches in the warp direction.
Class 3 Desert Camouflage Pattern	- 16.75 (+1.25, -1.75) inches in the warp direction.
Class 6, 7 and 8 Universal Camouflage Pattern	- 36.00 (+1.25, -2.50) inches in the warp direction.
Class 12, 13 and 14 Operational Camouflage pattern	- 25.255 (+1.25, -2.50) inches in the warp direction and 68-inches maximum camouflage printed area in the filling direction.

### 3.6 Spectral reflectance.

3.6.1 Class 1 and 2, Woodland Camouflage Pattern. The reflectance values shall conform to the requirements listed below, in Table II, when tested as specified in 4.4.1.

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TABLE II. Spectral reflectance requirements, Class 1 and 2.

Wavelength, Nanometers (nm)	Light Green 354		Dark Green 355 and Brown 356		Black 357	
	Min.	Max.	Min.	Max.	Min.	Max.
600	8	18	3	9	-	10
620	8	18	3	9	-	10
640	8	18	3	9	-	10
660	8	18	3	12	-	10
680	10	22	3	14	-	10
700	18	33	5	18	-	10
720	22	45	7	20	-	10
740	30	55	12	28	-	10
760	35	65	18	36	-	10
780	40	75	26	44	-	10
800	45	80	34	52	-	10
820	50	86	42	60	-	10
840	55	88	50	68	-	10
860	60	90	56	74	-	10

3.6.2 Class 3, Desert Camouflage Pattern. The reflectance values shall conform to the requirements listed below, in Table III, when tested as specified in 4.4.1.

TABLE III. Spectral reflectance requirements, Class 3.

Wavelength, Nanometers (nm)	Light Tan 492		Light Brown 493		Light Khaki 494	
	Min.	Max.	Min.	Max.	Min.	Max.
700	38	53	19	41	25	44
720	38	54	20	41	25	45
740	39	55	20	42	25	46
760	40	56	21	42	26	47
780	41	57	21	42	27	48
800	43	58	22	43	28	50
820	45	59	23	45	30	52
840	48	62	24	46	33	55
860	50	65	25	48	36	58

3.6.3 Class 5, Black 357. The reflectance values shall conform to the requirements listed below, in Table IV, when tested as specified in 4.4.1.

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TABLE IV. Spectral reflectance requirements, Class 5.

Wavelength, Nanometers (nm)	Black 357	
	Min.	Max.
600	2	10
620	2	10
640	2	11
660	2	13
680	2	15
700	4	20
720	9	30
740	14	40
760	18	49
780	23	55
800	29	60
820	34	64
840	39	69
860	45	75

3.6.4 Class 6, 7 and 8, Universal Camouflage Pattern (UCP). The reflectance values shall conform to the requirements listed in Table V, when tested as specified in 4.4.1.

TABLE V. Spectral reflectance requirements, Class 6, 7 and 8.

Wavelength, Nanometers (nm)	Desert Sand 500		Urban Gray 501		Foliage Green 502	
	Min.	Max.	Min.	Max.	Min.	Max.
600	28	40	12	26	8	18
620	30	42	14	26	8	18
640	34	48	14	28	8	20
660	38	56	14	30	10	26
680	44	60	18	34	10	26
700	46	66	24	38	12	28
720	48	68	26	42	16	30
740	48	72	30	46	16	30
760	50	74	32	48	18	32
780	54	76	34	48	18	34
800	54	76	34	50	20	36
820	54	76	36	54	22	38
840	55	78	38	54	24	40
860	56	78	40	56	26	42



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3.6.5 Class 12, 13 and 14, Operation Camouflage Pattern (OCP). The reflectance values for Class 12, 13 and 14 cloth(s) shall conform to the requirements listed in Table VI, when tested as specified in 4.4.1.

TABLE VI. Spectral reflectance requirements, Classes 12, 13 and 14.

Wavelength, Nanometers (nm)	Dark Cream 559 & Tan 525		Light Sage 560, Olive 527 & Brown 529		Dark Green 528 & Bark Brown 561	
	Min.	Max.	Min.	Max.	Min.	Max.
600	22	44	12	30	3	11
620	24	45	12	30	3	12
640	24	45	12	32	4	13
660	25	45	12	32	4	14
680	28	45	14	34	4	17
700	28	48	14	36	6	23
720	30	52	16	39	6	23
740	32	55	18	41	10	25
760	36	56	20	43	14	30
780	38	57	22	45	18	35
800	40	57	22	45	21	40
820	44	58	24	46	24	42
840	46	59	26	47	26	43
860	48	60	28	48	28	45

3.7 Physical requirements. The finished cloth(s) shall conform to the physical requirements, listed below, in Table VII, when tested as specified in 4.4.1.

TABLE VII. Physical requirements.

Characteristic	Classes 1,3,5,6 &12	Classes 2, 7 &13	Classes 8 &14
Weight, oz./sq.yd.			
Minimum	6.0	6.0	6.0
Maximum	7.0	7.0	7.0
Yarns per inch, (minimum)			
Warp	104	104	104
Filling	52	52	52
Breaking strength (pounds), (minimum)			
Warp	200	200	190
Filling	90	90	80

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TABLE VII. Physical requirements. – Continued

Characteristic	Classes 1,3,5,6 & 12	Classes 2, 7 & 13	Classes 8 & 14
Tearing strength (pounds), (minimum)			
Warp	7.0	7.0	7.0
Filling	5.0	5.0	5.0
Air permeability, (cu.ft./min./sq.ft.) (maximum)	15.0	10.0	10.0
Fabric appearance, (smoothness rating)			
After 20 launderings	N/A	N/A	4.5

3.7.1 Weave. The weave shall be a plain weave with reinforcement ribs in both the warp and filling directions forming a uniform pattern. The ribs shall be formed by having every twenty-fourth warp end contain two ends weaving as one and every thirteenth filling contain two picks weaving as one. Testing shall be as specified in 4.4.1.

3.7.2 Width. For government procurements only, the width of the finished cloth shall be as specified (see 6.2), and shall be the minimum acceptable width, inclusive of selvages.

3.8 Finish. The cloth shall be dyed and printed with the warp effect side as the face. The Class 2, 7, and 13 cloth(s) shall be given a durable water repellent treatment as specified in 3.8.1. The Class 8 and 14 cloth shall be given a wrinkle free finish as specified in 3.8.2.

3.8.1 Water repellency (Classes 2, 7 and 13). The Classes 2, 7 and 13 cloth(s) shall be given a durable water repellent treatment and meet the requirements of Table VIII when tested as specified in 4.4.1.

TABLE VIII. Water repellency (Classes 2, 7 and 13).

	Dynamic absorption (percent)		Spray rating <u>2/</u>	Resistance to organic liquid (Minimum)
	Maximum lot avg.	Maximum <u>1/</u>		
Initial	25	30	90, 90, 80	No wetting by n-tetradecane
After 15 launderings	25	30	---	No wetting by n-tetradecane

1/ No individual specimen shall exceed 30 percent

2/ The results of the three individual determinations.

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3.8.2 Wrinkle free finish (Class 8). The Class 8 cloth shall be given a wrinkle free finishing treatment to match the "hand" crispness, fabric appearance and smoothness of the guide sample provided when tested as specified in 4.4.1.

3.9 pH. The pH value of the water extract of the finished cloth(s) shall be not less than 5.0 and not greater than 8.5 when tested as specified in 4.4.1.

3.10 Dimensional stability. The shrinkage or elongation both in the warp and in the filling of the finished cloth 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 4.4.1.

3.11 Toxicity. The finished cloth shall not present a health hazard and shall show compatibility with prolonged, direct skin contact when tested as specified in 4.5.5. The use of chemicals recognized by the Environmental Protection Agency (EPA) as human carcinogens is prohibited.

3.11.1 Toxicity documents. All finishing treatments used to process the cloth shall be identified and accompanied by the appropriate Safety Data Sheet (SDS) information.

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

3.13 Length and put-up. For Government procurements only, 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 full width on a roll as specified in 5.1.

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

3.15 Workmanship. The finished cloth shall conform to the quality of product established on this specification. The occurrence of defects shall not exceed the quality acceptance levels as specified in the contract or purchase order.

#### 4. VERIFICATION

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

- a. First article inspection (see 4.2).
- b. Conformance inspection (see 4.3).

4.2 First article inspection. A first article, submitted in accordance with 3.1, shall be inspected, examined for appearance, color and finished defects listed in Table IX and tested for the characteristics as specified in 4.4.1.

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4.3 Conformance inspection. Conformance inspection shall include the visual examination of 4.4 and the tests of 4.4.1 through 4.5.5 as applicable. Sampling for inspection shall be performed in accordance with ANSI/ASQ Z1.4 and with quality acceptance levels (AQL) as specified in the contract and/or order, except where otherwise indicated.

4.3.1 Inspection conditions. In accordance with 4.1 above, the material shall be inspected in accordance with all the requirements of referenced documents, unless otherwise excluded, amended, modified or qualified in this specification or applicable procurement documents.

4.4 Yard by Yard examination. Each roll in the sample shall be examined yard-by-yard (full width excluding selvage) on the face side only with both overhead and back lighting. The defects are as defined in ASTM D3990 and only defects that are clearly noticeable at normal inspection distance (3-feet) shall be scored. The defects are assigned demerit points in accordance with ASTM D5430, Option A, with the exceptions listed below:

- a. The defects found shall be counted regardless of their proximity to each other, except where two (2) or more defects represent a single local condition of the cloth, in which case only the more serious defect shall be counted.
- b. Only coarse yarns that exceed twice or more the normal diameter shall be scored.
- c. Mixed filling shall be scored only if attributed to shade bar resulting from wrong ply, wrong twist in the yarn or off shade yarn.
- d. The defects specified in Table IX shall be scored four (4) points for each yard in which they occur.

TABLE IX. Defects that score four (4) points.

Defect Description
Any hole, cut, tear or abrasion mark.
Edge ravel when pulled outward.
Uneven weaving throughout.
Broken or missing yarn.
Any spot, stain or streak more than 1 inch in combined directions.
Knots greater than Fabric Defect Replica Scale Level D (see 2.3).
Slubs greater than Fabric Defect Replica Scale Level F (see 2.3).
Area of poor dye penetration, streak or shade bar.
Overall application of water repellent not uniform.
Width not as specified within a tolerance of no less than 1/2-inch.
Objectionable odor.
Slack or tight selvages.
Any embedded foreign matter or uncleanness.
Edges rolled folded, scalloped or corded, baggy, ridgy or wavy cloth.

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4.4.1 End item testing. The cloth shall be tested for the characteristics listed in Table X. The methods of testing as specified wherever applicable and as listed in Table X shall be followed. All test reports shall contain the individual values utilized in expressing the final results. The sample unit shall be five (5) continuous yards full width of the finished cloth for all physical and chemical tests. The lot shall be unacceptable if one test fails to meet any 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 X. End item tests.

Characteristic	Requirement paragraph	Test method
Cotton identification	3.4.1	AATCC 20 (see 6.4)
Nylon identification	3.4.2	AATCC 20 (see 6.4)
Denier, nylon	3.4.2	ASTM D1907/D1907M
Fiber content (cotton and nylon)	3.4.3	AATCC 20A (see 6.4)
Yarn ply	3.4.3	Visual
Visual shade matching	3.5.1	4.5.1
Colorfastness:		4.5.2
Light	3.5.2	AATCC 16.3, Option 3 <u>1</u> /
Laundering	3.5.2	AATCC 61, Test 3A <u>2</u> /, <u>3</u> /
Perspiration	3.5.2	AATCC 8 <u>2</u> /, <u>3</u> /
Crocking	3.5.2	AATCC 15 <u>4</u> /
Presence of labile sulfur	3.5.3	4.5.3
Pattern execution	3.5.4	Visual and linear measurement using a precision steel ruler
Spectral reflectance:		
Class 1 & 2	3.6.1	4.5.4
Class 3	3.6.2	4.5.4
Class 5	3.6.3	4.5.4
Class 6,7 & 8	3.6.4	4.5.4
Class 12, 13 & 14	3.6.5	4.5.4
Weight	3.7	ASTM D3776/D3776M
Yarns per inch	3.7	ASTM D3775
Breaking strength	3.7	ASTM D5034
Tearing strength	3.7	ASTM D1424
Air permeability	3.7	ASTM D737
Fabric appearance treatment (Class 8 & 14) After 20 Launderings	3.7	AATCC 143, (3)(V)Aiii

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TABLE X. End item tests. - Continued

Characteristic	Requirement paragraph	Test method
Weave	3.7.1	Visual
Water repellency (Class 2, 7 & 13): Dynamic absorption: Initial After 15 launderings  Spray rating:  Resistance to organic liquids: Initial After 15 launderings	3.8.1  3.8.1  3.8.1	AATCC 70 AATCC 135 (3)(V)(A)iii and AATCC 70  AATCC 22  AATCC 118 AATCC 135 (3)(V)(A)iii and AATCC 118
Fabric hand attribute (min)	3.8.2	AATCC Evaluation Procedure 5 <u>5/</u>
pH	3.9	AATCC 81
Dimensional stability After three (3) cycles	3.10	AATCC 135 (3)(V)(A)iii
Toxicity	3.11	4.5.5

1/ Rated using the AATCC Evaluation Procedure 1, Gray Scale for Color

2/ Rated using the AATCC Evaluation Procedure 1, Gray Scale for Color Change and AATCC Evaluation Procedure 2, Gray Scale for Staining.

3/ Only the stain on the nylon and cotton fibers of the color transfer cloth shall be evaluated.

4/ Rated using the AATCC Evaluation Procedure 8, AATCC 9-step Chromatic Transference Scale.

5/ The hand "crispness" of the sample shall be compared to the guide sample when evaluated in accordance with AATCC Evaluation Procedure 5.

#### 4.5 Methods of testing or inspection.

4.5.1 Visual shade matching evaluation. The color and appearance of the dyed and printed cloth shall match the standard sample when viewed using the AATCC Evaluation Procedure 9, Option A, with sources simulating artificial daylight D75 illuminant with a color temperature of 7500 ( $\pm$  200) K illumination of 100 ( $\pm$  20) foot candles, and shall be a good match to the standard sample under incandescent A illuminant with a color temperature of 2856K ( $\pm$  200).

4.5.2 Colorfastness evaluation testing. When testing for colorfastness properties, each color shall be evaluated, whenever possible, separately and reported as such. In cases where the print pattern does not allow for the evaluation of each color separately, the test results should indicate which colors were evaluated together.

4.5.2.1 Operation Camouflage pattern (OCP) (Classes 11, 12 and 13). All colorfastness testing for Operation Camouflage Pattern (Classes 11, 12 and 13) shall be performed on the solid color area and not the tonal area.

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4.5.3 Presence of labile sulfur test. In the determination of presence of labile sulfur in textile materials with lead acetate, two 1.50 ( $\pm 0.01$ ) gram samples from each material submitted for evaluation shall be tested. Each of the two samples shall be cut into very small pieces and placed into separate test tubes. The samples shall be submersed in a stannous chloride solution that contains 100 grams of stannous chloride crystals ACS in 100 milliliters of hydrochloric acid ACS (35 percent concentration) and 50 milliliters of distilled water. A filter paper wet out with a 5.0 percent lead acetate solution shall be placed over the top of the test tube. The lead acetate solution contains 5.0 grams of lead acetate CP reagent grade and enough distilled water to make up a 100 milliliter solution; if the solution is not clear add a few drops (one at a time) of glacial acetic acid until the solution is clear. The test tube containing the textile sample, stannous chloride and wet filter paper shall be heated over a low flame until the solution is boiling. The solution should not be heated for more than 15 seconds. A brown to black stain on the filter paper should be evaluated as follows:

- Free - The filter paper shows no discoloration or staining of any kind.
- Slight - The filter paper shows a light tan to light brown discoloration stain.
- Moderate - The filter paper shows a dark brown discoloration stain.
- Severe - The filter paper shows a black color stain.

4.5.4 Spectral reflectance test. Spectral reflectance data shall be obtained from 600 to 860 nanometer (nm) for Class 1, 2, 3, 6 and 7 and 700 nm to 860 nm for Class 4 and 5 at 20nm intervals on a spectrophotometer relative to the polytetrafluoroethylene (PTFE) family of compounds, the preferred white standard. Other white reference materials may be used provided they are calibrated to absolute white or vitrolite tiles. The spectral band width shall be less than 20 nm at 860 nm. Reflectance measurements shall be made by either the monochromatic or polychromatic mode of operation. When the polychromatic mode of operation is used, the spectrophotometer shall operate with the specimen diffusely illuminated with the full emission of a continuous source that simulates in the visible spectrum either CIE Source A or CIE Source D65. The specimen shall be viewed at an angle of no greater than 10° from normal, the specular component included. Measurements shall be taken on a minimum of two (2) different areas and the data averaged. The Woodland Camouflage Pattern (Classes 1 and 2) and Class 5 cloth shall be measured as a single layer using three (3) backing layers of the same shade for Light Green 354, Dark Green 355 and Brown 356 colors and two (2) backing layers of the same shade for Black 357. The Desert Camouflage Pattern (Class 3), Universal Camouflage Pattern (Classes 6, 7 and 8) and Operational Camouflage Pattern (OCP) (Classes 12, 13 and 14) shall be measured as a single layer backed with four (4) layers of the same shade cut from the standard. The spectral reflectance on OCP shall be measured on the mostly solid color area not the tonal area. Specimens shall be oriented in different directions during testing. When possible, the specimens tested shall not contain the same warp and filling yarns. The diameter for standard aperture size used in the color measurement device shall be 1.0 to 1.25-inches for Classes 1, 2, 3 and 5, and 0.3725-inches or larger for the Classes 6, 7, 8, 12, 13 and 14. The measured areas should be at least 6 inches away from the selvage. Photometric accuracy of the spectrophotometer shall be within one (1) percent and wavelength accuracy within two (2) nm. Any color having spectral reflectance values falling outside the limits at four (4) or more of the wavelengths specified shall be considered a test failure.

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4.5.5 Toxicity test. When required, (see 6.2) an acute dermal irritation study and a skin sensitization study shall be conducted. When the results of these studies indicate the material is not a sensitizer or irritant, a Repeat Insult Patch Test shall be performed in accordance with the Modified Draize Procedure (see 2.3). If toxicity requirement (see 3.11) can be demonstrated with historical use data, toxicity testing may not be required (see 6.2).

## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of material is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Department or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

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 in clothing which are wind resistant, and depending on the Class are water repellent and wrinkle free.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification
- b. Classes required (see 1.2)
- c. The specific issue of individual documents referenced (see 2.2)
- d. Camouflage pattern drawing, if required (see 2.2.2)
- e. When first article is required (see 3.1, 4.2 and 6.3)
- f. Width of cloth required (see 3.7.2)
- g. Length required if other than specified (see 3.13)
- h. Conformance inspection acceptance quality limits (AQL) (see 4.3)
- i. Inspection conditions (see 4.3.1)
- j. When toxicity testing is required (see 4.5.5)
- k. Packaging (see 5.1)

6.3 Standard sample. For access to samples and pattern drawings, address the contracting activity issuing the invitation for bids or request for proposal.

6.4 Certificate of compliance. The contracting activity may select to accept a certificate of compliance for stated requirement.



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6.5 Fabric defect replica scales. Fabric Defect Replica Scales are available to purchase from SDL Atlas. Contact Customer Service 1-803-329-2110 and request item number 402985-Slub/Knot Replica Set.

6.6 Deleted Classes. Classes 4, 9, 10 and 11 – DELETED. Desert Camouflage Printed Permethrin Treated has been deleted. The cloth is no longer treated with permethrin before garments are constructed; it is only applied to a completed end item.

6.7 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issues, due to the extensiveness of the changes.

6.8 Subject term (key word) listing.

Black  
Clothing  
Desert  
Operational Camouflage Pattern (OCP)  
Universal (UCP)  
Water repellent treated  
Wrinkle free  
Woodland

Custodian:  
Army – GL

Preparing activity:  
DLA – CT

Review activities:  
Army – MD

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NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using ASSIST Online database at <https://assist.dla.mil>.