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INCH-POUND
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SUPERSEDING
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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 Printed
Class 2 - Woodland Camouflage Printed, Water Repellent Treated (Quarpel Type)
Class 3 - Desert Camouflage Printed
Class 4 - Deleted (see 6.6)
Class 5 - Black 357
Class 6 - Universal Camouflage Printed
Class 7 - Universal Camouflage Printed, Water Repellent Treated (Quarpel Type)
Class 8 - Universal Camouflage Printed, Wrinkle Free Finish
Class 9 - Operation Enduring Freedom Camouflage Pattern (OCP) (see 6.4.1)
Class 10 - Operation Enduring Freedom Camouflage Pattern (OCP), Water Repellent Treated (Quarpel Type) (see 6.4.1)

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.daps.dla.mil/.

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2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4 or 5 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, 4 or 5 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.

FEDERAL STANDARDS

FED-STD-4 - Glossary of Fabric Imperfections

COMMERCIAL ITEM DESCRIPTIONS

A-A-50199 - Thread, Polyester-Core, Cotton- or Polyester-Covered

(Copies of these documents are available online at https://assist.daps.dla.mil/quicksearch/ or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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

(Copies of drawings are available from the Department of the Army, Natick Soldier Research Development and Engineering Center, Kansas St., Natick MA 01760, ATTN: RDNS-WPW-C)

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

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FEDERAL TRADE COMMISSION

Rules and Regulations Under the Textile Fiber Products Identification Act

(Copies are available online at http://www.ftc.gov or from the Federal Trade Commission, 600 Pennsylvania Avenue, N.W., Washington, DC 20580-0001.)

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 Test Method - 8 Colorfastness to Crocking: AATCC Crockmeter Method
AATCC Test Method - 15 Colorfastness to Perspiration
AATCC Test Method - 16 Colorfastness to Light
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 Textiles
AATCC Test Method - 96 Dimensional Changes in Commercial Laundering of Woven and Knitted Fabrics Except Wool
AATCC Test Method - 118 Oil Repellency: Hydrocarbon Resistance Test
AATCC Test Method - 143 Appearance of Apparel and Other Textile End Products after Repeated Home Laundering
AATCC Evaluation Procedure 1, Gray Scale for Color Change
AATCC Evaluation Procedure 2, Gray Scale for Staining
AATCC Evaluation Procedure 8, AATCC 9-Step Chromatic Transference Scale
AATCC Evaluation Procedure 9, Visual Assessment of Color Difference of Textiles
AATCC Standard Three-Dimensional Smoothness Replicas

(Copies of documents are available on line at http://www.aatcc.org or from the American Association of Textile Chemists and Colorists, P.O. Box 12215, Research Triangle Park, NC 27709-2215.)

ASTM INTERNATIONAL (ASTM)

ASTM D 276 - Standard Test Methods for Identification of Fibers in Textiles
ASTM D 629 - Standard Test Methods for Quantitative Analysis of Textiles
ASTM D 737 - Standard Test Method for Air Permeability of Textile Fabrics
ASTM D 1424 - Standard Test Method for Tearing Strength of Fabrics by Falling-Pendulum (Elmendorf) Apparatus
ASTM D 1683 - Standard Test Method for Failure in Sewn Seams of Woven Apparel Fabrics

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ASTM D 3775 - Standard Test Method for Warp (End) and Filling (Pick) Count of Woven Fabrics
ASTM D 3776 - Standard Test Method for Mass per Unit Area (Weight) of Fabric
ASTM D 5034- Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test)
ASTM D 6193 - Standard Practice for Stitches and Seams

(Copies of documents are available online at http://www.astm.org or from the ASTM INTERNATIONAL, 100 Barr Harbor Drive, P.O. Box C700 West Conshohocken, PA 19428-2959)

OTHER PUBLICATIONS

Repeat Insult Patch Test - Modified Draize Procedure -
Principles and Methods of Toxicology, (fourth edition) A Wallace Hayes (editor), pp 1057 – 1060, 2001.

(Copies are available online at http://www.taylorandfrancis.co.uk/ or from Taylor and Francis, 325 Chestnut Street ,Philadelphia PA 19106 .)

Sears Roebuck and Co.

Sears Fabric Defect Replica Scales

(Copies available from Sears Roebuck and Co., "Fabric Defect Replica Kit" Dept 817 (ATTN: FC 554B), 3333 Beverly Road, HG, FC568B, Hoffman Estates, IL 60179. For information call (847-286-8952.)

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 materials. Recycled, recovered, or environmentally preferable 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.

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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. No form of nylon waste shall be used, such as undrawn fiber, mixtures of deniers, lusters or cross sections, and waste from any stage of fiber production: whether drawn, un-drawn, or mixed or garneted fiber. Testing shall be as specified in 4.4.4.

3.4.3 Yarn. The warp and filling yarn shall be made from a blend of 50 (± 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 2-ply or singles.

3.5 Color.

3.5.1 Class 1 and 2, Woodland Camouflage. The cloth(s) shall be dyed to a ground shade either matching or approximating Light Green 354 and then overprinting with the camouflage pattern by roller or screen printing. When the ground shade is dyed to match Light Green 354, the remaining colors shall be obtained by subsequent printing using three rollers or screens, as appropriate for the Dark Green 355, Brown 356, and Black 357 areas of the pattern. When the ground shade is dyed to approximate Light Green 354, all four colors of the camouflage pattern shall be obtained by subsequent printing using four rollers or screens to match all four colors Resin bonded pigments are not permitted (see 6.5).

3.5.1.1 Class 3, Desert Camouflage. The cloth shall be dyed to a ground shade either matching or approximating Light Tan 492 and then overprinting with the camouflage pattern by roller or screen printing. When the ground shade is dyed to match Light Tan 492, the remaining colors shall be obtained by subsequent printing using two rollers or screens, as appropriate for the Light Brown 493 and Light Khaki 494 areas of the pattern. When the ground shade is dyed to approximate Light Tan 492, all three colors of the camouflage pattern shall be obtained by subsequent printing using three rollers or screens to match all three colors. Resin bonded pigments are not permitted (see 6.5).

3.5.1.2 Class 5, Black 357. The cloth shall be dyed to a ground shade approximating Black 357 in the Class 1 and 2 Woodland Camouflage print. Resin bonded pigments are not permitted (see 6.5).

3.5.1.3 Class 6, 7 and 8, Universal Camouflage. The cloth(s) shall be dyed to a ground shade either matching or approximating Desert Sand 500 and then overprinting with the camouflage pattern by roller or screen printing. When the ground shade is dyed to match Desert Sand 500, the remaining colors shall be obtained by subsequent printing using two rollers or screens, as appropriate for the Urban Gray 501 and Foliage Green 502 areas of the pattern. When the ground shade is dyed to approximate Desert Sand 500 all three colors of the camouflage pattern shall be obtained by subsequent printing using three rollers or screens to match all three colors.

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Resin bonded pigments are not permitted (see 6.5).

3.5.1.4 Class 9 and 10, Operation Enduring Freedom Camouflage Pattern (OCP). The cloth(s) shall be dyed to a ground shade either matching or approximating Cream 524 and then shall be overprinted with the camouflage pattern by roller or screen printing. When the ground shade is dyed to match Cream 524, the remaining colors shall be obtained by subsequent printing using six rollers or screens, as appropriate for the Tan 525, Pale Green 526, Olive 527, Dark Green 528, Brown 529 and Dark Brown 530 areas of the pattern. When the ground shade is dyed to approximate Cream 524 all seven colors of the camouflage pattern shall be obtained by subsequent printing using seven rollers or screens to match all seven colors. Resin bonded pigments shall not be used (see 6.3, 6.4 and 6.5).

3.5.2 Labile sulfur. Dyes and compounds containing elementary sulfur capable of oxidation to sulfuric acid shall not be used. The results shall be free (no discoloration) when tested in accordance with 4.4.4.

3.5.3 Visual shade matching (all Classes). The color and appearance of the cloth(s) shall match the standard sample when tested as specified in 4.4.4.

3.5.4 Colorfastness (all Classes). The finished cloth(s) shall conform to the colorfastness requirements listed below in Table I and IA when tested as specified in 4.4.4 and 4.5.1 and 4.5.2.

TABLE I. Colorfastness requirements (Classes 1, 2, 3, 5, 6, 7, 8).

Colors Evaluation	Laundering (4 cycles) 1/ (minimum)	Light (40 hrs or 170 kJ) 2/ (minimum)	Perspiration (acid & alkaline) 1/ (minimum)	Crocking 3/ (minimum)
Black 357	3	3-4	3-4	1
Dk. Green 355, Brown 356, Lt. Green 354, Desert Sand 500, Urban Gray 501, Foliage Green 502, Lt. Tan 492, Lt. Brown 493, Lt. Khaki 494	3-4	3	3-4	3.5

1/ Rated using the AATCC Evaluation Procedure 1, Gray Scale for Color Change and AATCC Evaluation Procedure 2, Gray Scale for Staining.
2/ Rated using the AATCC Evaluation Procedure 1, Gray Scale for Color Change
3/ Rated using the AATCC Evaluation Procedure 8, AATCC 9-Step Chromatic Transference Scale

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TABLE IA. Colorfastness requirements (Class 9 and 10).

Colors Evaluation	Laundering (4 cycles) 1/ (minimum)	Light (40 hrs or 170 kJ) 2/ (minimum)	Perspiration (acid & alkaline) 1/ (minimum)	Crocking 3/ (minimum)
All colors	3-4	--	3-4	3.5
Dk. Green 528, Brown 529, Dark Brown530	--	3-4	--	--
Cream 524, Tan 525, Pale Green 526, Olive 527	--	3	--	--

1/ Rated using the AATCC Evaluation Procedure 1, Gray Scale for Color Change and AATCC Evaluation Procedure 2, Gray Scale for Staining.
2/ Rated using the AATCC Evaluation Procedure 1, Gray Scale for Color Change
3/ Rated using the AATCC Evaluation Procedure 8, AATCC 9-Step Chromatic Transference Scale

3.6 Pattern execution (Class 1, 2, 3, 6, 7, 8, 9 and 10). The pattern on the printed finished cloth(s) shall reproduce the standard sample in respect to design, colors and registration of the respective areas. The pattern repeat of Class 1 and 2 shall be 27.25 (+1.25, -2.50) inches in the warp direction. The pattern repeat of Class 3 shall be 16.75 (+1.25, -1.75) inches in the warp direction. The pattern repeat of Class 6, 7 and 8 shall be 36.00 (+1.25, -2.50) inches in the warp direction. The pattern repeat of Classes 9 and 10 shall be 25.255 (+1.25, -2.50) inches in the warp direction. 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 exceeding that shown on the standard sample in any of the printed areas will not be acceptable. When the standard sample is not referenced for pattern execution, a pattern drawing shall be provided and the pattern for Class 1 and 2 shall match that of Drawing 2-1-1516; Class 3 shall match that of Drawing 2-1-2240 and Class 6, 7 and 8 shall match that of Drawing 2-1-2519 (see 2.2.2, 6.2, and 6.4).

3.7 Spectral reflectance.

3.7.1 Class 1 and 2, Woodland Camouflage. The reflectance values shall conform to the requirements listed below, in Table II, when tested as specified in 4.4.4.

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

Reflectance values (percent)						
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

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

Reflectance values (percent)						
Wavelength, Nanometers (nm)	Light Green 354		Dark Green 355 and Brown 356		Black 357	
	Min.	Max.	Min.	Max.	Min.	Max.
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

3.7.2 Class 3, Desert Camouflage. The reflectance values shall conform to the requirements listed below, in Table III, when tested as specified in 4.4.4.

TABLE III. Spectral reflectance requirements, Class 3.

Reflectance values (percent)						
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

3.7.3 Class 5, Black 357. The reflectance values shall conform to the requirements listed below, in Table IV, when tested as specified in 4.4.4.

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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

3.7.4 Class 6, 7 and 8, Universal Camouflage. The reflectance values shall conform to the requirements listed in Table V, when tested as specified in 4.4.4.

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

Reflectance values (percent)						
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	56	78	38	54	24	40
860	56	78	40	56	26	42

3.7.5 Class 9 and 10, Operation Enduring Freedom Camouflage Pattern (OCP). The reflectance values for Class 9 and Class 10 cloth(s) shall conform to the requirements listed in Table VI, when tested as specified in 4.4.4.

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TABLE VI Spectral reflectance requirements, Class 9 and 10

Wavelength, Nanometers (nm)	Cream 524 & Tan 525		Pale Green 526, Olive 527 and Brown 529		Dark Green 528 and Dark Brown 530	
	Min.	Max.	Min.	Max.	Min.	Max.
600	22	44	12	30	3	11
620	24	45	12	30	3	11
640	24	45	12	32	4	12
660	25	45	12	32	4	12
680	28	45	14	34	4	13
700	28	46	14	34	6	16
720	30	48	16	36	6	20
740	32	50	18	36	10	25
760	36	50	20	40	14	30
780	38	52	22	40	18	35
800	40	54	22	42	22	40
820	44	56	24	44	24	42
840	46	57	26	44	27	43
860	48	58	28	46	29	45

3.8 Physical requirements. The finished cloth(s) shall conform to the physical requirements, listed below, in Table VII, when tested as specified in 4.4.4.

TABLE VII. Physical requirements.

Characteristic	Class 1, 3, 5, 6 & 9	Class 2, 7, &10	Class 8
Weight, (oz./sq.yd.)			
Minimum	6.0	6.0	6.0
Maximum	7.0	7.0	7.0
Construction,(yarns per inch), (minimum)			
Warp	104	104	104
Filling	52	52	52
Breaking strength, (pounds) (minimum)			
Warp	200	200	190
Filling	90	90	80
Tearing strength, (pounds) (minimum)			
Warp	7.0	7.0	7.0
Filling	5.0	5.0	5.0

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TABLE VII. Physical requirements. - Continued

Characteristic	Class 1, 3, 5 6 & 9	Class 2, 7, &10	Class 8
Air permeability, (cu.ft./min/sq.ft.), (maximum)	15.0	10.0	10.0
Fabric appearance, (smoothness rating)			
Initial	N/A	N/A	5
After 20 launderings	N/A	N/A	4.5

3.8.1 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-forth warp end contain two ends weaving as one and every thirteenth filling contain two picks weaving as one. Testing shall be as specified in 4.4.4.

3.8.2 Width. For Government procurements only, the width of the cloth shall be as specified (see 6.2) and shall be the minimum acceptable width inclusive of the selvage when fly-shuttle looms or shuttleless 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).

3.9 Finish. The cloth shall be dyed and printed with the warp effect side as the face. The cloth shall be, desized, scoured, dyed, and printed. The Class 2, 7, and 10 cloth(s) shall be given a water repellent treatment as specified in 3.9.1. The Class 8 cloth shall be given a wrinkle free finish as specified in 3.9.2.

3.9.1 Water repellency (Class 2, 7 and 10). The Class 2 ,7 and 10 cloth(s) shall be given a fluorocarbon (Quarpel Type) water repellent treatment and meet the requirements of Table VIII when tested as specified in 4.4.4.

TABLE VIII. Water repellency (Class 2, 7 and 10)

	Dynamic absorption (percent) Max. lot avg.	Max. 1/	Spray rating 2/
Initial	25	30	90, 90, 80
After 15 launderings	25	30	----

1/ No individual specimen shall exceed the specified maximum.
2/ The results of the three individual determinations on the sample unit for spray rating shall be equal to or better than the specified ratings when tested as specified in 4.4.4.

3.9.2 Wrinkle free finish (Class 8). The Class 8 cloth shall be given a wrinkle free finish treatment to match the “hand” crispness, fabric appearance and smoothness of the guide sample provided.

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3.10 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 4.4.4.

3.11 Resistance to organic liquid. The Class 2, 7 and 10 finished cloth(s) shall show no wetting by n-tetradecane, initially and after 15 launderings when tested as specified in 4.4.4.

3.12 Dimensional stability. The shrinkage or elongation both in the warp and filling of the finished cloth(s) shall be not 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 4.4.4. The preshrinkage process used shall not be identified by name or trademark on the cloth, ticket, or package.

3.13 Seam efficiency. The finished cloth(s) shall have a seam efficiency of not less than 75 percent in the warp direction and not less than 80 percent in the fill direction when tested as specified in 4.4.4.

3.14 Toxicity. The finished fabric shall not present a health hazard and shall show compatibility with prolonged, direct skin contact when used as intended and tested as specified in 4.4.4. Chemicals recognized by the Environmental Protection Agency (EPA) as Human carcinogens shall not be used.

3.15 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 40 yards. Each length shall be put-up full width on a roll as specified (see 6.2).

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

3.17 Workmanship. The finished cloth(s) shall conform to the quality of product established by this specification. The demerit points per 100 square yards when calculated as specified in Section 4 shall not exceed the applicable established maximum point values.

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 4.4.4.

4.3 Conformance inspection. Conformance inspection shall include the examination of 4.4 and the tests of 4.4.4 through 4.5.4 as applicable. Sampling for Classes 1, 2, 3, 5, 6, 7, 8, 9 and 10 shall be accordance with 4.4.2.

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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 for Class 1, 2, 3, 6, 7, 8, 9 and 10 in the sample shall be examined yard-by-yard on the printed side only. Each roll for Class 5 sample shall be examined yard-by-yard. 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. 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 4.4.1 except as follows:

a. Only coarse yarns that exceed twice the normal diameter shall be scored.
b. Mixed filling (shade bar shall be scored only when resulting from wrong ply, wrong twist in the yarn, or off shade yarn.
c. Only knots and slubs that exceed limits shown on Sears Fabric Defect Scale (see 2.3) "F" for slubs and "D" for knots shall be scored.

The defects found shall be counted regardless of their proximity to each other, except where two or more defects represent a single local condition of the cloth, in which case only the more serious defect shall be counted. A continuous defect shall be counted as one defect for each warpwise yard or fraction thereof in which it occurs. 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 4 points. The sample size shall be 20 rolls selected from 20 containers. The lot shall be unacceptable if the points per 100 square yards examined exceeds 30.0 points. The lot shall be unacceptable if the points per 100 square yards of two or more individual rolls exceeds 45.0 points. If one roll in the sample exceeds 45.0 points per 100 square yards, a second sample of 20 rolls shall be examined for individual roll quality only. The lot shall be unacceptable if one or more rolls in the second sample exceeds 45.0 points per 100 square yards. Point computation for lot quality and individual roll quality shall be as follows:

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

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

For defects up to 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

All defects as specified in Table IX shall be scored four points for each yard in which they occur:

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TABLE IX. Defects

Defect Description
Any hole, cut, pinhole, tear, scratch or abrasion mark ,smash, burn, knots or slubs 1/
Edge ravels when pulled outward
Uneven weaving throughout
Pattern design not equal to the standard sample(Class 1, 2, 3,6, 7, 8, 9 and 10)
Incorrect color in any part of the pattern(Class 1, 2, 3, 6, 7, 8, 9 and 10)
Pattern repeat not equal to the standard sample(Class 1, 2, 3, 6, 7, 8, 9 and 10)
Pattern repeat less than 24.75 inches or more than 28.50 inches (Classes 1 and 2)
Pattern repeat less than 14.50 inches or more than 18.00 inches (Classes 3)
Pattern repeat less than 33.50 inches or more than 37.25 inches (Classes 6, 7 and 8)
Pattern repeat less than 22.755 inches or more than 26.505 inches (Classes 9 and 10)
Skitteriness (mottled, uneven color) of pattern exceeds that shown by the standard sample(Class 1, 2, 3, 6, 7, 8, 9 and 10)
Excessive feathering or spew (fuzziness at color boundaries) of pattern as compared to the standard sample
Excessive grinning (off register, gap where ground shade shows through) of pattern as compared to the standard sample
Excessive haloing or trapping (overlapping of colors) of pattern as compared to the standard sample
Overall application of water repellent not uniform (Classes 2, 7 and 10)
Tackiness (sticky to touch) (Classes 2, 7 and 10)
Design not printed on face side of cloth
Any spot, stain or streak more than 1 inch in combined directions. 2/
Any objectionable odor 3/
Width not as specified within a tolerance of ± 1/2 inch.
Broken or missing yarn. 2/
Any embedded foreign matter or uncleanness. 2/
Color not as specified
Slack or tight selvages 4/
Edges rolled folded, scalloped or corded, baggy, ridgy or wavy cloth.

1/ The same yardage shall be given a through –lighting inspection for pinholes and thinly coated areas.
2/ Clearly visible at normal inspection distance – (3 feet) by either direct viewing or through-lighting.
3/ Odors of chemicals commonly used in coating compounds shall not be considered objectionable.
4/ To determine the presence of unacceptable selvage conditions, the following procedure shall be observed: During the visual examination, the perch shall be stopped a minimum of three times for each roll in the sample, the tension removed, and the finished cloth examined for the selvage conditions. A waviness in the selvage or significant ripples diagonally across the width of the fabric is an indication of slack or tight selvages.

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4.4.1.1 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. The lot shall be unacceptable if the total of the actual lengths of rolls in the sample is less than the total of the lengths marked on the tickets.

4.4.2 Shade and appearance examination. During the yard-by-yard examination, each roll in the sample shall be examined for shade and appearance. Any roll in the sample, off shade or shaded side to side, side to center, or end to end, or any roll that does not have the same appearance as the standard sample, shall be cause for rejection of the entire lot. The shade and appearance examination sampling procedure for Classes 1-3 and 5-10 shall be followed as written below unless otherwise stated in the contract or solicitation.

a) Sampling: a 12 - inch by full width swatch (header) will be cut by the contractor from each piece or roll in the lot. The header will be cut in half to form Set A and Set B. The Government representative will select samples in accordance with the following:

Lot size (pieces)	pieces to be sampled
1 to 5	each piece
6 to 25	5
26 to 90	10
91 to 160	16
over 160 pieces	1 of every 10 pieces

b) The swatches shall be identified and submitted to the DLA Troop Support Laboratory for shade evaluation. If one or more of the shade swatches are found unacceptable, the entire lot shall be rejected. Any end items made from the component lot shall also be rejected. A lot that was rejected for shade shall, without cost to the Government, be screened and all defective pieces in the lot shall be removed before such a lot is resubmitted. Resubmitted lots shall again be subjected to the sampling and shade evaluation prescribed herein. This requirement does not negate the contractor's responsibility to perform shade evaluation prior to the submittal of a lot to the Government.

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c) When Section 3 of the fabric specification contains a specific requirement for uniformity of shade, the swatches submitted in accordance with (a) above shall also be evaluated for uniformity of shade.

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d) If the contractor reworks and resubmits pieces originally rejected for shade or finish, the contractor shall not combine the rejected pieces with normal production or with lots rejected for other causes. Such pieces shall be combined to form one resubmitted lot. Each piece shall retain it original piece number, suffixed with an “x”. The lot number shall also be suffixed with an “x”.

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e) Shade sampling procedures are detailed further in DLA Troop Support Manual, Quality Requirements, PSCM 4155.3, Part 1, which is incorporated by reference.

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The swatches shall be submitted to the following:

Commander
DLA Testing Center
Naval Support Station Philadelphia
700 Robbins Ave(Building 5 D)
Philadelphia. Pa. 19111-5098

4.4.3 Roll identification examination. During the yard-by-yard examination, each roll in the sample shall be examined that each roll is labeled or ticketed for fiber content in accordance with the Rules and Regulations under the Textile Fiber Products Identification Act.

4.4.4 End item testing. The cloth(s) shall be tested for the characteristics listed in Table X if applicable. 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 5 continuous yards full width of the finished cloth for all 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 requirement specified. The sample size shall be in accordance with the following:

Lot size (yards)	Sample size (sample units)
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
Material		
Cotton:		
Identification	3.4.1	AATCC-20 or ASTM D 276 1/
Combed cotton	3.4.1	
Nylon:		
Identification	3.4.2	AATCC-20 or ASTM D 276 1/
Luster	3.4.2	
Denier	3.4.2	
Absence of nylon waste	3.4.2	
Fiber content:		
Cotton content	3.4.3	AATCC-20A or ASTM D 629 1/, 2/
Nylon content	3.4.3	AATCC-20A or ASTM D 629 1/
Yarn Ply	3.4.3	Visual 3/
Presence of labile sulfur	3.5.2	4.5.1
Visual shade matching (all classes)	3.5.3	4/

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TABLE X. End item tests - Continued

Characteristic	Requirement paragraph	Test
Colorfastness:		4.5.2
Laundering (after 4 cycles)	3.5.4	AATCC-61 Test 3A 5/
Light (after 40 hrs or 170 kJ)	3.5.4	AATCC-16 Opt 1 or 3
Perspiration (acid & alkaline)	3.5.4	AATCC-15
Crocking	3.5.4	AATCC-8
Pattern execution	3.6	Visual
Spectral reflectance:		
Class 1 and 2	3.7.1	4.5.3
Class 3	3.7.2	4.5.3
Class 5	3.7.3	4.5.3
Class 6, 7 and 8	3.7.4	4.5.3
Class 9 and 10	3.7.5	4.5.3
Weight	3.8 Table VII	ASTM D 3776 Option C
Yarns per inch	3.8 Table VII	ASTM D 3775
Breaking strength	3.8 Table VII	ASTM D 5034
Tearing strength	3.8 Table VII	ASTM D 1424
Air permeability	3.8 Table VII	ASTM D 737
Fabric Appearance/Smoothness: (Class 8)	3.8 Table VII	
Initial	3.8 & 3.9.2	AATCC-143
After 20 Launderings	3.8 & 3.9.2	AATCC-143, Table II, 3VAiii
Weave	3.8.1	Visual
Water repellent treatment (Class 2, 7 and 10)		6/
Dynamic absorption:	3.9.1	
Initial		AATCC-70
After 15 launderings		AATCC-96 VIcA 7/, AATCC-70
Spray rating:	3.9.1	
Initial		AATCC-22
pH	3.10	AATCC-81
Resistance to organic liquids (Class 2, 7and 10)		
Initial	3.11	AATCC-118
After 15 launderings	3.11	AATCC-96 VIcA 7/and AATCC-118
Dimensional stability		
After 5 launderings	3.12	AATCC 96 VIcA 8/
Seam efficiency	3.13	ASTM D1683 9/
Toxicity	3.14	4.5.4

1/ In case of dispute, the ASTM method prevails.
2/ The cotton content shall be calculated as follows:

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Cotton content, percent = R/S x 100
R = Weight of residual fibers
S = Weight of dry desized specimen

3/ One determination shall be made from each sample unit and the result reported as "pass or fail".

4/ The color and appearance of the cloth(s) 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 (± 200)ºK illumination of 100 (± 20) foot candles, and shall be a good match to the standard sample under incandescent lamplight at 2856 (± 200)°K.

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

6/ The contractor shall report the approved water repellent used, and certify that no other material (except the specified buffer and acetic acid) has been added.

7/ Specimens shall be subjected to 15 complete cycles (wash and dry) prior to determinations of dynamic absorption, spray rating and resistance to organic liquid after laundering. The last two (2) wash cycles shall be performed without the addition of detergent.

8/ The dimensional stability shall be performed after 5 launderings. The cloth shall not be pressed after tumble drying prior to measurement.

9/ Table I default seam specification from ASTM D 1683 shall not be used. Seam type shall be LSc-2. Thread shall be A-A-50199, Type II, polyester core, polyester covered, Tex size 61-70, 2 ply for both the needle and looper. Needle size metric 110 (0.044 inches), chrome, medium ball with stitch type 401 per ASTM D 6183 at 12 stitches per inch (±1/2) inch for both the warp and filling directions.

4.5 Methods of inspection.

4.5.1 Presence of labile sulfur test. In the determination of presence of labile sulfur in textile materials with lead acetate, two 1.50 (± 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.

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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 indicated which colors were evaluated together.

4.5.2.1 Operation Enduring Freedom Camouflage pattern (OCP) (Class 9 and 10). All Colorfastness testing for Operation Enduring Freedom Camouflage pattern (Class 9 and 10) shall be performed on the solid color area and not the tonal area.

4.5.3 Spectral reflectance test. Spectral reflectance data shall be obtained from 600 to 860 nanometers (nm) for Classes 1, 2, 5, 6, 7, 8, 9 and 10 and 700 to 860 nanometers (nm) for Classes 3 at 20 nm intervals on a spectrophotometer relative to the barium sulfate standard, the preferred white standard. Other white reference materials may be used provided they are calibrated to absolute white, e.g. magnesium oxide or vitrolite tiles. The spectral band width shall be less than 26 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 either CIE Source A or CIE Source D65. Measurements shall be taken on a minimum of two (2) different areas and the data averaged. The measured areas should be at least 6 inches away from the selvage. The cloth for Classes 1, and 2 shall be measured as a single layer using three backing layers of the same shade for Light Green 354, Dark Green 355 and Brown 356 colors. The cloth for Class 5 shall be measured as a single layer using two backing layers of the same shade for Black 357. The cloth for Classes 3 shall be measured as a single layer backed with four layers of the same shade cut from the standard. The cloth for Classes 6, 7, 8, 9 and 10 shall be measured as a single layer backed with four layers of the same shade. The specimen shall be viewed at an angle no greater than 10 degrees from normal, with the specular component included. Measurements shall be taken on a minimum of two different areas. Specimens shall be oriented in different directions during testing. When possible, the specimens tested shall not contain the same warp or filling yarns when presented to the sample port. Photometric accuracy of the spectrophotometer shall be within 1 percent and wavelength accuracy within 2 nanometers. 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, 9 and 10. Any color having spectral reflectance values falling outside the limits at four or more of the wavelengths specified shall be considered a test failure.

4.5.4 Toxicity testing. Unless otherwise specified (see 6.2), an acute dermal irritation study and a skin sensitization study shall be conducted on laboratory animals. When the results of these studies indicate the cloth 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 the toxicity requirement (see 3.14) can be demonstrated with historical use data, toxicity testing may not be required (see 6.2).

5. PACKAGING

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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 materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service 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 Classes 1, 2, 3, 5, 6, 7, 8, 9 and 10 camouflage pattern or solid colored (Black) 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. Class of cloth required (see 1.2)
c. The specific issue of individual documents referenced (see 2.2)
d. When first article is required (see 3.1, 4.2 and 6.3)
e. Camouflage pattern drawing, if required (see 3.5)
f. Width of cloth required (see 3.8.2)
g. Length required if other than specified (see 3.15)
h. When toxicity testing is required (see 4.5.4)
i. Packaging (see 5.1)

6.3 First article. When a first article inspection is required (see 3.1), it will be inspected and approved under the appropriate provisions of FAR 52.209-4. 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 Standard sample. For access to samples and pattern drawings, address the contracting activity issuing the invitation for bids or request for proposal.

6.4.1 Operation Enduring Freedom Camouflage Pattern (OCP). For information on obtaining Operation Enduring Freedom approved screens address the contracting activity issuing the invitation for bids or request for proposal.

6.5 Dye Combination (all Classes). Both colorfastness and infrared spectral reflectance requirements have been satisfactorily met by the use of both acid and vat dyes.

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6.6 Class 4. Class 4, 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
Operation Enduring Freedom
OCP
Quarpel treated
Universal
Water repellent treated
Woodland

Custodian:
Army – GL

Preparing activity:
DLA – CT

Review activities:
Army – MD

Project Number: 8305-2012-002

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.daps.dla.mil.