Std Sample
Fall 06-04
Shade & Handonly

INCH POUND

PD 77AESG 06-02
30 November 2006

PURCHASE DESCRIPTION

CLOTH, WATERPROOF AND MOISTURE VAPOR PERMEABLE, AIR FORCE TIGER STRIPE CAMOUFLAGE PATTERN

This purchase description is approved for use by all Departments and Agencies of the Department of Defense

1. Scope

1.1. SCOPE. This Purchase Description covers the requirements for one (1) type of cloth, waterproof and moisture vapor permeable, Air Force digital. tiger stripe, print pattern used in the fabrication of Air Force garments.

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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 documents cited in sections 3 and 4 of this specification, whether or not they are listed

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to : Defense Supply Center Philadelphia, Clothing and Textiles Directorate, Attn: DSCP-FQAAE, 700 Robbins Avenue, Philadelphia, PA 19111-5096, By using the Standardization Document Improvement Proposal (DD Form 1426)

2.2. Government Documents.

The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the solicitation or contract. (see 6.2)

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-DTL-83133	Turbine Fuels, Aviation, Kerosene Types, NATO F-34 (JP-8), NATO F-35 and JP-8+100

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

2.2.1 Other Government Documents. The following other Government documents, drawings, and publications form a part of this document to the extent specified here in. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract

Drawing Number	Drawing Description	Drawing Date
05-AFCTO-194	AF Digital Tiger Stripe Print	10- August-04

(Copies of drawings are available from the Defense Supply Center Philadelphia, ATTN: DSCP-CBTC (Bldg 6)

FEDERAL TRADE COMMISSION

Rules and Regulations Under the Textile Fiber Products Identification Act

(Copies are available on line at http://ftc.gov or from the Federal Trade Commission, Pennsylvania Avenue at Sixth Street, N. W., Washington, DC 20580-0001

2.3 Non-Government Publications

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

AATCC -8	- Colorfastness to Crocking: Crockmeter Method
AATCC- 16	- Colorfastness to Light
AATCC-22	- Water Repellency: Spray Test
AATCC-61	-Colorfastness to Laundering, Home and Commercial Accelerated

AATCC-70	- Water Repellency: Tumble Jar Dynamic Absorption Test
AATCC-96	-Dimensional Changes in Commercial Laundering of Woven and Knitted Fabrics Except Wool
AATCC-135	-Dimensional Changes in Automatic Home Laundering of Woven and Knit Fabrics
AATCC -Evaluation Procedure 6 – Visual Assessment of Color Difference of Textiles	

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

ASTM INTERNATIONAL

ASTM D 751	-Water Resistance of Cloth; Water Permeability; Hydrostatic Pressure Method, Strength of Coating
ASTM D 2582	-Film, Plastic and Thin Sheeting, Puncture Propagation Tear Resistance Of
ASTM D 3393	-Specification for Coated Fabrics – Waterproofness
ASTM D 3776	-Standard Test Method for Mass Per Unit Area (Weight) of Fabric
ASTM D 3886	-Abrasion Resistance of Textile Fabrics (Inflated Diaphragm Method)
ASTM E 96	-Standard Test Methods for Water Vapor Transmission of Material
ASTM F 392	-Test Method for Flex Durability of Flexible Barrier Materials

(Copies are available on line at http://www.astm.org or from ASTM International at 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959)

AMERICAN Society for Quality Control

ASQ- Z1.4	Sampling Procedures and Tables for Inspection by Attributes (DOD Approved)

(Copies of this document are available on line at http://www.asq.org or from the American Society for Quality, 600 North Plankington Avenue, Milwaukee, WI 53203)

SAE INTERNATIONAL

SAE- AMS1424	Deicing/Anti-Icing Fluid, Aircraft, SAE Type 1

(Copies of this document are available from www.sae.org or SAE World Headquarters, 400 Commonwealth Drive, Warrendale, PA 15096-0001).

TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY (TAPPI)

TAPPI Method T-451 Stiffness, Preferred Procedure (1)

(Copies are available from www.tappi.org or TAPPI Press, Technology Park/ Atlanta, P.O. Box 105113, Atlanta, GA 30348.)

MISCELLANEOUS

Principles and Methods of Toxicology (fourth edition), A Wallace Hayes (editor), pp 1057 - 1060, 2001 are available from Taylor and Francis, Philadelphia PA).

(Copies of referenced documents are available from www.taylorandfrancis.com, Taylor and Francis, Philadelphia PA).

2. 4 Order of precedence.

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

3 REQUIREMENTS.

3.1 First article.

When specified a sample shall be subjected to first article inspection in accordance with 4.3. The sample size shall be specified in the procurement document.

3.2 Standard sample. The printed cloth shall match the standard sample for shade, colorfastness and appearance on the face side and shall be equal to or better than the standard sample with respect to hand and (unless otherwise indicated) all characteristics for which the standard is referenced.

3.3 Cloth The material shall be a waterproof, water vapor permeable laminate. The cloth shall consist of a 100% brushed nylon face, printed with the digital tiger stripe camouflage pattern, a bicomponent expanded polytretraflouroethylene membrane or equal (see 4.7) and a suitable backing that will allow the cloth to meet the performance requirements of this document. The cloth shall have a maximum weight of 5.8 oz./sq/ yd., and shall conform to the requirements specified in Table 1 and 3.5.1 through 3.6 when tested as specified in 4.5.

3.4 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 advantages life cycle costs.

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

TABLE I Physical requirements

Characteristic	Requirement
Weight oz/sq. yd.(max)	5.8
Tearing Strength kgf. (minimum)	
Warp	4.0
Fill	4.0
Stiffness , warp only, cm (max) at 70° F	7.5
Hydrostatic resistance (to burst) (min psi)	
Initial	90
After diethyltoluamide	90
Hydrostatic resistance (sustained)	
Initial	No Leakage
After Strength of Coating	No Leakage
After Abrasion	No Leakage
After High Humidity	No Leakage
After diethyltoluamide	
Initial and After Laundering	No Leakage
After Aircraft fluids	
Initial and after Laundering	No Leakage
After hydraulic fluids	
Initial and after Laundering	No Leakage
After motor oil	
Initial and after Laundering	No Leakage
After JP-8 Fuel	
Initial and after Laundering	No Leakage
Moisture vapor transmission rate (g/m^2/24 hr (min)	
Initial	
Procedure B	600
Procedure BW	4300
After Synthetic Perspiration	

Procedure B Procedure BW	600 4300
Water Permeability (min) Initial After Synthetic Perspiration Initial and after Laundering After Physical Surface Appearance After Flex (70 ° F) Warp Fill After Cold Flex (-40 ° F) Warp Fill	 No Leakage No Leakage No Leakage No Leakage No Leakage No Leakage No Leakage
Spray rating: Initial After 5 Launderings	 100,90,90 90,90,90
Resistance to organic liquids : tetradecane Initial After 5 Launderings	 4 4
Physical Surface Appearance After Laundering	No bubbling, cracking or delamination, significant shade change or fading
Dimensional Stability % (maximum) Warp Fill	 ±4 ±4
Spectral Reflectance	3.5.4, Table II

3.5.1 Color. The color of the face side of the cloth shall be printed to match the Air Force digital tiger stripe pattern of AF tan 1639, AF gray shade 1640, AF sage green shade 1641 and the AF blue shade.1642 for the designated areas of the pattern. Each area of the specified color of the pattern shall be in accordance with applicable standard sample. The color of the back side of the cloth shall be sage green 1641.

3.5.1.1 Color matching. The color and appearance of the camouflage printed cloth shall match the standard sample when viewed using AATCC Evaluation Procedure 9, Option A. Filtered tungsten lamps that approximate artificial daylight D75 illuminant having a color

temperature of 7500 ± 200 K with illumination of 100 ± 20 foot candles shall be used. The color and appearance shall be a good match to the standard sample under incandescent light illuminate A having a color temperature of 2856 ± 200 K.

3.5.2 Camouflage Pattern Execution. The pattern shall reproduce the standard sample in respect to design, colors, and registration of the respective areas. The pattern repeat of the camouflage printed finished cloth shall be 17± 1 inch. Each pattern area shall show solid coverage; skitteriness exceeding that shown on the standard sample in any of the printed areas shall not be acceptable. When the standard sample is not referenced for pattern execution, a pattern drawing will be provided, and the pattern for the finished cloth shall match that of the drawing.

3.5.3 Colorfastness. The finished camouflage printed laminated cloth shall show colorfastness to: light (after 40 AATCC standard fading hours or 170 Kilojoules); laundering after 3 cycles. The colorfastness for each color shall be equal to or better than a rating of 3-4 using the AATCC Gray Scale for Color Change and the AATCC Gray Scale for staining. The finished cloth shall show colorfastness to crocking equal to or better than a rating of 3.5 on the AATCC Chromatic Transference Scale.

3.5.4 Spectral reflectance. The reflectance values for the cloth shall conform to the requirements listed below in Table II and tested as specified in 4.5.1.

Table II Spectral reflectance requirements

Wavelengths	Tan 1639		Grey 1640		Sage Green 1641 & Blue 1642	
Nanometers	Min.	Max.	Min.	Max.	Min.	Max.
600	30	40	16	26	9	18
620	32	42	16	26	9	18
640	35	48	18	28	11	20
660	37	56	21	30	13	26
680	42	60	22	34	13	26
700	43	60	24	38	15	28
720	47	63	26	42	16	31
740	48	66	30	46	16	34
760	48	68	32	48	20	36
780	52	70	34	48	20	38
800	52	72	34	48	22	40
820	52	72	36	52	24	40
840	53	73	38	52	24	41
860	53	73	40	53	26	41

3.5.5 Hydrostatic resistance. The cloth shall have an initial hydrostatic resistance to burst rating of 90psi minimum and a minimum rating of 90psi after diethyltoluamide when tested according to 4.5 and Table IV.

3.5.6 Hydrostatic resistance (sustained). The cloth shall show no leakage to sustained hydrostatic resistance initially and no leakage when tested for those characteristics cited in Table I, and as specified in 4.5 and Table IV.

3.5.7 Moisture vapor transmission. The cloth shall show an initial minimum moisture vapor transmission rate of 600 g/m²/24 hours initial when tested for procedure B of ASTM E 96 and a minimum rate of 4300 when tested for procedure BW. The cloth will show an initial minimum rate of 600 when tested after synthetic perspiration for procedure B and a minimum rate of 4300 when tested for procedure BW.

3.5.8 Water permeability. The cloth shall show no initial leakage when tested for water permeability and no leakage when tested for those characteristics cited in Table I. and tested according to 4.5 and Table IV.

3.5.9 Spray Rating. The cloth shall have a minimum initial spray rating of 100, 90, 90 and a minimum rating of 90, 90, 90 after 5 launderings when tested according to 4.5.3.5

3.5.10 Resistance to organic liquids. The cloth shall show a minimum rating of 4 when treated with tetradecane initially and after 5 laundering when tested according to 4.5 and Table IV.

3.5.11 Physical Surface Appearance after laundry. The surface appearance of the cloth shall be equal to the unlaundered sample after 20 laundering and 20 drying cycle when tested according to 4.5.3.5.

3.5.12 Dimensional Stability The cloth shall not elongate or shrink more than 4.0% in the warp direction and 4.0% in the filling direction when tested according to 4.5 and Table IV.

3.6 Toxicity The finished cloth shall not present a health hazard and shall show compatibility with prolonged, direct skin contact when tested as specified in 4.6. If this requirement can be demonstrated with historical use data, toxicity testing may not be required (see 6.2). Chemicals recognized by the Environmental Protection Agency (EPA) as human carcinogens shall not be used.

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.

When a first article is required (see 3.1 and 6.2), first article inspection shall consist of the examination of 4.3.2 and all tests specified in 4.5.

4.3 Conformance inspection. Conformance inspection shall consist of all examinations and tests of this purchase description.

4.3.1 Conformance inspection sampling. Unless otherwise specified sampling for conformance inspection shall be in accordance with the provisions of ASQ Z1.4.

4.3.2 Examination of the end item. The cloth shall be examined for the defects specified in Table III. All defects found shall be counted regardless of their proximity to each other except where two or more defects represent a single local condition in which case only the more serious defect shall be counted. The lot size shall be expressed in yards. The sample unit shall be 1 roll. The number of rolls from which the sample is to be selected shall be as specified herein.

Lot size in yards	Sample size in rolls
1,200 or less	3
1,201 up to and including 3.200	5
3.201 up to and including 10,000	8
10,001 up to and including 35,000	13
35,001 up to and including 150,000	20
150,001 and over	32

Lots which contain fewer than three rolls, each roll in the lot shall be examined.

4.3.3 End Item testing. The cloth shall be tested as specified in 4.5 The sample unit for testing shall be 15 continuous yards full width of the finished cloth, put up in a manner to prevent folding and creasing or both. The lot shall be unacceptable if any sample unit fails to meet any 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:

Lot size (yards)	Sample size (sample units)
800 or less	2
801 up to and including 22,000	3
22.001 and over	5

4.4 Visual examination. The cloth shall be examined (on both sides for the defects listed in Table III

TABLE III End item visual defects

Defect	Classification	
	Major	Minor
Any hole, cut, tear or scratch, including edges	101	
Abrasion resulting in a thin or weak place	102	
Multiple floats or skips, ½ inch or more in either warp or filling direction of face fabric	103	

Any pit, blister, tunnel, bubble, or delamination of components	104	
Crease or wrinkle resulting in doubling or adhesion of surfaces that cannot be corrected by manual pressure,	105	
Any solid lump, defined as a slub or knot which exceeds 1/8 inch in diameter.	106	
Fabric edges rolled, folded, doubled, scalloped or wavy	107	
Any spot, stain 1/ or foreign matter 2/	108	
Any odor other than that which is characteristic of the component materials of the cloth		201
Any color off shade, not uniform, mottled or spotted (face side only)	109	
Any tackiness	110	
Any pinhole	111	
Any area without waterproof finish (i.e., laminating film, where required)	112	
Any scorch or burn	113	
Multiple floats or skips, ½ inch or more in either warp or filling direction of face fabric	114	
Not clean	115	
Camouflage pattern (face side): Any Skitteriness of pattern exceeding that shown by the standard sample	116	
Pattern design not equal to standard sample	117	
Excessive feathering or spew of pattern	118	
Pattern repeat not equal to the standard sample	119	
Warp wise pattern repeat 17± 1 inch	120	
Any color off shade, not uniform, mottled or spotted (face side only)	121	

1/ Clearly visible at the normal inspection distance of 3 feet.

2/ For the back side, any spot , stain, off-shade area, or discoloration that is a result of the distortion of a backing fabric or a result of uneven dyeing of a backing fabric shall not be scored for this condition. Foreign matter shall be defined as waste, fly, or extraneous material that has been formed into the fabric system.

4.5 Test Methods. The tests of this specification shall be conducted in accordance with the test methods specified in Table IV.

Table IV Test Methods

Characteristic	Requirement	Test Method
Weight oz/sq. yd.(max)	3.5	ASTM D 3776
Tearing Strength lbs. (minimum)	3.5	ASTM D 2582 and 4.5.2
Hydrostatic resistance (to burst) (min psi)		
Initial	3.5.5	ASTM D 751
After diethyltoluamide	3.5.5	4.5.3.1
Hydrostatic resistance (sustained)		
Initial (water pressure at 40psi)	3.5.6	ASTM D 3393
After Strength of Coating (stretched to 20lbs)	3.5.6	ASTM,sec 54-58
After Abrasion (multidirectional, 10,000 cycles)	3.5.6	ASTM D 3886 1/
After High Humidity	3.5.6	4.5.3.2
After diethyltoluamide		
Initial and After Laundering	3.5.6.	4.5.3.4, 4.5.3.5
After Aircraft fluids		
Initial and after Laundering	3.5.6	4.5.3.3, 4.5.3.5
After hydraulic fluids		
Initial and after Laundering	3.5.6	4.5.3.4, 4.5.3.5
After JP-8 Fuel		
Initial and after Laundering	3.5.6	4.5.3.4, 4.5.3.5
After Motor Oil		
Initial and after Laundering	3.5.6	4.5.3.4, 4.5.3.5
Moisture vapor transmission rate ($g/m^2/24$ hr (min)		
Initial		
Procedure B	3.5.7	4.5.4.1
Procedure BW	3.5.7	4.5.4.2
After Synthetic Perspiration		
Procedure B	3.5.7	4.5.7.2, 4.5.4.1
Procedure BW	3.5.7	4.5.7.2, 4.5.4.2
Stiffness, warp only, cm at 70° F (max)	3.5	Tappi T-451 2/

Water Permeability (min) Initial After Synthetic Perspiration After Physical Surface Appearance After Flex (70 ° F) Warp Fill After Cold Flex (-40 ° F) Warp Fill	3.5.8 3.5.8 3.5.8 3.5.8 3.5.8	ASTM D 751, 4.5.5 ASTM D 751, 4.5.7.2 ASTMD 751, 4.5.6 ASTM D 751, 4.5.5.1 ASTM D 751, 4.5.5.2
Spray rating: Initial After 5 Launderings	3.5.9	AATCC -22 AATCC-22, 4.5.3.5
Resistance to organic liquids : tetradecane Initial After 5 Launderings	3.5.10	AATCC -118 AATCC -135, 4.5.3.5
Physical Surface Appearance After Laundering	3.5.11	4.5.3.5
Colorfastness to light	3.5.3	AATCC-16, A for 40 hrs. or E at 170 kilojoules
Colorfastness to Laundering , 3 cycles	3.5.3	AATCC-61,1A
Colorfastness to Crocking (minimum) Dry Wet	3.5.3	AATCC-8
Dimensional Stability % (maximum) Warp Fill	3.5	AATCC 96 Opt 1c
Spectral Reflectance	3.5.4	4.5.1

1/ The face side of the cloth shall be abraded using the face side of the test material as the abradant and a load of six (6) pounds.

2/ Five specimens with the long dimension parallel to the warp direction of the cloth shall be tested. No individual test specimen result shall be greater than 7.5 centimeters.

4.5.1 Spectral reflectance test. Spectral reflectance data shall be obtained from 600 to 860 nanometers (nm) on a spectrophotometer relative to the barium sulfate standard, the preferred white standard. Other white reference materials maybe 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 specimen shall be viewed at an angle no greater than 10° from normal, with the specular component included. Photometric accuracy of the spectrophotometer shall be within 1 percent and wavelength accuracy within 2 nm. The diameter for standard aperture size used in the color measurement device shall be 1.0 to 1.25 inches for the gray 1640, sage green 1641, and blue 1642 and .3725 inches for the tan 1639. Any color having spectral reflectance values falling outside the limits at four or more of the wavelengths specified shall be considered a test failure.

4.5.2 Tear strength. Test according to ASTM D 2582 with the following exceptions: Five warp and five filling specimens shall be tested. The specimen size shall be 8-inches by 8-inches. Only 1 tear shall be made on a single specimen. The specimen shall be positioned with the face side toward the probe and the designated yarns of the face fabric at right angles to the direction of tear. The test shall be conducted using the standard drop height of 508 ± 2 mm. If the tear is not straight, the result shall be considered invalid and another specimen shall be tested.

4.5.3 Hydrostatic resistance

4.5.3.1 After diethyltoluamide. Five 4 x 4 inch specimens shall be tested. Each specimen shall be laid flat, face side up on a 4 x 4 inch, ¼ inch thick glass plate. Three drops of diethyltoluamide containing 75% diethyltoluamide and 25% ethanol shall be applied to the center of each specimen. A glass plate of the same dimensions shall be placed on the specimen and a 0.25 pounds per square inch of glass plate contact area shall be applied to the assembly. After 16 hours the specimens shall be removed from between the glass plates and tested immediately for hydrostatic resistance.

4.5.3.2 After high humidity. Three 4 x 4 inch specimens shall be laid flat, face side up on a supporting plate and the assembly placed in a desiccator containing water in the lower portion. The water level shall be approximately 1 inch below the specimens. The lid of the desiccator shall be put in place and the desiccator placed in a circulating air oven having a temperature of 125 ± 2° F for a period of 7 days. At the end of the testing period the specimens shall be removed and immediately tested for hydrostatic resistance.

4.5.3.3 After Aircraft fluids. The specimen (or specimen area) shall be laid flat, face side up, on a glass plate. One milliliter of JP-8 fuel conforming to MIL-T-83133 shall be spread over the middle of the sample, followed by 1 milliliter of de-icing fluid conforming to SAE-AMS1424. The samples shall then be placed flat in an air-circulating oven at 50° C for 30 minutes. Remove and immediately tested for hydrostatic resistance as specified in Table IV.

4.5.3.4 Contamination procedure. The specimen (or specimen area) shall be laid flat, face side up, on glass plate, Three drops of the test liquid (1 ml for sealed samples) shall be applied to the center of the specimen (or specimen area); as applicable, the test liquid shall be diethyltoluamide), motor oil, (ASTM D-4485, Grade CD-II), JP-8 fuel (MIL-T-83133),

and hydraulic fluid (MIL-T-83133). A glass plate of the same dimension shall be placed on the specimen (or specimen area) and a pressure of 0.0625 of glass plate contact area be applied to the assembly. After 16 hours remove the specimen (or specimen area) from the assembly and test immediately for the required performance property in the center of specimen (or specimen area). For testing the "initial condition, the test specimen shall be as specified by the applicable test method. For testing the "after laundering" condition the laundering test shall be conducted in accordance with 4.5.3.5 for one laundering and drying cycle and one laundering sample, 48-inches by the full width of the cloth, for each test liquid shall be marked on the face side (using a laundry marker pen) for the specimen areas for hydrostatic resistance and for leakage; after laundering, the specimen areas may be cut form the laundering sample to facilitate performance property testing. The (10) specimens (minimum) shall be tested for each of the initial and the after laundering conditions.

4.5.3.5 Laundering procedure. Place 2.0 ± 0.2 pounds of the cloth and if needed, ballast in an automatic washing machine set on the permanent press cycle, high water level and warm (100 to 110 ° F) wash temperature. Place 0.5 ounce (14 grams) of 1993 AATCC Standard Reference Detergent (non-phosphate) without optical brighteners into the washer. The duration of each laundering cycle shall be 30 ± 5 minutes. After laundering, place sample and ballast in automatic tumble dryer set on permanent press cycle, 150 to 160 ° F and dry for approximately thirty (30) minutes or until dry. The laundering equipment, washer and dryer, shall be in accordance with AATCC 135.

4.5.4 Moisture vapor transmission rate.

4.5.4.1. Water Method (B). Five specimens per sample unit shall be tested for each of the moisture vapor transmission rate (MVTR) method. The back side of the laminated cloth shall face the water and the specimens shall be sealed by any means which prevents leaking or wicking of water around the specimen. The tests shall be performed in an area with a controlled temperature of 73.4 ± 1° F and a controlled relative humidity of 50± 2 %. The water method for determining MVTR shall be conducted as specified in ASTM E 96, with the test dish in the upright position. The free stream air velocity shall be 550 ± 50 FPM as measured 2 inches above the cloth specimen. The air flow shall be measured at least 2 inches from any other surface. The test shall run for 24 hours and weight measurements shall be taken only at the start and the completion of the test. At the start of the 24 hour period, the air gap between the water surface and the back of the specimen shall be ¾ in. The minimum value shall be obtained by averaging all of the determinations obtained from the individual specimens taken from all of the sample units as a group. No single specimen determination shall be less than 350 gms/m² /24 hours. When applicable, three after synthetic perspiration tests in accordance with 4.5.7.2 shall be performed.

4.5.4.2. Inverted water method (BW). The inverted water method for determining MVTR shall be conducted as specified in ASTM E 96 with the test dish in the inverted position. The free stream air velocity shall be 550 ± 50 FPM as measured 2 inches below the cloth specimen. The air flow shall be measured at least 2 inches from any other surface. The test shall run for 2 hours and weight measurements shall be taken only at the start and completion of the test. The minimum value shall be obtained by averaging all of the determinations obtained from the individual specimens taken from all of the sample units

as a group. No single specimen determination shall be less than 2500 grams/meter²/24 hours.

4.5.5 Water permeability. Water permeability shall be tested as specified in ASTM D 751, Hydrostatic Resistance, Procedure B, Procedure2 with a fixed hydrostatic head of 1 psi applied to the face side of the test specimen for 10 minutes. Five specimens shall be tested. The report shall only include measurement for appearance of water droplets. Leakage is the appearance of one or more droplets of water within the 4-½ inch diameter test area, or any wicking through the sealed seam area. Wicking leaks can be checked by blotting sample area with a paper towel.

4.5.5.1 Water permeability after Flex at 70° F. One warp and one fill specimen, 8x12 inches shall be cut from the sample unit with 8-inch dimension in the indicated direction (warp or filling, as applicable). The specimen shall be conditioned and flexed as specified in ASTM F-392, except that the specimen shall not be aged, the short edges shall not be heat sealed or otherwise joined, and the specimen shall be flexed for 1500 full flex cycles. Two 6 x 8 inch specimens shall be cut from the 8 x 12 inch flexed specimen and tested for water permeability in accordance 4.5.5.

4.5.5.2 Water permeability after cold flex at -40° F. One warp and one fill specimen, 8x12 inches shall be cut from the sample unit with 8-inch dimension in the indicated direction (warp or filling, as applicable). The specimen shall be conditioned and flexed as specified in ASTM F-392, except that the specimen shall not be aged, the short edges shall not be heat sealed or otherwise joined. The 8 x 12 inch specimen shall be mounted on the flex test apparatus, placed in a test chamber at the specified temperature for 1 hour and then flexed for 1500 full flex cycles in the test chamber at the specified temperature. At the end of the flexing cycle two 6 x 8 inch specimens shall be cut from the 8 x 12 inch flexed specimen and tested for water permeability in accordance 4.5.5.

4.5.6 Physical Surface Appearance. Each sample, 48- inches in length by full width shall be cut in half across the width of the cloth One half of the sample (24 inches in length) shall be laundered and the remaining half retained as the unlaundered portion for the evaluation. Conduct 20 laundering and drying cycles in accordance with 4.5.3.5 After each drying cycle, examine both sides of the cloth for changes in physical surface appearance when compared to the unlaundered sample.

4.5.7 Colorfastness

4.5.7.1 Laundering. Laundering shall be tested as specified in AATCC No. 61, Test 1A, 3 cycles except that 1993 AATCC Standard Reference Detergent (non-phosphate) without optical brighteners shall be used.

4.5.7.2 Synthetic perspiration. The specimen, 8x8 inches, shall be cut and exposed to synthetic perspiration as follows: the synthetic perspiration solution shall be made by combining 3.0 grams sodium chloride, 1.0 gram trypticase soy broth powder, 1.0 gram normal propylpropionate, 0.5 gram of liquid lecithin and 500 ml of distilled water. Cover the solution and heat to 50° C, stirring frequently while heating. Continue until all ingredients are dissolved. Then cool the solution to 35 ° C, remove cover and dispense it immediately with a pipette or other measuring device. Dispense 2ml of perspiration solution at 35 ° C onto the center of an 8 x 8 by 1/4 inch glass plate. Place the specimen on

the glass plate with the back side contacting the glass. Dispense an additional 2 ml of the synthetic perspiration solution on the center of the specimen. Place a second 8 x8 by ¼ inch glass plate on top of the specimen and then place a 4 pound weight on top of the assembly in the center. After 16 hours remove the specimen (do not rinse) and air dry the specimen before testing the specimen as specified.

4.6. Toxicity Test. When required (see 3.6), an acute dermal irritation study and a skin sensitization study shall be conducted on laboratory animals. When the results of the studies indicate the coat is not a sensitizer or irritant, a Repeat Insult Patch Test shall be performed in accordance with the Modified Draize Procedure.

4.7 Equal item. Prior to use of an "equal" item, the contractor shall submit the item with supporting data to the contracting office for subsequent approval or disapproval by the responsible military agency.

5. 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 be performed by DoD 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 activity within the Military Department of Defense Agency, or within the 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 the fabrication of parkas and trousers for United States Air Force personnel.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number, and date of this specification.
b. When a first article sample is required, (see 3.1).
c. Packaging requirements (see 5).
d. Toxicity data

6.3 Subject term (key word) listing

Camouflage

Cloth

Digital Tiger Stripe

Physical Surface Appearance
Waterproof

CONCLUDING MATERIAL

Custodian:
Air Force 11

Preparing activity:
Air Force (311HSW/YAPC)