

## NOTICE

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## AVIS

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## SPECIFICATION FOR CLOTH, NYLON, POLYURETHANE COATED, MULTICAM®

### 1.1 Scope

This specification covers the requirements for cloth, nylon, polyurethane coated with the MULTICAM® camouflage pattern.

***Note: It is known that the Cloth, Duck, Textured Nylon, FRTEX, MULTICAM® (MIL-DTL-32439 Type 3 Class 4) material distributed by 1947 LLC (www.1947llc.com) fully meets the requirements within this specification.***

### 1.2 Classification

The fabric must be classified as follows: Cloth, Nylon, Polyurethane Coated, MULTICAM®.

### 1.3 Applicable Documents

The following documents form part of this specification to the extent specified, and are supportive of this specification when referenced; all other document references are to be considered supplemental information only. In the event of a conflict between the documents referenced and the contents of this specification, then the contents of this specification must take precedence:

*CAN/CGSB Standards (email: ncr.cgsb-ongc@pwgsc.gc.ca)*

- CAN/CGSB-4.2-M Textile Test Methods

*FED Standards (Download Documents: <http://assist.daps.dla.mil/quicksearch/>)*

- FED-STD-101 Federal Standard Test Procedures for Packaging Materials

*American Association of Textile Chemists and Colorists Standards (www.aatcc.org)*

- AATCC Test Method 8 Colourfastness to Light
- AATCC Test Method 116 Colorfastness to Crocking: Rotary Vertical Crockmeter Method

*American Society for the Testing of Materials (www.astm.org)*

- ASTM D 3884 Standard Guide for Abrasion Resistance of Textile Fabrics (Rotary Platform, Double Head Method)

- ASTM D 751 Blocking Resistance at Elevated Temperatures

International Standards Organization (ISO) ([www.iso.org](http://www.iso.org))

- ISO 811 Textile Fabric - Determination of Resistance to Water Penetration - Hydrostatic Pressure Test
- ISO 4920:1981 Determination of Resistance to Surface Wetting (Spray Test)

#### 1.4 Order of Precedence

In the event of any inconsistency in contract documents such as contract, specification and sealed patterns, the order of precedence must be contract, specification, and sealed pattern. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification must take precedence. For any inconsistency in technical details between languages, the language of the original document, which in this case is English, must take precedence. Nothing in this document supersedes applicable laws and regulations, unless a specific exemption has been obtained.

## 2.0 **REQUIREMENTS**

### 2.1 Fabric Structure

The base cloth must be plain woven from the yarn specified in Section 2.3, and must be of such construction that the requirements of Table 1 must be met after coating and finishing. The base cloth is to be thoroughly desized and scoured prior to being heat-set. The scoured cloth must contain no impurity which may adversely affect the coating process.

#### 2.1.1 Coating

The woven and printed textile must be further processed by the application of a coating to the backside only of the goods. The following processes will be acceptable provided that all requirements of this specification are met: calendar coating, cast coating, direct coating, roller coating, and transfer coating, or a combination of any of these processes. The polyurethane elastomer used must be hydrolysis and mildew resistant. The polyurethane is to be unpigmented (colorless). The resultant coating must be uniform, and free from bubbles, pinholes, thin spots, delamination, or any other coating defects.

#### 2.1.2 Finish

The coated, printed cloth must be given a durable water repellent finish to comply with the requirements of Table 1.

#### 2.1.3 Sealed Seams

Articles that will be made from this textile may have sewn seams that require sealing or taping. Therefore, any finish applied to either nylon fabric or polyurethane coating that will impair secure adhesion of sealant or sealing tape must be avoided.

### 2.2 Workmanship

The materials covered by this specification must be free of imperfections or blemishes such as may adversely affect its appearance or serviceability. For inspection purposes, imperfections and blemishes must be considered defects when clearly visible at a normal inspection distance of approximately 1 m (3.3 ft) under good, preferably Northern Light, lighting conditions. No weaving or yarn defect must be acceptable if the integrity of the coating is in question. Good commercial standard practices must apply throughout.

### 2.3 Yarns

The yarns for both warp and weft of the base cloth must be ~~air~~ textured continuous filament nylon, 500 denier.

### 2.4 Dyeing and Printing

The cloth(s) must be dyed to a ground shade either matching or approximating Cream 524 and then overprinted with the MULTICAM® camouflage pattern by roller or screen printing in a manner that gives the required degree of colour fastness and a uniform, good penetration of colour in the fibres and fabric as follows:

- (a) When the ground shade is dyed to match Cream 524, the remaining colors are 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;
- (b) When the ground shade is dyed to approximate Cream 524 all seven colors of the camouflage pattern are obtained by subsequent printing using seven rollers or screens to match all seven colors; and
- (c) Resin bonded pigments are not be used.

### 2.5 Spectral Reflectance

Spectral reflectance data must be obtained from 600 to 860 nanometers (nm) 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 must be less than 26 nm at 860 nm. Reflectance measurements must be made by either the monochromatic or polychromatic mode of operation. When the polychromatic mode of operation is used, the spectrophotometer must 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 must be taken on a minimum of two (2) different areas and the data averaged. The measured areas should be at least 15 cm (6 in) away from the selvage. The cloth must be measured as a single layer backed with four layers of the same shade. The specimen must be viewed at an angle no greater than 10 degrees from normal, with the specular component included. Specimens must be oriented in different directions during testing. When possible, the specimens tested must not contain the same warp or filling yarns when presented to the sample port. Photometric accuracy of the spectrophotometer must be within 1 percent and wavelength accuracy within 2 nanometers. The diameter for standard aperture size used in the color measurement device must be 9.4869 mm (0.3725 in) or larger. Any color having spectral reflectance values falling outside the limits at four or more of the wavelengths specified must be considered a test failure.

Wavelength, Nanometers (nm)	Cream 524 and 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

Table 1: Requirements for Finished Coated Fabric, 500 denier nylon

PROPERTY	TEST METHOD	SPECIFIED REQUIREMENTS	MINIMUM ACCEPTABLE	MAXIMUM ACCEPTABLE
Fiber content	CAN/CGSB-4.2 Test Method 14.3	100% textured continuous filament nylon		
Mass - finished (g/m <sup>2</sup> )	CAN/CGSB-4.2 Test Method 5.1		270	320
Woven Count (yarns per cm)	CAN/CGSB-4.2 Test Method 6		Warp: 18 Weft: 13	
Breaking Strength (N)	CAN/CGSB-4.2 Test Method 9.1 (Test 6.1)		Warp: 2100 Weft: 1400	
Puncture Resistance (N)	FED-STD-101 Test 2065.1	525	475	
Coating Adhesion (N/25 mm)	ASTM D 751 (Note 1)		Warp: 40 Weft: 40	
Colour fastness to light - all colours	AATCC Test Method 16 (Option 1 or 3)		Sample Grey Scale 3-4 after 20 AATCC fading units	
Colour fastness to crocking – each colour dry & wet	AATCC Test Method 8			Colour change and Staining: Grey Scale 3.5
Colour fastness to laundering - all colours	CAN/CGSB-4.2 Test Method 19.1 Test 2			Colour change and Staining: Grey Scale 3-4
Colour fastness to perspiration – all colours	CAN/CGSB-4.2 Test Method 23			Colour change and Staining: Grey Scale 3-4
Dimensional stability in laundering - after 3 washes (Note 2)	CAN/CGSB-4.2 Test Method 24.2 or 58 Test III.E.3 (50°C, normal agitation, tumble dry)			Warp: 3% Weft: 2%

PROPERTY	TEST METHOD	SPECIFIED REQUIREMENTS	MINIMUM ACCEPTABLE	MAXIMUM ACCEPTABLE
Stiffness (gf.cm <sup>2</sup> /cm)	Kawabata Evaluation System Bending property (B Mean) Sensitivity: 5x1 Specimen width: 10cm (Note 3)			Length: 2.2 Width: 1.2  Sum of Length + Width, Max: 3.0
Resistance to abrasion	ASTM D 3884 ( <del>modified</del> ): abradant is the face surface of the fabric under test.		Face: 800 Cycles Back: 800 Cycles	
Water Repellency -after 3 washes (Note 2)	CAN/CGSB-4.2 Test Method 26.2  OR  ISO 4920:1981		90	
Blocking	ASTM D 751 (180°F for 30 minutes)			Rating: 3
Hydrostatic Resistance - As received (cm)	CAN/CGSB-4.2 Test Method 26.3 / ISO 811 (60 cm/min)		35	
Hydrostatic Resistance - After 3 washes (Note 2) (cm)	CAN/CGSB-4.2 Test Method 58 III E		35	
Hydrostatic Resistance - After ageing (70°C & 95% RH for 24 hours) (cm)			35	

PROPERTY	TEST METHOD	SPECIFIED REQUIREMENTS	MINIMUM ACCEPTABLE	MAXIMUM ACCEPTABLE
Chemical Resistance as follows: - degreasers, cleaning agent (methyl ethyl ketone 99.8% assay) - insect repellent (DEET) liquid in accordance with CAN/CGSB-15.19 (75%) - insect repellent (DEET) cream, 32% - turbine fuel in accordance with CAN/CGSB-3.23 - diesel fuel in accordance with CAN/CGSB-3.6 type A	See Note 4 for chemical exposure test method.  Following exposure test: Hydrostatic Resistance CAN/CGSB-4.2 Test Method 26.3/ISO 811		35 cm, no individual result less than 35 cm	

## Notes:

- Adhesive “Loctite” 420, available from Acklands-Granger Inc., has been known to provide a good separation and consistent result. For the purpose of this specification, ‘separation’ must be interpreted as the separation of coating from substrate, between layers of coating, of the adhesive itself, or a combination of these. A satisfied separation may be either complete or partial, and the test result must be equal to or greater than the minimum requirement. For the purpose of this specification, test must be carried out by compressing the specimen with a 4.5 kg mass between two glass plates and curing specimens for one hour.
- Washing must be carried out in accordance with CAN/CGSB-4.2 No. 58, washing procedure III (50°C, synthetic detergent, normal agitation) and drying procedure E (tumble dry, normal setting). The last wash cycle is to be carried out without detergent.
- The Kawabata bending test is to be carried out on new fabric. A new roll or bolt of fabric must be submitted to the laboratory. The laboratory must cut test specimens from fabric taken directly from the new roll or bolt. It is imperative that the new fabric and the test specimens be handled as little as possible prior to conducting the Kawabata bending test. References for test procedure: (i) Kawabata, S (1980) The Standardization and Analysis of Hand Evaluation (2nd Edition), Chapter IV. Measurement of the Mechanical Properties of Fabrics, para 2.2 Bending property; and (ii) KES Kato Tech Co. Ltd, Manual for Tensile & Shear Tester, KES-FB-1.
- Test Procedure for Chemical Resistance - Fabric samples of sufficient size and quantity to carry out the following tests will be prepared. Five new specimens from each sample must be tested separately to each chemical. The chemicals must be placed on the side of the fabric that is intended to be the outer face side:

1. For liquid chemicals, a quantity of  $100 \text{ ml/m}^2$  of the test liquid must be placed on the top of the test fabric and spread as evenly as possible over the whole surface using a plastic squeegee. As much as possible of the test fabric should be covered with chemical, but leaving a border of one (1) cm width uncontaminated. This should ensure that none of the applied chemical seeps outside the weight, after it is applied;
2. For the non-liquid cream, a quantity of  $50 \text{ g/m}^2$  of the chemical must be placed on the top of the test fabric and spread as evenly as possible over the whole surface using a plastic squeegee. A border of one (1) cm width must be left uncontaminated;
3. The whole test area must then be covered with a glass plate and weighted to a total pressure of 6.895 kPa (1 psi);
4. This weighted cover must be left in place for two (2) hours; and
5. The fabric must then be submitted to hydrostatic resistance testing, and must comply with the requirements in Table 1. All five (5) specimens must pass. Note that the side of the fabric that was exposed to the chemical will be facing the water in testing.