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SPECIFICATION FOR WATERPROOF MOISTURE VAPOUR PERMEABLE (WMVP) BARRIER FABRIC

1.1 Scope

This specification defines the requirements for a Waterproof, Moisture Vapour Permeable (WMVP) barrier fabric.

1.2 Classification

The fabric must be classified as: Waterproof Moisture Vapour Permeable (WMVP) Barrier Fabric.

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

- CAN/CGSB 3.23 Aviation Turbine Fuel (Grades Jet A and Jet A-1)
- CAN/CGSB 3.6 Off-Road Diesel Fuel
- CAN/CGSB 4.2-M Textile Test Methods
- CAN/CGSB 15.19 Insect Repellent Diethyltoluamide

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

- ASTM D413 - Peel Adhesion of Rubber to Flexible Substrate
- ASTM F392 Standard Test Method for Flex Durability of Flexible Barrier Materials

FED Standards (Download Documents: http://assist.daps.dla.mil/quicksearch/

- FED-STD-191A Federal Standard for Textile Test Methods
- FED-STD-595C - Colors Used in Government Procurement

Transport Canada

- Canadian Coast Guard TP1324 Material Specification for coated Fabrics Used in the Manufacture of Inflatable Life Rafts (February 1992)

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 waterproof moisture vapour permeable barrier layer fabric must be commercially available cloth, laminated or coated with two (2) layers of either nylon or polyester tricot knit. This cloth must normally be used in commercial garments to provide a high degree of waterproofness and evaporation of sweat. It must be sturdy and stable enough to be used as a loose hanging layer between the shell fabric and the lining fabric.

2.2 Workmanship

The material 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 are considered defects when clearly visible at a normal inspection distance of approximately 1 m (3.3 ft) under good, preferably Northern Light, lighting conditions.

2.3 Testing

When tested in accordance with the applicable test methods, the finished barrier cloth must comply with the requirements specified in Table 1.

2.4 Seaming

Seams must be sealed with tape in a waterproof durable fashion to resist the ingress of water and must not separate with wear and normal maintenance. The same applies to seam joints and crossover points. Seamed areas, when exposed to chemicals, must not delaminate or show any visible signs of loss or damage, and must retain hydrostatic and water resistance properties in accordance with Table 2.

2.5 Delamination

The fabric must not show any visible signs of delamination or loss of film during the useful life of the garment. Delamination is defined as the undesirable separation of the components of bonded or laminated fabrics as evidenced through bubbles, cracks, or formation of holes and loose edges on any of the layers. Separation of substrate from film at the moment of failure or immediately preceding failure during hydrostatic resistance, tensile, puncture and tear testing is not considered to be delamination.

2.6 Colour

The colour of both sides of the fabric must be a non-florescent earth-tone colour. By definition, earth tone is considered a color scheme that draws from a color palette of browns, tans, grays, greens, oranges, whites and some reds. The colors in an earth tone scheme are muted and flat in an emulation of the natural colors found in soils, moss, trees and rocks. For the purpose of this specification, the earth tone color must be based on the predominantly brown, tan and gray color series (lusterless) within FED STD-595C, where those colors do not include any elements of orange, red and white.

Table 1: Testing Requirements for WMVP Barrier Fabric

Property	Test Method	Requirement	Minimum Acceptable	Maximum Acceptable
Mass (g/m^2)	CAN/CGSB-4.2 Test Method 5.1			160
Dimensional Stability (%) after 5 washes in accordance with Note 1	CAN/CGSB-4.2 Test Method 67			Warp: 5.0 % Weft: 5.0 %
Tear Strength (N) after 5 washes in accordance with Note 1	CAN/CGSB-4.2 Test Method 12.2		Warp: 50 Weft: 40	
Puncture Resistance (N)	Transport Canada TP1324 Para 4.5		100	
Stiffness - Drape (cm)	FED-STD-191 Method 5206			Warp: 3 Weft: 3
Moisture Vapour Transition Resistance (mm equivalent still air): a. initial; b. after ageing (70°C & 95% RH for 168 hrs); and c. after 5 washes in accordance with Note 1.	CAN/CGSB-4.2 Test Method 49-99 Option 1			11
Resistance to Fungal Growth (%)	CAN/CGSB-4.2 Test Method 28.2			10

Property	Test Method	Requirement	Minimum Acceptable	Maximum Acceptable
Hydrostatic Resistance (kPa) Face (outward facing side in garment) as defined by the manufacturer's directions, to be against water for test: a. initial; b. . after 5 washes in accordance with Note 1; c. after ageing (70°C & 95% RH for 168 hrs) & flexing; and d. After cold flex at -40°C (the sample is placed in the cold room and allowed to condition for one hour prior to commencing the flex test).	CAN/CGSB-4.2 Test Method 26.5 and ASTM Textile Test Method F 392 Flexing is carried out for one hour, or 2700 cycles		For All Conditions: Minimum: 550	
Water Resistance (kPa) Face (outward facing side in garment) as defined by the manufacturer's directions, to be against water for test: a. initial; b. . after 5 washes in accordance with Note 1; c. after ageing (70°C & 95% RH for 168 hrs) & flexing; and d. After cold flex at -40°C (the sample is placed in the cold room and allowed to condition for one hour prior to commencing the flex test).	Maintain test conditions at 10 psi (68.95 kPa) for 10 minutes using the equipment required for CAN/CGSB-4.2 Test Method 26.5 and ASTM - Textile Test Method F392 Flexing is carried out for one hour, or 2700 cycles	For all conditions: no leakage		

Property	Test Method	Requirement	Minimum Acceptable	Maximum Acceptable
Resistance to Chemicals (kPa) after exposure to: – Turbine fuel, in accordance with CAN/CGSB-3.23; – Diesel fuel, in accordance with CAN/CGSB-3.6 Type A; – Degreasers, cleaning agent (methyl ethyl ketone 99.8% assay); – Insect repellent (DEET) liquid in accordance with CAN/CGSB-15.19 (75%); and Insect repellent (DEET) cream, 32%.	Following exposure to each: 1. Hydrostatic Resistance: CAN/CGSB-4.2 Test Method 26.5 2. Water Resistance: Maintain test conditions at 10 psi (68.95 kPa) for 10 minutes using the equipment required for CAN/CGSB-4.2 Test Method 26.5	No Leakage	350 (all exposures)	

Table 2: Testing Requirements for Taped Seams

Property	Test Method	Requirement
Hydrostatic Resistance (kPa): a. initial; b. after 5 washes in accordance with Note 1; and c. after exposure in accordance with Note 2, to: – Turbine fuel, in accordance with CAN/CGSB-3.23; – Diesel fuel, in accordance with CAN/CGSB-3.6 Type A; – Degreasers, cleaning agent (methyl ethyl ketone 99.8% assay); – Insect repellent (DEET) liquid in accordance with CAN/CGSB-15.19 (75%); and – Insect repellent (DEET) cream, 32%.	CAN/CGSB-4.2 Test Method 26.5	Minimum (all conditions): 450 kPa
Water Resistance (kPa): a. initial; b. after 5 washes in accordance with Note 1; and c. after exposure in accordance with Note 2, to: – Turbine fuel, in accordance with CAN/CGSB-3.23; – Diesel fuel, in accordance with CAN/CGSB-3.6 Type A;	Maintain test conditions at 10 psi (68.95 kPa) for 10 minutes using the equipment required for CAN/CGSB-4.2 Test Method 26.5	For all conditions: no leakage

– Degreasers, cleaning agent (methyl ethyl ketone 99.8% assay); – Insect repellent (DEET) liquid in accordance with CAN/CGSB-15.19 (75%); and – Insect repellent (DEET) cream, 32%.		
Peel Strength Test (N/tape width)	ASTM D413 Machine method, Strip type A, 180° Peel	Minimum: 8 N/25 mm
Delamination a. after 5 washes in accordance with Note 1; b. after exposure in accordance with Note 2, to: – Insect repellent (DEET) liquid in accordance with CAN/CGSB-15.19 (75%); and – Insect repellent (DEET) cream, 32%; – c. After Water Resistance testing a&b (initial and after 5 washes).	Visual - during and after each procedure indicated under the conditions described in CAN/CGSB-4.2 Test Methods 46 & 47	No delamination or separation of the tape from the seam, or of the individual layers of the seam tape from each other

Notes:

1. Wash tests are to be done in accordance with CAN/CGSB-4.2, Test Method 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.
2. Test Procedure for Chemical Resistance of Fabric and Taped Seams - Fabric or taped-seam 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:
    a. For liquid chemicals, a quantity of 100 ml/m2 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;
    b. For the non-liquid cream, a quantity of 50 g/m2 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;
    c. The whole test area must then be covered with a glass plate and weighted to a total pressure of 6.895 kPa (1 psi);
    d. This weighted cover must be left in place for two (2) hours; and
    e. The fabric must then be submitted to hydrostatic resistance testing, and must comply with the requirements in **Error! Reference source not found.**. 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.