

MIL-C-83489

26 October 1976

MILITARY SPECIFICATION

CLOTH, COATED, NYLON, POLYURETHANE COATED

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

1. SCOPE

1.1 This specification covers the requirements for two types of polyurethane coated cloth, radio frequency or ultrasonically sealable with air holding characteristics (see 6.1).

1.2 Classification. The finished coated cloths shall be of the following types (see 6.2).

Type I - Oxford weave, 6.6 ozs./sq. yd.

Type II - Plain weave, 4.3 ozs./sq. yd.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

PPP-P-1136 - Packaging and Packing of Coated (Plastic, Rubber) and Laminated Fabrics

MILITARY

MIL-C-19002 - Cloth, coated, and Tape, Coated Cloth - Polychloroprene on Nylon

STANDARDS

FEDERAL

FED-STD-4 - Glossary of Fabric Imperfections

FSC 8305

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: AFML/MXE Wright-Patterson AFB, OH 45433 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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STANDARDS

FEDERAL

- FED-STD-191 - Textile Test Methods
- FED-STD-601 - Rubber: Sampling and Testing

MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection  
by Attributes
- MIL-STD-810 - Environmental Test Methods
- MIL-STD-1487 - Glossary of Cloth Coating Imperfections

(Copies of specifications, standards, drawings, and publications required by contractor in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer).

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated the issue in effect on date of invitation for bids or request for proposal shall apply:

Rules and Regulations Under the Textile Fiber  
Products Identification Act

(Copies may be obtained from the Federal Trade Commission, Washington, D. C. 20580).

3. REQUIREMENTS

3.1 Standard sample. When a standard sample is available, the finished cloth shall be equal to or better than the sample with respect to all characteristics for which the standard sample is referenced (see 6.3).

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3.2 First article approval. The requirement for the First Article will be as specified by the procuring activity (see 6.2).

### 3.3 Materials

3.3.1 Base cloth. The base cloth shall be continuous filament nylon conforming to the requirements of Table I

Table I. Physical requirements of base cloth

Characteristic	Requirements	
	Type I	Type II
Weight, ozs./sq. yd. (minimum)	2.9	1.7
Yarns per inch (minimum)		
Warp	60	108
Filling	50	88
Breaking strength (lbs.) (minimum)		
Warp	200	140
Filling	170	120
Tearing strength (lbs.) (minimum)		
Warp	18	6
Filling	16	5
Weave	Oxford	Plain

3.3.2 Coating compound. The coating compound shall be an ether type urethane capable of being radio frequency or ultrasonically bonded to itself. The compound shall contain not less than 60% by volume of elastomer with the remainder of the ingredients to ensure that the elastomeric coating shall comply with the performance criteria of the specification. The coating compound shall be compatible with the base cloth and shall contain no waxes or other ingredients that may cause blooming and adversely affect the coating adhesion or radio frequency or ultrasonic sealability of the finished product.

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3.3.2.1 Cured coating compound.Table II. Physical properties of cured coating compound

Condition	Requirements	
	Tensile Strength	Elongation
Original (minimum)	1800 psi	500%
After 96 hours Accelerated Aging-Percent loss (maximum)	10	10
After 100 hours Accelerated Weathering-Percent loss (maximum)	20	20

3.3.3 Dusting powder. When used the dusting powder shall not interfere with the radio frequency or ultrasonic sealability of the fabric and does not support mildew growth.

3.4 Coated cloth. The cloth shall be coated on one side only with the coating specified in 3.2.2 and shall conform to all the requirements of Table III, when tested as specified in 4.4. A suitable water repellent finish shall be applied to meet the requirements of Table III. At the supplier's option the coated side may be dusted with the dusting powder specified in 3.3.3.

Table III. Physical requirements of coated cloth

Characteristic	Requirements	
	Type I	Type II
Weight, ozs./sq. yd.	6.6 $\pm$ 0.2	4.3 $\pm$ 0.3
Breaking strength, pounds (minimum)		
Warp	190	85
Filling	160	75
Tearing strength, pound (minimum)		
Warp	6	3
Filling	5	2

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Table III. Physical requirements of coated cloth (CONT'D)

Characteristic	Requirements	
	Type I	Type II
Adhesion, lbs./inch width (minimum) Coating to base cloth	15	15
Adhesion, lbs./inch width (minimum) Coated surface to coated surface		
RF bonding - No adhesive	65	30
Blocking (scale rating)	No. 2	No. 2
Permeability to Hydrogen liters/sq. meter/24 hrs. at 25°C (Maximum)	5.0	5.0
Fungus	No growth	No growth
Water resistance:		
Condition of coating	No cracking	No cracking
Air Retention after exposure	No leakage	No leakage
Air Retention	No leakage	No leakage
Breaking strength pounds (minimum)		
Warp	190	90
Filling	165	80
After accelerated weathering		
Warp	180	75
Filling	150	65
After accelerated aging		
Warp	180	75
Filling	150	65
Cold temperature air retention at 25 psig.	No leaks or deformation	No leaks or deformation

### 3.4.1 Color

3.4.1.1 The color of the coated fabric shall be specified by the procuring agency (see 6.2).

3.4.1.2 The pigment or dye shall be free of carbon or metallic particles.

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3.4.1.3 Matching. The color of the coated side shall match the standard under artificial daylight having a color temperature of 7500° Kelvin and shall be a good approximation to the shade sample under incandescent light as 2800° Kelvin.

3.4.1.4 Colorfastness. The coated fabric shall show good colorfastness to light and water.

3.5 Length and put-up. Unless otherwise specified, the coated cloth shall be put up on rolls as specified in PPP-P-1136 and shall be in one continuous peice of not less than 40 yards.

3.6 Width. The minimum width of the coated cloth shall be as specified (see 6.2).

3.7 Fiber identification. Each roll shall be labeled, ticketed or invoiced for fiber content in accordance with the Textile Fiber Products Identification Act as amended.

3.8 Workmanship. The finished cloth shall conform to the quality established by this specification. The demerit points per 100 square yards, when calculated as specified in Section 4, shall not exceed the established maximum point value.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Certificate of compliance. Where certificates of compliance are submitted, the Government reserves the right to check test such items to determine the validity of the certification.

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4.2 First article inspection. The first article submitted in accordance with 3.2 shall be inspected as specified in 4.3.2 for color, finish and appearance and shall be tested for the chemical and physical properties in accordance with the applicable methods specified in 4.4.

4.3 Inspection. Inspection shall be in accordance with the provisions set forth in MIL-STD-105, except where otherwise indicated herein.

4.3.1 Component and material inspection. In accordance with 4.1, components and materials shall be inspected and tested in accordance with all the requirements of referenced specifications, drawings, and standards unless otherwise excluded, amended, modified, or qualified in this specification or applicable purchase document. The base cloth listed in Table V shall be tested for the characteristics specified and in accordance with referenced test methods of FED-STD-191. The coating compound shall be tested for the characteristics specified once during a procurement and at anytime a coating formulation change is made. The sample unit shall be one yard full width of the uncoated base cloth and the lot size shall be expressed in units of one linear yard. The lot shall be unacceptable if one or more units fail to meet any requirement specified. All test reports shall contain the individual values utilized in expressing the final result. The sample size shall be as indicated in Table IV.

Table IV. Sample Size

<u>Lot Size (yards)</u>	<u>Sample Size</u>
800 or less	2
801 up to and including 22,000	3
22,001 and over	5

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Table V. Testing of components

Component	Characteristic	Requirement reference	Test method
Base Cloth	Material Identification	3.3.1	<u>1/</u>
	Weave	3.3.1	Visual <u>2/</u>
	Weight	3.3.1	5041
	Yarns per inch	3.3.1	5050
	Breaking strength	3.3.1	5100
	Tearing strength	3.3.1	5134
Coating compound	Identification	3.3.2	<u>1/</u>
	Tensile strength	3.3.2.1	4.4.7
	Elongation	3.3.2.1	4.4.7
	Volume	3.3.2	4.4.6

1/ A certificate of compliance shall be accepted for this characteristic.

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

4.3.2 Examination of the end item. Examination of the end item shall be in accordance with 4.3.2.1 and 4.3.2.2. The lot size for purposes of determining the sample size in accordance with MIL-STD-105 shall be expressed in units of one yard each for the examinations in 4.3.2.1 and 4.3.2.2.

4.3.2.1 Yard-by-yard examination. The required yardage of each roll shall be inspected on one side only. However, the side shall be alternated, so that alternate rolls are examined on the face and back respectively. The defects found shall be classified as listed below. In addition, the cloth shall be given a through-light inspection for pinholes. The through-lighting inspection shall be performed in accordance with MIL-STD-1487. 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. The lot size shall be expressed in units of one linear yard. The sample unit for this examination shall be one linear



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yard. The Acceptable Quality Levels (AQL's) for the examination shall be 2.5 for major defects and 4.0 for total defects (Major and Minor) per 100 units (yards). The inspection level shall be Level II. The number of rolls from which the sample is to be selected shall be in accordance with Table VI. An approximately equal number of yards shall be examined in each roll sampled."

<u>Defect</u>	<u>Classification</u>	
	<u>Major</u>	<u>Minor</u>
<u>Uncoated Side</u>		
Any Hole, Cut or Tear	X	
Any Slub, Smash or Multiple Float	X	
Baggy, Ridgy or Wavy Cloth	X	
Any Strike through of Coating		X
Any Spot or Stain		X
<u>Coated Side</u>		
a. Any cut, hole, tear; any coated surface scratch or abrasion that results in baring the base cloth	X	
b. Any surface scratch or abrasion that does not result in baring the base cloth		X
c. Any area where coating is noticeably thinner	X	
d. Any blister, tunnel or delamination of coating	X	
e. Any lump or heavier coated area		X
f. Foreign matter imbedded in coating	X	
g. Crease or wrinkle-resulting in doubling or adhesion of surfaces that cannot be corrected by manual pressure	X	
h. Coating cracked or checked	X	
i. Coating not applied over full width of base cloth	X	
j. Any pinhole	X	
k. Any light area or window-resulting from improper distribution of pigment	X	
l. Coating streak		X
m. Any ripple, waviness or dimensional distortion	X	

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<u>Defect</u>	<u>Classification</u>	
	<u>Major</u>	<u>Minor</u>
<u>Coated Side (Cont'd)</u>		
n. Any spot, stain or streak 1 inch or more in combined length and width dimensions	X	
o. Any spot, stain or streak less than 1 inch in combined length and width dimensions		X
p. Width less than minimum specified		X
q. Color not as specified, off shade, uneven, mottled		X
r. Any evidence of uncleanliness		X
s. Any tackiness	X	
t. Any odor other than that which is characteristic of the coating compound		X

Table VI - Sample Size

<u>Lot Size (yards)</u>	<u>Sample Size</u>
Up to 1200 inclusive <u>1/</u>	3
1201 to 3200 inclusive	5
3201 to 10,000 inclusive	8
10,001 to 35,000	13
35,001 to 150,000 inclusive	20
150,001 and over	32

1/ If the lot contains fewer than 3 rolls, each piece in the lot shall be examined.

#### 4.3.2.2 Examination for length and put-up.

4.3.2.2.1 Individual pieces. During the yard-by-yard examination of the cloth, each piece in the sample shall be examined for length and put-up. Any length found to be less than the minimum specified, or more than two yards less than the length marked on the ticket shall be considered a defect with respect to length. Any roll not in one continuous piece shall be considered a defect with respect to put-up. The lot shall be unacceptable if two or more pieces in the sample are defective in respect to length or put-up.

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4.3.2.2.2 Total yardage in sample. 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.

4.3.3 Examination of preparation for delivery requirements. An examination shall be made in accordance with the provisions of PPP-P-1136 to determine that packaging, packing and marking comply with Section 5 requirements of this specification.

4.4 Testing of the end item. The methods of testing specified in FED-STD-191 wherever applicable, and as other methods as listed in Table VII shall be followed. The physical and chemical values specified in Section 3, except where otherwise specified, apply to the average of the determinations made on the sample unit for test purposes as specified in the applicable test methods. All test reports shall contain the individual values utilized in expressing the final results. The sample unit for test purposes shall be 3 continuous yards full width of the finished cloth. The lot size shall be expressed in units of one yard. The lot shall be unacceptable if one or more sample units fail to meet any of the test requirements specified. The sample size shall be as indicated in Table IV.

Table VII. Test Methods

Characteristic	Requirement reference	Test method
Coating compound		
Polyurethane identification	3.3.2	1/
Tensile strength	3.3.2.1	4.4.7
Elongation	3.3.2.1	4.4.7
Volume	3.3.2	4.4.6
Coated		
Weight	3.4	5041
Breaking strength	3.4	5100
After accelerated aging	3.4	5850
After accelerated weathering	3.4	5804

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Table VII. Test Methods (Cont'd)

<u>Characteristic</u>	<u>Requirement reference</u>	<u>Test Method</u>
Tearing Strength	3.4	5134
Adhesion of coating	3.4	
Coating to base cloth		5970
Coating to coating		4.4.1
Fungus Resistance	3.4	508 (Mil. Std. 810)
Blocking	3.4	5872
Permeability to hydrogen	3.4	5460
Air Retention	3.4	4.4.2
Water Resistance:		
Condition of coating	3.4	4.4.8
Air retention after exposure	3.4	4.4.8
Cold temperature air retention at 25 psig	3.4	4.4.3

1/ A certificate of compliance shall be accepted for this characteristic.

4.4.1 Adhesion - Coating to Coating. Ten specimens of the coated cloth shall be tested for adhesion. Each specimen shall be cut 1 inch (plus or minus 1/16 inch) wide and 6 inches (plus or minus 1/16 inch) long, with the length dimension in the warp direction of the coated nylon taffeta cloth. One of the specimens shall be superimposed and aligned on another of the specimens, with the coated sides in contact. The two specimens shall be heat sealed together, across the entire width, 1/4 inch from each end. The width of the seal (adhesive bond) shall be 1/8 inch (plus or minus 1/32 inch). A suitable inspection apparatus equipped with an autographic recording device (see Test Method 5100 of FED-STD-191) shall be used to conduct the adhesion test. The front clamp of each jaw of the inspection apparatus shall be 1 inch by 3 inches. The rate of separation of the jaws of the inspection apparatus, under no load, shall be 12 inches (plus or minus 1/2 inch) per minute. One of the free ends of a specimen

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(an end that is not bonded) shall be placed in the lower jaw of the inspection apparatus. The other free end of the bonded specimen shall be placed in the upper jaw of the inspection apparatus. The bonded portion of the specimen shall be in the center between the two jaws. The jaws shall be separated until either breakage of the cloth or separation of the bond occurs. The highest value required to separate the bonded specimen or to break the cloth shall be recorded as the test result of the individual bonded specimens. This test shall be repeated until the other eight specimens have been tested for adhesion. The lowest value obtained from the tests of the ten specimens shall be reported as the test result for the adhesion test and shall be not less than 65 pounds per inch width.

4.4.2 Air retention. Three 13-inch diameter specimens of the coated nylon taffeta cloth specified in Table II shall be individually inspected for air leakage. An apparatus conforming to Figure 1 of MIL-C-19002. The specimen with the coated side down shall be placed on the specimen holder. The rubber gasket shall be placed on the cloth side of the specimen. The plate collar shall be placed on the gasket. The specimen holder, the specimen, the gasket, and the collar shall then be securely bolted together so that a leak-tight fit shall result. A sufficient amount of water to keep the cloth side surface of the specimen completely covered during the inspection shall be placed on the cloth side of the specimen. The specimen shall then be inflated with oil and water free air to a pressure of 10 psig. This pressure shall be maintained for 5 minutes (plus or minus 1/2 minute). While this pressure is maintained, the specimen shall be observed for leakage through the top of the plate collar. Any air bubbles on the cloth side surface, which are produced by air pressure closing the spaces between the cloth and the coating, shall be removed. A continuous production (flow) of air bubbles is an indication of leakage and shall be cause for rejection. This test shall be repeated until the other two specimens have been tested for air leakage.

4.4.3. Cold temperature air retention. Three specimens (24" X 24") shall be folded so that a one inch accordion fold runs from the center of one edge to the corresponding center of its parallel edge. Repeat this procedure using the two edges perpendicular to the original reference edge. This will form two, one inch, accordion folds intersecting in a perpendicular manner at the center of the sample. Place the folded sample in the test fixture shown in Figure 1 of MIL-C-19002. Using an air reservoir of 3 liters minimum capacity, capable of withstanding 25 psig without leaking or deforming. The air regulator should have good sensitivity in the 0-25 psig range. The gauge should have 1/2

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psig reading capability. With the cold chamber maintained at the test temperature of  $-65^{\circ}\text{F}$ , cold soak the air retention fixture with the specimen installed, reservoir and inside tubing for a minimum of 30 minutes before testing. Determine the breaking air pressure for the material.

4.4.4 Accelerated aging. Three specimens shall be exposed to accelerated aging of Method 5850 of FED-STD-191 for a period of 96 hours at  $158^{\circ}\text{F}$ .

4.4.5 Accelerated weathering. Three specimens shall be exposed to accelerated weathering of Method 5804 of FED-STD-191 for a period of 24 hours with filters and the uncoated side of the cloth to the light source.

4.4.6 Volume. The volume of polyurethane present in the coating compound shall be determined in accordance with Method 15111 of Test Method Std. No. 601, and the following conversion formula for percent of polyurethane by volume.

$$\text{percent} = \frac{\text{percent by weight of polyurethane} \times \text{specific gravity of sample}}{\text{specific gravity of polyurethane } \underline{1}}$$

1/ specific gravity of polyurethane is 1.05

4.4.7 Tensile strength and elongation of coating compound. The tensile strength of cured coating compound samples shall be determined before and after exposure to the specified accelerated aging and accelerated weathering tests. Tensile strength and ultimate elongation shall be determined in accordance with Methods 4111 and 4121 of Fed. Test Method Std. No. 601. The type III die shall be used.

4.4.8 Resistance to water. The coated fabric shall be soaked in water for a period of 2 hours and then allowed to dry at room temperature for 48 hours.

## 5. PACKAGING

5.1 Packaging - Packaging shall be level A or C, as specified (see 6.2 and 6.2.1).

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5.1.1 Levels A and C - The cloth, put up as specified (see 3.5), shall be packaged in accordance with the applicable requirements of PPP-P-1136.

5.2 Packing - Packing shall be level A, B, or C, as specified (see 6.2).

5.2.1 Levels A, B, and C - The cloth shall be packed in accordance with the applicable requirements of PPP-P-1136.

5.3 Marking. In addition to any special marking required by the contract or order, shipments shall be marked in accordance with the applicable requirements of PPP-P-1136.

## 6. NOTES

6.1 Intended use. The coated cloth is intended for use in the manufacture of life rafts.

6.2 Ordering data. Procurement documents should specify the following:

- a. Title, number and date of this specification.
- b. First article requirements (see 3.2).
- c. Width required (see 3.6).
- d. Selection of applicable levels of packaging and packing (see 5.1 and 5.2).
- e. Type required (see 1.2)
- f. Color required (see 3.4.1.1).

6.2.1 In the preparation of contracts or orders, it must be noted that various options, choices and alternatives as indicated in PPP-P-1136 may be exercised in the preparation for delivery of the cloth.

6.3 Standard sample. For access to standard samples, address the Procuring Office issuing the Invitation for Bids (see 3.1).

### Custodian

Air Force - 11  
Navy - AS  
Army - GL

### Preparing Activity:

Air Force - 11

Project Number: 8305-0553

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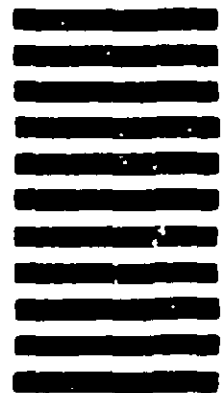
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## STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

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3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION (Mark one)
3b. ADDRESS (Street, City, State, ZIP Code)	<input type="checkbox"/> VENDOR <input type="checkbox"/> USER <input type="checkbox"/> MANUFACTURER <input type="checkbox"/> OTHER (Specify): _____
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