

MIL-C-43665C
14 November 1986
SUPERSEDING
MIL-C-43665B
23 August 1976

MILITARY SPECIFICATION

CLOTH, WOOL: MOTHPROOFING TREATMENT OF

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

1. SCOPE

1.1 Scope. This document governs the mothproofing treatment of wool stock, top, yarn, or cloth.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Documents. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

STANDARDS

FEDERAL

FED-STD-191 - Textile Test Methods

MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection
by Attributes

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to U.S. Army Natick Research, Development, and Engineering Center, Natick, MA 01760-5014, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

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(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.)

2.1.2 Other Government documents The following other Government documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues shall be those in effect on the date of the solicitation.

Rules and Regulations under the Wool Products Labeling Act

(Application for copies should be addressed to the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.)

- * 2.2 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 shall take precedence. Nothing in this document, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Cloth document. The document governing the cloth to be produced with wool treated under this document shall be cited in the applicable acquisition document (see 6.2).

3.2 Mothproofing compounds. Mothproofing shall be accomplished by the application of either compound specified in table I to wool stock, top, yarn, or cloth (see 3.4).

NOTE: Mixing mothproofing compounds in any proportion is prohibited.

TABLE I. Mothproofing compounds

Mothproofing compounds	Percent by weight to be applied to wool fiber	
	Minimum	Maximum
Sodium 5-chloro-2-[4-chloro-2-[3-(3, 4 dichlorophenyl)-ureido]phenoxy] benzenesulfonate (see 6.3.1)	0.65	1.45

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TABLE I Mothproofing compounds - Continued

Mothproofing compounds	Percent by weight to be applied to wool fiber	
	Minimum	Maximum
Sodium [(4, 5-dichloro, 2-chloromethane sulfonamido) 3', 4', 6', trichloro] diphenyl ether (see 6.3.2)	0.26	0.60

3.3 Mothproofing treatment. The wool content shall be mothproofed in accordance with this document. When white and colored wools are blended, the white wool need not be mothproofed if the white wool content is 15.0 percent or less. However, the total mothproofing compound in the finished cloth shall conform to this document. When white wools in blends of white and colored wools are in excess of 15.0 percent, all the white wool, in addition to the dyed wool, shall be treated with the mothproofing compound.

3.4 Finished cloth. The treated finished cloth shall conform to the requirements of the applicable document for the untreated cloth. The percentage of mothproofing compound specified in 3.2 shall be based upon the weight of pure compound on the wool fiber content after five cycles of dry cleaning, when tested as specified in 4.2.2.

3.5 Special marking.

3.5.1 Cloth. Piece tickets shall include the word "mothproofed" in the nomenclature.

3.5.2 Blanket. Each blanket containing wool treated in accordance with this document shall have the following information printed or stamped in black directly on the polyethylene bag across the center of the face or a white paper label inserted within the bag: "Mothproofed in accordance with MIL-C-43665."

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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 purchase order, the contractor 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 this document where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this document shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirement in the document shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.1.2 Certificates of compliance. When certificates of compliance are submitted, the Government reserves the right to inspect such items to determine the validity of the certification.

4.2 Quality conformance inspection. Unless otherwise specified, sampling for inspection shall be performed in accordance with MIL-STD-105.

4.2.1 Marking examination. During the examination of the end item (cloth or blanket), each unit in the sample shall be examined for conformance to the special marking requirements (see 3.5). Each unit not marked as specified shall be a defect. The examination shall be performed in conjunction with the "Examination For Compliance with the Wool Products Labeling Act" and the accompanying inspection and acceptance criteria specified in the untreated cloth or blanket end item document.

* 4.2.2 End item testing. In addition to the end item testing provisions of the untreated cloth document, the finished cloth shall be tested as required in table II. The methods of testing specified in FED-STD-191, wherever applicable, and as listed in table II shall be followed. The requirements specified in section 3 apply to the results of the determinations made on a sample unit. The sample unit and the sample size shall be as required in the end item testing provisions of the untreated cloth document. The lot shall be unacceptable if one or more sample units fail to meet any requirement specified.

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TABLE II. End item tests

Characteristic	Requirement paragraph	Test method
Identity of mothproofing compound	3.2	<u>1</u> /
Application of mothproofing on white wools	3.3	<u>2</u> /
Percent of mothproofing compound on wool component (after 5 cycles of dry cleaning) for:		
Sodium 5-chloro-2-[4-chloro-2-[3-(3, 4 dichlorophenyl)-ureido] phenoxy] benzenesulfonate	3.4	2015 <u>3</u> / <u>4</u> / <u>5</u> / <u>6</u> /
Sodium [4, 5-dichloro, 2-chloro-methane sulfonamido) 3', 4', 6', trichloro] diphenyl ether	3.4	4.3.1 <u>3</u> / <u>4</u> /

- 1/ The contractor shall furnish a certificate of compliance to indicate which mothproofing compound was used and whether the treatment was applied to wool stock, top, yarn, or cloth.
- 2/ When white wools in blends of white and colored wools are in excess of 15.0 percent, a certificate of compliance shall be submitted by the contractor certifying that all the white wool, in addition to the dyed wool, was treated with the mothproofing compound by exhaustion.
- 3/ When cloths containing wool blended with natural or synthetic fibers are applicable, the analysis shall be made on the blended cloth. The percent of mothproofing compound shall be calculated on the wool content only.
- 4/ The sample shall be dry-cleaned for five cycles in accordance with Method 5620 before determining mothproofing compound content.
- 5/ The percent of mothproofing agent content of a sample unit shall be reported as the average of the values obtained for the specimens tested and shall be reported to the nearest 0.1 percent.

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- 6/ The individual values for each individual specimen used to calculate the average shall be reported to the nearest 0.01 percent.
-

4.3 Methods of inspection.

4.3.1 Determination of sodium [(4, 5-dichloro, 2-chloromethane sulfonamido) 3', 4', 6', trichloro] diphenyl ether content (see 6.4).

4.3.1.1 Test specimen. When the material to be tested is 100 percent wool, the specimen shall weigh 5.000 grams \pm 0.200 gram. When the material to be tested is a blend of polyester and wool, the specimen shall weigh 10.000 grams \pm 0.500 gram.

4.3.1.2 Number of determinations Unless otherwise specified, two specimens shall be tested from each sample unit.

* 4.3.1.3 Apparatus.

- a. Electric heater with variable control.
- b. Soxhlet extraction unit with 300 mL glass flask.
- c. 100 mL volumetric flasks.
- d. 250 mL volumetric flasks.
- e. Gas chromatograph (see 6.5) with electron capture detector, with linearized indication, recorder, and integrator; and with 6-foot column filled with Chromosorb W (80/100 mesh) with 3 percent silicone rubber SE-30.
- f. 5 or 10 μ L syringe.
- g. Analytical balance.
- h. Laboratory drying oven.
- i. Desiccator.

* 4.3.1.4 Reagents.

- a. 2-methoxy ethanol (methylglycol) free of electron affine impurities.
- b. 95 percent argon/5 percent methane mixture as carrier gas.
- c. 20 mg/L solution of [(4, 5-dichloro, 2-chloromethane sulfonamido) 3', 4', 6' trichloro] diphenyl ether (see 6.4). Weigh 5.0 mg \pm 0.1 mg of the 100 percent active material, dissolve in 2-methoxy ethanol, and fill to 250 mL volume in a volumetric flask.

4.3.1.5 Weight of dry specimen. Place the specimen in a weighing bottle and dry it in a circulating air oven at a temperature of 105° to 110 C°. Cool the specimen in a desiccator and weigh it. Repeat this cycle until a weight is obtained that is constant to \pm 0.001 gram. This is the "weight of the dry specimen" and is indicated as "W" in the calculation.

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- * 4.3.1.6 Testing of specimens fabricated from 100 percent wool or of polyester/wool blend. Cut specimen into small pieces and place in a soxhlet extractor. Extract for 10 cycles (approximately 2 hours) using 2-methoxy ethanol as a solvent (see 6.6). After cooling, transfer the extract quantitatively into a 100 mL volumetric flask and fill to volume with 2-methoxy ethanol. Adjust the gas chromatograph to the following conditions.

Oven temperature - 240°C isothermal
 Injection temperature - 250°C
 Detector temperature - 300°C
 Run time - 10 minutes
 Flow rate - 50 mL/minute
 Chart speed - 1 cm/minute
 Attenuation - 219
 Slope sensitivity - 2.00
 Area rejection - 10

Inject exactly 1 μ L of the standard solution and 1 μ L of the extract of unknown content. Repeat the injections one time each. Record the absorption peaks obtained (see figure 1).

- * 4.3.1.7 Calculations. Integrate the 7 to 10 absorption peaks obtained with a suitable technique to determine the sum of the areas under the peaks and normalize the sum, if necessary, to equal sensitivity adjustment. Determine the average of the sums of the two tests for the standard (Fs) and of the two tests for the unknown sample (Fp).

- * 4.3.1.7.1 Specimens fabricated from 100 percent wool. The percent of mothproofing agent on the wool fiber shall be calculated as follows:

$$\text{Percent mothproofing agent} = \frac{S \times F_p \times DF_p}{F_s \times W} \times 100,$$

where S = ppm of 100 percent active material dissolved in 250 mL 2-methoxy ethanol standard solution;

Fp = the average peak sum of the unknown sample solution in relative units;

DFp = unknown sample dilution factor that gives an average peak sum in the linear portion of the Edolan U standard curve;

Fs = the average peak sum of the standard solution in relative units, and

W = the original dry weight of the textile sample in grams.

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- * 4.3.1.7.2 Specimens fabricated from polyester/wool blends. The percent of mothproofing agent on the wool fiber in the blend shall be calculated as follows.

$$\text{Percent mothproofing agent} = \frac{S \times F_p \times DF_p}{F_s \times W \times P} \times 100$$

where S, F_p, DF_p, F_s, and W are as defined in 4.3.1.7.1 and

P = the proportion of wool in the sample, expressed as a decimal to the nearest 0.01.

4 3.1.8 Report

- * 4.3.1.8.1 Mothproofing compound content. The percent mothproofing compound content of a sample unit shall be reported as the average of the values obtained for the specimens tested and shall be reported to the nearest 0.1 percent. The individual values for each individual specimen used to calculate the average shall be reported to the nearest 0.01 percent.

5. PACKAGING

5.1 Preservation, packing and marking. The requirements for preservation, packing and marking treated cloth shall be as specified in the applicable document for the untreated cloth, except that naphthalene flakes shall not be used.

6. NOTES

6.1 Intended use. The mothproofing treatment is intended for use as a protective agent against moths in wool cloths and blankets.

6.2 Ordering data. Acquisition documents should specify the following:

- a. Title, number and date of document governing untreated cloth (see 3.1).
- b. Type of mothproofing compound required (see 3.2).

6.3 Mothproofing compound.

6.3.1 Sodium 5-chloro-2-[4-chloro-2-[3-(3,4 dichlorophenyl)-ureido] phenoxy] benzenesulfonate. The formulation containing sodium 5-chloro-2-[4-chloro-2-[3-(3, 4 dichlorophenyl)-ureido] phenoxy] benzenesulfonate may be obtained under the trade name of Mitin FF High Concentrate from Ciba-Geigy Corp., Dyestuffs and Chemicals Division,

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Swing Road, P.O. Box 18300, Greensboro, NC 27409, or under the name of Intracide M from Crompton and Knowles Corp., Dyes and Chemicals Division, P.O. Box 33188, 3001 North Graham Street, Charlotte, NC 28233.

6.3.2 Sodium [4,5-dichloro, 2-chloromethane sulfonamido) 3', 4', 6', trichloro] diphenyl ether. The formulation containing sodium [(4, 5-dichloro, 2-chloromethane sulfonamido) 3', 4', 6', trichloro] diphenyl ether may be obtained under the trade name of Edolan U Highly Concentrate from the Mobay Corporation, Dyes and Pigments Division, P.O. Drawer 2855 CRS, Rock Hill, SC 29730. Another chemical name for this mothproofing compound registered by the Environmental Protection Agency is as follows: Sodium salt of 1, 4', 5'-trichloro-2'-(2, 4, 5-trichlorophenoxy) methanesulfonanilide (see 3.2).

- * 6.4 Active (pure) material content. This method determines the content of mothproofing agent as 100 percent active (pure) material and not as commercial product. The commercial product has a concentration of active material of 33.3 ± 0.5 percent. One hundred percent active material [(4, 5-dichloro, 2-chloromethane sulfonamido) 3', 4', 6' trichloro] diphenyl ether can be obtained from the Mobay Corporation, Dyes and Pigments Division, P.O. Drawer 2855 CRS, Rock Hill, SC 29730 (see 4.3.1 and 4.3.1.4).
- * 6.5 Gas chromatograph. A Hewlett-Packard Series 5840 gas chromatograph with electron capture detector is suitable for the determination. Other comparable equipment and column materials may be substituted. The suitability should be determined by making test runs with standard solutions of known concentrations (see 4.3.1.3).
- * 6.6 Extraction. The described extraction method removes 99 percent or more of the active material on the fiber. Aside from the active mothproofing agent, the 2-methoxy ethanol extract can contain other extractable substances such as dyes. These have not been found to have any influence on the determination of the active content of mothproofing agent (see 4.3.1.6).
- * 6.7 Subject term (key word) listing.

Mothproofing treatment, wool

6.8 Changes from previous issue. The margins of this document are marked with an asterisk (*) to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only, and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content, as written, irrespective of the marginal notations and relationship to the last previous issue.

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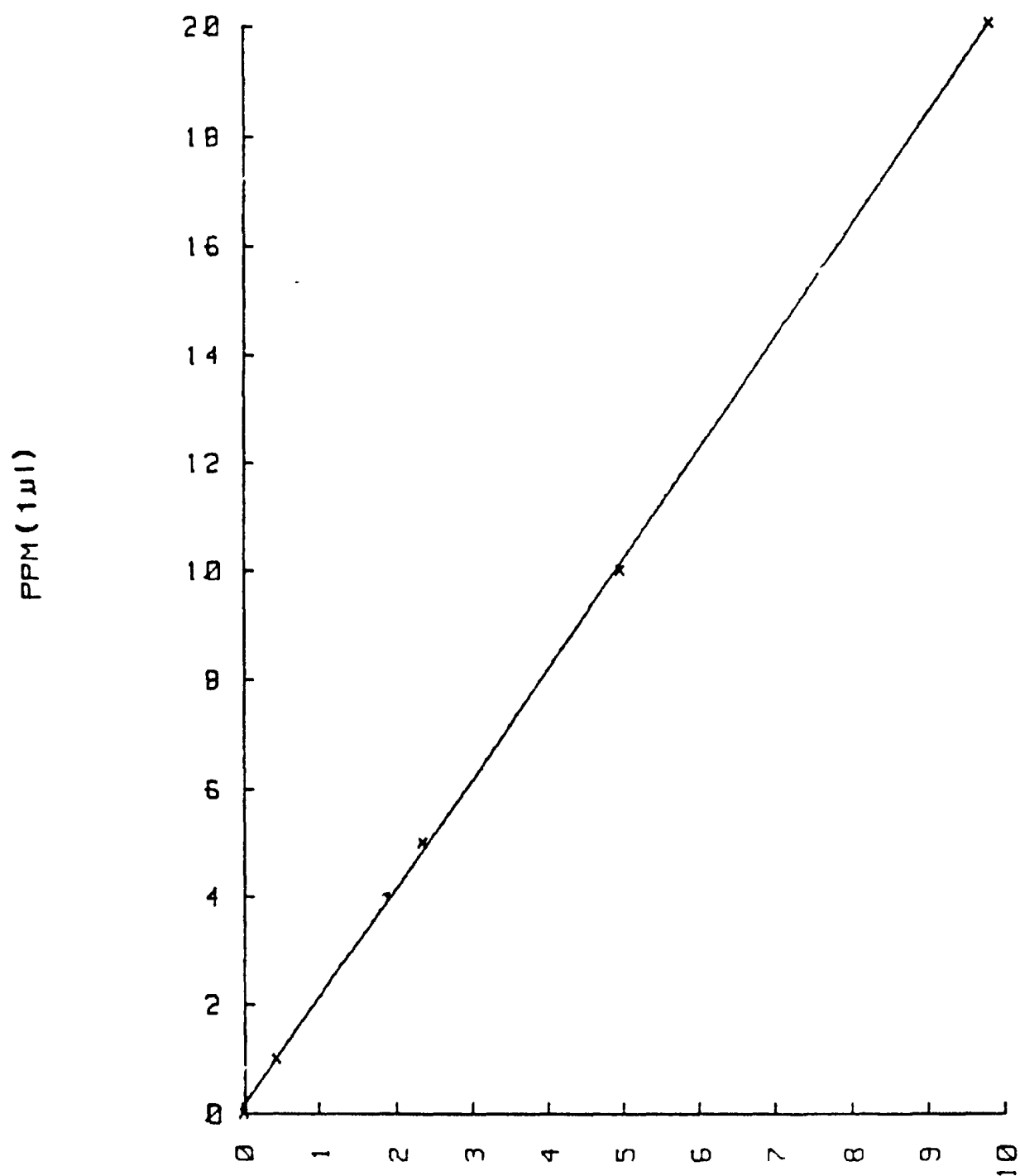


Figure 1. Edolan U Standard Curve

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