INCH-POUND

MIL-C-24671B(SH)
31 July 1995
SUPERSEDING
MIL-C-24671A(SH)
25 April 1991

MILITARY SPECIFICATION

CLOTH, LINT-FREE, FLUSHING AND CLEANING

This specification is approved for use by the Naval Sea Systems Command, Department of the Navy, and Is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers lint-free flushing and cleaning cloths with and without lanyards.

1.2 Classification. The cloth shall be of the following types and classes, as specified (see 6.2).

Types.

Type I - No lanyard attached
Type II - Lanyard attached.

Beneficial comments (recommendations, additions, deletions), and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 03R42, 2532 Jefferson Davis Highway, Arlington, VA 22242-5160 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A F.S.C. 8305

Classes.

Class A - 20 by 20 inches plus or minus I inch in each dimension

Class B - 20 by 30 Inches plus or minus I inch in each dimension

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications andstandards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

FEDERAL
P-D-680 - Dry Cleaning and Degreasing Solvent.

MILITARY
MIL-D-16791 - Detergents, General Purpose (Liquid, Nonionic).

STANDARDS

FEDERAL
FED-STD-191 - Textile Test Methods.
FED-STD-803 - Cotton and Cotton-Synthetic Fiber Blend Fabrics (Excluding Duck Fabrics), Packaging of.

MILITARY
MIL-STD-129 - Marking for Shipment and Storage.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Document Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5894).

2.2 Non-Government publication. The following document forms a part of this document to the extent specified herein. Unless otherwise specified, the issues of documents which are DoD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

D 1424 - Standard Test Method for Tear Resistance of Woven Fabrics by Falling-Pendulum (Elmendorf) Apparatus. (DoD adopted)

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103-1187.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 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 Material. The fabric shall be nainsook or muslin.

3.1.1 Yarn. The fabric yarn shall be made of cotton which has been cleaned, carded, drawn, and spun into single yarns for both the warp and the filling.

3.1.2 Color. The fabric color shall be bleached white.

3.1.3 Physical requirements. The fabric shall conform to the requirements in table I when tested as specified (see 4.2).

3.1.4 Weave. The fabric weave shall be plain weave.

3.1.5 Lint and foreign material. The cloth shall be free from loose thread, ravelings, fluff from cloth or yarn or particles of a size visible to the unaided eye. The cloth shall also be free of any visible foreign particulate matter, dirt or grease either embedded in the cloth or adhering thereto.

3.1.6 Finish. The fabric shall be free of sizing and be bleached white.

TABLE 1. Physical requirements.

Characteristics	Requirements	
	Minimum	Maximum
Weight, ounces per square yard	2.8	---
Yarns, per inch		
Warp	70	100[1/]
Filling	70	100[1/]
Breaking strength, pounds		---
Warp	45	
Filling	30	
Tearing strength, grams (newtons)		
Dry		
Warp	880 (8.6)	---
Filling	480 (4.7)	---
Wet-water		
Warp	1040 (10.2)	---
Filling	720 (7.1)	---
Wet-acetone		
Warp	560 (5.5)	---
Filling	320 (3.1)	---

[1/] The aggregate yarn count in both the warp and fill directions shall not be less than 150 yarns per square inch in addition to meeting the minimum yarns per inch specified.

3.1.7 Solvent compatibility. The fabric shall not discolor or show visible degradation when immersed in each of the following solvents for a period of 60 minutes at ambient temperature:

(a) Acetone
(b) Isopropyl alcohol
(c) Trichloroethylene
(d) Dry cleaning solvent (stoddard solvent) in accordance with p.D-680
(e) Nonionic detergent in accordance with MIL-D-16791 (one fluid ounce in one gallon of tap water) combined with trisodium phosphate detergent solution (approximately 23 ounces to every one gallon of total detergent solution)

3.1.8 pH. The pH value of the water extract of the fabric shall be no less than 6.0 and no more than 8.0 when tested as specified (see 4.2).

3.1.9 Nonfibrous materials. The fabric shall not exceed 2.0 percent starch and protein content including chloroform-soluble and water-soluble material when tested as specified (see 4.2).

3.1.10 Absorbency. The fabric shall be considered absorbent when the water and oil are absorbed into the fabric within 30 seconds, when tested as specified (see 4.4).

3.1.11 Leachable chemicals. The cloth shall contain no more than 250 parts per million (ppm) of water leachable sulfur or 250 ppm each of water leachable halides (fluoride, chloride, and bromide), when tested as specified (see 4.2).

3.1.12 Mercury. The fabric used to manufacture lint-free cloths shall not contain mercury and shall not be contaminated by mercury or mercury compounds during manufacturing of cloths.

3.2 Design and construction.

3.2.1 Dimensions. Unless other specified (see 6.2), the cloth dimensions shall be Class A or B.

3.2.2 Edge stitching. The outer periphery of the cloth shall be hem stitched with a three-thread tight needle thread overseam of 18 ± 1 stitches per inch. The thread shall be of polyester or hard finished cotton. Hem stitches shall be ended in such a manner so as to preclude the possibility of threads unraveling at these areas on the cloth. Any hanging threads shall be trimmed to a length of 1/16 inch or less.

3.2.3 Requirements for lanyard (type II design). The lanyard shall be made from 3/16 inch clean white braided nylon cord. The nylon lanyard shall have the ends melted to prevent fraying. All loose globules or residues resulting from the melting process shall be removed by wiping the ends off with a cloth while still hot. The lanyard length shall be no less than 32 inches and no more than 36 inches including a minimum of three inches stitched to the cloth as shown in figure 1. The lanyard shall be knotted as shown in figures 1 and 2. The overhand knot shall be tied snug up to the modified fisherman's knot. The length between the overhand knot and the melted end of the lanyard shall measure 2 ± 1/2 inches.

3.2.3.1 Lanyard stitching. Stitch the lanyard and cloth together by using polyester thread. The stitching shall consist of one row of straight line lock stitching down the center of the lanyard (minimum of six stitches per linear inch). A minimum of three inches of lanyard shall be stitched to the lint-free cloth. The cloth shall be wrapped around the lanyard one and one-half turns as shown in figure 1.

3.3 Workmanship. The final prepared cloth shall have no tears or holes and no visible hanging threads of a length greater than or equal to the 1/16 inch from cloth edges or loose stitching on cloth edges and lanyards. There shall be no sign of unraveling of thread on edge or lanyard stitching.

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 (examinations and tests) 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 specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspections set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.2 Test methods. Test methods shall be in accordance with table II, except for the absorbency test method which is given in 4.4. More than one cloth may be tested if needed to provide sufficient samples for all required tests. Test and inspection results shall meet the requirements of section 3.

4.3 Quality conformance inspection.

4.3.1 Fabric. Fabric from which the cloths are made shall be inspected and tested periodically (once per order or once each 100 days for each source of bolts of fabric, whatever is less frequent) for all attributes specified in table II. a. The fabric shall be tested using the applicable test methods in table II. a and shall meet the applicable requirements in section 3. All non conforming fabric shall be rejected. Test results shall be retained for review by the command or agency concerned upon request.

4.3.2 Cloth. Samples of individual finished cloths shall be selected at random from all the finished cloth in a lot. Samples shall be tested for the attributes listed in table II.b and shall meet the applicable requirements of section 3. The required number of samples and criteria for lot acceptance are listed in 4.3.2.2.

4.3.2.1 Inspection lot. An inspection lot shall consist of cloths of the sane Type and Class produced from the same supply of fabric and produced In the same production run. The lot size is the total number of Individual cloths in the lot.

4.3.2.2 Sampling Plan. Testing for water leachable elements is required to be performed on only one finished cloth per lot, regardless of lot size. If the sample fails, the lot shall be rejected. For other attributes in table II.b, the following sampling requirements apply:

Cloths per Lot	Sample size	Maximum permitted defective
Less than 1200	5	0
1200 - 35,000	8	1*
Greater than 35,000	13	1*

*0 for lint and foreign material (3.1.5) and workmanship (3.3).

TABLE II.a. Quality conformance inspection for fabric.

Examination or test	Requirement paragraph	Test method
Color	3.1.2	Visual 1/
Weave	3.1.4	Visual 1/
Finish	3.1.6	Visual 1/
Solvent compatibility	3.1.7	Visual 1/
Identification of cotton	3.1.1	1200/FED-STD-191
Weight	3.1.3	5041/FED-STD-191
Yarns per inch		
Warp	3.1.3	5050/FED-STD-191
Filling	3.1.3	5050/FED-STD-191
Breaking strength	3.1.3	
Warp	3.1.3	5100/FED-STD-191
Filling		5100/FED-STD-191
Tearing strength	3.1.3	
Dry	3.1.3	
Warp		ASTM D 1424
Filling	3.1.3	ASTM D 1424
Wet (water)	3.1.3	
Warp		ASTM D 1424
Filling	3.1.3	ASTM D 1424
Wet (acetone)	3.1.3	
Warp	3.1.3	ASTM D 1424
Filling	3.1.3	ASTM D 1424
PH	3.1.8	2811/FED-STD-191
Nonfibrous materials	3.1.9	2611/FED-STD-191
Absorbency	3.1.10	Paragraph 4.4

TABLE II.b. Quality conformance inspection for cloth.

Examination or test	Requirement paragraph	Test method
Lint and foreign material	3.1.5	Visual 1/
Dimensions	3.2.1	Visual 1/
Edge stitching	3.2.2	Visual 1/
Lanyard stitching	3.2.3	Visual 1/
(Type 11 cloths only)		Visual 1/
Workmanship	3.3	Visual 1/
Water leachable elements	3.1.11	Appendix A
Fluoride		
Chloride		
Bromide		
Sulfur		

1/ Visual inspection shall be performed by a person with normal visual acuity, natural or corrected. The lighting of inspection areas shall provide at least 50 foot candles on surfaces being inspected. The surface being inspected shall be free of foreign material.

4.3.3 Noncompliance. If a sample fails to pass inspection, the manufacturer shall notify the purchasing activity's contracting officer of such failure and take corrective action on the materials or processes, or both, as warranted, and on all units of product which can be corrected and which are manufactured under essentially the same materials and processes, and which are considered subject to the same failure. Acceptance and shipment of the product shall be discontinued until corrective action, acceptable to the purchasing activity's contracting officer, has been taken. After the corrective action has been taken, inspection shall be repeated on additional sample units (all tests and examinations, or the test which the original sample failed, at the option of the purchasing activity's contracting officer). Inspections may be reinstituted; however, final acceptance and shipment shall be withheld until the inspection has shown that the corrective action was successful. In the event of failure after reinspection, information concerning the failure shall be furnished to the purchasing activity's contracting officer.

4.4 Test for absorbency. The samples of fabric for absorbency shall be spread out on a non-absorbent surface. Drops measuring at least 0.04 milliliter in volume in water and light machine oil shall be applied separately to each sample through a capillary by allowing the drops to fall continuously and freely onto the sample from a height of 1/2 to 2 inches. After a time interval of 30 seconds, the samples shall be examined and the absorption and non-absorption of the water and oil reported. The sample is considered non-absorbent, and therefore shall be rejected, if the water or oil

is not absorbed but remains wholly or partly above the surface of the fabric or the supporting surface.

5. PACKAGING

5.1 Preservation. Cloths shall be packaged in heat sealed green polyethylene bags in quantities of 100 of the same type and class. Polyethylene bags shall be free of holes or tears and heat seals shall be tightly adherent to prevent tearing in this area. Cloths shall be flat or folded.

5.2 Packing. Packing shall be commercial level. The cloth shall be packed in accordance with FED-STD-803.

5.3 Marking. Shipments shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. The cloth shall be used for flushing or cleaning systems or components requiring high levels of cleanliness.

6.2 Acquisition requirements. Acquisition documents must specify the following:

(a) Title, number, and date of this specification.

(b) Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1 and 2.2).

(c) Type and class of cloth (see 1.2 and 3.2.1).

6.3 Definitions.

6.3.1 Fabric. Material supplied in bolts by the manufacturer or pieces thereof.

6.3.2 Cloth. Hemmed fabric which meets the classification requirements of 1.2.

6.4 Changes from previous issue. The margins of this specification are marked with vertical lines 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 irrespective of the marginal notations and relationship to the last previous issue.

6.5 Sub-iect term (key word) listing.

Polyester
Lanyard
Muslin
Nainsook

Preparing activity:
Navy – SH
(Project 8305-N601)

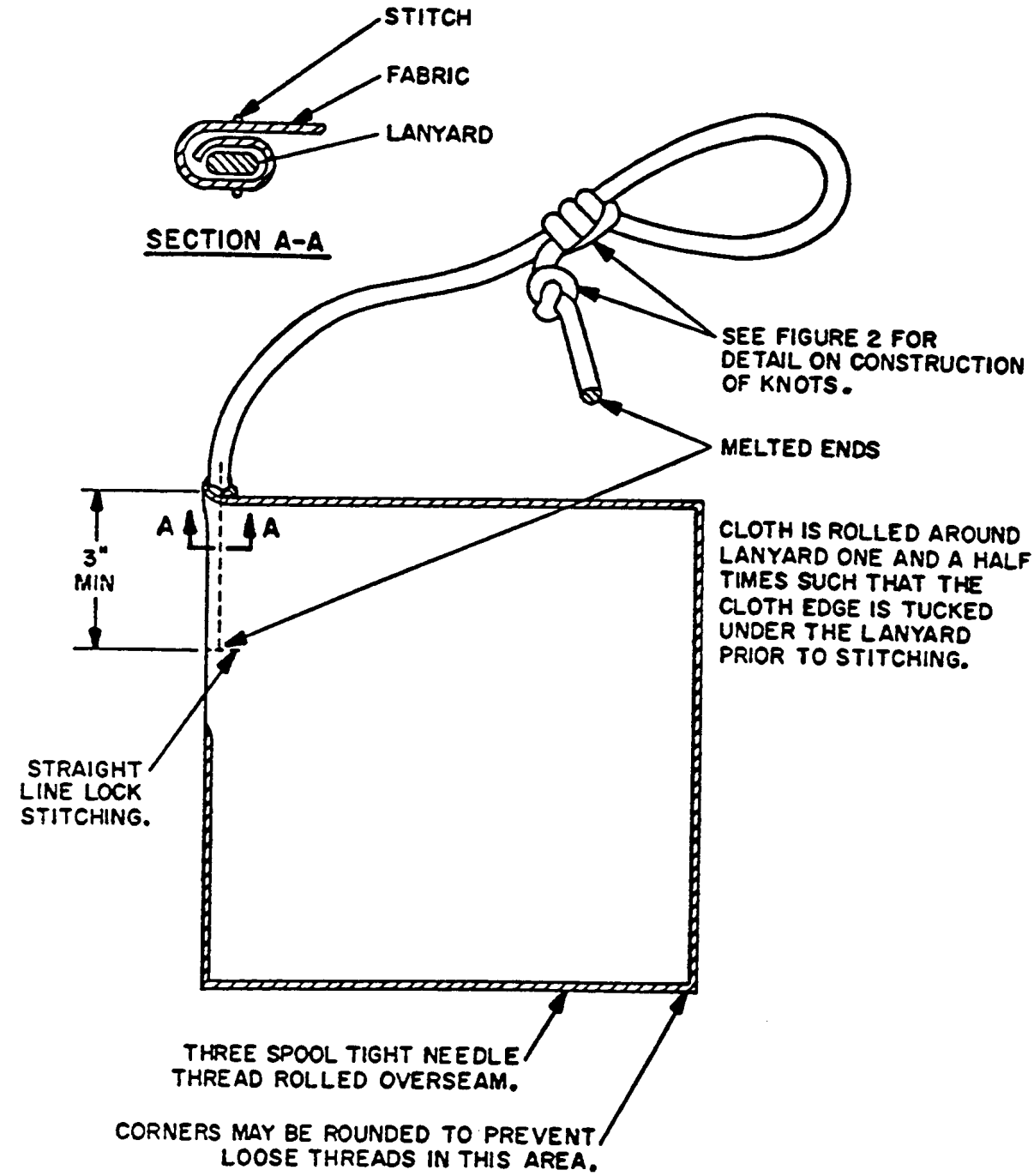

FIGURE 1. Example of cloth with lanyard attached.

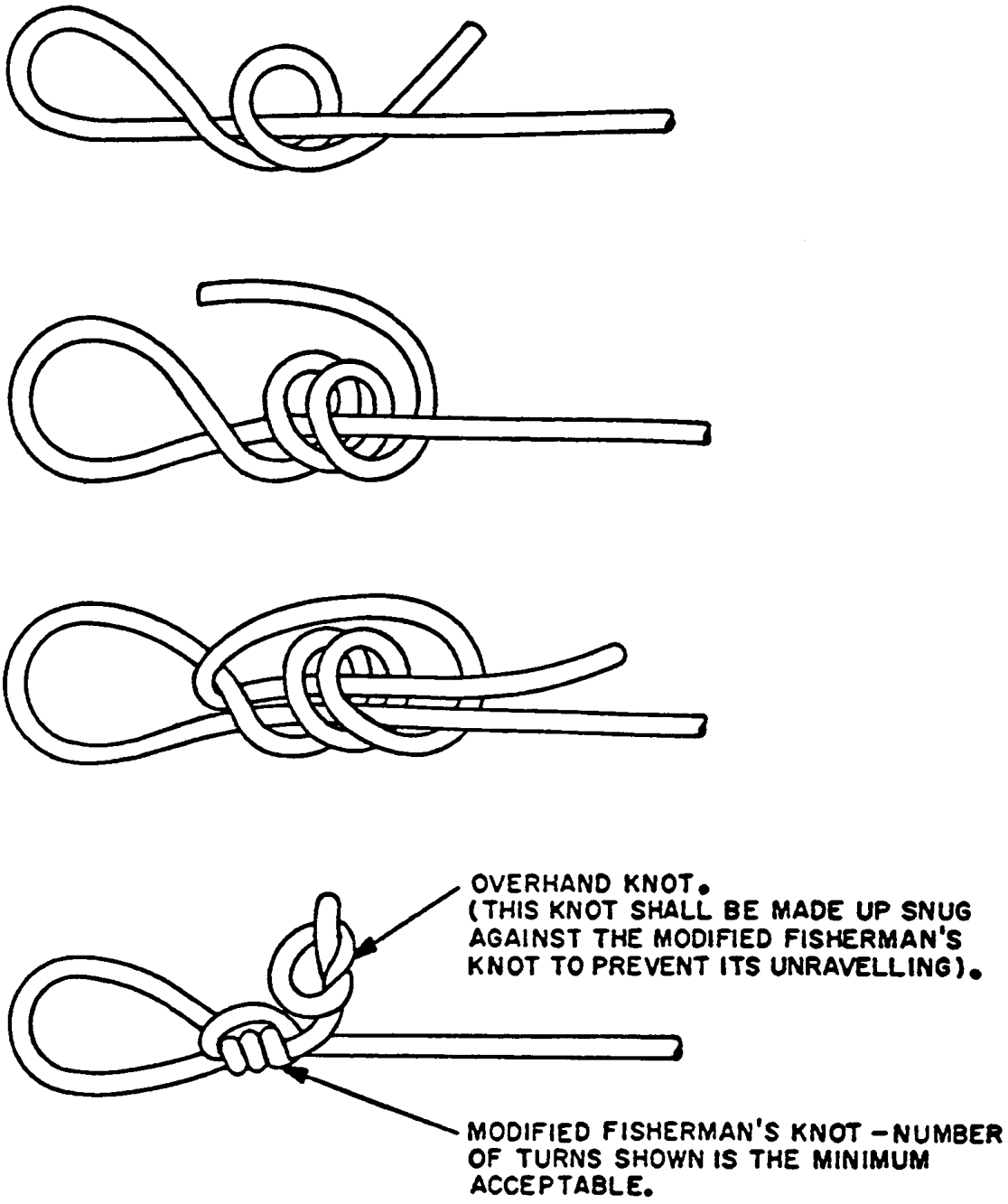

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FIGURE 2. Detail of knot for type II cloth.

APPENDIX A

WATER LEACHING TEST METHODS

10. SCOPE. This appendix specifies test methods to detect water leachable halides (i.e., chlorides, fluorides, and bromides) and sulfur.

20. APPLICABLE DOCUMENTS.

20.1 Non-Government publications. The following documents form a part of this standard to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted shall be those listed in the issue of the DoDISS cited in the solicitation. The issue of documents not listed in the DoDISS shall be the issues cited in the solicitation.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

D 512 - Chloride Ion in Water and Waste Water, Test for.
D 516 - Sulfate Ion in Water, Standard Test Methods for. (DOD adopted)
D 1179 - Fluoride Ion in Water, Standard Test Methods for. (DOD adopted)
D 1246 - Iodide and Bromide in Water, Standard Test Methods for. (DOD adopted)
D 4327 - Anions in Water by Ion Chromatography, Test Method for.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

(Non-Government standards and other publications are normally available from the organizations which prepare or which distribute the documents. These documents may also be available in or through libraries or other informational services.)

30. WATER LEACHING TESTS.

30.1 Test Procedure. The water leaching test shall be performed as follows:

a. Cut one specimen from the selected sample, weighing approximately 15 grams, and record its exact weight to 0.1 gram. The sample weight may be adjusted provided the ratio of sample weight to final volume of solution is maintained (i.e., 15 g/500 ml).
b. Cut the specimen into small pieces not greater than 1/4 inch in any dimension.
c. Place the specimen in an 800 milliliter (ml) or larger beaker.
d. Add approximately 400 ml of distilled water per 15 grams of sample weight to the beaker.

e. Cover the beaker with a watch glass and heat for one hour minimum at 200-212°F.
f. Allow the beaker to cool to room temperature.
g. Vacuum filter the leachate from the beaker separately through a prewashed filter (No. 41 Whatman or equivalent coarse porosity filter) and a Buchner funnel. Wash the beaker thoroughly with distilled water using ten or more washes and vacuum filter the wash solutions. Dilute the filtrate to 500 ml, or the appropriate volume to maintain a 15 g/500 ml ratio.
h. If necessary, store the filtrate In a cleaned polyethylene or glass container covered to prevent evaporation.
i. Prepare a control filtrate with no specimen following the instructions in d through h.

30.2 Determination of leachable halide ion concentration. Using aliquots from the control filtrate and the sample filtrate, the concentration of bromide, chloride, and fluoride ions in each filtrate shall be determined by an appropriate method of ASTM D 1246, ASTM D 512, and ASTM D 1179, respectively. The concentration of water-leachable halide in the material shall be determined as follows:

Bromide, Chloride, or Fluoride, μg/g (ppm) - C X V_s/M

Where:

C = concentration of bromide, chloride, or fluoride in filtrate, in milligrams per liter, and

V_s= final volume of solution in milliliters per 30.1.g

M = grams of the test specimen, prepared per 30.1. a

30.2.1 Acceptance criteria. If the concentrations of leached halide ions in the specimen exceeds the limits specified in section 3, the lot shall be rejected.

30.3 Determination of leachable sulfur concentration. Using aliquots from the control filtrate and the sample filtrate in 30.1.g, determine the concentration of sulfur as follows:

a. Place 25 ml of the filtrate in a 50 ml or larger clean beaker properly identified.
b. Add distilled water saturated with bromine drop by drop while stirring until a red-brown color persists. Then cover the beaker with a watch glass.
c. Heat the solution in the covered beaker on a hot plate until the bromine color disappears.
d. Allow the solution to cool to room temperature.
e. Transfer the solution to a volumetric flask and add distilled water rinses from the beaker to make up a final volume that is consistent with the sulfate test method. Determine the

sulfate ion concentration of this final diluted volume using an appropriate method of ASTM D 516.

f. Use the following formula to obtain the water-leachable sulfur concentration of the filtrate:

C = concentration of sulfate ion (SO_4) in filtrate, in milligrams per liter, determined in step e.

V_s= final volume of solution in milliliters per 30.1.g

V = milliliters of final diluted volume, and

M = grams of the test specimen, prepared per 30.1.a

30.3.1 Acceptance criteria. If the concentration of leached sulfur and sulfur compounds in the specimen exceeds the limit specified in section 3, the lot shall be rejected.

30.4 Acceptable alternate test methods. Ion chromatography analysis in accordance with ASTM D 4327 and inductively coupled plasma (ICP) analysis are acceptable alternates for the ASTM leachate analyses specified herein. In addition, other alternate analyses may be used when approved by NAVSEA or its authorized representative.

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4,5,6, and 7 and send to preparing activity.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-C-24671B	2. DOCUMENT DATE *(YYYYMMDD)* 1995/07/31

3. DOCUMENT TITLE
CLOTH, LINT-FREE, FLUSHING AND CLEANING

4. NATURE OF CHANGE *(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed)*

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME *(Last, First, Middle Initial)*	b. ORGANIZATION	
c. ADDRESS *(Include Zip Code)*	d. TELEPHONE *(Include Area Code)* (1) Commercial (2) DSN *(if applicable)*	7. DATE SUBMITTED *(YYYYMMDD)*

8. PREPARING ACTIVITY

a. NAME Commander, Naval Sea Systems Command SEA 03Q	b. TELEPHONE *(Include Area Code)* (1) Commercial (703) 602-7748 (2) DSN 332-7748
c. ADDRESS *(Include Zip Code)* Commander, Naval Sea Systems Command ATTN: SEA 03Q, 2531 Jefferson Davis Hwy Arlington, VA 22242-5160	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Standardization Program Office (DLSC-LM) 8725 John J. Kingman Road, Suite 2533, Fort Belvoir, VA 22060-6221 Telephone (703) 767-6888 DSN 427-6888