MILITARY SPECIFICATION

CLOTH, LINT-FREE, FLUSHING AND CLEANING

This specification is approved for use within 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 (see 6.4).

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

Classes:

Class A - 20 by 20 inches
plus or minus 1/2 inch in each dimension

Class B - 20 by 30 inches
plus or minus 1/2 inch in each dimension

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form a part of this specification 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.

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 55Z3, Department of the Navy, Washington, DC 20362-5101 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 FSC 8305

SPECIFICATIONS

FEDERAL

P-D-680 - Dry Cleaning Solvent.
PPP-P-1134 - Packaging of Cotton and Cotton-Synthetic Fiber Blend Fabrics (Excluding Duck Fabrics).

MILITARY

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

STANDARDS

FEDERAL

FED-STD-191 - Textile Test Methods.

MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-129 - Marking for Shipment and Storage.

(Copies of specifications and standards required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Other publications. The following documents form a part of this specification 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 specified in the solicitation. Unless otherwise specified, the issues of the documents not listed in the DoDISS shall be the issue of the nongovernment documents which is current on the date of the solicitation.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

D 512 - Standard Test Methods for Chloride Ion in Water and Waste Water. (DoD adopted)
D 516 - Standard Test Methods for Sulfate Ion in Water and Waste Water.
D 1179 - Standard Test Methods for Fluoride Ion in Water. (DoD adopted)
D 1246 - Standard Test Methods for Iodide and Bromide in Water. (DoD adopted)
D 1424 - Standard Test Methods 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.)

(Nongovernment standards and other publications are normally available from the organizations which prepare or which 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 specification and the references cited herein, the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. When specified in the contract or purchase order (see 6.2), a sample of the fabric and/or a sample of cloths, as specified, shall be subjected to first article inspection (see 4.3 and 6.3).

3.2 Material. The fabric shall be nainsook or muslin.

3.2.1 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.

3.2.2 Color. The fabric color shall be bleached white.

3.2.3 Physical requirements. The finished cloth shall conform to the requirements in table I when tested as specified in 4.5.

3.2.4 Weave. The fabric weave shall be plain weave.

3.2.5 Lint-free. 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.

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

3.2.7 Solvent compatability. The fabric and cloths 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) Denatured (ethyl) alcohol
(c) Isopropyl alcohol
(d) Perchloroethylene (tetrachloroethylene)
(e) Trichloroethylene
(f) Trichloroethane (methyl chloroform)
(g) Dry cleaning solvent (stoddard solvent) in accordance with P-D-680
(h) Nonionic detergent in accordance with MIL-D-16791 (1 fluid ounce in 1 gallon of tap water)
(i) Trisodium phosphate detergent solution (approximately 23 ounces in 1 gallon of tap water)

3.2.8 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 4.5).

3.2.9 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 4.5).

3.2.10 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 4.5).

3.2.11 Leachable chemicals. A water extract of the fabric shall contain no more than 250 parts per million (ppm) of sulfur or of total halides (fluoride, chloride, and bromide), when tested as specified (see 4.5).

TABLE I. 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 be not less than 150 yarns per square inch in addition to meeting the minimum yarns per inch specified.

3.2.12 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.

3.3 Design and construction.

3.3.1 Dimensions. Unless otherwise specified (see 6.2), the cloth dimensions shall be class A or B.

3.3.2 Edge stitching. The outer periphery of the cloth is to be hem stitched with a three-thread tight needle thread overseam of 18 + 1 stitches per inch. The thread shall be of "dacron" 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 (see 6.1).

3.3.3 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 3 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 $\pm$ 1/2 inches.

3.3.3.1 Lanyard stitching. Stitch the lanyard and cloth together by using "dacron" 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 3 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 on figure 1.

3.4 Workmanship. The final prepared cloth shall have no tears or holes and no visible hanging threads of a length greater than or equal to 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 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 the specification 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 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 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.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

(a) First article inspection (see 4.3).
(b) Quality conformance inspection (see 4.4).

4.3 First article inspection. When required (see 6.2), samples in accordance with 4.4 from the first production lot of fabric and cloths shall be examined and tested for visual, physical, and chemical properties specified herein in accordance with the applicable methods specified in table II. In addition, the fabric shall be tested and shall meet the absorbency requirement as specified in 4.6.

4.4 Quality conformance inspection.

4.4.1 Fabric from which the cloths are made shall be receipt inspected and tested periodically (at least once each 100 days for each source of bolts of fabric) for visual, physical, and chemical properties specified herein. The applicable test methods are those specified in table II. The fabric shall meet the requirements specified 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.

4.4.2 Cloth samples shall be selected from each lot in accordance with 4.4.2.2 for visual, physical, and chemical property testing. Samples shall be examined and tested using the test methods specified in table II and shall meet the requirements specified in section 3.

4.4.2.1 Inspection lot. The inspection lot for cloths shall be in accordance with MIL-STD-105.

4.4.2.2 Sampling plan. Cloth samples shall be selected at random from each lot of cloths in accordance with MIL-STD-105, general inspection level I, single normal inspection, with an acceptable quality level (AQL) as follows:

	Inspection attribute	MIL-STD-105 AQL
(a)	Cloth length and width	2.5
(b)	Edge stitching	2.5
(c)	Lanyard stitching for type II cloths	2.5
(d)	Loose thread, ravelings, fluff, visible foreign particulate matter, dirt or grease	0.4

4.4.3 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.

4.5 Methods of inspection. The methods of testing shall be as specified in table II, except for the test for absorbency which is given below.

4.6 Test for absorbency. The samples of cloths (or equivalent sized fabric for first article inspection) for absorbency shall be spread out on a non-absorbent surface. Drops measuring 0.04 milliliter in volume of water and light machine oil shall be applied separately to each cloth 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.

TABLE II. Quality conformance inspection.

Examination or test	Requirement paragraph	Test method
Color	3.2.2	Visual 1/
Weave	3.2.4	Visual 1/
Lint	3.2.5	Visual 1/
Desizing	3.2.6	Visual 1/
Solvent compatability	3.2.7	Visual 1/
Dimensions	3.3.1	Visual 1/
Edge stitching	3.3.2 and 3.4	Visual 1/
Lanyard	3.3.3 and 3.4	Visual 1/
Identification of cotton	3.2.1	1200/FED-STD-191
Weight	3.2.3	5041/FED-STD-191
Yarns per inch		
Warp	3.2.3	5050/FED-STD-191
Filling	3.2.3	5050/FED-STD-191
Breaking strength		
Warp	3.2.3	5100/FED-STD-191
Filling	3.2.3	5100/FED-STD-191
Tearing strength		
Dry		
Warp	3.2.3	ASTM D 1424-63
Filling	3.2.3	ASTM D 1424-63
Wet (water)		
Warp	3.2.3	ASTM D 1424-63
Filling	3.2.3	ASTM D 1424-63
Wet (acetone)		
Warp	3.2.3	ASTM D 1424-63
Filling	3.2.3	ASTM D 1424-63

See footnotes at end of table.

TABLE II. Quality conformance inspection. - Continued

Examination or test	Requirement paragraph	Test method
pH	3.2.8	2811/FED-STD-191
Non-fibrous materials	3.2.9	2611/FED-STD-191
Absorbency	3.2.10	paragraph 4.6
Water leachable elements	3.2.11	
Fluoride		ASTM D 1179 2/ 3/
Chloride		ASTM D 512 3/ 4/
Bromide		ASTM D 1246 2/ 3/
Sulfur		ASTM D 516 2/ 3/

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.
2/ The cloth sample or an equivalent sized piece of fabric shall be soaked in water at 200 degrees Fahrenheit (°F) for 1 hour. The water shall then be tested for the elements listed.
3/ Ion chromatography methods are acceptable.
4/ The procedure for the water leachable chloride determination shall be that in appendix A.

4.7 Inspection of packaging. Sample packages and packs, and the inspection of the preservation-packaging, packing and marking for shipment and storage, shall be in accordance with the requirements of section 5 and the documents specified therein.

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 PPP-P-1134.

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 Ordering data. Acquisition documents should specify the following:

(a) Title, number, and date of this specification.
(b) Type and class of cloth (see 1.2 and 3.3.1).
(c) If first article inspection is required (see 3.1).

6.3 First article. When a first article inspection is required, the items should be a first article sample. The first article should consist of one unit of packaged cloths, or one bolt of fabric or both as specified. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results, and disposition of first articles. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract.

6.4 Definitions.

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

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

6.5 Subject term (key word) listing.

Dacron
Lanyard
Muslin
Nainsook

Preparing activity:
Navy - SH
(Project 8305-N098)

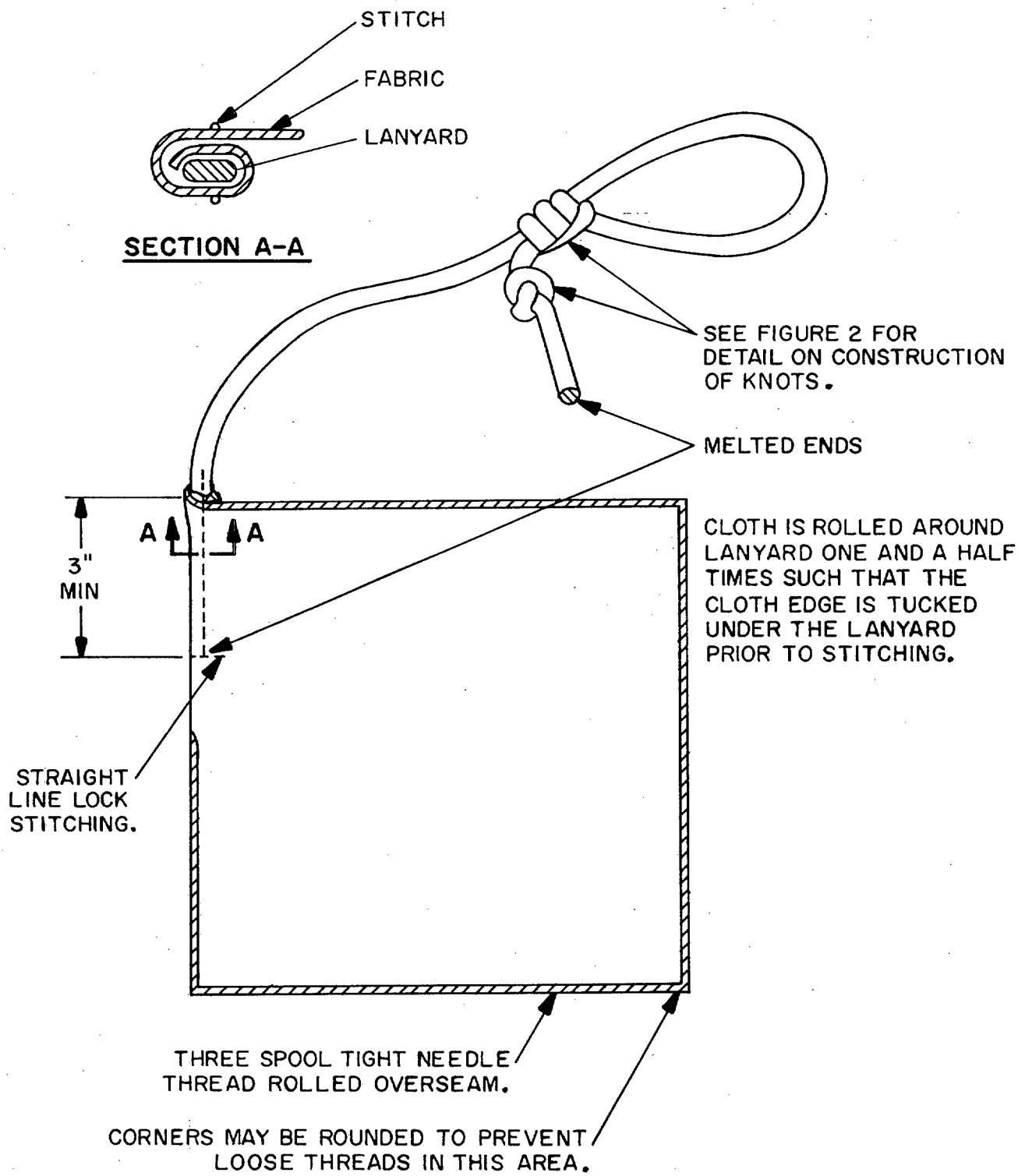

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FIGURE 1. Example of cloth with lanyard attached.

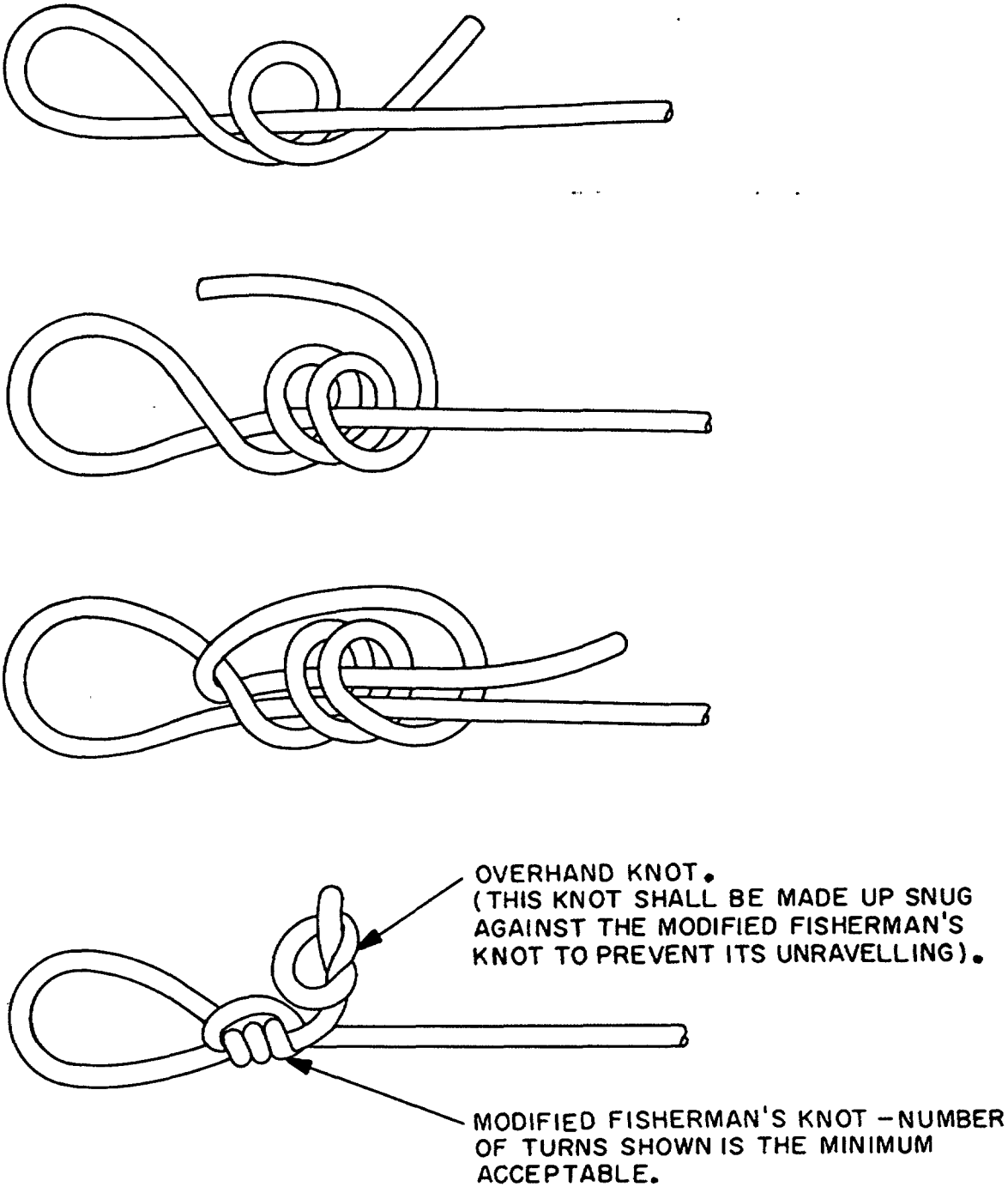

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FIGURE 2. Detail of knot for type II cloth.

APPENDIX

PROCEDURE FOR ANALYSIS OF WATER LEACHABLE CHLORIDE

10. SCOPE

10.1 Scope. This appendix details the procedure for the analysis of samples selected in accordance with 4.4.2 for water leachable chloride. This appendix is a mandatory part of the specification. The procedure contained herein is intended for compliance.

20. APPLICABLE DOCUMENTS

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
D 512 - Standard Test Method for Chloride Ion in Water and Waste Water, Test for. (DoD adopted)

30. ANALYSIS OF WATER LEACHABLE CHLORIDE

30.1 Procedure. An analysis of samples selected in accordance with 4.4.2 shall be conducted to determine water leachable chloride content. The samples may be class A or class B cloths or equivalent sized pieces of fabric.

30.1.1 Water leaching procedure. Place each weighed specimen in an individual 800 milliliter (mL) Pyrex beaker, or equivalent, and cover the specimen with sufficient water to leach the specimen, approximately 200 to 400 mL. Cover the beaker with a watch glass and heat for 1 hour at 95 to 100 degrees Celsius (°C) (203 to 212°F), then remove from heat. Cool the beaker and its contents naturally (do not agitate) to a room temperature of 20 to 30°C (68 to 86°F). Filter the leach solution through a prewashed no. 41 Whatman, or equal, filter paper in a Buchner funnel, transferring the specimen to the funnel and using light suction as necessary. The beaker and the specimen shall be washed thoroughly using a minimum of ten small washes to make up the filtrate to 500 mL. This solution shall be the source of aliquots for the chemical testing.

30.1.2 Analysis for chloride. An aliquot of solution shall be analyzed by one of the ASTM D 512 methods or the potentiometric method listed below:

(a) ASTM D 512 - Method A, C, or D may be used to analyze the water leachable chloride content, or
(b) Potentiometric method.

(1) Transfer 100 mL of the leached solution obtained in 30.1.1 to a 150 mL beaker. Boil solution to reduce the volume to less than 20 mL. Cool to room temperature.
(2) Add 4.0 mL of 1:1 concentrated nitric acid:water, and 90 mL of a mixture of equal parts (by volume) of acetone and methyl alcohol.
(3) Place beaker in an automatic titrimeter (Brinkman 636 Titro processor, or equivalent).

(4) Using a 1 mL burrette, titrate with 0.01 N silver nitrate solution using a silver-silver chloride electrode (see note 1 below) as indicating electrode and a glass electrode as reference electrode.

Note 1: Coat a silver billet electrode (Beckman No. 39261 or Corning No. 476005 or equivalent) with silver chloride in conformance with the manufacturer's instructions.

(5) Calculate chloride concentration in ppm as follows:

$$\frac{\text{mL of 0.01 N } AgNO_3 \times 355 \times 5}{\text{total weight of sample in grams}} = \text{ppm of chloride}$$

30.2 Acceptance criteria. If the sample fails to conform to the requirements of 3.2.11 calculated on the basis of the original sample weight, the lot represented by that sample shall be rejected.

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
DOD-C-24671(SH)	CLOTH, LINT-FREE, FLUSHING AND CLEANING

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)*
	☐ VENDOR
b. ADDRESS *(Street, City, State, ZIP Code)*	☐ USER
	☐ MANUFACTURER
	☐ OTHER *(Specify)*: _____

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional	b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	8. DATE OF SUBMISSION *(YYMMDD)*

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