

**INCH-POUND**

MIL-C-43303C

22 May 1990

SUPERSEDING

MIL-C-43303B

8 November 1971

**MILITARY SPECIFICATION****CORD, ELASTIC COTTON**

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

**1. SCOPE**

1.1 Scope. This specification covers elastic cord encased within a braided cotton cover.

1.2 Classification. The cord shall be of the following classes as specified (see 6.2):

Class 1 - General purpose.

Class 2 - Special purpose.

**2. APPLICABLE DOCUMENTS****2.1 Government documents.**

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks 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).

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

AMSC N/A

FSC 8305

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SPECIFICATIONS

FEDERAL

UU-T-81 - Tags, Shipping and Stock.

MILITARY

MIL-C-3131 - Cordage; Packaging Of.

STANDARDS

FEDERAL

FED-STD-191 - Textile Test Methods.

FED-STD-595 - Colors.

MILITARY

MIL STD-105 - Sampling Procedures and Tables for Inspection

(Unless otherwise indicated, copies of federal and military specifications, standards and handbooks are available from the Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Non-Government publications. The following document forms a part of this document to the extent specified herein. Unless otherwise specified, the issues of the 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 OF TESTING AND MATERIALS (ASTM)

D 573 Rubber - Deterioration in An Air Oven

Orders 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.

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## 3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection (see 6.3) in accordance with 4.3.

3.2 Standard sample. The dyed cord shall match the standard sample for shade and shall be equal to or better than the standard sample with respect to all characteristics for which the standard sample is referenced (see 6.4).

3.3 Government and supplier purchases. The requirements specified in 3.8 and 3.9 apply only to cord purchased directly by the Government. All other requirements apply to cord purchased by a contractor as a component for an end item and to cord purchased directly by the Government.

3.4 Material. It is encouraged that recycled material be used when practical as long as it meets the requirements of this specification.

3.4.1 Cotton. The cotton shall be of suitable staple length and grade to meet the requirements of this specification.

3.4.2 Elastic strands. The elastic strands shall be made of compounded natural rubber, synthetic rubber, or a mixture thereof.

3.5 Color. The color of the cord shall be natural or dyed as specified (see 6.2). When dyed cord is specified the cotton yarn shall be dyed before braiding. The use of dyes and compounds containing elementary sulfur capable of oxidation to sulfuric acid is prohibited. The dyestuff shall be chosen and applied so that the dyed and finished cotton yarn shall contain no more labile sulfur than shown by the standard sample when tested as specified in 4.4.1. When a standard sample is not available the dyed and finished cotton yarn shall show no more than a slight trace of labile sulfur as defined in the test method when tested as specified in 4.4.1. When Camouflage Green 483 is specified, the color shall approximate color chip 34094 of FED-STD-595 (see 2.1.1 and 6.3).

3.5.1 Colorfastness. The dyed cord shall show fastness to laundering (after 3 cycles) equal to or better than the standard sample or equal to or better than a rating of "good" when tested as specified in 4.4.3.

3.5.2 Matching. The color of the dyed cord shall match the standard sample when viewed under filtered tungsten lamps that approximate artificial daylight and that have a correlated color temperature of  $7500 \pm 200$  K, with illumination of  $100 \pm 20$  foot candles, and shall be a good match to the standard sample under incandescent lamplight at  $2300 \pm 200$  K.

3.6 Physical requirements. The finished cord shall conform to the physical requirements specified in table I when tested as specified in 4.4.3.

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TABLE I Physical requirements and construction

Diameter inch	Weight oz/lin. yd. (minimum)	Elastic strands	Cover carriers	Cotton yarn size		Picks per inch (min)	Rubber strand gage (max)
				$\pm$ 2 counts cover	core		
3/16 $\pm$ 1/32	0.18	7	16 carriers 1 end per carrier	20/2	20/1	26	36
-or-							
			8 carriers 2 ends per carrier				

3.6.1 Core. The core shall be composed of seven ends of rubber, each end shall be individually wrapped first with four ends of 20/1 cotton yarn, S or Z twist direction, and overwrapped with one end of 20/1 cotton yarn in the opposite twist direction.

3.6.2 Cover. The cover shall be braided over the core in a basket weave construction with the carriers braiding in pairs.

### 3.7 Elongation and set.

3.7.1 Class 1. The class 1 cord shall have an elongation in the range of 117 through 143 percent when tested as specified in 4.4.3.

#### 3.7.2 Class 2.

3.7.2.1 Initial elongation. The class 2 cord shall have initial elongation in the range of 117 through 143 percent when tested as specified in 4.4.3.

3.7.2.2 Elongation after accelerated aging. The change in elongation of the class 2 cord after accelerated aging shall be not more than 20 percent when tested as specified in 4.4.3.

3.7.2.3 Low temperature elongation. The class 2 cord after subjection to a temperature of  $-40^{\circ}\text{F}$ . shall retain not less than 20 percent of its initial elongation when tested as specified in 4.4.3.

3.7.2.4 Permanent set. The class 2 cord shall have an initial permanent set of not more than 8.0 percent when tested as specified in 4.4.3.

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3.7 2.5 Permanent set after accelerated aging. The change in permanent set of the class 2 cord after accelerated aging shall be not more than 20 percent when tested as specified in 4.4.3.

3.8 Put-up. Unless otherwise specified (see 6.2), the cord shall be put-up on spools (reels), flat head type, containing 144 yards  $\pm$  2 yards, with not more than three pieces per spool, and no one piece less than 10 yards in length. The cord shall be wound on the spools (reels) so that each turn and layer is free from entanglement.

3.9 Identification. Each spool (reel) of cord shall have a ticket (identification tag) or label attached to it for identification purposes. The ticket shall conform to the requirements for type B, class 1, size 4 or 5 of UU-T-81. The ticket shall be made of not less than 15-point paper stock and shall have a minimum tearing resistance of both directions (total) of 850 grams when tested as specified in UU-T-81. When labels are used, the label shall be attached in such a manner as to remain in place and be clearly legible until all cord has been removed. The ticket or label shall be legibly printed, stamped or typed with water insoluble ink. Handwritten entries shall be prohibited. The ticket or label shall contain the following information:

Stock number  
Item description  
Specification number  
Length  
Contract number and date  
Date of manufacture  
Contractor's name

3.10 Workmanship The fabricated cord shall conform to the quality of product established by this specification.

#### 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.

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4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection 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.

4.1.2 Responsibility for dimensional requirements. Unless otherwise specified in the contract or purchase order, the contractor is responsible for ensuring that all specified dimensions have been met. Where dimensions cannot be examined on the end item, inspection shall be made at any point, or at all points in the manufacturing process necessary to assure compliance with all dimensional requirements.

4.1.3 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 Classification of inspection. 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 a first article is required (see 3.1 and 6.2), it shall be examined for the defects specified in 4.4.2 and shall be tested for the characteristics specified in 4.4.3.

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

4.4.1 Component and material inspection. In accordance with 4.1, components and materials shall be inspected in accordance with all the requirements of referenced documents unless otherwise excluded, amended, modified or qualified in this specification or applicable purchase document.

4.4.1.1 Component and material certification. A certificate of compliance may be acceptable as evidence that the characteristics listed in table II conform to the specified requirements.

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TABLE II. Component and material certification

Characteristic	Paragraph reference	Test method
Elastic strands		
Material	3.4.2	---
Gage	Table I	4.6.6
Cotton yarns:		
Material	3.4.1	1200 <u>1/</u>
Labile sulfur	3 5	2020 <u>1/</u>
Yarn sizes	Table I	4021 <u>1/</u>

1/ Refers to test method of FEL STD-191.

#### 4.4.2 End item examination.

4.4.2.1 Yard-by-yard examination. The cord shall be examined for the defects listed in table III. All defects found shall be counted regardless of their proximity to each other. A continuous defect shall be counted as one defect for each linear yard or fraction thereof in which it occurs. The lot size shall be expressed in yards. The sample unit shall be one linear yard. The inspection level shall be I, and the acceptable quality level (AQL), expressed in terms of defects per hundred units, shall be 2.5. The number of spools from which the sample yardage is to be selected shall be in accordance with table IV. The sample yardage shall be apportioned equally among the selected spools (reels).

TABLE III. End item visual defects

Core not completely covered
Any cut or tear
Broken or missing end or carrier
Spot or stain <u>1/</u>
Abrasion mark, resulting in a weak place
Unevenly braided resulting in open place, break in continuity of braid or soft spot.

1/ Clearly visible at normal inspection distance (approximately 3 feet).

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4.4.2.2 Overall examination. The elastic cord shall be examined for the defects listed below. Each defect listed shall be counted not more than once in each spool examined. The sample size shall be the applicable number of spools indicated in table IV. Each spool in the sample shall be examined over its entire length. The lot shall be rejected if the total number of defects in the sample exceeds the applicable acceptance number specified in table IV.

Defects

Offshade, mottled, or uneven color, when dyed.  
 Not clean throughout  
 Objectionable odor.  
 Improperly wound resulting in rinking, knotting, entangling or slippage during unwinding or otherwise affecting free unhampered unwinding of cord.

TABLE IV. Sample size

Lot size in yards	Sample size in spools 1/	Acceptance number
1,200 or less	3	0
1,201 up to and including 3,200	5	0
3,201 up to and including 10,000	8	0
10,001 up to and including 35,000	13	0
35,001 up to and including 150,000	20	1
150,001 and over	32	2

1/ If the lot contains fewer than three spools, each spool in the lot shall be examined

4.4.2.3 Length examination. During the overall examination, each spool in the sample shall be examined for the defects listed below. If the total number of length defects in the sample exceeds the applicable acceptance number specified in table IV, the lot shall be rejected. In addition, the lot shall be rejected if the total of the actual lengths of cord on all the spools in the sample is less than the total of the lengths marked on the tickets

Length defects

Total length of cord on a spool is more than 2 yards less than the total length marked on the ticket  
 Length of cord on a spool not as specified  
 Any individual piece of cord is less than 10 yards in length  
 More than three pieces of cord on a spool



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4 4.3 End item testing. The end items shall be tested for the characteristics listed in table V. The methods of testing specified in FED-STD-191, wherever applicable, and as listed in table V shall be followed. All tests shall be conducted on specimens in moisture equilibrium with standard conditions as defined in FED-STD-191. The sample unit shall be 15 yards of cord. The lot size shall be expressed in units of 1 linear yard. The lot shall be rejected if one or more sample units fail to meet any requirement specified. The sample size shall be in accordance with the following:

<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

TABLE V. End item tests

<u>Characteristic</u>	<u>Requirement paragraph</u>	<u>Test method</u>	<u>No. of determinations per sample unit</u>	<u>Results reported as</u>
Colorfastness to laundering (after 3 cycles)	3.5.1	5610 <u>1/</u> <u>2/</u>	-	-
Diameter	3.6	Micrometer	5	To nearest 1/32 inch
Weight	3.6	4.6.5	5	Average of 5 determinations to nearest 0.01 ounce
Fnds per carriers	3.6	Visual	1	Pass or fail
Number of carriers	3.6	Visual	1	Pass or fail
Picks per inch	3.6	4.6.4	5	Nearest whole number
Total number of elastic strands	3.6.1	Visual	1	Pass or fail

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TABLE V. End item tests (cont'd)

Characteristic	Requirement paragraph	Test method	No. of determinations per sample unit	Results reported as
Weave	3.6.2	Visual	1	Pass or fail
Elongation:				
Initial (classes 1 and 2)	3.7.1 and 3.7.2.1	4.6.1	3	Nearest 0.1 percent
After accelerated aging (class 2)	3.7.2.2	4.6.1 and ASTM D 573 3/	3	Nearest 0.1 percent
Low temperature (class 2)	3.7.2.3	4.6.3	3	Nearest 0.1 percent
Permanent set:				
Initial (class 2)	3.7.2.4	4.6.2	3	Nearest 0.1 percent
After accelerated aging (class 2)	3.7.2.5	4.6.2 and ASTM D 573 3/	3	Nearest 0.1 percent

1/ The specimens must be dried after each of the three laundering cycles.

2/ On the color transfer cloth evaluation, only the stain on the cotton fibers of the color transfer cloth shall be evaluated.

3/ Except that the accelerated aging shall be carried out at a temperature of 212°F for 70 hours.

4.5 Packaging inspection The inspection shall be in accordance with the requirements of MIL-C-3131, except that the inspection level shall be S-2, and the AQL, expressed in terms of defects per hundred units, shall be 2.5

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4.6 Methods of inspection

4.6.1 Elongation. A 14-inch specimen shall be cut from a representative sample of cord and two marks made on the cord so that a distance of 10 inches is between the gage marks. The cord shall be suspended from a clamp in such a manner as to allow the 2-pound weight to be hung on the lower end. The weight shall be gradually lowered until the entire load is carried by the cord. After 2 minutes a measurement is taken between the two marks and the increase in length shall be calculated as follows:

$$\frac{B - A}{A} \times 100 = \text{percent elongation}$$

A - Initial measurement

B - Measurement of elongation at 2 pounds

4.6.2 Permanent set. A 14-inch test specimen shall be marked so that a distance of 10 inches is between the gage marks. The specimen then shall be stretched 50 percent (5 inches), and held for 24 hours under laboratory conditions. The sample shall then be released, and allowed to rest for 10 minutes. The extension remaining shall be measured and expressed as a percentage of the original distance between the gage marks. The calculation of permanent set shall be calculated as follows:

$$\frac{B - A}{A} \times 100 = \text{permanent set}$$

A - Initial measurement

B - Measurement after permanent set

4.6.3 Low temperature elongation test. A 14-inch test specimen of cord shall be marked with two marks so that a distance of 10 inches is between gage marks. The specimen shall then be exposed in a cold chamber to a temperature of  $-40^{\circ}\text{F} \pm 5^{\circ}\text{F}$  for 2 hours. At the end of the exposure period, the specimen shall be tested in the cold chamber at that temperature for elongation in accordance with 4.6.1 under an elongation load of 2 pounds.

4.6.4 Picks per inch. Picks per inch shall be counted visually with the cord so positioned that the repeat of the stitch pattern creates a straight line parallel to the axis of the cord.

4.6.5 Weight. A 48-inch test specimen of cord shall be suspended in such a manner as to allow a 2-ounce weight to be hung on the lower end without obstruction. After 1 minute, two marks shall be made on the cord a distance of 36 inches apart. Release the tension, cut the specimen at the 36-inch gage marks and weigh to the nearest 0.01 ounce.

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4.6.6 Gage of rubber. The gage of rubber shall be determined by counting the actual number of strands, laid side by side, contained in 1 inch. The gage is equivalent to the actual number of rubber yarns contained in 1 inch. A measuring device which measures the gage of rubber yarns may be utilized providing results are comparable.

## 5. PACKAGING

5.1 Preservation, packing, and marking. Preservation, packing, and marking shall be in accordance with applicable requirements of MIL-C-3131 (see 6.2).

## 6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory )

6.1 Intended use. The Class I elastic cord is for general purpose use. The Class II cord is used as a drawcord in the man's field coat, vesicant gas protective coat, overalls CVC, traffic-control ensemble, man's parka, and fragmentation protective body armor.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Class required (see 1.2).
- c. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
- d. When first article is required (see 3.1, 4.3, and 6.3).
- e. Color required (see 3.5).
- f. When put-up other than specified is required (see 3.8).
- g. Levels of preservation and packing (see 5.1).

6.3 First article. When a first article is required, it shall be inspected and approved under the appropriate provisions of FAR 52.209. The first article should be a preproduction sample. The contracting officer should specify the appropriate type of first article and the number of units to be furnished. The contracting officer should also include specific instructions to acquisition documents regarding arrangements for selection, inspection, and approval of the first article.

6.4 Sample. For access to samples, address the contracting activity issuing the invitation for bids.

n 5 Color. Olive Drab 7 has been replaced by Camouflage Green 483. Any end item which previously required Olive Drab 7 shall use Camouflage Green 483.

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6.6 Subject term (key word) listing

Braid  
Drawcord

6.7 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:

Army - GL  
Navy - NU

Preparing activity:

Army - GL

(Project 8305-0337)

Review activity:

Army - MD  
DLA - CT

User activities:

Navy - OS, MC

# 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.
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.

<b>I RECOMMEND A CHANGE:</b>	1 DOCUMENT NUMBER MIL-C-43303C	2 DOCUMENT DATE (YYMMDD) 90/05/22
3 DOCUMENT TITLE CORD, ELASTIC COTTON		
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) AUTOVON (if applicable)	7. DATE SUBMITTED (YYMMDD)
8. PREPARING ACTIVITY		
a. NAME	b. TELEPHONE (Include Area Code) (1) Commercial 508-651-5221	(2) AUTOVON 256-5221
c. ADDRESS (Include Zip Code) Commander, U S Army Natick RD&E Center ATTN STRN-ES Natick, MA 01760-5014	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041 3466 Telephone (703) 756-2340 AUTOVON 289-2340	