

MIL-T-43548C
30 September 1986
SUPERSEDING
MIL-T-43548B
30 September 1981

MILITARY SPECIFICATION

* THREAD, POLYESTER CORE: COTTON-, RAYON-, OR POLYESTER-COVERED

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

1. SCOPE

* 1.1 Scope. This document covers cotton-covered, rayon-covered, and polyester-covered threads with polyester cores.

1.2 Classification. The thread shall be of the cover material and sizes specified (see tables I and II and 6.2).

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.

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

FSC 8310

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SPECIFICATIONS

FEDERAL

PPP-P-50 - Packaging and Packing of Thread for Domestic and Overseas Shipment

STANDARDS

FEDERAL

FED-STD-191 - Textile Test Methods

MILITARY

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

(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.)

- * 2.2 Other publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issues of the DODISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS shall be the issues of the nongovernment documents which are current on the date of the solicitation.

THE COLOR ASSOCIATION OF THE UNITED STATES

Department of Defense Standard Shades for Sewing Threads

(Application for copies should be addressed to the Color Association of the United States, Inc., 343 Lexington Avenue, New York, NY 10016.)

(Technical society and technical association documents are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

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

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3. REQUIREMENTS

3.1 Government and contractor purchases. The requirements specified in 3.7, 3.8, 3.9 and the related provisions of section 4, and all of section 5 apply only to thread purchased directly by the Government. All other requirements apply both to thread purchased by a contractor as a component for an end item and to thread purchased by the Government.

3.2 Standard sample. When a standard sample is established (see 6.3), the thread shall match the standard for shade and shall be equal to or better than the standard sample with respect to all characteristics for which the standard is referenced.

3.3 Material.

* 3.3.1 Yarns. The yarns for the thread shall consist of one end of a bright, continuous multifilament polyester (polyethylene glycol terephthalate having a specific gravity within the range of 1.36 to 1.40) spun with one or more ends of cotton or high wet-modulus rayon or high tenacity staple polyester roving so that the cotton, rayon, or staple polyester shall cover the continuous multifilament polyester (see 4.2.2).

3.3.1.1 Construction. The final thread shall be made by twisting together two or more ends of the combination yarn to meet the physical requirements for a specified ticket number when tested as specified in 4.2.2.

3.3.1.2 Twist direction. Unless otherwise specified (see 6.2), the direction of the final twist shall be "Z" when tested as specified in 4.2.2.

3.4 Color. The color (shade) shall be as specified in the applicable end item document or in the contract (see 6.2). The dyed thread shall conform to the applicable approved shade standard (see 6.3) when tested as specified in 4.2.2. The shade of the polyester core shall approximate that of the cotton or rayon, or staple polyester covering. Shade designations by letter (e.g., Olive Drab S-1) and related cable numbers (e.g., C.A. 66022) refer to the DOD Standard Shades for Sewing Threads (see 2.2).

3.4.1 Labile sulfur. 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 thread shall contain no more labile sulfur than shown by the standard sample when tested as specified in 4.2.2. When a standard sample is not available, the dyed and finished thread shall show no more than a slight trace of labile sulfur as defined in the test method specified in 4.2.2.

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3.4.2 Colorfastness. The colorfastness of the dyed and finished thread shall be as specified in the applicable end item document or as set forth in the contract (see 6.2 and 6.4) except that, when requirements are not stated or referenced to a standard sample for colorfastness, the thread shall show "good" fastness to laundering (after 3 cycles) and light. The thread shall also have a "good" colorfastness to dry heat for color change and "good" colorfastness for color transfer (staining). When a standard sample for colorfastness is referenced, the thread shall be equal to or better than the standard sample for the specified colorfastness properties or (when specific properties are not specified) for colorfastness to laundering (after 3 cycles) and light. Tests for colorfastness (including tests for wet drycleaning, perspiration, and weathering, when specified) shall be as specified in 4.2.2, as applicable (see 4.3.1).

- * 3.5 Physical requirements. The finished thread shall conform to the applicable requirements for the specified size set forth in tables I and II when tested as specified in 4.2.2.

TABLE I. Physical requirements for cotton-covered and rayon-covered thread

Size (ticket number)	Plies	Length per pound (yards)		Breaking force, minimum (pounds)	Elongation, maximum (percent)
		Min.	Max.		
100	2 or 3	15,001	21,000	2.0	26
70	2 or 3	12,501	15,000	2.6	26
50	2 or 3	10,001	12,500	2.9	26
40	2 or 3	8,001	10,000	3.8	26
30	2 or 3	6,501	8,000	4.5	26
24	2, 3, or 4	4,701	6,500	6.8	26
16	2, 3, or 4	3,001	4,700	9.9	26
12	2, 3, or 4	2,201	3,000	13.0	26

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TABLE II. Physical requirements for polyester-covered thread

Size (ticket number)	Plies	Length per pound (yards)		Breaking force, minimum (pounds)	Elongation, maximum (percent)
		Min.	Max.		
120	2	19,501	23,100	1.80	26
100	2	15,501	19,500	2.40	26
70	2	12,501	15,500	3.00	26
50	2	9,901	12,500	3.70	26
40	2 or 3	8,501	9,900	4.70	26
30	2 or 3	6,001	8,500	6.10	26
24	2, 3, or 4	4,501	6,000	7.20	26
16	2, 3, or 4	3,001	4,500	10.80	26
12	2, 3, or 4	2,001	3,000	14.40	26

- * 3.6 Soft finish. The thread shall have a soft finish with no luster other than that inherent in the constituent yarns (see 4.2.2).

3.6.1 Finishing materials. The finished thread shall have no chemical finishes or treatments other than those commonly used on commercial threads that have been demonstrated to have no deleterious effects on the polyester fiber including effects in prolonged storage. No finish or treatment shall be applied for the purpose of increasing breaking force (see 4.2.2).

3.7 Knots and splices. The thread shall average not more than one full thread knot or splice per 1,000 yards.

- * 3.8 Put-up. Unless otherwise specified (see 6.2), the thread shall be put up on holders in accordance with table III or 3.8.1. The type of holder and nominal length per holder shall be as specified (see 6.2). The average length per holder (as applicable) shall be not less than the specified nominal amount minus 3.0 percent tolerance when examined (on a 10-holder basis) as specified in 4.2.1.3. The thread shall be put up in one continuous length per holder and shall be so wound that each turn and layer is free from entanglement when examined as specified in 4.2.1.2.

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TABLE III. Put-up on spools, cones, or tubes

Size (ticket number)	<u>Nominal length per holder</u> (yards)
100	6,000 or 12,000
70	6,000 or 12,000
50	6,000 or 12,000
40	6,000 or 12,000
30	6,000 or 12,000
24	6,000 or 12,000
16	3,000 or 6,000
12	3,000

3.8.1 Ready-made lockstitch bobbins. When thread is put up on lockstitch bobbins, the style of bobbin and length of thread thereon shall be as specified (see 6.2). Unless otherwise specified (see 6.2), ready-made lockstitch bobbins shall be put up in unit packs of either one-half gross or one gross each.

3.9 Identification marking. Except when commercial identification markings are specified in the invitation to bid, each holder except ready-made lockstitch bobbins shall have a label attached in such a manner as to remain in place and be clearly legible until all thread has been removed. Ready-made lockstitch bobbins shall have the label attached to the unit container (gross pack). The label shall be printed with the following information:

Stock number
 Length (yardage)
 Direction of twist
 Color
 Ply
 Size (ticket number)
 Name of contractor
 Nomenclature

3.10 Workmanship. The finished thread shall conform to the quality of product established by this document, and the occurrence of defects shall not exceed the applicable acceptable quality levels.

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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 End item examination.

4.2.1.1 Thread on holder examination. Thread on the holder shall be examined for the defects listed in table IV. The lot size shall be expressed in units of holders. The sample unit shall be one holder. The inspection level shall be S-3 and the acceptable quality level (AQL), expressed in terms of defects per hundred units, shall be 4.0.

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TABLE IV. Thread on holder defects

Examine	Defect
Identification label	Missing, incorrect, incomplete, illegible, insecurely attached
Type of holder	Other than specified
Surface condition	Loose or unattached ply Cut, tear, chafe, or slip affecting strength of thread or interfering with easy location of end and initial unwinding
Cleanness	Dirt, spot, or stain clearly noticeable
Finish	Other than specified Uneven, lumpy, or bare or thin spots

4.2.1.2 Thread as unwound examination. The thread shall be examined while unwinding for the defects listed in table V. All defects shall be counted regardless of their proximity to each other. The lot size shall be expressed in units of holders, and the sample unit shall be one holder. For ready-made lockstitch bobbins, the lot size unit and sample unit shall be expressed in units of one half gross pack or one gross pack (as applicable). The inspection level shall be S-3 and the AQL, expressed in terms of defects per hundred units, shall be 4.0.

TABLE V. Thread as unwound defects

Examine	Defect
Continuous length	Not in one continuous length
Knots and splices	Averaging more than one full thread or splice per 1,000 yards

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TABLE V. Thread as unwound defects - Continued

Examine	Defect
Winding	Improperly or not firmly wound resulting in kinks, knots, entangling, or slippage during unwinding, or otherwise affecting free unwinding of thread
Color	Uneven, apparent on successive layers or end to end
Tackiness or adhesion	Strands adhere to each other or to holder, affecting unwinding tension
Yarn	Unevenly spun or twisted

4.2.1.3 Length examination. Ten holders from each lot shall be measured individually for thread length. Measurements shall be made on a winding machine over an accurate measuring clock under normal winding tensions. The values obtained shall be averaged and this average shall represent the average length per holder in the lot. The lot shall be unacceptable if the length per holder is less than the specified amount minus the 3.0 percent tolerance (see 3.8).

4.2.2 End item testing. The end item shall be tested as indicated in table VI. The methods of testing specified in FED-STD-191, wherever applicable, and as listed in table VI shall be followed. The lot size shall be expressed in units of one holder or one gross of ready-made bobbins. The sample unit shall be one wound holder. (For ready-made bobbins, the sample unit shall be a sufficient number of bobbins to provide thread for the applicable tests.) The inspection level shall be S-1 and the AQL, expressed in terms of defects per hundred units, for each characteristic shall be 6.5. A test failure shall be considered a defect. All test reports shall contain the individual values used in expressing the final result.

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TABLE VI. End item tests

Characteristic	Requirement paragraph	Test method
Cotton or rayon	3.3.1	<u>1/</u>
Polyester		
Identification	3.3.1	<u>1/</u>
Specific gravity	3.3.1	<u>1/</u>
Bright	3.3.1	<u>1/</u>
Continuous multifilament	3.3.1	<u>1/</u>
Construction	3.3.1.1	<u>1/</u>
Direction of twist	3.3.1.2	4050
Shade match	3.4	4.3.1 and 4.3.2
Labile sulfur	3.4.1	2020
Colorfastness to:		
Laundering (after 3 cycles)	3.4.2	4.3.1 and 5610 <u>2/</u> <u>3/</u>
Light	3.4.2	4.3.1 and 5660
Wet drycleaning	3.4.2	5622
Perspiration	3.4.2	4.3.1 and 5680
Weathering	3.4.2	4.3.1 and 5671 <u>4/</u>
Dry heat (sublimation)	3.4.2	5642 <u>5/</u>
Number of plies	3.5	Visual <u>6/</u>
Length per pound	3.5	4010 <u>7/</u>
Breaking force	3.5	4100 <u>8/</u>
Elongation	3.5	4100
Soft finish	3.6	<u>1/</u>
Finishing material limitation	3.6.1	<u>1/</u>

- 1/ Unless otherwise specified, a certificate of compliance shall be furnished and will be acceptable for the stated requirement.
- 2/ The specimens must be dried after each of the three laundering cycles.
- 3/ The color transfer cloth evaluation shall not apply. No appreciable change in shade or loss of color of the tested specimen shall be visible when compared to the untested thread retained.
- 4/ The exposure time shall be 80 hours.

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- 5/ The heat at which the specimen is to be tested shall be $376^{\circ} \pm 6^{\circ}\text{F}$.
- 6/ One determination shall be made per sample unit, and the results reported as "pass" or "fail".
- 7/ In cases of dispute, the length per pound of the thread shall be determined on thread without finish. Procedure for the removal of the finish shall be as specified in 4.3.1.
- 8/ Except that five determinations shall be made per sample unit.
-

4.2.3 Packaging inspection. The inspection shall be in accordance with the quality assurance provisions of PPP-P-50.

4.3 Methods of inspection.

4.3.1 Finish removal procedure. Before evaluation for shade matching and testing for colorfastness, except colorfastness to wet drycleaning, the sample of thread shall be wet drycleaned in accordance with Method 5622 of FED-STD-191 (disregarding reference to the standard sample). Excess solvent shall be removed by centrifuging or wringing. The sample shall then be rinsed in distilled water at 120° to 160°F and dried at a temperature not exceeding 180°F . The dried sample shall then be conditioned for a minimum of 4 hours prior to evaluation for shade match or colorfastness. Colorfastness tests shall be as specified in table VI.

4.3.2 Shade matching procedure. The sample shall be wound or prepared for examination in a manner similar to that for the standard shade sample. The sample and the standard shall be viewed under filtered tungsten lamps that approximate artificial daylight and that have a correlated color temperature of 7000 ± 500 K with illumination of 100 ± 20 foot candles. The sample shall be considered a test failure if it is not a good match to the shade standard. The sample shall also be compared to the standard under incandescent lamplight at 2300 ± 100 K. The sample shall be considered a test failure if it is not a good approximation to the shade standard.

5. PACKAGING

- * 5.1 Preservation. Preservation shall be level A, B, or Commercial, as specified (see 6.2).

5.1.1 Levels A, B, and Commercial. The thread put up as specified in table III, shall be preserved in accordance with the applicable requirements of PPP-P-50.

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

5.2.1 Levels A, B, and Commercial. The thread shall be packed in accordance with the applicable requirements of PPP-P-50.

5.3 Marking. In addition to any special markings specified in the contract or purchase order, unit packs and shipping containers shall be marked in accordance with the applicable provisions of PPP-P-50.

6. NOTES

6.1 Intended use. The thread is intended for machine sewing of clothing and other items.

- * 6.2 Ordering data. Acquisition documents should specify the following:
- a. Title, number, and date of this document.
 - b. Cover material and thread size required (see 1.2 and tables I and II).
 - c. Direction of twist if other than specified (see 3.3.1.2).
 - d. Color required (see 3.4).
 - e. Colorfastness properties required (see 3.4.2).
 - f. Ply required (see tables I and II).
 - g. Put-up required (see 3.8).
 - h. Style of bobbin and length of thread for ready-made lockstitch bobbins (see 3.8.1).
 - i. When ready-made lockstitch bobbins are to be put-up other than specified (see 3.8.1).
 - j. Selection of applicable levels of preservation and packing (see 5.1 and 5.2).

6.3 Standard sample. For military shades, the standards for shade reference are those contained in the Standard Color Card for the DOD Standard Shades for Sewing Threads (see 2.2). For other shades, address the contracting activity issuing the invitation for bids or request for proposal. Standard samples frequently used by the military (directly or for components of end items) have been made available to normal contractors as basic reference for the establishment of the contractor's secondary standards conforming to the characteristics of the official standards. The basic shade standards are those appearing in the DOD Color Card. Prime thread manufacturers who inadvertently have not been furnished standards for establishment of their colorfastness standards in accordance with this document may obtain samples for this purpose from the U.S. Army Natick Research, Development, and Engineering Center, Natick, MA 01760-5014, (ATTN: STRNC-VTC).

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6.4 Colorfastness. Normally, colorfastness requirements for thread are to be specified in keeping with those specified for the basic material into which the thread will be sewed (see 3.4.2). Typical examples are:

<u>Use</u>	<u>Colorfastness</u>
Thread for sewing wool clothing that is drycleaned.	Good fastness to wet drycleaning, perspiration, and light.
Thread for sewing wool clothing that is laundered.	Good fastness to laundering, perspiration, and light.
Thread for sewing cotton clothing that is laundered.	Good fastness to laundering, perspiration, and light.
Thread for sewing durable press clothing.	Good fastness to dry heat (sublimation).
Thread for sewing footwear.	Colorfastness not applicable.
Thread for sewing tentage.	Good fastness to weathering.
Thread for sewing equipage.	Good fastness to weathering and, in special cases, to laundering.

* 6.5 Subject term (key word) listing.

Clothing
Sewing, machine
Thread, covered
Thread, polyester core

6.6 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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Review activities:

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