

INCH – POUND

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SUPERSEDING
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DETAIL SPECIFICATION

TWINE, FIBROUS: IMPREGNATED, LACING AND TYING

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

1. SCOPE

1.1 Scope. This specification covers the requirements of twine suitable for lacing and tying (see 6.1).

1.2 Classification. The twine will be of the following types, treatments, and classes as specified (see 6.2).

Type N, waxed	- Vegetable fiber
Type P, unwaxed	- Polyamide (nylon)
Type P, waxed	- Polyamide (nylon)
Class 1	- 70 pounds minimum breaking strength
Class 2	- 48 pounds minimum breaking strength
Class 3	- 32 pounds minimum breaking strength

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in section 3, 4, or 5 of this standard. This section does not include documents cited in other sections of this standard or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this standard, whether or not they are listed.

Comments, suggestions, or questions on this document should be addressed to Defense Supply Center Philadelphia, ATTN: DSCP-NASA, 700 Robbins Avenue, Philadelphia, PA 19111-5096 or email to dscpg&inspeccomments@dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <http://assist.daps.dla.mil>.

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2.2 Government documents.

2.2.1 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 cited in the solicitation or contract.

FEDERAL STANDARDS

FED-STD-191 - Textile Test Methods

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-C-572 - Cord, Yarns and Monofilaments Organic Synthetic Fiber

MIL-T-3530 - Thread and Twine, Mildew Resistant or Water Repellent treated

(Copies of these documents are available online at <http://assist.daps.dla.mil> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

AMERICAN SOCIETY FOR QUALITY (ASQ)

ASQ Z1.4 - Sampling Procedures and Tables for Inspection by Attributes

(Copies of this document are available from www.asq.org or the American Society for Quality, 611 East Wisconsin Avenue, Milwaukee, WI 53202.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, 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 Government and contractor purchases. The requirements specified in 3.7 and 3.8 apply only to twine purchased directly by the Government. All other requirements apply to twine purchased by a contractor as a component for an end item and to twine purchased directly by the Government.

3.2 Materials.

3.2.1 Type N, vegetable fiber. The type N twine shall be fabricated from cotton, flax, soft hemp, flax and soft hemp, or flax and ramie fiber.

3.2.2 Type P, polyamide fiber. Type P twine shall be fabricated from polyamide fiber conforming to type P, form C of MIL-C-572.

3.3 Construction.

3.3.1 Type N twine. The type N twine shall be constructed from a minimum of six Z-twist singles yarns twisted together with S-twist.

3.3.2 Type P twine. The type P twine shall be composed of continuous filament twisted yarns.

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3.4 Finish.

3.4.1 Type N, waxed twine. The type N twine shall be uniformly mildew resistant and microcrystalline wax treated. The mildew resistant treatment shall conform to the requirements for type I, class 2 inhibitor of MIL-T-3530. The inhibitor may be applied with the microcrystalline wax treatment. The treatment utilized shall not contain copper or mercury, or compounds of copper or mercury.

3.4.1.1 Type N, wax content. The treated type N twine shall contain a minimum of 10 percent and a maximum of 25 percent wax when tested as specified in 4.2.4.

3.4.2 Type P waxed twine. Type P waxed twine shall be uniformly treated with a microcrystalline fungicidal wax. The treatment utilized shall not contain copper or mercury, or compounds of copper or mercury.

3.4.2.1 Type P, wax content. The treated type P twine shall contain a minimum of 20 percent and a maximum of 32 percent wax when tested as specified in 4.2.4.

3.4.2.2 Fungus resistance effectiveness. The type P waxed twine shall show no visible growth (to the naked eye) on the surface of the test specimens when tested as specified in 4.2.4.

3.5 Color. Unless otherwise specified (see 6.2), the color of the twine shall be natural unbleached color of the fiber and as naturally resulting from treatment.

3.6 Physical requirements. The finished twine shall conform to the requirements specified in table I (see 6.3) for the respective types and classes when tested as specified in 4.2.4.

Table I. Physical requirements.

Type	Class	Length per pound, minimum		Breaking strength, minimum, pound	Elongation maximum maximum, percent
		waxed twine, yards	unwaxed twine, yards		
N	1	300	-	70.0	15.0
N	2	450	-	48.0	15.0
N	3	600	-	32.0	15.0
P	1	550	650	70.0	20.0
P	2	750	950	48.0	20.0
P	3	1100	1400	32.0	20.0

3.6.1 Stiffness (applicable only to type N). The type N twine shall not deflect more than 1/8 inch when tested as specified in 4.2.4.

3.7 Put-up. Unless otherwise specified (see 6.2), the twine shall be furnished in 1 pound net weight tubes or spools. A plus or minus tolerance of 10 percent shall be permitted on the weight of any one tube or spool provided the average weight does not fall below 1 pound. The twine shall be wound in such a manner that each turn and layer is free from entanglement. A maximum total of two knots or laid-on ends or combination thereof per tube or spool shall be permitted. No piece of twine shall be less than 16 yards in length. The empty tube or spool shall measure $1 \pm \frac{1}{4}$ inch inside diameter, $1\text{-}1/4 \pm \frac{1}{4}$ inches outside diameter, and $4\text{-}1/8 \pm \frac{1}{4}$ inches in length.

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3.8 Identification. Each holder of twine shall have a label attached in such a manner as to remain in place and be clearly legible until all twine has been removed. The label shall be legibly printed, stamped, or typed with water insoluble ink. The label shall contain the following information:

- Stock number
- Nomenclature
- Specification number
- Type, treatment, and class
- Length or weight
- Contract number and date
- Contractor's name

3.9 Workmanship. The finished twine shall conform to the quality and grade of product established by this specification.

4. VERIFICATION

4.1 Certificate of compliance. When certificates of compliance are submitted, the Government reserves the right to check test such items to determine the validity of the certification.

4.2 Conformance inspection. Unless otherwise specified, sampling for inspection shall be performed in accordance with ASQ Z1.4. Unless otherwise specified, the Acceptable Quality Limits (AQLs) listed in this section shall be used to establish the sample sizes, however, the acceptance number shall be zero.

4.2.1 Inspection of components and materials. Components and materials shall be inspected in accordance with all requirements of referenced specifications, drawings, and standards unless otherwise excluded, amended, modified or qualified in the specification or applicable purchase documents. A contractor's certificate of compliance will be acceptable for the requirements listed in table II.

Table II. Material inspection.

Material identification	3.2.1 and 3.2.2
Twist (singles)	3.3.1

4.2.2 Examination of the end item for visual defects. The defects listed in table III shall be counted regardless of their proximity to each other. The sample unit for this examination shall be one tube or spool of twine. The lot size for this examination shall be expressed in units of one tube or spool. The acceptable quality limit (AQL) shall be 4.0 defects per 100 units. The inspection level shall be level I. Not less than 100 feet in each sample unit shall be subjected to visual examination.

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Table III. Visual examination – defects.

Examine	Defect
Appearance and workmanship	Any cut Chafed or damaged Finish lumpy or unevenly applied resulting in thin or bare spots, clearly visible <u>1/</u>
Type and finish	Not as specified
Color	Not as specified
Cleanness	Overall uncleanness, clearly visible <u>1/</u>
Identification	Omitted, incorrect, illegible, insecurely attached, or not as specified

1/ At normal inspection distance, approximately 3 feet.

4.2.3 Examination for weight and winding. The sample unit for this examination shall be one tube or spool of twine. For lots consisting of 500 or fewer units, the sample size (number of sample units) shall be 10. The inspection level shall be S-3 and the AQL shall be 4.0 percent defective. The lot size shall be the number of tubes or spools of twine in the inspection lot. Defects shall be as listed in 4.2.3.1 and 4.2.3.2.

4.2.3.1 Examination for weight. A defects with regard to weight shall be considered to exist if the net weight of a tube or spool is less than the minimum or more than the maximum specified in 3.7. The number of holders examined shall be utilized in determining the average weight. A lot shall be unacceptable if the average weight is less than the 1 pound weight specified in 3.7.

4.2.3.2 Examination for winding. Defects with regard to winding shall be considered to exist if any of the following are determined during inspection.

- (a) Improperly or not firmly wound resulting in kinking, knotting, entangling or slippage during unwinding, or otherwise affecting free unhampered unwinding of twine.
- (b) Any length of twine less than 16 yards on a tube or spool.
- (c) A total of three or more knots or laid-on ends on a tube or spool.

4.2.4 Testing of the end item. The methods of testing specified in FED-STD-191, wherever applicable and as listed in table V shall be followed. When the data in the “number of determinations” and “Results reported as” columns are not specified in the table, they shall be as required by the referenced test method. The physical and chemical values specified in section 3 apply to the average of the determinations made on a sample unit for test purposes as specified in the applicable test methods. The sample size shall be in accordance with table IV. The sample unit for testing shall be one tube or spool of twine. The lot size shall be expressed in units of one tube or spool. All test reports shall contain the individual values utilized in expressing the final result. The lot shall be unacceptable if one or more units fail to meet any requirement. Tests to determine compliance with specification requirements, including quantity of delivery, may be made under prevailing atmospheric conditions. In cases of dispute, tests shall be made upon material which has reached equilibrium under Standard Conditions as defined in FED-STD-191.

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Table IV. Sampling for tests.

No. of units in lot	Sample size
800 or less	2
801 up to and including 22,000	3
22,001 and over	5

Table V. Test methods.

Characteristic	Requirement reference	Test method	No. of determinations per individual sample unit	Results reported as
Ply	3.3.1	<u>1/</u>	-	-
Twist (twine)	3.3.1	<u>1/</u>	-	-
Mercury and copper content	3.4.1 and 3.4.2	<u>1/</u>	-	-
Wax content (Extractable matter)	3.4.1.1 and 3.4.2.1	2611 <u>2/</u>	-	-
Fungus resistance effectiveness	3.4.2.2	5760	1	Growth or no growth
Length per pound	3.6	4010	3	Avg. of 3 deter. to nearest 1 yard
Breaking strength	3.6	6016	5	Avg. of 5 deter. to nearest 0.5 pound
Elongation	3.6	6016	5	Avg. of 5 deter. to nearest 0.1 percent
Stiffness	3.6.1	4.3.1	5	Avg. of 5 deter. to nearest 1/32 inch

1/ Unless otherwise specified, a certificate of compliance will be acceptable for these requirements.

2/ The extractable matter shall be determined using the chloroform extraction procedure of Method 2611.

4.3 Test methods.

4.3.1 Stiffness (applicable only to type N twine). The twine shall be extended as a cantilever beam for a distance of 3-1/4 inches. The twine shall then be straightened by running the fingers lightly over it once or twice. Not less than 10 seconds later, the deflection at the free end shall be measured (see 3.6.1).

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of material is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from then managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contracting the responsible packaging activity.

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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 twine is intended for lacing and tying telephone switchboard cable forms, hookup wires, cable ends, aircraft cable bundles, electrical and electronic equipment, and electrical wire-harness assemblies.

6.1.1 Type N twine. Type N twine is intended for use where it is determined that heat has no appreciable effect on strength or elongation.

6.1.2 Type P twine. Type P twine is a strong, lightweight twine suitable for applications at relatively high humidity.

6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) type, treatment and class required (see 1.2).
- (c) Color of twine if other than natural (see 3.5).
- (d) Put-up if other than specified (see 3.7).
- (e) Packaging requirements (see 5.1).

6.3 Elongation. The values for elongation specified in 3.6 are based on natural twine. If colored twines are specified, it may be necessary to increase the maximum elongation specified, based upon the method of coloring employed. Requisitioning and procuring officers should take this into account if colored twine is specified (see 6.2).

6.4 Subject term (key word) listing.

Coils
Nylon
Vegetable fiber
Waxed

6.5 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 – SH
Air Force – 99

Preparing activity:
DLA – IS

(Project 4020-2009-002)

Review activities:
Army – AR, CR4, MD, MI
Navy – MC, OS
Other – DS

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST online database at <http://assist.daps.dla.mil>.