

MIL-T-713E
14 June 1977
SUPERSEDING
MIL-T-713D
27 March 1968

MILITARY 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 shall 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 Issues of documents. The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

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

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SPECIFICATIONS

MILITARY

- MIL-C-572 - Cords, Yarns and Monofilaments Organic Synthetic Fiber
- MIL-C-3131 - Cordage; Preparation for Delivery of
- MIL-T-3530 - Thread and Twine; Mildew Resistant or Water Repellent Treated

STANDARDS

FEDERAL

- FED-STD-191 - Textile Test Methods

MILITARY

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

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

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.

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3.3 Construction.

3.3.1 Type N twine. The type N twine shall be constructed from a minimum of six 2-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.

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 4.2.5.

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 4.2.5.

* 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 4.2.5.

3.5 Color. Unless otherwise specified (see 6.2), the color of the twine shall be the 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 4.2.5.

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* TABLE I. Physical requirements

Type	Class	Length per pound, minimum		Breaking strength, minimum Pounds	Elongation, maximum, percent
		Waxed twine Yard	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 4.2.5.

* 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 $1 + \frac{1}{4}$ inch inside diameter, $1\frac{1}{4} + \frac{1}{4}$ inches outside diameter, and $4\frac{1}{8} + \frac{1}{4}$ inches in length.

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. 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, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, 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 Certificate of compliance. Where certificates of compliance are submitted, the Government reserves the right to check test 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 Inspection of components and materials. In accordance with 4.1 above, 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 level (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

<u>Examine</u>	<u>Defect</u>
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 and the acceptance number 1. 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 defect 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.

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4.2.4 Packaging inspection. Packaging and packing shall be inspected in accordance with the quality assurance provisions of MIL-C-3131, except that the inspection level shall be S-2 and the AQL shall be 2.5 defects per 100 units.

4.2.5 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.

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	Require- ment refer- ence	Test method	No. of deter- minations per individual sample unit	Results reported as
Ply	3.3.1	$\frac{1}{1}$	-	-
Twist (twine)	3.3.1	$\frac{1}{1}$	-	-

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TABLE V. Test methods (cont'd)

Characteristic	Requirement reference	Test method	No. of determinations per individual sample unit	Results reported as
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).

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5. PACKAGING

5.1 Preservation-packaging. Packaging shall be level A or C as specified (see 6.2).

5.1.1 Levels A and C. The twine shall be packaged in accordance with the applicable requirements of MIL-C-3131.

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

5.2.1 Levels A, B and C. The twine shall be packed in accordance with the applicable requirements of MIL-C-3131.

5.3 Marking. In addition to any special markings required by the contract or order, interior packages and shipping containers shall be marked in accordance with MIL-C-3131.

6. NOTES

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, and when a relatively stiff twine is required.

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

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) Selection of applicable levels of packaging and packing (see 5.1 and 5.2).

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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 International interest. Certain provisions of this specification are the subject of international standardization agreement as cited in ABC-NAVY-STD-17. When amendment, revision or cancellation of this specification is proposed which will effect or violate the international agreement concerned, the preparing activity will take appropriate reconciliation action through international standardization channels including departmental standardization offices, if required.

6.5 Changes from previous issue. The margins of this specification 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 irrespective of the marginal notations and relationship to the last previous issue.

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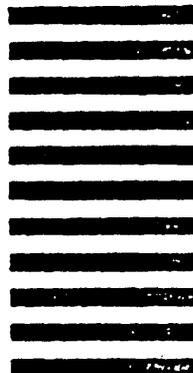


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