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MILITARY SPECIFICATION

CORDS, YARNS AND MONOFILAMENTS ORGANIC SYNTHETIC FIBER

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

1. SCOPE

1.1 Scope. This specification covers organic synthetic fibers that may be used for insulation, tying, and other applications (see 6.1).

1.2 Classification. Fibers furnished under this specification shall be of the following types and forms, as specified (see 6.2):

1.2.1 Type:

P	-	Polyamide. (All forms.)
PAA	-	Polyaryl-amide. (Forms C and Y only.)
VC	-	Copolymer of vinylidene chloride and vinyl chloride. (Form MF only.)
PVCA	-	Polyvinyl chloride, and its copolymers. (Form MF only.)
AR	-	Cellulose acetate. (Forms C and Y only.)
VCR	-	Viscose rayon. (Forms C and Y only.)
CTA	-	Cellulose triacetate. (Forms C and Y only.)
PSTR	-	Polyester. (Forms C and Y only.)

1.2.2 Form:

C	-	Cordage (see 6.5.1).
Y	-	Yarn (see 6.5.2).
MF	-	Monofilament (see 6.5.3).

2. APPLICABLE DOCUMENTS

2.1 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:

SPECIFICATIONS

FEDERAL

QQ-S-781	-	Strapping, Steel, Flat and Seals.
PPP-B-585	-	Boxes, Wood, Wirebound.
PPP-B-601	-	Boxes, Wood, Cleated-Plywood.
PPP-B-621	-	Boxes, Wood, Nailed and Lock-Corner.
PPP-B-636	-	Box, Fiberboard.
PPP-T-60	-	Tape: Pressure-Sensitive Adhesive, Waterproof, For Packaging.
PPP-T-76	-	Tape, Pressure-Sensitive Adhesive Paper, (For Carton Sealing).

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MIL-P-116	-	Preservation, Methods of.
MIL-C-45662	-	Calibration System Requirements.

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STANDARDS

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MIL-STD-129 - Marking for Shipment and Storage.
MIL-STD-147 - Palletized and Containerized Unit Loads 40" x 48" Pallets, Skids, Runners, or Pallet-Type Base.

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

3. REQUIREMENTS

3.1 Material. The material shall consist of a suitable synthetic properly formulated with plasticizers pigment, lubricants, or such other ingredients as may be necessary to conform to this specification.

3.1.1 Uniformity. All material of the same type and product of any one manufacturer shall be uniform in texture, color, cross section, finish, and in the properties specified in tables I and Ia.

3.1.2 Color. Unless otherwise specified in the contract or purchase order (see 6.2), the material shall be furnished in natural color.

3.2 Direction of twist. Unless otherwise specified in the contract or purchase order (see 6.2), the direction of twist of yarn or cordage shall be either S or Z.

NOTE: A yarn or cordage has S-twist if, when held in a vertical position, the spirals conform in direction of slope to the central portion of the letter S, and Z-twist if the spirals conform in direction of slope to the central portions of the letter Z.

3.3 Units. Organic synthetic fibers shall be supplied in balls, braider tubes, serving cheeses, cops, or spools, as specified (see 6.2).

3.4 Sizes. Organic synthetic fibers shall be furnished in the size (diameters for monofilaments; or deniers (see 6.5.5) for yarns and cordages) specified (see 6.2 and 6.4).

3.5 Property values. The property values shall be as specified in tables I and Ia for the various types and forms of fibers.

3.6 Workmanship. The material shall be manufactured and processed in a manner that will insure its meeting all the requirements of this specification.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier 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.

TABLE I. Property values of organic synthetic fibers.

Property to be tested	Method paragraph	Conditioning procedure (see 4.5.1.2)	Unit of value	Values required for each type of material								
				Type P		Type PAA	Type VC	Type PVCA	Type AR	Type VCR	Type CTA	Type PSTR
				Form MF	Forms C and Y	Forms C and Y	Form MF	Form MF	Forms C and Y	Forms C and Y	Forms C and Y	Forms C and Y
Tenacity unknotted	4.5.4.3	C-96/23/50	Minimum average gm/denier	---	4.10	4	---	---	1.20	1.50	1.18	---
			Minimum average lb/in²	42,000	---	---	30,000	3,000	---	---	---	---
		C-24/23/65	Minimum average gm/denier	---	---	---	---	---	---	---	---	6.0
		D-24/23	Maximum average percent decrease	20	20	25	10	5	54	50	50	5.0
Elongation at rupture unknotted	4.5.4.3	C-96/23/50	Minimum average percent	20	10	16	20	200	20	10	20	---
		C-24/23/65	Minimum average percent	---	---	---	---	---	---	---	---	11
		D-24/23	Minimum average percent	18	10	18	10	180	20	10	25	13
Elastic recovery	4.5.4.4	C-96/23/50	Minimum average percent	80	65	70	75	75	15	20	20	---
		C-24/23/65	Minimum average percent	---	---	---	---	---	---	---	---	80
Moisture absorption	4.5.4.5	(See 4.5.4.5)	Maximum average percent	6	12	10	1	1	14	28	11	3
Lengthwise linear change	4.5.4.6	E-2/100	Maximum average percent	5	5	0.5	10	10	0.5	1.5	0.5	5
Cold bend	4.5.4.7	E-2/-35	---	1/	1/	1/	1/	1/	1/	1/	1/	---
		E-2/-67	---	---	---	---	---	---	---	---	---	1/

1/ No cracks or breaks.

TABLE Ia. Additional property values for type PAA.

Property to be tested 1/	Conditioning procedure	Unit of value	Value
Initial modulus	C-96/23/50	Minimum gm/denier	90
Modulus at 1% elongation	C-96/23/50	Minimum gm/denier	85
Loss in tenacity	E-168/260	Maximum percent	25
Loss in elongation at rupture	E-168/260	Maximum percent	40
Modulus at 1% elongation	E-168/260	Minimum gm/denier	80

1/ Method paragraph is 4.5.4.3.3.1

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4.1.1 Test equipment and inspection facilities. Test and measuring equipment and inspection facilities of sufficient accuracy, quality and quantity to permit performance of the required inspection shall be established and maintained by the supplier. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with MIL-C-45662.

4.2 Classification of inspections. The inspection specified herein is classified as quality conformance inspection (see 4.4).

4.3 Inspection conditions. Unless otherwise specified herein, all inspections shall be performed in accordance with the following test conditions:

Temperature	-	15° to 35°C.
Relative humidity	-	45 to 75 percent.
Air pressure	-	650 to 800 millimeters of mercury.

4.4 Quality conformance inspection.

4.4.1 Inspection of product for delivery. Inspection of product for delivery shall consist of groups A and B inspection.

4.4.1.1 Inspection lot. An inspection lot shall consist of not more than 2,000 units of material of a given type, form, color, and size produced under essentially the same conditions and offered for inspection at one time.

4.4.1.2 Group A inspection. Group A inspection shall consist of the examination specified in table II.

TABLE II. Group A inspection.

Examination	Requirement paragraph	Method paragraph
Visual and dimensional examination:		
Type and form	3.1 to 3.1.2, inclusive	4.5.4.1
Authorized material		
Uniform texture, color, cross section, and finish		
Direction and number of twists (if specified)	3.2	
Material supplied in balls, braider tubes, serving cheeses, cops, or spools (as specified)	3.3	
Diameter (monofilament)	3.4	
Number of filaments, yarns, and ply yarns (as applicable)		

4.4.1.2.1 Sampling plan. Sample units shall be selected randomly from each inspection lot. The sample size shall be in accordance with table III. Approximately 7 yards shall be unwound from each unit in the sample.

TABLE III. Sampling for group A inspection.

Lot size	Sample size	Accept	Reject
50 and under	8	0	1
51 and over	32	1	2

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4.4.1.2.2 Classification of defects. The classification of defects for visual and dimensional examination shall be as specified in table IV.

TABLE IV. Classification of defects.

Categories	Defects
Critical:	
1	None defined.
Major:	
101	Product not type and form specified.
102	Evidence of use of unauthorized material.
103	Material not uniform in texture, color, cross-section, and finish not as specified.
104	Direction and number of twists nonconforming (if specified).
105	Material not supplied in balls, braider tubes, serving cheeses, cops, or spools (as specified).
106	Material not diameter (monofilament) specified.
107	Number of filaments, number of yarns, number of ply yarns nonconforming (as applicable).
Minor:	
201	Nondefined.

4.4.1.2.3 Defectives. Any unit in the sample containing one or more defects shall be rejected, and if the number of defective units in any sample exceeds the acceptance number for that sample (see table III), the lot represented by that sample shall be rejected. (The approximate acceptable quality level is 1.5 percent defective.)

4.4.1.2.4 Rejected lots. If an inspection lot is rejected, the supplier may rework it to correct the defects, or screen out the defective units, and resubmit for reinspection. Such lots shall be separate from new lots, and shall be clearly identified as reinspected lots.

4.4.1.3 Group B inspection. Group B inspection shall consist of the examinations and tests specified in table V.

TABLE V. Group B inspection.

Examination or test	Requirement paragraph	Method paragraph	Minimum number of specimens
Denier weight - - - - - - - - - - - - - - - - -	3.4	4.5.4.2	---
Tenacity, unknotted - - - - - - - - - - - - -	(See table I)	4.5.4.3	10
Elongation at rupture, unknotted - - - - - -			10
Initial modulus 1/ - - - - - - - - - - - - - - -	(See table Ia)	4.5.4.3.3.1	5
Modulus at 1% elongation 1/ - - - - - - - - -			5
Loss in tenacity 1/ - - - - - - - - - - - - - -			5
Loss in elongation at rupture 1/ - - - - - -			5
Modulus at 1% elongation 1/ - - - - - - - - -			5
Elastic recovery - - - - - - - - - - - - - - -	(See table I)	4.5.4.4	5
Moisture absorption - - - - - - - - - - - - -		4.5.4.5	2
Lengthwise linear change - - - - - - - - - -		4.5.4.6	3
Cold bend - - - - - - - - - - - - - - - - - - -		4.5.4.7	3

1/ Applicable to type PAA only.

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4.4.1.3.1 Sampling plan. Sample balls, braider tubes, serving cheeses, cops, or spools shall be selected in accordance with table VI. These sample units may be chosen from the group A inspection samples.

TABLE VI. Sampling for group B inspection.

Lot size	Sample size
1 to 8	1
9 to 180	2
181 to 500	3
501 to 800	5
801 to 1300	7
1301 to 2000	10

4.4.1.3.2 Defectives. If one or more units fail any test, the lot shall be rejected (see 4.5.3 and 6.6).

4.4.1.3.3 Rejected lots. If an inspection lot is rejected, the supplier may rework it to correct the defects, or screen out the defective units, and resubmit for reinspection. Such lots shall be separate from new lots, and shall be clearly identified as reinspected lots.

4.4.1.3.4 Disposition of samples. Sample units that have passed all the group B inspection may be delivered on the contract or purchase order, if the lot is accepted.

4.4.2 Inspection of preparation for delivery. 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.

4.5 Methods of examination and test.

4.5.1 Specimens.

4.5.1.1 Selection. The specimens required for testing shall be drawn from the package directly as required. The specimens shall be drawn from the side of the package to avoid disturbing the twist.

4.5.1.2 Conditioning. Specimens shall be conditioned before test, as specified in tables I and Ia.

4.5.1.2.1 Designation. The type of conditioning required shall be designated as follows:

Condition C - Humidity conditioning.
Condition D - Immersion conditioning in distilled water.
Condition E - Temperature conditioning.

4.5.1.2.2 Procedures. The conditioning procedure required shall be indicated by the following combination of symbols:

(a) A capital letter indicates the type of conditioning.
(b) The first number indicates in hours the duration of the conditioning.
(c) The second number indicates in degrees centigrade the conditioning temperature (a minus preceding a number indicates a negative temperature).
(d) The third number indicates relative humidity, whenever relative humidity is controlled. (Relative humidity obtained over calcium chloride shall be taken as zero.)

The capital letter shall be followed by a dash and the numbers shall be separated by a slant mark.

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4.5.1.2.3 Tolerances. Conditioning chambers and baths shall be such as to maintain the specified temperature within ±1°C and the specified relative humidity within ±2 percent. Tolerances for time of exposure shall be as follows: 2 ±1/4 hour, 24 ±1/4 hour, 96 ±1/2 hour, and 168 ±1/2 hour. Heat aging shall be in a forced-air circulation type chamber. The uniformity of the temperature throughout the chamber shall be ±1°C except for Type PAA which shall be 260° ± 5°C and Type PSTR which shall be -67° ± 3°C.

4.5.2 Number of tests. The minimum number of specimens to be subjected to each test shall be as specified in table V. When more than one conditioning procedure is specified (see table I), the number of specimens shall be equally divided between the conditioning procedures.

4.5.3 Property values. When specimens are tested as specified herein, the values obtained from a set of specimens for a specific property and conditioning procedure shall be averaged and that average shall conform to the specified requirements (see table I), except those for the additional property values for type PAA. For the additional properties specified for type PAA, at least 90 percent of the specimens tested shall conform to the specified requirements (see table Ia).

4.5.4 Test methods.

4.5.4.1 Visual and dimensional examination. The specimen shall be examined to verify that the material, dimensions, and workmanship are in accordance with the applicable requirements (see 3.1 to 3.4, inclusive, and 3.6).

4.5.4.2 Denier weight (see 3.4). A length of yarn weighing at least 0.1 gram, conditioned at C-96/23/50, shall be weighed, and its length shall be measured. The precision of measurement of weight and length shall be such as to introduce a relative error of 0.25 percent or less. The denier (see 6.5.5) shall be calculated from the following formulas:

$$\text{Denier} = \frac{\text{weight in grams}}{\text{length in meters}} \times 9{,}000$$

or

$$\text{Denier} = \frac{\text{weight in grams}}{\text{length in inches}} \times 354{,}300$$

4.5.4.3 Tenacity and elongation at rupture and modulus (see tables I and Ia).

4.5.4.3.1 Apparatus. Tenacity and elongation shall be determined by using a standard pendulum-type tensile tester or other suitable type test equipment. The machine shall preferably be power-driven.

4.5.4.3.2 Specimens. Specimens, each at least 18 inches long, shall be tested unknotted. The test on wet specimens shall be started within 1 minute after removal from the water bath.

4.5.4.3.3 Procedure. Bench marks 10 inches apart shall be used. When measuring the distance stretched, sufficient tension shall be applied to remove any kink or slack, but not enough to produce any appreciable lengthening. The specimens shall be stretched in the machine until they break, with the jaws of the machine separating at the rate of 12 ±1/2 inches per minute. The breaking strength shall be recorded in all cases. The elongation shall be measured at the instant of rupture for the unknotted specimens. Tests in which the specimen breaks at the jaw shall be disregarded and new specimens shall be substituted for them. The average tenacity (in grams per denier or lbf/in^2 for all specimens and the percent elongation for unknotted specimens shall be determined.

4.5.4.3.3.1 Procedure for polyaryl-amide, type PAA. The procedure for type PAA shall be the same as 4.5.4.3.3, except that the rate of separation shall be 6 ±1/2 inches per minute. Stress-strain data shall be recorded for up to at least 1 percent elongation of the specimen. Initial modulus in grams per denier shall be calculated from that portion of the data which show a constant modulus. The modulus at 1 percent elongation shall also be recorded.

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4.5.4.4 Elastic recovery (see table I).

4.5.4.4.1 Specimens. Specimens, each at least 18 inches long, shall be tested unknotted. The specimens shall be stretched an amount equal to 50 percent of the elongation value specified in table I; the stretch shall be maintained for a period of 100 seconds and the material allowed to recover for 60 seconds.

4.5.4.4.2 Procedure. The rate of elongation and the bench marks shall be as specified in 4.5.4.3.3. When measuring the distance stretched, sufficient tension shall be applied to remove any kink or slack, but not enough to produce any appreciable lengthening. The percent return shall be determined as follows:

$$\text{Percent return} = R/S \times 100$$

Where:

S = distance stretched (distance between bench marks after stretching, less 10 inches).

R = distance returned (distance between bench marks after stretching, less distance between bench marks after return).

4.5.4.5 Moisture absorption (see table I). Specimens, each weighing at least 0.10 gram, shall be tested by placing the specimens in individual uncovered weighing bottles 100 millimeters high by 40 millimeters in diameter, and subjecting them to condition C-96/23/0. Each bottle with specimen shall then be weighed and subjected to condition C-96/23/96, after which it shall be weighed again. All weighings shall be made with bottles covered. The gain in weight divided by the dry weight of the specimen and multiplied by 100 shall be reported as the percent moisture absorption.

4.5.4.6 Lengthwise linear change (see table I).

4.5.4.6.1 Specimens. Specimens, each 6 inches long, shall be tested.

4.5.4.6.2 Procedure. Bench marks shall be 5 inches apart. The specimens shall be supported on a thin smooth-surfaced metal plate well covered with talc, in an oven and subjected to condition E-2/100. The specimens shall then be removed and cooled to room temperature (23°C). The length of the material before and after heating shall be measured and the percent shrinkage calculated from these values as follows:

$$\text{Percent shrinkage} = \frac{L_1 - L_2}{L_1} \times 100$$

Where:

L_1 = length before heating.

L_2 = length after heating.

4.5.4.7 Cold bend (see table I).

4.5.4.7.1 Specimens. Specimens, each 6 inches long, shall be tested.

4.5.4.7.2 Procedure. Each specimen shall be creased upon itself while at the specified conditioning temperature (see table I). Failure shall be defined by cracks or breaks.

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5. PREPARATION FOR DELIVERY

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

5.1.1 Level A.

5.1.1.1 Cleaning. Synthetic fiber material shall be cleaned in accordance with MIL-P-116, process C-1.

5.1.1.2 Drying. Synthetic fiber material shall be dried in accordance with MIL-P-116.

5.1.1.3 Preservative application. Preservatives shall not be used.

5.1.1.4 Unit packaging. Synthetic fiber material shall be packaged in the unit specified (see 3.3 and 6.2) in accordance with MIL-P-116, method III insuring compliance with the general requirements paragraph under methods of preservation (unit protection) and the physical protection requirements paragraph therein.

5.1.1.5 Intermediate packaging. Not required.

5.1.2 Level C. Synthetic fiber material shall be clean, dry and packaged in a manner that will afford adequate protection against corrosion, deterioration and physical damage during shipment from supply source to the first receiving activity.

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

5.2.1 Level A. The packaged synthetic fiber material shall be packed in fiberboard containers conforming to PPP-B-636, class weather resistant, style optional, special requirements. In lieu of the closure and waterproofing requirements in the appendix of PPP-B-636, closure and waterproofing shall be accomplished by sealing all seams, corners and manufacturer's joint with tape, two inches minimum width, conforming to PPP-T-60, class 1 or PPP-T-76. Banding (reinforcement requirements) shall be applied in accordance with the appendix to PPP-B-636 using nonmetallic or tape banding only.

5.2.2 Level B. The packaged synthetic fiber material shall be packed in fiberboard containers conforming to PPP-B-636, class domestic, style optional, special requirements. Closures shall be in accordance with the appendix thereto.

5.2.3 Level C. The packaged synthetic fiber material shall be packed in shipping containers in a manner that will afford adequate protection against damage during direct shipment from the supply source to the first receiving activity. These packs shall conform to the applicable carrier rules and regulations.

5.2.4 Unitized loads. Unitized loads, commensurate with the level of packing specified in the contract or order, shall be used whenever total quantities for shipment to one destination equal 40 cubic feet or more. Quantities less than 40 cubic feet need not be unitized. Unitized loads shall be uniform in size and quantities to the greatest extent practicable.

5.2.4.1 Level A. Synthetic fiber material, packed as specified in 5.2.1. shall be placed on pallets in conformance with MIL-STD-147, load type I, with a fiberboard cap (storage aid 4) positioned over the load.

5.2.4.2 Level B. Synthetic fiber material, packed as specified in 5.2.2, shall be palletized as specified in 5.2.4.1 except that the fiberboard caps shall be class domestic.

5.2.4.3 Level C. Synthetic fiber material, packed as specified in 5.2.3. shall be unitized with pallets and caps of the type, size and kind commonly used for the purpose and shall conform to the applicable carrier rules and regulations.

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5.3 Marking. In addition to any special marking required by the contract or order, each unit package, exterior container and unitized load shall be marked in accordance with MIL-STD-129.

5.4 General.

5.4.1 Exterior containers. Exterior containers (see 5.2.1, 5.2.2 and 5.2.3) shall be of a minimum tare and cube consistent with the protection required and shall contain equal quantities of identical stock numbered items to the greatest extent practicable.

5.4.2 Navy procurements. For Navy procurements the use of polystyrene, loose fill material (such as strips, strands and beads) is prohibited for packaging and packing applications.

5.4.3 Army procurements (see 5.1.1.4, 5.2.1, 5.2.2 and 5.2.4.2). All unit containers shall either be weather resistant or overwrapped with waterproof barrier materials. For level A packing when quantities per destination are less than a unitized load, the fiberboard containers shall not be banded but shall be placed in a close fitting box conforming to PPP-B-601, overseas type; PPP-B-621, class 2, style 4 or PPP-B-585, class 3, style 2 or 3. Closure and strapping shall be in accordance with the applicable container specification except that metal strapping shall conform to QQ-S-781, type I, class B. For level B packing fiberboard boxes shall be weather resistant as specified in level A and the containers shall be banded. Weather resistant fiberboard caps shall be used for level B unitized loads.

6. NOTES

6.1 Intended use.

6.1.1 Type P material is intended for applications requiring high tenacity, moisture resistance, and recovery. It is employed in lieu of silk in the finer sizes of magnet wire and cable applications. This type of material should not be used out-of-doors.

6.1.2 Type PAA material is intended for applications requiring tenacity, modulus, or heat resistance higher than for any of the types listed above. It may be used in contact with copper in wet or dry environments.

6.1.3 Type VC material in monofilament form is intended for applications requiring a relatively high tenacity and very high moisture resistance.

6.1.4 Type PVCA material is intended for cordage applications requiring a high degree of elongation and good elastic recovery.

6.1.5 Type AR material is intended for applications not requiring high tenacity, but where use may be made of its dyeing properties, sea-water resistance, and thermoplastic properties.

6.1.6 Type VCR material is intended for applications requiring good tenacity and ability to take a high degree of twist and where a fair degree of moisture absorption can be tolerated. This material should not be used in contact with copper under humid conditions.

6.1.7 Type CTA material is intended for use in applications where high electrical resistivity and high moisture resistance are required.

6.1.8 Type PSTR material is intended for use in applications requiring extremely high tenacity and recovery and good cold bend properties. This material also has good resistance to aging and abrasion.

6.2 Ordering data. Procurement documents should specify the following:

(a) Title, number, and date of this specification.
(b) Type and form required (see 1.2).
(c) Color, if other than natural is required (see 3.1.2).

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(d) Whether material is to be furnished in balls, braider tubes, serving cheeses, cops, or spools; the number required and the number of yards to be furnished in each (see 3.3).
(e) Size required (see 3.4, 6.4, and table VII).
(f) Number of filaments in yarn (if required by application).
(g) Number of plies in cordage (if required by application).
(h) Number of twists and direction of twist (if required by application).
(i) Levels of preservation, packaging, and packing required (see section 5).

6.3 Calculation of diameters. The approximate diameters in inches of the various sizes of the various types of materials, at condition C-96/23/50, can be calculated from the approximate density and nominal deniers by using the following formula: 1/

$$D = 0.000468 \sqrt{\frac{\text{denier}}{d}}$$

Where:

D = diameter in inches.

d = density in gm/cm^3.

Example: Type P

Denier size = 15

d = 1.14 gm/cm^3

$$D = 0.000468 \sqrt{\frac{15}{1.14}}$$

$$= 0.000468 \sqrt{13.16}$$

$$= 0.000468 \ (3.6)$$

$$= 0.001685 \text{ inch}$$

6.4 Sizes. Not all synthetic fibers are available in all forms and sizes from all manufacturers. Before requisitioning, sizes available should be checked with the manufacturer. For the guidance of those requisitioning these materials, table VII gives the presently available forms and sizes.

6.4.1 Tex yarn numbering system. Denier units may be converted into Tex units by dividing by 9. (A Tex unit is numerically equal to the mass in grams of 1 kilometer of yarn.)

6.5 Definitions.

6.5.1 Cordage. Cordage (form C) is the product formed by twisting together two or more ply yarns.

6.5.2 Yarn. Yarn (form Y) is the product formed by two or more single continuous filament threads when twisted together.

6.5.3 Monofilament. Monofilament (form MF) is a single continuous filament.

6.5.4 Ply yarn. Ply yarn is the product formed by twisting together two or more yarns.

6.5.5 Denier. Denier is the unit weight of yarn or cordage, based upon a skein 450 meters long, weighing 0.05 gram. It is numerically equal to the number of grams per 9,000 meters (see 6.4.1).

1/ Applicable to untwisted strands only.

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TABLE VII. Forms and sizes.

Denier	Type P	Type PAA	Type VC	Type PVCA	Type AR	Type VCR	Type CTA	Type PSTR
Monofilaments (form MF)								
---	Diameter 0.005 to 0.055 inch	---	Diameter 0.004 to 0.08 inch	Diameter up to 0.060 inch	---	---	---	---
Yarn (form Y) and cordage (form C)								
15	X	---	---	---	---	---	---	---
20	X	---	---	---	---	---	---	---
30	X	---	---	---	---	X	---	---
39	X	---	---	---	---	---	---	---
40	X	---	---	---	---	---	---	---
45	---	---	---	---	X	---	---	---
50	---	---	---	---	---	X	X	---
55	---	---	---	---	X	---	X	X
60	X	---	---	---	---	---	---	X
70	X	---	---	---	---	---	---	X
75	---	---	---	---	X	X	X	---
90	---	---	---	---	---	---	---	---
100	---	---	---	---	X	X	X	---
120	---	---	---	---	X	---	X	---
125	---	---	---	---	---	X	---	---
140	---	---	---	---	---	---	---	X
150	---	---	---	---	X	X	X	---
200	---	X	---	---	X	X	X	---
220	---	---	---	---	---	---	---	X
250	---	---	---	---	---	X	---	---
270	---	---	---	---	---	---	---	---
300	---	---	---	---	X	X	X	---
440	---	---	---	---	---	---	---	X
450	---	---	---	---	X	X	X	---
600	---	---	---	---	X	---	X	---
840	---	---	---	---	---	---	---	X
900	---	---	---	---	X	---	---	---
1000	---	---	---	---	---	---	---	X
1100	---	---	---	---	---	---	---	X
1200	---	X	---	---	---	---	---	---

X = An available form, type, and size.

6.6 Indications of possible test failures. Possible test failures are defined as follows:

(a) Denier weight: (specified procedures). Material not denier specified.
(b) Tenacity and elongation: (specified procedure and conditions).
  (1) Average tenacity less than minimum required value.
  (2) Elongation at rupture less than minimum requirement.
(c) Elastic recovery: (specified procedures).
  Recovery less than minimum specified.
(d) Moisture absorption: (specified procedures).
  Average percent moisture absorption exceeds limiting maximum.
(e) Lengthwise linear change: (specified procedures).
  Average percent shrinkage exceeds limiting maximum.
(f) Cold bend: (specified procedures).
  Material cracks, breaks.

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

Custodians:
Army - EL
Navy -
Air Force - 82

Review activities:
Army - EL, MI, AV
Navy -
Air Force - 80, 82
DSA - ES

User activities:
Army - MU, WC
Navy - SH, YD
Air Force -

Preparing activity:
Army - EL

Agent:
DSA - ES

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(TO DETACH THIS FORM, "ALONG THIS LINE.")

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER

2. DOCUMENT TITLE

3a. NAME OF SUBMITTING ORGANIZATION

4. TYPE OF ORGANIZATION *(Mark one)*

- ☐ VENDOR
- ☐ USER
- ☐ MANUFACTURER
- ☐ OTHER *(Specify)*: _____

b. ADDRESS *(Street, City, State, ZIP Code)*

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 Code)* – Optional

c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional

8. DATE OF SUBMISSION *(YYMMDD)*

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