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Superseding
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The following commercial specification is originally adopted from the military documents. Revision A includes all known accepted revisions, amendments, notices and Department of Defense (DOD) engineering changes previously developed for this item. Revision B and forward include changes adopted to reflect technology and design evolution.

TAPE, TEXTILE: WEBBING TEXTILE, NYLON

The Parachute Industry Association makes this document available for use by Industry and Government organizations that wish to apply this specification to their products.

1. SCOPE

1.1 Scope. This specification covers five classes of nylon tapes used in the fabrication of canopies of ribbon parachutes.

1.2 Classification. The tapes shall be furnished in the various classes and types indicated in TABLE I, as specified (see 6.2).

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in Sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification 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 the documents cited in Sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government publications.

2.2.1 Government publications. The following Government publication forms a part of this document.

FEDERAL TRADE COMMISSION (FTC)

16 CFR 303 - Rules and Regulations Under the Textile Fiber Products Identification Act

(Copies are available online at www.ftc.gov or from the Federal Trade Commission, 600 Pennsylvania Avenue, N.W. Washington, DC 20580-0001. Electronic copies may also be obtained from <http://www.access.gpo.gov/>.)

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Documents
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2.3 Non-government publications. The following documents form part of this document.

AMERICAN SOCIETY FOR QUALITY (ASQ)

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

(Copies are available online at: www.asq.org or from the American Society for Quality, 600 North Plankinton Avenue, Milwaukee, WI 53203. Electronic copies may also be obtained from www.access.gpo.gov/.)

ASTM INTERNATIONAL (ASTM)

ASTM D276	- Standard Test Methods for Identification of Fibers in Textiles
ASTM D737	- Standard Test Method for Air Permeability of Textile Fabrics
ASTM D1423	- Standard Test Method for Twist in Yarns by Direct-Counting
ASTM D1776	- Standard Practice for Conditioning and Testing Textiles
ASTM D1907	- Standard Test Method for Linear Density of Yarn (Yarn Number) by the Skein Method
ASTM D2256	- Standard Test Method for Tensile Properties of Yarns by the Single Strand Method
ASTM D3774	- Standard Test Method for Width of Textile Fabric
ASTM D3775	- Standard Test Method for Warp (End) and Filling (Pick) Count of Woven Fabrics
ASTM D3776	- Standard Test Methods for Mass per Unit Area (Weight)
ASTM D5034	- Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test)
ASTM D5035	- Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method)
ASTM D6775	- Standard Test Method for Breaking Strength and Elongation of Textile Webbing, Tape and Braided Materials
ASTM G151	- Standard Practice for Exposing Nonmetallic Materials in Accelerated Test Devices that Use Laboratory Light Sources
ASTM G155	- Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

(Application for copies should be addressed to ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959. Electronic copies may be obtained from www.astm.org.)

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

AATCC 8	- Colorfastness to Crocking: AATCC Crockmeter Method
AATCC 16.2	- Colorfastness to Light: Carbon-Arc

- AATCC 16.3 - Colorfastness to Light: Xenon-Arc
- AATCC 20 - Fiber Analysis: Qualitative
- AATCC 81 - pH of Water-Extract from Wet Processed Textiles
- AATCC 192 - Weather Resistance of Textiles: Sunshine-Arc Lamps
Exposure With and Without Wetting

AATCC Evaluation Procedures:

- 1 Gray Scale for Color Change
- 2 Gray Scale for Staining
- 8 AATCC 9- Step Chromatic Transference Scale
- 9 Visual Assessment of Color Differences of Textiles

(Applications for copies should be addressed to the AATCC National Headquarters, P.O. Box 12215 Research Triangle Park, NC 27709-2215. Electronic copies may be obtained from www.aatcc.org.)

PARACHUTE INDUSTRY ASSOCIATION (PIA)

PIA-STD-1480 - COLOR CODES FOR WEBBING, TEXTILE;
MANUFACTURES IDENTIFICATION

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 First Article. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.2.

3.2 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs (see 3.4).

3.3 Standard. When applicable, the finished tape shall match the standard for shade and appearance, and shall, unless otherwise indicated, be equal to or better than the standard with respect to all characteristics for which the standard is referenced (see 6.1).

3.4 Material.

3.4.1 Nylon Yarns. The nylon used in the manufacture of Class A tapes shall be semi-dull, normal tenacity yarns. The nylon used in the manufacture of Classes B, C, D, and E shall be bright, high-tenacity, light and heat resistant yarns. The nylon yarns used for all classes shall be polyamide prepared from hexamethylene diamine and adipic acid or its derivatives and shall have a melting point of $254 \pm 10^{\circ}\text{C}$ when tested in accordance with method AATCC 20. The yarn shall not be bleached in any manner or process (see 4.2.3.3).

3.4.2 Twist. The warp and filling yarn for Classes A, B, and C shall have 10 turns ± 1 turn of "Z" twist per inch. For Class D all Types and Class E, Types I, II, III and IV the warp yarns shall have 1 turn $\pm 1/2$ turn of "Z" twist per inch, and the filling yarns shall have a minimum of 2 $\frac{1}{2}$ turns of "S" twist per inch. For Class E, Types V and VI the warp and filling yarns shall have a minimum of 2 $\frac{1}{2}$ turns of either "S" or "Z" twist per inch.

3.4.3 Fiber identification. When directed in the procurement document or purchase order, each spool of tape shall be labeled or ticketed and invoiced for fiber content in accordance with the Rules and Regulations Under the Textile Fiber Products Identification Act 303 16 CFR (see 2.2.1).

3.5 Weave.

3.5.1 Body. Unless otherwise specified, the body weave shall be a conventional two-up and two-down, right-hand twill, except that for Class E, Type VI the warp ends shall weave two ends as one.

3.5.2 Selvage. Unless otherwise specified, the selvage weave for Classes A, B, and C shall be a double weave of a conventional hatband type. For Classes D and E there shall be no additional selvage ends.

3.6 Physical and chemical properties. The physical and chemical properties of the finished tape shall conform to TABLE I and 3.6.1 through 3.6.4.

3.6.1 pH. The pH value of the finished tape shall be within the range of 5.5 to 9.0, when tested as specified in 4.4.4.

3.6.2 Color. Unless otherwise specified, the color shall be natural, except for Class B, Type VI which shall be dyed International Orange, color No. 12197 of FED-STD-595, and Class C, Type V which shall be yarn or piece-dyed yellow, Air Force color No. 1365 (see 6.2). Premetallized dyes have proven satisfactory in dyeing the tape. The requirements for light and heat resistance are based on the use of this class of dye.

3.6.2.1 Visual shade matching. When evaluated in accordance with 4.5.2, the color of the dyed webbing shall match the standard with sources simulating artificial daylight and shall be a good match to the standard under incandescent lamplight.

3.6.2.2 Colorfastness to light. PIA has adopted AATCC 16.3 as an acceptable alternative test method to AATCC 16.2 for the testing of Narrow Fabrics using Xenon (see TABLE V).

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TABLE I Construction and Physical Requirements.

Class	Type	Width, inches	Weight (yd./lb.) minimum	Breaking strength lbs. minimum	Warp ends (minimum)		Filling picks per inch minimum	Elongation (percent) minimum	Air permea- bility ^{2/} (cfm/sq. ft.)	Yarn denier	
					Total	Selvage				Warp	Filling
A Extra light- weight	I	0.250 ± .0156	1,300	13	72	12	140	18	—	20	40
	II	0.375 ± .0156	875	18	104	12	140	18	—	20	40
	III	0.625 ± .0312	440	43	237	32	140	18	—	20	40
	IV	1.250 ± .0625	260	65	352	32	140	18	—	20	40
	V	2.000 ± .0625	165	96	537	32	—	18	150 ± 30	20	40
B Light- weight	I	0.250 ± .0156	970	22	86	12	118	18	—	30	40
	II	0.375 ± .0156	650	33	126	12	118	18	—	30	40
	III	0.625 ± .0312	360	70	237	32	118	18	—	30	40
	IV	1.250 ± .0625	210	120	392	32	118	18	—	30	40
	V	2.000 ± .0625	120	200	657	32	—	18	150 ± 30	30	40
	VI	5.000 ± .1875	50	100 ^{1/}	1,616	32	—	18	150 ± 30	30	40
C Medium- weight	I	0.250 ± .0156	770	39	100	12	82	22	—	40	40
	II	0.375 ± .0156	520	58	148	12	82	22	—	40	40
	III	0.625 ± .0312	335	90	227	32	82	22	—	40	40
	IV	1.250 ± .0625	160	185	457	32	82	22	—	40	40
	V	2.000 ± .0625	100	300	757	32	80	22	150 ± 30	40	40
D Heavy- weight	I	1.250 ± .0625	80	280	94	0	52	18	—	210	210 ^{2/}
	II	2.000 ± .0625	45	460	154	0	52	18	—	210	210 ^{2/}
E Extra Heavy- weight	I	1.250 ± .0625	50	650	240	0	36	18	—	210	210 ^{2/}
	II	2.000 ± .0625	30	1,000	378	0	36	18	—	210	210 ^{2/}
	IIa	2.000 ± .0625	30	1,000	378	0	72 ^{3/}	18	—	210	210
	III	2.000 ± .0625	22	1,500	280 ^{1/}	0	36	—	—	420	420
	IV	2.000 ± .0625	17	2,000	378 ^{1/}	0	36	—	—	420	420
	V	2.000 ± .0625	13	3,000	260	0	26	—	—	840/1	840 ^{1/}
	VI	2.000 ± .0625	11	4,000	350	0	24	—	—	840/1	420 ^{1/}

Notes:

^{1/} Pound per inch of width^{2/} Applicable to both dyed and undyed tape^{3/} Shuttleless loom construction 2 picks per shed.

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3.6.2.3 Colorfastness. When tested as specified in 4.4.4, the dyed tape or webbing shall show fastness to light, laundering and crocking as follows:

Characteristic	Rating, minimum
Light (Fade) ^{2/}	3-4
Laundering ^{1/} :	
Color Stain	3-4
Shade Change	3-4
Crocking ^{3/} :	
Dry	3.5
Wet	3.5
Testing shall be as specified in 4.4.4	

Notes:

^{1/} Rated using the AATCC Evaluation Procedure 1, Gray Scale for Color Change and AATCC Evaluation Procedure 2, Gray Scale for Staining.

^{2/} Rated using the AATCC Evaluation Procedure 1, Gray Scale for Color Change.

^{3/} Rated using the AATCC Evaluation Procedure 8, AATCC 9-Step Chromatic Transference Scale.

3.6.2.4 Color fastness of identification yarns. The type identification, manufacturer's identification and catch-cord yarns for Class E, Type IIA only, shall show colorfastness to light and laundering as follows:

Characteristic	Rating, Min
Light (Fade) ^{2/}	3-4
Laundering ^{1/} :	
Color Change	2-3
Staining Shade Change	2-3
Testing shall be as specified in 4.3.1.1	

Notes:

^{1/} Rated using the AATCC Evaluation Procedure 1, Gray Scale for Color Change and AATCC Evaluation Procedure 2, Gray Scale for Staining.

^{2/} Rated using the AATCC Evaluation Procedure 1, Gray Scale for Color Change.

3.6.2.5 Manufacturer's identification. Each manufacturer shall incorporate, as part of the binder warp, 2 ends dyed to match the shade assigned to that manufacturer in accordance with PIA-STD-1480.

3.6.3 Light and heat resistant. With the exception of Class A, the finished tape shall not lose more than 25 percent of its initial strength, when tested in accordance with 4.5.1.

3.6.4 Bleaching. The tape shall not be bleached in any manner or process.

3.7 Length and put-up. Unless otherwise specified (see 6.2), the tape shall be put on spools. No spool shall contain more than 3 pieces, and no piece shall be less than 40 yards unless other-specified (see 4.4.3 and 6.2).