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

WEBBING, TEXTILE, NYLON, TUBULAR

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 woven nylon tubular webbing for parachutes.

1.2 Classification. The webbing shall be of the following classes, and the widths shall be as specified in TABLE I (see 6.2).

Class 1	- Shuttle loom
Class 1a	- Shuttle or shuttleless loom

1.2.1 Class reference. Unless otherwise noted (see 6.2), when procurement documents referencing this specification do not specify the class of webbing, the requirements for Class 1a webbing shall apply. When Class 1a webbing is specified, Class 1 is an acceptable alternate.

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 nor is it 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 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 publications form a part of this document.

STANDARDS

FEDERAL

FED-STD-595 - Colors Used in Government Procurement

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AA Documents
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(Unless otherwise indicated, copies of the above standard are available from the DLA Document Services, Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094. Electronic copies may be obtained from <https://assist.daps.dla.mil/quicksearch/>.)

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 20580-001. Electronic copies may also be obtained from www.access.gpo.gov/.)

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

AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS (AATCC)

- AATCC 16.2 - Colorfastness to Light: Carbon-Arc
- AATCC 16.3 - Colorfastness to Light: Xenon-Arc
- AATCC 20 - Fiber Analysis: Qualitative
- AATCC 61 - Colorfastness to Laundering: Accelerated
- AATCC 81 - pH of the Water-Extract from Wet Processed Textiles
- AATCC 192 - Weather Resistance of Textiles: Sunshine-Arc Lamp Exposure with and without Wetting
- AATCC Evaluation Procedures:
 - 1 Gray Scale for Color Change
 - 2 Gray Scale for Staining
 - 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.)

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.)

ASTM INTERNATIONAL (ASTM)

- ASTM D1423 - Standard Test Method for Twist in Yarns by Direct-Counting
- ASTM D1776 - Standard Practice for Conditioning and Testing Textiles
- ASTM D1777 - Standard Test Method for Thickness of Textile Materials
- ASTM D1907 - Standard Test Method for Linear Density of Yarn (Yarn Number) by the Skein Method
- ASTM D3774 - Test Method for Width of Textile Fabric
- ASTM D3775 - Standard Test Method for Warp (End) Count and Filling (Pick) Count of Woven Fabric

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| ASTM D3776 | - Standard Test Method for Mass Per Unit Area (Weight) of Fabric |
| 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 the ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959. Electronic copies may be obtained from www.astm.org/.)

PARACHUTE INDUSTRY ASSOCIATION (PIA)

PIA-TEST METHOD-4108 - STRENGTH AND ELONGATION, BREAKING; TEXTILE WEBBING, TAPE AND BRAIDED ITEMS

(Electronic copies may be obtained from www.pia.com.)

2.4 Order of precedence. Unless otherwise stated 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 Standard. The dyed webbing shall match the standard for shade and appearance, unless otherwise indicated, and shall be equal to or better than the standard with respect to all characteristics for which the standard is referenced (see 6.1).

3.3 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.

3.4 Material.

3.4.1 Yarn. The nylon yarn shall be a bright, high tenacity, light and heat resistant polyamide prepared from hexamethylene diamine and adipic acid or its derivatives. It shall have a melting point of $496 \pm 16^{\circ}\text{F}$ ($258 \pm 9^{\circ}\text{C}$). The yarn shall not be bleached in any manner or in any subsequent process.

3.4.2 Weave. For shuttle loom construction the weave shall be tubular, plain, one up and one down. Webbing woven with two filling yarns per shed is prohibited. For shuttleless loom construction the weave shall be tubular, plain (two up and two down with 2 filling yarns per shed). The filling yarn shall traverse the full width of the webbing and shall be held at the edge by an extra catch-cord end (3.7) interlaced with the filling yarn, in accordance with a method shown in FIGURE 1.

3.4.3 Denier. The warp yarns for shuttle loom constructions shall be singles 840 (nominal). The final ply of warp yarn shall be as referenced in TABLE 1. The filling yarn for all shuttle loom widths shall be single 840 denier (nominal) except; 5/8, 3/4 and 1 inch width webbing shall be 2 ply 840 (nominal). The filling yarn for all shuttleless loom widths shall be single 420 denier (nominal) except; 5/8, 3/4 and 1 inch width webbing shall be single 840 (nominal). When a 2 ply 840 denier nylon is specified, a single 1680 denier nylon is an acceptable substitute.

3.4.4 Twist. The final ply of yarn, whether single or multiple, shall have a minimum of 2-1/2 turns per inch in both the warp and fill of shuttle loom constructions, and only the warp in shuttleless loom constructions, when taken from the webbing and tested as specified in 4.7.4.

3.5 Color. When dyed webbing is required, the webbing shall be either piece dyed or yarn dyed. Except for the identification yarns (see 3.6), the color of the webbing and its referenced standard shall be as specified by the procuring activity or order (see 6.1).

3.5.1 Visual shade matching. When evaluated in accordance with 4.8.4, the color of the dyed fabric shall match the standard when viewed with sources simulating artificial daylight, and shall be a good match to the standard under incandescent lamplight.

3.5.2 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).

3.5.2.1 Colorfastness. When tested as specified in 4.8.4, the webbing and tape shall show fastness to light and laundering as follows:

Characteristic	Rating (minimum)
Light (Fade) ^{2/}	3-4
Laundering ^{1/} :	
Color change	2-3
Staining	2-3
Testing shall be specified in 4.7.4	

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.

3.6 Identification yarns.

3.6.1 Natural color webbing. The identification yarns used for the natural color webbing shall be polyester, nylon 6 or nylon 6,6 yarn with an approximate size to the warp yarns and shall be woven as follows:

- a. Webbing of 1/2, 3/4 and 1 inch width shall have a yellow or black warp yarn woven in the center of one side.
- b. Webbing of 9/16 inch width shall have 3 yellow or black warp yarns woven only on the face. They shall be woven in such a manner that when the webbing is flattened these yarns will weave over the same face pick. One of the 3 yellow or black yarns shall be positioned in the center of the face side; the other 2 shall be spaced on each side of the center yarn at a distance of not less than 9, but not more than 11 face warp yarns.



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- c. Webbing of 5/8 inch width shall have 2 yellow or black warp yarns separated by 3 face warp yarns located in the center of the face side. The yellow or black yarns shall be woven in such a manner that when the webbing is flattened the yarns will weave over the same face pick.
- d. Webbing of 3/8 inch width shall have 2 yellow or black warp yarns on the face with no ends of natural in between.
- e. Webbing of 7/8 inch width shall have no identification warp yarns.

3.6.2 Dyed webbing. When dyed webbing is required, the identification yarns shall be as specified in 3.6.1, except that the color shall be black and the yarns shall be spun-dyed polyester, spun-dyed nylon 6 or yarn-dyed nylon 6,6. The identification yarns shall not pucker or form loops after the webbing has been dyed and shall be the approximate size of the warp yarns.

3.6.3 Colorfastness of identification yarns. The dyed identification yarns shall show fastness as follows:

Characteristic	Rating (minimum)
Light (Fade) ^{2/}	3-4
Laundering ^{1/} :	
Color change	2-3
Staining	2-3
Testing shall be specified in 4.7.4	

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.

3.7 Shuttleless loom identification. When shuttleless loom construction is utilized, the catch cord yarns shall respectively be 70 to 210 denier nylon or polyester, color-sealed black (see 3.4.2).

3.8 Physical requirements. The construction and physical properties of the finished webbing shall be as specified in TABLE I.

TABLE I **Physical requirements.**

Width in inches ±1/16	Thickness inch (max.)	Weight oz./linear yd. (max.)	Breaking strength, lbs. (min.)	Ends warp (min.)	Yarns per inch, filling (min.) ^{1/}	Final ply of yarn Warp
3/8	0.090	0.40	950	83	26	1
1/2	0.090	0.50	1000	111	26	1
9/16	0.090	0.60	1500	137	26	1
5/8	0.100	0.75	2250	89	26	2
3/4	0.120	1.05	2300	109	26	2
7/8	0.120	1.00	3100	121	26	2
1	0.120	1.70	4000	159	26	2

Note:

^{1/} Two yarns per shed for shuttleless webbing.



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