

AEROSPACE MATERIAL SPECIFICATION

SAE AMS3778

REV. B

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Superseding AMS3778A

Tape and Webbing, Woven, Nylon

RATIONALE

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1. SCOPE:

1.1 Form: This specification and its supplementary detail specifications cover two types of nylon tape and three types of nylon webbing.

1.2 Application: Primarily for use in the manufacture of flight clothing.

1.3 Classification: Tape and webbing shall be classified by breaking strength as shown in the applicable detail specifications.

1.4 Safety - Hazardous Materials: While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

2.1.1 Aerospace Material Specifications:

AMS-5610 - Steel Bars and Forgings, Corrosion and Moderate Heat Resistant, 12.5Cr, Low Carbon (SAE 51416, 51416Se), Free Machining

2.2 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM D 123 - Terminology Relating to Textile Materials

2.3 U.S. Government Publications: Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

2.3.1 Federal Standards:

FED-STD-191 - Textile Test Methods

2.3.2 Military Specifications:

MIL-P-43334 - Packaging of Textile Webbing and Tape

2.3.3 Military Standards:

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

3. TECHNICAL REQUIREMENTS:

3.1 Detail Specifications: The requirements for a specific tape or webbing shall consist of all requirements specified herein in addition to requirements specified in the applicable detail specification. In case of conflict between requirements of this specification and an applicable detail specification, requirements of the detail specification shall govern.

3.2 Material:

3.2.1 Nylon Yarn: Except for AMS-3778/5, the nylon yarn used in the manufacture of the tape and webbing 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 minimum melting point of 243°C (469°F). The supplier shall certify that the yarn has not been subjected to any type of bleaching process. The yarn used in the manufacture of AMS-3778/5 webbing may be a nylon made from chemicals that will ensure that the product will meet all requirements of AMS-3778/5.

3.2.2 Tape and Webbing:

3.2.2.1 Color: Shall be Air Force Sage Green No. 1520.

3.2.2.1.1 Colorfastness: Tape and webbing shall have a colorfastness rating of "good" to light (at 20 standard fading hours), to crocking, and to perspiration, determined in accordance with Table II. When a sample is designated as standard for certain colorfastness properties, the dyed and finished tape and webbing shall be equal to or better than the standard in those respects when tested as specified. If duplication of a designated colorfastness property exists by reference to an adjective rating and a standard sample, the standard sample shall govern.

- 3.2.2.1.2 Color Matching: The dyed tape and webbing shall be matched to the approved standard shade under natural (north sky) daylight, or artificial daylight, having a color temperature of 7500° Kelvin.
- 3.2.2.2 Finish:
- 3.2.2.2.1 Residual size, finishing oils, or other nonfibrous materials shall not exceed 3% of the dry weight of the tape or webbing, determined in accordance with FED-STD-191, Method 2611.
- 3.2.2.2.2 Acidity: The finished tape or webbing shall have a pH value of 5.0 to 9.0, determined in accordance with FED-STD-191, Method 2811.
- 3.3 Properties: Shall be as specified in the applicable detail specification determined in accordance with 4.5.
- 3.4 Quality: The product, as received by purchaser, shall be evenly woven and free from foreign materials and from imperfections detrimental to usage of the product.

4. QUALITY ASSURANCE PROVISIONS:

- 4.1 Responsibility for Inspection: The vendor of the product shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the requirements of this specification and the applicable detail specification.

4.2 Classification of Tests:

- 4.2.1 Acceptance Tests: Tests for the following requirements are acceptance tests and shall be performed on each lot:

Requirement	Reference
Weight	See applicable detail specification
Breaking Strength	See applicable detail specification
Quality	3.4

- 4.2.2 Preproduction Tests: Tests for all technical requirements are preproduction tests and shall be performed prior to or on the initial shipment of tape or webbing to a purchaser, when a change in ingredients and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

- 4.2.2.1 For direct U.S. Military procurement, substantiating test data, and, when requested, preproduction test material shall be submitted to the cognizant agency as directed by the procuring activity, contracting officer, or request for procurement.

- 4.3 Sampling and Testing: Shall be as follows:

4.3.1 For Acceptance Tests: Except as specified in 4.3.1.6, sufficient tape or webbing shall be taken from each lot to perform all required tests. The number of determinations for each requirement shall be as specified in the applicable test procedure or, if not specified therein, not less than three.

4.3.1.1 A lot shall be all tape or webbing of a single size and configuration produced in a single production run under the same fixed conditions and presented for vendor's inspection at one time. An inspection lot shall not exceed 5000 yards (4572 m) and may be packaged in smaller quantities and delivered under the basic lot approval provided lot identification is maintained.

4.3.1.2 Acceptance Quality Levels: Shall be as follows:

4.3.1.2.1 For yard-by-yard (metre-by-metre) examination, there shall be no more than 0.4 major imperfections (see Table I) and 6.5 total imperfections per 100 units (yards or m).

4.3.1.2.2 For overall examination, there shall be no more than one imperfection per 100 units (pieces).

4.3.1.2.3 For examination for length of spool or roll, there shall be no more than one imperfection per 100 units (spools or rolls).

4.3.1.3 Inspection Levels: Shall be as follows:

4.3.1.3.1 MIL-STD-105, Level III, shall be used for the yard-by-yard (metre-by-metre) examination. The lot size shall be expressed in units of 1 yard (1 m) each. An approximately equal number of yards (metres) shall be examined from each piece in the sample. The number of pieces to be drawn shall be computed as follows:

$$\text{Number to be drawn} = \frac{\text{Yards (m) in sample}}{35}$$

4.3.1.3.2 Overall Examination: The pieces examined shall be those selected for the yard-by-yard (metre-by-metre) examination.

4.3.1.3.3 Examination for Length of Spools or Rolls: The spools or rolls examined shall be those from which the pieces for the yard-by-yard (metre-by-metre) examination were taken.

4.3.1.4 For testing for requirements listed in the applicable detail specification, a sample or samples, each at least 7-1/2 yards (7 m) long, (for AMS-3778/1, AMS-3778/2, AMS-3778/3, and AMS-3778/4) and at least 15 yards (14 m) long (for AMS-3778/5) shall be taken from each 10,000 yards (9144 m), or fraction thereof, of finished tape or webbing of one type submitted for acceptance testing at one time, except that on lots containing 20,000 yards (18,288 m), or fraction thereof, not less than three samples shall be submitted.

4.3.1.5 When a statistical sampling plan has been agreed upon by purchaser and vendor, sampling shall be in accordance with such plan in lieu of sampling as in 4.3.1 and the report of 4.6 shall state that such plan was used.

4.3.1.6 For direct U.S. Military procurement, sampling and inspection shall be in accordance with MIL-STD-105.

4.3.2 For Preproduction Tests: As agreed upon by purchaser and vendor.

4.4 Approval:

4.4.1 Sample tape or webbing shall be approved by purchaser before tape or webbing for production use is supplied, unless such approval be waived by purchaser. Results of tests on production tape and webbing shall be essentially equivalent to those on the approved sample tape or webbing.

4.4.2 Vendor shall use ingredients, manufacturing procedures, processes, and methods of inspection on production tape and webbing which are essentially the same as those used on the approved sample tape or webbing. If necessary to make any change in ingredients or processing, in type of equipment for processing, or in manufacturing procedures, vendor shall submit for reapproval a statement of the proposed changes in ingredients and/or processing and, when requested, sample tape and webbing. Production tape and webbing made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Test Methods: Shall be as specified in Table II and the following:

4.5.1 Yard-by-Yard (Metre-by-Metre) Examination: The required length of each piece shall be inspected and visual imperfections classified as listed in Table I. The imperfections found shall be counted regardless of their proximity to each other, except where two or more imperfections represent a single local condition of the tape or webbing, in which case only the more serious imperfection shall be counted. A continuous imperfection shall be counted as one imperfection for each warpwise yard (metre), or fraction thereof, in which it occurs. The unit of tape or webbing for this examination shall be 1 linear yard(1 linear m).

4.5.1.1 The terms "noticeable" and "clearly noticeable" as used in Table I refer to imperfections clearly visible at normal inspection distance of approximately 3 feet (1m). Definition of terms used herein are given in ASTM D 123.

4.5.2 Resistance to Abrasion (AMS-3778/5 Webbing Only): Shall be tested on a device conforming to Figure 1 as follows:

4.5.2.1 Attach weight (B) to one end of the webbing (A).

4.5.2.2 Pass the webbing over the hexagon rod (C) and attach to the oscillating drum (D).

- 4.5.2.3 Oscillate the drum so that the webbing is given a 12-inch $\pm$ 1 (305-mm $\pm$ 25) traverse over the rod at a rate of 60 $\pm$ 2 strokes per minute for 5000 strokes.
- 4.5.2.4 Remove the webbing from the device and determine the breaking strength.
- 4.5.2.5 The edges of each new hexagon rod shall be identified as 1 through 6. Only alternate edges (e.g. 1, 3, and 5) shall be used for abrading the webbing and no abrading edge shall be used more than once.

TABLE I

CLASSIFICATION OF IMPERFECTIONS

Imperfection	Description	Major	Minor
Abrasion marks	Resulting in rupture of yarns, or in nap sufficient to obscure the identity of any yarn exceeding 10% of width or 1 inch (25 mm) in length.	X	
Broken or missing end	Two or more regardless of length or a single end 6 inches (152 mm) and over in length.	X	
	Single end under 6 inches (152 mm) but exceeding 1/4 inch (6.4 mm).		X
Broken or missing pick	Two or more regardless of extent.	X	
Coarse or light filling bar	Resulting in noticeable difference in stiffness or thickness of tape or webbing and extending 1/4 inch (6.4 mm) and over in the length direction.	X	
	Resulting in noticeable difference in stiffness or thickness of tape or webbing and under 1/4 inch (6.4 mm) in the length direction.		X
Crease or wrinkle	Twisted or distorted. Will not lay flat upon application of manual pressure.		X
Cut, hole, or tear	Any cut, hole, or tear.	X	
Drop ply	Clearly noticeable on more than 2 ends within the same length and extending 9 linear inches (229 mm) and over.	X	
	Clearly noticeable on 1 or 2 ends within the same length and extending 9 linear inches (229 mm) and over.		X

TABLE I (Cont'd.)

CLASSIFICATION OF IMPERFECTIONS

Imperfection	Description	Major	Minor
Edge beaded or corded	Noticeable increase in edge thickness or misformed edge.		X
Edge folded or rolled	Twisted or distorted. Will not lay flat upon application of manual pressure.		X
Edge loopy	Forming clearly noticeable filling loops, or edge tied loosely to body of tape or webbing 2 linear inches (51 mm) and over .	X	
Edge loose (slack)	Resulting in waviness, distortion in orientation of filling, or looseness along edge.		X
Edge-nicks or bumps	Any nick or bump falling outside the width tolerance as specified or exceeding 1/4 inch (6.4 mm) in length.	X	
Edge cut, torn, or frayed	Any cut, torn, or frayed edge, clearly noticeable rupture of yarn along edge.	X	
Edge tight	Resulting in noticeable tension along edge, or pucker, waviness, bagginess, or slackness that cannot be flattened by manual pressure.	X	
Edge scalloped	Any noticeable indentation of edge longer than 1/4 inch (6.4 mm).	X	
Fine or light filling bar, light place	Clearly noticeable.	X	
Floats or skips	Multiple, 1/2 inch (12.7 mm) or more in combined warp and filling directions or single float or skip over more than 1 inch (25 mm).	X	
	Multiple, less than 1/2 inch (12.7 mm) in combined warp and filling directions or, if in warp, single float or skip over 1/2 to 1 inch (12.7 to 25 mm), incl, or, if in filling, over 1/4 to 1 inch (6.4 to 25 mm), incl, of width.		X

TABLE I (Cont'd.)

CLASSIFICATION OF IMPERFECTIONS

Imperfection	Description	Major	Minor
Hitchback crack	Clearly noticeable opening between adjoining picks, or warpwise tension area over part of the width resulting in noticeable light and heavy places.		X
Jerked-in filling slough-off, slug	More than twice the thickness of normal yarn.		X
Kinks	More than 3 kinks in any 9 linear inches (229 mm).	X	
Knots	More than 2 knots in any 9 linear inches (229 mm).	X	
	Single knot with untrimmed ends extending more than 1/16 inch (1.6 mm) from surface.		X
Mispick, double pick	Two or more across the full width.	X	
	Single across the full width.		X
Slack end	Two or more in the same length, jerked in between picks, or forming clearly noticeable loops on the surface.	X	
	Single jerked in between picks, or forming clearly noticeable loops on the surface.		X
Slub, slug, or gout	More than twice the thickness of the yarn (or ply, if plied).		X
Smash	Any smash.	X	
Spot, stain, or streak	Any clearly noticeable dirt, rust, grease, oil spot, stain, or streak,		X
Tight end	Clearly noticeable.	X	
Tight pick or tight filling	Resulting in rolling of tape or webbing longer than 1/4 inch (6.4 mm).	X	
Weak, soft, or tender spot	Any weak, soft, or tender spot.	X	
Wrong draw	Extending for more than 9 inches (229 mm).		X

4.5.3 Overall Examination: The unit of tape or webbing for this examination shall be one piece. The tape and webbing shall be unacceptable if it has an objectionable odor, is unclean throughout, has uneven weaving throughout, or has a width beyond the specified tolerance.

4.5.4 Examination for Length:

4.5.4.1 Individual Spool (Tape): The spool shall be examined for gross length and the number and length of pieces in the spool. Any gross length (spool) found to be less than 90 yards (82 m) **or more than 110 yards** (100 m) long, any gross length found to be more than 2 yards (2 m) below the gross length marked on the piece ticket, or any spool found to contain more than 3 pieces or any piece less than 10 yards (9 m) in length shall be considered an imperfection with respect to length. The unit of tape for this examination shall be one spool.

4.5.4.2 Individual Roll (Webbing): The roll shall be examined for gross length, and the number and length of pieces in the roll. Any gross length (roll) found to be less than 45 yards (41 m) or more than 55 yards (50 m) long, any gross length found to be more than 2 yards (2 m) below the gross length marked on the piece ticket, or any roll found to contain more than three pieces or any piece less than 10 yards (9 m) in length shall be considered an imperfection with respect to length. The unit of webbing for this examination shall be one roll.

TABLE II

TEST METHODS

Property	Test Method, FED-STD-191, and Visual, Method
Warp, Binder, Stuffer, and Filling Yarn	
Nylon Identification	1/
Denier	4021
Tenacity	1/
Luster	1/
Melting Point	1534 1/
Light Resistance	1/
Heat Resistance	1/
Unbleached	2/
Twist	4054
Width	5020
Thickness	5030 3/
Weight	5040
Yarns per inch (25.4 mm)	5050
Yarn Ply	Visual
Weave	Visual
Breaking Strength	
Original	4108
After Abrasion (Type V Only)	4421/4108

TABLE II (Cont'd.)

Colorfastness to:	
Crocking	5651
Light 4/	5660
Perspiration	5680

- 1/ A certificate of compliance shall be submitted for those requirements and it shall include: A certified statement that the yarn used is the specified type and supported by a certified copy of the yarn producer's certification to the tape and webbing manufacturer.
- 2/ A certified statement shall be submitted stating that the yarn or webbing has not been submitted to any type of bleaching process.
- 3/ Except that a 6-ounce (170 grams) total load shall be applied and the pressure foot diameter shall be 3/8 inch (9.5 mm).
- 4/ Time of exposure shall be 20 standard fading hours.
- 4.5.4.3 Total Length in Sample: The lot shall be unacceptable if the total of the actual gross length of spools or rolls in the sample is less than the total of the gross lengths marked on the ticket.
- 4.5.5 Atmospheric Conditions: Shall be in accordance with FED-STD-191.
- 4.6 Reports: The vendor of the product shall furnish with each shipment a report showing the results of tests to determine conformance to the acceptance tests and stating that the product conforms to the other technical requirements. This report shall include the purchase order number, lot number, AMS-3778B and the applicable detail specification number and their revision letters if any, vendor's material designation, specified breaking strength, and quantity.
- 4.7 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the product may be based on the results of testing three additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the product represented and no additional testing shall be permitted. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Packaging and Identification:

- 5.1.1 Tape and webbing shall be supplied on spools or rolls in a length specified by purchaser. The ends of all tape and webbing shall be taped or sewn to prevent fraying.