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AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

SAE AMS 3814

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CORD, CORELESS, PARA-ARAMID, Intermediate Modulus

1. SCOPE:

1.1 Form: This specification and its supplementary detail specifications cover para-aramid in the form of braided, coreless cord.

1.2 Application: Primarily for use in cargo type parachutes.

1.3 Classification: Cord shall be classified by breaking strength and weight (length per unit weight) as shown in the title of the detail specifications.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

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

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods

2.2 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.2.1 Federal Specifications:

UU-T-81 - Tag, Shipping and Stock

2.2.2 Federal Standards:

FED-STD-191 - Textile Test Methods

2.2.3 Military Specifications:

MIL-C-3131 - Cordage, Packaging of

2.2.4 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 cord shall consist of all requirements specified herein in addition to the 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: Shall be a braided, coreless cord made from para-aramid yarn (See 8.1). Plied yarns shall be made by twisting the specified number of ends of producer's twist singles to the number of turns specified in the applicable detail specification (See 8.2).

3.2.1 Lapping of Ends: When carrier ends are run off, they shall be spliced 5 to 10 in. (125 to 250 mm) in length. When splicing, the outgoing carrier ends shall be joined with the new ends and hand braided for 4 to 5 picks and the tail of the splice shall be run into the center of the braided cord. The approximate center of each overlap shall be marked by inserting a bright red thread through the sleeve.

3.3 Properties: Shall be as specified in the applicable detail specification. Tests shall be performed on the cord supplied and in accordance with specified test methods, insofar as practicable.

3.4 Quality: Cord, as received by purchaser, shall be clean, evenly braided, and free from foreign materials and from imperfections detrimental to usage of the cord.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of cord shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.6. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the cord conforms to the requirements of this specification and the applicable detail specification.

4.2 Classification of Tests: Tests to determine conformance to all technical requirements of this specification and the applicable detail specification are classified as acceptance tests and as preproduction tests and shall be performed prior to or on the initial shipment of cord to a purchaser, on each lot, when a change in material, processing, or both requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.2.1 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, the contracting officer, or the request for procurement.

4.3 Sampling: Shall be as follows except as specified in 4.3.1.6:

4.3.1 For Acceptance Tests: Each lot of cord shall be visually examined for quality (3.4) and sampled at random for all other 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 cord of a single weight 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 yd (4570 m). A lot may be packaged and delivered in smaller quantities under the basic lot approval provided lot identification is maintained.

4.3.1.2 Properties specified in the applicable detail specifications apply to the average of the determinations made on a sample unit. Sample size shall be as noted below. The sample unit for testing shall be one spool or reel of cord. The lot shall be unacceptable if one or more units fail to meet any requirement. The lot size shall be expressed in units of spools or reels.

Number of Spools or Reels in the Lot	Sample Size
Up to 15, incl	2
Over 15 to 40, incl	3
Over 40 to 110, incl	5
Over 110 to 300, incl	7
Over 300 to 500, incl	10
Over 500	15

4.3.1.3 Examination for Visual Defects: The defects listed in Table I shall be counted regardless of their proximity to each other, except where two or more defects represent a single local condition, in which case only the more serious defect shall be counted. The sample unit shall be one spool or reel. Ten percent of the length contained in the sample unit, but not less than 100 ft (30 m), shall be subjected to visual examination. The lot size shall be expressed in units of spools or reels. The inspection level shall be in accordance with MIL-STD-105,

4.3.1.3 (Cont'd.)

Level III. The acceptance quality level (AQL) shall be zero critical defects, 1.5 major defects, and 6.5 total defects (major and minor combined) per 100 units.

TABLE I

Classification of Defects

Characterisitc	Defect	Classification		
		Critical	Major	Minor
Appearance and Workmanship	Any cut.	X		
	Abrasion, chafed area, or distortion in the orientation of yarns.	X		
	Kinks, knots, or unevenly braided resulting in open places, breaks in continuity of braid, or soft spots.	X		
	Floats; broken, projecting, or missing ends or picks.	X		
	Over one knot per 100 linear yd (90 linear m) in plied yarns.	X		
	One knot per 100 linear yd (90 linear m) in plied yarns.		X	
Type	Other than specified.	X		
Color	Other than specified.		X	
Cleanliness	Spot or stain, noticeable at normal inspection distance of 3 ft (1 m).			X
	Objectionable odor.			X
Identification	Omitted, incorrect, illegible. or insecurely attached.			X
	Ticket or label not as specified.			X
	Handwritten entries.			X

4.3.1.4 Examination for Length and Winding: Sample unit shall be one spool or reel. Inspection level shall be S-3 of MIL-C-3131 and the acceptance quality level (AQL) shall be 4.0% defective. For lots consisting of 500 or fewer units, the sample size shall be 10 and the acceptance level shall be number 1. The lot size shall be the number of spools or reels in the lot. Defects shall be as listed in 4.3.1.4.1.1 and 4.3.1.4.1.2.

4.3.1.4.1.1 Defects in Length:

4.3.1.4.1.1.1 Length is less than specified or more than 10% in excess of the specified length.

4.3.1.4.1.1.2 Length is less than marked on the ticket or label.

4.3.1.4.1.2 Winding Defects:

4.3.1.4.1.2.1 Improperly or not firmly wound resulting in kinks, knots, entangling, or slippage during winding, or otherwise affecting the free unhampered unwinding of the cord.

4.3.1.4.1.2.2 Put-up is not as specified.

4.3.1.4.1.2.3 Any end not taped, sewed, or heat sealed.

4.3.1.4.1.2.4 Any knot or splice.

4.3.1.4.1.2.5 Cord is not in a continuous length.

4.3.1.5 When a statistical sampling plan and acceptance quality level (AQL) have 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 4.6.1 shall state that such plan was used.

4.3.1.6 For direct U.S. Military procurement, sampling 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 cord shall be approved by purchaser before cord for production use is supplied, unless such approval be waived by purchaser. Results of tests of production cord shall be essentially equivalent to those on the approved sample cord.

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

4.5 Test Methods: Shall be as in Table II and 4.5.1 through 4.5.3; a certificate of compliance from the vendor will be acceptable for material identification and ply.

TABLE II

TEST METHODS

Requirement	Test Method	Number of Determinations per Sample Unit	Results as Reported
Breaking Strength	FED-STD-191, Method 4108 1/, 2/	1	3/
Weight	4.5.3	3	4/
Number of Carriers	Visual	3	4/
Ends per carrier	Visual	3	4/
Total Ends	Visual	3	4/
Denier	FED-STD-191, Method 4121	-	--
Yarn Twist	FED-STD-191, Method 4054	-	--
Picks per in. (25.4 mm)	Visual	3	4/

1/ Cord shall be under a pre-tensioned load equal to 1% of the specified minimum breaking strength for the type.

2/ The pulling clamp shall have a speed of 2.0 in. ± 0.5 (50 mm ± 12) per minute.

3/ One determination of breaking strength shall be made from each spool or reel in the sample size and reported as the breaking strength of that spool or reel. If the breaking strength of the single determination of any one spool or reel is below the specified minimum requirement for the type of cord being tested, three additional determinations shall be conducted from the same spool or reel and the average of the four determinations shall be reported as the breaking strength of that spool or reel.

4/ Average of three determinations to the nearest whole number.

4.5.1 Tests to determine conformance to specification requirements shall be made under ambient atmospheric conditions except in case of dispute, in which case, testing shall be done on cord which has reached equilibrium under standard conditions as defined in FED-STD-191.

4.5.2 For direct U.S. Military procurement, examination for preparation for delivery requirements shall be in accordance with MIL-C-3131 except that the inspection level shall be S-2 and the acceptance quality level (AQL) shall be 2.5 defects per 100 units.

4.5.3 Weight: The specimen shall be subjected to a tension load equal to 1% of the specified minimum breaking strength for the applicable type. While the specimen is under load, a length of 10 ft (3 m) shall be measured to the nearest 1/4 in. (6 mm) and marked off. This length shall then be cut, weighed, and the length per lb (kg), using the 10 ft (3 m) length measurement determined under load, shall be calculated to the nearest 0.1 ft (30 mm).

4.6 Reports:

4.6.1 The vendor of cord shall furnish with each shipment a report showing the results of tests to determine conformance to the technical requirements of this specification and the applicable detail specification. This report shall include the purchase order number, AMS 3814 and the applicable detail specification number, vendor's material designation, lot number, specified cord breaking strength, and quantity.

4.6.2 The vendor of finished or semi-finished parts shall furnish with each shipment a report showing the purchase order number, AMS 3814 and the applicable detail specification number, contractor or other direct supplier of cord, supplier's material identification, part number, and quantity. When cord for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of cord to determine conformance to the requirements of this specification and shall include in the report either a statement that the cord conforms or copies of laboratory reports showing the results of tests to determine conformance.

4.7 Resampling and Retesting: Except as specified in Note 3 of Table II, if any specimen used in the above tests fails to meet the specified requirements, disposition of the cord 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 cord represented and no additional testing shall be permitted. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY:

5.1 Packaging and Identification: