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AEROSPACE MATERIAL SPECIFICATION

SAE AMS-3782 REV A

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Submitted for recognition as an American National Standard

Superseding AMS-3782

WEBBING, TEXTILE, TUBULAR, PARA-ARAMID
Intermediate Modulus

1. SCOPE:

1.1 Form: This specification and its supplementary detail specifications cover various types of para-aramid fabric in the form of webbing.

1.2 Application: Primarily for use in the manufacture of parachutes and their accessories.

1.3 Classification: The requirements specified herein and in the applicable detail specification define each type of webbing by weight and breaking strength as shown in the detail specification titles.

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 applicable issue of referenced publications shall be the issue in effect on the date of the purchase order.

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

ASTM D 123 - Terminology Relating to Textile Materials

2.2 U.S. Government Publications: Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094 except as noted in 2.2.4.

2.2.1 Federal Standards:

FED-STD-191 - Textile Test Methods

2.2.2 Military Specifications:

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

2.2.3 Military Standards:

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

2.2.4 Other Publications: Available from the Federal Trade Commission, Washington, DC 20580.

Textile Fiber Products Identification Act, Rules and Regulations

3. TECHNICAL REQUIREMENTS:

3.1 Detail Specification: The requirements for a specific 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: The yarn shall be a para-aramid, intermediate modulus type.

3.3 Properties: Webbing shall conform to requirements specified in the applicable detail specification; tests shall be performed on the product supplied and in accordance with test methods specified in 4.5.

3.4 Quality: Webbing, as received by purchaser, shall be evenly woven and free from foreign materials and from imperfections detrimental to usage of the webbing.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the webbing shall supply all Ø 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 webbing 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	Paragraph Reference
Breaking Strength	See Detail Specification
Weight	See 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 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:
Ø

4.3.1 For Acceptance Tests: Sufficient 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 webbing of a single weight produced in a single production run under the same fixed conditions and presented for vendor's inspection at one time.

4.3.1.2 The sample unit shall be 5 yards (4.6 m). The sample size shall be as shown below. Lot size shall be expressed in units of 1 linear yard (1 linear m). The lot shall be unacceptable if one or more units fail to meet any specified requirement.

Lot Size		Sample Size
Yards	Metres	
Up to 800, incl	Up to 732, incl	2
Over 800 to 5,000, incl	Over 732 to 4,572, incl	3
Over 5,000 to 22,000, incl	Over 4,572 to 20,117, incl	5
Over 22,000	Over 20,117	7

4.3.1.3 Yard-by-Yard (Metre-by-Metre) Examination: The sample unit shall be 1 linear yard (1 linear m). Sample size shall be in accordance with MIL-STD-105, Level III. The required yard (metre) of each roll shall be examined on each side and imperfections shall be classified in accordance with Table I. All imperfections found shall be counted regardless of their proximity to each other, except when two or more imperfections represent a single local condition of the 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 acceptance quality level for minor imperfections shall be 2.5 per 100 yards (91 m) and the lot shall be unacceptable if one or more critical imperfections appear in the sample. An approximately equal number of yards (metres) shall be examined from each roll, spool, or tube selected. The number of rolls, spools, or tubes, from which the sample is to be selected, shall be in accordance with Table II.

4.3.1.3.1 "Clearly visible" as referenced in Table I means imperfections are Ø visible at the normal inspection distance of 3 feet (1 m). Definition of terms used herein are given in ASTM D 123.

4.3.1.4 Overall Examination: Each imperfection listed below shall be counted no more than once in each roll, spool, or tube examined. The sample unit shall be one roll, spool, or tube, the sample size and acceptance number shall be in accordance with Table II.

4.3.1.4.1 Uncleanliness throughout.

4.3.1.4.2 Uneven weaving throughout.

4.3.1.4.3 Not labeled in accordance with Textile Fiber Products Identification Act

4.3.1.5 Length Examination:

4.3.1.5.1 Individual Roll, Spool, or Tube: Each roll, spool, or tube in the sample shall be examined for imperfections listed below. The sample unit shall be one roll, spool, or tube. Sample size and acceptance number shall be as shown in Table II.

4.3.1.5.1.1 Gross length more than 2 yards (2 m) less than gross length marked on the piece ticket

4.3.1.5.1.2 Any piece less than 20 yards (18 m) in length.

4.3.1.5.1.3 Any spool containing more than 3 pieces.

4.3.1.5.2 Total Yards (Metres) in Sample: The lot shall be unacceptable if the total of the actual gross lengths of the rolls, spools, or tubes in the samples, selected in accordance with Table II, is less than the total of the gross lengths marked on the roll, spool, or tube tickets.

4.3.1.6 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.

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

4.3.2.1 If required, sample shall be at least 10 yards (9 m) of webbing.

4.4 Approval:

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

4.4.2 Vendor shall use ingredients, manufacturing procedures, processes, and methods of inspection on production webbing which are essentially the same as those used on the approved sample webbing. If necessary to make any change in ingredients, 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 webbing. Production webbing made by the revised procedure shall not be shipped prior to receipt of reapproval.

4.5 Test Methods: Shall be in accordance with Table III and the following; vendor's certification of conformance is acceptable for material identification and denier:

4.5.1 Breaking Strength: Shall be determined in accordance with FED-STD-191, Method 4108, using a pulling jaw speed of 2 inches per minute ± 0.5 (51 mm/minute ± 12.7), using a single specimen for testing.

4.5.1.1 Testing may be conducted using the double pin jaw design as specified in 4.5.1.2. In case of dispute of test results, the higher values obtained with either the double pin jaws or the split drum jaws, separately, are acceptable.

4.5.1.2 Double Pin and Jaw Design:

4.5.1.2.1 Alternate Jaw Design: This design is shown as the double pin jaws of Figures 1 through 7.

4.5.1.2.2 Machine Adjustment: Mount the jaws with careful attention to rotational and axial alignment. Set speed of the moving jaw at 1 inch per minute ± 0.5 (25.4 mm/minute ± 12.7) and the initial jaw separation such that the distance between the tangent points where the specimen first touches the primary (large diameter) pins is 12.0 inches ± 0.1 (305 mm ± 2.5).

4.5.1.2.3 Specimen Size and Number: Each specimen shall be the full width of the webbing and 60 inches (1.5 m) long. Test five specimens or enough to get five acceptable breaks. An acceptable break is defined as one which occurs in the unsupported length of the specimen between the primary pin contact points or at the contact points, but not within the material which is wrapped around each double pin jaw.

4.5.1.2.4 Specimen Mounting: Wrap the specimen around the primary and secondary pins of each jaw as shown in Figure 8. Be careful to keep all legs of the specimen in alignment with the direction of stress application, and successive wraps exactly in line. For materials having a strength under 500 pounds force per inch of width (88 N/m of width), or for stronger materials which are not breaking acceptably, insert a double layer of cotton fabric between the two layers of para-aramid fabric which pass around the primary pin in both the top and bottom jaws.

4.6 Reports: The vendor of webbing shall furnish with each shipment a report showing the results of tests to determine conformance to the acceptance test requirements and stating that the webbing conforms to the other technical requirements. This report shall include the purchase order number, lot number, AMS-3782A and the applicable detail specification number and its revision letter if any, vendor's webbing designation, specified webbing weight, and quantity.

4.7 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the webbing 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 webbing 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 Webbing shall be supplied in rolls, on double-headed spools, or tubes of 90 to 100 yards (82 to 91 m). No roll, spool, or tube shall contain more than three pieces; no piece shall be less than 20 yards (18 m) in length.

5.1.2 A lot of webbing may be packaged in small quantities and delivered under the basic lot approval provided lot identification is maintained.

5.1.3 Each roll, spool, or tube shall have a label or tag legibly marked with not less than the following information and attached in such a manner as to remain in place until all webbing has been removed from the roll, spool, or tube.

WEBBING, TEXTILE, TUBULAR, PARA-ARAMID
AMS 3782A/*
WIDTH _____
WEIGHT PER YARD (METRE) _____
MANUFACTURER'S IDENTIFICATION _____
QUANTITY _____
LOT NUMBER _____
ROLL, SPOOL, OR TUBE NUMBER (If used) _____
DATE OF MANUFACTURE _____

*Insert applicable detail specification number.

5.1.4 Each roll, spool, or tube of webbing shall be labeled or ticketed for fiber content in accordance with Textile Fiber Products Identification Act.

5.1.5 Individual rolls, spools, or tubes shall be wrapped in a suitable protective film and packaged in an exterior shipping container in such a manner that the webbing, during shipment and storage, will be protected from exposure to moisture, weather, or any other normal hazard.

5.1.6 Each shipping container shall be legibly marked with not less than the following information in such a manner that the markings will not smear or be obliterated during normal handling or use:

WEBBING, TEXTILE, TUBULAR, PARA-ARAMID
AMS 3782A/*
PURCHASE ORDER NUMBER _____
MANUFACTURER'S IDENTIFICATION _____
DESCRIPTION _____
LOT NUMBER _____
NET WEIGHT _____

*Insert applicable detail specification number.

5.1.7 Ø Containers of webbing shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the webbing to ensure carrier acceptance and safe delivery.

5.1.8 For direct U.S. Military procurement, packaging shall be in accordance with MIL-P-43334, Commercial Level, unless Level A or Level B is specified in the request for procurement.

6. ACKNOWLEDGMENT: A vendor shall mention this specification number and the applicable detail specification number and their revision letters, if any, in all quotations and when acknowledging purchase orders.

7. REJECTIONS: Webbing not conforming to this specification and the applicable detail specification, or to modifications authorized by purchaser, will be subject to rejection.

8. NOTES:

8.1 Marginal Indicia: The phi (Ø) symbol is used to indicate technical changes from the previous issue of this specification.

8.2 Precautions:

8.2.1 Twisting:

8.2.1.1 Slightly heavier travelers than those used for nylon should be used.

8.2.1.2 High humidity should be maintained to minimize electrostatic charge between filaments.

8.2.2 Winding: Anti-wear tension gates should be used.

8.2.3 Weaving:

8.2.3.1 Polytetrafluoroethylene coated needles should be used.

8.2.3.2 Harness times should be:

8.2.3.2.1 Two inches (51 mm) before front center for 0.5 inch (13 mm) webbing when using 400 denier yarn

8.2.3.2.2 0.75 inch (19 mm) before front center for 1 inch (25 mm) and wider webbings

8.2.3.3 Warp line should be level.

8.2.3.4 Looms selected for weaving yarns shall be in good running condition with minimum wear or play in the various mechanical components. Loom should be operated at a reduced speed (90 to 100 picks per minute) when weaving 200 or 400 denier yarn into narrow webbing.

8.2.3.5 Warp beam should be not more than 0.5 inch (13 mm) wider than the required width of the finished webbing.

8.2.3.6 Fine sand rolls should be used for webbing take-up.

8.2.3.7 Due to the low extensibility of the yarn, it is important that uniform yarn length be maintained at all times across the entire set of warp yarns.

8.2.3.8 Avoid contact of the yarn with a rough surface or sharp edges wherever possible in order to minimize damage.

8.2.3.9 High humidity should be maintained during weaving.

8.3 Dimensions and properties in inch/pound units and the Celsius temperatures are primary; dimensions and properties in SI units and the Fahrenheit temperatures are shown as the approximate equivalents of the primary units and are presented only for information.

8.4 For direct U.S. Military procurement, purchase documents should specify not less than the following:

Title, number, and date of this specification and the applicable detail specification
Width of webbing desired
Weight of webbing desired
Level A or Level B packaging, if required (See 5.1.8).

8.5 Similar Specifications: MIL-W-87127 is listed for information only and shall not be construed as an acceptable alternate unless all requirements of the AMS are met.

8.6 Webbing meeting the requirements of this specification and its applicable detail specifications has been classified under Federal Supply Classification (FSC) 8305.

This specification and its detail specifications are under the jurisdiction of AMS Committee “CP”.

TABLE I
Imperfection Descriptions

Imperfection	Description	Critical	Minor
Abrasion marks	Resulting in rupture of yarns or in nap insufficient to obscure the identity of any yarn exceeding 10% of width or 1 inch (25 mm) in length.	X	
Broken end (Missing end)	Two or more, regardless of length, or a single end over 6 inches (152 mm) in length.	X	
	Single end under 6 inches (152 mm) but over 0.25 inch (6.4 mm) in length.		X
Broken pick (Missing pick)	Two or more regardless of extent. The filling tie-in or joining shall not be construed as an imperfection of any nature.	X	
Coarse filling bar (Light filling bar)	Resulting in visible difference in stiffness or thickness of tubular webbing and extending over 0.25 inch (6.4 mm) in the length direction.	X	
	Resulting in visible difference in stiffness or thickness of tubular webbing and extending 0.25 inch (6.4 mm) or under in the length direction.		X
Cut, hole, or tear	Any cut, hole, or tear	X	
Distortion or Twist	Tubular webbing will not lie flat upon application of manual pressure due to distortion or twist.		X
Double pick (Mispick)	Two or more across the full width.	X	
	Single across the full width.		X
Drop-ply	Clearly visible on more than 2 ends within the same length and extending over 9 linear inches (229 linear mm).	X	

TABLE I
Imperfection Descriptions (Continued)

Imperfection	Description	Critical	Minor
Drop ply	Clearly visible on 1 or 2 ends within the same length and extending over 9 linear inches (229 linear mm).		X
Edges	Frayed, slack, or otherwise poorly constructed and over 0.25 inch (6.4 mm) in length.	X	
Filling yarns (Yarns)	Two yarns per shed.	X	
Floats (Skips)	Three or more 0.5 inch (13 mm) or more in combined warp and filling directions or single float or skip over 1 inch (25 mm).	X	
	Three or more, under 0.5 inch (13 mm) in combined warp and filling directions or single float or skip over 0.5 inch (13 mm) but not over 1 inch (25 mm), if in warp; or more than 0.25 inch (6.4 mm) of width but not over 1 inch (25 mm), if in filling.		X
Hitchback crack	Clearly visible opening between adjoining picks, or warpwise tension area over part of the width resulting in visible light and heavy places.		X
Hole, cut, or tear	See Cut.		
Jerked-in filling (Slough-off filling, slug filling)	A clearly visible loop of filling pulled in at the edges.		X
Kinks	More than 3 kinks in any 9 linear inches (229 linear mm).	X	
Knots	More than 1 knot in any 9 linear inches (229 linear mm).		X
	One knot every 2 yards (1.8 m) with untrimmed ends extending from the surface of the tubular webbing.		X

TABLE I
Imperfection Descriptions (Continued)

Imperfection	Description	Critical	Minor
Light filling bar (Coarse filling bar)	Resulting in visible difference in stiffness or thickness of tubular webbing and extending more than 0.25 inch (6.4 mm) in the length direction.	X	
	Resulting in visible difference in stiffness or thickness of tubular webbing and extending 0.25 inch (6.4 mm) or under in the length direction.		X
Mispick (Double pick)	Two or more mispicks (double picks) across the full width.	X	
	Single pick across the full width.		X
Missing End (Broken end)	Two or more regardless of length or a single end over 6 inches (152 mm) in length.	X	
	Single end under 6 inches (152 mm) but over 0.25 inch (6.4 mm).		X
Missing pick (Broken pick)	Two or more regardless of extent. The filling tie-in or joining shall not be construed as an imperfection of any nature.	X	
Skips	See Floats.		
Slack end	Two or more slack ends in the same length, jerked in between picks, or forming clearly visible loops on the surface.	X	
	Single slack end jerked in between picks or forming clearly visible loops on the surface.		X
Slub gout or Slug gout	More than twice the thickness of the yarn (or ply, if plied).		X
Slough-off filling	See Jerked-in filling.		

TABLE I
Imperfection Descriptions (Continued)

Imperfection	Description	Critical	Minor
Slug filling	See Jerked-in filling.		
Slug gout	See Slub gout.		
Smash	Any smash.	X	
Spot, stain, or streak	Any clearly visible spot, stain, or streak.		X
Stain	See Spot.		
Streak	See Spot.		
Tight end	Clearly visible up to 12 inches (305 mm) in length.	X	
Tear, cut, or hole	See Cut.		
Twist	See Distortion.		
Width	Beyond specified tolerances.		X
Wrong draw	Extending over 9 inches (229 mm).	X	
Yarns (Filling yarns)	Two yarns per shed.	X	

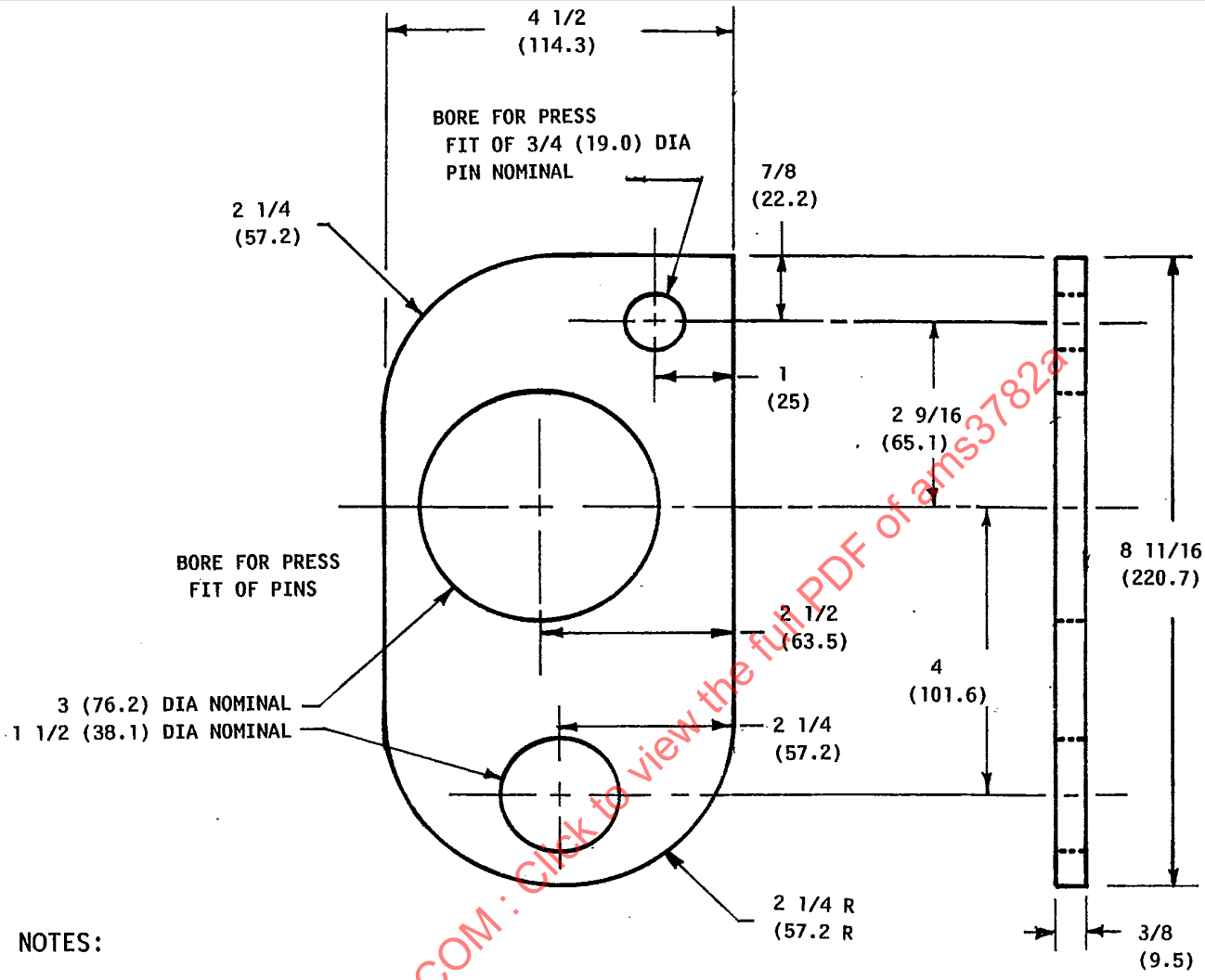
TABLE II
Lot, Sample Size, and Number of Imperfections Acceptable

Code	Lot Size		Sample Size
	Yards	Metres	
Rolls			
A	Up to 1,200, incl	Up to 1,097, incl	3
B	Over 1,200 to 3,200, incl	Over 1,097 to 2,926, incl	5
C	Over 3,200 to 10,000, incl	Over 2,926 to 9,144, incl	8
D	Over 10,000 to 35,000, incl	Over 9,144 to 32,004, incl	13
E	Over 35,000 to 150,000, incl	Over 32,004 to 137,160, incl	20
F	Over 150,000	Over 137,160	32

	Number of Imperfections Acceptable in Sample
A	0
B	0
C	0
D	0
E	1
F	2

TABLE III
Test Methods

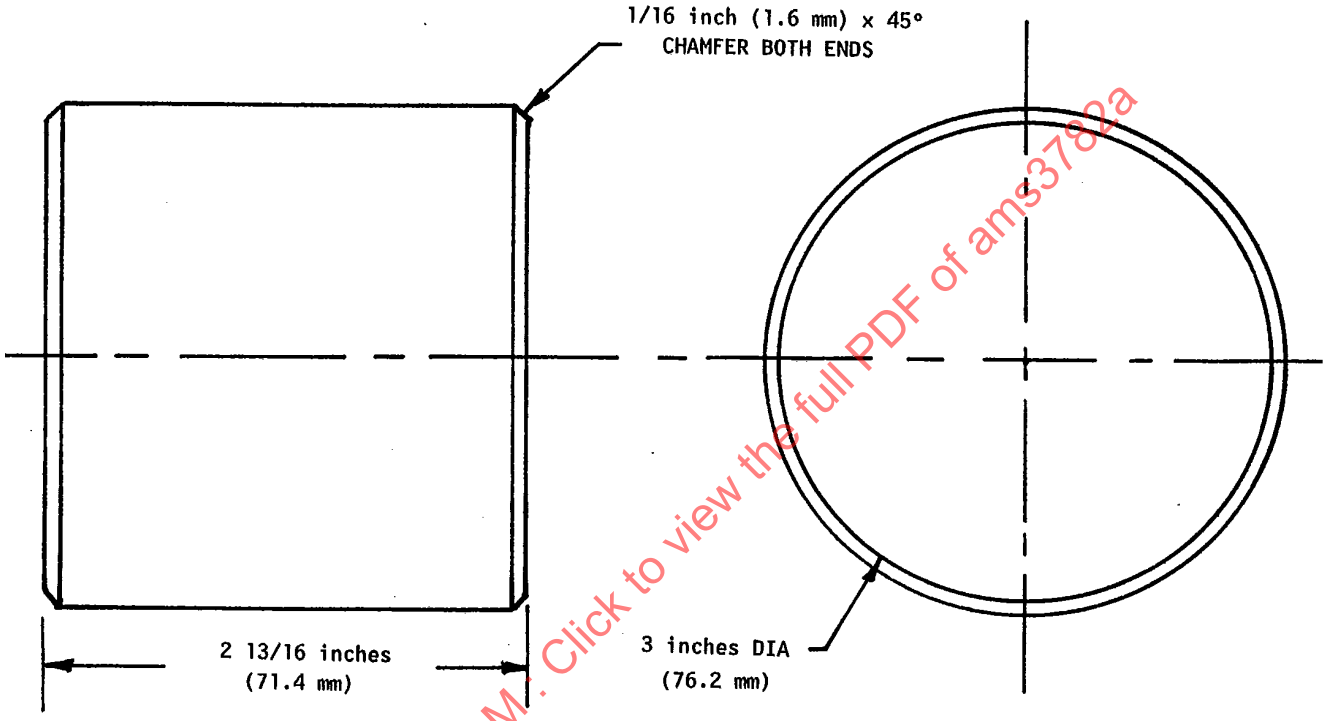
Requirement	FED-STD-191, Test Method
Denier	4021
Twist	4052
Weight	5041
Texture: Ends, face, and back warp	5050
Picks per inch (25.4 mm)	5050
Breaking Strength	4108
Width	5020
Weave	Visual



NOTES:

1. Bore holes in sets to ensure hole alignment.
2. Heat treat 3/4 (19.0) D pin before boring.
3. Minimum interference fit between pin and hole; 0.001 per inch (25.4 mm) diameter.
4. Material: Type 303 corrosion resistant steel.
5. Quantity required: 4.
6. Dimensions are in inches (mm). Tolerances:
   Fractions ± 1/64 inch (±1.6 mm)
   Decimals ± 0.005 inch (±0.13 mm)
   Angles ± 1/4 degree
7. Deburr and break all edges to 0.005 inch (0.13 mm) maximum.
8. Concentricity on common diameter within 0.003 tir.
9. All surfaces to be machined to RMS 125.
10. Threads are Class 2.
11. Normality, squareness, and parallelism of all surfaces are to be within 0.005 inch per inch (0.13 mm/mm) to a maximum of 0.010 inch (0.25 mm) per surface.

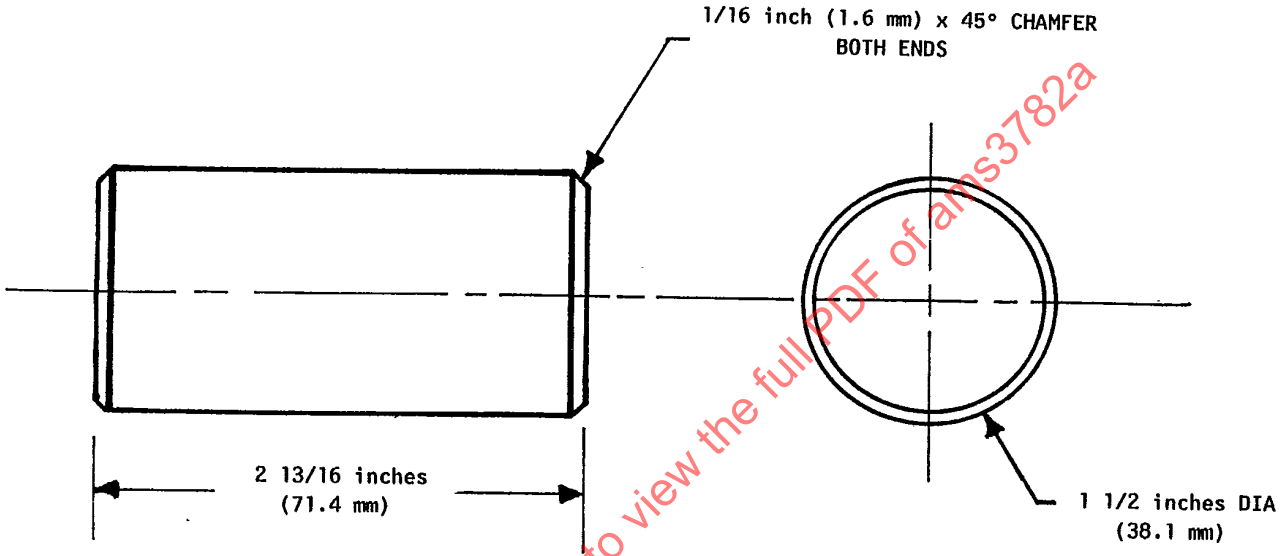
Figure 1. Side Plate



NOTES:

1. Material: Type 303 corrosion resistant steel.
2. Quantity required: 2.
3. See Figure 1, Notes 6, 7, 8, 9, 10, and 11.

Figure 2. Primary Pin



NOTES:

1. Material: Type 303 corrosion resistant steel.
2. Quantity required: 2.
3. See Figure 1, Notes 6, 7, 8, 9, 10, and 11.

Figure 3. Secondary Pin