

TAPE AND WEBBING, TEXTILE, PARA-ARAMID  
Intermediate Modulus

1. SCOPE:

- 1.1 Form: This specification and its supplementary detail specifications cover para-aramid in the form of tape and webbing.
- 1.2 Application: Primarily for use in parachutes and their accessories.
- 1.3 Classification: Tape and webbing shall be classified by width and weight as shown in 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 except as specified in 2.2.4.

2.2.1 Federal Standards:

FED-STD-191 - Textile Test Methods

2.2.2 Military Specifications:

MIL-W-43334 - Webbing and Tape, Textile, Packaging and Packing of

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### 2.2.3 Military Standards:

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

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

Textile Fiber Products Identification Act, Rules and Regulations

## 3. TECHNICAL REQUIREMENTS:

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

3.2 Material: Shall be tape and webbing woven from para-aramid, intermediate modulus type of yarn (See 8.2). Warp yarns shall be nominally two turns per in. (25.4 mm). Plied yarns shall be made by twisting together the specified number of zero twist singles, as supplied by the producer. Filling yarns shall have the yarn producer's twist only.

3.3 Properties: Shall be as specified in the applicable detail specification. Tests shall be performed on the tape and webbing supplied and in accordance with test methods specified in 4.5 insofar as practicable.

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

## 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. 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 product 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 product 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:

4.3.1 For Acceptance Tests: Each lot of tape and webbing 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 product 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 (4,570 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 determinations made on a sample unit. Sample size shall be as noted below. The sample unit for testing shall be 5 yd (5 m). The lot size shall be expressed in units of 1 linear yd (1 linear m). The lot shall be unacceptable if one or more units fail to meet any of the specified requirements. The lot size shall be as follows:

Lot Size		Sample Size
Yards	Metres	
Up to 800, incl	Up to 730, incl	2
Over 800 to 5,000, incl	Over 730 to 4,570, incl	3
Over 5,000 to 22,000, incl	Over 4,570 to 20,115, incl	5
Over 22,000	Over 20,115	7

4.3.1.3 Yard-by-Yard (Metre-by-Metre) Examination: The required length of each roll shall be examined on both sides and visual defects classified as listed in Table I. All defects found shall be counted regardless of their proximity to one another, except where two or more defects represent a single local condition of the tape or webbing, in which case only the more serious defect shall be counted. A continuous defect shall be counted as one defect for each warpwise yard (metre) or fraction in which it occurs. The sample unit for this examination shall be in accordance with MIL-STD-105, Level III. The acceptance quality level (AQL) for minor defects shall be 2.5 defects per 100 units and the lot shall be unacceptable if one or more critical defects appear in the sample. The lot size shall be expressed in units of 1 linear yd (1 linear m) each. An approximately equal length shall be examined from each roll selected. The number of rolls or spools from which the sample is to be selected shall be in accordance with Table II except that if a lot contains less than three rolls or spools, each roll or spool in the lot shall be examined.

TABLE I

## Classification of Defects

Defect	Description	Classification	
		Critical	Minor
Abrasion Marks	Resulting in rupture of yarns or in nap sufficient to obscure the identity of any yarn over 10% of width or 1 in. (25 mm) in length.	X	
Yarns (filling)	Two yarns per shed.	X	
Broken or Missing End	Two or more regardless of length or a single end over 6 in. (150 mm) in length.	X	
	Single end under 6 in. (150 mm) but over 0.25 in. (6 mm).		X
Broken or Missing Pick	Two or more regardless of extent. The filling tie-in or joining shall not be construed as a defect of any nature.	X	
Coarse or Light Filling Bar	Resulting in visible difference in stiffness or thickness of webbing and extending over 0.25 in. (6 mm) in the length direction.	X	
	Resulting in visible difference in stiffness or thickness of webbing and extending 0.25 in. (6 mm) or under in the length direction.		X
Twist or Distortion	Webbing will not lie flat upon application of manual pressure due to twist or distortion.		X
Cut, Hole, or Tear	Any cut, hole, or tear.	X	

TABLE I

## Classification of Defects (Continued)

Defect	Description	Classification	
		Critical	Minor
Drop-ply	Clearly visible on more than 2 ends within the same length and extending 9 linear in. (225 linear mm) or over.	X	
	Clearly visible on 1 or 2 ends within the same length and extending under 9 linear in. (225 mm).		X
Edges	Frayed, slack, or otherwise poorly constructed and over 0.25 in. (6 mm) in length.	X	
Floats or Skips	Three or more, 0.5 in. (12 mm) or over, in combined warp and filling directions or single float or skip over 1 in. (25 mm).	X	
	Three or more, under 0.5 in. (12 mm) in combined warp or filling directions or single float or skip over 0.5 in. (12 mm) but not over 1 in. (25 mm), if in warp; or over 0.25 in. (6 mm) of width but not over 1 in. (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
Jerked-in Filling, Slough-off, Slug	A clearly visible loop of filling pulled in at the edges.		X

TABLE I

## Classification of Defects (Continued)

Defect	Description	Classification	
		Critical	Minor
Kinks	More than three kinks in any 9 linear in. (225 linear mm).	X	
Knots	More than one knot in 9 linear in. (225 mm).		X
	One knot every 2 yd (2 m) with untrimmed ends extending from the surface of the webbing.		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 the picks, or forming clearly visible loops on the surface.	X	
	Single jerked in between picks or forming clearly visible 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 visible.		X
Tight End	Clearly visible up to 12 in. (300 mm) in length.	X	
Wrong Draw	Extending over 9 in. (225 mm).	X	
Width	Beyond specified tolerances.		X

4.3.1.3.1 Clearly visible, as used in Table I, is defined as being visible at an inspection distance of 3 ft (3 m).

4.3.1.4 Overall Examination: The following defects shall be counted no more than once in each roll or spool examined. The sample unit for this examination shall be one roll or spool. Sample size and acceptance number shall be as in Table II.

Uncleanliness throughout

Uneven weaving throughout

Not labeled in accordance with Textile Fiber Products Identification Act

TABLE II

Sampling Plan

		Lot Size		Sample Size in Rolls or Spools	Number of Defects Acceptable, max		
		Yards	Metres				
	Up to	1,200, incl	Up to	1,095, incl	3	0	
Over	1,200 to	3,200, incl	Over	1,095 to	2,925, incl	5	0
Over	3,210 to	10,000, incl	Over	2,925 to	9,145, incl	8	0
Over	10,000 to	35,000, incl	Over	9,145 to	32,005, incl	13	0
Over	35,000 to	150,000, incl	Over	32,005 to	137,160, incl	20	1
Over	150,000		Over	137,160		32	2

4.3.1.5 Length Examination:

4.3.1.5.1 Individual Rolls or Spools: Each roll or spool in the sample shall be examined for the defects listed below. The sample unit for this examination shall be one roll or spool. The sample size and acceptance number shall be as specified in Table II.

Gross length more than 2 yd (2 m) less than the length marked on the piece ticket

Any piece less than 20 yd (18 m) in length

Any roll containing more than three 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 rolls or spools in the samples selected in accordance with Table II is less than the total of gross lengths marked on the roll or spool tickets.

- 4.3.1.6 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.
- 4.3.1.7 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 tape and webbing shall be approved by purchaser before tape and webbing for production use are supplied, unless such approval be waived by purchaser. Results of tests of production tape and webbing shall be essentially equivalent to those on the approved sample tape and 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 and webbing. 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 tape or webbing. Production tape or 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 III and in 4.5.1; a certificate of compliance from the vendor will be acceptable for material identification and denier:

TABLE III

Property	FED-STD-191 Test Method
Material Identification	See 4.5
Breaking Strength	4108
Denier (See 4.5)	4021
Twist	4052
Weight	5041
Texture	
Ends, Face and Back Warp	5050
Picks per in. (25.4 mm)	5050
Width	5020
Weave	Visual

4.5.1 Breaking Strength: Speed of pulling jaw shall be 2 in.  $\pm$  0.5 (50 mm  $\pm$  12) per minute. Testing shall be performed using the double pin jaw design as specified in 4.5.1.1. In case of dispute of the test values, the higher values obtained with either the double pin jaws or the split drum jaws, separately, are acceptable. The lot is not acceptable if any single determination is below the specified minimum.

4.5.1.1 Double Pin Jaw Design:

4.5.1.1.1 Alternate Jaw Design: Shall be identified as the double pin jaws as specified in Fig. 1 through Fig. 7.

4.5.1.1.2 Machine Adjustment: Mount the jaws with careful attention to rotational and axial alignment. Set the speed of the moving jaw at 1.000 in.  $\pm$  0.250 (25.00 mm  $\pm$  6.25) per min. and the initial jaw separation such that the distance between the tangent points where the specimen first touches the primary (large diameter) pins is 12.000 in.  $\pm$  0.100 (305.00 mm  $\pm$  2.50).

4.5.1.1.3 Specimen Size and Number: Each specimen shall be the full width of the tape or webbing and 5 ft (1.5 m) long. Test 5 specimens or enough to get 5 acceptable breaks. An acceptable break is defined as one which occurs in the unsupported length of the specimen between the primary pin tangent contact points or at the contact points, but not within the material which is wrapped around each double pin jaw.

4.5.1.1.4 Specimen Mounting: Wrap the specimen around the primary and secondary pins of each jaw as shown in Fig. 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 of less than 500 lb (2,225 N) per in. (87,565 N/m) of width, or for stronger materials which are not breaking acceptably, insert a double layer of cotton fabric between two layers of aramid fabric which pass around the primary pin on both top and bottom jaws.

4.6 Reports:

4.6.1 The vendor of tape and webbing 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 3793 and the applicable detail specification number, vendor's material designation, lot number, specified 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 3793 and the applicable detail specification number, contractor or other direct supplier of tape or webbing, supplier's product identification, part number, and quantity. When tape or webbing for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of tape or webbing to determine conformance to the requirements of this specification and shall include in the report either a statement that the tape or webbing conforms or copies of laboratory reports showing the results of tests to determine conformance.

4.7 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the tape or 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 tape or 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 Length and Put-up: Tape and webbing 9/16 in. (14 mm) and under in width shall be furnished on double headed rolls or spools. Tape and webbing 5/8 in. (15.5 mm) and over in width shall be furnished in rolls. No roll or spool shall contain more than three pieces and no piece shall be under 20 yd (18 m) in length.

5.1.2 Each spool or roll shall be identified with a durable 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 tape or webbing has been removed from the roll or spool:

TAPE AND WEBBING, TEXTILE, PARA-ARAMID, Intermediate Modulus

AMS 3793/\*

MANUFACTURER'S IDENTIFICATION \_\_\_\_\_

QUANTITY \_\_\_\_\_

WIDTH \_\_\_\_\_

LOT NUMBER \_\_\_\_\_

ROLL OR SPOOL NUMBER (If used) \_\_\_\_\_

DATE OF MANUFACTURE \_\_\_\_\_

\* Insert applicable detail specification number.

5.1.3 Each roll or spool of tape or webbing shall be labeled or ticketed for fiber content in accordance with the Textile Fiber Products Identification Act.

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

TAPE AND WEBBING, TEXTILE, PARA-ARAMID, Intermediate Modulus

AMS 3793/\*

PURCHASE ORDER NUMBER \_\_\_\_\_

MANUFACTURER'S IDENTIFICATION \_\_\_\_\_

LOT NUMBER \_\_\_\_\_

NET WEIGHT \_\_\_\_\_

\* Insert applicable detail specification number.

- 5.1.6 Containers of tape or 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 tape or webbing to ensure carrier acceptance and safe delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.
- 5.1.7 For direct U.S. Military procurement, packaging shall be in accordance with MIL-C-43334, Level A, Level B, or Level C, as specified in the request for procurement. Commercial packaging, as in 5.1.1, 5.1.4, and 5.1.6 will be acceptable if it meets the requirements of Level C.
6. ACKNOWLEDGMENT: A vendor shall mention this specification number and the applicable detail specification number in all quotations and when acknowledging purchase orders.
7. REJECTIONS: Tape and 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 Dimensions and properties in inch/pound units are primary; dimensions and properties in SI units are shown as the approximate equivalents of the primary units are presented only for information.
- 8.2 Kevlar 29, a product of E. I. duPont de Nemours & Company, has been found to be an acceptable yarn for this application.
- 8.3 Precautions:
- 8.3.1 Twisting:
- 8.3.1.1 Slightly heavier travelers than those used for nylon yarn should be used.

- 8.3.1.2 High humidity should be maintained to minimize electrostatic charge between filaments.
- 8.3.2 Winding: Anti-wear tension gates (Leesona Corp.), or the equivalent, should be used.
- 8.3.3 Weaving:
- 8.3.3.1 PFTE coated heddles (Precision Coating Co., Inc., Dedham, MA 02026), or the equivalent, should be used.
- 8.3.3.2 Harness tines should be 2 in. (50 mm) front center for 1/2 in. (12.5 mm) wide webbing when using 400 denier yarn and 3/4 in. (19 mm) before front center for 1 in. (25 mm) and wider webbings.
- 8.3.3.3 Warp line should be level.
- 8.3.3.4 Loom(s) selected for weaving must be in good running condition with minimum wear or "play" in the various mechanical components. Loom(s) should be operated at a reduced speed (90 to 100 picks per min.) when weaving 200 or 400 denier yarn into narrow webbing.
- 8.3.3.5 Warp beam should be not more than 1/2 in. (12.5 mm) wider than the required width of the finished webbing.
- 8.3.3.6 Fine sand rolls should be used for webbing take-up.
- 8.3.3.7 Due to the low extensibility of Kevlar 29 yarn, it is important that uniform yarn length be maintained at all times across the entire set of warp yarns.
- 8.3.3.8 Avoid contact of yarn with rough surfaces or sharp edges wherever possible in order to minimize damage.
- 8.3.3.9 High humidity should be maintained during weaving.
- 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 and weight of tape or webbing desired
  - Quantity of tape or webbing desired
  - Applicable level of packaging (See 5.1.7)

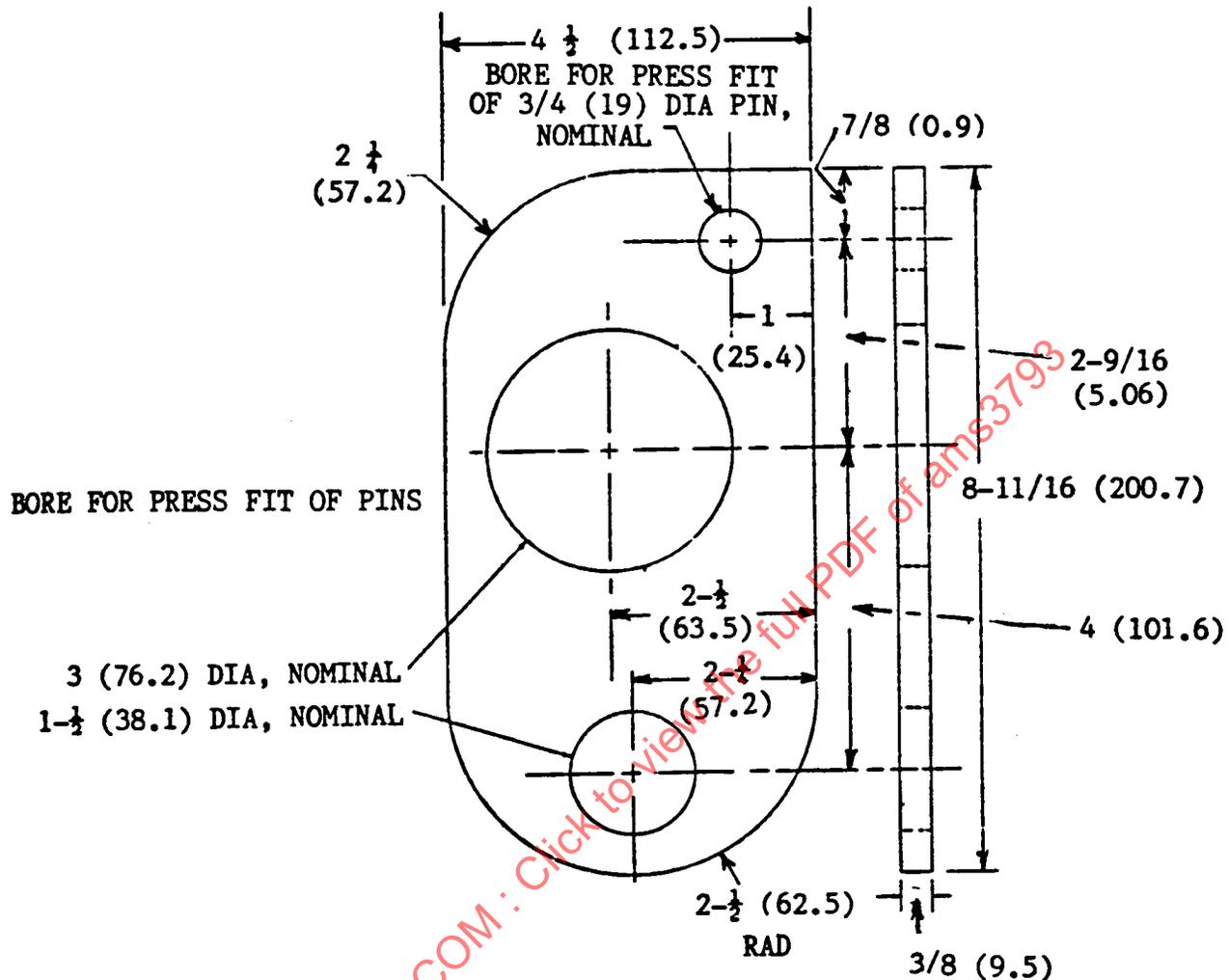
8.5 Similar Specifications: This specification is the equivalent of MIL-C-87130 (USAF), Amendment 2, dated 6 April 1981, as follows:

Draft 3793/1 = MIL-C-87130, Type I  
Draft 3793/2 = MIL-C-87130, Type II  
Draft 3793/3 = MIL-C-87130, Type IV  
Draft 3793/4 = MIL-C-87130, Type VI  
Draft 3793/5 = MIL-C-87130, Type VII  
Draft 3793/6 = MIL-C-87130, Type VII  
Draft 3793/7 = MIL-C-87130, Type IX  
Draft 3793/8 = MIL-C-87130, Type X  
Draft 3793/9 = MIL-C-87130, Type XI

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

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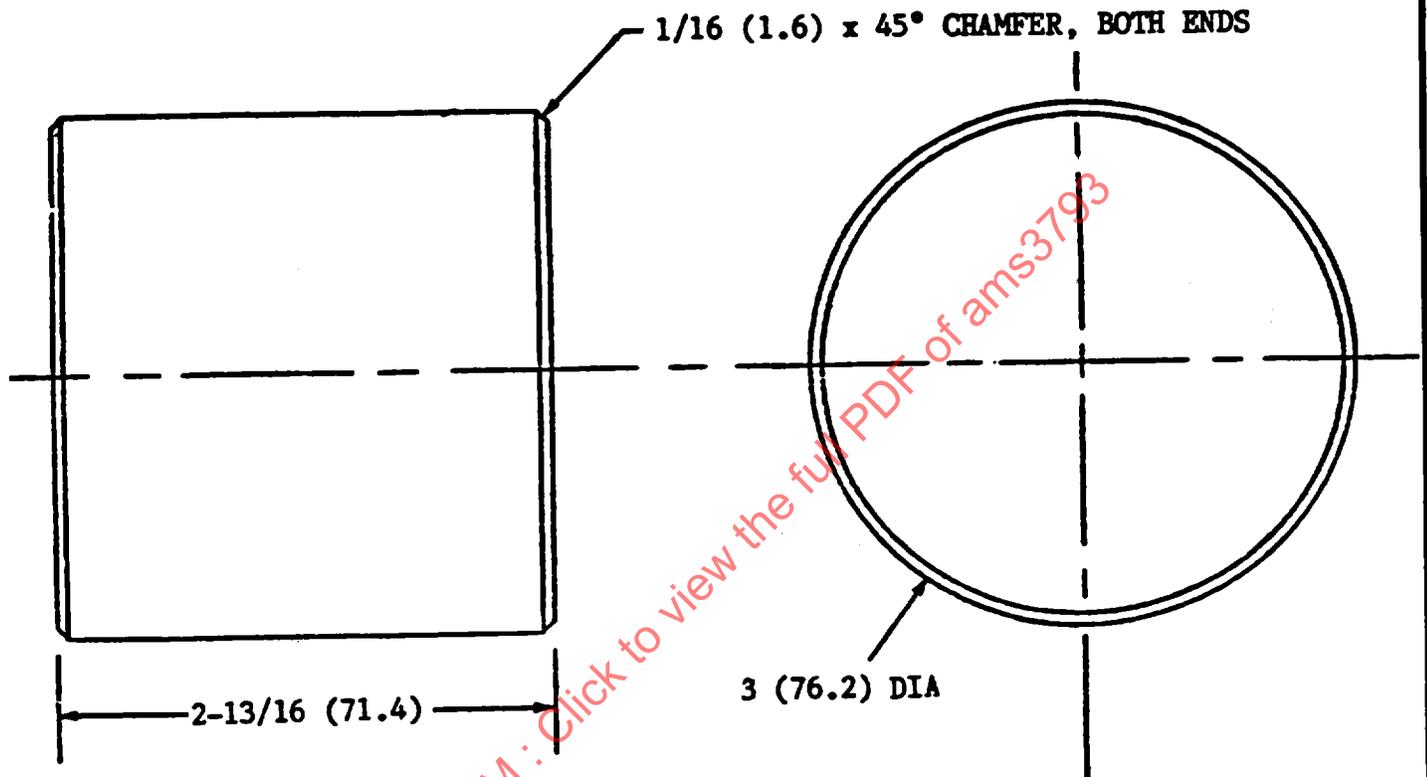
This specification and its detail specifications are under the jurisdiction of AMS Committee "C P".



## NOTES:

- Bore holes in sets to ensure hole alignment.
- Heat treat 3/4 (19) D pin before boring.
- Minimum interference fit between pin and hole; 0.001 per in. (25 mm) diameter.
- Material is Type 303 corrosion-resistant steel.
- Quantity required is 4.
- Dimensions are in inches (millimetres). Tolerances:
  - Fractions  $\pm 1/64$  in. (0.4 mm)
  - Decimals  $\pm 0.005$  in. (0.12 mm)
  - Angles  $\pm 1/4$  deg
- Deburr and break all edges to 0.005 in. (0.12 mm) maximum.
- Concentricity on common diameter within 0.003 tir.
- All surfaces to be machined to RMS 125.
- Threads are Class 2.
- Normality, squareness, and parallelism of all surfaces are to be within 0.005 per in. (0.12/mm) to a maximum of 0.010 in. (0.25 mm) per surface.

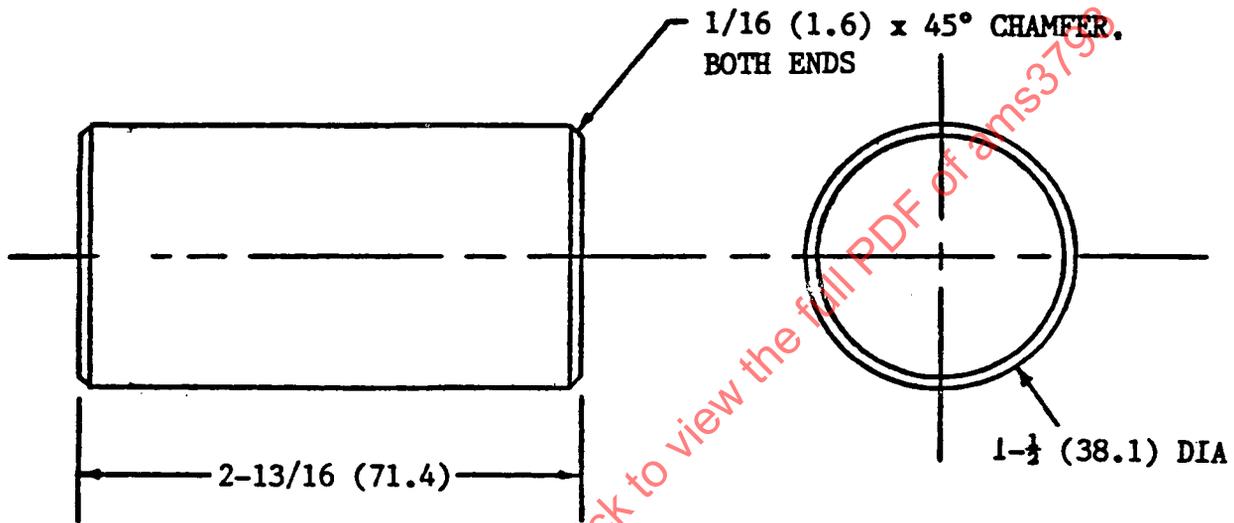
Figure 1. Side Plate



## NOTES:

1. Material is Type 303 corrosion-resistant steel.
2. Quantity required is 2.
3. See Fig. 1, Notes 6, 7, 8, 9, 10, and 11.
4. Dimensions are in inches (millimetres).

Figure 2. Primary Pin



## NOTES:

1. Material is Type 303 corrosion-resistant steel.
2. Quantity required is 2.
3. See Fig. 1, Notes 6, 7, 8, 9, 10, and 11.
4. Dimensions are in inches (millimetres).

Figure 3. Secondary Pin