



AEROSPACE STANDARD

AS 3071

SOCIETY OF AUTOMOTIVE ENGINEERS, Inc.

Two Pennsylvania Plaza, New York, N Y 10001

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Revised

ACCEPTANCE CRITERIA - MAGNETIC PARTICLE, FLUORESCENT PENETRANT, AND CONTRAST DYE PENETRANT INSPECTION

1. **ACKNOWLEDGMENT:** A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.
2. **APPLICATION:** To establish criteria for acceptability of discontinuities as revealed by inspection by magnetic particle, fluorescent penetrant, or contrast dye penetrant inspection. Criteria for acceptability of discontinuities cited herein revealed by other methods required by applicable part specification shall be as specified in applicable part specification. This specification is primarily intended to cover standard parts such as pins, nuts and fittings. It may be applied to any item which must meet the specified requirements except that the requirements of AS1177 apply to bolts, screws and studs.
 - 2.1 When this specification number appears on a drawing, it shall apply in support of AMS 2640 (Magnetic Particle Inspection), AMS 2645 (Fluorescent Penetrant Inspection), or AMS 2646 (Contrast Dye Penetrant Inspection).
3. **REQUIREMENTS:** Parts shall be uniform in quality and condition, and free from internal and external imperfections detrimental to their performance. The requirements in the following paragraphs shall be applicable as indicated in TABLE I.

TABLE I

Applicable Paragraph	3.1	3.2	3.3	3.4	3.5	3.6
Parts made from Castings (a)	X		X	X		
Parts made from Bar, Rod, or Forgings (b)	X	X	X			
Fluid Fittings (c)	X	X	X	X		
Nuts	X				X	
Pins	X					X

(a) For other than Fluid Fittings.

(b) For other than Nuts and Pins.

(c) Including but not limited to caps, tees, elbows, plugs and sleeves.

Technical Board rules provide that: "All technical reports, including standards approved and practices recommended, are advisory only. Their use by anyone engaged in industry or trade is entirely voluntary. There is no agreement to adhere to any SAE standard or recommended practice, and no commitment to conform to or be guided by any technical report. In formulating and approving technical reports, the Board and its Committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against liability for infringement of patents."

- 3.1 General Indications: Parts shall show no indications of cracks, cold shuts, seams, laminations, machining tears, pipes, grinding checks, nonmetallic inclusions except as allowed in 3.2 and 3.3, or laps as related to the applicable manufacturing process.
- 3.1.1 Thread Discontinuities: Indications as in 3.1 and rolling laps in threads as shown by Figures 1, 2, 3 and 4, shall not be permitted. Indications of slight laps as shown by Figures 5 and 6 will be permitted.
- 3.2 Stringer Indications: Indications shall not exceed a length of .125 inch (3.18 mm) for surface indications; and, in the case of magnetic particle inspection, shall not exceed a length of .188 inch (4.78 mm) for subsurface indications. Stringers shall be no closer to each other than .500 inch (12.7 mm) lineally and .250 inch (6.35 mm) apart laterally, and shall not extend over the edge.
- 3.3 General Discontinuities: Permissible discontinuities, other than porosity and stringers, shall not exceed a length of .047 inch (1.19 mm) for surface indications; and, in the case of magnetic particle inspection, shall not exceed a length of .062 inch (1.57 mm) for subsurface indications. Discontinuities shall be no closer to each other than three times the length of the largest of adjacent indications. No more than three discontinuities within any one inch (25.4 mm) square area are acceptable. Indications of surface and subsurface discontinuities shall not be permitted if in a common line.
- 3.4 Porosity: Indications of porosity in castings shall not be acceptable when the following conditions are revealed:
- 3.4.1 Evidence of porosity shall not appear in corresponding places on both sides of a wall or web.
- 3.4.2 Evidence of porosity shall not appear in areas such as the following:
- (a) Between a hole and the adjacent edge of the part
 - (b) On sealing surfaces (surface porosity only)
 - (c) In thin sections that restrain fluids
 - (d) In threads

3.4.3 Areas other than those defined in Paragraphs 3.4.1 and 3.4.2 shall show no porosity in excess of the following limitations:

3.4.3.1 Gas hole pores in unmachined areas shall not exceed a diameter of .031 inch (0.79 mm). Discontinuities shall be no closer to each other than three times the diameter of the largest of adjacent pores. No more than five pores within any one inch (25.4 mm) square area are acceptable.

3.4.3.2 Gas hole pores in machined areas shall not exceed a diameter of .016 inch (0.41 mm). Discontinuities shall be no closer to each other than three times the diameter of the largest of adjacent pores. No more than five pores within any one inch (25.4 mm) square area are acceptable.

3.5 Nuts: Indications in nuts shall not exceed the following limitations.

3.5.1 Indications of longitudinal discontinuities shall not exceed .016 inch (0.41 mm) or $1/3$ of the nut height whichever is the lesser. As used herein, height is defined as the distance from the bearing face to the extreme opposite parallel face of the nut.

3.5.2 There shall be no indications of discontinuities transverse to grainflow (i.e., at an angle of more than 10° to the longitudinal axis).

3.5.3 The requirements of Paragraph 3.1.1 shall apply in detail only when specifically so indicated on the drawing.

3.6 Pins, Headed and Headless: Indications in pins shall not exceed the following limitations.

3.6.1 There shall be no indications of discontinuities transverse to grainflow (i.e., at an angle of more than 10° to the longitudinal axis).

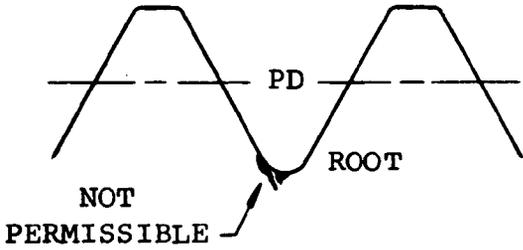
3.6.2 Longitudinal indications of surface seams and forming laps parallel to grainflow are acceptable within the following limits, provided the separation between indications is not less than .062 inch (1.57 mm) in all directions.

- 3.6.2.1 Sides of Head: A maximum of three surface discontinuities per head is permitted and the length of each indication may be full height of the surface. No indication shall extend over either edge to a depth greater than .031 inch (0.79 mm).
- 3.6.2.2 Top of Head and End of Stem: A maximum of three surface discontinuities in each area is permitted provided the length or diameter of any individual indication does not exceed .047 inch (1.19 mm).
- 3.6.2.3 Shank or Stem: A maximum of five indications is permitted. The length of any one indication may be the full length of the surface but the total length of all indications shall not exceed twice the length of the surface. No indication shall extend into a fillet or over an edge.

4. DEFINITIONS:

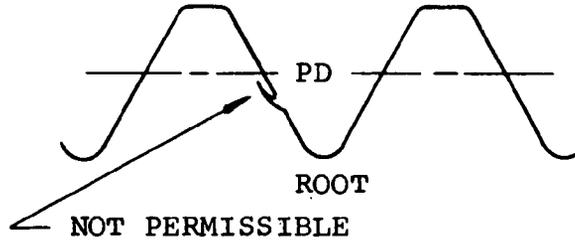
- 4.1 Discontinuity: A discontinuity is an interruption in the normal physical structure or surface configuration of a part material and is considered to be a defect when its nature, degree, frequency and location is detrimental to the quality, appearance, or performance of the part.
- 4.2 Indication: An indication is visual evidence of a discontinuity, as determined by one of the means indicated in Paragraph 2.1.
- 4.3 Cold Shut: A cold shut is a portion of a part that is partially separated from the main body of metal by oxide, or by the failure of two streams of metal to unite.
- 4.4 Grinding Check: Grinding checks are fine thermal cracks that develop from overheating of the area being ground. Such cracks are generally at right angles to the direction of grinding but may appear as a complete network.
- 4.5 Laminations: Laminations, found only in plate steel, are thin flat discontinuities seen only at the edge or end of the plate.

- 4.6 Inclusion: Inclusions are nonmetallic impurities such as slag, oxide, and sulphides which were present in the original ingot.
- 4.7 Seam: A seam is a surface discontinuity which is relatively long, straight and parallel to axis of bar. Seams are caused by cracks or tears in the billet from which the bar is rolled.
- 4.8 Lap: A lap is similar to a seam and may result from improper rolling practices or, in the case of forging, the metal being folded over but failing to weld into a single piece. Rolling laps generally run lengthwise with the bar but can extend into the bar at an angle.
- 4.9 Machining Tear: Tears are generally short and jagged, at right angles to the direction of machining, and are the result of improperly set tools or dull tools. Indications are a pattern of short, jagged individual cracks.
- 4.10 Pipe: A pipe is a discontinuity in the center of a rolled bar. It is caused by internal cavities in the ingot formed during solidification and which have become elongated or stretched in the rolling operations.
- 4.11 Porosity: Porosity is the lack of soundness, usually in the form of gas holes or shrinkage voids that take on the character of gas holes.
- 4.12 Stringer: A stringer is a solid nonmetallic impurity in the parent metal, often the result of an inclusion that has been stretched during a rolling process.
5. REJECTION: Parts not conforming to this standard and the applicable drawing shall be rejected.



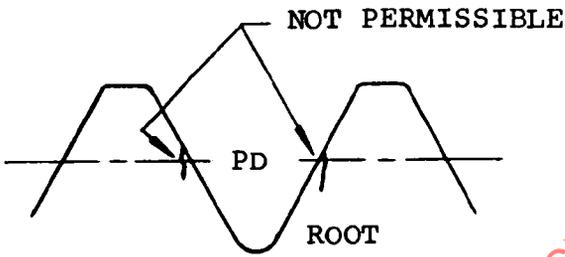
ROLLED THREAD

FIGURE 1



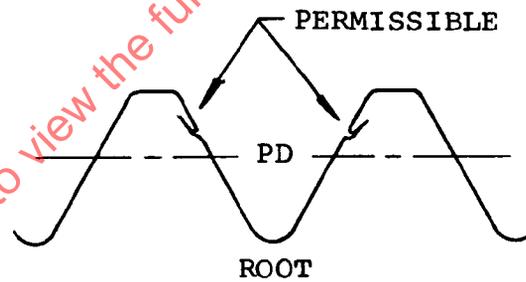
ROLLED THREAD

FIGURE 4



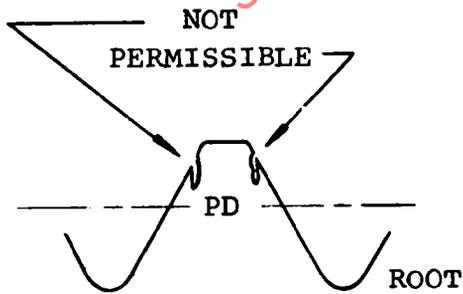
ROLLED THREAD

FIGURE 2



ROLLED THREAD

FIGURE 5



ROLLED THREAD

FIGURE 3

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