



AEROSPACE STANDARD

AS1177™

REV. B

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Nondestructive Inspection Standards for Bolts and Screws

RATIONALE

This document has been determined to contain basic and stable technology which is not dynamic in nature.

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1. SCOPE:

1.1 Purpose:

To establish the acceptance criteria of surface discontinuities of bolts and screws.

- 1.1.1 This acceptance criteria establishes the location, number, size, depth, and type of surface discontinuities that are permitted on bolts and screws as revealed by visual, magnetic particle, or fluorescent penetrant inspection.

1.2 Application:

Applicable to all types of bolts and screws made of low alloy steel (magnetic) or corrosion and heat resistant alloys (magnetic or nonmagnetic) that are primarily used in aerospace propulsion systems.

2. REFERENCES:

2.1 Applicable Documents:

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply; they are available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2640	Magnetic Particle Inspection
AMS 2645	Fluorescent Penetrant Inspection

2.2 Definitions:

- 2.2.1 **DISCONTINUITY:** An interruption in the normal physical structure or configuration of a part; such as a lap, seam, inclusion, crack, machining tear, or stringer.

- 2.2.2 DEFECT: Any nonconformance of the unit of product with the specified requirements that is severe enough to cause the service of the product not to be fulfilled.
- 2.2.3 LAP: A surface imperfection appearing as a seam or crack, caused by folding of material during such operations as forming, rolling, or drawing.
- 2.2.4 SEAM: Open surface imperfection that is narrow and continuous, usually straight, running generally parallel to the bolt or screw axis. Seams are generally inherent in the bar from which the bolt or screw is made.
- 2.2.5 INCLUSION: Nonmetallic particles inherent in the material when it was made. These particles may be isolated or distributed in the form of longitudinal stringers.
- 2.2.6 CRACK: A fracture passing through or across grain boundaries. Cracks may occur during heat treatment or may be caused by over-stressing the metal during forging or forming.
- 2.2.7 MACHINING TEAR: A pattern of short, jagged individual cracks, generally at right angles to the direction of machining, frequently the result of improperly set cutting tools, or dull cutting tools.
- 2.2.8 STRINGER: A solid nonmetallic impurity in the metal bar, often the result of inclusions that have been extended during the rolling process.

3. TECHNICAL REQUIREMENTS:

3.1 Nonpermissible Discontinuities:

The following discontinuities shall be cause for rejection of parts inspected by either magnetic particle or fluorescent penetrant inspection procedures:

- 3.1.1 Discontinuities transverse to grainflow (i.e., at an angle of more than 10° to the axis of the shank), such as cracks, stringers, machining tears, and quench cracks.
- 3.1.2 Longitudinal discontinuities (i.e., at an angle of 10° or less to the axis of the shank) due to discontinuities other than seams, forming laps, and nonmetallic inclusions.

3.2 Magnetic Particle Inspection:

Parts inspected by magnetic particle inspection shall be considered acceptable if longitudinal discontinuities (i.e., at an angle of 10° or less to the axis of the shank) of seams, forming laps, and nonmetallic inclusions parallel to the grainflow are within the following limits, provided that the separation between discontinuities is not less than 0.06 inch (1.52 mm) in all directions:

- 3.2.1 Sides of Head: There shall be not more than six surface or subsurface discontinuities per head. The length of each discontinuity may be the full height of the surface but no discontinuity shall break over either edge to a depth greater than 0.03 inch (0.76 mm) or the equivalent of the basic thread height (see Table 1), whichever is less.