AERONAUTICAL MATERIAL SPECIFICATION

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AMS 7470B

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BOLTS AND SCREWS, STEEL, CORROSION RESISTANT
Heat Treated - Roll Threaded

1. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

2. APPLICATION: Bolts and screws primarily made from AMS 5616 steel, for use up to 900 F.

3. FABRICATION: Heads may be formed by hot upsetting, cold upsetting, or machining. Threads shall be formed by rolling after heat treatment.

4. TECHNICAL REQUIREMENTS:

4.1 Flow Lines: Flow lines of upset heads shall conform to the general arrangement shown in Figure 1A, 1B, or 1C. The intersection of the longitudinal axis of the part and the approximate transverse axis of the flow lines shall be not less than D/4 in. from the bearing surface for hexagonal, round, and square head bolts and screws and not less than D/7 in. from the bearing surface for 12 point head bolts and screws where D is the nominal diameter of the shank after heading.

4.1.1 Examination for Internal Defects: Visual examination of a longitudinal section of head and 1/4 in. or more of the shank, after etching in approximately equal volumes of hydrochloric acid (sp gr 1.19) and water at 160-180 F for 10-15 min., shall reveal no cracks, laps, or porosity.

4.2 Machining: The metal removed from the bearing surface of the head of upset-head parts shall be as little as practicable to obtain a clean, smooth surface.

4.3 Heat Treatment: Headed and machined blanks shall, before finishing the shank and the bearing surface of the head and rolling the threads, be heat treated as follows:

4.3.1 Heating Equipment: Furnaces may be any type ensuring uniform temperature throughout the parts being heated and shall be equipped with and operated by automatic temperature controllers. The heating medium or atmosphere shall cause no surface hardening other than that permitted by 4.7.

4.3.2 Hardening: Blanks of AMS 5616 shall be uniformly heated to 1750 F ± 10, held at heat for 15-20 min., and quenched in oil. Elapsed time between hardening and tempering shall be as short as practicable.

4.3.3 Tempering: Hardened blanks shall be tempered by heating uniformly to the temperature necessary to produce the specified hardness, holding at heat for not less than 1 hr, and cooling.

4.4 Threads:

4.4.1 Threads shall be produced on the heat treated and finished blanks by a single rolling. Flow lines at threads shall be continuous, shall follow the general thread contour, and shall be of maximum density at root of thread (see Figure 2).

4.4.2 Threads shall have no multiple or single laps at the root or on the sides (see Figures 3, 4, and 5), except that slight laps are permissible at the crest, on the non-pressure side inside the pitch diameter, and on the sides outside the pitch diameter (see Figures 6, 7, and 8). Slight deviation from thread contour is permissible at the crest of the thread as shown in Figure 9; the incomplete thread at each end of the threaded section may also deviate slightly from contour.

4.4.3 Parts having holes for locking devices are permitted to have slight ovalization of the hole and the countersink and slight flattening of the crest of the thread at the countersink, provided the diameter of the hole is within specified tolerances.

4.5 Cleaning: Parts, after finishing, shall be degreased and then immersed for not less than 20 min. in a solution of 1 volume of nitric acid (sp gr 1.42) and 9 volumes of water at room temperature.

4.6 Structure: Parts shall have microstructure of tempered martensite.

4.7 Surface Hardening: Parts shall have no surface hardening except as produced during rolling of threads. Determinations of surface hardening may be made by microscopic method or by a sensitive hardness testing instrument.

4.8 Hardness: Hardness shall be uniform and as specified on the drawing but hardness of the threaded portion may be higher as a result of the thread rolling.

5. QUALITY: Parts shall be uniform in quality and condition, clean, sound, smooth, and free from burrs and foreign materials and from internal and external defects detrimental to their performance.

5.1 Parts subject to magnetic particle inspection shall conform to the following
Ø standards:

5.1.1 Pipes, grinding checks, rolling laps, quench cracks, and indications transverse
Ø to the grain flow shall be cause for rejection.

5.1.2 Longitudinal indications of seams and nonmetallic inclusions are acceptable
Ø within the following limits:

5.1.2.1 Sides of Head: Six or fewer surface or subsurface indications; the length of each indication may be the full height of the surface. The separation be-
Ø tween parallel indications shall be not less than 1/16 inch. No indication shall break over either edge to a depth greater than 1/32 inch.

5.1.2.2 Shank or Stem: Ten or fewer subsurface and hairline surface indications; the length of any indication may run the full length of the surface but the total
Ø length of all indications shall not exceed twice the length of the shank. The separation between parallel indications shall be not less than 1/16 inch. No indication shall break into a fillet or over an edge to a depth greater than 1/64 inch.

5.1.2.3 Threads: On the profile or crest, three or fewer interrupted hairline indications are acceptable the full length of the thread if they do not Ø extend more than 1/64 in. into the profile. The separation between parallel indications shall be not less than 1/16 inch.

5.2 Any method of magnetic particle inspection may be used to determine conformance of the parts to the above requirements, but resolution of disputed Ø rejections shall be based upon the wet, residual, black oxide suspension method using amperages shown in 5.2.1 and 5.2.2.

5.2.1 Circular Magnetization: 800-1000 amp per sq in. of contact area passed through Ø the part longitudinally.

5.2.2 Longitudinal Magnetization: Sufficient to produce 5000 amp-turns per inch of Ø shank diameter with the part placed in a standard solenoid of appropriate size.

6. REJECTIONS: Parts not conforming to this specification or to authorized modifications will be subject to rejection.

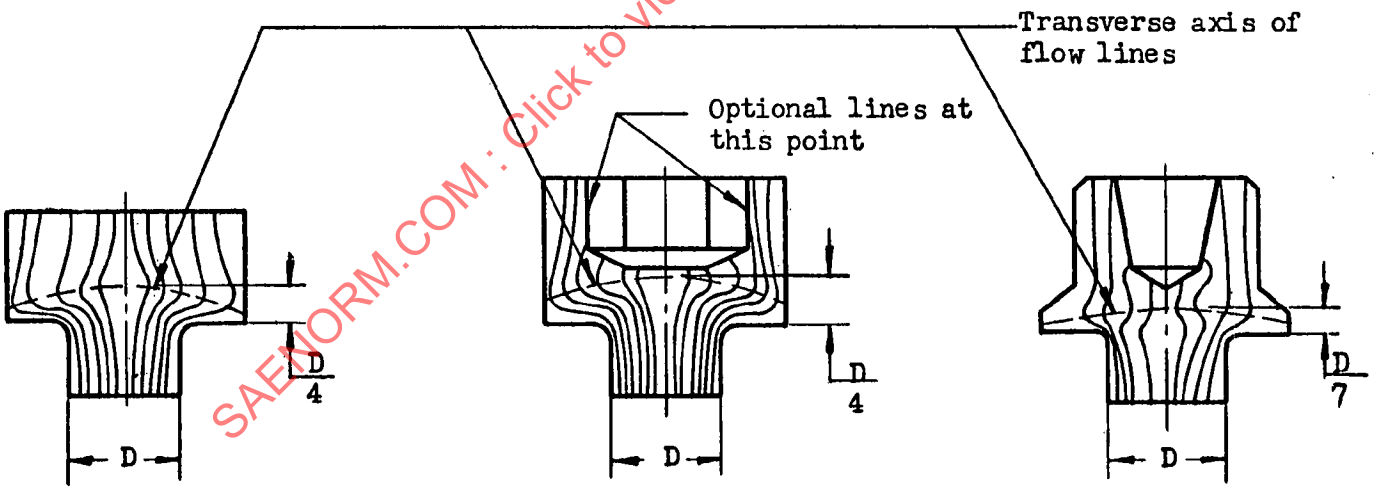

Figure 1A Figure 1B Figure 1C

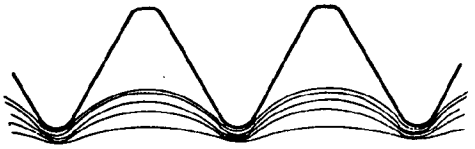

FIGURE 2
FLOW LINES
ROLLED THREAD

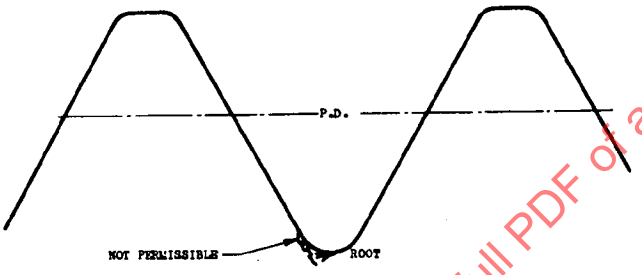

FIGURE 3
ROLLED THREAD

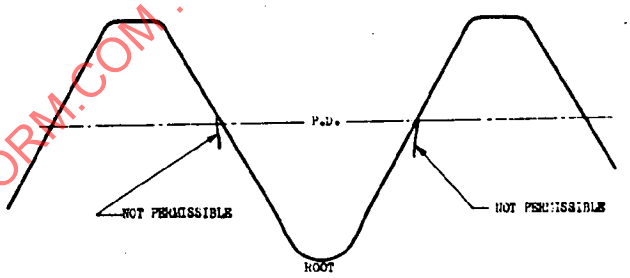

FIGURE 4
ROLLED THREAD

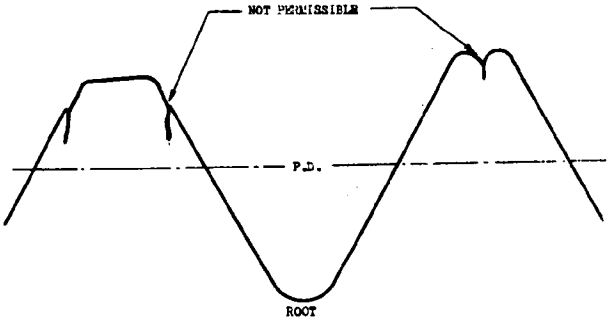

FIGURE 5
ROLLED THREAD