AERONAUTICAL MATERIAL SPECIFICATIONS

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AMS 7454

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Revised

BOLTS AND SCREWS, STEEL, LOW ALLOY HEAT RESISTANT
Normalized and Tempered - Roll Threaded

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

2. APPLICATION: Bolts and screws made primarily from AMS 6304 steel for use up to 1000 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 a 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 neither surface hardening nor decarburization other than that permitted by 4.6 and 4.7.

4.3.2 Normalizing: Blanks of AMS 6304 shall be uniformly heated to 1750 F ± 25, held at heat for 1 - 1.5 hr, and cooled in still air, or in a cooling chamber of the furnace. For other steels, the temperature shall be as agreed upon by purchaser and vendor. Elapsed time between normalizing and tempering shall not be excessive.

4.3.3 Tempering: Normalized blanks shall be tempered by heating to the temperature necessary to produce the specified hardness but not lower than 1100 F, holding at heat for 6 hr, and cooling in air.

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.

4.4.4 Threads may be 0.001 in. under the specified limits before plating but shall conform to the gage requirements after plating.

4.5 Structure: Parts shall have microstructure of finely divided carbide and ferrite in a typical Widmanstatten pattern, essentially free of tempered martensite.

4.6 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.

4.6.1 This requirement prevents heat treating procedures such as uncontrolled atmosphere for heating, bath heating medium, carbon restoration, and other similar processes.

4.7 Decarburization:

4.7.1 The bearing surface of the head, the fillet between head and shank, the shank, and threads shall be free from decarburization.

4.7.2 Depth of decarburization on those surfaces of the head which are the original surfaces of the bar shall be not greater than that permitted by the applicable material specification, except as noted in 4.7.1.

4.7.3 Depth of decarburization on the OD of the head of cylindrical head bolts and screws made by upsetting is not restricted.

4.7.4 Depth of decarburization at any point on any surface not covered by 4.7.1, 4.7.2, or 4.7.3 shall not exceed 0.002 inch.

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 imperfections detrimental to their performance.

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

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

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

5.1.2.1 Sides of Heads: Six or fewer surface or subsurface indications; the length of each indication may be the full height of the surface. The separation between 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 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 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 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 the part longitudinally.

5.2.2 Longitudinal Magnetization: Sufficient to produce 5000 amp-turns per inch of 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.

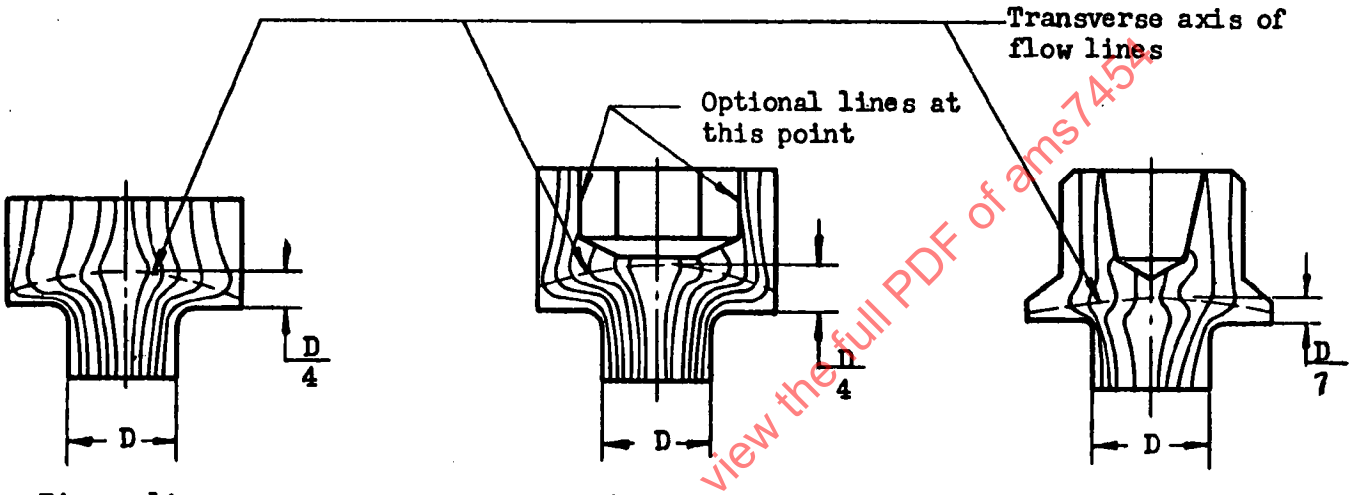

Figure 1A

Figure 1B

Figure 1C