AEROSPACE MATERIAL SPECIFICATION

Society of Automotive Engineers, Inc.
29 West 39th Street
New York City

AMS 7479

Issued 8-15-55
Revised

BOLTS AND SCREWS, STEEL, CORROSION AND HEAT RESISTANT
Heat Treated - Roll Threaded
1650 F Heat Treatment

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

2. APPLICATION: High quality bolts and screws made from AMS 5733 or AMS 5735 steel for use up to 1200 F.

3. MATERIAL: Shall be AMS 5733 or AMS 5735 steel as specified on the drawing.

4. FABRICATION: Heads may be formed by hot-cold upsetting at a temperature not higher than 1600 F, by cold upsetting, or by machining. Threads shall be formed by rolling after precipitation heat treatment.

5. TECHNICAL REQUIREMENTS:

5.1 Stock: Parts shall be fabricated from solution heat treated stock. Solution heat treatment shall be in accordance with AMS 5733 or AMS 5735 as applicable.

5.2 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.

5.2.1 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 50% hydrochloric acid (sp gr 1.19), 20% hydrofluoric acid (sp gr 1.15), 4% nitric acid (sp gr 1.42), and 26% water for 10-30 min. at room temperature shall reveal no cracks, laps, or porosity.

5.3 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.

5.4 Heat Treatment:

5.4.1 Intermediate Heat Treatment: Upset-headed blanks shall be heated to 1650 F ± 25, held at heat for 1 hr, and quenched in oil or water.

5.4.2 Precipitation Heat Treatment: Upset-headed blanks after being heat treated as in 5.4.1, and machined blanks after machining the heads, shall be precipitation heat treated in accordance with AMS 5733 or AMS 5735 as applicable.

5.4.3 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 by carburizing or nitriding.

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5.5 Threads:

5.5.1 Threads shall be produced on the finished and completely heat treated 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).

5.5.2 Threads shall have no multiple or single laps at the root or on the sides (see Figures 3, 4, and 5) except that single 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.

5.5.3 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.

5.6 Structure: Parts shall have microstructure of completely recrystallized material except in the area of the threads. Grain size after solution heat treatment shall be 4 or finer, by comparison of polished and etched specimens with the chart in ASTM E19. Up to 25%, by area of abnormally large grains will be permitted in any specific area of 100 or more adjacent grains; abnormally large grains are defined as grains more than 3 ASTM numbers coarser than the average grain size of the part.

5.7 Hardness: Shall be uniform and within the range of Brinell 248-341 or equivalent, but hardness of the threaded portion may be higher as a result of the thread rolling.

5.8 Tensile Properties:

5.8.1 Finished Parts: Shall be capable of showing tensile strength not lower than 130,000 psi when aligned in fixtures so that at least three threads are exposed in the gage section. The diameter of the area on which the stress is based shall be taken as the mean of the nominal root and pitch diameters of the part or the shank diameter, whichever is smaller.

5.8.2 Tensile Test Specimens: Tensile test specimens machined from finished parts shall conform to the following requirements:

Tensile Strength, psi	130,000 min
Yield Strength at 0.2% Offset or at 0.0099 in. in 2 in. Extension Under Load (E = 29,000,000), psi	85,000 min
Elongation, % in 4D	15 min
Reduction of Area, %	20 min

5.9 Stress-Rupture Test at 1200 F: Material shall be capable of meeting the notched stress-rupture test of AMS 5733 or AMS 5735 as applicable, using a finished part as the test specimen. The diameter of the area on which stress is based shall be taken as the mean of the nominal root and pitch diameters of the part or the shank diameter, whichever is smaller.

5.9.1 If the geometry of the thread is substantially different from that of the notched specimen described in the applicable material specification, or if the size or shape of a part is such that the part cannot be tested satisfactorily, a test may be made on a specimen machined from the stock and heat treated in the same manner as the parts.

6. 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.

6.1 Parts subject to fluorescent penetrant inspection shall not reveal indications of cracks, seams, pipes, or rolling laps as shown by Figures 3, 4, and 5, except that indications of slight laps as shown by Figures 6, 7, and 8 will be permitted.

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

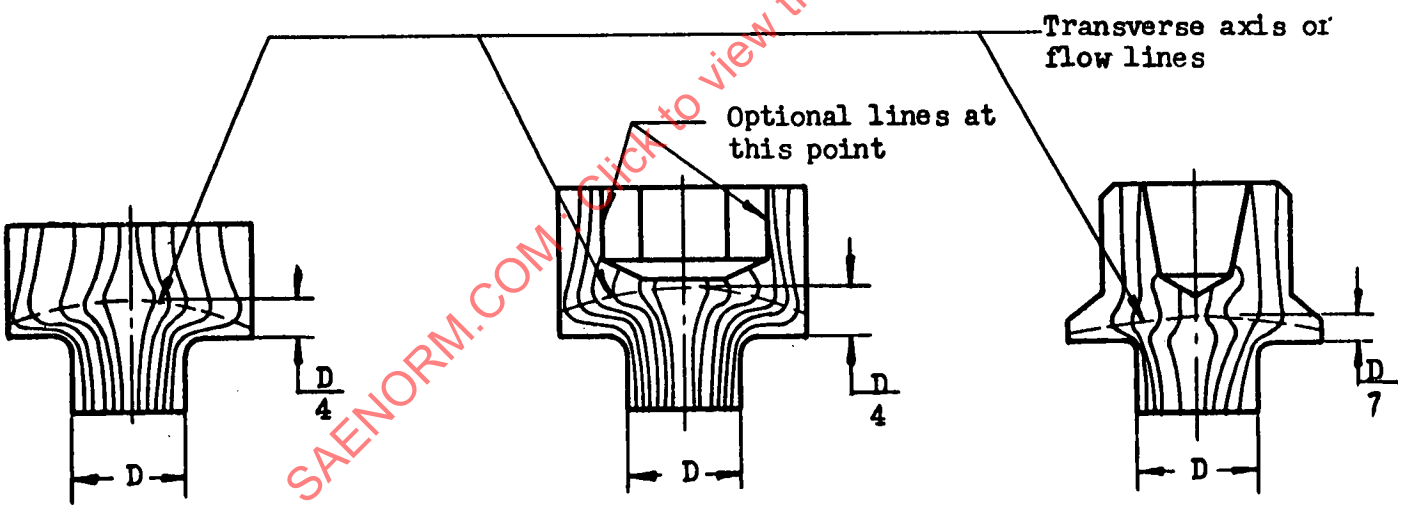

Figure 1A

Figure 1B

Figure 1C

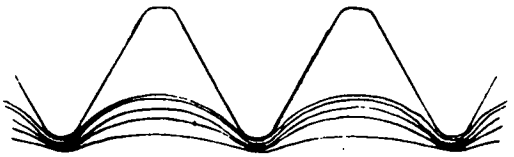

FIGURE 3
[illegible]
ROLLED THREAD

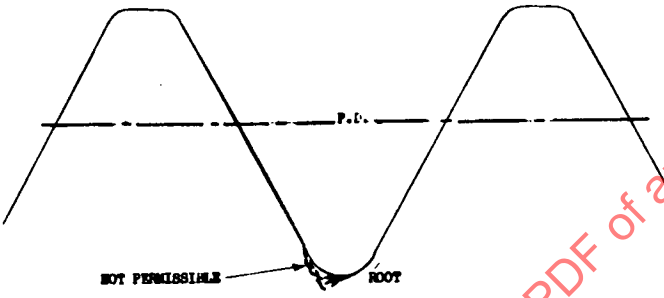

FIGURE 3
ROLLED THREAD

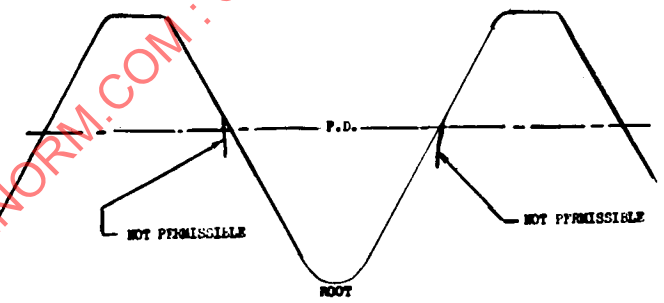

FIGURE 4
ROLLED THREAD

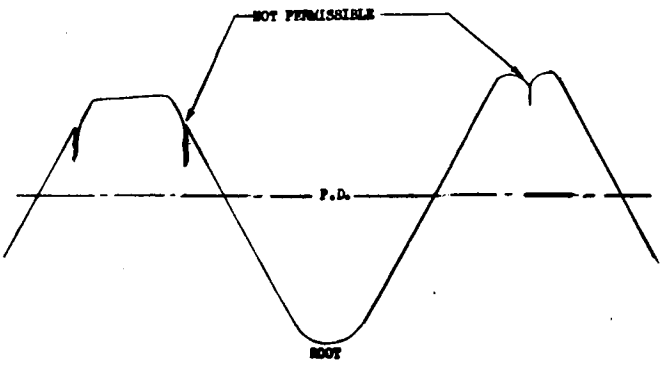

FIGURE 5
ROLLED THREAD