

AERONAUTICAL MATERIAL SPECIFICATION

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

AMS 7478

Issued 2-15-53

Revised

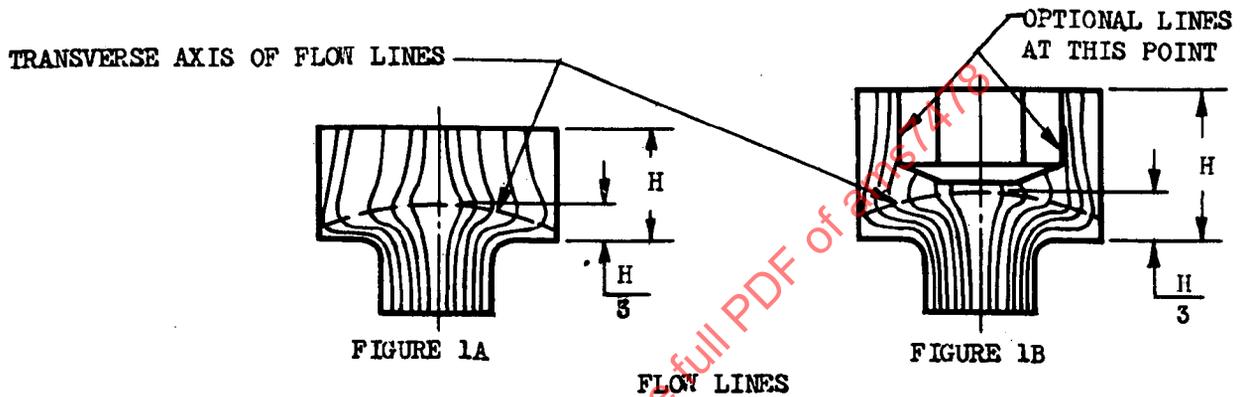
BOLTS AND SCREWS, STEEL, CORROSION AND HEAT RESISTANT Heat Treated - Roll Threaded

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 solution heat treatment.
5. TECHNICAL REQUIREMENTS:
 - 5.1 Stock: Shall be reduced 15-25% in cross sectional area during final drawing or rolling at a temperature not higher than 1600 F and shall have hardness of Brinell 201-285 or equivalent. Stock may be centerless ground, but if ground, it shall be given a final light cold pass to remove grinding marks. When heads are machined, stock may be solution heat treated before machining.
 - 5.2 Flow Lines: Flow lines of upset heads shall conform to the general arrangement shown in Figure 1A or 1B. The intersection of the longitudinal axis of the part and the approximate transverse axis of the flow lines shall be not less than H/3 in. from the bearing surface.
 - 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 Solution Heat Treatment: Headed and machined blanks, unless machined from solution heat treated stock, shall, before rolling the threads, be solution heat treated in accordance with AMS 5733 or AMS 5735 as applicable.
 - 5.4.1 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 by carburizing or nitriding.
 - 5.5 Threads:
 - 5.5.1 Threads shall be produced on the finished and solution 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).

Section 7C of the SAE Technical Board rules provides 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."

- 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 thread 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 Precipitation Heat Treatment: The finished parts shall be precipitation heat treated in accordance with AMS 5733 or AMS 5735 as applicable.
- 5.6.1 Heating Equipment: Shall conform to 5.4.1.
- 5.7 Structure: Parts shall have microstructure of completely recrystallized material except in the area of the threads. Grain size after solution heat treatment shall be 5 or finer, by comparison of polished and etched specimens with the chart in ASTM E19-46. 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.
- 5.8 Hardness: Shall be uniform and within the range of Brinell 248-321 or equivalent but hardness of the threaded portion may be higher as a result of the thread rolling.
- 5.9 Tensile Properties:
- 5.9.1 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 stress is based shall be taken as the mean of the nominal root and pitch diameters of the part.
- 5.9.2 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 l_D | 15 min |
| Reduction of Area, % | 20 min |
- 5.10 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 either the notched specimen described in the material specification or a finished part as the test specimen, provided geometry of the thread is comparable to that of the machined 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.
- 5.10.1 If tests on actual parts fail to meet these requirements, a test may be made on a machined specimen, and that shall govern.

- 6. **QUALITY:** Parts shall be uniform in quality and condition, clean, sound, smooth, and free from foreign materials and from internal and external defects detrimental to their performance.
- 7. **REJECTIONS:** Parts not conforming to this specification or to authorized modifications will be subject to rejection.



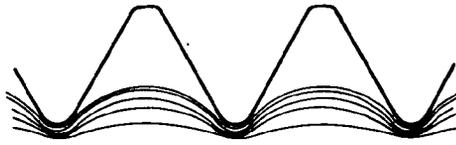


FIGURE 2
FLOW LINES
ROLLED THREAD

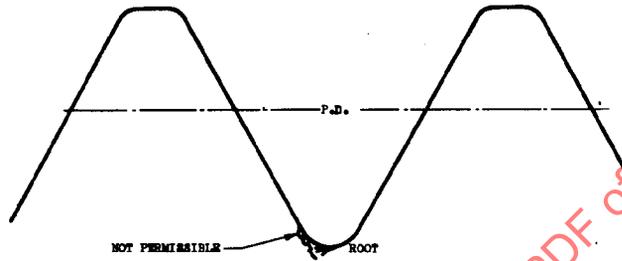


FIGURE 3
ROLLED THREAD

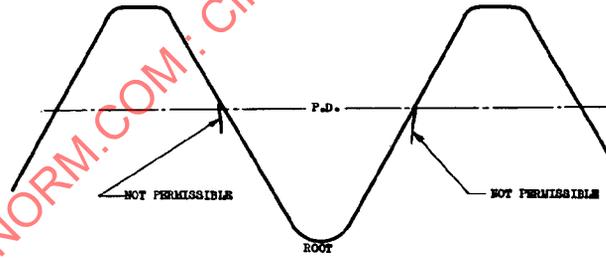


FIGURE 4
ROLLED THREAD

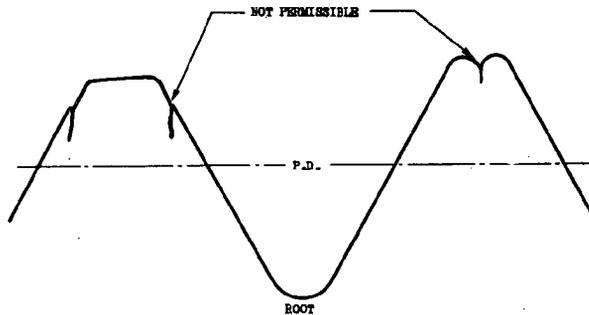


FIGURE 5
ROLLED THREAD

SAENORM.COM: Click to view the full PDF of ams7478