AEROSPACE
MATERIAL SPECIFICATIONS
SOCIETY OF AUTOMOTIVE ENGINEERS, Inc. 485 Lexington Ave., New York 17, N.Y.

AMS 7458A

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STUDS, STEEL, LOW ALLOY HEAT RESISTANT
Normalized and Tempered, 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: High quality studs used primarily up to 900 F.

3. MATERIAL: Shall be AMS 6304 steel unless otherwise specified on the drawing.

4. FABRICATION:

4.1 Blanks: Shall be machined from bar stock and shall be machined sufficiently to remove surface defects and decarburization except as permitted in 5.5. The smaller diameter or nut end of blanks for stepped studs may be reduced as necessary but the larger diameter or stud end shall not be upset.

4.2 Heat Treatment: Machined blanks, unless machined from heat treated stock, shall, before finishing the shank and rolling the threads, be heat treated as follows:

4.2.1 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 5.5.

4.2.2 Normalizing: Blanks shall be heated uniformly 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. Elapsed time between normalizing and tempering shall not be excessive.

4.2.3 Tempering: Normalized blanks shall be tempered by heating uniformly 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.

4.3 Thread Rolling: Threads shall be formed on the heat treated and finished blanks by a single rolling for each end.

5. TECHNICAL REQUIREMENTS:

5.1 Threads: Screw Thread Standards for Federal Services 1944 (National Bureau of Standards Handbook H28) and the 1950 supplement thereto shall be a part of this specification and shall be the basis for all screw thread requirements. Tolerances for pitch diameter of the stud end shall be as shown on the drawing. Tolerances for lead and thread form, and for accuracy of the thread angle, of the stud end shall be in accordance with Class 4 Fit screw threads in the above referenced Handbook H28; any error in lead shall be in the same relative direction on the lead thread of the stud end as on the full thread of the stud end (See Figure 10).

5.1.1 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).

5.1.2 Root defects such as notches, slivers, folds, roughness, or oxide scale are not permitted (Figure 3).

5.1.3 Multiple laps on the sides of threads are not permissible regardless of location. Single laps on the sides of threads that extend toward the root are not permissible (See Figures 4 and 5).

5.1.4 A single lap is permissible along the side of the thread below the pitch diameter on the non-pressure side provided the lap does not originate less than 20% of the basic thread height from the root and extends toward the crest and generally parallel to the side (See Figure 6). A single lap is permissible along the side of the thread above the pitch diameter on either the pressure or non-pressure side (one lap per thread) provided it extends toward the crest and generally parallel to the side (See Figure 7). Basic thread height is defined as being equivalent to 0.650 times the pitch (See Table II).

5.1.5 Crest craters, crest laps, or a crest lap in combination with a crest crater are permissible, provided the imperfections do not extend deeper than 20% of the basic thread height (See Table II) as measured from the thread crest when the thread major diameter is at minimum size (See Figure 8). The major diameter of the thread shall be measured prior to sectioning. As the major diameter of the thread approaches maximum size, values for crest crater or crest lap imperfections listed in Table II may be increased by 1/2 the difference between the minimum major diameter and the actual major diameter as measured on the part.

5.1.6 Slight deviations from thread contour are permissible at the crest of the thread within the major diameter limits as shown in Figure 9 and at the incomplete thread at each end of the threaded sections.

5.1.7 The pitch diameter of all full threads on the stud end, Figure 10, shall not taper more than 0.0005 in. per in. and, if tapered, the smaller diameter shall be at the entering end of the stud. Taper variations shall fall within pitch diameter tolerances specified on the drawing.

5.1.8 The pitch diameter of the lead threads on the stud end shall originate from the stud pitch diameter and continue, decreasing for a distance B specified in the following Table I and illustrated in Figure 1.

Table I

Pitch	32	24	20	18	16	14	13	12	11	10	9	8
B, Inch, max	0.09	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.30	0.33	0.38

5.1.9 Circularity (out-of-roundness) of the pitch diameter of the stud end shall not exceed 0.0005 in. full indicator reading. Circularity shall fall within pitch diameter tolerances specified on the drawing.

5.1.10 The minimum lead thread length on the stud end is controlled by the number of threads that the stud will enter a lead thread ring gage or gage of equivalent accuracy made to the maximum pitch diameter of the lead threads specified on the drawing; the number of such threads shall be not less than 1 nor more than 2.

5.1.11 Studs without necks that are made in accordance with this specification will have a minimum full thread length shown on the drawing. A maximum full thread length will also be shown and this will include the imperfect threads due to the lead. Parts shall have a minimum thread run-out of 1 thread and a maximum of 3 threads. The run-out shall fair onto the shank eliminating any abrupt change in cross-sectional area. Bottom and sides of threads contained in run-out shall be filleted, smooth, and devoid of abrupt tool stop marks, and shall not be cut or mutilated in any way by the threading operation, unless so indicated on the drawing.

5.1.12 The general "break edge" note on drawings does not apply to the crest of the thread; sharp edges (without burrs and feather edges) at this location are permissible. Any operation to remove burrs from the thread should not break the edge more than approximately 0.003 in. radius.

5.1.13 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.

5.1.14 Threads on the nut end and the lead threads on the stud end may be 0.0012 in. under the specified limits before plating but shall conform to the gage requirements after plating.

5.1.15 All thread elements on the nut thread end shall be within specified limits starting at a length 2 times the pitch from the end, including chamfer, and extending for the specified full thread length.

5.2 Structure: Parts shall have microstructure consisting primarily of finely divided carbide and ferrite in a typical Widmanstatten pattern but presence of Ø tempered martensite, particularly in small diameter parts, will not be cause for rejection.

5.3 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.

5.4 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.

5.5 Decarburization: Parts shall be free from decarburization except as follows:

5.5.1 Decarburization up to a depth of 0.002 in. will be permitted on ends and in holes for locking devices.

5.5.2 The periphery of the shoulder of shouldered studs may be decarburized to a depth not exceeding that permitted by the material specification for material of the size used for the part.

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 imperfections detrimental to their performance.

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

6.1.1 Discontinuities transverse to grainflow such as pipes, grinding checks, and quench cracks shall be cause for rejection.

6.1.2 Longitudinal indications of seams, forming laps, and nonmetallic inclusions parallel to grainflow are acceptable within the following limits, provided the separation between indications is not less than 1/16 in. in all directions.

6.1.2.1 Sides of Shoulders: A maximum of 6 surface or subsurface indications is permitted and the length of each indication may be the full height of the surface. No indication shall break over either edge to a depth greater than 1/32 in. or the equivalent of the basic thread height (See Table II), whichever is less.

6.1.2.2 Unthreaded Sections Other Than Sides of Shoulders: A maximum of 10 subsurface and hairline surface indications is permitted. The length of any indication may be the full length of the surface but the total length of all indications shall not exceed twice the length of the surface. No indications shall break into a fillet or over an edge. If parts have positioning shoulders shoulders within the total unthreaded section, these requirements apply to each such unthreaded section between thread and shoulder or between shoulders.

6.1.2.3 Threads: 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.

6.2 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 6.2.1 and 6.2.2.

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

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

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

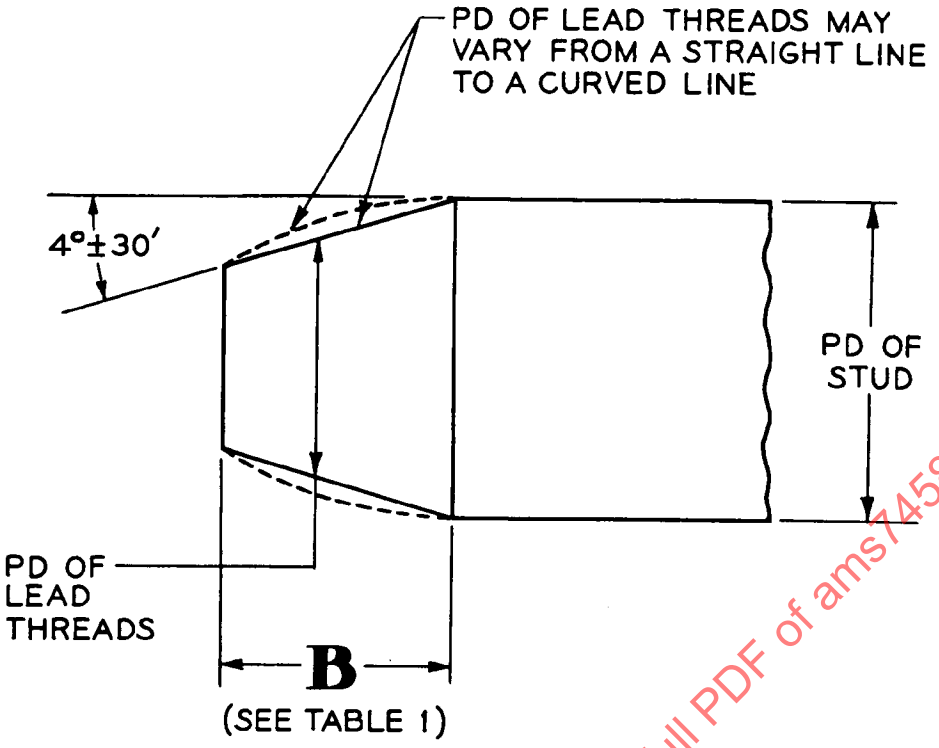


FIGURE 1
For Illustrative Purposes Only

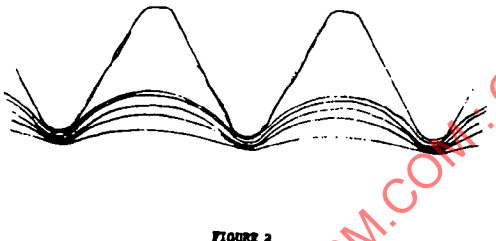


FIGURE 2
[illegible]
ROLLED THREAD

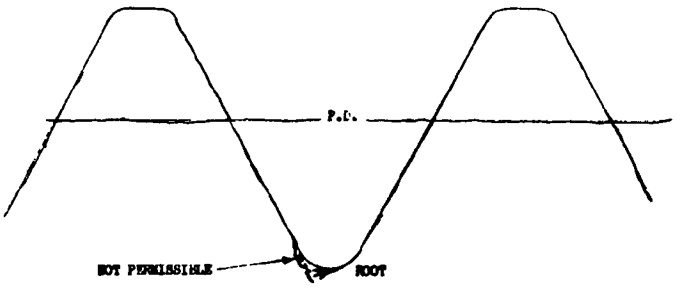


FIGURE 3
ROLLED THREAD

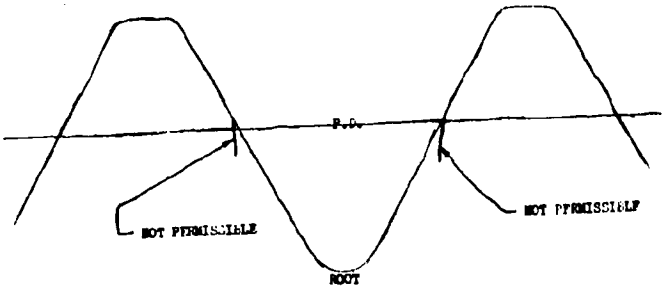


FIGURE 4
ROLLED THREAD

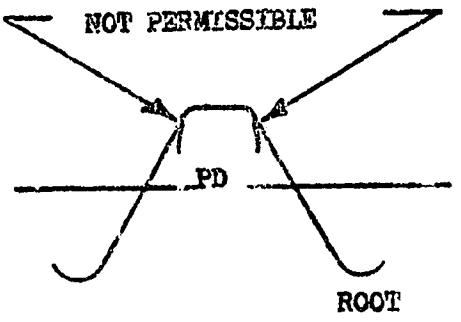


FIGURE 5
ROLLED THREAD

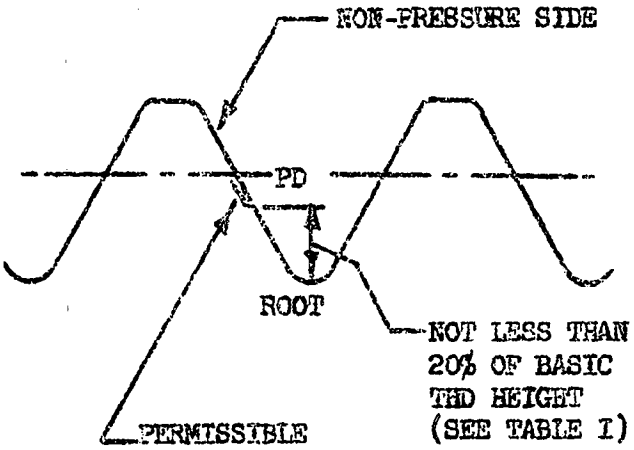


FIGURE 6
ROLLED THREAD

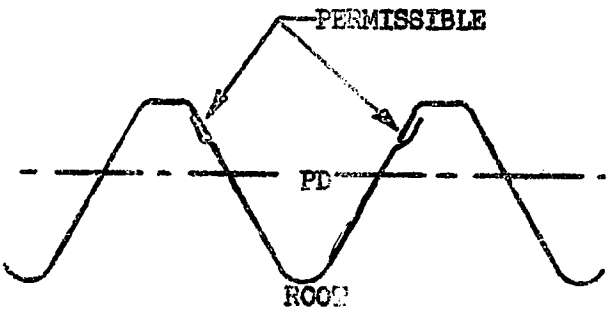
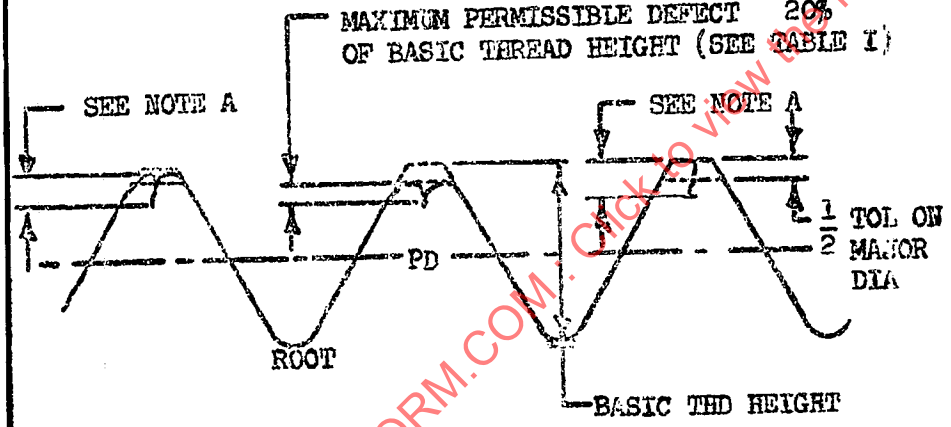


FIGURE 7
ROLLED THREAD



NOTE A: DEPTH OF DEFECT EQUALS 20% OF BASIC THREAD HEIGHT PLUS 1/2 THE DIFFERENCE OF THE ACTUAL MAJOR DIAMETER AND MINIMUM MAJOR DIAMETER.

FIGURE 8
ROLLED THREAD

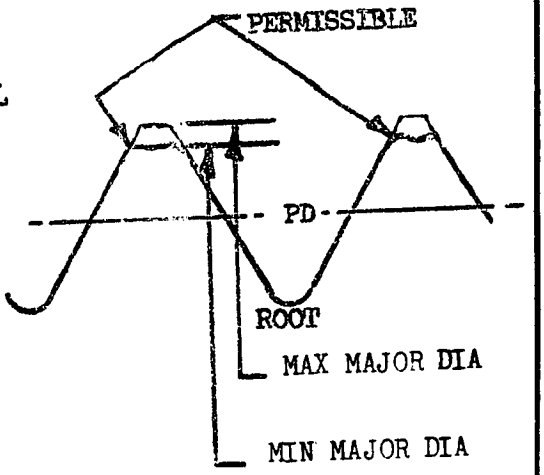


FIGURE 9
ROLLED THREAD