AEROSPACE STANDARD

AS7482™	REV. C
Issued 1991-10 Reaffirmed 2015-04 Revised 2021-10 Superseding AS7482B	

(R) Studs, Steel, UNS S66286
Tensile Strength 130 ksi
1800 °F Solution Heat Treated, Aged Before Roll Threading
Procurement Specification

FSC 5307

RATIONALE

Extensive changes, both technical and editorial, throughout to harmonize with simlar procurement specifications for externally threaded fasteners, add definition for a rateable lap, update references, and clarify microscopic examination and testing requirements.

1. SCOPE

This specification covers studs made from a corrosion and heat resistant, precipitation hardenable iron base alloy of the type identified under the Unified Numbering System as UNS S66286.

1.1 Type

The following specification designations and their properties are covered:

AS7482	130 ksi minimum ultimate tensile strength at room temperature 70 ksi stress-rupture strength at 1200 °F
AS7482-1	130 ksi minimum ultimate tensile strength at room temperature 78 ksi minimum ultimate shear strength at room temperature
AS7482-2	130 ksi minimum ultimate tensile strength at room temperature

1.1.1 Classification

130 ksi minimum tensie strength at room temperature.
1200 °F maximum test temperature of parts.

1.2 Application

Primarily for aerospace propulsion system applications where a good combination of strength and resistance to corrosion are required. AS7482 studs are intended for use at elevated temperatures in corrosion resistant steel parts. AS7482-1 studs are intended for studs loaded in shear. AS7482-2 studs are intended for use where the coefficient of expansion of the stud is more compatible for use in aluminum or magnesium alloys.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
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For more information on this standard, visit
https://www.sae.org/standards/content/AS7482C

1.3 Safety - Hazardous Materials

While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA and Canada), www.sae.org.

AMS2700	Passivation of Corrosion Resistant Steels
AMS2759/3	Heat Treatment, Precipitation Hardening, Corrosion-Resistant, Maraging, and Secondary Hardening Steel Parts
AMS5731	Steel, Corrosion and Heat-Resistant, Bars, Wire, Forgings, Tubing, and Rings, 15Cr - 25.5Ni - 1.2Mo - 2.1Ti - 0.006B - 0.30V, Consumable Electrode Melted, 1800 °F (982 °C) Solution Heat Treated
AMS5732	Steel, Corrosion and Heat-Resistant, Bars, Wire, Forgings, Tubing, and Rings, 15Cr - 25.5Ni - 1.2Mo - 2.1Ti - 0.006B - 0.30V, Consumable Electrode Melted 1800 °F (982 °C) Solution and Precipitaion Heat Treated
AS1132	Bolts, Screws, and Nuts - External Wrenching UNJ Thread, Inch - Design Standard
AS3062	Bolts, Screws, and Studs, Screw Thread Requirements
AS3063	Bolts, Screws, and Studs, Geometric Control Requirements
AS6416	Bolts, Screws, Studs, and Nuts, Definitions for Design, Testing and Procurement
AS8879	Screw Threads - UNJ Profile, Inch - Controlled Radius Root with Increased Minor Diameter

2.1.2 AIA/NAS Publications

Available from Aerospace Industries Association, 1000 Wilson Boulevard, Suite 1700, Arlington, VA 22209-3928, Tel: 703-358-1000, www.aia-aerospace.org.

NASM1312-6	Fastener Test Methods, Method 6, Hardness
NASM1312-8	Fastener Test Methods, Method 8, Tensile Strength
NASM1312-10	Fastener Test Methods, Method 10, Stress Rupture
NASM1312-13	Fastener Test Methods, Method 13, Double Shear Test

2.1.3 ASME Publications

Available from ASME, P.O. Box 2900, 22 Law Drive, Fairfield, NJ 07007-2900. Tel. 800-843-2763 (U.S./Canada), 001-800-843-2763 (Mexico), 974-882-1170 (outside North America), www.asme.org.

ASME B46.1 Surface Texture (Surface Roughness, Waviness, and Lay)

2.1.4 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM A380/A380M Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems

ASTM A967/A967M Standard Specification for Chemical Passivation Treatments for Stainless Steel Parts

ASTM D3951 Commercial Packaging

ASTM E8/E8M Tension Testing of Metallic Materials

ASTM E112 Determining Average Grain Size

ASTM E139 Conducting Creep-Rupture, and Stress-Rupture Tests of Metallic Materials

ASTM E140 Standard Hardness Tables for Metals

ASTM E1417/E1417M Liquid Penetrant Examination

2.2 Definitions

Definitions shall be in accordance with AS6416.

2.3 Unit Symbols and Abbreviations

°C degree Celsius

°F degree Fahrenheit

% percent (1% = 1/100)

lbf pounds force

ksi kips (1000 pounds) per square inch

sp gr specific gravity

HRC hardness Rockwell C scale

3. TECHNICAL REQUIREMENTS

3.1 Material

Shall be AMS5731 corrosion and heat resistant steel heading stock or AMS5732 corrosion and heat resistant steel.

3.2 Design

Finished (completely manufactured) parts shall conform to the following requirements:

3.2.1 Dimensions

The dimensions of finished parts, after all processing including plating or coating, shall conform to the part drawing. Dimensions apply after plating but before coating with dry film lubricants.

3.2.2 Surface Texture

Surface texture of finished parts, prior to plating or coating, shall conform to the requirements as specified on the part drawing, determined in accordance with ASME B46.1.

3.2.3 Threads

Screw thread shall be UNJ profile and dimensions shall be in accordance with AS8879, unless otherwise specified on the part drawing. Tolerances for pitch diameter of the stud end thread shall be as specified on the part drawing. The special stud end thread variations shall be in accordance with AS3062 for the following requirements:

a. Lead and half-angle variation

b. Taper

c. Out-of-roundness

d. Stud lead threads

e. Stud thread runout

3.2.3.1 The requirements for thread crest variations, locking holes in the nut end thread, incomplete lead threads, and thread runout in the nut end threads shall be as specified in AS3062.

3.2.3.2 Chamfer

The entering end of the thread shall be chamfered as specified on the part drawing.

3.2.4 Geometric Tolerances

Part features shall be within the geometric tolerances specified on the part drawing and, where applicable, controlled in accordance with AS3063.

3.3 Fabrication

3.3.1 Blanks

Blanks shall be machined sufficiently to remove surface defects. Blanks may be produced by machining, hot or cold forging, extruding, or a combination of these methods. Flash or chip clearance in machined recesses shall not cause recess dimensions to exceed the specified limits. Heading stock to be hot forged shall be heated to a temperature not higher than 2100 °F.

3.3.1.1 When a shoulder or shoulders are produced by upsetting, the metal removed from the bearing surface shall be as little as practicable to provide a clean, smooth surface.

3.3.2 Heat Treatment

Blanks shall, before finishing the shank and any bearing surface, cold rolling any filet radii, and rolling the threads, conform to the technical requirements and other provisions specified in AMS2759/3 for A-286, 1800 °F solution treatment, and 1325 °F aging treatment.

3.3.2.1 Solution Heat Treatment

Blanks, unless machined from solution heat treated stock or AMS5732 steel, shall be solution heat treated as in 3.3.2.

3.3.2.2 Aging Treatment

After solution heat treatment as in 3.3.2.1, shall be heat treated by aging as in 3.3.2.

3.3.3 Oxide Removal

Surface oxide and oxide penetration resulting from prior heat treatment shall be removed from the full body diameter, thread roll diameter, and bearing surface of shoulders, as applicable, of the solution heat treated and aged blanks prior to rolling the threads. The oxide removal process shall produce no intergranular attack or corrosion of the blanks.

3.3.4 Thread Rolling

Threads shall be formed on the heat treated and finished blanks by a single cold rolling process for each end after removal of oxide as in 3.3.3.

3.3.5 Cleaning

Parts, after finishing, shall be cleaned in one of the following solutions for the time and temperature shown and then thoroughly rinsed:

a. One volume of nitric acid (sp gr 1.42) and nine volumes of water for not less than 20 minutes at room temperature.

b. One volume of nitric acid (sp gr 1.42) and four volumes of water for 30 to 40 minutes at room temperature.

c. One volume of nitric acid (sp gr 1.42) and four volumes of water for 10 to 15 minutes at 140 to 160 °F.

d. ASTM A967/A967M, ASTM A380/A380M, or AMS2700 for cleaning parts only, excluding any additional verification requirements (such as salt spray).

3.4 Plating or Coating

Where required, surfaces shall be plated as specified by the part drawing. Where coating with solid film lubricants is required, the under-head bearing surface (if applicable), the unthreaded shank, and the threads shall be coated as specifiied on the part drawing. Coating other surfaces is optional, unless otherwise specified. Plating thickness shall be determined in accordance with the requirements in the applicable plating specification.

3.5 Product Marking

Each part shall be marked for oversize on the stud end thread and for material code on the nut end thread as specified by the part drawing. The markings may be formed by stamping, depressed 0.010 inch maximum, with rounded root form on depressed characters.

3.6 Mechanical Properties

Where AS7482 is specified, parts shall conform to the requirements of 3.6.1, 3.6.2, and 3.6.3. Where AS7482-1 is specified, parts shall conform to the requirements of 3.6.1, 3.6.2, and 3.6.4. Where AS7482-2 is specified, parts shall conform to the requirements of 3.6.1 and 3.6.2. Threaded members of gripping fixtures for tensile and stress-rupture tests shall be of sufficient size and strength to develop the full strength of the part without stripping the thread.

AS7482 finished parts shall be tested in accordance with the following test methods:

a. Hardness: MIL-STD-1312-6 in accordance with NASM1312-6.

b. Ultimate tensile strength at room temperature: MIL-STD-1312-8 in accordance with NASM1312-8.

c. Stress-rupture strength at 1200 °F: MIL-STD-1312-10 in accordance with NASM1312-10.

AS7482-1 finished parts shall be tested in accordance with the following test methods:

a. Hardness: MIL-STD-1312-6 in accordance with NASM1312-6.

b. Ultimate tensile strength at room temperature: MIL-STD-1312-8 in accordance with NASM1312-8.

c. Ultimate double shear strength at room temperature: MIL-STD-1312-13 in accordance with NASM1312-13.

AS7482-2 finished parts shall be tested in accordance with the following test methods:

a. Hardness: MIL-STD-1312-6 in accordance with NASM1312-6.

b. Ultimate tensile strength at room temperature: MIL-STD-1312-8 in accordance with NASM1312-8.

3.6.1 Ultimate Tensile Strength at Room Temperature

3.6.1.1 Finished Parts

Parts shall have an ultimate tensile load not lower than that specified in Table 1 and shall be tested to failure in order to observe fracture location, first measuring and recording the maximum tensile load achieved. If the size or shape of the part is such that failure would occur outside the threaded section but the part can be tested satisfactorily, such as parts having a shank diameter equal to or less than the thread root diameter (smaller thread root diameter for studs with unequal size threads) or having an undercut, parts shall have an ultimate tensile strength not lower than 130 ksi; for such parts, the diameter of the area on which stress is based shall be the actual measured minimum diameter of the part.

3.6.1.2 Machined Test Specimens

If the size or shape of the part is such that a tensile test cannot be made on the part, tensile tests shall be conducted in accordance with ASTM E8/E8M on specimens prepared as in 4.4.7. Specimens may be required by the purchaser to perform confirmatory tests. Such specimens shall meet the following requirements:

a. Ultimate tensile strength, minimum: 130 ksi.

b. Yield strength at 0.2% Offset, minimum: 85 ksi.

c. Elongation in 2 inches or 4D, minimum: 15%.

d. Reduction of area, minimum: 20%.

3.6.1.2.1 When permitted by purchaser, hardness tests on the end of parts may be substituted for tensile tests of machined specimens.

3.6.2 Hardness

Shall be uniform within the range 24 to 37 HRC (see 8.1), but hardness of the threaded section may be higher as a result of the cold rolling operations. Parts shall not be rejected on the basis of hardness if the tensile strength properties specified in 3.6.1 are met.

3.6.3 Stress-Rupture Strength at 1200 °F

3.6.3.1 Finished Parts

Parts, maintained at 1200 °F ± 3 °F while the tensile load specified in Table 1 is applied continuously, shall not rupture in less than 23 hours. If the shank diameter of the part is less than the maximum minor (root) diameter of the thread but the part can be tested satisfactorily, parts shall conform to the requirements of 3.6.3.1.1.

3.6.3.1.1 Parts having a shank diameter less than the maximum minor (root) diameter of the thread shall be tested as in 3.6.3.1, except that the load shall be as specified in 3.6.3.2. The diameter of the area on which stress is based shall be the actual measured minimum diameter of the part.

3.6.3.2 Machined Test Specimens

If the size or shape of the part is such that a stress-rupture test cannot be made on the part, a test specimen prepared as in 4.4.7, maintained at 1200 °F ± 3 °F while a load sufficient to produce an initial axial stress of 70 ksi is applied continuously, shall not rupture in less than 23 hours. Tests shall be conducted in accordance with ASTM E139. Specimens may be required by purchaser to perform confirmatory tests.

3.6.4 Ultimate Double Shear Strength

Finished parts having a close toleranced full shank as in AS1132 shall have an ultimate double shear load not lower than that specified in Table 1. The double shear test may be discontinued without a complete shear failure after the ultimate double shear load has been reached, first measuring and recording the maximum double shear load achieved. Shear studs having special shank diameters shall have the minimum ultimate double shear load based on 78 ksi minimum shear strength. Shear tests are not required for studs having a grip less than 2 times the nominal diameter. Shear test is not required for the following conditions:

a. Studs fully threaded.

b. Studs having coarse tolerance full shank.

c. Studs having a pitch diameter or relieved shank.

3.7 Quality

Parts shall be uniform in quality and condition, free from burrs, foreign materials, and from imperfections detrimental to the usage of the part.

3.7.1 Microscopic Examination

Specimens cut from finished parts shall be polished, etched in Kalling's reagent, Marble's reagent, or other suitable etchant, and examined at 100X magnification to determine conformance to the requirements of 3.7.1.1, 3.7.1.2, 3.7.1.3, and 3.7.1.4 and at 200X magnification to determine conformance to the requirements of 3.7.1.5 and 3.7.1.6.

3.7.1.1 Threads

Examination of a longitudinal section through the threaded ends shall show evidence that the threads were rolled. Flow lines in threads shall be continuous, shall follow the general thread contour, and shall be of maximum density at root of thread (see Figure 1). Below the thread roots, flow lines not affected by forming shall be parallel to the axis, except that on the nut end of parts formed by extruding, the flow lines may be oblique to the axis for a distance from the end of the larger diameter to the smaller diameter equal to 1.5 times the "B" dimension of Table 2 of AS3062.

3.7.1.2 Internal Imperfections

Examination of longitudinal section of the part shall reveal no cracks, laps, or porosity. Thread imperfections shall meet the requirements in 3.7.1.6.

3.7.1.3 Microstructure

Parts shall have microstructure of completely recrystallized material except in the area of the threads. In case of dispute over results of the microscopic examination, microhardness testing shall be used as a referee method. A Vickers hardness reading of an unrolled surface/finished surface which exceeds the reading in the core by more than 30 points shall be evidence of nonconformance to this requirement.

3.7.1.4 Grain Size

Shall be ASTM No. 5 or finer as determined by the comparison method of ASTM E112. Up to 25% of the areas examined may exhibit a grain size as large as ASTM No. 2. Such areas shall be separated by at least 0.025 inch. Bands of fine or coarse grains are not permitted. In case of disagreement on grain size by comparison method, the intercept (Heyn) method shall be used.

3.7.1.5 Surface Hardening

Parts shall have no change in hardness from core to surface, except as produced during cold rolling of threads. There shall be no evidence of carburization or nitriding. In case of dispute over results of the microscopic examination, microhardness testing shall be used as a referee method; a Vickers hardness reading of an unrolled surface which exceeds the reading in the core by more than 30 points shall be evidence of nonconformance to this requirement. An equivalent Knoop hardness test may be used.

3.7.1.6 Threads

3.7.1.6.1 Root defects such as laps, seams, notches, slivers, folds, roughness, and oxide scale are not permissible (see Figure 2).

3.7.1.6.2 Multiple laps on thread flanks are not permissible regardless of location. Single laps on the flanks of threads that extend towards the root are not permissible (see Figures 3 and 4).

3.7.1.6.3 Single lap on thread shall conform to the following: A rateable lap shall have its length equal to or greater than three times its width. The minimum interpretable lap size is 0.0005 inch length or depth when viewed at 200X magnification.

3.7.1.6.4 Thread flank above the pitch diameter: A lap is permissible along the flank of the thread above the pitch diameter on either the pressure or non-pressure flank (one lap at any cross-section through the thread) provided it extends towards the crest and generally parallel to the flank (see Figure 3). The lap depth shall not exceed the limit specified in Table 2 for the applicable thread pitch. A lap extending toward the root is not permissible (see Figure 4).

3.7.1.6.5 Thread flank below the pitch diameter: A lap along the thread flank below the pitch diameter, regardless of direction it extends, is not permissible (see Figure 5).

3.7.1.6.6 Crest craters, crest laps, or a crest lap in combination with a crest crater are permissible provided that the imperfections do not extend deeper than the limit specified in Table 2 as measured from the thread crest when the thread major diameter is at minimum size (see Figure 6). The major diameter of the thread shall be measured prior to sectioning. As the major diameter of the thread approaches maximum size, values for depth of crest crater and crest lap imperfections listed in Table 2 may be increased by one-half of the difference between the minimum major diameter and actual major diameter as measured on the part.

3.7.2 Fluorescent Penetrant Inspection

Prior to any required plating or coating, parts shall be subject to fluorescent penetrant inspection in accordance with ASTM E1417/E1417M, Type I, Sensitivity Level 2 minimum. Any discontinuity shall be reviewed by a metallurgist or skilled metallographer.

3.7.2.1 The following conditions shall be cause for rejection of parts inspected.

3.7.2.1.1 Discontinuities transverse to grain flow (i.e., at an angle of more than 10 degrees to the axis of the shank), such as grinding checks.

3.7.2.1.2 Longitudinal indications (i.e., at an angle of 10 degrees or less to the axis of the shank) due to imperfections such as quench cracks, other than seams, forming laps and nonmetallic inclusions.

3.7.2.2 The following conditions shall be considered acceptable on parts inspected.

3.7.2.2.1 Parts having longitudinal indications (i.e., at an angle of 10 degrees or less to the axis of the shank) of seams and forming laps parallel to the grain flow that are within the limits specified in 3.7.2.2.2 through 3.7.2.2.5 provided the separation between indications is not less than 0.062 inch.

3.7.2.2.2 Sides of Shoulders

There shall be not more than three indications per shoulder. The length of each indication may be the full height of the surface but no indication shall break over either edge to a depth greater than 0.031 inch or the equivalent of the 2H/3 thread depth (see Table 2), whichever is less.

3.7.2.2.3 Shank or Stem

There shall be not more than five indications. 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 indication shall break into a fillet or over an edge.

3.7.2.2.4 Threads

There shall be no indications, except as permitted in 3.7.1.6. Rateable lap indications shall confrom to 3.7.1.6.3.

3.7.2.2.5 End of Stem

The number of indications is not restricted but the depth of any individual indication shall not exceed 0.010 inch, as shown by sectioning representative samples. No indication, except those of 3.7.2.2.2, shall break over an edge.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The vendor of parts shall supply all samples and shall be responsible for performing all required tests. The purchaser reserves the right to perform such confirmatory testing as deemed necessary to ensure that the parts conform to the requirements of this specification.

4.2 Responsibility for Compliance

The manufacturer's system for parts production shall be based on preventing product defects, rather than detecting the defects at final inspection and then requiring corrective action to be invoked. An effective manufacturing in-process control system shall be established, subject to the approval of the purchaser, and used during production of parts.

4.3 Production Acceptance Tests

The purpose of production acceptance tests is to check, as simply as possible, using a method which is inexpensive and representative of the part usage, with the uncertainty inherent in random sampling, that the parts comprising a production inspection lot satisfy the requirements of this specification.

4.3.1 Tests for all technical requirements are acceptance tests and shall be performed on each production inspection lot. A summary of acceptance tests is specified in Table 3.

4.4 Acceptance Test Sampling

4.4.1 Material

Sampling for material composition on each heat shall be in accordance with AMS5731 or AMS5732.

4.4.2 Nondestructive Test, Visual and Dimensional

A random sample of parts shall be taken from each production inspection lot; the size of the sample to be as specified in Table 4. The classification of dimensional characteristics shall be as specified in Table 5. All dimensional characteristics are considered defective when out of tolerance.

4.4.3 Fluorescent Penetrant Inspection

A random sample shall be selected from each production inspection lot; the size of the sample shall be as specified in Table 4 and classified as in Table 5. The sample units may be selected from those that have been subjected to and passed the visual and dimensional inspection, with additional units selected at random from the production inspection lot as necessary.

4.4.4 Stress-Rupture Test

A random sample of one part (or one specimen where required) shall be selected from each production inspection lot.

4.4.5 Destructive Tests

A random sample shall be selected from each production inspection lot; the size of the sample shall be as specified in Table 6. The sample units may be selected from those that have been subjected to and passed the nondestructive tests and the fluorescent penetrant inspection, with additional units selected at random from the production inspection lot as necessary.

4.4.6 Acceptance Quality

Of random samples tested, acceptance quality shall be based on zero defectives.

4.4.7 Test Specimens

Specimens for tensile and stress-rupture testing of machined test specimens shall be of standard proportions in accordance with ASTM E8/E8M. Specimens shall be machined from finished parts or coupons of the same lot of alloy and be processed together with the parts they represent. Specimens shall be machined from the center of parts, less than 0.800 inch in nominal diameter, from the center of coupons 0.800 inch and under in nominal diameter or distance between parallel sides, and from mid-radius of larger size parts or coupons.

4.5 Reports

The vendor of parts shall furnish with each shipment a report stating that the chemical composition of the parts conforms to the applicable material specification, and showing the results of tests to determine conformance to the room temperature ultimate tensile property, hardness, double shear test (if required), and stress-rupture requirements, and stating that the parts conform to the other technical requirements. This report shall include the purchase order number, AS7482 (or AS7482-1 or AS7482-2, as applicable) and revision letter, lot number, contractor or other direct supplier of material, part number, nominal size, and quantity.

4.6 Rejected Lots

If a production inspection lot is rejected, the manufacturer of parts shall perform corrective action to screen out or rework the defective parts, resubmit for acceptance tests inspection as in Table 3, or scrap the entire lot. Resubmitted lots shall be clearly identified as reinspected lots.

5. PREPARATION FOR DELIVERY

5.1 Packaging and Identification

5.1.1 Packaging shall be in accordance with ASTM D3951.

5.1.2 Parts having different part numbers shall be packed in separate containers.

5.1.3 Each container of parts shall be marked to show not less than the following information:

STUDS, STEEL, CORROSION AND HEAT RESISTANT
AS7482 (or AS7482-1 or AS7482-2, as applicable)
PART NUMBER
LOT NUMBER
PURCHASE ORDER NUMBER
QUANTITY
MANUFACTURER'S IDENTIFICATION

5.1.4 Threaded fasteners shall be protected from abrasion and chafing during handling, transportation, and storage.

6. ACKNOWLEDGMENT

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

7. REJECTIONS

Parts not conforming to this specification, or to modifications authorized by purchaser, will be subject to rejection.

8. NOTES

8.1 Hardness Conversion Tables

Hardness conversion tables for metals are presented in ASTM E140.

8.2 Revision Indicator

A change bar (|) located in the left margin is for the convenience of the user in locating areas where technical revisions, not editorial changes, have been made to the previous issue of this document. An (R) symbol to the left of the document title indicates a complete revision of the document, including technical revisions. Change bars and (R) are not used in original publications, nor in documents that contain editorial changes only.

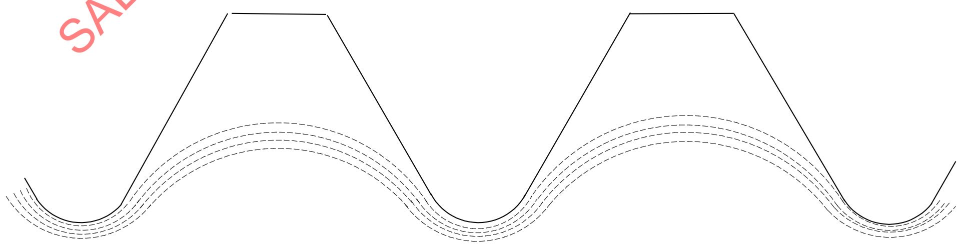

Figure 1 - Flow lines, rolled thread

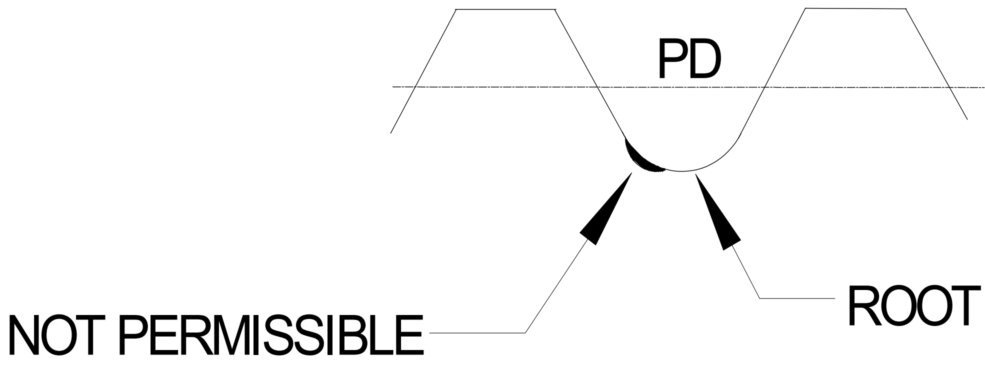

Figure 2 - Root defects, rolled thread

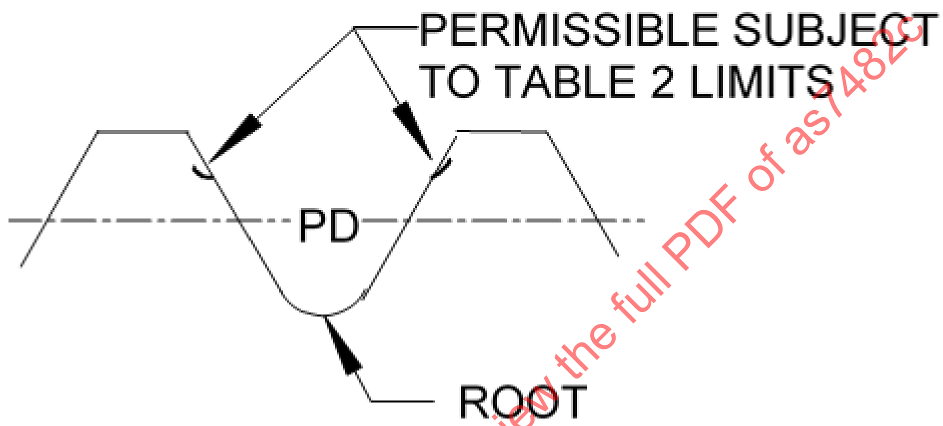

Figure 3 - Laps above pitch diameter extending towards crest, rolled thread

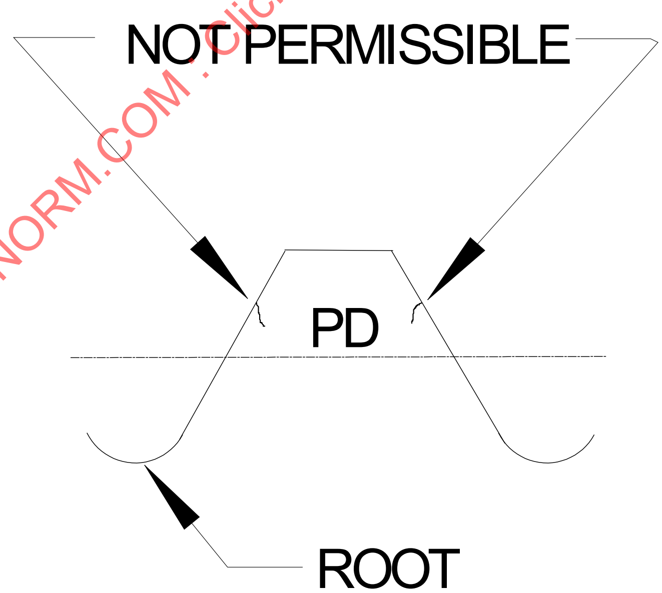

Figure 4 - Laps above PD extending toward root, rolled thread

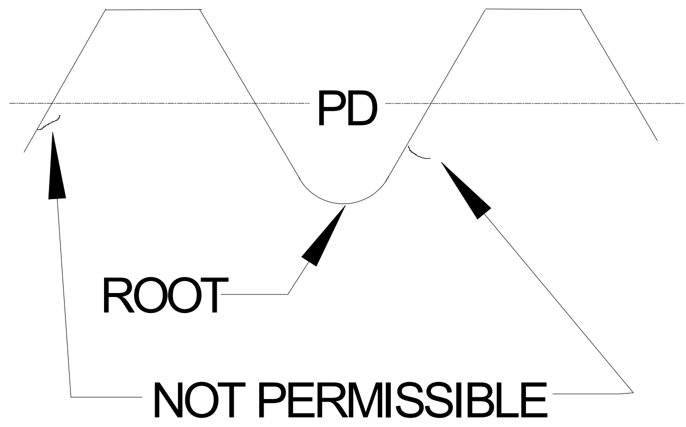

Figure 5 - Laps below PD extending in any direction, rolled thread

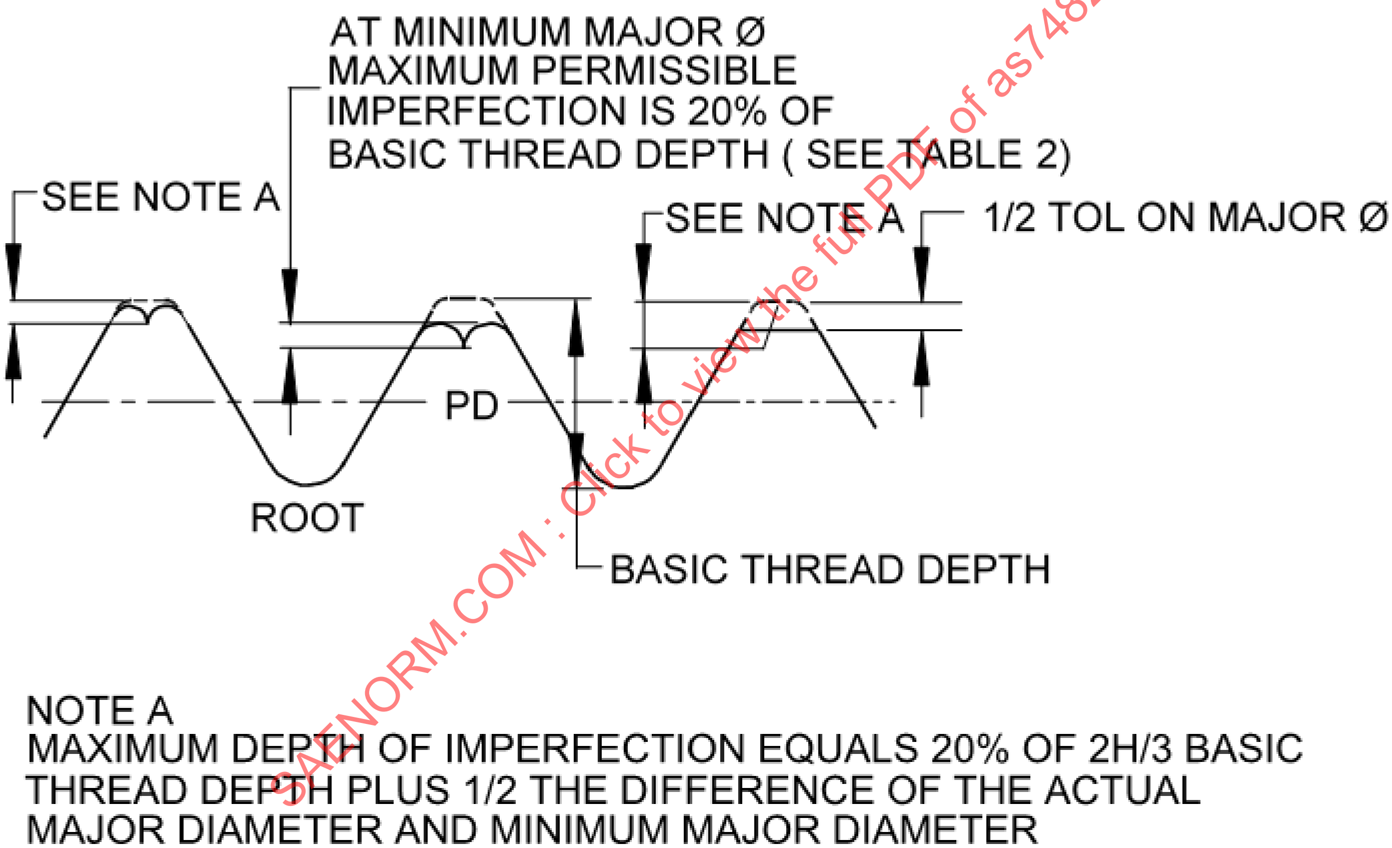

Figure 6 - Crest craters and crest laps, rolled thread

Table 1 - Test loads

Thread Size	Ultimate Tensile Strength Test Load, lbf, Minimum	Stress-Rupture Strength Test Load, lbf	Ultimate Double Shear Strength Test Load lbf, Minimum
0.1900 - 24	2279	1060	4423
0.1900 - 32	2599	1265	4423
0.2500 - 20	4137	1957	7658
0.2500 - 28	4729	2337	7658
0.3125 - 18	6816	3282	11965
0.3125 - 24	7549	3756	11965
0.3750 - 16	10070	4893	17230
0.3750 - 24	11420	5767	17230
0.4375 - 14	13820	6730	23452
0.4375 - 20	15430	7779	23452
0.5000 - 13	18450	9046	30631
0.5000 - 20	20790	10580	30631
0.5625 - 12	23650	11650	38767
0.5625 - 18	26390	13440	38767
0.6250 - 11	29380	14500	47860
0.6250 - 18	33280	17050	47860
0.7500 - 10	43480	21640	68919
0.7500 - 16	48480	24920	68919
0.8750 - 9	60020	30000	93806
0.8750 - 14	66230	34080	93806
1.0000 - 8	78750	39410	122522
1.0000 - 12	86200	44310	122522

NOTE 1:

Requirements above apply to parts with UNC, UNF, UNJC, or UNJF threads, as applicable for the sizes shown.

The area upon which stress for ultimate tensile strength test load is based is the UNJ basic minor diameter at 0.5625H thread depth, where H is the height of sharp V-thread, calculated from Equation 1:

$$A_1 = 0.7854\,(d - 1.125H)^2 = 0.7854\,(d - (0.9743/n))^2 \quad \text{(Eq. 1)}$$

where:

A_1 = area at the UNJ basic minor diameter at 0.5625H thread depth, in^2

d = maximum major diameter of external thread

H = height of sharp V-thread = (cos 30 degrees)/n

n = number of thread pitches per inch

The area upon which stress for stress-rupture strength test load requirements is based is the area at 17H/24 thread depth below the basic major diameter and calculated from Equation 2:

$$A_2 = 0.7854\ [d - (17H/12)]^2 = 0.7854\ [d - (1.2269/n)]^2 \qquad \text{(Eq. 2)}$$

where:

A_2 = area at 17H/24 thread depth below basic major diameter (maximum rounded root diameter of UN thread profile), in^2

d = basic (maximum) major diameter

H = height of sharp V-thread = (cos 30 degrees)/n

n = number of thread pitches per inch

The area upon which stress for ultimate double shear test load is based is at the nominal diameter of the close tolerance full shank bolt (refer to AS1132), calculated from Equation 3:

$$A_3 = 0.7854(d)^2 \qquad \text{(Eq. 3)}$$

where:

A_3 = area of nominal close tolerance shank diameter, in^2

d = nominal diameter of close tolerance full shank

Load requirements are based on:

130 ksi for ultimate tensile strength test load, minimum, room temperature.

70 ksi for stress-rupture strength test load, at 1200 °F.

78 ksi for ultimate double shear test load, minimum, room temperature.

Test loads are computed as follows:

ultimate tensile test load = $130000A_1$

stress-rupture test load at 1200 °F = $70000A_2$

ultimate double shear test load = $78000(2A_3)$

NOTE 2:

For sizes not shown and for parts having other than Class 3A thread tolerances, ultimate tensile strength test load, stress-rupture strength test load, and ultimate double shear test load for parts tested as parts, not as specimens machined from parts or from coupons of the stock, shall be based upon the respective areas and stresses given in Note 1.