AEROSPACE STANDARD

AS7469™ REV. B

Issued 1993-04
Revised 2018-08
Reaffirmed 2024-04

Superseding AS7469A

(R) Bolts and Screws, UNS N07041 Nickel Alloy, Corrosion and Heat Resistant, 155 ksi, Procurement Specification

FSC 5306

RATIONALE

AS6416 added, Paragraphs on Mechanical properties, Oxide removal, Flow lines head to shank and threads, Micro structure, Surface hardening, Fluorescent penetrant inspection have all been modified. Existing Figures 1, 1A, 1B, 1C deleted, New Figures 1 to 7 redrawn, Table 1 retyped, Table 2 values rounded and retyped. New paragraph 1.4 added.

AS7469B has been reaffirmed to comply with the SAE Five-Year Review policy.

1. SCOPE

1.1 Type

This procurement specification covers bolts and screws made from a corrosion and heat resistant, age hardenable, nickel base alloy of the type identified under the Unified Numbering System as UNS N07041 and of 155 ksi tensile strength at room temperature, with maximum test temperature of parts at 1400 °F.

1.2 Application

Primarily for aerospace propulsion system applications where parts are required to have high strength and good resistance to relaxation up to 1600 °F and oxidation resistance up to 1800 °F.

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.

1.4 Usage of Existing Manufactured Stock

Unless otherwise specified, part inventory manufactured to previous revisions of this specification may be procured and used until stock is depleted.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

For more information on this standard, visit
https://www.sae.org/standards/content/AS7469B/

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), www.sae.org.

AMS2750 Pyrometry

AMS5712 Nickel Alloy, Corrosion and Heat-Resistant, Bars, Forgings, and Rings 53Ni - 19Cr - 11Co - 9.8Mo - 3.2Ti - 1.6Al - 0.006B Vacuum Melted, Solution Heat Treated Precipitation Hardenable

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 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, Room Temperature

NASM1312-10 Fastener Test Methods, Method 10, Stress Rupture

NASM1312-12 Fastener Test Methods, Method 12, Thickness of Metallic Coatings

NASM1312-18 Fastener Test Methods, Method 18 , Tensile Strength, Elevated Temperatures Class lll (1400ºF)

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), 973-882-1170 (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 E8 Tension Testing of Metallic Materials

ASTM E21 Elevated Temperature Tests of Metallic Materials

ASTM E112 Determining Average Grain Size

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

ASTM E1417/E1417M Standard Practice for Liquid Penetrant Inspection

2.1.5 U.S. Government Publications

Copies of these documents are available online at http://quicksearch.dla.mil.

MIL-STD-2073-1 DoD Materiel Procedures for Development and Application of Packaging Requirements

2.2 Definitions

Refer to AS6416.

2.3 Unit Symbols

°F Fahrenheit

% percent (1% = 1/100)

ft^3 cubic feet

h hour

in inch

lbf pound-force

ksi kips (1000 pounds) per square inch

min minute of time

sp gr specific gravity

g gram

cm^3 cubic centimeter

HRC hardness, Rockwell C scale

3. TECHNICAL REQUIREMENTS

3.1 Material

Shall be AMS5712.

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, 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 UNJ profile and dimensions shall be in accordance with AS8879, unless otherwise specified on the part drawing.

3.2.3.1 Incomplete Threads

Incomplete threads are permissible at the chamfered end and the juncture of the unthreaded portion of the shank or adjacent to the head 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

Heads shall be formed by hot forging or cold forging; machined heads are not permitted, except lightening holes may be produced by any suitable method. Wrenching recesses may be forged or machined. Flash or chip clearance in machined recesses shall not cause recess dimensions to exceed the specified limits.

3.3.2 Heat Treatment

Headed blanks shall, before finishing the shank and the bearing surface of the head, cold working the head-to-shank fillet radius and rolling the threads, be solution heat treated as follows; precipitation heat treatment shall follow cold working of the fillet radius and rolling the threads.

3.3.2.1 Heating Equipment

Furnaces may be any type ensuring uniform temperature throughout the blanks being heated and shall be equipped with, and operated by, automatic temperature controllers and data recorders conforming to AMS2750. The heating medium or atmosphere shall cause no surface hardening by carburizing or nitriding. The total sulfur content of the atmosphere shall be maintained at less than 5 grains per 100 ft^3.

3.3.2.2 Solution Heat Treatment

Blanks shall be solution heat treated by uniformly heating to 2050 °F ± 25 °F, holding at heat for 30 minutes, and quenching at a cooling rate equivalent to air cool or faster.

3.3.2.3 Precipitation Heat Treatment

After cold working the fillet radius as in 3.3.4 and rolling the threads as in 3.3.5, parts shall be precipitation heat treated by heating to 1650 °F ± 15 °F, holding at heat for 4 hours ± 0.25 hour, and cooling in air. Parts should be heated rapidly through the temperature range 1200 to 1400 °F.

3.3.3 Oxide Removal

Surface oxide and oxide penetration resulting from prior heat treatment shall be removed from the full body diameter and the bearing surface of the head of the solution heat treated blanks prior to cold working the underhead fillet radius and rolling the threads. The oxide removal process shall produce no intergranular attack or corrosion of the blanks. The metal removed from the bearing surface of the head and the full body diameter of the shank shall be as little as practicable to obtain a clean, smooth surface.

3.3.4 Cold Working of Fillet Radius

After removal of oxide as in 3.3.3, the head-to-shank fillet radius of parts having the radius complete throughout the circumference of the part shall be cold worked. The fillet shall be cold worked sufficiently to remove all visual evidence of grinding or tool marks. If there is no visual evidence of grinding or tool marks prior to cold working, the fillet shall still be cold worked. Distortion due to cold working shall conform to Figure 1, unless otherwise specified on the part drawing. It shall not raise metal more than 0.002 inch above the contour at "A" or depress metal more than 0.002 inch below the contour at "B" as shown in Figure 1. Distorted areas shall not extend beyond "C" as shown in Figure 1. In configurations having an undercut associated with the fillet radius, the cold working will be required only for 90 degrees of fillet arc, starting at the point of tangency of the fillet radius and the bearing surface of the head. For shouldered bolts having an unthreaded shank diameter larger than the thread major diameter and having an undercut associated with a fillet between the threaded shank and the shoulder of the unthreaded shank, the cold working will be required only for 90 degrees of fillet arc, starting at the point of tangency of the fillet radius and the shouldered surface of the unthreaded shank. The shank diameter on full shank close tolerance bolts shall not exceed its maximum diameter limit after cold rolling the head to shank fillet radius.

3.3.5 Thread Rolling

Threads shall be formed on the finished, solution heat treated blanks by a single rolling process after removal of oxide as in 3.3.3.

3.3.6 Cleaning

Parts, after finishing, shall be degreased and then immersed in one of the following solutions for the time and temperature shown:

a. One volume of nitric acid (sp gr 1.42) and 9 volumes of water for not less than 20 minutes at room temperature.

b. One volume of nitric acid (sp gr 1.42) and 4 volumes of water for 30 to 40 minutes at room temperature.

c. One volume of nitric acid (sp gr 1.42) and 4 volumes of water for 10 to 15 minutes at 140 to 160 °F.

3.4 Product Marking

Each part shall be identification marked as specified on the part drawing. Unless otherwise specified on the part drawing, markings may be formed by forging or stamping, raised or depressed 0.010 inch maximum with rounded root form on depressed characters.

3.5 Plating

Where required, surfaces shall be plated as specified by the part drawing.

3.6 Mechanical Properties

Parts shall conform to the requirements of Ultimate Tensile strength, Hardness and Stress rupture at 1350 °F. 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. The loaded portion of the shank shall have two to three full thread turns from the thread runout exposed between the loading fixtures during the tensile and stress-rupture tests. Finished parts shall be tested in accordance with the following applicable test methods:

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

b. Room Temperature Ultimate Tensile Strength: MIL-STD-1312-8 in accordance with NASM1312-8

c. Stress-Rupture Strength at 1350 °F: MIL-STD-1312-10 in accordance with NASM1312-10

d. Ultimate Tensile Strength at 1400 °F: MIL-STD-1312-18 in accordance with NASM1312-18 ultimate tensile strength

3.6.1 At Room Temperature

3.6.1.1 Finished Parts

Parts shall have an ultimate tensile load not lower than that specified in Table 2 and shall be tested to failure, 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 or having an undercut, parts shall have an ultimate tensile strength not lower than 155 ksi. For such parts, the diameter of the area on which stress is based shall be the actual measured minimum diameter of the part. Tension fasteners with either standard double hexagon or hexagon type heads having a minimum metal condition in the head equal to the design parameters specified in AS1132 shall not fracture in the head-to-shank fillet radius except when this radius is connected with an undercut or with a shank diameter less than the minimum pitch diameter of the thread.

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 on specimens prepared as in 4.5.7. Specimens may be required by purchaser to perform confirmatory tests. Such specimens shall meet the following requirements:

a. Ultimate Tensile Strength, minimum: 155 ksi

b. Elongation in 4D, minimum: 8%

c. Reduction of Area, minimum: 10%

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

3.6.1.4 At 1400 °F

3.6.1.4.1 Finished Parts

Parts, heated to 1400 °F ± 5 °F, held at heat for 30 minutes before testing, and tested at 1400 °F ± 5 °F, shall have an ultimate tensile load not lower than that specified in Table 2 and shall be tested to failure, 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 or having an undercut, parts shall have an ultimate tensile strength not lower than 126 ksi; for such parts the diameter of the area on which stress is based shall be the actual measured minimum diameter of the part. Tension fasteners with either standard double hexagon or hexagon type heads having a minimum metal condition in the head equal to the design parameters specified in AS1132 shall not fracture in the head-to- shank fillet radius except when this radius is connected with an undercut or with a shank diameter less than the minimum pitch diameter of the thread.

3.6.1.4.2 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 E21 on specimens prepared as in 4.5.7. Specimens may be required by purchaser to perform confirmatory tests. Such specimens shall meet the following requirements:

a. Ultimate Tensile Strength, Minimum: 126 ksi

b. Elongation in 4D, minimum: 8%

c. Reduction of Area, minimum: 10%

3.6.2 Hardness

Shall be uniform and not lower than 30 HRC, but hardness of the threaded section and the head-to-shank fillet area may be higher than that of other areas as a result of the cold working operations. Parts shall not be rejected on the basis of hardness if tensile properties specified in 3.6.1 are met.

3.6.3 Stress-Rupture at 1350 °F

3.6.3.1 Finished Parts

Finished parts, maintained at 1350 °F ± 3 °F while the load specified in Table 2 is applied continuously, shall not rupture in less than 30 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 4.5.7, maintained at 1350 °F ± 3 °F while a load sufficient to produce an initial stress of 85 ksi is applied continuously, shall not rupture in less than 30 hours. Tests shall be conducted in accordance with ASTM E139. Specimens may be required by purchaser to perform confirmatory tests.

3.7 Quality

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

3.7.1 Macroscopic Examination

Parts or sections of parts, as applicable, shall be etched in a solution consisting of 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, or other suitable etchant, for sufficient time to reveal flow lines, but not longer than 30 minutes, and then be examined at a magnification of approximately 20X to determine conformance to 3.7.1.1 and 3.7.1.2.

3.7.1.1 Flow Lines

3.7.1.1.1 Head-to-Shank

After heading and prior to heat treatment, examination of an etched section taken longitudinally through the blank shall show flow lines in head-to-shank fillet and bearing surface which are representative of a forging process and shall generally follow the head contour. Flow lines in headed blanks having special heads, such as Dee- or Tee-shaped heads or thinner than AS1132 standard heads, shall be as agreed upon by purchaser and vendor.

3.7.1.1.2 Threads

Threads to be 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 2).

3.7.1.2 Internal Defects

Examination of longitudinal sections of the head and shank and of the threads shall reveal no cracks, laps, or porosity except laps in threads as permitted in 3.7.2.4.3 and 3.7.2.4.4. The head and shank section shall extend not less than D/2 from the bearing surface of the head and the threaded section shall extend not less than D/2 beyond the thread runout where "D" is the nominal diameter of the shank after heading. If the two sections would overlap, the entire length of the part shall be sectioned and examined as a whole.

3.7.2 Microscopic Examination

Specimens cut from parts shall be polished, etched in Kalling's reagent [100 cm^3 of absolute ethyl alcohol, 100 cm^3 of hydrochloric acid (sp gr 1.19), and 5 g of cupric chloride], Marble's reagent [20 cm^3 of hydrochloric acid (sp gr 1.19), 20 cm^3 of water, and 4 g of cupric sulfate pentahydrate], or other suitable etchant, and examined at a magnification not lower than 100X to determine conformance to the requirements of 3.7.2.1, 3.7.2.2, 3.7.2.3, and 3.7.2.4.

3.7.2.1 Microstructure

Parts shall have microstructure of completely recrystallized material except in the area of the threads and the head-to-shank fillet radius. and examined at a magnification not lower than 100X to determine conformance to the requirements of 3.7.2.1, 3.7.2.2 and 200X to determine conformance to the requirements of 3.7.2.3 and 3.7.2.4

3.7.2.2 Grain Size

Shall be one or finer, determined by comparison of the specimen with the chart in ASTM E112.

3.7.2.3 Surface Hardening

Parts shall have no change in hardness from core to surface except as produced during cold working of the head-to-shank fillet radius and during rolling of threads. There shall be no evidence of carburization, recarburization, 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 within 0.003 inch of an unrolled surface which exceeds the reading in the core by more than 30 points shall be evidence of nonconformance to this requirement.

3.7.2.4 Threads

3.7.2.4.1 Root defects such as laps, seams, notches, slivers, folds, roughness, and oxide scale are not permissible (see Figure 3).

3.7.2.4.2 Multiple laps on the flanks of threads are not permissible regardless of location. Single laps on the flanks of threads that extend toward the root are not permissible (see Figures 4 and 5).

3.7.2.4.3 Single lap on thread profile 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.

3.7.2.4.4 There shall be no laps along the flank of the thread below the pitch diameter (see Figure 6). A single lap is permissible along the flank of the thread above the pitch diameter on either the pressure or nonpressure flank (one lap at any cross-section through the thread) provided it extends toward the crest and is generally parallel to the flank (see Figure 6).

3.7.2.4.5 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 20% of the basic thread height (see Table 1) as measured from the thread crest when the thread major diameter is at minimum size (see Figure 7). 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 1 may be increased by one-half of the difference between the minimum major diameter and the actual major diameter as measured on the part.

3.7.3 Fluorescent Penetrant Inspection

Parts shall be subject to fluorescent penetrant inspection in accordance with ASTM E1417/E1417M, Type I, Sensitivity Level 2 minimum. Plated parts shall have plating removed for this inspection.

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

3.7.3.1.1 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 and quench cracks.

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

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

3.7.3.2.1 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 3.7.3.2.2 through 3.7.3.2.5 provided the separation between indications is not less than 0.062 inch in all directions.

3.7.3.2.2 Sides of Head

There shall be not more than three indications per head. 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 0.032 inch or the equivalent of the basic thread height (see Table 1), whichever is less.

3.7.3.2.3 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.

3.7.3.2.4 Threads

There shall be no indications, except as permitted in 3.7.2.4.

3.7.3.2.5 Top of Head and 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 3.7.3.2.2, 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. 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.

4.4 Classification of Tests

The inspection of parts is classified as follows:

a. Acceptance tests that are to be performed on each production inspection lot. A summary of acceptance tests is specified in Table 3.

b. Periodic tests which are to be performed periodically on production lots at the discretion of the vendor or purchaser. Ultimate tensile strength test at 1400 °F (3.6.1.2) is classified as a periodic test.

4.5 Acceptance Test Sampling

4.5.1 Material

Sampling shall be in accordance with AMS5712.

4.5.2 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.

4.5.3 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.

4.5.4 Stress-Rupture Test

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

4.5.5 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.

4.5.6 Acceptance Quality

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

4.5.7 Test Specimens

Specimens for tensile and stress-rupture testing of machined test specimens shall be of standard proportions in accordance with ASTM E8 with either 0.250 inch diameter at the reduced parallel gage section or smaller specimens proportional to the standard when required. 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 0.750 inch and under 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.

4.6 Periodic Test Sampling

Sampling as agreed upon by purchaser and vendor.

4.7 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, showing the results of tests to determine conformance to the room temperature ultimate tensile property, hardness, and stress-rupture requirements, and stating that the parts conform to the other technical requirements. This report shall include the purchase order number, AS7469B, lot number, contractor or other direct supplier of material, part number, nominal size, and quantity.

4.8 Rejected Lots

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

5. PREPARATION FOR DELIVERY

5.1 Packaging and Identification

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

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

FASTENERS, NICKEL ALLOY, CORROSION AND HEAT RESISTANT
AS7469B
PART NUMBER
LOT NUMBER
PURCHASE ORDER NUMBER
QUANTITY
MANUFACTURER'S IDENTIFICATION

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

5.1.4 Containers of parts shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the product to ensure carrier acceptance and safe delivery.

5.1.5 For direct U.S. Military procurement, packaging shall be in accordance with MIL-STD-2073-1, industrial packaging, unless Level A is specified in the request for procurement.

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

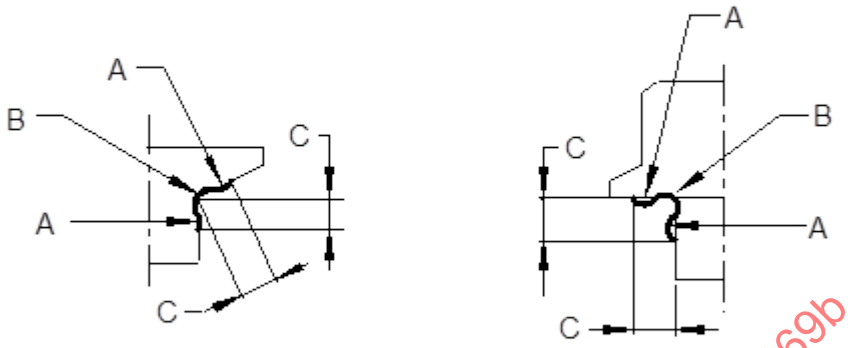
8.1 Direct U.S. Military Procurement

Purchase documents should specify not less than the following:

Title, number, and date of this specification
Part number of parts desired
Quantity of parts desired
Level A packaging, if required (see 5.1.5)

8.2 Revision Indicator

A change bar (l) 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.



Nominal bolt diameter	C MAX
Up to 0.3125	0.062
0.3125 and 0.375	0.094
0.4375 to 0.625	0.125
0.750 to 1.000	0.156
Over 1.000	0.188

Figure 1 - Permissible distortion from fillet working

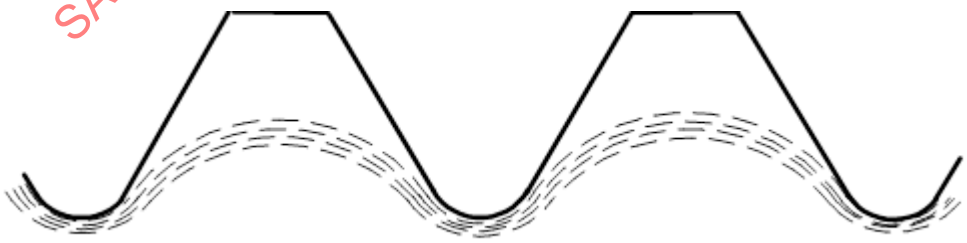


Figure 2 - Flow lines, rolled thread

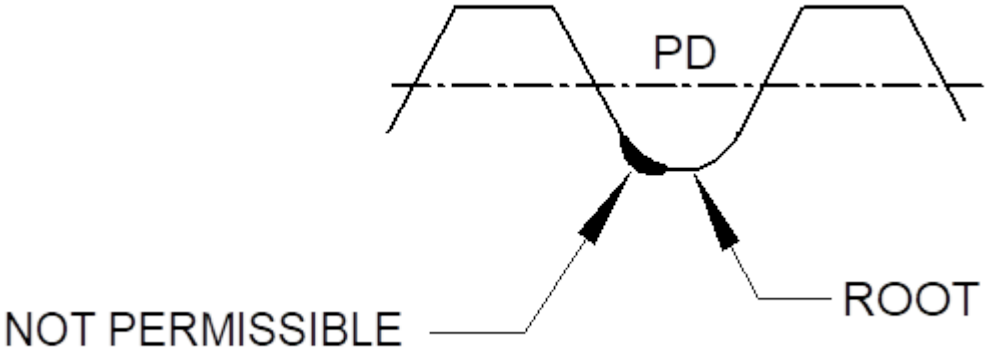


Figure 3 - Root defects, rolled thread

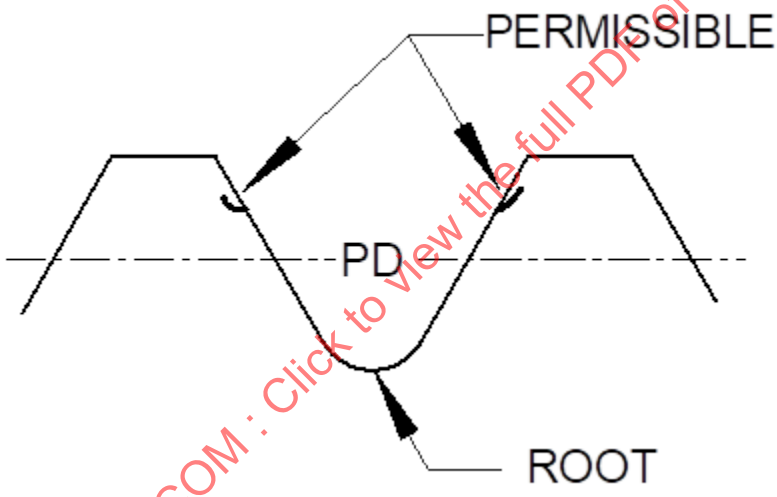


Figure 4 - Laps above pitch diameter extending towards crest, rolled thread

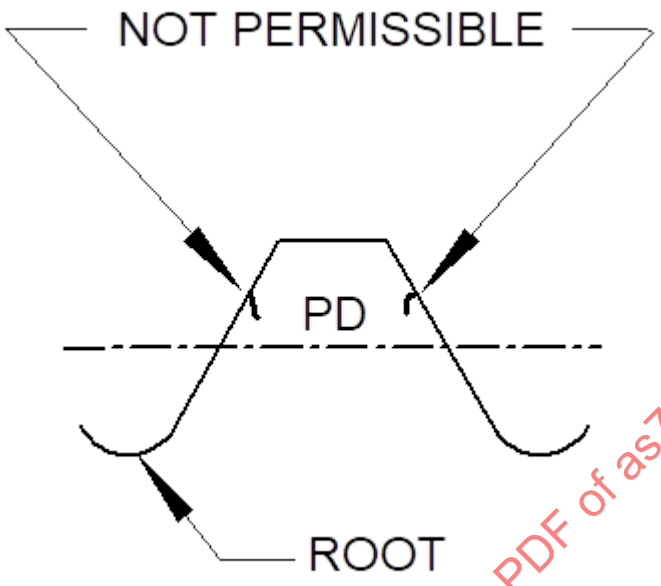


Figure 5 - Laps above PD extending toward root, rolled thread

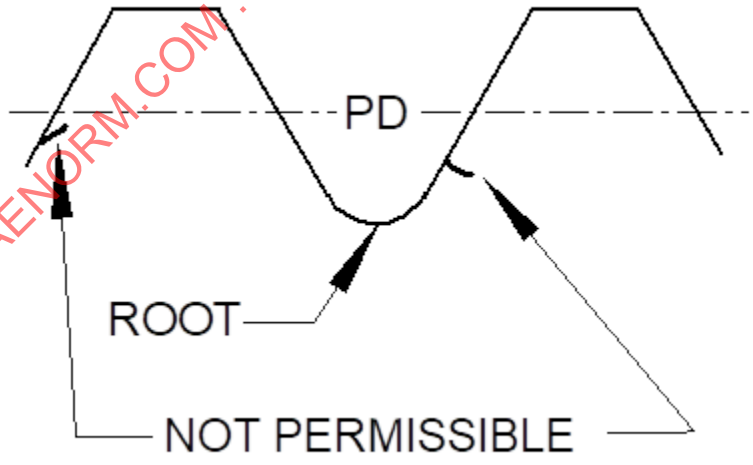
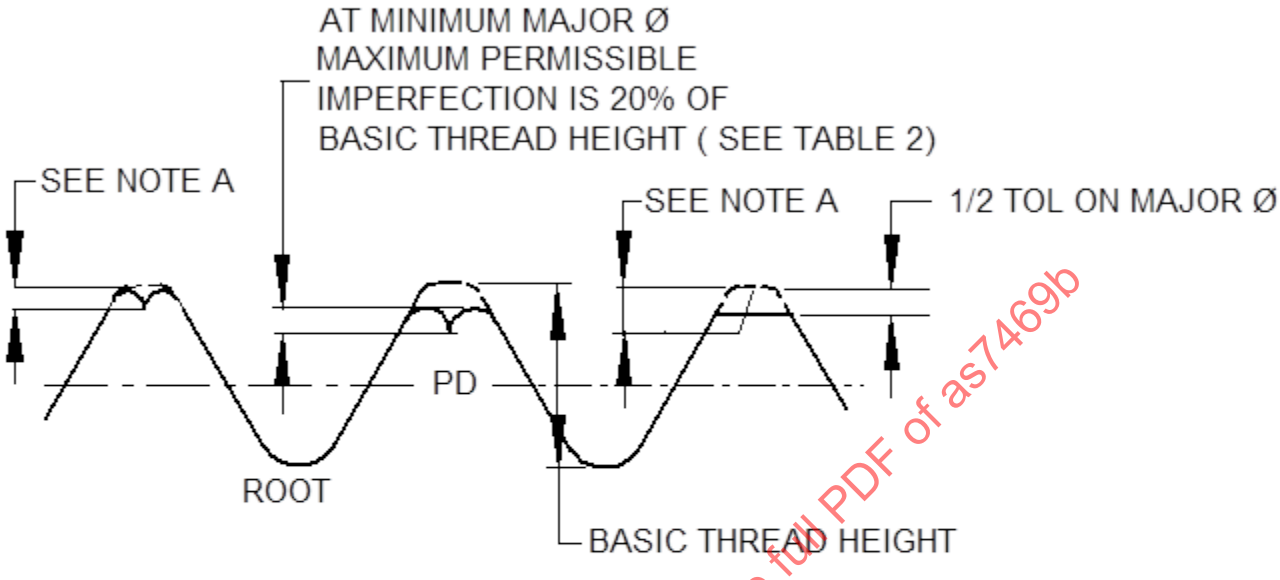


Figure 6 - Laps extending towards crest, rolled thread



NOTE A
MAXIMUM DEPTH OF IMPERFECTION EQUALS 20% OF 2H/3 BASIC THREAD DEPTH PLUS 1/2 THE DIFFERENCE OF THE ACTUAL MAJOR DIAMETER AND MINIMUM MAJOR DIAMETER

Figure 7 - Crest craters and crest laps, rolled thread

Table 1 - Thread height

n Thread Pitches per Inch	Basic Thread Height Ref /1/ Inch	20% Basic Thread Height Inch
80	0.0081	0.0016
72	0.0090	0.0018
64	0.0102	0.0020
56	0.0116	0.0023
48	0.0135	0.0027
44	0.0148	0.0030
40	0.0163	0.0033
36	0.0181	0.0036
32	0.0203	0.0041
28	0.0232	0.0046
24	0.0271	0.0054
20	0.0325	0.0065
18	0.0361	0.0072
16	0.0406	0.0081
14	0.0464	0.0093
13	0.0500	0.0100
12	0.0542	0.0108
11	0.0591	0.0118
10	0.0650	0.0130
9	0.0722	0.0144
8	0.0813	0.0163

/1/ Basic thread height is defined as being equivalent to 0.650 times the pitch, where pitch equals 1/n.