MIL-B-85604A
25 January 1988
SUPERSEDING
MIL-B-85604
10 October 1986

MILITARY SPECIFICATION

BOLT, NICKEL ALLOY 718, TENSION, HIGH STRENGTH, (125 KSI F_{su} AND 220 KSI F_{tu}), HIGH TEMPERATURE, SPLINE DRIVE GENERAL SPECIFICATION FOR

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the manufacture and acceptance requirements for corrosion resistant, high temperature, external wrenching, tension bolts

2 APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards and handbooks. The following specifications, standards, and handbooks form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

SPECIFICATIONS

FEDERAL

PPP-H-1581 Hardware (Fasteners and Related Items), Packaging of

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer, Naval Air Engineering Center, Systems Engineering and Standardization Department (SESD), Code 53, Lakehurst, NJ 08733-5100, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter

AMSC N/A FSC 5306

SPECIFICATIONS (Continued)

MILITARY

MIL-H-6875	Heat Treatment of Steel (Aircraft Practice), Process for
MIL-S-8879	Screw Threads, Controlled Radius Root With Increased Minor Diameter, General Specification for

STANDARDS

MILITARY

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-1312	Fastener Test Methods
MIL-STD-6866	Inspection, Liquid Penetrant
MS 33787	Wrenching Element, External Spline, Dimensions For

(Copies of specifications, standards, handbooks, drawings, publications and other Goverment documents required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Other publications The following document(s) form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS shall be the issue of the non-goverment documents which is current on the date of the solicitation.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

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

(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018)

AMERICAN SOCIETY OF TESTING AND MATERIALS

ASTM A380	Cleaning and Descaling Stainless Steel Parts, Equipment and Systems
ASTM E8	Practice for Standard Methods of Tension Testing of Metallic Materials
ASTM E112	Standard Methods for Determining the Average Grain Size

(Application for copies should be addressed to the American Society of Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

NATIONAL AEROSPACE STANDARDS

NAS 1348	Fasteners - Recommended Tensile Stress Areas for External Threaded

(Application for copies should be addressed to the National Aerospace Standards Committee, 1725 De Sales Street N.W., Washington, DC 20036.)

AEROSPACE MATERIAL SPECIFICATIONS

AMS 2750	Pyrometry
AMS 5662	Alloy Bars, Forgings, and Rings, Corrosion and Heat Resistant - Nickel Alloy 718 (UNS N07718)

(Application for copies should be addressed to SAE, 400 Commonwealth Drive, Warrendale, PA 15096.)

UNIFORM CLASSIFICATION COMMITTEE

Uniform Freight Classification Rules

(Application for copies should be addressed to the Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.)

2 3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3 REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

3.2 Qualification. The bolts furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable qualified products list at the time set for opening of bids, see 4.3 and 6.3.

3.3 Material. Material shall be per AMS 5662 (Nickel Alloy 718, UNS N07718), and of 220-250 KSI ultimate tensile strength.

3.3.1 Ductility. After aging, material ductility shall be not less than 8 percent elongation and 15 percent reduction in area when tested as specified in ASTM E8, see 4.5.4.8.

3.4 Design and construction.

3 4.1 Dimensions. The dimensions shall be as specified in the applicable specification sheet or drawing.

3.4.2 Threads.

3.4.2.1 Form and dimensions. Dimensions, form and contour shall be as specified in MIL-S-8879.

3.4.2.2 Rolling Threads shall be fully formed after final heat treatment by a process which incorporates a single rolling operation for forming the thread. Thread rolling temperature shall be not greater than 800°F

3 4.2.3 Incomplete threads The threads shall be faired onto the shank as shown on Figure 1 & 1A The root and flanks of runout thread may deviate from true thread form but shall be smooth and free of tool marks.

3 4.2 4 Grain flow The grain flow in the threads shall be continuous and shall follow the thread contour with the maximum density at the bottom of the root radius as shown on Figure 2

3 4.3 Bolt heads. The bolt heads shall be forged. Machined or forged holes for reduction of weight are acceptable. Forging temperature shall not be greater than 1850°F.

3.4.3.1 Wrenching element. Unless otherwise specified in the applicable specification sheet the wrenching element shall be in accordance with MS33787.

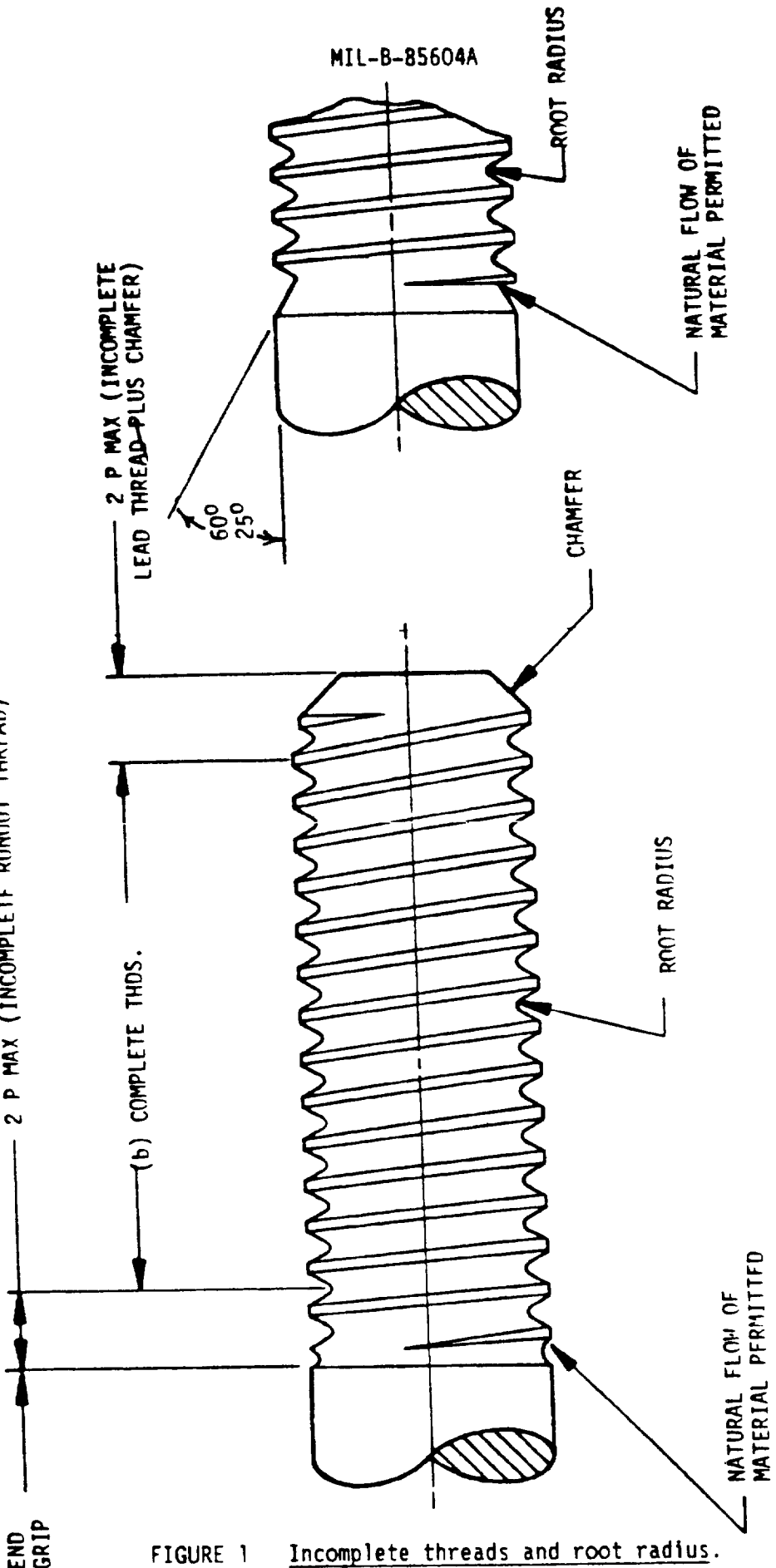


FIGURE 1 Incomplete threads and root radius.

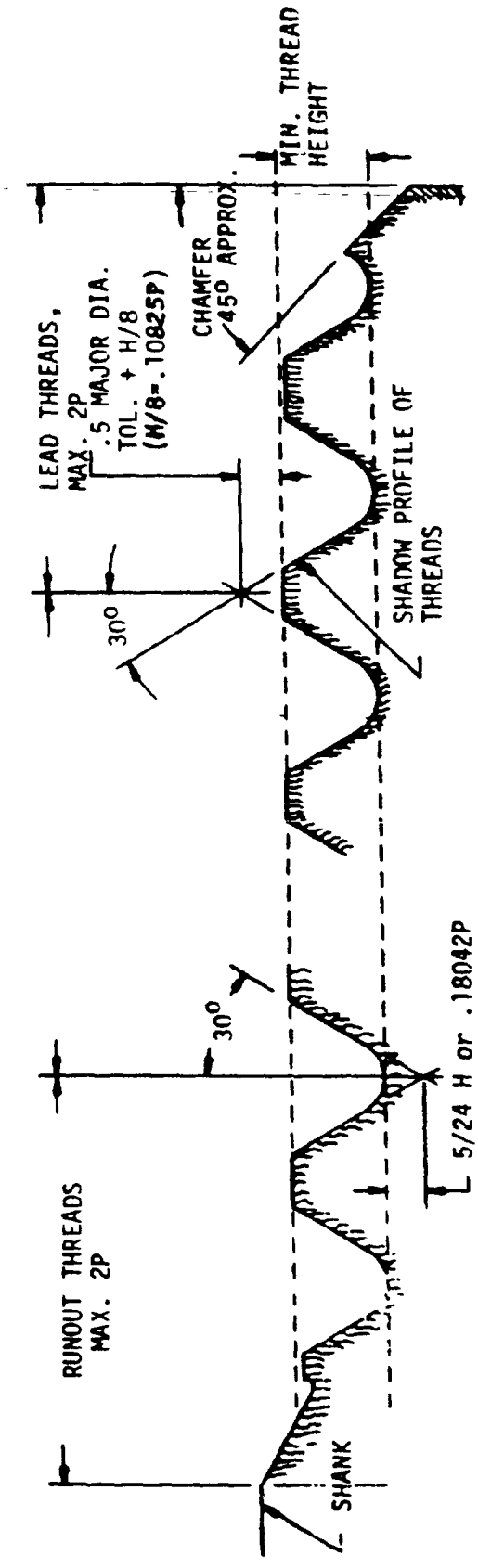


FIGURE 1A. Determination of incomplete threads.

3.4.3.2 Bearing surface The bearing surface of bolt heads shall be at right angles to the shank within the limits shown on Figure 3 The angular variation of the underside of the head shall be uniform around the shank within a tolerance of ±10 minutes, as measured between the bearing surface of the head and the shank at a length along the shank from head equal to the diameter of the bolt.

3 4.3.3 Head structure and grain flow A section of the head shall show no detrimental defects, see 4 5.4.2. Flow lines in the fillet area immediately below the surface shall conform to the fillet contour as shown on figure 4. The intersection of the longitudinal axis of the bolt and the approximate transverse axis of the flow lines shall be not less than D/7 inches from the bearing surface of the bolt where "D" is the nominal diameter of the bolt. The metal removed from the bearing surface shall be as small as practicable to obtain a clean, smooth surface.

3.4.4 Fillet (head-to-shank). The head-to-shank fillet radius shall be cold worked after final heat treat to meet the strength requirements specified herein. The fillet shall be furnished to the radius specified on the applicable specification sheet. The fillet shall show no evidence of seams or inclusions, see 4 5.3 2

3 4 4 1 Distortion of radius. Distortion of the radius (due to cold work) shall be not greater than height A and depth B, and the distorted area shall not extend beyond C, see Figure 5.

3 5 Surface texture. The surface texture of the bolts shall be not greater than the values specified in Table I or as specified in the applicable specification sheet or drawing The surface texture shall be measured as specified in ANSI B46.1, see 4.5.1.1 and 4.5 1.3

TABLE I. Surface texture

Area	Microinches (MAX)
Shank and underside of head	32
Head-to-shank fillet	32
Flanks of thread and root area	32
Other surfaces	125

3.6 Metallurgical properties.

3.6.1 Discontinuities. All bolts shall be examined by fluorescent penetrant inspection, see 4 5 3.2. Any bolts having discontinuities equal to or exceeding the limitations specified in Table II shall be rejected. Care must be exercised to avoid confusing cracks, as described herein with other discontinuities.

3.6.1.1 Cracks Bolts shall be free from cracks in any direction or location, see 4.5.3.2 and 6.4 2.

FIGURE 2. Grain flow.

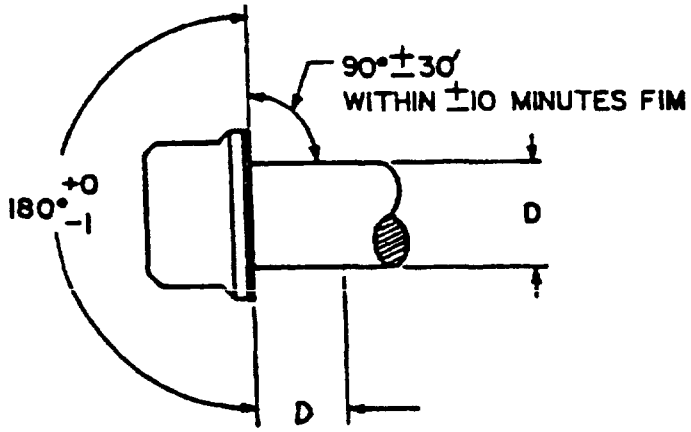


FIGURE 3. Head angularity.

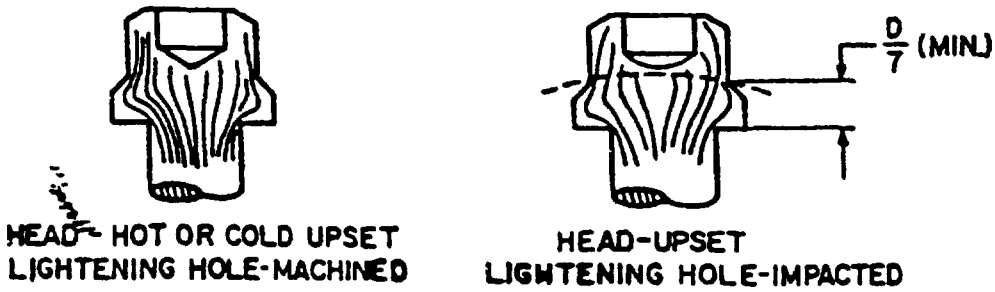
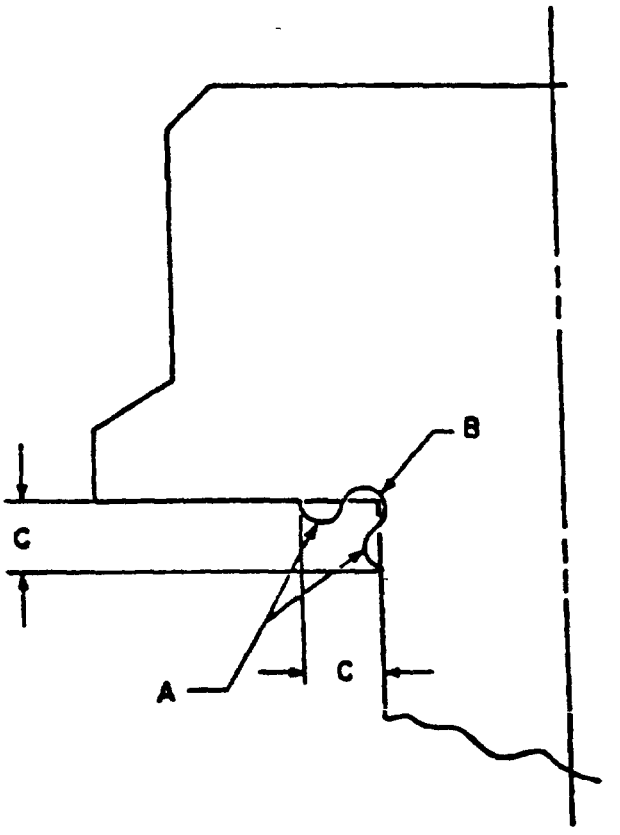


FIGURE 4. Head structure and grain flow.



Nominal Size	Less Than .312	.312 and .375	.437 Thru .625	750 Thru 1"	Greater Than 1"
A & B max	.002	.002	.003	.003	.004
C max	.062	.094	.125	.156	.188

DIMENSIONS IN INCHES.

FIGURE 5. Fillet rolling permissible distortion.

3.6.1.2 Laps and seams. Bolts may possess laps and seams, except in locations specified in 3.6.1.5. The depths shall not be greater than the amounts specified in Table II, see 6.4.3 and 6.4.4.

TABLE II Discontinuity depths. 1/

Nominal Size (Inches)	0.190, 0.250, 0 312	0.375	0.4375	.500 Through 1.125, Incl
Discontinuity depth (inch maximum)	0 005	0.006	0 007	0.008

1/ Depth of discontinuity shall be measured normal to the surface at point of greatest penetration.

3.6.1.3 Inclusions. Bolts shall show no evidence of surface or subsurface inclusions at the thread root or head-to-shank fillet, see 4.5.3.2 Small inclusions in other parts of the bolt which are not indicative of unsatisfactory quality shall not be cause for rejection.

3.6.1.4 Head and shank discontinuities (seams, inclusions or folds). The bolt heads and shanks shall not possess seams, inclusions, or folds greater than twice the depth limits specified in Table II Bolts having seams on the bearing surface greater than the limits specified in Table II shall be cause for rejection. Discontinuities shall not be permitted on the head-to-shank fillet.

3.6.1.5 Thread discontinuities (laps, seams and surface irregularities). Threads shall have no laps at the root or along the flanks as shown on Figure 6. Laps are permissible at the crest as shown on Figure 7. Laps at the crest shall be not greater than 25 percent of the basic thread depth Slight deviation from the thread contour is permissible at the crest of the thread as shown on Figure 7 The incomplete thread at each end of the thread may also deviate slightly from contour.

3 6.2 Work effect The bolt threads and head-to-shank fillet shall show evidence of working, see 4.5.4 2.

3 7 Straightness The straightness of the bolt shank shall be within the values specified in Table III, see 4.5.1.1.

3.8 Heat treatment. The material shall be solution heat treated, then cold reduced by rolling or drawing methods to obtain an ultimate tensile strength of 220-250 KSI

TABLE III. Straightness of shank.

Nominal Size	Bolt shank straightness FIM (inch per inch of bolt length) (maximum)
.312 and smaller	.0030
.375 and .437	.0025
.500 and larger	.0020

3 9 Cleaning Unless otherwise stated, bolts shall be acid cleaned as specified in Part I of ASTM A380. The bolt surface shall be clean, free of oxides and metal contaminants.

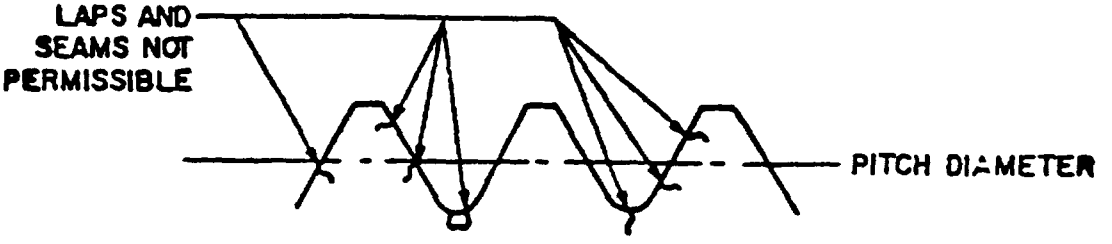
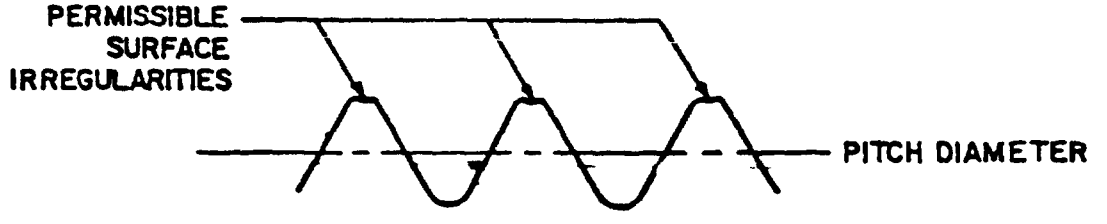


FIGURE 6. Nonpermissible laps, seams and surface irregularities.



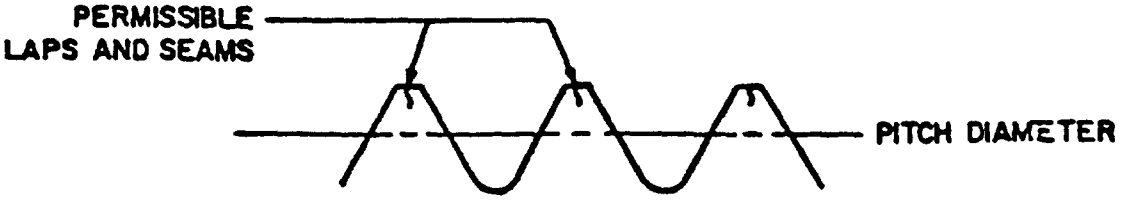


FIGURE 7. Permissible laps, seams and surface irregularities.

TABLE IV Mechanical Properties

Nominal Size	Ultimate Tensile Load Pounds 1/			Area at Min Shank Diameter (in.^{2}) 2/	Double Shear Strength Pounds (min) 2/	Stress Rupture Strength at 900°F-Pounds (min) 3/	Area at Basic Pitch Dia (in ^{2}) 1/	900°F Dbl Shear Min 4/
	Max	Min	Min at 900°F					
0.190-32	5,760	4,970	3,915	0 02791	6,975	2,780	0 0226	5,580
0.250-28	10,300	8,885	7,110	0 04850	12,125	4,975	0 0404	9,890
0.312-24	16,320	14,080	11,265	0 07596	18,990	7,880	0 0640	15,490
0.375-24	24,250	20,920	16,735	0 10956	27,390	11,710	0 0951	22,350
0.437-20	32,800	28,300	22,600	0 14930	37,325	15,840	0 1288	30,457
0.500-20	43,800	37,800	30,200	0 19517	48,790	21,200	0.1717	39,810
0.562-18	55,500	47,900	38,300	0 24674	61,685	26,800	0.2176	50,330
0 625-18	69,500	59,900	47,900	0 30484	76,210	33,500	0 2724	62,180
0.750-16	100,800	86,900	69,500	0 43943	109,857	48,700	0 3952	89,640
0.875-14	137,000	119,000	95,000	0 59857	149,640	66,600	0 5392	122,100
1.000-12	179,000	155,000	124,000	0 78226	195,565	86,800	0 7027	159,580
1.125-12	230,000	198,000	158,000	0 98961	247,400	110,900	0 9007	199,100

1/ The stress areas used for the calculations of the ultimate tensile load values are based on the pitch diameter of the external thread as specified in NAS 1348. The maximum tensile load values are based on 255 ksi and the minimum tensile load values are based on 220 ksi At 900° F, the tensile load values are based on 80 percent of the minimum tensile load values

2/ The room temperature minimum double shear strength is equal to 125 ksi x 2 x area Area equals area of minimum bolt diameter.

3/ The listed stress rupture values are based on 56 percent of the minimum tensile strength

4/ The double shear strength at 900°F is equal to 100,000 psi x 2 x area Area equals area of minimum diameter bolt

3.10 Mechanical properties.

3 10.1 Ultimate tensile load. The bolts shall meet the minimum and maximum ultimate tensile loads specified in Table IV, see 4.5.4.3.

3.10 2 Double shear strength. The bolts shall meet or exceed the double shear values specified in Table IV, see 4.5.4.4.

3.10.3 Fatigue strength. Using the tension loads specified in Table V, the bolts shall conform to the following Sampling shall be in accordance with Table VI.

a. There shall be no bolt failure at less than 65,000 cycles.

b. The average fatigue life shall be not less than 65,000 cycles

c. No bolts shall be subjected to more than 130,000 cycles, see 4 5.4.5.

TABLE V. Fatigue loading

Nominal Size	High-Tension Load (Pounds) ±2 Percent 1/	Low-Tension Load (Pounds) ±2 Percent 2/
0 190-32	2,580	258
.250-28	4,620	462
.312-24	7,320	732
.375-24	10,900	1,090
.437-20	14,700	1,470
.500-20	19,600	1,960
.562-18	24,900	2,490
.625-18	31,200	3,120
.750-16	45,200	4,520
.875-14	61,700	6,170
1.000-12	80,400	8,040
1 125-12	103,000	10,300

1/ High-tension fatigue load is based on 0.52 x F_{tu} minimum of Table IV.

2/ Low-tension fatigue load is 10 percent of high tension load.

3.10.4 Elevated temperature tensile strength. The bolts at 900°F shall meet or exceed 900°F ultimate tensile load values specified in Table IV, see 4.5.4.6.

3.10.5 Stress rupture Bolts at 900°F shall meet the stress rupture load values specified in Table IV for 23 hours, see 4.5 4.7.

3 11 Identification of product. Each bolt shall be marked as specified in the applicable specification sheet. The manufacturer's identification and code marking for traceability by production lot shall be marked on the top or side of the head, on the base of the lightening hole or on the point of the bolt. Traceability code marking is required for all bolt sizes. Markings may be formed by forging or stamping Marking may be raised or indented. Marking depth shall be not greater than 0 010-inch.

3 12 Workmanship The bolts shall be free from burrs, scale, excessive seams and other defects which would interfere with their intended use.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements

4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Goverment for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Goverment to acceptance of defective material

4.2 Classification of inspections The inspection requirements specified herein are classified as follows

a Qualification inspection, see 4 3

b. Quality conformance inspection, see 4.4.

4.3 Qualification inspection. Qualification inspections shall consist of all the inspections specified in Table VI.

4.3.1 Sampling plan. The qualification inspection samples shall consist of 20 bolts for each diameter upon which qualification is desired. The number of tests or examinations shall be as specified in Table VI. Bolts shall have a grip length not less than 4 times the diameter The manufacturer shall supply at least 20 nuts conforming to MIL-STD-1312-11. Samples shall be identified and forwarded to the activity responsible for qualification, designated in the letter of authorization from that activity, see 6.3.

4 3.2 Certified test report. The manufacturer shall make available to the activity responsible for qualification a certified test report showing that the manufacturer's product conforms to this specification The test report shall include as a minimum, actual numerical results of each of the tests or examinations specified herein and listed in the order of their appearance in Table VI, including photographs of macro- and micro-examinations When this report is made available, it shall be accompanied by a detail drawing which completely describes the manufacturer's product by specifying all dimensions and tolerances, composition of material, selected coating or plating applied, and the heat treatment The manufacturer's part number for each size and length shall be included on the above drawing Failure of a manufacturer to make available a satisfactory certified test report with the qualification samples shall be sufficient cause for rejection of the qualification request.

TABLE VI. Qualification inspections.

Type of Inspection	No of Inspections	Requirement Paragraph	Test Paragraph
Ductility	3	3.3 1	4.5.4.8
Threads	3	3 4 2	4 5 1 2
Head Structure and Grain Flow	1	3.4.3.3	4.5.4.2
Finish Dimensions and Surface Texture	3	3.5	4.5.1.3
Cracks and Discontinuities	3	3 6 1, 3.6.1.1	4.5.3 2
Work Effect	1	3.6 2	4 5 4 2 1
Ultimate Tensile Load	3	3 10 1	4.5.4.3
Double Shear Strength	3	3.10.2	4.5.4.4
Fatigue Strength	3	3.10.3	4.5.4.5
Elevated Temperature Tensile Strength	3	3 10 4	4.5.4.6
Stress Rupture	3	3.10.5	4.5.4.7

4.3.3 Retention of qualification. To maintain status on a Qualified Products List (QPL), certification shall be made available to indicate continued compliance with the requirements of this specification. Certification shall be requested by NAVAIRDEVCEN (Naval Air Development Center), Code 6013, Warminster, PA 18974, from each manufacturer. NAVAIRDEVCEN will forward certification to NAVAIRENGCEN who is acting as agent for NAVAIRSYSCOM (Naval Air Systems Command), AIR-53033G. Certification shall be at the time of the

two-year review and shall be signed by a responsible official of management, attesting that the listed product(s) is still available from the listed plant, can be produced under the same conditions as originally qualified (i.e., same process, materials, construction, design, manufacturer's part number, or designation), and meets the requirements of the current issue of the specification. Failure to provide the certification will be cause for removal from the QPL. After completion of the certification review, the QPL shall be reprinted to show the date of validation. (DD Form 1718, Certification of Qualified Products, shall be used for obtaining certification.)

4.4 Quality conformance inspections. The quality conformance inspections shall consist of all the inspections specified in Table VII.

TABLE VII. Quality conformance inspections.

Test	Requirement Paragraph	Test Paragraph
Threads	3.4.2	4.5 1 2
Head Structure and Grain Flow	3.4.3.3	4.5 1 3
Finish Dimensions and Surface Texture	3 5	4.5.1.4
Cracks and Discontinuities	3.6 1 3 6.1.1	4.5.3.2
Work Effect	3 6 2	4.5 4 2
Ultimate Tensile Load	3.10 1	4.5.4.3
Double Shear Strength	3 10.2	4.5 4.4
Fatigue Strength	3.10.3	4.5.4 5
Ductility	3.3.1	4 5 4 8

4.4.1 Production lot. A production lot shall consist of bolts that are fabricated from a single mill heat, heat treated, and processed as one continuous run.

4.4.2 Inspection lot. An inspection lot shall consist of bolts from a single production lot.

4 4.3 Manufacturer's certification report. Each inspection lot of bolts shall be accompanied by a copy of the manufacturer's certification report, signed by an authorized quality assurance representative of the manufacturer. This report shall state that the bolts are from a production lot that was manufactured, inspected and accepted in accordance with the requirements of this specification. This report shall identify the part number and production lot number, and shall include as a minimum, actual numerical results of each of the tests specified herein, as applicable.

4.5 Test methods.

4.5.1 Visual and dimensional inspection.

4.5.1.1 Straightness and surface texture. Straightness shall be measured by the use of a dial-type indicator gage. Surface texture of threads shall be determined by a visual comparator method.

4.5.1.2 Threads. The threads shall be examined for conformance to 3.4.2 in accordance with Method B of MIL-S-7742 or MIL-S-8879 unless otherwise specified.

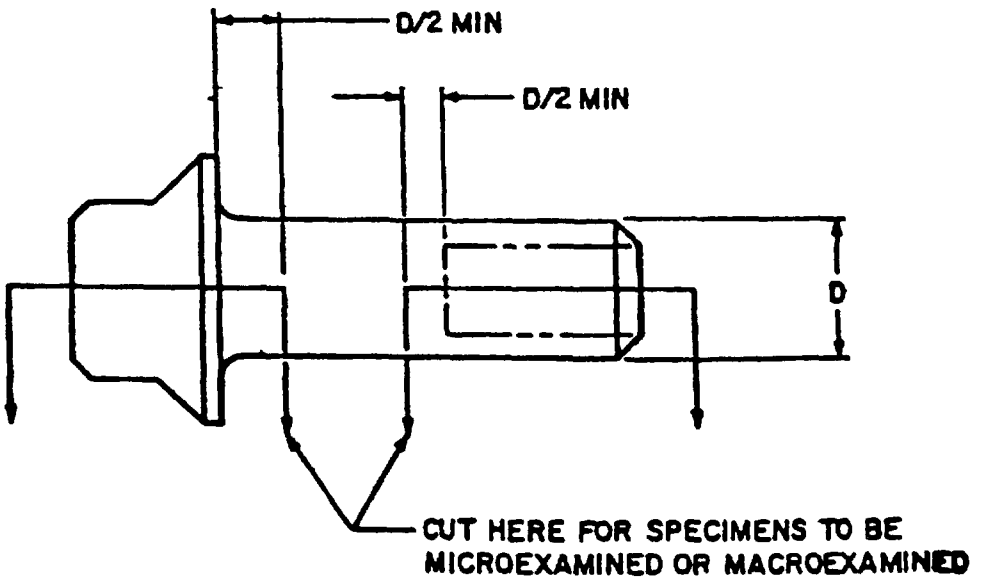


FIGURE 8. Metallurgical specimens.

4.5.1.3 Finish dimensions and surface texture. Dimensions and surface texture shall be inspected by means of applicable gages or by a visual comparator method.

4.5.1.4 Classification of defects. All dimensional characteristics are considered defective when out of tolerance. The classification of defects for bolts shall be as specified in Table VIII.

TABLE VIII Classification of defects.

Category		Defect
Critical		None defined
Major:	101	Thread size and form
	102	Shank diameter
	103	Incomplete threads
	104	Grip length
	105	Radius under head
	106	Drilled holes in head missing (when required)
	107	Squareness between head and shank (bearing surface)
	108	Straightness of shank
	109	Surface texture
	110	Burrs and tool marks
	112	Identification
	113	Overall length, under size
	114	Wrenching dimensions
Minor A	201	Overall length, over size
	202	Head diameter (and chamfer)
	203	Head height
	204	Concentricity of head and shank
	205	Concentricity of shank and thread pitch diameter
	206	Drilled hole diameters and location
	207	Lightening hole dimensions
Minor B	301	Chamfer on thread end
	302	Flange height

4.5.2 Use of identical sample bolts Identical sample bolts may be used for the various acceptance inspections and tests, provided that none of the characteristics of the sample bolts are altered during the examination procedure.

4.5.3 Nondestructive tests.

4.5.3.1 Sampling A random sample shall be selected from each inspection lot in accordance with MIL-STD-105, acceptable quality level (AQL) of 1.0 percent defective for Major defects, 2.5 percent defective for Minor A defects and 4.0 percent defective for Minor B defects.

4.5.3.2 Cracks and discontinuities. Fluorescent penetrant inspection shall be used to determine the presence of cracks and discontinuities such as laps, seams and inclusions. Fluorescent penetrant indications in and of themselves shall not be cause for rejection. If indications are considered cause for rejection, representative samples shall be taken from those bolts showing indications and these samples shall be further examined by microexamination to determine whether the indicated discontinuities exceed the limits specified herein

4.5.3.2.1 Fluorescent penetrant inspection. Fluorescent penetrant inspection shall be performed in accordance with MIL-STD-6866.

4.5 4 Destructive tests.

4.5.4.1 Sampling plan. The sampling plan shall be as specified in MIL-STD-105. Normal inspection shall be used at the start of each production lot with reduced inspection applicable, provided provisions in 8.3.3 of MIl-STD-105 are satisfied. The AQL shall be 1.0 percent defective and the inspection level shall be S-2. For quality conformance tests, the AQL shall be zero percent defective. The sample units may be selected from those that have been subjected to and passed the non-destructive tests with additional bolts selected at random from the inspection lot as necessary.

4.5.4.2 Head structure and grain flow. Head structure and grain flow shall be determined by macroexamination at a magnification of 10X. Specimens shall be taken from the finished bolt as shown on Figure 8. The bolts shall be etched in Lepito's etchant (15 grams $(NH_4)_2\ SO_4$ in 75 milliliters of water, 250 grams $FeCl_3$ in 100 milliliters of HCI mix and add 30 milliliters HNO_3) for sufficient time to reveal the macrostructure.

4.5.4.2.1 Work effect. The cold work of the bolt threads shall be determined by microexamination Work effect on the head-to-shank fillet shall be determined by visual examination.

4.5.4.3 Ultimate tensile strength. The bolts shall be tested in tension between the head of the bolt and a threaded member as specified in MIL-STD-1312-8 Bolts having a grip length less than two times the shank diameter need not be tested

4 5.4.4 Double shear strength. The double shear strength test shall be performed on the unthreaded portion of the bolt as specified in MIL-STD-1312-13. Bolts having a grip length of less than twice their shank diameter need not be shear tested

4.5.4.5 Fatigue strength The fatigue test shall be conducted at room temperature. The tension-tension fatigue testing method and fixture requirements shall be as specified in MIL-STD-1312-11. Bolts having a grip length less than twice their shank diameter need not be fatigue tested.

4.5.4.6 Elevated temperature tensile strength. The bolts shall be tested at 900°F ± 25°F in tension between the head of the bolt and a threaded member as specified in MIL-STD-1312-18.

4.5.4.7 Stress rupture. The bolts shall be tested at 900°F ± 25°F in tension between the head of the bolt and a threaded member as specified in MIL-STD-1312-10.

4.5.4.8 Ductility. The specimen for the ductility test shall be prepared from a section of the raw material, processed with the production lot, or manufactured from the finished bolt. The ductility test shall be conducted as specified in ASTM E8.

4.5.5 Resubmitted inspection lots. The paragraph titled "Resubmitted Lots" of MIL-STD-105 shall apply except that a resubmitted inspection lot shall be inspected by the contractor, using tightened inspection. Before an inspection lot is resubmitted, full particulars concerning the cause of previous rejection and the action taken to correct the defects found in the inspection lot shall be furnished by the contractor to the Government inspector.

4.6 Inspection of packaging The sampling and inspection of the preservation, packing and container marking shall be in accordance with PPP-H-1581 to determine conformance to Section 5.

5. PACKAGING

5.1 Bolts shall be preserved, packaged, packed, and marked for shipment in accordance with PPP-H-1581. The full length of threads and shanks of individual bolts shall be protected by sleeving material Preservation and packing shall be level A or C as specified in the contract or purchase order, see 6.2

5.2 Packing shall be level A, B or C as specified in the contract or purchase order, see 6.2.

5.3 Marking of shipments. In addition to any special requirements of the contract or order, shipments shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. Bolts procured to this specification are intended for use in tension applications which require a bolt with 220 ksi strength and high-fatigue strength and not intended for use in applications greater than 900°F.

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.

b. Military part number.

c. Applicable levels of packaging and packing.

6 3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time set for opening of bids, qualified for inclusion in the applicable Qualified Products List (QPL-85604) whether or not such products have actually been so listed by that date The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification The activity responsible for the Qualified Products List is the Naval Air Systems Command, Department of the Navy, Washington, DC 20361, however, information pertaining to qualification of products may be obtained from the Naval Air Development Center, Warminster, PA 18974, Attention: Code 6013.

6 3 1 Qualification tests will be authorized only upon presentation of certified test reports indicating that the bolts conform to this specification, see 4.3 2, and the applicable military specification sheet or a standard approved by the activity responsible for qualification

6 4 Definitions

6.4 1 Defective A defective is defined as an item containing one or more defects

6 4 2 Crack. A crack is defined as a clean crystalline break passing through the grain or grain boundary without the inclusion of foreign elements

6.4 3 Lap A lap is defined as a surface defect appearing as a seam caused by folding over hot metal fins or sharp corners and then rolling or forging them into the surface, but not welding them

6.4 4 Seam A seam is defined as an unwelded fold or lap which appears as an opening in the raw material as received from the source

6.4 5 Subject term (keyword) listing

Bolt
Nickel Alloy 718
Tension
High Strength
125 KSI Fsu
220 KSI Ftu
High Temperature

Custodians:
Navy - AS
Air Force - 99
Army - AV

Reviewer activity:
Army - AR
DSA - IS
Air Force - 82

User activity:
Army - MI

Preparing Activity:
Navy - AS
(Project No 5306-1204)

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(See Instructions – Reverse Side)

1 DOCUMENT NUMBER	2 DOCUMENT TITLE

3a. NAME OF SUBMITTING ORGANIZATION	4 TYPE OF ORGANIZATION *(Mark one)*
	☐ VENDOR
b. ADDRESS *(Street, City, State, ZIP Code)*	☐ USER
	☐ MANUFACTURER
	☐ OTHER *(Specify)* _____

5 PROBLEM AREAS

a. Paragraph Number and Wording

b. Recommended Wording

c. Reason/Rationale for Recommendation

6 REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional	b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	8. DATE OF SUBMISSION *(YYMMDD)*

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