

INCH-POUND

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 SUPERSEDING
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MILITARY SPECIFICATION

BOLT, INTERNAL WRENCHING, 160 KSI FTU

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

1. SCOPE

1.1 Scope. This specification covers internal wrenching bolts for use in applications requiring 160 KSI tensile strength, 96 KSI shear strength, or high fatigue strength and combinations thereof.

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

QQ-P-416	Plating, Cadmium (Electrodeposited)
PPP-B-566	Boxes, Folding, Paperboard
PPP-B-585	Boxes, Wood, Wirebound
PPP-B-601	Boxes, Wood, Cleated-Plywood
PPP-B-621	Boxes, Wood, Nailed and Lock-Corner

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Naval Air Engineering Center, Systems Engineering and Standardization Department (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

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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SPECIFICATIONS (Continued)

FEDERAL (Continued)

PPP-B-636	Box, Fiberboard
PPP-B-665	Boxes, Paperboard, Metal Stayed (Including Stay Material)
PPP-B-676	Boxes, Setup Paperboard
MILITARY	
MIL-P-116	Preservation, Methods of
MIL-B-121	Barrier Material, Greaseproofed, Waterproofed, Flexible
MIL-S-5000	Steel, Chrome-Nickel-Molybdenum (E4340) Bars and Reforging Stock
MIL-T-5544	Thread Compound; Antiseize, Graphite-Petrolatum
MIL-S-5626	Steel, Chrome-Molybdenum (4140) Bars, Rods and Forging Stock (for Aircraft Applications)
MIL-S-6049	Steel, Chrome-Nickel-Molybdenum (8740) Bars and Forging Stock (for Aircraft Applications)
MIL-S-6098	Steel, Chrome-Nickel-Molybdenum (8735) Bars and Forging Stock (for Aircraft Applications)
MIL-H-6875	Heat Treatment of Steels (Aircraft Practice), Process for
MIL-S-7742	Screw Threads, Standard, Optimum Selected Series, General Specification for
MIL-S-8503	Steel Bars; Chrome-Vanadium (6150) Aircraft Quality
MIL-S-8879	Screw Threads, Controlled Radius Root With Increased Minor Diameter, General Specification for
MIL-L-10547	Liners, Case, Waterproof

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STANDARDS

MILITARY

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-1186	Cushioning, Anchoring, Bracing, Blocking and Waterproofing; With Appropriate Test Methods
MIL-STD-1312	Fastener Test Methods
MIL-STD-1949	Inspection, Magnetic Particle
MS20004 thru MS20024	Bolt, Internal Wrenching, 160 KSI

(Copies of specifications, standards and handbooks 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) forms 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 nongovernment 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)
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(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018.)

UNIFORM CLASSIFICATION COMMITTEE

Uniform Freight Classification Rules

(Application for copies should be addressed to the Uniform Classification Committee, 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.

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3. REQUIREMENTS

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

3.2 Qualification. 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 Materials. Qualification bolts shall be made from alloy steel conforming to specification MIL-S-5000 (UNS G43400 or UNS G43406), MIL-S-5626 (UNS G41400), MIL-S-6049 (UNS G87400), MIL-S-6098 (UNS G87350) or MIL-S-8503. Production bolts shall be made from material procured to the same nominal composition limits as that used for qualification.

3.4 Design and construction. The design and construction of the bolt shall be as specified herein and on the applicable standard.

3.4.1 Dimensions. Dimensions shall be in accordance with MS20004 thru MS20024 or other applicable specifications.

3.4.2 Threads.

3.4.2.1 Form and dimensions. The form and dimensions shall conform to MIL-S-8879 with the following exception: size 1-14 thread form and dimensions shall be per MIL-S-7742 and MS20016, except thread roots shall be round and minor diameter modified as specified in Figure 1.

3.4.2.2 Rolling. Threads shall be fully formed by single rolling process after heat treatment.

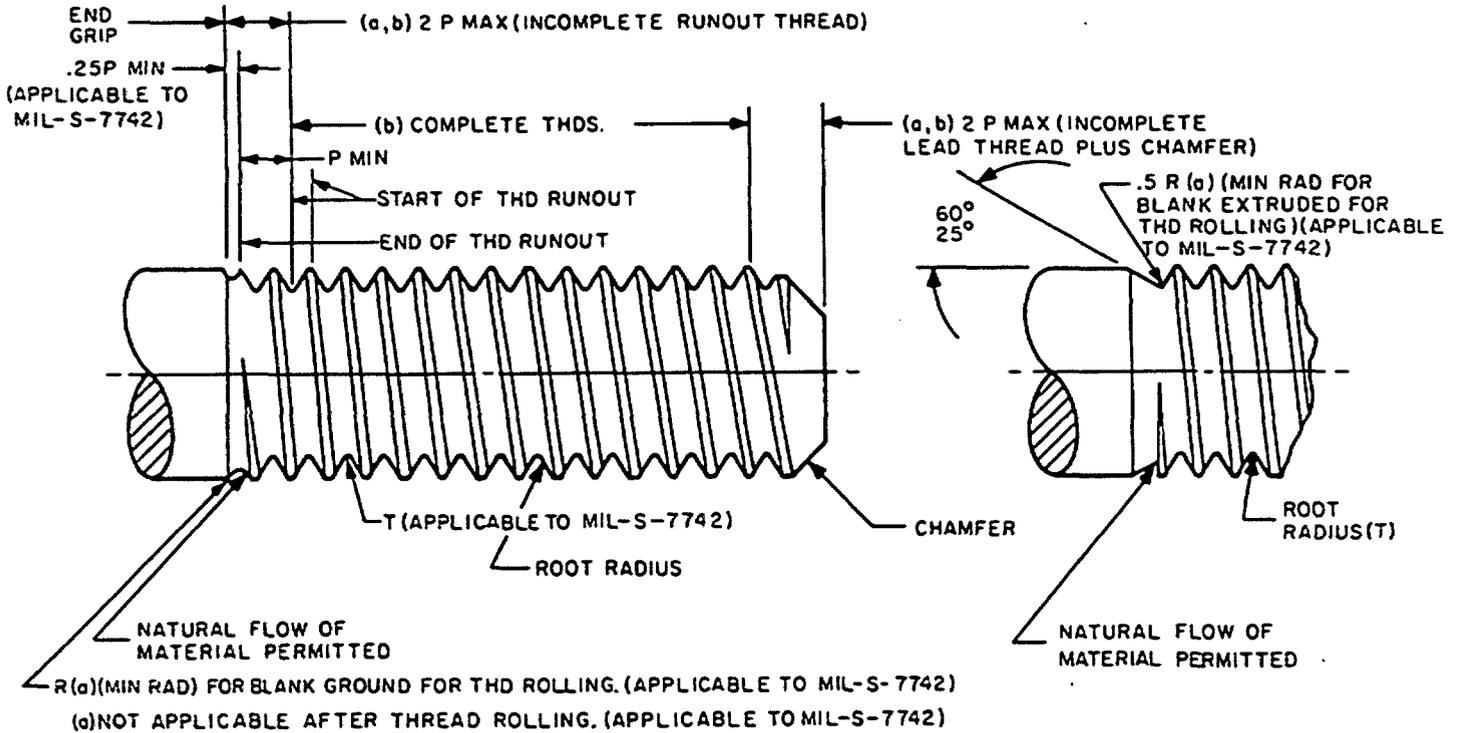
3.4.2.3 Incomplete threads. Thread runout, consisting of not more than two incomplete threads, shall fair onto shank, thereby eliminating an abrupt change in cross sectional area as illustrated in Figure 1. There shall be a thread runout of not less than one thread. Bottom and sides of threads in runout may deviate from true thread form, but shall be smooth and devoid of tool marks. Incomplete threads shall conform to Figure 1A.

3.4.2.4 Grain flow. The grain flow in the threads shall be continuous and shall follow the general thread contour with the maximum density at the bottom of the root radius as shown in Figure 2.

3.4.3 Heads. Heads shall be forged. Sockets may be forged or machined. Flash or chip clearance in machined sockets shall not penetrate the head dimensional thickness nor shall it be any larger than the hexagon width across flats.

3.4.3.1 Bearing surface. The bearing surface of bolt heads shall be at right angles to the shank within limits shown in Figure 3. The angular error of the underside of the head must be uniform around the shank within a tolerance of +10 minutes, as measured from the face of the head at length approximately equal to the diameter of the bolt.

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The following table is applicable to MIL-S-7742 and MS20016 only.

Thread Size	P (Pitch of Thread)	.25 P (Min)	2 P (Max)	R (Min Runout Radius)	.5 R	1/ T (Min Root Radius)
2/ 1-14	.07143	.018	.143	.025	.012	.008

- 1/ Maximum thread root radius limited by requirement that threads accept "GO" thread gage.
- 2/ 1-14NS inactive for new design.

FIGURE 1. Incomplete thread pitches, runout radius and root radius (optional designs).

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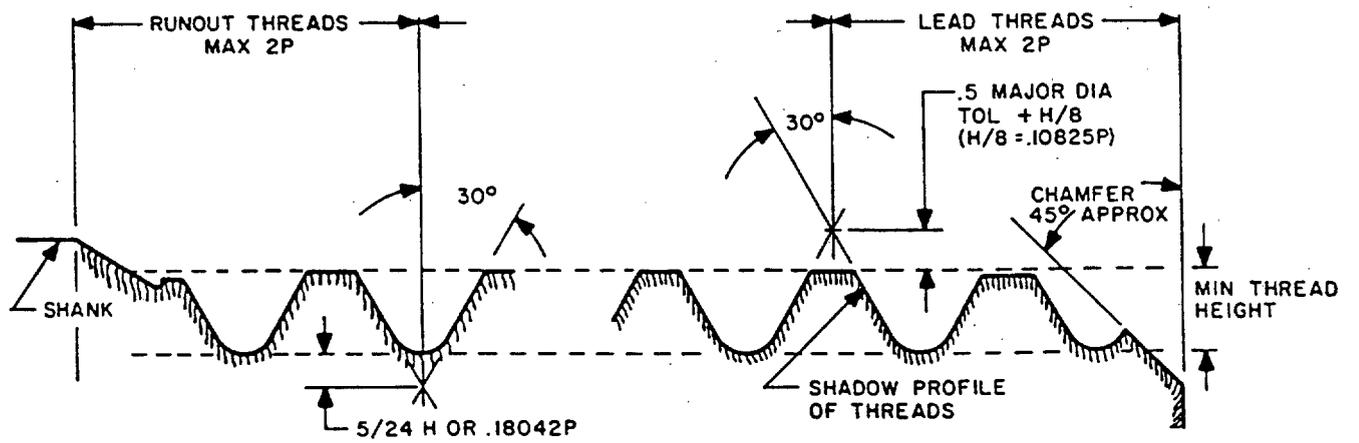


FIGURE 1A. Determination of incomplete threads.

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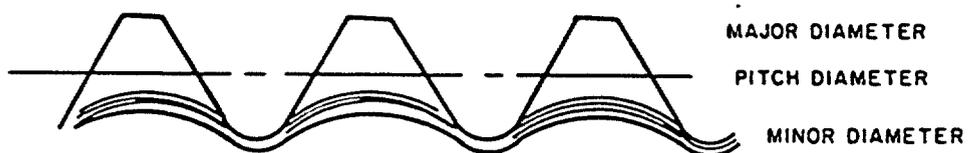


FIGURE 2. Thread grain flow.

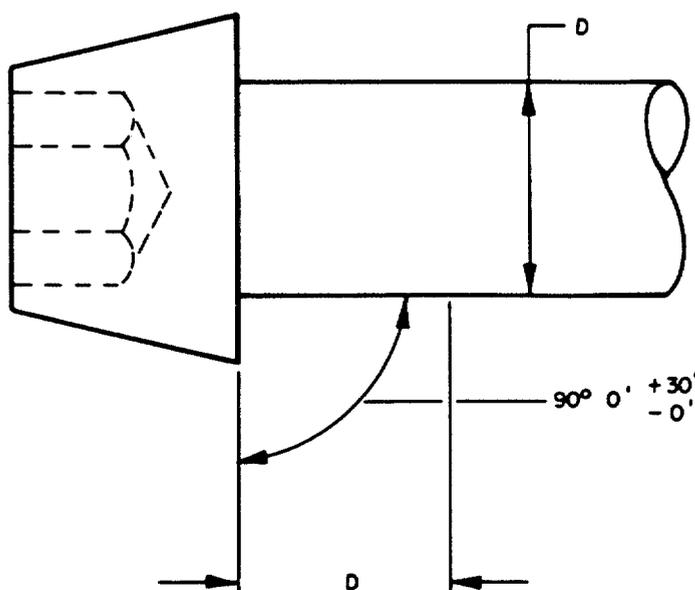


FIGURE 3. Head angularity.

3.4.3.2 Head structure and grain flow. A section of the head shall show no detrimental defects and shall show grain-flow lines substantially as shown in Figure 4. The grain-flow lines may be slightly broken by the finish machining or grinding.

3.4.4 Fillet (head-to-shank). The fillet shall be cold-worked in such a manner as to produce the fatigue strength requirements specified herein. Fillet shall be finished to radius specified on the applicable drawing. Cold working of fillet radius shall be accomplished subsequent to heat treatment of bolt. Fillet shall show no evidence of seams or inclusions.

3.4.4.1 Distortion radius. Cold working of head-to-shank fillet may cause distortion of fillet area. Distortion shall not exceed 0.002-inch above A or below B contour shown on Figure 5. Distorted area shall not extend beyond C as illustrated in Figure 5.

3.5 Surface roughness. The surface roughness of the bolt, after plating, shall be not greater than the values shown in Table I. The surface roughness shall be measured in accordance with ANSI B46.1.

TABLE I. Roughness height rating (R_a).

Area	Maximum Microinches
Shank and undersize of head	32
Head-to-shank fillet	32
Sides of thread and root area	32
Other surfaces	125

3.6 Straightness. The straightness of the bolt shank shall be within the values specified in Table II when the bolt is rolled on a surface plate and the point of greatest deviation is measured with a feeler gage.

TABLE II. Straightness of shank.

Bolt Size	Deviation of Bolt Shank From Plate (Inch Per Inch of Bolt Length) (Maximum)
.250 and .313	0.0030
.375 and .438	0.0025
.500 and larger	0.0020

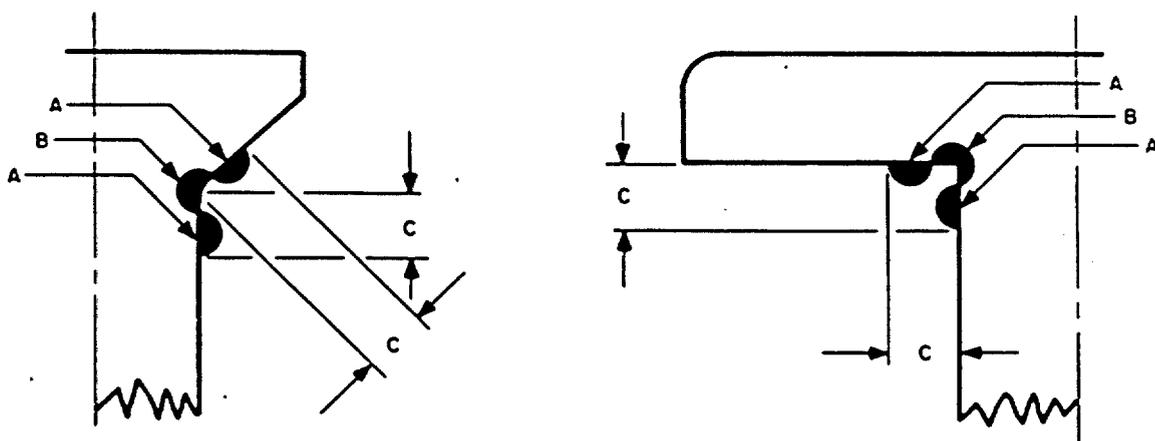
3.7 Heat treatment. Heat treatment shall be in accordance with MIL-H-6875 to develop the mechanical properties specified herein.

3.8 Finish. All surfaces shall be cadmium plated in accordance with QQ-P-416, Type II, Class 2. The bolts shall be heated to a temperature of $190^{\circ} \pm 14^{\circ}\text{C}$ ($375^{\circ} \pm 25^{\circ}\text{F}$) within 4 hours after plating and before magnetic particle inspection, and held at this temperature for 23 hours, after which the bolts shall be allowed to cool normally at room temperature.

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FIGURE 4. Head structure and grain flow.



Nominal Size	Under .313	.313 and .375	.438 Through .625	.750 Through 1	Over 1
C max	0.062	0.094	0.125	0.156	0.188

DIMENSIONS IN INCHES.

FIGURE 5. Permissible distortion.

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3.9 Stress durability. The bolts shall satisfactorily pass the stress durability test of 4.5.8.

3.10 Mechanical properties.

3.10.1 Ultimate tensile strength. The finished bolts shall develop the ultimate tensile strength listed in Table III.

3.10.2 Ultimate double shear. The finished bolts shall develop the ultimate double shear listed in Table III.

3.10.3 Hardness. Bolts shall have Rockwell hardness of 34-40 HRC.

3.10.4 Fatigue strength. Bolts shall be capable of withstanding not less than 65,000 fatigue cycles when loaded in accordance with Table III (see 4.5.6). Bolts need not be tested in excess of 130,000 cycles if failure has not occurred before that time.

3.11 Metallurgical properties.

3.11.1 Carburization. The bolts shall show no decarburization or recarburization on the bearing surface of the head, head-to-shank fillet, shank or threads.

3.11.2 Work effect. In threads and head-to-shank fillet, work effect shall be evident when metallurgically examined.

3.11.3 Discontinuities. All bolts shall be examined by magnetic particle inspection as specified in 4.5.7.3. Heads of bolts shall not be marked for identification of magnetic inspection. Any bolts having discontinuities equal to or exceeding the limitations specified herein shall be rejected. Care must be exercised to avoid confusing cracks, as described herein (see 3.11.3.1), with other discontinuities.

3.11.3.1 Cracks. Bolts shall be free from cracks in any direction or location. A crack is defined as a clean crystalline break passing through the grain or grain boundary without the inclusion of foreign elements.

3.11.3.2 Laps and seams. Bolts may possess laps and seams as described herein. The depths shall be not greater than the amounts specified in Table IV. A lap is 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. A seam is an unwelded fold or lap which appears as an opening in the raw material as received from the source.

3.11.3.3 Inclusions. Inclusions that are not indicative of unsatisfactory quality and do not extend into thread roots or head-to-shank fillet will be permitted.

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TABLE III. Mechanical properties and fatigue loading.

Nominal diameter (inches)	Mechanical properties		Fatigue loading <u>3/</u>		
	Ultimate tensile strength lbs (min) <u>1/</u>	Ultimate double shear strength lbs (min) <u>2/</u>	Area at minor diameter of thread (sq. in.)	Low tension load - lbs. <u>+2 percent</u>	High tension load - lbs. <u>+ 2 percent</u>
.250-28	6,190	9,300	0.0326	271	2,710
.313-24	9,820	14,600	0.0524	435	4,350
.375-24	15,200	21,000	0.0809	671	6,710
.438-20	20,600	28,600	0.1090	905	9,050
.500-20	27,400	37,300	0.1486	1,230	12,300
.563-18	34,800	47,200	0.1888	1,570	15,700
.625-18	43,600	58,300	0.2400	1,990	19,900
.750-16	63,200	83,900	0.3513	2,920	29,200
.875-14	86,100	114,200	0.4805	3,990	39,900
1.000-12	112,000	149,200	0.6250	5,190	51,900
1.000-14	114,000	149,200	0.6464	5,370	53,700
1.125-12	144,000	188,900	0.8118	6,740	67,400
1.250-12	180,000	233,200	1.0237	8,500	85,000
1.375-12	219,000	282,100	1.2602	10,500	105,000
1.500-12	263,000	335,800	1.5212	12,600	126,000

1/ Ultimate tensile strength = $F_{tu} A$ where, F_{tu} = 160,000 psi (minimum strength required by heat treatment). A = Cross-sectional area of thread in square inches at basic (maximum) pitch diameter. For .250 and .313 inch, stress area is based on 98 percent of the pitch diameter.

2/ The listed shear values are based on a minimum single shear strength of 96 KSI and the stress area at the basic shank diameter (e.g., .0250 is the nominal diameter for .250-28 bolt).

Ultimate double shear strength = $F_{su} A$

Where F_{su} = 2 x 96,000 (96,000 psi = 60 percent of 160,000 psi).

A = Twice the cross-sectional area of bolt shank in square inches at nominal diameter (e.g., 0.250 is nominal diameter for .250-28 bolt).

3/ High tension fatigue loading is based on 83,000 psi load applied at basic minor diameter area. Low tension fatigue load is 10 percent of high load.

TABLE IV. Discontinuity depths. 1/

Bolt size	#10, .250	.313	.375	.438	.500 thru 1.500 incl
Seam depth (inch) (maximum)	0.005	0.005	0.006	0.007	0.008

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

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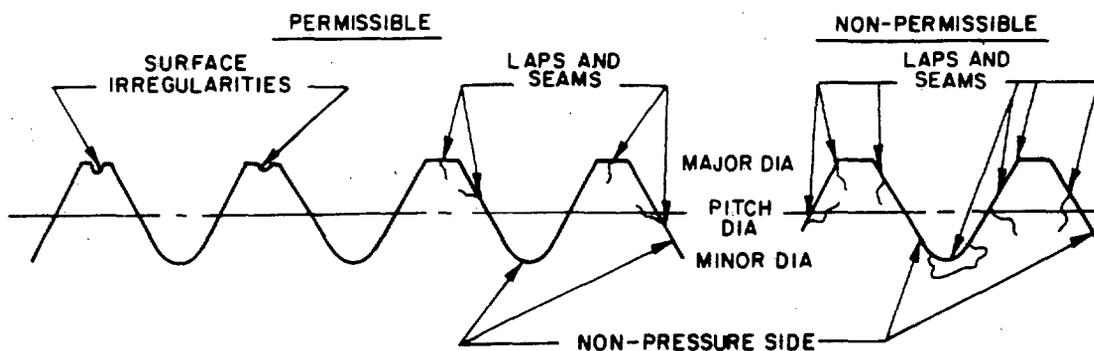


FIGURE 6. Laps, seams and surface irregularities in thread.

3.12 Identification of product. Each bolt shall be marked in accordance with the requirements of MS20004 thru MS20024 on top of the head or side of the flange. The manufacturer's identification shall be marked on top or side of the head or on the base of the lightening hole. Markings may be raised or indented 0.010 inch (max), except that raised markings only shall be used on the lightening hole. Markings may be formed by forging or stamping, and the height of characters shall be as specified on the applicable drawing.

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 (examinations and tests) 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 shall 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 ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements; however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

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

- a. Qualification inspection (see 4.3).
- b. Acceptance inspection (see 4.4).

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4.3 Qualification inspection.

4.3.1 Samples. Samples shall consist of 12 bolts of the grip length specified by the qualifying activity for each diameter upon which qualification is desired. Samples shall be identified as required and forwarded to the activity responsible for qualification, designated in the letter of authorization from that activity (see 6.3).

4.3.2 Inspections. Qualification inspections of bolts shall consist of all tests specified under 4.5.

4.3.2.1 Certified test report. The manufacturer shall furnish to the qualifying activity a certified test report showing that the manufacturer's product submitted for qualification satisfactorily conforms to the applicable approved standard and this specification. The test report shall include as a minimum, actual results of each of the tests specified herein in the order listed. When this report is submitted, 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, the heat treatment, and the manufacturer's part number for each size and length. Failure of manufacturer to furnish a satisfactory certified test report and qualification samples shall be sufficient cause for rejection of qualification request.

4.4 Acceptance inspection.

4.4.1 Inspection lot. An inspection lot shall consist of bolts of one MS part number and one grip length, manufactured from the same materials under essentially the same conditions and presented for inspection at one time.

4.4.2 Acceptance inspection and tests. Acceptance tests of bolts shall consist of all tests specified under 4.5.

4.4.3 Sampling for examination of product. Sampling for examination of threads, finish, dimensions and surface roughness shall conform to MIL-STD-105, inspection level S-1, with AQLs as follows:

Major defects	1.0 percent
Minor A defects	2.5 percent
Minor B defects	4.0 percent

4.4.3.1 Classification of defects. Defects shall be classified as shown in Table V.

4.4.4 Sampling for acceptance tests.

4.4.4.1 Selection of test samples. The same sample may be used for each of the tests, provided that known characteristics of the sample do not alter the integrity of test involved, and provided that none of the bolt characteristics are altered during the tests.

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TABLE V. Classification of defects.

AQL percent defective	Classification	Dimensional characteristics
	Critical None	
1.5	Major 101 102 103 104 105 106 107 108 109 110 111 112	Thread size and form Shank diameter (a) Incomplete threads and thread runout Grip length Radius under head (R) Drilled holes in head missing (when required) Hex drive missing Squareness between head and shank (bearing surface) Straightness of shank Surface roughness Surface finish, plating Head diameter (B)
2.5	Minor A 201 202 203 204 205 206 207 208	Overall length Head diameter (C) Head height (D) Socket dimensions (H, E and F) Concentricity of head and shank (X) Concentricity of socket and head (Y) Concentricity of shank and thread pitch diameter (Z) Drilled hole diameters and location (J and M)
4.0	Minor B 301 302 303 304 305	Chamfer on thread end Hexagon socket radii (N and P) Land height (K) Identification Burrs and tool marks

NOTE: Letters in parentheses correspond to dimensions on MS20004 thru MS20024.

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4.4.4.2 Sampling for hardness test. Sampling shall be according to MIL-STD-105, inspection level S-1, AQL of 1.5 percent defective.

4.4.4.3 Sampling for tensile and shear strength tests, stress durability test, fatigue strength tests, carburization and work effect, head structure and grain flow. Sampling shall be according to MIL-STD-105, inspection level S-2, acceptance number zero. Each sample bolt selected in accordance with this paragraph shall not be submitted to the procuring activity for acceptance. Samples shall be taken from those bolts showing magnetic particle indications but which are acceptable under 4.5.7.3.

4.5 Test methods.

4.5.1 Threads. Threads shall be inspected in accordance with MIL-S-8879.

4.5.2 Finish, dimensions and surface roughness. Finish, dimensions and surface roughness shall be checked visually and by means of applicable gages. In case of controversy, gages certified by Government laboratories shall be used.

4.5.3 Tensile strength. The bolts shall be tested in tension between the head of the bolt and a threaded member in accordance with MIL-STD-1312-8. In the event the bolt is too short to conduct the tensile test, acceptability shall be based on results of the hardness test (4.5.5).

4.5.4 Shear strength. The double shear strength test shall be performed on the unthreaded portion of the bolt in accordance with MIL-STD-1312-13.

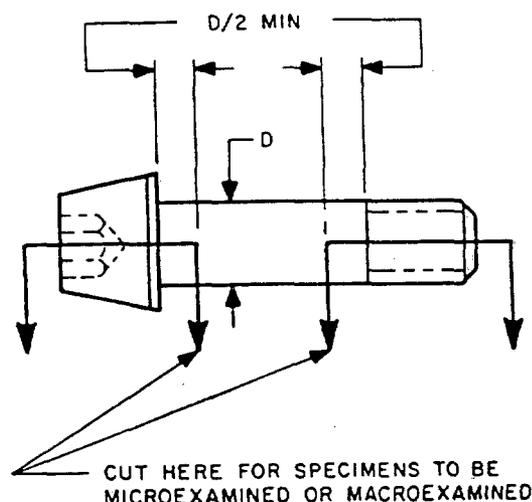
4.5.5 Hardness. Bolts shall be inspected for Rockwell hardness in accordance with MIL-STD-1312-6.

4.5.6 Fatigue strength. The fatigue loading applied to bolts shall be tension-tension. The fatigue test shall be conducted at room temperature. The fatigue loading applied to the respective bolts shall conform to Table III. The method of testing and fixture requirements shall be in accordance with MIL-STD-1312-11.

4.5.7 Metallurgical examination.

4.5.7.1 Carburization and work effect. Absence of decarburization or recarburization on the bearing surface of the head, head-to-shank fillet, shank, threads and cold work effect of the bolt threads shall be determined by microexamination. Specimens shall be taken from the finished bolt as shown in Figure 7. The etchant shall be 5 percent nital. Microscopic examination shall be made at a magnification of 100 diameters. 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.

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FIGURE 7. Metallurgical specimens.

4.5.7.2 Head structure and grain flow. Head structure and grain flow shall be determined by macroexamination. Specimens shall be taken from the finished bolt as shown in Figure 4. The bolts shall be etched in an aqueous solution containing 50 percent (by volume) of commercial hydrochloric acid at 71° to 82°C (160° to 180°F) for sufficient time to reveal the macrostructure properly.

4.5.7.3 Cracks and discontinuities. The presence of cracks and discontinuities such as laps, seams and inclusions shall be determined by magnetic-particle inspection. Magnetic-particle indications of themselves shall not be cause for rejection. If, in the opinion of the inspector, the indications are cause for rejection, bolts showing the worst indications shall be microexamined to determine whether discontinuities exceed specified limits.

4.5.7.3.1 Magnetic-particle inspection. Magnetic-particle inspection shall be in accordance with MIL-STD-1949. Inspection shall be on finished bolts or subsequent to any processing operations which could adversely affect the part. Each bolt shall be magnetically inspected by longitudinal and circular methods.

4.5.8 Stress durability. Bolts shall be assembled in a steel block heat treated to a Rockwell hardness of R_C 26-32. The threads of the bolt, the seating surface of the bolt head, and the seating surface of the nuts shall be lubricated with graphite petrolatum conforming to MIL-T-5544. The bolt shall be preloaded by applying the torque or load specified in Table VI. This load shall be maintained 24 hours without failure.

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TABLE VI. Torque values for stress durability test.

Nominal fastener dia.	Torque - in.-lbs. (min.)	Load lbs. (min.)
.250	110	4,460
.313	220	7,060
.375	410	10,900
.438	650	14,800
.500	980	19,700
.563	1,400	25,000
.625	1,950	31,300
.750	3,400	45,400
.875	5,400	62,000
1.000	8,200	82,000
1.125	11,700	104,000
1.250	16,100	129,000
1.375	21,700	158,000
1.500	28,300	189,000

4.6 Inspection of packaging. The sampling and inspection of the preservation, packing and container marking shall be in accordance with Section 5.

5. PACKAGING

5.1 Preservation. Unless otherwise specified, each bolt shall have the shank and threads protected by means of a sleeve extending over the full length of the shank and thread. The sleeve shall be manufactured from cardboard, asphalt-impregnated chipboard, plastic sleeve covering, or a spiral wrap of kraft paper over chipboard, and shall be lined with material conforming to MIL-B-121.

5.2 Intermediate packaging. Only identical items shall be included in an intermediate package. Bolts, preserved and packaged as specified in 5.1, shall be packaged in containers conforming to PPP-B-566, PPP-B-636, PPP-B-665 or PPP-B-676. Unless otherwise specified by the procuring activity, the quantity of unit packages shall be as specified in Table VII (see 6.2).

TABLE VII. Unit packaging.

Size (inch)	Length (inches)	Quantity in unit package
.250 and .313	Up to 1.500	100
.500 and .313	1.500 to 3.000	50
.375 to .563	Up to 3	25
.500 to .563	Over 3	10
Over .563	All lengths	10

5.3 Packing. Packing shall be level A or commercial packaging, as specified (see 6.2).

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5.3.1 Level A. Bolts, preserved and packaged as specified shall be packed in overseas containers conforming to PPP-B-585, PPP-B-621 or PPP-B-601. Plywood containers shall be surface treated in accordance with the specification. As far as practicable, exterior shipping containers shall be of uniform shape and size, be of minimum cube and tare consistent with the protection required, and contain identical quantities. The gross weight of each pack shall be limited to approximately 200 pounds. Containers shall be closed and strapped in accordance with the applicable container specification or appendix thereto. Containers shall be provided with a case liner conforming to MIL-L-10547 and shall be sealed in accordance with the appendix thereto. The case liner will not be required when the intermediate container conforms to PPP-B-636, class weather-resistant, closed and taped in accordance with the appendix.

5.3.2 Commercial packaging. Packages that require overpacking for acceptance by the carrier shall be packed in exterior-type shipping containers in a manner that will insure safe transportation at the lowest rate to the point of delivery. Containers shall conform to the Uniform Freight Classification Rules or regulations of other common carriers as applicable to the mode of transportation.

5.4 Physical protection. Cushioning, blocking, bracing and bolting, as required shall be in accordance with MIL-STD-1186, except that for domestic shipments, waterproofing requirements for cushioning materials and containers shall be waived. Drop tests of MIL-STD-1186 shall be waived when packaging and packing of the item is for immediate use or when drop tests of MIL-P-116 are applicable.

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

6. NOTES

6.1 Intended use. The bolts specified in this specification are for use in applications requiring bolts of 160 KSI tensile strength, high fatigue strength or both.

6.1.1 Interchangeability. Standard and nonstandard bolt designs that are approved for use and are specified by reference to this specification and have all descriptive factors that affect interchangeability the same, except for the type of plating in accordance with QQ-P-416, are considered to have the following interchangeability relationship:

- a. Bolts with Type II plating can be used to replace those bolts with Type I plating in all applications.
- b. Bolts with Type I plating can be used in place of bolts with Type II plating until present stocks are depleted or until 1 January 1964.

6.2 Acquisition requirements. Acquisition documents should specify the following:

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- a. Title, number and date of this specification.
- b. MS part number of the bolt desired, and quantity.
- c. Applicable levels of preservation, packaging and packing, and unit quantities required.

6.2.1 Procurement of bolts for which no product is listed on QPL-7838.

If no product is listed on QPL-7838 for a particular bolt listed on the applicable standard, a product may be procured to the provisions of this specification and the bolt requirements on applicable standard if the following procedure is followed:

- a. The manufacturers that are prospective suppliers should provide the procuring activity with a complete certified test report showing the conformance of their product with all the requirements of this specification and the applicable standard.
- b. A copy of the above certified test report, the manufacturer's part number, a complete description of the product as manufactured, and a request for qualification evaluation or testing of the product should be submitted to the Commander, Naval Air Development Center (6013), Warminster, PA 18974.
- c. Procurement will be contingent upon the manufacturer providing the above test data, information, and the qualification evaluation and testing of his product. It is not required that procurement be delayed until the qualification evaluation and testing are completed.

6.3 Qualification. With respect to products requiring qualification, except for procurement in accordance with the provisions of 6.2.1, awards will be made only for such products which are, at the time set for opening of bids, qualified for inclusion in the Qualified Products List (QPL-7838) whether or not such products have actually been so listed by that date. The attention of the contractors is called to this requirement, 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 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 20631; however, information pertaining to qualification may be obtained from the Commander, Naval Air Development Center (6013), Warminster, PA 18974.

6.4 Part or identifying number. The part number to be used for bolts acquired to this specification are as specified on the applicable military standard.

6.5 Subject term (keyword) listing.

Bolt
Internal wrenching
160 KSI Ft_u

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6.6 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:

Navy - AS
Air Force - 99
Army - AV

Preparing Activity:

Navy - AS
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