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 SUPERSEDING
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MILITARY SPECIFICATION

BOLT, 180 KSI Ft_u and 108 KSI Fs_u, 450°F
 PROTRUDING AND FLUSH HEAD;
 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 is for bolts used where temperatures are not greater than 450°F and ultimate tensile strength is 180 KSI Ft_u (ultimate tensile stress) and 108 KSI Fs_u.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified, the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) as specified in the solicitation, form a part of this specification to the extent specified herein.

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	Box, Wood, Nailed and Lock-Corner
PPP-B-636	Box, Fiberboard
PPP-B-665	Boxes, Paperboard, Metal Stayed (Including Stay Material)

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, ESSD, Lakehurst, NJ 08733, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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SPECIFICATIONS (Continued)

FEDERAL (Continued)

PPP-B-676 Boxes, Set-Up, Paperboard

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MIL-P-116 Preservation, Methods of

MIL-B-121 Barrier Material, Greaseproofed, Waterproofed, Flexible

MIL-I-6868 Inspection Process, Magnetic Particle

MIL-H-6875 Heat Treatment of Steels (Aircraft Practice) Process for

MIL-S-8879 Screw Threads, Controlled Radius Root with Increased Minor Diameter; General Specification for

MIL-N-8922 Nut, Self-locking, Steel, 220 KSI Ftu, 450°F

MIL-N-8985 Nut, Self-locking, Steel, 180 KSI Ftu, 450°F

MIL-L-10547 Liners, Case, Waterproof

(See Supplement 1 for applicable specification sheets and standards.)

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 Fasteners, Test Methods

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

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2.2 Other publications. The following documents form a part of this specification to the extent specified herein. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B46.1-1978 Surface Texture (Surface Roughness, Waviness and Lay)

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

NATIONAL AEROSPACE STANDARDS (NAS)

NAS 1348 Fasteners - Recommended Tensile Stress Areas for External Threaded Alloy Steel.

(Application for copies should be addressed to National Standards Association, 5161 River Road, Washington, D.C. 20016.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

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

3.2 Qualification. The bolt furnished under this specification shall be a product which is qualified for listing on the applicable Qualified Products List at the time set for opening of bids (see 4.3 and 6.3).

3.2.1 Retention of qualification. To maintain status on a Qualified Products List, certification shall be submitted at two year intervals to indicate continued compliance with the requirements of this specification (see 4.3.2).

3.3 Material. The material shall be as specified on applicable specification sheet or standard. Unless otherwise specified, the choice of material shall be based on the ability of the bolt to conform to the strength requirements.

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3.4 Design and construction.

3.4.1 Dimensions. The dimensions of the bolt shall conform to the applicable specification sheets or military standard.

3.4.2 Threads.

3.4.2.1 Thread dimensions and form. The thread dimensions, form and contour shall conform to MIL-S-8879 and shall be right handed.

3.4.2.2 Thread rolling. Threads shall be fully formed by any single rolling process subsequent to 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 (see 4.5.1.1.3).

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 in figure 2.

3.4.3 Heads. The bolt heads shall be forged. Forged or machined lightening holes for reduction of weight are acceptable for protruding head bolts.

3.4.3.1 Wrenching element. The wrenching element shall be in accordance with the applicable specification sheets or standards.

3.4.3.2 Bearing surface (protruding head). The bearing surface of protruding bolt heads shall be at right angles to the shank within the limits shown in figure 3. The angular error of the underside of the head must be uniform around the shank within ± 10 minutes, as measured from the bearing surface of the head to a length equal to the diameter of the bolt.

3.4.3.3 Head structure and grain flow. A section of the head, when examined as specified in 4.5.3.6 shall show no defects. Flow lines in the fillet area below the surface shall closely conform to the fillet contour as shown in figure 4. The metal removed from the bearing surface shall be as little as practicable to obtain a clean, smooth surface. For protruding head bolts only, 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 (see 4.5.3.6).

3.4.4 Fillet (head-to-shank). The head-to-shank fillet radius shall meet the fatigue strength requirements specified in 3.9.4. The fillet shall be finished to the radius specified on the applicable

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standards. The working on the fillet radius shall be accomplished subsequent to the heat treatment of the bolt. The fillet shall show no evidence of seams or inclusions when tested as specified in 4.5.2.2.2.

3.4.4.1 Distortion of fillet area. Cold working of head-to-shank fillet may cause distortion of fillet area. Distortion shall be not greater than height (A) and depth (B) of 0.002-inch and the distorted area shall not extend beyond (C), as illustrated on figure 8.

3.5 Surface texture. The surface texture of the bolt, after plating, shall be not greater than the values shown in table I. The surface texture shall be measured in accordance with ANSI B46.1 (see 4.5.1.1.1).

TABLE I. Roughness height rating (R_a).

Area	Maximum Microinches (μ)
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 (see 4.5.1.1.1).

TABLE II. Straightness of shank.

Bolt Size	Deviation of bolt shank from plate (inch per inch of bolt length) (maximum)
5/16 and under	0.0030
3/8 and 7/16	0.0025
1/2 and larger	0.0020

3.7 Heat treatment. Bolts shall be heat treated in accordance with MIL-H-6875 to develop the mechanical properties specified herein. All bolts shall be retempered, subsequent to grinding and before thread rolling and fillet working at a temperature not greater than the original tempering temperature to a maximum temperature of 500°F.

3.8 Cadmium plating. All surfaces of alloy steel shall be cadmium plated in accordance with QQ-P-416, type II, class 2.

3.9 Mechanical properties.

3.9.1 Ultimate tensile load. The finished bolts shall develop the ultimate tensile load listed in table III (see 4.5.3.2.1).

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TABLE III. Mechanical properties.

Nominal Size	Ultimate Tensile Load (pounds minimum) <u>1/</u>	Double Shear Strength (pounds minimum) <u>2/</u>	Area At Basic Shank DIA (As) in ² <u>2/</u>
#10-32	3,910	6,100	.0284
1/4-28	6,980	10,600	.0491
5/16-24	11,100	16,600	.0767
3/8-24	17,100	23,900	.1104
7/16-20	23,200	32,500	.1503
1/2-20	30,900	42,400	.1963
9/16-18	39,200	53,700	.2485
5/8-18	49,000	66,300	.3068
3/4-16	71,100	95,400	.4418
7/8-14	97,100	129,900	.6013
1- 12	126,000	169,600	.7854
1-1/8-12	162,000	214,700	.9940
1-1/4-12	202,000	265,100	1.2270
1-3/8-12	247,000	320,700	1.4850
1-1/2-12	296,000	381,700	1.7670

1/ The stress areas used for the calculation of the ultimate tensile load values are based on the basic pitch diameter of the external thread as specified in NAS 1348.

2/ The listed shear values are based on a minimum 2X single shear strength of 108 KSI and the stress area at nominal shank diameter.

3.9.2 Double shear strength. The bolts shall meet the double shear values listed in table III (see 4.5.3.2.2).

3.9.3 Hardness. Bolts shall have a Rockwell hardness of C39 to C43 (see 4.5.2.2.1).

3.9.4 Fatigue strength. Bolts shall be capable of withstanding not less than 65,000 fatigue cycles when loaded in accordance with table IV (see 4.5.3.2.3). Bolts need not be tested in excess of 130,000 cycles if failure has not occurred before that time.

3.9.5 Stress durability. The bolts shall satisfactorily pass the stress durability test of 4.5.3.3.

3.10 Metallurgical properties.

3.10.1 Carburization and nitrogenization. The bolts shall show no decarburization, carburization, recarburization or increase in nitrogenization on the bearing surface of the head-to-shank fillet, shank, or threads (see 4.5.3.4).

3.10.2 Work effect. The bolt threads and head-to-shank fillet shall show evidence of working when tested as specified in 4.5.3.5.

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TABLE IV. Fatigue loading.

Nominal Bolt Diameter (inches)	Low-Tension Load (pounds) <u>+2 percent 2/</u>	High-Tension Load (pounds) <u>+2 percent 1/</u>
10-32	180	1,800
1/4-28	321	3,210
5/16-24	510	5,100
3/8-24	786	7,860
7/16-20	1,065	10,650
1/2-20	1,420	14,200
9/16-18	1,800	18,000
5/8-18	2,250	22,500
3/4-16	3,270	32,700
7/8-14	4,460	44,600
1 -12	5,790	57,900
1-1/8-12	7,450	74,500
1-1/4-12	9,290	92,900
1-3/8-12	11,340	113,400
1-1/2-12	13,600	136,000

1/ High-tension load is based on $.46 \times F_{tu}$ of table III.

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

3.10.3 Discontinuities. All bolts shall be examined by magnetic particle inspection as specified in 4.5.2.2.2. 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 6.4.1), with other discontinuities.

3.10.3.1 Cracks. Bolts shall be free from cracks in any direction or location.

3.10.3.2 Laps and seams. Bolts may possess laps (see 6.4.2) and seams (see 6.4.3), except in locations specified in 3.10.3.5. The depths shall be not greater than the amounts specified in table V.

TABLE V. Discontinuity depths. 1/

Bolt Size	#10, 1/4	5/16	3/8	7/16	1/2 thru 1-1/2 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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3.10.3.3 Inclusions. The bolt shall show no evidence of surface or subsurface inclusions at the thread root or head-to-shank fillet (see 4.5.2.2.2). Small inclusions on other parts of the bolt are not indicative of unsatisfactory quality.

3.10.3.4 Head and shank discontinuities (seams, inclusions, or folds). Seams, inclusions, or folds along the top or sides of the bolt head shall be not greater than twice the depth limits shown in table V. The seams on the bearing surface shall be not greater than the limits shown in table V. There shall be no discontinuities on the head-to-shank fillet.

3.10.3.5 Thread discontinuities (laps, seams, and surface irregularities). Threads shall have no multiple or single laps at the root or on the sides (see figure 5). Laps are permissible at the crest which are not greater than 25 percent of basic thread depth. Laps are permissible above the pitch diameter (see figure 6). Slight deviation from the thread contour is permissible at the crest of the thread as shown in figure 6. The incomplete thread at each end of the thread may also deviate slightly from contour.

3.10.4 Grinding burns. The bolt shall show no evidence of grinding burns (see 4.5.3.8).

3.11 Sleeve expansion. When the sleeve is pushed to the pin head, the expanded bolt sleeve diameter shall be as specified on the applicable specification sheet (see 4.5.3.9).

3.12 Identification of product. Each bolt shall be marked on top of the head or side of the flange. The manufacturer's identification shall be marked on the top or side of the head or on the base of the lightening hole. Markings may be raised or indented not more than 0.10-inch, except that only raised markings shall be used on the lightening hole. Markings may be forged or stamped.

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.

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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 inspections. The qualification inspections shall consist of the tests listed in table VI as specified under 4.5.

4.3.1 Sampling size. The qualification test samples shall consist of 15 bolts for each diameter for which qualification is desired. Samples up to and including 1/2-inch diameter shall have a grip length of 1-3/8 inches; samples from 9/16-inch diameter up to and including 1-1/2-inch diameter shall have a minimum grip length of 4 inches. In addition, the manufacturer shall supply 15 nuts conforming to MIL-N-8922 and MIL-N-8985 and tested in accordance with MIL-STD-1312, Test 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).

TABLE VI. Qualification inspections.

Inspections	Number of Samples	Requirement Paragraph	Inspection Paragraph
Ultimate Tensile Load	3	3.9.1	4.5.3.2.1
Double Shear Strength	3	3.9.2	4.5.3.2.2
Fatigue Strength	3	3.9.4	4.5.3.2.3
Stress Durability	3	3.9.5	4.5.3.3
Carburization and Nitrogenization	1	3.10.1	4.5.3.4
Grinding Burns	3	3.10.4	4.5.3.8
Sleeve Expansion	3	3.11	4.5.3.9

4.3.2 Retention of qualification. To comply with the requirements specified in 3.2.1, the manufacturer shall forward qualification certification to the Commander, Naval Air Development Center, Code 6013, Warminster, PA 18974. This certification, signed by a responsible official of management, shall attest that the manufacturer has the capability to produce bolts under conditions equal to those existing at the time of the original approved listing.

4.4 Quality conformance inspection. The quality conformance inspections shall consist of all the tests specified in table VII.

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TABLE VII. Quality conformance inspections.

Inspection	Number of Samples	Requirement Paragraph	Inspection Paragraph
Straightness and Surface Texture	3	3.5 3.6	4.5.1.1.1
Cracks and Discontinuities	3	3.10.3 3.10.3.1	4.5.2.2.2
Magnetic Particle Inspection			4.5.2.2.2.1
Carburization and Nitrogenization		3.10.1	4.5.3.4
Work Effect		3.10.2	4.5.3.5
Head Structure and Grain Flow	1	3.4.3.3	4.5.3.6
Transverse Hardness	3		4.5.3.7
Grinding Burns		3.10.4	4.5.3.8

4.4.1 Sampling.

4.4.1.1 Inspection lot. An inspection lot shall consist of bolts, from a single production lot, of one part number which indicates one size, one grip length, and whether the heads are drilled or undrilled.

4.4.1.2 Production lot. A production lot shall consist of finished bolts, which have the same part number; fabricated from a single mill heat by the same process, heat treated in the same manner, and produced as one continuous run or order.

4.4.1.3 Random sample. A random sample is a sample drawn in such a manner that each unit (bolt) in the inspection lot has the same chance of being the first unit in the random sample; after the first unit in the sample is drawn, each of the remaining units in the inspection lot has the same chance of being the second unit in the sample, etc.

4.4.1.4 Inspection records. Copies of all records and examinations shall be certified and shall be supplied for each production lot or portion thereof. These records shall identify the manufacturers of the bolts and provide the address of the plant where the bolts were manufactured. The records shall be available to the purchaser and shall be signed by an authorized representative of the manufacturer.

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4.5 Test methods.4.5.1 Visual and dimensional inspection.

4.5.1.1 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.

4.5.1.1.1 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.

4.5.1.1.2 Classification of defects. 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 (B)
103	Imperfect threads
104	Grip length
105	Radius under head (R)
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
111	Surface finish, plating
112	Identification
113	Installation
Minor A:	
201	Overall length (L)
202	Head diameter (A)
203	Head height (H)
204	Socket dimensions (E and J)
205	Concentricity of head and shank (X)
206	Concentricity of shank and thread pitch diameter (Z)
207	Drilled hole diameters and location (H and M)
Minor B:	
301	Chamfer on thread end
302	Flange height (Q)

NOTE: Letters in parentheses correspond to dimensions specified in MS21134 and MS21250.

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4.5.1.1.3 Incomplete threads. Incomplete threads shall be inspected for compliance to figure 1A.

4.5.1.1.4 Dimensions. Dimensions shall be checked by means of applicable gages or optical comparators.

4.5.2 Nondestructive tests.

4.5.2.1 Sampling plan. Statistical sampling shall be in accordance with MIL-STD-105, except for magnetic particle inspection which shall be 100 percent inspected. The AQL shall be 2.5 percent defective and the inspection level shall be S-4. The sample units may be selected from those that have been subjected to and passed the visual and dimensional inspection.

4.5.2.2 Method.

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

4.5.2.2.2 Cracks and discontinuities. The presence of cracks and discontinuities in bolts such as laps, seams, and inclusions shall be determined by magnetic particle inspection. Particle indications of themselves shall not be cause for rejection. If, in the opinion of the inspector, the indications are cause for rejection, the bolts shall be examined by microexamination to determine if the discontinuities are within the limits specified herein.

4.5.2.2.2.1 Magnetic particle inspection. Magnetic particle inspection shall be performed in accordance with MIL-I-6868. The bolts shall be magnetically inspected by both the longitudinal and circular methods.

4.5.3 Destructive tests.

4.5.3.1 Sampling plan. The sampling procedure shall be in accordance with MIL-STD-105. Normal inspection shall be used at the start of each production lot. The AQL shall be 1.0 percent defective and the inspection level shall be S-2. The sample units may be selected from those that have been subjected to and passed the nondestructive tests with additional units selected at random from the inspection lot as necessary.

4.5.3.2 Strength tests. Acceptance of bolts shall be based on the results of actual tensile and shear tests (4.5.3.2.1 and 4.5.3.2.2). In the event the bolts to be tested in shear have a grip of less than two times the shank diameter, the tensile test shall determine acceptability.

4.5.3.2.1 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, Test 8. In the event the bolt is too short to conduct the tensile test, acceptability shall be based on results of the hardness test (4.5.2.2.1).

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

4.5.3.2.3 Fatigue strength. The bolts with expandable sleeves pushed to the bolt head shall be used for this test. Cracks in the sleeve will not constitute failure of the bolt. Parts having a grip length less than two times their diameter need not be fatigue tested, and acceptance for these shall be on the basis of their tensile 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 IV. The method of testing and fixture requirements shall be in accordance with MIL-STD-1312, Test 11.

4.5.3.3 Stress durability. The stress durability test shall be conducted in accordance with MIL-STD-1312, Test 5. The bolt shall be maintained for 23 hours without failure.

4.5.3.4 Carburization and nitrogenization. Carburization, decarburization, recarburization, or nitrogenization on the bearing surface of the head, head-to-shank fillet, shank and threads shall be determined by microexamination. Specimens shall be taken as shown in figure 7. The specimens shall be etched in 5 percent nital and examined optically at 100X magnification. In case of disagreement over carburization, decarburization, or nitrogenization, microhardness testing of the shank shall be used as a referee method. Except as noted herein, testing shall be in accordance with MIL-STD-1312, Test 6. The indenter test load shall be 200 grams. Three (3) readings shall be taken at the core (a minimum distance of 0.125 inch from the surface or at mid-radius whichever is less). The average of these readings shall represent the core hardness. Starting at a point 0.002 from the surface and transversing toward the core, staggered reading shall be taken every 0.001 inch until the core hardness is reached. A microhardness reading within 0.003 of the surface that is higher than the core reading by more than 10 points Knoop shall be evidence of carburization. A microhardness reading within 0.003 of the surface less than the core reading by 25 points Knoop shall be evidence of decarburization. Any relative soft subsurface layer indicated by the microhardness survey, shall be evidence of recarburization. This does not apply to the threads or fillet area.

4.5.3.5 Work effect. The cold work of the bolt threads shall be determined by microexamination as specified in 4.5.3.6. Work effect on the head-to-shank fillet shall be determined by visual examination.

4.5.3.6 Head structure and grain flow. Head structure and grain flow shall be determined by macroexamination at a magnification of 10 diameters. Specimens shall be taken from the finished bolt as shown on figure 7. The bolts shall be etched in an aqueous solution containing 50 percent (by volume) of hydrochloric acid at 160° to 180°F for sufficient time to reveal the macrostructure properly.

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4.5.3.7 Tranverse hardness. The acceptance of bolts having grip lengths less than twice the nominal size shall be based on the tranverse hardness test taken on a circular cross section halfway between the head surface and the thread. The Rockwell hardness range for acceptance shall be C39 to C43. Readings shall be taken at distances of 1/8 inch from the surface, at one-half the radius, where practicable, and at the core.

4.5.3.8 Grinding burns. Indications of grinding burns (untempered martensite) are white streaks appearing on the surface of the test sample after the following treatment:

- a. Remove all foreign matter from the bolt such as grease, dirt, plating, or oxide fiber.
- b. Rinse the bolt in cold water. If water breaks occur, bolts shall be recleaned.
- c. Immerse and agitate the bolt in a 4 percent solution of nitric acid for approximately 30 seconds.
- d. Rinse in cold water and dry bolt.
- e. Immerse the bolt in 2 percent solution of hydrochloric acid in acetone for 30 seconds.
- f. Rinse in cold water.
- g. Rinse the bolt in 5 percent sodium bicarbonate solution.
- h. Rinse the bolt in hot water and dry.

4.5.3.9 Sleeve expansion. The sleeve shall be expanded by the method shown in figure 9. Failure to meet the dimensions as specified on the applicable specification sheet shall constitute failure.

4.5.4 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 Section 5.

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5. PACKAGING

5.1 Packaging.

5.1.1 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 chip board, plastic sleeve covering, or a spiral wrap of kraft paper over chip board, and shall be lined with material conforming to MIL-B-121.

5.1.2 Intermediate packaging. Only identical items shall be included in an intermediate package. Bolts, preserved and packaged as specified in 5.1.1, 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 IX (see 6.2).

TABLE IX. Allowable quantities per package.

Size	Length	Maximum quantity per carton
#10 to 5/16	Up to 1-1/2 inch	100
#10 to 5/16	1-1/2 in. to 3 in.	50
3/8 and 9/16	Up to 3 in.	50
#10 to 9/16	Over 3 in.	25
Over 9/16	All lengths	25

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

5.2.1 Level A. Bolts, preserved and packaged as specified in 5.1 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.

5.2.2 Commercial packaging. Packages which 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.

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5.3 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.

5.4 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. Bolts covered by this specification are intended for use in applications which require a bolt with 180,000 PSI tensile strength and 108 KSI shear strength.

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Part number of the bolt desired.
- c. Quantity (see table IX).
- d. Applicable levels of packing (see 5.2).

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 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, Navy Department, Washington, D.C. 20360; however, information pertaining to qualification of products may be obtained from the Naval Air Development Center (NADC), Warminster, Pennsylvania 18974 Attention (Code 6061).

6.4 Definitions.

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

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6.4.2 Lap. 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.

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

6.5 Changes from previous issue. Asterisks 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 - 11
Army - AV

Preparing activity:
Navy - AS
Project No. 5306-0658

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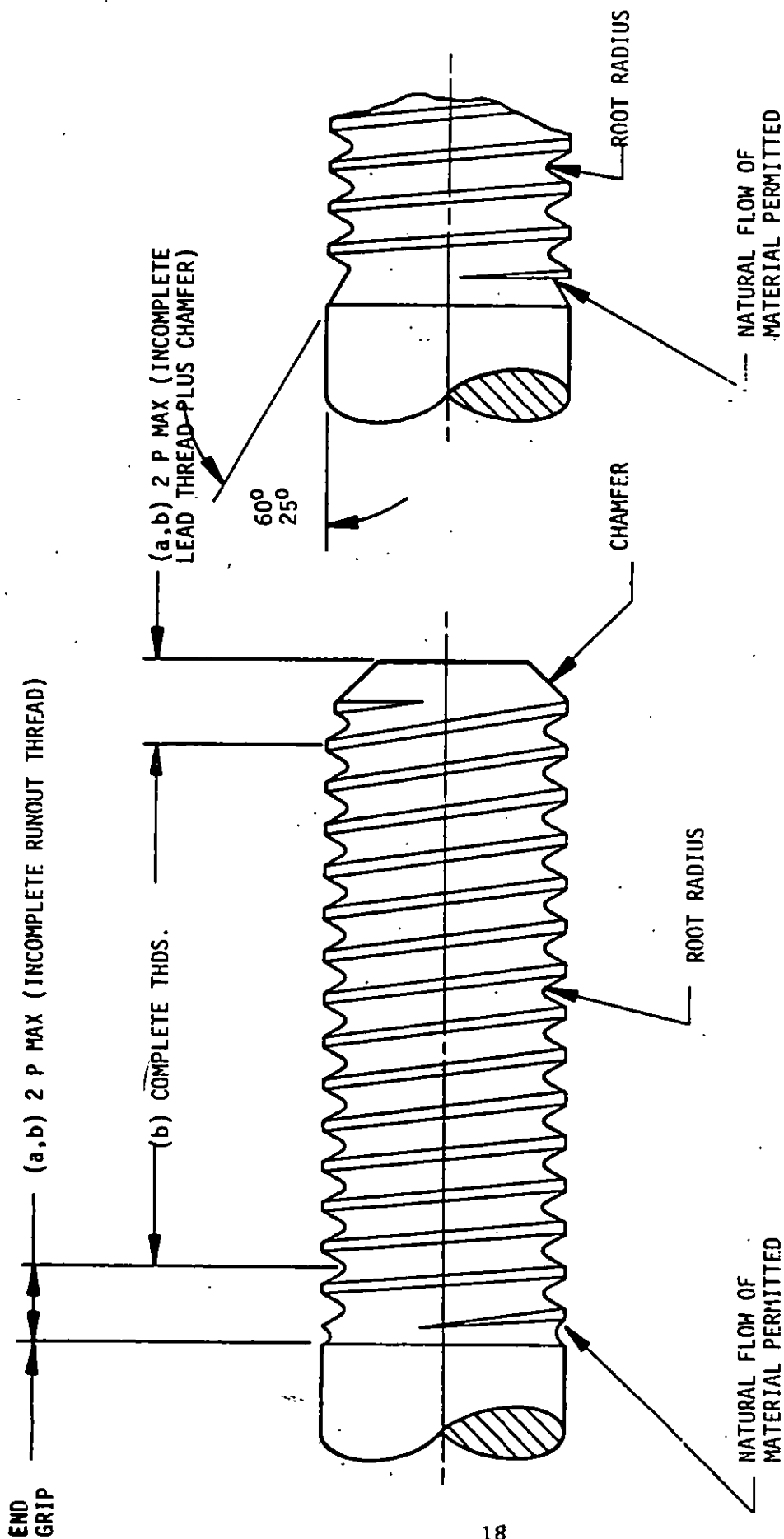


FIGURE 1. Incomplete threads and root radius.

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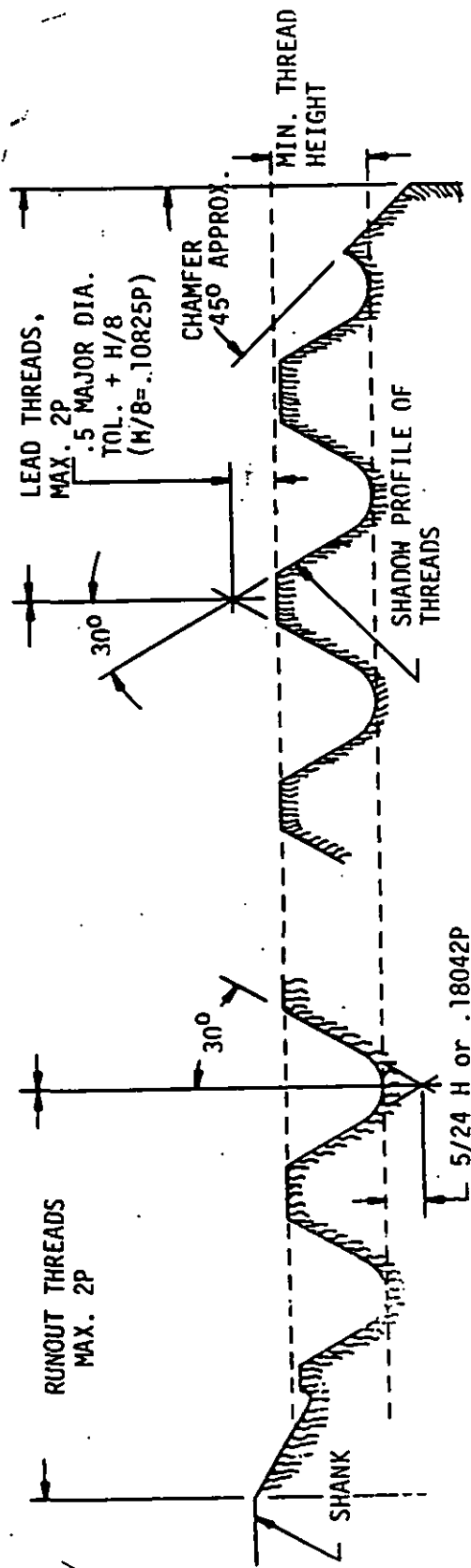


FIGURE 1A. Determination of incomplete threads.

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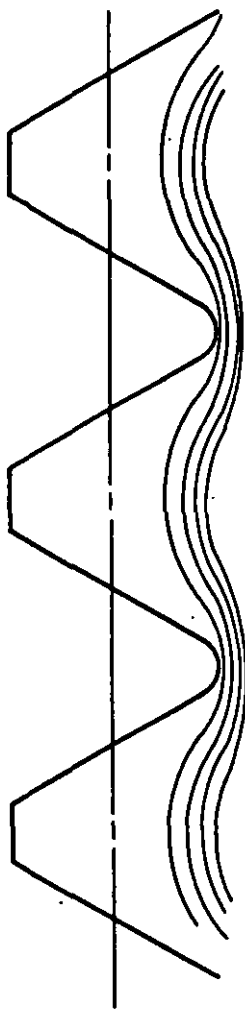


FIGURE 2. Grain flow in complete threads.

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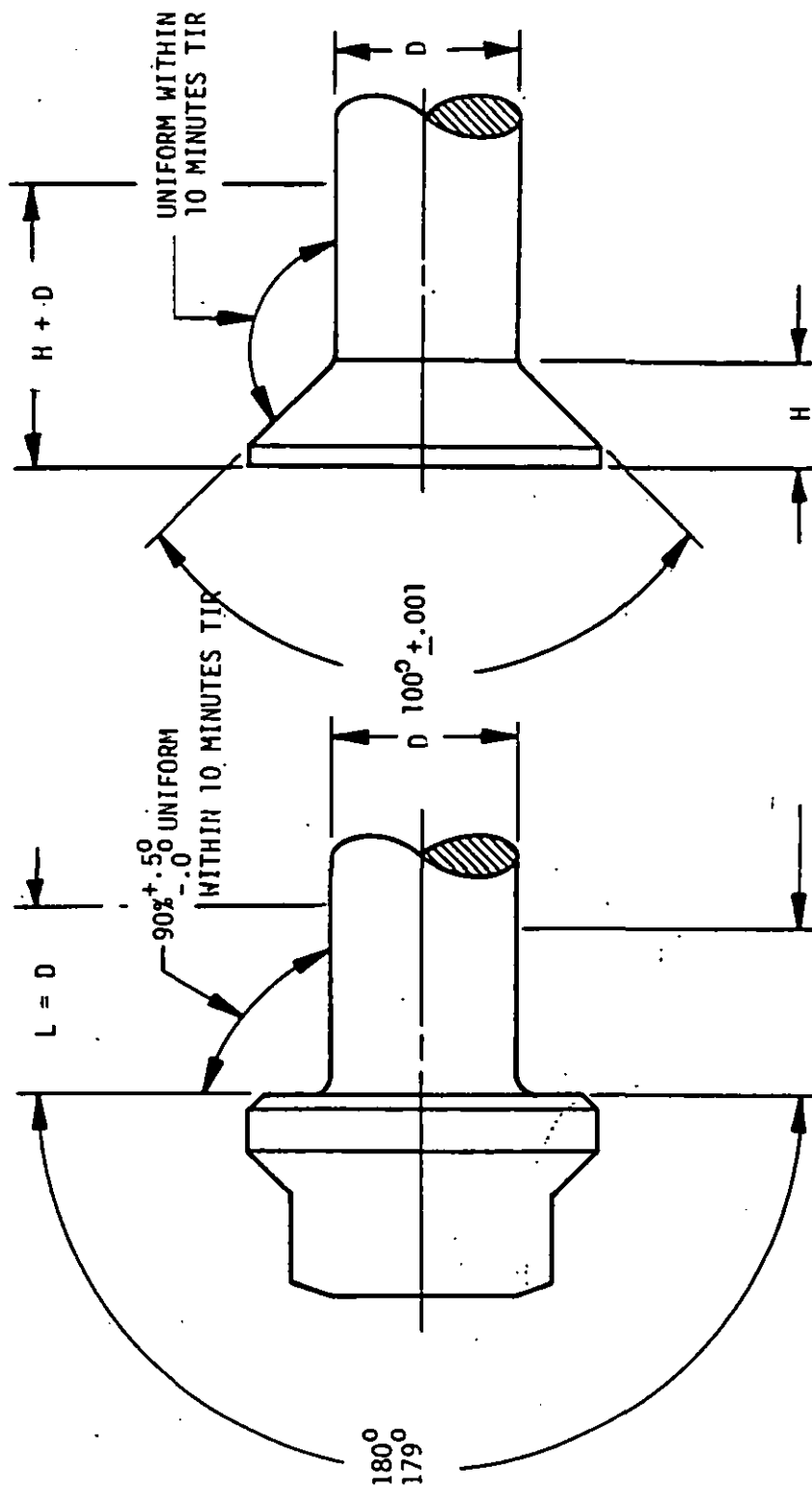


FIGURE 3. Head angularity

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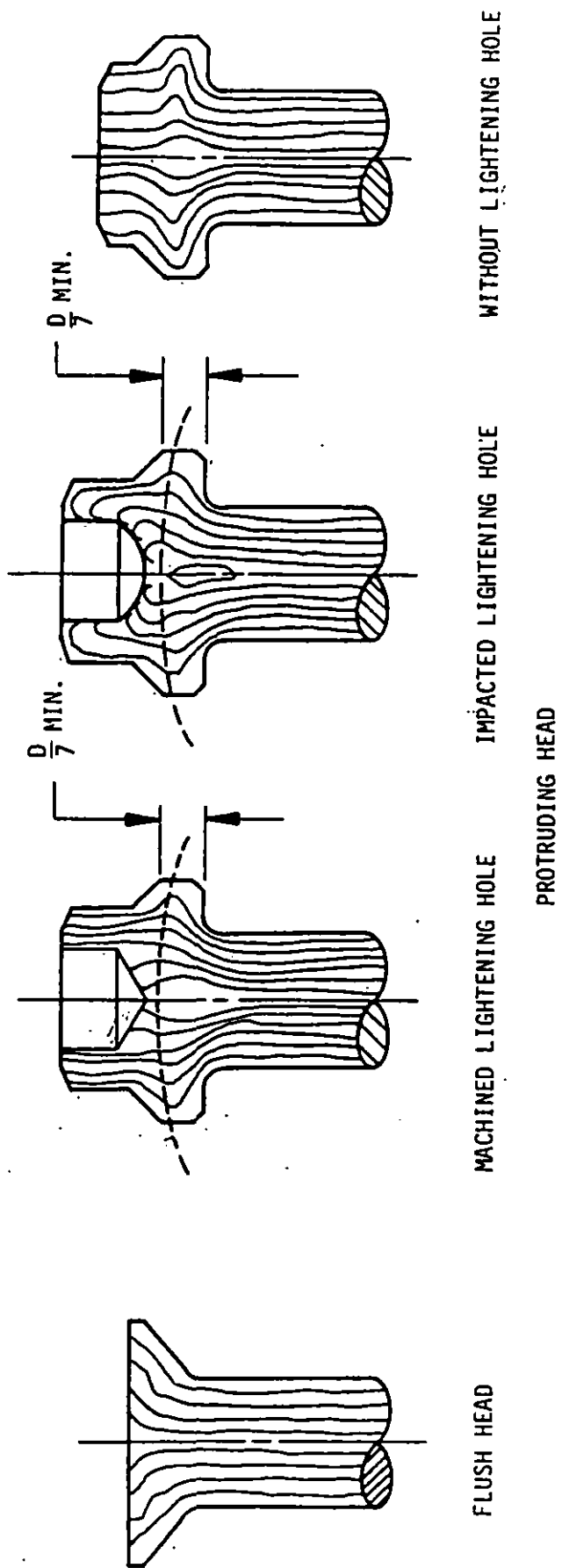


Figure 4. Forged Head Structure and Grain Flow.

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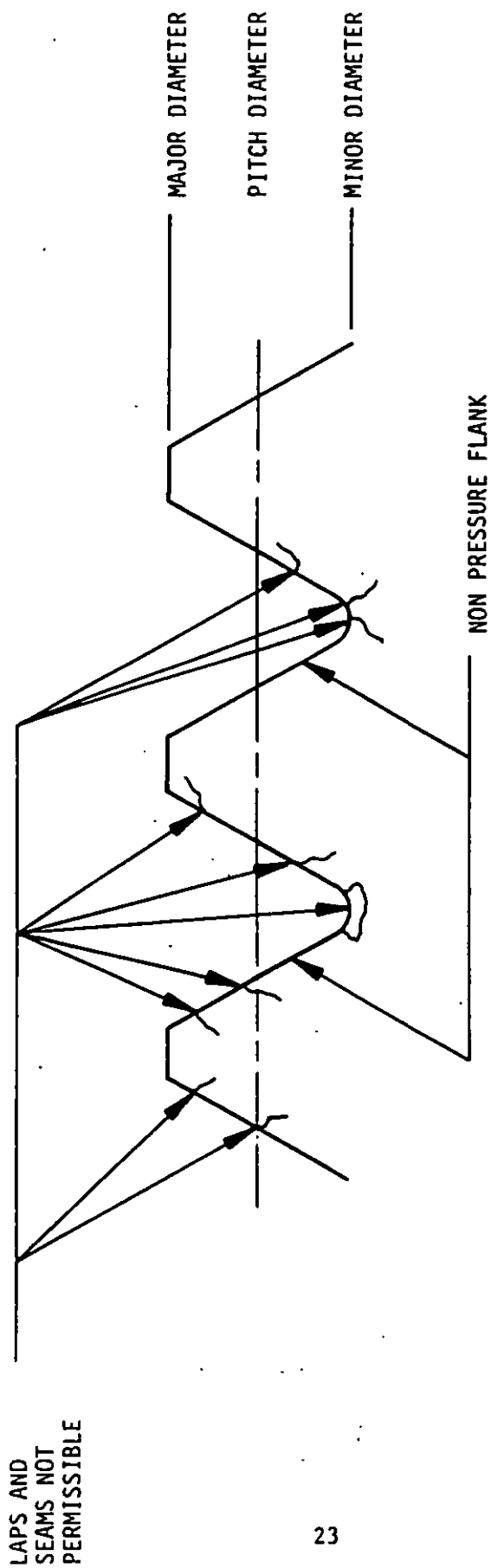


Figure 5. Non Permissible Laps, Seams and Surface Irregularities.

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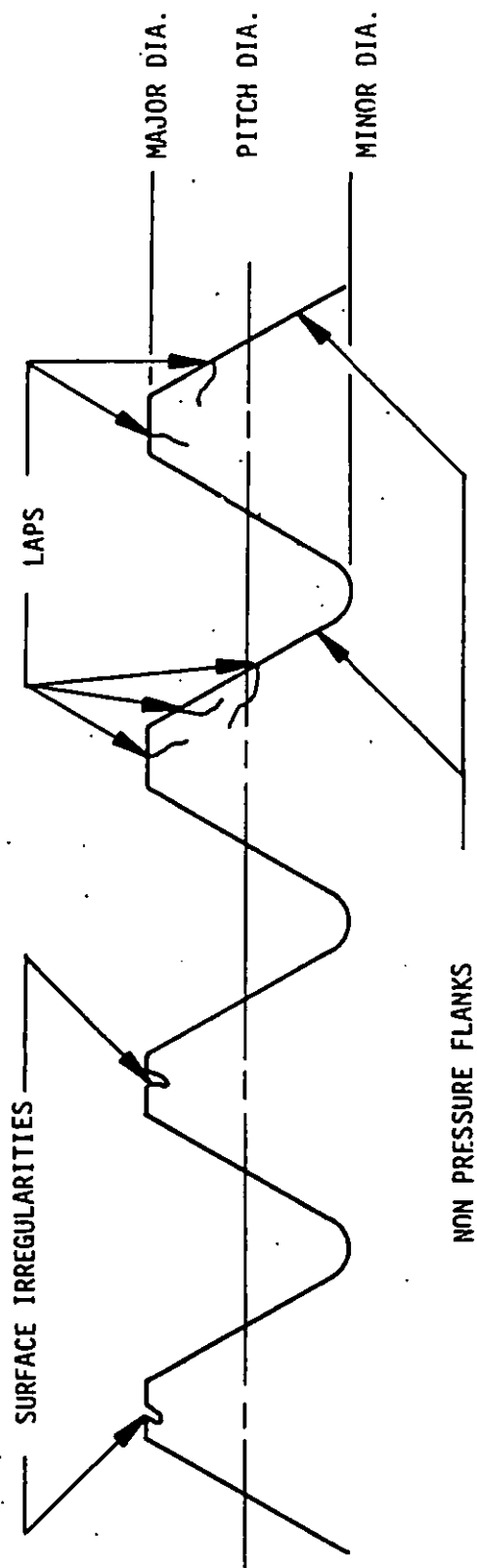


Figure 6. Permissible Laps, Seams and Surface Irregularities.

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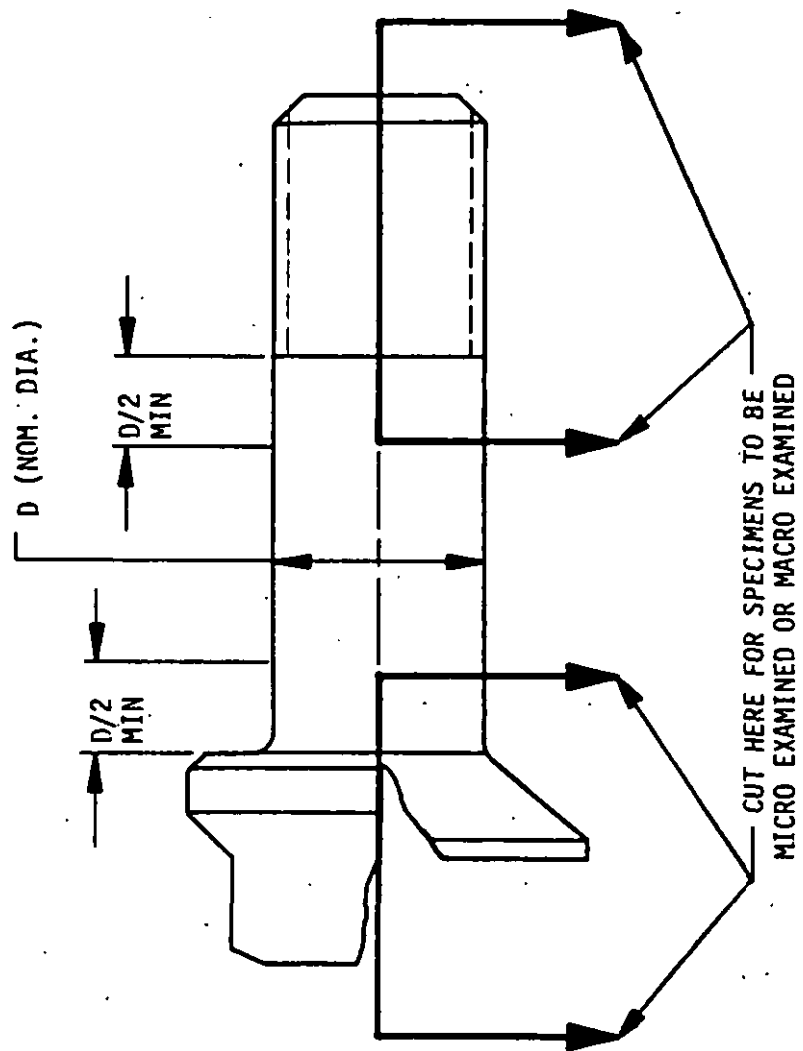
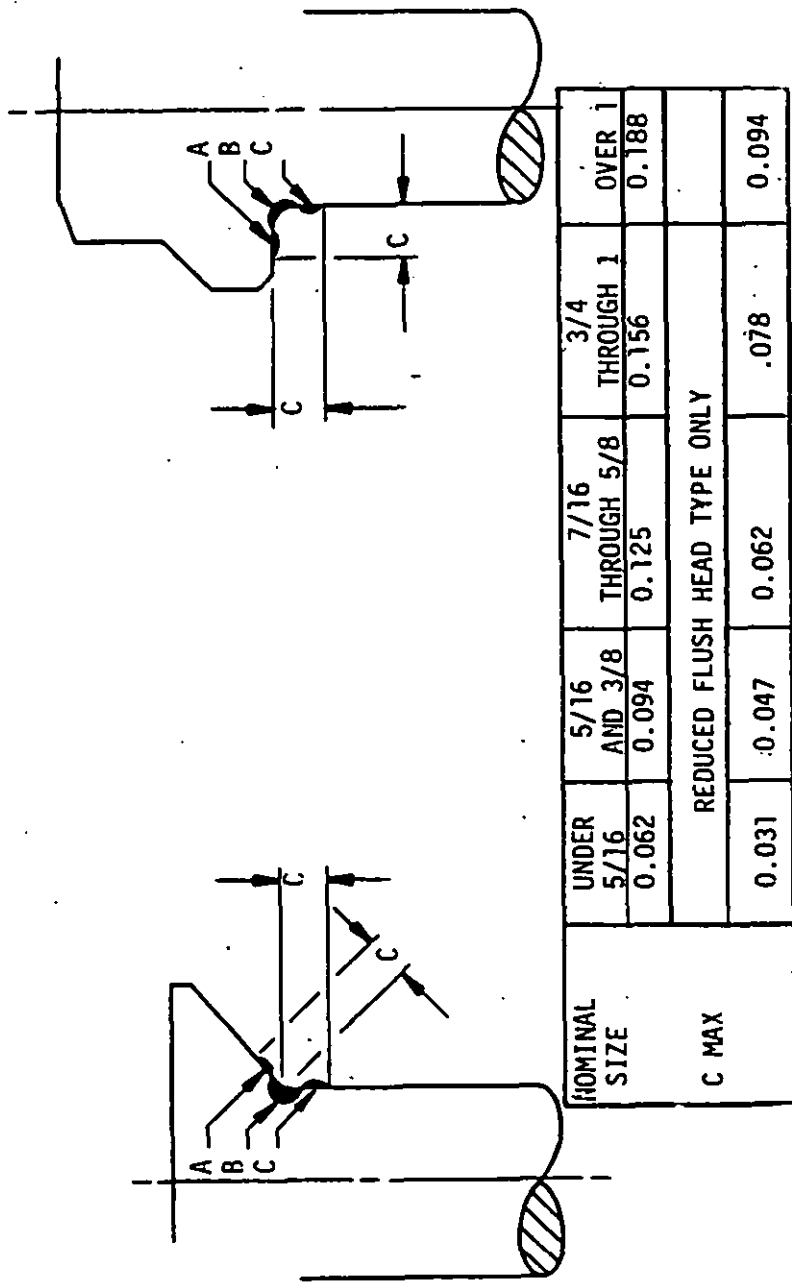


Figure 7. Metallurgical Specimen.

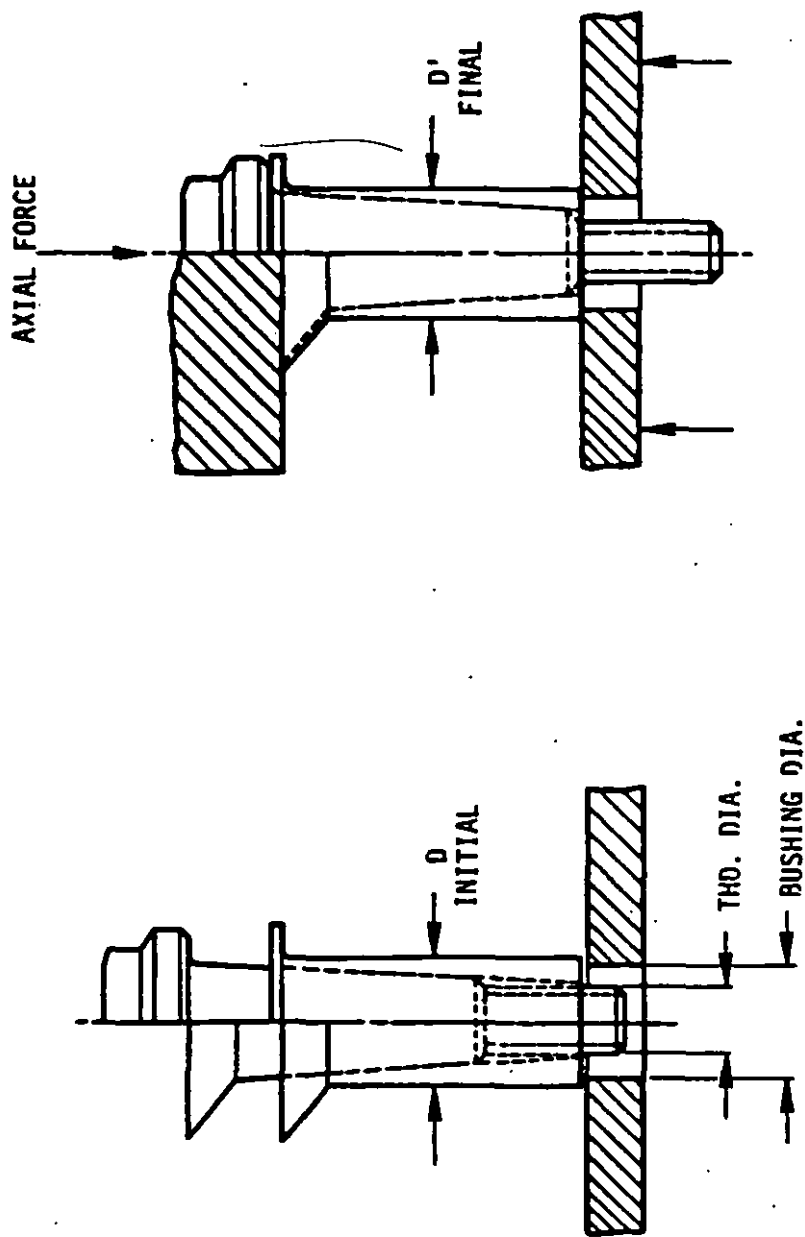
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DIMENSIONS IN INCHES

Figure 8. Permissible Fillet Distortion (3.3.4.1).

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SIZE DASH NO.	3	4	5	6	7	8	9	10	12	14	16
BUSHING I. D.	.188	.248	.311	.373	.437	.499	.561	.625	.750	.875	1.001
	.186	.246	.308	.370	.433	.495	.557	.620	.745	.870	.995

DIMENSIONS IN INCHES

Figure 9. Sleeve Expansion (4.5.3.9)

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DOCUMENT IDENTIFIER (Number) AND TITLE

MIL-B-8831 Rev. B Bolt, 180 Ftu and 108 KSI Fsu, 450⁰F Protruding and FlushHead: General Specification for
NAME OF ORGANIZATION AND ADDRESS OF SUBMITTER

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1 OCT 76

Replaces edition of 1 Jan 72 which may be used.

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