

MIL-N-45913B
 28 October 1970
SUPERSEDING
 MIL-N-45913A(WC)
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MILITARY SPECIFICATION

NUTS, SELF-LOCKING, HEXAGON, PREVAILING TORQUE

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

1. SCOPE

1.1 This specification establishes mechanical and performance requirements for prevailing-torque hexagon locknuts.

1.2 Classification. Locknuts shall be of the following types, grades and series (see 6.2).

1.2.1 Types

- Type I - Nut, self-locking, hexagon, prevailing-torque, general purpose.
- Type II - Nut, self-locking, hexagon, prevailing-torque, critical installations.
- Type III - Nut, self-locking, flange, prevailing-torque.
- Type IV - Nut, self-locking, cap, general purpose.
- Type V - Nut, self-locking, spline, general purpose.

1.2.2 Grades. Three grades of carbon and alloy steel locknuts are designated as Grade A, Grade B and Grade C. Nonferrous materials as specified herein may be used for general purpose locknuts, but tensile strengths indicated below do not apply (see 6.2).

Each grade of carbon and alloy steel locknuts is suggested for use with bolts having specified minimum tensile strengths within the following values:

<u>Grade of Locknut</u>	<u>Specified Minimum Ultimate Tensile Strength of Bolt, P.S.I.</u>
Grade A	not greater than 90,000
Grade B	not greater than 120,000
Grade C	not less than 105,000 nor greater than 150,000

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1.2.3 Series. Locknuts shall be of the following series.

Hex locknut (regular)
 Hex thin locknut
 Hex thick locknut
 Hex heavy locknut
 Hex flanged locknut
 Cap locknut
 Spline locknut

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS

Federal

- QQ-A-225/5 - Aluminum Alloy Bar, Rod and Wire, Rolled, Drawn or Cold Finished, 2017.
- QQ-B-626 - Brass, Leaded and Nonleaded: Rod, Shapes, Forgings and Flat Products with Finished Edges (Bar and Strip).
- QQ-P-35 - Passivation Treatments for Austenitic, Ferritic and Martensitic Corrosion-Resisting Steel (Fastening Devices).
- QQ-P-416 - Plating, Cadmium (Electrodeposited).

Military

- MIL-F-495 - Finish, Chemical, Black for Copper Alloys.
- MIL-H-3982 - Hardware (Fasteners and Related Items), Packaging and Packing for Shipment and Storage of.
- MIL-A-8625 - Anodic Coatings, for Aluminum and Aluminum Alloys.
- MIL-P-16232 - Phosphate Coatings, Heavy, Manganese or Zinc Base (For Ferrous Metals).

STANDARDS

Federal

- FED. STD. NO. 66 - Steel: Chemical Composition and Hardenability.

Military

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-1312 - Fasteners, Test Methods.
- MS51922 - Nut, Self-Locking, Hexagon-Prevailing-Torque, General Purpose, 250°F., UNC and UNF.

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- MS51943 - Nut, Self-Locking, Hexagon-Prevailing-Torque, For Critical Installations, 250°F., UNC and UNF.
 MS51988 - Nut, Self-Locking-Flanged, Prevailing-Torque, Steel, Cadmium, UNC and UNF.
 MS51865 - Nut, Self-Locking, Cap-General Purpose, 250°F.
 MS51866 - Nut, Self-Locking, Spline-General Purpose, 250°F.

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

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

American National Standards Institute (ANSI) Standards:

- ANSI B18.2.1 - Square and Hex Bolts and Screws
 ANSI B46.1 - Surface Texture

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

American Society for Testing and Materials (ASTM) Standards:

- ASTM A219 - Test for Thickness of Electrodeposited Coatings.
 ASTM A354 - Quench and Tempered Alloy Steel Bolts and Studs with Suitable Nuts.
 ASTM A449 - Quench and Tempered Steel Bolts and Studs.
 ASTM B134 - Brass Wire.
 ASTM E18 - Test for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials.

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

Society of Automotive Engineers SAE Handbook:

- SAE J429 - Mechanical and Quality Requirements for Threaded Fasteners.

(Application for copies should be addressed to the Society of Automotive Engineers, Inc., 785 Lexington Ave., New York, N. Y. 10017.)

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National Bureau of Standards (NBS) Handbook:

H28, Part I - Screw-Thread Standards for Federal Services.

(Application for copies should be addressed to the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.)

3. REQUIREMENTS

3.1 Material.

3.1.1 Carbon and alloy steel. Locknuts shall be manufactured from carbon or alloy steel of such a quality that the locknuts shall meet the proof loads specified in Table II (see 1.2.2 and 6.2).

3.1.2 Corrosion-resisting steel. Unless otherwise specified (see 6.2), corrosion-resisting steel locknuts shall be manufactured from the 300 series as specified in FED. STD. NO. 66 or any other austenitic corrosion-resisting steel developed for cold heading or free machining. These locknuts shall meet the requirements for Grade A locknuts.

3.1.3 Brass. Unless otherwise specified (see 6.2), brass for general purpose locknuts shall conform to ASTM B134, alloy number 270, half-hard or QQ-B-626, composition 11, half-hard.

3.1.4 Aluminum alloy. Unless otherwise specified (see 6.2), aluminum alloy for general purpose locknuts shall conform to QQ-A-225/5.

3.1.5 Prevailing-torque element. The prevailing-torque element may be a material other than steel that shall meet the requirements specified herein.

3.2 Protective finish.

3.2.1 Carbon and alloy steel. Unless otherwise specified (see 6.2), carbon and alloy steel locknuts shall be furnished plain and shall be provided with a supplementary lubricant which shall be clean and dry to touch.

3.2.1.1 Cadmium plating. When specified (see 6.2), cadmium plating shall be in accordance with QQ-P-416, Type II, Class 3 and shall be provided with a supplementary lubricant which shall be clean and dry to the touch.

3.2.1.2 Phosphate coating. When specified (see 6.2), phosphate coating shall be in accordance with MIL-P-16232, Type Z, Class 2.

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3.2.2 Corrosion-resisting steel. Corrosion-resisting steel locknuts shall be passivated in accordance with QQ-P-35, Type II and shall be provided with a supplementary lubricant which shall be clean and dry to the touch.

3.2.3 Brass. When specified (see 6.2), brass locknuts shall be black oxide coated in accordance with MIL-F-495 and shall be provided with a supplementary lubricant which shall be clean and dry to the touch.

3.2.4 Aluminum alloy. Aluminum alloy locknuts shall be anodized in accordance with MIL-A-8625, Type II and shall be provided with a supplementary lubricant which shall be clean and dry to the touch.

3.2.5 Hydrogen embrittlement. Electroplated or phosphate coated, heat treated, Grade C locknuts shall be subjected to an embrittlement relief treatment, as soon as possible after plating or coating, conducted in accordance with the applicable plating or coating specification.

3.3 Heat treatment. Grade A locknuts may be heat treated. Grade B locknuts shall be heat treated, if necessary, to meet the mechanical and performance requirements of this specification. Grade C locknuts shall be heat treated as necessary to meet the mechanical and performance requirements of this specification.

3.4 Dimensions. Locknuts shall conform to the dimensions specified on MS51922, MS51943, MS51988, MS51865 and MS51866. The portion of the locknut containing the locking feature may have a special contour within the maximum permitted width across flats and thickness. The tapered sides of the locknut shall not exceed 2° , the specified width across flats being the largest dimension. The bearing surface of the locknut shall be flat and either washer faced or with chamfered corners. Bearing surfaces shall be square with the thread pitch diameter, within the dimensions specified below. Bearing surface roughness shall not exceed 110 microinches in accordance with ANSI B46.1.

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Nom Size	Angularity of Bearing Surface - TIR, Max		Nom Size	Angularity of Bearing Surface - TIR, Max	
	MS51988	Other Stds		MS51988	Other Stds
# 4	--	.008	9/16	.019	.015
6	--	.008	5/8	.021	.016
8	--	.009	3/4	.023	.018
10	.010	.009	7/8	--	.020
12	--	.010	1	--	.022
1/4	.011	.010	1-1/8	--	.025
5/16	.013	.011	1-1/4	--	.028
3/8	.015	.012	1-3/8	--	.031
7/16	.016	.013	1-1/2	--	.034
1/2	.018	.014			

The threaded hole shall be countersunk on the bearing surface to a maximum of .030 inch over the basic major diameter for sizes 3/8 inch and smaller and 1.08 times the basic major diameter for sizes larger than 3/8 inch.

3.5 Threads.

3.5.1 Thread form, series and tolerances. Locknut threads shall be unified coarse or fine, as specified (see 6.2), in accordance with Handbook H28, except that the portion of the thread containing the prevailing-torque element need not conform. Unless otherwise specified (see 6.2), Class 2B tolerances shall apply.

3.5.2 Thread start. Locknuts 3/8 inch and smaller shall assemble a minimum of one-half turn and locknuts 7/16 inch and larger shall assemble a minimum of one full turn by hand on a basic "Go" thread plug gage. The plug gage shall be without a chip groove and shall have a point, with dimensions conforming to those for the point on hexagon cap screws as specified in ANSI B18.2.1.

3.6 Mechanical requirements.

3.6.1 Proof load. Locknuts shall withstand the proof loads, in accordance with the applicable grades, specified in Table II. Locknuts made of the materials specified in 3.1.3 and 3.1.4 shall meet the requirements as specified in the applicable standard or specification.

3.6.2 Hardness. Locknut hardness shall be in accordance with Table III.

3.6.3 Prevailing-torque. Locknuts shall meet the prevailing-torque requirements for the applicable grades as specified in Table IV.

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3.6.4 Vibration. Locknuts shall withstand the vibration test specified in 4.5.9.

3.7 Construction. The locknut shall be a self-contained unit or assembly, including the locking feature. The locking feature shall not operate by means of separate movement from the installation and shall not depend upon pressure on the bearing surface for locking action.

3.8 Marking. Grade A locknuts are not required to be marked for grade identification. Grade B and C locknuts shall be marked with equally spaced identical symbols (notch, dot or letter) as indicated in Figure 1. Marks shall be raised or depressed, at the manufacturer's option. Raised marks shall not project beyond the specified maximum height or width of the locknut.

3.9 Workmanship. Nuts shall contain no burrs or slivers which may become dislodged under usage and shall have no sharp edges, cracks or surface contamination.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspections 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.

4.2 Inspection lot. A lot shall consist of completed locknuts which are of the same type, grade, size and series, produced by the same manufacturer under essentially the same conditions, and submitted for acceptance at one time.

4.3 Sampling for lot inspection.

4.3.1 Sampling for examination. A random sample of locknuts shall be taken from each lot in accordance with MIL-STD-105, Inspection Level II. The Acceptable Quality Level (AQL) shall be as specified in Table I.

4.3.2 Sampling for tests. Sampling for tests (proof load, hardness and prevailing-torque) shall be in accordance with MIL-STD-105, Inspection Level S-2. The AQL shall be 2.5 percent defective.

4.3.2.1 Sampling for vibration test. A random sample of five locknuts shall be taken from each lot in accordance with MIL-STD-105.

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4.3.3 Sampling for protective finishes. Sampling for test of protective finishes (except black oxide finish of 3.2.3) shall be in accordance with the applicable specification of 3.2.

4.3.3.1 Sampling for black oxide finish. Sampling for test of black oxide finish (3.2.3) shall be in accordance with Inspection Level S-1 of MIL-STD-105. The AQL shall be 6.5 percent defective.

4.3.4 Sampling for packaging and packing. Sampling for inspection and test of packaging and packing shall be in accordance with MIL-H-3982.

4.4 Examination. Each locknut taken as specified in 4.3.1 shall be examined to verify conformance with this specification. Examination shall be conducted in accordance with Table I.

TABLE I

Classification of Defects

<u>Categories</u>	<u>Defects</u>	<u>Inspection Method</u>
Critical	None defined	
Major A	AQL = 0.4 percent defective	
101	Prevailing-torque element missing	Visual
102	Non-tapped and wrong size	Visual
Major B	AQL = 2.5 percent defective	
103	Dimensions (3.4)	SIE*
104	Threads, not as specified (3.5.1)	SIE
105	Thread start (3.5.2)	SIE
106	Angularity of bearing surface (3.4)	SIE
107	Bearing surface roughness (3.4)	SIE
Minor	AQL = 4.0 percent defective	
201	Protective coating, not as specified (3.2)	Visual
202	Grade marking incorrect (3.8)	Visual
203	Workmanship (3.9)	Visual

* Standard Inspection Equipment

4.4.1 Packaging and packing. Examination of packaging and packing shall be in accordance with MIL-H-3982.

4.5 Test Methods. Cap nuts shall be completely threaded on the test bolt for proof load and torque tests. The bolt shall not bottom in the nut. Prior to torque testing, Type V - Spline locknuts shall be properly

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installed into the recommended hole and material. Spline locknuts shall withstand the prevailing-torque test without loosening or turning in the hole.

4.5.1 Proof load test. Locknuts taken as specified in 4.3.2 shall be assembled on a test bolt (4.5.2) or on a hardened mandrel (4.5.3) with a minimum of three threads projecting through the locknut. For referee test purposes, the hardened mandrel shall be used. The maximum prevailing torque occurring during the assembly of the locknut on the test bolt or mandrel shall be recorded. A tensile load equal to the specified proof load for the locknut, as given in Table II, shall be applied through the test bolt or mandrel, against the locknut in an axial direction. The locknut shall resist this load without thread stripping or rupture. The prevailing torque necessary to remove the locknut from the test bolt or mandrel shall not exceed the maximum prevailing torque occurring during assembly.

4.5.2 Test bolt. The test bolt used for the proof load test shall have threads conforming to Class 2A tolerances as specified in Handbook H28. The test bolt shall have a yield strength in excess of the specified proof load of the locknut being tested.

4.5.3 Hardened mandrel. The hardened mandrel used for the proof load test shall be as specified in Table VI.

4.5.4 Prevailing-torque test. Locknuts taken as specified in 4.3.2 shall be subjected to the prevailing-torque test, using a load measuring device (4.5.6).

A test bolt (4.5.5) shall be inserted in the load measuring device, a hardened washer (4.5.7) placed on the bolt, and the sample locknut assembled on the bolt. The locknut shall be advanced on the bolt until a minimum of two full bolt threads protrude through the nut. The maximum torque occurring while the locknut is being advanced through the next 360° of locknut rotation shall be recorded. This torque shall not exceed the first installation value as specified for the applicable grade in Table IV.

Tightening shall be continued until the locknut is seated against the hardened washer. The length of the test bolt shall be such that seating of the locknut shall occur when a length equivalent to 6 to 9 thread pitches of test bolt protrude through the top of the locknut. The locknut shall then be tightened until a tensile load equal to the clamp load, as specified for the applicable grade in Table IV, is developed in the bolt. The hardened washer shall be prevented from turning during locknut tightening.

The locknut shall then be backed off by the application of reverse torque until the tensile load in the bolt has been reduced to zero.

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The maximum and minimum torques occurring while the locknut is being backed off through the next 360° of rotation shall be recorded. The maximum torque shall not be less than the first removal "highest reading" value as specified in Table IV. The minimum torque shall not be less than the first removal "lowest reading" value as specified in Table IV. The locknut shall then be backed off until the prevailing-torque element is disengaged from the bolt thread.

The locknut shall be reassembled and removed four more times. On each reassembly, the locknut shall be assembled to the initial first off position, but no clamp load shall be induced in the bolt. This portion of the test need not be conducted in the load cell, however, the test washer shall not be removed. At no time during these four additional installations and removals shall the torque exceed the maximum first installation value as specified for the applicable grade in Table IV. During the fifth removal, the maximum and minimum torques occurring while the locknut is being backed off through the first 360° of rotation shall be recorded. The maximum torque shall not be less than the fifth removal "highest reading" value as specified in Table IV. The minimum torque shall not be less than the fifth removal "lowest reading" value as specified in Table IV. Sufficient time shall elapse between torquing cycles to prevent overheating of the test assembly.

Torque wrenches shall be accurate within plus or minus 2 percent of the maximum specified torque range of the wrench.

4.5.5 Test bolt. The test bolt used in the prevailing-torque test of steel locknuts shall have a zinc phosphate and oil finish (dry to the touch) meeting a 72 hour salt spray test when tested in accordance with Test 1 of MIL-STD-1312. Corrosion-resisting steel locknuts shall be torque tested on passivated corrosion-resisting steel test bolts. Aluminum alloy locknuts shall be torque tested on anodized aluminum alloy test bolts. Brass locknuts shall be torque tested on plain brass test bolts.

The bolt shall have threads conforming to Class 2A tolerances as specified in Handbook H28. Threads on all bolts 1 inch diameter and smaller shall be produced by rolling. Bolt length shall be such that a minimum length equivalent to six thread pitches, as measured from the end of the bolt, shall protrude through the locknut when the locknut is seated against the test washer. Thread length shall be such that a minimum of two full threads are within the grip after the locknut is seated. The bolt shall be pointed in accordance with the dimensional requirements for hex cap screws as given in ANSI B18.2.1. The thread surface shall be free of scale, iron oxide, burrs or other contamination that might affect an accurate determination of the prevailing-torque developed by the locknut.

The bolt shall have an ultimate tensile strength not less than the specified proof load of the locknut being tested. A new bolt shall be used for testing each locknut.

4.5.6 Load measuring device. The load measuring device used in the prevailing-torque test shall be an instrument capable of measuring the actual tension induced in the test bolt as the locknut is tightened. The device shall be accurate within plus or minus 5 percent of the test clamp load being used. Diameter of the bolt clearance hole in the backing plate should be the same diameter and tolerances as the test washer.

4.5.7 Test washer. The test washer shall conform to the dimensional, metallurgical and mechanical requirements specified in Table V. A new washer shall be used for testing each locknut.

4.5.8 Hardness. Locknuts taken in accordance with 4.3.2 shall be tested for hardness in accordance with ASTM E18. The hardness shall be as specified in Table III. The test shall be made on opposite polished surfaces of the locknut face, halfway between the thread and the hex corner. When necessary, the test may be made upon opposite hex faces or wrench faces, one-third the distance from the hex corner to the center of the wrench face, provided accuracy of hardness reading or thread size is not affected.

4.5.9 Vibration. Locknuts taken in accordance with 4.3.2.1 shall be vibration tested in accordance with test 7 of MIL-STD-1312. Vibration life of less than 30,000 cycles shall be cause for rejection. Vibration tests on locknuts larger than specified in Table VII are waived, provided that the smaller locknuts of the same type and design of locking device have satisfactorily passed the vibration test. Unless otherwise specified (see 6.2), Grade C locknuts only shall be vibration tested.

TABLE VII
Vibration Torque Requirements

Nominal Locknut Size	Assembly Torque (In-Lb)
# 10	36
1/4	60
5/16	120
3/8	160
7/16	200
1/2	300
9/16	400
5/8	600

4.5.9.1 Vibration test. The locknuts shall be assembled in accordance with figure 1 of test 7, MIL-STD-1312, with mating grade bolts and torque values as specified in Table VII. The locknuts shall then be removed and reinstalled to this torque four additional times before being vibrated.

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4.5.9.1.1 Determination shall be made throughout the test to guarantee that the assembly is traversing the entire length of the slots in the test fixture. The test shall be run for 30,000 cycles except that it shall be stopped prior to the completion of the 30,000 cycles in the event a locknut becomes disassembled from the bolt. The locknuts shall be examined for cracks under 10X magnification.

4.5.9.1.2 Locknuts shall be considered to have failed the vibration test under the following conditions. Any one (1) locknut failure shall be cause for rejection of the represented lot.

a. If any structural failure, such as broken segments, locking inserts falling out or cracks occur during the test, provided failure is not the result of failure of the bolt.

b. If any locknut comes completely off the bolt or can be turned completely on or off the bolt with the fingers during or after completion of 30,000 cycles.

c. If relative rotation between any locknut and bolt exceeds 360°.

4.5.10 Protective finish. Test of protective finishes shall be in accordance with the applicable specification of 3.2.

5. PREPARATION FOR DELIVERY

5.1 Preservation and packaging. Preservation and packaging shall be level A or C, as specified (see 6.2), in accordance with MIL-H-3982.

5.2 Packing. Packing shall be level A, B or C, as specified (see 6.2), in accordance with MIL-H-3982.

5.3 Marking. Marking of unit packages and shipping containers shall be in accordance with MIL-H-3982.

6. NOTES

6.1 Intended use. A prevailing-torque type locknut is a nut which is frictionally resistant to rotation due to a self-contained prevailing-torque feature, and not because of a compressive load developed against the bearing surface of the locknut.

6.2 Ordering data. Procurement documents should specify the following:

- a. Title, number and date of this specification.
- b. Type, grade and series (1.2).

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- c. Military Standard part number (3.4).
- d. Material (3.1).
- e. Protective finish, when required (3.2).
- f. Thread form, series and class (3.5.1).
- g. Grade marking, if required (3.8).
- h. Selection of applicable level of packaging and packing required (5.1 and 5.2).
- i. When Grade A or Grade B locknuts are required to be vibration tested (4.5.9).

6.3 Non-metallic insert. Locknuts with non-metallic inserts should not be used in installations where temperatures exceed 250°F.

6.4 Do not use cadmium plated locknuts in installations where temperatures exceed 450°F.

6.5 These locknuts are not suitable for aeronautical structural use.

Custodian:

Army - WC
Navy - None
Air Force - 11

Preparing activity:

Army - WC

Project No. 5310-0667

Reviewer:

Army - MI, MU
Navy - None
Air Force - 82
DSA - IS

User:

Army - AT, AV, EL, GL
Navy - MC, OS, SH
Air Force - None

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TABLE II - Proof Load-Lb.

Nominal Size	Grade A		Grade B		Grade C	*
	Coarse Thd.	Fine Thd.	Coarse Thd.	Fine Thd.	Coarse Thd.	Fine Thd.
	<u>90,000</u>		<u>120,000</u>		<u>150,000</u>	
No. 4	540	600	720	790	910	990
6	820	900	1,100	1,200	1,350	1,500
8	1,250	1,350	1,700	1,750	2,100	2,200
10	1,550	1,800	2,100	2,400	2,600	3,000
12	2,200	2,300	2,900	3,100	3,650	3,900
1/4	2,900	3,300	3,800	4,350	4,750	5,450
5/16	4,700	5,200	6,300	6,950	7,850	8,700
3/8	7,000	7,900	9,300	10,500	11,600	13,200
7/16	9,550	10,700	12,800	14,200	15,900	17,800
1/2	12,800	14,400	17,000	19,200	21,300	24,000
9/16	16,400	18,300	21,800	24,400	27,300	30,400
5/8	20,300	22,900	27,200	30,700	33,900	38,400
3/4	30,000	33,600	40,100	44,800	50,100	56,000
7/8	41,600	45,800	55,400	61,100	69,300	76,400
1	54,500	59,700	72,700	79,600	90,900	99,500
1-1/4		61,100		81,500		101,900
			<u>105,000</u>			
1-1/8	68,700	76,900	80,100	89,900	115,000	128,000
1-1/4	87,200	96,600	101,700	113,000	145,000	161,000
1-3/8	104,000	118,000	121,300	138,000	173,000	197,000
1-1/2	126,000	142,000	147,500	166,000	211,000	237,000

For reference purposes, the proof stress values (P.S.I.) from which the proof load values (lb.) were computed are shown underlined in bold type.

The proof loads for all sizes 1/4-inch and larger apply to hex (regular), cap and spline locknuts. Proof loads of hex thick and heavy hex locknuts may be assumed as 115 percent of the tabulated values. Proof loads of hex thin locknuts may be assumed as 50 percent of the tabulated values.

*Bolt rated tensile strength, for assembly with grade C nuts, shall not be less than 105,000 p.s.i., nor greater than 150,000 p.s.i. (see 1.2.2).

TABLE III - MECHANICAL PROPERTY REQUIREMENTS

GRADE	LOCKNUT SIZE (BOLT DIA) IN	PROOF LOAD STRESS PSI	ROCKWELL HARDNESS
A	NO 4 THRU 1-1/2	90,000	C28 MAX
	NO. 4 THRU 1	120,000	C28 MAX
B	OVER 1 THRU 1-1/2	105,000	C28 MAX
	NO 4 THRU 5/8		C24/32
C	OVER 5/8 THRU 1	150,000	C26/34
	OVER 1 THRU 1-1/2		C26/36

TABLE IV - CLAMP LOAD, AND PREVAILING TORQUES FOR LOCKNUTS
COURSE THREAD SERIES

NOM SIZE AND THREADS PER INCH	GRADE A LOCKNUTS						GRADE B LOCKNUTS						GRADE C LOCKNUTS						
	CLAMP LOAD LB			PREVAILING TORQUE			CLAMP LOAD LB			PREVAILING TORQUE			CLAMP LOAD LB			PREVAILING TORQUE			
	FIRST INSTALL IN. LB MAX	HIGH- EST READ- ING MIN IN. LB	LOW- EST READ- ING MIN IN. LB	FIFTH REMOVAL HIGH- EST READ- ING MIN IN. LB	FIFTH REMOVAL HIGH- EST READ- ING MIN IN. LB	FIFTH REMOVAL LOW- EST READ- ING MIN IN. LB	FIRST INSTALL IN. LB MAX	HIGH- EST READ- ING MIN IN. LB	LOW- EST READ- ING MIN IN. LB	FIFTH REMOVAL HIGH- EST READ- ING MIN IN. LB	FIFTH REMOVAL HIGH- EST READ- ING MIN IN. LB	FIFTH REMOVAL LOW- EST READ- ING MIN IN. LB	FIRST INSTALL IN. LB MAX	HIGH- EST READ- ING MIN IN. LB	LOW- EST READ- ING MIN IN. LB	FIFTH REMOVAL HIGH- EST READ- ING MIN IN. LB	FIFTH REMOVAL HIGH- EST READ- ING MIN IN. LB	FIFTH REMOVAL LOW- EST READ- ING MIN IN. LB	
NO 4-40	250	1 0	0 5	0 5	0 5	3 0	1 0	0 5	0 5	0 5	0 2	4 0	1 0	0 5	0 5	0 2	4 0	1 0	0 5
6-32	370	1 5	0 5	1 0	0 5	8 0	1 5	0 5	1 0	0 5	0 5	8 0	2 0	1 0	1 5	0 5	8 0	2 0	1 0
8-32	580	2 0	1 0	1 5	0 5	12 0	2 0	1 0	1 5	0 5	0 5	12 0	2 5	1 0	2 0	1 0	12 0	2 5	1 0
10-24	720	2 5	1 0	2 0	1 0	13	2 5	1 0	2 0	1 0	1 0	13	3 5	1 5	2 5	1 0	13	3 5	1 5
12-24	1,000	3 5	1 5	2 5	1 0	20	3 5	1 5	2 5	1 0	1 0	20	4 5	2	3 0	1 5	20	4 5	2
1/4 - 20	1,400	5 0	2 5	3 5	1 5	30	5 0	2 5	3 5	1 5	1 5	30	6 0	3	4 5	2	30	6 0	3
5/16 - 18	2,150	8 0	4	5 5	2 5	60	8 0	4	5 5	2 5	2 5	60	10 5	5	7 5	3	60	10 5	5
3/8 - 16	3,200	12	5	8 5	4	80	12	5	8 5	4	4	80	16	7 5	5	5	80	16	7 5
7/16 - 14	4,400	17	7 5	12	5	100	17	7 5	12	5	5	100	23	10	11 5	7 5	100	23	10
1/2 - 13	5,850	22	10	15	7 5	150	22	10	15	7 5	7 5	150	30	15	20	10	150	30	15
9/16 - 12	7,550	30	15	21	10	17*	30	15	21	10	10	17*	40	20	28	12 5	150	40	20
5/8 - 11	9,000	39	17 5	27	12 5	25*	39	17 5	27	12 5	10	25*	52	25	36	15	150	52	25
3/4 - 10	11,800	58	25	41	20	35*	58	25	41	20	20	35*	78	35	54	25	150	78	35
7/8 - 9	11,400	88	40	62	30	50*	88	40	62	30	30	50*	117	50	82	40	150	117	50
1 - 8	15,000	120	60	84	40	70*	120	60	84	40	40	70*	160	80	112	50	150	160	80
1 1/8 - 7	18,900	150	70	105	50	75*	150	70	105	50	50	75*	200	100	140	70	150	200	100
1 1/4 - 7	24,000	188	90	132	60	85*	188	90	132	60	60	85*	250	110	176	80	150	250	110
1 1/2 - 6	28,700	220	110	154	70	100*	220	110	154	70	70	100*	293	140	205	100	150	293	140
1 3/4 - 6	34,800	260	130	187	90	110*	260	130	187	90	90	110*	346	170	242	120	150	346	170

* Ft lb

NOTE: Clamp loads for Grades A, B and C locknuts respectively equal 75% of the proof loads specified for Grades 2, 5, and 8 bolts in SAE J429. Clamp loads for Grades B and C locknuts also respectively equal 75% of the proof loads specified for ASTM A449 and ASTM A354 Grade BD bolts.

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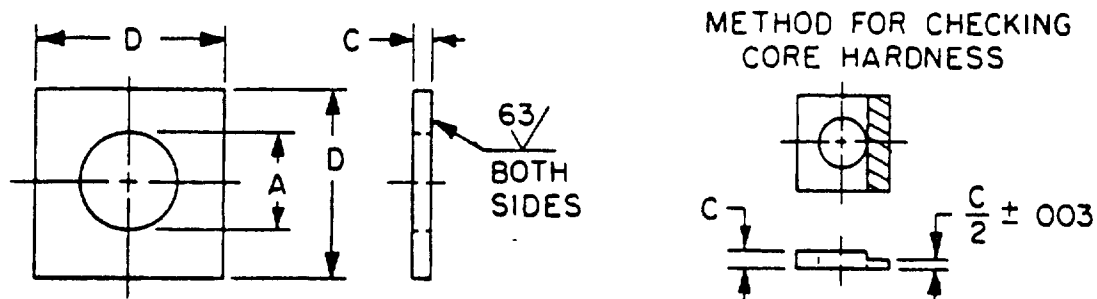


TABLE V - TEST WASHER

TEST BOLT SIZE	A INSIDE DIA ± .005	D WIDTH ± .012	C THICKNESS	
			MAX	MIN
No. 4	.125	.403	.028	.021
6	.156	.450	.048	.041
8	.187	.499	.065	.058
10	.203	.596	.065	.058
12	.234	.601	.065	.058
1/4	.281	.656	.080	.073
5/16	.344	.776	.080	.073
3/8	.406	.892	.080	.073
7/16	.469	1.018	.080	.073
1/2	.531	1.152	.121	.114
9/16	.594	1.274	.121	.114
5/8	.656	1.422	.121	.114
3/4	.781	1.678	.160	.153
7/8	.906	1.916	.160	.153
1	1.031	2.184	.160	.153
1-1/8	1.187	2.318	.192	.185
1-1/4	1.312	2.562	.192	.185
1-3/8	1.437	2.804	.213	.206
1-1/2	1.562	3.046	.213	.206

- All dimensions are in inches.
- Material shall be carbon steel with a chemical composition of C-.48 to .60%, Mn-.60 to 1.50%, P-.035% max and S-.045% max, quenched and tempered, with a surface hardness of Rockwell 15 N 85 to 88, and a core hardness of Rockwell A73 to 78.
- Washers shall be electrodeposited zinc plated, .0002 to .0004 in. thick. As soon as practicable following plating, washers shall be baked for 1 hour at 375°F ± 25°F. Plating thickness shall be checked in accordance with ASTM A219 (Microscopic Test).
- Washers shall be free from burrs and sharp edges. Corners may be rounded to a max radius of C max.

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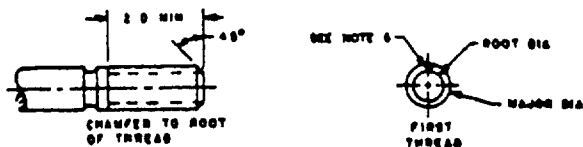


TABLE VI-MANDRELS

SIZE	MAX. MANDREL *		MIN MANDREL #		TOL. IN LEAD	TOLERANCE ON HALF ANGLE OF THREADS IN MINUTES PLUS OR MINUS
	MAJOR DIA. + .0005 - .0005	PITCH DIA. -.0005	MAJOR DIA. + .0005 - .0005	PITCH DIA. -.0005		
No. 4-40	0.1107	0.0953	0.1061	0.0925	.0005	30
4-48	0.1108	0.0980	0.1068	0.0954	.0005	30
6-32	0.1365	0.1171	0.1312	0.1141	.0005	30
6-40	0.1368	0.1214	0.1321	0.1184	.0005	30
8-32	0.1625	0.1431	0.1571	0.1399	.0005	30
8-36	0.1627	0.1455	0.1577	0.1424	.0005	30
10-24	0.1892	0.1623	0.1818	0.1586	.0005	30
10-32	0.1995	0.1691	0.1931	0.1658	.0005	30
12-24	0.2142	0.1883	0.2078	0.1845	.0005	30
12-28	0.2143	0.1922	0.2085	0.1886	.0005	30
1/4 -20	0.2479	0.2168	0.2408	0.2127	.0005	30
1/4 -28	0.2483	0.2261	0.2425	0.2225	.0005	30
5/16-18	0.3104	0.2756	0.3026	0.2712	.0005	30
5/16-24	0.3107	0.2847	0.3042	0.2806	.0005	30
3/8 -16	0.3726	0.3336	0.3643	0.3287	.0005	30
3/8 -24	0.3732	0.3471	0.3667	0.3430	.0005	30
7/16-14	0.4149	0.3902	0.4258	0.3850	.0005	30
7/16-20	0.4154	0.4042	0.4291	0.3995	.0005	30
1/2 -13	0.4973	0.4491	0.4876	0.4435	.0005	30
1/2 -20	0.4978	0.4667	0.4906	0.4619	.0005	30
9/16-12	0.5596	0.5074	0.5495	0.5016	.0005	30
9/16-18	0.5603	0.5255	0.5524	0.5205	.0005	30
5/8 -11	0.6220	0.5650	0.6113	0.5589	.0005	30
5/8 -18	0.6225	0.5880	0.6149	0.5829	.0005	30
3/4 -10	0.7464	0.6939	0.7353	0.6773	.0005	30
3/4 -16	0.7476	0.7084	0.7391	0.7029	.0005	30
7/8 -9	0.8715	0.8016	0.8592	0.7946	.0005	30
7/8 -14	0.8724	0.8275	0.8631	0.8216	.0005	30
1 -8	0.9962	0.9175	0.9830	0.9100	.0005	30
1 -12	0.9972	0.9448	0.9868	0.9382	.0005	30
1 -14	0.9974	0.9525	0.9880	0.9463	.0005	30
1-1/8 -7	1.1209	1.0308	1.1064	1.0228	.0005	30
1-1/8 -12	1.1221	1.0697	1.1118	1.0631	.0005	30
1-1/4 -7	1.2459	1.1558	1.2314	1.1476	.0005	30
1-1/4 -12	1.2471	1.1947	1.2368	1.1879	.0005	30
1-3/4 -6	1.3704	1.2652	1.3544	1.2563	.0005	30
1-3/8 -12	1.3722	1.3197	1.3617	1.3127	.0005	30
1-1/2 -6	1.4944	1.3902	1.4794	1.3812	.0005	30
1-1/2 -12	1.4972	1.4447	1.4867	1.4376	.0005	30

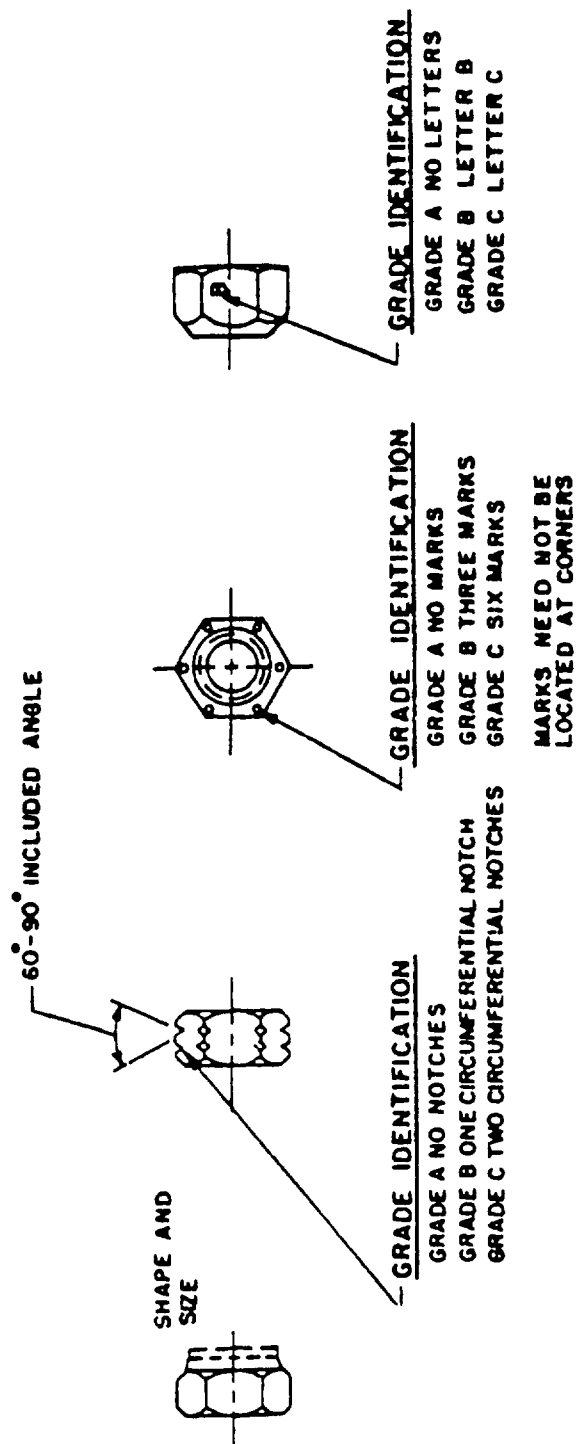
* Major diameter of maximum mandrel is established at 75 percent of the major diameter tolerance range of class 3A above minimum major diameter. Pitch diameter of maximum mandrel is established at 75 percent of the pitch diameter.

Major and pitch diameters of minimum mandrel are minimum major and minimum pitch diameters of class 2A.

Recommended Details:

1. Material: Steel
2. Hardness: Heat treated to Rockwell C45-50.
3. Threads: The thread form shall conform to that shown in the current edition of HANDBOOK M28. The thread dimensions shall be as shown in table VI.
4. Surface roughness: 20 micro inch maximum.
5. Finish: Vapor blast or liquid hone using a 1250 mesh abrasive to produce a smooth uniform color. Any other finish that is equivalent will be acceptable.
6. The mandrel end shall have a 45° chamfer extending below the root diameter. The lead thread of the mandrel shall be modified so as not to remove metal or the locking element from the nut in torquing.

FIGURE 1 -GRADE IDENTIFICATION



NUT, SELF-LOCKING, HEXAGON, PREVAILING-TORQUE

SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No 22-R255

INSTRUCTIONS This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity. Comments and suggestions submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or serve to amend contractual requirements.

SPECIFICATION

ORGANIZATION

CITY AND STATE

CONTRACT NUMBER

MATERIAL PROCURED UNDER A

 DIRECT GOVERNMENT CONTRACT SUBCONTRACT

1 HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A GIVE PARAGRAPH NUMBER AND WORDING

B RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES

2 COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3 IS THE SPECIFICATION RESTRICTIVE?

YES NO (If "yes" in what way?)

4 REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers attach to form and place both in an envelope addressed to preparing activity.)

SUBMITTED BY (Printed / typed name and activity - Optional)

DATE

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NOTICE OF
VALIDATION

MIL-N-45913B
NOTICE 1
2 April 1986

MILITARY SPECIFICATION

NUTS, SELF-LOCKING, HEXAGON,
PREVAILING TORQUE

MIL-N-45913B has been reviewed and determined to be valid for use
in acquisition.

Custodians:

Army - AR
Air Force - 11

Preparing activity:

Army - AR

Review activities:

Army - MI
DLA - IS

User activities:

Army - AT, AV
Navy - MC, OS

FSC 5310

AMSC N/A

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INCH-POUND

MIL-N-45913B
 AMENDMENT 1
 1 February 1994

MILITARY SPECIFICATION SHEET

NUT, SELF-LOCKING, HEXAGON,
 PREVAILING TORQUE

This amendment forms a part of MIL-N-45913B, dated 28 October 1970, and is approved for use by all Departments and Agencies of the Department of Defense.

PAGE 7, PARAGRAPH 3.8

Change Paragraph 3.8 to read:

"3.8 Marking. Grade A locknuts are not required to be marked for grade identification. Grade B and C locknuts shall be marked with equally spaced symbols (notch, dot or letter) as indicated in Figure 1. All locknuts shall be marked to identify the manufacturer. Such markings may be additional to the grade markings or an alteration of one or more of the three or six grade marking symbols. Marks shall be raised or depressed, at the manufacturer's option. Raised marks shall not project beyond the specified maximum height or width of the locknut."

Custodians:
 Army-AR
 Air Force-11

Preparing activity:
 DLA-IS

Review activities:
 Army-MI

(Project 5310-1971)

User activities:
 Army-AT, AV
 Navy-MC, OS

1 of 1

AMSC N/A

FSC 5310

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