

Table 4-3-8. Proof Load and Tensile Strength Requirements

Nominal Diameter and threads per in.	Stress Area in. ²	Grade 5		Grade 8	
		Proof Load (lb.)	Min. Tensile Strength (lb.)	Proof Load (lb.)	Min. Tensile Strength (lb.)
7/8 - 9	0.462	39,300	55,400	55,400	69,300
1 - 8	0.606	51,500	72,700	72,700	90,900
1-1/16 - 8	0.694	51,400	72,900	83,300	104,100
1-1/8 - 7	0.763	56,500	80,100	91,600	114,400

3.5.6.4.1 Full Size Testing:

- a. A bolt shall be placed in the tensile testing machine and axial loading applied until failure occurs. The speed of the testing as determined with a free running cross head, shall not exceed 1 inch per minute.
- b. To meet the requirements of this test:
 - (1) The bolt shall not fracture before having withstood the minimum tensile load specified for the applicable bolt diameter, thread series and grade as indicated in [Table 4-3-8](#).
 - (2) The ultimate failure location shall occur in the body or threaded section and not at the junction of the head and shank of the bolt.

3.5.6.5 Testing of Machined Specimens

- a. Bolts to be tested for either proof load or tensile strength requirements, that require machined specimen testing, shall be conducted using test specimens machined from the bolt.
- b. Bolts 7/8 in. to 1-1/8 in. in diameter shall have their shanks machined to the dimensions of a standard 0.500 inch round, 2 inch gage length test specimen concentric with the axis of the bolt as per [Table 4-3-9](#) below.
- c. The manufacturer shall leave the bolt head and threaded section intact as shown in [Figure 4-3-10](#) below. The specimen shall be placed in the testing machine holders in such a manner to ensure that the applied load is axial.

Table 4-3-9. Dimensions of Machined Test Specimens

Nominal bolt diameter (in.)	Gage Length (in.) G	Diameter parallel section (in.) D	Length parallel section (in.) A	Recommended fillet radius (in.) R	Min. fillet radius (in.) R
7/8 to 1-1/8	2.000±0.005	0.500±0.010	2.25	0.375	0.125

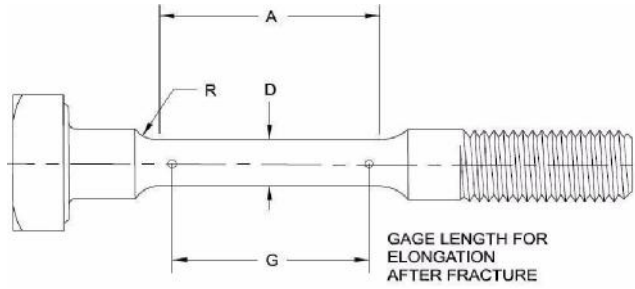


Figure 4-3-10. Standard 2 Inch Gage Length Tension Specimen

- d. The test specimens shall be tensile tested, and the yield strength, tensile strength, elongation and reduction of area determined. To meet requirements, the test specimen must have a yield strength, tensile strength, elongation and reduction of area equal to or greater than the values indicated for the applicable bolt diameter and grade designation in [Table 4-3-6](#).

3.5.6.6 Nut Proof Load Test

- a. Nuts covered by this specification shall withstand the proof load specified for the applicable nut grade, nominal diameter and thread series. The proof load to be applied is indicated in [Table 4-3-10](#).
- b. The nut shall be assembled on a threaded, hardened mandrel. The specified proof load for that nut shall be applied against the nut in an axial direction. The nut shall resist this load without failure by stripping and shall be removable from the mandrel by the fingers after the load is released.

Table 4-3-10. Proof Load Requirements for Nuts

Nominal Diameter and threads per in.	Stress Area (in. ²)	Grade 5	Grade 8
		Proof Load (lb.)	Proof Load (lb.)
7/8 - 9	0.462	55,400	69,300
1 - 8	0.606	72,700	90,900
1-1/16 - 8	0.694	72,900	104,100
1-1/8 - 7	0.763	80,100	114,400

3.5.6.7 Bend Test

In addition to the above tests, a full size carbon-steel track bolt shall withstand being bent cold through 45 degrees without cracking on the outside of the bent portion, around a pin whose diameter is not greater than the diameter of the bolt. Should the bend specimen break in the threaded portion of the bolt, one retest shall be allowed.

3.5.6.8 Carburization and Decarburization

- a. The testing of track bolts and nuts for carburization and decarburization shall be undertaken in conformance with the testing requirements of the latest issue of ASTM Standard F2328, *Standard Method for Determining Decarburization and Carburization in Hardened and Tempered Threaded Steel Bolts, Screws, Studs and Nuts*.
- b. Track bolts and nuts must be free of complete decarburization and any carburization.
- c. In case of dispute, the amount of decarburization and carburization shall be evaluated by microhardness method using either Vickers (VH) or Knoop (HK) as described below. In Figure 4-3-11, h and h_s are the height of the external thread at its maximum boundary, disregarding any surface coating. The pitch line is located at a height of $h/2$.

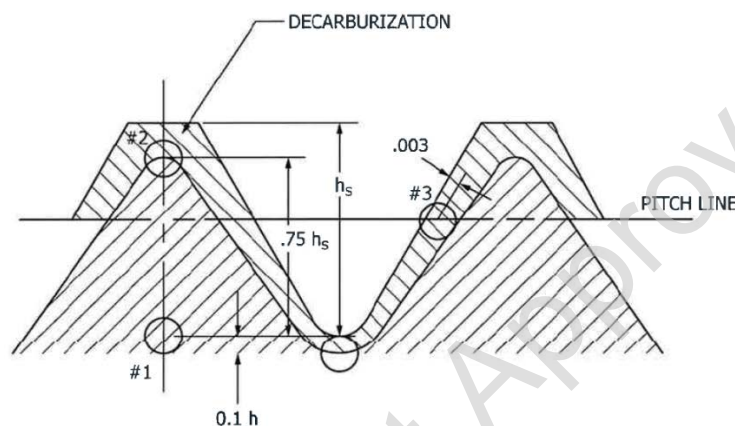


Figure 4-3-XX Microindentation Measurement Locations

- d. A decrease of more than 30 hardness points of either HV or HK between Position 1 and position 2 indicates decarburization and the product does not conform to this specification.
- e. An increase of more than 30 hardness points of either HV or HK between Position 1 and Position 3 indicates carburization and the product does not conform to this specification.

3.5.6.9 Number of Tests

- a. One of each of the following: core hardness, surface hardness, bolt proof load, bolt axial tension, nut proof load (strip test) and bend test, shall be made from each lot of 50 kegs of bolts or fraction thereof.
- b. If any test specimen shows defective machining or develops flaws, it may be discarded and another specimen substituted.
- c. If the percentage of elongation or reduction of area, of any test specimen is less than that specified in Table 4-3-6 and any part of the fracture is more than $3/4$ inch from the center of the gage length, as indicated by scribe marks on the specimen before testing, a retest shall be allowed.

RE-HEAT TREATMENT (2016)

- a. If the results of any of the physical tests do not conform to the requirements of this specification, the manufacturer may re-heat treat the non-threaded lot not more than twice. Re-heat treatment of the threaded bolts is not permitted.
- b. Should the manufacturer elect to re-heat treat a non-conforming lot, the tests specified in [Article 3.5.6](#) shall be repeated in duplicate and all tests must conform to the requirements specified.

3.5.8 TOLERANCES (2007)

- a. The bolts and nuts shall conform to the dimensions specified in [Table 4-3-12](#) and [Table 4-3-13](#) respectively, subject to the following variations:
 - (1) The nominal diameter of the bolts shall be taken as the overall diameter of the threads.
 - (2) The diameter of the rolled threads shall not exceed the diameter of the shank by more than 1/16 inch for bolts 7/8 inch in diameter and under, nor more than 3/32 inch for bolts 1 inch in diameter and over.
- b. The following tolerances (in inches) shall apply to finished nuts and bolts:

Shank diameter.....	+1/64 or -1/32
Neck dimensions	±0.0313"
Length under head.....	±1/8"
Height and diameter of head.....	±0.0625"
Nut-Width	-0.05 x thread diameter of bolt
Nut-Height.....	±((0.016 x thread diameter of bolt) + 0.012)

3.5.9 FINISH (2007)

- a. Both the bolts and the nuts shall be neatly formed and free from fins, nicking or other injurious defects. The head of the bolt shall be concentric with the shank, with the underside at right angles to the axis of the bolt. The bolts and nuts shall have a workmanlike finish.

3.5.10 THREADS AND THREAD FIT (2016)

- a. The threads on bolts must be cold rolled after heat treatment.
- b. The threads on nuts and bolts shall conform to the latest issue of the American National Standards Institute, Unified Screw Thread Requirements, ANSI B1.1, Course Thread Series, UNC, with the tolerances and allowances in accordance with Class 2A for external threads (bolts) and Class 2B for internal threads (nuts).
- c. The threaded portion of the bolts shall be coated with a metal preservative, and before packaging, the nuts shall be screwed onto the bolts with enough turns to hold them in place until used.
- d. The grade of the nut supplied must be equal to or greater than the grade of bolt.
- e. The bolts and nuts must be free of un-tempered martensite.

3.5.11 HEADING (2007)

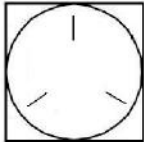
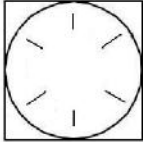
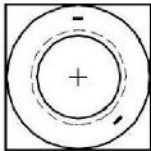
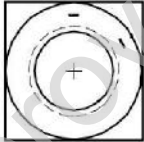
- a. Bolts may only be headed by method of upsetting and/or extrusion.

3.5.12 MARKING (2020)

- a. A letter or brand indicating the manufacturer and month and year of manufacture shall be located on the top of the head and may be either raised or depressed. It shall be pressed onto the head when the bolt head is formed.
- b. Grade 5 and Grade 8 bolts shall have grade identification markings as shown in [Table 4-3-11](#). Grade 5 bolts shall have 3 markings 120° apart and Grade 8 bolts shall have 6 markings 60° apart. Markings shall be located on top of the head and may be raised or depressed.
- c. Grade 5 and 8 nuts shall have a letter or brand indicating the manufacturer and the month and year of manufacture.
- d. Grade 5 and Grade 8 nuts shall have grade identification markings as shown in [Table 4-3-11](#). Grade 5 nuts shall have two depressed circumferential lines 120° apart, and Grade 8 nuts shall have two depressed circumferential lines 60° apart. The circumferential lines shall conform to the following dimensions:

Nut to fit bolt diameter	line width	line length	line depth
7/8 in.	0.03	0.08	0.01
1 in. or greater	0.03	0.12	0.01

Table 4-3-11. Bolt and Nut Marking

	Grade 5	Grade 8
Bolt Marking		
Nut Marking		

3.5.13 PACKAGING (2007)

a. All containers shall be marked by the manufacturer as follows:

- (1) Name of manufacturer
- (2) Size of bolt (both diameter and length)
- (3) Grade designation for both bolt and nut
- (4) Weight of filled container

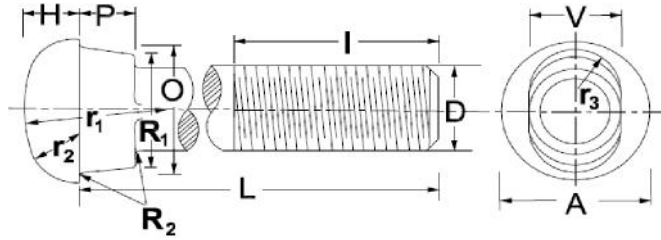


Figure 4-3-11. Oval Neck Track Bolt

Table 4-3-12. Oval Neck Track Bolt Dimensions

D	A	H	R ₂	r ₁	r ₂	O	R ₁	P	r ₃	V	L	I	Threads Per Inch
Nom. Dia. Over Thread	Head					Neck					Length Under Head	Min. Thread Length	
7/8	1.484	0.5469	0.0625	1.3906	0.515	1.218	1.1875	0.50	1/2 body	Same as	Under 7", in steps of 1/4" From 7" to 10" in steps of 1/2"	2	9
1	1.687	0.6250	0.0625	1.6250	0.593	1.375	1.3438	0.5625	dia. of	body dia.		2-1/4"	8
1-1/8	1.890	0.7031	0.0625	1.8594	0.671	1.531	1.50	0.6250	bolt	bolt	2-1/2"	7	
6					9	3							
Additional Sizes Now in Use But Not Recommended for New Designs													
13/16	1.281	0.4688	0.0625	1.1563	0.437	1.062	1.0313	0.4375	Same	Same	Same as above	1-7/8	10
15/16	1.484	0.5469	0.0625	1.3906	0.515	1.218	1.1875	0.50	as	as		2-1/8	9
1-1/16	1.687	0.6250	0.0625	1.6250	0.593	1.375	1.3438	0.5625	above	above		2-3/8	8
Notes: All dimension given in inches. Tolerances: Length (L) ±1/8", Neck (O and R₁) ±0.0313", Head (A and H) ±0.0625", R₂ ±0.0175" In ordering bolts, specify the nominal diameter, "D", over the threads and not the body diameter.													

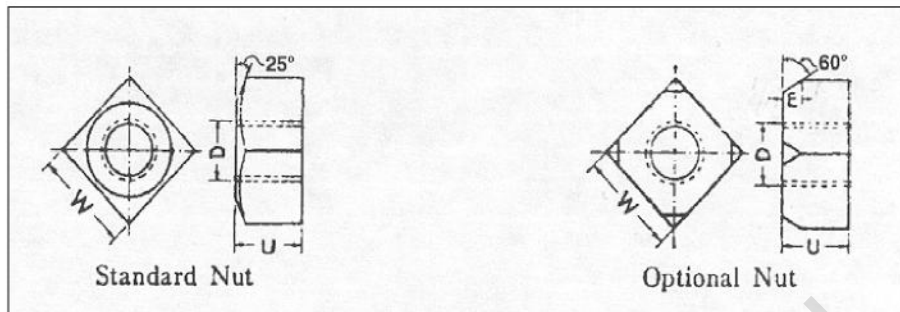


Figure 4-3-12. Track Nuts

Dimensions

Nominal Diameter	Width Across Flats (W)			Thickness (U)			Chamfer (Optional Nut Only)
	D	Nominal	Max.	Min.	Nominal	Max.	Min.
7/8	1.4375	1.4375	1.3940	0.8750	0.9010	0.8330	0.2500
1	1.6250	1.6250	1.5750	1.0000	1.0280	0.9560	0.3750
1-1/8	1.8125	1.8125	1.7560	1.1250	1.1550	1.0790	0.5000
13/16	1.2500	1.2500	1.2120				0.2500
15/16	1.5000	1.5000	1.4500				0.3750
1	1.5000	1.5000	1.4500				0.3750
1-1/16	1.6250	1.6250	1.5750				0.3750
1-1/8	1.6875	1.6875	1.6310				0.5000

**Notes: All dimensions given in inches.
A 25 degree chamfer is standard.**