BOLTS, SCREWS, NUTS, AND WASHERS

Dimensions of bolts, screws, nuts, and washers used in machine construction are given here. For data on thread forms, see *Square and Hex Bolts, Screws, and Nuts* in "Screw Thread Systems" section.

American Square and Hexagon Bolts, Screws, and Nuts.—The 1941 American Standard ASA B18.2 covered head dimensions only. In 1952 and 1955 the Standard was revised to cover the entire product. Some bolt and nut classifications were simplified by elimination or consolidation in agreements reached with the British and Canadians. In 1965 ASA B18.2 was redesignated into two standards: B18.2.1 covering square and hexagon bolts and screws including hexagon cap screws and lag screws and B18.2.2 covering square and hexagon nuts. In B18.2.1-1965, hexagon head cap screws and finished hexagon bolts were consolidated into a single product heavy semifinished hexagon bolts and heavy finished hexagon bolts were consolidated into a single product; regular semifinished hexagon bolts were eliminated; a new tolerance pattern for all bolts and screws and a positive identification procedure for determining whether an externally threaded product should be designated as a bolt or screw were established. Also included in this standard are heavy hexagon bolts and heavy hexagon structural bolts. In B18.2.2-1965, regular semifinished nuts were discontinued; regular hexagon and heavy hexagon nuts in sizes $\frac{1}{4}$ through 1 inch, finished hexagon nuts in sizes larger than $1\frac{1}{2}$ inches, washer-faced semifinished style of finished nuts in sizes $\frac{5}{8}$-inch and smaller and heavy series nuts in sizes $\frac{7}{16}$-inch and smaller were eliminated.

Further revisions and refinements include the addition of askew head bolts and hex head lag screws and the specifying of countersunk diameters for the various hex nuts. Heavy hex structural bolts and heavy hex nuts were moved to a new structural applications standard. Additionally, B18.2.1 has been revised to allow easier conformance to Public Law 101-592. All these changes are reflected in ANSI/ASME B18.2.1-1996, and ANSI/ASME B18.2.2-1987 (R1999).

Unified Square and Hexagon Bolts, Screws, and Nuts.—Items that are recognized in the Standard as "unified" dimensionally with British and Canadian standards are shown in bold-face in certain tables.

The other items in the same tables are based on formulas accepted and published by the British for sizes outside the ranges listed in their standards which, as a matter of information, are BS 1768:1963 (obsolescent) for Precision (Normal Series) Unified Hexagon Bolts, Screws, Nuts (UNC and UNF Threads) and B.S. 1769 and amendments for Black (Heavy Series) Unified Hexagon Bolts, etc. Tolerances applied to comparable dimensions of American and British Unified bolts and nuts may differ because of rounding off practices and other factors.

Differentiation between Bolt and Screw.—A bolt is an externally threaded fastener designed for insertion through holes in assembled parts, and is normally intended to be tightened or released by torquing a nut.

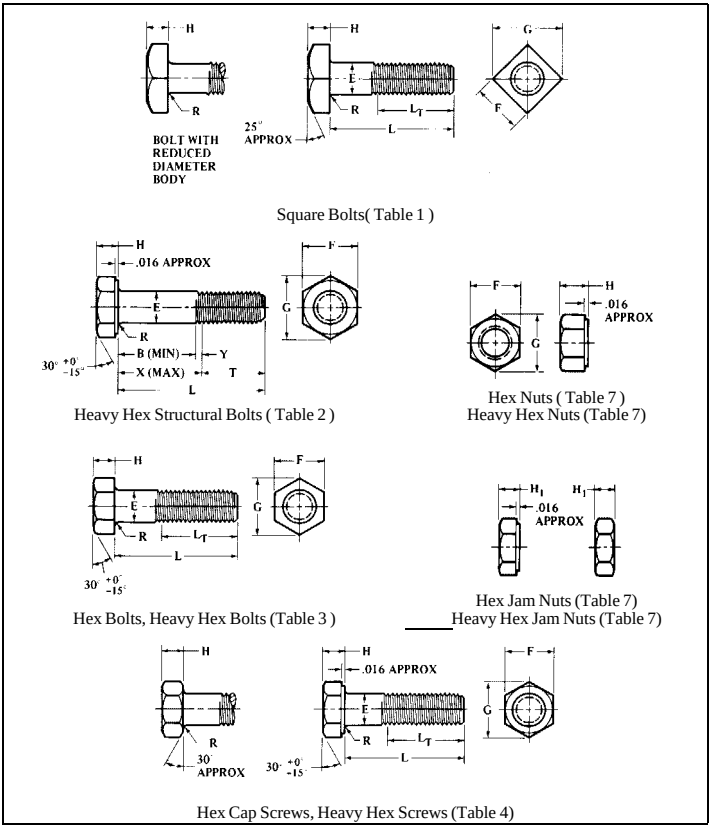
A screw is an externally threaded fastener capable of being inserted into holes in assembled parts, of mating with a preformed internal thread or forming its own thread and of being tightened or released by torquing the head.

An externally threaded fastener which is prevented from being turned during assembly, and which can be tightened or released only by torquing a nut is a *bolt*. (*Example:* round head bolts, track bolts, plow bolts.)

An externally threaded fastener that has a thread form which prohibits assembly with a nut having a straight thread of multiple pitch length is a *screw*. (*Example:* wood screws, tapping screws.)

An externally threaded fastener that must be assembled with a nut to perform its intended service is a *bolt*. (*Example:* heavy hex structural bolt.)

An externally threaded fastener that must be torqued by its head into a tapped or other preformed hole to perform its intended service is a *screw*. (*Example:* square head set screw.)



Square and Hex Bolts, Screws, and Nuts.—The dimensions for square and hex bolts and screws given in the following tables have been taken from American National Standard ANSI/ASME B18.2.1-1996 and for nuts from American National Standard ANSI/ASME B18.2.2-1987 (R1999) Reference should be made to these Standards for information or data not found in the following text and tables:

Designation: Bolts and screws should be designated by the following data in the sequence shown: nominal size (fractional and decimal equivalent); threads per inch (omit for lag screws); product length for bolts and screws (fractional or two-place decimal equivalent); product name; material, including specification, where necessary; and protective

finish, if required. Examples: (1) $\frac{3}{8}$-16 × 1$\frac{1}{2}$ Square Bolt, Steel, Zinc Plated; (2) $\frac{1}{2}$-13 × 3 Hex Cap Screw, SAE Grade 8 Steel; and (3) .75 × 5.00 Hex Lag Screw, Steel. (4) $\frac{1}{2}$-13 Square Nut, Steel, Zinc Plated; (5) $\frac{3}{4}$-16 Heavy Hex Nut, SAE J995 Grade 5 Steel; and (6) 1000-8 Hex Thick Slotted Nut, ASTM F594 (Alloy Group 1) Corrosion-Resistant Steel.

Table 1. American National Standard and Unified Standard Square Bolts
ANSI/ASME B18.2.1-1996

SQUARE BOLTS										
Nominal Size[a] or Basic Product Dia.		Body Dia.[b] *E*	Width Across Flats *F*			Width Across Corners *G*		Head Height *H*			Thread Length[c] L_T
		Max.	Basic	Max.	Min.	Max.	Min.	Basic	Max.	Min.	Nom.
$\frac{1}{4}$	**0.2500**	**0.260**	**$\frac{3}{8}$**	**0.375**	**0.362**	**0.530**	**0.498**	**$\frac{11}{64}$**	**0.188**	**0.156**	0.750
$\frac{5}{16}$	**0.3125**	**0.324**	**$\frac{1}{2}$**	**0.500**	**0.484**	**0.707**	**0.665**	**$\frac{13}{64}$**	**0.220**	**0.186**	0.875
$\frac{3}{8}$	**0.3750**	**0.388**	**$\frac{9}{16}$**	**0.562**	**0.544**	**0.795**	**0.747**	**$\frac{1}{4}$**	**0.268**	**0.232**	1.000
$\frac{7}{16}$	**0.4375**	**0.452**	**$\frac{5}{8}$**	**0.625**	**0.603**	**0.884**	**0.828**	**$\frac{15}{64}$**	**0.316**	**0.278**	1.125
$\frac{1}{2}$	**0.5000**	**0.515**	**$\frac{3}{4}$**	**0.750**	**0.725**	**1.061**	**0.995**	**$\frac{21}{64}$**	**0.348**	**0.308**	1.250
$\frac{5}{8}$	**0.6250**	**0.642**	**$\frac{15}{16}$**	**0.938**	**0.906**	**1.326**	**1.244**	**$\frac{27}{64}$**	**0.444**	**0.400**	1.500
$\frac{3}{4}$	**0.7500**	**0.768**	**1$\frac{1}{8}$**	**1.125**	**1.088**	**1.591**	**1.494**	**$\frac{1}{2}$**	**0.524**	**0.476**	1.750
$\frac{7}{8}$	**0.8750**	**0.895**	**1$\frac{5}{16}$**	**1.312**	**1.269**	**1.856**	**1.742**	**$\frac{19}{32}$**	**0.620**	**0.568**	2.000
1	**1.0000**	**1.022**	**1$\frac{1}{2}$**	**1.500**	**1.450**	**2.121**	**1.991**	**$\frac{21}{32}$**	**0.684**	**0.628**	2.250
1$\frac{1}{8}$	**1.1250**	**1.149**	**1$\frac{11}{16}$**	**1.688**	**1.631**	**2.386**	**2.239**	**$\frac{3}{4}$**	**0.780**	**0.720**	2.500
1$\frac{1}{4}$	**1.2500**	**1.277**	**1$\frac{7}{8}$**	**1.875**	**1.812**	**2.652**	**2.489**	**$\frac{27}{32}$**	**0.876**	**0.812**	2.750
1$\frac{3}{8}$	**1.3750**	**1.404**	**2$\frac{1}{16}$**	**2.602**	**1.994**	**2.917**	**2.738**	**$\frac{29}{32}$**	**0.940**	**0.872**	3.000
1$\frac{1}{2}$	**1.5000**	**1.531**	**2$\frac{1}{4}$**	**2.250**	**2.175**	**3.182**	**2.986**	**1**	**1.036**	**0.964**	3.250

[a] Where specifying nominal size in decimals, zeros before the decimal point and in the fourth decimal place are omitted.

[b] See *Body Diameter* footnote in Table 3.

[c] Thread lengths, L_T, shown are for bolt lengths 6 inches and shorter. For longer bolt lengths add 0.250 inch to thread lengths shown.

Table 2. American National Standard Heavy Hex Structural Bolts
ANSI/ASME B18.2.1-1981 (R1992)[a]

HEAVY HEX STRUCTURAL BOLTS													
Nominal Size[a] or Basic Product Dia.		Body Dia. *E*		WidthAcross Flats *F*		Width Across Corners *G*		Height *H*		Radius of Fillet *R*		Thrd. Lgth. L_T	Transition Thrd. *Y*
		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Basic	Max.
$\frac{1}{2}$	0.5000	0.515	0.482	0.875	0.850	1.010	0.969	0.323	0.302	0.031	0.009	1.00	0.19
$\frac{5}{8}$	0.6250	0.642	0.605	1.062	1.031	1.227	1.175	0.403	0.378	0.062	0.021	1.25	0.22
$\frac{3}{4}$	0.7500	0.768	0.729	1.250	1.212	1.443	1.383	0.483	0.455	0.062	0.021	1.38	0.25
$\frac{7}{8}$	0.8750	0.895	0.852	1.438	1.394	1.660	1.589	0.563	0.531	0.062	0.031	1.50	0.28
1	1.0000	1.022	0.976	1.625	1.575	1.876	1.796	0.627	0.591	0.093	0.062	1.75	0.31
1$\frac{1}{8}$	1.1250	1.149	1.098	1.812	1.756	2.093	2.002	0.718	0.658	0.093	0.062	2.00	0.34
1$\frac{1}{4}$	1.2500	1.277	1.223	2.000	1.938	2.309	2.209	0.813	0.749	0.093	0.062	2.00	0.38
1$\frac{3}{8}$	1.3750	1.404	1.345	2.188	2.119	2.526	2.416	0.878	0.810	0.093	0.062	2.25	0.44
1$\frac{1}{2}$	1.5000	1.531	1.470	2.375	2.300	2.742	2.622	0.974	0.902	0.093	0.062	2.25	0.44

[a] Heavy hex structural bolts have been removed from the latest version, ANSI/ASME B18.2.1-1996. The table has been included for reference.

All dimensions are in inches. **Bold type shows bolts unified dimensionally with British and Canadian Standards.** Threads, when rolled, shall be Unified Coarse, Fine, or 8-thread series (UNRC, UNRF, or 8 UNR Series), Class 2A. Threads produced by other methods may be Unified Coarse, Fine, or 8-thread series (UNC, UNF, or 8 UN Series), Class 2A.

Table 3. American National Standard and Unified Standard Hex and Heavy Hex Bolts *ANSI/ASME B18.2.1-1996*

Nominal Size[a] or Basic Dia.		Full Size Body Dia. *E*	Width Across Flats *F*			Width Across Corners *G*		Head Height *H*			Thread Length[b] L_T
		Max.	Basic	Max.	Min.	Max.	Min.	Basic	Max.	Min.	Nom.
HEX BOLTS											
1/4	**0.2500**	**0.260**	**7/16**	**0.438**	**0.425**	**0.505**	**0.484**	**11/64**	**0.188**	**0.150**	0.750
5/16	**0.3125**	**0.324**	**1/2**	**0.500**	**0.484**	**0.577**	**0.552**	**7/32**	**0.235**	**0.195**	0.875
3/8	**0.3750**	**0.388**	**9/16**	**0.562**	**0.544**	**0.650**	**0.620**	**1/4**	**0.268**	**0.226**	1.000
7/16	**0.4375**	**0.452**	**5/8**	**0.625**	**0.603**	**0.722**	**0.687**	**19/64**	**0.316**	**0.272**	1.125
1/2	**0.5000**	**0.515**	**3/4**	**0.750**	**0.725**	**0.866**	**0.826**	**11/32**	**0.364**	**0.302**	1.250
5/8	**0.6250**	**0.642**	**15/16**	**0.938**	**0.906**	**1.083**	**1.033**	**27/64**	**0.444**	**0.378**	1.500
3/4	**0.7500**	**0.768**	**1 1/8**	**1.125**	**1.088**	**1.299**	**1.240**	**1/2**	**0.524**	**0.455**	1.750
7/8	**0.8750**	**0.895**	**1 5/16**	**1.312**	**1.269**	**1.516**	**1.447**	**37/64**	**0.604**	**0.531**	2.000
1	**1.0000**	**1.022**	**1 1/2**	**1.500**	**1.450**	**1.732**	**1.653**	**43/64**	**0.700**	**0.591**	2.250
1 1/8	**1.1250**	**1.149**	**1 11/16**	**1.688**	**1.631**	**1.949**	**1.859**	**3/4**	**0.780**	**0.658**	2.500
1 1/4	**1.2500**	**1.277**	**1 7/8**	**1.875**	**1.812**	**2.165**	**2.066**	**27/32**	**0.876**	**0.749**	2.750
1 3/8	**1.3750**	**1.404**	**2 1/16**	**2.062**	**1.994**	**2.382**	**2.273**	**29/32**	**0.940**	**0.810**	3.000
1 1/2	**1.5000**	**1.531**	**2 1/4**	**2.250**	**2.175**	**2.598**	**2.480**	**1**	**1.036**	**0.902**	3.250
1 3/4	**1.7500**	**1.785**	**2 5/8**	**2.625**	**2.538**	**3.031**	**2.893**	**1 5/32**	**1.196**	**1.054**	3.750
2	**2.000**	**2.039**	**3**	**3.000**	**2.900**	**3.464**	**3.306**	**1 11/32**	**1.388**	**1.175**	4.250
2 1/4	2.2500	2.305	3 3/8	3.375	3.262	3.897	3.719	1 1/2	1.548	1.327	4.750
2 1/2	2.5000	2.559	3 3/4	3.750	3.625	4.330	4.133	1 21/32	1.708	1.479	5.250
2 3/4	2.7500	2.827	4 1/8	4.125	3.988	4.763	4.546	1 13/16	1.869	1.632	5.750
3	3.0000	3.081	4 1/2	4.500	4.350	5.196	4.959	2	2.060	1.815	6.250
3 1/4	3.2500	3.335	4 7/8	4.875	4.712	5.629	5.372	2 3/16	2.251	1.936	6.750
3 1/2	3.5000	3.589	5 1/4	5.250	5.075	6.062	5.786	2 5/16	2.380	2.057	7.250
3 3/4	3.7500	3.858	5 5/8	5.625	5.437	6.495	6.198	2 1/2	2.572	2.241	7.750
4	4.0000	4.111	6	6.000	5.800	6.928	6.612	2 11/16	2.764	2.424	8.250
HEAVY HEX BOLTS											
1/2	**0.5000**	**0.515**	**7/8**	**0.875**	**0.850**	**1.010**	**0.969**	11/32	0.364	0.302	1.250
5/8	**0.6250**	**0.642**	**1 1/16**	**1.062**	**1.031**	**1.227**	**1.175**	27/64	0.444	0.378	1.500
3/4	**0.7500**	**0.768**	**1 1/4**	**1.250**	**1.212**	**1.443**	**1.383**	1/2	0.524	0.455	1.750
7/8	**0.8750**	**0.895**	**1 7/16**	**1.438**	**1.394**	**1.660**	**1.589**	37/64	0.604	0.531	2.000
1	**1.0000**	**1.022**	**1 5/8**	**1.625**	**1.575**	**1.876**	**1.796**	43/64	0.700	0.591	2.250
1 1/8	**1.1250**	**1.149**	**1 13/16**	**1.812**	**1.756**	**2.093**	**2.002**	3/4	0.780	0.658	2.500
1 1/4	**1.2500**	**1.277**	**2**	**2.000**	**1.938**	**2.309**	**2.209**	27/32	0.876	0.749	2.750
1 3/8	**1.3750**	**1.404**	**2 1/16**	**2.188**	**2.119**	**2.526**	**2.416**	29/32	0.940	0.810	3.000
1 1/2	**1.5000**	**1.531**	**2 3/8**	**23.75**	**2.300**	**2.742**	**2.622**	1	1.036	0.902	3.250
1 3/4	**1.7500**	**1.785**	**2 3/4**	**2.750**	**2.662**	**3.175**	**3.035**	1 5/32	1.196	1.054	3.750
2	**2.0000**	**2.039**	*3 1/8*	**3.125**	**3.025**	**3.608**	**3.449**	1 11/32	1.388	1.175	4.250
2 1/4	2.2500	2.305	3 1/2	3.500	3.388	4.041	3.862	1 1/2	1.548	1.327	4.750
2 1/2	2.5000	2.559	3 7/8	3.875	3.750	4.474	4.275	1 21/32	1.708	1.479	5.250
2 3/4	2.7500	2.827	4 1/4	4.250	4.112	4.907	4.688	1 13/16	1.869	1.632	5.750
3	3.0000	3.081	4 5/8	4.625	4.475	5.340	5.102	2	2.060	1.815	6.250

[a] *Nominal Size:* Where specifying nominal size in decimals, zeros preceding the decimal point and in the fourth decimal place are omitted.

[b] Thread lengths, L_T, shown are for bolt lengths 6 inches and shorter. For longer bolt lengths add 0.250 inch to thread lengths shown.

All dimensions are in inches.

Bold type shows bolts unified dimensionally with British and Canadian Standards.

Threads: Threads, when rolled, are Unified Coarse, Fine, or 8-thread series (UNRC, UNRF, or 8 UNR Series), Class 2A. Threads produced by other methods may be Unified Coarse, Fine or 8-thread series (UNC, UNF, or 8 UN Series), Class 2A.

Body Diameter: Bolts may be obtained in "reduced diameter body." Where "reduced diameter body" is specified, the body diameter may be reduced to approximately the pitch diameter of the thread. A shoulder of full body diameter under the head may be supplied at the option of the manufacturer.

Material: Unless otherwise specified, chemical and mechanical properties of steel bolts conform to ASTM A307, Grade A. Other materials are as agreed upon by manufacturer and purchaser.

Table 4. American National Standard and Unified Standard Heavy Hex Screws and Hex Cap Screws *ANSI/ASME B18.2.1-1996*

Nominal Size[a] or Basic Product Dia.		Body Dia. *E*		Width Across Flats *F*			Width Across Corners *G*		Height *H*			Thread Length[b] L_T
		Max.	Min.	Basic	Max.	Min.	Max.	Min.	Basic	Max.	Min.	Basic
HEAVY HEX SCREWS												
1/2	**0.5000**	**0.5000**	0.482	**7/8**	**0.875**	**.0850**	**1.010**	**0.969**	5/16	0.323	0.302	1.250
5/8	**0.6250**	**0.6250**	0.605	**1 1/16**	**1.062**	**1.031**	**1.227**	**1.175**	25/64	0.403	0.378	1.500
3/4	**0.7500**	**0.7500**	0.729	**1 1/4**	**1.250**	**1.212**	**1.443**	**1.383**	15/32	0.483	0.455	1.750
7/8	**0.8750**	**0.8750**	0.852	**1 7/16**	**1.438**	**1.394**	**1.660**	**1.589**	35/64	0.563	0.531	2.000
1	**1.0000**	**1.0000**	0.976	**1 5/8**	**1.625**	**1.575**	**1.876**	**1.796**	39/64	0.627	0.591	2.250
1 1/8	**1.1250**	**1.1250**	1.098	**1 13/16**	**1.812**	**1.756**	**2.093**	**2.002**	11/16	0.718	0.658	2.500
1 1/4	**1.2500**	**1.2500**	1.223	**2**	**2.000**	**1.938**	**2.309**	**2.209**	25/32	0.813	0.749	2.750
1 3/8	**1.3750**	**1.3750**	1.345	**2 3/16**	**2.188**	**2.119**	**2.526**	**2.416**	27/32	0.878	0.810	3.000
1 1/2	**1.5000**	**1.5000**	1.470	**2 3/8**	**2.375**	**2.300**	**2.742**	**2.622**	15/16	0.974	0.902	3.250
1 3/4	**1.7500**	**1.7500**	1.716	**2 3/4**	**2.750**	**2.662**	**3.175**	**3.035**	1 3/32	1.134	1.054	3.750
2	**2.0000**	**2.0000**	1.964	**3 1/8**	**3.125**	**3.025**	**3.608**	**3.449**	1 7/32	1.263	1.175	4.250
2 1/4	2.2500	2.2500	2.214	3 1/2	3.500	3.388	4.041	3.862	1 3/8	1.423	1.327	5.000[c]
2 1/2	2.5000	2.5000	2.461	3 7/8	3.875	3.750	4.474	4.275	1 17/32	1.583	1.479	5.500[c]
2 3/4	2.7500	2.7500	2.711	4 1/4	4.250	41.112	4.907	4.688	1 11/16	1.744	1.632	6.000[c]
3	3.0000	3.0000	2.961	4 5/8	4.625	4.475	5.340	5.102	1 7/8	1.935	1.815	6.500[c]
HEX CAP SCREWS (Finished Hex Bolts)												
1/4	**0.2500**	**0.2500**	**0.2450**	**7/16**	**0.438**	**0.428**	**0.505**	**0.488**	**5/32**	**0.163**	**0.150**	0.750
5/16	**0.3125**	**0.3125**	**0.3065**	**1/2**	**0.500**	**0.489**	**0.577**	**0.557**	**1 3/64**	**0.211**	**0.195**	0.875
3/8	**0.3750**	**0.3750**	**0.3690**	**9/16**	**0.562**	**0.551**	**0.650**	**0.628**	**15/64**	**0.243**	**0.226**	1.000
7/16	**0.4375**	**0.4375**	**0.4305**	**5/8**	**0.625**	**0.612**	**0.722**	**0.698**	**9/32**	**0.291**	**0.272**	1.125
1/2	**0.5000**	**0.5000**	**0.4930**	**3/4**	**0.750**	**0.736**	**0.866**	**0.840**	**5/16**	**0.323**	**0.302**	1.250
9/16	**0.5625**	**0.5625**	**0.5545**	**13/16**	**0.812**	**0.798**	**0.938**	**0.910**	**23/64**	**0.371**	**0.348**	1.375
5/8	**0.6250**	**0.6250**	**0.6170**	**15/16**	**0.938**	**0.922**	**1.083**	**1.051**	**25/64**	**0.403**	**0.378**	1.500
3/4	**0.7500**	**0.7500**	**0.7410**	**1 1/8**	**1.125**	**1.100**	**1.299**	**1.254**	**15/32**	**0.483**	**0.455**	1.750
7/8	**0.8750**	**0.8750**	**0.8660**	**1 5/16**	**1.312**	**1.285**	**1.516**	**1.465**	**35/64**	**0.563**	**0.531**	2.000
1	**1.0000**	**1.0000**	**0.9900**	**1 1/2**	**1.500**	**1.469**	**1.732**	**1.675**	**39/64**	**0.627**	**0.591**	2.250
1 1/8	**1.1250**	**1.1250**	**1.1140**	**1 11/16**	**1.688**	**1.631**	**1.949**	**1.859**	**11/16**	**0.718**	**0.658**	2.500
1 1/4	**1.2500**	**1.2500**	**1.2390**	**1 7/8**	**1.875**	**1.812**	**2.165**	**2.066**	**25/32**	**0.813**	**0.749**	2.750
1 3/8	**1.3750**	**1.3750**	**1.3630**	**2 1/16**	**2.062**	**1.994**	**2.382**	**2.273**	**27/32**	**0.878**	**0.810**	3.000
1 1/2	**1.5000**	**1.5000**	**1.4880**	**2 1/4**	**2.250**	**2.175**	**2.598**	**2.480**	**15/16**	**0.974**	**0.902**	3.250
1 3/4	**1.7500**	**1.7500**	**1.7380**	**2 5/8**	**2.625**	**2.538**	**3.031**	**2.893**	**1 3/32**	**1.134**	**1.054**	3.750
2	**2.0000**	**2.0000**	**1.9880**	**3**	**3.000**	**2.900**	**3.464**	**3.306**	**1 7/32**	**1.263**	**1.175**	4.250
2 1/4	2.2500	2.2500	2.2380	3 3/8	3.375	3.262	3.897	3.719	1 3/8	1.423	1.327	5.000[c]
2 1/2	2.5000	2.5000	2.4880	3 3/4	3.750	3.625	4.330	4.133	1 17/32	1.583	1.479	5.500[c]
2 3/4	2.7500	2.7500	2.7380	4 1/8	4.125	3.988	4.763	4.546	1 11/16	1.744	1.632	6.000[c]
3	3.0000	3.0000	2.9880	4 1/2	4.500	4.350	5.196	4.959	1 7/8	1.935	1.815	6.500[c]

[a] *Nominal Size:* Where specifying nominal size in decimals, zeros preceding the decimal and in the fourth decimal place are omitted.

[b] Thread lengths, L_T, shown are for bolt lengths 6 inches and shorter. For longer bolt lengths add 0.250 inch to thread lengths shown.

[c] Thread lengths, L_T, shown are for bolt lengths over 6 inches.

All dimensions are in inches.

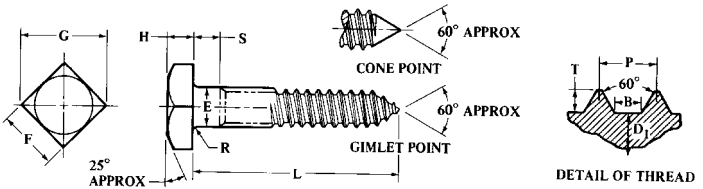
Unification: **Bold type indicates product features unified dimensionally with British and Canadian Standards.** Unification of fine thread products is limited to sizes 1 inch and smaller.

Bearing Surface: Bearing surface is flat and washer faced. Diameter of bearing surface is equal to the maximum width across flats within a tolerance of minus 10 per cent.

Threads Series: Threads, when rolled, are Unified Coarse, Fine, or 8-thread series (UNRC, UNRF, or 8 UNR Series), Class 2A. Threads produced by other methods shall preferably be UNRC, UNRF or 8 UNR but, at manufacturer's option, may be Unified Coarse, Fine or 8-thread series (UNC, UNF, or 8 UN Series), Class 2A.

Material: Chemical and mechanical properties of steel screws normally conform to Grades 2, 5, or 8 of SAE J429, ASTM A449 or ASTM A354 Grade BD. Where specified, screws may also be made from brass, bronze, corrosion-resisting steel, aluminum alloy or other materials.

Table 5. American National Standard Square Lag Screws *ANSI/ASME B18.2.1-1996*



Nominal Size[a] or Basic Product Dia.		Body or Shoulder Dia. *E*		Width Across Flats *F*			Width Across Corners *G*		Height *H*			Shoulder Length *S*	Radius of Fillet *R*	Thds. per Inch	Thread Dimensions			
		Max.	Min.	Basic	Max.	Min.	Max.	Min.	Basic	Max.	Min.	Min.	Max.		Pitch *P*	Flat at Root *B*	Depth of Thd. *T*	Root Dia. D_1
No. 10	0.1900	0.199	0.178	9/32	0.281	0.271	0.398	0.372	1/8	0.140	0.110	0.094	0.03	11	0.091	0.039	0.035	0.120
1/4	0.2500	0.260	0.237	3/8	0.375	0.362	0.530	0.498	11/64	0.188	0.156	0.094	0.03	10	0.100	0.043	0.039	0.173
5/16	0.3125	0.324	0.298	1/2	0.500	0.484	0.707	0.665	13/64	0.220	0.186	0.125	0.03	9	0.111	0.048	0.043	0.227
3/8	0.3750	0.388	0.360	9/16	0.562	0.544	0.795	0.747	1/4	0.268	0.232	0.125	0.03	7	0.143	0.062	0.055	0.265
7/16	0.4375	0.452	0.421	5/8	0.625	0.603	0.884	0.828	19/64	0.316	0.278	0.156	0.03	7	0.143	0.062	0.055	0.328
1/2	0.5000	0.515	0.482	3/4	0.750	0.725	1.061	0.995	21/64	0.348	0.308	0.156	0.03	6	0.167	0.072	0.064	0.371
5/8	0.6250	0.642	0.605	15/16	0.938	0.906	1.326	1.244	27/64	0.444	0.400	0.312	0.06	5	0.200	0.086	0.077	0.471
3/4	0.7500	0.768	0.729	1 1/8	1.125	1.088	1.591	1.494	1/2	0.524	0.476	0.375	0.06	4 1/2	0.222	0.096	0.085	0.579
7/8	0.8750	0.895	0.852	1 5/16	1.312	1.269	1.856	1.742	19/32	0.620	0.568	0.375	0.06	4	0.250	0.108	0.096	0.683
1	1.0000	1.022	0.976	1 1/2	1.500	1.450	2.121	1.991	21/32	0.684	0.628	0.625	0.09	3 1/2	0.286	0.123	0.110	0.780
1 1/8	1.1250	1.149	1.098	1 11/16	1.688	1.631	2.386	2.239	3/4	0.780	0.720	0.625	0.09	3 1/4	0.308	0.133	0.119	0.887
1 1/4	1.2500	1.277	1.223	1 7/8	1.875	1.812	2.652	2.489	27/32	0.876	0.812	0.625	0.09	3 1/4	0.308	0.133	0.119	1.012

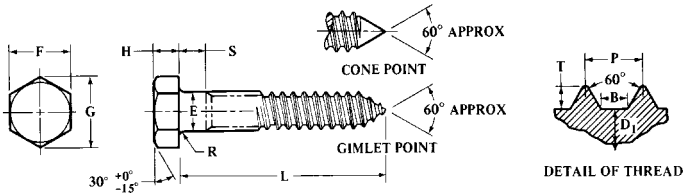
[a] When specifying decimal nominal size, zeros before decimal point and in fourth decimal place are omitted.

All dimensions in inches.

Minimum thread length is ½ length of screw plus 0.50 inch, or 6.00 inches, whichever is shorter. Screws too short for the formula thread length shall be threaded as close to the head as practicable.

Thread formulas: Pitch = 1 ÷ thds. per inch. Flat at root = 0.4305 × pitch. Depth of single thread = 0.385 × pitch.

Table 6. American National Standard Hex Lag Screws *ANSI/ASME B18.2.1-1996*



Nominal Size[a] or Basic Product Dia.		Body or Shoulder Dia. *E*		Width Across Flats *F*			Width Across Corners *G*		Height *H*			Shoulder Length *S*	Radius of Fillet *R*	Thds. per Inch	Thread Dimensions			
		Max.	Min.	Basic	Max.	Min.	Max.	Min.	Basic	Max.	Min.	Min.	Max.		Pitch *P*	Flat at Root *B*	Depth of Thd. *T*	Root Dia. D_1
No. 10	0.1900	0.199	0.178	9/32	0.281	0.271	0.323	0.309	1/8	0.140	0.110	0.094	0.03	11	0.091	0.039	0.035	0.120
1/4	0.2500	0.260	0.237	3/8	0.438	0.425	0.505	0.484	11/64	0.188	0.150	0.094	0.03	10	0.100	0.043	0.039	0.173
5/16	0.3125	0.324	0.298	1/2	0.500	0.484	0.577	0.552	7/32	0.235	0.195	0.125	0.03	9	0.111	0.048	0.043	0.227
3/8	0.3750	0.388	0.360	9/16	0.562	0.544	0.650	0.620	1/4	0.268	0.226	0.125	0.03	7	0.143	0.062	0.055	0.265
7/16	0.4375	0.452	0.421	5/8	0.625	0.603	0.722	0.687	19/64	0.316	0.272	0.156	0.03	7	0.143	0.062	0.055	0.328
1/2	0.5000	0.515	0.482	3/4	0.750	0.725	0.866	0.826	11/32	0.364	0.302	0.156	0.03	6	0.167	0.072	0.064	0.371
5/8	0.6250	0.642	0.605	15/16	0.938	0.906	1.083	1.033	27/64	0.444	0.378	0.312	0.06	5	0.200	0.086	0.077	0.471
3/4	0.7500	0.768	0.729	1 1/8	1.125	1.088	1.299	1.240	1/2	0.524	0.455	0.375	0.06	4 1/2	0.222	0.096	0.085	0.579
7/8	0.8750	0.895	0.852	1 5/16	1.312	1.269	1.516	1.447	37/64	0.604	0.531	0.375	0.06	4	0.250	0.108	0.096	0.683
1	1.0000	1.022	0.976	1 1/2	1.500	1.450	1.732	1.653	43/64	0.700	0.591	0.625	0.09	3 1/2	0.286	0.123	0.110	0.780
1 1/8	1.1250	1.149	1.098	1 11/16	1.688	1.631	1.949	1.859	3/4	0.780	0.658	0.625	0.09	3 1/4	0.308	0.133	0.119	0.887
1 1/4	1.2500	1.277	1.223	1 7/8	1.875	1.812	2.165	2.066	27/32	0.876	0.749	0.625	0.09	3 1/4	0.308	0.133	0.119	1.012

[a] When specifying decimal nominal size, zeros before decimal point and in fourth decimal place are omitted.

All dimensions in inches.

Minimum thread length is 1/2 length of screw plus 0.50 inch, or 6.00 inches, whichever is shorter. Screws too short for the formula thread length shall be threaded as close to the head as practicable.

Thread formulas: Pitch = 1 ÷ thds. per inch. Flat at root = 0.4305 × pitch. Depth of single thread = 0.385 × pitch.

Table 7. American National Standard and Unified Standard Hex Nuts and Jam Nuts and Heavy Hex Nuts and Jam *ANSI/ASME B18.2.2-1987 (R1999)*

Nominal Size or Basic Major Dia. of Thread		Width Across Flats *F*			Width Across Corners *G*		Thickness, Nuts *H*			Thickness,Jam Nuts H_1		
		Basic	Max.	Min.	Max.	Min.	Basic	Max.	Min.	Basic	Max.	Min.
Hex Nuts and Hex Jam Nuts												
1/4	**0.2500**	**7/16**	**0.438**	**0.428**	**0.505**	**0.488**	**7/32**	**0.226**	**0.212**	**5/32**	**0.163**	**0.150**
5/16	**0.3125**	**1/2**	**0.500**	**0.489**	**0.577**	**0.557**	**17/64**	**0.273**	**0.258**	**3/16**	**0.195**	**0.180**
3/8	**0.3750**	**9/16**	**0.562**	**0.551**	**0.650**	**0.628**	**21/64**	**0.337**	**0.320**	**7/32**	**0.227**	**0.210**
7/16	**0.4375**	**11/16**	**0.688**	**0.675**	**0.794**	**0.768**	**3/8**	**0.385**	**0.365**	**1/4**	**0.260**	**0.240**
1/2	**0.5000**	**3/4**	**0.750**	**0.736**	**0.866**	**0.840**	**7/16**	**0.448**	**0.427**	**5/16**	**0.323**	**0.302**
9/16	**0.5625**	**7/8**	**0.875**	**0.861**	**1.010**	**0.982**	**31/64**	**0.496**	**0.473**	**5/16**	**0.324**	**0.301**
5/8	**0.6250**	**15/16**	**0.938**	**0.922**	**1.083**	**1.051**	**35/64**	**0.559**	**0.535**	**3/8**	**0.387**	**0.363**
3/4	**0.7500**	**1 1/8**	**1.125**	**1.088**	**1.299**	**1.240**	**41/64**	**0.665**	**0.617**	**27/64**	**0.446**	**0.398**
7/8	**0.8750**	**1 5/16**	**1.312**	**1.269**	**1.516**	**1.447**	**3/4**	**0.776**	**0.724**	**31/64**	**0.510**	**0.458**
1	**1.0000**	**1 1/2**	**1.500**	**1.450**	**1.732**	**1.653**	**55/64**	**0.887**	**0.831**	**35/64**	**0.575**	**0.519**
1 1/8	**1.1250**	**1 11/16**	**1.688**	**1.631**	**1.949**	**1.859**	**31/32**	**0.999**	**0.939**	**39/64**	**0.639**	**0.579**
1 1/4	**1.2500**	**1 7/8**	**1.875**	**1.812**	**2.165**	**2.066**	**1 1/16**	**1.094**	**1.030**	**23/32**	**0.751**	**0.687**
1 3/8	**1.3750**	**2 1/16**	**2.062**	**1.994**	**2.382**	**2.273**	**1 11/64**	**1.206**	**1.138**	**25/32**	**0.815**	**0.747**
1 1/2	**1.5000**	**2 1/4**	**2.250**	**2.175**	**2.598**	**2.480**	**1 7/32**	**1.317**	**1.245**	**27/32**	**0.880**	**0.808**
Heavy Hex Nuts and Heavy Hex Jam Nuts												
1/4	0.2500	1/2	0.500	0.488	0.577	0.556	15/64	0.250	0.218	11/64	0.188	0.156
5/16	0.3125	9/16	0.562	0.546	0.650	0.622	19/64	0.314	0.280	13/64	0.220	0.186
3/8	0.3750	11/16	0.688	0.669	0.794	0.763	23/64	0.377	0.341	15/64	0.252	0.216
7/16	0.4375	3/4	0.750	0.728	0.866	0.830	27/64	0.441	0.403	17/64	0.285	0.247
1/2	**0.5000**	**7/8**	**0.875**	**0.850**	**1.010**	**0.969**	**31/64**	**0.504**	**0.464**	**19/64**	**0.317**	**0.277**
9/16	0.5625	15/16	0.938	0.909	1.083	1.037	35/64	0.568	0.526	21/64	0.349	0.307
5/8	**0.6250**	**1 1/16**	**1.062**	**1.031**	**1.227**	**1.1175**	**39/64**	**0.631**	**0.587**	**23/64**	**0.381**	**0.337**
3/4	**0.7500**	**1 1/4**	**1.250**	**1.212**	**1.443**	**1.382**	**47/64**	**0.758**	**0.710**	**27/64**	**0.446**	**0.398**
7/8	**0.8750**	**1 7/16**	**1.438**	**1.394**	**1660**	**1.589**	**55/64**	**0.885**	**0.833**	**31/64**	**0.510**	**0.458**
1	**1.0000**	**1 5/8**	**1.625**	**1.575**	**1.876**	**1.796**	**63/64**	**1.012**	**0.956**	**35/64**	**0.575**	**0.519**
1 1/8	**1.1250**	**1 13/16**	**1.812**	**1.756**	**2.093**	**2.002**	**1 7/64**	**1.139**	**1.079**	**39/64**	**0.639**	**0.579**
1 1/4	**1.2500**	**2**	**2.000**	**1.938**	**2.309**	**2.209**	**1 7/32**	**1.251**	**1.187**	**23/32**	**0.751**	**0.687**
1 3/8	**1.3750**	**2 3/16**	**2.188**	**2.119**	**2.526**	**2.416**	**1 11/32**	**1.378**	**1.310**	**25/32**	**0.815**	**0.747**
1 1/2	**1.5000**	**2 3/8**	**2.375**	**2.300**	**2.742**	**2.622**	**1 15/32**	**1.505**	**1.433**	**27/32**	**0.880**	**0.808**
1 5/8	1.6250	2 9/16	2.562	2.481	2.959	2.828	1 19/32	1.632	1.556	29/32	0.944	0.868
1 3/4	**1.7500**	**2 3/4**	**2.750**	**2.662**	**3.175**	**3.035**	**1 23/32**	**1.759**	**1.679**	**31/32**	**1.009**	**0.929**
1 7/8	1.8750	2 15/16	2.938	2.844	3.392	3.242	1 27/32	1.886	1.802	1 1/32	1.073	0.989
2	**2.0000**	**3 1/8**	**3.125**	**3.025**	**3.608**	**3.449**	**1 31/32**	**2.013**	**1.925**	**1 3/32**	**1.138**	**1.050**
2 1/4	2.2500	3 1/2	3.500	3.388	4.041	3.862	2 13/64	2.251	2.155	1 13/64	1.251	1.155
2 1/2	2.5000	3 7/8	3.875	3.750	4.474	4.275	2 29/64	2.505	2.401	1 29/64	1.505	1.401
2 3/4	2.7500	4 1/4	4.250	4.112	4.907	4.688	2 45/64	2.759	2.647	1 37/64	1.634	1.522
3	3.0000	4 5/8	4.625	4.475	5.340	5.102	2 61/64	3.013	2.893	1 45/64	1.763	1.643
3 1/4	3.2500	5	5.000	4.838	5.774	5.515	3 3/16	3.252	3.124	1 13/16	1.876	1.748
3 1/2	3.5000	5 3/8	5.375	5.200	6.207	5.928	3 7/16	3.506	3.370	1 15/16	2.006	1.870
3 3/4	3.7500	5 3/4	5.750	5.562	6.640	6.341	3 11/16	3.760	3.616	2 1/16	2.134	1.990
4	4.0000	6 1/8	6.125	5.925	7.073	6.755	3 15/16	4.014	3.862	2 3/16	2.264	2.112

All dimensions are in inches.

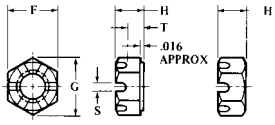
Bold type shows nuts unified dimensionally with British and Canadian Standards.

Threads are Unified Coarse-, Fine-, or 8-thread series (UNC, UNF or 8UN), Class 2B. Unification of fine-thread nuts is limited to sizes 1 inch and under.

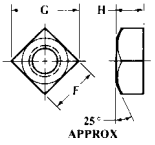
Table 8. American National Standard and Unified Standard Hex Flat Nuts and Flat Jam Nuts and Heavy Hex Flat Nuts and Flat Jam Nuts
ANSI/ASME B18.2.2-1987 (R1999)

Nominal Size or Basic Major Dia. of Thread		Width Across Flats *F*			Width Across Corners *G*		Thickness, Flat Nuts *H*			Thickness, Flat Jam Nuts H_1		
		Basic	Max.	Min.	Max.	Min.	Basic	Max.	Min.	Basic	Max.	Min.
Hex Flat Nuts and Hex Flat Jam Nuts												
1 1/8	**1.1250**	**1 11/16**	**1.688**	**1.631**	**1.949**	**1.859**	**1**	**1.030**	**0.970**	**5/8**	**0.655**	**0.595**
1 1/4	**1.2500**	**1 7/8**	**1.875**	**1.812**	**2.165**	**2.066**	**1 3/32**	**1.126**	**1.062**	**3/4**	**0.782**	**0.718**
1 3/8	**1.3750**	**2 1/16**	**2.062**	**1.994**	**2.382**	**2.273**	**1 13/64**	**1.237**	**1.169**	**13/16**	**0.846**	**0.778**
1 1/2	**1.5000**	**2 1/4**	**2.250**	**2.175**	**2.598**	**2.480**	**1 5/16**	**1.348**	**1.276**	**7/8**	**0.911**	**0.839**
Heavy Hex Flat Nuts and Heavy Hex Flat Jam Nuts												
1 1/8	**1.1250**	**1 13/16**	**1.812**	**1.756**	**2.093**	**2.002**	**1 1/8**	**1.155**	**1.079**	**5/8**	**0.655**	**0.579**
1 1/4	**1.2500**	**2**	**2.000**	**1.938**	**2.309**	**2.209**	**1 1/4**	**1.282**	**1.187**	**3/4**	**0.782**	**0.687**
1 3/8	**1.3750**	**2 1/16**	**2.188**	**2.119**	**2.526**	**2.416**	**1 3/8**	**1.409**	**1.310**	**13/16**	**0.846**	**0.747**
1 1/2	**1.5000**	**2 1/8**	**2.375**	**2.300**	**2.742**	**2.622**	**1 1/2**	**1.536**	**1.433**	**7/8**	**0.911**	**0.808**
1 3/4	**1.7500**	**2 3/4**	**2.750**	**2.662**	**3.175**	**3.035**	**1 3/4**	**1.790**	**1.679**	**1**	**1.040**	**0.929**
2	**2.0000**	**3 1/8**	**3.125**	**3.025**	**3.608**	**3.449**	**2**	**2.044**	**1.925**	**1 1/8**	**1.169**	**1.050**
2 1/4	2.2500	3 1/2	3.500	3.388	4.041	3.862	2 1/4	2.298	2.155	1 1/4	1.298	1.155
2 1/2	2.5000	3 7/8	3.875	3.750	4.474	4.275	2 1/2	2.552	2.401	1 1/2	1.552	1.401
2 3/4	2.7500	4 1/4	4.250	4.112	4.907	4.688	2 3/4	2.806	2.647	1 5/8	1.681	1.522
3	3.0000	4 5/8	4.625	4.475	5.340	5.102	3	3.060	2.893	1 3/4	1.810	1.643
3 1/4	3.2500	5	5.000	4.838	5.774	5.515	3 1/4	3.314	3.124	1 7/8	1.939	1.748
3 1/2	3.5000	5 3/8	5.375	5.200	6.207	5.928	3 1/2	3.568	3.370	2	2.068	1.870
3 3/4	3.7500	5 3/4	5.750	5.562	6.640	6.341	3 3/4	3.822	3.616	2 1/8	2.197	1.990
4	4.0000	6 1/8	6.125	5.925	7.073	6.755	4	4.076	3.862	2 1/4	2.326	2.112

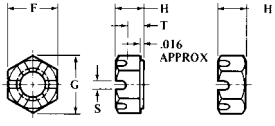
All dimensions are in inches.
Bold type indicates nuts unified dimensionally with British and Canadian Standards.
Threads are Unified Coarse-thread series (UNC), Class 2B.



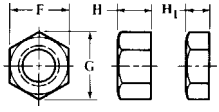
Hex Slotted Nuts (Table 9)
Heavy Hex Slotted Nuts (Table 9)
Hex Thick Slotted Nuts (Table9)



Square Nuts Heavy Square Nuts
(Table 10)



Hex Thick Nuts
(Table 10)



Hex Flat Nuts (Table 8)
Heavy Hex Flat Nuts (Table 8)
Hex Flat Jam Nuts (Table 8)
Heavy Hex Flat Jam Nuts (Table 8)

Table 9. American National and Unified Standard Hex Slotted Nuts, Heavy Hex Slotted Nuts, and Hex Thick Slotted Nuts *ANSI/ASME B18.2.2-1987 (R1999)*

Nominal Size or Basic Major Dia. of Thread	Width Across Flats *F*			Width Across Corners *G*		Thickness *H*			Unslotted Thickness *T*		Width of Slot *S*	
	Basic	Max.	Min.	Max.	Min.	Basic	Max.	Min.	Max.	Min.	Max.	Min.
Hex Slotted Nuts												
1/4	**0.2500**	**7/16**	**0.438**	**0.428**	**0.505**	**0.488**	**9/32**	**0.226**	**0.212**	0.14	0.12	0.10	0.07
5/16	**0.3125**	**1/2**	**0.500**	**0.489**	**0.577**	**0.557**	**17/64**	**0.273**	**0.258**	0.18	0.16	0.12	0.09
3/8	**0.3750**	**9/16**	**0.562**	**0.551**	**0.650**	**0.628**	**21/64**	**0.337**	**0.320**	0.21	0.19	0.15	0.12
7/16	**0.4375**	**11/16**	**0.688**	**0.675**	**0.794**	**0.768**	**3/8**	**0.385**	**0.365**	0.23	0.21	0.15	0.12
1/2	**0.5000**	**3/4**	**0.750**	**0.736**	**0.866**	**0.840**	**7/16**	**0.448**	**0.427**	0.29	0.27	0.18	0.15
9/16	**0.5625**	**7/8**	**0.875**	**0.861**	**1.010**	**0.982**	**31/64**	**0.496**	**0.473**	0.31	0.29	0.18	0.15
5/8	**0.6250**	**15/16**	**0.938**	**0.922**	**1.083**	**1.051**	**35/64**	**0.559**	**0.535**	0.34	0.32	0.24	0.18
3/4	**0.7500**	**1 1/4**	**1.125**	**1.088**	**1.299**	**1.240**	**41/64**	**0.665**	**0.617**	0.40	0.38	0.24	0.18
7/8	**0.8750**	**1 5/16**	**1.312**	**1.269**	**1.516**	**1.447**	**3/4**	**0.776**	**0.724**	0.52	0.49	0.24	0.18
1	**1.0000**	**1 1/2**	**1.500**	**1.450**	**1.732**	**1.653**	**55/64**	**0.887**	**0.831**	0.59	0.56	0.30	0.24
1 1/8	**1.1250**	**1 11/16**	**1.688**	**1.631**	**1.949**	**1.859**	**31/32**	**0.999**	**0.939**	0.64	0.61	0.33	0.24
1 1/4	**1.2500**	**1 7/8**	**1.875**	**1.812**	**2.165**	**2.066**	**1 1/16**	**1.094**	**1.030**	0.70	0.67	0.40	0.31
1 3/8	**1.3750**	**2 1/16**	**2.062**	**1.994**	**2.382**	**2.273**	**1 11/64**	**1.206**	**1.138**	0.82	0.78	0.40	0.31
1 1/2	**1.5000**	**2 1/4**	**2.250**	**2.175**	**2.598**	**2.480**	**1 9/32**	**1.317**	**1.245**	0.86	0.82	0.46	0.37
Heavy Hex Slotted Nuts												
1/4	0.2500	1/2	0.500	0.488	0.577	0.556	15/64	0.250	0.218	0.15	0.13	0.10	0.07
5/16	0.3125	9/16	0.562	0.546	0.650	0.622	19/64	0.314	0.280	0.21	0.19	0.12	0.09
3/8	0.3750	11/16	0.688	0.669	0.794	0.763	23/64	0.377	0.341	0.24	0.22	0.15	0.12
7/16	0.4375	3/4	0.750	0.728	0.866	0.830	27/64	0.441	0.403	0.28	0.26	0.15	0.12
1/2	**0.5000**	**7/8**	**0.875**	**0.850**	**1.010**	**0.969**	**31/64**	**0.504**	**0.464**	0.34	0.32	0.18	0.15
9/16	0.5625	15/16	0.938	0.909	1.083	1.037	35/64	0.568	0.526	0.37	0.35	0.18	0.15
5/8	**0.6250**	**1 1/16**	**1.062**	**1.031**	**1.227**	**1.175**	**39/64**	**0.631**	**0.587**	0.40	0.38	0.24	0.18
3/4	**0.7500**	**1 1/4**	**1.250**	**1.212**	**1.443**	**1.382**	**47/64**	**0.758**	**0.710**	0.49	0.47	0.24	0.18
7/8	**0.8750**	**1 7/16**	**1.438**	**1.394**	**1.660**	**1.589**	**55/64**	**0.885**	**0.833**	0.62	0.59	0.24	0.18
1	**1.0000**	**1 5/8**	**1.625**	**1.575**	**1.876**	**1.796**	**63/64**	**1.012**	**0.956**	0.72	0.69	0.30	0.24
1 1/8	**1.1250**	**1 13/16**	**1.812**	**1.756**	**2.093**	**2.002**	**1 7/64**	**1.139**	**1.079**	0.78	0.75	0.33	0.24
1 1/4	**1.2500**	**2**	**2.000**	**1.938**	**2.309**	**2.209**	**1 7/32**	**1.251**	**1.187**	0.86	0.83	0.40	0.31
1 3/8	**1.3750**	**2 3/16**	**2.188**	**2.119**	**2.526**	**2.416**	**1 15/32**	**1.378**	**1.310**	0.99	0.95	0.40	0.31
1 1/2	**1.5000**	**2 3/8**	**2.375**	**2.300**	**2.742**	**2.622**	**1 15/32**	**1.505**	**1.433**	1.05	1.01	0.46	0.37
1 3/4	**1.7500**	**2 3/4**	**2.750**	**2.662**	**3.175**	**3.035**	**1 23/32**	**1.759**	**1.679**	1.24	1.20	0.52	0.43
2	**2.0000**	**3 1/8**	**3.125**	**3.025**	**3.608**	**3.449**	**1 31/32**	**2.013**	**1.925**	1.43	1.38	0.52	0.43
2 1/4	2.2500	3 1/2	3.500	3.388	4.041	3.862	2 13/64	2.251	2.155	1.67	1.62	0.52	0.43
2 1/2	2.5000	3 7/8	3.875	3.750	4.474	4.275	2 29/64	2.505	2.401	1.79	1.74	0.64	0.55
2 3/4	2.7500	4 1/4	4.250	4.112	4.907	4.688	2 45/64	2.759	2.647	2.05	1.99	0.64	0.55
3	3.0000	4 5/8	4.625	4.475	5.340	5.102	2 61/64	3.013	2.893	2.23	2.17	0.71	0.62
3 1/4	3.2500	5	5.000	4.838	5.774	5.515	3 3/16	3.252	3.124	2.47	2.41	0.71	0.62
3 1/2	3.5000	5 3/8	5.375	5.200	6.207	5.928	3 7/16	3.506	3.370	2.72	2.65	0.71	0.62
3 3/4	3.7500	5 3/4	5.750	5.562	6.640	6.341	3 11/16	3.760	3.616	2.97	2.90	0.71	0.62
4	4.0000	6 1/8	6.125	5.925	7.073	6.755	3 15/16	4.014	3.862	3.22	3.15	0.71	0.62
Hex Thick Slotted Nuts												
1/4	**0.2500**	**7/16**	**0.438**	**0.428**	**0.505**	**0.488**	**9/32**	**0.288**	**0.274**	0.20	0.18	0.10	0.07
5/16	**0.3125**	**1/2**	**0.500**	**0.489**	**0.577**	**0.557**	**21/64**	**0.336**	**0.320**	0.24	0.22	0.12	0.09
3/8	**0.3750**	**9/16**	**0.562**	**0.551**	**0.650**	**0.628**	**13/32**	**0.415**	**0.398**	0.29	0.27	0.15	0.12
7/16	**0.4375**	**11/16**	**0.688**	**0.675**	**0.794**	**0.768**	**29/64**	**0.463**	**0.444**	0.31	0.29	0.15	0.12
1/2	**0.5000**	**3/4**	**0.750**	**0.736**	**0.866**	**0.840**	**9/16**	**0.573**	**0.552**	0.42	0.40	0.18	0.15
9/16	**0.5625**	**7/8**	**0.875**	**0.861**	**1.010**	**0.982**	**39/64**	**0.621**	**0.598**	0.43	0.41	0.18	0.15
5/8	**0.6250**	**15/16**	**0.938**	**0.922**	**1.083**	**1.051**	**21/32**	**0.731**	**0.706**	0.51	0.49	0.24	0.18
3/4	**0.7500**	**1 1/8**	**1.125**	**1.088**	**1.299**	**1.240**	**13/16**	**0.827**	**0.798**	0.57	0.55	0.24	0.18
7/8	**0.8750**	**1 5/16**	**1.312**	**1.269**	**1.516**	**1.447**	**29/32**	**0.922**	**0.890**	0.67	0.64	0.24	0.18
1	**1.0000**	**1 1/2**	**1.500**	**1.450**	**1.732**	**1.653**	**1**	**1.018**	**0.982**	0.73	0.70	0.30	0.24
1 1/8	**1.1250**	**1 11/16**	**1.688**	**1.631**	**1.949**	**1.859**	**1 5/32**	**1.176**	**1.136**	0.83	0.80	0.33	0.24
1 1/4	**1.2500**	**1 7/8**	**1.875**	**1.812**	**2.165**	**2.066**	**1 1/4**	**1.272**	**1.228**	0.89	0.86	0.40	0.31
1 3/8	**1.3750**	**2 1/16**	**2.062**	**1.994**	**2.382**	**2.273**	**1 3/8**	**1.399**	**1.351**	1.02	0.98	0.40	0.31
1 1/2	**1.5000**	**2 1/4**	**2.250**	**2.175**	**2.598**	**2.480**	**1 1/2**	**1.526**	**1.474**	1.08	1.04	0.46	0.37

All dimensions are in inches.

Bold type indicates nuts unified dimensionally with British and Canadian Standards.

Threads are Unified Coarse-, Fine-, or 8-thread series (UNC, UNF, or 8UN), Class 2B.

Unification of fine-thread nuts is limited to sizes 1 inch and under.

Table 10. American National and Unified Standard Square Nuts and Heavy Square Nuts and American National Standard Hex Thick Nuts

ANSI/ASME B18.2.2-1987 (R1999)

Nominal Size or Basic Major Dia. of Thread		Width Across Flats *F*			Width Across Corners *G*		Thickness *H*		
		Basic	Max.	Min.	Max.	Min.	Basic	Max.	Min.
Square Nuts[a]									
1/4	**0.2500**	**7/16**	**0.438**	**0.425**	**0.619**	**0.554**	**7/32**	**0.235**	**0.203**
5/16	**0.3125**	**9/16**	**0.562**	**0.547**	**0.795**	**0.721**	**17/64**	**0.283**	**0.249**
3/8	**0.3750**	**5/8**	**0.625**	**0.606**	**0.884**	**0.802**	**21/64**	**0.346**	**0.310**
7/16	**0.4375**	**3/4**	**0.750**	**0.728**	**1.061**	**0.970**	**3/8**	**0.394**	**0.356**
1/2	**0.5000**	**13/16**	**0.812**	**0.788**	**1.149**	**1.052**	**7/16**	**0.458**	**0.418**
5/8	**0.6250**	**1**	**1.000**	**0.969**	**1.414**	**35/64**	**0.569**	**0.525**	
3/4	**0.7500**	**1 1/8**	**1.125**	**1.088**	**1.591**	**1.464**	**21/32**	**0.680**	**0.632**
7/8	**0.8750**	**1 5/16**	**1.312**	**1.269**	**1.856**	**1.712**	**49/64**	**0.792**	**0.740**
1	**1.0000**	**1 1/2**	**1.500**	**1.450**	**2.121**	**1.961**	**7/8**	**0.903**	**0.847**
1 1/8	**1.1250**	**1 11/16**	**1.688**	**1.631**	**2.386**	**2.209**	**1**	**1.030**	**0.970**
1 1/4	**1.2500**	**1 7/8**	**1.875**	**1.812**	**2.652**	**2.458**	**1 3/32**	**1.126**	**1.062**
1 3/8	**1.3750**	**2 1/16**	**2.062**	**1.994**	**2.917**	**2.708**	**1 13/64**	**1.237**	**1.169**
1 1/2	**1.5000**	**2 1/4**	**2.250**	**2.175**	**3.182**	**2.956**	**1 5/16**	**1.348**	**1.276**
Heavy Square Nuts[a]									
1/4	0.2500	1/2	0.500	0.488	0.707	0.640	1/4	0.266	0.218
5/16	0.3125	9/16	0.562	0.546	0.795	0.720	5/16	0.330	0.280
3/8	0.3750	11/16	0.688	0.669	0.973	0.889	3/8	0.393	0.341
7/16	0.4375	3/4	0.750	0.728	1.060	0.970	7/16	0.456	0.403
1/2	0.5000	7/8	0.875	0.850	1.237	1.137	1/2	0.520	0.464
5/8	0.6250	1 1/16	1.062	1.031	1.503	1.386	5/8	0.647	0.587
3/4	0.7500	1 1/4	1.250	1.212	1.768	1.635	3/4	0.774	0.710
7/8	0.8750	1 7/16	1.438	1.394	2.033	1.884	7/8	0.901	0.833
1	1.0000	1 5/8	1.625	1.575	2.298	2.132	1	1.028	0.956
1 1/8	1.1250	1 13/16	1.812	1.756	2.563	2.381	1 1/8	1.155	1.079
1 1/4	1.2500	2	2.000	1.938	2.828	2.631	1 1/4	1.282	1.187
1 3/8	1.3750	2 3/16	2.188	2.119	3.094	2.879	1 3/8	1.409	1.310
1 1/2	1.5000	2 3/8	2.375	2.300	3.359	3.128	1 1/2	1.536	1.433
Hex Thick Nuts[b]									
1/4	0.2500	7/16	0.438	0.428	0.505	0.488	9/32	0.288	0.274
5/16	0.3125	1/2	0.500	0.489	0.577	0.557	21/64	0.336	0.320
3/8	0.3750	9/16	0.562	0.551	0.650	0.628	13/32	0.415	0.398
7/16	0.4375	11/16	0.688	0.675	0.794	0.768	29/64	0.463	0.444
1/2	0.5000	3/4	0.750	0.736	0.866	0.840	9/16	0.573	0.552
9/16	0.5625	7/8	0.875	0.861	1.010	0.982	37/64	0.621	0.598
5/8	0.6250	15/16	0.938	0.922	1.083	1.051	23/32	0.731	0.706
3/4	0.7500	1 1/8	1.125	1.088	1.299	1.240	13/16	0.827	0.798
7/8	0.8750	1 5/16	1.312	1.269	1.516	1.447	29/32	0.922	0.890
1	1.0000	1 1/2	1.500	1.450	1.732	1.653	1	1.018	0.982
1 1/8	1.1250	1 11/16	1.688	1.631	1.949	1.859	1 5/32	1.176	1.136
1 1/4	1.2500	1 7/8	1.875	1.812	2.165	2.066	1 1/4	1.272	1.228
1 3/8	1.3750	2 1/16	2.062	1.994	2.382	2.273	1 3/8	1.399	1.351
1 1/2	1.5000	2 1/4	2.250	2.175	2.598	2.480	1 1/2	1.526	1.474

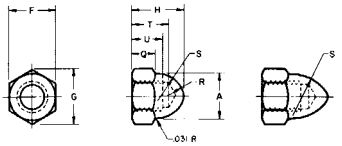
[a] Coarse-thread series, Class 2B.

[b] Unified Coarse-, Fine-, or 8-thread series (8 UN), Class 2B.

All dimensions are in inches.

Bold type indicates nuts unified dimensionally with British and Canadian Standards.

Low and High Crown (Blind, Acorn) Nuts *SAE Recommended Practice J483a*



Low Crown

Nom. Size[a] or Basic Major Dia. of Thread		Width Across Flats, *F*			Width Across Corners, *G*		Body Dia., *A*	Overall Hgt., *H*	Hexagon Hgt., *Q*	Nose Rad., *R*	Body Rad., *S*	Drill Dep., *T*	Full Thd., *U*
		Max.	(Basic)	Min.	Max.	Min.						Max.	Min.
6	0.1380	5/16	0.3125	0.302	0.361	0.344	0.30	0.34	0.16	0.08	0.17	0.25	0.16
8	0.1640	5/16	0.3125	0.302	0.361	0.344	0.30	0.34	0.16	0.08	0.17	0.25	0.16
10	0.1900	3/8	0.3750	0.362	0.433	0.413	0.36	0.41	0.19	0.09	0.22	0.28	0.19
12	0.2160	3/8	0.3750	0.362	0.433	0.413	0.36	0.41	0.19	0.09	0.22	0.31	0.22
1/4	0.2500	7/16	0.4375	0.428	0.505	0.488	0.41	0.47	0.22	0.11	0.25	0.34	0.25
5/16	0.3125	1/2	0.5000	0.489	0.577	0.557	0.47	0.53	0.25	0.12	0.28	0.41	0.31
3/8	0.3750	9/16	0.5625	0.551	0.650	0.628	0.53	0.62	0.28	0.14	0.33	0.45	0.38
7/16	0.4375	5/8	0.6250	0.612	0.722	0.698	0.59	0.69	0.31	0.16	0.36	0.52	0.44
1/2	0.5000	3/4	0.7500	0.736	0.866	0.840	0.72	0.81	0.38	0.19	0.42	0.59	0.50
9/16	0.5625	7/8	0.8750	0.861	1.010	0.982	0.84	0.94	0.44	0.22	0.50	0.69	0.56
5/8	0.6250	15/16	0.9375	0.922	1.083	1.051	0.91	1.00	0.47	0.23	0.53	0.75	0.62
3/4	0.7500	1 1/16	1.0625	1.045	1.227	1.191	1.03	1.16	0.53	0.27	0.59	0.88	0.75
7/8	0.8750	1 1/4	1.2500	1.231	1.443	1.403	1.22	1.36	0.62	0.31	0.70	1.00	0.88
1	1.0000	1 7/16	1.4375	1.417	1.660	1.615	1.41	1.55	0.72	0.36	0.81	1.12	1.00
1 1/8	1.1250	1 5/8	1.6250	1.602	1.876	1.826	1.59	1.75	0.81	0.41	0.92	1.31	1.12
1 1/4	1.2500	1 13/16	1.8125	1.788	2.093	2.038	1.78	1.95	0.91	0.45	1.03	1.44	1.25

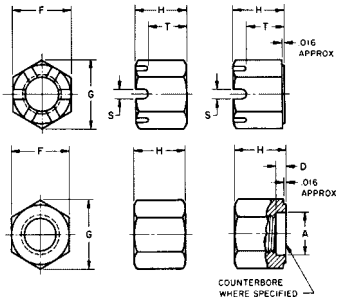
High Crown

Nom. Size[a] or Basic Major Dia. of Thread		Width Across Flats, *F*			Width Across-Corners, *G*		Body Dia., *A*	Overall Hgt., *H*	Hexagon Hgt. *Q*	Nose Rad., *R*	Body Rad., *S*	Drill Dep., *T*	Full Thd., *U*
		Max.	(Basic)	Min.	Max.	Min.						Max.	Min.
6	0.1380	5/16	0.3125	0.302	0.361	0.344	0.30	0.42	0.17	0.05	0.25	0.28	0.19
8	0.1640	5/16	0.3125	0.302	0.361	0.344	0.30	0.42	0.17	0.05	0.25	0.28	0.19
10	0.1900	3/8	0.3750	0.362	0.433	0.413	0.36	0.52	0.20	0.06	0.30	0.34	0.25
12	0.2160	3/8	0.3750	0.362	0.433	0.413	0.36	0.52	0.20	0.06	0.30	0.38	0.28
1/4	0.2500	7/16	0.4375	0.428	0.505	0.488	0.41	0.59	0.23	0.06	0.34	0.41	0.31
5/16	0.3125	1/2	0.5000	0.489	0.577	0.557	0.47	0.69	0.28	0.08	0.41	0.47	0.38
3/8	0.3750	9/16	0.5625	0.551	0.650	0.628	0.53	0.78	0.31	0.09	0.44	0.56	0.47
7/16	0.4375	5/8	0.6250	0.612	0.722	0.698	0.59	0.88	0.34	0.09	0.50	0.62	0.53
1/2	0.5000	3/4	0.7500	0.736	0.866	0.840	0.72	1.03	0.42	0.12	0.59	0.75	0.62
9/16	0.5625	7/8	0.8750	0.861	1.010	0.982	0.84	1.19	0.48	0.16	0.69	0.81	0.69
5/8	0.6250	15/16	0.9375	0.922	1.083	1.051	0.91	1.28	0.53	0.16	0.75	0.91	0.78
3/4	0.7500	1 1/16	1.0625	1.045	1.227	1.191	1.03	1.45	0.59	0.17	0.84	1.06	0.94
7/8	0.8750	1 1/4	1.12500	1.231	1.443	1.403	1.22	1.72	0.70	0.20	0.98	1.22	1.09
1	1.0000	1 7/16	1.4375	1.417	1.660	1.615	1.41	1.97	0.81	0.23	1.14	1.38	1.25
1 1/8	1.1250	1 5/8	1.6250	1.602	1.876	1.826	1.59	2.22	0.92	0.27	1.28	1.59	1.41
1 1/4	1.2500	1 13/16	1.8125	1.788	2.093	2.038	1.78	2.47	1.03	0.28	1.44	1.75	1.56

[a] When specifying a nominal size in decimals, any zero in the fourth decimal place is omitted.

All dimensions are in inches. Threads are Unified Standard Class 2B, UNC or UNF Series.

Hex High and Hex Slotted High Nuts *SAE Standard J482a*



Nominal Size[a] or Basic Major Diameter of Thread		Width Across Flats, *F*			Width Across Corners, *G*		Slot Width, *S*	
		Basic	Max.	Min.	Max.	Min.	Min.	Max.
1/4	0.2500	7/16	0.4375	0.428	0.505	0.488	0.07	0.10
5/16	0.3125	1/2	0.5000	0.489	0.577	0.557	0.09	0.12
3/8	0.3750	9/16	0.5625	0.551	0.650	0.628	0.12	0.15
7/16	0.4375	11/16	0.6875	0.675	0.794	0.768	0.12	0.15
1/2	0.5000	3/4	0.7500	0.736	0.866	0.840	0.15	0.18
9/16	0.5625	7/8	0.8750	0.861	1.010	0.982	0.15	0.18
5/8	0.6250	15/16	0.9375	0.922	1.083	1.051	0.18	0.24
3/4	0.7500	1 1/8	1.1250	1.088	1.299	1.240	0.18	0.24
7/8	0.8750	1 5/16	1.3125	1.269	1.516	1.447	0.18	0.24
1	1.0000	1 1/2	1.5000	1.450	1.732	1.653	0.24	0.30
1 1/8	1.1250	1 11/16	1.6875	1.631	1.949	1.859	0.24	0.33
1 1/4	1.2500	1 7/8	1.8750	1.812	2.165	2.066	0.31	0.40

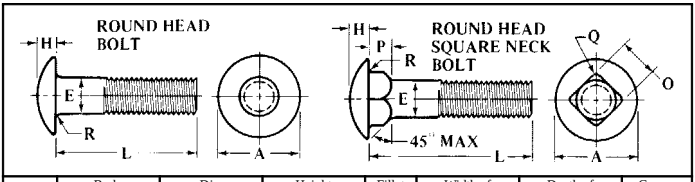
Nominal Size[a] or Basic Major Diameter of Thread		Thickness, *H*			Unslotted Thickness, *T*		Counterbore (Optional)	
		Basic	Max.	Min.	Max.	Min.	Dia., *A*	Depth, *D*
1/4	0.2500	3/8	0.382	0.368	0.29	0.27	0.266	0.062
5/16	0.3125	29/64	0.461	0.445	0.37	0.35	0.328	0.078
3/8	0.3750	1/2	0.509	0.491	0.38	0.36	0.391	0.094
7/16	0.4375	39/64	0.619	0.599	0.46	0.44	0.453	0.109
1/2	0.5000	21/32	0.667	0.645	0.51	0.49	0.516	0.125
9/16	0.5625	49/64	0.778	0.754	0.59	0.57	0.594	0.141
5/8	0.6250	27/32	0.857	0.831	0.63	0.61	0.656	0.156
3/4	0.7500	1	1.015	0.985	0.76	0.73	0.781	0.188
7/8	0.8750	1 5/32	1.172	1.140	0.92	0.89	0.906	0.219
1	1.0000	1 5/16	1.330	1.292	1.05	1.01	1.031	0.250
1 1/8	1.1250	1 1/2	1.520	1.480	1.18	1.14	1.156	0.281
1 1/4	1.2500	1 11/16	1.710	1.666	1.34	1.29	1.281	0.312

[a] When specifying a nominal size in decimals, any zero in the fourth decimal place is omitted.

All dimensions are in inches. Threads are Unified Standard Class 2B, UNC or UNF Series.

American National Standard Round Head and Round Head Square Neck Bolts

ANSI/ASME B18.5 –1990



Nominal Size	Body Dia., *E*		Dia. of Head, *A*		Height of Head, *H*		Fillet Rad., *R*	Width of Square, *O*		Depth of Square, *P*		Corner Rad. on Square, *Q*
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Max.	Min.	Max.	Min.	Max.
No. 10	0.199	.182	.469	.438	.114	.094	.031	.199	.185	.125	.094	.031
1/4	0.260	.237	.594	.563	.145	.125	.031	.260	.245	.156	.125	.031
5/16	0.324	.298	.719	.688	.176	.156	.031	.324	.307	.187	.156	.031
3/8	0.388	.360	.844	.782	.208	.188	.031	.388	.368	.219	.188	.047
7/16	0.452	.421	.969	.907	.239	.219	.031	.452	.431	.250	.219	.047
1/2	0.515	.483	1.094	1.032	.270	.250	.031	.515	.492	.281	.250	.047
5/8	0.642	.605	1.344	1.219	.344	.313	.062	.642	.616	.344	.313	.078
3/4	0.768	.729	1.594	1.469	.406	.375	.062	.768	.741	.406	.375	.078
7/8	0.895	.852	1.844	1.719	.469	.438	.062	.895	.865	.469	.438	.094
1	1.022	.976	2.094	1.969	.531	.500	.062	1.022	.990	.531	.500	.094

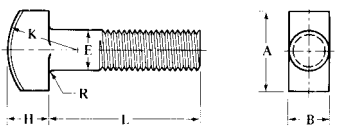
All dimensions are in inches unless otherwise specified.

Threads are Unified Standard, Class 2A, UNC Series, in accordance with ANSI B1.1. For threads with additive finish, the maximum diameters of Class 2A shall apply before plating or coating, whereas the basic diameters (Class 2A maximum diameters plus the allowance) shall apply to a bolt after plating or coating.

Bolts are designated in the sequence shown: nominal size (number, fraction or decimal equivalent); threads per inch; nominal length (fraction or decimal equivalent); product name; material; and protective finish, if required.

i.e.: ½-13 × 3 Round Head Square Neck Bolt, Steel .375-16 × 2.50 Step Bolt, Steel, Zinc Plated

American National Standard T-Head Bolts *ANSI/ASME B18.5 –1990*



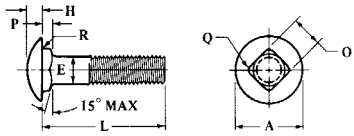
Nom. Size[a] or Basic Bolt Dia.		Body Dia., *E*		Head Length, *A*		Head Width, *B*		Head Height, *H*		Head Rad., *K*	Fillet Rad., *R*
		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Basic	Max.
1/4	0.2500	.260	.237	.500	.488	.280	.245	.204	.172	.438	.031
5/16	0.3125	.324	.298	.625	.609	.342	.307	.267	.233	.500	.031
3/8	0.3750	.388	.360	.750	.731	.405	.368	.331	.295	.625	.031
7/16	0.4375	.452	.421	.875	.853	.468	.431	.394	.356	.875	.031
1/2	0.5000	.515	.483	1.000	.975	.530	.492	.458	.418	.875	.031
5/8	0.6250	.642	.605	1.250	1.218	.675	.616	.585	.541	1.062	.062
3/4	0.7500	.768	.729	1.500	1.462	.800	.741	.649	.601	1.250	.062
7/8	0.8750	.895	.852	1.750	1.706	.938	.865	.776	.724	1.375	.062
1	1.0000	1.022	.976	2.000	1.950	1.063	.990	.903	.847	1.500	.062

[a] Where specifying nominal size in decimals, zeros preceding the decimal point and in the fourth decimal place are omitted. For information as to threads and method of bolt designation, see footnotes to preceding table.

All dimensions are given in inches.

American National Standard Round Head Short Square Neck Bolts

ANSI/ASME B18.5 –1990



Nominal Size	Body Dia., *E*		Head Dia., *A*		Head Height, *H*		Square Width, *O*		Squre Depth, *P*		Cor. Rad. on Sq., *Q*	Fillet Rad., *R*
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Max
1/4	0.260	0.213	0.594	0.563	0.145	0.125	0.260	0.245	0.124	0.093	0.031	0.031
5/16	0.324	0.272	0.719	0.688	0.176	0.156	0.324	0.307	0.124	0.093	0.031	0.031
3/8	0.388	0.329	0.844	0.782	0.208	0.188	0.388	0.368	0.156	0.125	0.047	0.031
7/16	0.452	0.385	0.969	0.907	0.239	0.219	0.452	0.431	0.156	0.125	0.047	0.031
1/2	0.515	0.444	1.094	1.032	0.270	0.250	0.515	0.492	0.156	0.125	0.047	0.031
5/8	0.642	0.559	1.344	1.219	0.344	0.313	0.642	0.616	0.218	0.187	0.078	0.062
3/4	0.768	0.678	1.594	1.469	0.406	0.375	0.768	0.741	0.218	0.187	0.078	0.062

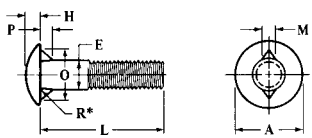
All dimensions are given in inches.

Threads are Unified Standard, Class 2A, UNC Series, in accordance with ANSI B1.1. For threads with additive finish, the maximum diameters of Class 2A apply before plating or coating, whereas the basic diameters (Class 2A maximum diameters plus the allowance) apply to a bolt after plating or coating.

Bolts are designated in the sequence shown: nominal size (number, fraction or decimal equivalent); threads per inch; nominal length (fraction or decimal equivalent); product name; material; and protective finish, if required.

i.e., 1/2-13 × 3 Round Head Short Square Neck Bolt, Steel .375-16 × 2.50 Round Head Short Square Neck Bolt, Steel, Zinc Plated

American National Standard Round Head Fin Neck Bolts *ANSI/ASME B18.5-1990*



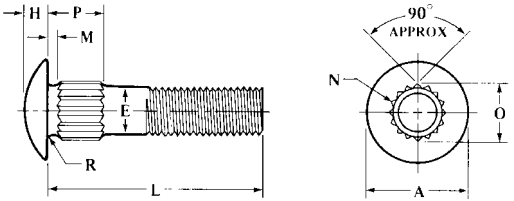
Nominal Size	Body Dia., *E*		Head Dia., *A*		Head Height, *H*		Fin Thick., *M*		Dist.Across Fins, *O*		Fin Depth, *P*	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
No. 10	0.199	0.182	0.469	0.438	0.114	0.094	0.098	0.078	0.395	0.375	0.088	0.078
1/4	0.260	0.237	0.594	0.563	0.145	0.125	0.114	0.094	0.458	0.438	0.104	0.094
5/16	0.324	0.298	0.719	0.688	0.176	0.156	0.145	0.125	0.551	0.531	0.135	0.125
3/8	0.388	0.360	0.844	0.782	0.208	0.188	0.161	0.141	0.645	0.625	0.151	0.141
7/16	0.452	0.421	0.969	0.907	0.239	0.219	0.192	0.172	0.739	0.719	0.182	0.172
1/2	0.515	0.483	1.094	1.032	0.270	0.250	0.208	0.188	0.833	0.813	0.198	0.188

All dimensions are given in inches unless otherwise specified.

*Maximum fillet radius *R* is 0.031 inch for all sizes.

For information as to threads and method of bolt designation, see foonotes to the preceding table.

American National Standard Round Head Ribbed Neck Bolts *ANSI/ASME B18.5 –1990*



Nominal Size[a] or Basic Bolt Diameter		Body Diameter, *E*		Head Diameter, *A*		Head Height, *H*		Head to Ribs, *M*		Number of Ribs, *N*	Dia. Over Ribs, *O*	Depth Over Ribs, *P*			Fillet Radius, *R*
								For Lengths of				For Lengths of			
								⅞ in. and Shorter	1 in. and Longer			⅞ in. and Shorter	1 in. and 1⅛ in.	¼ in. and Longer	
		Max	Min	Max	Min	Max	Min	±0.031[b]		Approx	Min	±0.031			Max[c]
No. 10	0.1900	0.199	0.182	0.469	0.438	0.114	0.094	0.031†	0.063	9	0.210	0.250	0.407	0.594	0.031
¼	0.2500	0.260	0.237	0.594	0.563	0.145	0.125	0.031†	0.063	10	0.274	0.250	0.407	0.594	0.031
5/16	0.3125	0.324	0.298	0.719	0.688	0.176	0.156	0.031†	0.063	12	0.340	0.250	0.407	0.594	0.031
⅜	0.3750	0.388	0.360	0.844	0.782	0.208	0.188	0.031†	0.063	12	0.405	0.250	0.407	0.594	0.031
7/16	0.4375	0.452	0.421	0.969	0.907	0.239	0.219	0.031†	0.063	14	0.470	0.250	0.407	0.594	0.031
½	0.5000	0.515	0.483	1.094	1.032	0.270	0.250	0.031†	0.063	16	0.534	0.250	0.407	0.594	0.031
⅝	0.6250	0.642	0.605	1.344	1.219	0.344	0.313	0.094	0.094	19	0.660	0.313	0.438	0.625	0.062
¾	0.7500	0.768	0.729	1.594	1.469	0.406	0.375	0.094	0.094	22	0.785	0.313	0.438	0.625	0.062

[a] Where specifying nominal size in decimals, zeros preceding decimal and in the fourth decimal place shall be omitted.

[b] Tolerance on the No. 10 through ½ in. sizes for nominal lengths ⅞ in. and shorter shall be + 0.031 and – 0.000.

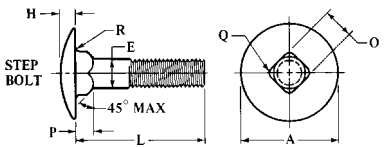
[c] The minimum radius is one half of the value shown.

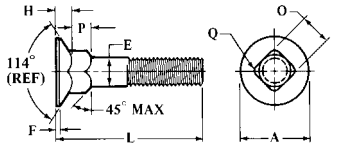
All dimensions are given in inches unless otherwise specified.

For information as to threads and method of designating bolts, see following table.

American National Standard Step and 114 Degree Countersunk Square Neck Bolts

ANSI/ASME B18.5 –1990





114 DEGREE COUNTERSUNK SQUARE NECK BOLT

Nominal Size	Step & 114° Countersunk Bolts					Step Bolts							114° Countersunk Square Neck Bolts						
	Body Dia., *E*		Corner Rad. on Square, *Q*	Width of Square, *O*		Depth of Square, *P*		Dia. of Head, *A*		Height of Head, *H*		Fillet Radius, *R*	Depth of Square, *P*		Dia. of Head, *A*		Flat on Head, *F*	Height of Head, *H*	
	Max.	Min.	Max.	Min.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Max.	Min.	Max.	Min.	Min.	Max.	Min.
No. 10	0.199	0.182	0.031	0.199	0.185	0.125	0.094	0.656	0.625	0.114	0.094	0.031	0.125	0.094	0.548	0.500	0.015	0.131	0.112
¼	0.260	0.237	0.031	0.260	0.245	0.156	0.125	0.844	0.813	0.145	0.125	0.031	0.156	0.125	0.682	0.625	0.018	0.154	0.135
5/16	0.324	0.298	0.031	0.324	0.307	0.187	0.156	1.031	1.000	0.176	0.156	0.031	0.219	0.188	0.821	0.750	0.023	0.184	0.159
⅜	0.388	0.360	0.047	0.388	0.368	0.219	0.188	1.219	1.188	0.208	0.188	0.031	0.250	0.219	0.960	0.875	0.027	0.212	0.183
7/16	0.452	0.421	0.047	0.452	0.431	0.250	0.219	1.406	1.375	0.239	0.219	0.031	0.281	0.250	1.093	1.000	0.030	0.235	0.205
½	0.515	0.483	0.047	0.515	0.492	0.281	0.250	1.594	1.563	0.270	0.250	0.031	0.312	0.281	1.233	1.125	0.035	0.265	0.229
5/8[a]	.642	0.605	0.078	0.642	0.616	…	…	…	…	…	…	…	0.406	0.375	1.495	1.375	0.038	0.316	0.272
¾[a]	0.768	0.729	0.078	0.768	0.741	…	…	…	…	…	…	…	0.500	0.469	10.754	1.625	0.041	0.368	0.314

[a] These sizes pertain to 114 degree countersunk square neck bolts only. Dimensions given in last seven columns to the right are for these bolts only.

All dimensions are in inches unless otherwise specified.

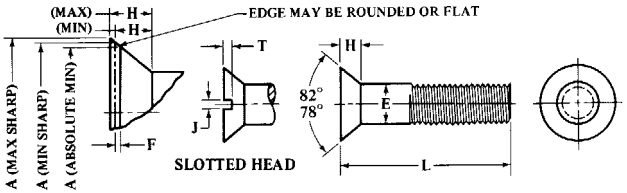
Threads are Unified Standard, Class 2A, UNC Series, in accordance with ANSI B1.1. For threads with additive finish, the maximum diameters of Class 2A shall apply before plating or coating, whereas the basic diameters (Class 2A maximum diameters plus the allowance) shall apply to a bolt after plating or coating.

Bolts are designated in the sequence shown: nominal size (number, fraction or decimal equivalent); threads per inch; nominal length (fraction or decimal equivalent); product name; material; and protective finish, if required. For example

½-13 × 3 Round Head Square Neck Bolt, Steel .375-16 × 2.50 Step Bolt, Steel, Zinc Plated

American National Standard Countersunk Bolts and Slotted Countersunk Bolts

ANSI/ASME B18.5–1990



Nominal Size[a] or Basic Bolt Diameter		Body Diameter, *E*		Head Diameter, *A*			Flat on Min Dia., Head, *F*[b]
		Max	Min	Max Edge Sharp	Min Edge Sharp	Absolute Min Edge Rounded or Flat	Max
¼	0.2500	0.260	0.237	0.493	0.477	0.445	0.018
5/16	0.3125	0.324	0.298	0.618	0.598	0.558	0.023
⅜	0.3750	0.388	0.360	0.740	0.715	0.668	0.027
7/16	0.4375	0.452	0.421	0.803	0.778	0.726	0.030
½	0.5000	0.515	0.483	0.935	0.905	0.845	0.035
5/8	0.6250	0.642	0.605	1.169	1.132	1.066	0.038
¾	0.7500	0.768	0.729	1.402	1.357	1.285	0.041
⅞	0.8750	0.895	0.852	1.637	1.584	1.511	0.042
1	1.0000	1.022	0.976	1.869	1.810	1.735	0.043
1⅛	1.1250	1.149	1.098	2.104	2.037	1.962	0.043
1¼	1.2500	1.277	1.223	2.337	2.262	2.187	0.043
1⅜	1.3750	1.404	1.345	2.571	2.489	2.414	0.043
1½	1.5000	1.531	1.470	2.804	2.715	2.640	0.043

Nom. Size or Basic Bolt Dia.		Head Height, *H*		Slot Width, *J*		Slot Depth, *T*	
		Max[c]	Min[d]	Max	Min	Max	Min
¼	0.2500	0.150	0.131	0.075	0.064	0.068	0.045
5/16	0.3125	0.189	0.164	0.084	0.072	0.086	0.057
⅜	0.3750	0.225	0.196	0.094	0.081	0.103	0.068
7/16	0.4375	0.226	0.196	0.094	0.081	0.103	0.068
½	0.5000	0.269	0.233	0.106	0.091	0.103	0.068
5/8	0.6250	0.336	0.292	0.133	0.116	0.137	0.091
¾	0.7500	0.403	0.349	0.149	0.131	0.171	0.115
⅞	0.8750	0.470	0.408	0.167	0.147	0.206	0.138
1	1.0000	0.537	0.466	0.188	0.166	0.240	0.162
1⅛	1.1250	0.604	0.525	0.196	0.178	0.257	0.173
1¼	1.2500	0.671	0.582	0.211	0.193	0.291	0.197
1⅜	1.3750	0.738	0.641	0.226	0.208	0.326	0.220
1½	1.5000	0.805	0.698	0.258	0.240	0.360	0.244

[a] Where specifying size in decimals, zeros preceding decimal and in fourth decimal place are omitted.

[b] Flat on minimum diameter head calculated on minimum sharp and absolute minimum head diameters and 82° head angle.

[c] Maximum head height calculated on maximum sharp head diameter, basic bolt diameter, and 78° head angle.

[d] Minimum head height calculated on minimum sharp head diameter, basic bolt diameter, and 82° head angle.

All dimensions are given in inches.

For thread information and method of bolt designation see foonotes to previous table.

Heads are unslotted unless otherwise specified. For slot dimensions see Table 1 in Slotted Head Cap Screw section.

Wrench Openings for Nuts *ANSI/ASME B18.2.2-1987 (R1999), Appendix*

Max.[a] Width Across Flats of Nut	Wrench Opening[b]		Max.[a] Width Across Flats of Nut	Wrench Opening[b]		Max.[a] Width Across Flats of Nut	Wrench Opening[b]	
	Min.	Max.		Min.	Max.		Min.	Max.
5/32	0.158	0.163	1 1/4	1.257	1.267	2 15/16	2.954	2.973
3/16	0.190	0.195	1 5/16	1.320	1.331	*3*	*3.016*	*3.035*
7/32	0.220	0.225	*1 3/8*	*1.383*	*1.394*	3 1/8	3.142	3.162
1/4	0.252	0.257	1 7/16	1.446	1.457	3 3/8	*3.393*	*3.414*
9/32	0.283	0.288	1 1/2	1.508	1.520	3 1/2	3.518	3.540
5/16	0.316	0.322	1 5/8	1.634	1.646	3 3/4	*3.770*	*3.793*
11/32	0.347	0.353	1 11/16	1.696	1.708	3 7/8	3.895	3.918
3/8	0.378	0.384	1 13/16	1.822	1.835	4 1/8	*4.147*	*4.172*
7/16	0.440	0.446	1 7/8	1.885	1.898	4 1/4	4.272	4.297
1/2	0.504	0.510	2	2.011	2.025	4 1/2	4.524	4.550
9/16	0.556	0.573	2 1/16	2.074	2.088	4 5/8	4.649	4.676
5/8	0.629	0.636	2 3/16	2.200	2.215	*4 7/8*	*4.900*	*4.928*
11/16	0.692	0.699	2 1/4	2.262	2.277	5	5.026	5.055
3/4	0.755	0.763	2 3/8	2.388	2.404	*5 1/4*	*5.277*	*5.307*
13/16	0.818	0.826	*2 7/16*	*2.450*	*2.466*	5 3/8	5.403	5.434
7/8	0.880	0.888	2 9/16	2.576	2.593	*5 5/8*	*5.654*	*5.686*
15/16	0.944	0.953	*2 5/8*	*2.639*	*2.656*	5 3/4	5.780	5.813
1	1.006	1.015	2 3/4	2.766	2.783	*6*	*6.031*	6.157
1/16	1.068	1.077	*2 13/16*	*2.827*	*2.845*	6 1/8	6.065	6.192
1 1/8	1.132	1.142						

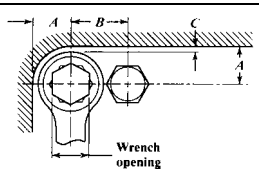
[a] Wrenches are marked with the "Nominal Size of Wrench," which is equal to the basic or maximum width across flats of the corresponding nut. Minimum wrench opening is (1.005W + 0.001). Tolerance on wrench opening is (0.005W + 0.004) from minimum, where W equals nominal size of wrench.

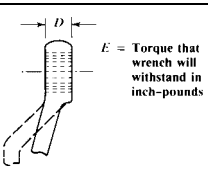
[b] Openings for 5/32 to 3/8 widths from old ASA B18.2-1960 and italic values are from former ANSI B18.2.2-1972.

All dimensions given in inches.

Wrench Clearance Dimensions.—Wrench clearances are given in Tables 1 and Tables 2. They are based on a wrench opening corresponding to the dimensions across the flats of the fastener. The listed values were obtained from a composite study of the alloy steel wrenches that are commercially available and military specifications. They are suitable for general use as minimum requirements.

Table 1. Wrench Clearances for Box Wrench—12 Point
From SAE Aeronautical Drafting Manual

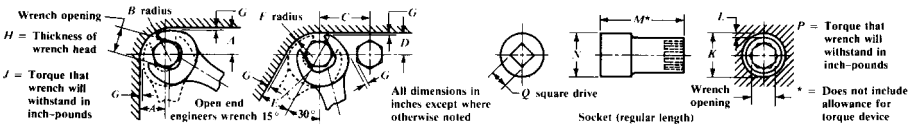




Wrench Opening	A Min.	B Min.	C Ref.	D Max.	E Min.	Wrench Opening	A Min.	B Min.	C Ref.	D Max.	E Min.
0.156	0.190	0.280	0.030	0.156	100	0.781	0.690	10.140	0.030	0.594	2600
0.188	0.200	0.309	0.030	0.172	150	0.812	0.720	10.190	0.030	0.594	3000
0.250	0.270	0.410	0.030	0.250	150	0.875	0.750	10.260	0.030	0.594	3300
0.312	0.300	0.480	0.030	0.281	210	0.938	0.780	10.320	0.030	0.656	4100
0.344	0.300	0.500	0.030	0.281	250	1.000	0.810	10.390	0.030	0.718	4900
0.375	0.340	0.560	0.030	0.344	370	1.062	0.840	10.450	0.030	0.781	5400
0.438	0.400	0.650	0.030	0.359	650	1.125	0.950	10.600	0.030	0.844	5900
0.500	0.450	0.740	0.030	0.375	1020	1.250	0.980	1.700	0.030	0.875	7200
0.562	0.500	0.830	0.030	0.406	1200	1.312	1.090	1.850	0.030	0.906	8000
0.594	0.530	0.870	0.030	0.469	1200	1.438	1.220	2.050	0.030	1.000	8400
0.625	0.560	0.920	0.030	0.469	2000	1.500	1.270	2.140	0.030	1.062	10450
0.688	0.590	0.990	0.030	0.531	2300	1.625	1.340	2.280	0.030	1.156	11750
0.750	0.660	1.090	0.030	0.594	2600	…	…	…	…	…	…

Table 2. Wrench Clearances for Open End Engineers Wrench 15° and Socket Wrench (Regular Length)

From SAE Aeronautical Drafting Manual; © Society of Automotive Engineers, Inc.



Wrench Opening	Open End Engineers Wrench 15°									Socket (Regular Length)														Wrench Opening
												Q = .250			Q = .375			Q = .500			Q = .750			
	A Min.	B Max.	C Min.	D Min.	E Max.	F Max.	G Ref.	H Max.	J Min.	K Min.	L Ref.	M Max.	N Max.	P Min.	M Max.	N Max.	P Min.	M Max.	N Max.	P Min.	M Max.	N Max.	P Min.	
.156	.220	.250	.390	.160	.250	.200	.030	.094	25	…	…	…	…	…	…	…	…	…	…	…	…	…	…	…
.188	.250	.280	.430	.190	.270	.230	.030	.172	40	.370	.030	1.000	.510	125	…	…	…	…	…	…	…	…	…	.188
.250	.280	.340	.530	.270	.310	.310	.030	.172	60	.470	.030	1.000	.510	200	1.250	.690	250	…	…	…	…	…	…	.250
.312	.380	.470	.660	.280	.390	.390	.050	.203	125	.550	.030	1.000	.510	300	1.250	.690	400	…	…	…	…	…	…	.312
.344	.420	.500	.750	.340	.450	.450	.050	.203	175	.580	.030	1.000	.519	450	1.250	.690	675	…	…	…	…	…	…	.344
.375	.420	.500	.780	.360	.450	.520	.050	.219	250	.620	.030	1.000	.580	550	1.250	.690	900	1.500	.880	1600	…	…	…	.375
.438	.470	.590	.890	.420	.520	.640	.050	.250	375	.750	.030	1.000	.683	550	1.250	.880	1250	1.500	.940	1700	…	…	…	.438
.500	.520	.640	1.000	.470	.580	.660	.050	.266	490	.810	.030	1.000	.692	600	1.250	.880	1450	1.500	.940	2000	…	…	…	.500
.562	.590	.770	1.130	.520	.660	.700	.050	.297	700	.870	.030	…	…	…	1.250	.932	1600	1.500	.940	2700	…	…	…	.562
.594	.640	.830	1.210	.530	.700	.700	.050	.344	800	.920	.030	…	…	…	1.250	.963	1750	1.562	.970	3000	…	…	…	.594
.625	.640	.830	1.230	.550	.700	.700	.050	.344	935	.950	.030	…	…	…	1.250	.995	2000	1.562	1.000	3600	…	…	…	.625
.688	.770	.920	1.470	.660	.880	.800	.060	.375	1250	1.030	.030	…	…	…	1.250	1.058	2000	1.562	1.065	4300	…	…	…	.688
.750	.770	.920	1.510	.670	.880	.800	.060	.375	1500	1.120	.030	…	…	…	1.250	1.120	2000	1.562	1.130	5000	…	…	…	.750
.781	.830	.950	1.550	.690	.890	.840	.060	.375	1615	1.150	.030	…	…	…	1.250	1.126	2000	1.625	1.130	5000	…	…	…	.781
.812	.910	1.120	1.660	.720	.970	.860	.060	.406	1710	1.200	.030	…	…	…	1.250	1.213	2000	1.625	1.222	5000	…	…	…	.812
.875	.970	1.150	1.810	.800	1.060	.910	.060	.438	2250	1.280	.030	…	…	…	…	…	…	1.750	1.285	5000	…	…	…	.875
.938	.970	1.150	1.850	.810	1.060	.950	.060	.438	2750	1.370	.030	…	…	…	…	…	…	1.750	1.410	5000	…	…	…	.938
1.000	1.050	1.230	2.000	.880	1.160	1.060	.060	.500	3250	1.470	.030	…	…	…	…	…	…	1.750	1.410	5000	…	…	…	1.000
1.062	1.090	1.250	2.100	.970	1.200	1.200	.080	.500	3500	1.550	.030	…	…	…	…	…	…	1.844	1.505	5000	…	…	…	1.062
1.125	1.140	1.370	2.210	1.000	1.270	1.230	.080	.500	4000	1.610	.030	…	…	…	…	…	…	1.938	1.567	5000	…	…	…	1.125
1.250	1.270	1.420	2.440	1.080	1.390	1.310	.080	.562	5250	1.890	.030	…	…	…	…	…	…	2.000	1.723	5000	2.375	1.855	7250	1.250
1.312	1.390	1.690	2.630	1.170	1.520	1.340	.080	.562	6000	1.980	.030	…	…	…	…	…	…	…	…	…	2.500	1.920	8000	1.312
1.438	1.470	1.720	2.800	1.250	1.590	1.340	.090	.641	7500	2.140	.030	…	…	…	…	…	…	…	…	…	2.625	2.075	9550	1.438
1.500	1.470	1.720	2.840	1.270	1.590	1.450	.090	.641	8250	2.200	.030	…	…	…	…	…	…	…	…	…	2.625	2.170	10450	1.500
1.625	1.560	1.880	3.100	1.380	1.750	1.560	.090	.641	9000	2.390	.030	…	…	…	…	…	…	…	…	…	2.750	2.325	11750	1.625

Table 1a. American National Standard Type A Plain Washers—Preferred Sizes *ANSI/ASME B18.22.1-1965 (R1998)*

Nominal Washer Size[a]		Series	Inside Diameter			Outside Diameter			Thickness		
				Tolerance			Tolerance				
			Basic	Plus	Minus	Basic	Plus	Minus	Basic	Max.	Min.
—	—		0.078	0.000	0.005	0.188	0.000	0.005	0.020	0.025	0.016
—	—		0.094	0.000	0.005	0.250	0.000	0.005	0.020	0.025	0.016
—	—		0.125	0.008	0.005	0.312	0.008	0.005	0.032	0.040	0.025
No. 6	0.138		0.156	0.008	0.005	0.375	0.015	0.005	0.049	0.065	0.036
No. 8	0.164		0.188	0.008	0.005	0.438	0.015	0.005	0.049	0.065	0.036
No. 10	0.190		0.219	0.008	0.005	0.500	0.015	0.005	0.049	0.065	0.036
3/16	0.188		0.250	0.015	0.005	0.562	0.015	0.005	0.049	0.065	0.036
No. 12	0.216		0.250	0.015	0.005	0.562	0.015	0.005	0.065	0.080	0.051
1/4	0.250	N	0.281	0.015	0.005	0.625	0.015	0.005	0.065	0.080	0.051
1/4	0.250	W	0.312	0.015	0.005	0.734[b]	0.015	0.007	0.065	0.080	0.051
5/16	0.312	N	0.344	0.015	0.005	0.688	0.015	0.007	0.065	0.080	0.051
5/16	0.312	W	0.375	0.015	0.005	0.875	0.030	0.007	0.083	0.104	0.064
3/8	0.375	N	0.406	0.015	0.005	0.812	0.015	0.007	0.065	0.080	0.051
3/8	0.375	W	0.438	0.015	0.005	1.000	0.030	0.007	0.083	0.104	0.064
7/16	0.438	N	0.469	0.015	0.005	0.922	0.015	0.007	0.065	0.080	0.051
7/16	0.438	W	0.500	0.015	0.005	1.250	0.030	0.007	0.083	0.104	0.064
1/2	0.500	N	0.531	0.015	0.005	1.062	0.030	0.007	0.095	0.121	0.074
1/2	0.500	W	0.562	0.015	0.005	1.375	0.030	0.007	0.109	0.132	0.086
9/16	0.562	N	0.594	0.015	0.005	1.156[b]	0.030	0.007	0.095	0.121	0.074
9/16	0.562	W	0.625	0.015	0.005	1.469[b]	0.030	0.007	0.109	0.132	0.086
5/8	0.625	N	0.656	0.030	0.007	1.312	0.030	0.007	0.095	0.121	0.074
5/8	0.625	W	0.688	0.030	0.007	1.750	0.030	0.007	0.134	0.160	0.108
3/4	0.750	N	0.812	0.030	0.007	1.469	0.030	0.007	0.134	0.160	0.108
3/4	0.750	W	0.812	0.030	0.007	2.000	0.030	0.007	0.148	0.177	0.122
7/8	0.875	N	0.938	0.030	0.007	1.750	0.030	0.007	0.134	0.160	0.108
7/8	0.875	W	0.938	0.030	0.007	2.250	0.030	0.007	0.165	0.192	0.136
1	1.000	N	1.062	0.030	0.007	2.000	0.030	0.007	0.134	0.160	0.108
1	1.000	W	1.062	0.030	0.007	2.500	0.030	0.007	0.165	0.192	0.136
1 1/8	1.125	N	1.250	0.030	0.007	2.250	0.030	0.007	0.134	0.160	0.108
1 1/8	1.125	W	1.250	0.030	0.007	2.750	0.030	0.007	0.165	0.192	0.136
1 1/4	1.250	N	1.375	0.030	0.007	2.500	0.030	0.007	0.165	0.192	0.136
1 1/4	1.250	W	1.375	0.030	0.007	3.000	0.030	0.007	0.165	0.192	0.136
1 3/8	1.375	N	1.500	0.030	0.007	2.750	0.030	0.007	0.165	0.192	0.136
1 3/8	1.375	W	1.500	0.045	0.010	3.250	0.045	0.010	0.180	0.213	0.153
1 1/2	1.500	N	1.625	0.030	0.007	3.000	0.030	0.007	0.165	0.192	0.136
1 1/2	1.500	W	1.625	0.045	0.010	3.500	0.045	0.010	0.180	0.213	0.153
1 5/8	1.625		1.750	0.045	0.010	3.750	0.045	0.010	0.180	0.213	0.153
1 3/4	1.750		1.875	0.045	0.010	4.000	0.045	0.010	0.180	0.213	0.153
1 7/8	1.875		2.000	0.045	0.010	4.250	0.045	0.010	0.180	0.213	0.153
2	2.000		2.125	0.045	0.010	4.500	0.045	0.010	0.180	0.213	0.153
2 1/4	2.250		2.375	0.045	0.010	4.750	0.045	0.010	0.220	0.248	0.193
2 1/2	2.500		2.625	0.045	0.010	5.000	0.045	0.010	0.238	0.280	0.210
2 3/4	2.750		2.875	0.065	0.010	5.250	0.065	0.010	0.259	0.310	0.228
3	3.000		3.125	0.065	0.010	5.500	0.065	0.010	0.284	0.327	0.249

[a] Nominal washer sizes are intended for use with comparable nominal screw or bolt sizes.

[b] The 0.734-inch, 1.156-inch, and 1.469-inch outside diameters avoid washers which could be used in coin operated devices.

All dimensions are in inches.

Preferred sizes are for the most part from series previously designated “Standard Plate” and “SAE.” Where common sizes existed in the two series, the SAE size is designated “N” (narrow) and the Standard Plate “W” (wide). These sizes as well as all other sizes of Type A Plain Washers are to be ordered by ID, OD, and thickness dimensions.

Additional selected sizes of Type A Plain Washers are shown in Table 1b.

Table 1b. American National Standard Type A Plain Washers — Additional Selected Sizes *ANSI/ASME B18.22.1-1965 (R1998)*

Inside Diameter			Outside Diameter			Thickness		
	Tolerance			Tolerance				
Basic	Plus	Minus	Basic	Plus	Minus	Basic	Max.	Min.
0.094	0.000	0.005	0.219	0.000	0.005	0.020	0.025	0.016
0.125	0.000	0.005	0.250	0.000	0.005	0.022	0.028	0.017
0.156	0.008	0.005	0.312	0.008	0.005	0.035	0.048	0.027
0.172	0.008	0.005	0.406	0.015	0.005	0.049	0.065	0.036
0.188	0.008	0.005	0.375	0.015	0.005	0.049	0.065	0.036
0.203	0.008	0.005	0.469	0.015	0.005	0.049	0.065	0.036
0.219	0.008	0.005	0.438	0.015	0.005	0.049	0.065	0.036
0.234	0.008	0.005	0.531	0.015	0.005	0.049	0.065	0.036
0.250	0.015	0.005	0.500	0.015	0.005	0.049	0.065	0.036
0.266	0.015	0.005	0.625	0.015	0.005	0.049	0.065	0.036
0.312	0.015	0.005	0.875	0.015	0.007	0.065	0.080	0.051
0.375	0.015	0.005	0.734[a]	0.015	0.007	0.065	0.080	0.051
0.375	0.015	0.005	1.125	0.015	0.007	0.065	0.080	0.051
0.438	0.015	0.005	0.875	0.030	0.007	0.083	0.104	0.064
0.438	0.015	0.005	1.375	0.030	0.007	0.083	0.104	0.064
0.500	0.015	0.005	1.125	0.030	0.007	0.083	0.104	0.064
0.500	0.015	0.005	1.625	0.030	0.007	0.083	0.104	0.064
0.562	0.015	0.005	1.250	0.030	0.007	0.109	0.132	0.086
0.562	0.015	0.005	1.875	0.030	0.007	0.109	0.132	0.086
0.625	0.015	0.005	1.375	0.030	0.007	0.109	0.132	0.086
0.625	0.015	0.005	2.125	0.030	0.007	0.134	0.160	0.108
0.688	0.030	0.007	1.469[a]	0.030	0.007	0.134	0.160	0.108
0.688	0.030	0.007	2.375	0.030	0.007	0.165	0.192	0.136
0.812	0.030	0.007	1.750	0.030	0.007	0.148	0.177	0.122
0.812	0.030	0.007	2.875	0.030	0.007	0.165	0.192	0.136
0.938	0.030	0.007	2.000	0.030	0.007	0.165	0.192	0.136
0.938	0.030	0.007	3.375	0.045	0.010	0.180	0.213	0.153
1.062	0.030	0.007	2.250	0.030	0.007	0.165	0.192	0.136
1.062	0.045	0.010	3.875	0.045	0.010	0.238	0.280	0.210
1.250	0.030	0.007	2.500	0.030	0.007	0.165	0.192	0.136
1.375	0.030	0.007	2.750	0.030	0.007	0.165	0.192	0.136
1.500	0.045	0.010	3.000	0.045	0.010	0.180	0.213	0.153
1.625	0.045	0.010	3.250	0.045	0.010	0.180	0.213	0.153
1.688	0.045	0.010	3.500	0.045	0.010	0.180	0.213	0.153
1.812	0.045	0.010	3.750	0.045	0.010	0.180	0.213	0.153
1.938	0.045	0.010	4.000	0.045	0.010	0.180	0.213	0.153
2.062	0.045	0.010	4.250	0.045	0.010	0.180	0.213	0.153

[a] The 0.734-inch and 1.469-inch outside diameters avoid washers which could be used in coin operated devices.

All dimensions are in inches.

The above sizes are to be ordered by ID, OD, and thickness dimensions.

Preferred Sizes of Type A Plain Washers are shown in Table 1a.

ANSI Standard Plain Washers.—The Type A plain washers were originally developed in a light, medium, heavy and extra heavy series. These series have been discontinued and the washers are now designated by their nominal dimensions.

The Type B plain washers are available in a narrow, regular and wide series with proportions designed to distribute the load over larger areas of lower strength materials.

Plain washers are made of ferrous or non-ferrous metal, plastic or other material as specified. The tolerances indicated in the tables are intended for metal washers only.

Table 2. American National Standard Type B Plain Washers —

Nominal Washer Size[a]		Series[b]	Inside Diameter			Outside Diameter			Thickness		
				Tolerance			Tolerance				
			Basic	Plus	Minus	Basic	Plus	Minus	Basic	Max.	Min.
		N	0.068	0.000	0.005	0.125	0.000	0.005	0.025	0.028	0.022
No. 0	0.060	R	0.068	0.000	0.005	0.188	0.000	0.005	0.025	0.028	0.022
		W	0.068	0.000	0.005	0.250	0.000	0.005	0.025	0.028	0.022
		N	0.084	0.000	0.005	0.156	0.000	0.005	0.025	0.028	0.022
No. 1	0.073	R	0.084	0.000	0.005	0.219	0.000	0.005	0.025	0.028	0.022
		W	0.084	0.000	0.005	0.281	0.000	0.005	0.032	0.036	0.028
		N	0.094	0.000	0.005	0.188	0.000	0.005	0.025	0.028	0.022
No. 2	0.086	R	0.094	0.000	0.005	0.250	0.000	0.005	0.032	0.036	0.028
		W	0.094	0.000	0.005	0.344	0.000	0.005	0.032	0.036	0.028
		N	0.109	0.000	0.005	0.219	0.000	0.005	0.025	0.028	0.022
No. 3	0.099	R	0.109	0.000	0.005	0.312	0.000	0.005	0.032	0.036	0.028
		W	0.109	0.008	0.005	0.406	0.008	0.005	0.040	0.045	0.036
		N	0.125	0.000	0.005	0.250	0.000	0.005	0.032	0.036	0.028
No. 4	0.112	R	0.125	0.008	0.005	0.375	0.008	0.005	0.040	0.045	0.036
		W	0.125	0.008	0.005	0.438	0.008	0.005	0.040	0.045	0.036
		N	0.141	0.000	0.005	0.281	0.000	0.005	0.032	0.036	0.028
No. 5	0.125	R	0.141	0.008	0.005	0.406	0.008	0.005	0.040	0.045	0.036
		W	0.141	0.008	0.005	0.500	0.008	0.005	0.040	0.045	0.036
		N	0.156	0.000	0.005	0.312	0.000	0.005	0.032	0.036	0.028
No. 6	0.138	R	0.156	0.008	0.005	0.438	0.008	0.005	0.040	0.045	0.036
		W	0.156	0.008	0.005	0.562	0.008	0.005	0.040	0.045	0.036
		N	0.188	0.008	0.005	0.375	0.008	0.005	0.040	0.045	0.036
No. 8	0.164	R	0.188	0.008	0.005	0.500	0.008	0.005	0.040	0.045	0.036
		W	0.188	0.008	0.005	0.625	0.015	0.005	0.063	0.071	0.056
		N	0.203	0.008	0.005	0.406	0.008	0.005	0.040	0.045	0.036
No. 10	0.190	R	0.203	0.008	0.005	0.562	0.008	0.005	0.040	0.045	0.036
		W	0.203	0.008	0.005	0.734[c]	0.015	0.007	0.063	0.071	0.056
		N	0.234	0.008	0.005	0.438	0.008	0.005	0.040	0.045	0.036
No. 12	0.216	R	0.234	0.008	0.005	0.625	0.015	0.005	0.063	0.071	0.056
		W	0.234	0.008	0.005	0.875	0.015	0.007	0.063	0.071	0.056
		N	0.281	0.015	0.005	0.500	0.015	0.005	0.063	0.071	0.056
1/4	0.250	R	0.281	0.015	0.005	0.734[c]	0.015	0.007	0.063	0.071	0.056
		W	0.281	0.015	0.005	1.000	0.015	0.007	0.063	0.071	0.056
		N	0.344	0.015	0.005	0.625	0.015	0.005	0.063	0.071	0.056
5/16	0.312	R	0.344	0.015	0.005	0.875	0.015	0.007	0.063	0.071	0.056
		W	0.344	0.015	0.005	1.125	0.015	0.007	0.063	0.071	0.056
		N	0.406	0.015	0.005	0.734[c]	0.015	0.007	0.063	0.071	0.056
3/8	0.375	R	0.406	0.015	0.005	1.000	0.015	0.007	0.063	0.071	0.056
		W	0.406	0.015	0.005	1.250	0.030	0.007	0.100	0.112	0.090
		N	0.469	0.015	0.005	0.875	0.015	0.007	0.063	0.071	0.056
7/16	0.438	R	0.469	0.015	0.005	1.125	0.015	0.007	0.063	0.071	0.056
		W	0.469	0.015	0.005	1.469[c]	0.030	0.007	0.100	0.112	0.090
		N	0.531	0.015	0.005	1.000	0.015	0.007	0.063	0.071	0.056
1/2	0.500	R	0.531	0.015	0.005	1.250	0.030	0.007	0.100	0.112	0.090
		W	0.531	0.015	0.005	1.750	0.030	0.007	0.100	0.112	0.090
		N	0.594	0.015	0.005	1.125	0.015	0.007	0.063	0.071	0.056
9/16	0.562	R	0.594	0.015	0.005	1.469[c]	0.030	0.007	0.100	0.112	0.090
		W	0.594	0.015	0.005	2.000	0.030	0.007	0.100	0.112	0.090
		N	0.656	0.030	0.007	1.250	0.030	0.007	0.100	0.112	0.090
5/8	0.625	R	0.656	0.030	0.007	1.750	0.030	0.007	0.100	0.112	0.090
		W	0.656	0.030	0.007	2.250	0.030	0.007	0.160	0.174	0.146
		N	0.812	0.030	0.007	1.375	0.030	0.007	0.100	0.112	0.090
3/4	0.750	R	0.812	0.030	0.007	2.000	0.030	0.007	0.100	0.112	0.090
		W	0.812	0.030	0.007	2.500	0.030	0.007	0.160	0.174	0.146
		N	0.938	0.030	0.007	1.469[c]	0.030	0.007	0.100	0.112	0.090
7/8	0.875	R	0.938	0.030	0.007	2.250	0.030	0.007	0.160	0.174	0.146
		W	0.938	0.030	0.007	2.750	0.030	0.007	0.160	0.174	0.146
		N	1.062	0.030	0.007	1.750	0.030	0.007	0.100	0.112	0.090
1	1.000	R	1.062	0.030	0.007	2.500	0.030	0.007	0.160	0.174	0.146
		W	1.062	0.030	0.007	3.000	0.030	0.007	0.160	0.174	0.146
		N	1.188	0.030	0.007	2.000	0.030	0.007	0.100	0.112	0.090
1 1/8	1.125	R	1.188	0.030	0.007	2.750	0.030	0.007	0.160	0.174	0.146
		W	1.188	0.030	0.007	3.250	0.030	0.007	0.160	0.174	0.146

Table 2. *(Continued)* **American National Standard Type B Plain Washers —**

Nominal Washer Size[a]		Series[b]	Inside Diameter			Outside Diameter			Thickness		
			Basic	Tolerance Plus	Tolerance Minus	Basic	Tolerance Plus	Tolerance Minus	Basic	Max.	Min.
		N	1.312	0.030	0.007	2.250	0.030	0.007	0.160	0.174	0.146
1¼	1.250	R	1.312	0.030	0.007	3.000	0.030	0.007	0.160	0.174	0.146
		W	1.312	0.045	0.010	3.500	0.045	0.010	0.250	0.266	0.234
		N	1.438	0.030	0.007	2.500	0.030	0.007	0.160	0.174	0.146
1⅜	1.375	R	1.438	0.030	0.007	3.250	0.030	0.007	0.160	0.174	0.146
		W	1.438	0.045	0.010	3.750	0.045	0.010	0.250	0.266	0.234
		N	1.562	0.030	0.007	2.750	0.030	0.007	0.160	0.174	0.146
1½	1.500	R	1.562	0.045	0.010	3.500	0.045	0.010	0.250	0.266	0.234
		W	1.562	0.045	0.010	4.000	0.045	0.010	0.250	0.266	0.234
		N	1.750	0.030	0.007	3.000	0.030	0.007	0.160	0.174	0.146
1⅝	1.625	R	1.750	0.045	0.010	3.750	0.045	0.010	0.250	0.266	0.234
		W	1.750	0.045	0.010	4.250	0.045	0.010	0.250	0.266	0.234
		N	1.875	0.030	0.007	3.250	0.030	0.007	0.160	0.174	0.146
1¾	1.750	R	1.875	0.045	0.010	4.000	0.045	0.010	0.250	0.266	0.234
		W	1.875	0.045	0.010	4.500	0.045	0.010	0.250	0.266	0.234
		N	2.000	0.045	0.010	3.500	0.045	0.010	0.250	0.266	0.234
1⅞	1.875	R	2.000	0.045	0.010	4.250	0.045	0.010	0.250	0.266	0.234
		W	2.000	0.045	0.010	4.750	0.045	0.010	0.250	0.266	0.234
		N	2.125	0.045	0.010	3.750	0.045	0.010	0.250	0.266	0.234
2	2.000	R	2.125	0.045	0.010	4.500	0.045	0.010	0.250	0.266	0.234
		W	2.125	0.045	0.010	5.000	0.045	0.010	0.250	0.266	0.234

[a] Nominal washer sizes are intended for use with comparable nominal screw or bolt sizes.

[b] N indicates Narrow; R, Regular; and W, Wide Series.

[c] The 0.734-inch and 1.469-inch outside diameter avoids washers which could be used in coin operated devices.

All dimensions are in inches.

Inside and outside diameters shall be concentric within at least the inside diameter tolerance.

Washers shall be flat within 0.005-inch for basic outside diameters up through 0.875-inch and within 0.010 inch for larger outside diameters.

For 2¼-, 2½- , 2¾-, and 3-inch sizes see ANSI/ASME B18.22.1-1965 (R1998).

American National Standard Helical Spring and Tooth Lock Washers ANSI/ASME B18.21.1-1994.—This standard covers helical spring lock washers of carbon steel; boron steel; corrosion resistant steel, Types 302 and 305; aluminum-zinc alloy; phosphor-bronze; silicon-bronze; and K-Monel; in various series. Tooth lock washers of carbon steel having internal teeth, external teeth, and both internal and external teeth, of two constructions, designated as Type A and Type B. Washers intended for general industrial application are also covered. American National Standard Lock Washers (Metric Series) ANSI/ASME B18.21.2M-1994 covers metric sizes for helical spring and tooth lock washers.

Helical spring lock washers: These washers are used to provide: 1) good bolt tension per unit of applied torque for tight assemblies; 2) hardened bearing surfaces to create uniform torque control; 3) uniform load distribution through controlled radii—section—cut-off; and 4) protection against looseness resulting from vibration and corrosion.

Nominal washer sizes are intended for use with comparable nominal screw or bolt sizes. These washers are designated by the following data in the sequence shown: Product name; nominal size (number, fraction or decimal equivalent); series; material;and protective finish, if required. For example: Helical Spring Lock Washer, 0.375 Extra Duty, Steel, Phosphate Coated.

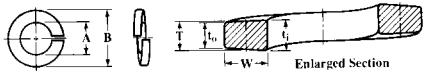
Helical spring lock washers are available in four series: Regular, heavy, extra duty and hi-collar as given in Tables 2 and 1. Helical spring lock washers made of materials other than carbon steel are available in the regular series as given in Table 2.

Table 1. American National Standard Hi-Collar Helical Spring Lock Washers
ANSI/ASME B18.21.1-1994

Nominal Washer Size		Inside Diameter		Outside Diameter	Washer Section	
					Width	Thickness[a]
		Min.	Max.	Max.	Min.	Min.
No. 4	0.112	0.114	0.120	0.173	0.022	0.022
No. 5	0.125	0.127	0.133	0.202	0.030	0.030
No. 6	0.138	0.141	0.148	0.216	0.030	0.030
No. 8	0.164	0.167	0.174	0.267	0.042	0.047
No. 10	0.190	0.193	0.200	0.294	0.042	0.047
1/4	0.250	0.252	0.260	0.363	0.047	0.078
5/16	0.3125	0.314	0.322	0.457	0.062	0.093
3/8	0.375	0.377	0.385	0.550	0.076	0.125
7/16	0.4375	0.440	0.450	0.644	0.090	0.140
1/2	0.500	0.502	0.512	0.733	0.103	0.172
5/8	0.625	0.628	0.640	0.917	0.125	0.203
3/4	0.750	0.753	0.765	1.105	0.154	0.218
7/8	0.875	0.878	0.890	1.291	0.182	0.234
1	1.000	1.003	1.015	1.478	0.208	0.250
1 1/8	1.125	1.129	1.144	1.663	0.236	0.313
1 1/4	1.250	1.254	1.272	1.790	0.236	0.313
1 3/8	1.375	1.379	1.399	2.031	0.292	0.375
1 1/2	1.500	1.504	1.524	2.159	0.292	0.375
1 3/4	1.750	1.758	1.778	2.596	0.383	0.469
2	2.000	2.008	2.028	2.846	0.383	0.469
2 1/4	2.250	2.262	2.287	3.345	0.508	0.508
2 1/2	2.500	2.512	2.537	3.559	0.508	0.508
2 3/4	2.750	2.762	2.787	4.095	0.633	0.633
3	3.000	3.012	3.037	4.345	0.633	0.633

[a] Mean section thickness = (inside thickness + outside thickness) ÷ 2.

Table 2. American National Standard Helical Spring Lock Washers *ANSI/ASME B18.21.1-1994*



Nominal Washer Size		Inside Diameter, *A*		Regular			Heavy			Extra Duty		
		Max.	Min.	O.D., *B* Max.	Section Width, *W*	Section Thickness, *T*[a]	O.D., *B* Max.	Section Width, *W*	Section Thickness, *T*[a]	O.D., *B* Max.	Section Width, *W*	Section Thickness, *T*[a]
No. 2	0.086	0.094	0.088	0.172	0.035	0.020	0.182	0.040	0.025	0.208	0.053	0.027
No. 3	0.099	0.107	0.101	0.195	0.040	0.025	0.209	0.047	0.031	0.239	0.062	0.034
No. 4	0.112	0.120	0.114	0.209	0.040	0.025	0.223	0.047	0.031	0.253	0.062	0.034
No. 5	0.125	0.133	0.127	0.236	0.047	0.031	0.252	0.055	0.040	0.300	0.079	0.045
No. 6	0.138	0.148	0.141	0.250	0.047	0.031	0.266	0.055	0.040	0.314	0.079	0.045
No. 8	0.164	0.174	0.167	0.293	0.055	0.040	0.307	0.062	0.047	0.375	0.096	0.057
No. 10	0.190	0.200	0.193	0.334	0.062	0.047	0.350	0.070	0.056	0.434	0.112	0.068
No. 12	0.216	0.227	0.220	0.377	0.070	0.056	0.391	0.077	0.063	0.497	0.130	0.080
1/4	0.250	0.060	0.252	0.487	0.109	0.062	0.489	0.110	0.077	0.533	0.132	0.084
5/16	0.3125	0.322	0.314	0.583	0.125	0.078	0.293	0.130	0.097	0.619	0.143	0.108
3/8	0.375	0.385	0.377	0.680	0.141	0.094	0.688	0.145	0.115	0.738	0.170	0.123
7/16	0.4375	0.450	0.440	0.776	0.156	0.109	0.784	0.160	0.133	0.836	0.186	0.143
1/2	0.500	0.512	0.502	0.869	0.171	0.125	0.879	0.176	0.151	0.935	0.204	0.162
9/16	0.5625	0.574	0.564	0.965	0.188	0.141	0.975	0.193	0.170	1.035	0.223	0.182
5/8	0.625	0.641	0.628	1.073	0.203	0.156	1.087	0.210	0.189	1.151	0.242	0.202
11/16	0.6875	0.704	0.691	1.170	0.219	0.172	1.186	0.227	0.207	1.252	0.260	0.221
3/4	0.750	0.766	0.753	1.265	0.234	0.188	1.285	0.244	0.226	1.355	0.279	0.241
13/16	0.8125	0.832	0.816	1.363	0.250	0.203	1.387	0.262	0.246	1.458	0.298	0.261
7/8	0.875	0.894	0.878	1.459	0.266	0.219	1.489	0.281	0.266	1.571	0.322	0.285
15/16	0.9375	0.958	0.941	1.556	0.281	0.234	1.590	0.298	0.284	1.684	0.345	0.308
1	1.000	1.024	1.003	1.656	0.297	0.250	1.700	0.319	0.306	1.794	0.366	0.330
1 1/16	1.0625	1.087	1.066	1.751	0.312	0.266	1.803	0.338	0.326	1.905	0.389	0.352
1 1/8	1.125	1.153	1.129	1.847	0.328	0.281	1.903	0.356	0.345	2.013	0.411	0.375
1 3/16	1.1875	1.217	1.192	1.943	0.344	0.297	2.001	0.373	0.364	2.107	0.431	0.396
1 1/4	1.250	1.280	1.254	2.036	0.359	0.312	2.104	0.393	0.384	2.222	0.452	0.417
1 5/16	1.3125	1.344	1.317	2.133	0.375	0.328	2.203	0.410	0.403	2.327	0.472	0.438
1 3/8	1.375	1.408	1.379	2.219	0.391	0.344	2.301	0.427	0.422	2.429	0.491	0.458
1 7/16	1.4375	1.472	1.442	2.324	0.406	0.359	2.396	0.442	0.440	2.530	0.509	0.478
1 1/2	1.500	1.534	1.504	2.419	0.422	0.375	2.491	0.458	0.458	2.627	0.526	0.496

[a] T = mean section thickness $= (t_i + t_o) \div 2$.

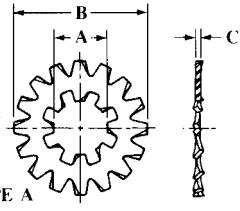
All dimensions are given in inches.*See ANSI/ASME B18.21.1-1994 standard for sizes over 1½ to 3, inclusive, for regular and heavy helical spring lock washers and over 1½ to 2, inclusive, for extra-duty helical spring lock washers.

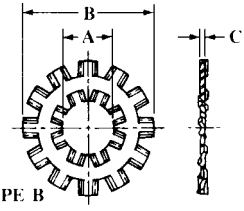
When carbon steel helical spring lock washers are to be hot-dipped galvanized for use with hot-dipped galvanized bolts or screws, they are to be coiled to limits onto inch in excess of those specified in Tables 2 and 1 for minimum inside diameter and maximum outside diameter. Galvanizing washers under ¼ inch nominal size are not recommended.

Tooth lock washers: These washers serve to lock fasteners, such as bolts and nuts, to the component parts of an assembly, or increase the friction between the fasteners and the assembly. They are designated in a manner similar to helical spring lock washers, and are available in carbon steel. Dimensions are given in Tables 3 and 4.

Table 3. American National Standard Internal-External Tooth Lock Washers
ANSI/ASME B18.21.1-1994

All dimensions are given in inches except whole numbers under "Size"

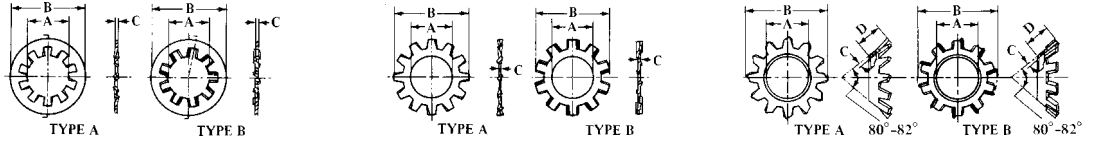




Size	A Inside Diameter Max.	A Inside Diameter Min.	B Outside Diameter Max.	B Outside Diameter Min.	C Thickness Max.	C Thickness Min.
			.475	.460	.021	.016
No. 4	.123	.115	.510	.495	.021	.017
			.610	.580	.021	.017
			.510	.495	.028	.023
No. 6	.150	.141	.610	.580	.028	.023
			.690	.670	.028	.023
			.610	.580	.034	.028
No. 8	.176	.168	.690	.670	.034	.028
			.760	.740	.034	.028
			.610	.580	.034	.028
			.690	.670	.040	.032
No. 10	.204	.195	.760	.740	.040	.032
			.900	.880	.040	.032
			.690	.670	.040	.032
No. 12	.231	.221	.760	.725	.040	.032
			.900	.880	.040	.032
			.985	.965	.045	.037
			.760	.725	.040	.032
			.900	.880	.045	.037
¼	.267	.256	.985	.965	.045	.037
			1.070	1.045	.045	.037

Size	A Inside Diameter Max.	A Inside Diameter Min.	B Outside Diameter Max.	B Outside Diameter Min.	C Thickness Max.	C Thickness Min.
			.900	.865	.040	.032
5/16	.332	.320	.985	.965	.045	.037
			1.070	1.045	.050	.042
			1.155	1.130	.050	.042
			.985	.965	.045	.037
3/8	.398	.384	1.070	1.045	.050	.042
			1.070	1.130	.050	.042
			1.260	1.220	.050	.042
			1.070	1.045	.050	.042
7/16	.464	.448	1.155	1.130	.050	.042
			1.260	1.220	.055	.047
			1.315	1.290	.055	.047
			1.260	1.220	.055	.047
			1.315	1.290	.055	.047
½	.530	.512	1.410	1.380	.060	.052
			1.620	1.590	.067	.059
			1.315	1.290	.055	.047
			1.430	1.380	.060	.052
9/16	.596	.576	1.620	1.590	.067	.059
			1.830	1.797	.067	.059
			1.410	1.380	.060	.052
			1.620	1.590	.067	.059
5/8	.663	.640	1.830	1.797	.067	.059
			1.975	1.935	.067	.059

Table 4. American National Standard Internal and External Tooth Lock Washers *ANSI/ASME B18.21.1-1994*



Internal Tooth Lock Washers

	Size	#2	#3	#4	#5	#6	#8	#10	#12	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16	7/8	1	1 1/8	1 1/4
A	Max	0.095	0.109	0.123	0.136	0.150	0.176	0.204	0.231	0.267	0.332	0.398	0.464	0.530	0.596	0.663	0.728	0.795	0.861	0.927	1.060	1.192	1.325
	Min	0.089	0.102	0.115	0.129	0.141	0.168	0.195	0.221	0.256	0.320	0.384	0.448	0.512	0.576	0.640	0.704	0.769	0.832	0.894	1.019	1.144	1.275
B	Max	0.200	0.232	0.270	0.280	0.295	0.340	0.381	0.410	0.478	0.610	0.692	0.789	0.900	0.985	1.071	1.166	1.245	1.315	1.410	1.637	1.830	1.975
	Min	0.175	0.215	0.245	0.255	0.275	0.325	0.365	0.394	0.460	0.594	0.670	0.740	0.867	0.957	1.045	1.130	1.220	1.290	1.364	1.590	1.799	1.921
C	Max	0.015	0.019	0.019	0.021	0.021	0.023	0.025	0.025	0.028	0.034	0.040	0.040	0.045	0.045	0.050	0.050	0.055	0.055	0.060	0.067	0.067	0.067
	Min	0.010	0.012	0.015	0.017	0.017	0.018	0.020	0.020	0.023	0.028	0.032	0.032	0.037	0.037	0.042	0.042	0.047	0.047	0.052	0.059	0.059	0.059

External Tooth Lock Washers

A	Max	…	0.109	0.123	0.136	0.150	0.176	0.204	0.231	0.267	0.332	0.398	0.464	0.530	0.596	0.663	0.728	0.795	0.861	0.927	1.060	…	…
	Min	…	0.102	0.115	0.129	0.141	0.168	0.195	0.221	0.256	0.320	0.384	0.448	0.513	0.576	0.641	0.704	0.768	0.833	0.897	1.025	…	…
B	Max	…	0.235	0.260	0.285	0.320	0.381	0.410	0.475	0.510	0.610	0.694	0.760	0.900	0.985	1.070	1.155	1.260	1.315	1.410	1.620	…	…
	Min	…	0.220	0.245	0.270	0.305	0.365	0.395	0.460	0.494	0.588	0.670	0.740	0.880	0.960	1.045	1.130	1.220	1.290	1.380	1.590	…	…
C	Max	…	0.015	0.019	0.019	0.022	0.023	0.025	0.028	0.028	0.034	0.040	0.040	0.045	0.045	0.050	0.050	0.055	0.055	0.060	0.067	…	…
	Min	…	0.012	0.014	0.015	0.016	0.018	0.020	0.023	0.023	0.028	0.032	0.032	0.037	0.037	0.042	0.042	0.047	0.047	0.052	0.059	…	…

Heavy Internal Tooth Lock Washers

	Size	1/4	5/16	3/8	7/16	1/2	9/16	5/8	3/4	7/8
A	Max	0.267	0.332	0.398	0.464	0.530	0.596	0.663	0.795	0.927
	Min	0.256	0.320	0.384	0.448	0.512	0.576	0.640	0.768	0.894
B	Max	0.536	0.607	0.748	0.858	0.924	1.034	1.135	1.265	1.447
	Min	0.500	0.590	0.700	0.800	0.880	0.990	1.100	1.240	1.400
C	Max	0.045	0.050	0.050	0.067	0.067	0.067	0.084	0.084	0.084
	Min	0.035	0.040	0.042	0.050	0.055	0.055	0.059	0.070	0.075

Countersunk External Tooth Lock Washers[a]

	Size	#4	#6	#8	#10	#12	1/4	#16	5/16	3/8	7/16	1/2
A	Max	0.123	0.150	0.177	0.205	0.231	0.267	0.287	0.333	0.398	0.463	0.529
	Min	0.113	0.140	0.167	0.195	0.220	0.255	0.273	0.318	0.383	0.448	0.512
C	Max	0.019	0.021	0.021	0.025	0.025	0.025	0.028	0.028	0.034	0.045	0.045
	Min	0.015	0.017	0.017	0.020	0.020	0.020	0.023	0.023	0.028	0.037	0.037
D	Max	0.065	0.092	0.105	0.099	0.128	0.128	0.147	0.192	0.255	0.270	0.304
	Min	0.050	0.082	0.088	0.083	0.118	0.113	0.137	0.165	0.242	0.260	0.294

[a] Starting with #4, approx. O.D.'s are: 0.213, 0.289, 0.322, 0.354, 0.421 0.454, 0.505, 0.599, 0.765, 0.867, and 0.976.

All dimensions are given in inches.