

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.*)

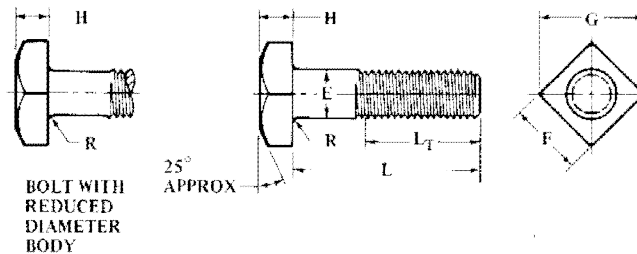


Fig. 1. Square Bolts (Table 1)

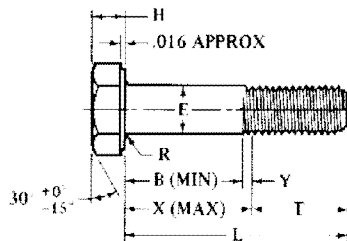


Fig. 2. Heavy Hex Structural Bolts (Table 2)

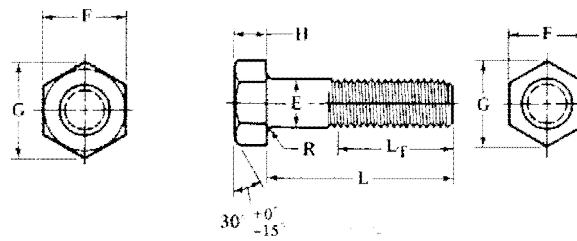


Fig. 3. Hex Bolts, Heavy Hex Bolts (Table 3)

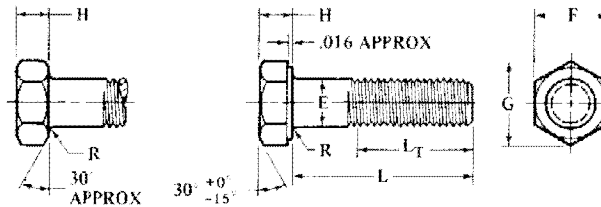


Fig. 4. Hex Cap Screws, Heavy Hex Screws (Table 4)

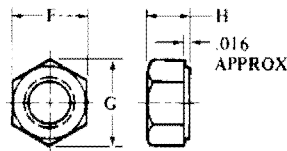


Fig. 5. Hex Nuts, Heavy Hex Nuts (Table 7)

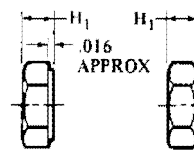


Fig. 6. Hex Jam Nuts, Heavy Hex Jam Nuts (Table 7)

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 $\times$ 1½ Square Bolt, Steel, Zinc Plated; (2) $\frac{1}{2}$ -13 $\times$ 3

Hex Cap Screw, SAE Grade 8 Steel; and (3) .75 × 5.00 Hex Lag Screw, Steel. (4) ½-13 Square Nut, Steel, Zinc Plated; (5) ¾-16 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 (Fig. 1)											
Nominal Size ^a or Basic Product Dia.		Body Dia. ^b <i>E</i>	Width Across Flats <i>F</i>			Width Across Corners <i>G</i>		Head Height <i>H</i>			Thread Length ^c <i>L_T</i>
		Max.	Basic	Max.	Min.	Max.	Min.	Basic	Max.	Min.	Nom.
¼	0.2500	0.260	⅜	0.375	0.362	0.530	0.498	11⁄64	0.188	0.156	0.750
⅝ ₁₆	0.3125	0.324	½	0.500	0.484	0.707	0.665	13⁄64	0.220	0.186	0.875
⅜	0.3750	0.388	9⁄16	0.562	0.544	0.795	0.747	¼	0.268	0.232	1.000
7⁄16	0.4375	0.452	5⁄8	0.625	0.603	0.884	0.828	19⁄64	0.316	0.278	1.125
½	0.5000	0.515	¾	0.750	0.725	1.061	0.995	21⁄64	0.348	0.308	1.250
⅝ ₈	0.6250	0.642	15⁄16	0.938	0.906	1.326	1.244	27⁄64	0.444	0.400	1.500
¾	0.7500	0.768	1⅛	1.125	1.088	1.591	1.494	½	0.524	0.476	1.750
7⁄8	0.8750	0.895	15⁄16	1.312	1.269	1.856	1.742	19⁄32	0.620	0.568	2.000
1	1.0000	1.022	1½	1.500	1.450	2.121	1.991	21⁄32	0.684	0.628	2.250
1⅛	1.1250	1.149	111⁄16	1.688	1.631	2.386	2.239	¾	0.780	0.720	2.500
1¼	1.2500	1.277	17⁄8	1.875	1.812	2.652	2.489	27⁄32	0.876	0.812	2.750
1⅜	1.3750	1.404	21⁄16	2.602	1.994	2.917	2.738	29⁄32	0.940	0.872	3.000
1½	1.5000	1.531	2¼	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 (Fig. 2)													
Nominal Size ^a or Basic Product Dia.		Body Dia. <i>E</i>		Width Across Flats <i>F</i>		Width Across Corners <i>G</i>		Height <i>H</i>		Radius of Fillet <i>R</i>		Thrd. Lgth. <i>L_T</i>	Transi- tion Thrd. <i>Y</i>
		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Basic	Max.
½	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
⅝	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
¾	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
⅞	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
1⅛	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
1¼	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
1⅜	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
1½	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 <i>F</i>			Width Across Corners <i>G</i>		Head Height <i>H</i>			Thread Length ^b <i>L_T</i>
	Max.		Basic	Max.	Min.	Max.	Min.	Basic	Max.	Min.	Nom.
HEX BOLTS (Fig. 3)											
$\frac{1}{4}$ 0.2500	0.260		$\frac{7}{16}$	0.438	0.425	0.505	0.484	$\frac{11}{64}$	0.188	0.150	0.750
$\frac{5}{16}$ 0.3125	0.324		$\frac{1}{2}$	0.500	0.484	0.577	0.552	$\frac{7}{32}$	0.235	0.195	0.875
$\frac{3}{8}$ 0.3750	0.388		$\frac{9}{16}$	0.562	0.544	0.650	0.620	$\frac{1}{4}$	0.268	0.226	1.000
$\frac{7}{16}$ 0.4375	0.452		$\frac{5}{8}$	0.625	0.603	0.722	0.687	$\frac{9}{64}$	0.316	0.272	1.125
$\frac{1}{2}$ 0.5000	0.515		$\frac{3}{4}$	0.750	0.725	0.866	0.826	$\frac{11}{32}$	0.364	0.302	1.250
$\frac{5}{8}$ 0.6250	0.642		$\frac{15}{16}$	0.938	0.906	1.083	1.033	$\frac{27}{64}$	0.444	0.378	1.500
$\frac{3}{4}$ 0.7500	0.768		$1\frac{1}{8}$	1.125	1.088	1.299	1.240	$\frac{1}{2}$	0.524	0.455	1.750
$\frac{7}{8}$ 0.8750	0.895		$1\frac{5}{16}$	1.312	1.269	1.516	1.447	$\frac{37}{64}$	0.604	0.531	2.000
1 1.0000	1.022		$1\frac{1}{2}$	1.500	1.450	1.732	1.653	$\frac{43}{64}$	0.700	0.591	2.250
$1\frac{1}{8}$ 1.1250	1.149		$1\frac{11}{16}$	1.688	1.631	1.949	1.859	$\frac{3}{4}$	0.780	0.658	2.500
$1\frac{1}{4}$ 1.2500	1.277		$1\frac{7}{8}$	1.875	1.812	2.165	2.066	$\frac{27}{32}$	0.876	0.749	2.750
$1\frac{3}{8}$ 1.3750	1.404		$2\frac{1}{16}$	2.062	1.994	2.382	2.273	$\frac{29}{32}$	0.940	0.810	3.000
$1\frac{1}{2}$ 1.5000	1.531		$2\frac{1}{4}$	2.250	2.175	2.598	2.480	1	1.036	0.902	3.250
$1\frac{3}{4}$ 1.7500	1.785		$2\frac{5}{8}$	2.625	2.538	3.031	2.893	$1\frac{5}{32}$	1.196	1.054	3.750
2 2.000	2.039		3	3.000	2.900	3.464	3.306	$1\frac{11}{32}$	1.388	1.175	4.250
$2\frac{1}{4}$ 2.2500	2.305		$3\frac{3}{8}$	3.375	3.262	3.897	3.719	$1\frac{1}{2}$	1.548	1.327	4.750
$2\frac{1}{2}$ 2.5000	2.559		$3\frac{7}{8}$	3.750	3.625	4.330	4.133	$1\frac{21}{32}$	1.708	1.479	5.250
$2\frac{3}{4}$ 2.7500	2.827		$4\frac{1}{8}$	4.125	3.988	4.763	4.546	$1\frac{13}{16}$	1.869	1.632	5.750
3 3.0000	3.081		$4\frac{1}{2}$	4.500	4.350	5.196	4.959	2	2.060	1.815	6.250
$3\frac{1}{4}$ 3.2500	3.335		$4\frac{7}{8}$	4.875	4.712	5.629	5.372	$2\frac{3}{16}$	2.251	1.936	6.750
$3\frac{1}{2}$ 3.5000	3.589		$5\frac{1}{4}$	5.250	5.075	6.062	5.786	$2\frac{5}{16}$	2.380	2.057	7.250
$3\frac{3}{4}$ 3.7500	3.858		$5\frac{5}{8}$	5.625	5.437	6.495	6.198	$2\frac{1}{2}$	2.572	2.241	7.750
4 4.0000	4.111		6	6.000	5.800	6.928	6.612	$2\frac{11}{16}$	2.764	2.424	8.250
HEAVY HEX BOLTS (Fig. 3)											
$\frac{1}{2}$ 0.5000	0.515		$\frac{7}{8}$	0.875	0.850	1.010	0.969	$\frac{11}{32}$	0.364	0.302	1.250
$\frac{5}{8}$ 0.6250	0.642		$1\frac{1}{16}$	1.062	1.031	1.227	1.175	$\frac{27}{64}$	0.444	0.378	1.500
$\frac{3}{4}$ 0.7500	0.768		$1\frac{1}{4}$	1.250	1.212	1.443	1.383	$\frac{1}{2}$	0.524	0.455	1.750
$\frac{7}{8}$ 0.8750	0.895		$1\frac{1}{6}$	1.438	1.394	1.660	1.589	$\frac{37}{64}$	0.604	0.531	2.000
1 1.0000	1.022		$1\frac{5}{8}$	1.625	1.575	1.876	1.796	$\frac{43}{64}$	0.700	0.591	2.250
$1\frac{1}{8}$ 1.1250	1.149		$1\frac{13}{16}$	1.812	1.756	2.093	2.002	$\frac{3}{4}$	0.780	0.658	2.500
$1\frac{1}{4}$ 1.2500	1.277		2	2.000	1.938	2.309	2.209	$\frac{27}{32}$	0.876	0.749	2.750
$1\frac{3}{8}$ 1.3750	1.404		$2\frac{3}{16}$	2.188	2.119	2.526	2.416	$\frac{29}{32}$	0.940	0.810	3.000
$1\frac{1}{2}$ 1.5000	1.531		$2\frac{3}{8}$	23.75	2.300	2.742	2.622	1	1.036	0.902	3.250
$1\frac{3}{4}$ 1.7500	1.785		$2\frac{3}{4}$	2.750	2.662	3.175	3.035	$1\frac{5}{32}$	1.196	1.054	3.750
2 2.0000	2.039		$3\frac{1}{8}$	3.125	3.025	3.608	3.449	$1\frac{11}{32}$	1.388	1.175	4.250
$2\frac{1}{4}$ 2.2500	2.305		$3\frac{1}{2}$	3.500	3.388	4.041	3.862	$1\frac{1}{2}$	1.548	1.327	4.750
$2\frac{1}{2}$ 2.5000	2.559		$3\frac{7}{8}$	3.875	3.750	4.474	4.275	$1\frac{21}{32}$	1.708	1.479	5.250
$2\frac{3}{4}$ 2.7500	2.827		$4\frac{1}{4}$	4.250	4.112	4.907	4.688	$1\frac{13}{16}$	1.869	1.632	5.750
3 3.0000	3.081		$4\frac{5}{8}$	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.