

appendix

Figure A-1

Wire and Sheet Metal Gauges

Gauge	Thickness	Gauge	Thickness
000 000	0.5800	18	0.0403
00 000	0.5165	19	0.0359
0 000	0.4600	20	0.0320
000	0.4096	21	0.0285
00	0.3648	22	0.0253
0	0.3249	23	0.0226
1	0.2893	24	0.0201
2	0.2576	25	0.0179
3	0.2294	26	0.0159
4	0.2043	27	0.0142
5	0.1819	28	0.0126
6	0.1620	29	0.0113
7	0.1443	30	0.0100
8	0.1285	31	0.0089
9	0.1144	32	0.0080
10	0.1019	33	0.0071
11	0.0907	34	0.0063
12	0.0808	35	0.0056
13	0.0720	36	0.0050
14	0.0641	37	0.0045
15	0.0571	38	0.0040
16	0.0508	39	0.0035
17	0.0453	40	0.0031

American Standard Clearance Locational Fits

Nominal Size Range Inches Over To		Limits of Clearance	Class LC1		Limits of Clearance	Class LC2		Limits of Clearance	Class LC3		Limits of Clearance	Class LC4	
			Standard Limits			Standard Limits			Standard Limits			Standard Limits	
			Hole H6	Shaft h5		Hole H7	Shaft h6		Hole H8	Shaft h7		Hole H10	Shaft h9
0	- 0.12	0	+0.25	0	0	+0.4	0	0	+0.6	0	0	+1.6	0
		0.45	0	-0.2	0.65	0	-0.25	1	0	-0.4	2.6	0	-1.0
0.12	- 0.24	0	+0.3	0	0	+0.5	0	0	+0.7	0	0	+1.8	0
		0.5	0	-0.2	0.8	0	-0.3	1.2	0	-0.5	3.0	0	-1.2
0.24	- 0.40	0	+0.4	0	0	+0.6	0	0	+0.9	0	0	+2.2	0
		0.65	0	-0.25	1.0	0	-0.4	1.5	0	-0.6	3.6	0	-1.4
0.40	- 0.71	0	+0.4	0	0	+0.7	0	0	+1.0	0	0	+2.8	0
		0.7	0	-0.3	1.1	0	-0.4	1.7	0	-0.7	4.4	0	-1.6
0.71	- 1.19	0	+0.5	0	0	+0.8	0	0	+1.2	0	0	+3.5	0
		0.9	0	-0.4	1.3	0	-0.5	2	0	-0.8	5.5	0	-2.0
1.19	- 1.97	0	+0.6	0	0	+1.0	0	0	+1.6	0	0	+4.0	0
		1.0	0	-0.4	1.6	0	-0.6	2.6	0	-1.0	6.5	0	-2.5

Figure A-2A

American Standard Clearance Locational Fits

Nominal Size Range Inches Over To		Limits of Clearance	Class LC5		Limits of Clearance	Class LC6		Limits of Clearance	Class LC7		Limits of Clearance	Class LC8	
			Standard Limits			Standard Limits			Standard Limits			Standard Limits	
			Hole H7	Shaft g6		Hole H9	Shaft f8		Hole H10	Shaft e9		Hole H10	Shaft d9
0	0.12	0.1	+0.4	-0.1	0.3	+1.0	-0.3	0.6	+1.6	-0.6	1.0	+1.6	-1.0
		0.75	0	-0.35	1.9	0	-0.9	3.2	0	-1.6	3.6	0	-2.0
0.12	- 0.24	0.15	+0.5	-0.15	0.4	+1.2	-0.4	0.8	+1.8	-0.8	1.2	+1.8	-1.2
		0.95	0	-0.45	2.3	0	-1.1	3.8	0	-2.0	4.2	0	-2.4
0.24	- 0.40	0.2	+0.6	-0.2	0.5	+1.4	-0.5	1.0	+2.2	-1.0	1.6	+2.2	-1.6
		1.2	0	-0.6	2.8	0	-1.4	4.6	0	-2.4	5.2	0	-3.0
0.40	- 0.71	0.25	+0.7	-0.25	0.6	+1.6	-0.6	1.2	+2.8	-1.2	2.0	+2.8	-2.0
		1.35	0	-0.65	3.2	0	-1.6	5.6	0	-2.8	6.4	0	-3.6
0.71	- 1.19	0.3	+0.8	-0.3	0.8	+2.0	-0.8	1.6	+3.5	-1.6	2.5	+3.5	-2.5
		1.6	0	-0.8	4.0	0	-2.0	7.1	0	-3.6	8.0	0	-4.5
1.19	- 1.97	0.4	+1.0	-0.4	1.0	+2.5	-1.0	2.0	+4.0	-2.0	3.0	+4.0	-3.0
		2.0	0	-1.0	5.1	0	-2.6	3.5	0	-4.5	9.5	0	-5.5

Figure A-2B

American Standard Running and Sliding Fits (Hole Basis)

Nominal Size Range Inches Over To		Class RC1			Class RC2			Class RC3			Class RC4		
		Limits of Clearance	Standard Limits		Limits of Clearance	Standard Limits		Limits of Clearance	Standard Limits		Limits of Clearance	Standard Limits	
			Hole H5	Shaft g4		Hole H6	Shaft g5		Hole H7	Shaft f6		Hole H8	Shaft f7
0	- 0.12	0.1 0.45	+0.2 0	-0.1 -0.25	0.1 0.55	+0.25 0	-0.1 -0.3	0.3 0.95	+0.4 0	-0.3 -0.55	0.3 1.3	+0.6 0	-0.3 -0.7
0.12	- 0.24	0.15 0.5	+0.2 0	-0.15 -0.3	0.15 0.65	+0.3 0	-0.15 -0.35	0.4 1.12	+0.5 0	-0.4 -0.7	0.4 1.5	+0.7 0	-0.4 -0.0
0.24	- 0.40	0.2 0.6	+0.25 0	-0.2 -0.35	0.2 0.85	+0.4 0	-0.2 -0.45	0.5 1.5	+0.6 0	-0.5 -0.9	0.5 2.0	+0.9 0	-0.5 -1.1
0.40	- 0.71	0.25 0.75	+0.3 0	-0.25 -0.45	0.25 0.95	+0.4 0	-0.25 -0.55	0.6 1.7	+0.7 0	-0.6 -1.0	0.6 2.3	+1.0 0	-0.6 -1.3
0.71	- 1.19	0.3 0.95	+0.4 0	-0.3 -0.55	0.3 1.2	+0.5 0	-0.3 -0.7	0.8 2.1	+0.8 0	-0.8 -1.3	0.8 2.8	+1.2 0	-0.8 -1.6
1.19	- 1.97	0.4 1.1	+0.4 0	-0.4 -0.7	0.4 1.4	+0.6 0	-0.4 -0.8	1.0 2.6	+1.0 0	-1.0 -1.6	1.0 3.6	+1.6 0	-1.0 -2.0

Figure A-3A

Nominal Size Range Inches Over To		Class RC5			Class RC6			Class RC7			Class RC8		
		Limits of Clearance	Standard Limits		Limits of Clearance	Standard Limits		Limits of Clearance	Standard Limits		Limits of Clearance	Standard Limits	
			Hole H8	Shaft e7		Hole H9	Shaft e8		Hole H9	Shaft d8		Hole H10	Shaft c9
0	- 0.12	0.6 1.6	+0.6 0	-0.6 -1.0	0.6 2.2	+1.0 0	-0.6 -1.2	1.0 2.6	+1.0 0	-1.0 -1.6	2.5 5.1	+1.6 0	-2.5 -3.5
0.12	- 0.24	0.8 2.0	+0.7 0	-0.8 -1.3	0.8 2.7	+1.2 0	-0.8 -1.5	1.2 3.1	+1.2 0	-1.2 -1.9	2.8 5.8	+1.8 0	-2.8 -4.0
0.24	- 0.40	1.0 2.5	+0.9 0	-1.0 -1.6	1.0 3.3	+1.4 0	-1.0 -1.9	1.6 3.9	+1.4 0	-1.6 -2.5	3.0 6.6	+2.2 0	-3.0 -4.4
0.40	- 0.71	1.2 2.9	+1.0 0	-1.2 -1.9	1.2 3.8	+1.6 0	-1.2 -2.2	2.0 4.6	+1.6 0	-2.0 -3.0	3.5 7.9	+2.8 0	-3.5 -5.1
0.71	- 1.19	1.6 3.6	+1.2 0	-1.6 -2.4	1.6 4.8	+2.0 0	-1.6 -2.8	2.5 5.7	+2.0 0	-2.5 -3.7	4.5 10.0	+3.5 0	-4.5 -6.5
1.19	- 1.97	2.0 4.6	+1.6 0	-2.0 -3.0	2.0 6.1	+2.5 0	-2.0 -3.6	3.0 7.1	+2.5 0	-3.0 -4.6	5.0 11.5	+4.0 0	-5.0 -7.5

Figure A-3B

Figure A-4A

American Standard Transition Locational Fits

Nominal Size Range Inches		Class LT1			Class LT2			Class LT3		
		Fit	Standard Limits		Fit	Standard Limits		Fit	Standard Limits	
			Hole H7	Shaft js6		Hole H8	Shaft js7		Hole H7	Shaft k6
Over	To									
0	- 0.12	-0.10 +0.50	+0.4 0	+0.10 -0.10	-0.2 +0.8	+0.6 0	+0.2 -0.2			
0.12	- 0.24	-0.15 -0.65	+0.5 0	+0.15 -0.15	-0.25 +0.95	+0.7 0	+0.25 -0.25			
0.24	- 0.40	-0.2 +0.5	+0.6 0	+0.2 -0.2	-0.3 +1.2	+0.9 0	+0.3 -0.3	-0.5 +0.5	+0.6 0	+0.5 +0.1
0.40	- 0.71	-0.2 +0.9	+0.7 0	+0.2 -0.2	-0.35 +1.35	+1.0 0	+0.35 -0.35	-0.5 +0.6	+0.7 0	+0.5 +0.1
0.71	- 1.19	-0.25 +1.05	+0.8 0	+0.25 -0.25	-0.4 +1.6	+1.2 0	+0.4 -0.4	-0.6 +0.7	+0.8 0	+0.6 +0.1
1.19	- 1.97	-0.3 +1.3	+1.0 0	+0.3 -0.3	-0.5 +2.1	+1.6 0	+0.5 -0.5	+0.7 +0.1	+1.0 0	+0.7 +0.1

Figure A-4B

Nominal Size Range Inches		Class LT4			Class LT5			Class LT6		
		Fit	Standard Limits		Fit	Standard Limits		Fit	Standard Limits	
			Hole H8	Shaft k7		Hole H7	Shaft n6		Hole H7	Shaft n7
Over	To									
0	- 0.12				-0.5 +0.15	+0.4 0	+0.5 +0.25	-0.65 +0.15	+0.4 0	+0.65 +0.25
0.12	- 0.24				-0.6 +0.2	+0.5 0	+0.6 +0.3	-0.8 +0.2	+0.5 0	+0.8 +0.3
0.24	- 0.40	-0.7 +0.8	+0.9 0	+0.7 +0.1	-0.8 +0.2	+0.6 0	+0.8 +0.4	-1.0 +0.2	+0.6 0	+1.0 +0.4
0.40	- 0.71	-0.8 +0.9	+1.0 0	+0.8 +0.1	-0.9 +0.2	+0.7 0	+0.9 +0.5	-1.2 +0.2	+0.7 0	+1.2 +0.5
0.71	- 1.19	-0.9 +1.1	+1.2 0	+0.9 +0.1	-1.1 +0.2	+0.8 0	+1.1 +0.6	-1.4 +0.2	+0.8 0	+1.4 +0.6
1.19	- 1.97	-1.1 +1.5	+1.6 0	+1.1 +0.1	-1.3 +0.3	+1.0 0	+1.3 +0.7	-1.7 +0.3	+1.0 0	+1.7 +0.7

Figure A-5

American Standard Interference Locational Fits

Nominal Size Range Inches Over To		Limits of Interference	Class LN1		Limits of Interference	Class LN2		Limits of Interference	Class LN3	
			Standard Limits			Standard Limits			Standard Limits	
			Hole H6	Shaft n5		Hole H7	Shaft p6		Hole H7	Shaft r6
0 - 0.12	0	+0.25	+0.45	0	+0.4	+0.63	0.1	+0.4	+0.75	
	0.45	0	+0.25	0.65	0	+0.4	0.75	0	+0.5	
0.12 - 0.24	0	+0.3	+0.5	0	+0.5	+0.8	0.1	+0.5	+0.9	
	0.5	0	+0.3	0.8	0	+0.5	0.9	0	+0.6	
0.24 - 0.40	0	+0.4	+0.65	0	+0.6	+1.0	0.2	+0.6	+1.2	
	0.65	0	+0.4	1.0	0	+0.6	1.2	0	+0.8	
0.40 - 0.71	0	+0.4	+0.8	0	+0.7	+1.1	0.3	+0.7	+1.4	
	0.8	0	+0.4	1.1	0	+0.7	1.4	0	+1.0	
0.71 - 1.19	0	+0.5	+1.0	0	+0.8	+1.3	0.4	+0.8	+1.7	
	1.0	0	+0.5	1.3	0	+0.8	1.7	0	+1.2	
1.19 - 1.97	0	+0.6	+1.1	0	+1.0	+1.6	0.4	+1.0	+2.0	
	1.1	0	+0.6	1.6	0	+1.0	2.0	0	+1.4	

American Standard Force and Shrink Fits

Nominal Size Range Inches Over To		Limits of Interference	Class FN 1		Limits of Interference	Class FN 2		Limits of Interference	Class FN 3		Limits of Interference	Class FN 4	
			Standard Limits			Standard Limits			Standard Limits			Standard Limits	
			Hole	Shaft		Hole	Shaft		Hole	Shaft		Hole	Shaft
0 - 0.12	0.05	+0.25	+0.5	0.2	+0.4	+0.85				0.3	+0.4	+0.95	
	0.5	0	+0.3	0.85	0	+0.6				0.95	0	+0.7	
0.12 - 0.24	0.1	+0.3	+0.6	0.2	+0.5	+1.0				0.4	+0.5	+1.2	
	0.6	0	+0.4	1.0	0	+0.7				1.2	0	+0.9	
0.24 - 0.40	0.1	+0.4	+0.75	0.4	+0.6	+1.4				0.6	+0.6	+1.6	
	0.75	0	+0.5	1.4	0	+1.0				1.6	0	+1.2	
0.40 - 0.56	0.1	+0.4	+0.8	0.5	+0.7	+1.6				0.7	+0.7	+1.8	
	0.8	0	+0.5	1.6	0	+1.2				1.8	0	+1.4	
0.56 - 0.71	0.2	+0.4	+0.9	0.5	+0.7	+1.6				0.7	+0.7	+1.8	
	0.9	0	+0.6	1.6	0	+1.2				1.8	0	+1.4	
0.71 - 0.95	0.2	+0.5	+1.1	0.6	+0.8	+1.9				0.8	+0.8	+2.1	
	1.1	0	+0.7	1.9	0	+1.4				2.1	0	+1.6	
0.95 - 1.19	0.3	+0.5	+1.2	0.6	+0.8	+1.9	0.8	+0.8	+2.1	1.0	+0.8	+2.1	
	1.2	0	+0.8	1.9	0	+1.4	2.1	0	+1.6	2.3	0	+1.8	
1.19 - 1.58	0.3	+0.6	+1.3	0.8	+1.0	+2.4	1.0	+1.0	+2.6	1.5	+1.0	+3.1	
	1.3	0	+0.9	2.4	0	+1.8	2.6	0	+2.0	3.1	0	+2.5	
1.58 - 1.97	0.4	+0.6	+1.4	0.8	+1.0	+2.4	1.2	+1.0	+2.8	1.8	+1.0	+3.4	
	1.4	0	+1.0	2.4	0	+1.8	2.8	0	+2.2	3.4	0	+2.8	

Figure A-6

Preferred Clearance Fits — Cylindrical Fits
(Hole Basis; ANSI B4.2)

Basic Size		Loose Running			Free Running			Close Running			Sliding			Locational Clear.		
		Hole H11	Shaft c11	Fit	Hole H9	Shaft d9	Fit	Hole H8	Shaft f7	Fit	Hole H7	Shaft g6	Fit	Hole H7	Shaft h6	Fit
4	Max	4.075	3.930	0.220	4.030	3.970	0.090	4.018	3.990	0.040	4.012	3.996	0.024	4.012	4.000	0.020
	Min	4.000	3.855	0.070	4.000	3.940	0.030	4.000	3.978	0.010	4.000	3.988	0.004	4.000	3.992	0.000
5	Max	5.075	4.930	0.220	5.030	4.970	0.090	5.018	4.990	0.040	5.012	4.996	0.024	5.012	5.000	0.020
	Min	5.000	4.855	0.070	5.000	4.940	0.030	5.000	4.978	0.010	5.000	4.988	0.004	5.000	4.992	0.000
6	Max	6.075	5.930	0.220	6.030	5.970	0.090	6.018	5.990	0.040	6.012	5.996	0.024	6.012	6.000	0.020
	Min	6.000	5.885	0.070	6.000	5.940	0.030	6.000	5.978	0.010	6.000	5.988	0.004	6.000	5.992	0.000
8	Max	8.090	7.920	0.260	8.036	7.960	0.112	8.022	7.987	0.050	8.015	7.995	0.029	8.015	8.000	0.024
	Min	8.000	7.830	0.080	8.000	7.924	0.040	8.000	7.972	0.013	8.000	7.986	0.005	8.000	7.991	0.000
10	Max	10.090	9.920	0.226	10.036	9.960	0.112	10.022	9.987	0.050	10.015	9.995	0.029	10.015	10.000	0.024
	Min	10.000	9.830	0.080	10.000	9.924	0.040	10.000	9.972	0.013	10.000	9.986	0.005	10.000	9.991	0.000
12	Max	12.112	11.905	0.315	12.043	11.950	0.136	12.027	11.984	0.061	12.018	11.994	0.035	12.018	12.000	0.029
	Min	12.000	11.795	0.095	12.000	11.907	0.050	12.000	11.966	0.016	12.000	11.983	0.006	12.000	11.989	0.000
16	Max	16.110	15.905	0.315	16.043	15.950	0.136	16.027	15.984	0.061	16.018	15.994	0.035	16.018	16.000	0.029
	Min	16.000	15.795	0.095	16.000	15.907	0.050	16.000	15.966	0.016	16.000	15.983	0.006	16.000	15.989	0.000
20	Max	20.130	19.890	0.370	20.052	19.935	0.169	20.033	19.980	0.074	20.021	19.993	0.041	20.021	20.000	0.034
	Min	20.000	19.760	0.110	20.000	19.883	0.065	20.000	19.959	0.020	20.000	19.980	0.007	20.000	19.987	0.000
25	Max	25.130	24.890	0.370	25.052	24.935	0.169	25.033	24.980	0.074	25.021	24.993	0.041	25.021	25.000	0.034
	Min	25.000	24.760	0.110	25.000	24.883	0.065	25.000	24.959	0.020	25.000	24.980	0.007	25.000	24.987	0.000
30	Max	30.130	29.890	0.370	30.052	29.935	0.169	30.033	29.980	0.074	30.021	29.993	0.041	30.021	30.000	0.034
	Min	30.000	29.760	0.110	30.000	29.883	0.065	30.000	29.959	0.020	30.000	29.980	0.007	30.000	29.987	0.000

Figure A-7

Preferred Transition and Interference Fits — Cylindrical Fits
(Hole Basis; ANSI B4.2)

Basic Size		Locational Trans.			Locational Trans.			Locational Inter.			Medium Drive			Force		
		Hole H7	Shaft k6	Fit	Hole H7	Shaft n6	Fit	Hole H7	Shaft p6	Fit	Hole H7	Shaft s6	Fit	Hole H7	Shaft u6	Fit
4	Max	4.012	4.009	0.011	4.012	4.016	0.004	4.012	4.020	0.000	4.012	4.027	-0.007	4.012	4.031	-0.011
	Min	4.000	4.001	-0.009	4.012	4.008	-0.016	4.012	4.012	-0.020	4.012	4.019	-0.027	4.012	4.023	-0.031
5	Max	5.012	5.009	0.011	5.012	5.016	0.004	5.012	5.020	0.000	5.012	5.027	-0.007	5.012	5.031	-0.011
	Min	5.000	5.001	-0.009	5.012	5.008	-0.016	5.012	5.012	-0.020	5.012	5.019	-0.027	5.012	5.023	-0.031
6	Max	6.012	6.009	0.011	6.012	6.016	0.004	6.012	6.020	0.000	6.012	6.027	-0.007	6.012	6.031	-0.011
	Min	6.000	6.001	-0.009	6.012	6.008	-0.016	6.012	6.012	-0.020	6.012	6.019	-0.027	6.012	6.023	-0.031
8	Max	8.015	8.010	0.014	8.015	8.019	0.005	8.015	8.024	0.000	8.015	8.032	-0.008	8.015	8.037	-0.013
	Min	8.000	8.001	-0.010	8.015	8.010	-0.019	8.015	8.015	-0.024	8.015	8.023	-0.032	8.015	8.028	-0.037
10	Max	10.015	10.010	0.014	10.015	10.019	0.005	10.015	10.024	0.000	10.015	10.032	-0.008	10.015	10.037	-0.013
	Min	10.000	10.001	-0.010	10.015	10.010	-0.019	10.015	10.015	-0.024	10.015	10.023	-0.032	10.015	10.028	-0.037
12	Max	12.018	12.012	0.017	12.018	12.023	0.006	12.018	12.029	0.000	12.018	12.039	-0.010	12.018	12.044	-0.015
	Min	12.000	12.001	-0.012	12.018	12.012	-0.023	12.018	12.018	-0.029	12.018	12.028	-0.039	12.018	12.033	-0.044
16	Max	16.018	16.012	0.017	16.018	16.023	0.006	16.018	16.029	0.000	16.018	16.039	-0.010	16.018	16.044	-0.015
	Min	16.000	16.001	-0.012	16.018	16.012	-0.023	16.018	16.018	-0.029	16.018	16.028	-0.039	16.018	16.033	-0.044
20	Max	20.021	20.015	0.019	20.021	20.028	0.006	20.021	20.035	-0.001	20.021	20.048	-0.014	20.021	20.054	-0.020
	Min	20.000	20.002	-0.015	20.021	20.015	-0.028	20.021	20.022	-0.035	20.021	20.035	-0.048	20.021	20.041	-0.054
25	Max	25.021	25.015	0.019	25.021	25.028	0.006	25.021	25.035	-0.001	25.021	25.048	-0.014	25.021	25.061	-0.027
	Min	25.000	25.002	-0.015	25.021	25.015	-0.028	25.021	25.022	-0.035	25.021	25.035	-0.048	25.021	25.048	-0.061
30	Max	30.021	30.015	0.019	30.021	30.028	0.006	30.021	30.035	-0.001	30.021	30.048	-0.014	30.021	30.061	-0.027
	Min	30.000	30.002	-0.015	30.021	30.015	-0.028	30.021	30.022	-0.035	30.021	30.035	-0.048	30.021	30.048	-0.061

Figure A-8

Preferred Clearance Fits — Cylindrical Fits (Shaft Basis; ANSI B4.2)

Basic Size	Loose Running			Free Running			Close Running			Sliding			Locational Clear.			
	Hole C11	Shaft h11	Fit	Hole D9	Shaft h9	Fit	Hole F8	Shaft h7	Fit	Hole G7	Shaft h6	Fit	Hole H7	Shaft h6	Fit	
4	Max	4.145	4.000	0.220	4.060	4.000	0.090	4.028	4.000	0.040	4.016	4.000	0.024	4.012	4.000	0.020
	Min	4.070	3.925	0.070	4.030	3.970	0.030	4.010	3.988	0.010	4.004	3.992	0.004	4.000	3.992	0.000
5	Max	5.145	5.000	0.220	5.060	5.000	0.090	5.028	5.000	0.040	5.016	5.000	0.024	5.012	5.000	0.020
	Min	5.070	4.925	0.070	5.030	4.970	0.030	5.010	4.988	0.010	5.004	4.992	0.004	5.000	4.992	0.000
6	Max	6.145	6.000	0.220	6.060	6.000	0.090	6.028	6.000	0.040	6.016	6.000	0.024	6.012	6.000	0.020
	Min	6.070	5.925	0.070	6.030	5.970	0.030	6.010	5.988	0.010	6.004	5.992	0.004	6.000	5.992	0.000
8	Max	8.170	8.000	0.260	8.076	8.000	0.112	8.035	8.000	0.050	8.020	8.000	0.029	8.015	8.000	0.024
	Min	8.080	7.910	0.080	8.040	7.964	0.040	8.013	7.985	0.013	8.005	7.991	0.005	8.000	7.991	0.000
10	Max	10.170	10.000	0.260	10.076	10.000	0.112	10.035	10.000	0.050	10.020	10.000	0.029	10.015	10.000	0.024
	Min	10.080	9.910	0.080	10.040	9.964	0.040	10.013	9.985	0.013	10.005	9.991	0.005	10.000	9.991	0.000
12	Max	12.205	12.000	0.315	12.093	12.000	0.136	12.043	12.000	0.061	12.024	12.000	0.035	12.018	12.000	0.029
	Min	12.095	11.890	0.095	12.050	11.957	0.050	12.016	11.982	0.016	12.006	11.989	0.006	12.000	11.989	0.000
16	Max	16.205	16.000	0.315	16.093	16.000	0.136	16.043	16.000	0.061	16.024	16.000	0.035	16.018	16.000	0.029
	Min	16.095	15.890	0.095	16.050	15.957	0.050	16.016	15.982	0.016	16.006	15.989	0.006	16.000	15.989	0.000
20	Max	20.240	20.000	0.370	20.117	20.000	0.169	20.053	20.000	0.074	20.028	20.000	0.041	20.021	20.000	0.034
	Min	20.110	19.870	0.110	20.065	19.948	0.065	20.020	19.979	0.020	20.007	19.987	0.007	20.000	19.987	0.000
25	Max	25.240	25.000	0.370	25.117	25.000	0.169	25.053	25.000	0.074	25.028	25.000	0.041	25.021	25.000	0.034
	Min	25.110	24.870	0.110	25.065	24.948	0.065	25.020	24.979	0.020	25.007	24.987	0.007	25.000	24.987	0.000
30	Max	30.240	30.000	0.370	30.117	30.000	0.169	30.053	30.000	0.074	30.028	30.000	0.041	30.021	30.000	0.034
	Min	30.110	29.870	0.110	30.065	29.948	0.065	30.020	29.979	0.020	30.007	29.987	0.007	30.000	29.987	0.000

Figure A-9

Preferred Transition and Interference Fits — Cylindrical Fits (Shaft Basis; ANSI B4.2)

Basic Size	Locational Trans.			Locational Trans.			Locational Inter.			Medium Drive			Force			
	Hole K7	Shaft h6	Fit	Hole N7	Shaft h6	Fit	Hole F7	Shaft h6	Fit	Hole S7	Shaft h6	Fit	Hole U7	Shaft h6	Fit	
4	Max	4.003	4.000	0.011	3.996	4.000	0.004	3.992	4.000	0.000	3.985	4.000	-0.007	3.981	4.000	-0.011
	Min	3.991	3.992	-0.009	3.984	3.992	-0.016	3.980	3.992	-0.020	3.973	3.992	-0.027	3.969	3.992	-0.031
5	Max	5.003	5.000	0.011	4.996	5.000	0.004	4.992	5.000	0.000	4.985	5.000	-0.007	4.981	5.000	-0.011
	Min	4.991	4.992	-0.009	4.984	4.992	-0.016	4.980	4.992	-0.020	4.973	4.992	-0.027	4.969	4.992	-0.031
6	Max	6.003	6.000	0.011	5.996	6.000	0.004	5.992	6.000	0.000	5.985	6.000	-0.007	5.981	6.000	-0.011
	Min	5.991	5.991	-0.009	5.984	5.992	-0.016	5.980	5.992	-0.020	5.973	5.992	-0.027	5.969	5.992	-0.031
8	Max	8.005	8.000	0.014	7.996	8.000	0.005	7.991	8.000	0.000	7.983	8.000	-0.008	7.978	8.000	-0.013
	Min	7.990	7.991	-0.010	7.981	7.991	-0.019	7.976	7.991	-0.024	7.968	7.991	-0.032	7.963	7.991	-0.037
10	Max	10.005	10.000	0.014	9.996	10.000	0.005	9.991	10.000	0.000	9.983	10.000	-0.008	9.978	10.000	-0.013
	Min	9.990	9.991	-0.010	9.981	9.991	-0.019	9.976	9.991	-0.024	9.968	9.991	-0.032	9.963	9.991	-0.037
12	Max	12.006	12.000	0.017	11.995	12.000	0.006	11.989	12.000	0.000	11.979	12.000	-0.010	11.974	12.000	-0.015
	Min	11.988	11.989	-0.012	11.977	11.989	-0.023	11.971	11.989	-0.029	11.961	11.989	-0.039	11.956	11.989	-0.044
16	Max	16.006	16.000	0.017	15.995	16.000	0.006	15.989	16.000	0.000	15.979	16.000	-0.010	15.974	16.000	-0.015
	Min	15.988	15.989	-0.012	15.977	15.989	-0.023	15.971	15.989	-0.029	15.961	15.989	-0.039	15.956	15.989	-0.044
20	Max	20.006	20.000	0.019	19.993	20.000	0.006	19.986	20.000	-0.001	19.973	20.000	-0.014	19.967	20.000	-0.020
	Min	19.985	19.987	-0.015	19.972	19.987	-0.028	19.965	19.987	-0.035	19.952	19.987	-0.048	19.946	19.987	-0.054
25	Max	25.006	25.000	0.019	24.993	25.000	0.006	24.986	25.000	-0.001	24.973	25.000	-0.014	24.960	25.000	-0.027
	Min	24.985	24.987	-0.015	24.972	24.987	-0.028	24.965	24.987	-0.035	24.952	24.987	-0.048	24.939	24.987	-0.061
30	Max	30.006	30.000	0.019	29.993	30.000	0.006	29.986	30.000	-0.001	29.973	30.000	-0.014	29.960	30.000	-0.027
	Min	29.985	29.987	-0.015	29.972	29.987	-0.028	29.965	29.987	-0.035	29.952	29.987	-0.048	29.939	29.987	-0.061

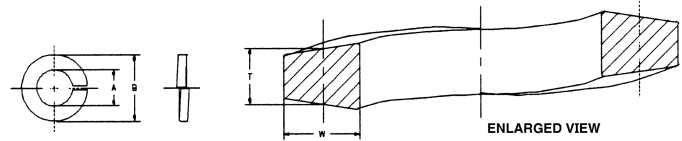
Figure A-10

American National Standard Type A Plain Washers
(ANSI B18.22.1-1965, R1975)

Nominal Washer Size	Series	Inside Diameter			Outside Diameter			Thickness			
		Basic	Tolerance		Basic	Tolerance		Basic	Max.	Min.	
			Plus	Minus		Plus	Minus				
#6	.138		.156	.008	.005	.375	.015	.005	.049	.065	.036
#8	.164		.188	.008	.005	.438	.015	.005	.049	.065	.036
#10	.190		.219	.008	.005	.500	.015	.005	.049	.065	.036
1/4	.250	N	.281	.015	.005	.625	.015	.005	.065	.080	.051
1/4	.250	W	.312	.015	.005	.734	.015	.007	.065	.080	.051
5/16	.312	N	.344	.015	.005	.688	.015	.007	.065	.080	.051
5/16	.312	W	.375	.015	.005	.875	.030	.007	.083	.104	.064
3/8	.375	N	.406	.015	.005	.812	.015	.007	.065	.080	.051
3/8	.375	W	.438	.015	.005	1.000	.030	.007	.083	.104	.064
7/16	.438	N	.469	.015	.005	.922	.015	.007	.065	.080	.051
7/16	.438	W	.500	.015	.005	1.250	.030	.007	.083	.104	.064
1/2	.500	N	.531	.015	.005	1.062	.030	.007	.095	.121	.074
1/2	.500	W	.562	.015	.005	1.375	.030	.007	.109	.132	.086
9/16	.562	N	.594	.015	.005	1.156	.030	.007	.095	.121	.074
9/16	.562	W	.625	.015	.005	1.469	.030	.007	.109	.132	.086
5/8	.625	N	.656	.030	.007	1.312	.030	.007	.095	.121	.074
5/8	.625	W	.688	.030	.007	1.750	.030	.007	.134	.160	.108
3/4	.750	N	.812	.030	.007	1.469	.030	.007	.134	.160	.108
3/4	.750	W	.812	.030	.007	2.000	.030	.007	.148	.177	.122
7/8	.875	N	.938	.030	.007	1.750	.030	.007	.134	.160	.108
7/8	.875	W	.938	.030	.007	2.250	.030	.007	.165	.192	.136
1	1.000	N	1.062	.030	.007	2.000	.030	.007	.134	.160	.108
1	1.000	W	1.062	.030	.007	2.500	.030	.007	.165	.192	.136
1 1/8	1.125	N	1.250	.030	.007	2.250	.030	.007	.134	.160	.108
1 1/8	1.125	W	1.250	.030	.007	2.750	.030	.007	.165	.192	.136
1 1/4	1.250	N	1.375	.030	.007	2.500	.030	.007	.165	.192	.136
1 1/4	1.250	W	1.375	.030	.007	3.000	.030	.007	.165	.192	.136
1 3/8	1.375	N	1.500	.030	.007	2.750	.030	.007	.165	.192	.136
1 3/8	1.375	W	1.500	.045	.010	3.250	.045	.010	.180	.213	.153
1 1/2	1.500	N	1.625	.030	.007	3.000	.030	.007	.165	.192	.136
1 1/2	1.500	W	1.625	.045	.010	3.500	.045	.010	.180	.213	.153
1 5/8	1.625		1.750	.045	.010	3.750	.045	.010	.180	.213	.153
1 3/4	1.750		1.875	.045	.010	4.000	.045	.010	.180	.213	.153
1 7/8	1.875		2.000	.045	.010	4.250	.045	.010	.180	.213	.153
2	2.000		2.125	.045	.010	4.500	.045	.010	.180	.213	.153
2 1/4	2.250		2.375	.045	.010	4.750	.045	.010	.220	.248	.193
2 1/2	2.500		2.625	.045	.010	5.000	.045	.010	.238	.280	.210
2 3/4	2.750		2.875	.065	.010	5.250	.065	.010	.259	.310	.228
3	3.000		3.125	.065	.010	5.500	.065	.010	.284	.327	.249

Figure A-11

American National Standard Helical Spring Lock Washers (ANSI B18.21.1-1972)



Nominal Washer Size	Inside Diameter, A		Regular			Heavy			Extra Duty			
	Max	Min	O.D., B Max	Section Width	Section Thickness	O.D., B Max	Section Width	Section Thickness	O.D., B Max	Section Width	Section Thickness	
#2	.086	.094	.088	.172	.035	.020	.182	.040	.025	.208	.053	.027
#3	.099	.107	.101	.195	.040	.025	.209	.047	.031	.239	.062	.034
#4	.112	.120	.114	.209	.040	.025	.223	.047	.031	.253	.062	.034
#5	.125	.133	.127	.236	.047	.031	.253	.055	.040	.300	.079	.045
#6	.138	.148	.141	.250	.047	.031	.266	.055	.040	.314	.079	.045
#8	.164	.174	.167	.293	.055	.040	.307	.062	.047	.375	.096	.057
#10	.190	.200	.193	.334	.062	.047	.350	.070	.056	.434	.112	.068
#12	.216	.227	.220	.377	.070	.056	.391	.077	.063	.497	.130	.080
1/4	.250	.262	.254	.489	.109	.062	.491	.110	.077	.535	.132	.084
5/16	.312	.326	.317	.586	.125	.078	.596	.130	.097	.622	.143	.108
3/8	.375	.390	.380	.683	.141	.094	.691	.145	.115	.741	.170	.123
7/16	.438	.455	.443	.779	.156	.109	.787	.160	.133	.839	.186	.143
1/2	.500	.518	.506	.873	.171	.125	.883	.176	.151	.939	.204	.162
9/16	.562	.582	.570	.971	.188	.141	.981	.193	.170	1.041	.223	.182
5/8	.625	.650	.635	1.079	.203	.156	1.093	.210	.189	1.157	.242	.202
11/16	.688	.713	.698	1.176	.219	.172	1.192	.227	.207	1.258	.260	.221
3/4	.750	.775	.760	1.271	.234	.188	1.291	.244	.226	1.361	.279	.241
13/16	.812	.843	.824	1.367	.250	.203	1.391	.262	.246	1.463	.298	.261
7/8	.875	.905	.887	1.464	.266	.219	1.494	.281	.266	1.576	.322	.285
15/16	.938	.970	.950	1.560	.281	.234	1.594	.298	.284	1.688	.345	.308
1	1.000	1.042	1.017	1.661	.297	.250	1.705	.319	.306	1.799	.366	.330
1 1/16	1.062	1.107	1.080	1.756	.312	.266	1.808	.338	.326	1.910	.389	.352
1 1/8	1.125	1.172	1.144	1.853	.328	.281	1.909	.356	.345	2.019	.411	.375
1 3/16	1.188	1.237	1.208	1.950	.344	.297	2.008	.373	.364	2.124	.431	.396
1 1/4	1.250	1.302	1.271	2.045	.359	.312	2.113	.393	.384	2.231	.452	.417
1 5/16	1.312	1.366	1.334	2.141	.375	.328	2.211	.410	.403	2.335	.472	.438
1 3/8	1.375	1.432	1.398	2.239	.391	.344	2.311	.427	.422	2.439	.491	.458
1 7/16	1.438	1.497	1.462	2.334	.406	.359	2.406	.442	.440	2.540	.509	.478
1 1/2	1.500	1.561	1.525	2.430	.422	.375	2.502	.458	.458	2.638	.526	.496

Figure A-12

American National Standard Internal-External Tooth Lock Washers (ANSI B18.21.1-1972)

Size	A		B		C		Size	A		B		C	
	Inside Diameter		Outside Diameter		Thickness			Inside Diameter		Outside Diameter		Thickness	
	Max.	Min.	Max.	Min.	Max.	Min.		Max.	Min.	Max.	Min.	Max.	Min.
#4	.123	.115	.475	.460	.021	.021	5/16	.332	.320	.900	.865	.040	.032
	.123	.115	.510	.495	.021	.017		.332	.320	.985	.965	.045	.037
#6	.150	.141	.610	.580	.028	.023	3/8	.332	.320	1.070	1.045	.050	.042
			.610	.580				.398	.384	.985	.965	.045	.037
			.690	.670				.398	.384	1.070	1.045	.050	.042
#8	.176	.168	.610	.580	.034	.028	7/16	.398	.384	1.155	1.130	.055	.047
			.610	.580				.464	.448	1.070	1.045		
			.690	.670				.464	.448	1.260	1.220		
#10	.204	.195	.610	.580	.034	.028	1/2	.464	.448	1.315	1.290	.060	.052
			.690	.670				.530	.512	1.260	1.220		
			.760	.740				.530	.512	1.315	1.290		
#12	.231	.221	.610	.580	.040	.032	9/16	.530	.512	1.410	1.380	.067	.059
			.690	.670				.596	.576	1.260	1.220		
			.760	.725				.596	.576	1.315	1.290		
1/4	.267	.256	.690	.670	.045	.037	5/8	.596	.576	1.620	1.590	.067	.059
			.690	.670				.663	.640	1.410	1.380		
			.985	.965				.663	.640	1.620	1.590		
			1.070	1.045					1.830	1.797			

Figure A-13

Figure A-14

British Standard Bright Metal Washers - Metric Series (BS 4320:1968)

NORMAL DIAMETER SIZES												
Nominal Size of Bolt or Screw	Inside Diameter			Outside Diameter			Thickness					
							Form A (Normal Range)			Form B (Light Range)		
	Nom.	Max.	Min.	Nom.	Max.	Min.	Nom.	Max.	Min.	Nom.	Max.	Min.
M 1.0	1.1	1.25	1.1	2.5	2.5	2.3	.3	.4	.2			
M 1.2	1.3	1.45	1.3	3.0	3.0	2.8	.3	.4	.2			
M 1.4	1.5	1.65	1.5	3.0	3.0	2.8	.3	.4	.2			
M 1.6	1.7	1.85	1.7	4.0	4.0	3.7	.3	.4	.2			
M 2.0	2.2	2.35	2.2	5.0	5.0	4.7	.3	.4	.2			
M 2.2	2.4	2.55	2.4	5.0	5.0	4.7	.5	.6	.4			
M 2.5	2.7	2.85	2.7	6.5	6.5	6.2	.5	.6	.4			
M 3	3.2	3.4	3.2	7	7	6.7	.5	.6	.4			
M 3.5	3.7	3.9	3.7	7	7	6.7	.5	.6	.4			
M 4	4.3	4.5	4.3	9	9	8.7	.8	.9	.7			
M 4.5	4.8	5.0	4.8	9	9	8.7	.8	.9	.7			
M 5	5.3	5.5	5.3	10	10	9.7	1.0	1.1	.9			
M 6	6.4	6.7	6.4	12.5	12.5	12.1	1.6	1.8	1.4	.8	.9	.7
M 7	7.4	7.7	7.4	14	14	13.6	1.6	1.8	1.4	.8	.9	.7
M 8	8.4	8.7	8.4	17	17	16.6	1.6	1.8	1.4	1.0	1.1	.9
M 10	10.5	10.9	10.5	21	21	20.5	2.0	2.2	1.8	1.25	1.45	1.05
M 12	13.0	13.4	13.0	24	24	23.5	2.5	2.7	2.3	1.6	1.80	1.40
M 14	15.0	15.4	15.0	28	28	27.5	2.5	2.7	2.3	1.6	1.8	1.4
M 16	17.0	17.4	17.0	30	30	29.5	3.0	3.3	2.7	2.0	2.2	1.8
M 18	19.0	19.5	19.0	34	34	33.2	3.0	3.3	2.7	2.0	2.2	1.8
M 20	21	21.5	21	37	37	36.2	3.0	3.3	2.7	2.0	2.2	1.8
M 22	23	23.5	23	39	39	38.2	3.0	3.3	2.7	2.0	2.2	1.8
M 24	25	25.5	25	44	44	43.2	4.0	4.3	3.7	2.5	2.7	2.3
M 27	28	28.5	28	50	50	49.2	4.0	4.3	3.7	2.5	2.7	2.3
M 30	31	31.6	31	56	56	55.0	4.0	4.3	3.7	2.5	2.7	2.3
M 33	34	34.6	34	60	60	59.0	5.0	5.6	4.4	3.0	3.3	2.7
M 36	37	37.6	37	66	66	65.0	5.0	5.6	4.4	3.0	3.3	2.7
M 39	40	40.6	40	72	72	71.0	6.0	6.6	5.4	3.0	3.3	2.7

American National Standard and Unified Standard Square Bolts (ANSI B18.2.1-1972)

SQUARE BOLTS											
Nominal Size or Basic Product Diameter		Body Diam., E	Width Across Flats, F			Width Across Corners, G		Height, H			Radius of Fillet, R
			Basic	Max.	Min.	Max.	Min.	Basic	Max.	Min.	
1/4	.2500	.260	3/8	.375	.362	.530	.498	11/64	.188	.156	.03
5/16	.3125	.324	1/2	.500	.484	.707	.665	13/64	.220	.186	.03
3/8	.3750	.388	9/16	.562	.544	.795	.747	1/4	.268	.232	.03
7/16	.4375	.452	5/8	.625	.603	.884	.828	19/64	.316	.278	.03
1/2	.5000	.515	3/4	.750	.725	1.061	.995	21/64	.348	.308	.03
5/8	.6250	.642	15/16	.938	.906	1.326	1.244	37/64	.444	.400	.06
3/4	.7500	.768	1 1/8	1.125	1.088	1.591	1.494	1/2	.524	.476	.06
7/8	.8750	.895	1 5/16	1.312	1.269	1.856	1.742	19/32	.620	.568	.06
1	1.0000	1.022	1 1/2	1.500	1.450	2.121	1.991	21/32	.684	.628	.09
1 1/8	1.1250	1.149	1 11/16	1.688	1.631	2.386	2.239	3/4	.780	.720	.09
1 1/4	1.2500	1.277	1 7/8	1.875	1.812	2.652	2.489	27/32	.876	.812	.09
1 3/8	1.3750	1.404	2 1/16	2.062	1.994	2.917	2.738	29/32	.940	.872	.09
1 1/2	1.5000	1.531	2 1/4	2.250	2.175	3.182	2.986	1	1.036	.964	.09

Figure A-15

Figure A-16

American National Standard and Unified Standard Hex Head Screws
(ANSI B18.2.1-1972)

Nominal Size or Basic Diam.	Body Diam, E	Width Across Flats, F		Width Across Corners, G		Height, H			Radius of Fillet, R			
		Max.	Basic	Max.	Min.	Max.	Min.	Basic	Max.	Min.	Max.	Min.
HEX BOLTS												
1/4	.2500	.260	7/16	.438	.425	.505	.484	11/64	.188	.150	.03	.01
5/16	.3125	.324	1/2	.500	.484	.577	.552	7/32	.235	.195	.03	.01
3/8	.3750	.388	9/16	.562	.544	.650	.620	1/4	.268	.226	.03	.01
7/16	.4375	.452	5/8	.625	.603	.722	.687	19/64	.316	.272	.03	.01
1/2	.5000	.515	3/4	.750	.725	.866	.826	11/32	.364	.302	.03	.01
5/8	.6250	.642	15/16	.938	.906	1.083	1.033	27/64	.444	.378	.06	.02
3/4	.7500	.768	1 1/8	1.125	1.088	1.299	1.240	1/2	.524	.455	.06	.02
7/8	.8750	.895	1 5/16	1.312	1.269	1.516	1.447	37/64	.604	.531	.06	.02
1	1.0000	1.022	1 1/2	1.500	1.450	1.732	1.653	43/64	.700	.591	.09	.03
1 1/8	1.1250	1.149	1 11/16	1.688	1.631	1.949	1.859	3/4	.780	.658	.09	.03
1 1/4	1.2500	1.277	1 7/8	1.875	1.812	2.165	2.066	27/32	.876	.749	.09	.03
1 3/8	1.3750	1.404	2 1/16	2.062	1.994	2.382	2.273	29/32	.940	.810	.09	.03
1 1/2	1.5000	1.531	2 1/4	2.250	2.175	2.598	2.480	1	1.036	.902	.09	.03
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	.12	.04
2	2.0000	2.039	3	3.000	2.900	3.464	3.306	1 11/32	1.388	1.175	.12	.04
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	.19	.06
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	.19	.06
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	.19	.06
3	3.0000	3.081	4 1/2	4.500	4.350	5.196	4.959	2	2.060	1.815	.19	.06
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	.19	.06
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	.19	.06
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	.19	.06
4	4.0000	4.111	6	6.000	5.800	6.982	6.612	2 11/16	2.764	2.424	.19	.06

Figure A-17

Coarse-Thread Series, UNC, UNRC, and NC — Basic Dimensions

Sizes	Basic Major Diam, D	Thds. per Inch, n	Basic Pitch Diam, E	Minor Diameter		Lead Angle at Basic P.D.	Area of Minor Diam. at D-2h	Tensile Stress Area
				Ext. Thds., Ks	Int. Thds., Kn			
	Inches	Inches	Inches	Inches	Inches	Deg. Min.	Sq. In.	Sq. In.
1 (.073)	.0730	64	.0629	.0538	.0561	4 31	.00218	.00263
2 (.086)	.0860	56	.0744	.0641	.0667	4 22	.00310	.00370
3 (.099)	.0990	48	.0855	.0734	.0764	4 26	.00406	.00487
4 (.112)	.1120	40	.0958	.0813	.0849	4 45	.00496	.00604
5 (.125)	.1250	40	.1088	.0943	.0979	4 11	.00672	.00796
6 (.138)	.1380	32	.1177	.0997	.1042	4 50	.00745	.00909
8 (.164)	1.640	32	.1437	.1257	.1302	3 58	.01196	.0140
10 (.190)	.1900	24	.1629	.1389	.1449	4 39	.01450	.0175
12 (.216)	.2160	24	.1889	.1649	.1709	4 1	.0206	.0242
1/4	.2500	20	.2175	.1887	.1959	4 11	.0269	.0318
5/16	.3125	18	.2764	.2443	.2524	3 40	.0454	.0524
3/8	.3750	16	.3344	.2983	.3073	3 24	.0678	.0775
7/16	.4375	14	.3911	.3499	.3602	3 20	.0933	.1063
1/2	.5000	13	4.500	.4056	.4167	3 7	.1257	.1419
9/16	.5625	12	.5084	.4603	.4723	2 59	.162	.182
5/8	.6250	11	.5660	.5135	.5266	2 56	.202	.226
3/4	.7500	10	.6850	.6273	.6417	2 40	.302	.334
7/8	.8750	9	.8028	.7387	.7547	2 31	.419	.462
1	1.0000	8	.9188	.8466	.8647	2 29	.551	.606
1 1/8	1.1250	7	1.032	.9497	.9704	2 31	.693	.763
1 1/4	1.2500	7	1.572	1.0747	1.0954	2 15	.890	.969
1 3/8	1.3750	6	1.2667	1.1705	1.1946	2 24	1.054	1.155
1 1/2	1.5000	6	1.3917	1.2955	1.3196	2 11	1.294	1.405

Figure A-18

Fine-Thread Series, UNC, UNRC, and NC — Basic Dimensions

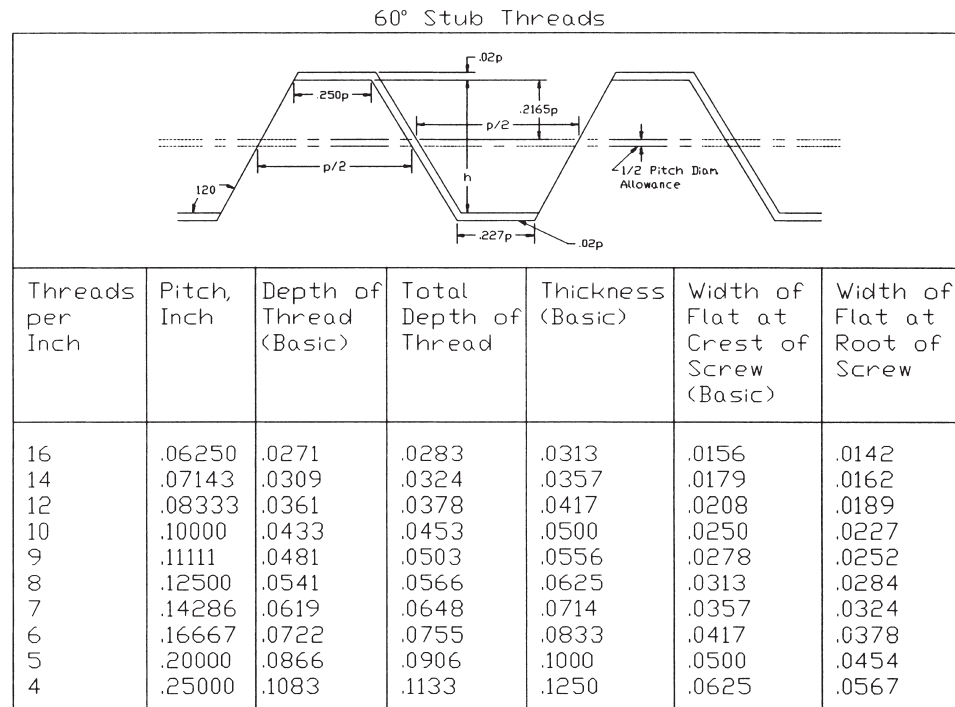
Sizes	Basic Major Diam., D	Thds. per Inch, n	Basic Pitch Diam., E	Minor Diameter		Lead Angle at Basic P.D.	Area of Minor Diam. at D-2h	Tensile Stress Area	
				Ext. Thds., Ks	Int. Thds., Kn				
	Inches		Inches	Inches	Inches	Deg.	Min.	Sq. In.	Sq. In.
1 (.073)	.0730	72	.0640	.0560	.0580	3	57	.00237	.00278
2 (.086)	.0860	64	.0759	.0668	.0691	3	45	.00339	.00394
3 (.099)	.0990	56	.0874	.0771	.0797	3	43	.00451	.00523
4 (.112)	.1120	48	.0985	.0864	.0894	3	51	.00566	.00661
5 (.125)	.1250	44	.1102	.0971	.1004	3	45	.00716	.00830
6 (.138)	.1380	40	.1218	.1073	.1109	3	44	.00874	.01015
8 (.164)	.1640	36	.1460	.1299	.1339	3	28	.01285	.01474
10 (.190)	.1900	32	.1697	.1517	.1562	3	21	.0175	.0200
12 (.216)	.2160	28	.1928	.1722	.1773	3	22	.0226	.0258
1/4	.2500	28	.2268	.2062	.2113	2	52	.0326	.0364
5/16	.3125	24	.2854	.2614	.2674	2	40	.0524	.0580
3/8	.3750	24	.3479	.3239	.3299	2	11	.0809	.0878
7/16	.4375	20	.4050	.3762	.3834	2	15	.1090	.1187
1/2	.5000	20	.4675	.4387	.4459	1	57	.1486	.1599
9/16	.5625	18	.5264	.4943	.5024	1	55	.189	.203
5/8	.6250	18	.5889	.5568	.5649	1	43	.240	.256
3/4	.7500	16	.7094	.6733	.6823	1	36	.351	.373
7/8	.8750	14	.8286	.7874	.7977	1	34	.480	.509
1	1.0000	12	.9459	.8978	.9098	1	36	.625	.663
1 1/8	1.1250	12	1.0709	1.0228	1.0348	1	25	.812	.856
1 1/4	1.2500	12	1.1959	1.1478	1.1598	1	16	1.024	1.073
1 3/8	1.3750	12	1.3209	1.2728	1.2848	1	9	1.260	1.315
1 1/2	1.5000	12	1.4459	1.3978	1.4098	1	3	1.521	1.581

Figure A-19

American National Standard General-Purpose Acme Screw Thread Form— Basic Dimensions (ANSI B1.5-1977)

Thds. per Inch	Pitch	Height of Thread (Basic)	Total Height of Thread	Thread Thickness (Basic)	Width of Flat	
					Crest of Internal Thread (Basic)	Root of Internal Thread
16	.06250	.03125	.0362	.03125	.0232	.0206
14	.07143	.03571	.0407	.03571	.0265	.0239
12	.08333	.04167	.0467	.04167	.0309	.0283
10	.10000	.05000	.0600	.05000	.0371	.0319
8	.12500	.06250	.0725	.06250	.0463	.0411
6	.16667	.08333	.0933	.08333	.0618	.0566
5	.20000	.10000	.1100	.10000	.0741	.0689
4	.25000	.12500	.1350	.12500	.0927	.0875
3	.33333	.16667	.1767	.16667	.1236	.1184
2 1/2	.40000	.20000	.2100	.20000	.1483	.1431
2	.50000	.25000	.2600	.25000	.1853	.1802
1 1/2	.66667	.33333	.3433	.33333	.2471	.2419
1 1/3	.75000	.37500	.3850	.37500	.2780	.2728
1	1.0000	.50000	.5100	.50000	.3707	.3655

Figure A-20



American National Standard Slotted 100° Flat Countersunk Head Machine Screws (ANSI B18.6.3-1972, R1977)

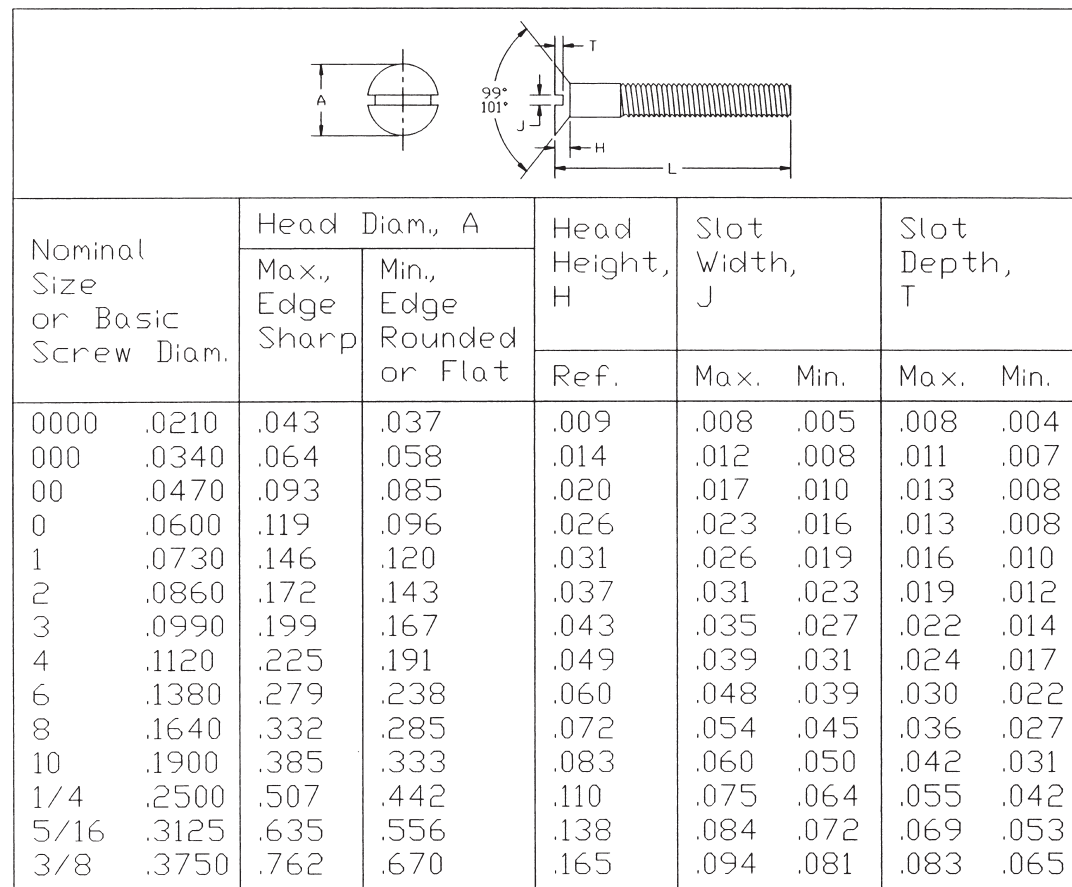
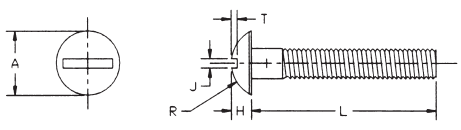


Figure A-21

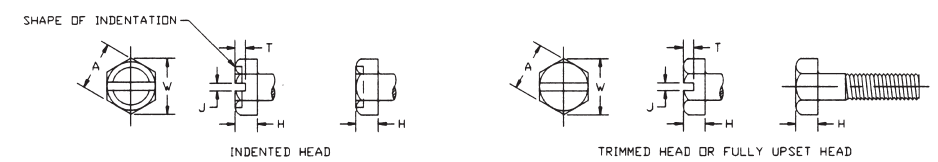
Figure A-22

American National Standard Slotted Truss Head Machine Screws (ANSI B18.6.3-1972, R1977)



Nominal Size or Basic Screw Diam.	Head Diam., A		Head Height, H		Head Radius, R	Slot Width, J		Slot Depth, T		
	Max.	Min.	Max.	Min.	Max.	Max.	Min.	Max.	Min.	
0000	.0210	.049	.043	.014	.010	.032	.009	.005	.009	.005
000	.0340	.077	.071	.022	.018	.051	.013	.009	.013	.009
00	.0470	.106	.098	.030	.024	.070	.017	.010	.018	.012
0	.0600	.131	.119	.037	.029	.087	.023	.016	.022	.014
1	.0730	.164	.149	.045	.037	.107	.026	.019	.027	.018
2	.0860	.194	.180	.053	.044	.129	.031	.023	.031	.022
3	.0990	.226	.211	.061	.051	.151	.035	.027	.036	.026
4	.1120	.257	.241	.069	.059	.169	.039	.031	.040	.030
5	.1250	.289	.272	.078	.066	.191	.043	.035	.045	.034
6	.1380	.321	.303	.086	.074	.211	.048	.039	.050	.037
8	.1640	.384	.364	.102	.088	.254	.054	.045	.058	.045
10	.1900	.448	.425	.118	.103	.283	.060	.050	.068	.053
12	.2160	.511	.487	.134	.118	.336	.067	.056	.077	.061
1/4	.2500	.573	.546	.150	.133	.375	.075	.064	.087	.070
5/16	.3125	.698	.666	.183	.162	.457	.084	.072	.106	.085
3/8	.3750	.823	.787	.215	.191	.538	.094	.081	.124	.100
7/16	.4375	.948	.907	.248	.221	.619	.094	.081	.142	.116
1/2	.5000	1.073	1.028	.280	.250	.701	.106	.091	.161	.131
9/16	.5625	1.198	1.149	.312	.279	.783	.118	.102	.179	.146
5/8	.6250	1.323	1.269	.345	.309	.863	.133	.116	.196	.162
3/4	.7500	1.573	1.511	.410	.368	1.024	.149	.131	.234	.182

American National Standard Plain and Slotted Hexagon Head Machine Screws (ANSI B18.6.3-1972, R1977)

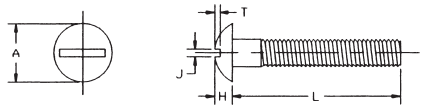


Nominal Size or Basic Screw Diam.	Regular Head		Large Head		Head Height H	Slot Width J	Slot Depth T			
	Width Across Flats A	Across Corn. W	Width Across Flats A	Across Corn. W						
	Max.	Min.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
1	.0730	.125	.120	.134	.044	.036				
2	.0860	.125	.120	.134	.050	.040				
3	.0990	.188	.181	.202	.055	.044				
4	.1120	.188	.181	.202	.060	.049	.039	.031	.036	.025
5	.1250	.188	.181	.202	.070	.058	.043	.035	.042	.030
6	.1380	.250	.244	.272	.093	.080	.048	.039	.046	.033
8	.1640	.250	.244	.272	.110	.096	.054	.045	.066	.052
10	.1900	.312	.305	.340	.120	.105	.060	.050	.072	.057
12	.2160	.312	.305	.340	.155	.139	.067	.056	.093	.077
1/4	.2500	.375	.367	.409	.190	.172	.075	.064	.101	.083
5/16	.3125	.500	.489	.545	.230	.208	.084	.072	.122	.100
3/8	.3750	.562	.551	.614	.295	.270	.094	.081	.156	.131

Figure A-23

Figure A-24

Slotted Round Head Machine Screws
(ANSI B18.6.3-1972, R1977 Appendix)



Nominal Size or Basic Screw Diam.	Head Diameter, A		Head Height, H		Slot Width, J		Slot Depth, T		
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
0000	.0210	.041	.035	.022	.016	.008	.004	.017	.013
000	.0340	.062	.056	.031	.025	.012	.008	.018	.012
00	.0470	.089	.080	.045	.036	.017	.010	.026	.018
0	.0600	.113	.099	.053	.043	.023	.016	.039	.029
1	.0730	.138	.122	.061	.051	.026	.019	.044	.033
2	.0860	.162	.146	.069	.059	.031	.023	.048	.037
3	.0990	.187	.169	.078	.067	.035	.027	.053	.040
4	.1120	.211	.193	.086	.075	.039	.031	.058	.044
5	.1250	.236	.217	.095	.083	.043	.035	.063	.047
6	.1380	.260	.240	.103	.091	.048	.039	.068	.051
8	.1640	.309	.287	.120	.107	.054	.045	.077	.058
10	.1900	.359	.334	.137	.123	.060	.050	.087	.065
12	.2160	.408	.382	.153	.139	.067	.056	.096	.073
1/4	.2500	.472	.443	.175	.160	.075	.064	.109	.082
5/16	.3125	.590	.557	.216	.198	.084	.072	.132	.099
3/8	.3750	.708	.670	.256	.237	.094	.081	.155	.117
7/16	.4375	.750	.707	.328	.307	.094	.081	.196	.148
1/2	.5000	.813	.766	.355	.332	.106	.091	.211	.159
9/16	.5625	.938	.887	.410	.385	.118	.102	.242	.183
5/8	.6250	1.000	.944	.438	.411	.133	.116	.258	.195
3/4	.7500	1.250	1.185	.547	.516	.149	.131	.320	.242

AMERICAN NATIONAL STANDARD SQUARE HEAD SET SCREWS
(ANSI B18.6.2)

Nominal Size of Basic Screw Diameter	Width Across Flats		Width Across Corners		Head Height		Neck Relief Diameter		Max Neck Relief Fillet Radius	Min Neck Relief Width	Min Head Radius	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.				
10	0.1900	0.188	0.180	0.265	0.247	0.148	0.134	0.145	0.140	0.027	0.083	0.48
1/4	0.2500	0.250	0.241	0.354	0.331	0.196	0.178	0.185	0.170	0.032	0.100	0.62
5/16	0.3125	0.312	0.302	0.442	0.415	0.245	0.224	0.240	0.225	0.036	0.111	0.78
3/8	0.3750	0.375	0.362	0.530	0.497	0.293	0.270	0.294	0.279	0.041	0.125	0.94
7/16	0.4375	0.438	0.423	0.619	0.581	0.341	0.315	0.345	0.330	0.046	0.143	1.09
1/2	0.5000	0.500	0.484	0.707	0.665	0.389	0.361	0.400	0.385	0.050	0.154	1.25
9/16	0.5625	0.562	0.545	0.795	0.748	0.437	0.407	0.454	0.439	0.054	0.167	1.41
5/8	0.6250	0.625	0.606	0.884	0.833	0.485	0.452	0.507	0.492	0.059	0.182	1.56
3/4	0.7500	0.750	0.729	1.060	1.001	0.582	0.544	0.620	0.605	0.065	0.200	1.88
7/8	0.8750	0.875	0.852	1.237	1.170	0.678	0.635	0.731	0.716	0.072	0.222	2.19
1	1.0000	1.000	0.974	1.414	1.337	0.774	0.726	0.838	0.823	0.081	0.250	2.50
1 1/8	1.1250	1.125	1.096	1.591	1.505	0.870	0.817	0.939	0.914	0.092	0.283	2.81
1 1/4	1.2500	1.250	1.219	1.768	1.674	0.966	0.908	1.064	1.039	0.092	0.283	3.12
1 3/8	1.3750	1.375	1.342	1.945	1.843	1.063	1.000	1.159	1.134	0.109	0.333	3.44
1 1/2	1.5000	1.500	1.464	2.121	2.010	1.159	1.091	1.284	1.259	0.109	0.333	3.75

Figure A-25

AMERICAN NATIONAL STANDARD SQUARE HEAD SETSCREWS
(ANSI B18.6.2)

Nominal Size or Basic Screw Diameter	Cup and Flat Point Diameters		Dog and Half-Dog Point Diameters		Point Length				Oval Point Radius +0.031 -0.000	Cone Point Angle 90° ± 2° for these Nominal Lengths or Longer, 118° ± 2° for Shorter Screws	
	Max.	Min.	Max.	Min.	Dog		Half-Dog				
					Max.	Min.	Max.	Min.			
10	0.1900	0.102	0.088	0.127	0.120	0.095	0.085	0.050	0.040	0.142	1/4
1/4	0.2500	0.132	0.118	0.156	0.149	0.130	0.120	0.068	0.058	0.188	5/16
5/16	0.3125	0.172	0.156	0.203	0.195	0.161	0.151	0.083	0.073	0.234	3/8
3/8	0.3750	0.212	0.194	0.250	0.241	0.193	0.183	0.099	0.089	0.281	7/16
7/16	0.4375	0.252	0.232	0.297	0.287	0.224	0.214	0.114	0.104	0.328	1/2
1/2	0.5000	0.291	0.270	0.344	0.334	0.255	0.245	0.130	0.120	0.375	9/16
9/16	0.5625	0.332	0.309	0.391	0.379	0.287	0.275	0.146	0.134	0.422	5/8
5/8	0.6250	0.371	0.347	0.469	0.456	0.321	0.305	0.164	0.148	0.469	3/4
3/4	0.7500	0.450	0.425	0.562	0.549	0.383	0.367	0.196	0.180	0.562	7/8
7/8	0.8750	0.530	0.502	0.656	0.642	0.446	0.430	0.227	0.221	0.656	1
1	1.0000	0.609	0.579	0.750	0.734	0.510	0.490	0.260	0.240	0.750	1 1/8
1 1/8	1.1250	0.689	0.655	0.844	0.826	0.572	0.552	0.291	0.271	0.844	1 1/4
1 1/4	1.2500	0.767	0.733	0.938	0.920	0.635	0.615	0.323	0.303	0.938	1 1/2
1 3/8	1.3750	0.848	0.808	1.031	1.011	0.698	0.678	0.354	0.334	1.031	1 5/8
1 1/2	1.5000	0.926	0.886	1.125	1.105	0.760	0.740	0.385	0.365	1.125	1 3/4

Figure A-26

American National Standard Slotted Headless Setscrews (ANSI B18.6.2)

Nominal Size or Basic Screw Diameter	Crown Radius Basic	Slot Width		Slot Depth		Cup and Flat Point Diameters		Dog Point Diameters		Point Length				Oval Point Radius Basic	Cone Point Angle 90°±2° For These Nominal Lengths or Longer 118°±2° For Shorter	
		MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	Dog		Half-Dog				
										MAX	MIN	MAX	MIN			
0	0.0600	0.060	0.014	0.0010	0.020	0.016	0.033	0.027	0.040	0.037	0.032	0.028	0.017	0.013	0.045	5/64
1	0.0730	0.073	0.016	0.012	0.020	0.016	0.040	0.033	0.049	0.045	0.040	0.036	0.021	0.017	0.055	3/32
2	0.0860	0.086	0.018	0.014	0.025	0.019	0.047	0.039	0.057	0.053	0.046	0.042	0.024	0.020	0.064	7/64
3	0.0990	0.099	0.020	0.016	0.028	0.022	0.054	0.045	0.066	0.062	0.052	0.048	0.027	0.023	0.074	1/8
4	0.1120	0.112	0.024	0.018	0.031	0.025	0.061	0.051	0.075	0.070	0.058	0.054	0.030	0.026	0.084	5/32
5	0.1250	0.125	0.026	0.020	0.036	0.026	0.067	0.057	0.083	0.078	0.063	0.057	0.033	0.027	0.094	3/16
6	0.1380	0.138	0.028	0.022	0.040	0.030	0.074	0.064	0.092	0.087	0.073	0.067	0.038	0.032	0.104	3/16
8	0.1640	0.164	0.032	0.026	0.046	0.036	0.087	0.076	0.109	0.103	0.083	0.077	0.043	0.037	0.123	1/4
10	0.1900	0.190	0.035	0.029	0.053	0.043	0.102	0.088	0.127	0.120	0.095	0.085	0.050	0.040	0.142	1/4
12	0.2160	0.216	0.042	0.035	0.061	0.051	0.115	0.101	0.144	0.137	0.115	0.105	0.060	0.050	0.162	5/16
1/4	0.2500	0.250	0.049	0.041	0.068	0.058	0.132	0.118	0.156	0.149	0.130	0.120	0.068	0.058	0.188	5/16
5/16	0.3125	0.312	0.055	0.047	0.083	0.073	0.172	0.156	0.203	0.195	0.161	0.151	0.083	0.073	0.234	3/8
3/8	0.3750	0.375	0.068	0.060	0.099	0.089	0.212	0.194	0.250	0.241	0.193	0.183	0.099	0.089	0.281	7/16
7/16	0.4375	0.438	0.076	0.068	0.114	0.104	0.252	0.232	0.297	0.287	0.224	0.214	0.114	0.104	0.328	1/2
1/2	0.5000	0.500	0.086	0.078	0.130	0.120	0.291	0.270	0.344	0.334	0.255	0.245	0.130	0.120	0.375	9/16
9/16	0.5625	0.562	0.096	0.088	0.146	0.136	0.332	0.309	0.391	0.379	0.287	0.275	0.146	0.134	0.422	5/8
5/8	0.6250	0.625	0.107	0.097	0.161	0.151	0.371	0.347	0.469	0.456	0.321	0.305	0.164	0.148	0.469	3/4
3/4	0.7500	0.750	0.134	0.124	0.193	0.183	0.450	0.425	0.562	0.549	0.383	0.367	0.196	0.180	0.562	7/8

Figure A-27

Lengths for Threaded Fasteners

	LENGTHS																	
	.250	.313	.375	.438	.500	.563	.625	.750	.875	1.000	1.250	1.500	1.750	2.000	2.500	3.000	3.500	4.000
5(.125)	●	●	●	●	●	●	●	●	●	●		●						
6(.138)	●	●	●	●	●	●	●	●	●	●	●	●		●				
8(.164)	●	●	●	●	●	●	●	●	●	●	●	●		●				
10(.190)	●	●	●	●	●	●	●	●	●	●	●	●	●	●				
12(.216)	●	●	●	●	●	●	●	●	●	●	●	●	●	●				
.250	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
.313	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
.375	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
.438	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
.500	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
.563			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
.625			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
.750					●	●	●	●	●	●	●	●	●	●	●	●	●	●
.875							●	●	●	●	●	●	●	●	●	●	●	●
1.000												●	●	●	●	●	●	●

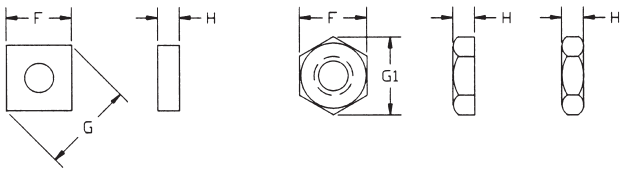
Figure A-28

Lengths for Metric Threaded Fasteners

	LENGTHS														
	4	5	8	10	12	16	20	24	30	36	40	45	50	60	70
1.6	●	●	●												
2	●	●	●												
2.5	●	●	●	●	●										
3		●	●	●	●										
4			●	●	●	●	●								
5			●	●	●	●	●	●							
6				●	●	●	●	●							
8					●	●	●	●	●	●					
10						●	●	●	●	●	●	●	●	●	
12							●	●	●	●	●	●	●	●	●
16								●	●	●	●	●	●	●	●
20									●	●	●	●	●	●	●
24										●	●	●	●	●	●
30											●	●	●	●	●

Figure A-29

American National Standard Square and Hexagon Machine Screw Nuts
(ANSI B18.6.3-1972, R1977)



Nom. Size	Basic Diam.	Basic F	Max. F	Min. F	Max. G	Min. G	Max. G1	Min. G1	Max. H	Min. H
0	.0600	5/32	.156	.150	.221	.206	.180	.171	.050	.043
1	.0730	5/32	.156	.150	.221	.206	.180	.171	.050	.043
2	.0860	3/16	.188	.180	.265	.247	.217	.205	.066	.057
3	.0990	3/16	.188	.180	.265	.247	.217	.205	.066	.057
4	.1120	1/4	.250	.241	.354	.331	.289	.275	.098	.087
5	.1250	5/16	.312	.302	.442	.415	.361	.344	.114	.102
6	.1380	5/16	.312	.302	.442	.415	.361	.344	.114	.102
8	.1640	11/32	.344	.332	.486	.456	.397	.378	.130	.117
10	.1900	3/8	.375	.362	.530	.497	.433	.413	.130	.117
12	.2160	7/16	.438	.423	.619	.581	.505	.482	.161	.148
1/4	.2500	7/16	.438	.423	.619	.581	.505	.482	.193	.178
5/16	.3125	9/16	.562	.545	.795	.748	.650	.621	.225	.208
3/8	.3750	5/8	.625	.607	.884	.833	.722	.692	.257	.239

Figure A-30

Figure A-31

Standard Twist Drill Sizes (Inches)

SIZE	DIAMETER	SIZE	DIAMETER	SIZE	DIAMETER	SIZE	DIAMETER
40	.098	19	.166	C	.242	U	.368
39	.0995	18	.1695	D	.246	3/8	.375
38	.1015	11/64	.1719	1/4(E)	.250	V	.377
37	.104	17	.173	F	.257	W	.386
36	.1065	16	.177	G	.261	25/64	.3906
7/16	.1094	15	.180	17/64	.2656	X	.397
35	.110	14	.182	H	.266	Y	.404
34	.111	13	.185	I	.272	13/32	.4062
33	.113	3/16	.1875	J	.277	Z	.413
32	.116	12	.189	K	.281	27/64	.4219
31	.120	11	.191	9/32	.2812	7/16	.4375
1/8	.125	10	.1935	L	.290	29/64	.4531
30	.1285	9	.196	M	.295	15/32	.4688
29	.136	8	.199	19/64	.2969	31/64	.4844
28	.1405	7	.201	N	.302	1/2	.5000
9/64	.1406	13/64	.2031	5/16	.3125	9/16	.5625
27	.144	6	.204	O	.316	5/8	.625
26	.147	5	.2055	P	.323	11/16	.6875
25	.1495	4	.209	21/64	.3281	3/4	.750
24	.152	3	.213	Q	.332	13/16	.8125
23	.154	7/32	.2188	R	.339	7/8	.875
5/32	.1562	2	.221	11/32	.3438	15/16	.9375
22	.157	1	.228	S	.348		
21	.159	A	.234	T	.358		
20	.161	B	.238	23/64	.3594		

NOTES FOR TWIST DRILL SIZES - INCHES

1. This is only a partial list of standard drill sizes.
2. Whenever possible, specify holes sizes that correspond to standard drill sizes.
3. Drill sizes are available in 1/64 increments between .5000 and 1.2500.
4. Drill sizes are available in 1/32 increments between 1.2500 and 1.500.

Figure A-32

Standard Twist Drill Sizes (Millimeters)					
0.40	2.05	5.10	8.60	15.25	30.00
0.42	2.10	5.20	8.70	15.50	30.50
0.45	2.15	5.30	8.80	15.75	31.00
0.48	2.20	5.40	8.90	16.00	31.50
0.50	2.25	5.50	9.00	16.25	32.00
0.55	2.30	5.60	9.10	16.50	32.50
0.60	2.35	5.70	9.20	16.75	33.00
0.65	2.40	5.80	9.30	17.00	33.50
0.70	2.45	5.90	9.40	17.25	34.00
0.75	2.50	6.00	9.50	17.50	34.50
0.80	2.60	6.10	9.60	17.75	35.00
0.85	2.70	6.20	9.70	18.00	35.50
0.90	2.80	6.30	9.80	18.50	36.00
0.95	2.90	6.40	9.90	19.00	36.50
1.00	3.00	6.50	10.00	19.50	37.00
1.05	3.10	6.60	10.20	20.00	37.50
1.10	3.20	6.70	10.50	20.50	38.00
1.15	3.30	6.80	10.80	21.00	40.00
1.20	3.40	6.90	11.00	21.50	42.00
1.25	3.50	7.00	11.20	22.00	44.00
1.30	3.60	7.10	11.50	22.50	46.00
1.35	3.70	7.20	11.80	23.00	48.00
1.40	3.80	7.30	12.00	23.50	50.00
1.45	3.90	7.40	12.20	24.00	
1.50	4.00	7.50	12.50	24.50	
1.55	4.10	7.60	12.80	25.00	
1.60	4.20	7.70	13.00	25.50	
1.65	4.30	7.80	13.20	26.00	
1.70	4.40	7.90	13.50	26.50	
1.75	4.50	8.00	13.80	27.00	
1.80	4.60	8.10	14.00	27.50	
1.85	4.70	8.20	14.25	28.00	
1.90	4.80	8.30	14.50	28.50	
1.95	4.90	8.40	14.75	29.00	
2.00	5.00	8.50	15.00	29.50	

Figure A-33

Metric Threads—Preferred Sizes		
Nominal Diameter	Pitch	
	Coarse	Fine
1	0.25	
1.2	0.25	
1.6	0.35	
2	0.40	
2.5	0.45	
3	0.50	
4	0.70	
5	0.80	
6	1.00	
8	1.25	1.00
10	1.50	1.25
12	1.75	1.50
16	2.00	1.50
20	2.50	1.50
24	3.00	2.00
30	3.50	2.00

Figure A-34

Standard Thread Sizes—Inches				
Number or Fraction	Decimal	Pitch		
		Coarse UNC	Fine UNF	Extra Fine UNEF
# 0	0.060		80	
# 2	0.088	56	64	
# 4	0.112	40	48	
# 6	0.138	32	40	
# 8	0.164	32	36	
# 10	0.190	24	32	
1/4	0.250	20	28	32
5/16	0.312	18	24	32
3/8	0.375	16	24	32
7/16	0.438	14	20	28
1/2	0.500	13	20	28
9/16	0.562	12	18	24
5/8	0.625	11	18	24
3/4	0.750	10	16	20
7/8	0.875	9	14	20
1	1.000	8	12	20

Thread Lengths	3/16	1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/4	1 1/2	1 3/4	2	2 1/2	3
#2 - 5	√	√	√	√	√	√	√	√						
#4 - 40		√	√	√	√	√	√	√	√	√				
#6 - 32		√	√	√	√	√		√	√	√	√	√	√	√
#8 - 32		√	√	√	√	√		√	√	√	√	√	√	√
#10 - 24		√	√	√	√	√		√	√	√	√	√	√	√
#10 - 32		√	√	√		√		√	√	√	√	√	√	√
#12 - 24			√	√	√	√		√	√	√	√	√	√	√
1/4 - 20				√	√	√	√	√	√	√	√	√	√	√
5/16 - 18				√	√	√	√	√	√	√	√	√	√	√
3/8 - 16				√	√	√	√	√	√	√	√	√	√	√
1/2 - 13						√	√	√	√	√	√	√	√	√
5/8 - 11							√	√	√	√	√	√	√	√
3/4 - 10										√		√		√

Figure A-35

Thread Specs	Fasteners—Standard Lengths											
	5	6	8	10	12	14	16	18	20	25	30	35
M3×.5	√	√	√	√	√	√	√	√	√	√	√	√
M4×.7		√	√	√	√	√	√	√	√	√	√	√
M5×.8		√	√	√	√	√	√	√	√	√	√	√
M6×1		√	√	√	√	√	√	√	√	√	√	√
M8× 1		√	√	√	√	√	√	√	√	√	√	√
M8× 1.25			√	√	√	√	√	√	√	√	√	√
M10×1				√	√	√	√	√	√	√	√	√
M10×1.5				√	√	√	√	√	√	√	√	√
M12×1.25					√	√	√	√	√	√	√	√
M12×1.5					√	√	√	√	√	√	√	√
M14×1.5						√	√	√	√	√	√	√
M16×1.5							√	√	√	√	√	√
M18×1.5								√	√	√	√	√
M20×1.5									√	√	√	√
M22×1.5										√	√	√
M24×2										√	√	√

Figure A-36

Figure A-37

American National Standard Plain Washers

Nominal Washer Size		Series	Inside Diameter	Outside Diameter	Thickness
No. 0	0.060	N	0.068	0.125	0.025
		R	0.068	0.188	0.025
		W	0.068	0.250	0.025
No. 1	0.073	N	0.084	0.155	0.025
		R	0.084	0.219	0.025
		W	0.084	0.281	0.032
No. 2	0.086	N	0.094	0.188	0.025
		R	0.094	0.250	0.032
		W	0.094	0.344	0.032
No. 3	0.099	N	0.109	0.219	0.025
		R	0.109	0.312	0.032
		W	0.109	0.406	0.040
No. 4	0.112	N	0.125	0.250	0.032
		R	0.125	0.375	0.040
		W	0.125	0.438	0.040
No. 5	0.125	N	0.141	0.281	0.032
		R	0.141	0.406	0.040
		W	0.141	0.500	0.040
No. 6	1.380	N	0.156	0.312	0.032
		R	0.156	0.438	0.040
		W	0.156	0.562	0.040
No. 8	0.164	N	0.188	0.375	0.040
		R	0.188	0.500	0.040
		W	0.188	0.633	0.063
No. 10	0.190	N	0.203	0.406	0.040
		R	0.203	0.562	0.040
		W	0.203	0.734	0.063
No. 12	0.216	N	0.234	0.438	0.040
		R	0.234	0.625	0.063
		W	0.234	0.875	0.063
1/4	0.250	N	0.281	0.500	0.063
		R	0.281	0.734	0.063
		W	0.281	1.000	0.063
5/16	0.312	N	0.344	0.625	0.063
		R	0.344	0.875	0.063
		W	0.344	1.125	0.063
3/8	0.375	N	0.406	0.734	0.063
		R	0.406	1.000	0.063
		W	0.406	1.250	0.100
7/16	0.438	N	0.469	0.875	0.063
		R	0.469	1.125	0.063
		W	0.469	1.469	0.100
1/2	0.500	N	0.531	1.000	0.063
		R	0.531	1.25	0.100
		W	0.531	1.125	0.100
9/16	0.562	N	0.594	1.125	0.063
		R	0.594	1.469	0.100
		W	0.594	2.000	0.100
5/8	0.625	N	0.656	1.250	0.100
		R	0.656	1.750	0.100
		W	0.656	2.250	0.160
3/4	0.750	N	0.812	1.375	0.100
		R	0.812	2.000	0.100
		W	0.812	2.500	0.160
7/8	0.875	N	0.938	1.469	0.100
		R	0.938	2.250	0.160
		W	0.938	2.750	0.160
1	1.000	N	1.062	1.750	0.100
		R	1.062	2.500	0.160
		W	1.062	3.000	0.160

Figure A-38

Flat Washers—Metric Sizes			
Nominal	Inside \varnothing	Outside \varnothing	Thickness
16	1.7	4	0.35
2	2.2	5	0.35
2.5	2.7	6	0.55
3	3.2	7	0.55
3.5	3.7	8	0.55
4	4.3	9	0.9
5	5.3	10	1.1
6	6.4	12	1.8
8	8.4	16	1.8
10	10.5	20	2.2
12	13	24	2.7
14	15	28	2.7
16	17	30	3.3
20	21	37	3.3
24	25	44	4.3
30	31	56	4.3