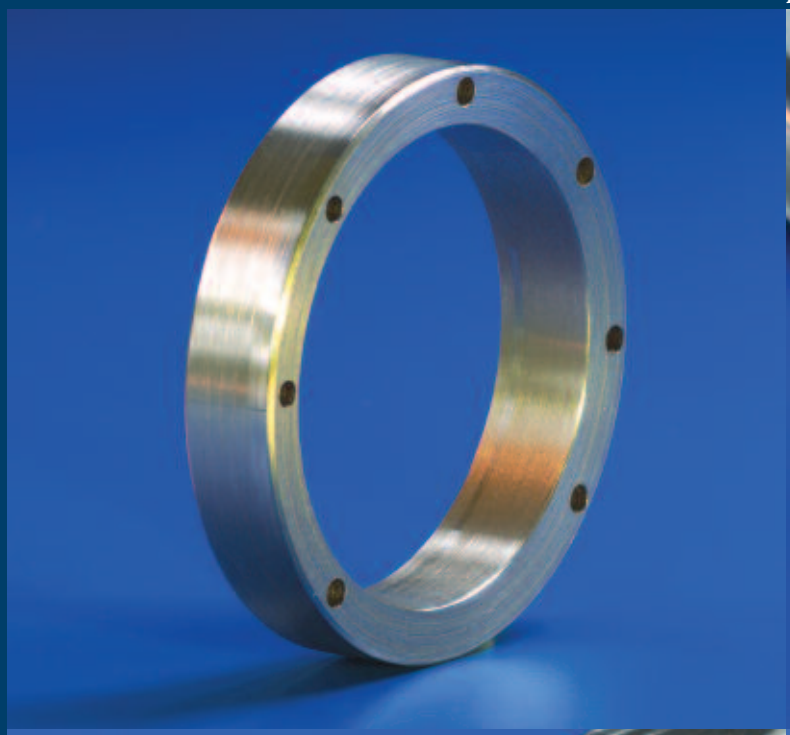
Castle Metals®

Cold Finished Carbon Steel Bars

Quik Guide

Your Foremost Provider of Specialty Products and Services



Cold Finished Carbon Steel Bars *Quik*

TYPE	GRADE	MACHINABILITY RATING% BASED 0N 1212 AS 100%	DESCRIPTION
LOW CARBON COLD DRAWN OR TURNED & POLISHED	1018	78	A general purpose low carbon steel with good case hardening qualities. Especially suited to cold forming, bending and welding operations.
	1117	91	A resulphurized steel offering higher strength and better machinability than 1018. Good for applications requiring carburization.
	11L17	104	A leaded and resulphurized steel. The lead addition augments the effect of the sulphur, reducing friction and permitting increased machine speed and better finish.
MEDIUM CARBON COLD DRAWN OR TURNED & POLISHED	1045	65	A higher strength alternative to 1018, as a result of the higher carbon content.
	1141	70	A resulphurized, heat treatable grade with better machining characteristics than 1045
	11L41	79	A leaded and resulphurized heat treatable steel. Machines even better than 1141.
	1144	76	A medium carbon, resulphurized steel with free-machining qualities. Higher carbon than 1141 or 1045 results in better heat treatability.
	1144/ASTMA 311 CLASS B STRESSPROOF® (2)	83	This grade offers an exceptional combination of machinability and high strength without heat treatment. 1144 modified chemistry. Pretested for machinability. Guaranteed 100,000 PSI minimum yield strength.
	Overized 1144/ASTMA 311 CLASS B STRESSPROOF®(2)	83	Slightly oversized material ordered to permit finishing by grinding to the nominal diameter.
	FATIGUE-PROOF®(1)	80	FATIGUE-PROOF® (2) has the high strength properties usually associated only with heat treated steels. Features excellent machining characteristics. 1144 modified chemistry. Pretested for machinability.
SCREW MACHINE STOCK COLD DRAWN OR TURNED & POLISHED	1215	136	The basic rephosphorized and resulphurized screw machine grade.
	12L14	180	The most widely used leaded, rephosphorized and resulphurized screw machine grade.
	ProCut™(1) 12L14	200	Restricted chemistry and melting practice provides 12L14 at the best and most consistent levels of machining within the grade.
	Oversized 12L14	180	Slightly oversized cold drawn 12L14 ordered to permit finishing at nominal diameters.
	12L14 with Te or Se	250	The addition of Tellurium or Selenium to 12L14 produces further improvements in machining performance. These trace elements promote the formation of desirable globular sulphide inclusions, which enhance machinability.
	INCUT 100®(3) 1215BIZ	200	Features high sulphur plus bismuth to ensure excellent machinability.
GROUND SHAFTING TURNED OR DRAWN GROUND & POLISHED	1018	71	Turned, ground and polished or drawn, ground and polished bars offer high dimensional accuracy and superior surface finish. Minimizes decarburization, seams and slivers. Ground and polished bars are generally used in shafting applications.
	1045	53	
	1141	67	
	1144/ASTMA 311 CLASS B STRESSPROOF® (2)	70	
ACCURACY STOCK COLD DRAWN GROUND & POLISHED	1215	136	Special accuracy stock suitable for precision requirements. Features a highly polished finish and close dimensional tolerance of ±.0005.
	1141	70	

(1) Procut™ are trademarks of A. M. Castle & Co.

(2) STRESSPROOF® and FATIGUE-PROOF® are registered trademarks of Niagara/LaSalle

(3) INCUT 100® is a registered trademark of Mittal Steel USA

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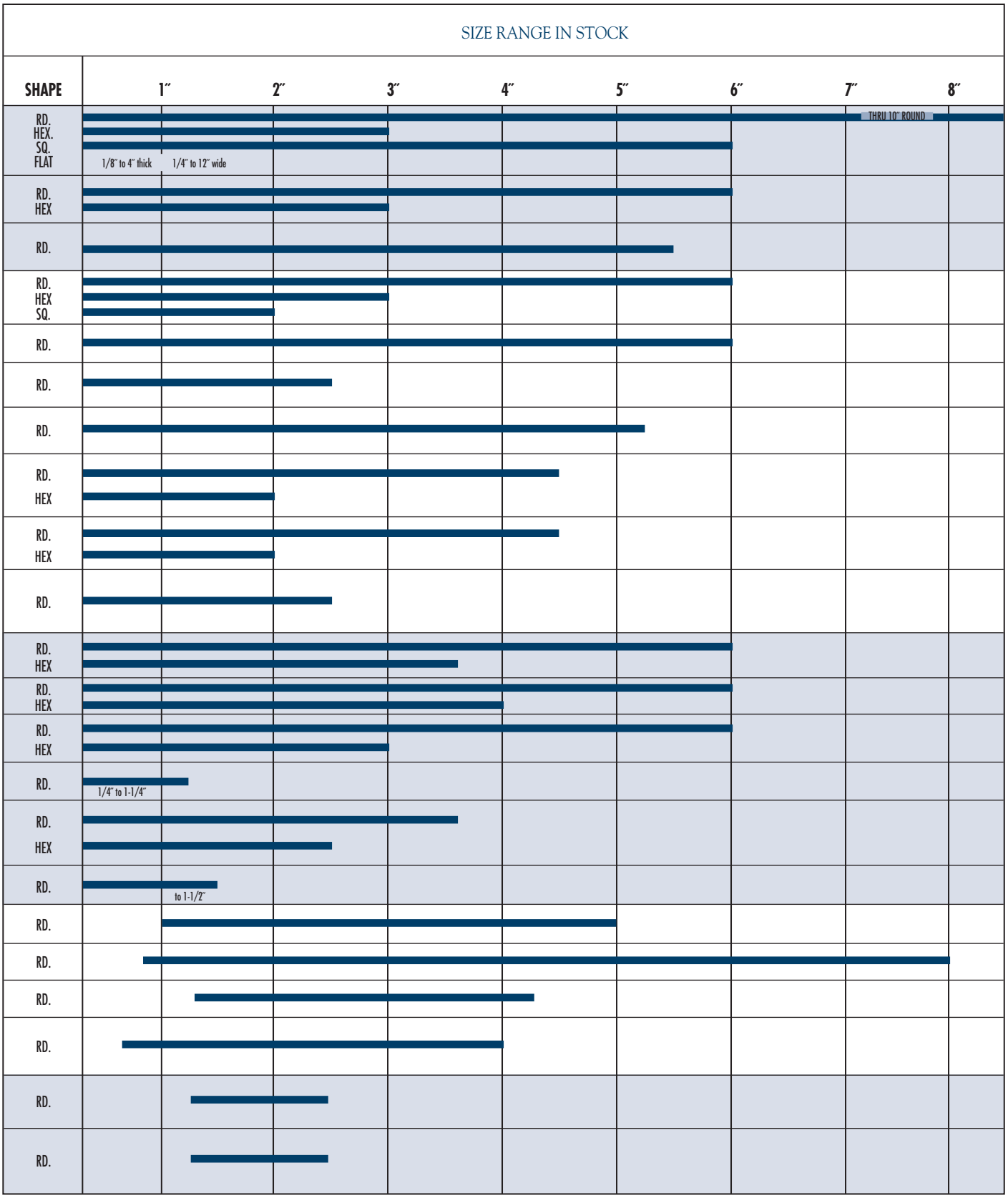
SIZE RANGE IN STOCK
SHAPE
1″
2″
3″
4″
5″
6″
7″
8″
RD.
HEX.
SQ.
FLAT
THRU 10″ ROUND
1/8″ to 4″ thick
1/4″ to 12″ wide
RD.
HEX
RD.
RD.
HEX
SQ.
RD.
RD.
RD.
HEX
RD.
HEX
RD.
RD.
HEX
RD.
HEX
RD.
HEX
RD.
1/4″ to 1-1/4″
RD.
HEX
RD.
to 1-1/2″
RD.
RD.
RD.
RD.
RD.

CHEMISTRY						TYPICAL MECHANICAL PROPERTIES [3]				GRADE
% Carb.	% Mang.	% Phos.	% Sul.	% Lead.	% Other	Tensile PSI	Yield PSI	% Elong. in 2″	% Red. of Area	
.15/.20	.60/.90	.040 Max.	.050 Max.	—	—	65,000	55,000	16	40	1018
.14/.20	1.00/1.30	.040 Max.	.08/.13	—	—	70,000	60,000	15	40	1117
.14/.20	1.00/1.30	.040 Max.	.08/.13	.15/.35	—	70,000	60,000	16	41	11L17
.43/.50	.60/.90	.040 Max.	.050 Max.	—	—	90,000	80,000	11	35	1045
.37/.45	1.35/1.65	.040 Max.	.08/.13	—	—	100,000	90,000	10	30	1141
.37/.45	1.35/1.65	.040 Max.	.08/.13	.15/.35	—	100,000	90,000	10	30	11L41
.40/.48	1.35/1.65	.040 Max.	.24/.33	—	—	100,000	95,000	10	30	1144
.40/.48	1.35/1.65	.040 Max.	.24/.33	—	Si .15/.30	130,000	100,000 Min.	12	34	1144/ASTMA 311 CLASS B STRESSPROOF®[2]
.40/.48	1.35/1.65	.040 Max.	.24/.33	—	Si .15/.30	130,000	100,000 Min.	12	34	Overized 1144/ASTMA 311 CLASS B STRESSPROOF®[2]
.40/.48	1.35/1.65	.040 Max.	.24/.33	—	Si .15/.30	140,000 Min.	125,000 Min.	10	26	FATIGUE-PROOF®[1]
.09 Max.	.75/1.05	.04/.09	.26/.35	—	—	78,000	60,000	15 to 20	35	1215
.15 Max.	.85/1.15	.04/.09	.26/.35	.15/.35	—	78,000	60,000	17	35	12L14
separate bulletin available						78,000	60,000	17	35	ProCut™[1] 12L14
.15 Max.	.85/1.15	.04/.09	.26/.35	.15/.35	—	78,000	60,000	17	35	Oversized 12L14
.15 Max.	.85/1.15	.04/.09	.26/.35	.15/.35	Te or Se .035 Aim	74,000	70,000	16	44	12L14 with Te or Se
.06/.09	.95/1.20	.04/.09	.40 Min.	—	Bi .10 Mean	65,000	60,000	11.5	40	1215 BIZ
.15/.20	.60/.90	.040 Max.	.050 Max.	—	—	65,000	45,000	36	58	1018
.43/.50	.60/.90	.040 Max.	.050 Max.	—	—	90,000	59,000	24	45	1045
.37/.45	1.35/1.65	.040 Max.	.08/.13	—	—	99,000	61,000	25	51	1141
.40/.48	1.35/1.65	.040 Max.	.24/.33	—	Si .15/.30	130,000	100,000 Min.	10	30	STRESSPROOF®[2] 1144/ASTMA 311 CLASS B
.09 Max.	.75/1.05	.04/.09	.26/.35	—	—	78,000	73,000	18	53	1215
.37/.45	1.35/1.65	.040 Max.	.08/.13	—	—	100,000	90,000	16	40	1141

(3) Nominal Values only. Mechanical properties are not guaranteed unless denoted "Minimum" or "Min."

Tolerance Tables for Cold Finished Carbon Steel Bars

ASTM A108 Straightness Tolerances For Cold Finished Carbon Steel Bars For Automatic Screw Machine Use

Size, in inch	Length, in feet	Straightness tolerance, in inch[4] (maximum deviation from straightness in any 10-foot portion of the bar)
ROUNDS: Maximum of Carbon Range 0.28 Per Cent or Less		
Less than 5/8	Less than 15	1/8
Less than 5/8	15 and over	1/8
5/8 and over	Less than 15	1/16
5/8 and over	15 and over	1/8
ROUNDS: Maximum of Carbon Range over 0.28 Per Cent and all Grades Heat Treated[5]		
Less than 5/8	Less than 15	3/16
Less than 5/8	15 and over	5/16
5/8 and over	Less than 15	1/8
5/8 and over	15 and over	3/16
SQUARES, HEXAGONS: Maximum of Carbon Range 0.28 Per Cent or Less		
Less than 5/8	Less than 15	3/16
Less than 5/8	15 and over	5/16
5/8 and over	Less than 15	1/8
5/8 and over	15 and over	3/16
SQUARES, HEXAGONS: Maximum of Carbon Range Over 0.28 Per Cent and all Grades Heat Treated[5]		
Less than 5/8	Less than 15	1/4
Less than 5/8	15 and over	3/8
5/8 and over	Less than 15	3/16
5/8 and over	15 and over	1/4

(4) The tolerance is based on the following method of measuring straightness. Deviation from straightness is measured by placing the bar on a level table so that the arc or deviation from straightness is horizontal, and the depth of the arc is measured with a steel scale and a straight edge.

(5) All grades quenched and tempered or normalized and tempered before cold finishing, and all grades stress relieved or annealed after cold finishing.

NOTE: It should be recognized that straightness is a perishable quality and may be altered by mishandling. The preservation of straightness in cold finished bars requires the utmost care in subsequent handling.

ASTM A108 Size Tolerances for Cold Finished Round Bars Cold Drawn, Ground and Polished or Turned, Ground and Polished

Size, in. Cold Drawn Ground and Polished	Turned, Ground and Polished	Tolerances from Specified Size, Minus Only, in.
To 1-1/2 incl.	To: 1-1/2, incl.	0.001
Over 1-1/2 to 2-1/2 excl.	Over 1-1/2, to 2-1/2, excl.	0.0015
2-1/2 to 3, incl.	2-1/2 to 3, incl.	0.002
Over 3 to 4, incl.	Over 3 to 4, incl.	0.003
—	Over 4 to 6 incl.	0.004[6]
—	Over 6	0.005[6]

(6) For non-resulphurized steels (steels specified to maximum sulphur limits under 0.08%), or for steels thermally treated, the tolerance in increased by 0.001 in.

ASTM A108 Size Tolerances for Cold Finished Carbon Steel Bars, Cold Drawn or Turned and Polished[7]

Size, inch[10]	Maximum of Carbon Range 0.28% or less	Maximum of Carbon Range Over 0.28% to 0.55%, incl.	Maximum of Carbon Range to 0.55%, incl. Stress Relieved or Annealed after Cold Finishing[8]	Maximum of Carbon Range Over 0.55% or All Grades Quenched and Tempered or Normalized and Tempered Before Cold Finishing
All Tolerances are in inches and are minus				
Rounds — Cold Drawn (to 6 in.) or Turned and Polished				
To 1-1/2, incl.	0.002	0.003	0.004	0.005
Over 1-1/2 to 2-1/2, incl.	0.003	0.004	0.005	0.006
Over 2-1/2 to 4, incl.	0.004	0.005	0.006	0.007
Over 4 to 6, incl.	0.005	0.006	0.007	0.008
Over 6 to 8, incl.	0.006	0.007	0.008	0.009
Over 8 to 9, incl.	0.007	0.008	0.009	0.010
Hexagons				
To 3/4, incl.	0.002	0.003	0.004	0.006
Over 3/4 to 1-1/2, Incl	0.003	0.004	0.005	0.007
Over 1-1/2 to 2-1/2, incl.	0.004	0.005	0.006	0.008
Over 2-1/2 to 3-1/8, incl.	0.005	0.006	0.007	0.009
Over 3-1/8 to 4, incl.	0.005	0.006	—	—
Squares				
To 3/4, incl.	0.002	0.004	0.005	0.007
Over 3/4 to 1-1/2, incl.	0.003	0.005	0.006	0.008
Over 1-1/2 to 2-1/2, incl.	0.004	0.006	0.007	0.009
Over 2-1/2 to 4, incl.	0.006	0.008	0.009	0.011
Over 4 to 5, incl.	0.010	—	—	—
Over 5 to 6, incl.	0.014	—	—	—
Flats[9]				
Width,[10] in.				
To 3/4 incl.	0.003	0.004	0.006	0.008
Over 3/4 to 1-1/2, incl.	0.004	0.005	0.008	0.010
Over 1-1/2 to 3, incl.	0.005	0.006	0.010	0.012
Over 3 to 4, incl.	0.006	0.008	0.011	0.016
Over 4 to 6, incl.	0.008	0.010	0.012	0.020
Over 6	0.013	0.015	—	—

(7) This table includes tolerances for bars that have been annealed, spheroidize annealed, normalized, normalized and tempered, or quenched and tempered before cold finishing. this table does not include tolerances for bars that are annealed, spheroidize annealed, normalized, normalized and tempered, or quenched and tempered after cold finishing; the producer should be consulted for tolerances for such bars.

(8) STRESSPROOF® [2] and FATIGUE-PROOF® [2] have separate tolerances.

(9) Width governs the tolerances for both width and thickness of flats. For example, when the maximum of carbon range is 0.28% or less, for a flat 2 in. wide and 1 in. thick, the width tolerance is 0.005 in. and the thickness tolerance is the same, namely, 0.005 in.

(10) Tolerances may be ordered all plus, or distributed plus minus with the sum equivalent to the tolerances listed.

AISI Recommended Stock Removal

Size Range	Material	
	Non-Resulphurized Grades Maximum Clean Up Cut	Resulphurized Grades Maximum Clean Up Cut
Thru 5/8″	0.010″ Per Side	0.015″ Per Side
Over 5/8″	.001″ Per Side For Each 1/16″ of Diameter	0.0015″ Per Side For Each 1/16″ of Diameter

Note: STRESSPROOF® [2] and FATIGUE-PROOF® [2] are resulphurized grades but have a recommended stock removal of .001″ per side for each 1/16″ of diameter for all sizes.

Theoretical Weights of Round, Square, Flat[11] and Hexagon Steel Bars

Theoretical weight per cubic inch + 0.2836

Thickness or Diameter, In.	Round Weight Lbs. Per Ft.	Square Weight Lbs. Per Ft.	Hexagon Weight Lbs. Per Ft.
1/32	0.0025	0.0033	0.0028
1/16	0.0104	0.0133	0.0115
3/32	0.0235	0.0299	0.0259
1/8	0.0417	0.0532	0.0460
5/32	0.0653	0.0831	0.0720
3/16	0.0940	0.1196	0.1036
7/32	0.1279	0.1629	0.1410
1/4	0.1671	0.2127	0.1842
9/32	0.2114	0.2692	0.2331
5/16	0.2611	0.3324	0.2878
11/32	0.3158	0.4022	0.3483
3/8	0.3759	0.4786	0.4154
13/32	0.4412	0.5617	0.4865
7/16	0.5116	0.6515	0.5642
15/32	0.5873	0.7479	0.6477
1/2	0.6683	0.8509	0.7369
17/32	0.7544	0.9606	0.8319
9/16	0.8458	1.077	0.9327
19/32	0.9424	1.200	1.039
5/8	1.044	1.329	1.151
21/32	1.151	1.466	1.269
11/16	1.263	1.609	1.393
23/32	1.381	1.758	1.523
3/4	1.504	1.915	1.658
25/32	1.632	2.077	1.799
13/16	1.765	2.247	1.946
27/32	1.903	2.424	2.098
7/8	2.046	2.606	2.256
29/32	2.195	2.795	2.421
15/16	2.349	2.991	2.591
31/32	2.509	3.194	2.766
1	2.673	3.404	2.947
1-1/16	3.018	3.842	3.328
1-1/8	3.384	4.308	3.731
1-3/16	3.770	4.800	4.156
1-1/4	4.176	5.319	4.606
1-5/16	4.605	5.863	5.077
1-3/8	5.054	6.435	5.573
1-7/16	5.524	7.033	6.091
1-1/2	6.014	7.658	6.632
1-9/16	6.526	8.310	7.197
1-5/8	7.058	8.988	7.783

Theoretical weight per cubic inch + 0.2836

Thickness or Diameter, In.	Round Weight Lbs. Per Ft.	Square Weight Lbs. Per Ft.	Hexagon Weight Lbs. Per Ft.
1-11/16	7.612	9.692	8.394
1-3/4	8.187	10.42	9.028
1-13/16	8.782	11.18	9.680
1-7/8	9.398	11.96	10.36
1-15/16	10.03	12.77	11.06
2	10.69	13.61	11.79
2-1/16	11.37	14.48	12.54
2-1/8	12.07	15.37	13.31
2-3/16	12.79	16.29	14.10
2-1/4	13.53	17.23	14.93
2-5/16	14.29	18.20	15.77
2-3/8	15.08	19.20	16.63
2-7/16	15.89	20.22	17.51
2-1/2	16.71	21.27	18.42
2-5/8	18.42	23.45	20.31
2-3/4	20.21	25.74	22.29
2-7/8	22.09	28.13	24.37
3	24.05	30.63	26.53
3-1/8	26.11	33.24	28.78
3-1/4	28.24	35.95	31.13
3-3/8	30.45	38.77	33.58
3-1/2	32.74	41.69	36.11
3-5/8	35.13	44.73	38.73
3-3/4	37.59	47.86	41.45
3-7/8	40.14	51.10	44.26
4	42.77	54.46	47.16
4-1/8	45.49	57.91	50.15
4-1/4	48.28	61.48	53.24
4-3/8	51.16	65.15	56.42
4-1/2	54.13	68.92	59.69
4-5/8	57.18	72.81	63.05
4-3/4	60.13	76.79	66.51
4-7/8	63.53	80.89	70.05
5	66.83	85.09	73.69
5-1/8	70.21	89.39	77.42
5-1/4	73.68	93.81	81.25
5-3/8	77.23	98.33	85.16
5-1/2	80.87	103.0	89.16
5-5/8	84.58	107.7	93.26
5-3/4	88.38	112.5	97.45
5-7/8	92.27	117.5	102.7
6	96.23	122.5	106.1

(11) Flats. To determine the theoretical weight in pounds per linear foot, multiply the width in inches times the thickness in inches times 3.404

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