Alro Steel

America's Premier Metals Service Center

Aluminum • Alloys • Carbon Steel • Stainless Steel • Red Metals

METALS GUIDE

alro.com

Since 1948

Terms and Conditions:

Returned Goods
Orders may not be returned without prior authorization from Alro. If the responsibility is ours or the manufacturer's, we will replace the material promptly. In all other cases, we will attempt to minimize the customer's expense or loss. If we authorize a return, we reserve the right to make reasonable handling charges for returned goods.

Cancellations
Special orders (goods not normally carried in stock) may not be cancelled without our prior authorization. Such authorization will depend on terms we receive from the manufacturers. Orders for stock material that have already been processed may not be cancellable. This determination will be made at Alro's sole discretion.

Claims
Claims for shortages in shipment, defective goods, or errors must be made within 10 days after receipt of order. Claims for shortages or damage caused by delivering carrier should be made directly with them. Claims for defective material may need to be inspected and approved by the manufacturer before credit can be issued.

Responsibility
Alro's liability is limited to replacement of defective material. We are not responsible for and assume no liability for labor, incidental or consequential damages or other expenses. Statistical information contained in this catalog (pertaining to speeds, strength, specifications, proper working load of materials, tools, machines) was derived from manufacturer's tables and reprinted by us for our customer's convenience. We assume no responsibility by this reprint.

The information contained in this catalog has been prepared to the best of our ability, however, there is no guarantee that all of the information is correct and updated. The latest version of this catalog can be found online at www.alro.com.

This catalog has been compiled to provide information on a wide variety of products to assist with selecting the proper materials for your application. All of the information listed in this catalog is for reference only. The information listed should not be the final determination in material selection for your specific application.

WARNING: These products can potentially expose you to chemicals including Nickel, Chromium, Lead, Cobalt, Mercury and Beryllium, which are known to the state of California to cause cancer and/or birth defects or other reproductive harm. For more information, visit **www.P65Warnings.ca.gov**

Our Philosophy:

Our business philosophy can best be represented by our Mission Statement and our commitment to continuous improvement.

MISSION STATEMENT

To ensure the long term success of Alro and its people by exceeding our customers' expectations.

SERVICE EXPECTATIONS

Tender Loving Care for all Customers
Everyone is your customer.

Next Day Delivery
Most customers rely on it.

Zero Errors
What good is great delivery if it's wrong?

Heroic Recoveries
Turn a problem into an opportunity. If something goes wrong, fix it now!
Figure out what happened later and learn from it.

FOUNDATIONS

PEOPLE • SAFETY • SYSTEMS • INVENTORY • FACILITIES • EQUIPMENT

We exceed our customers' expectations through vast inventory, superior technology, value-added services and on-time deliveries!

Our History:

Alro is proud to celebrate 75 years in business! Al Glick began Alro Steel with his brother Robert, the “RO” in ALRO, with one location in Jackson, Michigan in 1948. Since that time, Alro has been focused on exceeding customers' expectations. Through hard work and commitment from more than 3,000 Alro teammates, the company has grown to over 80 locations in 16 states. We strive to be America's premier metals, industrial supplies, and plastics service center.

We would like to thank our customers, suppliers, and teammates for their support to reach this milestone.

Alro History • Scan Now!

Alro is a distributor of metals and plastics founded 75 years ago in 1948. Alro is focused on offering cut-to-size metals and plastics with next day delivery to over 50,000 customers in North America through its distribution network that covers 16 states with over 80 locations. The company provides a broad inventory of products and services under the following companies: Alro Steel, Alro Metals, Alro Metals Outlet, and Alro Plastics.

1948 75 2023

Celebrating **75** Years!

Steel Bars

Cold Finished & Hot Rolled Bar Products

WARNING: These products can potentially expose you to chemicals including Nickel, Chromium, Lead, Cobalt, Mercury and Beryllium, which are known to the state of California to cause cancer and/or birth defects or other reproductive harm. For more information, visit **www.P65Warnings.ca.gov**

Cold Finished Carbon Bars

Grades and Descriptions

Cold Finished Bars are produced from Special Bar Quality Hot Rolled Bars by cold drawing, turning or grinding or by a combination of these methods. The cross sectional area of the hot rolled bar is cold reduced, resulting in accurate size, smooth surface, increased mechanical properties and machinability.

1018 is a general purpose low carbon steel with good case hardening qualities. It is especially suited to cold forming and bending operations. Material is suitable for parts which require cold forming (such as crimping, swaging, or bending). For severe bends, however, stress relieving may be necessary to prevent cracking.

1045 is a medium carbon steel used extensively in induction hardening applications. This is not normally considered a screw machine steel and is only fair for brazing and welding. However, it can be forged satisfactorily and is the most common shafting steel in the medium carbon range.

1117 is a low carbon, high manganese steel. Machinability is improved over 1018, and case hardening is deep and uniform, supported by a tough ductile core.

11L17 is a resulphurized steel with good machinability and surface finish. The product is made much the same way as 12L14 where the lead does not alloy with the steel. Lead is retained in its elemental state and is dispersed within the steel's structure allowing chips to break off easier during machining.

1141 is a medium carbon, special quality, manganese steel, with improved machinability and better heat treatment response. Surface hardness is deeper and more uniform than plain carbon steels.

1144 is a resulphurized carbon steel containing manganese and sulphur to provide a free-machining steel. It is recommended especially for high-production automatic machine products and machined parts requiring higher strength and wear resistance than is possible with lower carbon steels.

A311 Class B, includes Stressproof®, is a medium carbon free machining steel that has been severely cold reduced to improve its mechanical properties. Its inherent strength, without heat treatment, is comparable to heat treated steels of equal hardness. This permits direct use of many parts following the last machining operation, without the necessity of a further hardening treatment.

12L14 is considered to be one of the fastest machining steels currently produced. This has been achieved through the addition and even dispersal of tiny lead particles throughout the bar. C12L14 gives a smooth, machined surface and because of its low friction component allows increased tool life. This grade is recommended for high-speed automatic screw machine parts.

1215 is one of the most popular screw stocks marketed today. C1215 provides good surface finish and brazing properties.

Fatigueproof® is made by various combinations of mechanical working and thermal treatment which can include Niagara LaSalle's "e.t.d."® (elevated temperature drawing) process. This is a high strength steel bar that eliminates heat treating and secondary operations such as cleaning, straightening, secondary machining and inspections. All this, in combination with free machining and high strength, operates to lower end costs. Fatigueproof® induction hardens satisfactorily, but should be watched for quench cracks. Fatigueproof® is also comparitor or roto tested.

Cold Finished - Rounds

Stock Lengths: 12 foot (Other lengths are available upon request)

Diameter (inches)	Weight (lbs./ft.)	Weight per 12 Foot Bar	1018	1045*	1117	11L17	1141	1144	Stressproof® A311, Class B**	12L14	1215	Fatigueproof®
1/8	0.040	0.48	●							●		
5/32	0.070	0.84	●							●		
3/16	0.090	1.08	●	●						●	●	
13/64	0.110	1.32								●		
7/32	0.130	1.56	●							●	●	
15/64	0.147	1.76								●		
1/4	0.167	2.00	●	●	●				●	●	●	●
17/64	0.190	2.28								●		
9/32	0.210	2.52	●							●	●	
19/64	0.240	2.88								●		
5/16	0.260	3.12	●	●	●				●	●	●	●
21/64	0.290	3.48								●		
11/32	0.320	3.84	●							●	●	
23/64	0.350	4.20								●		
3/8	0.380	4.56	●	●	●		●		●	●	●	●
25/64	0.410	4.92								●		
13/32	0.441	5.29	●							●	●	
27/64	0.480	5.76								●		
7/16	0.510	6.12	●	●	●				●	●	●	●
29/64	0.550	6.60								●		
15/32	0.587	7.04	●							●	●	
31/64	0.630	7.56								●		
1/2	0.670	8.04	●	●	●	●	●	●	●	●	●	●
33/64	0.710	8.52								●		
17/32	0.754	9.04	●							●	●	
35/64	0.798	9.57										
9/16	0.850	10.20	●	●	●		●	●	●	●	●	●
19/32	0.940	11.28	●		●					●	●	
39/64	0.990	11.88										
5/8	1.040	12.48	●	●	●	●	●	●	●	●	●	●
41/64	1.100	13.20								●		
21/32	1.150	13.80	●							●	●	
11/16	1.260	15.12	●	●	●					●	●	●
23/32	1.380	16.56	●							●	●	
47/64	1.440	17.28								●		
3/4	1.500	18.00	●	●	●	●	●	●	●	●	●	●

** 1045 is available in turned, ground and polished condition.*

*** Stressproof® A311 Class B is available in ground and polished condition starting at 3/8".*

Continued on next page

Cold Finished - Rounds

Stock Lengths: 12 and 20 foot (Other lengths are available upon request)

Diameter (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft)	1018	1045*	1117	11L17	1141	1144	Stressproof® A311, Class B**	12L14	1215	Fatigueproof®
49/64	1.570	18.84								●		
25/32	1.630	19.56	●							●	●	
13/16	1.760	21.12	●	●	●		●	●	●	●	●	●
27/32	1.901	22.81	●							●	●	
7/8	2.040	24.48	●	●	●	●	●	●	●	●	●	●
29/32	2.193	26.31	●							●	●	
15/16	2.350	28.20	●	●	●		●	●	●	●	●	
31/32	2.506	30.07	●							●		
1	2.670	32.04	●	●	●	●	●	●	●	●	●	●
1-1/16	3.014	36.17	●	●	●		●	●	●	●	●	
1-1/8	3.379	40.55	●	●	●	●	●	●	●	●	●	●
1-3/16	3.770	45.24	●	●	●		●		●	●	●	●
1-1/4	4.170	50.04	●	●	●	●	●	●	●	●	●	●
1-5/16	4.600	55.20	●	●	●	●	●		●	●	●	
1-3/8	5.050	60.60	●	●	●	●	●	●	●	●	●	●
1-7/16	5.520	66.24	●	●	●		●		●	●	●	
1-1/2	6.010	72.12	●	●	●	●	●	●	●	●	●	●
1-9/16	6.510	78.12	●	●	●		●		●	●	●	
1-5/8	7.050	84.60	●	●	●	●	●	●	●	●	●	●
1-11/16	7.600	91.20	●	●					●	●	●	
1-3/4	8.170	98.04	●	●	●	●	●	●	●	●	●	●
1-13/16	8.770	105.24	●	●	●				●	●	●	
1-7/8	9.390	112.68	●	●	●	●	●	●	●	●	●	●
1-15/16	10.020	120.24	●	●	●				●	●	●	
2	10.680	128.16	●	●	●	●	●	●	●	●	●	●
2-1/16	11.360	136.32	●						●	●	●	
2-1/8	12.060	144.72	●	●	●	●	●	●	●	●	●	●
2-3/16	12.780	153.36	●	●					●	●	●	
2-1/4	13.520	162.24	●	●	●		●	●	●	●	●	●
2-5/16	14.280	171.36	●	●					●	●	●	
2-3/8	15.060	180.72	●	●	●	●	●	●	●	●	●	●
2-7/16	15.870	190.44	●	●					●	●	●	
2-1/2	16.690	200.28	●	●	●	●	●	●	●	●	●	●
2-9/16	17.530	210.36	●						●	●	●	
2-5/8	18.400	220.80	●	●	●		●	●	●	●	●	●
2-11/16	19.290	231.48	●	●					●		●	

** 1045 is available in ground and polished condition. However, 1/2" to 7/8" diameter may be cold drawn, ground and polished or turned, ground and polished. Over 1" diameter is hot rolled, turned, ground and polished.*

*** Stressproof® A311 Class B is available in ground and polished condition.*

Continued on next page

Cold Finished - Rounds

Stock Lengths: 12 and 20 foot (Other lengths are available upon request)

Diameter (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft)	1018 (1) (2)	1045 (1) (2) (3)	1117	11L17	1141	1144	Stressproof® A311, Class B (4)	12L14 (2)	1215	Fatigueproof®
2-3/4	20.19	242.28	●	●	●	●	●	●	●	●	●	●
2-13/16	21.12	253.44	●								●	
2-7/8	22.07	264.84	●	●	●	●	●	●	●	●	●	
2-15/16	23.04	276.48	●	●					●		●	
3	24.03	288.36	●	●	●	●	●	●	●	●	●	●
3-1/16	25.05	300.60										
3-1/8	26.08	312.96	●	●	●		●	●	●	●	●	
3-3/16	27.13	325.54		●								
3-1/4	28.21	338.52	●	●	●		●	●	●	●	●	●
3-3/8	30.42	365.04	●	●	●		●	●	●	●	●	
3-7/16	31.55	378.60	●	●					●			
3-1/2	32.71	392.49	●	●	●		●	●	●	●	●	
3-5/8	35.09	421.08	●	●	●			●	●	●	●	
3-3/4	37.55	450.36	●	●	●		●	●	●	●	●	
3-7/8	40.10	481.20	●		●				●	●	●	
3-15/16	41.40	496.80	●	●					●			
4	42.73	512.76	●	●	●		●	●	●	●	●	
4-1/8	45.44	545.28	●	●					●	●	●	
4-1/4	48.23	578.76	●	●	●				●	●	●	
4-3/8	51.11	613.32	●	●						●	●	
4-7/16	52.58	630.91	●	●								
4-1/2	54.07	648.84	●	●	●		●	●	●	●	●	
4-5/8	57.12	685.44	●									
4-3/4	60.25	723.00	●	●	●					●	●	
4-7/8	63.46	761.52	●	●								
4-15/16	65.10	781.20	●									
5	66.75	801.12	●	●	●		●	●	●	●	●	
5-1/8	70.14	841.68	●									
5-1/4	73.59	883.20	●	●	●					●	●	
5-7/16	78.94	947.28	●									
5-1/2	80.77	969.24	●	●	●		●			●	●	
5-3/4	88.29	1059.48	●	●	●					●	●	
6	96.13	1153.56	●	●	●					●	●	

(1) Sizes over 10" diameter are rough turned to +1/8 to +3/16" overside
(2) Sizes over 6" diameter are turned and polished. See tolerance chart at the end of this section.
(3) 1045 is available in ground and polished condition. However, 1/2" to 7/8" diameter may be cold drawn, ground and polished or turned, ground and polished. Over 1" diameter is hot rolled, turned, ground and polished.
(4) Stressproof® A311 Class B is available in ground and polished condition up through 4" diameter.

Continued on next page

Cold Finished - Rounds

Stock Lengths: 12 and 20 foot (Other lengths are available upon request)

Diameter (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft)	1018 (1) (2)	1045 (1) (2) (3)	1117	11L17	1141	1144	Stressproof® A311, Class B (4)	12L14 (2)	1215	Fatigueproof®
6-1/4	104.31	1314.99	●	●						●		
6-1/2	112.82	1419.63	●	●						●		
6-3/4	121.68	1528.28	●	●						●		
7	130.84	1640.92	●	●						●		
7-1/4	140.36	1757.59	●	●								
7-1/2	150.21	1878.25	●	●						●		
7-3/4	160.37	2002.92	●	●								
8	170.90	2131.59	●	●						●		
8-1/2	192.93	2400.96	●	●						●		
9	216.30	2686.34	●	●						●		
9-1/2	241.00	2987.74	●	●								
10	266.87	3202.42	●	●						●		
10-1/2	302.84	3634.08	●									
11	332.29	3987.48	●	●								
11-1/2	362.75	4353.00	●									
12	394.54	4734.49	●	●								
12-1/2	427.66	5131.92	●	●								
13	462.12	5545.44	●	●								
13-1/2	497.93	5975.16	●	●								
14	535.05	6420.60	●	●								
14-1/2	573.51	6882.12	●	●								
15	613.31	7359.72	●	●								
15-1/2	654.44	7853.28	●	●								
16	696.91	8362.92	●	●								
16-1/2	740.72	8888.64	●	●								
17	785.85	9430.20	●	●								
18	880.14	10561.68	●	●								
19	979.76	11757.12	●	●								
20	1084.73	13016.76	●	●								
22	1310.67	15728.04	●	●								
24	1557.98	18695.76	●	●								
26	1826.64	21919.68	●	●								
28	2116.67	25400.04	●	●								
30	2443.22	29318.64	●	●								
32	2776.97	33323.64	●	●								

(1) Sizes over 10" diameter are rough turned to +1/8 to +3/16" overside
(2) Sizes over 6" diameter are turned and polished. See tolerance chart at the end of this section.
(3) 1045 is available in ground & polished condition. However, 1/2" to 7/8" diameter may be cold drawn, ground & polished or turned, ground & polished. Over 1" diameter is hot rolled, turned, ground & polished.
(4) Stressproof® A311 Class B is available in ground and polished condition up through 4" diameter.

Chrome Plated Steel Bars

Produced from a commercial grade of cold finished and hot rolled steel bars. After centerless grinding the bars are polished and then hard-chrome plated (usually up to .001"). The bar may be induction hardened to core depth of .050" minimum with a surface hardness of RC50 minimum. Primary application is for shafting in the manufacture of hydraulic cylinders.

Diameter (inches)	Weight (lbs./ft.)	1045 75K min. yield/.0005 min. plate	1045/1050 100K min. yield/.0005 min. plate	1045/1050 Induction Hardened 100K min. yield/.001 min. plate
3/8	.375		●	
1/2	.668	●		
5/8	1.04	●		
3/4	1.50	●		
7/8	2.04	●		
1	2.67	●		●
1-1/8	3.38	●		●
1-1/4	4.17	●		●
1-3/8	5.05	●		●
1-1/2	6.01	●		●
1-5/8	7.05	●		
1-3/4	8.18	●		●
2	10.68	●		●
2-1/4	13.52	●		●
2-1/2	16.69	●		●
2-3/4	20.19	●		●
3	24.03	●		●
3-1/4	28.20			●
3-1/2	32.71	●		●
3-3/4	37.55	●		●
4	42.72	●		●
4-1/4	48.23			
4-1/2	54.07	●		
5	66.75	●		

Standard Diameter Tolerances

(Undersized Variation Only; +0.000")

0.750" to less than 2.500" dia. = -0.0015"
2.500" to less than 3.000" dia. = -0.0020"
3.000" to less than 4.000" dia. = -0.0030"
4.000" to 5.000" diameter = -0.0040"

Cold Finished - Squares

Size (inches)	Weight (lbs./foot)	Weight (lbs./12 ft.)	Stock Lengths : 12 foot			
			1018	1045	12L14	1215
1/8	0.05	0.60	●			
3/16	0.12	1.44	●		●	
1/4	0.21	2.52	●	●	●	●
5/16	0.33	3.96	●	●	●	●
3/8	0.478	5.73	●	●	●	●
7/16	0.65	7.80	●	●	●	
1/2	0.85	10.20	●	●	●	●
9/16	1.08	12.96	●		●	
5/8	1.328	15.93	●	●	●	●
11/16	1.61	19.32	●		●	
3/4	1.91	22.92	●	●	●	●
13/16	2.24	26.88	●		●	
7/8	2.60	31.20	●	●	●	●
15/16	2.99	35.88	●		●	
1	3.40	40.80	●	●	●	●
1-1/16	3.84	46.08	●			
1-1/8	4.30	51.60	●	●	●	●
1-3/16	4.80	57.60	●			
1-1/4	5.31	63.72	●	●	●	●
1-5/16	5.86	70.32	●			
1-3/8	6.43	77.16	●		●	●
1-7/16	7.03	84.36				
1-1/2	7.65	91.80	●	●	●	●
1-5/8	8.98	107.76	●		●	
1-3/4	10.413	124.95	●	●	●	●
1-13/16	11.163	133.95	●			
1-7/8	11.95	143.40	●			
2	13.60	163.20	●	●	●	●
2-1/8	15.35	184.20				
2-1/4	17.22	206.64	●	●	●	
2-3/8	19.18	230.16	●			
2-1/2	21.26	255.12	●	●	●	●
2-5/8	23.43	281.16	●			
2-3/4	25.71	308.52	●		●	
3	30.60	367.20	●	●	●	●
3-1/4	35.91	430.92	●			
3-1/2	41.65	499.80	●	●	●	
3-3/4	47.81	573.72	●			
4	54.40	652.80	●	●	●	
4-1/2	68.85	826.20	●			
5	85.04	1020.48	●			
5-1/2	102.80	1233.60	●			
6	122.40	1468.80	●			

Cold Finished - Hexagons

Size (inches)	Weight (lbs./foot)	Weight (lbs./12 ft.)	Stock Lengths : 12 foot						
			1018	1045	1117	12L14	1215	Stressproof®	Fatigueproof®
3/16	0.10	1.20				●			
1/4	0.183	2.19	●			●	●		
5/16	0.28	3.36	●			●	●	●	
3/8	0.41	4.92	●			●	●	●	●
7/16	0.563	6.75	●			●	●		
1/2	0.73	8.76	●	●	●	●	●	●	●
9/16	0.93	11.16	●			●	●	●	
5/8	1.15	13.80	●		●	●	●	●	●
11/16	1.39	16.68	●			●	●	●	
3/4	1.66	19.92	●	●	●	●	●	●	●
13/16	1.94	23.28				●	●		
7/8	2.25	27.00	●	●	●	●	●	●	●
15/16	2.59	31.08	●			●	●	●	
1	2.94	35.28	●	●	●	●		●	●
1-1/16	3.32	39.84	●			●	●		
1-1/8	3.72	44.65	●	●	●	●	●	●	
1-3/16	4.15	49.80	●			●			
1-1/4	4.60	55.20	●	●	●	●	●	●	
1-5/16	5.07	60.84				●	●		
1-3/8	5.56	66.72	●	●	●	●	●	●	
1-7/16	6.09	73.08				●			
1-1/2	6.63	79.56	●	●	●	●	●	●	
1-9/16	7.19	86.28							
1-5/8	7.78	93.36	●			●	●	●	
1-11/16	8.39	100.68				●			
1-3/4	9.00	108.00	●	●		●	●	●	
1-13/16	9.65	115.89				●			
1-7/8	10.35	124.20	●			●	●	●	
2	11.76	141.12	●	●		●	●	●	
2-1/8	13.30	159.60	●			●			
2-1/4	14.884	178.60	●			●	●		
2-3/8	16.58	198.96	●			●	●		
2-1/2	18.40	220.80	●	●		●	●		
2-5/8	20.29	243.48				●	●		
2-3/4	22.27	267.24	●			●	●		
2-7/8	24.30	291.60				●			
3	26.50	318.00	●			●	●		
3-1/4	31.10	373.20	●			●			
3-1/2	36.08	432.96	●			●			
3-3/4	41.34	496.08	●			●			
4	47.04	564.48	●			●			

Cold Finished - Flats

Stock Lengths: 12 foot (1018 and 11L17)

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft)
1/8 x		
3/16	0.08	0.96
1/4	0.11	1.32
5/16	0.13	1.56
3/8	0.16	1.92
7/16	0.19	2.23
1/2	0.21	2.52
9/16	0.24	2.86
5/8	0.27	3.24
3/4	0.32	3.84
7/8	0.37	4.46
15/16	0.40	4.81
1	0.43	5.16
1-1/8	0.48	5.76
1-1/4	0.53	6.36
1-1/2	0.64	7.68
1-3/4	0.74	8.88
2	0.85	10.20
2-1/4	0.96	11.52
2-1/2	1.06	12.75
2-3/4	1.17	14.04
3	1.28	15.36
3-1/4	1.38	16.59
3-1/2	1.49	17.88
3-3/4	1.59	19.11
4	1.70	20.40
4-1/4	1.81	21.66
4-1/2	1.91	22.92
4-3/4	2.02	24.24
5	2.13	25.56
5-1/2	2.34	28.08
6	2.55	30.60
7	2.98	35.70
8	3.40	40.80
9	3.83	45.90
10	4.25	51.00
11	4.69	56.28
12	5.13	61.56
3/16 x		
1/4	0.16	1.92
5/16	0.19	2.28
3/8	0.24	2.88
7/16	0.28	3.36
1/2	0.32	3.84
9/16	0.36	4.30
5/8	0.40	4.80
11/16	0.44	5.28
3/4	0.48	5.76
13/16	0.52	6.24
7/8	0.56	6.72
15/16	0.64	7.68
1	0.68	8.16

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft)
3/16 x (Continued)		
1-1/8	0.72	8.62
1-1/4	0.80	9.60
1-3/8	0.88	10.52
1-1/2	0.96	11.52
1-5/8	1.04	12.48
1-3/4	1.12	13.44
1-7/8	1.20	14.34
2	1.28	15.36
2-1/8	1.36	16.28
2-1/4	1.44	17.20
2-1/2	1.59	19.08
2-3/4	1.76	21.03
3	1.92	22.92
3-1/4	2.07	24.86
3-1/2	2.24	26.77
3-3/4	2.39	28.68
4	2.56	30.60
4-1/4	2.71	32.52
4-1/2	2.88	34.42
4-3/4	3.03	36.34
5	3.20	38.28
5-1/2	3.51	42.07
6	3.84	45.96
7	4.47	53.55
8	5.11	61.20
9	5.74	68.85
10	6.38	76.50
11	7.01	84.15
12	7.65	91.80
1/4 x		
5/16	0.26	3.12
3/8	0.32	3.84
7/16	0.37	4.44
1/2	0.43	5.16
9/16	0.48	5.76
5/8	0.53	6.36
3/4	0.64	7.68
7/8	0.74	8.88
1	0.85	10.20
1-1/8	0.96	11.52
1-1/4	1.06	12.72
1-3/8	1.17	14.04
1-1/2	1.28	15.36
1-5/8	1.38	16.56
1-3/4	1.49	17.88
1-7/8	1.59	19.08
2	1.70	20.40
2-1/4	1.91	22.92
2-1/2	2.13	25.56
2-3/4	2.34	27.96
3	2.55	30.60

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft)
1/4 x (Continued)		
3-1/4	2.76	33.12
3-1/2	2.98	35.64
3-3/4	3.19	38.28
4	3.40	40.80
4-1/4	3.61	43.32
4-1/2	3.83	45.60
4-3/4	4.04	48.48
5	4.25	51.00
5-1/2	4.68	56.16
6	5.10	61.20
6-1/2	5.53	66.36
7	5.95	71.40
8	6.80	81.60
9	7.65	91.80
10	8.50	102.00
11	9.35	112.20
12	10.20	122.40
14	11.90	142.80
16	13.60	163.20
5/16 x		
3/8	0.40	4.80
7/16	0.47	5.56
1/2	0.53	6.36
5/8	0.66	7.92
3/4	0.80	9.60
7/8	0.93	11.16
1	1.06	12.72
1-1/8	1.20	14.34
1-1/4	1.33	15.96
1-3/8	1.46	17.52
1-1/2	1.59	19.08
1-3/4	1.86	22.32
2	2.13	25.56
2-1/4	2.39	28.68
2-1/2	2.66	31.92
2-3/4	2.92	35.04
3	3.19	38.28
3-1/2	3.72	44.64
4	4.25	51.00
4-1/2	4.78	57.36
5	5.31	63.72
6	6.38	76.50
7	7.44	89.28
8	8.50	102.00
10	10.63	127.56
12	12.75	153.00
3/8 x		
7/16	0.56	6.72
1/2	0.64	7.68
5/8	0.80	9.60
3/4	0.96	11.52

** Size available in 1018 & 11L17*

***** Sizes are stocked in 10 foot lengths***

Continued on next page

Cold Finished - Flats

Stock Lengths: 12 foot (1018 and 11L17)

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft)
3/8 x (Continued)		
7/8	1.12	13.44
1	1.28	15.36
1-1/8	1.43	17.16
1-1/4	1.59	19.08
1-3/8	1.75	21.00
1-1/2	1.91	22.95
1-5/8	2.07	24.84
1-3/4	2.23	26.76
1-7/8	2.39	28.69
2	2.55	30.60
2-1/4	2.87	34.44
2-1/2	3.18	38.16
2-3/4	3.51	42.12
3	3.82	45.84
3-1/4*	4.14	49.68
3-1/2	4.46	53.52
3-3/4	4.78	57.36
4	5.10	61.20
4-1/4	5.42	65.01
4-1/2	5.70	68.40
4-3/4	6.06	72.67
5	6.38	76.56
5-1/2	7.01	84.12
6	7.65	91.80
6-1/2	8.29	99.48
7	8.93	107.16
8	10.20	122.40
9	11.48	137.76
10	12.75	153.00
11	14.03	168.30
12	15.30	183.60
14	18.00	216.00
7/16 x		
1/2	0.74	8.88
9/16	0.84	10.08
5/8	0.93	11.16
3/4	1.12	13.44
7/8	1.30	15.60
1	1.49	17.88
1-1/4	1.86	22.32
1-1/2	2.23	26.76
1-3/4	2.60	31.20
2	2.98	35.76
2-1/4	3.35	40.20
2-1/2	3.72	44.64
3	4.46	53.52
3-1/2	5.21	62.52
4	5.95	71.40
4-1/2	6.70	80.40
5	7.44	89.25
6	8.93	107.16

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft)
1/2 x		
9/16	0.96	11.52
5/8	1.06	12.72
3/4	1.28	15.36
7/8	1.49	17.88
1	1.70	20.40
1-1/8	1.91	22.92
1-1/4	2.13	25.56
1-3/8	2.34	28.08
1-1/2*	2.55	30.60
1-5/8	2.77	33.24
1-3/4	2.98	35.76
2*	3.40	40.80
2-1/8	3.61	43.34
2-1/4	3.83	45.96
2-1/2*	4.25	51.00
2-3/4	4.68	56.16
3	5.10	61.20
3-1/4	5.53	66.36
3-1/2	5.95	71.40
3-3/4	6.38	76.56
4	6.80	81.60
4-1/4	7.23	86.76
4-1/2	7.65	91.80
4-3/4	8.07	96.84
5	8.50	102.00
5-1/2	9.35	112.20
5-3/4	9.78	117.30
6	10.20	122.40
6-1/2	11.05	132.60
7	11.90	142.80
8	13.60	163.20
9	15.30	183.60
10	17.00	204.00
11	18.70	224.40
12	20.40	244.80
14	23.80	288.00
16	27.20	326.40
18	30.60	367.20
20	34.00	408.00
9/16 x		
5/8	1.20	14.34
3/4	1.44	17.16
1	1.91	22.92
1-1/4	2.39	28.68
1-1/2	2.87	34.44
2	3.83	45.96
2-1/2	4.78	57.38
5/8 x		
3/4	1.59	19.08
7/8	1.86	22.32
1*	2.13	25.56
1-1/8	2.39	28.68

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft)
5/8 x (Continued)		
1-1/4	2.65	31.80
1-3/8	2.92	35.04
1-1/2*	3.19	38.28
1-5/8	3.45	41.40
1-3/4	3.72	44.52
2*	4.25	51.00
2-1/4	4.78	57.36
2-1/2	5.31	63.72
2-3/4	5.84	70.08
3*	6.38	76.56
3-1/4	6.90	82.80
3-1/2	7.44	89.28
3-3/4	7.96	95.52
4	8.50	102.00
4-1/4	9.03	108.37
4-1/2	9.56	114.72
4-3/4	10.09	121.08
5	10.63	127.56
5-1/2	11.69	140.16
6	12.75	153.00
6-1/2	13.81	165.72
7	14.88	178.56
8	17.00	204.00
9	19.13	229.44
10	21.25	255.00
11	23.38	280.56
12	25.50	306.00
14	29.75	357.00
3/4 x		
7/8	2.23	26.76
1	2.55	30.60
1-1/8	2.87	34.44
1-1/4*	3.19	38.16
1-3/8	3.51	42.12
1-1/2*	3.83	45.84
1-5/8	4.14	49.68
1-3/4	4.46	53.52
2*	5.10	61.20
2-1/4	5.70	68.40
2-1/2*	6.38	76.56
2-3/4	7.01	84.12
3*	7.65	91.80
3-1/4	8.29	99.48
3-1/2	8.93	107.04
3-3/4	9.56	114.72
4	10.20	122.40
4-1/4	10.84	130.05
4-1/2*	11.48	137.64
4-3/4	12.11	145.32
5*	12.75	153.00
5-1/2	14.03	168.36
6	15.30	183.60

** Size available in 1018 & 11L17*

***** Sizes are stocked in 10 foot lengths***

Continued on next page

Cold Finished - Flats

Stock Lengths: 12 foot (1018 and 11L17)

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft)
3/4 x (Continued)		
6-1/2	16.58	198.96
7	17.85	214.20
8	20.40	244.80
9	22.95	275.40
10	25.50	306.00
11	28.05	336.60
12	30.60	367.20
14	35.70	428.40
16**	**40.80**	**408.00**
18**	**45.90**	**459.00**
20**	**51.00**	**510.00**
7/8 x		
1	2.98	35.76
1-1/8	3.35	40.20
1-1/4	3.72	44.64
1-3/8	4.09	49.08
1-1/2*	4.46	54.24
1-3/4	5.21	62.52
2	5.90	70.80
2-1/4	6.69	80.40
2-1/2	7.44	89.28
2-3/4	8.18	98.16
3	8.93	107.16
3-1/2	10.41	124.92
4	11.90	142.80
4-1/2	13.39	160.68
5	14.88	178.44
5-1/2	16.36	196.35
6	17.85	214.20
6-1/2	19.34	232.05
7	20.83	249.96
8	23.80	285.60
9	26.78	321.36
10	29.75	357.00
12	35.70	428.40
1 x		
1-1/8	3.83	45.96
1-1/4*	4.25	51.00
1-3/8	4.68	56.04
1-1/2*	5.10	61.20
1-5/8*	5.53	66.36
1-3/4*	5.95	71.40
1-7/8	6.38	76.56
2*	6.80	81.60
2-1/4*	7.65	91.80
2-1/2*	8.50	102.00
2-3/4	9.35	112.20
3*	10.20	122.40
3-1/4	11.05	132.60
3-1/2	11.90	142.80
3-3/4	12.75	153.00
4*	13.60	163.20

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft)
1 x (Continued)		
4-1/4	14.45	173.40
4-1/2	15.30	183.60
4-3/4	16.15	193.80
5	17.00	204.00
5-1/2	18.70	224.40
6	20.40	244.80
6-1/2	22.10	265.20
7	23.80	285.60
7-1/2	25.50	306.00
8	27.20	326.40
9	30.60	367.20
10	34.00	408.00
11	37.40	448.80
12	40.80	489.60
14	47.60	571.20
16**	**54.40**	**544.00**
18**	**61.20**	**612.00**
20**	**68.00**	**680.00**
1-1/8 x		
1-1/4	4.78	57.36
1-1/2	5.74	68.88
1-3/4	6.69	80.28
2	7.65	91.80
2-1/4	8.61	103.20
2-1/2	9.56	114.72
2-3/4	10.52	126.21
3	11.48	137.76
4	15.30	183.60
4-1/4	16.26	195.07
5	19.13	229.56
6	22.95	275.40
8	30.60	367.20
1-1/4 x		
1-3/8	5.84	70.08
1-1/2*	6.38	77.88
1-5/8	6.91	82.92
1-3/4*	7.44	88.80
1-7/8	7.97	95.63
2*	8.50	102.00
2-1/4	9.58	114.99
2-1/2*	10.63	127.56
2-3/4	11.69	140.16
3	12.75	153.00
3-1/4	13.81	165.72
3-1/2*	14.88	178.56
3-3/4	15.94	191.28
4*	17.00	204.00
4-1/2	19.13	229.56
5	21.25	255.00
5-1/2	23.38	280.56
6	25.50	306.00
7	29.70	356.40

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft)
1-1/4 x (Continued)		
8	34.00	408.00
9	38.25	459.00
10	42.50	510.00
11	46.75	561.00
12	51.00	612.00
14	59.50	714.00
1-3/8 x		
1-1/2	7.01	84.12
2	9.35	112.20
3	14.03	168.36
1-1/2 x		
1-5/8	8.29	99.48
1-3/4*	8.93	107.16
2*	10.20	122.40
2-1/4	11.48	137.76
2-1/2*	12.75	153.00
2-3/4	14.03	168.36
3*	15.30	183.60
3-1/4	16.58	198.96
3-1/2*	17.85	214.20
4*	20.40	244.80
4-1/2*	22.95	275.40
5*	25.50	306.00
5-1/2	28.05	336.60
6	30.60	367.20
6-1/2	33.15	397.80
7	35.70	428.40
7-1/2	38.25	459.00
8	40.80	489.60
9	45.90	550.80
10	51.00	612.00
10-1/2	53.55	642.60
11**	**56.10**	**561.00**
12	61.20	734.40
14	71.40	856.80
16**	**81.60**	**816.00**
20**	**102.00**	**1020.00**
1-5/8 x		
2	11.05	132.60
3	16.59	199.08
4	22.10	265.20
6	33.15	397.80
1-3/4 x		
2	11.90	142.80
2-1/4	13.30	159.60
2-1/2*	14.88	178.50
2-3/4	16.36	196.80
3*	17.85	214.80
3-1/4	19.34	232.08
3-1/2	20.83	249.60

** Size available in 1018 & 11L17*

***** Sizes are stocked in 10 foot lengths***

Continued on next page

Cold Finished - Flats

Stock Lengths: 12 foot (1018 and 11L17)

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft)
1-3/4 x (Continued)		
3-3/4	22.31	267.72
4	23.80	285.60
4-1/2	26.78	321.60
5*	29.75	357.60
5-1/2	32.73	392.76
6	35.70	428.40
7	41.65	499.80
8	47.60	571.20
10	59.50	714.00
12	71.40	856.80
2 x		
2-1/4	15.30	183.60
2-1/2*	17.00	204.00
2-3/4	18.70	224.40
3*	20.40	244.80
3-1/4	22.10	265.20
3-1/2*	23.80	285.60
3-3/4	25.50	306.00
4*	27.20	326.40
4-1/4	28.90	347.00
4-1/2	30.60	367.20
5*	34.00	408.00
5-1/2	37.40	448.80
6*	40.80	489.60
6-1/2	44.20	530.40
7	47.60	571.20
8	54.40	652.80
9	61.20	734.40
10	68.00	816.00
11**	**74.80**	**748.00**
12	81.60	979.20
14**	**95.20**	**952.00**
16**	**108.80**	**1088.00**
20**	**136.00**	**1360.00**
2-1/4 x		
2-1/2	19.10	229.20
2-3/4	21.04	252.48
3	22.90	274.80
3-1/4	24.86	298.32
3-1/2	26.70	320.40
4	30.60	367.20
4-1/2	34.40	412.80
5	38.25	459.00
5-1/2	42.08	504.90
6	45.90	550.80
8	61.20	734.40
10	76.50	918.00
12	91.80	1101.60
2-1/2 x		
2-3/4	23.38	280.56
3*	25.50	306.00

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft)
2-1/2 x (Continued)		
3-1/2	29.75	357.00
4	25.50	408.00
4-1/2	38.25	459.00
5	42.50	510.00
5-1/2	46.75	561.00
6	51.00	612.00
7	59.50	714.00
8	68.00	816.00
8-1/2	72.25	867.00
9	76.50	918.00
10	85.00	1020.00
12	102.00	1224.00
14**	**119.00**	**1190.00**
16**	**136.00**	**1360.00**
20**	**170.00**	**1700.00**
2-3/4 x		
3	28.05	336.60
3-1/2**	**32.72**	**327.25**
4**	**37.40**	**374.00**
6**	**56.10**	**561.00**
3 x		
3-1/2	35.70	428.40
4*	40.80	489.60
4-1/2	45.90	550.80
5	51.00	612.00
5-1/2**	**56.10**	**561.00**
6	61.20	734.40
7	71.40	856.80
8	81.60	979.20
9**	**91.80**	**918.00**
10	102.00	1224.00
12**	**122.40**	**1224.00**
14**	**142.80**	**1428.00**
16**	**163.20**	**1632.00**
20**	**204.00**	**2040.00**
3-1/2 x		
4**	**47.60**	**476.00**
4-1/2**	**53.50**	**535.00**
5	**59.50**	**595.00**
5-1/2**	**65.45**	**654.50**
6**	**71.40**	**714.00**
7**	**83.30**	**833.00**
8**	**95.20**	**952.00**
8-1/2**	**101.15**	**1011.50**
9**	**107.10**	**1071.00**
10**	**119.00**	**1190.00**
12**	**142.80**	**1428.00**
14**	**166.60**	**1666.00**
16**	**190.40**	**1904.00**
20**	**238.00**	**2380.00**

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft)
4 x		
4-1/2**	**61.20**	**612.00**
5**	**68.00**	**680.00**
5-1/2**	**74.80**	**748.00**
6**	**81.60**	**816.00**
7**	**95.20**	**952.00**
8**	**108.80**	**1088.00**
9**	**122.40**	**1224.00**
10**	**136.00**	**1360.00**
12**	**163.20**	**1632.00**
14**	**190.40**	**1904.00**
16**	**217.60**	**2176.00**
20**	**272.00**	**2720.00**
4-1/2 x		
5**	**76.50**	**765.00**
5-1/2**	**84.15**	**841.50**
6**	**91.80**	**918.00**
7**	**107.10**	**1071.00**
8**	**122.40**	**1224.00**
9**	**137.70**	**1377.00**
10**	**153.00**	**1530.00**
12**	**183.60**	**1836.00**
14**	**214.20**	**2142.00**
16**	**244.80**	**2448.00**
20**	**306.00**	**3060.00**
5 x		
5-1/2**	**93.50**	**935.00**
6**	**102.00**	**1020.00**
7**	**119.00**	**1190.00**
8**	**136.00**	**1360.00**
9**	**153.00**	**1530.00**
10**	**170.00**	**1700.00**
12**	**204.00**	**2040.00**
14**	**238.00**	**2380.00**
16**	**272.00**	**2720.00**
20**	**340.00**	**3400.00**
5-1/2 x		
6**	**112.20**	**1122.00**
6 x		
7**	**143.64**	**1436.40**
8**	**163.20**	**1632.00**
9**	**183.60**	**1836.00**
10**	**204.00**	**2040.00**
12**	**244.80**	**2448.00**
14**	**285.60**	**2856.00**
16**	**326.40**	**3264.00**
20**	**408.00**	**4080.00**

* *Size available in 1018 & 11L17*

** ***Sizes are stocked in 10 foot lengths***

Cold Finished Carbon Steel Bars

Standard Manufacturing Tolerances

Undersize Variation in Inches

Shape & Size (inches)	Carbon to .28% Max.	Max. Carbon Over .28% up to .55%	*Stressproof®	Max. Carbon Over .55% or All Carbons Heat Treated	Fatigueproof®
Rounds (Cold Drawn or Turned & Polished)					
Up thru 1-1/2	.002	.003	.004	.005	.005
Over 1-1/2 thru 2-1/2	.003	.004	.005	.006	.006
Over 2-1/2 thru 4	.004	.005	.006	.007	.006
Over 4 thru 6	.005	.006	---	.008	---
Over 6 thru 8	.006	.007	---	.009	---
Over 8 thru 9	.007	.008	---	.010	---
Over 9	.008	.009	---	---	---
Hexagons					
Up thru 3/4	.002	.003	.004	.006	---
Over 3/4 thru 1-1/2	.003	.004	.005	.007	---
Over 1-1/2 thru 2-1/2	.004	.005	.006	.008	---
Over 2-1/2 thru 3-1/8	.005	.006	---	.009	---
Squares					
Up thru 3/4	.002	.004	---	.007	---
Over 3/4 thru 1-1/2	.003	.005	---	.008	---
Over 1-1/2 thru 2-1/2	.004	.006	---	.009	---
Over 2-1/2 thru 3-1/8	.005	.008	---	.011	---
Flats (Width)(1)					
Up thru 3/4	.003	.004	---	.008	---
Over 3/4 thru 1-1/2	.004	.005	---	.010	---
Over 1-1/2 thru 3	.005	.006	---	.012	---
Over 3 thru 4	.006	.008	---	.016	---
Over 4 thru 6	.008	.010	---	.020	---
Over 6	.013	.015	---	---	---

** For Cold Drawn, Ground and Polished or Turned, Ground and Polished tolerances for Stressproof®, see below.*

(1) Tolerances for Flats apply to thickness as well as width and include 16", 18" and 20" wide flats.

Note: Rough turned 1018 rounds are produced to an oversize tolerance of +1/8" to +3/16" oversize.

Shape & Size (inches)	Turned, Ground & Polished Includes Stressproof®	Bearing Shaft Quality (all undersize)
Rounds		
Up thru 1-1/2	.0010	.0005/.0015
Over 1-1/2 thru 2-1/2	.0015	.0005/.0020
Over 2-1/2 thru 3	.0020	.0005/.0025
Over 3 thru 4	.0030	.0005/.0035
Over 4 thru 6	.0040*	.0005/.0045

** For nonresulphurized steels (steels specified to maximum sulphur limits under 0.08%) or for steels thermally treated, the tolerance is increased by .001"*

Hot Rolled Carbon Bars

Grades and Descriptions

Hot rolled carbon bars, often referred to as "SBQ" or "special bar quality", are known for their superior mechanical properties over commodity grades of merchant bar. These products are produced to specific chemistry and mechanical properties ranges and often are used in engineered applications such as gears, shafts, axles covering markets such as automotive, heavy truck and agricultural equipment.

CQ or Commercial Quality Steel is ordinarily produced from a low carbon steel. Specific chemistry and mechanical properties are not inherit in CQ products.

A36 is produced to a 36 ksi min yield point. A mild carbon steel with many uses that works well for fabricating, welding, bending and cold forming.

1018 is a general purpose low carbon steel with good case hardening qualities. It is especially suited to cold forming and bending operations and has excellent weldability.

1044 is a medium carbon steel used when greater strength is needed. Has good heat treating properties when induction or flame hardened.

1045 is a medium carbon steel used extensively in induction hardening applications. This is not normally considered a screw machine steel and is only fair for brazing and welding. 1045 hot rolled can be used for applications requiring more strength and wear resistance than the low carbon mild steels can provide.

1117 is a low carbon, high manganese steel. Machinability is improved over 1018 and case hardening is deep and uniform, supported by a tough ductile core. A free machining grade with improved mechanical properties suitable for carburized parts.

1141 is a medium carbon, special quality, manganese steel with improved machinability and better heat treatment response. Surface hardness is deeper and more uniform than plain carbon steels.

1144 is a resulphurized carbon steel containing manganese and sulphur to provide a free-machining steel. It is recommended especially for high-production automatic machine products and machined parts requiring higher strength and wear resistance than is possible with lower carbon steels.

WARNING: These products can potentially expose you to chemicals including Nickel, Chromium, Lead, Cobalt, Mercury and Beryllium, which are known to the state of California to cause cancer and/or birth defects or other reproductive harm. For more information, visit **www.P65Warnings.ca.gov**

Hot Rolled - Rounds

Stock Lengths: 20 foot (A36, 1018, 1045, 1117, & 1144 grades available.)

Diameter (inches)	Weight (lbs./foot)	CQ	A-36	1018	1045	1117	1141	1144
3/16	0.094	●						
1/4	0.167	●	●					
5/16	0.260	●	●					
3/8	0.375	●	●					
7/16	0.510	●	●					
1/2	0.670	●	●					
9/16	0.850		●					
5/8	1.040		●					
3/4	1.500		●		●			
7/8	2.050		●		●			
1	2.670		●		●			
1-1/8	3.380		●		●			
1-1/4	4.170		●		●			
1-3/8	5.050		●		●			
1-1/2	6.010		●		●			
1-5/8	7.050		●		●			
1-3/4	8.180		●		●			
1-7/8	9.390		●		●			
2	10.680		●		●		●	
2-1/8	12.234		●		●			
2-1/4	13.704		●		●		●	
2-3/8	15.258		●		●			
2-1/2	16.896		●		●		●	
2-5/8	18.724		●		●			
2-3/4	20.533		●		●		●	
2-7/8	22.426		●		●			
3	24.645		●		●	●	●	●
3-1/8	26.717			●	●			
3-1/4	28.872			●	●	●	●	●
3-3/8	31.111			●	●			
3-1/2	33.434			●	●	●	●	●
3-5/8	36.070			●	●			
3-3/4	38.568			●	●	●	●	●
4	43.814			●	●	●	●	●

Continued on next page

Hot Rolled - Rounds

Stock Lengths: 20 foot (A36, 1018, 1045, 1117, & 1144 grades available.)

Diameter (inches)	Weight (lbs./foot)	CQ	A-36	1018	1045	1117	1141	1144
4-1/8	46.562			●	●			
4-1/4	49.394			●	●	●	●	●
4-3/8	52.310			●	●			
4-1/2	55.309			●	●	●	●	●
4-5/8	58.685				●			
4-3/4	61.859			●	●	●	●	●
5	68.459			●	●	●	●	●
5-1/4	75.393			●	●	●	●	●
5-1/2	82.661			●	●	●	●	●
5-3/4	91.359			●	●	●	●	●
6	99.343			●	●	●	●	●
6-1/4	107.662			●	●	●		●
6-1/2	116.315			●	●	●	●	●
6-3/4	126.162			●	●	●		●
7	135.515			●	●	●	●	●
7-1/4	145.202			●	●			●
7-1/2	155.224			●	●	●	●	●
7-3/4	165.580			●	●			●
8	176.271			●	●	●	●	●
8-1/4	187.296			●	●	●		●
8-1/2	199.737			●	●	●	●	●
8-3/4	211.463			●	●			
9	223.522			●	●	●	●	●
9-1/2	248.207			●	●	●	●	●
9-3/4	263.735				●			
10	277.171			●	●	●	●	●
10-1/2	305.044			●	●	●	●	●
11	334.253			●	●	●		●
11-1/2	364.796			●	●			
12	396.675			●	●	●		●
12-1/2	429.889			●	●			
13	466.624							

Hot Rolled - Flats (A-36)

Stock Lengths: 20 foot

Size (inches)	Weight (lbs./foot)
1/4 x	
1/2	0.430
5/8	0.530
3/4	0.640
7/8	0.750
1	0.850
1-1/4	1.060
1-3/8	1.170
1-1/2	1.280
1-5/8	1.380
1-3/4	1.490
2	1.700
2-1/4	1.910
2-1/2	2.130
2-3/4	2.330
3	2.550
3-1/4	2.760
3-1/2	2.980
3-3/4	3.190
4	3.400
4-1/4	3.610
4-1/2	3.830
5	4.250
5-1/2	4.680
6	5.100
6-1/2	5.530
7	5.950
7-1/2	6.375
8	6.800
9	7.650
10	8.500
11	9.350
11-1/2	9.870
12	10.200

Size (inches)	Weight (lbs./foot)
5/16 x	
1/2	0.530
3/4	0.797
1	1.060
1-1/4	1.330
1-1/2	1.590
1-3/4	1.860
2	2.130
2-1/4	2.390
2-1/2	2.660
2-3/4	2.920
3	3.190
3-1/2	3.720
4	4.250
4-1/2	4.780
5	5.310
5-1/2	5.840
6	6.380
7	7.440
8	8.500

Size (inches)	Weight (lbs./foot)
3/8 x	
1/2	0.640
5/8	0.800
3/4	0.960
7/8	1.120
1	1.270
1-1/4	1.590
1-3/8	1.750
1-1/2	1.910
1-5/8	2.072
1-3/4	2.230
2	2.550
2-1/4	2.870
2-1/2	3.180
2-3/4	3.500
3	3.830
3-1/4	4.140
3-1/2	4.460
3-3/4	4.780
4	5.100
4-1/2	5.740
5	6.380
5-1/2	7.010
6	7.650
6-1/2	8.290
7	8.930
7-1/2	9.560
8	10.200
9	11.480
10	12.800
11	14.025
12	15.300
14	17.850

Size (inches)	Weight (lbs./foot)
7/16 x	
2	2.970

Size (inches)	Weight (lbs./foot)
1/2 x	
3/4	1.280
1	1.700
1-1/4	2.130
1-1/2	2.550
1-5/8	2.760
1-3/4	2.975
2	3.400
2-1/4	3.830
2-1/2	4.250
2-3/4	4.680
3	5.100
3-1/4	5.530
3-1/2	5.950
3-3/4	6.380
4	6.800
4-1/2	7.650
5	8.500
5-1/2	9.350

Size (inches)	Weight (lbs./foot)
1/2 x	
6	10.200
6-1/2	11.060
7	11.900
7-1/2	12.750
8	13.600
9	15.300
10	17.000
11	18.700
12	20.400
14	23.800

Size (inches)	Weight (lbs./foot)
5/8 x	
1	2.130
1-1/4	2.660
1-1/2	3.190
1-3/4	3.720
2	4.250
2-1/4	4.780
2-1/2	5.310
2-3/4	5.840
3	6.380
3-1/4	6.910
3-1/2	7.440
4	8.500
4-1/2	9.560
5	10.630
5-1/2	11.690
6	12.750
7	14.870
8	17.000
9	19.130
10	21.250
11	23.375
12	25.500
14	29.750

Size (inches)	Weight (lbs./foot)
3/4 x	
1	2.550
1-1/8	2.870
1-1/4	3.190
1-1/2	3.830
1-3/4	4.460
2	5.100
2-1/4	5.740
2-1/2	6.380
2-3/4	7.010
3	7.650
3-1/4	8.290
3-1/2	8.930
4	10.200
4-1/2	11.480
5	12.750
5-1/2	14.030
6	15.300
6-1/2	16.575

Thicknesses 3/16" and under, see Hot Rolled Strip (pg. 1-20).

Continued on next page

Hot Rolled - Flats (A-36)

Stock Lengths: 20 foot

Size (inches)	Weight (lbs./foot)
3/4 x	
7	17.900
8	20.400
9	22.950
10	25.500
11	28.050
12	30.600
14	35.700
7/8 x	
1-1/4	3.720
1-1/2	4.460
1-3/4	5.210
2	5.950
2-1/2	7.400
2-3/4	8.180
3	8.930
3-1/2	10.410
4	11.900
4-1/2	13.390
5	14.880
6	17.850
7	20.830
8	23.800
1 x	
1-1/4	4.250
1-1/2	5.100
1-3/4	5.950
2	6.800
2-1/4	7.650
2-1/2	8.500
2-3/4	9.350
3	10.200
3-1/4	11.050
3-1/2	11.900
4	13.600
4-1/2	15.300
5	17.000
5-1/2	18.700
6	20.400
7	23.800
8	27.200
9	30.600
10	34.000
12	40.800
14	47.600
1-1/8 x	
2	7.650
3	11.480
4	15.300
5	19.130
6	22.950
8	30.600

Size (inches)	Weight (lbs./foot)
1-1/4 x	
1-1/2	6.380
1-3/4	7.440
2	8.500
2-1/4	9.560
2-1/2	10.630
2-3/4	11.690
3	12.750
3-1/4	13.810
3-1/2	14.880
4	17.000
4-1/2	19.130
5	21.250
5-1/2	23.380
6	25.500
7	29.750
8	34.000
10	42.500
12	51.000
1-1/2 x	
1-3/4	8.925
2	10.200
2-1/4	11.480
2-1/2	12.750
2-3/4	14.030
3	15.300
3-1/4	16.580
3-1/2	17.850
4	20.400
4-1/2	22.950
5	25.500
5-1/2	28.050
6	30.600
7	35.700
8	40.800
10	51.000
12	61.200
1-3/4 x	
2	11.900
2-1/2	14.880
3	17.850
3-1/2	20.830
4	23.800
4-1/2	26.790
5	29.750
5-1/2	32.730
6	35.700
7	41.600

Size (inches)	Weight (lbs./foot)
2 x	
2-1/4	15.300
2-1/2	17.000
3	20.400
3-1/2	23.800
4	27.200
4-1/2	30.600
5	34.000
5-1/2	37.400
6	40.800
7	47.600
8	54.400
10	68.060
12	81.600
2-1/4 x	
3	22.950
4	30.600
5	38.250
2-1/2 x	
3	25.500
3-1/2	29.750
4	34.000
4-1/2	38.250
5	42.500
5-1/2	46.750
6	51.000
3 x	
3-1/2	35.700
4	40.800
4-1/2	45.900
5	51.000
6	61.200
3-1/2 x	
4	47.600
5	51.000
6	71.400
4 x	
4-1/2	61.200
5	68.000
6	81.600

Thicknesses 3/16" and under, see Hot Rolled Strip (pg. 1-20).

Hot Rolled - Strip

Stock Lengths: 20 foot

B.W. Gauge and Size	Weight (lbs./foot)	Stock Lengths
1/8 x		
1/2	.210	20'
5/8	.270	20'
3/4	.320	20'
7/8	.370	20'
1	.430	20'
1-1/4	.530	20'
1-3/8	.590	20'
1-1/2	.640	20'
1-3/4	.740	20'
2	.850	20'
2-1/4	.960	20'
2-1/2	1.060	20'
2-3/4	1.170	20'
3	1.280	20'
3-1/2	1.490	20'
4	1.700	20'
4-1/2	1.910	20'
5	2.130	20'
6	2.550	20'
8	3.400	20'
10	4.250	20'
12	5.130	20'

B.W. Gauge and Size	Weight (lbs./foot)	Stock Lengths
3/16 x		
1/2	.320	20'
5/8	.400	20'
3/4	.480	20'
7/8	.557	20'
1	.640	20'
1-1/4	.800	20'
1-3/8	.880	20'
1-1/2	.960	20'
1-3/4	1.120	20'
2	1.280	20'
2-1/4	1.430	20'
2-1/2	1.590	20'
2-3/4	1.750	20'
3	1.910	20'
3-1/4	2.070	20'
3-1/2	2.230	20'
4	2.550	20'
4-1/2	2.870	20'
5	3.190	20'
5-1/2	3.510	20'
6	3.820	20'
8	5.100	20'
10	6.380	20'
12	7.650	20'

Note: Material is also available in 12' lengths and in Pickled & Oiled, please inquire with Alro Sales.

Hot Rolled - Flats (M1044)

Stock Lengths: 20 foot

Size (inches)	Weight (lbs./foot)
1/4 x	
1	0.850
1-1/4	1.060
1-1/2	1.275
2	1.700
3/8 x	
1	1.280
1-1/4	1.590
1-1/2	1.910
2	2.550
2-1/2	3.180
3	3.830
4	5.100
5	6.380
6	7.650
1/2 x	
1	1.700
1-1/2	2.550
2	3.400
2-1/2	4.250
3	5.100
4	6.800
5	8.500
6	10.200

Size (inches)	Weight (lbs./foot)
5/8 x	
2	4.250
2-1/2	5.310
8	17.000
3/4 x	
1-1/2	3.830
2	5.100
2-1/2	6.380
3	7.650
3-1/2	8.930
4	10.200
5	12.750
6	15.300
1 x	
2	6.80
2-1/2	8.500
3	10.200
4	13.600
5	17.000
6	20.400

Size (inches)	Weight (lbs./foot)
1-1/4 x	
2	8.500
3-1/2	14.880
4	17.000
5	20.250
6	25.500
8	34.000
1-1/2 x	
2	10.200
2-1/2	12.750
3	15.300
4	20.400
5	25.500
2 x	
3	20.400
4	27.200
5	34.000
6	40.800

Hot Rolled - Squares

Stock Lengths: 20 foot

Size (inches)	Weight (lbs./foot)
3/8	0.480
1/2	0.850
5/8	1.330
3/4	1.910
7/8	2.600
1	3.400
1-1/4	5.310

Size (inches)	Weight (lbs./foot)
1-1/2	7.650
1-3/4	10.400
2	13.600
2-1/4	17.210
2-1/2	21.300
2-3/4	25.700
3	30.600

Size (inches)	Weight (lbs./foot)
3-1/2	41.700
4	54.400
4-1/2	68.900
5	85.000
6	122.400

Concrete Reinforcing Bars

Material Available in Grades 40 and 60

Stock Lengths: 20 foot and 40 foot

Size (inches)	Bar Number	Weight (lbs./foot)
3/8 Rd.	3	.376
1/2 Rd.	4	.668
5/8 Rd.	5	1.043
3/4 Rd.	6	1.502
7/8 Rd.	7	2.044
1 Rd.	8	2.670
1-1/8 Rd.	9	3.379

Round bars equal in cross sectional area to the standard square sizes indicated

Alro will deliver your Concrete Reinforcement order to your facility or job site

Concrete Reinforcing Mesh

6" x 6" x 6 Gauge Wire Mesh - 8' x 15' sheets
6" x 6" x 10 Gauge Wire Mesh - 8' x 15' sheets

Hot Rolled Steel Bars Tolerances

Permissible Variations in Cross Section for Hot-Wrought Round, Square and Round-Cornered Square Bars of Steel

Permissible Variation From Specified Size, In.[A]			Out-of-Round or Out-of-Square[B] (inches)
Specified Sizes (inches)	Over	Under	
7/16 thru 5/8	0.007	0.007	0.010
Over 5/8 thru 7/8	0.008	0.008	0.012
Over 7/8 thru 1	0.009	0.009	0.013
Over 1 thru 1-1/8	0.010	0.010	0.015
Over 1-1/8 thru 1-1/4	0.011	0.011	0.016
Over 1-1/4 thru 1-3/8	0.012	0.012	0.018
Over 1-3/8 thru 1-1/2	0.014	0.014	0.021
Over 1-1/2 thru 2	1/64	1/64	0.023
Over 2 thru 2-1/2	1/32	0	0.023
Over 2-1/2 thru 3-1/2	3/64	0	0.035
Over 3-1/2 thru 4-1/2	1/16	0	0.046
Over 4-1/2 thru 5-1/2	5/64	0	0.058
Over 5-1/2 thru 6-1/2	1/8	0	0.070
Over 6-1/2 thru 8-1/4	5/32	0	0.085
Over 8-1/4 thru 9-1/2	3/16	0	0.100
Over 9-1/2 thru 10	1/4	0	0.120

[A] Steel bars are regularly cut to length by shearing or hot sawing, which can cause end distortion resulting in those portions of the bar being outside the applicable size tolerance. When this end condition is objectionable, a machine cut end should be considered.

[B] Out-of-round is the difference between the maximum and minimum diameters of the bar, measured at the same transverse cross section. Out-of-square section is the difference in perpendicular distance between opposite faces, measured at the same transverse cross section.

Square Edge and Round Edge Flats

Permissible Variations in Thickness and Width for Hot-Wrought Square Edge and Round Edge Flat Bar

Specified Widths (inches)	Permissible variations in thickness, for thickness given over and under in[B]								
	0.203 up to 0.230	0.233 up to 0.250	0.25 up to 0.50	0.50 up to 1.00	1.00 up to 2.00	2.00 up to 3.00	Over 3.00	Widths Over	Widths Under
Up thru 1	.007	.007	.008	.010	. . . .	. . . .	. . . .	1/64	1/64
Over 1 thru 2	.007	.007	.012	.015	1/32	. . . .	. . . .	1/32	1/32
Over 2 thru 4	.008	.008	.015	.020	1/32	3/64	3/64	1/16	1/32
Over 4 thru 6	.009	.009	.015	.020	1/32	3/64	3/64	3/32	1/16
Over 6 thru 8	*	.015	.018	.025	1/32	3/64	1/16	1/8	3/32**

[A] When a square is held against a face and an edge of a square edge flat bar, the edge shall not deviate by more than 3° or 5% of the thickness.

[B] Steel bars are regularly cut to length by shearing or hot sawing, which can cause end distortion resulting in those portions of the bar being outside the applicable size tolerance. When this end condition is objectionable, a machine cut end should be considered.

* Flats over 6 to 8 in., incl, in width, are not available as hot-wrought steel bars in thickness under 0.230 in.

*Straightness Tolerances: Steel Bars

Hot Rolled Bars

Straightness is a perishable tolerance; therefore, reasonable care in handling and storage should be taken to avoid bending the bars. 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. A tightly-stretched string can be used as a substitute for a steel scale.

Hot Rolled Bars	1/4" in any 5 ft.	or	1/4 x	$\frac{\text{no. of ft. of length}}{5}$	inches
Hot Rolled, Thermally Treated	1/4" in any 5 ft.	or	1/4 x	$\frac{\text{no. of ft. of length}}{5}$	inches

** There is not a published flatness or straightness tolerance for flat bars.*

*Straightness Tolerances: Steel Bars

Cold Finished Bars

Form Size	Length (in Feet)	Maximum Curvature (Depth of arc in inches)
	Rounds	
Less than .28 Carbon		
Less than 5/8"	Less than 15'	1/8" in any 10' portion of the total length
Less than 5/8"	15' and over	1/8" in any 10' portion of the total length
5/8" and over	Less than 15'	1/16" in any 10' portion of the total length
5/8" and over	15' and over	1/8" in any 10' portion of the total length
.28 Carbon and over and all heat treated material		
Less than 5/8"	Less than 15'	3/16" in any 10' portion of the total length
Less than 5/8"	15' and over	5/16" in any 10' portion of the total length
5/8" and over	Less than 15'	1/8" in any 10' portion of the total length
5/8" and over	15' and over	3/16" in any 10' portion of the total length
	Hexagons & Squares	
Less than .28 Carbon		
Less than 5/8"	Less than 15'	3/16" in any 10' portion of the total length
Less than 5/8"	15' and over	5/16" in any 10' portion of the total length
5/8" and over	Less than 15'	1/8" in any 10' portion of the total length
5/8" and over	15' and over	3/16" in any 10' portion of the total length
.28 Carbon and over and all heat treated material		
Less than 5/8"	Less than 15'	1/4" in any 10' portion of the total length
Less than 5/8"	15' and over	3/8" in any 10' portion of the total length
5/8" and over	Less than 15'	3/16" in any 10' portion of the total length
5/8" and over	15' and over	1/4" in any 10' portion of the total length

* There is not a published flatness or straightness tolerance for flat bars.

Steel Structurals

Angles, Channels, Beams, Tees & Fiberglass

Angles - Bar Size

ASTM A-36, Pickled & Oiled and Galvanized

Tensile Strength: 58,000/80,000 PSI
Yield Point: 36,000 PSI Min.

Leg	Leg	Thickness	Weight (lbs./ft.)
1/2"	1/2"	1/8	0.38
5/8"	5/8"	1/8	0.48
3/4"	3/4"	1/8	0.59
7/8"	7/8"	1/8	0.70
1"	5/8"	1/8	0.64
1"	3/4"	1/8	0.70
1"	1"	1/8 3/16 1/4	0.80 1.16 1.49
1-1/8"	1-1/8"	1/8	0.90
1-1/4"	1-1/4"	1/8 3/16 1/4	1.01 1.48 1.92
1-1/2"	1-1/2"	1/8 3/16 1/4 3/8	1.23 1.80 2.34 3.35
1-3/4"	1-3/4"	1/8 3/16 1/4	1.44 2.12 2.77

Leg	Leg	Thickness	Weight (lbs./ft.)
2"	1-1/4"	3/16 1/4	1.96 2.55
2"	1-1/2"	1/8 3/16 1/4	1.44 2.12 2.77
2"	2"	1/8 3/16 1/4 5/16 3/8	1.65 2.44 3.19 3.92 4.70
2-1/2"	1-1/2"	3/16 1/4 5/16	2.44 3.16 3.92
2-1/2"	2"	3/16 1/4 5/16 3/8	2.75 3.62 4.50 5.30
2-1/2"	2-1/2"	3/16 1/4 5/16 3/8 1/2	3.07 4.10 5.00 5.90 7.70

Angles - Structural

ASTM A-36, Pickled & Oiled and Galvanized

Tensile Strength: 58,000/80,000 PSI
Yield Point: 36,000 PSI Min.

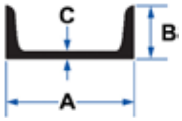
Leg	Leg	Thickness	Weight (lbs./ft.)
3"	2"	3/16	3.07
		1/4	4.1
		5/16	5.0
		3/8	5.9
		1/2	7.7
3"	2-1/2"	1/4	4.5
		5/16	5.6
		3/8	6.6
		1/2	8.5
3"	3"	3/16	3.71
		1/4	4.9
		5/16	6.1
		3/8	7.2
		1/2	9.4
3-1/2"	2-1/2"	1/4	4.9
		5/16	6.1
		3/8	7.2
		1/2	9.4
3-1/2"	3"	1/4	5.4
		5/16	6.6
		3/8	7.9
		1/2	10.2
3-1/2"	3-1/2"	1/4	5.8
		5/16	7.2
		3/8	8.5
4"	3"	1/4	5.8
		5/16	7.2
		3/8	8.5
		1/2	11.1
4"	3-1/2"	1/4	6.2
		5/16	7.7
		3/8	9.1
		1/2	11.9
4"	4"	1/4	6.6
		5/16	8.2
		3/8	9.8
		1/2	12.8
		5/8	15.7
		3/4	18.5

Leg	Leg	Thickness	Weight (lbs./ft.)
5"	3"	1/4	6.6
		5/16	8.2
		3/8	9.8
		1/2	12.8
5"	3-1/2"	1/4	7.0
		5/16	8.7
		3/8	10.4
		1/2	13.6
		5/8	16.8
		3/4	19.8
5"	5"	5/16	10.3
		3/8	12.3
		1/2	16.2
		5/8	20.0
		3/4	23.6
6"	3-1/2"	5/16	9.8
		3/8	11.7
		1/2	15.3
6"	4"	5/16	10.3
		3/8	12.3
		1/2	16.2
		5/8	20.0
		3/4	23.6
6"	6"	5/16	12.4
		3/8	14.9
		1/2	19.6
		5/8	24.2
		3/4	28.7
		1	37.4
7"	4"	3/8	13.6
		1/2	17.9
		3/4	26.2
8"	4"	1/2	19.6
		3/4	28.7
		1	37.4
8"	6"	1/2	23.0
		3/4	33.8
		1	44.2
8"	8"	1/2	26.4
		5/8	32.7
		3/4	38.9
		1	51.0

Channels - Bar Size

ASTM A-36

Tensile Strength: 58,000/80,000 PSI
Yield Point: 36,000 PSI Min.



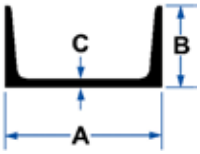
"A" Depth	"B" Flange	"C" Web Thickness	Weight (lbs./ft.)
3/4"	3/8	1/8	0.56
1"	1/2	1/8	0.84
1-1/4"	1/2	1/8	1.01
1-1/2"	1/2	1/8	1.12
1-1/2"	9/16	3/16	1.44
1-1/2"	3/4	1/8	1.17

"A" Depth	"B" Flange	"C" Web Thickness	Weight (lbs./ft.)
2"	1/2	1/8	1.43
2"	9/16	3/16	1.86
2"	5/8	1/4	2.28
2"	1	1/8	1.59
2"	1	3/16	2.32
2-1/2"	5/8	3/16	2.27

Channels - Ship and Car

ASTM A-36

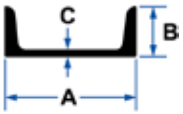
Tensile Strength: 58,000/80,000 PSI
Yield Point: 36,000 PSI Min.



"A" Depth	Weight (lbs./ft.)	"C" Thickness of Web	"B" Width of Flange
3"	7.1	.312	1.938
4"	13.8	.500	2.500
6"	12.0	.310	2.497
	15.1	.316	2.941
	15.3	.340	3.500
	16.3	.375	3.000
	18.0	.379	3.504
7"	19.1	.352	3.452
	22.7	.503	3.603
8"	18.7	.353	2.978
	20.0	.400	3.025
	21.4	.375	3.450
	22.8	.427	3.502
9"	23.9	.400	3.450
	25.4	.450	3.500
10"	22.0	.290	3.315
	25.0	.380	3.405
	28.5	.425	3.950
	33.6	.575	4.100
	41.1	.796	4.321

"A" Depth	Weight (lbs./ft.)	"C" Thickness of Web	"B" Width of Flange
12"	31.0	.370	3.670
	35.0	.465	3.765
	40.0	.590	3.890
	45.0	.710	4.010
	50.0	.835	4.135
13"	31.8	.375	4.000
	35.0	.447	4.072
	40.0	.560	4.185
	50.0	.787	4.412
18"	42.7	.450	3.950
	45.8	.500	4.000
	51.9	.600	4.100
	58.0	.700	4.200

Channels - Structural A-36

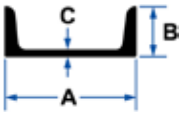


ASTM A-36 Modified

Yield Point: 50,000 PSI Min.

"A" Depth	Weight (lbs./ft.)	"C" Thickness of Web	"B" Width of Flange
3"	3.5	.132	1.375
4"	4.5	.125	1.584

Channels - Structural

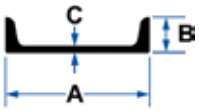


ASTM A-36

Tensile Strength: 58,000/80,000 PSI
Yield Point: 36,000 PSI Min.

"A" Depth	Weight (lbs./ft.)	"C" Thickness of Web	"B" Width of Flange
3"	4.1	.170	1.410
	5.0	.258	1.498
	6.0	.356	1.596
4"	5.4	.184	1.584
	6.25	.247	1.647
	7.25	.320	1.720
5"	6.7	.190	1.750
	9.0	.325	1.885
6"	8.2	.200	1.920
	10.5	.314	2.034
	13.0	.437	2.157
7"	9.8	.210	2.090
	12.25	.314	2.194
	14.75	.419	2.299
8"	11.5	.220	2.260
	13.75	.303	2.343
	18.75	.487	2.527
9"	13.4	.233	2.433
	15.0	.285	2.485
	20.0	.448	2.648
10"	15.3	.240	2.600
	20.0	.379	2.739
	25.0	.526	2.886
	30.0	.673	3.033
12"	20.7	.282	2.942
	25.0	.387	3.047
	30.0	.510	3.170
15"	33.9	.400	3.400
	40.0	.520	3.520
	50.0	.716	3.716

Channels - Stair Stringer



ASTM A-36 (Junior)

Tensile Strength: 58,000/80,000 PSI
Yield Point: 36,000 PSI Min.

"A" Depth	Weight (lbs./ft.)	"C" Thickness of Web	"B" Width of Flange
8"	8.5	.179	1.874
10"	8.4	.170	1.500
12"	10.6	.190	1.500
12"	14.3	.250	2.130

American Standard I Beam

ASTM A-992/A572-50 (Grade 50)

Tensile Strength: 65,000 PSI Min
Yield Point: 65,000 PSI Max

"A" Depth	Weight (lbs./ft.)	"C" Thickness of Web	"B" Width of Flange
3"	5.7* 7.5	.170 .349	2.330 2.509
4"	7.7* 9.5	.193 .326	2.663 2.796
5"	10.0	.214	3.004
6"	12.5 17.25	.232 .465	3.332 3.565
8"	18.4 23.0	.271 .441	4.001 4.171
10"	25.4 35.0	.311 .594	4.661 4.944
12"	31.8 35.0 40.8 50.0	.350 .428 .462 .687	5.000 5.078 5.252 5.477
15"	42.9 50.0	.411 .550	5.501 5.640
18"	54.7 70.0	.461 .711	6.001 6.251
20"	66.0 75.0 86.0 96.0	.505 .635 .660 .800	6.255 6.385 7.060 7.200
24"	80.0 90.0 100.0 106.0 121.0	.500 .625 .745 .620 .800	7.000 7.125 7.245 7.870 8.050

**Also available in 1045 HR*

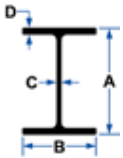
Junior Beams

ASTM A-529-50 (Grade 50)

Tensile Strength: 70,000-100,000 PSI
Yield Point: 50,000 PSI Min

"A" Depth	Weight (lbs./ft.)	"C" Thickness of Web	"B" Width of Flange
6"	4.4	.114	1.844
8"	6.5	.135	2.281
10"	8.0	.141	2.690
10"	9.0	.157	2.690
12"	10.8	.160	3.065
12"	11.8	.177	3.065

Wide Flange and H Beams



ASTM A992/A572 (Grade 50)

Tensile Strength: 65,000 min. PSI
Yield Point: 50,000 min. - 65,000 max. PSI

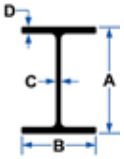
Nominal Depth	Weight (lbs./ft.)	"A" Depth of Section	"D" Flange Thickness	"B" Width of Flange	"C" Thickness of Web
W 4 x	13.0	4.16	.345	4.060	.280
W 5 x	16.0	5.01	.360	5.000	.240
	19.0	5.15	.430	5.030	.270
W 6 x	9.0	5.90	.215	3.940	.170
	12.0	6.03	.280	4.000	.230
	16.0	6.28	.405	4.030	.260
	15.0	5.99	.260	5.990	.230
	20.0	6.20	.365	6.020	.260
	25.0	6.38	.455	6.080	.320
W 8 x	10.0	7.89	.205	3.940	.170
	13.0	7.99	.255	4.000	.230
	15.0	8.11	.315	4.015	.245
	18.0	8.14	.330	5.250	.230
	21.0	8.28	.400	5.270	.250
	24.0	7.93	.400	6.495	.245
	28.0	8.06	.465	6.535	.285
	31.0	8.00	.435	7.995	.285
	35.0	8.12	.495	8.020	.310
	40.0	8.25	.560	8.070	.360
	48.0	8.50	.685	8.110	.400
	58.0	8.75	.810	8.220	.510
	67.0	9.00	.935	8.280	.570
W 10 x	12.0	9.87	.210	3.960	.190
	15.0	9.99	.270	4.000	.230
	17.0	10.11	.330	4.010	.240
	19.0	10.24	.395	4.020	.250
	22.0	10.17	.360	5.750	.240
	26.0	10.33	.440	5.770	.260
	30.0	10.47	.510	5.810	.300
	33.0	9.73	.435	7.960	.290
	39.0	9.92	.530	7.985	.315
	45.0	10.10	.620	8.020	.350
	49.0	9.98	.560	10.000	.340

Continued on next page

Wide Flange and H Beams

ASTM A992/A572 Grade 50

Tensile Strength: 65,000 min. PSI
Yield Point: 50,000 min. - 65,000 max. PSI



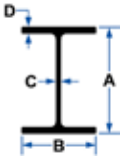
Nominal Depth	Weight (lbs./ft.)	"A" Depth of Section	"D" Flange Thickness	"B" Width of Flange	"C" Thickness of Web
W 10 x	54.0	10.09	.615	10.030	.370
	60.0	10.22	.680	10.080	.420
	68.0	10.40	.770	10.130	.470
	77.0	10.60	.870	10.190	.530
	88.0	10.84	.990	10.265	.605
	100.0	11.10	1.120	10.340	.680
	112.0	11.36	1.250	10.415	.755
W 12 x	14.0	11.91	.225	3.970	.200
	16.0	11.99	.265	3.990	.220
	19.0	12.16	.350	4.005	.235
	22.0	12.31	.425	4.030	.260
	26.0	12.22	.380	6.490	.230
	30.0	12.34	.440	6.520	.260
	35.0	12.50	.520	6.560	.300
	40.0	11.94	.515	8.005	.295
	45.0	12.06	.575	8.045	.335
	50.0	12.19	.640	8.080	.370
	53.0	12.06	.575	9.995	.345
	58.0	12.19	.640	10.010	.360
	65.0	12.12	.605	12.000	.390
	72.0	12.25	.670	12.040	.430
	79.0	12.38	.735	12.080	.470
	87.0	12.53	.810	12.125	.515
	96.0	12.71	.900	12.160	.550
	106.0	12.89	.990	12.220	.610
	120.0	13.12	1.105	12.320	.710
	136.0	13.41	1.250	12.400	.790
	152.0	13.71	1.400	12.480	.870
	170.0	14.03	1.560	12.570	.960
	190.0	14.38	1.735	12.670	1.060
	210.0	14.71	1.900	12.790	1.180
	230.0	15.05	2.070	12.895	1.285
	252.0	15.41	2.250	13.005	1.395
	279.0	15.85	2.470	13.140	1.530
	305.0	16.32	2.705	13.235	1.625
	336.0	16.82	2.955	13.385	1.775
W 14 x	22.0	13.74	.335	5.000	.230
	26.0	13.91	.420	5.025	.255
	30.0	13.84	.385	6.730	.270
	34.0	13.98	.455	6.745	.285
	38.0	14.10	.515	6.770	.310
	43.0	13.66	.530	7.995	.305
	48.0	13.79	.595	8.030	.340
	53.0	13.92	.660	8.060	.370
	61.0	13.89	.645	9.995	.375
	68.0	14.04	.720	10.035	.415
	74.0	14.17	.785	10.070	.450
	82.0	14.31	.855	10.130	.510

Continued on next page

Wide Flange and H Beams

ASTM A992/A572 Grade 50

Tensile Strength: 65,000 min. PSI
Yield Point: 50,000 min. - 65,000 max. PSI



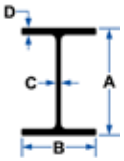
Nominal Depth	Weight (lbs./ft.)	"A" Depth of Section	"D" Flange Thickness	"B" Width of Flange	"C" Thickness of Web
W 14 x	90.0	14.02	.710	14.520	.440
	99.0	14.16	.780	14.565	.485
	109.0	14.32	.860	14.605	.525
	120.0	14.48	.940	14.670	.590
	132.0	14.66	1.030	14.725	.645
	145.0	14.78	1.090	15.500	.680
	159.0	14.98	1.190	15.565	.745
	176.0	15.22	1.310	15.650	.830
	193.0	15.48	1.440	15.710	.890
	211.0	15.72	1.560	15.800	.980
	233.0	16.04	1.720	15.890	1.070
	257.0	16.38	1.890	15.995	1.175
	283.0	16.74	2.070	16.110	1.290
	311.0	17.12	2.260	16.230	1.410
	342.0	17.54	2.470	16.360	1.540
	370.0	17.92	2.660	16.475	1.655
	398.0	18.29	2.845	16.590	1.770
	426.0	18.67	3.035	16.695	1.875
	455.0	19.02	3.210	16.835	2.015
	500.0	19.60	3.500	17.010	2.190
	550.0	20.24	3.820	17.200	2.380
	605.0	20.92	4.160	17.415	2.595
	665.0	21.64	4.520	17.650	2.830
	730.0	22.42	4.910	17.890	3.070
W 16 x	26.0	15.69	.345	5.500	.250
	31.0	15.88	.440	5.525	.275
	36.0	15.86	.430	6.985	.295
	40.0	16.01	.505	6.995	.305
	45.0	16.13	.565	7.035	.345
	50.0	16.26	.630	7.070	.380
	57.0	16.43	.715	7.120	.430
	67.0	16.33	.665	10.235	.395
	77.0	16.52	.760	10.295	.455
	89.0	16.75	.875	10.365	.525
	100.0	16.97	.985	10.425	.585
W 18 x	35.0	17.70	.425	6.000	.300
	40.0	17.90	.525	6.015	.315
	46.0	18.06	.605	6.060	.360
	50.0	17.99	.570	7.495	.355
	55.0	18.11	.630	7.530	.390
	60.0	18.24	.695	7.555	.415
	65.0	18.35	.750	7.590	.450
	71.0	18.47	.810	7.635	.495
	76.0	18.21	.680	11.035	.425
	86.0	18.39	.770	11.090	.480
	97.0	18.59	.870	11.145	.535

Continued on next page

Wide Flange and H Beams

ASTM A992/A572 Grade 50

Tensile Strength: 65,000 min. PSI
Yield Point: 50,000 min. - 65,000 max. PSI



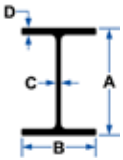
Nominal Depth	Weight (lbs./ft.)	"A" Depth of Section	"D" Flange Thickness	"B" Width of Flange	"C" Thickness of Web
W 18 x	106.0	18.73	.940	11.200	.590
	119.0	18.97	1.060	11.265	.655
	130.0	19.25	1.200	11.160	.670
	143.0	19.49	1.320	11.220	.730
	158.0	19.72	1.440	11.300	.810
	175.0	20.04	1.590	11.375	.890
	192.0	20.35	1.750	11.455	.960
	211.0	20.67	1.910	11.555	1.060
	234.0	21.06	2.110	11.650	1.160
	258.0	21.46	2.300	11.770	1.280
	283.0	21.85	2.500	11.890	1.400
	311.0	22.32	2.740	12.005	1.520
W 21 x	44.0	20.66	.450	6.500	.350
	48.0	20.62	.430	8.140	.350
	50.0	20.83	.535	6.530	.380
	55.0	20.80	.522	8.220	.375
	57.0	21.06	.650	6.555	.405
	62.0	20.99	.615	8.240	.400
	68.0	21.13	.685	8.270	.430
	73.0	21.24	.740	8.295	.455
	83.0	21.43	.835	8.355	.515
	93.0	21.62	.930	8.420	.580
	101.0	21.36	.800	12.290	.500
	111.0	21.51	.875	12.340	.550
	122.0	21.68	.960	12.390	.600
	132.0	21.83	1.035	12.440	.650
	147.0	22.06	1.150	12.510	.720
	166.0	22.48	1.360	12.420	.750
	182.0	22.72	1.480	12.500	.830
	201.0	23.03	1.630	12.575	.910
W 24 x	55.0	23.57	.505	7.005	.395
	62.0	23.74	.590	7.040	.430
	68.0	23.73	.585	8.965	.415
	76.0	23.92	.680	8.990	.440
	84.0	24.10	.770	9.020	.470
	94.0	24.31	.875	9.065	.515
	103.0	24.53	.980	9.000	.550
	104.0	24.06	.750	12.750	.500
	117.0	24.26	.850	12.800	.550
	131.0	24.48	.960	12.855	.605
	146.0	24.74	1.090	12.900	.650
	162.0	25.00	1.220	12.955	.705
	176.0	25.24	1.340	12.890	.750
	192.0	25.47	1.460	12.950	.810
	207.0	25.71	1.570	13.010	.870
	229.0	26.02	1.730	13.110	.960

Continued on next page

Wide Flange and H Beams

ASTM A992/A572 Grade 50

Tensile Strength: 65,000 min. PSI
Yield Point: 50,000 min. - 65,000 max. PSI



Nominal Depth	Weight (lbs./ft.)	"A" Depth of Section	"D" Flange Thickness	"B" Width of Flange	"C" Thickness of Web
W 24 x	250.0	26.34	1.890	13.185	1.040
	279.0	26.73	2.090	13.305	1.160
	306.0	27.13	2.280	13.405	1.260
	335.0	27.52	2.480	13.520	1.380
	370.0	27.99	2.720	13.660	1.520
W 27 x	84.0	26.71	.640	9.960	.460
	94.0	26.92	.745	9.990	.490
	102.0	27.09	.830	10.015	.515
	114.0	27.29	.930	10.070	.570
	129.0	27.63	1.100	10.010	.610
	146.0	27.38	.975	13.965	.605
	161.0	27.59	1.080	14.020	.660
	178.0	27.81	1.190	14.085	.725
	194.0	28.11	1.340	14.035	.750
	217.0	28.43	1.500	14.115	.830
	235.0	28.66	1.610	14.190	.910
	258.0	28.98	1.770	14.270	.980
	281.0	29.29	1.930	14.350	1.060
	307.0	29.61	2.090	14.445	1.160
	336.0	30.00	2.280	14.550	1.260
	368.0	30.39	2.480	14.665	1.380
W 30 x	90.0	29.53	.610	10.400	.470
	99.0	29.65	.670	10.450	.520
	108.0	29.83	.760	10.475	.545
	116.0	30.01	.850	10.495	.565
	124.0	30.17	.930	10.515	.585
	132.0	30.31	1.000	10.545	.615
	148.0	30.67	1.180	10.480	.650
	173.0	30.44	1.065	14.985	.655
	191.0	30.68	1.185	15.040	.710
	211.0	30.94	1.315	15.105	.775
	235.0	31.30	1.500	15.055	.830
	261.0	31.61	1.650	15.155	.930
	292.0	32.01	1.850	15.255	1.020
	326.0	32.40	2.050	15.370	1.140
	357.0	32.80	2.240	15.470	1.240
	391.0	33.19	2.440	15.590	1.360
W 33 x	118.0	32.86	.740	11.480	.550
	130.0	33.09	.855	11.510	.580
	141.0	33.30	.960	11.535	.605
	152.0	33.49	1.055	11.565	.635
	169.0	33.82	1.220	11.500	.670
	201.0	33.68	1.150	15.745	.715
	221.0	33.93	1.275	15.805	.775
	241.0	34.18	1.400	15.860	.830
	263.0	34.53	1.570	15.805	.870
	291.0	34.84	1.730	15.905	.960
	318.0	35.16	1.890	15.985	1.040
	354.0	35.55	2.090	16.100	1.160
	387.0	35.95	2.280	16.200	1.260

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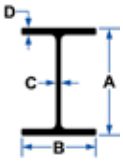
Wide Flange and H Beams

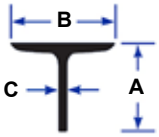
ASTM A992/A572 Grade 50

Tensile Strength: 65,000 min. PSI
Yield Point: 50,000 min. - 65,000 max. PSI



Nominal Depth	Weight (lbs./ft.)	"A" Depth of Section	"D" Flange Thickness	"B" Width of Flange	"C" Thickness of Web
W 36 x	135.0	35.55	.790	11.950	.600
	150.0	35.85	.940	11.975	.625
	160.0	36.01	1.020	12.000	.650
	170.0	36.17	1.100	12.030	.680
	182.0	36.33	1.180	12.075	.725
	194.0	36.49	1.260	12.115	.765
	210.0	36.69	1.360	12.180	.830
	231.0	36.49	1.260	16.470	.760
	232.0	37.12	1.570	12.120	.870
	247.0	36.67	1.350	16.510	.800
	256.0	37.43	1.730	12.215	.960
	262.0	36.85	1.440	16.550	.840
	282.0	37.11	1.570	16.595	.885
	302.0	37.33	1.680	16.655	.945
	330.0	37.67	1.850	16.630	1.020
	361.0	37.99	2.010	16.730	1.120
	395.0	38.41	2.200	16.830	1.220
	441.0	38.85	2.440	16.965	1.360
W 40 x	149.0	38.20	.830	11.810	.630
	167.0	38.59	1.025	11.810	.650
	183.0	38.98	1.200	11.810	.650
	211.0	39.37	1.415	11.810	.750
	235.0	39.69	1.575	11.890	.830
	264.0	40.00	1.730	11.930	.960
	278.0	40.16	1.810	11.970	1.025
	294.0	40.39	1.930	12.010	1.060
	327.0	40.79	2.130	12.130	1.180
	199.0	38.67	1.065	15.750	.650
	215.0	38.98	1.220	15.750	.650
	249.0	39.38	1.420	15.750	.750
	277.0	39.69	1.575	15.830	.830
	297.0	39.84	1.650	15.825	.930
	324.0	40.16	1.810	15.910	1.000
	362.0	40.55	2.010	16.020	1.120
	372.0	40.63	2.045	16.065	1.160
	397.0	40.95	2.200	16.120	1.220
	431.0	41.26	2.360	16.220	1.340
W 44 x	230.0	42.91	1.220	15.750	.710
	262.0	43.31	1.415	15.750	.785
	290.0	43.62	1.575	15.825	.865
	335.0	44.02	1.770	15.945	1.025

Tees-Bar Size Hot Rolled



ASTM A-36

Tensile Strength: 58,000/80,000 PSI
Yield Point: 36,000 Min. PSI

"A" Stem	"B" Flange	"C" Stem Thickness	Weight (lbs./ft.)
1	1	1/8	.85
1-1/4	1-1/4	1/8	1.09
1-1/2	1-1/2	1/8 3/16 1/4	1.37 1.90 2.43
2	2	1/4	3.62

Special Tee Sections

Alro offers a wide range of Tee sizes from stock. By flame cutting through the length of the web of Standard Wide Flange or I Beams we can furnish Tees to your specification.

Alro has a variety of Tee sizes in stock. Sizes not stocked can be cut from beams.

Structural Tolerances

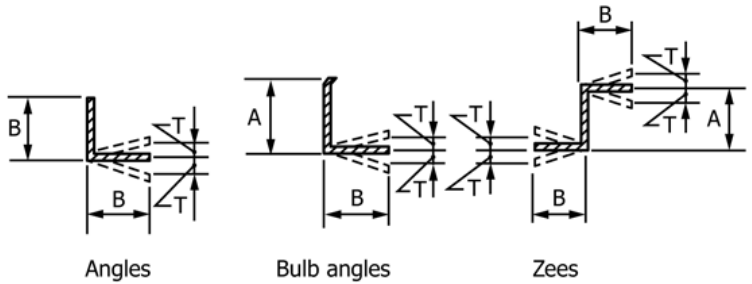
Permissible variations in Cross Section for W, HP, S, M, C, and MC Shapes

Shape	Section Nominal Sizes (inches)	Depth (inches)		Flange Width (inches)		Flange Out-of-Square, max. in.[AB]
		Over Theoretical	Under Theoretical	Over Theoretical	Under Theoretical	
W and HP	Up thru 12	1/8	1/8	1/4	3/16	1/4
	Over 12	1/8	1/8	1/4	3/16	5/16
S and M	3 thru 7	3/32	1/16	1/8	1/8	1/32
	Over 7 thru 14	1/8	3/32	5/32	5/32	1/32
	Over 14 thru 24	3/16	1/8	3/16	3/16	1/32
C and MC	Up thru 1-1/2	1/32	1/32	1/32	1/32	1/32
	Over 1-1/2 up to 3	1/16	1/16	1/16	1/16	1/32
	3 thru 7	3/32	1/16	1/8	1/8	1/32
	Over 7 thru 14	1/8	3/32	1/8	5/32	1/32
	Over 14	3/16	1/8	1/8	3/16	1/32

[A] Applies when flanges of channels are toed in or out. For channels 5/8" and under in depth, the permissible out-of-square is 3/64 in./in. of depth.
[B] Tolerance is per inch of flange width for S, M, C, and MC shapes.

Structural Tolerances

Permissible Variations in Cross Section for Angles (L Shapes), Bulb Angles, and Zees



Angles Bulb angles Zees

Section	Nominal Sizes (inches)	Permitted Variations in Sectional Dimensions Given, in.							
		A, Depth (inches)		*B*, Flange Width or Length of Leg (inches)			Permitted Variations Over or Under Theoretical Thickness (inches)		
		Over Theoretical	Under Theoretical	Over Theoretical	Under Theoretical	*T*, Out of Square per Inch, of *B*	3/16 and under	Over 3/16 to 3/8, incl	Over 3/8
Angles[A] (L Shapes)	1 and under	...	...	1/32	1/32	3/128[B]	0.008	0.010	...
	Over 1 to 2, incl	...	...	3/64	3/64	3/128[B]	0.010	0.010	0.012
	Over 2 to 2 1/2 , incl	...	...	1/16	1/16	3/128[B]	0.012	0.015	0.015
	Over 2 1/2 to 4, incl	...	...	1/8	3/32	3/128[B]	...	...	...
	Over 4 to 6, incl	...	...	1/8	1/8	3/128[B]	...	...	...
	Over 6 to 8, incl	...	...	3/16	1/8	3/128[B]	...	...	...
	Over 8 to 10, incl	...	...	1/4	1/4	3/128[B]	...	...	...
	Over 10	...	...	1/4	3/8	3/128[B]	...	...	...
Bulb Angles	(Depth) 3 to 4, incl	1/8	1/16	1/8	1/32	3/128[B]	...	...	...
	Over 4 to 6, incl	1/8	1/16	1/8	1/8	3/128[B]	...	...	...
	Over 6	1/8	1/16	3/16	1/8	3/128[B]	...	...	...
Zees	3 to 4, incl	1/8	1/16	1/8	1/32	3/128[B]	...	...	...
	Over 4 to 6, incl	1/8	1/16	1/8	1/8	3/128[B]	...	...	...

[A] For unequal leg angles, longer leg determines classifications. • [B] 3/128 in./in. = 1-1/2 deg.

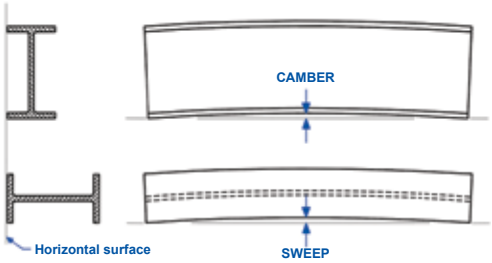
Structural Tolerances

Permissible Variations in Wide Flange Shapes
Straightness - Camber and Sweep

Wide Flange Shapes	Permissible Variation
All, except following: When certain shapes** with a flange width approximately equal to depth are specified on order as columns:	$1/8" \times \frac{\text{number of feet of total length*}}{10}$
Lengths of 45 feet and under	$1/8" \times \frac{\text{number of feet of total length}}{10}$ but not over 3/8"
Lengths over 45 feet	$3/8" + 1/8" \times \frac{\text{number of feet of total length - 45}}{10}$

*Shapes with a flange width less than 6 inches, variation for sweep = $1/8" \times \frac{\text{number of feet of total length}}{5}$

**Applies only to :
8 inch deep shapes 31 lbs. per foot and heavier,
10 inch deep shapes 49 lbs. per foot and heavier,
12 inch deep shapes 65 lbs. per foot and heavier, and
14 inch deep shapes 90 lbs. per foot and heavier,
If other shapes are specified on the order as columns, the variation will be subject to negotiation with the manufacturer.



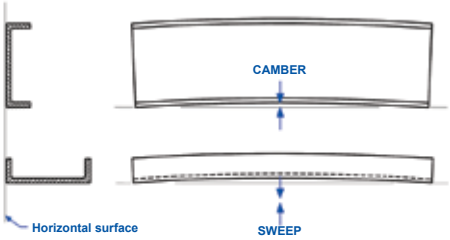
Ends Out-of-Square

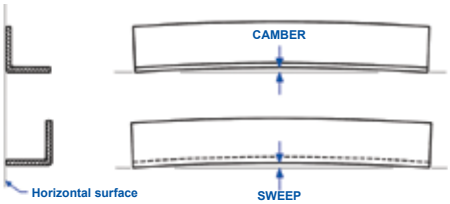
S, M, C, MC Shapes..... 1/64" per inch of depth

S - American Standard Beams *C - American Standard Channels*
M - Miscellaneous Beams *MC - Miscellaneous Channels*

Straightness (Angles, Beams and Channels)

		Permissible Variation	
Camber	Under 3 3 and over	1/4 in. in any 5 ft, or 1/4 x (number of feet of total length/5) 1/8 x (number of feet of total length/5)	$1/8" \times \frac{\text{number of feet of total length}}{5}$
Sweep		Due to the extreme variations in flexibility of standard beams and channels, sweep tolerances are subject to negotiations for the individual shapes involved.	





Steel Plate & Sheet

Steel Plate, Floor Plate & Sheet Products

⚠ **WARNING:** These products can potentially expose you to chemicals including Nickel, Chromium, Lead, Cobalt, Mercury and Beryllium, which are known to the state of California to cause cancer and/or birth defects or other reproductive harm. For more information, visit **www.P65Warnings.ca.gov**

ASTM A-36 Hot Rolled Plate

A-36 is a structural quality carbon steel used in a variety of general construction applications including; bolted, riveted, or welded construction of bridges and buildings.

Typical Analysis	ASTM A-36				
	Up thru 3/4"	Over 3/4" thru 1-1/2"	Over 1-1/2" thru 2-1/2"	Over 2-1/2" thru 5"	Over 4"
Carbon (C) max %	0.25	0.25	0.26	0.27	0.29
Manganese (Mn) %	-	.80/1.20	.85/1.20	.85/1.20	.85/1.20
Phosphorus (P) max %	.04	.04	.04	.04	.04
Sulphur (S) %	.05	.05	.05	.05	.05
Silicon (Si) %	.40 max	.40 max	.15/.40	.15/.40	.15/.40
Copper (Cu) min % when copper steel is specified	.20	.20	.20	.20	.20
Tensile Strength	58,000-80,000 psi				
Min. Yield Strength	36,000 psi (Over 8" 32,000 psi)				
Elongation in 2"	23%				

*For each reduction of 0.01% below the specified carbon maximum, an increase of 0.06% manganese above the specified maximum will be permitted up to the maximum of 1.35%

C1020 Hot Rolled Plate

The controlled carbon range of 1020 improves the machinability of this grade. Good formability and weldability are also characteristic.

Typical Analysis	AISI 1020
Carbon (C)	0.18 / 0.23
Manganese (Mn)	0.30 / 0.60
Phosphorus (P)	0.04 max
Sulphur (S)	0.05 max

C1045 Hot Rolled Plate

Work Hardening Steel

1045 is silicon killed with a higher carbon content for greater strength. Strength can be improved in the lighter and medium thicknesses by heat treatment. Machinability is good, while forming and welding properties are limited.

Typical Analysis	AISI 1045
Carbon (C)	0.43 / 0.50
Manganese (Mn)	0.60/ 0.90
Phosphorus (P)	0.04 max
Sulphur (S)	0.05 max

ASTM A1011/A1018 HR CS Type B

Hot rolled commercial quality steel is suitable for many applications where normal surface imperfections are not objectionable. Heat treatment and other processing operations must be properly performed so as to not detrimentally affect the properties of the steel. Commercial steel will follow the bend test requirements of ASTM E290.

Typical Analysis	%
Carbon (C)	0.10
Manganese (Mn)	0.25 / 0.50
Phosphorus (P)	0.04 max
Sulphur (S)	0.05 max

Hot Rolled Plate

Standard Lengths: 96", 120", 144" and 240"
Other custom lengths available upon request.

Size (Thick)	Weight (lbs/sqft)	ASTM A-36	ASTM A-36 Pickled & Oiled	C1020	C1045	CS Type B Pickled & Oiled
3/16	7.66	●	●	●	●	●
1/4	10.21	●	●		●	●
5/16	12.76	●	●		●	●
3/8	15.31	●	●	●	●	●
7/16	17.85	●				
1/2	20.42	●	●	●	●	●
9/16	22.97	●				
5/8	25.52	●		●	●	
3/4	30.63	●		●	●	
7/8	35.74	●		●	●	
1	40.84	●		●	●	
1-1/8	45.94	●		●	●	
1-1/4	51.05	●		●	●	
1-3/8	56.15	●		●		
1-1/2	61.26	●		●	●	
1-5/8	66.36	●		●	●	
1-3/4	71.47	●		●	●	
1-7/8	76.57	●				
2	81.50	●		●	●	
2-1/8	86.60	●				
2-1/4	91.89	●		●	●	
2-1/2	102.10	●		●	●	
2-5/8	107.20	●				
2-3/4	112.31	●		●	●	
2-7/8	117.41	●				
3	122.52	●		●	●	

Continued on next page

Hot Rolled Plate

Standard Lengths: 96", 120", 144" and 240"
Other custom lengths available upon request.

Size (Thick)	Weight (lbs/sqft)	ASTM A-36	ASTM A-36 Pickled & Oiled	C1020	C1045	CS Type B Pickled & Oiled
3-1/8	127.62	●				
3-1/4	132.72	●			●	
3-1/2	142.93	●		●	●	
3-3/4	153.15	●			●	
4	163.36	●		●	●	
4-1/4	173.56	●				
4-1/2	183.77	●		●	●	
4-3/4	193.98	●				
5	204.20	●		●	●	
5-1/4	214.41	●				
5-1/2	224.61	●		●	●	
5-3/4	234.83	●				
6	245.03	●		●	●	
6-1/4	255.24	●				
6-1/2	265.46	●			●	
7	285.87	●		●	●	
7-1/2	306.29	●				
8	326.71	●		●	●	
8-1/2	347.13	●				
9	367.55	●		●		
10	408.38	●		●	●	
10-1/2	428.64	●				
11	449.22	●				
12	490.06	●				
12-1/2	510.48	●				
13	530.90	●				
14	571.73	●				

100XF Temper Leveled Plate

100XF steel plate has been developed for applications where increased strength-to-weight ratios are required. It has physical properties similar to those of ASTM A514 even though its manufacturing process does not require heat treatment.

100XF is available as temper leveled, cut-to-length plate. Temper leveling improves flatness and surface quality, and eliminates coil memory, all of which enhance laser and plasma cutting quality. It also offers good weldability, formability, toughness, and weathering resistance. This excellent combination of properties is possible because of the low-carbon chemistry and the thermo-mechanical controlled processing used in the manufacture of 100 XF.

Typical Applications

Applications for 100XF include transport trailers, construction equipment, crane booms, mobile manlifts, agriculture equipment, heavy vehicle frames, and chassis.

Typical Analysis	100XF Temper Leveled
Carbon (C)	.10
Manganese (Mn)	2.00
Molybdenum (Mo)	.50
Sulphur (S)	.006
Phosphorus (P)	.02
Silicon (Si)	.40
Aluminum (Al)	.06
Ti+Nb+V	.025
.2% Offset Yield Strength ksi (Mpa)	100 (690)
Tensile Strength ksi (Mpa)	110 (760)
Elongation in 2 in.	16%

100XF Temper Leveled Plate

Stock Lengths: 120", 144" & 240" (Custom lengths available by request.)

Flatness: Guaranteed to meet 1/2 ASTM A6 flatness tolerances.

Size (inches)	Width (inches)	Weight (lbs./sqft.)
3/16	60	7.66
3/16	72	7.66
1/4	60	10.21
1/4	72	10.21
5/16	72	12.76
3/8	60	15.31
3/8	72	15.31
3/8	96	15.31
1/2	60	20.42
1/2	72	20.42

ASTM A-514 Plate

Grade B, Grade H, Grade F and Grade Q

The A-514 plate steels are a group of quenched and tempered alloys with attractive advantages and characteristics. The most important are high yield strength at 90 or 100 ksi minimum, weldability, and good toughness at low atmospheric temperatures. Designed for a wide range of structural uses as well as machinery and equipment, these alloy steels offer help with selecting the optimum in strength, toughness, corrosion resistance, impact-abrasion resistance, and long-term economy.

Typical Analysis	A-514			
	Grade B*	Grade H*	Grade F*, Q*	Grade Q*
Type of Steel	Alloy	Alloy	Alloy	Alloy
Requirements for Delivery	A6	A6	A6	A6
Tensile Strength (ksi)	110/130	110/130	110/130	100/130
Yield Strength (Min. ksi)	100	100	100	90
Spec. Thickness (Max. in.)	1-1/4	2	2-1/2	6
Chemical Composition (%) Carbon (Max.)	.12/.21	.12/.21	.10/.20	.14/.21
Manganese	.70/1.00	.95/1.30	.60/1.00	.98/1.30
Phosphorous (Max.)	.035	.035	.035	.035
Sulphur (Max.)	.035	.035	.035	.035
Silicon	.20/.35	.20/.35	.15/.35	.15/.35
Chromium	.40/.65	.40/.65	.40/.65	1.00/1.50
Nickel	--	.30/.70	.70/1.00	1.20/1.50
Molybdenum	.15/.25	.20/.30	.40/.60	.40/.60
Copper	--	--	.15/.50	
Other Elements	.03/.08 V	.03/.08 V	.03/.08 V	
	.01/.03 Ti	.0005/.005 B	.0005/.006 B	
	.0005/.005B			
Heat Treatment Required	Q&T	Q&T	Q&T	Q&T

**This grade of steel may be susceptible to cracking in the heat-affected zone of welds during post-weld heat treatment (stress relief). Careful consideration should be given by competent welding engineers before stress relieving to weldments of this grade.*

Tensile and Hardness Requirements

Note 1–See the Orientation and Preparation subsections in the Tension Tests section of Specification A6/A 6M.

Note 2–Where "..." appears in this table there is no requirement.

Thickness inches [mm]	Tensile Strength ksi [MPa]	Yield Strength ksi [MPa]	Elongation in 2" [50 mm] min. [BCD], %	Reduction of Area min. [BC], %	Brinell Hardness Number[E]
Up to 3/4 [20], incl.	110 - 130 [760 - 895]	100 [690]	18	40[F]	235 to 293 HBW
Over 3/4 [20] to 2-1/2 [65], incl.	110 - 130 [760 - 895]	100 [690]	18	40[F], 50[G]	---
Over 2-1/2 [65] to 6 [150], incl.	110 - 130 [760 - 895]	100 [620]	16	50[G]	---

[A]Measured at 0.2% offset or 0.5% extension under load as described in the Determination of Tensile Properties section of Test Methods and Definitions A 370.

[B]Elongation and reduction of area need not be determined for floor plates.

[C]For plates tested in the transverse direction, the elongation requirement is reduced by two percentage points and the reduction of area minimum requirement is reduced by five percentage points.

[D]If measured on the Fig. 3 (Test Methods and Definitions A 370) 1-1/2" [40mm] wide tension test specimen, the elongation is determined in a 2" [50mm] gage length that includes the fracture and shows the greatest elongation.

[E]Hardness Test - For plates 3/8" [10 mm] and under in thickness, a Brinell hardness test may be used instead of tension testing each plate, in which case a tension test shall be made from a corner of each of two plates per lot. A lot shall consist of plates from the same heat, thickness, prior condition, and scheduled heat treatment and shall not exceed 15 tons [15 Mg] in weight [mass]. A Brinell hardness test shall be made on each plate not tension tested and the results shall conform to the hardness requirements given above.

[F]If Measured on the Fig. 3 (Test Methods and Definitions A370) 1-1/2" [40mm] wide tension test specimen.

[G]If Measured on the Fig. 4 (Test Methods and Definitions A370) 1/2" [12.5mm] round tension test specimen.

High Strength

ASTM A-656 Gr. 80

ASTM A-656 Gr. 80 combines outstanding toughness, ease of fabrication and positive strength to cost relationships when compared to A572-50 and A-36. Applications such as telescopic cranes, truck trailers, railroad cars, construction equipment and transmission towers; or any other extreme load-bearing job where the economy of superior strength and weight are paramount.

Typical Analysis	ASTM A656 Gr. 80
Carbon max.[A]	.18
Manganese max.[A]	1.65
Phosphorus max.	.025
Sulphur max.	.035
Silicon max.	.60
Vanadium max.	.15[B]
Nitrogen max.	.020
Columbium	.10 max.[B]
Yield Point min. ksi (Mpa)	80 (550)
Tensile Strength min. ksi (Mpa)	90 (620)
Elongation in 8"	12%
Elongation in 2"	15%

[A] For each reduction of 0.01 percentage point below the specified maximum for carbon, an increase of 0.06 percentage points above the specified maximum for manganese is permitted, up to a maximum of 1.75% for Grades 50, 60, 70 and up to a maximum of 1.90% for Grade 80.

[B] The contents of columbium and vanadium shall additionally be in accordance with one of the following:

Columbium 0.0008 - 0.10% with vanadium <0.008%;

Columbium <0.008% with vanadium 0.008 - 0.15%; or

Columbium 0.008 - 0.10% with vanadium 0.008 - 15% and columbium plus vanadium not in excess of .20%.

High Strength

ASTM A-588 Gr. A/B

ASTM A-588 Gr. A/B steel plate offers all the advantages of ASTM A572-50 but is produced with elevated levels of copper to add corrosion resistance. Because of the self-repairing, natural oxide patina, this "weathering" grade is often used in unpainted applications such as bridges, utility sign/poles and highway structures.

High Strength

ASTM A-572 Gr. 50

This high strength, low alloy steel plate offers an optimum combination of strength, weldability and notch toughness. Applications include: bridges, buildings, automotive and truck parts, railroad cars, cargo containers, tote boxes, construction equipment, structural tubing, lighting standards and transmission poles.

Typical Analysis*	A-572 Grade 50	
	Up thru 1½"	Over 1½ to 4"
Carbon (C) max %	.23	.23
Manganese (Mn) max %	1.35**	1.35**
Phosphorus (P) max %	.04	.04
Sulphur (S) max %	.05	.05
Silicon (Si) %	.40 max	.15/.40
Other Elements	.01/.15 V	.01/.15 V
Min. Tensile Strength		65,000 psi
Min. Yield Strength (Yield Point if designated YP)		50,000 psi
Elongation in 2"		21%

* Post-weld heat treatment may degrade heat-affected zone strength and toughness. Pretesting of specific welding and post-weld heat treating procedures is recommended to assure optimization of final property levels.

**1.50 max. Mn permissible with reduction of carbon maxcimum of .03%

ASTM A-516 Gr. 70 (PVQ)
ASME SA516-70

Intended primarily for service in welded pressure vessels where improved notch toughness is required, this grade of ASTM A516/ASME SA516-70 is normally found in moderate and lower temperature applications. Supplementary testing such as Charpy, Impacts, Ultrasonic Examination and Carbon Equivalency are available.

Typical Analysis	A-516 Grade 70			
	Up thru 1/2"	Over 1/2" thru 2"	Over 2" thru 4"	Over 4"
Carbon (C) max %** [A, B]	.27	.28	.30	.31
Manganese (Mn) %** [B]	.85/1.20	.85/1.20	.85/1.20	.85/1.20
Phosphorus (P) max %	.035	.035	.035	.035
Sulphur (S) %	.035	.035	.035	.035
Silicon (Si) max %	.15/.40	.15/.40	.15/.40	.15/.40
Tensile Strength			70,000-90,000 psi	
Min. Yield Strength (Yield Point if designated YP)			38,000 psi	
Elongation in 2"			21%	
Elongation in 8"			17%	

[A] Applies to both heat and product analyses

[B] For each reduction of 0.01 percentage point below the specified maximum for carbon, an increase of 0.06 percentage point above the specified maximum for manganese is permitted, up to a maximum of 1.50% by heat analysis and 1.60% by product analysis.

High Strength - PVQ

Pressure Vessel Quality

Size (inch)	Weight (lbs./sqft.)	High Strength					PVQ	
		ASTM A-514 Gr. B/H/F/Q Q&T	ASTM A-656 Gr. 80 Controlled Rolled	ASTM A-572 Gr. 42	ASTM A-572 Gr. 50 As Rolled	ASTM A-588 Gr. A/B	ASTM A-516 Gr. 70 As Rolled	ASTM A-516 Gr. 70 Norm.
3/16	7.66	●	●		●	●	●	
1/4	10.21	●	●		●	●	●	
5/16	12.76	●	●		●		●	●
3/8	15.31	●	●		●	●	●	●
1/2	20.42	●	●		●	●	●	●
5/8	25.52	●			●	●	●	●
3/4	30.63	●			●	●	●	●
7/8	35.74	●					●	
1	40.84	●			●	●	●	●
1-1/8	45.91				●			
1-1/4	51.05	●			●	●	●	●
1-3/8	56.15	●			●		●	●
1-1/2	61.26	●			●	●	●	●
1-5/8	66.36				●			
1-3/4	71.47	●			●	●		●
2	81.68	●			●	●		●
2-1/4	91.89	●			●			●
2-1/2	102.00	●			●	●		●
2-3/4	112.30	●			●			●
3	122.52	●			●	●		●
3-1/4	132.72	●			●			●
3-1/2	142.92	●			●	●		●
3-3/4	153.15						●	
4	163.35	●			●	●		●
4-1/4	173.56					●		●
4-1/2	183.80	●		●				●
4-3/4	193.00							●
5	204.20	●		●				●
5-1/2	224.61	●						●
6	245.03	●		●				●
6-1/2	265.46							●
7	285.87	●						●
8	326.71						●	
8-1/2	347.13							●
9	367.56							●
10	408.38							●
11	449.22							●
12	490.06							●

Free Machining Plate

(Low & Medium Carbon)

1144 Modified

1144 Modified offers high strength and hardness and is applicable where resistance to deformation and wear are essential. It may be flame hardened to further enhance surface properties. It is frequently used as an economical replacement for more expensive quenched-and-tempered alloy grades.

Typical Applications

Typical applications include cams, dies, gears, machine ways, molds, and sprockets.

Typical Analysis	1144 Carbon Steel
Carbon (C)	0.40 / 0.48
Manganese (Mn)	1.35 / 1.65
Phosphorus (P)	0.04 max
Sulphur (S)	0.24 / 0.33

Clean-Cut 20®/LFM 20/FM 15®/1119 Modified

The Clean-Cut/LFM 20 families of plate steel were developed for improved machining. Produced by a special calcium treatment and a controlled sulphur process, Clean-Cut steels contain sulfide inclusions which are predominately calcium modified to make them smaller and more uniformly distributed. The result: enhanced machinability.

Typical Analysis	Clean Cut 20/LFM 20	Type FM15®	Type 1119 Modified
Carbon (C)	0.14 - 0.22	0.14 - 0.20	0.17 - 0.23
Manganese (Mn)	1.20 - 1.50	1.00 - 1.30	1.00 - 1.30
Phosphorus (P)	0.04 max	0.04 max	0.04 max
Sulphur (S)	0.06 - 0.12	0.24 - 0.33	0.23 - 0.33
Silicon (Si)	0.10 - 0.40	0.30 max	0.30 max

Free Machining Plate

(Low & Medium Carbon)

Thickness	Weight (lbs./sqft.)	Clean-Cut 20®/LFM 20 HR	1144 Modified HR
1/2	20.42		●
5/8	25.52		●
3/4	30.63		●
7/8	35.73		
1	40.84	●	●
1-1/8	45.94	●	
1-1/4	51.05	●	●
1-3/8	56.15	●	
1-1/2	61.26	●	●
1-5/8	66.36	●	
1-3/4	71.47	●	●
1-7/8	76.57	●	
2	81.68	●	●
2-1/8	86.78	●	
2-1/4	91.89	●	●
2-3/8	96.99	●	
2-1/2	102.10	●	●
2-5/8	107.20	●	
2-3/4	112.31	●	●
2-7/8	117.41		
3	122.52	●	●
3-1/8	127.62		
3-1/4	132.72	●	●
3-3/8	137.83		
3-1/2	142.93	●	●
3-5/8	147.90	●	
3-3/4	153.14	●	
4	163.35	●	●
4-1/4	173.56	●	
4-1/2	183.77	●	
4-3/4	193.98		
5	204.19	●	
5-1/2	224.61	●	
6	245.03	●	●
6-1/2	265.20	●	
7	285.60	●	
8	326.40		
9	367.55		
10	408.38		

Abrasion Resisting Plate

Abrasion Resisting Steel was designed to satisfy the demand for a grade of steel that would give prolonged service life where abrasion is the primary cause of failure. The surface hardness of Abrasion Resisting Steel will vary by grade from 180-500 BRINELL.

Typical Analysis*	AR 235	AR 400F	AR 450F	AR 500F
Carbon (C) %	.40/.50	.12/.16	.21/.23	.27/.34
Manganese (Mn) max %	.60/.90	1.55	1.60	.35/.60
Phosphorus (P) max %	.040	.025	.025	.035
Sulphur (S) max %	.050	.005	.010	.010
Chromium (Cr) max %	---	.55	.30/1.00	.80/1.15
Nickel (Ni) %	---	1.00	.30	---
Molybdenum (Mo) max %	---	.55	.25	.15/.25
Silicon (Si) %	.10/.40	.35/.55	.70	.15/.40
Vanadium (V) %	---	---	---	---
Boron (B) %	---	.0005/.005	.0005	.0005 min
Surface Brinell Hardness (HB)	Typical 180-250	360/444	409-492	444 min

Armor Plate - MIL-A-46100 (e)

A popular high hardness armor grade (HHA), 46100 is selected for use by all departments and agencies of the Department of Defense. This grade is produced to 2 inches (51mm) thick with hardness requirements of 477-534 BHN and Charpy Impact testing on every plate.

Abrasion Resisting Plate

Thickness	Weight (lbs./sqft.)	AR 235	AR 400F	AR 450F	AR 500F	Armor
1/8	5.10		●			
3/16	7.66	●	●		●	●
1/4	10.21	●	●	●	●	●
5/16	12.76		●	●		●
3/8	15.31	●	●	●	●	●
1/2	20.42	●	●	●	●	●
5/8	25.52	●	●	●	●	
3/4	30.63	●	●	●	●	
1	40.84	●	●	●	●	
1-1/4	51.05		●	●	●	
1-1/2	61.26		●	●	●	
1-3/4	71.47		●			
2	81.68		●	●		
2-1/2	102.10		●			
3	122.52		●			

Manganese Plate (11% - 14% Manganese)

Manganese plate is a nonmagnetic steel that work hardens to a 650 Brinell. It is a 12-Mn austenitic steel with an exceptionally high level of wear-resistance when subject to work-hardening by shocks or high pressures in service.

Wear Resistance

Severe wear on the surface has a work-hardening affect on the austenitic structure of this steel. This leads to an increase from the initially low hardness (about 200 BHN) to a service hardness of at least 500 BHN. This work-hardening maintains itself through in-service life. The underlayers not work-hardened maintain a very high resistance to shock.

Sizes

Alro's thickness range is 3/16" - 1/2"

Applications

Manganese Plate is the ideal solution for cases where severe wear is combined with shocks or high pressure capable of work-hardened its austenitic structure. Used in jaws of crushers, hammers or pulverizers, cutting edges of large excavators, liners of shotblasting units, cores and wall of parpen moulds, and screens.

Alro stocks Manganese Plate in pattern sizes in 3/16", 1/4", & 3/8".

Typical Analysis	Manganese Plate
Carbon (C) max%	1.15
Silicon (Si) max%	0.60
Manganese (Mn) max%	12.00

Beveled parts are available from *Alro Steel*

Alro's Plasma Cutting System provides tighter tolerances, minimizes machining on finished parts and provides greater part accuracy than standard flame cutting.

O2 Plasma means a smaller, heat affected zone and reduced edge cracking when forming.

PC-based control technology increases control in shape cutting.

Advantages include:

- High quality edge cuts
- Higher precision than conventional plasma
- Minimal clean up
- Smaller kerf than conventional plasma
- Small heat affected zone
- Low cost per foot of cut

Our HPR 400 plasma cutting machine with bevel cutting capabilities.

Our advanced plasma cutting machine, with five axis bevel capabilities is capable of cutting 2" thick carbon plate with less than 1 degree bevel.

To request a burning quote for your existing CAD drawing please send it along in an email, to: burnprints@alro.com

Floor Plate

Floor Plate is an economical safety flooring that gives long life under the most severe usage. Its raised lug pattern is scientifically designed to resist skidding and slipping in any direction and makes possible safer and faster movement of men and materials.

Size & Gauge	Weight per Sheet
16 ga x (3.00 lbs./sqft.)	
48 x 96	96.00
48 x 120	120.00
14 ga x (3.75 lbs./sqft.)	
48 x 96	120.00
48 x 120	150.00
48 x 144	180.00
60 x 120	187.50
12 ga x (5.25 lbs./sqft.)	
48 x 96	168.00
48 x 120	210.00
48 x 144	252.00
60 x 96	210.00
60 x 120	262.50
60 x 144	315.00
1/8 x (6.16 lbs./sqft.)	
48 x 96	197.10
48 x 120	246.40
48 x 144	295.70
60 x 96	246.40
60 x 120	308.00
60 x 144	369.60
72 x 120	369.60
72 x 144	443.52
3/16 x (8.71 lbs./sqft.)	
48 x 96	278.70
48 x 120	348.40
48 x 144	418.10
60 x 96	348.40
60 x 120	435.50
60 x 144	522.60
72 x 96	418.10
72 x 120	522.60
72 x 144	627.10
96 x 240	1393.60
1/4 x (11.26 lbs./sqft.)	
48 x 96	360.30
48 x 120	450.40
48 x 144	540.50
60 x 96	450.40
60 x 120	563.00
60 x 144	675.60
60 x 240	1126.00
72 x 96	540.48
72 x 120	675.60
72 x 144	810.70
72 x 240	1351.20
96 x 240	1801.60

Size & Gauge	Weight per Sheet
5/16 x (13.81 lbs./sqft.)	
48 x 96	441.90
48 x 120	552.40
48 x 144	662.88
60 x 120	690.50
72 x 120	828.60
3/8 x (16.37 lbs./sqft.)	
48 x 96	523.80
48 x 120	654.80
48 x 144	785.76
60 x 120	818.50
60 x 144	982.20
72 x 120	982.20
72 x 144	1178.64
72 x 240	1964.40
96 x 240	2619.20
1/2 x (21.47 lbs./sqft.)	
48 x 96	687.00
48 x 120	858.80
48 x 144	1030.56
60 x 120	1073.50
60 x 144	1288.20
60 x 240	2147.00
72 x 120	1288.20
72 x 144	1545.84
96 x 240	3435.20
5/8 x (26.58 lbs./sqft.)	
96 x 240	4252.80
3/4 x (31.68 lbs./sqft.)	
96 x 240	5068.8
1 x (41.89 lbs./sqft.)	
96 x 240	6702.40

Safety Plate & Grating Products

SlipNOT® is a surface treatment performed on a variety of metals through a plasma stream depositions. Plasma stream deposition is the application of a molten metal alloy to a metallic surface. The extreme temperature of this method assures maximum adhesion to the base surface. It results in a Martensitic (hard alloy) product. This is not a grit simply rolled or coated onto the base plate!

SlipNOT® can be utilized in the following applications:

- Floors
- Floor Armor
- Wet Decks
- Pump Platforms
- Drill Platforms
- Walkways
- Pump Platforms
- Trench Covers
- Flume Covers
- Bridge Decking
- Ladder Rungs
- Pit Covers
- Machine Platforms
- Ramps
- Mezzanines
- Stair Treads
- Catwalks

File Hard

Extreme wear longevity is the product of the Martensitic formation of the super-alloy, allowing a hardness of up to 62 on the Rockwell “C” scale.

Random Hatch Matrix

This stacked hatched surface means the continuous presentation of new sharp faces as the surface slowly wears.

Weldable

In that the wear surface is uncoated steel integral with the base plate, SlipNOT® can be directly welded to with no surface preparation of any kind.

Bond Strength

The bond strength of SlipNOT® to plate exceeds 4,450 psi. The “coated-on” grit product claims only 710 psi maximum.

Fabrication

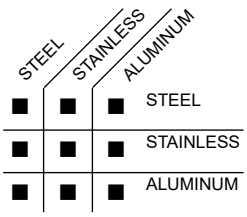
Shear, flame cut, drill, and punch right through the face for complete versatility in shop or field.

Maintenance

SlipNOT® can be cleaned by all standard industrial cleaning methods.

Availability

SlipNOT® provides the design flexibility to offer unique combinations of different metals for your unique applications, such as merging the toughness of steel with the light weight of aluminum.



Grade Availability

Grade 1: A fine surface with minimum surface depth variation for comfort where pedestrian traffic flow is not directional only, but requires a lot of turning and reversing and is subject to only moderate thin liquid accumulation.

Grade 2: A medium surface particularly applicable to heavier and more viscous accumulations. This is the all-purpose surface.

Grade 3: A coarse surface applicable for extremely heavy traffic and higher debris accumulation and high viscosity fluids.

Continued on next page

Safety Plate & Grating Products

Specifying *Slip*NOT® Products

*Slip*NOT® Grip Plate®

***Slip*NOT® Surfaces:** Steel, Stainless Steel and Aluminum

***Slip*NOT® Finishes:** Mill, Painted or Galvanized Steel

Available in Grade 1 (Fine), Grade 2 (Medium), Grade 3 (Coarse - Steel surface only)

Available in thicknesses 1/8" up to 2"+

Plates up to 72" x 144"

*Slip*NOT® Grip Grate®

***Slip*NOT® Surfaces:** Steel, Stainless Steel and Aluminum

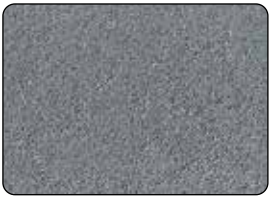
***Slip*NOT® Finishes:** Mill, Painted or Galvanized Steel

Available in Grade 1 (Fine), Grade 2 (Medium), Grade 3 (Coarse - Steel surface only)

***Slip*NOT®** surface is applied to smooth bar grating for maximum traction.

Grade 1 - Fine

A fine surface with minimum surface depth variation for comfort where pedestrian traffic flow is not directional only, but requires a lot of turning and reversing and is subject to only moderate thin liquid accumulation



Grade 1 - Fine

Grade 2 - Medium

A medium surface particularly applicable to heavier and more viscous accumulations. This is the all-purpose surface.

Grade 2 - Medium

Grade 3 - Coarse

A coarse surface applicable for extremely heavy traffic and higher debris accumulation and high viscosity fluids

Grade 3 - Coarse

Carbon and Alloy Plate Tolerances

Tolerance Over Specified Thickness for Widths Given (inches)								
Specified Thickness (inches)	**Up thru 48"**	**>48" up to 60"**	**>60" up to 72"**	**>72" up to 84"**	**>84" up to 96"**	**>96" up to 108"**	**>108" up to 120"**	**>120" up to 132"**
Up thru 1/4	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
>1/4 to 5/16	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04
5/16 to 3/8	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04
3/8 to 7/16	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04
7/16 to 1/2	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04
1/2 to 5/8	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04
5/8 to 3/4	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04
3/4 to 1	0.03	0.03	0.03	0.03	0.04	0.04	0.05	0.05
1 to 2	0.06	0.06	0.06	0.06	0.06	0.07	0.08	0.10
2 to 3	0.09	0.09	0.09	0.10	0.10	0.11	0.12	0.13
3 to 4	0.11	0.11	0.11	0.11	0.11	0.13	0.14	0.14
4 to 6	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
6 to 10	0.23	0.24	0.24	0.24	0.24	0.24	0.24	0.24
10 to 12	0.29	0.29	0.33	0.33	0.33	0.33	0.33	0.33
12 to 15	0.29	0.29	0.35	0.35	0.35	0.35	0.35	0.35

Permissible variations in thickness for rectangular carbon, high strength, low alloy and alloy-steel plates, when ordered to thickness.
Note[1]: Permissible variation under specificed thickness - 0.01"
Note[2]: Thickness to be measured at 3/8" to 3/4" from longitudinal edge.
Note[3]: For thickness measured at any location other than that specified in Note[2], the permissible maximum over tolerance shall be increased by 75%, rounded to the nearest 0.01".

Permitted Variations in Width and Length for Sheared Plates 1-1/2" and Under in Thickness; Length Only of Universal Mill Plates 2-1/2" and Under in Thickness.

Specified Dimensions (inches)		Variations over Specified Width and Length[A] for Thicknesses and Equivalent Weights (lb./ft²) Given							
Length	**Width**	**Up to 3/8"**		**3/8" up to 5/8"**		**5/8" up to 1"**		**1" up to 2"**	
		Width	**Length**	**Width**	**Length**	**Width**	**Length**	**Width**	**Length**
Up to 120"	Up to 60"	3/8"	1/2"	7/16"	5/8"	1/2"	3/4"	5/8"	1"
	60" up to 84"	7/16"	5/8"	1/2"	11/16"	5/8"	7/8"	3/4"	1"
	84" up to 108"	1/2"	3/4"	5/8"	7/8"	3/4"	1"	1"	1-1/8"
	108" and over	5/8"	7/8"	3/4"	1"	7/8"	1-1/8"	1-1/8"	1-1/4"
120" up to 240"	Up to 60"	3/8"	3/4"	1/2"	7/8"	5/8"	1"	3/4"	1-1/8"
	60" up to 84"	1/2"	3/4"	5/8"	7/8"	3/4"	1"	7/8"	1-1/4"
	84" up to 108"	9/16"	7/8"	11/16"	15/16"	13/16"	1-1/8"	1"	1-3/8"
	108" and over	5/8"	1"	3/4"	1-1/8"	7/8"	1-1/4"	1-1/8"	1-3/8"
240" up to 360"	Up to 60"	3/8"	1"	1/2"	1-1/8"	5/8"	1-1/4"	3/4"	1-1/2"
	60" up to 84"	1/2"	1"	5/8"	1-1/8"	3/4"	1-1/4"	7/8"	1-1/2"
	84" up to 108"	9/16"	1"	11/16"	1-1/8"	7/8"	1-3/8"	1"	1-1/2"
	108" and over	11/16"	1-1/8"	7/8"	1-1/4"	1"	1-3/8"	1-1/4"	1-3/4"
360" up to 480"	Up to 60"	7/16"	1-1/8"	1/2"	1-1/4"	5/8"	1-3/8"	3/4"	1-5/8"
	60" up to 84"	1/2"	1-1/4"	5/8"	1-3/8"	3/4"	1-1/2"	7/8"	1-5/8"
	84" up to 108"	9/16"	1-1/4"	3/4"	1-3/8"	7/8"	1-1/2"	1"	1-7/8"
	108" and over	3/4"	1-3/8"	7/8"	1-1/2"	1"	1-5/8"	1-1/4"	1-7/8"

[A]Permissible variation under specified width and length - 1/4".
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Carbon and Alloy Plate Tolerances

Permissible variations in width for Mill Edge Strip Mill Carbon and High-Strength Low-Alloy Plate

Specified Width (inches)	Variations Over Specified Width (inches)	Variations Under Specified Width (inches)
35 up to 50	1-1/4	-0
50 up to 60	1-1/2	-0
60 up to 65	1-5/8	-0
65 up to 70	1-3/4	-0
70 up to 80	1-7/8	-0

Permissible variations in width and length for Rectangular Plate When Gas Cutting is Specified or Required

Specified Thickness (inches)	Alloys Variations Over for All Specified Widths or Lengths (inches)	Carbon Variations Over for All Specified Widths or Lengths (inches)
Up to 2	3/4	1/2
2 up to 4	1	5/8
4 up to 6	1-1/8	3/4
6 up to 8	1-5/16	7/8
8 up to 15	1-1/2	1

Note: These variations may be taken all under or divided over and under, if so specified.

ASTM A1011 CS Type B Hot Rolled Sheets

Hot Rolled Pickled & Oiled Sheets

A prime quality low carbon sheet suitable for forming, punching, welding, etc. Sheets will be furnished in standard mill edge unless sheared edge is specified. Hot rolled sheets are commercial quality and in most sizes temper flat to improve flatness and relieve internal stress.

High-Strength-Low-Alloy (HSLA) Sheets

Specification: HR A1011 HSLA-F

Temper Flat *GR 50

High Strength Sheet Steels have higher strength properties along with improved formability, weldability and/or atmospheric corrosion resistance than normally obtained from conventional carbon sheet steels. These desirable properties are obtained through selected chemical composition and controlled mill processing. **High strength steels lend themselves to applications where weight reduction is a major factor.**

Hot Rolled Sheets/Pickled & Oiled

Gauge	Sheet Size (inches)	Nominal Thickness Decimal (inches)	Est. Weight per Sqft. (lbs.)	Est. Weight per Sheet (lbs.)	A1011 CSB	A1011 CSB P&O	A1011 HSLA-F GR 50	A606
6	48 x 96	0.1943	8.125	260.00		●		
	48 x 120	0.1943	8.125	325.00		●		
7	36 x 96	0.1793	7.500	180.00	●	●		
	36 x 120	0.1793	7.500	225.00	●	●		
	36 x 144	0.1793	7.500	270.00	●	●		
	48 x 96	0.1793	7.500	240.00	●	●	●	●
	48 x 120	0.1793	7.500	300.00	●	●	●	●
	48 x 144	0.1793	7.500	360.00	●	●		●
	60 x 96	0.1793	7.500	300.00	●	●		●
	60 x 120	0.1793	7.500	375.00	●	●		●
	60 x 144	0.1793	7.500	450.00	●	●		
	72 x 96	0.1793	7.500	360.00	●	●		
	72 x 120	0.1793	7.500	450.00	●	●		
	72 x 144	0.1793	7.500	540.00	●	●		
	72 x 240	0.1793	7.500	900.00	●			
8	48 x 96	0.1644	6.875	220.00	●	●		
	48 x 120	0.1644	6.875	275.00	●	●		
	60 x 120	0.1644	6.875	344.00	●	●		
9	48 x 96	0.1495	6.250	200.00		●		
	48 x 120	0.1495	6.250	250.00		●		
10	36 x 96	0.1345	5.625	135.00	●	●		
	36 x 120	0.1345	5.625	168.75	●	●		
	36 x 144	0.1345	5.625	202.50	●	●		
	48 x 96	0.1345	5.625	180.00	●	●	●	●
	48 x 120	0.1345	5.625	225.00	●	●	●	●
	48 x 144	0.1345	5.625	270.00	●	●		●
	60 x 96	0.1345	5.625	225.00	●	●		●
	60 x 120	0.1345	5.625	281.25	●	●		●
	60 x 144	0.1345	5.625	337.50	●	●		●
	72 x 96	0.1345	5.625	270.00	●	●		
	72 x 120	0.1345	5.625	337.50	●	●		
	72 x 144	0.1345	5.625	405.00	●	●		
	72 x 240	0.1345	5.625	675.60	●			
	96 x 240	0.1345	5.625	900.80	●			

Continued on next page

Hot Rolled Sheets/Pickled & Oiled

Gauge	Sheet Size (inches)	Nominal Thickness Decimal (inches)	Est. Weight per Sqft. (lbs.)	Est. Weight per Sheet (lbs.)	A1011 CSB	A1011 CSB P&O	A1011 HSLA-F GR 50	A606
11	36 x 96	0.1196	5.000	120.00	●	●		
	36 x 120	0.1196	5.000	150.00	●	●		
	36 x 144	0.1196	5.000	180.00	●	●		
	48 x 96	0.1196	5.000	160.00	●	●	●	●
	48 x 120	0.1196	5.000	200.00	●	●	●	●
	48 x 144	0.1196	5.000	240.00	●	●		●
	60 x 96	0.1196	5.000	200.00	●	●		●
	60 x 120	0.1196	5.000	250.00	●	●		●
	60 x 144	0.1196	5.000	300.00	●	●		●
	72 x 96	0.1196	5.000	240.00	●	●		
	72 x 120	0.1196	5.000	300.00	●	●		
	72 x 144	0.1196	5.000	360.00	●	●		
	72 x 240	0.1196	5.000	600.00	●	●		
	96 x 240	0.1196	5.000	800.00	●			
12	36 x 96	0.1046	4.380	105.12	●	●		
	36 x 120	0.1046	4.380	131.40	●	●		
	36 x 144	0.1046	4.380	157.68	●	●		
	48 x 96	0.1046	4.380	140.16	●	●	●	●
	48 x 120	0.1046	4.380	175.20	●	●	●	●
	48 x 144	0.1046	4.380	210.24	●	●		●
	60 x 96	0.1046	4.380	175.20	●	●		●
	60 x 120	0.1046	4.380	219.00	●	●		●
	60 x 144	0.1046	4.380	262.80	●	●		●
	72 x 96	0.1046	4.380	210.24	●	●		
	72 x 120	0.1046	4.380	262.80	●	●		
	72 x 144	0.1046	4.380	315.36	●	●		
	72 x 240	0.1046	4.380	525.60	●	●		
13	48 x 96	0.0897	3.750	120.00	●	●		
	48 x 120	0.0897	3.750	150.00	●	●		
14	36 x 96	0.0747	3.125	75.00	●	●		
	36 x 120	0.0747	3.125	93.75	●	●		
	36 x 144	0.0747	3.125	112.50	●	●		
	48 x 96	0.0747	3.125	100.00	●	●	●	●
	48 x 120	0.0747	3.125	125.00	●	●	●	●
	48 x 144	0.0747	3.125	150.00	●	●		●
	60 x 96	0.0747	3.125	125.00	●	●		
	60 x 120	0.0747	3.125	156.25	●	●		
	60 x 144	0.0747	3.125	187.50	●	●		
	72 x 96	0.0747	3.125	150.00	●			
	72 x 120	0.0747	3.125	187.50	●			
	72 x 144	0.0747	3.125	225.00	●			
16	36 x 96	0.0598	2.500	60.00	●	●		
	36 x 120	0.0598	2.500	75.00	●	●		
	36 x 144	0.0598	2.500	90.00	●	●		
	48 x 96	0.0598	2.500	80.00	●	●	●	●
	48 x 120	0.0598	2.500	100.00	●	●	●	●
	48 x 144	0.0598	2.500	120.00	●	●		●
	60 x 96	0.0598	2.500	100.00	●	●		
	60 x 120	0.0598	2.500	125.00	●	●		
	60 x 144	0.0598	2.500	150.00	●	●		
18	48 x 96	0.0478	2.000	64.00		●		
	48 x 120	0.0478	2.000	80.00		●		

Cold Rolled Sheets

Commercial Steel (CS) ASTM A1008

These sheets are rolled to a close thickness tolerance and possess a fine surface finish. Cold Rolled Sheets are suitable for stamping, forming and moderate drawing operations. Very desirable nickel or chrome plating results can be secured. Also, Cold Rolled Sheets provide an excellent base for baked enamel and lacquer finishes.

Gauge	Size (inches)	Nominal Thickness Decimal (inches)	Est. Weight per Square Foot (lbs.)	Est. Weight Per Sheet (lbs.)
10	36 x 96	0.1345	5.625	135.00
	36 x 120	0.1345	5.625	168.75
	48 x 96	0.1345	5.625	180.00
	48 x 120	0.1345	5.625	225.00
	48 x 144	0.1345	5.625	270.00
	60 x 120	0.1356	5.625	281.50
11	36 x 96	0.1196	5.000	120.00
	36 x 120	0.1196	5.000	150.00
	48 x 96	0.1196	5.000	160.00
	48 x 120	0.1196	5.000	200.00
	48 x 144	0.1196	5.000	240.00
	60 x 120	0.1196	5.000	250.00
12	36 x 96	0.1046	4.380	105.12
	48 x 96	0.1046	4.380	140.16
	48 x 120	0.1046	4.380	175.20
	48 x 144	0.1046	4.380	210.24
	60 x 120	0.1046	4.380	219.00
13	48 x 96	0.0897	3.750	120.00
	48 x 120	0.0897	3.750	150.00
14	36 x 96	0.0747	3.125	75.00
	36 x 120	0.0747	3.125	93.75
	48 x 96	0.0747	3.125	100.00
	48 x 120	0.0747	3.125	125.00
	48 x 144	0.0747	3.125	150.00
	60 x 120	0.0747	3.125	156.25
	72 x 120	0.0747	3.125	187.50
	72 x 144	0.0747	3.125	225.00
16	36 x 96	0.0598	2.500	60.00
	36 x 120	0.0598	2.500	75.00
	48 x 96	0.0598	2.500	80.00
	48 x 120	0.0598	2.500	100.00
	48 x 144	0.0598	2.500	120.00
	60 x 120	0.0598	2.500	125.00
	72 x 120	0.0598	2.500	150.00
	72 x 144	0.0598	2.500	180.00
18	36 x 96	0.0478	2.000	48.00
	36 x 120	0.0478	2.000	60.00
	48 x 96	0.0478	2.000	64.00
	48 x 120	0.0478	2.000	80.00
	48 x 144	0.0478	2.000	96.00
	60 x 120	0.0478	2.000	100.00
20	36 x 96	0.0359	1.500	36.00
	36 x 120	0.0359	1.500	45.00
	48 x 96	0.0359	1.500	48.00
	48 x 120	0.0359	1.500	60.00
	60 x 120	0.0359	1.500	75.00
22	48 x 96	0.0299	1.250	40.00
	48 x 120	0.0299	1.250	50.00
24	48 x 96	0.0239	1.000	32.00
	48 x 120	0.0239	1.000	40.00

Galvanized Sheets

Commercial Quality ASTM A653

Size (gauge)	Nom. Thick (inches)	Sheet Sizes (inches)	Est. Weight (lbs./sqft.)	Est. Weight (lbs./sheet)
7	0.1800	48 x 96	7.660	245.12
7	0.1800	48 x 120	7.660	306.40
8	0.1650	48 x 96	7.030	224.96
8	0.1650	48 x 120	7.030	281.20
10	0.1382	48 x 96	5.781	184.99
10	0.1382	48 x 120	5.781	231.24
10	0.1382	48 x 144	5.781	277.49
10	0.1382	60 x 96	5.781	231.20
10	0.1382	60 x 120	5.781	289.05
10	0.1382	60 x 144	5.781	346.80
11	0.1233	48 x 96	5.156	164.99
11	0.1233	48 x 120	5.156	206.24
11	0.1233	48 x 144	5.156	247.48
11	0.1233	60 x 96	5.156	206.24
11	0.1233	60 x 120	5.156	257.80
11	0.1233	60 x 144	5.156	309.36
12	0.1084	36 x 96	4.531	108.74
12	0.1084	36 x 120	4.531	135.93
12	0.1084	48 x 96	4.531	144.99
12	0.1084	48 x 120	4.531	181.24
12	0.1084	60 x 96	4.531	181.24
12	0.1084	60 x 120	4.531	226.55
12	0.1084	60 x 144	4.531	271.86
13	0.0897	48 x 96	3.906	124.99
13	0.0897	48 x 120	3.906	156.24
14	0.0785	36 x 96	3.281	78.74
14	0.0785	36 x 120	3.281	98.43
14	0.0785	48 x 96	3.281	104.99
14	0.0785	48 x 120	3.281	131.24
14	0.0785	48 x 144	3.281	157.49
14	0.0785	60 x 96	3.281	131.20
14	0.0785	60 x 120	3.281	164.05
14	0.0785	60 x 144	3.281	196.80
16	0.0635	36 x 96	2.656	63.74
16	0.0635	36 x 120	2.656	79.68
16	0.0635	48 x 96	2.656	84.99
16	0.0635	48 x 120	2.656	106.24
16	0.0635	48 x 144	2.656	127.49
16	0.0635	60 x 96	2.656	106.24
16	0.0635	60 x 120	2.656	132.80
16	0.0635	60 x 144	2.656	159.60

Size (gauge)	Nom. Thick (inches)	Sheet Sizes (inches)	Est. Weight (lbs./sqft.)	Est. Weight (lbs./sheet)
18	0.0516	36 x 96	2.156	51.74
18	0.0516	36 x 120	2.156	64.68
18	0.0516	48 x 96	2.156	68.99
18	0.0516	48 x 120	2.156	86.24
18	0.0516	48 x 144	2.156	103.49
18	0.0516	60 x 96	2.156	86.40
18	0.0516	60 x 120	2.156	107.80
18	0.0516	60 x 144	2.156	129.60
20	0.0396	36 x 96	1.656	39.74
20	0.0396	36 x 120	1.656	49.68
20	0.0396	48 x 96	1.656	52.99
20	0.0396	48 x 120	1.656	66.24
20	0.0396	48 x 144	1.656	79.49
20	0.0396	60 x 96	1.656	66.40
20	0.0396	60 x 120	1.656	82.80
20	0.0396	60 x 144	1.656	99.60
22	0.0336	36 x 96	1.406	33.74
22	0.0336	36 x 120	1.406	42.18
22	0.0336	48 x 96	1.406	44.99
22	0.0336	48 x 120	1.406	56.24
22	0.0336	48 x 144	1.406	67.49
22	0.0336	60 x 96	1.406	56.40
22	0.0336	60 x 120	1.406	70.30
22	0.0336	60 x 144	1.406	84.60
24	0.0276	36 x 96	1.156	27.74
24	0.0276	36 x 120	1.156	34.68
24	0.0276	48 x 96	1.156	36.99
24	0.0276	48 x 120	1.156	46.24
24	0.0276	48 x 144	1.156	55.49
24	0.0276	60 x 96	1.156	46.24
24	0.0276	60 x 120	1.156	57.80
26	0.0217	36 x 96	0.906	21.74
26	0.0217	36 x 120	0.906	27.18
26	0.0217	48 x 96	0.906	28.99
26	0.0217	48 x 120	0.906	36.24
26	0.0217	48 x 144	0.906	43.49
26	0.0217	60 x 120	0.906	45.30
28	0.0187	36 x 96	0.781	18.74
28	0.0187	36 x 120	0.781	23.43
28	0.0187	48 x 96	0.781	24.99
28	0.0187	48 x 120	0.781	31.24
30	0.0157	36 x 96	0.657	15.77
30	0.0157	36 x 120	0.657	19.71

Galvannealed Sheets

Commercial Quality ASTM A653

Galvannealed sheet is carbon steel coated with zinc on both sides by the continuous hot dip process. Immediately as the strip exits the coating bath, the zinc coating is subjected to an in-line heat treatment that converts the entire coating to a zinc iron alloy, giving the sheet a better surface for painting. Normally stocked in an A-60 coating weight.

Gauge	Sheet Size (inches)	Nominal Thickness Decimal (inches)	Est. Weight per Squarefoot (lbs.)	Est. Weight per Sheet (lbs.)
10	48 x 96	0.1382	5.781	184.96
	48 x 120	0.1382	5.781	231.20
	60 x 120	0.1382	5.781	289.00
11	48 x 96	0.1233	5.156	164.99
	48 x 120	0.1233	5.156	206.24
	48 x 144	0.1233	5.156	247.49
	60 x 120	0.1233	5.156	257.80
12	48 x 96	1.0840	4.531	144.99
	48 x 120	1.0840	4.531	181.24
	60 x 120	1.0840	4.531	226.55
14	48 x 96	0.0785	3.281	104.99
	48 x 120	0.0785	3.281	131.24
	48 x 144	0.0785	3.281	157.49
	60 x 120	0.0785	3.281	164.05
16	48 x 96	0.0635	2.656	84.99
	48 x 120	0.0635	2.656	106.24
	48 x 144	0.0635	2.656	127.49
	60 x 120	0.0635	2.656	132.80
18	48 x 96	0.0516	2.156	68.99
	48 x 120	0.0516	2.156	86.24
	48 x 144	0.0516	2.156	103.49
	60 x 120	0.0516	2.156	107.80
20	48 x 96	0.0396	1.656	52.99
	48 x 120	0.0396	1.656	66.24
	48 x 144	0.0396	1.656	79.49
22	48 x 96	0.0336	1.406	44.99
	48 x 120	0.0336	1.406	56.24
	48 x 144	0.0336	1.406	67.49
24	48 x 96	0.0276	1.156	36.99
	48 x 120	0.0276	1.156	46.24
	48 x 144	0.0276	1.156	55.49

Aluminized Sheets

Commercial Quality

Aluminized coated carbon steel sheets have an aluminum and silicon alloy coating on both sides. They are principally used in heat-resisting applications and also where corrosion and heat are involved.

Gauge	Sheet Size (inches)	Nominal Thickness Decimal (inches)	Est. Weight per Squarefoot (lbs.)	Est. Weight per Sheet (lbs.)
11	48 x 96	0.1234	5.180	165.76
	48 x 120	0.1234	5.180	207.20
12	48 x 96	0.1084	4.533	145.25
	48 x120	0.1084	4.533	181.32
	60 x120	0.1084	4.533	226.65
14	48 x 96	0.0785	3.283	105.05
	48 x120	0.0785	3.283	131.32
	60 x120	0.0785	3.283	164.15
16	36 x 96	0.0635	2.656	63.74
	36 x120	0.0635	2.656	79.68
	48 x 96	0.0635	2.656	84.99
	48 x120	0.0635	2.656	106.24
	60 x 96	0.0635	2.656	106.24
	60 x120	0.0635	2.656	132.80
18	36 x 96	0.0516	2.156	51.74
	36 x120	0.0516	2.156	64.68
	48 x 96	0.0516	2.156	68.99
	48 x120	0.0516	2.156	86.24
	60 x 96	0.0516	2.156	86.32
	60 x120	0.0516	2.156	107.80
20	36 x 96	0.0396	1.656	39.74
	36 x120	0.0396	1.656	49.68
	48 x 96	0.0396	1.656	52.99
	48 x120	0.0396	1.656	66.24
	60 x120	0.0396	1.656	82.80

Sheared Sheet Blanks

Investment conscious customers rely on Alro Steel to provide them with sheared sheet blanks. A battery of shears, working around the clock, assure availability of material to meet production schedules. This results in reduced inventory and handling costs, less in-plant scrap accumulations, and provides customers with quality blanks ready for immediate processing.

Hot and Cold Rolled Sheet Tolerances

Manufacturers' Standard Gauge

Hot Rolled, HR P&O, Cold Rolled					Galvanized, Galvannealed			
Gauge	Decimal Equiv. (inches)	Tolerance Range (inches) HR P&O	Tolerance Range (inches) CR	Lbs. per Sqft.	Gauge	Decimal Equiv. (inches)	Tolerance Range (inches)	Lbs. per Sqft.
4	.2242	.2332 .2152		9.376	4	. . . .	. . . .	. . . .
5	.2092	.2182 .2002		8.748	5	. . . .	. . . .	. . . .
6	.1943	.2033 .1853		8.125	6	. . . .	. . . .	. . . .
7	.1793	.1873 .1713		7.498	7	. . . .	. . . .	. . . .
8	.1644	.1724 .1564		6.875	8	. . . .	. . . .	. . . .
9	.1495	.1575 .1415		6.252	9	. . . .	. . . .	. . . .
10	.1345	.1425 .1265	.1405 .1285	5.624	10	.1382	.1472 .1292	5.779
11	.1196	.1276 .1116	.1256 .1136	5.001	11	.1233	.1323 .1143	5.156
12	.1046	.1126 .0966	.1106 .0986	4.374	12	.1084	.1174 .0994	4.533
13	.0897	.0967 .0827	.0947 .0847	3.751	13	.0934	.1014 .0854	3.906
14	.0747	.0817 .0677	.0797 .0697	3.124	14	.0785	.0865 .0705	3.283
15	.0673	.0733 .0613	.0723 .0623	2.814	15	.0710	.0770 .0650	2.969
16	.0598	.0658 .0538	.0648 .0548	2.501	16	.0635	.0695 .0575	2.655
17	.0538	.0598 .0478	.0578 .0498	2.250	17	.0575	.0625 .0525	2.405
18	.0478	.0528 .0428	.0518 .0438	1.999	18	.0516	.0566 .0466	2.158
19	.0418		.0458 .0378	1.748	19	.0456	.0506 .0406	1.907
20	.0359		.0389 .0329	1.501	20	.0396	.0436 .0356	1.656
21	.0329		.0359 .0299	1.376	21	.0366	.0406 .0326	1.531
22	.0299		.0329 .0269	1.250	22	.0336	.0376 .0296	1.405
23	.0269		.0299 .0239	1.125	23	.0306	.0346 .0266	1.280
24	.0239		.0269 .0209	.999	24	.0276	.0316 .0236	1.154
25	.0209		.0239 .0179	.874	25	.0247	.0287 .0207	1.033
26	.0179		.0199 .0159	.749	26	.0217	.0247 .0187	.907
27	.0164		.0184 .0144	.686	27	.0202	.0232 .0172	.845
28	.0149		.0169 .0129	.623	28	.0187	.0217 .0157	.782
29	.0135		.0155 .0115	.562	29	.0172	.0202 .0142	.719
30	.0120		.0140 .0100	.500	30	.0157	.0187 .0127	.657

Guideline only. Some products are not produced in all gauge ranges.

Steel Tube & Pipe

Round, Square and Rectangular Tube & Pipe

WARNING: These products can potentially expose you to chemicals including Nickel, Chromium, Lead, Cobalt, Mercury and Beryllium, which are known to the state of California to cause cancer and/or birth defects or other reproductive harm. For more information, visit **www.P65Warnings.ca.gov**

Square Tubing

Mechanical Tubing: Under 2" or 11 ga and under - ASTM A-513.
Structural Tubing: 2" and over 11 ga wall thickness - ASTM A-500 Grade B.
Standard Lengths: 20 ft., 24 ft., 40 ft., and 48 ft.

Outside Dimension & Gauge (inches)	Wall Thickness (inches)	Weight (lbs./ft.)
1/2 x 1/2		
18 ga	0.049	0.301
16 ga	0.065	0.385
5/8 x 5/8		
18 ga	0.049	0.400
16 ga	0.065	0.495
3/4 x 3/4		
18 ga	0.049	0.467
16 ga	0.065	0.606
14 ga	0.083	0.753
11 ga	0.120	1.028
7/8 x 7/8		
18 ga	0.049	0.550
16 ga	0.065	0.716
14 ga	0.083	0.894
1 x 1		
18 ga	0.049	0.634
16 ga	0.065	0.827
15 ga	0.072	0.909
14 ga	0.083	1.035
13 ga	0.095	1.169
12 ga	0.109	1.321
11 ga	0.120	1.436
10 ga	0.134	1.583
1-1/4 x 1-1/4		
18 ga	0.049	0.780
16 ga	0.065	1.048
14 ga	0.083	1.317
13 ga	0.095	1.492
12 ga	0.109	1.691
11 ga	0.120	1.844
3/16	0.188	2.400
1-1/2 x 1-1/2		
16 ga	0.065	1.269
14 ga	0.083	1.600
13 ga	0.095	1.815
12 ga	0.109	2.062
11 ga	0.120	2.252
10 ga	0.134	2.489
8 ga	0.165	2.760
7 ga	0.188	3.040
1/4	0.250	4.250
1-3/4 x 1-3/4		
16 ga	0.065	1.490
14 ga	0.083	1.882
12 ga	0.109	2.433
11 ga	0.120	2.660
7 ga	0.188	3.680
2 x 2		
18 ga	0.049	1.283
16 ga	0.065	1.710
14 ga	0.083	2.160

Outside Dimension & Gauge (inches)	Wall Thickness (inches)	Weight (lbs./ft.)
2 x 2		
13 ga	0.095	2.461
12 ga	0.109	2.803
11 ga	0.125	3.060
10 ga	0.134	3.400
8 ga	0.165	4.120
7 ga	0.188	4.320
1/4	0.250	5.410
2-1/8 x 2-1/8		
11 ga	0.125	3.270
2-1/4 x 2-1/4		
16 ga	0.065	1.923
11 ga	0.125	3.510
2-1/2 x 2-1/2		
16 ga	0.065	2.120
14 ga	0.083	2.728
12 ga	0.109	3.544
11 ga	0.125	3.900
10 ga	0.134	4.312
8 ga	0.165	5.240
7 ga	0.188	5.590
.238	0.238	6.830
1/4	0.250	7.110
5/16	0.312	8.440
3 x 3		
14 ga	0.083	3.240
11 ga	0.125	4.750
10 ga	0.134	5.223
8 ga	0.165	6.130
7 ga	0.188	6.870
1/4	0.250	8.810
5/16	0.312	10.580
3/8	0.375	12.170
3-1/2 x 3-1/2		
11 ga	0.125	5.610
10 ga	0.134	6.134
8 ga	0.165	7.250
7 ga	0.188	8.150
1/4	0.250	10.510
5/16	0.312	12.710
3/8	0.375	14.710
4 x 4		
14 ga	0.083	4.320
11 ga	0.125	6.460
10 ga	0.134	7.045
8 ga	0.165	8.730
7 ga	0.188	9.420
1/4	0.250	12.210
5/16	0.313	14.830
3/8	0.375	17.270
1/2	0.500	21.630

Outside Dimension & Gauge (inches)	Wall Thickness (inches)	Weight (lbs./ft.)
4-1/2 x 4-1/2		
11 ga	0.125	7.310
10 ga	0.134	7.790
8 ga	0.165	9.500
7 ga	0.188	10.700
1/4	0.250	13.910
5/16	0.313	16.960
3/8	0.375	19.820
1/2	0.500	25.030
5 x 5		
11 ga	0.125	8.160
10 ga	0.134	8.710
8 ga	0.165	10.610
7 ga	0.188	11.970
1/4	0.250	15.620
5/16	0.313	19.080
3/8	0.375	22.370
1/2	0.500	28.430
6 x 6		
11 ga	0.125	9.860
10 ga	0.134	10.530
8 ga	0.165	12.870
7 ga	0.188	14.530
1/4	0.250	19.020
5/16	0.312	23.340
3/8	0.375	27.480
1/2	0.500	35.240
5/8	0.625	42.300
7 x 7		
7 ga	0.188	17.080
1/4	0.250	22.420
5/16	0.313	27.600
3/8	0.375	32.580
1/2	0.500	42.050
5/8	0.625	50.810
8 x 8		
7 ga	0.188	19.630
1/4	0.250	25.820
5/16	0.313	31.840
3/8	0.375	37.690
1/2	0.500	48.850
5/8	0.625	59.320
10 x 10		
7 ga	0.188	24.730
1/4	0.250	32.630
5/16	0.313	40.350
3/8	0.375	47.900
1/2	0.500	62.460
5/8	0.625	76.330

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Square Tubing

Mechanical Tubing: Under 2" or 11 ga and under - ASTM A-513.
Structural Tubing: 2" and over 11 ga wall thickness - ASTM A-500 Grade B.
Standard Lengths: 20 ft., 24 ft., 40 ft., and 48 ft.

Outside Dimension & Gauge (inches)	Wall Thickness (inches)	Weight (lbs./ft.)
12 x 12		
1/4	0.250	39.430
5/16	0.313	48.860
3/8	0.375	58.100
1/2	0.500	76.070
5/8	0.625	93.340

Outside Dimension & Gauge (inches)	Wall Thickness (inches)	Weight (lbs./ft.)
14 x 14		
5/16	0.313	57.360
3/8	0.375	68.310
1/2	0.500	89.680
5/8	0.625	110.360

Outside Dimension & Gauge (inches)	Wall Thickness (inches)	Weight (lbs./ft.)
16 x 16		
5/16	0.313	65.870
3/8	0.375	78.520
1/2	0.500	103.300
5/8	0.625	127.370

Rectangular Tubing

Mechanical Tubing: Under 2" or 11 ga and under - ASTM A-513.
Structural Tubing: 2" and over 11 ga wall thickness - ASTM A-500 Grade B.
Standard Lengths: 20 ft., 24 ft., 40 ft., and 48 ft.

Outside Dimension & Gauge (inches)	Wall Thickness (inches)	Weight (lbs./ft.)
1 x 1/2		
16 ga	0.065	0.606
1-1/2 x 1/2		
16 ga	0.065	0.827
1-1/2 x 3/4		
16 ga	0.065	0.937
14 ga	0.083	1.176
11 ga	0.120	1.601
1-1/2 x 1		
16 ga	0.065	1.048
14 ga	0.083	1.317
11 ga	0.120	1.844
10 ga	0.134	2.134
2 x 1		
18 ga	0.049	0.956
16 ga	0.065	1.269
14 ga	0.083	1.600
11 ga	0.120	2.252
10 ga	0.134	2.489
8 ga	0.165	2.760
7 ga	0.188	3.040
2 x 1-1/4		
14 ga	0.083	1.741
11 ga	0.120	2.456
2 x 1-1/2		
16 ga	0.065	1.500
14 ga	0.083	1.882
11 ga	0.120	2.660
10 ga	0.134	2.945
8 ga	0.165	3.320
7 ga	0.188	3.680

Outside Dimension & Gauge (inches)	Wall Thickness (inches)	Weight (lbs./ft.)
2-1/2 x 1		
16 ga	0.065	1.489
14 ga	0.083	1.882
11 ga	0.120	2.660
10 ga	0.134	2.950
8 ga	0.165	3.320
7 ga	0.188	3.680
2-1/2 x 1-1/4		
14 ga	0.083	2.023
2-1/2 x 1-1/2		
16 ga	0.065	1.710
14 ga	0.083	2.160
11 ga	0.125	3.070
10 ga	0.134	3.401
8 ga	0.165	4.118
7 ga	0.188	4.320
1/4	0.250	5.410
2-1/2 x 2		
11 ga	0.125	3.480
10 ga	0.134	3.856
8 ga	0.165	4.440
7 ga	0.188	4.960
3 x 1		
16 ga	0.065	1.710
14 ga	0.083	2.160
12 ga	0.109	2.803
11 ga	0.125	3.070
10 ga	0.134	3.401
8 ga	0.165	4.118
7 ga	0.188	4.320

Outside Dimension & Gauge (inches)	Wall Thickness (inches)	Weight (lbs./ft.)
3 x 1-1/2		
16 ga	0.065	1.932
14 ga	0.083	2.390
11 ga	0.125	3.480
10 ga	0.134	3.856
8 ga	0.165	4.440
7 ga	0.188	4.960
1/4	0.250	6.250
3 x 2		
16 ga	0.065	2.140
14 ga	0.083	2.728
13 ga	0.095	3.107
11 ga	0.125	3.900
10 ga	0.134	4.312
8 ga	0.165	5.239
7 ga	0.188	5.590
1/4	0.250	7.110
5/16	0.313	8.450
3-1/2 x 1-1/2		
11 ga	0.125	3.900
10 ga	0.134	4.312
8 ga	0.165	5.239
7 ga	0.188	5.600
3-1/2 x 2-1/2		
11 ga	0.125	4.750
10 ga	0.134	5.070
8 ga	0.165	6.130
7 ga	0.188	6.870
1/4	0.250	8.810
4 x 1-1/2		
11 ga	0.125	4.330
7 ga	0.188	6.230

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Rectangular Tubing

Mechanical Tubing: Under 2" or 11 ga and under - ASTM A-513.
Structural Tubing: 2" and over 11 ga wall thickness - ASTM A-500 Grade B.
Standard Lengths: 20 ft., 24 ft., 40 ft., and 48 ft.

Outside Dimension & Gauge (inches)	Wall Thickness (inches)	Weight (lbs./ft.)
4 x 2		
14 ga	0.083	3.293
11 ga	0.125	4.750
10 ga	0.134	5.070
8 ga	0.165	6.130
7 ga	0.188	6.870
4 x 2		
1/4	0.250	8.810
5/16	0.313	10.580
3/8	0.375	12.170
4 x 2-1/2		
11 ga	0.125	5.180
7 ga	0.188	7.482
1/4	0.250	9.660
4 x 3		
11 ga	0.125	5.610
10 ga	0.134	6.134
8 ga	0.165	7.250
7 ga	0.188	8.150
1/4	0.250	10.510
5/16	0.313	12.700
3/8	0.375	14.720
4-1/2 x 3		
11 ga	0.125	6.030
10 ga	0.134	6.589
8 ga	0.165	8.045
7 ga	0.188	8.780
1/4	0.250	11.360
5 x 2		
11 ga	0.125	5.610
10 ga	0.134	6.134
8 ga	0.165	7.250
7 ga	0.188	8.150
1/4	0.250	10.510
5/16	0.313	12.700
3/8	0.375	14.720
5 x 2-1/2		
11 ga	0.125	6.030
10 ga	0.134	6.589
8 ga	0.165	8.045
7 ga	0.188	8.780
1/4	0.250	11.360
5 x 3		
11 ga	0.125	6.460
10 ga	0.134	7.045
8 ga	0.165	8.370
7 ga	0.188	9.420
1/4	0.250	12.210
5/16	0.313	14.840
3/8	0.375	17.270
1/2	0.500	21.630

Outside Dimension & Gauge (inches)	Wall Thickness (inches)	Weight (lbs./ft.)
5 x 4		
11 ga	0.125	7.310
10 ga	0.134	7.790
8 ga	0.165	9.500
7 ga	0.188	10.700
1/4	0.250	13.910
5 x 4		
5/16	0.313	16.960
3/8	0.375	19.820
1/2	0.500	25.030
6 x 2		
11 ga	0.125	6.460
10 ga	0.134	7.045
8 ga	0.165	8.370
7 ga	0.188	9.420
1/4	0.250	12.210
5/16	0.313	14.830
3/8	0.375	17.270
6 x 3		
11 ga	0.125	7.300
10 ga	0.134	7.790
8 ga	0.165	9.500
7 ga	0.188	10.700
1/4	0.250	13.910
5/16	0.313	16.960
3/8	0.375	19.820
1/2	0.500	25.030
6 x 4		
11 ga	0.125	8.160
10 ga	0.134	8.710
8 ga	0.165	10.610
7 ga	0.188	11.970
1/4	0.250	15.620
5/16	0.313	19.080
3/8	0.375	22.370
1/2	0.500	28.430
7 x 3		
11 ga	0.125	8.160
10 ga	0.134	8.710
8 ga	0.165	10.610
7 ga	0.188	11.970
1/4	0.250	15.620
5/16	0.313	19.090
3/8	0.375	22.370
1/2	0.500	28.430
7 x 4		
11 ga	0.125	9.010
10 ga	0.134	9.620
8 ga	0.165	11.740

Outside Dimension & Gauge (inches)	Wall Thickness (inches)	Weight (lbs./ft.)
7 x 4		
7 ga	0.188	13.300
1/4	0.250	17.320
5/16	0.313	21.220
3/8	0.375	24.930
1/2	0.500	31.840
7 x 5		
11 ga	0.125	9.860
10 ga	0.134	10.530
8 ga	0.165	12.870
7 ga	0.188	14.530
1/4	0.250	19.020
5/16	0.313	23.340
3/8	0.375	27.480
1/2	0.500	35.240
8 x 2		
11 ga	0.125	8.160
10 ga	0.134	8.710
8 ga	0.165	10.610
7 ga	0.188	11.970
1/4	0.250	15.620
5/16	0.313	19.080
3/8	0.375	22.370
8 x 3		
11 ga	0.125	9.010
10 ga	0.134	9.620
8 ga	0.165	11.740
7 ga	0.188	13.300
1/4	0.250	17.320
5/16	0.313	21.220
3/8	0.375	24.930
1/2	0.500	31.840
8 x 4		
11 ga	0.125	9.860
10 ga	0.134	10.530
8 ga	0.165	12.870
7 ga	0.188	14.530
1/4	0.250	19.020
5/16	0.313	23.340
3/8	0.375	27.480
1/2	0.500	35.240
5/8	0.625	42.300
8 x 6		
7 ga	0.188	17.080
1/4	0.250	22.420
5/16	0.313	27.590
3/8	0.375	32.580
1/2	0.500	42.050
5/8	0.625	50.810

Continued on next page

Rectangular Tubing

Mechanical Tubing: Under 2" or 11 ga and under - ASTM A-513.
Structural Tubing: 2" and over 11 ga wall thickness - ASTM A-500 Grade B.
Standard Lengths: 20 ft., 24 ft., 40 ft., and 48 ft.

Outside Dimension & Gauge (inches)	Wall Thickness (inches)	Weight (lbs./ft.)
9 x 5		
3/8	0.375	32.580
1/2	0.500	42.050
10 x 2		
11 ga	0.125	9.860
10 ga	0.134	10.530
8 ga	0.165	12.850
10 x 2		
7 ga	0.188	14.530
1/4	0.250	19.020
5/16	0.313	23.340
3/8	0.375	27.480
10 x 3		
11 ga	0.125	10.710
10 ga	0.134	11.440
8 ga	0.165	13.990
7 ga	0.188	15.840
1/4	0.250	20.720
5/16	0.313	25.460
3/8	0.375	30.030
10 x 3-1/2		
11 ga	0.125	11.130
10 ga	0.134	12.000
8 ga	0.165	14.550
7 ga	0.188	16.440
1/4	0.250	21.570
5/16	0.313	26.530
3/8	0.375	31.310
10 x 4		
7 ga	0.188	17.080
1/4	0.250	22.420
5/16	0.313	27.590
3/8	0.375	32.580
1/2	0.500	42.050
10 x 5		
1/4	0.250	24.120
3/8	0.375	35.140
10 x 6		
7 ga	0.188	19.630
1/4	0.250	25.820
5/16	0.313	31.840
3/8	0.375	37.690
1/2	0.500	48.850
5/8	0.625	59.320
10 x 8		
7 ga	0.188	22.180
1/4	0.250	29.230
5/16	0.313	36.100
3/8	0.375	42.790
1/2	0.500	55.660
5/8	0.625	67.820

Outside Dimension & Gauge (inches)	Wall Thickness (inches)	Weight (lbs./ft.)
12 x 2		
7 ga	0.188	17.080
1/4	0.250	22.420
12 x 3		
7 ga	0.188	18.400
1/4	0.250	24.120
12 x 4		
7 ga	0.188	19.630
1/4	0.250	25.820
5/16	0.313	31.840
3/8	0.375	37.690
1/2	0.500	48.850
12 x 6		
7 ga	0.188	22.180
1/4	0.250	29.230
5/16	0.313	36.100
3/8	0.375	42.790
1/2	0.500	55.660
5/8	0.625	67.820
12 x 8		
7 ga	0.188	24.730
1/4	0.250	32.630
5/16	0.313	40.350
3/8	0.375	47.900
1/2	0.500	62.460
5/8	0.625	76.330
14 x 4		
7 ga	0.188	22.180
1/4	0.250	29.230
5/16	0.313	36.100
3/8	0.375	42.790
1/2	0.500	55.660
14 x 6		
7 ga	0.188	24.730
1/4	0.250	32.630
5/16	0.313	40.350
3/8	0.375	47.900
1/2	0.500	62.460
5/8	0.625	76.330
14 x 10		
1/4	0.250	39.430
5/16	0.313	48.860
3/8	0.375	58.100
1/2	0.500	76.070
5/8	0.625	93.340

Outside Dimension & Gauge (inches)	Wall Thickness (inches)	Weight (lbs./ft.)
16 x 4		
7 ga	0.188	24.730
1/4	0.250	32.630
5/16	0.313	40.350
3/8	0.375	47.900
1/2	0.500	62.460
16 x 8		
1/4	0.250	39.430
5/16	0.313	48.860
3/8	0.375	58.100
1/2	0.500	76.070
5/8	0.625	93.360
16 x 12		
5/16	0.313	57.360
3/8	0.375	68.310
1/2	0.500	89.680
5/8	0.625	110.360
18 x 6		
1/4	0.250	39.430
5/16	0.313	48.860
3/8	0.375	58.100
1/2	0.500	76.070
5/8	0.625	93.340
20 x 4		
1/4	0.250	39.430
5/16	0.313	48.860
3/8	0.375	58.100
1/2	0.500	76.070
20 x 8		
5/16	0.313	57.360
3/8	0.375	68.310
1/2	0.500	89.680
5/8	0.625	110.360
20 x 12		
5/16	0.313	65.870
3/8	0.375	78.520
1/2	0.500	103.300
5/8	0.625	127.370

Electric Resistance Weld (ERW)

ASTM A-513 T-1 (HREW) + A-513 T-2 (CREW)
Carbon: 1010 - 1026 (may vary by size)

Cold Drawn Seamless (CDS)

ASTM A-519
Carbon: 1026

Drawn-Over-Mandrel (DOM)

ASTM A-513 Type 5
Carbon: 1010 - 1026 (may vary by size)

Hot Finished Seamless (HFS)

ASTM A-519 and/or A-106
Carbon: 1026

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
1/4 OD							
24 ga	0.022	0.206	0.0536	-	-	-	-
22 ga	0.028	0.194	0.0664	-	-	●	-
21 ga	0.032	0.187	0.0745	-	-	-	-
20 ga	0.035	0.180	0.0804	-	-	●	-
19 ga	0.042	0.166	0.0933	-	-	-	-
18 ga	0.049	0.152	0.1052	-	-	-	-
16 ga	0.065	0.120	0.1284	-	-	●	-
5/16 OD							
23 ga	0.025	0.263	0.0770	-	-	-	-
21 ga	0.032	0.249	0.0960	-	-	-	-
20 ga	0.035	0.242	0.1039	-	-	-	-
18 ga	0.049	0.214	0.1382	-	-	●	-
16 ga	0.065	0.182	0.1722	-	-	●	-
3/8 OD							
20 ga	0.035	0.305	0.1271	-	-	●	-
18 ga	0.049	0.277	0.1706	-	-	●	-
17 ga	0.058	0.259	0.1964	-	-	●	-
16 ga	0.065	0.245	0.2152	-	-	●	-
14 ga	0.083	0.209	0.2588	-	-	●	-
13 ga	0.095	0.185	0.2840	-	-	-	-
7/16 OD							
20 ga	0.035	0.368	0.1506	-	-	-	-
18 ga	0.049	0.340	0.2036	-	-	●	-
17 ga	0.058	0.322	0.2354	-	-	●	-
16 ga	0.065	0.307	0.2589	-	-	●	-
14 ga	0.083	0.271	0.3147	-	-	●	-
13 ga	0.095	0.248	0.3480	-	-	-	-
12 ga	0.109	0.220	0.3830	-	-	-	-

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:
• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

Continued on next page

Electric Resistance Weld (ERW)
Cold Drawn Seamless (CDS)
Drawn-Over-Mandrel (DOM)
Hot Finished Seamless (HFS)

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
1/2 OD							
20 ga	0.035	0.430	0.1738	-	-	●	-
18 ga	0.049	0.402	0.2360	-	-	●	-
17 ga	0.058	0.384	0.2738	-	-	●	-
16 ga	0.065	0.370	0.3020	●	-	●	-
15 ga	0.072	0.356	0.3291	-	-	-	-
14 ga	0.083	0.334	0.3696	-	-	●	-
13 ga	0.095	0.310	0.4109	-	-	●	-
12 ga	0.109	0.282	0.4552	-	-	●	-
11 ga	0.120	0.260	0.4870	-	-	●	-
1/8	0.125	0.250	0.5010	-	-	●	-
10 ga	0.134	0.232	0.5238	-	-	-	-
8 ga	0.156	0.188	0.5660	-	-	●	-
9/16 OD							
16 ga	0.065	0.432	0.3460	-	-	●	-
14 ga	0.083	0.396	0.4255	-	-	●	-
13 ga	0.095	0.372	0.4748	-	-	●	-
12 ga	0.109	0.344	0.5285	-	-	-	-
11 ga	0.120	0.322	0.5677	-	-	●	-
5/8 OD							
20 ga	0.035	0.555	0.2210	-	-	●	-
18 ga	0.049	0.527	0.3014	-	-	●	-
17 ga	0.058	0.509	0.3512	-	-	●	-
16 ga	0.065	0.495	0.3888	-	-	●	-
14 ga	0.083	0.459	0.4805	-	-	●	-
13 ga	0.095	0.435	0.5377	-	-	●	-
12 ga	0.109	0.407	0.6007	-	-	●	-
11 ga	0.120	0.385	0.6472	-	-	●	-
1/8	0.125	0.375	0.6675	-	-	●	-
10 ga	0.134	0.357	0.7027	-	-	●	-
5/32	0.156	0.312	0.7814	-	-	●	-
3/16	0.188	0.250	0.8774	-	-	●	-
11/16 OD							
16 ga	0.065	0.558	0.4325	-	-	●	-
14 ga	0.083	0.521	0.5363	-	-	●	-
13 ga	0.095	0.497	0.6017	-	-	●	-
12 ga	0.109	0.469	0.6740	-	-	●	-
11 ga	0.120	0.447	0.7279	-	-	●	-
10 ga	0.134	0.419	0.7928	-	-	●	-
5/32	0.156	0.375	0.8864	-	-	-	-
3/16	0.188	0.312	1.0040	-	-	-	-
7/32	0.218	0.252	1.0950	-	-	-	-

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:

• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

Continued on next page

Electric Resistance Weld (ERW)
Cold Drawn Seamless (CDS)
Drawn-Over-Mandrel (DOM)
Hot Finished Seamless (HFS)

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
3/4 OD							
20 ga	0.035	0.680	0.2673	-	-	●	-
18 ga	0.049	0.652	0.3668	●	-	●	-
17 ga	0.058	0.634	0.4287		-	●	-
16 ga	0.065	0.620	0.4755	●	-	●	-
15 ga	0.072	0.606	0.5214	-	-	-	-
14 ga	0.083	0.584	0.5913	-	-	●	-
13 ga	0.095	0.560	0.6646	-	-	●	-
12 ga	0.109	0.532	0.7462	-	-	●	-
11 ga	0.120	0.510	0.8074	-	-	●	-
1/8	0.125	0.500	0.8344	-	-	●	-
10 ga	0.134	0.482	0.8816	-	-	●	-
5/32	0.156	0.437	0.9897	-	-	●	-
11/64	0.172	0.406	1.0620	-	-	●	-
3/16	0.188	0.375	1.1280	-	-	●	-
7/32	0.219	0.312	1.2420	-	-	●	-
1/4	0.250	0.250	1.3350	-	-	●	-
13/16 OD							
22 ga	0.028	0.757	0.2347	-	-	-	-
20 ga	0.035	0.742	0.2908	-	-	-	-
18 ga	0.049	0.714	0.3998	-	-	-	-
16 ga	0.065	0.682	0.5193	-	-	●	-
14 ga	0.083	0.647	0.6471	-	-	●	-
13 ga	0.095	0.622	0.7260	-	-	●	-
11 ga	0.120	0.572	0.8881	-	-	●	-
10 ga	0.134	0.544	0.9717	-	-	-	-
5/32	0.156	0.500	1.0950	-	-	●	-
3/16	0.188	0.437	1.2550	-	-	●	-
7/8 OD							
20 ga	0.035	0.805	0.3140	-	-	-	-
18 ga	0.049	0.777	0.4323	-	-	●	-
17 ga	0.058	0.759	0.5061	-	-	●	-
16 ga	0.065	0.745	0.5623	-	-	●	-
14 ga	0.083	0.709	0.7021	-	-	●	-
13 ga	0.095	0.685	0.7914	-	-	●	-
12 ga	0.109	0.657	0.8917	-	-	●	-
11 ga	0.120	0.635	0.9676	-	-	●	-
1/8	0.125	0.625	1.0013	-	-	●	-
10 ga	0.134	0.607	1.0600	-	-	●	-
5/32	0.156	0.562	1.1980	-	-	●	-
3/16	0.188	0.500	1.3790	-	-	●	-
7/32	0.219	0.437	1.5340	-	-	●	-
1/4	0.250	0.375	1.6690	-	-	●	-

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:

• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

Continued on next page

Electric Resistance Weld (ERW)
Cold Drawn Seamless (CDS)
Drawn-Over-Mandrel (DOM)
Hot Finished Seamless (HFS)

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
15/16 OD							
16 ga	0.065	0.808	0.6060	-	-	●	-
14 ga	0.083	0.771	0.7579	-	-	-	-
13 ga	0.095	0.747	0.8553	-	-	-	-
11 ga	0.120	0.697	1.0480	-	-	●	-
10 ga	0.134	0.669	1.1510	-	-	●	-
5/32	0.156	0.625	1.3030	-	-	-	-
3/16	0.188	0.562	1.5060	-	-	-	-
7/32	0.219	0.500	1.6820	-	-	-	-
1/4	0.250	0.437	1.8370	-	-	-	-
1 OD							
22 ga	0.028	0.944	0.2907	-	-	-	-
20 ga	0.035	0.930	0.3607	-	-	●	-
18 ga	0.049	0.902	0.4977	-	-	●	-
17 ga	0.058	0.884	0.5835	-	-	●	-
16 ga	0.065	0.870	0.6491	●	-	●	-
15 ga	0.072	0.856	0.7136	-	-	-	-
14 ga	0.083	0.834	0.8129	●	-	●	-
13 ga	0.095	0.810	0.9182	-	-	●	-
12 ga	0.109	0.782	1.0370	-	-	●	-
11 ga	0.120	0.760	1.1280	●	-	●	-
1/8	0.125	0.750	1.1680	-	-	●	-
10 ga	0.134	0.732	1.2390	-	-	●	-
5/32	0.156	0.687	1.4060	-	-	●	-
11/64	0.172	0.656	1.5210	-	-	-	-
7 ga	0.180	0.640	1.576	-	-	●	-
3/16	0.188	0.625	1.8810	-	-	●	-
7/32	0.219	0.562	1.8270	-	-	●	-
1/4	0.250	0.500	2.0030	-	-	●	-
9/32	0.281	0.437	2.1580	-	-	●	-
5/16	0.313	0.375	2.2970	-	●	-	-
3/8	0.375	0.250	2.5030	-	●	-	-
1-1/16 OD							
16 ga	0.065	0.933	0.6928	-	-	●	-
14 ga	0.083	0.897	0.8687	-	-	●	-
13 ga	0.095	0.872	0.9821	-	-	●	-
12 ga	0.109	0.844	1.1110	-	-	●	-
11 ga	0.120	0.822	1.2090	-	-	●	-
10 ga	0.134	0.794	1.3300	-	-	●	-
5/32	0.156	0.750	1.5110	-	-	●	-
3/16	0.188	0.687	1.7570	-	-	●	-
7/32	0.219	0.625	1.9740	-	-	-	-

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:

• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

Continued on next page

Electric Resistance Weld (ERW)
Cold Drawn Seamless (CDS)
Drawn-Over-Mandrel (DOM)
Hot Finished Seamless (HFS)

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
1-1/16 OD							
1/4	0.250	0.562	2.1710	-	-	●	-
9/32	0.281	0.500	2.3470	-	-	-	-
5/16	0.313	0.437	2.5070	-	-	-	-
3/8	0.375	0.312	2.7550	-	-	-	-
1-1/8 OD							
20 ga	0.035	1.055	0.4074	-	-	-	-
18 ga	0.049	1.027	0.5631	-	-	●	-
17 ga	0.058	1.009	0.6609	-	-	-	-
16 ga	0.065	0.995	0.7359	●	-	●	-
14 ga	0.083	0.959	0.9237	●	-	●	-
13 ga	0.095	0.935	1.0450	-	-	●	-
12 ga	0.109	0.907	1.1830	-	-	●	-
11 ga	0.120	0.885	1.2880	●	-	●	-
1/8	0.125	0.875	1.3350	-	-	●	-
10 ga	0.134	0.857	1.4180	-	-	●	-
5/32	0.156	0.812	1.6140	-	-	●	-
11/64	0.172	0.781	1.7510	-	-	●	-
3/16	0.188	0.750	1.8810	-	-	●	-
7/32	0.219	0.687	2.1190	-	-	●	-
1/4	0.250	0.625	2.3360	-	-	●	-
9/32	0.281	0.563	2.5330	-	-	●	-
5/16	0.313	0.500	2.7140	-	-	-	-
3/8	0.375	0.375	3.0040	-	-	-	-
1-3/16 OD							
16 ga	0.065	1.057	0.7796	-	-	●	-
14 ga	0.083	1.021	0.9795	-	-	●	-
11 ga	0.120	0.948	1.3690	-	-	●	-
1/8	0.125	0.938	1.4184	-	-	●	-
5/32	0.156	0.875	1.7190	-	-	●	-
3/16	0.188	0.812	2.0080	-	-	●	-
7/32	0.219	0.750	2.2660	-	-	●	-
1/4	0.250	0.687	2.5040	-	-	●	-
1-1/4 OD							
20 ga	0.035	1.180	0.4542	-	-	-	-
18 ga	0.049	1.152	0.6285	-	-	●	-
16 ga	0.065	1.120	0.8226	●	-	●	-
14 ga	0.083	1.084	1.0340	●	-	●	-
13 ga	0.095	1.060	1.1720	-	-	●	-
12 ga	0.109	1.032	1.3280	-	-	●	-
11 ga	0.120	1.010	1.4480	●	-	●	-
1/8	0.125	1.000	1.5020	-	-	●	-

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:

• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

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Electric Resistance Weld (ERW)
Cold Drawn Seamless (CDS)
Drawn-Over-Mandrel (DOM)
Hot Finished Seamless (HFS)

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
1-1/4 OD							
10 ga	0.134	0.982	1.5970	-	-	●	-
5/32	0.156	0.937	1.8230	-	-	●	-
3/16	0.188	0.875	2.1320	-	-	●	-
7/32	0.219	0.812	2.4110	-	-	●	-
1/4	0.250	0.750	2.6700	-	-	●	-
9/32	0.281	0.687	2.9080	-	-	●	-
5/16	0.313	0.625	3.1320	-	-	●	-
3/8	0.375	0.500	3.5040	-	●	●	-
7/16	0.438	0.375	3.8000	-	●	●	-
1-5/16 OD							
20 ga	0.035	1.242	0.4777	-	-	-	-
16 ga	0.065	1.182	0.8664	-	-	●	-
14 ga	0.083	1.146	1.0900	-	-	●	-
13 ga	0.095	1.122	1.2360	-	-	●	-
12 ga	0.109	1.094	1.4020	-	-	●	-
11 ga	0.120	1.072	1.5290	-	-	●	-
10 ga	0.134	1.044	1.6870	-	-	●	-
5/32	0.156	1.000	1.9280	-	-	●	-
3/16	0.188	0.937	2.1590	-	-	●	-
7/32	0.219	0.875	2.5590	-	-	●	-
1/4	0.250	0.812	2.8380	-	-	●	-
9/32	0.281	0.750	3.0970	-	-	-	-
5/16	0.313	0.687	3.3430	-	-	●	-
1-3/8 OD							
20 ga	0.035	1.305	0.5009	-	-	-	-
18 ga	0.049	1.277	0.6939	-	-	●	-
16 ga	0.065	1.245	0.9094	●	-	●	-
14 ga	0.083	1.209	1.1450	●	-	●	-
13 ga	0.095	1.185	1.2990	-	-	●	-
12 ga	0.109	1.157	1.4740	-	-	●	-
11 ga	0.120	1.135	1.6080	●	-	●	-
1/8	0.125	1.125	1.6690	-	-	●	-
10 ga	0.134	1.107	1.7760	-	-	●	-
5/32	0.156	1.062	2.0310	-	-	●	-
11/64	0.172	1.031	2.2100	-	-	●	-
3/16	0.188	1.000	2.3830	-	-	●	-
7/32	0.219	0.937	2.7040	-	-	●	-
1/4	0.250	0.875	3.0040	-	-	●	-
9/32	0.281	0.813	3.2830	-	-	●	-
5/16	0.313	0.750	3.5500	-	-	●	-
3/8	0.375	0.625	4.0050	-	-	●	-

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:

• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

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Electric Resistance Weld (ERW)
Cold Drawn Seamless (CDS)
Drawn-Over-Mandrel (DOM)
Hot Finished Seamless (HFS)

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
1-7/16 OD							
18 ga	0.049	1.339	0.7269	-	-	-	-
16 ga	0.065	1.308	0.9531	-	-	-	-
14 ga	0.083	1.271	1.2010	-	-	-	-
13 ga	0.095	1.247	1.3630	-	-	-	-
11 ga	0.120	1.197	1.6890	-	-	●	-
10 ga	0.134	1.170	1.8660	-	-	-	-
5/32	0.156	1.125	2.1360	-	-	-	-
3/16	0.188	1.062	2.5100	-	-	●	-
7/32	0.219	1.000	2.8510	-	-	-	-
1/4	0.250	0.937	3.1720	-	-	-	-
1-1/2 OD							
20 ga	0.035	1.430	0.5476	-	-	-	-
18 ga	0.049	1.402	0.7593	-	-	●	-
17 ga	0.058	1.384	0.8932	-	-	●	-
16 ga	0.065	1.370	0.9962	●	-	●	-
15 ga	0.072	1.356	1.0980	-	-	-	-
14 ga	0.083	1.334	1.2560	●	-	●	-
13 ga	0.095	1.310	1.4260	●	-	●	-
12 ga	0.109	1.282	1.6190	-	-	●	-
11 ga	0.120	1.260	1.7690	●	-	●	-
1/8	0.125	1.250	1.8360	-	-	●	-
10 ga	0.134	1.232	1.9550	-	-	●	-
5/32	0.156	1.187	2.2390	-	-	●	-
11/64	0.172	1.156	2.4390	-	-	-	-
3/16	0.188	1.125	2.6340	-	-	●	-
7/32	0.219	1.062	2.9960	-	-	●	-
15/64	0.234	1.032	3.1640	-	-	●	-
1/4	0.250	1.000	3.3380	-	-	●	-
9/32	0.281	0.938	3.6580	-	-	●	-
5/16	0.313	0.875	3.9680	-	-	●	-
11/32	0.344	0.812	4.2470	-	-	●	-
3/8	0.375	0.750	4.5060	-	-	●	-
7/16	0.438	0.625	4.9680	-	●	-	-
1/2	0.500	0.500	5.3400	-	●	-	-
1-9/16 OD							
16 ga	0.065	1.433	1.0399	-	-	-	-
13 ga	0.095	1.372	1.4890	-	-	-	-
11 ga	0.120	1.322	1.8490	-	-	●	-
1/8	0.125	1.313	1.9200	-	-	●	-
10 ga	0.134	1.295	2.0450	-	-	-	-
5/32	0.156	1.250	2.3440	-	-	●	-
3/16	0.188	1.187	2.7610	-	-	●	-

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:

• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

Continued on next page

Electric Resistance Weld (ERW)
Cold Drawn Seamless (CDS)
Drawn-Over-Mandrel (DOM)
Hot Finished Seamless (HFS)

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
1-9/16 OD							
7/32	0.219	1.125	3.1440	-	-	-	-
1/4	0.250	1.062	3.5060	-	-	●	-
3/8	0.375	0.813	4.7580	-	-	●	-
1-5/8 OD							
20 ga	0.035	1.555	0.5943	-	-	-	-
18 ga	0.049	1.527	0.8248	-	-	-	-
17 ga	0.058	1.509	0.9707	-	-	●	-
16 ga	0.065	1.495	1.0830	-	-	●	-
14 ga	0.083	1.459	1.3670	-	-	●	-
13 ga	0.095	1.435	1.5520	-	-	●	-
12 ga	0.109	1.407	1.7650	-	-	●	-
11 ga	0.120	1.385	1.9290	●	-	●	-
1/8	0.125	1.375	2.0030	-	-	●	-
10 ga	0.134	1.357	2.1340	-	-	●	-
5/32	0.156	1.312	2.4470	-	-	●	-
11/64	0.172	1.281	2.6690	-	-	●	-
3/16	0.188	1.250	2.8850	-	-	●	-
7/32	0.219	1.187	3.2890	-	-	●	-
1/4	0.250	1.125	3.6710	-	-	●	-
9/32	0.281	1.063	4.0330	-	-	●	-
5/16	0.313	1.000	4.3860	-	-	●	-
3/8	0.375	0.875	5.0060	-	-	●	-
1/2	0.500	0.625	6.0070	-	-	-	-
1-11/16 OD							
16 ga	0.065	1.557	1.1270	-	-	-	-
11 ga	0.120	1.447	2.0100	-	-	●	-
3/16	0.188	1.313	3.0120	-	-	-	-
7/32	0.219	1.250	3.4360	-	-	-	-
1/4	0.250	1.187	3.8390	-	-	●	-
1-3/4 OD							
20 ga	0.035	1.680	0.6411	-	-	-	-
18 ga	0.049	1.652	0.8902	-	-	●	-
16 ga	0.065	1.620	1.1700	●	-	●	-
14 ga	0.083	1.584	1.4780	●	-	●	-
13 ga	0.095	1.560	1.6790	-	-	●	-
12 ga	0.109	1.532	1.9100	-	-	●	-
11 ga	0.120	1.510	2.0890	●	-	●	-
1/8	0.125	1.500	2.1690	-	-	●	-
10 ga	0.134	1.482	2.3130	-	-	●	-
5/32	0.156	1.437	2.6560	-	-	●	-
3/16	0.188	1.375	3.1360	-	-	●	-
7/32	0.219	1.312	3.5810	-	-	●	-

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:

• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

Continued on next page

Electric Resistance Weld (ERW)
Cold Drawn Seamless (CDS)
Drawn-Over-Mandrel (DOM)
Hot Finished Seamless (HFS)

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
1-3/4 OD							
1/4	0.250	1.250	4.0050	-	-	●	-
9/32	0.281	1.188	4.4090	-	-	●	-
5/16	0.313	1.125	4.8040	-	-	●	-
3/8	0.375	1.000	5.5070	-	-	●	-
7/16	0.438	0.874	6.1370	-	●	-	-
1/2	0.500	0.750	6.6750	-	●	-	-
1-13/16 OD							
3/16	0.188	1.437	3.2630	-	-	-	-
7/32	0.219	1.375	3.7280	-	-	-	-
1/4	0.250	1.313	4.1730	-	-	-	-
1-7/8 OD							
20 ga	0.035	1.805	0.6880	-	-	-	-
18 ga	0.049	1.777	0.9556	-	-	-	-
16 ga	0.065	1.745	1.2570	●	-	●	-
14 ga	0.083	1.709	1.5890	-	-	-	-
13 ga	0.095	1.685	1.8060	-	-	●	-
12 ga	0.109	1.657	2.0560	-	-	●	-
11 ga	0.120	1.635	2.2490	●	-	●	-
1/8	0.125	1.625	2.3360	-	-	●	-
10 ga	0.134	1.607	2.4920	-	-	●	-
5/32	0.156	1.562	2.8640	-	-	●	-
3/16	0.188	1.500	3.3870	-	-	●	-
7/32	0.219	1.437	3.8730	-	-	●	-
1/4	0.250	1.375	4.3390	-	-	●	-
9/32	0.281	1.313	4.7840	-	-	●	-
5/16	0.313	1.250	5.2220	-	-	●	-
3/8	0.375	1.125	6.0080	-	-	●	-
1-15/16 OD							
16 ga	0.065	1.808	1.3000	-	-	-	-
1/8	0.125	1.688	2.4200	-	-	-	-
5/32	0.156	1.625	2.9690	-	-	-	-
7/32	0.219	1.500	4.0210	-	-	-	-
1/4	0.250	1.438	4.5070	-	-	-	-
3/8	0.375	1.188	6.2600	-	-	-	-
2 OD							
20 ga	0.035	1.930	0.7345	-	-	-	-
18 ga	0.049	1.902	1.0210	-	-	-	-
16 ga	0.065	1.870	1.3430	●	-	●	-
14 ga	0.083	1.834	1.6990	●	-	●	-
13 ga	0.095	1.810	1.9330	-	-	●	-

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:

• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

Continued on next page

Electric Resistance Weld (ERW)
Cold Drawn Seamless (CDS)
Drawn-Over-Mandrel (DOM)
Hot Finished Seamless (HFS)

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
2 OD							
12 ga	0.109	1.782	2.0210	-	-	●	-
11 ga	0.120	1.760	2.4090	●	-	●	-
1/8	0.125	1.750	2.5030	-	-	●	-
10 ga	0.134	1.732	2.6700	-	-	●	-
5/32	0.156	1.688	3.0720	-	-	●	-
3/16	0.188	1.625	3.6380	-	-	●	-
7/32	0.219	1.562	4.1660	-	-	●	-
1/4	0.250	1.500	4.6730	-	-	●	-
9/32	0.281	1.438	5.1590	-	-	●	-
5/16	0.313	1.375	5.6390	-	-	●	-
11/32	0.344	1.312	6.0840	-	-	●	-
3/8	0.375	1.250	6.5080	-	●	●	-
13/32	0.406	1.188	6.9100	-	●	-	-
7/16	0.438	1.124	7.3070	-	●	●	-
1/2	0.500	1.000	8.0100	-	●	●	-
9/16	0.563	0.874	8.6400	-	-	●	-
5/8	0.625	0.750	9.1780	-	●	-	-
2-1/16 OD							
3/16	0.188	1.689	3.7650	-	-	-	-
1/4	0.250	1.562	4.8410	-	-	-	-
2-1/8 OD							
18 ga	0.049	2.027	1.0860	-	-	-	-
16 ga	0.065	1.995	1.4300	-	-	●	-
14 ga	0.083	1.959	1.8100	-	-	-	-
13 ga	0.095	1.935	2.0600	-	-	●	-
11 ga	0.120	1.885	2.5700	-	-	●	-
1/8	0.125	1.875	2.6700	-	-	●	-
5/32	0.156	1.812	3.2810	-	-	●	-
3/16	0.188	1.750	3.8890	-	-	●	-
7/32	0.219	1.687	4.4580	-	-	●	-
1/4	0.250	1.625	5.0060	-	-	●	-
9/32	0.281	1.563	5.5340	-	-	●	-
5/16	0.313	1.500	6.0570	-	-	●	-
3/8	0.375	1.375	7.0090	-	-	●	-
7/16	0.438	1.249	7.8920	-	●	-	-
15/32	0.469	1.187	8.2950	-	●	-	-
1/2	0.500	1.125	8.6780	-	●	-	-
2-3/16 OD							
1/4	0.250	1.688	5.174	-	-	●	-

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:

• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

Continued on next page

Electric Resistance Weld (ERW)
Cold Drawn Seamless (CDS)
Drawn-Over-Mandrel (DOM)
Hot Finished Seamless (HFS)

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
2-1/4 OD							
18 ga	0.049	2.152	1.1520	-	-	-	-
16 ga	0.065	2.120	1.5170	●	-	●	-
14 ga	0.083	2.084	1.9210	-	-	●	-
13 ga	0.095	2.060	2.1860	-	-	●	-
12 ga	0.109	2.032	2.4920	-	-	●	-
11 ga	0.120	2.010	2.7300	●	-	●	-
1/8	0.125	2.000	2.8370	-	-	●	-
10 ga	0.134	1.982	3.0280	-	-	●	-
5/32	0.156	1.937	3.4890	-	-	●	-
3/16	0.188	1.875	4.1400	-	-	●	-
7/32	0.219	1.812	4.7500	-	-	●	-
1/4	0.250	1.750	5.3400	-	-	●	-
9/32	0.281	1.688	5.9090	-	-	●	-
5/16	0.313	1.625	6.4750	-	-	●	-
11/32	0.344	1.562	7.0020	-	-	●	-
3/8	0.375	1.500	7.5090	-	-	●	-
7/16	0.438	1.374	8.4760	-	●	●	-
1/2	0.500	1.250	9.3450	-	●	●	-
9/16	0.563	1.124	10.1440	-	-	●	-
5/8	0.625	1.000	10.8500	-	●	-	-
3/4	0.750	0.750	12.0200	-	●	-	-
2-5/16 OD							
3/16	0.188	1.936	4.2670	-	-	-	-
1/4	0.250	1.813	5.5080	-	-	-	-
2-3/8 OD							
16 ga	0.065	2.245	1.6040	●	-	●	-
14 ga	0.083	2.209	2.0320	-	-	-	-
13 ga	0.095	2.185	2.3130	-	-	●	-
12 ga	0.109	2.157	2.6380	-	-	-	-
11 ga	0.120	2.135	2.8900	●	-	-	-
1/8	0.125	2.125	3.0040	-	-	●	-
5/32	0.156	2.063	3.6970	-	-	●	-
7 ga	0.180	2.015	4.2200	-	-	-	-
3/16	0.188	2.000	4.3910	-	-	●	-
13/64	0.203	1.969	4.7090	-	-	-	-
7/32	0.219	1.937	5.0430	-	-	●	-
1/4	0.250	1.875	5.6740	-	-	●	-
9/32	0.281	1.813	6.2840	-	-	●	-
5/16	0.313	1.750	6.8930	-	-	●	-
3/8	0.375	1.625	8.0100	-	-	●	-
7/16	0.438	1.499	9.0610	-	-	●	-
1/2	0.500	1.375	10.0013	-	-	●	-
9/16	0.563	1.249	10.9000	-	-	-	-
5/8	0.625	1.125	11.6810	-	●	-	-

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:
• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

Continued on next page

Electric Resistance Weld (ERW)
Cold Drawn Seamless (CDS)
Drawn-Over-Mandrel (DOM)
Hot Finished Seamless (HFS)

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
2-1/2 OD							
18 ga	0.049	2.402	1.2830	-	-	-	-
16 ga	0.065	2.370	1.6900	●	-	●	-
14 ga	0.083	2.334	2.1430	●	-	●	-
13 ga	0.095	2.310	2.4400	-	-	●	-
12 ga	0.109	2.282	2.7830	-	-	●	-
11 ga	0.120	2.260	3.0500	●	-	●	-
1/8	0.125	2.250	3.1710	-	-	●	-
10 ga	0.134	2.232	3.3860	-	-	●	-
5/32	0.156	2.187	3.9050	-	-	●	-
3/16	0.188	2.125	4.6420	-	-	●	-
7/32	0.219	2.062	5.3350	-	-	●	-
1/4	0.250	2.000	6.0080	-	-	●	-
9/32	0.281	1.938	6.6590	-	-	●	-
5/16	0.313	1.875	7.3110	-	-	●	-
11/32	0.344	1.812	7.9210	-	-	●	-
3/8	0.375	1.750	8.5110	-	-	●	-
7/16	0.438	1.624	9.6460	-	●	●	-
1/2	0.500	1.500	10.6800	-	●	●	-
9/16	0.563	1.375	11.6469	-	-	●	-
5/8	0.625	1.250	12.5156	-	●	-	-
3/4	0.750	1.000	14.0200	-	●	-	-
2-9/16 OD							
1/4	0.250	2.063	6.1760	-	-	●	-
2-5/8 OD							
16 ga	0.065	2.495	1.7770	-	-	●	-
14 ga	0.083	2.459	2.2530	-	-	-	-
13 ga	0.095	2.435	2.5670	-	-	●	-
12 ga	0.109	2.407	2.9290	-	-	●	-
11 ga	0.120	2.385	3.2100	-	-	●	-
5/32	0.156	2.312	4.1140	-	-	●	-
3/16	0.188	2.250	4.8930	-	-	●	-
7/32	0.219	2.187	5.6270	-	-	●	-
1/4	0.250	2.125	6.3410	-	-	●	-
9/32	0.281	2.063	7.0350	-	-	-	-
5/16	0.313	2.000	7.7290	-	-	●	-
3/8	0.375	1.875	9.0110	-	-	●	-
7/16	0.438	1.750	10.2300	-	-	-	-
1/2	0.500	1.625	11.3475	-	-	●	-
9/16	0.563	1.500	12.4000	-	-	-	-
5/8	0.625	1.375	13.3500	-	-	-	-

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:

• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

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Electric Resistance Weld (ERW)
Cold Drawn Seamless (CDS)
Drawn-Over-Mandrel (DOM)
Hot Finished Seamless (HFS)

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
2-3/4 OD							
16 ga	0.065	2.620	1.8640	-	-	●	-
14 ga	0.083	2.584	2.3640	-	-	●	-
13 ga	0.095	2.560	2.6940	-	-	●	-
11 ga	0.120	2.510	3.3710	-	-	●	-
1/8	0.125	2.500	3.5040	-	-	●	-
10 ga	0.134	2.482	3.7440	-	-	-	-
5/32	0.156	2.438	4.3220	-	-	●	-
3/16	0.188	2.375	5.1440	-	-	●	-
7/32	0.219	2.312	5.9200	-	-	●	-
1/4	0.250	2.250	6.6750	-	-	●	-
9/32	0.281	2.188	7.4100	-	-	●	-
5/16	0.313	2.125	8.1470	-	-	●	-
11/32	0.344	2.062	8.8390	-	-	●	-
3/8	0.375	2.000	9.5120	-	-	●	-
7/16	0.438	1.874	10.8150	-	-	●	-
1/2	0.500	1.750	12.0200	-	●	●	-
9/16	0.563	1.625	13.1500	-	-	●	-
5/8	0.625	1.500	14.1840	-	●	-	-
11/16	0.688	1.375	15.1500	-	-	-	-
3/4	0.750	1.250	16.0200	-	●	-	-
7/8	0.875	1.000	17.5200	-	●	-	-
2-7/8 OD							
16 ga	0.065	2.745	1.9510	-	-	●	-
14 ga	0.083	2.709	2.4750	-	-	-	-
13 ga	0.095	2.685	2.8210	-	-	-	-
11 ga	0.120	2.635	3.5310	-	-	●	-
1/8	0.125	2.625	3.6710	-	-	●	-
5/32	0.156	2.563	4.5300	-	-	●	-
3/16	0.188	2.500	5.3950	-	-	●	-
7/32	0.219	2.437	6.2120	-	-	●	-
1/4	0.250	2.375	7.0090	-	-	●	-
9/32	0.281	2.313	7.7850	-	-	●	-
5/16	0.313	2.250	8.5640	-	-	●	-
3/8	0.375	2.125	10.0100	-	-	●	-
7/16	0.438	1.999	11.4000	-	-	●	-
1/2	0.500	1.875	12.6830	-	-	●	-
9/16	0.563	1.749	13.9000	-	-	-	-
5/8	0.625	1.625	15.0190	-	-	-	-
3/4	0.750	1.375	17.0200	-	-	-	-

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:

• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

Continued on next page

Electric Resistance Weld (ERW)
Cold Drawn Seamless (CDS)
Drawn-Over-Mandrel (DOM)
Hot Finished Seamless (HFS)

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
3 OD							
18 ga	0.049	2.902	1.5440	-	-	-	-
16 ga	0.065	2.870	2.0370	●	-	●	-
14 ga	0.083	2.834	2.5860	●	-	●	-
13 ga	0.095	2.810	2.9470	-	-	●	-
12 ga	0.109	2.782	3.3650	-	-	●	-
11 ga	0.120	2.760	3.6910	●	-	●	-
1/8	0.125	2.750	3.8380	-	-	●	-
10 ga	0.134	2.732	4.1020	-	-	●	-
5/32	0.156	2.687	4.7380	-	-	●	-
3/16	0.188	2.625	5.6460	-	-	●	-
7/32	0.219	2.562	6.5050	-	-	●	-
1/4	0.250	2.500	7.3430	-	-	●	-
9/32	0.281	2.438	8.1600	-	-	●	-
5/16	0.313	2.375	8.9820	-	-	●	-
11/32	0.344	2.312	9.7580	-	-	●	-
3/8	0.375	2.250	10.5100	-	-	●	-
7/16	0.438	2.124	11.9850	-	-	●	-
1/2	0.500	2.000	13.3500	-	●	●	-
9/16	0.563	1.875	14.6500	-	-	●	-
5/8	0.625	1.750	15.8530	-	●	●	-
11/16	0.688	1.624	16.9900	-	●	-	-
3/4	0.750	1.500	18.0220	-	●	-	-
7/8	0.875	1.250	19.8600	-	●	-	-
1	1.000	1.000	21.3600	-	●	-	-
3-1/8 OD							
16 ga	0.065	2.995	2.1240	-	-	-	-
11 ga	0.120	2.885	3.8510	-	-	●	-
1/8	0.125	2.875	4.0050	-	-	-	-
3/16	0.188	2.750	5.8970	-	-	●	-
7/32	0.219	2.687	6.7969	-	-	-	-
1/4	0.250	2.625	7.6760	-	-	●	-
5/16	0.313	2.500	9.4000	-	-	●	-
3/8	0.375	2.375	11.0138	-	-	●	-
7/16	0.438	2.249	12.5690	-	-	-	-
1/2	0.500	2.125	14.0175	-	-	●	-
9/16	0.563	2.000	15.4049	-	-	●	-
5/8	0.625	1.875	16.6875	-	-	●	-
3/4	0.750	1.625	19.0200	-	-	-	-
7/8	0.875	1.375	21.0300	-	-	-	-

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:
• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

Continued on next page

Electric Resistance Weld (ERW)
Cold Drawn Seamless (CDS)
Drawn-Over-Mandrel (DOM)
Hot Finished Seamless (HFS)

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
3-1/4 OD							
16 ga	0.065	3.120	2.2100	-	-	●	-
14 ga	0.083	3.084	2.8070	-	-	-	-
13 ga	0.095	3.060	3.2010	-	-	●	-
11 ga	0.120	3.010	4.0110	-	-	●	-
1/8	0.125	3.000	4.1720	-	-	●	-
10 ga	0.134	2.982	4.4590	-	-	-	-
5/32	0.156	2.938	5.1550	-	-	●	-
3/16	0.188	2.875	6.1480	-	-	●	-
7/32	0.219	2.812	7.0890	-	-	●	-
1/4	0.250	2.750	8.0100	-	-	●	-
9/32	0.281	2.688	8.9100	-	-	-	-
5/16	0.313	2.625	9.8180	-	-	●	-
11/32	0.344	2.562	10.6800	-	-	-	-
3/8	0.375	2.500	11.5100	-	-	●	-
7/16	0.438	2.376	13.1500	-	-	●	-
1/2	0.500	2.250	14.6900	-	●	●	-
9/16	0.563	2.126	16.1565	-	-	●	-
19/32	0.594	2.062	16.8500	-	-	-	-
5/8	0.625	2.000	17.5200	-	-	●	-
3/4	0.750	1.750	20.0300	-	●	-	-
7/8	0.875	1.500	22.1900	-	●	-	-
1	1.000	1.250	24.0300	-	●	-	-
3-3/8 OD							
1/8	0.125	3.125	4.1750	-	-	●	-
3/16	0.188	3.000	6.3990	-	-	●	-
1/4	0.250	2.875	8.3440	-	-	●	-
5/16	0.313	2.750	10.2360	-	-	●	-
3/8	0.375	2.625	12.0150	-	-	●	-
7/16	0.438	2.499	13.7400	-	-	-	-
1/2	0.500	2.375	15.3500	-	-	●	-
9/16	0.563	2.249	16.9100	-	-	-	-
5/8	0.625	2.125	18.3600	-	-	●	-
3/4	0.750	1.875	21.0300	-	-	-	-
3-1/2 OD							
16 ga	0.065	3.370	2.3850	●	-	●	-
14 ga	0.083	3.334	3.0290	●	-	●	-
13 ga	0.095	3.310	3.4550	-	-	●	-
11 ga	0.120	3.260	4.3320	●	-	●	-
1/8	0.125	3.250	4.5060	-	-	●	-
10 ga	0.134	3.232	4.8170	-	-	●	-
5/32	0.156	3.187	5.5710	-	-	●	-
3/16	0.188	3.125	6.6500	-	-	●	-

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:

• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

Continued on next page

Electric Resistance Weld (ERW)
Cold Drawn Seamless (CDS)
Drawn-Over-Mandrel (DOM)
Hot Finished Seamless (HFS)

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
3-1/2 OD							
7/32	0.219	3.062	7.6740	-	-	●	-
1/4	0.250	3.000	8.6780	-	-	●	-
9/32	0.281	2.938	9.6600	-	-	●	-
5/16	0.313	2.875	10.6500	-	-	●	-
3/8	0.375	2.750	12.5200	-	-	●	-
7/16	0.438	2.624	14.3200	-	-	●	-
1/2	0.500	2.500	16.0200	-	●	●	-
9/16	0.563	2.374	17.6600	-	-	●	-
5/8	0.625	2.250	19.1900	-	-	●	-
3/4	0.750	2.000	22.0300	-	●	-	-
7/8	0.875	1.750	24.5300	-	●	-	-
1	1.000	1.500	26.7000	-	●	-	-
3-5/8 OD							
16 ga	0.065	3.495	2.4710	-	-	-	-
3/16	0.188	3.250	6.9010	-	-	●	-
1/4	0.250	3.125	9.0110	-	-	●	-
9/32	0.281	3.063	10.0400	-	-	-	-
5/16	0.313	3.000	11.0700	-	-	●	-
3/8	0.375	2.875	13.0200	-	-	●	-
7/16	0.438	2.749	14.9100	-	-	-	-
1/2	0.500	2.625	16.6880	-	-	-	-
9/16	0.563	2.500	18.4100	-	-	-	-
5/8	0.625	2.375	20.0300	-	-	●	-
3/4	0.750	2.125	23.0300	-	-	-	-
3-3/4 OD							
16 ga	0.065	3.620	2.5580	-	-	-	-
14 ga	0.083	3.584	3.2510	-	-	-	-
13 ga	0.095	3.560	3.7080	-	-	●	-
11 ga	0.120	3.510	4.6520	-	-	-	-
1/8	0.125	3.500	4.8390	-	-	●	-
3/16	0.188	3.375	7.1520	-	-	●	-
1/4	0.250	3.250	9.3450	-	-	●	-
9/32	0.281	3.188	10.4100	-	-	-	-
5/16	0.313	3.125	11.4900	-	-	●	-
11/32	0.344	3.062	12.5100	-	-	-	-
3/8	0.375	3.000	13.5200	-	-	●	-
7/16	0.438	2.874	15.4900	-	-	●	-
1/2	0.500	2.750	17.3600	-	●	-	-
9/16	0.563	2.624	19.1600	-	-	-	-
5/8	0.625	2.500	20.8600	-	-	●	-
11/16	0.688	2.374	22.5000	-	-	-	-
3/4	0.750	2.250	24.0300	-	●	-	-
7/8	0.875	2.000	26.8700	-	●	-	-
1	1.000	1.750	29.3700	-	●	-	-

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:

• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

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Electric Resistance Weld (ERW)
Cold Drawn Seamless (CDS)
Drawn-Over-Mandrel (DOM)
Hot Finished Seamless (HFS)

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
3-7/8 OD							
3/16	0.188	3.500	7.4030	-	-	●	-
1/4	0.250	3.375	9.6790	-	-	●	-
3/8	0.375	3.125	14.0200	-	-	●	-
7/16	0.438	2.999	16.0800	-	-	-	-
1/2	0.500	2.875	18.0200	-	-	-	-
5/8	0.625	2.625	21.6900	-	-	-	-
3/4	0.750	2.375	25.0300	-	-	-	-
4 OD							
16 ga	0.065	3.870	2.7320	●	-	●	-
14 ga	0.083	3.834	3.4720	●	-	●	-
13 ga	0.095	3.810	3.9620	-	-	●	-
12 ga	0.109	3.782	4.5300	-	-	-	-
11 ga	0.120	3.760	4.7930	●	-	●	-
1/8	0.125	3.750	5.1730	-	-	●	-
10 ga	0.134	3.732	5.5330	-	-	●	-
5/32	0.156	3.687	6.4040	-	-	-	-
3/16	0.188	3.625	7.6540	-	-	●	-
7/32	0.219	3.562	8.8430	-	-	●	-
1/4	0.250	3.500	10.0100	-	-	●	-
9/32	0.281	3.438	11.1600	-	-	-	-
5/16	0.313	3.375	12.3300	-	-	●	-
3/8	0.375	3.250	14.5200	-	-	●	-
7/16	0.438	3.124	16.6600	-	-	●	-
1/2	0.500	3.000	18.6900	-	●	●	-
9/16	0.563	2.874	20.6700	-	-	●	-
5/8	0.625	2.750	22.5300	-	●	●	-
11/16	0.688	2.624	24.3400	-	-	-	-
3/4	0.750	2.500	26.0300	-	●	-	●
7/8	0.875	2.250	29.2000	-	●	-	●
1	1.000	2.000	32.0400	-	●	-	●
1-1/8	1.125	1.750	34.5400	-	-	-	-
1-1/4	1.250	1.500	36.7100	-	-	-	●
4-1/8 OD							
3/16	0.188	3.750	7.9050	-	-	●	-
1/4	0.250	3.625	10.3500	-	-	●	-
5/16	0.313	3.500	12.7400	-	-	●	-
3/8	0.375	3.375	15.0200	-	-	-	-
7/16	0.438	3.249	17.2500	-	-	-	-
1/2	0.500	3.125	19.3600	-	-	●	-
9/16	0.563	3.000	21.4180	-	-	●	-
5/8	0.625	2.875	23.3600	-	-	●	-
3/4	0.750	2.625	27.0300	-	-	-	-

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:

• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

Continued on next page

Electric Resistance Weld (ERW)
Cold Drawn Seamless (CDS)
Drawn-Over-Mandrel (DOM)
Hot Finished Seamless (HFS)

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
4-1/4 OD							
16 ga	0.065	4.120	2.9050	-	-	-	-
13 ga	0.095	4.060	4.2160	-	-	●	-
11 ga	0.120	4.010	5.2930	-	-	-	-
1/8	0.125	4.000	5.5070	-	-	●	-
5/32	0.156	3.937	6.8210	-	-	-	-
3/16	0.188	3.875	8.1560	-	-	●	-
1/4	0.250	3.750	10.6800	-	-	●	-
5/16	0.313	3.625	13.1600	-	-	●	-
11/32	0.344	3.562	14.3500	-	-	-	-
3/8	0.375	3.500	15.5200	-	-	●	-
7/16	0.438	3.374	17.8300	-	-	-	-
1/2	0.500	3.250	20.0300	-	-	●	-
9/16	0.563	3.125	22.1700	-	-	-	-
5/8	0.625	3.000	24.2000	-	-	●	-
11/16	0.688	2.875	26.1700	-	-	-	-
3/4	0.750	2.750	28.0400	-	●	-	-
7/8	0.875	2.500	31.5400	-	●	-	-
1	1.000	2.250	34.7100	-	●	-	-
1-1/8	1.125	2.000	37.5500	-	-	-	-
1-1/4	1.250	1.750	40.0500	-	-	-	-
4-3/8 OD							
3/16	0.188	4.000	8.4070	-	-	●	-
1/4	0.250	3.875	11.0100	-	-	●	-
5/16	0.313	3.750	13.5800	-	-	-	-
3/8	0.375	3.625	16.0200	-	-	●	-
7/16	0.438	3.499	18.4200	-	-	-	-
1/2	0.500	3.375	20.6900	-	-	●	-
5/8	0.625	3.125	25.0300	-	-	-	-
3/4	0.750	2.875	29.0400	-	-	-	-
4-1/2 OD							
16 ga	0.065	4.370	3.0790	-	-	-	-
14 ga	0.083	4.334	3.9150	●	-	-	-
13 ga	0.095	4.310	4.4690	-	-	●	-
11 ga	0.120	4.260	5.6130	●	-	-	-
1/8	0.125	4.250	5.8400	-	-	●	-
10 ga	0.134	4.232	6.2480	-	-	-	-
5/32	0.156	4.188	7.2370	-	-	●	-
3/16	0.188	4.125	8.6580	-	-	●	-
7/32	0.219	4.062	10.0100	-	-	●	-
1/4	0.250	4.000	11.3500	-	-	●	-
5/16	0.313	3.875	13.9960	-	-	●	-
3/8	0.375	3.750	16.5200	-	-	●	-

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:

• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

Continued on next page

Electric Resistance Weld (ERW)
Cold Drawn Seamless (CDS)
Drawn-Over-Mandrel (DOM)
Hot Finished Seamless (HFS)

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
4-1/2 OD							
7/16	0.438	3.624	19.0000	-	-	●	-
1/2	0.500	3.500	21.3600	-	-	●	-
9/16	0.563	3.375	23.6700	-	-	●	-
5/8	0.625	3.250	25.8700	-	-	●	-
11/16	0.688	3.124	28.0100	-	-	-	-
3/4	0.750	3.000	30.0400	-	●	-	-
7/8	0.875	2.750	33.8760	-	●	-	-
1	1.000	2.500	37.3800	-	●	-	-
1-1/8	1.125	2.250	40.5510	-	-	-	●
1-1/4	1.250	2.000	43.3900	-	-	-	●
1-1/2	1.500	1.500	48.0600	-	-	-	●
4-5/8 OD							
3/16	0.188	4.249	8.9090	-	-	●	-
1/4	0.250	4.125	11.6800	-	-	●	-
5/16	0.313	4.000	14.4100	-	-	●	-
3/8	0.375	3.875	17.0200	-	-	-	-
7/16	0.438	3.748	19.5900	-	-	-	-
1/2	0.500	3.625	22.0300	-	-	●	-
5/8	0.625	3.375	26.7000	-	-	●	-
3/4	0.750	3.125	31.0400	-	-	-	-
4-3/4 OD							
11 ga	0.120	4.510	5.9340	-	-	-	-
1/8	0.125	4.500	6.1740	-	-	●	-
3/16	0.188	4.375	9.1600	-	-	●	-
1/4	0.250	4.250	12.0200	-	-	●	-
5/16	0.313	4.125	14.8300	-	-	●	-
3/8	0.375	4.000	17.5200	-	-	●	-
7/16	0.438	3.874	20.1710	-	-	-	-
1/2	0.500	3.750	22.7000	-	-	●	-
9/16	0.563	3.624	25.1800	-	-	-	-
5/8	0.625	3.500	27.5340	-	-	●	-
3/4	0.750	3.250	32.0400	-	●	-	-
7/8	0.875	3.000	36.2100	-	●	-	-
1	1.000	2.750	40.0500	-	●	-	-
1-1/4	1.250	2.250	46.7300	-	-	-	-
4-7/8 OD							
3/16	0.188	4.500	9.4110	-	-	-	-
1/4	0.250	4.375	12.3500	-	-	-	-
3/8	0.375	4.125	18.0200	-	-	-	-
7/16	0.438	3.999	20.7600	-	-	-	-
1/2	0.500	3.875	23.3600	-	-	-	-
3/4	0.750	3.375	33.0400	-	-	-	-

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:

• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

Continued on next page

Electric Resistance Weld (ERW)
Cold Drawn Seamless (CDS)
Drawn-Over-Mandrel (DOM)
Hot Finished Seamless (HFS)

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
5 OD							
16 ga	0.065	4.870	3.4260	●	-	-	-
14 ga	0.083	4.834	4.3590	●	-	-	-
13 ga	0.095	4.810	4.9770	-	-	-	-
11 ga	0.120	4.760	6.2542	●	-	●	-
1/8	0.125	4.750	6.5080	-	-	●	-
5/32	0.156	4.688	8.0700	-	-	-	-
3/16	0.188	4.625	9.6620	-	-	●	-
1/4	0.250	4.500	12.6800	-	-	●	-
5/16	0.313	4.375	15.6700	-	-	●	-
3/8	0.375	4.250	18.5200	-	-	●	-
7/16	0.438	4.124	21.3400	-	-	●	-
1/2	0.500	4.000	24.0300	-	-	●	-
9/16	0.563	3.875	26.6800	-	-	●	-
5/8	0.625	3.750	29.2000	-	-	●	-
3/4	0.750	3.500	34.0400	-	●	-	-
7/8	0.875	3.250	38.5500	-	●	-	-
1	1.000	3.000	42.7200	-	●	-	●
1-1/4	1.250	2.500	50.0600	-	●	-	●
1-1/2	1.500	2.000	56.0700	-	-	-	●
1-5/8	1.625	1.750	58.5700	-	-	-	-
5-1/8 OD							
3/8	0.375	4.375	19.0200	-	-	-	-
1/2	0.500	4.125	24.6980	-	-	-	-
5/8	0.625	3.875	30.0400	-	-	-	-
1	1.000	3.125	44.0600	-	-	-	-
5-1/4 OD							
11 ga	0.120	5.010	6.5750	-	-	-	-
1/8	0.125	5.000	6.8420	-	-	●	-
3/16	0.188	4.875	10.1600	-	-	●	-
1/4	0.250	4.750	13.3500	-	-	●	-
5/16	0.313	4.625	16.5000	-	-	●	-
3/8	0.375	4.500	19.5200	-	-	●	-
1/2	0.500	4.250	25.3700	-	-	●	-
5/8	0.625	4.000	30.8700	-	-	●	-
3/4	0.750	3.750	30.0500	-	●	-	●
7/8	0.875	3.500	40.8800	-	●	-	-
1	1.000	3.250	45.3900	-	●	-	-
1-1/8	1.125	3.000	49.5600	-	-	-	-
1-1/4	1.250	2.750	53.4000	-	-	-	-
1-1/2	1.500	2.250	60.0750	-	-	-	●

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:

• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

Continued on next page

Electric Resistance Weld (ERW)
Cold Drawn Seamless (CDS)
Drawn-Over-Mandrel (DOM)
Hot Finished Seamless (HFS)

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
5-1/2 OD							
16 ga	0.065	5.370	3.7730	-	-	-	-
14 ga	0.083	5.334	4.8020	-	-	-	-
11 ga	0.120	5.260	6.8950	●	-	●	-
3/16	0.188	5.125	10.6700	-	-	●	-
1/4	0.250	5.000	14.0200	-	-	●	-
5/16	0.313	4.875	17.3400	-	-	-	-
3/8	0.375	4.750	20.5300	-	-	●	-
7/16	0.438	4.624	23.6800	-	-	-	-
1/2	0.500	4.500	26.7000	-	-	●	-
5/8	0.625	4.250	32.5400	-	-	●	-
3/4	0.750	4.000	38.0500	-	●	-	●
7/8	0.875	3.750	43.2200	-	●	-	-
1	1.000	3.500	48.0600	-	●	-	●
1-1/4	1.250	3.000	56.7400	-	●	-	●
1-1/2	1.500	2.500	64.0800	-	-	-	●
5-5/8 OD							
5/16	0.313	5.000	17.7600	-	-	●	-
3/8	0.375	4.875	21.0300	-	-	-	-
1/2	0.500	4.625	27.3700	-	-	-	-
5/8	0.625	4.375	33.3800	-	-	-	-
3/4	0.750	4.125	39.0500	-	-	-	-
5-3/4 OD							
11 ga	0.120	5.510	7.2150	-	-	-	-
1/8	0.125	5.500	7.5090	-	-	●	-
3/16	0.188	5.375	11.1700	-	-	●	-
1/4	0.250	5.250	14.6900	-	-	●	-
5/16	0.313	5.125	18.1800	-	-	●	-
3/8	0.375	5.000	21.5300	-	-	●	-
1/2	0.500	4.750	28.0400	-	-	●	-
5/8	0.625	4.500	34.2100	-	-	●	-
3/4	0.750	4.250	40.0500	-	●	-	-
7/8	0.875	4.000	45.5600	-	●	-	-
1	1.000	3.750	50.7300	-	●	-	-
1-1/4	1.250	3.250	60.0800	-	-	-	-
6 OD							
16 ga	0.065	5.870	4.1200	●	-	-	-
14 ga	0.083	5.834	5.2450	●	-	-	-
12 ga	0.109	5.782	6.8580	-	-	-	-
11 ga	0.120	5.760	7.5360	●	-	●	-
1/8	0.125	5.750	7.8430	-	-	●	-
10 ga	0.134	5.732	8.3950	-	-	-	-
7 ga	0.180	5.640	11.1900	-	-	-	-

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:

• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

Continued on next page

Electric Resistance Weld (ERW)
Cold Drawn Seamless (CDS)
Drawn-Over-Mandrel (DOM)
Hot Finished Seamless (HFS)

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
6 OD							
3/16	0.188	5.625	11.6700	-	-	●	-
1/4	0.250	5.500	15.3500	-	-	●	-
5/16	0.313	5.375	19.0100	-	-	●	-
3/8	0.375	5.250	22.5300	-	-	●	-
1/2	0.500	5.000	29.3700	-	-	●	-
5/8	0.625	4.750	35.8800	-	-	●	-
3/4	0.750	4.500	42.0500	-	●	-	●
7/8	0.875	4.250	47.8900	-	●	-	-
1	1.000	4.000	53.4000	-	●	-	●
1-1/4	1.250	3.500	63.4100	-	●	-	●
1-1/2	1.500	3.000	72.0900	-	-	-	●
1-3/4	1.750	2.500	79.4330	-	-	-	●
2	2.000	2.000	85.4400	-	-	-	●
6-1/4 OD							
3/16	0.188	5.875	12.1700	-	-	●	-
1/4	0.250	5.750	16.0200	-	-	●	-
3/8	0.375	5.500	23.5300	-	-	●	-
1/2	0.500	5.250	30.7100	-	-	●	-
5/8	0.625	5.000	37.5500	-	-	●	-
3/4	0.750	4.750	44.0600	-	●	-	-
7/8	0.875	4.500	50.2300	-	-	-	-
1	1.000	4.250	56.0700	-	-	-	●
1-1/8	1.125	4.000	61.5800	-	-	-	-
1-1/4	1.250	3.750	66.7500	-	-	-	●
6-1/2 OD							
10 ga	0.134	6.232	9.1110	-	-	-	-
3/16	0.188	6.124	12.6700	-	-	●	-
1/4	0.250	6.000	16.6900	-	-	●	-
3/8	0.375	5.750	24.5300	-	-	●	-
1/2	0.500	5.500	32.0400	-	-	●	-
5/8	0.625	5.250	39.2200	-	-	●	-
3/4	0.750	5.000	46.0600	-	●	-	●
7/8	0.875	4.750	52.2700	-	-	-	-
1	1.000	4.500	58.7400	-	●	-	●
1-1/8	1.125	4.250	64.5800	-	-	-	-
1-1/4	1.250	4.000	70.0900	-	-	-	●
1-1/2	1.500	3.500	80.1000	-	-	-	●
1-3/4	1.750	3.000	88.7780	-	-	-	●
2	2.000	2.500	96.1200	-	-	-	-

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:
• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

Continued on next page

Electric Resistance Weld (ERW)
Cold Drawn Seamless (CDS)
Drawn-Over-Mandrel (DOM)
Hot Finished Seamless (HFS)

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
6-5/8 OD							
16 ga	0.059	6.507	4.3800	-	-	-	-
12 ga	0.105	6.415	7.2900	-	-	-	-
1/8	0.125	6.375	8.6700	-	-	-	-
10 ga	0.135	6.355	9.3200	-	-	-	-
3/16	0.188	6.250	12.9200	-	-	-	-
1/4	0.250	6.125	17.0200	-	-	-	-
5/16	0.313	6.000	21.1000	-	-	●	-
6-3/4 OD							
1/4	0.250	6.250	17.3600	-	-	●	-
3/8	0.375	6.000	25.5300	-	-	●	-
1/2	0.500	5.750	33.3800	-	-	●	-
5/8	0.625	5.500	40.8800	-	-	●	-
3/4	0.750	5.250	48.0600	-	-	-	●
7/8	0.875	5.000	54.9000	-	-	-	-
1	1.000	4.750	61.4100	-	-	-	-
1-1/8	1.125	4.500	67.5800	-	-	-	-
1-1/4	1.250	4.250	73.4300	-	-	-	●
1-1/2	1.500	3.750	84.1100	-	-	-	-
7 OD							
16 ga	0.059	6.882	4.5900	-	-	-	-
14 ga	0.075	6.850	5.6600	-	-	-	-
1/8	0.125	6.750	9.3800	●	-	-	-
3/16	0.188	6.625	13.6800	-	-	●	-
1/4	0.250	6.500	18.0200	-	-	●	-
3/8	0.375	6.250	26.5300	-	-	●	-
1/2	0.500	6.000	34.7100	-	-	●	-
5/8	0.625	5.750	42.5500	-	-	●	-
3/4	0.750	5.500	50.0600	-	●	-	-
7/8	0.875	5.250	57.2300	-	-	-	-
1	1.000	5.000	64.0800	-	●	-	-
1-1/4	1.250	4.500	76.9000	-	-	-	●
1-1/2	1.500	4.000	88.1100	-	-	-	●
1-3/4	1.750	3.500	98.1230	-	-	-	●
2	2.000	3.000	106.8000	-	-	-	●
7-1/4 OD							
3/16	0.188	6.874	14.1790	-	-	-	-
1/4	0.250	6.750	18.6900	-	-	●	-
3/8	0.375	6.500	27.5300	-	-	●	-
1/2	0.500	6.250	36.0500	-	-	●	-
5/8	0.625	6.000	44.2200	-	-	●	-
3/4	0.750	5.750	52.0700	-	-	-	-
7/8	0.875	5.500	59.5700	-	-	-	-
1	1.000	5.250	66.7500	-	-	-	●

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:

• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

Continued on next page

Electric Resistance Weld (ERW)
Cold Drawn Seamless (CDS)
Drawn-Over-Mandrel (DOM)
Hot Finished Seamless (HFS)

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
7-1/2 OD							
1/4	0.250	7.000	19.3600	-	-	●	-
3/8	0.375	6.750	28.5400	-	-	●	-
1/2	0.500	6.500	37.3800	-	-	●	-
5/8	0.625	6.250	45.8900	-	-	●	-
3/4	0.750	6.000	54.0700	-	-	-	●
1	1.000	5.500	69.4200	-	-	-	●
1-1/8	1.125	5.250	57.2300	-	-	-	-
1-1/4	1.250	5.000	83.4400	-	-	-	●
1-1/2	1.500	4.500	96.1200	-	-	-	●
1-3/4	1.750	4.000	107.468	-	-	-	●
2	2.000	3.500	117.5000	-	-	-	●
7-5/8 OD							
1/2	0.500	6.625	38.0500	-	-	-	-
7/8	0.875	5.875	63.0800	-	-	-	-
1	1.000	5.625	70.7600	-	-	-	-
7-3/4 OD							
1/4	0.250	7.250	20.0300	-	-	●	-
3/8	0.375	7.000	29.5400	-	-	●	-
1/2	0.500	6.750	38.7200	-	-	●	-
5/8	0.625	6.500	47.5600	-	-	●	-
3/4	0.750	6.250	56.0600	-	-	-	●
7/8	0.875	6.000	64.2500	-	-	-	-
1	1.000	5.750	72.0900	-	-	-	-
8 OD							
16 ga	0.065	7.780	5.2900	●	-	-	-
14 ga	0.075	7.850	6.4800	-	-	-	-
12 ga	0.105	7.790	9.0500	-	-	-	-
1/8	0.125	7.750	10.7700	●	-	-	-
10 ga	0.135	7.730	11.5800	-	-	-	-
3/16	0.188	7.624	15.6400	-	-	-	-
1/4	0.250	7.500	20.6900	-	-	●	-
3/8	0.375	7.250	30.5400	-	-	●	-
1/2	0.500	7.000	40.0500	-	-	●	-
5/8	0.625	6.750	49.2300	-	-	●	-
3/4	0.750	6.500	58.0700	-	●	-	●
1	1.000	6.000	74.7600	-	●	-	●
1-1/4	1.250	5.500	90.1100	-	-	-	●
1-1/2	1.500	5.000	104.1000	-	-	-	●
1-3/4	1.750	4.500	116.8200	-	-	-	●
2	2.000	4.000	128.1600	-	-	-	●
2-1/4	2.250	3.500	138.2000	-	-	-	-

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:

• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

Continued on next page

Electric Resistance Weld (ERW)
Cold Drawn Seamless (CDS)
Drawn-Over-Mandrel (DOM)
Hot Finished Seamless (HFS)

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
8-1/4 OD							
1/4	0.250	7.750	21.3600	-	-	●	-
3/8	0.375	7.500	31.5400	-	-	●	-
1/2	0.500	7.250	41.3900	-	-	●	-
3/4	0.750	6.750	60.0800	-	-	-	-
7/8	0.875	6.500	68.9200	-	-	-	-
1	1.000	6.250	77.4300	-	-	-	-
1-1/8	1.125	6.000	85.6100	-	-	-	-
1-3/16	1.188	5.875	89.6100	-	-	-	-
1-1/4	1.250	5.750	93.4500	-	-	-	-
8-1/2 OD							
1/4	0.250	8.000	22.0300	-	-	●	-
3/8	0.375	7.750	32.5400	-	-	●	-
1/2	0.500	7.500	42.7200	-	-	●	-
3/4	0.750	7.000	62.0800	-	-	-	●
1	1.000	6.500	80.1000	-	-	-	●
1-1/4	1.250	6.000	96.7900	-	-	-	●
1-1/2	1.500	5.500	112.1000	-	-	-	●
1-3/4	1.750	5.000	126.1600	-	-	-	●
2	2.000	4.500	138.8400	-	-	-	-
8-3/4 OD							
3/8	0.375	8.000	33.5400	-	-	●	-
1/2	0.500	7.750	44.0600	-	-	●	-
3/4	0.750	7.250	64.0800	-	-	-	●
7/8	0.875	7.000	73.6000	-	-	-	-
1	1.000	6.750	82.7700	-	-	-	●
1-1/4	1.250	6.250	100.1300	-	-	-	-
1-1/2	1.500	5.750	116.1100	-	-	-	-
9 OD							
1/4	0.250	8.500	23.3600	-	-	●	-
3/8	0.375	8.250	34.5400	-	-	●	-
1/2	0.500	8.000	45.3900	-	-	●	-
3/4	0.750	7.500	66.0800	-	-	-	●
7/8	0.875	7.250	75.9200	-	-	-	-
1	1.000	7.000	85.4400	-	-	-	●
1-1/4	1.250	6.500	103.5000	-	-	-	●
1-1/2	1.500	6.000	120.5000	-	-	-	●
2	2.000	5.000	149.7000	-	-	-	●
2-1/2	2.500	4.000	173.5500	-	-	-	-
3	3.000	3.000	192.2400	-	-	-	●

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:

• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

Continued on next page

Electric Resistance Weld (ERW)
Cold Drawn Seamless (CDS)
Drawn-Over-Mandrel (DOM)
Hot Finished Seamless (HFS)

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
9-1/4 OD							
1/4	0.250	8.750	24.0300	-	-	●	-
1/2	0.500	8.250	46.7300	-	-	-	-
3/4	0.750	7.750	68.0900	-	-	-	-
1	1.000	7.250	88.1100	-	-	-	-
1-1/2	1.500	6.250	124.2000	-	-	-	-
9-1/2 OD							
1/4	0.250	9.000	24.6980	-	-	●	-
3/8	0.375	8.750	36.5500	-	-	●	-
1/2	0.500	8.500	48.0600	-	-	●	-
3/4	0.750	8.000	70.0880	-	-	-	●
1	1.000	7.500	90.7800	-	-	-	●
1-1/8	1.125	7.250	100.8000	-	-	-	-
1-1/4	1.250	7.000	110.1000	-	-	-	-
1-1/2	1.500	6.500	128.2000	-	-	-	●
2	2.000	5.500	160.2000	-	-	-	●
2-1/2	2.500	4.500	186.9000	-	-	-	-
9-3/4 OD							
1/4	0.250	9.250	25.3700	-	-	-	-
3/8	0.375	9.000	37.5500	-	-	-	-
3/4	0.750	8.250	72.0900	-	-	-	-
1	1.000	7.750	93.4500	-	-	-	-
1-1/2	1.500	6.750	132.2000	-	-	-	-
10 OD							
14 ga	0.075	9.850	8.1700	-	-	-	-
12 ga	0.105	9.790	11.1000	-	-	-	-
1/8	0.125	9.750	13.4900	●	-	-	-
10 ga	0.134	9.732	14.5200	-	-	-	-
3/16	0.188	9.625	19.7000	-	-	-	-
1/4	0.250	9.500	26.0300	-	-	●	-
3/8	0.375	9.250	38.5500	-	-	●	-
1/2	0.500	9.000	50.7300	-	-	●	-
5/8	0.625	8.750	62.5800	-	-	-	-
3/4	0.750	8.500	74.0900	-	-	-	●
7/8	0.875	8.250	85.2600	-	-	-	-
1	1.000	8.000	96.1200	-	-	-	●
1-1/8	1.125	7.750	106.6000	-	-	-	-
1-1/4	1.250	7.500	116.8000	-	-	-	-
1-5/16	1.313	7.375	121.8200	-	-	-	-
1-1/2	1.500	7.000	136.2000	-	-	-	●
1-3/4	1.750	6.500	154.2000	-	-	-	●
2	2.000	6.000	170.9000	-	-	-	●
3	3.000	4.000	224.2800	-	-	-	●

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:

• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

Continued on next page

Electric Resistance Weld (ERW)
Cold Drawn Seamless (CDS)
Drawn-Over-Mandrel (DOM)
Hot Finished Seamless (HFS)

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
10-1/2 OD							
1/4	0.250	10.000	27.3700	-	-	●	-
3/8	0.375	9.750	40.5500	-	-	●	-
1/2	0.500	9.500	53.4000	-	-	●	-
3/4	0.750	9.000	78.1000	-	-	-	-
1	1.000	8.500	101.5000	-	-	-	●
1-1/4	1.250	8.000	123.5000	-	-	-	-
1-1/2	1.500	7.500	144.2000	-	-	-	●
10-3/4 OD							
1/2	0.500	9.750	54.7400	-	-	-	-
3/4	0.750	9.250	80.1000	-	-	-	-
7/8	0.875	9.000	92.3000	-	-	-	-
1	1.000	8.750	104.1000	-	-	-	-
1-1/4	1.250	8.250	126.8300	-	-	-	-
1-1/2	1.500	7.750	148.2000	-	-	-	-
11 OD							
1/4	0.250	10.500	27.368	-	-	●	-
3/8	0.375	10.250	42.553	-	-	●	-
1/2	0.500	10.000	56.0700	-	-	●	-
3/4	0.750	9.500	82.1000	-	-	-	-
1	1.000	9.000	106.8000	-	-	-	●
1-1/2	1.500	8.000	152.1900	-	-	-	-
2	2.000	7.000	192.2000	-	-	-	●
3	3.000	5.000	256.3200	-	-	-	-
11-1/2 OD							
1/4	0.250	11.000	30.0400	-	-	-	-
1/2	0.500	10.500	58.7400	-	-	●	-
3/4	0.750	10.000	86.1100	-	-	-	-
1	1.000	9.500	112.1000	-	-	-	-
1-1/2	1.500	8.500	106.2000	-	-	-	-
12 OD							
12 ga	0.105	11.790	13.6500	-	-	-	-
10 ga	0.135	11.730	17.5500	-	-	-	-
3/16	0.188	11.625	24.3000	-	-	-	-
1/4	0.250	11.500	31.3730	-	-	●	-
3/8	0.375	11.250	45.5600	-	-	●	-
1/2	0.500	11.000	61.4100	-	-	●	-
3/4	0.750	10.500	90.1100	-	-	-	●
1	1.000	10.000	117.5000	-	-	-	●
1-1/4	1.250	9.500	143.5000	-	-	-	-
1-1/2	1.500	9.000	168.2000	-	-	-	●
2	2.000	8.000	213.6000	-	-	-	●
2-1/4	2.250	7.500	234.3000	-	-	-	-

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:
• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

Continued on next page

Electric Resistance Weld (ERW)
Cold Drawn Seamless (CDS)
Drawn-Over-Mandrel (DOM)
Hot Finished Seamless (HFS)

ERW - Electric Resistance Weld
CDS - Cold Drawn Seamless
DOM - Drawn Over Mandrel
HFS - Hot Finished Seamless

20 foot - ERW
x - Stock Size
17 - 24 ft. random lengths DOM/CDS
12 - 24 ft. - HFS

(OD) Outside Dimension & Gauge (inches)	Wall Thickness (inches)	(ID) Inside Diameter (inches)	Weight (lbs./ft.)	ERW	CDS	DOM	HFS
12-1/2 OD							
1	1.000	10.500	122.8200	-	-	-	●
13 OD							
1/2	0.500	12.000	66.7500	-	-	-	●
14 OD							
3/4	0.750	12.500	106.1330	-	-	-	●
1	1.000	12.000	138.8400	-	-	-	●
1-1/2	1.500	11.000	200.2500	-	-	-	●
15 OD							
1/2	0.500	14.000	77.4300	-	-	-	●
16 OD							
1/2	0.500	15.000	82.7700	-	-	-	●
17 OD							
1/2	0.500	16.000	88.1100	-	-	-	●

Drawn over Mandrel (DOM) tubing is defined by three different dimensions:

• Inside Diameter (ID) • Outside Diameter (OD) • Wall Thickness

When ordering, only 2 of the 3 tolerances must be defined. Alro Steel purchases DOM tubing, for general inventory, to the outside diameter and inside diameter. If you do not see a size listed, please contact your Alro representative.

WARNING: These products can potentially expose you to chemicals including Nickel, Chromium, Lead, Cobalt, Mercury and Beryllium, which are known to the state of California to cause cancer and/or birth defects or other reproductive harm. For more information, visit **www.P65Warnings.ca.gov**

Hydraulic Tubing (Seamless)

SAE - J524

This SAE Standard covers cold drawn and annealed seamless low-carbon steel pressure tubing intended for use as hydraulic lines and in other applications requiring tubing of a quality suitable for flaring and bending.

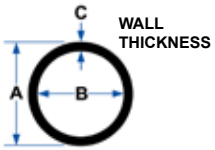
● = ***Alro Stock Size***

(OD) Outside Diameter and Gauge (inches)				(ID) Inside Dia. (inches)	Weight (lbs./ft.)	Seamless
1/8	OD	x	.028 Wall	0.069	0.0290	-
			.035 Wall	0.055	0.0320	●
3/16	OD	x	.035 Wall	0.117	0.0572	●
1/4	OD	x	.028 Wall	0.194	0.0660	-
			.035 Wall	0.180	0.0804	●
			.049 Wall	0.152	0.1050	●
			.065 Wall	0.120	0.1280	-
5/16	OD	x	.035 Wall	0.242	0.1040	●
3/8	OD	x	.035 Wall	0.305	0.1271	●
			.049 Wall	0.277	0.1706	●
			.065 Wall	0.245	0.2152	●
1/2	OD	x	.035 Wall	0.430	0.1738	●
			.049 Wall	0.402	0.2360	●
			.065 Wall	0.370	0.3020	●
			.083 Wall	0.334	0.3700	-
5/8	OD	x	.035 Wall	0.555	0.2205	●
			.049 Wall	0.527	0.3010	●
			.065 Wall	0.495	0.3890	●
			.083 Wall	0.459	0.4810	●
3/4	OD	x	.035 Wall	0.680	0.2670	-
			.049 Wall	0.652	0.3670	●
			.065 Wall	0.620	0.4755	●
			.083 Wall	0.584	0.5910	●
			.095 Wall	0.560	0.6646	-
			.120 Wall	0.510	0.8070	●
1	OD	x	.049 Wall	0.930	0.4980	-
			.065 Wall	0.870	0.6490	●
			.083 Wall	0.834	0.8130	-
			.120 Wall	0.760	1.1280	●

Carbon Steel Pipe

ASTM A-53 (Tested) and ASTM A-500 Grade B (Structural)

Standard Lengths: 21 ft. and 42 ft.



"A" Schedule	"C" Wall Thick	"B" Theor. I.D.	Weight (lbs./ft.)	ASTM Type
1/8 IPS (.405 OD)				
Sched. 40	.068	.269	.245	A-53
Sched. 80	.095	.215	.315	A-53
1/4 IPS (.540 OD)				
Sched. 40	.088	.364	.425	A-53
Sched. 80	.119	.302	.535	A-53
3/8 IPS (.675 OD)				
Sched. 40	.091	.493	.568	A-53
Sched. 80	.126	.423	.739	A-53
1/2 IPS (.840 OD)				
Sched. 10	.083	.674	.670	A-500B
Sched. 40	.109	.622	.851	A-53
Sched. 40	.109	.622	.851	A-500B
Sched. 80	.147	.546	1.088	A-53
3/4 IPS (1.050 OD)				
Sched. 10	.083	.884	.857	A-500B
Sched. 40	.113	.824	1.131	A-53
Sched. 40	.113	.824	1.131	A-500B
Sched. 80	.154	.742	1.474	A-53
1 IPS (1.315 OD)				
Sched. 10	.109	1.097	1.410	A-500B
Sched. 40	.133	1.049	1.679	A-53
Sched. 40	.133	1.049	1.679	A-500B
Sched. 80	.179	.957	2.172	A-53
1-1/4 IPS (1.660 OD)				
Sched. 10	.109	1.442	1.810	A-500B
Sched. 40	.140	1.380	2.273	A-53
Sched. 40	.140	1.380	2.273	A-500B
Sched. 80	.191	1.278	2.997	A-53
Sched. 80	.191	1.278	2.997	A-500B
1-1/2 IPS (1.900 OD)				
Sched. 10	.109	1.682	2.090	A-500B
Sched. 40	.145	1.610	2.718	A-53
Sched. 40	.145	1.610	2.718	A-500B
Sched. 80	.200	1.500	3.631	A-53
Sched. 80	.200	1.500	3.631	A-500B

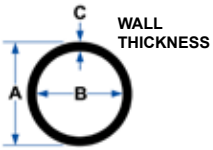
A-53 is available in Galvanized

Continued on next page

Carbon Steel Pipe

ASTM A-53 (Tested) and ASTM A-500 Grade B (Structural)

Standard Lengths: 21 ft. and 42 ft.



"A" Schedule	"C" Wall Thick	"B" Theor. I.D.	Weight (lbs./ft.)	ASTM Type
2 IPS (2.375 OD)				
Sched. 10	.109	2.157	2.640	A500B
Sched. 40	.154	2.067	3.653	A-53
Sched. 40	.154	2.067	3.653	A-500B
Sched. 80	.218	1.939	5.022	A-53
Sched. 80	.218	1.939	5.022	A-500B
2-1/2 IPS (2.875 OD)				
Sched. 40	.203	2.469	5.793	A-53
Sched. 40	.203	2.469	5.793	A-500B
Sched. 80	.276	2.323	7.661	A-53
Sched. 80	.276	2.323	7.661	A-500B
3 IPS (3.500 OD)				
Sched. 40	.216	3.068	7.576	A-53
Sched. 40	.216	3.068	7.576	A-500B
Sched. 80	.300	2.900	10.250	A-53
Sched. 80	.300	2.900	10.250	A-500B
3-1/2 IPS (4.000 OD)				
Sched. 40	.226	3.548	9.109	A-53
Sched. 40	.226	3.548	9.109	A-500B
Sched. 80	.318	3.364	12.510	A-53
Sched. 80	.318	3.364	12.510	A-500B
4 IPS (4.500 0D)				
Sched. 40	.237	4.026	10.790	A-53
Sched. 40	.237	4.026	10.790	A-500B
Sched. 80	.337	3.826	14.997	A-53
Sched. 80	.337	3.826	14.997	A-500B
5 IPS (5.563 OD)				
Sched. 40	.258	5.047	14.620	A-53
Sched. 40	.258	5.047	14.620	A-500B
Sched. 80	.375	4.813	20.780	A-53
Sched. 80	.375	4.813	20.780	A-500B
6 IPS (6.625 0D)				
Sched. 10	.134	6.357	9.289	
Sched. 40	.280	6.065	18.970	A-53
Sched. 40	.280	6.065	18.970	A-500B
Sched. 80	.432	5.761	28.570	A-53
Sched. 80	.432	5.761	28.570	A-500B

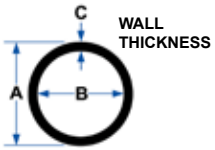
A-53 is available in Galvanized

Continued on next page

Carbon Steel Pipe

ASTM A-53 (Tested) and ASTM A-500 Grade B (Structural)

Standard Lengths: 21 ft. and 42 ft.



"A" Schedule	"C" Wall Thick	"B" Theor. I.D.	Weight (lbs./ft.)	ASTM Type
8 IPS (8.625 0D)				
Sched. 40	.322	7.981	28.550	A-53
Sched. 40	.322	7.981	28.550	A-500B
Sched. 80	.500	7.625	43.428	A-53
Sched. 80	.500	7.625	43.428	A-500B
10 IPS (10.75 0D)				
Sched. 20	.250	10.250	28.040	A-500B
Sched. 40	.365	10.020	40.480	A-53
Sched. 80	.594	9.562	64.430	A-500B
12 IPS (12.75 OD)				
	.375	12.000	49.608	A-500B
	.500	11.750	65.476	A-500B
Sched. 80	.688	11.374	88.710	A-500B
14 IPS				
	.375	13.250	54.619	
16 IPS (16.00 OD)				
Sched.10	.250	15.500	42.090	A-500B
Sched. 30	.375	15.250	62.640	A-500B
Sched. 40	.500	15.000	82.848	A-500B
20 IPS				
Sched. 20	.375	19.250	78.600	

Mechanical Tubing Tolerances

Tolerances, Outside Dimensions for Square and Rectangular Tubing*

Widest Side (inches)	Tolerance (inches)
3/8 thru 5/8	+/- 0.004
Over 5/8 up to 1-1/8	+/- 0.005
1-1/8 up to 1-1/2	+/- 0.006
1-1/2 to 2	+/- 0.008

**** Measured at corners at least 2" from cut end of tubing.***

Convexity and Concavity Tolerances**

Widest Side (inches)	Tolerance (inches)
Up thru 2-1/2	+/- 0.010
Over 2-1/2 to 4	+/- 0.015

***** Measured in center of the flat sides, applies to size determined at the corners.***

Straightness Tolerances	Wall Tolerances
Maximum = 1/16" in 3 ft.	+/- 10% of nominal wall spec.

Structural Tubing Tolerances

Outside dimension tolerances for Square & Rectangular Structural Tubing

Largest Out. Dim., Across Flats, inches (mm)	Tolerance*, inches (mm)
Up thru 2-1/2 (63.5)	+/- 0.020 (0.51)
Over 2-1/2 thru 3-1/2 (63.5 to 88.9)	+/- 0.025 (0.64)
Over 3-1/2 thru 5-1/2 (88.9 to 139.7)	+/- 0.030 (0.76)
Over 5-1/2" (139.7)	+/- 1%

*Tolerances include allowance for convexity and concavity. For rectangular sections, the tolerance calculated for the larger flat dimension shall also apply to the smaller flat dimension. This tolerance may be increased 50% when applied to the smaller dimension, if the ratio of cross-sectional dimensions is between 1.5 and 3, and 100% when the ratio exceeds 3.

Wall Thickness Tolerances for Square and Rectangular Structural Tubing 10% of the specified wall thickness.

Radius of Corners: For Square and Rectangular Structutral Tubing, the radius of each outside corner of the section shall not exceed three times the specified wall thickness.

Specified Mill Length Tolerances for Square & Rectangular Structural Tubing

Widest Side inches (mm)	Up thru 22 ft. (6.7 m)		Over 22 ft. thru 44 ft. (6.7 m thru 13.4 m)	
	Over	Under	Over	Under
Length Tolerance for Specified Mill Length, inches (mm)	1/2 (12.7)	1/4 (6.4)	3/4 (19.0)	1/4 (6.4)

**Measured at corners at least 2" from cut end of tubing.*

Straightness Tolerances Max. = .025" per ft.

Cold Drawn Seamless Tubing Tolerances

ASTM A519

O.D. (inches)	Wall as % of O.D.	O.D. (inches) +	O.D. (inches) -	I.D. (inches) +	I.D. (inches) -
Up to 0.499	all	0.004	0.000	---	---
0.500 - 1.699	all	0.005	0.000	0.000	0.005
1.700 - 2.099	all	0.006	0.000	0.000	0.006
2.100 - 2.499	all	0.007	0.000	0.000	0.007
2.500 - 2.899	all	0.008	0.000	0.000	0.008
2.900 - 3.299	all	0.009	0.000	0.000	0.009
3.300 - 3.699	all	0.010	0.000	0.000	0.010
3.700 - 4.099	all	0.011	0.000	0.000	0.011
4.100 - 4.499	all	0.012	0.000	0.000	0.012
4.500 - 4.899	all	0.013	0.000	0.000	0.013
4.900 - 5.299	all	0.014	0.000	0.000	0.014
5.300 - 5.549	all	0.015	0.000	0.000	0.015
5.550 - 5.999	under 6	0.010	0.010	0.010	0.010
	6 to 7-1/2	0.009	0.009	0.009	0.009
	over 7-1/2	0.018	0.000	0.009	0.009
6.000 - 6.499	under 6	0.013	0.013	0.013	0.013
	6 to 7-1/2	0.010	0.010	0.010	0.010
	over 7-1/2	0.020	0.000	0.010	0.010
6.500 - 6.999	under 6	0.015	0.015	0.015	0.015
	6 to 7-1/2	0.012	0.012	0.012	0.012
	over 7-1/2	0.023	0.000	0.012	0.012
7.000 - 7.499	under 6	0.018	0.018	0.018	0.018
	6 to 7-1/2	0.013	0.013	0.013	0.013
	over 7-1/2	0.026	0.000	0.013	0.013
7.500 - 7.999	under 6	0.020	0.020	0.020	0.020
	6 to 7-1/2	0.015	0.015	0.015	0.015
	over 7-1/2	0.029	0.000	0.015	0.015
8.000 - 8.499	under 6	0.023	0.023	0.023	0.023
	6 to 7-1/2	0.016	0.016	0.016	0.016
	over 7-1/2	0.031	0.000	0.015	0.016
8.500 - 8.999	under 6	0.025	0.025	0.025	0.025
	6 to 7-1/2	0.017	0.017	0.017	0.017
	over 7-1/2	0.034	0.000	0.015	0.019
9.000 - 9.499	under 6	0.028	0.028	0.028	0.028
	6 to 7-1/2	0.019	0.019	0.019	0.019
	over 7-1/2	0.037	0.000	0.015	0.022
9.500 - 9.999	under 6	0.030	0.030	0.030	0.030
	6 to 7-1/2	0.020	0.020	0.020	0.020
	over 7-1/2	0.040	0.000	0.015	0.025
10.000 - 10.999	under 6	0.034	0.034	0.034	0.034
	6 to 7-1/2	0.022	0.022	0.022	0.022
	over 7-1/2	0.044	0.000	0.015	0.029
11.000 - 12.000	under 6	0.035	0.035	0.035	0.035
	6 to 7-1/2	0.025	0.025	0.025	0.025
	over 7-1/2	0.045	0.000	0.015	0.035

- Many tubes with ID less than 50% of OD or with wall more than 25% of OD, or with wall over 1-1/4", or weighing more than 90 lb./ft. are difficult to draw over a mandrel. Therefore, the ID can vary over or under by an amount equal to 10% of the wall thickness.
- For tubes with ID less than 1/2", or less than 5/8" when the wall thickness is more than 20% of the OD, which are not commonly drawn over a mandrel the above footnote not applicable.
- Tubing having a wall less than 3% of the OD cannot be straightened properly without a certain amount of distortion. Consequently such tubes, while having an average OD and ID within the tolerances shown in this table, require an ovality of tolerance of 1/2% over and under nominal outside diameter, in addition to the tolerances indicated in this table.

Cold Drawn Seamless

Wall Thickness Tolerances

Wall Thickness as % of OD ASTM A519	% Over & Under Nominal	
	thru 1.4999" ID	1.500" ID & up
25 and under	10.0	7.5
Over 25	12.5	10.0

Straightness Tolerances for Seamless Round Mechanical Tubing

NOTE 1—The straightness variation for any 3 ft (0.9 m) of length is determined by measuring the concavity between the tube and a 3-ft straightedge with a feeler gage. The total variation, that is, the maximum curvature at any point in the total length of tube, is determined by rolling the tube on a surface plate and measuring the concavity with a feeler gauge.

NOTE 2—The tolerances apply generally to unannealed, finish-annealed, and medium-annealed cold-finished or hot-finished tubes. When straightening stress would interfere with the use of the end product, the straightness tolerances shown do not apply when tubing is specified "not to be straightened after furnace treatment.'' These straightness tolerances do not apply to soft-annealed or quenched and tempered tubes.

Size Limits	Maxiumum Curvature in any 3 ft./in. (mm/m)	Maxiumum Curvature in Total Lengths, inches (mm)	Maxiumum Curvature for Lengths under 3 feet or 1 meter
OD 5 in. (127.0 mm) and smaller. Wall thickness, over 3 % of OD	0.030 (0.83)	0.030 × (no. of ft of length/3) (0.83 × no. of m of length)	ratio of 0.010 in./ft or 0.83 mm/m
OD over 5 to 8 in. (127.0 to 203.2 mm), incl. Wall thickness, over 4 % of OD	0.045 (1.25)	0.045 × (no. of ft of length/3) (1.25 × no. of m of length)	ratio of 0.015 in./ft or 1.25 mm/m
OD over 8 to 12-3⁄4 in. (203.2 to 323.8 mm), incl. Wall thickness, over 4 % of OD	0.060 (1.67)	0.060 × (no. of ft of length/3) (1.67 × no. of m of length)	ratio of 0.020 in./ft or 16.7 mm/m

Sizes over 12-3/4" do not have an ASTM published straightness tolerance. These sizes vary by producer. Check with your Alro Representative for more details.

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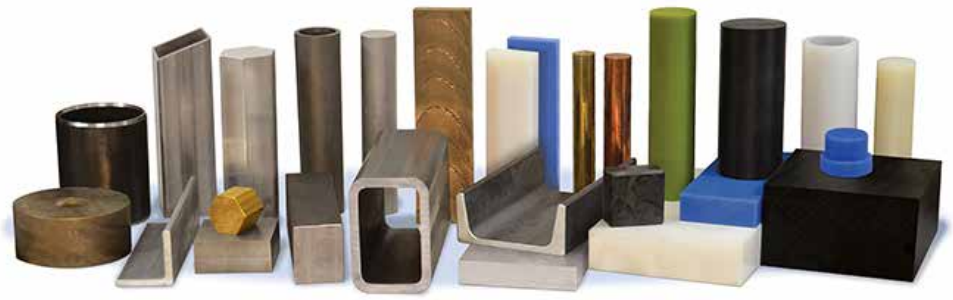

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- **Purchase orders**
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- **Quotes**
- **POD - Electronic Proof of Delivery**
- **ACH Payment notifications**
- **Mill Certifications**
- **CAD drawings**
- **Burn prints**
- **Material releases**

Diameter Tolerances for Type 1 (A.W.H.R.) Round Tubing

Note: Measurements for diameter are to be taken at least 2 inches from the ends of the tubes.

Outside Diameter Range (inches)	Bwg[E]	Wall Thickness (inches)	Flash-in-Tubing[A,B]	Flash Controlled to 0.010" max Tubing[B,C]	Flash Controlled to 0.005" (0.13 mm) max Tubing[C,D]	
			Outside Dia., +/- (inches)	Outside Dia., +/- (inches)	Outside Dia., +/- (inches)	Inside Dia., +/- (inches)
1/2 to 1-1/8	16 to 10	0.065 to 0.134	0.0035	0.0035	0.0035	0.020
Over 1-1/8 to 2	16 to 14	0.065 to 0.083	0.005	0.005	0.005	0.021
Over 1-1/8 to 2	13 to 7	0.095 to 0.180	0.005	0.005	0.005	0.025
Over 1-1/8 to 2	6 to 5	0.203 to 0.220	0.005	0.005	0.005	0.029
Over 1-1/8 to 2	4 to 3	0.238 to 0.259	0.005	0.005	0.005	0.039
Over 2 to 2-1/2	16 to 14	0.065 to 0.083	0.006	0.006	0.006	0.022
Over 2 to 2-1/2	13 to 5	0.095 to 0.220	0.006	0.006	0.006	0.024
Over 2 to 2-1/2	4 to 3	0.238 to 0.259	0.006	0.006	0.006	0.040
Over 2-1/2 to 3	16 to 14	0.065 to 0.083	0.008	0.008	0.008	0.024
Over 2-1/2 to 3	13 to 5	0.095 to 0.220	0.008	0.008	0.008	0.026
Over 2-1/2 to 3	4 to 3	0.238 to 0.259	0.008	0.008	0.008	0.040
Over 2-1/2 to 3	2 to 0.320	0.284 to 0.320	0.010	0.010	0.010	0.048
Over 3 to 3-1/2	16 to 14	0.065 to 0.083	0.009	0.009	0.009	0.025
Over 3 to 3-1/2	13 to 5	0.095 to 0.220	0.009	0.009	0.009	0.027
Over 3 to 3-1/2	4 to 3	0.238 to 0.259	0.009	0.009	0.009	0.043
Over 3 to 3-1/2	2 to 0.360	0.284 to 0.360	0.012	0.012	0.012	0.050
Over 3 1/2 to 4	16 to 14	0.065 to 0.083	0.010	0.010	0.010	0.026
Over 3 1/2 to 4	13 to 5	0.095 to 0.220	0.010	0.010	0.010	0.028
Over 3 1/2 to 4	4 to 3	0.238 to 0.259	0.010	0.010	0.010	0.044
Over 3 1/2 to 4	2 to 0.500	0.284 to 0.500	0.015	0.015	0.015	0.053
Over 4 to 5	16 to 14	0.065 to 0.083	0.020	0.020	0.020	0.036
Over 4 to 5	13 to 5	0.095 to 0.220	0.020	0.020	0.020	0.045
Over 4 to 5	4 to 3	0.238 to 0.259	0.020	0.020	0.020	0.054
Over 4 to 5	2 to 0.500	0.284 to 0.500	0.020	0.020	0.020	0.058

[A] Flash-In-Tubing is produced only to outside diameter tolerances and wall thickness tolerances and the inside diameter welding flash does not exceed the wall thickness or 3/32 in., whichever is less.

[B] Flash Controlled to 0.010 in. maximum tubing consists of tubing which is commonly produced only to outside diameter tolerances and wall thickness tolerances, in which the height of the remaining welding flash is controlled not to exceed 0.010 in.

[C] Flash Controlled to 0.005 in. maximum tubing is produced to outside diameters and wall thickness tolerance, inside diameter and wall thickness tolerances, or outside diameters and inside diameter tolerances, in which the height of the remaining flash is controlled not to exceed 0.005 in. Any remaining flash is considered to be part of the applicable inside diameter tolerances

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Diameter Tolerances for Type 1 (A.W.H.R.) Round Tubing

Note: Measurements for diameter are to be taken at least 2 inches from the ends of the tubes.

Outside Diameter Range (inches)	Bwg[E]	Wall Thickness (inches)	Flash-in-Tubing[A,B]	Flash Controlled to 0.010" max Tubing[B,C]	Flash Controlled to 0.005" (0.13 mm) max Tubing[C,D]	
			Outside Dia., +/- (inches)	Outside Dia., +/- (inches)	Outside Dia., +/- (inches)	Inside Dia., +/- (inches)
Over 5 to 6	16 to 10	0.065 to 0.134	0.020	0.020	0.020	0.036
Over 5 to 6	9 to 5	0.148 to 0.220	0.020	0.020	0.020	0.040
Over 5 to 6	4 to 3	0.238 to 0.259	0.020	0.020	0.020	0.054
Over 5 to 6	2 to 0.500	0.284 to 0.500	0.020	0.020	0.020	0.058
Over 6 to 8	11 to 10	0.120 to 0.134	0.025	0.025	0.025	0.043
Over 6 to 8	9 to 5	0.148 to 0.220	0.025	0.025	0.025	0.045
Over 6 to 8	4 to 3	0.238 to 0.259	0.025	0.025	0.025	0.059
Over 6 to 8	2 to 0.500	0.284 to 0.500	0.025	0.025	0.025	0.063
Over 8 to 10	16 to 10	0.065 to 0.134	0.030	0.030	0.030	0.041
Over 8 to 10	16 to 14	0.065 to 0.083	0.030	0.030	0.030	0.043
Over 8 to 10	13 to 7	0.095 to 0.180	0.030	0.030	0.030	0.045
Over 8 to 10	6 to 5	0.203 to 0.220	0.030	0.030	0.030	0.059
Over 8 to 10	4 to 3	0.238 to 0.259	0.030	0.030	0.030	0.063
Over 10 to 12	14 to 12	0.083 to 0.109	0.035	0.035	0.035	0.041
Over 10 to 12	11 to 10	0.120 to 0.134	0.035	0.035	0.035	0.043
Over 10 to 12	9 to 5	0.148 to 0.220	0.035	0.035	0.035	0.045
Over 10 to 12	4 to 3	0.238 to 0.259	0.035	0.035	0.035	0.059
Over 10 to 12	2 to 0.500	0.284 to 0.500	0.035	0.035	0.035	0.063
Over 12 to 15	14 to 12	0.083 to 0.109	0.040	0.040	0.040	0.058
Over 12 to 15	11 to 10	0.120 to 0.134	0.040	0.040	0.040	0.058
Over 12 to 15	9 to 5	0.148 to 0.220	0.040	0.040	0.040	0.060
Over 12 to 15	4 to 3	0.238 to 0.259	0.040	0.040	0.040	0.074
Over 12 to 15	2 to 0.500	0.284 to 0.500	0.040	0.040	0.040	0.086

[A] Flash-In-Tubing is produced only to outside diameter tolerances and wall thickness tolerances and the inside diameter welding flash does not exceed the wall thickness or 3⁄32 in., whichever is less.

[B] Flash Controlled to 0.010 in. maximum tubing consists of tubing which is commonly produced only to outside diameter tolerances and wall thickness tolerances, in which the height of the remaining welding flash is controlled not to exceed 0.010 in.

[C] Flash Controlled to 0.005 in. maximum tubing is produced to outside diameters and wall thickness tolerance, inside diameter and wall thickness tolerances, or outside diameters and inside diameter tolerances, in which the height of the remaining flash is controlled not to exceed 0.005 in. Any remaining flash is considered to be part of the applicable inside diameter tolerances

Wall Thickness Tolerances for Type 1 (A.W.H.R.) Round Tubing

Wall Thickness		Outside Diameter,[A]									
		3/4" to 1", including		Over 1" to 1-15/16", incl.		Over 1-15/16" to 3-3/4", incl.		Over 3-3/4" to 4-1/2", incl.		Over 4-1/2" to 6", incl.	
		Wall Thickness Tolerances, inches, +/-[B]									
in.[A]	Bwg.[A]	+	–	+	–	+	–	+	–	+	–
0.065	16	0.005	0.009	0.004	0.010	0.003	0.011	0.002	0.012	0.002	0.012
0.072	15	0.005	0.009	0.004	0.010	0.003	0.011	0.002	0.012	0.002	0.012
0.083	14	0.006	0.010	0.005	0.011	0.004	0.012	0.003	0.013	0.003	0.013
0.095	13	0.006	0.010	0.005	0.011	0.004	0.012	0.003	0.013	0.003	0.013
0.109	12	0.006	0.010	0.005	0.011	0.004	0.012	0.003	0.013	0.003	0.013
0.120	11	0.006	0.010	0.005	0.011	0.004	0.012	0.003	0.013	0.003	0.013
0.134	10	0.006	0.010	0.005	0.011	0.004	0.012	0.003	0.013	0.003	0.013
0.148	9	---	---	0.006	0.012	0.005	0.013	0.004	0.014	0.004	0.014
0.165	8	---	---	0.006	0.012	0.005	0.013	0.004	0.014	0.004	0.014
0.180	7	---	---	0.006	0.012	0.005	0.013	0.004	0.014	0.004	0.014
0.203	6	---	---	---	---	0.007	0.015	0.006	0.016	0.005	0.017
0.220	5	---	---	---	---	0.007	0.015	0.006	0.016	0.005	0.017
0.238	4	---	---	---	---	0.012	0.020	0.011	0.021	0.010	0.022
0.259	3	---	---	---	---	0.013	0.021	0.012	0.022	0.011	0.023
0.284	2	---	---	---	---	0.014	0.022	0.013	0.023	0.012	0.024
0.300	1	---	---	---	---	0.015	0.023	0.014	0.024	0.013	0.025
0.320		---	---	---	---	0.016	0.024	0.015	0.025	0.014	0.026
0.344		---	---	---	---	0.017	0.025	0.016	0.026	0.015	0.027
0.360		---	---	---	---	0.017	0.025	0.016	0.026	0.015	0.027
0.375		---	---	---	---	---	---	0.016	0.026	0.015	0.027
0.406		---	---	---	---	---	---	0.017	0.027	0.016	0.028
0.438		---	---	---	---	---	---	0.017	0.027	0.016	0.028
0.469		---	---	---	---	---	---	---	---	0.016	0.028
0.500		---	---	---	---	---	---	---	---	0.016	0.028

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Wall Thickness Tolerances for Type 1 (A.W.H.R.) Round Tubing

Wall Thickness		Outside Diameter,[A]							
		Over 6" to 8", incl.		Over 8" to 10", incl.		Over 10" to 12", incl.		Over 12" to 15", incl.	
		Wall Thickness Tolerances, inches, +/-[B]							
in.[A]	Bwg.[A]	+	–	+	–	+	–	+	–
0.065	16	0.002	0.012	---	---	---	---	---	---
0.072	15	0.002	0.012	0.003	0.013	---	---	---	---
0.083	14	0.003	0.013	0.003	0.013	0.003	0.013	0.003	0.013
0.095	13	0.003	0.013	0.003	0.013	0.003	0.013	0.003	0.013
0.109	12	0.003	0.013	0.003	0.013	0.003	0.013	0.003	0.013
0.120	11	0.003	0.013	0.003	0.013	0.003	0.013	0.003	0.013
0.134	10	0.003	0.013	0.003	0.013	0.003	0.013	0.003	0.013
0.148	9	0.004	0.014	0.004	0.014	0.004	0.014	0.004	0.014
0.165	8	0.004	0.014	0.004	0.014	0.004	0.014	0.004	0.014
0.180	7	0.004	0.014	0.004	0.014	0.004	0.014	0.004	0.014
0.203	6	0.005	0.017	0.005	0.017	0.005	0.017	0.005	0.017
0.220	5	0.005	0.017	0.005	0.017	0.005	0.017	0.005	0.017
0.238	4	0.010	0.022	0.010	0.022	0.010	0.022	0.010	0.022
0.259	3	0.011	0.023	0.011	0.023	0.011	0.023	0.011	0.023
0.284	2	0.012	0.024	0.012	0.024	0.012	0.024	0.012	0.024
0.300	1	0.013	0.025	0.013	0.025	0.013	0.025	0.013	0.025
0.320		0.014	0.026	0.014	0.026	0.014	0.026	0.014	0.026
0.344		0.015	0.027	0.015	0.027	0.015	0.027	0.015	0.027
0.360		0.015	0.027	0.015	0.027	0.015	0.027	0.015	0.027
0.375		0.015	0.027	0.015	0.027	0.015	0.027	0.015	0.027
0.406		0.016	0.028	0.016	0.028	0.016	0.028	0.016	0.028
0.438		0.016	0.028	0.016	0.028	0.016	0.028	0.016	0.028
0.469		0.016	0.028	0.016	0.028	0.016	0.028	0.016	0.028
0.500		0.016	0.028	0.016	0.028	0.016	0.028	0.016	0.028

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Diameter Tolerances for D.O.M Tubing

ASTM A513-T5

Outside diameter tolerances for cold rolled steel tubing, sink drawn and mandrel drawn

Outside Diameter Size Range[A]	Wall % of Outside Diameter	Types 3 and 4, (Sink Drawn)[A,B] Types 5 and 6 (Mandrel Drawn)[B,C] OD in inches		Types 5 and 6 (Mandrel Drawn)[B,C] ID in inches	
		Over	Under	Over	Under
Up to 0.499	all	.004	.000	-	-
0.500 - 1.699	all	.005	.000	.000	.005
1.700 - 2.099	all	.006	.000	.000	.006
2.100 - 2.499	all	.007	.000	.000	.007
2.500 - 2.899	all	.008	.000	.000	.008
2.900 - 3.299	all	.009	.000	.000	.009
3.300 - 3.699	all	.010	.000	.000	.010
3.700 - 4.099	all	.011	.000	.000	.011
4.100 - 4.499	all	.012	.000	.000	.012
4.500 - 4.899	all	.013	.000	.000	.013
4.900 - 5.299	all	.014	.000	.000	.014
5.300 - 5.549	all	.015	.000	.000	.015
5.550 - 5.999	under 6 6 and over	.010 .009	.010 .009	.010 .009	.010 .009
6.000 - 6.499	under 6 6 and over	.013 .010	.013 .010	.013 .010	.013 .010
6.500 - 6.999	under 6 6 and over	.015 .012	.015 .012	.015 .012	.015 .012
7.000 - 7.499	under 6 6 and over	.018 .013	.018 .013	.018 .013	.018 .013
7.500 - 7.999	under 6 6 and over	.020 .015	.020 .015	.020 .015	.020 .015
8.000 - 8.499	under 6 6 and over	.023 .016	.023 .016	.023 .016	.023 .016
8.500 - 8.999	under 6 6 and over	.025 .017	.025 .017	.025 .017	.025 .017
9.000 - 9.499	under 6 6 and over	.028 .019	.028 .019	.028 .019	.028 .019
9.500 - 9.999	under 6 6 and over	.030 .020	.030 .020	.030 .020	.030 .020
10.000 - 10.999	all	.034	.034	.034	.034
11.000 - 11.999	all	.035	.035	.035	.035
12.000 - 12.999	all	.036	.036	.036	.036
13.000 - 13.999	all	.037	.037	.037	.037
14.000 - 14.999	all	.038	.038	.038	.038

NOTE: Alro Steel lists

[A] Tubing, flash in or flash controlled which is further processed without mandrel to obtain tolerances closer than those .

[B] Birmingham Wire Gauge.

[C] Where the elipsis (...) appears in this table, the tolerance is not addressed.

[D] The ovality shall be within the above tolerances except when the wall thickness is less than 3% of outside diameter, in such cases see "Ovality Tolerances" (pg. 4-49)

Straightness-- The straightness tolerance is 1/16 in./3 ft (1.7mm/1m). The test method for straightness measurement is at the manufacturer's option, unless a specific test method is specified in the purchase order.

Outside Diameter Tolerances for Hot Finished Seamless Tubing [A,B,C]

Outside Diameter (inches)	Over (inches)	Under (inches)
Up to 2.999	0.020	0.020
3.000 to 4.499	0.025	0.025
4.500 to 5.999	0.031	0.031
6.000 to 7.499	0.037	0.037
7.500 to 8.999	0.045	0.045
9.000 to 10.750	0.050	0.050

[A] Diameter tolerances are not applicable to normalized and tempered or quenched and tempered conditions.

[B] The common range of sizes of hot finished tubes is 1½" to 10¾" outside diameter with wall thickness at least 3% more of outside diameter, but not less than 0.095".

[C] Larger sizes are available; consult manufacturer for sizes and tolerances.

Hot Finished Seamless Round Tubing Wall Thickness Tolerances

Wall Thickness (inches), as % of Outside Dia. ASTM A519	Wall Thickness Tolerance[A] (inches), % Over and Under Nominal		
	2.999"O.D. & Smaller	3.000" to 5.999"O.D.	6.000" to 10.750"O.D.
Under 15	12.5	10.0	10.0
15 and over	10.0	7.5	10.0

[A] *Wall thickness tolerances may not be applicable to walls 0.199" and less; consult manufacturer for wall tolerances on such tube sizes.*

Ovality Tolerances

ASTM A513-T5

Ovality shall be within the above tolerance except when thickness is less than 3% of the OD. In such cases, the additional ovality shall be as follows, but the mean diameter shall be within the specified OD/ID tolerance.

Outside Diameter (inches)	Additional Ovality Tolerance (inches)
Up to 2.000	0.010
> 2.000 up to 3.000	0.015
> 3.000 up to 4.000	0.020
> 4.000 up to 5.000	0.025
> 5.000 up to 6.000	0.030
> 6.000 up to 7.000	0.035

Outside Diameter (inches)	Additional Ovality Tolerance (inches)
> 7.000 up to 8.000	0.040
> 8.000 up to 9.000	0.045
> 9.000 up to 10.000	0.050
> 10.000 up to 11.000	0.055
> 11.000 up to 12.000	0.060
> 12.000 up to 12.500	0.065

Structural Pipe Tolerances

Outside Diameter (inches)	
0.840 thru 1.900	+/- 0.50%
2.000 and larger	+/- 0.75%

The outside diameter measurements shall be made at positions at least 1" from either end of the pipe.

Length Tolerance Mill Cut	
22 feet and under	+1/2" / -1/4"
Over 22 ft. to 44 ft.	+3/4" / -1/4"

Straightness
1/8 times the number of feet of total length divided by 5

Wall Tolerance
+/- 10% of nominal wall specified

Tested Pipe (A-53) Tolerances

Outside Diameter, at any point, shall not vary more than:		
Nominal	Over	Under
1-1/2" and smaller	1/64"	1/64"
2" and larger	1%	1%

Wall Tolerance: +0 / -12.5% of the nominal wall

Hydraulic Tubing (Seamless) Tolerances

SAE J-524

The diameter of the tubing shall not vary from that specified more than the following amounts:

Outside Diameter Sizes (inches)	Outside Dia. (inches)		Inside Dia. (inches)	
	Plus	Minus	Plus	Minus
Below 3-1/2 to 1-1/2 incl.	0.010	0.010	0.010	0.010
Below 1-1/2 to 1/2 incl.	0.005	0.005	0.005	0.005
Below 1/2	0.003	0.003	0.005	0.005

When the outside diameter and wall thickness of 1/2 inch to 3-1/2 inch OD tubes are specified, the outside diameter shall conform to the tolerances given in the above table, and the wall thicknesses shall not vary from that specified more than plus or minus 10 percent.

When less than 1/2 inch ID, the outside diameter shall conform to the tolerances given in the above table. The wall thickness shall not vary from that specified more than plus or minus 15 percent.

Stainless Steel

Bar, Sheet, Plate, Structural, Tube & Pipe

WARNING: These products can potentially expose you to chemicals including Nickel, Chromium, Lead, Cobalt, Mercury and Beryllium, which are known to the state of California to cause cancer and/or birth defects or other reproductive harm. For more information, visit www.P65Warnings.ca.gov

Grade 201

201 alloy is a high performance austenitic stainless steel formulated to have a lower and more stable cost due to the substitution of manganese for a portion of the nickel used in 300 series stainless steels such as Type 304.

In addition, the chemical composition of alloy 201 provides higher annealed mechanical properties than type 304 which can result in an additional benefit of weight reduction. The 201 tensile strength is about 10% higher than Type 304 which may allow for thinner gauges and therefore less material. However, due to the lower Chromium and Nickel content, Type 201 stainless may not have the same corrosion resistance as Type 304.

Typical Applications

Commercial and residential food service applications, architectural end uses such as handrails and support frame work, washing machines, hose clamps, sinks, containers and structural components of truck trailers and railcars.

Typical Analysis	Grade 201
Chrome	16.00 - 18.00
Nickel	3.50 - 5.50
Carbon	0.15 max.
Manganese	5.50 - 7.50
Silicon	1.00 max.
Sulphur	0.03 max.
Phosphorus	0.06 max.
Nitrogen	0.25 max.
Iron	Balance
Mechanical Properties	**(Annealed)**
Brinell Hardness	175
Tensile–KSI	105
Yield–KSI	45
Elongation in 2"-%	58
Red. in Area-% Min	88
Welding Characteristics	Very good
Machining Compared to B1112 Screw Stock	45%
Specifications	**201 (Sheet)**
ASTM	A240

Grade 303

303 is a free-machining variation of 304. The addition of sulfur for better machinability makes this a favorite for use in automatic screw machines. Corrosion resistant to atmospheric exposures, as well as a wide range of chemicals; most dyes, foods and nitric acid.

Typical Applications

Bolts, bushings, nuts, shafts, and parts produced on automatic screw machines.

Typical Analysis	Grade 303/303 G&P
Chrome	17.0 - 19.0
Nickel	8.0 - 10.0
Carbon	0.15 max.
Manganese	2.00 max.
Silicon	1.00 max.
Molybdenum	0.60 max.
Sulphur	0.15 min.
Mechanical Properties	**(Annealed)**
Brinell Hardness	160
Tensile–KSI	90
Yield–KSI	35
Elongation in 2"-%	50
Red. in Area-% Min	55
Welding Characteristics	Fusion welding not recommended
Machining Compared to B1112 Screw Stock	70%
Specifications	**303 (Bar)**
AISI	303
ASTM	A581, A582
AMS	5640

Grade 304/304L

The most widely used of the austenitic grades, 304 offers good corrosion resistance to many chemicals and industrial atmospheres. Generally considered non-magnetic, it can become slightly magnetic when cold-worked. 304 is non-hardenable by heat treatment. In 304L, the carbon content has been lowered to .03% max. for corrosion resistance at heat affected zones from welding.

Typical Applications

Architectural trim, beer barrels, cryogenic vessels, dairy equipment, and a wide variety of most food applications.

Typical Analysis	Grade 304	Grade 304L
Chrome	18.00 - 20.00	18.00 - 20.00
Nickel	8.00 - 11.00	8.00 - 11.00
Carbon	0.08 max.	0.03 max.
Manganese	2.00 max.	2.00 max.
Silicon	1.00 max.	1.00 max.
Molybdenum		
Other		
Mechanical Properties		**(Annealed)**
Brinell Hardness	170	160
Tensile–KSI	85	75
Yield–KSI	34	30
Elongation in 2"-%	60	60
Red. in Area-% Min	70	–
Welding Characteristics	Very good - tough welds	
Machining Compared to B1112 Screw Stock	45%	
Specifications		
AISI	**304 (Bar)**	**304L (Bar)**
ASTM	A276, A479, A580	A276,A479
AMS	5639	5647
QQS	763	763
AISI	**304 (Sheet)**	**304 (Plate)**
ASTM	A240	A240
AMS	5513	5513

Grade 309

Type 309 is an austenitic chromium nickel stainless steel (. 08% max carbon). Type 309 is employed for parts requiring both corrosion and heat resistance and oxidation resistance up to 2000 °F. Strength at elevated temperatures is similar to that of 18-8 Stainless Steels.

The 309 grades of stainless steel are noted for excellent corrosion and heat resistance. In general 309 and 309S are more resistant than type 304. They provide high resistance to sulfite liquors and are often chosen for applications where the metal may be exposed to acids including nitric, nitric-sulfur, citric, lactic and more.

Plates can be hot or cold formed as well as annealed to optimize corrosion resistance. It can also be welded by typical methods The machinability of 309 is similar to grade 304.

Typical Applications

Furnace equipment, oven linings, annealing boxes, thermowells, baffle plates, quenching pots for salt, valves and fittings.

Typical Analysis	Grade 309
Chrome	22.0 - 24.0
Nickel	12.0 - 15.0
Carbon	0.08 max.
Manganese	2.00 max.
Silicon	1.00 max.
Molybdenum	0.75 max.
Sulphur	0.03 max.
Phosphorus	0.04 max.
Copper	0.75 max.
Iron	Balance
Mechanical Properties	**(Annealed)**
Brinell Hardness	160
Tensile–KSI	75
Yield–KSI	30
Elongation in 2"-%	40
Red. in Area-% Min	-
Welding Characteristics	-
Machining Compared to B1112 Screw Stock	45%
Specifications	**309**
AISI	309
ASTM	A167
AMS	5523

Grade 316L

316L is an austenitic chrome nickel steel with superior corrosion resistance to that of other chrome nickel steels. Widely used when exposed to chemical corrodents, as well as marine atmospheres. 316L is generally considered non-magnetic, but can become magnetic when cold worked. In 316L, the carbon content has been lowered to .03% max. for corrosion resistance at heat affected zones from welding.

Typical Applications

Acetic acid compounds, kettles for cooking catsup, pulp and paper processing equipment, water softener tanks, and many marine applications.

Typical Analysis	Grade 316L
Chrome	16.00 - 18.00
Nickel	10.00 - 14.00
Carbon	0.03 max.
Manganese	2.00 max.
Silicon	1.00 max.
Molybdenum	2.00 - 3.00
Other	
Mechanical Properties	**(Annealed)**
Brinell Hardness	160
Tensile–KSI	75
Yield–KSI	30
Elongation in 2"-%	60
Red. in Area-% Min	—
Welding Characteristics	Very good - tough welds
Machining Compared to B1112 Screw Stock	45%
Specifications	
AISI	**316L (Bar)**
ASTM	A276, A479, A580
AMS	5653
QQS	763
AISI	**316L (Sheet/Plate)**
ASTM	A240
AMS	5507

Grade 2205

Duplex 2205 is a two phase, ferritic, austenitic 22% chromium, 3% molybdenum, 5-6% nickel alloyed stainless steel. It is characterized by high yield strength and good corrosion resistance.

Typical Applications

Machined parts, pump shafts, bushings, mining machinery, screws, valves, cutlery, oil burner Processing Equipment, Transport, Storage and Chemical Processing, Oil & Gas

Typical Analysis	Grade 2205
Chrome	22.0 - 23.0
Nickel	4.5 - 6.5
Molybdenum	3.0 - 3.5
Manganese	2.00 max.
Silicon	1.00 max.
Carbon	0.30 max.
Nitrogen	0.20 max.
Phosphorus	0.030 max.
Sulphur	0.020 max.
Iron	Balance
Mechanical Properties Brinell Hardness	**(Annealed)** 31 HRC max.
Tensile–KSI	95 min.
Yield–KSI	65 min.
Elongation in 2"-%	25% min.
Density	.283 lb/in^3
Welding Characteristics	Good weldability
Machining Compared to B1112 Screw Stock	-
Specifications ASTM	A240
ASME	AS-240

Grade 409

409 is a general purpose stainless steel with 11% chromium. 409 is especially useful for applications requiring oxidation or corrosion protection beyond the capability of carbon steel and some coated steels. 409 has good oxidation resistance and formability, but lower corrosion resistance due to the chromium content. 409 is not as corrosion resistant as 304, 430 or 439 grades, but far superior to mild carbon steel. 409 can be formed by roll forming, stretch bending, deep drawing or pressing.

Typical Applications

Automotive exhaust system applications such as manifolds, exhaust pipes, catalytic converters, mufflers, tail pipes and other components. Non automotive exhaust applications such as home heating systems, automotive thermostats and fuel filters, electrical transformer cases, caskets and heat exchanger tubing.

Typical Analysis	Grade 409
Chrome	10.50 - 11.70
Nickel	0.50
Carbon	0.03
Manganese	1.00
Silicon	1.00
Molybdenum	-
Other	-
Mechanical Properties	
Brinell Hardness	≤ 88 (179)
Tensile–KSI	55 (380)
Yield–KSI	25 (170)
Elongation in 2"-%	≥ 20
Red. in Area-% Min	-
Welding Characteristics	Successful in TIG-laser, HF, MIG and Spot Welding
Machining Compared to B1112 Screw Stock	
Specifications	
AISI	
ASTM	A240
AMS	
QQS	
AISI	
ASTM	
AMS	

Grade 410

410 is a martensitic stainless steel that is air or oil hardened and responds well to hardening and tempering operations. Considered a 12% chromium steel, it offers superb combinations of strength and toughness depending on degree of heat treatments. In the annealed condition, it is a ready choice for forming and cold heading.

Typical Applications

Machined parts, pump shafts, bushings, mining machinery, screws, valves, cutlery, oil burner parts and hardware.

Typical Analysis	Grade 410
Chrome	11.5-13.5
Carbon	.15 max.
Manganese	1.00 max.
Phosphorus	.040 max.
Sulphur	.025 max.
Silicon	1.00 max.
Mechanical Properties	**(Annealed)**
Brinell Hardness	185
Tensile–KSI	95
Yield–KSI	65
Elongation in 2"-%	30
Red. in Area-% Min	70
Welding Characteristics	Can be readily welded Pre-heat recommended
Machining Compared to B1112 Screw Stock	54%
Specifications	
AISI	410
ASTM	A193, A194, A276, A314, A479
AMS	5612, 5613

Grade 416

416 is a martensitic chromium steel to which elements have been added to enhance the machinability. 416 is the most readily machinable of all the stainless steels and is suitable for use in automatic screw machines. 416 is less corrosion resistant than the chrome-nickel steels. It is magnetic in all conditions.

Typical Applications

Aircraft fittings, bolts, nuts, studs, rivets, screws, many nonseizing and nongalling applications.

Typical Analysis	Grade 416
Chrome	12.00-14.00
Nickel	
Carbon	.15 max.
Manganese	1.25 max.
Silicon	1.00 max.
Molybdenum	.06 max.
Sulphur	.15 min.
Mechanical Properties	**(Annealed)**
Brinell Hardness	155
Tensile–KSI	75
Yield–KSI	40
Elongation in 2"-%	30
Red. in Area-% Min	60
Welding Characteristics	Poor brittle welds
Machining Compared to B1112 Screw Stock	90%
Specifications	**416 (Bar)**
AISI	416
ASTM	A581, A582
AMS	5610

Grade 420

420 is a martensitic chrome steel capable of hardening to a maximum of approximately 500 Brinell. It has its optimum corrosion resisting qualities in the hardened and tempered condition. 420 is magnetic in all conditions.

Typical Applications

Flatware knife blades, glass molds, hand tools, vegetable choppers.

Typical Analysis	Grade 420
Chrome	12.00-14.00
Carbon	.15 min.
Manganese	1.0 max.
Silicon	1.0 max.
Molybdenum	
Other	
Mechanical Properties	**(Annealed)**
Brinell Hardness	195
Tensile–KSI	95
Yield–KSI	50
Elongation in 2"-%	25
Red. in Area-% Min	55
Welding Characteristics	Fair - Preheat 400°-500° Anneal at 1300° after welding
Machining Compared to B1112 Screw Stock	54%
Specifications	**420 (Bar)**
AISI	420
ASTM	A276
AMS	5621
QQS	763

Grade 430

430 stainless steel has good corrosion resistance combined with good formability. 430 is very similar to 439 grade stainless steel with slightly less chromium at 16% minimum content. 430 is more oxidation resistant and corrosion resistant than 409 grade. 430 is a popular non-hardenable grade most commonly used in indoor environments. 430 is readily cold formed by bending, deep drawing and stretch forming. 430 is relatively easy to machine and is comparable to that of structural carbon steel requiring the same recommendations regarding tooling, cutting speeds and cutting feeds. 430 can be welded although it may require annealing.

Typical Applications

Appliances, food equipment, automotive, flue liners and roofing.

Typical Analysis	Grade 430
Chrome	14.00 - 18.00
Carbon	.12 max.
Nickel	
Manganese	1.0 max.
Silicon	1.0 max.
Molybdenum	
Other	
Mechanical Properties	**(Annealed)**
Brinell Hardness	155
Tensile–KSI	75
Yield–KSI	45
Elongation in 2"-%	30
Red. in Area-% Min	65
Welding Characteristics	Fair - Brittle welds Slight response to annealing
Machining Compared to B1112 Screw Stock	54%
Specifications	**430 (Sheet/Plate)**
AISI	430
ASTM	A176
AMS	5503

Grade 439

439 stainless steel has good corrosion resistance due to its 17% minimum chromium content. 439 can be formed using a wide range of roll forming or mild stretch bending operations as well as more common drawing and bending operations. Special adjustment to chemical composition give this alloy excellent formability. 439 is more oxidation resistant and corrosion resistant than 409 grade. 439 has high thermal conductivity and low thermal expansion.

Typical Applications

Automotive exhaust components, heating units and evaporator tubes.

Typical Analysis	Grade 439
Chrome	17.00 - 19.00
Carbon	0.030
Nickel	0.50
Manganese	1.00
Silicon	1.00
Molybdenum	
Other	
Mechanical Properties	**(Annealed)**
Brinell Hardness	≤ 89 (183)
Tensile–KSI	60 (415)
Yield–KSI	30 (205)
Elongation in 2"-%	≥ 22
Red. in Area-% Min	-
Welding Characteristics	Prone to grain growth in heat affected zone of weldment = poor tensile, fatigue and toughness in welded area.
Machining Compared to B1112 Screw Stock	
Specifications	**439 (Sheet)**
AISI	439
ASTM	A240
AMS	

Grade 440C

440C is a martensitic chrome steel that is capable of acquiring, upon heat treatment, the highest hardness of any type of corrosion resisting steels. It has its optimum corrosion resisting qualities in the hardened and tempered condition and is magnetic in all conditions.

Typical Applications

Instrument bearings, nozzles, steel balls and seats for oil well pumps, valve parts.

Typical Analysis	Grade 440C
Chrome	16.00-18.00
Nickel	
Carbon	.95-1.20
Manganese	1.0 max.
Silicon	1.0 max.
Molybdenum	.75 max.
Other	
Mechanical Properties	**(Annealed)**
Brinell Hardness	230
Tensile–KSI	110
Yield–KSI	65
Elongation in 2"-%	14
Red. in Area-% Min	25
Welding Characteristics	Not recommended
Machining Compared to B1112 Screw Stock	30%
Specifications	**440C (Bar)**
AISI	440C
ASTM	A276, A580
AMS	5630
QQS	763

Grade 17-4 PH (630)/17-4 G&P/17-4 H900 G&P

17-4 is a martensitic precipitation hardening (maraging) steel that combines high strength and hardness with a moderate level of corrosion resistance. A simple one-step aging treatment in the range of 900 to 1150 degrees hardens the alloy to its design strength levels.

Typical Applications

High strength fittings, valves, bolts, shafting, pump parts, medical instruments.

Typical Analysis	Gr. 17-4, 17-4 G&P, 17-4 H900 G&P
Chrome	15.00-17.50
Nickel	3.00-5.00
Carbon	.07 max.
Manganese	1.00 max.
Silicon	1.00 max.
Molybdenum	
Copper	3.00-5.00
Mechanical Properties	**(Solution Treated)**
Brinell Hardness	332
Tensile–KSI	160
Yield–KSI	145
Elongation in 2"-%	15
Red. in Area-% Min	55
Welding Characteristics	
Machining Compared to B1112 Screw Stock	45%
Specifications	**17-4 (Bar)**
AISI	S17400
ASTM	A564
AMS	5643
QQS	–

Hardness Properties					Gr. 17-4, 17-4 G&P, 17-4 H900 G&P		
Code	UTS min (kis)	YS min (kis)	El min (%)	RA min (%)	Hardness min HRC / HB	Hardness max HRC / HB	Charpy min (ft-lb)
H925	170	155	10	44	38 / 375	45 / 429	5
H1025	155	145	12	45	35 / 331	42 / 401	15
H1050	155	145	13	45	32 / 311	38 / 375	15
H1075	145	125	13	45	32 / 311	38 / 375	20
H1100	140	115	14	45	31 / 302	37 / 363	25
H1150	135	105	16	50	28 / 277	37 / 352	30
H1150M	115	75	18	55	24 / 255	---	55
H1150D	125	105	16	50	24 / 255	33 / 311	30

Stainless Rounds

Standard Lengths: 12 foot random

AISI	303, 303 G&P	304 / 304L	316L, 316L BSQ	416, 416 PSQ
	17-4 PH	17-4 G&P	17-4 H900	410
	420	440C		

Size (inches)	Weight (lbs./ft.)	Size (inches)	Weight (lbs./ft.)	Size (inches)	Weight (lbs./ft.)	Size (inches)	Weight (lbs./ft.)
1/16	.010	1-1/8	3.379	2-5/8	19.322	6-1/2	117.584
3/32	.023	1-3/16	3.766	2-11/16	20.248	6-3/4	127.532
1/8	.042	1-1/4	4.173	2-3/4	21.181	7	136.987
5/32	.065	1-5/16	4.600	2-13/16	22.150	7-1/4	146.780
3/16	.094	1-3/8	5.049	2-7/8	23.125	7-1/2	156.911
7/32	.128	1-7/16	5.518	2-15/16	24.121	7-3/4	167.380
1/4	.167	1-1/2	6.008	3	25.155	8	178.187
9/32	.211	1-9/16	6.520	3-1/8	27.270	8-1/2	201.935
5/16	.261	1-5/8	7.051	3-1/4	29.470	9	225.981
11/32	.316	1-11/16	7.604	3-3/8	31.756	9-1/2	251.379
3/8	.376	1-3/4	8.178	3-7/16	32.941	10	278.129
13/32	.441	1-13/16	8.773	3-1/2	34.128	11	335.685
7/16	.511	1-7/8	9.388	3-5/8	36.824	12	398.651
15/32	.587	1-15/16	10.024	3-3/4	39.375	13	468.698
1/2	.668	2	10.681	4	44.731	14	542.609
9/16	.845	2-1/16	11.879	4-1/4	50.429	15	621.928
5/8	1.043	2-1/8	12.607	4-1/2	56.468	16	708.669
11/16	1.262	2-3/16	13.357	4-3/4	63.166	18	884.603
3/4	1.502	2-1/4	14.117	5	69.905	20	1102.171
13/16	1.763	2-5/16	14.910	5-1/4	76.985	22	1331.376
7/8	2.044	2-3/8	15.712	5-1/2	83.074	24	1582.217
15/16	2.347	2-7/16	16.549	5-3/4	93.289		
1	2.670	2-1/2	17.393	6	100.428		
1-1/16	3.014	2-9/16	18.431	6-1/4	108.837		

Available in Ground & Polished -- (+/-.0005)

Stainless Half-Rounds

Type 304

Width (inches)	Height (inches)	Weight (lbs./ft.)
1/2	1/4	0.334
5/8	5/16	0.520
3/4	3/8	0.751

Stainless Squares

Annealed & Cold Drawn

Standard Lengths: 12 foot random

AISI	303	304/304L	316L	416	17-4	420

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1/8	.054	.64
3/16	.120	1.44
1/4	.213	2.55
5/16	.332	3.98
3/8	.480	5.76
7/16	.666	7.99
1/2	.850	10.20
9/16	1.076	12.91
5/8	1.330	15.96
3/4	1.910	22.92
7/8	2.600	31.20

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1	3.400	40.80
1-1/8	4.303	51.63
1-1/4	5.310	63.72
1-1/2	7.650	91.80
1-3/4	10.410	124.92
2	13.600	163.20
2-1/2	21.250	255.00
3	31.030	372.36
3-1/2	42.740	512.88
4	54.450	653.40
5	85.000	1020.00

Note: Squares 2-1/2" and under are typically CF products. All squares over 2-1/2" are HRAP products.

Stainless Hexagons

Annealed & Cold Drawn

Standard Lengths: 12 foot random

AISI	303	304/304L	316L	416

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1/8	.046	.56
3/16	.104	1.24
1/4	.184	2.21
5/16	.288	3.45
3/8	.414	4.97
7/16	.564	6.77
1/2	.736	8.83
9/16	.932	11.18
5/8	1.150	13.80
11/16	1.393	16.72
3/4	1.660	19.92
13/16	1.940	23.28
7/8	2.250	27.00
15/16	2.590	31.08
1	2.950	35.40
1-1/16	3.324	39.89

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1-1/8	3.730	44.76
1-3/16	4.152	49.82
1-1/4	4.600	55.20
1-5/16	5.080	60.96
1-3/8	5.570	66.84
1-1/2	6.630	79.56
1-5/8	7.775	93.24
1-3/4	9.026	108.31
1-7/8	10.360	124.32
2	11.780	141.36
2-1/4	14.920	179.04
2-3/8	16.610	199.32
2-1/2	18.400	220.80
2-3/4	22.290	267.41
3	26.530	318.36

Stainless Flats

Hot Rolled Annealed, Pickled, True Mill Bar, Cold Drawn (303 only), Processed Plate Flat*, or Sheared and Edged

Standard Lengths: 12 foot

AISI	303	304/304L	316L	17-4	17-4 H1150	420

"L" grade sizes available upon request.

Size (inches)		Wgt. (lbs./ft.)
1/8 x	3/4	.326
	1	.435
	1-1/4	.544
	1-1/2	.653
	1-3/4	.761
	2	.870
	2-1/2	1.090
	3	1.310
	3-1/2	1.489
	4	1.740
	6	2.610
3/16 x	3/4	.489
	1	.653
	1-1/4	.816
	1-1/2	.979
	1-3/4	1.150
	2	1.305
	2-1/2	1.630
	3	1.960
	3-1/2	2.160
	4	2.610
	5	3.260
	6	3.910
1/4 x	3/4	.638
	1	.870
	1-1/4	1.088
	1-1/2	1.305
	1-3/4	1.488
	2	1.740
	2-1/4	1.913
	2-1/2	2.175
	3	2.610
	3-1/2	3.045
	4	3.480
	4-1/2	3.915
	5	4.350
	6	5.220
	8	6.960
5/16 x	1	1.088
	2	2.291

Size (inches)		Wgt. (lbs./ft.)
3/8 x	1/2	.653
	3/4	.979
	1	1.305
	1-1/8	1.468
	1-1/4	1.630
	1-1/2	1.956
	1-3/4	2.284
	2	2.550
	2-1/2	3.263
	3	3.915
	3-1/2	4.800
	4	5.220
	5	6.505
	6	7.830
	8	10.440
1/2 x	3/4	1.305
	1	1.740
	1-1/4	2.175
	1-1/2	2.610
	1-3/4	2.975
	2	3.480
	2-1/2	4.350
	3	5.220
	3-1/2	6.090
	4	6.960
	5	8.700
	6	10.440
	8	13.420
5/8 x	3/4	1.631
	1	2.130
	1-1/4	2.656
	1-1/2	3.188
	2	4.250
	2-1/2	5.313
	3	6.380
	3-1/2	7.438
	4	8.500
	5	11.183
	6	13.419

Size (inches)		Wgt. (lbs./ft.)
3/4 x	1	2.550
	1-1/4	3.190
	1-1/2	3.830
	1-3/4	4.88
	2	5.100
	2-1/2	6.380
	3	7.650
	3-1/2	8.930
	4	10.200
	5	12.750
	6	15.300
1x	1-1/4	4.250
	1-12	5.100
	1-3/4	6.000
	2	6.800
	2-1/2	8.500
	3	10.200
	3-1/2	11.900
	4	13.600
	5	17.000
	6	20.400
1-1/4 x	1-1/2	6.490
	2	8.500
	2-1/2	10.630
	3	12.750
	4	17.670
	6	25.520
1-1/2 x	2	10.200
	2-1/2	13.196
	3	15.300
	4	20.400
	6	30.600
2 x	2-1/2	17.000
	3	20.400
	4	27.200
3 x	4	40.800

** Weight per foot on Processed Plate Flats slightly higher and specifications would be plate specifications.*

Stainless Sheet

Cold Rolled, Annealed & Pickled Finishes:

- 2B Paper Interleaved
- 2B Laser Film, 1 Side
- #4 Laser Film, 1 Side
- BA Laser Film, 1 Side
- #8 Laser Film, 1 Side

AISI	201	304	304L	316L

Gauge (nom. dec.)	Sheet Size (inches)	Weight (lbs./sqft.)	Approx. Sheet Wgt. (lbs.)
7 ga (.1874)	48 x 96	7.871	251.87
	48 x 120	7.871	314.80
	48 x 144	7.871	377.80
	60 x 96	7.871	314.84
	60 x 120	7.871	393.55
	60 x 144	7.871	472.26
	72 x 96	7.871	377.80
	72 x 120	7.871	472.26
	72 x 144	7.871	566.71
8 ga (.1644)	48 x 96	7.014	224.44
	48 x 120	7.014	280.56
	60 x 120	7.014	350.70
	60 x 144	7.014	420.84
10 ga (.1350)	36 x 96	5.670	136.08
	36 x 120	5.670	170.10
	48 x 96	5.670	181.44
	48 x 120	5.670	226.80
	48 x 144	5.670	272.16
	60 x 96	5.670	226.80
	60 x 120	5.670	283.50
	60 x 144	5.670	340.20
	72 x 96	5.670	272.16
	72 x 120	5.670	340.20
	72 x 144	5.670	408.24
11 ga (.1200)	36 x 96	5.050	121.20
	36 x 120	5.050	151.50
	36 x 144	5.050	181.80
	48 x 96	5.050	161.60
	48 x 120	5.050	202.00
	48 x 144	5.050	242.40
	60 x 96	5.050	202.00
	60 x 120	5.050	252.50
	60 x 144	5.050	303.00
	72 x 96	5.050	242.40
	72 x 120	5.050	303.00
	72 x 144	5.050	363.60

Gauge (nom. dec.)	Sheet Size (inches)	Weight (lbs./sqft.)	Approx. Sheet Wgt. (lbs.)
12 ga (.1054)	36 x 96	4.420	106.08
	36 x 120	4.420	132.60
	36 x 144	4.420	159.12
	48 x 96	4.420	141.44
	48 x 120	4.420	176.80
	48 x 144	4.420	212.16
	60 x 96	4.420	176.80
12 ga (.1054)	60 x 120	4.420	221.00
	60 x 144	4.420	265.20
	72 x 96	4.420	272.16
	72 x 120	4.420	265.20
	72 x 144	4.420	318.24
13 ga (.0900)	48 x 96	3.780	120.96
	48 x 120	3.780	151.20
	48 x 144	3.780	181.44
14 ga (.075)	36 x 96	3.155	75.72
	36 x 120	3.155	94.65
	36 x 144	3.155	113.58
	48 x 96	3.155	100.96
	48 x 120	3.155	126.20
	48 x 144	3.155	151.44
	60 x 96	3.155	126.20
	60 x 120	3.155	157.75
	60 x 144	3.155	189.30
	72 x 96	3.155	151.44
	72 x 120	3.155	189.30
	72 x 144	3.155	227.16
16 ga (.060)	36 x 96	2.520	60.48
	36 x 120	2.520	75.60
	36 x 144	2.520	90.72
	48 x 96	2.520	80.64
	48 x 120	2.520	100.80
	48 x 144	2.520	120.96
	60 x 96	2.520	100.80
	60 x 120	2.520	126.00
	60 x 144	2.520	151.20
	72 x 96	2.520	120.96
	72 x 120	2.520	151.20
	72 x 144	2.520	181.44

Special length sheets available by request, please inquire with your Alro sales representative.

***Note: Laser Film is dual purpose fiber optic / CO2 laser film.**

Continued on next page

Stainless Sheet

Cold Rolled, Annealed and Pickled Finishes:

- 2B Paper Interleaved
- 2B Laser Film, 1 Side
- #4 Laser Film, 1 Side
- BA Laser Film, 1 Side
- #8 Laser Film, 1 Side

AISI	201	304	304L	316L

Gauge (nom. dec.)	Sheet Size (inches)	Weight (lbs./sqft.)	Approx. Sheet Wgt. (lbs.)
18 ga (.048)	36 x 96	2.020	48.48
	36 x 120	2.020	60.60
	36 x 144	2.020	72.72
	48 x 96	2.020	64.64
	48 x 120	2.020	80.80
	48 x 144	2.020	96.96
	60 x 96	2.020	80.80
	60 x 120	2.020	101.00
	60 x 144	2.020	121.20
20 ga (.036)	36 x 96	1.512	36.28
	36 x 120	1.512	45.36
	36 x 144	1.512	54.43
	48 x 96	1.512	48.38
	48 x 120	1.512	60.48
	48 x 144	1.512	72.57
	60 x 96	1.512	60.48
	60 x 120	1.512	75.60
	60 x 144	1.512	90.72

Gauge (nom. dec.)	Sheet Size (inches)	Weight (lbs./sqft.)	Approx. Sheet Wgt. (lbs.)
22 ga (.030)	36 x 96	1.260	30.24
	36 x 120	1.260	37.80
	36 x 144	1.260	45.36
	48 x 96	1.260	40.32
	48 x 120	1.260	50.40
	48 x 144	1.260	60.48
	60 x 96	1.260	50.40
	60 x 120	1.260	63.00
24 ga (.024)	36 x 96	1.008	24.19
	36 x 120	1.008	30.24
	48 x 96	1.008	32.25
	48 x 120	1.008	40.32
	48 x 144	1.008	48.38
26 ga (.018)	36 x 96	.756	18.14
	36 x 120	.756	22.68
	48 x 96	.756	24.19
	48 x 120	.756	30.24
	48 x 144	.756	36.29

Special length sheets available by request, please inquire with your Alro sales representative.

Note: Laser Film is dual purpose fiber optic / CO2 laser film.

Stainless Sheet

Cold Rolled, Annealed and Pickled Finishes:

- 2B Paper Interleaved
- 2B Laser Film, 1 Side
- #4 Laser Film, 1 Side
- BA Laser Film, 1 Side
- #8 Laser Film, 1 Side

AISI	409-2D	430	439-2D

Gauge (Nominal Decimal)	Sheet Size (inches)	Weight (lbs./sqft.)	Approx. Weight (lbs./sheet)
24 ga (.024)	48 x 96	1.008	32.25
	48 x 120	1.008	40.32
22 ga (.030)	48 x 96	1.260	40.32
	48 x 120	1.260	50.40
20 ga (.036)	48 x 96	1.512	48.38
	48 x 120	1.512	60.48
18 ga (.048)	48 x 96	2.020	64.64
	48 x 120	2.020	80.80
16 ga (.060)	48 x 96	2.520	80.64
	48 x 120	2.520	100.80
14 ga (.075)	48 x 96	3.155	100.96
	48 x 120	3.155	126.20
12 ga (.1054)	48 x 96	4.420	141.44
	48 x 120	4.420	176.80
11 ga (.1200)	48 x 96	5.050	161.60
	48 x 120	5.050	202.00

Note: Laser Film is dual purpose fiber optic / CO2 laser film.

Stainless Plate

Hot Rolled, Annealed & Pickled

AISI	201	304	304L	316L
ASTM	A240	A240	A240	A240

Thickness (inches) (lbs./sqft.)	Width (inches)
3/16 (8.579)	48 60 72 96
3/16 (304L only)	78.74
1/4 (11.162)	48 60 72 96
1/4 (304L only)	78.74
5/16 (13.746)	48 60 72 96
3/8 (16.496)	48 60 72 96
1/2 (21.663)	48 60 72 96
5/8 (26.831)	48 60 72 96
3/4 (32.123)	48 60 96
7/8 (37.290)	60 96

Thickness (inches) (lbs./sqft.)	Width (inches)
1 (43.013)	48 60 96
1-1/4 (53.453)	60 96
1-1/2 (63.893)	60 96
1-3/4 (74.333)	60 96
2 (85.921)	60 96
2-1/4 (96.361)	60 96
2-1/2 (106.801)	60 96
2-3/4 (117.241)	60 96
3 (128.725)	60 96
3-1/2 (149.605)	60 96
4 (172.051)	60 96
5 (213.811)	60 72
6 (255.571)	60 72

Stainless 304L 2B Plate

Hot Rolled, Annealed & Pickled

- 2B with Laser Film, 1 Side
- #4 Polished with Laser Film, 1 Side

AISI	304L

Thickness (nominal dec.)	Plate Size (inches)	Weight (lbs./sqft.)	Approx. Sheet Wgt. (lbs.)
1/4" (.250)	48 x 96	11.162	357.184
	48 x 120	11.162	446.480
	48 x 144	11.162	535.776
1/4"	60 x 120	11.162	558.100
	60 x 144	11.162	669.720
1/4"	72 x 120	11.162	669.720
	72 x 144	11.162	803.664

Note: Laser Film is dual purpose fiber optic / CO2 laser film.

Stainless Tread Plate

Hot Rolled, Annealed & Pickled

AISI	304
ASTM	A793 Pattern B

Thickness (Inches)	Width (inches)
1/8	48 60
3/16	48 60

Thickness (Inches)	Width (inches)
1/4	48 60
3/8	48 60

Stainless Angle

Hot Rolled, Annealed & Pickled

20 - 24 foot Random Lengths

AISI	304	304L	316L
ASTM	A276	A276	A276
FEDERAL	QQS-763		

Size (inches)	Weight (lbs./ft.)
3/4 x 3/4 x 1/8	.592
1 x 1 x 1/8	.807
1 x 1 x 3/16	1.171
1 x 1 x 1/4	1.507
1-1/4 x 1-1/4 x 1/8	1.023
1-1/4 x 1-1/4 x 3/16	1.494
1-1/4 x 1-1/4 x 1/4	1.938
1-1/2 x 1-1/2 x 1/8	1.238
1-1/2 x 1-1/2 x 3/16	1.817
1-1/2 x 1-1/2 x 1/4	2.369
2 x 2 x 1/8	1.669
2 x 2 x 3/16	2.463
2 x 2 x 1/4	3.230
2 x 2 x 3/8	4.683
2-1/2 x 2-1/2 x 3/16	3.109
2-1/2 x 2-1/2 x 1/4	4.091
2-1/2 x 2-1/2 x 3/8	5.975

Size (inches)	Weight (lbs./ft.)
3 x 2 x 3/16	3.070
3 x 2 x 1/4	4.100
3 x 3 x 3/16	3.710
3 x 3 x 1/4	4.952
3 x 3 x 3/8	7.267
3 x 3 x 1/2	9.474
3-1/2 x 3-1/2 x 1/4	5.800
3-1/2 x 3-1/2 x 3/8	8.650
4 x 3 x 1/4	5.800
4 x 3 x 3/8	8.500
4 x 4 x 1/4	6.675
4 x 4 x 3/8	9.851
4 x 4 x 1/2	12.920
5 x 3 x 3/8	9.850
5 x 5 x 1/4	8.895
5 x 5 x 3/8	12.802
6 x 4 x 3/8	12.300
6 x 6 x 1/4	10.755
6 x 6 x 3/8	15.551

Stainless Channel

Type 304/304L, Rolled or Extruded

20 foot Random Lengths

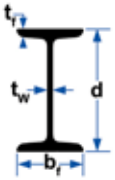
ASTM	A276
ASME	A279
FEDERAL	QQS-763

Size (inches)	Weight (lbs./ft.)
1-1/2 x 3/4 x 1/8	1.200
2 x 1 x 3/16	2.650
2 x 1 x 1/4	3.080
3 x 1-3/8 x 3/16	3.533
3 x 1-1/2 x 3/16	3.703
3 x 1-1/2 x 1/4	4.784

Size (inches)	Weight (lbs./ft.)
4 x 1-3/4 x 1/4	6.055
4 x 2 x 1/4	6.484
5 x 2-1/2 x 1/4	8.200
6 x 1.90 x .343	8.300
6 x 3 x 1/4	10.140
8 x 4 x 3/8	20.000

Stainless Beams

Type 304/304L - 20 foot Random Lengths
ASTM A276, ASME A279, Federal QQS-763



Shape	Web		Flange	
	d (inches)	t_w (inches)	b_f (inches)	t_f (inches)
HR S 3 x 5.7	3.00	.170	2.330	.260
HR S 4 x 7.7	4.00	.193	2.663	.293
HR S 6 x 12.5	6.00	.232	3.332	.359

Laser Fused	d (inches)	t_w (inches)	b_f (inches)	t_f (inches)
LC W 6 x 12	6.03	.230	4.000	.280
LC W 6 x 15	5.99	.230	5.990	.260
LC W 6 x 20	6.20	.260	6.020	.365
LC W 8 x 15	8.11	.245	4.015	.315
LC W 8 x 18	8.14	.230	5.250	.330
LC W 8 x 31	8.00	.285	7.995	.435

Stainless Ornamental Tubing

Type 304 Welded, Type 316L - 20 foot Random Lengths
ASTM: A-554 (Polished finish available upon request)

Squares & Rectangles

Outside Dimension and Gauge	Wall (inches)	Weight (lbs./ft.)
1/2" x 1/2"		
16	.062	.389
5/8" x 5/8"		
16	.062	.510
3/4" x 3/4"		
18	.049	.469
16	.062	.610
14	.083	.763
11	.120	1.020
1" x 1"		
18	.049	.630
16	.062	.827
14	.083	1.035
11	.120	1.440
1-1/4" x 1-1/4"		
18	.049	.790
16	.062	1.048
14	.083	1.317
11	.120	1.844
7	.180	2.620

Outside Dimension and Gauge	Wall (inches)	Weight (lbs./ft.)
1-1/2" x 1-1/2"		
18	.049	0.970
16	.062	1.268
14	.083	1.610
11	.120	2.252
7	.180	3.630
1/4	.250	4.067
1-3/4" x 1-3/4"		
11	.120	2.660
2" x 2"		
16	.062	1.710
14	.083	2.140
11	.120	3.050
7	.180	4.320
1/4	.250	6.010
2-1/2" x 2-1/2"		
11	.120	3.880
7	.180	5.680
1/4	.250	7.343

Continued on next page

Stainless Ornamental Tubing

Type 304 Welded, Type 316L - 20 foot Random Lengths
ASTM: A-554 (Polished finish available upon request)

Squares & Rectangles

Outside Dimension and Gauge	Wall (inches)	Weight (lbs./ft.)
3" x 3"		
14	.083	3.290
11	.120	4.970
7	.180	6.900
1/4	.250	9.350
3-1/2"x 3-1/2"		
1/4	.250	11.015
4" x 4"		
11	.120	6.450
7	.180	9.410
1/4	.250	12.680
3/8	.375	18.485
5" x 5"		
7	.180	11.799
1/4	.250	16.150
3/8	.375	23.588
6" x 6"		
7	.180	14.247
1/4	.250	18.770
3/8	.375	28.688
8" x 8"		
1/4	.250	26.350
3/8	.375	38.888
1" x 1/2"		
16	.062	.606
1-1/2"x 1/2"		
16	.062	.830
1-1/2"x 3/4"		
16	.062	.990
1-1/2"x 1"		
16	.062	1.048
11	.120	1.884
2" x 1"		
16	.062	1.269
11	.120	2.252
2" x 1-1/2"		
11	.120	2.660
3 x 1		
11	.120	3.070

Outside Dimension and Gauge	Wall (inches)	Weight (lbs./ft.)
3" x 1-1/2"		
14	.083	3.030
11	.120	3.480
7	.180	4.960
3" x 2"		
11	.120	3.884
7	.180	5.679
1/4	.250	7.100
4" x 2"		
11	.120	4.750
7	.180	6.903
1/4	.250	9.350
4" x 3"		
11	.120	5.516
7	.180	8.130
1/4	.250	11.024
5" x 3"		
1/4	.250	12.683
6" x 2"		
7	.180	9.270
1/4	.250	12.680
6" x 3"		
7	.180	10.520
1/4	.250	13.730
6" x 4"		
7	.180	11.900
1/4	.250	16.350
8" x 2"		
7	.180	11.900
1/4	.250	18.270
8" x 4"		
1/4	.250	18.770
3/8	.375	28.688
8" x 6"		
1/4	.250	22.910
10" x 2"		
1/4	.250	18.770

Stainless Round Tube

Type 304 Welded, Type 316L Welded, 409 Welded
ASTM A554, Seamless ASTM A269 - 20 foot Random Lengths

AISI	304	316L	409

O.D. (inches)	Wall (inches)	Weight (lbs./ft.)
1/4	.028	.066
1/4	.035	.080
1/4	.049	.105
1/4	.065	.129
1/4	.083	.148
5/16	.028	.086
5/16	.049	.139
5/16	.065	.172
3/8	.028	.104
3/8	.035	.127
3/8	.049	.171
3/8	.065	.215
3/8	.083	.220
1/2	.035	.174
1/2	.049	.236
1/2	.065	.302
1/2	.083	.370
1/2	.095	.411
1/2	.120	.487
5/8	.035	.221
5/8	.049	.301
5/8	.065	.389
5/8	.120	.647
3/4	.035	.267
3/4	.049	.367
3/4	.065	.476
3/4	.083	.591
3/4	.120	.807
3/4	.188	.850
7/8	.049	.432
7/8	.065	.562
7/8	.120	.968
1	.035	.361
1	.049	.498
1	.065	.649
1	.083	.813
1	.120	1.128
1	.188	1.630
1	.250	2.004

O.D. (inches)	Wall (inches)	Weight (lbs./ft.)
1-1/4	.049	.629
1-1/4	.065	.823
1-1/4	.083	1.034
1-1/4	.120	1.467
1-1/4	.188	2.132
1-1/4	.250	2.670
1-1/2	.049	.759
1-1/2	.065	.996
1-1/2	.083	1.257
1-1/2	.120	1.770
1-1/2	.188	2.634
1-1/2	.250	3.338
1-5/8	.065	1.083
1-3/4	.065	1.170
1-3/4	.120	2.089
1-3/4	.188	3.136
1-3/4	.250	4.005
2	.049	1.021
2	.056	1.204
2	.065	1.343
2	.071	1.498
2	.120	2.409
2	.188	3.670
2	.250	4.673
2	.375	6.508
2-1/4	.056	1.359
2-1/4	.065	1.530
2-1/4	.071	1.692
2-1/4	.120	2.730
2-1/4	.188	4.140
2-1/4	.250	5.340
2-1/4	.375	7.509
2-1/2	.056	1.514
2-1/2	.065	1.683
2-1/2	.071	1.887
2-1/2	.120	3.050
3	.056	1.824
3	.065	2.030
3	.071	2.276
3	.120	3.691
4	.065	2.732

Stainless Welded Pipe

20 foot Random Lengths

AISI	304	316L
ASTM	A312	A312

Nominal Pipe Size	O.D. (inches)	I.D. (inches)	Wall Thickness	Weight (lbs./foot)
Schedule 10				
1/2	.840	.674	.083	.671
3/4	1.050	.884	.083	.857
1	1.315	1.097	.109	1.420
1-1/4	1.660	1.442	.109	1.806
1-1/2	1.900	1.682	.109	2.080
2	2.375	2.157	.109	2.638
2-1/2	2.875	2.635	.120	3.530
3	3.500	3.260	.120	4.332
4	4.500	4.260	.120	5.610
5	5.563	5.295	.134	7.840
6	6.625	6.357	.134	9.290
8	8.625	8.329	.148	13.400
10	10.750	10.420	.165	18.650
Schedule 40				
1/8	.405	.269	.068	.240
1/4	.540	.364	.088	.420
3/8	.675	.493	.091	.570
1/2	.840	.622	.109	.851
3/4	1.050	.824	.113	1.131
1	1.315	1.049	.133	1.680
1-1/4	1.660	1.380	.140	2.270
1-1/2	1.900	1.610	.145	2.720
2	2.375	2.067	.154	3.650
2-1/2	2.875	2.469	.203	5.850
3	3.500	3.068	.216	7.580
3-1/2	4.000	3.548	.226	9.110
4	4.500	4.026	.237	10.790
5	5.563	5.047	.258	14.620
6	6.625	6.065	.280	18.970
8	8.625	7.981	.322	28.550
10	10.750	10.020	.365	40.480
Schedule 80				
1/4	.540	.302	.119	.540
3/8	.675	.423	.126	.730
1/2	.840	.546	.147	1.090
3/4	1.050	.742	.154	1.470
1	1.315	.957	.179	2.170
1-1/4	1.660	1.278	.191	3.030
1-1/2	1.900	1.500	.200	3.630
2	2.375	1.939	.218	5.070
2-1/2	2.875	2.323	.276	7.660
3	3.500	2.900	.300	10.250
4	4.500	3.826	.337	14.980

Stainless Bar Tolerances

Rounds, Cold Finished (CF)

Drawn, Turned or Centerless Ground

Specified Size (inches)	Over (inches)	Under (inches)
1/16 to 5/16, excl.	0.0010	0.0010
5/16 to 1/2, excl.	0.0015	0.0015
1/2 to 1, excl.	0.0020	0.0020
1 to 1-1/2, excl.	0.0025	0.0025
1-1/2 to 3-1/4, incl.	0.0030	0.0030
3-1/4 to 4, incl.	0.0050	0.0050

Unless otherwise specified, size tolerances are over and under as shown in the above table. When required, however, they may be specified all over and nothing under, or all under and nothing over, or any combination of over and under, if the total spread in size tolerance for a specified is not less than the total spead shown in the table.

When it is necessary to heat treat or heat treat and pickle after cold finishing, size tolerances are double those shown in the table.

Cold-finished bars over 4 inch in diameter are produced; size tolerances for such bars are not included herein.

Rounds, Rough Turned (RT)

Specified Size (inches)	Over (inches)	Under (inches)
>2 to 2-1/2	0.031	0.000
>2-1/2 to 3-1/2	0.046	0.000
>3-1/2 to 4-1/2	0.062	0.000
>4-1/2 to 5-1/2	0.078	0.000
>5-1/2 to 6-1/2	0.125	0.000
>6-1/2 to 8	0.156	0.000
>8 to 12	0.187	0.000
>12 and up	0.218	0.000

Stainless Rounds Straightness Tolerances

Hot Rolled	Cold Finished
1/8" in any 5 foot section of the bar	1/16" in any 5 foot section of the bar

Stainless Hex and Squares

Specified Size (inches)	Over (inches)	Under (inches)	Finish
1/8 to 5/16	0.000	0.002	Cold Finished
5/16 to 1/2	0.000	0.003	Cold Finished
1/2 to 1	0.000	0.004	Cold Finished
> 1 to 2	0.000	0.006	Cold Finished
> 2 to 3	0.000	0.008	Cold Finished
> 3 to < 3-1/2	0.000	0.010	Cold Finished
3-1/2 to 4*	0.100	0.100	Forged
4 to 4-1/2*	0.100	0.100	Forged
4-1/2 to 6*	0.100	0.100	Forged
6 to 6-3/8*	0.100	0.100	Forged
6-3/8 to 6-5/8*	0.100	0.100	Forged
6-5/8 and Over*	0.100	0.100	Forged

* Forged HRAP Square Bars over 3-1/2" square - Billets and other semi-finished material shall conform to shape and dimensions specified by the purchaser within a permitted variation of +/-5%.

Stainless Ground Bar Tolerances

Abbreviation	Description	Tolerance	Microfinish	Straightness
CG	Centerless Ground	+/- Tolerance by size	45 RMS	.008" TIR/FT
G&P	Ground & Polished	+/-.0005"	32/20 RMS	.006" TIR/FT
PG	Precision Ground	+0/-.0005"	16 RMS	.006" TIR/FT
TG&P Stainless	Turned Ground & Polished	+/-.0005"	32 RMS	.006" TIR/FT
RT	Rough Turned	+.032/-0"	125 RMS	.012" TIR/FT
	STN	Straightened	---	.008/.006" TIR/FT
P STN	Precision Straightened	---	---	.004" TIR/FT
BSQ	Bearing Shaft Quality	-.0005/-.0015"	32 RMS	.006" TIR/FT
PSQ -.500"-<1.500"	Pump Shaft Quality	+0/-.0015"	32/25 RMS	.0015" TIR/FT
PSQ -1.500"-4.000"	Pump Shaft Quality	+0/-.002"	32/25 RMS	.0015" TIR/FT
PSQ ->4.000"-5.000"	Pump Shaft Quality	+0/-.003"	32/25 RMS	.0015" TIR/FT

Stainless Sheet Thickness Tolerances

Gauge	Nominal Decimal	Tolerance Plus/Minus
7	.1874	.007
8	.1650	.007
10	.1350	.006
11	.1200	.005
12	.1054	.005
13	.0900	.004
14	.0751	.004
16	.0595	.003
18	.0480	.003
19	.0420	.003
20	.0355	.002
22	.0293	.002
24	.0235	.0015
26	.0178	.0015
28	.0151	.0015

Stainless Sheet Tolerances

Flatness, Stretcher Level Flatness

Thickness (inches)	Width (inches)	Length (inches)	Flatness Tolerances
under 3/16	thru 48	up to 96	1/8
under 3/16	thru 48	over 96	1/4
under 3/16	over 48	thru 96	1/4
under 3/16	over 48	over 96	1/4

***Note:** Flatness is defined as maximum deviation from a horizontal flat surface.*

Stainless Plate Tolerances

Thickness Tolerance for Stainless and Heat Resisting Steels

Specified Thickness (inches)	Width (inches)	
	Thru 84	Over 84 thru 120
3/16 up to 3/8	+.045 / –.010	+.050 / –.010
3/8 up to 3/4	+.055 / –.010	+.060 / –.010
3/4 up to 1	+.060 / –.010	+.065 / –.010
1 up to 2	+.070 / –.010	+.075 / –.010
2 up to 3	+.125 / –.010	+.150 / –.010
3 up to 4	+.175 / –.010	+.210 / –.010
4 up to 6	+.250 / –.010	+.300 / –.010
6 up to 8	+.350 / –.010	+.420 / –.010
8 thru 10	+.450 / –.010	+.540 / –.010

Flatness Tolerance for Annealed Stainless and Heat Resisting Steel Plate

Specified Thickness (inches)	Flatness Tolerance for Thickness & Widths				
	Widths (inches)				
	Up thru 48	Over 48 up to 60	60 up thru 72	72 up thru 84	84 up thru 96
3/16 up to 1/4	3/4	1-1/16	1-1/4	1-3/8	1-5/8
1/4 up to 3/8	11/16	3/4	15/16	1-1/8	1-3/8
3/8 up to 1/2	1/2	9/16	11/16	3/4	15/16
1/2 up to 3/4	1/2	9/16	5/8	5/8	13/16
3/4 up to 1	1/2	9/16	5/8	5/8	3/4
1 up to 1-1/2	1/2	9/16	9/16	9/16	11/16
1-1/2 up to 4	3/16	5/16	3/8	7/16	1/2
4 thru 6	1/4	3/8	1/2	9/16	5/8

***Note:** Flatness is defined as maximum deviation from a horizontal flat surface.*

Stainless Flats Tolerances

Sheared and Edged Flats

Order Thickness (inches)	Permitted Variation in Thickness (inches)		Permitted Variation in Width (inches)			
	Over	Under	Width up to 4"		Widths Over 4"	
			Over	Under	Over	Under
1/8 Over 0.114 to 0.130	0.010	0.010	0.094	0.031	0.094	0.094
3/16 - 3/8	0.050	0.010	0.094	0.031	0.094	0.094
3/8 - 3/4	0.060	0.010	0.094	0.031	0.094	0.094

True Bar Flats

True Bar	Permitted Variations in Thickness for Thicknesses Given (inches)			Permitted Variations in Width Tolerance (inches)	
Width (inches)	1/8 thru 1/2	Over 1/2 thru 1	Over 1 thru 2	Over	Under
Up thru 1	+/-.008	+/-.010	—	.015	.015
Over 1 thru 2	+/-.012	+/-.015	+/-.031	.031	.031
Over 2 thru 4	+/-.015	+/-.020	+/-.031	.062	.031
Over 4 thru 6	+/-.015	+/-.020	+/-.031	.093	.062
Over 6 thru 8	+/-.016	+/-.025	+/-.031	.125	.156
Over 8 thru 10	+/-.021	+/-.031	+/-.031	.156	.187

True Bar Straightness Tolerances

Hot Rolled	Cold Finished
1/8" in any 5 foot section of the bar	1/16" in any 5 foot section of the bar

Note: Straightness tolerances have not been established for sizes less than 1/2".

Stainless Angle Tolerances

Leg Tolerance (Length)	+/- 1/8"
Weight Tolerance	+/- 7.5%
Right Angle Tolerance	+/- 2°
Straightness or Camber	1/8" in 5'

Stainless Channel Tolerances

Section (Leg Tolerance)

Under 1" (Total)..... 0.040
1" - 3" incl..... 0.062
3" - 4" incl..... 0.093
Over 4"..... 0.125

Angular +/-2"

Corner Radii 1/4" or less

Leg Radii 1/4" or less

Transverse Flatness

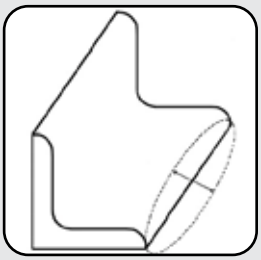
.010" per inch of width, .050" max.

Length

Up to 12' incl.	
To 3" wide section	
Over 3" to 6" incl.	+ 3/16 / - 0
Over 6"	+ 1/4 / - 0
Over 12'	
To 3" wide section	+ 3/16 / - 0
Over 3" to 6" incl.	+ 1/4 / - 0
Over 6"	+ 5/16 / - 0

Camber

Camber or bow tolerances shall not exceed 0.025 in. [0.60mm] x length in ft. [$^{m}/_{3}$]



Twist

Width of Section	Rise in 5 ft.
1/2" to 1-1/2" incl.	.125"
Over 1-1/2" to 4" incl.	.188"
Over 4"	.250"

Stainless Round Tube Tolerances

Nominal Round (inches)	Wall Thickness (inches)	Outside Dia. Tolerance (inches)	Wall Tolerance (percent)
5/8 to 1 incl	0.035 to 0.062	+ or - 0.005	+ or - 10%
5/8 to 1 incl	Over 0.062	+ or - 0.010	+ or - 10%
Over 1 to 1-1/2 incl	0.035 to 0.062	+ or - 0.008	+ or - 10%
Over 1 to 1-1/2 incl	Over 0.062	+ or - 0.010	+ or - 10%
Over 1 to 2-1/2 incl	Over 0.035	+ or - 0.012	+ or - 10%
Over 2-1/2 to 3-1/2 incl	Over 0.049	+ or - 0.020	+ or - 10%
Over 3-1/2 to 5 incl	Over 0.049	+ or - 0.025	+ or - 10%
Over 5	Over 0.083	+ or - 0.030	+ or - 10%

Stainless Square & Rectangular Tube Tolerances

Largest Nominal Outside Diameter (inches)	O.D. Tolerance Concavity or Convexity (inches)	Wall Tolerance (percent)
To 1-1/4 incl.	+ or - 0.015	+ or - 10%
Over 1-1/4 to 2-1/2 incl.	+ or - 0.020	+ or - 10%
Over 2-1/2 to 5-1/2 incl.	+ or - 0.030	+ or - 10%
Over 5-1/2	+ or - 0.060	+ or - 10%

Aluminum

Bar, Sheet, Plate, Structurals, Tube & Pipe

NOTE: Typical properties shown for alloys are not guaranteed by publication herein. In most cases, the values are averages for various sizes, product forms and manufacturing practices. The typical properties do not exactly represent particular products or sizes. The data is intended only as a basis for comparing alloys and tempers and should not be specified as engineering requirements or used for design purposes.

WARNING: These products can potentially expose you to chemicals including Nickel, Chromium, Lead, Cobalt, Mercury and Beryllium, which are known to the state of California to cause cancer and/or birth defects or other reproductive harm. For more information, visit **www.P65Warnings.ca.gov**

Aluminum

Rod, Bar and Wire (Cold Finished)

Rounds • Flats • Hexagons • Squares

Alloy Descriptions and Applications

2011 – This free machining alloy compares favorably with free cutting brass. It is the most suitable alloy for machining on automatics, milling machines, lathes, planers, shapers and other machine tools, and is the most widely used alloy for all types of screw machine parts. It can be machined at high speeds and comparatively heavy feeds. Machined surfaces are bright and smooth. Mechanical finishes readily match joined parts. Mechanical properties and hardness are excellent; corrosion resistance fair. Weldability by resistance method is fair; other welding is not recommended.

2014 – One of the strongest of heat-treatable alloys, 2014 is used in heavy duty applications. Machinability is good to excellent when high rakes and clearances, adequate coolant, sharp tools, fast speeds, and light-to-medium cuts and feeds are employed. Machined surfaces are very smooth. Weldability is good with arc and resistance methods. Corrosion resistance is fair. This is the most widely used forging alloy.

2017 – Like 2011, this is also a general-purpose alloy for automatic screw machine work. It is stronger than 2011, but harder to machine and does not have the fine chip associated with 2011. It is recommended for heavy-duty parts because of its high strength. Workability is fair, with ductility and formability considered better than 2014. Arc and resistance weldability are satisfactory. Corrosion resistance is fair. It is used for rivets, fasteners, and aircraft components.

2024 – Known as the “aircraft alloy” in machining rod, this alloy has properties higher than 2017 and 2014. Though formability is generally considered only fair in the cold state, it is one of the most popular alloys for cold heading and roll threading applications. Can be machined to a high finish. Corrosion resistance is fair. Applications include Phillips head screws, wood screws, hydraulic fittings and small parts in clocks and meters. It is also the basic alloy for cold finished rectangular bar where strength and machinability are essential for precision fittings and parts.

6061 – Generally selected where welding or brazing is required, or for its particularly high corrosion resistance in all tempers. Formability is excellent in 0 temper, good in T4. Machining is more difficult than with other machining alloys; it is particularly gummy in 0 condition, fair in hard tempers. Corrosion resistance and appearance after anodizing are highest of screw machine alloys, though properties are generally lower. Applications include railway car components, bridge components, pipe fittings, wheels and various transportation end uses.

Aluminum

Rod, Bar and Wire (Cold Finished)

Rounds • Flats • Hexagons • Squares

Alloy Descriptions and Applications

6262 – 6262 aluminium alloy is an alloy in the wrought aluminium-magnesium-silicon family (6000 or 6xxx series). It is related to 6162 aluminium alloy (Aluminum Association designations that only differ in the second digit are variations on the same alloy), but sees much more widespread use. It is notably distinct from 6162, and most other aluminium alloys, in that it contains lead in its alloy composition. Has excellent machinability, is readily welded, and has good corrosion resistance. Formability is fair in T6 temper, difficult in T9. Bright, smooth finish is easy to obtain.

7075/7175 – 7075 has been the strongest and hardest alloy sold commercially for decades. 7175 is more pure, but may not be suitable for fracture toughness applications. The superior stress corrosion resistance of the T73 and T7351 tempers of 7075 rolled or cold finished rod have made them a logical replacement for alloys 2014, 2017 and 2024 in many of the most critical applications. In machined parts and forgings it is used primarily in aircraft, ordnance, highly stressed structural applications, keys, small gears, etc. It is more difficult to forge than other alloys, but is often selected because of its properties. Machinability is good, resistance welding satisfactory, finishing characteristics excellent, and corrosion resistance fair.

Aluminum

Rod, Bar and Wire (Cold Finished)

Typical Mechanical Properties

Alloy & Temper	Tension			
	Strength (ksi)		Elongation % in 2"	
	Ultimate	Yield	1/16" thk	1/2" dia.
2011-T3	55	43	---	15
2011-T8	59	45	---	12
2014-0	27	14	---	18
2014-T4, T451	62	42	---	20
2014-T6, T651	70	60	---	13
2017-0	26	10	---	22
2017-H13	35	33	---	10
2017-T4, T451	62	40	---	22
2024-0	27	11	20	22
2024-H13	37	35	---	0
2024-T351, T4	68	47	20	19
2024-T361	72	57	13	---
2024-T851	70	65	6	---
6061-0	18	8	25	30
6061-H13	26	---	---	---
6061-T4, T451	35	21	22	25
6061-T6, T651	45	40	12	17
6061-T913	67	66	---	10
6061-T94	57	---	---	---
6063-0	13	7	---	---
6063-T4	25	13	22	---
6063-T6	35	31	12	---
6262-T6, T651	45	40	---	17
6262-T8	50	47	---	14
6262-T9	58	55	---	10
7075-0	33	15	17	16
7075-H13	40	---	---	---
7075-T6, T651	83	73	11	11
7075-T73, T7351	73	63	13	---

Two page chart, continues on next page

The above typical properties are not guaranteed since in most cases they are averages for various sizes, product forms and methods of manufacture and may not be exactly representative of any particular product or size. This data is intended only as a basis for comparing alloys and tempers and should not be specified as engineering requirements or used for design purposes.

Aluminum

Rod, Bar and Wire (Cold Finished)

Typical Mechanical Properties

Hardness	Shear	Fatigue	Modulus
Brinell # 500 kg load 10 mm ball	Ultimate Shearing Strength (ksi)	Endurance Limit[2] (ksi)	Mod of Elasticity[3] (ksi x 10^{-3})
95	32	18	10.2
100	35	18	10.2
45	18	13	10.6
105	38	20	10.6
135	42	18	10.6
45	18	13	10.5
---	---	---	10.5
105	38	18	10.5
47	18	13	10.6
---	---	---	10.6
120	41	20	10.6
130	42	18	10.6
128	43	18	10.6
30	12	9	10.0
---	---	---	10.0
65	24	14	10.0
95	30	14	10.0
---	35	---	10.0
---	---	---	10.0
25	10	8	10.0
---	16	---	10.0
73	22	10	10.0
95	30	---	10.0
---	---	---	10.0
120	35	13	10.0
60	22	17	10.4
---	---	---	10.4
150	48	23	10.4
---	44	23	10.4

Two page chart, continued from previous page

Notes:

(1) The indicated typical mechanical properties for all except 0 temper material are higher than the specified minimum properties. For O temper products typical ultimate and yield values are slightly lower than specified (maximum) values.

(2) Based on 500,000,000 cycles of completely reversed stress using the R.R. Moore type of machine and specimen.

(3) Average of tension and compression moduli. Compression modulus is about 2% greater than tension modulus.

Aluminum Rounds, 2011-T3

Standard Screw Machine Stock, Cold Finished

ASTM-B211, AMS-QQ-A-225/3 • Stock Lengths: 12 foot

Diameter (inches)	Approx Wt. (lbs./foot)
1/8	.015
5/32	.023
3/16	.034
7/32	.046
1/4	.060
9/32	.076
5/16	.094
11/32	.114
3/8	.135
13/32	.158
7/16	.184
15/32	.211
1/2	.240
17/32	.271
9/16	.304
19/32	.339
5/8	.376
21/32	.414
11/16	.454
23/32	.496
3/4	.542
25/32	.586
13/16	.636
27/32	.684

Diameter (inches)	Approx Wt. (lbs./foot)
7/8	0.736
15/16	0.845
1	0.961
1-1/16	1.085
1-1/8	1.217
1-3/16	1.356
1-1/4	1.502
1-5/16	1.656
1-3/8	1.818
1-7/16	1.990
1-1/2	2.163
1-9/16	2.347
1-5/8	2.539
1-11/16	2.736
1-3/4	2.942
1-13/16	3.156
1-7/8	3.380
1-15/16	3.620
2	3.845
2-1/16	4.087
2-1/8	4.339
2-3/16	4.620
2-1/4	4.864
2-5/16	5.150

Diameter (inches)	Approx Wt. (lbs./foot)
2-3/8	5.420
2-7/16	5.730
2-1/2	6.008
2-9/16	6.316
2-5/8	6.624
2-11/16	6.960
2-3/4	7.270
2-13/16	7.623
2-7/8	7.946
2-15/16	8.320
3	8.652
3-1/8	9.388
3-1/4	10.154
3-5/16	10.548
3-3/8	10.950
3-1/2	11.776
3-3/4	13.518
4	15.381
4-1/4	17.364
5	24.103
6	34.708
8	61.704

Aluminum Hexagons, 2011-T3

Standard Screw Machine Stock, Cold Finished

ASTM-B211, AMS-QQ-A-225/3 • Stock Lengths: 12 foot

Distances Across Flat (inches)	Approx Wt. (lbs./foot)
1/4	.0662
5/16	.1035
3/8	.1491
7/16	.2029
1/2	.2660
9/16	.3354
5/8	.4141
11/16	.5010
3/4	.5980
13/16	.7000

Distances Across Flat (inches)	Approx Wt. (lbs./foot)
7/8	.8130
15/16	.9330
1	1.061
1-1/16	1.198
1-1/8	1.343
1-1/4	1.658
1-5/16	1.826
1-3/8	2.000
1-7/16	2.190
1-1/2	2.385

Distances Across Flat (inches)	Approx Wt. (lbs./foot)
1-5/8	2.7990
1-3/4	3.2462
1-7/8	3.7265
2	4.2399
2-1/4	5.3662
2-1/2	6.6249
2-3/4	8.0161
3	9.5399

Aluminum Rounds, 2017-T451

Standard Screw Machine Stock, Cold Finished

ASTM-B211, AMS-QQ-A-225/5

Stock Lengths: 12 foot (sizes over 3-1/2" Dia. in random lengths)

Diameter (inches)	Approx Wt. (lbs./foot)	Diameter (inches)	Approx Wt. (lbs./foot)	Diameter (inches)	Approx Wt. (lbs./foot)
1/8*	.0148	1	0.9514	2-1/2	5.9600
5/32*	.0232	1-1/16	1.0741	2-9/16	6.2474
3/16*	.0334	1-1/8	1.2041	2-5/8	6.5559
7/32*	.0455	1-3/16	1.3500	2-3/4	7.1951
1/4*	.0594	1-1/4	1.4570	2-7/8	7.8641
9/32*	.0752	1-5/16	1.6060	3	8.5628
5/16*	.0929	1-3/8	1.7988	3-1/8	9.2912
11/32*	.1124	1-7/16	1.9270	3-1/4	10.0494
3/8*	.1338	1-1/2	2.0980	3-5/16	10.4396
13/32*	.1569	1-9/16	2.3228	3-3/8	10.8373
7/16*	.1821	1-5/8	2.5123	3-1/2	11.4230
15/32*	.2091	1-11/16	2.7093	3-5/8	12.5023
1/2*	.2410	1-3/4	2.9137	3-3/4	13.3793
17/32*	.2685	1-13/16	3.1256	4	15.2227
9/16*	.3010	1-7/8	3.3448	4-1/4	17.1850
19/32*	.3354	1-15/16	3.5715	4-1/2	19.2663
5/8	.3640	2	3.6700	4-3/4	21.4664
21/32	.4097	2-1/16	4.0473	5	23.7855
11/16	.4497	2-1/8	4.2963	5-1/4	26.2235
23/32	.4915	2-3/16	4.5527	5-1/2	28.2240
3/4	.5370	2-1/4	4.8166	5-3/4	31.4563
13/16	.6281	2-5/16	5.0879	6	34.2511
7/8	.7284	2-3/8	5.3666	7	46.6196
15/16	.8362	2-7/16	5.6528	8*	60.8909

**Temper T4*

Aluminum Hexagons, 2017-T451

Standard Screw Machine Stock, Cold Finished

ASTM-B211, AMS-QQ-A-225/5 • Stock Lengths: 12 foot

Distances Across Flat (inches)	Approx Wt. (lbs./foot)	Distances Across Flat (inches)	Approx Wt. (lbs./foot)	Distances Across Flat (inches)	Approx Wt. (lbs./foot)
1/4*	.0656	7/8	.8042	1-9/16	2.5645
5/16*	.1026	15/16	.9232	1-5/8	2.7737
11/32*	.1241	1	1.0504	1-11/16	2.9912
3/8*	.1477	1-1/16	1.1858	1-3/4	3.2169
7/16*	.2010	1-1/8	1.3294	1-7/8	3.6928
1/2*	.2626	1-3/16	1.4812	2	4.2016
9/16*	.3324	1-1/4	1.6413	2-1/4	5.3177
5/8	.4103	1-5/16	1.8095	2-1/2	6.5565
11/16	.4965	1-3/8	1.9859	2-3/4	7.9436
3/4	.5909	1-7/16	2.1706	3	9.4536
13/16	.6934	1-1/2	2.3634		

**Temper T4*

Aluminum Square Bars, 2017-T451

Standard Screw Machine Stock, Cold Finished

ASTM-B211, AMS-QQ-A-225/5 • Stock Lengths: 12 foot

Size (inches)	Approx Wt. (lbs./lineal ft.)	Size (inches)	Approx Wt. (lbs./lineal ft.)	Size (inches)	Approx Wt. (lbs./lineal ft.)
1/4*	.0757	5/8	.4734	1-1/8	1.5339
3/8*	.1704	11/16	.5728	1-1/4	1.8938
7/16*	.2320	3/4	.6818	1-1/2	2.7270
1/2*	.3030	7/8	.9279	1-3/4	3.7118
9/16*	.3835	1	1.2120	2	4.8480

**Temper T4*

Aluminum Rounds, 2024-T351

Standard Screw Machine Stock, Cold Finished

ASTM-B211, AMS-QQ-A-225/6 • Stock Lengths: 12 foot

Diameter (inches)	Approx Wt. (lbs./foot)	Diameter (inches)	Approx Wt. (lbs./foot)	Diameter (inches)	Approx Wt. (lbs./foot)
1/8*	.0147	7/8	0.7212	2-1/2	5.8875
5/32*	.0230	29/32	0.7736	2-9/16	6.1856
11/64*	.0278	15/16	0.8279	2-5/8	6.4909
3/16*	.0331	31/32	0.8841	2-3/4	7.1239
13/64*	.0389	1	0.9400	2-7/8	7.7862
7/32*	.0451	1-1/16	1.0634	3	8.4788
15/64*	.0516	1-1/8	1.1923	3-1/8	9.1992
1/4*	.0588	1-3/16	1.3284	3-1/4	9.9499
17/64*	.0664	1-1/4	1.4720	3-5/16	10.3362
9/32*	.0745	1-5/16	1.6228	3-3/8	10.7299
5/16*	.0920	1-3/8	1.7809	3-1/2	11.5395
11/32*	.1113	1-7/16	1.9460	3-3/4	13.2469
3/8*	.1324	1-1/2	2.1195	4	15.0720
25/64*	.1437	1-9/16	2.2998	4-1/4	17.0148
13/32*	.1554	1-5/8	2.4877	4-1/2	19.0755
7/16*	.1803	1-11/16	2.6828	4-3/4	21.2538
15/32*	.2070	1-3/4	2.8849	5	23.5300
1/2*	.2355	1-13/16	3.0946	5-1/4	25.9638
17/32*	.2658	1-7/8	3.3117	5-1/2	28.4955
9/16*	.2981	1-15/16	3.5362	5-3/4	31.1449
19/32*	.3319	2	3.7683	6	33.9120
5/8	.3679	2-1/16	4.0072	6-1/4	36.7969
21/32	.4056	2-1/8	4.2537	6-1/2	39.7995
11/16	.4452	2-3/16	4.5076	7	46.1580
23/32	.4867	2-1/4	4.7689	7-1/4	49.5139
3/4	.5298	2-5/16	5.0375	7-1/2	52.9875
25/32	.5749	2-3/8	5.3135	8*	60.2880
13/16	.6219	2-7/16	5.5968		

**Temper T4*

Aluminum Hexagons, 2024-T351

Standard Screw Machine Stock, Cold Finished

ASTM-B211, AMS-QQ-A-225/6 • Stock Lengths: 12 foot

Distances Across Flat (inches)	Approx Wt. (lbs./foot)
3/16	.037
1/4*	.065
5/16*	.101
11/32*	.122
3/8*	.146
7/16*	.199
1/2*	.260
9/16*	.329
5/8	.406
11/16	.492
3/4	.585
13/16	.686
7/8	0.796
15/16	0.914
1	1.040
1-1/16	1.174
1-1/8	1.316
1-3/16	1.466
1-1/4	1.625
1-5/16	1.792
1-3/8	1.966
1-7/16	2.150
1-1/2	2.340
1-9/16	2.539
1-5/8	2.746
1-11/16	2.962
1-3/4	3.185
1-7/8	3.656
2	4.160
2-1/4	5.259
2-7/16	6.160
2-1/2	6.500
2-5/8	7.158
2-3/4	7.865
3	9.349

**Temper T4*

Aluminum Squares, 2024-T4 & 2024-T351

Cold Finished Square Bar

ASTM-B211, AMS-QQ-A-225/6 • Stock Lengths: 12 foot

Size (inches)	Approx Wt. (lbs./lineal ft.)
1/4	.075
3/8	.169
7/16	.230
1/2	.300
9/16	.379
5/8	.478
3/4	.675
7/8	0.919
1	1.200
1-1/8	1.519
1-1/4	1.875
1-1/2	2.700
1-3/4	3.675
2	4.800
2-1/4	5.954
2-1/2	7.575
2-3/4	9.185
3	10.800
3-1/4	12.675
3-1/2	14.700
4	19.240

Aluminum Rect. Bar, 2024-T4 & 2024-T351

Cold Finished Rectangular Bars

ASTM-B211, AMS-QQ-A-225/6 • Stock Lengths: 12 foot

Bar Size (inches)	Weight (lbs./foot)
1/8 x 1/2	0.080
1/8 x 5/8	0.090
1/8 x 3/4	0.113
1/8 x 1	0.150
1/8 x 1-1/4	0.180
1/8 x 1-1/2	0.220
1/8 x 2	0.300
3/16 x 1/2	0.113
3/16 x 5/8	0.141
3/16 x 3/4	0.169
3/16 x 1	0.225
3/16 x 1-1/4	0.281
3/16 x 1-1/2	0.338
3/16 x 2	0.450
1/4 x 1/2	0.150
1/4 x 5/8	0.188
1/4 x 3/4	0.225
1/4 x 7/8	0.263
1/4 x 1	0.300
1/4 x 1-1/4	0.375
1/4 x 1-1/2	0.450
1/4 x 2	0.600
1/4 x 2-1/2	0.750
1/4 x 3	0.909
1/4 x 4	1.200
5/16 x 1/2	0.188
5/16 x 5/8	0.234
5/16 x 3/4	0.281
5/16 x 1	0.375
5/16 x 1-1/2	0.563
5/16 x 2	0.750
3/8 x 1/2	0.225
3/8 x 5/8	0.281
3/8 x 3/4	0.338
3/8 x 1	0.455
3/8 x 1-1/4	0.563
3/8 x 1-1/2	0.675
3/8 x 1-3/4	0.788
3/8 x 2	0.909
3/8 x 2-1/2	1.136
3/8 x 3	1.350

Bar Size (inches)	Weight (lbs./foot)
1/2 x 5/8	0.379
1/2 x 3/4	0.455
1/2 x 7/8	0.525
1/2 x 1	0.606
1/2 x 1-1/4	0.758
1/2 x 1-1/2	0.909
1/2 x 1-3/4	1.061
1/2 x 2	1.212
1/2 x 2-1/4	1.350
1/2 x 2-1/2	1.515
1/2 x 3	1.818
1/2 x 4	2.424
1/2 x 6	3.363
5/8 x 3/4	0.551
5/8 x 7/8	0.656
5/8 x 1	0.758
5/8 x 1-1/4	0.947
5/8 x 1-1/2	1.136
5/8 x 2	1.515
3/4 x 1	0.909
3/4 x 1-1/4	1.136
3/4 x 1-1/2	1.364
3/4 x 1-3/4	1.591
3/4 x 2	1.818
3/4 x 2-1/2	2.273
3/4 x 3	2.727
3/4 x 3-1/2	3.182
3/4 x 4	3.636
3/4 x 6	5.454
1 x 1-1/4	1.515
1 x 1-1/2	1.818
1 x 1-3/4	2.100
1 x 2	2.424
1 x 2-1/2	3.030
1 x 3	3.636
1 x 3-1/2	4.190
1 x 4	4.848
1 x 5	5.990
1 x 6	7.272

Bar Size (inches)	Weight (lbs./foot)
1-1/4 x 1-1/2	2.250
1-1/4 x 2	3.000
1-1/4 x 2-1/4	3.375
1-1/4 x 2-1/2	3.750
1-1/4 x 3	4.500
1-1/4 x 4	6.000
1-1/2 x 2	3.600
1-1/2 x 2-1/2	4.500
1-1/2 x 3	5.400
1-1/2 x 3-1/2	6.300
1-1/2 x 4	7.200
1-1/2 x 5	9.000
1-1/2 x 6	10.800
1-1/2 x 8	14.400
1-3/4 x 2	4.200
1-3/4 x 3	6.300
1-3/4 x 4	8.400
2 x 2-1/4	5.400
2 x 2-1/2	6.000
2 x 3	7.272
2 x 3-1/2	8.400
2 x 4	9.600
2 x 5	12.000
2 x 6	14.400
2-1/4 x 4	10.80
2-1/2 x 3	9.00
2-1/2 x 4	12.00
2-1/2 x 4-1/2	13.50
2-1/2 x 5	15.00
2-1/2 x 6	18.00
2-3/4 x 4	13.20
3 x 4	14.40
3 x 5	18.00
3 x 6	21.60

Aluminum Rounds, 6061-T651

Standard Screw Machine Stock, Cold Finished

ASTM-B211, AMS-QQ-A-225/8 • Stock Lengths: 12 foot

Diameter (inches)	Approx Wt. (lbs./foot)
1/8*	.014
5/32*	.023
11/64*	.027
3/16*	.033
13/64*	.038
7/32*	.044
15/64*	.051
1/4*	.058
17/64*	.065
9/32*	.073
5/16*	.090
11/32*	.109
3/8*	.130
25/64*	.141
13/32*	.152
7/16*	.177
15/32*	.203
1/2	.231
17/32	.261
35/64	.276
9/16	.292
19/32	.325
5/8	.361
21/32	.398
11/16	.436
23/32	.477
3/4	.519
25/32	.564
13/16	.609
7/8	.707
29/32	.758

Diameter (inches)	Approx Wt. (lbs./foot)
15/16	0.811
31/32	0.866
1	0.923
1-1/32	0.982
1-1/16	1.042
1-3/32	1.104
1-1/8	1.168
1-5/32	1.234
1-3/16	1.302
1-7/32	1.371
1-1/4	1.442
1-9/32	1.515
1-5/16	1.590
1-3/8	1.745
1-7/16	1.908
1-1/2	2.077
1-9/16	2.254
1-5/8	2.438
1-11/16	2.629
1-3/4	2.827
1-13/16	3.033
1-7/8	3.245
1-15/16	3.465
2	3.693
2-1/16	3.927
2-1/8	4.169
2-3/16	4.417
2-1/4	4.673
2-5/16	4.937
2-3/8	5.207
2-7/16	5.485

Diameter (inches)	Approx Wt. (lbs./foot)
2-1/2	5.770
2-9/16	6.062
2-5/8	6.361
2-3/4	6.981
2-7/8	7.630
3	8.308
3-1/8	9.015
3-1/4	9.751
3-5/16	10.130
3-3/8	10.515
3-1/2	11.309
3-3/4	12.982
4	14.771
4-1/4	16.675
4-1/2	18.694
4-3/4	20.828
5	23.079
5-1/4	25.445
5-1/2	27.926
5-3/4	30.522
6	33.234
6-1/8	34.633
6-1/4	36.061
6-1/2	39.004
6-3/4	42.061
7	45.235
7-1/2	51.928
8	59.082

**Temper T6*

Aluminum Hexagons, 6061-T651

Standard Screw Machine Stock, Cold Finished

ASTM-B211, AMS-QQ-A-225/8 • Stock Lengths: 12 foot

Distances Across Flat (inches)	Approx Wt. (lbs./foot)
1/4*	.064
9/32	.081
3/8*	.143
7/16*	.195
1/2	.255
9/16	.322
5/8	.398
11/16	.482
3/4	.573
13/16	.673
7/8	.780
15/16	0.896
1	1.019
1-1/16	1.151
1-1/8	1.290
1-3/16	1.437
1-1/4	1.593
1-5/16	1.756
1-3/8	1.927
1-7/16	2.106
1-1/2	2.293
1-9/16	2.488
1-5/8	2.691
1-11/16	2.902
1-3/4	3.121
1-7/8	3.583
2	4.077
2-1/8	4.602
2-1/4	5.160
2-1/2	6.370
2-3/4	7.708
3	9.173

**Temper T6*

Aluminum Rounds, 6262-T9

Standard Screw Machine Stock, Cold Finished

ASTM-B211, AMS-QQ-A-225/10 • Stock Lengths: 12 foot

Diameter (inches)	Approx Wt. (lbs./foot)
1/8	.014
5/32	.023
11/64	.027
3/16	.032
13/64	.038
7/32	.044
15/64	.051
1/4	.058
17/64	.065
9/32	.073
5/16	.090
11/32	.109
3/8	.130
25/64	.141
13/32	.152
7/16	.177
15/32	.203
1/2	.231
17/32	.261
35/64	.276
9/16	.292
19/32	.325
5/8	.361
21/32	.398
11/16	.436
23/32	.477
3/4	.519
25/32	.563
13/16	.609
7/8	.707
29/32	.758
15/16	.811
31/32	.866
1	.923
1-1/32	.980
1-1/16	1.042
1-3/32	1.104
1-1/8	1.168
1-5/32	1.234
1-3/16	1.302
1-7/32	1.371
1-1/4	1.442
1-9/32	1.515
1-5/16	1.590
1-3/8	1.745
1-7/16	1.908
1-1/2	2.077
1-9/16	2.254
1-5/8	2.438
1-11/16	2.629
1-3/4	2.827
1-13/16	3.033
1-7/8	3.245
1-15/16	3.465
2	3.693
2-1/16	3.927
2-1/8	4.169
2-3/16	4.417
2-1/4	4.673
2-5/16	4.937
2-3/8	5.207
2-7/16	5.485
2-1/2	5.770
2-9/16	6.062
2-5/8	6.361
2-3/4	6.981
2-7/8	7.630
3	8.308
3-1/8	9.015
3-1/4	9.751
3-5/16	10.130
3-3/8	10.515

Aluminum Hexagons, 6262-T9

Standard Screw Machine Stock, Cold Finished

ASTM-B211, AMS-QQ-A-225/10 • Stock Lengths: 12 foot

Distances Across Flat (inches)	Approx Wt. (lbs./foot)
1/4	.064
3/8	.143
7/16	.195
1/2	.255
9/16	.322
5/8	.398
11/16	.482
3/4	.573
13/16	.673
7/8	.780

Distances Across Flat (inches)	Approx Wt. (lbs./foot)
15/16	0.896
1	1.019
1-1/16	1.151
1-1/8	1.290
1-3/16	1.437
1-1/4	1.593
1-5/16	1.756
1-3/8	1.927
1-7/16	2.106
1-1/2	2.293

Distances Across Flat (inches)	Approx Wt. (lbs./foot)
1-9/16	2.488
1-5/8	2.691
1-11/16	2.902
1-3/4	3.121
1-7/8	3.583
2	4.077

Aluminum Squares, 7075-T651

Cold Finished Square Bar

ASTM-B211, AMS-QQ-A-225/9 • Stock Lengths: 12 foot

Size (inches)	Approx Wt. (lbs./lineal ft.)
1/4	.075
3/8	.169
7/16	.230
1/2	.300
9/16	.379
5/8	.478
3/4	.675

Size (inches)	Approx Wt. (lbs./lineal ft.)
7/8	0.919
1	1.200
1-1/8	1.519
1-1/4	1.875
1-1/2	2.700
1-3/4	3.675
2	4.800

Size (inches)	Approx Wt. (lbs./lineal ft.)
2-1/4	5.954
2-1/2	7.575
2-3/4	9.185
3	10.800
3-1/4	12.675
3-1/2	14.700
4	19.240

Aluminum Rounds, 7075-T651

Standard Screw Machine Stock, Cold Finished

ASTM-B211, AMS-QQ-A-225/9 • Stock Lengths: 12 foot

Diameter (inches)	Approx Wt. (lbs./foot)
1/8*	.0150
5/32*	.0232
11/64*	.0281
3/16*	.0334
13/64*	.0393
7/32*	.0455
15/64*	.0523
1/4*	.0595
17/64*	.0671
9/32*	.0753
5/16*	.0929
11/32*	.1124
3/8*	.1338
25/64*	.1452
13/32*	.1570
7/16*	.1821
15/32*	.2091
1/2*	.2379
17/32*	.2685
35/64*	.2845
9/16*	.3010
19/32*	.3354
5/8	.3716
21/32	.4097
11/16	.4497
23/32	.4915
3/4	.5352
25/32	.5807
13/16	.6281
7/8	.7284

Diameter (inches)	Approx Wt. (lbs./foot)
29/32	.7814
15/16	.8362
31/32	.8929
1	.9514
1-1/32	1.0120
1-1/16	1.0741
1-3/32	1.1382
1-1/8	1.2041
1-5/32	1.2720
1-3/16	1.3417
1-7/32	1.4132
1-1/4	1.4866
1-9/32	1.5618
1-5/16	1.6390
1-3/8	1.7988
1-7/16	1.9660
1-1/2	2.1407
1-9/16	2.3228
1-5/8	2.5123
1-11/16	2.7093
1-3/4	2.9137
1-13/16	3.1256
1-7/8	3.3448
1-15/16	3.5715
2	3.8057
2-1/16	4.0473
2-1/8	4.2963
2-3/16	4.5527
2-1/4	4.8166
2-5/16	5.0879

Diameter (inches)	Approx Wt. (lbs./foot)
2-3/8	5.3666
2-7/16	5.6528
2-1/2	5.9464
2-9/16	6.2474
2-5/8	6.5559
2-3/4	7.1951
2-7/8	7.8641
3	8.5628
3-1/8	9.2912
3-1/4	10.0494
3-5/16	10.4396
3-3/8	10.8373
3-1/2	11.6549
3-5/8	12.5023
3-3/4	13.3793
4	15.2227
4-1/4	17.1850
4-1/2	19.2663
4-3/4	21.4664
5	23.7855
5-1/4	26.2235
5-1/2	28.7805
5-3/4	31.4563
6	34.2511
6-1/2	40.1980
7	46.6196
7-1/2	53.5170
8	60.8909

**Temper T6*

Aluminum Rectangles, 7075-T6

Cold Finished Rectangular Bar Stock

ASTM-B221, AMS-QQ-A-225/9 • Stock Lengths: 12 foot

Bar Size (inches)	Weight (lbs./foot)
1/8 x 1/2	.076
1/8 x 5/8	.095
1/8 x 3/4	.114
1/8 x 1	.152
1/8 x 1-1/4	.190
1/8 x 1-3/8	.209
1/8 x 1-1/2	.227
1/8 x 1-3/4	.265
1/8 x 2	.303
1/8 x 2-1/2	.379
1/8 x 3	.455
1/8 x 3-1/2	.531
1/8 x 4	.607
1/8 x 5	.758
1/8 x 6	.910
3/16 x 1/2	.114
3/16 x 5/8	.142
3/16 x 3/4	.171
3/16 x 7/8	.199
3/16 x 1	.227
3/16 x 1-1/4	.284
3/16 x 1-1/2	.341
3/16 x 1-3/4	.398
3/16 x 2	.455
3/16 x 2-1/4	.512
3/16 x 2-1/2	.569
3/16 x 3	.682
3/16 x 3-1/2	.796
3/16 x 4	.910
3/16 x 5	1.137
3/16 x 6	1.365
3/16 x 12	2.730
1/4 x 3/8	.114
1/4 x 1/2	.152
1/4 x 5/8	.190
1/4 x 3/4	.227
1/4 x 7/8	.265
1/4 x 1	.303
1/4 x 1-1/4	.379
1/4 x 1-1/2	.455
1/4 x 1-3/4	.531
1/4 x 2	.607
1/4 x 2-1/4	.682
1/4 x 2-1/2	.758
1/4 x 2-3/4	.834
1/4 x 3	.910
1/4 x 3-1/4	.986
1/4 x 3-1/2	1.062
1/4 x 4	1.213

Bar Size (inches)	Weight (lbs./foot)
1/4 x 4-1/2	1.365
1/4 x 5	1.517
1/4 x 5-1/2	1.668
1/4 x 6	1.820
1/4 x 7	2.123
1/4 x 8	2.426
1/4 x 9	2.730
1/4 x 9-1/2	2.881
1/4 x 10	3.033
1/4 x 12	3.640
5/16 x 1/2	.190
5/16 x 5/8	.237
5/16 x 3/4	.284
5/16 x 1	.379
5/16 x 1-1/4	.474
5/16 x 1-1/2	.569
5/16 x 1-3/4	.663
5/16 x 2	.758
5/16 x 2-1/2	.948
5/16 x 2-3/4	1.043
5/16 x 3	1.137
5/16 x 4	1.517
5/16 x 6	2.275
3/8 x 1/2	.227
3/8 x 5/8	.284
3/8 x 3/4	.341
3/8 x 7/8	.398
3/8 x 1	.455
3/8 x 1-1/4	.569
3/8 x 1-1/2	.682
3/8 x 1-3/4	.796
3/8 x 2	.910
3/8 x 2-1/4	1.024
3/8 x 2-1/2	1.137
3/8 x 2-3/4	1.251
3/8 x 3	1.365
3/8 x 3-1/4	1.479
3/8 x 3-1/2	1.592
3/8 x 4	1.820
3/8 x 4-1/4	1.934
3/8 x 4-1/2	2.047
3/8 x 5	2.275
3/8 x 6	2.730
3/8 x 7	3.185
3/8 x 8	3.640
3/8 x 9	4.095
3/8 x 10	4.550
3/8 x 11	5.004
3/8 x 12	5.459
3/8 x 14	6.369

Bar Size (inches)	Weight (lbs./foot)
1/2 x 1	.607
1/2 x 1-1/4	.758
1/2 x 1-3/8	.834
1/2 x 1-1/2	.910
1/2 x 1-5/8	.986
1/2 x 1-3/4	1.062
1/2 x 1-7/8	1.137
1/2 x 2	1.213
1/2 x 2-1/4	1.365
1/2 x 2-1/2	1.517
1/2 x 2-3/4	1.668
1/2 x 3	1.820
1/2 x 3-1/4	1.971
1/2 x 3-1/2	2.123
1/2 x 3-3/4	2.275
1/2 x 4	2.426
1/2 x 4-1/2	2.730
1/2 x 5	3.033
1/2 x 5-1/2	3.336
1/2 x 6	3.640
1/2 x 6-1/2	3.943
1/2 x 7	4.246
1/2 x 7-1/2	4.550
1/2 x 8	4.853
1/2 x 9	5.459
1/2 x 10	6.066
1/2 x 12	7.279
1/2 x 14	8.492
5/8 x 3/4	.569
5/8 x 1	.758
5/8 x 1-1/4	.948
5/8 x 1-1/2	1.137
5/8 x 1-3/4	1.327
5/8 x 2	1.517
5/8 x 2-1/2	1.896
5/8 x 3	2.275
5/8 x 3-1/2	2.654
5/8 x 4	3.023
5/8 x 4-1/2	3.412
5/8 x 5	3.791
5/8 x 6	4.550
5/8 x 7	5.308
5/8 x 8	6.066
5/8 x 9	6.824
5/8 x 10	7.582
5/18 x 12	9.099

Aluminum Rectangles, 7075-T6

Cold Finished Rectangular Bar Stock

ASTM-B221, AMS-QQ-A-225/9 • Stock Lengths: 12 foot

Bar Size (inches)	Weight (lbs./foot)
3/4 x 1	0.910
3/4 x 1-1/4	1.137
3/4 x 1-1/2	1.365
3/4 x 1-3/4	1.592
3/4 x 2	1.820
3/4 x 2-1/4	2.047
3/4 x 2-1/2	2.275
3/4 x 2-3/4	2.502
3/4 x 3	2.730
3/4 x 3-1/2	3.185
3/4 x 4	3.640
3/4 x 4-1/2	4.095
3/4 x 5	4.550
3/4 x 6	5.459
3/4 x 6-1/2	5.914
3/4 x 7	6.369
3/4 x 7-1/2	6.824
3/4 x 8	7.279
3/4 x 9	8.189
3/4 x 10	9.099
3/4 x 12	10.919
3/4 x 14	12.739
1 x 1-1/4	1.517
1 x 1-1/2	1.820
1 x 1-3/4	2.123
1 x 2	2.426
1 x 2-1/4	2.730
1 x 2-1/2	3.033
1 x 2-3/4	3.336
1 x 3	3.640
1 x 3-1/2	4.246
1 x 4	4.853
1 x 4-1/2	5.459
1 x 5	6.066
1 x 6	7.279
1 x 7	8.492
1 x 8	9.706
1 x 9	10.919
1 x 10	12.132
1 x 12	14.558
1 x 14	16.985
1-1/8 x 2	2.760
1-3/16 x 2-3/8	3.422
1-3/16 x 2-7/8	4.142
1-3/16 x 3-3/8	4.862
1-1/4 x 1-1/2	2.275
1-1/4 x 1-5/8	2.464
1-1/4 x 1-3/4	2.654
1-1/4 x 2	3.033
1-1/4 x 2-1/4	3.412
1-1/4 x 2-1/2	3.791
1-1/4 x 3	4.550
1-1/4 x 3-1/4	4.929
1-1/4 x 3-1/2	5.308
1-1/4 x 3-3/4	5.687
1-1/4 x 4	6.066
1-1/4 x 4-1/2	6.824
1-1/4 x 5	7.583
1-1/4 x 5-1/2	8.341
1-1/4 x 6	9.099
1-1/4 x 6-1/2	9.857
1-1/4 x 7	10.616
1-1/4 x 7-1/2	11.374
1-1/4 x 8	12.132
1-1/4 x 8-1/2	12.890
1-1/4 x 10	15.165
1-1/4 x 12	18.198
1-1/2 x 1-3/4	3.185
1-1/2 x 2	3.640
1-1/2 x 2-1/4	4.095
1-1/2 x 2-1/2	4.550
1-1/2 x 2-3/4	5.000
1-1/2 x 3	5.459
1-1/2 x 3-1/4	5.914
1-1/2 x 3-1/2	6.369
1-1/2 x 4	7.279
1-1/2 x 4-1/4	7.734
1-1/2 x 4-1/2	8.189
1-1/2 x 5	9.099
1-1/2 x 5-1/2	10.009
1-1/2 x 6	10.919
1-1/2 x 6-1/2	11.829
1-1/2 x 8	14.558
1-1/2 x 8-1/2	15.468
1-1/2 x 10	18.198
1-1/2 x 12	21.838
1-1/2 x 14	25.477
1-3/4 x 2	4.246
1-3/4 x 2-1/2	5.308
1-3/4 x 3	6.369
1-3/4 x 3-1/2	7.431
1-3/4 x 3-3/4	7.962
1-3/4 x 4	8.492
1-3/4 x 4-1/2	9.554
1-3/4 x 5	10.616
1-3/4 x 5-1/2	11.677
1-3/4 x 6	12.739
2 x 2-1/4	5.459
2 x 2-1/2	6.066
2 x 3	7.279
2 x 3-1/2	8.492
2 x 4	9.706
2 x 4-1/2	10.919
2 x 5	12.132
2 x 6	14.558
2 x 6-1/2	15.772
2 x 8	19.411
2 x 8-1/2	20.624
2 x 10	24.264
2 x 12	29.117
2 x 14	33.970
2-1/4 x 2-1/2	6.824
2-1/4 x 2-3/4	7.507
2-1/4 x 3	8.189
2-1/4 x 3-1/2	9.554
2-1/4 x 4	10.919
2-1/4 x 4-1/2	12.284
2-1/4 x 5	13.649
2-1/4 x 5-1/2	15.013
2-1/2 x 2-3/4	8.341
2-1/2 x 3	9.099
2-1/2 x 3-1/4	9.857
2-1/2 x 3-1/2	10.616
2-1/2 x 4	12.132
2-1/2 x 4-1/2	13.649
2-1/2 x 5	15.165
2-1/2 x 5-1/2	16.682
2-1/2 x 6	18.198
2-3/4 x 3	10.009
2-3/4 x 3-1/4	10.843
2-3/4 x 3-1/2	11.677
2-3/4 x 4-1/4	14.179
3 x 3-1/2	12.739
3 x 4	14.558
3 x 4-1/2	16.378
3 x 5	18.198
3 x 6	21.838
3-1/2 x 4	16.985
3-1/2 x 4-1/2	19.108
3-1/2 x 5	21.231
3-1/2 x 6	25.477
3-1/2 x 7	29.723
4 x 4-1/2	21.838
4 x 5	24.264
4 x 6	29.117
4-1/2 x 5	27.297
4-1/2 x 6	32.756
5 x	36.396

Rod, Bar & Wire - Cold Finished

Standard Tolerances

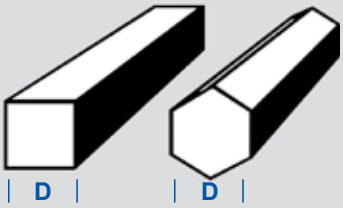
Diameter Tolerances

Cold Finished Round Wire and Rod

Specified Dia. (inches)	Tolerance - Plus and Minus (in inches) Allowable Deviation from Specified Diameter			
	Drawn Wire	Cold Finish Rod	Rolled Rod	
			Plus	Minus
Up thru 0.035	.0005	---	---	---
0.036 - 0.064	.0010	---	---	---
0.065 - 0.374	.0015	---	---	---
0.375 - 0.500	---	.0015	---	---
0.501 - 1.000	---	.0020	---	---
1.001 - 1.500	---	.0025	---	---
1.501 - 2.000	---	.0040	.006	.006
2.001 - 3.000	---	.0060	.008	.008
3.001 - 3.499	---	.0080	.012	.012
3.500 - 5.000	---	.0120	.031	.016
5.001 - 6.000	---	.0200	.062	.031
6.001 - 7.000	---	.0250	---	---
7.001 - 8.000	---	.0300	---	---

Distance Across Flats

Square, Hexagonal and Octagonal Wire and Bar

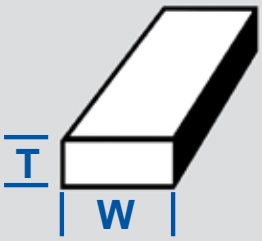
Specified Distance Across Flats (inches)	Tolerances (inches) Plus or Minus (Allowable Deviation from Specified Distance Across Flats)		
	Drawn Wire	Cold Finished Bar	Rolled Bar
Up thru 0.035	.0010	---	---
0.036 - 0.064	.0015	---	---
0.065 - 0.374	.0020	---	---
0.375 - 0.500	---	.0020	---
0.501 - 1.000	---	.0025	---
1.001 - 1.500	---	.0030	---
1.501 - 2.000	---	.0050	.0016
2.001 - 3.000	---	.0080	.0020
3.001 - 4.000	---	---	.0020

Rod, Bar & Wire - Cold Finished

Standard Tolerances

Thickness & Width Tolerances

Rectangular Wire and Bar

Specified Thickness or Width (inches) 	Tolerance Plus and Minus (inches)	
	Allowable Deviation from Specified Thickness and Width	
	Drawn Wire and Cold Finished Bar	
	Thickness	Width
Up thru 0.035	.0010	---
0.036 - 0.064	.0015	---
0.065 - 0.500	.0020	.0020
0.501 - 0.750	.0025	.0025
0.751 - 1.000	.0025	.0025
1.001 - 1.500	.0030	.0030
1.501 - 2.000	.0050	.0050
2.001 - 3.000	.0080	.0080
3.001 - 4.000	---	.0100

Aluminum

Extruded Product Offerings

- Round Bar
- Hexagons
- Squares
- Flat Bar
- Angles
- Channels
- I-Beams
- Square Tubing
- Rectangular Tubing
- Round Pipe
- Round Tubing

Alloy Descriptions and Applications

2024 – Used principally for structural members in aircraft construction for high-strength tube. Similar to 2014 in behavior and strength. Can be spot welded.

6061 – Transportation, structural pipe, furniture applications. Most versatile of heat-treatable group. Will take considerable forming in T4 temper. Good resistance to corrosion. Widely used for structural tube, handrails and baggage racks where moderate strength is required.

6063 – Has best all-around extruding properties. Can be used for comparatively intricate sections; excellent for hollow extrusions and architectural applications. Takes a good surface finish, is corrosion resistant and can be anodized. Its strength, as extruded, is somewhat higher than that of 3003. It can be precipitation heat-treated to strengths just under 6061 alloy. In tube form it is used for irrigation pipe, furniture, electrical conduit, and handrails.

6262 – High machinability and finishability with good chip-forming characteristics; substitute for 2011 in some applications; strength same as 6061.

7075 – Used for aircraft structural members when extra strength is required. Can be formed by regular methods but requires more care and precision. Can be spot welded but not fusion welded.

Aluminum Rounds, 6061-T6511

Extruded Aluminum Rounds

ASTM-B221, AMS-QQ-A-200/8 • Stock Lengths:

Diameter (inches)	Approx Wt. (lbs./foot)
1/4	.058
5/16	.090
11/32	.109
3/8	.130
7/16	.177
15/32	.202
1/2	.231
9/16	.292
5/8	.361
11/16	.437
3/4	.520
13/16	.609
7/8	.707
15/16	.813
1	.924
1-1/16	1.042
1-1/8	1.169
1-3/16	1.304
1-1/4	1.443
1-5/16	1.590
1-3/8	1.746
1-7/16	1.910
1-1/2	2.078
1-9/16	2.254
1-5/8	2.439
1-11/16	2.632
1-3/4	2.829
1-13/16	3.033
1-7/8	3.247
1-15/16	3.494
2	3.695
2-1/16	4.060
2-1/8	4.171
2-1/4	4.676

Diameter (inches)	Approx Wt. (lbs./foot)
2-5/16	4.941
2-3/8	5.210
2-1/2	5.773
2-9/16	6.067
2-5/8	6.364
2-3/4	6.985
2-7/8	7.635
3	8.313
3-1/8	9.020
3-1/4	9.756
3-3/8	10.521
3-1/2	11.314
3-5/8	12.137
3-3/4	12.989
3-7/8	13.869
4	14.778
4-1/8	15.716
4-1/4	16.683
4-3/8	17.679
4-1/2	18.703
4-5/8	19.757
4-3/4	20.839
5	23.091
5-1/16	23.667
5-1/4	25.458
5-1/2	27.940
5-5/8	29.224
5-3/4	30.537
6	33.251
6-1/8	34.650
6-1/4	36.079
6-3/8	37.537
6-1/2	39.023
6-3/4	42.083

Diameter (inches)	Approx Wt. (lbs./foot)
7	45.258
7-1/4	48.590
7-1/2	51.954
7-3/4	55.475
8	59.112
8-1/8	60.974
8-1/4	62.864
8-1/2	66.732
9*	74.814
9-1/4*	79.028
9-1/2*	83.357
10*	92.363
10-1/8*	94.686
10-1/2*	101.830
11*	111.759
11-1/2*	122.150
12*	133.002
12-1/8*	135.790
12-1/2*	148.966
13*	155.990
14*	181.032
15*	207.900
16*	236.500
17*	266.793
18*	299.104
19*	333.431
20*	369.452
21*	407.321
22*	447.037
23*	488.600
24*	532.011
25*	577.269
26*	624.056

**Temper T6*

Aluminum Rounds, Extruded

6262-T6511, 6042-T5511 and 6064-T6511

ASTM-B221

6042 and 6064 are Rohs compliant extruded 6000 series alloys.
6042 and 6064 are controlled lead alloys that offer improved machinability ratings over 6061 as well as good corrosion resistance. Both have similar machinability characteristics when compared to 6262, but are Rohs and IMDS/ELV compliant and can be used in place of 6262 extruded products.

Diameter (inches)	Approx Wt. (lbs./foot)	Diameter (inches)	Approx Wt. (lbs./foot)	Diameter (inches)	Approx Wt. (lbs./foot)
5/16	.090	1	.923	1-3/4	2.829
3/8	.129	1-1/32	.982	1-7/8	3.247
7/16	.177	1-1/16	1.042	2	3.695
1/2	.230	1-1/8	1.168	2-1/8	4.171
9/16	.292	1-3/16	1.304	2-1/4	4.676
5/8	.361	1-1/4	1.443	2-3/8	5.210
11/16	.437	1-9/32	1.516	2-1/2	5.773
3/4	.519	1-5/16	1.590	2-5/8	6.364
13/16	.609	1-3/8	1.746	2-3/4	6.985
7/8	.707	1-1/2	2.078	3	8.313
15/16	.813	1-5/8	2.439		

Note: Rounds over 3" diameter are availble by request, please inquire with your Alro representative.

Aluminum Rounds, 6061-T6/T6511

Extruded Rounds vs Cold Finished Rounds

Comparison of Tolerances*

Diameter Sizes (inches)	** Close Tolerance Extruded Rod	Cold Finished Tolerances	Diameter Sizes (inches)	** Close Tolerance Extruded Rod	Cold Finished Tolerances
.375 - .500	.005	.005	3.500 - 3.750	.012	.0120
.501 - 1.000	.004	.004	3.751 - 5.000	.017	.0200
1.001 - 1.500	.005	.005	5.001 - 5.750	.017	.0200
1.501 - 1.938	.005	.005	5.751 - 6.000	.022	.0250
1.939 - 2.000	.008	.008	6.001 - 7.000	.022	.0250
2.001 - 3.000	.008	.008	7.001 - 7.500	.022	.0300
3.001 - 3.499	.012	.012	7.501 - 8.000	.027	.0300

All tolerances shown are plus or minus.
****Also available in precision tolerances 1/3 to 1/4 normal.***

Aluminum Rounds, Extruded

6061-T6/T6511 and 6262-T6511

Comparison of Mechanical Properties

	Alloy and Temper	Minimum Tension		
		Strength (psi)		Elongation % in 2"
		Ultimate	Yield	
Commercial	6061-T6, -T6511	38,000	35,000	17*
Extrusion :	6262-T6, -T6511	38,000	35,000	17*
Cold Finish :	6061-T6, -T651	42,000	35,000	17*
	6262-T6, -T651	42,000	35,000	17*

** 1/2" diameter specimen*

Typical Physical Properties

	Alloy and Temper	Specific Gravity	Density	Electrical Conductivity % IACS
Commercial	6061-T6, -T6511	2.70	0.098	43
Extrusion :	6262-T6, -T6511	2.72	0.098	44
Cold Finish :	6061-T6, -T651	2.70	0.098	43
	6262-T6, -T651	2.72	0.098	44

Two page charts, continues on next page

Precision Tolerance Extruded Rounds are produced in 6061 and 6262 alloys, both fully certified and available in a choice of -T6 or -T6511 tempers. Chamfer available on one end. Precision Tolerance Extruded Rounds are designed to perform with outstanding mechanical and physical properties, please refer to above charts for results.

Aluminum Rounds, Extruded

6061-T6/T6511 and 6262-T6511

Comparison of Mechanical Properties

	Alloy and Temper	Typical Hardness Brinell #, 500 kg load, 10 mm ball	Typical Shear Shearing Strength (psi)
Commercial	6061-T6, -T6511	95	30,000
Extrusion :	6262-T6, -T6511	95	30,000
Cold Finish :	6061-T6, -T651	95	30,000
	6262-T6, -T651	95	30,000

Typical Physical Properties

	Electrical Resistivity microhm.xm	Thermal Conductivity		Average coefficient of thermal expansion per oF (1 million times actual value)	
		at 77°F	at 25°C CGS Units	-58° to 48°F	68° to 212°F
Commercial	24	1160	0.40	12.20	13.10
Extrusion :	24	1160	0.41	12.20	13.00
Cold Finish :	24	1160	0.40	12.20	13.10
	24	1160	0.41	12.20	13.00

Two page charts, continued from previous page

Precision Tolerance Extruded Rounds are produced in 6061 and 6262 alloys, both fully certified and available in a choice of -T6 or -T6511 tempers. Chamfer available on one end. Precision Tolerance Extruded Rounds are designed to perform with outstanding mechanical and physical properties, please refer to above charts for results.

Aluminum Rounds, Extruded

6061-T6/T6511 and 6262-T6511, Precision Tolerance

Comparison of Aluminum Alloys[1]

	Alloy and Temper	Machinability[2]	Cold Forming Capacity	Anodizing Response
Precision Tolerance Extruded Rounds	6061-T6, -T6511 6262-T6, -T6511	C B	C C	A A
Commercial Extrusion :	6061-T6, -T6511 6262-T6, -T6511	C B	C C	A A
Cold Finish :	6061-T6, -T651 6262-T6, -T651	C B	C C	A A

	Alloy and Temper	Brazeability	Weldability (ARC)	Corrosion Resistance	Stress Corrosion[3] Crack Resist.
Prec. Tolerance Ext. Rounds	6061-T6, -T6511 6262-T6, -T6511	A A	A A	B B	A A
Commercial Extrusion :	6061-T6, -T6511 6262-T6, -T6511	A A	A A	B B	A A
Cold Finish :	6061-T6, -T651 6262-T6, -T651	A A	A A	B B	A A

[1] Except for machinability and resistance to stress-corrosion cracking, the relative ratings are indicated as follows: A - Excellent thru E - Poor ratings are based on aluminum base alloys as a group and are not to be used in comparison with other metals.

[2] A: Free cutting, very small broken chips and excellent finish
B: Curied or easily broken chips and good to excellent finish
C: Continuous chips and good finish

[3] A = No known instances of failure in service or in laboratory tests
B = No known instance of failure in service: laboratory failures only under special conditions
C = Service and laboratory failures under special conditions

Aluminum Hexagons, Extruded

6061-T6/T6511 and 6262-T6511

6061-T6511*, ASTM-B221, AMS-QQ-A-200/8 or 6262-T6511*, ASTM-B221

Stock Lengths: 12 foot

Distances Across Flat (inches)	Approx Wt. (lbs./foot)
3/8	.143
1/2	.250
9/16	.321
5/8	.398
11/16	.482
3/4	.573
13/16	.671
7/8	.780
15/16	.896
1	1.018

Distances Across Flat (inches)	Approx Wt. (lbs./foot)
1-1/16	1.149
1-1/8	1.289
1-1/4	1.591
1-3/8	1.925
1-7/16	2.106
1-1/2	2.292
1-5/8	2.689
1-3/4	3.119
1-7/8	3.580
2	4.074

Distances Across Flat (inches)	Approx Wt. (lbs./foot)
2-1/4	5.156
2-3/8	5.745
2-7/16	6.053
2-1/2	6.365
2-5/8	7.018
2-3/4	7.702
2-7/8	8.418
3	9.166

**Available in T6 Temper*

Aluminum Squares, Extruded

6061-T6511

ASTM-B221, AMS-QQ-A-200/8 • Stock Lengths: 12 foot

Size (inches)	Approx Wt. (lbs./lineal ft.)
1/4	.074
5/16	.114
3/8	.165
1/2	.294
5/8	.459
3/4	.662
7/8	.900
1	1.176
1-1/8	1.488
1-1/4	1.838
1-3/8	2.223

Size (inches)	Approx Wt. (lbs./lineal ft.)
1-1/2	2.646
1-5/8	3.105
1-3/4	3.601
1-7/8	4.134
2	4.704
2-1/4	5.954
2-1/2	7.350
2-3/4	8.894
3	10.584
3-1/4	12.422
3-1/2	14.406

Size (inches)	Approx Wt. (lbs./lineal ft.)
3-3/4	16.538
4	18.816
4-1/2	23.814
5	29.400
5-1/2	35.574
6	42.336
6-1/2	49.686
7	57.624
8	75.264
9*	95.252

** 84" maximum length and .062" radius corners.*

Aluminum Rectangles, Extruded

6061-T6511 Rectangular Bars

ASTM-B221, AMS-QQ-A-200/8 • Stock Lengths: 12 foot

Bar Size (inches)	Weight (lbs./foot)
1/8 x 1/2	0.074
1/8 x 5/8	0.092
1/8 x 3/4	0.110
1/8 x 1	0.147
1/8 x 1-1/4	0.184
1/8 x 1-3/8	0.202
1/8 x 1-1/2	0.220
1/8 x 1-3/4	0.257
1/8 x 2	0.294
1/8 x 2-1/2	0.368
1/8 x 3	0.441
1/8 x 3-1/2	0.515
1/8 x 4	0.588
1/8 x 5	0.735
1/8 x 6	0.880
3/16 x 1/2	0.111
3/16 x 5/8	0.138
3/16 x 3/4	0.166
3/16 x 7/8	0.193
3/16 x 1	0.221
3/16 x 1-1/4	0.276
3/16 x 1-1/2	0.332
3/16 x 1-3/4	0.387
3/16 x 2	0.442
3/16 x 2-1/4	0.497
3/16 x 2-1/2	0.553
3/16 x 3	0.663
3/16 x 3-1/2	0.774
3/16 x 4	0.884
3/16 x 5	1.105
3/16 x 6	1.327
3/16 x 12	2.653
1/4 x 3/8	0.110
1/4 x 1/2	0.147
1/4 x 5/8	0.184
1/4 x 3/4	0.220
1/4 x 7/8	0.257
1/4 x 1	0.294
1/4 x 1-1/4	0.368
1/4 x 1-1/2	0.441
1/4 x 1-3/4	0.514
1/4 x 2	0.588
1/4 x 2-1/4	0.662
1/4 x 2-1/2	0.735
1/4 x 2-3/4	0.809

Bar Size (inches)	Weight (lbs./foot)
1/4 x 3	0.882
1/4 x 3-1/4	0.956
1/4 x 3-1/2	1.029
1/4 x 4	1.176
1/4 x 4-1/2	1.323
1/4 x 5	1.470
1/4 x 5-1/2	1.617
1/4 x 6	1.764
1/4 x 7	2.058
1/4 x 8	2.352
1/4 x 9	2.646
1/4 x 9-1/2	2.793
1/4 x 10	2.940
1/4 x 12	3.528
5/16 x 1/2	0.183
5/16 x 5/8	0.229
5/16 x 3/4	0.275
5/16 x 1	0.367
5/16 x 1-1/4	0.459
5/16 x 1-1/2	0.550
5/16 x 1-3/4	0.642
5/16 x 2	0.734
5/16 x 2-1/2	0.917
5/16 x 2-3/4	1.009
5/16 x 3	1.101
5/16 x 4	1.468
5/16 x 6	2.201
3/8 x 1/2	0.221
3/8 x 5/8	0.276
3/8 x 3/4	0.331
3/8 x 7/8	0.386
3/8 x 1	0.441
3/8 x 1-1/4	0.551
3/8 x 1-1/2	0.662
3/8 x 1-3/4	0.772
3/8 x 2	0.882
3/8 x 2-1/4	0.992
3/8 x 2-1/2	1.102
3/8 x 2-3/4	1.213
3/8 x 3	1.323
3/8 x 3-1/4	1.433
3/8 x 3-1/2	1.544
3/8 x 4	1.764
3/8 x 4-1/4	1.874
3/8 x 4-1/2	1.985

Bar Size (inches)	Weight (lbs./foot)
3/8 x 5	2.205
3/8 x 6	2.646
3/8 x 7	3.087
3/8 x 8	3.528
3/8 x 9	3.969
3/8 x 10	4.410
3/8 x 11	4.851
3/8 x 12	5.292
3/8 x 14	6.174
1/2 x 5/8	0.368
1/2 x 3/4	0.441
1/2 x 1	0.588
1/2 x 1-1/4	0.735
1/2 x 1-3/8	0.809
1/2 x 1-1/2	0.882
1/2 x 1-5/8	0.956
1/2 x 1-3/4	1.029
1/2 x 1-7/8	1.103
1/2 x 2	1.176
1/2 x 2-1/4	1.323
1/2 x 2-1/2	1.470
1/2 x 2-3/4	1.617
1/2 x 3	1.764
1/2 x 3-1/4	1.911
1/2 x 3-1/2	2.058
1/2 x 3-3/4	2.205
1/2 x 4	2.352
1/2 x 4-1/2	2.646
1/2 x 5	2.940
1/2 x 5-1/2	3.234
1/2 x 6	3.528
1/2 x 6-1/2	3.822
1/2 x 7	4.116
1/2 x 7-1/2	4.410
1/2 x 8	4.704
1/2 x 9	5.292
1/2 x 10	5.880
1/2 x 12	7.056
1/2 x 14	8.232
5/8 x 3/4	0.551
5/8 x 1	0.735
5/8 x 1-1/4	0.919
5/8 x 1-1/2	1.102
5/8 x 1-3/4	1.286
5/8 x 2	1.470

(Any listed size can be ordered in 6063-T52 alloy and temper.)

Aluminum Rectangles, Extruded

6061-T6511 Rectangular Bars

ASTM-B221, AMS-QQ-A-200/8 • Stock Lengths: 12 foot

Bar Size (inches)	Weight (lbs./foot)
5/8 x 2-1/2	1.838
5/8 x 3	2.205
5/8 x 3-1/2	2.582
5/8 x 4	2.940
5/8 x 4-1/2	3.308
5/8 x 5	3.675
5/8 x 6	4.410
5/8 x 7	5.145
5/8 x 8	5.880
5/8 x 9	6.615
5/8 x 10	7.350
5/8 x 12	8.820
3/4 x 1	0.882
3/4 x 1-1/4	1.102
3/4 x 1-1/2	1.323
3/4 x 1-3/4	1.544
3/4 x 2	1.764
3/4 x 2-1/4	1.984
3/4 x 2-1/2	2.205
3/4 x 2-3/4	2.426
3/4 x 3	2.646
3/4 x 3-1/2	3.087
3/4 x 4	3.528
3/4 x 4-1/2	3.969
3/4 x 5	4.410
3/4 x 6	5.292
3/4 x 6-1/2	5.733
3/4 x 7	6.174
3/4 x 7-1/2	6.615
3/4 x 8	7.056
3/4 x 9	7.938
3/4 x 10	8.820
3/4 x 12	10.584
3/4 x 14	12.348
1 x 1-1/4	1.470
1 x 1-1/2	1.764
1 x 1-3/4	2.058
1 x 2	2.352
1 x 2-1/4	2.646
1 x 2-1/2	2.940
1 x 2-3/4	3.234
1 x 3	3.528
1 x 3-1/4	3.822
1 x 3-1/2	4.116
1 x 4	4.704
1 x 4-1/2	5.292
1 x 5	5.880
1 x 5-1/2	6.468

Bar Size (inches)	Weight (lbs./foot)
1 x 6	7.056
1 x 6-1/2	7.644
1 x 7	8.232
1 x 8	9.408
1 x 9	10.584
1 x 10	11.760
1 x 12	14.112
1 x 14	16.464
1-1/8 x 2	2.646
1-3/16 x 2-3/8	3.319
1-3/16 x 2-7/8	4.017
1-3/16 x 3-3/8	4.711
1-1/4 x 1-1/2	2.205
1-1/4 x 1-5/8	2.389
1-1/4 x 1-3/4	2.572
1-1/4 x 2	2.940
1-1/4 x 2-1/4	3.307
1-1/4 x 2-1/2	3.675
1-1/4 x 3	4.410
1-1/4 x 3-1/4	4.778
1-1/4 x 3-1/2	5.145
1-1/4 x 3-3/4	5.512
1-1/4 x 4	5.880
1-1/4 x 4-1/2	6.615
1-1/4 x 5	7.350
1-1/4 x 5-1/2	8.085
1-1/4 x 6	8.820
1-1/4 x 6-1/2	9.555
1-1/4 x 7	10.289
1-1/4 x 7-1/2	11.025
1-1/4 x 8	11.760
1-1/4 x 8-1/2	12.495
1-1/4 x 10	14.700
1-1/4 x 12	17.640
1-1/2 x 1-3/4	3.087
1-1/2 x 2	3.528
1-1/2 x 2-1/4	3.969
1-1/2 x 2-1/2	4.410
1-1/2 x 2-3/4	4.851
1-1/2 x 3	5.292
1-1/2 x 3-1/4	5.733
1-1/2 x 3-1/2	6.174
1-1/2 x 4	7.056
1-1/2 x 4-1/4	7.497
1-1/2 x 4-1/2	7.938

Bar Size (inches)	Weight (lbs./foot)
1-1/2 x 5	8.820
1-1/2 x 5-1/2	9.702
1-1/2 x 6	10.584
1-1/2 x 6-1/2	11.466
1-1/2 x 7	12.350
1-1/2 x 8	14.112
1-1/2 x 8-1/2	14.994
1-1/2 x 9	15.876
1-1/2 x 10	17.640
1-1/2 x 12	21.168
1-1/2 x 14	24.696
1-3/4 x 2	4.116
1-3/4 x 2-1/2	5.145
1-3/4 x 3	6.174
1-3/4 x 3-1/2	7.203
1-3/4 x 3-3/4	7.717
1-3/4 x 4	8.232
1-3/4 x 4-1/2	9.261
1-3/4 x 5	10.290
1-3/4 x 5-1/2	11.319
1-3/4 x 6	12.348
2 x 2-1/4	5.292
2 x 2-1/2	5.880
2 x 3	7.056
2 x 3-1/2	8.232
2 x 4	9.408
2 x 4-1/2	10.584
2 x 5	11.760
2 x 6	14.100
2 x 6-1/2	15.288
2 x 7	16.464
2 x 8	18.816
2 x 8-1/2	19.992
2 x 9	21.168
2 x 10	23.520
2 x 12	28.224
2 x 14	32.928
2-1/4 x 2-1/2	6.615
2-1/4 x 2-3/4	7.276
2-1/4 x 3	7.938
2-1/4 x 3-1/2	9.261
2-1/4 x 4	10.584
2-1/4 x 4-1/2	11.907
2-1/4 x 5	13.230
2-1/4 x 5-1/2	14.553

(Any listed size can be ordered in 6063-T52 alloy and temper.)

Aluminum Rectangles, Extruded

6061-T6511 Rectangular Bars

ASTM-B221, AMS-QQ-A-200/8 • **Stock Lengths: 12 foot**

Bar Size (inches)	Weight (lbs./foot)
2-1/2 x 2-3/4	8.085
2-1/2 x 3	8.820
2-1/2 x 3-1/4	9.555
2-1/2 x 3-1/2	10.290
2-1/2 x 4	11.760
2-1/2 x 4-1/2	13.230
2-1/2 x 5	14.700
2-1/2 x 5-1/2	16.170
2-1/2 x 6	17.640
2-1/2 x 8	23.712
2-3/4 x 3	9.702
2-3/4 x 3-1/4	10.511
2-3/4 x 3-1/2	11.319
2-3/4 x 4-1/4	13.744
2-3/4 x 5-1/4	17.011

Bar Size (inches)	Weight (lbs./foot)
3 x 3-1/2	12.348
3 x 4	14.112
3 x 4-1/2	15.876
3 x 5	17.640
3 x 6	21.168
3 x 8	28.433
3-1/2 x 4	14.464
3-1/2 x 4-1/2	18.522
3-1/2 x 5	20.580
3-1/2 x 6	24.696
3-1/2 x 7	28.812
3-1/2 x 10	41.159
4 x 4-1/2	21.168
4 x 5	23.520
4 x 6	28.224
4 x 7	32.930
4 x 8	37.919

Bar Size (inches)	Weight (lbs./foot)
4-1/2 x 5	26.460
4-1/2 x 5-1/2	29.306
4-1/2 x 6	32.400
4-1/2 x 8-3/4	46.623
5 x 5-1/2	32.550
5 x 6	35.280
5 x 7	41.430
5 x 8	47.358
5-1/2 x 6	39.071
5-1/2 x 8	52.078
6 x 6-1/2	46.188
6 x 7	49.729
6 x 8	56.846

(Any listed size can be ordered in 6063-T52 alloy and temper.)

Aluminum 6061-T6511, Extruded

Manifold Quality

Manifold quality is a precision extruded aluminum product for high speed machining, offering extra tight tolerances, improved straightness, reduced twist, and elevated minimum mechanical properties. Typical applications include fluid power, hydraulic & pneumatic manifolds, machinery & equipment and fixturing devices.

Manifold Tolerances

- Elevated mechanical properties - 44 minimum ksi UTS
- 1/2 commercial twist and straightness
- 1/2 commercial dimension tolerance all on the plus side

Thickness & Width (inches)	Manifold Tolerances
1.000 - 1.499	+.012 / -.000
1.500 - 1.999	+.014 / -.000
2.000 - 3.999	+.024 / -.000
4.000 - 5.999	+.034 / -.000
6.000 - 7.999	+.044 / -.000
8.000	+.054 / -.000

Aluminum Squares, Extruded

6061-T6511, Manifold Quality

ASTM-B221, AMS-QQ-A-200/8 • Stock Lengths: 12 foot

Manifold quality is a precision extruded aluminum product for high speed machining, offering extra tight tolerances, improved straightness, reduced twist, and elevated minimum mechanical properties. Typical applications include fluid power, hydraulic & pneumatic manifolds, machinery & equipment and fixturing devices.

Size (inches)	Approx Wt. (lbs./lineal ft.)
7/8	0.911
1	1.190
1-1/8	1.507
1-1/4	1.855
1-3/8	2.270
1-1/2	2.671
1-5/8	3.132
1-3/4	3.630

Size (inches)	Approx Wt. (lbs./lineal ft.)
2	4.761
2-1/4	6.016
2-1/2	7.421
2-3/4	8.970
3	10.669
3-1/4	12.513
3-1/2	14.546
3-3/4	16.740

Size (inches)	Approx Wt. (lbs./lineal ft.)
4	18.976
4-1/2	23.994
5	29.400
5-1/2	35.574
6	42.647
6-1/2	49.686
8*	75.886

** Available in T6 Temper Only*

Aluminum Rectangles, Extruded

6061-T6511, Manifold Quality

ASTM-B221, AMS-QQ-A-200/8 • Stock Lengths: 12 foot

Bar Size (inches)	Weight (lbs./foot)
1 x 1-1/4	1.490
1 x 1-1/2	1.783
1 x 1-3/4	2.081
1 x 2	2.383
1 x 2-1/4	2.675
1 x 2-1/2	2.940
1 x 2-3/4	3.260
1 x 3	3.563
1 x 3-1/4	3.859
1 x 3-1/2	4.155
1 x 4	4.752
1 x 4-1/2	5.349
1 x 5	5.935
1 x 5-1/2	6.530
1 x 6	7.131
1 x 7	8.310
1 x 8	9.506
1-1/4 x 1-1/2	2.280
1-1/4 x 1-3/4	2.597
1-1/4 x 2	2.971
1-1/4 x 2-1/4	3.390
1-1/4 x 2-1/2	3.710
1-1/4 x 3	4.449
1-1/4 x 3-1/2	5.187
1-1/4 x 3-3/4	5.557
1-1/4 x 4-1/2	6.672
1-1/4 x 5	7.416
1-1/4 x 5-1/2	8.155
1-1/4 x 6	8.900
1-1/2 x 1-3/4	3.110
1-1/2 x 2	3.566
1-1/2 x 2-1/2	4.452
1-1/2 x 3	5.337
1-1/2 x 3-1/2	6.233
1-1/2 x 4	7.119
1-1/2 x 4-1/2	8.005
1-1/2 x 5	8.891
1-1/2 x 5-1/2	9.776
1-1/2 x 6	10.672
1-1/2 6-1/2	11.558
1-1/2 x 7	12.443
1-1/2 x 8	14.820
1-1/2 x 8-1/2	15.112

Bar Size (inches)	Weight (lbs./foot)
1-3/4 x 2	4.157
1-3/4 x 2-1/2	5.190
1-3/4 x 2-3/4	5.707
1-3/4 x 3	6.210
1-3/4 x 3-1/2	7.310
1-3/4 x 3-3/4	7.783
1-3/4 x 4-1/2	9.333
1-3/4 x 5	10.368
1-3/4 x 5-1/2	11.399
1-3/4 x 6-1/2	13.476
2 x 2-1/4	5.352
2 x 2-1/2	5.944
2 x 3	7.127
2 x 3-1/2	8.322
2 x 4	9.505
2 x 4-1/2	10.688
2 x 5	11.871
2 x 5-1/2	13.053
2 x 6	14.249
2 x 6-1/2	15.432
2 x 8	18.816
2-1/4 x 3	8.012
2-1/4 x 3-1/2	9.342
2-1/4 x 4	10.656
2-1/2 x 3	8.898
2-1/2 x 3-1/4	9.636
2-1/2 x 3-1/2	10.390
2-1/2 x 4	11.867
2-1/2 x 4-1/2	13.344
2-1/2 x 5	14.821
2-1/2 x 5-1/2	16.297
2-1/2 x 6	17.790
2-1/2 x 8	23.712
2-3/4 x 3	9.783
2-3/4 x 3-1/4	10.725

Bar Size (inches)	Weight (lbs./foot)
3 x 3-1/2	12.458
3 x 4	14.229
3 x 4-1/2	16.000
3 x 5	17.771
3 x 5-1/2	19.541
3 x 6	21.331
3 x 7	24.695
3 x 8	28.433
3-1/2 x 4	16.614
3-1/2 x 4-1/2	18.682
3-1/2 x 5	20.750
3-1/2 x 5-1/2	22.785
3-1/2 x 6	24.907
3-1/2 x 7	28.812
4 x 4-1/2	21.338
4 x 5	23.700
4 x 5-1/2	26.061
4 x 6	28.448
4 x 7	32.930
4 x 8	37.919
4-1/2 x 5	26.650
4-1/2 x 5-1/2	29.306
4-1/2 x 6	31.989
4-1/2 x 6-1/2	34.644
4-1/2 x 7	37.300
4-1/2 x 8-3/4	46.623
4-1/2 x 9-1/2	50.694
5 x 5-1/2	32.550
5 x 6	35.530
5 x 6-1/2	38.479
5 x 7	41.430
5 x 7-1/2	44.379
5 x 8	47.358
5 x 8-1/2	50.308
5-1/2 x 6	39.071
5-1/2 x 8	52.078
6 x 6-1/2	46.188
6 x 7	49.729
6 x 8	56.846

Aluminum Wide Bar, Extruded

6061-T6511, Extruded Wide Bar

ASTM-B221, AMS-SB-221 • Stock Lengths: 12 foot

Thickness (inches)	Width (inches)	Weight (lbs./ ft)	Thickness Tolerance
1/4	12	3.667	+.016
1/4	14	4.343	+.016
3/8	12	5.457	+.016
3/8	14	6.348	+.016
3/8	16	7.386	+.016
1/2	12	7.262	+.022
1/2	14	8.470	+.022
1/2	16	9.753	+.022
5/8	12	9.038	+.022
5/8	14	10.541	+.022
5/8	16	12.045	+.022
3/4	12	10.871	+.030
3/4	14	12.680	+.030
3/4	16	14.488	+.030
3/4	18	16.296	+.030
7/8	12	12.648	+.030
7/8	14	14.760	+.030
7/8	16	16.964	+.030
7/8	18	18.959	+.030
1	12	14.481	+.038
1	14	16.890	+.038
1	16	19.298	+.038
1	18	21.707	+.038

Thickness (inches)	Width (inches)	Weight (lbs./ ft)	Thickness Tolerance
1-1/4	12	18.034	+.038
1-1/4	14	21.033	+.038
1-1/4	16	24.033	+.038
1-1/4	18	27.033	+.038
1-1/2	12	21.587	+.038
1-1/2	14	25.177	+.038
1-1/2	16	28.767	+.038
1-1/2	18	32.358	+.038
1-3/4	12	25.210	+.048
1-3/4	14	29.040	+.048
1-3/4	16	33.596	+.048
2	12	28.805	+.054
2	14	33.597	+.054
2	16	38.388	+.054
2-1/4	14	37.740	+.054
2-1/2	10	30.116	+.074
3	10	35.979	+.074
4	10	48.158	+.130

Comparative Properties	6061-T6511 Extruded Wide Bar	6061-T6511 Extruded Wide Bar
Longitudinal Flatness (up to 72 inches)	.100 inches (max deviation)	.100 inches (max deviation)
Short Span Flatness (in any 2 ft. or less dimension)	.060 inches (max deviation)	.060 inches (max deviation)
Minimum Tensile Strength	42,000 psi 38,000 psi (< 3/8" thk)	42,000 psi
Minimum Yield Strength	35,000 psi	35,000 psi
Elongation %	10%	8%
Typical Brinell Hardness	95	95
Surface Finish	90 Micro-inch (max)	90 Micro-inch (max)
Stress Relieved	Yes	Yes
Specifications	ASTM-B-221 ASME-SB-221	ASTM-B-209 ASME-SB-209 QQ-A-250/11

Aluminum Structural Shapes

Selection Guide

Aluminum Structural Shapes are available in a variety of cross sections to meet your needs. As noted in each of the following sections, you will find each structural product is stocked in one of the following shapes:

American Standard - Similar in cross section to rolled steel angles, channels and beams with traditional tapered flanges and rounded ends.

Aluminum Association - The new design with flanges that are straight instead of tapered and thicker than the web. This results in easier joining and improved section properties.

Sharp Corner - Flanges and webs are uniformly thick and all corners are sharp, with nearly invisible radii.

We can also special order the cross section, size and alloy you may desire for your application.

Aluminum Angles, 6061-T6

EQUAL LEG

American Standard, Extruded Angles

ASTM-B308, AMS-QQ-A-200/8, ASME-SB308

Stock Lengths: 25 foot

Angle Size (inches)	Approx. Wt. (lbs./lineal ft.)
3/4 x 3/4 x 1/8	.202
1 x 1 x 1/8	.275
1 x 1 x 3/16	.400
1 x 1 x 1/4	.514
1-1/4 x 1-1/4 x 1/8	.350
1-1/4 x 1-1/4 x 3/16	.494
1-1/4 x 1-1/4 x 1/4	.662
1-1/2 x 1-1/2 x 1/8	.423
1-1/2 x 1-1/2 x 3/16	.623
1-1/2 x 1-1/2 x 1/4	.809
1-1/2 x 1-1/2 x 3/8	1.158
1-3/4 x 1-3/4 x 1/8	.498
1-3/4 x 1-3/4 x 3/16	.733
1-3/4 x 1-3/4 x 1/4	.956
2 x 2 x 1/8	.578
2 x 2 x 3/16	.850
2 x 2 x 1/4	1.110
2 x 2 x 3/8	1.606
2-1/2 x 2-1/2 x 3/16	1.070
2-1/2 x 2-1/2 x 1/4	1.404
2-1/2 x 2-1/2 x 3/8	2.047

Angle Size (inches)	Approx. Wt. (lbs./lineal ft.)
3 x 3 x 3/16	1.283
3 x 3 x 1/4	1.684
3 x 3 x 5/16	2.080
3 x 3 x 3/8	2.474
3 x 3 x 1/2	3.227
3-1/2 x 3-1/2 x 1/4	1.988
3-1/2 x 3-1/2 x 3/8	2.925
3-1/2 x 3-1/2 x 1/2	3.826
4 x 4 x 1/4	2.282
4 x 4 x 3/8	3.366
4 x 4 x 1/2	4.414
5 x 5 x 3/8	4.237
5 x 5 x 1/2	5.578
6 x 6 x 3/8	5.119
6 x 6 x 1/2	6.754
6 x 6 x 5/8	8.853
6 x 6 x 3/4	9.915
8 x 8 x 1/2	9.142
8 x 8 x 5/8	11.328
8 x 8 x 3/4	13.478
8 x 8 x 1	17.668

Aluminum Angles, 6061-T6

American Standard, Extruded Angles

ASTM-B308, AMS-QQ-A-200/8, ASME-SB308

Stock Lengths: 25 foot

UNEQUAL LEG

Angle Size (inches)	Approx. Wt. (lbs./lineal ft.)
1-1/2 x 1 x 1/8	.347
1-1/2 x 1 x 1/4	.662
1-1/2 x 1-1/4 x 3/16	.567
1-1/2 x 1-1/4 x 1/4	.736
1-3/4 x 1-1/4 x 1/8	.421
1-3/4 x 1-1/4 x 316	.620
1-3/4 x 1-1/4 x 1/4	.809
2 x 1-1/2 x 1/8	.494
2 x 1-1/2 x 3/16	.729
2 x 1-1/2 x 1/4	.953
2-1/2 x 1-1/2 x 1/8	.570
2-1/2 x 1-1/2 x 1/4	1.105
2-1/2 x 2 x 3/16	.964
2-1/2 x 2 x 1/4	1.258
3 x 2 x 3/16	1.068
3 x 2 x 1/4	1.399
3 x 2 x 3/8	2.046
3 x 2-1/2 x 1/4	1.537

Angle Size (inches)	Approx. Wt. (lbs./lineal ft.)
3-1/2 x 2-1/2 x 1/4	1.684
3-1/2 x 2-1/2 x 3/8	2.474
3-1/2 x 3 x 1/4	1.846
4 x 2 x 1/4	1.696
4 x 3 x 1/4	1.989
4 x 3 x 3/8	2.926
4 x 3 x 1/2	3.826
5 x 3 x 1/4	2.278
5 x 3 x 3/8	3.349
5 x 3 x 1/2	4.396
5 x 3-1/2 x 1/2	4.704
6 x 3 x 3/8	3.768
6 x 4 x 3/8	4.237
6 x 4 x 1/2	5.578
8 x 6 x 3/4	11.679

Aluminum Angles, 6063-T52

Sharp Corner, Extruded Angles

ASTM-B221, AMS-QQ-A-200/9, ASME-SB221

Stock Lengths: 16 foot

EQUAL LEG

UNEQUAL LEG

Angle Size (inches)	Approx. Wt. (lbs./lineal ft.)
1/2 x 1/2 x 1/16	.069
1/2 x 1/2 x 1/8	.128
3/4 x 3/4 x 1/16	.105
3/4 x 3/4 x 18	.202
1 x 1 x 1/16	.141
1 x 1 x 1/8	.276
1 x 1 x 3/16	.401
1-1/4 x 1-1/4 x 1/8	.349
1-1/4 x 1-1/4 x 3/16	.511
1-1/2 x 1-1/2 x 1/16	.216
1-1/2 x 1-1/2 x 1/8	.422
1-1/2 x 1-1/2 x 3/16	.622
1-1/2 x 1-1/2 x 1/4	.808
1-3/4 x 1-3/4 x 1/8	.496
2 x 2 x 1/8	.570
2 x 2 x 3/16	.843
2 x 2 x 1/4	1.102
3 x 3 x 1/8	.864
3 x 3 x 3/16	1.303
3 x 3 x 1/4	1.690

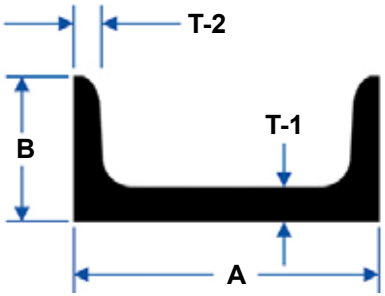
Angle Size (inches)	Approx. Wt. (lbs./lineal ft.)
1 x 1/2 x 1/8	.202
1 x 3/4 x 1/8	.239
1-1/4 x 1/2 x 1/8	.239
1-1/2 x 3/4 x 1/8	.313
1-1/2 x 1 x 1/8	.349
2 x 1 x 1/8	.423
2 x 1-1/2 x 1/8	.496
2 x 1-1/2 x 3/16	.732
2-1/2 x 1-1/2 x 1/8	.570
2-1/2 x 2 x 1/8	.643
3 x 1 x 1/8	.570
3 x 2 x 1/8	.716
3 x 2 x 1/4	1.397
3-1/2 x 1-1/4 x 1/8	.680
4 x 2 x 1/8	.864
4 x 2 x 1/4	1.690

Aluminum Channels, 6061-T6

American Standard, Extruded Channels

ASTM-B308, AMS-QQ-A-200/8, ASME-SB308

Stock Lengths: 25 foot



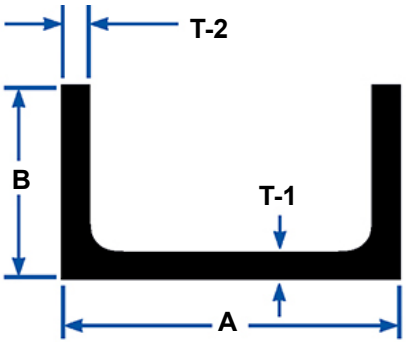
A	B	T-1	T-2	Approx. Wt. (lbs./lineal foot)
3.00	1.410	.170	.170	1.418
3.00	1.498	.258	.170	1.729
3.00	1.596	.356	.170	2.070
4.00	1.580	.180	.180	1.846
4.00	1.647	.247	.180	2.163
4.00	1.720	.320	.180	2.505
5.00	1.750	.190	.190	2.316
5.00	1.885	.325	.190	3.110
5.00	2.032	.472	.190	3.974
6.00	1.920	.200	.200	2.826
6.00	1.945	.225	.200	3.002
6.00	2.034	.314	.200	3.630
6.00	2.157	.437	.200	4.505
7.00	2.110	.230	.210	3.541
8.00	2.290	.250	.220	4.252
8.00	2.527	.488	.220	6.482
9.00	2.648	.448	.230	6.911
10.00	2.600	.240	.240	5.279
10.00	2.886	.526	.240	8.642
12.00	2.960	.300	.280	7.411
12.00	3.047	.387	.280	8.639
12.00	3.170	.510	.280	10.374

Aluminum Channels, 6061-T6

Aluminum Association, Extruded Channels

ASTM-B308, AMS-QQ-A-200/8, ASME-SB308

Stock Lengths: 25 foot



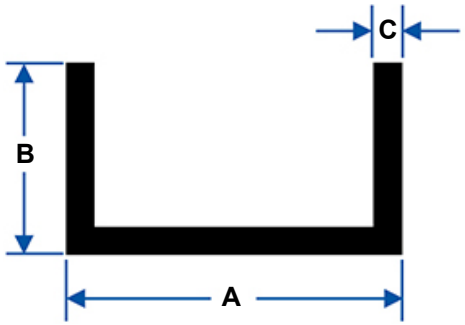
A	B	T-1	T-2	Approx. Wt. (lbs./lineal foot)
2.00	1.000	.130	.130	.577
2.00	1.250	.170	.260	1.071
3.00	1.500	.130	.200	1.134
3.00	1.750	.170	.260	1.597
4.00	2.000	.150	.230	1.738
4.00	2.250	.190	.290	2.330
5.00	2.250	.150	.260	2.211
5.00	2.750	.190	.320	3.089
6.00	2.500	.170	.290	2.834
6.00	3.250	.210	.350	4.030
7.00	2.750	.170	.290	3.204
7.00	3.50	.210	.380	4.714
8.00	3.000	.190	.350	4.146
8.00	3.750	.250	.410	5.789
9.00	3.250	.230	.350	4.982
9.00	4.000	.290	.440	6.970
10.00	3.500	.250	.410	6.136
10.00	4.250	.310	.500	8.360
12.00	4.000	.290	.470	8.274
12.00	5.000	.350	.620	11.822

Aluminum Channels, 6063-T52

Equal & Unequal Extruded Architectural Channels

ASTM-B221, AMS-QQ-A-200/9

Stock Lengths: n/a



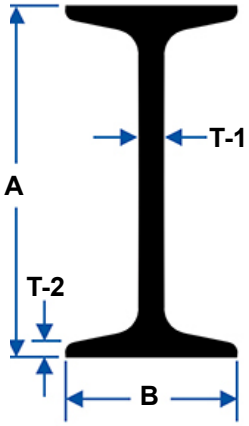
A	B	C	Approx. Wt. (lbs./lineal foot)
0.50	0.75	.125	.263
0.625	0.625	.125	.236
0.75	0.375	.125	.184
0.75	0.75	.125	.300
1.00	0.50	.125	.263
1.00	1.00	.125	.404
1.00	2.00	.125	.691
1.25	0.50	.125	.300
1.25	1.25	.125	.515
1.50	0.50	.125	.337
1.50	0.75	.125	.404
1.50	1.00	.125	.478
1.50	1.50	.125	.618
1.75	0.75	.125	.441
1.75	1.00	.125	.514
2.00	0.50	.125	.413
2.00	1.00	.125	.551
2.00	2.00	.125	.845
2.00	2.00	.250	1.616
2.50	1.50	.125	.772
3.00	0.50	.125	.551
3.00	1.00	.125	.698
3.00	1.50	.188	1.250
5.00	2.00	.1875	1.940

Aluminum I-Beams, 6061-T6

American Standard, Extruded I-Beams

ASTM-B308, AMS-QQ-A-200/8, ASME-SB308

Stock Lengths: 25 foot



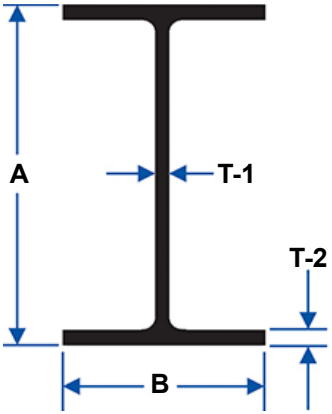
A	B	T-1	T-2	Approx. Wt. (lbs./lineal foot)
3.000	2.330	.170	.170	1.963
3.000	2.509	.349	.170	2.599
4.000	2.660	.190	.190	2.646
4.000	2.796	.326	.190	3.281
5.000	3.000	.210	.210	3.430
5.000	3.284	.494	.210	5.099
6.000	3.330	.230	.230	4.303
6.000	3.443	.343	.230	5.104
7.000	3.755	.345	.250	6.052
8.000	4.000	.270	.270	6.350
12.000	5.000	.350	.350	10.996

Aluminum I-Beams, 6061-T6

Aluminum Association, Extruded I-Beams

ASTM-B308, AMS-QQ-A-200/8, ASME-SB308

Stock Lengths: 25 foot

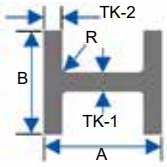


A	B	T-1	T-2	Approx. Wt. (lbs./lineal foot)
3.000	2.500	.130	.200	1.637
3.000	2.500	.150	.260	2.030
4.000	3.000	.170	.290	2.793
5.000	3.500	.190	.320	3.700
6.000	4.000	.190	.290	4.030
6.000	4.000	.210	.350	4.692
7.000	4.500	.230	.380	5.800
8.000	5.000	.230	.350	6.181
8.000	5.000	.250	.410	7.023
10.000	6.000	.250	.410	8.646
10.000	6.000	.290	.500	10.287
12.000	7.000	.290	.470	11.671
12.000	7.000	.310	.620	14.292

Aluminum Beams, 6061-T6

Wide Flange Beams (Structural)

ASTM-B308 • **Stock Lengths: n/a**

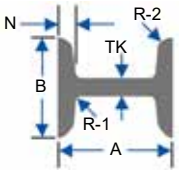


A Depth	B Flange Width	TK-1 Web	TK-2	R	Est. Wgt. (lbs./foot)	Packaging		Section No.
						Bundle Wt.	Pcs.	
6.000	4.000	.230	.279	.250	4.160	1036	10	42100D
6.000	6.000	.240	.269	.250	5.401	1074	8	42100H
8.000	8.000	.288	.433	.400	10.725	1100	4	42100G

Aluminum H-Beams, 6061-T6

H-Beams (Structural)

ASTM-B308 • **Stock Lengths: n/a**

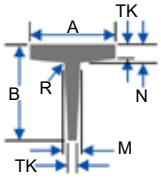


A Depth	B Flange Width	TK Web	N	R1	R2	Est. Wgt. (lbs./foot)	Packaging		Section No.
							Bundle Wt.	Pcs.	
4.000	4.000	.313	.290	.313	.145	4.757	1058	9	3002A

Aluminum Tees, 6061-T6

Tees (Structural)

ASTM-B308 • **Stock Lengths: n/a**



A Flange Width	B Stem	TK	N	M	R	Est. Wgt. (lbs./foot)	Packaging		Section No.
							Bundle Wt.	Pcs.	
2.000	2.000	.250	.312	.312	.250	1.255	521	17	853C

Aluminum Square Tubing, 6061-T6

Sharp Corner, Square Tubing

ASTM-B221, AMS-QQ-A-200/8

Stock Lengths: 24 foot

Size O.D.* (inches)	Nominal Wall Thickness	Approx. Wgt. (lbs./lineal ft.)
1	.125	.515
1-1/4	.125	.654
1-1/2	.125	.809
1-1/2	.250	1.470
1-3/4	.125	.974
2	.125	1.102
2	.188	1.636
2	.250	2.058
2-1/2	.125	1.383
2-1/2	.250	2.646
3	.125	1.691
3	.188	2.487
3	.250	3.234
4	.125	2.279
4	.188	3.371
4	.250	4.410
4	.500	8.232
6	.250	6.762
6	.500	13.200

** O.D. refers to Outside Dimensions on Square and Rectangular Tubing*

Aluminum Rectangular Tubing, 6061-T6

Sharp Corner, Extruded Rectangular Tubing

ASTM-B221, AMS-QQ-A-200/8

Stock Lengths: 24 foot

Size O.D.* (inches)	Nominal Wall Thickness	Approx. Wgt. (lbs./lineal foot)
1/2 x 1	.125	.367
3/4 x 1-1/2	.125	.588
1 x 1-1/2	.125	.661
1 x 2	.062	.428
1 x 2	.125	.809
1 x 3	.125	1.102
1 x 4	.125	1.430
1-1/4 x 2-1/2	.125	1.029
1-1/2 x 2	.125	.956
1-1/2 x 2-1/2	.125	1.103
1-1/2 x 3	.125	1.250
1-1/2 x 3	.187	1.824
1-1/2 x 4	.125	1.544
1-3/4 x 3	.125	1.323
1-3/4 x 4	.125	1.617
2 x 3	.125	1.397
2 x 3	.250	2.646
2 x 4	.125	1.690
2 x 4	.250	3.201
2 x 5	.125	1.985
2 x 5	.188	2.929
2 x 6	.125	2.279
2 x 6	.188	3.372
2 x 6	.250	4.410
3 x 4	.125	1.985
3 x 5	.125	2.279
3 x 5	.250	4.410
3 x 6	.188	3.814
4 x 6	.188	4.256
4 x 6	.250	5.586
4 x 6	.500	10.584
4 x 8	.250	6.762

** O.D. refers to Outside Dimensions on Square and Rectangular Tubing*

Aluminum Square Tubing, 6063-T52

Sharp Corner, Extruded Square Tubing

ASTM-B221, AMS-QQ-A-200/9

Stock Lengths: 21 feet - 1 inch (253")

Size O.D.* (inches)	Nominal Wall Thickness	Approx. Wgt. (lbs./lineal foot)
3/4	.062	.201
3/4	.125	.368
1	.062	.271
1	.125	.515
1-1/4	.065	.343
1-1/4	.125	.654
1-1/2	.062	.420
1-1/2	.125	.809
1-1/2	.188	1.161
1-3/4	.125	.955
2	.125	1.126
2	.188	1.598
2	.250	2.058
2-1/2	.125	1.383
2-1/2	.250	2.646
2-3/4	.188	2.266
3	.125	1.691
3	.188	2.487
3	.250	3.234
3-1/2	.125	1.984
4	.125	2.279
4	.250	4.410
4	.375	6.395
4	.500	8.232
6	.125	3.455

** O.D. refers to Outside Dimensions on Square and Rectangular Tubing*

Aluminum Rectangular Tubing, 6063-T52

Sharp Corner, Extruded Rectangular Tubing

ASTM-B221, AMS-QQ-A-200/9

Stock Lengths: 21 feet - 1 inch (253")

Size O.D.* (inches)	Nominal Wall Thickness	Approx. Wgt. (lbs./lineal foot)
1/2 x 1	.125	.367
3/4 x 1-1/2	.125	.588
1 x 1-1/2	.125	.661
1 x 2	.062	.428
1 x 2	.125	.809
1 x 3	.125	1.102
1 x 4	.125	1.430
1-1/4 x 2-1/2	.125	1.029
1-1/2 x 2	.125	.956
1-1/2 x 2-1/2	.125	1.103
1-1/2 x 3	.125	1.250
1-1/2 x 3	.187	1.824
1-1/2 x 4	.125	1.544
1-3/4 x 3	.125	1.323
1-3/4 x 4	.125	1.617
2 x 3	.125	1.397
2 x 3	.250	2.646
2 x 4	.125	1.690
2 x 4	.250	3.201
2 x 5	.125	1.985
2 x 5	.188	2.929
2 x 6	.125	3.279
2 x 6	.188	3.372
2 x 6	.250	4.410
2 x 8	.125	2.837
3 x 4	.125	1.985
3 x 5	.125	2.279
3 x 5	.250	4.410
3 x 6	.188	3.814
4 x 6	.188	4.256
4 x 6	.250	5.586
4 x 6	.500	10.584
4 x 8	.250	6.762

** O.D. refers to Outside Dimensions on Square and Rectangular Tubing*

Aluminum Round Pipe, 6061-T6

Extruded (Structural) Round Pipe

ASTM-B429, AMS-QQ-A-200/8

Stock Lengths: 20 foot

Pipe Size Designation	Schedule Number	Outside Dia. (inches)	Inside Dia. (inches)	Approx. Wgt. (lbs./lineal ft.)
1/2	40	.840	.622	.294
1/2	80	.840	.546	.376
3/4	40	1.050	.824	.391
3/4	80	1.050	.742	.510
1	40	1.315	1.049	.581
1	80	1.315	.957	.751
1-1/4	40	1.660	1.380	.786
1-1/4	80	1.660	1.278	1.037
1-1/2	40	1.900	1.610	.940
1-1/2	80	1.900	1.500	1.256
2	10	2.375	2.157	.913
2	40	2.375	2.067	1.264
2	80	2.375	1.939	1.737
2-1/2	40	2.875	2.469	2.004
2-1/2	80	2.875	2.323	2.650
3	40	3.500	3.068	2.621
3	80	3.500	2.900	3.547
3-1/2	40	4.000	3.548	3.151
3-1/2	80	4.000	3.364	4.326
4	40	4.500	4.026	3.733
4	80	4.500	3.826	5.183
5	40	5.563	5.047	5.057
5	80	5.563	4.813	7.188
6	40	6.625	6.065	6.564
6	80	6.625	5.761	9.884
8	40	8.625	7.981	9.878
8	80	8.625	7.625	15.010
10	40	10.750	10.020	14.004

Note: Pipe also available in seamless tested grade.

Aluminum Round Pipe, 6063-T6

Extruded (Structural) Round Pipe

ASTM-B429, AMS-QQ-A-200/9

Stock Lengths: 20 foot

Pipe Size Designation	Schedule Number	Outside Dia. (inches)	Inside Dia. (inches)	Approx. Wgt. (lbs./lineal ft.)
1/2	40	.840	.622	.294
1/2	80	.840	.546	.376
3/4	40	1.050	.824	.391
3/4	80	1.050	.742	.510
1	40	1.315	1.049	.581
1	80	1.315	.957	.751
1-1/4	40	1.660	1.380	.786
1-1/4	80	1.660	1.278	1.037
1-1/2	40	1.900	1.610	.940
1-1/2	80	1.900	1.500	1.256
2	10	2.375	2.157	.913
2	40	2.375	2.067	1.264
2	80	2.375	1.939	1.737
2-1/2	40	2.875	2.469	2.004
2-1/2	80	2.875	2.323	2.650
3	40	3.500	3.068	2.621
3	80	3.500	2.900	3.547
3-1/2	40	4.000	3.548	3.151
3-1/2	80	4.000	3.364	4.326
4	40	4.500	4.026	3.733
4	80	4.500	3.826	5.183
5	40	5.563	5.047	5.057
5	80	5.563	4.813	7.188
6	40	6.625	6.065	6.564
6	80	6.625	5.761	9.884
8	40	8.625	7.981	9.878
8	80	8.625	7.625	15.010
10	40	10.750	10.020	14.004

Note: Pipe also available in seamless tested grade.

Aluminum Round Tubing, 6061-T6

Extruded (Structural) Round Tubing

ASTM-B221, AMS-QQ-A-200/8

Stock Lengths: 12 foot & 24 foot

Size O.D. (inches)	Size I.D. (inches)	Wall Thickness	Approx. Wgt. (lbs./lineal ft.)
1	0.870	0.065	0.225
1	0.750	0.125	0.405
1	0.624	0.188	0.564
1	0.500	0.250	0.693
1-1/8	0.995	0.065	0.255
1-1/8	0.875	0.125	0.462
1-1/4	1.152	0.049	0.217
1-1/4	1.134	0.058	0.255
1-1/4	1.120	0.065	0.285
1-1/4	1.000	0.125	0.520
1-1/4	0.874	0.188	0.740
1-1/4	0.750	0.250	0.920
1-3/8	1.125	0.125	0.577
1-1/2	1.430	0.035	0.189
1-1/2	1.384	0.058	0.309
1-1/2	1.370	0.065	0.345
1-1/2	1.334	0.083	0.434
1-1/2	1.250	0.125	0.635
1-1/2	1.124	0.188	0.911
1-1/2	1.000	0.250	1.155
1-1/2	0.750	0.375	1.559
1-5/8	1.555	0.035	0.206
1-5/8	1.125	0.250	1.270
1-3/4	1.620	0.065	0.405
1-3/4	1.500	0.125	0.750
1-3/4	1.374	0.188	1.082
1-3/4	1.250	0.250	1.385
1-3/4	1.000	0.375	1.905
1-7/8	1.759	0.058	0.389
2	1.884	0.058	0.416
2	1.750	0.125	0.866
2	1.624	0.188	1.260
2	1.500	0.250	1.617
2	1.250	0.375	2.251
2	1.000	0.500	2.771
2-1/8	2.055	0.035	0.273

Aluminum Round Tubing, 6061-T6

Extruded (Structural) Round Tubing

ASTM-B221, AMS-QQ-A-200/8

Stock Lengths: 12 foot & 24 foot

Size O.D. (inches)	Size I.D. (inches)	Wall Thickness	Approx. Wgt. (lbs./lineal ft.)
2-1/4	2.120	0.065	0.525
2-1/4	2.084	0.083	0.665
2-1/4	2.000	0.125	0.981
2-1/4	1.874	0.188	1.429
2-1/4	1.750	0.250	1.847
2-1/4	1.500	0.375	2.598
2-1/4	1.250	0.500	3.232
2-3/8	1.875	0.250	1.963
2-1/2	2.250	0.125	1.096
2-1/2	2.124	0.188	1.602
2-1/2	2.000	0.250	2.078
2-1/2	1.750	0.375	2.944
2-1/2	1.500	0.500	3.695
2-1/2	1.000	0.750	4.849
2-3/4	2.250	0.250	2.308
2-3/4	2.000	0.375	3.290
2-3/4	1.750	0.500	4.156
3	2.834	0.083	0.895
3	2.750	0.125	1.328
3	2.624	0.188	1.944
3	2.500	0.250	2.540
3	2.408	0.296	2.957
3	2.250	0.375	3.637
3	2.000	0.500	4.618
3	1.874	0.563	4.620
3	1.500	0.750	6.234
3-1/16	2.501	0.281	2.827
3-1/4	3.016	0.117	1.360
3-1/4	2.750	0.250	2.827
3-1/4	2.500	0.375	3.983
3-1/4	2.250	0.500	5.083
3-1/2	3.250	0.125	1.558
3-1/2	3.000	0.250	3.002
3-1/2	2.750	0.375	4.330
3-1/2	2.500	0.500	5.541
3-1/2	1.500	1.000	9.236
3-1/2	1.000	1.250	10.390

Aluminum Round Tubing, 6061-T6

Extruded (Structural) Round Tubing

ASTM-B221, AMS-QQ-A-200/8

Stock Lengths: 12 foot & 24 foot

Size O.D. (inches)	Size I.D. (inches)	Wall Thickness	Approx. Wgt. (lbs./lineal ft.)
3-3/4	3.250	0.250	3.232
3-3/4	2.750	0.500	6.004
4	3.870	0.065	0.945
4	3.750	0.125	1.789
4	3.500	0.250	3.463
4	3.250	0.375	5.022
4	3.000	0.500	6.465
4	2.500	0.750	9.005
4-1/4	4.000	0.125	1.905
4-1/4	3.750	0.250	3.695
4-1/4	3.250	0.500	6.927
4-1/2	4.250	0.125	2.020
4-1/2	4.000	0.250	3.925
4-1/2	3.500	0.500	7.389
4-3/4	4.375	0.188	3.160
4-3/4	3.750	0.500	7.850
5	4.500	0.250	4.388
5	4.000	0.500	8.313
5	3.500	0.750	11.776
5-1/2	5.000	0.250	4.849
5-1/2	4.500	0.500	9.236
6	5.750	0.125	2.713
6	5.500	0.250	5.311
6	5.250	0.375	7.793
6	5.000	0.500	10.160
6	4.000	1.000	18.473
6-1/2	5.500	0.500	11.084
7	6.250	0.375	9.179
7	6.000	0.500	12.007
7	5.000	1.000	22.167
8	7.750	0.125	3.637
8	7.500	0.250	7.158
8	6.000	1.000	25.861
8-1/2	6.500	1.000	27.709
9-1/2	8.250	0.625	20.493
10	9.500	0.250	9.005
10-1/2	9.000	0.750	24.400

Aluminum Round Tubing, 6061-T6

Extruded (Seamless) Round Tubing

ASTM-B241

Stock Lengths: 12 foot

O.D. (inches)	I.D. (inches)	Wall Thickness	Weight (lbs./foot)
1-1/4	1.084	0.083	0.365
1-1/4	0.750	0.250	0.923
1-1/2	1.334	0.083	0.434
1-1/2	1.250	0.125	0.635
1-1/2	1.000	0.250	1.155
1-3/4	1.250	0.250	1.385
2	1.750	0.125	0.866
2	1.500	0.250	1.616
2-1/8	1.055	0.535	3.142
2-1/4	2.000	0.125	0.981
2-1/4	1.750	0.250	1.867
2-1/4	1.250	0.500	3.266
2-1/2	2.250	0.125	1.100
2-1/2	2.000	0.250	2.078
2-1/2	1.906	0.297	2.417
2-1/2	1.750	0.375	2.944
2-1/2	1.062	0.719	4.731
2-1/2	1.000	0.750	4.849
2-5/8	1.625	0.500	3.925
2-11/16	1.282	0.703	5.154
2-3/4	2.500	0.125	1.225
2-3/4	2.250	0.250	2.333
2-3/4	1.750	0.500	4.200
2-16/21	1.378	0.692	5.292
3	2.870	0.065	0.704
3	2.750	0.125	1.342
3	2.500	0.250	2.540
3	1.376	0.812	6.564

O.D. (inches)	I.D. (inches)	Wall Thickness	Weight (lbs./foot)
3-1/2	3.000	0.250	3.002
3-1/2	2.500	0.500	5.541
3-1/2	2.000	0.750	7.620
3-1/2	1.500	1.000	9.236
3-3/4	2.750	0.500	6.004
3-7/8	2.875	0.500	6.234
4	3.750	0.125	1.789
4	3.000	0.500	6.465
4	2.000	1.000	11.083
4-1/2	3.500	0.500	7.389
4-1/2	2.375	1.063	13.493
4-11/20	3.695	4.275	6.553
4-3/4	2.375	1.188	15.629
5	4.000	0.500	8.313
5	3.500	0.750	11.776
5	3.000	1.000	14.778
5-1/10	3.250	0.925	14.267
5-1/2	3.500	1.000	16.964
6	4.000	1.000	18.473
6-1/2	5.000	0.750	15.930
7	6.000	0.500	12.007
7	5.500	0.750	17.317
8	6.500	0.750	20.089
10	8.000	1.000	33.300
12	11.000	0.500	22.100
12	10.000	1.000	40.640

Aluminum Round Tubing, 6061-T6

Drawn (Seamless) Round Tubing

ASTM-B210

Stock Lengths: 12 foot

O.D. (inches)	I.D. (inches)	Wall Thickness	Weight (lbs./foot)
1/4	0.180	0.035	0.028
1/4	0.152	0.049	0.036
5/16	0.197	0.058	0.054
3/8	0.305	0.035	0.044
3/8	0.277	0.049	0.059
3/8	0.259	0.058	0.067
3/8	0.245	0.065	0.075
7/16	0.3395	0.049	0.071
7/16	0.308	0.065	0.089
1/2	0.430	0.035	0.060
1/2	0.402	0.049	0.082
1/2	0.384	0.058	0.095
1/2	0.370	0.065	0.105
1/2	0.334	0.083	0.128
1/2	0.260	0.120	0.168
5/8	0.527	0.049	0.104
5/8	0.495	0.065	0.135
5/8	0.375	0.125	0.229
3/4	0.680	0.035	0.092
3/4	0.652	0.049	0.127
3/4	0.620	0.065	0.164
3/4	0.584	0.083	0.205
3/4	0.500	0.125	0.289
7/8	0.805	0.035	0.109
7/8	0.777	0.049	0.150
7/8	0.759	0.058	0.175
7/8	0.745	0.065	0.195
7/8	0.685	0.095	0.274
7/8	0.635	0.120	0.335

O.D. (inches)	I.D. (inches)	Wall Thickness	Weight (lbs./foot)
1	0.902	0.049	0.172
1	0.884	0.058	0.206
1	0.834	0.083	0.281
1	0.750	0.125	0.405
1-1/8	1.009	0.058	0.229
1-1/8	0.995	0.065	0.255
1-1/4	1.152	0.049	0.217
1-1/4	1.120	0.065	0.285
1-1/4	1.084	0.083	0.365
1-1/4	1.010	0.120	0.501
1-3/8	1.277	0.049	0.245
1-3/8	1.259	0.058	0.282
1-3/8	1.245	0.065	0.315
1-1/2	1.402	0.049	0.263
1-1/2	1.370	0.065	0.345
1-31/54	1.150	0.212	1.066
1-5/8	1.509	0.058	0.336
1-5/8	1.375	0.125	0.693
1-3/4	1.652	0.049	0.308
1-3/4	1.634	0.058	0.362
1-3/4	1.500	0.125	0.750
2	1.902	0.049	0.353
2	1.870	0.065	0.465
2-1/2	2.370	0.065	0.585
2-1/2	2.334	0.083	0.741

Aluminum Products, Extruded

Standard Tolerances

Wire, Rod, Bar and Shapes

Diameter or Distance Across Flats

Round Wire & Rod - Square, Hexagonal and Octagonal Wire & Bar[1]

Specified Dimension (inches)	Tolerance[3] - plus/minus (inches) Allowable deviation from specified dimension across flats or diameter			
	Round Wire and Rod		Square Wire and Rod	
	Standard Tolerance, All Except 5XXX Alloys [11]	Precision Tolerance, All Except 5XXX Alloys	Standard Tolerance, All Except 5XXX Alloys [11]	Precision Tolerance, All Except 5XXX Alloys
Up thru 0.124	0.006	0.004	0.006	0.004
0.125 - 0.249	0.007	0.005	0.007	0.005
0.250 - 0.499	0.008	0.005	0.008	0.005
0.500 - 0.749	0.009	0.006	0.009	0.006
0.750 - 0.999	0.010	0.007	0.010	0.007
1.000 - 1.499	0.012	0.008	0.012	0.008
1.500 - 1.999	0.014	0.009	0.014	0.009
2.000 - 3.999	0.024	0.016	0.024	0.016
4.000 - 5.999	0.034	0.022	0.034	0.022
6.000 - 7.070	0.044	0.029	0.044	0.029
7.071 - 7.999	0.044	0.029	0.054	0.036
8.000 - 8.659	0.054	0.036	0.064	0.042
8.660 - 8.999	0.054	0.036	0.064	0.042
9.000 - 9.238	0.054	0.036	0.064	0.042
9.239 - 9.999	0.054	0.036	0.064	0.042
10.000 - 11.999	0.074	0.049	0.074	0.049
12.000 - 13.999	0.084	0.055	0.084	0.055
14.000 - 15.999	0.094	0.062	0.094	0.062

Note: Shaded tolerances denote products with a circumscribing circle size of 10 inches in diameter and over.

Please refer to pg. 6-55 for all applicable footnotes.

Two page chart, continues on next page

Aluminum Products, Extruded

Standard Tolerances

Wire, Rod, Bar and Shapes

Diameter or Distance Across Flats

Round Wire & Rod - Square, Hexagonal and Octagonal Wire & Bar[1]

Specified Dimension (inches)	Tolerance[3] - plus/minus (inches) Allowable deviation from specified dimension across flats or diameter			
	Hexagonal Wire and Rod		Octagonal Wire and Rod	
	Standard Tolerance, All Except 5XXX Alloys [11]	Precision Tolerance, All Except 5XXX Alloys	Standard Tolerance, All Except 5XXX Alloys [11]	Precision Tolerance, All Except 5XXX Alloys
Up thru 0.124	0.006	0.004	0.006	0.004
0.125 - 0.249	0.007	0.005	0.007	0.005
0.250 - 0.499	0.008	0.005	0.008	0.005
0.500 - 0.749	0.009	0.006	0.009	0.006
0.750 - 0.999	0.010	0.007	0.010	0.007
1.000 - 1.499	0.012	0.008	0.012	0.008
1.500 - 1.999	0.014	0.009	0.014	0.009
2.000 - 3.999	0.024	0.016	0.024	0.016
4.000 - 5.999	0.034	0.022	0.034	0.022
6.000 - 7.070	0.044	0.029	0.044	0.029
7.071 - 7.999	0.044	0.029	0.044	0.029
8.000 - 8.659	0.054	0.036	0.054	0.036
8.660 - 8.999	0.064	0.042	0.054	0.036
9.000 - 9.238	0.064	0.042	0.054	0.036
9.239 - 9.999	0.064	0.042	0.064	0.042
10.000 - 11.999	0.074	0.049	0.074	0.049
12.000 - 13.999	0.084	0.055	0.084	0.055
14.000 - 15.999	0.094	0.062	0.094	0.062

Note: Shaded tolerances denote products with a circumscribing circle size of 10 inches in diameter and over.

Please refer to pg. 6-55 for all applicable footnotes.

Two page chart, continued from previous page

Aluminum Products, Extruded

Standard Tolerances

Wire, Rod, Bar and Shapes

Thickness or Width Distance Across Flats

Rectangular Wire & Bar[1]

Specified Dimension (inches)	Tolerance[3] - plus/minus (inches) Allowable deviation from specified dimension across flats or diameter			
	Standard Tolerance, All Except 5XXX Alloys [11]	Precision Tolerance, All Except 5XXX Alloys	Standard Tolerance, All Except 5XXX Alloys [11]	Precision Tolerance, All Except 5XXX Alloys
Up thru 0.124	0.006	0.004	0.014	0.009
0.125 - 0.249	0.007	0.005	0.015	0.010
0.250 - 0.499	0.008	0.005	0.016	0.011
0.500 - 0.749	0.009	0.006	0.017	0.011
0.750 - 0.999	0.010	0.007	0.018	0.012
1.000 - 1.499	0.012	0.008	0.019	0.013
1.500 - 1.999	0.014	0.009	0.024	0.016
2.000 - 3.999	0.024	0.016	0.034	0.022
4.000 - 5.999	0.034	0.022	0.044	0.029
6.000 - 7.999	0.044	0.029	0.054	0.036
8.000 - 9.999	0.054	0.036	0.064	0.042
10.000 - 11.999	---	---	0.074	0.049
12.000 - 13.999	---	---	0.084	0.055
14.000 - 15.999	---	---	0.094	0.062
16.000 - 17.999	---	---	0.104	0.069
18.000 - 19.999	---	---	0.114	0.075
20.000 - 21.999	---	---	0.124	0.082
22.000 - 24.000	---	---	0.134	0.088

Note: Shaded tolerances denote products with a circumscribing circle size of 10 inches in diameter and over.

Please refer to pg. 6-55 for all applicable footnotes.

Aluminum Products, Extruded

Standard Tolerances

Wire, Rod, Bar and Shapes

Footnotes

(1) When outside diameter, inside diameter, and wall thickness (or their equivalent dimensions in other than round tube) are all specified, standard tolerances are applicable to any two of these dimensions, but not to all three. When both outside and inside diameters or inside diameter and wall thickness are specified, the tolerance applicable to the specified or calculated O.D. dimension shall also apply to the I.D. dimension.

(2) When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which applied to the mean of the maximum and minimum dimensions permissible under the tolerance for the dimension under consideration.

(3) Mean diameter is the average of two diameter measurements taken at right angles to each other at any point along the length.

(4) Not applicable in the annealed (O) temper of if wall thickness is less than 2½ percent of outside diameter of a circle having a circumference equal to the perimeter of the tube.

(5) The mean wall thickness of round tube is the average of two measurements taken opposite each other. The mean wall thickness of other-thanround tube is the average of two measurements taken opposite each other at approximate center line of tube and perpendicular to the longitudinal axis of the cross section.

(6) When dimensions specified are outside and inside, rather than wall thickness itself, allowable deviation at any point (eccentricity) applies to mean wall thickness.

(7) Tolerances for O, T3510, T4510, T6510, T73510, T76510 and T8510 tempers shall be as agreed upon between purchaser and vendor at the time the contract or order is entered.

(8) TX510 and TX511 are general designations for the following stressrelieved tempers: T3510, T4510, T6510, T8510, T73510, T76510; and T3511, T4511, T6511, T8511, T73511, T76511, respectively.

(9) When weight of piece on flat surface minimizes deviation.

(10) The circumscribing circle diameter is the diameter of the smallest circle that will completely enclose the cross section of the extruded product.

(11) Twist is normally measured by placing the extruded tube on a flat surface and at any point along its length measuring the maximum distance between the bottom surface of the extruded tube and the fl at surface. From this measurement, the actual deviation from straightness of the extruded tube at that point is subtracted. The remainder is the twist. To convert the standard twist tolerance (degrees) to an equivalent linear value, the sine of the standard tolerance is multiplied by the width of the surface of the section that is on the flat surface. The following values are used to convert angular tolerances to linear deviation:

Tolerance, degrees	Maximum allowable linear deviation per inch of width
1/4	0.004"
1/2	0.009"
1	0.017"
1-1/2	0.026"
3	0.052"

Tolerance, degrees	Maximum allowable linear deviation per inch of width
5	0.087"
7	0.122"
9	0.156"
15	0.259"
21	0.358"

(12) Tolerances not applicable to TX510, or TX511 temper tube having a wall thickness less than 0.095 in.

(13) Conditions include die lines, mandrel lines and handling marks.

(14) For tube over 12.750 in. O.D. the 2000 and 7000 series alloys and 5000 series alloys with nominal magnesium content of 3 percent or more are excluded.

(15) Not applicable to O temper tube.

(16) Tolerances apply to 5xxx alloys with ≥4.0% Mg.

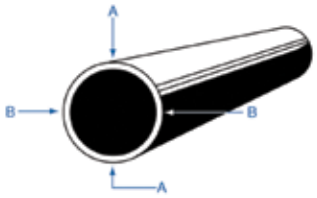
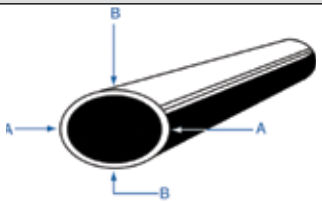
(17) Not applicable to 2219 alloy tube. Most tubes in 2219 alloy will have die lines about twice the depth shown in the table; however, for each tube size the supplier should be contacted for the roughness value to apply.

(18) If unspecified, the radius shall be Q-ew in. maximum including tolerances.

Aluminum Tolerances

Extruded Tube Tolerances

Diameter Round Tube

Specified Diameter (inches)	Tolerance[2] (inches, plus and minus)	
	Allowable Deviation of Mean Diameter[3] from Specified Diameter (size)	Allowable Deviation of Diameter at Any Point from Specified Diameter[4]
		
	Difference between 1/2 (AA + BB) and Specified Diamete Alloys[7]	Difference between AA or BB and Specified Diameter Alloys[7]
0.500 - 0.999	0.010	0.020
1.000 - 1.999	0.012	0.025
2.000 - 3.999	0.015	0.030
4.000 - 5.999	0.025	0.050
6.000 - 7.999	0.035	0.075
8.000 - 9.999	0.045	0.100
10.000 11.999	0.055	0.125
12.000 - 13.999	0.065	0.150
14.000 - 15.999	0.075	0.175
16.000 - 17.999	0.085	0.200
18.000 - 19.999	0.095	0.225
20.000 - 21.999	0.105	0.250
22.000 - 23.999	0.115	0.275

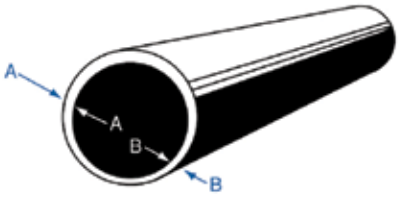
Footnotes

1. When outside diameter, inside diameter, and wall thickness (or their equivalent dimensions in other than round tube) are all specified, standard tolerances are applicable to any two of these dimensions, but not to all three. When both outside and inside diameters or inside diameter and wall thickness are specified, the tolerance applicable to the specified or calculated O.D. dimension shall also apply to the I.D. dimension.
2. When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which would apply to the mean of the maximum and minimum dimensions permissible under the tolerance for the dimension under consideration.
3. Mean diameter is the average of two diameter measurements taken at right angles to each other at any point along the length.
4. Not applicable in the annealed (0) temper or if wall thickness is less than 2-1/2 percent of the outside diameter or equivalent round diameter.The equivalent round diameter is the diameter of a circle having a circumference equal to the perimeter of the tube.
5. The mean wall thickness of round tube is the average of two measurements taken opposite each other. The mean wall thickness of other-than-round tube is the average of two measurements taken opposite each other at approximate center line of tube and perpendicular to the longitudinal axis of the cross section.
6. When dimensions specified are outside and inside, rather than wall thickness itself, allowable deviation at any point (eccentricity) applies to mean wall thickness.
7. Limited to the following alloys: 6005, 6061, 6063, 6101, 6262.

Aluminum Tolerances

Extruded Tube Tolerances

Wall Thickness Round Tube

Specified Wall Thickness[6] (inches)	Tolerance[1,2] (inches, plus and minus)			
	Allowable Deviation of Mean Wall Thickness[5] from Specified Wall Thickness  Difference between 1/2 (AA + BB) and Specified Wall Thickness			
	Outside Diameter (inches)			
	Under 1.250" Alloys[7]	1.250" - 2.999" Alloys[7]	3.000" - 4.999" Alloys[7]	5.000" & Over Alloys[7]
Under 0.047	0.006	---	---	---
0.047 - 0.061	0.007	0.008	0.008	0.010
0.062 - 0.077	0.008	0.008	0.009	0.012
0.078 - 0.124	0.009	0.009	0.010	0.015
0.125 - 0.249	0.009	0.009	0.013	0.020
0.250 - 0.374	0.011	0.011	0.016	0.025
0.375 - 0.499	---	0.015	0.021	0.035
0.500 - 0.749	---	0.020	0.028	0.045
0.750 - 0.999	---	---	0.035	0.055
1.000 - 1.499	---	---	0.045	0.065
1.500 - 2.000	---	---	---	0.075
2.001 - 2.499	---	---	---	0.085
2.500 - 2.999	---	---	---	0.095
3.000 - 3.499	---	---	---	
3.500 - 4.000	---	---	---	0.115

Please refer to previous page (6-56) for all applicable footnotes.

Aluminum

Sheet and Plate Products

Alloy Descriptions and Applications

1100 – This low-strength alloy has excellent corrosion resistance, satisfactory anodizing and conversion coating finishing characteristics, and is unmatched by any other commercial aluminum alloy in workability. It lends itself readily to welding, brazing, and soldering, but tends toward gumminess when machined. Typical end uses are spun holloware, fin stock, chemical storage and processing equipment, kitchen utensil items, and general sheet metal work.

3003 – About 20% higher in strength than 1100 but retaining an excellent workability rating. May show some slight discoloration when anodized, but reacts well to mechanical and organic finishings. Is easily welded and brazed, but soldering is limited to the torch method. Like 1100, tends to be gummy when machined, but will perform somewhat satisfactorily in the higher tempers with the proper set-up and maximum speeds. Typical end uses include food and chemical handling equipment, appliance components, truck/trailer roofing, heat exchangers, pipe jacketing, and lawn furniture components.

5052 – For many years, until the advent of 5083 and 5086, this alloy was the highest strength non-heat-treatable alloy commercially available. Although easily welded, it is not recommended for brazing and soldering applications. Excellent corrosion resistance, particularly in marine applications. Adapts to most mechanical and finishing processes although the heavier anodic films may take on a yellowish cast. Fair machining with the proper set-up. Typical end uses include fuel tanks, truck/trailer side panels, small boat hulls, truck cabs, bumpers, storage tanks, and pressure vessels.

5083 – With excellent corrosion resistance and weldability together with high strength, this alloy was designed for welded structures requiring maximum joint strength and efficiency. Can be anodized for increased corrosion resistance, but does not lend itself to decorative applications. Not meant to be a machining alloy, but can be machined fairly well with proper preparation. Because of its relatively high magnesium content, the workability rating is fair. Typical end uses are large marine craft, containers, railroad cars, structurals, and elevator cars.

5086 – Sister alloy to 5083 with comparable characteristics but slightly less strength.

2024 – Thought of as the "aircraft alloy" because of its strength, 2024 has only fair corrosion resistance but good machinability. Lends itself only to resistance welding as a hot joining process and is not recommended for brazing or soldering. In the annealed state, 2024 has good workability but is only fair to poor in tempers. Typical end uses are aircraft skins and cowls and truck and aircraft structurals.

6061 – This is a popular general-purpose alloy. Very good corrosion resistance and finishability plus excellent weldability and a strength level approximating that of mild steel. Machinability is good and, in the annealed state, its workability carries a high rating, staying at the “good” level if heat-treated without aging. Typical end uses are aircraft landing mats, large and small marine vessels, structural architectural parts, storage tanks, and highway signs.

Aluminum

Sheet and Plate Products

Alloy Descriptions and Applications

7075 – One of the highest strength, commercially available alloys with fair corrosion resistance and machinability. Low workability rating and welded only by the resistance process. Typically used as aircraft skins, cowls, and structures.

Alumold® 500 - A high strength 7XXX series aluminum mold plate product produced by Alcan. Alumold is rolled and stretched in thicknesses 1" through 8" and compression forged in 10" through 20"+Alumold 500 is a heat treated and stress relieved product that will bring you superior hardness and strength with better thermal conductivity when compared to other aluminum products. You will find Alumold 500 a terrific product to mill, polish, engrave/etch and weld. Altogether Alumold 500 will allow you to create a mold that has increased durability which will result in longer tool life, which makes this product a great option for a number of mold applications such as production and prototype injection and blow molds, foam molds, RIM molds or aluminum die sets.

Cast Tool and Jig Plate (Mic-6®, Alca 5® and ATP 5™) - When dimensional stability and flatness is critical, consider Cast Aluminum Tool and Jig Plate. This product has very low internal residual stress levels and as a result machines relatively stress free. It is also fully weldable, has superior corrosion resistance, and has an outstanding surface condition at 20 RMS or better allowing for excellent anodizability. Cast Aluminum Tool and Jig Plate is suitable for jigs, fixtures, mounting plates and low-strength/low-pressure mold applications such as vacuum form mold.

Cast Aluminum Mold Plate (Max 5®) - This direct chill cast plate product is virtually residual stress free due to a proprietary thermal treatment process and as a result exhibits uniformly consistent machinability and polishability throughout the thickness of the plate. It is also weldable and is ultrasonically inspected prior to shipment to ensure product quality. Cast Aluminum Mold Plate is suitable for use in blow molds, prototype injection molds, structural foam molds and investment cast molds.

Note: Alca Max, Dura Mold 2®, Dura Mold 5®, M1, M5 and K100-S™ are other produced cast plate trade names , but these items are not stocked at **Alro Steel.**

Aluminum Sheet, 3003-H14

Non-Heat Treatable (Mill Finish)

ASTM-B209, AMS-QQ-A-250/2

Thickness (inches)	Sheet Size (inches)	Approx. Wt. (lbs./sqft.)
.025	48 x 120*	0.365
.032	48 x 96*	0.456
.032	48 x 120*	0.456
.032	48 x 144	0.456
.040	48 x 96*	0.570
.040	48 x 120*	0.570
.040	48 x 144	0.570
.050	36 x 96	0.713
.050	48 x 96*	0.713
.050	48 x 120*	0.713
.050	48 x 144	0.713
.063	36 x 96	0.898
.063	48 x 96*	0.898
.063	48 x 120*	0.898
.063	48 x 144	0.898
.063	60 x 120	0.898
.080	48 x 96*	1.141
.080	48 x 120	1.141
.080	48 x 144	1.141
.080	60 x 120	1.141
.090	48 x 96*	1.283
.090	48 x 120*	1.283
.090	48 x 144	1.283
.090	60 x 120	1.283
.090	60 x 144	1.283

Thickness (inches)	Sheet Size (inches)	Approx. Wt. (lbs./sqft.)
.100	48 x 96*	1.426
.100	48 x 120*	1.426
.100	48 x 144	1.426
.125	36 x 120	1.782
.125	48 x 96*	1.782
.125	48 x 120*	1.782
.125	48 x 144	1.782
.125	60 x 120	1.782
.125	60 x 144	1.782
.187	48 x 144	2.639
.187	60 x 144	2.639
.190	48 x 96	2.709
.190	48 x 120	2.709
.190	48 x 144	2.709
.190	60 x 120	2.709
.190	60 x 144	2.709
.250	48 x 96	3.560
.250	48 x 120	3.560
.250	48 x 144	3.560
.250	60 x 96	3.560
.250	60 x 120	3.560
.250	60 x 144	3.560

*** Size available in painted sheet (3003/3105).**

(Gloss Black, Gloss White, Bright Green, Bright Red, Bright Yellow, Chevron Blue)

Aluminum Sheet & Plate, 5052-H32

Non-Heat Treatable (Mill Finish)

ASTM-B209, AMS-QQ-A-250/8

Thickness (inches)	Sheet Size (inches)	Approx. Wt. (lbs./sqft.)
.032	48 x 96	0.447
.032	48 x 120	0.447
.032	48 x 144	0.447
.040	48 x 96	0.559
.040	48 x 120	0.559
.040	48 x 144	0.559
.050	48 x 96	0.698
.050	48 x 120	0.698
.050	48 x 144	0.698
.063	48 x 96	0.880
.063	48 x 120	0.880
.063	48 x 144	0.880
.063	60 x 120	0.880
.063	60 x 144	0.880
.080	48 x 96	1.117
.080	48 x 120	1.117
.080	48 x 144	1.117
.080	60 x 120	1.117
.080	60 x 144	1.117
.090	36 x 96	1.257
.090	48 x 96	1.257
.090	48 x 120	1.257
.090	48 x 144	1.257
.090	60 x 144	1.257
.090	72 x 144	1.257
.100	48 x 96	1.397
.100	48 x 120	1.397
.100	48 x 144	1.397
.100	60 x 120	1.397
.100	60 x 144	1.397
.125	48 x 96	1.746
.125	48 x 120	1.746
.125	48 x 144	1.746
.125	60 x 120	1.746
.125	60 x 144	1.746
.125	72 x 144	1.746

Thickness (inches)	Sheet Size (inches)	Approx. Wt. (lbs./sqft.)
.160	48 x 120	2.235
.160	48 x 144	2.235
.190	36 x 96	2.654
.190	48 x 96	2.654
.190	48 x 120	2.654
.190	48 x 144	2.654
.190	60 x 96	2.654
.190	60 x 120	2.654
.190	60 x 144	2.654
.190	72 x 96	2.654
.190	72 x 120	2.654
.190	72 x 144	2.654
.250	48 x 96	3.492
.250	48 x 120	3.492
.250	48 x 144	3.492
.250	60 x 96	3.492
.250	60 x 120	3.492
.250	60 x 144	3.492
.250	72 x 96	3.492
.250	72 x 120	3.492
.250	72 x 144	3.492
.375	48 x 96	5.238
.375	48 x 120	5.238
.375	48 x 144	5.238
.375	60 x 144	5.238
.500	48 x 96	6.984
.500	48 x 120	6.984
.500	48 x 144	6.984
.750	48 x 144	10.476

Aluminum Sheet, 5086-H32

Non-Heat Treatable (Mill Finish)

ASTM-B209, AMS-QQ-A-250/7

Thickness (inches)	Sheet Size (inches)	Approx. Wt. (lbs./sqft.)
.063	48 x 120	0.871
.063	48 x 144*	0.871
.090	48 x 96	1.244
.090	48 x 120	1.244
.090	48 x 144*	1.244
.100	48 x 96	1.382
.100	48 x 144	1.382
.125	48 x 96	1.728
.125	48 x 120	1.728
.125	48 x 144*	1.728

Thickness (inches)	Sheet Size (inches)	Approx. Wt. (lbs./sqft.)
.190	48 x 96	2.626
.190	48 x 120	2.626
.190	48 x 144	2.626
.249	48 x 96	3.442
.249	48 x 120	3.442
.249	48 x 144	3.442

** Also available in H116 Temper.*

Aluminum Sheet, 2024-T3

Heat Treatable (Mill Finish)

ASTM-B209, AMS-QQ-A-250/4

Thickness (inches)	Sheet Size (inches)	Approx. Wt. (lbs./sqft.)
.032	48 x 144	0.465
.040	48 x 144	0.582
.050	48 x 144	0.727
.063	48 x 144	0.916
.071	48 x 144	1.033
.080	48 x 144	1.152

Thickness (inches)	Sheet Size (inches)	Approx. Wt. (lbs./sqft.)
.090	48 x 144	1.296
.100	48 x 144	1.440
.125	48 x 144	1.800
.160	48 x 144	2.304
.190	48 x 144	2.736

Aluminum Sheet, 6061-T6

Heat Treatable (Mill Finish)

ASTM-B209, AMS-QQ-A-250/11

Thickness (inches)	Sheet Size (inches)	Approx. Wt. (lbs./sqft.)
.032	48 x 144	0.452
.040	48 x 144	0.576
.050	48 x 144	0.706
.063	48 x 144	0.889
.063	60 x 144	0.889
.080	48 x 144	1.129
.090	48 x 144	1.270
.090	60 x 144	1.270
.100	48 x 144	1.411

Thickness (inches)	Sheet Size (inches)	Approx. Wt. (lbs./sqft.)
.125	36 x 96	1.764
.125	48 x 96	1.764
.125	48 x 120	1.764
.125	48 x 144	1.764
.125	60 x 144	1.764
.160	48 x 144	2.258
.190	48 x 144	2.681
.190	60 x 144	2.681

Aluminum Sheet, 7075-T6

Heat Treatable (Mill Finish)

ASTM-B209, AMS-QQ-A-250/12

Thickness (inches)	Sheet Size (inches)	Approx. Wt. (lbs./sqft.)
.063	48 x 144	0.916
.080	48 x 144	1.164
.090	48 x 144	1.310

Thickness (inches)	Sheet Size (inches)	Approx. Wt. (lbs./sqft.)
.100	48 x 144	1.454
.125	48 x 144	1.818
.190	48 x 144	2.763

Aluminum Plate, 2024-T351

Heat Treatable (Mill Finish)

ASTM-B209, AMS-QQ-A-250/4

Thickness (inches)	Plate Size (inches)	Approx. Wt. (lbs./sqft.)
1/4	48.5 x 144.5	3.636
5/16	48.5 x 144.5	4.417
3/8	48.5 x 144.5	5.454
3/8	60.5 x 144.5	5.454
1/2	48.5 x 144.5	7.272
5/8	48.5 x 144.5	9.090
3/4	48.5 x 144.5	10.908
7/8	48.5 x 144.5	12.726
1	48.5 x 144.5	14.544
1-1/4	48.5 x 144.5	18.180
1-1/2	48.5 x 144.5	21.816

Thickness (inches)	Plate Size (inches)	Approx. Wt. (lbs./sqft.)
1-3/4	48.5 x 144.5	25.452
2	48.5 x 144.5	29.088
2-1/4	48.5 x 144.5	32.750
2-1/2	48.5 x 144.5	36.360
2-3/4	48.5 x 144.5	39.996
3	48.5 x 144.5	43.632
3-1/2	48.5 x 144.5	50.400
4	48.5 x 144.5	58.176
5	48.5 x 144.5	72.720
6	48.5 x 144.5	87.264

Aluminum Plate, 6061-T651

Heat Treatable

ASTM-B209, AMS-QQ-A-250/11

Thickness (inches)	Plate Size (inches)	Approx. Wt. (lbs./sqft.)
1/4	36.5 x 96.5	3.634
1/4	48.5 x 96.5	3.634
1/4	48.5 x 144.5	3.634
1/4	60 x 120	3.634
1/4	60.5 x 144.5	3.634
1/4	72.5 x 144.5	3.634
5/16	48.5 x 144.5	4.520
5/16	60.5 x 144.5	4.520
3/8	48.5 x 96.5	5.433
3/8	48.5 x 144.5	5.433
3/8	60.5 x 144.5	5.433
3/8	72.5 x 144.5	5.433
1/2	48.5 x 96.5	7.246
1/2	48.5 x 144.5	7.246
1/2	60.5 x 144.5	7.246
1/2	72.5 x 144.5	7.246
5/8	48.5 x 144.5	9.010
5/8	60.5 x 144.5	9.010
5/8	72.5 x 144.5	9.010
3/4	48.5 x 96.5	10.845
3/4	48.5 x 144.5	10.845
3/4	60.5 x 144.5	10.845
3/4	72.5 x 144.5	10.845
7/8	48.5 x 144.5	12.567
7/8	60.5 x 144.5	12.567
7/8	72.5 x 144.5	12.567
1	48.5 x 96.5	14.444
1	48.5 x 144.5	14.444
1	60.5 x 144.5	14.444
1	72.5 x 144.5	14.444
1-1/8	48.5 x 144.5	16.145
1-1/4	48.5 x 144.5	17.972
1-1/4	60.5 x 144.5	17.972
1-1/4	72.5 x 144.5	17.972
1-3/8	48.5 x 144.5	19.736
1-3/8	60.5 x 144.5	19.736

Thickness (inches)	Plate Size (inches)	Approx. Wt. (lbs./sqft.)
1-1/2	48.5 x 96.5	21.499
1-1/2	48.5 x 144.5	21.499
1-1/2	60.5 x 144.5	21.499
1-1/2	72.5 x 144.4	21.499
1-3/4	48.5 x 96.5	25.084
1-3/4	48.5 x 144.5	25.084
1-3/4	60.5 x 144.5	25.084
2	48.5 x 96.5	28.647
2	48.5 x 144.5	28.647
2	60.5 x 144.5	28.647
2	72.5 x 144.5	28.647
2-1/4	48.5 x 144.5	32.130
2-1/4	60.5 x 144.5	32.130
2-1/2	48.5 x 144.5	35.809
2-1/2	60.5 x 144.5	35.809
2-3/4	48.5 x 144.5	39.337
2-3/4	60.5 x 144.5	39.337
3	48.5 x 144.5	42.865
3	60.5 x 144.5	42.865
3-1/2	48.5 x 144.5	50.097
3-1/2	60.5 x 144.5	50.097
4	48.5 x 144.5	57.365
4	60.5 x 144.5	57.365
4-1/2	48.5 x 144.5	64.421
5	48.5 x 144.5	71.477
5	60.5 x 144.5	71.477
5-1/2	48.5 x 144.5	78.533
5-1/2	60.5 x 144.5	78.533
6	48.5 x 144.5	85.589
6	60.5 x 144.5	85.589
7	60.5 x 144.5	101.112
8	60.5 x 144.5	115.224
9	60.5 x 144.5	129.336
10	60.5 x 144.5	143.801
12	60.5 x 144.5	172.025
14	60.5 x 144.5	200.249

Note: T651 temper is available up through and including 10" thick.
T6 temper only, 10.01" thick and above.

Aluminum Plate, 7075-T651

Heat Treatable

ASTM-B209, AMS-QQ-A-250/12

Thickness (inches)	Plate Size (inches)	Approx. Wt. (lbs./sqft.)
1/4	48.5 x 144.5	3.636
3/8	48.5 x 144.5	5.454
1/2	48.5 x 144.5	7.272
5/8	48.5 x 144.5	9.090
3/4	48.5 x 144.5	10.908
7/8	48.5 x 144.5	12.726
1	48.5 x 144.5	14.544
1-1/4	48.5 x 144.5	18.180
1-1/4	60.5 x 144.5	18.180
1-1/2	48.5 x 144.5	21.816
1-1/2	60.5 x 144.5	21.816
1-3/4	48.5 x 144.5	25.452
2	48.5 x 144.5	29.088
2	60.5 x 144.5	29.088
2-1/2	48.5 x 144.5	36.360
2-1/2	60.5 x 144.5	36.360

Thickness (inches)	Plate Size (inches)	Approx. Wt. (lbs./sqft.)
3	48.5 x 144.5	43.632
3	60.5 x 144.5	43.632
3-1/2	48.5 x 144.5	50.900
3-1/2	60.5 x 144.5	50.900
3-3/4	48.5 x 144.5	54.540
3-3/4	60.5 x 144.5	54.540
4	48.5 x 144.5	58.176
4	60.5 x 144.5	58.176
5	48.5 x 144.5	72.720
5	60.5 x 144.5	72.720
6	48.5 x 144.5	87.264
6	60.5 x 144.5	87.264
7	48.5 x 144.5	102.244
8	44.5 x 144.5	116.788
8	60.5 x 144.5	116.788

Alro stocked Aluminum Plate thickness tolerances:		
6061	1.00" & under:	+/- full commercial tolerance
	Over 1" thick:	Half commercial tolerance, all to the plus side (+1/2 commercial / -0)
2024	Under 3" thick:	+/- full commercial tolerance
	3.00" & over:	+.030" min, then 1/2 commercial, all to the plus side.
7075	Under 3" thick:	+/- full commercial tolerance
	3.00" & over:	+.030" min, then 1/2 commercial, all to the plus side.

Note: See pages 6-77 thru 6-79 for commercial thickness tolerances.

Cast Aluminum Tool & Jig Plate

Characteristics

- Dimensional Stability
- Elongation - a remarkable 10% to 12%
- Identical, consistent hardness throughout its entire thickness range
- Identical, consistent mechanical properties throughout its entire thickness range, regardless of size
- The closest flatness and thickness tolerances available
- Fully weldable
- Superior anodizability, including hardcost anodizing
- Can be nickel plated
- Surface finish is the finest and smoothest of any aluminum plate produced, an 18-20 RMS, perfect for almost all finished product applications

Precision finished Cast Aluminum Tool and Jig Plate is readily available from Alro Steel. Contact your Alro sales representative today to discuss your specific needs.

Mic-6®

Cast Aluminum Tool & Jig Plate

Precision Machined / PVC Two Sides

Available Sizes

Standard Thicknesses	1/4" through 4"	
Standard Widths & Lengths	48.5" x 96.5"	60.5" x 96.5"
	48.5" x 120.5"	60.5" x 120.5"
	48.5" x 144.5"	60.5" x 144.5"

** Non-standard thicknesses, widths and lengths may be available upon inquiry*

Typical Properties

Typical Tensile Strength	24 ksi / 166 Mpa
Typical Yield Strength	15 ksi / 105 Mpa
Percent Elongation	3%
Brinell Hardness	65
Coefficient of Thermal Expansion (Average)	13.1 x 10^6 in./in./ºF (68º - 212ºF) 13.6 x 10^6 in./in./ºF (68º - 392ºF)
Thermal Conductivity	0.34 cal./cm./s./ºC 142 W/m K 82 Btu/ft./hr./ºF
Electrical Conductivity, IACS:	36%
Modulus of Elasticity:	10.3 x 10^6 psi / 71,000 Mpa
Alloy	7XXX
Density	0.101 lb./inch^3

Tolerances

Surface	Each side is machined to a maximum 20 microinch or 0.50 micron smoothness
Edge Condition	
Width	Milled or Saw Cut
Length	Saw Cut
Mill Plate	
Width Tolerance	(+ 1/4 inch / - 0)
Length Tolerance	(+ 1/2 inch / - 0)
Thickness Tolerance	Tolerance for any thickness is +/-.005 Maximum Deviation From Flat
Specified Plate Flatness Maximum Variation	
1/4 inch to 5/8 inch	.015 inches
3/4 inch and over	.005 inches

Flatness Tolerances apply to standard mill plates and saw cut blanks when proper equipment and techniques are used.

Typical Applications

Fully stress-relieved, MIC-6 is a free cutting aluminum alloy with excellent machining characteristics, producing small, uniform chips in a variety of high speed operations. Excellent for:

- Tooling
- Checking Fixtures
- Routing Tables
- Medical Instrumentation
- Packaging Machinery
- Printing Machinery
- Robotics
- Vacuum Chambers/Chucks

Alca 5®

Cast Aluminum Tool & Jig Plate

Precision Machined / PVC Two Sides

Available Sizes

Standard Thicknesses	1/4" through 4-1/2"		
Standard Widths & Lengths	48.5" x 96.5"	60.5" x 96.5"	72.5" x 96.5"
	48.5" x 120.5"	60.5" x 120.5"	72.5" x 120.5"
	48.5" x 144.5"	60.5" x 144.5"	72.5" x 144.5"

** Non Standard thicknesses, widths and lengths may be available upon inquiry*

Typical Properties

Typical Tensile Strength	41,000 psi
Typical Yield Strength	18,000 psi
Elongation in 2 inch E%	16%
Brinell Hardness	70
Coefficient of Thermal Expansion	13.2 micro in./in./ºF (68º - 212ºF)
Thermal Conductivity	69.3 Btu/ft./hr./ºF (68ºF)
Electrical Conductivity, IACS:	27% (68ºF)
Modulus of Elasticity	10.3 x 10^6 psi
Alloy	5083
Density	0.096 lb./inch^3

Tolerances

Surface	Each side is machined to a maximum 20 microinch or 0.50 micron smoothness
Edge Condition	
Width	Milled or Saw Cut
Length	Saw Cut
Mill Plate	
Width Tolerance	(+ 1/8 inch / - 0)
Length Tolerance	(+ 1/8 inch / - 0)
Thickness Tolerance	Tolerance for any thickness is +/-.005" Maximum Deviation From Flat
Specified Plate Flatness Maximum Variation	
1/4 inch to 1/2 inch	.015 inches max
5/8 inch to 4 1/2 inch	.005 inches max

Flatness Tolerances apply to standard mill plates and saw cut blanks when proper equipment and techniques are used.

Typical Applications

Alca 5® is a precision plate product that is characterized by excellent dimensional stability offering a low level of internal stress that reduces after machining deformation considerably. Excellent for:

- Fixtures
- Reference Plates
- Machine Construction
- Molds
- Jigs
- Construction Equipment

ATP-5™

Cast Aluminum Tool & Jig Plate

Precision Machined / PVC Two Sides

Available Sizes

Standard Thicknesses	3/8" - 4"		
Standard Widths & Lengths	48.5" x 96.5"	60.5" x 96.5"	72.5" x 96.5"
	48.5" x 120.5"	60.5" x 120.5"	72.5" x 120.5"
	48.5" x 144.5"	60.5" x 144.5"	72.5" x 144.5"

** Non Standard thicknesses, widths and lengths may be available upon inquiry*

Typical Properties

Typical Tensile Strength	41,000 ksi
Typical Yield Strength	18,000 ksi
Percent Elongation in 2 inches	15%
Brinell Hardness	70
Coefficient of Thermal Expansion(Average)	13.1 x 10^6 in./in./ºF (68º - 212ºF) 13.4 x 10^6 in./in./ºF (68º - 392ºF)
Thermal Conductivity	63-81 Btu/ft./hr./ºF 110 - 140 W/mK
Electrical Conductivity, IACS	35%
Modulus of Elasticity	10.1 x 10^6 psi / 70,000 Mpa
Alloy	5XXX
Density	0.096 lb./inch^3

Tolerances

Surface	Each side is machined to a maximum 20 microinch
Edge Condition	
Width	Milled or Saw Cut
Length	Saw Cut
Mill Plate	
Width Tolerance	(+ 1/4 inch / - 0)
Length Tolerance	(+ 1/4 inch / - 0)
Thickness Tolerance	Tolerance for any thickness is +/-.005 Maximum Deviation From Flat
Specified Plate Flatness Maximum Variation	
Under 1/2 inch	0.015 inch
Over 1/2 inch	0.005 inch

Flatness Tolerances apply to standard mill plates and saw cut blanks when proper equipment and techniques are used.

Typical Applications

ATP-5™ has outstanding machinability, excellent high speed cutting & feed rates, offers dimensional control & outstanding flatness characteristics. Excellent For:

- Computer & Electronic Work
- Machining Fixtures
- Index Tables
- Packaging Machinery
- Vacuum Chucks
- Printing Machinery
- Food Machinery Molds
- Heating & Cooling Plates

Cast Aluminum Tool & Jig Plate

Precision Finished

Two Sides Machined to a Typical 20 RMS max.

Includes: Mic 6® • Alca 5® • ATP-5™

Thick (inches)	5XXX Series Alca 5, ATP-5, (lbs./ sqft.)	7XXX Series MIC-6 (lbs./ sqft.)
1/4	3.460	3.636
5/16	4.325	4.545
3/8	5.189	5.454
1/2	6.920	7.272
5/8	8.649	9.090
3/4	10.379	10.908
7/8	12.109	12.726
1	12.838	14.544
1-1/8	15.568	16.376
1-1/4	17.298	18.180
1-1/2	20.758	21.816

Thick (inches)	5XXX Series Alca 5, ATP-5, (lbs./ sqft.)	7XXX Series MIC-6 (lbs./ sqft.)
1-5/8	22.487	23.634
1-3/4	24.217	25.452
2	27.677	29.088
2-1/4	31.136	32.724
2-1/2	34.596	36.630
2-3/4	38.056	39.996
3	41.515	43.632
3-1/2	48.434	50.904
4	55.354	58.185
4-1/2	62.273	66.357

Available Pattern Sizes

48-1/2 x 96-1/2	60-1/2 x 96-1/2	62 x 96-1/2	72-1/2 x 96-1/2
48-1/2 x 120-1/2	60-1/2 x 120-1/2	62 x 120-1/2	72-1/2 x 120-1/2
48-1/2 x 144-1/2	60-1/2 x 144-1/2	62 x 144-1/2	72-1/2 x 144-1/2

- Extra Wide and Extra Long Cast Tool & Jig plate available on RFQ basis.
- Special thicknesses over 6" are available
- Special widths available up to 120-1/2”
- Special lengths available up to 288"
- Precision sawing of aluminum plate available

Flatness Tolerances:*

Sizes under 1/2" thick - up to 60-1/2" wide flat within .015"

Sizes 3/4" to 4-1/2" thick - up to 60-1/2" wide flat within .005"

*(*When checked on a precision surface plate measured with a feeler gauge.)*

Brinell Hardness: 64 - 74

Weldability is excellent:

Use conventional TIG or MIG methods and 4043 (5% silicon) welding wire or rod.

Max 5®

5000 Series Cast Aluminum Mold Plate

Description

5000 Series mold plate is a modified 5083 alloy that provides strength, good anodizing response, weldability and machinability. Produced using the direct chill continuous cast process, these products also exhibit excellent dimensional stability. The low density of the 5000 series is an advantage over other aluminum mold plates.

Available Sizes

Standard Thicknesses	2" through 30"
Standard Widths & Lengths	64" x 145.5"
	64" x 150.5"

** Non-standard thicknesses, widths and lengths may be available upon inquiry*

Typical Properties

Typical Tensile Strength	38,000 - 41,000 psi
Typical Yield Strength	18,000 psi
Percent Elongation	15% - 16%
Brinell Hardness	70
Coefficient of Thermal Expansion (Average)	13.2 µin./in./°F (68°F - 212°F) - Max 5®
	13.1 x 10^6 (68°F - 212°F) - Duramold 5™
Thermal Conductivity	69.3 Btu/ft./hr./ºF - Max 5®
	81.0 Btu/ft./hr./°F - Duramold 5™
Electrical Conductivity, IACS:	7% to 29% (68ºF)
Modulus of Elasticity:	10.3 x 10^6 psi - Max 5®
	10.7 x 10^6 psi - Duramold 5™
Alloy	5000 Series
Density	0.096 lb./inch^3

Tolerances

Surface	Precision sawed top and bottom
Edge Condition	Precision sawed width and length
Mill Plate	
Thickness Tolerance	(+ 1/8 inch / - 0)
Width Tolerance	(+ 1/4 inch / - 0)
Length Tolerance	(+ 1/4 inch / - 0)

Typical Applications

- Injection Molds
- Blow Molds
- Thermoform Tools & Molds
- RIM & RTM Molding
- Vacuum Forming Tools
- Heating & Cooling Plates
- Rubber Molds
- Structural Foam Molds

Cast Aluminum Mold Plate

Includes: Max 5®

Thickness (inches)	2XXX Series Approx. Wgt. (lbs./ sqft.)	Max 5® 5XXX Series Approx. Wgt. (lbs./ sqft.)
3	43.632	42.509
3-1/2	50.904	49.392
5	74.538	70.848
6	89.082	84.672
7	103.626	98.496
8	118.170	112.320
9	132.714	126.144
10	147.258	139.968
11	161.802	153.792
12	176.346	167.616
13	190.890	181.440
14	205.434	195.264
15	219.978	209.088
16	234.522	222.912
17	249.066	241.688
18	263.610	250.560
20	292.698	278.208

Available Pattern Sizes

54" x 132" • 53" x 150" • 64" x 145.5" • 64" x 150.5"

Alro has the capability to cut Aluminum Mold Plate up to 30" thick.

Alumold® 500

7000 Series Aluminum Mold Plate

Description

Alumold® 500 is a high strength aluminum mold plate product that offers exceptional thermal conductivity for an aluminum alloy, which can improve cycle times and molding efficiencies when compared to typical mold steels such as P-20. Alumold® also has excellent machining, polishing, and hardness characteristics as well as being easily weldable. This 7000 series alloy accepts a wide range of surface treatments and has consistent through thickness hardness qualities.

Available Sizes

Standard Thicknesses ..... 1" through 8" Rolled & Stress Relieved
10" through 20" Forged & Stress Relieved
Standard Widths & Lengths ..... Widths ranging from 50" up to 72.50"
Lengths ranging from 64" up to 144.50"

** Width and length combinations depend on thickness*

Typical Properties

Typical Ultimate Strength ..... 80 - 85 ksi (1" - 8") and 70 - 76 ksi (10" & over)
Typical Yield Strength..... 73 - 78 ksi (1" - 8") and 60 - 67 ksi (10" & over)
Elongation in 2" E%..... 2% - 10% (1" - 8") and 7% - 9% (10" & over)
Brinell Hardness..... 180 - 185 (1" - 8") and 165 - 180 (10" & over)
Coefficient of Thermal Expansion ... 13.2 x 10^6
Thermal Conductivity..... 88 Btu/ft./hr./ºF - Max 5®
Modulus of Elasticity:..... Compressive: 10.6 x 10^6 psi
Tensile: 10.4 x 10^6 psi
Alloy ..... 7000 Series
Density ..... 0.102 lb./inch^3

Typical Applications

Injection Molds
Blow Molds
Thermoform Tools & Molds
RIM & RTM Molding
Vacuum Forming Tools
Heating & Cooling Plates
Rubber Molds
Structural Foam Molds

Thickness (inches)	Approx. Wt. (lbs./sqft.)	Thickness (inches)	Approx. Wt. (lbs./sqft.)	Thickness (inches)	Approx. Wt. (lbs./sqft.)
1	15.628	4	61.029	12*	176.256
1-1/2	22.972	5	75.717	14*	205.632
2	30.551	6	90.625	16*	235.008
2-1/2	38.189	7	104.358	18*	264.384
3	45.533	8	119.046	20*	293.760
3-1/2	53.317	10*	146.880		

**Width and length combinations depend on thickness*

Tolerances - Mill Plate

Thickness Tolerance..... Nominal +1/4" / -0" Rolled.
+.400" / -0" on Forged
Width Tolerance..... +1/2" / -0"
Length Tolerance..... +1/2" / -0"

Aluminum Sheet & Plate, 3003-H22

Diamond Tread, Reflective Finish

Thickness (inches)	Sheet Size (inches)	Approx. Wt. (lbs./sqft.)
.063	48 x 96	1.058
.063	48 x 120	1.058
.063	48 x 192	1.058
.080	48 x 96	1.283
.080	48 x 192	1.283
.100	48 x 96	1.570
.100	48 x 120	1.570
.100	48 x 192	1.570
.100	60 x 120	1.570
.125	48 x 96	1.900
.125	48 x 120	1.900
.125	48 x 144	1.900
.125	48 x 192	1.900
.125	60 x 96	1.900
.125	60 x 192	1.900

Thickness (inches)	Sheet Size (inches)	Approx. Wt. (lbs./sqft.)
.188	48 x 96	2.820
.188	48 x 120	2.820
.188	48 x 144	2.820
.188	48 x 192	2.820
.188	60 x 96	2.820
.188	60 x 192	2.820
.250	48 x 96	3.700
.250	48 x 120	3.700
.250	48 x 192	3.700
.250	60 x 120	3.700
.250	60 x 192	3.700

Aluminum Sheet & Plate, 6061-T6

Diamond Tread, Standard Mill Finish

Thickness (inches)	Sheet Size (inches)	Approx. Wt. (lbs./sqft.)
.125	48 x 96	1.900
.125	48 x 192	1.900
.125	60 x 192	1.900
.188	48 x 96	2.79
.188	48 x 192	2.79
.188	60 x 192	2.79
.250	48 x 96	3.67
.250	48 x 192	3.67
.250	60 x 192	3.67

Thickness (inches)	Sheet Size (inches)	Approx. Wt. (lbs./sqft.)
.375	48 x 96	5.43
.375	48 x 192	5.43
.375	60 x 192	5.43
.500	48 x 192	7.20
.500	60 x 192	7.20

Flatness Tolerances

Aluminum Sawed or Sheared Plate

Longitudinal Flatness

Specified Thickness (inches)	Tolerance① in. – Allowable Deviation from Flat	
	TX51 tempers②	Other than TX51 tempers②⑦
0.250 - 3.000	3/16in in any 6ft ③	1/4” in any 6’ or less
3.001 - 8.000	1/8” in any 6’ or less	1/4” in any 6’ or less

TRANSVERSE FLATNESS

SPECIFIED THICKNESS (inches)	TOLERANCE 1 in.–Allowable Deviation from Flat				
	Widths over 4ft thru 6ft ④		Widths over 2ft thru 4ft		Widths 2ft and less
	TX51 tempers②	Other than TX51 tempers②⑦	TX51 tempers②	Other Than TX51 tempers②⑦	All tempers⑦
0.250 - 0.624	3/8	1/2	5/16	3/8	
0.625 - 1.500	5/16	3/8	3/16	1/4	
1.501 - 3.000	3/16	1/4	3/16	3/16	
3.001 - 8.000	1/8	1/4	1/8	3/16	

SHORT-SPAN FLATNESS ⑤

Specified Thickness (inches)	Tolerance⑥ in. – Allowable Deviation from Flat	
	TX51 tempers②	Other than TX51 tempers②⑦
0.250 - 0.624	.100	.125
0.625 - 8.000	.075	.090

①As measured with plate resting on a flat surface concave side upward, using a straightedge and a feeler gauge, dial gauge or scale.
②TX51 is a general designation for the following stress-relieved tempers: T351, T451, T651, T851, T7351 and T7651.
③For pieces ordered to less than 6ft length, the tolerance is 1/8” for the total length.
④For widths over 6ft, these tolerances apply for any 6ft of total width.
⑤Short-span flatness is the deviation from flat over full span for spans 2ft and less.
⑥As measured with the plate resting on a flat surface
⑦Not applicable to O, F, and HX8 and harder tempers.

Standard Tolerances

Aluminum Sheet, Plate & Coil

Thickness - Applicable to all alloys not included in the Aerospace Alloys table or specified for Aerospace applications. Also applicable to alloys when supplied as Alclad.

Specified Thickness[1] (inches)		Specified Width (inches)			
		Up thru 39.37	Over 39.37 thru 59.06	Over 59.06 thru 78.74	Over 78.74 thru 98.43
Over	Thru	Tolerances +/- (inches)			
0.0059	0.010	0.0010	0.0015	---	---
0.010	0.016	0.0010	0.0015	---	---
0.016	0.025	0.0015	0.0020	0.0030	0.0035
0.025	0.032	0.0020	0.0025	0.0035	0.0040
0.032	0.039	0.0020	0.0030	0.0035	0.0045
0.039	0.047	0.0025	0.0035	0.0045	0.006
0.047	0.063	0.0030	0.0035	0.0050	0.006
0.063	0.079	0.0035	0.0040	0.006	0.007
0.079	0.098	0.0035	0.0045	0.006	0.007
0.098	0.126	0.0045	0.006	0.007	0.009
0.126	0.158	0.006	0.007	0.009	0.011
0.158	0.197	0.007	0.009	0.011	0.013
0.197	0.248	0.009	0.011	0.013	0.015
0.248	0.315	0.012	0.014	0.015	0.018
0.315	0.394	0.015	0.017	0.020	0.023
0.394	0.630	0.023	0.023	0.027	0.032
0.630	0.984	0.031	0.031	0.037	0.043
0.984	1.575	0.039	0.039	0.047	0.055
1.575	2.362	0.055	0.055	0.060	0.070
2.362	3.150	0.075	0.075	0.085	0.100
3.150	3.937	0.100	0.100	0.115	0.125
3.937	6.299	0.130	0.130	0.145	0.165
6.300	8.000	0.160	0.160	0.160	0.165

Notes: The above standards are those published by the Aluminum Association, Aluminum Standards & Data 2009.

(1) When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which applies to the mean of the maximum and minimum dimensions permissible under the tolerance for the dimension under consideration.

(2) Tolerances applicable at ambient mill temperatures. A change in dimension of 0.013 in. per 10°F must be recognized.

Two page chart, continues on next page

Standard Tolerances

Aluminum Sheet, Plate & Coil

Thickness - Applicable to all alloys not included in the Aerospace Alloys table or specified for Aerospace applications. Also applicable to alloys when supplied as Alclad.

Specified Thickness[1] (inches)		Specified Width (inches)			
		Over 98.43 thru 118.11	Over 118.11 thru 137.80	Over 137.80 thru 157.48	Over 157.48 thru 177.17
Over	Thru	Tolerances +/- (inches)			
0.0059	0.010	---	---	---	---
0.010	0.016	---	---	---	---
0.016	0.025	---	---	---	---
0.025	0.032	---	---	---	---
0.032	0.039	0.006	---	---	---
0.039	0.047	0.007	0.008	---	---
0.047	0.063	0.007	0.009	---	---
0.063	0.079	0.008	0.010	---	---
0.079	0.098	0.009	0.011	---	---
0.098	0.126	0.011	0.013	---	---
0.126	0.158	0.013	0.015	---	---
0.158	0.197	0.015	0.018	---	---
0.197	0.248	0.018	0.022	0.027	---
0.248	0.315	0.022	0.027	0.035	0.043
0.315	0.394	0.027	0.033	0.041	0.051
0.394	0.630	0.035	0.043	0.053	0.065
0.630	0.984	0.047	0.058	0.070	0.085
0.984	1.575	0.065	0.075	0.090	0.105
1.575	2.362	0.085	0.100	0.155	---
2.362	3.150	0.105	0.125	---	---
3.150	3.937	0.130	0.160	---	---
3.937	6.299	---	---	---	---
6.300	8.000	---	---	---	---

Notes: The above standards are those published by the Aluminum Association, Aluminum Standards & Data 2009.

(1) When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which applies to the mean of the maximum and minimum dimensions permissible under the tolerance for the dimension under consideration.

(2) Tolerances applicable at ambient mill temperatures. A change in dimension of 0.013 in. per 10°F must be recognized.

Two page chart, continued from previous page

Standard Tolerances

Aluminum Sheet, Plate & Coil

Thickness for Sheet and Plate for Aerospace Alloys - Alloys 2014, 2024, 2124, 2219, 7049, 7050, 7075, 7150, 7178 and 7475 and other alloys when specified for aerospace applications. Also applicable to alloys when supplied as Alclad.

Specified Thickness[1] (inches)		Specified Width (inches)					
		Up thru 39.37	Over 39.37 thru 47.24	Over 47.24 thru 55.12	Over 55.12 thru 59.06	Over 59.06 thru 70.87	Over 70.87 thru 78.84
Over	Thru	Tolerances +/- (inches)					
0.0059	0.010	0.0010	0.0020	0.0020	0.0020	---	---
0.010	0.016	0.0015	0.0025	0.0025	0.0025	---	---
0.016	0.025	0.0015	0.0025	0.0025	0.0025	---	---
0.025	0.032	0.0015	0.0015	0.0020	0.0030	0.0030	---
0.032	0.039	0.0015	0.0015	0.0020	0.0030	0.0030	0.0035
0.039	0.047	0.0020	0.0020	0.0020	0.0030	0.0030	0.0035
0.047	0.063	0.0020	0.0020	0.0030	0.0030	0.0030	0.0035
0.063	0.079	0.0020	0.0020	0.0030	0.0035	0.0035	0.0035
0.079	0.098	0.0025	0.025	0.0035	0.0040	0.0040	0.0045
0.098	0.126	0.0035	0.035	0.0035	0.0045	0.0045	0.0045
0.126	0.158	0.0040	0.040	0.0045	0.007	0.007	0.009
0.158	0.197	0.0055	0.007	0.007	0.009	0.009	0.011
0.197	0.248	0.009	0.012	0.012	0.012	0.017	0.017
0.248	0.315	0.012	0.015	0.015	0.015	0.019	0.019
0.315	0.394	0.017	0.018	0.018	0.018	0.022	0.022
0.394	0.630	0.023	0.023	0.023	0.023	0.028	0.028
0.630	0.984	0.031	0.031	0.031	0.031	0.037	0.037
0.984	1.575	0.039	0.039	0.039	0.039	0.047	0.047
1.575	2.362	0.055	0.055	0.055	0.055	0.060	0.060
2.362	3.150	0.075	0.075	0.075	0.075	0.085	0.085
3.150	3.937	0.100	0.100	0.100	0.100	0.115	0.115
3.937	6.299	0.130	0.130	0.130	0.130	0.145	0.145
6.300	8.000	0.160	0.160	0.160	0.160	0.160	0.160

Notes: The above standards are those published by the Aluminum Association, Aluminum Standards & Data 2009.
(1)When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which applies to the mean of the maximum and minimum dimensions permissible under the tolerance for the dimension under consideration.

(2) Capability to provide tighter tolerances may vary with suppliers

Standard Tolerances

Aluminum Sheet, Plate & Coil

Thickness for Sheet and Plate for Aerospace Alloys - Alloys 2014, 2024, 2124, 2219, 7049, 7050, 7075, 7150, 7178 and 7475 and other alloys when specified for aerospace applications. Also applicable to alloys when supplied as Alclad.

Specified Thickness[1] (inches)		Specified Width (inches)					
		Over 78.74 thru 86.61	Over 86.61 thru 98.43	Over 98.43 thru 118.11	Over 118.11 thru 137.80	Over 137.80 thru 157.48	Over 157.48 thru 177.17
Over	Thru	Tolerances +/- (inches)					
0.0059	0.010	---	---	---	---	---	---
0.010	0.016	---	---	---	---	---	---
0.016	0.025	---	---	---	---	---	---
0.025	0.032	---	---	---	---	---	---
0.032	0.039	0.0035	0.007	---	---	---	---
0.039	0.047	0.0035	0.008	0.010	0.011	---	---
0.047	0.063	0.0035	0.009	0.011	0.013	---	---
0.063	0.079	0.0035	0.010	0.013	0.015	---	---
0.079	0.098	0.0045	0.011	0.015	0.018	---	---
0.098	0.126	0.0045	0.013	0.016	0.020	---	---
0.126	0.158	0.009	0.015	0.018	0.022	---	---
0.158	0.197	0.011	0.018	0.022	0.026	---	---
0.197	0.248	0.021	0.021	0.025	0.029	---	---
0.248	0.315	0.024	0.024	0.029	0.033	0.041	0.051
0.315	0.394	0.028	0.028	0.033	0.039	0.047	0.059
0.394	0.630	0.033	0.033	0.039	0.047	0.059	0.070
0.630	0.984	0.043	0.043	0.051	0.060	0.070	0.085
0.984	1.575	0.055	0.055	0.065	0.075	0.090	0.105
1.575	2.362	0.070	0.070	0.090	0.100	0.155	---
2.362	3.150	0.100	0.100	0.110	0.125	---	---
3.150	3.937	0.130	0.130	0.150	0.160	---	---
3.937	6.299	0.165	0.165	---	---	---	---
6.300	8.000	0.165	0.165	---	---	---	---

Notes: The above standards are those published by the Aluminum Association, Aluminum Standards & Data 2009.
(1)When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which applies to the mean of the maximum and minimum dimensions permissible under the tolerance for the dimension under consideration.

(2) Capability to provide tighter tolerances may vary with suppliers

Standard Tolerances

Aluminum Sheet, Plate & Coil

Width and Length - Sawed Flat Sheet and Plate

Specified Thickness[1] (inches)			Specified Width (inches)			
			Up thru 39.37	Over 39.37 thru 59.06	Over 59.06 thru 78.74	Over 78.74 thru 98.43
Over		Thru	Tolerances +/- (inches)			
0.080	-	0.249	+/- 1/8	+/- 1/8	+/- 3/16	+/- 1/4
0.250	-	6.000	+/- 1/4	+/- 5/16	+/- 3/8	+/- 1/2

Specified Thickness[1] (inches)			Specified Width (inches)			
			Over 98.43 thru 118.11	Over 118.11 thru 137.80	Over 137.80 thru 157.48	Over 157.48 thru 177.17
Over		Thru	Tolerances +/- (inches)			
0.080	-	0.249	+/- 1/4	+/- 5/16	+/- 3/8	+/- 7/16
0.250	-	6.000	+/- 9/16	+/- 5/8	+/- 3/4	+/- 7/8

Notes: The above standards are those published by the Aluminum Association, Aluminum Standards & Data 2009.

(1) When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which applies to the mean of the maximum and minimum dimensions permissible under the tolerance for the dimension under consideration.

(2) Tolerances applicable at ambient mill temperatures. A change in dimension of 0.013 in. per 10°F must be recognized.

Standard Tolerances

Aluminum Sheet, Plate & Coil

Width Tolerances - Sheared Flat Sheet and Plate

Specified Thickness[1] (inches)	Specified Width (inches)					
	Up thru 6	Over 6 thru 24	Over 24 thru 60	Over 60 thru 96	Over 96 thru 132	Over 132 thru 168
	Tolerance[2] (inches)					
0.006 - 0.124	±1/16	±3/32	±1/8	±1/8	±5/32	-
0.125 - 0.249	±3/32	±3/32	±1/8	±5/32	±3/16	-
0.250 - 0.499	±1/4	±5/16	±3/8	±3/8	±7/16	±1/2

Length Tolerances - Sheared Flat Sheet and Plate

Specified Thickness[1] (inches)	Specified Width (inches)							
	Up thru 30	Over 30 thru 60	Over 60 thru 120	Over 120 thru 240	Over 240 thru 360	Over 360 thru 480	Over 480 thru 600	Over 600 thru 720
	Tolerance[2] (inches)							
0.006 - 0.125	±1/16	±3/32	±1/8	±5/32	±3/16	±7/32	±9/32	-
0.125 - 0.249	±3/32	±3/32	±1/8	±5/32	±7/32	±1/4	±5/16	-
0.250 - 0.499	±1/4	±3/8	±7/16	±1/2	±9/16	±5/8	±11/16	3/4

Width Tolerances - Slit Coiled Sheet

Specified Thickness[1] (inches)	Specified Width (inches)					
	Up thru 6	Over 6 thru 12	Over 12 thru 24	Over 24 thru 48	Over 48 thru 60	Over 60 thru 96
	Tolerance[2] (inches)					
0.006 - 0.125	0.010	1/64	1/32	3/64	1/16	1/8
0.126 - 0.186	0.012	1/32	1/32	1/16	3/32	-
0.187 - 0.249	0.016	1/32	3/64	3/32	1/8	-

Lateral Bow Tolerances - Coiled Sheet

Specified Thickness[1] (inches)	Specified Width (inches)				
	1/2 thru 6	Over 1 thru 2	Over 2 thru 4	Over 4 thru 10	Over 10
	Tolerance (inches in 6 ft.) - Available Deviation of a Side Edge from a Straight Line				
0.006 - 0.064	3/4	9/16	3/8	1/4	3/16
0.065 - 0.125	-	-	3/8	1/4	3/16

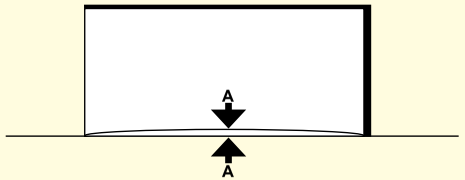
Width and Length Tolerances - Sawed Flat Sheet and Plate

Specified Thickness[1] (inches)	Specified Width and Length (inches)							
	Up thru 30	Over 30 thru 60	Over 60 thru 120	Over 120 thru 240	Over 240 thru 360	Over 360 thru 480	Over 480 thru 600	Over 600 thru 720
	Tolerance[2] (inches)							
0.080 - 0.249	±1/8	±1/8	±3/16	±1/4	±1/4	±5/16	±3/8	±7/16
0.250 - 8.000	±1/4	±5/16	±3/8	±1/2	±9/16	±5/8	±3/4	±7/8

Standard Tolerances

Aluminum Sheet, Plate & Coil

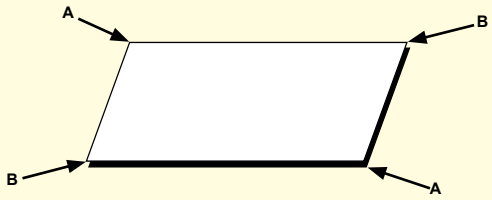
Lateral Bow Tolerances - Flat Sheet and Plate

Specified Thickness (inches)	Specified Width (inches)	ALLOWABLE DEVIATION OF A SIDE EDGE FROM A STRAIGHT LINE  Maximum allowable value of AA						
		Specified Length (inches)						
		Up thru 60	Over 60 thru 90	Over 90 thru 120	Over 120 thru 150	Over 150 thru 180	Over 180 thru 210	Over 210 thru 240
		Tolerance[2] (inches)						
0.006 - 0.125	**Up thru 4**	0.250	0.563	1.000	1.563	2.250	3.000	4.000 ⑤
	Over 4 Thru 10	0.094	0.219	0.375	0.563	0.875	1.156	1.500 ⑤
	Over 10 thru 35	0.063	0.125	0.188	0.250	0.375	0.500	0.750 ⑤
	Over 35	0.032	0.063	0.125	0.188	0.250	0.375	0.500 ⑤
0.126 - 0.249	**Over 4 Thru 15**	0.063	0.125	0.250	0.375	0.563	0.750	1.000 ⑤
	Over 15	0.032	0.063	0.125	0.188	0.250	0.375	0.500 ⑤
0.250 - 8.000	Up thru 10	0.250	0.563	1.000	1.563	2.250	3.000	4.000 ⑤
	Over 10 thru 18	0.063	0.125	0.250	0.406	0.594	0.781	1.000 ⑤
	Over 18	0.032	0.094	0.125	0.219	0.312	0.438	0.562 ⑤

Standard Tolerances

Aluminum Sheet and Plate

Squareness Tolerances

Specified Length (feet)	Specified Width - (feet)	
	Up thru 3	Over 3
	Allowable Difference in Length of Diagonals ④ (inches)  Maximum difference between AA and BB	
Up thru 12	3/32 x width, ft ③	5/64 x width, ft ③
Over 12	9/64 x width, ft ③	7/64 x width, ft ③

Notes: The above standards are those published by the Aluminum Association, Aluminum Standards & Data 2009.

(1) When a dimension tolerance is specified other than as an equal bilateral tolerance, the value of the standard tolerance is that which applies to the mean of the maximum and minimum dimensions permissible under the tolerance for the dimension under consideration.

(2) Tolerances applicable at ambient mill temperatures. A change in dimension of 0.013 in. per 10°F must be recognized.

(3) If specified width is other than an exact multiple of 12", tolerance is determined by using the next largest exact multiple. For example, if specified width is 53" and specified length is 72", the tolerance is 5/64" x 5 = 25/64". This result is then rounded to 7/16" in accordance with footnote (4).

(4) Use values for calculating only. Round result upward to nearest 1/16".

(5) Also applicable to any 240-inch increment of longer sheet or plate.

Technical Data

Aluminum Products

Alloy Designation System

A system for designating wrought aluminum and wrought aluminum alloys established by the Aluminum Association. Specific limits for chemical compositions to which conformance is required are provided by applicable product standards.

Wrought Aluminum and Aluminum Alloy Designation System

A system of four-digit numerical designations is used to identify wrought aluminum and wrought aluminum alloys. The first digit indicates the alloy group as follows:

Aluminum, 99.00% minimum and greater	1XXX
Aluminum alloys grouped by major alloying elements:	
Copper (Cu)	2XXX
Manganese (Mn)	3XXX
Silicon (Si)	4XXX
Magnesium (Mg)	5XXX
Magnesium and Silicon (Mg and Si)	6XXX
Zinc (Zn)	7XXX
Other element	8XXX
Unused series	9XXX

Aluminum

In the 1XXX group for minimum aluminum purities of 99.00% and greater, the last two of the four digits in the designation indicate the minimum aluminum percentage. These digits are the same as the last two digits to the right of the decimal point in the minimum aluminum percentage when it is expressed to the nearest 0.01%. The second digit in the designation indicates unalloyed aluminum having natural impurity limits; integers 1 through 9, which are assigned consecutively as needed, indicate special control of one or more individual impurities or alloying elements.

Aluminum Alloys

In the 2XXX through 8XXX alloy groups the last two of the four digits in the designation have no special significance but serve only to identify the different aluminum alloys in the group. The second digit in the alloy designation indicates alloy modifications. If the second digit is zero, it indicates the original alloy; integers 1 through 9, which are assigned consecutively, indicate alloy modifications.

Temper Designation System

The Aluminum Association's established temper designation system is used for all forms of wrought and cast aluminum and aluminum alloys except ingot. It is based on the sequence of basic treatments used to produce various tempers. The temper designation follows the alloy designation with the two separated by a hyphen. Basic designations consist of a letter while the subdivisions of those basic tempers, where required, are indicated by one or more digits following those letters. The system is designed to set down specific sequences of fabrication processes, but only those operations that are recognized as significantly influencing the characteristics of the product are involved. Should some other variation of the same sequence of basic operations be applied to the same alloy, resulting in different characteristics, then additional digits will be added to the numerical designation.

Basic Temper Designations

F **as fabricated.** Denotes metal that has been fabricated to ordered dimensions without any attempt on the part of the producer to control the results of either strain-hardening operations or thermal treatments. There are no mechanical property limits and the strength levels may vary from lot to lot and from shipment to shipment.

O **annealed.** Applies to wrought products that have undergone a thermal treatment to reduce their mechanical property levels to their minimums. Often described as "dead soft" metal.

W **solution heat-treated.** An unstable temper applying to certain heat-treat able alloys that, after heat treatment, spontaneously age harden at room temperature. Only when the period of natural aging is indicated (W 1 hr for example) is this a specific and complete designation.

H **strain-hardened.** Applies to those wrought products which have had an increase in strength by reduction through strain-hardening, or cold-working, operations. The "H" is always followed by two or more digits.

T **thermally treated to produce tempers other than F, O or H.** Applies to those products which have had an increase in strength due to thermal treatments, with or without supplementary strain-hardening operations. The "T" is always followed by one or more digits.

Temper Designation System

Subdivisions of Basic Tempers

Subdivision of "H" Temper-Non-Heat-Treatable Alloys

H1 **strain-hardened only.** Applies to products which are strain-hardened or cold worked to obtain the desired strength level without supplementary thermal treatments. The number following this designation indicates the degree of strain-hardening.

H2 **strain-hardened and partially annealed.** Applies to products strain-hardened or cold worked more than the desired final amount and then reduced in strength to that desired level by partial annealing. The number following this designation indicates the degree of strain-hardening remaining after the partial annealing operation.

H3 **strain-hardened and stabilized.** Applies to products in the magnesium-aluminum class which will age-soften at room temperature after strain-hardening. These products are strain-hardened to the desired amount and then subjected to a low temperature thermal operation which results in a stable but slightly lower tensile strength and improved ductility. The number following this designation indicates the degree of strain-hardening remaining after the stabilization treatment.

The digit following the designation H1, H2 or H3 indicates the degree of strain-hardening as follows:

H_1 1/8 hard
H_2 1/4 hard
H_3 3/8 hard
H_4 1/2 hard
H_5 5/8 hard
H_6 3/4 hard
H_7 7/8 hard
H_8 full hard (approximately 75% reduction after a full anneal)
H_9 extra hard (limited to certain alloys and/or product forms)

The third digit, when used, indicates a variation of the two-digit temper.

It is used when the degree of control of temper or the mechanical properties are different from but close to the two-digit designation to which it is added, or when some other characteristic is significantly affected.

The following three-digit H temper designations have been assigned for wrought products in all alloys:

H_11 Applies to products which incur such sufficient strain hardening the after final anneal that they fail to qualify as annealed but not enough to qualify as H-1.

H_12 Applies to products which may acquire some temper from working at an elevated temperature and for which there are mechanical property limits.

Temper Designation System

Subdivisions of Basic Tempers

Subdivision of "T" Temper-Heat-Treatable Alloys

T1 **cooled from an elevated temperature shaping process and naturally aged to a substantially stable condition.** Usually associated with extruded products and limited to certain of the 6XXX series alloys.

T2 **cooled from an elevated temperature shaping process, cold worked, and naturally aged to a substantially stable condition.** Usually associated with cast products.

T3 **solution heat-treated, cold worked, and naturally aged to a substantially stable condition.** The working serves to increase the strength. (T4+cold work)

T4 **solution heat-treated and naturally aged to a substantially stable condition.**

T5 **cooled from an elevated temperature shaping process and artificially aged.** Usually associated with extruded products in certain of the 6XXX series alloys. (T1 + artificial age)

T6 **solution heat-treated and artificially aged.** A stable temper. (T4 + artificial age)

T7 **solution heat-treated and overaged/stabilized.** Applies to alloy products which are thermally over-aged after solution heat-treatment to carry them beyond the point of maximum strength to provide control of some special characteristic. A stable temper.

T8 **solution heat-treated, cold worked, and artificially aged.** A stable temper. (T3+ artificial age)

T9 **solution heat-treated, artificially aged, and cold worked.** A stable temper. (T6 + cold work)

T10 **cooled from an elevated temperature shaping process, cold worked, and artificially aged.** Usually associated with cast products. A stable temper. (T2 + artificial age)

Temper Designation System

Subdivisions of Basic Tempers

Subdivision of "T" Temper-Heat-Treatable Alloys

Additional digits, the first of which shall not be zero, may be added to the basic desIgnatIons to indicate a variation in treatment which significantly alters the characteristics of the product.

The following specific additional digits have been assigned for stress-relieved tempers of wrought products:

T_51 Applies to certain products when stress-relieved by stretching the indicated amount. Stretching is performed after solution heat treatment or after cooling from an elevated temperature shaping process. No straightening takes place after stretching.

Plate ..... 1-1/2 to 3% permanent set
Rolled or cold finished rod or bar ..... 1 to 3% permanent set
Die or ring forgings ..... 1 to 5% permanent set

T_510 Applies to extruded products and to drawn tube when stress-relieved by stretching the indicated amount. Stretching is performed after solution heat treatment or after cooling from an elevated temperature shaping process. No straightening takes place after stretching.

Rod, bar, shapes and tube ..... 1 to 3% permanent set
Drawn tube ..... 1/2 to 3% permanent set

T_511 Applies to extruded products, and to drawn tube when stress-relieved by stretching the indicated amount. Stretching is performed after solution heat treatment or after cooling from an elevated temperature shaping process. These products ***may*** receive minor straightening after stretching to comply with standard tolerances.

Bar, shapes and tube ..... 1 to 3% permanent set
Drawn tube ..... 1/2 to 3% permanent set

T_52 Applies to products stress-relieved by compressing.

T_54 Applies to die forgings stress-relieved by restriking cold.

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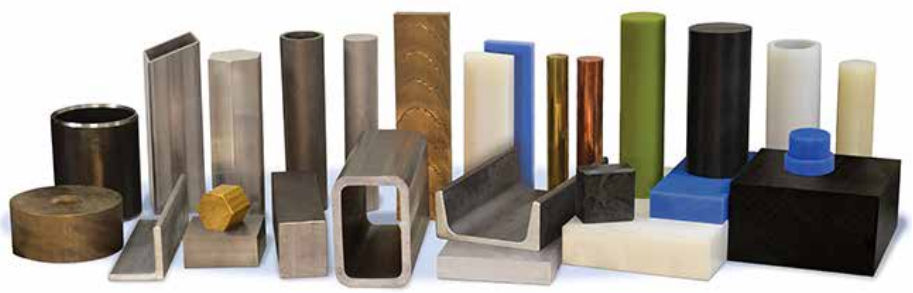

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- Pipe & Tubing
- Full lengths
- Remnants
- Cut-offs & Drops
- Saw Cutting
- Shearing

SCAN ME

Wrought Aluminum Alloys(1)(2)

Chemical Composition Limits

** Please refer to pg.6-92 for all applicable footnotes*

Alloy	Silicon	Iron	Copper	Manganese	Magnesium
1100	0.95	---	0.05 - 0.20	0.05	---
1145(7)	0.55	0.05	0.05	0.05	---
1350(9)	0.10	0.40	0.05	0.01	---
2011	0.40	0.70	5.00 - 6.00	---	---
2014	0.50 - 1.20	0.70	3.90 - 5.00	0.40 - 1.20	0.20 - 0.80
2017	0.20 - 0.80	0.70	3.50 - 4.50	0.40 - 1.00	0.40 - 0.80
2024	0.50	0.50	3.80 - 4.90	0.30 - 0.90	1.20 - 1.80
2117	0.80	0.70	2.20 - 3.00	0.20	0.20 - 0.50
2124	0.20	0.30	3.80 - 4.90	0.30 - 0.90	1.20 - 1.80
2219	0.20	0.30	5.80 - 6.80	0.20 - 0.40	0.02
3003	0.60	0.70	0.05 - 0.20	1.00 - 1.50	---
3004	0.30	0.70	0.25	1.00 - 1.50	0.80 - 1.30
3005	0.60	0.70	0.30	1.00 - 1.50	0.20 - 0.60
3105	0.60	0.70	0.30	0.30 - 0.80	0.20 - 0.80
4043	4.50 - 6.00	0.80	0.30	0.05	0.05
5005	0.30	0.70	0.20	0.20	0.50 - 1.10
5050	0.40	0.70	0.20	0.10	1.10 - 1.80
5052	0.25	0.40	0.10	0.10	2.20 - 2.80
5056	0.30	0.40	0.10	0.05 - 0.20	4.50 - 5.60
5083	0.40	0.40	0.10	0.40 - 1.00	4.00 - 4.90
5086	0.40	0.50	0.10	0.20 - 0.70	3.50 - 4.50
5154	0.25	0.40	0.10	0.10	3.10 - 3.90
5183	0.40	0.40	0.10	0.50 - 1.00	4.30 - 5.20
5252	0.08	0.10	0.10	0.10	2.20 - 2.80
5356	0.25	0.40	0.10	0.05 - 0.20	4.50 - 5.50
5454	0.25	0.40	0.10	0.50 - 1.00	2.40 - 3.00
5456	0.25	0.40	0.10	0.50 - 1.00	4.70 - 5.50
6061	0.40 - 0.80	0.70	0.15 - 0.40	0.15	0.80 - 1.20
6063	0.20 - 0.60	0.35	0.10	0.10	0.45 - 0.90
6101(13)	0.30 - 0.70	0.50	0.10	0.03	0.35 - 0.80
6105	0.60 - 1.00	0.35	0.10	0.10	0.45 - 0.80
6262	0.40 - 0.80	0.70	0.15 - 0.40	0.15	0.80 - 1.20
6351	0.70 - 1.30	0.50	0.10	0.40 - 0.80	0.40 - 0.80
7005	0.35	0.40	0.10	0.20 - 0.70	1.00 - 1.80
7049	0.25	0.35	1.20 - 1.90	0.20	2.00 - 2.90
7050	0.12	0.15	2.00 - 2.60	0.10	1.90 - 2.60
7075	0.40	0.50	1.20 - 2.00	0.30	2.10 - 2.90
7129	0.15	0.30	0.50 - 0.90	0.10	1.30 - 2.00
7178	0.40	0.50	1.60 - 2.40	0.30	2.40 - 3.10

Two page chart, continues on next page

Wrought Aluminum Alloys[1][2]

Chemical Composition Limits

** Please refer to pg.6-92 for all applicable footnotes*

Chromium	Zinc	Titanium	Others		Aluminum Minimum[5]
			Each[3]	Total[4]	
---	0.10	---	0.05[6]	0.15	99.00
0.05	0.03	---	0.03[8]	---	99.45
0.01	0.05	---	0.03[10]	0.10	99.50
---	0.30	---	0.05[11]	0.15	Remainder
0.10	0.25	0.15	0.05	0.15	Remainder
0.10	0.25	0.15	0.05	0.15	Remainder
0.10	0.25	0.15	0.05	0.15	Remainder
0.10	0.25	---	0.05	0.15	Remainder
0.10	0.25	0.15	0.05	0.15	Remainder
---	0.10	0.02 - 0.10	0.05[12]	0.15	Remainder
---	0.10	---	0.05	0.15	Remainder
---	0.25	---	0.05	0.15	Remainder
0.10	0.25	0.10	0.05	0.15	Remainder
0.20	0.40	0.10	0.05	0.15	Remainder
---	0.10	0.20	0.05[6]	0.15	Remainder
0.10	0.25	---	0.05	0.15	Remainder
0.10	0.25	---	0.05	0.15	Remainder
0.15 - 0.35	0.10	---	0.05	0.15	Remainder
0.05 - 0.20	0.10	---	0.05	0.15	Remainder
0.05 - 0.25	0.25	0.15	0.05	0.15	Remainder
0.05 - 0.25	0.25	0.15	0.05	0.15	Remainder
0.15 - 0.35	0.20	0.20	0.05	0.15	Remainder
0.05 - 0.25	0.25	0.15	0.05[6]	0.15	Remainder
---	0.05	---	0.03[8]	0.10	Remainder
0.05 - 0.20	0.10	0.06 - 0.20	0.05[6]	0.15	Remainder
0.05 - 0.20	0.25	0.20	0.05	0.15	Remainder
0.05 - 0.20	0.25	0.20	0.05	0.15	Remainder
0.04 - 0.35	0.25	0.15	0.05	0.15	Remainder
0.10	0.10	0.10	0.05	0.15	Remainder
0.03	0.10	---	0.03[14]	0.10	Remainder
0.10	0.10	0.10	0.05	0.15	Remainder
0.04 - 0.14	0.25	0.15	0.05[15]	0.15	Remainder
---	0.20	0.20	0.05	0.15	Remainder
0.06 - 0.20	4.00 - 5.00	0.01 - 0.06	0.05[16]	0.15	Remainder
0.10 - 0.22	7.20 - 8.20	0.10	0.05	0.15	Remainder
0.04	5.70 - 6.70	0.06	0.05[17]	0.15	Remainder
0.18 - 0.28	5.10 - 6.10	0.20	0.05	0.15	Remainder
0.10	4.20 - 5.20	0.05	0.05[18]	0.15	Remainder
0.18 - 0.28	6.30 - 7.30	0.20	0.05	0.15	Remainder

Two page chart, continued from previous page

Chemical Composition Limits

NOTE:

The preceding tables do not include all active alloys registered with the Aluminum Association.

(1) Composition in percent by weight maximum unless shown as a range or a minimum.
(2) Except for “aluminum” and “others,” analysis normally is made for elements for which specific limits are shown. For purposes of determining conformance to these limits, an observed value or a calculated value obtained from analysis is rounded off to the nearest unit in the last right-hand place of figures used in expressing the specified limit, in accordance with ASTM Recommended Practice E 29.

(3) In addition to those alloys referencing footnote (6), a 0.0008 weight percent maximum beryllium is applicable to any alloy to be used as welding electrode or welding rod.

(4) The sum of those “others” metallic elements 0.010% or more each, expressed to the second decimal before determining the sum.

(5) The aluminum content for unalloyed aluminum not made by a refining process is the difference between 100.00% and sum of all other metallic elements present in amounts of 0.010% or more each, expressed to the second decimal before determining the sum.

(6) Beryllium 0.0008% maximum for welding electrode and welding rod only.

(7) Foil.

(8) Vanadium 0.05% maximum.

(9) Electric conductor. Formerly designated EC.

(10) Vanadium plus titanium 0.02% maximum; boron 0.05% maximum; gallium 0.03% maximum.

(11) Also contains 0.20-0.6% each of lead and bismuth.

(12) Vanadium 0.05-0.15%; zirconium 0.10-0.25%.

(13) Bus conductor.

(14) Boron 0.06% maximum.

(15) Also contains 0.40-0.7% each of lead and bismuth.

(16) Zirconium 0.08-0.20%.

(17) Zirconium 0.08-0.15%.

(18) Vanadium 0.05% maximum; gallium 0.03% maximum.

Comparative Characteristics

** Please refer to pg.6-97 for all applicable footnotes*

ALLOY & TEMPER	RESISTANCE TO CORROSION		Workability (Cold) (5)	Machinability (5)	Brazeability (6)
	General (1)	Stress-Corrosion Cracking (2)			
2011-T3	D(3)	D	C	A	A
T4, T451	D(3)	D	B	A	A
T8	D	B	D	A	A
2017-T4, T451	D(3)	C	C	B	B
2024-0	---	---	---	D	D
T4, T3, T351, T3510, T3511	D(3)	C	C	B	B
T361	D(3)	C	D	B	B
T6	D	B	C	B	B
T861, T81, T851, T8510, T8511	D	B	D	B	B
T72	---	---	---	B	B
3003-0	A	A	A	E	E
H12	A	A	A	E	E
H14	A	A	B	D	D
H16	A	A	C	D	D
H18	A	A	C	D	D
H25	A	A	B	D	D
3105-0	A	A	A	E	A
H12	A	A	B	E	A
H14	A	A	B	D	A
H16	A	A	C	D	A
H18	A	A	C	D	A
H25	A	A	B	D	A
5005-0	A	A	A	E	B
H12	A	A	A	E	B
H14	A	A	B	D	B
H16	A	A	C	D	B
H18	A	A	C	D	B
H32	A	A	A	E	B
H34	A	A	B	D	B
H36	A	A	C	D	B
H38	A	A	C	D	B
5052-0	A	A	A	D	C
H32	A	A	B	D	C
H34	A	A	B	C	C
H36	A	A	C	C	C
H38	A	A	C	C	C

Two page chart, continues on next page

Comparative Characteristics

** Please refer to pg.6-97 for all applicable footnotes*

ALLOY & TEMPER	WELDABILITY			APPLICATIONS OF ALLOYS
	Gas	Arc	Resistance Spot and Seam	
2011-T3	D	D	D	Screw machine products
T4, T451	D	D	D	
T8	D	D	D	
2017-T4, T451	D	B	B	Screw mach. products, fittings
2024-0	D	D	D	Truck wheels, screw machine products, aircraft structures
T4, T3, T351, T3510, T3511	C	B	B	
T361	D	C	B	
T6	D	C	B	
T861, T81, T851, T8510, T8511	D	C	B	
T72	D	C	B	
3003-0	A	A	B	Cooking utensils, chemical equipment, pressure vessels, sheet metal work, builder's hardware, storage tanks
H12	A	A	A	
H14	A	A	A	
H16	A	A	A	
H18	A	A	A	
H25	A	A	A	
3105-0	A	A	B	Residential siding, mobile homes, rain carrying goods, sheet metal work
H12	A	A	A	
H14	A	A	A	
H16	A	A	A	
H18	A	A	A	
H25	A	A	A	
5005-0	A	A	B	Appliances, utensils, electrical conductor, architectural
H12	A	A	A	
H14	A	A	A	
H16	A	A	A	
H18	A	A	A	
H32	A	A	A	
H34	A	A	A	
H36	A	A	A	
H38	A	A	A	
5052-0	A	A	B	Sheet metal work, hydraulic tube, appliances
H32	A	A	A	
H34	A	A	A	
H36	A	A	A	
H38	A	A	A	

Two page chart, continued from previous page

Comparative Characteristics

** Please refer to pg.6-97 for all applicable footnotes*

ALLOY & TEMPER	RESISTANCE TO CORROSION		Workability (Cold) (5)	Machinability (5)	Brazeability (6)
	General (1)	Stress-Corrosion Cracking (2)			
5083-0	A(4)	A(4)	B	D	D
H321, H116	A(4)	A(4)	C	D	D
H111	A(4)	B(4)	C	D	D
5086-0	A(4)	A(4)	A	D	D
H32, H116	A(4)	A(4)	B	D	D
H34	A(4)	B(4)	B	C	D
H36	A(4)	B(4)	C	C	D
H38	A(4)	B(4)	C	C	D
H111	A(4)	A(4)	B	D	D
6061-0	B	A	A	D	A
T4, T451, T4510, T4511	B	B	B	C	A
T6, T651, T652, T6510, T6511	B	A	C	C	A
6061-T6, T63	A	A	C	C	A
T61, T64	A	A	B	D	A
6063-T1	A	A	B	D	A
T4	A	A	B	D	A
T5, T52	A	A	B	C	A
T6	A	A	C	C	A
T83, T831, T832	A	A	C	C	A
6262-T6, T651, T6510, T6511	B	A	C	B	B
T9	B	A	D	B	B
7075-0,	---	---	---	D	D
T6, T651, T652, T6510, T6511	C(3)	C	D	B	D
T73, T7351	C	B	D	B	D

Two page chart, continues on next page

Comparative Characteristics

** Please refer to pg.6-97 for all applicable footnotes*

ALLOY & TEMPER	WELDABILITY			APPLICATIONS OF ALLOYS
	Gas	Arc	Resistance Spot and Seam	
5083-0	C	A	B	Unfired, welded pressure vessels, marine, auto, aircraft, cryogenics, TV towers, drilling rigs, transportation equipment, missle components
H321, H116	C	A	A	
H111	C	A	A	
5086-0	C	A	B	
H32, H116	C	A	A	
H34	C	A	A	
H36	C	A	A	
H38	C	A	A	
H111	C	A	A	
6061-0	A	A	B	Heavy-duty structures requiring good corrosion resistance, truck and marine, railroad cars, furniture, pipelines
T4, T451, T4510, T4511	A	A	A	
T6, T651, T652, T6510, T6511	A	A	A	
6061-T6, T63	A	A	A	High strength bus conductors
T61, T64	A	A	A	
6063-T1	A	A	A	Pipe railing, furniture, architectural extrusions
T4	A	A	A	
T5, T52	A	A	A	
T6	A	A	A	
T83, T831, T832	A	A	A	
6262-T6, T651, T6510, T6511	B	B	A	Screw machine products
T9	B	B	A	
7075-0,	D	D	B	Aircraft and other structures
T6, T651, T652, T6510, T6511	D	D	B	
T73, T7351	D	D	B	

Two page chart, continued from previous page

Comparative Characteristics

(1) Ratings A through E are relative ratings in decreasing order of merit, based on exposures to sodium chloride solution by intermittent spraying or immersion. Alloys with A and B ratings can be used in industrial and seacoast atmospheres without protection. Alloys with C, D and E ratings generally should be protected at least on faying surfaces.

(2) Stress-corrosion cracking ratings are based on service experience and on laboratory tests of specimens exposed to the 3.5% sodium chloride alternate immersion test.

A = No known instance of failure in service or in laboratory tests.

B = No known instance of failure in service; limited failures in laboratory tests of short transverse specimens.

C = Service failures with sustained tension stress acting in short transverse direction relative to grain structure; limited failures in laboratory tests of long transverse specimens.

D = Limited service failures with sustained longitudinal or long transverse areas.

(3) In relatively thick sections the rating would be E.

(4) This rating may be different for material held at elevated temperature for long periods.

(5) Ratings A through D for Workability (cold), and A through E for Machinability, are relative ratings in decreasing order of merit.

(6) Ratings A through D for Weldability and Brazeability are relative ratings defined as follows:

A = Generally weldable by all commercial procedures and methods.

B = Weldable with special techniques or for specific applications that justify preliminary trials or testing to develop welding procedure and weld performance.

C = Limited weldability because of crack sensitivity or loss in resistance to corrosion and mechanical properties.

D = No commonly used welding methods have been developed.

(7) T74 type tempers, although not previously registered, have appeared in various literature and specifications as T736 type tempers.

Specification Cross Reference

* Please refer to pg.6-102 for all applicable footnotes

Aluminum Mill Product Specifications*(1)(2)(3)(4)

Alloy	Product	Specifications				
		ASTM	Military	Federal	AMS	ASME
1100	Sheet and plate	B209	---	---	4001,4003 QQ-A-250/1	SB209
2011	Tube; drawn, seamless	B210	---	---	---	---
	Wire, rod, and bar; rolled or cold finished	B211	---	---	QQ-A-225/3	---
2017	Wire, rod, and bar; rolled or cold finished	B211	---	---	4118 QQ-A-225/5	---
	Rivet wire and rod	B316	---	QQ-A-430	---	---
2024	Sheet and plate	B209	---	---	4035,4037 4193, 4297 QQ-A-250/4	---
	Wire, rod, and bar; rolled or cold finished	B211	---	---	4120, 4339 QQ-A-225/6	SB211
	Wire, rod, bar, shapes, and tube; extruded	B221	---	---	4152, 4164, 4165 QQ-A-250/3	SB221
	Tube; extruded, seamless	B241	---	---	---	---
	Tube; drawn, seamless	B210	MIL-T-50777	WW-T-700/3	4087, 4088	---
	Tube; hydraulic	---	---	---	4086	---
	Rivet wire and rod	B316	---	QQ-A-430	---	---
	Foil	---	---	---	4007 QQ-A-81596	---
3003	Sheet and plate	B209	---	---	4006,4008 QQ-A-250/2	SB209 ---
	Wire, rod and bar; rolled or cold finished	B211	---	---	QQ-A-225/2	---
	Wire, rod, bar, shapes and tube; extruded	B221	---	---	QQ-A-200/1	SB221
	Tube; extruded, seamless	B241	---	---	---	SB241
	Tube; extruded, coiled	B491	---	---	---	---
	Tube; drawn	B483	---	---	---	---
	Tube; drawn, seamless	B210	---	WW-T-700/2	4065, 4067	SB210
	Tube; condenser	B234	---	---	---	SB234
	Tube; condenser with integral fins	B404	---	---	---	---
	Tube; welded	B313 B547	--- ---	--- ---	--- ---	--- ---

Continued on the next page.

Specification Cross Reference

** Please refer to pg.6-102 for all applicable footnotes*

Aluminum Mill Product Specifications*(1)(2)(3)(4)

Alloy	Product	Specifications				
		ASTM	Military	Federal	AMS	ASME
3003	Pipe	B241	MIL-P-25995	---	---	SB241
	Pipe; gas and oil trans.	B345	---	---	---	---
	Rivet wire and rod	B316	---	QQ-A-430	---	---
	Forgings & forging stock	B247	---	---	---	SB247
	Foil	---	---	---	4010	---
5052	Sheet and plate	B209	---	---	4015, 4016, 4017 QQ-A-250/8	SB209
	Sheet and plate	B211	---	---	4114 QQ-A-225/7	---
	Wire, rod and bar rolled or cold finished	B211	---	---	4114 QQ-A-250/8	---
	Tube; drawn	B483	---	---	---	---
	Tube; drawn, seamless	B210	---	WW-T-700/4	4069, 4070	SB210
	Tube; hydraulic	B221	---	---	4071	---
	Tube; extruded	B221	---	---	---	---
	Tube; extruded, seamless	B241	---	---	---	SB241
	Tube; condenser	B234	---	---	---	SB234
	Tube; condenser with integral fins	B404	---	---	---	---
	Tube; welded	B313 B547	---	---	---	---
	Rivet wire and rod	B316	---	QQ-A-430	---	---
	Foil	---	---	---	4004	
5083	Sheet and plate	B209	---	---	4056 QQ-A-250/6	SB209
	Wire, rod, bar, shapes	B221	---	---	QQ-A-200/4	SB221
	Tube; extruded, seamless	B241	---	---	---	SB241
	Tube; drawn, seamless	B210	---	---	---	---
	Tube; welded	B547	---	---	---	---
	Forgings & forging stock	B247	---	---	---	SB247
	Pipe; gas & oil trans.	B345	---	---	---	---
	Armor Plate	---	MIL-A-46027	---	---	---
	Extruded armor	---	MIL-A-46083	---	---	---
	Forged armor	---	MIL-A-45225	---	---	---

Continued on the next page.

Specification Cross Reference

* Please refer to pg.6-102 for all applicable footnotes

Aluminum Mill Product Specifications*(1)(2)(3)(4)

Alloy	Product	Specifications				
		ASTM	Military	Federal	AMS	ASME
5086	Sheet and plate	B209	---	---	QQ-A-250/7	SB209
	Wire, rod, bar, shapes, and tube; extruded	B221	---	---	QQ-A-200/5	SB221
	Tube; extruded, seamless	B241	---	---	---	SB241
	Tube; drawn, seamless	B210	---	WW-T-700/5	---	---
	Tube; welded	B313 B547	---	---	---	---
	Pipe; gas & oil trans.	B345	---	---	---	---
6061	Sheet and plate	B209	---	---	4025,4026, 4027 QQ-A-250/11	SB209
	Tread	B632	---	---	---	---
	Wire, rod, and bar; rolled or cold finished	B211	---	---	4115, 4116, 4117, 4128 QQ-A-225/8	SB211
	Wire, rod, bar, shapes, and tube; extruded	B221	---	---	4150, 4060, 4061, 4172, 4173 QQ-A-200/8	SB221
	Structural	B308	---	---	4113 QQ-A-200/16	SB308
	Tube; drawn	B483	---	---	---	---
	Tube; extruded, seamless	B241	---	---	---	SB241
	Tube; drawn, seamless	B210	---	WW-T-700/6	4079, 4080, 4082	SB210
	Tube; hydraulic	---	---	---	4081, 4083	---
	Tube; condenser	B234	---	---	---	SB234
	Tube; condenser with integral fans	B404	---	---	---	---
	Tube; welded	B313	---	---	---	---
	Pipe	B241	MIL-P-25995	---	---	SB241
	Pipe; gas & oil trans.	B345	---	---	---	---
	Forgings & forging stock	B247	MIL-A-22771	---	4127, 4248, 4146(5)	SB247
	Rings; forged or rolled	---	---	---	4312	---
	Rivet wire and rod	B316	---	QQ-A-430	---	---
	Impacts	B221	---	---	---	---
	Structural pipe and tube; extruded	B429	---	---	---	---
	Foil	---	---	---	4009(5)	---

Continued on the next page.

Specification Cross Reference

** Please refer to pg.6-102 for all applicable footnotes*

Aluminum Mill Product Specifications*(1)(2)(3)(4)

Alloy	Product	Specifications				
		ASTM	Military	Federal	AMS	ASME
6063	Wire, rod, bar, shapes, and tube; extruded	B221	---	---	4156 QQ-A-200/9	SB221
	Tube; extruded, seamless	B241	---	---	---	SB241
	Tube; extruded, coiled	B491	---	---	---	---
	Tube; drawn	B483	---	---	---	---
	Tube; drawn, seamless	B210	---	---	---	---
	Pipe	B241	MIL-P-25995	---	---	SB241
	Pipe; gas & oil trans.	B345	---	---	---	---
	Structural pipe and tube; extruded	B429	---	---	---	---
7075	Sheet and plate	B209	---	---	4044, 4045, 4078 QQ-A-250/12 QQ-A-250/24	SB209
	Wire, rod and bar rolled or cold finished	B211	---	---	4122, 4123, 4124, 4186, 4187(5) QQ-A-225/9	---
	Wire, rod, bar, shapes,	B221 B211	---	---	4154, 4166, 4167, 4168, 4169 QQ-A-200/11 QQ-A-200/15	---
	Tube; extruded, seamless	B241	---	---	---	---
	Tube; drawn, seamless	B210	---	WW-T-700/7	---	---
	Forgings & forging stock	B247	MIL-A-22771	---	4126, 4131, 4141, 4147	---
	Hand forgings	B247	---	---	4323	---
	Rings, forged or rolled	B247	---	---	4310, 4311	---
	Impacts	B221	---	---	---	---
	Rivet wire	B316	---	QQ-A-430	---	---

Continued on the next page.

Specification Cross Reference

Footnotes for pages 6-98 thru 6-101

NOTE:

(1) The Aluminum Association and its members assume no responsibility for use of this index, for errors, for omissions, or for failure to advise of subsequent revisions or amendments.

(2) This cross-reference index lists the basic specification or standard num-ber and no attempt is made to reflect the latest revision or amendment to any particular document. The appropriate specification index published by the specifi cation issuing body should be consulted to determine the latest issue of any particular specification or standard. The aluminum industry generally prefers to use the latest issue of any given specification or standard.

(3) Different organizations' specifications for the same alloy and product may contain different requirements.

(4) Copies of specifications can be obtained from:

AMS /Aerospace Material Specifications
SAE, Inc.
400 Commonwealth Drive
Warrendale, PA 15096-0001

Military and Federal
Standardization Documents Order Desk
Building 4D, 700 Robins Avenue
Philadelphia, PA 19111-5094

ASME
American Society of Mechanical Engineers
345 East 47th Street
New York, NY 10017

ASTM
100 Barr Harbor Drive
West Conshohocken, PA
19428-2959

AWS /American Welding Society
American Welding Society
550 NW LeJeune Road
Miami, FL 33126

(5) Noncurrent

Red Metals

Brass, Copper and Bronze Products

WARNING: These products can potentially expose you to chemicals including Nickel, Chromium, Lead, Cobalt, Mercury and Beryllium, which are known to the state of California to cause cancer and/or birth defects or other reproductive harm. For more information, visit **www.P65Warnings.ca.gov**

360 Free Cutting Brass - Round Rod

CDA Alloy 360 (ASTM B16)

Standard Lengths: up thru 6" Diameter: 12 ft. (+/- 1/2")
Over 6" Diameter: Approx. 6 ft. - 8 ft. random

Dia. (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)	Diameter Tolerance (+ or -)
3/32	0.025	0.300	.0013
1/8	0.045	0.540	.0013
5/32	0.070	0.840	.0015
11/64	0.085	1.020	.0015
3/16	0.101	1.210	.0015
13/64	0.119	1.420	.0015
7/32	0.138	1.656	.0015
15/64	0.159	1.908	.0015
1/4	0.181	2.172	.0015
17/64	0.204	2.448	.0015
9/32	0.230	2.760	.0015
19/64	0.254	3.040	.0015
5/16	0.283	3.396	.0015
21/64	0.311	3.732	.0015
11/32	0.342	4.104	.0015
23/64	0.373	4.470	.0015
3/8	0.407	4.884	.0015
25/64	0.441	5.294	.0015
13/32	0.477	5.724	.0015
7/16	0.554	6.648	.0015
29/64	0.594	7.120	.0015
15/32	0.635	7.620	.0015
31/64	0.678	8.130	.0015
1/2	0.723	8.676	.0015
33/64	0.769	9.228	.0015
17/32	0.816	9.792	.002
35/64	0.865	10.380	.002
9/16	0.915	10.980	.002
19/32	1.019	12.228	.002
39/64	1.074	12.888	.002
5/8	1.130	13.560	.002
41/64	1.187	14.240	.002
21/32	1.245	14.440	.002
11/16	1.367	16.401	.002
23/32	1.494	17.924	.002
3/4	1.627	19.524	.002
25/32	1.765	21.180	.002
13/16	1.909	22.908	.002
27/32	2.059	24.702	.002
7/8	2.215	26.580	.002
57/64	2.295	27.540	.002
29/32	2.375	28.500	.002
15/16	2.542	30.504	.002

Dia. (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)	Diameter Tolerance (+ or -)
31/32	2.714	32.568	.002
1	2.893	34.716	.002
1-1/16	3.265	39.180	.0025
1-1/8	3.660	43.920	.0025
1-3/16	4.078	48.936	.0025
1-1/4	4.519	54.238	.0025
1-5/16	4.982	59.784	.0025
1-3/8	5.468	65.616	.0025
1-7/16	5.976	71.712	.0025
1-1/2	6.507	78.084	.0025
1-9/16	7.060	84.720	.0025
1-5/8	7.637	91.644	.0025
1-11/16	8.235	98.820	.0025
1-3/4	8.857	106.284	.0025
1-13/16	9.500	114.000	.0025
1-7/8	10.170	122.040	.0025
1-15/16	10.856	130.222	.0025
2	11.568	138.816	.0025
2-1/16	12.302	147.624	.0025
2-1/8	13.059	156.708	.003
2-3/16	13.838	166.056	.003
2-1/4	14.640	175.680	.004
2-5/16	15.465	185.58	.004
2-3/8	16.312	195.744	.004
2-7/16	17.182	206.184	.004
2-1/2	18.075	216.900	.004
2-9/16	18.999	227.98	.004
2-5/8	19.927	239.124	.004
2-3/4	21.870	262.440	.004
2-7/8	23.904	286.848	.0035
3	26.027	312.324	.005
3-1/8	28.242	338.904	.005
3-1/4	30.546	366.552	.005
3-3/8	32.957	395.48	.005
3-1/2	35.426	425.112	.005
3-5/8	38.020	456.24	.005
3-3/4	40.668	488.016	.006
4	46.271	555.252	.006
4-1/4	52.236	626.832	.006
4-1/2	58.562	702.744	.007
4-3/4°	65.249	782.988	+.050/-0
5°	72.298	867.576	+.050/-0
5-1/4°	79.704	956.448	+.050/-0

° Provided as Cast & Turned only.

Continued on next page

360 Free Cutting Brass - Round Rod

CDA Alloy 360 (ASTM B16)

Standard Lengths: up thru 6” Diameter: 12 ft. (+/- 1/2”)
Over 6” Diameter: Approx. 6 ft. - 8 ft. random

Dia. (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)	Diameter Tolerance (+ or -)
5-1/2°	87.481	1049.772	+.050/-0
5-3/4°	95.615	1147.380	+.050/-0
6°	104.110	1249.320	+.050/-0
6-1/2*°	122.184	977.472	+.050/-0
7*°	141.705	1133.640	+.050/-0
7-1/2*°	162.672	1301.376	+.050/-0
8*	185.084	1480.672	+.050/-0

Dia. (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)	Diameter Tolerance (+ or -)
9*°	234.247	1873.976	+.050/-0
10*°	289.194	2313.552	+.115/-0
11*°	350.100	2800.800	+.115/-0
12**°	416.439	2498.634	NA

***Stock Length - 6 to 8’ randoms. Weight is calculated from 8’ lengths.**
**** Weight is calculated from 6’ lengths.**
° Provided as Cast & Turned only.

360 Free Cutting Brass - Square Rod

CDA Alloy 360 (ASTM B16)

Standard Lengths: 12 ft. (+/- 1/2”)

Dia. (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)	Diameter Tolerance (+ or -)
1/8	.058	.696	.002
3/16	.130	1.560	.003
1/4	.230	2.760	.0035
5/16	.360	4.320	.0035
3/8	.518	6.216	.0035
7/16	.705	8.460	.0035
1/2	.921	11.052	.0035
9/16	1.166	13.992	.0045
5/8	1.439	17.268	.0045
11/16	1.741	20.892	.0045
3/4	2.072	24.864	.0045
13/16	2.432	29.184	.0045
7/8	2.821	33.852	.0045

Dia. (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)	Diameter Tolerance (+ or -)
1	3.684	44.208	.0045
1-1/8	4.663	55.956	.005
1-1/4	5.756	69.072	.005
1-3/8	6.965	83.580	.005
1-1/2	8.289	99.468	.005
1-5/8	9.728	116.736	.005
1-3/4	11.282	135.384	.005
2	14.736	176.832	.005
2-1/4	18.650	223.800	.007
2-1/2	23.025	276.300	.008
3	33.156	397.872	.009
3-1/2	45.129	541.548	.011
4	58.944	707.328	.012

***Note:** Special sizes and alloys available on mill orders.*

360 Free Cutting Brass - Hexagon Rod

CDA Alloy 360 (ASTM B16)

Standard Lengths: 12 ft. (+/- 1/2")

Dia. (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)	Diameter Tolerance (+ or -)
1/8	.050	.600	.0025
3/16	.112	1.344	.003
7/32	.153	1.830	.003
1/4	.200	2.400	.003
9/32	.252	3.020	.003
5/16	.312	3.744	.003
11/32	.376	4.510	.003
3/8	.449	5.388	.003
7/16	.611	7.332	.003
15/32	.700	8.400	.003
1/2	.798	9.576	.003
9/16	1.010	12.120	.004
19/32	1.125	13.500	.004
5/8	1.247	14.964	.004
11/16	1.509	18.108	.004
3/4	1.796	21.552	.004
13/16	2.108	25.296	.004
7/8	2.444	29.328	.004
15/16	2.806	33.672	.004
1	3.193	38.316	.004
1-1/16	3.604	43.248	.005
1-1/8	4.041	48.492	.005

Dia. (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)	Diameter Tolerance (+ or -)
1-3/16	4.502	54.024	.005
1-1/4	4.989	59.868	.005
1-5/16	5.500	66.000	.005
1-3/8	6.036	72.432	.005
1-7/16	6.598	79.176	.005
1-1/2	7.184	86.208	.005
1-5/8	8.431	101.172	.005
1-3/4	9.778	117.336	.005
1-13/16	10.489	125.868	.005
1-7/8	11.225	134.700	.005
2	12.771	153.252	.005
2-1/8	14.417	173.004	.006
2-1/4	16.164	193.968	.007
2-3/8	18.009	216.108	.007
2-1/2	19.955	239.460	.008
2-5/8	22.000	264.000	.008
2-3/4	24.145	289.740	.008
3	28.735	344.820	.009
3-1/8	31.180	374.160	.009
3-1/4	33.724	404.688	.009
3-1/2	39.112	469.344	.011
4	51.085	613.020	.012

***Note:** Special sizes and alloys available on mill orders.*

360 Free Cutting Brass Benefits:

- Excellent Machinability
- Screw Machine Jobs
- Finest Appearance
- Lower Finishing Costs
- Corrosion Resistance
- High Scrap-Value Recovery

360 Free Cutting Brass - Flat Bar

CDA Alloy 360 (ASTM B16)

Standard Lengths: 12 ft. random

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1/8		
1/4	.115	1.380
3/8	.173	2.070
1/2	.230	2.760
5/8	.287	3.444
3/4	.345	4.140
7/8	.408	4.836
1	.460	5.520
1-1/4	.575	6.900
1-1/2	.690	8.280
1-3/4	.805	9.660
2	.921	11.052
2-1/2	1.151	13.812
3	1.381	16.572
4	1.842	22.104
3/16 x		
1/4	.172	2.064
3/8	.259	3.108
1/2	.345	4.140
5/8	.431	5.172
3/4	.518	6.216
1	.690	8.280
1-1/4	.863	10.356
1-1/2	1.036	12.432
1-3/4	1.208	14.496
2	1.381	16.572
3	2.072	24.864
4	2.763	33.156
1/4 x		
5/16	.287	3.444
3/8	.345	4.140
1/2	.461	5.532
5/8	.576	6.912
3/4	.690	8.280
7/8	.805	9.660
1	.921	11.052
1-1/4	1.151	13.812
1-1/2	1.381	16.572
1-3/4	1.611	19.332
2	1.842	22.104
2-1/4	2.072	24.864
2-1/2	2.302	27.624
3	2.763	33.156
3-1/2	3.223	38.676
4	3.684	44.208
4-1/2	4.144	49.734
5	4.605	55.260
6	5.510	66.120

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
5/16 x		
3/8	.431	5.172
1/2	.575	6.900
5/8	.719	8.628
3/4	.863	10.356
1	1.151	13.812
1-1/4	1.439	17.268
1-1/2	1.726	20.712
2	2.302	27.624
3/8 x		
1/2	.690	8.280
5/8	.863	10.356
3/4	1.036	12.432
7/8	1.208	14.496
1	1.381	16.572
1-1/4	1.726	20.712
1-1/2	2.072	24.864
1-3/4	2.417	29.004
2	2.763	33.156
2-1/2	3.453	41.436
3	4.144	49.728
3-1/2	4.835	58.020
4	5.526	66.312
6	8.289	99.468
1/2 x		
5/8	1.151	13.812
3/4	1.381	16.572
7/8	1.611	19.332
1	1.842	22.104
1-1/4	2.302	27.624
1-1/2	2.763	33.156
1-3/4	3.223	38.676
2	3.684	44.208
2-1/4	4.144	49.728
2-1/2	4.605	55.260
3	5.526	66.312
3-1/2	6.447	77.364
4	7.368	88.416
4-1/2	8.289	99.468
5	9.210	110.520
6	11.052	132.624
5/8 x		
3/4	1.726	20.712
7/8	2.014	24.168
1	2.302	27.624
1-1/4	2.878	34.536
1-1/2	3.453	41.436
1-3/4	4.029	48.348
2	4.605	55.260
2-1/2	5.756	69.072
3	6.907	82.884
4	9.210	110.520

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
3/4 x		
7/8	2.417	29.004
1	2.763	33.156
1-1/8	3.108	37.299
1-1/4	3.453	41.436
1-1/2	4.144	49.728
1-3/4	4.835	58.020
2	5.526	66.312
2-1/4	6.216	74.592
2-1/2	6.907	82.884
3	8.289	99.468
4	11.052	132.624
7/8 x		
1	3.223	38.676
2	6.447	77.364
1 x		
1-1/4	4.605	55.260
1-1/2	5.526	66.312
1-3/4	6.447	77.364
2	7.368	88.416
2-1/2	9.210	110.520
3	11.052	132.624
3-1/2	12.894	154.728
4	14.736	176.832
5	18.420	221.040
6	22.104	265.248
1-1/4 x		
1-1/2	6.907	82.884
1-3/4	8.058	96.696
2	9.210	110.520
2-1/2	11.512	138.144
3	13.815	165.780
4	18.420	221.040
1-1/2 x		
2	11.052	132.624
2-1/2	13.815	165.780
3	16.578	198.936
4	22.104	265.248
1-3/4 x		
2	12.894	154.728
3	19.341	232.092
2 x		
2-1/2	18.420	221.040
3	22.104	265.248
4	29.472	353.664
2-1/2 x		
3	27.630	331.560
3 x		
4	44.200	530.496

360 Free Cutting Brass Tolerances

Round and Hexagonal

Diameter (inches)	Rounds (inches)	Hexagonal (inches)
Up to .150 Incl.	± .0013	± .0025
Over .150 to .500 Incl.	± .0015	± .0030
Over .500 to 1.00 Incl.	± .0020	± .0040
Over 1.00 to 2.00 Incl.	± .0025	± .0050
Over 2.00	± 0.15%*	± 0.30%*

** Expressed to the nearest 0.001"*

Thickness Tolerance for Rectangular & Square Bar

Thickness (inches)	Width (inches)					
	Up to 1/2" Incl.	Over 1/2" up to 1-1/4" Incl.	Over 1-1/4" up to 2" Incl.	Over 2" up to 4" Incl.	Over 4" up to 8" Incl.	Over 8" up to 12" Incl.
Incl. .062 to .130 Incl.	± .002	± .0025	± .0035	...	...	...
Over .130 to .188 Incl.	± .003	± .0035	± .004	...	...	...
Over .188 to .500 Incl.	± .0035	± .004	± .0045	± .0045	± .006	± .008
Over .500 to 1.00 Incl.	...	± .0045	± .005	± .005	± .007	± .009
Over 1.00 to 2.00 Incl.	...	± .005	± .005	± .006	± .008	...
Over 2.00 to 4.00 Incl.	...	...	...	± .30%*	...	...

** Expressed to the nearest 0.001"*

Width Tolerance For Rectangles Only
For Squares Use Thickness Tolerances

Width (inches)	Tolerance (inches)
Over 0.130 to 0.188 incl.	± .003
Over 0.188 to 0.500 incl.	± .0035
Over 0.500 to 1.25 incl.	± .005
Over 1.25 to 2.00 incl.	± .008
Over 2.00 to 4.00 incl.	± .012
Over 4.00 to 12 incl.	± 0.30%*

** Expressed to the nearest 0.001"*

360 Free Cutting Brass - Straightness Tolerances

Drawn Rectangles & Squares - 1/2" maximum bow edgewise curvature (depth arc) in any 6 foot portion of the total length.

Drawn Rod (General Use)

Length (feet)	Maximum Curvature (depth arc)
Under 2	1/32"
2 and under 5	1/32" in 2 foot portion of the total length
5 and under 10	1/8" in any 5 foot portion or the total length
10 and over	1/2" in any 10 foot portion of the total length

260 Half Hard Brass Sheet/Plate

CDA Alloy 260 (ASTM B36) UNS-C2600

CDA 260 Half Hard Brass , also known as cartridge brass, has a high zinc content (30%) giving it the optimum combination of strength and ductility. It has excellent cold workability and used in the automotive industry as well as plumbing, hardware, and ammunition components. Easily machined, but more often cold formed and is highly corrosion resistant.

Thickness (inches)	Sheet/Plate Size (inches)	Weight, Approx. (lbs./sqft.)
.025	36 x 96	1.110
.032	36 x 96	1.420
.040	36 x 96	1.774
.050	36 x 96	2.220
.063	36 x 96	2.772
.080	36 x 96	3.550
.093	36 x 96	4.156
.125	36 x 96	5.544
.1875	36 x 96	8.320
.250	36 x 96	11.170
.375	36 x 96	16.910
.500	36 x 96	22.655

260 Half Hard Brass Sheet/Plate

Thickness Tolerance

Thickness (inches)	Over 24” wide up to 28” wide	Over 28” wide up to 36” wide	Over 36” wide up to 48” wide	Over 48” wide up to 60” wide
Over .021 to .026 incl	.003	.003	.0035	.004
Over .026 to .037 incl	.0035	.0035	.004	.005
Over .037 to .050 incl	.004	.005	.006	.007
Over .050 to .073 incl	.005	.006	.007	.008
Over .073 to .130 incl	.006	.007	.008	.010
Over .130 to .188 incl	.007	.008	.010	.012
Over .188 to .205 incl	.007	.008	.010	.012
Over .205 to .300 incl	.009	.010	.012	.014
Over .300 to .500 incl	.012	.013	.015	.018

Temper	Tensile Strength		Approximate Rockwell Hardness - “B” Scale			
			0.020” - 0.036”		Over 0.036”	
	Min.	Max.	Min.	Max.	Min.	Max.
M20 - As Hot Rolled	41	51	**	**	**	**
H01 - Quarter Hard	49	59	40	61	44	65
H02 - Half Hard	57	67	60	74	63	77
H04 - Hard	71	81	79	84	81	86

***** Per ASTM B-36M Standards***

110 Copper Rounds

CDA Alloy 110 (ASTM B187) UNS-C11000

Standard Lengths: 12 ft.

Diameter (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1/8	0.048	.570
3/16	0.108	1.290
1/4	0.190	2.282
5/16	0.298	3.577
3/8	0.428	5.134
7/16	0.581	6.973
1/2	0.761	9.128
9/16	0.961	11.532
5/8	1.189	14.262
3/4	1.711	20.538
7/8	2.330	27.954

Diameter (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
15/16	2.671	32.056
1	3.043	36.512
1-1/8	3.851	46.210
1-1/4	4.754	57.050
1-3/8	5.753	69.030
1-1/2	6.846	82.152
1-5/8	8.035	96.414
1-3/4	9.318	111.818
2	12.171	146.048
2-1/4	15.403	184.842
2-3/8	17.109	205.308

Diameter (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
2-1/2	19.017	228.200
2-5/8	21.013	252.156
2-3/4	23.010	276.121
2-7/8	75.197	302.244
3	27.384	328.607
3-1/2	37.273	447.271
4	48.683	584.191
4-1/4*	54.958	494.622
4-1/2**	61.614	492.911
5***	76.067	456.399
6***	109.536	657.215

* 9 ft. mill length
** 8 ft. mill length
*** 5 - 6 ft. random mill lengths

110 Copper Squares

CDA Alloy 110 (ASTM B187) UNS-C11000

Standard Lengths: 12 ft.

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1/4	0.242	2.907
3/8	0.545	6.541
1/2	0.969	11.628
5/8	1.514	18.169
3/4	2.180	26.163

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
7/8	3.028	36.336
1	3.876	46.512
1-1/4	6.056	72.675
1-1/2	8.721	104.652
1-3/4	11.870	142.443

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
2	15.504	186.048
2-1/2	24.225	290.700
3	34.884	418.608
4**	62.009	744.100

***** Produced to ASTM B124***

110 Copper Flats (Square Edge)

CDA Alloy 110 (ASTM B187) UNS-C11000

Standard Lengths: 12 ft.

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1/16 x		
1/2	0.122	1.465
5/8	0.153	1.831
3/4	0.183	2.198
1	0.244	2.930
1-1/2	0.360	4.326
1/8 x		
1/2	0.242	2.907
5/8	0.303	3.634
3/4	0.363	4.361
7/8	0.424	5.087

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1/8 x		
1	0.485	5.814
1-1/4	0.606	7.268
1-1/2	0.727	8.721
1-3/4	0.848	10.175
2	0.969	11.628
2-1/4	1.090	13.082
2-1/2	1.211	14.535
3	1.454	17.442
4	1.938	23.256
5	2.423	29.070
6	2.907	34.884

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
3/16 x		
3/8	.271	3.250
1/2	0.364	4.372
5/8	0.453	5.436
3/4	0.547	6.558
7/8	0.638	7.651
1	0.729	8.744
1-1/4	0.911	10.930
1-1/2	1.093	13.116
1-3/4	1.268	15.221
2	1.457	17.489

Continued on next page

110 Copper Flats (Square Edge)

CDA Alloy 110 (ASTM B187) UNS-C11000

Standard Lengths: 12 ft.

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
3/16 x		
2-1/4	1.640	19.675
2-1/2	1.822	21.861
3	2.186	26.233
4	2.915	34.977
6	4.372	52.466
1/4 x		
1/2	0.485	5.814
5/8	0.606	7.268
3/4	0.727	8.721
7/8	0.848	10.175
1	0.969	11.628
1-1/4	1.211	14.535
1-1/2	1.454	17.442
1-5/8	1.575	18.896
1-3/4	1.696	20.349
2	1.938	23.256
2-1/4	2.180	26.163
2-1/2	2.423	29.070
2-3/4	2.665	31.977
3	2.907	34.884
3-1/4	3.149	37.791
3-1/2	3.392	40.698
4	3.876	46.512
4-1/2	4.361	52.326
5	4.845	58.140
6	5.814	69.768
7	6.783	81.396
8	7.752	93.024
5/16 x		
7/8	1.062	12.738
1	1.213	14.558
1-1/2	1.820	21.837
2	2.426	29.117
4	4.853	58.233
3/8 x		
1/2	.727	8.724
3/4	1.090	13.082
1	1.454	17.442
1-1/4	1.817	21.803
1-1/2	2.180	26.163
1-3/4	2.544	30.524
2	2.907	34.884
2-1/4	3.270	39.245
2-1/2	3.634	43.605
3	4.361	52.326
3-1/2	5.087	61.047

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
3/8 x		
4	5.814	69.768
4-1/2	6.541	78.489
5	7.268	87.210
6	8.721	104.652
7	10.175	122.094
8	11.628	139.536
12	17.442	209.304
1/2 x		
5/8	1.211	14.535
3/4	1.454	17.442
1	1.938	23.256
1-1/4	2.423	29.070
1-1/2	2.907	34.884
1-3/4	3.392	40.698
2	3.876	46.512
2-1/4	4.361	52.326
2-1/2	4.845	58.140
3	5.814	69.768
3-1/4	6.299	75.582
3-1/2	6.783	81.396
4	7.752	93.024
4-1/4	8.237	98.838
5	9.690	116.280
6	11.628	139.536
8	15.504	186.048
5/8 x		
1	2.423	29.070
1-1/4	3.028	36.338
1-1/2	3.634	43.605
2	4.846	58.140
2-1/2	6.056	72.675
3	7.268	87.210
4	9.690	116.280
5	12.113	145.356
3/4 x		
1	2.907	34.884
1-1/4	3.634	43.605
1-1/2	4.361	52.326
1-3/4	5.087	61.047
2	5.814	69.768
2-1/2	7.268	87.210
2-3/4	7.994	95.931
3	8.721	104.652
3-1/2	10.175	122.094
4	11.628	139.536
5	14.535	174.420
6	17.442	209.304

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1 x		
1-1/4	4.845	58.140
1-1/2	5.814	69.768
1-3/4	6.783	81.396
2	7.752	93.024
2-1/2	9.690	116.280
3	11.628	139.536
3-1/2	13.566	162.792
4	15.504	186.048
5	19.380	232.560
6	23.256	279.072
8	31.008	372.096
1-1/4 x		
1-1/2	7.268	87.210
2	9.690	116.280
2-1/2	12.113	145.350
3	14.535	174.420
3-1/2	16.958	203.490
4	19.380	232.560
5	24.225	290.700
6	29.070	348.840
1-1/2 x		
2	11.628	139.536
2-1/2	14.535	174.420
3	17.442	209.304
3-1/2	20.349	244.188
4	23.256	279.072
5	29.070	348.840
6	34.884	418.608
1-3/4 x		
2	13.566	162.792
2-1/2	16.958	203.490
3	20.349	244.188
2 x		
2-1/2	19.380	232.560
3	23.256	279.072
4	31.008	372.096
5	38.760	465.120
2-1/2 x		
3	29.070	348.840
4	38.760	465.120
3 x		
4	46.512	558.144

110 Copper Flats (Full Round Edge)

CDA Alloy 110 (ASTM B187) UNS-C11000

Standard Lengths: 12 ft.

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1/8 x		
1/2	0.229	2.748
5/8	0.289	3.468
3/4	0.349	4.188
1	0.470	5.640
1-1/2	0.712	8.544
2	0.953	11.436
3	1.420	17.040
4	1.906	22.872
3/16 x		
3/4	0.543	6.516
1	0.695	8.340
1-1/4	0.876	10.512
1-1/2	1.058	12.696
1-3/4	1.268	15.216
2	1.420	17.040
2-1/2	1.782	21.384
2-3/4	1.963	23.556
3	2.575	30.900

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1/4 x		
3/4	0.673	8.076
1	0.914	10.968
1-1/4	1.156	13.872
1-1/2	1.397	16.764
1-3/4	1.639	19.668
2	1.880	22.560
2-1/2	2.363	28.356
3	2.846	34.152
4	3.812	45.744
5	4.778	57.336
6	5.744	68.928
8	7.676	92.112

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
3/8 x		
1	1.332	15.984
1-1/4	1.694	20.328
1-1/2	2.057	24.684
2	2.781	33.372
2-1/2	3.506	42.072
3	4.230	50.760
4	5.679	68.148
5	7.128	85.536
6	8.577	102.924
1/2 x		
1-1/2	2.690	32.280
2	3.656	43.872
2-1/2	4.622	55.464
3	5.588	67.056
4	7.520	90.240
5	9.660	115.920
6	11.385	136.620

110 Cold Rolled 1/8 - 1/2 Hard Copper Sheet

CDA Alloy 110 (ASTM B152) UNS-C11000

Thickness (inches)	Size (inches)	Weight (lbs./sqft.)
.032	36 x 96	1.488
.040	36 x 96	1.860
.050	36 x 96	2.326
.063	36 x 96	2.907

Thickness (inches)	Size (inches)	Weight (lbs./sqft.)
.080	36 x 96	3.721
.093	36 x 96	4.465
.125	36 x 96	5.814
.1875	36 x 96	8.744

110 Quarter Hard Copper Sheet

CDA Alloy 110 (ASTM B152) UNS-C11000

Thickness (inches)	Size (inches)	Weight (lbs./sqft.)
.0625	36 x 96	2.907
.080	36 x 96	3.721
.125	36 x 96	5.814
.1875	36 x 96	8.744

Rolled Copper Sheet

Construction Grade/Roofing Copper - ASTM B370

Weight	Thickness (inches)	Size (inches)	Weight (lbs./sqft.)
12 oz.	.0162	36 x 96	0.753
16 oz.	.0216	36 x 96	1.001
16 oz.	.0216	36 x 120	1.001
20 oz.	.0270	36 x 120	1.251
24 oz.	.0323	36 x 120	1.502
36 oz.	.0500	36 x 120	2.326

110 Cold Rolled Copper Plate

CDA Alloy 110 (ASTM B152) UNS-C11000

Thickness (inches)	Size (inches)	Weight (lbs./sqft.)
1/4 x	36 x 96	11.628
3/8 x	36 x 96	17.442
1/2 x	36 x 96	23.256
	36 x 144	23.256
5/8 x	36 x 96	29.070
3/4 x	36 x 96	34.884
	36 x 144	34.884
1 x	36 x 96	46.512
1-1/4 x	36 x 144	58.140
1-1/2 x	36 x 144	69.768

Thickness (inches)	Size (inches)	Weight (lbs./sqft.)
1-3/4 x	36 x 96	81.396
	36 x 144	81.396
2 x	36 x 96	93.024
2-1/2 x	36 x 96	116.280
3 x	36 x 96	139.536
3-1/2 x	36 x 96	162.792
4 x	36 x 96	186.048
5 x	36 x 96	232.560
6 x	36 x 96	279.070

145 Half Hard Tellurium Copper Rounds

CDA Alloy 145 (ASTM B301) UNS-C14500

Standard Lengths: 12 ft.

CDA 145 Tellurium Copper is used for forgings, screw machine parts or any parts requiring high conductivity, extensive machining, and or corrosion resistance. The addition of Tellurium results in short, clean chips and allows for higher cutting speeds than that of pure copper, with much less wear on tool life. Typical uses include electrical connectors, motor or switch parts, plumbing fittings, welding torch tips, and transistor bases.

Dia. (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1/4	0.190	2.280
5/16	0.297	3.565
3/8	0.428	5.136
7/16	0.582	6.987
1/2	0.760	9.127
9/16	0.975	11.700
5/8	1.189	14.268

Dia. (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
3/4	1.711	20.532
7/8	2.330	27.960
1	3.043	36.516
1-1/16	3.435	41.217
1-1/8	3.851	42.209
1-1/4	4.754	57.048
1-3/8	5.753	69.036

Dia. (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1-1/2	6.846	82.152
1-5/8	8.035	96.420
1-3/4	9.318	111.816
1-7/8	10.697	128.364
2	12.171	146.050

172 Beryllium Copper Plate

Low Hard (Supra) - Rockwell C25 - 32

High Hard (Ultra) - Rockwell C36 - 42

CDA Alloy 172 (ASTM B194) UNS-C17200

CDA Beryllium Copper is the most universally used beryllium copper alloy and is known to demonstrate higher strength and hardness when compared to commercial copper alloys. It has strength and hardness characteristics that are comparable to steel. It is also recognized as an alloy that has outstanding wear & corrosion resistance, thermal fatigue, and thermal conductivity. Typical applications are electrical switches and connectors, fasteners, mold inserts, pump parts and valve seats.

Thickness (inches)	Weight (lbs./sqft.)
1/4	12.176
3/8	17.612
1/2	23.040
5/8	28.480
3/4	34.268
1	45.466
1-1/4	56.208

Thickness (inches)	Weight (lbs./sqft.)
1-1/2	67.660
2	89.128
2-1/4	102.079
2-1/2	111.260
3	130.464
3-1/2	154.556
4	178.747

17510 RWMA Class 3 Copper Rounds

CDA Alloy 17510, UNS-C17510

Standard Lengths: 12 ft.

Dia. (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1/8	0.047	.564
3/16	0.104	1.248
1/4	0.187	2.244
5/16	0.291	3.492
3/8	0.420	5.040
7/16	0.570	6.840
1/2	0.747	8.964
9/16	0.943	11.316
5/8	1.166	13.992
3/4	1.680	20.160
7/8	2.286	27.432

Dia. (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1	2.986	35.832
1-1/8	3.779	45.348
1-1/4	4.666	55.992
1-3/8	5.646	67.752
1-1/2	6.719	80.628
1-5/8	7.885	94.620
1-3/4	9.145	109.740
2	11.945	143.340
2-1/4	15.117	181.404
2-1/2	18.663	223.956
2-3/4	22.583	270.996

Dia. (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
3	26.875	322.500
3-1/8	29.162	349.944
3-1/4	31.541	378.492
3-1/2	36.580	438.960
3-3/4	41.993	503.916
4-1/8	50.811	609.732
4-1/2	60.469	725.628
5-1/8	78.433	941.196
6-1/8	112.027	1344.324

17510 RWMA Class 3 Copper Flats

CDA Alloy 17510, UNS-C17510

Standard Lengths: 12 ft.

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1/8 x		
3/4	0.357	4.284
1	0.476	5.712
1/4 x		
1/2	0.476	5.712
3/4	0.713	8.556
1	0.951	11.412
1-1/4	1.189	14.268
1-1/2	1.427	17.124
2	1.902	22.824
2-1/2	2.378	28.536
3/8 x		
1/2	0.713	8.556
3/4	1.070	12.840
1	1.427	17.124
1-1/2	2.140	25.680
2	2.853	34.236
3	4.280	51.360

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1/2 x		
5/8	1.189	14.268
3/4	1.427	17.124
1	1.902	22.824
1-1/4	2.378	28.536
1-1/2	2.853	34.236
2	3.804	45.648
3	5.706	68.472
5/8 x		
3/4	1.783	21.396
1	2.378	28.536
1-1/2	3.566	42.792
2	4.755	57.060
3/4 x		
1	2.853	34.236
1-1/4	3.566	42.792
1-1/2	4.280	51.360
2	5.706	68.472
3	8.559	102.708

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1 x		
1-1/4	4.755	57.060
1-1/2	5.706	68.472
3	11.412	136.944
4	15.216	182.592
1-1/4 x		
1-1/2	7.133	85.596
2	9.510	114.120
3	14.265	171.180
1-1/2 x		
2	11.412	136.944
3	17.118	205.416
2 x		
3	22.824	273.888

17510 RWMA Class 3 Heat Treated Copper Plate

CDA Alloy 17510, UNS-C17510

Thickness (inches)	Weight (lbs./sqft.)
3/8	17.118
1/2	22.824
5/8	28.530
3/4	34.236
1	45.648

Thickness (inches)	Weight (lbs./sqft.)
1-1/4	57.060
1-1/2	68.472
1-3/4	79.884
2	91.296
2-1/2	114.120

Thickness (inches)	Weight (lbs./sqft.)
3	136.944
4	182.592
5	228.240
6	257.472

180 RWMA Class 3 Copper Rounds, Beryllium Free

CDA Alloy 180, UNS-C180

Standard Lengths: 12 ft.

Dia. (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1/2	0.758	9.096
5/8	1.185	14.220
3/4	1.706	20.472
7/8	2.322	27.864
1	3.033	36.396
1-1/4	4.739	56.868
1-3/8	5.735	68.820
1-1/2	6.825	81.900

Dia. (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1-3/4	9.289	111.468
2	12.133	145.596
2-1/4	15.356	184.272
2-1/2	18.958	227.496
2-3/4	22.939	275.268
3	27.299	327.588
3-1/8	29.621	355.452
3-1/2	37.157	445.884

Dia. (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
3-5/8	39.859	478.308
3-3/4	42.655	511.860
4-1/8	51.612	619.344
4-1/2	61.423	737.076
5	75.831	909.972
5-1/8	79.670	956.040

180 Copper Flats, Beryllium Free

CDA Alloy 180, UNS-C180

Standard Lengths: 12 ft.

Dia. (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1/4 x		
1	0.966	11.592
1-1/4	1.208	14.496
2	1.932	23.184
3/8 x		
1/2	0.725	8.700
3/4	1.087	13.044
1	1.449	17.388
1-1/2	2.174	26.088
2	2.898	34.776
3	4.347	52.164
1/2 x		
3/4	1.449	17.388
1	1.932	23.184
1-1/4	2.415	28.980

Dia. (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1/2 x		
1-1/2	2.898	34.776
2	3.864	46.368
2-1/2	4.830	57.960
3	5.796	69.552
5/8 x		
1	2.415	28.980
1-1/2	3.623	43.476
2	4.755	57.060
3/4 x		
1	2.898	34.776
1-1/2	4.347	52.164
2	5.796	69.552
3	8.694	104.328

Dia. (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1 x		
1-1/4	4.830	57.960
1-1/2	5.796	69.552
2	7.728	92.736
2-1/2	9.660	115.920
3	11.592	139.104
1-1/4 x		
1-1/2	7.245	86.940
1-3/4	8.453	101.436
2	9.660	115.920
1-1/2 x		
2	11.592	139.104
3	17.388	208.656

182 RWMA Class 2 Copper Rounds

CDA Alloy 182, UNS-C182

Standard Lengths: 12 ft.

Dia. (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1/8	0.047	.564
3/16	0.106	1.272
1/4	0.189	2.268
5/16	0.294	3.528
3/8	0.425	5.100
7/16	0.577	6.924
1/2	0.756	9.072
9/16	0.955	11.460
5/8	1.181	14.172
3/4	1.701	20.412

Dia. (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
7/8	2.315	27.780
1	3.024	36.288
1-1/8	3.827	45.924
1-1/4	4.725	56.700
1-3/8	5.717	68.604
1-1/2	6.804	81.648
1-5/8	7.985	95.820
1-3/4	9.260	111.120
2	12.095	145.140
2-1/4	15.308	183.696

Dia. (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
2-1/2	18.899	226.788
2-5/8	20.836	250.032
2-3/4	22.868	274.416
3	27.214	326.568
3-1/4	31.939	383.268
3-1/2	37.042	444.504
3-3/4	42.522	510.264
4-1/8	51.452	617.424
5-1/8	79.423	953.076

182 RWMA Class 2 Copper Squares

CDA Alloy 182, UNS-C182

Standard Lengths: 12 ft.

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
3/8	0.542	6.504
1/2	0.963	11.556
5/8	1.505	18.060
3/4	2.167	26.004

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1	3.852	46.224
1-1/4	6.019	72.228
1-1/2	8.667	104.004
2	15.408	184.896

182 RWMA Class 2 Copper Hex

CDA Alloy 182, UNS-C182

Standard Lengths: 12 ft.

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1/2	0.835	10.020
5/8	1.304	15.648
3/4	1.878	22.536
7/8	2.556	30.672
1	3.338	40.056

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1-1/8	4.225	50.700
1-1/4	5.216	62.592
1-3/8	6.312	75.744
1-1/2	7.511	90.132

182 RWMA Class 2 Copper Flats

CDA Alloy 182, UNS-C182

Standard Lengths: 12 ft.

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1/4 x		
1/2	0.482	5.784
3/4	0.722	8.664
1	0.963	11.556
1-1/2	1.445	17.340
2	1.926	23.112
2-1/2	2.408	28.896
3	2.889	34.668
3/8 x		
1/2	0.722	8.664
3/4	1.083	12.996
1	1.445	17.340
1-1/2	2.167	26.004
2	2.889	34.668
3	4.334	52.008
1/2 x		
3/4	1.445	17.340
1	1.926	23.112
1-1/2	2.889	34.668
2	3.852	46.224

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1/2 x		
2-1/2	4.815	57.780
3	5.778	69.336
4	7.704	92.448
5/8 x		
3/4	1.806	21.672
1	2.408	28.896
1-1/2	3.611	43.332
2	4.815	57.780
4	9.630	115.560
3/4 x		
1	2.889	34.668
1-1/4	3.611	43.332
1-1/2	4.334	52.008
1-3/4	5.056	60.672
2	5.778	69.336
2-1/2	7.223	86.676
3	8.667	104.004
4	11.556	138.672

Size (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1 x		
1-1/4	4.815	57.780
1-1/2	5.778	69.336
2	7.704	92.448
2-1/2	9.630	115.560
3	11.556	138.672
4	15.408	184.896
1-1/4 x		
1-1/2	7.223	86.676
1-3/4	8.426	101.112
2	9.630	115.560
3	14.445	173.340
1-1/2 x		
2	11.556	138.672
3	17.334	208.008

182 RWMA Class 2 Copper Plate

CDA Alloy 182, UNC-C182

Thickness (inches)	Weight (lbs./sqft.)
1/4	11.556
3/8	17.334
1/2	23.112
5/8	28.890
3/4	34.668
1	46.224
1-1/4	57.780

Thickness (inches)	Weight (lbs./sqft.)
1-1/2	69.336
2	92.448
2-1/2	115.560
3	138.672
3- 1/2	161.784
4	184.896

187 Copper Rounds

CDA Alloy 187, UNS-C187

Standard Lengths: 12 ft.

Dia. (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
1/4	0.190	2.280
5/16	0.298	3.576
3/8	0.428	5.136
5/8	1.189	14.268

Dia. (inches)	Weight (lbs./ft.)	Weight (lbs./12 ft.)
3/4	1.711	20.532
7/8	2.330	27.960
1	3.043	36.516

Copper Products Rod and Bar Tolerances

Tolerances for Diameter or Distance Between Parallel Surfaces of Cold-Drawn Rod

Diameter or Distance Between Parallel Surfaces	Tolerances, Plus and Minus, [A]in.	
	Round	Hex
Up to 0.150, incl	0.0013	0.0025
Over 0.150 to 0.500, incl	0.0015	0.0030
Over 0.500 to 1.00, incl	0.0020	0.0040
Over 1.00 to 2.00, incl	0.0025	0.0050
Over 2.00	0.1500[B]	0.3000[B]

Applicable to alloys C11000 and C14500

[A] When tolerances are specified as all plus or all minus, double the values given.

[B] Percent of specified diameter or distance between parallel surfaces.

Tolerances for Diameter or Distance Between Parallel Surfaces of As Extruded Rod and Bar

Diameter or Distance Between Parallel Surfaces	Tolerances, Plus and Minus, [A]in.	
	Round	Hex
Up to 1.00, incl	0.020	0.020
Over 1.00 to 2.00, incl	0.030	0.030
Over 2.00 to 3.00, incl	0.050	0.050
Over 3.00 to 3.50, incl	0.070	0.070
Over 3.50 to 4.00, incl	0.120	0.120

Applicable to alloys C11000 and C14500

[A] When tolerances are specified as all plus or all minus, double the values given.

Thickness Tolerances for Drawn or Rolled Rectangular and Square Bar

Thickness (inches)	Thickness Tolerances, Plus and Minus,[A] for Widths given (inches)			
	2" and under	Over 2" up to 4"	Over 4" up to 8"	Over 8" up to 12"
Up to 0.500, incl	0.003	0.004	0.0045	0.0055
Over 0.500 to 1.00, incl	0.004	0.0045	0.005	0.006
Over 1.00 to 2.00, incl	0.0045	0.005	0.006	-

[A] When tolerances are specified as all plus or all minus, double the values given.

Copper Products Tolerances

Thickness Tolerances for Sawed Edge, Deburred Coner Rectangular and Square Bar

Thickness (inches)	Thickness Tolerances, Plus and Minus,[A] for Widths given (inches)			
	2" and under	Over 2" up to 4"	Over 4" up to 8"	Over 8" up to 12"
Up to 0.250, incl	0.0025	0.003	0.0035	0.005
Over 0.250 to 0.375, incl	0.003	0.004	0.0045	0.005
Over 0.375 to 0.500, incl	0.0035	0.0045	0.005	0.006
Over 0.500 to 0.750, incl	0.0055	0.0055	0.0055	0.007
Over 0.750 to 1.000, incl	0.007	0.007	0.007	0.009
Over 1.000 to 1.500, incl	0.015	0.020	0.022	0.025
Over 1.500 to 2.000	0.020	0.024	0.026	0.030

[A] When tolerances are specified as all plus or all minus, double the values given.

Width Tolerances for Rectangular Bar

Width (inches)	Tolerances, Plus and Minus[A] (inches)
Over 0.188 to 0.500, incl	0.0035
Over 0.500 to 1.25, incl	0.005
Over 1.25 to 2.00, incl	0.008
Over 2.00 to 4.00, incl	0.012
Over 4.00 to 12.00, incl	0.300[B]

Applicable to alloys C11000 and C14500

[A] When tolerances are specified as all plus or all minus, double the values given.

[B] Percent of specified diameter or distance between parallel surfaces.

Straightness Tolerances

Drawn Rectangles & Squares - 1/2" maximum bow edgewise curvature (depth of arc) in any 6 foot portion of the total length.

Drawn Rod (General Use)

Length (feet)	Maximum Curvature (depth arc) (inches)
Under 2	1/32
2 and under 5	1/32 in any 2 foot portion of the total length
5 and under 10	1/8 in any 5 foot portion of the total length
10 and over	1/2 in any 10 foot portion of the total length

Copper Products Tolerances

Thickness Tolerances - Rectangular and Square R.W.M.A. Class 2 and Class 3

Thickness (inches)	Width (inches) Tolerance, Plus or Minus			
	Up to .500 incl	Over .500 to 1.25 incl	Over 1.25 to 2.00 incl	Over 2.00 to 4.00 incl
Up to .500 incl	.005	.005	.006	.007
Over .500 to 1.00 incl	...	.006	.007	.008
Over 1.00 to 2.00 incl	...	.006	.007	.009
Over 2.00 to 4.00 incl	...	...	...	0.50%*

Expressed to the nearest 0.001.

These tolerance schedules are used by the industry as applicable to commercial material, in absence of other specifications by the purchaser.

Thickness Tolerances - Rectangles Only R.W.M.A. Class 2 and Class 3

Width (inches)	Tolerance (+/-)
Up to .500 incl.	.005
Over .500 to 1.250 incl.	.007
Over 1.250 to 2.00 incl.	.010
Over 2.00 to 4.00 incl.	.015

***Note:** For squares use thickness tolerances.*

Length & Width Tolerances - Square Sheared Metal

Length or Width (inches)	Up to 1/16" thick incl.	Over 1/16" to 1/8" incl.	Over 1/8" thick
Up to 20" incl.	1/32	3/64	1/16
Over 20" up to 36" incl.	3/64	3/64	1/16
Over 36" up to 120" incl.	1/16	1/16	1/16

Straightness Tolerances for Square Sheared Metal

Thickness (inches)	Up to 10" wide incl.	Over 10" wide
Up to 1/8 incl.	1/16	1/16
Over 1/8 to 3/16 incl.	1/8	1/8
Over 3/16	1/8	1/8

Beryllium Copper & R.W.M.A. Class #2 & #3 Tolerances

Diameter (inches)	Cold Drawn Rounds	HR, A&T* Rounds	Cold Drawn Hexagon
Incl. .090 to 1/2 incl	± .002	...	± .004
Over 1/2 to 1.00 incl	± .003	...	± .005
Over 1.00 to 2.00 incl	± .004	...	± .006
Over 2.00 to 3.00 incl	...	± .006	...
Over 3.00 to 4.75 incl	...	± .009	...

**** Hot Rolled, Annealed & Turned.***

Copper Products Tolerances

Length and Width Tolerances - For Sawed Metal

Width (inches)	Length Tolerance All Plus (inches)	Width Tolerance Plus or Minus in inches		
		For Lengths up to 10 ft. incl		For Lengths Over 10 ft.
		For Thicknesses up to 1-1/2 Incl	For Thicknesses Over 1-1/2	All Thicknesses
Up to 12” wide incl.	1/4	1/32	1/16	1/16
>12" to 120" wide incl.	1/4	1/16	1/16	1/16

Straightness Tolerances - For Sawed Metal

These tolerance schedules are used by the industry as applicable to commercial material in the absence of other specifications by the purchaser.

Width (inches)	
Up to 3”, incl.	1/16
Over 3”	3/64

Copper Products Tolerances

Sheet, Strip and Plate

Thickness (inches)	Width (inches), Tolerances Plus or Minus							
	Up to 8 incl	Over 8 to 12 incl	Over 12 to 14 incl	Over 14 to 20 incl	Over 20 to 24 incl	Over 24 to 28 incl	Over 28 to 36 incl	Over 36 to 48 incl
Over .021 to .026 incl	.0015	.002	.002	.0025	.003	.003	.0035	.004
Over .026 to .037 incl	.002	.002	.002	.0025	.0035	.0035	.004	.005
Over .037 to .050 incl	.002	.0025	.0025	.003	.004	.004	.005	.006
Over .050 to .073 incl	.0025	.003	.003	.0035	.005	.005	.006	.007
Over .073 to .130 incl	.003	.0035	.0035	.004	.006	.006	.007	.008
Over .130 to .188 incl	.0035	.004	.004	.0045	.007	.007	.008	.010
Over .188 to .205 incl	.0035	.004	.004	.0045	.007	.007	.008	.010
Over .205 to .300 incl	.004	.0045	.0045	.005	.009	.009	.010	.012
Over .300 to .500 incl	.0045	.005	.005	.006	.012	.012	.013	.015
Over .500 to .750 incl	.0055	.007	.007	.009	.015	.015	.017	.019
Over .750 to 1.00 incl	.007	.009	.009	.011	.018	.018	.021	.024
Over 1.00 to 1.50 incl	...	...	...	...	.022	.022	.025	.029
Over 1.50 to 2.00 incl	...	...	...	...	.026	.026	.030	.036
Over 2.00 to 3.00 incl	...	...	...	...	.031	.031	.031	...
Over 3.00 to 4.00 incl	...	...	...	...	.036	.036	.036	...
Over 4.00 to 5.00 incl	...	...	...	...	.054	.054	.054	...
Over 5.00 to 6.00 incl	...	...	...	...	.059	.059	.059	...

932 (SAE 660) Bearing Bronze

ASTM B505

Typical Mechanical Properties

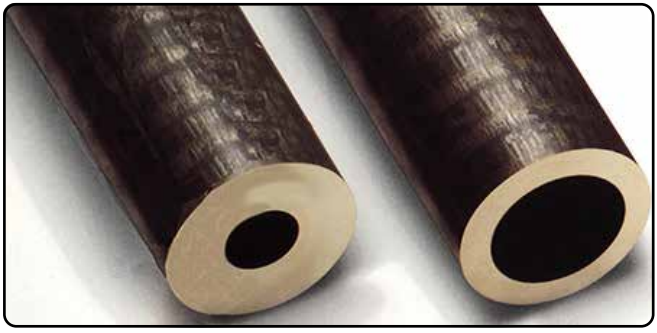
Chemical Composition	932
Copper	83%
Tin	7%
Lead	7%
Zinc	3%
Tensile Strength	35,000 KSI
Yield Strength	20,000 KSI
Elongation in 2 inches	10%
Brinell Number at 500 KG Load	65 - 70 Typical
Equivalent Specifications:	
CDA 932, SAE 660, ASTM B505, QQ-C-390A	

954 Aluminum Bronze

ASTM B505

Typical Mechanical Properties

Chemical Composition	954
Aluminum	10.5%
Iron	4%
Copper	85.5%
Tensile Strength	85,000 KSI
Yield Strength	32,000 KSI
Elongation in 2 inches	12%
Brinell Number at 500 KG Load	170 Typical



Alro stocks 932 Bearing Bronze Tubing from 1” OD to 16” OD

932 Bronze Rounds

ASTM B505 Standard Lengths: 105” - 107.5”

Diameter (inches)	Approx. Wt. (lbs./foot)
3/8	.510
1/2	.868
5/8	1.321
3/4	1.869
7/8	2.512
1	3.249
1-1/8	4.028
1-1/4	5.009
1-3/8	6.030
1-1/2	7.147
1-5/8	8.358
1-3/4	9.665
1-7/8	11.066
2	12.611

Diameter (inches)	Approx. Wt. (lbs./foot)
2-1/8	14.204
2-1/4	15.893
2-3/8	17.676
2-1/2	19.554
2-5/8	21.527
2-3/4	23.594
2-7/8	25.756
3	28.014
3-1/4	32.812
3-1/2	37.990
3-3/4	43.547
4	50.073
4-1/4	56.464
4-1/2	63.155

Diameter (inches)	Approx. Wt. (lbs./foot)
4-3/4	70.265
5	77.754
5-1/4	86.657
5-1/2	94.953
6	112.682
6-1/2	131.888
7	152.647
7-1/2	174.923
8	198.716
9	250.851
10	310.279
11	374.669
12	445.125
13	523.877

954 Bronze Rounds

ASTM B505 Standard Lengths: 12 ft.

Diameter (inches)	Approx. Wt. (lbs./foot)
3/8	.485
1/2	.800
5/8	1.198
3/4	1.673
7/8	2.227
1	2.861
1-1/8	3.573
1-1/4	4.365
1-3/8	5.236
1-1/2	6.186
1-5/8	7.216
1-3/4	8.325
2	10.884
2-1/4	13.551

Diameter (inches)	Approx. Wt. (lbs./foot)
2-1/2	16.639
2-3/4	20.044
3	23.776
3-1/4	28.336
3-1/2	32.731
3-3/4	37.443
4	42.472
4-1/4	47.817
4-1/2	53.479
4-3/4	60.222
5	66.557
5-1/4	73.208
5-1/2	80.177
5-3/4	89.348

Diameter (inches)	Approx. Wt. (lbs./foot)
6	97.029
6-1/4	105.028
6-1/2	113.343
7	130.924
8	169.886
9	213.917
10	263.015
11	317.182
12	367.416
13	440.718
14	510.089
15	584.527

959 Bronze Rounds

ASTM B505 Standard Lengths: 12 ft.

Diameter (inches)	Approx. Wt. (lbs./foot)
1	2.712
1-1/4	4.318
1-1/2	5.865
1-3/4	7.891
2	10.218
2-1/4	12.846

Diameter (inches)	Approx. Wt. (lbs./foot)
2-1/2	15.773
3	22.529
3-1/2	31.028
4	40.261
4-1/2	50.696
5	63.093

Diameter (inches)	Approx. Wt. (lbs./foot)
6	91.980
8	161.045

932 Bronze Flats and Squares

ASTM B505 Standard Lengths: 12 ft. random

Size (inches)	Weight (lbs./foot)
1/4 x	
2	2.495
3	3.704
4	5.442
8	11.773
12	17.569
3/8 x	
2	3.491
4	7.419
8	15.698
12	23.426
1/2 x	
3/4	1.450
1	2.312
2	4.488
3	6.663
4	9.397
5	11.692
6	14.792
7	17.207
8	19.622
9	22.037
10	24.452
12	29.282
14	34.112
15	36.527
5/8 x	
4	11.374
8	23.546
3/4 x	
1	3.339
2	6.481
3	9.622
4	13.351
5	16.613

Size (inches)	Weight (lbs./foot)
3/4 x	
6	20.709
7	24.090
8	27.471
9	30.852
10	34.233
12	40.995
14	47.757
16	54.519
18	61.281
1 x	
2	8.474
3	12.881
4	17.306
5	21.533
6	26.625
7	30.972
8	35.319
9	39.666
10	44.013
11	48.360
12	52.707
13	57.054
14	61.401
15	65.748
16	70.095
18	78.789
20	89.916
1-1/4 x	
4	21.261
6	32.542
8	43.168
12	64.420

Size (inches)	Weight (lbs./foot)
1-1/2 x	
2	12.459
4	25.216
8	51.017
12	76.133
1-3/4 x	
4	29.171
8	58.866
12	87.846
2 x	
4	33.125
8	66.714
11	91.347
12	99.558
2-1/2 x	
4	41.035
8	82.412
3 x	
11	134.334
4 x	
4	64.764
11	177.321
6 x	
10	239.628
6-1/4 x	
6-1/4	157.035
8 x	
8	255.084

954 Bronze Flats and Squares

ASTM B505 Standard Lengths: 12 ft. random

Size (inches)	Weight (lbs./foot)
1/4 x	
1	1.156
1-1/4	1.428
1-1/2	1.700
1-3/4	1.972
2	2.244
2-1/2	2.788
2-3/4	3.060
3	3.332
3-1/2	3.876
4	4.420

Size (inches)	Weight (lbs./foot)
1/4 x	
5	5.508
6	7.016
8	9.321
10	11.625
12	13.930
3/8 x	
1	1.585
1-1/2	2.331
2	3.077
2-1/2	3.822

Size (inches)	Weight (lbs./foot)
3/8 x	
3	4.568
3-1/2	5.314
4	6.059
5	7.551
6	9.472
8	12.584
10	15.696
12	18.808

Continued on next page

954 Bronze Flats and Squares

ASTM B505

Standard Lengths: 12 ft. random

Size (inches)	Weight (lbs./foot)
1/2 x	
1/2	1.112
1	2.014
1-1/4	2.488
1-1/2	2.962
1-3/4	3.435
2	3.909
2-1/2	4.856
3	5.804
3-1/4	6.278
3-1/2	6.751
4	7.699
4-1/2	8.646
5	9.594
5-1/2	10.541
6	11.929
7	13.888
8	15.848
10	19.766
12	23.685
5/8 x	
1	2.443
1-1/2	3.592
2	4.741
2-1/2	5.891
3	7.040
3-1/2	8.189
4	9.338
4-1/2	10.487
5	11.636
6	14.385
7	16.748
8	19.111
10	23.837
12	28.563
3/4 x	
3/4	2.261
1	2.872
1-1/2	4.223
1-3/4	4.898
2	5.574
2-1/2	6.925
3	8.276
3-1/2	9.627
4	10.978
4-1/2	12.328
5	13.679
6	16.842
7	19.608
8	22.375
10	27.907
12	33.440

Size (inches)	Weight (lbs./foot)
1 x	
1	3.814
1-1/4	4.607
1-1/2	5.484
1-3/4	6.362
2	7.239
2-1/2	8.993
3	10.748
3-1/2	12.502
4	14.256
4-1/2	16.011
5	17.765
6	21.755
7	25.328
8	28.902
9	32.475
10	36.048
12	43.195
1-1/4 x	
1-1/4	5.770
1-1/2	6.746
1-3/4	7.825
2	8.904
2-1/2	11.061
3	13.219
3-1/2	15.377
4	17.535
5	21.851
6	26.668
8	35.429
10	44.189
12	52.950
1-3/8	
3	14.455
4	19.175
1-1/2 x	
1-1/2	8.130
1-3/4	9.288
2	10.568
2-1/2	13.130
3	15.691
3-1/2	18.253
4	20.814
1-1/2 x	
5	25.937
5-1/2	28.498
6	31.581
8	41.956
10	52.330
12	62.705

Size (inches)	Weight (lbs./foot)
1-3/4 x	
2	12.233
2-1/2	15.198
3	18.163
4	24.093
5	30.023
6	36.494
2 x	
2	14.060
2-1/2	17.267
3	20.635
3-1/2	24.003
4	27.372
5	34.109
6	41.407
10	68.612
12	82.215
2-1/2 x	
2-1/2	21.604
3	25.579
4	34.402
5	42.818
6	50.631
12	100.736
3 x	
3	30.761
4	40.487
6	61.059
12	121.235
3-1/2 x	
12	140.745
4 x	
4	53.919
6 x	
6	120.390

959 Bronze Flats

ASTM B505

Standard Lengths: 12 ft. random

Size (inches)	Weight (lbs./foot)
1/4 x	
1	1.612
2	3.029
3	4.446
4	5.863
5	7.279
6	8.696
7	10.113
8	11.530
9	12.947
10	14.470
12	17.303
3/8 x	
1	2.048
2	3.847
3	5.646
4	7.445
5	9.245
6	11.044
7	12.843
8	14.643
9	16.442
10	18.376
12	21.975

Size (inches)	Weight (lbs./foot)
1/2 x	
1	2.483
2	4.665
3	6.846
4	9.028
5	11.210
6	13.392
7	15.574
8	17.755
9	19.937
10	22.283
12	26.646
5/8 x	
1	2.918
1-1/2	4.200
2	5.482
3/4 x	
1	3.353
2	6.300
3	9.247
4	12.194
5	15.141
6	18.087
7	21.034
8	23.981
9	26.928
10	30.095
12	35.989

Size (inches)	Weight (lbs./foot)
1 x	
1-1/4	5.152
2	7.936
2-1/2	9.792
3	11.648
4	15.359
5	19.071
6	22.783
7	26.495
8	30.206
10	37.908
12	45.330
1-1/2 x	
4	21.690
1-3/4 x	
2-1/2	15.846
2 x	
4	28.022
5	34.793
8	55.109
2-1/2 x	
4	34.353
7	59.258
8	67.560

932 Bronze Tube

ASTM B505

Standard Lengths: 105” - 107.5”

ID x OD (inches)	Weight (lbs./foot)
1/2 x	
1	2.687
1-1/8	3.524
1-1/4	4.456
1-3/8	5.484
1-1/2	6.607
1-3/4	9.138
2	12.101
5/8 x	
1	2.307
1-1/8	3.144
1-1/4	4.076
1-3/8	5.104
1-1/2	6.227
1-3/4	8.758
2	11.721
3/4 x	
1	1.832
1-1/8	2.669
1-1/4	3.601
1-3/8	4.628
1-1/2	5.751
1-3/4	8.283
2	11.245
2-1/4	14.545
2-1/2	18.227
2-3/4	22.289
7/8 x	
1-1/8	2.098
1-1/4	3.030
1-3/8	4.058
1-1/2	5.180
1-5/8	6.399
1-3/4	7.712
2	10.674
1 x	
1-1/4	2.364
1-3/8	3.392
1-1/2	4.514
1-5/8	5.732
1-3/4	7.046
1-7/8	8.455
2	10.008
2-1/8	11.611
2-1/4	13.308
2-3/8	15.101
2-1/2	16.990
2-3/4	21.052
3	25.496
3-1/4	30.321
3-1/2	35.528
4	47.928

ID x OD (inches)	Weight (lbs./foot)
1-1/8 x	
1-3/8	2.630
1-1/2	3.753
1-5/8	4.971
1-3/4	6.253
1-7/8	7.693
2	9.247
1-1/4 x	
1-1/2	2.896
1-5/8	4.114
1-3/4	5.428
1-7/8	6.837
2	8.390
2-1/8	9.993
2-1/4	11.690
2-1/2	15.372
2-3/4	19.434
3	23.878
3-1/4	28.703
3-1/2	33.910
4	46.379
1-3/8 x	
1-5/8	3.162
1-3/4	4.476
1-7/8	5.885
2	7.438
2-1/8	9.041
2-1/4	10.738
2-3/8	12.531
2-1/2	14.420
2-5/8	16.403
3	22.926
1-1/2 x	
1-3/4	3.429
1-7/8	4.837
2	6.391
2-1/8	7.993
2-1/4	9.691
2-3/8	11.484
2-1/2	13.372
2-3/4	17.485
3	21.879
3-1/4	26.704
3-1/2	31.910
3-3/4	37.498
4	44.448
4-1/2	57.603

ID x OD (inches)	Weight (lbs./foot)
1-5/8 x	
2	5.248
2-1/8	6.851
2-1/4	8.549
2-3/8	10.342
2-1/2	12.230
2-3/4	16.292
3	20.736
1-3/4 x	
2	4.011
2-1/8	5.613
2-1/4	7.311
2-3/8	9.104
2-1/2	10.992
2-5/8	12.976
2-3/4	15.055
3	19.498
3-1/4	24.324
3-1/2	29.530
3-3/4	35.117
4	42.136
4-1/4	48.523
1-7/8 x	
2-1/4	5.977
2-3/8	7.770
2-1/2	9.659
2-5/8	11.642
3	18.165
2 x	
2-1/4	4.549
2-3/8	6.342
2-1/2	8.230
2-5/8	10.214
2-3/4	12.293
2-7/8	14.467
3	16.737
3-1/4	21.562
3-1/2	26.768
3-5/8	29.514
3-3/4	32.356
4	39.443
4-1/2	52.598
5	67.277
5-1/2	85.095
6	102.919
2-1/8 x	
2-5/8	8.690
2-3/4	10.769

Continued on next page

932 Bronze Tube

ASTM B505

Standard Lengths: 105” - 107.5”

ID x OD (inches)	Weight (lbs./foot)
2-1/4 x	
2-3/4	9.150
2-7/8	11.324
3	13.594
3-1/4	18.419
3-1/2	23.625
3-3/4	29.213
4	36.368
4-1/4	42.755
2-3/8 x	
2-7/8	10.610
3	11.879
3-1/4	16.704
3-1/2	21.911
2-1/2 x	
2-3/4	5.625
2-7/8	7.800
3	10.069
3-1/8	12.434
3-1/4	14.894
3-1/2	20.101
3-3/4	25.688
4	32.913
4-1/4	39.300
4-1/2	46.067
4-3/4	53.217
5	60.747
5-1/2	78.714
6	96.538
7	136.762
2-5/8 x	
3-1/2	18.196
2-3/4 x	
3-1/4	10.989
3-1/2	16.195
3-3/4	21.783
4	29.076
4-1/4	35.463
4-1/2	42.231
4-3/4	49.380
3 x	
3-1/2	11.908
3-3/4	17.496
4	24.858
4-1/4	31.244
4-1/2	38.012
4-3/4	45.162
5	52.692
5-1/2	70.808
6	88.633

ID x OD (inches)	Weight (lbs./foot)
3 x	
6-1/2	107.982
7	128.856
8	175.179
3-1/4 x	
3-3/4	12.828
4	20.258
4-1/4	26.645
4-1/2	33.413
4-3/4	40.562
5	48.093
5-1/2	66.284
3-1/2 x	
4	15.278
4-1/4	21.664
4-1/2	28.432
4-3/4	35.582
5	43.112
5-1/2	61.378
6	79.202
6-1/2	98.551
3-3/4 x	
4-1/2	23.070
4-3/4	30.220
5	37.750
5-1/2	56.091
6	73.915
4-1/2	17.327
4-3/4	24.477
5	32.007
4 x	
5-1/4	42.082
5-1/2	50.422
6	68.246
6-1/2	87.896
7	108.470
7-1/2	130.869
8	154.793
9	207.217
4-1/4 x	
4-3/4	18.352
5	25.883
5-1/4	36.032
5-1/2	44.373
6	62.197
6-1/2	81.546
4-1/2 x	
5	19.377
5-1/2	37.942
6	55.766

ID x OD (inches)	Weight (lbs./foot)
4-1/2 x	
6-1/2	75.115
7	95.989
4-3/4 x	
5-3/4	39.851
6	48.954
6-1/2	68.303
5 x	
5-1/2	23.936
5-3/4	32.657
6	41.760
6-1/2	61.109
7	81.984
7-1/2	104.383
8	128.307
9	180.730
10	241.194
5-1/2 x	
6	26.230
6-1/2	45.579
7	66.453
7-1/2	88.852
8	112.776
5-3/4 x	
6-3/4	47.488
7-1/4	69.125
7-1/2	80.515
8	104.439
8-1/2	129.295
6 x	
6-1/2	28.523
6-3/4	38.770
7	49.397
7-1/4	60.151
7-1/2	71.486
8	95.721
8-1/2	121.170
9	148.144
10	208.754
11	273.499
12	344.345
6-1/2 x	
7-1/4	41.663
7-1/2	52.998
8	77.140
8-1/2	102.589
9	129.564
9-1/2	160.161

Continued on next page

932 Bronze Tube

ASTM B505

Standard Lengths: 105” - 107.5”

ID x OD (inches)	Weight (lbs./foot)
7 x	
7-3/4	44.707
8	57.035
8-1/2	82.484
9	109.458
9-1/2	140.129
10	170.214
11	234.959
12	305.805
7-1/2 x	
8-1/2	60.853
9	89.619
9-1/2	118.571
10	148.657
10-1/2	180.267
8 x	
9	64.672
9-1/4	80.673
9-1/2	95.489
10	125.574
10-1/2	157.184
11	190.320
12	261.165
13	341.876
8-1/2 x	
9-1/2	70.882
10	100.967
10-1/2	132.577
11-1/2	200.372

ID x OD (inches)	Weight (lbs./foot)
9 x	
10	74.834
10-1/4	90.063
10-1/2	106.445
11	139.580
11-1/2	174.240
12	210.425
9-1/2 x	
10-1/2	78.787
11	111.922
11-1/2	146.583
12-1/2	220.478
10 x	
11	82.740
11-1/2	117.400
12	153.585
13	234.686
14	317.903
10-1/2 x	
11-1/2	86.693
12	122.878
12-1/2	160.588
13	204.077
11 x	
12	90.646
12-1/2	131.962
13	171.942
14	255.158
11-1/2 x	
13	138.282
13-1/2	179.128
14-1/2	297.568

ID x OD (inches)	Weight (lbs./foot)
12 x	
13-1/2	143.943
14	186.313
15	275.630
12-1/2 x	
14	148.861
13 x	
14-1/2	154.493
15	200.685
13-1/2 x	
15-1/2	206.838
14 x	
15-1/2	165.759
16	215.057
15 x	
17	229.428
16 x	
17	136.184
18	243.800
19	357.516
20	477.332
17 x	
19	258.171
20	377.988
18 x	
20	272.543

954 Bronze Tube

Standard ASTM B505 Alloy

Standard Lengths: 12 ft. random

ID x OD (inches)	Weight (lbs./foot)
3/4 x	
1-1/4	3.300
1-1/2	5.133
1-3/4	7.285
2	9.755
7/8 x	
1-1/4	2.827
1 x	
1-3/8	3.183
1-1/2	4.139
1-3/4	6.291
2	8.761
2-1/4	11.550
2-1/2	14.658
2-3/4	17.981
3	21.830
3-1/2	31.074
4	40.876
1-1/4 x	
1-3/4	4.978
2	7.449
2-1/4	10.238
2-1/2	13.346
2-3/4	16.772
3	20.517
3-1/2	29.824
1-1/2 x	
1-7/8	4.542
2	5.817
2-1/4	8.606
2-1/2	11.714
2-3/4	15.141
3	18.866
3-1/4	23.833
3-1/2	28.256
3-3/4	32.808
4	38.058
4-1/2	49.135
1-3/4 x	
2-1/8	5.222
2-1/4	6.656
2-1/2	9.764
2-3/4	13.191
3	16.936
3-1/4	21.946
3-1/2	26.369
3-3/4	31.111
4	36.171

ID x OD (inches)	Weight (lbs./foot)
2 x	
2-3/8	5.901
2-1/2	7.495
2-3/4	10.922
3	14.667
3-1/4	19.740
3-1/2	24.163
3-3/4	28.905
4	33.966
4-1/2	45.043
5	58.391
6	89.127
7	122.870
2-1/4 x	
2-5/8	6.581
2-3/4	8.334
3	12.079
3-1/4	17.216
3-1/2	21.639
3-3/4	26.381
4	31.441
2-1/2 x	
3	9.173
3-1/4	14.373
3-1/2	18.796
3-3/4	23.537
4	28.598
4-1/2	39.675
4-3/4	45.429
5	53.074
6	84.270
2-3/4 x	
3-1/4	11.211
3-1/2	15.634
3-3/4	20.375
4	25.436
4-1/4	30.815
4-1/2	36.513
3 x	
3-1/2	12.153
3-3/4	16.895
4	21.955
4-1/4	27.334
4-1/2	33.032
5	46.482
5-1/2	60.189
6	77.793
7	111.902

ID x OD (inches)	Weight (lbs./foot)
3-1/4 x	
3-3/4	13.095
4	18.156
4-1/4	23.535
4-1/2	29.233
5	42.708
3-1/2 x	
4	14.037
4-1/4	19.416
4-1/2	25.114
5	38.616
5-1/2	52.322
6	70.041
3-3/4 x	
4-3/4	27.829
4 x	
4-1/2	15.922
4-3/4	23.099
5	29.474
5-1/2	43.180
6	61.014
6-1/2	67.129
7	95.123
8	134.332
4-1/4 x	
5	24.425
4-1/2 x	
5	19.057
5-1/4	25.751
5-1/2	32.763
6	50.712
6-1/2	67.129
5 x	
5-1/2	21.072
5-3/4	31.405
6	39.135
6-1/2	55.552
7	73.244
8	112.453
9	156.762
10	206.171
5-1/2 x	
6-1/2	42.700
5-3/4 x	
7-1/2	72.038

Continued on next page

954 Bronze Tube

Standard ASTM B505 Alloy

Standard Lengths: 12 ft. random

ID x OD (inches)	Weight (lbs./foot)
6 x	
7	46.265
8	85.474
9	129.783
10	179.192
6-1/2 x	
7-1/2	49.830
8-1/2	91.589
6-3/4 x	
7-3/4	51.316
7 x	
8	53.395
9	97.704
10	146.266
11	200.461
11-1/2	229.460

ID x OD (inches)	Weight (lbs./foot)
7-1/2 x	
8-1/2	56.632
9-1/2	103.819
10	128.417
11	182.612
8 x	
9	60.525
9-1/2	84.592
10	109.934
8-1/2 x	
9-1/2	36.721
9 x	
11	121.460
12	180.726
10 x	
11	74.354

ID x OD (inches)	Weight (lbs./foot)
10-1/2 x	
12	108.165
11 x	
12	81.443

Bronze Products Tolerances

Roundness Tolerances

Outside Diameter in Maximum Out of Roundness[A] (inches)

[A] The deviation from roundness is measured as the difference between major and minor diameters at any one cross section of the tube.

932 (SAE 660) Bearing Bronze	
Up to 4” excluded	0.020
4” up to 5” included	0.032
Over 5”	0.064

954 and 959 Aluminum Bronze	
Up to 3” included	0.025
Over 3” to 4” included	0.040
Over 4” to 5-1/2” included	0.060
Over 5-1/2”	0.075

Straightness Tolerances

Product	Length[A] (Feet)	Maximum Curvature[B] (Depth or arc) (inches)
Round Rod or Tube	Up to 10	1/4 in any 5 ft. portion
Round Rod or Tube	10 and Over	1/2 in any 10 ft. portion
Bar and Shape	Any Length	1/2 in any 6 ft. portion

Finishing Alloweances Added to 932 Bearing Bronze Tubes and Rounds

Standard inventory of bars and shapes are produced oversized to finish machine to the print or part size.

Finish Allowances		
Finished Outside Dia. (inches)	**Inside Diameter (inches)**	**Outside Diameter (inches)**
Up to 1.999 inclusive	-0.0190 to -0.0640	+0.0290 to +0.0390
Over 2 to 3.999 inclusive	-0.0190 to -0.0640	+0.0340 to +0.0440
Over 4 to 5 inclusive	-0.0470 to -0.1090	+0.0550 to +0.0710
Over 5 to 9 inclusive	-0.0620 to -0.1580	+0.0780 to +0.1100
Over 9 to 12 inclusive	-0.0780 to -0.1820	+0.0940 to +0.1340
Over 12 to 16 inclusive	-0.1020 to -0.2140	+0.1180 to +0.1660

Bronze Products Tolerances

Finishing Allowances Added to 932 Bearing Bronze Rectangles

Standard inventory of bars and shapes are produced oversized to finish machine to the print of part size.

Finish Allowances		
Finished Width (inches)	Thickness (inches)	Width (inches)
Up to 3.999 inclusive	+0.047 to +0.079	+0.047 to +0.079
Over 4 to 5 inclusive	+0.078 to +0.110	+0.078 to +0.110
Over 5.001 inclusive	+0.109 to +0.141	+0.109 to +0.141

Finishing Allowances Added to 954 and 959 Aluminum Bronze Tubes and Rounds

Finish Allowances		
Finished Outside Dia. (inches)	Inside Diameter (inches)	Outside Diameter (inches)
Up to 3 inclusive	-0.0505 to -0.0955	+0.0525 to +0.0725
Over 3 to 4-1/2 inclusive	-0.0900 to -0.1450	+0.0790 to +0.1090
Over 4-1/2 to 5-1/2 inclusive	-0.1000 to -0.1650	+0.1050 to +0.1450
Over 5-1/2 to 9 inclusive	-0.1350 to -0.2100	+0.1630 to +0.2130

Finishing Allowances Added to 954 Aluminum Bronze Rectangles

Finish Allowances		
Finished Width (inches)	Thickness (inches)	Width (inches)
Up to 3 inclusive	+0.067 to +0.107	+0.043 to +0.083
Over 3 to 5-1/2 inclusive	+0.067 to +0.107	+0.043 to +0.083
Over 5-1/2 to 12 inclusive	+0.087 to +0.127	+0.063 to +0.113
Over 12	+0.163 to +0.263	+0.125 to +0.225

NOTE: *Thickness of rectangles 3" and thicker will use the over 12" wide tolerances.*

Finishing Allowances Added to 959 Aluminum Bronze Rectangles

Finish Allowances		
Finished Width (inches)	Thickness (inches)	Width (inches)
Up to 3 inclusive	+0.100 to +0.130	+0.113 to +0.163
Over 3 to 5-1/2 inclusive	+0.100 to +0.130	+0.113 to +0.163
Over 5-1/2 to 9-1/2 inclusive	+0.100 to +0.130	+0.113 to +0.163
Over 9-1/2	+0.163 to +0.263	+0.163 to +0.263

Alloys & Tool Steel

Bar and Plate Products

WARNING: These products can potentially expose you to chemicals including Nickel, Chromium, Lead, Cobalt, Mercury and Beryllium, which are known to the state of California to cause cancer and/or birth defects or other reproductive harm. For more information, visit **www.P65Warnings.ca.gov**

Toolox®44

Pre-hardened Steel 45 HRC with ESR Properties

Toolox® 44 is a highly engineered quench & tempered pre-hardened tool and machine steel with measured and guaranteed mechanical properties. Toolox® 44 is delivered ready to use, no heat treating required, saving you valuable production time, reducing risks and lowering overall costs.

Toolox® has ESR properties. The casting process along with the low carbon concept gives a high degree of cleanliness and a homogenious structure.

The high hardness, in combination with excellent toughness, ensures lower tool wear. Toolox® 44 is two to three times tougher than comparable steels of similar hardness.
Additional product features include:

- Easy to machine with good dimensional stability
- High strength and toughness at esevated temperatures
- Excellent for etching, polishing and EDM
- Low residual stresses, no stress relieving required
- Excellent substrate for surface treatments

Typical Applications

Cold Work Tooling, Machine Components, Wear Components, Guide Rails, Plastic Molds, Rubber Molds, Press Forming, Dies (Forging, Die Cast)

Typical Analysis	Toolox® 44
Carbon (C)	0.32%
Silicon (Si)	0.60 - 1.10%
Manganese (Mn)	0.80%
Chromium (Cr)	1.35%
Molybdenum (Mo)	0.80%
Vanadium	0.14%

Mechanical Properties	+20°C	+200°C	+300°C	+400°C	+500°C
Hardness (HBW)	450				
Hardness (HRC)	~45				
Yield Strength $R_{p0.2}$ (MPa)	1,300	1,150	1,120	1,060	930
Tensile Strength RM (MPa)	1,450	1,380			
Elongation, A5, (%)	13	10			
Impact toughness, Charpy-V (J)	30	60	80	80	

Note: Toolox®44 is not intended for further heat treatment. If Toolox® 44 is heated above 590° after delivery from Alro, no guarantees for the properties of the steel are given.

Thickness (inches)	Weight (lbs./sqft)
5/8	25.524
3/4	30.629
7/8	35.735
1	49.008
1-1/2	69.428

Thickness (inches)	Weight (lbs./sqft)
2	89.848
2-1/2	110.628
3	130.688
4	164.585
5	209.100

ETD 150®

E.T.D. 150® is produced from AISI medium carbon 4100 series alloy steel. The heats to be used for e.t.d. 150® are controlled to contain nitrogen in quantities normally associated with steel produced by the electric furnace process. Only one additive, such as tellurium, selenium, or sulfur is also added to improve machinability.

Like Fatigue-Proof®, it is another Niagara LaSalle high strength material made by using specially designed dies. It eliminates heat treating and secondary operations such as straightening, finish grinding, cleaning, and inspections. e.t.d.® 150® can be roll threaded, knurled and plated. Suitable for induction hardening, e.t.d.® 150® is also electromagnetically tested using eddy currents and pretested for machinability through Niagara LaSalle's unique testing procedure.

Typical Analysis*	ETD 150®
Carbon (C)	0.40 Min
Manganese (Mn)	0.70 / 1.10
Silicon (Si)	0.15 / 0.35
Chromium (Cr)	0.80 / 1.20
Molybdenum (Mo)	0.15 / 0.25

Mechanical Properties

Tensile Strength.....**150,000 psi (Min)
Yield Strength (.2% offset)..... 130,000psi (Min)
Elongation ..... 5% Min
Reduction of Area..... 20% Min
Machinability.....75% of 1212 (approx)
Rockwell C Hardness ..... **32 (Min)
Brinell Hardness ..... **302 (Min)

ETD 150® contains additives for improving machinability. These may be Tellurium, Selenium, Sulphur (.06 max), or others, separately or in combination.

****In the event of disagreement between hardness and tensile strength, the tensile strength shall govern.***

ETD 150® Rounds

Stock Lengths: 12 foot

Size (inches)	Weight (lbs./foot)	Weight (lbs./12 ft.)
1/2	0.670	8.04
9/16	0.850	10.20
5/8	1.040	12.48
11/16	1.260	15.12
3/4	1.500	18.00
13/16	1.760	21.12
7/8	2.040	24.48
1	2.670	32.04
1-1/16	3.014	36.17
1-1/8	3.379	40.55
1-3/16	3.770	45.24
1-1/4	4.170	50.04
1-3/8	5.050	60.60
1-1/2	6.010	72.12
1-5/8	7.050	84.60
1-3/4	8.170	98.04
1-7/8	9.390	112.68
2	10.680	128.16
2-1/8	12.06	144.72
2-1/4	13.52	162.24
2-3/8	15.06	180.72
2-1/2	16.69	200.28
2-5/8	18.40	220.80
2-3/4	20.19	242.28
2-7/8	22.07	264.84
3	24.03	288.36
3-1/4	28.21	338.52
3-3/8	30.42	365.04
3-1/2	32.71	392.49

AISI 4140/41L40 - Annealed

HR / CF (Also available in DCF)

This medium carbon alloy grade is widely used for many general purpose parts requiring high tensile strength and toughness. 4140 contains chromium and molybdenum as alloying elements and may be heat treated over a wide range to give the combined advantages of proper hardness, strength and ductility. In conditions where localized hardness may be required, this steel is readily flame or induction hardened.

Typical Analysis	AISI 4140 / 41L40
Carbon (C)	0.38 / 0.43
Manganese (Mn)	0.75 / 1.00
Silicon (Si)	0.15 / 0.30
Molybdenum (Mo)	0.15 / 0.25
Chromium (Cr)	0.80 / 1.10
Phosphorus (P)	0.035 MAX
Sulphur (S)	0.040 MAX
*Lead	0.15 / 0.35

Applies only to 4140 leaded alloy steel bars.

AISI 4140 - Annealed Flats & Squares

HR (Cut From Plate) (Also available in DCF)

Size (inches)	Weight (lbs./foot)
3/8 x	
3/8	0.594
1/2	0.765
5/8	0.935
3/4	1.105
1	1.446
1-1/4	1.786
1-1/2	2.126
1-3/4	2.467
2	2.807
2-1/4	3.147
2-1/2	3.488
2-3/4	3.827
3	4.168
3-1/2	4.849
4	5.530
6	8.252
1/2 x	
1/2	1.004
5/8	1.227
3/4	1.451
1	1.897
1-1/4	2.344
1-1/2	2.791
1-3/4	3.237
2	3.684
2-1/4	4.131
2-1/2	4.577
2-3/4	5.024
3	5.471
3-1/2	6.364
4	7.257
4-1/2	8.151
5	9.044
6	10.831
7	12.618
8	14.404
10	17.978
12	21.551
16	28.697
20	35.844
24	42.991
5/8 x	
5/8	1.520
3/4	1.796
1	2.349
1-1/4	2.902
1-1/2	3.455
1-3/4	4.008
2	4.561

Size (inches)	Weight (lbs./foot)
5/8 x	
2-1/4	5.114
2-1/2	5.667
2-3/4	6.220
3	6.773
3-1/2	7.879
4	8.985
4-1/2	10.092
5	11.198
6	13.410
8	17.834
10	22.257
12	26.682
16	35.530
20	44.378
24	53.227
3/4 x	
3/4	2.141
1	2.801
1-1/4	3.460
1-1/2	4.120
1-3/4	4.779
2	5.438
2-1/4	6.098
2-1/2	6.757
2-3/4	7.417
3	8.076
3-1/2	9.395
4	10.713
4-1/2	12.032
5	13.351
6	15.988
8	21.263
10	26.538
12	31.813
16	42.363
20	52.913
24	63.463
1 x	
1	3.704
1-1/8	4.141
1-1/4	4.577
1-1/2	5.449
1-3/4	6.321
2	7.193
2-1/4	8.065
2-1/2	8.937
2-3/4	9.809
3	10.681
3-1/2	12.425

Size (inches)	Weight (lbs./foot)
1 x	
4	14.169
4-1/2	15.914
5	17.658
6	21.146
8	28.123
10	35.099
12	42.076
16	56.028
20	69.981
24	83.934
1-1/4 x	
1-1/4	5.692
1-1/2	6.778
1-3/4	7.862
2	8.947
2-1/4	10.032
2-1/2	11.117
2-3/4	12.201
3	13.286
3-1/2	15.456
4	17.625
4-1/2	19.795
5	21.964
6	26.304
8	34.982
10	43.660
12	52.338
16	69.694
20	87.050
24	104.406
1-1/2 x	
1-1/2	8.106
2	10.702
2-1/4	11.999
2-1/2	13.296
2-3/4	14.594
3	15.891
3-1/2	18.486
4	21.081
4-1/2	23.676
5	26.271
6	31.461
8	41.841
10	52.221
12	62.600
16	83.359
20	104.119
24	124.878

Please refer to pages 8-32 thru 8-34 for alloy tolerances.
Note, sizes not listed above can be cut from plate.
Weights above include nominal oversize tolerance. Actual weights may vary.

Continued on next page

AISI 4140 - Annealed Flats & Squares

HR (Cut from plate) (Also available in DCF)

Size (inches)	Weight (lbs./foot)
1-3/4 x	
1-3/4	10.945
2	12.456
2-1/2	15.476
3	18.497
4	24.537
4-1/2	27.557
5	30.578
6	36.619
8	48.700
10	60.781
12	72.862
16	97.025
20	121.188
24	145.350
2 x	
2	14.210
2-1/4	15.933
2-1/2	17.656
2-3/4	19.379
3	21.102
3-1/2	24.547
4	27.993
4-1/2	31.438
5	34.885
6	41.776
8	55.559
9	62.451
10	69.342
12	83.125
16	110.690
20	138.257
24	165.822
2-1/4 x	
2-1/4	17.900
2-1/2	19.836

Size (inches)	Weight (lbs./foot)
2-1/4 x	
2-3/4	21.771
3	23.707
3-1/2	27.578
4	31.449
4-1/2	35.320
5	39.191
5-1/2	43.063
6	46.934
8	62.418
10	77.903
12	93.387
16	124.357
20	155.326
24	165.823
2-1/2 x	
2-1/2	22.015
2-3/4	24.164
3	26.312
3-1/2	30.609
4	34.905
4-1/2	39.202
5	43.498
5-1/2	47.795
6	52.091
8	69.277
10	86.464
12	103.650
16	138.022
20	172.394
24	206.767
3 x	
3	31.522
3-1/2	36.670
4	41.817
4-1/2	46.964

Size (inches)	Weight (lbs./foot)
3 x	
5	52.112
6	62.406
8	82.996
10	103.585
12	124.174
16	165.353
20	206.532
24	247.711
3-1/2 x	
3-1/2	42.730
4	48.525
4-1/2	54.523
5	60.521
5-1/2	66.723
6	72.518
8	96.510
10	120.502
12	144.495
16	192.480
20	240.465
24	288.451
4 x	
4	55.408
4-1/2	62.257
5	69.106
5-1/2	75.955
6	82.804
8	110.199
10	137.595
12	164.991
16	219.782
20	274.574
24	329.366

Please refer to pages 8-32 thru 8-34 for alloy tolerances.

Sizes not listed above can be cut from plate.

AISI 4140 - Annealed Rounds

HR (Also available in DCF)

Diameter (inches)	Weight (lbs./foot)
5/8	1.044
3/4	1.500
7/8	2.040
1	2.676
1-1/8	3.384
1-1/4	4.176
1-3/8	5.052
1-1/2	6.012
1-5/8	7.056
1-3/4	8.172
1-7/8	9.384
2	10.680
2-1/8	12.234
2-1/4	13.704
2-3/8	15.258
2-1/2	16.896
2-5/8	18.724
2-3/4	20.533
2-7/8	22.426
3	24.409
3-1/8	26.463
3-1/4	28.872
3-3/8	31.111

Diameter (inches)	Weight (lbs./foot)
3-1/2	33.434
3-5/8	36.070
3-3/4	38.568
4	43.814
4-1/4	49.394
4-1/2	55.309
4-3/4	61.859
5	68.459
5-1/4	75.393
5-1/2	82.661
5-3/4	91.359
6	99.343
6-1/4	107.662
6-1/2	116.315
6-3/4	126.162
7	135.515
7-1/4	145.202
7-1/2	155.224
7-3/4	165.580
8	176.275
8-1/4	187.296
8-1/2	199.737
8-3/4	211.463

Diameter (inches)	Weight (lbs./foot)
9	223.522
9-1/4	235.501
9-1/2	248.207
9-3/4	263.735
10	277.171
10-1/2	305.044
11	334.253
11-1/2	364.796
12	396.675
12-1/2*	429.889
13*	466.624
13-1/2*	502.591
14*	539.893
14-1/2*	578.531
15*	618.503
15-1/2*	659.811
16*	702.454
17*	791.746
18*	886.378
19*	986.351
20*	1091.664
22*	1318.314
24*	1566.326

** Sizes above 12" are 16-20' randoms, forged and roughturned.*
Please refer to pages 8-32 thru 8-34 for alloy tolerances.
Stock Lengths: 20 foot

AISI 4140 Rounds - Q&T

Typical Analysis	AISI 4140
Carbon (C)	0.37 / 0.49
Manganese (Mn)	0.65 / 1.10
Silicon (Si)	0.15 / 0.35
Molybdenum (Mo)	0.15 / 0.25
Chromium (Cr)	0.75 / 1.20
Sulphur (S)	.040 MAX
Phosphorus (P)	.035 MAX
Tensile Strength	approx. 110,000 lbs psi
Yield Point	approx. 85,000 lbs psi
Brinell Hardness	269 - 341
Elongation in 2"	16%
Reduction in Area	50%

AISI 4140 - Rounds

HR Q&T

Diameter (inches)	Weight (lbs./foot)
3/4	1.500
7/8	2.040
1	2.670
1-1/8	3.379
1-1/4	4.170
1-3/8	5.048
1-1/2	6.010
1-5/8	7.050
1-3/4	8.180
1-7/8	9.387
2	10.680
2-1/8	12.234
2-1/4	13.704
2-3/8	15.258
2-1/2	16.896
2-5/8	18.724
2-3/4	20.533
2-7/8	22.426
3	24.645
3-1/4	28.872
3-1/2	33.434
3-3/4	38.568

Diameter (inches)	Weight (lbs./foot)
4	43.814
4-1/4	49.394
4-1/2	55.309
4-3/4	61.859
5	68.459
5-1/4	75.393
5-1/2	82.661
5-3/4	91.359
6	99.343
6-1/4	107.662
6-1/2	116.315
6-3/4	126.162
7	135.515
7-1/4	145.202
7-1/2	155.224
7-3/4	165.580
8	176.275
8-1/4	187.296
8-1/2	199.737
9	223.522
9-1/2	248.207

Diameter (inches)	Weight (lbs./foot)
10	277.171
10-1/2	305.044
11	334.253
11-1/2	364.796
12	396.675
13	466.624
13-1/2	502.591
14	539.893
14-1/2	578.531
15	618.503
15-1/2	659.811
16	702.454
18	886.378
20	1091.664
22	1318.314
23	1435.275
24	1566.326
26	1826.400
28	2126.440
30	2443.220
32	2776.970

Please refer to pages 8-32 thru 8-34 for alloy tolerances.
Stock Lengths: 20 foot randoms, Bars over 10-1/2" diameter are forged.

AISI 4140 and 41L40* Annealed Rounds

Cold Finished

Diameter (inches)	Weight (lbs./foot)
3/16	0.100
1/4	0.170
5/16	0.261
3/8	0.380
7/16	0.510
1/2	0.668
9/16	0.845
5/8	1.043
11/16	1.261
3/4	1.500
13/16	1.763
7/8	2.044
15/16	2.347
1	2.670
1-1/16	3.010

Diameter (inches)	Weight (lbs./foot)
1-1/8	3.379
1-3/16	3.770
1-1/4	4.172
1-5/16	4.600
1-3/8	5.048
1-7/16	5.517
1-1/2	6.008
1-9/16	6.519
1-5/8	7.050
1-3/4	8.177
1-7/8	9.387
1-15/16	10.023
2	10.680
2-1/8	12.057
2-1/4	13.517

Diameter (inches)	Weight (lbs./foot)
2-3/8	15.060
2-1/2	16.688
2-9/16	17.532
2-5/8	18.398
2-3/4	20.192
2-7/8	22.069
3	24.030
3-1/4	28.202
3-1/2	32.708
3-3/4	37.547
4	42.720
4-1/4	48.227
4-1/2	54.068
5	66.750

Refer to pages 8-32 thru 8-34 for alloy tolerances.
Stock Lengths: 12 foot (20 foot available in most sizes).
**41L40 is a superior free machining direct hardening alloy (Lead of .15/.35).*

AISI 4140/4142 Q&T Rounds

Cold Finish T&P

4140/4142 CF Q&T SR is a general purpose alloy used where substantial strength, toughness and hardness are required. Through tempering, quenching and the cold-finishing process, the end result is improved strength and ductility, improved toughness, better fatigue resistance and superior surface condition.

4140 CF Q&T SR Rounds are also calcium-treated for improved machinability and fully stress relieved after drawing so that distortion during machining is held to a minimum.

AISI 4140 Quench & Tempered Rounds

Cold Finish T&P

Diameter (inches)	Length (feet)	Weight (lbs./foot)
3/8	12	.375
1/2	12	.667
5/8	12	1.042
3/4	12	1.501
7/8	20	2.044
1	20	2.670
1-1/8	20	3.379
1-3/16	20	3.765
1-1/4	20	4.171
1-3/8	20	5.047
1-7/16	20	5.510
1-1/2	20	6.007
1-5/8	20	7.050
1-3/4	20	8.176
1-7/8	20	9.387
1-15/16	20	10.020
2	20	10.680

Diameter (inches)	Length (feet)	Weight (lbs./foot)
2-3/16	20	12.776
2-1/4	20	13.516
2-7/16	20	15.863
2-1/2	20	16.687
2-11/16	20	19.277
2-3/4	20	20.191
2-15/16	20	23.031
3	20	24.030
3-1/4	20	28.202
3-7/16	20	31.541
3-1/2	20	32.707
3-15/16	20	41.384
4	20	42.720
4-7/16	20	52.564
4-1/2	20	54.080
5	20	66.750
6	20	96.120

Please refer to pages 8-32 thru 8-34 for alloy tolerances.

Stock Lengths: 12 foot randoms.

AISI 4140 Annealed Squares

Cold Finish

Size (inches)	Weight (lbs./foot)
3/8	0.478
1/2	0.850
5/8	1.328
3/4	1.913
7/8	2.603

Size (inches)	Weight (lbs./foot)
1	3.400
1-1/8	4.303
1-1/4	5.313
1-1/2	7.650

Size (inches)	Weight (lbs./foot)
1-3/4	10.413
2	13.600
2-1/2	21.250
3	30.600

AISI 4140 Annealed Hexagons

Cold Finish

Size (inches)	Weight (lbs./foot)
3/8	0.413
7/16	0.563
1/2	0.735
9/16	0.930
5/8	1.148
11/16	1.300
3/4	1.654
13/16	1.953
7/8	2.251

Size (inches)	Weight (lbs./foot)
15/16	2.584
1	2.940
1-1/16	3.324
1-1/8	3.721
1-1/4	4.594
1-3/8	5.558
1-7/16	6.085
1-1/2	6.625

Size (inches)	Weight (lbs./foot)
1-5/8	7.763
1-3/4	9.004
1-7/8	10.350
2	11.780
2-1/4	14.910
2-1/2	18.400
2-3/4	22.220
3	26.500

Please refer to pages 8-32 thru 8-33 for alloy tolerances.

Stock Lengths: 12 foot randoms

AISI 4140 Annealed Flats

Cold Finish

Size (inches)	Weight (lbs./foot)
1/4 x	
1-1/2	1.28
2	1.70
3	2.55
3/8 x	
1	1.28
1-1/4	1.59
1-1/2	1.91
2	2.55
3	3.83
3-1/2	4.46
4	5.10
1/2 x	
1	1.70
1-1/2	2.55
2	3.40
2-1/2	4.25
3	5.10
4	6.80
4-1/2	7.65
5	8.50
6	10.20
5/8 x	
1	2.13
2	4.25
2-1/2	5.31
3	6.77
4	8.50
5	10.63
6	12.75

Size (inches)	Weight (lbs./foot)
3/4 x	
1	2.55
1-1/4	3.19
1-1/2	3.83
2	5.10
2-1/2	6.38
3	7.65
4	10.20
5	12.75
6	15.30
1 x 1-1/4	4.25
1-1/2	5.10
1-3/4	5.95
2	6.80
2-1/2	8.50
3	10.20
3-1/2	11.90
4	13.60
5	17.00
6	20.40
7	23.80
8	27.20
1-1/4 x	
1-1/2	6.38
2	8.50
2-1/4	9.56
3	12.75
3-1/2	14.88
4	17.00
4-1/2	19.13

Size (inches)	Weight (lbs./foot)
1-1/4 x	
5	21.25
6	25.50
1-1/2 x	
2	10.20
2-1/2	12.75
3	15.30
3-1/2	17.84
4	20.40
5	25.50
6	30.60
2 x	
2-1/2	17.00
3	20.40
3-1/2	23.80
4	27.20
5	34.00
6	40.80
2-1/2 x	
4	34.00
3 x	
4	40.80
5	51.00

Please refer to pages 8-32 thru 8-34 for alloy tolerances.

AISI 4140/4142 (MOD) DCF

Medium Carbon Alloy, Pre-Hardened (Cut From Plate)

Also available in HR

4140/4142 is a fine pre-hardened alloy steel, ready for use and is machinable in its hardened state 260/321 Brinell for thickness under 3" and 241/321 Brinell for 3" and over.

Typical Applications

Strippers, Holder Blocks, Mold Bases, Ejectors, Back Up and Support Tooling, Fixtures, Jigs, Molds, Cams, and many more applications where time and money are important considerations.

Typical Analysis	AISI 4140/4142 (MOD)
Carbon (C)	0.36 / 0.46
Manganese (Mn)	0.70 / 1.70
Silicon (Si)	0.15 / 0.45
Molybdenum (Mo)	0.15 / 0.35
Chromium (Cr)	0.75 / 1.20
Phosphorus (P)	0.035 max.
Sulphur (S)	0.040 max.
Nickel (Ni)	0.50 max.
Tempering	
Tempering temperature	
Approx. tempered hardness, Rockwell C	26-34
Wear Resistance	Medium
Toughness	Very High
Resistance to Softening Effect of Elevated	
Temperature	Low
Depth of Hardening	Medium
Machinability	Medium
Grindability	High

Please refer to pages 8-32 thru 8-34 for alloy tolerances.

AISI 4140/4142 (MOD) - Flats & Squares

Pre-Hardened DCF, HR Pre-Hardened, Annealed DCF and HR Annealed (Cut from Plate)

Size (inches)	Weight (lbs./foot)
1/4 x	
1/2	0.540
5/8	0.657
3/4	0.774
1	1.008
1-1/8	1.125
1-1/4	1.242
1-1/2	1.476
1-3/4	1.710
2	1.944
2-1/4	2.178
2-1/2	2.412
2-3/4	2.646
3	2.880
3-1/2	3.348
3-3/4	3.582
4	3.816
4-1/2	4.284
5	4.751
6	5.687
7	6.623
8	7.559
9	8.495
10	9.431
12	13.533
16	17.998
20	22.463
24	26.928
32	35.858
3/8 x	
3/8	0.615
1/2	0.785
5/8	0.956
3/4	1.126
1	1.466
1-1/4	1.806
1-1/2	2.147
1-3/4	2.487
2	2.827
2-1/4	3.168
2-1/2	3.508
2-3/4	3.848
3	4.189
3-1/2	4.869
4	5.550
6	8.272
7	9.634
8	10.995
10	13.718

Size (inches)	Weight (lbs./foot)
3/8 x	
12	18.691
16	24.858
20	31.024
24	37.191
32	49.524
1/2 x	
1/2	1.031
5/8	1.254
3/4	1.478
1	1.924
1-1/4	2.371
1-1/2	2.818
1-3/4	3.264
2	3.711
2-1/4	4.158
2-1/2	4.604
2-3/4	5.051
3	5.498
3-1/2	6.391
4	7.284
5	9.071
6	10.858
6-1/2	11.751
7	12.644
8	14.431
9	16.218
10	18.004
12	23.849
14	27.783
16	31.717
18	35.651
20	39.585
24	47.453
32	63.190
5/8 x 5/8	1.553
3/4	1.829
1	2.382
1-1/4	2.935
1-1/2	3.488
1-3/4	4.041
2	4.594
2-1/4	5.148
2-1/2	5.701
2-3/4	6.254
3	6.807
3-1/2	7.913
4	9.019

Size (inches)	Weight (lbs./foot)
5/8 x	
4-1/2	10.125
5	11.231
6	13.443
8	17.867
10	22.291
12	29.006
16	38.576
20	48.146
24	57.715
32	76.855
3/4x	
3/4	2.181
1	2.841
1-1/4	3.500
1-1/2	4.159
1-3/4	4.819
2	5.478
2-1/4	6.137
2-1/2	6.797
2-3/4	7.456
3	8.116
3-1/2	9.434
4	10.753
5	13.390
6	16.028
8	21.303
10	26.578
12	34.164
16	45.435
20	56.706
24	67.978
32	90.521
7/8x	
7/8	2.916
1	3.299
1-1/4	4.064
1-1/2	4.830
1-3/4	5.596
2	6.362
2-1/4	7.127
2-1/2	7.893
2-3/4	8.659
3	9.424
3-1/2	10.956
4	12.487
4-1/2	14.019
5	15.550

Please refer to pages 8-32 thru 8-34 for alloy tolerances.
Note, sizes not listed above can be cut from plate.

Continued on next page

AISI 4140/4142 (MOD) - Flats & Squares

Pre-Hardened DCF, HR Pre-Hardened, Annealed DCF and HR Annealed (Cut from Plate)

Size (inches)		Weight (lbs./foot)
7/8 x		
	6	18.613
	8	24.739
	10	30.865
	12	39.321
	16	52.294
	20	65.267
	24	78.240
	32	104.186
1 x	1	3.757
	1-1/4	4.629
	1-1/2	5.501
	1-3/4	6.373
	2	7.245
	2-1/4	8.117
	2-1/2	8.989
	2-3/4	9.861
	3	10.733
	3-1/2	12.478
	4	14.222
	4-1/2	15.966
	5	17.710
	6	21.198
	7	24.687
	8	28.175
	9	31.663
	10	35.151
	12	44.479
	16	59.153
	20	73.828
	24	88.503
	32	117.852
1-1/8 x		
	1-1/4	5.193
	1-1/2	6.172
	2	8.129
	2-1/2	10.086
	3	12.042
	3-1/2	13.999
	4	15.956
	5	19.870
	6	23.783
	8	31.611
	10	39.438
1-1/8 x	12	49.636
	16	66.012
	20	82.389
	24	98.765
	32	131.517

Size (inches)		Weight (lbs./foot)
1-1/4 x		
	1-1/4	5.758
	1-1/2	6.843
	1-3/4	7.927
	2	9.012
	2-1/4	10.097
	2-1/2	11.182
	2-3/4	12.267
	3	13.351
	3-1/2	15.521
	4	17.690
	4-1/2	19.860
	5	22.030
	6	26.369
	8	35.047
	10	43.725
	12	54.794
	16	72.872
	20	90.949
	24	109.027
	32	145.183
1-3/8 x	1-3/8	6.918
	1-1/2	7.514
	1-3/4	8.705
	2	9.896
	2-1/4	11.087
	2-1/2	12.278
	2-3/4	13.469
	3	14.660
	3-1/2	17.043
	4	19.425
	5	24.189
	6	28.954
	8	38.483
	10	48.012
	12	59.951
	16	79.731
	20	99.510
	24	119.290
	32	158.848
1-1/2 x	1-1/2	8.184
	1-3/4	9.482
	2	10.779
	2-1/4	12.077
	2-1/2	13.374
	2-3/4	14.672
	3	15.969
	3-1/2	18.564
	4	21.159

Size (inches)		Weight (lbs./foot)
1-1/2 x	4-1/2	23.754
	5	26.349
	6	31.539
	8	41.919
	10	52.298
	12	65.109
	16	86.590
	20	108.071
	24	129.552
	32	172.514
1-3/4 x		
	1-3/4	11.036
	2	12.546
	3	18.587
	3-1/2	21.608
	4	24.628
	4-1/2	27.648
	5	30.669
	6	36.709
	8	48.791
	10	60.872
	12	75.424
	16	100.308
	20	125.192
	24	150.077
	32	199.845
2 x		
	2	14.314
	2-1/4	16.036
	2-1/2	17.759
	2-3/4	19.482
	3	21.205
	3-1/2	24.651
	4	28.097
	4-1/2	31.542
	5	34.988
	6	41.880
	8	55.662
	10	69.445
	12	85.739
	16	114.027
	20	142.314
	24	170.601
	32	227.176

Please refer to pages 8-32 thru 8-34 for alloy tolerances.
Note, sizes not listed above can be cut from plate.

Continued on next page

AISI 4140/4142 (MOD) - Flats & Squares

Pre-Hardened DCF, HR Pre-Hardened, Annealed DCF and HR Annealed (Cut from Plate)

Size (inches)		Weight (lbs./foot)
2-1/4 x	2-1/4	18.016
	2-1/2	19.952
	3	23.823
	3-1/2	27.694
	4	31.565
	5	39.308
	6	47.050
	8	62.534
	10	78.019
	12	96.054
	16	127.745
	20	159.435
	24	191.126
	32	254.507
2-1/2 x	2-1/2	22.144
	2-3/4	24.293
	3	26.441
	3.5	30.737
	4	35.034
	5	43.627
	6	52.220
	8	69.406
	10	86.592
	12	106.369
	16	141.463
	20	176.557
	24	211.651
	32	281.838
2-3/4 x	2-3/4	26.698
	3	29.059
	4	38.503
	5	47.947
	6	57.390
	8	76.278
	10	95.166
	12	116.684
	16	155.181
	20	193.678
	24	232.175
	32	309.169

Size (inches)		Weight (lbs./foot)
3 x	3	31.677
	3-1/2	36.824
	4	41.971
	5	52.266
	6	62.561
	8	83.150
	10	103.739
	12	127.000
	16	168.900
	20	210.800
	24	252.700
	32	336.500
3-1/2 x	3-1/2	42.911
	4	48.909
	5	60.905
	6	72.901
	8	96.894
	10	120.887
	12	147.630
	16	196.336
	20	245.043
	24	293.749
	32	391.163
4 x	4	55.846
	5	69.544
	6	83.242
	8	110.638
	10	138.034
	12	168.260
	16	223.773
	20	279.286
	24	334.799
	32	445.825
4-1/2 x	4-1/2	70.745
	5	78.445
	6	93.844
	8	124.643
	10	155.442
	12	186.241
	16	247.839
	20	309.437
	24	371.035
	32	494.231

Size (inches)		Weight (lbs./foot)
5 x	5	88.550
	6	105.832
	8	140.394
	10	174.957
	12	209.520
	16	278.646
	20	347.772
	24	416.898
	32	555.149
5-1/2 x	5-1/2	106.761
6 x	6	126.673
	8	168.042
	10	209.411
	12	250.781
	16	333.519
	24	498.996
	32	664.474
7 x	7	171.602
	8	195.690
	10	243.865
	12	292.041
	16	388.392
	20	484.744
	24	581.095
	32	773.798
8 x	8	223.337
	10	278.319
	12	333.301
	16	443.266
	20	553.230
	24	663.194
	32	883.122

Please refer to pages 8-32 thru 8-34 for alloy tolerances.

Note, sizes not listed above can be cut from plate.

AISI 4140 - As Rolled Plate

Also available in Annealed & Pre-Hardened

4140 Hot Rolled - As Rolled is available to be saw cut or flame cut to custom sizes.

Thickness (inches)	Weight (lbs./sqft)
1/2	20.42
5/8	25.53
3/4	30.60
7/8	35.735
1	40.80
1-1/4	51.10
1-1/2	61.30
1-5/8	66.40
1-3/4	71.47
1-7/8	76.575
2	81.70
2-1/4	91.90
2-1/2	102.10

Thickness (inches)	Weight (lbs./sqft)
2-3/4	112.30
3	122.50
3-1/4	132.73
3-1/2	142.90
3-3/4	153.15
4	163.30
4-1/4	173.57
4-1/2	183.78
4-3/4	193.99
5	204.20
5-1/4	214.40
5-1/2	224.62
5-3/4	234.83

Thickness (inches)	Weight (lbs./sqft)
6	245.04
6-1/4	255.25
6-1/2	265.45
6-3/4	275.67
7	285.88
7-1/2	306.30
8	326.72
8-1/4	336.93
8-1/2	347.14
8-3/4	357.35
9	367.56

Please refer to pages 8-32 thru 8-34 for alloy tolerances.

AISI 4150 Hot Rolled Annealed

4150 grade is a medium-carbon, chromium-molybdenum steel. 4150 is also capable of good strength and wear resistance, has excellent toughness, good ductility and has the ability to resist stress and creep at prolonged high temperatures. In the annealed condition, machinability is improved.

Typical Analysis	AISI 4150
Carbon (C)	0.48 / 0.53
Manganese (Mn)	0.75 / 1.00
Phosphorus (P)	0.035 max
Sulphur (S)	0.02 / 0.04
Chromium (Cr)	0.80 / 1.10
Molybdenum (Mo)	0.15 / 0.25
Silicon (Si)	0.15 / 0.35
Nickel (Ni)	0.25 max
Copper (Cu)	0.35 max
Vanadium (V)	0.10 max
Aluminum (Al)	0.020 to 0.050
Microstructure - Steel to have a predominately lamellar pearlite structure for optimum machinability.	

AISI 4150 Hot Rolled Annealed Rounds

Diameter (inches)	Weight (lbs./foot)	Diameter (inches)	Weight (lbs./foot)	Diameter (inches)	Weight (lbs./foot)
2	10.680	3-3/4	38.568	6-3/4	126.162
2-1/8	12.234	4	43.814	7	135.515
2-1/4	13.704	4-1/8	46.562	7-1/4	145.202
2-3/8	15.258	4-1/4	49.394	7-1/2	155.224
2 -1/2	16.896	4-1/2	55.309	7-3/4	165.580
2-5/8	18.724	4-3/4	61.859	8	176.275
2-3/4	20.533	5	68.459	8-1/4	187.296
2-7/8	22.426	5-1/4	75.393	8-1/2	199.737
3	24.645	5-1/2	82.661	8-3/4	211.463
3-1/8	26.717	5-3/4	91.359	9	223.522
3-1/4	28.872	6	99.343	9-1/4	235.501
3-1/2	33.434	6-1/4	107.662	9-1/2	248.207
3-5/8	36.070	6-1/2	116.315	10	277.171

Please refer to pages 8-32 thru 8-34 for alloy tolerances.

Stock Lengths: 20 foot randoms

AISI 4150R Q&T SR Hot Rolled

(Resulphurized, Hot Rolled, Quenched and Tempered, Stress Relieved)

4150R HR Q&T SR is a free-machining alloy steel that provides an outstanding combination of heat treated properties and superior machinability. This alloy steel is manufactured under close quality control for uniformity to an ASTM grain size of 5 to 8. It is especially suitable for service applications where substantial strength, toughness and hardness are required.

Typical Analysis	AISI 4150R
Carbon (C)	0.47 / 0.55
Manganese (Mn)	0.75 / 1.35
Silicon (Si)	0.15 / 0.30
Molybdenum (Mo)	0.15 / 0.25
Chromium (Cr)	0.70 / 1.10
Sulphur (S)	0.06 / 0.10
Phosphorus (P)	0.035 max.
Tensile Strength	approx. 110,000 lbs psi
Yield Point	approx. 85,000 lbs psi
Brinell Hardness	269 - 341
Elongation in 2"	16%
Reduction in Area	51%
Rounds 11" and up are not resulphurized.	
Flats and Squares Hot rolled, heat treated, machine straightened, stress relieved. BHN 269/321	

AISI 4150R Q&T SR Hot Rolled Rounds

Diameter (inches)	Weight (lbs./foot)
3/4	1.500
7/8	2.040
1	2.676
1-1/8	3.384
1-1/4	4.176
1-3/8	5.052
1-1/2	6.012
1-5/8	7.056
1-3/4	8.172
1-7/8	9.384
2	10.680
2-1/8	12.234
2-1/4	13.704
2-3/8	15.258
2 -1/2	16.896
2-5/8	18.724
2-3/4	20.533
2-7/8	22.426
3	24.645
3-1/8	26.717
3-1/4	28.872
3-1/2	33.434

Diameter (inches)	Weight (lbs./foot)
3-5/8	36.070
3-3/4	38.568
4	43.814
4-1/8	46.562
4-1/4	49.394
4-1/2	55.309
4-3/4	61.859
5	68.459
5-1/4	75.393
5-1/2	82.661
5-3/4	91.359
6	99.343
6-1/4	107.662
6-1/2	116.315
6-3/4	126.162
7	135.515
7-1/4	145.202
7-1/2	155.224
7-3/4	165.580
8	176.275
8-1/4	187.296
8-1/2	199.737

Diameter (inches)	Weight (lbs./foot)
8-3/4	211.463
9	223.522
9-1/4	235.501
9-1/2	248.207
10	277.171
10-1/2	305.044
11	334.253
11-1/2	364.796
12	396.675
12-1/2	429.889
13	466.624
13-1/2	502.591
14	539.893
14-1/2	573.511
15	618.503
16	702.454
17	791.746
18	886.378
19	986.351
20	1091.664
22	1318.314

Please refer to pages 8-32 thru 8-34 for alloy tolerances.

Rounds 12" and up are not resulphurized. Stock lengths 20' randoms

4150 Dybar - (MOD) RS Hot Rolled

4150 Dybar is a special quality alloy steel that has been resulphurized for considerations for machining. Modifications have been made to the chemical composition for increased hardenability. This steel is made by a single slab electric furnace process to a silicon fully killed practice and resulphurized to set limits.

Typical Analysis	AISI 4150
Carbon (C)	0.47 / 0.55
Manganese (Mn)	0.95 / 1.30
Silicon (Si)	0.20 / 0.35
Molybdenum (Mo)	0.15 / 0.25
Chromium (Cr)	0.60 / 0.90
Vanadium (V)	0.10 max.
Sulphur (S)	0.06 / 0.10
Phosphorus (P)	0.025 max.
Nickel (Ni)	0.25 max.
Columbium	0.015 / 0.035

4150 Dybar - (MOD) RS HR Flats & Squares

Size (inches)	Weight (lbs./foot)
5/8 x	
2-1/2	5.471
3	6.566
4-1/2	9.848
1 x	
2-1/2	8.755
3-1/2	12.250
4-1/2	15.759
1-1/8 x	
2-1/2	9.848
3-1/2	13.788
4-1/2	17.728
5	19.698
8	31.550
1-1/4 x	
2-1/2	10.943
3-1/2	15.321
4	17.510
4-1/2	19.698
5	21.887
7	30.670

Size (inches)	Weight (lbs./foot)
1-1/2 x	
2-1/2	13.132
3	15.759
3-1/2	18.385
4	21.012
4-1/2	23.638
5	26.265
6	31.518
7	36.810
8	42.024
1-3/4 x	
3-1/4	19.940
2 x 2-1/2	17.510
3	21.012
3-1/2	24.514
4	28.016
4-1/2	31.518
5	35.050
6	42.060
8	56.080

Size (inches)	Weight (lbs./foot)
2-1/2 x	
2-1/2	21.887
3	26.265
3-1/2	30.642
4	35.020
4-1/2	39.397
6	52.530
3 x	
3	31.518
4	42.024
5	52.530
6	63.036
3-1/2 x	
3-1/2	42.899
4 x	
4	56.040
8	112.170
4-5/8 x 4-5/8	74.065
5-1/8 x 5-1/8	93.666
5-5/8 x 5-5/8	112.652
6-1/8 x 6-1/8	133.085

Please refer to pages 8-32 thru 8-34 for alloy tolerances.

AISI 4340

Annealed, Hot Rolled

4340 is a highly alloyed steel with high nickel and chromium content which assures deep hardening when oil quenched, with high strength characteristics throughout the section. Used for heavily stressed parts operating under strenuous conditions.

Typical Analysis	AISI 4340
Carbon (C)	0.38 / 0.43
Manganese (Mn)	0.60 / 0.80
Silicon (Si)	0.15 / 0.35
Molybdenum (Mo)	0.20 / 0.30
Chromium (Cr)	0.70 / 0.90
Nickel (Ni)	1.65 / 2.00
Sulphur (S)	0.040 max.
Phosphorus (P)	0.035 max.

AISI 4340

Q&T (For Reference Only), Hot Rolled

Typical Analysis	AISI 4340
Carbon (C)	0.38 / 0.43
Manganese (Mn)	0.60 / 0.80
Silicon (Si)	0.15 / 0.35
Molybdenum (Mo)	0.20 / 0.30
Chromium (Cr)	0.70 / 0.90
Nickel (Ni)	1.65 / 2.00
Sulphur (S)	0.040 max.
Phosphorus (P)	0.035 max.
Tensile Strength	approx. 130,000 lbs psi
Yield Point	approx. 100,000 lbs psi
Brinell Hardness	285 - 363
Elongation in 2"	approx. 14%
Reduction in Area	approx. 35%

Note: Mechanical Properties for Q&T are for reference only!

AISI 4340 - HR Q&T Rounds

Diameter (inches)	Weight (lbs./foot)
1	2.670
1-1/8	3.379
1-1/4	4.170
1-3/8	5.048
1-1/2	6.010
1-5/8	7.050
1-3/4	8.180
1-7/8	9.387
2	10.680
2-1/8	12.234
2-1/4	13.704
2-3/8	15.258
2-1/2	16.896
2-5/8	18.724
2-3/4	20.533
2-7/8	22.426
3	24.645
3-1/8	26.717
3-1/4	28.872

Diameter (inches)	Weight (lbs./foot)
3-1/2	33.434
3-3/4	38.568
4	43.814
4-1/4	49.394
4-1/2	55.309
4-3/4	61.859
5	68.459
5-1/4	75.393
5-1/2	82.661
5-3/4	91.359
6	99.343
6-1/4	107.662
6-1/2	116.315
6-3/4	126.162
7	135.515
7-1/4	145.202
7-1/2	155.224
7-3/4	165.580
8	176.275

Diameter (inches)	Weight (lbs./foot)
8-1/4	187.296
8-1/2	199.737
9	223.522
9-1/2	248.207
10	277.171
10-1/2	305.044
11	334.253
11-1/2	364.796
12	396.675
13	466.624
14	539.893
15	618.503
16	702.454
17	791.746
18	886.378
19	986.351
20	1091.664

Rounds over 12" are Forged, Rough Turned, Q&T

AISI 4340 - Annealed Rounds

Diameter (inches)	Weight (lbs./foot)
3/4	1.500
7/8	2.040
1	2.676
1-1/8	3.384
1-1/4	4.176
1-3/8	5.052
1-1/2	6.012
1-5/8	7.056
1-3/4	8.172
1-7/8	9.384
2	10.680
2-1/8	12.234
2-1/4	13.704
2-3/8	15.258
2-1/2	16.896
2-3/4	20.533
3	24.645
3-1/4	28.872
3-1/2	33.434

Diameter (inches)	Weight (lbs./foot)
3-3/4	38.568
4	43.814
4-1/8	46.562
4-1/4	49.394
4-1/2	55.309
4-5/8	58.685
4-3/4	61.859
5	68.459
5-1/4	75.393
5-1/2	82.661
5-3/4	91.359
6	99.343
6-1/4	107.662
6-1/2	116.315
6-3/4	126.162
7	135.515
7-1/2	155.224
8	176.275
8-1/4	187.296

Diameter (inches)	Weight (lbs./foot)
8-1/2	199.737
9	223.522
9-1/4	235.501
9-1/2	248.207
10	277.171
10-1/2	305.044
11	334.253
11-1/2	364.796
12	396.675
12-1/2	429.889
13	466.624
13-1/2	502.591
14	539.893
15	618.503
16	702.454
17	791.746
18	886.378
20	1091.664

Rounds 1/2" - 11" are Hot Rolled Annealed. Rounds over 11" are Forged, Rough Turned, Annealed.
Please refer to pages 8-32 thru 8-34 for alloy tolerances.
Stock Lengths: 20 foot randoms

AISI 4340
Annealed Aircraft Quality (AQ) Rounds

AISI	4340 CFA-AQ	4340 HRA-AQ
ASTM	A108, A331	A322, A304, E381
AMS	6415	6415

Diameter (inches)	Weight (lbs./foot)	4340 CFA-AQ	4340 HRA-AQ
1/2	.668	●	
3/4	1.500	●	
1	2.676	●	
1-1/4	4.176	●	
1-1/2	6.012	●	
1-3/4	8.172	●	
2	10.680	●	
2-1/4	13.704	●	
2-1/2	16.896	●	
2-3/4	20.533	●	
3	24.645	●	●
3-1/4	28.872		●
3-1/2	33.434		●
3-3/4	38.568		●
4	43.814		●
4-1/4	49.394		●
4-1/2	55.309		●
4-3/4	61.859		●
5	68.459		●
5-1/2	82.661		●
6	99.343		●
6-1/2	116.315		●
7	135.515		●
7-1/2	155.224		●
8	176.275		●
8-1/2	199.737		●
9	223.522		●
9-1/2	248.207		●
10	277.171		●

AISI 6150 - Annealed, HR/DCF

An electric furnace melt of chrome vanadium steel possessing the following characteristics: oil-hardening, high resistance to vibratory stress, standard deformation, medium hardness, high torque strength and bright polish.

Typical Applications

Arbors, Heavy Machinery Parts, Gears, Shafts, High Strength Studs and Spindles.

Typical Analysis	AISI 6150
Carbon (C)	0.48 / 0.53
Manganese (Mn)	0.70 / 0.90
Silicon (Si)	0.15 / 0.30
Phosphorus (P)	0.035 max.
Sulphur (S)	0.040 max.
Molybdenum (Mo)	
Chromium (Cr)	0.80 / 1.10
Vanadium (V)	0.15 min.
Cobalt (Co)	
Forging (a) Start forging at Do not forge below	1750 - 2150ºF (950 - 1175ºC) 1600º F (870ºC)
Normalizing (b)	1650 - 1700ºF (899 - 927ºC)
Annealing (c) Temperature Rate of cooling, max. per hour Typical annealed hardness, Brinell	 1525 - 1575ºF (828 - 855ºC) 179 - 217
Hardening Rate of heating Preheat temperature Hardening temperature Time at temperature, minutes Quenching medium	 Slowly 1500 - 1550ºF (816 - 843ºC) O (I)
Tempering Tempering temperature Approx. tempered hardness, Rockwell C	 400ºF (204ºC) 56 - 58
Wear Resistance	Medium
Toughness	Very High
Resistance to Softening Effect of Elevated Temperature	Low
Depth of Hardening	Medium
Machinability	Medium
Grindability	High
Distortion in Heat Treating	Medium
Safety in Hardening	Low
Resistance to Carburization	Medium

AISI 6150 - Annealed Flats & Squares

DCF (Cut From Plate)

Size (inches)	Weight (lbs./foot)
1/2 x	
1/2	1.031
5/8	1.254
3/4	1.478
1	1.924
1-1/4	2.371
1-1/2	2.818
1-3/4	3.264
2	3.711
2-1/4	4.158
2-1/2	4.604
2-3/4	5.051
3	5.498
3-1/2	6.391
4	7.284
5	9.071
6	10.858
8	14.431
10	18.004
12	23.849
16	31.717
20	39.585
24	47.453
5/8 x	
5/8	1.553
3/4	1.829
1	2.382
1-1/4	2.935
1-1/2	3.488
1-3/4	4.041
2	4.594
2-1/4	5.148
2-1/2	5.701
2-3/4	6.254
3	6.807
3-1/2	7.913
4	9.019
4-1/2	10.125
5	11.231
5-1/2	12.337
6	13.443
7	15.655
8	17.867
9	20.079
10	22.291
12	29.006
16	38.576
20	48.146
24	57.715
32	76.855

Size (inches)	Weight (lbs./foot)
3/4 x	
3/4	2.181
1	2.841
1-1/4	3.500
1-1/2	4.159
1-3/4	4.819
2	5.478
2-1/4	6.137
2-1/2	6.797
2-3/4	7.456
3	8.116
3-1/2	9.434
4	10.753
5	13.390
6	16.028
8	21.303
10	26.578
12	34.164
16	45.435
20	56.706
24	67.978
32	90.521
1 x	
1	3.757
1-1/4	4.629
1-1/2	5.501
1-3/4	6.373
2	7.245
2-1/4	8.117
2-1/2	8.989
2-3/4	9.861
3	10.733
3-1/2	12.478
4	14.222
4-1/2	15.966
5	17.710
6	21.198
7	24.687
8	28.175
10	35.151
12	44.479
16	59.153
20	73.828
24	88.503
32	117.852
1-1/8x	
2-1/2	10.086
4-1/2	17.913
1-1/4 x	
1-1/4	5.758
1-1/2	6.843
1-3/4	7.927

Size (inches)	Weight (lbs./foot)
1-1/4 x	
2	9.012
2-1/4	10.097
2-1/2	11.182
2-3/4	12.267
3	13.351
3-1/2	15.521
4	17.690
4-1/2	19.860
5	22.030
6	26.369
8	35.047
10	43.725
12	54.794
16	72.872
20	90.949
24	109.027
32	145.183
1-3/8 x	
1-3/8	6.918
1-1/2	7.514
1-3/4	8.705
2	9.896
2-1/4	11.087
2-1/2	12.278
2-3/4	13.469
3	14.660
3-1/2	17.043
4	19.425
5	24.189
6	28.954
8	38.483
10	48.012
12	59.951
16	79.731
20	99.510
24	119.290
32	158.848
1-1/2 x	
1-1/2	8.184
1-3/4	9.290
2	10.587
2-1/4	11.885
2-1/2	13.182
2-3/4	14.480
3	15.803
3-1/2	18.372
4	20.967
4-1/2	23.562
5	26.157
6	31.347

Please refer to pages 8-32 thru 8-34 for alloy tolerances.
Note, sizes not listed above can be cut from plate.

Continued on next page

AISI 6150 - Annealed Flats & Squares

DCF (Cut From Plate)

Size (inches)	Weight (lbs./foot)
1-1/2 x	
8	41.727
10	52.106
12	65.109
16	83.246
20	104.005
24	127.765
32	166.284
1-3/4 x	
1-3/4	11.036
2	12.546
3	18.587
3-1/2	21.608
4	24.628
4-1/2	27.648
5	30.669
5-1/2	33.689
6	36.709
7	42.750
8	48.791
9	54.831
10	60.872
12	75.424
16	100.308
20	125.192
24	150.077
32	199.845
2 x	
2	14.314
2-1/4	16.036
2-1/2	17.759
2-3/4	19.482
3	21.205
3-1/2	24.651
4	28.097
4-1/2	31.542
5	34.988
6	41.880
8	55.662
10	69.445
12	85.739
16	114.027
20	142.314
24	170.601
32	227.176

Size (inches)	Weight (lbs./foot)
2-1/2 x	
2-1/2	22.144
2-3/4	24.293
3	26.441
3-1/2	30.737
4	35.034
5	43.627
6	52.220
8	69.406
10	86.592
12	106.369
16	141.463
20	176.557
24	211.651
3 x	
3	31.677
3-1/2	36.824
4	41.971
5	52.266
6	62.561
8	83.150
10	103.739
12	127.000
14	147.950
16	168.900
20	210.800
24	252.700
32	336.500
3-1/2 x	
3-1/2	42.911
4	48.909
5	60.905
6	72.901
8	96.894
10	120.887
12	147.630
16	196.336
20	245.043
24	293.749
32	391.163

Size (inches)	Weight (lbs./foot)
4 x	
4	55.846
5	69.544
6	83.242
8	110.638
10	138.034
12	168.260
14	196.016
16	223.773
20	279.286
24	334.799
32	445.825
4-1/2 x	
4-1/2	72.041
5	79.831
6	95.411
8	126.571
10	157.730
12	188.890
16	251.209
20	313.529
24	375.848
32	500.487
5 x	
5	88.550
6	105.832
8	140.394
10	174.957
12	209.520
16	278.646
20	347.772
24	416.898
32	555.149
6 x	
6	126.673
8	168.042
10	209.411
12	250.781
16	333.519
20	416.258
24	498.996
32	664.474

Please refer to pages 8-32 thru 8-34 for alloy tolerances.
Note, sizes not listed above can be cut from plate.

AISI 6150 - Annealed HR Rounds

Diameter (inches)	Weight (lbs./foot)
1	2.676
1-1/8	3.384
1-1/4	4.176
1-3/8	5.052
1-1/2	6.012
1-5/8	7.056
1-3/4	8.180
1-7/8	9.390
2	10.680
2-1/8	12.230
2-1/4	13.704
2-1/2	16.896
2-5/8	18.724
2-3/4	20.533
3	24.409
3-1/4	28.606
3-1/2	33.143

Diameter (inches)	Weight (lbs./foot)
3-3/4	38.175
4	43.394
4-1/4	48.939
4-1/2	54.822
4-3/4	61.243
5	67.804
5-1/4	74.699
5-1/2	81.928
5-3/4	90.203
6	98.146
6-1/4	103.390
6-1/2	114.985
6-3/4	123.078
7	133.771
7-1/4	143.397
7-1/2	153.348
7-3/4	163.633

Diameter (inches)	Weight (lbs./foot)
8	174.251
8-1/4	185.204
8-1/2	197.178
8-3/4	208.818
9	220.816
9-1/4	235.501
9-1/2	248.207
10*	277.171
10-1/2*	305.044
11*	334.253
11-1/2*	364.796
12*	396.675
13*	466.624
14*	539.893
15*	618.503
16*	702.454

**** Over 10" is forged***

Diameter tolerance may vary depending on sourcing.
Stock Lengths: 20 foot randoms

AISI 8620/86L20

Carefully controlled proportions of chromium, nickel and molybdenum are responsible for the extensive use of 8620 as a carburizing alloy steel. Valuable features of this grade include extreme surface hardenability and internal strength.

Typical Analysis	AISI 8620 / 86L20
Carbon (C)	0.18 / 0.23
Manganese (Mn)	0.70 / 0.90
Silicon (Si)	0.15 / 0.30
Nickel (Ni)	0.40 / 0.70
Molybdenum (Mo)	0.15 / 0.25
Chromium (Cr)	0.40 / 0.60
Phosphorus (P)	0.035 MAX
Sulphur (S)	0.040 MAX
*Lead	0.15 / 0.35

Applies only to 8620 leaded alloy steel bars.

AISI 8620 Flats and Squares

HR (Cut From Plate)

Size (inches)	Weight (lbs./foot)
3/8 x	
3/8	0.594
1/2	0.765
5/8	0.935
3/4	1.105
1	1.446
1-1/4	1.786
1-1/2	2.126
1-3/4	2.467
2	2.807
2-1/4	3.147
2-1/2	3.488
2-3/4	3.827
3	4.168
3-1/2	4.849
4	5.530
6	8.252
1/2 x	
1/2	1.004
5/8	1.227
3/4	1.451
1	1.897
1-1/4	2.344
1-1/2	2.791
1-3/4	3.237
2	3.684
2-1/4	4.131
2-1/2	4.577
2-3/4	5.024
3	5.471
3-1/2	6.364
4	7.257
4-1/2	8.151
5	9.044
6	10.831
7	12.618
8	14.404
10	17.978
12	21.551
16	28.697
20	35.844
24	42.991
5/8 x	
5/8	1.520
3/4	1.796
1	2.349
1-1/4	2.902
1-1/2	3.455
1-3/4	4.008
2	4.561

Size (inches)	Weight (lbs./foot)
5/8 x	
2-1/4	5.114
2-1/2	5.667
2-3/4	6.220
3	6.773
3-1/2	7.879
4	8.985
4-1/2	10.092
5	11.198
6	13.410
8	17.834
10	22.257
12	26.682
16	35.530
20	44.378
24	53.227
3/4 x	
3/4	2.141
1	2.801
1-1/4	3.460
1-1/2	4.120
1-3/4	4.779
2	5.438
2-1/4	6.098
2-1/2	6.757
2-3/4	7.417
3	8.076
3-1/2	9.395
4	10.713
4-1/2	12.032
5	13.351
6	15.988
8	21.263
10	26.538
12	31.813
16	42.363
20	52.913
24	63.463
1 x	
1	3.704
1-1/8	4.141
1-1/4	4.577
1-1/2	5.449
1-3/4	6.321
2	7.193
2-1/4	8.065
2-1/2	8.937
2-3/4	9.809
3	10.681
3-1/2	12.425

Size (inches)	Weight (lbs./foot)
1 x	
4	14.169
4-1/2	15.914
5	17.658
6	21.146
8	28.123
10	35.099
12	42.076
16	56.028
20	69.981
24	83.934
1-1/4 x	
1-1/4	5.692
1-1/2	6.778
1-3/4	7.862
2	8.947
2-1/4	10.032
2-1/2	11.117
2-3/4	12.201
3	13.286
3-1/2	15.456
4	17.625
4-1/2	19.795
5	21.964
6	26.304
8	34.982
10	43.660
12	52.338
16	69.694
20	87.050
24	104.406
1-1/2 x	
1-1/2	8.106
2	10.702
2-1/4	11.999
2-1/2	13.296
2-3/4	14.594
3	15.891
3-1/2	18.486
4	21.081
4-1/2	23.676
5	26.271
6	31.461
8	41.841
10	52.221
12	62.600
16	83.359
20	104.119
24	124.878

Please refer to pages 8-32 thru 8-34 for alloy tolerances.
Note, sizes not listed above can be cut from plate, please inquire.
Weights above include nominal oversize tolerance. Actual weights may vary.

Continued on next page

AISI 8620 Flats and Squares

HR (Cut From Plate)

Size (inches)	Weight (lbs./foot)
1-3/4 x	
1-3/4	10.945
2	12.456
2-1/2	15.476
3	18.497
4	24.537
4-1/2	27.557
5	30.578
6	36.619
8	48.700
10	60.781
12	72.862
16	97.025
20	121.188
24	145.350
2 x	
2	14.210
2-1/4	15.933
2-1/2	17.656
2-3/4	19.379
3	21.102
3-1/2	24.547
4	27.993
4-1/2	31.438
5	34.885
6	41.776
8	55.559
9	62.451
10	69.342
12	83.125
16	110.690
20	138.257
24	165.822

Size (inches)	Weight (lbs./foot)
2-1/4 x	
2-1/4	17.900
2-1/2	19.836
2-3/4	21.771
3	23.707
3-1/2	27.578
4	31.449
4-1/2	35.320
5	39.191
5-1/2	43.063
6	46.934
8	62.418
10	77.903
12	93.387
16	124.357
20	155.326
24	165.823
2-1/2 x	
2-1/2	22.015
2-3/4	24.164
3	26.312
3-1/2	30.609
4	34.905
4-1/2	39.202
5	43.498
5-1/2	47.795
6	52.091
8	69.277
10	86.464
12	103.650
16	138.022
20	172.394
24	206.767

Size (inches)		Weight (lbs./foot)
3 x	3	31.522
	3-1/2	36.670
	4	41.817
	4-1/2	46.964
	5	52.112
	6	62.406
	8	82.996
	10	103.585
	12	124.174
	16	165.353
	20	206.532
	24	247.711
3-1/2 x		
	3-1/2	42.730
	4	48.525
	4-1/2	54.523
	5	60.521
	5-1/2	66.723
	6	72.518
	8	96.510
	10	120.502
	12	144.495
	16	192.480
	20	240.465
	24	288.451
4 x	4	55.408
	4-1/2	62.257
	5	69.106
	5-1/2	75.955
	6	82.804
	8	110.199
	10	137.595
	12	164.991
	16	219.782
	20	274.574
	24	329.366

Please refer to pages 8-32 thru 8-34 for alloy tolerances.
Note, sizes not listed above can be cut from plate.

AISI 8620 HR Rounds

Diameter (inches)	Weight (lbs./foot)
5/8	1.044
3/4	1.500
7/8	2.040
1	2.676
1-1/16	3.01
1-1/8	3.384
1-3/16	3.76
1-1/4	4.176
1-5/16	4.60
1-3/8	5.052
1-7/16	5.52
1-1/2	6.012
1-5/8	7.056
1-3/4	8.172
1-7/8	9.384
2	10.680
2-1/8	12.234
2-1/4	13.704
2-3/8	15.258
2-1/2	16.896
2-5/8	18.724
2-3/4	20.533
2-7/8	22.426
3	24.645

Diameter (inches)	Weight (lbs./foot)
3-1/8	26.717
3-1/4	28.872
3-1/2	33.434
3-5/8	36.070
3-3/4	38.568
4	43.814
4-1/8	46.562
4-1/4	49.394
4-1/2	55.309
4-3/4	61.859
5	68.459
5-1/4	75.393
5-1/2	82.661
5-3/4	91.359
6	99.343
6-1/4	107.662
6-1/2	116.315
6-3/4	126.162
7	135.515
7-1/4	145.202
7-1/2	155.224
7-3/4	165.580
8	176.271
8-1/4	187.296

Diameter (inches)	Weight (lbs./foot)
8-1/2	199.737
8-3/4	211.463
9	223.522
9-1/4	235.501
9-1/2	248.207
9-3/4	253.812
10	277.171
10-1/4	290.941
10-1/2	305.044
11	334.253
11-1/2	364.796
12	396.675
12-1/2	429.889
13	466.624
14	539.893
15	618.503
16	702.454
17	791.746
18	886.378
19	986.351
20	1091.664
22	1318.314
24	1566.326
26	1835.701

Please refer to pages 8-32 thru 8-34 for alloy tolerances.
Stock Lengths: 18 - 20 foot randoms

AISI 8620 CF Rounds

Diameter (inches)	Weight (lbs./foot)
1/4	0.167
5/16	0.261
3/8	0.375
7/16	0.511
1/2	0.668
9/16	0.845
5/8	1.043
11/16	1.262
3/4	1.502
13/16	1.763
7/8	2.044
15/16	2.347
1	2.670
1-1/16	3.014
1-1/8	3.379

Diameter (inches)	Weight (lbs./foot)
1-3/16	3.765
1-1/4	4.172
1-5/16	4.599
1-3/8	5.048
1-7/16	5.517
1-1/2	6.008
1-5/8	7.050
1-3/4	8.177
1-7/8	9.387
2	10.680
2-1/8	12.057
2-1/4	13.517
2-3/8	15.060
2-1/2	16.688
2-5/8	18.398

Diameter (inches)	Weight (lbs./foot)
2-3/4	20.192
2-7/8	22.069
3	24.030
3-1/8	26.074
3-1/4	28.202
3-3/8	30.413
3-1/2	32.708
3-3/4	37.547
4	42.720
4-1/4	48.227
4-1/2	54.068
4-3/4	60.242
5	66.750
6	96.120

Please refer to pages 8-32 thru 8-34 for alloy tolerances.
Stock Lengths: 12 foot (20 foot also available in most sizes).

AISI 86L20 CF Rounds

Diameter (inches)	Weight (lbs./foot)
3/8	0.38
1/2	0.67
9/16	0.85
5/8	1.04
3/4	1.50
13/16	1.76
7/8	2.04
15/16	2.35
1	2.67
1-1/8	3.38

Diameter (inches)	Weight (lbs./foot)
1-1/4	4.17
1-5/16	4.60
1-3/8	5.05
1-7/16	5.52
1-1/2	6.01
1-5/8	7.05
1-3/4	8.18
1-7/8	9.39
2	10.68
2-1/8	12.06

Diameter (inches)	Weight (lbs./foot)
2-1/4	13.52
2-3/8	15.06
2-1/2	16.69
2-5/8	18.40
2-3/4	20.19
3	24.03
3-1/4	28.20
3-1/2	32.71

AISI 8620 HR Plate

Thickness (inches)	Weight (lbs./sqft)
1/2	20.4
3/4	30.6
1	40.8
1-1/8	45.9
1-1/4	51.0
1-1/2	61.2
1-3/4	71.47

Thickness (inches)	Weight (lbs./sqft)
2	81.6
2-1/4	91.89
2-1/2	102.0
2-3/4	112.31
3	122.4
3-1/2	142.9
4	163.3

Refer to pages 8-32 thru 8-34 for alloy tolerances.

AISI 52100

AISI 52100 is a moderately deep hardening alloy having high resistance to wear, medium toughness, and low resistance to softening at high temperatures.

Typical Analysis	AISI 52100
Carbon (C)	0.98 / 1.10
Manganese (Mn)	0.25/ 0.45
Silicon (Si)	0.15 - 0.30
Chromium (Cr)	1.30 / 1.60
Phosphorus (P)	0.025 MAX
Sulphur (S)	0.025 MAX
Physical Properties	
Contact Alro for specific certification.	

AISI 52100 Rounds

Spheroidize Annealed, B.Q.

Diameter (inches)	Weight (lbs./foot)	Diameter (inches)	Weight (lbs./foot)	Diameter (inches)	Weight (lbs./foot)
3/8	0.380	2	10.680	5-1/4	73.590
1/2	0.667	2-1/4	13.512	5-1/2	80.767
5/8	1.042	2-3/8	15.060	6	96.120
3/4	1.501	2-1/2	16.687	6-1/4	104.296
13/16	1.760	2-5/8	18.400	6-1/2	112.807
7/8	2.044	2-3/4	20.191	6-3/4	123.078
1	2.670	3	24.030	7	130.830
1-1/8	3.379	3-1/4	28.201	7-1/2	150.187
1-1/4	4.171	3-1/2	32.710	8	170.880
1-3/8	5.047	3-3/4	37.547	8-1/2	197.178
1-1/2	6.007	4	42.720	9	220.816
1-5/8	7.050	4-1/4	48.230	10	277.171
1-3/4	8.176	4-1/2	54.067	11	334.253
1-13/16	8.780	4-3/4	60.240	12	396.675
1-7/8	9.386	5	66.750		

Diameter tolerance may vary depending on sourcing.

Hot Rolled Alloy Bars

Size Tolerances and Out-of-Round or Out-of Square Tolerances

Hot Rolled Alloy Bars Round, Square and Round-Cornered Square			
Specified Sizes (inches)	Size Tolerances (inches)		Out-of-Round or Out-of-Square Section (inches)
	Over	Under	
Up thru 5/16	0.005	0.005	0.008
Over 5/16 thru 7/16	0.006	0.006	0.009
Over 7/16 thru 5/8	0.007	0.007	0.010
Over 5/8 thru 7/8	0.008	0.008	0.012
Over 7/8 thru 1	0.009	0.009	0.013
Over 1 thru 1-1/8	0.010	0.010	0.015
Over 1-1/8 thru 1-1/4	0.011	0.011	0.016
Over 1-1/4 thru 1-3/8	0.012	0.012	0.018
Over 1-3/8 thru 1-1/2	0.014	0.014	0.021
Over 1-1/2 thru 2	1/64	1/64	0.023
Over 2 thru 2-1/2	1/32	0	0.023
Over 2-1/2 thru 3-1/2	3/64	0	0.035
Over 3-1/2 thru 4-1/2	1/16	0	0.046
Over 4-1/2 thru 5-1/2	5/64	0	0.058
Over 5-1/2 thru 6-1/2	1/8	0	0.070
Over 6-1/2 thru 8-1/4	5/32	0	0.085
Over 8-1/4 thru 9-1/2	3/16	0	0.100
Over 9-1/2 thru 10	1/4	0	0.120

Out-of-round is the difference between the maximum and minimum diameters of the bar, measured at the same transverse cross section. Out-of-square section is the difference in perpendicular distance between opposite faces, measured at the same transverse cross section.

Size Tolerances - Rounds

Turned, Ground & Polished	
Diameter Range (inches)	Heat Treated
Up thru 1-1/2	+0 - 0.0015
Over 1-1/2 thru 2-1/2	+0 - 0.0020
Over 2-1/2 thru 3	+0 - 0.0025
Over 3 thru 4	+0 - 0.0035
Over 4 thru 6	+0 - 0.0045

Straightness *Tolerances - Steel Bars

Hot Rolled Bars

Straightness is a perishable tolerance; therefore, reasonable care in handling and storage should be taken to avoid bending the bars. 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. A tightly-stretched string can be used as a substitute for a steel scale.

Hot Rolled Bars	1/4" in any 5 ft.	or	$1/4 \times \frac{\text{no. of ft. of length}}{5}$ inches
Hot Rolled, Thermally Treated	1/4" in any 5 ft.	or	$1/4 \times \frac{\text{no. of ft. of length}}{5}$ inches

** There is not a published flatness or straightness tolerance for flat bars.*

Straightness *Tolerances - Steel Bars

Cold Finished Bars

Form Size (inches)	Length (feet)	Maximum Curvature (Depth of arc in inches)
	Rounds	
Less than .28 Carbon		
Less than 5/8"	Less than 15'	1/8" in any 10' portion of the total length
Less than 5/8"	15' and over	1/8" in any 10' portion of the total length
5/8" and over	Less than 15'	1/16" in any 10' portion of the total length
5/8" and over	15' and over	1/8" in any 10' portion of the total length
.28 Carbon and over and all heat treated material		
Less than 5/8"	Less than 15'	3/16" in any 10' portion of the total length
Less than 5/8"	15' and over	5/16" in any 10' portion of the total length
5/8" and over	Less than 15'	1/8" in any 10' portion of the total length
5/8" and over	15' and over	3/16" in any 10' portion of the total length
	Hexagons & Squares	
Less than .28 Carbon		
Less than 5/8"	Less than 15'	3/16" in any 10' portion of the total length
Less than 5/8"	15' and over	5/16" in any 10' portion of the total length
5/8" and over	Less than 15'	1/8" in any 10' portion of the total length
5/8" and over	15' and over	3/16" in any 10' portion of the total length
.28 Carbon and over and all heat treated material		
Less than 5/8"	Less than 15'	1/4" in any 10' portion of the total length
Less than 5/8"	15' and over	3/8" in any 10' portion of the total length
5/8" and over	Less than 15'	3/16" in any 10' portion of the total length
5/8" and over	15' and over	1/4" in any 10' portion of the total length

**** There is not a published flatness or straightness tolerance for flat bars.***

Thickness & Width Oversize Ranges

De-Carb Free Flats and Squares

Size (inches)	Width - Based on Thickness (inches)	Thickness (inches)
Through 4" thick	+.035 / +.077 oversize	+.015 / +.035 oversize
Rough Milled 4" thru <5"	+.062 / +.124 oversize	+.062 / +.125 oversize
Rough Milled 5" and over	+.062 / +.124 oversize	+.125 / +.250 oversize

Thickness Tolerances

4140 HRA and 8620 HR Flats

All widths range from .035 - .124 oversize

Thickness (inches)	Tolerance
3/8	+.03 -.01
1/2	+.03 -.01
5/8	+.04 -.01
3/4 and 7/8	+.04 -.01
1 to 1-7/8	+.07 -.01
2 to 2-3/4	+.11 -.01
3 to 3-3/4	+.13 -.01
4 to 4-1/2	+.15 -.01

Standard Manufacturing Tolerances

Cold Finished Alloy Bars (Undersize variation in inches)

Size & Shape	Carbon thru .28% Max.	Max. Carbon over .28% thru .55%	Max. Carbon over .55% or All Carbons Heat Treated	E.T.D. 150®
Rounds (Cold Drawn or Turned and Polished)				
Up thru 1-1/2	.003	.004	.006	.005
Over 1-1/2 thru 2-1/2	.004	.005	.007	.006
Over 2-1/2 thru 4	.005	.006	.008	.007
Over 4 thru 6	.006	.007	.009	---
Over 6 thru 8	.007	.008	.010	---
Over 8 thru 9	.008	.009	.011	---
Hexagons				
Up thru 3/4	.003	.004	.007	---
Over 3/4 thru 1-1/2	.004	.005	.008	---
Over 1-1/2 thru 2-1/2	.005	.006	.009	---
Over 2-1/2 thru 3-1/8	.006	.007	.010	---
Squares				
Up thru 3/4	.003	.005	.008	---
Over 3/4 thru 1-1/2	.004	.006	.009	---
Over 1-1/2 thru 2-1/2	.005	.007	.010	---
Over 2-1/2 thru 3-1/8	.007	.009	.012	---
Flats (Width)				
Up thru 3/4	.004	.006	.009	---
Over 3/4 thru 1-1/2	.005	.007	.011	---
Over 1-1/2 thru 3	.006	.008	.013	---
Over 3 thru 4	.007	.010	.017	---
Over 4 thru 6	.009	.012	.021	---
Over 6	.014	---	---	---

Note: Tolerances for flats apply to thickness as well as to width.

AISI A2 DCF

An air-hardening tool steel containing five percent chromium. Replaces the oil hardening (O1 type) when safer hardening, less distortion and increased wear-resistance are required. Provides an intermediate grade between the oil hardening and the high carbon, high chromium (D2) types.

Typical Applications

Large Blanking Dies, Thread Roller Dies, Long Punches, Rolls, Master Hubs, Trimming Dies, Forming Dies, Precision Tools, Gauges, Coining Dies, Extrusion Dies, Mandrels, Shear Blades and Slitters.

Typical Analysis	Type A2 (UNS T30102)
Carbon (C)	0.95 / 1.05
Manganese (Mn)	1.00 max.
Silicon (Si)	0.50 max.
Tungsten (W)	
Molybdenum (Mo)	0.90 / 1.40
Chromium (Cr)	4.75 / 5.50
Vanadium (V)	0.15 / 0.50
*Nickel (Ni)	0.30 max.
Forging (a) Start forging at	 1850 - 2000°F (1010 - 1093°C)
Do not forge below	1650°F (899°C)
Normalizing (b)	Do not normalize
Annealing (c) Temperature Rate of cooling, max. per hour	 1550 - 1600°F (843 - 871°C) 40°F (22°C)
Typical annealed hardness, Brinell	201 - 235
Hardening Rate of heating Preheat temperature Hardening temperature Time at temperature, minutes Quenching medium	 Slowly 1450 °F (788°C) 1700 - 1800°F (927 - 962°C) 20 - 45 (j) A (l)
Tempering Tempering temperature Approx. tempered hardness, Rockwell C	 350 - 1000°F (177 - 538°C) 57 - 62
Wear Resistance	High
Toughness	Medium
Resistance to Softening Effect of Elevated Temperature	Medium to High
Depth of Hardening	Deep
Machinability	Medium
Grindability	Medium
Distortion in Heat Treating	Lowest
Safety in Hardening	Highest
Resistance to Decarburization	Medium

Please refer to pg. 8-58 for notes (a) to (o) incl., explanation of letter 0, A, S, B and W.

**Unless otherwise specified, nickel plus copper equal 0.75% max. for all tool steel types.*

AISI A6

A6 is an air-hardening, non-deforming tool steel that combines the deep hardening characteristics of air-hardening steels with the simplicity of low temperature heat treatment possible in many of the oil-hardening grades.

Typical Applications

Blanking Dies, Precision Tools, Forming Dies, Coining Dies, Master Hubs, Shear Blades, Plastic Molds, Spindles, Mandrels, Heavy Duty Punches.

Typical Analysis	Type A6 (UNS T30106)
Carbon (C)	0.65 / 0.75
Manganese (Mn)	1.80 / 2.50
Silicon (Si)	0.50 max.
Tungsten (W)	
Molybdenum (Mo)	0.90 / 1.40
Chromium (Cr)	0.90 /1.20
Vanadium (V)	
Cobalt (Co)	
*Nickel (Ni)	0.30 max.
Forging (a)	
Start forging at	1900 - 2050°F (1038 - 1213°C)
Do not forge below	1600°F (871°C)
Normalizing (b)	Do not normalize
Annealing (c)	
Temperature	1350 - 1375°F (732 - 746°C)
Rate of cooling, max. per hour	25°F (14°C)
Typical annealed hardness, Brinell	217 - 248
Hardening	
Rate of heating	Slowly
Preheat temperature	1200°F (649°C)
Hardening temperature	1525 - 1600°F (829 - 871°C)
Time at temperature, minutes	20 - 45 (j)
Quenching medium	A (l)
Tempering	
Tempering temperature	300 - 800°F (149 - 427°C)
Approx. tempered hardness, Rockwell C	54 - 60
Wear Resistance	Low to Medium
Toughness	Medium to High
Resistance to Softening Effect of Elevated Temperature	Medium
Depth of Hardening	Deep
Machinability	Low to Medium
Grindability	Medium
Distortion in Heat Treating	Lowest
Safety in Hardening	Highest
Resistance to Decarburization	Medium to High

Please refer to pg. 8-58 for notes (a) to (o) incl., explanation of letter 0, A, S, B and W.

**Unless otherwise specified, nickel plus copper equal 0.75% max. for all tool steel types.*

AISI D2

D2 is an air-hardening, high carbon, high chromium tool steel with extremely high wear resisting properties. It is a very deep hardening steel and will be practically free from size change after proper treatment. The high percentage of chromium gives it mild corrosion-resisting properties in the hardened condition.

Typical Applications

Blanking Dies, Forming Dies, Coining Dies, Slitting Cutters, Heading Tools, Long Punches, Forming Rolls, Edging Rolls, Master Tools, Beading Rolls, Intricate Punches, Extrusion Dies, Drawing Dies, Lamination Dies, Thread Rolling Dies, Shear Blades, Burnishing Tools, Gauges, Knurls, Wear Parts.

Typical Analysis	Type D2 (UNS T30402)
Carbon (C)	1.40 / 1.60
Manganese (Mn)	0.60 max.
Silicon (Si)	0.60 max.
Tungsten (W)	
Molybdenum (Mo)	0.70 / 1.20
Chromium (Cr)	11.00 / 13.00
Vanadium (V)	1.10 max.
Cobalt (Co)	1.00 max.
*Nickel (Ni)	0.30 max.
Forging (a) Start forging at Do not forge below	 1850 - 2000°F (1010 - 1093°C) 1700°F (927°C)
Normalizing (b)	Do not normalize
Annealing (c) Temperature Rate of cooling, max. per hour Typical annealed hardness, Brinell	 1600 - 1650°F (871 - 899°C) 40°F (22°C) 217 - 255
Hardening Rate of heating Preheat temperature Hardening temperature Time at temperature, minutes Quenching medium	 Very Slowly 1500°F (816°C) 1800 - 1875°F (982 - 1024°C) 15 - 45 (j) A (l)
Tempering Tempering temperature Approx. tempered hardness, Rockwell C	 400 - 1000°F (204 - 538°C) 54 - 61
Wear Resistance	High to Very High
Toughness	Low
Resistance to Softening Effect of Elevated Temperature	Medium to High
Depth of Hardening	Deep
Machinability	Low
Grindability	Low
Distortion in Heat Treating	Lowest
Safety in Hardening	Highest
Resistance to Decarburization	Medium

Please refer to pg. 8-58 for notes (a) to (o) incl., explanation of letter 0, A, S, B and W.

**Unless otherwise specified, nickel plus copper equal 0.75% max. for all tool steel types.*

DC53

DC53 is a general purpose, cold work die and mold steel whose strength and toughness approach those of high-speed steels.

Typical Applications

Forming Dies, Thread Rolling Dies, Cold Forging Dies, Gauges, Plastic Molds, Stepped Punch and Press Punching Dies.

Typical Analysis	Type DC53
Carbon (C)	0.95
Molybdenum (Mo)	2.00
Chromium (Cr)	8.00
Vanadium (V)	0.25
Cobalt (Co)	
*Nickel (Ni)	
Forging (a) Start forging at Do not forge below	 1100°C 900°C
Normalizing (b)	
Annealing (c) Temperature Rate of cooling, max. per hour Typical annealed hardness, Brinell	 830°C - 880°C 40°F (22°C) 255°
Hardening Rate of heating Preheat temperature Hardening temperature Time at temperature, minutes Quenching medium	 Slowly 800°C - 850°C) 1020° C - 1040°C 15 - 45 Air, Gas
Tempering Tempering temperature Approx. tempered hardness, Rockwell C	 520 - 550°C 64 - 58
Wear Resistance	High to Very High
Toughness	High
Resistance to Softening Effect of Elevated Temperature	High
Depth of Hardening	Through Harden
Machinability	High
Grindability	High
Distortion in Heat Treating	Low
Safety in Hardening	High
Resistance to Decarburization	High

Please refer to pg. 8-58 for notes (a) to (o) incl., explanation of letter 0, A, S, B and W.

**Unless otherwise specified, nickel plus copper equal 0.75% max. for all tool steel types.*

AISI 01

O1 is an oil-hardening, non-deforming tool steel which can be hardened at relatively low temperatures. Tools and dies made from O1 will have good wearing qualities since the tungsten and higher chromium content gives improved wear resistance over the straight manganese grades.

Typical Applications

Blanking Dies, Bushings, Forming Dies, Master Tools, Forming Rolls, Gauges, Trim Dies.

Typical Analysis	Type O1 (UNS T31501)
Carbon (C)	0.85 / 1.00
Manganese (Mn)	1.00 / 1.40
Silicon (Si)	0.50 max.
Tungsten (W)	0.40 / 0.60
Molybdenum (Mo)	
Chromium (Cr)	0.40 / 0.70
Vanadium (V)	0.30 max.
Cobalt (Co)	
*Nickel (Ni)	0.30 max.
Forging (a) Start forging at Do not forge below	 1800 - 1950°F (982 - 1066°C) 1550°F (843°C)
Normalizing (b)	1600°F (871 °C)
Annealing (c) Temperature Rate of cooling, max. per hour Typical annealed hardness, Brinell	 1400 - 1450°F (760 - 788°C) 40°F (22°C) 183 - 212
Hardening Rate of heating Preheat temperature Hardening temperature Time at temperature, minutes Quenching medium	 Slowly 1200°F (649°C) 1450 - 1500°F (788 - 816°C) 10 - 30 0 (I)
Tempering Tempering temperature Approx. tempered hardness, Rockwell C	 350 - 500°F (177 - 260°C) 57 - 62
Wear Resistance	Medium
Toughness	Medium
Resistance to Softening Effect of Elevated Temperature	Low
Depth of Hardening	Medium
Machinability	High
Grindability	High
Distortion in Heat Treating	Low
Safety in Hardening	Medium to High
Resistance to Decarburization	High

Please refer to pg. 8-58 for notes (a) to (o) incl., explanation of letter 0, A, S, B and W.

**Unless otherwise specified, nickel plus copper equal 0.75% max. for all tool steel types.*

AISI O6

O6 is an oil-hardening cold work steel which has outstanding machinability resulting from small particles of graphitic carbon uniformly distributed throughout the steel. These particles increase resistance to wear and galling in service. For an oil-hardening steel, 06 holds size well during heat treating.

Typical Applications

Blanking Dies, Piercing Dies, Drawing Dies, Pneumatic Hammers, Forming Dies, Spinning Tools, Punches, Stamps, Gauges, Wear Plates, Cams, Rotary Slitting Cutters.

Typical Analysis	Type O6 (UNS T31506)
Carbon (C)	1.25 / 1.55
Manganese (Mn)	0.30 / 1.10
Silicon (Si)	0.55 / 1.50
Tungsten (W)	
Molybdenum (Mo)	0.20 / 0.30
Chromium (Cr)	0.30 max
*Nickel (Ni)	0.30 max
Forging (a) Start forging at Do not forge below	 1800 - 1950°F (982 - 1066°C) 1500°F (816°C)
Normalizing (b)	1600°F (871 °C)
Annealing (c) Temperature Rate of cooling, max. per hour Typical annealed hardness, Brinell	 1400 - 1450°F (766 - 788°C) 20°F (11°C) 183 - 217
Hardening Rate of heating Preheat Temperature Hardening temperature Time at temperature, minutes Quenching medium	 Slowly 1450 - 1500°F (788 - 816°C) 10 - 30 0 (I)
Tempering Tempering temperature Approx. tempered hardness, Rockwell C	 350 - 600°F (177 - 316°C) 58 - 63
Wear Resistance	Medium
Toughness	Medium
Resistance to Softening Effect of Elevatated Temperature	Low
Depth of Hardening	Medium
Machinability	Highest
Grindability	High
Distortion in Heat Treating	Low
Safety in Hardening	Medium to High
Resistance to Decarburization	High

Please refer to pg. 8-58 for notes (a) to (o) incl., explanation of letter 0, A, S, B and W.

**Unless otherwise specified, nickel plus copper equal 0.75% max. for all tool steel types.*

AISI L6

L6 is a tough, oil-hardening tool steel possessing a fine-grained structure and desirable shock resistance. L6 is also associated with high strength and good non-deforming characteristics.

Typical Applications

Forming Rolls, Spindles, Punches, Trim Dies, Blanking Dies, Embossing Dies, Forming Dies, and Shear Blades.

Typical Analysis	Type L6 (UNS T61206)
Carbon (C)	0.65 / 0.75
Manganese (Mn)	0.25 / 0.80
Silicon (Si)	0.50 max
Molybdenum (Mo)	0.50 max
Chromium (Cr)	0.60 / 1.20
Vanadium (V)	0.30 max
*Nickel (Ni)	1.25 / 2.00
Forging (a) Start forging at Do not forge below	 1800 - 2000°F (982 - 1093°C) 1550°F (843°C)
Normalizing (b)	1600°F (871 °C)
Annealing (c) Temperature Rate of cooling, max. per hour Typical annealed hardness, Brinell	 1400 - 1450°F (760 - 788°C) 40°F (22°C) 183-255
Hardening Rate of heating Hardening temperature Time at temperature, minutes Quenching medium	 Slowly 1450 - 1550°F (788 - 843°C) 10 - 30 (j) 0 (l)
Tempering Tempering temperature Approx. tempered hardness, Rockwell C	 350 - 1000°F (177 - 538°C) 45 - 62
Wear Resistance	Medium
Toughness	Very High
Resistance to Softening Effect of Elevatated Temperature	Low
Depth of Hardening	Medium
Machinability	Medium
Grindability	High
Distortion in Heat Treating	Low
Safety in Hardening	Medium
Resistance to Decarburization	High

Please refer to pg. 8-58 for notes (a) to (o) incl., explanation of letter 0, A, S, B and W.

**Unless otherwise specified, nickel plus copper equal 0.75% max. for all tool steel types.*

AISI S5

S5 is an oil-hardening silicon-manganese steel of medium carbon content especially adapted for punches, shear blades, chisels, and other shock resisting applications. S5 is therefore applicable where the properties of silicon-manganese steels are desired in combination with well-known advantages of oil-hardening steels. A reduced tendency to distort or crack in heat treatment is accordingly combined with high toughness in S5.

Typical Analysis	Type S5 (UNS T41905)
Carbon (C)	0.50 / 0.65
Manganese (Mn)	0.60 / 1.00
Silicon (Si)	1.75 / 2.25
Tungsten (W)	
Molybdenum (Mo)	0.20 / 1.35
Chromium (Cr)	0.35 max
Vanadium (V)	0.35 max
Cobalt (Co)	
Forging (a) Start forging at Do not forge below	 1850 - 2050°F (1010 - 1121°C) 1600°F (871°C)
Normalizing (b)	Do not normalize
Annealing (c) Temperature Rate of cooling, max. per hour Typical annealed hardness, Brinell	 1425 -1475°F (774 - 802°C) 25°F (14°C) 192-229
Hardening Rate of heating Preheat Temperature Hardening temperature Time at temperature, minutes Quenching medium	 Slowly 1400°F (760°C) 1600 - 1700°F (871 - 927°C) 5 - 20 0 (I)
Tempering Tempering temperature Approx. tempered hardness, Rockwell C	 350 - 800°F (177 - 427°C) 50 - 60
Wear Resistance	Low to Medium
Toughness	Highest
Resistance to Softening Effect of Elevated Temperature	Low
Depth of Hardening	Medium
Machinability	Medium to High
Grindability	Medium to High
Distortion in Heat Treating	Medium
Safety in Hardening	High
Resistance to Decarburization	Low

Please refer to pg. 8-58 for notes (a) to (o) incl., explanation of letter 0, A, S, B and W.
**Unless otherwise specified, nickel plus copper equal 0.75% max. for all tool steel types.*

AISI S7

AISI S7 is a general purpose air-hardening tool steel with high impact and shock resistance. It has good resistance to softening at moderately high temperatures. This combination of properties makes it suitable for many hot work and cold work applications. Excellent combination of high strength and toughness. Useful in moderate hot work as well as cold work work tooling. Added size stability when air hardened.

Typical Applications

Bull Riveters, Concrete Breakers (Moll Points), Riveting Dies, Powder Metal Dies, Notching Dies, Dowels, Drills, Drill Plates, Hubs, Plastic Mold Dies, Cold Forming Dies, Blanking Dies, Bending Dies, and Master Hobs.

Typical Analysis	Type S7 (UNS T41907)
Carbon (C)	0.45 / 0.55
Manganese (Mn)	0.20 / 0.80
Silicon (Si)	0.20 / 1.00
Tungsten (W)	
Molybdenum (Mo)	1.30 / 1.80
Chromium (Cr)	3.00 / 3.50
Vanadium (V)	0.30 max
Cobalt (Co)	
Forging (a) Start forging at Do not forge below	 1950 - 2050°F (1066 - 1121°C) 1700°F (927°C)
Normalizing (b)	Do not normalize
Annealing (C) Temperature Rate of cooling, max. per hour Typical annealed hardness, Brinell	 1500 - 1550°F (816 - 843°C) 25°F (14°C) 187-223
Hardening Rate of heating Preheat Temperature Hardening temperature Time at temperature, minutes Quenching medium	 Slowly 1200 - 1300°F (649 - 704°C) 1700 - 1750°F (927 - 954°C) 15 - 45 (j) A or O (l)
Tempering Tempering temperature (Do not temper below 400°F) Approx. tempered hardness, Rockwell C	 400 - 1150°F (204 - 621°C) 45 - 57
Wear Resistance	Low to Medium
Toughness	Very High
Resistance to Softening Effect of Elevated Temperature	High
Depth of Hardening	Medium to Deep
Machinability	Medium to High
Grindability	Medium to High
Distortion in Heat Treating	A: Lowest /O: Low
Safety in Hardening	A: Highest /O: High
Resistance to Decarburization	Medium

Please refer to pg. 8-58 for notes (a) to (o) incl., explanation of letter 0, A, S, B and W.

**Unless otherwise specified, nickel plus copper equal 0.75% max. for all tool steel types.*

AISI S7 ESR

S7 ESR tool steel is specifically designed for use in molds and other applications where a highly polished or a very smooth finish is required. The ESR (Electro Slag Remelt) process removes most of the non-metallic inclusions in the steel. S7 ESR double melt's relatively low carbon level, fortified chemistry, ultra-clean, uniform, and homogeneous internal structure make it superior to the other conventionally manufactured shock-resisting tool steels. The following charts show microcleanliness ratings of ESR tool steels by ASTM E45, Method D:

Typical Microcleanliness	A	B	C	D
Thin	< 0.5	< 0.5	< 0.5	1.0
Heavy	< 0.5	< 0.5	< 0.5	1.0

Maximum Rated Microcleanliness	A	B	C	D
Thin	1.5	1.5	2.0	1.5
Heavy	1.0	1.0	1.0	1.0

The quality control of the S7 ESR process assures the exceptional cleanliness throughout by removing most harmful inclusions in the material (such as, oxides, nitrides and sulfides). The ESR steel produced will reflect a mirror like surface condition, subsequently reducing friction giving you easier ejection of parts, the elimination of minute scratches, and other stress-raisers that could lead to premature die failures.

The higher quality steel produced by special melt practices imparts a most important characteristic—freedom of inclusions and other imperfections. Other advantages include: cleanliness, stability, improved mechanical properties, structures relatively free from segregation resulting in less cracking, and quality assurance by ultrasonic testing of all ESR material produced.

Typical Analysis	Type S7 ESR
Carbon (C)	.50
Manganese (Mn)	.60
Silicon (Si)	.65
Molybdenum (Mo)	1.40
Chromium (Cr)	3.25

Annealing (C)

When properly annealed, this steel has a machinability rating of 95 as compared to a 1% carbon steel rated at 100.

Tempering

Tempering	Rockwell C
As Quenched	60
400°F	58
500°F	56
600°F	55
700°F	54
800°F	53
900°F	52
1000°F	51
1100°F	47
1200°F	38

1" specimen, 3 long were air-hardened from 1725°F.

Material may become brittle when tempered at less than 400°F.

Please refer to pg. 8-58 for Hardening information

** Unless otherwise specified, nickel plus copper equal 0.75% max. for all tool steel types.*

AISI P20

Prehardened

P20 is a chrome-moly tool steel made specifically to fill the requirements for the machined cavities and forces used in zinc die casting and plastic molding. It is delivered fully quenched and tempered to approximately Brinell 300. Other hardness levels may be obtained through additional heat treatment. P20 composition and structure provide excellent machining and polishing characteristics.

Typical Analysis	Type P20 (UNS T51620)
Carbon (C)	0.35
Manganese (Mn)	0.80
Silicon (Si)	0.50
Tungsten (W)	
Molybdenum (Mo)	0.45
Chromium (Cr)	1.70
Vanadium (V)	
Cobalt (Co)	
Nickel (Ni)	
Forging (a) Start forging at Do not forge below	 2000°F (1093°C) 1700°F (927°C)
Normalizing (b)	Do not normalize
Annealing (c) Temperature Rate of cooling, max. per hour Typical annealed hardness, Brinell	 1450-1500°F (788-816°C) 30°F per hour to 1000°F 207 max.
Hardening Rate of heating Preheat temperature Hardening temperature Time at temperature, minutes Quenching medium	 Slowly None 1500-1600°F (816-871°C) 60 min. per inch of thick. O (I)
Tempering Tempering temperature Approx. tempered hardness, Rockwell C	 300-1200°F (149-649°C) 26-54
Wear Resistance	Low to Medium
Toughness	Very High
Resistance to Softening Effect of Elevated Temperature	High
Depth of Hardening	Medium to Deep
Machinability	Medium
Grindability	Medium
Distortion in Heat Treating	Low
Safety in Hardening	High
Resistance to Decarburization	High

Please refer to pg. 8-58 for notes (a) to (o) incl., explanation of letter 0, A, S, B and W.

**Unless otherwise specified, nickel plus copper equal 0.75% max. for all tool steel types.*

AISI T420 Stainless ESR

AISI T420 ESR is an air or oil hardening mold steel having superior internal steel cleanliness combined with good resistance to corrosion. It is suitable for mold applications and is capable of providing an excellent polished surface. A special re-melting process called Electro Slag Refining or ESR provides a 420 type steel with the very low inclusion content required by mold makers who polish mold surfaces.

Typical Analysis	Type T420 (UNS S42000)
Carbon (C)	Over 0.15
Manganese (Mn)	1.00 max
Silicon (Si)	1.00 max
Tungsten (W)	0.03 max
Molybdenum (Mo)	0.03 max
Chromium (Cr)	12.00 / 14.00
Vanadium (V)	
Cobalt (Co)	
*Nickel (Ni)	
Forging (a) Start forging at Do not forge below	
Normalizing (b)	
Annealing (c) Temperature Rate of cooling, max. per hour Typical annealed hardness, Brinell	 1600 - 1650°F (871 - 899°C) 192 - 241
Hardening Rate of heating Preheat temperature Hardening temperature Time at temperature, minutes Quenching medium	 1350 - 1450°F (735 - 788°C) 1850 - 1950°F (1110 - 1066°C) A (l)
Tempering Tempering temperature Approx. tempered hardness, Rockwell C	 450 - 750°F (232 - 399°C) 49 - 53
Wear Resistance	Low
Toughness	Medium
Resistance to Softening Effect of Elevated Temperature	Good
Depth of Hardening	Medium
Machinability	Medium
Grindability	Good
Distortion in Heat Treating	Low
Safety in Hardening	High
Resistance to Decarburization	Medium

Please refer to pg. 8-58 for notes (a) to (o) incl., explanation of letter 0, A, S, B and W.

**Unless otherwise specified, nickel plus copper equal 0.75% max. for all tool steel types.*

AISI W2

W2 is a shallow hardening tool steel. Due to its vanadium content, the grain is superior in toughness and resistance to fatigue compared to straight carbon tool steels thereby making it desirable for many types of impact tools.

Typical Analysis	Type W2 (UNS T27302)
Carbon (C)	0.85 / 1.50
Manganese (Mn)	0.10 / 0.40
Silicon (Si)	0.10 / 0.40
Tungsten (W)	0.15 max
Molybdenum (Mo)	0.10 max
Chromium (Cr)	0.15 max
Vanadium (V)	0.15 / 0.35
Cobalt (Co)	
*Nickel (Ni)	0.20 max
Forging (a) Start forging at Do not forge below	 1800 - 1950°F (982 - 1066°C) 1500°F (816°C)
Normalizing (b)	1450 - 1700°F (d)
Annealing (c) Temperature Rate of cooling, max. per hour Typical annealed hardness, Brinell	 1360 - 1450°F(d) (738 - 788°C) 40°F (22°C) 156 - 201
Hardening Rate of heating Preheat temperature Hardening temperature Time at temperature, minutes Quenching medium	 Slowly (g) 1400 - 1550°F (e) (760 - 843°C) 10 - 30 B or W (l)
Tempering Tempering temperature Approx. tempered hardness, Rockwell C	 350 - 650°F (177 - 343°C) 50 - 64
Wear Resistance	Low to Medium
Toughness	High (l)
Resistance to Softening Effect of Elevated Temperature	Low
Depth of Hardening	Shallow
Machinability	Highest
Grindability	Highest
Distortion in Heat Treating	High
Safety in Hardening	Low to Medium
Resistance to Decarburization	Highest

Please refer to pg. 8-58 for notes (a) to (o) incl., explanation of letter 0, A, S, B and W.

**Unless otherwise specified, nickel plus copper equal 0.75% max. for all tool steel types.*

AISI H13

H13 is a 5% chromium hot work tool steel designed for applications that require extreme toughness combined with good red-hardness. H13 will allow an extra margin of safety in tools subject to heavy hammer blows, and those containing deep recesses or sharp corners. Although H13 was designed as a hot work steel, it has solved many cold work applications where extra toughness could be gained with some sacrifice of wear resistance.

Typical Applications

Aluminum Extrusion Dies, Die Casting Dies, Heavy Duty Compression Tools, Forming Punches, Hot Forging Dies, Shear Blades, Plastic Mold Dies, and Bolt Dies.

Typical Analysis	Type H13 (UNS T20813)
Carbon (C)	0.32 / 0.45
Manganese (Mn)	0.20 / 0.50
Silicon (Si)	0.80 / 1.20
Tungsten (W)	
Molybdenum (Mo)	1.10 / 1.75
Chromium (Cr)	4.75 / 5.50
Vanadium (V)	0.80 / 1.20
Cobalt (Co)	
*Nickel (Ni)	0.30 max
Forging (a) Start forging at Do not forge below	 1950 - 2100°F (1066 - 1149°C) 1650°F (899°C)
Normalizing (b)	Do not normalize
Annealing (c) Temperature Rate of cooling, max. per hour Typical annealed hardness, Brinell	 1550 - 1650°F (843 - 899°C) 40°F (22°C) 192 - 229
Hardening Rate of heating Preheat temperature Hardening temperature Time at temperature, minutes Quenching medium	 Moderately from preheat 1500°F (816°C) 1825 - 1900°F (996 - 1038°C) 15 - 40 (j) A (l)
Tempering Tempering temperature Approx. tempered hardness, Rockwell C	 1000-1200°F (k) (538-649°C) 38-53
Wear Resistance	Medium
Toughness	Very High
Resistance to Softening Effect of Elevated Temperature	High
Depth of Hardening	Deep
Machinability	Medium to High
Grindability	Medium to High
Distortion in Heat Treating	Very Low
Safety in Hardening	Highest
Resistance to Decarburization	Medium to High

Please refer to pg. 8-58 for notes (a) to (o) incl., explanation of letter 0, A, S, B and W.

**Unless otherwise specified, nickel plus copper equal 0.75% max. for all tool steel types.*

Viscount 44®

Prehardened AISI Type H13 Typical Analysis

Viscount 44® is fully heat treated H13 hot work steel with carefully controlled and evenly dispersed sulphide additives. It is the same analysis type as Latrobe's popular VDC, but the free-machining sulphides improve the machinability to the point where die work at a hardness of Rockwell C 42-46 is practical. It is thus possible to bypass the risk of heat treatment involved in tool building.

Prehardening gives Viscount 44® a tremendous advantage when used for hot work dies because of the constant danger of size change or distortion during heat treatment. The product also eliminates costly finishing operations after heat treatment.

Using prehardened Viscount 44® for extrusion tools makes it possible to produce dies, backers, bolsters, dummy blocks, etc. in a few hours, allowing extremely short delivery schedules to be met. In addition, the use of prehardened Viscount 44® for extrusion dies ensures clean metal at the bearing surfaces free from any possible decarburization, carburization, scale, sub-scale or other deleterious conditions sometimes encountered when finished dies are heat treated.

Field tests show that Viscount 44®'s performance in aluminum, magnesium, and zinc die casting dies is at best the equivalent of regular H13. Particular examples have shown that over 100,000 shots can be obtained in large dies and over 200,000 shots in smaller dies.

Field reports also indicate excellent performance with Viscount 44® on forging dies, plastic molds, extrusion tools, and other hot work tools.

Typical Analysis	Viscount 44®
Carbon (C)	0.40
Manganese (Mn)	0.80
Silicon (Si)	1.00
Tungsten (W)	
Molybdenum (Mo)	1.35
Chromium (Cr)	5.25
Vanadium (V)	1.00
Cobalt (Co)	
Tempering Approx. tempered hardness, Rockwell C	42 - 46
Wear Resistance	Medium
Toughness	Very High
Resistance to Softening Effect of Elevated Temperature	High
Depth of Hardening	
Machinability	Low
Grindability	Medium
Distortion in Heat Treating	
Safety in Hardening	
Resistance to Decarburization	

DRM1

Hot and Warm Forging Die Steel

DRM1 tool steel features high hardness and high tough Matrix type high speed tool steel vastly surpasses hot work die steels. DRM1 improves hot and warm die life by its higher toughness than conventional grade.

Typical Applications

Used for hot and warm forging dies and punches.

Typical Analysis	Type DRM1
Carbon (C)	0.60
Manganese (Mn)	0.50
Silicon (Si)	0.20
Tungsten (W)	3.00
Molybdenum (Mo)	1.00
Chromium (Cr)	4.20
Vanadium (V)	1.50
Cobalt (Co)	2.00
Annealing (c) Temperature Slow cooling Typical annealed hardness, Brinell	 1472 - 1616°F (800 - 880°C) ≤ 235HB
Hardening Rate of heating Preheat temperature Hardening temperature Time at temperature, minutes Quenching	 Moderately from preheat 1742°F (950°C) 2012 - 2084°F (1100 - 1140°C) 20-30 per inch of thickness for material under 4" 10-20 per inch of thickness for material 4" and over OQ-Oil Quenching, GC-Gas Quenching in vacuum furnace, Salt Bath, Similar to conventional high speed steels
Tempering Tempering temperature Approx. tempered hardness, Rockwell C	Minimal Double Temper AC-Air Cooling, 1022-1148°F (550-620°C) 56-58 HRC
Wear Resistance	Good
Toughness	Very High
Resistance to Softening Effect of Elevated Temperature	High
Machinability	Better and faster than conventional high speed steels
Grindability	Better and faster than conventional high speed steels

DRM2

Warm and Cold Forging Die Steel

DRM2 is a matrix type high speed tool steel available for warm and cold forging tools where critical performance is required. DRM2 prolongs service life due to its higher hardness and toughness than those of conventional grades.

Typical Applications

Used for warm and cold forging dies and punches.

Typical Analysis	Type DRM2
Carbon (C)	0.70
Tungsten (W)	1.00
Molybdenum (Mo)	2.40
Chromium (Cr)	5.50
Vanadium (V)	1.00
Annealing (c) Temperature Slow cooling Typical annealed hardness, Brinell	 1472 - 1616°F (800 - 880°C) ≤ 235HB
Hardening Rate of heating Preheat temperature Hardening temperature Time at temperature, minutes Quenching	 Moderately from preheat 1742°F (950°C) 1922 - 2012°F (1050 - 1100°C) 20-30 per inch of thickness for material under 4" 10-20 per inch of thickness for material 4" and over OQ-Oil Quenching, GC-Gas Quenching in vacuum furnace, Salt Bath, Similar to conventional high speed steels
Tempering Tempering temperature Approx. tempered hardness, Rockwell C	Minimal Double Temper AC-Air Cooling, 1022 - 1148°F (550 - 620°C) 58 - 62 HRC
Wear Resistance	Good
Toughness	High
Resistance to Softening Effect of Elevated Temperature	High
Machinability	Better and faster than conventional high speed steels
Grindability	Better and faster than conventional high speed steels

DRM3

Cold Forging Die Steel

Conventional grade MH88 has been improved to DRM3. High hardness and tough DRM3 with excellent hardenability is suitable for high precision cold working tools.

Typical Applications

Used for hot and warm forging dies and punches.

Typical Analysis	Type DRM3
Carbon (C)	0.80
Manganese (Mn)	0.35
Silicon (Si)	0.70
Tungsten (W)	0.95
Molybdenum (Mo)	4.35
Chromium (Cr)	5.50
Vanadium (V)	1.20
Annealing (c)	
Temperature	1472 - 1616°F (800 - 880°C)
Slow cooling	
Typical annealed hardness, Brinell	≤ 235HB
Hardening	
Rate of heating	Moderately from preheat
Preheat Temperature	1742°F (950°C)
Hardening temperature	2012 - 2084°F (1100 - 1140°C)
Time at temperature, minutes	30 - 90
Quenching	OQ-Oil Quenching, GC-Gas Quenching in vacuum furnace, Salt Bath, Similar to conventional high speed steels
Tempering	Minimal Double Temper AC-Air Cooling,
Tempering temperature	1022-1148°F (550-620°C)
Approx. tempered hardness, Rockwell C	62-66 HRC
Wear Resistance	Very High
Toughness	Good
Resistance to Softening Effect of Elevated Temperature	High
Machinability	Better and faster than conventional high speed steels
Grindability	Better and faster than conventional high speed steels

AISI M2

M2 is a tungsten-molybdenum high-speed steel and is a popular grade for general purpose cutting and non-cutting applications. It has a wider heat-treating range than most of the molybdenum high-speed steels, coupled with a resistance to decarburization that is characteristic of tungsten types. M2 offers an excellent combination of red hardness, toughness, and wear resistance. M2 is available in a wide variety of shapes and sizes. As with all Alro Specialty Metal products, M2 is subjected to a variety of rigid quality control tests and inspection to ensure quality, uniformity, and reliability.

Typical Applications

Broaches, Boring Tools, Chasers, Cold Forming Rolls, Cold Heading Inserts, Drills, End Mills, Form Tools, Hobs, Lathe and Planer Tools, Punches, Milling Cutters, Taps, Reamers, and Saws.

Typical Analysis	Type M2 (UNS T11302)
Carbon (C)	0.78 / 0.88
Manganese (Mn)	0.15 / 0.88
Silicon (Si)	0.20 / 0.45
Tungsten (W)	5.50 / 6.75
Molybdenum (Mo)	4.50 / 5.50
Chromium (Cr)	3.75 / 4.50
Vanadium (V)	1.75 / 2.20
Nickel (Ni)	0.30 max
Forging (a) Start forging at Do not forge below	 1900 - 2100°F (1038 - 1149°C) 1700°F (927°C)
Normalizing (b)	Do not normalize
Annealing (c) Temperature Rate of cooling, max. per hour Typical annealed hardness, Brinell	 1600 - 1650°F (871 - 899°C) 40°F (22°C) 212 - 241
Hardening Rate of heating Preheat Temperature Hardening temperature Time at temperature, minutes Quenching medium	 Rapidly from preheat 1350-1550°F (732-843°C) 2175-2250°F (h) (1191-1232°C) 2-5 O, A, or S (l)
Tempering Tempering temperature Approx. tempered hardness, Rockwell C	 1000-1100°F (538-593°C) 60-65
Wear Resistance	Very High
Toughness	Low
Resistance to Softening Effect of Elevated Temperature	Very High
Depth of Hardening	Deep
Machinability	Medium
Grindability	Low
Distortion in Heat Treating	A or S: Low/O: Medium
Safety in Hardening	Medium
Resistance to Decarburization	High

AISI M3

M3 was developed after extensive studies of the effect of increased carbon and vanadium contents on the intermediate molybdenum-tungsten high-speed steels. The analysis was tried and proven on practically all high-speed steel applications. M3 offers the unusual combination of extremely high-edge strength at high hardness levels. With few exceptions, best life is accomplished with a minimum hardness of 65.5 Rockwell C. Experience indicates that the chemical balance achieved in M3 results in optimum combination of cutting ability, abrasion resistance, edge strength, red hardness, and long service life. M3 is more readily machined and offers less grinding resistance than higher vanadium types.

Typical Applications

Drills, Taps, End Mills, Reamers, Counterbores, Broaches, Hobs, Form Tools, Lathe and Planer Tools, Checking Tools, Milling Cutters, Slitting Saws, Punches, Drawing Dies, and Wood Working Knives.

Typical Analysis	Type M3 (UNS T11313)
Carbon (C)	1.00 - 1.10
Manganese (Mn)	0.15 - 0.40
Silicon (Si)	0.20 - 0.45
Tungsten (W)	5.00 - 6.75
Molybdenum (Mo)	4.75 - 6.50
Chromium (Cr)	3.75 - 4.50
Vanadium (V)	2.25 - 2.75
Nickel (Ni)	0.30 max
Forging (a) Start forging at Do not forge below	 1900 - 2100°F (1038 - 1149°C) 1700°F (927°C)
Normalizing (b)	Do not normalize
Annealing (c) Temperature Rate of cooling, max. per hour Typical annealed hardness, Brinell	 1600 - 1650°F (871 - 899°C) 40°F (22°C) 223 - 255
Hardening Rate of heating Preheat Temperature Hardening temperature Time at temperature, minutes Quenching medium	 Rapidly from preheat 1350 - 1550°F (732-843°C) 2200 - 2250°F (h) (1191 - 1232°C) 2 - 5 O, A, or S (l)
Tempering Tempering temperature Approx. tempered hardness, Rockwell C	 1000-1100°F (538-593°C) 61 - 66
Wear Resistance	Highest
Toughness	Low
Resistance to Softening Effect of Elevated Temperature	Very High
Depth of Hardening	Deep
Machinability	Medium
Grindability	Very Low
Distortion in Heat Treating	A or S: Low/O: Medium
Safety in Hardening	Medium
Resistance to Decarburization	High

AISI M4 (PM)

M4 PM, a member of the molybdenum-tungsten family of high-speed steels, is a special purpose grade which utilizes its higher carbon and vanadium contents to develop excellent abrasion resistance. Produced conventionally, M4 is difficult to machine in the annealed condition and grind in the hardened condition. M4 PM is produced by the powder metallurgy process and allows an addition of .06/.08 sulfur which provides a uniform dispersion of small sulfides throughout the structure and enhances machinability. Coupled with finer carbides and structural uniformity, better grindability is also achieved. These factors, along with increased toughness, are ideally suited for heavy-duty cold-work applications.

Typical Applications

Blades, Broaches, Chasers, Die Inserts, Form Tools, Lathe and Planer Tools, Milling Cutters, Punches, Reamers, Slitter Knives, Spade Drills, and Taps.

Typical Analysis	Type M4 PM (UNS T11304)
Carbon (C)	1.30
Manganese (Mn)	0.30
Silicon (Si)	0.40
Tungsten (W)	5.50
Molybdenum (Mo)	4.50
Chromium (Cr)	4.50
Vanadium (V)	4.00
Sulphur (S)	0.07
Forging (a) Start forging at Do not forge below	
Annealing (c) Temperature Rate of cooling, max. per hour Typical annealed hardness, Brinell	 1550 - 1600°F (843 - 871°C)
Hardening Rate of heating Preheat Temperature Hardening temperature Time at temperature, minutes Quenching medium	 1450 - 1550°F (788 - 843°C) 2150 - 2250°F (h) (1176 - 1232°C) 10 - 30 O (I)
Tempering Tempering temperature Approx. tempered hardness, Rockwell C	 1000 - 1100°F (538 - 593°C) 62 - 66
Wear Resistance	Highest
Toughness	Low
Resistance to Softening Effect of Elevated Temperature	Very High
Depth of Hardening	Deep
Machinability	Medium
Grindability	High
Distortion in Heat Treating	Low
Safety in Hardening	Medium
Resistance to Decarburization	Medium

AISI M42

M42 is a molybdenum-cobalt high-speed steel capable of being hardened to 70 Rockwell C. The carbon content is higher than in most high-speed steels, and with this balanced composition, contributes to wear resistance and hot hardness as well as the high hardness capability. M42 exhibits good grindability and relatively good toughness at high hardness levels. M42 is being used for the machining of heat treated materials (high hardness) and high temperature alloys.

Typical Applications

Broaches, Circular and Dovetail Form Tools, Drills, End Mills, Lathe Tools, Milling Cutters, Punches, Reamers, Slitting Saws, and Twist Drills.

Typical Analysis	Type M42 (UNS T11342)
Carbon (C)	1.05 - 1.15
Manganese (Mn)	0.15 - 0.40
Silicon (Si)	0.15 - 0.65
Tungsten (W)	1.15 - 1.85
Molybdenum (Mo)	9.00 - 10.00
Chromium (Cr)	3.50 - 4.25
Vanadium (V)	0.95 - 1.35
Cobalt (Co)	7.75 - 8.75
Nickel (Ni)	0.30 max
Forging (a)	
Start forging at	1900 - 2100°F (1038 - 1149°C)
Do not forge below	1700°F (927°C)
Annealing (c)	
Temperature	1600 - 1650°F (871 - 899°C)
Rate of cooling, max. per hour	40°F (22°C)
Typical annealed hardness, Brinell	235 - 269
Hardening	
Rate of heating	Rapidly from preheat
Preheat Temperature	1350 - 1550°F (733 - 843°C)
Hardening temperature	2125 - 2175°F (h)(o) (1163 - 1191°C)
Time at temperature, minutes	2 - 5
Quenching medium	O, A, or S (I)
Tempering	
Tempering temperature	950-1100°F (510-593°C)
Approx. tempered hardness, Rockwell C	65-70
Wear Resistance	Very High to Highest
Toughness	Low
Resistance to Softening Effect of Elevated Temperature	Highest
Depth of Hardening	Deep
Machinability	Medium
Grindability	Low
Distortion in Heat Treating	A or S: Low/O: Medium
Safety in Hardening	Low to Medium
Resistance to Decarburization	Low

AISI T15 (PM)

T15 PM is a tungsten high-speed steel designed for use in machining operations requiring heavy cuts, high speeds and feeds. Its primary use is in applications requiring the machining of high-hardness heat-treated materials such as high temperature alloys. The high carbon, vanadium, and cobalt contents contribute to good wear resistance, hot hardness and good hardness capabilities. T15 PM is produced by the powder metallurgy process which has resulted in improved quality from the standpoint of structural uniformity, response to heat treatment and grindability. These factors, along with increased toughness, are increased usage in the industry because of its recognized superior cutting ability.

Typical Applications

Broaches, Chasers, Form Tools, Heavy Duty Cutting Tools, High Production Blades, Milling Cutters, Reamers, and Taps.

Typical Analysis	Type T15 PM (UNS T12015)
Carbon (C)	1.55
Manganese (Mn)	0.30
Silicon (Si)	0.30
Tungsten (W)	12.25
Molybdenum (Mo)	
Chromium (Cr)	4.00
Vanadium (V)	5.00
Cobalt (Co)	5.00
Forging (a) Start forging at Do not forge below	
Annealing (c) Temperature Rate of cooling, max. per hour Typical annealed hardness, Brinell	 1600 - 1650°F (871 - 899°C)
Hardening Rate of heating Preheat Temperature Hardening temperature Time at temperature, minutes Quenching medium	 1450 - 1500°F (788 - 816°C) 2175 - 2225°F (h)(o) (1190 - 1218°C)
Tempering Tempering temperature Approx. tempered hardness, Rockwell C	 1000 - 1100°F (538 - 593°C) 66 - 68
Wear Resistance	Highest
Toughness	Low
Resistance to Softening Effect of	
Elevated Temperature	Very High
Depth of Hardening	Deep
Machinability	Medium
Grindability	High
Distortion in Heat Treating	Medium
Safety in Hardening	Medium
Resistance to Decarburization	Medium

Heat Treating Notes

(a) The temperature at which to start heat treating is given as a range, the higher side of which should be used for large sections and heavy or rapid reductions, and the lower side for smaller sections and lighter reduction. As the alloy content of steel increases, the time of soaking at forging temperature increases proportionately. Likewise, as the alloy content increases, it becomes necessary to cool slowly from the maximum heating temperature. With very high alloy steels, such as high-speed steels and air- hardening steels, this slow cooling is imperative in order to prevent cracking and to leave the steel in semi-soft condition. Either furnace cooling or burying in an insulating medium, such as lime, mica, or silocel is satisfactory.

(b) The length of time the steel is held after being uniformly heated through at the normalizing temperature varies from about 15 minutes for a small section to about one hour for large sizes. Cooling from the normalizing temperature is done in still air. The purpose of normalizing after forging is to refine the grain structure and to produce a uniform structure throughout the forging. Normalizing should not be confused with low temperature [about 1200°F (649°C)] annealing used for the relief of residual stresses resulting from heavy machining, bending, and forming.

(c) The annealing temperature is given as a range, the upper limit of which should be used for large sections and the lower limit for smaller sections. The length of time the steel is held after being uniformly heated through at the annealing temperature varies from about one hour for light sections and small furnace charges of carbon or low alloy tool steel to about four hours for heavy sections and large furnace charges of high alloy steel.

(d) Normalizing, annealing, and hardening temperatures of carbon tool steels are given as ranges as they vary with carbon content. The following temperatures are suggested:

Normalizing

0.60 to 0.75%	C: 1500°F (816°C)
0.75 to 0.90%	C: 1450°F (788°C)
0.90 to 1.10%	C: 1600°F (871°C)
1.10 to 1.40%	C: 1600 to 1700°F (871 to 927°C)

Annealing

0.60 to 0.90%	C: 1360 to 1400°F (738 to 760°C)
0.90 to 1.40%	C: 1400 to 1450°F (760 to 788°C)

(e) Varies with carbon content as follows:

0.60-0.80%	C: 1450-1550°F (788 to 843°C)
0.85-1.05%	C: 1425-1550°F (774 to 843°C)
1.10-1.40%	C: 1400-1525°F (760 to 829°C)

(f) Toughness decreases with increasing carbon content and depth of hardening.

(g) For large tools and tools having intricate sections, preheating at 1050-1200°F (566-649°C) is recommended.

(h) When high temperature heating is carried out in a salt bath, the range of temperatures should be about 25°F (14°C) lower than that shown.

(j) Times shown apply to open furnace heat treatment. For pack hardening a common rule is to heat for 1/2 hour per inch (25.4 mm) of cross section of the pack.

(k) Double tempering suggested for not less than one hour at temperature each temper.

(l) O: Oil quench
A: Air Cool
S: Salt bath quench
B: Brine quench
W: Water quench

(m) Triple tempering suggested for not less than one hour at temperature each temper.

(n) When high carbon material is involved, lowering of the hardening temperature an additional 25°F (14°C) is suggested. This is in addition to the 25°F (14°C) reduction involving salt bath hardening.

(o) Available in two silicon contents, nominally 0.33% and 0.55%. When 0.55% silicon is used, the maximum suggested hardening temperature is 2150°F (1177°C).

Tool Wrap

Tool Wrap is a revolutionary new approach to the heat treatment process. Here's how it works: wrap your parts in our special Tool Wrap as you would a package or a sandwich because Tool Wrap can be wrinkled, folded or cut with scissors (.002 thick T321 Stainless). Then place in your furnace and air cool as usual with the Tool Wrap on the material. Try Tool Wrap on all air hardening grades and hot work steels.

Consider the following advantages of Tool Wrap:

- ✓ No costly atmosphere or special controls needed.
- ✓ No time consuming Ni chrome box packing.
- ✓ Scale free heat treating.
- ✓ Hardened parts remain scale free, minimizing grinding.

Grade Availability		
Grade	**Thickness**	**Maximum Temperature**
321 Stainless	.002"	2000°F (1093°C)
309 Stainless	.002"	2240°F (1093°C)

Tool Wrap edges are extremely sharp, gloves should always be worn when working with Tool Wrap.

Tool Steel Flats and Squares (DCF)

Size (inches)		Weight (lbs./foot)
3/8 x	1/2	0.785
	3/4	1.126
	1	1.466
	1-1/4	1.806
	1-3/8	1.977
	1-1/2	2.147
	1-3/4	2.487
	2	2.827
	2-1/4	3.168
	2-1/2	3.508
	2-3/4	3.848
	3	4.189
	3-1/2	4.869
	3-3/4	5.210
	4	5.550
	4-1/2	6.231
	5	6.911
	6	8.272
	6-1/2	8.953
	7	9.634
	8	10.995
	9	12.356
	10	13.718
	12	18.691
1/2 x	1/2	1.031
	5/8	1.254
	3/4	1.478
	7/8	1.701

Size (inches)		Weight (lbs./foot)
1/2 x	1	1.924
	1-1/8	2.148
	1-1/4	2.371
	1-3/8	2.594
	1-1/2	2.818
	1-3/4	3.264
	1-7/8	3.488
	2	3.711
	2-1/4	4.158
	2-1/2	4.604
	2-3/4	5.051
	3	5.498
	3-1/4	5.944
	3-1/2	6.391
	4	7.284
	4-1/2	8.178
	5	9.071
	5-1/2	9.964
	6	10.858
	6-1/2	11.751
	7	12.644
	8	14.431
	9	16.218
	10	18.004
	12	23.849
	14	27.783
	16	31.717

Size (inches)		Weight (lbs./foot)
5/8 x	5/8	1.553
	3/4	1.829
	7/8	2.106
	1	2.382
	1-1/8	2.659
	1-1/4	2.935
	1-3/8	3.212
	1-1/2	3.488
	1-3/4	4.041
	2	4.594
	2-1/4	5.148
	2-1/2	5.701
	2-3/4	6.254
	3	6.807
	3-1/4	7.360
	3-1/2	7.913
	4	9.019
	4-1/2	10.125
	5	11.231
	5-1/2	12.337
	6	13.443
	6-1/2	14.549
	7	15.655
	8	17.867
	9	20.079
	10	22.291
	12	29.006

Tool Steel Flats and Squares (DCF)

Size (inches)		Weight (lbs./foot)
3/4 x	3/4	2.181
	7/8	2.511
	1	2.841
	1-1/8	3.170
	1-1/4	3.500
	1-3/8	3.830
	1-1/2	4.159
	1-3/4	4.819
	2	5.478
	2-1/4	6.137
	2-1/2	6.797
	2-3/4	7.456
	3	8.116
	3-1/4	8.775
	3-1/2	9.434
	4	10.753
	4-1/2	12.072
	5	13.390
	5-1/2	14.709
	6	16.028
	6-1/2	17.347
	7	18.665
	8	21.303
	9	23.940
	10	26.578
	12	34.164
	14	39.799
	16	45.435
	20	56.706
7/8 x	7/8	2.916
	1	3.299
	1-1/8	3.682
	1-1/4	4.064
	1-3/8	4.447
	1-1/2	4.830
	1-3/4	5.596
	2	6.362
	2-1/4	7.127
	2-1/2	7.893
	2-3/4	8.659
	3	9.424
	3-1/4	10.190
	3-1/2	10.956
	4	12.487
	4-1/2	14.019
	5	15.550
	5-1/2	17.082
	6	18.613

Size (inches)		Weight (lbs./foot)
7/8 x	7	21.676
	8	24.739
	9	27.802
	10	30.865
	12	39.321
1 x	1	3.757
	1-1/4	4.629
	1-3/8	5.065
	1-1/2	5.501
	1-3/4	6.373
	2	7.245
	2-1/4	8.117
	2-1/2	8.989
	2-3/4	9.861
	3	10.733
	3-1/2	12.478
	4	14.222
	4-1/2	15.966
	5	17.710
	5-1/2	19.454
	6	21.198
	6-1/2	22.942
	7	24.687
	8	28.175
	9	31.663
	10	35.151
	12	44.479
	14	51.816
	16	59.153
1-1/8 x	1-1/8	4.704
	1-1/4	5.193
	1-1/2	6.172
	1-3/4	7.150
	2	8.129
	2-1/4	9.107
	2-1/2	10.086
	2-3/4	11.064
	3	12.042
	3-1/2	13.999
	4	15.956
	4-1/2	17.913
	5	19.870
1-1/8 x	5-1/2	21.827
	6	23.783
	8	31.611
	10	39.438
	12	49.636

Size (inches)		Weight (lbs./foot)
1-1/4 x	1-1/4	5.758
	1-1/2	6.843
	1-3/4	7.927
	2	9.012
	2-1/4	10.097
	2-1/2	11.182
	2-3/4	12.267
	3	13.351
	3-1/2	15.521
	4	17.690
	4-1/2	19.860
	5	22.030
	5-1/2	24.199
	6	26.369
	7	30.708
	8	35.047
	9	39.386
	10	43.725
	12	54.794
	16	72.872
	20	90.949
	24	109.027
1-3/8 x	1-3/8	6.918
	1-1/2	7.514
	1-3/4	8.705
	2	9.896
	2-1/4	11.087
	2-1/2	12.278
	2-3/4	13.469
	3	14.660
	3-1/2	17.043
	4	19.425
	4-1/2	21.807
	5	24.189
	5-1/2	26.572
	6	28.954
	8	38.483
	9	43.247
	10	48.012
	12	59.951
1-1/2x	1-1/2	8.184
	1-3/4	9.482
	2	10.779
	2-1/4	12.077
	2-1/2	13.374
	2-3/4	14.672
	3	15.969

DCF Thickness and Width Oversize Ranges :

Width (based on thickness)	
Thru < 4" thick	+0.035 to +0.077 oversize
Rough Milled 4" thru < 5"	+0.062 to +0.124 oversize
Rough Milled 5" and over	+0.062 to +0.124 oversize

Thickness	
Thru < 4" thick	+0.015 to +0.035 oversize
Rough Milled 4" thru < 5"	+0.062 to +0.125 oversize
Rough Milled 5" and over	+0.125 to +0.250 oversize

***Note:** Actual weight may vary because of oversize tolerance. Sizes not listed above can be cut from plate. For Powdered Metal add 3% for weight.*

Tool Steel Flats and Squares (DCF)

Size (inches)		Weight (lbs./foot)
1-1/2x	3-1/2	18.564
	4	21.159
	4-1/2	23.754
	5	26.349
	5-1/2	28.944
	6	31.539
	7	36.729
	8	41.919
	9	47.109
	10	52.298
	12	65.109
	16	86.590
	20	108.071
	24	129.552
1-3/4x	1-3/4	11.036
	2	12.546
	2-1/4	14.057
	2-1/2	15.567
	2-3/4	17.077
	3	18.587
	3-1/2	21.608
	4	24.628
	4-1/2	27.648
	5	30.669
	5-1/2	33.689
	6	36.709
	7	42.750
	8	48.791
	9	54.831
	10	60.872
	12	75.424
2 x	2	14.314
	2-1/4	16.036
	2-1/2	17.759
	2-3/4	19.482
	3	21.205
	3-1/2	24.651
	4	28.097
	4-1/2	31.542
	5	34.988
	5-1/2	38.434
	6	41.880
	7	48.771
	8	55.662
	9	62.554
	10	69.445

Size (inches)		Weight (lbs./foot)
2 x	12	85.739
	16	114.027
	20	142.314
	24	170.601
2-1/4x	2-1/4	18.016
	2-1/2	19.952
	2-3/4	21.887
	3	23.823
	3-1/2	27.694
	4	31.565
	4-1/2	35.436
	5	39.308
	5-1/2	43.179
	6	47.050
	7	54.792
	8	62.534
	9	70.277
	10	78.019
	12	96.054
2-1/2x	2-1/2	22.144
	2-3/4	24.293
	3	26.441
	3-1/2	30.737
	4	35.034
	4-1/2	39.331
	5	43.627
	5-1/2	47.924
	6	52.220
	7	60.813
	8	69.406
	9	77.999
	10	86.592
2-1/2x	12	106.369
	16	141.463
	20	176.557
	24	211.651
2-3/4x	2-3/4	26.698
	3	29.059
	3-1/2	33.781
	4	38.503
	4-1/2	43.225
	5	47.947
	5-1/2	52.669
	6	57.390
	7	66.834
	8	76.278
	9	85.722

Size (inches)		Weight (lbs./foot)
2-3/4x	10	95.166
	12	116.684
	16	155.181
	20	193.678
	24	232.175
3 x	3	31.677
	3-1/2	36.824
	4	41.971
	4-1/2	47.119
	5	52.266
	5-1/2	57.413
	6	62.561
	7	72.855
	8	83.150
	9	93.445
	10	103.739
	12	127.000
	16	168.900
	20	210.800
3-1/2x	3-1/2	42.911
	4	48.909
	4-1/2	54.907
	5	60.905
	5-1/2	66.903
	6	72.901
	7	84.898
	8	96.894
	9	108.890
	10	120.887
	12	147.630
	16	196.336
	20	245.043
4 x	4	55.846
	4-1/2	62.695
	5	69.544
	5-1/2	76.393
	6	83.242
	7	96.940
	8	110.638
	9	124.336
	10	138.034
	12	168.260
	16	223.773
	20	279.286

DCF Thickness and Width Oversize Ranges :

Width (based on thickness)	
Thru < 4" thick	+0.035 to +0.077 oversize
Rough Milled 4" thru < 5"	+0.062 to +0.124 oversize
Rough Milled 5" and over	+0.062 to +0.124 oversize

Thickness	
Thru < 4" thick	+0.015 to +0.035 oversize
Rough Milled 4" thru < 5"	+0.062 to +0.125 oversize
Rough Milled 5" and over	+0.125 to +0.250 oversize

Note: Actual weight may vary because of oversize tolerance. Sizes not listed above can be cut from plate. For Powdered Metal add 3% for weight.

Tool Steel Flats and Squares (DCF)

Size (inches)		Weight (lbs./foot)
4-1/2 x	4-1/2	72.041
	5	79.831
	6	95.411
	8	126.571
	10	157.730

Size (inches)		Weight (lbs./foot)
5 x	5	88.550
	5-1/2	97.191
	6	105.832
	7	123.113
	8	140.394
	10	174.957
	12	209.520
5-1/2x	5-1/2	106.761
	6	116.252
	8	154.218
	10	192.184

Size (inches)		Weight (lbs./foot)
6 x	6	126.673
	7	147.357
	8	168.042
	10	209.411
	12	250.781

*** 10" thick plate is available in some grades. Please inquire.**

DCF Thickness and Width Oversize Ranges :

Width (based on thickness)	
Thru < 4" thick	+0.035 to +0.077 oversize
Rough Milled 4" thru < 5"	+0.062 to +0.124 oversize
Rough Milled 5" and over	+0.062 to +0.124 oversize

Thickness	
Thru < 4" thick	+0.015 to +0.035 oversize
Rough Milled 4" thru < 5"	+0.062 to +0.125 oversize
Rough Milled 5" and over	+0.125 to +0.250 oversize

Note: Actual weight may vary because of oversize tolerance. Sizes not listed above can be cut from plate. For Powdered Metal add 3% for weight.

Carbon and Alloy Plate Tolerances

Tolerance Over Specified Thickness for Widths Given (inches)								
Specified Thickness (inches)	**Up thru 48"**	**>48" up to 60"**	**>60" up to 72"**	**>72" up to 84"**	**>84" up to 96"**	**>96" up to 108"**	**>108" up to 120"**	**>120" up to 132"**
Up thru 1/4	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
>1/4 to 5/16	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04
5/16 to 3/8	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04
3/8 to 7/16	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04
7/16 to 1/2	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04
1/2 to 5/8	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04
5/8 to 3/4	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.04
3/4 to 1	0.03	0.03	0.03	0.03	0.04	0.04	0.05	0.05
1 to 2	0.06	0.06	0.06	0.06	0.06	0.07	0.08	0.10
2 to 3	0.09	0.09	0.09	0.10	0.10	0.11	0.12	0.13
3 to 4	0.11	0.11	0.11	0.11	0.11	0.13	0.14	0.14
4 to 6	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
6 to 10	0.23	0.24	0.24	0.24	0.24	0.24	0.24	0.24
10 to 12	0.29	0.29	0.33	0.33	0.33	0.33	0.33	0.33
12 to 15	0.29	0.29	0.35	0.35	0.35	0.35	0.35	0.35

Permissible variations in thickness for rectangular carbon, high strength, low alloy and alloy-steel plates, when ordered to thickness.
Note[1]: Permissible variation under specificed thickness - 0.01"
Note[2]: Thickness to be measured at 3/8" to 3/4" from longitudinal edge.
Note[3]: For thickness measured at any location other than that specified in Note[2], the permissible maximum over tolerance shall be increased by 75%, rounded to the nearest 0.01".

Tool Steel Rounds (DCF)

Diameter (inches)	Weight (lbs./foot)
1/4	.182
5/16	.285
3/8	.404
7/16	.545
1/2	.727
9/16	.912
5/8	1.117
11/16	1.344
3/4	1.591
7/8	2.157
1	2.799
1-1/8	3.525
1-1/4	4.335
1-3/8	5.225
1-1/2	6.206
1-5/8	7.408
1-3/4	8.564
1-7/8	9.803
2	11.125
2-1/8	12.531
2-1/4	14.021
2-3/8	15.595
2-1/2	17.252
2-5/8	18.993

Diameter (inches)	Weight (lbs./foot)
2-3/4	20.817
2-7/8	22.725
3	25.778
3-1/8	27.896
3-1/4	30.099
3-1/2	34.754
3-3/4	39.745
4	45.070
4-1/4	51.079
4-1/2	57.094
4-3/4	63.443
5	70.126
5-1/4	77.145
5-1/2	84.498
5-3/4	92.185
6	100.207
6-1/4	109.830
6-1/2	118.571
6-3/4	127.646
7	137.057
7-1/4	149.891
7-1/2	160.074
7-3/4	170.592
8	181.445

Diameter (inches)	Weight (lbs./foot)
8-1/2	204.154
8-3/4	211.460
9	228.202
9-1/2	253.589
10	280.423
10-1/2	308.492
11	337.900
11-1/2	368.646
12	400.928
12-1/2	434.359
13	469.130
13-1/2	505.238
14	543.372
14-1/2	582.182
15	622.331
16	706.644
17	796.311
18	891.333
19	991.709
20	1097.440
22	1324.964
24	1573.907
26	1844.266
28	2136.044

Notes: For Powdered Metal add 3% for weight.

DC53 rounds under 6-1/2" are hot rolled and oversized to finish at their normal size. Rounds 6-1/2" and over are rough turned and oversized to finish at their normal size. DC-53 is ordered to metric sizes and the weight (lbs./ft.) may vary compared to the imperial measurements.

M2 rounds are available in on-size diameters and oversize diameters. M2 rounds are available in 3/8" to 6" diameters.

Tool Steel
Thickness & Width Oversize Ranges

De-Carb Free Flats and Squares

Size (inches)	Width - Based on Thickness (inches)	Thickness (inches)
Through 4" thick	+.035 / +.077 oversize	+.015 / +.035 oversize
Rough Milled 4" thru <5"	+.062 / +.124 oversize	+.062 / +.125 oversize
Rough Milled 5" and over	+.062 / +.124 oversize	+.125 / +.250 oversize

De-Carb Rounds, Typical Machining Allowances

	Nominal Size (inches)	Oversize Tolerance (inches)
	1/2 to under 3	+0.007 to +0.062
Rough Turned Tolerances:	3 thru 6	+0.020 to +0.186
(All rounds 3" diameter and	Over 6 thru 7	+0.060 to +0.250
over are supplied with a	Over 7 thru 18	+0.090 to +0.375
Rough Turned tolerance)	Over 18	+0.118 to +0.375

Machining and Decarburization Allowances

When ordering hot rolled bar stock, allowances must be made for machining in order to remove all decarburized surface. Decarburization is caused by heating for forging or rolling, and annealing. To obtain a uniform surface hardness and keep warpage to a minimum on finished tools, it is necessary to remove all the decarburization from all surfaces before hardening.

The minimum allowances for machining and the maximum decarburization limits for rounds, hexagons, octagons, and flats are given in the following tables.

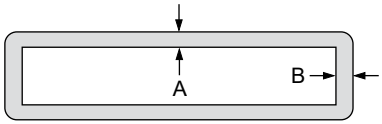
Minimum Allowances Per Side for Machining Prior to Heat Treatment for Hot Rolled Rounds

Ordered Size (inches)	Hot Rolled	Forged	Rounds Rough Turned
Up to 1/2, incl.	.016	—	—
Over 1/2 to 1, incl.	.031	—	—
Over 1 to 2, incl.	.048	.072	—
Over 2 to 3, incl.	.063	.094	.020
Over 3 to 4, incl.	.088	.120	.024
Over 4 to 5, incl.	.112	.145	.032
Over 5 to 6, incl.	.150	.170	.040
Over 6 to 8, incl.	.200	.200	.048
Over 8	—	.200	.072

Tool Steel, Hot Rolled

Machining and Decarburization Allowances

Maximum Decarburization Limits — 80% of allowances per side for machining



Minimum Allowances Per Side for Machining Prior to Heat Treatment for Hot-Rolled Square and Flat Bars

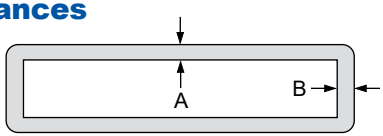
Specified Thickness (inches)		Specified Width (inches)					
		0 to 1/2 incl.	Over 1/2 to 1 incl.	Over 1 to 2 incl.	Over 2 to 3 incl.	Over 3 to 4 incl.	Over 4 to 5 incl.
0 to 1/2, incl.	A	.025	.025	.030	.035	.040	.045
	B	.025	.036	.044	.056	.068	.092
Over 1/2 to 1, incl.	A	---	.045	.045	.050	.055	.060
	B	---	.045	.052	.064	.080	.104
Over 1 to 2, incl.	A	---	---	.065	.065	.070	.070
	B	---	---	.065	.075	.084	.112
Over 2 to 3, incl.	A	---	---	---	.085	.085	.085
	B	---	---	---	.085	.102	.120
Over 3 to 4, incl.	A	---	---	---	---	.115	.115
	B	---	---	---	---	.115	.127
Over 4 to 5, incl.	A	---	---	---	---	---	.150
	B	---	---	---	---	---	.150
Over 5 to 6, incl.	A	---	---	---	---	---	---
	B	---	---	---	---	---	---
Over 6	A	---	---	---	---	---	---
	B	---	---	---	---	---	---

Specified Thickness (inches)		Specified Width (inches)				
		Over 5 to 6, incl.	Over 6 to 7, incl.	Over 7 to 8, incl.	Over 8 to 9, incl.	Over 9 to 10, incl.
0 to 1/2, incl.	A	.050	.055	.060	.060	.060
	B	.104	.120	.136	.144	.152
Over 1/2 to 1, incl.	A	.070	.070	.075	.075	.075
	B	.120	.136	.160	.160	.160
Over 1 to 2, incl.	A	.075	.075	.090	.095	.100
	B	.124	.144	.168	.180	.180
Over 2 to 3, incl.	A	.085	.090	.100	.100	.100
	B	.136	.160	.180	.190	.190
Over 3 to 4, incl.	A	.115	.115	.125	.125	.125
	B	.140	.180	.190	.190	.190
Over 4 to 5, incl.	A	.150	.150	.150	.150	.150
	B	.165	.180	.190	.190	.190
Over 5 to 6, incl.	A	.190	.190	.190	.190	.190
	B	.190	.190	.190	.190	.190
Over 6	A	---	.250	.250	.250	.250
	B	---	.250	.250	.250	.250

Tool Steel, Hot Rolled

Machining and Decarburization Allowances

Minimum Allowances Per Side for Machining of Forged Squares and Flat Bars



Specified Thickness (inches)		Specified Width (inches) 0 to 1/2 incl.	Over 1/2 to 1 incl.	Over 1 to 2 incl.	Over 2 to 3 incl.	Over 3 to 4 incl.	Over 4 to 5 incl.
0 to 1/2, incl.	A	.030	.030	.035	.040	.045	.055
	B	.030	.048	.064	.080	.100	.120
Over 1/2 to 1, incl.	A	---	.060	.060	.065	.065	.075
	B	---	.060	.072	.084	.100	.120
Over 1 to 2, incl.	A	---	---	.090	.090	.090	.100
	B	---	---	.090	.100	.108	.124
Over 2 to 3, incl.	A	---	---	---	.120	.120	.125
	B	---	---	---	.120	.130	.140
Over 3 to 4, incl.	A	---	---	---	---	.150	.150
	B	---	---	---	---	.150	.150
Over 4 to 5, incl.	A	---	---	---	---	---	.180
	B	---	---	---	---	---	.180
Over 5 to 6, incl.	A	---	---	---	---	---	---
	B	---	---	---	---	---	---
Over 6	A	---	---	---	---	---	---
	B	---	---	---	---	---	---

Specified Thickness (inches)		Specified Width (inches) Over 5 to 6, incl.	Over 6 to 7, incl.	Over 7 to 8, incl.	Over 8 to 9, incl.	Over 9 to 10, incl.
0 to 1/2, incl.	A	.065	.070	.075	---	---
	B	.144	.168	.200	---	---
Over 1/2 to 1, incl.	A	.080	.085	.090	.100	.110
	B	.144	.168	.200	.200	.200
Over 1 to 2, incl.	A	.110	.115	.125	.140	.150
	B	.148	.172	.200	.200	.200
Over 2 to 3, incl.	A	.130	.135	.150	.160	.175
	B	.148	.172	.200	.200	.200
Over 3 to 4, incl.	A	.160	.180	.190	.210	.225
	B	.160	.180	.190	.210	.225
Over 4 to 5, incl.	A	.180	.190	.210	.225	.250
	B	.180	.190	.210	.225	.250
Over 5 to 6, incl.	A	.210	.225	.225	.250	.250
	B	.210	.225	.225	.250	.250
Over 6	A	---	.250	.250	.250	.250
	B	---	.250	.250	.250	.250

Other Products

Additional Metal Product Offerings

WARNING: These products can potentially expose you to chemicals including Nickel, Chromium, Lead, Cobalt, Mercury and Beryllium, which are known to the state of California to cause cancer and/or birth defects or other reproductive harm. For more information, visit **www.P65Warnings.ca.gov**

Flat Ground Stock Size Chart

Low Carbon • A-2 • A-6 • D-2 • O-1 • O-6 • S-7 • 4142

Size (inches)	Weight (lbs./inch)
1/16 x	
1/2	0.009
3/4	0.013
1-1/4	0.022
2	0.035
2-1/2	0.044
3	0.053
3-1/2	0.062
4	0.071
5	0.089
6	0.106
8	0.142
10	0.177
12	0.213
3/32 x	
1/2	0.013
3/4	0.020
1	0.027
1-1/4	0.033
1-1/2	0.040
2	0.053
2-1/2	0.066
3	0.080
3-1/2	0.093
4	0.106
5	0.133
6	0.159
8	0.213
10	0.266
12	0.319
1/8 x	
1/2	0.018
3/4	0.027
1	0.035
1-1/4	0.044
1-1/2	0.053
2	0.071
2-1/2	0.089
3	0.106
3-1/2	0.124
4	0.142
5	0.177
6	0.213
8	0.283
10	0.354
12	0.425

Size (inches)	Weight (lbs./inch)
5/32 x	
1/2	0.022
3/4	0.033
1	0.044
1-1/4	0.055
1-1/2	0.066
2	0.089
2-1/2	0.111
3	0.133
3-1/2	0.155
4	0.177
5	0.221
6	0.266
8	0.354
10	0.443
12	0.531
3/16 x	
3/16	0.010
1/2	0.027
3/4	0.040
1	0.053
1-1/4	0.066
1-1/2	0.080
2	0.106
2-1/2	0.133
3	0.159
3-1/2	0.186
4	0.213
5	0.266
6	0.319
8	0.425
10	0.531
12	0.638
1/4 x	
1/4	0.018
1/2	0.035
3/4	0.053
1	0.071
1-1/4	0.089
1-1/2	0.106
2	0.142
2-1/2	0.177
3	0.213
3-1/2	0.248
4	0.283
5	0.354

Size (inches)	Weight (lbs./inch)
1/4 x	
6	0.425
8	0.567
10	0.708
12	0.850
5/16 x	
5/16	0.028
1/2	0.044
3/4	0.066
1	0.089
1-1/4	0.111
1-1/2	0.133
2	0.177
2-1/2	0.221
3	0.266
3-1/2	0.310
4	0.354
5	0.443
6	0.531
7	0.620
8	0.708
9	0.797
10	0.885
12	1.063
3/8 x	
3/8	0.040
1/2	0.053
3/4	0.080
1	0.106
1-1/4	0.133
1-1/2	0.159
2	0.213
2-1/2	0.266
3	0.319
3-1/2	0.372
4	0.425
5	0.531
6	0.638
7	0.744
8	0.850
9	0.956
10	1.063
12	1.275
7/16 x	
7/16	0.054

Please refer to pages 9-5 thru 9-6 for metallurgical data.

Available in 24" lengths.

Continued on next page

Flat Ground Stock Size Chart

Low Carbon • A-2 • A-6 • D-2 • O-1 • O-6 • S-7 • 4142

Size (inches)	Weight (lbs./inch)
1/2 x	
1/2	0.071
3/4	0.106
1	0.142
1-1/4	0.177
1-1/2	0.213
2	0.283
2-1/2	0.354
3	0.425
3-1/2	0.496
4	0.567
5	0.708
6	0.850
7	0.992
8	1.133
9	1.275
10	1.417
12	1.700
5/8 x	
5/8	0.111
3/4	0.133
1	0.177
1-1/4	0.221
1-1/2	0.266
2	0.354
2-1/2	0.443
3	0.531
3-1/2	0.620
4	0.708
5	0.885
6	1.063
7	1.240
8	1.417
9	1.594
10	1.771
12	2.125
3/4 x	
3/4	0.159
1	0.213
1-1/4	0.266
1-1/2	0.319
2	0.425
2-1/2	0.531

Size (inches)	Weight (lbs./inch)
3/4 x	
3	0.638
3-1/2	0.744
4	0.850
5	1.063
6	1.275
7	1.488
8	1.700
9	1.913
10	2.125
12	2.550
7/8 x	
7/8	0.217
1	0.248
1-1/4	0.310
1-1/2	0.372
2	0.496
2-1/2	0.620
3	0.744
3-1/2	0.868
4	0.992
5	1.240
6	1.488
7	1.735
8	1.983
9	2.231
10	2.479
12	2.975
1 x	
1	0.283
1-1/4	0.354
1-1/2	0.425
2	0.567
2-1/2	0.708
3	0.850
3-1/2	0.992
4	1.133
5	1.417
6	1.700
7	1.983
8	2.267
9	2.550
10	2.833
12	3.400

Size (inches)	Weight (lbs./inch)
1-1/8 x	
1-1/8	0.359
1-1/4 x	
1-1/4	0.443
1-1/2	0.531
2	0.708
2-1/2	0.885
3	1.063
3-1/2	1.240
4	1.417
5	1.771
6	2.125
7	2.479
8	2.833
9	3.188
10	3.542
12	4.250
14	4.958
16	5.667
1-1/2 x	
1-1/2	0.638
2	0.850
2-1/2	1.063
3	1.275
3-1/2	1.488
4	1.700
5	2.125
6	2.550
7	2.975
8	3.400
9	3.825
10	4.250
12	5.100
14	5.950
16	6.800
1-7/8x	
1-7/8	0.996
2-1/4x	
2-1/4	1.434
2-3/8 x	
2-3/8	1.598
2-1/2 x	
2-1/2	1.771

Please refer to pages 9-5 thru 9-6 for metallurgical data.

Available in 24" lengths.

Characteristics

AISI / SAE O1 Flat Ground Stock

01 Flat Ground Stock is an electric furnace melt oil- hardening tool steel supplied with a fully spheroidized structure. A non-shrinking general-purpose tool steel, it has excellent abrasion resistance, toughness and machinability characteristics.

AISI / SAE A2 Flat Ground Stock

A2 Flat Ground Stock is made from fine grain, electric furnace air-hardening, 5% chrome tool steel. It is a superior quality steel which has excellent wear and abrasion resistance properties. A2 is furnished with a fully spheroidized structure and is 100% free of decarb and other surface imperfections.

AISI / SAE D2 Flat Ground Stock

D2 Flat Ground Stock is a fine quality, air-hardening, electric furnace melt tool steel. The combination of superior abrasion resistance and toughness found in D2 results from its high carbon and high chromium analysis. D2 is an extraordinary tool steel that can be specified for the most demanding application. It is, of course, supplied in the full spheroidized condition, 100% free of decarb and other surface imperfections.

AISI / SAE S7 Flat Ground Stock

S7 Flat Ground Stock is an excellent air-hardening shock steel that can be and is often used in hot work applications where the tool temperature does not exceed 1000º F. S7 combines the qualities of high strength and good ductility for cold and medium hot work applications.

AISI / SAE C1018 Low Carbon Flat Ground Stock

C1018 Flat Ground Stock is fine-grained, vacuum-degassed carbon steel. It is easily machined, has excellent weldability, and responds uniformly to case hardening. The manganese content provides greater strength and hardness compared to many other carbon steels. It is often used in its natural state for such applications as back-up plate, stripper plates, punch pads, and machine parts. As a case-hardened material, it is used for jigs, fixtures, cams, and patterns.

AISI / SAE 4142 Pre-Hardened Flat Ground Stock

4142 Flat Ground Stock is a modified pre-hardened alloy steal with a Brinell hardness of 261-321 (R_C28-32). It is normalized and tempered in a machinable condition of approximately 85% of a 1.00 carbon steel. It is useful in applications requiring a lower hardness and less wear resistance than a fully heat treated tool steel, but can be flame-hardened where a hardness is desired.

Metallurgical Data - Flat Ground Stock

Chemistry and Specifications

The chemical composition of all Flat Ground Stock falls within ranges that are rigidly controlled and in many cases much tighter than those widely accepted under industry specifications. This insures maximum predictability and consistency in service. The chemical ranges and specifications met are shown below.

Chemical Compositions (%)							
Grade	**01**	**A2**	**A6**	**D2**	**S7**	**Low Carbon**	**4142**
Carbon	.85-1.00	.95-1.05	.65-.75	1.40-1.60	.45-.55	.15-.20	.38-.46
Manganese	1.00-1.40	1.00 MAX	1.80-2.50	.60 MAX	.20-.80	.60-.90	.70-1.00
Silicon		.50 MAX	.50 MAX	.50 MAX	.60 MAX	.20-1.00	.15-.30
Phosphorus						.050 MAX	.040 MAX
Sulphur						.050 MAX	.040 MAX
Chromium	.40-.60	4.75-5.50	.90-1.20	11.00-13.00	3.00-3.50		.80-1.15
Vanadium	.30 MAX	.15-.50		1.10 MAX	.30 MAX		.030 MIN
Tungsten	.40-.60						
Molybdenum		.90-1.40	.90-1.40	.70-1.20	1.30-1.80		.15-.25
Cobalt				1.00 MAX			
Nickel	.30 MAX	.30 MAX	.30 MAX	.30 MAX			

Tolerances - Flat Ground Stock

Thickness Regular	±.001"
Thickness Oversize	+.010/.015"
Width Regular	+.000/.005"
Width Oversize	+.010/.015"
Squares Regular	±.001"
Squares Oversize	+.010/.015"
Length 18"	+.125/.250"
Length 24"	+.1875/.375"
Length 36"	+.250/.500"
Squareness Edge	.003" per inch of thickness
Squareness End	.004" per inch of width

Metallurgical Data - Flat Ground Stock

Surface Conditions and Finish

All Flat Ground Stock is 100% free of decarburization on all six sides and can heat treated without further metal removal. Thickness and width are horizontally ground to a maximum finish of 35 R[a]. Blanchard ground squares are vertically ground to a maximum finish of 80 R[a].

Physical Properties

Hardness			
Grade	Brinell	Rockwell	Machinability (Compared to 1.0% Carbon Tool Steel)
01	177-212	R[b] 88-95	85
A2	200-235	R[b] 94-99	65
A6	217-248	R[b] 96-101	85
D2	220-255	R[b] 97-R[c] 25	50
S7	188-223	R[b] 90-97	95
Low Carbon	168 Max	R[b] 85 Max	—
4142	261-321	R[c] 26-34	85

Microstructure

All tool steel analyses (O1, A2, A6, D2, S7) are supplied in the annealed condition. Close control assures complete spheroidization throughout. The low carbon analysis is supplied with pearlitic microstructure.

Cross-Rolling

All Flat Ground Stock is produced from cross-rolled sheet or plate, assuring a more homogeneous structure and finer grain size than any of the other types. Furthermore, the cross-rolling process significantly enhances toughness of the product and increases tensile strength in the transverse direction.

Saw-Cut and Sheared Ends

All ends of Flat Ground Stock are precisely cut and deburred to ensure excellent yields and handling safety. Thicknesses 3/16" and up are cold sawn, while lighter sections are sheared.

Drill Rod

Stock Lengths: 3 foot (*Available in 12 foot lengths)

Size	Dec.	W-1*	O-1*	S-7	A-2*	D-2	M-2	H-13 RC 42/46
69	.0290	●	●					
68	.0300	●	●					
67	.0310	●	●					
1/32	.0312	●	●					
66	.0320	●	●					
65	.0330	●	●					
64	.0350	●	●					
63	.0360	●	●					
62	.0370	●	●					
61	.0380	●	●					
60	.0390	●	●					
59	.0400	●	●					
58	.0410	●	●					
57	.0420	●	●					
56	.0450	●	●					
3/64	.0468	●	●					
55	.0500	●	●					
54	.0550	●	●					
53	.0580	●	●					
1/16	.0625	●	●		●	●	●	●
52	.0630	●	●					
51	.0660	●	●					
50	.0690	●	●					
49	.0720	●	●					
48	.0750	●	●					
47	.0770	●	●					
5/64	.0781	●	●		●	●	●	●
46	.0790	●	●					
45	.0810	●	●					
44	.0850	●	●					
43	.0880	●	●					
42	.0920	●	●					
3/32	.0937	●	●		●	●	●	●
41	.0950	●	●					
40	.0970	●	●					
39	.0990	●	●					
38	.1010	●	●					
37	.1030	●	●					
36	.1060	●	●					
35	.1080	●	●					
7/64	.1093	●	●		●	●	●	●
34	.1100	●	●					
33	.1120	●	●					
32	.1150	●	●					

Size letter and number designations refer to non-standard fractional sizes.
Please refer to page 9-12 for drill rod specifications and tolerances.
Sizes not listed are available upon request.

Continued on next page

Drill Rod

Stock Lengths: 3 foot (*Available in 12 foot lengths)

Size	Dec.	W-1*	O-1*	S-7	A-2*	D-2	M-2	H-13 RC 42/46
31	.1200	●	●					
1/8	.1250	●	●	●	●	●	●	●
30	.1270	●	●					
29	.1340	●	●					
28	.1390	●	●					
9/64	.1406	●	●		●	●	●	●
27	.1430	●	●					
26	.1460	●	●					
25	.1480	●	●					
24	.1510	●	●					
23	.1530	●	●					
22	.1550	●	●					
5/32	.1562	●	●	●	●	●	●	●
21	.1570	●	●					
20	.1610	●	●					
19	.1640	●	●					
18	.1680	●	●					
11/64	.1718	●	●		●	●	●	●
17	.1720	●	●					
16	.1750	●	●					
15	.1780	●	●					
14	.1800	●	●					
13	.1820	●	●					
12	.1850	●	●					
3/16	.1874	●	●	●	●	●	●	●
11	.1880	●	●					
10	.1910	●	●					
9	.1930	●	●					
8	.1970	●	●					
7	.1990	●	●					
6	.2010	●	●					
13/64	.2031	●	●	●	●	●	●	●
5	.2040	●	●					
4	.2070	●	●					
3	.2120	●	●					
7/32	.2187	●	●	●	●	●	●	●
2	.2190	●	●					
1	.2270	●	●					
A	.2340	●	●					
15/64	.2343	●	●	●	●	●	●	●
B	.2380	●	●					
C	.2420	●	●					
D	.2460	●	●					
1/4	.2500	●	●	●	●	●	●	●

Size letter and number designations refer to non-standard fractional sizes.
Please refer to page 9-12 for drill rod specifications and tolerances.
Sizes not listed are available upon request.

Continued on next page

Drill Rod

Stock Lengths: 3 foot (*Available in 12 foot lengths)

Size	Dec.	W-1*	O-1*	S-7	A-2*	D-2	M-2	H-13 RC 42/46
E	.2500	●	●					
F	.2570	●	●					
G	.2610	●	●					
17/64	.2656	●	●		●	●	●	●
H	.2660	●	●					
I	.2720	●	●					
J	.2770	●	●					
K	.2810	●	●					
9/32	.2812	●	●	●	●	●	●	●
L	.2900	●	●					
M	.2950	●	●					
19/64	.2968	●	●		●	●	●	●
N	.3020	●	●					
5/16	.3125	●	●	●	●	●	●	●
O	.3160	●	●					
P	.3230	●	●					
21/64	.3281	●	●		●	●	●	●
Q	.3320	●	●					
R	.3390	●	●					
11/32	.3437	●	●	●	●	●	●	●
S	.3480	●	●					
T	.3580	●	●					
23/64	.3593	●	●		●	●	●	●
U	.3680	●	●					
3/8	.3750	●	●	●	●	●	●	●
V	.3770	●	●					
W	.3860	●	●					
25/64	.3906	●	●		●	●	●	●
X	.3970	●	●					
Y	.4040	●	●					
13/32	.4062	●	●		●	●	●	●
Z	.4130	●	●					
27/64	.4218	●	●		●	●	●	●
7/16	.4375	●	●	●	●	●	●	●
29/64	.4531	●	●		●	●	●	●
15/32	.4687	●	●		●	●	●	●
31/64	.4843	●	●		●	●	●	●
1/2	.5000	●	●	●	●	●	●	●
33/64	.5156	●	●					
17/32	.5312	●	●	●	●	●	●	●
35/64	.5468	●	●					
9/16	.5625	●	●	●	●	●	●	●
37/64	.5781	●	●					
19/32	.5937	●	●		●	●	●	●

Size letter and number designations refer to non-standard fractional sizes.
Please refer to page 9-12 for drill rod specifications and tolerances.
Sizes not listed are available upon request.

Continued on next page

Drill Rod

Stock Lengths: 3 foot (*Available in 12 foot lengths)

Size	Dec.	W-1*	O-1*	S-7	A-2*	D-2	M-2	H-13 RC 42/46
39/64	.6093	●	●					
5/8	.6250	●	●	●	●	●	●	●
41/64	.6406	●	●					
21/32	.6562	●	●	●	●	●	●	●
43/64	.6718	●	●					
11/16	.6875	●	●	●	●	●	●	●
45/64	.7031	●	●					
23/32	.7187	●	●	●	●	●	●	●
47/64	.7343	●	●					
3/4	.7500	●	●	●	●	●	●	●
49/64	.7656	●	●					
25/32	.7812	●	●					
51/64	.7968	●	●					
13/16	.8125	●	●	●	●	●	●	●
53/64	.8281	●	●					
27/32	.8437	●	●					
55/64	.8593	●	●					
7/8	.8750	●	●	●	●	●	●	●
57/64	.8906	●	●					
29/32	.9062	●	●					
59/64	.9281	●	●					
15/16	.9375	●	●		●	●	●	●
61/64	.9531	●	●					
31/32	.9687	●	●					
63/64	.9843	●	●					
1	1.0000	●	●	●	●	●	●	●
1-1/64	1.0156	●	●					
1-1/32	1.0312	●	●					
1-3/64	1.0468	●	●					
1-1/16	1.0625	●	●		●			
1-5/64	1.0781	●	●					
1-3/32	1.0937	●	●					
1-7/64	1.1093	●	●					
1-1/8	1.1250	●	●	●	●	●	●	●
1-9/64	1.1406	●	●					
1-5/32	1.1562	●	●					
1-11/64	1.1718	●	●					
1-3/16	1.1875	●	●				●	
1-13/64	1.2031	●	●					
1-7/32	1.2187	●	●					
1-15/64	1.2343	●	●					
1-1/4	1.2500	●	●	●	●	●	●	●

Please refer to page 9-12 for drill rod specifications and tolerances.

Sizes not listed are available upon request.

Continued on next page

Drill Rod

Stock Lengths: 3 foot (*Available in 12 foot lengths)

Size	Dec.	W-1*	O-1*	S-7	A-2*	D-2	M-2	H-13 RC 42/46
1-17/64	1.2656	●	●					
1-9/32	1.2812	●	●					
1-19/64	1.2968	●	●					
1-5/16	1.3125	●	●				●	
1-21/64	1.3281	●	●					
1-11/32	1.3437	●	●					
1-23/64	1.3593	●	●					
1-3/8	1.3750	●	●	●	●	●		●
1-25/64	1.3906	●	●					
1-13/32	1.4062	●	●					
1-27/64	1.4218	●	●					
1-7/16	1.4375	●	●					
1-29/64	1.4531	●	●					
1-15/32	1.4687	●	●					
1-31/64	1.4843	●	●					
1-1/2	1.5000	●	●	●	●	●		●
1-9/16	1.5625	●	●					
1-5/8	1.6250	●	●					●
1-11/16	1.6875	●	●					
1-3/4	1.7500	●	●					●
1-13/16	1.8125	●	●					
1-7/8	1.8750	●	●					
1-15/16	1.9375	●	●					
2	2.0000	●	●					●

Please refer to page 9-12 for drill rod specifications and tolerances.
Sizes not listed are available upon request.

Drill Rod Specifications

Fine Standard Tolerances

Dimensional Tolerances			
	Standard* Tolerance (section)	Concentricity Max T.I.R.	Standard Tolerance (length)
Round Drill Rod			
3.000" to .500"	±.001"	.005"	+1/8", -.0
.499" thru .125" dia.	±.0005"	.005"	+1/8", -.0
.124" and smaller dia.	±.0003"	.005"	+1/8", -.0
Flat and Square Drill Rod			
1.000" thru .750" (largest dim.)	±.0015"		+1/8", -.0
.749" thru .250" (largest dim.)	±.001"		+1/8", -.0
.249" and smaller	±.0005"		+1/8", -.0

*Closer tolerances than standard can be produced upon inquiry.

Closely-controlled Chemical Compositions

Uniform machining properties and consistent response to heat treatment are obtained through careful control of chemical analysis.

Chemical Compositions (%)							
Grade	**W1**	**O1**	**A2**	**S7**	**D2**	**H13**	**M2**
Carbon	.95-1.05	.85-1.00	.95-1.05	.45-.55	1.40-1.60	.32-.45	.78-.88
Manganese	.30-.40	1.00-1.40	1.00 max	.20-.80	.60 max	.20-.50	.15-.85
Silicon	.10-.25	.50 max	.50 max	.20-1.00	.60 max	.80-1.20	.20-.45
Phosphorus	.025 max						
Sulphur	.025 max						
Chromium	.15 max	.40-.60	4.75-5.50	3.00-3.50	11.00-13.00	4.75-5.50	3.75-4.50
Vanadium	.10 max	.30 max	.15-.50	.30 max	1.10 max	.80-1.20	1.75-2.20
Tungsten	.15 max	.40-.60					
Molybdenum	.10 max		.90-1.40	1.30-1.80	.70-1.20	1.10-1.75	4.50-5.50
Cobalt					1.00 max		
Nickel		.30 max	.30 max		.30 max	.30 max	.30 max

Dura-Bar®

Continuous Cast Iron Bars

Dura-Bar® is a family of engineered cast iron bar products designed to offer the best combination of machinability, sliding wear resistance, heat treat response, noise and vibration damping and guaranteed mechanical properties when compared to most other as-rolled ferrous materials. Dura-Bar® can often be used to replace castings, some carbon steels, bearing bronze at times and extruded aluminum materials. Due to its outstanding milling and drilling characteristics, heavily machined components are usually excellent candidates for Dura-Bar® products to help reduce manufacturing costs. A full range of metallurgical, engineering, heat treating and machining data can be provided from Alro product specialists upon request.

Cast Irons are not typically referenced by chemistry rather mechanical properties, specifically strength and hardness. The primary difference in these types is the shape and distribution of graphite in their microstructure.

Dura-Bar® offers a zero defect guarantee plus the inherent benefits of cast iron such as:

- Improved machinability
- Lower Tool Cost
- Decreased Downtime For Tooling Changes
- Reduced Scrap By Using Defect-Free Material

Dura-Bar®

Grade G2/GX (Gray Iron)

G2 is a pearlitic gray iron containing Type A graphite. Gray iron bars made to this specification will have optimal strength, wear and hardness when compared to the other gray iron grades. This material is well suited for applications requiring high resistance to wear and response to heat treatment. This specification is similar to ASTM A48 Class 40.

Typical Applications

Typical applications for G2 are listed below. They are classified by industry.

Fluid Power: Cylinder Blocks, Glands, Manifolds, Pistons, Spools, Valves.

Machinery: Bushings, Gears, Gibs, Pulleys, Rams, Sheaves, Side Frames, Slides, Ways, Spindles, Housings.

Transportation: Cylinder Liners, Gears, Lash Adjusters, Shock Absorber Pistons, Valve Guides, Valve Seat Inserts, Brake Rotors.

Pump and Compressor: Liners, Pistons, Rollers, Rotors, Seals.

Oil and Gas: Bridge Plugs, Cement Plugs, Cones, Mandrels, Retainers, Slips.

Miscellaneous: Aluminum Mold Plates, Bushings, Cams, Chain Sheaves, Core Boxes, Dies, Gears, Pattern Plates, Pulleys, Wheels

Typical Analysis	Grade G2/GX
Carbon	2.60 - 3.75%
Silicon	1.80 - 3.00%
Manganese	0.60 - 0.95%
Sulphur	0.07% MAX
Phosphorus	0.12%
Other	
Mechanical Properties	
Brinell Hardness	183 - 301
Tensile–PSI	40,000*
Yield–PSI	-
Elongation in 2”-%	-

The tensile data does not indicate a minimum but rather typical expected tensile strength.

Heat Treat Response: 50 Rc on outside.

Dura-Bar G2 can be hardened by fast methods, such as flame and induction hardening, in addition to conventional quench and temper methods.
Dura-Bar G2 can be oil quench hardened from 1600° F (885° C) to a minimum hardness of Rockwell C 50 on the outside of the bar. Inside diameter hardness will be less than Rockwell C 50.

Dura-Bar®

Grade 65-45-12 (4512X)

Dura-Bar® 65-45-12 ductile iron contains nodular graphite in a matrix of ferrite with small amounts of pearlite. Because of it's unmatched combination of machinability, mechanical properties and heat treat response, Grade 65-45-12 is the most often chosen material of all the Dura-Bar® iron types. The ferritic structure produces the most machinable ferrous grade of material available anywhere in combination with good surface finishes, optimal impact strengths, fatigue properties, electrical conductivity and high magnetic permeability.

This iron has approximately the same tensile and yield strengths as AISI 1020 steel in the as-rolled condition. This specification conforms to ASTM A536 grade 65-45-12.

Typical Applications

Typical applications for 65-45-12 are listed below. They are classified by industry.

Fluid Power:	Cylinder Blocks, End Caps, Gear Rack Housings, Gerotors, Manifolds, Pistons, Glands, Rotors, Valves.
Machinery:	Bushings, Chuck Bodies, Die Blocks, Gears, Journals, Pulleys, Rotary Tables, Side Frames, Spindle Housings, Tie Rod Nuts, Flywheels, Rams.
Transportation:	Rail Spacers, Sprockets.
Pump and Compressor:	Gears, Housings, Pistons, Rotary Screws.
Glass Mold:	Blank Molds, Plungers.

Typical Analysis	Grade 65-45-12
Carbon	3.50 - 3.90%
Silicon	2.25 - 3.00%
Manganese	0.15 - 0.35%
Sulphur	0.025% MAX.
Phosphorus	0.05%
Other	
Mechanical Properties	
Brinell Hardness	131 - 217
Tensile–PSI (min)	65,000
Yield–PSI (min)	45,000
Elongation in 2"-%	12%*

In bars under 2" diameter, elongation will be 9% minimum

Heat Treat Response: Rc 50

Dura-Bar 65-45-12 can be oil quench hardened from 1600° F (885° C) to Rockwell C 50 minimum on the outside of the bar. Hardness in the core will be less than the hardness on the outside surfaces. Typical Jominy end quench test data can be provided upon request.

This grade also responds well to surface hardening methods such as flame or induction heat treating. It is well suited for austempering because of the low residual alloy content, and the highly ferritic matrix provides predictable growth with minimal heat-distortion.

Dura-Bar®

Grade 80-55-06 (5506X)

Dura-Bar® 80-55-06 ductile iron will contain nodular graphite in a matrix of ferrite and pearlite. The pearlite/ferrite structure provides higher wear resistance and strength when compared to a ferritic grade of ductile iron. This material will be readily machinable with good surface finishes. Tensile and yield strengths will be similar to AISI 1040 steel in the as-rolled condition. This grade conforms to ASTM A536 grade 80-55-06.

Typical Applications

Typical applications for 80-55-06 are listed below. They are classified by industry.

Fluid Power: Cylinder Blocks, Gerotors, Manifolds, Pistons, Glands, Rotors, Valve Bodies.

Machinery: Bushings, Chain Sheave Rollers, Chuck Bodies, Die Blocks, Gears, Gear Racks, Pulleys, Press Rams, Rotary Tables Tie Rod Nuts, Guide Ways, Barrel Rollers (cement truck), Flywheels, Pile Drivers, Pulleys, Rams.

Transportation: Pulleys, Gears, Rail Spacers.

Pump and Compressor: Gears, Housings, Liners, Pistons, Rotary Screws.

Steel Mill: Guide Rolls, Pinch Rolls, Runout Table Rolls.

Miscellaneous: Disamatic Pouring Rails, Dies, Pattern Plates, Core Boxes, Grinding Rolls, Mill Liners.

Typical Analysis	Grade 80-55-06
Carbon	3.50 - 3.90%
Silicon	2.25 - 3.00%
Manganese	0.15 - 0.35%
Sulphur	.0.025% max.
Phosphorus	0.05%
Other	
Mechanical Properties	
Brinell Hardness	187 - 269
Tensile–PSI (min.)	80,000
Yield–PSI (min.)	55,000
Elongation (min.)	6%*

In bars under 1-1/2" diameter, elongation will be 4% minimum

Heat Treat Response

Dura-Bar 80-55-06 can be oil quench hardened from 1600° (885° C) to a minimum hardness of Rockwell C 50 on the outside of the bar. The inside diameter hardness will be less than Rockwell C 50. Lower quench hardness on the inside diameters are a result of larger graphite nodules and not a loss of matrix hardness.

Typical Jominy end quench test can be provided upon request.

Dura-Bar® Rounds

Grades: G2/GX • 80-55-06 • 65-45-12

Stock Lengths: 12 foot

Nominal Diameter (inches)	Weight (lbs./foot)		Gray Iron Grade G2/GX		Ductile Iron Grade 80-55-06		Ductile Iron Grade 65-45-12	
	A/C	C/F	A/C	C/F	A/C	C/F	A/C	C/F
5/8	1.2	1.0	●	●				
3/4	1.7	1.4	●	●				
7/8	2.3	1.9	●	●				
1	2.9	2.5	●	●				
1-1/8	3.6	3.1	●	●				
1-1/4	4.4	3.9	●	●	●		●	
1-3/8	5.2	4.7	●	●	●			
1-1/2	6.2	5.6	●	●	●		●	
1-5/8	7.2	6.5	●	●	●			
1-3/4	8.3	7.6	●	●	●		●	
1-7/8	9.4	8.7	●	●				
2	10.7	9.9	●	●	●	●	●	●
2-1/8	12.2	11.1	●	●	●			
2-1/4	13.7	12.5	●	●	●		●	●
2-3/8	15.1	13.9	●	●	●	●		
2-1/2	16.7	15.4	●	●	●		●	●
2-5/8	18.3	17.0	●	●	●	●	●	●
2-3/4	20.0	18.6	●	●	●		●	
2-7/8	21.8	20.3	●	●				
3	23.7	22.1	●	●	●	●	●	●
3-1/8	25.9	24.0	●	●			●	
3-1/4	27.9	26.0	●	●	●		●	
3-3/8	30.0	28.0	●	●			●	
3-1/2	32.2	30.0	●	●	●		●	
3-5/8	34.5	32.3	●	●			●	
3-3/4	36.8	34.6	●	●	●	●	●	
4	41.7	39.3	●	●	●		●	●
4-1/8	44.6	41.8					●	
4-1/4	47.2	44.4	●		●		●	
4-3/8	50.0	47.0					●	
4-1/2	52.8	49.8	●		●		●	
4-5/8	55.6	52.5			●		●	
4-3/4	58.6	55.4	●		●		●	
5	64.7	61.4	●		●		●	
5-1/4	71.6	67.7	●		●		●	

NOTE: A/C refers to As-Cast
C/F refers to Cold Finished
C/G refers to Centerless Ground
C/T refers to Centerless Turned

Continued on next page

Dura-Bar® Rounds

Grades: G2/GX • 80-55-06 • 65-45-12

Stock Lengths: 12 foot

Nominal Diameter (inches)	Weight (lbs./foot)		Gray Iron		Ductile Iron			
			Grade G2		Grade 80-55-06		Grade 65-45-12	
	A/C	C/F	A/C	C/F	A/C	C/F	A/C	C/F
5-1/2	78.4	74.3	●		●		●	
5-3/4	85.4	81.2	●		●		●	
6	92.8	88.4	●		●		●	
6-1/4	101.0		●		●		●	
6-1/2	109.0		●		●		●	
6-3/4	117.3		●		●		●	
7	126.0		●		●		●	
7-1/4	135.6		●		●		●	
7-1/2	144.9		●		●		●	
7-3/4	154.5		●		●		●	
8	164.4		●		●		●	
8-1/4	175.6		●		●			
8-1/2	186.2		●		●		●	
8-3/4	197.0		●					
9	208.1		●		●		●	
9-1/4	221.3		●		●			
9-1/2	233.1		●		●		●	
10	257.7		●		●		●	
10-1/4	277.9		●					
10-1/2	291.1		●		●		●	
11	318.5		●		●		●	
11-1/2	357.7		●		●			
12	387.9		●		●		●	
12-1/2	419.4		●					
13	452.0		●		●		●	
14	521.1		●		●		●	
15	595.0		●		●		●	
16	673.8		●		●		●	
17	773.1		●		●			
18	862.6		●		●		●	
19	957.0		●					
20	1056.3		●		●		●	
21	1093.5		●				●	
22	1199.5		●				●	
23	1310.4		●				●	
24	1426.2		●				●	
25	1546.9		●				●	

NOTE: A/C refers to As-Cast
C/F refers to Cold Finished
C/G refers to Centerless Ground
C/T refers to Centerless Turned

Dura-Bar®

Grade 65-45-12 (4512X) Flats (Ductile Iron)

As-Cast Size (inches)	Length (inches)	Max. Finish Size (inches)	Weight (lbs./foot)
1.500 X 2.250	69	1.300 X 3.070	10.910
1.500 X 3.250	69	1.300 X 3.300	15.720
1.750 X 3.250	69	1.570 X 3.070	18.150
2.150 X 2.930	74	1.970 X 2.750	20.040
2.250 X 3.250	72	2.070 X 3.070	23.200
2.250 X 3.750	72	2.070 X 3.570	26.710
2.250 X 4.250	72	2.070 X 4.070	30.220
2.500 X 4.250	69	2.320 X 4.070	33.500
2.550 X 2.930	74	2.350 X 2.730	23.780
2.750 X 3.000	72	2.550 X 2.800	26.200
2.750 X 3.250	72	2.550 X 3.050	28.340
2.750 X 4.250	72	2.550 X 4.050	36.910
3.250 X 4.250	72	3.050 X 4.050	43.490
3.250 X 4.750	72	3.050 X 4.550	48.540
3.250 X 5.250	72	3.050 X 5.050	53.590
3.250 X 5.750	72	3.050 X 5.550	58.640
3.250 X 6.250	72	3.050 X 6.050	63.690
3.500 X 4.550	73	3.300 X 4.350	50.040
3.750 X 4.250	72	3.550 X 4.050	50.070
3.750 X 4.750	72	3.550 X 4.550	55.880
4.250 X 5.250	72	4.026 X 5.026	71.200
4.250 X 5.750	72	4.026 X 5.526	77.900
4.250 X 6.250	72	4.026 X 6.026	84.590
4.250 X 6.750	72	4.026 X 6.526	91.290
4.250 X 7.250	72	4.026 X 7.026	97.990
4.250 X 8.250	72	4.026 X 8.026	109.400
4.710 X 4.710	74	4.486 X 4.486	70.670
4.750 X 6.250	72	4.526 X 6.026	94.240

NOTE: Pounds per foot are based on As-Cast size.

Continued on next page

Dura-Bar®

Grade 65-45-12 (4512X) Flats (Ductile Iron)

As-Cast Size (inches)	Length (inches)	Max. Finish Size (inches)	Weight (lbs./foot)
5.000 X 6.500	72	4.776 X 6.276	102.990
5.250 X 6.250	72	5.026 X 6.026	103.890
5.250 X 7.250	72	5.026 X 7.026	120.340
5.250 X 8.250	72	5.026 X 8.026	136.800
5.780 X 8.150	60	5.556 X 7.926	148.460
6.080 X 9.040	77	5.830 X 8.790	173.370
6.250 X 7.250	72	6.000 X 7.000	143.110
6.250 X 8.250	72	6.000 X 8.000	162.660
7.250 X 8.250	72	7.000 X 8.000	188.100
7.250 X 10.250	72	7.000 X 10.000	233.320
7.250 X 11.875	72	7.000 X 11.625	268.600
7.680 X 9.180	79	7.430 X 8.930	221.290
8.000 X 21.000	72	7.500 X 20.500	533.350
8.250 X 12.250	72	8.000 X 12.000	316.220
8.750 X 9.250	72	8.374 X 8.874	255.520
8.750 X 10.750	73	8.374 X 10.374	296.490
9.300 X 11.500	79	8.924 X 11.124	336.480
10.250 X 12.250	72	9.874 X 11.874	394.110
10.340 X 13.540	79	9.964 X 13.164	439.020
12.100 X 12.400	74	11.600 X 11.900	472.390
12.540 X 14.540	72	12.040 X 14.040	572.750
13.250 X 15.250	86	12.250 X 14.250	633.860
14.000 X 21.000	54	13.500 X 20.500	919.200
15.500 X 17.500	75	14.500 X 16.500	864.260
18.500 X 22.000	52	18.000 X 21.500	1295.910

NOTE: Pounds per foot are based on As-Cast size.

Dura-Bar®

Grade G2/GX Flats (Gray Iron)

Stock Lengths: 6 foot

Type/ Grade	As-Cast Size (inches)	Max. Finish Size (inches)	Weight (lbs./foot)
GX	0.75 X 1.50	0.550 X 1.300	3.90
GX	1.25 X 2.25	1.070 X 2.070	9.30
GX	1.25 X 3.25	1.050 X 3.050	13.45
GX	1.25 X 4.25	1.000 X 4.000	17.80
GX	1.25 X 5.25	1.000 X 5.000	21.85
GX	1.25 X 6.25	0.874 X 5.874	30.50
GX	1.25 X 10.25	0.874 X 9.874	51.25
GX	1.50 X 2.25	1.320 X 2.070	11.12
GX	1.50 X 4.25	1.300 X 4.050	20.87
GX	1.50 X 5.25	1.250 X 5.000	26.01
GX	1.50 X 6.25	1.250 X 6.000	30.88
GX	1.50 X 10.25	1.124 X 9.874	57.49
GX	1.75 X 4.25	1.550 X 4.050	24.22
GX	1.75 X 6.25	1.500 X 6.000	38.46
GX	2.00 X 2.50	1.820 X 2.320	16.29
GX	2.25 X 3.25	2.070 X 3.070	23.65
GX	2.25 X 4.25	2.070 X 4.070	30.81
GX	2.25 X 5.25	2.050 X 5.050	38.10
GX	2.25 X 6.25	2.050 X 6.050	45.28
GX	2.50 X 3.25	2.320 X 3.070	26.22
GX	2.50 X 4.25	2.320 X 4.070	34.16
GX	2.50 X 6.25	2.300 X 6.050	50.19
GX	2.50 X 8.25	2.250 X 8.000	70.04
G2	2.75 X 3.50	2.550 X 3.300	31.08
G2	2.75 X 4.25	2.550 X 4.050	37.64
G2	3.25 X 4.25	3.050 X 4.050	44.34
G2	3.25 X 6.25	3.050 X 6.050	64.94
G2	3.25 X 7.25	2.875 X 6.874	79.12
G2	4.25 X 4.50	4.026 X 4.276	62.35
G2	4.25 X 5.25	4.026 X 5.026	72.59
G2	4.25 X 6.25	4.026 X 6.026	86.25
G2	5.25 X 6.25	5.026 X 6.026	105.93
G2	8.00 X 21.00	7.500 X 20.500	543.81
G2	14.000 X 21.000	13.500 X 20.500	917.30

Note: Pounds per foot are based on "As-Cast" size.

Dura-Bar®

Grade G2/GX Squares (Gray Iron)

Type/ Grade	As-Cast Size (inches)	Length (inches)	Max. Finish Size (inches)	Weight (lbs./foot)
GX	1.50 X 1.50	72	1.320 X 1.320	7.50
GX	2.25 X 2.25	72	2.070 X 2.070	16.49
GX	2.50 X 2.50	72	2.320 X 2.320	20.27
G2	3.00 X 3.00	72	2.800 X 2.800	29.09
G2	3.25 X 3.25	72	3.050 X 3.050	34.05
G2	4.25 X 4.25	72	4.026 X 4.026	58.94
G2	5.25 X 5.25	72	5.026 X 5.026	89.15
G2	6.25 X 6.25	72	6.000 X 6.000	125.99
G2	7.25 X 7.25	72	7.000 X 7.000	168.73
G2	8.25 X 8.25	72	8.000 X 8.000	217.72
G2	9.25 X 9.25	72	8.874 X 8.874	275.10
G2	10.25 X 10.25	72	9.874 X 9.874	336.78
G2	12.25 X 12.25	72	11.750 X 11.750	481.68

Dura-Bar®

Grade 65-45-12 (4512X) Squares (Ductile Iron)

As-Cast Size (inches)	Length (inches)	Max. Finish Size (inches)	Weight (lbs./foot)
2.25 X 2.25	72	2.070 X 2.070	16.17
2.75 X 2.75	72	2.550 X 2.550	24.06
3.25 X 3.25	72	3.050 X 3.050	33.39
3.75 X 3.75	72	3.550 X 3.550	44.26
4.25 X 4.25	72	4.026 X 4.026	57.80
5.25 X 5.25	72	5.026 X 5.026	87.43
6.18 X 6.18	74	5.930 X 5.930	123.56
6.25 X 6.25	72	6.000 X 6.000	123.56
6.68 X 6.68	74	6.430 X 6.430	140.84
7.25 X 7.25	72	7.000 X 7.000	165.49
8.25 X 8.25	72	8.000 X 8.000	213.54
9.375 X 9.375	72	9.000 X 9.000	277.04
10.375 X 10.375	72	10.000 X 10.000	338.30

Dura-Bar® Tubing

As-Cast Size OD x ID (inches)	Tube Length (inches)	Weight (lbs./foot)	Gray Iron Grade G2	Ductile Iron 65-45-12 80-55-06
3.500 X 1.500	72	28.4	●	●
4.000 X 2.000	72	34.2	●	●
4.500 X 1.500	72	48.9	●	●
4.500 X 2.500	72	40.4	●	●
5.000 X 2.000	72	57.2	●	●
5.000 X 3.000	72	46.2	●	●
5.500 X 2.500	72	66.0	●	●
5.500 X 3.500	72	52.5	●	●
6.000 X 3.000	72	74.3	●	●
6.000 X 4.000	72	58.4	●	●
6.500 X 2.500	72	96.6	●	●
6.500 X 3.500	72	83.1	●	●
6.500 X 4.500	72	64.8	●	●
7.000 X 3.000	72	107.4	●	●
7.000 X 4.000	72	91.5	●	●
7.000 X 5.000	72	70.7	●	●
7.500 X 2.500	72	132.5	●	●
7.500 X 3.500	72	119.0	●	●
7.500 X 4.500	72	100.7	●	●
7.500 X 5.500	72	77.4	●	●
8.000 X 3.000	72	145.8	●	●
8.000 X 5.000	72	109.1	●	●
8.000 X 6.000	72	83.4	●	●
8.500 X 5.500	72	118.6	●	●
9.000 X 4.000	72	173.7	●	●
9.000 X 7.000	72	96.5	●	●

Dura-Bar® Plate

2 Sides Milled, Stress Relieved

Size (inches)	Length (inches)	Grade	Finish
7.750 X 20.50	72	4512X	2 sides milled
7.750 X 20.50	72	5506X	2 sides milled
7.750 X 20.50	72	G2	2 sides milled
13.750 X 20.50	72	4512X	2 sides milled
13.750 X 20.50	72	5506X	2 sides milled
13.750 X 20.50	72	G2	2 sides milled

Dura-Bar® Plate

4 Sides Milled, Stress Relieved

Size (inches)	Length (inches)	Grade	Finish
7.50 X 20.50	72	4512X	4 sides milled
7.50 X 20.50	72	5506X	4 sides milled
7.50 X 20.50	72	G2	4 sides milled
13.50 X 20.50	72	4512X	4 sides milled
13.50 X 20.50	72	5506X	4 sides milled
13.50 X 20.50	72	G2	4 sides milled

Dura-Bar®

Grade 65-45-12 (4512X) (Ductile Iron)
Precision Duplex Milled Rectangles, 4 Sides

Size (inches)			Length (inches)	Weight (lbs./foot)
1.530	X	2.780	72	13.27
1.500	X	3.000	72	14.20
1.600	X	2.000	72	9.98
1.750	X	2.440	72	13.32
1.750	X	2.750	72	15.02
2.000	X	2.500	72	16.00
2.000	X	2.500	72	15.60
2.000	X	3.000	72	18.88
2.000	X	4.000	72	24.96
2.000	X	6.000	72	37.44
2.030	X	2.530	72	15.70
2.030	X	3.030	72	19.20
2.030	X	4.030	72	25.52
2.050	X	2.800	72	17.90
2.250	X	4.000	72	28.08
2.250	X	4.000	72	28.90
2.440	X	5.000	72	38.06
2.500	X	3.000	72	23.40
2.500	X	3.250	72	25.35
2.500	X	4.000	72	31.20
2.500	X	4.500	72	35.10
2.500	X	5.000	72	39.00
2.500	X	6.000	72	48.00
2.530	X	2.780	72	21.94
2.530	X	4.030	72	31.81
2.530	X	4.280	72	33.79
2.530	X	4.530	72	35.76
2.530	X	4.750	72	37.50
2.660	X	3.500	72	29.05
2.850	X	3.650	72	32.46
3.000	X	4.000	72	37.44
3.000	X	5.000	72	48.00
3.000	X	5.000	72	46.80

Continued on next page

Dura-Bar®

Grade 65-45-12 (4512X) (Ductile Iron)
Precision Duplex Milled Rectangles, 4 Sides

Size (inches)			Length (inches)	Weight (lbs./foot)
3.000	X	5.130	72	48.02
3.030	X	3.530	72	32.70
3.030	X	4.030	72	37.40
3.030	X	4.530	72	42.00
3.030	X	5.030	72	47.55
3.030	X	5.130	72	48.50
3.030	X	5.530	72	52.28
3.030	X	6.030	72	57.01
3.250	X	5.400	72	54.76
3.400	X	3.500	72	37.13
3.500	X	4.000	72	43.68
3.500	X	4.500	72	49.14
3.500	X	5.630	72	61.48
3.500	X	6.000	72	67.00
3.500	X	6.000	72	65.52
3.500	X	6.250	72	68.25
3.500	X	8.000	72	87.36
3.530	X	4.030	72	44.39
3.530	X	4.530	72	49.58
3.530	X	5.030	72	55.40
3.630	X	6.030	72	72.06
3.750	X	4.500	72	52.65
4.000	X	5.000	72	62.40
4.000	X	5.000	72	68.60
4.000	X	5.500	72	68.64
4.000	X	6.000	72	74.88
4.030	X	4.530	72	56.96
4.030	X	5.030	72	63.25
4.030	X	5.530	72	69.53
4.030	X	6.030	72	74.40
4.030	X	7.030	72	88.39
4.250	X	5.750	72	78.33

Continued on next page

Dura-Bar®

Grade 65-45-12 (4512X) (Ductile Iron)
Precision Duplex Milled Rectangles, 4 Sides

Size (inches)			Length (inches)	Weight (lbs./foot)
4.500	X	5.000	72	70.20
4.500	X	7.130	72	100.10
4.500	X	7.250	72	101.79
4.530	X	6.030	72	83.60
4.530	X	8.030	72	113.49
4.590	X	8.100	72	115.99
4.700	X	5.300	72	77.72
5.000	X	5.000	72	78.00
5.000	X	6.000	72	93.60
5.000	X	7.000	72	109.20
5.000	X	7.630	72	119.03
5.000	X	8.500	72	132.60
5.030	X	5.030	72	77.40
5.030	X	5.800	72	91.02
5.030	X	6.030	72	94.63
5.030	X	7.030	72	110.33
5.030	X	8.030	72	126.02
5.030	X	9.530	72	149.56
5.510	X	7.880	72	135.47
5.700	X	10.750	72	191.18
6.000	X	7.000	72	131.04
6.020	X	14.000	72	262.95
6.030	X	7.030	72	132.25
6.030	X	7.530	72	141.67
6.030	X	8.030	72	151.07
6.030	X	9.780	72	184.00
6.030	X	10.000	74	202.80
6.414	X	7.738	72	154.85
6.500	X	7.000	72	162.24
6.500	X	8.000	72	166.00
6.500	X	9.750	72	197.73

Continued on next page

Dura-Bar®

Grade 65-45-12 (4512X) (Ductile Iron)

Precision Duplex Milled Rectangles, 4 Sides

Size (inches)	Length (inches)	Weight (lbs./foot)
6.530 X 8.030	72	163.60
6.750 X 10.500	72	227.00
6.920 X 8.690	79	187.62
7.000 X 8.000	72	174.72
7.030 X 8.030	72	176.13
7.030 X 9.030	72	198.06
7.030 X 10.030	72	219.99
7.130 X 9.750	72	216.90
7.530 X 8.030	72	188.65
7.530 X 11.250	72	264.30
8.000 X 10.000	72	249.60
8.050 X 10.050	72	252.42
8.130 X 10.000	72	253.66
8.160 X 10.780	72	274.45
8.180 X 8.900	72	227.14
8.180 X 10.000	72	255.22
8.188 X 9.000	72	229.91
8.188 X 10.000	72	255.47
8.500 X 12.630	72	334.95
8.690 X 13.100	72	355.18
8.750 X 12.630	60	344.80
9.030 X 11.030	79	310.78
9.500 X 14.000	79	414.96
10.050 X 13.050	79	409.20
11.030 X 12.030	74	414.00
12.040 X 14.040	72	527.41
13.500 X 20.500	54	863.46
13.830 X 14.430	82	622.65
15.290 X 17.040	75	812.89

Dura-Bar®

Grade 65-45-12 (4512X) (Ductile Iron)
Precision Duplex Milled Squares, 4 Sides

Size (inches)	Length (inches)	Weight (lbs./foot)
1.75 X 1.75	72	9.56
1.75 X 1.75	73.5	9.45
1.78 X 1.78	72	9.70
2.00 X 2.00	72	12.48
2.00 X 2.00	72	12.60
2.03 X 2.03	72	12.60
2.03 X 2.03	72	12.86
2.05 X 2.05	72	17.91
2.50 X 2.50	72	19.50
2.50 X 2.50	72	19.52
2.53 X 2.53	72	19.60
2.78 X 2.78	72	24.11
3.00 X 3.00	72	25.10
3.03 X 3.03	72	28.10
3.50 X 3.50	72	38.22
3.53 X 3.53	72	38.10
3.75 X 3.75	72	43.88
3.78 X 3.78	72	44.58
4.00 X 4.00	72	49.92
4.00 X 4.00	72	48.80
4.03 X 4.03	72	49.70
4.50 X 4.50	72	63.18
4.53 X 4.53	72	64.03
4.88 X 4.88	72	74.30
5.06 X 5.06	72	79.88
6.00 X 6.00	72	112.32
6.03 X 6.03	72	113.45
6.53 X 6.53	74	133.04
7.03 X 7.03	72	154.19
7.53 X 7.53	72	176.91
8.00 X 8.00	72	199.68
8.03 X 8.03	72	201.18
8.50 X 8.50	72	225.42
9.05 X 9.05	72	255.54
9.50 X 9.50	72	281.58
10.00 X 10.00	72	312.00
10.03 X 10.03	72	313.88
11.05 X 11.05	74	380.96
12.03 X 12.03	74	451.53
18.00 X 18.00	35	1010.88

Dura-Bar® Tolerances

This section lists Dura-Bar dimensional tolerances. Metallurgical tolerances and mechanical properties are listed under each metal grade in the specification section. Customer specifications may be written from the information contained in this section. If tighter tolerances or additional testing are required for a special make item, a specific customer specification may be written.

Dura-Bar® Rounds

Round bars are made with sufficient stock on the outside diameter to guarantee clean-up at the nominal dimensions. Stock allowances and allowable deviations for round bars are listed in Table 1.

Nominal Diameter Bar Size (inches)	Stock Allowance		Stock Allowance Variation (+/-) All Metal Specs (inches)
	Gray Iron (inches)	Ductile Iron (inches)	
00.750 - 01.250	0.085	0.088	0.017
01.251 - 02.000	0.090	0.095	0.024
02.001 - 03.000	0.110	0.118	0.030
03.001 - 04.000	0.125	0.136	0.038
04.001 - 05.000	0.140	0.154	0.048
05.001 - 06.000	0.155	0.172	0.055
06.001 - 07.000	0.170	0.190	0.062
07.001 - 08.000	0.190	0.213	0.085
08.001 - 09.000	0.216	0.242	0.108
09.001 - 10.000	0.254	0.283	0.129
10.001 - 11.000	0.400	0.432	0.150
11.001 - 16.000	0.582	0.623	0.206
16.001 - 18.000	0.762	0.815	0.262
18.001 - 20.000	0.762	0.819	0.262

Cold Finish

Cold finish centerless turning tolerances are listed in the table below.

Nominal Length (inches)	Bar Diameter (inches)	Cold Finish Tolerance* (inches)
72	0.750 - 4.00	+0.010/-0.000
72	4.001 - 6.00	+0.015/-0.000
144	0.750 - 3.00	+0.010/-0.000
144	3.001 - 4.00	+0.015/-0.000

** Centerless turning tolerance is +0.003"/+0.008".*

Dura-Bar® Tolerances

Dura-Bar® Flat Bars

Dura-Bar flats are made to the actual dimensions. Clean-up stock must be considered when ordering. Minimum clean-up stock allowances are shown in the table below.

Height (inches)	Ratio (Width:Height) - (inches)				
	0.000 thru 1.999	2.000 thru 2.999	3.000 thru 4.999	5.000 thru 7.999	8.000 and up
00.750 - 01.500	0.090	0.100	0.125	0.188	0.188
01.501 - 02.500	0.090	0.100	0.125	0.125	0.188
02.501 - 04.000	0.100	0.188	0.250	0.250	-
04.001 - 06.000	0.112	0.188	0.250	-	-
06.001 - 08.500	0.125	0.250	0.250	-	-
08.501 - 11.500	0.188	0.250	-	-	-
11.501 - 14.125	0.250	-	-	-	-
14.126 - 20.000	0.500	-	-	-	-

Note: Clean-up stock for special shapes is based on the maximum width and the maximum height of the cross section.

Dimension in the vertical center of flats and shapes may be larger than the vertical ends. Allowable swell is based on the dimension of the bar according to the data in the table below.

Height (inches)	Ratio (Width:Height) - (inches)				
	0.000 thru 1.999	2.000 thru 2.999	3.000 thru 4.999	5.000 thru 7.999	8.000 and up
00.750 - 01.500	-	-	-	0.350	0.460
01.501 - 02.500	-	-	0.262	0.370	0.485
02.501 - 04.000	-	0.189	0.282	0.395	-
04.001 - 06.000	0.143	0.209	0.307	-	-
06.001 - 08.500	0.153	0.234	0.337	-	-
08.501 - 11.500	0.163	0.254	-	-	-
11.501 - 14.125	0.173	-	-	-	-
14.126 - 18.000	0.250	-	-	-	-
18.001 - 20.000	0.500	-	-	-	-

Note: Swell allowance for special shapes is based on the maximum width and the maximum height of the cross section.

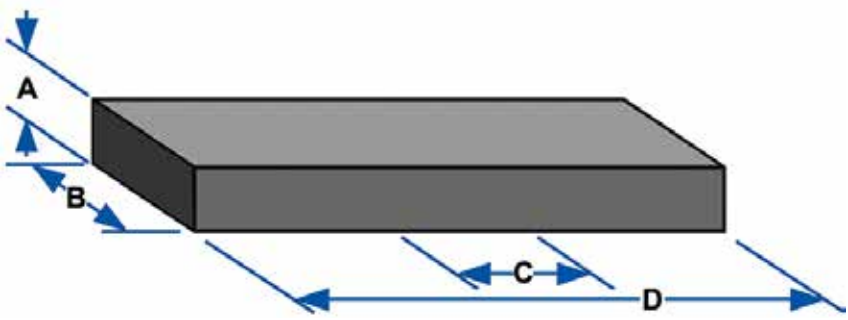
Dura-Bar® Tolerances

Standard Lengths

Continuous cast bars are notched and broken off on the production line in standard lengths of 6 feet and 12 feet. (Larger bars will be shorter because of their weight.) Stock is added on to the break-off length in order to guarantee the nominal length. The stock allowance for bar lengths is shown in the table below.

Nominal Bar Diameter (inches)	Tolerance on Standard Lengths		Non-Standard Length (inches)
	6-Foot Bars (inches)	12-Foot Bars (inches)	
00.625 - 03.999	72 - 74.5	144 - 147	Nominal +3
04.000 - 09.999	72 - 75.5	144 - 148	Nominal +4
10.000 - 18.000	72 - 76.0	144 - 149	Nominal +5
19.000	57 - 60.5	-	Nominal +5
20.000	54 - 57.5	-	Nominal +5

Duplex Milled Tolerances



- Standard Milled Tolerances are +.005”/-.000” on Height “A”/Width”B”. Tolerances produced to "+.010/-000 on Height "A and Width "B" are available upon request
- Maximum Milled Length “D” up to 84”
- Milled Height/Width “A&B” 1.25”-25.00” Square
- Square, Parallel and Flat Within 0.010” in any 6.000” section (C)

Expanded Metal

Terminology

Style Designation

A combination of numbers, letters, and abbreviations permitting proper specifications of dimension, gauge, style, and weight. In expanded metal products, the first number designates nominal dimension, short way of design. The second number completes the designation and may specify the gauge of metal, weight per 100 square feet, or may have some other significance. Grating products are designated by weight of finished product per square foot.

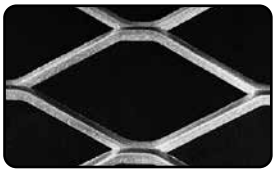
Standard Expanded Metal

Standard expanded metal as it comes from the press. The strands and bonds are set at a uniform angle to the plane on the sheet. This gives added strength and rigidity, as well as skid-resistant surface. Standard expanded metal is abbreviated XM.

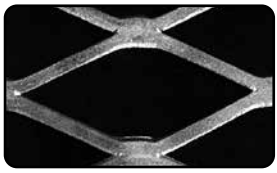
Flattened Metal

Flattened expanded metal is manufactured by passing the standard expanded sheet through a cold roll reducing mill. Flattened expanded metal turns the strands and bonds down to provide a flattened surface, reducing the thickness (gauge) and elongating the pattern. Thickness may vary plus or minus 10% from published dimensions.

Standard Expanded Metal



Flattened Expanded Metal



Grating

Grating is a standard expanded metal pattern produced from heavier gauge low carbon steel plates. Strands and the openings of grating are considerably larger than other meshes. It is ideal for use wherever a strong, durable, lightweight surface is needed. Although used primarily for pedestrian traffic, grating can accommodate heavier loads if properly supported.

DESIGN SIZE
Actual dimensions SWD and LWD. Measured from a point to a corresponding point on the design shown.

SWD
Nominal dimension Short Way of Design

SWO
Short Way of Opening

LWD
Nominal dimension Long Way of Design

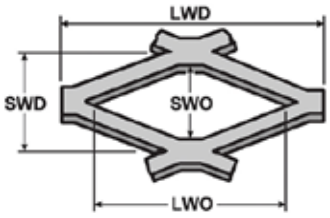
LWO
Long Way of Opening

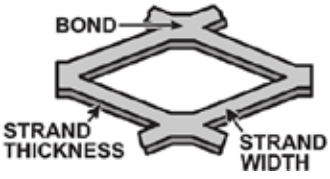
STRANDS
The sides of the expanded metal design.

STRAND THICKNESS
Gauge thickness of metal expanded.

STRAND WIDTH
Amount of metal fed under dies to produce one strand.

BOND
The solid intersection of two strands.





Expanded Metal

Side Shearing

The process of cutting a piece of expanded metal parallel to the long dimension of the diamond.

Random Side Shearing

Side shearing is a cut made parallel to the LWD dimension of the sheet which usually leaves open diamonds.

Bond Side Shearing

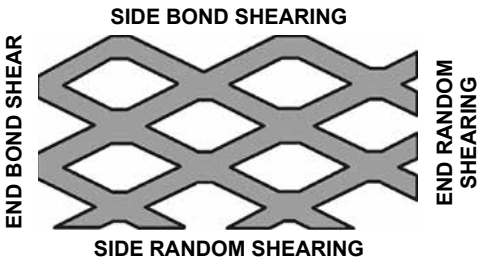
This cut is made along the length of the sheet on the center line of the bond over the specified width. In most cases it is not practical to attempt to Bond Side Shear either regular or flattened expanded metal because of the camber.

End Shearing
End Random Shearing

The process of shearing a piece of expanded metal to a specified length (LWD). This cut normally leaves open diamonds at both ends but accomplishes close tolerance when both ends are sheared.

End Bond Shearing

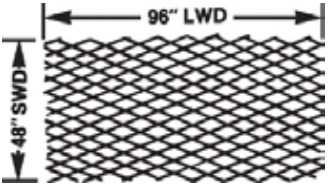
The process of shearing a piece of expanded metal to a specified length (LWD). One end is cut on the Bond parallel to the SWD—the other end usually has open diamonds.



Ordering Procedure

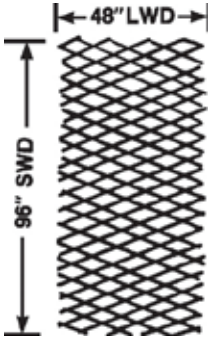
When ordering Expanded Metals, give complete style specifications to avoid possible error. Include style, standard or flattened, type of metal, and sheet dimensions. SWD dimensions always given before LWD.

EXAMPLE 1:
1/2" #18 carbon steel standard
4 ft. SWD by 8 ft. LWD



Drawings are exaggerated for illustrative purposes.

EXAMPLE 2:
1/2" .051 aluminum standard
8 ft. SWD by 4 ft. LWD



Expanded Metal Sheets

Carbon Steel Standard Expanded Metal
1/4" Through 2" Diamond Designs

Style	lbs per 100 Sq. ft.	Standard Sheet Size (ft)		Design Size (inches)		Opening Size (inches)		Strand Size (inches)		Overall Thick (in)	No. of Designs per Foot		(%) Open Area
		Width	Length										
		SWD	LWD	SWD	LWD	SWD	LWD	Width	Thick		SWD	LWD	
STANDARD													
¼"–#20	86	4	8	.250	1.00	.125	.718	.072	.036	.135	48	12	45
¼"–#18	114	4	8	.250	1.00	.110	.718	.072	.048	.147	48	12	43
½"–#20	43	4	8	.500	1.00	.438	.938	.072	.036	.140	24	10	80
½"–#18	70	4&6	8&10	.500	1.20	.438	.938	.088	.048	.172	24	10	72
½"–#16	86	4	8	.500	1.00	.375	.938	.087	.060	.175	24	10	65
½"–#13	147	4&6	8&10	.500	1.20	.312	.938	.096	.092	.204	24	10	57
¾"–#16	54	4&6	8&10	.923	2.00	.813	1.750	.101	.060	.210	13	6	78
¾"–#13	80	4&6	8&10	.923	2.00	.750	1.688	.096	.092	.205	13	6	76
¾"–#10 (13 ga.)	120	4&6	8&10	.923	2.00	.750	1.625	.144	.092	.290	13	6	72
¾"–# 9 (10 ga.)	180	4&6	8&10	.923	2.00	.688	1.562	.150	.134	.312	13	6	68
1"–#16	44	4	8	1.00	2.40	.938	2.062	.087	.060	.192	12	5	82
1½"–#18	20	4	8	1.33	3.00	1.313	2.625	.068	.048	.140	9	4	90
1½"–#16	40	4	8	1.33	3.00	1.250	2.625	.108	.060	.230	9	4	85
1½"–#13	60	4&6	8&10	1.33	3.00	1.188	2.500	.105	.092	.242	9	4	85
1½"–#10 (13 ga.)	79	4&6	8&10	1.33	3.00	1.188	2.500	.138	.092	.284	9	4	80
1½"–# 9 (10 ga.)	120	4&6	8&10	1.33	3.00	1.125	2.375	.144	.134	.312	9	4	76
1½"–# 6 (6 ga.)	250	4&6	8	1.33	3.00	1.110	2.313	.203	.198	.433	9	4	69
2"–#10 (13 ga.)	68	6	12	1.85	4.00	1.625	3.438	.164	.092	.327	6.5	3	82
2"–# 9 (10 ga.)	90	4	8	1.85	4.00	1.563	3.375	.149	.134	.312	6.5	3	84

Expanded Metal Sheets

Carbon Steel Flattened Expanded Metal

1/4" Through 1-1/2" Diamond Designs

In Standard Expanded Metal, the strands are set at sharp angles to the plane of the sheet. In the Flattened Expanded Metal, the strands have been cold rolled to bring them into one plane, thus providing a flat surface.

Style	lbs. per 100 Sqft.	Standard Sheet Size (ft.)		Design Size (inches)		Opening Size (inches)		Strand Size (inches)		Overall Thick-ness (in.)	No. of Designs per Foot		% Open Area
		Width SWD	Length LWD	SWD	LWD	SWO	LWO	Width	Thick		SWD	LWD	
¼"—#20	82	3&4	8	.250	1.05	0.084	.715	.079	.030	.030	48	11.600	35
¼"—#18	108	3&4	8	.250	1.05	0.075	.715	.080	.040	.040	48	11.600	35
½"—#20	40	3&4	8	.500	1.25	0.375	1.00	.079	.029	.029	24	9.500	65
½"—#18	66	3&4	8&10	.500	1.25	0.312	1.00	.097	.039	.039	24	9.500	60
½"—#16	82	3&4	8&10	.500	1.25	0.312	1.00	.096	.050	.050	24	9.500	63
½"—#13	140	3&4	8&10	.500	1.25	0.265	1.00	.107	.070	.070	24	9.500	52
¾"—#16	51	3&4	8&10	.923	2.10	0.750	1.750	.111	.048	.048	13	5.700	74
¾"—#14	63	3&4	8&10	.923	2.10	0.688	1.813	.105	.061	.061	13	5.700	74
¾"—#13	75	3&4	8,10&12	.923	2.10	0.688	1.781	.106	.070	.070	13	5.700	74
¾"—#10 (13 ga.)	114	4	8	.923	2.10	0.637	1.755	.160	.070	.070	13	5.700	68
¾"—# 9 (10 ga.)	171	3&4	8,10&12	.923	2.10	0.563	1.688	.165	.120	.120	13	5.700	63
1"—#16	41	3&4	8	1.00	2.50	0.813	2.250	.098	.050	.050	12	4.684	78
1½"—#16 (Lt.)	29	4	8	1.33	3.20	1.175	2.620	.093	.050	.050	9	3.750	83
1½"—#16	38	3&4	8	1.33	3.20	1.062	2.750	.119	.048	.048	9	3.750	83
1½"—#14	46	3&4	8	1.33	3.20	1.062	2.750	.134	.060	.060	9	3.750	80
1½"—#13	57	3&4	8&10	1.33	3.20	1.062	2.750	.116	.070	.070	9	3.750	80
1½"—#9 (10 ga.)	114	3&4-4	8&10,12	1.33	3.20	1.000	2.563	.158	.110	.110	9	3.750	75

Above material conforms to military specification MIL-M-17194C Type II Class 1
Weights, gauges, dimensions, and sizes listed above are approximate.

Expanded Metal Sheets

Stainless Steel Type 304 Standard Expanded Metal
1/2" Through 1-1/2" Diamond Designs

Style	lbs per 100 Sqft.	Standard Sheet Size (ft)		Design Size (inches)		Opening Size (inches)		Strand Size (inches)		Overall Thickness (in)	No. of Designs per ft.	(%) Open Area
		Width	Length									
		SWD	LWD	SWD	LWD	SWD	LWD	Width	Thick		SWD	
STANDARD												
½"–#20	50	4	8	.500	1.200	.437	.097	.080	.037	.164	24	70
½"–#18	73	4	8	.500	1.200	.438	.938	.087	.050	.164	24	77
½"–#16	91	4	8	.500	1.200	.438	.938	.087	.062	.164	24	70
½"–#13	187	4	8	.500	1.200	.313	.875	.120	.093	.225	24	58
¾"–#18	48	4	8	.923	2.000	.813	1.750	.106	.050	.200	13	89
¾"–#16	60	4	8	.923	2.000	.813	1.750	.106	.062	.200	13	85
¾"–#13	91	4	8	.923	2.000	.750	1.688	.108	.093	.200	13	78
¾"–# 9 (10 ga.)	205	4	8	.923	2.000	.688	1.563	.161	.140	.300	13	67
1½"–#16	45	4	8	1.333	3.000	1.250	2.750	.115	.062	.220	9	89
1½"–#13	68	4	8	1.333	3.000	1.250	2.625	.116	.093	.220	9	86
1½"–# 9 (10 ga.)	137	4	8	1.333	3.000	1.125	2.500	.155	.140	.280	9	75

Above material conforms to EMMA 557-99

Expanded Metal Sheets

Stainless Steel Type 304 Flattened Expanded Metal

1/2" Through 1-1/2" Diamond Designs

Style	lbs. per 100 Sq. ft.	Standard Sheet Size (ft.)		Design Size (inches)		Opening Size (inches)		Strand Size (inches)		Overall Thick-ness (in.)	No. of Designs per ft.	% Open Area
		Width SWD	Length LWD	SWD	LWD	SWO	LWO	Width	Thick		SWD	
½"—#20	48	4	8	.500	1.260	0.312	1.000	.091	.033	.033	24	60
½"—#18	69	4	8	.500	1.260	0.313	1.000	.093	.040	.040	24	68
½"—#16	86	4	8	.500	1.260	0.313	1.000	.093	.050	.050	24	60
½"—#13	178	4	8	.500	1.260	0.250	1.000	.132	.080	.080	24	56
¾"—#18	46	4	8	.923	2.100	0.750	1.813	.118	.040	.040	13	77
¾"—#16	57	4	8	.923	2.100	0.750	1.813	.118	.050	.048	13	75
¾"—#13	87	4	8	.923	2.100	0.625	1.750	.120	.070	.070	13	74
¾"—# 9 (10 ga.)	195	4	8	.923	2.100	0.563	1.688	.160	.119	.119	13	64
1½"—#16	43	4	8	1.330	3.150	1.063	2.750	.124	.050	.050	9	83
1½"—#13	65	4	8	1.330	3.150	1.000	2.625	.124	.079	.079	9	79
1½"—#9 (10 ga.)	131	4	8	1.330	3.150	0.938	2.625	.165	.119	.119	9	76

Above material conforms to EMMA 557-99

Expanded Metal Sheets

Aluminum Alloy 3003 H14 Standard Expanded Metal

3/16" Through 1-1/2" Diamond Designs

Style	Lbs. per 100 Sqft.	Standard Sheet Size (ft)		Design Size (inches)		Opening Size (inches)		Strand Size (inches)		Overall Thickness (in)	No. of Designs per ft.	(%) Open Area
		Width	Length									
		SWD	LWD	SWD	LWD	SWO	LWO	Width	Thick		SWD	
STANDARD												
3/16"– .032	23	B	B	.200	.500	.166	.437	.020	.032	.068	60	52
½"– .051	27	4	8	.500	1.200	.375	.938	.094	.051	.158	24	70
½"– .081	44	4	8	.500	1.200	.375	.938	.096	.081	.186	24	60
¾"– .051	17	4	8	.923	2.000	.813	1.175	.109	.051	.200	13	90
¾"– .064	22	4-8	8-4	.923	2.000	.823	1.660	.111	.064	.200	13	75
¾"– .081	41	4	8	.923	2.000	.750	1.688	.166	.081	.300	13	74
¾"– .081L	27	4-8	8-4	.923	2.000	.750	1.680	.110	.081	.200	13	76
¾"– .081H	41	4-8	8-4	.923	2.000	.750	1.688	.165	.081	.300	13	69
¾"– .125	65	4	8	.923	2.000	.688	1.688	.170	.125	.305	13	66
¾"– .188	113	4-8	8-4	.923	2.000	.590	1.350	.200	.188	.400	13	60
1½"– .051	13	4-8	8-4	1.330	3.000	1.225	2.400	.110	.051	.200	9	88
1½"– .081	22	4	8	1.333	3.000	1.188	2.500	.128	.081	.240	9	87
1½"– .125	43	4	8	1.333	3.000	1.188	2.500	.163	.125	.300	9	78

Above material conforms to EMMA 557-99

Expanded Metal Sheets

Aluminum Alloy 3003 H14 Flattened Expanded Metal

3/16" Through 1-1/2" Diamond Designs

Style	lbs. per 100 Sqft.	Standard Sheet Size (ft.)		Design Size (inches)		Opening Size (inches)		Strand Size (inches)		Overall Thick-ness (inch)	No. of Designs per foot	% Open Area
		Width SWD	Length LWD	SWD	LWD	SWO	LWO	Width	Thick		SWD	
3/16"– .032	25	8	4	.218	.438	.078	.313	.060	.029	.028	60	43
1/2"– .051	25	4	8	.500	1.270	.313	1.000	.091	.040	.040	24	57
1/2"– .081	41	4	8	.500	1.270	.313	1.000	.103	.060	.060	24	57
3/4"– .051	16	4	8	.923	2.120	.750	1.813	.114	.040	.040	13	73
3/4"– .064	20	4-8	8-4	.923	2.130	.750	1.780	.122	.051	.051	13	72
3/4"– .081L	25	4-8	8-4	.923	2.215	.687	1.750	.134	.070	.070	13	70
3/4"– .081H	38	4-8	8-4	.923	2.120	.688	1.750	.172	.070	.070	13	63
3/4"– .125	61	4	8	.923	2.120	.625	1.750	.180	.095	.095	13	55
3/4"– .188	107	4-8	8-4	.923	2.130	.484	1.593	.205	.170	.170	13	60
1½"– .051	11	4-8	8-4	1.330	3.090	1.095	2.750	.120	.040	.040	9	80
1½"– .081	20	4	8	1.333	3.150	1.063	2.750	.144	.055	.055	9	75
1½"– .125	40	4	8	1.333	3.150	1.100	2.750	.190	.080	.080	9	65

Above material conforms to EMMA 557-99

Expanded Metal Sheets

Catwalk and Structural Gratings (Carbon Steel)

Style	Weight (lbs/sqft)	Standard Sheet Size (feet)		Design Size (inches)		Opening Size (inches)		Strand Size (inches)		Overall Thick-ness (inches)	No. of Designs per Foot		(%) Open Area
		Width SWD	Length LWD	SWD	LWD	SWO	LWO	Width	Thick		SWD	LWD	
3.0 lb.	3.0	4&6	8,10&12	1.33	5.33	.940	3.44	.264	.183	.540	9	2.25	60
3.14 lb.	3.14	4-4&6	8&10	2.00	6.00	1.625	4.88	.312	.250	.656	6	2	69
4.0 lb.	4.0	4,5&6	8&10	1.33	5.33	.940	3.44	.300	.215	.618	9	2.25	55
4.27 lb.	4.27	4&6	8&10	1.41	4.00	1.00	2.88	.300	.250	.625	8.5	3	58
5.0 lb.	5.0	4,5&6	8&10	1.33	5.33	.813	3.38	.331	.250	.655	9	2.25	50
6.25 lb.	6.25	4&6	8&12	1.41	5.33	.813	3.38	.350	.312	.715	8.5	2.25	50
7.0 lb.	7.0	4	8	1.41	5.33	.813	3.38	.391	.312	.740	8.5	2.25	45

Above material meets all requirements of Military Specifications MIL-M-17194C (Metals, Expanded, Steel) and MIL-G 18015 (Ships) (Gratings, Metal, other than Bar Type) and the deflection requirements of Federal Specification RR-G-661-B.

Expanded Metal Sheets

Catwalk and Structural Gratings (Carbon Steel) Selection Chart

CONCENTRATED LOAD (lbs. per ft. of Length of Catwalk or Platform)		CLEAR SPAN (Distance between supports, measured from the inside edge of one support to the inside edge of the next support)						
		23"	30"	35"	42"	47"	54"	60"
50#	Light or Occasional Pedestrian Traffic	3.0 3.14	3.0 3.14	3.0 3.14	3.0 3.14	3.0 3.14	4.0 4.27	5.0 6.25
100#	Normal or Frequent Pedestrian Traffic	3.0 3.14	3.0 3.14	3.0 3.14	4.0 4.27	5.0 6.25	7.0	7.0
150#	Heavy or Constant Pedestrian Traffic	3.0	4.0 3.14	4.0 4.27	5.0 4.27	6.25 6.25	7.0	
200#		3.0	4.0 3.14	4.27 4.27	6.25 5.0	7.0	7.0	
250#		4.0	5.0 4.27	5.0	7.0 6.25			
300#		4.0	5.0 4.27	6.25 6.25				
350#		4.0	6.25 4.27	7.0				

The concentrated load deflections for the above selection chart do not exceed the 1/4” maximum deflection as stated by Federal Specification RR-G-661b and the generally accepted recommendation for normal pedestrian comfort.

Perforated Carbon Steel Sheets

Perforated Carbon Steel Sheets are steel sheets that have been subject to a perforation process. Perforation is the process of punching or stamping holes or other shapes into a material in a pattern or in sequence. Steel, because of its ductility and qualities of strength, makes Perforated Carbon Steel Sheets an excellent product for screening or architectural use.

Gage	Sheet Size (inches)	Hole Size (inches)	Weight (lbs./sqft.)	Weight (lbs./sheet)
20	48 x 120	1/8" round 3/16 staggered centers	.999	39.60
18	48 x 120	1/8" round 3/16 staggered centers	1.212	48.48
	48 x 120	1/4" round 3/8 staggered centers	1.200	48.00
16	48 x 120	1/8" round 3/16 staggered centers	1.500	60.00
14	48 x 120	1/8" round 3/16 staggered centers	1.878	75.12
12	48 x 120	1/8" round 3/16 staggered centers	2.630	105.20
11	48 x 120	1/8" round 3/16 staggered centers	2.550	102.00
1/4"	48 x 120	1/4" round 3/8 staggered centers	6.150	246.00
1/4"	48 x 120	1/2" round 11/16 staggered centers	5.380	215.20

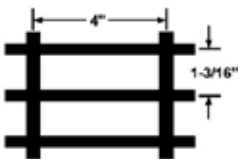
Steel Grating

Standard Mesh Types

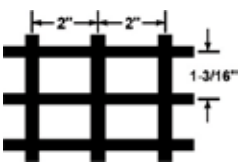
Stock width of panels, 2' and 3'. Stock length panels 20' and 24'.

For 3/16" main bars 5/16" hexagonal cross bars are used. For 1/8" main bars 1/4" hexagonal bars are used.

19W4



19W2

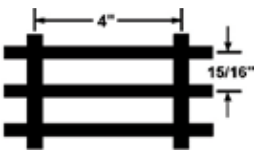


Close Mesh Types

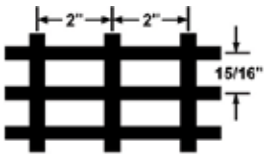
Stock width of panels, 2' and 3'. Stock length panels 20' and 24'.

For 3/16" main bars 5/16" hexagonal cross bars are used. For 1/8" main bars 1/4" hexagonal cross bars are used.

15W4



15W2



Steel Grating

Surfaces

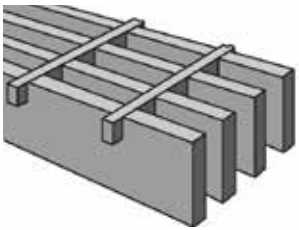
Smooth Surfaces

Smooth surface steel grating is available in a wide variety of materials for many applications.

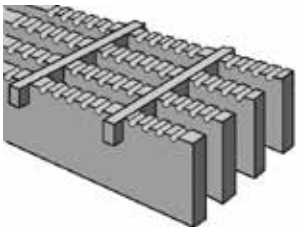
Serrated Surfaces

Serrated surfaces are available on many types of grating. The serrated surface provides a safe, slip-resistant surface. These surfaces offer more secure footing where a variety of liquids such as oil, chemicals, or water are present.

Smooth Surface



Serrated Surface



Steel Grating

Weights

Special prices are available upon request for cut lengths & widths and for fabrication.

Main Bar Size	19W4 Weight (lbs./sqft.)	19W2 Weight (lbs./sqft.)	15W4 Weight (lbs./sqft.)	15W2 Weight (lbs./sqft.)
3/4 x 1/8	3.9	4.4	4.7	5.3
3/4 x 3/16	5.6	6.2	6.9	7.5
1 x 1/8	5.0	5.5	6.1	6.7
1 x 3/16	7.2	7.8	8.9	9.6
1-1/4 x 1/8	6.1	6.6	7.5	8.1
1-1/4 x 3/16	8.9	9.5	11.0	11.6
1-1/2 x 1/8	7.2	7.7	8.9	9.4
1-1/2 x 3/16	10.5	11.2	13.1	13.7
1-3/4 x 3/16	12.2	12.8	15.2	15.8
2 x 3/16	13.9	14.5	17.3	17.9
2-1/4 x 3/16	15.5	16.1	19.4	20.0
2-1/2 x 3/16	17.2	17.8	21.4	22.0

Safety Grating Products

Grip Strut®

Grip Strut® is a lightweight metal grating designed for safety underfoot. The unique one-piece diamond shaped construction provides slip resistance in all directions. Grip Strut® is ideally suited for all walking/working surfaces where mud, ice, snow, grease, oil and detergents create slippery or hazardous conditions.

Grip Strut® grating is commonly used for work platforms, industrial flooring, catwalks, balconies, storage areas, walkways, and stair treads.

Available Configurations

Side Channels Available	Type Available	Gauge Available	Product Widths Available
1-1/2" 2" 2-1/2" 3"	Galvanized	14ga 12ga	4-3/4" 7" 9-1/2" 11-3/4" 18-3/4" 24"
	HR P&O	14ga 12ga	
	5052-H32 Aluminum	.080" .100"	
2"	Type *304 Stainless	16ga	9-1/2" 11-3/4"

Walkway	Type Available	Gauge Available	Product Widths Available
4-1/2	Galvanized HR P&O	14ga 12ga	24"

Standard Lengths: 10' and 12'.

Type 316 Stainless available upon special quote.

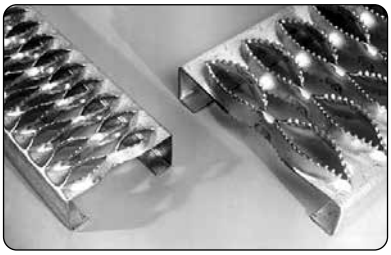
Special fabrication cutting or specialty configurations available upon request and special quotation.

**Note: Stainless only available in plank form.*

Safety Grating Products

Heavy Duty Grip Strut®

Heavy Duty Grip Strut® Safety Grating products offer the advantages of regular Grip Strut® plus the capabilities for greater loads and/or longer spans. Heavy Duty Grip Strut® walkways are ideal for process plants, refineries, grain elevators, conveyor walkways, underbridge inspection walkways, papermills, etc.



Heavy Duty Grip Strut® is more competitive than ever against Bar Grating. Shorter lead times, 24-foot lengths, less support structure, and labor savings make it the most unique formed-plank grating available.

Available Configurations

Channels Heights Available	Types Available	Gauges Available	Widths Available
2" 2-1/2" 3" 4"	Galvanized HR P&O	10ga ***Note:** 11ga and 9ga are special ordered. Contact your Alro Sales Rep.*	9-1/4" 13-3/4" 23-1/4" 27-3/4" 36"

Walkway	Type Available	Gauge Available	Widths Available
5"	Galvanized HR P&O	10ga	24" 30" 36"

Standard Lengths: 10' and 12'.

24', special order. Contact your Alro Sales Rep

Plain HRP&O Steel available upon request and special quotation. Hot Dip Galvanized after fabrication is available upon request or special order.

Special fabrication cutting or specialty configurations available upon request and special quotation.

**Note: Stainless only available in plank form.*

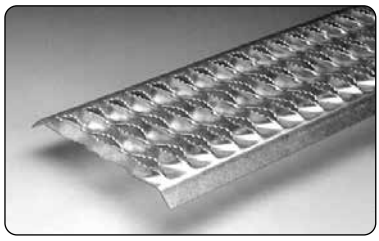
Safety Grating Products

Grip Strut® - Stair Treads, Ladder Rungs, Reconditioning Material

Alro offers a full range of standard and non-standard Stair Tread products from Grip Strut®, Heavy Duty Grip Strut®, Perf-O Grip®, Traction Tread™, and Grate-Lock. Products will be offered with or without abrasive nosing.

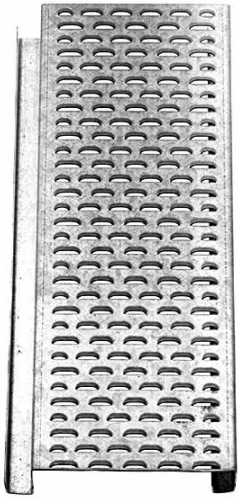
Reconditioning material is offered as an economical method of resurfacing worn and unsafe floors. Down-turned edges allow the grating to lie flat and secure over existing flooring.

Alro offers a large variety of ladder rungs for use in different environments and industries. Grip Strut® One-Diamond Ladder Rungs are ideal in environments where safe footing is hard to come by. Grip Strut® Ladder Rungs ensure maximum slip resistance and safe footing. Traction Tread™ Ladder Rungs are ideal for use in hand-over-hand ladder applications where safe footing is also required.



Aeration Decking

Aeration Decking provides municipal waste treatment plants with a highly efficient, low-energy way to process effluents into usable compost. In North America daily production from municipally operated water treatment plants yields well over 15,000 tons (dry basis) of sludge. North America faces a growing process while keeping operating costs at a minimum. Aeration Decking can be the keystone for systems that transform waste into usable by-product, while conserving energy.

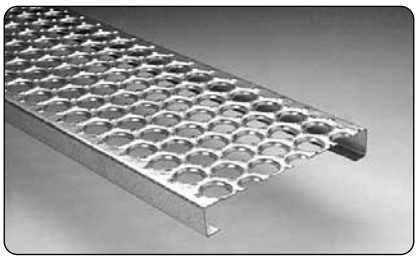


Available Configurations		
Channel Height	**Material Gauge**	**Available Widths**
2-1/2"	14 ga Galvanized Steel	9" wide

Safety Grating Products

Perf-O Grip® Grating

Perf-O Grip® is a plank metal grating offering a slightly less aggressive surface than Grip Strut®. Perf-O Grip® is made with a round hole pattern. Perf-O Grip's® light weight and resilient design makes the product easy to handle and install producing a very economical installed cost.



Available Configurations			
Channels Heights Available	**Types Available**	**Gauges Available**	**Widths Available**
1-1/2"	Galvanized	11ga	5", 7", 10"
2"	HR P&O	13ga	12", 18", 24"
2"	Aluminum	.125"	5", 7", 10", 12"

Walkway Heights Available	**Types Available**	**Gauges Available**	**Widths Available**
5"	Galvanized HR P&O	11ga	24", 30", 36"

Standard Lengths: 10' and 12'.

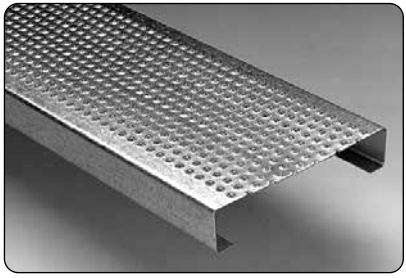
Plain HRP&O Steel and Stainless sheet available upon request and special quotation. Hot Dip Galvanized after fabrication is available upon request and special order.

Special fabrication cutting or specialty configurations available upon request and special quotation.

Traction Tread™ Flooring

Plank, Sheet and Ladder Rungs

Traction Tread™ panels have a surface of perforated raised buttons. The perforations allow spillage to drain and break oil film, detergent, and other slippery agents away from the walking surface. Traction Tread™ is ideal for pedestrian traffic and the button design is the best in the industry for allowing women in heels, as well as a man in work boots, to walk comfortably and safely over the surfaces. This product is offered in planks and 36" x 120" sheets. Traction Tread™ services many applications such as pedestrian walkways, scaffold planking, mezzanines, stair treads, the resurfacing of worn materials, etc.—useful anywhere a light slip-resistant flooring is required.



Available Configurations				
Product	**Material**	**Gauge**	**Width**	**Channel Height**
Sheet	HR P&O Steel	11ga 12ga 13ga 14ga 16ga	36"	N/A
	5052-H32 Aluminum	.125"	36"	N/A
Planks	Galvanized HR P&O Steel ***Note: HR P&O Planks are special ordered. Contact your Alro Sales Rep.***	11ga 13ga	7" 10" 12"	2" (1-1/2" min.)
	5052-H32 Aluminum	.125"	7" 10" 12"	2"
Ladder Rungs	Galvanized HR P&O Steel	13ga	1-1/4" 1-5/8"	1-1/2" 1-1/8"
	5052-H32 Aluminum	.125"	2-1/4"	1-1/2"

Standard Lengths: 10' (120") Sheets.

Plank Lengths: 10' and 12'.

Ladder Rung Length: 60"

Special fabrication, cutting or specialty configurations available upon request and special quotation.

Safety Grating Products

Rooftop Walkway Systems

Although roofs look durable, they were never intended to be walked on. As the volume of rooftop equipment keeps expanding, the wear and tear of mounting maintenance traffic can lead to leaks and premature roof replacement. Rooftop Walkway Systems solve these problems to keep your roof leak free and long lived. The patented elevated Grip Strut® Rooftop Walkway System is unlike others in that they are elevated and discourage shortcuts and emphatically define a path that is visible even in heavy snow. This system is interchangeable with our different walking surfaces such as Perf-O Grip® and Grate Lock and is ideal for built-up roof systems. Grate-Lock RTWW systems are also available for any standing seam metal roof.

Alro Plastics

Your Source for Engineering Plastics

Sheet • Rod • Tube • Film • Profiles • Machined Parts

Ask your Alro Plastics Sales Representative about our Fiberglass Grating and our other alternatives to using steel.

Fiberglass Grating - Molded

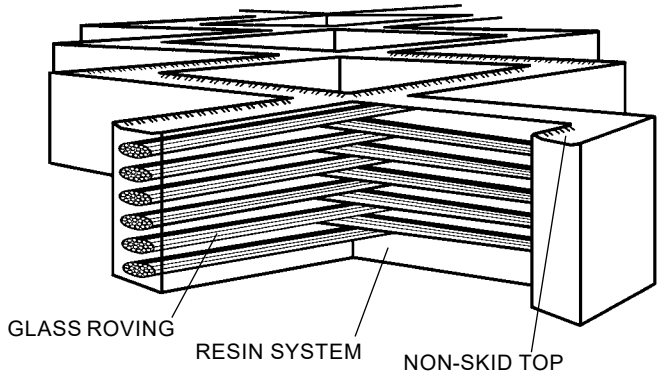
Duragrate™ Molded Grating

Molded Grating has many features to satisfy the needs and design requirements of our customers:

- **Corrosion Resistant:** Resistant to nearly all industrial chemicals and will give long life and low life cycle cost.
- **Slip Resistant:** The concave surface provides positive traction even when wet, creating a safer work environment.
- **Fire Retardant:** All resin systems are fire retardant Class I ASTM E-84 with zero fuel contribution.
- **Non-Conductive:** Creates a safety barrier for personnel in electrical applications. Non-magnetic and non-sparking.
- **Light Weight:** The low weight makes it easy to install and remove without heavy equipment.
- **Low Maintenance:** The high corrosive resistance eliminates costly maintenance.

Fiberglass Grating - Molded

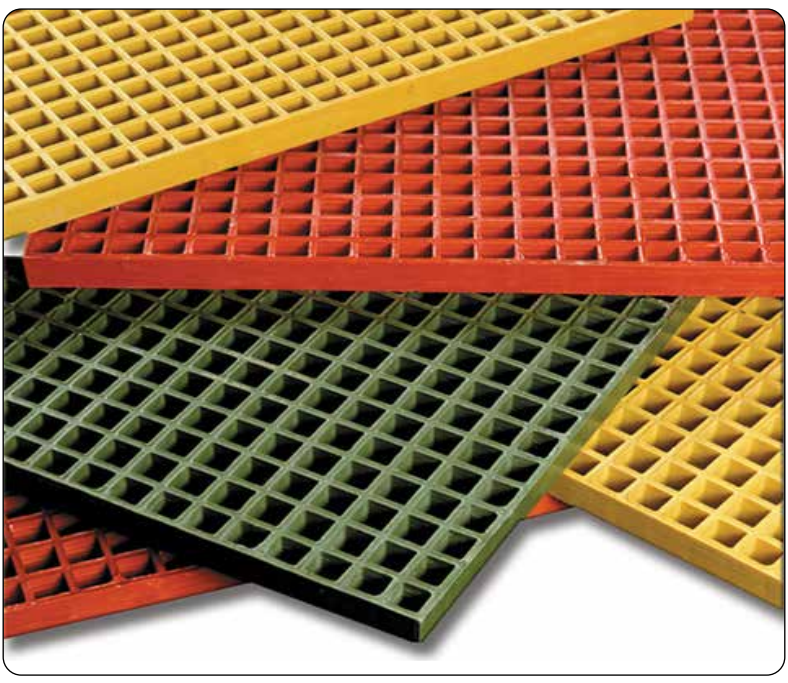
Duragrate™ Molded Grating



Resin Systems

Premium Grade Polyester Resins

DESCRIPTION	STANDARD COLORS
•Standard Fire Retardant •Extra Fire Retardant •Vinyl Ester Fire Retardant	green gray orange
(Other resin systems and colors are available on special order.)	



Fiberglass Grating - Molded

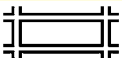
Duragrate™ Molded Grating

STANDARD GRATINGS

Additional features and accessories:

- **Gritted Top:** An epoxy grit can be added to the top of the standard grating.
- **USDA Approved Grating:** Where incidental food contact may occur USDA approved grating is available.
- **Custom Colors:** Contact Alro Plastics about custom colors.
- **Seal Kits:** All field cuts should be sealed with a compatible resin.

STANDARD GRATINGS

Top View	Open Area	Depth	Pattern	Approx Weight (lbs./sqft)	Mesh Size	Panel Sizes
	70%	1	Square Mesh	2.5	1½ x 1½	3 x 10 4 x 12
	69%	1	Rect. Mesh	2.5	1 x 4	3 x 10 4 x 12
	70%	1½	Square Mesh	3.75	1½ x 1½	3 x 10 4 x 12
	72%	2	Square Mesh	4.0	2 x 2	4 x 12

Note: Standard and Heavy Duty grades are available.

Fiberglass Grating - Pultruded

Duradeck™ Pultruded Grating

Fiberglass Grating bars consist of two glass reinforcements. First, continuous glass roving is used for high longitudinal strength. Second, continuous strand mat is introduced, primarily for transverse strength. The mat also provides a resin-rich surface for added corrosion resistance and helps prevent chipping and splitting from impact. Fiberglass Grating, in addition to the glass reinforcement, provides a synthetic surface veil to match the resin selection. The veil provides a greater corrosion capability for harsh chemical environments and creates an ultra-violet barrier for continuous exposure outdoors.

Product Applications

Breweries, Chemical, Fire Equipment, Food Processing, Gas/Coal Fire/Nuclear Power, Marine Applications, Micro Electronics, Mining, Offshore Equipment, Petroleum Production, Plating Operations, Pollution Control, Pulp/Paper, Recreational Equipment, Swimming Pools, and Water/Waste Water.

Specifications

Resin Systems

- **Isophthalic, Isophthalic Fire Retardant:** Made with a premium-grade fire retardant isophthalic polyester resin which meets ASTM E-84, Class 1, Flame Rating, and self-extinguishing requirements of ASTM D-635.
- **Vinylester, Vinylester Fire Retardant:** Made with a premium grade vinylester resin system for severe corrosion applications also meeting ASTM E-84, Class 1, Flame Rating, and self-extinguishing requirements of ASTM D-635.

Safety/Non-Skid Surfaces

The walking surfaces of Fiberglass Grating have a coarse epoxy grit bonded to both the bearing bar and the flush top cross-rod. The patented flush-top design provides a greater non-skid surface area as well as improved appearance.

Typical Properties

- Corrosion resistant.
- Fire retardant.
- High impact strength.
- High strength.
- Light weight.
- Low maintenance.
- Low thermal conductivity.
- Maximum unsupported spans.
- Safety non-skid surface.

Fully Threaded Steel Bars

Low Carbon plain & High Strength (B7) plain
Low Carbon Zinc plated & High Strength (B7) Zinc plated
Stainless Steel

Standard Lengths: 2 ft., 3 ft., 6 ft., 10 ft. & 12 ft.

National Coarse Sizes	
6-32	5/8-11
8-32	3/4-10
10-24	7/8-9
1/4-20	1-8
5/16-18	1-1/8-7
3/8-16	1-1/4-7
7/16-14	1-3/8-6
1/2-13	1-1/2-6
9/16-12	1-3/4-6
	2-4-1/2

National Fine Sizes	
10-32	7/8-14
1/4-28	1-14
5/16-24	1-1/8-12
3/8-24	1-1/4-12
7/16-20	1-3/8-12
1/2-20	1-1/2-12
9/16-18	1-3/4-12
5/8-18	2-12
3/4-16	

Note: Available in Metric sizes also.

Square Key Stock

Zinc Plated finish (Cold Drawn)

Standard Lengths: 12” and 36”

Sizes (inches)		
1/8	3/8	3/4
5/32	7/16	13/16
3/16	1/2	7/8
7/32	9/16	15/16
1/4	5/8	1
5/16	11/16	

Note: Available in Metric sizes also.

Steel Strapping

Regular Duty

Strap Size				Specifications	
Width		Thickness		Average Strength (lbs.)	Footage Yield (ft./lbs.)
(inch)	(mm)	(inch)	(mm)		
3/8	10	.020	.51	865	39.22
1/2	13	.015 .020 .023	.38 .51 .58	860 1150 1320	39.22 29.42 25.58
5/8	16	.020 .023	.51 .58	1440 1650	23.53 20.46
3/4	19	.020 .023	.51 .58	1725 1980	19.61 17.05

Steel Strapping

High Tensile

Strap Size				Specifications	
Width		Thickness		Average Strength (lbs.)	Footage Yield (ft./lbs.)
(inch)	(mm)	(inch)	(mm)		
1/2	13	.020	.51	1485	29.42
5/8	16	.020 .023	.51 .58	1855 2130	23.53 20.46
3/4	19	.020 .025 .029 .031	.51 .64 .75 .80	2325 2675 3320 3250	19.61 15.69 13.30 12.65
1-1/4	32	.029 .031 .035 .044	.75 .80 .89 1.12	5437 5450 6780 7700	8.11 7.59 6.72 5.35
2	51	.044	1.12	12300	3.34

Diamond Case Shafting

Carbon (1060) Standard Sizes

Nom. Dia.	Tolerances				Weight lbs. per inch	Surface Hardness	Depth of Hardness	Bar Lengths
	Grade 1 (L)	Grade 2 (S)	Grade 3 (N)	Grade 4 (D)				
1/4"	.2495/.2485	.2490/.2485			.014	60/65 RC	.040	144"
3/8"	.3745/.3740	.3740/.3735			.031	60/65 RC	.040	144"
1/2"	.4995/.4990	.4990/.4985	.5000/.4998		.055	60/65 RC	.060	184"
5/8"	.6245/.6240	.6240/.6235	.6250/.6248		.070	60/65 RC	.060	184"
3/4"	.7495/.7490	.7490/.7485	.7500/.7498		.125	60/65 RC	.060	184"
7/8"	.8745/.8740				.170	60/65 RC	.060	208"
1"	.9995/.9990	.9990/.9985	1.0000/.9998		.222	60/65 RC	.080	208"
1-1/8"	1.1245/1.1240				.282	60/65 RC	.080	208"
1-1/4"	1.2495/1.2490	1.2490/1.2498	1.2500/1.2498		.348	60/65 RC	.080	208"
1-3/8"	1.3745/1.3740				.421	60/65 RC	.080	208"
1-1/2"	1.4994/1.4989	1.4989/1.4984	1.5000/1.4997		.500	60/65 RC	.080	208"
1-3/4"	1.7495/1.7490				.681	60/65 RC	.100	208"
2"	1.9994/1.9987	1.9987/1.9980	2.0000/1.9997	2.0000/2.0003	.890	60/65 RC	.100	208"
2-1/4"	2.2493/2.2486				1.127	60/65 RC	.100	208"
2-1/2"	2.4993/2.4985	2.4985/2.4977			1.392	60/65 RC	.100	208"
3"	2.9992/2.9983	2.9983/2.9974	3.0000/2.9996		2.004	60/65 RC	.100	208"
3-1/2"	3.4990/3.4980				2.728	60/65 RC	.100	208"
4"	3.9988/3.9976	3.9976/3.9964			3.565	60/65 RC	.100	208"

Diamond Case Shafting

Carbon (1060) Metric Sizes

Nominal Diameter	Tolerance Grade 1 (L)	Weight per inch	Surface Hardness	Depth of Hardness	Bar Lengths
6	.2362/.2358	.012	60/65 RC	.040	144"
8	.3150/.3146	.022	60/65 RC	.040	144"
10	.3937/.3933	.035	60/65 RC	.040	144"
12	.4724/.4720	.050	60/65 RC	.060	184"
14	.5512/.5508	.069	60/65 RC	.060	184"
16	.6299/.6295	.088	60/65 RC	.060	184"
18	.7087/.7083	.112	60/65 RC	.060	184"
20	.7874/.7869	.138	60/65 RC	.060	184"
25	.9843/.9838	.216	60/65 RC	.080	208"
30	1.1811/1.1806	.311	60/65 RC	.080	208"
32	1.2598/1.2593	.349	60/65 RC	.081	208"
35	1.3780/1.3775	.417	60/65 RC	.082	208"
40	1.5748/1.5743	.553	60/65 RC	.080	208"
45	1.7717/1.7710	.698	60/65 RC	.080	208"
50	1.9685/1.9679	.864	60/65 RC	.100	208"
60	2.3622/2.3615	1.240	60/65 RC	.100	208"
63	2.4806/2.4799	1.343	60/65 RC	.100	208"
80	3.1496/3.1489	2.210	60/65 RC	.100	208"
100	3.9370/3.9363	3.397	60/65 RC	.100	208"

Diamond Case Shafting

Stainless (440 C) Standard Sizes

Nominal Diameter	Tolerances		Weight per inch	Surface Hardness	Depth of Hardness	Bar Lengths
	Grade 1 (L)	Grade 2 (S)				
1/2”	.4995/.4990	.4990/.4985	.055	50/550 RC	.060	184”
5/8”	.6245/.6240	.6240/.6235	.086	50/550 RC	.060	184”
3/4”	.7495/.7490	.7490/.7485	.125	50/550 RC	.060	184”
1”	.9995/.9990	.9990/.9985	.222	50/550 RC	.080	208”
1-1/4”	1.2495/1.2490	1.2490/1.2485	.348	50/550 RC	.080	208”
1-1/2”	1.4994/1.4989	1.4989/1.4984	.500	50/550 RC	.080	208”
2”	1.9994/1.9987	1.9987/1.9980	.890	50/550 RC	.100	208”

Diamond Case Linear Shafting Specifications:

- **Material** - 1060 or 440C stainless
- **Dimensional Tolerance** - See pages 9-54 & 9-55
- **Roundness** - Superior
- **Cylindricity** - High
- **Straightness** - .001/.002 TIR cumulative
- **Surface Finish** - 8 RMS or better
- **Hardness** - See pages 9-54 & 9-55
- **Depth of Hardness** - See pages 9-54 & 9-55

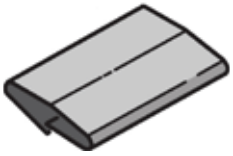
Strapping Seals

Regular Duty Seals

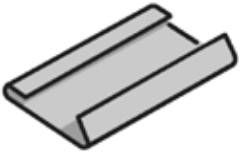
Strap Width (inches)	Seal Number	Seal Type	Type of Joint (Notch)	Seal Length (inches)	Standard Pack	Shipping Weight (pounds)
3/8	31	Open	Double	1	5000	31
	32PB	Push	Double	1	6000	53
1/2	41	Open	Double	1	5000	39
	42	Closed	Double	1	5000	42
	44PB	Push	Single	7/8	6000	56
5/8	51	Open	Double	1-3/32	5000	53
	52FM	Closed	Double	1-3/32	5000	54
	52PB	Push	Double	1-3/32	5000	68
3/4	61	Open	Double	1-3/32	5000	60
	62PB	Push	Double	1-3/32	5000	78
	632 PBH	Push	Double	1-25/32	2500	78
	637	Semi-Open	Double	1-25/32	2000	43
1-1/4	1032 PBH	Push	Double	2-1/4	1000	63

Seal Examples

OPEN (SNAP-ON)
Open seals have open legs to permit them to be snapped onto the over-lapping strap-ends prior to tensioning. Regular Duty sizes only.



PUSH (OVERLAP)
Push-type seals have closed overlapping legs to be used with push-type tensioners.



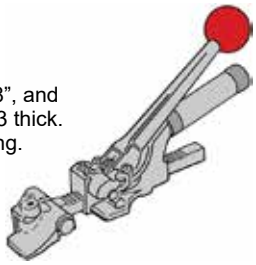
SEMI-OPEN (ONE LEG RAISED)
Semi-open seals are used on heavy-duty strapping. The closed leg is hooked over the strapping and the seal snapped down into position.

Tools for Steel Strapping

Regular Duty

Manual

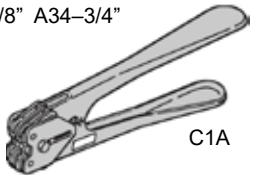
NH-4 Tensioner
Use for 3/8", 1/2", 5/8", and 3/4" widths, .015-.023 thick. Regular duty strapping.



Om Tensioner (Manual)

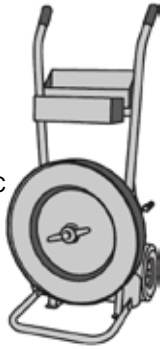
Multicrimp Tong Sealers

A38–3/8" A12–1/2"
A58–5/8" A34–3/4"



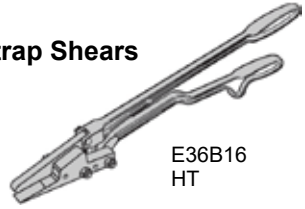
C1A

Dispensers

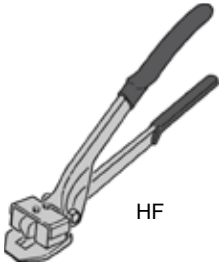


NRC

Strap Shears



E36B16
HT

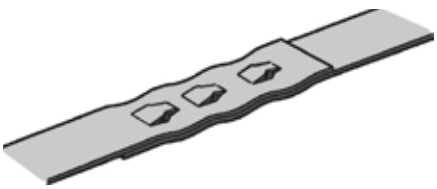


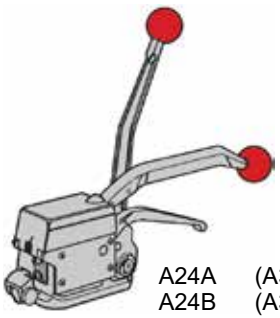
HF

Model	Strap Size		Weight	
	(inches)	(millimeters)	(lbs.)	(kg.)
E14B0	thru 3/4 x .025	thru 19 x 0.64	1	0.45
S	thru 3/4 x .025	thru 19 x 0.64	1	0.45
E36C0	thru 1-1/4 x .035	thru 32 x 0.89	2	0.90
V	thru 1-1/4 x .035	thru 32 x 0.89	2	0.90
HF	thru 1-1/4 x .035	thru 32 x 0.89	2	0.90
E36B16	thru 2 x .065	thru 51 x 1.65	7	3.14
HT	thru 2 x .050	thru 51 x 1.27	6	2.69

Sealless Joint

Eliminates the need for separate metal seals.





A24A (A332)
A24B (A333, A335)

Shipping Steel Strapping

All Regular Duty and Supramet is shipped in approximately 100 lb. (45kg) oscillated coils, which are approximately 1,100 lbs. (499.2 kg) per skid. Heavy duty and High Tensile strapping is shipped in approximately 60 to 105 lb. ribbon wound coils, which are approximately 1,500 to 2,500 lbs. (680.7 to 1134.5 kg) per skid.

Oscillated

Ribbon

Skids are available in cardboard wrapped Skid Packs and unwrapped Open Packs.

Skid Pack

Open Pack

Metals Processing

Overview of Alro's Value-Added Services

Metals Processing

Plate Laser Cutting

Laser tolerances in stainless, aluminum and carbon plate up to 1” thick, up to 1/4” thick in red metals

- Maximum plate capacity 80” X 159”
- High precision and repeatability on cut parts
- Produces near net or finished products to your print
- Minimal heat affected zone
- Minimal to no clean-up
- Etching (not offered on red metals) and “stitch-cutting” available

Potential Secondary Processes:

- Tapping from #10 - 3/4” and M5 - M12 available depending on size/thickness
- Forming

Video available on YouTube

Oxy-Fuel Cutting

Alro offers oxy-fuel flame cut pieces (rectangles, ID, OD and per print items) to customer specifications. Our CNC machines allow us to flame cut carbon plate up to 14” thick. Some advantages of flame cutting include:

- Thick material cutting capability
- Multi-torch cutting to increase efficiency
- Good edge quality
- In-house stress-relieving, normalizing and annealing
- Maximum table cutting capacity 120" x 600"

Video available on YouTube

Metals Processing

Plasma Cutting

Alro's Plasma Cutting Systems provide tighter tolerances, minimize machining on finished parts and provide greater part accuracy than standard flame cutting. Plasma has a smaller heat affected zone and reduced edge cracking when forming. PC-based control technology increases control in shape cutting. Advantages include:

- High quality edge cuts
- Minimal clean-up
- Small heat affected zone
- Etching and beveling capabilities
- Forming as a potential secondary process

Video available on YouTube

Waterjet Cutting

Waterjet Cutting is a great alternative to traditional Plate Processing. Use waterjet for cutting jigs, mechanical parts or customized tooling. Waterjet cutting eliminates the need for drilling and punching, and is perfect for cutting Stainless Steel, Aluminum, Alloys, Copper, Brass, Bronze, and Plastics. Advantages include:

- No heat affected zones
- No mechanical stress
- More accurate cutting in all materials
- Produces a near net, finished part
- Thicker cutting with minimal distortion
- Reduces or eliminates secondary machining operations
- Tighter nesting for optimal material utilization

Video available on YouTube

Metals Processing

Precision Plate Saw Cutting

Our precision plate saws are capable of producing square cuts with tight tolerances. These precision saws can cut up to 12" thick and 12 feet wide/long.

Circle sawing is available for many materials and can cut up to a 60" dia. circle. We can also precision saw aluminum mold plate up to 30" thick.

- Precision plate saw cutting
- Mold plate saw cutting
- Circle saw cutting

Video available on YouTube

Shearing

Shearing sheet metal and plate steel is performed in most of Alro's steel warehouses. We'll shear your order to your exact specifications, place your material on a skid for safe transporting and safe handling after your order is delivered to your specified location.

We are capable of shearing plate up to 1/2" thick. Thickness capacities vary depending on the grade of the material. Please inquire.

Metals Processing

Tube Laser Cutting

6-axis Tube Laser Cutting up to 24" for tube, angle, channel and beams.

- Up to 24” diameter x 50 feet long
- Miter cut, top notch and slot holes
- Tabs, etching, pipe joints and more
- High quality cut and parts repeatability
- Tapping from #10 - 3/4” and M5 - M20
- Reduce assembly time by eliminating need for: sawing, fixtures, milling, drilling, punching, bending, and welding

Video available on YouTube

Tube Cutting & Chamfering

Alro offers cut-to-size and ID/OD chamfers on both ends in a single operation at production speeds with precision tolerances (+/-.005").

Video available on YouTube

Capabilities:

- OD: 0.750” up to 6.700”
- Wall thickness: 0.049” up to 1.000”
- Minimum cut length: 0.750”
- Standard bevel features: 30°, 40° and 45°

  Note: Actual size of 30° bevel is 27.5°
- Capable of 60° weld prep
- Inquire for even more features

Materials:

Carbon Steel, Stainless, Aluminum, Brass, Bronze, Copper and Alloys.

Metals Processing

Bar & Structural Saw Cutting

All Alro warehouses employ state-of-the-art equipment for handling and processing orders. Alro offers next-day delivery on most saw cutting orders. We can cut your material to a specified length for storage or handling or your order can be cut within your specified tolerance.

- Bar saw cutting
- Miter saw cutting
- Structural saw cutting

Video available on YouTube

Press Brake Forming

With multiple machines of varying capabilities, Alro Steel is uniquely qualifed to cut and form your custom parts. Along with standard formed shapes, Alro is capable of producing more complex parts such as:

- 3- and 4-sided pans
- Multiple profile parts
- Overbending of a variety of thickness
- Multiple hit “step brake/rolled parts”

Video available on YouTube

Alro continually invests in new technology and updating their machines to provide the highest quality parts with the following advantages:

- Use of precision ground and high-quality finish tooling for accurate repeatability
- Sophisticated interactive programming software
- 6-axis back-gauge with independent finger movement for complex geometry
- Use of static surface tooling

Metals Processing

Precision Milling Super Square

Precision milled Super Square offers better utilization of skilled labor, machine time and overall productivity.

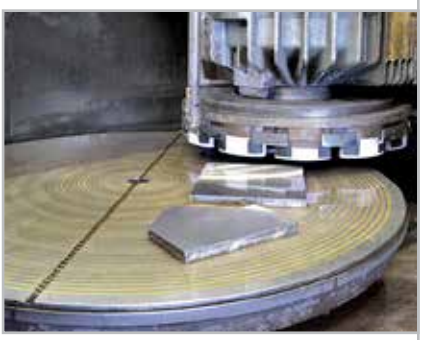
- 2, 4, 6 side precision milled
- Available in all metal grades
- Thickness = .250” - 15.750”
- Width/Length = .750” - 39.375”
- Square and parallel .002” per foot
- Milled to customer tolerances
- Fast delivery to meet customer needs

Video available on YouTube

Plate Grinding

Blanchard (Rotary) Grinding: Alro’s Blanchard Grinding machines allow for great turnaround time and the capability of grinding metals with a 152” swing from corner to corner.

Reciprocal Grinding: For jobs requiring a smoother finish and a tighter tolerance, Alro offers Reciprocal Grinding with a surface capacity up to 48” x 120”



Video available on YouTube

Metals Processing

Thermal Processing

Stress Relieving diminishes the residual stress in steel caused by working the material (i.e. flame cutting, forming, rolling, casting, machining, welding, bending, straightening). This is accomplished by reheating the steel then cooling it at a slower rate.

- Stress relieving can be performed before grinding on parts that require light machining
- Often used on weldments

Video available on YouTube

Normalizing is accomplished by heating the metal above the transformation temperature, then cooling it in still or slightly agitated air. Benefits include:

- Refines/reduces the grain size of steels that have been subjected to high temperatures
- Prepares steel for heavy machining
- When machined, provides a better surface finish

Annealing is accomplished by heating the metal just below the transformation temperature, then cooling in a controlled cycle which limits the cooling rate and brings the temperature down slowly. Benefits include:

- Softens metal
- Changes mechanical/electrical properties
- Aids in dimensional stability
- Greatly improves forming and bending

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Reference Section

Metal Product Information, Data and Tolerances

WARNING: These products can potentially expose you to chemicals including Nickel, Chromium, Lead, Cobalt, Mercury and Beryllium, which are known to the state of California to cause cancer and/or birth defects or other reproductive harm. For more information, visit **www.P65Warnings.ca.gov**

Average Mechanical Properties

Various Steels Commonly Ordered to Chemical Specifications

A.I.S.I Number	Condition	*Tensile Strength	*Yield Point	Elongation %, 2"
C1018	Hot Rolled	58	32	25
C1018	Cold Drawn	64	54	15
C1020	Hot Rolled	55	30	25
C1020	Cold Drawn	64	54	24
C1040	Hot Rolled	90	56	24
C1040	Cold Drawn	85	71	17
C1040	Heat Treated	108	79	23
C1040	Heat Treated	100	70	26
C1040	Heat Treated	94	68	27
C1040	Heat Treated	96	68	27
C1040	Heat Treated	92	64	28
C1040	Heat Treated	85	60	30
C1042	Hot Rolled	92	58	24
C1042	Cold Drawn	101	86	19
C1045	Hot Rolled	82	45	16
C1045	Cold Drawn	91	77	12
C1117	Hot Rolled	62	34	27
C1117	Cold Drawn	69	58	21
C1137	Hot Rolled	87	54	20
C1137	Cold Drawn	98	82	16
C1137	Heat Treated	122	98	17
C1137	Heat Treated	110	71	21
C1137	Heat Treated	108	69	20
C1137	Heat Treated	108	76	21
C1137	Heat Treated	101	69	24
C1137	Heat Treated	98	69	24
C1141	Hot Rolled	94	51	15
C1141	Cold Drawn	105	88	10
C1144	Cold Drawn	108	90	10
A311 Class B	Cold Drawn	115	100	8
C12L14	Cold Drawn	78	60	10
C1215	Cold Drawn	78	60	10

**Tensile Strength and Yield Point based on 1,000 lbs. PSI*

Two page chart, continues on next page

The information shown above represents the average results of a number of tests made at steel mill laboratories. Tensile strength, yield point, elongation, reduction of area and hardness are all affected by the size of the section being heat treated and permissable variations in analysis. This information, therefore, is only a guide and cannot be used as a basis for the acceptance or rejection of material. Physical properties can be guaranteed only on steels ordered heat treated to acceptable commercial limits. All tests were made on 1" diameter round bars.

Average Mechanical Properties

Various Steels Commonly Ordered to Chemical Specifications

A.I.S.I Number	Reduction Area, %	Hardness, Brinell	Hardness, Rockwell	Machinability %
C1018	50	116	B79	52
C1018	40	126	B85	70
C1020	50	137	B76	50
C1020	54	126	B79	58
C1040	49	187	B91	63
C1040	42	170	B93	62
C1040	63	217	B96	---
C1040	65	207	B95	---
C1040	68	197	B93	---
C1040	61	197	B93	---
C1040	64	187	B91	---
C1040	67	170	B87	---
C1042	49	201	B94	63
C1042	40	207	B95	60
C1045	40	163	C16	56
C1045	35	179	C15	55
C1117	47	131	B78	84
C1117	52	137	B87	90
C1137	47	192	B92	70
C1137	35	199	C15	70
C1137	51	248	C24	---
C1137	56	229	C21	---
C1137	52	223	B97	---
C1137	56	223	B97	---
C1137	60	207	B95	---
C1137	61	187	B94	---
C1141	35	212	B95	65
C1141	30	223	C19	70
C1144	30	217	---	83
A311 Class B	25	---	---	83
C 12L14	35	163	B86	180
C 1215	35	163	B86	136

Two page chart, continued from previous page

The information shown above represents the average results of a number of tests made at steel mill laboratories. Tensile strength, yield point, elongation, reduction of area and hardness are all affected by the size of the section being heat treated and permissable variations in analysis. This information, therefore, is only a guide and cannot be used as a basis for the acceptance or rejection of material. Physical properties can be guaranteed only on steels ordered heat treated to acceptable commercial limits. All tests were made on 1" diameter round bars.

Average Mechanical Properties

Various Steels Commonly Ordered to Chemical Specifications

A.I.S.I Number	Condition	*Tensile Strength	*Yield Point	Elongation %, 2"	Reduction Area, %
4130	HR Annealed	84	53	29	54
4130	CD Annealed	97	87	21	51
4130	Heat Treated	161	138	15	54
4130	Heat Treated	145	130	19	62
4130	Heat Treated	128	113	21	68
4140	HR Annealed	89	62	26	57
4140	CD Annealed	102	90	18	50
4140	Heat Treated	153	131	16	45
4140	Heat Treated	140	135	20	62
4140	Heat Treated	133	123	21	65
4150	HR Heat Treat.	156	138	18	51
4340	HR Annealed	101	69	21	45
4340	CD Annealed	114	96	15	44
4340	Heat Treated	175	166	14	46
4340	Heat Treated	165	159	17	54
4340	Heat Treated	139	128	20	60
6150	HR Annealed	91	58	22	53
6150	Heat Treated	155	132	15	44
8620	Hot Rolled	92	64	25	58
8620	Cold Drawn	104	79	21	49

**Tensile Strength and Yield Point based on 1,000 lbs. PSI*

Two page chart, continues on next page

The information shown above represents the average results of a number of tests made at steel mill laboratories. Tensile strength, yield point, elongation, reduction of area and hardness are all affected by the size of the section being heat treated and permissable variations in analysis. This information, therefore, is only a guide and cannot be used as a basis for the acceptance or rejection of material. Physical properties can be guaranteed only on steels ordered heat treated to acceptable commercial limits. All tests were made on 1" diameter round bars.

Average Mechanical Properties

Various Steels Commonly Ordered to Chemical Specifications

				Heat Treatment		
A.I.S.I Number	Hardness, Brinell	Hardness, Rockwell	Mach. %	Quenched From	Tempered At	Medium
4130	183	B90	65	---	---	---
4130	201	B96	70	---	---	---
4130	321	C34	---	1575°	900°	Water
4130	293	C31	---	1575°	1000°	Water
4130	262	C27	---	1575°	1100°	Water
4140	187	B91	57	---	---	---
4140	223	C19	66	---	---	---
4140	311	C33	---	1550°	1000°	Oil
4140	285	C30	---	1550°	1100°	Oil
4140	269	C28	---	1550°	1200°	Oil
4150	302	C32	---	1525°	1100°	Oil
4340	207	C15	45	---	---	---
4340	229	C21	55	---	---	---
4340	352	C38	---	1475°	1000°	Oil
4340	331	C36	---	1475°	1100°	Oil
4340	277	C29	---	1475°	1200°	Oil
6150	183	B90	50	---	---	---
6150	302	C32	---	1550°	1000°	Oil
8620	192	B92	58	---	---	---
8620	212	B96	66	---	---	---

Two page chart, continued from previous page

The information shown above represents the average results of a number of tests made at steel mill laboratories. Tensile strength, yield point, elongation, reduction of area and hardness are all affected by the size of the section being heat treated and permissable variations in analysis. This information, therefore, is only a guide and cannot be used as a basis for the acceptance or rejection of material. Physical properties can be guaranteed only on steels ordered heat treated to acceptable commercial limits. All tests were made on 1" diameter round bars.

Combined AISI & SAE Standard Steel List

Chemical Composition Limits (percent)

A.I.S.I #	Carbon	Manganese	Phosphorus	Sulfur	S.A.E. #
C 1005	0.06 (max)	0.35 (max)	0.040 (max)	0.050 (max)	---
C 1006	0.08 (max)	0.25 / 0.40	0.040 (max)	0.050 (max)	1006
C 1008	0.10 (max)	0.25 / 0.50	0.040 (max)	0.050 (max)	1008
C 1010	0.08 / 0.13	0.30 / 0.60	0.040 (max)	0.050 (max)	1010
C 1011	0.08 / 0.13	0.60 / 0.90	0.040 (max)	0.050 (max)	---
C 1012	0.10 / 0.15	0.30 / 0.60	0.040 (max)	0.050 (max)	---
C 1013	0.11 / 0.16	0.50 / 0.80	0.040 (max)	0.050 (max)	---
C 1015	0.13 / 0.18	0.30 / 0.60	0.040 (max)	0.050 (max)	1015
C 1016	0.13 / 0.18	0.60 / 0.90	0.040 (max)	0.050 (max)	1016
C 1017	0.15 / 0.20	0.30 / 0.60	0.040 (max)	0.050 (max)	1017
C 1018	0.15 / 0.20	0.60 / 0.90	0.040 (max)	0.050 (max)	1018
C 1019	0.15 / 0.20	0.70 / 1.00	0.040 (max)	0.050 (max)	1019
C 1020	0.18 / 0.23	0.30 / 0.60	0.040 (max)	0.050 (max)	1020
C 1021	0.18 / 0.23	0.60 / 0.90	0.040 (max)	0.050 (max)	1021
C 1022	0.18 / 0.23	0.70 / 1.00	0.040 (max)	0.050 (max)	1022
C 1023	0.20 / 0.25	0.30 / 0.60	0.040 (max)	0.050 (max)	---
C 1024	0.19 / 0.25	1.35 / 1.65	0.040 (max)	0.050 (max)	1024
C 1025	0.22 / 0.28	0.30 / 0.60	0.040 (max)	0.050 (max)	1025
C 1026	0.22 / 0.28	0.60 / 0.90	0.040 (max)	0.050 (max)	1026
C 1027	0.22 / 0.29	1.20 / 1.50	0.040 (max)	0.050 (max)	1027
C 1029	0.25 / 0.31	0.60 / 0.90	0.040 (max)	0.050 (max)	---
C 1030	0.28 / 0.34	0.60 / 0.90	0.040 (max)	0.050 (max)	1030
C 1031	0.28 / 0.34	0.30 / 0.60	0.040 (max)	0.050 (max)	---
C 1032	0.30 / 0.36	0.60 / 0.90	0.040 (max)	0.050 (max)	---
C 1033	0.30 / 0.36	0.70 / 1.00	0.040 (max)	0.050 (max)	1033
C 1034	0.32 / 0.38	0.50 / 0.80	0.040 (max)	0.050 (max)	---
C 1035	0.32 / 0.38	0.60 / 0.90	0.040 (max)	0.050 (max)	1035
C 1036	0.30 / 0.37	1.20 / 1.50	0.040 (max)	0.050 (max)	1036
C 1037	0.32 / 0.38	0.70 / 1.00	0.040 (max)	0.050 (max)	---
C 1038	0.35 / 0.42	0.60 / 0.90	0.040 (max)	0.050 (max)	1038
C 1039	0.37 / 0.44	0.70 / 1.00	0.040 (max)	0.050 (max)	1039
C 1040	0.37 / 0.44	0.60 / 0.90	0.040 (max)	0.050 (max)	1040
C 1041	0.36 / 0.44	1.35 / 1.65	0.040 (max)	0.050 (max)	1041
C 1042	0.40 / 0.47	0.60 / 0.90	0.040 (max)	0.050 (max)	1042
C 1043	0.40 / 0.47	0.70 / 1.00	0.040 (max)	0.050 (max)	1043
C 1045	0.43 / 0.50	0.60 / 0.90	0.040 (max)	0.050 (max)	1045
C 1046	0.43 / 0.50	0.70 / 1.00	0.040 (max)	0.050 (max)	1046
C 1049	0.46 / 0.53	0.60 / 0.90	0.040 (max)	0.050 (max)	1049
C 1050	0.48 / 0.55	0.60 / 0.90	0.040 (max)	0.050 (max)	1050
C 1051	0.45 / 0.56	0.85 / 1.15	0.040 (max)	0.050 (max)	---
C 1052	0.47 / 0.55	1.20 / 1.50	0.040 (max)	0.050 (max)	1052
C 1053	0.48 / 0.55	0.70 / 1.00	0.040 (max)	0.050 (max)	---
C 1054	0.50 / 0.60	0.50 / 0.80	0.040 (max)	0.050 (max)	---
C 1055	0.50 / 0.60	0.60 / 0.90	0.040 (max)	0.050 (max)	1055
C 1057	0.50 / 0.61	0.85 / 1.15	0.040 (max)	0.050 (max)	---
C 1059	0.55 / 0.65	0.50 / 0.80	0.040 (max)	0.050 (max)	---
C 1060	0.55 / 0.65	0.60 / 0.90	0.040 (max)	0.050 (max)	1060
C 1061	0.54 / 0.65	0.75 / 1.05	0.040 (max)	0.050 (max)	---
C 1062	0.54 / 0.65	0.85 / 1.15	0.040 (max)	0.050 (max)	1062
C 1064	0.60 / 0.70	0.50 / 0.80	0.040 (max)	0.050 (max)	1064
C 1065	0.60 / 0.70	0.60 / 0.90	0.040 (max)	0.050 (max)	1065
C 1066	0.60 / 0.71	0.85 / 1.15	0.040 (max)	0.050 (max)	1066
C 1069	0.65 / 0.75	0.40 / 0.70	0.040 (max)	0.050 (max)	---

Continued on next page

Combined AISI & SAE Standard Steel List

Chemical Composition Limits (percent)

A.I.S.I #	Carbon	Manganese	Phosphorus	Sulfur	S.A.E. #
C 1070	0.65 / 0.75	0.60 / 0.90	0.040 (max)	0.050 (max)	**1070**
C 1071	0.65 / 0.76	0.75 / 1.05	0.040 (max)	0.050 (max)	**---**
C 1072	0.65 / 0.76	1.00 / 1.30	0.040 (max)	0.050 (max)	**---**
C 1074	0.70 / 0.80	0.50 / 0.80	0.040 (max)	0.050 (max)	**1074**
C 1075	0.70 / 0.80	0.40 / 0.70	0.040 (max)	0.050 (max)	**---**
C 1078	0.72 / 0.85	0.30 / 0.60	0.040 (max)	0.050 (max)	**1078**
C 1080	0.75 / 0.88	0.60 / 0.90	0.040 (max)	0.050 (max)	**1080**
C 1084	0.80 / 0.93	0.60 / 0.90	0.040 (max)	0.050 (max)	**---**
C 1085	0.80 / 0.93	0.70 / 1.00	0.040 (max)	0.050 (max)	**1085**
C 1086	0.82 / 0.95	0.30 / 0.50	0.040 (max)	0.050 (max)	**1086**
C 1090	0.85 / 0.98	0.60 / 0.90	0.040 (max)	0.050 (max)	**1090**
C 1095	0.90 / 1.03	0.30 / 0.50	0.040 (max)	0.050 (max)	**1095**
B 1006	0.08 (max)	0.45 (max)	0.07 / 0.12	0.060 (max)	**---**
B 1010	0.13 (max)	0.30 / 0.60	0.07 / 0.12	0.060 (max)	**---**
C 1106	0.08 (max)	0.30 / 0.60	0.040 (max)	0.08 / 0.13	**---**
C 1108	0.08 / 0.13	0.50 / 0.80	0.040 (max)	0.08 / 0.13	**---**
C 1109	0.08 / 0.13	0.60 / 0.90	0.040 (max)	0.08 / 0.13	**1109**
C 1110	0.08 / 0.13	0.30 / 0.60	0.040 (max)	0.08 / 0.13	**---**
C 1111	0.08 / 0.13	0.60 / 0.90	0.040 (max)	0.16 / 0.23	**---**
C 1113	0.10 / 0.16	1.00 / 1.30	0.040 (max)	0.24 / 0.33	**---**
C 1114	0.10 / 0.16	1.00 / 1.30	0.040 (max)	0.08 / 0.13	**1114**
C 1115	0.13 / 0.18	0.60 / 0.90	0.040 (max)	0.08 / 0.13	**1115**
C 1116	0.14 / 0.20	1.10 / 1.40	0.040 (max)	0.16 / 0.23	**1116**
C 1117	0.14 / 0.20	1.00 / 1.30	0.040 (max)	0.08 / 0.13	**1117**
C 1118	0.14 / 0.20	1.30 / 1.60	0.040 (max)	0.08 / 0.13	**1118**
C 1119	0.14 / 0.20	1.00 / 1.30	0.040 (max)	0.24 / 0.33	**1119**
C 1120	0.18 / 0.23	0.70 / 1.00	0.040 (max)	0.08 / 0.13	**1120**
C 1125	0.22 / 0.28	0.60 / 0.90	0.040 (max)	0.08 / 0.13	**---**
C 1126	0.23 / 0.29	0.70 / 1.00	0.040 (max)	0.08 / 0.13	**1126**
C 1132	0.27 / 0.34	1.35 / 1.65	0.040 (max)	0.08 / 0.13	**1132**
C 1137	0.32 / 0.39	1.35 / 1.65	0.040 (max)	0.08 / 0.13	**1137**
C 1138	0.34 / 0.40	0.70 / 1.00	0.040 (max)	0.08 / 0.13	**1138**
C 1140	0.37 / 0.44	0.70 / 1.00	0.040 (max)	0.08 / 0.13	**1140**
C 1141	0.37 / 0.45	1.35 / 1.65	0.040 (max)	0.08 / 0.13	**1141**
C 1144	0.40 / 0.48	1.35 / 1.65	0.040 (max)	0.24 / 0.33	**1144**
C 1145	0.42 / 0.49	0.70 / 1.00	0.040 (max)	0.04 / 0.07	**1145**
C 1146	0.42 / 0.49	0.70 / 1.00	0.07 / 0.12	0.08 / 0.13	**1146**
C 1148	0.45 / 0.52	0.70 / 1.00	0.040 (max)	0.04 / 0.07	**---**
C 1151	0.48 / 0.55	0.70 / 1.00	0.040 (max)	0.08 / 0.13	**1151**
C 1211	0.13 (max)	0.60 / 0.90	0.07 / 0.12	0.08 / 0.15	**---**
C 1212	0.13 (max)	0.70 / 1.00	0.07 / 0.12	0.16 / 0.23	**---**
C 1213	0.13 (max)	0.70 / 1.00	0.07 / 0.12	0.24 / 0.33	**---**
C 12L14	0.15 (max)	0.85 / 1.15	0.04 / 0.09	0.26 / 0.35	**12L14**
C 1215	0.09 (max)	0.75 / 1.05	0.04 / 0.09	0.26 / 0.35	**---**
B 1111	0.13 (max)	0.60 / 0.90	0.07 / 0.12	0.08 / 0.15	**1111**
B 1112	0.13 (max)	0.70 / 1.00	0.07 / 0.12	0.16 / 0.23	**1112**
B 1113	0.13 (max)	0.70 / 1.00	0.07 / 0.12	0.24 / 0.33	**1113**

Silicon: When a Silicon range is specified, standard limitations are as follows for Open Hearth Steels:

To C 1015 Exclusive: 0.10 (max)

C 1015 To C 1025 Inclusive: 0.10 (max), 0.10 / 0.20 or 0.15 / 0.30

Over C 1025: 0.10 / 0.20 or 0.15 / 0.30

To C 1113 Exclusive: 0.10 (max)

C 1113 and Over: 0.10 (max), .10/ .20 or .15/ .30

C 12L14 - Pb: 0.15 / 0.35 Lead Added

Acid Bessemer Steel is not furnished with specified silicon content.

Combined AISI & SAE Standard Steel List

Open Hearth Alloy and Electric Furnace Alloy Steels

Chemical Composition Limits (percent)

A.I.S.I #	Carbon	Manganese	Phos. (max.)	Sulf. (max.)
1330	0.28 / 0.33	1.60 / 1.90	0.040	0.040
1335	0.33 / 0.38	1.60 / 1.90	0.040	0.040
1340	0.38 / 0.43	1.60 / 1.90	0.040	0.040
1345	0.43 / 0.48	1.60 / 1.90	0.040	0.040
2317	0.15 / 0.20	0.40 / 0.60	0.040	0.040
2515	0.12 / 0.17	0.40 / 0.60	0.040	0.040
E2517	0.15 / 0.20	0.45 / 0.60	0.025	0.025
3120	0.17 / 0.22	0.60 / 0.80	0.040	0.040
3130	0.28 / 0.33	0.60 / 0.80	0.040	0.040
3135	0.33 / 0.38	0.60 / 0.80	0.040	0.040
3140	0.38 / 0.43	0.70 / 0.90	0.040	0.040
E3310	0.08 / 0.13	0.45 / 0.60	0.025	0.025
E3316	0.14 / 0.19	0.45 / 0.60	0.025	0.025
4023	0.20 / 0.25	0.70 / 0.90	0.040	0.040
4024	0.20 / 0.25	0.70 / 0.90	0.040	0.035
4024	---	---	---	0.050
4027	0.25 / 0.30	0.70 / 0.90	0.040	0.040
4028	0.25 / 0.30	0.70 / 0.90	0.040	0.035
4028	---	---	---	0.050
4032	0.30 / 0.35	0.70 / 0.90	0.040	0.040
4037	0.35 / 0.40	0.70 / 0.90	0.040	0.040
4042	0.40 / 0.45	0.70 / 0.90	0.040	0.040
4047	0.45 / 0.50	0.70 / 0.90	0.040	0.040
4053	0.50 / 0.56	0.75 / 1.00	0.040	0.040
4063	0.60 / 0.67	0.75 / 1.00	0.040	0.040
4068	0.63 / 0.70	0.75 / 1.00	0.040	0.040
4118	0.18 / 0.23	0.70 / 0.90	0.040	0.040
4130	0.28 / 0.33	0.40 / 0.60	0.040	0.040
4135	0.33 / 0.38	0.70 / 0.90	0.040	0.040
4137	0.35 / 0.40	0.70 / 0.90	0.040	0.040
4140	0.38 / 0.43	0.75 / 1.00	0.040	0.040
4142	0.40 / 0.45	0.75 / 1.00	0.040	0.040
4145	0.43 / 0.48	0.75 / 1.00	0.040	0.040
4147	0.45 / 0.50	0.75 / 1.00	0.040	0.040
4150	0.48 / 0.53	0.75 / 1.00	0.040	0.040
4320	0.17 / 0.22	0.45 / 0.65	0.040	0.040
4337	0.35 / 0.40	0.60 / 0.80	0.040	0.040
E4337	0.35 / 0.40	0.65 / 0.85	0.025	0.025

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Combined AISI & SAE Standard Steel List

Open Hearth Alloy and Electric Furnace Alloy Steels

Chemical Composition Limits (percent)

Silicon	Nickel	Chromium	Molybdenum	S.A.E. #
0.20 / 0.35	---	---	---	**1330**
0.20 / 0.35	---	---	---	**1335**
0.20 / 0.35	---	---	---	**1340**
0.20 / 0.35	---	---	---	**1345**
0.20 / 0.35	3.25 / 3.75	---	---	**2317**
0.20 / 0.35	4.75 / 5.25	---	---	**2515**
0.20 / 0.35	4.75 / 5.25	---	---	**2517**
0.20 / 0.35	1.10 / 1.40	0.55 / 0.75	---	**3120**
0.20 / 0.35	1.10 / 1.40	0.55 / 0.75	---	**3130**
0.20 / 0.35	1.10 / 1.40	0.55 / 0.75	---	**3135**
0.20 / 0.35	1.10 / 1.40	0.55 / 0.75	---	**3140**
0.20 / 0.35	3.25 / 3.75	1.40 / 1.75	---	**3310**
0.20 / 0.35	3.25 / 3.75	1.40 / 1.75	---	**3316**
0.20 / 0.35	---	---	0.20 / 0.30	**4023**
0.20 / 0.36	---	---	0.20 / 0.30	**4024**
---	---	---	---	**4024**
0.20 / 0.35	---	---	0.20 / 0.30	**4027**
0.20 / 0.35	---	---	0.20 / 0.30	**4028**
---	---	---	---	**4028**
0.20 / 0.35	---	---	0.20 / 0.30	**4032**
0.20 / 0.35	---	---	0.20 / 0.30	**4037**
0.20 / 0.35	---	---	0.20 / 0.30	**4042**
0.20 / 0.35	---	---	0.20 / 0.30	**4047**
0.20 / 0.35	---	---	0.20 / 0.30	**4053**
0.20 / 0.35	---	---	0.20 / 0.30	**4063**
0.20 / 0.35	---	---	0.20 / 0.30	**4068**
0.20 / 0.35	---	0.40 / 0.60	0.08 / 0.15	**4118**
0.20 / 0.35	---	0.80 / 1.10	0.15 / 0.25	**4130**
0.20 / 0.35	---	0.80 / 1.10	0.15 / 0.25	**4135**
0.20 / 0.35	---	0.80 / 1.10	0.15 / 0.25	**4137**
0.20 / 0.35	---	0.80 / 1.10	0.15 / 0.25	**4140**
0.20 / 0.35	---	0.80 / 1.10	0.15 / 0.25	**4142**
0.20 / 0.35	---	0.80 / 1.10	0.15 / 0.25	**4145**
0.20 / 0.35	---	0.80 / 1.10	0.15 / 0.25	**4147**
0.20 / 0.35	---	0.80 / 1.10	0.15 / 0.25	**4150**
0.20 / 0.35	1.65 / 2.00	0.40 / 0.60	0.20 / 0.30	**4320**
0.20 / 0.35	1.65 / 2.00	0.70 / 0.90	0.20 / 0.30	**4337**
0.20 / 0.35	1.65 / 2.00	0.70 / 0.90	0.20 / 0.30	**---**

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Combined AISI & SAE Standard Steel List

Open Hearth Alloy and Electric Furnace Alloy Steels

Chemical Composition Limits (percent)

A.I.S.I #	Carbon	Manganese	Phos. (max.)	Sulf. (max.)
4340	0.38 / 0.43	0.60 / 0.80	0.040	0.040
E4340	0.38 / 0.43	0.65 / 0.85	0.025	0.025
4608	0.06 / 0.11	0.25 / 0.45	0.040	0.040
4615	0.13 / 0.18	0.45 / 0.65	0.040	0.040
4617	0.15 / 0.20	0.45 / 0.65	0.040	0.040
4620	0.17 / 0.22	0.45 / 0.65	0.040	0.040
X4620	0.18 / 0.23	0.50 / 0.70	0.040	0.040
4621	0.18 / 0.23	0.70 / 0.90	0.040	0.040
4640	0.38 / 0.43	0.60 / 0.80	0.040	0.040
4720	0.17 / 0.22	0.50 / 0.70	0.040	0.040
4812	0.10 / 0.15	0.40 / 0.60	0.040	0.040
4815	0.13 / 0.18	0.40 / 0.60	0.040	0.040
4817	0.15 / 0.20	0.40 / 0.60	0.040	0.040
4820	0.18 / 0.23	0.50 / 0.70	0.040	0.040
5015	0.12 / 0.17	0.30 / 0.50	0.040	0.040
5046	0.43 / 0.50	0.75 / 1.00	0.040	0.040
5117	0.15 / 0.20	0.70 / 0.90	0.040	0.040
5120	0.17 / 0.22	0.70 / 0.90	0.040	0.040
5130	0.28 / 0.33	0.70 / 0.90	0.040	0.040
5132	0.30 / 0.35	0.60 / 0.80	0.040	0.040
5135	0.33 / 0.38	0.60 / 0.80	0.040	0.040
5140	0.38 / 0.43	0.70 / 0.90	0.040	0.040
5145	0.43 / 0.48	0.70 / 0.90	0.040	0.040
5147	0.45 / 0.52	0.70 / 0.95	0.040	0.040
5150	0.48 / 0.53	0.70 / 0.90	0.040	0.040
5152	0.48 / 0.55	0.70 / 0.90	0.040	0.040
5155	0.50 / 0.60	0.70 / 0.90	0.040	0.040
5160	0.55 / 0.65	0.75 / 1.00	0.040	0.040
E50100	0.95 / 1.10	0.25 / 0.45	0.025	0.025
E51100	0.95 / 1.10	0.25 / 0.45	0.025	0.025
E52100	0.95 / 1.10	0.25 / 0.45	0.025	0.025
6117*	0.15 / 0.20	0.70 / 0.90	0.040	0.040
6120*	0.17 / 0.22	0.70 / 0.90	0.040	0.040
6145**	0.43 / 0.48	0.70 / 0.90	0.040	0.040
6150**	0.48 / 0.53	0.70 / 0.90	0.040	0.040
8615	0.13 / 0.18	0.70 / 0.90	0.040	0.040
8617	0.15 / 0.20	0.70 / 0.90	0.040	0.040

** Vanadium 0.10 minimum*

*** Vanadium 0.15 minimum*

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Combined AISI & SAE Standard Steel List

Open Hearth Alloy and Electric Furnace Alloy Steels

Chemical Composition Limits (percent)

Silicon	Nickel	Chromium	Molybdenum	S.A.E. #
0.20 / 0.35	1.65 / 2.00	0.70 / 0.90	0.20 / 0.30	**4340**
0.20 / 0.35	1.65 / 2.00	0.70 / 0.90	0.20 / 0.30	**E4340**
0.25 (max)	1.40 / 1.75	---	0.15 / 0.25	**4608**
0.20 / 0.35	1.65 / 2.00	---	0.20 / 0.30	**4615**
0.20 / 0.35	1.65 / 2.00	---	0.20 / 0.30	**4617**
0.20 / 0.35	1.65 / 2.00	---	0.20 / 0.30	**4620**
0.20 / 0.35	1.65 / 2.00	---	0.20 / 0.30	**X4620**
0.20 / 0.35	1.65 / 2.00	---	0.20 / 0.30	**4621**
0.20 / 0.35	1.65 / 2.00	---	0.20 / 0.30	**4640**
0.20 / 0.35	0.90 / 1.20	0.35 / 0.55	0.15 / 0.25	**4720**
0.20 / 0.35	3.25 / 3.75	---	0.20 / 0.30	**4812**
0.20 / 0.35	3.25 / 3.75	---	0.20 / 0.30	**4815**
0.20 / 0.35	3.25 / 3.75	---	0.20 / 0.30	**4817**
0.20 / 0.35	3.25 / 3.75	---	0.20 / 0.30	**4820**
0.20 / 0.35	---	0.30 / 0.50	---	**5015**
0.20 / 0.35	---	0.20 / 0.35	---	**5046**
0.20 / 0.35	---	0.70 / 0.90	---	**5117**
0.20 / 0.35	---	0.70 / 0.90	---	**5120**
0.20 / 0.35	---	0.80 / 1.10	---	**5130**
0.20 / 0.35	---	0.75 / 1.00	---	**5132**
0.20 / 0.35	---	0.80 / 1.05	---	**5135**
0.20 / 0.35	---	0.70 / 0.90	---	**5140**
0.20 / 0.35	---	0.70 / 0.90	---	**5145**
0.20 / 0.35	---	0.85 / 1.15	---	**5147**
0.20 / 0.35	---	0.70 / 0.90	---	**5150**
0.20 / 0.35	---	0.90 / 1.20	---	**5152**
0.20 / 0.35	---	0.70 / 0.90	---	**5155**
0.20 / 0.35	---	0.70 / 0.90	---	**5160**
0.20 / 0.35	---	0.40 / 0.60	---	**50100**
0.20 / 0.35	---	0.90 / 1.15	---	**51100**
0.20 / 0.35	---	1.30 / 1.60	---	**52100**
0.20 / 0.35	---	0.70 / 0.90	---	**6117**
0.20 / 0.35	---	0.70 / 0.90	---	**6120**
0.20 / 0.35	---	0.80 / 1.10	---	**6145**
0.20 / 0.35	---	0.80 / 1.10	---	**6150**
0.20 / 0.35	0.40 / 0.70	0.40 / 0.60	0.15 / 0.25	**8615**
0.20 / 0.35	0.40 / 0.70	0.40 / 0.60	0.15 / 0.25	**8617**

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Combined AISI & SAE Standard Steel List

Open Hearth Alloy and Electric Furnace Alloy Steels

Chemical Composition Limits (percent)

A.I.S.I #	Carbon	Manganese	Phos. (max.)	Sulf. (max.)
8620	0.18 / 0.23	0.70 / 0.90	0.040	0.040
8622	0.20 / 0.25	0.70 / 0.90	0.040	0.040
8625	0.23 / 0.28	0.70 / 0.90	0.040	0.040
8627	0.25 / 0.30	0.70 / 0.90	0.040	0.040
8630	0.28 / 0.33	0.70 / 0.90	0.040	0.040
8635	0.33 / 0.38	0.75 / 1.00	0.040	0.040
8637	0.35 / 0.40	0.75 / 1.00	0.040	0.040
8640	0.38 / 0.43	0.75 / 1.00	0.040	0.040
8641	0.38 / 0.43	0.75 / 1.00	0.040	0.040
8642	0.40 / 0.45	0.75 / 1.00	0.040	0.040
8645	0.43 / 0.48	0.75 / 1.00	0.040	0.040
8650	0.48 / 0.53	0.75 / 1.00	0.040	0.040
8653	0.50 / 0.56	0.75 / 1.00	0.040	0.040
8655	0.50 / 0.60	0.75 / 1.00	0.040	0.040
8660	0.55 / 0.65	0.75 / 1.00	0.040	0.040
8715	0.13 / 0.18	0.70 / 0.90	0.040	0.040
8717	0.15 / 0.20	0.70 / 0.90	0.040	0.040
8720	0.18 / 0.23	0.70 / 0.90	0.040	0.040
8735	0.33 / 0.38	0.75 / 1.00	0.040	0.040
8740	0.38 / 0.43	0.75 / 1.00	0.040	0.040
8742	0.40 / 0.45	0.75 / 1.00	0.040	0.040
8750	0.48 / 0.53	0.75 / 1.00	0.040	0.040
9255	0.50 / 0.60	0.70 / 0.95	0.040	0.040
9260	0.55 / 0.65	0.70 / 1.00	0.040	0.040
9261	0.55 / 0.65	0.75 / 1.00	0.040	0.040
9262	0.55 / 0.65	0.75 / 1.00	0.040	0.040
E9310	0.08 / 0.13	0.45 / 0.65	0.025	0.025
E9314	0.11 / 0.17	0.40 / 0.70	0.025	0.025
9840	0.38 / 0.43	0.70 / 0.90	0.040	0.040
9845	0.43 / 0.48	0.70 / 0.90	0.040	0.040
9850	0.48 / 0.53	0.70 / 0.90	0.040	0.040

Note: Small quantities of certain elements may be found in alloy steel which are not specified or required. These elements are to be considered as incidental and acceptable to thE following maximum amounts: copper, 0.35 per cent; nickel, 0.025 per cent; chromium, 0.20 per cent; molybdenum, 0.06 per cent.

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Combined AISI & SAE Standard Steel List

Open Hearth Alloy and Electric Furnace Alloy Steels

Chemical Composition Limits (percent)

Silicon	Nickel	Chromium	Molybdenum	S.A.E. #
0.20 / 0.35	0.40 / 0.70	0.40 / 0.60	0.15 / 0.25	**8620**
0.20 / 0.35	0.40 / 0.70	0.40 / 0.60	0.15 / 0.25	**8622**
0.20 / 0.35	0.40 / 0.70	0.40 / 0.60	0.15 / 0.25	**8625**
0.20 / 0.35	0.40 / 0.70	0.40 / 0.60	0.15 / 0.25	**8627**
0.20 / 0.35	0.40 / 0.70	0.40 / 0.60	0.15 / 0.25	**8630**
0.20 / 0.35	0.40 / 0.70	0.40 / 0.60	0.15 / 0.25	**8635**
0.20 / 0.35	0.40 / 0.70	0.40 / 0.60	0.15 / 0.25	**8637**
0.20 / 0.35	0.40 / 0.70	0.40 / 0.60	0.15 / 0.25	**8640**
0.20 / 0.35	0.40 / 0.70	0.40 / 0.60	0.15 / 0.25	**8641**
0.20 / 0.35	0.40 / 0.70	0.40 / 0.60	0.15 / 0.25	**8642**
0.20 / 0.35	0.40 / 0.70	0.40 / 0.60	0.15 / 0.25	**8645**
0.20 / 0.35	0.40 / 0.70	0.40 / 0.60	0.15 / 0.25	**8650**
0.20 / 0.35	0.40 / 0.70	0.50 / 0.80	0.15 / 0.25	**8653**
0.20 / 0.35	0.40 / 0.70	0.40 / 0.60	0.15 / 0.25	**8655**
0.20 / 0.35	0.40 / 0.70	0.40 / 0.60	0.15 / 0.25	**8660**
0.20 / 0.35	0.40 / 0.70	0.40 / 0.60	0.20 / 0.30	**8715**
0.20 / 0.35	0.40 / 0.70	0.40 / 0.60	0.20 / 0.30	**8717**
0.20 / 0.35	0.40 / 0.70	0.40 / 0.60	0.20 / 0.30	**8720**
0.20 / 0.35	0.40 / 0.70	0.40 / 0.60	0.20 / 0.30	**8735**
0.20 / 0.35	0.40 / 0.70	0.40 / 0.60	0.20 / 0.30	**8740**
0.20 / 0.35	0.40 / 0.70	0.40 / 0.60	0.20 / 0.30	**8742**
0.20 / 0.35	0.40 / 0.70	0.40 / 0.60	0.20 / 0.30	**8750**
1.80 / 2.20	---	---	---	**9255**
1.80 / 2.20	---	---	---	**9260**
1.80 / 2.20	---	0.10 / 0.25	---	**9261**
1.80 / 2.20	---	0.25 / 0.40	---	**9262**
0.20 / 0.35	3.00 / 3.50	1.00 / 1.40	0.08 / 0.15	**9310**
0.20 / 0.35	3.00 / 3.50	1.00 / 1.40	0.08 / 0.15	**9314**
0.20 / 0.35	0.85 / 1.15	0.70 / 0.90	0.20 / 0.30	**9840**
0.20 / 0.35	0.85 / 1.15	0.70 / 0.90	0.20 / 0.30	**9845**
0.20 / 0.35	0.85 / 1.15	0.70 / 0.90	0.20 / 0.30	**9850**

Note: Small quantities of certain elements may be found in alloy steel which are not specified or required. These elements are to be considered as incidental and acceptable to thE following maximum amounts: copper, 0.35 per cent; nickel, 0.025 per cent; chromium, 0.20 per cent; molybdenum, 0.06 per cent.

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Metric System of Measurements

The principal units are the meter for length, the liter for capacity, and the gram for weight. The following prefixes are used for sub-divisions and multiples:

milli = 1/000; centi = 1/100; deci = 1/10; deca = 10; hecto = 100; kilo = 1000.

Measures of Length

10 millimeters (mm.)	=	1 centimeter (cm.)
10 centimeters	=	1 decimeter (dm.)
10 decimeters	=	1 meter (m.)
1000 meters	=	1 kilometer (km.)

Square Measure

100 sq. millimeters ($mm.^2$)	=	1 sq. centimeter ($cm.^2$)
100 sq. centimeters	=	1 sq. decimeter ($dm.^2$)
100 sq. decimeters	=	1 sq. meter ($m.^2$)

Cubic Measure

1000 cu. millimeters ($mm.^3$)	=	1 cu. centimeter ($cm.^3$)
1000 cu. centtmeters	=	1 cu. decimeter ($dm.^3$)
1000 cu. decimeters	=	1 cu. meter ($m.^3$)

Measure of Weight

10 milligrams (mg.)	=	1 centigram (cg.)
10 centigrams	=	1 decigram (dg.)
10 decigrams	=	1 gram (q.)
10 grams	=	1 decagram (Dg.)
10 decigrams	=	1 hectogram (Hg.)
10 hectograms	=	1 Kilogram (Kg.)
1000 kilograms	=	1 (metric) ton (T.)s

Dry and Liquid Measure

10 milliliters (ml.)	=	1 centiliter (cl.)
10 centiliters	=	1 deciliter (dl.)
10 deciliters	=	1 liter (l.)
100 liters	=	1 hectoliter (Hl.)
1 liter	=	1 cubic decimeter = the volume of 1 kilogram water at a temperature of 39.2 degrees F.

Length Conversion Constants for Metric and U.S. Units

Millimeters	x	.03937	= inches	Inches	x	25.4001	= millimeters
Meters	x	39.370	= inches	Inches	x	.0254	= meters
Meters	x	3.2808	= feet	Feet	x	.30480	= meters
Meters	x	1.09361	= yards	Yards	x	.91440	= meters
Kilometers	x	3,280.8	= feet	Feet	x	.0003048	= kilometers
Kilometers	x	.62137	= Statute Miles	Statute Miles	x	1.60935	= kilometers
Kilometers	x	.53959	= Nautical Miles	Nautical Miles	x	1.85325	= kilometers

Continued on next page

Metric System of Measurements

The principal units are the meter for length, the liter for capacity, and the gram for weight. The following prefixes are used for sub-divisions and multiples:

milli = 1/000; centi = 1/100; deci = 1/10; deca = 10; hecto = 100; kilo = 1000.

Weight Conversion Constants for Metric and U.S. Units

Grams	x	981	= dynes	Dynes	x	0.0010193	= grams
Grams	x	15.432	= grams	Grams	x	0.0648	= grams
Grams	x	.03527	= ounces (Avd.)	Ounces (Avd.)	x	28.35	= grams
Grams	x	.033818	= fluid ounces (water)	Fluid Oz. (Water)	x	29.57	= grams
Kilograms	x	35.27	= ounces (Avd.)	Ounces (Avd.)	x	0.02835	= kilograms
Kilograms	x	2.20462	= pounds (Avd.)	Pounds (Avd.)	x	0.45359	= kilograms
Metric Tons (1000 Kg)	x	1.10231	= Net Ton (2000 lbs.)	Net Ton (2000 lbs)	x	0.90719	= Metric Tons (1000 Kg)
Metric Tons (1000 Kg)	x	0.98421	= Gross Ton (2240 lbs.)	Gross Ton (2240 lbs)	x	1.01605	= Metric Tons (1000 Kg)

Area Conversion Constants for Metric and U.S. Units

Square Millimeters	x	.00155	= square inches	Square Inches	x	645.163	= square millimeters
Square Centimeters	x	.155	= square inches	Square Inches	x	6.45163	= square centimeters
Square Meters	x	10.76387	= square feet	Square Feet	x	0.0929	= square meters
Square Meters	x	1.19599	= square yards	Square Yards	x	0.83613	= square meters
Hectares	x	2.47104	= acres	Acres	x	0.40469	= hectares
Square Kilometers	x	247.104	= acres	Acres	x	0.0040469	= square kilometers
Square Kilometers	x	.3861	= square miles	Square Miles	x	2.5899	= square kilometers

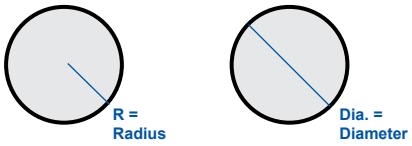
Volume Conversion Constants for Metric and U.S. Units

Cubic Centimeters	x	.033818	= fluid ounces	Fluid Ounces	x	29.57	= cubic centimeters
Cubic Centimeters	x	.061023	= cubic inches	Cubic Inches	x	16.387	= cubic centimeters
Cubic Centimeters	x	.271	= fluid drams	Fluid Drams	x	3.69	= cubic centimeters
Liters	x	61.023	= cubic inches	Cubic Inches	x	.016387	= liters
Liters	x	1.05668	= quarts	Quarts	x	.04636	= liters
Liters	x	.26417	= gallons	Gallons	x	3.78543	= liters
Liters	x	.035317	= cubic feet	Cubic Feet	x	28.316	= liters
Hectoliters	x	26.417	= gallons	Gallons	x	.0378543	= hectoliters
Hectoliters	x	3.5317	= cubic feet	Cubic Feet	x	.28316	= hectoliters
Hectoliters	x	2.83794	= bushel (2150.42 cu.in.)	Bushels (2150.42 cu. in.)	x	.352379	= hectoliters
Hectoliters	x	.1308	= cubic yards	Cubic Yards	x	7.645	= hectoliters
Cubic Meters	x	264.17	= gallons	Gallons	x	.00378543	= cubic meters
Cubic Meters	x	35.317	= cubic feet	Cubic Feet	x	.028316	= cubic meters
Cubic Meters	x	1.308	= cubic yards	Cubic Yards	x	.7645	= cubic meters

Geometric Formulas

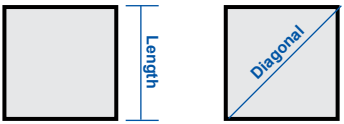
Circle

Area = π (3.1416) x r² (Radius squared) = Area
Circumference = Diameter x 3.1416
Diameter = Circumference x .3183
Doubling diameter increases area four times; tripling diameter increases area nine times, etc.



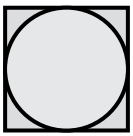
Square

Area = Length of one side² (squared)
Diagonal = Length of side x 1.4142
Side Length = Diagonal x 0.7071



Square inscribed inside Circle

Side of Square = Diameter of Circle x 0.7071 or Circumference of Circle x 0.22251
Diameter of Circle = Length of one side of the Square x 1.4142
Circumference of Circle = Length of one side of the Square x 4.4429

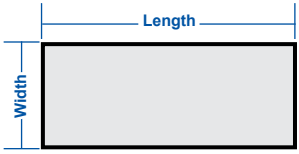


Square and Circle with equal area

Side of Square = Diameter of Circle x 0.8862
Diameter of Circle = Length of one side of the Square x 1.128
Circumference of Circle = Length of one side of the Square x 3.545

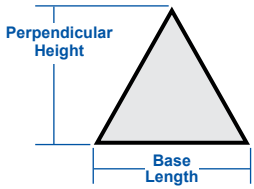
Rectangle

Area = Length x Width
Diagonal = Square root of the sum of Width² (squared) + Length² (squared).



Triangle

Area = Base Length x 1/2 of the perpendicular height.



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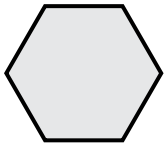
Geometric Formulas

Hexagon (Equal sides and angles)

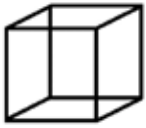


Area = Distance across flats^2 (squared) x 0.886 or Side Length^2 (squared) x 2.598
Side = Half of diagonal or Distance across flats x 0.577
Diagonal = Distance across flats x 1.155 or Length of Side x 2

Octagon (Equal sides and angles)

Area = Distance across flats^2 (squared) x 0.828 or Side Length^2 (squared) x 4.828
Side = Diagonal x 0.383 or Distance across Flats x 0.414
Diagonal = Distance across flats x 1.082 or Length of Side x 2.613

Cube



Area of Surface = Side^2 (squared) x 6
Volume = Side length^3 (cubed)
Diagonal = Side length x 1.732

Sphere

Area of Surface = Dia.^{2} (squared) x π (3.1416)
Volume = Diameter^3 (cubed) x 0.5236

Cylinder

Area of Curved Surface = Diameter x Length x π (3.1416)
Volume = Diameter^2 (squared) x Length x 0.7854

Cone

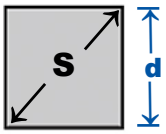
Area of Curved Surface = Diameter of Base x Slant Height x 1.5708
Volume = Diameter of Base^2 (squared) x Perpendicular Height x 0.2618
or Area of Base x 1/3 Perpendicular Height

Pyramid

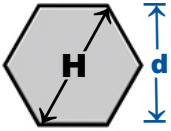
Lateral Surface Area (not including base) = Perimeter of Base x Half of Slant Height
Volume = Area of Base x 1/3 Perpendicular Height

Distance Across Corners

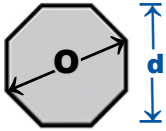
Squares (S), Hexagons (H), and Octagons (O)



S = 1.414d



H = 1.155d



O = 1.082d

"d" Size (inches)	Distance across corners (inches)		
	S Square	H Hexagon	O Octagon
1/8	.177	.144	.135
3/16	.265	.217	.203
1/4	.354	.289	.271
5/16	.442	.361	.338
3/8	.530	.433	.406
7/16	.619	.505	.474
1/2	.707	.577	.541
9/16	.795	.650	.609
5/8	.884	.722	.677
11/16	.972	.794	.744
3/4	1.061	.866	.812
13/16	1.149	.938	.879
7/8	1.237	1.010	.947
15/16	1.326	1.083	1.015
1	1.414	1.155	1.082
1-1/16	1.503	1.227	1.150
1-1/8	1.591	1.299	1.218
1-3/16	1.679	1.371	1.285
1-1/4	1.768	1.443	1.353
1-5/16	1.856	1.516	1.421
1-3/8	1.945	1.588	1.488
1-7/16	2.033	1.660	1.556
1-1/2	2.121	1.732	1.624
1-9/16	2.210	1.804	1.691
1-5/8	2.298	1.876	1.759
1-11/16	2.386	1.949	1.827
1-3/4	2.475	2.021	1.894
1-13/16	2.563	2.093	1.962
1-7/8	2.652	2.165	2.030
1-15/16	2.740	2.237	2.097
2	2.828	2.309	2.165
2-1/16	2.917	2.382	2.232

"d" Size (inches)	Distance across corners (inches)		
	S Square	H Hexagon	O Octagon
2-1/8	3.005	2.454	2.300
2-3/16	3.094	2.526	2.368
2-1/4	3.182	2.598	2.435
2-5/16	3.270	2.670	2.503
2-3/8	3.359	2.742	2.571
2-7/16	3.447	2.815	2.638
2-1/2	3.536	2.887	2.706
2-9/16	3.624	2.959	2.774
2-5/8	3.712	3.031	2.841
2-11/16	3.801	3.103	2.909
2-3/4	3.889	3.175	2.977
2-13/16	3.977	3.248	3.044
2-7/8	4.066	3.320	3.112
2-15/16	4.154	3.392	3.180
3	4.243	3.464	3.247
3-1/8	4.419	3.608	3.383
3-1/4	4.596	3.753	3.518
3-3/8	4.773	3.897	3.653
3-1/2	4.950	4.041	3.788
3-5/8	5.126	4.186	3.924
3-3/4	5.303	4.330	4.059
3-7/8	5.480	4.474	4.194
4	5.657	4.619	4.330
4-1/4	6.010	4.907	4.600
4-1/2	6.364	5.196	4.871
4-3/4	6.717	5.485	5.141
5	7.071	5.774	5.412
5-1/4	7.425	6.062	5.683
5-1/2	7.778	6.351	5.953
5-3/4	8.132	6.640	6.224
6	8.485	6.928	6.494

Weight Formulas

Steel bar weights are based on .2836 lb. per cubic inch. Aluminum weights are based on .098 lb. per cubic inch, which applies to 1100 alloy.

Rounds

Steel:

Lb. per lineal foot = 2.6729 X D^2

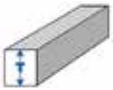
Lb. per lineal inch = .22274 x D^2

Aluminum:

Lb. per lineal foot = .924 x D^2

D = Diameter in inches

Squares



Steel:

Lb. per lineal foot = 3.4032 x T^2

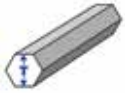
Lb. per lineal inch = .2836 x T^2

Aluminum:

Lb. per lineal foot = 1.18 X T^2

T = Thickness in inches

Hexagons



Steel:

Lb. per lineal foot = 2.9473 x T^2

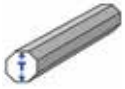
Lb. per lineal inch = .2456 X T^2

Aluminum:

Lb. per lineal foot = 1.02 x T^2

T = Size in inches

Octagons



Steel:

Lb. per lineal foot = 2.8193 x T^2

Lb. per lineal inch = .23494 x T^2

Aluminum:

Lb. per lineal foot = .974 x T^2

T = Size in inches

Flats

Steel:

Lb. per lineal foot = 3.4032 x T x W

Lb. per lineal inch = .2836 x T x W

Aluminum:

Lb. per lineal foot = 1.18 x T x W

T = Thickness in inches

W = Width in inches

Tubing

Steel: (round)

Lb. per lineal foot = 10.68 x (OD - W) x W

Lb. per lineal inch = .89 x (OD - W) x W

Aluminum:

Lb. per lineal foot = 3.70 x (OD - W) x W

OD = Outside Diameter to 3 decimal places

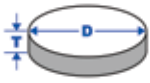
W = Wall Thickness to 3 decimal places

Steel (square and rectangular):

Lb per lineal foot =

$13.6 \times \left(\frac{\text{sum of 4 sides}}{4} - W\right) \times W$

Circles



Steel:

Wt. of Circle in Lbs. = .22274 x T x D^2

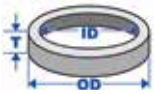
Aluminum:

Wt. of Circle in Lbs. = .077 x T x D^2

D = Diameter in inches

T = Thickness in inches

Rings



Steel:

Wt. of Ring in Lbs. =

.22274 x T x (OD^2 — ID^2)

Aluminum:

Wt. of Ring in Lbs. =

.077 x T x (OD^2 — ID^2)

OD = Outside Diameter in inches

ID = Inside Diameter in inches

T = Thickness in inches

Cut to Length

Approximate Stock Required to Produce 1000 Pieces

Finished Piece Length plus Cut-Off (inches)	Number of Feet per 1000 Cut Pieces
3/32	7.8
7/64	9.1
1/8	10.4
9/64	11.7
5/32	13.0
11/64	14.3
3/16	15.6
13/64	16.9
7/32	18.2
15/64	19.5
1/4	20.8
17/64	22.1
9/32	23.4
19/64	24.7
5/16	26.0
21/64	27.3
11/32	28.6
23/64	29.9
3/8	31.3
25/64	32.6
13/32	33.9
27/64	35.2
7/16	36.5
29/64	37.8
15/32	39.1
31/64	40.4
1/2	41.7
33/64	43.0
17/32	44.3
35/64	45.6
9/16	46.9
37/64	48.2
19/32	49.5
39/64	50.8
5/8	52.1
41/64	53.4
21/32	54.7
43/64	56.0
11/16	57.3
45/64	58.6

Finished Piece Length plus Cut-Off (inches)	Number of Feet per 1000 Cut Pieces
23/32	59.9
47/64	61.2
3/4	62.5
49/64	63.8
25/32	65.1
51/64	66.4
13/16	67.7
53/64	69.0
27/32	70.3
55/64	71.6
7/8	72.9
57/64	74.2
29/32	75.5
59/64	76.8
15/16	78.1
61/64	79.4
31/32	80.7
63/64	82.0
1	83.3
1-1/64	84.6
1-1/32	85.9
1-3/64	87.2
1-1/16	88.5
1-5/64	89.8
1-3/32	91.1
1-7/64	92.4
1-1/8	93.8
1-9/64	95.1
1-5/32	96.4
1-11/64	97.7
1-3/16	99.0
1-13/64	100.3
1-7/32	101.6
1-15/64	102.9
1-1/4	104.2
1-17/64	105.5
1-9/32	106.8
1-19/64	108.1
1-5/16	109.4
1-21/64	110.7

Finished Piece Length plus Cut-Off (inches)	Number of Feet per 1000 Cut Pieces
1-11/32	112.0
1-23/64	113.3
1-3/8	114.6
1-25/64	115.9
1-13/32	117.2
1-27/64	118.5
1-7/16	119.8
1-29/64	121.1
1-15/32	122.4
1-31/64	123.7
1-1/2	125.0
1-33/64	126.3
1-17/32	127.6
1-35/64	128.9
1-9/16	130.2
1-37/64	131.5
1-19/32	132.8
1-39/64	134.1
1-5/8	135.4
1-41/64	136.7
1-21/32	138.0
1-43/64	139.3
1-11/16	140.6
1-45/64	141.9
1-23/32	143.2
1-47/64	144.5
1-3/4	145.8
1-49/64	147.1
1-25/32	148.4
1-51/64	149.7
1-13/16	151.0
1-53/64	152.3
1-27/32	153.6
1-55/64	154.9
1-7/8	156.3
1-57/64	157.6
1-29/32	158.9
1-59/64	160.2
1-15/16	161.5
1-61/64	162.8

Based on 12 foot bars, the losses in bar ends are:

- 1" bar end - 0.70%
- 2" bar end - 1.38%
- 3" bar end - 2.08%
- 4" bar end - 2.80%

Cut to Length

Approximate Stock Required to Produce 1000 Pieces

Finished Piece Length plus Cut-Off (inches)	Number of Feet per 1000 Cut Pieces
1-31/32	164.1
1-63/64	165.4
2	166.7
2-1/64	168.0
2-1/32	169.3
2-3/64	170.6
2-1/16	171.9
2-5/64	173.2
2-3/32	174.5
2-7/64	175.8
2-1/8	177.1
2-9/64	178.4
2-5/32	179.7
2-11/64	181.0
2-3/16	182.3
2-13/64	183.6
2-7/32	184.9
2-15/64	186.2
2-1/4	187.5
2-17/64	188.8
2-9/32	190.1
2-19/64	191.4
2-5/16	192.7
2-21/64	194.0
2-11/32	195.3
2-23/64	196.6
2-3/8	197.9
2-25/64	199.2
2-13/32	200.5
2-27/64	201.8
2-7/16	203.1
2-29/64	204.4
2-15/32	205.7
2-31/64	207.0
2-1/2	208.3
2-33/64	209.6
2-17/32	210.9
2-35/64	212.2
2-9/16	213.5
2-37/64	214.8

Finished Piece Length plus Cut-Off (inches)	Number of Feet per 1000 Cut Pieces
2-19/32	216.1
2-39/64	217.4
2-5/8	218.8
2-41/64	220.1
2-21/32	221.4
2-43/64	222.7
2-11/16	224.0
2-45/64	225.3
2-23/32	226.6
2-47/64	227.9
2-3/4	229.2
2-49/64	230.5
2-25/32	231.8
2-51/64	233.1
2-13/16	234.4
2-53/64	235.7
2-27/32	237.0
2-55/64	238.3
2-7/8	239.6
2-57/64	240.9
2-29/32	242.2
2-59/64	243.5
2-15/16	244.8
2-61/64	246.1
2-31/32	247.4
2-63/64	248.7
3	250.0
3-1/64	251.3
3-1/32	252.6
3-3/64	253.9
3-1/16	255.2
3-5/64	256.5
3-3/32	257.8
3-7/64	259.1
3-1/8	260.4
3-9/64	261.7
3-5/32	263.0
3-11/64	264.3
3-3/16	265.6
3-13/64	266.9

Finished Piece Length plus Cut-Off (inches)	Number of Feet per 1000 Cut Pieces
3-7/32	268.2
3-15/64	269.5
3-1/4	270.8
3-17/64	272.1
3-9/32	273.4
3-19/64	274.7
3-5/16	276.0
3-21/64	277.3
3-11/32	278.6
3-23/64	279.9
3-3/8	281.3
3-25/64	282.6
3-13/32	283.9
3-27/64	285.2
3-7/16	286.5
3-29/64	287.8
3-15/32	289.1
3-31/64	290.4
3-1/2	291.7
3-33/64	293.0
3-17/32	294.3
3-35/64	295.6
3-9/16	296.9
3-37/64	298.2
3-19/32	299.5
3-39/64	300.8
3-5/8	302.1
3-41/64	303.4
3-21/32	304.7
3-43/64	306.0
3-11/16	307.3
3-45/64	308.6
3-23/32	309.9
3-47/64	311.2
3-3/4	312.5
3-25/32	314.1
3-13/16	316.7
3-7/8	322.9
3-15/16	328.1
4	333.3

Based on 12 foot bars, the losses in bar ends are:

- 1" bar end - 0.70%
- 2" bar end - 1.38%
- 3" bar end - 2.08%
- 4" bar end - 2.80%

U.S. Gallons In Round Tanks

For One Foot In Depth

Diameter of Tank	# of U.S. Gallons	Cubic Ft. & Area in Sqft.
1 ft.	5.87	.785
1 ft. 1 in.	**6.89**	**.922**
1 ft. 2 in.	8.00	1.069
1 ft. 3 in.	**9.18**	**1.227**
1 ft. 4 in.	10.44	1.396
1 ft. 5 in.	**11.79**	**1.576**
1 ft. 6 in.	13.22	1.767
1 ft. 7 in.	**14.73**	**1.969**
1 ft. 8 in.	16.32	2.182
1 ft. 9 in.	**17.99**	**2.405**
1 ft. 10 in.	19.75	2.640
1 ft. 11 in.	**21.58**	**2.885**
2 ft.	23.50	3.142
2 ft. 1 in.	**25.50**	**3.409**
2 ft. 2 in.	27.58	3.687
2 ft. 3 in.	**29.74**	**3.976**
2 ft. 4 in.	31.99	4.276
2 ft. 5 in.	**34.31**	**4.587**
2 ft. 6 in.	36.72	4.909
2 ft. 7 in.	**39.21**	**5.241**
2 ft. 8 in.	41.78	5.585
2 ft. 9 in.	**44.43**	**5.940**
2 ft. 10 in.	47.16	6.305
2 ft. 11 in.	**49.98**	**6.681**
3 ft.	52.88	7.069
3 ft. 1 in.	**55.86**	**7.467**
3 ft. 2 in.	58.92	7.867
3 ft. 3 in.	**62.06**	**8.296**
3 ft. 4 in.	65.28	8.727
3 ft. 5 in.	**68.58**	**9.168**
3 ft. 6 in.	71.97	9.621
3 ft. 7 in.	**75.44**	**10.085**
3 ft. 8 in.	78.99	10.559
3 ft. 9 in.	**82.62**	**11.045**
3 ft. 10 in.	86.33	11.541
3 ft. 11 in.	**90.13**	**12.048**
4 ft.	94.00	12.566
4 ft. 1 in.	**97.96**	**13.095**
4 ft. 2 in.	102.00	13.635
4 ft. 3 in.	**106.12**	**14.186**
4 ft. 4 in.	110.32	14.748
4 ft. 5 in.	**114.61**	**15.321**
4 ft. 6 in.	118.97	15.900
4 ft. 7 in.	**123.42**	**16.500**
4 ft. 8 in.	127.95	17.10
4 ft. 9 in.	**132.56**	**17.72**
4 ft. 10 in.	137.25	18.35
4 ft. 11 in.	**142.02**	**18.99**

Diameter of Tank	# of U.S. Gallons	Cubic Ft. & Area in Sqft.
5 ft.	146.88	19.63
5 ft. 1 in.	**151.82**	**20.29**
5 ft. 2 in.	156.83	20.97
5 ft. 3 in.	**161.93**	**21.65**
5 ft. 4 in.	167.12	22.34
5 ft. 5 in.	**172.38**	**23.04**
5 ft. 6 in.	177.72	23.76
5 ft. 7 in.	**183.15**	**24.48**
5 ft. 8 in.	188.66	25.22
5 ft. 9 in.	**194.25**	**25.97**
5 ft. 10 in.	199.92	26.73
5 ft. 11 in.	**205.67**	**27.49**
6 ft.	211.51	28.27
6 ft 3 in.	**229.50**	**30.68**
6 ft. 6 in.	248.23	33.18
6 ft. 9 in.	**267.69**	**35.78**
7 ft.	287.88	38.48
7 ft. 3 in.	**308.81**	**41.28**
7 ft. 6 in.	330.48	44.18
7 ft. 9 in.	**352.88**	**47.17**
8 ft.	376.01	50.27
8 ft. 3 in.	**399.88**	**53.46**
8 ft. 6 in.	424.48	56.75
8 ft. 9 in.	**449.82**	**60.13**
9 ft.	475.89	63.62
9 ft. 3 in.	**502.70**	**67.20**
9 ft. 6 in.	530.24	70.88
9 ft. 9 in.	**558.51**	**74.66**
10 ft.	587.52	78.54
10 ft. 3 in.	**617.26**	**82.52**
10 ft. 6 in.	647.74	86.59
10 ft. 9 in.	**678.95**	**90.76**
11 ft.	710.90	95.03
11 ft. 3 in.	**743.58**	**99.40**
11 ft. 6 in.	776.99	103.87
11 ft. 9 in.	**811.14**	**108.43**
12 ft.	846.03	113.10
12 ft. 3 in.	**881.65**	**117.86**
12 ft. 6 in.	918.00	122.72
12 ft. 9 in.	**955.09**	**127.68**
13 ft.	992.91	132.73
13 ft. 3 in.	**1031.50**	**137.89**
13 ft. 6 in.	1070.80	143.14
13 ft. 9 in.	**1110.80**	**148.49**
14 ft.	1151.50	153.94
14 ft. 3 in.	**1193.00**	**159.48**
14 ft. 6 in.	1235.30	165.13
14 ft. 9 in.	**1278.20**	**170.87**

31½ Gallons = 1 Barrel

To find the capacity of tanks greater than the largest given in the table, look in the table for a tank of one-half of the given size and multiply its capacity by 4, or one of one-third its size and multiply its capacity by 9, etc.

U.S. Gallons In Round Tanks

For One Foot In Depth

Diameter of Tank	# of U.S. Gallons	Cubic Ft. & Area in Sqft.
15 ft.	1321.90	176.71
15 ft. 3 in.	**1366.40**	**182.65**
15 ft. 6 in.	1411.50	188.69
15 ft. 9 in.	**1457.40**	**194.83**
16 ft.	1504.10	201.06
16 ft. 3 in.	**1551.40**	**207.39**
16 ft. 6 in.	1599.50	213.82
16 ft. 9 in.	**1648.40**	**220.35**
17 ft.	1697.90	226.98
17 ft. 3 in.	**1748.20**	**233.71**
17 ft. 6 in.	1799.30	240.53
17 ft. 9 in.	**1851.10**	**247.45**
18 ft.	1903.60	254.47
18 ft. 3 in.	**1956.80**	**261.59**
18 ft. 6 in.	2010.80	268.80
18 ft. 9 in.	**2065.50**	**276.12**
19 ft.	2120.90	283.53
19 ft. 3 in.	**2177.10**	**291.04**
19 ft. 6 in.	2234.00	298.65
19 ft. 9 in.	**2291.70**	**306.35**
20 ft.	2350.10	314.16
20 ft. 3 in.	**2409.20**	**322.06**
20 ft. 6 in.	2469.10	330.06
20 ft. 9 in.	**2529.60**	**338.16**
21 ft.	2591.00	346.36
21 ft. 3 in.	**2653.00**	**354.66**
21 ft. 6 in.	2715.80	363.05
21 ft. 9 in.	**2779.30**	**371.54**
22 ft.	2843.60	380.13
22 ft. 3 in.	**2908.60**	**388.82**
22 ft. 6 in.	2974.30	397.61
22 ft. 9 in.	**3040.80**	**406.49**
23 ft.	3108.00	415.48
23 ft. 3 in.	**3175.90**	**424.56**
23 ft. 6 in.	3244.60	433.74
23 ft. 9 in.	**3314.00**	**443.01**

Diameter of Tank	# of U.S. Gallons	Cubic Ft. & Area in Sqft.
24 ft.	3384.10	452.39
24 ft. 3 in.	**3455.00**	**461.86**
24 ft. 6 in.	3526.60	471.44
24 ft. 9 in.	**3598.90**	**481.11**
25 ft.	3672.00	490.87
25 ft. 3 in.	**3745.80**	**500.74**
25 ft. 6 in.	3820.30	510.71
25 ft. 9 in.	**3895.60**	**520.77**
26 ft.	3971.60	530.93
26 ft. 3 in.	**4048.40**	**541.19**
26 ft. 6 in.	4125.90	551.55
26 ft. 9 in.	**4204.10**	**562.00**
27 ft.	4283.00	572.56
27 ft. 3 in.	**4362.70**	**583.21**
27 ft. 6 in.	4443.10	593.96
27 ft. 9 in.	**4524.30**	**604.81**
28 ft.	4606.20	615.75
28 ft. 3 in.	**4688.80**	**626.80**
28 ft. 6 in.	4772.10	637.94
28 ft. 9 in.	**4856.20**	**649.18**
29 ft.	4941.00	660.52
29 ft. 3 in.	**5026.60**	**671.96**
29 ft. 6 in.	5112.90	683.49
29 ft. 9 in.	**5199.90**	**695.13**
30 ft.	5287.70	706.86
30 ft. 3 in.	**5376.20**	**718.69**
30 ft. 6 in.	5465.40	730.62
30 ft. 9 in.	**5555.40**	**742.64**
31 ft.	5646.10	754.77
31 ft. 3 in.	**5737.50**	**766.99**
31 ft. 6 in.	5829.70	779.31
31 ft. 9 in.	**5922.60**	**791.73**
32 ft.	6016.20	804.25
32 ft. 3 in.	**6110.60**	**816.86**
32 ft. 6 in.	6205.70	829.58
32 ft. 9 in.	**6301.50**	**842.39**

31½ Gallons = 1 Barrel

To find the capacity of tanks greater than the largest given in the table, look in the table for a tank of one-half of the given size and multiply its capacity by 4, or one of one-third its size and multiply its capacity by 9, etc.

U.S. Gallons In Rectangular Tanks

For One Foot In Depth

Width of Tank	Length of Tank									
	2 feet	2-1/2 feet	3 feet	3-1/2 feet	4 feet	4-1/2 feet	5 feet	5-1/2 feet	6 feet	6-1/2 feet
2 ft.	29.92	37.40	44.88	52.36	59.84	67.32	74.81	82.29	89.77	97.25
2-1/2 ft.	---	46.75	56.10	65.45	74.80	84.16	93.51	102.86	112.21	121.56
3 ft.	---	---	67.32	78.54	89.77	100.99	112.21	123.43	134.65	145.87
3-1/2 ft.	---	---	---	91.64	104.73	117.82	130.91	144.00	157.09	170.18
4 ft.	---	---	---	---	119.69	134.65	149.61	164.57	179.53	194.49
4-1/2 ft.	---	---	---	---	---	151.48	168.31	185.14	201.97	218.80
5 ft.	---	---	---	---	---	---	187.01	205.71	224.41	243.11
5-1/2 ft.	---	---	---	---	---	---	---	226.28	246.86	267.43
6 ft.	---	---	---	---	---	---	---	---	269.30	291.74
6-1/2 ft.	---	---	---	---	---	---	---	---	---	361.05
7 ft.	---	---	---	---	---	---	---	---	---	---
7-1/2 ft.	---	---	---	---	---	---	---	---	---	---
8 ft.	---	---	---	---	---	---	---	---	---	---
8-1/2 ft.	---	---	---	---	---	---	---	---	---	---
9 ft.	---	---	---	---	---	---	---	---	---	---
9-1/2 ft.	---	---	---	---	---	---	---	---	---	---
10 ft.	---	---	---	---	---	---	---	---	---	---
10-1/2 ft.	---	---	---	---	---	---	---	---	---	---
11 ft.	---	---	---	---	---	---	---	---	---	---
11-1/2 ft.	---	---	---	---	---	---	---	---	---	---
12 ft	---	---	---	---	---	---	---	---	---	---

Two page chart, continues on next page

U.S. Gallons In Rectangular Tanks

For One Foot In Depth

Length of Tank										
7 feet	7-1/2 feet	8 feet	8-1/2 feet	9 feet	9-1/2 feet	10 feet	10-1/2 feet	11 feet	11-1/2 feet	12 feet
104.73	112.21	119.69	127.17	134.65	142.13	149.61	157.09	164.57	172.05	179.53
130.91	140.26	149.61	158.96	168.31	177.66	187.01	196.36	205.71	215.06	224.41
157.09	168.31	179.53	190.75	202.97	213.19	224.41	235.63	246.86	258.07	269.30
183.27	196.36	209.45	222.54	235.63	248.73	261.82	274.90	288.00	301.09	314.18
209.45	224.41	239.37	254.34	269.30	284.26	299.22	314.18	329.14	344.10	359.06
235.63	252.47	269.30	286.13	302.96	319.79	336.62	353.45	370.28	387.11	403.94
261.82	280.52	299.22	317.92	336.62	355.32	374.03	392.72	411.43	430.13	448.83
288.00	308.57	329.14	349.71	370.28	390.85	411.43	432.00	452.57	473.14	493.71
314.18	336.62	359.06	381.50	403.94	426.39	448.83	471.27	493.71	516.15	538.59
340.36	364.67	388.98	413.30	437.60	461.92	486.23	510.54	534.85	559.16	583.47
366.54	392.72	418.91	445.09	471.27	497.45	523.64	549.81	575.99	602.18	628.36
---	420.78	448.83	476.88	504.93	532.98	561.04	589.08	617.14	645.19	673.24
---	---	478.75	508.67	538.59	568.51	598.44	628.36	658.28	688.20	718.12
---	---	---	540.46	572.25	604.05	635.84	667.63	699.42	731.21	763.00
---	---	---	---	605.92	639.58	673.25	706.90	740.56	774.23	807.89
---	---	---	---	---	675.11	710.65	746.17	781.71	817.24	852.77
---	---	---	---	---	---	748.05	785.45	822.86	860.26	897.66
---	---	---	---	---	---	---	824.73	864.00	903.26	942.56
---	---	---	---	---	---	---	---	905.14	946.27	987.43
---	---	---	---	---	---	---	---	---	989.29	1032.3
---	---	---	---	---	---	---	---	---	---	1077.2

Two page chart, continued from previous page

Hardness Conversion Table

Brinell		Rockwell		Vickers	Approximate Tensile Strength	
Dia. Ball Impression (mm)	Hardness Number (Std. Ball)	C	B	VHN	KSI	MPA
-	-	68	-	940	-	-
-	-	67	-	900	-	-
-	-	66	-	865	-	-
-	-	65	-	832	-	-
-	-	64	-	800	-	-
-	-	63	-	772	-	-
-	-	62	-	746	-	-
-	-	61	-	720	-	-
-	-	60	-	697	-	-
-	-	59	-	674	326	2237.8
-	-	58	-	653	315	2171.9
-	-	56	-	613	295	2034.0
-	-	55	-	595	287	1978.9
-	-	54	-	577	278	1916.8
2.70	514	52.4	-	533	265	1827.2
2.75	495	51.0	-	528	253	1744.4
2.80	477	49.4	-	504	241	1661.7
2.85	461	48.1	-	485	232	1599.6
2.90	444	46.3	-	462	221	1523.8
2.95	429	45.7	-	454	216	1489.3
3.00	415	44.5	-	440	209	1441.1
3.05	401	43.1	-	424	201	1385.9
3.10	388	41.7	-	409	194	1337.6
3.15	375	40.4	-	396	188	1296.3
3.20	363	39.0	-	382	181	1248.0
3.25	352	37.8	-	370	175	1206.6
3.30	341	36.6	-	359	170	1172.2
3.35	331	35.4	-	349	165	1137.7
3.40	321	34.3	-	339	160	1103.2
3.45	311	33.0	-	327	154	1061.8
3.50	302	32.1	(107)	319	150	1034.3
3.55	293	30.9	(106)	309	146	1006.7
3.60	285	30.0	(105.5)	301	142	979.1
3.65	277	28.8	(104.5)	293	138	951.5
3.70	269	27.7	(103.5)	283	132	910.1
3.75	262	26.7	(103)	277	129	889.5
3.80	255	25.5	(102)	269	126	868.7
3.85	248	24.2	(101)	261	121	834.3
3.90	241	22.7	100.2	254	117	806.7
3.95	235	21.7	99.2	247	114	786.0
4.00	229	20.6	98.2	241	112	772.2
4.05	223	19.4	97.2	(236)	109	751.6
4.10	217	(18)	96.2	(231)	106	730.8
4.15	212	(16)	95.3	(225)	102	703.3
4.20	207	(15)	94.4	(219)	100	689.5
4.25	201	(14)	93.2	(213)	98	675.7
4.30	197	(13)	92.4	(207)	96	661.9
4.35	192	(12)	91.4	(201)	94	648.1
4.40	187	(10)	90.4	(195)	90	620.6
4.45	183	(9)	89.6	(189)	88	606.8
4.50	179	(8)	88.8	(183)	87	599.9
4.55	174	(7)	87.5	(177)	85	586.1
4.60	170	(6)	86.3	(171)	84	579.2
4.65	167	(5)	85.5	(167)	82	565.4
4.70	163	(4)	84.3	(163)	80	551.6
4.75	159	(3)	83.0	(159)	78	537.8
4.80	156	(2)	82.0	(156)	77	530.9

Material Safety Data Sheet - Steel

Product Description and Hazardous Ingredients/Identity Information

I. MANUFACTURER/DISTRIBUTOR and PRODUCT IDENTIFICATION

DISTRIBUTOR: Alro Steel Corporation
3100 East High Street
Jackson, MI 49204

REVIEWED AND REVISED: 12/21/95 by Alro Steel Corporation
MANUFACTURER: Various manufacturers
CHEMICAL FAMILY: Metals
CHEMICAL NAME AND SYNONYMS: Steel
EMERGENCY PHONE NUMBER: (517) 787-5500

II. CHEMICAL COMPONENTS

See section II-A, "Product Description & Hazardous Ingredients/Identity Information" and II-B "Percentile of Weight by Grade and Type of Material."

III. PHYSICAL DATA

Melting point F : Greater than 2400 **Specific Gravity(H_20=1):** Greater than 7.0
Vapor pressure: n/a **% Volatile by Volume:** n/a
Vapor Density (Air=1): n/a **Evaporation Rate:** n/a
Solubility in Water: Negligible
Appearance and Odor: Grayish to silvery odorless product in various shapes.

IV. FIRE AND EXPLOSION DATA

NONFLAMMABLE. Use fire-fighting methods appropriate for the surrounding area.

V. HEALTH HAZARD INFORMATION

See Section V-A, General Health Hazard Information.

VI. REACTIVITY DATA

STABILITY: Stable
INCOMPATIBILITY: Not incompatible. HAZARDOUS POLYMERIZATION: n/a
HAZARDOUS DECOMPOSITION PRODUCTS: n/a
CONDITIONS TO AVOID: May liberate metal fumes & metal oxides if burned or welded.

VII. SPILL AND LEAK PROCEDURES/ENVIRONMENTAL

Residue from cutting or grinding should be swept or vacuumed and placed in suitable containers for disposal in accordance with federal, state, or local waste disposal regulations. This material may be reclaimed for reuse. See section II-A for information concerning materials subject to SARA Title III reporting requirements.

VIII. SPECIAL PROTECTION

RESPIRATORY PROTECTION: When exposure limits are exceeded, use proper approved respirator. (Consult OSHA and/or state or local codes)
VENTILATION: Use local exhaust when cutting, grinding or welding.
EYE PROTECTION AND PROTECTIVE CLOTHING: Proper protective clothing and appropriate face and eye protection should be used when cutting, grinding, or welding. (Consult OSHA and/or state or local rules and regulations)

IX. SPECIAL PRECAUTIONS

PEL/TLV exposures should be controlled to remain below OSHA and ACGIH specifications to ensure proper health protection of workers.

The information in this MSDS was obtained from sources believed to be reliable. However, the information is provided without any representation or warranty, expressed or implied regarding the accuracy or correctness. The conditions or methods of handling, storage use and disposal of the product are beyond our control and knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use, or disposal of the product.

Continued on next page

Material Safety Data Sheet - Steel

Product Description and Hazardous Ingredients/Identity Information

BASE METAL	CAS #	% COMP. BY WEIGHT	ACGIH TLV (mg/m^3)	OSHA 1910.1000 (mg/m^3)	LD_{50} Species Route
Iron, Fe	7439-89-6	Usually >95.0	5.0 as oxide fume	10.0 as oxide dust and fume	NE
ALLOYING ELEMENTS	**CAS NUMBER**	**% COMPOSITION BY WEIGHT**	**ACGIH TWA (mg/m^3)**	**OSHA 1910.1000 TWA (mg/m^3)**	**LD_{50} Species Route**
Aluminum, Al	7429-90-5	.01 - 1.50	10.0 as metal dust & oxide 5.0 as welding fume	15.0 as total dust 5.0 as respirable fraction	NE
Carbon, C	1333-86-4	.01 - 2.5	3.5 as carbon black	3.5 as carbon black	NE
Chromium, Cr	7440-47-3	.01 - 20.0	0.5 as metal	1.0 as metal	NE
Cobalt, Co	7440-84-4	.01 - 8.0	0.05 as dust and fume	0.10 as dust and fume	NE
Copper, Cu	7440-50-8	.01 - 2.0	0.2 as fume; 1.0 as dust	0.1 as fume; 1.0 as dust	NE
Lead, Pb	7439-92-1	.01 - 1.0	0.15 as dust and fume	0.05	NE
Manganese, Mn	7439-96-5	.01 - 10.0	1.0 as fume/5.0 as dust 3.0 STEL as fume	5.0 Ceiling	9gm/kg Rat, oral
Molybdenum , Mo	7439-98-7	.01 - 7.0	5.0 soluble/15.0 total dust	5.0 soluble/10.0 insoluble	NE
Nickel, Ni	7440-02-0	.01 - 20.0	1.0 as metal	1.0 as metal	50 mg/kg mouse-intravenous
Silicon, Si	7440-21-3	.01 - 3.0	10.0 as total dust	15.0 as total dust 5.0 as respirable fraction	NE
Sulphur, S	7404-34-9	< 0.1	5.2 as SO_2/13.0 STEL as SO_2	13.0 as SO_2	NE
Tungsten, W	7440-33-7	.00 - 19.0	5.0 as dust	5.0 as dust	NE
Vanadium, V	7440-62-2	.01 - 5.0 0.1(C) - fume as V_2O_5	0.5 (C) - dust as V_2O_5 fume as V_2O_5	0.05 - respirable dust and	59.0 mg/kg Mouse-subcutaneous
Zinc, Zn	7440-66-6	.00 - 99.0 as coating only	5.0 as oxide fume 10.0 STEL as oxide fume 10.0 dust as ZnO	5.0 as oxide fume 15.0 as oxide total dust 5.0 as respirable fraction	NE

ABBREVIATIONS:(C) - Ceiling Level PEL - Permissable Exposure Limit NE - Not Established CAS No. - Chemical Abstract Service Number
LD50 - Lethal dose for 50% of tested animals STEL - Short Term Exposure Limit
ACGIH-TLV American Conference of Governmental Industrial Hygienist - Threshold Limit Value Revised 12/21/95

Continued on next page

Material Safety Data Sheet - Steel

Product Description and Hazardous Ingredients/Identity Information

PERCENTILE OF WEIGHT BY GRADE AND TYPE OF MATERIAL								
Grade Symbol	Iron Fe	Manganese Mn	Carbon C	Aluminum Al	Chromium Cr	Copper Cu	Molybdenum Mo	Nickel Ni
Mild Steel	Balance	0.25-2.0	0.18-0.31	n/a	n/a	n/a	n/a	n/a
Low Alloy	Balance	0.25-2.0	0.01-1.20	n/a	0.01-1.00	0.10-1.00	n/a	0.01-1.0
Alloy Steel	Balance	0.25-2.0	0.01-1.20	n/a	0.10-2.50	0.10-1.00	0.01-1.10	0.01-1.0
Leaded Steel	Balance	0.25-2.0	0.01-1.20	n/a	0.10-2.50	0.10-1.00	0.01-1.10	0.01-4.0
Galvanized	Balance	0.25-2.0	0.01-1.80	n/a	0.10-2.00	0.01-2.00	n/a	0.01-1.0
Tool Steel	Balance	0.25-2.5	0.05-2.50	0.01-1.50	0.10-13.0	0.01-1.00	0.01-10.00	0.01-4.0
Stainless	Balance	0.10-10.0	0.03-2.00	n/a	4.00-20.00	n/a	0.01-5.00	3.0-20.0
Powder Metal	Balance	0.20-2.0	0.01-2.00	n/a	1.00-5.00	n/a	1.00-7.00	0.01-0.8

PERCENTILE OF WEIGHT BY GRADE AND TYPE OF MATERIAL (Continued)								
Grade Symbol	Lead Pb	Vanadium V	Cobalt Co	Sulfur S	Tungsten W	Silicon Si	Zinc Zn	
Mild Steel	n/a	n/a	n/a	<0.50	n/a	....	....	
Low Alloy	n/a	n/a	n/a	<0.30	n/a	....	....	
Alloy Steel	n/a	n/a	n/a	<0.10	n/a	....	....	
Leaded Steel	.01-1.0	n/a	n/a	<0.40	n/a	0.15-2.20	....	
Galvanized	n/a	n/a	n/a	<0.50	n/a	....	99.0 coat	
Tool Steel	n/a	0.01-5.00	0.01-8.0	<0.10	0 - 0.75	0.01-2.50	....	
Stainless	n/a	n/a	0.01-1.0	<0.20	n/a	0.01-3.00	....	
Powder Metal	n/a	1.00-5.00	0.01-6.0	<0.10	1.0-19.0	0.10-0.50	....	

Material Safety Data Sheet - Aluminum

Product Description and Hazardous Ingredients/Identity Information

I. MANUFACTURER/DISTRIBUTOR and PRODUCT IDENTIFICATION

DISTRIBUTOR: Alro Steel Corporation
3100 East High Street
Jackson, MI 49204
REVIEWED AND REVISED: 12/21/95 by Alro Steel Corporation
EMERGENCY PHONE NUMBER:(517) 787-5500
MANUFACTURER: Various Sources
CHEMICAL NAME: Aluminum and Alloys
CHEMICAL FAMILY: Metals

II. CHEMICAL COMPONENTS

See section II-C, Product Description & Hazardous Ingredients/Identity Information.

III. PHYSICAL DATA

Melting point F°: 950 - 1215
Specific Gravity(H_20=1): 2.5 - 2.9
Vapor pressure: n/a
% Volatile by Volume: n/a
Vapor Density (Air=1): n/a
Evaporation Rate: n/a
Solubility in Water(% by weight): nil
Appearance and Odor: Metallic appearance, no odor. Solid at normal conditions.

IV. FIRE AND EXPLOSION DATA

PRODUCT NONFLAMMABLE. Damp aluminum dust may spontaneously heat with liberation of hydrogen to form explosive air mixtures. Do not use water or halogen on dust fires, use dry powder or sand.

V. HEALTH HAZARD INFORMATION

See Section V-A, General Health Hazard Information and Section IX. Appropriate personal protective equipment is required when melting, casting, forging, machining, or otherwise processing. The nature of activity will determine the form of protection necessary (i.e., glasses, respirator, clothing, and ear protection).

VI. REACTIVITY DATA

STABILITY: Stable
INCOMPATIBILITY: Anhydrous bromine
HAZARDOUS POLYMERIZATION: n/a
HAZARDOUS DECOMPOSITION PRODUCTS and CONDITIONS TO AVOID: See Fire and Explosion Section. See Additional Information Section.

VII. SPILL AND LEAK PROCEDURES/ ENVIRONMENTAL

Used or unused product should be tested to determine hazard status and disposal requirements under federal, state, and local laws and regulations. This material may be reclaimed for reuse. See section II-A for information concerning materials subject to SARA Title III reporting requirements.

VIII. SPECIAL PROTECTION

RESPIRATORY PROTECTION: When limits are exceeded, use proper approved respirator. (Consult OSHA and/or state or local codes for all requirements)
VENTILATION: Use local exhaust when cutting, grinding or welding.
EYE PROTECTION AND PROTECTIVE CLOTHING: Proper protective clothing and appropriate face and eye protection should be used when processing.

Continued on next page

Material Safety Data Sheet - Aluminum

Product Description and Hazardous Ingredients/Identity Information

IX. Special Precautions & Additonal Information

(1) PEL/TLV exposures should be controlled to remain below OSHA and ACGIH specifications to ensure proper health protection of workers. (2) Acids and bases in contact with aluminum may generate explosive mixtures with hydrogen. (3) Finely divided aluminum will form explosive mixtures in air. It will also form explosive mixtures in air in the presence of bromates, iodates, or ammonium nitrate. (4) When remelting aluminum scrap, entrapped moisture or the presence of strong oxidizers such as ammonium nitrate could cause an explosion. (5) Do not touch cast or heated aluminum without knowing the temperature. Aluminum experiences no color change during heating. (6) Aluminum powder must be packed and shipped as a flammable solid, UN1396. (7) Hard alloy ingots in the 2000 and 7000 series must be stress relieved to prevent explosion or violent cracking when sawed. (8) The welding of aluminum alloys may generate carbon dioxide, ozone, carbon monoxide, nitrogen oxides, infra-red radiation and ultra-violet radiation, in addition to metal fume. (9) Vapor degreaser must be properly maintained to limit the accumulation of aluminum fines. Such accumulation could result in a potential degreaser fire or explosion. (10) Some aluminum scrap may be contaminated with oil at levels greater than 1%. Melting of aluminum scrap may generate oil vapors which are irritating to the eyes and upper respiratory tract. Prolonged or repeated skin contact with oil may cause skin irritation. (11) Nickel, Chromium, Lead, Beryllium and Cadmium, listed on California's Proposition 65 list of "Chemicals Known to the State to cause Cancer or Reproductive Harm," may exist in aluminum alloys at the maximum concentrations by weight - Ni (1.20), Cr (0.35), Pb (0.70), Be (0.05), Ca (0.05).

DISCLAIMER: The information in this MSDS was obtained from sources believed to be reliable. However, the information is provided without any representation or warranty, expressed or implied regarding the accuracy or correctness. The conditions or methods of handling, storage use and disposal of the product are beyond our control and knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use, or disposal of the product.

Continued on next page

Material Safety Data Sheet - Aluminum

Product Description and Hazardous Ingredients/Identity Information

BASE METAL	CAS #	% COMP. BY WEIGHT	ACGIH TLV (mg/m³)	OSHA 1910.1000 TWA (mg/m³)	WISHA PEL (mg/m³)
Aluminum, Al	7429-90-5	80.0 - 99.7	10.0 as metal dust & oxide 5.0 as welding fume	15.0 as total dust 5.0 as respirable fraction	10.0 as metal dust & oxide 5.0 as welding fume
ALLOYING ELEMENTS	**CAS NUMBER**	**% COMPOSITION BY WEIGHT**	**ACGIH TWA (mg/m³)**	**OSHA 1910.1000 TWA (mg/m³)**	**WISHA PEL (mg/m³)**
Chromium, Cr	7440-47-3	0.0 - 1.0	0.5 as metal	1.0 as metal	0.5 as metal
Cobalt, Co	7440-48-4	0.1 - 10.0	0.05 as dust and fume	0.10 as dust and fume	0.05 as fume and dust
Copper, Cu	7440-50-8	1.0 - 20.0	0.2 as fume; 1.0 as dust	0.1 as fume; 1.0 as dust	0.1 as fume; 1.0 as dust
Iron, Fe	7439-89-6	1.0 - 10.0	5.0 as oxide fume	10.0 as oxide dust and fume	5.0 as oxide dust and fume
Magnesium, Mg	1309-48-4	1.0 - 20.0	10.0 as oxide fume	15.0 as particulates	10.0 as total oxide dust fume
Manganese, Mn	7439-96-5	1.0 - 10.0	1.0 as fume	5.0 Ceiling 3.0 STEL as fume 5.0 as dust	5.0 Ceiling
Nickel, Ni	7440-02-0	1.0 - 10.0	1.0 as metal	1.0 as metal	1.0 as metal
Silicon, Si	7440-21-3	1.0 - 20.0	10.0 as total dust	15.0 as total dust 5.0 as respirable fraction	100 as total dust 5.0 as respirable fraction
Silver, Ag	7440-22-4	0.1 - 10.0	0.1 as metal	0.01 as metal dust and fume	0.01 as metal
Tin, Sn	7440-31-5	1.0 - 10.0	2.0 as oxide and metal	2.0 except oxide	2.0 as oxide fume and metal
Zinc, Zn	7440-66-6	1.0 - 10.0	5.0 as oxide fume 10.0 STEL as oxide fume 10.0 as oxide dust	5.0 as oxide fume 15.0 as oxide total dust 5.0 as respirable fraction	5.0 as oxide fume 10.0 STEL as oxide fume 10.0 as oxide total dust 5.0 as oxide respirable fraction

Key: STEL - Short Term Exposure Limit
PEL - Permissible Exposure Limit
CAS No. - Chemical Abstract Service Number
ACGIH-TLV American Conference of Governmental Industrial Hygienists - Threshold Limit Value
Aluminum alloys may be comprised of all or variations of the alloys shown here. In addition, the welding of aluminum alloys may produce the hazards listed in V-B.

Revised 12/21/95

Continued on next page

Material Safety Data Sheet - Aluminum

Product Description and Hazardous Ingredients/Identity Information

V-A. GENERAL HEALTH AND HAZARD DATA (Product, Alloying Elements and Compounds)

NOTE: Steel and aluminum products in their usual physical form do not pose any health hazard and are not listed by IARC or NTP as carcinogens or suspected carcinogens. However, when subjected to welding, burning, sawing, brazing, grinding, etc., potentially hazardous fumes or dust may be generated. These operations should be performed in well-ventilated areas. The primary route of exposure is from inhalation of fumes or dust. The effects of overexposure to the various metal fumes and dusts which may be generated from this product and the associated health effects from overexposure are as follows:

ACUTE: Excessive inhalation of metallic fume or dust may be irritating to respiratory passages. Excessive inhalation of fume from metals can produce an acute reaction called “metal fume fever.” Symptoms consist of chills and fever (easily confused with flu), a metallic taste in the mouth, dryness, and irritation of the throat. The symptoms arrive a few hours after exposure and may last 12-48 hours. Long-term effects have not been noted. High concentrations of metallic dusts can result in eye irritation.

CHRONIC: Chronic inhalation of high concentrations of metallic fume and dusts are associated with the following:

IRON OXIDE: Chronic inhalation of excessive iron dust or fumes may result in development of a benign pneumoconiosis (siderosis). No physical impairment of lung function has been associated with siderosis.

ALUMINUM: Chronic excessive exposure to certain aluminum compounds as fume or dusts may initiate fibrotic changes to lung tissue.

MANGANESE: Chronic exposure to excessive fumes and dusts may result in bronchitis, pneumonitis, or effect the central nervous system causing lack of coordination.

CHROMIUM: Health hazards associated with exposure to chromium are dependent on its oxidation state. The metal form, as it exists in this product, is of very low toxicity. The hexavalent form is very toxic. Adverse effects may include skin ulcerations, dermatitis, and skin allergies. Inhalation of hexavalent chromium compounds can result in ulceration of mucous membranes and perforation of the nasal septum, bronchitis, and bronchial carcinoma. IARC lists hexavalent chromium compounds as known human carcinogens. ACGIH has reviewed the toxicity data and concluded that chromium metal is not carcinogenic to humans.

NICKEL: Nickel fumes are respiratory irritants and may cause pneumonitis. Skin contact may cause allergic skin rash. Nickel sensitivity, once acquired, is apparently not lost. Certain airborne nickel contaminating dusts are regarded as carcinogens via inhalation. Listed by NTP and the IARC Monographs. Nickel is listed as a mutagen.

VANADIUM PENTOXIDE: Chronic exposure to vanadium pentoxide dust and fume may cause severe irritation of the eyes, skin and upper respiratory tract. Symptoms include conjunctivitis, nasopharyngitis, cough, dyspnea, palpitation, lung changes, chronic bronchitis, skin pallor, rash, greenish-black tongue.

COBALT: Mildly irritating to eyes, skin, and upper respiratory tract. Chronic inhalation of dust or fume may result in an asthma-like respiratory disorder.

LEAD: Chronic exposure to excessive concentrations of lead and lead compounds as dust or fume may lead to anemia, urinary dysfunction, weakness, constipation, nausea and disorders of the central and peripheral nervous systems. Prolonged exposure may cause kidney damage and reproductive disorders.

COPPER: Overexposure to copper fume can cause upper respiratory tract irritation. Skin sensitization has been reported.

MOLYBDENUM: Chronic excessive exposure to certain compounds have indicated morphological changes in the liver, kidneys, and spleen; anemia, diarrhea, bone deformity, and growth deformation.

SULPHUR (as Sulphur Dioxide): Excessive exposure may result in upper respiratory tract irritation and pulmonary edema.

ZINC: Exposure to zinc oxide fume may result in “zinc chills” (metal fume fever).

Continued on next page

MSDS - Steel and Aluminum

TIN: Toxicity is generally low. Exposure to excessive levels of dust or fume can result in a benign pneumoconiosis called stannosis.

TUNGSTEN: Metal and insoluble compounds are generally considered to have a low level of toxicity but have produced lung changes in laboratory animals.

MAGNESIUM: Oxide fume may cause irritation to eyes, nose and throat; overexposure may cause flu-like symptoms. Chronic exposure may cause metal fume fever.

EMERGENCY AND FIRST AID PROCEDURES: SKIN CONTACT; Remove particles by washing with water and soap. EYE CONTACT: Flush with water for at least 15 minutes. Get medical attention if irritation persists. INHALATION: In the event of acute exposure, remove the subject from exposure and obtain prompt medical attention. If unconscious, administer oxygen. If not breathing, resuscitate immediately.

DISCLAIMER

Alro makes no warranties, expressed or implied, including but not limited to, implied warranties of merchantability and fitness for a particular purpose. The information contained in this Material Safety Data Sheet (MSDS) is believed to be correct, but no representations, guarantees or warranties of any kind are made as to its accuracy, suitability for particular applications, hazards connected with the use of the material, or the results to be obtained from the use thereof. The user assumes all risk and liability of any use, processing, or handling of any material. Variations in methods, conditions, equipment used to store, handle, or process the material and hazards connected with the use of the material are solely the responsibility of the user and remain at its sole discretion.

As sold, the product described in this MSDS is considered by Alro to be an “article” within the meaning of Title 29 of the Code of Federal Regulations, section 1910, 1200 *et seq.* This MSDS is intended to be used solely for the purpose of satisfying informational requests made pursuant to that requirement. It is not intended to preempt, replace, or expand the terms contained in Alro’s Conditions of Sale. Compliance with all applicable federal, state, and local laws and regulations remains the responsibility of the user. The user has the responsibility to provide a safe workplace, to examine all aspects of its operation, and to determine if or where precautions, in addition to those herein, are required. Revised 12/21/95

Additional Offerings

More from Alro Steel

alro.com

Alro Plastics

Your Source for Engineering Plastics

Sheet • Rod • Tube • Film • Profiles • Machined Parts

In 1987, the Alro Steel Corporation created the Plastics division to sell plastic sheet, rod, tube and film to Alro's existing customer base. Alro customers can now purchase steel, plastics and industrial supplies from one fully integrated supplier and receive the same superior service while lowering their total procurement costs.

Alro Plastics is committed to providing the best overall value and service the industry has to offer. Our focus is on helping you to select the proper materials for your industrial applications, stocking the appropriate engineering materials, cutting and/or shipping the same day you place the order, and offering value added processing to meet your most demanding fabrication requirements.

Whether your business is large or small, we will provide you with competitive prices, technical support, and superior service. The Alro Steel Corporation has established an internal quality program guaranteeing continuous improvement in our people and systems. Alro is committed to being a primary supplier of plastics by assuring quality, service, support, and by listening to the needs of our customers.

Our 60,000 square-foot Alro Plastics location in Jackson, Michigan

Plastics Product Offerings

ABS	Fiberglass Grating	Nylatron®	PVDF
Acetal Copolymer	Films	Nyloil®	Radel®
Acetron® GP	Foamlite®	Nylon	Repro UHMW
Acrylic	Fluorosint®	Optix®	Rubber
Boltaron®	G10 / FR-4	PBT	SafPlate®
Cast Nylon	GPO-3	PEEK	SafRail™
Chemgrate®	HDPE	PET	Sanalite®
Clear PVC	Hydex® 202 / 301	PETG	Semitron®
Composolite®	Hydex® 4101	Phenolic	Sustarin® C
Corrugated	Hydlar® Z	Plexiglas®	Tecaform®
CPVC	Ind. Laminates	Polycarbonate	Tecasint™
Cutting Board	Ketron® PEEK	Polyethylene	Techtron® PPS
Delrin®	King ColorCore®	Polypropylene	TIVAR® 1000
Densetec®	King Hy-Pact®	Polystone® M	TIVAR® 88
Detectables	King StarBoard®	Polystyrene	Tooling Board
DuraDek®	Kynar® PVDF	Polysulfone	Torlon® PAI
DuraGrate®	LDPE	PPS	TUFFAK®
DuraGrid®	Life Science Grade	Precision Board Plus	UHMW-PE
DuraTread®	LubX® C / CV	Profiles	Ultem®
Duratron®	MC® 901/907	Propylux®	Urethane
Ertalyte®	Medical Grades	Proteus® LF PP	VHMW Sheet
Extren®	Micarta®	PTFE / TFE	Vivak® PETG
Extrusions	Noryl® PPO	PVC	WallTuf®
EZ-PRO/Durawood	Nyla-Glide GR™	PVC Foam Sheet	Zelux®

All tradenames listed above are the property of their respective owners.

Alro Plastics is an industry leader in supplying engineering plastic shapes and parts. We cut and/or ship the same day your order is placed and provide value added processing to meet the most demanding fabrication requirements.

Panel Saw Cutting


Band Saw Cutting


Waterjet Cutting

CNC Routing


Milling & Machining


Drilling & Tapping


Plastic Welding

Bending & Gluing

Plastics Processing

Advantages of Stock Shape Plastics

Plastics can provide many advantages over other materials.
Some benefits include:

Light Weight	LEADS TO	Increased Productivity
High Wear Resistance		**Longer Part Life**
High Impact Resistance		Increased Product Reliability
Noise Reduction		**OSHA Compliance**
Self Lubricating		No Lubrication Required
Easily Machined		**Cost Savings**
Corrosion Resistance		Less Down Time
Aesthetics		**Appearance**

General Selection Criteria

The selection of a material for an application is a very difficult task. Usually one is only able to narrow the selection down to two or three candidates and the final selection is then determined by testing.

The first and most important step in selecting a material from the broad spectrum (steel, aluminum, brass, UHMW, Delrin®, nylon, etc.) is to carefully define the properties required and the environment in which the material will need to perform.

It may be necessary to ask some or all of the following questions to define the application. The more completely the application is defined, the better the chance of selecting the best material for the job.

What load will the part have to carry?

Will the design carry high loads? What will the highest load be? What is the maximum stress in the part? What kind of stress is it (tensile, flexural, etc.)? How long will the load be applied? What is the projected life of the part or design?

What temperatures will the part see and for how long?

What is the maximum temperature the material must sustain? What is the minimum temperature the material will sustain? How long will the material be at these temperatures? Will the material have to withstand impact at the low temperature?

Will the material be exposed to chemicals or moisture?

Will the material be exposed to normal relative humidity? Will the material be submergedinwater? If so, at what temperature? Will the material be exposed to steam? Will the material be painted? Will the material be submerged or wiped with solvents or other chemicals? If so, which ones? Will the material be exposed to chemical or solvent vapors? If so, which ones? Will the material be exposed to other materials that can outgas or leach detrimental materials, such as plasticizers?

Will the material be used as a bearing or need to resist wear?

Will the material be expected to perform as a bearing? If so, what will the load, shaft diameter, shaft material, shaft finish, and rpm be? What wear or abrasion condition will the material see? Note: Materials with friction reducers added, such as TFE, molybdenum disulfide, or graphite, generally exhibit less wear in rubbing applications.

Does the part have to retain its dimensional shape?

What kind of dimensional stability is required?

General Selection Criteria

Will the part have to meet any regulatory requirements?

Is an FDA approved material required (taste/odor)? Is this for a Medical application?

Should the material have a special color and/or appearance?

What color material is desired? Does it have to match anything else? Is a textured surface needed?

Will the part be used outdoors?

Is material cost an important factor?

LEAST EXPENSIVE

MOST EXPENSIVE

HDPE (High Density Polyethylene)
Polypropylene
PVC Type 1 (PolyVinyl Chloride)
VHMW (Very High Molecular Weight Polyethylene)
LDPE (Low Density Polyethylene)
Acrylic (Clear sheet, Plexiglas®)
Polycarbonate (1/2" thick and under, Makrolon®)
UHMW-PE (Ultra High Molecular Wgt, TIVAR® 1000)
Phenolic CE (Industrial Laminate Sheet)
Nylon 6 (Cast), **Nylatron® GSM** (Cast)
ABS (Acrylonitrile-Butadiene-Styrene)
Acetal Copolymer (Acetron® GP)
Phenolic G10/FR4
TIVAR® 88 (Specialty UHMW product)
Delrin® (Acetal Homopolymer)
Nylon 6/6 (Extruded), **Nylatron® GS** (Extruded)
Urethane / Polyurethane
CPVC (Chlorinated PolyVinyl Chloride)
PTFE, Virgin (PolyTetra-FluoroEthylene)
Polycarbonate (Machine Grade, 3/4" thick and up)
Noryl® (PPO)
Nylatron® NSM (Cast, Premium Bearing grade)
Ertalyte® PET-P (Polyethylene Terephthalate)
Polycarbonate (Window Grade/optically clear)
Hydex® 202, 301, 4101, 4101L
Ertalyte® TX
Ultem® 1000 (Duratron® PEI)
Polyethersulfone (PES)
PVDF (Kynar®)
Polysulfone
Delrin® AF (Acetal Homopolymer PTFE blend)
Hydlar® Z (Kevlar® fiber reinforced Nylon 6/6)
PEEK (Polyetheretherketone, Ketron®)
Techtron® PPS & HPV
Torlon® (Polyamide-imide, Duratron® PAI)
Tecasint™

*Note: Comparative pricing based on price per square foot for 1 inch thick slab.

Plastics Processing Overview

For customers with processing and fabrication requirements, Alro Plastics is capable of supplying finished parts per print to your specific requirements. Our modern manufacturing methods and state-of-the-art computer systems virtually eliminate mistakes and reruns. By utilizing computer planning and control systems, we offer faster, more efficient manufacturing. The end result allows Alro Plastics to maintain the lowest lead times in the industry. Regardless of your requirements, simply provide Alro with the specifications for your projects and let us handle the rest.

Cut-To-Size Capabilities

CNC Saw Cutting

With a multitude of CNC Production Saws Alro Plastics is able to offer same day cutting and shipping on the majority of cut-to-size orders. These high precision saws are capable of cutting sheets up to 8" thick quickly and accurarely. The large 14 ft x 14 ft tables are able to handle very large sheets allowing for better material yields.

- Quantities: 1 pc - 50,000 pcs
- Thickness: 1/16" up to 8" thick
- Length/Width: 1/2" up to 168" wide/long
- Standard Cut Tolerance: +1/16" / -0"
- Custom tolerances available by request
- Multiple shifts for shortest lead times

Rod and Tube Saw Cutting

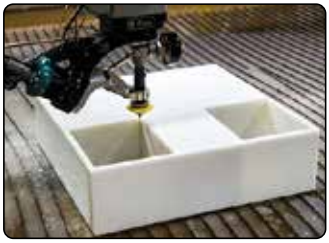
Alro Plastic stocks rod and tube up to 12" diameter in a variety of materials and also has the ability to cut it to desired length. Our horizontal band saws can cut round stock up to 18" in diameter. These saws are easy to set up for quick 1 piece cut jobs and can also be programmed for longer production jobs.

- Quantities: 1 pc - 10,000 pcs
- Diameter: 1/8" up to 18" diameter
- Length/Width: 1" up to 20 feet long
- Standard Cut Tolerance: +1/4" / -0"
- Custom tolerances available by request
- Solid rounds and hollow rounds

5-Axis Waterjet Cutting

Alro also offers 5-Axis Waterjet Cutting capable of cutting sheet stock as thick as 10" in a single pass. The 5-axis rotation allows the machine to cut bevels and 3-dimensional parts. The Waterjet is also ideal for cutting the more challening materials such as rubber, urethane, foam, fiberglass and the many glass-filled plastic materials. These materials can be trouble for conventional cutting methods, but the Waterjet is able to cut them easily while holding tight tolerances.

- Quantities: 1 pc - 20,000 pcs
- Thickness: 1/32" up to 10" thick
- Width: 1/2" up to 78" wide
- Length: 1/2" up to 157" long
- Standard Cut Tolerance: +/- .015"
- Fiberglass, G10, glass-filled materials, rubber, urethane, foam and more



Plastics Processing Overview

CNC Machining Capabilities

CNC Routing

Alro Plastics features computerized, three-axis CNC Routers with additional vertical and horizontal drilling capabilities. With this equipment, extremely close tolerances for milled, drilled and routed parts up to 120" x 144" x 4" thick can be achieved.

These production style routers have dual tables to allow them to run parts on one while loading and unloading the other table to increase productivity. The dual and quad heads allow for running two and four parts at the same time for maximum efficiency while the auto toolchangers hold up to 16 indexable tools each to decrease downtime.

- Quantities: 1 pc - 50,000 pcs
- Thickness: 1/16" up to 4" thick
- Width: 1/2" up to 120" wide
- Length: 1/2" up to 144" long
- Standard Cut Tolerance: +/- .015"
- Custom tolerances available by request
- Multi-Table Routers for production runs
- Automatic tool changers, up to 32 tools

CNC Vertical Machining Center

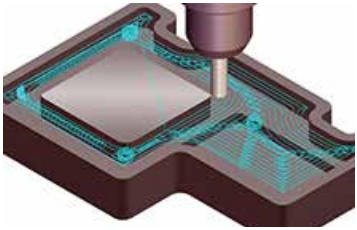
In addition to the CNC routers Alro Plastics also has a vertical machining center for more complex parts and prototype runs. The VMC has the ability to cut parts from 1/16" thick up to 6" thick with a 32" wide x 60" long work surface for large parts. With its 4-axis capabilities and automatic tool changers the VMC is an excellent compliment to the CNC routers.

- Quantities: 1 pc - 10,000 pcs
- Thickness: 1/16" up to 6" thick
- Width: 1" up to 32" wide
- Length: 1" up to 60" long
- Ideal for prototypes and small, complex parts
- Custom tolerances available by request

CAD/CAM Programming

Alro Plastics utilizes the latest CAD/CAM programming software to run our CNC equipment. We can accept customer supplied files in .DWG and .DXF formats and import the data directly into our machines. This software allows us to test run the program in the virtual world before wasting any material or labor time. Our customers can email us CAD data and prints to plastics@alro.com.

- **Email** : plastics@alro.com
- **File Types** : .DWG, .DXF, .IGES
- Virtual test runs to prevent errors
- Able to upload customer files directly
- Store files electronically for repeat orders



Plastics Processing Overview

Additional Services

Drilling and Tapping

Our FlexArm equipment allows Alro Plastics to offer in house capability of part tapping and Helicoil inserts. The FlexArm keeps the Helicoil insertion tool perpendicular to the work piece. The depth control ability offers consistency from part to part whether tapping or inserting helicoils. A FlexArm Tapping Machine will take care of prep work such as reaming, chamfering and deburring.

- Quantities: 1 pc - 10,000 pcs
- Thickness: 1/4" up to 4" thick
- Length/Width: 1" up to 120" wide/long
- Helicoil Sizes:
- Standard: 8-32, 10-24, 10-32, 1/4-20, 3/8-20 and 1/2-13
- Metric: M3-0.5, M4-0.7, M5-0.8, M6 x 1.0, M8 x 1.25 and M10 x 1.50

Plastic Welding

Alro Plastics has invested the time and resources to become very good at plastic welding and we offer this service to all of our customers. From the simple task of butt-welding two sheets together to make one longer sheet, to the complex process of creating custom fabricated tanks to print, we can do it all.

- Hot gas and modified extrustion welding
- Done in house, better control of lead times
- Pieces machined on routers for best finish
- Experienced welders specializing in plastics
- Many plastics can be welded

Bending and Gluing

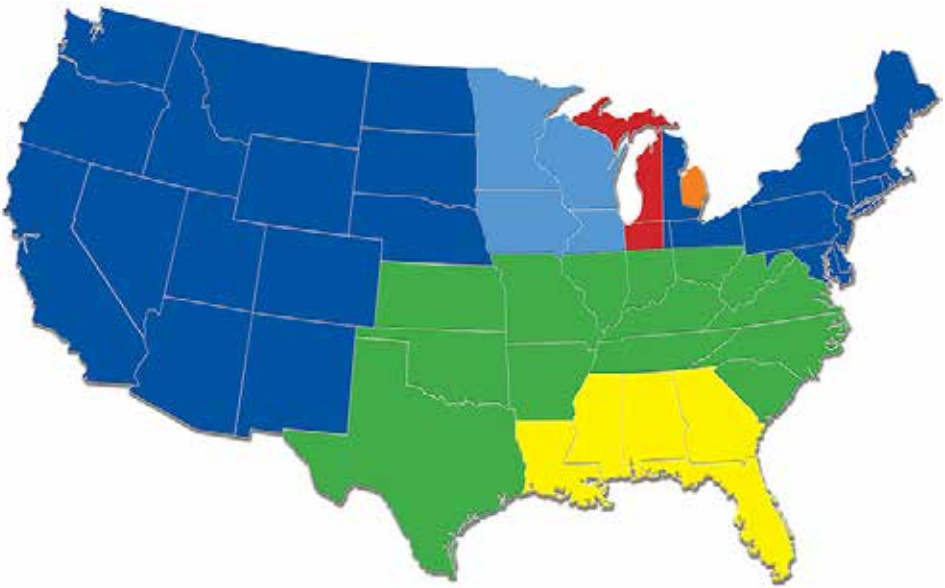
Alro Plastics also offers our customers custom fabricated bent and glued parts to print. Some of our thinner gage plastics can be heat bent or cold formed on a press break, mostly our “See-through” materials like Acrylic, Plexiglas, Polycarbonate and PETG. We can also CNC Saw Cut and Router these parts and assemble them together on custom fabricated jobs. ISO certified to ensure high quality finished parts in a timely manner.

- CNC machined edges for the best bonds
- Ability to heat bend plastics per print
- Cold forming and bending also available
- Experienced fabricators specializing in plastics
- Complete assembly of finished parts

Plastics Locations and Coverage Map

Servicing Warehouse and Contact Information

(Color shades indicate branch coverage)



Jackson, MI

2218 Enterprise
Jackson, MI 49203
Ph: (517) 787-5500
Fx: (517) 787-6380

Detroit, MI

1750 E. Heights Drive
Madison Heights, MI 48071
Ph: (800) 877-2576
Fx: (517) 787-6380

Grand Rapids, MI

4670 60th S.E.
Grand Rapids, MI 49512
Ph: (616) 656-2820
Fx: (616) 656-2828

Chicago, IL

279 Madsen
Suite #102
Bloomingdale, IL 60108
Ph: (888) 877-2576
Fx: (616) 656-2828

Evansville, IN

1414 Baker Avenue
Evansville, IN 47710
Ph: (812) 424-5554
Fx: (812) 421-1265

Louisville, KY

5500 Shepherdsville Rd
Suite #300
Louisville, KY 40228
Ph: (502) 968-9980
Fx: (502) 968-5530

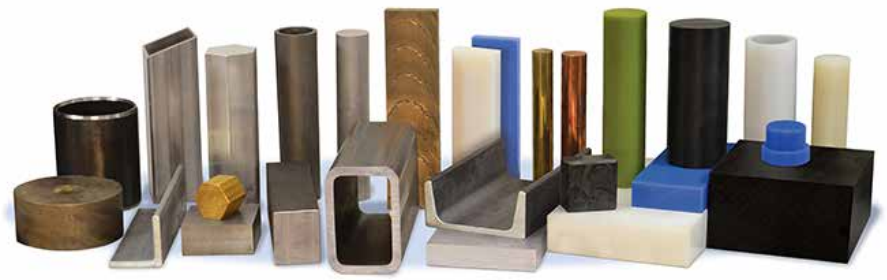
Clearwater, FL

12171 62nd Street
Suite #150
Largo, FL 33773
Ph: (727) 573-1480
Fx: (727) 573-1632

alroplastics.com

Alro Metals Outlet

Public Welcome
Retail Setting
No Minimums
Fast Service

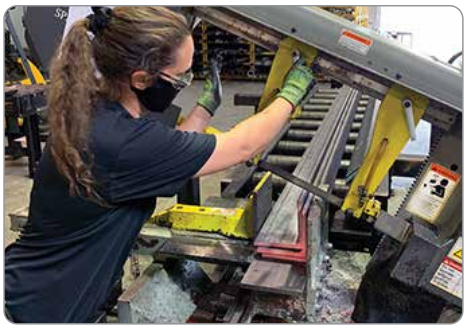


Your one-stop shop for all your Metal and Plastic needs!

- Carbon Steel
- Aluminum
- Stainless Steel
- Brass
- Plastics
- Tool Steel
- CF Bar
- HR Bar
- Structurals
- Expanded Metals
- Re-rod & Mesh
- Pipe & Tubing
- **Full lengths**
- **Remnants**
- **Cut-offs & Drops**
- **Saw Cutting**
- **Shearing**

SCAN ME

Alro Metals Outlet locations act as an outlet store for metals, plastics and hardware supplies. We stock a broad range of products in a convenient retail setting. Alro Metals Outlet specializes in small and large orders, perfect for do-it-yourself (DIY), machine shops and maintenance departments. We sell drops as well as standard length material in bar, sheet and plate. Orders can be processed to size at the store while you wait. Stop by and browse our selection of metals and plastics to find just what you need.



Shearing and Saw Cutting available at all locations!

Outlet Locations

Racine, Wisconsin
Chicago, Illinois
Elkhart, Indiana
Fort Wayne, Indiana
Ann Arbor, Michigan
Grand Rapids, Michigan
Jackson, Michigan
Kalamazoo, Michigan
Lansing, Michigan
Livonia, Michigan
Troy, Michigan
Warren, Michigan
Cincinnati, Ohio
Cleveland, Ohio
Philadelphia, Pennsylvania
Baltimore, Maryland
Rochester, New York
Syracuse, New York
Greensboro, N. Carolina
Clearwater, Florida
Jacksonville, Florida
Miami, Florida
Orlando, Florida
Pompano Beach, Florida
Sarasota, Florida

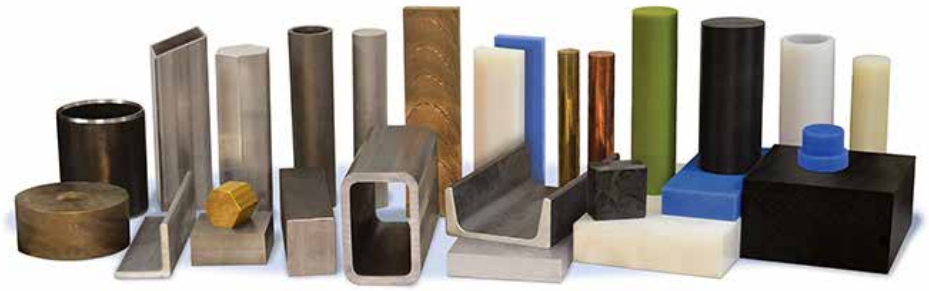
Alro Locations by State pages 12-13 to 12-17

SQUARES & FLATS | ROUNDS | HEX | ROUND PIPE & TUBE | RECTANGULAR & SQUARE TUBE | SHEET & PLATE | ANGLES | BEAMS | CHANNELS

Alro Online Store

MyAlro.com

Aluminum • Alloys • Carbon Steel • Stainless Steel • Red Metals • Plastics



Did you know Alro also offers online shopping and e-business solutions for all of our customers? Visit the Alro Online Store from your computer or mobile device 24 hours a day. Set up your company account and purchase metals, plastics and industrial supplies from our vast inventory.

Alro utilizes systems technology to achieve the benefits of e-Business in raw material procurement processes.

- **Business to Business (B2B) – Helps reduce purchasing transaction costs.**
- **Web Ordering (MyAlro.com) – Helps with material selection, quoting and estimating.**
- **Automated Inventory Replenishment (APOS) – helps reduce Kan Ban replenishment costs**
- **Summary Billing – helps reduce admin costs of processing raw material payables**
- **Advance Shipping Notices – helps reduce receiving time**

Alro computers retrieve business information from customers/vendors computers via the internet. During the process we pickup and deliver electronic business documents. This process typically does not require any programming on the part of our customers, as Alro systems are designed to accept virtually any customer document format. Some examples of these documents are as follows:

- **Purchase orders**
- **Invoices**
- **Quotes**
- **POD - Electronic Proof of Delivery**
- **ACH Payment notifications**
- **Mill Certifications**
- **CAD drawings**
- **Burn prints**
- **Material releases**

Alro Locations Listed by State

FLORIDA LOCATIONS

Alro Metals
6200 Park of Commerce Blvd
Boca Raton, FL 33487-8201
Ph: (561) 997-6766
Fx: (561) 994-6261

Alro Metals Outlet
12490 49th Street N.
Clearwater, FL 33762
Ph: (727) 572-1380
Fx: (727) 561-7498

Alro Metals Outlet
1631 S. Dixie Hwy, Bldg "A"
Pompano Beach, FL 33060
Ph: (954) 545-9755
Fx: (954) 545-9756

Alro Metals
2505 N. Forsyth Road
Orlando, FL 32807-6494
Ph: (407) 678-2576
Fx: (407) 679-0495

Alro Metals Outlet
5875 Highway Avenue, #2
Jacksonville, FL 32254
Ph: (904) 693-2893
Fx: (904) 693-2876

Alro Metals Outlet
4500 Northgate Court
Sarasota, FL 34234
Ph: (941) 952-1918
Fx: (941) 952-0267

Alro Metals
10223 Woodberry Road
Tampa, FL 33619-8009
Ph: (813) 661-1646
Fx: (813) 661-8353

Alro Metals Outlet
6329 NW 74th Street
Miami, FL 33161
Ph: (305) 392-9990
Fx: (305) 392-9991

Alro Metals Outlet
1101 Oak Lane
Winter Springs, FL 32708
Ph: (407) 339-2576
Fx: (407) 339-7532

Alro Plastics
12171 62nd St., Suite 150
Largo, FL 33773
Ph: (727) 573-1480
Fx: (727) 573-1632

ILLINOIS

Alro Steel
350 S. Joliet Road
Bolingbrook, IL 60440
Ph: (630) 739-2222
Fx: (630) 739-2223

Alro Steel
4501 James Place
Melrose Park, IL 60160
Ph: (708) 343-4343
Fx: (708) 343-7588

Alro Metals Outlet
565 Busse Road
Elk Grove Village, IL 60007
Ph: (847) 640-1111
Fx: (847) 640-1292

Alro Steel
777 Industrial Drive
University Park, IL 60466
Ph: (708) 534-5400
Fx: (708) 534-5563

Alro Plastics
279 Madsen, Suite 102
Bloomingdale, IL 60108
Ph: (888) 877-2576
Fx: (616) 656-2828

INDIANA

Alro Steel
5620 Churchman Ave.
Indianapolis, IN 46203
Ph: (317) 781-3800
Fx: (317) 781-3810

Alro Metals Outlet
909 Hall Avenue
Elkhart, IN 46516
Ph: (574) 747-9825

Alro Steel
2301 S. Walnut Street
Muncie, IN 47302
Ph: (765) 282-5335
Fx: (765) 289-3083

Alro Metals Outlet
5119 Executive Blvd
Fort Wayne, IN 46808
Ph: (260) 257-6990
Fx: (260) 257-6988

Alro Steel
2912 Pleasant Center Rd
Yoder, IN 46798
Ph: (260) 749-9661
Fx: (260) 749-9601

Alro Plastics
1414 Baker Avenue
Evansville, IN 47710
Ph: (812) 424-5554
Fx: (812) 421-1265

IOWA

Alro Steel
9620 Earhart Lane SW
Cedar Rapids, IA 52404
Ph: (319) 893-7850
Fx: (319) 893-7861

Continued on next page

Alro Locations Listed by State

KENTUCKY

Alro Steel
310 Boxley Avenue
Louisville, KY 40209
Ph: (502) 635-7481
Fx: (502) 637-4290

Alro Plastics
5500 Shepherdsville Rd., Ste 300
Louisville, KY 40228
Ph: (502) 968-9980
Fx: (502) 968-5530

MARYLAND

Alro Metals Outlet
8893 Kelso Drive
Essex, MD 21221
Ph: (410) 687-2414
Fx: (410) 687-2418

MICHIGAN

Alro Steel
901 Commerce Drive
Alpena, MI 49707
Ph: (989) 354-4188
Fx: (989) 354-4801

Alro Steel
801 N. 20th Street
Battle Creek, MI 49037
Ph: (269) 968-0234
Fx: (269) 968-3865

Alro Steel
3125 N. Water Street
Bay City, MI 48708
Ph: (989) 893-9553
Fx: (989) 893-6331

Alro Steel
707 Works Avenue
Cadillac, MI 49601
Ph: (231) 775-9336
Fx: (231) 775-7822

Alro Steel
1298 Lipsey Drive
Charlotte, MI 48813
Ph: (517) 541-2558
Fx: (517) 541-2559

Alro Steel
500 Industrial Drive
Clare, MI 48617
Ph: (989) 386-7725
Fx: (989) 386-7654

Alro Steel
18695 Sherwood Ave.
Detroit, MI 48234
Ph: (313) 366-8000
Fx: (313) 366-8039

Alro Steel
18881 Sherwood Ave.
Detroit, MI 48234
Ph: (313) 892-1212
Fx: (313) 369-4651

Alro Steel
3000 Tri Park Drive
Grand Blanc, MI 48439
Ph: (810) 695-7300
Fx: (810) 695-7333

Alro Steel
1033 Freeman SW
Grand Rapids, MI 49503
Ph: (616) 452-5111
Fx: (616) 452-2779

Alro Steel
2471 Industrial St.
Grayling, MI 49738
Ph: (989) 348-3350
Fx: (989) 348-6368

Alro Steel
3100 E. High Street
Jackson, MI 49203
Ph: (517) 787-5500
Fx: (517) 787-6390

Alro Steel
2500 Enterprise
Jackson, MI 49203
Ph: (517) 788-3194
Fx: (517) 780-3468

Alro Steel
1800 W. Willow St.
Lansing, MI 48915
Ph: (517) 371-9600
Fx: (517) 371-9640

Alro Steel
34401 Schoolcraft Rd.
Livonia, MI 48150
Ph: (734) 261-2200
Fx: (734) 261-2201

Alro Steel
1775 Foundation Dr.
Niles, MI 49120
Ph: (269) 687-4000
Fx: (269) 687-4040

Alro Steel
5859 Alro Park Drive
Potterville, MI 48876
Ph: (517) 645-9900
Fx: (517) 645-9909

Alro Grinding
2425 E. High Street
Jackson, MI 49204
Ph: (517) 787-5500
Fx: (517) 787-6390

Continued on next page

Alro Locations Listed by State

MICHIGAN (Continued)

Alro Metals Outlet
2466 S. Industrial Hwy
Ann Arbor, MI 48104
Ph: (734) 213-2727

Alro Metals Outlet
4150 Broadmoor SE
Grand Rapids, MI 49512
Ph: (616) 656-2807

Alro Metals Outlet
409 Wisner Street
Jackson, MI 49202
Ph: (517) 788-3190

Alro Metals Outlet
5382 Wynn Road
Kalamazoo, MI 49048
Ph: (269) 343-9575

Alro Metals Outlet
4832 W.Saginaw Hwy, Suite 3
Lansing, MI 48917
Ph: (517) 321-3773

Alro Metals Outlet
34401 Schoolcraft Rd.
Livonia, MI 48150
Ph: (734) 261-2020

Alro Metals Outlet
33603 Dequindre Rd.
Troy, MI 48083
Ph: (248) 577-5800

Alro Metals Outlet
26200 Groesbeck Hwy.
Warren, MI 48089
Ph: (586) 498-9999

Alro Plastics
4670 60th SE
Grand Rapids, MI 49512
Ph: (616) 656-2820
Fx: (616) 656-2828

Alro Plastics
2218 Enterprise
Jackson, MI 49203
Ph: (517) 787-5500
Fx: (517) 787-6380

Alro Plastics
1750 E. Heights Drive
Madison Heights, MI 48071
Ph: (800) 877-2576
Fx: (517) 787-6380

MISSOURI

Alro Steel
746 Keystone Industrial Park Dr
Camdenton, MO 65020
Ph: (573) 346-5641
Fx: (573) 346-1253

Alro Steel
3701 Rider Trail S.
Earth City, MO 63045
Ph: (314) 726-3080
Fx: (314) 726-5017

Alro Steel
1900 Rissler Road
Sedalia, MO 65301
Ph: (660) 826-7600
Fx: (660) 827-2700

NEW YORK

Alro Steel
105 Vanguard Parkway
Rochester, NY 14606
Ph: (585) 328-4000
Fx: (585) 328-0470

Alro Steel
50 Ensminger Road
Tonawanda, NY 14150
Ph: (716) 877-6242
Fx: (716) 877-6851

Alro Metals Outlet
1462 Lyell Avenue
Rochester, NY 14606
Ph: (585) 458-8100
Fx: (585) 458-9119

Alro Metals Outlet
1 General Motors Dr. Unit 14
Syracuse, NY 13206
Ph: (315) 454-3165
Fx: (315) 454-3645

N. CAROLINA

Alro Steel
12933 Sam Neely Road
Charlotte, NC 28273
Ph: (704) 588-5880
Fx: (704) 588-5897

Alro Steel
7966 National Service Rd.
Greensboro, NC 27409
Ph: (336) 664-6556
Fx: (336) 664-6220

Alro Metals Outlet
110 Industrial Avenue
Greensboro, NC 27406
Ph: (336) 691-8113
Fx: (336) 691-8114

Continued on next page

Alro Locations Listed by State

OHIO

Alro Steel
10310 S. Medallion Dr.
Cincinnati, OH 45241
Ph: (513) 769-9999
Fx: (513) 769-9600

Alro Steel
555 Hilliard-Rome
Columbus, OH 43228
Ph: (614) 878-7271
Fx: (614) 878-0769

Alro Steel
4787 State Road
Cuyahoga Falls, OH 44223
Ph: (330) 929-4660
Fx: (330) 929-3936

Alro Steel
821 Springfield Street
Dayton, OH 45403
Ph: (937) 253-6121
Fx: (937) 253-6126

Alro Steel
3003 Airport Highway
Toledo, OH 43609
Ph: (419) 720-5300
Fx: (419) 720-5301

Alro Metals Outlet
24790 Lakeland Blvd
Euclid, OH 44132
Ph: (216) 535-0020
Fx: (216) 535-0021

Alro Metals Outlet
9800 Princeton Glendale Rd
West Chester, OH 45246
Ph: (513) 714-3838
Fx: (513) 714-3837

OKLAHOMA

Alro Steel
4321 North Garnett Rd.
Tulsa, OK 74116
Ph: (918) 439-1000
Fx: (918) 439-9708

PENNSYLVANIA

Alro Steel
140 Solar Drive
Imperial, PA 15126
Ph: (724) 899-4900
Fx: (724) 899-4901

Alro Steel
17 Progress Drive
Morrisville, PA 19067
Ph: (215) 938-1900
Fx: (267) 725-3653

Alro Steel
130 Keeney Lane
York, PA 17406
Ph: (717) 252-0250
Fx: (717) 252-0329

Alro Metals Outlet
3361 Richmond Street
Philadelphia, PA 19134
Ph: (215) 861-1185

TENNESSEE

Alro Metals
211 Gatlin Street
Clarksville, TN 37040
Ph: (931) 648-0851
Fx: (931) 648-1288

Continued on next page

Alro Locations Listed by State

VIRGINIA

Alro Steel
2200 Buford Ave. SW
Roanoke, VA 24015
Ph: (540) 985-0292
Fx: (540) 343-3273

WISCONSIN

Alro Steel
4343 S. 6th Street
Milwaukee, WI 53221
Ph: (414) 453-1700
Fx: (414) 453-1702

Alro Steel
3970 Poberezny Rd.
Oshkosh, WI 54902
Ph: (920) 231-7200
Fx: (920) 231-0743

Alro Metals Outlet
2711 Mt. Pleasant Street
Racine, WI 53404
Ph: (262) 637-9574
Fx: (262) 631-6085

For the most up to date information please visit **alro.com**

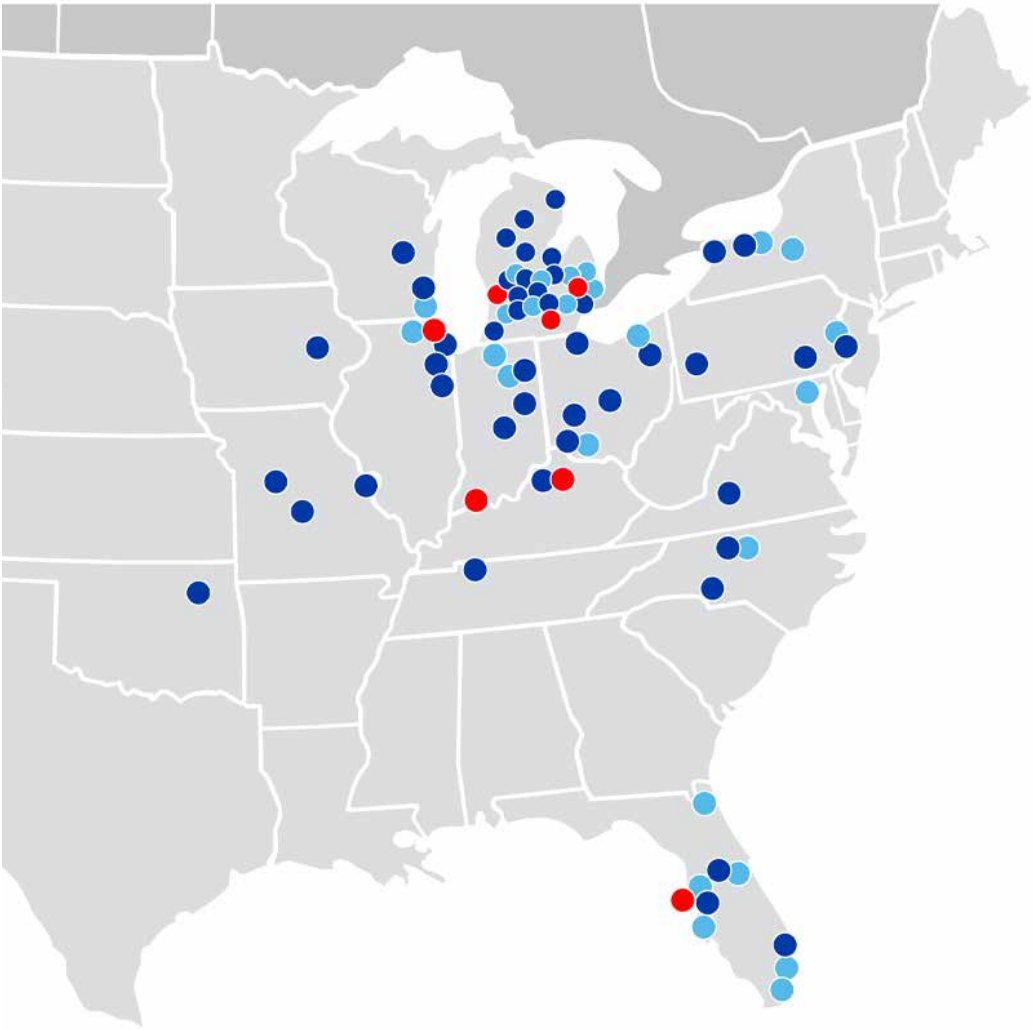
Alro Steel Corporate Office - Jackson Michigan

Notes

Alro Locations

View the Map below or scan QR Code

● Alro Steel ● Alro Metals Outlet ● Alro Plastics



Founded in 1948 in Jackson, Michigan by brothers Al and Robert Glick, Alro has grown to over 80 locations in 16 states. Alro Steel is a distributor of metals and plastics to over 50,000 customers in North America. Alro offers cut-to-size metals and plastics with next day delivery. For more information on Alro locations see pages 12-13 thru 12-17 in this Metals Guide or scan the QR code at the top of the page.

Decimal Equivalent Chart

Fraction	Decimal (inches)	Decimal (mm)	Fraction	Decimal (inches)	Decimal (mm)
1/64	.015625	.397	33/64	.515625	13.097
1/32	.031250	.794	17/32	.531250	13.494
3/64	.046875	1.191	35/64	.546875	13.891
1/16	.062500	1.588	**9/16**	.562500	14.288
5/64	.078125	1.984	37/64	.578125	14.684
3/32	.093750	2.381	19/32	.593750	15.081
7/64	.109375	2.778	39/64	.609375	15.487
1/8	.125000	3.175	**5/8**	.625000	15.875
9/64	.140625	3.572	41/64	.640625	16.272
5/32	.156250	3.969	21/32	.656250	16.669
11/64	.171875	4.366	43/64	.671875	17.066
3/16	.187500	4.763	**11/16**	.687500	17.463
13/64	.203125	5.159	45/64	.703125	17.859
7/32	.218750	5.556	23/32	.718750	18.256
15/64	.234375	5.953	47/64	.734375	18.653
1/4	.250000	6.350	**3/4**	.750000	19.050
17/64	.265625	6.747	49/64	.765625	19.447
9/32	.281250	7.144	25/32	.781250	19.844
19/64	.296875	7.541	51/64	.796875	20.241
5/16	.312500	7.938	**13/16**	.812500	20.638
21/64	.328125	8.334	53/64	.828125	21.034
11/32	.343750	8.731	27/32	.843750	21.431
23/64	.359375	9.128	55/64	.859375	21.828
3/8	.375000	9.525	**7/8**	.875000	22.225
25/64	.390625	9.922	57/64	.890625	22.622
13/32	.406250	10.319	29/32	.906250	23.019
27/64	.421875	10.716	59/64	.921875	23.416
7/16	.437500	11.113	**15/16**	.937500	23.813
29/64	.453125	11.509	61/64	.953125	24.209
15/32	.468750	11.906	31/32	.968750	24.606
31/64	.484375	12.303	63/64	.984375	25.003
1/2	.500000	12.700	**1**	1.00000	25.400