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B

SECTION B

HOT ROLLED CARBON BARS and STRIP

HOT ROLLED CARBON BARS

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HOT ROLLED MILD STEEL BARS

ASTM A 36 UNS K02600

Color Marking: Ends painted Blue

Hot Rolled Mild Steel Bars are used for general purpose applications. This steel is a low carbon grade, having good over-all mechanical properties. It is easy to fabricate by the usual structural methods, such as mild cold and hot forming and welding.

ANALYSIS

	Carbon Max.	Manganese	Phosphorus	Sulphur
3/4" and Under	.26	—	.04 Max.	.05 Max.
Over 3/4" to 1 1/2" Incl.	.27	.60/.90	.04 Max.	.05 Max.
Over 1 1/2"	.28	.60/.90	.04 Max.	.05 Max.

APPLICATIONS — This material is used for general purpose structural and miscellaneous non-critical applications that involve mild cold bending, mild hot forming, punching, and welding. Such applications include parts for general machinery, agricultural implements, transportations equipment, etc. It is used where seams and other surface imperfections may be tolerated.

MECHANICAL PROPERTIES — The following values are average for 1" round and may be considered as representative of this grade:

Tensile Strength (psi)	Yield Strength (psi)	Elongation in 2"
ASTM A 36 58/80,000	36,000 Min.	23% Min.

WELDABILITY — This material is easily welded by all welding processes, and the resultant welds and joints are of extremely high quality. The grade of welding rod used depends on welding conditions, such as thickness of section, design, service requirements, etc.

HOT ROLLED MILD STEEL BARS (Continued)



HOT ROLLED MILD STEEL ROUNDS

Stock Lengths 20'

Size in Inches	Estimated Weight, Lbs.		Size in Inches	Estimated Weight, Lbs.	
	Per Foot	20-Ft. Bar		Per Foot	20-Ft. Bar
3/16	.0940	1.879	1 1/8	3.383	67.66
1/4	.1671	3.341	1/4	4.176	83.53
5/16	.2610	5.220	3/8	5.053	101.1
23/64	.3452	6.904	1/2	6.014	120.3
3/8	.3759	7.517	5/8	7.058	141.2
7/16	.5116	10.23	3/4	8.186	163.7
31/64	.6271	12.54	7/8	9.397	187.9
1/2	.6682	13.36	2	10.69	213.8
9/16	.8457	16.91	1/8	12.07	241.4
39/64	.9925	19.85	1/4	13.53	270.6
5/8	1.044	20.88	3/8	15.08	301.5
47/64	1.442	28.83	1/2	16.71	334.1
3/4	1.504	30.07	5/8	18.42	368.4
55/64	1.974	39.48	3/4	20.21	404.3
7/8	2.046	40.93	7/8	22.09	441.9
63/64	2.590	51.80	NOTE – For Rounds 3" and over, refer to 1018 Special Quality Bars on Page 7 of this section.		
1	2.673	53.46			
1 1/16	3.017	60.35			



HOT ROLLED MILD STEEL SQUARES

Stock Lengths 20'

Size in Inches	Estimated Weight, Lbs.		Size in Inches	Estimated Weight, Lbs.	
	Per Foot	20-Ft. Bar		Per Foot	20-Ft. Bar
1/4	.2127	4.254	1 5/8	8.987	179.7
5/16	.3323	6.647	3/4	10.42	208.4
3/8	.4786	9.572	7/8	11.96	239.3
7/16	.6514	13.03	2	13.61	272.3
1/2	.8508	17.02	1/4	17.23	344.6
5/8	1.329	26.59	1/2	21.27	425.4
3/4	1.914	38.29	3/4	25.74	514.7
7/8	2.606	52.11	3	30.63	612.6
1	3.403	68.06	1/4	35.95	718.9
1 1/8	4.307	86.14	1/2	41.69	833.8
1 1/4	5.318	106.4	4	54.45	1089
3/8	6.434	128.7	1/2	68.91	1378
1/2	7.657	153.1	5	85.08	1702
			6	122.5	2450

HOT ROLLED MILD STEEL BARS (Continued)



HOT ROLLED MILD STEEL FLATS

Stock Lengths 20'

Size			Size			Size		
Est. Wt., Lbs.			Est. Wt., Lbs.			Est. Wt., Lbs.		
In	Per	20-Ft.	In	Per	20-Ft.	In	Per	20-Ft.
Inches	Foot	Bar	Inches	Foot	Bar	Inches	Foot	Bar
$\frac{1}{8}$ and $\frac{3}{16}$ thick – See Flats, Page 15			$\frac{3}{8}$ x			$\frac{5}{8}$ x		
$\frac{1}{4}$ x			$\frac{1}{2}$	6.381	12.76	$\frac{3}{4}$	1.595	31.91
$\frac{3}{8}$	.3191	6.381	$\frac{5}{8}$	.7976	15.95	$\frac{7}{8}$	1.861	37.22
$\frac{1}{2}$	.4254	8.508	$\frac{3}{4}$	.9572	19.14	1	2.127	42.54
$\frac{5}{8}$	.5318	10.64	$\frac{7}{8}$	1.117	22.33	$\frac{1}{8}$	2.393	47.86
$\frac{3}{4}$	.6381	12.76	1	1.276	25.52	$\frac{1}{4}$	2.659	53.18
$\frac{7}{8}$	.7445	14.89	$\frac{1}{8}$	1.436	28.71	$\frac{1}{2}$	3.191	63.81
1	.8508	17.02	$\frac{1}{4}$	1.595	31.91	$\frac{5}{8}$	3.456	69.13
$\frac{1}{8}$	.9572	19.14	$\frac{3}{8}$	1.755	35.10	$\frac{3}{4}$	3.722	74.45
$\frac{1}{4}$	1.064	21.27	$\frac{1}{2}$	1.914	38.29	2	4.254	85.08
$\frac{3}{8}$	1.170	23.40	$\frac{5}{8}$	2.074	41.48	$\frac{2}{4}$	4.786	95.72
$\frac{1}{2}$	1.276	25.52	$\frac{3}{4}$	2.233	44.67	$\frac{2}{2}$	5.318	106.4
$\frac{5}{8}$	1.383	27.65	2	2.552	51.05	$\frac{2}{4}$	5.849	117.0
$\frac{3}{4}$	1.489	29.78	$\frac{2}{4}$	2.871	57.43	3	6.381	127.6
2	1.702	34.03	$\frac{2}{2}$	3.191	63.81	$\frac{3}{4}$	6.913	138.3
$\frac{2}{4}$	1.914	38.29	$\frac{2}{4}$	3.510	70.19	3	7.445	148.9
$\frac{2}{2}$	2.127	42.54	3	3.829	76.57	$\frac{3}{2}$	7.972	159.6
$\frac{2}{4}$	2.340	46.79	$\frac{3}{4}$	4.148	82.95	4	8.508	170.2
3	2.552	51.05	$\frac{3}{2}$	4.467	89.33	$\frac{4}{2}$	9.572	191.4
$\frac{3}{4}$	2.765	55.30	$\frac{3}{4}$	4.786	95.72	5	10.64	212.7
$\frac{3}{2}$	2.978	59.56	4	5.105	102.1	$\frac{5}{2}$	11.70	234.0
$\frac{3}{4}$	3.191	63.81	$\frac{4}{4}$	5.424	108.5	6	12.76	255.2
4	3.403	68.06	$\frac{4}{2}$	5.743	114.9	7	14.89	297.8
$\frac{4}{4}$	3.616	72.32	5	6.381	127.6	8	17.02	340.3
$\frac{4}{2}$	3.829	76.57	$\frac{5}{2}$	7.019	140.4	9	19.14	382.8
5	4.254	85.08	6	7.657	153.1	10	21.27	425.4
$\frac{5}{2}$	4.679	93.59	$\frac{6}{2}$	8.295	165.9	12	25.52	510.5
6	5.105	102.1	7	8.933	178.7			
$\frac{6}{2}$	5.530	110.6	$\frac{7}{2}$	9.572	191.4	$\frac{3}{4}$ x		
7	5.956	119.1	8	10.21	204.2	$\frac{7}{8}$	2.233	44.67
$\frac{7}{2}$	6.381	127.6	9	11.49	229.8	1	2.552	51.05
8	6.806	136.1	10	12.76	255.2	$\frac{1}{8}$	2.871	57.43
9	7.657	153.1	11	14.04	280.8	$\frac{1}{4}$	3.191	63.81
10	8.508	170.2	12	15.31	306.3	$\frac{1}{2}$	3.829	76.57
11	9.359	187.2				$\frac{5}{8}$	4.148	82.95
12	10.21	204.2	$\frac{7}{16}$ x			$\frac{3}{4}$	4.467	89.33
			1	1.489	29.78	2	5.105	102.1
			$\frac{1}{4}$	1.861	37.22	$\frac{2}{4}$	5.743	114.9
			$\frac{1}{2}$	2.233	44.67	$\frac{2}{2}$	6.381	127.6
			2	2.978	59.56	$\frac{2}{4}$	7.019	140.4
			$\frac{2}{2}$	3.722	74.45	3	7.657	153.1
			3	4.467	89.33	$\frac{3}{4}$	8.295	165.9
			$\frac{1}{2}$ x			$\frac{3}{2}$	8.933	178.7
			$\frac{5}{8}$	1.064	21.27	4	10.21	204.2
			$\frac{3}{4}$	1.276	25.52	$\frac{4}{2}$	11.49	229.7
			$\frac{7}{8}$	1.489	29.78	5	12.76	255.2
			1	1.702	34.03	$\frac{5}{2}$	14.04	280.8
			$\frac{1}{8}$	1.914	38.29	6	15.31	306.3
			$\frac{1}{4}$	2.127	42.54	7	17.02	340.3
			$\frac{3}{8}$	2.340	46.79	8	20.42	408.4
			$\frac{1}{2}$	2.552	51.05	10	25.52	510.5
			$\frac{5}{8}$	2.765	55.30	12	30.63	612.6
			$\frac{3}{4}$	2.978	59.56			
			2	3.403	68.06	$\frac{7}{8}$ x		
			$\frac{2}{4}$	3.829	76.57	1	2.978	59.56
			$\frac{2}{2}$	4.254	85.08	$\frac{1}{4}$	3.722	74.45
			$\frac{2}{4}$	4.679	93.59	$\frac{1}{2}$	4.467	89.33
			3	5.105	102.1	$\frac{3}{4}$	5.211	104.2
			$\frac{3}{4}$	5.530	110.6	2	5.956	119.1
			$\frac{3}{2}$	5.956	119.1	$\frac{2}{4}$	6.700	134.0
			$\frac{3}{4}$	6.381	127.6	$\frac{2}{2}$	7.445	148.9
			4	6.806	136.1	$\frac{2}{4}$	8.189	163.8
			$\frac{4}{2}$	7.657	153.1	3	8.933	178.7
			5	8.508	170.2	$\frac{3}{2}$	10.42	208.4
			$\frac{5}{2}$	9.359	187.2	4	11.91	238.2
			6	10.21	204.2	$\frac{4}{2}$	13.40	268.0
			$\frac{6}{2}$	11.06	221.2	5	14.89	297.8
			$\frac{6}{4}$	11.49	229.8	$\frac{5}{2}$	16.38	327.6
			7	11.91	238.2	6	17.87	357.3
			8	13.61	272.3	7	20.84	416.9
			9	15.31	306.3	8	23.82	476.4
			10	17.02	340.3			
			11	18.72	374.4			
			12	20.42	408.4			

(Continued next page)

HOT ROLLED MILD STEEL BARS (Continued)



HOT ROLLED MILD STEEL FLATS

Stock Lengths 20'

Size In Inches	Est. Wt., Lbs.		Size In Inches	Est. Wt., Lbs.		Size In Inches	Est. Wt., Lbs.	
	Per Foot	20-Ft. Bar		Per Foot	20-Ft. Bar		Per Foot	20-Ft. Bar
1 x			1 1/4 x			1 3/4 x		
1 1/4	4.254	85.08	1 1/2	6.381	127.6	2	11.91	238.2
1 1/2	5.105	102.1	1 3/4	7.445	148.9	2 1/2	14.89	297.8
1 3/4	5.956	119.1	2	8.508	170.2	3	17.87	357.3
2	6.806	136.1	2 1/4	9.572	191.4	3 1/2	20.84	416.9
2 1/4	7.657	153.1	2 1/2	10.64	212.7	4	23.82	476.4
2 1/2	8.508	170.2	2 3/4	11.70	234.0	4 1/2	26.80	536.0
2 3/4	9.359	187.2	3	12.76	255.2	5	29.78	595.6
3	10.21	204.2	3 1/4	13.82	276.4	5 1/2	32.76	655.1
3 1/4	11.06	221.2	3 1/2	14.89	297.8	6	35.73	714.7
3 1/2	11.91	238.2	4	17.02	340.3	2 x		
4	13.61	272.3	4 1/2	19.14	382.9	2 1/4	15.31	306.3
4 1/2	15.31	306.3	5	21.27	425.4	2 1/2	17.02	340.3
5	17.02	340.3	5 1/2	23.40	467.9	3	20.42	408.4
5 1/2	18.72	374.4	6	25.52	510.5	3 1/2	23.82	476.4
6	20.42	408.4	7	29.78	595.6	4	27.23	544.5
7	23.82	476.4	8	34.03	680.6	4 1/2	30.63	612.6
8	27.23	544.5	1 1/2 x			5	34.03	680.6
10	34.03	680.6	1 3/4	8.933	178.7	6	40.84	816.8
12	40.84	816.8	2	10.21	204.2	7	47.64	952.9
1 1/8 x			2 1/4	11.49	229.7	8	54.45	1089
2	7.657	153.1	2 1/2	12.76	255.2	2 1/4 x		
3	11.49	229.7	2 3/4	14.04	280.8	4	30.63	612.6
4	15.31	306.3	3	15.31	306.3	2 1/2 x		
5	19.14	382.9	3 1/2	17.87	357.3	3	25.52	510.5
6	22.97	459.4	4	20.42	408.4	3 1/2	29.78	595.6
			4 1/2	22.97	459.4	4	34.03	680.6
			4 3/4	24.25	485.0	4 1/2	38.29	765.7
			5	25.52	510.5	5	42.54	850.8
			5 1/2	28.08	561.5	6	51.05	1021
			6	30.63	612.6	8	68.06	1361
			7	35.73	714.7	3 x		
			8	40.84	816.8	4	40.84	816.8
						4 1/2	45.94	918.9
						5	51.05	1021
						6	61.26	1225

MILD STEEL HALF ROUNDS



Stock Lengths 20'

Size In Inches	Estimated Weight, Lbs.		
	Per Foot	20-Ft. Bar	
1/2	.334	6.68	
5/8	.522	10.44	
3/4	.751	15.02	
1		1.335	26.70
1 1/2	3.004	60.08	

1018 HOT ROLLED BARS

Special Quality

ASTM A 576 UNS G10180

Color Marking: Ends painted Black

A low-carbon steel having a higher manganese content than Mild Steel and certain other low-carbon steels. Being richer in manganese, it is a better steel for carburized parts, since it produces a harder and more uniform case. It also has higher mechanical properties, including Brinell hardness, and better machining characteristics. In its production, special manufacturing controls are used for chemical composition, heating, rolling, surface preparation, etc. The result is a quality product suitable for applications involving forging, heat treating, cold drawing, machining, etc.

ANALYSIS

Carbon	Manganese	Phosphorus	Sulphur
.15/.20	.60/.90	.04 Max.	.05 Max.

APPLICATIONS – Since 1018 is a good carburizing steel, it is especially suitable for parts requiring high surface hardness with a relatively soft core, such as gears, pinions, worms, king pins, chain pins, ratchets, dogs, oil tool slips and liners. 1018 is also often specified for studs, anchor pins, special bolts, tie rods, etc.

MECHANICAL PROPERTIES – The following are average values for 1" round and may be considered as representative of this grade:

	Tensile Strength (psi)	Yield Strength (psi)	Elongation in 2"	Reduction of Area	Brinell Hardness
As Rolled	67,000	45,000	36%	58%	137
Normalized	66,000	43,000	37%	60%	137
Annealed	60,000	40,000	38%	62%	121

WELDABILITY – This grade is easily welded by all the welding processes, and the resultant welds and joints are of extremely high quality. The grade of welding rod to be used depends on thickness of section, design, service requirements, etc.

FORGING – Heat to 2150°-2250°F

NORMALIZING – Heat to 1650°-1750°F. Cool in air.

ANNEALING – Heat to 1550°-1650°F. Cool in furnace.

HARDENING – This grade will respond to any of the standard carburizing methods and subsequent heat treatments. For a hard case and a tough core, the following heat treatment is suggested: Carburize at 1650°-1700°F for approximately eight hours, cool in box, reheat to 1400°-1450°F, quench in water, and draw at 300°-350°F.



1018 HOT ROLLED BARS (Continued)

1018 HOT ROLLED ROUNDS

Special Quality
Stock Lengths 20'

Size in Inches	Estimated Weight, Lbs.		Size in Inches	Estimated Weight, Lbs.	
	Per Foot	20-Ft. Bar		Per Foot	20-Ft. Bar
3	24.06	481.1			
1/8	26.10	522.0	6 1/2	112.9	2259
1/4	28.23	564.6	3/4	121.8	2436
3/8	30.45	608.9	7	131.0	2619
1/2	32.74	654.8	1/4	140.5	2810
5/8	35.12	702.5	1/2	150.4	3007
3/4	37.59	751.7	3/4	160.5	3211
7/8	40.14	802.7	8	171.1	3421
4	42.77	855.3	1/4	181.9	3638
1/8	45.48	909.6	1/2	193.1	3862
1/4	48.28	965.6	3/4	204.6	4093
1/2	54.13	1083	9	216.5	4330
3/4	60.31	1206	1/4	228.7	4574
5	66.82	1336	1/2	241.2	4824
1/4	73.67	1473	3/4	254.1	5082
1/2	80.86	1617	10	267.3	5346
3/4	88.37	1767	1/2	294.7	5894
6	96.22	1924	11	323.4	6468
1/4	104.4	2088	12	384.9	7698
			1/2	417.6	8353

Size in Inches	Hot Rolled Wt./Ft.	Hot Rolled WT 20 FT Bar	Press Forged Rough Turned 1/4" Over	Press Forged Wt./Ft.	Press Forged WT 20 FT Bar
13	451.72	9034	13.250	469.26	9385
1/4	469.26	9385	13.500	487.14	9743
1/2	487.14	9743	13.750	505.35	10107
14	523.89	10478	14.250	542.77	10855
3/8	552.33	11047	14.625	571.71	11434
1/2	561.98	11240	14.750	581.52	11630
3/4	581.52	11630	15.000	601.40	12028
7/8	591.42	11828	15.125	611.47	12229
15	601.40	12028	15.250	621.62	12432
1/2	642.16	12843	15.750	663.05	13261
7/8	673.61	13472	16.125	695.00	13900
16	684.26	13685	16.250	705.81	14116
1/4	705.81	14116	16.500	727.70	14554
1/2	727.70	14554	16.750	749.92	14998
17	772.47	15449	17.250	795.35	15907
1/4	795.35	15907	17.500	818.58	16372
18	866.02	17320	18.250	890.24	17805
1/4	890.24	17805	18.500	914.80	18296
19	964.92	19298	19.250	990.48	19810
1/2	1016.37	20327	19.750	1042.60	20852
3/4	1042.60	20852	20.000	1069.16	21383
20	1069.16	21383	20.250	1096.06	21921
1/2	1123.29	22466	20.750	1150.85	23017
3/4	1150.85	23017	21.000	1178.75	23575
21	1178.75	23575	21.250	1206.98	24140
1/4	1206.98	24140	21.500	1235.55	24711
1/2	1235.55	24711	21.750	1264.45	25289
22	1293.68	25874	22.250	1323.25	26465
3/4	1383.39	27668	23.000	1413.96	28279
23	1413.96	28279	23.250	1444.87	28897
1/4	1444.87	28897	23.500	1476.11	29522
1/2	1476.11	29522	23.750	1507.68	30154
24	1539.59	30792	24.250	1571.83	31437
26	1806.88	36138	26.250	1841.80	36836
1/2	1877.04	37541	26.750	1912.63	38253
28	2095.55	41911	28.250	2133.14	42663
30	2405.61	48112	30.250	2445.87	48917
32	2737.05	54741	32.250	2779.98	55600



FLATS

Carried in ASTM A 36. See page 4 of this section.

1040/42/45 HOT ROLLED BARS

Special Quality

ASTM A 576 UNS G10400, G10420, G10450

Color Marking: Ends painted Red

These are medium-carbon steels. In their production, special controls are used for chemical composition, heating, rolling, surface preparation, etc. As a result of this careful processing, these bars are suitable for applications involving forging, heat treating (including flame hardening), cold drawing, machining, etc.

ANALYSIS

	Carbon	Manganese	Phosphorus	Sulphur
1040	.37/.44	.60/.90	.04 Max.	.05 Max.
1042	.40/.47	.60/.90	.04 Max.	.05 Max.
1045	.43/.50	.60/.90	.04 Max.	.05 Max.

APPLICATIONS – These grades, particularly when heat treated, should be used where greater strength is required than can be obtained from the lower carbon steels. A few of the most frequent uses are for axles, machinery parts, stud bolts, ordinary shafts, pinions, gears, rock screens, forming dies, tool shanks.

MECHANICAL PROPERTIES – The following are average values for 1" round and may be considered as representative:

	Tensile Strength (psi)	Yield Strength (psi)	Elongation in 2"	Reduction of Area	Brinell Hardness
As Rolled	90,000	59,000	26%	50%	201
Normalized	87,000	58,000	28%	52%	192
Annealed	80,000	48,000	30%	54%	159

WELDABILITY – These grades, due to higher carbon content, are not readily welded. As carbon content increases, difficulty in welding is likely to develop. With thin sections and flexible design, gas or arc welding may be used without preheating, but in joints over 1/2" to 3/4" thick preheating is necessary. To develop equivalent strength in a weld, a low alloy filler is recommended. Stress relieving is also recommended. The grade of welding rod to be used depends on thickness of section, design, service requirements, etc.

FORGING – Heat to 2100°-2200°F.

NORMALIZING – Heat to 1600°-1750°F. Cool in air.

ANNEALING – Heat to 1450°-1550°F. Cool in furnace.

HARDENING – These grades are essentially water-hardening steels but may be quenched in oil. The recommended quenching temperatures are 1550°F for water and 1575°F for oil. A wide range of mechanical properties can be obtained by tempering at different temperatures between 700°F and 1300°F. Tempering in the range from 500° to 700°F should be avoided.

1040 – 1042 – 1045 HOT ROLLED BARS (Continued)



1040/42/45 HOT ROLLED ROUNDS

Special Quality
Stock Lengths 20' (Some 30')

Size In Inches	Est. Wt., Lbs.		Size In Inches	Est. Wt., Lbs.		Size In Inches	Est. Wt., Lbs.	
	Per Foot	20-Ft. Bar		Per Foot	20-Ft. Bar		Per Foot	20-Ft. Bar
3/16	.0940	1.879	2 1/8	12.07	241.4	5 3/4	88.37	1767
3/8	.3759	7.517		13.53	270.6	6	96.22	1924
7/16	.5116	10.23	1/4	15.08	301.5	1/4	104.4	2088
1/2	.6682	13.36	3/8	16.71	334.1	1/2	112.9	2259
9/16	.8457	16.91	1/2	18.42	368.4	3/4	121.8	2436
5/8	1.044	20.88	5/8	20.21	404.3	7	131.0	2619
21/32	1.151	23.02	3/4	22.09	441.9	1/4	140.5	2810
3/4	1.504	30.07	7/8	24.06	481.1	1/2	150.4	3007
13/16	1.765	35.29	3	26.10	522.0	3/4	160.5	3211
7/8	2.046	40.93	1/8	28.23	564.6	8	171.1	3421
15/16	2.349	46.98	1/4	30.45	608.9	1/4	181.9	3638
1	2.673	53.46	3/8	32.74	654.8	1/2	193.1	3862
1/16	3.017	60.35	1/2	35.12	702.5	3/4	204.6	4093
1/8	3.383	67.66	5/8	37.59	751.7	9	216.5	4330
3/16	3.769	75.38	3/4	40.14	802.7	1/4	228.7	4574
1/4	4.176	83.53	7/8	42.77	855.3	1/2	241.2	4824
5/16	4.604	92.09	1/8	45.48	909.6	3/4	254.1	5082
3/8	5.053	101.1	1/4	48.28	965.6	10	267.3	5346
7/16	5.523	110.5	3/8	51.16	1023	1/2	294.7	5894
1/2	6.014	120.3	1/2	54.13	1083	11	323.4	6468
9/16	6.526	130.5	3/4	60.31	1206	12	384.9	7698
5/8	7.058	141.2	5	66.82	1336	1/2	417.6	8353
11/16	7.612	152.2	1/4	73.67	1473	13	451.7	9034
3/4	8.186	163.7	1/2	80.86	1617	1/2	487.1	9743
7/8	9.397	187.9						
2	10.69	213.8						
1/16	11.37	227.4						



1040/42/45 HOT ROLLED SQUARES

Special Quality
Stock Lengths 20'

Size In Inches	Est. Wt., Lbs.		Size In Inches	Est. Wt., Lbs.		Size In Inches	Est. Wt., Lbs.	
	Per Foot	20-Ft. Bar		Per Foot	20-Ft. Bar		Per Foot	20-Ft. Bar
1/2	.8508	17.02	1 3/8	6.434	128.7	3	30.63	612.6
5/8	1.329	26.59	1/2	7.657	153.1	1/2	41.69	833.8
3/4	1.914	38.29	3/4	10.42	208.4	4	54.45	1089
7/8	2.606	52.11	2	13.61	272.3	1/2	68.91	1378
1	3.403	68.06	1/4	17.23	244.6	5	85.08	1702
1/8	4.307	86.14	1/2	21.27	425.4	1/2	102.9	2059
1/4	5.318	106.4	3/4	25.74	514.7	6	122.5	2450

1117 HOT ROLLED BARS

Special Quality

ASTM A 576 UNS G11170

Color Marking: Ends painted Aluminum with Red Stripe

This grade is low-carbon, high-manganese steel. It possesses much of the machining quality of 1212 Screw Stock but with improved mechanical properties. The grade also has excellent carburizing properties.

ANALYSIS

Carbon	Manganese	Phosphorus	Sulphur
.14/.20	1.00/1.30	.04 Max.	.08/.13

APPLICATIONS – This steel is used for manufacturing numerous parts requiring considerable machining and close tolerances, along with a smooth finish. It may be bent or formed where such cold working operations are not too severe. It is especially suitable for carburized parts requiring soft core and high surface hardness such as gears, pinions, worms, king pins, ratchets, dogs, etc.

MECHANICAL PROPERTIES – The following are average values for 1" round and may be considered as representative of the grade:

	Tensile Strength (psi)	Yield Strength (psi)	Elongation in 2"	Reduction of Area	Brinell Hardness
As Rolled	69,000	46,000	34%	61%	143
Normalized	68,000	44,000	34%	64%	137
Annealed	62,000	41,000	34%	58%	121

MACHINABILITY – 1117 has a machinability rating of 91%, based on 1212 as 100%. Average surface cutting speed is 150 feet per minute.

WELDABILITY – This grade is not readily welded due to high sulphur content. Gas or arc welding may be used providing joints are preheated. To develop equivalent strength in a weld, a low alloy filler is recommended. Stress relieving after welding is also recommended. The grade of welding rod to be used depends on the thickness of section, design, service requirements. etc.

HARDENING – This grade will respond to any of the standard carburizing methods and subsequent heat treatments. For a hard case and a tough core, the following heat treatment is suggested: Carburize at 1650°-1700°F for approximately eight hours. Cool in box and reheat to 1400°-1450°F. Quench in water and draw at 300°-350°F.



1117 HOT ROLLED ROUNDS

Special Quality

Stock Lengths 20'

Size In Inches	Estimated Weight, Lbs.		Size In Inches	Estimated Weight, Lbs.	
	Per Foot	20-Ft. Bar		Per Foot	20-Ft. Bar
2 1/2	16.71	334.1	6	96.22	1924
3	24.06	481.1	1/4	104.4	2088
1/4	28.23	564.6	1/2	112.9	2259
1/2	32.74	654.8	3/4	121.8	2436
3/4	37.59	751.7	7	131.0	2619
4	42.77	855.3	1/4	140.5	2810
1/4	48.28	965.6	1/2	150.4	3007
1/2	54.13	1083	3/4	160.5	3211
3/4	60.31	1206	8	171.1	3421
5	66.82	1336	1/4	181.9	3638
1/4	73.67	1473	1/2	193.1	3862
1/2	80.86	1617	3/4	204.6	4093
3/4	88.37	1767	9	216.5	4330
			1/2	241.2	4824
			10	267.3	5346
			11	323.4	6468
			12	384.9	7698

1141 HOT ROLLED BARS

Special Quality

ASTM A 576 UNS G11410

Color Marking: Ends painted Purple

This is medium-carbon, manganese steel. It is melted to special bar quality and fine-grain specifications, possessing high consistency and uniformity. Strength characteristics are high in the as-rolled condition, and greater hardness and strength may be obtained through heat treatment. Machinability is excellent, due to addition of sulphur.

ANALYSIS

Carbon	Manganese	Phosphorus	Sulphur
.37/.45	1.35/1.65	.04 Max.	.08/.13

APPLICATIONS — This grade is used to advantage in applications where good machinability combined with higher strength is required, such as axles, studs, bolts, shafts, tie rods, etc.

MECHANICAL PROPERTIES — The following values are average for 1" round and may be considered as representative:

	Tensile Strength (psi)	Yield Strength (psi)	Elongation in 2"	Reduction of Area	Brinell Hardness	Izod Impact Ft./Lbs.
As Rolled	95,000	56,000	25%	50%	197	—
Normalized	97,000	58,000	23%	49%	201	45
Annealed	85,000	50,000	26%	53%	174	35

MACHINABILITY — 1141 has a machinability rating of approximately 70%, based on 1212 as 100%. Average surface cutting speed is 115 feet per minute.

WELDABILITY — This grade is not readily welded due to high carbon, manganese, and sulphur content. Gas or arc welding may be performed, provided area to be welded is preheated. Stress relieving after welding is recommended.

FORGING — Heat to 2100°-2200°F.

NORMALIZING — Heat to 1600°-1700°F. Cool in air.

ANNEALING — Heat to 1400°-1500°F. Cool in furnace.

HARDENING — This grade is essentially an oil-hardening steel. It can be water quenched, but great care should be exercised when this is done. Oil quenching temperature is between 1475° and 1550°F. A wide range of mechanical properties may be obtained by tempering at temperatures between 400° and 1200°F.



1141 HOT ROLLED ROUNDS

Special Quality

Stock Lengths 20'

Size In Inches	Estimated Weight, Lbs.		Size In Inches	Estimated Weight, Lbs.	
	Per Foot	20-Ft. Bar		Per Foot	20-Ft. Bar
1 1/8	3.383	67.66	4	42.77	855.3
1/4	4.176	83.53	1/4	48.28	965.6
3/8	5.053	101.1	1/2	54.13	1083
1/2	6.014	120.3	3/4	60.31	1206
5/8	7.058	141.2	5	66.82	1336
3/4	8.186	163.7	1/4	73.67	1473
7/8	9.397	187.9	1/2	80.86	1617
2	10.69	213.8	3/4	88.37	1767
1/8	12.07	241.4	6	96.22	1924
1/4	13.53	270.6	1/4	104.4	2088
3/8	15.08	301.5	1/2	112.9	2259
7/16	15.88	317.6	3/4	121.8	2436
1/2	16.71	334.1	7	131.0	2619
5/8	18.42	368.4	1/4	140.5	2810
3/4	20.21	404.3	1/2	150.4	3007
7/8	22.09	441.9	3/4	160.5	3211
3	24.06	481.1	8	171.1	3421
1/8	26.10	522.0	1/4	181.9	3638
1/4	28.23	564.6	1/2	193.1	3862
3/8	30.45	608.9	9	216.5	4330
1/2	32.74	654.8	1/2	241.2	4824
5/8	35.12	702.5	3/4	254.1	5082
3/4	37.59	751.7	10	267.3	5346

M1044 FLATS (PLOW STEEL)

Merchant Quality

ASTM A 575 UNS G10440

Color Marking: Ends painted Red

Hot Rolled M1044 is a medium-carbon steel used in general purpose applications when special quality is not required. It has good overall properties somewhat higher than low-carbon Mild Steel Flats. This grade may be fabricated using the usual structural methods. It is machinable and is capable of being induction hardened.

ANALYSIS

Carbon	Manganese	Phosphorus	Sulphur
.40/.50	.25/.60	.04 Max.	.05 Max.

APPLICATIONS – This steel is used in the manufacture and maintenance of plows and various other agricultural implements, such as sub-soilers, ditchers, border ridgers, cultivators, furrowers, and harrows. It is also used in the manufacture and maintenance of construction machinery, such as tractors, scrapers, bulldozers, shovels, concrete mixers, etc. Other applications include brake dies, brake bands, racks, slides, etc.

MECHANICAL PROPERTIES – The following values are typical for 1" thickness and may be considered as representative in the as-rolled condition:

Tensile Strength (psi)	Yield Strength (psi)	Elongation in 2"	Reduction of Area	Brinell Hardness
90,000	55,000	23%	45%	201

MACHINABILITY – This material is generally machined in the as-rolled condition without difficulty. Average cutting speed is 85 surface feet per minute.

WELDABILITY – May be welded with proper precautions. With thin sections and a flexible design, gas or arc welding may be used without preheating; but in joints over 1/2" to 3/4" thick preheating is necessary. To develop equivalent strength in a weld, a low-alloy filler is recommended. Stress relieving is also recommended. The grade of welding rod to be used depends on thickness of section, design, service requirements, etc.

FORGING – Heat to 2100°-2200°F.

NORMALIZING – Heat to 1550°-1650°F. Cool in air.

ANNEALING – Heat to 1450°-1550°F. Cool in furnace. Average Brinell hardness 192.

HARDENING – The recommended quenching temperature is 1450°-1550°F for oil, or 25° lower for water. Temper to required hardness.



M1044 FLATS (PLOW STEEL)

Stock Lengths 20'

Size In Inches	Est. Wt., Lbs.		Size In Inches	Est. Wt., Lbs.		Size In Inches	Est. Wt., Lbs.	
	Per Foot	20-Ft. Bar		Per Foot	20-Ft. Bar		Per Foot	20-Ft. Bar
1/4 x			1/2 x			1 x		
1	.8508	17.02	3 1/2	5.956	119.1	1 1/2	5.105	102.1
1 1/4	1.064	21.27	4	6.806	136.1	2	6.806	136.1
1 1/2	1.276	25.52	4 1/2	7.657	153.1	2 1/2	8.508	170.2
2	1.702	34.03	5	8.508	170.2	3	10.21	204.2
2 1/2	2.127	42.54	6	10.21	204.2	3 1/4	11.06	221.2
3	2.552	51.05	8	13.61	272.3	3 1/2	11.91	238.2
3 1/2	2.978	59.56	5/8 x			4	13.61	272.3
4	3.403	68.06	1	2.127	42.54	4 1/2	15.31	306.3
5	4.254	85.08	1 1/4	2.659	53.18	5	17.02	340.3
6	5.105	102.1	1 1/2	3.191	63.81	6	20.42	408.4
5/16 x			1 3/4	3.722	74.45	8	27.23	544.5
1 1/4	1.329	26.59	2	4.254	85.08	1 1/4 x		
1 1/2	1.595	31.91	2 1/2	5.318	106.4	1 3/4	7.445	148.9
2	2.127	42.54	3	6.381	127.6	2	8.508	170.2
2 1/2	2.659	53.18	3 1/2	7.445	148.9	2 1/2	10.64	212.7
3	3.191	63.81	4	8.508	170.2	3	12.76	255.2
4	4.254	85.08	4 1/2	9.572	191.4	3 1/2	14.89	297.8
6	6.381	127.6	5	10.64	212.7	4	17.02	340.3
3/8 x			6	12.76	255.2	4 1/2	19.14	382.9
1	1.276	25.52	8	17.02	340.3	5	21.27	425.4
1 1/4	1.595	31.91	3/4 x			6	25.52	510.5
1 1/2	1.914	38.29	1	2.552	51.05	1 1/2 x		
1 3/4	2.233	44.67	1 1/4	3.191	63.81	2	10.21	204.2
2	2.552	51.05	1 1/2	3.829	76.57	2 1/2	12.76	255.2
2 1/4	2.871	57.43	1 3/4	4.467	89.33	3	15.31	306.3
2 1/2	3.191	63.81	2	5.105	102.1	3 1/2	17.87	357.3
3	3.829	76.57	2 1/4	5.743	114.9	4	20.42	408.4
3 1/2	4.467	89.33	2 1/2	6.381	127.6	4 1/2	22.97	459.4
4	5.105	102.1	3	7.657	153.1	5	25.52	510.5
5	6.381	127.6	3 1/2	8.933	178.7	6	30.63	612.6
6	7.657	153.1	4	10.21	204.2	1 3/4 x		
1/2 x			4 1/2	11.49	229.7	6	35.73	714.7
5/8	1.064	21.27	5	12.76	255.2	2 x		
3/4	1.276	25.52	6	15.31	306.3	2 1/2	17.02	340.3
1	1.702	34.03	8	20.42	408.4	3	20.42	408.4
1 1/4	2.127	42.54	7/8 x			3 1/2	23.82	476.4
1 1/2	2.552	51.05	1	2.978	59.56	4	27.23	544.5
1 3/4	2.978	59.56	1 1/2	4.467	89.33	4 1/2	30.63	612.6
2	3.403	68.06	2	5.956	119.1	5	34.03	680.6
2 1/4	3.829	76.57	2 1/2	7.445	148.9	6	40.84	816.8
2 1/2	4.254	85.08	3	8.933	178.7			
3	5.105	102.1	3 1/2	10.42	208.4			
			4	11.91	238.2			
			4 1/2	13.40	268.0			
			5	14.89	297.8			
			6	17.87	357.3			

REINFORCING STEEL

Deformed Bars – Grade 40

ASTM Specification A 615

Color Marking: Ends painted Blue

ASTM A 615 Specification covers deformed billet-steel concrete-reinforcement bars. The bars are intended for use as reinforcement in reinforced concrete construction. The surface of the bar is provided with small lugs which inhibit longitudinal movement of the bar relative to the concrete which surrounds it.

Bars produced to the above specifications are marked with the size number and letter N.

MECHANICAL PROPERTIES – The tensile and bend requirements of ASTM Spec. A 615 for deformed bars, Grade 40, are outlined below, minimum properties are as follows:

Bar Designation Number	Tensile Strength (psi)	Yield Strength (psi)	Elongation in 8"
3	70,000	40,000	11%
4,5,6	70,000	40,000	12%
7	70,000	40,000	11%
8	70,000	40,000	10%

Bars are capable of being bent cold around a pin without cracking on the outside of the bent portion, as follows:

Under $\frac{3}{4}$ " diameter—Will bend 90° around a pin four times own diameter.

$\frac{3}{4}$ " diameter & over—Will bend 90° around a pin five times own diameter.



ROUND REINFORCING BARS Deformed – Grade 40 Stock Lengths 20', 30', and 40'

Bar Designation Number	Size In Inches	Estimated Weight, Lbs.			
		Per Foot	20' Bar	30' Bar	40' Bar
3	$\frac{3}{8}$	.3759	7.517	11.28	15.04
4	$\frac{1}{2}$	.6682	13.36	20.05	26.73
5	$\frac{5}{8}$	1.044	20.88	31.32	41.76
6	$\frac{3}{4}$	1.504	30.07	45.12	60.16
7	$\frac{7}{8}$	2.046	40.93	61.38	81.84
8	1	2.673	53.46	80.19	106.9

HOT ROLLED STRIP FLATS

UNS K02303

Color Marking: Ends painted Blue

This is a low-carbon steel with good ductility.

ANALYSIS

Carbon	Manganese	Phosphorus	Sulphur
.15 Max.	.30/.60	.04 Max.	.05 Max.

APPLICATIONS – Since this steel has good ductility, it is easy to fabricate and is used for a wide variety of purposes, such as for strapping, banding, brackets, ornamental iron work, and similar applications requiring a steel that can be cold formed.

MECHANICAL PROPERTIES – Will bend flat on itself at room temperature, either crosswise or lengthwise, without readily visible cracks along the bend. Average properties are as follows:

Tensile Strength (psi)	Yield Strength (psi)	Elongation in 8"	Reduction of Area
55,000	37,000	30%	55%

WELDABILITY – This grade is easily welded by all the welding processes and the resultant welds and joints are of extremely high quality. The grade of welding rod to be used depends on thickness of section, design, service requirements, etc.



HOT ROLLED STRIP FLATS

Stock Lengths 20'

Thickness			Thickness		
In Inches	Estimated Weight, Lbs.		In Inches	Estimated Weight, Lbs.	
	Per Foot	20-Ft. Bar		Per Foot	20-Ft. Bar
1/8x			3/16x		
3/8	.1595	3.191	3/8	.2393	4.786
1/2	.2127	4.254	1/2	.3191	6.381
5/8	.2659	5.318	5/8	.3988	7.976
3/4	.3191	6.381	3/4	.4786	9.572
7/8	.3722	7.445	7/8	.5583	11.17
1	.4254	8.508	1	.6381	12.76
1 1/8	.4786	9.572	1 1/8	.7179	14.36
1 1/4	.5318	10.64	1 1/4	.7976	15.95
1 3/8	.5849	11.70	1 3/8	.8774	17.55
1 1/2	.6381	12.76	1 1/2	.9572	19.14
1 3/4	.7445	14.89	1 3/4	1.117	22.33
2	.8508	17.02	2	1.276	25.52
2 1/4	.9572	19.14	2 1/4	1.436	28.71
2 1/2	1.064	21.27	2 1/2	1.595	31.91
2 3/4	1.170	23.40	2 3/4	1.755	35.10
3	1.276	25.52	3	1.914	38.29
3 1/4	1.383	27.65	3 1/4	2.074	41.48
3 1/2	1.489	29.78	3 1/2	2.233	44.67
4	1.702	34.03	4	2.552	51.05
4 1/2	1.914	38.29	4 1/2	2.871	57.43
5	2.127	42.54	5	3.191	63.81
5 1/2	2.340	46.80	5 1/2	3.510	70.20
6	2.552	51.05	6	3.829	76.57
7	2.978	59.56	7	4.467	89.33
8	3.403	68.06	8	5.105	102.1
10	4.254	85.08	10	6.381	127.6
12	5.105	102.1	12	7.657	153.1

1/4 and thicker - ASTM A36 Flat Bars See page 4 of this section

HIGH STRENGTH, LOW-ALLOY STEEL

ASTM A 572 Grade 50 UNS K02303

This material is micro-alloy, in which strengthening is provided by the addition of small amounts of columbium, vanadium or combinations.

ANALYSIS

C	Mn	P	S	Si
.23 Max.	1.35 Max.	.04 Max.	.05 Max.	.04 Max.

Type 1 .005-.05% columbium

Type 2 .010-.15% vanadium

Type 3 .05 max columbium + vanadium > 4 times nitrogen

MECHANICAL PROPERTIES – Minimum properties are as follows:

Tensile Strength (psi)	Yield Strength (psi)	Elongation in 2"
65,000	50,000	21%

APPLICATIONS – This material is used for structural and forged components where as-hot rolled strengths are an important asset.

HARDENING – This material is used in the Hot Worked Condition.

MACHINABILITY – This material has a machinability rating of approximately 70% of 1212.

WELDABILITY – This material is readily weldable using any process developed for plain carbon steels.

WORKABILITY – This material has good formability. Forming is generally done at room temperature.

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