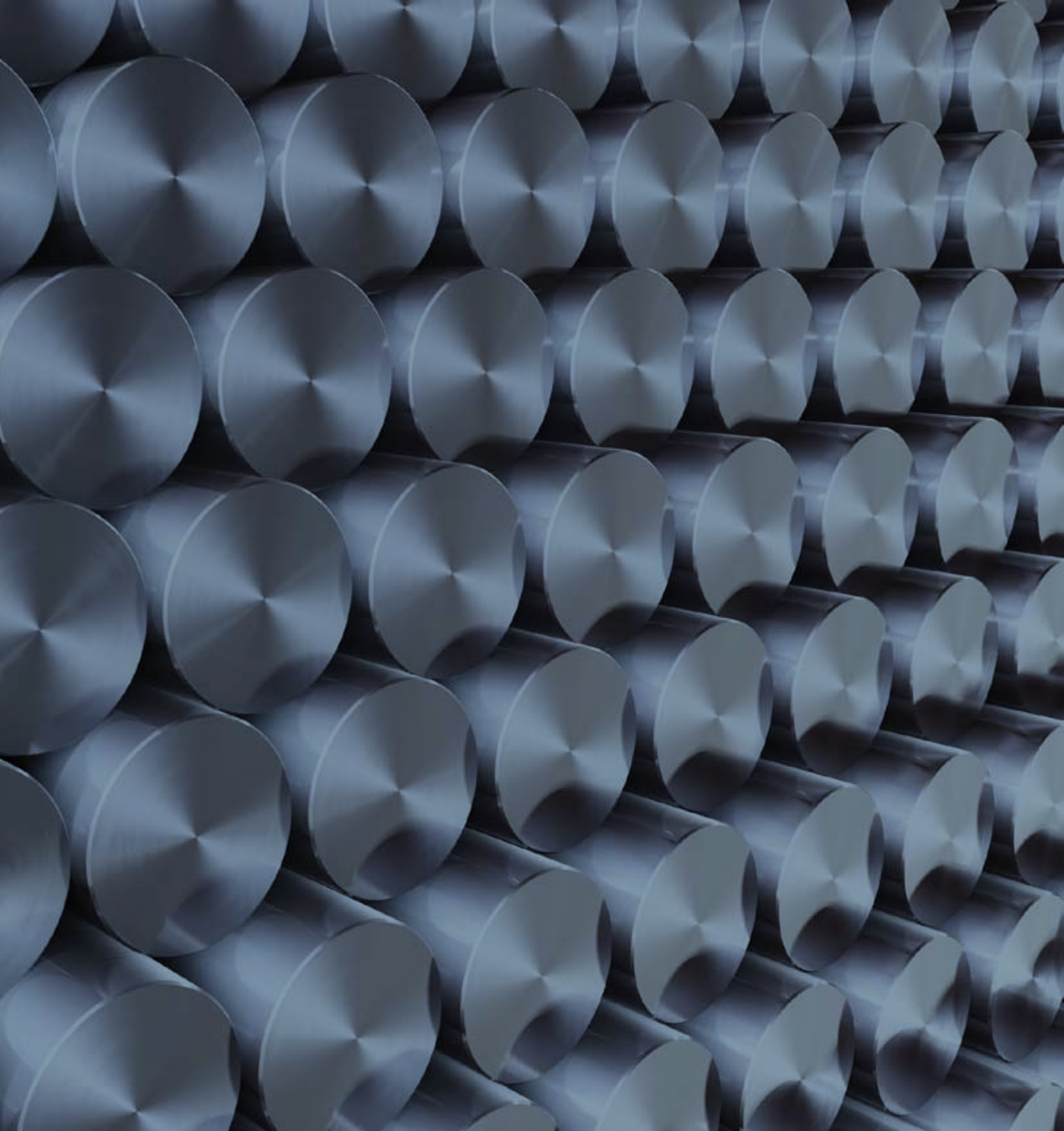
PARAGON STEEL

Carbon Resource Guide

HOT ROLLED BAR PRODUCTS

WEIGHTS & TYPES



Hot Rolled Bar Products

Commercial Quality

Commercial Quality bars are typically produced in grades C1008, C1020 and A569 by a variety of steelmaking methods and tested to chemical specifications. Commercial Quality bars are not subject to mechanical property tests. Typical properties are given for reference only. Mill size tolerances apply to all Commercial Quality bars.

Applications

Commercial Quality bars are used in many applications. Among them are structural uses involving moderate cold bending or hot forming, welding, punching and the production, if non-critical parts of buildings, bridges, railway equipment, agricultural equipment and implements and general machinery.

ASTM-A36

Hot rolled, ASTM-A36 bars are produced by steelmaking methods that result in a sound product throughout the cross-section and are tested to both chemical and physical specifications. ASTM-A36 material is suitable for most construction purposes, including riveted, bolted and welded structures. Material that is made to ASTM-A36 is suitable for mild hot and cold forming. Most hot rolled flats, rounds and squares are available in ASTM-A36.

Analysis

Carbon (Max.)	Manganese	Phosphorus (Max.)	Sulphur (Max.)
.26 - .29	.60 - .90	.04	.05

Mechanical Properties

Tensile Strength (P.S.I.)	Yeild Point (P.S.I.)	Elongation In 2”	Brinell Hardness (BHN)
58,000 - 65,000	36,000 Min.	23%	137

Weldability

Hot rolled A36 bars present no welding problems when using all welding processes. The quality of welds is generally extremely high for both welds and joints. Welding rod specifications are dependent on welding conditions such as the thickness of the sections to be welded, service requirements and design.

ASTM-A529

Hot rolled ASTM-A529 bars are produced in two grades, Grade 42 with a 42,000 minimum yield and Grade 50 with a 50,000 minimum yield. This is a carbon-manganese material designed for structural purposes such as riveted, bolted and welded construction.

Analysis

	Carbon (Max.)	Manganese (Max.)	Phosphorus (Max.)	Sulphur (Max.)	Silicon (Max.)
Gr. 42	.27	1.20	.04	.05	----
Gr. 50	.27	1.35	.04	.05	.40

Mechanical Properties

	Tensile (Min PSI)	Tensile (Max. PSI)	Yield (Min. PSI)	Elongation In 2 Inches
Gr. 42	60,000	85,000	42,000	22%
Gr. 50	70,000	100,000	50,000	21%

ASTM-A572 Grade 50

High Tensile bars are rolled by various steel mills. They are a high strength low alloy material, intended primarily for weight reduction, or longer life, by means of greater strength.

Analysis (Typical)

	Carbon	Mn	P	Sulphur	Silicon	Cb
Gr. 50	.21 Max	1.35 Max	.04 Max	.05 Max	.30 Max	.01 Min

Mechanical Properties (Typical)

	Tensile strength (PSI)	Yield Point (PSI)	Elongation In 2 Inches
Gr. 50	65,000 Min	50,000	Min 23%

C-1040 Hot Rolled Rounds

Special Quality

These Special Quality rounds are medium-carbon open-hearth steel. Special controls are exercised in their production for chemical compositions, heating, rolling and surface preparation.

Analysis

Carbon	Manganese	Phosphorus	Sulphur
.37 - .44	.69 - .90	.04 Max.	.05 Max.

Applications

The C-1040 rounds are frequently used for axles, forming dies, gears, ordinary shafts, pinions, rock screens, stud bolts, tool shanks and other similar machinery parts where greater strength is required than can be obtained from carbon steels.

Typical Mechanical Properties (1" Round Bars)

Tensile Str. (PSI)	Yield Point (PSI)	Elongation In 2"	% Reduction of Area	Brinell Hardness	Reduced Hardness
91,000	58,000	27%	50	201	B 94

Machinability

Machinability is rated at 63%.

Weldability

High carbon content makes 1040 steel a little more difficult to weld. Thin sections do not require preheating. Joints of 1/2" to 3/4" should be preheated. A low-alloy filler is recommended to develop equivalent strength in a weld as well as stress relieving. Welding rod grade is dependent upon design, service requirements and thickness of sections.

Hot Rolled Medium Carbon C-1055 Bars

Hot Rolled Medium Carbon steel is an open-hearth steel of fine grain size. Special production controls are used for chemical composition, rolling, heating, surface preparation, etc. The result is a quality product suitable for applications involving forging, flame or induction hardening, heat treating and machining.

Analysis

Carbon	Manganese	Phosphorus	Sulphur
.50 - .60	.60 - .90	.040 Max	.050 Max

Applications

This steel is used in the maintenance and manufacture of plows, and various other agricultural implements such as discs, harrows, ditchers, subsoilers, cultivators and furrowers. Medium Carbon steel is also used in the maintenance and manufacture of construction machinery such as tractors, bulldozers, scrapers, shovels, concrete mixers, etc.

Typical Mechanical Properties

Tensile Strength (P.S.I.)	Yield Point (P.S.I.)
112,000 - 132,000	60,000 - 81,000

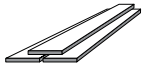
Machinability

This grade is generally machined in the as-rolled condition without difficulty. Cutting speed is approximately 85 surface feet per minute.

Weldability

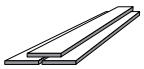
Plow steel may be welded with necessary precautions. With thin sections and a flexible design, arc or gas welding may be used without preheating the material. However, in joints over ½" to ¾" thick, preheating is necessary. A low-alloy filler is recommended to develop equivalent strength in a weld. Welding rod grade depends on design, service requirements and thickness of grade.

Hot Rolled Strip



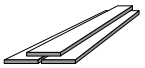
Size In Inches			Weight Per Foot	Weight Per 20'	Size In Inches			Weight Per Foot	Weight Per 20'
1/8	x	1/2	0.213	4.26	3/16	x	1/2	0.319	6.38
		5/8	0.266	5.32			5/8	0.398	7.96
		3/4	0.319	6.38			3/4	0.478	9.56
		7/8	0.372	7.44			7/8	0.559	11.18
		1	0.425	8.50			1	0.639	12.78
		1 1/8	0.478	9.56			1 1/8	0.718	14.36
		1 1/4	0.531	10.62			1 1/4	0.798	15.96
		1 1/2	0.639	12.78			1 1/2	0.957	19.14
		1 3/4	0.745	14.90			1 3/4	1.117	22.34
		2	0.851	17.02			2	1.276	25.52
		2 1/4	0.957	19.14			2 1/4	1.435	28.70
		2 1/2	1.064	21.28			2 1/2	1.596	31.92
		2 3/4	1.170	23.40			2 3/4	1.755	35.10
		3	1.276	25.52			3	1.915	38.30
		3 1/2	1.489	29.78			3 1/2	2.233	44.66
		4	1.702	34.04			4	2.552	51.04
		4 1/2	1.915	38.30			4 1/2	2.872	57.44
		5	2.127	42.54			5	3.191	63.82
		6	2.552	51.04			6	3.829	76.58
		8	3.403	68.06			8	5.105	102.10
		10	4.254	85.08			10	6.381	127.62
		12	5.105	102.10			12	7.657	153.14

Hot Rolled Flats



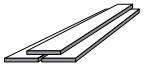
Size In Inches			Weight Per Foot	Weight Per 20'	Size In Inches			Weight Per Foot	Weight Per 20'
1/4	x	1/2	.425	8.50	5/16	x	2 1/4	2.393	47.86
		5/8	.531	10.62			2 1/2	2.658	53.16
		3/4	.639	12.78			2 3/4	2.925	58.50
		7/8	.745	14.90			3	3.191	63.82
		1	.851	17.02			3 1/2	3.723	74.46
		1 1/4	1.064	21.28			4	4.254	85.08
		1 1/2	1.276	25.52			4 1/2	4.785	95.70
		1 3/4	1.489	29.78			5	5.318	106.36
		2	1.702	34.04			5 1/2	5.850	117.00
		2 1/4	1.915	38.30			6	6.381	127.62
		2 1/2	2.127	42.54			7	7.445	148.90
		2 3/4	2.340	46.80			8	8.508	170.16
		3	2.552	51.04	3/8	x	12	.639	12.78
		3 1/4	2.766	55.32			5/8	.798	15.96
		3 1/2	2.978	59.56			3/4	.957	19.14
		4	3.403	68.06			7/8	1.117	22.34
		4 1/2	3.829	76.58			1	1.276	25.52
		5	4.254	85.08			1 1/4	1.596	31.92
		5 1/2	4.679	93.58			1 1/2	1.915	38.30
		6	5.105	102.10			1 3/4	2.233	44.66
		7	5.956	119.12			2	2.552	51.04
		8	6.806	136.12			2 1/4	2.872	57.44
5/16	x	1/2	.531	10.62			2 1/2	3.191	63.82
		5/8	.665	13.30			2 3/4	3.509	70.18
		3/4	.798	15.96			3	3.829	76.58
		7/8	.931	18.62			3 1/4	4.148	82.96
		1	1.064	21.28			3 1/2	4.467	89.34
		1 1/4	1.329	26.58			4	5.105	102.10
		1 1/2	1.594	31.88			4 1/2	5.743	114.86
		1 3/4	1.861	37.22			5	6.381	127.62
		2	2.127	42.54			5 1/2	7.020	140.40

Hot Rolled Flats (Continued)

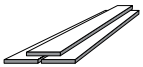


Size In Inches			Weight Per Foot	Weight Per 20'
3/8	x	6	7.657	153.14
		7	8.933	178.66
		8	10.210	204.20
1/2	x	3/4	1.276	25.52
		7/8	1.489	29.78
		1	1.702	34.04
		1 1/4	2.127	42.54
		1 1/2	2.552	51.04
		1 3/4	2.978	59.56
		2	3.403	68.06
		2 1/4	3.829	76.58
		2 1/2	4.254	85.08
		2 3/4	4.679	93.58
		3	5.105	102.10
		3 1/4	5.530	110.60
		3 1/2	5.956	119.12
		4	6.806	136.12
		4 1/2	7.657	153.14
		5	8.508	170.16
		5 1/2	9.359	187.18
		6	10.210	204.20
		7	11.911	238.22
		8	13.613	272.26
5/8	x	1	2.127	42.54
		1 1/4	2.658	53.16
		1 1/2	3.191	63.82
		1 3/4	3.723	74.46
		2	4.254	85.08
		2 1/4	4.785	95.70
		2 1/2	5.318	106.36
		2 3/4	5.850	117.00
		3	6.381	127.62
		3 1/4	6.913	138.26
		3 1/2	7.445	148.90
		4	8.508	170.16
		4 1/2	9.572	191.44
		5	10.640	212.80
		5 1/2	11.699	233.98
		6	12.762	255.24
		7	14.894	297.88
		8	17.016	340.32
3/4	x	1	2.552	51.04
		1 1/4	3.191	63.82
		1 1/2	3.829	76.58
		1 3/4	4.467	89.34
		2	5.105	102.10
		2 1/4	5.743	114.86
		2 1/2	6.381	127.62
		2 3/4	7.020	140.40
		3	7.657	153.14
		3 1/2	8.933	178.66
		4	10.210	204.20
		4 1/2	11.491	229.82
		5	12.762	255.24
		5 1/2	14.038	280.76
		6	15.134	306.28
		7	17.867	357.34
		8	20.419	408.30
7/8	x	1	2.978	59.56
		1 1/4	3.723	74.46
		1 1/2	4.467	89.34
		2	5.956	119.12

Hot Rolled Flats (Continued)



Size In Inches			Weight Per Foot	Weight Per 20'
		2 1/2	7.445	148.90
		3	8.933	178.66
		3 1/2	10.420	208.40
		4	11.911	238.22
		4 1/2	13.403	268.06
		5	14.894	297.88
		6	17.867	357.34
		7	20.830	416.60
		8	23.822	476.44
1	x	1 1/4	4.254	85.08
		1 1/2	5.105	102.10
		1 3/4	5.956	119.12
		2	6.806	136.12
		2 1/4	7.657	153.14
		2 1/2	8.508	170.16
		2 3/4	9.359	187.18
		3	10.210	204.20
		3 1/4	11.060	221.20
		3 1/2	11.911	238.22
		4	13.613	272.26
		4 1/2	15.314	306.28
		5	17.016	340.32
		5 1/2	18.718	374.36
		6	20.419	408.38
		7	23.822	476.44
		8	27.226	544.52
1 1/4	x	1 1/2	6.381	127.62
		1 3/4	7.445	148.90
		2	8.508	170.16
		2 1/4	9.572	191.44
		2 1/2	10.640	212.80
		3	12.762	255.24
		3 1/2	14.894	297.88
		4	17.816	340.32
1 1/4	x	4 1/2	19.148	382.96
		5	21.270	425.40
		6	25.524	510.48
		7	29.778	595.56
		8	34.032	680.64
1 1/2	x	2	10.210	204.20
		2 1/2	12.762	255.24
		3	15.314	306.20
		3 1/2	17.867	357.34
		4	20.419	408.38
		4 1/2	22.972	459.44
		5	25.524	510.48
		6	30.629	612.58
		7	35.734	714.68
		8	40.834	816.76
2	x	2 1/2	17.016	340.32
		3	20.419	408.38
		3 1/2	23.822	476.44
		4	27.226	544.52
		4 1/2	30.629	612.58
		5	34.032	680.64
		6	40.838	816.76
		7	47.600	952.00
		8	54.451	1089.02



Universal Mill Plates

Specifications: ASTM A-36 & A529 Gr: 50

Universal Mill Plates (U.M. Plates) are defined as flat steel over 8 inches wide and ¼ inch or more in thickness. Universal Mill Plates are rolled between both horizontal and vertical rolls, producing straight, almost perfectly parallel rolled edges.

Analysis

	Carbon	Manganese	Phosphorus	Sulphur
A-36	.24 Max.	.80 - 1.20	.04 Max.	.05 Max.
A-529 GR.50	.27 Max.	1.35 Max.	.04 Max.	.05 Max.

Applications

These plates are used for base plates, cover plates and a wide variety of uses where long narrow plates are desired and the appearance of specification require a finished edge. UM Plates are not recommended for lengthwise bending or breaking, such as formed channels.

Specified Mechanical Properties

	Tensile Strength (P.S.I.)	Yield Strength (P.S.I.)	Elongation In 8 Inches
A-36	58,000 - 80,000	36,000 Min.	20%
A-529 Gr. 50	70,000 - 100,000	50,000 Min.	18%

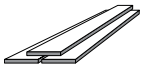
Machinability

This is not considered a free machining grade, although it is satisfactory for moderate machining operations.

Weldability

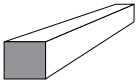
This material presents no welding problems, when using all welding processes. Welding quality is generally extremely high. Welding rod specifications are dependent on welding conditions such as thickness of section, service requirements and design.

Weights For UM Plates



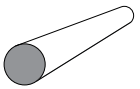
Size In Inches			Wt. Per Foot	Wt. Per 20 Ft.	Size In Inches			Wt. Per Foot	Wt. Per 20 Ft.
1/4	x	9	7.66	153.1	1/2	x	11	18.72	374.4
		10	8.51	170.2			12	20.42	408.4
		11	9.36	187.2			14	23.82	476.5
		12	10.21	204.2	5/8	x	9	19.15	383.0
		14	11.91	238.2			10	21.27	425.4
5/16	x	9	9.57	191.4			12	25.52	510.5
		10	10.64	212.8			14	29.77	595.5
		12	12.76	255.2	3/4	x	9	22.97	459.4
		14	14.89	297.7			10	25.52	510.5
3/8	x	9	11.49	229.8			12	30.63	612.6
		10	12.76	255.2			14	35.74	714.7
		11	14.03	280.6	1	x	9	30.63	612.6
		12	15.31	306.3			10	34.03	680.6
		14	17.86	357.2			12	40.84	816.8
1/2	x	9	15.31	306.3			14	47.65	952.9
		10	17.02	340.4					

Hot Rolled Squares



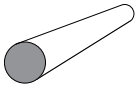
Size In Inches	Wt. Per Foot	Wt. Per 20 Ft.	Size In Inches	Wt. Per Foot	Wt. Per 20 Ft.
1/4	.213	4.26	1 5/8	8.986	179.72
5/16	.332	6.64	1 3/4	10.423	208.46
3/8	.478	9.56	2	13.310	266.20
7/16	.652	13.04	2 1/8	15.367	307.34
1/2	.851	17.02	2 1/4	17.229	344.58
5/8	1.329	26.58	2 1/2	21.270	425.40
3/4	1.915	38.30	2 3/4	25.737	514.74
7/8	2.605	52.10	3	30.629	612.58
1	3.403	68.06	3 1/4	35.944	718.88
1 1/8	4.307	86.14	3 1/2	41.689	833.78
1 1/4	5.318	106.36	4	54.451	1089.02
1 3/8	6.434	128.68	4 1/2	68.915	1378.30
1 1/2	7.567	153.14	5	85.080	1701.60

Hot Rolled Rounds



Size In Inches	Wt. Per Foot	Wt. Per 20 Ft.	Size In Inches	Wt. Per Foot	Wt. Per 20 Ft.
3/16	.094	1.88	1 1/2	6.014	120.28
1/4	.167	3.34	1 5/8	7.058	141.16
5/16	.261	5.22	1 3/4	8.186	163.72
3/8	.376	7.52	1 7/8	9.397	187.94
7/16	.511	10.22	2	10.690	213.80
1/2	.669	13.38	2 1/8	12.071	241.42
9/16	.846	16.92	2 1/4	13.533	270.66
5/8	1.044	20.88	2 5/16	14.293	285.86
3/4	1.503	30.06	2 3/8	15.074	301.48
7/8	2.046	40.92	2 1/2	16.706	334.12
1	2.673	53.46	2 5/8	18.417	368.34
1 1/8	3.382	67.64	2 3/4	20.219	404.38
1 1/4	4.177	83.54	2 7/8	22.091	441.82
1 3/8	5.054	101.08	3	24.053	481.06

Hot Rolled Rounds (Continued)



Size In Inches	Wt. Per Foot	Wt. Per 20 Ft.	Size In Inches	Wt. Per Foot	Wt. Per 20 Ft.
3 1/4	28.237	564.74	6 1/4	104.398	2087.96
3 3/8	30.449	608.98	6 1/2	112.926	2258.52
3 1/2	32.741	654.82	6 3/4	121.785	2435.70
3 5/8	35.123	702.46	7	130.973	2619.46
3 3/4	37.585	751.70	7 1/4	140.492	2809.84
3 7/8	40.138	802.76	7 1/2	150.352	3007.04
4	42.770	855.40	7 3/4	160.541	3210.82
4 1/4	48.275	965.50	8	171.061	3421.22
4 1/2	54.131	1082.62	8 1/4	181.921	3638.42
4 3/4	60.307	1206.14	8 1/2	193.112	3862.24
5	66.823	1336.46	8 3/4	204.643	4092.86
5 1/4	73.669	1473.38	9	216.504	4330.08
5 1/2	80.856	1617.12	9 1/4	228.695	4573.90
5 3/4	88.373	1767.46	9 1/2	241.227	4824.54
6	96.221	1924.42	10	267.342	5346.84

Concrete Reinforcing Bars Weights & Dimensions

Bar Number (Metric)	Weight Per Ft.	Nominal Diameter	Nominal Dec. Diam.	Cross Section Area (In^2)	Perimeter In Inches
3 (10)	.376	3/8	0.375	0.11	1.178
4 (13)	.669	1/2	0.500	0.20	1.571
5 (16)	1.044	5/8	0.625	0.31	1.963
6 (19)	1.503	3/4	0.750	0.44	2.356
7 (22)	2.046	7/8	0.875	0.60	2.749
8 (25)	2.673	1	1.00	0.79	3.142
9 (29)	3.403	1 1/8	1.128	1.00	3.544
10 (32)	4.307	1 1/4	1.270	1.27	3.990
11 (36)	5.318	1 3/8	1.410	1.56	4.430
14 (43)	7.650	1 5/8	1.693	2.25	5.320
18	13.600	2 1/4	2.257	4.00	7.090

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