EARLE M. JORGENSEN COMPANY

REFERENCE BOOK

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SECTION D

PLATES

Plates Listed in Other Sections

HOT ROLLED CARBON STEEL PLATES

Sheared — Flame Cut

Color Marking: Corner striped Blue

Hot Rolled Carbon Steel Plates are produced from basic oxygen process steel. The designations applied to this material are based upon the types of mills used to produce the plates and resulting edge conditions. SHEARED PLATES have been rolled between horizontal rolls, with edges and ends later trimmed by shearing to obtain rectangular shape. In the heavier thicknesses (generally over 1½"), the trimming is accomplished by flame cutting—hence the designation FLAME CUT PLATES.

SPECIFICATIONS

	Thickness Range Normally Stocked
ASTM A 36	3/16"—16"

When material over 1½" thick is used as bearing plates in structures other than bridges, ASTM A 36 applies.

ANALYSIS (ASTM A 36)

	C Max.	Mn	P Max.	S Max.	Si
¾" & under	.25	—	.04	.05	—
Over ¾" to 1½"	.25	.80/1.20	.04	.05	—
Over 1½" to 2½"	.26	.80/1.20	.04	.05	.15/.40
Over 2½" to 4"	.27	.85/1.20	.04	.05	.15/.40
Over 4"	.29	.85/1.20	.04	.05	.15/.40

APPLICATIONS — Storage tanks, storage bins, welded pipe, bridge construction, freight and passenger cars, barges, tankers, machinery construction, mining cars and equipment, bearing plates for buildings, and other structural applications and various parts obtained by flame cutting with our modern shape cutting facilities.

MECHANICAL PROPERTIES (Typical)

	Tensile Strength (psi)	Yield Strength (psi)	Elongation in 8"*
ASTM A 36	58/80,000	36,000 Min.	18% Min.

* Subject to reduction for thicknesses under 5/16".

MACHINABILITY — Hot Rolled Carbon Plates have a machinability rating of approximately 72%, based on 1212 as 100%, with average surface cutting speed of 120 feet per minute. When considerable machining or drilling is to be performed, we recommend the use of Free-Cutting Plates, described on Page 3 of this section.

WELDABILITY — These plates are 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 the thickness of section, design, service requirements, etc.

STOCK SIZES

Sheared: Stocked in thicknesses from 3/16" to 1½", widths up to 120", and lengths up to 480". For weights refer to Pages 6 and 7 of this section.

Flame Cut: Stocked in thicknesses from 1⅝" to 16". Maximum widths vary from 72" to 96", depending on thickness. Stock lengths are up to 360".

FREE-CUTTING CARBON STEEL PLATES

J-20 Carbon Plate
J-45 Carbon Plate

Color Marking: J-20 —Corner striped Black
J-45 —Corner striped White

J-20 and J-45 free-cutting carbon steel plates are made to EMJ's own specifications in order to insure free-machining steel of uniformly high quality. Because of their outstanding machinability and excellent finishing characteristics, substantial savings are effected through use of these materials.

J-20 is a low-carbon analyses that may be carburized and hardened using the same treatments employed with ordinary low-carbon steels.

J-45 is a high-carbon analyses that may be hardened satisfactorily by direct-heating and quenching, flame hardening, or induction hardening.

ANALYSIS (Typical)

	Carbon	Manganese	Phosphorus	Sulphur	Silicon
J-20	.20	1.25	.04 Max.	.25	.20
J-45	.45	1.25	.04 Max.	.25	.15

APPLICATIONS — The low carbon grades are used for mechanical rubber molds, V-belt mold rings, gears, cams, sprockets, jigs and fixtures, templates, etc. The high carbon grades are used for rubber molds, short-run blanking and trimming dies, slides, racks, machine ways, spinning chucks, etc.

MECHANICAL PROPERTIES (Typical) — The following values are average and may be considered as representative of the grade:

	Tensile Strength (psi)	Yield Strength (psi)	Elongation in 2"	Reduction of Area	Brinell Hardness
Low Carbon Grades	72,000	48,000	30%	60%	149
High Carbon Grades	90,000	56,000	20%	40%	187

In thicker sections, properties are somewhat lower.

MACHINABILITY — These steels are machinable at speeds up to 40% higher than other steels with comparable carbon content. J-20 is machined at cutting speeds up to 170 surface feet per minute. J-45 is machined at cutting speeds up to 145 surface feet per minute. Flame cutting of the high carbon grades produces a hardening effect on the cut edge which may be minimized by stress relieving.

WELDABILITY — These free machining steels are not generally recommended for welding. They can be welded using the proper techniques and electrodes. Low-hydrogen electrodes are recommended to avoid excessive porosity and under-bead cracking that is likely to occur with the use of cellulose-covered rods. American Welding Society Classes EXX16 or EXX18 should be used with the tensile strength class determined by the strength desired. Current control is critical, and amperage should be regulated to obtain adequate fluidity of the weld metal and yet minimize dilution of the weld metal by the parent metal. The high carbon grades should be preheated to 350º-450º prior to welding and stress-relieved or normalized (see below) immediately after welding.

HARDENING — J-20 responds to any of the standard carburizing and subsequent hardening methods used for such grades as 1018. J-45 responds to any of the standard treatments used for such grades as 1144.

	J-20	J-45
Normalize	1650º-1750º F	1600º-1700º F
Anneal	1550º-1600º F	1450º-1500º F
Stress Relieve	1250º-1300º F	1200º-1300º F
Carburize	1650º-1700º F	—
Harden	1450º-1500º F (water)	1475º-1550ºF (oil or water)

"J-20" and "J-45" are trademarks of the Earle M. Jorgensen Co.

STOCK SIZES

These plates are stocked in thicknesses from 1/4" to 6". Most thicknesses are carried in widths up to 96" and lengths up to 240".

HIGH CARBON PLATES
Sheared — Flame Cut
UNS G10450

Color Marking: 1045 As-Rolled—Corner striped Red

This high carbon grade possesses higher strength with good toughness than is found in low carbon plate. It has low hardenability which means that it can be fully hardened in thin sections only with a drastic quench. In heavier sections, partial hardening increases strength substantially, and flame or induction hardening produces high surface hardness.

1045 has good wear and abrasion resistance which can be further improved by heat treatment.

ANALYSIS

	Carbon	Manganese	Phosphorus	Sulphur
1045	.42/.50	.60/.90	.04 Max.	.05 Max.

APPLICATIONS — The 1045 grade is generally used for gears, pinions, brake discs, wear plates, base plates, etc.

MECHANICAL PROPERTIES (Typical) — The following values are average and may be considered as representative of the grade:

	Tensile Strength (psi)	Yield Strength (psi)	Elongation in 2"	Reduction of Area	Brinell Hardness
1045 As Rolled	95,000	56,000	21%	44%	197

MACHINABILITY — 1045 As-Rolled—average cutting speed is 95 surface feet per minute. This is not free-machining steel and when considerable machining is to be performed, J-45 are the free-machining steel equivalents to 1045.

WELDABILITY — High Carbon Plates 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 3/8" 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 the thickness of section, design, service requirements, etc.

HARDENING — This Grade is essentially a water-hardening steel, but may be quenched in oil.

	1045
Normalize	1600º-1700ºF
Anneal	1400º-1500º F
Hardening	1475º-1550º F
Temper	To Desired Hardness

STOCK SIZES

High Carbon Plates are stocked in thicknesses from 3/16" to 14", widths up to 96", and lengths up to 30 feet.

PRESSURE VESSEL QUALITY PLATES

These are hot rolled carbon steel plates produced by the basic oxygen process. They are high quality products which meet ASTM and ASME specifications, as well as those of the Hartford Steam Boiler Inspection and Insurance Co. They have been rigidly inspected and tested to insure quality satisfactory for pressure vessels.

SPECIFICATIONS and COLOR MARKING

	ASTM Specification	Color Marking (Corner Stripe)
Pressure Vessel Quality	ASTM A 285, Grade C	Yellow
	ASTM A 515, Grade 70	Purple
	ASTM A 516, Grade 70	Black & Pink

ANALYSIS

	Carbon Max.	Man-ganese	Phosphorus Max.	Sulphur Max.	Silicon
A 285, Grade C	.28	.90 Max.	.035	.04	—
A 515, Grade 70					
1" thick & under	.31	1.20 Max.	.035	.04	.15/.40
Over 1" to 2" incl	.33	1.20 Max.	.035	.04	.15/.40
Over 2" to 8" incl	.35	1.20 Max.	.035	.04	.15/.40
A 516, Grade 70					
1/2" thick & under	.27	.85/1.20	.035	.04	.15/.40
Over 1/2" to 2" incl	.28	.85/1.20	.035	.04	.15/.40
Over 2" to 4" incl	.30	.85/1.20	.035	.04	.15/.40
Over 4" to 8" incl	.31	.85/1.20	.035	.04	.15/.40

APPLICATIONS

ASTM A 285 covers plates of low and intermediate tensile strengths for pressure vessels. The maximum thickness of plates produced to this specification is 2".

ASTM A 515 covers a course grain carbon silicon steel intended for intermediate or high temperature service in boilers and other pressure vessels.

ASTM A 516 covers a fine grain carbon manganese silicon steel intended for service in pressure vessels at temperatures where improved notch toughness is important.

Material for all three specifications is intended for fusion welding where the welding technique is of prime importance with welding procedure accomplished under approved methods.

MECHANICAL PROPERTIES

	Tensile Strength (psi)	Yield Strength (psi)	Elongation in 8"
A 285, Grade C	55,000/75,000	30,000 Min.	23% Min.*
A 515 and A 516, Grade 70	70,000/90,000	38,000 Min.	17% Min.

*Subject to modification for thicknesses under 5/16" and over 3/4".

MACHINABILITY — Although not considered free-machining, these grades can be surface machined or drilled readily.

WELDABILITY — These grades are easily welded by all welding processes although they are intended for fusion welding. The resultant welds are of high quality, when the welding procedure is accomplished under approved methods.

STOCK SIZES

Pressure Vessel Quality Plates are stocked in thicknesses from 3/16" to 8", widths up to 96", and lengths up to 336".

FLOOR PLATE

ASTM A 786

Floor Plate provides maximum skid resistance regardless of how the plate is laid or the angle from which it is approached. Patterns are continuous whether adjoining plates are laid end to end, side to side, or side to end. Cutting waste is reduced to a minimum. Cleaning is easily accomplished with a hose, brush, or mop, with rapid and complete drainage.

ANALYSIS

Carbon	Manganese	Phosphorus	Sulphur
.10/.25	.30/.70	.05 Approx.	.05 Approx.

APPLICATIONS — Running board steps, floors, walkways, platforms, cover plates, stair treads, hatch covers, trench covers, truck runways, conveyors, etc.

MECHANICAL PROPERTIES — Floor Plates are not normally used as main stress-carrying members and are seldom specified to tensile requirement. However, properties are approximately as follows:

Tensile Strength (psi)	Yield Strength (psi)	Elongation in 8″
60,000	33,000	22%

MACHINABILITY — Can be machined or drilled readily.

WELDABILITY — Easily welded by all the welding process, and the resultant welds are of extremely good quality. The grade of welding rod to be used depends on thickness of section, design, service requirements, etc.

SIZES AND WEIGHTS

See next Page.

FLOOR PLATES
STOCK SIZES

16 Ga. To 1/8" — As indicated below.
3/16" to 3/4" — Thickness and Widths as indicated below. Lengths up to 24'.

Thickness refers to body of plate, not including raised portion.

Stock Size	Estimated Weight, Lbs. Per Sq.In.	Per Sq.Ft.	Per Lin.Ft.	Per Plate
16 Ga.				
30x 96	.0208	3.00	7.50	60.00
36x 96	"	"	9.00	72.00
120	"	"	"	90.00
48x 120	"	"	12.00	120.0
144	"	"	"	144.0
14 Ga.				
30x 120	.0260	3.75	9.38	93.75
168	"	"	"	131.3
36x 96	"	"	11.25	90.00
120	"	"	"	112.5
144	"	"	"	135.0
48x 96	"	"	15.00	120.0
120	"	"	"	150.0
144	"	"	"	180.0
12 Ga.				
30x 120	.0365	5.25	13.13	131.3
180	"	"	"	196.9
36x 96	"	"	15.75	126.0
120	"	"	"	157.5
144	"	"	"	189.0
180	"	"	"	236.3
48x 96	"	"	21.00	168.0
120	"	"	"	210.0
144	"	"	"	252.0
240	"	"	"	420.0
60x 96	"	"	26.25	210.0
120	"	"	"	262.5
144	"	"	"	315.0
240	"	"	"	525.0
1/8				
24x 168	.0427	6.15	12.30	172.2
30x 96	"	"	15.38	123.0
120	"	"	"	153.8
144	"	"	"	184.6
192	"	"	"	246.1
36x 96	"	"	18.45	147.6
120	"	"	"	184.5
144	"	"	"	221.4
192	"	"	"	295.2
42x 120	"	"	21.53	215.3
48x 96	"	"	24.60	196.8
120	"	"	"	246.0
144	"	"	"	295.2
168	"	"	"	344.4
192	"	"	"	393.6
240	"	"	"	492.0
288	"	"	"	590.4
60x 96	"	"	30.75	246.0
120	"	"	"	307.5
144	"	"	"	369.0
240	"	"	"	615.0
288	"	"	"	738.0
72x 240	"	"	36.90	738.0
288	"	"	"	885.6

Thickness and Width	Estimated Weight, Lbs. Per Sq.In.	Per Sq.Ft.	Per Lin.Ft.
3/16			
x 24	.0605	8.71	17.42
30	"	"	21.78
36	"	"	26.13
42	"	"	30.49
48	"	"	34.84
60	"	"	43.55
72	"	"	52.26
84	"	"	60.97
96	"	"	69.68
1/4			
x 24	.0782	11.26	22.52
30	"	"	28.15
36	"	"	33.78
42	"	"	39.41
48	"	"	45.04
60	"	"	56.30
72	"	"	67.56
84	"	"	78.82
96	"	"	90.08
5/16			
x 24	.0959	13.81	27.62
30	"	"	34.53
36	"	"	41.43
48	"	"	55.24
60	"	"	69.05
72	"	"	82.86
84	"	"	96.67
96	"	"	110.5
3/8			
x 24	.1137	16.37	32.74
30	"	"	40.93
36	"	"	49.11
42	"	"	57.30
48	"	"	65.48
60	"	"	81.85
72	"	"	98.22
84	"	"	114.6
96	"	"	131.0
1/2			
x 24	.1491	21.47	42.94
30	"	"	53.68
36	"	"	64.41
48	"	"	85.88
60	"	"	107.4
72	"	"	128.8
84	"	"	150.3
96	"	"	171.8
5/8			
x 60	.1845	26.58	132.9
72	"	"	159.5
3/4			
x 60	.2200	31.68	158.4
96	"	"	253.4

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