PRODUCT DESCRIPTION

Steel plates are produced either as a flat rolled plate or plate coil which is a continuous plate in coil form. Flat rolled plates are run two ways; one, through a continuous set of roll stands which reduces the plate to final thickness or, two, on a reversing mill where the plate slab is run back and forth through one mill to final thickness. Plate coil is continuously rolled through a series of stands on a continuous plate mill which coils the hot plate into large coils. In each case the rolling temperatures along with the chemistry are closely monitored to produce the desired mechanical properties.

Steel plates are produced in many chemical grades and quality levels covered under various ASTM and ASME specifications. Structural grades range from low-yield strengths starting at 30,000 psi to high-yield strengths over 100,000 psi such as A514. Mechanical properties are controlled by chemistry, controlled rolling and heat treatment depending on the steel grade. Some grades such as A537 or ABS grade DH36 are produced for high strength and low temperature applications where Charpy values will exceed 15 ft-lb at -50 F. Other grades with 70,000 and 80,000 psi minimum yields are produced with low inclusion levels. These grades have good resistance to lamellar tearing, minimal differences in mechanical properties in the three dimensions of the plate, and excellent formability.

Pressure Vessel Quality plates (PVQ) are plates used in the fabrication of pressure tanks and boilers and these plates must meet the requirements of the ASME Boiler and Pressure Vessel Code. It is for this reason each plate is tested in the steel mill for its mechanical strength.

Specialty plates such as AR, AR321 and AR400 are produced with special chemistries to increase abrasion resistance. AR321 and AR400 are medium alloy steels with approximately .25% carbon and are heat treated to 321 and 425 Brinell hardness levels. Both these steels will have good abrasion resistance and are totally weldable using proper welding procedures for these grades of steel.

AISI 4140 is a medium carbon, chromium and molybdenum alloy steel used in a wide variety of machinery parts requiring tensile strengths to 250,000 psi. The steel is through hardening up to 5" in thickness and will harden to a Rockwell C hardness range of 38–48. The best toughness range is HRC 38–45.

Brochures and technical data are available for all our plate products.

ASTM PLATE GRADES

A 36 — This is the most common grade of structural steel used. It has a minimum yield strength of 36,000 psi and is available in plate, bars and rolled structural shapes. It is used for riveted, bolted or welded structures. In many cases our A36 plates are dual specified with ABS grade A.

A 131 — ABS equivalent specification for structural steels used for ship building. The specification covers plate, bar and structural shapes. There are two categories of steel grades — Ordinary Strength and Higher Strength steels which in some caes are normalize heat treated.

A 242 — A high strength low alloy steel used for structural purposes with yield strengths of 42,000 to 50,000 psi minimum yield depending on thickness. It can be used in place of A36 where savings in weight or added durability are important. A 242 has enhanced atmospheric corrosion resistance of approximately two times that of carbon structural steels with copper or four times that of carbon structural steels without copper.

A 514 (T-1 Type) — Quenched and tempered alloy steel plates of structural quality produced in thicknesses up to and including 6". Specified minimum yield strength is 100,000 psi for thicknesses up to and including 2-1/2". Each steel mill has their own proprietary chemical analysis. There are thirteen different chemical grades. Material has good impact properties and welding characteristics.

A 516 — Pressure vessel quality plates for moderate and lower temperature service produced to a fine austenitic grain size. The specification covers four strength levels and is intended for pressure vessels where improved low temperature notch toughness is important.

A 537 — Heat treated pressure vessel quality plates produced to a fine austenitic grain size. Class 1 is normalize heat treated and will meet 50,000 psi minimum yield under 2-1/2" in thickness and 45,000 psi minimum yield over 2-1/2" up to and including 4".

A 572 — Specification A572 defines six grades of high-strength low-alloy steel having specified minimum yield points of 42,000, 45,000, 50,000, 60,000, and 65,000 psi. Grades 42, 45, and 50 are intended for riveted, bolted or welded construction of bridges, buildings, and other structures.

A 588 (Corten) — A group of high-strength low-alloy steels with four to six times the corrosion resistance of plain carbon structural steels. Produced in thicknesses up to and including 8", yield strength minimums will be 50,000 psi through 4"; there are five chemical analyses listed in the specification. The enhanced atmospheric corrosion resistance permits the use of this steel in the unpainted condition in many applications.

ASTM PLATE GRADES *(Continued)*

A 656 — A very high strength product with 70,000 and 80,000 psi minimum yield strengths and good Charpy impact test properties to -20° F. Toughness and strength are controlled by a combination of micro-alloying and controlled rolling procedures. In addition this steel grade has good formability in the rolling and transverse direction of the plate. This is accomplished by reducing the inclusion levels and controlling the shape of the sulfide inclusion.

A 786 — Safety floor plate rolled to Patterns No. 3 and 4. The product is available in plate and in plate coil in some thicknesses. Grades available are Commercial Quality and A36 depending on size.

OTHER GRADES

AR 235 — An as-rolled abrasion resistant plate with approximately 1.25% manganese and .45% carbon. Brinell hardness is approximately 235, however, since the plate is as-rolled there will be variations of hardness in various locations of the plate. Since these plates have a tendency to have low ductility caution should be used in press brake forming or bending these plates. Special welding procedures should be used because of a Carbon Equivalent Ratio of approximately .65%. This product is used for sliding abrasion jobs with minimal impact.

AR 321 — Abrasion resistant plate heat treated to a 321-363 Brinell hardness developed for sliding and impact abrasion type applications. Steel has an A514 chemistry and will have good weldability with proper welding procedures for this type of steel. Applications would be for high impact and sliding abrasion. Plates will have limited formability because of the plate hardness.

AR 400 — Abrasion resistant plate heat treated to a higher level of hardness typically 425 Brinell. Higher plate hardness is obtained by increasing the carbon content and tempering at a lower temperature. Applications would be for higher abrasion and impact problems. Alaska Steel inventories AR400 with a Charpy value of 20 ft-lb at -40 F.

UNIVERSAL MILL PLATE

Size	Weight in Pounds Per Foot	20' Bar
1/4 x 9	7.6572	153.14
10	8.5080	170.16
12	10.2096	204.19
5/16 x 9	9.5715	191.43
10	10.6350	212.70
12	12.7620	255.24
3/8 x 9	11.4858	229.72
10	12.7620	255.24
12	15.3144	306.29
1/2 x 9	15.3144	306.29
10	17.0160	340.32
12	20.4192	408.38
5/8 x 9	19.1430	382.86
10	21.2700	425.40
12	25.5240	510.48
3/4 x 9	22.9716	459.43
10	25.5240	510.48
12	30.6288	612.57
1 x 9	30.6288	612.58
10	34.0320	680.64
12	40.8384	816.77

STEEL PLATES

ASTM A-36

Size			Sq. Ft.
3/16	x	48	7.66
		60	7.66
		72	7.66
		84	7.66
		96	7.66
1/4	x	48	10.21
		60	10.21
		72	10.21
		84	10.21
		96	10.21
		120	10.21
5/16	x	48	12.76
		60	12.76
		72	12.76
		84	12.76
		96	12.76
		120	12.76
3/8	x	48	15.32
		60	15.32
		72	15.32
		84	15.32
		96	15.32
		120	15.32
7/16	x	84	17.87
		96	17.87
1/2	x	48	20.42
		60	20.42
		72	20.42
		84	20.42
		96	20.42
		120	20.42
5/8	x	48	25.52
		60	25.52
		72	25.52
		84	25.52
		96	25.52
		120	25.52

Size			Sq. Ft.
3/4	x	48	30.63
		60	30.63
		72	30.63
		84	30.63
		96	30.63
		120	30.63
7/8	x	72	35.74
		84	35.74
		96	35.74
1	x	48	40.84
		60	40.84
		72	40.84
		84	40.84
		96	40.84
		120	40.84
1-1/8	x	72	45.94
		84	45.94
		96	45.94
1-1/4	x	60	51.05
		72	51.05
		84	51.05
		96	51.05
1-1/2	x	60	61.26
		72	61.26
		84	61.26
		96	61.26
1-3/4	x	84	71.47
		96	71.47
2	x	48	81.67
		60	81.67
		72	81.67
		84	81.67
		96	81.67
2-1/4	x	48	91.88
		60	91.88
		72	91.88
		84	91.88
		96	91.88

STEEL PLATES

ASTM A-36

Size	Sq. Ft.	Size	Sq. Ft.
2-1/4	91.88	6	245.03
2-1/2	102.09	6-1/2	265.45
2-3/4	112.31	7	285.87
3	122.52	7-1/2	306.29
3-1/4	132.72	8	326.71
3-1/2	142.93	8-1/2	347.13
3-3/4	153.15	9	367.55
4	163.35	9-1/2	387.96
4-1/2	183.77	10	408.38
5	204.19	10-1/2	428.80
5-1/2	224.69	11	449.22
		12	490.06

Plateburning with 5 head computerized pentagraph

STEEL PLATES

ASTM A-36

Specifications: Ordered to ASTM Spec. A-36

Chemical Analysis:

	Carbon	Manganese	Phosphorus	Sulphur
3/4" Thick & Under	.25 Max	—	.04 Max.	.05 Max.
Over 3/4" to 1-1/2" incl.	.25 Max.	.80/1.20	.04 Max.	.05 Max.
Over 1-1/2" to 2-1/2" incl.*	.26 Max.	.80/1.20	.04 Max.	.05 Max.
Over 2-1/2" to 4" incl.*	.27 Max.	.85/1.20	.04 Max.	.05 Max.
Over 4"*	.29 Max.	.85/1.20	.04 Max.	.05 Max.

*Plates 1-1/2" and over also require .15/.30 Silicon content.

Mechanical Properties:

Tensile Strength P.S.I.	Yield Point P.S.I.	Elongation in 8"
58,000 to 80,000	36,000a Min.	20% Min.

a. Yield point 32,000 psi for plate over 8" in thickness.

PRESSURE VESSEL QUALITY PLATES

ASTM A285-Grade C (Intermediate Tensile)
ASTM A515-Grade 70 (High Temperature)
ASTM A516-Grade 70 (Low Temperature)

Specifications: Carbon steel plate to conform to the above ASTM specifications and the corresponding ASME specifications. This steel meets the requirements of the Hartford Steam Boiler Inspection and Insurance Co.

Chemical Analysis:

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

Mechanical Properties:

	Tensile Strength P.S.I.	Yield Point P.S.I.	Elongation in 8"
A285 Grade C	55,000/75,000	30,000 Min.	23% Min.a
A515 Grade 70	70,000/90,000	38,000 Min.	17% Min.
A516 Grade 70	70,000/90,000	38,000 Min.	17% Min.

PRESSURE VESSEL QUALITY PLATE

ASTM A537-Class 1 (Normalized)

This grade is a normalized, fine-grain, carbon-manganese-silicon steel offering high strength in thicknesses up through 4 inches. It has good low temperature notch toughness. 15 ft.-lbs. longitudinal and transverse Charpy V-Notch at -75 F.

Specifications: Ordered in the normalized condition to ASTM. A537-Class 1. Meets API requirements to -60 F. for refrigerated storage tanks.

Chemical Analysis:

	Carbon	Manganese	Phosphorus	Sulpher	Silicon
A537 Class 1					
1-1/2" thick & under	.24 Max.	.70/1.35	.035 Max.	.035 Max.	.15/.50
Over 1-1/2" to 4" incl.	.24 Max.	1.00/1.60	.035 Max.	.035 Max.	.15/.50

Mechanical Properties:

	Tensile Strength P.S.I.	Yield Point P.S.I.	Elongation in 8" a
2-1/2" thick & under	70,000/90,000	50,000 Min.	18% Min.
Over 2-1/2" to 4" incl.	65,000/85,000	45,000 Min.	18% Min.

HIGH STRENGTH LOW ALLOY SHEETS & PLATE
(50,000# Minimum Yield — Copper Bearing)

Specifications: The listed steels are an open hearth low alloy steel to ASTM Specs. A-588-Grade A, ASTM A-572 Grade 50 and ASTM A-441. Our flexible buying policy normally enables us to supply any trade name or its ASTM equivalent specification. Our A-572 Grade 50 is ordered with a tested charpy V-notch at -50°F for low temperature applications.

Chemical Analysis:

	A-588-Gr A	A-572-Gr 50	A-441	Cor-Ten	Tri-Ten
Carbon	.10/.19	.23 Max.	.22 Max.	.12 Max.	.22 Max.
Manganese	.90/1.25	1.35 Max.	.85/1.25	.20/.50	1.25 Max.
Phosphorus	.04 Max.	.04 Max.	.04 Max.	.07/.15	.04 Max.
Sulphur	.05 Max.	.05 Max.	.05 Max.	.05 Max.	.05 Max.
Silicon	.15/.30	.40 Max.	.30 Max.	.25/.75	.30 Max.
Nickel	—	—	—	.65 Max.	—
Chromium	.40/.65	—	—	.30/1.25	—
Molybdenum	—	—	—	—	—
Vanadium	.02/.10	0.01 — 0.15	.02 Min.	—	.02 Min.
Copper	.25/.40	.20 Min.*	.20 Min.	.25/.55	.20 Min.
Boron	—	—	—	—	—
Titanium	—	—	—	—	—

*Copper must be a minimum of 0.20% but only when specified as part of the ASTM A-572-Gr. 50 specification.

Mechanical Properties: (Average Range)

Type	Tensile Strength P.S.I.	Yield Strength P.S.I.	Elongation in 8"
A588-Gr A	70,000 Min.	50,000 Min.	18% Min.
572-Gr 50	65,000 Min.	50,000 Min.	18% Min.
A441	70,000 Min.	50,000 Min.	18% Min.
Cor-Ten	70,000 Min.	50,000 Min.	19% Min.
Tri-Ten	70,000 Min.	50,000 Min.	18% Min.

The above chemical and physical specifications are average specs, and may vary at different times with any producer according to a particular application.

HIGH STRENGTH ALLOY PLATES QUENCHED AND TEMPERED

Structural Quality & Pressure Vessel Quality

These grades are low carbon, quenched and tempered alloy steels that combine weldability with exceptional strength and toughness. Used in buildings, bridges, pressure vessels, machinery, etc.

Specifications:* Ordered to ASTM A-514 (structural quality) and ASTN A-517 (pressure vessel quality). A letter designation following the 514 or 517 indicates the mill manufacturer and the chemistry that individual mill uses in producing and conforming to these ASTM standards. These letter designations are referred to as the "Type" or "Grade". (The most commonly known trade name is United States Steel grade T-1.)

Chemical Analysis: The examples shown are some of the "Types" or "Grades" that we commonly stock. They are typical of the many grades offered under these ASTM specifications, however, the chemistry will vary depending upon the specific type or grade. For detailed information see latest publication of the "BOOK OF ASTM STANDARDS".

	A514 Type B	A514 Type H	A514 Type F	A517 Grade F
Carbon	.12/.21	.12/.21	.10/.20	.10/.20
Manganese	.70/1.00	.95/1.30	.60/1.00	.60/1.00
Phosphorus	.035 Max.	.035 Max.	.035 Max.	.035 Max.
Sulphur	.040 Max.	.040 Max.	.040 Max.	.040 Max.
Silicon	.20/.35	.20/.35	.15/.35	.15/.35
Nickel	—	.30/.70	.70/1.00	.70/1.00
Chromium	.40/.65	.40/.65	.40/.65	.40/.65
Molybdenum	.15/.25	.20/.30	.40/.60	.40/.60
Vanadium	.03/.08	.03/.08	.03/.08	.03/.08
Copper	—	—	.15/.50	.15/.50
Boron	.0005/.005	.0005/.005	.002/.006	.002/.006
Titanium	.01/.03	—	—	—

Mechanical Properties: (Same requirements for both ASTM A514 & A517.)

Thickness	Tensile Strength P.S.I.	Yield Point P.S.I.	Elongation Min. in 2"
3/16" to 2-1/2" incl.	115,000/135,000	100,000	18%
Over 2-1/2" to 4" incl.	105,000/135,000	90,000	17%
Over 4" to 6" incl.	105,000/135,000	90,000	16%

400 BRINELL

CHEMICAL COMPOSITION
Typical values

Thickness inch	C	Si	Mn max	Cr max	Ni max	Mo max	B	CE*
3/16-3/4	.10/.20	.10/.70	1.7	—	—	—	.001/.005	.37
(3/4)-1 1/4	.10/.20	.10/.70	1.7	1.0	—	—	.001/.005	.50
(1 1/4)-2	.10/.20	.10/.70	1.7	1.0	—	.70	.001/.005	.56
(2)-3	.15/.26	.10/.70	1.2	1.0	1.0	.70	.001/.005	.62

* Carbon equivalent $CE = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Cu + Ni}{15}$

HARDNESS 360-440 HB.

MECHANICAL PROPERTIES	Yield strength ksi	Tensile strength ksi	Elongation A_5 %
	145*	180	10

* HARDOX 400 can be supplied with a guaranteed yield strength of 130 ksi.

IMPACT PROPERTIES Charpy-V, longitudinal specimen — 40°F
Typical value 22 ft. lbs

500 BRINELL

CHEMICAL COMPOSITION
Typical values

Thickness inch	C	Si	Mn	Cr	Mo	B	CE
1/4-3	.20/.30	.10/.70	1.7 max	1.0 max	0.5 max	.001/.005	.57/.59

HARDNESS 450-560 HB (>2" thickness slightly lower value)

MECHANICAL PROPERTIES	Yield strength ksi	Tensile strength ksi	Elongation A_5 %
Typical values	190	225	8

IMPACT PROPERTIES Charpy-V, longitudinal specimen — 40°F
Typical values 15 ft. lbs