

ASTM A514 Grade B

General Product Description

ASTM A514 Grade B is a quenched and tempered alloy steel plate for structural applications requiring high yield strength combined with good formability and toughness. A514 Grade B has a minimum yield strength of 100 ksi [690 MPa] and may be ordered with supplemental Charpy V-notch impact test requirements.

Applications

Typical applications for A514 Grade B include transport trailers, construction equipment, crane booms, mobile man-lifts, agricultural equipment, heavy vehicle frames and chassis, and welded bridge structural members.

Dimensions

Thickness (Inches)	Width (Inches)	Length (Inches)
0.188- 1.250	72- 120	240- 600

Mechanical Properties

Tensile Test: Tensile testing is performed in the transverse direction according to ASTM A6 requirements. The specified tensile properties and hardness requirements are tabulated below:

0.2% YS (ksi)	UTS (ksi)	Elongation in 2" ¹⁾ (min %)	Reduction of Area ²⁾ (min %)	Brinell Hardness ³⁾
100	110- 130	16	35	235- 293

¹⁾ See elongation requirement adjustments in Tension Test section of ASTM A6.

²⁾ Reduction in area for 1.5 in. wide rectangular tension specimen.

³⁾ For plates up to 0.375", a Brinell hardness test may be used instead of a tensile test for those plates not tensile tested in a 15-ton lot.

Charpy V-Notch Impact Toughness requirements may be ordered as a supplementary requirement. Please inquire for applications requiring a specified minimum impact toughness

Chemical Composition

Meets chemical requirements of ASTM A514 Grade B, as shown below (wt % ladle analysis):

C (wt %)	Mn (wt %)	P (max wt %)	S (max wt %)	Si (wt %)	Cr (wt %)	Mo (wt %)	V (wt %)	Ti (wt %)	B (wt %)
0.12- 0.21	0.70- 1.00	0.025*	0.005*	0.20- 0.35	0.40- 0.65	0.15- 0.25	0.03- 0.08	0.01- 0.04	0.0005- 0.005

Inquire if a more restrictive chemistry is needed.

* Note that SSAB's P and S levels are more restrictive than ASTM A514 Grade B requirements.

Carbon Equivalent Values

Thickness (Inches)	0.188 - 1.250
Typical CEV** (wt %)	0.51
Typical CET** (wt %)	0.34

** CEV and CET typical values are based on historical averages.

$$CET = C + \frac{Mn + Mo}{10} + \frac{Cr + Cu}{20} + \frac{Ni}{40}$$

$$CEV = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Cu + Ni}{15}$$

Tolerances

Thickness, width, and length tolerances for A514 Grade B steel plate are in accordance with the requirements of ASTM A6. The flatness tolerance for as-supplied product is ½ ASTM A6.

Formability Properties

A514 Grade B material exhibits good cold forming characteristics. Shear burrs and heat-affected zones of thermal cut edges on or near the bend axis as well as sharp corners on edges and on gas cut or punched holes located on or adjacent to the bend axis should be removed by grinding prior cold forming. The following recommended minimum inside bend radius, R, and die width opening, W, as a function of bending orientation are provided:

Thickness (in. [mm])	Bend axis perpendicular to rolling direction. Inside radius, R, (min.)	Bend axis perpendicular to rolling direction. Die width, W.	Bend axis parallel to rolling direction. Inside radius, R (min.)	Bend axis parallel to rolling direction. Die width, W
0.1875 – 0.75 [4.8 – 19]	1.75t	7t	2.625t	9t
>0.75 – 1.00 [19 – 25.4]	2.25t	8t	3.375t	10t
>1.00 – 1.25 [25.4 – 31.8]	4.5t	12t	6.75t	16t

Weldability

Welding of A514 Grade B shall be performed in accordance with the applicable welding code. In the absence of a specified welding code, the following suggested minimum preheat and interpass temperatures and welding consumables are provided. Special welding consumables and welding procedures may be required to avoid detrimental effects on the mechanical properties of the base metal. Low hydrogen practices are strongly recommended, including the removal of surface moisture. A514 Grade B may be susceptible to reheat cracking in the heat-affected zone of welds during stress relieving or postweld heat treatment. As a result, SSAB recommends that a qualified welding engineer consider this potential before stress relieving weldments of this product.

Welding Process	Thickness (in. [mm])	Minimum Preheat and Interpass Temperature (°F [°C])	Consumables
Shielded Metal Arc (SMAW)	Up to ¾ [19]	50 [10]	AWS E10015-X, E10016-X, E10018-X, E10018-M
Shielded Metal Arc (SMAW)	>¾ – 1.25 [19 – 31.8]	150 [65]	AWS E10015-X, E10016-X, E10018-X, E10018-M
Gas Metal Arc (GMAW)	Up to ¾ [19]	50 [10]	AWS ER110S-XXX-XX
Gas Metal Arc (GMAW)	>¾ – 1.25 [19 – 31.8]	150 [65]	AWS ER110S-XXX-XX
Submerged Arc (SAW)	Up to ¾ [19]	50 [10]	AWS F11XX-EXXX-XX, F11XX-ECXXX-XX
Submerged Arc (SAW)	>¾ – 1.25 [19 – 31.8]	150 [65]	AWS F11XX-EXXX-XX, F11XX-ECXXX-XX
Flux Cored Arc (FCAW)	Up to ¾ [19]	50 [10]	AWS E11XTX-X, E11XTX-XM
Flux Cored Arc (FCAW)	>¾ – 1.25 [19 – 31.8]	150 [65]	AWS E11XTX-X, E11XTX-XM

Contact Information

www.ssab.com/contact