



# A-514

## High Yield Strength, Quenched & Tempered Alloy Steel Plate

Grade	Chemical Composition* – % Weight											
	C	Mn	P	S	Si	Ni	Cr	Mo	Cu	V	Ti	B
B	.21	1.00	.025 <sup>†</sup>	.010 <sup>†</sup>	.35	.70	.65	.25	-	.08	.04	.005
H	.21	1.30	.025 <sup>†</sup>	.010 <sup>†</sup>	.35	.70	.65	.30	-	.08	-	.005
F	.20	1.00	.035	.035	.35	1.00	.65	.60	.50	.08	-	.006
Q	.21	1.30	.035	.035	.35	1.50	1.50	.60	-	.08	-	-

Grade	Physical Properties – Typical Values at 68°F		
	Thickness	Tensile Strength	Yield Strength
B	1 ¼"	130 ksi	100 ksi
H	2"	130 ksi	100 ksi
F	2 ½"	130 ksi	100 ksi
Q	≤ 2 ½"	130 ksi	100 ksi

- \* Fine grained, fully killed alloy steel used in applications where high strength, low weight and high impact values are required.
- \* Quenched and tempered constructional alloy with high yield strength at 90 or 100 ksi minimum, with weldability and good toughness at low atmospheric temperatures.
- \* Offers the optimum in strength, toughness, corrosion resistance, impact-abrasion resistance, and long term economy.
- \* Used in components for earthmoving or transport equipment, booms, bucket parts for power shovels or cranes, penstocks, turbine scroll cases and unfired pressure vessels.
- \* Not recommended for service at temperatures lower than -50°F or higher than 800°F.

Note: The data contained in this document is accurate at time of printing, and intended for use as a general guide.

\* Typical maximum values. Mill certifications are available upon request.

† Nucor restricts P & S to lower levels than required by ASTM A514 Grade B/H



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## WELDING

Suggested welding consumables for arc welding processes:

Process	≤ 2 ½"	>2 ½"
Manual Shielded Metal-Arc Low Hydrogen	E11015-x, E11016-x, E11018-x	E11015-x, E11016-x, E11018-x
Submerged-Arc	F11xx-Exx-xx	F10xx-Exx-xx
Gas Metal-Arc	ER110S-x	ER110S-x
Flux Cored-Arc	E11xTx-x	E10xTx-x

Deposit weld metal shall have a minimum impact strength of 20 ft-lb at 0°F when Charpy V-Notch specimens are required.

Suggested minimum preheat & INTER-PASS temperatures for welding:

Thickness	Temperature
Up to ½" incl.	100°F
Over ½" to 1 ½" incl.	150°F
Over 1 ½" to 2 ½" incl.	200°F
Over 2 ½"	250°F

A preheat or inter-pass temperature above the minimum shown may be required for highly restrained welds – preheat or inter-pass temperatures should not exceed 400°F for thicknesses up to 1 ½" or 450°F for thicknesses over 1 ½".

It is important to note that Grades B, H, F, and Q may be susceptible to cracking in the heat affected zone of welds during post weld heat treatment (stress relief). Careful consideration should be given to this phenomenon by competent welding engineers before stress relieving is applied to weldments.

## CUTTING

- \* Thermal or oxy-fuel cutting of plate steel with an oxygen torch is recommended.
- \* Preheat plate thicknesses of 2 ½" and under; to a minimum of 60°F in grades B, H, and F.
- \* Preheat plate thicknesses of greater than 2 ½"; to a minimum of 300°F in grade Q.

## FORMING

Cold, warm, and hot forming are processes that can be utilized. The mechanical properties of the particular steel grade being formed dictates the process required for forming. A minimum plate temperature of +60F, grinding plate edges, conditioning and lubricating form dies, as well as the application of uniform bending force is suggested during forming. Due to the enhanced mechanical properties of this plate, the bending forces required to form the plate will be greater and more plate "springback" can be expected to occur. The plate should not be hot formed without causing degradation to the mechanical properties.

th = thickness		Perpendicular to grain direction	Parallel to grain direction
Grade B	Inner bend radius Ri (min)	4 x th	5 x th
	V die aperture (min)	12 x th	12 x th
Grade H	Inner bend radius Ri (min)	3 x th	4 x th
	V die aperture (min)	16 x th	16 x th
Grade F & Q	Inner bend radius Ri (min)	5.5 x th	8.25 x th
	V die aperture (min)	16 x th	16 x th

For wear applications in many industries:

- \* Aggregate
- \* Forestry
- \* Pulp & Paper
- \* Construction
- \* Mining
- \* Steel

## PROCESSING CAPABILITIES

- \* Plasma Cutting
- \* Drilling
- \* Forming
- \* Laser Cutting
- \* Oxy Fuel Cutting
- \* Welding



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