

A CARBON & ALLOY PLATE GUIDE FOR THE WIND TURBINE INDUSTRY

THE POWER OF THE WIND

RELIES ON THE STRENGTH IN METAL FROM RYERSON

WIND TURBINE PLATE GRADES

PROCESSING SERVICES

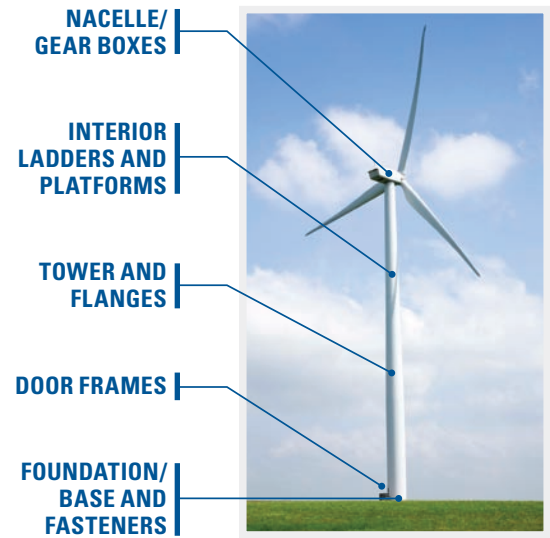
WIND INDUSTRY DEFINITIONS



When it comes to plate and plate processing, one name stands tall.

Ryerson.

A longtime, nationwide supplier of carbon and alloy steel plate, Ryerson has made a commitment to the Wind Turbine Industry. We recognize the importance of this market to North America and know we play a key role in it. With service centers strategically located coast-to-coast, we can deliver plate directly from stock, process it to your specifications or develop a stocking program specifically for you, which can minimize total costs, bringing additional dollars direct to your bottom line.



Quality & Testing

Ryerson understands the high quality standards necessary for these products. We want to assure you that we can meet your quality standards in tolerance, flatness, surface quality and appearance. Ryerson can also provide Ultrasonic and Charpy testing.



TESTING REQUIREMENTS:

Ultrasonic Testing

In ultrasonic testing, very short ultrasonic pulse-waves with center frequencies ranging from 0.1-15 MHz and occasionally up to 50 MHz are launched into materials to detect internal flaws or to characterize materials. Common ASTM reference to ultrasonic testing is ASTM A578. This specification covers the procedure and acceptance standards for straight-beam, pulse-echo, ultrasonic examination of rolled carbon and alloy steel plates, 3/8" (10mm) in thickness and over, for special applications. The method will detect internal discontinuities parallel to the rolled surfaces. There are three levels of acceptance standards — A, B, C.

Charpy Testing

The Charpy impact test, also known as the Charpy v-notch test, is a standardized high strain-rate test which determines the amount of energy absorbed by a material during fracture. This absorbed energy is a measure of a given material's toughness and acts as a tool to study temperature-dependent brittle-ductile transition. Charpy values are typically reported in Joules. One joule is defined as the amount of energy expended or work done by a force of one newton moving an object one meter in the same direction as the force.

Carbon & Alloy Plate Readily Available (Most Common)

U.S. SPECS/GRADES			
	Description	Yield (KSI)	Tensile (KSI)
ASTM A36 (Can be dual certified to A709 Gr 36 – See Note Below)	This specification covers carbon steel shapes, plates and bars of structural quality. Usually for general purposes and with a 36,000 min. yield.	36 min.	58 – 80
ASTM A572 Gr 50 (Can be dual certified to A709 Gr 50 – See Note Below)	Specification covers 5 grades of high strength low alloy structural shapes, plates and bars. A572 Gr 50 is one grade that has a 50,000 min. yield.	50 min.	65 min.
ASTM A588 Gr A	This specification covers high strength low alloy structural steel shapes, plates and bars for welded, riveted, or bolted construction but intended primarily for use in welded bridges and buildings where savings in weight or added durability are important. The atmospheric corrosion resistance of this steel in most environments is substantially better than that of carbon structural steels with or without copper addition. When properly exposed to the atmosphere, this steel is suitable for many applications in the bare (unpainted) condition. There are a variety of grades available.	50 min.	70 min.
ASTM A514 Gr B	This specification covers quench and tempered alloy steel plates in thicknesses up to 6" and under, and intended for bridges and other end uses. Plates shall be subjected to heat treatment to conform to the tensile and hardness requirements for thickness, tensile strength, yield strength, elongation, reduction of area and Brinnell hardness. There are a variety of grades including A, B, E, F, H, P, Q and S.	100 min.	110 – 130

Note: ASTM A709 – Refers to carbon and high strength low alloy structural shapes, plates, bars and quench and tempered alloy steel for structural plates intended for use in bridges.

EUROPEAN SPECS/GRADES — NON-ALLOY STRUCTURAL STEELS

(For additional grades & properties, refer to EN 10025-2:2004)

Grades	Properties are in MPa.* Strength at t = 16MM (MPa)	
	Yield (Reh) min.	Tensile (Rm)
S235 JR	235	360/510
S235 JO	235	360/510
S235 J2	235	360/510
S275 JR	275	410/560
S275 JO	275	410/560
S275 J2	275	410/560
S355 JR	355	470/630
S355 JO	355	470/630
S355 J2	355	470/630
S355 K2	355	470/630

WIND INDUSTRY DEFINITIONS

per EN 10025-2:2004 – non-alloy structural steels

S	Structural Steel
E	Engineering Steel
JR	Longitudinal Charpy V-Notch impacts at 27J@+20 degrees C
JO	Longitudinal Charpy V-Notch impacts at 27J@0 degrees C
J2	Longitudinal Charpy V-Notch impacts at 27J@-20 degrees C
K2	Longitudinal Charpy V-Notch impacts at 40J@-20 degrees C
+AR	Supply condition, as rolled
+N	Supply condition, normalized or normalized rolled
Z	Grade with improved properties perpendicular to the surface. Test usually associated.
Option 5	Product shall be suitable for hot zinc coating, usually associated with controlled silicon content. Class 3 = 0.14 ≤ Si ≤ 0.25 and P = ≤ 0.035.
CEV	Carbon equivalent value. Specific formula applies.
J or Joule	One joule is defined as the amount of energy expended or work done by a force of one newton moving an object one meter in the same direction as the force.

* To convert MPa to KSI, multiply by .1450377. MM to inches, multiply by .03937.

Processing & Fabrication Services Available

Our first and second stage processing operations can provide you with finished or semi-finished parts. Specifications and drawings can be stored for quick repetitive parts.

FIRST STAGE:	SECOND STAGE:
Oxy-Fuel Cutting	Machining
Plasma Cutting	Beveling
Laser Cutting	Punching
Sawing	Forming
Shearing	Rolling
Temper Passing	Grinding
Cutting to Length	Shot Blasting
Heat Treating	Welding
Stress Relieving	Painting
	Drilling



Beveling



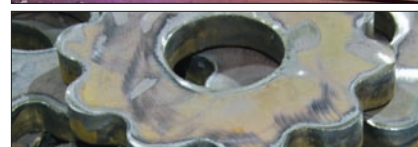
Flame Cutting



Blasted & Oiled Parts



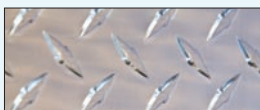
Plasma Cutting



Rings, Discs & Shapes

WIND TURBINE COMPONENT PROCESSING:

- **Nacelle Frames** – Burn-outs per spec/drawing
- **Interior Parts** – Sheared or flame cut plate; floor plate
- **Towers and Flanges** – Beveled and blasted plate; flame cut parts
- **Door Frames** – Heavy plate flame cut to spec/drawing
- **Foundation/Embedments** – Close tolerance flame cut rings & discs



Ryerson's commitment to the Wind Turbine Industry means that we are able to provide all your metal requirements. We offer an unparalleled range of products—carbon, alloy, stainless, aluminum, nickel, brass & copper in bar, plate, sheet & coil, structurals and tubing & pipe; along with leading processing and fabricating capabilities, a broad geographic reach, and an established commitment to superior service.

Our products, our people and our performance combine to make Ryerson The Strength in Metal.

For more information, please call 800-865-5679 or contact Phil Damm at Philip.Damm@ryerson.com.



ryerson.com

Reference sources: ASTM, EN 10025

Joseph T. Ryerson & Son, Inc. does not accept responsibility or liability for errors or information which is found to be misleading. Information in this document is subject to change.

©2010 Ryerson Inc.

We are where you need us to be!

A complete listing of Ryerson service centers is available on our website at ryerson.com.