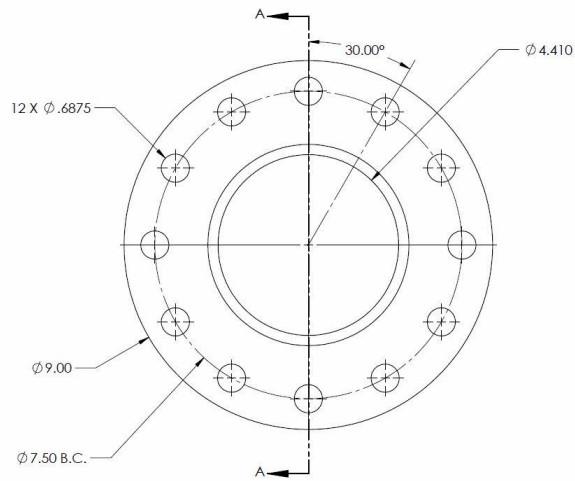


## **BASIC TOWER REQUIREMENTS for the BWC EXCEL 15 WIND TURBINE**

**Customer supplied towers for the BWC EXCEL 15 should meet the following requirements:**

<b>Tower Height:</b>	60 ft (18 m) minimum, 80 ft (24 m) or higher recommended
<b>Design Wind Speed:</b>	120 mph (54 m/s)
<b>Turbine Weight:</b>	1350 lb (612 kg)
<b>Turbine Thrust Load:</b>	2500 lb (11.1 kN) @ any wind $\geq$ 40 mph (18 m/s)
<b>Distance, Blade Tip to Tower Centerline</b>	60 inches (1.52 m)
<b>Blade Clearance:</b>	The top 15 ft (4.6 m) of the tower must not extend beyond a 22 inch (0.57 m) radius from the tower centerline.
<b>Tower Plumb Tolerance:</b>	Up to 0.25° tolerance from plumb allowed.
<b>Tower Stiffness:</b>	Tilt at the top of the tower should be no more than 2.0°. Deflection of monopole towers at 50 mph should be no more than 1.0% of tower height; at 120 mph no more than 2.5% of tower height. (For a 120 ft tower this would be 14.4 in and 36.0 in, respectively.) Overly flexible towers can cause vibration and/or fatigue problems. A professional engineer should approve the tower and foundation design.
<b>Turbine Center of Mass:</b>	5.1 inches (0.13 m) forward (upwind) of tower center and 16.5 inches (0.42 m) above the tower top
<b>Tower Design Loads</b>	Fx: 2,500 lbs (11.1 kN) Fy: 210 lbs (0.94 kN) Fz: 1,400 lbs (6.2 kN) Mx: 7,150 ft-lbs (9.7 kN-m) My: 4,130 ft-lbs (5.6 kN-m)
<b>Frequencies to Avoid:</b>	1.2 – 2.5 Hz (1P) 3.5 – 7.5 Hz (3P) Note: Blade first flap frequency is 5.5 – 6.0 Hz
<b>Stall Regulation Speed:</b>	150 RPM
<b>Maximum Rotor Speed:</b>	170 RPM
<b>Turbine Mounting:</b>	<ul style="list-style-type: none"><li>○ Provisions shall be made for connecting turbine, providing tower wiring strain relief and mounting tower climbing anti-fall equipment.</li><li>○ Tubular towers will require a 5" diameter access port ~5" below the tower top.</li><li>○ The top of the tower shall be designed to allow the connection of the power cable through a 2" or larger hole in the center of the tower top plate.</li><li>○ Hardware for attaching the wind turbine to the tower are NOT supplied with the turbine and must be supplied separately.</li><li>○ Tower connection shall be made using twelve (12) 5/8" bolts per the turbine mounting details drawing provided below:</li></ul>



This sketch shows the bottom flange of the Excel 15 tower adapter. The 4.3" center hole in the flange is larger than required in the top plate of the tower.

**Turbine Output Wiring:** The output is a 3-phase AC. Tower wiring is three conductor. There is no neutral or bond wire required for the tower wiring.