

BASIC TOWER REQUIREMENTS for the BWC EXCEL 10 WIND TURBINE

Customer supplied towers for the BWC EXCEL 10 should meet the following requirements:

- Tower Height:** 60 ft (18 m) minimum, 80 ft (24 m) or higher recommended
- Design Wind Speed:** 120 mph (54 m/s)
- Turbine Weight:** 1200 lb (545 kg)
- Turbine Thrust Load:** 2400 lb (1090 kg) @ any wind \geq 40 mph (18 m/s)
- Blade Clearance:** The top 12 ft (3.5 m) of the tower must not extend beyond an 18 inch (0.46 m) radius from the tower centerline.
- Tower Plumb Tolerance:** Up to 0.25° tolerance from plumb allowed.
- Tower Stiffness:** Tilt at the top of the tower should be no more than 2.0° for consistent furling. 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 civil engineer should approve the tower and foundation design.

Blade Frequency:

10kW Alternator Style	First Flap Frequency for 10 kW (Not Rotating)	Rotor Diameter (ft)
Ferrite	3.012Hz	22
Neodymium	2.703Hz	23

Turbine Mounting:

- Provisions shall be made for connecting turbine and mounting furling winch, tower wiring strain relief, and tower climbing anti-fall equipment. See tubular tower note below.
- Tubular towers will require a 5" diameter access port ~5" below the tower top.
- The top of the tower shall be designed to allow the connection of the power cable and furling cable to the turbine via two 2.3" diameter holes in the turbine's attachment plate.

Separately Purchased Items.

- A connection shall be made between the turbine furling cable and the tower furling winch by using:

Item Number	Item Description	Qty.	Unit
11508-xx	FURL CABLE ASSY, 3/16 X xx' SS	1	EA
HM3003	THIMBLE 3/16 SS	2	EA
HM3002-B	CLIP 3/16" MALLEABLE - S.S.	2	EA

- Self-Supporting Lattice towers require furling cable lanyard to prevent cable/tower interference.

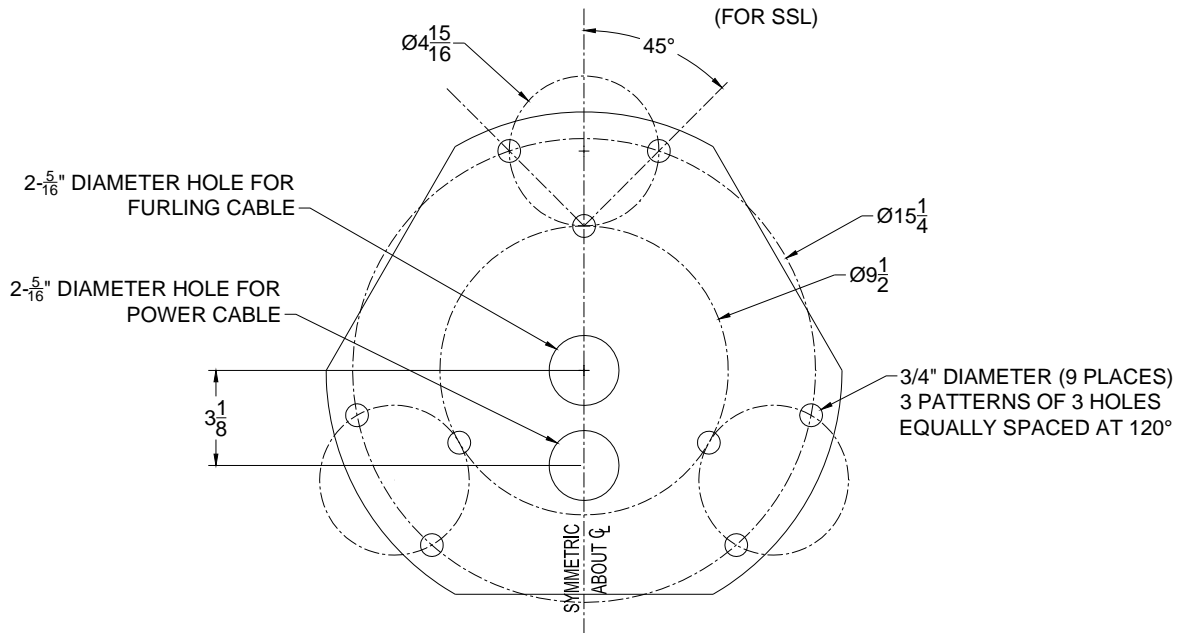
Item Number	Item Description	Qty.	Unit
11155	LANYARD, SSV FURLING CABLE	1	EA

- Monopole towers provided by American Resource & Energy (ARE) will require different hardware to mount the furling assembly.

Item Number	Item Description	Qty.	Unit
HA0005	WINCH XL FURL - MONOPOLE TWR	1	EA
11601-PLT	WINCH DRIVE HANDLE	1	EA
HB6016	BOLT 3/8"-16x 1-1/2",HH,G5,S.S	3	EA
HW6004	WASHER 3/8 SAE FLAT SS 13/16OD	6	EA
HW6002	WASHER 3/8 SPLIT LOCK SS	3	EA
HN6001	NUT 3/8-16 HEX SS	3	EA

- Tower connection shall be made using either nine 5/8" bolts or six 3/4" bolts using the patterns illustrated below: The bolt lengths below are based on a 3/4" tower flange. If the flange is not 3/4" the bolt length should be adjusted accordingly.

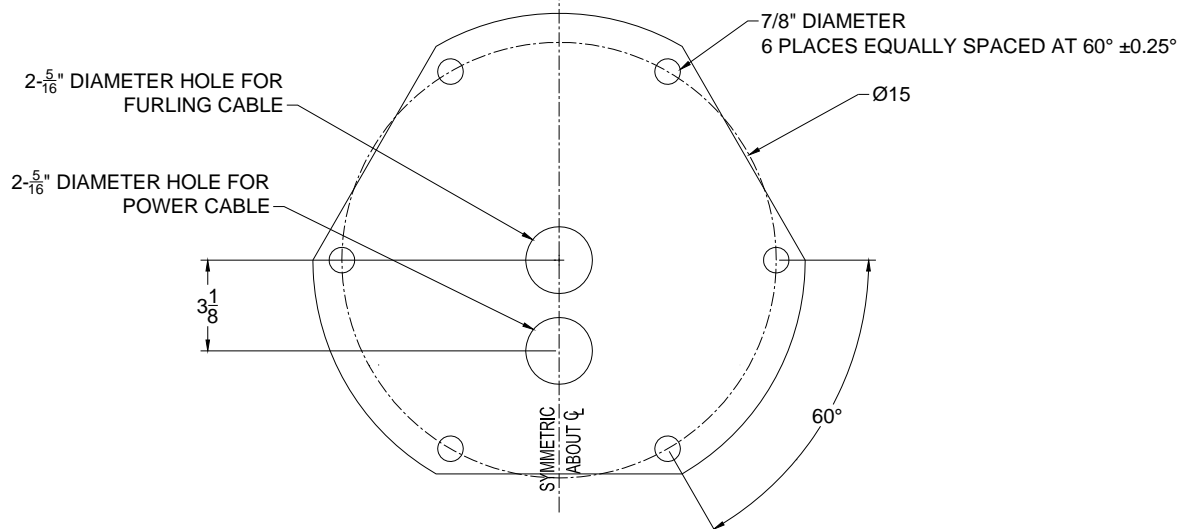
FOR 9 X 5/8" BOLT MOUNTING



Item Number	Item Description	Qty.	Unit
HBA011	BOLT 5/8"-11 x 2-1/2" HH A325	9	EA
HNA008	NUT 5/8"-11 HEX A563-DH HDG	9	EA
HNA004	PAL NUT 5/8" HDG	9	EA

FOR 6 X 3/4" BOLT MOUNTING

(BWC GL/GLT TOWERS)



Item Number	Item Description	Qty.	Unit
HBB024	BOLT 3/4"-10 X 2.5 A325 HDG	6	EA
HNB011	NUT 3/4"-10 A563-DH HEX HDG	6	EA
HNB008	PAL NUT 3/4" HDG	6	EA