

AWP3.7 Wind Generator



Owners Manual

Version 1.1

African Windpower

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Safety Warning !

1. Electrical Shock hazard

The Wind generator can produce higher than nominal voltages when running open circuit. This is especially dangerous with the higher voltage machines which can produce over 500 volts. Keep the output wires shorted initially and carefully follow the installation instructions.

2. The AWP3.7 is a heavily built machine and can cause injury if not assembled and erected carefully, according to the instructions and using the correct equipment.
3. Do not approach the machine while the blades are spinning-they can cause serious injury!

Notice

African Windpower has made every effort to ensure that the information presented in this manual is accurate but assumes no responsibility for any errors or omissions. Users of this information and AWP products assume full responsibility and risk.

2. Introduction.

This manual contains all necessary information for assembling, operating and maintaining the AWP3.7 Wind generator, in the battery charging configuration, please read it carefully and retain for future reference.

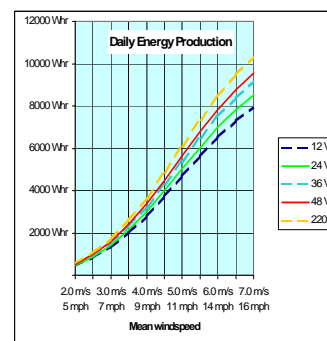
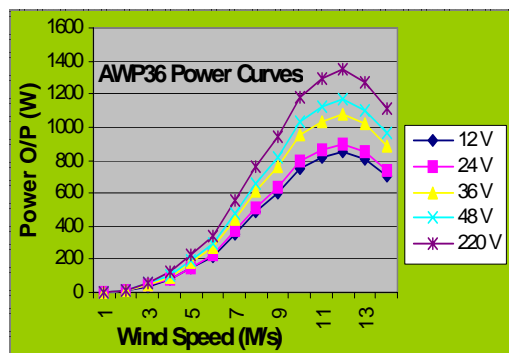
The AWP3.7 is ruggedly built, in the style of the "Heavy Metal School". The 30 pole machine operates at a relatively low RPM, which together with only 3 moving parts, ensures very long life with little maintenance. The high efficiency blades sweep a large area, ensuring maximum energy capture from low wind speeds other machines ignore. The machine is also suitable for high winds with the simple, upwind side furling gravity return yaw system, protecting the machine by reliably swinging the rotor out of winds faster than 12 m/sec (40 Km/Hr).

Other versions of the AWP3.7 can be used for Building Heating, Electric Water Pumping and Inverter Grid Connect.

3. Specifications.

Peak Power Rating	1500 Watts Battery Charging
	2000 Watts – Inverter - Grid Connect
Rated Wind Speed	12m/s
Start up wind Speed	3.5m/sec
Cut in Wind Speed	3m/sec
Energy Production	3m/s 4KWHr/Day - 4m/s 7KWHrs/Day – 5m/s 10KWHr/day
Alternator Design	30 Pole (Ceramic Magnet) Rotor, Laminated Axial Stator
Electrical Output	3 Phase 'Wild' AC, 0-125Hz, 12V,24V,36V,48V,96V,110/220V
Rotor Diameter	3.7 Meters
Maximum RPM	500
Number of Blades	3
Blade Construction	GRP Composite design
Speed/Power Control	Gravity Yaw System
Max Design Wind Speed	60m/sec
Configuration	Upwind Rotor – furling tail
Corrosion protection	Epoxy coated / Marine version hot dip galvanised
Cable Connection	Heavy duty slip rings
Tower Top Mounting	3 Inch (80mm NB) Table D Flange - (4 x M16 Bolts on 150mm PCD)
Tower Top Weight	110Kgs (220 Pounds)
Controller	Turbine Side diversion dump control
Dump Load	Wall mounted resistive heater 2000W
Shipping dimensions	150Kgs (308 Pounds) Crate 1900x 570x 540mm (74x23x21ins)

Performance Curves (AWP3.6)



4. Acquiring a Machine

It is recommended that you purchase an AWP Wind Turbine from a dealer in your country if possible. This should reduce your delivery time and cost, and improve the back up service available to you.

4.1 List of Dealers World Wide

Australia	Australian Windpower Perth	
Canada		
France	Krug SARL	
Greece		
Kenya Uganda Tanzania	Digital Communications Nairobi	
Namibia	HPS Engineering	
New Zealand		
South Africa	Otto Solar Uppington	
South Africa	Jacobs Electrical Carnarvon	
UK	Scoraig Wind Electric Scoraig Scotland	
USA		

If this is not possible then African Windpower can supply you directly from Johannesburg South Africa by Sea or Air or put you in touch with your nearest dealer.

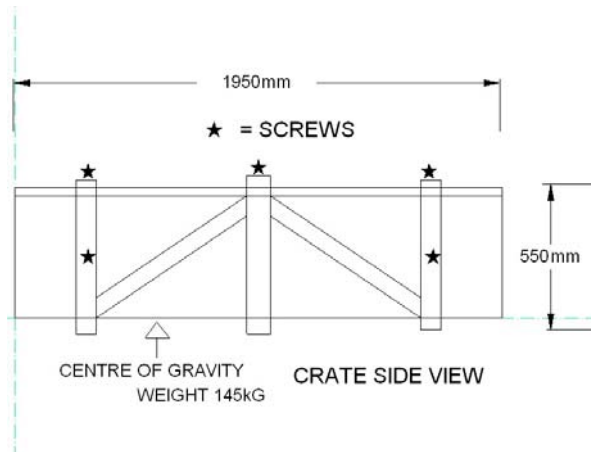
Contact : Oloff Smyth awpower@yoafrica.com +27 84 4444118

4.2 Shipping Crate Dimensions

A complete AWP.3.7 with Controller and Dump Load is packed into a wooden crate 1950mm x 550mm x 550mm (74"x 24"x 24") weighing 145Kgs (250Pounds).

4.3 Unpacking the Crate

The crate lid is secured with 6 posi-drive screws marked by red circles. After removing the blades and tail booms, the two blocking braces should be removed by unscrewing 4 posi drive screws on the sides of the crate also marked by red circles.

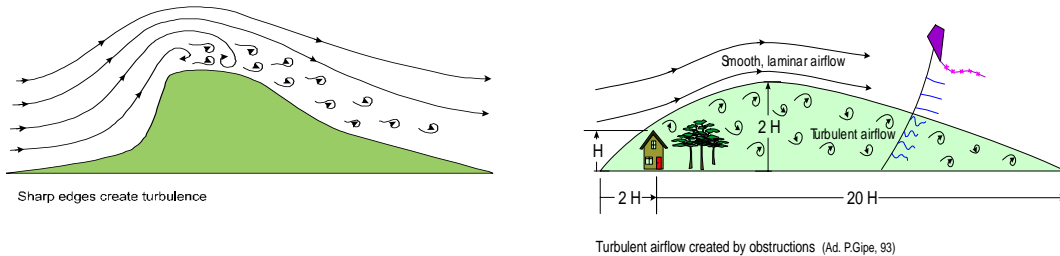


4.4 List of Equipment Supplied

QTY	DESCRIPTION
1	ALTERNATOR (OF CHOSEN VOLTAGE)
1	YAW HEAD EQUIPED WITH SLIP RINGS AND TAIL HINGE PIN FITTED
1	TAIL BOOM FRONT SECTION
1	TAIL BOOM REAR SECTION
1	TAIL FIN SET
3	BLADES –(BALANCED SET)
1	NOSE CONE
1	CONTROLLER
1	DUMP LOAD
1	FITTINGS KIT CONTAINING THE FOLLOWING :
3	ALTERNATOR MOUNTING BOLTS M16 X 30MM , STAR WASHERS
4	YAW HEAD MOUNTING BOLTS M16 X 50 , NYLOCK NUTS, WASHERS
7	TAIL FIN BOLTS M8 X 60MM , NYLOCK NUTS AND WASHERS
2	TAIL BOOM CLAMP BOLTS M8X 100MM, NYLOCK NUTS , WASHERS
1	TOP CAP
2	TOP CAP BOLTS M6X 15, WASHERS
1	CABLE SUPPORT THIMBOLE, M8 BOLT, NYLOCK NUT, 40MM WASHER
3	NOSE CONE BOLTS M6 X 30MM, WASHERS
6	BLADE BOLTS M12 , NYLOCK NUTS, WASHERS
3	BLADE CLAMPING PLATE
3	BLADE CLAMPING PAD
3	NOSE CONE MOUNTING BRACKET
1	TOWER TOP FLANGE AND 4 GUSSETTS
1	USER MANUAL

5 Pre Installation Planning

5.2 Siting The Wind Turbine



To ensure good performance from the Wind Generator it is important that care is taken in the siting of the machine.

Buildings, trees and rocky outcrops etc disrupt the smooth flow of wind creating a wind shear with the wind velocity nearer the ground being slower than higher up.

Turbulence is also created by these obstructions. Turbulence is detrimental as the swirling air causes the Turbine to continuously yaw increasing stress and wear and tear on components and reducing the useful life of the equipment. Therefore, as a general rule the Turbine should be mounted twice as high as any such obstructions. The power obtained from the wind is proportional the cube of the wind speed, and the wind speed increases with height from the ground. A 26% increase in wind speed from a higher tower will yield a 100% increase in power from the turbine.

A little more money spent on a higher tower will harvest the same power as 2 machines!

Preference should be given to the prevailing wind direction but it should be noted that tall features behind the Turbine can also slow down the wind flow through the turbine.

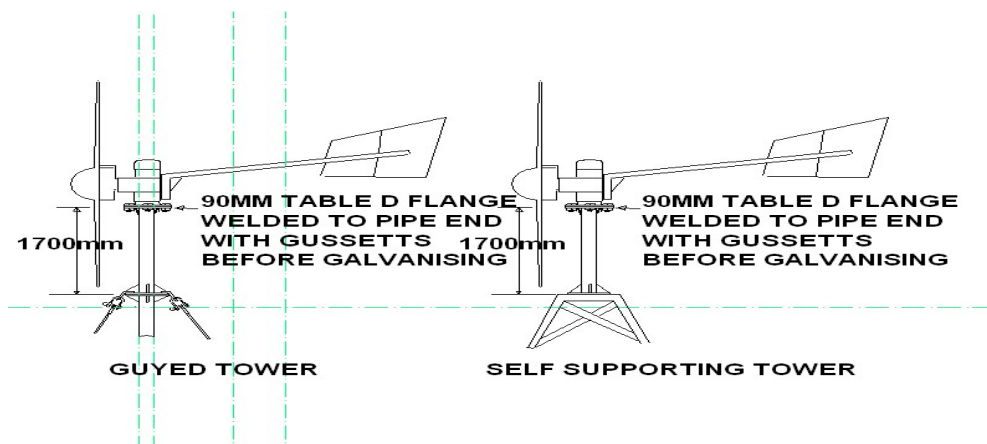
5.3 Tower and Rigging

Great care should be taken in the selection and preparation of the wind turbine tower as this is the most difficult and crucial aspect of the entire installation. Towers can be the triangulated self supporting type used with traditional wind rose water pumps however they are normally about 8 meters high with surrounding established trees out growing them. Greater heights can only economically be achieved with guyed towers. They can be tubular tilt up or fixed lattice types. Tilt up towers permit assembly and maintenance on the ground while latticed towers make climbing easier and safer.

In all cases it is imperative that the turbine should be mounted on a 90mm pipe extending at least 1700mm from the last flange to which the guys or structure is attached.

There should be a minimum of 300mm measured horizontally from the lowest tip of the blade to any part of the tower. Many blades have had their tips shattered when this has not been observed.

A separate manual covering towers in detail is available.



5.4 Cables, Controller and Battery Bank

The table below indicates the correct cable size for various cable runs.

Machine	20 Meters	50 Metres	100 Meters	200 Meters
12 Volt	10mm	16mm	25mm	35mm
24 Volt	10mm	10mm	16mm	25mm
36 Volt	6mm	10mm	16mm	25mm
48 Volt	6mm	6mm	10mm	16mm
110 Volt	4mm	4mm	6mm	10mm
220 Volt	2.5mm	2.5mm	4mm	4mm

5.5 Tools required.

1	10MM COMBINATION SPANNER OR SOCKET
1	13MM COMBINATION SPANNER AND SOCKET
1	17MM SPANNER
1	19MM COMBINATION SPANNER OR SOCKET
1	24MM COMBINATION SPANNER AND SOCKET
1	SOCKET DRIVER
1	SHIFTING SPANNER/ADJUSTABLE WRENCH 250MM/12INCH
1	SCREW DRIVER
1	SIDE CUTTERS
1	CRIMPING TOOL
1	SMALL HAMMER
1	TEST METER
1	DRILLING MACHINE AND 9MM DRILL BIT
1	LOCKTITE

5.6 Other Items Required

	Insulation Tape
	Flexible Drop Cable and Lugs to suit
	Armoured 3 core cable or house wire and conduit
	Batteries, Clamps and Battery cable
	Charger Fuse
	Main Battery Fuse
	Inverter and AC Wiring

6 Assembly Instructions

- Install the Controller, Dump Load, Battery, Fuses and Cables first so that you can control the Turbine when the tower is lifted, in a safe and orderly manner.
- It is best to assemble the machine while on the ground, onto a lowered tilt-up tower, which can then be raised. Due to the considerable weight of the generator (125 kg), it is difficult and dangerous to attach it to a tower already erected.
- Before assembling the turbine to the tower top, the tower should be first be assembled and raised, all rigging should be adjusted to ensure that the tower is straight and vertical, so that the tower can be raised and lowered without problems
- Although one person can assemble the machine with mechanical aids, it is advisable to have an assistant since many parts are heavy and cumbersome to manoeuvre into position. At least two people are needed to raise the machine.
- Keep the alternator wrapped in the plastic sheeting as long as possible to prevent dirt or metal objects from entering the alternator and becoming lodged between the magnets and the rotor.
- Check that all components as listed are present. Open the yaw head inspection door and check the slip ring brushes are running true and all the connections are tight.

6.1 Charge Controller and Dump Load

The charge controller supplied by AWP contains a three phase rectifier, a DC meter, a Dump Load Controller, and a Turbine Brake Switch.

The terminals are marked as shown below. The three cables from the alternator connect to the Brass screw terminals marked L1, L2 and L3.

BAT +	+	DUMP -	BATT -	SHUNT
L1		L2		L3

The Battery and Dump Load must be connected to the Marked Terminals using 6mm lugs. Take care not to reverse the Battery Cables as this WILL damage the rectifier diodes.

The controller should be located near the batteries in a well ventilated, dry room.

The battery should be protected by fuses to the controller and the load (inverter etc).

Do not use only one fuse as the inverter could be left connected directly to the wind turbine in the event of the fuse blowing and could be damaged if the dump load circuit was not connected or functioning correctly.

Make sure that the cables from the controller to the battery and the dump load are both rated for the full output current of the turbine.

Make sure the links and connections in the Dump Load are correct for the voltage of the system, and And are all tight.



CAUTION : Before removing the short on the alternator wires make sure all the controller connections are correct and secure. (If you allow the turbine to run and feed power to the controller with no battery or dump load connected, the resulting high voltages will destroy the PWM circuit and possibly the rectifiers.

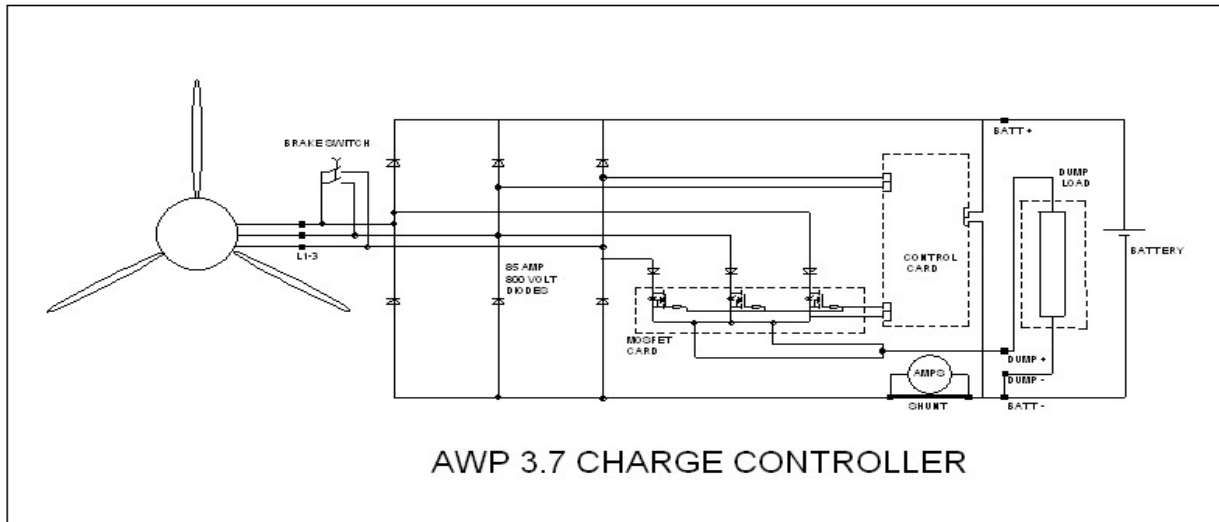


Dump Load and Controller

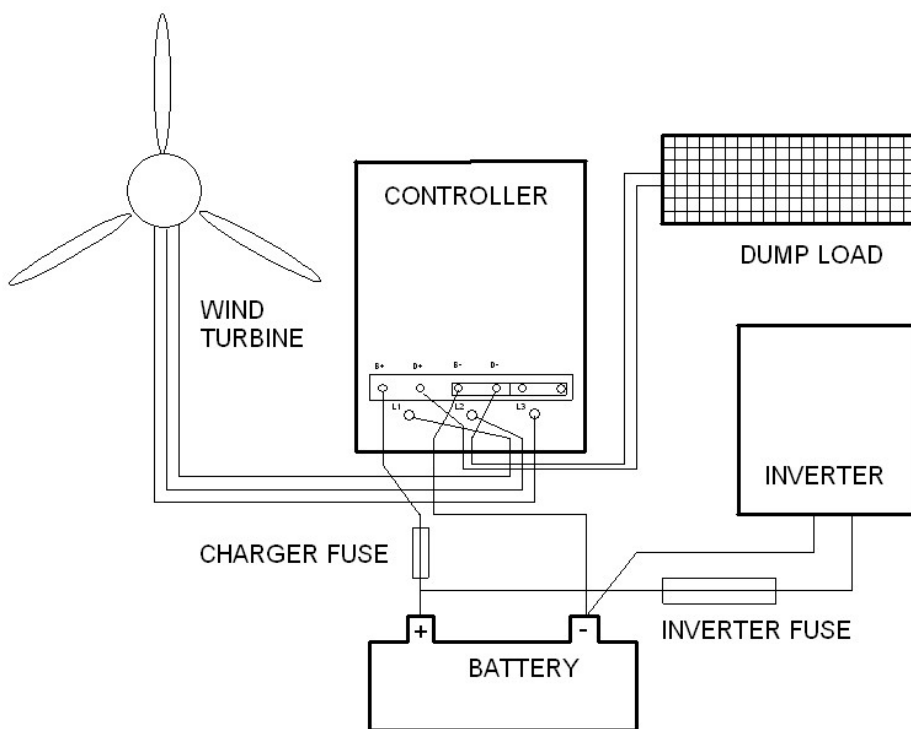


Open Controller

Controller Schematic Diagram



Inter Connections



Wind Turbine Assembly Procedure :

Slip Ring Version

Yaw Head

- a. The top of the lowered tower should be supported about 1,5 meters off the ground. (1)
- b. Drill a 9mm hole through the tower pipe 60mm from the top flange(2).
- c. Pull the drop cable through the tower with fence wire or something suitable, make a loop 300mm from the end, place it over the thimble and secure with cable ties (3).



1

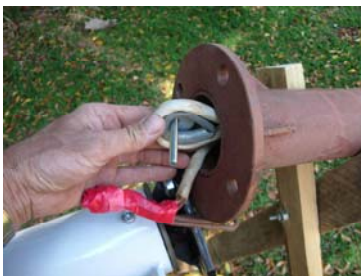


2



3

- d. Attach the yaw head to the top flange loosely with one of the M16 x 50 bolts (3)
- e. Connect the three cables from the slip rings in the yaw head to the three drop wires using split nuts, crimped ferrules or crimped lugs bolted together. Take great care to insulate the connections with a large amount of insulation tape to prevent wear through due to vibrations (4).
- f. Through the drilled hole, bolt the thimble to the internal side wall of the tower pipe making sure the large flat washer is on the inner side of the thimble (3)
- g. Push the joined cables into the tower and secure the yaw head with the remaining bolts (4).
- h. Swing the yaw head up into position and tighten the 4 x M16 x 50mm bolts(5)
- i. Fit and secure the top cap with the two M6 x 15mm bolts (6).



4



5



6

Alternator

- j. The alternator weighs about 75 Kgs and is very awkward to hold, so plan this carefully. The tail gate of a pick up works well, or you could use a wheel barrow or drum etc. (7)
- k. Line up the bolt holes and pass the cables through the correct hole provided. Take care not to crush the cable while doing this and tighten the 24mm bolts with lock washers after first putting some lock tight on the threads (8)
- l. Screw one blade stud (short threaded end) into one hole in the front of the alternator. Ensure the leads are not touching each other or parts of the yaw head. Use the blade bolt to turn the alternator – it should turn freely. Short the three leads together and turn again. It should be difficult to turn (9).
- m. Bolt the other 5 blade bolts into place (short threads into alternator) (9).



7



8



9

Tail

- n. Remove the tail hinge pin and attach the front tail boom section (10). Tighten the tail hinge pin nut so that the bolt is tight against the lugs and can not turn (11)..
- o. Attach the rear tail boom section the front section using the two angle clamps and M8 x 100mm bolts.
- p. Attach the tail fins to the rear tail boom section with M8 x 60 bolts and make sure the two M5 anti rattle bolts are fitted to the top and bottom of the tail fin (12).



10



11



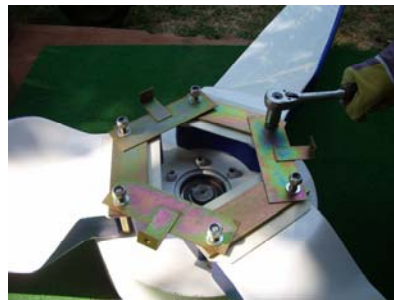
12

Blades

- q. Mount the blades onto the blade bolts with the flatter side facing away from the alternator(13)
- r. Fit the flexible blade clamping pads onto the blade bolts directly over each blade, followed by the blade clamping plates, then fit the nose cone brackets to the blade bolts between the blades, with the threaded tabs facing away from the alternator face. Fit the washers and M12 nylock nuts to the blade bolts and tighten the nuts on one blade to 10 N-m of torque (14) and lightly tighten the other two blades.
- s. Measure the tip to tip spacing to ensure that they are within 5mm of each other. If not, adjust the spacing by holding the tightened blade and bump the other two by hand (16). When correct tighten all the nuts to 20 N-m (15 ft lbs) of torque.
- t. Fit nose cone and bolt on with M6 x 30mm bolts and washers (15).



13

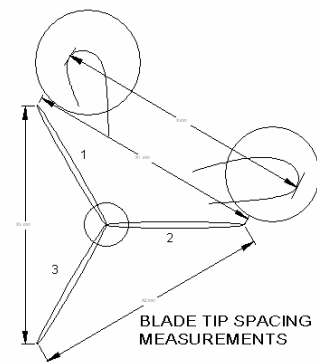


14



15

- u. Check that the rotor can turn freely and that the blades pass by the tower at equal distances. If there is more than 15mm difference loosen the blade bolts and fit small shims of thin plastic (such as pieces of plastic bottles) between the blade and generator.
- v. Connect the cables from the alternator to the slip ring terminals and make sure all is in order in the terminal box. Close the door and screw down the locking screw. Connect all the cables through to the controller. Make sure everything is connected up in the controller including the battery, to prevent damage when the turbine runs. Place the brake switch in the Stop position.



- w. Check that the rotor has resistance to turning resistance to turning the rotor.
- x. Raise the tower and secure guy cables.
- y. Switch the Brake switch to run. If there is sufficient wind the turbine will start turning and the ammeter will show the amperage flowing into the battery. Check that Dumping occurs when the recommended Battery Float Voltage is reached.
- z. Check that there is no vibration or untoward noises coming from the turbine. Secure all rigging on the tower.

8. Inspection and Maintenance

- a. **Wind Turbine-** The turbine has been designed to operate with a minimum of maintenance.
- Every 6 months check excessive twisting of the electrical cables inside the tower and if necessary disconnect at tower base and untwist (Non Slip Ring Versions). Listen for unusual alternator or blade noise and look for excessive vibration which would all call for close inspection.
 - Inspect the blades for leading edge wear and apply grease to all lubricating points. This should be done either by lowering the tower or by climbing it.

b. Tower

Every 6 months

- Check that the guys are tight. Check that the guy cable clamps are tight by ensuring that there is still a slack loop between the upper most clamp and the next lower one.
- Check that the shackles are tight.
- Check that the stay rod bolts are still locked together.
- Check all cables for excess fraying or rust.

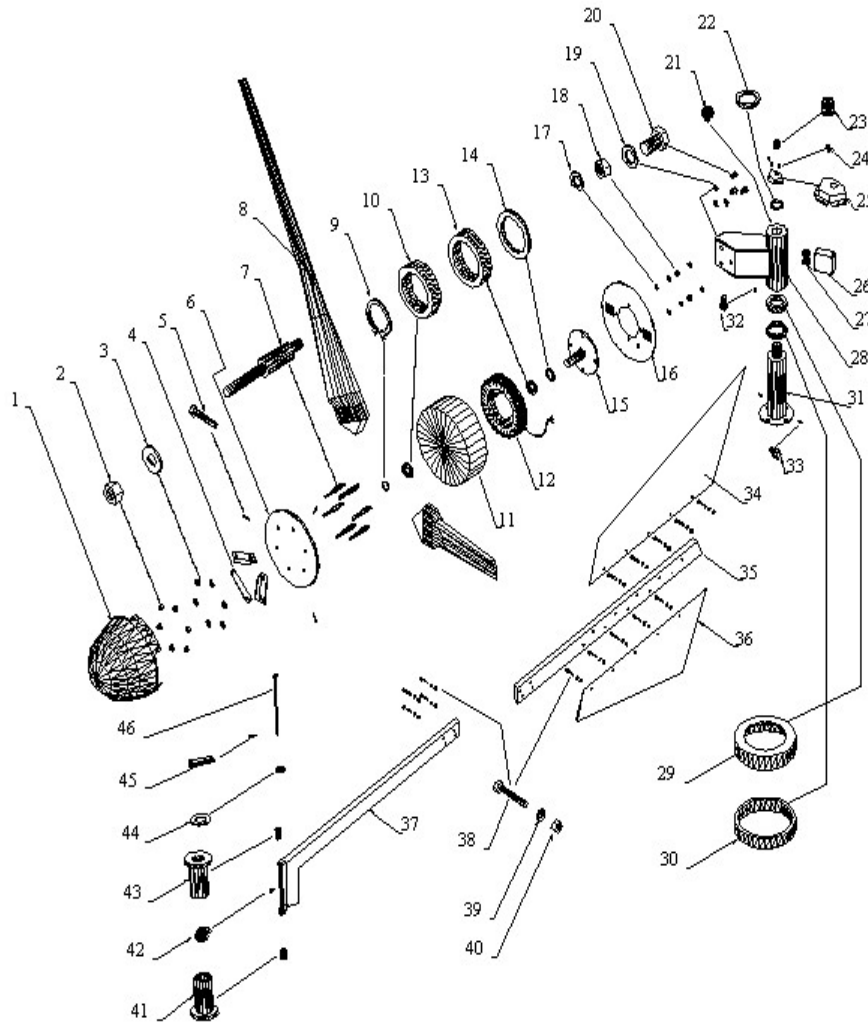
Every 12 months

- Check the upper guy joints for wear and rust
- Paint all exposed metal parts.

9. Fault Finding

Symptoms	Possible Causes	Solutions
Turbine Fails to Turn in good wind	Shorted cables Shorted diodes Failed bearings Foreign body in generator	Remove short Replace faulty diode(s) Replace Remove obstruction
Turbine turns slowly in good wind	Partial short in cables 1 diode short	Remove short Replace diode
Turbine growls and amps are low	1 phase open circuit Faulty diodes	Repair open circuit Replace diodes
Low output batteries flat	Insufficient wind High power usage	Improve tower siting/height Economise on power use
Turbine vibrates excessively	Blades out of balance Yaw bearing worn	Check blade geometry/balance Replace yaw bearing
Turbine fails to swing into the wind	Tower top not vertical Yaw bearing worn/broken	Adjust guy cables Replace yaw bearing
Turbine running at high speed no output	Cables disconnected Battery Fuse blown Controller Ammeter open circuit	Fix cables Replace fuse Replace meter

10. Exploded View and Parts List (AWP3.6)



11. Warrantee

African Windpower Warrantee

Wind generators, controllers, and associated equipment manufactured by African Windpower and distributed by ***Distributor*** are warranted against defects in design, material, and workmanship for normal use for which intended. The warranty period extends one year from installation or two years from the date of purchase by the user, whichever comes first. During the warranty period AWP will repair or replace, at its option, defective components and assemblies. In __COUNTRY__ warranty service for AWP is provided by ***Distributor***. Customers should ship defective components and assemblies to ***Distributor*** at their own expense for repair or replacement. Return shipping will be provided. Please call ***Distributor*** and make arrangements before shipping.

This limited warranty does not cover the following:

Towers, equipment, materials, or supplies not manufactured by AWP.
 AWP equipment that has been improperly installed or modified without approval from AWP or ***Distributor***
 Damage or loss from winds in excess of 45 m/s (100 mph)
 Lightning damage or other acts of God.
 Incidental or consequential damages.

AWP reserves the right to make design changes, improvements, or additions to its products without obligation to install such changes or improvements in existing products.

This warranty may be extended to five years by the purchase of an extended warranty. The extended warranty shall have the same terms and conditions, except it shall be in force for 5 years from the date of installation.

12. One last thing

Try not to get friends like this to help...

