

How to install AEA’s 10-meter meteorological tower

Before you start: This guide assumes that you have obtained permission from the land owner, consulted with US Fish & Wildlife Service and obtained approval from the FAA prior to erecting a tower at your site. The guide is intended for AEA’s custom portable met tower and may not be applicable to other systems.

Tools and supplies you will need:

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|--|-----------------------------------|
| Pliers or channel locks | Cutting pliers to snip zip ties |
| Handheld sledgehammer | Two 5/16 inch nut drivers |
| Tape measure - 20’ | Two 7/16 inch nut drivers |
| One role of electrical tape | Small piece of 2 x 4 scrap lumber |
| Hardhat and safety goggles | Knife or box cutter |
| ½ inch, 9/16 inch socket wrench or crescent wrench | Phillips head screwdriver |
| 15/16 inch socket wrench or large adjustable crescent wrench | |

Site selection criteria: You should select a site that is flat enough to allow laying the tower out on the ground to assemble the poles and attach the instruments and data cables prior to raising your met tower. The site should have minimal vegetative cover with nothing taller than shrubs with open grass or tundra preferred. Logging clear cuts have been used as well. Basically you want to choose a site where your instrumentation is well above the surrounding vegetation and any terrain that could block the winds. The anchors are placed 6 meters (20 feet) from the base plate in the four cardinal directions. You will want to layout the tower poles pointing north from the base plate so that the instrument boom will be pointing south as you raise the tower. For safety reasons, AEA does not recommend installing met towers in high-traffic areas. Consider guy wire guards or other clear marking if people may be riding snowmobiles or four wheelers near your tower.

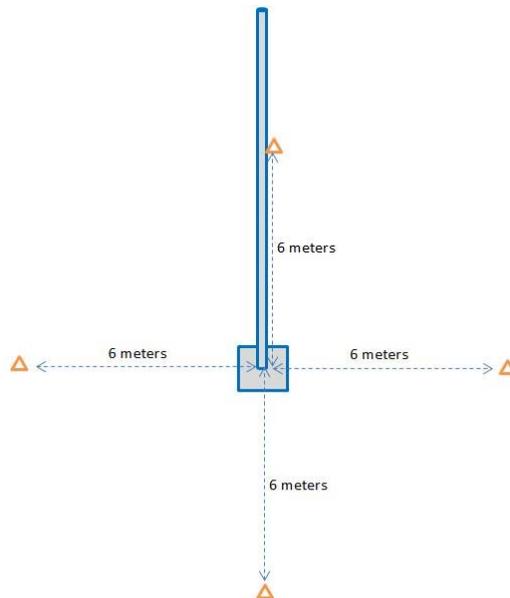


Figure 1 – Tower assembly layout on the ground. Triangles represent anchors. North is up.

Install the anchors:

This is usually the hardest step of a met tower installation. Choose the proper anchor for your soil condition. The standard tower kit comes with four duckbill anchors, but you may wish to substitute with screw-in earth anchors, rock anchors or other options based on soil conditions so long as the anchors are capable of supporting the load of the tower. When driving the duckbill anchors with a drive rod or screwing in earth anchors, make sure that the anchor is placed so that it is in line with the load on the guy wires. **Always wear eye protection when using a sledgehammer or similar device to drive anchors as metal fragments can fly off when striking the drive rod.**

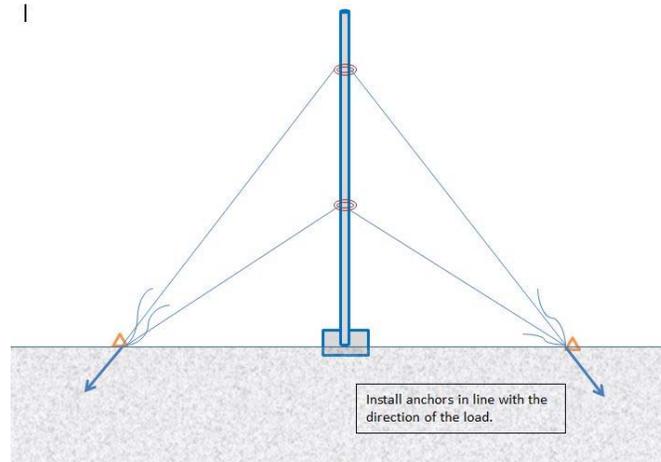


Figure 2 - Tower and anchors side view.

Assembling the base plate:

Lay the base plate sheets flush to each other with the cleats on the outside edge pointing toward the ground. Insert the eight bolts through the oval holes pointing upward.



Figure 3 – Base plate bolts

Set the base plate cross pieces over the bolts with the flange pointing out. Hand-tighten the nuts onto each bolt.



Figure 4 – Cross pieces on with bolts hand-tightened.

Find the tower pipe section with a large hole at the end. Place this between the base plate cross pieces and insert the large bolt through the pipe and cross pieces. Use a 15/16 inch wrench to tighten the nut. You may need a second wrench to hold the bolt while you tighten the nut. Make sure the opposite end of the pipe section is pointing toward North.



Figure 5 – Tower pipe and baseplate.

Tower and guy wires:

Find the pipe section with two screw holes drilled near the top. Set it aside until you are ready to install the last pipe piece which holds the instrument boom.

Add two more pipe sections on to the tower pipe, then slide the collar with the short guy wires over that third pipe section down to the base of the third pipe section (see Figure 12). To avoid kinks in the guy wires, uncoil each one as if you were rolling a wheel. Start with the side (East and West) anchors first. Thread each guy wire through its anchor, pulling the wire snug but not too tight. Secure the guy wire with a U bolt using a 5/16" inch nut driver. Make note of the slack in each side wire, then thread the back guy wire through the anchor next to the main pipe

and leave a similar amount of slack before securing that wire with a U bolt. Layout the guy wire to the south - it will not reach all the way to the anchor.

Have someone stand on the base plate while you place a board on top of the third pipe section and gently hammer/tap those pipe sections in place. **Do not try to hammer the pipe without a board or you will deform the pipe section.**

Add the last remaining sections of pipe. The top section of pipe should be the piece that you set aside earlier with two holes drilled at the top. Gently hammer/tap these pipe sections into place as well. Now the collar with the long guy wires over that top pipe section down to the base of the top pipe section. Again, to avoid kinks in the guy wires, uncoil each one as if you were rolling a wheel. Start with the side (East and West) anchors first. Thread each guy wire through its anchor, pulling the wire snug but not too tight. Secure the guy wire with a U bolt using a 5/16" inch nut driver making sure that the upper guy wire is not tangled with the lower guy wire. Make note of the slack in each side wire, then thread the back/North guy wire through the anchor next to the main pipe and leave a similar amount of slack before securing that wire with a U bolt. Layout the guy wire to the south - it will not reach all the way to the anchor.

If you will be installing bird diverters, attach one on each guy wire anywhere from ½ to 2/3 of the distance from the anchor to the collar/pipe. Standard AEA bird diverters require a 7/16" nut driver.

Boom, sensors and data logger: *(You may wish to do this step in advance or have someone perform these tasks while the baseplate and tower sections are being assembled.)*

Assembly of the sensors and boom can be done indoors to prevent dropping screws into the snow. Details of how to program up the data logger can be found in the Power Predictor manual included with the tower kit. There is an activation code on the back cover of this manual. Write this number down in a safe place or take a photo as you will need it when you set up your account online. Install a 2-GB SD card into the spring-loaded slot at the top of the data logger. **Data cards larger than 2 GB will not work with this data logger.**

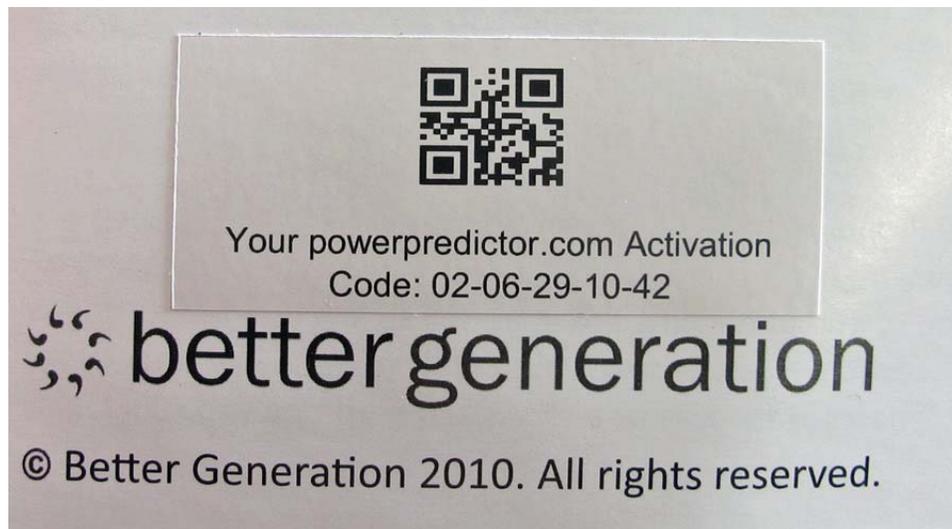


Figure 6 – Datalogger activation code.

When sliding out the printed circuit board to install or change the 9 V battery on the data logger it is critical that you first unscrew the compression fitting on the data cable where it enters the bottom of the data logger and feed in some cable slack, otherwise you could pull the connection loose damaging the data logger.



Figure 7 - Loosen the compression fitting and install the battery.

To set the date and time, press the left button on the top of the data logger. Use the right button to advance the display to the correct year. Press the left button again and use the right button to advance the display to the correct month. Press the left button again and use the right button to advance the display to the correct date. Use the left, then right button to advance the display to the correct hour. Press the left button again and use the right button to advance the display to the correct minute. When the data logger is programmed the correct time should appear on the display and the letter "R" will indicate when the unit is recording. If the "R" is not displayed, press the right button one time. Leave the timeout at five minutes. The time, wind speed and solar value will also appear on the main display.



Figure 9 - Setting the date and time.

The boom has been designed to place the sensor far enough from the main pipe to minimize wind flow interference near the pipe that could affect your readings. Using a Phillips head screwdriver, install the anemometer/vane sensor at the end of the sensor boom. Make sure the anemometer cups are down, the solar detector is pointed out and up and the vane can swing freely without hitting the boom.



Figure 10 - Sensor assembly installed on boom

Place the boom against the top section of pipe, ensuring that the anemometer cups are still down and the wind vane is up. Insert the two long bolts and tighten the knots using a ½ inch socket or crescent wrench. You will need a pair of pliers to hold the bolt while tightening the nut. Do not over tighten the bolts as this will warp the pipe.



Figure 11 - Attaching the boom to the tower pipe.

Note that the screws that mount the boom have the added benefit of preventing birds from trying to nest in the top of the pipe and falling down getting stuck and dying. If you choose to mount a different type of sensor assembly, you should still install the screws to prevent avian fatalities.

The sensor boom should now be pointing straight up so that the solar sensor will be facing due south the tower is raised. Unravel the data cable and attach to the pipe every four or 5 feet using electrical or duct tape. When you come across a guy wire collar, allow enough slack so that the data cable will not rub against the collar edge. Secure the data cable with tape on both sides of the collar.

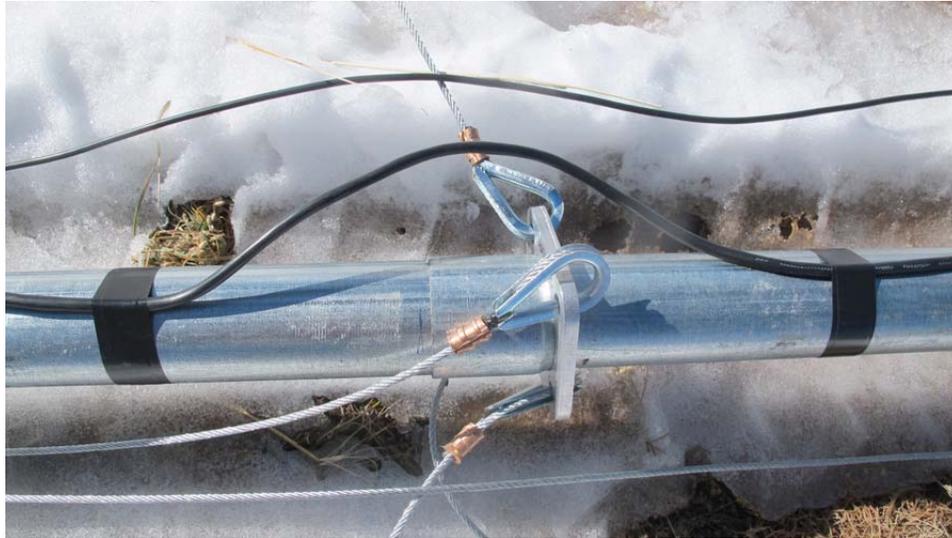


Figure 12 - Provide slack in the data cable where it crosses a guy wire collar.

Attach the daily cable extension and then connect to the data logger, coiling up any excess cable links and taping this to the main pipe about chest high. Snap the data logger on to the main pipe about 4 feet above ground level. Press the right button on the data logger to start recording and test the anemometer and wind vane.

Raising the met tower:

The key to successfully raising the met tower is to ensure that the person pulling the South guy wires maintains sufficient tension on the pipe as the other person is lifting and walking the pipe up. Inadequate attention could cause the pipe to bow and separate at one of the intersections. The person pulling on the guy wire should be strong and prepared to get their whole body weight into the lifting operation. They should have a 5/16 inch nut driver in an accessible pocket and the U-bolts should be threaded through the cable. If there's a heavy rock or a toolbox, place it on the baseplate to keep it stationary during the lift operation. Otherwise expect that it may rotate somewhat.

The pipe lifter begins lifting at the sensor boom raising the pipe over their head and walking the pipe forward and upward as the guy wire puller maintains tension on the top guy wire. **A hardhat is recommended for this step.** If the winds are strong out of the South, you may need to people pulling on guy wires. If it's too windy you may have to wait for a calmer day. The pipe lifter will need to stand on the baseplate and support the pipe while the puller secures the guy wires with you bolts. Now is the time to see if you allowed the proper amount of slack on the back/North guy wires.

Once the South guy wires are secured, inspect the tower straightness from all four anchors. You may need to allow some slack on one side and provide tension on the opposite side to square up the tower. Adjust the bottom set of guy wires first at all anchors and then adjust the top set of guy wires. At this step it helps to have two 5/16 inch nut drivers so that both people can make final adjustments.

Check all your U-bolts one last time and make sure the data logger shows that it is in record (R) mode.

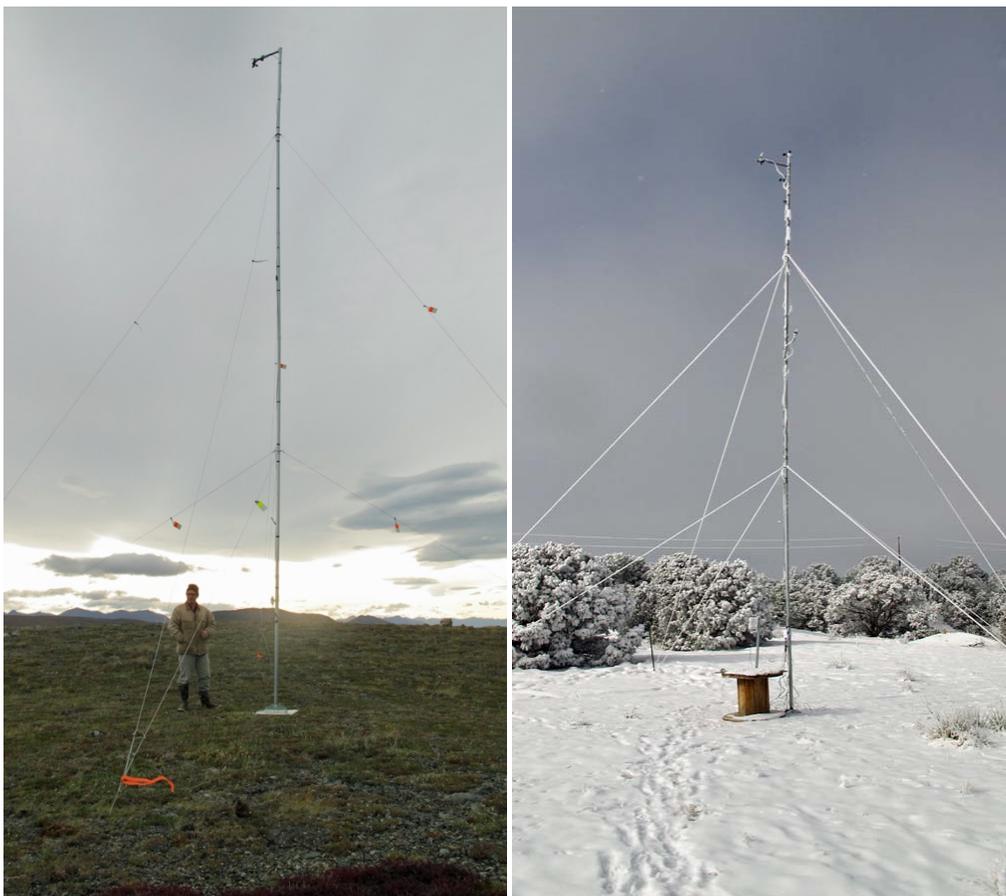


Figure 13 – Successful met tower installations

Check your met tower monthly to retrieve data (bring a spare 2GB SD card or a laptop where you can download the data) and check for signs of bird strikes – carcasses or feathers. If so, lower the tower immediately and contact US Fish & Wildlife Service.

Create an account on www.powerpredictor.com using your activation code and upload your data. Feel free to download your data on the advanced tab and send to the AEA wind program for further analysis at no cost.

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