Here's a simple wire vertical antenna that you can build with ease. An added advantage to this one is that it gets a bit higher off the ground each year.

A Simple Wire Vertical Antenna For 40 Meters

BY ROBERT A. LEHNING*, WA2YSG

Many of us in the ranks of amateur radio have relatively modest stations. After plunking down all that hard-earned cash for a fancy transceiver, there sometimes isn't much left for a huge and expensive, commercially-made antenna. Simple antennas are a basic part of amateur radio, and at one time or another we all have constructed and used one.

This article describes a simple wire vertical which I have built and used with fair success on 40 meters. The beauty of this antenna is that it is made from readily available materials, the cost of which can be reasonable, and the method of support just needs water to get taller. In fact, I found most of the needed material in my junk box. All I had to purchase was some good coaxial cable to use as the feedline to the vertical.

There are several factors to consider when thinking of an antenna of this size. Cost, of course, is one. Another is the weather. Antennas in western New York can take a real beating during the winter months, and antenna design must take into consideration the weather factor. I chose to use wire for this antenna rather than aluminum tubing. I had enough #12 solid copper wire on hand and a large red oak tree for support, allowing me to avoid aluminum tubing and hardware, which would have cost a fortune, and the job of getting it upright into the air in one piece, which would have been a major undertaking.

For this kind of installation some thought also had to be given to the type of rope that was to be used to support the antenna from the tree. A good quality, woven, nylon rope wears well and withstands a lot of weather without having to be replaced every year or two. In the past I have purchased quantities of nylon rope in several diameters and lengths at the Dayton Hamvention at very reasonable prices. Rope usually is also available at local hamfests and hardware or marine stores.

Over the years I have become adept at getting a line over a tree branch to support an antenna. Using a light ⅛ inch nylon line with a 1 inch pipe fitting tied to it, I managed to get a line over a branch in a small fork in the red oak about 40 feet up. Once this was accomplished, I bent a ¼ inch woven nylon rope to it and hauled it up over the branch. This ¼ inch woven nylon rope supports the vertical very nicely. This particular tree has supported several different antennas over the years.

There are many sources for vertical antenna theory and design information. The design information for this antenna was found in *The ARRL Antenna Book*. I used the formula:

$$L \text{ (in feet)} = 234/f \text{ (in MHz)}$$

for the vertical radiator, and

$$L \text{ (in feet)} = 240/f \text{ (in MHz)}$$

for the radials. The radials are 2.5% longer than the vertical radiator. Using the information tabulated in Table I, I cut the radiator and radials for an operating frequency of 7.05 MHz. The radiator and three radials used all the wire I had on hand, but a fourth radial could be added to make a "classic" ground plane.

I allowed about 6 inches extra on the vertical radiator and 3 inches extra on each radial for the installation of the ceramic insulators. If a ceramic insulator were to be used on the ends of the radials, another 3 inches would have to be added per radial. These measurements don't have to be exact. A little less or a little more won't affect the operation of the antenna greatly. These extra dimensions also depend on the size and type of insulators to be used.

The insulators were installed on each end of the vertical radiator after the wire was cut to length and the appropriate amount of insulation was stripped off the wire. The bare wire was fed through one end of each insulator, bent around and wrapped back upon itself, and soldered together. The radials were fed through the remaining hole of the insulator that was to be at the bottom of the antenna and likewise bent and soldered together. When everything was assembled, the rope that I had over the branch was attached to the top insulator, and I hauled

	L (in feet)	
f (in MHz)	**Radiator**	**Radials**
7.0	33.42	34.28
7.05	33.19	34.04
7.1	32.95	33.80
7.15	32.73	33.56
7.2	32.5	33.33
7.25	32.27	33.10

Table I– Dimensions for a 40 meter vertical antenna.

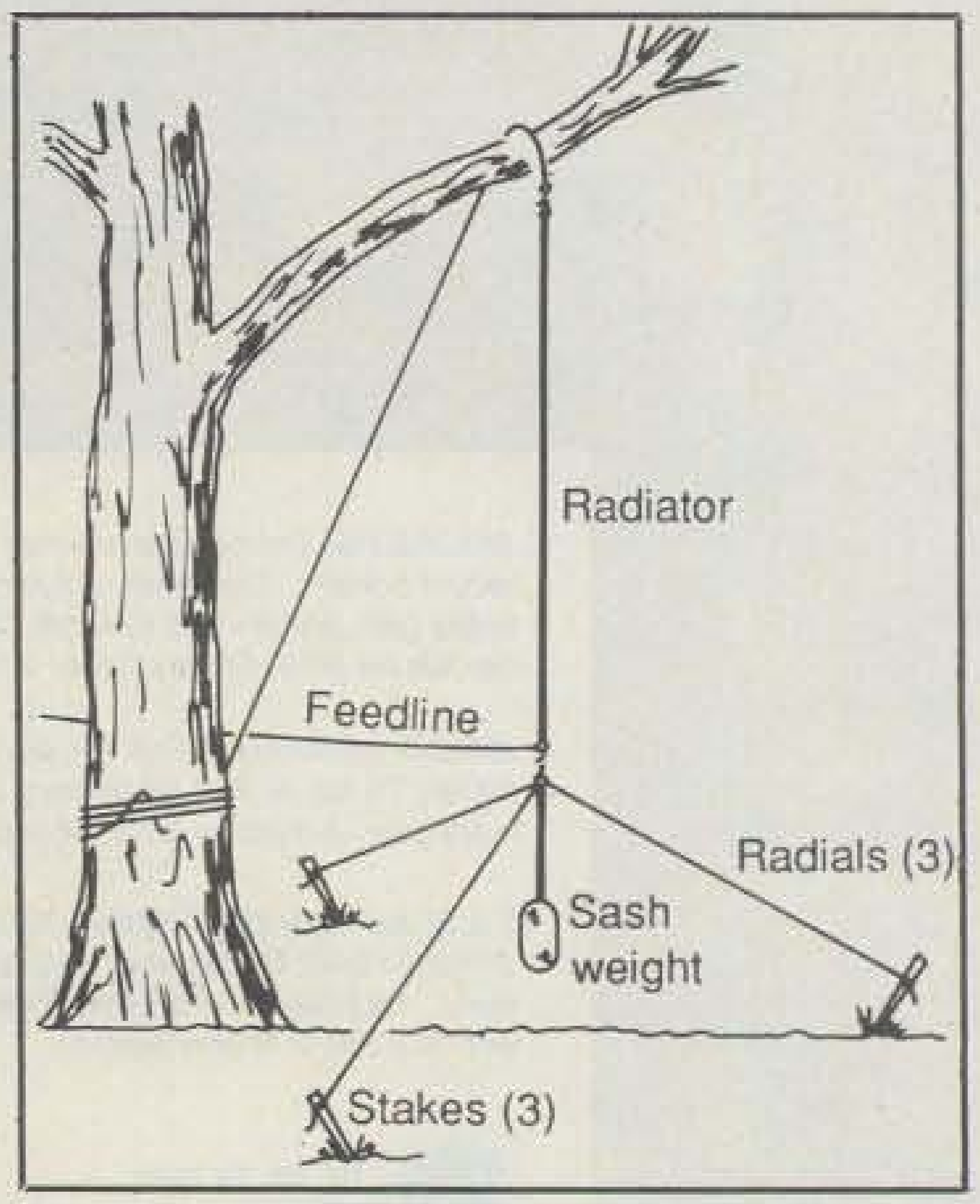

Fig. 1– The tree-mounted 40 meter vertical antenna. The sash weight keeps enough tension on the vertical to keep it straight even in winds.

*1295 Wisconsin Rd., Derby, NY 14047

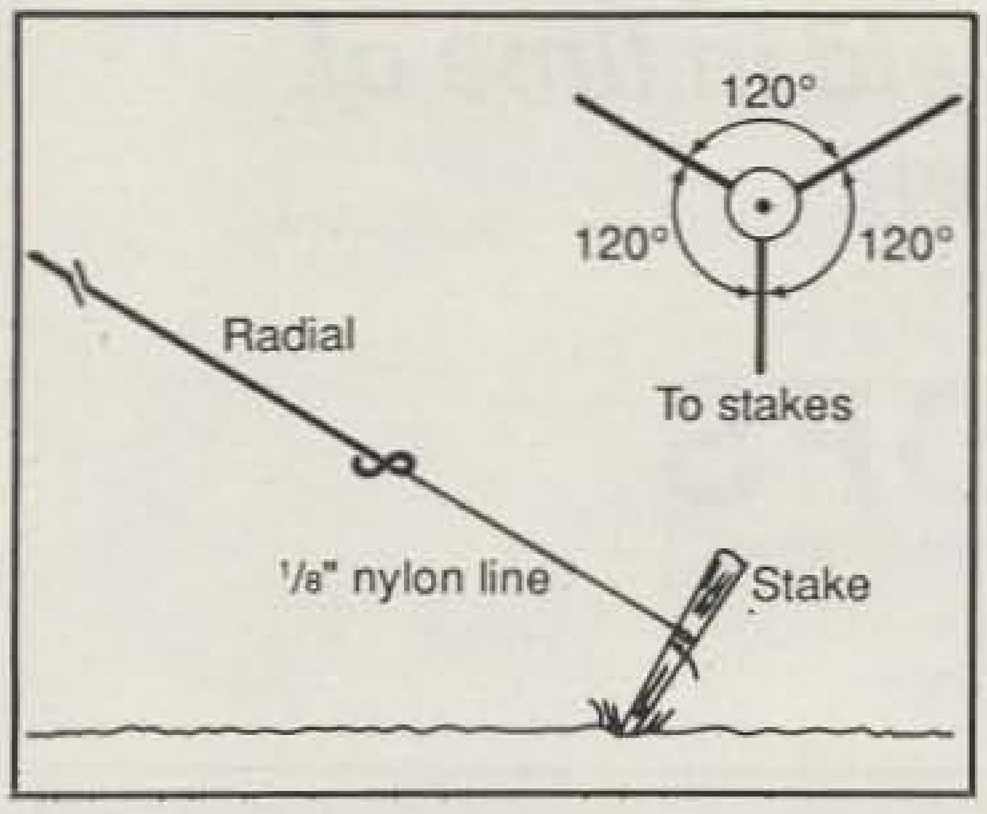

Fig. 2– The method for securing the antenna's radials.

the antenna up into a vertical position. The top insulator was about 40 feet in the air, not quite up to the branch. The bottom insulator was about 7 feet off the ground. I stretched the radials out to stakes which I had already placed in the ground. Using the configuration shown in fig. 2, the radials were tied off to their respective stakes with ⅛ inch nylon line. I bent a loop in the end of each radial to attach the line. I also left some "sag" in each radial.

I then attached a short length of ⅛ inch line to the bottom insulator and hung a small sash weight to keep the antenna straight and taut. Copper wire stretches under stress of this kind, but I have not noticed any change in the operation of the antenna. This weight, coupled with the sag in the radials, allows the antenna to move up and down with the motion of the tree branch when the wind blows. Tying the radials to the stakes keeps the sideways motion to a minimum. I have seen that sash weight move up and down 8 to 10 inches when the wind really gets to howling in off Lake Erie. This antenna has ridden out many storms in this fashion.

When the antenna was up in place, it was time to attach the feedline. I used about 30 feet of RG55 B/U coaxial cable. This cable has a solid center conductor, polyethylene dielectric, and a double braid. It was readily available locally. The specified impedance of this type of cable is 53.5 ohms. This must be considered when the antenna and feedline must show a 50 ohm input impedance to the transmitter or transceiver. Other types of cable can be used depending on the availability and requirements of the particular station. Poly cable is not too difficult to work with when installing connectors or attaching to an antenna. You have to remember that the poly dielectric gets soft and runs when you heat it. I stripped the coax as shown in fig. 3 and soldered the center conductor to the vertical radiator and the braid to the radials.

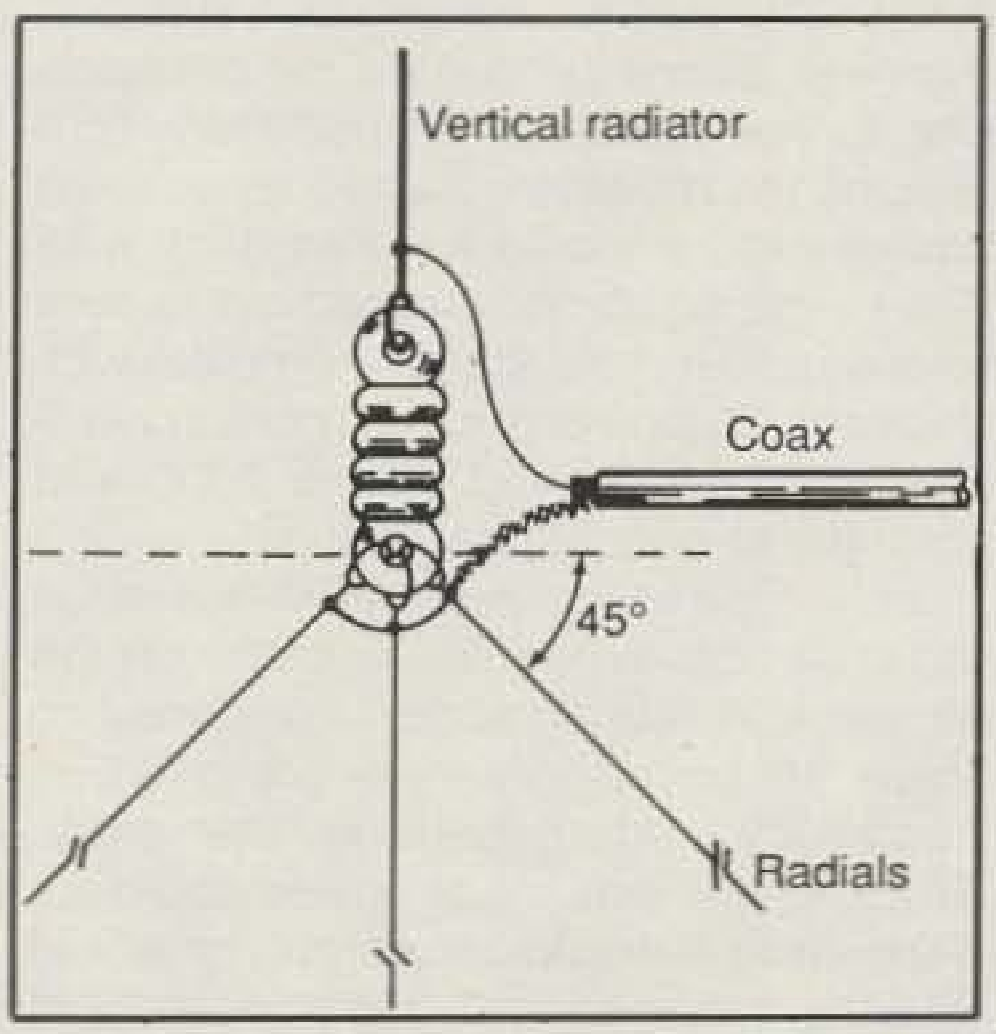

Fig. 3– The simple connections for the 40 meter vertical antenna.

After all the soldered connections were cool, I sprayed a coating of clear acrylic to weatherproof all the exposed metal. I also wrapped a few layers of plastic electrician's tape around the open end of the jacket on the coax. The feedline runs into the house and my shack in a fairly straight line 7 to 8 feet off the ground. It is supported by a line from another tree branch and a line from the gutter on the corner of the porch. Once the cable was into the shack and the entrance weatherproofed with some exterior caulk, I installed a coaxial connector on the end to attach the antenna/feedline to my transceiver.

Initial tests indicated a VSWR of about 1.15 to 1. As my transceiver has a built-in power reduction circuit to protect the finals from high VSWR, this was acceptable. Over the last two years I have noticed very little change in the VSWR and antenna performance.

While vertical antennas have several advantages over other types of antennas, they also have several disadvantages. The most notable is the reception of signals from all directions. The noise and QRM at times can be quite overwhelming. However, at the same time there can be a signal in this noise from a station in some faraway place just begging for an answer to his call. Sometimes you just have to contend and cope with noise and QRM.

You must remember that while you are receiving from all directions, when you are transmitting you are also transmitting in all directions. A little discretion is required when the band is crowded with local communications and the station you want to contact is not too strong. This precept applies to all amateur activities on any band. Common sense and courtesy should prevail. You must take into consideration that patience, good listening habits, and determination usually get results.

In the two years that this antenna has been in operation at my QTH, I have managed to work and confirm some 60-odd countries on 40 meters. It has been my experience that if I can hear them, I can usually work them, band conditions and level of activity notwithstanding. I can see no reason why an antenna like this couldn't be used on any of the other amateur bands, including the new WARC bands, with similar results. Who knows? I just might try it. Working DX with a modest station and simple antenna can be very gratifying. CQ