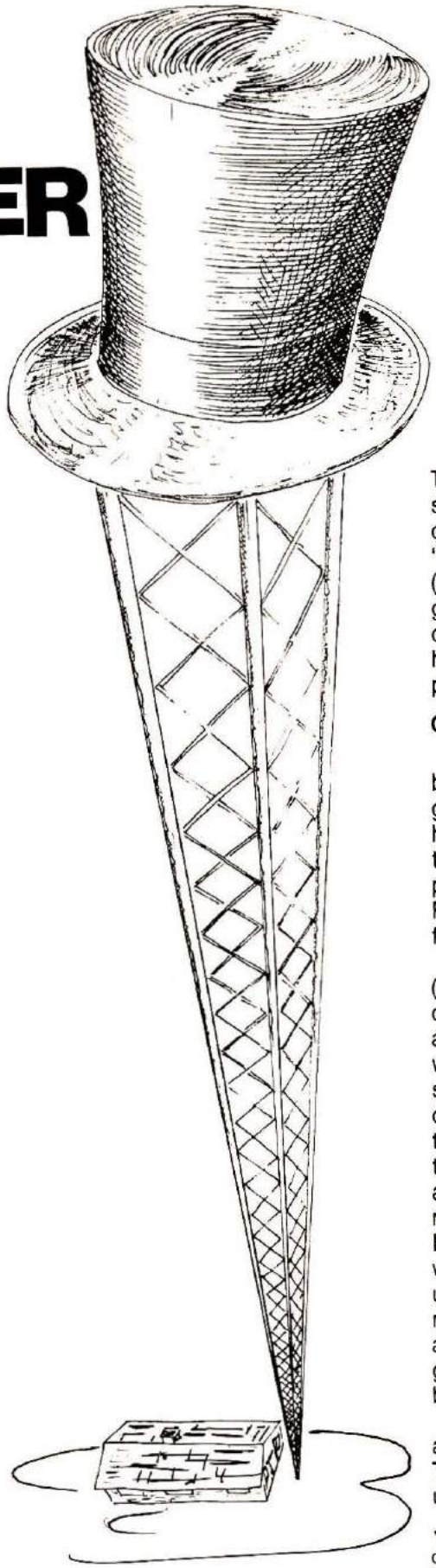
80 METER VERTICAL TOP HAT FOR DX



BY STANLEY SMITHSON

To work DX on 80 meters, you need a lot of real estate for the antenna farm, right? Not necessarily! If you can spare a chunk of yard 50 feet (15m) in diameter, this vertical may be just what you need. It has been used on 80 CW and 75 ssb at W3TQM's station to consistently work Europe, South America, Australia, and New Zealand with only 200 watts input to the final.

Description

Fig. 1 is an isometric sketch of the antenna system. The main pole, 28 feet (8.5m) tall, is mounted on a ground stake with two insulators. The ground stake is a 6-foot (1.8m) galvanized steel pipe driven half-way into the ground.

Four metal guy wires are electrically connected to the top of the main pole. The wires are 39 feet (11.9m) long and terminate at 6-foot (1.8m) vertical poles spaced at 90-degree intervals about the main pole, to form a capacitive "top hat." With this arrangement, the current near the top of the vertical can be much higher than that of a base- or center-loaded whip. In addition, the *Q* of this antenna is lower than that of a whip of the same height, giving it greater bandwidth.

Sixteen radials, each 25 feet (7.6m) long, are spaced evenly on the ground, and radiate outward from the ground stake at the base of the main pole. They are not buried, but are securely fastened to the turf at one-foot (30cm) intervals with "hairpins" of no. 15 (approximately 1.4 metric gauge) galvanized wire. A year of lawn mowing at our station has not disturbed the ground plane.

Construction

To build this vertical, begin by driving a 6-foot (1.8m) galvanized steel ground stake half-way into the dirt. I used a two-inch (5cm) diameter "line post" of the type sold by Sears Roebuck or Montgomery Ward for chain-link fencing.

Next, assemble the 28-foot (8.5m) main pole. This can be done with telescoping aluminum tubing, as I did, or with other material.* **Fig. 2** shows two suggested methods of assembly. My antenna used the system of **Fig. 2A**, but if telescoping tubing is not available, the "lap joint" method of **Fig. 2B** can be used. Either aluminum or steel pipe will work. But *beware* — if you use commonly available TV masting, remove the paint or anodized coating to insure good electrical contact between sections.

The four top-hat wires are attached as shown in **Fig. 3**. They are 39 feet (11.9m) long. I used 15-gauge (approximately

*I obtained the aluminum from a mail-order firm, and you could do the same. Write to Smithe Aluminum, Box 442, Laurel, Maryland 20810.

1.4 metric gauge) aluminum wire in the first model, but found that 17-gauge galvanized electric fence wire works just as well in the second model. Both are available through the Sears Roebuck catalog.

Mount the main pole on the ground stake as shown in **Fig. 4**. Insulate it with two pieces of 2-inch (5cm) black polyethylene plastic pipe. These are 2 inches (5cm) long and are slit along their length with a hacksaw to form insulators shaped like the letter C. Wrap them around the base of the main pole. Exercise care to overlap the cut ends of the insulator, or to adjust the gap so the hose clamp does not short against the main pole. Allow 2 inches (5cm) of space between ground and the bottom of the main pole.

In my installation, I used two hose clamps to wrap around each insulator. The slotted, stainless-steel band of one was pulled taut by the worm of the other, giving the effect of using one large clamp. If you cannot find large clamps to do the job, you can copy my procedure. I used this trick only because the junk box coughed up a bag of smaller hose clamps.

Clamps of the type needed are available at most hardware and auto parts stores. They are also available in the plumbing department at Sears Roebuck and Montgomery Ward.

While you're perusing **Fig. 4**, go ahead and install two more

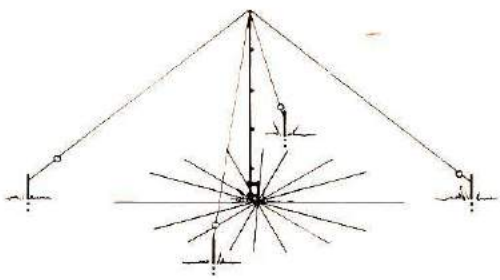


Fig. 1. Is a view of the top-hat vertical antenna for 75 and 80 meters. Center pole is only 28 feet (8.5m) high, radials are 25 feet (7.6m) long, and top-hat wires are 39 feet (11.9m) long. This antenna is very effective for DX operation, and feedline matching does not appear to be a problem. A simple tuning network may be used if desired. See text and **Fig. 5** for details.

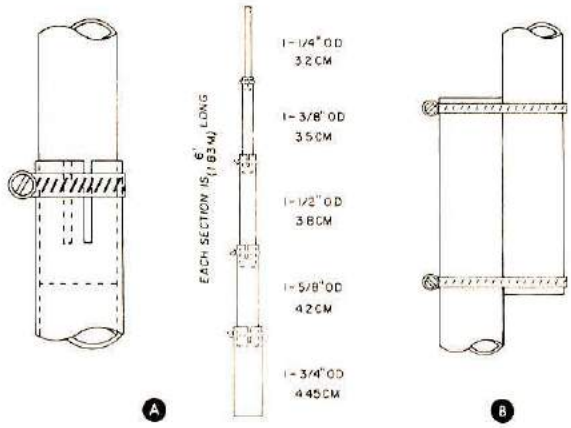


Fig. 2. Aluminum tubing sections are joined to form the center pole. If non-telescoping tubing is all that is available, the sections may be joined as shown in **A**. Telescoping tubing sections are slotted at ends and joined with hose clamps as shown in **B**. If necessary, TV mast sections may be used.

hose clamps. Only this time, make sure that one wraps around the base of the main pole and makes good electrical contact. It is used to attach the "hot" end of the feedline to the pole. The other clamp wraps around the ground stake and connects the 16 radials and shield braid of the feedline to the ground stake.

Install four posts to hold the top hat. I used 6-foot (1.8m) steel fence posts of the sort sold for wire fencing. Tie the ends of the top hat wires to nylon rope, using about 3 feet (1m) of rope as an insulator on each wire. Be sure to insulate the ends of these wires, as the rf voltage is high at these points.

Finally, spread the 16 ground-plane radials uniformly around the ground stake. Attach one end of each wire to the ground stake hose clamp. Fasten the radials to the ground with 8-inch (20cm) hairpins of galvanized steel wire, using one hairpin per foot or two (30 to 60cm) of radial length.

Tuning and operation

I worried a bit about feed-point impedance, bandwidth, swr, and matching. But, before measurements were completed, I took the easy way out — the "what, me worry?" approach of **Fig. 4**. I attached the coax directly to the vertical and radials as if it were a standard quarter-wave antenna. *It worked*! To be sure, the line swr was not 1:1, but I can't be convinced that I should do anything about it! It seems I read a series of articles by W2DU a few years ago, and have not worried about swr since!

Who can argue with success? While most books prompt you to tune antennas for low SWR, and leave the impression that my vertical couldn't possibly fly with this means of feeding it, I ignored their advice. I was too busy working DX to worry much about the matter. It seems that most signals that could be heard could be worked, and QSOs with Gs, Is, Fs, OKs, VKs, etc. were racked up without trying hard.

If you have trouble with matching, I have since found the simple network of **Fig. 5** very useful on the *second* model. It was first suggested to me by ex-W3MTI some quarter-century ago. The *LC* circuit is resonant on 80 or 75 meters. The coax cable is permanently connected between ground and the midpoint of the coil.

Begin by attaching the vertical to the same coil tap as the coax, and tune the *LC* circuit for minimum swr. Move the *antenna* tap up or down one turn and re-tune the circuit

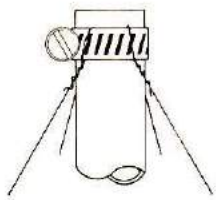


Fig. 3. Method of attaching the top-hat wires to the tip section of the center pole. A single hose clamp secures the four wires which also serve as guy wires for the system.

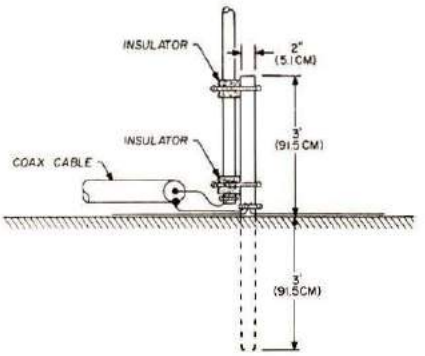


Fig. 4. Method of attaching the base of the center pole to a six-foot ground stake. Insulators are made from slotted pieces of plastic pipe that fit over the base of the pole. Note that shield braid of coaxial cable feedline and ends of radials all connect to the ground stake, and that center conductor of cable attaches to center pole with hose clamp.

for lowest swr. Repeat this procedure to get the lowest swr you are willing to work for.

Weatherproof the LC network with a large plastic container, such as a polyethylene freezer container, or an empty bleach bottle. I generally use a bleach bottle as a "rain hat" with the bottom left open for air circulation.

Closing comments

You will find this antenna rather surprising, particularly if you've been trying to DX with some of the commercial vertical antennas on 80 meters. Use a base tuning network if you must, but I am is still going direct — I can't seem to be bothered with weatherproofing coils and variable capacitors.

HRH

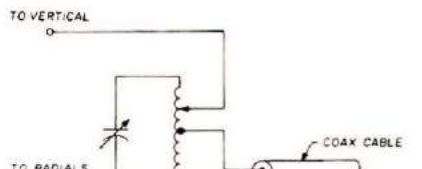


Fig. 5. An optional tuning network for matching the feedline impedance to the impedance at the base of the antenna. The coil and capacitor combination are chosen to resonate on the desired operating frequency. Note that center of coaxial cable is permanently attached to the center tap point on the coil, and that only the antenna connection is moved. Swr can be brought to 1:1 with this arrangement.