Here's a neat little vertical antenna that you can build and get plenty of use out of all in the same weekend.

Build A Top-Hat Vertical Antenna For 80/75 Meters

BY ANDY BOURASSA*, WA1LJJ

It's hard to put up a good DX antenna for 80/75 meters if you have limited space and a limited budget. Without a tower or tall trees from which to hang antennas you are pretty limited in your choices. Urban or suburban dwellers may lack the flat-top space needed for a dipole or inverted Vee. The vertical provides a good solution to the space problem and provides good low-angle radiation for DX work.

I like to work across the entire 80/75 meter band, operating CW and phone as well as packet. Most verticals require you to choose a particular segment of the band when setting up the antenna. Outside of the usual 100 kHz or so selected, the SWR rises rapidly to unacceptably high levels. You can choose to ignore the SWR and use an antenna tuner, but then feed-line losses begin to take their toll. I was looking for a broad-band, yet compact vertical that I could construct from easily available materials. Here in the woods of New Hampshire extruded aluminum tubing is hard to come by in small quantities unless you have connections in the business.

With these parameters in mind, I came up with a design that has an SWR of less than 2:1 over the entire 80/75 meter band and is still fairly compact. I used easily available materials which kept the cost around $50 for the entire project. The antenna is compact and requires only a 60 × 60 foot area on which to install it. It uses a large capacitive hat to resonate the shortened vertical, instead of coils or traps, and thereby achieves a high radiating resistance.

*Box 646A Holmes Road, Barnstead, NH 03225

Construction and Materials

The antenna can easily be constructed in an afternoon with the help of another person. It consists simply of a vertical ele-

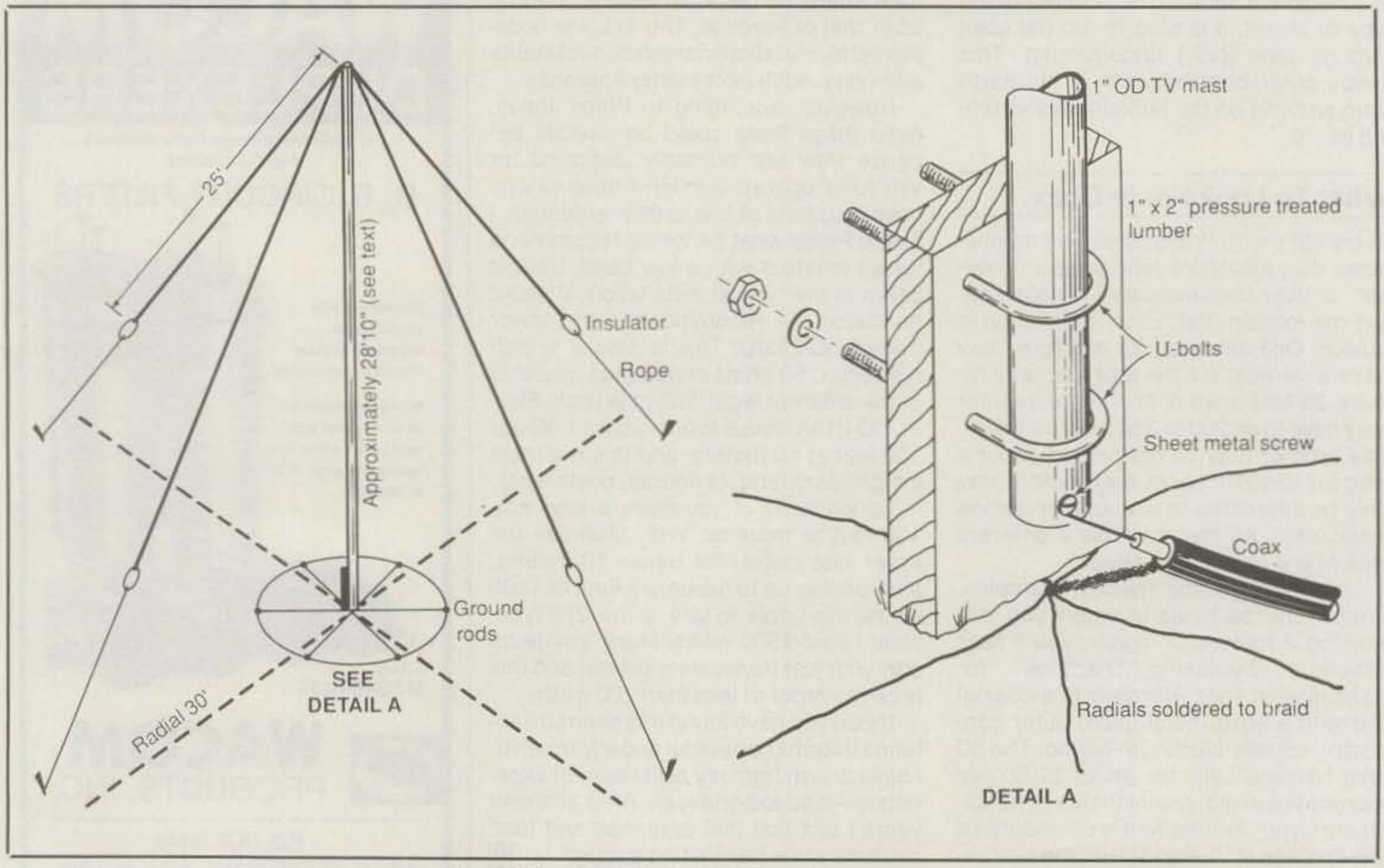

Fig. 1– The plans for the 80/75 top-hat vertical.

ment approximately 28 feet 10 inches high with four 25 foot wire elements spaced evenly around the top of the antenna to form the capacitive hat and guy the antenna as well. For the vertical element I used three 10 foot lengths of Radio Shack antenna mast fastened with sheet-metal screws to secure the sections together. You can use any brand of antenna mast as long as it is reasonably strong and has an outside diameter of 1 inch.

Cut the vertical element to an initial length of 28 feet 10 inches to begin with. It will have to be fine tuned by cutting an inch at a time once the antenna is erected. Now install the base insulator, which consists of an 18 inch section of 1 inch reinforced heater hose. You can buy it by the foot at most automotive supply stores. Work the heater hose onto the base of the antenna mast. A bit of soap and a twisting motion helps it along. Keep working the heater hose along until about 4 inches of the mast is visible. This will give you room to cut the mast during adjustment and fasten to it.

The next step is to make the capacitive hat. I used Radio Shack 16-gauge copper antenna wire and plastic insulators. Copper wire does have a tendency to want to twist up and tangle easily even if it's fairly light aloft. Cut each of the 4 wires 25 feet long, solder an eye to the upper end, and fasten them 90 degrees apart at the top of the vertical element with sheet-metal screws. Coat the sheet-metal screws with grease or Coax Seal® to prevent corrosion. Attach the insulators to the other end. I used inexpensive clothesline for the rest of the run to the ground. It's cheaper than wire and much easier to see so you aren't always tripping over it. Allow about 12 feet of clothesline for each element.

The antenna mounts onto a piece of 1 × 4 inch pressure-treated lumber 4 feet long. Begin by cutting a point on one end to make it easier to drive into the ground. Two 1¼ inch general-purpose pipe clamps fit over the rubber heater hose and through the 1 × 4 board to fasten the antenna to the base. Once the antenna is erected and the capacitive hat fastened to stakes in the ground, they will steady the antenna in place. It's easiest to lay out the holes for the clamps before driving the 1 × 4 into the ground. Simply center the clamps on the board about 12 inches apart and lightly tap the clamp with a hammer. The impression left in the wood marks where the holes need to be drilled. Once you've finished drilling the hole, you are ready to set up the antenna.

Siting and Adjustment

All ¼-wave vertical antennas need a good ground for maximum efficiency. Picking a good site can help. A wet, soggy area is preferable to a ledge or dry ground. You might also take into account sources of good grounds. An artesian well casing or a lawn sprinkler system with metal pipes can provide a good ground for the antenna with a minimum of effort.

If you don't have a ready ground, you'll need to make one. I used a series of ground rods spaced 6 feet apart in a circle around the base along with 4 radials 30 feet long. The radials need not be full length since the antenna is shortened and the RF field is also more compact. The radials only need to be as long as the antenna (see Doug DeMaw's *W1FB's Antenna Handbook*, p. 4). Because of the high radiating resistance, a good ground isn't as critical, but still, go for the best ground you can get.

Begin by driving the 1 × 4 about 18 inches into the ground. Lay out 4 stakes evenly around the mounting post and 30 feet away so you can fasten the guys/capacitive hat onto them. Next step the base of the antenna up against the mounting stake, and with the help of another person walk the mast up to a vertical position. While one person holds the antenna, the other person can loosely tie the guys to the four stakes you laid out previously. This should steady the antenna while you lift the mast up along the mounting stake to where the clamps will go. Work the U clamps over the heater hose and through the holes in the mounting stake and tighten. Now snug up the guys, and the antenna is ready for adjustment.

Because there is so much capacitance in the hat, the length of the vertical element becomes critical. I used an antenna bridge to tune up mine, but an SWR meter will also do the job provided it is used at the base of the antenna. Tune up your transceiver on the lower, middle, and upper part of the band and write down the resulting SWR. You should find the SWR lowest at the low end of the band and higher on the upper end of the band. If so, begin cutting the mast 1 inch at a time while recording the SWR. Don't be tempted to cut off several inches or you may come up short. Cutting even 1 inch off the mast changes the SWR. In my case I found a length of 28 feet 7 inches gave me an SWR of 2:1 or less over the entire band.

Once you find the proper length, solder an eye onto the center conductor of your coax (RG/8 or other low-loss 52 ohm coax) and fasten to the antenna with a sheet-metal screw. Coat the connection with a layer of grease or Coax Seal® for corrosion protection.

The bandwidth is almost unbelievable at first. However, once you get used to it you'll love being able to QSY all over the band without fiddling with tuners each time. It's a good contest antenna and the performance will surprise you. For a shortened antenna it has a surprising signal, and you can't beat the price.

Materials List

Three 10 foot lengths of TV antenna mast from Radio Shack, or any 1 inch outside diameter antenna mast.

100 feet of 16-gauge stranded antenna wire, Radio Shack or equivalent.

18 feet of 1 inch reinforced heater hose, from auto parts supplier.

Two 1¼ inch general-purpose U clamps, from any hardware store.

Four insulators, Radio Shack or any brand.

50 feet of clothesline rope.

Seven sheet-metal screws, any convenient size.

4 feet of 1 × 4 pressure-treated board, from any lumber yard.

Four stakes.

Tools: drills and bits, soldering iron, screwdriver, 7/16 inch wrench, hammer, hacksaw. CQ