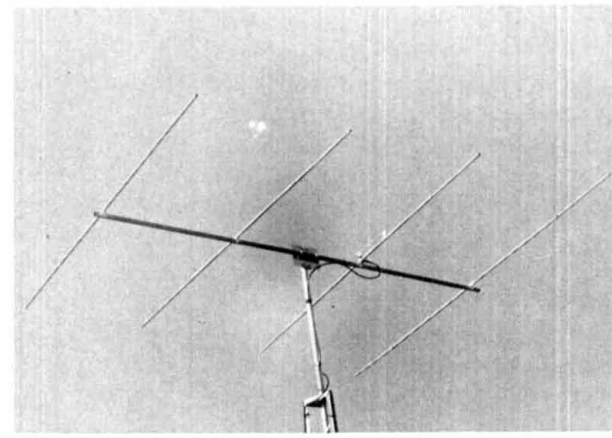
cheap and dirty 6-meter beam



Inexpensive way to attach elements

For over 40 years the Amateur Radio fraternity has used an antenna construction technique known as "plumber's delight". This method, based on the fact that the center of a half-wave antenna lies at a 0-voltage point, allows the center of the element to be grounded to the boom material and can make for easier rotary beam construction.

Many different ways of attaching elements to the boom have been tried over the years. Some have been as simple as a single "U" bolt with holes drilled in the element; others have been much more complicated. The beam construction method described here is simple and inexpensive. It cost me less than a dollar!

Several years ago, the local Amateur Radio club needed a 6-meter beam for Field Day operation. Not wishing to expend much in the way of funds, we made a quick search of the antenna graveyard. We found various pieces of aluminum but no way to attach the elements. Then it hit me; just use simple E.M.T. clamps (**photo A**)!

These clamps, often made of galvanized iron, are available from any well-stocked hardware store for as little as 7 cents apiece. Drill the element material to pass a No. 10 bolt and the clamp easily attaches to the element. Next, drill two 1/8-inch holes into the boom, through the clamp, to pass a No. 8 sheet metal screw. Viola! A "cheap and dirty" way to attach the elements to the boom.

This antenna worked great for Field Day, but was relegated to the antenna graveyard soon after. Over the next several years, the boom and other pieces found their way into other antenna projects and soon only the elements remained. I finally decided to resurrect the antenna, and the "Cheap and Dirty 6-meter Beam" was the result.

The beam consists of four elements on a 10-foot boom (antenna dimensions shown in **fig. 1**). The material used for the boom is two sections of Radio Shack heavy-duty mast that telescopes approximately 6 inches. The elements are made from 5/8-inch 6061-T3 aluminum, and the gamma match from 3/16-inch rod. You could probably use Radio Shack light-duty mast for the boom material, but the difference in cost is minor.

To build the antenna, cut the elements to length, drill them to attach to the E.M.T. clamps, and attach them to the boom. To attach the boom to the mast, drill a sheet of aluminum about 12 x 6 inches to accept "U" bolts. The model built at W5UOJ (see lead photo) uses Radio Shack TV-type "U" bolts for both the boom and mast. However, the actual "U" bolts used depend on the size of the mast and boom material.

The gamma match, shown in **fig. 2**, is straightforward; it's a piece of 3/16-inch rod approximately 14 inches long. Make a movable strap from a small piece of aluminum and attach it near the end of the material. A second strap attaches the rod to the variable capacitor. A small plastic enclosure can be used for weatherproofing; I didn't use one.

Instead of a plastic enclosure, the variable capacitor was set, then wrapped with a plastic bag and black plastic tape. This appears to work; the capacitor has

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made it through two separate ice storms so far. But, if in doubt, use a small plastic box.

You don't need stand-off insulators in the gamma match assembly — the gamma rod isn't long enough to need any and the aluminum strap gives enough support. By the way, the gamma capacitor used at W5UOJ was an old "APC" type, but you can use any variable with an appropriate value.

There are two methods of adjusting the gamma match for best SWR. The first is to mount the antenna directly on a tower, mast, or other suitable point and make the necessary adjustments. A simpler method is to take a wooden stepladder, prop the antenna on it pointing upward, and make your adjustments to the gamma match.

You don't have to use 6061-T3 for the elements; almost any aluminum tubing from 1/2 to 5/8 inch will work. The lengths are such that any droop is insignificant. The gamma rod can be made from aluminum ground wire, like the kind available from Radio Shack, but probably will have to be a couple of inches longer for the best match.

You'll probably have to use bolts about 1/2 to 1 inch longer than necessary when attaching the E.M.T. clamps to the elements because the clamps are a bit too short. But the bending that results from tightening the bolts firmly secures the elements to the boom.

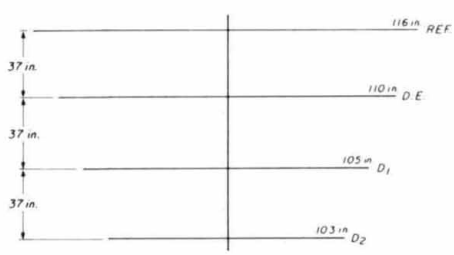

fig. 1. Antenna dimensions.

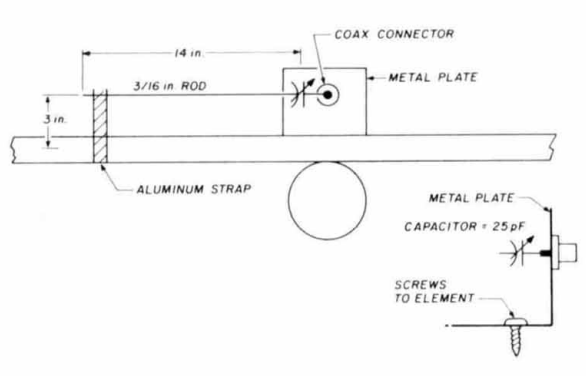

fig. 2. Gamma match.

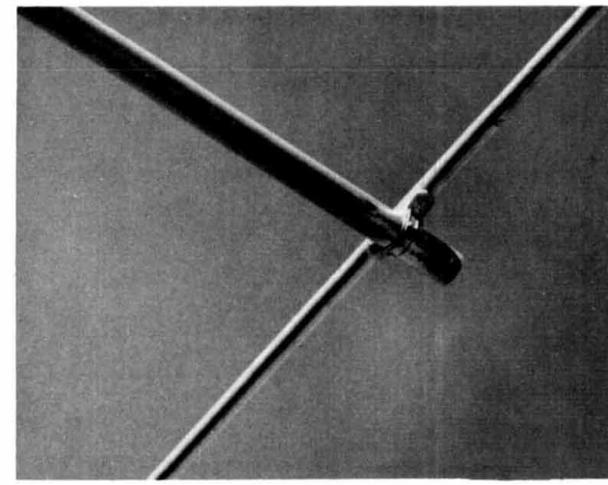

photo A. An E.M.T. clamp makes an excellent method of connecting the elements to the boom.

The extra bolt length can be cut off with a pair of side-cutters. Next, drill the clamp on each side and secure it to the boom with sheet metal screws.

The clamps used with the 1-1/4 inch boom material are for 1-inch E.M.T. For a 1-1/2 inch boom, use clamps for 1-1/4 inch E.M.T. Antennas built for higher frequency operation can use smaller clamps. Boom material 1-1/2 inches in diameter results in a stronger beam.

If you use Radio Shack boom material, make sure that the two boom halves do not turn. Put the two sections together and drill a 1/8-inch hole. Then, secure the boom material with a No. 8 sheet metal screw.

The same technique was also applied to a three-element 10-meter beam used for OSCAR 6 and 7 work. Here, however, I used boom material 1-1/2 inches in diameter along with the heavier clamps to secure the elements to the boom.

Obviously, there are other ways to secure elements to the boom in a "plumber's delight" Yagi. But I doubt you'll find any as inexpensive. Although I haven't tried it, there's no reason why E.M.T. clamps can't be used for 6-meter antennas with more than four elements, or smaller clamps for 2 meters and up.

While the actual performance of this antenna has not been checked on an antenna range, it compares favorably with commerically made four- and five-element beams used in this area. The total cost was less than $15; the aluminum and the variable capacitor were surplus. You'll spend approximately $25 to $30 on this antenna if you buy all the parts. But, it's still cheaper than buying a beam and takes only a few hours to build.

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