Building a Non—Guyed Steel Tower

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LAST SPRING, after getting on phone with a long-wire antenna and hearing all the talk of different kinds and shapes of beams, we decided that we needed a beam, too. Cost seems to be a big item with most hams, so after figuring on several materials to support a beam, steel seemed to be the answer. Steel could be purchased very reasonably, and, as the tower would be near the house, it would be neat looking also. We purchased it from Jones and Laughlin in Chicago for $16.11; the freight charge was $2.60. This cost will fit in with every ham's budget. We ordered nine pieces 20 ft. long of 1¾″ × ⅛″, 90-degree angle-iron.

First we gave it a heavy coating of good aluminum paint to prevent rusting. Two of the 20 ft. lengths were bolted together with a 2 ft. lap. One × ⅜″ lengths bolts were used with lock washers. Three of these lengths were made for the legs of the tower, and two were laid on the ground. The angle was figured so that there would be one foot of spread for every seven feet of rise. Four feet were left to set into the ground. From this ground level measurement, spreader braces were put every 5′ 8″, or 5 in all, to the top.

Each spreader brace was cut with a hacksaw, and

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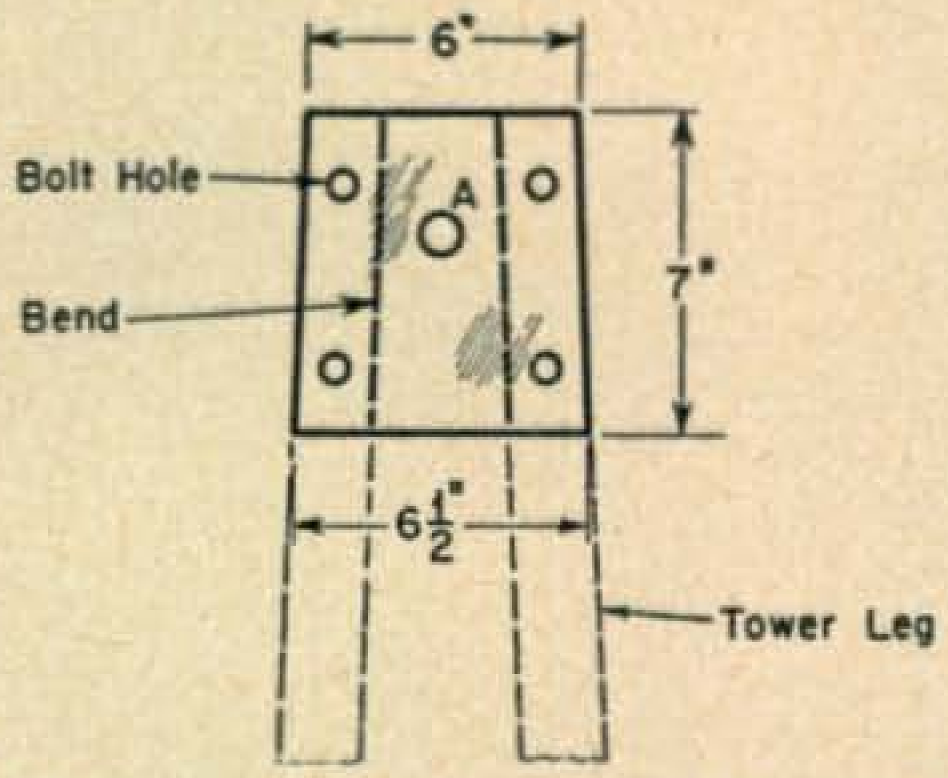


Three of these plates ensure rigidity at the top.

a small notch was cut at each end to fit the angle of the leg and then bolted to it. This means that there would be three of each length, each bolted to three legs. The notch cut was a small V, bent slightly to fit the 90-degree angle. This would not be necessary if 60-degree angle-iron could be bought.

From a machine shop a piece of ⅛-inch iron was purchased that was large enough to cover the small opening at the top of the tower and to lap down about 5 inches with enough for three extra pieces. These three pieces were cut 7 inches long, 6½ inches at one end and 6 inches at the other. Five holes were drilled for bolts in these plates. They also were bent slightly to fit the leg angles.

The top plate was a piece of this same ⅛ inch iron cut in the shape of a triangle 7½ inches to each side. Holes were drilled at the exact center and at each corner, the first for a pipe to run through, and the second for bolts. The corners were bent to almost a 90-degree angle, and a sleeve was welded in the center hole for the support pipe to go through.

This pipe supports the beam. When the three plates were bolted around the sides and the top plate lapped down and bolted, the top of the tower was very solid. From some iron that was left, several 8-inch pieces were sawed and bolted at intervals on one leg for steps for easy climbing.

We added another heavy coating of aluminum paint to cover scratches, bolts, etc. It now looked almost like a professional job, we thought. It certainly created a lot of curiosity among the neighbors and passersby.

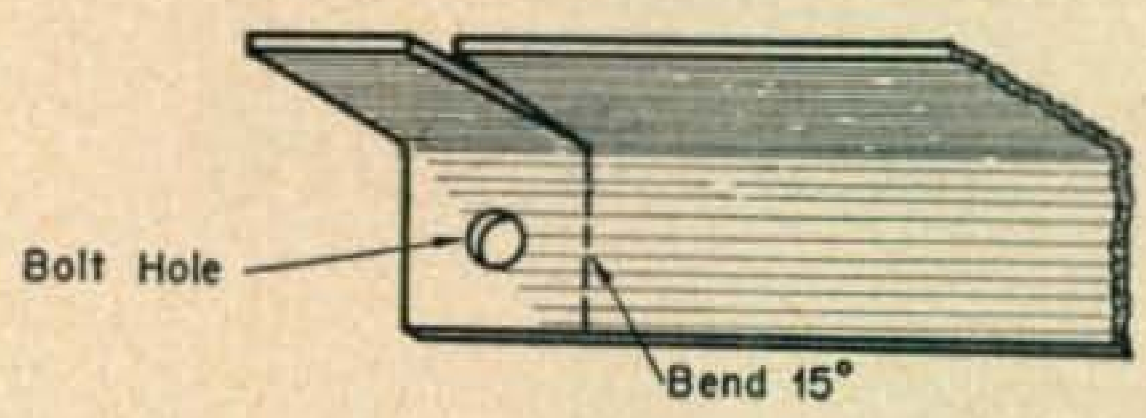
The Vertical Position

Before setting the tower in a vertical position, a string long enough to reach the ground was strung through the hole in the top plate. This was used later to level with. To set the tower in a vertical position was not so difficult—it only weighs 260 pounds. Three holes were dug, each 4 feet deep and approximately 1 foot in diameter, and the bottom of them levelled in respect to each other. Then a flat rock, block of wood, or something similar, was put in the bottom of each for the legs of the tower to rest on. Two ⅜ inch holes were drilled in each leg about 6 inches apart and near the bottom. A 6-inch bolt was stuck through to tie into the cement.

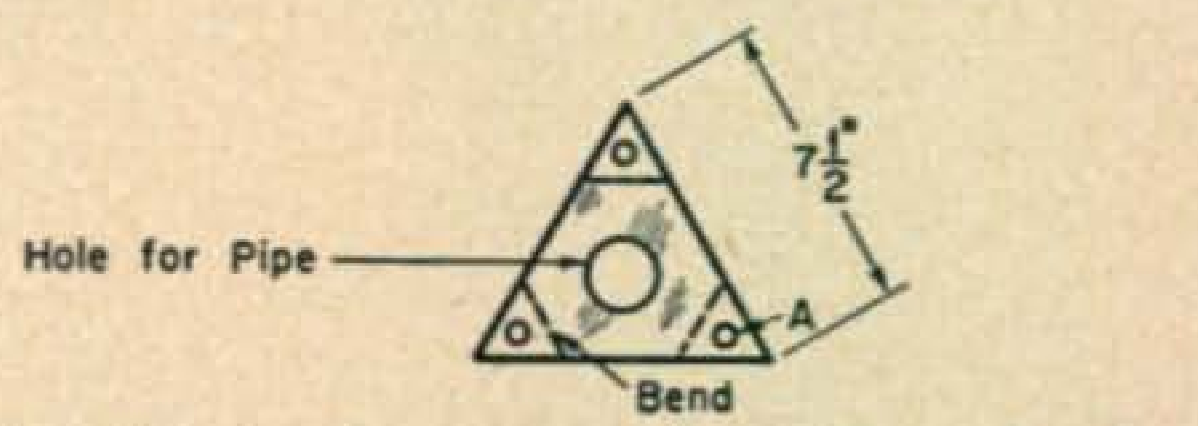
Two 2×4s were bolted near the bottom of two legs to the other leg at the first cross brace to carry the weight as the tower was raised. Some boards were laid near the holes, and a rope was tied near the top of the tower. A near-by tree was used as a gin-pole. With the help of three neighbors on the guy wires, it was raised easily. The 2×4s were taken off, and three men lifted it and set it down in the holes, a fourth man helping to steady it. We then levelled it using the center string.

We picked up some old scrap iron, broken bricks, etc., and put some in each of the holes. It was a good way of disposing of the debris.

Each leg was then filled with about 350 pounds of cement. Each guy wire was fastened down until the cement hardened, which was about eight days. Then we climbed the tower and unfastened the guy wires and string. It was neat-looking and now self-supporting.



The notching of the spreader braces.



The top plate fits the three legs and provides a bearing surface for the pipe.

The Quad

The contraption on top that you see in the picture is a quad. A piece of this same angle-iron about 3 feet long was welded on the 1 inch diameter pipe with the V up to hold a 2×2 boom. The arms were made of 9/16×1 1/8 clear fir. The radiator is two wires about 5 inches apart. One-fourth wavelength on a side, figured to the 468 formula, with the crossover in the bottom fed direct with 150-ohm Twinlead. The spacing is .02, and the reflector is a single wire 5 inches longer on a side than the radiator. A shorting stub runs up from the center to the boom and is used for tuning. Lucite or bakelite insulators are used.

This tower could be made of other material, such as pipe with the cross braces welded together, or maybe a different weight of iron. It doesn't need skilled labor to put it together and is within the price range of all. It is self-supporting. It has withstood many hard winds and storms. It isn't too tall to climb easily when any repair is necessary.

We think it really fulfills all of WØPJ's requirements and might be a helping idea for some of our other ham friends who need something for their antenna.

We all have had ideas and probably could find many ways to improve on and add to the ones I used in this tower.