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Easy-Way TOWER

A recent survey of towers disclosed that prices began at fantastic and then ranged upwards! Perhaps this is one factor that keeps large numbers of amateurs from putting their beams up there where they do the most good.

One tower material that hasn't been adequately explored is that electrical standby—thinwall steel tubing—otherwise known as EMT. This material is cheap, light, strong, galvanized, and easily worked. It's price makes it an attractive tower construction medium.

In the "Thinking about a tower" days, all kinds of questions arose, such as: What shear and compression forces are involved? What bending moments are acting on a section? What icing load will it stand? Not having access to much tower design information, I proceeded to weld (braze) up a ten foot section. See Fig. 1. Placing saw horses under the ends and sitting 300 pounds of people-weight on the center of the span hardly caused it to sag!! This empirical experimentation convinced me this was strong enough for amateur use. Other desirable features on my list included: (A) light-weight construction, (B)

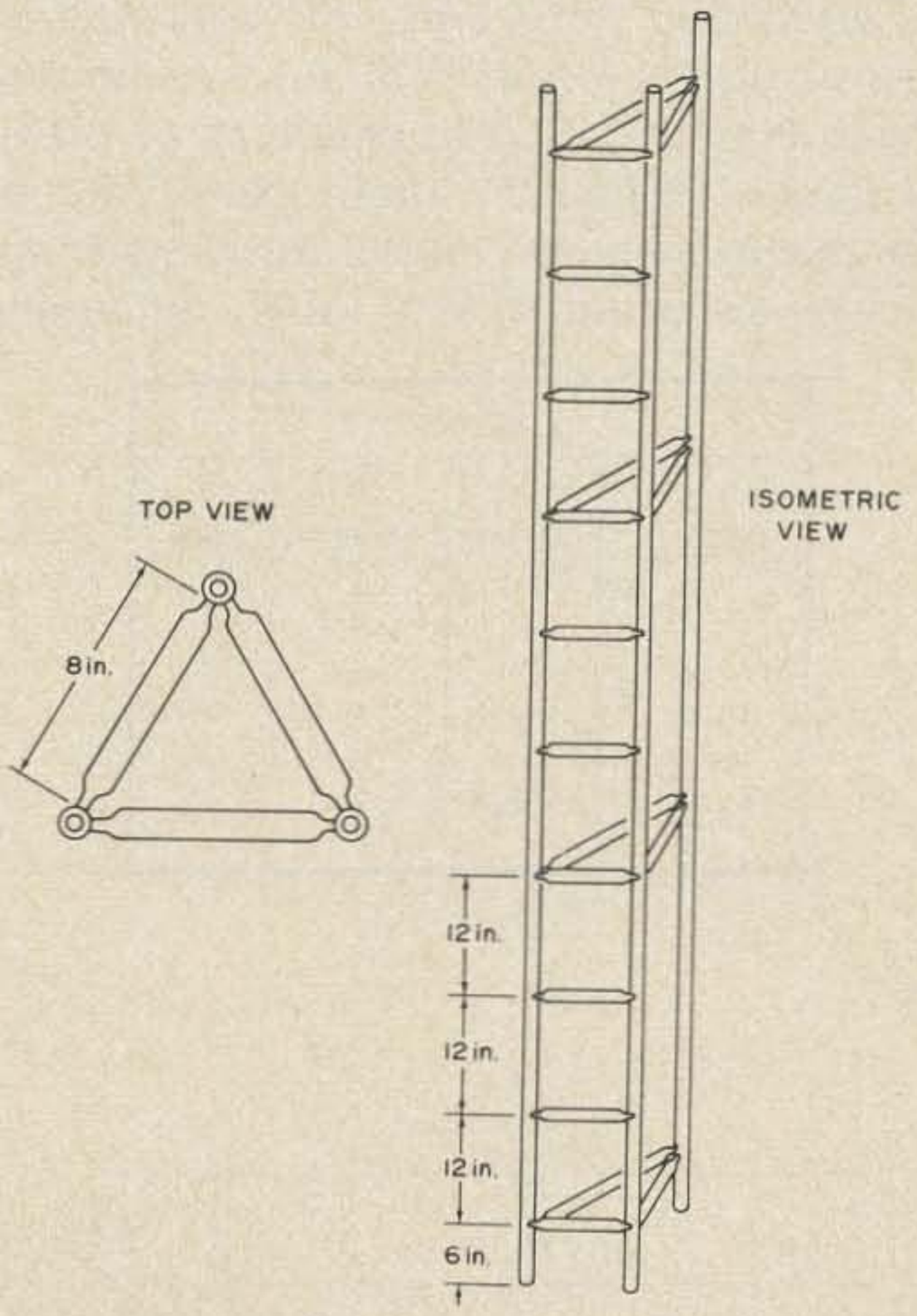

Fig. 1. Basic Building Block.

safe to climb, (C) a built in ladder, (D) reasonable cost.

The exact cost of building a tower depends on several variables, many readers know how to weld (braze), and have access to the required equipment. Others have a brother-in-law or friend who can be called upon to do the job. If not, the services of the local

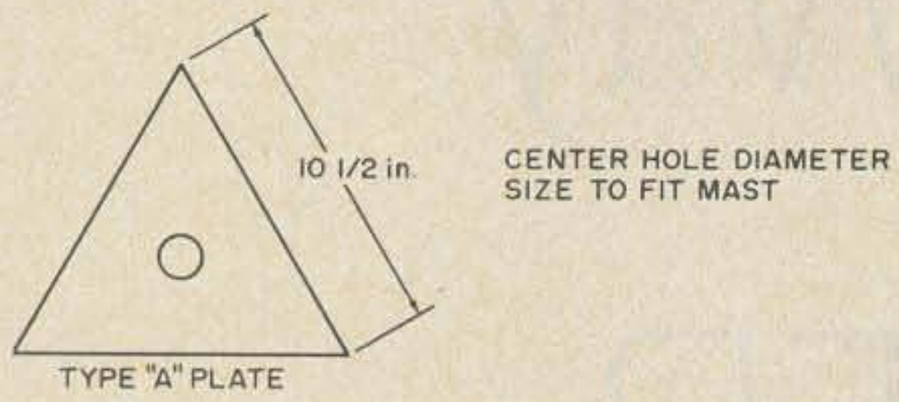

Fig. 2. Plate.

garage or metal working shop can be sought.

Metal Work

Fortunately this type of construction keeps outside metal work to a minimum. The builder will have to obtain three plates as shown in Fig. 2. These plates are of one-eighth inch iron and of the dimensions shown. Referring to the Table, determine

TABLE "A"

number of sections	spacers	EMT lengths	plugs
1 – 10'	18	3	0
2 – 20'	36	6	3
3 – 30'	54	9	6
4 – 40'	90	12	9
5 – 50'	144	15	12

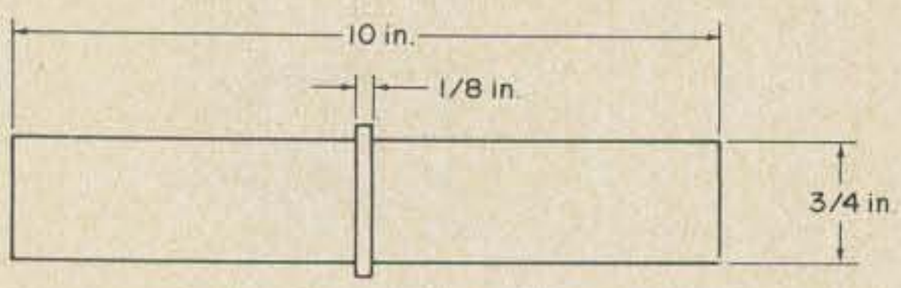

Fig. 3. Connector Plug.

the necessary number of connector plugs for your desired tower height. These connector plugs are made from ten inch lengths of ½ inch water pipe. See Fig. 3. The outside diameter of this pipe is slightly too large to slip into the tower leg tubing. Chuck the connector plug section of pipe in a lathe and take a cut each way from center as shown. Leaving the shoulder in the center of the plug keeps it centered when you join two legs together. Tower sections are joined by drilling through the tubing with plug inserted, and bolting with ¼ inch galvanized stove bolts. Use two per tower leg.

Basic Building Block

Fig. 1, is a drawing of the building block tower section. It requires three (3) ten foot lengths of EMT, and 18 spacers each eight inches long. After cutting the spacers to length, grip the last ¾ inch of the spacer in a vise and crush the ends *almost* flat. Use care to position each end of the spacer for crushing so that the flat ends are parallel. This permits snug fitting of the spacer against the tower leg for welding. A couple of trials and you'll produce perfectly formed spacers every time.

Now, with a felt tip pen, mark 2 of the ten foot lengths of EMT at a point 6 inches up from the end, and each 12 inches thereafter. These marks will indicate the center of each rung for the ladder side of the tower. A simple jig for holding everything in alignment is shown in Fig. 4a. It consists of 3 pieces of scrap 2x4 lumber, each piece about 14 inches long and bored for 1 inch diameter holes, spaced on 9 inch centers. (Make 4, as the extra jig will be used later to hold the third leg.)

Slip the ends of the previously marked EMY tubes through the end pieces and "runner," of the jig. With a carpenter's square position the tubes so that the ends are in square alignment. Weld the first rung. The "runner" is slid along the tubing just ahead of the rung being welded. It helps to keep everything rigid during the brazing process. Choose a fairly level place to work. I welded my sections on my concrete driveway.

When the ladder section is finished, slip a jig piece over *each* leg of the two ends of the ladder section, (see Fig. 4b) and thread the third length of EMT through both free holes at each end. This positions the third leg for welding the spacers between it and the ladder section. As can be seen from Fig. 1, the spacers are placed at the first, fourth, seventh and tenth rungs. This now completes a section of the basic building block. As many as are required can be fabricated. Construction will be speeded up if all connector plugs were prepared before welding began. When the first section is finished, insert the connector plugs and use

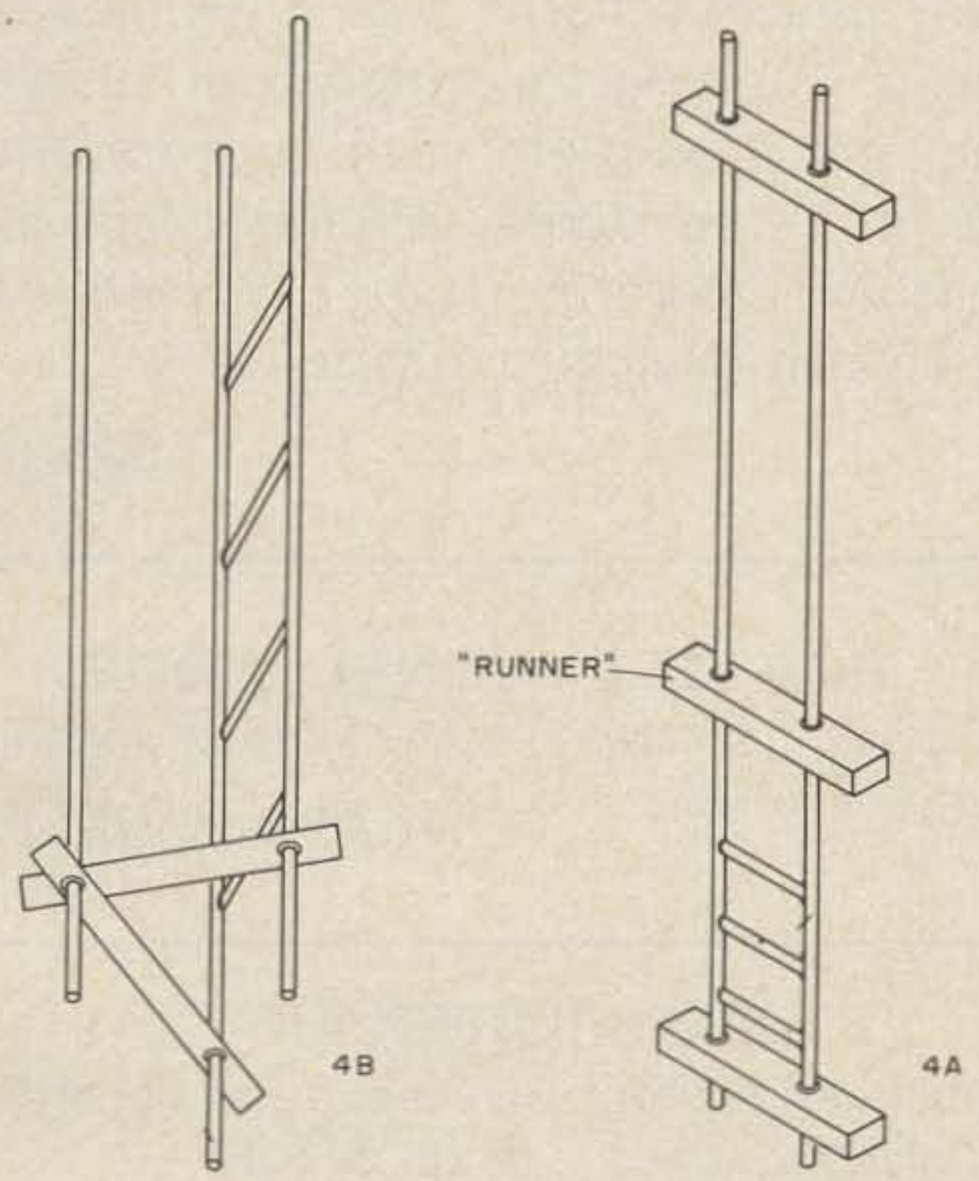

Fig. 4. Ladder.

the finished section as the jig for one end of the new section being built. This speeds things up considerably.

Top and Bottom Plates

When the desired length of tower has been fabricated, the tower is finished by the addition of a type "A" plate welded to each end. A type "B," lateral thrust plate, is welded three and one half feet down from the top plate. This positions it atop the second set of spacers.

Erection

Due to the light weight of this type construction, erection is easy compared with many other types. For a 40 or 50 foot tower, a couple of men on the guy wires will allow one man to walk it up. Three guy wires should be attached. With two people holding the forward guy wires, and the 3rd guy wire (the one that's behind the man walking the tower up) temporarily anchored —the tower can be raised with safety. I usually drive a 6 foot ground rod (½ inch water pipe) at the center of the tower location, leaving 4 inches protruding from the earth. By fitting this stub of pipe into the hole in the base plate as the tower is started up, it will solidly anchor the tower base. After the tower is in place, a ground strap is connected from the tower leg to the earth rod for lightning protection.

Durability

After completing the tower, wire brush and inspect all the brass to steel welds, and touch up any that may require it. Then wash thoroughly with a bucket of warm detergent. When dry paint with a good grade of aluminum fence paint. With these precautions, your tower will last indefinitely.

The last trip up for inspection was in 1972, and my 190 pounds felt perfectly safe although minimal maintenance has been taken on this tower.

The tallest tower of this type that I've built was a 90 footer. This monster was erected in one complete length using a 20 foot gin pole. A 20 foot length of pipe was hoisted to the top and a 32 element two meter array brought up and put in place. All that beam weight along with my (then) 150 pounds proved my experimental hypothesis about the ability of EMT to make a suitable tower construction material. My friend, W4EW, had a 100 footer supporting several six and two meter beams along with his 4 bay conical TV antenna. Six of these towers were/are in use in Alabama, and after 10 years of use, none that I know of have failed. Several hurricanes that played havoc with other TV type masts left these towers unscathed. If you want a light strong tower, and have a flat wallet, this type tower is hard to beat.

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