



## Push up mast for the Hexagonal Beam



## General

One of the most popular and cost effective means of supporting the hexagonal beam is the steel push up mast. Use of such an inexpensive support structure is one of the most important advantages of a hexagonal beam when compared to a full size Yagi which requires an expensive tower for support. Push up masts are available from Rohn in different heights from 20 – 50 feet. Channel master also has them.

The push up masts were originally developed for supporting outside TV antennas which required good height but had fairly reasonable weight requirements. Such antennas are now used very little comparatively as cable has largely supplanted on air transmission of TV. However, amateur radio has found a good use for the push up masts in supporting one of the hottest ham antennas that has been developed in many years, the Hexagonal beam.

The push up mast can be supported in a number of ways some of which are discussed here. The basic operation and mechanical makeup of the push up mast along with some tips for installation are the subject of this document. It should be pointed out that fiberglass masts are generally not strong enough, nor are aluminum masts, for support of the average commercial five band hexagonal beam.

## Disclaimer

The push up masts were designed primarily for outside television antennas. As such, they are not rated for the weight and wind load of a hexagonal beam. Nevertheless, this is probably the favored support used by most hex beam owners, including the author. However, this document that explains the push up mast and how to use it is not to be construed as a recommendation of the push up mast for hex beam use. Any decision by a hex beam owner to use this mast is taken at the risk of the hex beam owner himself. No responsibility is taken by the author for any use of the push up mast by any person.

This document is not a replacement of Rohn or Channel Master manuals and if there is any conflict in information, you should rely on the manufacturer.

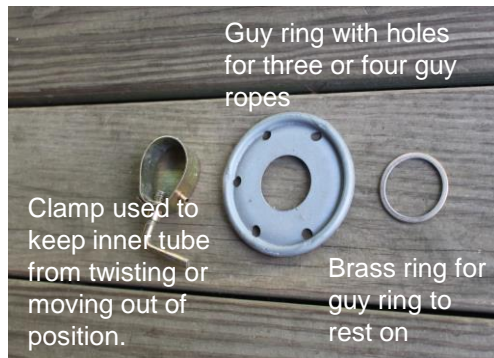
## Safety

There is no need to duplicate the well written and thorough warnings and cautions published in several ARRL handbooks on the subject of antennas and towers. Likewise, any towers or antennas in proximity with electrical lines pose a particular hazard that must be kept in mind. There are many sad stories about such lines or towers falling or other wise coming into contact with high voltage lines with fatal results to the careless amateur. So take heed.

## The Hardware and how it works.

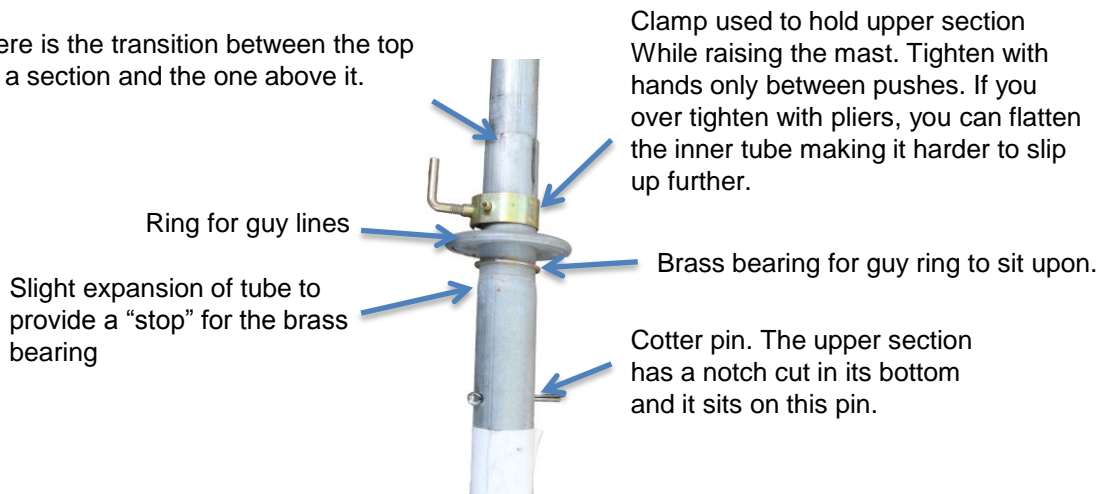
Below are photos of components of a Channel Master 30 foot push up mast made of 18 gauge galvanized steel. Photos of the entire installations with hex beams include other push up masts such as those sold by Rohn. The concepts are the same. Care should be taken in the selection of the push up mast for the type of material such as aluminum vs steel and fiberglass. Generally speaking, steel is stronger than either fiberglass or aluminum for the same gauge material. The Rohn masts do not have the brass ring shown above. The guy ring rests on the rim of the section below. Also, the clamp differs in appearance although its function is the same.

Rohn and Channel Master have web sites that provide pdf files on how to install their masts and some of that information is provided here.

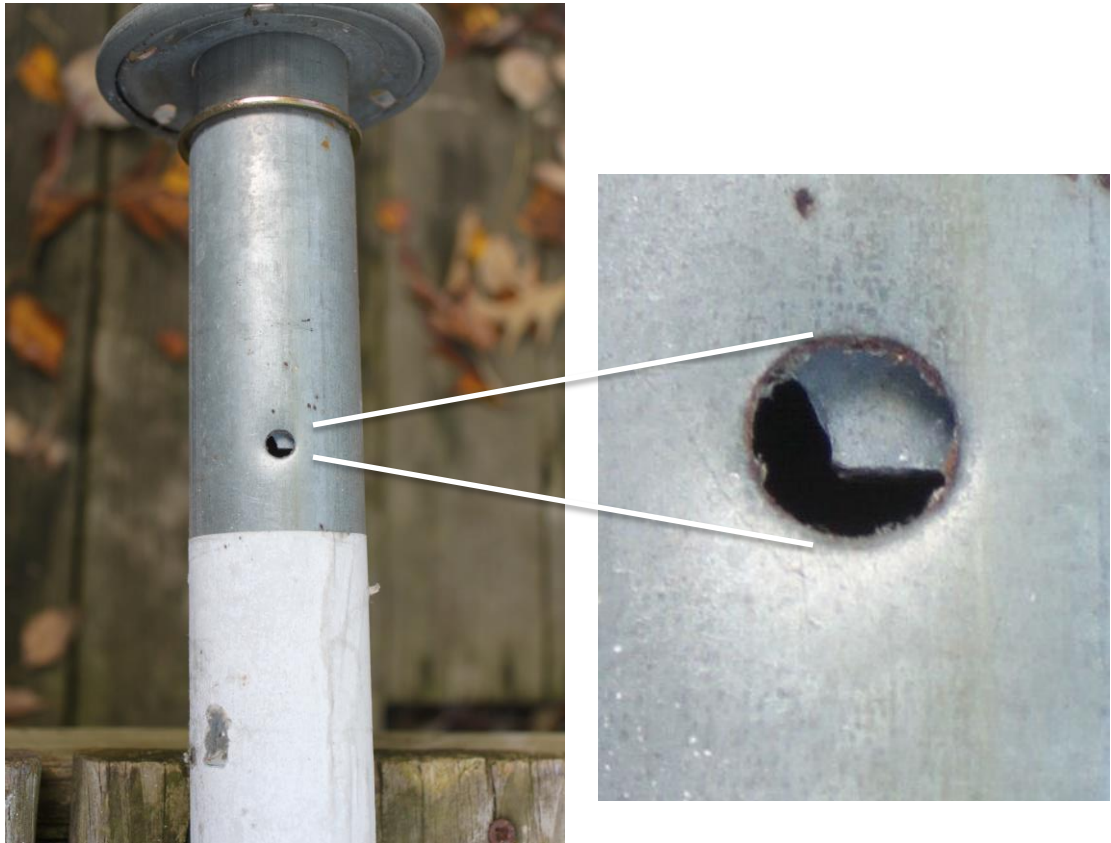


Below is the junction of two sections. This type junction and hardware fittings are found for each section and the pieces are explained in this and the following pages.

Here is the transition between the top of a section and the one above it.



Here is a view of the hole for the cotter pin. You can see the notch on the bottom of the upper tube showing through the hole. The cotter pin is slid in and the upper tube slot will rest on the pin when it is inserted.



The guy ring holes are visible here in the left view. The guy holes are configured for use of your choice of three or four guys. Dacron rope is a good choice as it resists UV degradation and also there are no accidental resonance issues that might occur with use of metal guys.

### Guys

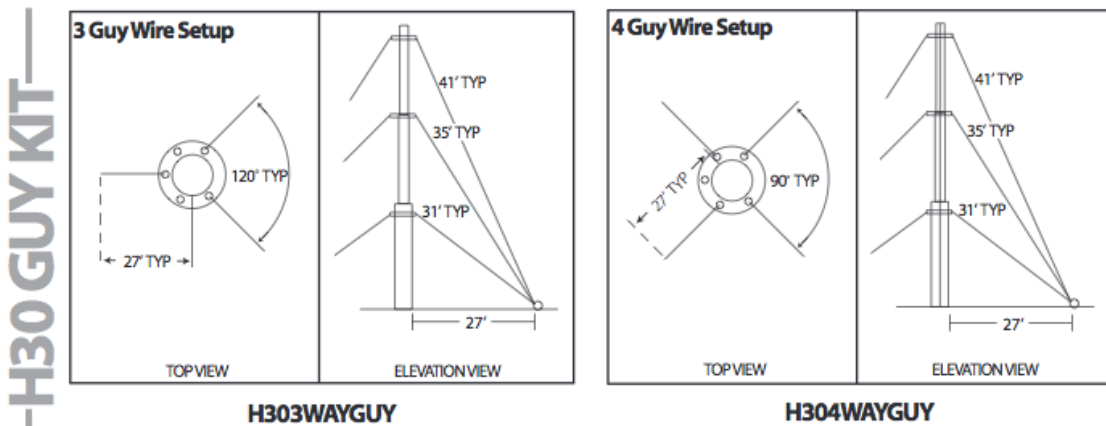
The mast should be guyed every ten feet and the guys should extend out as far as the height of the guy if possible. This is shown below for a Rohn push up mast. All the guys in one direction can be tied to the same anchor.

Dacron guy ropes are sufficient for push up masts. Metal guys can be resonant on the bands of the hex beam if the lengths are a wavelength or half wavelength.

You can get a 40 or 50 ft mast but I found it was exceedingly difficult to push my 40 feet mast all the way up. The weight is not the only problem; the

friction of the telescoping sections gets greater as the mast wants to tip slightly with the weight of the beam. The weight of a 40 foot mast and hex beam will be close to 60 lbs when pushing up the last section plus the friction of the sections.

### Rohn's Recommended guying for the 30 ft mast



### Rotating the Push up Mast

A small TV rotator is used successfully by many hex beam owners. Such a small rotator can be mounted at the top of the upper section of the push up mast where it turns only the antenna and the mast remains fixed. In this case, a thrust bearing is not needed since the mast is not rotating.

If the rotator is to be located at the bottom with the entire mast being rotated, probably a larger rotator will be needed than the TV rotator. And use of a thrust bearing is a good idea.

### Installation

Lay the mast out on the driveway and fully extend it so that you will be able to understand how all the parts fit together and how the holes are used with the cotter pins that are supplied.

With a black felt tip marker you might also make marks near the fully extended joints so that as you push the mast up during installation, you will know when you are getting close to the end of the section above the cotter pin hole.

Be sure and drill a cross bolt hole through the top of the mast and the bottom flange throat. The set screws in the flange will not hold the beam from spinning as eventually, the set screws will work loose.

It is not a good idea to extend the mast and antenna in a horizontal position and then try to raise it into a vertical position as the mast is quite likely to bend and be destroyed in addition to damaging the hex beam.

In the erect position, fully extend the mast without the beam installed and adjust the guy ropes. This way, when you raise the mast up with the hex beam installed on it, you will already have the guys prepared and they will help keep the beam vertical as you push it up.

Use latex covered gloves when trying to raise the beam.

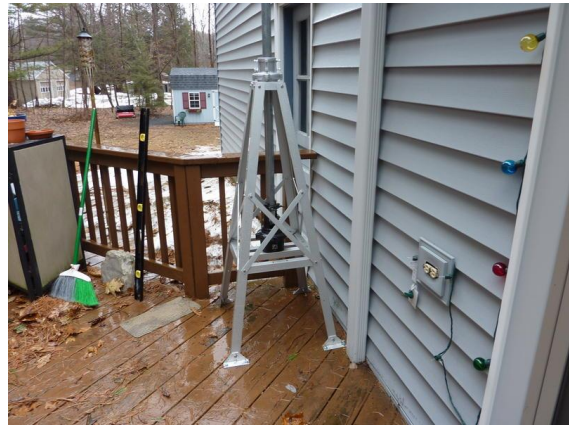
The best approach is to put the mast while unextended in a vertical position and then push it up section by section with the guys in place. Having several helpers to hold the guys to keep the mast vertical while pushing up is a good idea.

Do not over tighten the guys because the resultant downward pressure tends to buckle the mast. If the beam sways slightly in the wind, this is not a problem.

### Mounting

The bottom section of the mast can be fastened to the side of a building or to a tall post that is in concrete. Large U bolts or other clamps can be used to secure the section in a vertical position where the upper sections can then be pushed up from a ladder leaning against the bottom section as shown below.

If you wish to rotate the entire mast with a rotator at the bottom, you can build a bracket or shelf at the bottom of the post or side of the building to mount the rotator on and then place the mast on top of this. At the top of the lowest section, rather than a U bolt, another bracket can be built and a thrust bearing mounted on it. The advantage of a thrust bearing is that it allows the mast to turn easily and also provides support for the weight of the mast and the antenna instead of allowing that weight to bear upon the rotator below.



Above, this push up mast of W1JWC is mounted in a Glenn Martin roof tower on his deck. To the left K5 CJL has a professional looking version of the K4KIO arrangement. Note the thrust bearings that are mounted on the upper bracket of the posts and the top of the mini tower.

Below is the instructional material for the Channel Master push up mast. Notice that the guys are staked to the ground at different distances out depending on the height of the guy. This is different than the Rohn approach shown above on Page 5.

The pinning of the mast against the building shown by Channel Master can be done with a thrust bearing as shown above if you plan to rotate the entire mast which is the approach used by many hex owners. Just build a simple bracket arrangement with stock aluminum angle material and machine screws.

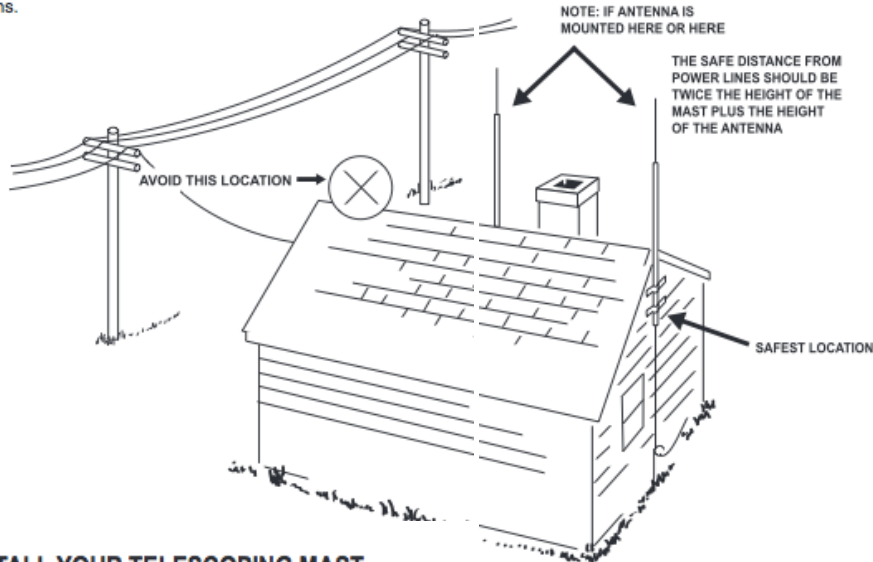
## SITE SELECTION WHERE TO INSTALL YOUR TELESCOPING MAST

Before attempting to install your antenna, think where you can best place your antenna for safety and performance.

To determine a safe distance from wires, power lines, and trees:

1. Measure the height of your antenna.
2. Add the antenna length to the length of your tower or mast, and then
3. Double this total for the minimum recommended safe distance.

If you are unable to maintain this safe distance, STOP! GET PROFESSIONAL HELP. Most antennas are supported by pipe masts attached to the chimney, roof, or side of the house. Normally, the higher the antenna is above ground, the better it performs. A good general rule is to install your vertical antenna about 5 to 10 feet above the roof line and as far away as possible from power line and obstructions.



Telescoping masts are usually mounted on the roof, but can also be mounted to the side of a structure.

The lower section of each telescoping mast is a different diameter. Choose the correct mount that will accept the lower section of the telescoping mast you are using.

Telescoping Mast Length	Lower Section Diameter
20 ft.	1 1/2 in.
30 ft.	1 3/4 in.
40 ft.	2 in.
50 ft.	2 1/4 in.

## HOW TO INSTALL YOUR TELESCOPING MAST

**Note:** For 50 ft. masts only, remove cotter pin and slide inner sections out past the hole. Then, insert the cotter pin into the same hole of the bottom section to support the inner mast sections as shown.

1. Select a safe position for the mount.
2. Position anchor points for the guy wire. (See Figure 1)

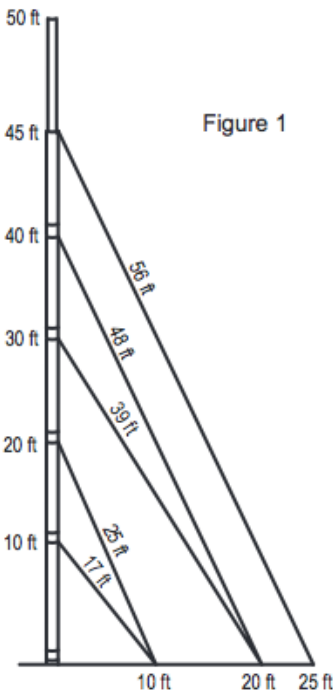


Figure 1

3. Attach guy wire (four (4) locations are recommended) to the lowest guy ring and wrap guy wire at least six (6) turns around itself. (See Figures 1 and 2)

4. Insert the lower section of the telescoping mast into the mount. Ensure that the mast is in a vertical position, and secure the guy wires at the anchor points.

**Note:** One person is required at each anchor point to hold the guy wires as you extend the remaining sections.

5. After the guy wires have been secured for the lower section, a ladder may be leaned against the mast and tied in place.

6. Mount your antennas to the upper mast section (1 1/4 in. diameter), and secure the transmission line with standouts. Secure the upper guy ring approximately 6 in. below the antenna using a mast clamp with a hex bolt.

## TYPES OF SUPPORT STRUCTURES AND MOUNTING

DESCRIPTION	USAGE	HEIGHT LIMITATION
Telescoping mast	Peaked and flat type roofs or side of structure	Professional installation is recommended
Tripod mount	Peaked and flat type roofs	10 feet above rooftop
Roof mount	Peaked and flat type roofs	10 feet above rooftop
Wall mount	Side of structure	10 feet above rooftop
Chimney mount	Chimney only	10 feet above chimney top
Tower	Not recommended	For professional use only

NOTE: IF ANTENNA IS MOUNTED HERE OR HERE

THE SAFE DISTANCE FROM POWER LINES SHOULD BE TWICE THE HEIGHT OF THE MAST PLUS THE HEIGHT OF THE ANTENNA

Attach guy rings as indicated in Step 3. above.

7. Raise the upper section of the mast with the mounted antenna until it reaches its stopping point. Insert the platform pin and rotate the mast until the slot in the bottom of the mast section engages with the platform pin. Tighten the "L" screw on the mast clamp to secure the upper section in place. (see Figure 3)

**Note:** Special "T-Nut" is provided on mast clamps for #10-20 combination standouts to a secure transmission line.

8. Using a person at each anchor point to hold the guy wires, begin raising the smallest mast section (1 1/4 in.) and secure it in place as indicated in Step 7. Continue to raise the remaining sections (smallest to largest) and secure each in place until the mast is fully extended to the necessary height.

9. After the telescoping mast is fully extended, draw the guy wires taut while keeping the mast perfectly vertical. Secure the guy wires to the anchor points. Untie ladder (from Step 5.) and carefully remove it.

Figure 2

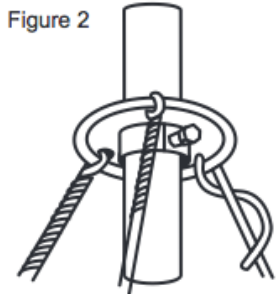


Figure 3

