Building the Moxon Antenna

I have been talking some about the modeling of the antenna, but no matter how good the model is, I got to build one and try it out. In the build process, I will try and document some of the parts that I used, so other might be able to duplicate at least parts of the antenna that they feel are interesting. So here goes.

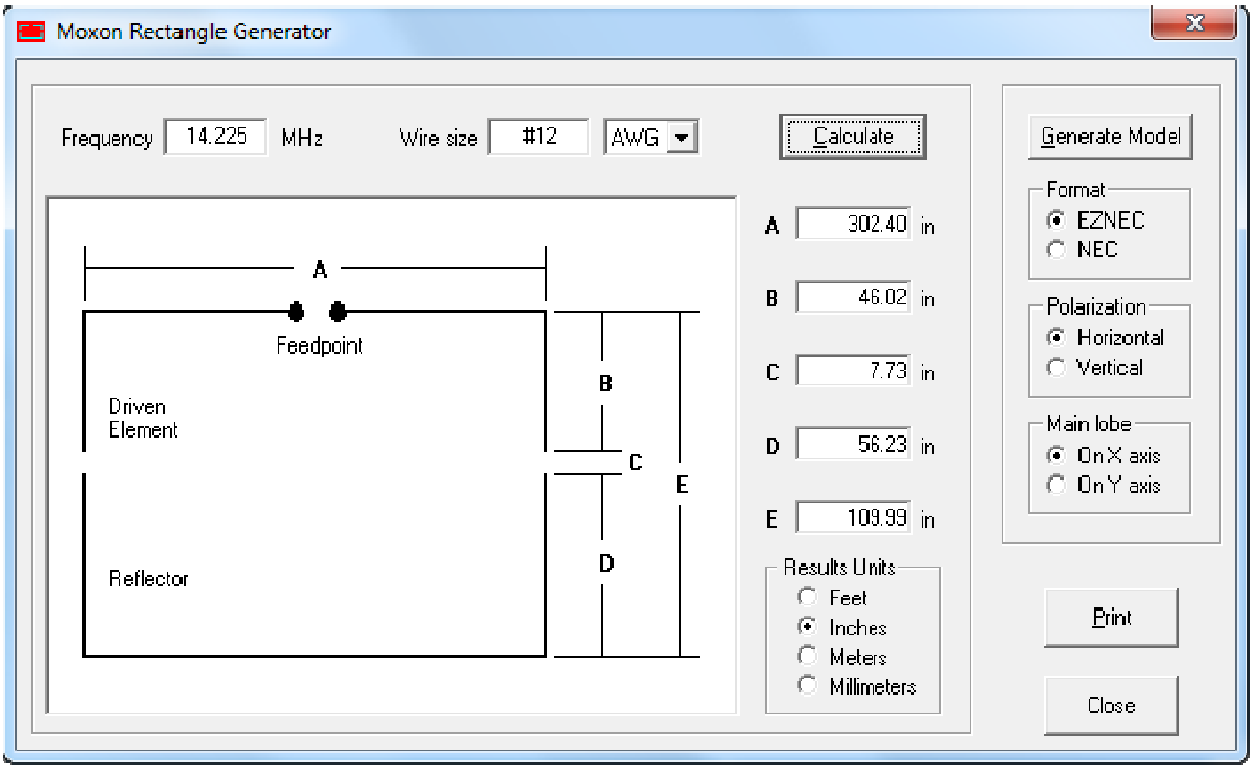
There is really a good on-line resource on the Moxon antennas. Take a look at:

http://www.moxonantennaproject.com/

From this web site that have a great tool for designing the antennas, the "Moxon Rectangle Generator"

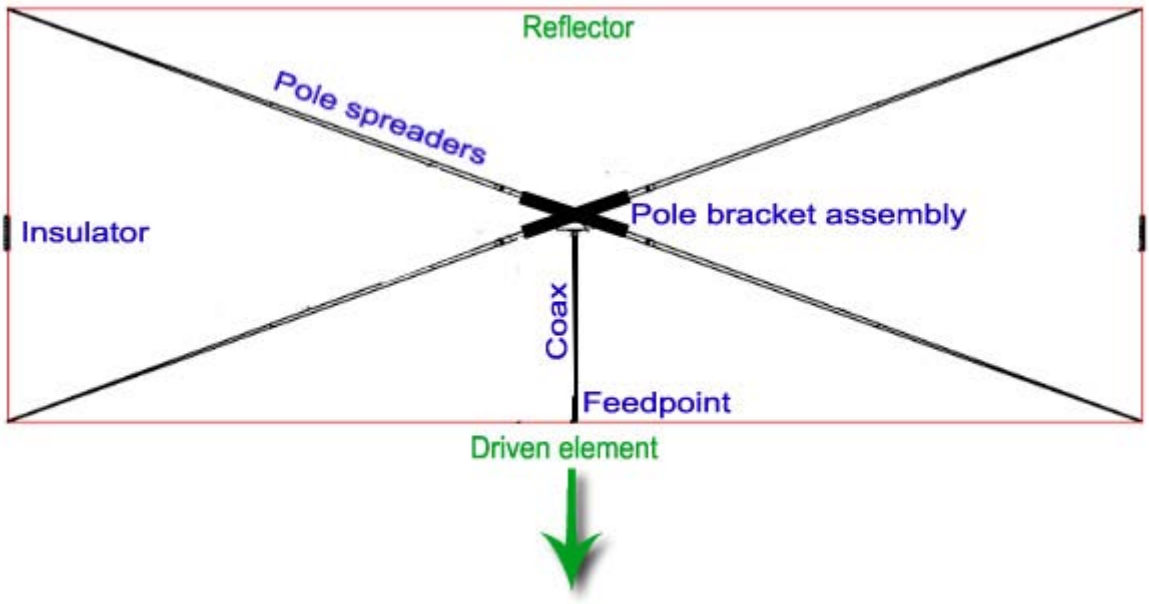
http://www.moxonantennaproject.com/design.htm

Below is the output of this program for the 20m version that I have modeled in the prior discussions. It's design frequency is 14.225 MHz



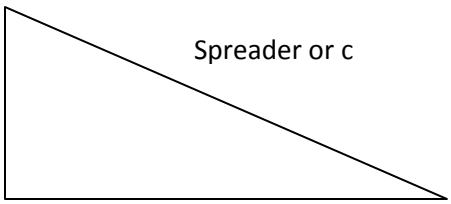
By the way, the screen grabs are from a program "Snagit!". This is a great program for this type of work.

The first problem to solve is the basic design of the supporting structure. I decided on the classical design of the X Spreaders.



The first thing I had to calculate is the approximate length of the spreaders. I used P**ythagorean theorem** . That is $a^2 + b^2 = c^2$. This is one of those very common equations that can be used with right triangles. So, here we go:

1/2 of the E dimension from MaxGen or a



1/2 of the A dimension from MaxGen or b

So, doing the math;

$(110/2)^2 + (302/2)^2 = c^2$

$3025 + 22801 = c^2$

$25826 = c^2$

Take the square root of 25826;

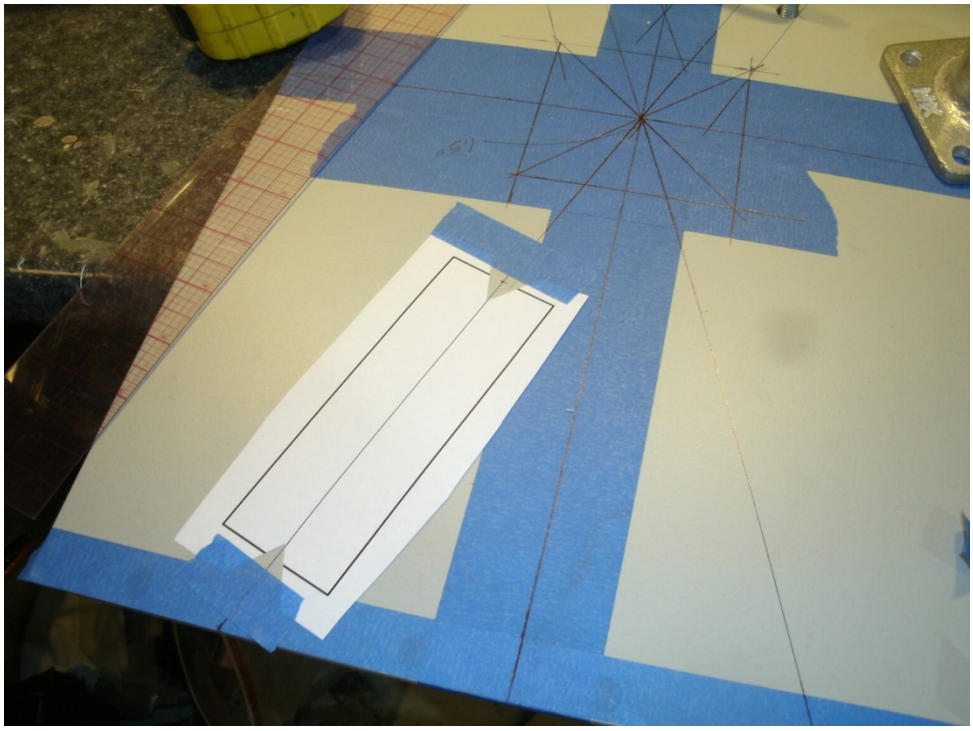
approximately 161" or 13.4 ft. Trust me, we don't have to be that exact at this point.

So, I need some kind of flexible pole about 13.5 ft long. We have a few options. If I was planning on making this a permanent installation I would have definitely gone with fiberglass tubes from Maxgain Systems http://www.mgs4u.com/. I used these on my hex beam and they were great. Since I was

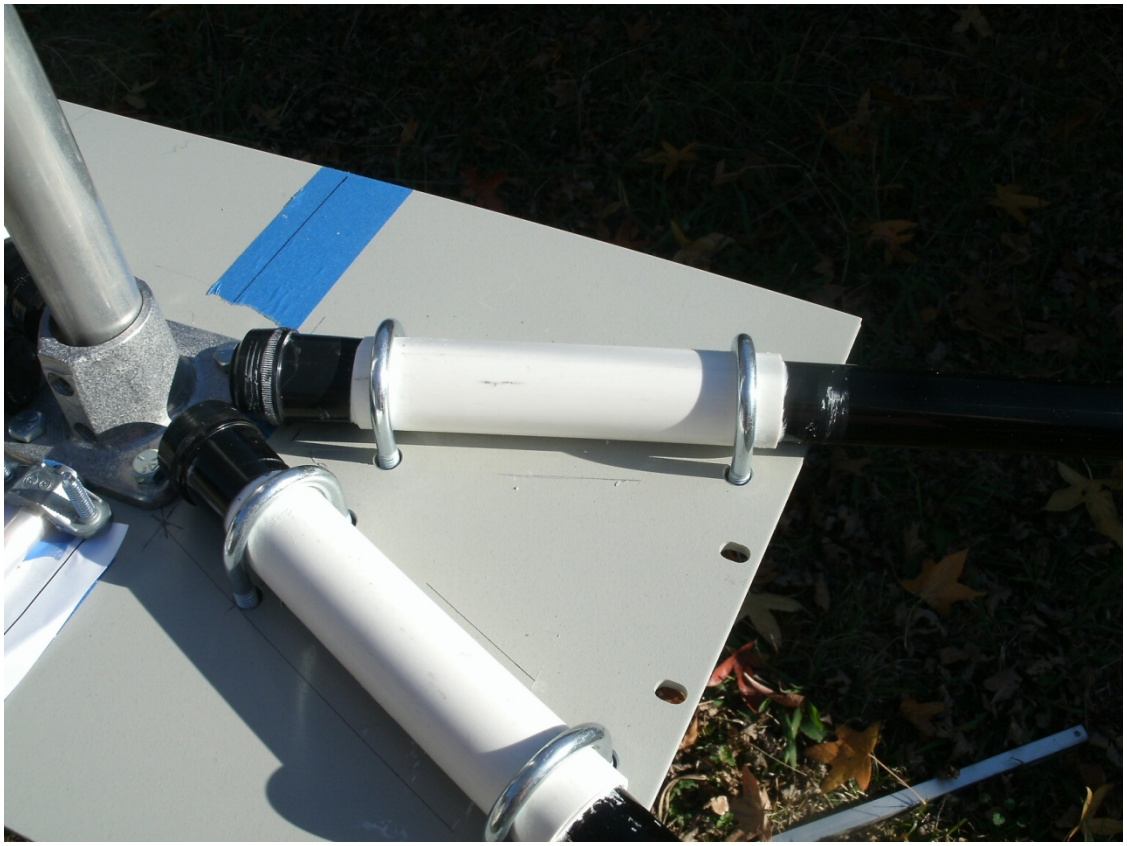
looking for something lower cost, I found some Crappie Poles at Cabella's. There model ***CCT-165*** at $9.95 is a great find for a 16.5 ft long pole. I picked a few up and was pleased with the quality.

I also went ahead and ordered some #12 Flexweave (model 543) cable from http://thewireman.com/index.html . This stuff is not the cheapest stuff, but it sure is great antenna wire for projects like this. Any common #12 wire would work, but it can't be insulated and use the same dimensions.

So, the construction begins. The first thing I needed to make was the center plate. I decided to go with the same basic design as the hex beam. I happen to have a 12" x 19" rack panel that I could use as the center plate. Below is a in process picture of the layout. Nothing high tech here, just a ruler, some blue painters tape and some real simple drill templates made in Powerpoint.



The white template is used to mark the holes for the U-bolts to hold down the spreaders. In looking at the spreaders, I decided that I wanted to reinforce the area that the U-bolts would clamp on. As it turns out, common 1" PVC water pipe worked just fine. I simply glued a 6" section to each spreader.



I also needed a way to hold the center mast in place. Looking at the picture above you can see the cast aluminum piece in the center. This is component from a system commonly called "Speed Rail". This is a very handy thing to know about in building up antennas. I generally get my parts like this from McMaster-Carr. This is one of the coolest companies in the world. Generally any part in their catalog will be delivered within two days without high shipping costs. I also got the U-bolts from them. Below is the website and part numbers:

http://www.mcmaster.com/

Part Number: 4698T2

Description: Aluminum Slip-on Rail Fittings Floor-Mount Flange, Rectangular, Fits 1" Pipe Size. (The description is a bit misleading. The 1" pipe refers to standard galvanized pipe with an outside diameter just less than 1-3/8". In this example the center support tube is 1-1/4" standard aluminum tube from Texas Towers.)

Part Number: 3043T24

Description: Zinc-plated U-bolt, 5/16"-18 x 1" Thread Length. For 1-3/8" OD Pipe. (I would normally use stainless steel on an antenna, but since this is just a Field Antenna, it should be just fine.)

The next issue to solve is how to attach the wire elements to the spreaders. I used the following parts from McMaster-Carr.

Part Number: 3781T51

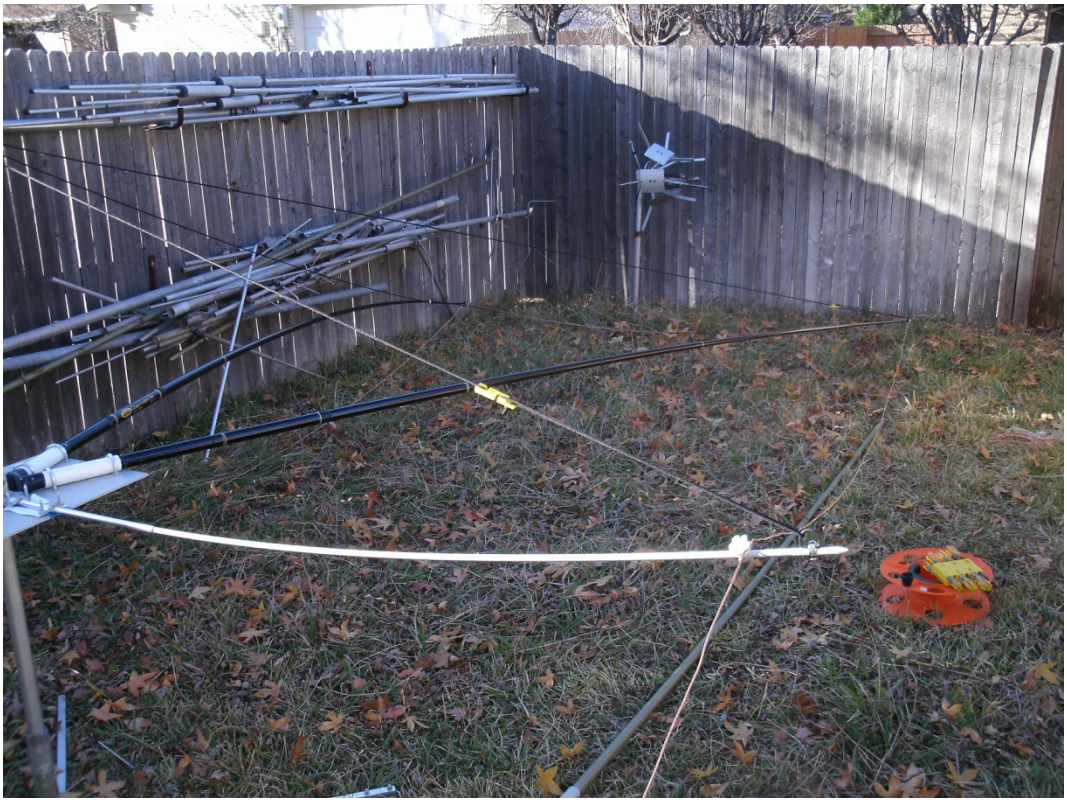
Description: Black Acetal D-Ring for 3/4" Webbing Width, packs of 25

Part Number: 5388K14

Description: Worm-Drive Hose Clamp W/Zinc Plated Steel Screw 7/32" to 5/8" Clamp Dia Range, 5/16" Band Width, packs of 10 (These are also available at local hardware stores.)

If you have a really sharp eye you might notice that the wire elements are currently 1/8" para-cord. This is cheaper than the real wire when you are just trying to figure out the mechanical design. This worked out well, the rings are clamped at the joint of the last section. Before the antenna is completed I will cut the last section off to make the whole antenna a little stronger and easier to handle. The spreaders are actually a little too long, which is desired. This will put the wires under a little tension to hold them straight.

So, here came the interesting part. I installed the #12 flexweave wire and here are were the results.



No amount of adjustments could keep the tips of the antenna up in the air. It appeared that the weight of the wire was just too much for the poles. The poles still may be a good idea, but I would likely have to use lighter wire or a smaller antenna system.

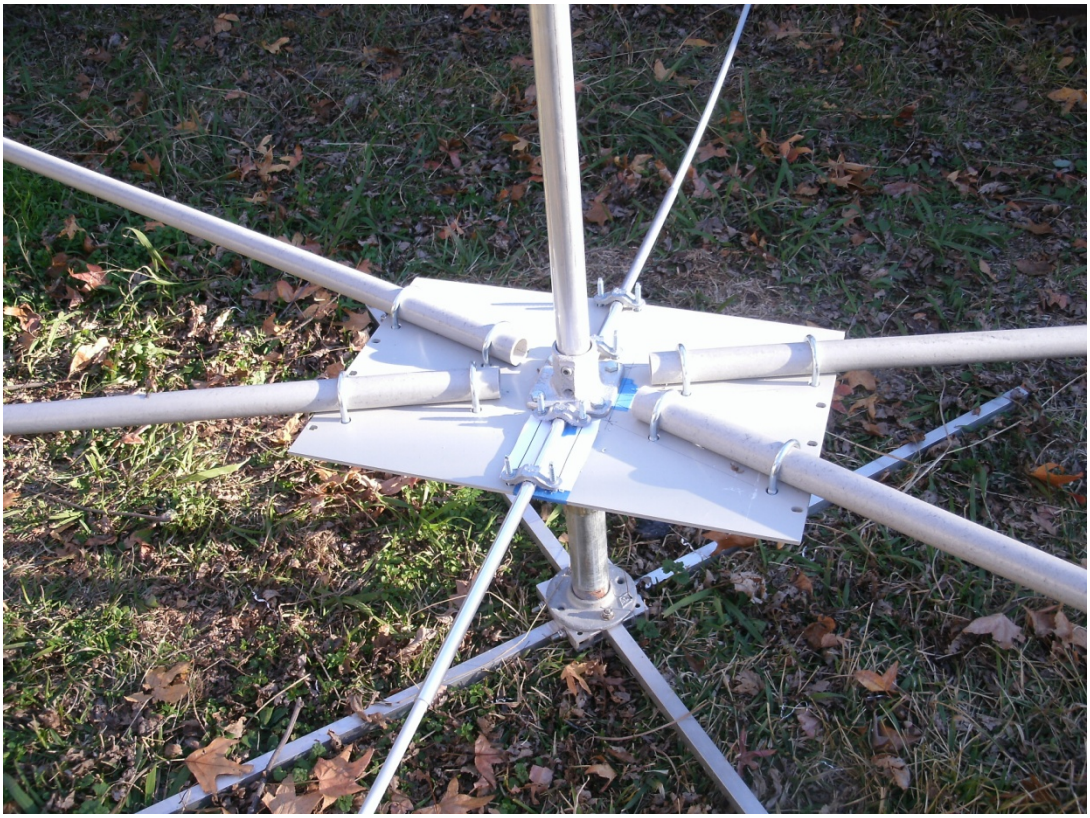
As it turns out, I had some stronger fiberglass poles that I have used on other antennas. What I had available was a 1-1/4" section and a 1" outer section. At this time I just have some hose clamps holding this whole thing together.

This did a much better job. I also increased the distance from the center plate to the top guy attachment point. The complete assembly got heavier, but This will do a much better job in the long term.

I used the same method to attach the D-rings to the end of the support tubes.

Here is a view of the driven element attachment point. The white string is just there to guage some of the distances between the elements.

I went ahead and installed a center support rod on the other side of the center plate to hold up the reflector center wire a little better.



Well that is all for now. I think I will clean up the installation just a little and go on to the testing phase of the project. I will go ahead and make up a few fixed length setting wires to allow this to be assembled just a little easier and I will double check all of the dimensions on the system.