HEX BEAM

By K4KIO (k4kio@leoshoemaker.com) - Page revision date 6/2010
By PU7IRR (rossijunior@bol.com.br) - Word edition date 12/2010

This file provides guidelines to build a G3TXQ broad band hexagonal beam R.F. antenna for the six amateur radio bands, 20, 17, 15, 12, 10 and 6 meters. This antenna is featured in the March 2009 edition of QST magazine and is a significant improvement over the Hex-Beam design.

The hexagonal beam offers a number of features as follows:

- Gain and front/back comparable to a two element Yagi.
- Five bands with low SWR
- Broad band characteristics
- Low weight and low wind load
- Construction from general hardware components
- Ease of adjustment

If you have been to other sites on construction of the hexagonal beam you might be a bit confused. You see, some sites tell you how to build the “original” hexagonal beam which is patterned after the design of the HEX-BEAM, a trademarked product of Traffie Technologies. The wires for this original design for a single band look from above, like an “M” over a “W”.

For a more full understanding of the technical parameters of the G3TXQ broad band hexagonal beam, visit the web site of its inventor, Steve Hunt, G3TXQ. (http://karinya.net/g3txq/hexbeam/)

If you feel you would rather not get into building your own G3TXQ broad band hexagonal beam, I can build one for you. See the Hexagonal Beam by K4KIO for sale details here. (http://k4kio.com/)

This original design is a good antenna and owners of the HEX-BEAM are quite vocal about its performance as were builders of the homebrew version. I used to be one of the homebrew builders and was so enthusiastic that I published a set of guidelines like these to help others build one.

But, things have progressed a little and thanks to the exhaustive work of Steve Hunt, G3TXQ, a slightly different configuration of the hexagonal beam has been discovered. Viewed from above the wires for a single bander look like the sketch to the right.

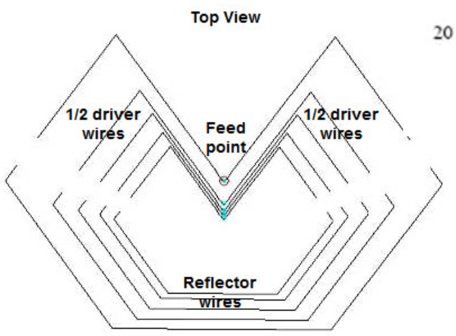
Which one is better? Well, owners of the original HEX-BEAM are very loyal. But the only competitors in the market are selling only the new broad band hexagonal beam and home brewers are all building that version of the hexagonal beam instead of the original. And here is the reason why.

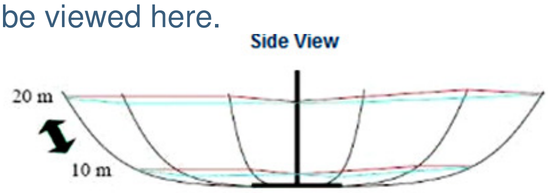
Overall Description

This is a G3TXQ broad band hexagonal beam for 6 - 20 meters. It is just less than 22 feet in diameter and is constructed of six fiberglass tubes and 14 or 16 gauge stranded copper wire. The center post is a five foot piece of fiberglass or PVC. The beam is fed at the top of the center post with 50 ohm coax and weighs about 25 pounds.

The hexagonal beam consists of two elements for each band. The driven element is in the shape of an "M" and the reflector element is wrapped around the four spreaders to the rear of the driver wires. The elements are made of wire instead of tubes used by most Yagi antennas. Therefore there is a need for a supporting structure. The supporting structure consists of six flexible fiberglass tubes attached to a base. The tubes are as shown and thus the name hexagonal beam.

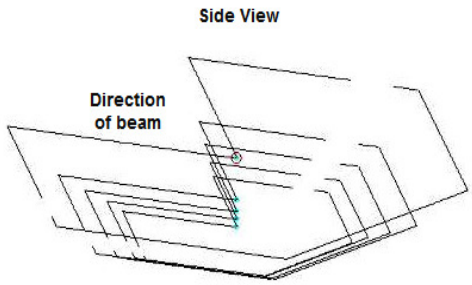
The antenna elements are held in place by the base/tube structure, the wires and Kevlar/Dacron cords. All bands of the antenna are fed by a single coax cable. To the right are sketches of how the G3TXQ broad band hexagonal beam is configured for a single band. A sketch of the wires of a five band hexagonal beam can be viewed here.





Overall data on the G3TXQ Broad Band Hexagonal beam by K4KIO

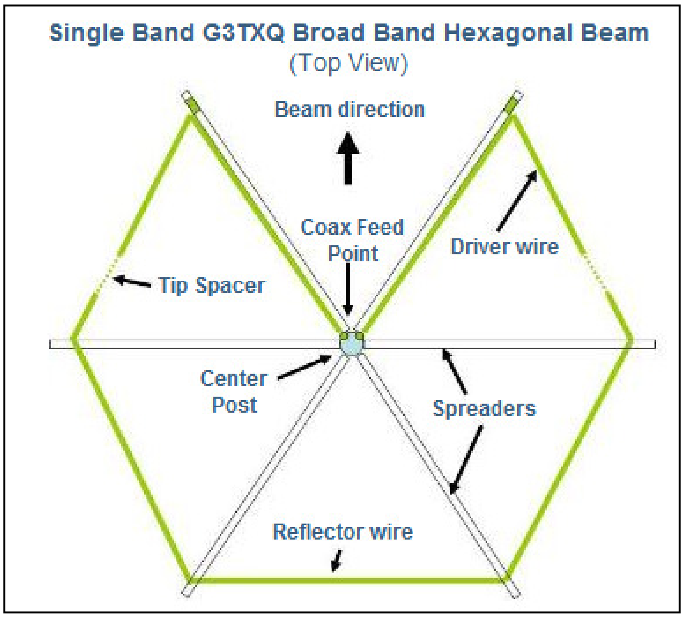
Freq. bands (M):	6, 10, 12,15,17,20
Weight:	25 lbs
Diameter:	22 ft
Wind Surface Area:	2.5 Sq Ft



The support structure for the hexagonal beam resembles an umbrella upside down. To the left, wires only for a five band hexagonal beam are shown. The wires for 20 meters are the outermost and 10 meters are the innermost. The gaps between the ends of wires are insulated end spacers which keep the tips of the driver wires and reflector wires at the specified distance from each other for proper coupling.

The driver wires are fed with a single coax from the top with each band's driver wires connected at different vertical positions on the center post (handle of the umbrella).The spokes of the hexagonal beam are flexible tubes that keep tension on the wires while supporting their weight.

Why the G3TXQ Broad Band Hexagonal Beam?



The classic hexagonal beam has been in use for several decades and a commercial version is available for purchase in a variety of configurations; multi-band, mono band, etc. Many, including the author have built home brew versions of the HEX-BEAMR and used them quite successfully. Guidelines for building one are available on other sites for those who prefer to stick with the tried and true.

The classic hexagonal beam, for its compact size, is fairly narrow banded in its front/back and SWR performance. This is one of the trade offs for the compact physical size that makes the classic hexagonal beam so attractive. In late 2007 Steve Hunt, G3TXQ conducted extensive testing and modeling of many variations of the classic hexagonal beam seeking to overcome its narrow banded deficiency without sacrificing the simplicity and small size. The design featured in this G3TXQ broad band hexagonal beam is the result of his efforts in this regard. A full explanation of the design is available on Steve's web site. An overall comparison of the new broad band design and the classic design is available. These guidelines are based on my own construction of the G3TXQ broad band hexagonal beam.

The New G3TXQ Broad Band Hexagonal Beam vs. the Classic Hexagonal Beam

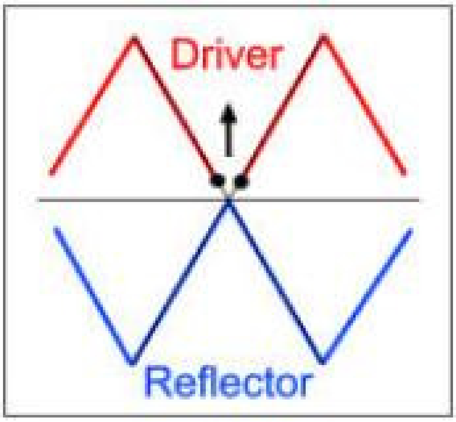
The original or classic hexagonal beam is the configuration of the Hex-beam manufactured by Traffie Technologies and copied by many homebrewers. The classic hexagonal beam is a proven winner among those who have built one. However, the classic beam has a significant shortcoming that is a result of its compressed configuration. It is rather narrow banded. In fact, if you design your classic hexagonal beam for use on the SSB portion of the larger bands such as 20 or 15 meters it will perform quite well. But you will find that the front to back performance on the CW end of the band is quite mediocre if not downright unacceptable. You can adjust the wires for resonance at the middle of the band but then it will be only average in performance on both the SSB and CW sub bands.

In November 2007, Steve Hunt, G3TXQ, developed a major improvement in the classic hexagonal beam to overcome these bandwidth limitations. The new G3TXQ hexagonal beam is much broader in its performance and as a result will deliver quite good front to back performance as well as low SWR over the entire range of frequencies of the larger bands. Below are charts that illustrate the differences in the classic and broadband hexagonal beams on 20 meters. The only penalty to be paid for this improved performance is a slightly larger diameter of the broad band. The five band classic hexagonal beam for 10, 12, 15, 17, 20 meters is about 19 feet in diameter; the broadband is 22 feet.

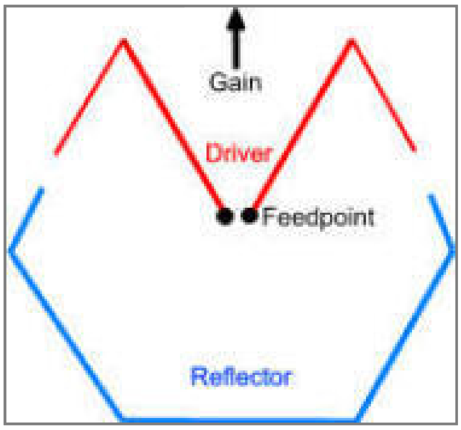
This minor difference in size for such a major improvement in performance causes me to recommend the G3TXQ hexagonal beam over the classic. I have modeled both, I have built both, I have tested both and I have used both. And I am convinced that the G3TXQ broad band beam is better. At the urging of the late L.B. Cebik, W4RNL, Steve recently authored an article featuring the broad band hexagonal beam in the December 2007 edition of the ham radio on line antenna magazine, AntenneX.

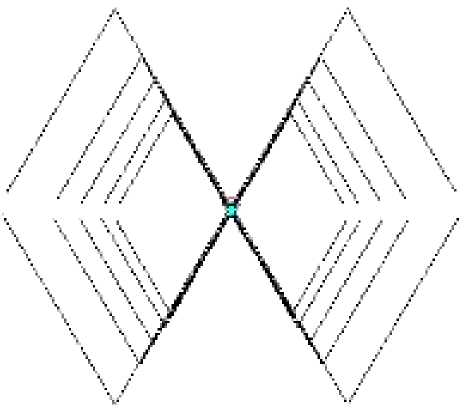
Below is a comparison of the classic and the broad band hexagonal beams.

Original Hex-beam

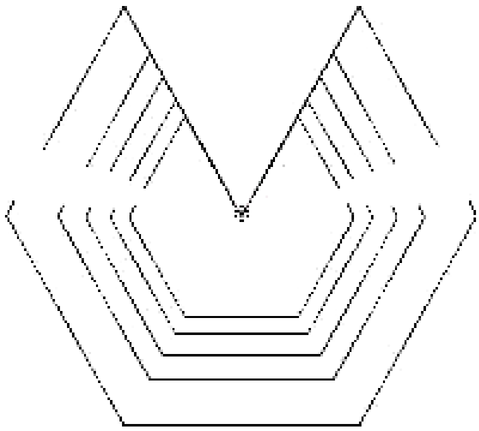


Broad band Hex-beam





Top view of a five band classic hexagonal beam antenna showing wires only with no spreaders or other supporting structure. Diameter is 19 feet



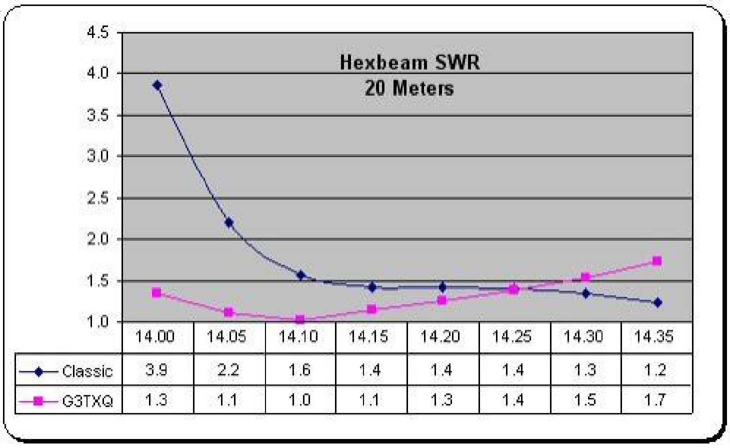
Top view of a five band G3TXQ hexagonal beam antenna showing wires only with no spreaders or other supporting structure. Diameter is 22 feet

GOLD TIP:

Construction of the G3TXQ broad band hexagonal beam is easier than the classic hexagonal beam:

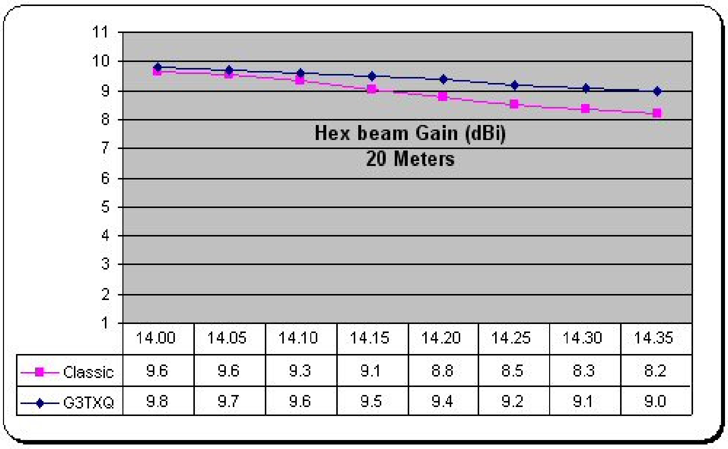
- *No terminals for the reflector on the center post*
- *Only two end spacers per band rather than four*
- *Reflector, driver and spacers are a single loop making adjustment much simpler*
- *Tuning is not as critical because the bandwidth is broader*

Data for five band beams on 20 meters at 30 feet above good ground. Azimuthal patterns at 29 degrees elevation. SWR for 50 ohm feed.



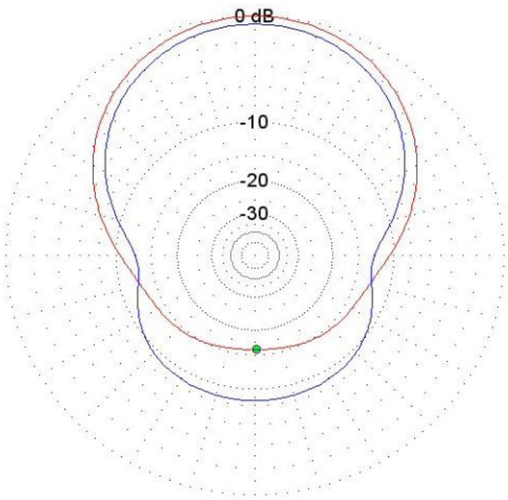
	14.00	14.05	14.10	14.15	14.20	14.25	14.30	14.35
Classic	3.9	2.2	1.6	1.4	1.4	1.4	1.3	1.2
G3TXQ	1.3	1.1	1.0	1.1	1.3	1.4	1.5	1.7

The SWR of the G3TXQ hexagonal beam is dramatically better on the low end of the band making it easier to couple the transceiver to the antenna for maximal power transfer.

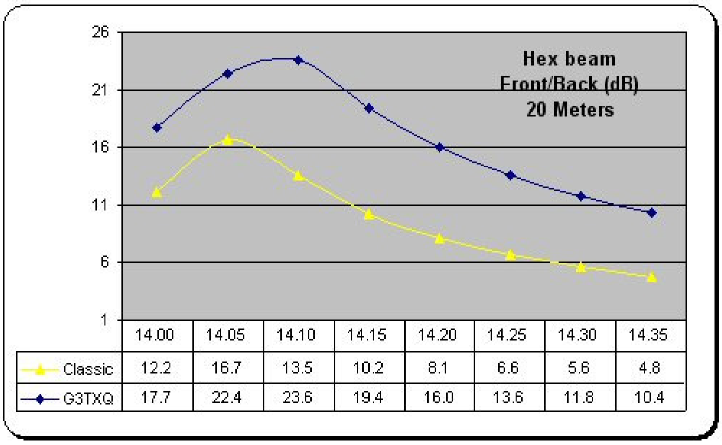


	14.00	14.05	14.10	14.15	14.20	14.25	14.30	14.35
Classic	9.6	9.6	9.3	9.1	8.8	8.5	8.3	8.2
G3TXQ	9.8	9.7	9.6	9.5	9.4	9.2	9.1	9.0

The forward gain of the G3TXQ hexagonal beam is slightly better than the classic design.



Azimuthal radiation patterns for the classic hexagonal beam and for the G3TXQ hexagonal beam. Note the slightly superior forward gain and the significantly superior front/back performance of the G3TXQ hexagonal beam.



	14.00	14.05	14.10	14.15	14.20	14.25	14.30	14.35
Classic	12.2	16.7	13.5	10.2	8.1	6.6	5.6	4.8
G3TXQ	17.7	22.4	23.6	19.4	16.0	13.6	11.8	10.4

The front/back gain ratio of the G3TXQ hexagonal beam is dramatically better than the classic design. This means that unwanted signals coming into the transceiver from the back of the beam will be much less than with the classic hex beam.

Note: *the peak of front/back performance of the classic version occurs at 14.05 MHz whereas the SWR at this same frequency is about 2.2:1, a sub-optimal point on the SWR curve. What this means is that it is necessary to compromise between optimal SWR and best F/B with the classic design. On the other hand, with the broadband version, the front/back performance peaks at the lowest SWR with the result that there is no need to compromise between these two major goals in beam performance.*

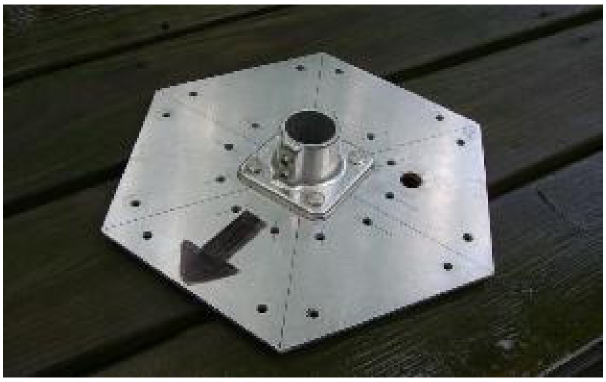
Building the G3TXQ Broad Band Hexagonal Beam Six Steps to build it:

The electrical design of this hexagonal beam is the same as the beam featured in the March 2009 QST article by the author. However, the mechanical details here differ somewhat and are an improvement, in my opinion, over the mechanical design in the QST article. The guidelines here are for a six band hexagonal beam.

However, if only three bands are desired or five bands, the same specifications apply for the bands you want to equip. The cost for materials for this beam are around $300 retail and sources for some key parts are on line while most of the small parts are obtainable from Home Depot or Lowes.

The approach in this site is to explain five steps for building the components shown below and then Step 6 outlines how they are all assembled into a hex beam.

Step 1: The Base Plate



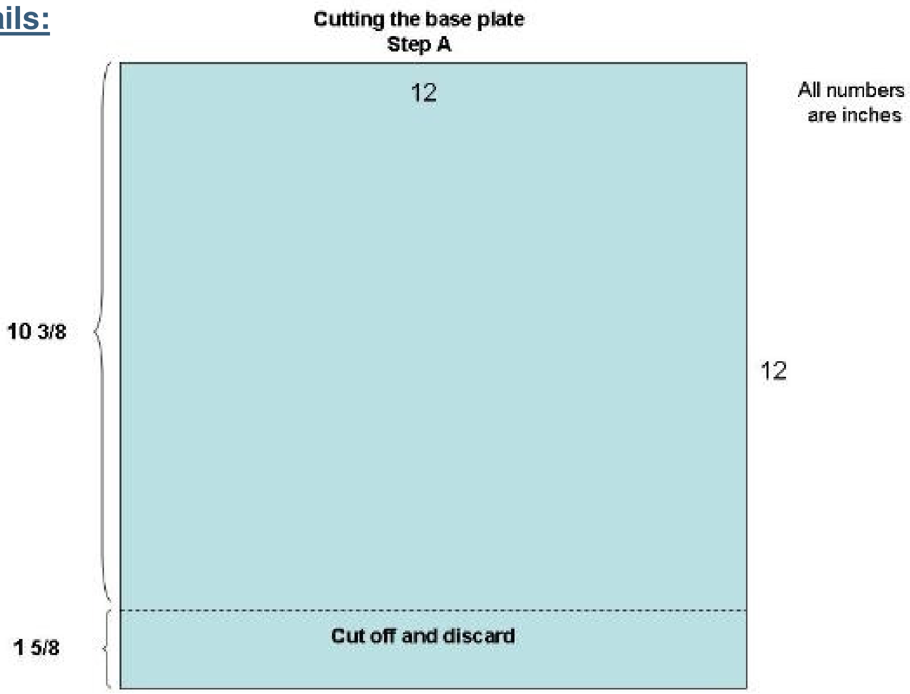
- The baseplate is made of a 12 inch square type 6061 T6 aluminum plate that is 3/16 inch thick. This particular type aluminum is harder than pure aluminum and less likely to bend while being resistant to weather. U-bolts attach the spreaders to the baseplate.
- Two square base floor flanges normally used for handrails are used to mount the center post to the base plate. One is on the top for mounting the center post and the other is on the bottom for insertion of the mast. These flanges are made of aluminum-magnesium alloy.
- Stainless steel hardware can be used to minimize corrosion especially in saltwater environments although it is more expensive. Lock washers should be used; otherwise movement of the hex beam by wind and rotation will eventually work the fixtures loose.

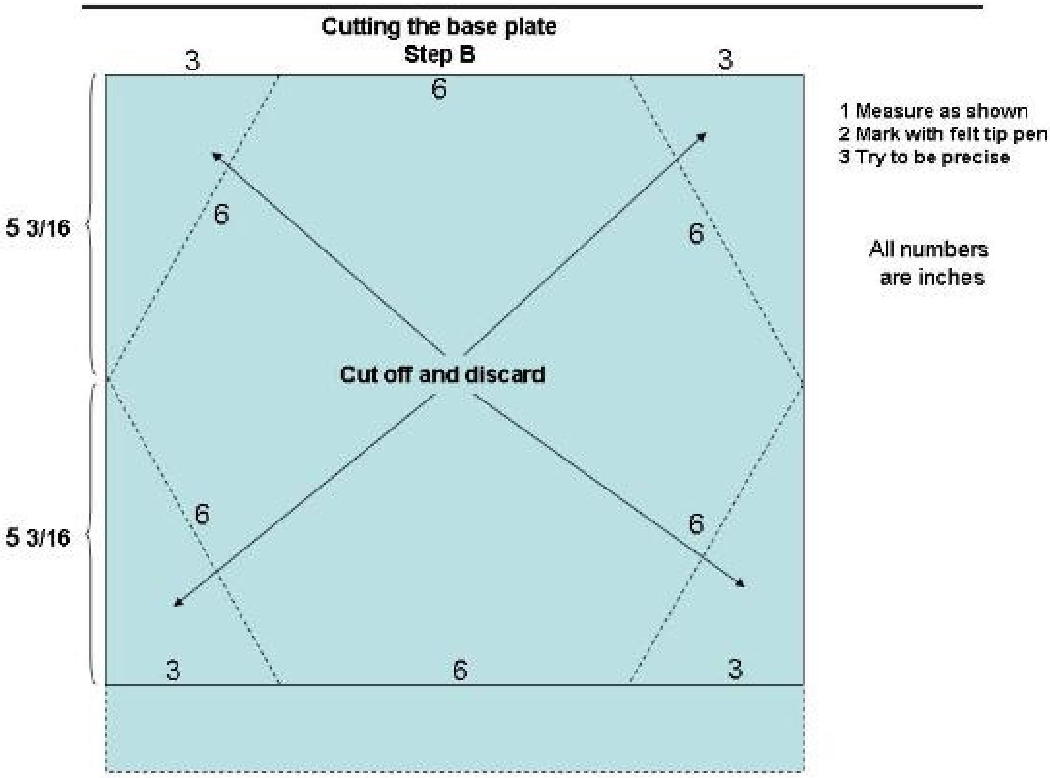
Don't want to cut and drill and chase down all these parts? Get the plate already cut and drilled and all hardware tools for under $90. Your cost for parts and shipping will be close to this if you go ahead and built it yourself so why bother? See the details at www.hexkit.com

Six Steps to build it - The Base plate:

Measuring and marking the hexagon. Bellow more details on how to do this.

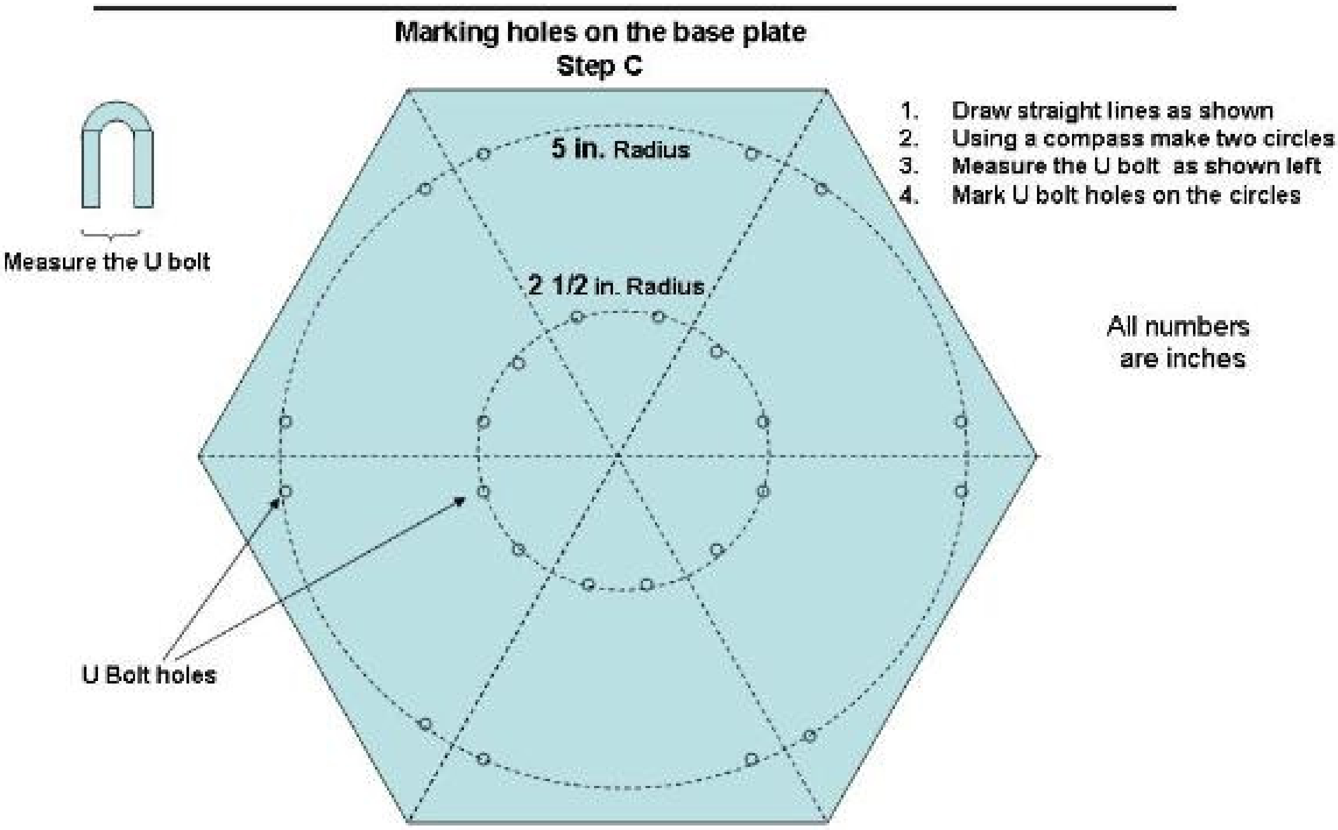
See more details:





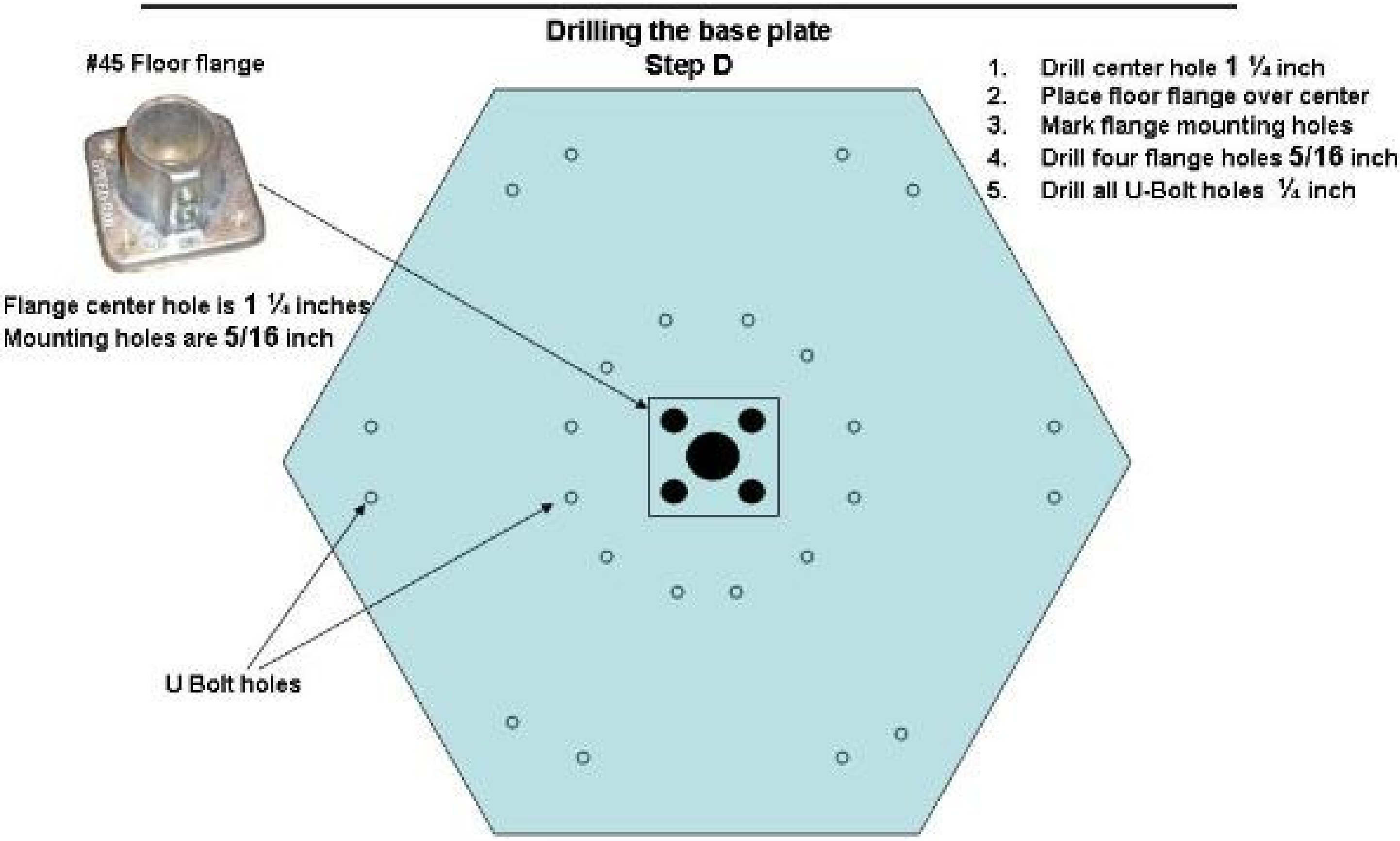
The plate can be cut with a hacksaw by hand or by a reciprocating saw with a metal cutting blade. A piece of board and clamp are used to hold it all steady for cutting.

See more details:



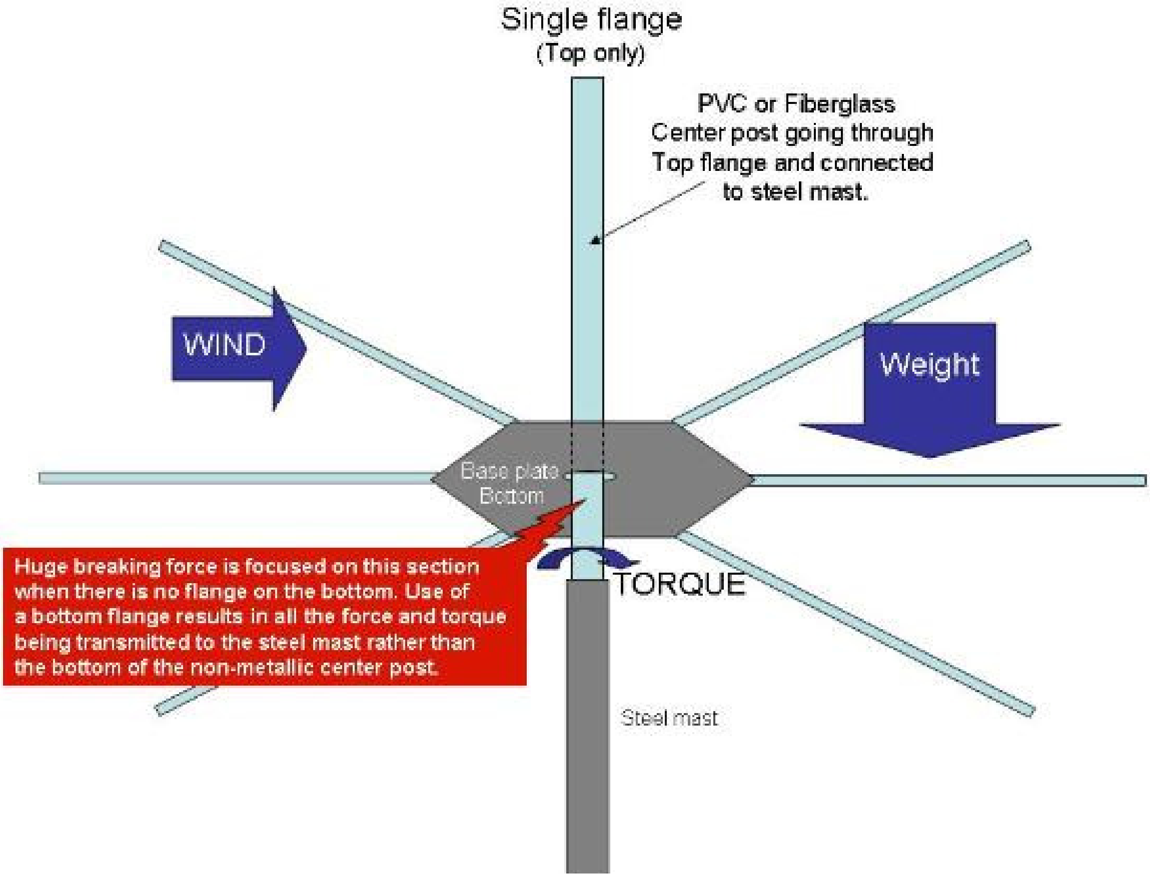
A metal hole saw and a hand operated drill can be used to easily cut out the center hole.
There is a rule in all building and repair projects. You will have to buy at least one new tool. This metal hole saw from Lowe's cost about 8 dollars and I'll probably never use it again.

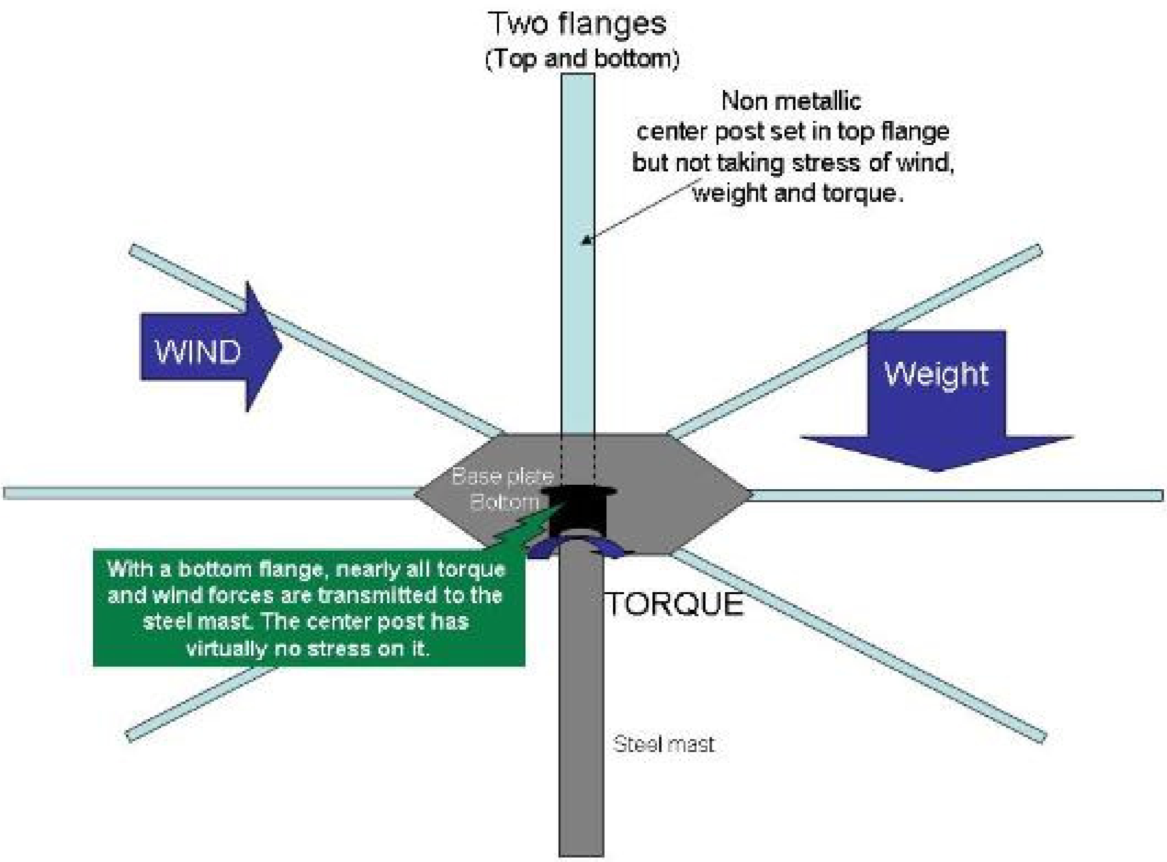
The holes for the U bolts are carefully cut where the lines have been measured. If you have a drill press, the holes will be more accurately cut. If you look closely you can see some of mine are a little short of perfection.



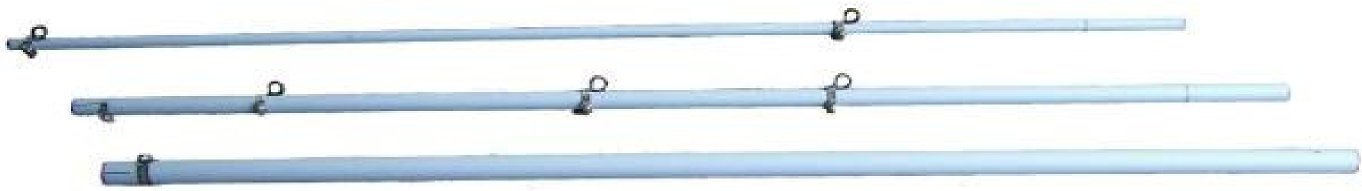
The center post will fit snugly into this floor flange. Put one on the top and bottom of the base plate for greatest strength. Bellow why is better this tip:

Why two flanges is a good idea?



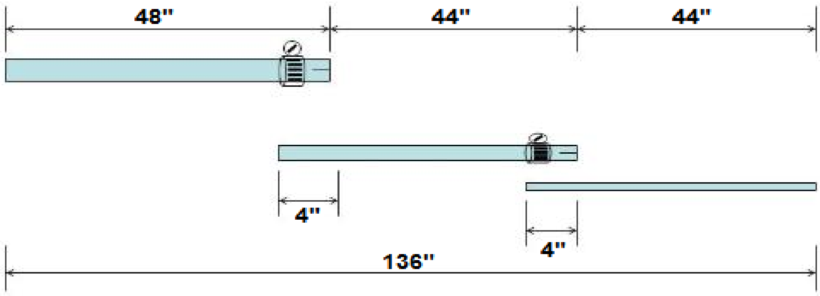


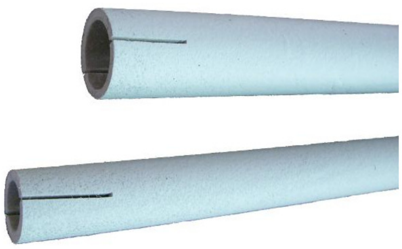
Step 2: **The Spreaders**



- Fiber glass tubes are recommended for the spreaders. These can be purchased from Max Gain Systems. Max Gain provides tips for attaching them together. Three thicknesses are needed **1" O.D., 3/4" O.D., and 1/2" O.D**. The smaller sizes fit perfectly into the next larger size.
- While it is not necessary, you can spray paint on the spreaders to achieve the color you want.
- Some have tried to build spreaders using PVC but I have heard of no one who has done this successfully. PVC is simply too limber and does not have the "spring tension" needed to maintain the hexagonal beam shape. I recommend against its use for a hexagonal beam.

The thinner pieces slip easily into the next larger pieces for a telescoping structure that will be 136" long when assembled. Each section is 48" long. Note the two clamps that tighten the three sections together. You should assemble six such telescoping spreader arms.

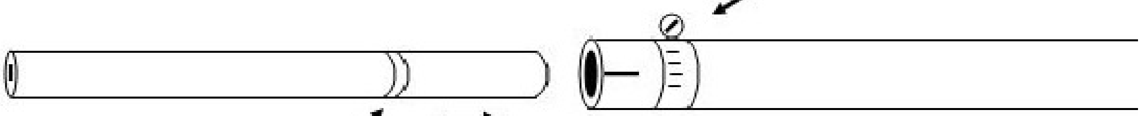




One end of the large and the medium spreaders should be slit about an inch with a hack saw or a jig saw, if available, as shown so that later, when telescoped together the clamp can be slipped over the slits and tightened. An unslit end goes into a slit end.

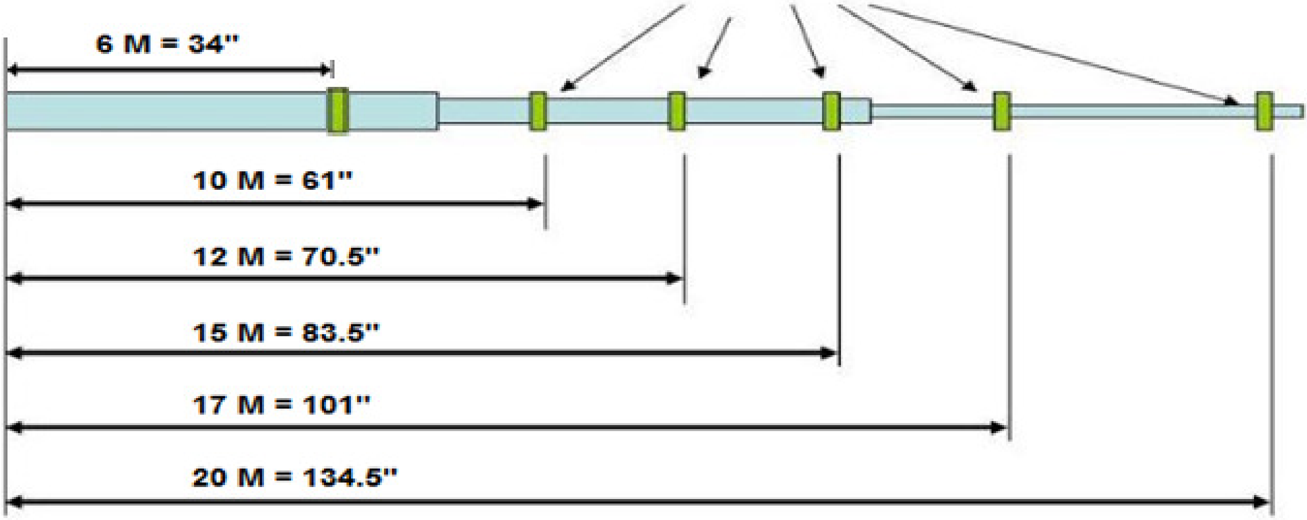
If you don't mind a permanent arrangement, you can just glue the sections together with Liquid Nail and then you won't have to slit the sections and buy the hose clamps to clamp them together.

See more details:



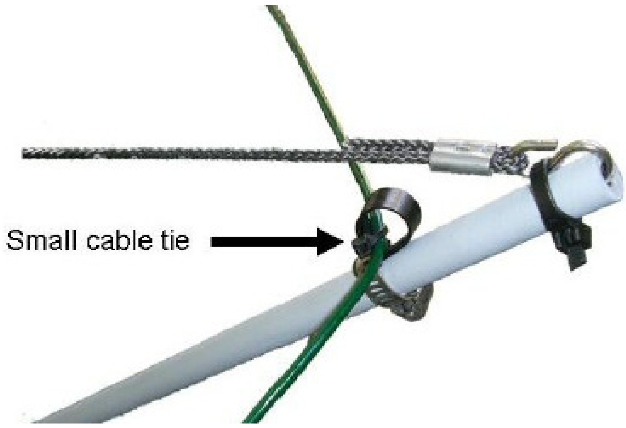
Mark with tape or felt tip pen the initial locations for the wire clamps. These should be as set forth below. These are preliminary and approximate clamp locations.

See more details:



Slip the hose clamps and P clips on now for use in attaching the wires later at the places marked in the preceding photo.
Use the #8 Med clamps on the large section and #6 on the other two sections. Insert P clamps under them for slipping the wires through later. Tighten them only a little as you will be making adjustments later in the assembly stage.

See more details:



Step 3: The Center post

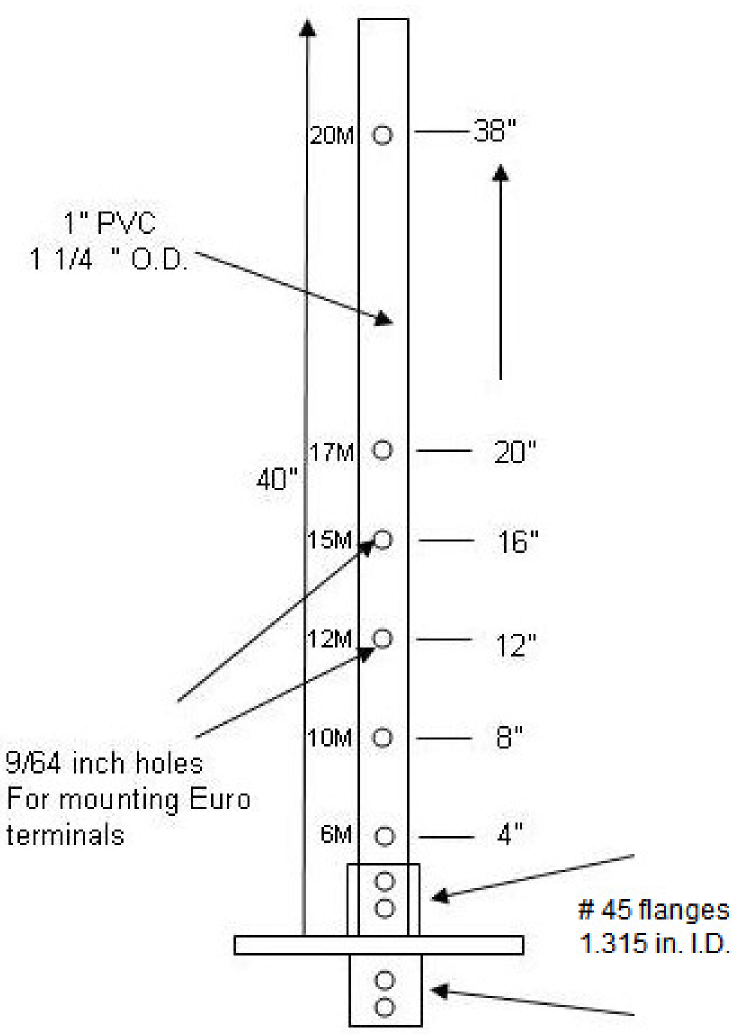
- The center post is for mounting the terminals that connect the various bands' driver wires to the coax feed line. It is made of basic one inch PVC plumbing that is a perfect fit into the baseplate described in Step 1.
- The terminals are located on the center post and are European terminals. The terminals are connected with 50 ohm coax pieces from the bottom terminals to the top where they are connected to the feedline from the transceiver.
- All bands are connected together via the coax links and are all fed by a single feedline.
- The terminal spacing on the center post and the length of the post itself are set forth below along with steps for constructing the center post.

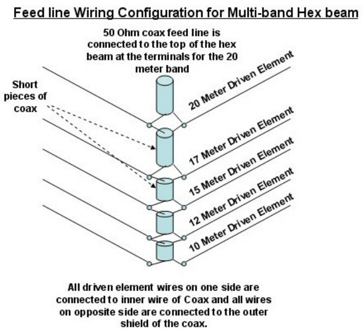
A vertical line to mark the holes for the European style terminals should be marked. The post should be 40 inches long and locations for the Euro terminal mounting holes should be marked as shown to the right.

These jumbo size European style terminal strips at Radio Shack can be easily cut into 6 double terminals to attach to the center post. The jumbo size is needed to accommodate the coax and the wires that must be inserted into the terminals. These can be obtained from other vendors such as Mouser

Drill a hole completely through the post for each terminal at the marks made in the first photo. You will be using a #6-32 X 2 brass or stainless steel bolt for each terminal. The bit size should be 9/64 inch. Install a double European terminal for each band at the marks.

See more details:

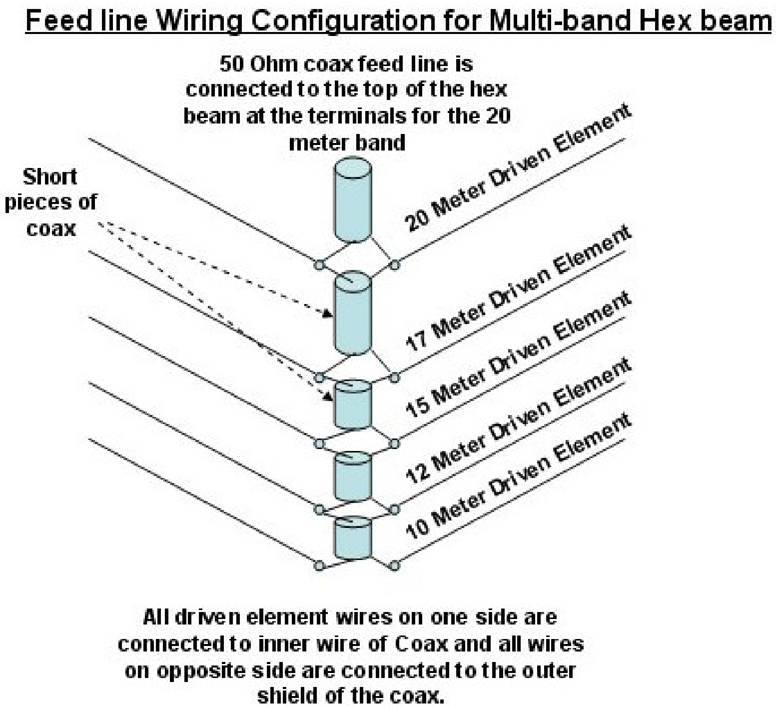




Here is schematically what you will be doing with the terminals on the center post. Only five bands are shown here but the sixth can be added below 10 meters. Be careful not to flip one of the coax pieces so as to put its shield on the side of the inner conductor of the others. It will cause big problems in performance.

Also, why not do a simple test for shorts when you get this finished? A piece of braid touching the inner conductor would be a headache to avoid with such a simple test.

See more details:



Cut coax pieces for connection between the center post driver terminals. If you are not going to be running more than 500 watts of transmitter power output, you can use RG 58 coax instead of RG 213 and it is much easier to work with.

Seal up the exposed coax braid with liquid tape or silicone sealant to keep moisture out. Apply it also to the metal of the terminals as the metal is steel and will rust if not protected. Paint has been applied. The driver wires will be bent to an "L" shape on the ends and pushed down into the tops of the terminals. Add a 1/2 inch to each driver half wire in Step 4.The feed line will also be connect to the top terminal and looped down the side of the post to the bottom of the hex beam.

Here is how your coax connects to the top of the center post to feed all the bands. Of course, you need to seal it up with liquid tape or silicone to prevent moisture from entering the braid and contaminating it. The wires are shown installed here as well as the radial cords. Use an eyebolt through the cap on top to anchor all the radial cords.

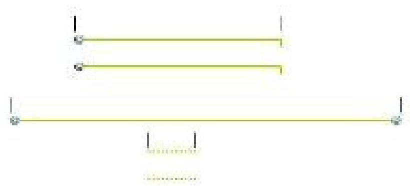
Step 4: The Wire Sets

- The driven element will consist of two pieces of wire for each band. The reflector will also consist of one piece of wire for each band. Each driven element piece will be shaped by the hex beam structure into an inverted "V" and when arranged next to the other piece, will form a "M." Each Reflector piece will be wrapped around the four spreaders and attached to the tip spacers which in turn are attached to the driver wires. Be precise with cutting the wires as an inch can make a difference in the resonant frequency of that band.

- Each outer half of the driver wires has a non-conducting line that connects that wire to one end of the reflector wire. These non-conducting lines will be called "tip spacers." The length of the spacers is important to proper performance of the hex beam and they are designed here so they can be adjusted precisely.

- The two ½ driver wires, the reflector wire and the two tip spacers should be measured and assembled as single end to end sets before installation on the spreaders using the approach below for each band.

- The higher frequency bands are nested inside the lower frequency bands but only one band is shown here for the sake of simplicity. The wire lengths are for #14 or #16 gauge bare wires. Insulated wire can be used in salt water environments and the lengths will be shorter. Tables for the lengths are on the next page.



For each band, make sections as shown here and then connect the pieces altogether for a single wire assembly that will look like the photo above when strung on the beam.
Use the table on the Specifications page for the lengths to measure and cut as shown above. You will need one set of the elements above for each band on your hexbeam. The cords can be made of Kevlar which has very little stretch or Dacron. When finished, connect all the pieces together for a complete wire assembly.

Lengths of wire elements and spacing
Note that driven element consists of two 1/2 sections and reflector consists of one section

Units are Inches (1 inch = 2.54 cm)

For use with #14 Ga. bare copper wire

Band (m)	2 x½ Driver (inch)	Reflector (inch)	Tip Space (inch)
20	218	412	24
17	169.5	321	18.5
15	144.5	274.4	16
12	121.7	232	13.5
10	106.8	204.4	12
6	58.5	112.5	6.5

For use with #14 Ga. PVC insulated copper wire only

Band (m)	2 x½ Driver (inch)	Reflector (inch)	Tip Space (inch)
20	213.5	403	24
17	165.5	313.5	18.5
15	141	268	16
12	118.75	226.25	13.5
10	104	199.25	12
6	57.3	110.25	6.5

Conversion table for driver wires only		
Wire Dia. (In.)	**Wire Gauge**	**Multiply lengths by**
0.032	20	0.996
0.040	18	0.998
0.051	16	1.000
0.064	14	1.002
0.081	12	1.004
0.102	10	1.006

*** Use 16 Ga. tables for reflector wires.**

Measure the half driver wire using the length found on the Specifications page. Include the ring terminal in the measurement and also add 1/2 inch for bending the other end into an "L" shape for insertion into the center post terminal. Repeat this for the other half driver wire for others meters.

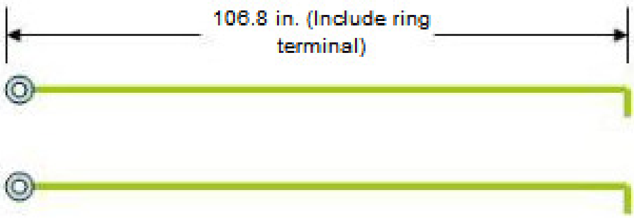
Then measure out the reflector wire per the Specifications page and solder a ring terminal on each end. Include these ring terminals in the measurement. A good way to handle the measurement process is to use a nail in a board so you can anchor the wire while stretching it out on the floor or driveway.

Be very careful with the measurements. It is not fun to have to solder a piece back in that was mistakenly cut off. So remember the old carpenter's adage.

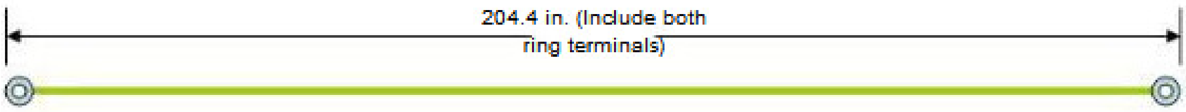
Measure once; cut twice or measure twice and cut once.

See more details:

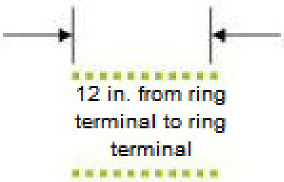
10 Meter Half Driver Wires

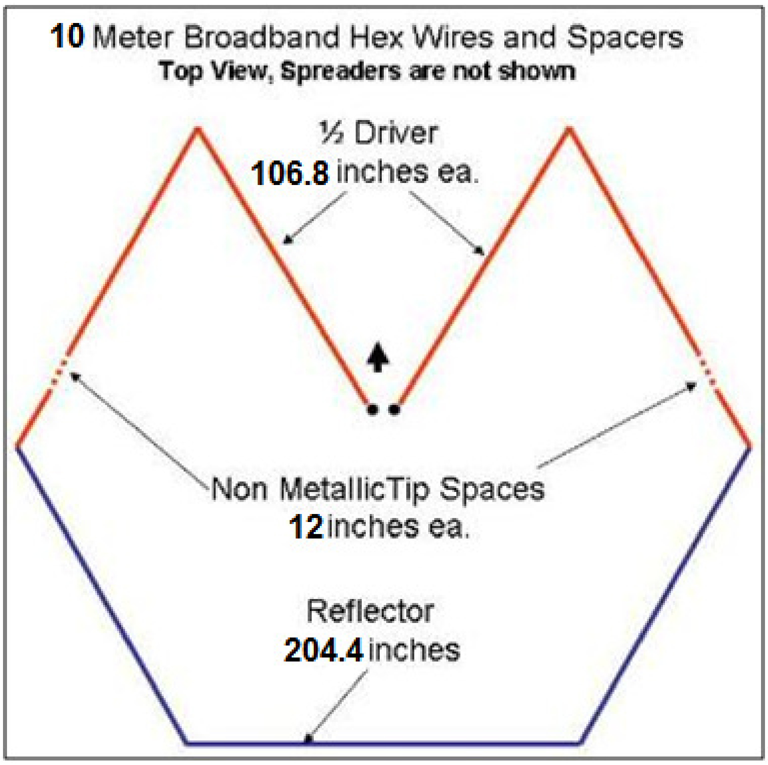


10 Meter Reflector Wire



10 Meter Tip Spacers





Here is an assembled wire set with the reflector coiled in the middle and the two half reflector wires coiled on the ends. The cord knots to the wires are covered with heat shrink but the heat shrink is not really necessary

<u>Step 5:</u> The Support Cords

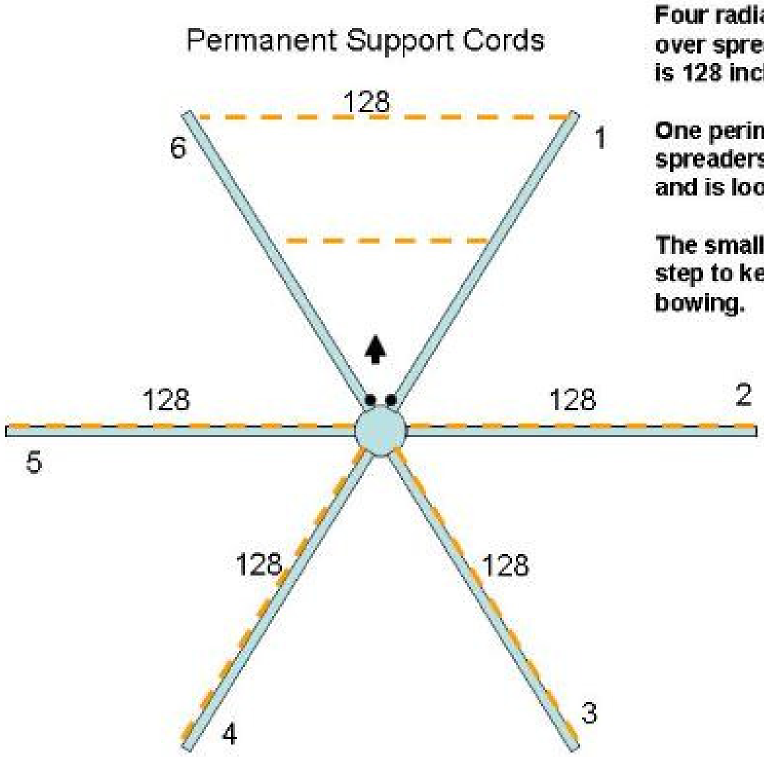
Support cords from the center post to the ends of the spreaders along with two other cords between the ends and the middle of the two front spreaders establish and hold the shape of the hexagonal beam. When installed properly, very little tension is on the wires as these cords do the physical work.

Measure six radial cords 128 inches including the hooks. You can choose to use knots instead of crimps.

Measure one perimeter cord 128 inches to be used between the two front spreaders because they tend to be pulled apart by the wires and need this counter pull provided by a cord. Add another short cord about 90 inches between the same two spreaders located in toward the center. Don't use hooks on this short cord; use a cable tie on each end to wrap around the spreaders.

Here is how the support cords are connected to the end of the spreaders. Just hook down into the end and then secure the hook with a large cable tie. Measure out 7 cords of Kevlar/Dacron with little "S" hooks on the end. The cords should be 128 inches long, including the hooks. The Kevlar is very strong and will not stretch and the Dacron covering provides resistance to UV radiation. Use the crimps instead of knots. You will need an intermediate cord between the two front spreaders. Make this cord 90 inches long but don't use hooks; instead put a cable tie on each end that will be used to wrap around the spreader at about the 15 M band. You can use plain Dacron instead of Kevlar but it stretches more and you need to pull it a bit before measuring. Also, using knots instead of the crimps is fine.

Here is how the cords are arranged on the spreaders viewing from above.



Four radial support cords are looped over spreaders and center post. Each is 128 inches.

One perimeter support cord between spreaders 1 and 6 is also 128 inches and is looped over the two spreaders.

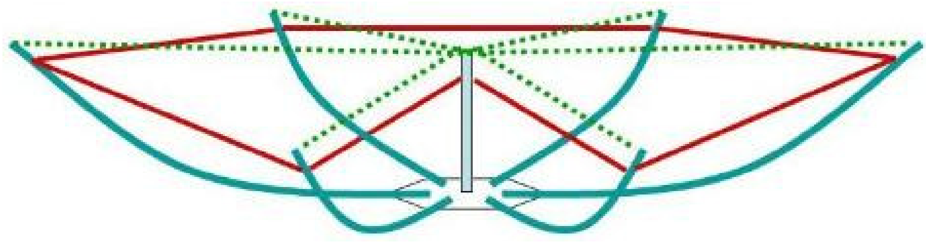
The small cord is adjusted as a last step to keep spreaders 1 and 6 from bowing.

When measuring the cords, remember that the cords, although relatively stretch-free, will stretch a couple inches under tension. So pull on them when measuring and before crimping them to end up with 128 inches including hooks, when stretched.

There is about 7 pounds of force on the cords when installed on the beam

Here is how the support cords are connected to the end of the spreaders. Just hook down into the end and then secure the hook with a large cable tie. Note how the wire is anchored to the P clip with a small cable tie. This should be done on the back four spreaders and for 20 meters only, as the last step after all adjustments of wires and clamps have been completed.
Anchoring the wire in this manner will add stability to the overall structure in windy conditions. Plus it will keep the wires from "sawing" through the P clip.

Step 6: **Assembly**



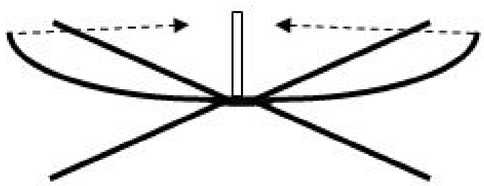
Now that you have built the components for your hexbeam, all that remains is to assemble them into a completed beam. Just follow these steps.

1. Set the base plate on a table, a 10 gallon paint bucket filled with water or rocks to serve as an assembly foundation.

Assemble the spreaders and insert them into the baseplate using the U bolts. All the P clips on the spreaders should be on the top side of the spreaders. Make sure each spreader is in line with the opposite spreader and if not, then loosen the U bolts and readjust. Do not over tighten the U bolts as you can easily crush the spreaders. If the spreaders are starting to flatten, you have tightened them too much.

2. Install the center post into the baseplate and tighten the two set screws snugly. Do not over tighten as they will penetrate the center post.

3. Install the support cords between each spreader end and the anchor eye bolt on top of the center post. The easiest way to do this is to hook one cord on the end of one spreader and another on the end of the opposite spreader. Then, standing in the middle, pull both cords up simultaneously and hook them on the center post eyehook. Repeat this process for another spreader pair and then another as shown here. Fasten the cords to the ends of the spreaders as shown in step 5.



4. Install the wire sets starting at the highest frequency band. Attach one end to a terminal for that band and then fish the other end through each of the P clips on the spreaders. Then attach the other end to the second center post terminal. If the wire will not reach the terminal without excessive tension, then loosen the P clips for that band and let them slip inward about 1/2 inch each or until the wire reaches. Take small steps in this for better results. Do not have the wires over taut. This only distorts the shape of the beam and makes the remaining wires harder to adjust. Tautness does not improve beam performance at all. A little slack is better.

5. After installing all wire sets, make adjustments so that all wires have generally the same slack and the overall shape of the beam is balanced and symmetrical.

6. Connect the coax to the top of the center post to the 20 meter terminal. Use a small piece of coax at first in order to make SWR tests before going further. You should see an SWR dip for each band but the lowest SWR will not be achieved until the beam is raised 20-30 feet.

If you do not get a dip in SWR, make sure all connections of the wires are tight in the terminals including the coax links. When finished, be sure to seal the terminals and coax ends to keep moisture out as contaminated coax will not perform correctly on the beam.

73 and Good DX´s

FAQ's

1. Why should I be considering a broad band beam?
Because it performs better than the classic hex beam. And on top of that it is easier to build and easier to adjust. The only drawback is that it is slightly larger in diameter by less than three feet.

2. Are the wire lengths critical?
A. Well, if you change the wire length for the reflector on 10M by one inch, it changes the design frequency by about 130 kHz. Two inches would be about 260 kHz, and so on. You can do a simple ratio of frequencies to figure the change in wire lengths.

Change in wire length (+,-) = Change in frequency (-,+) X Orig. wire length / Original frequency

(Remember, increasing frequency requires decreasing wire length and vice versa.)

If you change the reflector lengths be sure and do the same for the driver wires.

3. How important are the tip spaces?
A. They affect the front/back performance and the SWR and are designed for the optimal balance of these two performance criteria. But if you are off an inch or even two, it isn't going to make a lot of difference.

4. What if I want to use a different gauge of wire than 16 gauges?
A. That is fine. Just use the Conversion Table on this page to scale the driver wire lengths shown here for your particular wire thickness. The reflector wire gauge is relatively immune to differences in wire thickness so just use the table amounts for 16 gauges. Also, leave the end spaces as they are shown here.

5. How high should the hex beam be?
A. Higher is better for DX generally as it reduces the takeoff angle of the main RF lobe. However, the hex beam can be quite effective even at modest heights. Some say 40 feet is optimal but really, if you can get it higher for DX, go for it. Try to get 20 feet at least.

6. What about use of steel wire or aluminum instead of copper?
A. You will need new dimensions based on conductivity of those materials. The dimensions here are strictly for copper.

7. What about stranded wire or solid wire?
A. Either is fine.

8. What about insulated wire?
A. It can be used and if it is the specific wire in the table here you already have the specs. But you can't depend on these specifications for all other insulated wire.

9. How important is spacing on the center post?
A. Post spacing is mainly determined by the geometry of your particular hex beam. Try to get your wires generally parallel, level with the ground, symmetrical, etc. Spacing can become a problem if they are too close. In particular, it has been found by some that if the 10 meter wires are too close to the 12 meter wires, the two bands can interact with each other. If you can't get the specified 4 inch spacing between 12 and 10 meters while keeping the 10 meter wires parallel, that's OK; just pull the wires down the post a bit; performance will be better.

10. Should I feed the hex beam at the top or the bottom?
A. Top feeding will provide better results overall.

11. Should I connect the bands with wire or coax?
A. Coax will provide better results. Use 50 ohm coax.

12. Do I need a balun?
A. It is a good idea because it prevents surface currents flowing on the exterior of the coax and thereby distorting the radiation pattern. The best price for a ferrite bead balun I have found is at www.palomar.com.

13. Can I substitute materials if those on the parts list aren't available?
A. Well, sure. Your substitutions might be better than mine. Just be sure you know the physical factors that are important and make judicious choices. There are only a few things truly critical about the details of a hex beam such as wire length, general
shape, etc.

14. Where can I learn more about the hex beam theory?
A. Visit the web site of Steve, G3TXQ. (http://karinya.net/g3txq/hexbeam/)

15. Can I buy a broad band hexagonal beam?
A. Thought you'd never ask. Seriously, I am selling a multi-band hexagonal beam on another web site that is already built. You just assemble five modules when you get it and it works with no tuning. DX Engineering sells a kit of parts with illustrated instructions to build a broadband hexagonal beam. Is it as good as mine? Well, I'm sure it's a good product but be prepared to do more work than you would do with one purchased from me. You get over 200 parts and a 38 page manual.