# 10 AND 6 METER ROTATABLE DIPOLE ANTENNA CONSTRUCTION PROJECT

## Design Goals and Objective:

To construct a pair of compact, band-specific 6 and 10 meter dipole antennas resembling the active element of a yagi beam antenna, constructed of durable weather worthy components. They shall be easy to construct and adjust (i.e., tune.) Both shall be supported at a single point to minimize the footprint, obviating the need for multiple distant supports, with multiple support ropes crossing the yard, especially considering the relatively short length of higher band dipole antennas. This design presents lower visual impact and consumes less air space than typical wire dipole supported at the ends, leaving remaining air space for additional antennas. The antennas shall be installed on a 1.25 inch galvanized steel mast.

**Observation:** Cost is intentionally sacrificed to maximize the above stated goals of 1) durability, and 2) utilization of a single support.

## 10 Meter Aluminum Dipole Antenna Parts List:

| Quantity | Part No. | Description | @ Price | Total Price |
|---|---|---|---|---|
| 1 | DXE-MMP-P2 | .25 in. x 7.5 in. x 11.5 in. Plate, Polymer Plastic, Blank - DXE-MMP-P2 | $7.50 | $7.50 |
| 1 | DXE-SEI-1 | Split Element Insulator Designed for a 3/4 in. O.D. Aluminum Tube Being Used For a Driven Element | $.6.49 | $6.49 |
| 4 | DXE-SAD-075 A | 3/4 in. Saddle Clamp, Stainless 1/4 in. U-Bolt & Hardware | $5.35 | $21.40 |
| 2 | DXE-CAVS-1P | V-Saddle Clamp, 1/2 in. to 1-3/4 in. O.D. Applications - DXE-CAVS-1P | $9.95 | $19.90 |
| 2 | DXE-AT1243 | Aluminum Tubing 3' x 0.750" x 0.058" wall, one end slit | $4.80 | $9.60 |
| 2 | DXE-AT1242 | Aluminum Tubing 3' x 0.625" x 0.058" wall, one end slit | $4.55 | $9.10 |
| 2 | DXE-AT1205 | Aluminum Tubing 6' x 0.500" x 0.058 wall", one end slit | $6.60 | $13.20 |
| 2 | DXE-ECL-060 | Element Clamp for 3/4 and 7/8 in. tube | $1.90 | $3.80 |
| 3 | DXE-ECL-040 | Element Clamp for 5/8 in. tube | $1.90 | $5.70 |
| | | TOTAL (LESS SHIPPING) : | | $96.69 |

## 6 Meter Aluminum Dipole Antenna Parts list:

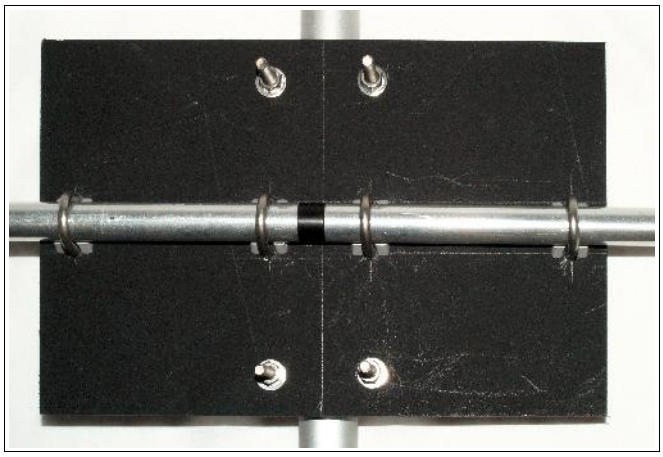
The 6 meter dipole uses the same parts as the 10 meter model, less the 6-foot length of .5 inch tubing.

Originally, plans specified a single set of ¾ inch saddle clamps and the much smaller element-to-boom plate DXE-BEB-3 - Polymer Plastic Boom to Element Bracket. The final arrangement is considerably stronger and does not unreasonably increase cost. It is, now, rock solid – overkill, perhaps, but sufficiently strong to withstand anything Mother Nature might toss its way.

## Incidental Parts and Components:

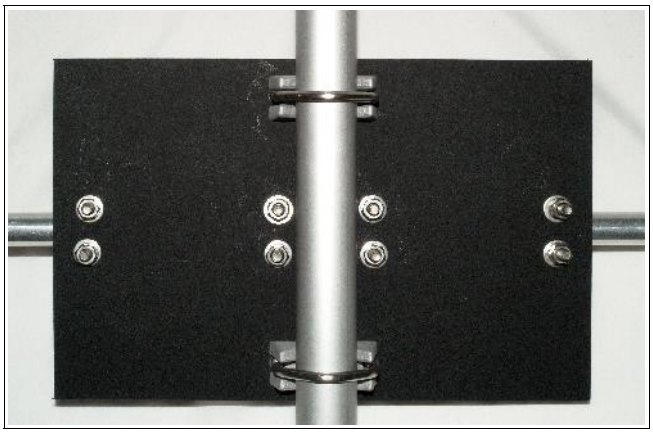
Two 2- 8-32 x 3/4" combo round machine screws with nuts and washers connect the wires from the balun to the aluminum antenna elements. Closed-end crimp lugs secure the balun wires to the machine screw connectors on the antenna elements. Stainless steel hose clamps secure the balun to the mast. Multiple plastic cable ties secure the feed line to the mast.

### Construction Notes and Photos



**Front Side** of the element-to-boom plate depicting the saddle clamps holding the tubular element, the tubular elements, themselves, and the black center insulator providing support and separation between the two dipole elements.

Note: The odd gray marks are pencil marks showing where to drill holes to accommodate the saddle clamps. The plate surface is rough and the pencil shows up well so I just marked the plate, itself.

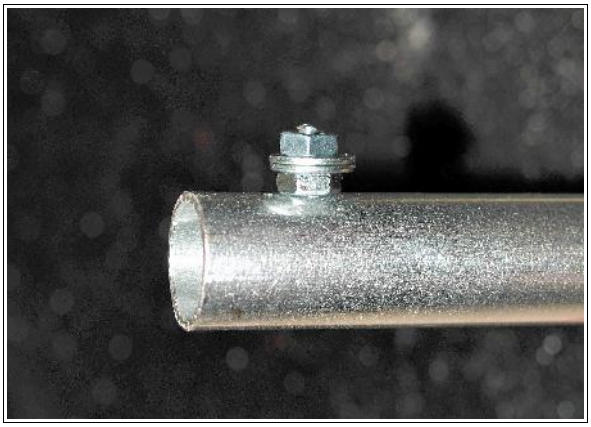


**Back Side** of the element-to-boom plate depicting the saddle clamps holding the plate and tubular dipole elements to the supporting mast. The saddle clamps are designed to accommodate a mast with a diameter of ½ inch to 1¾ inch in diameter. The original design called for 1¼ inch saddle clamp – but second thoughts compel me to use a clamp that might be more flexible to accommodate a variety of mast diameters.

The aluminum dipole elements are separated and connected by a plastic rod which feels the inside of the aluminum tubes to prevent the saddle clamps from pinching or compressing (crushing) the aluminum tubes. It also serves as an insulated divider keeping the ends of the to tubular elements approximately 1 inch from each other.

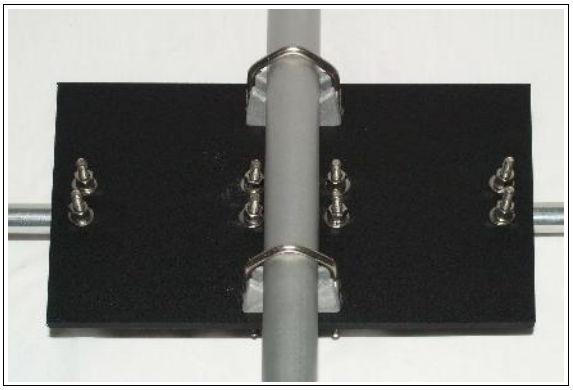
The 6 meter element is comprised of a 30-inch-long, .750” diameter aluminum tube, and a 28-inch-long, .625” diameter aluminum tube. When assembled, the two elements measure approximately 54.5” long with an approximately 3.5” overlap that provides sufficient variation in the overall length to facilitate tuning in the field.

Two small holes were drilled approximately .5” inch from the center ends of each element to accommodate a small 8-32 x . 75” machine screw that is secured Secured with a nut. On that were placed two small washers and another nut, to be used as a connector for the wires leading to the 1:1 line isolation choke/balun.



The to wires leading to the line isolation transformer/balun were trimmed. The ends were stripped and two closed-end lugs were crimped and soldered on the end of each lead wire.

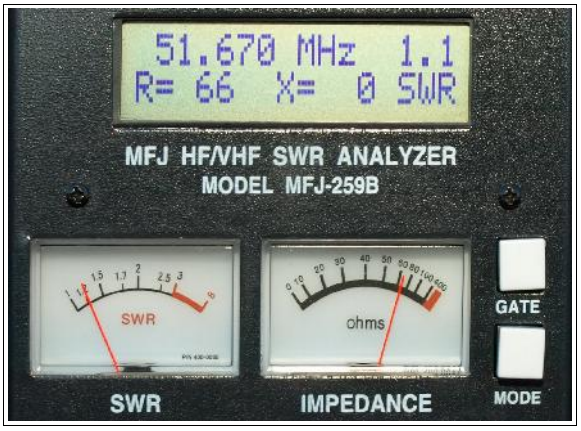
The whole assembly is attached to a 1-1/4” galvanized steel television antenna mast with saddle clamps.



The balun is attached to the mast with a 2” diameter steel hose clamp. The coax cable will be attached to the mast with black plastic cable ties to provide a neat finish, and provide cable strain relief.

## Final Assembly and SWR Adjustment:

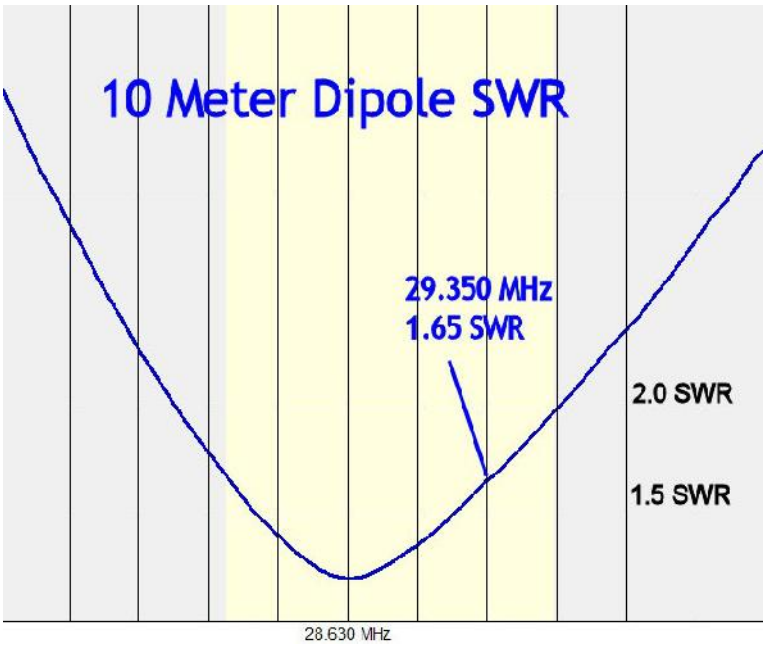
Each rotatable dipole was assembled, and temporarily affixed to a fiberglass push up mas (which hols my active receive-only loop antenna) and was tested and adjusted for best SWR.



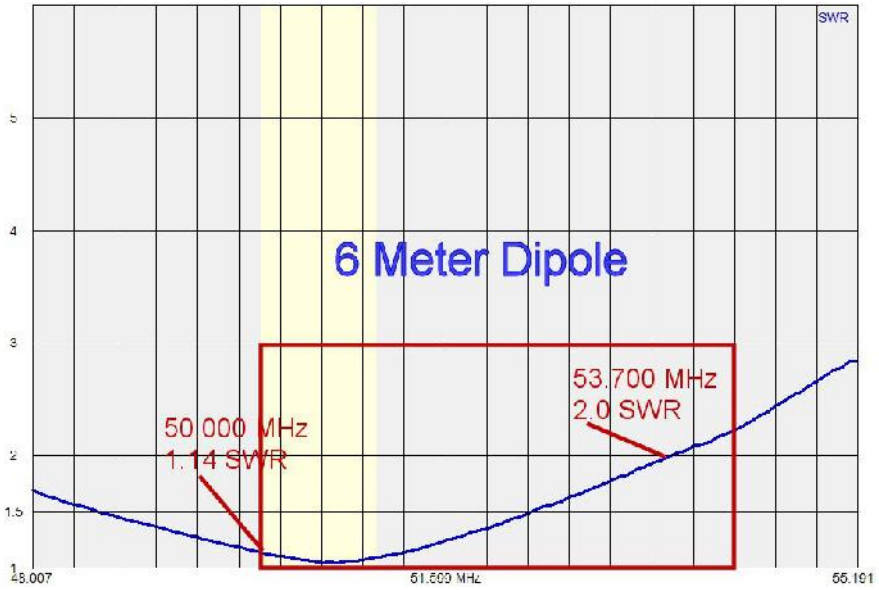

Results of initial testing, tuning and adjustment.

10 meter antenna temporarily set for initial tuning and adjustment above the rear deck.

After installing the antenna midway up a 45 foot Rohn galvanized steel mast braced against the rear deck, and further supported by 1/8 double braided Dacron guy ropes. According to my RigExpert AA-230 antenna analyzer, the antenna exhibits 1.5 : 1 SWR. Not that this is an altogether bad result, it was somewhat unexpected. I figured it might change, but not higher as it was raised above the roof. Apparently, the antenna coupled with the deck, and nearby objects, including metal gutters, and SWR was artificially lowered to the level shown above, and the antenna exhibits its more natural, correct SWR when installed high above the roof.



The 6 meter version tested out just as well, although I may have left it just an inch or so long, so as to emphasize the lwoer end of the 6 meter band, and I may, later, telecraphically shorten the elements and raise the sweet spot a few MHz. This is my first test, upon first installation, so I figured it was pretty close to the text book.




## Line Isolation / Choke Balun:

A line isolation balun isolates the antenna elements from the coaxial transmission line so that power is radiated by the dipole antenna elements and not by the feed line. This is a current-type balun. The dipole should have equal RF currents at the feed point. This type of transformer is often called a "common mode choke."

In this case I employed a Cal-AV EB-2 Line Isolation Choke – Balun, described and shown on the right.

## Specifications and Reasonable Expectations Concerning the Efficacy of the Isolation / Choke Balun:

The EB-2 Line Isolation Balun is constructed of a length of Teflon coaxial cable surrounded by a number of ferrite beads. At one end of the cable is a SO-239 UHF coax connector which accepts a common PL-259 connector. At the other end are two wire leads to which I installed round lug connectors to facilitate connecting the balun to the antenna elements. The wire leads are color-coded for ease of phasing in multi-element arrays.) This balun is vacuum impregnated and sealed against the weather. The balun is enclosed in gray PVC pipe, which can be painted.

> Note - This balun is not expected to improve SWR, as it is not part of a matching network. Also, this Balun is not expected to act as a lightning arrestor, because the winding inductance is too low.

Some operators installing a line isolation transformer or at the transmitter end of a coaxial cable transmission line to avoid providing a ground path for RF current induced by the antenna's radiation field on the coaxial feed line. The length of the coax will be a factor in determining whether, and to what extent, RF might be induced on the feed line. A detailed discussion of this application is beyond the scope of this work.

This writer is not fully convinced this sort of line isolation transformer is as efficacious as some manufacturers and operators claim. On the other hand, he is fairly certain it won't have a deleterious effect on transmission or reception, and speculates its expected benefits are greater than its potential detriments, which are believed are de minimis. In other words, it *might* help, but *probably* won't hurt.

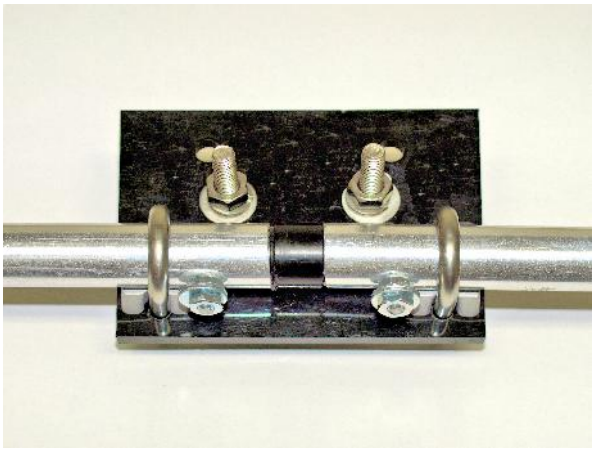
## FINAL CONSTRUCTION AND INSTALLATION

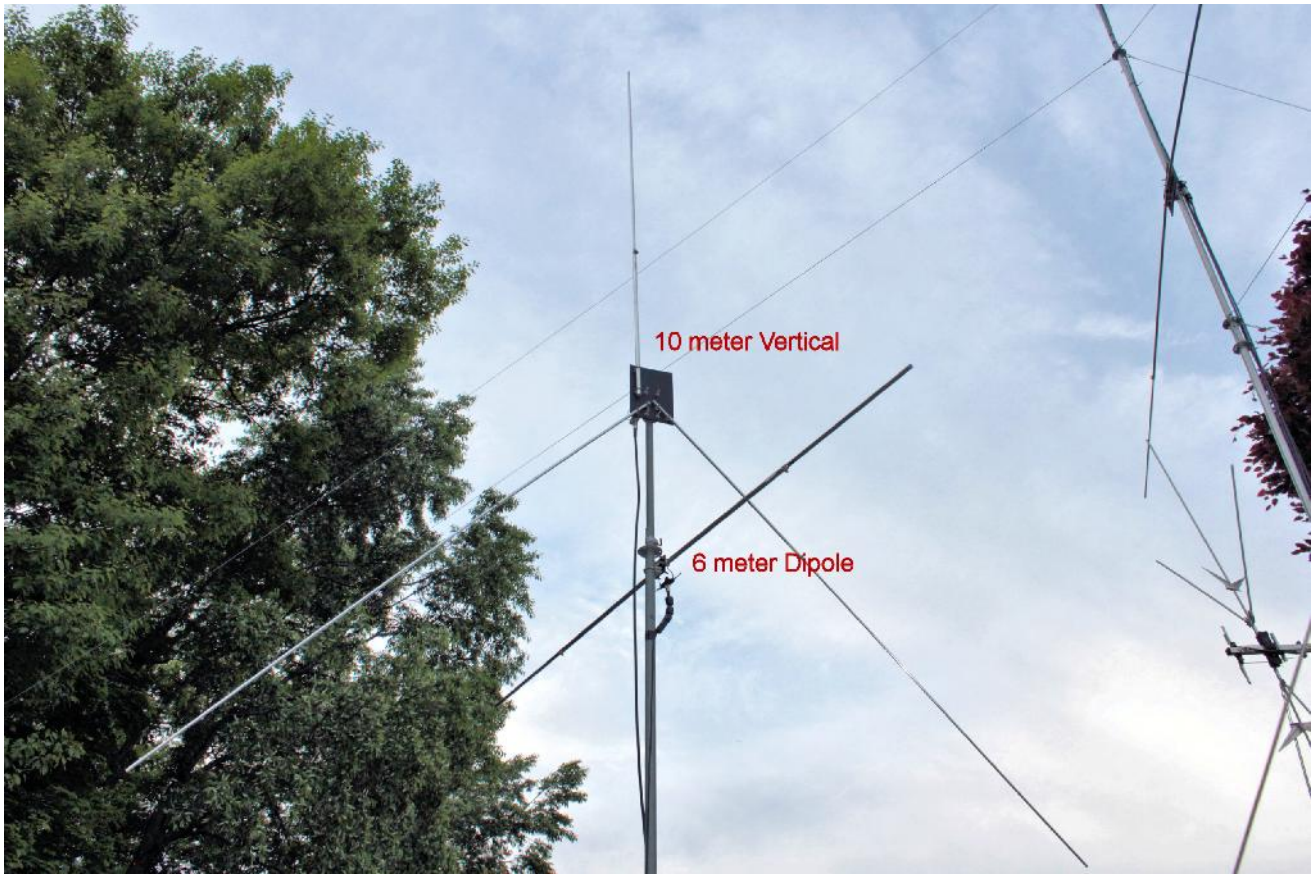
The 10 meter version has been installed midway up a 45 foot tall Rohn galvanized steel mast braced against the rear deck of my home, and further supported by six light weight 1/8 inch double braided Dacron guy ropes. The next photos show the 10 meter dipole installed and ready for use. It is oriented more or less on a North-to-South axis, aimed broadside to the East and West, which works out swell for working Europe, Japan, and the East and West Coast United States. It points North on one end, where there are the fewest stations, and South, where it works well enough, and which direction is also served by an Off Center Fed (ODF) dipole that works well on 10 meters, so I have all directions covered one way or another.

Note: Ultimately, a Unadilla 1:1 choke balun was substituted for the Cal-AV EB-2 line isolation balun, because the Cal-AV balun was installed on my 20 meter aluminum dipole. The Unadilla balun seems to work, and provide test measurements, equal to the Cal-AV balun. I can discern no difference between the two of them.

## ALTERNATIVE 6 METER DIPOLE CONSTRUCTION NOTES:

I have also used a smaller polymer DX-Engineering element-to-mast plate, with 3/4 inch tubing and the same 3/4 inch center insulator. These are pre-drilled for the 3/4 inch saddle clamps to hold the tubing, and also with three different spacings for different size saddle clamps to attach the element and bracket assembly to the boom or mast. BEB-3 Insulated Boom-to-Element Bracket - cost $4.95.



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