A Portable 75/40* Meter NVIS Antenna

- with 3/2/'09 updates -

by David B. Murray, KD1BL

Author's Note:

This article describes a 75/40 meter NVIS, but one could use the construction techniques to build just a 75 meter or a 40 meter version. I now have individual 80 and 40 meter NVIS antennas.

Background:

While taking the Level II Emergency Communications Course, my mentor, Ron Kane (AD6KV) presented informatiion on Near Vertical Incidence Skywave (NVIS) operation. Being interested in the reputed "no holes" coverage in mountainous regions, I used the Google Search Engine to learn more about NVIS antennas. With the wealth of information about NVIS operation available on Google, this artical will focus on construction and effectiveness of my "cloud warmer".

Bill, W1WAW, and I decided to set up NVIS antennas at our respective locations in northwest Vermont, and to use them to communicate on a daily basis over the two major ridges between us. I also have a CW-160 antenna averaging 40 feet high, so that antenna provided a comparative benchmark. We have held 8AM QSOs daily for about 4 months. Recently Earl, K1YLB, joined us each morning using his NVIS dipole which slopes from 10 to 20 feet above ground. Bill's NVIS dipole is constructed much as presented below, and is 10 feet above ground. Mine is hung at 8 to 10 feet above ground between two trees.

What we have learned has been very positive! Thus this article.

Performance:	**80 meter Daytime range = 350 -400 mile radius**	**No communications holes in the above Daytime range**	**Lower background noise**
Portability:	**Sedan Transportable**	**1 person setup = 20 min**	**Survived 65 mph wind**
Costs:	**Materials under $75**	**Labor approximately 8 hrs**	**Aesthetics**
Construction:	**Overall layout**	**Base Side View**	**Base Bottom View**

Range:

The 80 meter NVIS antenna consistently provides dependable communications from the northwest corner of Vermont to over a 350 - 400 mile RADIUS range, covering all of New England, down into Pennsylvania, and westward to the Niagra Falls area. I have been able to communicate **reliably** with any station in that area without asking for fills. The message gets through! My 40 meter NVIS work has been more limited, but I expect to have developed more information by the spring of 2008. **The NVIS antenna should be a strong candidate for emergency communications in mountainous terrain!**

* This article accurately shows the layout of the 75/40 meter antenna. All the performance information in this

article relates only to use of the 75 meter portion. My experience has shown that 40 meter NVIS activity has been possible only since early November. Using the NVIS F2 Layer Status Map one can learn to **know** when 40 meter NVIS work is possible. That map is updated at about 42 minutes after the hour. During the late Fall to early Spring, I expect to see daily 40 meter NVIS work available.

No Communications Holes:

Quite often I take part in the Carrier Net (name only; it's SSB) on 3.935 MHz at 0900 hrs local time, Monday through Saturday. When using my CW-160 antenna, I have had frequent trouble copying the stations from Syracuse to Buffalo, New York. Since being able to use my NVIS antenna, at 9 feet above ground, I have no trouble receiving those stations. On the Green Mountain Net (3.933 MHz at 1700 hrs local time) I sometimes hear station operators in the GM Net area stating that they can't hear other stations that have checked in. **I hear them all using my NVIS antenna.** Stations employing a vertical antenna generally present the weaker signsls because that antenna's radiation angle is higher and vertically polarized, thus *skipping over and cross-polarized to any true NVIS antenna. Most NVIS antennas are dipoles. All NVIS antennas **must** be horizontally polarized in order to present maximum RF energy to the F2 layer for reflection.*

Lower Background Noise:

Switching from my CW-160 antenna to the NVIS one, I realize one to two S units less background noise. That means I can hear weaker stations. Usually the received signal strength from the NVIS equates to that from the CW-160. Occasionally, however, I have seen as much as 10 dB more from the NVIS, probably due to propogation conditions. One other noticable "noise" reduction with the NVIS antenna is the reduced static crashes from distant summer storms, as much as 6 S units down when switching from the CW-160 to the NVIS antenna. If the storm generating the static crashes is at least 350 miles away, I can really notice the difference, and I can also plan on having about seven more hours of decent weather for outdoor activity.

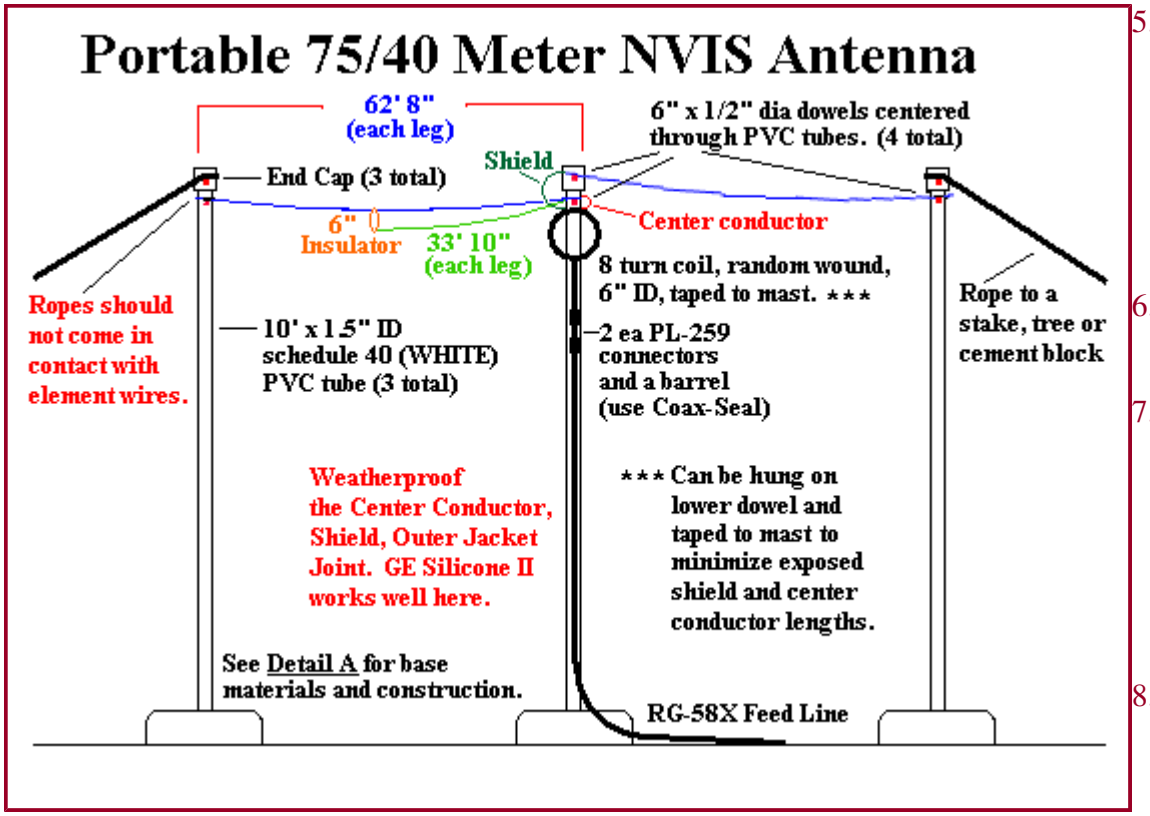
Overall Layout (using a 'choke coil' in the feedline):

Sedan Transportable:

Consider that I put the 3 bases, with their 2 foot long stems, in the trunk of our Saturn sedan, let the back seat down, put the masts entirely inside the car with their caps resting on the dash. The rest of the odds and ends go in the trunk. No problem during rainy or snowy days.

Setup:

1. Arriving at an operation site, place the center base and 2 dowel mast at the desire location, sliding the mast over the base stem.
2. Place the first 1/4 th wavelength element's loop over the mast cap down to the lower dowel.
3. Lay out that element to it's bitter end; get another base and mast; place it to support that element's end.
4. Put a rope loop over the end mast's cap, down to the dowel, drive a stake in the ground and secure the rope to the stake. *A bungie cord in series with the rope can really help here.*



5. Repeat for the element connected to the shield braid, hanging it on the top dowel at the center mast.
6. Adjust the tension on the two end stays.
7. At the center mast, connect the coax center lead to the lower loop, and the shield braid to the top element loop.
8. Connect your feed line to the coax choke and to the transceiver and operate.

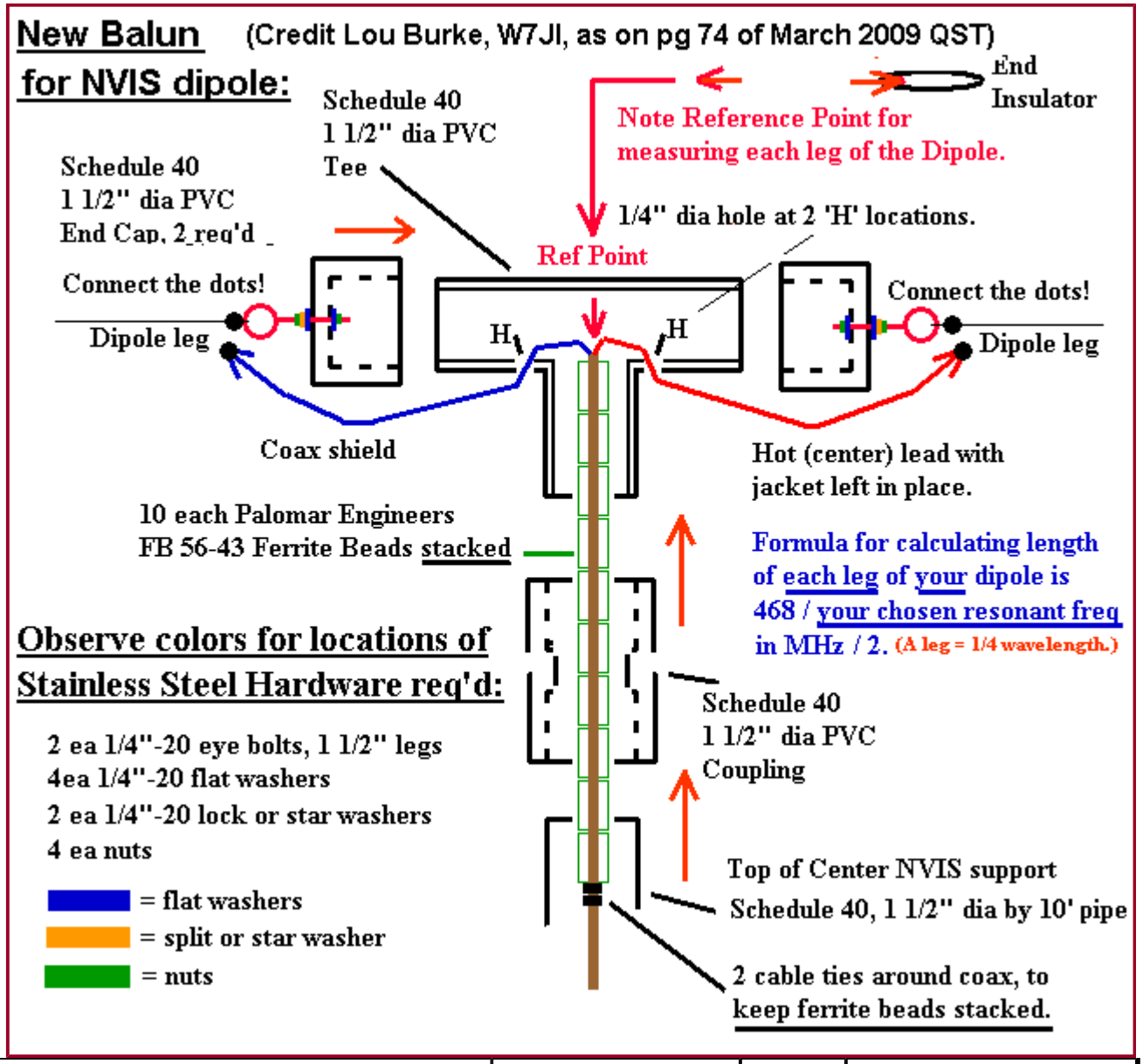
UPDATE: A March 2009 QST article shows a Current Balun which can replace the above choke coil as shown below.

Survived 65 mph winds:

During this past summer Bill's antenna, identical to the overall layout, remained upright and operational while a storm with 65 mph winds cavorted through his yard. The storm then proceeded about 10 blocks further to a local football field where it destroyed the scoreboard and a set of bleachers.

Materials under $75.00 for 75/40 meter version:

Items:	Quantity:	Total:	Vendor
Plastic Base Form	3	Free	Dairy Farmer
Cement mix	2 bags	$7.80	Hardware Store
1.5" dia Conduit Thick Wall	3 each 2 ft lengths	$12.00	Hardware Store
3.5" long nails	6	Free	Somebody's Junk Bin
3/8" or 1/2" Bolts	9	Free	Somebody's Junk Bin
10' x 1.5" sched 40 white PVC tubing	3 lengths	14.00	Hardware Store



End Caps for PVC tubes	3	$1.90	Hardware Store
6" x 1/3" dia. wood dowels	6	$2.00	Hardware Store
70' coils - #14 stranded copper wire	3 coils	$21.90	Radio Shack

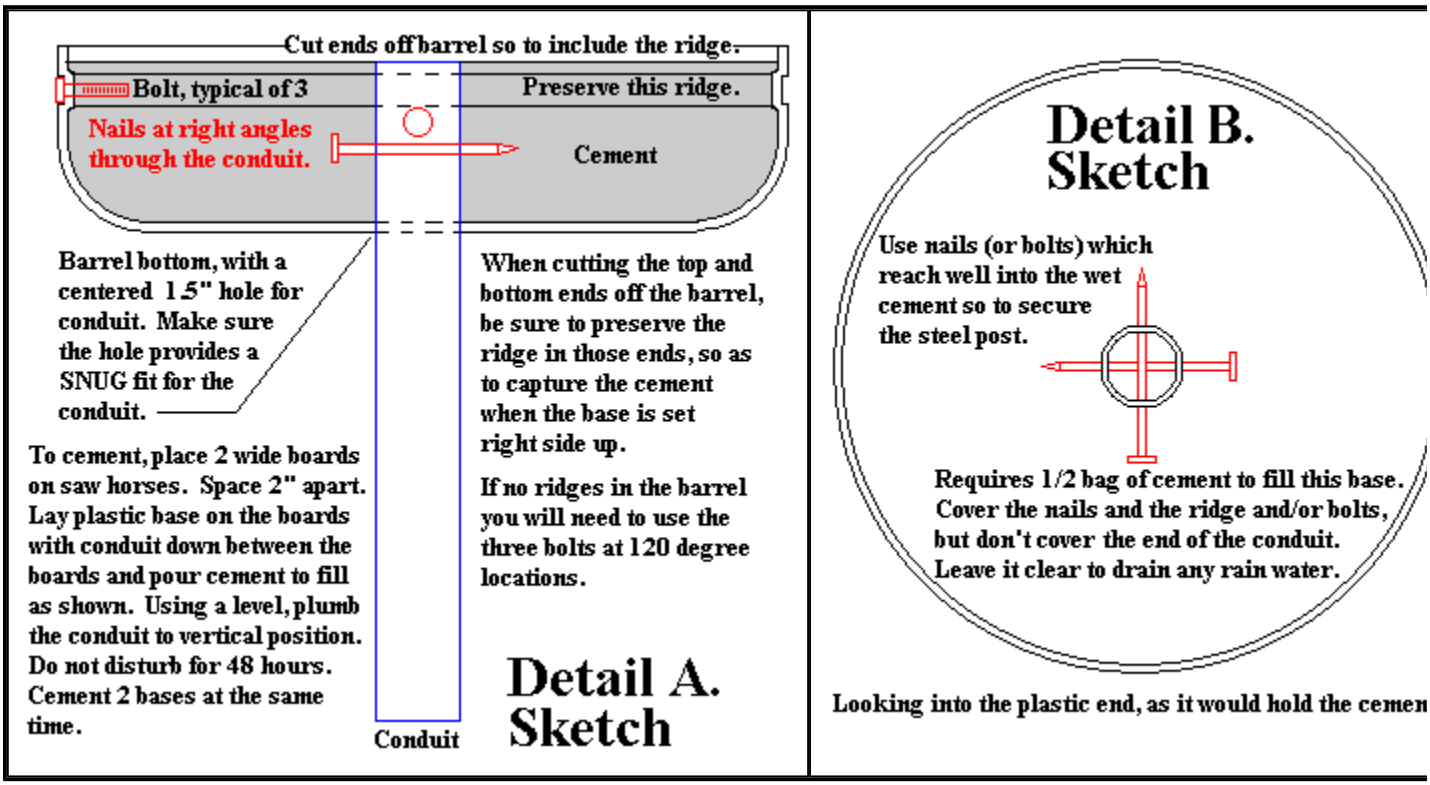
Labor approximately 8 hours:

Gather all materials first, so to be able to work effectively. The plastic base shells are the bottoms, or tops, of the chlorinated soap and/or teat-dip chemical barrels which dairy farmers discard. Cut the barrel ends off with a hand or jig saw, being sure to end up with a dish at least 3.5" deep. See Detail A and B drawings. **Make sure the hole cut for the steel conduit is a snug fit, so to prevent cement from oozing through when casting the base.** Also be sure the 1 and 1/2 inch diameter conduit hole is centered in the plastic dish, or just barely offset if the plastic dish has a handle. (Barrel tops have handles.) I drill 3 holes in the sides, 120 degrees apart, for old bolts which will be encased in the cement to lock the cement fill into the base.

Prepare the 3 pieces of conduit by drilling 2 hole sets through one end of each 2 foot length of conduit, on the diameters perpendicular to each other. See Detail B. Drive 3 and 1/2 inch long nails through, to make an X in the conduit end. Cement won't adhere to the conduit, so this locks the conduit in the cement. One bag of

concrete makes two bases, so you should plan to fill two base shells with one pouring.

Base cut-away Side View and Base cut-away Bottom View:



Prepare each of the 3 masts by drilling 2 sets of 1/2 inch diameter holes on the diameter, at the top end, one just below the bottom of the installed cap and one near the bottom of the cap. Please see the Overall Layout. Caps don't need to be glued in place but may be. Dowels need to be 4.5 inches long.

Aesthetics:

The bases, masts and caps, being white, stamd out against almost any background view. A coat of grey or black spray paint helps them vanish. When it comes time to mow the lawn, just loosen the ropes, move the masts over about 3 feet, mow over the mast locations, put the masts back and tighten the ropes. Not a big deal.

Now here's an important tip. If you are going to use this at your home location, decide on the mast base locations and bury a wire just under the sod, said wire being 5% longer and continuous, running under the NVIS antenna. That counterpoise will benefit your transmitions and reception. **My experiments have shown that with the NVIS 80 meter dipole at 10 feet above ground, and with a 5% longer wire buryied just under the sod, I lose one S Unit of signal strength, but the Noise Level Drops by at least two S Units**.

In conclusion:

This project has been fun and worthwhile! **And I didn't have to do any climbing!**

73 de KD1BL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Heads Up!