

N4IB

THE GREAT N4IB TOWER PROJECT

Tim Slay, N4IB

Is a Tower Allowed?

- Use PRB1 and NC's H1340 for assistance with zoning.
- Covenants and deed restrictions are a bigger challenge.

Restrictive Covenants

- Buyer agrees to abide by deed restrictions and covenants when the property is purchased.
- PRB1 and H1340 don't apply.
- Even if antennas aren't explicitly prohibited, watch out for:
 - Mandatory homeowners associations.
 - Architectural review committees.
 - Approval needed for “structures”.

Restrictive Covenants

- Look for property in older subdivisions (prior to 1980).
- Ask for a copy of all restrictions and covenants and have them reviewed by an attorney.
- You might be OK with restrictions if:
 - There's no one actively enforcing them.
 - Others have broken them with impunity.
 - But your neighbors still might sue!
- Make offer contingent on tower approval.
 - Have current owner get HOA approval.
 - Shop in new subdivisions where builder is still in control.

Tower Selection

Guyed Towers

- Best tower value.
- High wind loading capacity.
- Smaller foundation.
- Sections are easy to transport.
- House bracket might eliminate need for guys.
- Require lots of space for guys (70% tower height radius).
- Guys may affect antenna performance.
- No crank-down, tilt-over option.

Tower Selection

Self-Supporting Towers

- No guy wires needed.
- Less real estate.
- Crank-down, tilt-over option available (no climbing!).
- Monopole available.
- Higher cost.
- Lower wind loading capacity.
- Much larger foundation.
- Single-piece towers are difficult to transport.

Permitting

- Get one!
- Resolving zoning, covenant, and permitting issues before you buy the tower!
- Provide tower drawings with your permit application. Drawings should be sealed by a PE licensed in your state.
- Provide a site layout for your property showing the tower location.

Construction

This is a BIG construction project.

Consider hiring a professional contractor!

Foundation Construction

A rented backhoe is a good investment!

- Unloading the tower.
- Digging the foundation.
- Shoring may be required if you plan to work inside the foundation hole.
- Use wire tie to build re-bar cage.
 - SMI Re-bar in Gastonia is a good source.

Foundation Construction

- Build form for the foundation.
- Make sure anchor bolts are plumbed and secured!
- Keep rebar cage off ground.
- Use the correct concrete for the job.
- Rent a concrete vibrator.
- Order a little extra concrete.
- Use low shrink grout around the anchor bolts.

Foundation



Digging the foundation – first attempt

Foundation



Deeper...deeper...where's that water coming from?? It kinda stinks!

Foundation



Ooops...Be sure you know where all your utility cables, septic and water lines are located!

Foundation



Fixing the sewer line!

Foundation



Digging a new hole away from the sewer line!

Foundation



Completed hole – 6' x 6' x 6'

Building the Form



Get some help, but try to find someone who is already out of pre-school.

Building the Form



Anchor the form with stakes so the concrete doesn't push it apart.

Building the Form



Make sure the anchor bolts are plumb and secure. The concrete and vibrator may push them out of position if they aren't tied securely.

Building the Form



Make sure the re-bar cage isn't resting on the ground into the dirt. Set it off the ground on bricks or concrete blocks. The concrete must completely cover the re-bar or it will rust away..

Pouring Concrete



Rent a concrete vibrator to prevent air pockets.

Installing Base and Trenching Conduit



Installing Base and Trenching Conduit



Installing Base and Conduit



At the lowest point of the conduit run, I created a French drain. Water will get into the conduit, even from condensation. It needs a way out.

Installing Tower



Yes, it's too heavy to lift by hand. You'll also need a tractor available when you unload the tower from the truck.

Installing Tower



Installing Tower



Maneuvering the tower into the base bracket is tough!

Installing Tower



Done! Yeah!

Raising Tower



Raising Tower



Raising Tower



Raising Tower



Tower Installation

- Don't use guy wires on a crank-up tower!

Grounding & Lightning Protection

- Use 8', copper clad steel ground rods.
- Use bare copper wire, at least #6 solid, for ground connections outside.
- Reduce resistivity of ground system using radials, with ground rods spaced 20ft apart.

Grounding & Lightning Protection

- Cadweld buried connections.
- Tie outdoor grounds together (telephone, power, tower, shack).
- Avoid contact between dissimilar metals (copper to galvanized steel)!

Grounding & Lightning Protection



Rent a rotor-hammer with a ground rod bit. It makes ground rod installation easy even in hard Carolina clay.

Grounding & Lightning Protection



*Drive your ground rods until the top is several inches underground. You will **BURY** the rod connection.*

Cadweld



Use exothermic connections to create a permanent bond between the ground wire and the rod. I used Cadweld “One-Shot’s”

Cadweld – Filled with Weld Chemical



Cadweld – Cover Installed

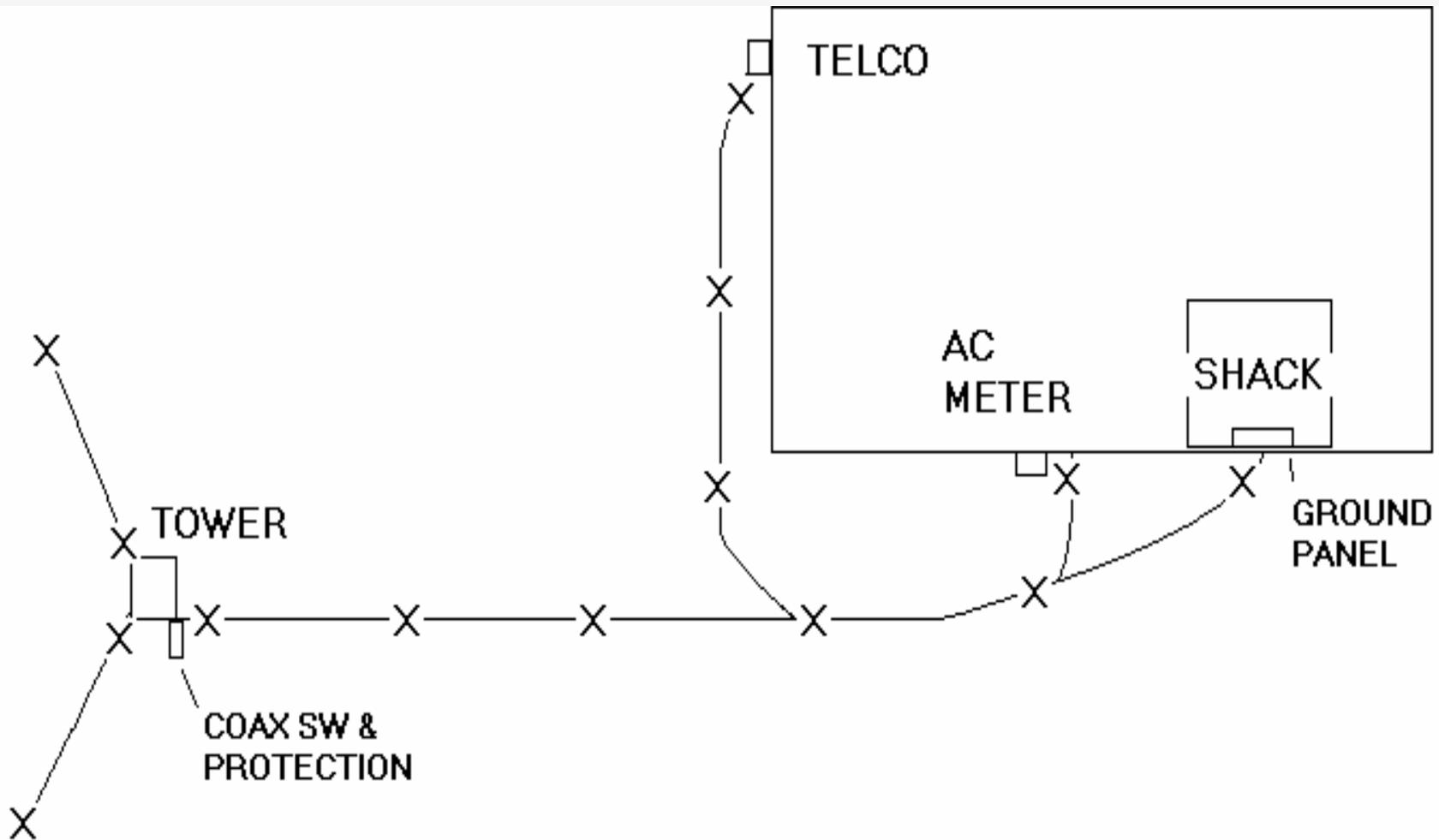


Cadweld – Lit with a Spark Gun



Stand back – it's filled with gunpowder!

Grounding & Lightning Protection

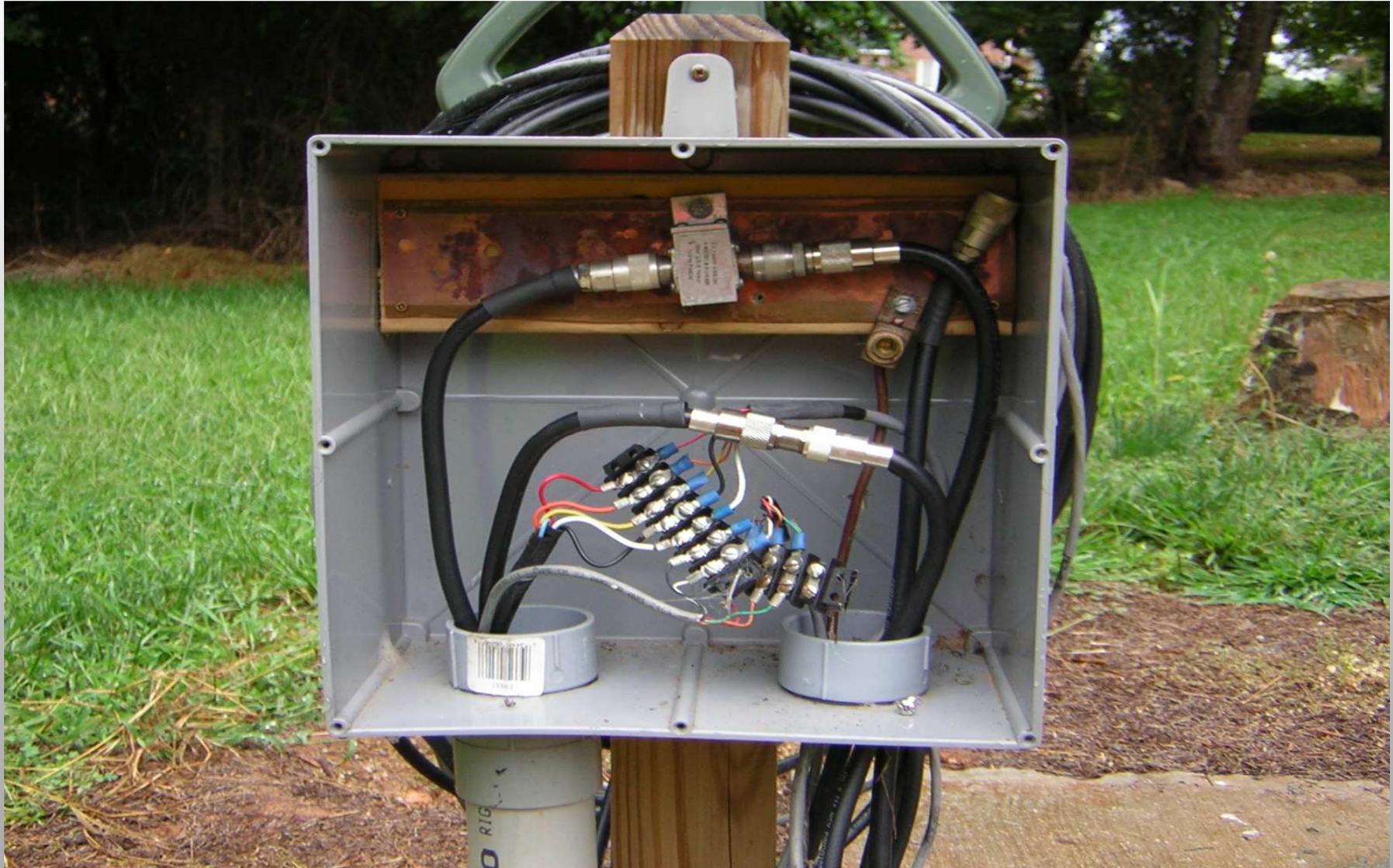


Grounding & Lightning Protection



NEVER let copper wire and your galvanized tower touch. Don't even let rain drip from copper wire to the tower. It will corrode your tower. Use brass or stainless steel transition clamps to bond to the tower.

Grounding & Lightning Protection



Grounding & Lightning Protection



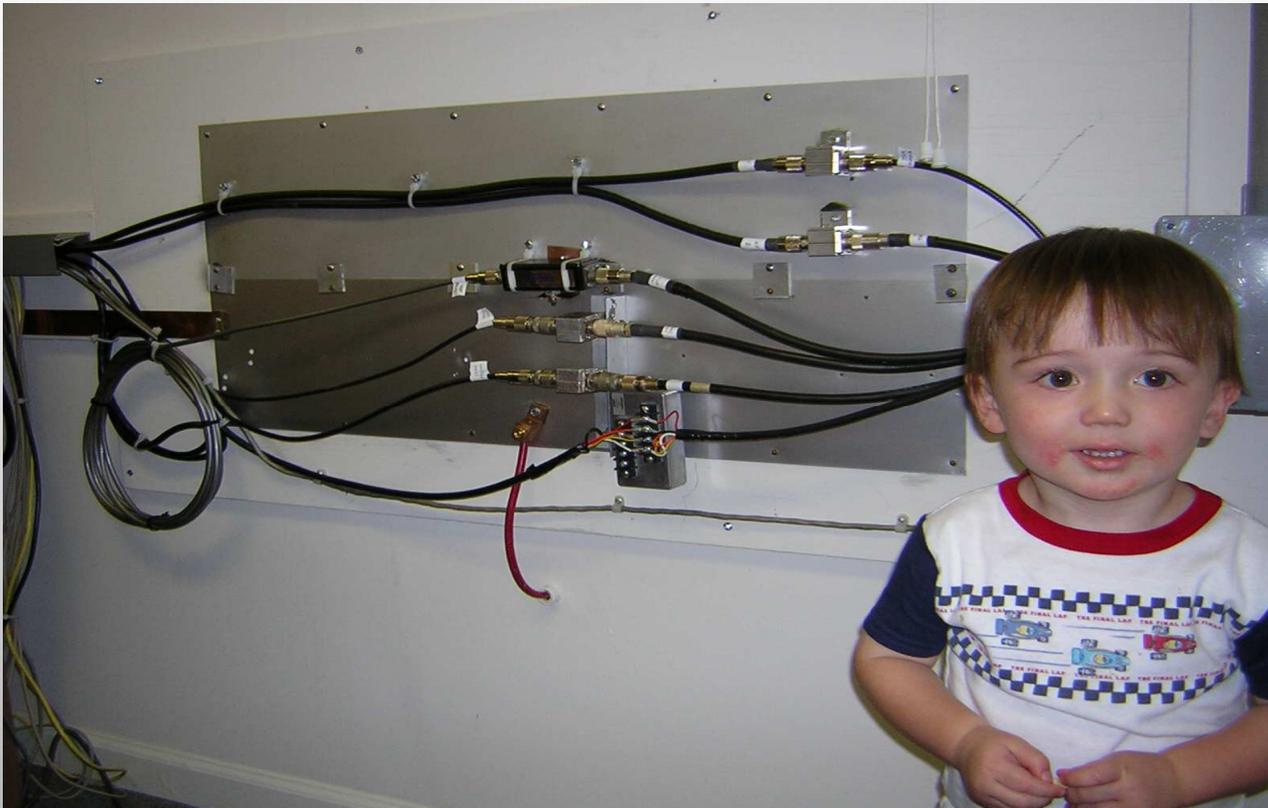
Feedline Entrance



Grounding & Lightning Protection

- Use single-point ground for all protection!
- Protect all input/output. Multiple protectors are better.
- Use low inductance connections to ground system (large surface area, bending radius $> 8''$).
- Double-hole lugs work best.

Master Ground Panel



Tie all grounds back to a single point, and mount your protectors there too. I used aluminum kick plate from Lowe's.

Master Ground Panel



1.5" copper strap run behind radio desk for bonding equipment to ground. Then the strap is bonded to the kick plate. Copper pipe works well too.

Equipment Ground



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- Force 12 C3 Tribander at 70'.
- 5 element 2m beam (horizontal) at 73'.
- 2m/70cm vertical at 75'.
- 75m NVIS drooping dipole, ends at 55' and center at 45'.
- 40m NVIS drooping dipole, ends at 20' and center at 15'.
- 2m/70cm whips in attic for packet and backup FM voice.

N4IB Antennas



Always wear your personal protective equipment when doing antenna work!

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N4ACF helping install my C3

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The Shack



Why I don't have much time to operate:

