

Tower Installation for the Radio Amateur

By Terry G. Glasgow / W1TR - 2012-01-25 21:20

- Your Dream Tower
- Tower Requirements
- Types of Towers
- Permit Process
- Installation
- Safety
- Maintenance
- Lessons Learned
- Summary

Your Dream Tower

- Large 6 stack of SteppIRs
- Large LP on Power Tower
- Rotating Tower Big Bertha
- KC1XX – 300 ft
- Moonbounce Array
- Moonbounce Dish
- Satellite Array
- Charlie Brown Tower

Large 6 stack of SteppIRs

73,

NØAE

K9LTN



Large LP on Power Tower

N5SDO



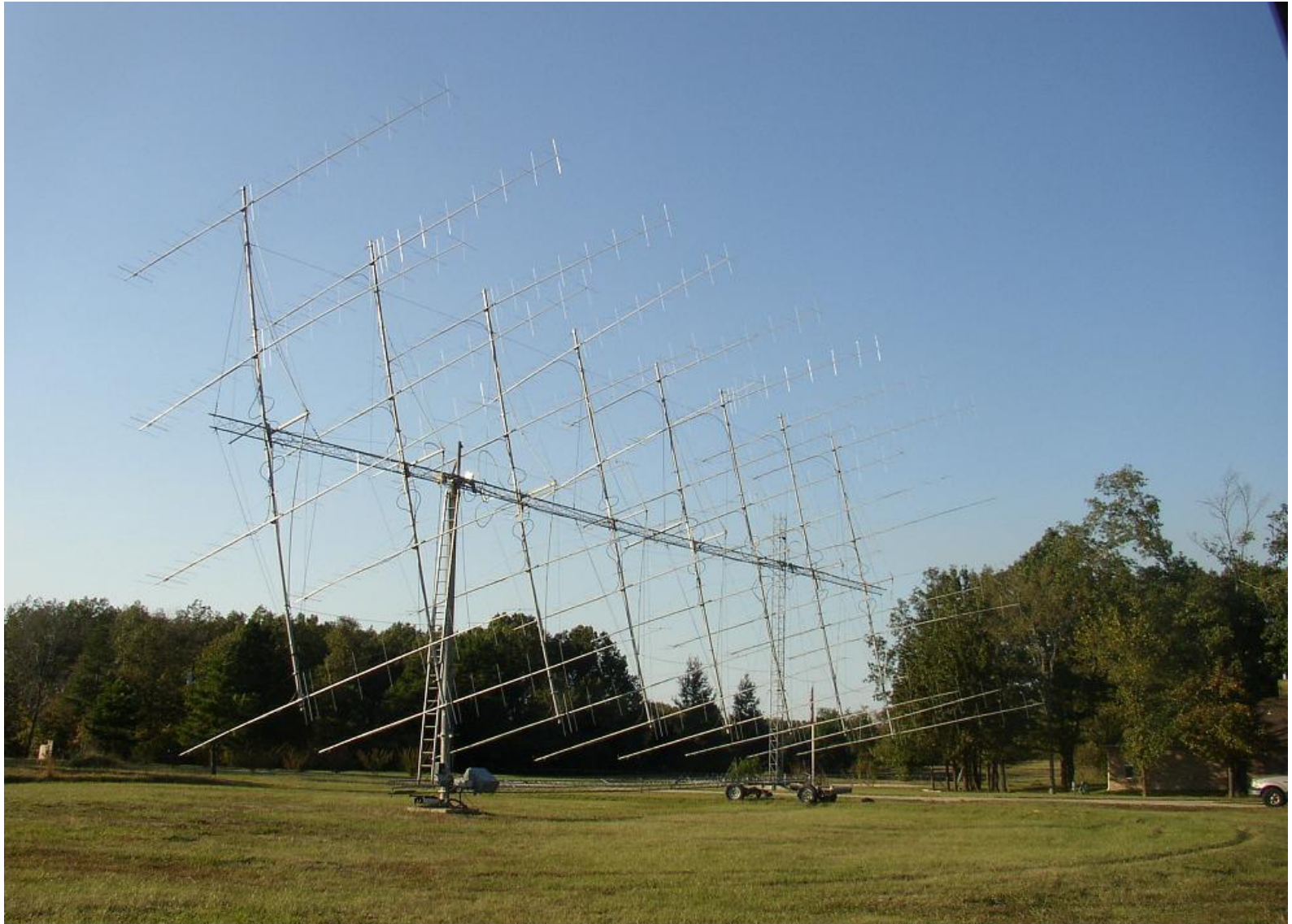
Rotating Tower Big Bertha



KC1XX – 300 ft



Moonbounce Array



W5UN EME Array with 32 2M5WL horizontal antennas, and 32 front mounted ten element vertical antennas

Moonbounce Dish



28 ft dish on Rohn 84

K2UYH

Satellite Array



Charlie Brown Tower – 10 ft

12-Sep-2007

Don't Laugh!

I made two 1296 contacts and many 6m, 2m, 432 contacts using this during the 2007 June VHF QSO Party ☺

After all... the lion's share of my VHF tower is the 1000 ft hill!

I decided I just had to put up some *real* towers after that fun!



Tower Requirements

- Fred K1VR: “Communications Requirements Drive Tower Requirements and Design...”
- DXing? – Tower Height, Antenna Type, Rotor
- Contesting? – Multiple Towers and Fixed Antennas
- VHF/UHF/Microwave? – Steadiness of Tower
- Moonbounce? – Array / Dish, Low Height, Tracking
- Satellite – Rapid Tracking Directive Array
- Wind Loading – Antenna Size
- What Can ***YOU*** Afford?

Types of Towers

- Guyed
- Self Supporting
- Fold Over
- Tilt Over
- Telescoping

Permit Process

- See K1VR's book
"Antenna Zoning for the Radio Amateur"
- Federal PRB-1
- Some States Have Version of PRB-1 (not CT)
- Visit Town Hall – Talk to Building Inspector
- Town Bylaws
- Building Permit
- Health Permit
- Inspection at Critical Construction Points

Rules in Ashford, CT (Bylaws)

- Amateur Radio Different from Commercial (CELL)
- 100 Ft Maximum for ***Standard*** Application
- 1 foot Property Setback for Each Foot Height
- 70 Feet from Well
- 15 Feet from Septic Tank / Drain Field
- Bldg Inspector ***Encourages*** Tower Construction
He's the Town ***Emergency Communications Coordinator!*** 😊
- K1VGF is on the Town Board 😊

Building & Health Permits

Town of Ashford
Planning and Zoning Commission

Application # _____

Application for ZONING PERMIT / CERTIFICATE OF COMPLIANCE

An application must be submitted along with the required fee and any other information required as outlined in the Town of Ashford Planning and Zoning Regulations before a zoning permit can be issued. The zoning permit is required for any new construction, addition, signage, and may be required for alterations to any building or property. Please use separate sheet for a site drawing showing all of the following: existing and proposed structures with their distances to the property lines and streets, dimensions of the property and distances to any wetlands or watercourses, driveway location, the septic system and well location, and the location of any sign in relationship to roads, property lines, distances to buildings. Some applications may require a formal site plan submitted to the Commission for a formal review. Check the regulations for more details of these requirements.

Name of applicant: _____ Phone # _____

Address of applicant: _____

Name of owner: _____ Phone # _____

Address of owner: _____

EMAIL: not required _____

Address of Property: _____

Assessor's Map # _____ Block _____ Lot # _____ Existing Zone _____ Acreage of Property _____

Proposed Activity: Residential _____ Commercial _____ Other: _____

New Construction: Addition _____ Alteration _____ New Building _____ Sign _____

Proposed Activity: _____

I (we) the undersigned petitioner(s) hereby depose that I am familiar with the Town of Ashford's Zoning Regulations and that all required supporting documentation accompanies this application. I (we) understand that the submission of inaccurate or incomplete information shall be grounds for denial of this application by the Commission. I (we) hereby authorize the Town of Ashford, the Ashford Planning and Zoning Commission or their respective agents to inspect the subject property at reasonable times both before and after a final decision is made.

Signature (s) Owner _____ Date: _____

Owner _____ Date: _____

Applicant _____ Date: _____

For Official Use: _____

Received by _____ Date _____ Fee Paid _____

Zoning Enforcement Officer Decision _____

Zoning Enforcement Officer _____ Date: _____

Commission Decision _____ Date: _____

Revised: August 28, 2007

EASTERN HIGHLANDS HEALTH DISTRICT B100A APPLICATION

(for building conversion, change of use, building addition, accessory structure and lot line change)

The initial review time is 5 - 10 working days. Applications requiring soil testing will require additional time to complete the review process.

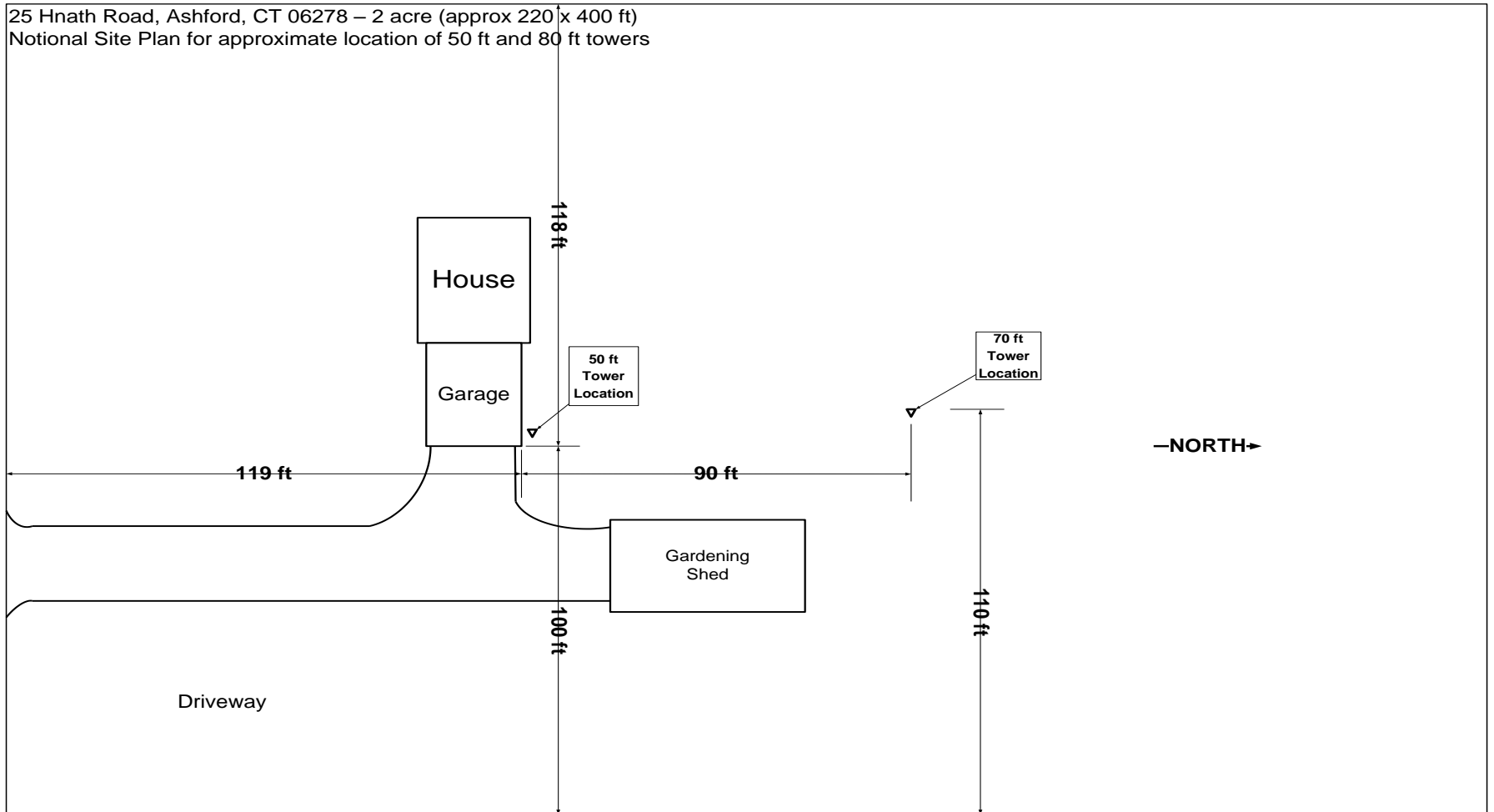
APPLICANT / OWNER SECTION	25 Hnath Road / Ashford, CT Address of proposed activity Street Number Town
	Terry G. Glagowski / 25 Hnath Road, Ashford, CT 06278 / (860) 429-9444 Owner Name Mailing Address (street address, city, zip) Telephone
	Applicant Name (if different than owner) / Mailing Address (street address, city, zip) Telephone
PROPOSED ACTIVITY	Describe the proposed structure or activity with dimensions (e.g. = "addition with bedroom, bathroom and family room" or "in ground pool" or "winterizing existing porch") Foundation for 52 ft Amateur Radio Tower behind garage, 4 ft x 4 ft x 6 ft deep Foundation for 80 ft Amateur Radio Tower behind garage, 5 ft x 5 ft x 8 ft deep
	Residential _____ Number of existing bedrooms 4 Non-residential _____ Please describe _____ Property served by septic system? YES Age of System 3 yrs Property served by on-site well? YES Other _____
EXISTING PROPERTY USE	Plot plan - attach a scaled drawing showing property lines and dimensions, location and size of existing and proposed structures, and site features, such as driveways, wells and septic systems, drains and watercourses. Building plan - attach a sketch/floor plan of the proposed structure, addition or renovation showing existing and proposed rooms with door and window locations.
PLAN NEEDS	NOTE: Soil test data (deep test pits and percolation test) are required for the review of this application. If soil test data is not available in your property file, you will need to schedule an appointment with the health district sanitarian in your town for soil testing (additional application and fees are required). Please schedule soil testing as soon as reasonably possible to avoid delays in processing your application. If you have any questions regarding the soil testing, please contact the Eastern Highlands Health District sanitarian in your town.
SOIL DATA REQUIRED	As property owner or duly authorized representative of the property owner of the above referenced property, I agree to permit EHHD staff to enter the above referenced property as part of this B100a application review process. I further agree that this authorization to enter the subject property may extend through a period of time ending with the final B100a application approval and affirm such with my signature below.
	Please read the requirements above before signing and submitting this application. Applicant Signature _____ Date _____
OFFICE USE ONLY	Application approved _____ Not approved _____ By _____ Date _____ Comments/Conditions _____

Please return this form, plans and an application review fee of \$35 to the Eastern Highlands Health District office in your town.

Revised May 2007

Tower Location – Plot Plan

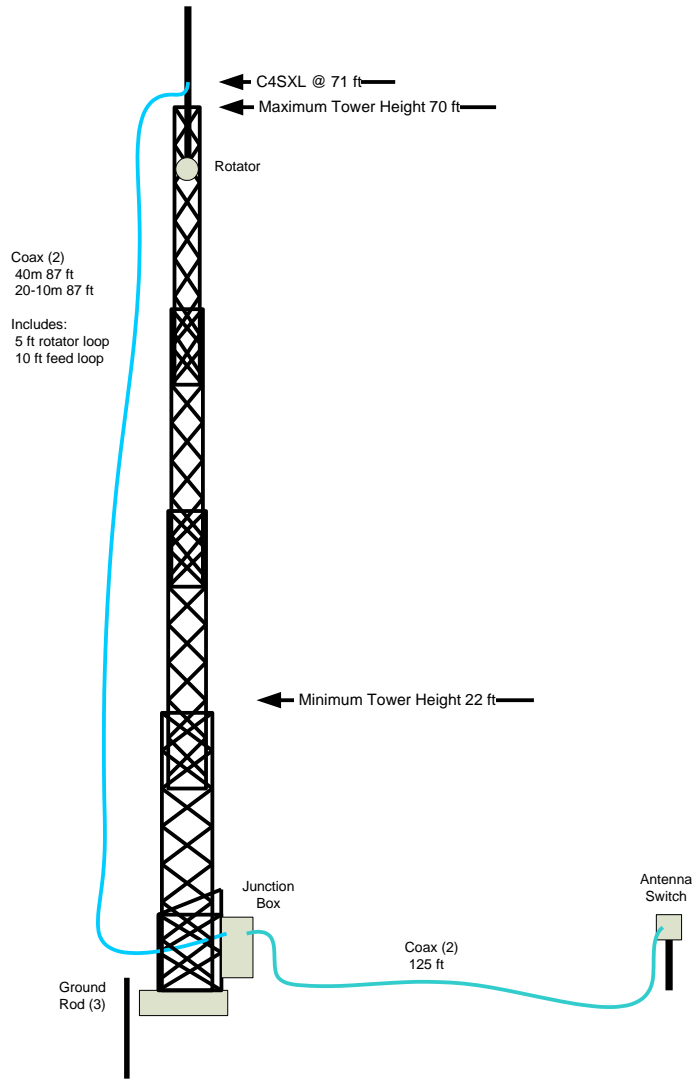
25 Hnath Road, Ashford, CT 06278 – 2 acre (approx 220 x 400 ft)
Notional Site Plan for approximate location of 50 ft and 80 ft towers



HF Tower Concept

LM470D Tower Antenna Layout

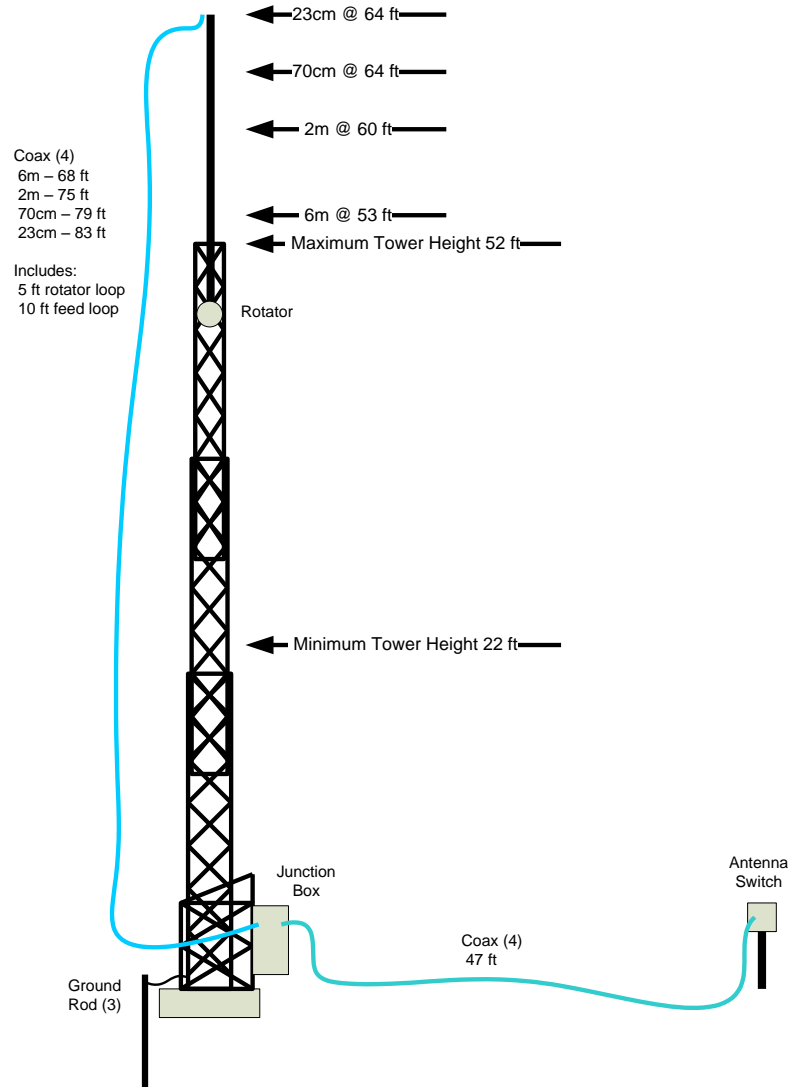
LM470D Tower Antenna Layout.vsd - 28-Oct-2011 01:28



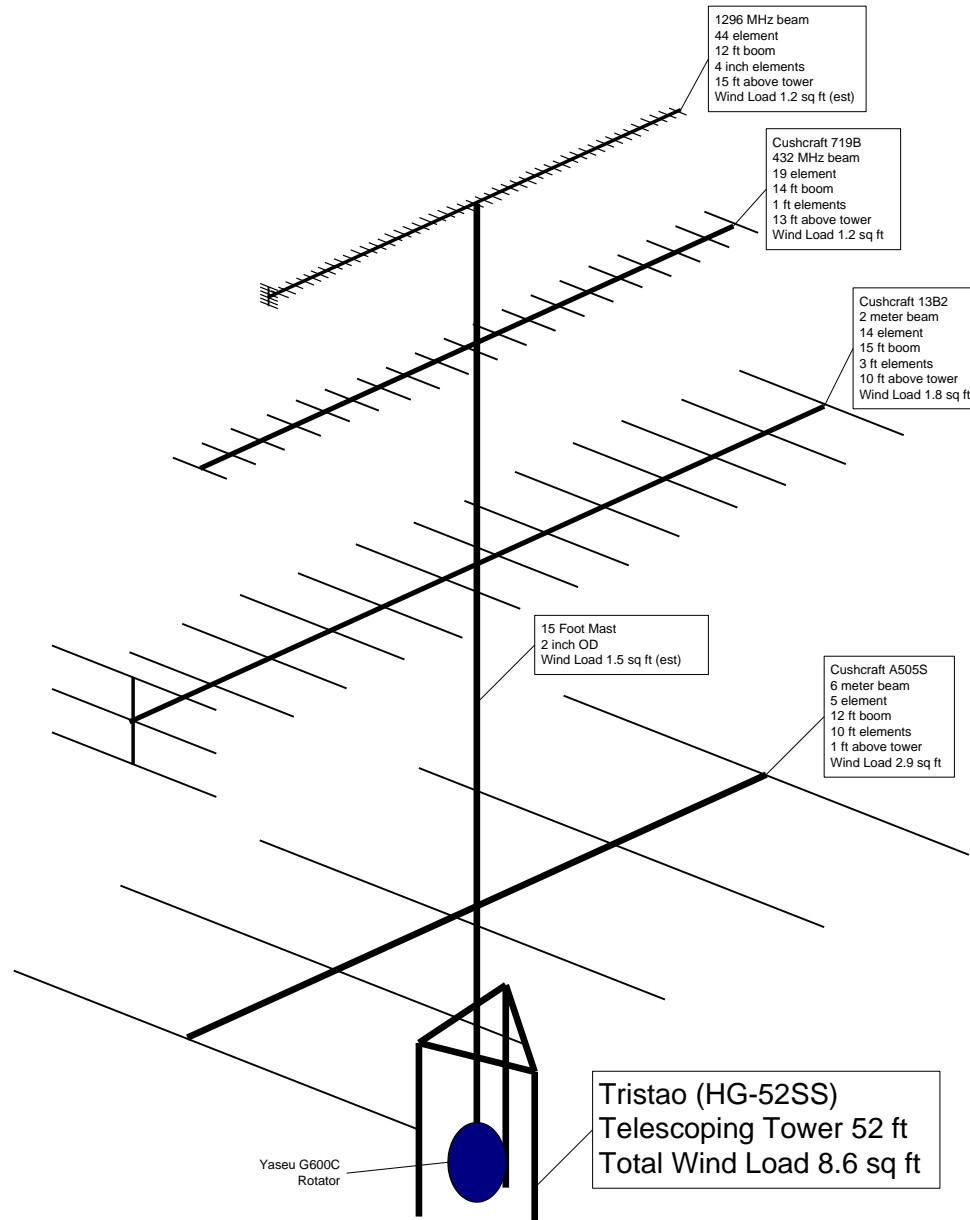
VHF Tower Concept

HG52SS Tower Antenna Layout

HG52SS Tower Antenna Layout.vsd - 28-Oct-2011 01:29



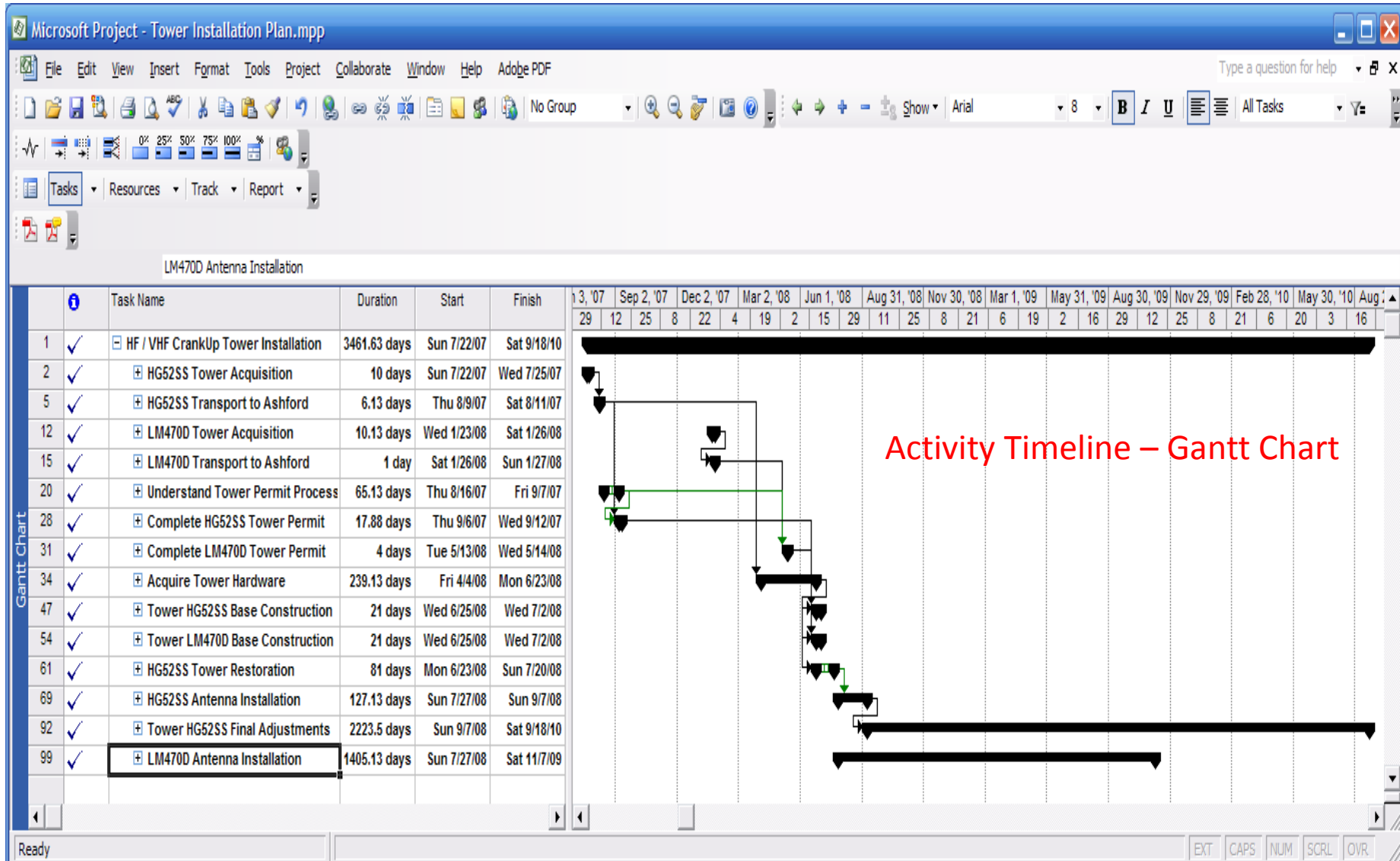
Windload Analysis – VHF/UHF



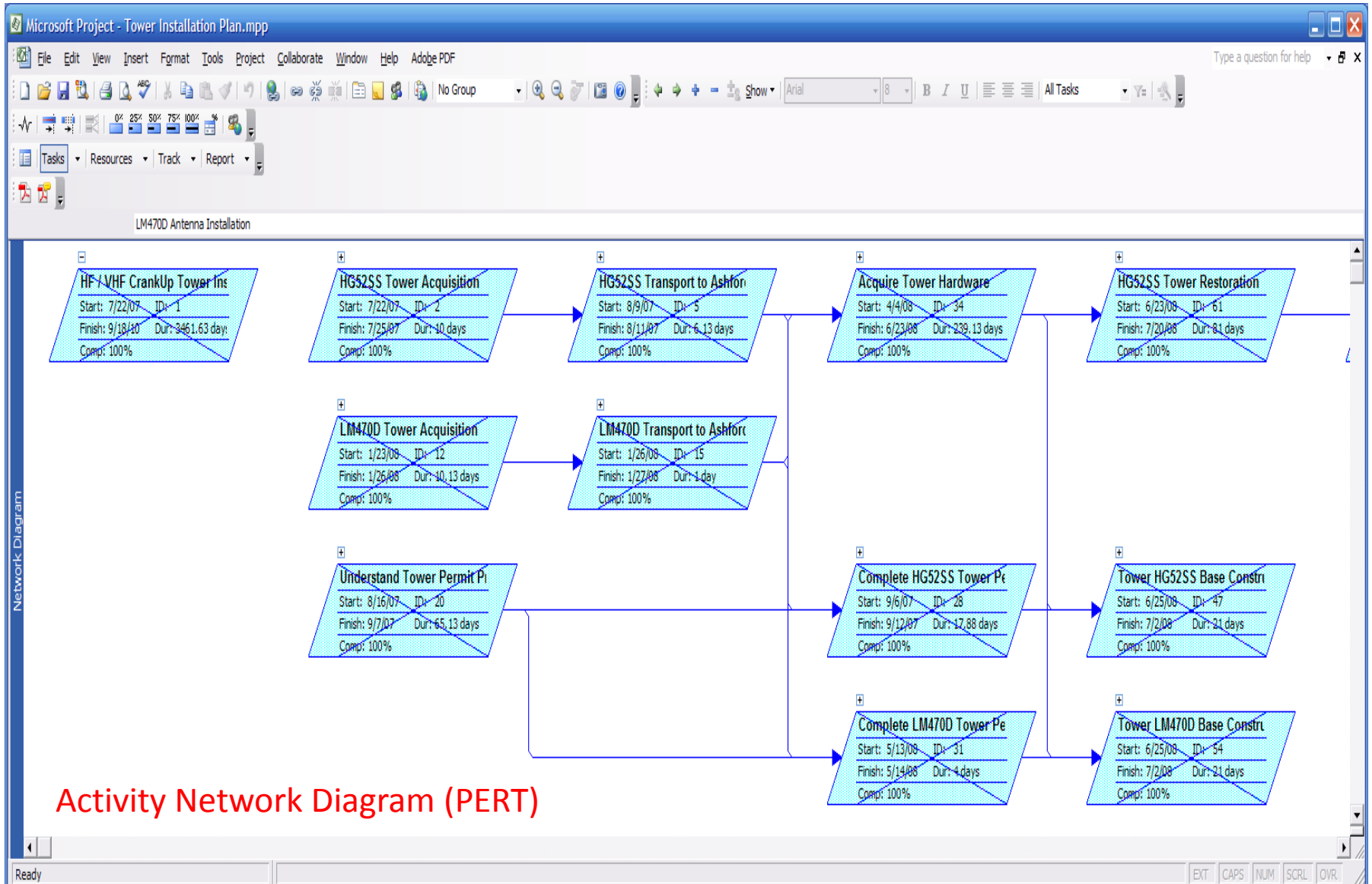
W1TR Tower Installation

- Making the Plan
- Transporting the Towers
- Storing the Towers
- Digging the Holes
- Installing Rebar and Tower Bases
- Pouring Concrete
- Mounting Towers on the Base
- Raising the Towers
- Tilting Up / Down
- Telescoping Up / Down

Project Plan – Timeline of Activities



Project Plan – Order of Activities



Bill of Materials

The screenshot shows a Microsoft Excel spreadsheet titled 'HG52SS Power Winch Design Parts List.xlsx'. The ribbon includes Home, Insert, Page Layout, Formulas, Data, Review, View, Developer, and Acrobat. The active cell is A1, containing the text 'HG52SS Power Winch Design Parts List'. A red annotation 'Perhaps COST should be added to this?' is placed over the title cell. The table below lists various parts with columns for Description, Quantity, Notes, and Specifications.

	A	B	C	D
1	HG52SS Power Winch Design Parts List			Perhaps COST should be added to this?
2				
3	Description	Quantity	Notes	Specifications
4	Winch	1	Have	Harbor Freight 1300 lb hoist
5	Steel Square Stock	1	Have	1.5 inch square, 1/8 inch thick wall, holes 7/16 dia, holes spaced 1 inch
6	Steel Strip Stock	1	Have	1 inch wide, 1/8 inch thick, 3 feet long or so
7	Hex Bolt	8	Have	3/8 inch dia, 2 inch long, 16 tpi
8	Hex Bolt	2	Have	3/8 inch dia, 3.5 inch long, 16 tpi
9	U-Bolt	4	Have	2 inch center, 2.5 inch long, 3/8 inch dia, 16 tpi (with bolt and lock washer)
10	Lock Washer	14	Have	3/8 inch dia
11	Hex Nut	14	Have	3/8 inch dia
12	Material to Cover Winch for Weather - Mailbox	1	Have	9 in high, 6 in wide, 15 1/2 in long, 11 inch up to spindle
13	Mount for Weather Cover	2	Have	Aluminum Angle Stock
14				
15				

Transporting the HG52SS Tower – Paul KE1LI



Storing the HG52SS

12-Aug-2007



It waited here until I figured out how to tilt it up.

Transporting the LM-470D Tower – Paul KE1LI



02-Feb-2008

February 2008
This tower came from K1YR,
a fellow marching bandsman
from UConn.
He was moving to Hawaii and
couldn't take the tower!

Storing the LM-470D

02-Feb-2008



It waited here until Summer.

Digging the Holes – Frank K1MAA

25-Jun-2008



I rented a small digger for this, unfortunately no pictures of it.

Installing Rebar and Tower Base – K1MAA



26-Jun-2008

Note that there are two bases here: one for the tower, and one for the tilt over accessory

Pouring the Concrete – K1MAA

27-Jun-2008

The supports should have been stiffer.
The tower is a little out of kilter.
Not to worry, there are adjustment bolts.



Completed Tower Base – HG52SS

30-Jun-2008



According to tradition, one must sign all wet concrete !
Our relationship is now *well cemented!* ;-)

Completed Tower Base – LM-470D

30-Jun-2008



Installing the Tower Mount Flanges

26-Jul-2008



There is one bolt underneath,
Two bolts on top.
The tower can be leveled by
adjusting the bolts!

Moving the HG52SS to the Base

10-Aug-2008



Installing the Tilt-Over Accessory

Since I got the towers almost free...
The Tilt-Over Accessories were the most expensive part of the tower system, especially due to shipping (30% of cost) from the West Coast!
But, they were an excellent investment because they are strong and safe.



Mounting HG52SS to the Base Flanges

Mount the tower
to the flanges on
the bolts

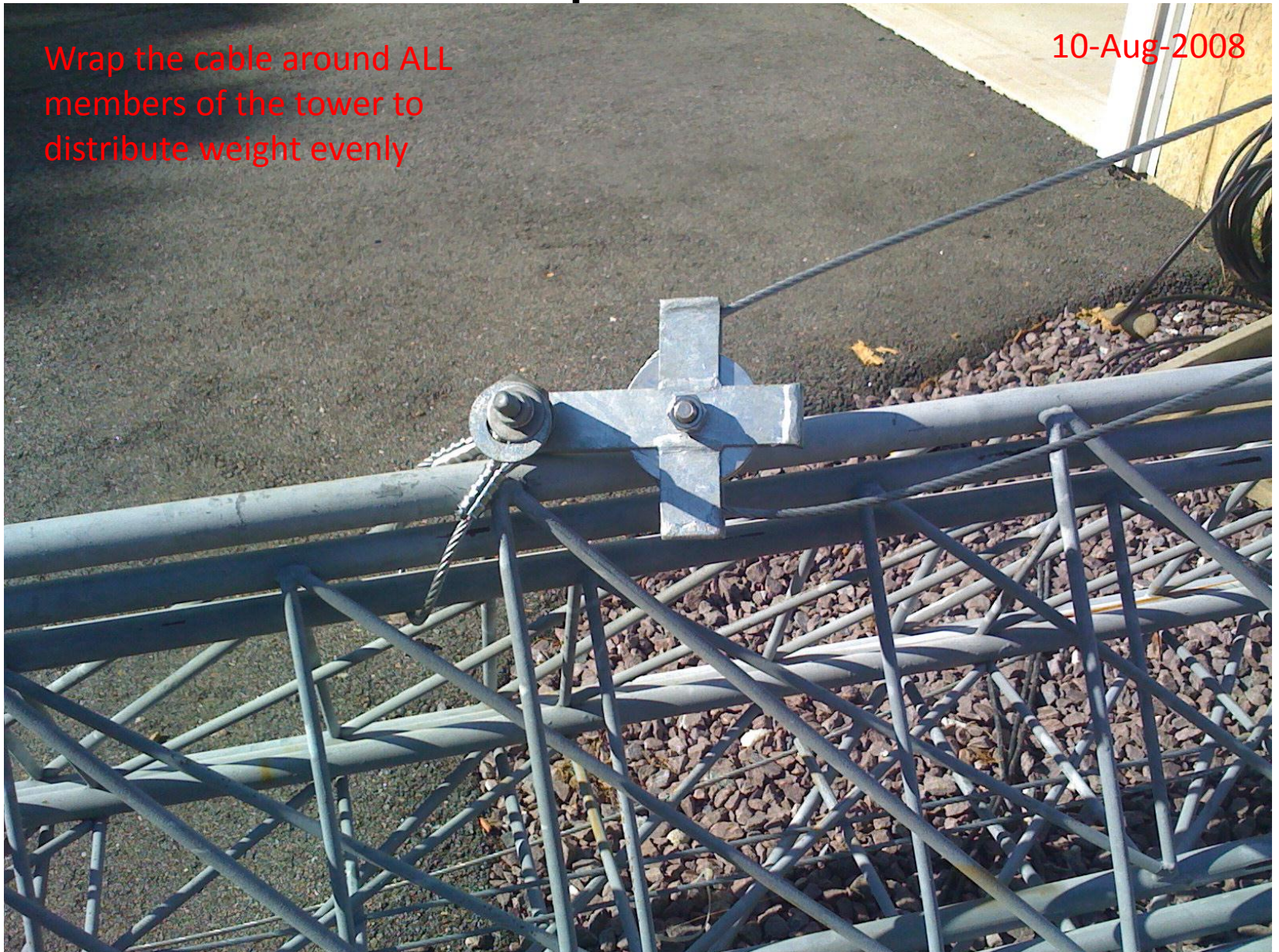
10-Aug-2008



HG52SS Tilt Up – Fasten Cables

Wrap the cable around ALL members of the tower to distribute weight evenly

10-Aug-2008



HG52SS Tilt Up – Just Getting Started



HG52SS Tilt Up – Long Way to Go

10-Aug-2008



HG52SS Tilt Up – Almost There



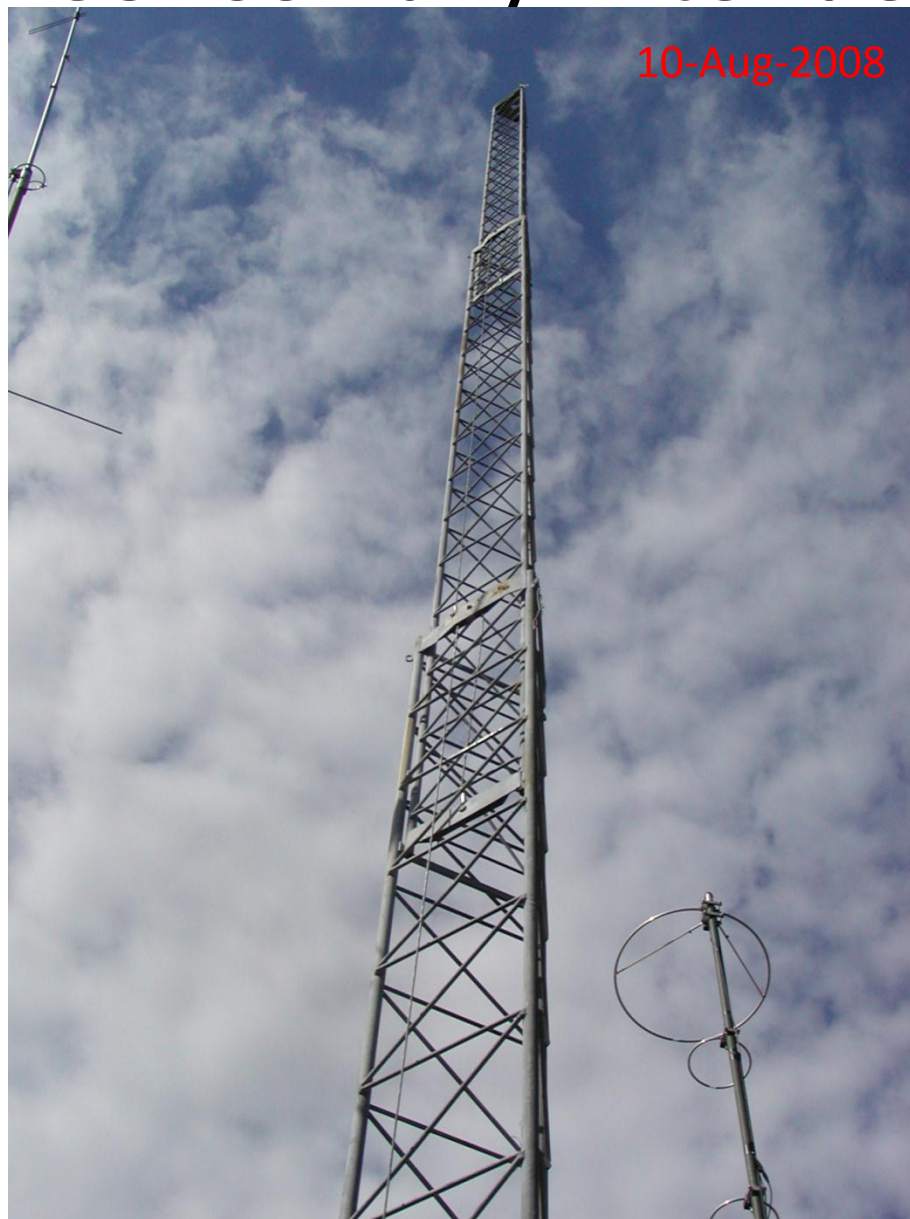
HG52SS Retracted



Hey OM's...

The secret to getting your **TOWER** is to let the XYL have her **POOL!**

HG52SS Fully Extended



HG52SS - Yaesu G-600RC Rotor - VHF

13-Sep-2008



The rotor mount is held in by gravity

Thrust Bearing & Weather Shield

13-Sep-2008



The weather shield is a rubber pipe-size-converter from the plumbing section of Home Depot

Installing the VHF/UHF Antennas

13-Sep-2008



Twist the 6m boom so the elements clear the ground

Electric Winch Added

28-Oct-2011



Electric Winch with Weather Shield

28-Oct-2011



VHF / UHF Tower



Moving the LM-470D to the Base

26-Jul-2008



This BobCat was here for landscaping of the pool. It came in handy when moving the LM-470D.

LM-470D Tilt Over Accessory



LM-470D Cable & HW Replacement

21-Sep-2008



LM-470D Retracted

26-Oct-2008



LM-470D Fully Extended



LM-470D Tilted Over



Tilting Tower Is Easy
Since it is Almost Balanced,
Slightly Top Heavy

LM-470D, Rotor, Mast, Thrust Bearing



W1TR Hanging Hinge Plate

28-Nov-2008



Keeps Antenna Level
While Tower Tilts Over
Using Gravity

C4SXL Mounted on Mast – Closeup



C4SXL Mounted on Mast



HF Tower & Antenna Finally UP

Ready for 2008 ARRL 10 Meter Contest 😊

Missed 2008 ARRL SS 😞

13-Dec-2008

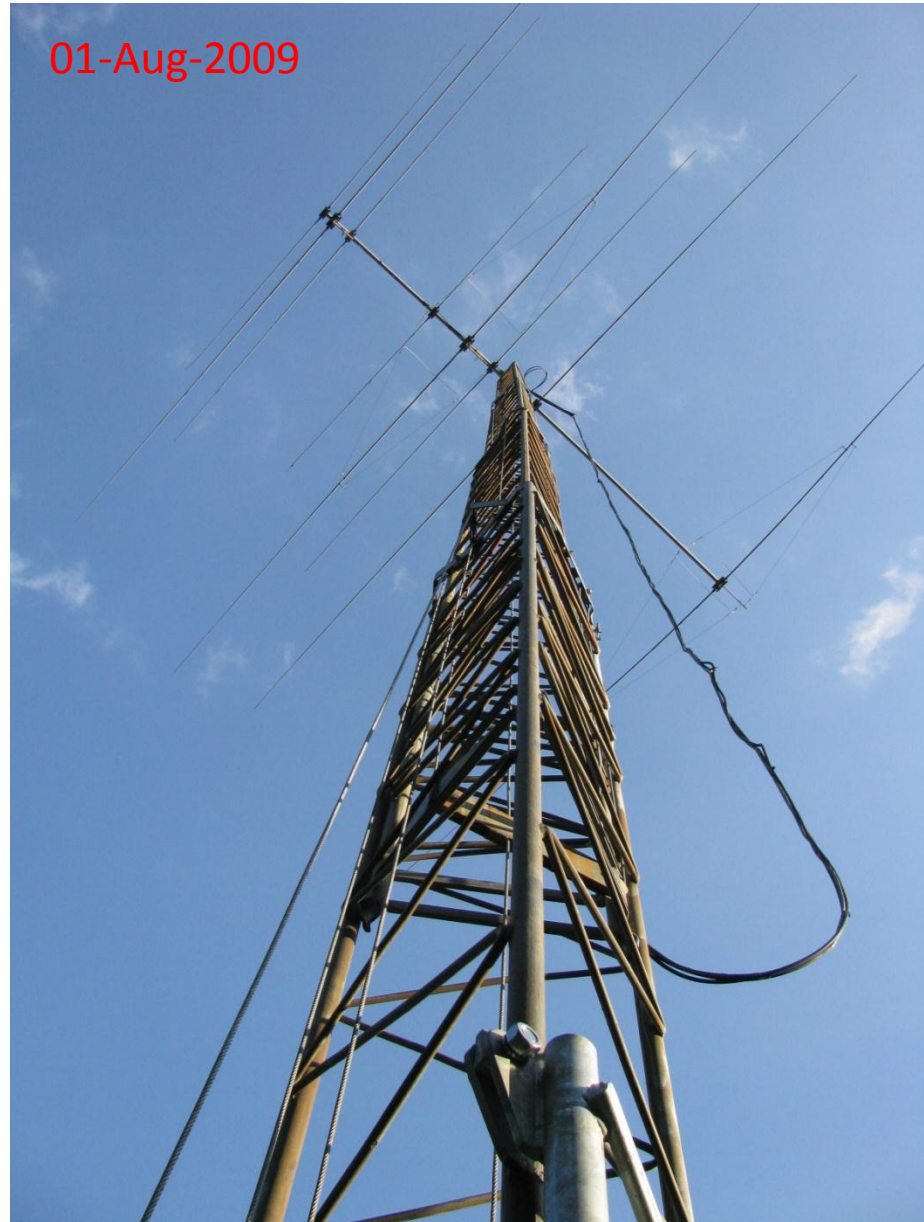


HF Tower

28-Oct-2011



01-Aug-2009



Safety

- Don't Climb Crank-Up Towers – Not Necessary
- Safety Harness
- Tool Carrier
- Ground Support
- Tower Safety Stand
- Tower Weight Capacity
- You Can Never Have TOO GOOD of a Ground

Tower Safety Stand

This item is made from available steel pipe from the plumbing section of Home Depot. I suggest painting it with Rustoleum soon after construction.



Maintenance

- Check Nuts & Bolts for Tightness
- Check for Deformation / Cracks
- Check for Corrosion
- Lubricate Motors, Joints, Bearings, Cables
- Check for ???
- Make Regular Inspections

Lessons Learned

- Think Ahead about Tower Base Orientation
- Make the rebar / base support very stiff
- Put Lock Washers on **ALL** Bolts / Nuts
- Hinge Pins Work Their Way Out
- Cotter Pins Break Off
- Hanging Hinge Plate – Watch Clearance on Holes
- Twist Antenna Booms When Near Ground (6m)
- Don't Use Walmart Plastic Containers Outside
- Pound Ground Rods In Loose Dirt IF Possible
- Do Things the EASY WAY, Power Tools
- Adding a Motorized Winch Easy

Think Ahead About Base Orientation

What if I were to
find another
LM-470D?
Could I Swap It for
the HG52SS?

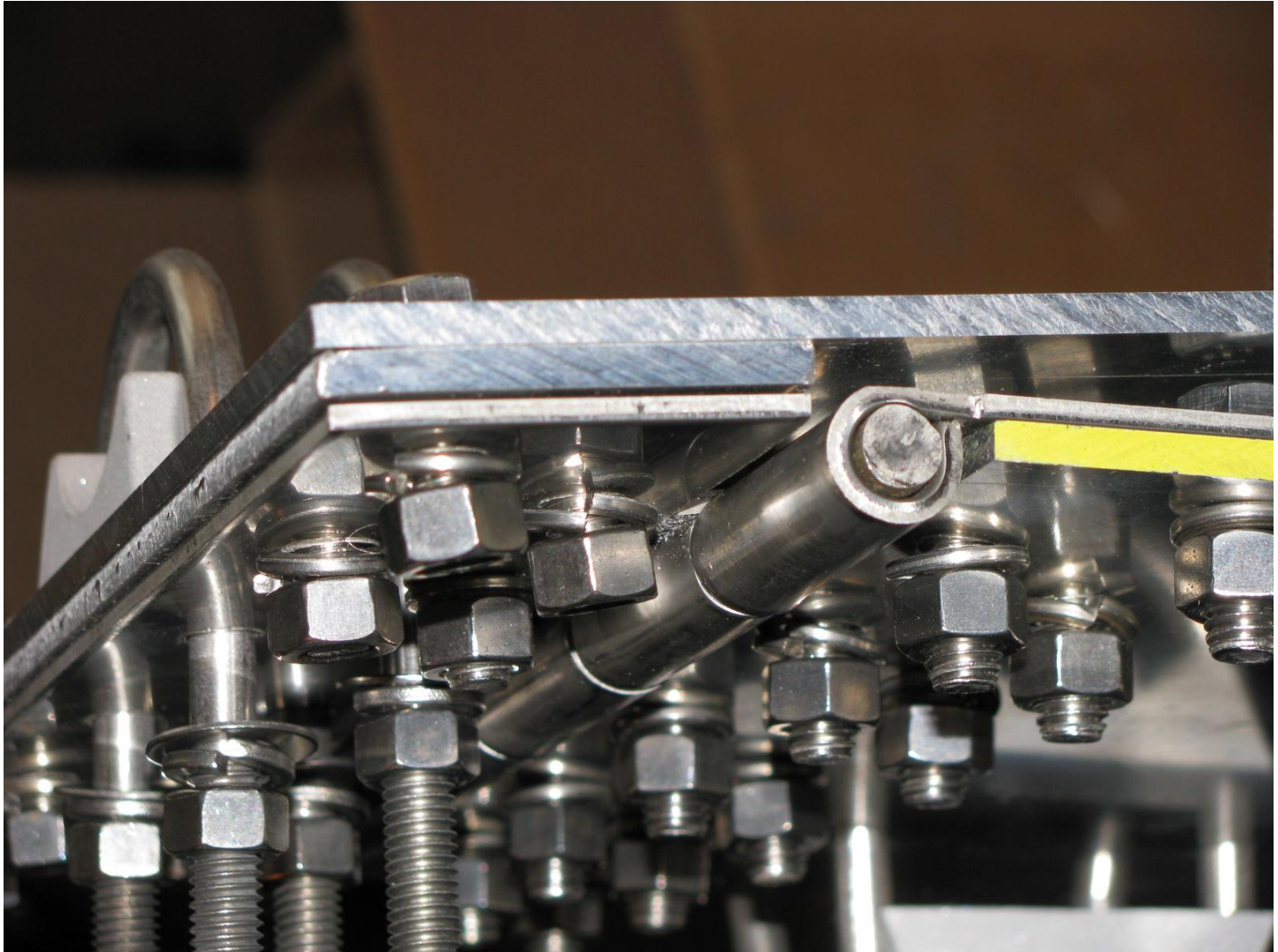


Lock Washers Added to HG52SS Base



The Lockwasher should have been there from the start.
After a year, the tower bolts began to loosen!

Hinge Pin Works Its Way Out



I tried a cotter pin, but it broke after a few months.
Next Idea: make small angle brackets to keep pin from working out

Hanging Hinge Plate – Watch Hole Clearance

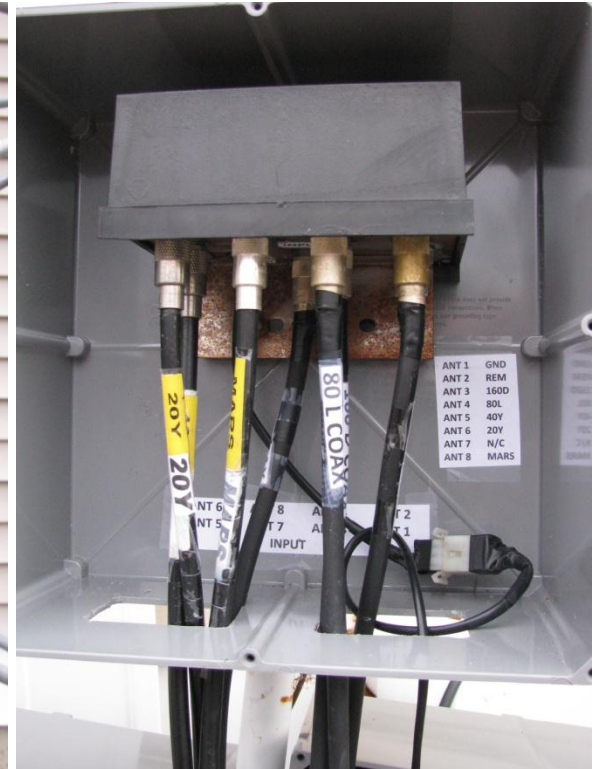
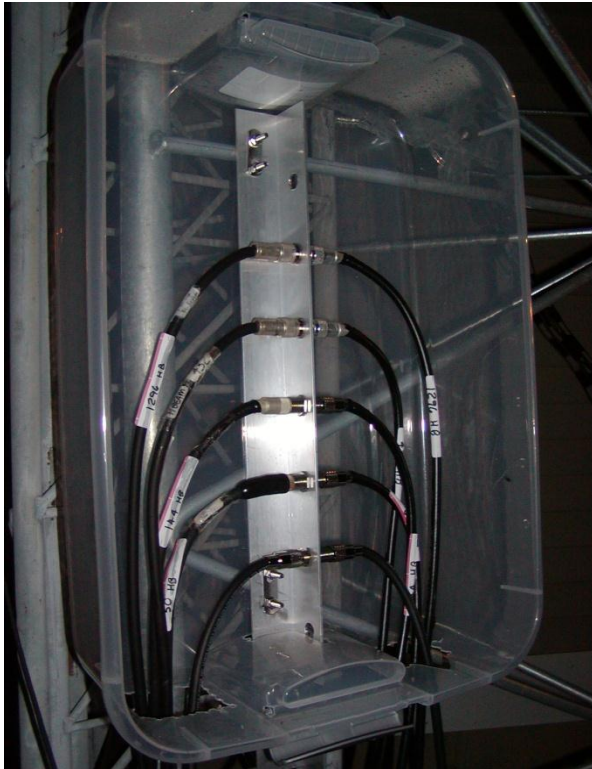
The clearance holes on the hanging hinge plate were insufficient, did not align properly, and the bolts were too long.

It caused the hinge plate to not completely close, leaving the antenna tilted (it still worked AOK).

I drilled / cut larger holes and cut the bolts shorter!



Walmart Boxes Replaced with PVC Electrical Boxes



On the left, I used cheap \$9 plastic storage boxes from Walmart. They worked great for a couple of years, then got brittle, crumbled and broke. I replaced them with electrical PVC boxes (\$20) from Home Depot

Twist Antenna Boom Near Ground



As the tower nears the ground, loosen the 6m boom from the mounting bracket. Twist it so that the tower can come lower without forcing the elements into the ground. The other beams have smaller elements and don't have this problem!

Summary

- Towers at W1TR are Telescoping / Tilt-Over
- Easy Maintenance for Antennas & Feedline
- Hanging Hinge Plate Great for HF Antenna
- Performance Difference of Beam Antennas vs Wire Antennas PRICELESS !

Google Earth Satellite Photo



73, Terry - W1TR

