NCRC Antenna Farm Setup Guide

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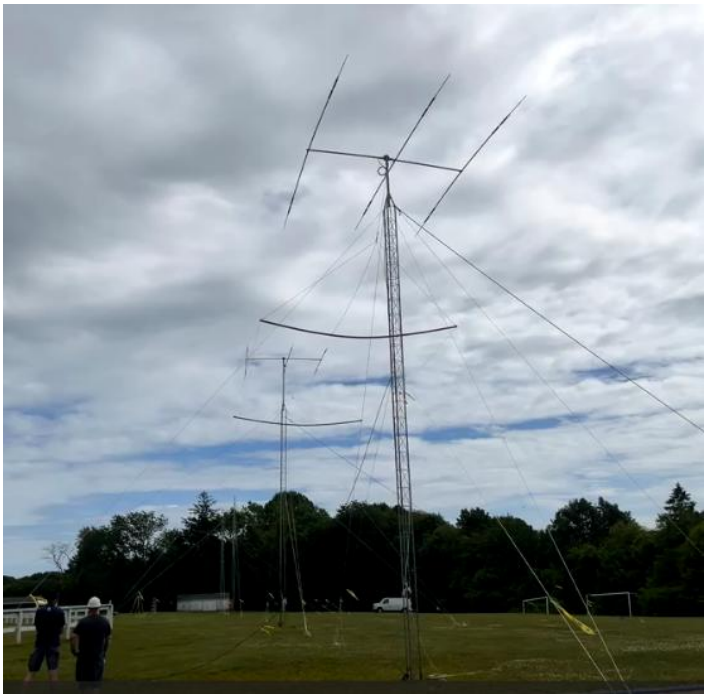

The Newport County Radio Club has consistently placed in the top 10% of the nation during Summer Field Days for the last 25 years. This document describes the antenna farm setup, which is a major contributing factor in this outstanding performance.

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1. Introduction

This Guide documents the installation of the major antennas used by the Newport County Radio Club during Field Day. This is the configuration used for the 2023 Summer Field Day.

2. Plan

The plan is to setup antennas for three stations: CW, Phone (SSB) and GOTA. Coverage includes 80, 40, 20, 15 and 10 Meter Bands. Ladder line or coax connect these antennas to Elecraft K3 radios, via Johnson Match Box antenna tuners.

To accomplish this Three (3) Tri-Band Trapped Yagi antennas (Cushcraft A3S) , two (2) 40 Meter Moxon antennas and Three (3) 80 Meter Center Fed Wire antennas are installed on four (4) 40 foot Rohn Towers. The antennas are on a North South reference line, so that when raised the rotor-less antennas will face in the Westerly direction. See Figure 1

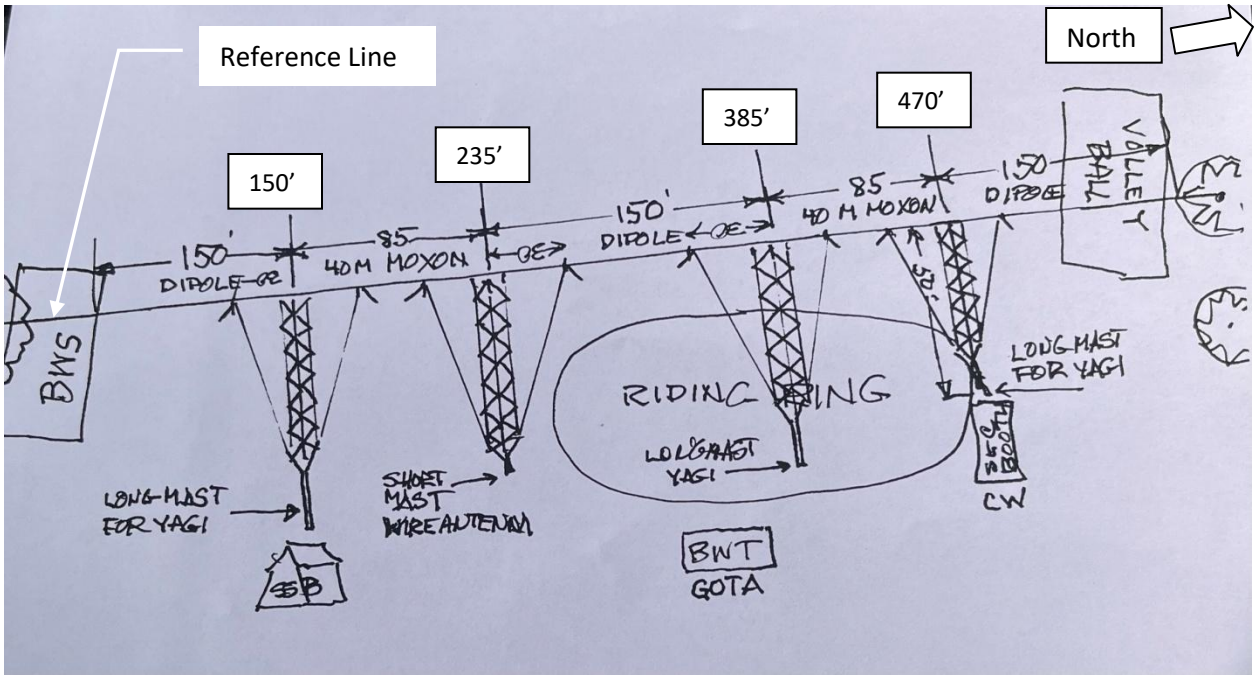


Figure 1 Antenna Layout Plan: Showing the North South Reference line, Antennas shown lying on the ground in an East West direction and the wire antennas to be mounted between them. The Yagis are mounted to the long masted towers and will face west when raised.

3. Safety

1. General

- **Appoint a Knowledgeable Safety Officer**
- **The Safety Officer will give a Safety Briefing to the entire team before any work starts**
- A Field Day Safety list is included in the June 2023 QST magazine. This list is in Appendix A.
- The Field Day Safety Briefing given by NCRC member Bruce Manning, NJ3K, is in Appendix B.
- RF exposure calculations shown in Appendix C are based on the ARRL website calculator.

2. Antenna Farm Safety Precautions

- Check all knots to insure that the antenna will not fall.
- The Antenna Fall Zone extends 75' from the base of any antenna.
- **Hard Hats are required when working in the Antenna Fall Zone.**
- **No One in the Lift Zone when the towers are being raised**. Once the towers are vertical and stable, the Lift Master will allow one person into the Lift Zone to secure the stays.
- Protect hands when handling stays and hammers.

4. Work Load Sharing

This document is written as though one team is assembling and raising the towers and antennas in a linear sequence. While this is possible, the time constraints of Field Day almost require that teams of workers to perform the required tasks in parallel. Once a team has completed their task, the team members can join another team or start another task. Teams and Tasks are described in detail in the below.

A suggested team approach, given the availability of personnel is:

1. Layout Team

This team would consist of **2 to 3 People**. Tasks Required:

- Set the Reference Line
- Layout the Tower Bases on the Reference Line

2. Tower Assembly Team

This team would consist of **4 People**. Tasks Required:

- Set the towers on the ground by their bases
- Connect the towers together and to their bases
- Extend the mast
- Install tower bases by pinning them to the ground

3. Yagi Antenna Assembly Team

This team would consist of **1 to 2 People**. Tasks Required:

- The Yagi Team assembles one 3- Element Yagi at a time, staying ahead of the tower guying and lifting crew
- Assemble Yagi antennas on the ground above each long masted tower
- Add extension legs to saw horse
- Move sawhorse to a position near the first tower to be raised

4. Tower Lifting Team

This team would consist of **4 to 6 People**. Tasks Required:

- Move Sawhorse under tower once the tower is lifted
- Lift tower and set it on the Sawhorse
- Lift and rotate the Yagi Antenna and connect it to the mast
- Connect COAX and RF choke and tape COAX
- Tie front lifting halyard to Van Lifting strap
- Raise Tower
- Set front stake and tie off lifting halyard

5. Wire Antenna Team

This team would consist of **4 to 6 People**. Tasks Required:

- Layout the Moxon antennas and connect them to their halyards
- Connect the COAX feed line
- Raze the Moxon antennas
- Shoot the 80 Meter Dipole Antenna rope leader into the Pine tree (used for the Dipoles on the ends of the Antenna Farm)
    - Connect the 80 Meter Antenna rope lead to one end of the Dipole and the other to the halyard on the mast
    - Lift the Dipole
- For the Dipole connected in the middle of the Antenna Field
    - Connect the Dipole to the halyards on the short masted tower and the GOTA tower
    - Lift the Dipole

6. Antenna Farm Turnover Team

This team would consist of **1 to 2 people**. Tasks Required:

- Mark all safety hazards with yellow caution tape
- Roll out all COAX to the Radio station tents.
- Circle the Antenna Field with Yellow safety tape to exclude accidental entry.
- Ensure that the Antenna Farm is clear of people. The Safety Officer will allow only personnel with Hard Hats into the farm.
- Turnover the Antenna Farm for Operation

7. Antenna Farm Take Down and Storage Team

This team would consist of **4 to 6 People**. Tasks Required:

- Wire Antenna Take down **(leave halyards attached to mast)**

- Roll up wire antennas and store in the Big White shed
- Position Sawhorse and take Down tower
- Remove Yagi Antenna.
- Move on to next tower
- Take apart Yagi Antenna , wrap up, tape nuts
- Breakdown each element into two pieces (approximately half) and tape the Yagi pieces together to form one package per station (CW, Fone, GOTA)
- Store in BWS

5. Location Equipment in the Big White Shed (BWS)

The NCRC is fortunate to use Glen Park in Portsmouth RI for Field Day. This facility has a field large enough to hold the antenna farm and is located high enough to assure good RF Propagation.

At Glen Park the antennas and towers are stored in the Big White Shed (BWS) located to the South side of the Field west of the Horse Ring. See Figure 1. Figure 2 shows the Field Day equipment stored correctly in the BWS.

Figure 2 Stored Field Day Equipment: Field Day antennas, towers, and feed line stored correctly in the Big White Shed (BWS)

6. Antenna Farm Layout

1. Layout the Line to Locate the Towers

As Shown in Figure 1, the Tower bases are positioned on a reference line marked in the North South direction. This line is marked by driving a van from the BWS towards the Pine tree on the opposite side of the field to the West of the Horse Riding Ring. See Figure 3. The reference line is the passenger's side tire track. Enough space is left on the West side for the Van to lift the towers.

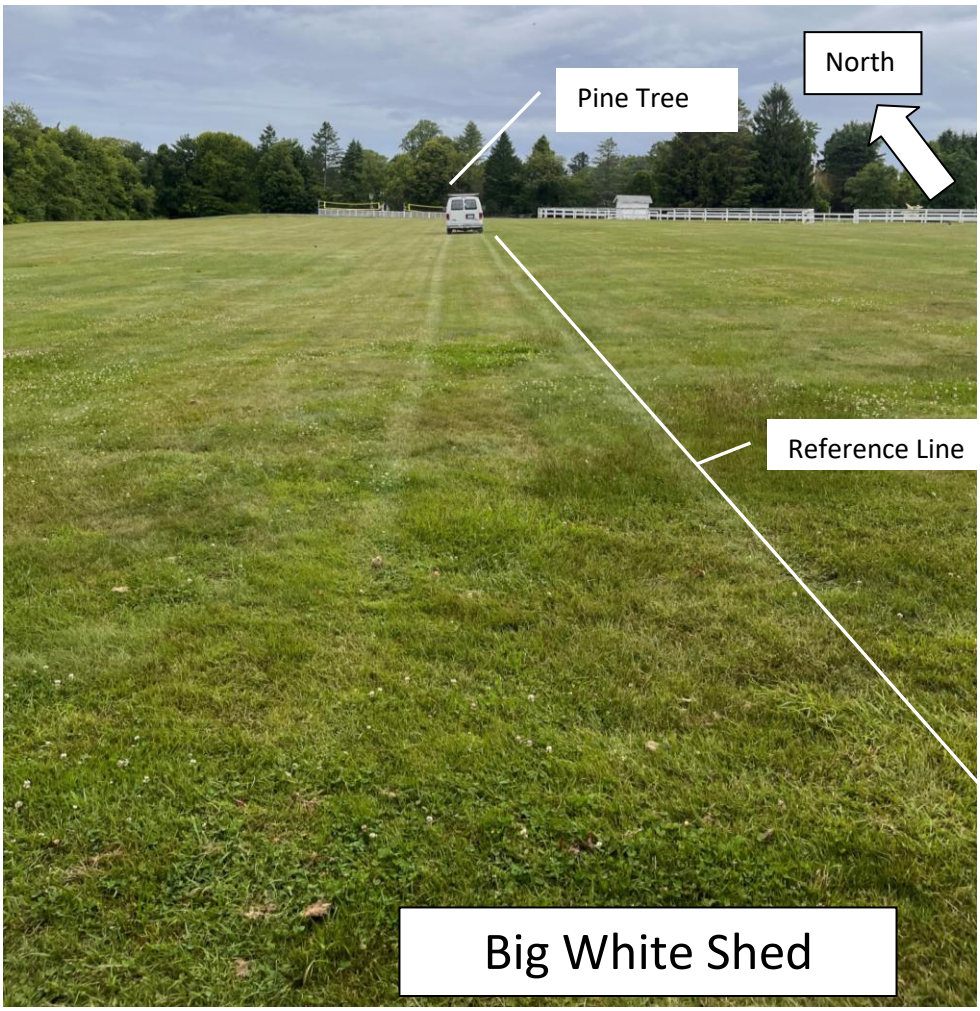


Figure 3 Reference Line Establishment: The Reference line is a North South line marked in the grass by the passenger's side tire of the Big White Van (BWV)

2. Mark Antenna Base and Tower Locations

In accordance with Figure 1, use a tape measure (or a known pace length) starting at the BWS side of the line mark off:

- 150' for the SSB tower base and long mast 40' Rohn tower (150' from the BWS)
- Then 85' for the Wire Antenna tower base and 40' short mast Rohn tower (235' from the BWS)
- Then 150' for the GOTA tower base and long mast 40' Rohn tower (385' from the BWS)

- Then 85’ for the CW tower base and long mast 40’ Rohn tower (470’ from the BWS)

3. Set Tower Bases on the line and stake them into the ground

There are three types of tower base; any tower base will fit any tower bottom. For the purposes of this document, lay out the following Tower bases on the reference line:

- **The Square Tower base is set at the SSB tower base position**. This base, shown in Figure 4, has four holes at the corners that are staked down. The stakes used are the ones with the “U” clamps installed.

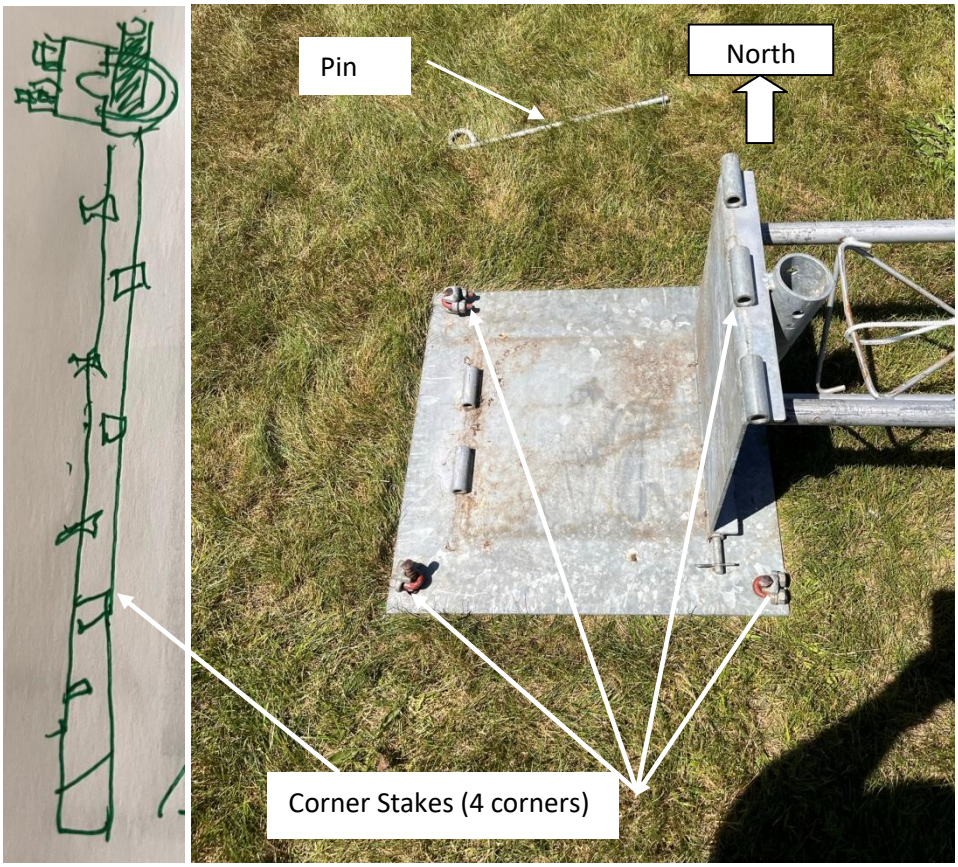


Figure 4 Square Tower Base Installation: Square tower base located 150’ from the BWS on the Reference line.

The tower base is located 150’ from the BWS on the Reference line and positioned so that the antenna tower bottom is west of the tower’s mast.

Note: The Pin must be Removed when the tower is raised or lowered, it is inserted when the tower is erect.

Caution: Remove the pin to drop the tower.

- **The Small Pipe tower bases are set at the Wire Antenna short mast tower position (235') and at the CW long mast tower position (470')**.

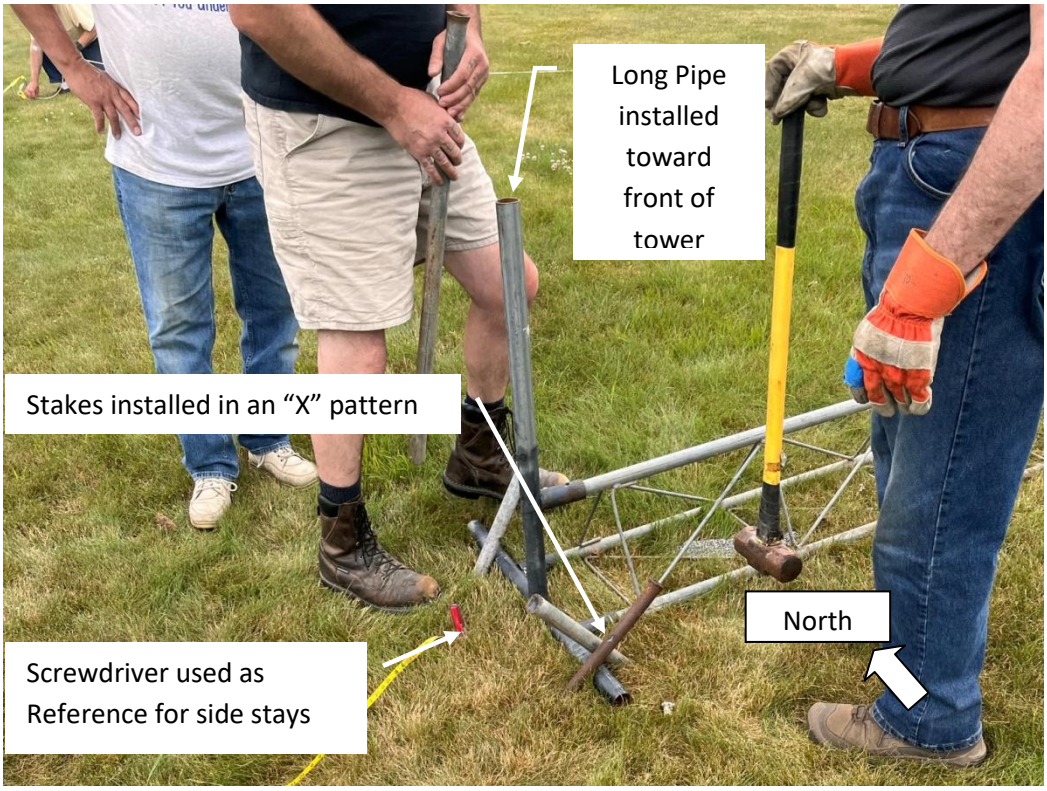


Figure 5 Small Pipe Tower Base Installation: Small pipe tower base is installed with crossed stakes. Screw driver and measuring tape shown for reference.

As Shown in Figure 5, the small pipe antenna bases are held to the ground by cross stakes driven in an "X" pattern. These stakes need to be solid due to the large force required to rotate the tower into an upright position.

This tower base is located 85' from the square tower base and is also use for the CW antenna 470' from the BWS and is positioned so that the antenna tower bottom is west of the tower's mast. Note: The long pipe is upward and helps stop the tower from falling forward.

- **The Large Pipe Tower Base is used on the GOTA tower** and is installed in a similar manner to the small pipe bases except that the weight of the base requires more labor to move it into position and should have longer and thicker "X" stakes for the ground mounting. See Figure 6

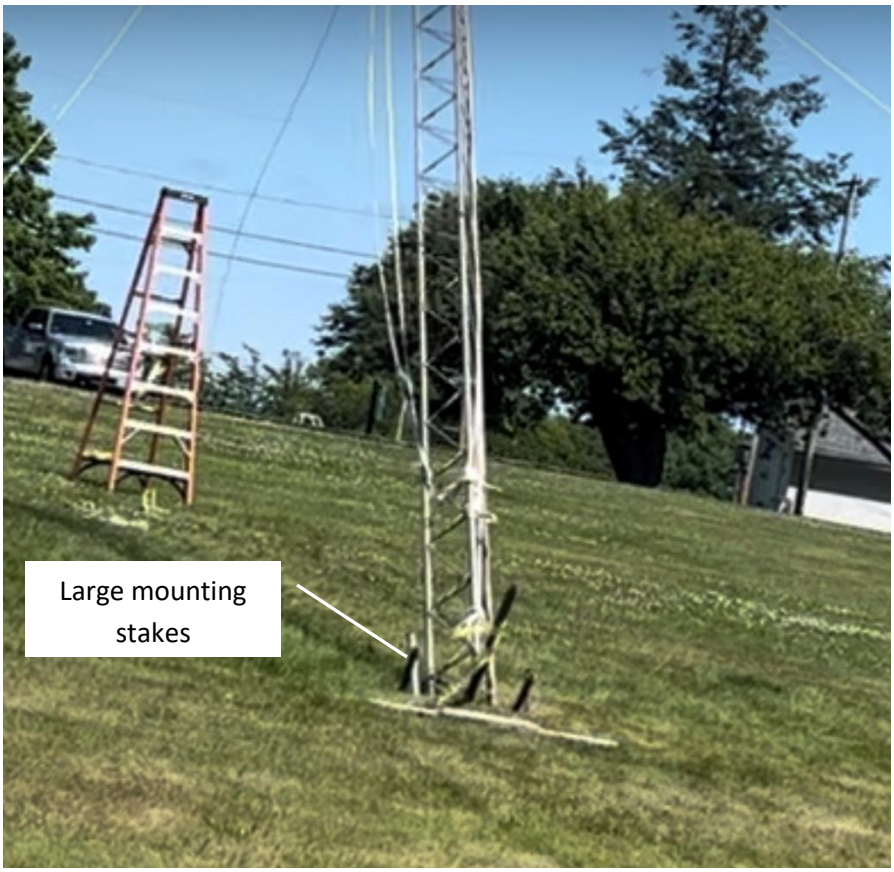


Figure 6 Large Pipe Tower Base Installation: Large pipe antenna base located 385 feet from the BWS on the Reference line using large crossed stakes.

4. Set Tower Segments on the line and bolt together

- **The Rohn towers are made-up of 10' sections** when the sections are stored we leave two (2) sections bolted together such that the Tower sections are 20' long when they come out of the BWS.

There are two types of 20' sections a Top section and a Bottom Section. Three of the top sections have long masts for attaching the Tri Band Yagis and the forth has a short mast for attaching Wire antennas. The Bottom sections are all the same and have three pipes welded into a triangular shape with rod bracing. The lower end of the bottom sections has the larger pipe opening.

As shown on Figure 1 position all four 20' tower bottom sections, one by each base such that the bottom section is next to the base at a 90 ^{o} angle to the line on the East side of the base. (The 90 ^{o} angle is verified using the side stays).The top sections are laid out on the East side of the tower bottoms paying attention to the plan shown in Figure 1.

Slide the bottom and top sections together. These sections may need to be giggled to fit. They can be pulled together using the yellow wrench (a notched bar that has a handle for leverage). See Figure 7

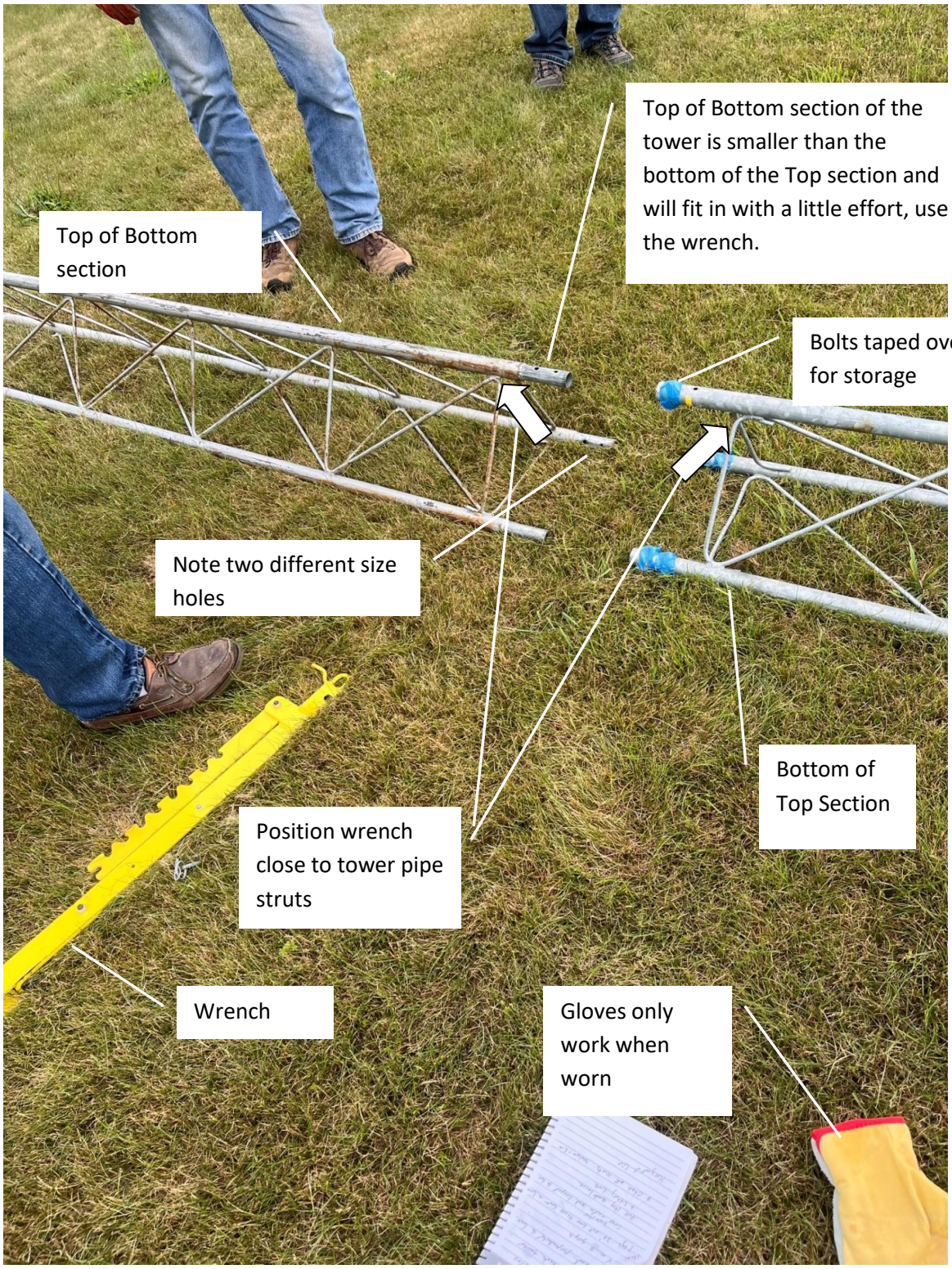


Figure 7 Assembly of Rohn Tower Sections: Giggle bottom and top Rohn tower sections to connect. Use two size bolts to secure. Yellow wrench is used for leverage.

Note: The wrench is positioned on the interconnecting rods near the pipe struts of the tower sections. If the wrench is positioned near the middle of the rods the geometry of the tower section could be compromised.

Bolt the Tower bottom to the Tower top**.** There are two deferent sizes of bolts used to connect the tower base to the top, 5/16' and 3/8". Slide the tower on to the base. There is no need to bolt the tower to the base. **Insure that the mounting bolts are tight, but not tight enough to deform the pipes.**

The long masts are stored inside the top section of the tower. Extend the mast and tighten the bolt or bolts securely. See Figures 8 and 9.

Figure 8 Long Mast stored in Retracted Position: This Long Mast is stored in the retracted Position and uses only one thru bolt to secure it in the extended position

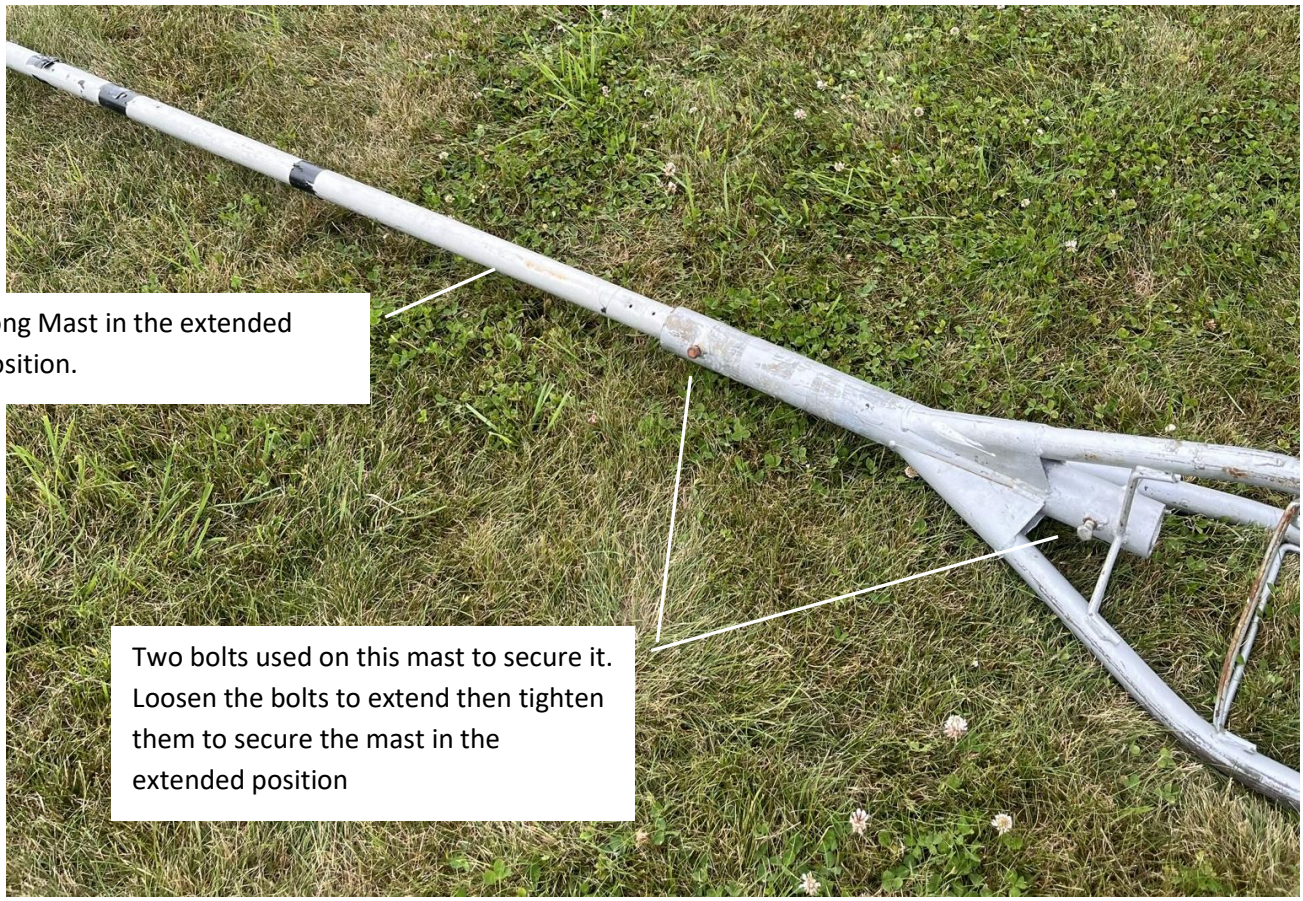


Figure 9 Long Mast shown in the Extended Position: This Long Mast is shown in the extended position and uses two bolts to secure it in the extended position.

Caution: Tighten bolts securely to prevent the antenna from rotating in the wind.

5. Install the stakes

As shown in Figure 10 the set the stakes at 25 feet from the tower base and 90º angles to it. Stays are shown connected between the top of the tower and the stakes.

- **Install the side stakes:** As seen in Figure 5 a screwdriver is used to pin a measuring tape at the middle the base of the tower. Drive a stake into the ground on the reference line 25' from the center of the base on each side of the tower. As shown in Figure 11.
- **Install the back stake:** Using the tape measure drive a stake at a 45 ^{o} angle to the ground and 90 ^{o} angle to the reference line and 25' from the tower base towards the East (back) of the tower.
- **Install the front stake:** Using the tape measure drive a stake at a 45 ^{o} angle to the ground and 90 ^{o} angle to the reference line and 25' from the tower base towards the West (front) of the tower.

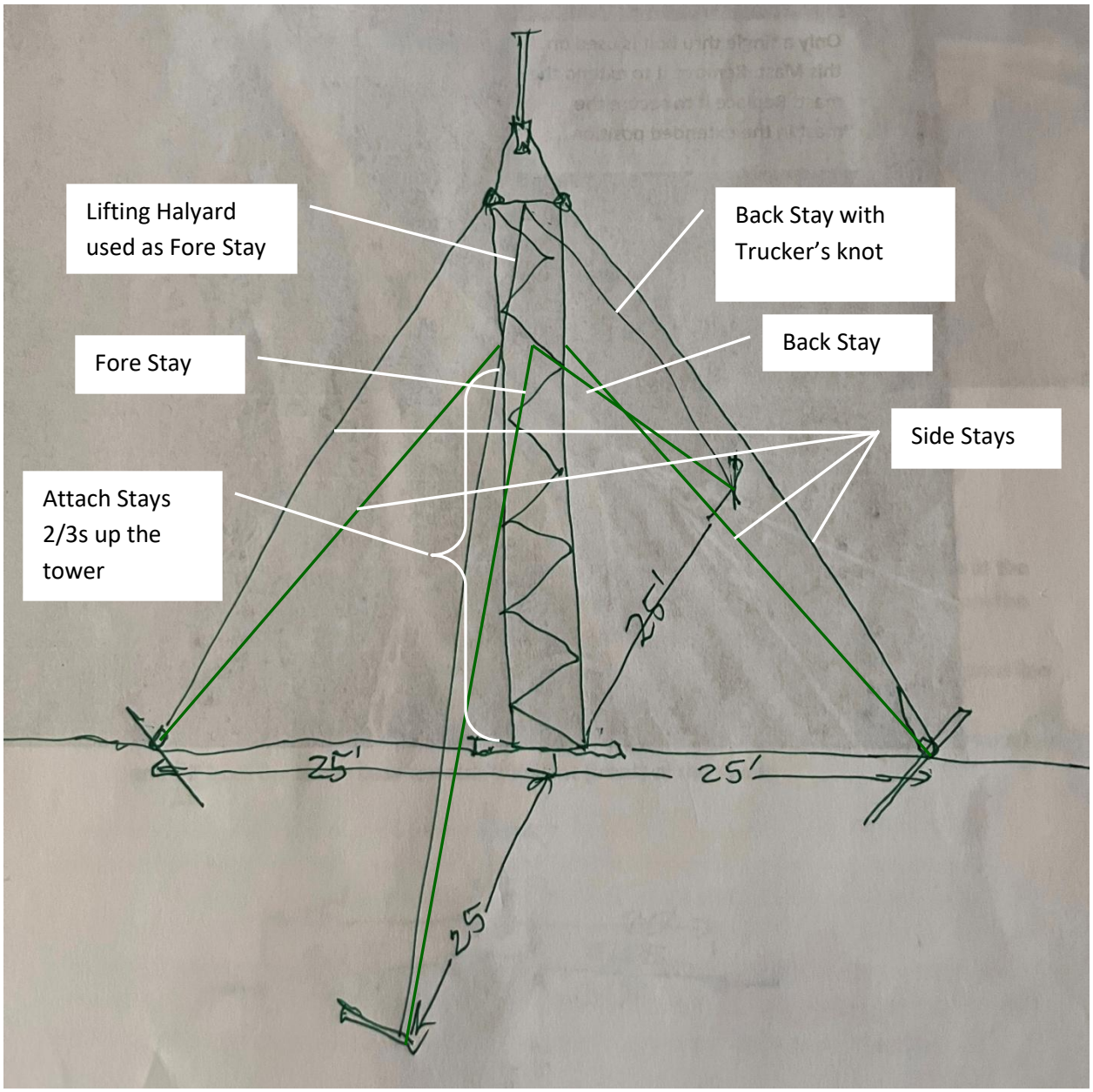


Figure 10 Diagram showing stake position 25 feet from the tower base at 90° angles. Stays shown connected between the top of the tower and the stakes.

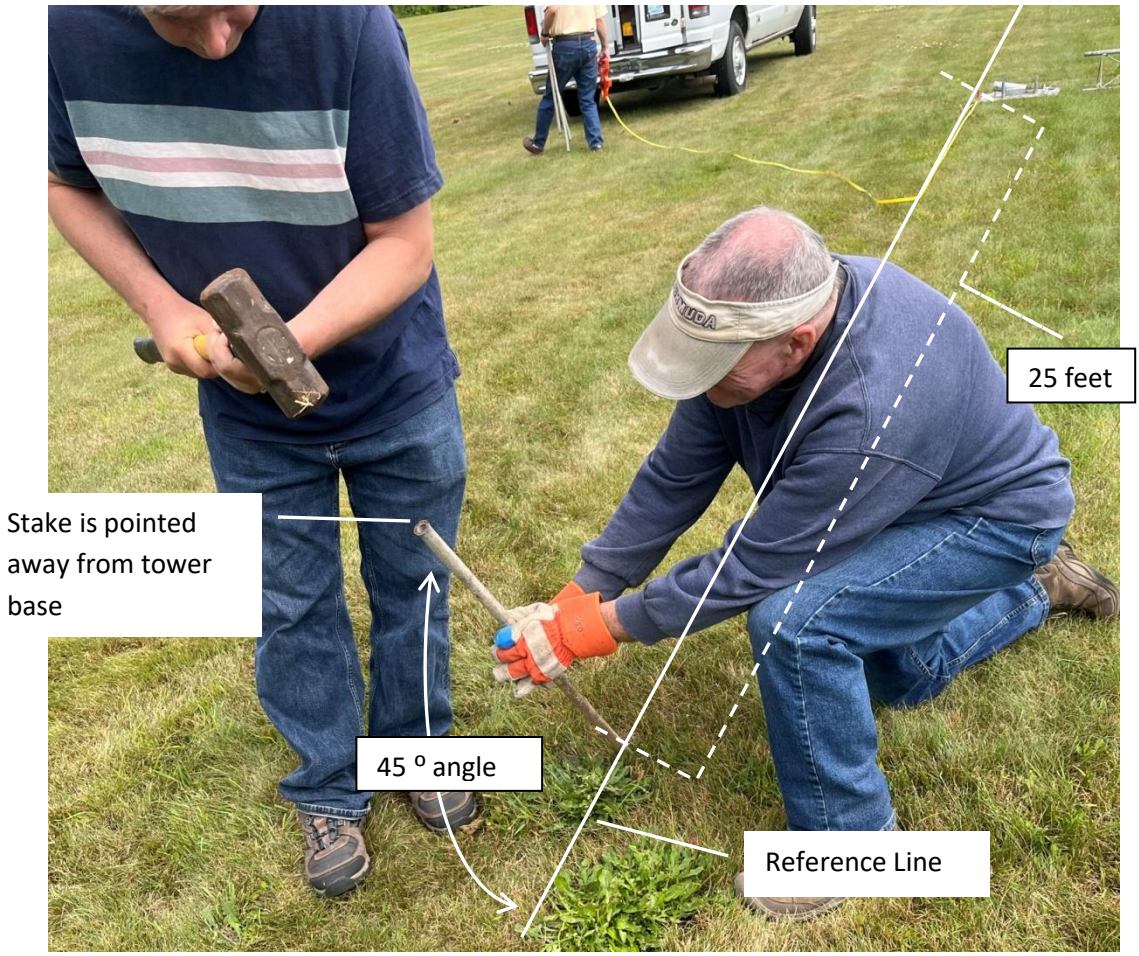


Figure 11 Installing the Stakes: The Stakes are pounded into the ground at a 45 º angle to the ground and 90 º angle to the reference line and 25' from the tower base. Stakes angle away from the tower base to hold the stays securely.

Note: Stakes angle away from the tower base to hold the stays securely.

6. Position the tower on the ground at a 90 º angle to the reference line.

Using a rope or side stay measure from the side stake to the side of the tower. Mark the line and verify that the other side of the tower has the same distance from the side to the stake. Adjust the tower as necessary to achieve equal distances.

7. Dress the Towers

The tower requires eight stays (see Figures 10 and 12). Two stays on each side (one attached to the top of the tower and a second attached about 2/3s up), two backstays and two fore stays. These stays require at least 50' of 3/8"- braded nylon rope. A lifting halyard (attached to the top of the tower) is used as the second fore stay. The lifting halyard uses 100' of ½" braded nylon rope.

1. Attach the Stays

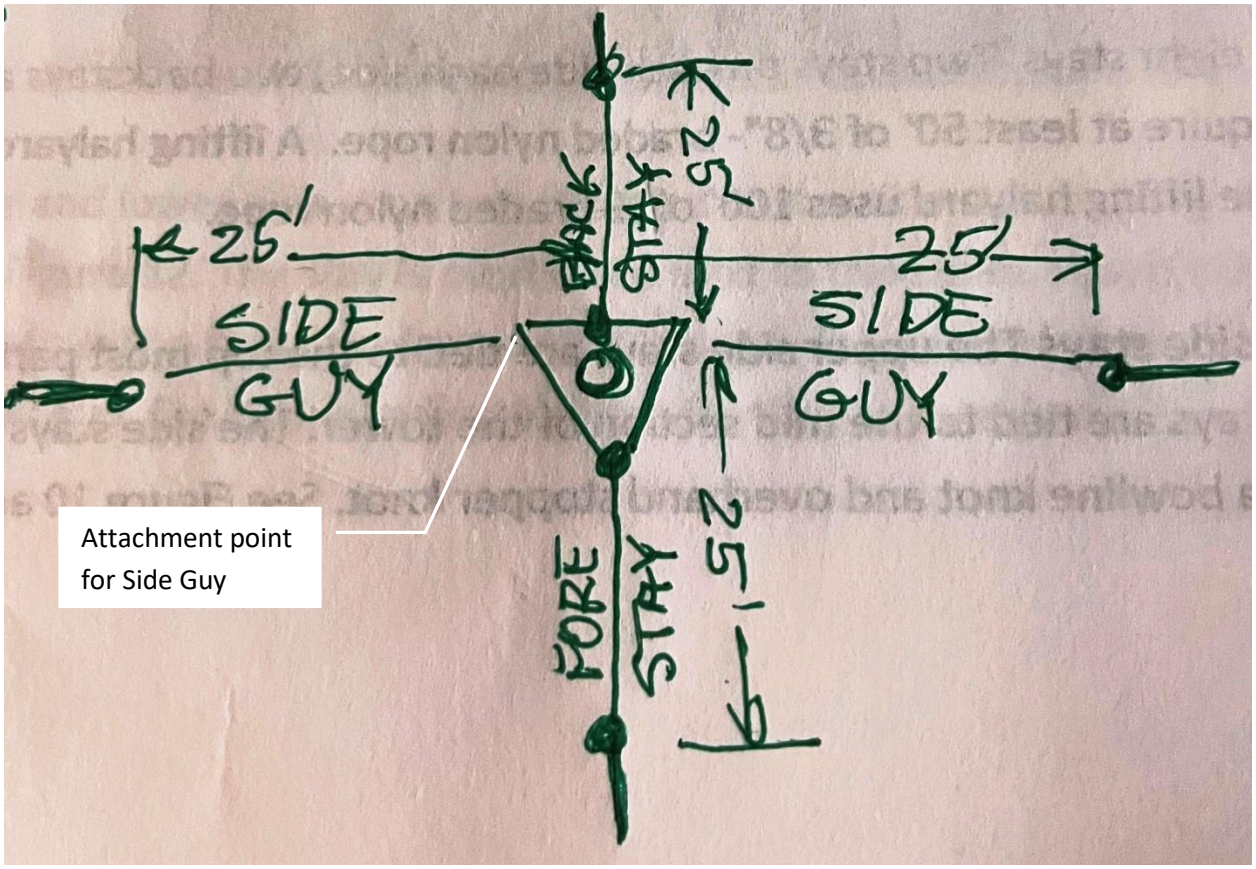


Figure 12 Diagram showing the attachment points for the Stays (aka Guys) to the tower struts and stakes

- **Attach the four side stays.**The upper side stays are tied to the top most part of the tower and lower side stays are tied to the mid section of the tower. The side stays are attached to the tower using a bowline knot and overhand stopper knot. See Figure 13 and Figure 14.

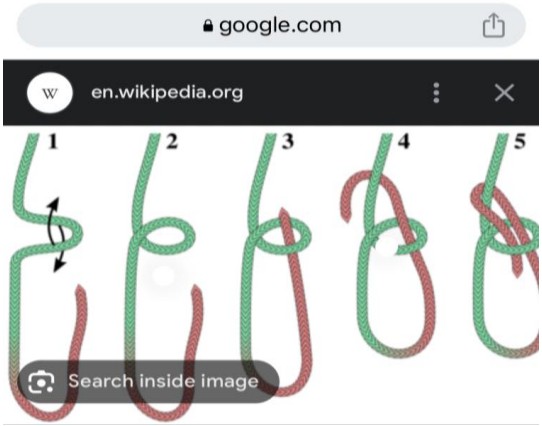


Figure 13 How to tie a Bowline knot

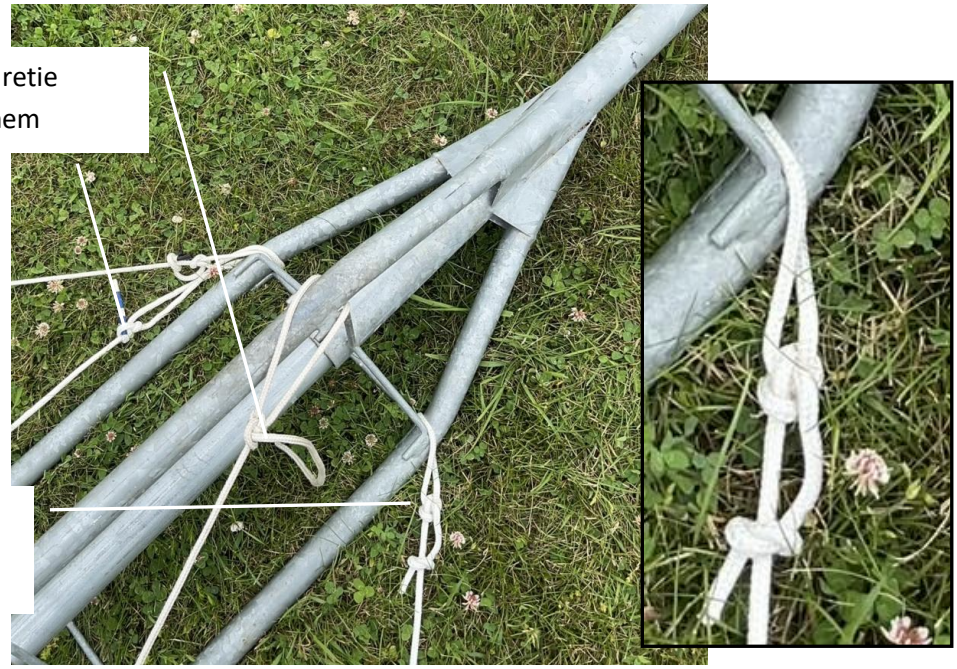


Figure 14 Stays tied to Tower with Bowline and stopper Knots

The upper and lower side stays are attached to the side stakes using a truckers knot. This knot is shown in Figure 15. The stay is positioned next to the stake. About three feet before the stake a loop is made in the stay. The free end of the stay is wrapped around the stake and the end is fed through to loop. The stay is pulled tight and a slipped over hand knot is tied to secure the stay.

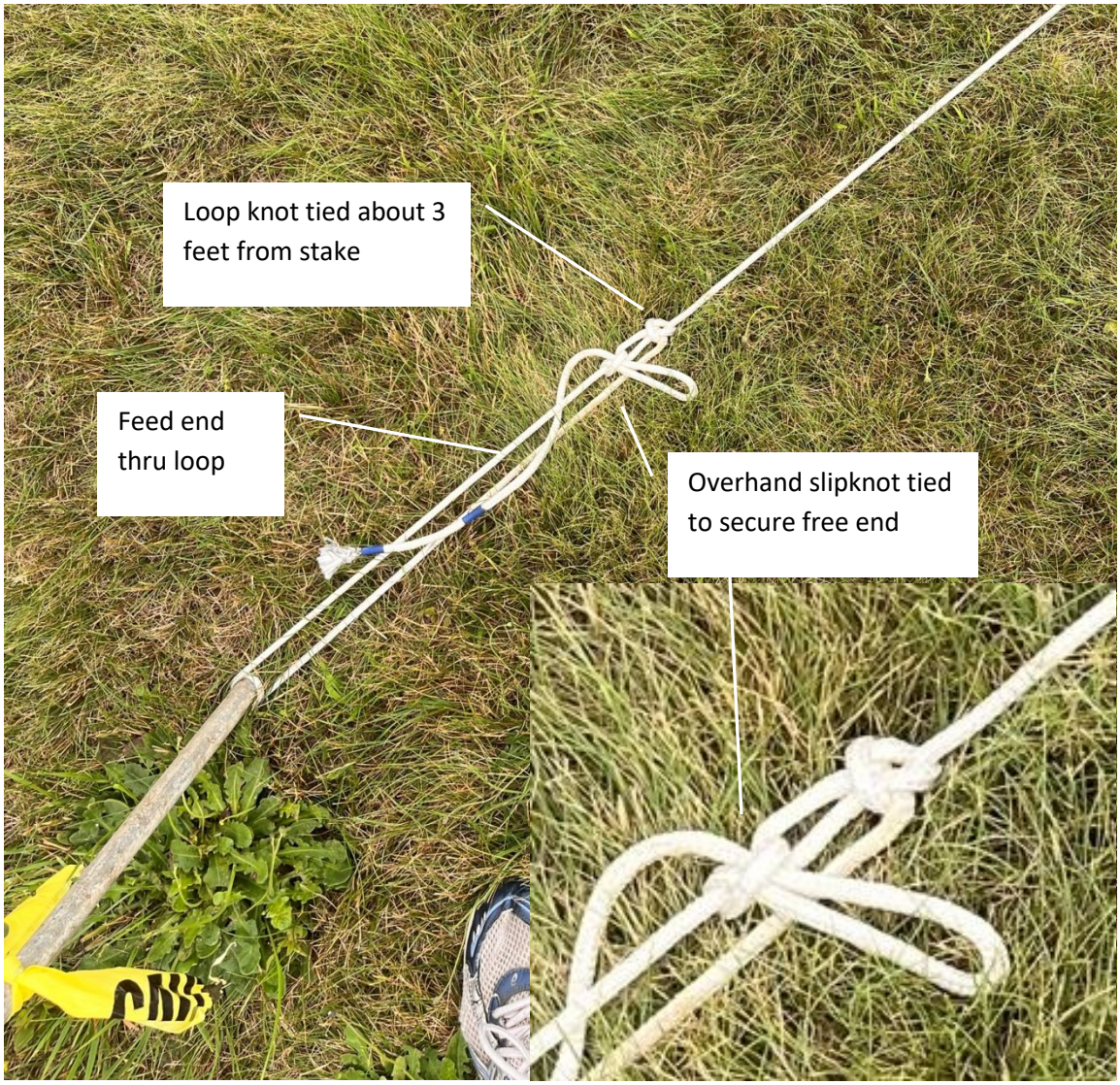


Figure 10 Stays attached to stakes with a Truckers Knot: The Truckers knot is setup with a slip knot as the stopper knot in order to allow for easier tension adjustment

Tighten the side stays evenly without pulling the tower out of 90 º alignment. This is done by tightening the stays alternately and tightening the loosest one first.
Tighten the four side stays very tightly to insure that the tower rises vertically.

- **Attach the two backstays.** The lower back stay is tied to the midpoint of the back of the tower at the same height as the lower side stays are and tied to the back stake. This stay is setup with enough slack to allow the tower to stand upright and not fall forward. Re-tension this stay when the upper backstay has been secured.

The upper back stay is measured by using the side stake as a reference. The truckers knot is used to tie the upper back stay to the back stake, This stay is should have enough slack to insure that the tower will stand upright and not fall forward when the tower is raised.

Caution: Since both backstays will be slack on the ground during the raising of the tower, the Lift Master must insure that the backstays do not fowl and prevent the tower from standing upright.

- **Attach the two forestays.** The lower fore stay is tied to the tower 2/3's of the way up in the front of the tower at the same height as the side and back lower stays. The lower fore stay is tied to the bottom of the tower and will be tied to the stake once the tower is raised.

A lifting halyard is used as the upper fore stay. The lifting halyard uses 100' of ½" braded nylon rope. The lifting halyard is tied to the top of the tower and walked forward. This halyard is left on the ground and will be tied to the lifting strap hooked to the van. Figure 10.

2. Attach the halyards

Insure that each mast has two pulleys securely tied on. (Figure 17) Thru these pulleys feed 100' halyards of 3/8"- braded nylon rope. Pull equal amounts of rope through the pulley and tie the ends to the bottom of the tower at the sides. Insure that the halyards are not fowled. These halyards are used to raise the wire antennas once the towers are standing.

Figure 11 Insure two pulleys are attached to the top of each Mast

3. Attach the Yagi antennas and coax

1. Assemble the Yagi antennas

Set the Yagi antennas parts on the ground upside down several feet beyond the top of the mast. The stored antenna is unwrapped and the pieces are placed upside down on the ground. The pieces are marked for their function and installed position. See Figure 18.

- **The boom is placed in line with the mast over the Yagi elements** with the boom end that holds the reflector (long Yagi element) closest to the mast. The mounting plate on the boom is set at a **90 º angle to the ground** and the **"U" bolts and element mounting clamps loosened**.
- **The reflector (long Yagi element) pieces are placed on the ground at a 90 º angle to the mast**. The reflector is stored in two pieces. One side is slid through the boom's element mounting clamp and is joined to the other by sliding one side into the other and clamping them together with the hose clamp. The reflector is marked for the proper insertion length. Since the antenna is being assembled upside down on the ground**, the weep holes are up.** The hose clamp is tightened securely but not tight enough to crush the antenna pipe. The "U" bolts of the element mounting clamp on the boom are tightened securely but not tight enough to crush the antenna.
- **The driven element is constructed in a similar manner to the reflector**. This segment is installed on the boom above the reflector.
- **The director element is constructed in a similar manner to the reflector**. This segment is installed on the boom above the driven element.

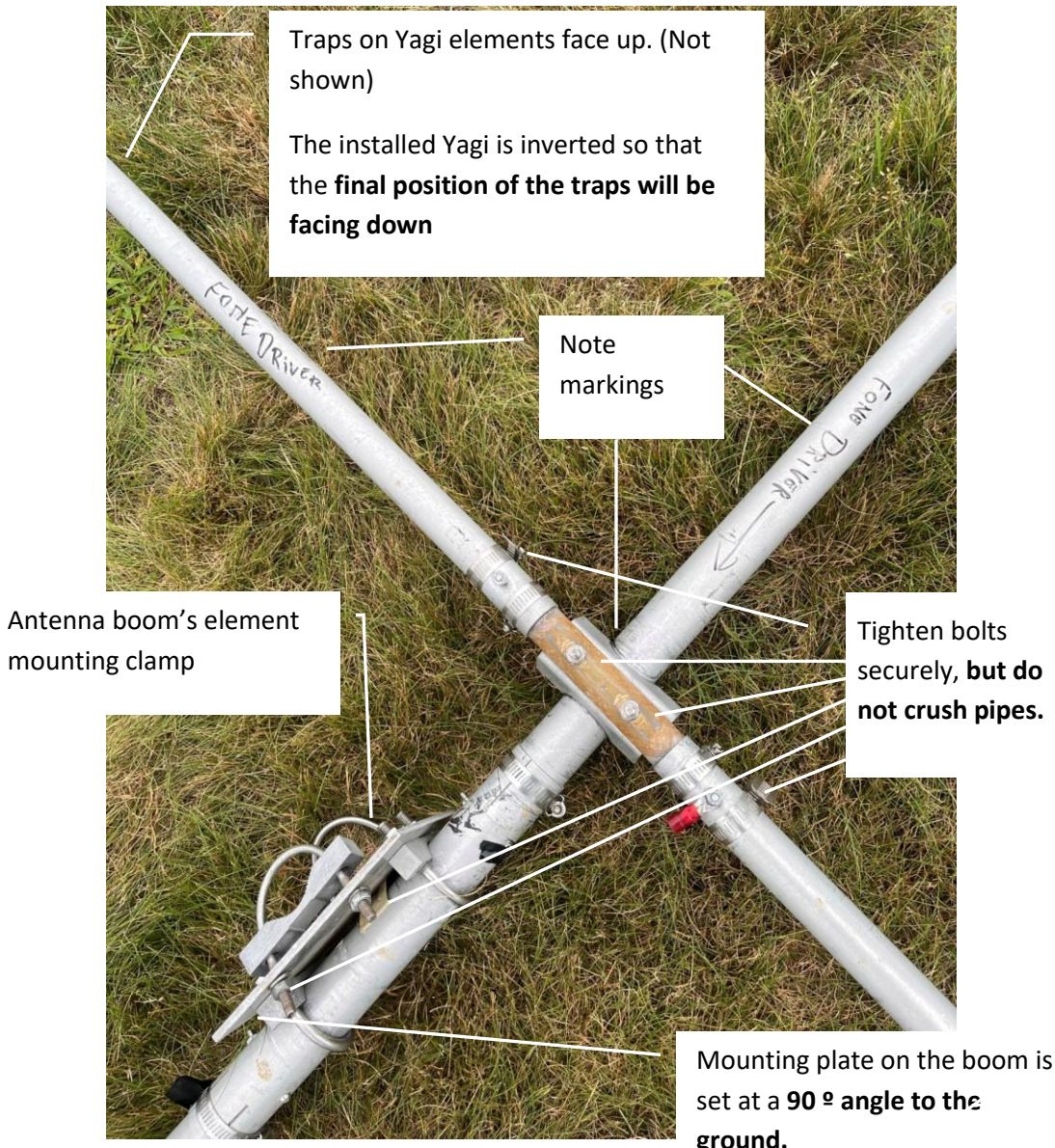


Figure 12 The SSB station Yagi antenna being assembled on the ground

2. Attach the Yagi antennas to the Towers with Long Masts

In order to install the assembled Yagi on the mast the tower must be lifted and supported on a "sawhorse" with extended legs. The sawhorse is tall enough (8 feet) to allow the Yagi boom "U" clamp mounting brackets be installed on the mast without contacting the ground.

- Lift and support the tower. This operation requires six people for safety. Four lifters (two on either side), and two movers to position the sawhorse under the top of the tower. See Figure 19.
  Note: This lift can be done with less people but is not recommended.

  Caution: At this point, hard hats are required when working overhead.

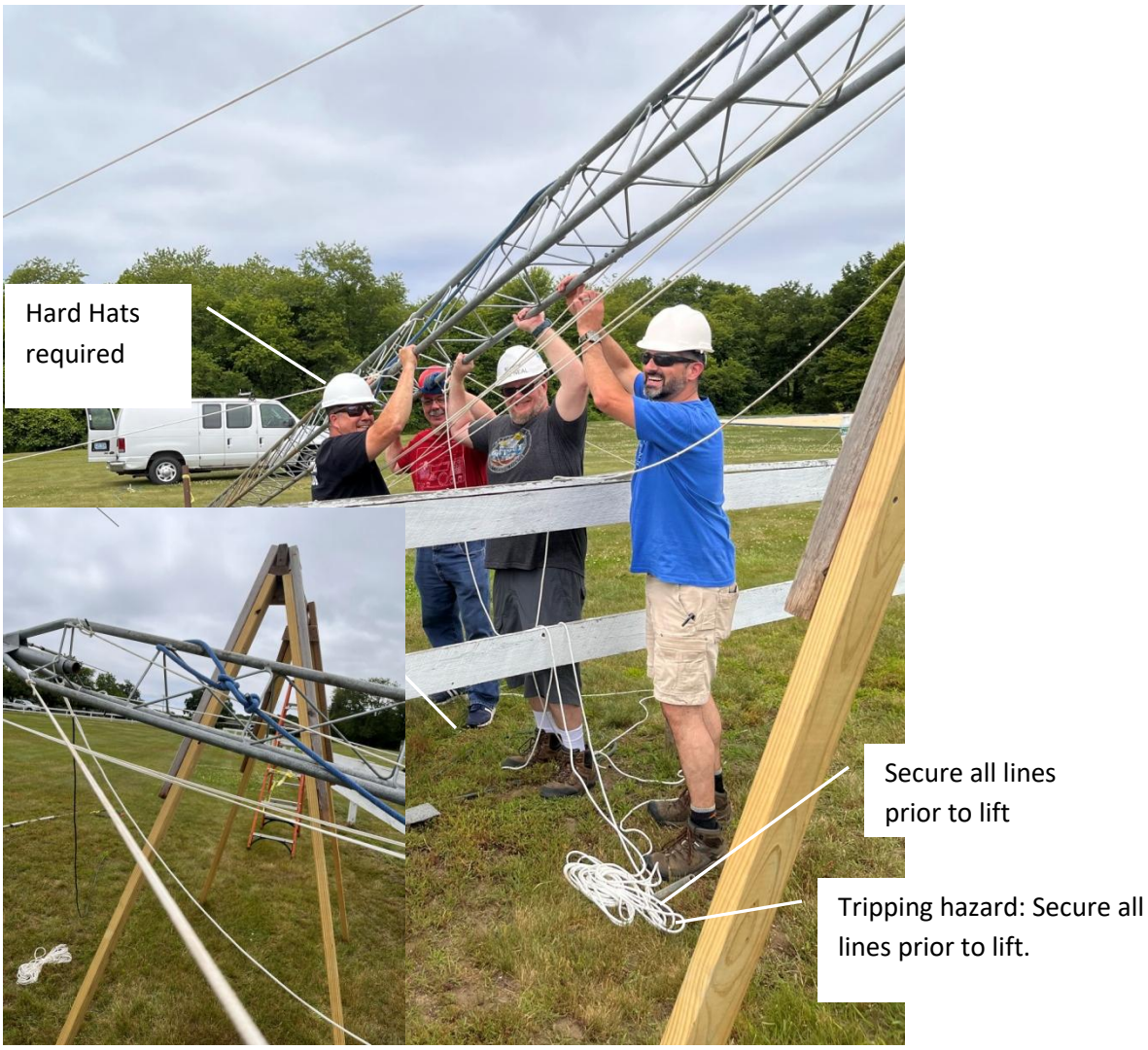


Figure 13 Antenna tower raised and supported on the sawhorse to facilitate installation of the antenna. Hard hats required

- Once the tower is securely supported on the sawhorse a ladder is used to allow a person to access the end of the mast. With the help of two other people, the antenna is picked up and rotated so that the boom-mounting bracket can be slid over the end of the mast. This operation rights the antenna and the traps will be facing the downward direction of the tower. The boom-mounting "U" bolts are tightened without crushing the pipe. See Figure 20
- The coax feed line and RF choke (coil of coax) are electrically connected to the terminals on the antenna driver and the coax and RF choke are taped to the mast with electrical tape. Continue taping the coax to the mast down the tower.

Note check the ends of the coax for weather proofing prior to installing. The antenna connections need not be weatherproofed due to the short exposure time and inherent weather resistance.

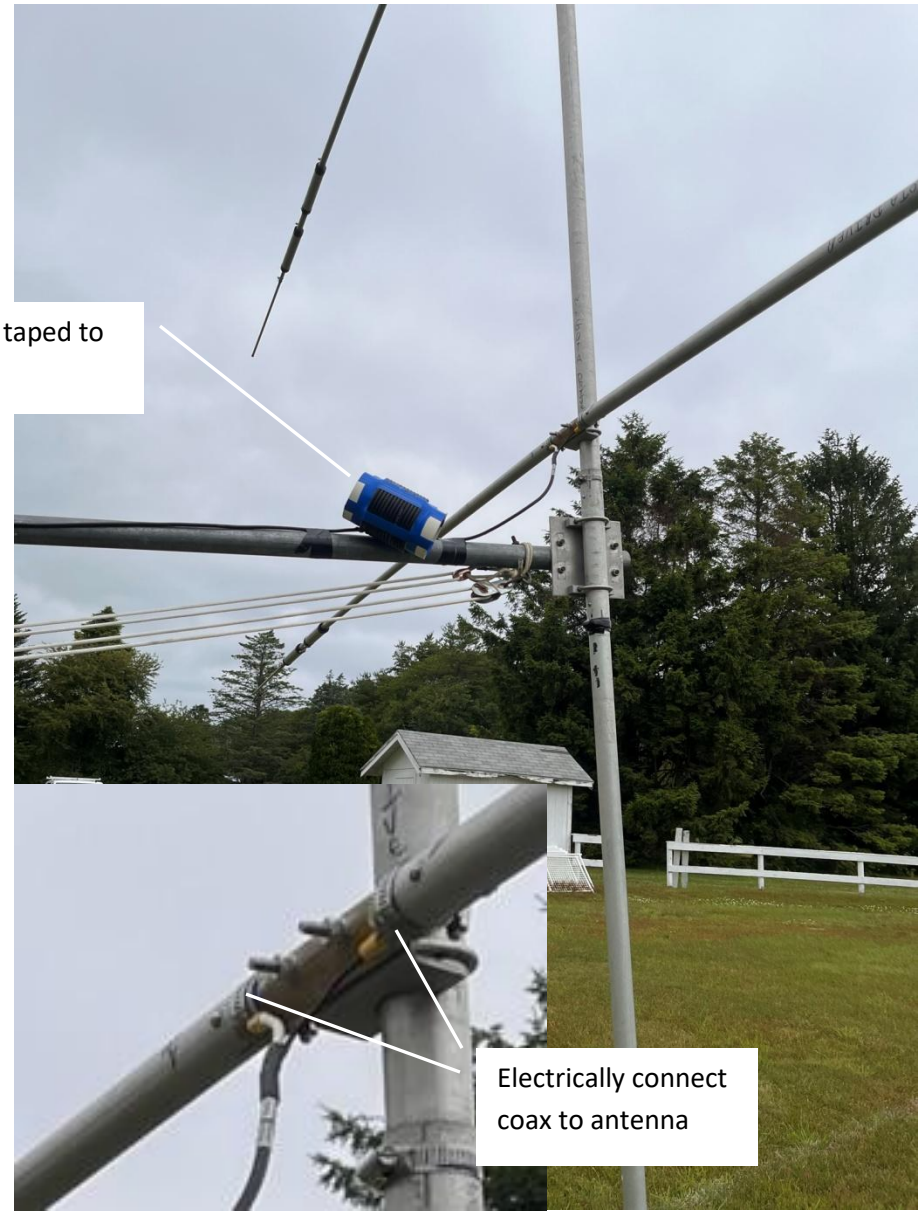


Figure 20: Coax and RF choke installed on antenna and taped to mast

Tip: Mark the position of the sawhorse legs on the ground. This will take away the guesswork when positioning the sawhorse for the tower take down.

8. Raise the tower

The BWV (Big White Van) is outfitted with a lifting strap. The lifting strap is tied to the front lifting halyard and the tower is lifted into an upright position with the antenna facing in a westerly direction.

- **Insure the tower is ready in all respects to be raised. Check the tower bolts and lines**
  - Insure all knots are correct and secure.

- **Insure that the all four side stays are tight** and that the tower is at a 90 ^{o} angle to the reference line.
- **Insure that the upper backstay is tied to the back stake.** Insure that the lower backstay is slack and will not foul when lifted. Tie the lower back stay to the bottom of the mast.
- Tie the two wire antenna halyards to the bottom of the mast.
- Tie the lower front stay to the bottom of the mast
- Tie the large upper front halyard to the top of the tower and extend it towards the front of the tower (west side).
- Insure that the coax will rise cleanly with the tower and not become kinked of pinched.

- **Position** the BWV on the west side of the tower directly in front of the tower, close enough for the front lifting halyard to be tied to the lifting strap. **Do not run over front stake**. See Figures 21 and 22.

- **Figure 21 Moving Big White Van into position: Dave Neal, W2DAN, moving the van into position using the yellow lifting strap**

Figure 22 Big White Van (BWV) in position to lift tower. Yellow lifting strap securely hooked to undercarriage and front lifting halyard securely tied to lifting strap. Only the lower front stake is installed.

- **Hook the lifting strap to the BWV and tie the front lifting halyard to it.**
    - **Clear the Fall Zone. Everyone is to stand clear for an area 75' around the tower. No one is in the Fall Zone. Hard Hats are required.**
- **Spotters will be positioned out of the Fall Zone to watch the position of the tower and signal if the tower is in danger of being lifted out of true vertical.**
- The Lift Master will insure that:
    - **The tower is ready in all respects**
    - **The lifting strap and lifting halyard are securely tied**
    - **The Back stay is tied to the stake and that the back stay will not foul when the tower is raised**
    - **No one is in the Fall Zone**
- The lift master will signal the Van Driver to raise the tower by backing up.
- The Van Driver will give **three horn blasts to warn anyone in the area that the lift is beginning and not to enter the Fall Zone**.
- The Driver will backup slowly until the tower raises off the sawhorse and continue until the tower is vertical (If the back stay has been measured correctly only minor adjustments will be necessary)
- The Lift Master will check with the spotters to verify that the tower is vertical.

- **The Lift Master will signal someone (or will do it himself) to attach the lower fore stay to the fore stake. Once the lower fore stay is attached and secured the upper fore stay (Lifting Halyard) is untied from the BWV and secured to the fore stake.**
- Once the front fore stays are secure and the stays are correctly tighten the tower is considered stable and the wire antennas installed**.**

Figure 14 Tower is lifted by the Van being driven in reverse slowly and stopped when the tower is vertical.

9. Install the Wire Antennas

There are two types of wire antennas, the two 40 Meter Moxon antennas and three 80 Meter Center Fed Dipole antennas. Install one of the Moxon antennas between the SSB tower at 150’ from the BWS and the Short Mast tower at 235’ from the BWS. Install the other Moxon antenna between the GOTA tower at 385’ from the BWS and the CW Tower at 470’ from the BWS. The first of the 80-Meter Dipole antennas is installed between a pine tree behind the BWS and the tower at 150’. Install the second 80-Meter Dipole between the towers at 235’ and 385’, and install the third 80-Meter Dipole between the 470’ tower and a pine tree on the north side of the Antenna field.

1. Install the 40 Meter Moxon Antennas

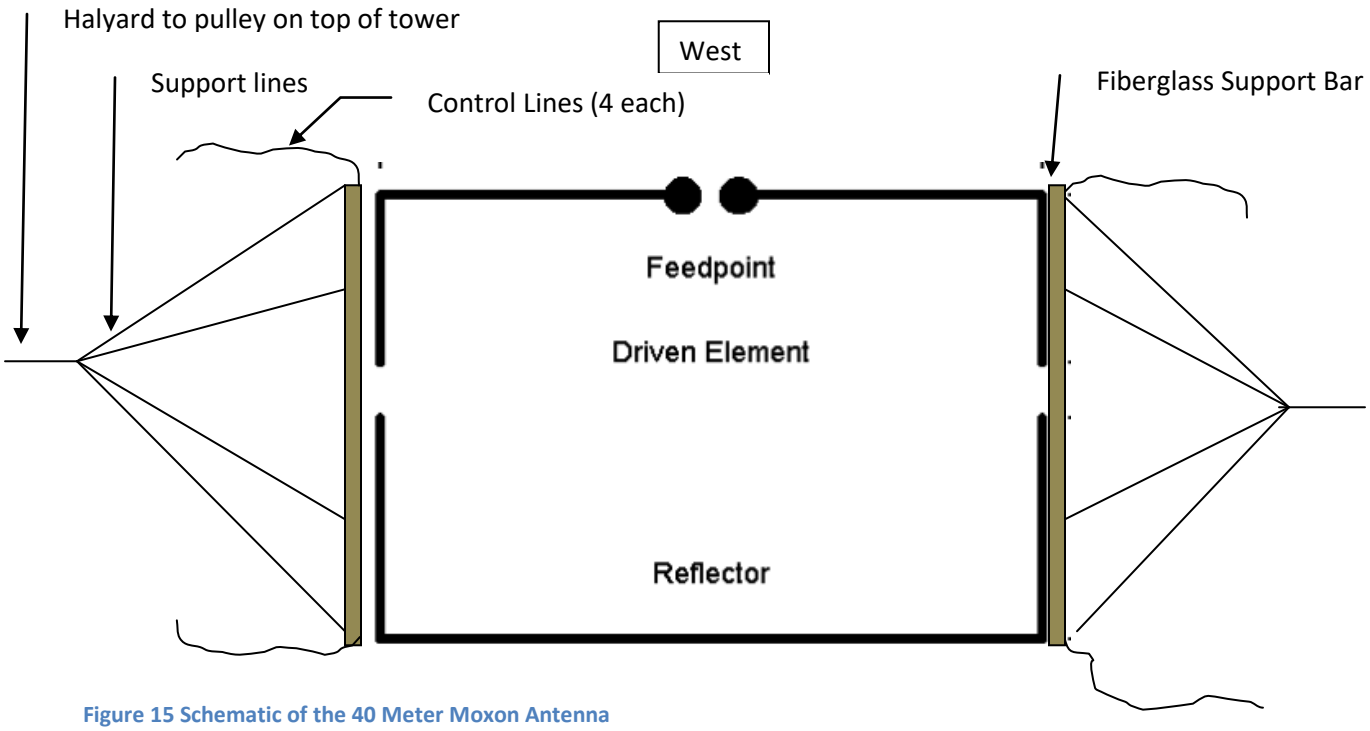


Figure 15 Schematic of the 40 Meter Moxon Antenna

The 40 Meter Moxon consists of two long fiberglass support bars connected with the antenna wire Driven Element and the Reflector. This Antenna is raised by attaching the support lines to the halyard running through the pulley on the top of the tower. The antenna is prevented from swaying by the control lines. **A COAX feed line is attached to the Feed point of the Driven Element.** The Moxon is oriented such that the Feed Point is on the Westerly side.

Due to the size and instability of this antenna four people are required for the lift. Two people (one at each tower) will pull on the halyards to raise the antenna bars evenly and two people (one on each control line) will control the upward motion to keep the antenna from excessive sway and parallel to the ground. **Care is taken not to fowl the COAX feed line or have it disconnect from the feed point** as it is being raised with the antenna.

Once the Moxon antenna is in position, the halyards are secured to the tower and the control lines are attached to stakes in the ground.

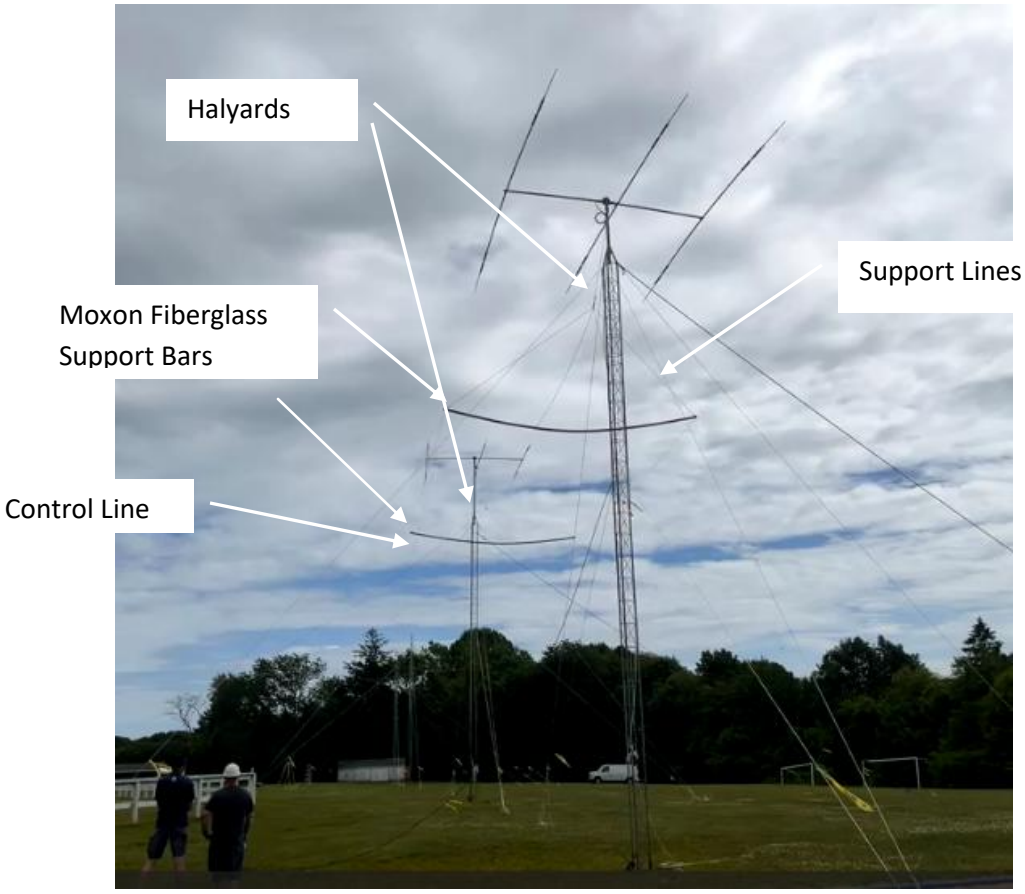


Figure 16 40 Meter Moxon Antenna mounted between the GOTA and CW Yagi Antennas Towers. Wire antenna elements and control lines barely visible.

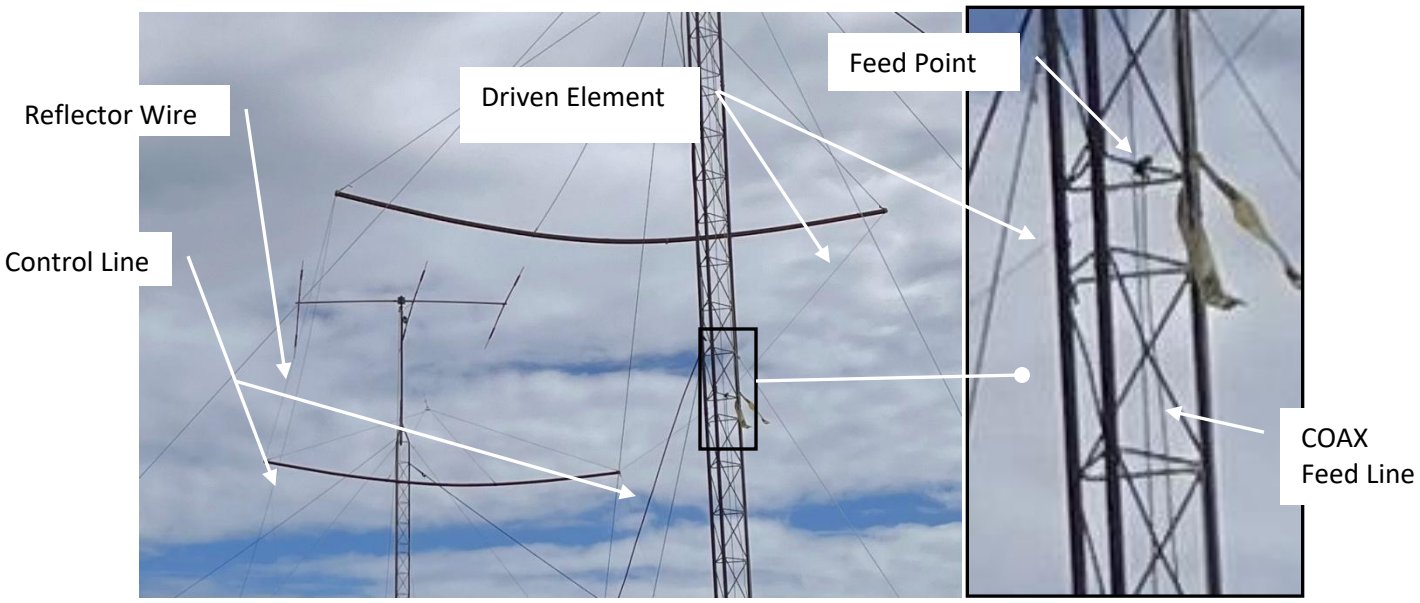


Figure 17 40 Meter Moxon Detail

2. Install 80 Meter Dipole Wire Antennas

There are three 80 Meter Dipole Wire Antennas in this design, these are marked CW, Fone, and GOTA). Install one between a pine tree behind the BWS and the tower at 150', another is installed between the towers at 235' and 385' and the third is installed from the tower at 470' and a pine tree past the volleyball courts. See Figure 1

1. Install the 80- Meter Dipole Antennas using the Pine tree as a tower

In order to raise the dipole antenna using a pine tree as a tower a weighted tennis ball connected to a fishing line launched over the chosen pine tree. This can be done by using Willy's (W1LY), PVC home built launcher, a commercially produced launcher, drone, fishing pole or having an outfielder from one of the local baseball teams through it over the tree. (Rumor has it that Jeff (WA1VQY) also has a launcher and maybe Mark (W1MBF) can launch as well).

Once there is a fishing line over the pine tree, the weighted tennis ball is disconnected and tie one end of a 3/16-inch Paracord leader to the line and pull it over the tree. Tie the other end of the Paracord leader to the insulator on one side of the Dipole.

Connect the other side of the Dipole by the insulator to the free halyard on the tower insulator. Both the halyard and Paracord are pulled evenly to raise the antenna**. Care is taken not to dislodge the ladder feed line connected to the center of the Dipole.**

When the Dipole is raised to the required height and is horizontal the Paracord is tied off to the tree and the halyard is tied off to the bottom off the tower.

2. Install the 80-Meter Dipole Antenna using two towers.

To install the center Dipole the free halyards mounted on the masts of the towers at 235' and 285' feet. To accomplish this tie the insulators on the ends of the Dipole to the halyards. Pull both halyards evenly

to raise the antenna**. Care is taken not to dislodge the ladder feed line connected to the center of the Dipole.**

When the Dipole is raised to the required height and is, horizontal the halyards are tied off to the bottom off the towers.

10. Turn Over Antenna Farm for Operation

1. Extend the Feed lines to the Stations

2. Mark all hazards in the Antenna Farm with Caution Tape

3. Erect temporary posts and connect them with Caution Tape

The Caution Tape should enclose each tower base at a 75-foot radius to ensure that the Fall Zone is Marked and Maintained. (Ideally, no one is allowed in the Fall Zone and if entry must be made Hard Hats and good lighting are required.).

4. Conduct a "Hot Wash-up" Before the Antenna Farm Setup Team Leaves

A Hot Wash-up is a meeting where each member of the team identifies needed improvements in the setup procedures. Address any safety problems encountered and solutions proposed. Update this Setup Guide after the meeting

11. Take Down

Follow the same Safety protocols used during setup (Hard Hats, No one in the Safety Zone …)

1. **Power off All equipment and disconnect the Feed lines**
2. **Wire Antenna Take down (coil all halyards and stays, guys)**
3. **Roll up wire antennas and store in the Big White shed**
4. **Position Sawhorse and take down tower**
5. **Remove Yagi Antenna.**

12. Storage

1. **Take apart the Yagi Antennas by separating the elements approximately in half and wrapping up each antenna with gaffer's tape, tape nuts and Store in BWS**
2. **Store Winter Tent in the Small Tent Box**

If the tent is even damp, roll it loosely and take it home and dry it out before rolling it and storing it in its bag and storing in the STB small tent box

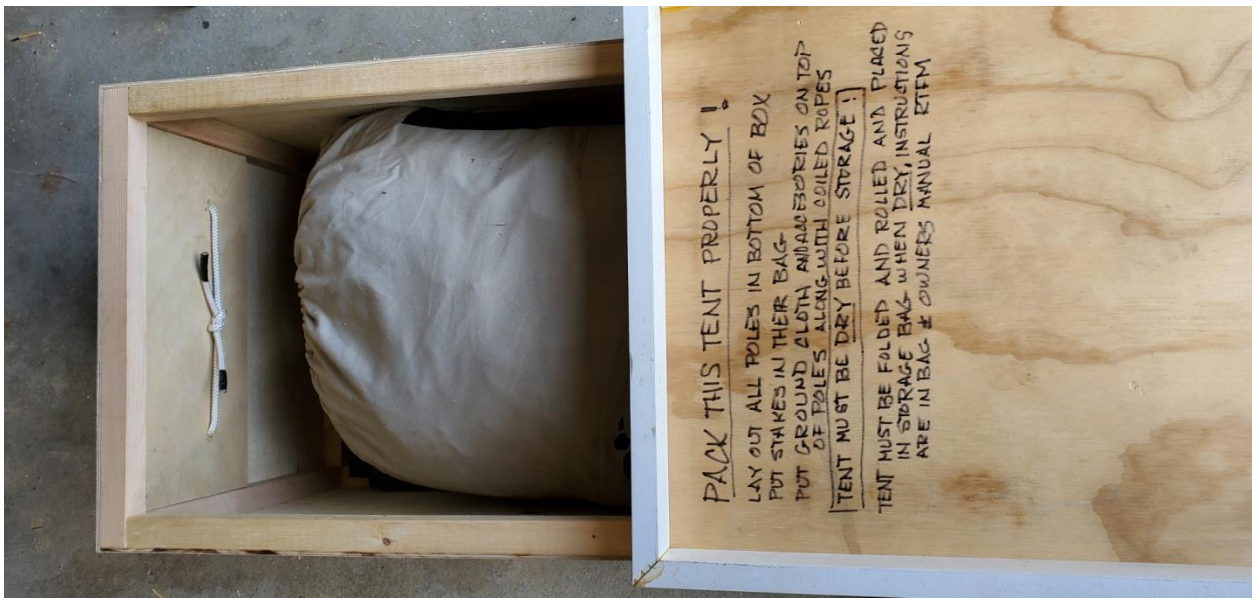
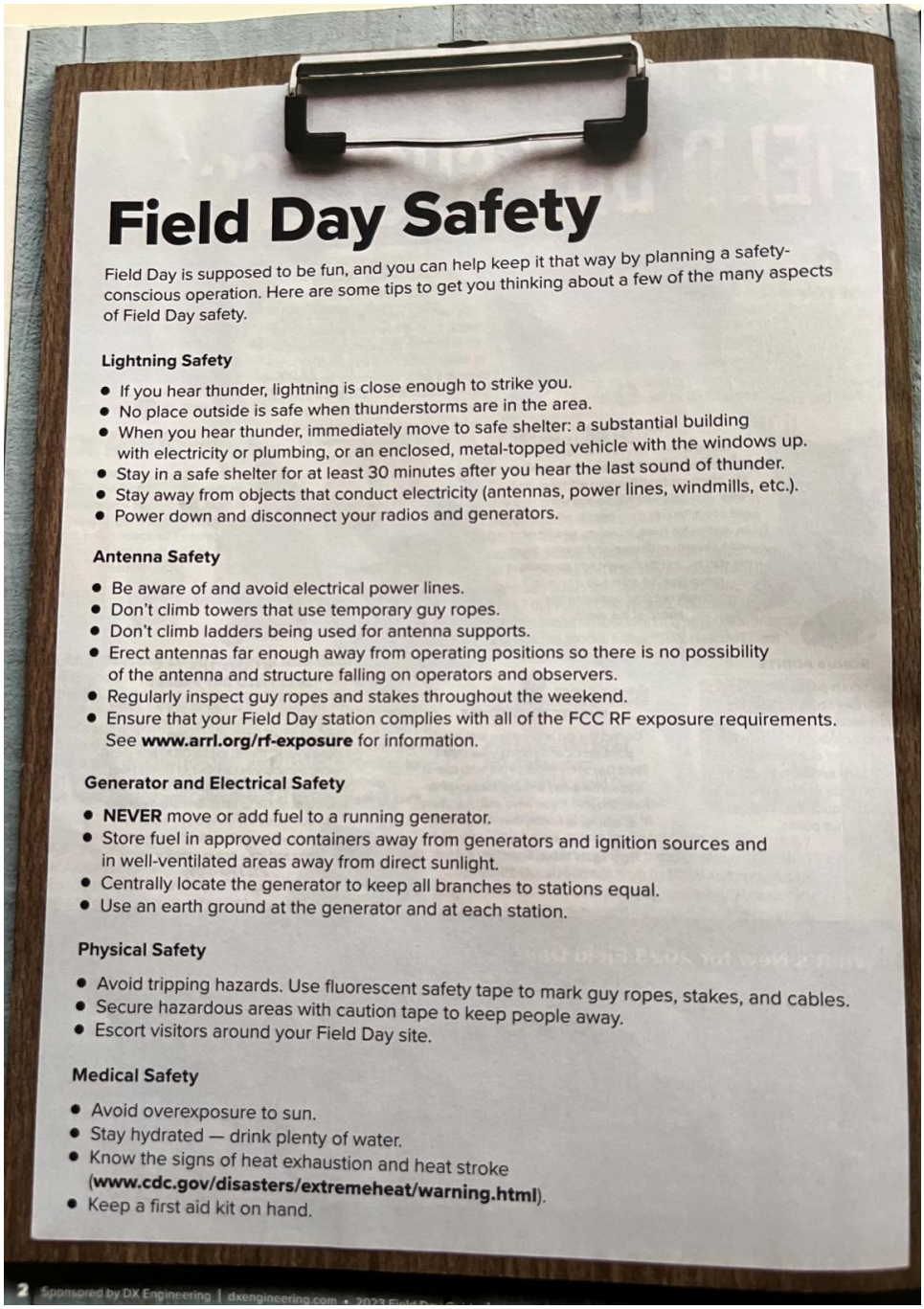


Figure 18 Winter Tent stored in Small Tent Box. Dry the tent before storage. Instructions are on tent box cover

Figure 19 Winter Tent stored in Small Tent Box and box secured in the BWS.

Appendix A

ARRL Safety Checklist



Field Day Safety

Field Day is supposed to be fun, and you can help keep it that way by planning a safety-conscious operation. Here are some tips to get you thinking about a few of the many aspects of Field Day safety.

Lightning Safety

- If you hear thunder, lightning is close enough to strike you.
- No place outside is safe when thunderstorms are in the area.
- When you hear thunder, immediately move to safe shelter: a substantial building with electricity or plumbing, or an enclosed, metal-topped vehicle with the windows up.
- Stay in a safe shelter for at least 30 minutes after you hear the last sound of thunder.
- Stay away from objects that conduct electricity (antennas, power lines, windmills, etc.).
- Power down and disconnect your radios and generators.

Antenna Safety

- Be aware of and avoid electrical power lines.
- Don't climb towers that use temporary guy ropes.
- Don't climb ladders being used for antenna supports.
- Erect antennas far enough away from operating positions so there is no possibility of the antenna and structure falling on operators and observers.
- Regularly inspect guy ropes and stakes throughout the weekend.
- Ensure that your Field Day station complies with all of the FCC RF exposure requirements. See **www.arrl.org/rf-exposure** for information.

Generator and Electrical Safety

- **NEVER** move or add fuel to a running generator.
- Store fuel in approved containers away from generators and ignition sources and in well-ventilated areas away from direct sunlight.
- Centrally locate the generator to keep all branches to stations equal.
- Use an earth ground at the generator and at each station.

Physical Safety

- Avoid tripping hazards. Use fluorescent safety tape to mark guy ropes, stakes, and cables.
- Secure hazardous areas with caution tape to keep people away.
- Escort visitors around your Field Day site.

Medical Safety

- Avoid overexposure to sun.
- Stay hydrated — drink plenty of water.
- Know the signs of heat exhaustion and heat stroke (**www.cdc.gov/disasters/extremeheat/warning.html**).
- Keep a first aid kit on hand.

Appendix B

Field Day RF Exposure Calculation

The antennas used at Field Day are: Three (3) Tri-Band Trapped Yagi antennas (Cushcraft A3S), two (2) 40 Meter Moxon antennas and Three (3) 80 Meter Center Fed Wire antennas are installed on four (4) 40 foot Rohn Towers. Additionally not part of this Antenna Farm description are the 6-Meter Ringo digital antenna and the antennas used for satellite communications.

1. Tri-Band Trapped Yagi antennas

From the RF Exposure ARRL website using the numbers for the 3 element tri-band antenna (gain 8.1), with 100 Watts operating at 100% on 14 MHz, it looks like we need to stay at least 4 feet from these antennas. These antennas are mounted on 40 foot Rohn towers so we should be OK.

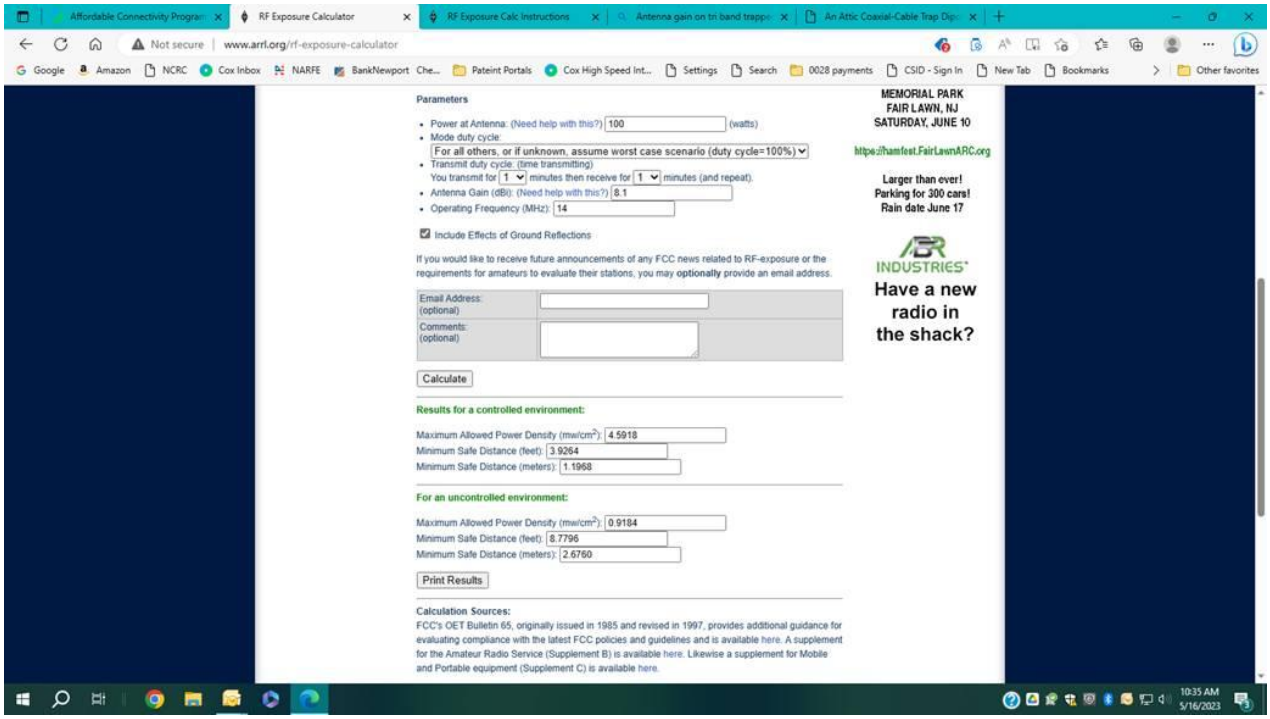


Figure B1 showing the ARRL RF Exposure Calculator for the Tri-Band Yagi antenna.

2. 40 Meter Moxon antennas

The ARRL website lists the Moxon antenna gain as 6.0. These antennas are mounted between the tops of the 40-foot towers giving it a clearance of 30 feet. Therefore, it should be OK as well.

3. 80 Meter Center Fed Wire antennas

These Dipole Antennas have a gain of one (1) and are mounted from the tops of the towers to the tops of the towers or to the trees. This gives them at least a 30 foot ground clearance. Therefore, it should be OK as well.

4. 6-Meter Ringo digital antenna

TBD

5. Satellite Antenna TBD

TBD