

HYDRO-EXCAVATION FOR

**TOWER CONSTRUCTION**

# A NICE SPOT FOR A TOWER



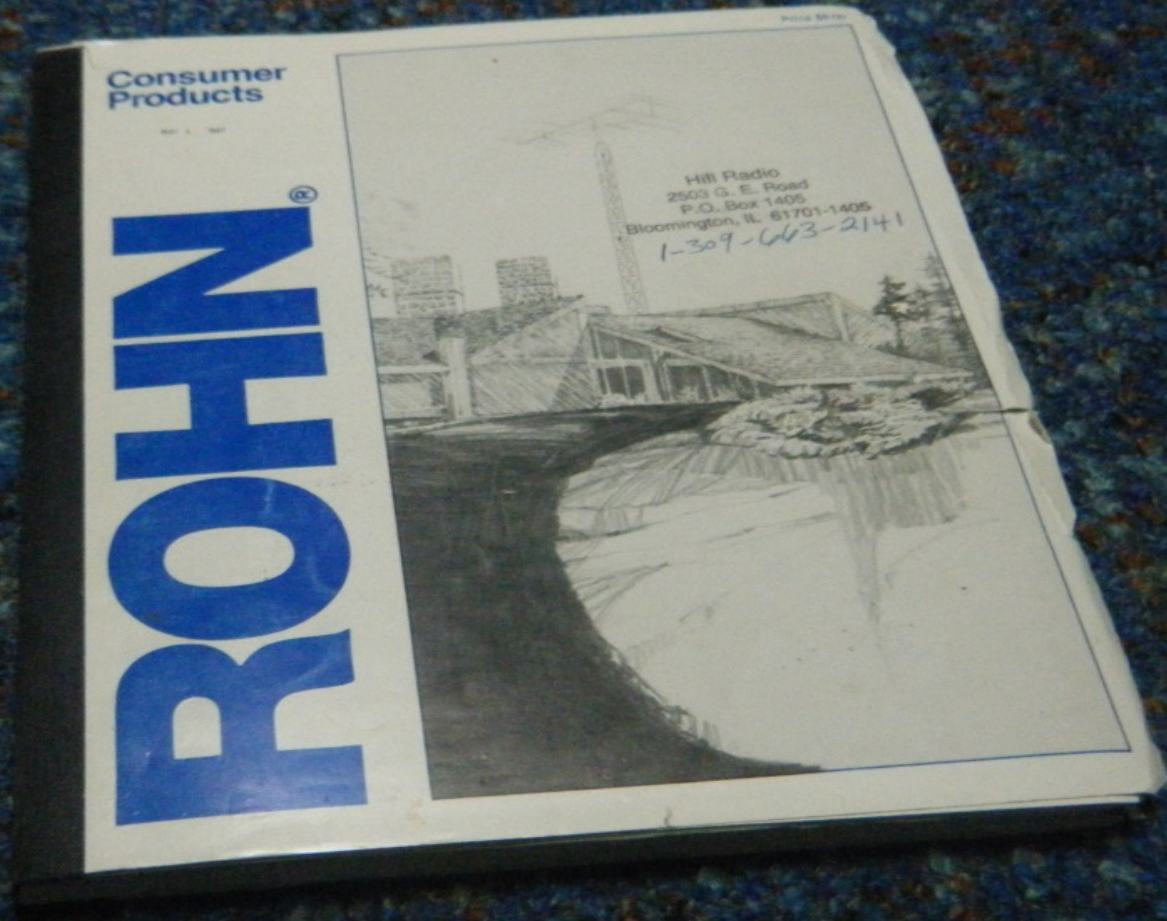
# NO MORE GUY WIRES



**10 FT. X 10 FT. X 4 FT. FOR SSV N-6 SECTION**



# GO BY THE BOOK



# INSTALLATION MANUAL FOR SSV TOWER

## **Installation Manual** BWC EXCEL Wind Turbine and Self-Supporting Lattice Towers

Revision 2.0  
August 5, 2003

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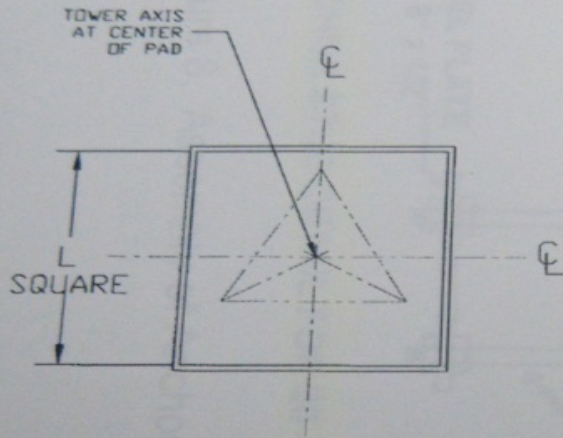
# J-BOLT ANCHORS 5" ABOVE CONCRETE

ANCHOR BOLT DATA (ENGLISH)							
TOWER HEIGHT (FT)	BASE SECT'N	LAYOUT DIMENSIONS (in)			J-BOLT SIZE (in)	BOLT CIRCLE DIAM. (in)	PROJEC. ABOVE CONCR. (in)
		M	N	R			
60	7N99W	79.25	68.63	45.75	3/4 x 36	5.6563	4.0
80	8N64W	103.25	89.44	59.63	7/8 x 42	7.0625	5.0
100	9N84W	127.63	110.50	73.69	7/8 x 42	7.0625	5.0
120	10N58W	151.63	131.31	87.56	7/8 x 42	7.0625	5.0

ANCHOR BOLT DATA (SI)							
TOWER HEIGHT (m)	BASE SECT'N	LAYOUT DIMENSIONS (mm)			J-BOLT SIZE (mm)	BOLT CIRCLE DIAM. (mm)	PROJEC. ABOVE CONCR. (mm)
		M	N	R			
18	7N99W	2013	1743	1162	19 x 914	143.67	102
24	8N64W	2622	2272	1514	22 x 1067	179.39	127
30	9N84W	3231	2803	1870	22 x 1067	179.39	127

# FOUNDATION 10N 3 FT X 18 FT = 44 YARDS

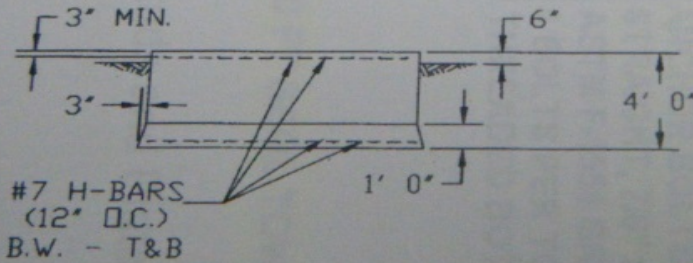
Figure 7. Thick Slab Foundation



FOUNDATION DATA						
TOWER HEIGHT		BASE SECT'N	L		REQ'D CONCRETE	
m	ft		m	ft	m <sup>3</sup>	yd <sup>3</sup>
18	60	7N99W	3.7	12.0	16.3	21.3
24	80	8N64W	4.2	13.75	21.4	28.0
30	100	9N84W	4.75	15.5	27.2	35.6
37	120	10N58W	5.25	17.25	33.7	44.1

**NOTES**

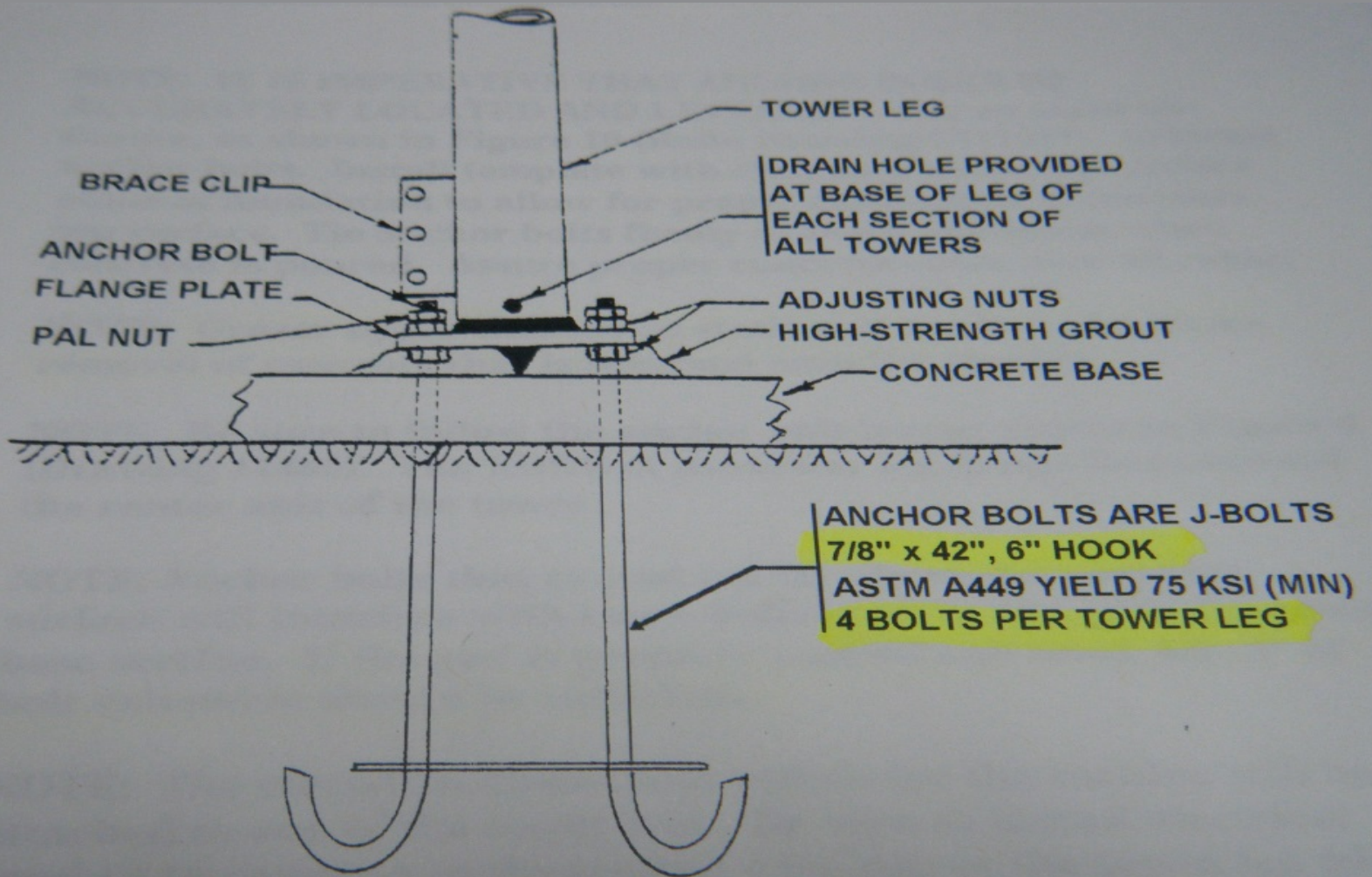
1. CONCRETE 3000 PSI MIN ULTIMATE STRENGTH @ 28 DAYS.
2. REINFORCING STEEL ASTM A-615 GRADE 40 DEFORMED.
3. SOIL BEARING STRENGTH 4000 PSF (192 KPA).
4. WATER TABLE BELOW BOTTOM OF FOUNDATION AT ALL TIMES.
5. MAXIMUM FROST DEPTH LESS THAN 4 FT. (122 CM).
6. ALLOWABLE PASSIVE PRESSURE 400 PSF/FT OF DEPTH.
7. FORMS MUST BE REMOVED BEFORE PLACING BACKFILL.
8. COMPACT BACKFILL TO DENSITY OF 100 LB/CU FT.



BERGEY WINDPOWER		
<small>DRAWN</small> K.G.C. 11-01-2002	<small>TITLE</small> THICK SLAB SSV TOWERS	
<small>CHECKED</small> K.Z. 11-01-2002	<small>DWG. NO.</small> 11464 0	
<small>APPROVED</small>	<small>SCALE</small> NONE	



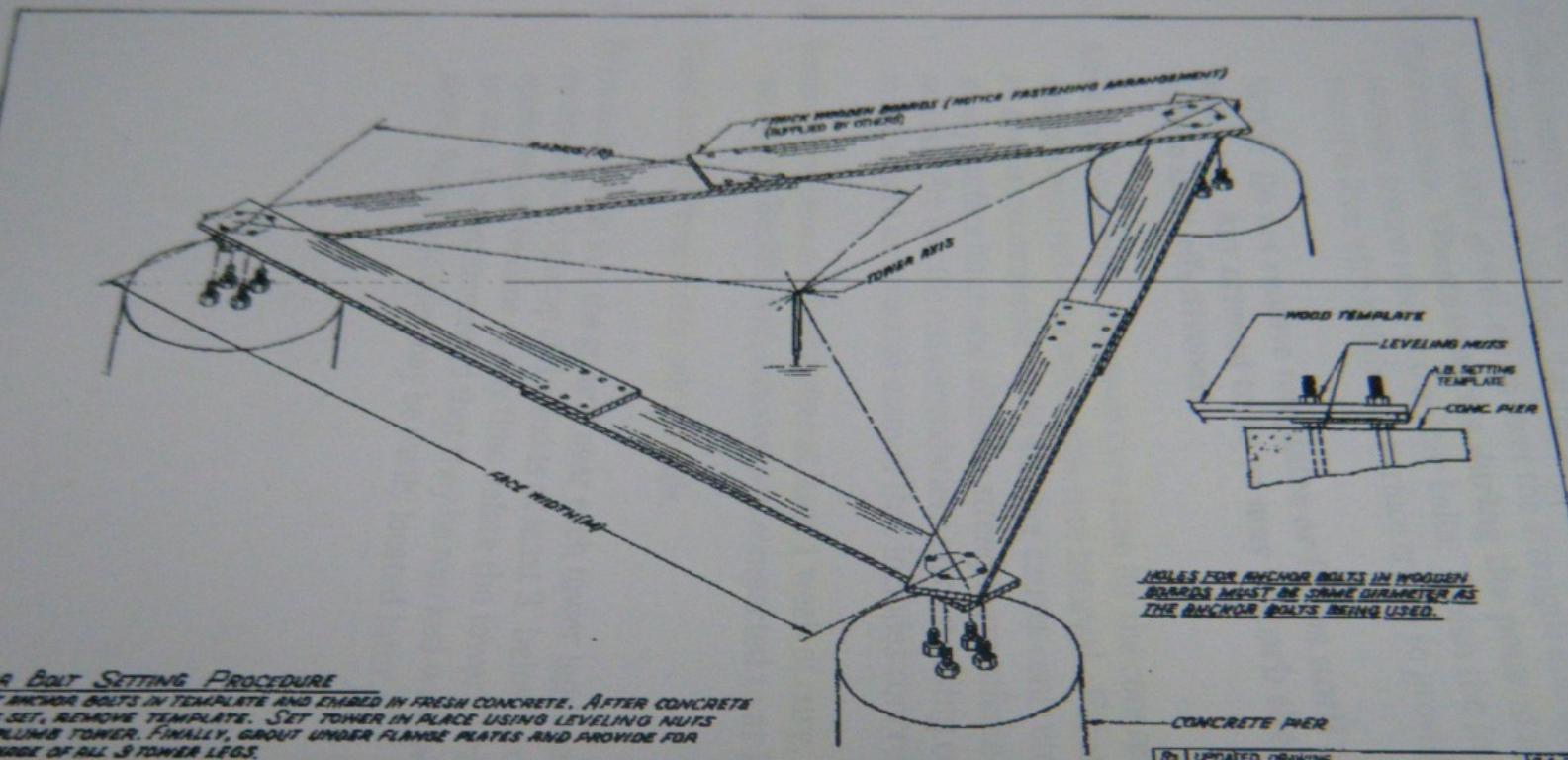
# ANCHOR BOLTS 7/8" X 42" 6" HOOK



ANCHOR J-BOLT DETAIL, 80 - 120 FT SSGL TOWERS

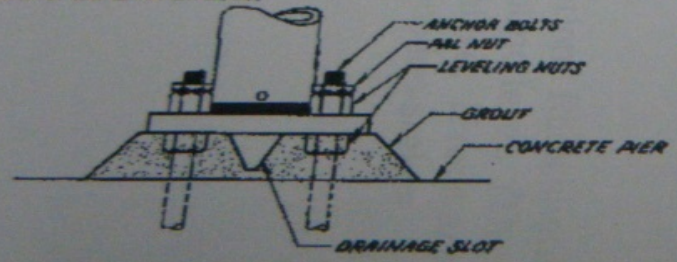
# ANCHOR BOLT SETTING

Figure 10. Triangular Anchor Bolt Five.



**ANCHOR BOLT SETTING PROCEDURE**

SET ANCHOR BOLTS IN TEMPLATE AND EMBED IN FRESH CONCRETE. AFTER CONCRETE HAS SET, REMOVE TEMPLATE. SET TOWER IN PLACE USING LEVELING NUTS TO PLUMB TOWER. FINALLY, GROUT UNDER FLANGE PLATES AND PROVIDE FOR DRAINAGE OF ALL 3 TOWER LEGS.



**NOTE:** ANCHOR BOLT ORIENTATION SHOWN ABOVE IS ONLY FOR SECTIONS 6N THRU 16N STANDARD OR HEAVY SERIES.

R2	UPDATED DRAWING	8-4-80	AJG
R1	ADDED NOTE	4-12-77	
Rev. #	Description	By	Date
<b>Unarco-Rohn</b> Division of Unarco Products, Inc.			
<b>ANCHOR BOLT SETTING PROCEDURE</b> <b>SELF-SUPPORTING TOWERS</b>			
FOR	NONE		
Drawn by	DA	Date	10-17-71
Checked by	TJ	Date	10-18-71
Approved by	RA	Date	11-1-71
Drawn by	RA	Date	11-1-71
Drawing Number	C711017 R2		

# VIBRATE CONCRETE

# 28 DAYS CURE

3. Order concrete. When ordering concrete refer to the specifications given on blueprints or drawings. Let the supplier determine the proper mix of cement, sand, gravel, etc. to meet the strength and stiffness requirements.
4. Pour concrete. **Vibrate concrete during the pour** to assure that it fills properly around rebar and anchor bolts. Finish the foundation making sure it is level with a slight top surface crown to provide drainage.

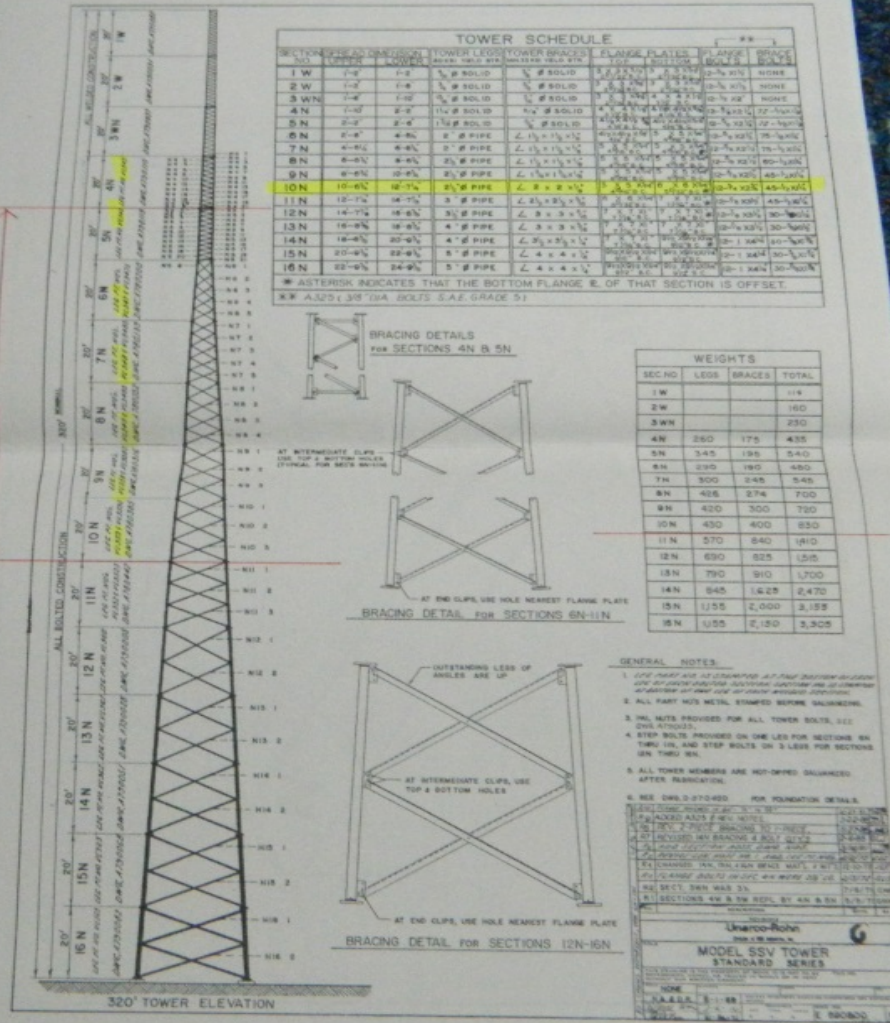
**NOTE: Do not remove templates or forms until concrete is cured and hard. Any attempt to do so may disturb the anchor bolts and reduce their effectiveness.**

5. Allow concrete to cure. **Minimum cure time for the concrete is 14 days; tower erection must not occur before this cure interval. For maximum strength 28 days is recommended.** Cold weather causes concrete to cure more slowly; surface finish and ultimate strength are affected by the cure process. For specific recommendations on controlling concrete cure, refer to a standard construction manual that includes concrete techniques.
6. **Remove templates and forms after at least 1 week of cure, and backfill if necessary.** Backfill with cohesive soil compacted to at least 100 lb/cu ft.
7. **Clean concrete from anchor bolt threads.**
8. Drive anchor rods into the ground near each tower leg location. Rods should be driven until the top of the rod is at least 3" below ground level. (This operation can be done at any time before the tower is raised. If rods are not now, it is recommended that they be marked with wooden stakes

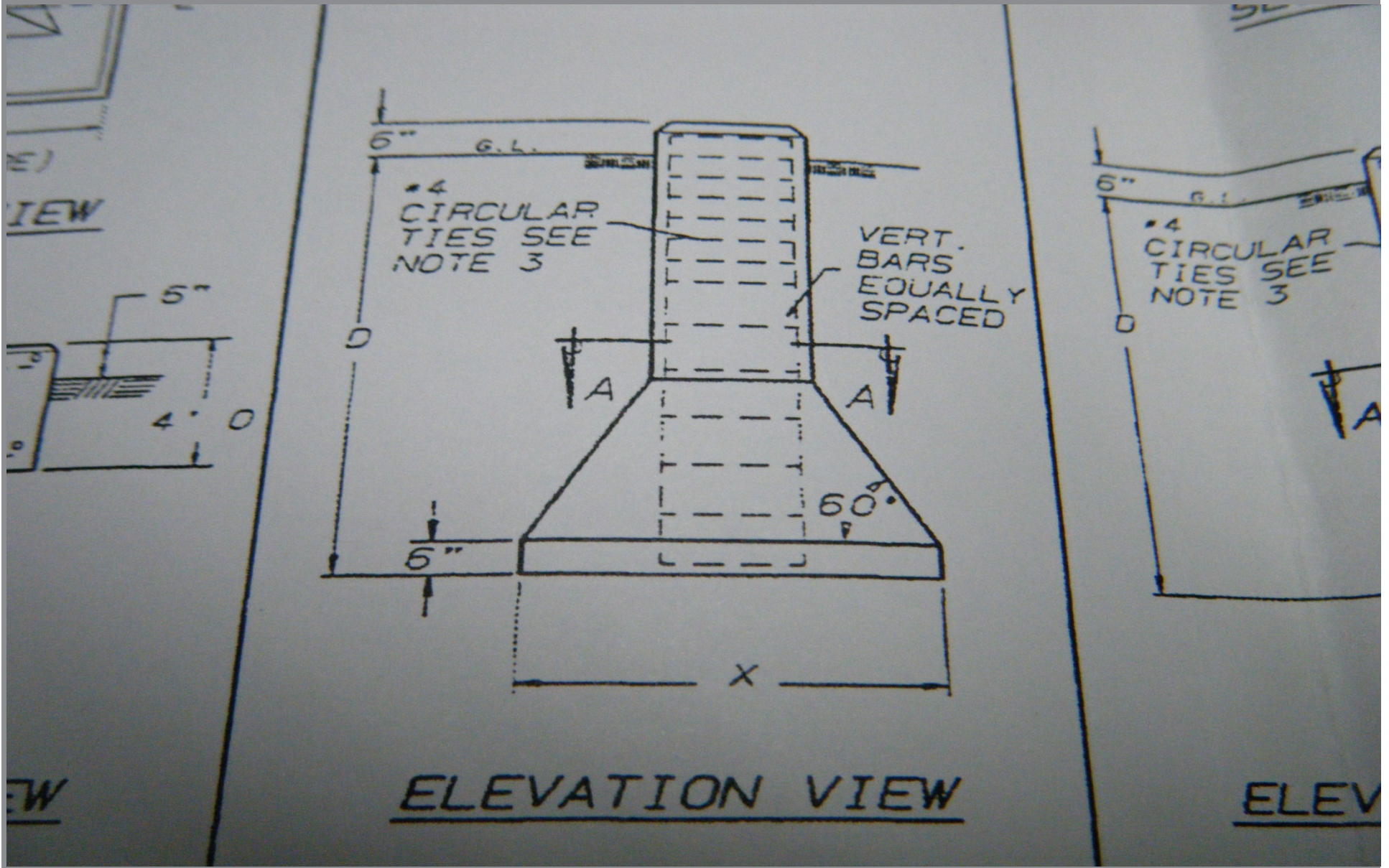
# START AT TOP, NUTS ON OUTSIDE OF TOWER

4. Assemble each section
  - a. **Start with the top section!**
  - b. Tower legs are usually bowed due to the manufacturing weld process. This bow will be pulled out as the section is assembled, but force will be required.
  - c. Use of jacks, a scaffold or an A-frame to hold the upper leg in place will be required. This can require a support over 10 ft high for the bottom section of a 120 ft tower!
  - d. Support the two lower legs with blocks at each end and in the middle to level them and keep them from bowing.
  - e. Bolts used for all brace connections are  $\frac{1}{2}$ " x  $1 \frac{1}{4}$ " A325. These will require  $\frac{7}{8}$ " wrenches.
  - f. Install the braces. Insert the bolts for the braces so that **all nuts will go on the outside of the tower. The end of the brace stamped with a part number is oriented toward the top of the tower. (The hole is NOT in the middle!)**
  - g. Do not tighten any of the hardware until the tower is erected and securely anchored.
  - h. Leave all brace hardware finger-tight until the tower is erected.
5. Attach the sections to each other. Flange bolts should be tightened to final torque specification. We suggest that all PAL nuts be installed after the tower is installed on the foundations; **install PAL nuts only after a**

15N TO 1W= 320 FT. 10N TO 5N= 120 FT.



# DRILL AND BELL



# SAVING SSV TOWER FOR 10 YEARS



# WORK AREA





# J BOLTS FROM DAYTON \$ 100.00



# ORIGINAL VS REFINISHED TOWER



# WATCHING THE PAINT DRY



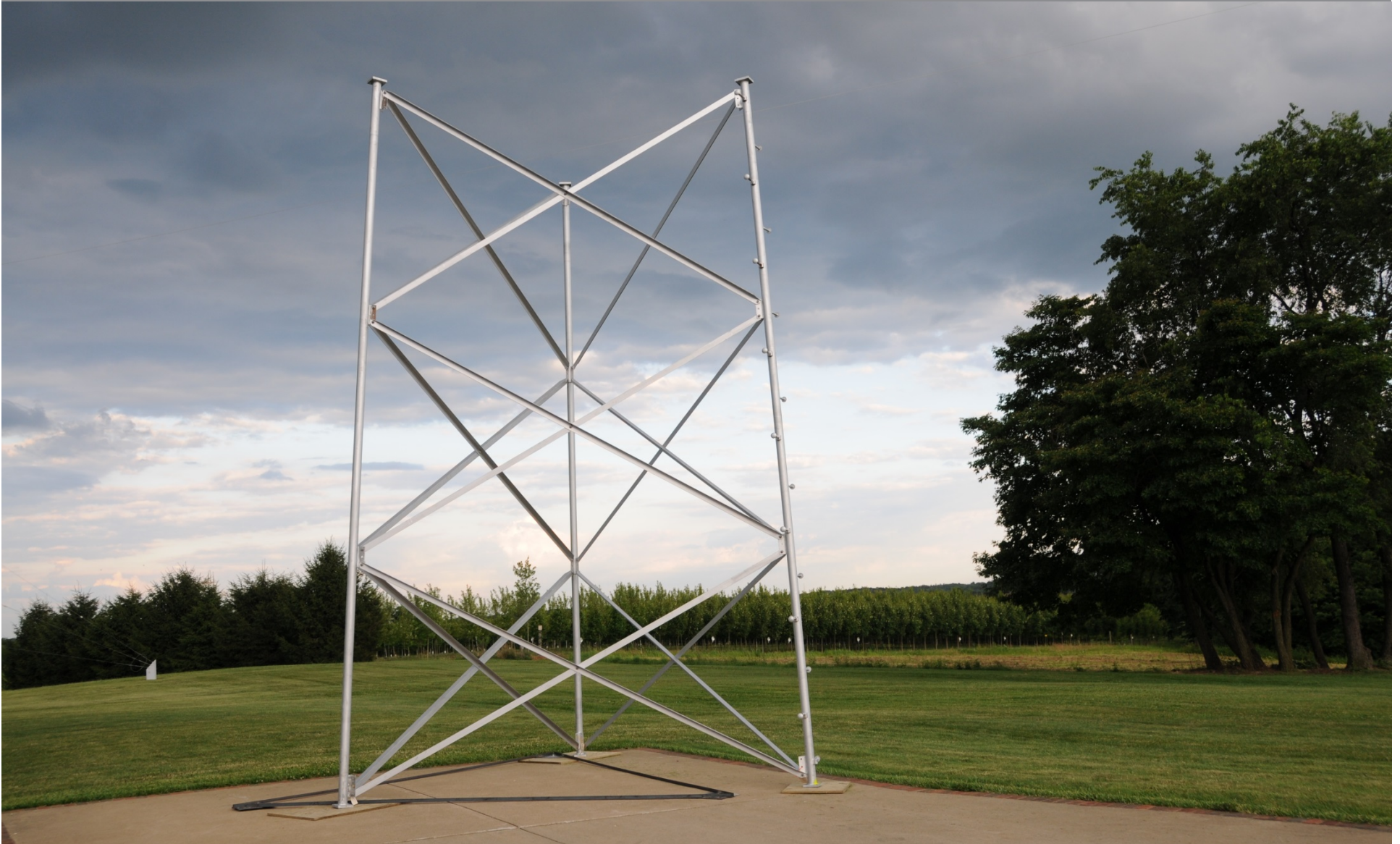
**MORE DRYING**



# CONSTRUCTION DAY



# 10N SET UP IN DRIVE WAY WITH BOLT LAYOUT



# REBAR CAGES



# QUALITY CONTROL MARKING





# MATCHING TEMPLATE TO TOWER LEG



# LOCATING THE TOWER



# HYDRO-EXCAVATION TRUCK



# READY TO START THE FIRST HOLE



# DIG WITHIN THE LINES



# HIGH PRESSURE HOSE TO CUT THE EARTH



# GETTING DEEPER



# INSIDE VIEW





# TAKING SHAPE



**TOP IS OPENED UP FOR THE CONCRETE**



**ON TO THE NEXT HOLE**



# NEED MORE WATER



# ADDING A FIVE FOOT SECTION



# GOING DEEPER



# YARD STICK AND STRING FOR MEASURING



# LUNCH TIME





# GETTING ORGANIZED



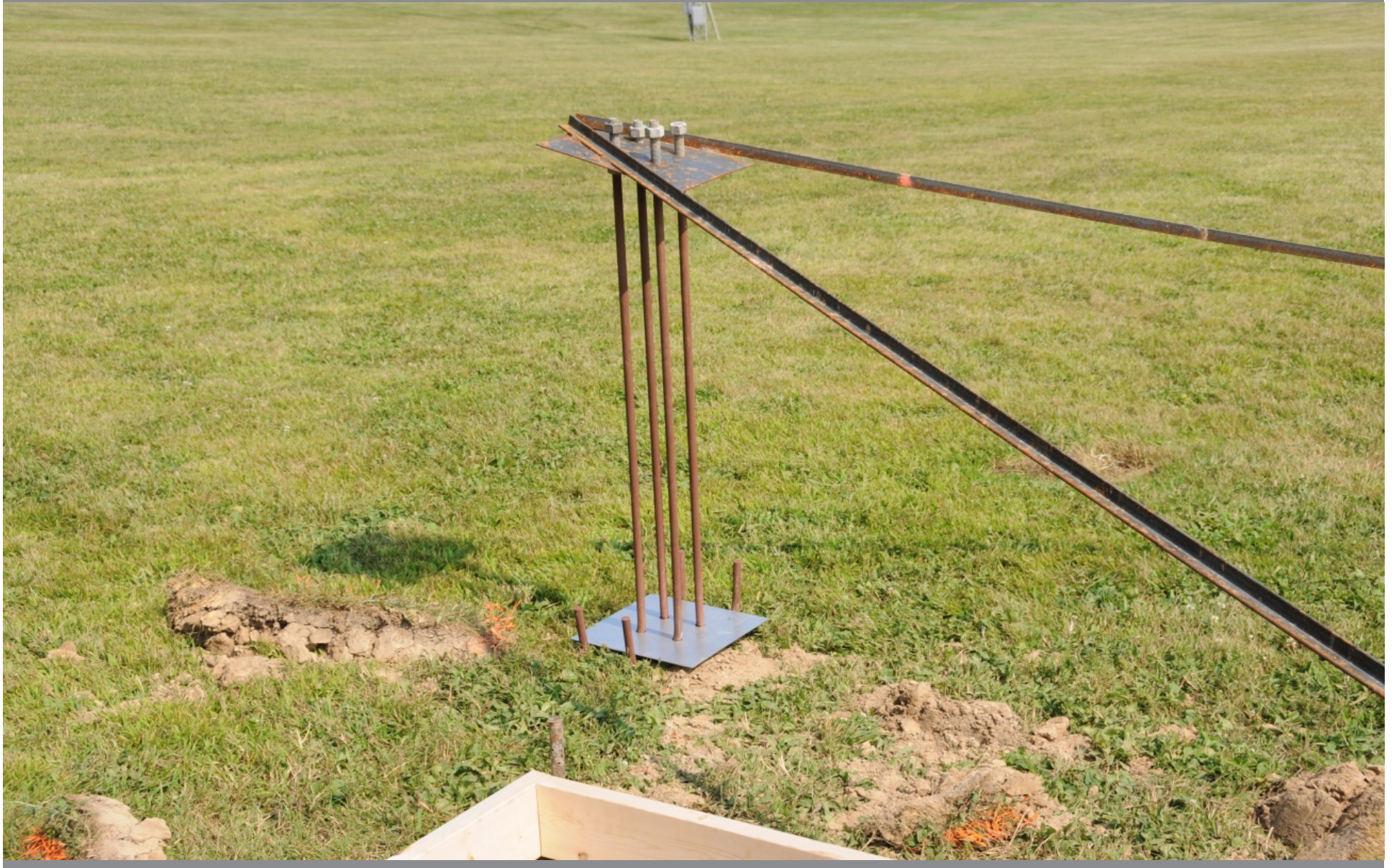
# SHOOTING ELEVATION



# ROUGH PLACEMENT



# PREPARING J BOLTS



# PRELIMINARY FORM FOR CONCRETE



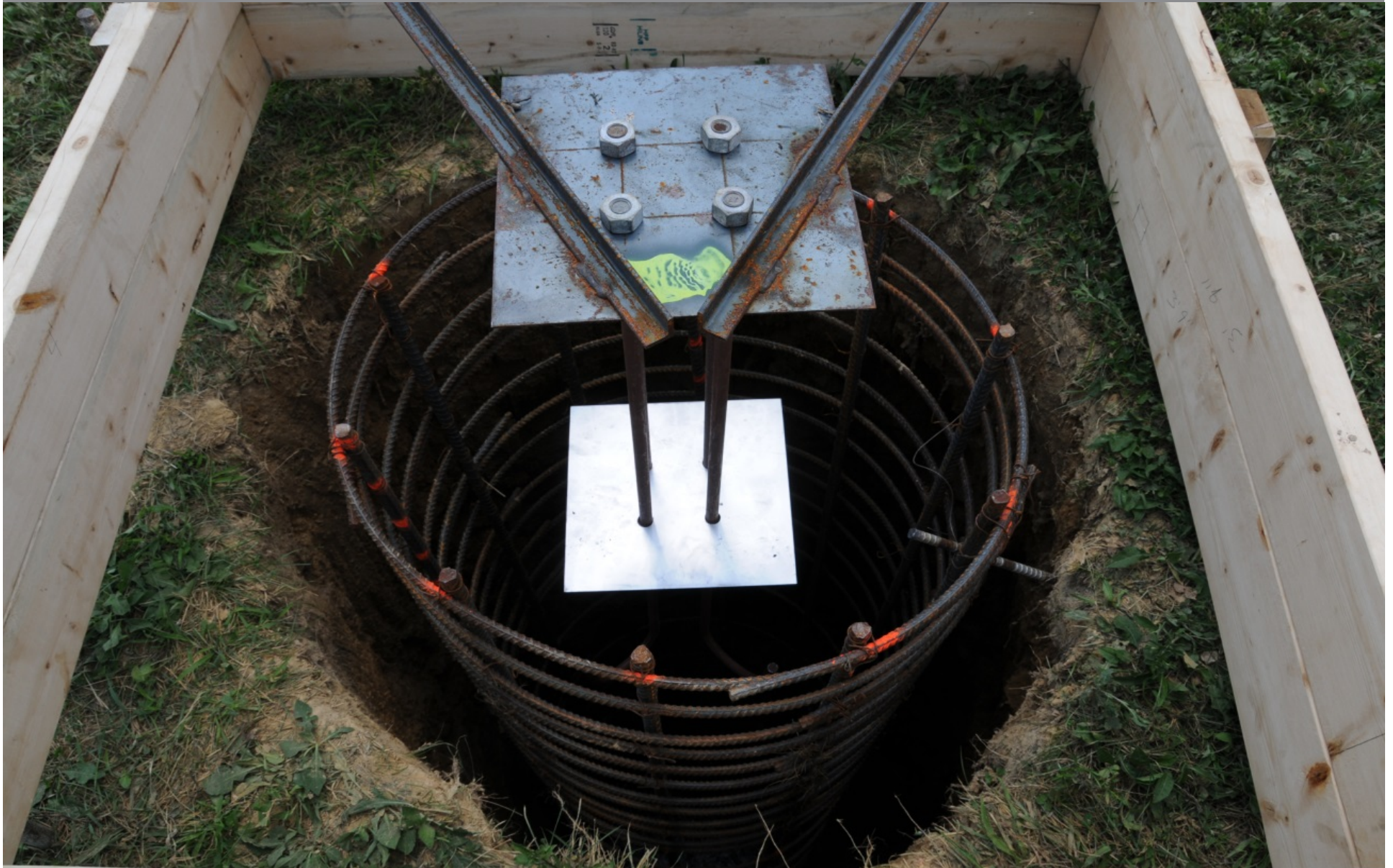
# FORMS FOR CONCRETE



# THIRD AND FINAL CONCRETE FORM



**READY FOR THE CONCRETE POUR**





# REBAR CAGE IS STABILIZED



# TEMPLATE IS STABILIZED



# READY FOR THE POUR WITH VIBRATOR



# VIBRATING AROUND THE REBAR CAGE



# LEVELING THE CAGE



# HOLDING CAGE IN PLACE AND VIBRATING



# MINIMUM SOIL DISTURBANCE



**ONE ALMOST FINISHED AND TWO TO GO**





# MORE CONCRETE



**ALMOST FULL**



# FINISHING TO SMOOTH FINISH



**NEEDS TO BE HIGHER IN THE CENTER**



**FINISHED**



## DUCT TAPE ON THE THREADS



**28 DAYS TO GO**



# COVERED DAY AND NIGHT





# CONSTRUCTION DAY



# MOVING THE 10N TO THE BASE



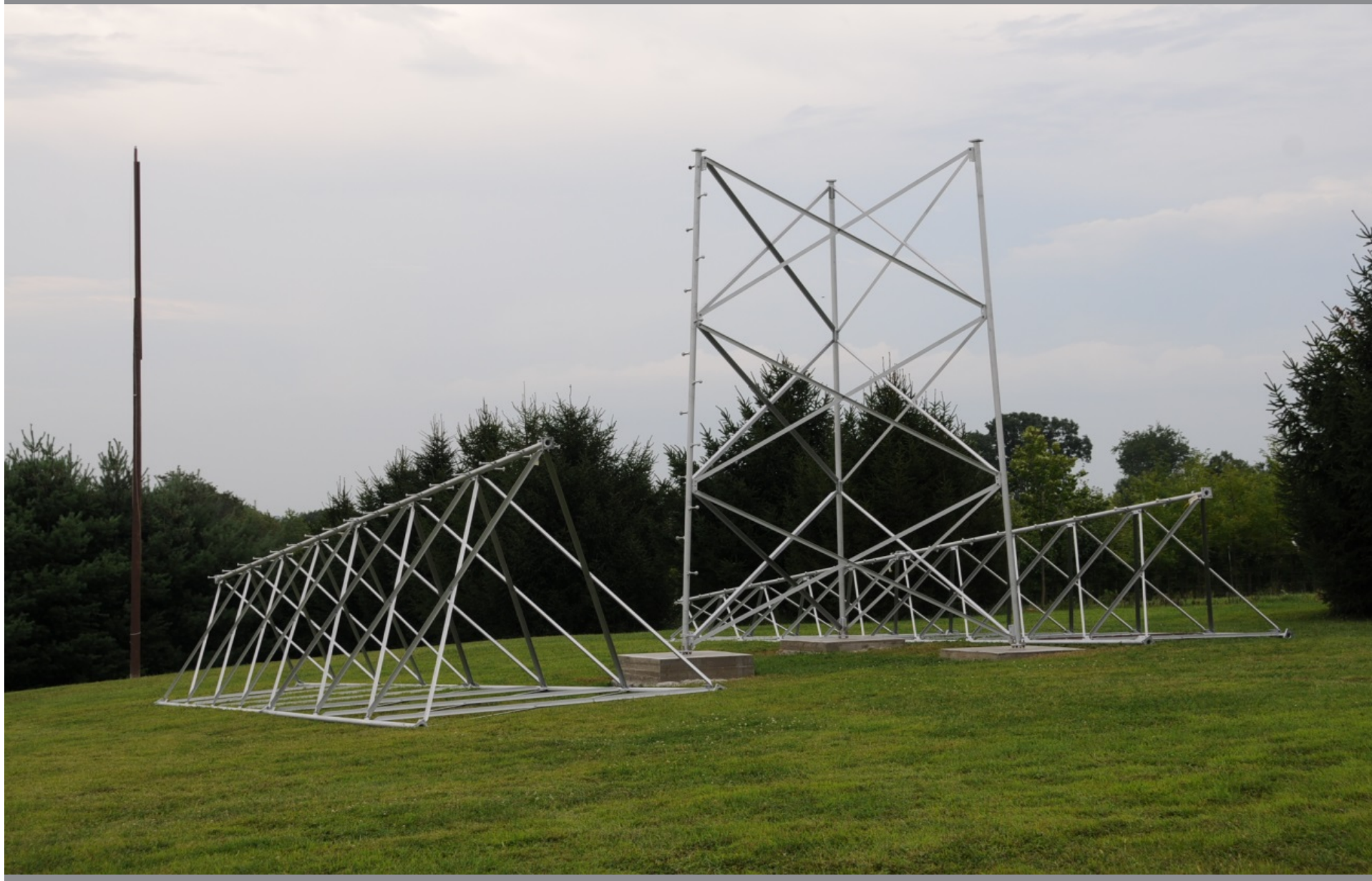
# FIRST TRY !



**PERFECT FIT**



**10N IN PLACE - 9N AND 8N READY TO GO UP**



# 120 FT SSV TOWER FINISHED (ALL MOST)



# 40 METER 3 EL BEAM @ 120 FT.



# **SOUTH AMERICA 40 METER 3 EL @ 40 FT.**





# FEED LINE IS NEEDED



**360FT. FROM TOWER TO STATION**



## 4 - 2 INCH PVC PIPE



**NO BACKHOE NEEDED**



**NICE AND STRAIGHT**



# UNDER THE SIDEWALK



# THROUGH THE BRICK AND BLOCK



# CONCRETE AND SEALED





**NO SIGN OF DIGGING**



# INSIDE VIEW



**WORKS BETTER WITH 7/8" HARD LINE**



# WEATHER RESISTANT BOX NEEDED



# ONE DAY TO PUT UNDERGROUND IN



# GRASS LOOKS GREAT AFTER RESEEDING



# WEATHER RESISTANT BOX AND BACK FILL



# TWO 40 METER BEAMS ON ONE TOWER





# 120 FT. ROHN SSV TOWER COMPLETED

