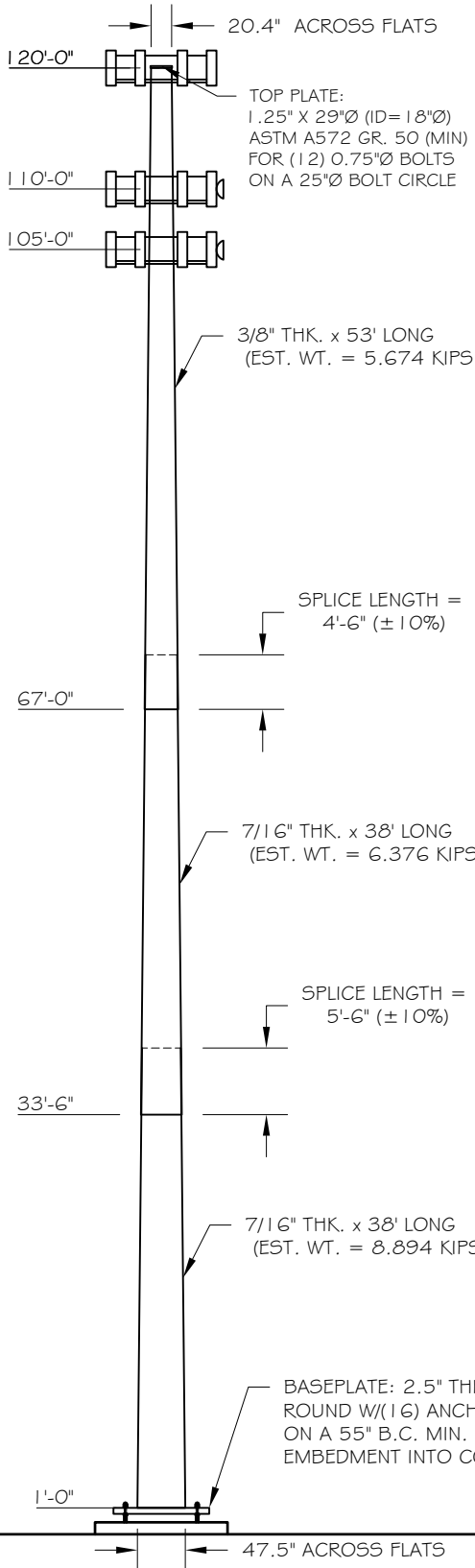


Page 1 of 2	Job Number: 23519-812
Eng: MFP	Customer Ref: TP-18469
	Date: 12/30/2019
Structure: 120-FT MONOPOLE	
Site: CT1225 HAMDEN II	
Location: NEW HAVEN CO., CT / 41°20'59.24", -72°57'45.31"	
Owner: TARPON TOWERS	
Revision No.:	Revision Date:



DESIGN			
Building Code: 2016 CONNECTICUT BUILDING CODE			
Design Standard: ANSI/TIA-222-G			
Wind Speed Load Cases: ASCE-7-05 CONVERTED TO ASCE-7-10			
Load Case #1: 97 MPH Design Wind Speed - $V_{ASD}$ ( $V_{ULT} = 125$ MPH)			
Load Case #2: 50 MPH Wind with 0.75" Ice Accumulation			
Load Case #3: 60 MPH Service Wind Speed			
Structure Class Risk Category	Exposure Cat.	Topography Cat.	Crest Height
II	C	I	

STRUCTURE MEETS THE MINIMUM REQUIREMENTS OF TIA-222-H

EQUIPMENT LIST	
Elev.	Description
120	(12) ANTENNAS + MOUNT (EPA 30,000 IN2)
120	GENERIC ANTENNA MOUNT
110	SEE SKETCH ON PAGE 3 FOR DETAILED LOADING
110	12-FT PLATFORM WITH HANDRAIL
105	SEE SKETCH ON PAGE 3 FOR DETAILED LOADING
105	12-FT PLATFORM WITH HANDRAIL

ANTENNA FEED LINES ROUTED ON THE INSIDE OF THE POLE

STRUCTURE PROPERTIES					
Cross-Section: 18-Sided			Taper: 0.24128 in/ft		
Shaft Steel: ASTM A572 GR 65			Baseplate Steel: ASTM A572 GR 50		
Anchor Rods: 2.25 in. A615 GR. 75 X 7'-0"					
Sect.	Length (ft)	Thickness (in)	Splice (ft)	Top Dia. (in)	Bot Dia. (in)
1	53.00	0.3750	4.50	20.41	33.20
2	38.00	0.4375	5.50	31.36	40.53
3	38.00	0.4375	0.00	38.33	47.50



BASE REACTIONS FOR FOUNDATION DESIGN

Moment: 4527 ft-kip  
Shear: 42 kip  
Axial: 45 kip

Page 2 of 2	Job Number: 23519-812
Eng: MFP	Customer Ref: TP-18469
	Date: 12/30/2019
Structure: 1 20-FT MONOPOLE	
Site: CT1225 HAMDEN II	
Location: NEW HAVEN CO., CT / 41°20'59.24", -72°57'45.31"	
Owner: TARPON TOWERS	
Revision No.:	Revision Date:

FOUNDATION NOTES:

1. ALL FOUNDATION CONCRETE SHALL USE TYPE II CEMENT AND ATTAIN A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI AT 28 DAYS. CONCRETE SHALL HAVE A MAXIMUM WATER/CEMENT RATIO OF 0.46 AND SHALL BE AIR ENTRAINED 6% (± 1.5%). ALL CONCRETE CONSTRUCTION SHALL BE IN ACCORDANCE WITH ACI 318, "THE BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE", LATEST EDITION.

2. ALL REINFORCING STEEL SHALL CONFORM TO ASTM A615 VERTICAL BARS SHALL BE GRADE 60, AND TIES OR STIRRUPS SHALL BE A MINIMUM OF GRADE 40. THE PLACEMENT OF ALL REINFORCEMENT SHALL CONFORM TO ACI 315, "MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES", LATEST EDITION.

3. THE CONTRACTOR SHALL DETERMINE THE MEANS AND METHODS TO SUPPORT THE EXCAVATION DURING CONSTRUCTION. THE CONTRACTOR SHALL READ THE GEOTECHNICAL REPORT AND SHALL CONSULT THE GEOTECHNICAL ENGINEER AS NECESSARY PRIOR TO CONSTRUCTION.

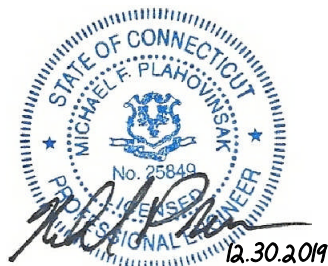
4. FOUNDATION DESIGN IS BASED ON ASSUMED SOIL CONDITIONS:

ALLOWABLE SOIL BEARING PRESSURE = 3000 PSF  
 WATER TABLE BELOW THE BASE OF THE FOUNDATION

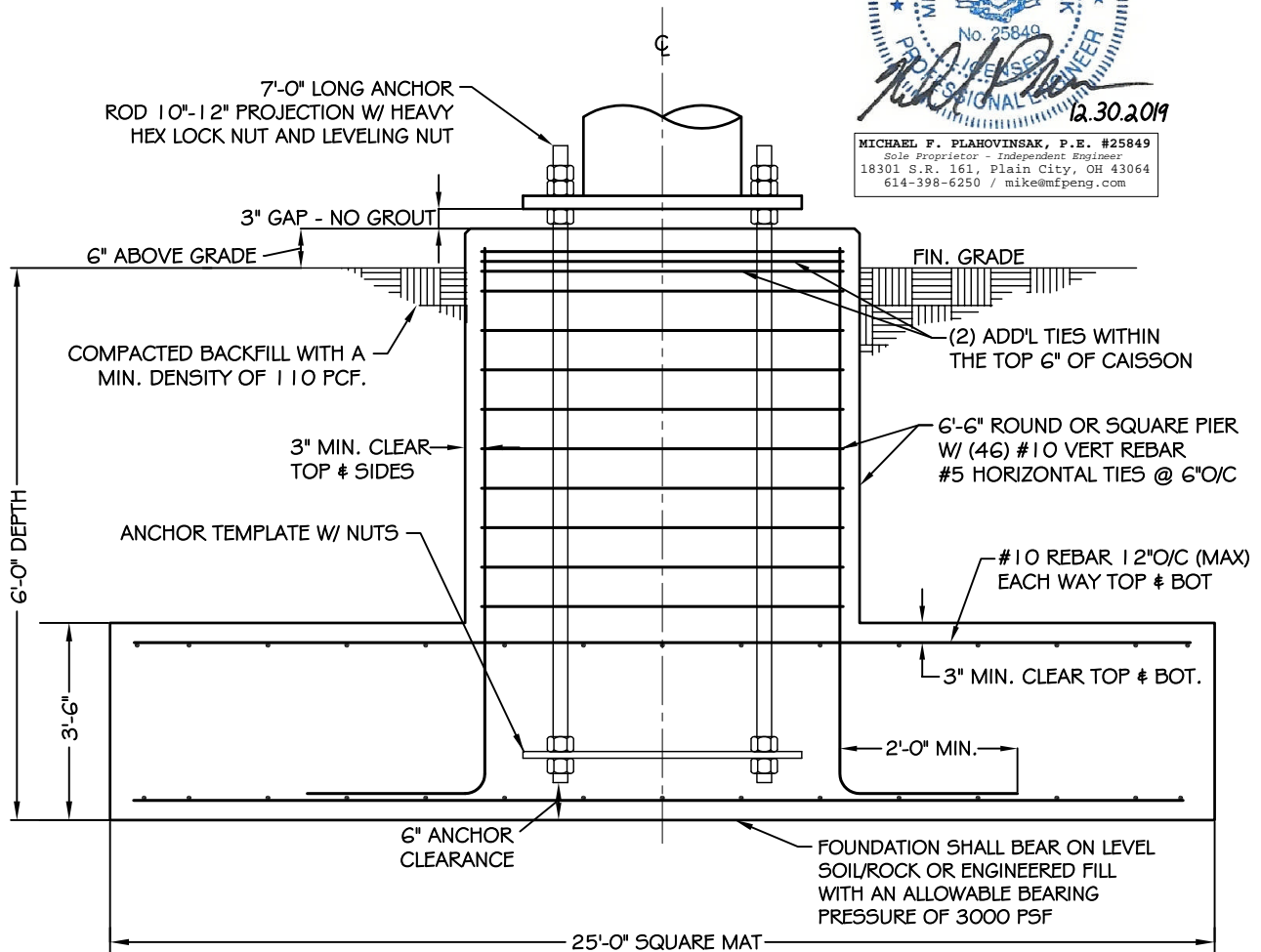
5. ESTIMATED CONCRETE VOLUME = 85.7 CUBIC YARDS.

6. THE FOUNDATION HAS BEEN DESIGNED TO RESIST THE FOLLOWING FACTORED LOADS:

MOMENT: 4527 FT\*KIPS  
 SHEAR: 42 KIPS  
 AXIAL: 45 KIPS



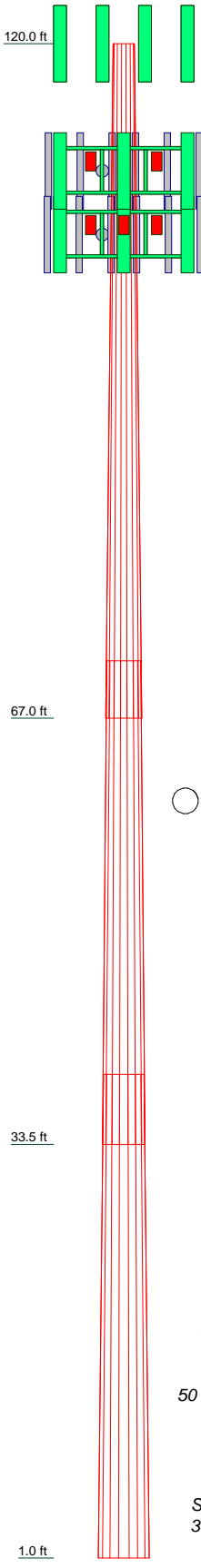
MICHAEL F. PLAHOVINSAK, P.E. #25849  
 Sole Proprietor - Independent Engineer  
 18301 S.R. 161, Plain City, OH 43064  
 614-398-6250 / mike@mfpeng.com



**SPREAD FOOTING**

NOT TO SCALE

Section	1	2	3	19.7
Length (ft)	53.00	38.00	38.00	
Number of Sides	18	18	18	
Thickness (in)	0.3750	0.4375	0.4375	
Socket Length (ft)	4.50	5.50		
Top Dia (in)	20.4128	31.3648	38.3314	
Bot Dia (in)	33.2006	40.5334	47.5000	
Grade		A572-65		
Weight (K)	5.7	6.4	7.6	



**DESIGNED APPURTENANCE LOADING**

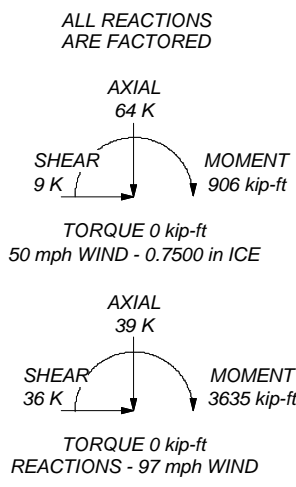
TYPE	ELEVATION	TYPE	ELEVATION
Panel Antennas + Mounting (EPA 30,000 in2)	120	Andrew VHLP1-23	110
Ericsson AIR 3246 B66	110	RFS - APXVAARR24_43-U-NA20	105
RFS - APXVAARR24_43-U-NA20	110	RFS APX16VDWV-16DWVS	105
RFS APX16VDWV-16DWVS	110	Ericsson AIR 3246 B66	105
Ericsson AIR 3246 B66	110	RFS - APXVAARR24_43-U-NA20	105
RFS - APXVAARR24_43-U-NA20	110	RFS APX16VDWV-16DWVS	105
RFS APX16VDWV-16DWVS	110	Ericsson AIR 3246 B66	105
Ericsson AIR 3246 B66	110	RFS - APXVAARR24_43-U-NA20	105
RFS - APXVAARR24_43-U-NA20	110	RFS APX16VDWV-16DWVS	105
RFS APX16VDWV-16DWVS	110	(3) Ericsson Radio 2217-B66A	105
(3) Ericsson Radio 2217-B66A	110	(3) Ericsson 4449 B12+B71	105
(3) Ericsson 4449 B12+B71	110	(3) Ericsson 4415 B25	105
(3) Ericsson 4415 B25	110	12' Platform w/ Handrail	105
12' Platform w/ Handrail	110	Ericsson AIR 3246 B66	105
		Andrew VHLP1-23	105

**MATERIAL STRENGTH**

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi			

**TOWER DESIGN NOTES**

1. Tower is located in New Haven County, Connecticut.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 97 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 50 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Structure Class II.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. ANSI/TIA-222-G wind speeds are Vasd winds. Refer to IBC Table 1609.3.1 for Vult wind speed conversions.
9. TOWER RATING: 79.8%



<b>Michael F. Plahovinsak, P.E.</b>			Job: <b>120-ft Pole - MFP #23519-812</b>		
18301 State Route 161 Plain City, OH 43064 Phone: 614-398-6250 FAX: mike@mpeng.com			Project: <b>CT1225 Hamden II</b>		
Client: TP-18469	Drawn by: Mike	App'd:	Code: TIA-222-G	Date: 12/30/19	Scale: NTS
Path: J:\Projects\235-TAPP\23519-812\23519-812 no ext.eri			Dwg No. E-1		

<b>tnxTower</b>  <b>Michael F. Plahovinsak, PE</b> 18301 State Route 161 Plain City, OH 4364 Phone: 614-398-6250 FAX: mike@mfpeng.com	<b>Job</b> 120-ft Pole - MFP #23519-812	<b>Page</b> 1 of 7
	<b>Project</b> CT1225 Hamden II	<b>Date</b> 10:55:10 12/30/19
	<b>Client</b> TP-18469	<b>Designed by</b> JC

## Tower Input Data

The tower is a monopole.

This tower is designed using the TIA-222-G standard.

The following design criteria apply:

Tower is located in New Haven County, Connecticut.

Basic wind speed of 97 mph.

Structure Class II.

Exposure Category C.

Topographic Category 1.

Crest Height 0.00 ft.

Nominal ice thickness of 0.7500 in.

Ice thickness is considered to increase with height.

Ice density of 56 pcf.

A wind speed of 50 mph is used in combination with ice.

Temperature drop of 50 °F.

Deflections calculated using a wind speed of 60 mph.

ANSI/TIA-222-G wind speeds are Vasd winds. Refer to IBC Table 1609.3.1 for Vult wind speed conversions..

A non-linear (P-delta) analysis was used.

Pressures are calculated at each section.

Stress ratio used in pole design is 1.

Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

## Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	120.00-67.00	53.00	4.50	18	20.4128	33.2006	0.3750	1.5000	A572-65 (65 ksi)
L2	67.00-33.50	38.00	5.50	18	31.3648	40.5334	0.4375	1.7500	A572-65 (65 ksi)
L3	33.50-1.00	38.00		18	38.3314	47.5000	0.4375	1.7500	A572-65 (65 ksi)

## Tapered Pole Properties

Section	Tip Dia. in	Area in <sup>2</sup>	I in <sup>4</sup>	r in	C in	I/C in <sup>3</sup>	J in <sup>4</sup>	I <sub>t</sub> /Q in <sup>2</sup>	w in	w/t
L1	20.6698	23.8500	1209.8323	7.1134	10.3697	116.6700	2421.2565	11.9273	2.9327	7.82
	33.6549	39.0706	5318.7908	11.6531	16.8659	315.3578	10644.5801	19.5390	5.1833	13.822
L2	32.8837	42.9465	5189.7868	10.9792	15.9333	325.7189	10386.4024	21.4773	4.7502	10.858
	41.0912	55.6782	11308.9765	14.2341	20.5910	549.2199	22632.8337	27.8444	6.3639	14.546
L3	40.2027	52.6204	9546.1922	13.4523	19.4723	490.2435	19104.9456	26.3152	5.9763	13.66
	48.1653	65.3522	18287.2083	16.7072	24.1300	757.8619	36598.4793	32.6823	7.5900	17.349

Tower Elevation ft	Gusset Area ft <sup>2</sup> (per face)	Gusset Thickness in	Gusset Grade	Adjust. Factor A <sub>f</sub>	Adjust. Factor A <sub>r</sub>	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontal in	Double Angle Stitch Bolt Spacing Redundants in
L1 120.00-67.00				1	1	1			
L2 67.00-33.50				1	1	1			
L3 33.50-1.00				1	1	1			

<b>tnxTower</b>  <b>Michael F. Plahovinsak, PE</b> 18301 State Route 161 Plain City, OH 4364 Phone: 614-398-6250 FAX: mike@mfpeng.com	<b>Job</b>	120-ft Pole - MFP #23519-812	<b>Page</b>	2 of 7
	<b>Project</b>	CT1225 Hamden II	<b>Date</b>	10:55:10 12/30/19
	<b>Client</b>	TP-18469	<b>Designed by</b>	JC

### Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number		C <sub>AA</sub> ft <sup>2</sup> /ft	Weight plf
6x12	C	No	Yes	Inside Pole	120.00 - 1.00	5	No Ice	0.00	0.92
							1/2" Ice	0.00	0.92
							1" Ice	0.00	0.92
6x12	C	No	Yes	Inside Pole	110.00 - 1.00	5	No Ice	0.00	0.92
							1/2" Ice	0.00	0.92
							1" Ice	0.00	0.92
6x12	C	No	Yes	Inside Pole	105.00 - 1.00	5	No Ice	0.00	0.92
							1/2" Ice	0.00	0.92
							1" Ice	0.00	0.92

### Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A <sub>R</sub> ft <sup>2</sup>	A <sub>F</sub> ft <sup>2</sup>	C <sub>AA</sub> In Face ft <sup>2</sup>	C <sub>AA</sub> Out Face ft <sup>2</sup>	Weight K
L1	120.00-67.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.61
L2	67.00-33.50	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.46
L3	33.50-1.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.45

### Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A <sub>R</sub> ft <sup>2</sup>	A <sub>F</sub> ft <sup>2</sup>	C <sub>AA</sub> In Face ft <sup>2</sup>	C <sub>AA</sub> Out Face ft <sup>2</sup>	Weight K
L1	120.00-67.00	A	1.662	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.61
L2	67.00-33.50	A	1.563	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.46
L3	33.50-1.00	A	1.405	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.45

### Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C <sub>AA</sub> Front ft <sup>2</sup>	C <sub>AA</sub> Side ft <sup>2</sup>	Weight K	
**									
Panel Antennas + Mounting (EPA 30,000 in2)	C	None		0.0000	120.00	No Ice 1/2" Ice	284.72 300.00	284.72 300.00	4.00 5.00

<b>tnxTower</b>  <b>Michael F. Plahovinsak, PE</b> 18301 State Route 161 Plain City, OH 4364 Phone: 614-398-6250 FAX: mike@mfpeng.com	<b>Job</b>	120-ft Pole - MFP #23519-812	<b>Page</b>	3 of 7
	<b>Project</b>	CT1225 Hamden II	<b>Date</b>	10:55:10 12/30/19
	<b>Client</b>	TP-18469	<b>Designed by</b>	JC

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>AA</sub> Front	C <sub>AA</sub> Side	Weight
			Horz Lateral	Vert					
**									
**									
Ericsson AIR 3246 B66	A	From Face	3.00	0.0000	110.00	No Ice	8.04	6.41	0.24
			0.00			1/2" Ice	8.45	7.09	0.31
			0.00			1" Ice	8.87	7.78	0.38
RFS -	A	From Face	3.00	0.0000	110.00	No Ice	20.24	10.79	0.16
APXVAARR24_43-U-NA20			0.00			1/2" Ice	20.89	12.21	0.29
			0.00			1" Ice	21.55	13.49	0.44
RFS	A	From Face	3.00	0.0000	110.00	No Ice	6.67	3.34	0.06
APX16VDWV-16DWVS			0.00			1/2" Ice	7.06	3.99	0.11
			0.00			1" Ice	7.47	4.64	0.16
Ericsson AIR 3246 B66	B	From Face	3.00	0.0000	110.00	No Ice	8.04	6.41	0.24
			0.00			1/2" Ice	8.45	7.09	0.31
			0.00			1" Ice	8.87	7.78	0.38
RFS -	B	From Face	3.00	0.0000	110.00	No Ice	20.24	10.79	0.16
APXVAARR24_43-U-NA20			0.00			1/2" Ice	20.89	12.21	0.29
			0.00			1" Ice	21.55	13.49	0.44
RFS	B	From Face	3.00	0.0000	110.00	No Ice	6.67	3.34	0.06
APX16VDWV-16DWVS			0.00			1/2" Ice	7.06	3.99	0.11
			0.00			1" Ice	7.47	4.64	0.16
Ericsson AIR 3246 B66	C	From Face	3.00	0.0000	110.00	No Ice	8.04	6.41	0.24
			0.00			1/2" Ice	8.45	7.09	0.31
			0.00			1" Ice	8.87	7.78	0.38
RFS -	C	From Face	3.00	0.0000	110.00	No Ice	20.24	10.79	0.16
APXVAARR24_43-U-NA20			0.00			1/2" Ice	20.89	12.21	0.29
			0.00			1" Ice	21.55	13.49	0.44
RFS	C	From Face	3.00	0.0000	110.00	No Ice	6.67	3.34	0.06
APX16VDWV-16DWVS			0.00			1/2" Ice	7.06	3.99	0.11
			0.00			1" Ice	7.47	4.64	0.16
(3) Ericsson Radio	A	From Face	2.00	0.0000	110.00	No Ice	1.30	0.45	0.06
2217-B66A			0.00			1/2" Ice	1.44	0.54	0.07
			0.00			1" Ice	1.59	0.64	0.08
(3) Ericsson 4449 B12+B71	B	From Face	2.00	0.0000	110.00	No Ice	1.64	1.02	0.07
			0.00			1/2" Ice	1.80	1.15	0.09
			0.00			1" Ice	1.97	1.29	0.11
(3) Ericsson 4415 B25	C	From Face	2.00	0.0000	110.00	No Ice	1.84	0.82	0.05
			0.00			1/2" Ice	2.01	0.94	0.06
			0.00			1" Ice	2.19	1.07	0.08
12' Platform w/ Handrail	C	None		0.0000	110.00	No Ice	30.00	30.00	1.80
						1/2" Ice	35.00	35.00	2.60
						1" Ice	40.00	40.00	3.40
**									
Ericsson AIR 3246 B66	A	From Face	3.00	0.0000	105.00	No Ice	8.04	6.41	0.24
			0.00			1/2" Ice	8.45	7.09	0.31
			0.00			1" Ice	8.87	7.78	0.38
RFS -	A	From Face	3.00	0.0000	105.00	No Ice	20.24	10.79	0.16
APXVAARR24_43-U-NA20			0.00			1/2" Ice	20.89	12.21	0.29
			0.00			1" Ice	21.55	13.49	0.44
RFS	A	From Face	3.00	0.0000	105.00	No Ice	6.67	3.34	0.06
APX16VDWV-16DWVS			0.00			1/2" Ice	7.06	3.99	0.11
			0.00			1" Ice	7.47	4.64	0.16
Ericsson AIR 3246 B66	B	From Face	3.00	0.0000	105.00	No Ice	8.04	6.41	0.24
			0.00			1/2" Ice	8.45	7.09	0.31
			0.00			1" Ice	8.87	7.78	0.38
RFS -	B	From Face	3.00	0.0000	105.00	No Ice	20.24	10.79	0.16
APXVAARR24_43-U-NA20			0.00			1/2" Ice	20.89	12.21	0.29

<b>tnxTower</b>  <b>Michael F. Plahovinsak, PE</b> 18301 State Route 161 Plain City, OH 4364 Phone: 614-398-6250 FAX: mike@mfpeng.com	<b>Job</b>	120-ft Pole - MFP #23519-812	<b>Page</b>	4 of 7
	<b>Project</b>	CT1225 Hamden II	<b>Date</b>	10:55:10 12/30/19
	<b>Client</b>	TP-18469	<b>Designed by</b>	JC

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>AA</sub> Front	C <sub>AA</sub> Side	Weight	
			Horz	Lateral						
			ft	ft	°	ft	ft <sup>2</sup>	ft <sup>2</sup>	K	
RFS APX16VDWV-16DWVS	B	From Face	0.00		0.0000	105.00	1" Ice	21.55	13.49	0.44
			3.00				No Ice	6.67	3.34	0.06
			0.00				1/2" Ice	7.06	3.99	0.11
Ericsson AIR 3246 B66	C	From Face	0.00		0.0000	105.00	1" Ice	7.47	4.64	0.16
			3.00				No Ice	8.04	6.41	0.24
			0.00				1/2" Ice	8.45	7.09	0.31
RFS - APXVAARR24_43-U-NA20	C	From Face	0.00		0.0000	105.00	1" Ice	8.87	7.78	0.38
			3.00				No Ice	20.24	10.79	0.16
			0.00				1/2" Ice	20.89	12.21	0.29
RFS APX16VDWV-16DWVS	C	From Face	0.00		0.0000	105.00	1" Ice	21.55	13.49	0.44
			3.00				No Ice	6.67	3.34	0.06
			0.00				1/2" Ice	7.06	3.99	0.11
(3) Ericsson Radio 2217-B66A	A	From Face	0.00		0.0000	105.00	1" Ice	7.47	4.64	0.16
			2.00				No Ice	1.30	0.45	0.06
			0.00				1/2" Ice	1.44	0.54	0.07
(3) Ericsson 4449 B12+B71	B	From Face	0.00		0.0000	105.00	1" Ice	1.59	0.64	0.08
			2.00				No Ice	1.64	1.02	0.07
			0.00				1/2" Ice	1.80	1.15	0.09
(3) Ericsson 4415 B25	C	From Face	0.00		0.0000	105.00	1" Ice	1.97	1.29	0.11
			2.00				No Ice	1.84	0.82	0.05
			0.00				1/2" Ice	2.01	0.94	0.06
12' Platform w/ Handrail	C	None	0.00		0.0000	105.00	1" Ice	2.19	1.07	0.08
							No Ice	30.00	30.00	1.80
							1/2" Ice	35.00	35.00	2.60
						1" Ice	40.00	40.00	3.40	

\*\*

## Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets:		Azimuth Adjustment	3 dB Beam Width	Elevation	Outside Diameter	Aperture Area	Weight	
				Horz	Lateral							
			ft	ft	°	°	ft	ft	ft <sup>2</sup>	K		
**												
Andrew VHLP1-23	A	Paraboloid w/Radome	From Face	1.00		0.0000		110.00	1.00	No Ice	0.79	0.03
				0.00						1/2" Ice	0.92	0.04
				0.00						1" Ice	1.06	0.04
**												
Andrew VHLP1-23	A	Paraboloid w/Radome	From Face	1.00		0.0000		105.00	1.00	No Ice	0.79	0.03
				0.00						1/2" Ice	0.92	0.04
				0.00						1" Ice	1.06	0.04

## Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 90 deg - No Ice
5	0.9 Dead+1.6 Wind 90 deg - No Ice
6	1.2 Dead+1.6 Wind 180 deg - No Ice

<b>tnxTower</b>  <b>Michael F. Plahovinsak, PE</b> 18301 State Route 161 Plain City, OH 4364 Phone: 614-398-6250 FAX: mike@mfpeng.com	<b>Job</b> 120-ft Pole - MFP #23519-812	<b>Page</b> 5 of 7
	<b>Project</b> CT1225 Hamden II	<b>Date</b> 10:55:10 12/30/19
	<b>Client</b> TP-18469	<b>Designed by</b> JC

Comb. No.	Description
7	0.9 Dead+1.6 Wind 180 deg - No Ice
8	1.2 Dead+1.0 Ice+1.0 Temp
9	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
10	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
11	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
12	Dead+Wind 0 deg - Service
13	Dead+Wind 90 deg - Service
14	Dead+Wind 180 deg - Service

### Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	120 - 67	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	8	-38.95	-0.46	0.44
			Max. Mx	4	-18.29	-1266.81	-0.64
			Max. My	2	-18.28	0.82	1268.35
			Max. Vy	4	30.97	-1266.81	-0.64
			Max. Vx	6	31.02	-1.38	-1268.33
L2	67 - 33.5	Pole	Max. Torque	2			-0.30
			Max Tension	1	0.00	0.00	0.00
			Max. Compression	8	-49.25	-0.46	0.44
			Max. Mx	4	-26.95	-2313.82	-1.57
			Max. My	6	-26.94	-2.56	-2317.13
			Max. Vy	4	33.40	-2313.82	-1.57
L3	33.5 - 1	Pole	Max. Vx	6	33.45	-2.56	-2317.13
			Max. Torque	2			-0.30
			Max Tension	1	0.00	0.00	0.00
			Max. Compression	8	-63.63	-0.46	0.44
			Max. Mx	4	-39.21	-3629.48	-2.65
			Max. My	6	-39.21	-3.91	-3634.83
			Max. Vy	4	35.67	-3629.48	-2.65
			Max. Vx	6	35.72	-3.91	-3634.83
			Max. Torque	2			-0.30

### Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	120 - 67	19.186	12	1.4308	0.0004
L2	71.5 - 33.5	6.670	12	0.9045	0.0002
L3	39 - 1	1.931	12	0.4666	0.0001

### Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
120.00	Panel Antennas + Mounting (EPA 30,000 in2)	12	19.186	1.4308	0.0004	33205
110.00	Andrew VHL1-23	12	16.334	1.3310	0.0004	16602
105.00	Andrew VHL1-23	12	14.931	1.2803	0.0003	11068



<b>tnxTower</b>  <b>Michael F. Plahovinsak, PE</b> 18301 State Route 161 Plain City, OH 4364 Phone: 614-398-6250 FAX: mike@mfpeng.com	<b>Job</b>	120-ft Pole - MFP #23519-812	<b>Page</b>	6 of 7
	<b>Project</b>	CT1225 Hamden II	<b>Date</b>	10:55:10 12/30/19
	<b>Client</b>	TP-18469	<b>Designed by</b>	JC

### Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	120 - 67	89.943	6	6.7103	0.0020
L2	71.5 - 33.5	31.310	6	4.2473	0.0007
L3	39 - 1	9.065	6	2.1913	0.0003

### Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
120.00	Panel Antennas + Mounting (EPA 30,000 in2)	6	89.943	6.7103	0.0021	7238
110.00	Andrew VHLP1-23	6	76.586	6.2436	0.0017	3618
105.00	Andrew VHLP1-23	6	70.013	6.0070	0.0016	2410

### Pole Design Data

Section No.	Elevation ft	Size	L ft	L <sub>u</sub> ft	Kl/r	A in <sup>2</sup>	P <sub>u</sub> K	φP <sub>n</sub> K	Ratio $\frac{P_u}{\phi P_n}$
L1	120 - 67 (1)	TP33.2006x20.4128x0.375	53.00	0.00	0.0	37.7783	-18.28	2806.74	0.007
L2	67 - 33.5 (2)	TP40.5334x31.3648x0.4375	38.00	0.00	0.0	53.8355	-26.94	3999.71	0.007
L3	33.5 - 1 (3)	TP47.5x38.3314x0.4375	38.00	0.00	0.0	65.3522	-39.21	4763.91	0.008

### Pole Bending Design Data

Section No.	Elevation ft	Size	M <sub>ux</sub> kip-ft	φM <sub>ux</sub> kip-ft	Ratio $\frac{M_{ux}}{\phi M_{ux}}$	M <sub>uy</sub> kip-ft	φM <sub>uy</sub> kip-ft	Ratio $\frac{M_{uy}}{\phi M_{uy}}$
L1	120 - 67 (1)	TP33.2006x20.4128x0.375	1268.35	1824.72	0.695	0.00	1824.72	0.000
L2	67 - 33.5 (2)	TP40.5334x31.3648x0.4375	2317.13	3177.82	0.729	0.00	3177.82	0.000
L3	33.5 - 1 (3)	TP47.5x38.3314x0.4375	3634.83	4603.76	0.790	0.00	4603.76	0.000

### Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V <sub>u</sub> K	φV <sub>n</sub> K	Ratio $\frac{V_u}{\phi V_n}$	Actual T <sub>u</sub> kip-ft	φT <sub>n</sub> kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	120 - 67 (1)	TP33.2006x20.4128x0.375	31.00	1403.37	0.022	0.30	3660.42	0.000
L2	67 - 33.5 (2)	TP40.5334x31.3648x0.4375	33.45	1999.85	0.017	0.29	6374.23	0.000
L3	33.5 - 1 (3)	TP47.5x38.3314x0.4375	35.72	2381.95	0.015	0.29	9231.67	0.000

<b>tnxTower</b>  <b>Michael F. Plahovinsak, PE</b> 18301 State Route 161 Plain City, OH 4364 Phone: 614-398-6250 FAX: mike@mfpeng.com	<b>Job</b> 120-ft Pole - MFP #23519-812	<b>Page</b> 7 of 7
	<b>Project</b> CT1225 Hamden II	<b>Date</b> 10:55:10 12/30/19
	<b>Client</b> TP-18469	<b>Designed by</b> JC

**Pole Interaction Design Data**

Section No.	Elevation ft	Ratio	Ratio	Ratio	Ratio	Ratio	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
		$\frac{P_u}{P_n}$	$\frac{M_{ux}}{M_{nx}}$	$\frac{M_{uy}}{M_{ny}}$	$\frac{V_u}{V_n}$	$\frac{T_u}{T_n}$			
L1	120 - 67 (1)	0.007	0.695	0.000	0.022	0.000	0.702	1.000	4.8.2 ✓
L2	67 - 33.5 (2)	0.007	0.729	0.000	0.017	0.000	0.736	1.000	4.8.2 ✓
L3	33.5 - 1 (3)	0.008	0.790	0.000	0.015	0.000	0.798	1.000	4.8.2 ✓

**Section Capacity Table**

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$\phi P_{allow}$ K	% Capacity	Pass Fail	
L1	120 - 67	Pole	TP33.2006x20.4128x0.375	1	-18.28	2806.74	70.2	Pass	
L2	67 - 33.5	Pole	TP40.5334x31.3648x0.4375	2	-26.94	3999.71	73.6	Pass	
L3	33.5 - 1	Pole	TP47.5x38.3314x0.4375	3	-39.21	4763.91	79.8	Pass	
							Summary		
							Pole (L3)	79.8	Pass
							<b>RATING =</b>	<b>79.8</b>	<b>Pass</b>

<b>Michael F. Plahovinsak, P.E.</b> 18301 State Route 161 W Plain City, OH 43064 Phone: 614-398-6250 email: mike@mfpeng.com	<b>Job</b> 130-ft monopole - MFP #23519-812	<b>Page</b> BP & AB Calc
	<b>Project</b> CT1225 Hamden II	<b>Date</b> 12/30/2019
	<b>Client</b> TAPP TP-18469	<b>Designed by</b> Mike

**Anchor Rod and Base Plate Calculation**

**ANSI/TIA-222-G**

<b>Factored Base Reactions:</b>	<b>Pole Shape:</b>	<b>Anchor Rods:</b>	<b>Base Plate:</b>
Moment: 4527 ft-kips	18-Sided	(16) 2.25 in. A615 GR. 75	2.5 in. x 61 in. Round
Shear: 42 kips	<b>Pole Dia. (<math>D_f</math>):</b>	Anchor Rods Evenly Spaced	$f_y = 50$ ksi
Axial: 45 kips	47.50 in	On a 55 in Bolt Circle	

**Anchor Rod Calculation According to TIA-222-G section 4.9.9**

$\phi_t, \phi_v = 0.80$  TIA 4.9.9  
 $I_{bolts} = 6050.00 \text{ in}^2$  Momet of Inertia  
 $P_u = 250 \text{ kips}$  Compr Force  
 $V_u = 2.6 \text{ kips}$  Shear Force  
 $R_{nt} = 325.00 \text{ kips}$  Nominal Tensile Strength  
 $n = 0.50$  for detail type (d)  
**Stress Rating = 98.1%** Satisfies TIA-G 4.9.9

**Base Plate Calculation According to TIA-222-G**

$\phi = 0.90$  TIA 4.7  
 $M_{PL} = 572.4 \text{ in-kip}$  Plate Moment  
 $L = 9.3 \text{ in}$  Section Length  
 $Z = 14.6$  Plastic Section Modulus  
 $M_P = 728.6 \text{ in-kip}$  Plastic Moment  
 $\phi M_n = 655.8 \text{ in-kip}$  Factored Resistance

*Calculated Moment vs Factored Resistance*

$572.43 \text{ in-kip} \leq 656 \text{ in-kip}$

**Stress Rating = 87.3%**

<b>Anchor Rods Are Adequate</b>	<b>98.1%</b> <input checked="" type="checkbox"/>
<b>Base Plate is Adequate</b>	<b>87.3%</b> <input checked="" type="checkbox"/>