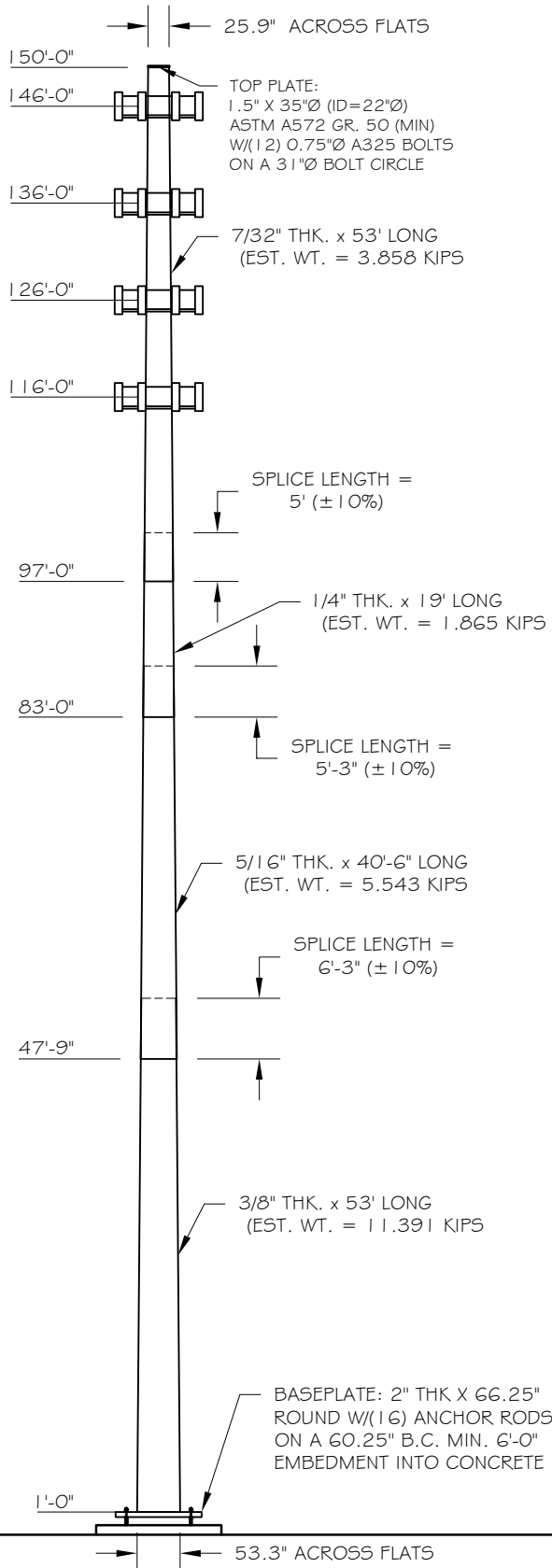




TAPP

2427 Kelly Lane
Houston, Texas 77066
281-444-8277

QUALITY STEEL POLES. DELIVERED.



Page 1 of 3	Job Number: 23522-307
Eng: MFP	Customer Ref: TP-21199
	Date: 8/24/2022
Structure: 150-FT MONOPOLE	
Site: NY0248 CHESTER DPW	
Location: ORANGE CO., NY / 41°18'26.3", -74°14'16.5"	
Owner: ARX WIRELESS	
Revision No.:	Revision Date:

DESIGN

Building Code: 2018 IBC / 2020 NEW YORK BUILDING CODE			
Design Standard: TIA-222-H			
Wind Speed Load Cases: ASCE-7-16 WIND SPEED			
Load Case #1: 114 MPH Design Wind Speed			
Load Case #2: 40 MPH Wind with 1" Ice Accumulation			
Load Case #3 60 MPH Service Wind Speed			
Structure Class Risk Category	Exposure Cat.	Topography Cat.	Crest Height
II	C	I	

EQUIPMENT LIST

Elev.	Description
146	ANTENNAS + MOUNTING (EPA 120 FT ² / 3,000 LBS)
146	GENERIC ANTENNA MOUNT
136	ANTENNAS + MOUNTING (EPA 120 FT ² / 3,000 LBS)
136	GENERIC ANTENNA MOUNT
126	ANTENNAS + MOUNTING (EPA 120 FT ² / 3,000 LBS)
126	GENERIC ANTENNA MOUNT
116	ANTENNAS + MOUNTING (EPA 120 FT ² / 3,000 LBS)
116	GENERIC ANTENNA MOUNT

ANTENNA FEED LINES ROUTED ON THE INSIDE OF THE POLE

STRUCTURE PROPERTIES

Cross-Section: 18-Sided			Taper: 0.19416 in/ft		
Shaft Steel: ASTM A572 GR 65			Baseplate Steel: ASTM A572 GR 55		
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	0.2188	5.00	25.88	36.17
2	19.00	0.2500	5.25	34.77	38.45
3	40.50	0.3125	6.25	36.93	44.80
4	53.00	0.3750	0.00	42.96	53.25



8.24.2022
MICHAEL F. PLAHOVINSK, P.E. #85261
Sole Proprietor - Independent Engineer
18301 S.R. 161, Plain City, OH 43064
614-398-6250 / mike@mfpeng.com

BASE REACTIONS FOR FOUNDATION DESIGN

Moment: 4331 ft-kip
Shear: 35 kip
Axial: 59 kip

Page 3 of 3	Job Number: 23522-307
Eng: MFP	Customer Ref: TP-21199
	Date: 8/24/2022
Structure: 150-FT MONOPOLE	
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Location: ORANGE CO., NY / 41°18'26.3", -74°14'16.5"	
Owner: ARX WIRELESS	
Revision No.: Revision Date:	

FOUNDATION NOTES:

1. ALL FOUNDATION CONCRETE SHALL USE TYPE II CEMENT AND ATTAIN A MINIMUM COMPRESSIVE STRENGTH OF 4500 PSI AT 28 DAYS. CONCRETE SHALL HAVE A MAXIMUM WATER/CEMENT RATIO OF 0.45 AND SHALL BE AIR ENTRAINED 6% ($\pm 1.5\%$). 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.

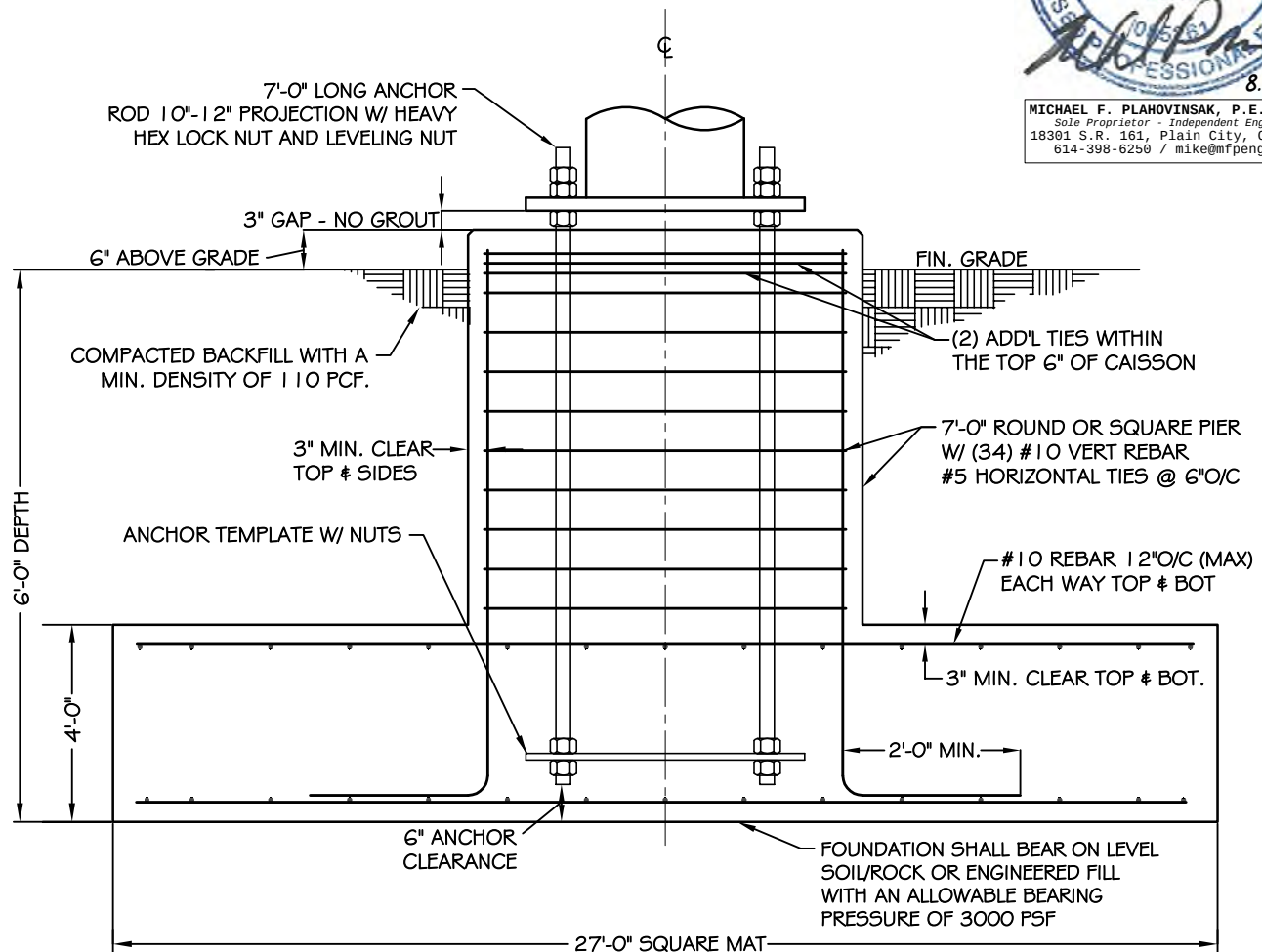
3. THE CONTRACTOR SHALL DETERMINE THE MEANS AND METHODS TO SUPPORT THE EXCAVATION DURING CONSTRUCTION. THE CONTRACTOR SHALL READ THE GEOTECHNICAL REPORT AND SHALL CONSULT THE GEOTECHNICAL ENGINEER AS NECESSARY PRIOR TO CONSTRUCTION.

4. FOUNDATION DESIGN IS BASED ON GEOTECHNICAL REPORT BY:
ENGINEER: DELTA OAKS GROUP
REPORT NO.: GEO22-14312-08 (DATED 7/1/22)

5. ESTIMATED CONCRETE VOLUME = 112.5 CUBIC YARDS.

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

MOMENT: 4331 FT*KIPS
SHEAR: 35 KIPS
AXIAL: 59 KIPS



SPREAD FOOTING

NOT TO SCALE

tnxTower Michael Plahovinsak, P.E. 18301 State Route 161 Plain City, OH 43064 Phone: 614-398-6250 FAX: mike@mfpeng.com	Job	150-ft Pole - MFP #23522-307	Page	1 of 6
	Project	NY0248 Chester DPW	Date	07:24:56 08/24/22
	Client	TP-21199	Designed by	JC

Tower Input Data

The tower is a monopole.

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

The following design criteria apply:

Tower base elevation above sea level: 746.00 ft.

Basic wind speed of 114 mph.

Risk Category II.

Exposure Category C.

Simplified Topographic Factor Procedure for wind speed-up calculations is used.

Topographic Category: 1.

Crest Height: 0.00 ft.

Nominal ice thickness of 1.0000 in.

Ice thickness is considered to increase with height.

Ice density of 56 pcf.

A wind speed of 40 mph is used in combination with ice.

Temperature drop of 50 °F.

Deflections calculated using a wind speed of 60 mph.

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	150.00-97.00	53.00	5.00	18	25.8831	36.1734	0.2188	0.8750	A572-65 (65 ksi)
L2	97.00-83.00	19.00	5.25	18	34.7652	38.4541	0.2500	1.0000	A572-65 (65 ksi)
L3	83.00-47.75	40.50	6.25	18	36.9348	44.7982	0.3125	1.2500	A572-65 (65 ksi)
L4	47.75-1.00	53.00		18	42.9597	53.2500	0.3750	1.5000	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in ²	I in ⁴	r in	C in	I/C in ³	J in ⁴	It/Q in ²	w in	w/t
L1	26.2487	17.8191	1482.8085	9.1109	13.1486	112.7728	2967.5681	8.9112	4.1704	19.065
L2	36.6977	24.9638	4077.1748	12.7639	18.3761	221.8736	8159.7145	12.4843	5.9815	27.344
L3	38.4914	36.3248	6155.0546	13.0009	18.7629	328.0441	12318.2083	18.1658	5.9505	19.042
L4	44.7968	50.6864	11612.7769	15.1176	21.8235	532.1220	23240.8341	25.3480	6.9009	18.402
	54.0136	62.9345	22229.3509	18.7706	27.0510	821.7571	44487.9518	31.4732	8.7120	23.232

tnxTower Michael Plahovinsak, P.E. 18301 State Route 161 Plain City, OH 43064 Phone: 614-398-6250 FAX: mike@mpeng.com	Job	150-ft Pole - MFP #23522-307	Page	2 of 6
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	Client	TP-21199	Designed by	JC

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals	Double Angle Stitch Bolt Spacing Redundants
ft	ft ²	in					in	in	in
L1 150.00-97.00				1	1	1			
L2 97.00-83.00				1	1	1			
L3 83.00-47.75				1	1	1			
L4 47.75-1.00				1	1	1			

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number		$C_A A_A$ ft ² /ft	Weight plf
1 5/8"	C	No	Yes	Inside Pole	146.00 - 1.00	18	No Ice	0.00	0.92
							1/2" Ice	0.00	0.92
							1" Ice	0.00	0.92
1 5/8"	C	No	Yes	Inside Pole	136.00 - 1.00	18	No Ice	0.00	0.92
							1/2" Ice	0.00	0.92
							1" Ice	0.00	0.92
1 5/8"	C	No	Yes	Inside Pole	126.00 - 1.00	18	No Ice	0.00	0.92
							1/2" Ice	0.00	0.92
							1" Ice	0.00	0.92
1 5/8"	C	No	Yes	Inside Pole	116.00 - 1.00	18	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_R ft ²	A_F ft ²	$C_A A_A$ In Face ft ²	$C_A A_A$ Out Face ft ²	Weight K
L1	150.00-97.00	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	2.24
L2	97.00-83.00	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	0.92
L3	83.00-47.75	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	2.33
L4	47.75-1.00	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	3.09

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft ²	A_F ft ²	$C_A A_A$ In Face ft ²	$C_A A_A$ Out Face ft ²	Weight K
L1	150.00-97.00	A	1.140	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	2.24
L2	97.00-83.00	A	1.105	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	0.92

tnxTower Michael Plahovinsak, P.E. 18301 State Route 161 Plain City, OH 43064 Phone: 614-398-6250 FAX: mike@mpeng.com	Job	150-ft Pole - MFP #23522-307	Page	3 of 6
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Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A _R ft ²	A _F ft ²	C _A A _A In Face ft ²	C _A A _A Out Face ft ²	Weight K
L3	83.00-47.75	A	1.070	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	2.33
L4	47.75-1.00	A	0.971	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	3.09

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _A A _A Front ft ²	C _A A _A Side ft ²	Weight K
Antennas + Mount (EPA 120 ft2 / 3,000 lbs)	C	None		0.0000	146.00	No Ice	120.00	3.00
						1/2" Ice	130.00	4.00
						1" Ice	140.00	5.00
Antennas + Mount (EPA 120 ft2 / 3,000 lbs)	C	None		0.0000	136.00	No Ice	120.00	3.00
						1/2" Ice	130.00	4.00
						1" Ice	140.00	5.00
Antennas + Mount (EPA 120 ft2 / 3,000 lbs)	C	None		0.0000	126.00	No Ice	120.00	3.00
						1/2" Ice	130.00	4.00
						1" Ice	140.00	5.00
Antennas + Mount (EPA 120 ft2 / 3,000 lbs)	C	None		0.0000	116.00	No Ice	120.00	3.00
						1/2" Ice	130.00	4.00
						1" Ice	140.00	5.00

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.0 Wind 0 deg - No Ice
3	0.9 Dead+1.0 Wind 0 deg - No Ice
4	1.2 Dead+1.0 Wind 90 deg - No Ice
5	0.9 Dead+1.0 Wind 90 deg - No Ice
6	1.2 Dead+1.0 Wind 180 deg - No Ice
7	0.9 Dead+1.0 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	150 - 97	Pole	Max Tension	2	0.00	0.00	-0.00
			Max. Compression	8	-32.32	0.00	0.00
			Max. Mx	4	-19.32	-634.60	0.00

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Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L2	97 - 83	Pole	Max. My	2	-19.32	0.00	634.60
			Max. Vy	4	22.42	-634.60	0.00
			Max. Vx	2	-22.42	0.00	634.60
			Max Tension	1	0.00	0.00	0.00
			Max. Compression	8	-36.31	0.00	0.00
			Max. Mx	4	-22.52	-950.78	0.00
L3	83 - 47.75	Pole	Max. My	2	-22.52	0.00	950.78
			Max. Vy	4	23.55	-950.78	0.00
			Max. Vx	2	-23.55	0.00	950.78
			Max Tension	1	0.00	0.00	0.00
			Max. Compression	8	-47.40	0.00	0.00
			Max. Mx	4	-31.92	-1804.36	0.00
L4	47.75 - 1	Pole	Max. My	2	-31.92	0.00	1804.36
			Max. Vy	4	26.20	-1804.36	0.00
			Max. Vx	2	-26.20	0.00	1804.36
			Max Tension	1	0.00	0.00	0.00
			Max. Compression	8	-68.51	0.00	0.00
			Max. Mx	4	-50.49	-3285.33	0.00
			Max. My	2	-50.49	0.00	3285.33
			Max. Vy	4	29.36	-3285.33	0.00
			Max. Vx	2	-29.36	0.00	3285.33

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	150 - 97	23.642	12	1.2996	0.0000
L2	102 - 83	11.297	12	1.0527	0.0000
L3	88.25 - 47.75	8.431	12	0.9157	0.0000
L4	54 - 1	3.109	12	0.5369	0.0000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
146.00	Antennas + Mount (EPA 120 ft2 / 3,000 lbs)	12	22.545	1.2863	0.0000	53560
136.00	Antennas + Mount (EPA 120 ft2 / 3,000 lbs)	12	19.821	1.2510	0.0000	19128
126.00	Antennas + Mount (EPA 120 ft2 / 3,000 lbs)	12	17.160	1.2090	0.0000	11158
116.00	Antennas + Mount (EPA 120 ft2 / 3,000 lbs)	12	14.606	1.1556	0.0000	7875

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	150 - 97	96.189	2	5.2935	0.0000
L2	102 - 83	45.967	2	4.2869	0.0000
L3	88.25 - 47.75	34.307	2	3.7287	0.0000

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Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L4	54 - 1	12.648	2	2.1852	0.0000

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
146.00	Antennas + Mount (EPA 120 ft2 / 3,000 lbs)	2	91.726	5.2392	0.0000	13341
136.00	Antennas + Mount (EPA 120 ft2 / 3,000 lbs)	2	80.644	5.0953	0.0000	4763
126.00	Antennas + Mount (EPA 120 ft2 / 3,000 lbs)	2	69.818	4.9242	0.0000	2776
116.00	Antennas + Mount (EPA 120 ft2 / 3,000 lbs)	2	59.430	4.7067	0.0000	1957

Pole Design Data

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio P _u φP _n
L1	150 - 97 (1)	TP36.1734x25.8831x0.2188	53.00	0.00	0.0	24.2898	-19.32	1420.95	0.014
L2	97 - 83 (2)	TP38.4541x34.7652x0.25	19.00	0.00	0.0	29.5062	-22.52	1726.11	0.013
L3	83 - 47.75 (3)	TP44.7982x36.9348x0.3125	40.50	0.00	0.0	42.9206	-31.92	2510.86	0.013
L4	47.75 - 1 (4)	TP53.25x42.9597x0.375	53.00	0.00	0.0	62.9345	-50.49	3681.67	0.014

Pole Bending Design Data

Section No.	Elevation ft	Size	M _{ux} kip-ft	φM _{nx} kip-ft	Ratio M _{ux} φM _{nx}	M _{uy} kip-ft	φM _{ny} kip-ft	Ratio M _{uy} φM _{ny}
L1	150 - 97 (1)	TP36.1734x25.8831x0.2188	634.60	1105.08	0.574	0.00	1105.08	0.000
L2	97 - 83 (2)	TP38.4541x34.7652x0.25	950.77	1473.28	0.645	0.00	1473.28	0.000
L3	83 - 47.75 (3)	TP44.7982x36.9348x0.3125	1804.36	2565.78	0.703	0.00	2565.78	0.000
L4	47.75 - 1 (4)	TP53.25x42.9597x0.375	3285.33	4565.42	0.720	0.00	4565.42	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V _u K	φV _n K	Ratio V _u φV _n	Actual T _u kip-ft	φT _n kip-ft	Ratio T _u φT _n
L1	150 - 97 (1)	TP36.1734x25.8831x0.2188	22.42	426.29	0.053	0.00	1306.02	0.000
L2	97 - 83 (2)	TP38.4541x34.7652x0.25	23.55	517.83	0.045	0.00	1686.30	0.000
L3	83 - 47.75 (3)	TP44.7982x36.9348x0.3125	26.20	753.26	0.035	0.00	2854.51	0.000
L4	47.75 - 1 (4)	TP53.25x42.9597x0.375	29.36	1104.50	0.027	0.00	5114.42	0.000

tnxTower Michael Plahovinsak, P.E. 18301 State Route 161 Plain City, OH 43064 Phone: 614-398-6250 FAX: mike@mfpeng.com	Job	150-ft Pole - MFP #23522-307	Page	6 of 6
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Pole Interaction Design Data

Section No.	Elevation ft	Ratio P_u	Ratio M_{ux}	Ratio M_{uy}	Ratio V_u	Ratio T_u	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	150 - 97 (1)	0.014	0.574	0.000	0.053	0.000	0.591 ✓	1.000	4.8.2 ✓
L2	97 - 83 (2)	0.013	0.645	0.000	0.045	0.000	0.660 ✓	1.000	4.8.2 ✓
L3	83 - 47.75 (3)	0.013	0.703	0.000	0.035	0.000	0.717 ✓	1.000	4.8.2 ✓
L4	47.75 - 1 (4)	0.014	0.720	0.000	0.027	0.000	0.734 ✓	1.000	4.8.2 ✓

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
L1	150 - 97	Pole	TP36.1734x25.8831x0.2188	1	-19.32	1420.95	59.1	Pass
L2	97 - 83	Pole	TP38.4541x34.7652x0.25	2	-22.52	1726.11	66.0	Pass
L3	83 - 47.75	Pole	TP44.7982x36.9348x0.3125	3	-31.92	2510.86	71.7	Pass
L4	47.75 - 1	Pole	TP53.25x42.9597x0.375	4	-50.49	3681.67	73.4	Pass
							Summary	
							Pole (L4)	Pass
							RATING = 73.4	Pass

Michael F. Plahovinsak, P.E. 18301 State Route 161 W Plain City, OH 43064 Phone: 614-398-6250 email: mike@mfpeng.com	Job 150-ft monopole - MFP #23522-307	Page BP & AB Calc
	Project NY0248 Chester DPW	Date 8/24/2022
	Client TAPP TP-21199	Designed by Mike

Anchor Rod and Base Plate Calculation

TIA-222-H

Factored Base Reactions:	Pole Shape:	Anchor Rods:	Base Plate:
Moment: 3285 ft-kips	18-Sided	(16) 2.25 in. A615 GR. 75	2 in. x 66.25 in. Round
Shear: 29 kips	Pole Dia. (D_f):	Anchor Rods Evenly Spaced	$f_y = 55$ ksi
Axial: 51 kips	53.25 in	On a 60.25 in Bolt Circle	

Anchor Rod Calculation According to TIA-222-H section 4.9.9

$$\begin{aligned}
\phi_t, \phi_v &= 0.75 \text{ TIA 4.9.6} \\
I_{\text{bolts}} &= 7260.13 \text{ in}^2 \text{ Momet of Inertia} \\
P_u &= 167 \text{ kips Compr Force} \\
V_u &= 1.8 \text{ kips Shear Force} \\
R_{nt} &= 325.00 \text{ kips Nominal Tensile Strength} \\
R_{nv} &= 198.80 \text{ kips (0.5 x } f_u \text{ x ag)} \\
\text{Stress Rating} &= \mathbf{69.7\%} \text{ Satisfies TIA-H 4.9.9}
\end{aligned}$$

Base Plate Calculation According to TIA-222-H

$$\begin{aligned}
\phi &= 0.90 \text{ TIA 4.7} \\
M_{PL} &= 354.7 \text{ in-kip Plate Moment} \\
L &= 10.5 \text{ in Section Length} \\
Z &= 10.5 \text{ Plastic Section Modulus} \\
M_P &= 575.1 \text{ in-kip Plastic Moment} \\
\phi M_n &= 517.6 \text{ in-kip Factored Resistance}
\end{aligned}$$

Calculated Moment vs Factored Resistance

$$354.65 \text{ in-kip} \leq 518 \text{ in-kip}$$

$$\text{Stress Rating} = \mathbf{68.5\%}$$

Anchor Rods Are Adequate	69.7% ☒
Base Plate is Adequate	68.5% ☒

Monopole Spread Footing Calculation

TIA-222-H

Factored Base Reactions:

Moment:	4331 ft-kips
Shear:	35 kips
Axial:	59 kips

Footing Dimensions:

27 ft x 27 ft	7 ft Square Pier
x 4 ft thick	w/6 in Reveal
Bearing 6 ft B.G.	112.5 Yd3 Concrete

Concrete:

$f'_c = 4500$ psi
Steel $f_y = 60$ ksi
$f = 0.75$

Soil Backfill	100 pcf	Ultimate Bearing:	6000 psf	Water Table	2.0
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Foundation Weight

Weight of Pole	59.0 kips
Weight of Concrete	455.775 kips
Weight of Soil	136 kips
Bouyancy of Water	-182.0 kips
Total	468.8 kips

Overturning Resistance:

Overturning Moment (M_u)	4558.5 ft-kips	$4331 \text{ ft-kips} + (35 \text{ kips} \times 6.5 \text{ ft})$
Resisting Moment (R_s)	6329.0241 ft-kips	$468.8166 \text{ kips} \times 27 \text{ ft} / 2$
$\phi \times R_s > M_u$	$M_{\text{overturning}} / f M_{\text{resist}}$	96.0% OK

Soil Bearing Pressure:

Eccentricity (e)	9.72 ft	$4558.5 \text{ ft-kips} / 468.8166 \text{ kips}$
$6(e)$	58.3 ft >	27.0 ft $6e > 27$
Maximum Soil Bearing	2851.7183 psf	Calculated across corners
Soil Overburden	-350.4 psf	Overburden - Bouyancy
Net Soil Bearing	2501.3183 psf	
Resisting Soil Bearing (R_s)	6000 psf	
Net Soil Bearing < $\phi \times R_s$	Net Bearing / $f R_s$	55.6% OK

Bending Moment in Pier:

Bending Moment	4418.5 ft-kips	$4331 \text{ ft-kips} + (35 \text{ kips} \times 2.5 \text{ ft})$
Min. Pier Steel	35.28 in ²	1/2% (Based on Square Pier)

Bending Moment in Footing:

Max Bending Moment	2920.5044 ft-kips	Σ Moments about pier face
Footing Steel Req'd (Loads)	0.80 in ² /ft	
Min. Footing Steel	1.04 in ² /ft	0.18%