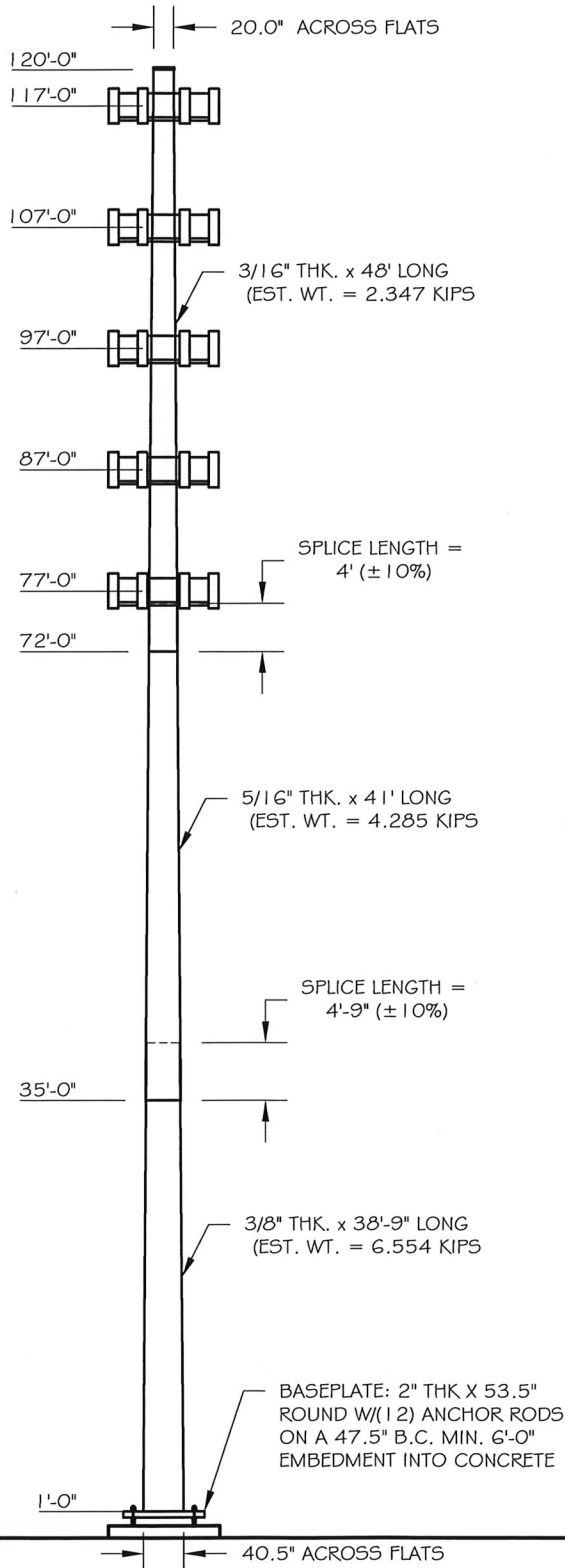




**TransAmerican
Power Products, Inc.**

2427 Kelly Lane
Houston, Texas 77066

PH: 281-444-8277 / FX: 281-444-7270



Page 1 of 2	Job Number: 23517-318
Eng: MFP	Customer Ref: TP-15525
	Date: 8/15/2017
Structure: 120-FT MONOPOLE	
Site: VA-112	
Location: HAMPTON, VA / 37°2'3.35", -76°2'11.5"	
Owner: SECTOR SITE	
Revision No.:	Revision Date:

DESIGN

Building Code: 2012 VIRGINIA UNIFORM STATEWIDE BUILDING CODE			
Design Standard: ANSI/TIA-222-G-2			
Wind Speed Load Cases: 3-SEC. GUSTED WIND SPEED			
Load Case #1: 90 MPH Design Wind Speed - V_{ASD} ($V_{ULT} = 116$ MPH)			
Load Case #2: 30 MPH Wind with 0.5" Ice Accumulation			
Load Case #3: 60 MPH Service Wind Speed			
Structure Class: II	Exposure Cat.: C	Topography Cat.: I	Crest Height:

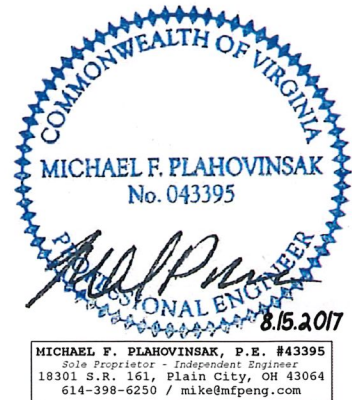
EQUIPMENT LIST

Elev.	Description
117	(12) ERICSSON AIR-32 ANTENNA + (12) RRU'S
117	12-FT PLATFORM WITH HANDRAIL
107	(12) ERICSSON AIR-32 ANTENNA + (12) RRU'S
107	12-FT PLATFORM WITH HANDRAIL
97	(12) ERICSSON AIR-32 ANTENNA + (12) RRU'S
97	12-FT PLATFORM WITH HANDRAIL
87	(12) ERICSSON AIR-32 ANTENNA + (12) RRU'S
87	12-FT PLATFORM WITH HANDRAIL
77	(12) ERICSSON AIR-32 ANTENNA + (12) RRU'S
77	12-FT PLATFORM WITH HANDRAIL

ANTENNA FEED LINES ROUTED ON THE INSIDE OF THE POLE

STRUCTURE PROPERTIES

Cross-Section: 18-Sided	Taper: 0.18067 in/ft				
Shaft Steel: ASTM A572 GR 65	Baseplate Steel: ASTM A572 GR 60				
Anchor Rods: 2.25 in. AG 15 GR. 75 X 7'-0" LONG					
Sect.	Length (ft)	Thickness (in)	Splice (ft)	Top Dia. (in)	Bot Dia. (in)
1	48.00	0.1875	4.00	20.00	28.67
2	41.00	0.3125	4.75	27.57	34.98
3	38.75	0.3750	0.00	33.50	40.50



BASE REACTIONS FOR FOUNDATION DESIGN

Moment:	2765 ft-kip
Shear:	30 kip
Axial:	49 kip

****NOTE: The subject property address is 332 Rip Rap Rd and is no longer 1012 Thomas Street.****



TransAmerican Power Products, Inc.

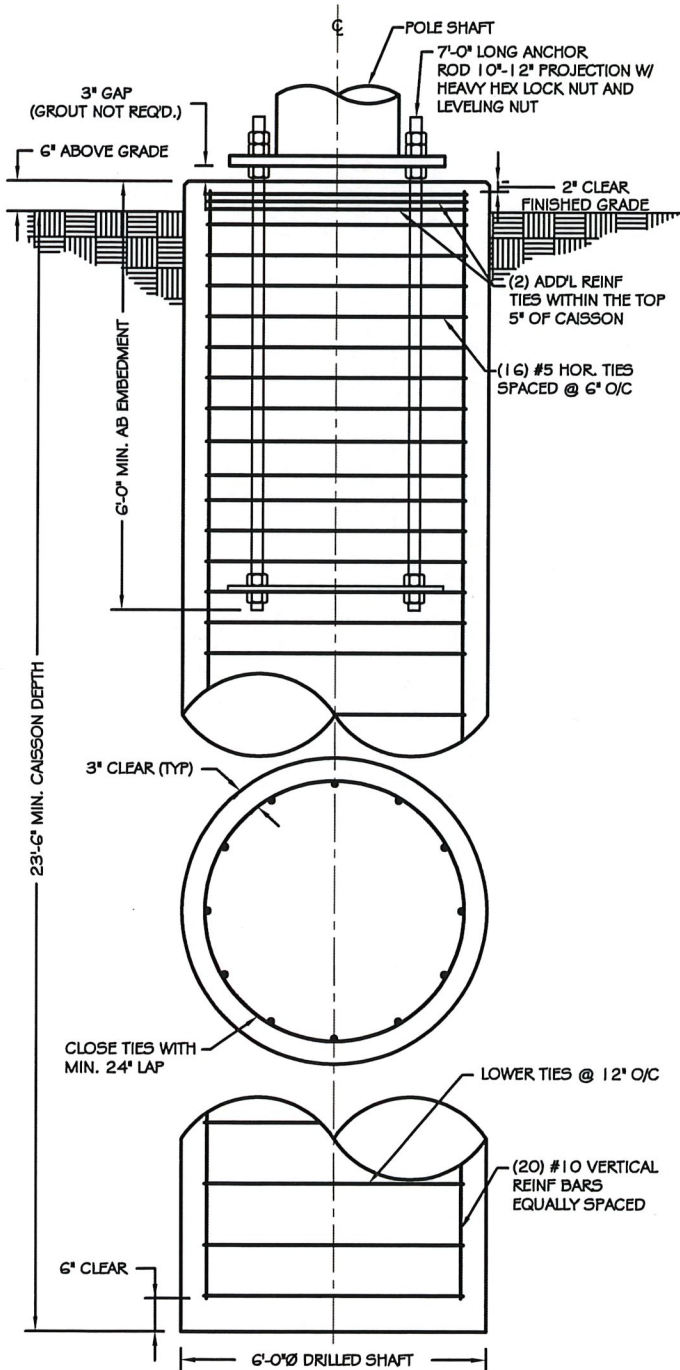
2427 Kelly Lane
Houston, Texas 77066

PH: 281-444-8277 / FX: 281-444-7270

Page 2 of 2	Job Number: 23517-318
Eng: MFP	Customer Ref: TP-15525
	Date: 8/15/2017
Structure: 1 20-FT MONOPOLE	
Site: VA-112	
Location: HAMPTON, VA / 37°2'3.35", -76°2'11.5.5"	
Owner: SECTOR SITE	
Revision No.:	Revision Date:

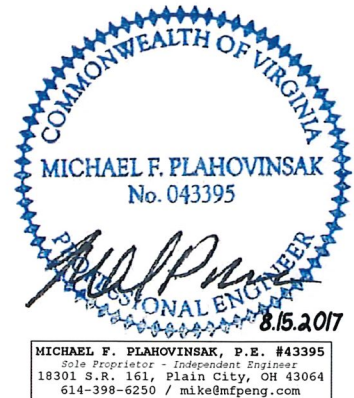
FOUNDATION NOTES:

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% ($\pm 1.5\%$). 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. CAISSON FOUNDATION INSTALLATION SHALL BE IN ACCORDANCE WITH ACI 336, "STANDARD SPECIFICATIONS FOR THE CONSTRUCTION OF DRILLED PIERS", LATEST EDITION.
4. 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.
5. FOUNDATION DESIGN IS BASED ON GEOTECHNICAL REPORT BY:
ENGINEER: ADVANTAGE ENGINEERS
REPORT NO.: 1700453.001 (DATED 8/2/17)
6. ESTIMATED CONCRETE VOLUME = 25 CUBIC YARDS.
7. THE FOUNDATION HAS BEEN DESIGNED TO RESIST THE FOLLOWING FACTORED LOADS:
MOMENT: 2765 FT*KIPS
SHEAR: 30 KIPS
AXIAL: 49 KIPS
8. GEOTECHNICAL REPORT INDICATES GROUNDWATER MAY BE ENCOUNTERED AT 3'-0" BELOW GRADE.



CAISSON FOUNDATION

NOT TO SCALE



tnxTower Michael F. Plahovinsak, P.E. 18301 State Route 161 Plain City, OH 43064 Phone: 614-398-6250 FAX: mike@mpeng.com	Job 120-ft Monopole - MFP #23517-318	Page 1 of 6
	Project VA-112	Date 07:03:46 08/15/17
	Client TAPP (TP-15525)	Designed by Mike

Tower Input Data

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

The following design criteria apply:

Tower is located in Hampton City County, Virginia.

Basic wind speed of 90 mph.

Structure Class II.

Exposure Category C.

Topographic Category 1.

Crest Height 0.00 ft.

Nominal ice thickness of 0.5000 in.

Ice thickness is considered to increase with height.

Ice density of 56 pcf.

A wind speed of 30 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, feedline 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	120.00-72.00	48.00	4.00	18	20.0000	28.6700	0.1875	0.7500	A572-65 (65 ksi)
L2	72.00-35.00	41.00	4.75	18	27.5725	34.9800	0.3125	1.2500	A572-65 (65 ksi)
L3	35.00-1.00	38.75		18	33.4968	40.5000	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	I _t /Q ₇ in ²	w in	w/t
L1	20.3085	11.7909	584.7409	7.0334	10.1600	57.5532	1170.2512	5.8966	3.1900	17.013
	29.1123	16.9506	1737.3206	10.1113	14.5644	119.2857	3476.9272	8.4769	4.7159	25.152
L2	28.7317	27.0385	2538.4695	9.6773	14.0068	181.2308	5080.2792	13.5218	4.3028	13.769
	35.5196	34.3858	5221.0995	12.3070	17.7698	293.8180	10449.0690	17.1962	5.6065	17.941
L3	34.8853	39.4232	5464.0917	11.7582	17.0164	321.1077	10935.3733	19.7154	5.2354	13.961
	41.1248	47.7588	9714.5072	14.2444	20.5740	472.1740	19441.7971	23.8839	6.4680	17.248

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Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	C _A A _A		Weight plf
						No Ice	1/2" Ice	
1 5/8"	C	No	Inside Pole	117.00 - 1.00	21	0.00	0.00	0.92
1 5/8"	C	No	Inside Pole	107.00 - 1.00	21	0.00	0.00	0.92
1 5/8"	C	No	Inside Pole	97.00 - 1.00	21	0.00	0.00	0.92
1 5/8"	C	No	Inside Pole	87.00 - 1.00	21	0.00	0.00	0.92
1 5/8"	C	No	Inside Pole	77.00 - 1.00	21	0.00	0.00	0.92

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment °	Placement ft	C _A A _A		Weight K	
			Horz Lateral ft	Vert ft			Front ft ²	Side ft ²		
(4) Ericsson AIR 32 w/ mount pipe	A	From Face	3.00 0.00 0.00	0.0000	0.0000	117.00	No Ice 1/2" Ice	6.42 6.88	5.70 6.42	0.13 0.18
(4) Ericsson AIR 32 w/ mount pipe	B	From Face	3.00 0.00 0.00	0.0000	0.0000	117.00	No Ice 1/2" Ice	6.42 6.88	5.70 6.42	0.13 0.18
(4) Ericsson AIR 32 w/ mount pipe	C	From Face	3.00 0.00 0.00	0.0000	0.0000	117.00	No Ice 1/2" Ice	6.42 6.88	5.70 6.42	0.13 0.18
(12) Ericsson RRUS-11 TIA-G	A	From Face	2.00 0.00 0.00	0.0000	0.0000	117.00	No Ice 1/2" Ice	2.19 2.47	0.80 0.99	0.04 0.06
12' Platform w/ Handrail	C	None			0.0000	117.00	No Ice 1/2" Ice	26.00 28.00	26.00 28.00	1.80 2.60
**										
(4) Ericsson AIR 32 w/ mount pipe	A	From Face	3.00 0.00 0.00	0.0000	0.0000	107.00	No Ice 1/2" Ice	6.42 6.88	5.70 6.42	0.13 0.18
(4) Ericsson AIR 32 w/ mount pipe	B	From Face	3.00 0.00 0.00	0.0000	0.0000	107.00	No Ice 1/2" Ice	6.42 6.88	5.70 6.42	0.13 0.18
(4) Ericsson AIR 32 w/ mount pipe	C	From Face	3.00 0.00 0.00	0.0000	0.0000	107.00	No Ice 1/2" Ice	6.42 6.88	5.70 6.42	0.13 0.18
(12) Ericsson RRUS-11 TIA-G	A	From Face	2.00 0.00 0.00	0.0000	0.0000	107.00	No Ice 1/2" Ice	2.19 2.47	0.80 0.99	0.04 0.06
12' Platform w/ Handrail	C	None			0.0000	107.00	No Ice 1/2" Ice	26.00 28.00	26.00 28.00	1.80 2.60
**										
(4) Ericsson AIR 32 w/ mount pipe	A	From Face	3.00 0.00 0.00	0.0000	0.0000	97.00	No Ice 1/2" Ice	6.42 6.88	5.70 6.42	0.13 0.18
(4) Ericsson AIR 32 w/ mount pipe	B	From Face	3.00 0.00 0.00	0.0000	0.0000	97.00	No Ice 1/2" Ice	6.42 6.88	5.70 6.42	0.13 0.18

tnxTower Michael F. Plahovinsak, P.E. 18301 State Route 161 Plain City, OH 43064 Phone: 614-398-6250 FAX: mike@mpeng.com	Job	120-ft Monopole - MFP #23517-318	Page	3 of 6
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Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _A A ₁ Front	C _A A ₁ Side	Weight	
			Horz	Lateral						°
(4) Ericsson AIR 32 w/ mount pipe	C	From Face	3.00	0.00	0.0000	97.00	No Ice 1/2" Ice	6.42 6.88	5.70 6.42	0.13 0.18
(12) Ericsson RRUS-11 TIA-G	A	From Face	2.00	0.00	0.0000	97.00	No Ice 1/2" Ice	2.19 2.47	0.80 0.99	0.04 0.06
12' Platform w/ Handrail	C	None			0.0000	97.00	No Ice 1/2" Ice	26.00 28.00	26.00 28.00	1.80 2.60
**										
(4) Ericsson AIR 32 w/ mount pipe	A	From Face	3.00	0.00	0.0000	87.00	No Ice 1/2" Ice	6.42 6.88	5.70 6.42	0.13 0.18
(4) Ericsson AIR 32 w/ mount pipe	B	From Face	3.00	0.00	0.0000	87.00	No Ice 1/2" Ice	6.42 6.88	5.70 6.42	0.13 0.18
(4) Ericsson AIR 32 w/ mount pipe	C	From Face	3.00	0.00	0.0000	87.00	No Ice 1/2" Ice	6.42 6.88	5.70 6.42	0.13 0.18
(12) Ericsson RRUS-11 TIA-G	A	From Face	2.00	0.00	0.0000	87.00	No Ice 1/2" Ice	2.19 2.47	0.80 0.99	0.04 0.06
12' Platform w/ Handrail	C	None			0.0000	87.00	No Ice 1/2" Ice	26.00 28.00	26.00 28.00	1.80 2.60
**										
(4) Ericsson AIR 32 w/ mount pipe	A	From Face	3.00	0.00	0.0000	77.00	No Ice 1/2" Ice	6.42 6.88	5.70 6.42	0.13 0.18
(4) Ericsson AIR 32 w/ mount pipe	B	From Face	3.00	0.00	0.0000	77.00	No Ice 1/2" Ice	6.42 6.88	5.70 6.42	0.13 0.18
(4) Ericsson AIR 32 w/ mount pipe	C	From Face	3.00	0.00	0.0000	77.00	No Ice 1/2" Ice	6.42 6.88	5.70 6.42	0.13 0.18
(12) Ericsson RRUS-11 TIA-G	A	From Face	2.00	0.00	0.0000	77.00	No Ice 1/2" Ice	2.19 2.47	0.80 0.99	0.04 0.06
12' Platform w/ Handrail	C	None			0.0000	77.00	No Ice 1/2" Ice	26.00 28.00	26.00 28.00	1.80 2.60
**										

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
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

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Comb. No.	Description
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 - 72	Pole	Max Tension	6	0.00	-0.00	0.00
			Max. Compression	8	-48.79	15.52	8.96
			Max. Mx	4	-25.77	-591.04	-25.47
			Max. My	2	-26.05	39.28	570.43
			Max. Vy	4	27.62	-591.04	-25.47
			Max. Vx	2	-26.04	39.28	570.43
			Max. Torque	7			-4.22
L2	72 - 35	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	8	-59.19	17.06	9.85
			Max. Mx	4	-35.77	-1621.56	-75.22
			Max. My	2	-35.92	90.10	1544.26
			Max. Vy	4	29.09	-1621.56	-75.22
			Max. Vx	2	-27.54	90.10	1544.26
			Max. Torque	7			-4.21
L3	35 - 1	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	8	-73.15	17.53	10.12
			Max. Mx	4	-49.31	-2764.68	-125.98
			Max. My	2	-49.31	141.15	2629.07
			Max. Vy	4	29.68	-2552.72	-116.90
			Max. Vx	2	-28.21	136.63	2528.32
			Max. Torque	7			-4.19

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	120 - 72	28.344	13	1.9396	0.0121
L2	76 - 35	11.775	13	1.4604	0.0056
L3	39.75 - 1	3.161	13	0.7434	0.0019

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
117.00	(4) Ericsson AIR 32 w/ mount pipe	13	27.126	1.9127	0.0116	25391
107.00	(4) Ericsson AIR 32 w/ mount pipe	13	23.100	1.8277	0.0100	9765
97.00	(4) Ericsson AIR 32 w/ mount pipe	13	19.192	1.7321	0.0085	5519
87.00	(4) Ericsson AIR 32 w/ mount pipe	13	15.494	1.6177	0.0071	3846
77.00	(4) Ericsson AIR 32 w/ mount pipe	13	12.095	1.4763	0.0057	2972

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Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	120 - 72	117.515	4	8.1169	0.0490
L2	76 - 35	48.574	4	6.0549	0.0225
L3	39.75 - 1	13.002	4	3.0628	0.0076

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
117.00	(4) Ericsson AIR 32 w/ mount pipe	4	112.443	8.0079	0.0471	6402
107.00	(4) Ericsson AIR 32 w/ mount pipe	4	95.668	7.6334	0.0407	2460
97.00	(4) Ericsson AIR 32 w/ mount pipe	4	79.396	7.2161	0.0345	1387
87.00	(4) Ericsson AIR 32 w/ mount pipe	4	64.011	6.7233	0.0285	964
77.00	(4) Ericsson AIR 32 w/ mount pipe	4	49.900	6.1223	0.0230	741

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 $\frac{P_u}{\phi P_n}$
L1	120 - 72 (1)	TP28.67x20x0.1875	48.00	0.00	0.0	16.5207	-25.77	1079.69	0.024
L2	72 - 35 (2)	TP34.98x27.5725x0.3125	41.00	0.00	0.0	33.5346	-35.77	2440.68	0.015
L3	35 - 1 (3)	TP40.5x33.4968x0.375	38.75	0.00	0.0	47.7588	-49.31	3486.51	0.014

Pole Bending Design Data

Section No.	Elevation ft	Size	M _{ux} kip-ft	φM _{ux} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{ux}}$	M _{uy} kip-ft	φM _{uy} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{uy}}$
L1	120 - 72 (1)	TP28.67x20x0.1875	591.59	617.01	0.959	0.00	617.01	0.000
L2	72 - 35 (2)	TP34.98x27.5725x0.3125	1623.31	1694.51	0.958	0.00	1694.51	0.000
L3	35 - 1 (3)	TP40.5x33.4968x0.375	2767.55	2872.48	0.963	0.00	2872.48	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V _u K	φV _n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T _u kip-ft	φT _n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	120 - 72 (1)	TP28.67x20x0.1875	27.65	539.85	0.051	2.41	1235.52	0.002
L2	72 - 35 (2)	TP34.98x27.5725x0.3125	29.12	1220.34	0.024	2.39	3393.16	0.001
L3	35 - 1 (3)	TP40.5x33.4968x0.375	29.69	1743.25	0.017	2.38	5752.00	0.000

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Pole Interaction Design Data

Section No.	Elevation ft	Ratio	Ratio	Ratio	Ratio	Ratio	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
		P_u	M_{ux}	M_{uy}	V_u	T_u			
L1	120 - 72 (1)	0.024	0.959	0.000	0.051	0.002	0.985	1.000	4.8.2 ✓
L2	72 - 35 (2)	0.015	0.958	0.000	0.024	0.001	0.973	1.000	4.8.2 ✓
L3	35 - 1 (3)	0.014	0.963	0.000	0.017	0.000	0.978	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	120 - 72	Pole	TP28.67x20x0.1875	1	-25.77	1079.69	98.5	Pass	
L2	72 - 35	Pole	TP34.98x27.5725x0.3125	2	-35.77	2440.68	97.3	Pass	
L3	35 - 1	Pole	TP40.5x33.4968x0.375	3	-49.31	3486.51	97.8	Pass	
							Summary		
							Pole (L1)	98.5	Pass
							RATING =	98.5	Pass

Michael F. Plahovinsak, P.E. 18301 State Route 161 W Plain City, OH 43064 Phone: 614-398-6250 email: mike@mfpeng.com	Job 120-ft monopole - MFP #23517-318	Page BP-G
	Project VA-112	Date 8/15/2017
	Client TAPP TP-15525	Designed by Mike

Anchor Rod and Base Plate Calculation

ANSI/TIA-222-G-2

Factored Base Reactions:	Pole Shape:	Anchor Rods:	Base Plate:
Moment: 2765 ft-kips	18-Sided	(12) 2.25 in. A615 GR. 75	2 in. x 53.5 in. Round
Shear: 30 kips	Pole Dia. (D_p): 40.50 in	Anchor Rods Evenly Spaced	f _y = 60 ksi
Axial: 49 kips		On a 47.5 in Bolt Circle	

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

- $\phi = 0.80$ TIA 4.9.9
- $I_{bolts} = 3384.38 \text{ in}^2$ Momet of Inertia
- $P_u = 233 \text{ kips}$ Tension Force
- $V_u = 3 \text{ kips}$ Shear Force
- $R_{nt} = 325.00 \text{ kips}$ Nominal Tensile Strength
- $\eta = 0.50$ for detail type (d)

The following Interaction Equation Shall Be Satisfied:

$$\left(\frac{P_u + \frac{V_u}{\eta}}{\phi R_{nt}} \right) \leq 1.0$$

$$0.915 \leq 1$$

Base Plate Calculation According to TIA-222-G

- $\phi = 0.90$ TIA 4.7
- $M_{PL} = 562.7 \text{ in-kip}$ Plate Moment
- $L = 10.6 \text{ in}$ Section Length
- $Z = 10.6$ Plastic Section Modulus
- $M_p = 636.2 \text{ in-kip}$ Plastic Moment
- $\phi M_n = 572.6 \text{ in-kip}$ Factored Resistance

Calculated Moment vs Factored Resistance

$$562.70 \text{ in-kip} \leq 573 \text{ in-kip}$$

Anchor Rods Are Adequate	91.5% <input checked="" type="checkbox"/>
Base Plate is Adequate	98.3% <input checked="" type="checkbox"/>

Michael F. Plahovinsak, P.E. 18301 State Route 161 W Plain City, OH 43064 Phone: 614-398-6250 email: mike@mjpeng.com	Job	120-ft monopole - MFP #23517-318	Page	FND
	Project	VA-112	Date	8/15/2017
	Client	TAPP TP-15525	Designed by	Mike

Caisson Calculation

According to ANSI/TIA-222-G-2

1. Foundation overturning resistance calculated with PLS Caisson, for Brom's method for rigid piles. Soil layers modeled after recommendations from the geotechnical report.
2. Cohesion strength for the upper 18 ft has been reduced by 50%
3. In lieu of a soil resistance factor $f_s = 0.75$ (TIA-9.4.1) an additional safety factor against soil failure of 1.33 has been applied.
4. Foundation is designed with a minimum safety factor resisting overturning of 2.0
5. Foundation has been designed with factored loads per TIA-222-G.
6. Design water table = 3 ft below grade

*** PIER PROPERTIES CONCRETE STRENGTH (ksi) = 4.00 STEEL STRENGTH (ksi) = 60.00

DIAMETER (ft) = 6.000 DISTANCE FROM TOP OF PIER TO GROUND LEVEL (ft) = 0.50

*** SOIL PROPERTIES	LAYER	TYPE	THICKNESS (ft)	DEPTH AT TOP OF LAYER (ft)	DENSITY (pcf)	CU (psf)	KP	PHI (degrees)
	1	S	4.00	0.00	100.0		1.000	-0.00
	2	S	3.00	4.00	57.6		3.000	30.00
	3	S	6.00	7.00	57.6		3.000	30.00
	4	S	30.00	13.00	57.6		2.770	28.00

*** DESIGN (FACTORED) LOADS AT TOP OF PIER MOMENT (ft-k) = 2765.0 VERTICAL (k) = 49.0 SHEAR (k) = 30.0
 ADDITIONAL SAFETY FACTOR AGAINST SOIL FAILURE = 1.33

*** CALCULATED PIER LENGTH (ft) = 24.000

*** CHECK OF SOILS PROPERTIES AND ULTIMATE RESISTING FORCES ALONG PIER

TYPE	TOP OF LAYER BELOW TOP OF PIER (ft)	THICKNESS (ft)	DENSITY (pcf)	CU (psf)	KP	FORCE (k)	ARM (ft)
S	0.50	4.00	100.0		1.000	14.40	3.17
S	4.50	3.00	57.6		3.000	78.80	6.09
S	7.50	6.00	57.6		3.000	241.57	10.73
S	13.50	3.40	57.6		2.770	172.46	15.26
S	16.90	7.10	57.6		2.770	-466.66	20.63

*** SHEAR AND MOMENTS ALONG PIER

DISTANCE BELOW TOP OF PIER (ft)	WITH THE ADDITIONAL SAFETY FACTOR		WITHOUT ADDITIONAL SAFETY FACTOR	
	SHEAR (k)	MOMENT (ft-k)	SHEAR (k)	MOMENT (ft-k)
0.00	40.6	3880.4	30.4	2910.3
2.40	37.3	3975.8	28.0	2981.8
4.80	19.6	4050.7	14.7	3038.0
7.20	-43.5	4025.6	-32.6	3019.2
9.60	-124.4	3827.6	-93.3	2870.7
12.00	-223.3	3413.9	-167.5	2560.5
14.40	-336.6	2743.0	-252.4	2057.3
16.80	-460.9	1789.3	-345.7	1342.0
19.20	-331.5	822.0	-248.6	616.5
21.60	-174.0	212.1	-130.5	159.1
24.00	-0.0	0.0	-0.0	0.0

*** TOTAL REINFORCEMENT PCT = 0.58 REINFORCEMENT AREA (in²) = 23.61
 *** USABLE AXIAL CAP. (k) = 49.0 USABLE MOMENT CAP. (ft-k) = 3124.6

For Design:

6-ft Diameter caisson x 24-ft long (23.5-ft Embedded with 0.5-ft above grade)
 Concrete strength = 4000 PSI @ 28 days. Estimated Concrete Volume = 25 CY3.
 (20) #10 Vertical Rebar. Steel Cross-Section = 25.4 in²