

December 9, 2015

VIA FIRST CLASS AND ELECTRONIC MAIL

Attorney Melanie Bachman
Acting Executive Director
Connecticut Siting Council
Ten Franklin Square
New Britain, CT 06051

**Re: *Docket No. 458: Florida Tower Partners LLC d/b/a North Atlantic Towers
Application for a Certificate of Environmental Compatibility and Public Need for
the construction, maintenance, and operation, of a telecommunications facility at
one of two locations at Bethel Tax Assessor's Map 65, Block 57, Lot 122,
62-64 Codfish Hill Road, Bethel, Connecticut.
D&M Supplemental Filing***

Dear Attorney Bachman,

As contemplated by paragraph 1 of the Council's Decision and Order dated September 17, 2015, enclosed please find the tower design specifications for the potential future expansion of this facility.

Please contact me if you have any questions.

Very truly yours,


Julie D. Kohler, Esq.

JDK/lcc
Enclosure

cc: Service List
Town of Bethel, First Selectman Matthew Knickerbocker
Brett Buggeln, North Atlantic Towers (w/o enclosure)
Todd Bowman, North Atlantic Towers (w/o enclosure)
Keith Coppins, Phoenix Partnership (w/o enclosure)



**TransAmerican
Power Products, Inc.**

2427 Kelly Lane
Houston, Texas 77069

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

Page 1 of 2	Job Number: 23515-0638
Emp: MFP	Customer Ref: TP-3840
	Date: 10/23/2015
Structure:	50-FT POLE (TOT. 170-FT)
Site:	CT1155 BETE
Location:	FAIRFIELD CO., CT 06424 31°, 73°22'50"
Owner:	TARFON TOWERS
Revision No:	Revision Date:

DESIGN

Building Code: 2006-2015 INTERNATIONAL BUILDING CODE

Design Standard: ANSI/TIA-222-G-2

Wind Speed Load Cases: 3-SEC GUSTED WIND SPEED

Load Case #1: 100 MPH Design Wind Speed

Load Case #2: 50 MPH Wind with 0.75" ice Accumulation

Load Case #3: 80 MPH Service Wind Speed

Structure Class	Exposure Cat.	Topography Cat.	Gust Height
I	C	3	100'

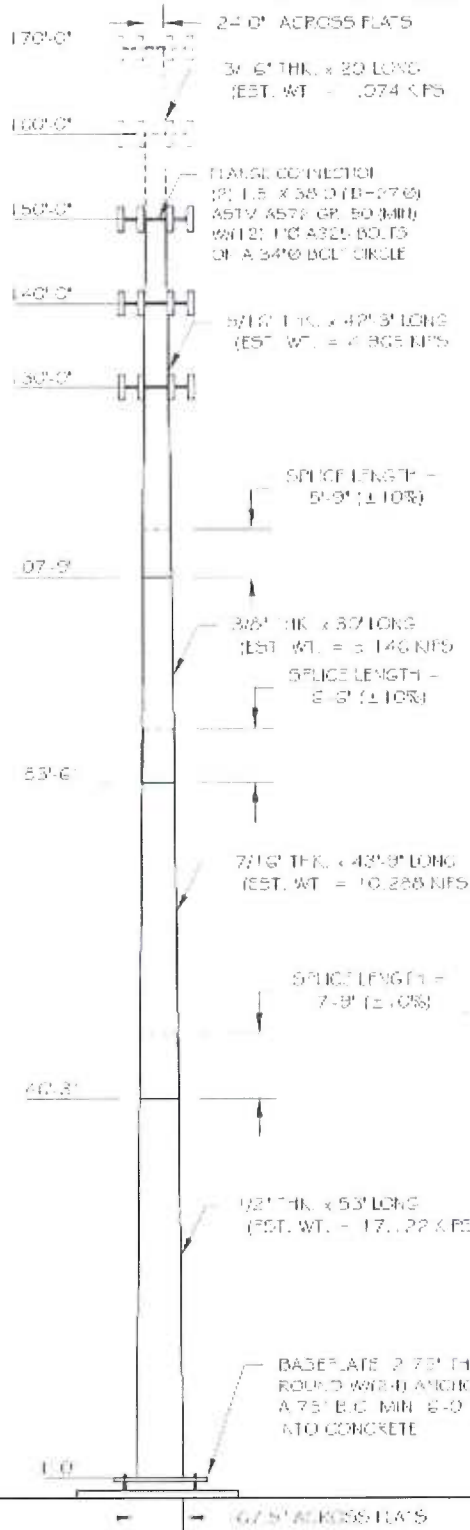
EQUIPMENT LIST

Elev.	Description
170	(12) 1PA-65K-BUJFB PANEL + (20) KRYDARCAP
170	12-FT LOW PROFILE PLATFORM
160	(8) 800-0736 + (6) 6WXG3X150X PANEL + (13) ENIRAYCAP
160	12-FT LOW PROFILE PLATFORM
150	(8) 800-10736 + (6) 6WXG3X150X PANEL + (13) ENIRAYCAP
150	12-FT LOW PROFILE PLATFORM
140	(3) 58V-FH-125555C + (9) KRC-118-054 + (18) KAYCAPBRU
140	12-FT LOW PROFILE PLATFORM
130	(3) 58V-FH-125555C + (9) KRC-118-054 + (18) KAYCAPBRU
130	12-FT LOW PROFILE PLATFORM

ANTENNA FEED LINES ROUTED ON THE NOSE OF THE POLE

STRUCTURE PROPERTIES

Cross-Section:	18-SIDED	Taper:	0.27071 in/ft.		
Shaft Steel:	A57M A572 GR 65	Base and Steel:	A57M A372 GR 60		
Anchor Rods:	2.25 in. A615 GR 75 X 7'-0" LONG				
Sect.	Length (ft)	Thickness (in)	Splice (ft)	Top Dia (in)	Bot Dia (in)
1	20.00	0.875	0.00	24.00	28.4
2	42.25	0.875	4.75	29.4	40.65
3	30.00	0.8750	6.50	35.67	46.79
4	65.75	0.875	7.75	44.26	56.13
5	33.00	0.5000	0.00	53.16	67.50



MICHAEL F. PLANCHOVINSAK, P.E. #25849
1001 E. 164th Street, 2nd Floor, CT 06444
401-353-2227, kplanchov@comcast.net

BASE REACTIONS FOR FOUNDATION DESIGN

Moment:	9425 ft-kip
Shear:	76 kip
Axial:	82 kip



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

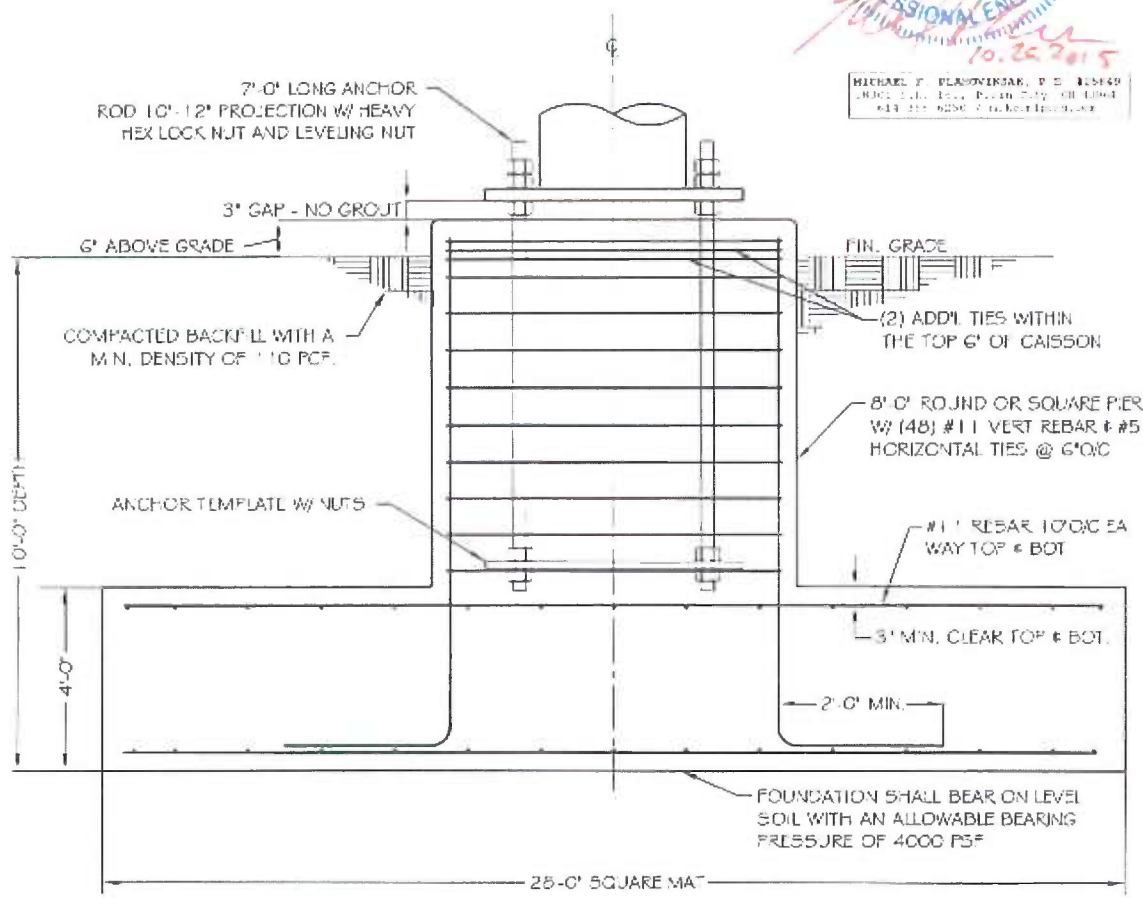
Page 2 of 2	Job Number: 235 5-0638
Fig. MTP	Customer Ref: TP 13840
	Date: 06/25/2015
Structure: 150-FT TOWER (HUT - 70-FT)	
Site: C11155 BETHEL	
Location: FARRELL CO., CT 741 22°51' - 75°22'56"	
Owner: CARPONY TOWERS	
Revision No:	Revision Date:

FOUNDATION NOTES

1. ALL FOUNDATION CONCRETE SHALL USE 15% CEMENT AND ATTAIN A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI AT 28 DAYS. CONCRETE SHALL HAVE A MAXIMUM WATER/CEMENT RATIO OF 0.45 AND SHALL BE AIR ENTRAINED @ 6% AIR. ALL CONCRETE CONSTRUCTION SHALL BE IN ACCORDANCE WITH ACI 318, THE BUILDING CODE REGULATIONS FOR REINFORCED CONCRETE (LATEST EDITION).
2. ALL REINFORCING STEEL SHALL CONFORM TO ASTM A615 VERTICAL BARS SHALL BE GRADE 60 AND TIES OR SPICERS SHALL BE A MINIMUM OF GRADE 40. THE PLACEMENT OF ALL REINFORCEMENT SHALL CONFORM TO ACI 318, '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: DR. CLARENCE WELT
REPORT NO.: N/A (DATED 06/15)
5. ESTIMATED CONCRETE VOLUME = 132 CUBIC YARDS.
6. THE FOUNDATION HAS BEEN DESIGNED TO RESIST THE FOLLOWING FACTORED LOADS:
MOVENT: 9425 FT-KIPS
SHEAR: 70 KIPS
AXIAL: 82 KIPS



MICHAEL F. PLACHOVINSKI, P.E. #25849
3000 E. Hill Road, Plainville, CT 06064
813.237.6250 / michael@plachovinski.com



SPREAD FOOTING

tnxTower Michael F. Plahovinsak, P.E. 18201 State Route 161 Plainville, CT 06064 Phone: 614-398-6250 FAX: mika@tnxeng.com	Job 150-ft Pole (Fut. 170-ft) - MFP #23515-638 r1	Page 1 of 8
	Project CT1155 Bethel	Date 07:32:46 10/25/15
	Client TAPP (TP-13840)	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 Fairfield County, Connecticut.

Basic wind speed of 100 mph.

Structure Class II.

Exposure Category C.

Topographic Category 3.

Crest Height 100.00 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.

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 Stakes	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	170.00-150.00	20.00	0.00	18	24.0000	29.4100	0.1875	0.7500	A572-65 (65 ksi)
L2	150.00-127.75	22.25	5.75	18	29.4100	40.8500	0.3125	1.2500	A572-65 (65 ksi)
L3	107.75-83.50	24.25	6.50	18	38.6681	46.7900	0.3750	1.5000	A572-65 (65 ksi)
L4	83.50-46.25	37.25	7.75	18	44.2803	56.1300	0.4375	1.7500	A572-65 (65 ksi)
L5	46.25-1.00	45.25		18	53.1559	67.5000	0.5000	2.0000	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in ²	I in ⁴	r in	C in	IC in ⁵	J in ⁶	I/Q in ³	w in	w/L
L1	24.3702	14.1714	1015.2211	8.4534	12.1920	83.2694	2031.7780	7.0871	3.8940	20.768
	29.8637	17.3910	1876.2804	10.3740	14.9403	125.8854	3755.0297	8.6972	4.8462	25.846
L2	29.8637	28.8611	3087.1763	16.3296	14.9403	206.6344	6178.4147	14.4333	4.6262	14.804
	41.4802	46.2081	8347.6701	14.1908	20.7518	402.2625	16706.3244	20.1079	6.6396	21.247
L3	40.8453	45.5783	8443.7708	13.5940	19.6434	429.8532	16898.6521	22.7935	6.1456	16.388
	47.5118	55.2455	15036.6266	15.4771	21.3693	632.6069	30093.0588	27.6280	7.5750	20.2
L4	46.7510	60.8811	14784.8115	15.5642	22.4944	657.2673	29589.0772	30.4464	7.0233	18.055
	56.9959	77.3360	30304.8801	19.7708	28.5140	1062.8056	60649.6362	38.6753	9.1989	20.82
L5	56.1658	82.5649	29272.2107	18.6928	27.0032	1054.0276	58582.9385	41.7904	8.4754	16.951
	68.5413	106.3290	60300.9815	23.7850	34.2906	1758.6171	120685.311	53.1746	11.0000	22

tnxTower Michael F. Plahovinsak, P.E. 18301 State Route 161 Plain City, OH 43064 Phone: 614-398-6250 FAX: mkeid@mfpeng.com	Job 150-ft Pole (Fut. 170-ft) - MFP #23515-638 r1	Page 2 of 8
	Project CT1155 Bethel	Date 07:32:46 10/25/15
	Client TAPP (TP-13840)	Designed by Mike

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	C _u A ₁		Weight #/ft
						#	ft	
1 5/8"	C	No	Inside Pole	170.00 - 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	Inside Pole	160.00 - 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	Inside Pole	150.00 - 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	Inside Pole	140.00 - 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	Inside Pole	130.00 - 1.00	18	No Ice	0.00	0.92
						1/2" Ice	0.00	0.92
						1" Ice	0.00	0.92

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement ft	C _u A ₁		Weight K
			Horiz	Lateral			Front	Side	
			Vert	"	"	ft ²	ft ²		
(4) CCI HPA-65R-BULU-H8 w/ mount pipe	A	From Face	3.00	0.0000	170.00	No Ice	13.62	9.18	0.10
			0.00			1/2" Ice	14.35	10.58	0.19
			0.00			1" Ice	15.09	11.83	0.29
(4) CCI HPA-65R-BULU-H8 w/ mount pipe	B	From Face	3.00	0.0000	170.00	No Ice	13.62	9.18	0.10
			0.00			1/2" Ice	14.35	10.58	0.19
			0.00			1" Ice	15.09	11.83	0.29
(4) CCI HPA-65R-BULU-H8 w/ mount pipe	C	From Face	3.00	0.0000	170.00	No Ice	13.62	9.18	0.10
			0.00			1/2" Ice	14.35	10.58	0.19
			0.00			1" Ice	15.09	11.83	0.29
(5) Ericsson RRUS-11	A	From Face	2.00	0.0000	170.00	No Ice	2.94	1.52	0.05
			0.00			1/2" Ice	3.17	1.69	0.08
			0.00			1" Ice	3.41	1.88	0.10
(6) Ericsson RRUS-13	B	From Face	2.00	0.0000	170.00	No Ice	3.67	1.46	0.06
			0.00			1/2" Ice	3.92	1.64	0.08
			0.00			1" Ice	4.19	1.84	0.11
(3) Ericsson RRUS-32	C	From Face	2.00	0.0000	170.00	No Ice	3.87	2.76	0.08
			0.00			1/2" Ice	4.15	3.02	0.10
			0.00			1" Ice	4.44	3.29	0.14
(6) Ericsson RRUS-A2	A	From Face	2.00	0.0000	170.00	No Ice	1.87	0.50	0.03
			0.00			1/2" Ice	2.05	0.62	0.04
			0.00			1" Ice	2.24	0.75	0.05
(3) Ericsson RRUS-42	B	From Face	2.00	0.0000	170.00	No Ice	3.67	1.49	0.06
			0.00			1/2" Ice	3.93	1.67	0.08
			0.00			1" Ice	4.19	1.87	0.11
(4) Raycap DC6 48-60-18-8F Suppressor	C	From Face	2.00	0.0000	170.00	No Ice	1.47	1.47	0.05
			0.00			1/2" Ice	1.67	1.67	0.05
			0.00			1" Ice	1.88	1.88	0.07
(2) Low Profile Platform (MT-196)	C	None		0.0000	170.00	No Ice	10.40	10.40	0.91
						1/2" Ice	10.70	10.70	1.20
						1" Ice	11.00	11.00	1.47

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tnxTower Michael F. Plahovinsuk, P.E. 18301 State Route 164 Plain City, OH 43064 Phone: 614-398-6250 FAX: mikes@tnxeng.com	Job	150-ft Pole (Fut. 170-ft) - MFP #23515-638 r1	Page	3 of 8
	Project	CT1155 Bethel	Date	07:32:46 10/25/15
	Client	TAPP (TP-13840)	Designed by	Mike

Description	Face or Leg	Offset Type	Offsets		Azimuth Adjustment	Placement	Cpl. Front	C ₁ /A ₁ Side	Weight
			Horz	Vert					
			ft	ft	°	ft	ft	K	
(2) Kathrein 800-10736 w/ mount pipe	A	From Face	3.00	0.0000	150.00	No Ice	17.39	7.07	0.07
			0.00			1/2" Ice	12.01	8.47	0.14
			0.00			1" Ice	17.61	9.72	0.23
			0.00			1/2" Ice	9.65	8.42	0.15
(2) Antel WWX063x19x00 w/ mount pipe	A	From Face	3.00	0.0000	160.00	No Ice	9.00	7.22	0.09
			0.00			1/2" Ice	9.65	8.42	0.15
			0.00			1" Ice	10.27	9.33	0.23
			0.00			1/2" Ice	9.65	8.42	0.15
(2) Kathrein 800-10736 w/ mount pipe	B	From Face	3.00	0.0000	160.00	No Ice	11.39	7.07	0.07
			0.00			1/2" Ice	12.01	8.47	0.14
			0.00			1" Ice	12.63	9.72	0.23
			0.00			1/2" Ice	9.65	8.42	0.15
(2) Antel WWX063x19x00 w/ mount pipe	B	From Face	3.00	0.0000	160.00	No Ice	9.00	7.22	0.09
			0.00			1/2" Ice	9.65	8.42	0.15
			0.00			1" Ice	10.27	9.33	0.23
			0.00			1/2" Ice	9.65	8.42	0.15
(2) Kathrein 800-10736 w/ mount pipe	C	From Face	3.00	0.0000	160.00	No Ice	11.39	7.07	0.07
			0.00			1/2" Ice	12.01	8.47	0.14
			0.00			1" Ice	12.63	9.72	0.23
			0.00			1/2" Ice	9.65	8.42	0.15
(2) Antel WWX063x19x00 w/ mount pipe	C	From Face	3.00	0.0000	160.00	No Ice	9.00	7.22	0.09
			0.00			1/2" Ice	9.65	8.42	0.15
			0.00			1" Ice	10.27	9.33	0.23
			0.00			1/2" Ice	9.65	8.42	0.15
(12) Lucent RRH2x00-850 Band 5	A	From Face	2.00	0.0000	160.00	No Ice	3.77	2.02	0.06
			0.00			1/2" Ice	4.08	2.30	0.08
			0.00			1" Ice	4.40	2.59	0.10
			0.00			1/2" Ice	3.93	2.56	0.03
Raycap DB-B1-6C-12As-0Z Box	B	From Face	2.00	0.0000	160.00	No Ice	3.93	2.56	0.03
			0.00			1/2" Ice	4.20	2.79	0.06
			0.00			1" Ice	4.48	3.04	0.09
			0.00			1/2" Ice	4.20	2.79	0.06
12' Low Profile Platform (MT-196)	C	None		0.0000	160.00	No Ice	10.40	10.40	0.91
						1/2" Ice	10.70	10.70	1.20
						1" Ice	11.00	11.00	1.47
						1/2" Ice	10.70	10.70	1.20
**									
(2) Kathrein 800-10736 w/ mount pipe	A	From Face	3.00	0.0000	150.00	No Ice	11.39	7.07	0.07
			0.00			1/2" Ice	12.01	8.47	0.14
			0.00			1" Ice	12.63	9.72	0.23
			0.00			1/2" Ice	9.65	8.42	0.15
(2) Antel WWX063x19x00 w/ mount pipe	A	From Face	3.00	0.0000	150.00	No Ice	9.00	7.22	0.09
			0.00			1/2" Ice	9.65	8.42	0.15
			0.00			1" Ice	10.27	9.33	0.23
			0.00			1/2" Ice	9.65	8.42	0.15
(2) Kathrein 800-10736 w/ mount pipe	B	From Face	3.00	0.0000	150.00	No Ice	11.39	7.07	0.07
			0.00			1/2" Ice	12.01	8.47	0.14
			0.00			1" Ice	12.63	9.72	0.23
			0.00			1/2" Ice	9.65	8.42	0.15
(2) Antel WWX063x19x00 w/ mount pipe	B	From Face	3.00	0.0000	150.00	No Ice	9.00	7.22	0.09
			0.00			1/2" Ice	9.65	8.42	0.15
			0.00			1" Ice	10.27	9.33	0.23
			0.00			1/2" Ice	9.65	8.42	0.15
(2) Kathrein 800-10736 w/ mount pipe	C	From Face	3.00	0.0000	150.00	No Ice	11.39	7.07	0.07
			0.00			1/2" Ice	12.01	8.47	0.14
			0.00			1" Ice	12.63	9.72	0.23
			0.00			1/2" Ice	9.65	8.42	0.15
(2) Antel WWX063x19x00 w/ mount pipe	C	From Face	3.00	0.0000	150.00	No Ice	9.00	7.22	0.09
			0.00			1/2" Ice	9.65	8.42	0.15
			0.00			1" Ice	10.27	9.33	0.23
			0.00			1/2" Ice	9.65	8.42	0.15
(12) Lucent RRH2x00-850 Band 5	A	From Face	2.00	0.0000	150.00	No Ice	3.77	2.02	0.06
			0.00			1/2" Ice	4.08	2.30	0.08
			0.00			1" Ice	4.40	2.59	0.10
			0.00			1/2" Ice	3.93	2.56	0.03
Raycap DB-B1-6C-12As-0Z Box	B	From Face	2.00	0.0000	150.00	No Ice	3.93	2.56	0.03
			0.00			1/2" Ice	4.20	2.79	0.06
			0.00			1" Ice	4.48	3.04	0.09
			0.00			1/2" Ice	4.20	2.79	0.06
12' Low Profile Platform (MT-196)	C	None		0.0000	150.00	No Ice	10.40	10.40	0.91
						1/2" Ice	10.70	10.70	1.20
						1" Ice	11.00	11.00	1.47
						1/2" Ice	10.70	10.70	1.20
**									
Andrew SBNH1-1 D6365C	A	From Face	3.00	0.0000	160.00	No Ice	11.47	9.48	0.09
			0.00			1/2" Ice	12.01	8.47	0.14
			0.00			1" Ice	12.63	9.72	0.23
			0.00			1/2" Ice	9.65	8.42	0.15

tnxTower Michael F. Plahovinsak, P.E. 18501 State Route 164 Plain City, OH 43064 Phone: 614-393-6239 FAX: mike@tnxteng.com	Job		Page
	150-ft Pole (Fut. 170-ft) - MFP #23515-638 r1		4 of 8
	Project		Date
CT1155 Bethel		07:32:46 10/25/15	
Client		Designed by	
TAPP (TP-13840)		Mike	

Description	Size w/ Leg	Offset Type	Offsets Horz Vert Lateral ft ft ft	Azimuth Adjustment °	Placement ft	C ₁ Front ft	C ₂ Side ft	Weight K
w/ mount pipe			0.00 0.00			12" Ice 12.08 1" Ice 12.71	10.90 12.17	0.17 0.27
(3) Ericsson KRC-118-054-1 w/ mount pipe	A	From Face	3.00 0.00 0.00	0.0000	140.00	No Ice 12.24 1/2" Ice 12.87 1" Ice 13.56	12.59 14.03 15.32	0.23 0.33 0.45
Andrew SBNHH-1D6565C w/ mount pipe	B	From Face	3.00 0.00 0.00	0.0000	140.00	No Ice 11.47 1/2" Ice 12.08 1" Ice 12.71	9.48 10.90 12.17	0.09 0.17 0.27
(5) Ericsson KRC-118-054-1 w/ mount pipe	B	From Face	3.00 0.00 0.00	0.0000	140.00	No Ice 12.24 1/2" Ice 12.87 1" Ice 13.56	12.59 14.03 15.32	0.23 0.33 0.45
Andrew SBNHH-1D6565C w/ mount pipe	C	From Face	3.00 0.00 0.00	0.0000	140.00	No Ice 11.47 1/2" Ice 12.08 1" Ice 12.71	9.48 10.90 12.17	0.09 0.17 0.27
(3) Ericsson KRC-118-054-1 w/ mount pipe	C	From Face	3.00 0.00 0.00	0.0000	140.00	No Ice 12.24 1/2" Ice 12.87 1" Ice 13.56	12.59 14.03 15.32	0.23 0.33 0.45
(4) Raycap DC6-48-60-18-8F Suppressor	A	From Face	2.00 0.00 0.00	0.0000	140.00	No Ice 1.47 1/2" Ice 1.67 1" Ice 1.88	1.47 1.67 1.88	0.03 0.05 0.07
(15) Ericsson RRC-11	B	From Face	2.00 0.00 0.00	0.0000	140.00	No Ice 2.94 1/2" Ice 3.17 1" Ice 3.41	1.52 1.69 1.88	0.05 0.08 0.10
12' Low Profile Platform (MT-196)	C	None		0.0000	140.00	No Ice 10.40 1/2" Ice 10.70 1" Ice 11.00	10.40 10.70 11.00	0.91 1.20 1.47
**								
Andrew SBNHH-1D6565C w/ mount pipe	A	From Face	3.00 0.00 0.00	0.0000	130.00	No Ice 11.47 1/2" Ice 12.08 1" Ice 12.71	9.48 10.90 12.17	0.09 0.17 0.27
(3) Ericsson KRC-118-054-1 w/ mount pipe	A	From Face	3.00 0.00 0.00	0.0000	130.00	No Ice 12.24 1/2" Ice 12.87 1" Ice 13.56	12.59 14.03 15.32	0.23 0.33 0.45
Andrew SBNHH-1D6565C w/ mount pipe	B	From Face	3.00 0.00 0.00	0.0000	130.00	No Ice 11.47 1/2" Ice 12.08 1" Ice 12.71	9.48 10.90 12.17	0.09 0.17 0.27
(3) Ericsson KRC-118-054-1 w/ mount pipe	B	From Face	3.00 0.00 0.00	0.0000	130.00	No Ice 12.24 1/2" Ice 12.87 1" Ice 13.56	12.59 14.03 15.32	0.23 0.33 0.45
Andrew SBNHH-1D6565C w/ mount pipe	C	From Face	3.00 0.00 0.00	0.0000	130.00	No Ice 11.47 1/2" Ice 12.08 1" Ice 12.71	9.48 10.90 12.17	0.09 0.17 0.27
(3) Ericsson KRC-118-054-1 w/ mount pipe	C	From Face	3.00 0.00 0.00	0.0000	130.00	No Ice 12.24 1/2" Ice 12.87 1" Ice 13.56	12.59 14.03 15.32	0.23 0.33 0.45
(4) Raycap DC6-48-60-18-8F Suppressor	A	From Face	2.00 0.00 0.00	0.0000	130.00	No Ice 1.47 1/2" Ice 1.67 1" Ice 1.88	1.47 1.67 1.88	0.03 0.05 0.07
(15) Ericsson RRC-11	B	From Face	2.00 0.00 0.00	0.0000	130.00	No Ice 2.94 1/2" Ice 3.17 1" Ice 3.41	1.52 1.69 1.88	0.05 0.08 0.10
12' Low Profile Platform (MT-196)	C	None		0.0000	130.00	No Ice 10.40 1/2" Ice 10.70 1" Ice 11.00	10.40 10.70 11.00	0.91 1.20 1.47

tnxTower Michael F. Pluhovinsak, P.E. 18301 State Route 161 Plain City, OH 43064 Phone: 614-298-4250 FAX: mikel@tnxpe.com	Job 150-ft Pole (Fut. 170-ft) - MFP #23515-638 r1	Page 5 of 8
	Project CT1155 Bethel	Date 07:32:46 10/25/15
	Client TAPP (TP-13840)	Designed by Mike

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.8 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+1.6 Wind 0 deg+1.0 Ice+1.0 Temp
10	1.2 Dead+1.6 Wind 90 deg+1.0 Ice+1.0 Temp
11	1.2 Dead+1.6 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	170 - 150	Pole	Max Tension	8	0.00	-0.00	-0.00
			Max Compression	8	-24.43	4.91	4.94
			Max. Mx	4	-6.07	-346.93	-0.99
			Max. My	2	-6.41	4.65	129.79
			Max. Vy	4	22.72	-346.93	-0.99
			Max. Vx	2	-21.37	4.65	129.79
			Max Torque	2			2.95
L2	150 - 107.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max Compression	8	-69.70	-0.98	19.51
			Max Mx	4	-24.53	-2023.28	-4.67
			Max My	2	-25.13	11.25	1914.25
			Max Vy	4	56.87	-2023.28	-4.67
			Max Vx	2	-53.82	11.25	1914.25
			Max Torque	4			9.45
L3	107.75 - 83.5	Pole	Max Tension	1	0.00	0.00	0.00
			Max Compression	8	-80.18	-1.01	19.96
			Max. Mx	4	-33.65	-3399.61	-0.93
			Max. My	2	-34.11	7.86	3218.62
			Max. Vy	4	60.20	-3399.61	-0.93
			Max. Vx	2	-57.13	7.86	3218.62
			Max Torque	4			9.41
L4	83.5 - 46.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max Compression	8	-100.11	-1.05	20.56
			Max Mx	4	-50.45	-5669.05	4.66
			Max My	2	-50.71	2.56	5377.80
			Max Vy	4	65.87	-5669.05	4.66
			Max Vx	2	-62.82	2.56	5377.80
			Max Torque	4			9.37
L5	46.25 - 1	Pole	Max Tension	1	0.00	0.00	0.00
			Max Compression	8	-136.52	-1.05	20.62
			Max. Mx	4	-81.38	-9424.71	12.62
			Max. My	2	-81.38	-5.34	8974.22
			Max. Vy	4	76.13	-9424.71	12.62
			Max. Vx	2	-73.19	-5.34	8974.22
			Max Torque	4			9.33

tnxTower Michael F. Plahovinsak, P.E. 18391 State Route 161 Plain City, OH 43064 Phone: 614-298-6250 FAX: mike@tnxeng.com	Job 150-ft Pole (Fut. 170-ft) - MFP #23515-638 r1	Page 6 of 8
	Project CT1155 Bethel	Date 07:32:46 10/25/15
	Client TAPP (TP-13840)	Designed by Mike

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt "	Twist "
L1	170 - 150	31.466	13	1.7289	0.0040
L2	150 - 107.75	24.375	13	1.6209	0.0028
L3	113.5 - 83.5	13.379	13	1.0996	0.0005
L4	90 - 48.25	8.122	13	0.9013	0.0004
L5	54 - 1	2.790	13	0.4868	0.0001

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt "	Twist "	Radius of Curvature ft
170.00	(4) CCI H2A-65R-BU-1-HB w/ mount pipe	13	31.466	1.7289	0.0080	25540
160.00	(2) Kathrein 800-10736 w/ mount pipe	13	27.871	1.6814	0.0077	12770
150.00	(2) Kathrein 800-10736 w/ mount pipe	13	24.175	1.6209	0.0072	6591
140.00	Andrew SBNH1-1D6565C w/ mount pipe	13	21.055	1.5291	0.0053	5593
130.00	Andrew SBNH1-1D6565C w/ mount pipe	13	17.950	1.4137	0.0051	4962

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt "	Twist "
L1	170 - 150	156.651	4	8.6381	0.0220
L2	150 - 107.75	121.374	4	8.0923	0.0163
L3	113.5 - 83.5	65.633	4	5.9823	0.0035
L4	90 - 48.25	45.499	4	4.4962	0.0019
L5	54 - 1	13.918	4	2.4288	0.0008

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt "	Twist "	Radius of Curvature ft
170.00	(4) CCI HPA-65R-BU-1-HB w/ mount pipe	4	156.651	8.6381	0.0412	5252
160.00	(2) Kathrein 800-10736 w/ mount pipe	4	138.776	8.4074	0.0399	2124
150.00	(2) Kathrein 800-10736 w/ mount pipe	4	121.374	8.0923	0.0373	1350
140.00	Andrew SBNH1-1D6565C w/ mount pipe	4	104.859	7.6308	0.0324	1147
130.00	Andrew SBNH1-1D6565C w/ mount pipe	4	89.418	7.0528	0.0262	1020

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	Project CT1155 Bethel	Date 07:32:46 10/25/15
	Client TAPP (TP-13840)	Designed by Mike

Pole Design Data

Section No.	Elevation ft	Size	I_x in ⁴	I_y in ⁴	KI_x	A in ²	F_c K	ϕP_n K	Ratio $\frac{P_p}{\phi P_n}$
L1	170 - 150 (1)	TP29.41x24x0.1875	29.00	0.00	0.0	17.3910	-6.07	1111.20	0.035
L2	150 - 107.75 (2)	TP40.85x29.41x0.3125	62.25	0.00	0.0	38.6639	-24.53	2694.79	0.039
L3	107.75 - 83.5 (3)	TP46.79x38.6681x0.375	39.00	0.00	0.0	53.1509	-33.65	3760.52	0.039
L4	83.5 - 46.25 (4)	TP56.13x44.2803x0.4375	43.75	0.00	0.0	74.4211	-50.45	5218.03	0.040
L5	46.25 - 1 (5)	TP67.5x53.1559x0.5	53.00	0.00	0.0	106.329	-81.38	7227.43	0.041

Pole Bending Design Data

Section No.	Elevation ft	Size	M_x kip-ft	ϕM_x kip-ft	Ratio $\frac{M_x}{\phi M_x}$	M_y kip-ft	ϕM_y kip-ft	Ratio $\frac{M_y}{\phi M_y}$
L1	170 - 150 (1)	TP29.41x24x0.1875	346.94	668.75	0.519	0.00	668.75	0.000
L2	150 - 107.75 (2)	TP40.85x29.41x0.3125	2023.28	2159.72	0.937	0.00	2159.72	0.000
L3	107.75 - 83.5 (3)	TP46.79x38.6681x0.375	3399.62	3451.29	0.985	0.00	3451.29	0.000
L4	83.5 - 46.25 (4)	TP56.13x44.2803x0.4375	5669.66	5748.83	0.986	0.00	5748.83	0.000
L5	46.25 - 1 (5)	TP67.5x53.1559x0.5	9424.75	9951.42	0.946	0.00	9951.42	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V_x K	ϕV_x K	Ratio $\frac{V_x}{\phi V_x}$	Actual T_x kip-ft	ϕT_x kip-ft	Ratio $\frac{T_x}{\phi T_x}$
L1	170 - 150 (1)	TP29.41x24x0.1875	22.72	555.63	0.041	2.17	1339.14	0.002
L2	150 - 107.75 (2)	TP40.85x29.41x0.3125	56.87	1347.39	0.042	9.42	4324.73	0.002
L3	107.75 - 83.5 (3)	TP46.79x38.6681x0.375	60.20	1880.26	0.032	9.38	5911.02	0.001
L4	83.5 - 46.25 (4)	TP56.13x44.2803x0.4375	65.87	2609.02	0.025	9.34	11513.75	0.001
L5	46.25 - 1 (5)	TP67.5x53.1559x0.5	76.12	3613.71	0.021	9.12	19947.25	0.000

tnxTower Michael F. Plahovinsak, P.E. 18201 State Route 161 Plain City, OH 43064 Phone: 614-298-6250 FAX: mfk@tmfeng.com	Job 150-ft Pole (Fut. 170-ft) - MFP #23515-638 r1	Page 8 of 8
	Project CT1155 Bethel	Date 07:32:46 10/25/15
	Client TAPP (TP-13840)	Designed by Mike

Pole Interaction Design Data

Section No.	Elevation ft	Ratio P_v	Ratio M_{vz}	Ratio M_{vz}	Ratio V_z	Ratio T_z	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	170 - 150 (1)	0.005	0.519	0.000	0.041	0.002	0.526	1.000	4.82 ✓
L2	150 - 107.75 (2)	0.009	0.937	0.000	0.042	0.002	0.948	1.000	4.82 ✓
L3	107.75 - 83.5 (3)	0.009	0.985	0.000	0.032	0.001	0.995	1.000	4.82 ✓
L4	83.5 - 46.25 (4)	0.010	0.986	0.000	0.025	0.001	0.996	1.000	4.82 ✓
L5	46.25 - 1 (5)	0.011	0.946	0.000	0.021	0.000	0.958	1.000	4.82 ✓

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	F _K	U _{Allow} K	% Capacity	Pass/Fail
L1	170 - 150	Pole	TP29.41x24x0.1875	1	-6.07	111.30	52.5	Pass
L2	150 - 107.75	Pole	TP40.85x29.41x0.3125	2	-24.53	2694.79	94.8	Pass
L3	107.75 - 83.5	Pole	TP46.79x38.6x0.375	3	-13.65	3760.57	99.5	Pass
L4	83.5 - 46.25	Pole	TP56.73x44.28x0.4375	4	-80.45	5218.03	99.6	Pass
L5	46.25 - 1	Pole	TP67.5x53.15x0.5	5	81.38	7227.41	95.8	Pass
Summary								
Pole (L4):							99.6	Pass
RATING =							99.6	Pass

Monopole Flange Connection Calculation

ANSI/TIA-222-G-2

Factored Connection Reactions:		Pole Shape:	Bolts:	Flange Plate:
Moment:	330 ft-kips	18-Sided	(12) 1 dia. A325 Bolts	1.5 in. x 38 in. Round
Shear:	23 kips	Pole Dia. (D _p):	On a 34 in Bolt Circle	fy = 50 ksi
Axial:	6 kips	29.41 in		Inner Dia = 27 in

Bolt Calculation TIA 4.9.6.4 (Combined Shear and Tension)

The following Interaction Equation Shall Be Satisfied:

$$\begin{aligned} \phi &= 0.75 \text{ (AISC)} \\ I_{bolts} &= 1734.00 \text{ in}^2 \text{ (Min of Inertia)} \\ T_u &= 38.82 \text{ kips (Tension Force)} \\ P_u &= 39.32 \text{ kips (Compressive Force)} \\ V_u &= 1.92 \text{ kips (Shear Force)} \\ \phi R_{nv} &= 28.30 \text{ kips (From AISC 7-1)} \\ \phi R_{nt} &= 53.00 \text{ kips (From AISC 7-2)} \end{aligned}$$

$$\left(\frac{V_{ub}}{\phi R_{nv}} \right)^2 + \left(\frac{T_{ub}}{\phi R_{nt}} \right)^2 \leq 1.0$$

$$0.541 < 1.0 \rightarrow \text{OK}$$

Base Plate Calculation According to TIA-222-G

$$\begin{aligned} \phi &= 0.90 \text{ (AISC)} \\ M_{PL} &= 90.16 \text{ in-kip (Elastic Moment)} \\ L &= 7.70 \text{ in (Section Length)} \\ Z &= 4.33 \text{ (Plastic Section Modulus)} \\ M_p &= 216.58 \text{ in-kip (Plastic Moment)} \\ \phi M_n &= 194.9218 \text{ in-kip (Factored Resistance)} \end{aligned}$$

Calculated Moment vs Factored Resistance

$$90.1649 \text{ in-kip} \leq 195 \text{ in-kip}$$

Bolts Are Adequate	54.1%
Plate is Adequate	46.3%

Michael F. Plahovinsak, P.E. 18301 State Route 161 W Plain City, OH 43064 Phone: 614-398-6250 email: mike@mfpe.com	Job 170-ft monopole - MFP #23515-0638	Page BP G
	Project CT1155 Bethel	Date 10/25/2015
	Client TAPP TP-13840	Designed by Mike

Anchor Rod and Base Plate Calculation

ANSI/TIA-222-G-2

<i>Factored Base Reactions:</i>		<i>Pole Shape:</i>	<i>Anchor Rods:</i>	<i>Base Plate:</i>
Moment:	9425 ft-kips	18-Sided	(24) 2.25 in. A615 GR. 75	2.75 in. x 81 in. Round
Shear:	76 kips	<i>Pole Dia. (D₁):</i>	Anchor Rods Evenly Spaced	fy = 50 ksi
Axial:	81 kips	67.50 in	On a 75 in Bolt Circle	

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

$\phi =$	0.80	(TIA 4.9.9)
$I_{bolts} =$	16875.00	in ² Modulus of Inertia
$P_u =$	251	kips Tension Force
$V_u =$	3	kips Shear Force
$R_{nt} =$	325.00	kips Nominal Tensile Strength
$\eta =$	0.50	for design type 10

The following Interaction Equation Shall Be Satisfied:

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

$$0.991 \leq 1$$

Base Plate Calculation According to TIA-222-G

$\phi =$	0.90	(TIA 4.9)
$M_{pl} =$	668.6	in-kip Plate Moment
$L =$	8.8	in Section Length
$Z =$	16.7	in ³ Section Modulus
$M_p =$	835.3	in-kip Plastic Moment
$\phi M_n =$	751.7	in-kip Factored Resistance

Calculated Moment vs Factored Resistance

$$668.61 \text{ in-kip} \leq 752 \text{ in-kip}$$

Anchor Rods Are Adequate	99.1%	<input checked="" type="checkbox"/>
Base Plate is Adequate	88.9%	<input checked="" type="checkbox"/>

Monopole Spread Footing Calculation

ANSI/TIA-222-G-2

Factored Base Reactions:	Footing Dimensions:	Concrete:
Moment: 9425 ft-kips	28 ft x 28 ft	$f_c = 4000$ psi
Shear: 76 kips	x 4 ft thick	Steel $f_y = 60$ ksi
Axial: 82 kips	Bearing 10 ft B.G.	$f = 0.75$
Soil Backfill 100 pcf	Ultimate Bearing: 8000 psf	Water Table n/a

Foundation Weight

Weight of Pole	82.0 kips
Weight of Concrete	532.8 kips
Weight of Soil	432 kips
Bouyancy of Water	0.0 kips
Total	1046.8 kips

Overturning Resistance:

Overturning Moment (M_u)	10223 ft-kips	9425 ft-kips - (76 kips x 10.5 ft)
Resisting Moment (R_n)	14655.2 ft-kips	1046.8 kips x 28 ft / 2
$\phi \times R_n > M_u$	$M_{overturning} / \phi M_{resist}$	93.0% OK

Soil Bearing Pressure:

Eccentricity (e)	9.77 ft	10223 ft-kips / 1046.8 kips
$6(e)$	58.6 ft >	28.0 ft $6e > 28$
Maximum Soil Bearing	5691.0938 psf	Calculated across corners
Soil Overburden	-1000 psf	
Net Soil Bearing	4691.0938 psf	
Resisting Soil Bearing (R_n)	8000 psf	
Net Soil Bearing $< \phi \times R_n$	Net Bearing / ϕR_n	78.2% OK

Bending Moment in Pier:

Bending Moment	9919 ft-kips	9425 ft-kips - (76 kips x 6.5 ft)
Pier Steel Req'd (Loads)	73.40 in ²	
Min. Pier Steel	46.08 in ²	1/2% (Based on Square Pier)

Bending Moment in Footing:

Max Bending Moment	6078.469 ft-kips	Σ Moments about pier face
Footing Steel Req'd (Loads)	1.75 in ² /ft	
Min. Footing Steel	1.04 in ² /ft	0.18%