



Date: **October 26, 2016**

Charles McGuirt
Crown Castle
3530 Toringdon Way Suite 300
Charlotte, NC 28277

Paul J. Ford and Company
250 East Broad St., Suite 600
Columbus, OH 43215
(614) 221-6679

Subject: Structural Analysis Report

Carrier Designation: **AT&T Mobility Co-Locate**
Carrier Site Number: CTL02014
Carrier Site Name: BRANFORD -
LEETES ISLAND

Crown Castle Designation: **Crown Castle BU Number:** 876316
Crown Castle Site Name: SECONDINO
PROPERTY
Crown Castle JDE Job Number: 402685
Crown Castle Work Order Number: 1318700
Crown Castle Application Number: 365855 Rev. 2

Engineering Firm Designation: **Paul J. Ford and Company Project Number:** 37516-2026.003.7805

Site Data: **21 Acorn Road, BRANFORD, New Haven County, CT**
Latitude 41° 17' 35.06", Longitude -72° 45' 46.4"
147 Foot - Monopole Tower

Dear Charles McGuirt,

Paul J. Ford and Company is pleased to submit this "Structural Analysis Report" to determine the structural integrity of the above mentioned tower. This analysis has been performed in accordance with the Crown Castle Structural 'Statement of Work' and the terms of Crown Castle Purchase Order Number 963312, in accordance with application 365855, revision 2.


The purpose of the analysis is to determine acceptability of the tower stress level. Based on our analysis we have determined the tower stress level for the structure and foundation, under the following load case, to be:

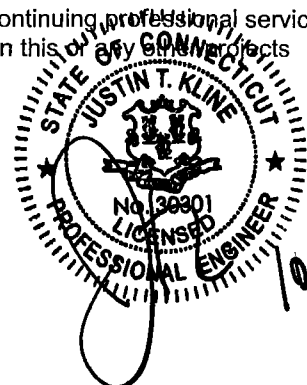
LC7: Existing + Reserved + Proposed Equipment **Sufficient Capacity**
Note: See Table I and Table II for the proposed and existing/reserved loading, respectively.

This analysis has been performed in accordance with the 2016 Connecticut State Building Code based upon an ultimate 3-second gust wind speed of 125 mph converted to a nominal 3-second gust wind speed of 97 mph per Section 1609.3 and Appendix N as required for use in the TIA-222-G Standard per Exception #5 of Section 1609.1.1. Exposure Category C with a maximum topographic factor, Kzt, of 1 and Risk Category II was/were used in this analysis.

We at Paul J. Ford and Company appreciate the opportunity of providing our continuing professional services to you and Crown Castle. If you have any questions or need further assistance on this or any other projects please give us a call.

Respectfully submitted by:


Maria C. Lopez, P.E., P. Eng.
Project Manager



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TABLE OF CONTENTS

1) INTRODUCTION

2) ANALYSIS CRITERIA

Table 1 - Proposed Antenna and Cable Information

Table 2 - Existing and Reserved Antenna and Cable Information

Table 3 - Design Antenna and Cable Information

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

3.1) Analysis Method

3.2) Assumptions

4) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary)

Table 6 – Tower Components vs. Capacity

4.1) Recommendations

5) APPENDIX A

tnxTower Output

6) APPENDIX B

Base Level Drawing

7) APPENDIX C

Additional Calculations

1) INTRODUCTION

This tower is a 147 ft Monopole tower designed by SUMMIT in August of 1997. The tower was originally designed for a wind speed of 90 mph per TIA/EIA-222-F.

2) ANALYSIS CRITERIA

This analysis has been performed in accordance with the 2016 Connecticut State Building Code based upon an ultimate 3-second gust wind speed of 125 mph converted to a nominal 3-second gust wind speed of 97 mph per Section 1609.3 and Appendix N as required for use in the TIA-222-G Standard per Exception #5 of Section 1609.1.1. Exposure Category C with a maximum topographic factor, Kzt, of 1 and Risk Category II was/were used in this analysis.

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
106.0	108.0	3	andrew	SBNHH-1D65A w/ Mount Pipe	-	-	-
		3	ericsson	RRUS12/RRUS A2			
	106.0	1	tower mounts	MT-195-12			
		1	tower mounts	RK-60-3M			

Table 2 - Existing and Reserved Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
147.0	147.0	3	alcatel lucent	1900MHz RRH (65MHz)	3 1	1-1/4 5/8	1
		3	alcatel lucent	800 EXTERNAL NOTCH FILTER			
		3	alcatel lucent	800MHZ RRH			
		3	alcatel lucent	TD-RRH8x20-25			
		9	rfs celwave	ACU-A20-N			
		3	rfs celwave	APXVSPP18-C-A20 w/ Mount Pipe			
		3	rfs celwave	APXVTM14-C-120 w/ Mount Pipe			
	1	tower mounts	Platform Mount [LP 1201-1]				
	143.0	1	tower mounts	Miscellaneous (NA507-1)			
135.0	135.0	3	ericsson	ERICSSON AIR 21 B2A B4P w/ Mount Pipe	6 1	1-5/8 1-3/16	1
		3	ericsson	ERICSSON AIR 21 B4A B2P w/ Mount Pipe			
		1	tower mounts	T-Arm Mount [TA 601-3]			
126.0	126.0	12	pole mounts	2.375" OD x 6' Mount Pipe	-	-	3
		1	tower mounts	Platform Mount [LP 712-1]			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
116.0	116.0	3	alcatel lucent	RRH2X60-PCS	1	1-5/8	2
		3	alcatel lucent	RRH2x60-700			
		3	alcatel lucent	RRH4X45-AWS4 B66			
		3	commscope	HBXX-6517DS-A2M w/ Mount Pipe			
		6	commscope	SBNHH-1D65B w/ Mount Pipe			
		1	rfs celwave	DB-T1-6Z-8AB-0Z			
		2	adc	ClearGain Dual Band 800/1900 MHz	7	1-5/8	1
		2	antel	LPA-80063/6CF w/ Mount Pipe			
		2	antel	LPA-80080/4CF w/ Mount Pipe			
		2	rfs celwave	APL868013 w/ Mount Pipe			
		1	rfs celwave	DB-T1-6Z-8AB-0Z			
		1	tower mounts	Platform Mount [LP 1201-1]			
106.0	108.0	3	kmw communications	AM-X-CD-14-65-00T-RET w/ Mount Pipe	-	-	3
		3	ericsson	RRUS-11	12 1 1 2	1-1/4 3/8 17/64 7/8	1
		6	powerwave technologies	7770.00 w/ Mount Pipe			
		12	powerwave technologies	LGP2140X			
	1	raycap	DC6-48-60-18-8F				
106.0	1	tower mounts	Platform Mount [LP 1201-1]				
76.0	77.0	1	kathreinscala	Kathrein OG-860/1920/GPS-A	-	-	1
		1	lucent	KS24019-L112A			
	76.0	1	tower mounts	Side Arm Mount [SO 701-3]			

Notes:

- 1) Existing Equipment
- 2) Reserved Equipment
- 3) Equipment To Be Removed

Table 3 - Design Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
-	-	-	-	-	-	-

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	Dr. Clarence Welti, 12/16/1996	1529736	CCSITES
4-POST-MODIFICATION INSPECTION	PJF, 41708-0180, 03/15/2009	2417887	CCSITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	Summit/PJF, 2737/29297-566, 09/29/1997	1632435	CCSITES
4-TOWER MANUFACTURER DRAWINGS	Summit/PJF, 2737-97/29297-566, 09/29/1997	1632399	CCSITES

3.1) Analysis Method

tnxTower (version 7.0.5.1), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

3.2) Assumptions

- 1) Tower and structures were built in accordance with the manufacturer's specifications.
- 2) The tower and structures have been maintained in accordance with the manufacturer's specification.
- 3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
- 4) The existing monopole shaft has been reinforced using a Crown-approved system in accordance with the above referenced documents. However, in this analysis we found that due to the change from the EIA/TIA-222-F Standard (the Standard used in the original reinforcing design) to the TIA-222-G-2 Standard (the most current Standard) the shaft reinforcing was found to be ineffective and, therefore, not considered in this analysis.

This analysis may be affected if any assumptions are not valid or have been made in error. Paul J. Ford and Company should be notified to determine the effect on the structural integrity of the tower.

4) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	147 - 105	Pole	TP29.141x22x0.25	1	-11.56	1506.56	46.9	Pass
L2	105 - 73.25	Pole	TP33.955x28.0884x0.3125	2	-20.83	2231.39	80.4	Pass
L3	73.25 - 42.25	Pole	TP38.601x32.6176x0.375	3	-28.57	3054.47	90.6	Pass
L4	42.25 - 0	Pole	TP45.12x37.0447x0.4375	4	-43.45	4255.20	95.5	Pass
							Summary	
						Pole (L4)	95.5	Pass
						Rating =	95.5	Pass

Table 6 - Tower Component Stresses vs. Capacity

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	84.5	Pass
1	Base Plate	0	71.6	Pass
1	Base Foundation	0	51.5	Pass
1	Base Foundation Soil Interaction	0	56.4	Pass

Structure Rating (max from all components) =	95.5%
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Notes:

- 1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.

4.1) Recommendations

The monopole and its foundation have sufficient capacity to carry the proposed loading configuration. No modifications are required at this time.

APPENDIX A
TNXTOWER OUTPUT

Tower Input Data

There is a pole section.
 This tower is designed using the TIA-222-G standard.
 The following design criteria apply:

- 1) Tower is located in New Haven County, Connecticut.
- 2) ASCE 7-10 Wind Data is used (wind speeds converted to nominal values).
- 3) Basic wind speed of 97 mph.
- 4) Structure Class II.
- 5) Exposure Category C.
- 6) Topographic Category 1.
- 7) Crest Height 0.00 ft.
- 8) Nominal ice thickness of 0.7500 in.
- 9) Ice thickness is considered to increase with height.
- 10) Ice density of 56 pcf.
- 11) A wind speed of 50 mph is used in combination with ice.
- 12) Deflections calculated using a wind speed of 60 mph.
- 13) A non-linear (P-delta) analysis was used.
- 14) Pressures are calculated at each section.
- 15) Stress ratio used in pole design is 1.
- 16) Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

Consider Moments - Legs Consider Moments - Horizontals Consider Moments - Diagonals Use Moment Magnification ✓ Use Code Stress Ratios ✓ Use Code Safety Factors - Guys Escalate Ice Always Use Max Kz Use Special Wind Profile Include Bolts In Member Capacity Leg Bolts Are At Top Of Section Secondary Horizontal Braces Leg Use Diamond Inner Bracing (4 Sided) SR Members Have Cut Ends SR Members Are Concentric	Distribute Leg Loads As Uniform Assume Legs Pinned ✓ Assume Rigid Index Plate ✓ Use Clear Spans For Wind Area ✓ Use Clear Spans For KL/r Retension Guys To Initial Tension ✓ Bypass Mast Stability Checks ✓ Use Azimuth Dish Coefficients ✓ Project Wind Area of Appurt. Autocalc Torque Arm Areas Add IBC .6D+W Combination Sort Capacity Reports By Component Triangulate Diamond Inner Bracing Treat Feed Line Bundles As Cylinder	Use ASCE 10 X-Brace Ly Rules Calculate Redundant Bracing Forces Ignore Redundant Members in FEA SR Leg Bolts Resist Compression All Leg Panels Have Same Allowable Offset Girt At Foundation ✓ Consider Feed Line Torque Include Angle Block Shear Check Use TIA-222-G Bracing Resist. Exemption Use TIA-222-G Tension Splice Exemption <div style="text-align: center; background-color: #e0e0e0; padding: 2px;">Poles</div> ✓ Include Shear-Torsion Interaction Always Use Sub-Critical Flow Use Top Mounted Sockets
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Tapered Pole Section Geometry

Section	Elevation <i>ft</i>	Section Length <i>ft</i>	Splice Length <i>ft</i>	Number of Sides	Top Diameter <i>in</i>	Bottom Diameter <i>in</i>	Wall Thickness <i>in</i>	Bend Radius <i>in</i>	Pole Grade
L1	147.00-105.00	42.00	3.25	18	22.0000	29.1410	0.2500	1.0000	A607-60 (60 ksi)
L2	105.00-73.25	35.00	4.25	18	28.0884	33.9550	0.3125	1.2500	A607-60 (60 ksi)
L3	73.25-42.25	35.25	4.75	18	32.6176	38.6010	0.3750	1.5000	A607-60 (60 ksi)
L4	42.25-0.00	47.00		18	37.0447	45.1200	0.4375	1.7500	A607-60 (60 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	22.3394	17.2586	1031.4832	7.7212	11.1760	92.2945	2064.3237	8.6310	3.4320	13.728
	29.5905	22.9250	2417.5313	10.2563	14.8036	163.3067	4838.2436	11.4647	4.6888	18.755
L2	29.0749	27.5502	2685.3438	9.8605	14.2689	188.1953	5374.2210	13.7777	4.3936	14.059
	34.4788	33.3692	4771.5467	11.9431	17.2491	276.6252	9549.3719	16.6877	5.4261	17.363
L3	33.8533	38.3768	5040.4234	11.4461	16.5698	304.1942	10087.479	19.1920	5.0807	13.549
	39.1965	45.4985	8399.4763	13.5702	19.6093	428.3413	16810.004	22.7536	6.1338	16.357
L4	38.4449	50.8337	8606.4299	12.9956	18.8187	457.3334	17224.184	25.4217	5.7499	13.143
	45.8160	62.0472	15650.738	15.8623	22.9210	682.8134	31322.069	31.0295	7.1711	16.391

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A _r	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 147.00-105.00				1	1	1			
L2 105.00-73.25				1	1	1			
L3 73.25-42.25				1	1	1			
L4 42.25-0.00				1	1	1			

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Component Type	Placement	Total Number	Number Per Row	Clear Spacing	Width or Diameter	Perimeter	Weight
				ft			in	r in	r in	plf
**										

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement	Total Number		C _A A _A	Weight
				ft			ft ² /ft	plf
HB114-1-0813U4-M5J(1 1/4")	C	No	Inside Pole	147.00 - 0.00	3	No Ice	0.00	1.20
						1/2" Ice	0.00	1.20
						1" Ice	0.00	1.20
HB058-M12-XXXF(5/8")	C	No	CaAa (Out Of Face)	147.00 - 0.00	1	No Ice	0.08	0.24
						1/2" Ice	0.18	1.06
						1" Ice	0.28	2.49

CR 50 1873(1-5/8")	C	No	CaAa (Out Of Face)	135.00 - 0.00	5	No Ice	0.00	0.83
						1/2" Ice	0.00	2.34
						1" Ice	0.00	4.47
561(1-5/8")	C	No	CaAa (Out Of Face)	135.00 - 0.00	1	No Ice	0.16	1.35
						1/2" Ice	0.26	2.65
						1" Ice	0.36	4.56
1.2 Masterline Extreme Hybrid(1 3/16")	C	No	CaAa (Out Of Face)	135.00 - 0.00	1	No Ice	0.00	0.95
						1/2" Ice	0.00	1.99
						1" Ice	0.00	3.64

LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	116.00 - 0.00	7	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	C _A A _A		Weight
						ft ² /ft	plf	
HB158-1-08U8-S8J18(1-5/8)	C	No	Inside Pole	116.00 - 0.00	1	1" Ice	0.00	0.82
						No Ice	0.00	1.30
						1/2" Ice	0.00	1.30
						1" Ice	0.00	1.30

LDF2-50A(3/8")	C	No	Inside Pole	106.00 - 0.00	1	No Ice	0.00	0.08
						1/2" Ice	0.00	0.08
						1" Ice	0.00	0.08
						No Ice	0.00	0.66
LDF6-50A (1-1/4 FOAM)	C	No	Inside Pole	106.00 - 0.00	12	1/2" Ice	0.00	0.66
						1" Ice	0.00	0.66
						No Ice	0.00	0.66
						1" Ice	0.00	0.72
2" (Nominal) Conduit	C	No	Inside Pole	106.00 - 0.00	1	No Ice	0.00	0.72
						1/2" Ice	0.00	0.72
						1" Ice	0.00	0.72
						No Ice	0.00	0.68
6-8AWG 3 PAIR(7/8")	C	No	Inside Pole	106.00 - 0.00	2	1/2" Ice	0.00	0.68
						1" Ice	0.00	0.68
						No Ice	0.00	0.68
						1" Ice	0.00	0.68
A-DQZNB2Yn1750 N(17/64")	C	No	Inside Pole	106.00 - 0.00	1	No Ice	0.00	0.03
						1/2" Ice	0.00	0.03
						1" Ice	0.00	0.03
						No Ice	0.00	0.00

Aero MP3-05	C	No	CaAa (Out Of Face)	90.50 - 0.00	1	No Ice	0.35	0.00
						1/2" Ice	0.40	0.00
						1" Ice	0.66	0.00
						No Ice	0.00	0.00
**								

Feed Line/Linear Appurtenances Section Areas

Tower Section n	Tower Elevation ft	Face	A _R	A _F	C _A A _A In Face	C _A A _A Out Face	Weight K
			ft ²	ft ²	ft ²	ft ²	
L1	147.00-105.00	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	8.403	0.44
L2	105.00-73.25	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	13.826	0.87
L3	73.25-42.25	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	18.423	0.85
L4	42.25-0.00	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	25.109	1.16

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section n	Tower Elevation ft	Face or Leg	Ice Thickness in	A _R	A _F	C _A A _A In Face	C _A A _A Out Face	Weight K
				ft ²	ft ²	ft ²	ft ²	
L1	147.00-105.00	A	1.714	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	33.084	2.28
L2	105.00-73.25	A	1.656	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	43.656	2.75
L3	73.25-42.25	A	1.586	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	53.050	2.60
L4	42.25-0.00	A	1.436	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	70.457	3.41

Feed Line Center of Pressure

Section	Elevation	CP _x	CP _z	CP _x Ice	CP _z Ice
	ft	in	in	in	in
L1	147.00-105.00	-0.2397	0.1384	-0.6859	0.3960
L2	105.00-73.25	-0.4865	0.2809	-1.0946	0.6320
L3	73.25-42.25	-0.6361	0.3672	-1.3245	0.7647
L4	42.25-0.00	-0.6502	0.3754	-1.3761	0.7945

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
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Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment t °	Placement ft	C _A A _A Front ft ²	C _A A _A Side ft ²	Weight K	
APXVSP18-C-A20 w/ Mount Pipe	A	From Leg	4.00	0.0000	147.00	No Ice	8.26	6.95	0.08
			0.00			1/2"	8.82	8.13	0.15
			0.00			Ice	9.35	9.02	0.23
APXVSP18-C-A20 w/ Mount Pipe	B	From Leg	4.00	0.0000	147.00	No Ice	8.26	6.95	0.08
			0.00			1/2"	8.82	8.13	0.15
			0.00			Ice	9.35	9.02	0.23
APXVSP18-C-A20 w/ Mount Pipe	C	From Leg	4.00	0.0000	147.00	No Ice	8.26	6.95	0.08
			0.00			1/2"	8.82	8.13	0.15
			0.00			Ice	9.35	9.02	0.23
800 EXTERNAL NOTCH FILTER	A	From Leg	4.00	0.0000	147.00	No Ice	0.66	0.32	0.01
			0.00			1/2"	0.76	0.40	0.02
			0.00			Ice	0.87	0.48	0.02
800 EXTERNAL NOTCH FILTER	B	From Leg	4.00	0.0000	147.00	No Ice	0.66	0.32	0.01
			0.00			1/2"	0.76	0.40	0.02
			0.00			Ice	0.87	0.48	0.02
800 EXTERNAL NOTCH FILTER	C	From Leg	4.00	0.0000	147.00	No Ice	0.66	0.32	0.01
			0.00			1/2"	0.76	0.40	0.02
			0.00			Ice	0.87	0.48	0.02
(3) ACU-A20-N	A	From Leg	4.00	0.0000	147.00	No Ice	0.07	0.12	0.00
			0.00			1/2"	0.10	0.16	0.00
			0.00			Ice	0.15	0.21	0.00
(3) ACU-A20-N	B	From Leg	4.00	0.0000	147.00	No Ice	0.07	0.12	0.00
			0.00			1/2"	0.10	0.16	0.00
			0.00			Ice	0.15	0.21	0.00
(3) ACU-A20-N	C	From Leg	4.00	0.0000	147.00	No Ice	0.07	0.12	0.00
			0.00			1/2"	0.10	0.16	0.00
			0.00			Ice	0.15	0.21	0.00
1900MHz RRH (65MHz)	A	From Leg	4.00	0.0000	147.00	No Ice	2.32	2.24	0.06
			0.00			1/2"	2.53	2.44	0.08

Description	Face or Leg	Offset Type	Offsets:			Azimuth Adjustment	Placement	C _{AA} _{Front}	C _{AA} _{Side}	Weight	
			Horz	Lateral	Vert						ft
			ft	ft	ft	°	ft	ft ²	ft ²	K	
					0.00		Ice	2.74	2.65	0.11	
1900MHz RRH (65MHz)	B	From Leg			4.00	0.0000	147.00	1" Ice			
					0.00			No Ice	2.32	2.24	0.06
					0.00			1/2"	2.53	2.44	0.08
1900MHz RRH (65MHz)	C	From Leg			4.00	0.0000	147.00	Ice	2.74	2.65	0.11
					0.00			1" Ice			
					0.00			No Ice	2.32	2.24	0.06
800MHZ RRH	A	From Leg			4.00	0.0000	147.00	1/2"	2.53	2.44	0.08
					0.00			Ice	2.74	2.65	0.11
					0.00			1" Ice			
800MHZ RRH	B	From Leg			4.00	0.0000	147.00	No Ice	2.13	1.77	0.05
					0.00			1/2"	2.32	1.95	0.07
					0.00			Ice	2.51	2.13	0.10
800MHZ RRH	C	From Leg			4.00	0.0000	147.00	1" Ice			
					0.00			No Ice	2.13	1.77	0.05
					0.00			1/2"	2.32	1.95	0.07
APXVTM14-C-120 w/ Mount Pipe	A	From Leg			4.00	0.0000	147.00	Ice	2.51	2.13	0.10
					0.00			1" Ice			
					0.00			No Ice	6.58	4.96	0.08
APXVTM14-C-120 w/ Mount Pipe	B	From Leg			4.00	0.0000	147.00	1/2"	7.03	5.75	0.13
					0.00			Ice	7.47	6.47	0.19
					0.00			1" Ice			
APXVTM14-C-120 w/ Mount Pipe	C	From Leg			4.00	0.0000	147.00	No Ice	6.58	4.96	0.08
					0.00			1/2"	7.03	5.75	0.13
					0.00			Ice	7.47	6.47	0.19
TD-RRH8x20-25	A	From Leg			4.00	0.0000	147.00	1" Ice			
					0.00			No Ice	4.05	1.53	0.07
					0.00			1/2"	4.30	1.71	0.10
TD-RRH8x20-25	B	From Leg			4.00	0.0000	147.00	Ice	4.56	1.90	0.13
					0.00			1" Ice			
					0.00			No Ice	4.05	1.53	0.07
TD-RRH8x20-25	C	From Leg			4.00	0.0000	147.00	1/2"	4.30	1.71	0.10
					0.00			Ice	4.56	1.90	0.13
					0.00			1" Ice			
Platform Mount [LP 1201-1]	C	None				0.0000	147.00	No Ice	23.10	23.10	2.10
								1/2"	26.80	26.80	2.50
								Ice	30.50	30.50	2.90
Miscellaneous (NA507-1)	C	From Leg			0.00	0.0000	147.00	1" Ice			
					0.00			No Ice	4.80	4.80	0.25
					-4.00			1/2"	6.70	6.70	0.29
(2) 2.375" OD x 4' Mount Pipe	A	From Leg			4.00	0.0000	147.00	Ice	8.60	8.60	0.34
					0.00			1" Ice			
					-2.00			No Ice	0.87	0.87	0.02
(2) 2.375" OD x 4' Mount Pipe	B	From Leg			4.00	0.0000	147.00	1/2"	1.11	1.11	0.03
					0.00			Ice	1.36	1.36	0.04
					-2.00			1" Ice			
(2) 2.375" OD x 4' Mount Pipe	C	From Leg			4.00	0.0000	147.00	No Ice	0.87	0.87	0.02
					0.00			1/2"	1.11	1.11	0.03
					-2.00			Ice	1.36	1.36	0.04

Description	Face or Leg	Offset Type	Offsets:			Azimuth Adjustment	Placement	C _{AA} _{Front}	C _{AA} _{Side}	Weight
			Horz	Lateral	Vert					
						1" Ice				

ERICSSON AIR 21 B2A B4P w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice	6.33 6.78 7.21	5.64 6.43 7.13	0.11 0.17 0.23	
(2) ERICSSON AIR 21 B2A B4P w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice	6.33 6.78 7.21	5.64 6.43 7.13	0.11 0.17 0.23	
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice	6.32 6.76 7.20	5.63 6.42 7.12	0.11 0.17 0.23	
(2) ERICSSON AIR 21 B4A B2P w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	135.00	No Ice 1/2" Ice	6.32 6.76 7.20	5.63 6.42 7.12	0.11 0.17 0.23	
T-Arm Mount [TA 601-3]	C	None		0.0000	135.00	No Ice 1/2" Ice	10.90 14.65 18.40	10.90 14.65 18.40	0.73 0.93 1.13	

(2) LPA-80080/4CF w/ Mount Pipe	A	From Face	4.00 0.00 0.00	0.0000	116.00	No Ice 1/2" Ice	2.86 3.22 3.59	6.57 7.19 7.84	0.03 0.08 0.13	
(2) LPA-80063/6CF w/ Mount Pipe	B	From Face	4.00 0.00 0.00	0.0000	116.00	No Ice 1/2" Ice	9.83 10.40 10.93	10.22 11.38 12.27	0.05 0.14 0.25	
(2) APL868013 w/ Mount Pipe	C	From Face	4.00 0.00 0.00	0.0000	116.00	No Ice 1/2" Ice	3.10 3.48 3.85	4.80 5.42 6.04	0.02 0.06 0.11	
(2) ClearGain Dual Band 800/1900 MHz	B	From Face	4.00 0.00 0.00	0.0000	116.00	No Ice 1/2" Ice	1.32 1.47 1.62	0.69 0.80 0.92	0.02 0.03 0.05	
RRH2x60-700	A	From Leg	4.00 0.00 0.00	0.0000	116.00	No Ice 1/2" Ice	3.50 3.76 4.03	1.82 2.05 2.29	0.06 0.08 0.11	
RRH4X45-AWS4 B66	A	From Leg	4.00 0.00 0.00	0.0000	116.00	No Ice 1/2" Ice	2.66 2.88 3.10	1.59 1.77 1.96	0.06 0.08 0.11	
RRH2X60-PCS	A	From Leg	4.00 0.00 0.00	0.0000	116.00	No Ice 1/2" Ice	2.20 2.39 2.59	1.72 1.90 2.09	0.06 0.08 0.10	
HBXX-6517DS-A2M w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	116.00	No Ice 1/2" Ice	8.77 9.34 9.89	6.96 8.18 9.14	0.07 0.14 0.21	
(2) SBNHH-1D65B w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	116.00	No Ice 1/2" Ice	8.40 8.96 9.49	7.07 8.26 9.18	0.07 0.14 0.21	
RRH2x60-700	B	From Leg	4.00 0.00 0.00	0.0000	116.00	No Ice 1/2" Ice	3.50 3.76 4.03	1.82 2.05 2.29	0.06 0.08 0.11	
RRH4X45-AWS4 B66	B	From Leg	4.00	0.0000	116.00	No Ice	2.66	1.59	0.06	

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA} _{Front}	C _{AA} _{Side}	Weight	
			Horz	Lateral						Vert
			ft	ft	°	ft	ft ²	ft ²	K	
			0.00			1/2"	2.88	1.77	0.08	
			0.00			Ice	3.10	1.96	0.11	
RRH2X60-PCS	B	From Leg	4.00		0.0000	116.00	1" Ice	2.20	1.72	0.06
			0.00				No Ice	2.39	1.90	0.08
			0.00				1/2"	2.59	2.09	0.10
			0.00				Ice			
			0.00				1" Ice			
HBXX-6517DS-A2M w/ Mount Pipe	B	From Leg	4.00		0.0000	116.00	No Ice	8.77	6.96	0.07
			0.00				1/2"	9.34	8.18	0.14
			0.00				Ice	9.89	9.14	0.21
			0.00				1" Ice			
(2) SBNHH-1D65B w/ Mount Pipe	B	From Leg	4.00		0.0000	116.00	No Ice	8.40	7.07	0.07
			0.00				1/2"	8.96	8.26	0.14
			0.00				Ice	9.49	9.18	0.21
			0.00				1" Ice			
RRH2x60-700	C	From Leg	4.00		0.0000	116.00	No Ice	3.50	1.82	0.06
			0.00				1/2"	3.76	2.05	0.08
			0.00				Ice	4.03	2.29	0.11
			0.00				1" Ice			
RRH4X45-AWS4 B66	C	From Leg	4.00		0.0000	116.00	No Ice	2.66	1.59	0.06
			0.00				1/2"	2.88	1.77	0.08
			0.00				Ice	3.10	1.96	0.11
			0.00				1" Ice			
RRH2X60-PCS	C	From Leg	4.00		0.0000	116.00	No Ice	2.20	1.72	0.06
			0.00				1/2"	2.39	1.90	0.08
			0.00				Ice	2.59	2.09	0.10
			0.00				1" Ice			
HBXX-6517DS-A2M w/ Mount Pipe	C	From Leg	4.00		0.0000	116.00	No Ice	8.77	6.96	0.07
			0.00				1/2"	9.34	8.18	0.14
			0.00				Ice	9.89	9.14	0.21
			0.00				1" Ice			
(2) SBNHH-1D65B w/ Mount Pipe	C	From Leg	4.00		0.0000	116.00	No Ice	8.40	7.07	0.07
			0.00				1/2"	8.96	8.26	0.14
			0.00				Ice	9.49	9.18	0.21
			0.00				1" Ice			
DB-T1-6Z-8AB-0Z	C	From Leg	4.00		0.0000	116.00	No Ice	4.80	2.00	0.04
			0.00				1/2"	5.07	2.19	0.08
			0.00				Ice	5.35	2.39	0.12
			0.00				1" Ice			
DB-T1-6Z-8AB-0Z	C	From Leg	4.00		0.0000	116.00	No Ice	4.80	2.00	0.04
			0.00				1/2"	5.07	2.19	0.08
			0.00				Ice	5.35	2.39	0.12
			0.00				1" Ice			
Platform Mount [LP 1201-1]	C	None			0.0000	116.00	No Ice	23.10	23.10	2.10
							1/2"	26.80	26.80	2.50
							Ice	30.50	30.50	2.90
							1" Ice			

(2) 7770.00 w/ Mount Pipe	A	From Face	4.00		0.0000	106.00	No Ice	5.81	4.63	0.09
			0.00				1/2"	6.27	5.51	0.14
			2.00				Ice	6.70	6.21	0.21
			2.00				1" Ice			
(2) 7770.00 w/ Mount Pipe	B	From Face	4.00		0.0000	106.00	No Ice	5.81	4.63	0.09
			0.00				1/2"	6.27	5.51	0.14
			2.00				Ice	6.70	6.21	0.21
			2.00				1" Ice			
(2) 7770.00 w/ Mount Pipe	C	From Face	4.00		0.0000	106.00	No Ice	5.81	4.63	0.09
			0.00				1/2"	6.27	5.51	0.14
			2.00				Ice	6.70	6.21	0.21
			2.00				1" Ice			
(4) LGP2140X	A	From Face	4.00		0.0000	106.00	No Ice	1.08	0.36	0.01
			0.00				1/2"	1.21	0.45	0.02
			2.00				Ice	1.35	0.56	0.03
			2.00				1" Ice			
(4) LGP2140X	B	From Face	4.00		0.0000	106.00	No Ice	1.08	0.36	0.01

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA} _{Front}	C _{AA} _{Side}	Weight
			Horz	Lateral					
			ft	ft	°	ft	ft ²	ft ²	K
			0.00			1/2"	1.21	0.45	0.02
			2.00			Ice	1.35	0.56	0.03
(4) LGP2140X	C	From Face	4.00	0.0000	106.00	1" Ice	1.08	0.36	0.01
			0.00			No Ice	1.21	0.45	0.02
			2.00			Ice	1.35	0.56	0.03
DC6-48-60-18-8F	A	From Face	0.50	0.0000	106.00	1" Ice	0.92	0.92	0.02
			0.00			No Ice	1.46	1.46	0.04
			2.00			Ice	1.64	1.64	0.06
RRUS-11	A	From Face	4.00	0.0000	106.00	1" Ice	2.79	1.19	0.05
			0.00			No Ice	3.00	1.34	0.07
			2.00			Ice	3.21	1.50	0.09
RRUS-11	B	From Face	4.00	0.0000	106.00	1" Ice	2.79	1.19	0.05
			0.00			No Ice	3.00	1.34	0.07
			2.00			Ice	3.21	1.50	0.09
RRUS-11	C	From Face	4.00	0.0000	106.00	1" Ice	2.79	1.19	0.05
			0.00			No Ice	3.00	1.34	0.07
			2.00			Ice	3.21	1.50	0.09
2.375" OD x 4' Mount Pipe	A	From Leg	4.00	0.0000	106.00	1" Ice	0.87	0.87	0.02
			0.00			No Ice	1.11	1.11	0.03
			2.00			Ice	1.36	1.36	0.04
2.375" OD x 4' Mount Pipe	B	From Leg	4.00	0.0000	106.00	1" Ice	0.87	0.87	0.02
			0.00			No Ice	1.11	1.11	0.03
			2.00			Ice	1.36	1.36	0.04
2.375" OD x 4' Mount Pipe	C	From Leg	4.00	0.0000	106.00	1" Ice	0.87	0.87	0.02
			0.00			No Ice	1.11	1.11	0.03
			2.00			Ice	1.36	1.36	0.04
Platform Mount [LP 1201-1]	C	None		0.0000	106.00	1" Ice	23.10	23.10	2.10
						No Ice	26.80	26.80	2.50
						Ice	30.50	30.50	2.90
SBNHH-1D65A w/ Mount Pipe	A	From Face	4.00	0.0000	106.00	1" Ice	5.82	5.05	0.06
			0.00			No Ice	6.20	5.72	0.11
			2.00			Ice	6.60	6.38	0.17
SBNHH-1D65A w/ Mount Pipe	B	From Face	4.00	0.0000	106.00	1" Ice	5.82	5.05	0.06
			0.00			No Ice	6.20	5.72	0.11
			2.00			Ice	6.60	6.38	0.17
SBNHH-1D65A w/ Mount Pipe	C	From Face	4.00	0.0000	106.00	1" Ice	5.82	5.05	0.06
			0.00			No Ice	6.20	5.72	0.11
			2.00			Ice	6.60	6.38	0.17
RRUS12/RRUS A2	A	From Face	4.00	0.0000	106.00	1" Ice	3.14	1.84	0.07
			0.00			No Ice	3.36	2.01	0.10
			2.00			Ice	3.59	2.20	0.13
RRUS12/RRUS A2	B	From Face	4.00	0.0000	106.00	1" Ice	3.14	1.84	0.07
			0.00			No Ice	3.36	2.01	0.10
			2.00			Ice	3.59	2.20	0.13
RRUS12/RRUS A2	C	From Face	4.00	0.0000	106.00	1" Ice	3.14	1.84	0.07
			0.00			No Ice	3.36	2.01	0.10
			2.00			Ice	3.59	2.20	0.13
RK-60-3M	C	None		0.0000	106.00	1" Ice	0.97	0.97	0.04
						No Ice	1.22	1.22	0.04

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustmen t °	Placement ft	C _{AA} Front ft ²	C _{AA} Side ft ²	Weight K	
						Ice 1" Ice No Ice 1/2" Ice 1" Ice	1.48 4.80 6.70 8.60	1.48 4.80 6.70 8.60	0.06 0.25 0.29 0.34
MT-195-12	C	None		0.0000	106.00				

Kathrein OG-860/1920/GPS-A	B	From Face	3.00 0.00 1.00	0.0000	76.00	No Ice 1/2" Ice 1" Ice	0.14 0.22 0.30	0.14 0.22 0.30	0.00 0.00 0.01
KS24019-L112A	C	From Face	3.00 0.00 1.00	0.0000	76.00	No Ice 1/2" Ice 1" Ice	0.10 0.18 0.26	0.10 0.18 0.26	0.01 0.01 0.01
Side Arm Mount [SO 701-3]	C	None		0.0000	76.00	No Ice 1/2" Ice 1" Ice	2.83 3.92 5.01	2.83 3.92 5.01	0.20 0.24 0.28
**									

Tower Pressures - No Ice

$G_H = 1.100$

Section Elevation ft	z ft	K _Z	q _z psf	A _G ft ²	F a c e	A _F ft ²	A _R ft ²	A _{leg} ft ²	Leg %	C _{AA} In Face ft ²	C _{AA} Out Face ft ²
L1 147.00-105.00	125.21	1.327	30	90.877	A	0.000	90.877	90.877	100.00	0.000	0.000
					B	0.000	90.877		100.00	0.000	0.000
					C	0.000	90.877		100.00	0.000	8.403
L2 105.00-73.25	88.82	1.234	28	84.076	A	0.000	84.076	84.076	100.00	0.000	0.000
					B	0.000	84.076		100.00	0.000	0.000
					C	0.000	84.076		100.00	0.000	13.826
L3 73.25-42.25	57.59	1.127	26	94.356	A	0.000	94.356	94.356	100.00	0.000	0.000
					B	0.000	94.356		100.00	0.000	0.000
					C	0.000	94.356		100.00	0.000	18.423
L4 42.25-0.00	21.33	0.914	21	148.334	A	0.000	148.334	148.334	100.00	0.000	0.000
					B	0.000	148.334		100.00	0.000	0.000
					C	0.000	148.334		100.00	0.000	25.109

Tower Pressure - With Ice

$G_H = 1.100$

Section Elevation ft	z ft	K _Z	q _z psf	t _z in	A _G ft ²	F a c e	A _F ft ²	A _R ft ²	A _{leg} ft ²	Leg %	C _{AA} In Face ft ²	C _{AA} Out Face ft ²
L1 147.00-105.00	125.21	1.327	8	1.7140	102.875	A	0.000	102.875	102.875	100.00	0.000	0.000
						B	0.000	102.875		100.00	0.000	0.000
						C	0.000	102.875		100.00	0.000	33.084
L2 105.00-73.25	88.82	1.234	7	1.6561	93.146	A	0.000	93.146	93.146	100.00	0.000	0.000
						B	0.000	93.146		100.00	0.000	0.000

Section Elevation ft	z ft	K _Z	q _z psf	t _z in	A _G ft ²	F a c e ft ²	A _F ft ²	A _R ft ²	A _{leg} ft ²	Leg %	C _A A _A In Face ft ²	C _A A _A Out Face ft ²
L3 73.25-42.25	57.59	1.127	7	1.5859	102.913	C	0.000	93.146	102.913	100.00	0.000	43.656
						A	0.000	102.913		100.00	0.000	0.000
						B	0.000	102.913		100.00	0.000	0.000
L4 42.25-0.00	21.33	0.914	6	1.4359	159.502	C	0.000	102.913	159.502	100.00	0.000	53.050
						A	0.000	159.502		100.00	0.000	0.000
						B	0.000	159.502		100.00	0.000	0.000
						C	0.000	159.502		100.00	0.000	70.457

Tower Pressure - Service

$G_H = 1.100$

Section Elevation ft	z ft	K _Z	q _z psf	A _G ft ²	F a c e ft ²	A _F ft ²	A _R ft ²	A _{leg} ft ²	Leg %	C _A A _A In Face ft ²	C _A A _A Out Face ft ²
L1 147.00-105.00	125.21	1.327	10	90.877	A	0.000	90.877	90.877	100.00	0.000	0.000
					B	0.000	90.877		100.00	0.000	0.000
					C	0.000	90.877		100.00	0.000	8.403
L2 105.00-73.25	88.82	1.234	10	84.076	A	0.000	84.076	84.076	100.00	0.000	0.000
					B	0.000	84.076		100.00	0.000	0.000
					C	0.000	84.076		100.00	0.000	13.826
L3 73.25-42.25	57.59	1.127	9	94.356	A	0.000	94.356	94.356	100.00	0.000	0.000
					B	0.000	94.356		100.00	0.000	0.000
					C	0.000	94.356		100.00	0.000	18.423
L4 42.25-0.00	21.33	0.914	7	148.334	A	0.000	148.334	148.334	100.00	0.000	0.000
					B	0.000	148.334		100.00	0.000	0.000
					C	0.000	148.334		100.00	0.000	25.109

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 30 deg - No Ice
5	0.9 Dead+1.6 Wind 30 deg - No Ice
6	1.2 Dead+1.6 Wind 60 deg - No Ice
7	0.9 Dead+1.6 Wind 60 deg - No Ice
8	1.2 Dead+1.6 Wind 90 deg - No Ice
9	0.9 Dead+1.6 Wind 90 deg - No Ice
10	1.2 Dead+1.6 Wind 120 deg - No Ice
11	0.9 Dead+1.6 Wind 120 deg - No Ice
12	1.2 Dead+1.6 Wind 150 deg - No Ice
13	0.9 Dead+1.6 Wind 150 deg - No Ice
14	1.2 Dead+1.6 Wind 180 deg - No Ice
15	0.9 Dead+1.6 Wind 180 deg - No Ice
16	1.2 Dead+1.6 Wind 210 deg - No Ice
17	0.9 Dead+1.6 Wind 210 deg - No Ice
18	1.2 Dead+1.6 Wind 240 deg - No Ice
19	0.9 Dead+1.6 Wind 240 deg - No Ice
20	1.2 Dead+1.6 Wind 270 deg - No Ice
21	0.9 Dead+1.6 Wind 270 deg - No Ice
22	1.2 Dead+1.6 Wind 300 deg - No Ice
23	0.9 Dead+1.6 Wind 300 deg - No Ice
24	1.2 Dead+1.6 Wind 330 deg - No Ice
25	0.9 Dead+1.6 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice

Comb. No.	Description
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 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	147 - 105	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-30.59	1.86	-0.69
			Max. Mx	20	-11.60	402.68	-2.46
			Max. My	14	-11.62	2.75	-401.36
			Max. Vy	20	-19.00	402.68	-2.46
			Max. Vx	14	18.88	2.75	-401.36
			Max. Torque	23			-0.98
L2	105 - 73.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-48.73	4.75	-2.15
			Max. Mx	20	-20.86	1190.03	-10.68
			Max. My	14	-20.88	11.18	-1184.80
			Max. Vy	20	-27.48	1190.03	-10.68
			Max. Vx	14	27.36	11.18	-1184.80
			Max. Torque	21			-0.92
L3	73.25 - 42.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-60.13	7.64	-3.84
			Max. Mx	20	-28.59	2089.14	-18.87
			Max. My	14	-28.60	19.50	-2080.12
			Max. Vy	20	-31.24	2089.14	-18.87
			Max. Vx	14	31.12	19.50	-2080.12
			Max. Torque	2			1.50
L4	42.25 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-79.82	12.11	-6.41
			Max. Mx	20	-43.45	3661.61	-31.14
			Max. My	14	-43.45	32.00	-3646.83
			Max. Vy	20	-35.27	3661.61	-31.14
			Max. Vx	14	35.16	32.00	-3646.83
			Max. Torque	24			3.13

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
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Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	26	79.82	-0.00	0.00
	Max. H _x	20	43.50	35.22	-0.25
	Max. H _z	3	32.62	-0.25	35.10
	Max. M _x	2	3644.66	-0.25	35.10
	Max. M _z	8	3658.18	-35.22	0.25
	Max. Torsion	24	3.13	17.40	30.28
	Min. Vert	21	32.62	35.22	-0.25
	Min. H _x	8	43.50	-35.22	0.25
	Min. H _z	14	43.50	0.25	-35.10
	Min. M _x	14	-3646.83	0.25	-35.10
	Min. M _z	20	-3661.61	35.22	-0.25
	Min. Torsion	12	-3.13	-17.40	-30.28

Tower Mast Reaction Summary

Load Combination	Vertical K	Shear _x K	Shear _z K	Overturning Moment, M _x kip-ft	Overturning Moment, M _z kip-ft	Torque kip-ft
Dead Only	36.25	0.00	-0.00	0.66	1.35	0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	43.50	0.25	-35.10	-3644.66	-28.58	-3.06
0.9 Dead+1.6 Wind 0 deg - No Ice	32.62	0.25	-35.10	-3589.48	-28.56	-3.05
1.2 Dead+1.6 Wind 30 deg - No Ice	43.50	17.82	-30.52	-3171.75	-1854.56	-2.16
0.9 Dead+1.6 Wind 30 deg - No Ice	32.62	17.82	-30.52	-3123.57	-1826.68	-2.15
1.2 Dead+1.6 Wind 60 deg - No Ice	43.50	30.62	-17.77	-1848.31	-3183.10	-0.68
0.9 Dead+1.6 Wind 60 deg - No Ice	32.62	30.62	-17.77	-1820.32	-3134.96	-0.68
1.2 Dead+1.6 Wind 90 deg - No Ice	43.50	35.22	-0.25	-29.44	-3658.18	0.98
0.9 Dead+1.6 Wind 90 deg - No Ice	32.62	35.22	-0.25	-29.19	-3602.67	0.97
1.2 Dead+1.6 Wind 120 deg - No Ice	43.50	30.38	17.34	1797.70	-3153.09	2.37
0.9 Dead+1.6 Wind 120 deg - No Ice	32.62	30.38	17.34	1770.07	-3105.40	2.36
1.2 Dead+1.6 Wind 150 deg - No Ice	43.50	17.40	30.28	3143.43	-1802.24	3.13
0.9 Dead+1.6 Wind 150 deg - No Ice	32.62	17.40	30.28	3095.26	-1775.18	3.12
1.2 Dead+1.6 Wind 180 deg - No Ice	43.50	-0.25	35.10	3646.83	32.00	3.05
0.9 Dead+1.6 Wind 180 deg - No Ice	32.62	-0.25	35.10	3590.93	31.08	3.04
1.2 Dead+1.6 Wind 210 deg - No Ice	43.50	-17.82	30.52	3173.45	1857.97	2.15
0.9 Dead+1.6 Wind 210 deg - No Ice	32.62	-17.82	30.52	3124.82	1829.19	2.15
1.2 Dead+1.6 Wind 240 deg - No Ice	43.50	-30.62	17.77	1850.02	3186.52	0.68
0.9 Dead+1.6 Wind 240 deg - No Ice	32.62	-30.62	17.77	1821.58	3137.48	0.68
1.2 Dead+1.6 Wind 270 deg - No Ice	43.50	-35.22	0.25	31.14	3661.61	-0.97
0.9 Dead+1.6 Wind 270 deg - No Ice	32.62	-35.22	0.25	30.44	3605.20	-0.97
1.2 Dead+1.6 Wind 300 deg - No Ice	43.50	-30.38	-17.34	-1796.02	3156.52	-2.37
0.9 Dead+1.6 Wind 300 deg - No Ice	32.62	-30.38	-17.34	-1768.83	3107.93	-2.36
1.2 Dead+1.6 Wind 330 deg - No Ice	43.50	-17.40	-30.28	-3141.75	1805.67	-3.13

Load Combination	Vertical	Shear _x	Shear _z	Overturning Moment, M _x	Overturning Moment, M _z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
0.9 Dead+1.6 Wind 330 deg - No Ice	32.62	-17.40	-30.28	-3094.02	1777.70	-3.12
1.2 Dead+1.0 Ice	79.82	0.00	-0.00	6.41	12.11	-0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice	79.82	0.05	-10.83	-1181.99	5.61	-1.71
1.2 Dead+1.0 Wind 30 deg+1.0 Ice	79.82	5.47	-9.41	-1026.18	-589.21	-1.08
1.2 Dead+1.0 Wind 60 deg+1.0 Ice	79.82	9.43	-5.46	-593.55	-1022.86	-0.15
1.2 Dead+1.0 Wind 90 deg+1.0 Ice	79.82	10.86	-0.05	-0.15	-1179.06	0.81
1.2 Dead+1.0 Wind 120 deg+1.0 Ice	79.82	9.38	5.37	595.03	-1016.24	1.56
1.2 Dead+1.0 Wind 150 deg+1.0 Ice	79.82	5.38	9.36	1032.42	-577.67	1.89
1.2 Dead+1.0 Wind 180 deg+1.0 Ice	79.82	-0.05	10.83	1194.96	18.88	1.71
1.2 Dead+1.0 Wind 210 deg+1.0 Ice	79.82	-5.47	9.41	1039.14	613.70	1.08
1.2 Dead+1.0 Wind 240 deg+1.0 Ice	79.82	-9.43	5.46	606.52	1047.36	0.15
1.2 Dead+1.0 Wind 270 deg+1.0 Ice	79.82	-10.86	0.05	13.12	1203.55	-0.81
1.2 Dead+1.0 Wind 300 deg+1.0 Ice	79.82	-9.38	-5.37	-582.07	1040.73	-1.56
1.2 Dead+1.0 Wind 330 deg+1.0 Ice	79.82	-5.38	-9.36	-1019.55	602.21	-1.89
Dead+Wind 0 deg - Service	36.25	0.05	-7.51	-773.57	-5.00	0.13
Dead+Wind 30 deg - Service	36.25	3.81	-6.53	-673.05	-392.78	-0.01
Dead+Wind 60 deg - Service	36.25	6.55	-3.80	-392.01	-674.92	-0.15
Dead+Wind 90 deg - Service	36.25	7.53	-0.05	-5.73	-775.84	-0.25
Dead+Wind 120 deg - Service	36.25	6.50	3.71	382.27	-668.49	-0.28
Dead+Wind 150 deg - Service	36.25	3.72	6.48	668.02	-381.64	-0.24
Dead+Wind 180 deg - Service	36.25	-0.05	7.51	774.97	7.86	-0.13
Dead+Wind 210 deg - Service	36.25	-3.81	6.53	674.45	395.64	0.01
Dead+Wind 240 deg - Service	36.25	-6.55	3.80	393.40	677.78	0.15
Dead+Wind 270 deg - Service	36.25	-7.53	0.05	7.13	778.70	0.25
Dead+Wind 300 deg - Service	36.25	-6.50	-3.71	-380.87	671.35	0.28
Dead+Wind 330 deg - Service	36.25	-3.72	-6.48	-666.62	384.50	0.24

Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
1	0.00	-36.25	0.00	-0.00	36.25	0.00	0.000%
2	0.25	-43.50	-35.10	-0.25	43.50	35.10	0.009%
3	0.25	-32.62	-35.10	-0.25	32.62	35.10	0.007%
4	17.82	-43.50	-30.52	-17.82	43.50	30.52	0.000%
5	17.82	-32.62	-30.52	-17.82	32.62	30.52	0.000%
6	30.62	-43.50	-17.77	-30.62	43.50	17.77	0.000%
7	30.62	-32.62	-17.77	-30.62	32.62	17.77	0.000%
8	35.22	-43.50	-0.25	-35.22	43.50	0.25	0.004%
9	35.22	-32.62	-0.25	-35.22	32.62	0.25	0.007%
10	30.38	-43.50	17.34	-30.38	43.50	-17.34	0.000%
11	30.38	-32.62	17.34	-30.38	32.62	-17.34	0.000%
12	17.40	-43.50	30.28	-17.40	43.50	-30.28	0.000%
13	17.40	-32.62	30.28	-17.40	32.62	-30.28	0.000%

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
14	-0.25	-43.50	35.10	0.25	43.50	-35.10	0.002%
15	-0.25	-32.62	35.10	0.25	32.62	-35.10	0.003%
16	-17.82	-43.50	30.52	17.82	43.50	-30.52	0.000%
17	-17.82	-32.62	30.52	17.82	32.62	-30.52	0.000%
18	-30.62	-43.50	17.77	30.62	43.50	-17.77	0.000%
19	-30.62	-32.62	17.77	30.62	32.62	-17.77	0.000%
20	-35.22	-43.50	0.25	35.22	43.50	-0.25	0.004%
21	-35.22	-32.62	0.25	35.22	32.62	-0.25	0.007%
22	-30.38	-43.50	-17.34	30.38	43.50	17.34	0.000%
23	-30.38	-32.62	-17.34	30.38	32.62	17.34	0.000%
24	-17.40	-43.50	-30.28	17.40	43.50	30.28	0.000%
25	-17.40	-32.62	-30.28	17.40	32.62	30.28	0.000%
26	0.00	-79.82	0.00	-0.00	79.82	0.00	0.001%
27	0.05	-79.82	-10.84	-0.05	79.82	10.83	0.002%
28	5.47	-79.82	-9.41	-5.47	79.82	9.41	0.001%
29	9.43	-79.82	-5.46	-9.43	79.82	5.46	0.001%
30	10.86	-79.82	-0.05	-10.86	79.82	0.05	0.002%
31	9.38	-79.82	5.37	-9.38	79.82	-5.37	0.001%
32	5.38	-79.82	9.36	-5.38	79.82	-9.36	0.002%
33	-0.05	-79.82	10.84	0.05	79.82	-10.83	0.002%
34	-5.47	-79.82	9.41	5.47	79.82	-9.41	0.001%
35	-9.43	-79.82	5.46	9.43	79.82	-5.46	0.001%
36	-10.86	-79.82	0.05	10.86	79.82	-0.05	0.002%
37	-9.38	-79.82	-5.37	9.38	79.82	5.37	0.001%
38	-5.38	-79.82	-9.36	5.38	79.82	9.36	0.001%
39	0.05	-36.25	-7.51	-0.05	36.25	7.51	0.002%
40	3.81	-36.25	-6.53	-3.81	36.25	6.53	0.002%
41	6.55	-36.25	-3.80	-6.55	36.25	3.80	0.002%
42	7.54	-36.25	-0.05	-7.53	36.25	0.05	0.002%
43	6.50	-36.25	3.71	-6.50	36.25	-3.71	0.002%
44	3.72	-36.25	6.48	-3.72	36.25	-6.48	0.002%
45	-0.05	-36.25	7.51	0.05	36.25	-7.51	0.002%
46	-3.81	-36.25	6.53	3.81	36.25	-6.53	0.002%
47	-6.55	-36.25	3.80	6.55	36.25	-3.80	0.002%
48	-7.54	-36.25	0.05	7.53	36.25	-0.05	0.002%
49	-6.50	-36.25	-3.71	6.50	36.25	3.71	0.002%
50	-3.72	-36.25	-6.48	3.72	36.25	6.48	0.002%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	6	0.00000001	0.00000001
2	Yes	15	0.00009438	0.00012065
3	Yes	15	0.00006039	0.00009589
4	Yes	20	0.00000001	0.00014718
5	Yes	20	0.00000001	0.00009438
6	Yes	20	0.00000001	0.00014966
7	Yes	20	0.00000001	0.00009602
8	Yes	16	0.00004252	0.00009016
9	Yes	15	0.00006034	0.00014470
10	Yes	20	0.00000001	0.00014382
11	Yes	20	0.00000001	0.00009247
12	Yes	20	0.00000001	0.00014152
13	Yes	20	0.00000001	0.00009095
14	Yes	17	0.00001888	0.00007464
15	Yes	16	0.00002655	0.00011683
16	Yes	21	0.00000001	0.00006544
17	Yes	20	0.00000001	0.00009660
18	Yes	20	0.00000001	0.00014832
19	Yes	20	0.00000001	0.00009502
20	Yes	16	0.00004251	0.00008729
21	Yes	15	0.00006033	0.00013839
22	Yes	20	0.00000001	0.00014242
23	Yes	20	0.00000001	0.00009150

24	Yes	20	0.00000001	0.00014456
25	Yes	20	0.00000001	0.00009297
26	Yes	12	0.00000001	0.00000626
27	Yes	17	0.00010292	0.00002881
28	Yes	18	0.00000001	0.00007864
29	Yes	18	0.00000001	0.00008354
30	Yes	17	0.00010292	0.00001837
31	Yes	18	0.00000001	0.00008662
32	Yes	17	0.00010255	0.00014672
33	Yes	17	0.00010290	0.00003287
34	Yes	18	0.00000001	0.00009293
35	Yes	18	0.00000001	0.00008785
36	Yes	17	0.00010290	0.00002110
37	Yes	18	0.00000001	0.00007892
38	Yes	18	0.00000001	0.00009011
39	Yes	15	0.00000001	0.00003276
40	Yes	15	0.00000001	0.00008575
41	Yes	15	0.00000001	0.00008943
42	Yes	15	0.00000001	0.00003394
43	Yes	15	0.00000001	0.00007669
44	Yes	15	0.00000001	0.00008694
45	Yes	15	0.00000001	0.00003233
46	Yes	15	0.00000001	0.00008761
47	Yes	15	0.00000001	0.00008461
48	Yes	15	0.00000001	0.00003309
49	Yes	15	0.00000001	0.00008876
50	Yes	15	0.00000001	0.00007781

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	147 - 105	30.729	47	1.6934	0.0017
L2	108.25 - 73.25	17.546	47	1.4898	0.0017
L3	77.5 - 42.25	9.059	47	1.0974	0.0009
L4	47 - 0	3.353	47	0.6553	0.0004

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
147.00	APXVSPP18-C-A20 w/ Mount Pipe	47	30.729	1.6934	0.0018	43483
135.00	ERICSSON AIR 21 B2A B4P w/ Mount Pipe	47	26.496	1.6529	0.0018	18117
116.00	(2) LPA-80080/4CF w/ Mount Pipe	47	20.028	1.5537	0.0018	7012
106.00	(2) 7770.00 w/ Mount Pipe	47	16.849	1.4678	0.0017	5489
76.00	Kathrein OG-860/1920/GPS-A	47	8.708	1.0756	0.0008	4142

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	147 - 105	144.154	18	7.9673	0.0082
L2	108.25 - 73.25	82.415	18	7.0139	0.0054
L3	77.5 - 42.25	42.588	18	5.1668	0.0047

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L4	47 - 0	15.770	18	3.0841	0.0031

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
147.00	APXVSPP18-C-A20 w/ Mount Pipe	18	144.154	7.9673	0.0082	9605
135.00	ERICSSON AIR 21 B2A B4P w/ Mount Pipe	18	124.339	7.7786	0.0070	4000
116.00	(2) LPA-80080/4CF w/ Mount Pipe	18	94.047	7.3141	0.0058	1543
106.00	(2) 7770.00 w/ Mount Pipe	18	79.144	6.9106	0.0053	1205
76.00	Kathrein OG-860/1920/GPS-A	18	40.941	5.0642	0.0047	896

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	KI/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
L1	147 - 105 (1)	TP29.141x22x0.25	42.00	0.00	0.0	22.486 5	-11.56	1506.56	0.008
L2	105 - 73.25 (2)	TP33.955x28.0884x0.312 5	35.00	0.00	0.0	32.662 6	-20.83	2231.39	0.009
L3	73.25 - 42.25 (3)	TP38.601x32.6176x0.375	35.25	0.00	0.0	44.538 8	-28.57	3054.47	0.009
L4	42.25 - 0 (4)	TP45.12x37.0447x0.4375	47.00	0.00	0.0	62.047 2	-43.45	4255.20	0.010

Pole Bending Design Data

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{rx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{rx}}$	M_{uy} kip-ft	ϕM_{ry} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ry}}$
L1	147 - 105 (1)	TP29.141x22x0.25	404.34	877.08	0.461	0.00	877.08	0.000
L2	105 - 73.25 (2)	TP33.955x28.0884x0.312 5	1197.79	1508.55	0.794	0.00	1508.55	0.000
L3	73.25 - 42.25 (3)	TP38.601x32.6176x0.375	2103.01	2345.30	0.897	0.00	2345.30	0.000
L4	42.25 - 0 (4)	TP45.12x37.0447x0.4375	3684.63	3902.28	0.944	0.00	3902.28	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	147 - 105 (1)	TP29.141x22x0.25	19.20	753.28	0.025	0.66	1756.31	0.000

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
L2	105 - 73.25 (2)	TP33.955x28.0884x0.312 5	27.68	1115.69	0.025	0.71	3020.78	0.000
L3	73.25 - 42.25 (3)	TP38.601x32.6176x0.375	31.43	1527.24	0.021	0.68	4696.34	0.000
L4	42.25 - 0 (4)	TP45.12x37.0447x0.4375	35.46	2127.60	0.017	0.68	7814.10	0.000

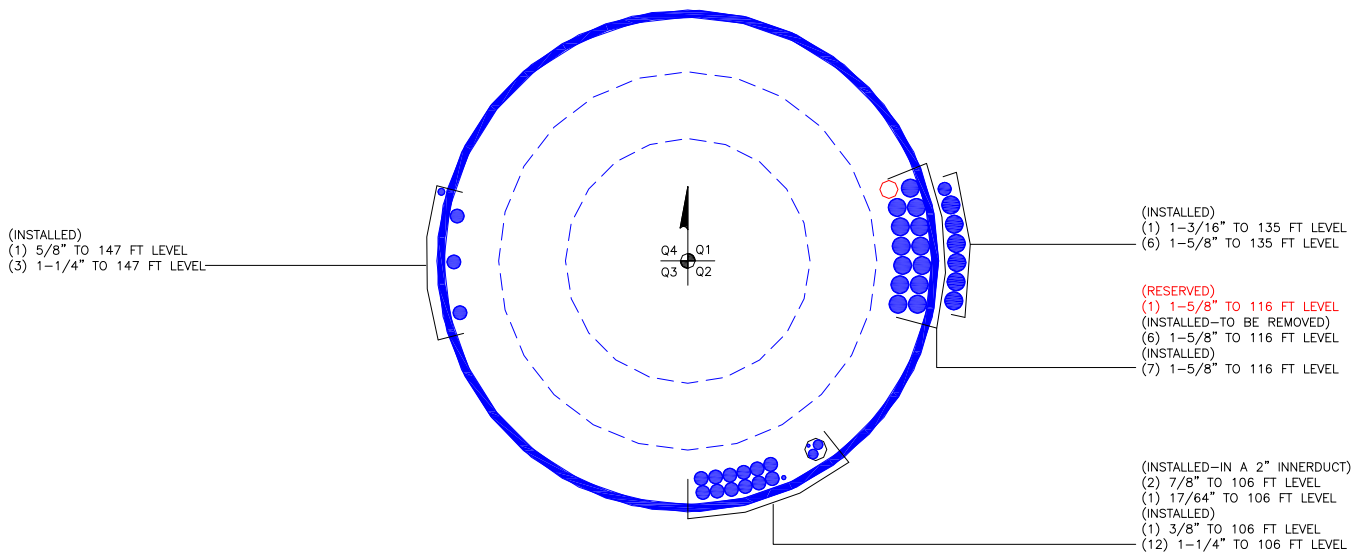
Pole Interaction Design Data

Section No.	Elevation ft	Ratio P_u ϕP_n	Ratio M_{ux} ϕM_{nx}	Ratio M_{uy} ϕM_{ny}	Ratio V_u ϕV_n	Ratio T_u ϕT_n	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	147 - 105 (1)	0.008	0.461	0.000	0.025	0.000	0.469	1.000	4.8.2 ✓
L2	105 - 73.25 (2)	0.009	0.794	0.000	0.025	0.000	0.804	1.000	4.8.2 ✓
L3	73.25 - 42.25 (3)	0.009	0.897	0.000	0.021	0.000	0.906	1.000	4.8.2 ✓
L4	42.25 - 0 (4)	0.010	0.944	0.000	0.017	0.000	0.955	1.000	4.8.2 ✓

Section Capacity Table

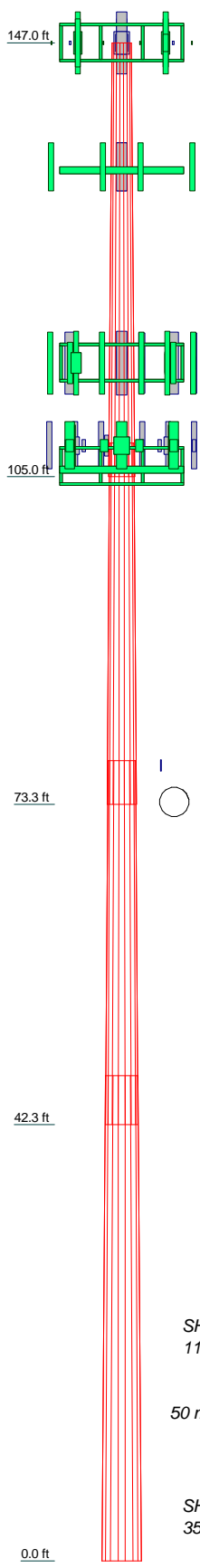
Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
L1	147 - 105	Pole	TP29.141x22x0.25	1	-11.56	1506.56	46.9	Pass
L2	105 - 73.25	Pole	TP33.955x28.0884x0.3125	2	-20.83	2231.39	80.4	Pass
L3	73.25 - 42.25	Pole	TP38.601x32.6176x0.375	3	-28.57	3054.47	90.6	Pass
L4	42.25 - 0	Pole	TP45.12x37.0447x0.4375	4	-43.45	4255.20	95.5	Pass
Summary								
Pole (L4)							95.5	Pass
RATING =							95.5	Pass

APPENDIX B
BASE LEVEL DRAWING



APPENDIX C
ADDITIONAL CALCULATIONS

Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	42.00	18	0.2500	3.25	22.0000	29.1410	A607-60	2.9
2	35.00	18	0.3125	4.25	28.0884	33.9550	A607-60	3.6
3	35.25	18	0.3750	4.75	32.6176	38.6010	A607-60	5.0
4	47.00	18	0.4375	37.0447	45.1200		A607-60	9.0



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
APXVSP18-C-A20 w/ Mount Pipe	147	RRH2X60-PCS	116
APXVSP18-C-A20 w/ Mount Pipe	147	HBXX-6517DS-A2M w/ Mount Pipe	116
APXVSP18-C-A20 w/ Mount Pipe	147	(2) SBNHH-1D65B w/ Mount Pipe	116
800 EXTERNAL NOTCH FILTER	147	RRH2x60-700	116
800 EXTERNAL NOTCH FILTER	147	RRH4X45-AWS4 B66	116
800 EXTERNAL NOTCH FILTER	147	RRH2X60-PCS	116
(3) ACU-A20-N	147	HBXX-6517DS-A2M w/ Mount Pipe	116
(3) ACU-A20-N	147	(2) SBNHH-1D65B w/ Mount Pipe	116
(3) ACU-A20-N	147	RRH2x60-700	116
1900MHz RRH (65MHz)	147	RRH4X45-AWS4 B66	116
1900MHz RRH (65MHz)	147	RRH2X60-PCS	116
1900MHz RRH (65MHz)	147	HBXX-6517DS-A2M w/ Mount Pipe	116
800MHz RRH	147	(2) SBNHH-1D65B w/ Mount Pipe	116
800MHz RRH	147	DB-T1-6Z-8AB-OZ	116
800MHz RRH	147	DB-T1-6Z-8AB-OZ	116
APXVTM14-C-120 w/ Mount Pipe	147	Platform Mount [LP 1201-1]	116
APXVTM14-C-120 w/ Mount Pipe	147	(2) 7770.00 w/ Mount Pipe	106
APXVTM14-C-120 w/ Mount Pipe	147	(2) 7770.00 w/ Mount Pipe	106
TD-RRH8x20-25	147	(2) 7770.00 w/ Mount Pipe	106
TD-RRH8x20-25	147	(4) LGP2140X	106
TD-RRH8x20-25	147	(4) LGP2140X	106
Platform Mount [LP 1201-1]	147	(4) LGP2140X	106
Miscellaneous (NA507-1)	147	DC6-48-60-18-8F	106
(2) 2.375" OD x 4' Mount Pipe	147	RRUS-11	106
(2) 2.375" OD x 4' Mount Pipe	147	RRUS-11	106
(2) 2.375" OD x 4' Mount Pipe	147	RRUS-11	106
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	135	2.375" OD x 4' Mount Pipe	106
(2) ERICSSON AIR 21 B2A B4P w/ Mount Pipe	135	2.375" OD x 4' Mount Pipe	106
(2) ERICSSON AIR 21 B2A B4P w/ Mount Pipe	135	2.375" OD x 4' Mount Pipe	106
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	135	Platform Mount [LP 1201-1]	106
(2) ERICSSON AIR 21 B4A B2P w/ Mount Pipe	135	SBNHH-1D65A w/ Mount Pipe	106
(2) ERICSSON AIR 21 B4A B2P w/ Mount Pipe	135	SBNHH-1D65A w/ Mount Pipe	106
(2) ERICSSON AIR 21 B4A B2P w/ Mount Pipe	135	SBNHH-1D65A w/ Mount Pipe	106
T-Arm Mount [TA 601-3]	135	RRUS12/RRUS A2	106
(2) LPA-80080/4CF w/ Mount Pipe	116	RRUS12/RRUS A2	106
(2) LPA-80063/6CF w/ Mount Pipe	116	RRUS12/RRUS A2	106
(2) APL868013 w/ Mount Pipe	116	RK-60-3M	106
(2) ClearGain Dual Band 800/1900 MHz	116	MT-195-12	106
RRH2x60-700	116	Kathrein OG-860/1920/GPS-A	76
RRH4X45-AWS4 B66	116	KS24019-L112A	76
		Side Arm Mount [SO 701-3]	76

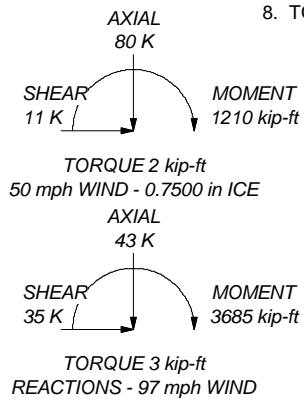
MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A607-60	60 ksi	75 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. TOWER RATING: 95.5%

ALL REACTIONS ARE FACTORED



Paul J. Ford and Company
 250 East Broad St., Suite 600
 Columbus, OH 43215
 Phone: (614) 221-6679
 FAX: (614) 448-4105

Job: **147 ft Monopole / Secondino Property**
 Project: **PJF 37516-2026/ BU 876316**
 Client: CCI
 Code: TIA-222-G
 Path:
 Drawn by: Maria C Lopez
 Date: 10/26/16
 App'd:
 Scale: NTS
 Dwg No. E-1

G:\TOWER\37516-2026\Drawn_Caller\2016\37516-2026_876316_Secundino\Proj\37516-2026\003\7805_5A_131870037516-2026\003_7805.dwg

Square, Stiffened / Unstiffened Base Plate, Any Rod Material - Rev. F /G

- Assumptions: 1) Rod groups at corners. Total # rods divisible by 4. Maximum total # of rods = 48 (12 per Corner).
 2) Rod Spacing = Straight Center-to-Center distance between any (2) adjacent rods (same corner)
 3) Clear space between bottom of leveling nut and top of concrete **not** exceeding $(1) \times (\text{Rod Diameter})$

Site Data

BU#: 876316

Site Name: *Secondino Property*

App #:

Anchor Rod Data

Eta Factor, η	0.5	TIA G (Fig. 4-4)
Qty:	16	
Diam:	2.25	in
Rod Material:	A615-J	
Yield, Fy:	75	ksi
Strength, Fu:	100	ksi
Bolt Circle:	52	in
Anchor Spacing:	6	in

Plate Data

W=Side:	53	in
Thick:	3	in
Grade:	50	ksi
Clip Distance:	0	in

Stiffener Data (Welding at both sides)

Configuration:	Unstiffened	
Weld Type:		**
Groove Depth:		in **
Groove Angle:		degrees
Fillet H. Weld:		<-- Disregard
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		ksi

Pole Data

Diam:	45.12	in
Thick:	0.4375	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round

Base Reactions

TIA Revision:	G	
Factored Moment, Mu:	3685	ft-kips
Factored Axial, Pu:	43	kips
Factored Shear, Vu:	35	kips

Anchor Rod Results

TIA G --> Max Rod $(C_u + V_u/\eta)$: 219.7 Kips
 Axial Design Strength, $\Phi * F_u * A_{net}$: 260.0 Kips
 Anchor Rod Stress Ratio: 84.5% **Pass**

Base Plate Results

Base Plate Stress: 32.2 ksi
 PL Design Bending Strength, $\Phi * F_y$: 45.0 ksi
 Base Plate Stress Ratio: 71.6% **Pass**

Flexural Check

PL Ref. Data

Yield Line (in):	29.83
Max PL Length:	29.83

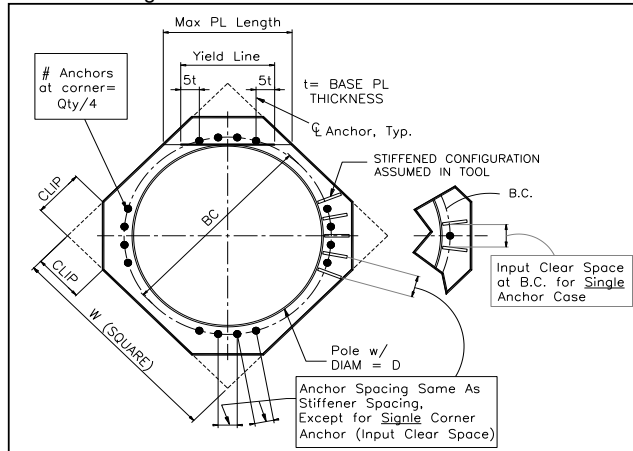
N/A - Unstiffened

Stiffener Results

Horizontal Weld : N/A
 Vertical Weld: N/A
 Plate Flex+Shear, $f_b/F_b + (f_v/F_v)^2$: N/A
 Plate Tension+Shear, $f_t/F_t + (f_v/F_v)^2$: N/A
 Plate Comp. (AISC Bracket): N/A

Pole Results

Pole Punching Shear Check: N/A



** Note: for complete joint penetration groove welds the groove depth must be exactly 1/2 the stiffener thickness for calculation purposes

DRILLED PIER SOIL AND STEEL ANALYSIS - TIA-222-G

Factored Base Reactions from RISA

	Comp. (+)	Tension (-)	
Moment, Mu =	3685.0		k-ft
Shear, Vu =	35.0		kips
Axial Load, Pu1 =	43.0		kips (from 1.2D + 1.6W)*
Axial Load, Pu2 =	32.3	0.0	kips (from 0.9D + 1.6W)**
OTMu =	3702.5	0.0	k-ft @ Ground

*Axial Load, Pu1 will be used for Soil Compression Analysis.
 **Axial Load, Pu2 will be used for Steel Analysis.

Drilled Pier Parameters

Diameter =	7	ft
Height Above Grade =	0.5	ft
Depth Below Grade =	22.5	ft
fc' =	3	ksi
εc =	0.003	in/in
L / D Ratio =	3.29	
Mat Ftdn. Cap Width =		ft
Mat Ftdn. Cap Length =		ft
Depth Below Grade =		ft

Steel Parameters

Number of Bars =	32	
Rebar Size =	#11	
Rebar Fy =	60	ksi
Rebar MOE =	29000	ksi
Tie Size =	#5	
Side Clear Cover to Ties =	4	in

Direct Embed Pole Shaft Parameters

Dia @ Grade =		in
Dia @ Depth Below Grade =		in
Number of Sides =		
Thickness =		in
Fy =		ksi
Backfill Condition =		

Define Soil Layers

Note: Cohesion = Undrained Shear Strength = Unconfined Compressive Strength / 2

Layer	Thickness ft	Unit Weight pcf	Cohesion psf	Friction Angle degrees	Soil Type	Ultimate End Bearing psf	Comp. Ult. Skin Friction psf	Tension Ult. Skin Friction psf	Depth ft
1	3	116	0	45	Sand		80		3
2	2	115	0	38	Sand		180		5
3	2	116	0	41	Sand		240		7
4	3	117		45	Sand		380		10
5	5	117		45	Sand		480		15
6	5	117	3250		Clay		1200		20
7	5	117		45	Sand	29050	760		25
8									
9									
10									
11									
12									

Soil Results: Overturning

Depth to COR =	16.00	ft, from Grade
Bending Moment, Mu =	4262.39	k-ft, from COR
Resisting Moment, ΦMn =	7560.60	k-ft, from COR

MOMENT RATIO = 56.4% OK

Shear, Vu =	35.00	kips
Resisting Shear, ΦVn =	62.08	kips

SHEAR RATIO = 56.4% OK

Soil Results: Uplift

Uplift, Tu =	0.00	kips
Uplift Capacity, ΦTn =	81.67	kips

UPLIFT RATIO = 0.0% OK

Soil Results: Compression

Compression, Cu =	43.00	kips
Comp. Capacity, ΦCn =	1001.37	kips

COMPRESSION RATIO = 4.3% OK

Steel Results (ACI 318-08):

Minimum Steel Area =	18.47	sq in
Actual Steel Area =	49.92	sq in

Axial, ΦPn (min) =	-2695.68	kips, Where ΦMn = 0 k-ft
Axial, ΦPn (max) =	8839.70	kips, Where ΦMn = 0 k-ft

Axial Load, Pu =	58.50	kips @ 5.25 ft Below Grade
Moment, Mu =	3859.15	k-ft @ 5.25 ft Below Grade
Moment, ΦMn =	7493.67	k-ft

MOMENT RATIO = 51.5% OK

Safety Factors / Load Factors / Φ Factors

Tower Type =	Monopole DP
ACI Code =	ACI 318-08
Seismic Design Category =	D
Reference Standard =	TIA-222-G
Use 1.3 Load Factor?	No
Load Factor =	1.00

	Safety Factor	Φ Factor
Soil Lateral Resistance =	2.00	0.75
Skin Friction =	2.00	0.75
End Bearing =	2.00	0.75
Concrete Wt. Resist Uplift =	1.25	

Load Combinations Checked per TIA-222-G

- (0.75) Ult. Skin Friction + (0.75) Ult. End Bearing + (1.2) Effective Soil Wt. - (1.2) Buoyant Conc. Wt. ≥ Comp.
- (0.75) Ult. Skin Friction + (0.9) Buoyant Conc. Wt. ≥ Uplift

Soil Parameters

Water Table Depth =	5.00	ft
Depth to Ignore Soil =	3.50	ft
Depth to Full Cohesion =	0	ft
Full Cohesion Starts at?*	Ground	

Above Full Cohesion Lateral Resistance = 4(Cohesion)(Dia)(H)
 Below Full Cohesion Lateral Resistance = 8(Cohesion)(Dia)(H)

Maximum Capacity Ratios

Maximum Soil Ratio =	100.0%
Maximum Steel Ratio =	100.0%

*Note: The drilled pier foundation was analyzed using the methodology in the software 'PLS-Caisson' (Version 8.10, or newer, by Power Line Systems, Inc.). Per the methods in PLS-Caisson, the soil reactions of cohesive soils are calculated using 8CD independent of the depth of the soil layer. The depth of soil to be ignored at the top of the drilled pier is based on the recommendations of the site specific geotechnical report. In the absence of any recommendations, the frost depth at the site or one half of the drilled pier diameter (whichever is greater) shall be ignored.

Moment Capacity of Drilled Concrete Shaft (Caisson) for TIA Rev F or G

Note: Shaft assumed to have ties, not spiral, transverse reinforcing

Site Data

BU#: 876316
Site Name: <i>Secondino Property</i>
App #:

Loads Already Factored		
For M (WL)	1	<----Disregard
For P (DL)	1	<----Disregard

Pier Properties	
Concrete:	
Pier Diameter =	7.0 ft
Concrete Area =	5541.8 in ²
Reinforcement:	
Clear Cover to Tie=	4.00 in
Horiz. Tie Bar Size=	5
Vert. Cage Diameter =	6.11 ft
Vert. Cage Diameter =	73.34 in
Vertical Bar Size =	11
Bar Diameter =	1.41 in
Bar Area =	1.56 in ²
Number of Bars =	32
As Total=	49.92 in ²
A s/ Aconc, Rho:	0.0090 0.90%

ACI 10.5 , ACI 21.10.4, and IBC 1810.
Min As for Flexural, Tension Controlled, Shafts:

$$(3) * (\text{Sqrt}(f'c) / Fy) = 0.0027$$

$$200 / Fy = 0.0033$$

Minimum Rho Check:

Actual Req'd Min. Rho:	0.33%	Flexural
Provided Rho:	0.90%	OK

Ref. Shaft Max Axial Capacities, ϕ Max(Pn or Tn):		
Max Pu = ($\phi=0.65$) Pn.		
Pn per ACI 318 (10-2)	8839.70	kips
at Mu=($\phi=0.65$)Mn=	5309.39	ft-kips
Max Tu, ($\phi=0.9$) Tn =	2695.68	kips
at Mu= $\phi=(0.90)$ Mn=	0.00	ft-kips

Maximum Shaft Superimposed Forces		
TIA Revision:	G	
Max. Factored Shaft Mu:	3859.15	ft-kips (* Note)
Max. Factored Shaft Pu:	58.5	kips
Max Axial Force Type:	Comp.	

(* Note: Max Shaft Superimposed Moment does not necessarily equal to the shaft top reaction moment

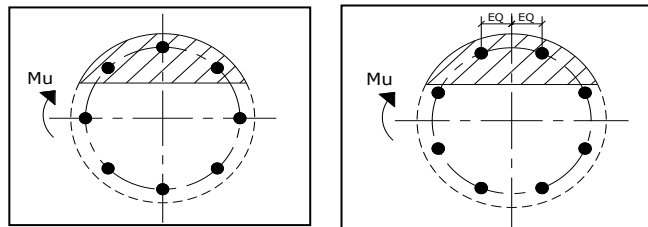
Load Factor	Shaft Factored Loads	
1.00	Mu:	3859.15 ft-kips
1.00	Pu:	58.5 kips

Material Properties		
Concrete Comp. strength, f'c =	3000	psi
Reinforcement yield strength, Fy =	60	ksi
Reinforcing Modulus of Elasticity, E =	29000	ksi
Reinforcement yield strain =	0.00207	
Limiting compressive strain =	0.003	
ACI 318 Code		
Select Analysis ACI Code=	2008	
Seismic Properties		
Seismic Design Category =	D	
Seismic Risk =	High	

Solve (Run) <-- Press Upon Completing All Input

Results:

Governing Orientation Case: 2



Case 1

Case 2

Dist. From Edge to Neutral Axis: 16.92 in

Extreme Steel Strain, ϵ_t : 0.0109

$\epsilon_t > 0.0050$, Tension Controlled

Reduction Factor, ϕ : 0.900

Output Note: Negative Pu=Tension

For Axial Compression, ϕ Pn = Pu:	58.50	kips
Drilled Shaft Moment Capacity, ϕ Mn:	7493.67	ft-kips
Drilled Shaft Superimposed Mu:	3859.15	ft-kips

(Mu/ ϕ Mn, Drilled Shaft Flexure CSR: 51.5%