



# STATE OF CONNECTICUT

## CONNECTICUT SITING COUNCIL

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VIA ELECTRONIC MAIL

May 18, 2018

Mark Roberts  
QC Development  
P.O. Box 916  
Storrs, CT 06268

RE: **EM-CING-085-180403** - New Cingular Wireless PCS, LLC (AT&T) notice of intent to modify an existing telecommunications facility located at 88 Main Street, Monroe, Connecticut.

Dear Mr. Roberts:

The Connecticut Siting Council (Council) is in receipt of your email correspondence of May 17, 2018 submitted in response to the Council's April 12, 2018 notification of an incomplete request for exempt modification with regard to the above-referenced matter.

The submission renders the request for exempt modification complete and the Council will process the request in accordance with the Federal Communications Commission 60-day timeframe.

Thank you for your attention and cooperation.

Sincerely,

Melanie A. Bachman  
Executive Director

MB/CMW/jmb



**From:** Mark Roberts [<mailto:mark.roberts@qcdevelopment.net>]

**Sent:** Thursday, May 17, 2018 4:58 PM

**To:** CSC-DL Siting Council

**Subject:** RE: Council Decision On Extension Request EM-CING-085-180403 - Main St.

**Importance:** High

Hello – Please see the attached Revised Structural Analysis Report, which now specifically identifies the proposed Handrail Kit (COMMSCOPE P/N MT-195-12) per your 4/12 incomplete letter.

Thanks

Mark Roberts  
QC Development  
860-670-9068

Date: **May 08, 2018**

Cheryl Schultz  
Crown Castle  
3530 Toringdon Way, Suite 300  
Charlotte, NC 28277



Crown Castle  
2000 Corporate Drive  
Canonsburg, PA 15317  
(724) 416-2000

**Subject:** **Structural Analysis Report**

**Carrier Designation:** **AT&T Mobility Co-Locate**  
**Carrier Site Number:** CT5189  
**Carrier Site Name:** MONROE SOUTH

**Crown Castle Designation:** **Crown Castle BU Number:** 826053  
**Crown Castle Site Name:** Monroe-1/Rt 25  
**Crown Castle JDE Job Number:** 478169  
**Crown Castle Work Order Number:** 1568972  
**Crown Castle Application Number:** 421219 Rev. 1

**Engineering Firm Designation:** **Crown Castle Project Number:** 1568972

**Site Data:** **88 Main Street, Monroe, Fairfield County, CT**  
**Latitude 41° 18' 6.06", Longitude -73° 15' 2.92"**  
**195 Foot - Monopole Tower**

Dear Cheryl Schultz,

Crown Castle 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 1568972, in accordance with application 421219, revision 1.

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 120 mph converted to a nominal 3-second gust wind speed of 93 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 B and Risk Category II were used in this analysis

All modifications and equipment proposed in this report shall be installed in accordance with the attached drawings for the determined available structural capacity to be effective.

We at Crown Castle 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.

Structural analysis prepared by: Luis Zarate / VDL

Respectfully submitted by:

Terry P. Styran, P.E.  
Senior Project Engineer

tnxTower Report - version 7.0.5.1



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## 1) INTRODUCTION

This tower is a 195 ft Monopole tower designed by Summit Manufacturing in May of 2001. The tower was originally designed for a wind speed of 85 mph per TIA/EIA-222-F.

## 2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of TIA-222-G Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a 3-second gust wind speed of 93 mph with no ice, 50 mph with 0.75 inch ice thickness and 60 mph under service loads, exposure category B.

**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
175.0	175.0	3	ericsson	RRUS 32	4 1	3/4 3/8	-
		3	ericsson	RRUS 32 B2			
		3	quintel technology	QS66512-2 w/ Mount Pipe			
		1	raycap	DC6-48-60-18-8C			
		1	commscope	MT-195-12			

**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
195.0	195.0	3	ericsson	ERICSSON AIR 21 B2A B4P w/ Mount Pipe	13	1-5/8	1
		3	ericsson	ERICSSON AIR 21 B4A B2P w/ Mount Pipe			
		3	ericsson	KRY 112 71			
		3	ericsson	RRUS 11 B12			
		1	tower mounts	Sector Mount [SM 901-3]			
	193.0	3	commscope	LNx-6515DS-VTM w/ Mount Pipe			
175.0	175.0	3	ericsson	RRUS12/RRUS A2	2 1	7/8 Conduit	3
		6	powerwave technologies	7020.00	6 2 1 1	1-5/8 7/8 5/8 3/8	1
		6	powerwave technologies	LGP21401			
		3	cci antennas	OPA-65R-LCUU-H6 w/ Mount Pipe			
		3	ericsson	RRUS-11			
		3	powerwave technologies	7770.00 w/ Mount Pipe			
		1	raycap	DC6-48-60-18-8F			
		1	tower mounts	Platform Mount [LP 303-1]			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
165.0	165.0	6	andrew	SBNHH-1D65B w/ Mount Pipe	14	1-5/8	1
		6	antel	LPA-80080/6CF w/ Mount Pipe			
		3	alcatel lucent	RRH2X60-PCS			
		3	alcatel lucent	RRH2x60-700			
		3	alcatel lucent	RRH4X45-AWS4 B66			
		2	rfs celwave	DB-B1-6C-8AB-0Z			
		1	tower mounts	Miscellaneous [NA 507-1]			
		1	tower mounts	Platform Mount [LP 403-1]			
155.0	155.0	6	alcatel lucent	800MHZ 2X50W RRH	3	1-5/8	2
		3	alcatel lucent	1900MHZ RRH (65MHZ)			
		3	commscope	NNVV-65B-R4 w/ Mount Pipe			
		3	nokia	AAHC w/ Mount Pipe			
		1	tower mounts	Miscellaneous [NA 507-1]			
		1	tower mounts	Platform Mount [LP 303-1]			

Notes:

- 1) Existing Equipment
- 2) Reserved Equipment
- 3) Equipment to be removed; Not considered in this analysis

**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)
195	195	12	ems wireless	EMS RR90-17-00DP PCS	-	-
185	185	12	ems wireless	EMS RR90-17-00DP PCS	-	-
175	175	12	ems wireless	EMS RR90-17-00DP PCS	-	-
165	165	12	ems wireless	EMS RR90-17-00DP PCS	-	-
155	155	12	ems wireless	EMS RR90-17-00DP PCS	-	-
140	135	2	generic	10' WHIP	-	-
120	115	2	generic	10' WHIP	-	-

**3) ANALYSIS PROCEDURE**

**Table 4 - Documents Provided**

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	Jaworski Geotech, Inc.	3488965	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	Summit Manufacturing, Inc./ PJF	3950063	CCISITES
4-TOWER MANUFACTURER DRAWINGS	Summit Manufacturing, Inc./ PJF	3488966	CCISITES

### 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.

This analysis may be affected if any assumptions are not valid or have been made in error. Crown Castle 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	195 - 157.5	Pole	TP33.351x26x0.25	1	-12.69	1763.91	22.2	Pass
L2	157.5 - 116.75	Pole	TP40.839x32.0179x0.3125	2	-23.60	2718.44	50.2	Pass
L3	116.75 - 77	Pole	TP48.006x39.1849x0.375	3	-34.64	3862.64	56.9	Pass
L4	77 - 38	Pole	TP54.901x46.0798x0.375	4	-47.38	4209.09	69.2	Pass
L5	38 - 0	Pole	TP61.6x52.7788x0.4375	5	-66.39	5681.23	64.4	Pass
							Summary	
						Pole (L4)	69.2	Pass
						Rating =	69.2	Pass

**Table 6 - Tower Component Stresses vs. Capacity – LC7**

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	63.0	Pass
1	Base Plate	0	54.3	Pass
1	Base Foundation (Structural)	0	59.6	Pass
1	Base Foundation (Soil Interaction)	0	41.1	Pass

<b>Structure Rating (max from all components) =</b>	<b>69.2%</b>
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Notes:

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

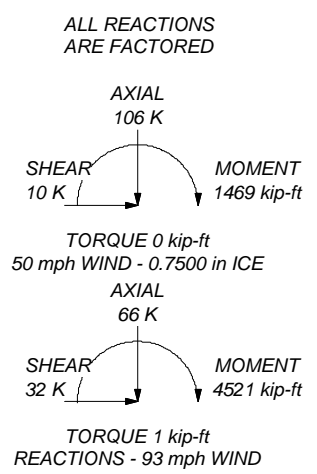
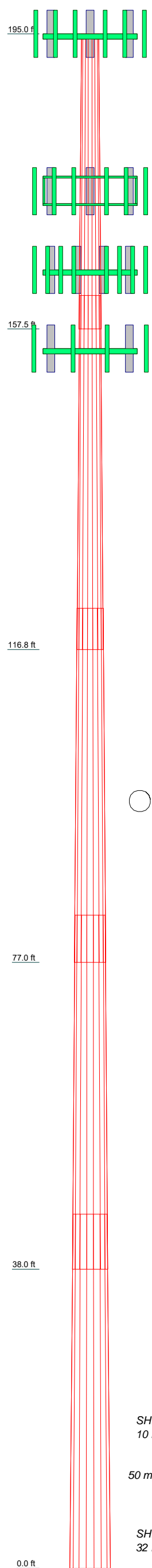
### 4.1) Recommendations

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

**APPENDIX A**  
**TNXTOWER OUTPUT**



Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	37.50	18	0.2500	4.25	26.0000	33.3510		3.0
2	45.00	18	0.3125	5.25	32.0179	40.8390		5.5
3	45.00	18	0.3750	6.00	39.1849	48.0060	A607-65	7.9
4	45.00	18	0.3750	7.00	46.0798	54.9010		9.1
5	45.00	18	0.4375	52.7788	61.6000			12.1
								37.5



**DESIGNED APPURTENANCE LOADING**

TYPE	ELEVATION	TYPE	ELEVATION
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	195	RRUS 32 B2	175
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	195	DC6-48-60-18-8C	175
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	195	Miscellaneous [NA 507-1]	175
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	195	Platform Mount [LP 303-1]	175
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	195	(2) SBNHH-1D65B w/ Mount Pipe	165
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	195	(2) SBNHH-1D65B w/ Mount Pipe	165
LNx-6515DS-VTM w/ Mount Pipe	195	(2) SBNHH-1D65B w/ Mount Pipe	165
LNx-6515DS-VTM w/ Mount Pipe	195	(2) LPA-80080/6CF w/ Mount Pipe	165
LNx-6515DS-VTM w/ Mount Pipe	195	(2) LPA-80080/6CF w/ Mount Pipe	165
RRUS 11 B12	195	(2) LPA-80080/6CF w/ Mount Pipe	165
RRUS 11 B12	195	RRH4X45-AWS4 B66	165
RRUS 11 B12	195	RRH4X45-AWS4 B66	165
KRY 112 71	195	RRH4X45-AWS4 B66	165
KRY 112 71	195	RRH2x60-700	165
KRY 112 71	195	RRH2x60-700	165
6' x 2" Mount Pipe	195	RRH2x60-700	165
6' x 2" Mount Pipe	195	RRH2X60-PCS	165
6' x 2" Mount Pipe	195	RRH2X60-PCS	165
Sector Mount [SM 901-3]	195	RRH2X60-PCS	165
OPA-65R-LCUU-H6 w/ Mount Pipe	175	DB-B1-6C-8AB-0Z	165
OPA-65R-LCUU-H6 w/ Mount Pipe	175	DB-B1-6C-8AB-0Z	165
OPA-65R-LCUU-H6 w/ Mount Pipe	175	(2) 6' x 2" Mount Pipe	165
7770.00 w/ Mount Pipe	175	(2) 6' x 2" Mount Pipe	165
7770.00 w/ Mount Pipe	175	(2) 6' x 2" Mount Pipe	165
7770.00 w/ Mount Pipe	175	Miscellaneous [NA 507-1]	165
(2) 7020.00	175	Platform Mount [LP 403-1]	165
(2) 7020.00	175	NNVV-65B-R4 w/ Mount Pipe	155
(2) 7020.00	175	NNVV-65B-R4 w/ Mount Pipe	155
(2) LGP21401	175	NNVV-65B-R4 w/ Mount Pipe	155
(2) LGP21401	175	AAHC w/ Mount Pipe	155
RRUS-11	175	AAHC w/ Mount Pipe	155
RRUS-11	175	AAHC w/ Mount Pipe	155
RRUS-11	175	1900MHZ RRH (65MHZ)	155
RRUS-11	175	1900MHZ RRH (65MHZ)	155
DC6-48-60-18-8F	175	1900MHZ RRH (65MHZ)	155
QS66512-2 w/ Mount Pipe	175	(2) 800MHZ 2X50W RRH	155
QS66512-2 w/ Mount Pipe	175	(2) 800MHZ 2X50W RRH	155
QS66512-2 w/ Mount Pipe	175	(2) 800MHZ 2X50W RRH	155
RRUS 32	175	6' x 2" Mount Pipe	155
RRUS 32	175	6' x 2" Mount Pipe	155
RRUS 32	175	6' x 2" Mount Pipe	155
RRUS 32 B2	175	Miscellaneous [NA 507-1]	155
RRUS 32 B2	175	Platform Mount [LP 303-1]	155

**MATERIAL STRENGTH**

GRADE	Fy	Fu	GRADE	Fy	Fu
A607-65	65 ksi	80 ksi			

**TOWER DESIGN NOTES**

1. Tower is located in Fairfield County, Connecticut.
2. Tower designed for Exposure B to the TIA-222-G Standard.
3. Tower designed for a 93 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: 69.2%

<p><b>CROWN CASTLE</b> The Pathway to Possible</p>	<p><b>Crown Castle</b> 2000 Corporate Dr. Canonsburg, PA 15317 Phone: (724) 416 - 2000 FAX:</p>		<p>Job: <b>BU 826053</b></p>
	<p>Project: Client: Crown Castle</p>	<p>Drawn by: vlarson</p>	<p>App'd:</p>
	<p>Code: TIA-222-G</p>	<p>Date: 05/08/18</p>	<p>Scale: NTS</p>
	<p>Path: R:\SA Models - Letters\Work Area\LZarate\WIP\826053 WO 1568972\QA_VDL\826053.er</p>	<p>Dwg No. E-1</p>	

## 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 Fairfield County, Connecticut.
- 2) Basic wind speed of 93 mph.
- 3) Structure Class II.
- 4) Exposure Category B.
- 5) Topographic Category 1.
- 6) Crest Height 0.00 ft.
- 7) Nominal ice thickness of 0.7500 in.
- 8) Ice thickness is considered to increase with height.
- 9) Ice density of 56 pcf.
- 10) A wind speed of 50 mph is used in combination with ice.
- 11) Temperature drop of 50 °F.
- 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<br>Consider Moments - Horizontals<br>Consider Moments - Diagonals<br>Use Moment Magnification<br>✓ Use Code Stress Ratios<br>✓ Use Code Safety Factors - Guys<br>Escalate Ice<br>Always Use Max Kz<br>Use Special Wind Profile<br><br>Include Bolts In Member Capacity<br><br>Leg Bolts Are At Top Of Section<br>Secondary Horizontal Braces Leg<br>Use Diamond Inner Bracing (4 Sided)<br>SR Members Have Cut Ends<br>SR Members Are Concentric | Distribute Leg Loads As Uniform<br>Assume Legs Pinned<br>✓ Assume Rigid Index Plate<br>✓ Use Clear Spans For Wind Area<br>Use Clear Spans For KL/r<br>Retension Guys To Initial Tension<br>✓ Bypass Mast Stability Checks<br>✓ Use Azimuth Dish Coefficients<br>✓ Project Wind Area of Appurt.<br><br>Autocalc Torque Arm Areas<br><br>Add IBC .6D+W Combination<br>✓ Sort Capacity Reports By Component<br>Triangulate Diamond Inner Bracing<br>Treat Feed Line Bundles As Cylinder | Use ASCE 10 X-Brace Ly Rules<br>Calculate Redundant Bracing Forces<br>Ignore Redundant Members in FEA<br>SR Leg Bolts Resist Compression<br>All Leg Panels Have Same Allowable<br>Offset Girt At Foundation<br>✓ Consider Feed Line Torque<br>Include Angle Block Shear Check<br>Use TIA-222-G Bracing Resist.<br>Exemption<br>Use TIA-222-G Tension Splice<br>Exemption<br><br><div style="text-align: center; background-color: #e0e0e0; padding: 2px;"><b>Poles</b></div> ✓ Include Shear-Torsion Interaction<br>Always Use Sub-Critical Flow<br>Use Top Mounted Sockets |
|--|--|---|

## Tapered Pole Section Geometry

Section	Elevation	Section Length	Splice Length	Number of Sides	Top Diameter	Bottom Diameter	Wall Thickness	Bend Radius	Pole Grade
	ft	ft	ft		in	in	in	in	
L1	195.00-157.50	37.50	4.25	18	26.0000	33.3510	0.2500	1.0000	A607-65 (65 ksi)
L2	157.50-116.75	45.00	5.25	18	32.0179	40.8390	0.3125	1.2500	A607-65 (65 ksi)
L3	116.75-77.00	45.00	6.00	18	39.1849	48.0060	0.3750	1.5000	A607-65 (65 ksi)
L4	77.00-38.00	45.00	7.00	18	46.0798	54.9010	0.3750	1.5000	A607-65 (65 ksi)
L5	38.00-0.00	45.00		18	52.7788	61.6000	0.4375	1.7500	A607-65 (65 ksi)

### Tapered Pole Properties

Section	Tip Dia. in	Area in <sup>2</sup>	I in <sup>4</sup>	r in	C in	I/C in <sup>3</sup>	J in <sup>4</sup>	I/Q in <sup>2</sup>	w in	w/t
L1	26.4011	20.4326	1711.6544	9.1412	13.2080	129.5922	3425.5610	10.2183	4.1360	16.544
	33.8655	26.2656	3635.8648	11.7509	16.9423	214.6027	7276.5137	13.1353	5.4298	21.719
L2	33.3578	31.4478	3993.8666	11.2554	16.2651	245.5484	7992.9885	15.7269	5.0851	16.272
	41.4690	40.1972	8340.8765	14.3869	20.7462	402.0433	16692.728	20.1024	6.6377	21.241
L3	40.8344	46.1934	8790.2699	13.7775	19.9059	441.5909	17592.106	23.1011	6.2365	16.631
	48.7466	56.6928	16249.677	16.9090	24.3870	666.3241	32520.736	28.3518	7.7891	20.771
L4	47.9850	54.4002	14356.959	16.2252	23.4086	613.3208	28732.810	27.2053	7.4501	19.867
	55.7479	64.8996	24377.353	19.3567	27.8897	874.0627	48786.783	32.4560	9.0026	24.007
L5	54.9864	72.6825	25156.862	18.5812	26.8116	938.2813	50346.826	36.3481	8.5191	19.472
	62.5503	84.9318	40140.069	21.7127	31.2928	1282.7254	80332.955	42.4740	10.0716	23.021

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A <sub>r</sub>	Adjust. Factor A <sub>r</sub>	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals	Double Angle Stitch Bolt Spacing Redundants
ft	ft <sup>2</sup>	in					in	in	in
L1 195.00-157.50				1	1	1			
L2 157.50-116.75				1	1	1			
L3 116.75-77.00				1	1	1			
L4 77.00-38.00				1	1	1			
L5 38.00-0.00				1	1	1			

### Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Section	Component Type	Placement	Total Number	Number Per Row	Start/End Position	Width or Diameter	Perimeter	Weight
	r		ft				r in	r in	klf
***									
HB158-1-08U8-S8J18(1-5/8)	A	Surface Ar (CaAa)	165.00 - 0.00	1	1	0.470 0.480	1.9800		0.00
****									

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

Description	Face or Leg	Allow Shield	Component Type	Placement	Total Number	C <sub>A</sub> A <sub>A</sub>	Weight
				ft		ft <sup>2</sup> /ft	klf
LDF7-50A(1-5/8)	B	No	Inside Pole	195.00 - 0.00	12	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00
MLE Hybrid 9Power/18Fiber RL 2(1-5/8)	B	No	Inside Pole	195.00 - 0.00	1	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00
****							

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C <sub>AA</sub> ft <sup>2</sup> /ft	Weight klf
LDF7-50A(1-5/8)	C	No	Inside Pole	175.00 - 0.00	6	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
LDF5-50A(7/8)	C	No	Inside Pole	175.00 - 0.00	2	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
9776(5/8)	C	No	Inside Pole	175.00 - 0.00	1	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
FB-L98B-002-XXX(3/8)	C	No	Inside Pole	175.00 - 0.00	1	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
FB-L98B-034-XXX(3/8)	C	No	Inside Pole	175.00 - 0.00	1	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
WR-VG86ST-BRD(3/4)	C	No	Inside Pole	175.00 - 0.00	4	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
LDF7-50A(1-5/8)	A	No	Inside Pole	165.00 - 0.00	13	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
****								
HB158-21U6S12-60M-01(1-5/8)	A	No	Inside Pole	155.00 - 0.00	3	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
****								

### Feed Line/Linear Appurtenances Section Areas

Tower Sectio n	Tower Elevation ft	Face	A <sub>R</sub> ft <sup>2</sup>	A <sub>F</sub> ft <sup>2</sup>	C <sub>AA</sub> In Face ft <sup>2</sup>	C <sub>AA</sub> Out Face ft <sup>2</sup>	Weight K
L1	195.00-157.50	A	0.000	0.000	1.485	0.000	0.09
		B	0.000	0.000	0.000	0.000	0.41
		C	0.000	0.000	0.000	0.000	0.15
L2	157.50-116.75	A	0.000	0.000	8.069	0.000	0.71
		B	0.000	0.000	0.000	0.000	0.44
		C	0.000	0.000	0.000	0.000	0.34
L3	116.75-77.00	A	0.000	0.000	7.871	0.000	0.70
		B	0.000	0.000	0.000	0.000	0.43
		C	0.000	0.000	0.000	0.000	0.33
L4	77.00-38.00	A	0.000	0.000	7.722	0.000	0.69
		B	0.000	0.000	0.000	0.000	0.43
		C	0.000	0.000	0.000	0.000	0.32
L5	38.00-0.00	A	0.000	0.000	7.524	0.000	0.67
		B	0.000	0.000	0.000	0.000	0.41
		C	0.000	0.000	0.000	0.000	0.32

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

Tower Sectio n	Tower Elevation ft	Face or Leg	Ice Thickness in	A <sub>R</sub> ft <sup>2</sup>	A <sub>F</sub> ft <sup>2</sup>	C <sub>AA</sub> In Face ft <sup>2</sup>	C <sub>AA</sub> Out Face ft <sup>2</sup>	Weight K
L1	195.00-157.50	A	1.773	0.000	0.000	4.144	0.000	0.15
		B		0.000	0.000	0.000	0.000	0.41
		C		0.000	0.000	0.000	0.000	0.15
L2	157.50-116.75	A	1.729	0.000	0.000	22.518	0.000	1.04
		B		0.000	0.000	0.000	0.000	0.44
		C		0.000	0.000	0.000	0.000	0.34
L3	116.75-77.00	A	1.670	0.000	0.000	21.616	0.000	1.01
		B		0.000	0.000	0.000	0.000	0.43
		C		0.000	0.000	0.000	0.000	0.33
L4	77.00-38.00	A	1.586	0.000	0.000	20.748	0.000	0.98

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A <sub>R</sub> ft <sup>2</sup>	A <sub>F</sub> ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> In Face ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Out Face ft <sup>2</sup>	Weight K
L5	38.00-0.00	B	1.416	0.000	0.000	0.000	0.000	0.43
		C		0.000	0.000	0.000	0.000	0.32
		A		0.000	0.000	19.575	0.000	0.93
		B		0.000	0.000	0.000	0.000	0.41
		C		0.000	0.000	0.000	0.000	0.32

### Feed Line Center of Pressure

Section	Elevation ft	CP <sub>x</sub> in	CP <sub>z</sub> in	CP <sub>x</sub> Ice in	CP <sub>z</sub> Ice in
L1	195.00-157.50	-0.0035	-0.0670	-0.0086	-0.1636
L2	157.50-116.75	-0.0152	-0.2894	-0.0354	-0.6753
L3	116.75-77.00	-0.0152	-0.2898	-0.0359	-0.6854
L4	77.00-38.00	-0.0152	-0.2901	-0.0360	-0.6865
L5	38.00-0.00	-0.0152	-0.2903	-0.0355	-0.6780

### Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K <sub>a</sub> No Ice	K <sub>a</sub> Ice
L1	13	HB158-1-08U8-S8J18(1-5/8)	157.50 - 165.00	1.0000	1.0000
L2	13	HB158-1-08U8-S8J18(1-5/8)	116.75 - 157.50	1.0000	1.0000
L3	13	HB158-1-08U8-S8J18(1-5/8)	77.00 - 116.75	1.0000	1.0000
L4	13	HB158-1-08U8-S8J18(1-5/8)	38.00 - 77.00	1.0000	1.0000

### Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Offsets: Vert ft	Azimuth Adjustmen t °	Placement ft	C <sub>A</sub> A <sub>A</sub> Front ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Side ft <sup>2</sup>	Weight K
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	A	From Leg	4.00	0.0000	195.00	No Ice	6.33	5.64	0.11
			0.00	0.0000		1/2"	6.78	6.43	0.17
			0.00	0.0000		Ice	7.21	7.13	0.23
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	B	From Leg	4.00	0.0000	195.00	No Ice	6.33	5.64	0.11
			0.00	0.0000		1/2"	6.78	6.43	0.17
			0.00	0.0000		Ice	7.21	7.13	0.23
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	C	From Leg	4.00	0.0000	195.00	No Ice	6.33	5.64	0.11
			0.00	0.0000		1/2"	6.78	6.43	0.17
			0.00	0.0000		Ice	7.21	7.13	0.23
ERICSSON AIR 21 B4A	A	From Leg	4.00	0.0000	195.00	1" Ice	6.33	5.64	0.11
						No Ice			

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>AA</sub> <sub>Front</sub>	C <sub>AA</sub> <sub>Side</sub>	Weight	
			Horz	Lateral						ft
			ft	ft	°	ft	ft <sup>2</sup>	ft <sup>2</sup>	K	
B2P w/ Mount Pipe			0.00			1/2"	6.78	6.43	0.17	
			0.00			Ice	7.21	7.13	0.23	
						1" Ice				
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	B	From Leg	4.00		0.0000	195.00	No Ice	6.33	5.64	0.11
			0.00				1/2"	6.78	6.43	0.17
			0.00				Ice	7.21	7.13	0.23
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	C	From Leg	4.00		0.0000	195.00	No Ice	6.33	5.64	0.11
			0.00				1/2"	6.78	6.43	0.17
			0.00				Ice	7.21	7.13	0.23
LNX-6515DS-VTM w/ Mount Pipe	A	From Leg	4.00		0.0000	195.00	No Ice	11.68	9.84	0.08
			0.00				1/2"	12.40	11.37	0.17
			-2.00				Ice	13.14	12.91	0.27
LNX-6515DS-VTM w/ Mount Pipe	B	From Leg	4.00		0.0000	195.00	No Ice	11.68	9.84	0.08
			0.00				1/2"	12.40	11.37	0.17
			-2.00				Ice	13.14	12.91	0.27
LNX-6515DS-VTM w/ Mount Pipe	C	From Leg	4.00		0.0000	195.00	No Ice	11.68	9.84	0.08
			0.00				1/2"	12.40	11.37	0.17
			-2.00				Ice	13.14	12.91	0.27
RRUS 11 B12	A	From Leg	4.00		0.0000	195.00	No Ice	2.83	1.18	0.05
			0.00				1/2"	3.04	1.33	0.07
			0.00				Ice	3.26	1.48	0.10
RRUS 11 B12	B	From Leg	4.00		0.0000	195.00	No Ice	2.83	1.18	0.05
			0.00				1/2"	3.04	1.33	0.07
			0.00				Ice	3.26	1.48	0.10
RRUS 11 B12	C	From Leg	4.00		0.0000	195.00	No Ice	2.83	1.18	0.05
			0.00				1/2"	3.04	1.33	0.07
			0.00				Ice	3.26	1.48	0.10
KRY 112 71	A	From Leg	4.00		0.0000	195.00	No Ice	0.58	0.40	0.01
			0.00				1/2"	0.69	0.49	0.02
			0.00				Ice	0.80	0.59	0.03
KRY 112 71	B	From Leg	4.00		0.0000	195.00	No Ice	0.58	0.40	0.01
			0.00				1/2"	0.69	0.49	0.02
			0.00				Ice	0.80	0.59	0.03
KRY 112 71	C	From Leg	4.00		0.0000	195.00	No Ice	0.58	0.40	0.01
			0.00				1/2"	0.69	0.49	0.02
			0.00				Ice	0.80	0.59	0.03
6' x 2" Mount Pipe	A	From Leg	4.00		0.0000	195.00	No Ice	1.43	1.43	0.02
			0.00				1/2"	1.92	1.92	0.03
			0.00				Ice	2.29	2.29	0.05
6' x 2" Mount Pipe	B	From Leg	4.00		0.0000	195.00	No Ice	1.43	1.43	0.02
			0.00				1/2"	1.92	1.92	0.03
			0.00				Ice	2.29	2.29	0.05
6' x 2" Mount Pipe	C	From Leg	4.00		0.0000	195.00	No Ice	1.43	1.43	0.02
			0.00				1/2"	1.92	1.92	0.03
			0.00				Ice	2.29	2.29	0.05
Sector Mount [SM 901-3]	C	None			0.0000	195.00	No Ice	12.90	12.90	1.26
							1/2"	17.16	17.16	1.43
							Ice	21.42	21.42	1.61
****175***										
OPA-65R-LCUU-H6 w/	A	From Leg	4.00		0.0000	175.00	No Ice	9.90	7.18	0.10

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	CAAA	CAAA	Weight	
			Horz	Lateral			Front	Side		
			ft	ft	°	ft	ft <sup>2</sup>	ft <sup>2</sup>	K	
Mount Pipe			0.00			1/2"	10.47	8.36	0.18	
			0.00			Ice	11.01	9.26	0.26	
						1" Ice				
OPA-65R-LCUU-H6 w/ Mount Pipe	B	From Leg	4.00		0.0000	175.00	No Ice	9.90	7.18	0.10
			0.00				1/2"	10.47	8.36	0.18
			0.00				Ice	11.01	9.26	0.26
OPA-65R-LCUU-H6 w/ Mount Pipe	C	From Leg	4.00		0.0000	175.00	No Ice	9.90	7.18	0.10
			0.00				1/2"	10.47	8.36	0.18
			0.00				Ice	11.01	9.26	0.26
7770.00 w/ Mount Pipe	A	From Leg	4.00		0.0000	175.00	No Ice	5.75	4.25	0.06
			0.00				1/2"	6.18	5.01	0.10
			0.00				Ice	6.61	5.71	0.16
7770.00 w/ Mount Pipe	B	From Leg	4.00		0.0000	175.00	No Ice	5.75	4.25	0.06
			0.00				1/2"	6.18	5.01	0.10
			0.00				Ice	6.61	5.71	0.16
7770.00 w/ Mount Pipe	C	From Leg	4.00		0.0000	175.00	No Ice	5.75	4.25	0.06
			0.00				1/2"	6.18	5.01	0.10
			0.00				Ice	6.61	5.71	0.16
(2) 7020.00	A	From Leg	4.00		0.0000	175.00	No Ice	0.10	0.17	0.00
			0.00				1/2"	0.15	0.24	0.01
			0.00				Ice	0.20	0.31	0.01
(2) 7020.00	B	From Leg	4.00		0.0000	175.00	No Ice	0.10	0.17	0.00
			0.00				1/2"	0.15	0.24	0.01
			0.00				Ice	0.20	0.31	0.01
(2) 7020.00	C	From Leg	4.00		0.0000	175.00	No Ice	0.10	0.17	0.00
			0.00				1/2"	0.15	0.24	0.01
			0.00				Ice	0.20	0.31	0.01
(2) LGP21401	A	From Leg	4.00		0.0000	175.00	No Ice	1.10	0.21	0.01
			0.00				1/2"	1.24	0.27	0.02
			0.00				Ice	1.38	0.35	0.03
(2) LGP21401	B	From Leg	4.00		0.0000	175.00	No Ice	1.10	0.21	0.01
			0.00				1/2"	1.24	0.27	0.02
			0.00				Ice	1.38	0.35	0.03
(2) LGP21401	C	From Leg	4.00		0.0000	175.00	No Ice	1.10	0.21	0.01
			0.00				1/2"	1.24	0.27	0.02
			0.00				Ice	1.38	0.35	0.03
RRUS-11	A	From Leg	4.00		0.0000	175.00	No Ice	2.78	1.19	0.05
			0.00				1/2"	2.99	1.33	0.07
			0.00				Ice	3.21	1.49	0.09
RRUS-11	B	From Leg	4.00		0.0000	175.00	No Ice	2.78	1.19	0.05
			0.00				1/2"	2.99	1.33	0.07
			0.00				Ice	3.21	1.49	0.09
RRUS-11	C	From Leg	4.00		0.0000	175.00	No Ice	2.78	1.19	0.05
			0.00				1/2"	2.99	1.33	0.07
			0.00				Ice	3.21	1.49	0.09
DC6-48-60-18-8F	B	From Leg	4.00		0.0000	175.00	No Ice	0.79	0.79	0.02
			0.00				1/2"	1.27	1.27	0.04
			0.00				Ice	1.45	1.45	0.05
QS66512-2 w/ Mount Pipe	A	From Leg	4.00		0.0000	175.00	No Ice	8.37	8.46	0.14
			0.00				1/2"	8.93	9.66	0.21
							1" Ice			

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment t °	Placement ft	CAAA Front ft²	CAAA Side ft²	Weight K
			0.00			Ice 9.46	10.55	0.30
QS66512-2 w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	175.00	1" Ice No Ice 8.37 8.93 Ice 9.46	8.46 9.66 10.55	0.14 0.21 0.30
QS66512-2 w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	175.00	1" Ice No Ice 8.37 8.93 Ice 9.46	8.46 9.66 10.55	0.14 0.21 0.30
RRUS 32	A	From Leg	4.00 0.00 0.00	0.0000	175.00	1" Ice No Ice 2.86 3.08 Ice 3.32	1.78 1.97 2.17	0.06 0.08 0.10
RRUS 32	B	From Leg	4.00 0.00 0.00	0.0000	175.00	1" Ice No Ice 2.86 3.08 Ice 3.32	1.78 1.97 2.17	0.06 0.08 0.10
RRUS 32	C	From Leg	4.00 0.00 0.00	0.0000	175.00	1" Ice No Ice 2.86 3.08 Ice 3.32	1.78 1.97 2.17	0.06 0.08 0.10
RRUS 32 B2	A	From Leg	4.00 0.00 0.00	0.0000	175.00	1" Ice No Ice 2.73 2.95 Ice 3.18	1.67 1.86 2.05	0.05 0.07 0.10
RRUS 32 B2	B	From Leg	4.00 0.00 0.00	0.0000	175.00	1" Ice No Ice 2.73 2.95 Ice 3.18	1.67 1.86 2.05	0.05 0.07 0.10
RRUS 32 B2	C	From Leg	4.00 0.00 0.00	0.0000	175.00	1" Ice No Ice 2.73 2.95 Ice 3.18	1.67 1.86 2.05	0.05 0.07 0.10
DC6-48-60-18-8C	C	From Leg	4.00 0.00 0.00	0.0000	175.00	1" Ice No Ice 2.74 2.96 Ice 3.20	2.74 2.96 3.20	0.03 0.05 0.08
Miscellaneous [NA 507-1]	C	None		0.0000	175.00	1" Ice No Ice 4.80 6.70 Ice 8.60	4.80 6.70 8.60	0.25 0.29 0.34
Platform Mount [LP 303-1]	C	None		0.0000	175.00	1" Ice No Ice 14.66 18.87 Ice 23.08	14.66 18.87 23.08	1.25 1.48 1.71
***165***						1" Ice		
(2) SBNHH-1D65B w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	165.00	No Ice 1/2" 8.39 8.95 Ice 9.48	7.08 8.28 9.19	0.08 0.15 0.22
(2) SBNHH-1D65B w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	165.00	No Ice 1/2" 8.39 8.95 Ice 9.48	7.08 8.28 9.19	0.08 0.15 0.22
(2) SBNHH-1D65B w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	165.00	No Ice 1/2" 8.39 8.95 Ice 9.48	7.08 8.28 9.19	0.08 0.15 0.22
(2) LPA-80080/6CF w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	165.00	1" Ice No Ice 4.56 5.11 Ice 5.61	10.26 11.43 12.31	0.05 0.11 0.19
(2) LPA-80080/6CF w/ Mount Pipe	B	From Leg	4.00 0.00	0.0000	165.00	1" Ice No Ice 4.56 5.11	10.26 11.43	0.05 0.11



Description	Face or Leg	Offset Type	Offsets:			Azimuth Adjustment	Placement	C <sub>AA</sub> Front	C <sub>AA</sub> Side	Weight	
			Horz	Lateral	Vert						ft
			ft	ft	ft	°	ft	ft <sup>2</sup>	ft <sup>2</sup>	K	
			0.00				Ice	5.61	12.31	0.19	
(2) LPA-80080/6CF w/ Mount Pipe	C	From Leg	4.00			0.0000	165.00	1" Ice			
			0.00					No Ice	4.56	10.26	0.05
			0.00					1/2"	5.11	11.43	0.11
RRH4X45-AWS4 B66	A	From Leg	4.00			0.0000	165.00	Ice	5.61	12.31	0.19
			0.00					1" Ice			
			0.00					No Ice	2.66	1.59	0.06
RRH4X45-AWS4 B66	B	From Leg	4.00			0.0000	165.00	1/2"	2.88	1.77	0.08
			0.00					Ice	3.10	1.96	0.11
			0.00					1" Ice			
RRH4X45-AWS4 B66	C	From Leg	4.00			0.0000	165.00	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
RRH2x60-700	A	From Leg	4.00			0.0000	165.00	1" Ice			
			0.00					No Ice	3.50	1.82	0.06
			0.00					1/2"	3.76	2.05	0.08
RRH2x60-700	B	From Leg	4.00			0.0000	165.00	Ice	4.03	2.29	0.11
			0.00					1" Ice			
			0.00					No Ice	3.50	1.82	0.06
RRH2x60-700	C	From Leg	4.00			0.0000	165.00	1/2"	3.76	2.05	0.08
			0.00					Ice	4.03	2.29	0.11
			0.00					1" Ice			
RRH2X60-PCS	A	From Leg	4.00			0.0000	165.00	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
RRH2X60-PCS	B	From Leg	4.00			0.0000	165.00	1" Ice			
			0.00					No Ice	2.20	1.72	0.06
			0.00					1/2"	2.39	1.90	0.08
RRH2X60-PCS	C	From Leg	4.00			0.0000	165.00	Ice	2.59	2.09	0.10
			0.00					1" Ice			
			0.00					No Ice	2.20	1.72	0.06
DB-B1-6C-8AB-0Z	B	From Leg	4.00			0.0000	165.00	1/2"	2.39	1.90	0.08
			0.00					Ice	2.59	2.09	0.10
			0.00					1" Ice			
DB-B1-6C-8AB-0Z	C	From Leg	4.00			0.0000	165.00	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
(2) 6' x 2" Mount Pipe	A	From Leg	4.00			0.0000	165.00	1" Ice			
			0.00					No Ice	1.43	1.43	0.02
			0.00					1/2"	1.92	1.92	0.03
(2) 6' x 2" Mount Pipe	B	From Leg	4.00			0.0000	165.00	Ice	2.29	2.29	0.05
			0.00					1" Ice			
			0.00					No Ice	1.43	1.43	0.02
(2) 6' x 2" Mount Pipe	C	From Leg	4.00			0.0000	165.00	1/2"	1.92	1.92	0.03
			0.00					Ice	2.29	2.29	0.05
			0.00					1" Ice			
Miscellaneous [NA 507-1]	C	None				0.0000	165.00	No Ice	4.80	4.80	0.25
								1/2"	6.70	6.70	0.29
								Ice	8.60	8.60	0.34

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment t °	Placement ft		C <sub>AA</sub> Front ft <sup>2</sup>	C <sub>AA</sub> Side ft <sup>2</sup>	Weight K
Platform Mount [LP 403-1]	C	None		0.0000	165.00	1" Ice No Ice 1/2" Ice 1" Ice	18.85 24.30 29.75	18.85 24.30 29.75	1.50 1.80 2.09
***155*** NNVV-65B-R4 w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice	12.51 13.11 13.67	7.41 8.60 9.50	0.10 0.19 0.29
NNVV-65B-R4 w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice	12.51 13.11 13.67	7.41 8.60 9.50	0.10 0.19 0.29
NNVV-65B-R4 w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice	12.51 13.11 13.67	7.41 8.60 9.50	0.10 0.19 0.29
AAHC w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice	4.41 4.73 5.06	2.69 3.08 3.49	0.12 0.16 0.20
AAHC w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice	4.41 4.73 5.06	2.69 3.08 3.49	0.12 0.16 0.20
AAHC w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice	4.41 4.73 5.06	2.69 3.08 3.49	0.12 0.16 0.20
1900MHZ RRH (65MHZ)	A	From Leg	4.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice	2.31 2.52 2.73	2.38 2.58 2.79	0.06 0.08 0.11
1900MHZ RRH (65MHZ)	B	From Leg	4.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice	2.31 2.52 2.73	2.38 2.58 2.79	0.06 0.08 0.11
1900MHZ RRH (65MHZ)	C	From Leg	4.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice	2.31 2.52 2.73	2.38 2.58 2.79	0.06 0.08 0.11
(2) 800MHZ 2X50W RRH	A	From Leg	4.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice	2.13 2.32 2.51	1.77 1.95 2.13	0.05 0.07 0.10
(2) 800MHZ 2X50W RRH	B	From Leg	4.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice	2.13 2.32 2.51	1.77 1.95 2.13	0.05 0.07 0.10
(2) 800MHZ 2X50W RRH	C	From Leg	4.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice	2.13 2.32 2.51	1.77 1.95 2.13	0.05 0.07 0.10
6' x 2" Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice	1.43 1.92 2.29	1.43 1.92 2.29	0.02 0.03 0.05
6' x 2" Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice	1.43 1.92 2.29	1.43 1.92 2.29	0.02 0.03 0.05
6' x 2" Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	155.00	No Ice 1/2" Ice 1" Ice	1.43 1.92 2.29	1.43 1.92 2.29	0.02 0.03 0.05

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	CAAA Front ft²	CAAA Side ft²	Weight K	
Miscellaneous [NA 507-1]	C	None		0.0000	155.00	1" Ice			
						No Ice	4.80	4.80	0.25
						1/2" Ice	6.70	6.70	0.29
Platform Mount [LP 303-1]	C	None		0.0000	155.00	1" Ice			
						No Ice	14.66	14.66	1.25
						1/2" Ice	18.87	18.87	1.48
						Ice	23.08	23.08	1.71
						1" Ice			

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### 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+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
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

Comb. No.	Description
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	195 - 157.5	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-31.08	0.24	-1.57
			Max. Mx	20	-12.68	250.40	-0.35
			Max. My	14	-12.70	0.03	-250.37
			Max. Vy	20	-16.70	250.40	-0.35
			Max. Vx	14	16.60	0.03	-250.37
			Max. Torque	11			-0.73
L2	157.5 - 116.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-49.59	0.27	-1.01
			Max. Mx	20	-23.60	1088.56	-0.29
			Max. My	14	-23.62	0.05	-1084.44
			Max. Vy	20	-23.32	1088.56	-0.29
			Max. Vx	14	23.22	0.05	-1084.44
			Max. Torque	11			-0.73
L3	116.75 - 77	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-64.67	0.31	-0.32
			Max. Mx	20	-34.64	2065.07	-0.20
			Max. My	14	-34.64	0.07	-2056.88
			Max. Vy	20	-26.66	2065.07	-0.20
			Max. Vx	14	26.56	0.07	-2056.88
			Max. Torque	23			0.73
L4	77 - 38	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-81.62	0.35	0.43
			Max. Mx	20	-47.38	3134.40	-0.07
			Max. My	14	-47.38	0.08	-3122.26
			Max. Vy	20	-29.44	3134.40	-0.07
			Max. Vx	2	-29.35	0.08	3122.10
			Max. Torque	23			0.73
L5	38 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-105.62	0.40	1.37
			Max. Mx	20	-66.39	4520.84	0.10
			Max. My	2	-66.39	0.09	4504.33
			Max. Vy	20	-32.03	4520.84	0.10
			Max. Vx	2	-31.93	0.09	4504.33
			Max. Torque	23			0.73

### Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	36	105.62	10.17	-0.00
	Max. H <sub>x</sub>	21	49.80	31.99	-0.00
	Max. H <sub>z</sub>	3	49.80	0.00	31.90
	Max. M <sub>x</sub>	2	4504.33	0.00	31.90
	Max. M <sub>z</sub>	8	4520.66	-31.99	-0.00
	Max. Torsion	23	0.73	27.70	15.95
	Min. Vert	13	49.80	-16.00	-27.62
	Min. H <sub>x</sub>	9	49.80	-31.99	-0.00
	Min. H <sub>z</sub>	15	49.80	0.00	-31.90

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
	Min. M <sub>x</sub>	14	-4504.14	0.00	-31.90
	Min. M <sub>z</sub>	20	-4520.84	31.99	-0.00
	Min. Torsion	11	-0.73	-27.70	-15.95

### Tower Mast Reaction Summary

Load Combination	Vertical K	Shear <sub>x</sub> K	Shear <sub>z</sub> K	Overturning Moment, M <sub>x</sub> kip-ft	Overturning Moment, M <sub>z</sub> kip-ft	Torque kip-ft
Dead Only	55.34	0.00	0.00	-0.09	0.07	0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	66.41	0.00	-31.90	-4504.33	0.09	-0.30
0.9 Dead+1.6 Wind 0 deg - No Ice	49.80	-0.00	-31.90	-4437.05	0.06	-0.30
1.2 Dead+1.6 Wind 30 deg - No Ice	66.41	16.00	-27.62	-3900.87	-2260.31	0.08
0.9 Dead+1.6 Wind 30 deg - No Ice	49.80	16.00	-27.62	-3842.62	-2226.58	0.08
1.2 Dead+1.6 Wind 60 deg - No Ice	66.41	27.70	-15.95	-2252.20	-3915.01	0.43
0.9 Dead+1.6 Wind 60 deg - No Ice	49.80	27.70	-15.95	-2218.56	-3856.58	0.43
1.2 Dead+1.6 Wind 90 deg - No Ice	66.41	31.99	0.00	-0.10	-4520.66	0.67
0.9 Dead+1.6 Wind 90 deg - No Ice	49.80	31.99	0.00	-0.08	-4453.17	0.67
1.2 Dead+1.6 Wind 120 deg - No Ice	66.41	27.70	15.95	2252.00	-3915.02	0.73
0.9 Dead+1.6 Wind 120 deg - No Ice	49.80	27.70	15.95	2218.40	-3856.58	0.73
1.2 Dead+1.6 Wind 150 deg - No Ice	66.41	16.00	27.62	3900.68	-2260.32	0.59
0.9 Dead+1.6 Wind 150 deg - No Ice	49.80	16.00	27.62	3842.47	-2226.59	0.59
1.2 Dead+1.6 Wind 180 deg - No Ice	66.41	0.00	31.90	4504.14	0.09	0.30
0.9 Dead+1.6 Wind 180 deg - No Ice	49.80	-0.00	31.90	4436.91	0.06	0.30
1.2 Dead+1.6 Wind 210 deg - No Ice	66.41	-16.00	27.62	3900.68	2260.49	-0.08
0.9 Dead+1.6 Wind 210 deg - No Ice	49.80	-16.00	27.62	3842.47	2226.71	-0.08
1.2 Dead+1.6 Wind 240 deg - No Ice	66.41	-27.70	15.95	2252.00	3915.19	-0.43
0.9 Dead+1.6 Wind 240 deg - No Ice	49.80	-27.70	15.95	2218.41	3856.71	-0.43
1.2 Dead+1.6 Wind 270 deg - No Ice	66.41	-31.99	0.00	-0.10	4520.84	-0.67
0.9 Dead+1.6 Wind 270 deg - No Ice	49.80	-31.99	0.00	-0.08	4453.30	-0.67
1.2 Dead+1.6 Wind 300 deg - No Ice	66.41	-27.70	-15.95	-2252.20	3915.18	-0.73
0.9 Dead+1.6 Wind 300 deg - No Ice	49.80	-27.70	-15.95	-2218.56	3856.71	-0.73
1.2 Dead+1.6 Wind 330 deg - No Ice	66.41	-16.00	-27.62	-3900.87	2260.48	-0.59
0.9 Dead+1.6 Wind 330 deg - No Ice	49.80	-16.00	-27.62	-3842.62	2226.71	-0.59
1.2 Dead+1.0 Ice+1.0 Temp	105.62	0.00	0.00	-1.37	0.40	0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	105.62	-0.00	-10.15	-1466.61	0.48	-0.05
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	105.62	5.09	-8.79	-1270.30	-733.91	0.05
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	105.62	8.81	-5.08	-733.97	-1271.52	0.13

Load Combination	Vertical	Shear <sub>x</sub>	Shear <sub>z</sub>	Overturning Moment, M <sub>x</sub>	Overturning Moment, M <sub>z</sub>	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	105.62	10.17	0.00	-1.33	-1468.30	0.17
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	105.62	8.81	5.08	731.31	-1271.52	0.17
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	105.62	5.09	8.79	1267.64	-733.91	0.13
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	105.62	-0.00	10.15	1463.96	0.48	0.05
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	105.62	-5.09	8.79	1267.64	734.87	-0.05
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	105.62	-8.81	5.08	731.31	1272.48	-0.13
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	105.62	-10.17	0.00	-1.33	1469.26	-0.17
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	105.62	-8.81	-5.08	-733.97	1272.48	-0.17
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	105.62	-5.09	-8.79	-1270.30	734.87	-0.13
Dead+Wind 0 deg - Service	55.34	0.00	-7.42	-1039.51	0.07	-0.07
Dead+Wind 30 deg - Service	55.34	3.72	-6.43	-900.25	-521.55	0.02
Dead+Wind 60 deg - Service	55.34	6.45	-3.71	-519.79	-903.41	0.10
Dead+Wind 90 deg - Service	55.34	7.45	0.00	-0.08	-1043.18	0.16
Dead+Wind 120 deg - Service	55.34	6.45	3.71	519.64	-903.41	0.17
Dead+Wind 150 deg - Service	55.34	3.72	6.43	900.09	-521.55	0.14
Dead+Wind 180 deg - Service	55.34	0.00	7.42	1039.35	0.07	0.07
Dead+Wind 210 deg - Service	55.34	-3.72	6.43	900.09	521.70	-0.02
Dead+Wind 240 deg - Service	55.34	-6.45	3.71	519.64	903.56	-0.10
Dead+Wind 270 deg - Service	55.34	-7.45	0.00	-0.08	1043.32	-0.16
Dead+Wind 300 deg - Service	55.34	-6.45	-3.71	-519.79	903.56	-0.17
Dead+Wind 330 deg - Service	55.34	-3.72	-6.43	-900.25	521.70	-0.14

## 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	-55.34	0.00	0.00	55.34	0.00	0.000%
2	0.00	-66.41	-31.90	0.00	66.41	31.90	0.000%
3	0.00	-49.80	-31.90	0.00	49.80	31.90	0.000%
4	16.00	-66.41	-27.62	-16.00	66.41	27.62	0.000%
5	16.00	-49.80	-27.62	-16.00	49.80	27.62	0.000%
6	27.70	-66.41	-15.95	-27.70	66.41	15.95	0.000%
7	27.70	-49.80	-15.95	-27.70	49.80	15.95	0.000%
8	31.99	-66.41	0.00	-31.99	66.41	-0.00	0.000%
9	31.99	-49.80	0.00	-31.99	49.80	-0.00	0.000%
10	27.70	-66.41	15.95	-27.70	66.41	-15.95	0.000%
11	27.70	-49.80	15.95	-27.70	49.80	-15.95	0.000%
12	16.00	-66.41	27.62	-16.00	66.41	-27.62	0.000%
13	16.00	-49.80	27.62	-16.00	49.80	-27.62	0.000%
14	0.00	-66.41	31.90	0.00	66.41	-31.90	0.000%
15	0.00	-49.80	31.90	0.00	49.80	-31.90	0.000%
16	-16.00	-66.41	27.62	16.00	66.41	-27.62	0.000%
17	-16.00	-49.80	27.62	16.00	49.80	-27.62	0.000%
18	-27.70	-66.41	15.95	27.70	66.41	-15.95	0.000%
19	-27.70	-49.80	15.95	27.70	49.80	-15.95	0.000%
20	-31.99	-66.41	0.00	31.99	66.41	-0.00	0.000%
21	-31.99	-49.80	0.00	31.99	49.80	-0.00	0.000%
22	-27.70	-66.41	-15.95	27.70	66.41	15.95	0.000%

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
23	-27.70	-49.80	-15.95	27.70	49.80	15.95	0.000%
24	-16.00	-66.41	-27.62	16.00	66.41	27.62	0.000%
25	-16.00	-49.80	-27.62	16.00	49.80	27.62	0.000%
26	0.00	-105.62	0.00	0.00	105.62	0.00	0.000%
27	0.00	-105.62	-10.15	0.00	105.62	10.15	0.000%
28	5.09	-105.62	-8.79	-5.09	105.62	8.79	0.000%
29	8.81	-105.62	-5.08	-8.81	105.62	5.08	0.000%
30	10.17	-105.62	0.00	-10.17	105.62	-0.00	0.000%
31	8.81	-105.62	5.08	-8.81	105.62	-5.08	0.000%
32	5.09	-105.62	8.79	-5.09	105.62	-8.79	0.000%
33	0.00	-105.62	10.15	0.00	105.62	-10.15	0.000%
34	-5.09	-105.62	8.79	5.09	105.62	-8.79	0.000%
35	-8.81	-105.62	5.08	8.81	105.62	-5.08	0.000%
36	-10.17	-105.62	0.00	10.17	105.62	-0.00	0.000%
37	-8.81	-105.62	-5.08	8.81	105.62	5.08	0.000%
38	-5.09	-105.62	-8.79	5.09	105.62	8.79	0.000%
39	0.00	-55.34	-7.42	0.00	55.34	7.42	0.000%
40	3.72	-55.34	-6.43	-3.72	55.34	6.43	0.000%
41	6.45	-55.34	-3.71	-6.45	55.34	3.71	0.000%
42	7.45	-55.34	0.00	-7.45	55.34	-0.00	0.000%
43	6.45	-55.34	3.71	-6.45	55.34	-3.71	0.000%
44	3.72	-55.34	6.43	-3.72	55.34	-6.43	0.000%
45	0.00	-55.34	7.42	0.00	55.34	-7.42	0.000%
46	-3.72	-55.34	6.43	3.72	55.34	-6.43	0.000%
47	-6.45	-55.34	3.71	6.45	55.34	-3.71	0.000%
48	-7.45	-55.34	0.00	7.45	55.34	-0.00	0.000%
49	-6.45	-55.34	-3.71	6.45	55.34	3.71	0.000%
50	-3.72	-55.34	-6.43	3.72	55.34	6.43	0.000%

### Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	5	0.00000001	0.00005066
3	Yes	4	0.00000001	0.00058972
4	Yes	6	0.00000001	0.00028359
5	Yes	6	0.00000001	0.00009613
6	Yes	6	0.00000001	0.00028217
7	Yes	6	0.00000001	0.00009555
8	Yes	5	0.00000001	0.00007522
9	Yes	4	0.00000001	0.00080731
10	Yes	6	0.00000001	0.00028631
11	Yes	6	0.00000001	0.00009710
12	Yes	6	0.00000001	0.00028141
13	Yes	6	0.00000001	0.00009529
14	Yes	5	0.00000001	0.00005066
15	Yes	4	0.00000001	0.00058977
16	Yes	6	0.00000001	0.00028325
17	Yes	6	0.00000001	0.00009598
18	Yes	6	0.00000001	0.00028525
19	Yes	6	0.00000001	0.00009670
20	Yes	5	0.00000001	0.00007523
21	Yes	4	0.00000001	0.00080734
22	Yes	6	0.00000001	0.00028115
23	Yes	6	0.00000001	0.00009516
24	Yes	6	0.00000001	0.00028548
25	Yes	6	0.00000001	0.00009684
26	Yes	4	0.00000001	0.00000001
27	Yes	6	0.00000001	0.00019348
28	Yes	6	0.00000001	0.00028522
29	Yes	6	0.00000001	0.00028475
30	Yes	6	0.00000001	0.00019401
31	Yes	6	0.00000001	0.00028653
32	Yes	6	0.00000001	0.00028496

33	Yes	6	0.00000001	0.00019371
34	Yes	6	0.00000001	0.00028575
35	Yes	6	0.00000001	0.00028668
36	Yes	6	0.00000001	0.00019421
37	Yes	6	0.00000001	0.00028491
38	Yes	6	0.00000001	0.00028603
39	Yes	4	0.00000001	0.00013839
40	Yes	4	0.00000001	0.00093252
41	Yes	4	0.00000001	0.00091699
42	Yes	4	0.00000001	0.00014664
43	Yes	4	0.00000001	0.00096060
44	Yes	4	0.00000001	0.00091160
45	Yes	4	0.00000001	0.00013850
46	Yes	4	0.00000001	0.00092989
47	Yes	4	0.00000001	0.00094931
48	Yes	4	0.00000001	0.00014668
49	Yes	4	0.00000001	0.00090749
50	Yes	4	0.00000001	0.00095260

### Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	195 - 157.5	30.625	48	1.3145	0.0010
L2	161.75 - 116.75	21.631	48	1.2431	0.0008
L3	122 - 77	12.256	48	0.9673	0.0004
L4	83 - 38	5.564	48	0.6485	0.0002
L5	45 - 0	1.606	48	0.3238	0.0001

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

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
195.00	ERICSSON AIR 21 B2A B4P w/ Mount Pipe	48	30.625	1.3145	0.0010	85579
175.00	OPA-65R-LCUU-H6 w/ Mount Pipe	48	25.149	1.2857	0.0009	21394
165.00	(2) SBNHH-1D65B w/ Mount Pipe	48	22.482	1.2562	0.0008	14266
155.00	NNVV-65B-R4 w/ Mount Pipe	48	19.898	1.2093	0.0008	11114

### Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	195 - 157.5	132.830	20	5.7077	0.0042
L2	161.75 - 116.75	93.838	20	5.3979	0.0035
L3	122 - 77	53.174	20	4.2005	0.0017
L4	83 - 38	24.136	20	2.8149	0.0009
L5	45 - 0	6.964	20	1.4046	0.0003

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



Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
195.00	ERICSSON AIR 21 B2A B4P w/ Mount Pipe	20	132.830	5.7077	0.0043	20125
175.00	OPA-65R-LCUU-H6 w/ Mount Pipe	20	109.092	5.5827	0.0039	5028
165.00	(2) SBNHH-1D65B w/ Mount Pipe	20	97.525	5.4550	0.0036	3351
155.00	NNVV-65B-R4 w/ Mount Pipe	20	86.320	5.2515	0.0032	2603

### Compression Checks

### Pole Design Data

Section No.	Elevation ft	Size	L ft	$L_u$ ft	$Kl/r$	A $in^2$	$P_u$ K	$\phi P_n$ K	Ratio $\frac{P_u}{\phi P_n}$
L1	195 - 157.5 (1)	TP33.351x26x0.25	37.50	0.00	0.0	25.604 6	-12.69	1763.91	0.007
L2	157.5 - 116.75 (2)	TP40.839x32.0179x0.312 5	45.00	0.00	0.0	39.176 5	-23.60	2718.44	0.009
L3	116.75 - 77 (3)	TP48.006x39.1849x0.375	45.00	0.00	0.0	55.292 9	-34.64	3862.64	0.009
L4	77 - 38 (4)	TP54.901x46.0798x0.375	45.00	0.00	0.0	63.266 3	-47.38	4209.09	0.011
L5	38 - 0 (5)	TP61.6x52.7788x0.4375	45.00	0.00	0.0	84.931 8	-66.39	5681.23	0.012

### Pole Bending Design Data

Section No.	Elevation ft	Size	$M_{ux}$ kip-ft	$\phi M_{nx}$ kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	$M_{uy}$ kip-ft	$\phi M_{ny}$ kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L1	195 - 157.5 (1)	TP33.351x26x0.25	250.50	1170.54	0.214	0.00	1170.54	0.000
L2	157.5 - 116.75 (2)	TP40.839x32.0179x0.312 5	1088.56	2207.79	0.493	0.00	2207.79	0.000
L3	116.75 - 77 (3)	TP48.006x39.1849x0.375	2065.07	3689.06	0.560	0.00	3689.06	0.000
L4	77 - 38 (4)	TP54.901x46.0798x0.375	3134.40	4604.28	0.681	0.00	4604.28	0.000
L5	38 - 0 (5)	TP61.6x52.7788x0.4375	4520.84	7150.31	0.632	0.00	7150.31	0.000

### Pole Shear Design Data

Section No.	Elevation ft	Size	Actual $V_u$ K	$\phi V_n$ K	Ratio $\frac{V_u}{\phi V_n}$	Actual $T_u$ kip-ft	$\phi T_n$ kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	195 - 157.5 (1)	TP33.351x26x0.25	16.67	881.96	0.019	0.43	2343.95	0.000
L2	157.5 - 116.75 (2)	TP40.839x32.0179x0.312 5	23.32	1359.22	0.017	0.67	4420.99	0.000
L3	116.75 - 77 (3)	TP48.006x39.1849x0.375	26.66	1931.32	0.014	0.67	7387.14	0.000
L4	77 - 38 (4)	TP54.901x46.0798x0.375	29.44	2104.54	0.014	0.67	9219.83	0.000
L5	38 - 0 (5)	TP61.6x52.7788x0.4375	32.03	2840.62	0.011	0.67	14318.08	0.000

### Pole Interaction Design Data

Section No.	Elevation ft	Ratio $P_u$ $\phi P_n$	Ratio $M_{ux}$ $\phi M_{nx}$	Ratio $M_{uy}$ $\phi M_{ny}$	Ratio $V_u$ $\phi V_n$	Ratio $T_u$ $\phi T_n$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	195 - 157.5 (1)	0.007	0.214	0.000	0.019	0.000	0.222	1.000	4.8.2
L2	157.5 - 116.75 (2)	0.009	0.493	0.000	0.017	0.000	0.502	1.000	4.8.2
L3	116.75 - 77 (3)	0.009	0.560	0.000	0.014	0.000	0.569	1.000	4.8.2
L4	77 - 38 (4)	0.011	0.681	0.000	0.014	0.000	0.692	1.000	4.8.2
L5	38 - 0 (5)	0.012	0.632	0.000	0.011	0.000	0.644	1.000	4.8.2

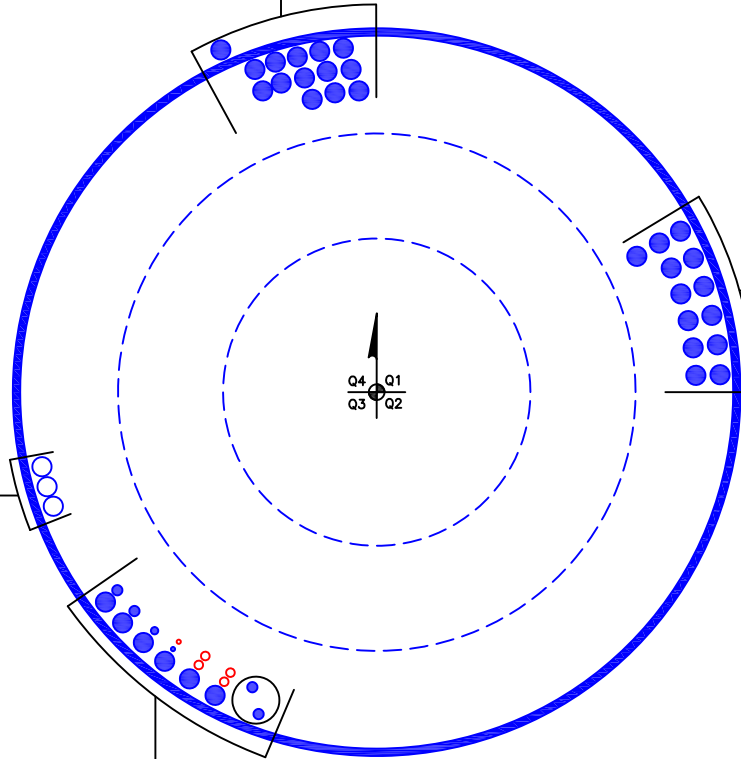
### Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$\phi P_{allow}$ K	% Capacity	Pass Fail
L1	195 - 157.5	Pole	TP33.351x26x0.25	1	-12.69	1763.91	22.2	Pass
L2	157.5 - 116.75	Pole	TP40.839x32.0179x0.3125	2	-23.60	2718.44	50.2	Pass
L3	116.75 - 77	Pole	TP48.006x39.1849x0.375	3	-34.64	3862.64	56.9	Pass
L4	77 - 38	Pole	TP54.901x46.0798x0.375	4	-47.38	4209.09	69.2	Pass
L5	38 - 0	Pole	TP61.6x52.7788x0.4375	5	-66.39	5681.23	64.4	Pass
Summary								
Pole (L4)							69.2	Pass
<b>RATING =</b>							<b>69.2</b>	<b>Pass</b>

**APPENDIX B**  
**BASE LEVEL DRAWING**



(INSTALLED)  
(14) 1-5/8" TO 165 FT LEVEL



(INSTALLED)  
(13) 1-5/8" TO 195 FT LEVEL

(RESERVED)  
(3) 1-5/8" TO 155 FT LEVEL

(PROPOSED)  
(1) 3/8" TO 175 FT LEVEL  
(4) 3/4" TO 175 FT LEVEL  
(INSTALLED-IN CONDUIT-TO BE REMOVED)  
(2) 7/8" TO 175 FT LEVEL  
(INSTALLED)  
(1) 3/8" TO 175 FT LEVEL  
(1) 5/8" TO 175 FT LEVEL  
(2) 7/8" TO 175 FT LEVEL  
(6) 1-5/8" TO 175 FT LEVEL

**APPENDIX C**  
**ADDITIONAL CALCULATIONS**

# 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#: 826053  
 Site Name: Monroe-1/Rt 25  
 App #: 421219 Rev. 1

## Anchor Rod Data

Eta Factor, $\eta$	0.5	TIA G (Fig. 4-4)
Qty:	20	
Diam:	2.25	in
Rod Material:	A615-J	
Yield, $F_y$ :	75	ksi
Strength, $F_u$ :	100	ksi
Bolt Circle:	69	in
Anchor Spacing:	6	in

## Plate Data

W=Side:	68	in
Thick:	3	in
Grade:	55	ksi
Clip Distance:	10.5	in

## Stiffener Data (Welding at both sides)

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

## Pole Data

Diam:	61.6	in
Thick:	0.4375	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round

## Base Reactions

TIA Revision:	G	
Factored Moment, $M_u$ :	4521	ft-kips
Factored Axial, $P_u$ :	66	kips
Factored Shear, $V_u$ :	32	kips

## Anchor Rod Results

TIA G --> Max Rod ( $C_u + V_u/\eta$ ): 163.8 Kips  
 Axial Design Strength,  $\Phi \cdot F_u \cdot A_{net}$ : 260.0 Kips  
 Anchor Rod Stress Ratio: 63.0% **Pass**

## Base Plate Results

Base Plate Stress: 26.9 ksi  
 PL Design Bending Strength,  $\Phi \cdot F_y$ : 49.5 ksi  
 Base Plate Stress Ratio: 54.3% **Pass**

## Flexural Check

## PL Ref. Data

Yield Line (in):	34.57
Max PL Length:	34.57

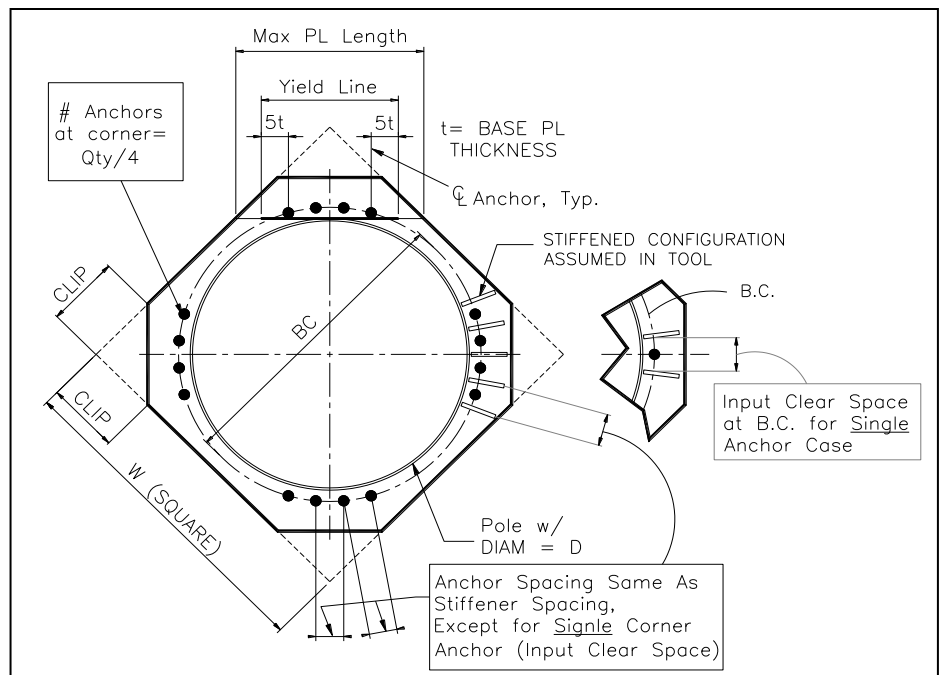
## N/A - Unstiffened

## 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 Foundation



BU # :	826053
Site Name:	Monroe-1/Rt 25
App. Number:	421219 Rev. 1

TIA-222 Revison:	G
Tower Type:	Monopole

Applied Loads		
	Comp.	Uplift
Moment (kip-ft)	4521	
Axial Force (kips)	66	
Shear Force (kips)	32	

Material Properties		
Concrete Strength, f'c:	4.5	ksi
Rebar Strength, Fy:	60	ksi

Pier Design Data		
Depth	37	ft
Ext. Above Grade	0.5	ft
Pier Section 1		
<i>From 0.5' above grade to 37' below grade</i>		
Pier Diameter	8	ft
Rebar Quantity	28	
Rebar Size	11	
Clear Cover to Ties	4	in
Tie Size	5	

Analysis Results		
Soil Lateral Capacity	Compression	Uplift
D <sub>v=0</sub> (ft from TOC)	14.85	-
Soil Safety Factor	3.24	-
Max Moment (kip-ft)	4978.66	-
Rating	41.1%	-
Soil Vertical Capacity	Compression	Uplift
Skin Friction (kips)	678.58	-
End Bearing (kips)	1130.97	-
Weight of Concrete (kips)	211.32	-
Total Capacity (kips)	1809.56	-
Axial (kips)	277.32	-
Rating	15.3%	-
Reinforced Concrete Capacity	Compression	Uplift
Critical Depth (ft from TOC)	14.89	-
Critical Moment (kip-ft)	4978.65	-
Critical Moment Capacity	8358.49	-
Rating	59.6%	-
<b>Soil Interaction Rating</b>	<b>41.1%</b>	
<b>Structural Foundation Rating</b>	<b>59.6%</b>	

Soil Profile			
Groundwater Depth	3	ft	# of Layers
			3

Layer	Top (ft)	Bottom (ft)	Thickness (ft)	γ <sub>soil</sub> (pcf)	γ <sub>concrete</sub> (pcf)	Cohesion (ksf)	Angle of Friction (degrees)	Calculated Ultimate Skin Friction Comp (ksf)	Calculated Ultimate Skin Friction Uplift (ksf)	Ultimate Skin Friction Comp Override (ksf)	Ultimate Skin Friction Uplift Override (ksf)	Ult. Gross Bearing Capacity (ksf)	SPT Blow Count	Soil Type
1	0	3	3	115	150	0	0	0.000	0.000	0.00	0.00			Cohesionless
2	3	13	10	52.6	87.6	0	0	0.000	0.000	0.00	0.00			Cohesionless
3	13	37	24	52.6	87.6	0	34	0.000	0.000	1.50	1.50	30		Cohesionless

# CCISeismic - Design Category

Per 2012/2015 IBC

Site BU: 826053  
 Work Order: 1568972  
 Application: 421219 Rev. 1



	Degrees	Minutes	Seconds	
Site Latitude =	41	18	6.05	41.3017 degrees
Site Longitude =	-73	15	2.91	-73.2508 degrees
Ground Supported Structure =	Yes			
Structure Class =	II			(Table 2-1)
Site Class =	D - Stiff Soil			(Table 2-11)
Spectral response acceleration short periods, $S_s$ =	0.215			<a href="#">USGS Seismic Tool</a>
Spectral response acceleration 1 s period, $S_1$ =	0.065			
Importance Factor, $I$ =	1.0			(Table 2-3)
Acceleration-based site coefficient, $F_a$ =	1.6			(Table 2-12)
Velocity-based site coefficient, $F_v$ =	2.4			(Table 2-13)
Design spectral response acceleration short period, $S_{DS}$ =	0.229			(2.7.6)
Design spectral response acceleration 1 s period, $S_{D1}$ =	0.104			(2.7.6)
Seismic Design Category - Short Period Response =	B			ASCE 7-05 Table 11.6-1
Seismic Design Category - 1s Period Response =	B			ASCE 7-05 Table 11.6-2
Worst Case Seismic Design Category =	B			ASCE 7-05 Tables 11.6-1 and 6-2