

Date: November 09, 2016

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

**JACOBS®**  
Jacobs Engineering Group, Inc.  
5449 Bells Ferry Rd  
Acworth, GA 30102  
(770) 701-2500

**Subject: Structural Analysis Report**

**Carrier Designation:** AT&T Mobility Co-Locate  
**Carrier Site Number:** CTL02105  
**Carrier Site Name:** FAIRFIELD-MURRAY

**Crown Castle Designation:** Crown Castle BU Number: 806355  
Crown Castle Site Name: BRG 126 943086  
Crown Castle JDE Job Number: 384544  
Crown Castle Work Order Number: 1323614  
Crown Castle Application Number: 353118 Rev. 3

**Engineering Firm Designation:** Jacobs Engineering Group, Inc. Project Number: 1323614

**Site Data:** 281 WOODHOUSE ROAD, FAIRFIELD, Fairfield County, CT  
Latitude 41° 11' 45.3", Longitude -73° 16' 52.9"  
170.5 Foot - Monopole Tower

Dear Charles McGuirt,

Jacobs Engineering Group, Inc. 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 968331, in accordance with application 353118, revision 3.

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:

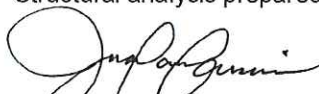
LC7: Existing + Reserved + Proposed Equipment **Sufficient Capacity**  
Note: See Table I and Table II for the proposed and existing/reserved loading, respectively.

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 B 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 Jacobs Engineering Group, Inc. 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:

  
Juan Pablo L. Bersamina  
Structural Engineer



Reviewed by:

Matthew E. Watkins, P.E.  
Engineering Project Manager

## 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 170.5 ft Monopole tower designed by ENGINEERED ENDEAVORS, INC. in May of 1998. The tower was originally designed for a wind speed of 85 mph per TIA/EIA-222-E&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 97 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
146.0	148.0	3	ericsson	RRUS 32	1 2	3/8 3/4	-
		3	ericsson	RRUS 32 B2			
		3	kathrein	782 10254			
		3	quintel technology	QS66512-2 w/ Mount Pipe			
		1	raycap	DC6-48-60-18-8F			

**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
166.0	167.0	3	ems wireless	DR90-14-00DPL2 w/ Mount Pipe	6	1-5/8	4
	166.0	1	tower mounts	Pipe Mount [PM 601-3]			
155.0	160.0	1	gps	GPS_A	-	-	1
	158.0	3	alcatel lucent	B66A RRH4X45	2	1-5/8	2
		3	alcatel lucent	RRH2X60-PCS			
		3	alcatel lucent	RRH2x60-700			
		2	rfs celwave	DB-T1-6Z-8AB-0Z			
		6	commscope	SBNHH-1D85B w/ Mount Pipe			
	6	decibel	DB844G65ZAXY w/ Mount Pipe	11 1	1-5/8 1/2	1	
	3	rymsa wireless	MG D3-800TV w/ Mount Pipe				
	6	rfs celwave	FD9R6004/2C-3L				
155.0	1	tower mounts	Platform Mount [LP 713-1]				

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note	
146.0	148.0	3	powerwave technologies	7770.00 w/ Mount Pipe	3	3/8	3	
		3	ericsson	RRUS 11 B2				
		1	raycap	DC6-48-60-18-8F				
		12	powerwave technologies	7020.00	12	1-5/8	1	
		3	powerwave technologies	7770.00 w/ Mount Pipe				
		3	powerwave technologies	P65-16-XLH-RR w/ Mount Pipe				
	146.0	146.0	1	raycap	DC6-48-60-18-8F	1	3/8	
			3	ericsson	RRUS-11			
			12	powerwave technologies	LGP2140X			
		1	tower mounts	Platform Mount [LP 713-1]				
138.0	140.0	3	commscope	LNx-6515DS-VTM w/ Mount Pipe	13	1-5/8	1	
		3	ericsson	ERICSSON AIR 21 B2A B4P w/ Mount Pipe				
		3	ericsson	ERICSSON AIR 21 B4A B2P w/ Mount Pipe				
		3	ericsson	RRUS 11 B12				
	138.0	138.0	3	ericsson	KRY 112 144/1			
			1	tower mounts	Platform Mount [LP 713-1]			
128.0	128.0	1	andrew	VHLP800-11	3	5/16	1	
		3	kathrein	840 10054 w/ Mount Pipe	3	1/4		
		1	tower mounts	Side Arm Mount [SO 101-3]	1	1/2		

Notes:

- 1) Existing Equipment
- 2) Reserved Equipment
- 3) Existing Equipment to be Removed; Not considered in this analysis
- 4) Abandoned Equipment; 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)
160.0	160.0	12	Allgon	ALP 9212	-	-
148.0	148.0	12	Allgon	ALP 11011	-	-
138.0	138.0	6	Celwave	APN 199015	-	-
128.0	128.0	12	Allgon	ALP 9212	-	-
118.0	118.0	12	Allgon	ALP 9212	-	-

### 3) ANALYSIS PROCEDURE

**Table 4 - Documents Provided**

Document	Remarks	Reference	Source
4-TOWER MANUFACTURER DRAWINGS	Engineered Endeavors, Inc.	653293	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	Engineered Endeavors, Inc.	1098364	CCISITES
4-GEOTECHNICAL REPORTS	Clarence Welti Assoc., Inc.	1099974	CCISITES

#### 3.1) Analysis Method

tnxTower (version 7.0.7.0), 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. Jacobs Engineering Group, Inc. 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	170.5 - 156	Pole	TP10.75x10.75x0.365	1	-1.05	375.11	10.6	Pass
L2	156 - 155.5	Pole	TP19.5x10.75x0.365	2	-1.07	375.11	10.6	Pass
L3	155.5 - 132.17	Pole	TP24.79x19.5x0.1875	3	-11.57	980.62	52.9	Pass
L4	132.17 - 86.5867	Pole	TP34.63x23.5836x0.375	4	-21.69	2933.29	58.8	Pass
L5	86.5867 - 42.5	Pole	TP43.75x32.7959x0.4375	5	-35.11	4329.85	59.1	Pass
L6	42.5 - 0	Pole	TP52.5x41.5315x0.5	6	-41.06	5176.79	54.4	Pass
							Summary	
							Pole (L5)	59.1 Pass
							Rating =	59.1 Pass

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

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	54.3	Pass
1	Base Plate	0	62.0	Pass
1	Base Foundation Structural	0	60.5	Pass
1	Base Foundation Soil Interaction	0	47.9	Pass
1	Flange Bolts	156	2.3	Pass
1	Flange Plate	156	15.1	Pass

<b>Structure Rating (max from all components) =</b>	<b>62.0%</b>
-----------------------------------------------------	--------------

Notes:

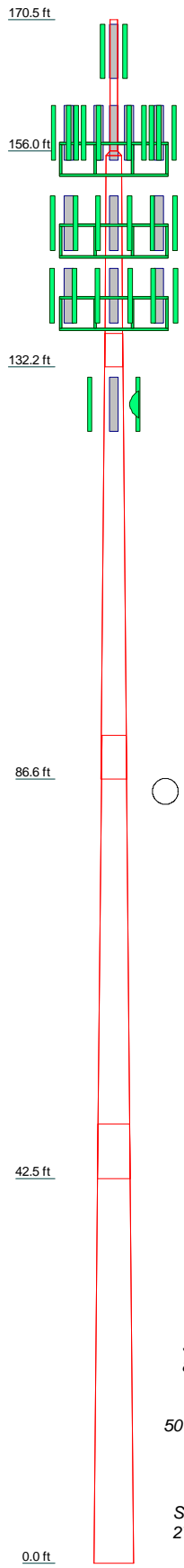
- 1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.

#### 4.1) Recommendations

The tower and its foundation have sufficient capacity to carry the existing, reserved and proposed loading. No modifications are required at this time.

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

Section	1	2	3	4	5	6
Length (ft)	14.50	0.90	23.33	49.25	48.92	48.50
Number of Sides	1	1	18	18	18	18
Thickness (in)	0.3650	0.3650	0.1875	0.3750	0.4375	0.5000
Socket Length (ft)	0.3650	0.3650	3.67	4.83	6.00	41.5315
Top Dia (in)	10.7500	10.7500	19.5000	23.5836	32.7959	52.5000
Bot Dia (in)	10.7500	19.9000	24.7900	34.6300	43.7500	
Grade	A53-B-35			A572-65		
Weight (K)	0.6	0.0	1.0	5.7	8.7	12.2



### DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Lightning Rod 1/2"x4'	166	RRUS 32 B2	146
DR90-14-00DPL2 w/ Mount Pipe	166	RRUS 32 B2	146
DR90-14-00DPL2 w/ Mount Pipe	166	RRUS 32 B2	146
DR90-14-00DPL2 w/ Mount Pipe	166	RRUS 32	146
Pipe Mount [PM 601-3]	166	RRUS 32	146
(2) DB844G65ZAXY w/ Mount Pipe	155	RRUS 32	146
(2) DB844G65ZAXY w/ Mount Pipe	155	782 10254	146
(2) DB844G65ZAXY w/ Mount Pipe	155	782 10254	146
(2) SBNHH-1D85B w/ Mount Pipe	155	782 10254	146
(2) SBNHH-1D85B w/ Mount Pipe	155	DC6-48-60-18-8F	146
(2) SBNHH-1D85B w/ Mount Pipe	155	DC6-48-60-18-8F	146
MG D3-800TV w/ Mount Pipe	155	6' x 2" Mount Pipe	146
MG D3-800TV w/ Mount Pipe	155	6' x 2" Mount Pipe	146
MG D3-800TV w/ Mount Pipe	155	6' x 2" Mount Pipe	146
(2) FD9R6004/2C-3L	155	Platform Mount [LP 713-1]	146
(2) FD9R6004/2C-3L	155	ERICSSON AIR 21 B2A B4P w/ Mount Pipe	138
(2) FD9R6004/2C-3L	155	ERICSSON AIR 21 B2A B4P w/ Mount Pipe	138
RRH2x60-700	155	ERICSSON AIR 21 B2A B4P w/ Mount Pipe	138
RRH2x60-700	155	ERICSSON AIR 21 B2A B4P w/ Mount Pipe	138
RRH2x60-700	155	ERICSSON AIR 21 B2A B4P w/ Mount Pipe	138
RRH2X60-PCS	155	ERICSSON AIR 21 B4A B2P w/ Mount Pipe	138
RRH2X60-PCS	155	ERICSSON AIR 21 B4A B2P w/ Mount Pipe	138
RRH2X60-PCS	155	ERICSSON AIR 21 B4A B2P w/ Mount Pipe	138
B66A RRH4X45	155	ERICSSON AIR 21 B4A B2P w/ Mount Pipe	138
B66A RRH4X45	155	ERICSSON AIR 21 B4A B2P w/ Mount Pipe	138
B66A RRH4X45	155	ERICSSON AIR 21 B4A B2P w/ Mount Pipe	138
(2) DB-T1-6Z-8AB-0Z	155	LNx-6515DS-VTM w/ Mount Pipe	138
GPS_A	155	LNx-6515DS-VTM w/ Mount Pipe	138
Platform Mount [LP 713-1]	155	LNx-6515DS-VTM w/ Mount Pipe	138
P65-16-XLH-RR w/ Mount Pipe	146	KRY 112 144/1	138
P65-16-XLH-RR w/ Mount Pipe	146	KRY 112 144/1	138
P65-16-XLH-RR w/ Mount Pipe	146	KRY 112 144/1	138
QS66512-2 w/ Mount Pipe	146	RRUS 11 B12	138
QS66512-2 w/ Mount Pipe	146	RRUS 11 B12	138
QS66512-2 w/ Mount Pipe	146	RRUS 11 B12	138
7770.00 w/ Mount Pipe	146	6' x 2" Mount Pipe	138
7770.00 w/ Mount Pipe	146	6' x 2" Mount Pipe	138
7770.00 w/ Mount Pipe	146	6' x 2" Mount Pipe	138
RRUS-11	146	Platform Mount [LP 713-1]	138
RRUS-11	146	840 10054 w/ Mount Pipe	128
RRUS-11	146	840 10054 w/ Mount Pipe	128
(4) 7020.00	146	840 10054 w/ Mount Pipe	128
(4) 7020.00	146	6' x 2" Mount Pipe	128
(4) 7020.00	146	6' x 2" Mount Pipe	128
(4) LGP2140X	146	Side Arm Mount [SO 101-3]	128
(4) LGP2140X	146	VHLP800-11	128
(4) LGP2140X	146		

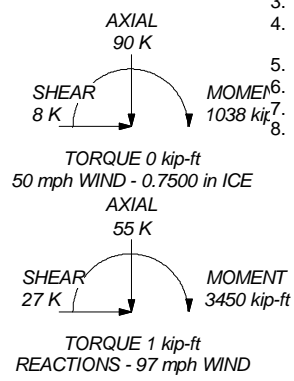
### MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A53-B-35	35 ksi	60 ksi	A572-65	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 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: 59.1%

ALL REACTIONS ARE FACTORED



**Jacobs Engineering Group, Inc.**  
 5449 Bells Ferry Rd  
 Acworth, GA 30102  
 Phone: (770) 701-2500  
 FAX: (770) 701-2501

Job: <b>BRG 126 943086</b>		
Project: <b>BU#806355 WO#1323614</b>		
Client: Crown Castle	Drawn by: Juan Paulo Bersamina	App'd:
Code: TIA-222-G	Date: 11/09/16	Scale: NTS
Path:		Dwg No. E-1



## 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 97 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 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="background-color: #e0e0e0; text-align: center; padding: 2px;"><b>Poles</b></div> ✓ Include Shear-Torsion Interaction Always Use Sub-Critical Flow Use Top Mounted Sockets
--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

## Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	170.50-156.00	14.50	0.00	Round	10.7500	10.7500	0.3650		A53-B-35 (35 ksi)
L2	156.00-155.50	0.50	0.00	Round	10.7500	19.5000	0.3650		A53-B-35 (35 ksi)
L3	155.50-132.17	23.33	3.67	18	19.5000	24.7900	0.1875	0.7500	A572-65 (65 ksi)
L4	132.17-86.59	49.25	4.83	18	23.5836	34.6300	0.3750	1.5000	A572-65 (65 ksi)
L5	86.59-42.50	48.92	6.00	18	32.7959	43.7500	0.4375	1.7500	A572-65 (65 ksi)
L6	42.50-0.00	48.50		18	41.5315	52.5000	0.5000	2.0000	A572-65 (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	10.7500	11.9083	160.7342	3.6739	5.3750	29.9040	321.4685	5.9506	0.0000	0
	10.7500	11.9083	160.7342	3.6739	5.3750	29.9040	321.4685	5.9506	0.0000	0
L2	10.7500	11.9083	160.7342	3.6739	5.3750	29.9040	321.4685	5.9506	0.0000	0
	19.5000	21.9417	1004.6069	6.7665	9.7500	103.0366	2009.2137	10.9643	0.0000	0
L3	19.8008	11.4934	541.5782	6.8559	9.9060	54.6717	1083.8689	5.7478	3.1020	16.544
	25.1724	14.6416	1119.6528	8.7339	12.5933	88.9085	2240.7788	7.3222	4.0330	21.51
L4	24.7825	27.6240	1879.8456	8.2391	11.9805	156.9092	3762.1648	13.8146	3.4907	9.309
	35.1642	40.7720	6044.3215	12.1605	17.5920	343.5828	12096.596	20.3899	5.4349	14.493
L5	34.4008	44.9337	5944.0760	11.4872	16.6603	356.7803	11895.973	22.4711	5.0021	11.433
	44.4249	60.1448	14254.834	15.3759	22.2250	641.3874	28528.426	30.0781	6.9300	15.84
L6	43.5500	65.1170	13850.526	14.5662	21.0980	656.4853	27719.277	32.5647	6.4295	12.859
	53.3099	82.5240	28191.904	18.4600	26.6700	1057.0643	56420.903	41.2698	8.3600	16.72

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 170.50-156.00				1	1	1			
L2 156.00-155.50				1	1	1			
L3 155.50-132.17				1	1	1			
L4 132.17-86.59				1	1	1			
L5 86.59-42.50				1	1	1			
L6 42.50-0.00				1	1	1			

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

Description	Sector	Component Type	Placement	Total Number	Number Per Row	Start/End Position	Width or Diameter	Perimeter	Weight
			ft				in	in	plf
CR 50 1873(1-5/8")	A	Surface Ar (CaAa)	155.00 - 6.00	2	2	-0.100 0.100	1.9800		0.83
LCF158-50JA-A0(1 5/8")	C	Surface Ar (CaAa)	138.00 - 6.00	6	6	0.400 0.400	1.9800		0.72
****									
***									
Safety Line 3/8	C	Surface Ar (CaAa)	166.00 - 0.00	1	1	0.000 0.000	0.3750		0.22

### 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	plf
** 166 **							

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	C <sub>AA</sub>		Weight plf
						ft <sup>2</sup> /ft		
LDF7-50A(1-5/8")	B	No	Inside Pole	166.00 - 6.00	6	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82
						1" Ice	0.00	0.82
** 155 **								
561(1-5/8")	A	No	Inside Pole	155.00 - 6.00	11	No Ice	0.00	1.35
						1/2" Ice	0.00	1.35
						1" Ice	0.00	1.35
LDF4-50A(1/2")	A	No	Inside Pole	155.00 - 6.00	1	No Ice	0.00	0.15
						1/2" Ice	0.00	0.15
						1" Ice	0.00	0.15
** 146 **								
CR 50 1873(1-5/8")	A	No	Inside Pole	146.00 - 6.00	12	No Ice	0.00	0.83
						1/2" Ice	0.00	0.83
						1" Ice	0.00	0.83
FB-L98B-002-75000(3/8")	A	No	Inside Pole	146.00 - 6.00	1	No Ice	0.00	0.06
						1/2" Ice	0.00	0.06
						1" Ice	0.00	0.06
WR-VG82ST-BRDA(5/8")	A	No	Inside Pole	146.00 - 6.00	2	No Ice	0.00	0.31
						1/2" Ice	0.00	0.31
						1" Ice	0.00	0.31
2" Rigid Conduit	A	No	Inside Pole	146.00 - 6.00	1	No Ice	0.00	2.80
						1/2" Ice	0.00	2.80
						1" Ice	0.00	2.80
FB-L98B-034-XXX(3/8")	A	No	Inside Pole	146.00 - 0.00	1	No Ice	0.00	0.06
						1/2" Ice	0.00	0.06
						1" Ice	0.00	0.06
WR-VG86ST-BRD(3/4")	A	No	Inside Pole	146.00 - 0.00	2	No Ice	0.00	0.58
						1/2" Ice	0.00	0.58
						1" Ice	0.00	0.58
2" Rigid Conduit	A	No	Inside Pole	146.00 - 6.00	1	No Ice	0.00	2.80
						1/2" Ice	0.00	2.80
						1" Ice	0.00	2.80
** 138 **								
LCF158-50JA-A0(15/8")	C	No	Inside Pole	138.00 - 6.00	7	No Ice	0.00	0.72
						1/2" Ice	0.00	0.72
						1" Ice	0.00	0.72
** 128 **								
7983A(1/2")	B	No	Inside Pole	128.00 - 6.00	1	No Ice	0.00	0.08
						1/2" Ice	0.00	0.08
						1" Ice	0.00	0.08
9207(5/16")	B	No	Inside Pole	128.00 - 6.00	3	No Ice	0.00	0.60
						1/2" Ice	0.00	0.60
						1" Ice	0.00	0.60
9258(1/4)	B	No	Inside Pole	128.00 - 6.00	3	No Ice	0.00	0.04
						1/2" Ice	0.00	0.04
						1" Ice	0.00	0.04
2" Rigid Conduit	B	No	Inside Pole	128.00 - 6.00	2	No Ice	0.00	2.80
						1/2" Ice	0.00	2.80
						1" Ice	0.00	2.80

### Feed Line/Linear Appurtenances Section Areas

Tower Section	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	170.50-156.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.05
		C	0.000	0.000	0.375	0.000	0.00
L2	156.00-155.50	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	0.019	0.000	0.00
L3	155.50-132.17	A	0.000	0.000	9.041	0.000	0.62
		B	0.000	0.000	0.000	0.000	0.11
		C	0.000	0.000	7.801	0.000	0.06
L4	132.17-86.59	A	0.000	0.000	18.051	0.000	1.56
		B	0.000	0.000	0.000	0.000	0.54

Tower Section	Tower Elevation ft	Face	$A_R$ $ft^2$	$A_F$ $ft^2$	$C_{AA}$ In Face $ft^2$	$C_{AA}$ Out Face $ft^2$	Weight K
L5	86.59-42.50	C	0.000	0.000	55.862	0.000	0.44
		A	0.000	0.000	17.458	0.000	1.50
		B	0.000	0.000	0.000	0.000	0.55
L6	42.50-0.00	C	0.000	0.000	54.028	0.000	0.42
		A	0.000	0.000	14.454	0.000	1.25
		B	0.000	0.000	0.000	0.000	0.46
		C	0.000	0.000	44.956	0.000	0.35

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

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	$A_R$ $ft^2$	$A_F$ $ft^2$	$C_{AA}$ In Face $ft^2$	$C_{AA}$ Out Face $ft^2$	Weight K
L1	170.50-156.00	A	1.760	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.05
		C		0.000	0.000	3.895	0.000	0.05
L2	156.00-155.50	A	1.752	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	0.194	0.000	0.00
L3	155.50-132.17	A	1.737	0.000	0.000	21.217	0.000	0.87
		B		0.000	0.000	0.000	0.000	0.11
		C		0.000	0.000	20.171	0.000	0.30
L4	132.17-86.59	A	1.689	0.000	0.000	42.362	0.000	2.05
		B		0.000	0.000	0.000	0.000	0.54
		C		0.000	0.000	105.038	0.000	1.69
L5	86.59-42.50	A	1.603	0.000	0.000	40.443	0.000	1.97
		B		0.000	0.000	0.000	0.000	0.55
		C		0.000	0.000	100.639	0.000	1.59
L6	42.50-0.00	A	1.431	0.000	0.000	32.696	0.000	1.61
		B		0.000	0.000	0.000	0.000	0.46
		C		0.000	0.000	84.051	0.000	1.28

### Feed Line Center of Pressure

Section	Elevation ft	$CP_x$ in	$CP_z$ in	$CP_x$ Ice in	$CP_z$ Ice in
L1	170.50-156.00	0.0000	0.0390	0.0000	0.2562
L2	156.00-155.50	0.0000	0.0560	0.0000	0.3873
L3	155.50-132.17	-0.6682	0.0648	-0.7422	0.1585
L4	132.17-86.59	-1.1716	0.6046	-1.1896	0.6318
L5	86.59-42.50	-1.2741	0.6579	-1.3915	0.7412
L6	42.50-0.00	-1.1866	0.6193	-1.4028	0.7880

### Shielding Factor $K_a$

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	$K_a$ No Ice	$K_a$ Ice
L1	27	Safety Line 3/8	156.00 - 166.00	1.0000	1.0000
L2	27	Safety Line 3/8	155.50 - 156.00	1.0000	1.0000
L3	6	CR 50 1873(1-5/8")	132.17 - 155.00	1.0000	1.0000
L3	18	LCF158-50JA-A0(1 5/8")	132.17 -	1.0000	1.0000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	$K_a$ No Ice	$K_a$ Ice
L3	27	Safety Line 3/8	138.00 132.17 - 155.50	1.0000	1.0000
L4	6	CR 50 1873(1-5/8")	86.59 - 132.17	1.0000	1.0000
L4	18	LCF158-50JA-A0(1 5/8")	86.59 - 132.17	1.0000	1.0000
L4	27	Safety Line 3/8	86.59 - 132.17	1.0000	1.0000
L5	6	CR 50 1873(1-5/8")	42.50 - 86.59	1.0000	1.0000
L5	18	LCF158-50JA-A0(1 5/8")	42.50 - 86.59	1.0000	1.0000
L5	27	Safety Line 3/8	42.50 - 86.59	1.0000	1.0000

### Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	$C_{AA}$ Front	$C_{AA}$ Side	Weight
			Horz	Vert					
Lightning Rod 1/2"x4'	C	None			0.0000	166.00	No Ice	0.20	0.03
							1/2" Ice	0.61	0.03
							Ice	0.95	0.04
							1" Ice		
** 166 ** DR90-14-00DPL2 w/ Mount Pipe	A	From Leg	1.00 0.00 1.00	0.0000	166.00	No Ice	4.59	3.32	0.04
						1/2" Ice	5.02	0.08	
						Ice	5.44	0.12	
						1" Ice			
DR90-14-00DPL2 w/ Mount Pipe	B	From Leg	1.00 0.00 1.00	0.0000	166.00	No Ice	4.59	3.32	0.04
						1/2" Ice	5.02	0.08	
						Ice	5.44	0.12	
						1" Ice			
DR90-14-00DPL2 w/ Mount Pipe	C	From Leg	1.00 0.00 1.00	0.0000	166.00	No Ice	4.59	3.32	0.04
						1/2" Ice	5.02	0.08	
						Ice	5.44	0.12	
						1" Ice			
Pipe Mount [PM 601-3]	C	None		0.0000	166.00	No Ice	4.39	4.39	0.20
						1/2" Ice	5.48	0.24	
						Ice	6.57	0.28	
						1" Ice			
** 155 ** (2) DB844G65ZAXY w/ Mount Pipe	A	From Leg	4.00 0.00 3.00	0.0000	155.00	No Ice	4.58	4.80	0.03
						1/2" Ice	4.96	0.08	
						Ice	5.34	0.13	
						1" Ice			
(2) DB844G65ZAXY w/ Mount Pipe	B	From Leg	4.00 0.00 3.00	0.0000	155.00	No Ice	4.58	4.80	0.03
						1/2" Ice	4.96	0.08	
						Ice	5.34	0.13	
						1" Ice			
(2) DB844G65ZAXY w/ Mount Pipe	C	From Leg	4.00 0.00 3.00	0.0000	155.00	No Ice	4.58	4.80	0.03
						1/2" Ice	4.96	0.08	
						Ice	5.34	0.13	
						1" Ice			
(2) SBNHH-1D85B w/ Mount Pipe	A	From Leg	4.00 0.00 3.00	0.0000	155.00	No Ice	8.32	7.00	0.07
						1/2" Ice	8.88	0.14	
						Ice	9.40	0.21	
						1" Ice			

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>A</sub> A <sub>A</sub> Front	C <sub>A</sub> A <sub>A</sub> Side	Weight
			Horz	Lateral Vert					
			ft	ft	°	ft	ft <sup>2</sup>	ft <sup>2</sup>	K
(2) SBNHH-1D85B w/ Mount Pipe	B	From Leg	4.00	0.0000	155.00	1" Ice	8.32	7.00	0.07
			0.00			No Ice	8.88	8.19	0.14
			3.00			1/2" Ice	9.40	9.08	0.21
(2) SBNHH-1D85B w/ Mount Pipe	C	From Leg	4.00	0.0000	155.00	1" Ice	8.32	7.00	0.07
			0.00			No Ice	8.88	8.19	0.14
			3.00			1/2" Ice	9.40	9.08	0.21
MG D3-800TV w/ Mount Pipe	A	From Leg	4.00	0.0000	155.00	1" Ice	3.57	3.42	0.04
			0.00			No Ice	3.98	4.12	0.07
			3.00			1/2" Ice	4.39	4.78	0.11
MG D3-800TV w/ Mount Pipe	B	From Leg	4.00	0.0000	155.00	1" Ice	3.57	3.42	0.04
			0.00			No Ice	3.98	4.12	0.07
			3.00			1/2" Ice	4.39	4.78	0.11
MG D3-800TV w/ Mount Pipe	C	From Leg	4.00	0.0000	155.00	1" Ice	3.57	3.42	0.04
			0.00			No Ice	3.98	4.12	0.07
			3.00			1/2" Ice	4.39	4.78	0.11
(2) FD9R6004/2C-3L	A	From Leg	4.00	0.0000	155.00	1" Ice	0.31	0.08	0.00
			0.00			No Ice	0.39	0.12	0.01
			0.00			1/2" Ice	0.47	0.17	0.01
(2) FD9R6004/2C-3L	B	From Leg	4.00	0.0000	155.00	1" Ice	0.31	0.08	0.00
			0.00			No Ice	0.39	0.12	0.01
			0.00			1/2" Ice	0.47	0.17	0.01
(2) FD9R6004/2C-3L	C	From Leg	4.00	0.0000	155.00	1" Ice	0.31	0.08	0.00
			0.00			No Ice	0.39	0.12	0.01
			0.00			1/2" Ice	0.47	0.17	0.01
RRH2x60-700	A	From Leg	4.00	0.0000	155.00	1" Ice	3.50	1.82	0.06
			0.00			No Ice	3.76	2.05	0.08
			3.00			1/2" Ice	4.03	2.29	0.11
RRH2x60-700	B	From Leg	4.00	0.0000	155.00	1" Ice	3.50	1.82	0.06
			0.00			No Ice	3.76	2.05	0.08
			3.00			1/2" Ice	4.03	2.29	0.11
RRH2x60-700	C	From Leg	4.00	0.0000	155.00	1" Ice	3.50	1.82	0.06
			0.00			No Ice	3.76	2.05	0.08
			3.00			1/2" Ice	4.03	2.29	0.11
RRH2X60-PCS	A	From Leg	4.00	0.0000	155.00	1" Ice	2.20	1.72	0.06
			0.00			No Ice	2.39	1.90	0.08
			3.00			1/2" Ice	2.59	2.09	0.10
RRH2X60-PCS	B	From Leg	4.00	0.0000	155.00	1" Ice	2.20	1.72	0.06
			0.00			No Ice	2.39	1.90	0.08
			3.00			1/2" Ice	2.59	2.09	0.10
RRH2X60-PCS	C	From Leg	4.00	0.0000	155.00	1" Ice	2.20	1.72	0.06
			0.00			No Ice	2.39	1.90	0.08
			3.00			1/2" Ice	2.59	2.09	0.10
B66A RRH4X45	A	From Leg	4.00	0.0000	155.00	1" Ice	2.58	1.63	0.07
			0.00			No Ice	2.79	1.81	0.09
			3.00			1/2" Ice	3.01	2.00	0.11
B66A RRH4X45	C	From Leg	4.00	0.0000	155.00	1" Ice	2.58	1.63	0.07
			0.00			No Ice	2.79	1.81	0.09
			3.00			1/2" Ice	3.01	2.00	0.11

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>A</sub> A <sub>A</sub> Front	C <sub>A</sub> A <sub>A</sub> Side	Weight
			Horz	Lateral					
			ft	ft	°	ft	ft <sup>2</sup>	ft <sup>2</sup>	K
B66A RRH4X45	B	From Leg	4.00	0.0000	155.00	No Ice	2.58	1.63	0.07
			0.00			1/2"	2.79	1.81	0.09
			3.00			Ice	3.01	2.00	0.11
(2) DB-T1-6Z-8AB-0Z	B	From Leg	4.00	0.0000	155.00	1" Ice	4.80	2.00	0.04
			0.00			No Ice	5.07	2.19	0.08
			3.00			1/2"	5.35	2.39	0.12
GPS_A	A	From Leg	4.00	0.0000	155.00	Ice	0.26	0.26	0.00
			0.00			No Ice	0.32	0.32	0.00
			5.00			1/2"	0.39	0.39	0.01
Platform Mount [LP 713-1]	C	None		0.0000	155.00	1" Ice	31.27	31.27	1.51
						No Ice	39.68	39.68	1.93
						Ice	48.09	48.09	2.35
** 146 ** P65-16-XLH-RR w/ Mount Pipe	A	From Leg	4.00	0.0000	146.00	1" Ice	8.37	6.36	0.08
			0.00			No Ice	8.93	7.54	0.14
			2.00			1/2"	9.46	8.43	0.22
P65-16-XLH-RR w/ Mount Pipe	B	From Leg	4.00	0.0000	146.00	Ice	8.37	6.36	0.08
			0.00			No Ice	8.93	7.54	0.14
			2.00			1/2"	9.46	8.43	0.22
P65-16-XLH-RR w/ Mount Pipe	C	From Leg	4.00	0.0000	146.00	1" Ice	8.37	6.36	0.08
			0.00			No Ice	8.93	7.54	0.14
			2.00			1/2"	9.46	8.43	0.22
QS66512-2 w/ Mount Pipe	A	From Leg	4.00	0.0000	146.00	Ice	8.37	8.46	0.14
			0.00			No Ice	8.93	9.66	0.21
			2.00			1/2"	9.46	10.55	0.30
QS66512-2 w/ Mount Pipe	B	From Leg	4.00	0.0000	146.00	1" Ice	8.37	8.46	0.14
			0.00			No Ice	8.93	9.66	0.21
			2.00			1/2"	9.46	10.55	0.30
QS66512-2 w/ Mount Pipe	C	From Leg	4.00	0.0000	146.00	Ice	8.37	8.46	0.14
			0.00			No Ice	8.93	9.66	0.21
			2.00			1/2"	9.46	10.55	0.30
7770.00 w/ Mount Pipe	A	From Leg	4.00	0.0000	146.00	1" Ice	5.75	4.25	0.06
			0.00			No Ice	6.18	5.01	0.10
			2.00			1/2"	6.61	5.71	0.16
7770.00 w/ Mount Pipe	B	From Leg	4.00	0.0000	146.00	Ice	5.75	4.25	0.06
			0.00			No Ice	6.18	5.01	0.10
			2.00			1/2"	6.61	5.71	0.16
7770.00 w/ Mount Pipe	C	From Leg	4.00	0.0000	146.00	1" Ice	5.75	4.25	0.06
			0.00			No Ice	6.18	5.01	0.10
			2.00			1/2"	6.61	5.71	0.16
RRUS-11	A	From Leg	4.00	0.0000	146.00	Ice	2.52	1.07	0.06
			0.00			No Ice	2.72	1.21	0.07
			0.00			1/2"	2.92	1.36	0.10
RRUS-11	B	From Leg	4.00	0.0000	146.00	1" Ice	2.52	1.07	0.06
			0.00			No Ice	2.72	1.21	0.07
			0.00			1/2"	2.92	1.36	0.10
RRUS-11	C	From Leg	4.00	0.0000	146.00	Ice	2.52	1.07	0.06
			0.00			No Ice	2.72	1.21	0.07
			0.00			1/2"	2.92	1.36	0.10
						1" Ice			

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>A</sub> A <sub>A</sub> Front	C <sub>A</sub> A <sub>A</sub> Side	Weight
			Horz	Lateral Vert					
(4) 7020.00	A	From Leg	4.00	0.0000	146.00	No Ice	0.10	0.17	0.00
			0.00			1/2"	0.15	0.24	0.01
			2.00			Ice	0.20	0.31	0.01
(4) 7020.00	B	From Leg	4.00	0.0000	146.00	1" Ice	0.10	0.17	0.00
			0.00			No Ice	0.15	0.24	0.01
			2.00			1/2"	0.20	0.31	0.01
(4) 7020.00	C	From Leg	4.00	0.0000	146.00	1" Ice	0.10	0.17	0.00
			0.00			No Ice	0.15	0.24	0.01
			2.00			1/2"	0.20	0.31	0.01
(4) LGP2140X	A	From Leg	4.00	0.0000	146.00	1" Ice	1.08	0.36	0.01
			0.00			No Ice	1.21	0.45	0.02
			0.00			Ice	1.35	0.56	0.03
(4) LGP2140X	B	From Leg	4.00	0.0000	146.00	1" Ice	1.08	0.36	0.01
			0.00			No Ice	1.21	0.45	0.02
			0.00			Ice	1.35	0.56	0.03
(4) LGP2140X	C	From Leg	4.00	0.0000	146.00	1" Ice	1.08	0.36	0.01
			0.00			No Ice	1.21	0.45	0.02
			0.00			Ice	1.35	0.56	0.03
RRUS 32 B2	A	From Leg	4.00	0.0000	146.00	1" Ice	2.73	1.67	0.05
			0.00			No Ice	2.95	1.86	0.07
			2.00			Ice	3.18	2.05	0.10
RRUS 32 B2	B	From Leg	4.00	0.0000	146.00	1" Ice	2.73	1.67	0.05
			0.00			No Ice	2.95	1.86	0.07
			2.00			Ice	3.18	2.05	0.10
RRUS 32 B2	C	From Leg	4.00	0.0000	146.00	1" Ice	2.73	1.67	0.05
			0.00			No Ice	2.95	1.86	0.07
			2.00			Ice	3.18	2.05	0.10
RRUS 32	A	From Leg	4.00	0.0000	146.00	1" Ice	2.86	1.78	0.06
			0.00			No Ice	3.08	1.97	0.08
			2.00			Ice	3.32	2.17	0.10
RRUS 32	B	From Leg	4.00	0.0000	146.00	1" Ice	2.86	1.78	0.06
			0.00			No Ice	3.08	1.97	0.08
			2.00			Ice	3.32	2.17	0.10
RRUS 32	C	From Leg	4.00	0.0000	146.00	1" Ice	2.86	1.78	0.06
			0.00			No Ice	3.08	1.97	0.08
			2.00			Ice	3.32	2.17	0.10
782 10254	A	From Leg	4.00	0.0000	146.00	1" Ice	0.14	0.08	0.00
			0.00			No Ice	0.19	0.12	0.00
			2.00			Ice	0.25	0.17	0.01
782 10254	B	From Leg	4.00	0.0000	146.00	1" Ice	0.14	0.08	0.00
			0.00			No Ice	0.19	0.12	0.00
			2.00			Ice	0.25	0.17	0.01
782 10254	C	From Leg	4.00	0.0000	146.00	1" Ice	0.14	0.08	0.00
			0.00			No Ice	0.19	0.12	0.00
			2.00			Ice	0.25	0.17	0.01
DC6-48-60-18-8F	A	From Leg	4.00	0.0000	146.00	1" Ice	0.92	0.92	0.03
			0.00			No Ice	1.46	1.46	0.05
			2.00			Ice	1.64	1.64	0.07
DC6-48-60-18-8F	C	From Leg	4.00	0.0000	146.00	No Ice	0.92	0.92	0.03



Description	Face or Leg	Offset Type	Offsets:			Azimuth Adjustment	Placement	C <sub>A</sub> A <sub>A</sub> Front	C <sub>A</sub> A <sub>A</sub> Side	Weight
			Horz	Lateral	Vert					
			ft	ft	ft	°	ft	ft <sup>2</sup>	ft <sup>2</sup>	K
			0.00				1/2"	1.46	1.46	0.05
			2.00				Ice	1.64	1.64	0.07
							1" Ice			
6' x 2" Mount Pipe	A	From Leg	4.00	0.0000	146.00		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
							1" Ice			
6' x 2" Mount Pipe	B	From Leg	4.00	0.0000	146.00		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
							1" Ice			
6' x 2" Mount Pipe	C	From Leg	4.00	0.0000	146.00		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
							1" Ice			
Platform Mount [LP 713-1]	C	None		0.0000	146.00		No Ice	31.27	31.27	1.51
							1/2"	39.68	39.68	1.93
							Ice	48.09	48.09	2.35
							1" Ice			
** 138 **										
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	A	From Leg	4.00	0.0000	138.00		No Ice	6.33	5.64	0.11
			0.00				1/2"	6.78	6.43	0.17
			2.00				Ice	7.21	7.13	0.23
							1" Ice			
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	B	From Leg	4.00	0.0000	138.00		No Ice	6.33	5.64	0.11
			0.00				1/2"	6.78	6.43	0.17
			2.00				Ice	7.21	7.13	0.23
							1" Ice			
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	C	From Leg	4.00	0.0000	138.00		No Ice	6.33	5.64	0.11
			0.00				1/2"	6.78	6.43	0.17
			2.00				Ice	7.21	7.13	0.23
							1" Ice			
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	A	From Leg	4.00	0.0000	138.00		No Ice	6.33	5.64	0.11
			0.00				1/2"	6.78	6.43	0.17
			2.00				Ice	7.21	7.13	0.23
							1" Ice			
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	B	From Leg	4.00	0.0000	138.00		No Ice	6.33	5.64	0.11
			0.00				1/2"	6.78	6.43	0.17
			2.00				Ice	7.21	7.13	0.23
							1" Ice			
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	C	From Leg	4.00	0.0000	138.00		No Ice	6.33	5.64	0.11
			0.00				1/2"	6.78	6.43	0.17
			2.00				Ice	7.21	7.13	0.23
							1" Ice			
LNx-6515DS-VTM w/ Mount Pipe	A	From Leg	4.00	0.0000	138.00		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
							1" Ice			
LNx-6515DS-VTM w/ Mount Pipe	B	From Leg	4.00	0.0000	138.00		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
							1" Ice			
LNx-6515DS-VTM w/ Mount Pipe	C	From Leg	4.00	0.0000	138.00		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
							1" Ice			
KRY 112 144/1	A	From Leg	4.00	0.0000	138.00		No Ice	0.35	0.16	0.01
			0.00				1/2"	0.43	0.22	0.01
			0.00				Ice	0.51	0.28	0.02
							1" Ice			
KRY 112 144/1	B	From Leg	4.00	0.0000	138.00		No Ice	0.35	0.16	0.01
			0.00				1/2"	0.43	0.22	0.01
			0.00				Ice	0.51	0.28	0.02
							1" Ice			
KRY 112 144/1	C	From Leg	4.00	0.0000	138.00		No Ice	0.35	0.16	0.01

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>A</sub> A <sub>A</sub> Front	C <sub>A</sub> A <sub>A</sub> Side	Weight	
			Horz	Lateral						Vert
			ft	ft	°	ft	ft <sup>2</sup>	ft <sup>2</sup>	K	
			0.00			1/2"	0.43	0.22	0.01	
			0.00			Ice	0.51	0.28	0.02	
						1" Ice				
RRUS 11 B12	A	From Leg	4.00		0.0000	138.00	No Ice	2.83	1.18	0.05
			0.00				1/2"	3.04	1.33	0.07
			2.00				Ice	3.26	1.48	0.10
							1" Ice			
RRUS 11 B12	B	From Leg	4.00		0.0000	138.00	No Ice	2.83	1.18	0.05
			0.00				1/2"	3.04	1.33	0.07
			2.00				Ice	3.26	1.48	0.10
							1" Ice			
RRUS 11 B12	C	From Leg	4.00		0.0000	138.00	No Ice	2.83	1.18	0.05
			0.00				1/2"	3.04	1.33	0.07
			2.00				Ice	3.26	1.48	0.10
							1" Ice			
6' x 2" Mount Pipe	A	From Leg	4.00		0.0000	138.00	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
							1" Ice			
6' x 2" Mount Pipe	B	From Leg	4.00		0.0000	138.00	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
							1" Ice			
6' x 2" Mount Pipe	C	From Leg	4.00		0.0000	138.00	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
							1" Ice			
Platform Mount [LP 713-1]	C	None			0.0000	138.00	No Ice	31.27	31.27	1.51
							1/2"	39.68	39.68	1.93
							Ice	48.09	48.09	2.35
							1" Ice			
** 128 **										
840 10054 w/ Mount Pipe	A	From Leg	2.00		0.0000	128.00	No Ice	4.81	2.39	0.05
			0.00				1/2"	5.16	2.92	0.09
			0.00				Ice	5.53	3.47	0.13
							1" Ice			
840 10054 w/ Mount Pipe	B	From Leg	2.00		0.0000	128.00	No Ice	4.81	2.39	0.05
			0.00				1/2"	5.16	2.92	0.09
			0.00				Ice	5.53	3.47	0.13
							1" Ice			
840 10054 w/ Mount Pipe	C	From Leg	2.00		0.0000	128.00	No Ice	4.81	2.39	0.05
			0.00				1/2"	5.16	2.92	0.09
			0.00				Ice	5.53	3.47	0.13
							1" Ice			
6' x 2" Mount Pipe	B	From Leg	2.00		0.0000	128.00	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
							1" Ice			
Side Arm Mount [SO 101-3]	C	None			0.0000	128.00	No Ice	7.50	7.50	0.25
							1/2"	8.90	8.90	0.33
							Ice	10.30	10.30	0.41
							1" Ice			
** 118 **										
*****										

**Dishes**

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft	Aperture Area ft <sup>2</sup>	Weight K
** 128 **										
VHLP800-11	B	Paraboloid w/o Radome	From Leg	1.00 0.00 0.00	-36.0000		128.00	2.92	No Ice 1/2" Ice 1" Ice	0.02 0.06 0.09
*****										

**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
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 Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	170.5 - 156	28.337	48	1.5155	0.0028
L2	156 - 155.5	23.753	48	1.4944	0.0028
L3	155.5 - 132.17	23.596	48	1.4941	0.0028
L4	135.837 - 86.5867	17.695	48	1.3318	0.0017
L5	91.42 - 42.5	7.455	48	0.8275	0.0006
L6	48.5 - 0	1.970	48	0.3807	0.0002

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

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
166.00	Lightning Rod 1/2"x4'	48	26.908	1.5072	0.0028	52717
155.00	(2) DB844G65ZAXY w/ Mount Pipe	48	23.440	1.4935	0.0028	14486
146.00	P65-16-XLH-RR w/ Mount Pipe	48	20.672	1.4429	0.0024	7719
138.00	ERICSSON AIR 21 B2A B4P w/ Mount Pipe	48	18.312	1.3573	0.0018	5553
128.00	VHLP800-11	48	15.553	1.2401	0.0013	5120

### Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	170.5 - 156	133.073	20	7.1308	0.0131
L2	156 - 155.5	111.567	20	7.0338	0.0131
L3	155.5 - 132.17	110.833	20	7.0323	0.0131
L4	135.837 - 86.5867	83.140	20	6.2666	0.0077
L5	91.42 - 42.5	35.042	20	3.8923	0.0028
L6	48.5 - 0	9.257	20	1.7899	0.0009

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

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
166.00	Lightning Rod 1/2"x4'	20	126.369	7.0928	0.0131	11794
155.00	(2) DB844G65ZAXY w/ Mount Pipe	20	110.100	7.0296	0.0131	3306
146.00	P65-16-XLH-RR w/ Mount Pipe	20	97.109	6.7911	0.0113	1724
138.00	ERICSSON AIR 21 B2A B4P w/ Mount Pipe	20	86.033	6.3871	0.0085	1223
128.00	VHLP800-11	20	73.084	5.8340	0.0056	1120

### Compression Checks

### Pole Design Data

Section No.	Elevation ft	Size	L ft	L <sub>u</sub> ft	Kl/r	A in <sup>2</sup>	P <sub>u</sub> K	φP <sub>n</sub> K	Ratio $\frac{P_u}{\phi P_n}$
L1	170.5 - 156 (1)	TP10.75x10.75x0.365	14.50	0.00	0.0	11.908 3	-1.05	375.11	0.003
L2	156 - 155.5 (2)	TP19.5x10.75x0.365	0.50	0.00	0.0	11.908 3	-1.07	375.11	0.003
L3	155.5 - 132.17 (3)	TP24.79x19.5x0.1875	23.33	0.00	0.0	14.146 8	-11.57	980.62	0.012
L4	132.17 - 86.5867 (4)	TP34.63x23.5836x0.375	49.25	0.00	0.0	39.481 7	-21.69	2933.29	0.007
L5	86.5867 - 42.5 (5)	TP43.75x32.7959x0.4375	48.92	0.00	0.0	58.279 2	-35.11	4329.85	0.008
L6	42.5 - 0 (6)	TP52.5x41.5315x0.5	48.50	0.00	0.0	69.678 9	-41.06	5176.79	0.008

### Pole Bending Design Data

Section No.	Elevation ft	Size	M <sub>ux</sub> kip-ft	φM <sub>rx</sub> kip-ft	Ratio $\frac{M_{ux}}{\phi M_{rx}}$	M <sub>uy</sub> kip-ft	φM <sub>ry</sub> kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ry}}$
L1	170.5 - 156 (1)	TP10.75x10.75x0.365	10.63	103.38	0.103	0.00	103.38	0.000
L2	156 - 155.5 (2)	TP19.5x10.75x0.365	10.63	103.38	0.103	0.00	103.38	0.000
L3	155.5 - 132.17 (3)	TP24.79x19.5x0.1875	247.04	479.32	0.515	0.00	479.32	0.000
L4	132.17 - 86.5867 (4)	TP34.63x23.5836x0.375	1158.10	1993.99	0.581	0.00	1993.99	0.000
L5	86.5867 - 42.5 (5)	TP43.75x32.7959x0.4375	2173.66	3727.27	0.583	0.00	3727.27	0.000
L6	42.5 - 0 (6)	TP52.5x41.5315x0.5	2496.84	4657.57	0.536	0.00	4657.57	0.000

### Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V <sub>u</sub> K	φV <sub>n</sub> K	Ratio $\frac{V_u}{\phi V_n}$	Actual T <sub>u</sub> kip-ft	φT <sub>n</sub> kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	170.5 - 156 (1)	TP10.75x10.75x0.365	1.14	187.56	0.006	0.00	157.00	0.000
L2	156 - 155.5 (2)	TP19.5x10.75x0.365	1.16	345.58	0.003	0.00	157.00	0.000
L3	155.5 - 132.17 (3)	TP24.79x19.5x0.1875	18.06	490.31	0.037	0.04	959.83	0.000
L4	132.17 - 86.5867 (4)	TP34.63x23.5836x0.375	22.21	1466.65	0.015	0.55	3992.86	0.000
L5	86.5867 - 42.5 (5)	TP43.75x32.7959x0.4375	24.99	2164.93	0.012	0.85	7463.65	0.000
L6	42.5 - 0 (6)	TP52.5x41.5315x0.5	25.91	2618.22	0.010	0.85	9326.50	0.000

### Pole Interaction Design Data

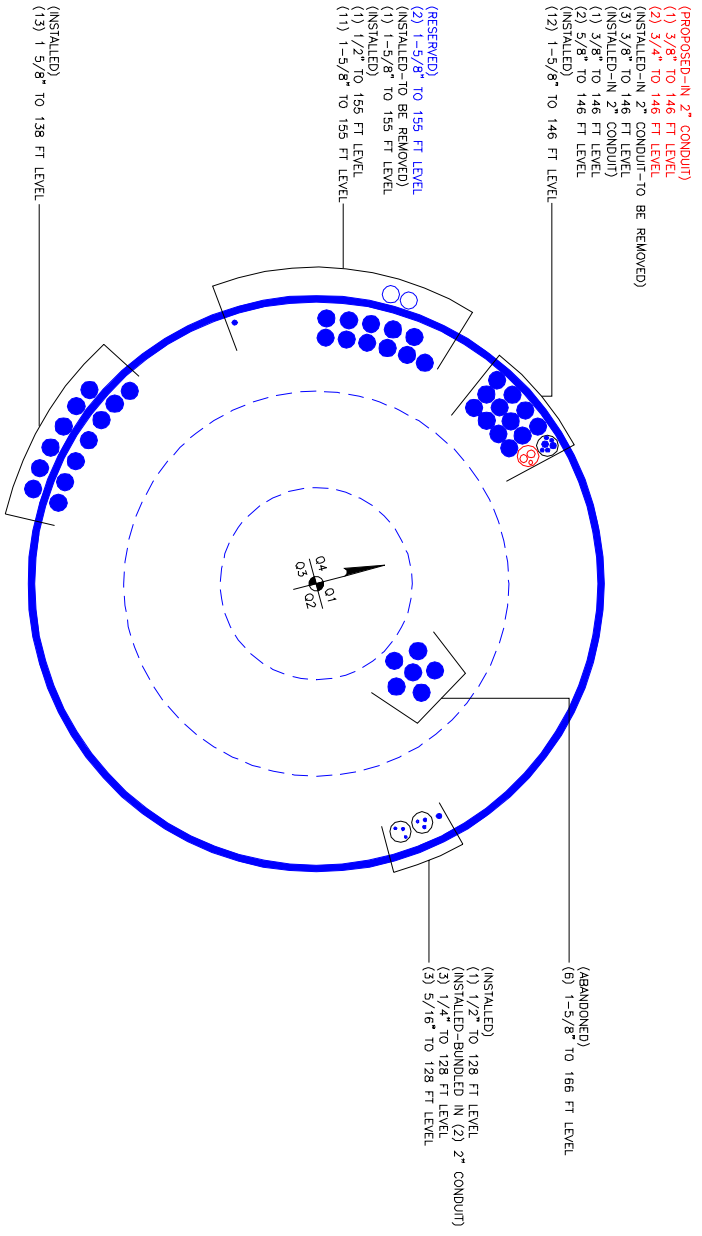
Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{rx}}$	Ratio $\frac{M_{uy}}{\phi M_{ry}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
-------------	-----------------	---------------------------------	---------------------------------------	---------------------------------------	---------------------------------	---------------------------------	--------------------------	---------------------------	----------

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	170.5 - 156 (1)	0.003	0.103	0.000	0.006	0.000	0.106 ✓	1.000	4.8.2 ✓
L2	156 - 155.5 (2)	0.003	0.103	0.000	0.003	0.000	0.106 ✓	1.000	4.8.2 ✓
L3	155.5 - 132.17 (3)	0.012	0.515	0.000	0.037	0.000	0.529 ✓	1.000	4.8.2 ✓
L4	132.17 - 86.5867 (4)	0.007	0.581	0.000	0.015	0.000	0.588 ✓	1.000	4.8.2 ✓
L5	86.5867 - 42.5 (5)	0.008	0.583	0.000	0.012	0.000	0.591 ✓	1.000	4.8.2 ✓
L6	42.5 - 0 (6)	0.008	0.536	0.000	0.010	0.000	0.544 ✓	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	170.5 - 156	Pole	TP10.75x10.75x0.365	1	-1.05	375.11	10.6	Pass
L2	156 - 155.5	Pole	TP19.5x10.75x0.365	2	-1.07	375.11	10.6	Pass
L3	155.5 - 132.17	Pole	TP24.79x19.5x0.1875	3	-11.57	980.62	52.9	Pass
L4	132.17 - 86.5867	Pole	TP34.63x23.5836x0.375	4	-21.69	2933.29	58.8	Pass
L5	86.5867 - 42.5	Pole	TP43.75x32.7959x0.4375	5	-35.11	4329.85	59.1	Pass
L6	42.5 - 0	Pole	TP52.5x41.5315x0.5	6	-41.06	5176.79	54.4	Pass
Summary								
Pole (L5)							59.1	Pass
<b>RATING =</b>							<b>59.1</b>	<b>Pass</b>

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



BUSINESS UNIT: 806395 TOWER ID: C-BASELEVEL

CROWN REGION ADDRESS  
 USA

15/04/11	APPLICATION ADDED PER WORK ORDER # 402471	PLW
15/07/11	UPDATED PER WORK ORDER # 417524	ATF
29/11/11	AS-BUILT INFORMATION ADDED PER WORK ORDER # 446790	MOB
14/05/12	AS-BUILT INFORMATION ADDED PER WORK ORDER # 480932	KAH
15/06/12	AS-BUILT INFORMATION ADDED PER WORK ORDER # 501440	MG
18/06/12	AS-BUILT INFORMATION ADDED PER WORK ORDER # 503953	BRM
25/10/12	APPLICATION ADDED PER WORK ORDER # 546209	MOB
11/10/13	UPDATED PER WORK ORDER # 659641	BMH
22/08/16	UPDATED PER WORK ORDER #1288475	ASF

DRAWN BY: SAC  
 CHECKED BY:  
 DRAWING DATE: 21/07/05

SITE NUMBER:

SITE NAME:

SITE NAME:

BUSINESS UNIT NUMBER:

BUSINESS UNIT NUMBER:

SITE ADDRESS:

28 WOODHOUSE ROAD  
 FAIRFIELD COUNTY  
 USA

SHEET TITLE:

BASE LEVEL

SHEET NUMBER:



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

## Stiffened or Unstiffened, Exterior Flange Plate - Any Bolt Material TIA Rev G

### Site Data

BU#: 806355  
 Site Name: BRG 126 943086  
 App #: 353118 Rev 3

### Reactions

Mu	10.63	ft-kips
Axial, Pu:	1.05	kips
Shear, Vu:	1.14	kips
Elevation:	156	feet

### Bolt Threads:

X-Excluded
$\phi V_n = \phi(0.55 A_b F_u)$
$\phi = 0.75, \phi V_n$ (kips):
38.88

Pole Manufacturer: Other

If No stiffeners, Criteria: TIA G

<-Only Applicable to Unstiffened Cases

### Bolt Data

Qty:	15	
Diameter (in.):	1	Bolt Fu: 120
Bolt Material:	A325	Bolt Fy: 92
N/A:	100	<-- Disregard
N/A:	75	<-- Disregard
Circle (in.):	25.75	

### Flange Bolt Results

Bolt Tension Capacity,  $\phi T_n, B1$ : 54.54 kips  
 Adjusted  $\phi T_n$  (due to  $V_u = V_u / Q_t$ ), **B**: 54.54 kips  
 Max Bolt directly applied Tu: 1.25 Kips  
 Min. PL "tc" for **B** cap. **w/o** Pry: 3.168 in  
 Min PL "treq" for actual **T w/** Pry: 0.388 in  
 Min PL "t1" for actual **T w/o** Pry: 0.480 in  
 T allowable with Prying: 8.30 kips  
 Prying Force, q: 0.00 kips  
 Total Bolt Tension = Tu + q: 1.25 kips  
 Prying Bolt Stress Ratio = (Tu + q) / (B): 2.3% **Pass**

### Non-Rigid

$\phi T_n$
$\phi T_n [(1 - (V_u / \phi V_n)^2)^{0.5}]$

$\alpha' > 1$  case

### Plate Data

Diam:	28.5	in
Thick, t:	1	in
Grade (Fy):	60	ksi
Strength, Fu:	75	ksi
Single-Rod B-eff:	2.25	in

### Exterior Flange Plate Results

Flexural Check  
 Compression Side Plate Stress: 5.6 ksi  
 Allowable Plate Stress: 54.0 ksi  
 Compression Plate Stress Ratio: 10.4% **Pass**  
**No Prying**  
 Tension Side Stress Ratio, (treq/t)<sup>2</sup>: 15.1% **Pass**

### Non-Rigid

TIA G
$\phi F_y$
Comp. Y.L. Length: 23.40

### Stiffener Data (Welding at Both Sides)

Config:	0	*
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

n/a

### Stiffener Results

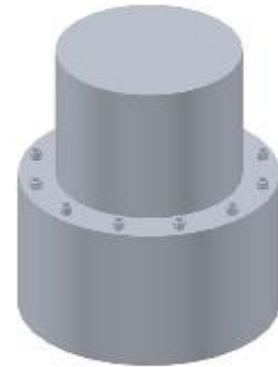
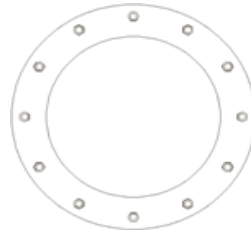
Horizontal Weld : n/a  
 Vertical Weld: n/a  
 Plate Flex+Shear,  $f_b / F_b + (f_v / F_v)^2$ : n/a  
 Plate Tension+Shear,  $f_t / F_t + (f_v / F_v)^2$ : n/a  
 Plate Comp. (AISC Bracket): n/a

### Pole Results

Pole Punching Shear Check: n/a

### Pole Data

Diam:	10.75	in
Thick:	0.365	in
Grade:	35	ksi
# of Sides:	0	"0" IF Round
Fu	60	ksi
Reinf. Fillet Weld	0	"0" if None



\* 0 = none, 1 = every bolt, 2 = every 2 bolts, 3 = 2 per bolt

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

## Stiffened or Unstiffened, Exterior Flange Plate - Any Bolt Material TIA Rev G

Site Data	
BU#:	806355
Site Name:	BRG 126 943086
App #:	353118 Rev 3

Pole Manufacturer:	Other
--------------------	-------

Bolt Data			
Qty:	15		
Diameter (in.):	1	Bolt Fu:	120
Bolt Material:	A325	Bolt Fy:	92
N/A:	100	<-- Disregard	
N/A:	75	<-- Disregard	
Circle (in.):	25.75		

Plate Data		
Diam:	28.5	in
Thick, t:	1.5	in
Grade (Fy):	60	ksi
Strength, Fu:	75	ksi
Single-Rod B-eff:	2.25	in

Stiffener Data (Welding at Both Sides)		
Config:	0	*
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:	10.75	in
Thick:	0.365	in
Grade:	35	ksi
# of Sides:	0	"0" IF Round
Fu	60	ksi
Reinf. Fillet Weld	0	"0" if None

Reactions		
Mu	10.63	ft-kips
Axial, Pu:	1.05	kips
Shear, Vu:	1.14	kips
Elevation:	156	feet

Bolt Threads:
X-Excluded
$\phi V_n = \phi(0.55 \cdot A_b \cdot F_u)$
$\phi = 0.75, \phi \cdot V_n$ (kips):
38.88

If No stiffeners, Criteria: **TIA G** <-Only Applicable to Unstiffened Cases

Flange Bolt Results	
Bolt Tension Capacity, $\phi \cdot T_n, B1$ :	54.54 kips
Adjusted $\phi \cdot T_n$ (due to $V_u = V_u / Q_t$ ), <b>B</b> :	54.54 kips
Max Bolt directly applied Tu:	1.25 Kips
Min. PL "tc" for <b>B cap. w/o Pry</b> :	3.168 in
Min PL "treq" for actual <b>T w/ Pry</b> :	0.388 in
Min PL "t1" for actual <b>T w/o Pry</b> :	0.480 in
T allowable with Prying:	18.68 kips
Prying Force, q:	0.00 kips
Total Bolt Tension = Tu + q:	1.25 kips
Prying Bolt Stress Ratio = (Tu + q) / (B):	2.3% <b>Pass</b>

Exterior Flange Plate Results	
Compression Side Plate Stress:	2.5 ksi
Allowable Plate Stress:	54.0 ksi
Compression Plate Stress Ratio:	4.6% <b>Pass</b>
<b>No Prying</b>	
Tension Side Stress Ratio, $(t_{req}/t)^2$ :	6.7% <b>Pass</b>

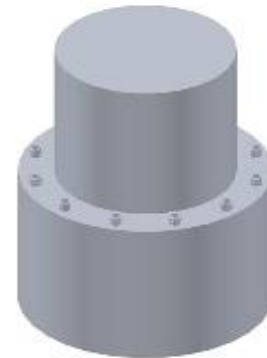
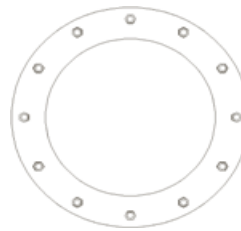
Stiffener Results	
Horizontal Weld :	n/a
Vertical Weld:	n/a
Plate Flex+Shear, $f_b/F_b + (f_v/F_v)^2$ :	n/a
Plate Tension+Shear, $f_t/F_t + (f_v/F_v)^2$ :	n/a
Plate Comp. (AISC Bracket):	n/a

Pole Results	
Pole Punching Shear Check:	n/a

Non-Rigid
$\phi \cdot T_n$
$\phi T_n [(1 - (V_u / \phi V_n)^2)^{0.5}]$

$\alpha > 1$  case

Non-Rigid
TIA G
$\phi \cdot F_y$
Comp. Y.L. Length:
23.40



\* 0 = none, 1 = every bolt, 2 = every 2 bolts, 3 = 2 per bolt

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

## Stiffened or Unstiffened, UngROUTED, Circular Base Plate - Any Rod Material

**TIA Rev G** Assumption: Clear space between bottom of leveling nut and top of concrete **not** exceeding (1)\*(Rod Diameter)

### Site Data

BU#: 806355
Site Name: BRG 126 943086
App #: 353118 Rev 3
Pole Manufacturer: <i>Other</i>

### Anchor Rod Data

Qty:	20	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	61	in

### Plate Data

Diam:	67	in
Thick:	2.25	in
Grade:	60	ksi
Single-Rod B-eff:	8.33	in

### Stiffener Data (Welding at both sides)

Config:	0	*
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:	52.5	in
Thick:	0.5	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

### Reactions

Mu:	3450	ft-kips
Axial, Pu:	55	kips
Shear, Vu:	27	kips
Eta Factor, η	0.5	TIA G (Fig. 4-4)

If No stiffeners, Criteria: **AISC LRFD** <-Only Applicable to Unstiffened Cases

### Anchor Rod Results

Max Rod (Cu+ Vu/η): 141.2 Kips  
 Allowable Axial,  $\Phi^*Fu^*Anet$ : 260.0 Kips  
 Anchor Rod Stress Ratio: 54.3% **Pass**

Rigid
AISC LRFD
$\phi^*Tn$

### Base Plate Results

Base Plate Stress: 33.5 ksi  
 Allowable Plate Stress: 54.0 ksi  
 Base Plate Stress Ratio: 62.0% **Pass**

Flexural Check

Rigid
AISC LRFD
$\phi^*Fy$
Y.L. Length: 31.06

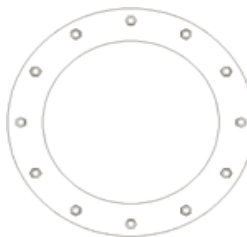
**n/a**

### Stiffener Results

Horizontal Weld : n/a  
 Vertical Weld: n/a  
 Plate Flex+Shear,  $fb/Fb+(fv/Fv)^2$ : n/a  
 Plate Tension+Shear,  $ft/Ft+(fv/Fv)^2$ : n/a  
 Plate Comp. (AISC Bracket): n/a

### Pole Results

Pole Punching Shear Check: n/a



\* 0 = none, 1 = every bolt, 2 = every 2 bolts, 3 = 2 per bolt

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

**(Bearing and Stability Checks) Tool for TIA Rev F or G - Application (MP, SST with unitbase)**

**Site Data**

BU#: 806355
Site Name: BRG 126 943086
App #: 353118 Rev.3

Loads Already Factored		
For P (DL)	1.2	<----Disregard
For P,V, and M (WL)	1.35	<----Disregard

Pad & Pier Data		
Base PL Dist. Above Pier:	0	in
Pier Dist. Above Grade:	12	in
Pad Bearing Depth, D:	9	ft
Pad Thickness, T:	3	ft
Pad Width=Length, L:	22	ft
Pier Cross Section Shape:	Square	<--Pull Down
Enter Pier Side Width:	7	ft
Concrete Density:	150.0	pcf
Pier Cross Section Area:	49.00	ft^2
Pier Height:	7.00	ft
Soil (above pad) Height:	6.00	ft

Soil Parameters		
Unit Weight, $\gamma$ :	125.0	pcf
Ultimate Bearing Capacity, $q_n$ :	24.00	ksf
Strength Reduct. factor, $\phi$ :	0.75	
Angle of Friction, $\Phi$ :	36.0	degrees
Undrained Shear Strength, $C_u$ :	0.00	ksf
Allowable Bearing: $\phi * q_n$ :	18.00	ksf
Passive Pres. Coeff., $K_p$ :	3.85	

Forces/Moments due to Wind and Lateral Soil		
Minimum of ( $\phi * \text{Ultimate Pad Passive Force, } V_u$ ):	27.0	kips
Pad Force Location Above D:	1.40	ft
$\phi$ (Passive Pressure Moment):	37.80	ft-kips
Factored O.T. M(WL), "1.6W":	3720.0	ft-kips
Factored OT (MW-Msoil), M1	3682.20	ft-kips

Resistance due to Foundation Gravity		
Soil Wedge Projection grade, a:	4.36	ft
Sum of Soil Wedges Wt:	75.83	kips
Soil Wedges ecc, K1:	10.03	ft
Ftg+Soil above Pad wt:	595.5	kips
Unfactored (Total ftg-soil Wt):	671.33	kips
1.2D. <b>No Soil Wedges.</b>	769.60	kips
0.9D. <b>With Soil Wedges</b>	645.45	kips

Resistance due to Cohesion (Vertical)		
$\phi * (1/2 * C_u)$ (Total Vert. Planes)	0.00	kips
Cohesion Force Eccentricity, K2	0.00	ft

Monopole Base Reaction Forces		
TIA Revision:	G	<--Pull Down
Factored DL Axial, PDU:	55	kips
Factored WL Axial, PWu:	0	kips
Factored WL Shear, Vu:	27	kips
Factored WL Moment, Mu:	3450	ft-kips

Load Factor	Shaft Factored Loads		
1.00	1.2D+1.6W, Pu:	55	kips
0.90	0.9D+1.6W, Pu:	41.25	kips
1.00	Vu:	27	kips
	Mu:	3450	ft-kips

**1.2D+1.6W Load Combination, Bearing Results:**

<b>(No Soil Wedges)</b> [Reaction+Conc+Soil]	769.60	P1="1.2D+1.6W" (Kips)
Factored "1.6W" Overturning Moment (MW-Msoil), M1	3682.20	ft-kips

Orthogonal Direction:

$ecc1 = M1/P1 = 4.78 \text{ ft}$   
 $Orthogonal qu = 2.97 \text{ ksf}$   
 $qu/\phi * q_n \text{ Ratio} = 16.52\% \text{ Pass}$

Diagonal Direction:

$ecc2 = (0.707M1)/P1 = 3.38 \text{ ft}$   
 $Diagonal qu = 3.32 \text{ ksf}$   
 $qu/\phi * q_n \text{ Ratio} = 18.42\% \text{ Pass}$

<-- Press Upon Completing All Input

**Overturning Stability Check**

**0.9D+1.6W Load Combination, Bearing Results:**

<b>(w/ Soil Wedges)</b> [Reaction+Conc+Soil]	645.45	P2="0.9D+1.6W" (Kips)
Factored "1.6W" Overturning Moment (MW-Msoil) - 0.9(M of Wedge + M of Cohesion), M2	2997.37	ft-kips

$Orthogonal ecc3 = M2/P2 = 4.64 \text{ ft}$   
 $Ortho Non Bearing Length, NBL = 9.29 \text{ ft}$   
 $Orthogonal qu = 2.46 \text{ ksf}$   
 $Diagonal qu = 2.71 \text{ ksf}$

Max Reaction Moment (ft-kips) so that  $qu = \phi * q_n = 100\%$  Capacity Rating

Actual M:	3450.00		
M Orthogonal:	7205.90	47.88%	Pass
M Diagonal:	7205.90	47.88%	Pass

Project Name: BRG 126 943086  
 Project Number: 806355  
 Job Number: 1323614  
 Date: 11/9/2016



Created On: 6/3/2014  
 Checked By: DW  
 Revised On: 3/4/2015  
 Revision No.: 1.6

### Monopole Pad & Pier Foundation

#### Foundation Parameters

Load	
Code	G
Axial	55 kips
Shear	27 kips
Moment	3450 k-ft
Soil Unit Weight	125 pcf
Friction Angle	36
Cohesion	0 psf

Material	
Concrete Strength (F'c)	4000 psi
Concrete Density	150 pcf
Rebar Tensile (Fy)	60 ksi
Clear Cover	3 in

Pad	
Thickness	3 ft
Bearing Depth	9 ft
Width	22 ft
Rebar Size	8
Rebar Quantity	36

Pier	
Pier type	Circle
Diameter	7 ft
Height above Grade	1 ft
Rebar Size	8
Rebar Quantity	46
Tie Size	4
Tie C/C Spacing	12 in

#### Structural Checks

Pad Beam Shear Capacity	788.9	kips
Pad Beam Shear	348.8	kips
Pad Beam Shear Check	44.2%	Pass

Pad Bending Moment Capacity	3909.7	k-ft
Pad Bending Moment	1539.3	k-ft
Pad Bending Moment Check	39.4%	Pass

Punching Shear Capacity	2168.7	kips
Punching Shear	310.0	kips
Punching Shear Check	14.3%	Pass

Pad-Pier Bearing Capacity	24494.6	kips
Pad-Pier Bearing	765.8	kips
Pad-Pier Bearing Check	3.1%	Pass

Pier Beam Shear Capacity	510.4	kips
Pier Beam Shear	27.0	kips
Pier Beam Shear Check	5.3%	Pass

Pier Bending Moment Capacity	5920.8	k-ft
Pier Bending Moment	3582.5	k-ft
Pier Bending Moment Check	60.5%	Pass