Date: **October 4, 2016**

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Subject: Structural Analysis Report

Carrier Designation:	***AT&T Mobility* Co-Locate**	
	Carrier Site Number:	CTL02154
	Carrier Site Name:	Wallingford
Crown Castle Designation:	**Crown Castle BU Number:**	876310
	Crown Castle Site Name:	Beaumont Farm
	Crown Castle JDE Job Number:	384292
	Crown Castle Work Order Number:	1307436
	Crown Castle Application Number:	345702 Rev. 5
Engineering Firm Designation:	**TEP Project Number:**	72875.98195
Site Data:	**945 East Center St., Wallingford, New Haven County, CT 06492** **Latitude *41° 26' 37.36"*, Longitude *-72° 47' 46.56"*** **147 Foot - Monopole Tower**	

Dear Charles McGuirt,

Tower Engineering Professionals 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 953632, in accordance with application 345702, revision 5.

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:

LC5: Existing + Proposed Equipment **Sufficient Capacity**
Note: See Table I and Table II for the proposed and existing loading, respectively.

This analysis has been performed in accordance with the 2016 Connecticut State Building Code (2012 International 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 1609.3.1 and Appendix N as required for use in the TIA-222-G Standard per Exception #5 of Section 1609.1.1. Exposure Category C and Risk Category II were used in this analysis.

All modifications and equipment proposed in this report shall be installed in accordance with the appurtenances listed in Tables 1 and 2 and the attached drawing for the determined available structural capacity to be effective.

We at *Tower Engineering Professionals* 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: Steven C. Williams, E.I. / TSA

Respectfully submitted by:

Graham M. Andres, P.E.

STATE OF CONNECTICUT GRAHAM M. ANDRES 29538 LICENSED PROFESSIONAL ENGINEER

10/4/16

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1) INTRODUCTION

This tower is a 147-ft monopole tower designed by Paul J. Ford and Company in June of 1998. The tower was originally designed for a height of 133-ft with a wind speed of 90 mph per TIA/EIA-222-F for the appurtenances listed in Table 3. The tower was previously extended 14-ft, bringing the overall tower height to 147-ft per reinforcement drawings by URS Greiner Woodward Clyde AES in December of 1999. TEP did not visit the site. All information provided to TEP was assumed to be accurate and complete.

2) ANALYSIS CRITERIA

The analysis has been performed in accordance with the ANSI/TIA-222-G-2-2009 Structural Standard for Antenna Supporting Structures and Antennas – Addendum 2 using a nominal 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 with the following design criteria:

Type of Analysis: **Rigorous Structural Analysis**
Classification of Structure: **Class II**
Exposure Category: **Exposure C**
Topographic Category: **Category 1**
Earthquake Category: **Not Considered**
Earthquake effects may be ignored per this standard for site locations where Ss does not exceed 1.0. (New Haven County Max Ss = 0.32).

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
111.0	112.0	3	CCI Antennas	TPA-65R-LCUUUU-H6 w/ Mount Pipe	-	-	-
		3	CCI Antennas	DTMABP7819VG12A			
		3	Ericsson	RRUS12/RRUS A2			

Table 2 - Existing 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
130.0	132.0	1	Andrew	VHLP1-23	6 3 3 1	5/16 1-1/4 1/2 7/8	1
		1	Andrew	VHLP2-23			
		1	Andrew	VHLP2.5-23			
	130.0	3	RFS Celwave	APXVTM14-C-120			
		1	RFS Celwave	APXV9ERR18-C-A20			
		1	RFS Celwave	APXVSPP18-C-A20			
		6	RFS Celwave	ACU-A20-N			
		3	Alcatel Lucent	TD-RRH8x20-25			
		2	Alcatel Lucent	800 External Notch Filter			
		2	Alcatel Lucent	800MHZ RRH			
		2	Alcatel Lucent	1900MHz RRH (65MHz)			
		1	Tower Mounts	Miscellaneous [NA 510-3]			
		1	Tower Mounts	Platform Mount [LP 1201-1]			
	128.0	3	Argus Technologies	LLPX310R			
		3	Samsung Telecommunications	FDD_R6_RRH			
	127.0	1	RFS Celwave	APXVSPP18-C-A20			
		3	RFS Celwave	ACU-A20-N			
		1	Alcatel Lucent	800 External Notch Filter			
		1	Alcatel Lucent	800MHZ RRH			
		1	Alcatel Lucent	1900MHz RRH (65MHz)			
121.0	121.0	4	Antel	LPA-80080-6CF-EDIN w/ Mount Pipe	12 1	1-5/8 1-1/4	1
		3	Commscope	HBX-6516DS-VTM w/ Mount Pipe			
		3	Antel	BXA-171063/12CF w/ Mount Pipe			
		2	Antel	BXA-70063/6CFx2 w/ Mount Pipe			
		1	Antel	BXA-70063/6CFx4 w/ Mount Pipe			
		2	Antel	LPA-80063/6CF w/ Mount Pipe			
		6	RFS Celwave	FD9R6004/2C-3L			
		1	RFS Celwave	DB-T1-6Z-8AB-0Z			
		3	Alcatel Lucent	RRH2X40-AWS			
		1	Tower Mounts	Platform Mount [LP 1201-1]			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
111.0	112.0	3	Powerwave Technologies	7770.00 w/ Mount Pipe	6	1-1/4	2
		3	KMW Communications	AM-X-CD-16-65-00T-RET w/ Mount Pipe			
		12	Kathrein	860 10025			
		6	Powerwave Technologies	LGP21401			
		6	Powerwave Technologies	LGP21901			
		3	Ericsson	RRUS-11			
		3	Powerwave Technologies	7770.00 w/ Mount Pipe	6 2 1	1-1/4 3/4 3/8	1
		3	Ericsson	RRUS-11			
		1	Raycap	DC6-48-60-18-8F			
	111.0	1	Tower Mounts	Platform Mount [LP 1201-1]			
70.0	70.0	1	Kathrein	OG-860/1920/GPS-A	1	1/2	1
		1	Tower Mounts	Side Arm Mount [SO 701-1]			

Notes:
1) Existing equipment
2) Existing 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)
130.0	130.0	12	Decibel	DB980H	-	-
110.0	110.0	12	Generic	3.9 sq.ft. Panel Antenna	-	-
95.0	95.0	12	Generic	3.9 sq.ft. Panel Antenna	-	-
70.0	70.0	1	Generic	GPS Antenna	-	-

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
Geotechnical Report	Dr. Clarence Welti, P.E., P.C.	1531484	CCISites
Tower Foundation Drawings	Paul J. Ford and Company	1855118	CCISites
Tower Manufacturer Drawings	Paul J. Ford and Company	1855980	CCISites
Tower Reinforcement Drawings	URS Greiner Woodward Clyde	2015154	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) The tower and foundation were built in accordance with the manufacturer's specifications.
2) The tower and foundation 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 "Appendix B – Base Level Drawing".
4) All tower components are in sufficient condition to carry their full design capacity.
5) Serviceability with respect to antenna twist, tilt, roll, or lateral translation, is not checked and is left to the carrier or tower owner to ensure conformance.
6) All antenna mounts and mounting hardware are structurally sufficient to carry the full design capacity requirements of appurtenance wind area and weight as provided by the original manufacturer specifications. It is the carrier's responsibility to ensure compliance to the structural limitations of the existing and/or proposed antenna mounts. TEP did not perform a site visit to verify the size, condition or capacity of the antenna mounts and did not analyze antennas supporting mounts as part of this structural analysis report.

This analysis may be affected if any assumptions are not valid or have been made in error. Tower Engineering Professionals 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 (lb)	ΦP_{allow} (lb)	% Capacity	Pass / Fail
L1	147 - 133	Pole	TP12.75x12.75x0.5	1	-1037.24	606131.00	2.5	Pass
L2	133 - 85.5	Pole	TP29.418x19.537x0.313	2	-16189.70	2074020.00	59.4	Pass
L3	85.5 - 42.75	Pole	TP37.687x27.477x0.375	3	-25363.60	3116790.00	77.5	Pass
L4	42.75 - 0	Pole	TP45.83x35.894x0.438	4	-40086.50	4432580.00	79.7	Pass
							Summary	
						Pole (L4)	79.7	Pass
						Rating =	**79.7**	**Pass**

Table 6 - Tower Component Stresses vs. Capacity

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Flange Connection	133.0	5.1	Pass
1	Anchor Rods	-	71.4	Pass
1	Base Plate	-	74.5	Pass
1	Base Foundation Soil Interaction	-	78.0	Pass
1	Base Foundation Structural	-	23.9	Pass

Structure Rating (max from all components) =	**79.7%**

Note:
1) See additional documentation in "Appendix C - Additional Calculations" for calculations supporting the % capacity listed.

4.1) Recommendations

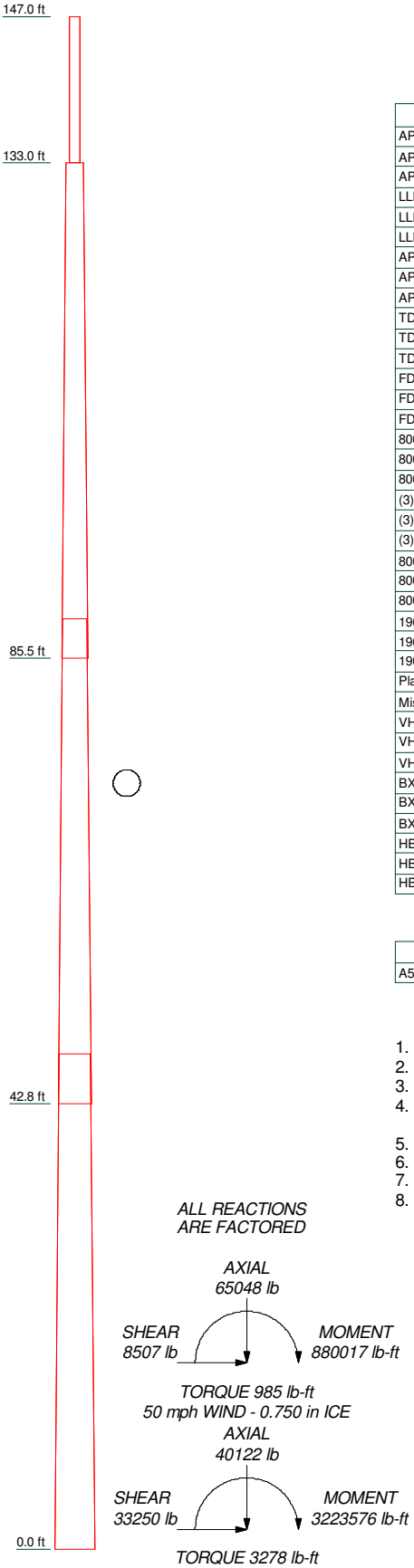
1) If the load differs from that described in Tables 1 and 2 of this report, “Appendix B – Base Level Drawing” or the provisions of this analysis are found to be invalid, another structural analysis should be performed.
2) The tower and its foundation have sufficient capacity to carry the proposed load configuration. No modifications are required at this time.

APPENDIX A

TNXTOWER OUTPUT

Section	1	2	3	4
Length (ft)	14.00	47.50	46.50	47.50
Number of Sides	1	12	12	12
Thickness (in)	0.500	0.313	0.375	0.438
Socket Length (ft)		3.75	4.75	
Top Dia (in)	12.750	19.537	27.477	35.894
Bot Dia (in)	12.750	29.418	37.687	45.830
Grade	A53-B-35		A607-65	
Weight (lb)	916.7	3930.3	6153.6	9204.7

Total Weight (lb): 20205.2



ALL REACTIONS ARE FACTORED

AXIAL 65048 lb

SHEAR 8507 lb *MOMENT 880017 lb-ft*

TORQUE 985 lb-ft
50 mph WIND - 0.750 in ICE

AXIAL 40122 lb

SHEAR 33250 lb *MOMENT 3223576 lb-ft*

TORQUE 3278 lb-ft
REACTIONS - 97 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
APXVTM14-C-120	130	BXA-171063/12CF w/ Mount Pipe	121
APXVTM14-C-120	130	BXA-171063/12CF w/ Mount Pipe	121
APXVTM14-C-120	130	BXA-171063/12CF w/ Mount Pipe	121
LLPX310R	130	(2) FD9R6004/2C-3L	121
LLPX310R	130	(2) FD9R6004/2C-3L	121
LLPX310R	130	(2) FD9R6004/2C-3L	121
APXV9ERR18-C-A20	130	DB-T1-6Z-8AB-0Z	121
APXVSPP18-C-A20	130	Platform Mount [LP 1201-1]	121
APXVSPP18-C-A20	130	RRH2X40-AWS	121
TD-RRH8x20-25	130	RRH2X40-AWS	121
TD-RRH8x20-25	130	RRH2X40-AWS	121
TD-RRH8x20-25	130	(2) LPA-80080-6CF-EDIN w/ Mount Pipe	121
FDD_R6_RRH	130		
FDD_R6_RRH	130	(2) LPA-80080-6CF-EDIN w/ Mount Pipe	121
FDD_R6_RRH	130		
800 EXTERNAL NOTCH FILTER	130	(2) LPA-80063/6CF w/ Mount Pipe	121
800 EXTERNAL NOTCH FILTER	130	RRUS-11	111
800 EXTERNAL NOTCH FILTER	130	RRUS-11	111
(3) ACU-A20-N	130	RRUS-11	111
(3) ACU-A20-N	130	DC6-48-60-18-8F	111
(3) ACU-A20-N	130	TPA-65R-LCUUUU-H6 w/ Mount Pipe	111
800MHZ RRH	130	TPA-65R-LCUUUU-H6 w/ Mount Pipe	111
800MHZ RRH	130	TPA-65R-LCUUUU-H6 w/ Mount Pipe	111
800MHZ RRH	130	DTMABP7819VG12A	111
1900MHz RRH (65MHz)	130	DTMABP7819VG12A	111
1900MHz RRH (65MHz)	130	DTMABP7819VG12A	111
1900MHz RRH (65MHz)	130	RRUS12/RRUS A2	111
Platform Mount [LP 1201-1]	130	RRUS12/RRUS A2	111
Miscellaneous [NA 510-3]	130	RRUS12/RRUS A2	111
VHLP1-23	130	2.4" Dia. x 6' Mount Pipe	111
VHLP2-23	130	2.4" Dia. x 6' Mount Pipe	111
VHLP2.5-23	130	2.4" Dia. x 6' Mount Pipe	111
BXA-70063/6CFx2 w/ Mount Pipe	121	Platform Mount [LP 1201-1]	111
BXA-70063/6CFx2 w/ Mount Pipe	121	7770.00 w/ Mount Pipe	111
BXA-70063/6CFx4 w/ Mount Pipe	121	7770.00 w/ Mount Pipe	111
HBX-6516DS-VTM w/ Mount Pipe	121	7770.00 w/ Mount Pipe	111
HBX-6516DS-VTM w/ Mount Pipe	121	Side Arm Mount [SO 701-1]	70
HBX-6516DS-VTM w/ Mount Pipe	121	OG-860/1920/GPS-A	70

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A53-B-35	35 ksi	60 ksi	A607-65	65 ksi	80 ksi

TOWER DESIGN NOTES

1. Tower is located in New Haven County, Connecticut.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 97 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 50 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Structure Class II.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. TOWER RATING: 79.7%

Tower Engineering Professionals

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Job:	***Beaumont Farm (BU 876310)***		
Project:	***TEP No. 72875.98195***		
Client: Crown Castle	Drawn by: TSA	App'd:	
Code: TIA-222-G	Date: 10/04/16	Scale: NTS	
Path: C:\Users\tsachan\Desktop\In Progress\72875\58710_98195_876310 - BEAUMONT FARM SA\tnxTower\876310_LC5.eri		Dwg No. E-1	

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Tower Input Data

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

Tower is located in New Haven County, Connecticut.
Basic wind speed of 97 mph.
Structure Class II.
Exposure Category C.
Topographic Category 1.
Crest Height 0.00 ft.
Nominal ice thickness of 0.750 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 50 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 60 mph.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

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

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	147.00-133.00	14.00	0.000	Round	12.750	12.750	0.500		A53-B-35 (35 ksi)
L2	133.00-85.50	47.50	3.750	12	19.537	29.418	0.313	1.250	A607-65 (65 ksi)

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
L3	85.50-42.75	46.50	4.750	12	27.477	37.687	0.375	1.500	A607-65 (65 ksi)
L4	42.75-0.00	47.50		12	35.894	45.830	0.438	1.750	A607-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	12.750	19.242	361.544	4.335	6.375	56.713	723.088	9.615	0.000	0
	12.750	19.242	361.544	4.335	6.375	56.713	723.088	9.615	0.000	0
L2	20.226	19.345	912.551	6.882	10.120	90.172	1849.075	9.521	4.398	14.075
	30.456	29.287	3166.774	10.420	15.239	207.814	6416.742	14.414	7.047	22.549
L3	29.299	32.726	3068.189	9.703	14.233	215.567	6216.983	16.107	6.359	16.957
	39.016	45.054	8006.057	13.358	19.522	410.107	16222.442	22.174	9.095	24.254
L4	38.189	49.949	8015.109	12.693	18.593	431.079	16240.785	24.584	8.447	19.308
	47.447	63.947	16817.916	16.251	23.740	708.423	34077.658	31.473	11.110	25.394

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
L1 147.00-133.00				1	1	1			
L2 133.00-85.50				1	1	1			
L3 85.50-42.75				1	1	1			
L4 42.75-0.00				1	1	1			

Feed Line/Linear Appurtenances - Entered As Round Or Flat

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

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
130								
7983A(1/2")	C	No	Inside Pole	130.00 - 0.00	3	No Ice	0.00	0.084
						1/2" Ice	0.00	0.084
						1" Ice	0.00	0.084
9207(5/16")	C	No	Inside Pole	130.00 - 0.00	6	No Ice	0.00	0.600
						1/2" Ice	0.00	0.600
						1" Ice	0.00	0.600

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
HB114-08U3M12-xxxF(7/8")	C	No	Inside Pole	130.00 - 0.00	1	No Ice	0.00	0.683
						1/2" Ice	0.00	0.683
						1" Ice	0.00	0.683
HB114-1-0813U4-M5J(1 1/4")	C	No	Inside Pole	130.00 - 0.00	3	No Ice	0.00	1.200
						1/2" Ice	0.00	1.200
						1" Ice	0.00	1.200
2" Flexible Conduit	C	No	Inside Pole	130.00 - 0.00	1	No Ice	0.00	0.340
						1/2" Ice	0.00	0.340
						1" Ice	0.00	0.340
121								
FLC 158-50J(1-5/8")	C	No	Inside Pole	121.00 - 0.00	12	No Ice	0.00	0.920
						1/2" Ice	0.00	0.920
						1" Ice	0.00	0.920
LDF6-50A(1-1/4")	C	No	Inside Pole	121.00 - 0.00	1	No Ice	0.00	0.660
						1/2" Ice	0.00	0.660
						1" Ice	0.00	0.660
111								
FLC 114-50J(1-1/4")	C	No	Inside Pole	111.00 - 0.00	6	No Ice	0.00	0.700
						1/2" Ice	0.00	0.700
						1" Ice	0.00	0.700
FB-L98B-002-75000(3/8")	C	No	Inside Pole	111.00 - 0.00	1	No Ice	0.00	0.059
						1/2" Ice	0.00	0.059
						1" Ice	0.00	0.059
WR-VG86ST-BRD(3/4)	C	No	Inside Pole	111.00 - 0.00	2	No Ice	0.00	0.590
						1/2" Ice	0.00	0.590
						1" Ice	0.00	0.590
2" Flexible Conduit	C	No	Inside Pole	111.00 - 0.00	2	No Ice	0.00	0.340
						1/2" Ice	0.00	0.340
						1" Ice	0.00	0.340
70								
LDF4-50A(1/2")	C	No	Inside Pole	70.00 - 0.00	1	No Ice	0.00	0.150
						1/2" Ice	0.00	0.150
						1" Ice	0.00	0.150
Misc								
Safety Line 3/8	A	No	CaAa (Out Of Face)	133.00 - 0.00	1	No Ice	0.04	0.220
						1/2" Ice	0.14	0.750
						1" Ice	0.24	1.280
Step Pegs (5/8" SR) 7-in. w/30" step	A	No	CaAa (Out Of Face)	147.00 - 0.00	1	No Ice	0.03	0.487
						1/2" Ice	0.14	1.006
						1" Ice	0.23	2.065
***								

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
L1	147.00-133.00	A	0.000	0.000	0.000	0.490	6.82
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
L2	133.00-85.50	A	0.000	0.000	0.000	3.444	33.58
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	948.51
L3	85.50-42.75	A	0.000	0.000	0.000	3.099	30.22
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	1128.14
L4	42.75-0.00	A	0.000	0.000	0.000	3.099	30.22
		B	0.000	0.000	0.000	0.000	0.00

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
		C	0.000	0.000	0.000	0.000	1130.46

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_A In Face ft^2	C_AA_A Out Face ft^2	Weight lb
L1	147.00-133.00	A	1.733	0.000	0.000	0.000	5.343	70.20
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
L2	133.00-85.50	A	1.689	0.000	0.000	0.000	35.529	325.16
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	948.51
L3	85.50-42.75	A	1.601	0.000	0.000	0.000	31.976	292.64
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	1128.14
L4	42.75-0.00	A	1.437	0.000	0.000	0.000	30.484	273.68
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	1130.46

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	147.00-133.00	0.000	-0.051	0.000	-0.351
L2	133.00-85.50	0.000	-0.102	0.000	-0.729
L3	85.50-42.75	0.000	-0.102	0.000	-0.796
L4	42.75-0.00	0.000	-0.103	0.000	-0.811

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
130									
APXVTM14-C-120	A	From Centroid	4.00 -7.000	-20.000	130.00	No Ice 1/2" Ice	6.34 6.72	3.61 3.97	56.00 95.53

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft Vert ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
		g	0.000			1" Ice	7.10	4.33	140.12
APXVTM14-C-120	B	From	4.00	-30.000	130.00	No Ice	6.34	3.61	56.00
		Centroid-Le	-7.000			1/2" Ice	6.72	3.97	95.53
		g	0.000			1" Ice	7.10	4.33	140.12
APXVTM14-C-120	C	From	4.00	-40.000	130.00	No Ice	6.34	3.61	56.00
		Centroid-Le	-7.000			1/2" Ice	6.72	3.97	95.53
		g	0.000			1" Ice	7.10	4.33	140.12
LLPX310R	A	From	4.00	-40.000	130.00	No Ice	4.31	1.96	28.66
		Centroid-Le	7.000			1/2" Ice	4.60	2.23	54.63
		g	-2.000			1" Ice	4.90	2.50	84.59
LLPX310R	B	From	4.00	-50.000	130.00	No Ice	4.31	1.96	28.66
		Centroid-Le	-2.000			1/2" Ice	4.60	2.23	54.63
		g	-2.000			1" Ice	4.90	2.50	84.59
LLPX310R	C	From	4.00	-40.000	130.00	No Ice	4.31	1.96	28.66
		Centroid-Le	-2.000			1/2" Ice	4.60	2.23	54.63
		g	-2.000			1" Ice	4.90	2.50	84.59
APXV9ERR18-C-A20	A	From	4.00	-20.000	130.00	No Ice	8.02	5.81	62.00
		Centroid-Le	2.000			1/2" Ice	8.48	6.27	113.99
		g	0.000			1" Ice	8.94	6.73	172.12
APXVSPP18-C-A20	B	From	4.00	-30.000	130.00	No Ice	8.02	5.28	57.00
		Centroid-Le	7.000			1/2" Ice	8.48	5.74	106.52
		g	-3.000			1" Ice	8.94	6.20	162.12
APXVSPP18-C-A20	C	From	4.00	-40.000	130.00	No Ice	8.02	5.28	57.00
		Centroid-Le	7.000			1/2" Ice	8.48	5.74	106.52
		g	0.000			1" Ice	8.94	6.20	162.12
TD-RRH8x20-25	A	From	4.00	-20.000	130.00	No Ice	4.05	1.53	70.00
		Centroid-Le	-7.000			1/2" Ice	4.30	1.71	97.15
		g	0.000			1" Ice	4.56	1.90	127.83
TD-RRH8x20-25	B	From	4.00	-30.000	130.00	No Ice	4.05	1.53	70.00
		Centroid-Le	-7.000			1/2" Ice	4.30	1.71	97.15
		g	0.000			1" Ice	4.56	1.90	127.83
TD-RRH8x20-25	C	From	4.00	-40.000	130.00	No Ice	4.05	1.53	70.00
		Centroid-Le	-7.000			1/2" Ice	4.30	1.71	97.15
		g	0.000			1" Ice	4.56	1.90	127.83
FDD_R6_RRH	A	From	4.00	-40.000	130.00	No Ice	0.00	0.78	33.00
		Centroid-Le	7.000			1/2" Ice	0.00	0.92	44.50
		g	-2.000			1" Ice	0.00	1.07	58.31
FDD_R6_RRH	B	From	4.00	-50.000	130.00	No Ice	0.00	0.78	33.00
		Centroid-Le	-2.000			1/2" Ice	0.00	0.92	44.50
		g	-2.000			1" Ice	0.00	1.07	58.31
FDD_R6_RRH	C	From	4.00	-40.000	130.00	No Ice	0.00	0.78	33.00
		Centroid-Le	-2.000			1/2" Ice	0.00	0.92	44.50
		g	-2.000			1" Ice	0.00	1.07	58.31
800 EXTERNAL NOTCH FILTER	A	From	4.00	-20.000	130.00	No Ice	0.66	0.32	11.00
		Centroid-Le	2.000			1/2" Ice	0.76	0.40	16.81
		g	0.000			1" Ice	0.87	0.48	24.26
800 EXTERNAL NOTCH FILTER	B	From	4.00	-30.000	130.00	No Ice	0.66	0.32	11.00
		Centroid-Le	7.000			1/2" Ice	0.76	0.40	16.81
		g	-3.000			1" Ice	0.87	0.48	24.26
800 EXTERNAL NOTCH FILTER	C	From	4.00	-40.000	130.00	No Ice	0.66	0.32	11.00
		Centroid-Le	7.000			1/2" Ice	0.76	0.40	16.81
		g	0.000			1" Ice	0.87	0.48	24.26
(3) ACU-A20-N	A	From	4.00	-20.000	130.00	No Ice	0.07	0.12	1.04
		Centroid-Le	2.000			1/2" Ice	0.10	0.16	2.32
		g	0.000			1" Ice	0.15	0.21	4.41
(3) ACU-A20-N	B	From	4.00	-30.000	130.00	No Ice	0.07	0.12	1.04
		Centroid-Le	7.000			1/2" Ice	0.10	0.16	2.32

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
		g	-3.000			1" Ice	0.15	0.21	4.41
(3) ACU-A20-N	C	From	4.00	-40.000	130.00	No Ice	0.07	0.12	1.04
		Centroid-Le	7.000			1/2" Ice	0.10	0.16	2.32
		g	0.000			1" Ice	0.15	0.21	4.41
800MHZ RRH	A	From	4.00	-20.000	130.00	No Ice	2.13	1.77	53.00
		Centroid-Le	2.000			1/2" Ice	2.32	1.95	74.19
		g	0.000			1" Ice	2.51	2.13	98.39
800MHZ RRH	B	From	4.00	-30.000	130.00	No Ice	2.13	1.77	53.00
		Centroid-Le	7.000			1/2" Ice	2.32	1.95	74.19
		g	-3.000			1" Ice	2.51	2.13	98.39
800MHZ RRH	C	From	4.00	-40.000	130.00	No Ice	2.13	1.77	53.00
		Centroid-Le	7.000			1/2" Ice	2.32	1.95	74.19
		g	0.000			1" Ice	2.51	2.13	98.39
1900MHz RRH (65MHz)	A	From	4.00	-20.000	130.00	No Ice	2.32	2.24	59.50
		Centroid-Le	2.000			1/2" Ice	2.53	2.44	82.62
		g	0.000			1" Ice	2.74	2.65	108.98
1900MHz RRH (65MHz)	B	From	4.00	-30.000	130.00	No Ice	2.32	2.24	59.50
		Centroid-Le	7.000			1/2" Ice	2.53	2.44	82.62
		g	-3.000			1" Ice	2.74	2.65	108.98
1900MHz RRH (65MHz)	C	From	4.00	-40.000	130.00	No Ice	2.32	2.24	59.50
		Centroid-Le	7.000			1/2" Ice	2.53	2.44	82.62
		g	0.000			1" Ice	2.74	2.65	108.98
Platform Mount [LP 1201-1]	C	None		0.000	130.00	No Ice	23.10	23.10	2100.00
						1/2" Ice	26.80	26.80	2500.00
						1" Ice	30.50	30.50	2900.00
Miscellaneous [NA 510-3]	C	None		0.000	130.00	No Ice	19.70	19.70	519.20
						1/2" Ice	28.20	28.20	721.60
						1" Ice	36.70	36.70	924.00
121									
(2) LPA-80080-6CF-EDIN w/ Mount Pipe	A	From	4.00	30.000	121.00	No Ice	4.56	10.27	46.22
		Centroid-Le	0.000			1/2" Ice	5.10	11.44	112.73
		g	0.000			1" Ice	5.61	12.32	187.10
(2) LPA-80080-6CF-EDIN w/ Mount Pipe	B	From	4.00	30.000	121.00	No Ice	4.56	10.27	46.22
		Centroid-Le	3.000			1/2" Ice	5.10	11.44	112.73
		g	0.000			1" Ice	5.61	12.32	187.10
(2) LPA-80063/6CF w/ Mount Pipe	C	From	4.00	30.000	121.00	No Ice	10.06	10.45	56.20
		Centroid-Le	0.000			1/2" Ice	10.75	11.74	151.25
		g	0.000			1" Ice	11.40	12.87	254.99
BXA-70063/6CFx2 w/ Mount Pipe	A	From	4.00	30.000	121.00	No Ice	7.83	5.42	42.55
		Centroid-Le	-3.000			1/2" Ice	8.39	6.58	101.64
		g	0.000			1" Ice	8.91	7.45	168.43
BXA-70063/6CFx2 w/ Mount Pipe	B	From	4.00	30.000	121.00	No Ice	7.83	5.42	42.55
		Centroid-Le	-7.000			1/2" Ice	8.39	6.58	101.64
		g	0.000			1" Ice	8.91	7.45	168.43
BXA-70063/6CFx4 w/ Mount Pipe	C	From	4.00	30.000	121.00	No Ice	7.81	5.40	42.25
		Centroid-Le	0.000			1/2" Ice	8.36	6.55	101.12
		g	0.000			1" Ice	8.87	7.41	167.67
HBX-6516DS-VTM w/ Mount Pipe	A	From	4.00	30.000	121.00	No Ice	4.20	3.89	39.60
		Centroid-Le	0.000			1/2" Ice	4.92	5.03	79.73
		g	0.000			1" Ice	5.56	6.02	126.11
HBX-6516DS-VTM w/ Mount Pipe	B	From	4.00	30.000	121.00	No Ice	4.20	3.89	39.60
		Centroid-Le	0.000			1/2" Ice	4.92	5.03	79.73
		g	0.000			1" Ice	5.56	6.02	126.11
HBX-6516DS-VTM w/ Mount Pipe	C	From	4.00	30.000	121.00	No Ice	4.20	3.89	39.60
		Centroid-Le	0.000			1/2" Ice	4.92	5.03	79.73
		g	0.000			1" Ice	5.56	6.02	126.11
BXA-171063/12CF w/ Mount	A	From	4.00	30.000	121.00	No Ice	4.79	5.04	36.90

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft Vert ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
Pipe		Centroid-Leg	3.000 0.000			1/2" Ice 1" Ice	5.24 5.70	5.98 6.80	80.24 130.80
BXA-171063/12CF w/ Mount Pipe	B	From Centroid-Leg	4.00 3.000 0.000	30.000	121.00	No Ice 1/2" Ice 1" Ice	4.79 5.24 5.70	5.04 5.98 6.80	36.90 80.24 130.80
BXA-171063/12CF w/ Mount Pipe	C	From Centroid-Leg	4.00 3.000 0.000	30.000	121.00	No Ice 1/2" Ice 1" Ice	4.79 5.24 5.70	5.04 5.98 6.80	36.90 80.24 130.80
(2) FD9R6004/2C-3L	A	From Centroid-Leg	4.00 -7.000 0.000	30.000	121.00	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.08 0.14 0.20	3.10 5.40 8.79
(2) FD9R6004/2C-3L	B	From Centroid-Leg	4.00 -7.000 0.000	30.000	121.00	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.08 0.14 0.20	3.10 5.40 8.79
(2) FD9R6004/2C-3L	C	From Centroid-Leg	4.00 -7.000 0.000	30.000	121.00	No Ice 1/2" Ice 1" Ice	0.00 0.00 0.00	0.08 0.14 0.20	3.10 5.40 8.79
DB-T1-6Z-8AB-0Z	C	From Centroid-Leg	4.00 3.000 0.000	30.000	121.00	No Ice 1/2" Ice 1" Ice	4.80 5.07 5.35	2.00 2.19 2.39	44.00 80.13 120.22
Platform Mount [LP 1201-1]	C	None		0.000	121.00	No Ice 1/2" Ice 1" Ice	23.10 26.80 30.50	23.10 26.80 30.50	2100.00 2500.00 2900.00
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RRH2X40-AWS	A	From Centroid-Leg	4.00 0.000 0.000	30.000	121.00	No Ice 1/2" Ice 1" Ice	2.16 2.36 2.57	1.42 1.59 1.77	44.00 61.40 81.69
RRH2X40-AWS	B	From Centroid-Leg	4.00 0.000 0.000	30.000	121.00	No Ice 1/2" Ice 1" Ice	2.16 2.36 2.57	1.42 1.59 1.77	44.00 61.40 81.69
RRH2X40-AWS	C	From Centroid-Leg	4.00 0.000 0.000	30.000	121.00	No Ice 1/2" Ice 1" Ice	2.16 2.36 2.57	1.42 1.59 1.77	44.00 61.40 81.69
111									
7770.00 w/ Mount Pipe	A	From Centroid-Leg	4.00 -7.000 1.000	20.000	111.00	No Ice 1/2" Ice 1" Ice	5.75 6.18 6.61	4.25 5.01 5.71	55.38 102.81 156.64
7770.00 w/ Mount Pipe	B	From Centroid-Leg	4.00 -7.000 1.000	20.000	111.00	No Ice 1/2" Ice 1" Ice	5.75 6.18 6.61	4.25 5.01 5.71	55.38 102.81 156.64
7770.00 w/ Mount Pipe	C	From Centroid-Leg	4.00 -7.000 1.000	20.000	111.00	No Ice 1/2" Ice 1" Ice	5.75 6.18 6.61	4.25 5.01 5.71	55.38 102.81 156.64
RRUS-11	A	From Centroid-Leg	4.00 0.000 1.000	20.000	111.00	No Ice 1/2" Ice 1" Ice	2.79 3.00 3.21	1.19 1.34 1.50	50.00 70.87 94.78
RRUS-11	B	From Centroid-Leg	4.00 0.000 1.000	20.000	111.00	No Ice 1/2" Ice 1" Ice	2.79 3.00 3.21	1.19 1.34 1.50	50.00 70.87 94.78
RRUS-11	C	From Centroid-Leg	4.00 0.000 1.000	20.000	111.00	No Ice 1/2" Ice 1" Ice	2.79 3.00 3.21	1.19 1.34 1.50	50.00 70.87 94.78
DC6-48-60-18-8F	A	From Centroid-Leg	4.00 0.000 1.000	20.000	111.00	No Ice 1/2" Ice 1" Ice	0.92 1.46 1.64	0.92 1.46 1.64	32.80 50.52 70.72
TPA-65R-LCUUUU-H6 w/ Mount Pipe	A	From Centroid-Leg	4.00 0.000	20.000	111.00	No Ice 1/2" Ice	8.41 9.05	9.68 10.94	96.51 176.35

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight lb
		g	1.000			1" Ice	9.66	11.91	264.39
TPA-65R-LCUUUU-H6 w/ Mount Pipe	B	From Centroid-Le	4.00 0.000	20.000	111.00	No Ice 1/2" Ice	8.41 9.05	9.68 10.94	96.51 176.35
		g	1.000			1" Ice	9.66	11.91	264.39
TPA-65R-LCUUUU-H6 w/ Mount Pipe	C	From Centroid-Le	4.00 0.000	20.000	111.00	No Ice 1/2" Ice	8.41 9.05	9.68 10.94	96.51 176.35
		g	1.000			1" Ice	9.66	11.91	264.39
DTMABP7819VG12A	A	From Centroid-Le	4.00 -7.000	20.000	111.00	No Ice 1/2" Ice	0.98 1.10	0.34 0.42	19.18 26.48
		g	1.000			1" Ice	1.23	0.51	35.63
DTMABP7819VG12A	B	From Centroid-Le	4.00 -7.000	20.000	111.00	No Ice 1/2" Ice	0.98 1.10	0.34 0.42	19.18 26.48
		g	1.000			1" Ice	1.23	0.51	35.63
DTMABP7819VG12A	C	From Centroid-Le	4.00 -7.000	20.000	111.00	No Ice 1/2" Ice	0.98 1.10	0.34 0.42	19.18 26.48
		g	1.000			1" Ice	1.23	0.51	35.63
RRUS12/RRUS A2	A	From Centroid-Le	4.00 0.000	20.000	111.00	No Ice 1/2" Ice	3.14 3.36	1.84 2.01	71.50 98.98
		g	1.000			1" Ice	3.59	2.20	129.87
RRUS12/RRUS A2	B	From Centroid-Le	4.00 0.000	20.000	111.00	No Ice 1/2" Ice	3.14 3.36	1.84 2.01	71.50 98.98
		g	1.000			1" Ice	3.59	2.20	129.87
RRUS12/RRUS A2	C	From Centroid-Le	4.00 0.000	20.000	111.00	No Ice 1/2" Ice	3.14 3.36	1.84 2.01	71.50 98.98
		g	1.000			1" Ice	3.59	2.20	129.87
2.4" Dia. x 6' Mount Pipe	A	From Centroid-Le	4.00 7.000	0.000	111.00	No Ice 1/2" Ice	1.43 1.93	1.43 1.93	21.90 37.81
		g	0.000			1" Ice	2.31	2.31	55.56
2.4" Dia. x 6' Mount Pipe	B	From Centroid-Le	4.00 7.000	0.000	111.00	No Ice 1/2" Ice	1.43 1.93	1.43 1.93	21.90 37.81
		g	0.000			1" Ice	2.31	2.31	55.56
2.4" Dia. x 6' Mount Pipe	C	From Centroid-Le	4.00 7.000	0.000	111.00	No Ice 1/2" Ice	1.43 1.93	1.43 1.93	21.90 37.81
		g	0.000			1" Ice	2.31	2.31	55.56
Platform Mount [LP 1201-1]	C	None		0.000	111.00	No Ice 1/2" Ice 1" Ice	23.10 26.80 30.50	23.10 26.80 30.50	2100.00 2500.00 2900.00
70									
OG-860/1920/GPS-A	C	From Face	3.00 0.000 0.000	0.000	70.00	No Ice 1/2" Ice 1" Ice	0.14 0.22 0.30	0.14 0.22 0.30	1.65 3.53 6.44
Side Arm Mount [SO 701-1]	C	From Face	1.50 0.000 0.000	0.000	70.00	No Ice 1/2" Ice 1" Ice	0.85 1.14 1.43	1.67 2.34 3.01	65.00 79.00 93.00
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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^2	Weight lb
130											
VHLP1-23	A	Paraboloid w/Shroud (HP)	From Centroid -Leg	4.00 -2.000 2.000	-40.000		130.00	1.27	No Ice 1/2" Ice 1" Ice	1.28 1.45 1.62	14.00 19.34 24.68
VHLP2-23	C	Paraboloid w/Shroud (HP)	From Centroid -Leg	4.00 -2.000 2.000	0.000		130.00	2.18	No Ice 1/2" Ice 1" Ice	3.73 4.02 4.31	31.00 51.64 72.27
VHLP2.5-23	C	Paraboloid w/Shroud (HP)	From Centroid -Leg	4.00 2.000 2.000	30.000		130.00	2.92	No Ice 1/2" Ice 1" Ice	6.68 7.07 7.46	47.60 83.89 120.17
***											

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

Comb. No.	Description
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
L1	147 - 133	Pole	Max Tension	9	0.05	0.01	0.90
			Max. Compression	26	-1600.94	9.93	38.24
			Max. Mx	8	-1037.24	-4524.50	4.75
			Max. My	2	-1039.65	0.50	4501.70
			Max. Vy	8	646.21	-4524.50	4.75
			Max. Vx	2	-642.37	0.50	4501.70
			Max. Torque	30			25.77
L2	133 - 85.5	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-35544.54	5464.80	330.85
			Max. Mx	8	-16189.74	-699398.17	2633.40
			Max. My	2	-16320.61	-2259.91	676228.25
			Max. Vy	8	22809.43	-699398.17	2633.40
			Max. Vx	14	22079.61	5738.88	-676063.67
			Max. Torque	25			3511.86
L3	85.5 - 42.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-47334.33	5834.74	349.15
			Max. Mx	8	-25363.64	-1761010.54	4878.24
			Max. My	14	-25436.17	10394.89	-1706636.97
			Max. Vy	8	28039.84	-1761010.54	4878.24
			Max. Vx	14	27281.36	10394.89	-1706636.97
			Max. Torque	25			3441.32
L4	42.75 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-65048.16	5859.09	879.36
			Max. Mx	8	-40086.52	-3223566.75	7618.68
			Max. My	14	-40088.29	15350.80	-3133767.67
			Max. Vy	8	33293.41	-3223566.75	7618.68
			Max. Vx	14	32568.41	15350.80	-3133767.67
			Max. Torque	25			3369.57

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Pole	Max. Vert	36	65048.16	8476.03	-8.69
	Max. H_x	20	40122.43	33101.41	-51.57
	Max. H_z	2	40122.43	-76.68	32523.64
	Max. M_x	2	3133454.65	-76.68	32523.64
	Max. M_z	8	3223566.75	-33250.13	54.58
	Max. Torsion	25	3264.77	16610.34	28085.58
	Min. Vert	5	30091.82	-16795.91	28137.59
	Min. H_x	9	30091.82	-33250.14	54.58
	Min. H_z	14	40122.43	100.43	-32526.35
	Min. M_x	14	-3133767.67	100.43	-32526.35
	Min. M_z	20	-3205698.29	33101.41	-51.57
	Min. Torsion	15	-3277.71	100.43	-32526.34

Tower Mast Reaction Summary

Load Combination	Vertical lb	$Shear_x$ lb	$Shear_z$ lb	Overturning Moment, M_x lb-ft	Overturning Moment, M_z lb-ft	Torque lb-ft
Dead Only	33435.36	-0.00	-0.00	-26.15	1108.14	-0.01
1.2 Dead+1.6 Wind 0 deg - No Ice	40122.43	76.68	-32523.64	-3133454.65	-9295.61	-3098.66
0.9 Dead+1.6 Wind 0 deg - No Ice	30091.82	76.68	-32523.64	-3092545.67	-9500.06	-3109.72
1.2 Dead+1.6 Wind 30 deg - No Ice	40122.43	16795.91	-28137.59	-2709456.19	-1635097.94	-2043.48
0.9 Dead+1.6 Wind 30 deg - No Ice	30091.82	16795.91	-28137.59	-2674099.99	-1613996.61	-2052.56
1.2 Dead+1.6 Wind 60 deg - No Ice	40122.43	28850.80	-16277.73	-1568713.48	-2799281.33	-859.64
0.9 Dead+1.6 Wind 60 deg - No Ice	30091.82	28850.80	-16277.73	-1548234.36	-2762993.45	-864.38
1.2 Dead+1.6 Wind 90 deg - No Ice	40122.43	33250.13	-54.58	-7618.90	-3223566.75	681.22
0.9 Dead+1.6 Wind 90 deg - No Ice	30091.82	33250.14	-54.58	-7489.76	-3181740.63	682.26
1.2 Dead+1.6 Wind 120 deg - No Ice	40122.43	28837.02	16136.21	1548972.33	-2797485.21	2060.79
0.9 Dead+1.6 Wind 120 deg - No Ice	30091.82	28837.02	16136.21	1528817.47	-2761218.09	2067.24
1.2 Dead+1.6 Wind 150 deg - No Ice	40122.43	16668.57	28096.32	2703740.62	-1617451.38	2928.59
0.9 Dead+1.6 Wind 150 deg - No Ice	30091.82	16668.57	28096.32	2668487.36	-1596614.79	2938.68
1.2 Dead+1.6 Wind 180 deg - No Ice	40122.43	-100.43	32526.35	3133767.67	15349.81	3266.64
0.9 Dead+1.6 Wind 180 deg - No Ice	30091.82	-100.43	32526.34	3092870.20	14767.36	3277.71
1.2 Dead+1.6 Wind 210 deg - No Ice	40122.43	-16664.09	28131.76	2708649.91	1619461.12	2376.66
0.9 Dead+1.6 Wind 210 deg - No Ice	30091.82	-16664.09	28131.76	2673314.30	1597896.30	2385.61
1.2 Dead+1.6 Wind 240 deg - No Ice	40122.43	-28720.35	16228.92	1561888.08	2783937.91	1030.07
0.9 Dead+1.6 Wind 240 deg - No Ice	30091.82	-28720.35	16228.92	1541525.80	2747170.69	1034.72
1.2 Dead+1.6 Wind 270 deg - No Ice	40122.43	-33101.41	51.57	7105.41	3205698.29	-565.55

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	lb	lb	lb	lb-ft	lb-ft	lb-ft
0.9 Dead+1.6 Wind 270 deg - No Ice	30091.82	-33101.41	51.57	7008.30	3163439.37	-566.40
1.2 Dead+1.6 Wind 300 deg - No Ice	40122.43	-28697.76	-16137.47	-1549315.48	2780872.54	-2106.31
0.9 Dead+1.6 Wind 300 deg - No Ice	30091.82	-28697.76	-16137.47	-1529122.53	2744152.87	-2112.52
1.2 Dead+1.6 Wind 330 deg - No Ice	40122.43	-16610.34	-28085.58	-2702371.30	1612060.98	-3254.70
0.9 Dead+1.6 Wind 330 deg - No Ice	30091.82	-16610.34	-28085.58	-2667110.79	1590611.97	-3264.77
1.2 Dead+1.0 Ice+1.0 Temp	65048.16	-0.02	-0.00	-879.36	5859.09	0.05
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	65048.16	14.51	-8364.37	-860848.71	3816.29	-687.78
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	65048.16	4286.13	-7237.84	-744749.66	-438208.08	-898.02
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	65048.16	7377.16	-4184.25	-431164.25	-756438.37	-950.03
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	65048.16	8506.66	-8.94	-2209.26	-872638.55	-717.91
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	65048.16	7376.14	4157.95	425490.42	-756294.67	-290.78
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	65048.16	4262.81	7230.94	741949.11	-434757.55	221.47
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	65048.16	-18.38	8365.38	859213.50	8686.63	723.11
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	65048.16	-4259.04	7236.46	742762.42	446108.16	963.11
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	65048.16	-7350.84	4174.11	427878.05	764455.42	984.83
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	65048.16	-8476.03	8.69	392.05	880017.05	742.89
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	65048.16	-7347.41	-4158.04	-427287.49	763956.45	282.88
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	65048.16	-4251.15	-7227.94	-743289.43	444953.73	-287.74
Dead+Wind 0 deg - Service	33435.36	16.41	-6958.79	-665975.87	-1094.81	-676.20
Dead+Wind 30 deg - Service	33435.36	3593.67	-6020.35	-575894.92	-346640.65	-384.08
Dead+Wind 60 deg - Service	33435.36	6172.95	-3482.80	-333460.96	-594121.98	-78.89
Dead+Wind 90 deg - Service	33435.36	7114.23	-11.68	-1635.63	-684323.12	275.71
Dead+Wind 120 deg - Service	33435.36	6170.00	3452.52	329225.94	-593726.88	560.95
Dead+Wind 150 deg - Service	33435.36	3566.42	6011.52	574628.81	-342882.61	703.39
Dead+Wind 180 deg - Service	33435.36	-21.49	6959.37	666002.46	4138.68	712.15
Dead+Wind 210 deg - Service	33435.36	-3565.47	6019.10	575669.21	345066.25	454.17
Dead+Wind 240 deg - Service	33435.36	-6145.03	3472.36	331958.25	592590.19	114.28
Dead+Wind 270 deg - Service	33435.36	-7082.41	11.03	1490.97	682249.07	-250.02
Dead+Wind 300 deg - Service	33435.36	-6140.20	-3452.79	-329320.11	591932.13	-568.40
Dead+Wind 330 deg - Service	33435.36	-3553.97	-6009.22	-574365.67	343492.04	-772.41

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX	PY	PZ	PX	PY	PZ	% Error
	lb	lb	lb	lb	lb	lb	
1	0.00	-33435.36	0.00	0.00	33435.36	0.00	0.000%
2	76.68	-40122.43	-32523.64	-76.68	40122.43	32523.64	0.000%
3	76.68	-30091.82	-32523.64	-76.68	30091.82	32523.64	0.000%
4	16795.91	-40122.43	-28137.59	-16795.91	40122.43	28137.59	0.000%
5	16795.91	-30091.82	-28137.59	-16795.91	30091.82	28137.59	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX lb	PY lb	PZ lb	PX lb	PY lb	PZ lb	% Error
6	28850.80	-40122.43	-16277.73	-28850.80	40122.43	16277.73	0.000%
7	28850.80	-30091.82	-16277.73	-28850.80	30091.82	16277.73	0.000%
8	33250.13	-40122.43	-54.58	-33250.13	40122.43	54.58	0.000%
9	33250.13	-30091.82	-54.58	-33250.14	30091.82	54.58	0.000%
10	28837.02	-40122.43	16136.21	-28837.02	40122.43	-16136.21	0.000%
11	28837.02	-30091.82	16136.21	-28837.02	30091.82	-16136.21	0.000%
12	16668.57	-40122.43	28096.32	-16668.57	40122.43	-28096.32	0.000%
13	16668.57	-30091.82	28096.32	-16668.57	30091.82	-28096.32	0.000%
14	-100.43	-40122.43	32526.34	100.43	40122.43	-32526.35	0.000%
15	-100.43	-30091.82	32526.34	100.43	30091.82	-32526.34	0.000%
16	-16664.09	-40122.43	28131.76	16664.09	40122.43	-28131.76	0.000%
17	-16664.09	-30091.82	28131.76	16664.09	30091.82	-28131.76	0.000%
18	-28720.35	-40122.43	16228.92	28720.35	40122.43	-16228.92	0.000%
19	-28720.35	-30091.82	16228.92	28720.35	30091.82	-16228.92	0.000%
20	-33101.41	-40122.43	51.57	33101.41	40122.43	-51.57	0.000%
21	-33101.41	-30091.82	51.57	33101.41	30091.82	-51.57	0.000%
22	-28697.76	-40122.43	-16137.47	28697.76	40122.43	16137.47	0.000%
23	-28697.76	-30091.82	-16137.47	28697.76	30091.82	16137.47	0.000%
24	-16610.34	-40122.43	-28085.58	16610.34	40122.43	28085.58	0.000%
25	-16610.34	-30091.82	-28085.58	16610.34	30091.82	28085.58	0.000%
26	0.00	-65048.16	0.00	0.02	65048.16	0.00	0.000%
27	14.51	-65048.16	-8364.21	-14.51	65048.16	8364.37	0.000%
28	4286.05	-65048.16	-7237.71	-4286.13	65048.16	7237.84	0.000%
29	7377.03	-65048.16	-4184.17	-7377.16	65048.16	4184.25	0.000%
30	8506.51	-65048.16	-8.94	-8506.66	65048.16	8.94	0.000%
31	7376.01	-65048.16	4157.88	-7376.14	65048.16	-4157.95	0.000%
32	4262.74	-65048.16	7230.80	-4262.81	65048.16	-7230.94	0.000%
33	-18.38	-65048.16	8365.22	18.38	65048.16	-8365.38	0.000%
34	-4258.96	-65048.16	7236.33	4259.04	65048.16	-7236.46	0.000%
35	-7350.71	-65048.16	4174.04	7350.84	65048.16	-4174.11	0.000%
36	-8475.87	-65048.16	8.69	8476.03	65048.16	-8.69	0.000%
37	-7347.27	-65048.16	-4157.97	7347.41	65048.16	4158.04	0.000%
38	-4251.07	-65048.16	-7227.81	4251.15	65048.16	7227.94	0.000%
39	16.41	-33435.36	-6958.79	-16.41	33435.36	6958.79	0.000%
40	3593.67	-33435.36	-6020.34	-3593.67	33435.36	6020.35	0.000%
41	6172.94	-33435.36	-3482.80	-6172.95	33435.36	3482.80	0.000%
42	7114.23	-33435.36	-11.68	-7114.23	33435.36	11.68	0.000%
43	6169.99	-33435.36	3452.52	-6170.00	33435.36	-3452.52	0.000%
44	3566.42	-33435.36	6011.51	-3566.42	33435.36	-6011.52	0.000%
45	-21.49	-33435.36	6959.37	21.49	33435.36	-6959.37	0.000%
46	-3565.46	-33435.36	6019.10	3565.47	33435.36	-6019.10	0.000%
47	-6145.03	-33435.36	3472.35	6145.03	33435.36	-3472.36	0.000%
48	-7082.41	-33435.36	11.03	7082.41	33435.36	-11.03	0.000%
49	-6140.20	-33435.36	-3452.79	6140.20	33435.36	3452.79	0.000%
50	-3553.96	-33435.36	-6009.22	3553.97	33435.36	6009.22	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	0.00030998
3	Yes	5	0.00000001	0.00014089
4	Yes	6	0.00000001	0.00017446
5	Yes	6	0.00000001	0.00005133
6	Yes	6	0.00000001	0.00018413

7	Yes	6	0.00000001	0.00005477
8	Yes	5	0.00000001	0.00007247
9	Yes	4	0.00000001	0.00092299
10	Yes	6	0.00000001	0.00018926
11	Yes	6	0.00000001	0.00005684
12	Yes	6	0.00000001	0.00016911
13	Yes	6	0.00000001	0.00004977
14	Yes	5	0.00000001	0.00039707
15	Yes	5	0.00000001	0.00017919
16	Yes	6	0.00000001	0.00018906
17	Yes	6	0.00000001	0.00005668
18	Yes	6	0.00000001	0.00017633
19	Yes	6	0.00000001	0.00005221
20	Yes	5	0.00000001	0.00010114
21	Yes	5	0.00000001	0.00004518
22	Yes	6	0.00000001	0.00016962
23	Yes	6	0.00000001	0.00005007
24	Yes	6	0.00000001	0.00019270
25	Yes	6	0.00000001	0.00005814
26	Yes	4	0.00000001	0.00006482
27	Yes	5	0.00000001	0.00053883
28	Yes	5	0.00000001	0.00087836
29	Yes	5	0.00000001	0.00092743
30	Yes	5	0.00000001	0.00052664
31	Yes	5	0.00000001	0.00090236
32	Yes	5	0.00000001	0.00087101
33	Yes	5	0.00000001	0.00054181
34	Yes	5	0.00000001	0.00097203
35	Yes	5	0.00000001	0.00091242
36	Yes	5	0.00000001	0.00053911
37	Yes	5	0.00000001	0.00092073
38	Yes	5	0.00000001	0.00096313
39	Yes	4	0.00000001	0.00032220
40	Yes	4	0.00000001	0.00062633
41	Yes	4	0.00000001	0.00071795
42	Yes	4	0.00000001	0.00013713
43	Yes	4	0.00000001	0.00082948
44	Yes	4	0.00000001	0.00059918
45	Yes	4	0.00000001	0.00035172
46	Yes	4	0.00000001	0.00081084
47	Yes	4	0.00000001	0.00065793
48	Yes	4	0.00000001	0.00013391
49	Yes	4	0.00000001	0.00059337
50	Yes	4	0.00000001	0.00089320

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	147 - 133	27.331	48	1.486	0.009
L2	133 - 85.5	22.976	48	1.483	0.009
L3	89.25 - 42.75	10.437	42	1.143	0.003
L4	47.5 - 0	2.865	42	0.562	0.001

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
132.00	VHLP1-23	48	22.666	1.481	0.010	47572
130.00	APXVTM14-C-120	48	22.046	1.476	0.010	33697
121.00	(2) LPA-80080-6CF-EDIN w/ Mount Pipe	42	19.290	1.439	0.009	13288
111.00	7770.00 w/ Mount Pipe	42	16.315	1.370	0.007	7927
70.00	OG-860/1920/GPS-A	42	6.273	0.882	0.002	3872

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	147 - 133	128.922	8	7.008	0.043
L2	133 - 85.5	108.437	8	6.991	0.043
L3	89.25 - 42.75	49.241	8	5.402	0.014
L4	47.5 - 0	13.508	8	2.652	0.005

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
132.00	VHLP1-23	8	106.977	6.982	0.044	11236
130.00	APXVTM14-C-120	8	104.061	6.959	0.043	7774
121.00	(2) LPA-80080-6CF-EDIN w/ Mount Pipe	8	91.047	6.786	0.038	2953
111.00	7770.00 w/ Mount Pipe	8	76.991	6.468	0.031	1737
70.00	OG-860/1920/GPS-A	8	29.586	4.165	0.007	828

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u lb	ϕP_n lb	Ratio $\frac{P_u}{\phi P_n}$
L1	147 - 133 (1)	TP12.75x12.75x0.5	14.00	0.00	0.0	19.242	-1037.24	606131.00	0.002
L2	133 - 85.5 (2)	TP29.418x19.537x0.313	47.50	0.00	0.0	28.503	-16189.70	2074020.00	0.008
L3	85.5 - 42.75 (3)	TP37.687x27.477x0.375	46.50	0.00	0.0	43.795	-25363.60	3116790.00	0.008
L4	42.75 - 0 (4)	TP45.83x35.894x0.438	47.50	0.00	0.0	63.947	-40086.50	4432580.00	0.009

Pole Bending Design Data

Section No.	Elevation ft	Size	M_{ux} lb-ft	ϕM_{nx} lb-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} lb-ft	ϕM_{ny} lb-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L1	147 - 133 (1)	TP12.75x12.75x0.5	4524.50	197066.67	0.023	0.00	197066.67	0.000
L2	133 - 85.5 (2)	TP29.418x19.537x0.313	699403.33	1193158.33	0.586	0.00	1193158.33	0.000
L3	85.5 - 42.75 (3)	TP37.687x27.477x0.375	1761016.67	2297475.00	0.766	0.00	2297475.00	0.000
L4	42.75 - 0 (4)	TP45.83x35.894x0.438	3223575.00	4092133.33	0.788	0.00	4092133.33	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V_u lb	ϕV_n lb	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u lb-ft	ϕT_n lb-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	147 - 133 (1)	TP12.75x12.75x0.5	646.21	303066.00	0.002	14.14	297741.67	0.000
L2	133 - 85.5 (2)	TP29.418x19.537x0.313	22809.50	1037010.00	0.022	863.38	2419358.33	0.000
L3	85.5 - 42.75 (3)	TP37.687x27.477x0.375	28039.90	1558400.00	0.018	914.61	4658566.67	0.000
L4	42.75 - 0 (4)	TP45.83x35.894x0.438	33293.50	2216290.00	0.015	691.54	8297566.67	0.000

Pole Interaction Design Data

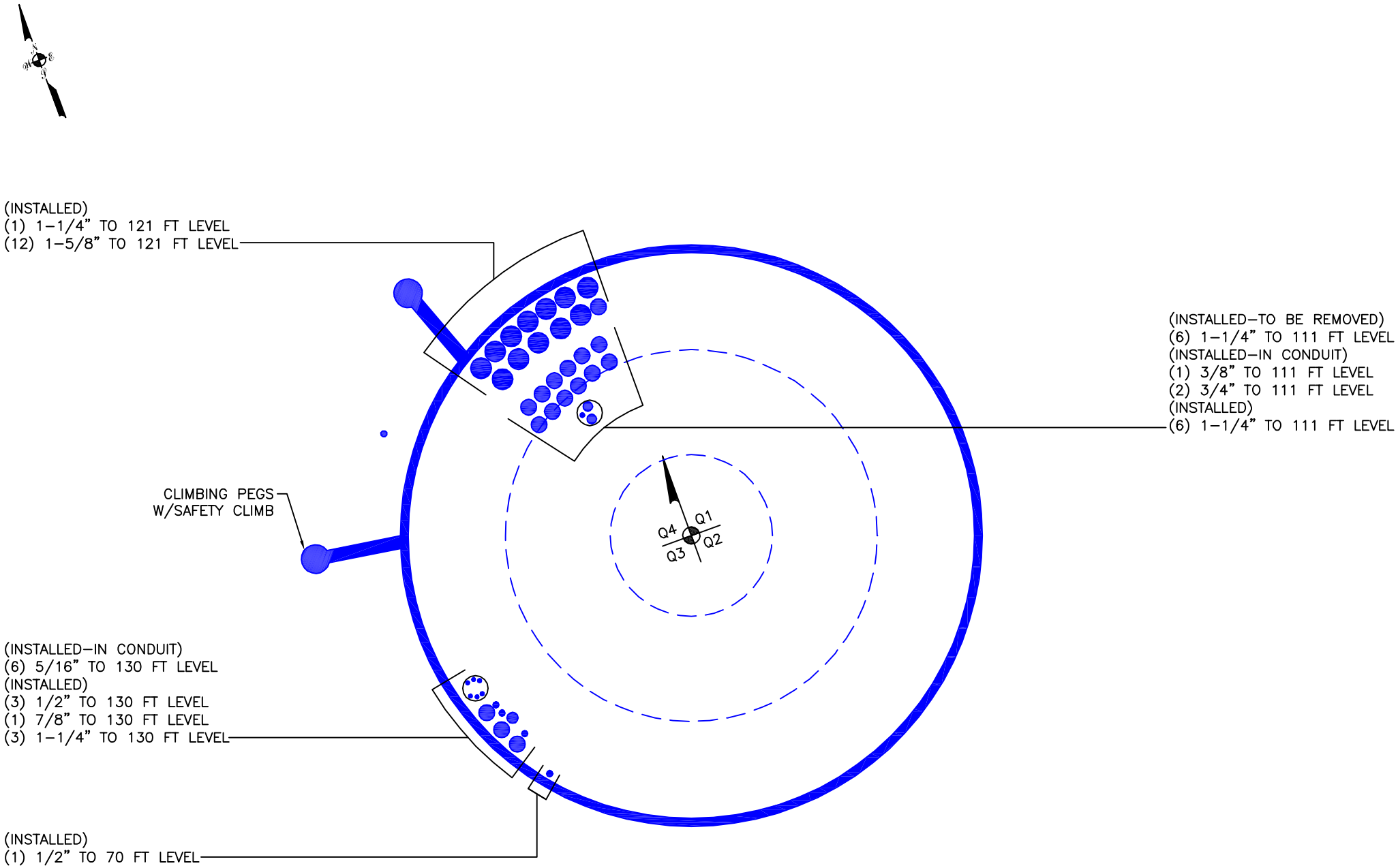
Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	147 - 133 (1)	0.002	0.023	0.000	0.002	0.000	0.025	1.000	4.8.2
L2	133 - 85.5 (2)	0.008	0.586	0.000	0.022	0.000	0.594	1.000	4.8.2
L3	85.5 - 42.75 (3)	0.008	0.766	0.000	0.018	0.000	0.775	1.000	4.8.2
L4	42.75 - 0 (4)	0.009	0.788	0.000	0.015	0.000	0.797	1.000	4.8.2

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	ϕP_{allow} lb	% Capacity	Pass Fail
L1	147 - 133	Pole	TP12.75x12.75x0.5	1	-1037.24	606131.00	2.5	Pass
L2	133 - 85.5	Pole	TP29.418x19.537x0.313	2	-16189.70	2074020.00	59.4	Pass
L3	85.5 - 42.75	Pole	TP37.687x27.477x0.375	3	-25363.60	3116790.00	77.5	Pass
L4	42.75 - 0	Pole	TP45.83x35.894x0.438	4	-40086.50	4432580.00	79.7	Pass
						Summary		
						Pole (L4)	79.7	Pass
						Rating =	**79.7**	**Pass**

APPENDIX B

BASE LEVEL DRAWING



BUSINESS UNIT: 876310 TOWER ID: C_BASELEVEL

APPENDIX C

ADDITIONAL CALCULATIONS

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

Site Data

BU#: *876310*
Site Name: *Beaumont Farm*
App #: *345702 Rev. 5*

Reactions		
Mu	4.52	ft-kips
Axial, Pu:	1.04	kips
Shear, Vu:	0.65	kips
Elevation:	133	feet

Bolt Threads:
X-Excluded
φVn=φ(0.55*Ab*Fu)
φ=0.75, φ*Vn (kips):
53.15

Pole Manufacturer:	Other

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

Bolt Data				
Qty:	20			
Diameter (in.):	1.25	Bolt Fu:	105	
Bolt Material:	A325	Bolt Fy:	81	
N/A:	100	<-- Disregard		
N/A:	75	<-- Disregard		
Circle (in.):	24			

Plate Data		
Diam:	28	in
Thick, t:	1	in
Grade (Fy):	50	ksi
Strength, Fu:	65	ksi
Single-Rod B-eff:	2.00	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:	12.75	in
Thick:	0.5	in
Grade:	35	ksi
# of Sides:	0	"0" IF Round
Fu	63	ksi
Reinf. Fillet Weld	0	"0" if None

Flange Bolt Results

Bolt Tension Capacity, φ*Tn,**B1**:	76.31	kips	Non-Rigid: φ*Tn
Adjusted φ*Tn (due to Vu=Vu/Qty), **B**:	76.31	kips	φTn[(1-(Vu/φVn)^2]^0.5
Max Bolt directly applied Tu:	0.40	Kips	
Min. PL "tc" for **B** cap. **w/o** Pry:	3.607	in	
Min PL "treq" for actual **T w/ Pry**:	0.225	in	
Min PL "t1" for actual **T w/o Pry**:	0.261	in	
T allowable with Prying:	7.88	kips	α'>1 case
Prying Force, q:	0.00	kips	
Total Bolt Tension=Tu+q:	0.40	kips	
Prying Bolt Stress Ratio=(Tu+q)/(B):	0.5%	**Pass**	

Exterior Flange Plate Results Flexural Check

Compression Side Plate Stress:	2.2	ksi	Non-Rigid: TIA G
Allowable Plate Stress:	45.0	ksi	φ*Fy
Compression Plate Stress Ratio:	4.8%	**Pass**	Comp. Y.L. Length: 20.33
No Prying			
Tension Side Stress Ratio, (treq/t)^2:	5.1%	**Pass**	

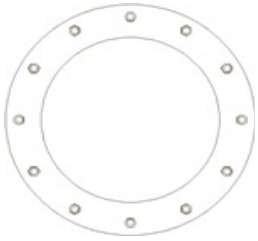
n/a

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

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)*(Rod Diameter)

Site Data

BU#: *876310*
Site Name: *Beaumont Farm*
App #: *345702 Rev. 5*

Anchor Rod Data		
Eta Factor, η	0.5	TIA G (Fig. 4-4)
Qty:	16	
Diam:	2.25	in
Rod Material:	A615-J	
Yield, Fy:	75	ksi
Strength, Fu:	100	ksi
Bolt Circle:	54	in
Anchor Spacing:	6	in

Plate Data		
W=Side:	54	in
Thick:	3	in
Grade:	50	ksi
Clip Distance:	6	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:	45.83	in
Thick:	0.4375	in
Grade:	65	ksi
# of Sides:	12	"0" IF Round

Base Reactions		
TIA Revision:	G	
Factored Moment, Mu:	3223.58	ft-kips
Factored Axial, Pu:	40.09	kips
Factored Shear, Vu:	33.29	kips

Anchor Rod Results

TIA G --> Max Rod (Cu+ Vu/η):	185.8 Kips
Axial Design Strength, Φ*Fu*Anet:	260.0 Kips
Anchor Rod Stress Ratio:	71.4% **Pass**

Base Plate Results — Flexural Check

Base Plate Stress:	33.5 ksi
PL Design Bending Strength, Φ*Fy:	45.0 ksi
Base Plate Stress Ratio:	74.5% **Pass**

PL Ref. Data	
Yield Line (in):	30.54
Max PL Length:	30.54

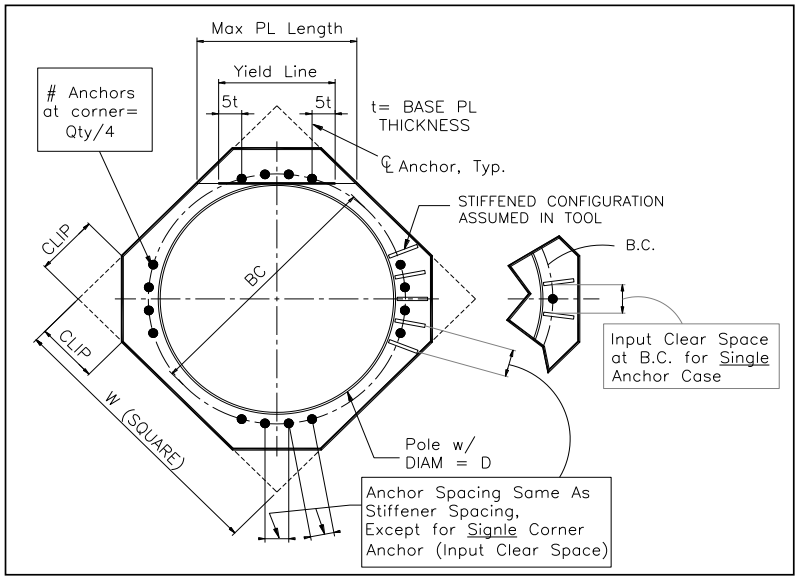
N/A - Unstiffened

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



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

TOWER ENGINEERING PROFESSIONALS

JOB:	Beaumont Farm (BU 876310); TEP No. 72875.98195		
SHEET NUMBER:	1	OF	2
CALCULATED BY:	SCW	DATE	10/4/2016
CHECKED BY:	TSA	DATE	10/4/2016

Pad and Pier Foundation for Monopole - TIA-222-G

q_a, ALLOWABLE SOIL PRESS. (ksf)	20.00
NET or GROSS	NET
SAFETY FACTOR IN q_a	2
SOIL DENSITY (pcf)	165

$\varphi^* q_n$ = 30.0 ksf

F'c (ksi)	3
F'y (ksi)	60

Base Reactions LC1: 1.2D + 1.6W

M, MOMENT (k-ft)	3223.6
P_t, TOTAL DOWNLOAD (k)	40.1
H, HORIZONTAL SHEAR (k)	33.3

Base Reaction LC 2: 0.9D + 1.6W

M (k-ft)	3223.6
P_t (k)	30.1
H (k)	33.3

Try:	L (ft.)	B (ft.)	t (ft.)	Soil depth to TOP of mat (ft.)	Soil depth to BOT. of mat (ft.)	Pier dia./width (ft.)	Pier Height, h (cu.ft.)	Pier Shape
	23	23	5.00	0	4.50	3.82	0.00	Square

W_m, Weight of Mat (k) =	396.8
W_p, Weight of Pier (k) =	0.0
W_s, Weight of Soil (k) =	0.0

Concrete Vol. (cu yd) 97.96

CHECK BEARING PRESSURE for LC1: 1.2D + 1.6W

P = P_t + Wf + Ws =	516.2 k
e = M / P =	6.57 ft
L/6 =	3.83 ft
Width of Wedge, L' =	9.87 ft
90° Axis: q_{max} =	1.53 ksf
Diag. Axis: q_{max} =	2.00 ksf

Capacity: 6.7%

CHECK BEARING STABILITY FOR LC2: 0.9D +1.6W

90° Axis	$M_{\varphi qn}$[1] =	4346.4 k-ft
	$M_{ot}/M_{\varphi qn}$ =	0.78
Diag. Axis	$M_{\varphi qn}$ =	5325.1 k-ft
	$M_{ot}/M_{\varphi qn}$ =	0.64

Capacity: 78.0%

[1] $M_{\varphi qn}$ is the overturning moment at which $q_{max} = \varphi q_n$

CHECK OVERTURNING: LC2 CONTROLS

M_{st} = P * (L/2) + (Vf+s * L/2) =	4452.4 k-ft
M_{ot} = M+H*(t+h) =	3389.8 k-ft
M_{ot}/M_{st} =	0.76

Capacity: 76.1%

TOWER ENGINEERING PROFESSIONALS

JOB:	Beaumont Farm (BU 876310); TEP No. 72875.98195		
SHEET NUMBER:	2	OF	2
CALCULATED BY:	SCW	DATE	10/4/2016
CHECKED BY:	TSA	DATE	10/4/2016

CHECK ONE WAY SHEAR

Vu = 301.9 k
Vc = 1261.3 k

Capacity: 23.94%

CHECK TWO WAY SHEAR: PUNCHING + UNBALANCED MOMENT

v_u = 19.0 psi
φv_c = 164.3 psi

Capacity: 11.54%

CALCULATE REINFORCING REQUIRED

F'c = 3.0 ksi F'y = 60.0 ksi

Temp & Shrinkage reinforcing, $A_{s,t}$ = 0.40 in^2/ft (ACI 318 Sec. 10.5.4)

BOTTOM REINFORCING

Bar Size = 11
Bar Spacing, c-c: 12.0
d = 54.9 in.
Mu= 1010.3 in-k/ft

φMn=0.9*As*Fy*d(1-0.59*As*Fy/(b*d*F'c))

Solution: As,req = 0.34 in^2/ft

Check, As = 1.56 in^2/ft

Capacity: 22.0%

TOP REINFORCING

Bar Size = 11
Bar Spacing, c-c: 12.0
d= 54.9 in.
Mu= 372.5 in-k/ft

φMn=0.9*As*Fy*d(1-0.59*As*Fy/(b*d*F'c))

Solution: As,req = 0.13 in^2/ft

Check, As = 1.56 in^2/ft

Capacity: 8.1%