EM-CING-029-121031

HPC WIRELESS SERVICES

ORIGINAL

October 26, 2012

RECEIVED
OCT 31 2012
CONNECTICUT
SITING COUNCIL

VIA OVERNIGHT COURIER

Connecticut Siting Council
10 Franklin Square
New Britain, Connecticut 06051
Attn: Ms. Linda Roberts, Executive Director

Re: New Cingular Wireless PCS, LLC – Exempt Modification
161 Pinney Street, Colebrook, Connecticut

Dear Ms. Roberts:

This letter and attachments are submitted on behalf of New Cingular Wireless PCS, LLC ("AT&T"). AT&T is making modifications to certain existing sites in its Connecticut system in order to implement LTE technology. Please accept this letter and attachments as notification, pursuant to Section 16-50j-73 of the Regulations of Connecticut State Agencies ("R.S.C.A."), of construction that constitutes an exempt modification pursuant to R.C.S.A. Section 16-50j-72(b)(2). In compliance with R.C.S.A. Section 16-50j-73, a copy of this letter and attachments is being sent to the First Selectman of the Town of Colebrook.

AT&T plans to modify the existing wireless communications facility owned by Crown Castle and located at 161 Pinney Street, Colebrook (coordinates 41° -57'-58.83" N, 73°-07'-17.98" W). Attached are a compound plan and elevation depicting the planned changes, and documentation of the structural sufficiency of the structure to accommodate the revised antenna configuration. Also included is a power density report reflecting the modification to AT&T's operations at the site.

The changes to the facility do not constitute a modification as defined in Connecticut General Statutes ("C.G.S.") Section 16-50i(d) because the general physical characteristics of the facility will not be significantly changed. Rather, the planned changes to the facility fall squarely within those activities explicitly provided for in R.C.S.A. Section 16-50j-72(b)(2).

1. AT&T will add three (3) LTE panel antennas, and a Surge Arrestor on new pipe mounts at a centerline height of approximately 140'. Six (6) RRUSs (remote radio units) will be attached to the pole behind the LTE antennas at a centerline height of approximately 138'. AT&T will also place a DC power and fiber run from the equipment

to the antennas along the existing coaxial cable run. These changes will not extend the height of the approximately 148' structure.

2. AT&T will place related equipment in the existing Shelter, and mount a new GPS antenna on the existing Ice Bridge Post. These changes will be within the existing compound and will have no effect on the site boundaries.

3. The proposed changes will not increase the noise level at the existing facility by six (6) decibels or more. The incremental effect of the proposed changes will be negligible.

4. The changes to the facility will not increase the calculated "worst case" power density for the combined operations at the site to a level at or above the applicable standard for uncontrolled environments as calculated for a mixed frequency site. As indicated on the attached report prepared by C Squared Systems, LLC, AT&T's operations at the site will result in a power density of approximately 1.64%; the combined site operations will result in a total power density of approximately 27.797%.

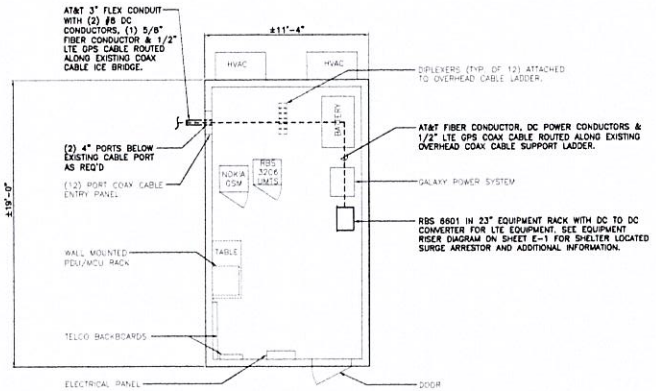
Please feel free to contact me by phone at (860) 798-7454 or by e-mail at jgaudet@hpcwireless.com with questions concerning this matter. Thank you for your consideration.

Respectfully yours,

Jennifer Young Gaudet (by MH)

Attachments

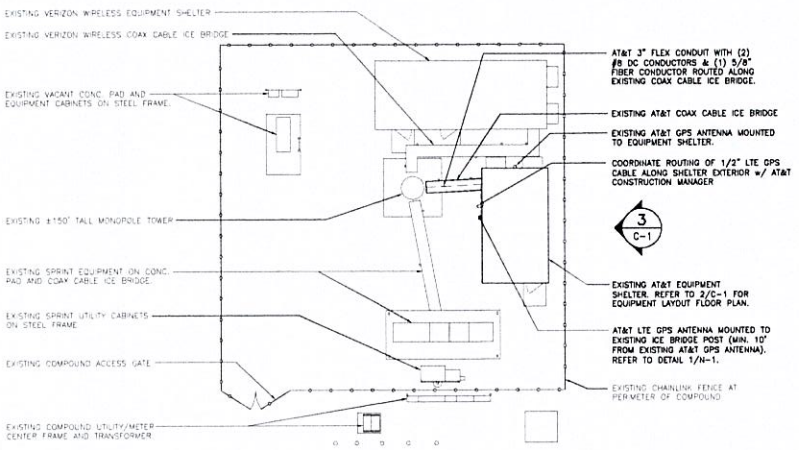
cc: Honorable Thomas D. Mckeon, First Selectman, Town of Colebrook
Ellen Fredsall (underlying property owner)



2 C-1 **EQUIPMENT BUILDING FLOOR PLAN**
SCALE: 1/4" = 1'-0"

APPROX. NORTH

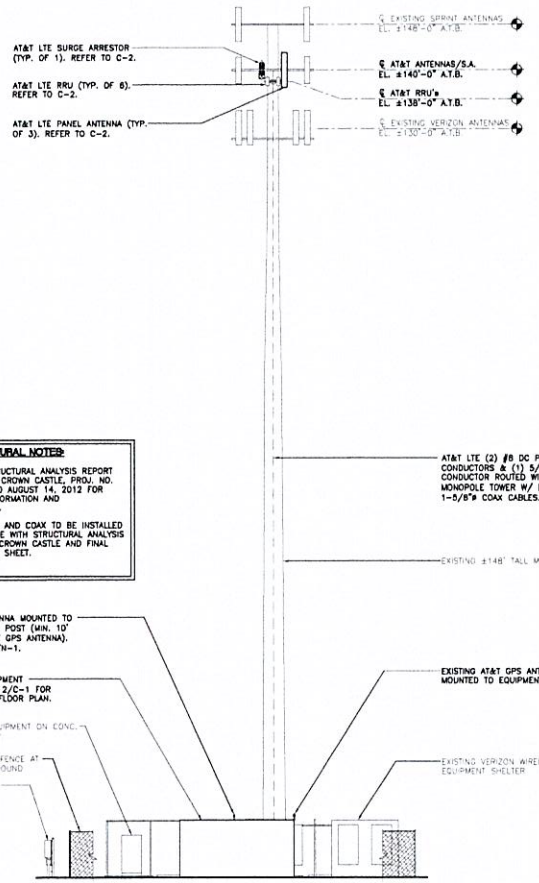
GRAPHIC SCALE
4 0 2 4 8 16
(IN FEET)
1 inch = 4 ft.



1 C-1 **COMPOUND PLAN**
SCALE: 1" = 10'-0"

APPROX. NORTH

GRAPHIC SCALE
10 0 5 10 20 40
(IN FEET)
1 inch = 10 ft.



TOWER STRUCTURAL NOTES:

1. REFER TO STRUCTURAL ANALYSIS REPORT PREPARED BY CROWN CASTLE, PROJ. NO. 519445, DATED AUGUST 14, 2012 FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
2. ALL ANTENNAS AND COAX TO BE INSTALLED IN ACCORDANCE WITH STRUCTURAL ANALYSIS PROVIDED BY CROWN CASTLE AND FINAL AT&T RF DATA SHEET.

3 C-1 **NORTH-WEST ELEVATION**
SCALE: 1" = 10'-0"

GRAPHIC SCALE
10 0 5 10 20 40
(IN FEET)
1 inch = 10 ft.

DESIGNED BY:	HMR
DRAWN BY:	HMR
CHK'D BY:	CFC

REV.	DATE	DRAWN BY	CHK'D BY	
1	10/1/12	HMR	DEB	CONSTRUCTION - CLIENT REVIEW
0	08/16/12	CLT	DEB	CONSTRUCTION

PROFESSIONAL ENGINEER SEAL

CENTEK engineering
Centered on Solutions℠
(203) 488-0580
(203) 488-8587 Fax
63-2 North Branford Road
Branford, CT 06405
www.CentekEng.com

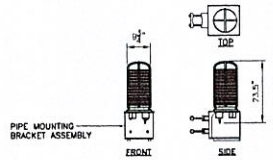
AT&T MOBILITY
WIRELESS COMMUNICATIONS FACILITY LTE UPGRADE
CT1012
CROWN SITE # 876377
COLEBROOK
161 PINNEY STREET
WINSTED, CT 06098

DATE: 10/1/12
SCALE: AS NOTED
JOB NO. 12063.0049

PLANS AND ELEVATION

C-1

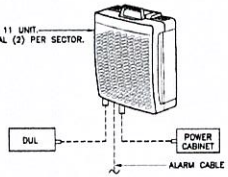
Sheet No. 2 of 5



SITE TYPE	ARRESTOR MAKE/MODEL	QTY REQUIRED	ARRESTOR LOCATION	WEIGHT
	MAKE: RAYCAP (SQUID) MODEL: DC6-48-60-18-8F	(1) PER SITE	TOWER, ADJACENT TO AT&T ANTENNAS AND RRUs.	20 LBS. (WITHOUT MOUNT)

NOTES:
1. CONTRACTOR TO COORDINATE FINAL SURGE ARRESTOR MODEL SELECTION(S) WITH AT&T CONSTRUCTION MANAGER PRIOR TO ORDERING.
2. CONTRACTOR TO INSTALL ARRESTOR IN CONFORMANCE WITH MANUFACTURERS RECOMMENDATIONS.

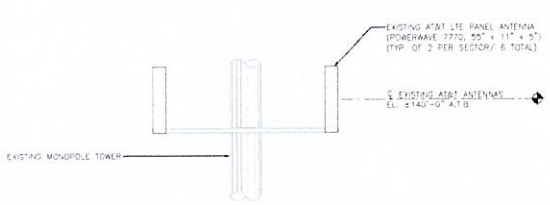
8 C-2 **SURGE ARRESTOR DETAIL**
NOT TO SCALE



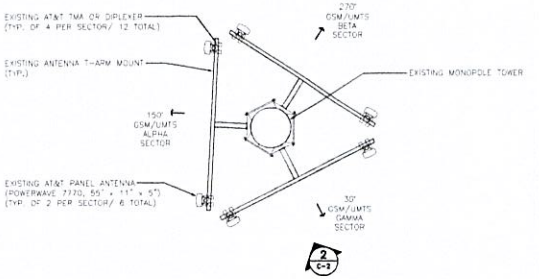
RRU (REMOTE RADIO UNIT)			
EQUIPMENT	DIMENSIONS	WEIGHT	CLEARANCES
MAKE: ERICSSON MODEL: RRUS 11	17.8"L x 17.3"W x 7.2"D	BAND 4: 44 LBS. BAND 12: 50 LBS.	ABOVE: 18" MIN. BELOW: 12" MIN. SIDE: 0" MIN.

NOTES:
1. CONTRACTOR TO COORDINATE FINAL EQUIPMENT MODEL SELECTION WITH AT&T CONSTRUCTION MANAGER PRIOR TO ORDERING.

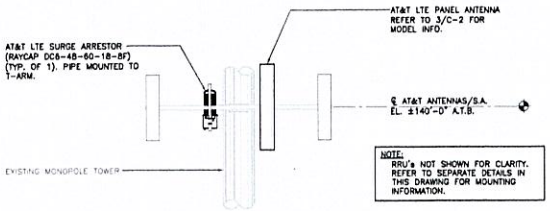
7 C-2 **RRU DETAIL**
NOT TO SCALE



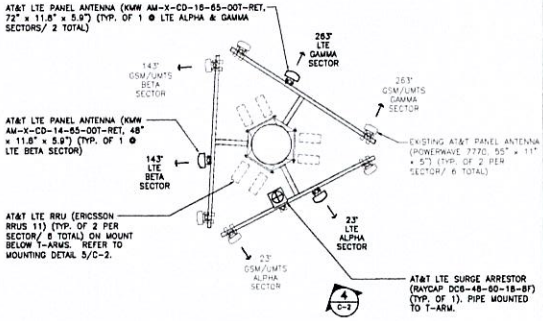
2 C-2 **EXISTING ANTENNA SECTOR ELEVATION**
SCALE: 1/4" = 1'-0"



1 C-2 **EXISTING ANTENNA PLAN**
SCALE: 1/4" = 1'-0"
APPROX. NORTH



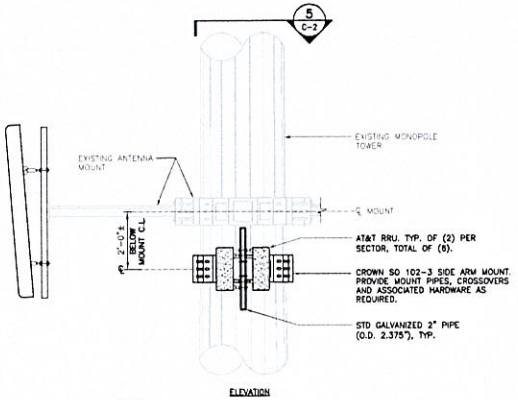
4 C-2 **PROPOSED LTE ANTENNA SECTOR ELEVATION**
SCALE: 1/4" = 1'-0"



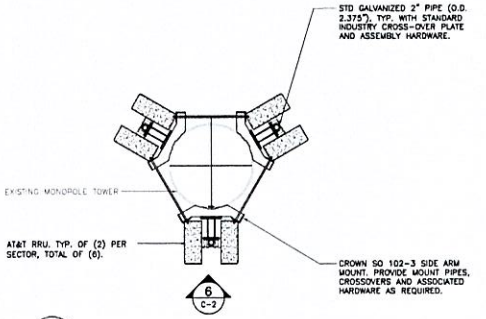
3 C-2 **PROPOSED ANTENNA PLAN**
SCALE: 1/4" = 1'-0"
APPROX. NORTH

NOTE:
1. REFER TO CROWN CASTLE AND FINAL AT&T RF DATA SHEET PRIOR TO INSTALLATION OF TOWER MOUNTED LTE RELATED ANTENNAS, CABLES AND RELATED EQUIPMENT.
2. COORDINATE ANTENNA CENTERLINE ELEVATION, RRU/SURGE ARRESTOR MOUNTING ELEVATION, ATTACHMENT HARDWARE WITH CROWN CASTLE.

NOTES:
1. PAN EXISTING ANTENNAS TO ACQUIRE PROPOSED AZIMUTHS.
2. PROVIDE MOUNTING PIPES, CROSSOVERS & ASSOCIATED HARDWARE TO COMPLETE THE PROPOSED UPGRADE.



6 C-2 **RRU MOUNTING DETAIL**
NOT TO SCALE



5 C-2 **RRU MOUNTING PLAN**
NOT TO SCALE

DESIGNED BY:	HWR
DRAWN BY:	HWR
CHK'D BY:	CFC

REV.	DATE	DRAWN BY	CHK'D BY	
1	10/1/12	HWR	DEB	CONSTRUCTION – CLIENT REVIEW
0	08/16/12	CLT	DEB	CONSTRUCTION – CLIENT REVIEW

PROFESSIONAL ENGINEER SEAL

at&t
NEXLINK
CENTEK engineering
Centered on Solutions
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(203) 488-8587 Fax
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www.CentekEng.com

AT&T MOBILITY
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COLEBROOK
161 PINNEY STREET
WINSTED, CT 06098

DATE:	10/1/12
SCALE:	AS NOTED
JOB NO.	12083.C049

LTE EQUIPMENT DETAILS

C-2

Sheet No. 4 of 5

C Squared Systems, LLC
65 Dartmouth Drive, Unit A3
Auburn, NH 03032
(603) 644-2800
support@csquaredsystems.com

Calculated Radio Frequency Emissions

CT1012

(Pinney Street)

161 Pinney Street, Colebrook, CT 06098

October 2, 2012

Table of Contents

List of Tables

List of Figures

1. Introduction

The purpose of this report is to investigate compliance with applicable FCC regulations for the proposed modifications to the existing AT&T antenna arrays mounted on the monopole tower located at 161 Pinney Street in Colebrook, CT. The coordinates of the tower are 41° 57' 58.89" N, 73° 07' 18.06" W.

AT&T is proposing the following modifications:

1) Install three multi-band (700/850/1900/2100 MHz) antennas for their LTE network (one per sector).

2. FCC Guidelines for Evaluating RF Radiation Exposure Limits

In 1985, the FCC established rules to regulate radio frequency (RF) exposure from FCC licensed antenna facilities. In 1996, the FCC updated these rules, which were further amended in August 1997 by OET Bulletin 65 Edition 97-01. These new rules include Maximum Permissible Exposure (MPE) limits for transmitters operating between 300 kHz and 100 GHz. The FCC MPE limits are based upon those recommended by the National Council on Radiation Protection and Measurements (NCRP), developed by the Institute of Electrical and Electronics Engineers, Inc., (IEEE) and adopted by the American National Standards Institute (ANSI).

The FCC general population/uncontrolled limits set the maximum exposure to which most people may be subjected. General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

Public exposure to radio frequencies is regulated and enforced in units of milliwatts per square centimeter (mW/cm^2). The general population exposure limits for the various frequency ranges are defined in the attached "FCC Limits for Maximum Permissible Exposure (MPE)" in Attachment B of this report.

Higher exposure limits are permitted under the occupational/controlled exposure category, but only for persons who are exposed as a consequence of their employment and who have been made fully aware of the potential for exposure, and they must be able to exercise control over their exposure. General population/uncontrolled limits are five times more stringent than the levels that are acceptable for occupational, or radio frequency trained individuals. Attachment B contains excerpts from OET Bulletin 65 and defines the Maximum Exposure Limit.

Finally, it should be noted that the MPE limits adopted by the FCC for both general population/uncontrolled exposure and for occupational/controlled exposure incorporate a substantial margin of safety and have been established to be well below levels generally accepted as having the potential to cause adverse health effects.

4. Calculation Results

Table 1 below outlines the power density information for the site. Because the proposed AT&T antennas are directional in nature, the majority of the RF power is focused out towards the horizon. As a result, there will be less RF power directed below the antennas relative to the horizon, and consequently lower power density levels around the base of the tower. Please refer to Attachment C for the vertical patterns of the proposed AT&T antennas. The calculated results for AT&T in Table 1 include a nominal 10 dB off-beam pattern loss to account for the lower relative gain below the antennas.

Carrier	Antenna Height (Feet)	Operating Frequency (MHz)	Number of Trans.	ERP Per Transmitter (Watts)	Power Density (mw/cm^2)	Limit	%MPE
Cingular GSM	*137*	*880*	*4*	*296*	*0.0227*	*0.5867*	*3.87%*
Cingular GSM	*137*	*1900*	*2*	*427*	*0.0164*	*1.0000*	*1.64%*
Cingular UMTS	*137*	*880*	*1*	*500*	*0.0096*	*0.5867*	*1.63%*
Sprint	147	1962.5	11	250	0.0458	1.0000	4.58%
Verizon PCS	130	1970	7	281	0.0419	1.0000	4.19%
Verizon cellular	130	869	9	305	0.0584	0.5793	10.08%
Verizon AWS	130	2145	1	702	0.0149	1.0000	1.49%
Verizon LTE	130	698	2	636	0.0271	0.4653	5.82%
AT&T UMTS	140	880	2	565	0.0021	0.5867	0.35%
AT&T UMTS	140	1900	2	875	0.0032	1.0000	0.32%
AT&T LTE	140	734	1	1313	0.0024	0.4893	0.49%
AT&T GSM	140	880	1	283	0.0005	0.5867	0.09%
AT&T GSM	140	1900	4	525	0.0039	1.0000	0.39%
						Total	**27.79%**

Table 1: Carrier Information[1] [2] [3]

[1] The existing CSC filing for Cingular should be removed and replaced with the updated AT&T technologies and values provided in Table 1. The power density information for carriers other than AT&T was taken directly from the CSC database dated 7/26/2012. Please note that %MPE values listed are rounded to two decimal points. The total %MPE listed is a summation of each unrounded contribution. Therefore, summing each rounded value may not reflect the total value listed in the table.

[2] In the case where antenna models are not uniform across all 3 sectors for the same frequency band, the antenna model with the highest gain was used for the calculations to present a worse-case scenario.

[3] Antenna height listed for AT&T is in reference to the Paul J Ford & Company Structural Analysis dated August 14, 2012.

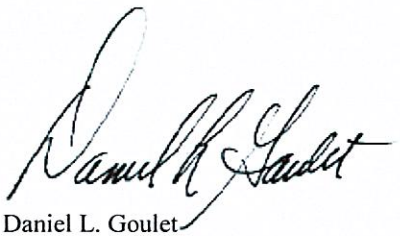
5. Conclusion

The above analysis verifies that emissions from the existing site will be below the maximum power density levels as outlined by the FCC in the OET Bulletin 65 Ed. 97-01. Even when using conservative methods, the cumulative power density from the proposed transmit antennas at the existing facility is well below the limits for the general public. The highest expected percent of Maximum Permissible Exposure at ground level is **27.79% of the FCC limit**.

As noted previously, obstructions (trees, buildings, etc.) that would normally attenuate the signal are not taken into account. As a result, the predicted signal levels are more conservative (higher) than the actual signal levels will be from the finished modifications.

6. Statement of Certification

I certify to the best of my knowledge that the statements in this report are true and accurate. The calculations follow guidelines set forth in ANSI/IEEE Std. C95.3, ANSI/IEEE Std. C95.1 and FCC OET Bulletin 65 Edition 97-01.



Daniel L. Goulet
C Squared Systems, LLC

October 2, 2012
Date

Attachment A: References

OET Bulletin 65 - Edition 97-01 - August 1997 Federal Communications Commission Office of Engineering & Technology

ANSI C95.1-1982, American National Standard Safety Levels With Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 300 kHz to 100 GHz. IEEE-SA Standards Board

IEEE Std C95.3-1991 (Reaff 1997), IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave. IEEE-SA Standards Board

Attachment B: FCC Limits for Maximum Permissible Exposure (MPE)

(A) Limits for Occupational/Controlled Exposure[4]

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (E) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $|E|^2$, $|H|^2$ or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	($900/f^2$)*	6
30-300	61.4	0.163	1.0	6
300-1500	-	-	f/300	6
1500-100,000	-	-	5	6

(B) Limits for General Population/Uncontrolled Exposure[5]

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (E) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $|E|^2$, $|H|^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	($180/f^2$)*	30
30-300	27.5	0.073	0.2	30
300-1500	-	-	f/1500	30
1500-100,000	-	-	1.0	30

f = frequency in MHz * Plane-wave equivalent power density

Table 2: FCC Limits for Maximum Permissible Exposure (MPE)

[4] Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

[5] General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

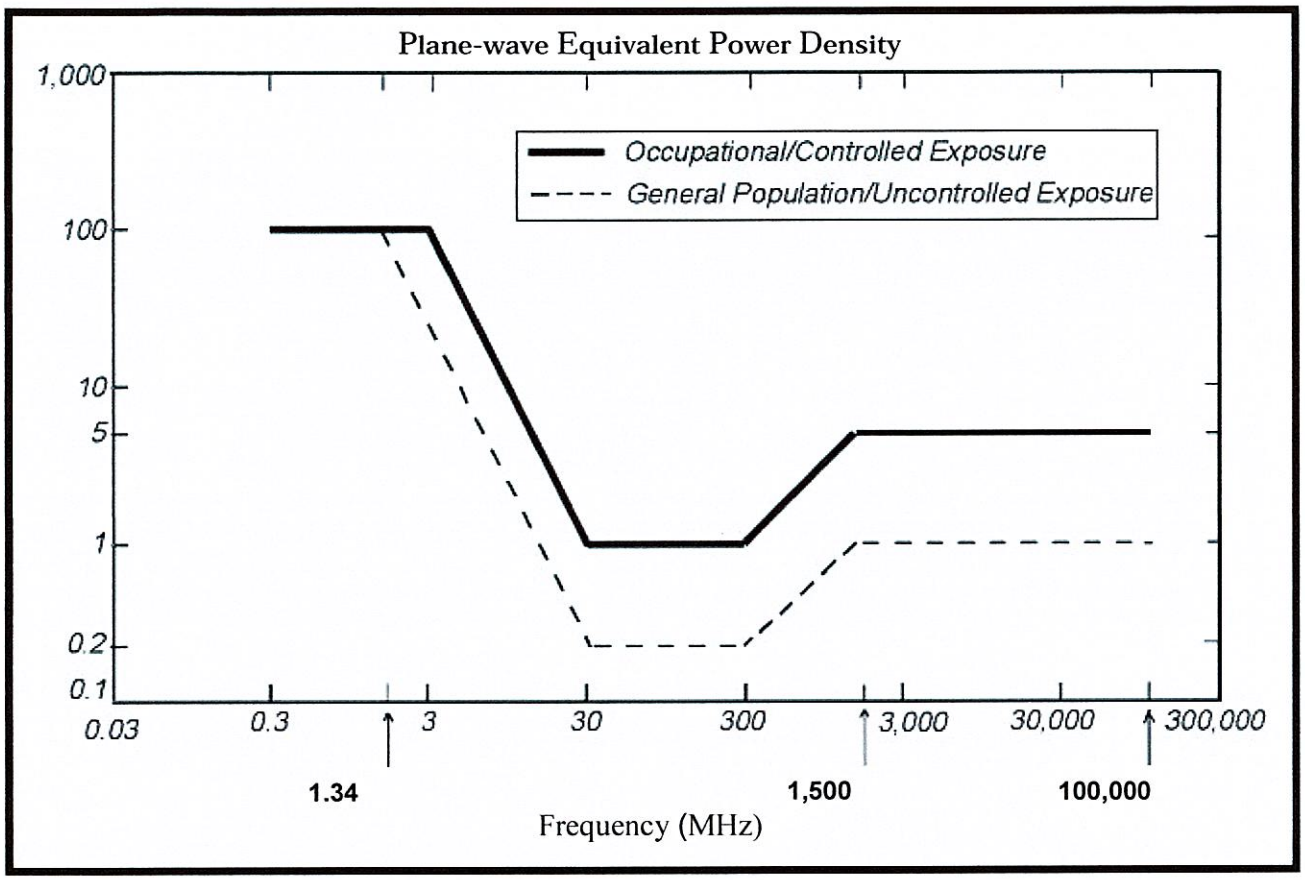
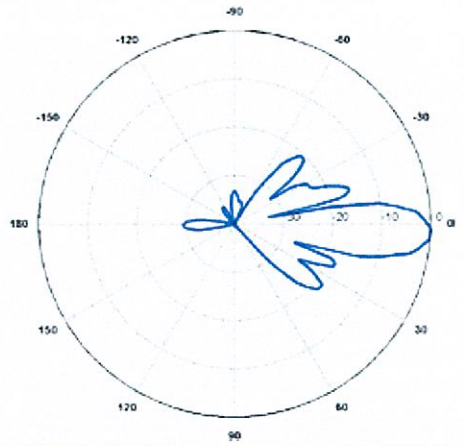


Figure 1: Graph of FCC Limits for Maximum Permissible Exposure (MPE)

Attachment C: AT&T Antenna Data Sheets and Electrical Patterns

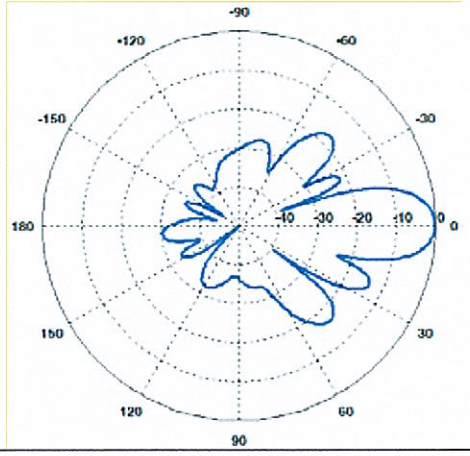
700 MHz

Manufacturer:	KMW
Model #:	AM-X-CD-16-65-00T-RET
Frequency Band:	698-806 MHz
Gain:	13.4 dBd
Vertical Beamwidth:	12.3°
Horizontal Beamwidth:	65°
Polarization:	Dual Slant ± 45°
Size L x W x D:	72.0" x 11.8" x 5.9"



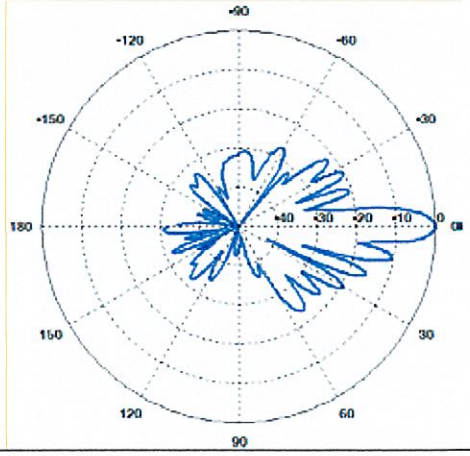
850 MHz

Manufacturer:	Powerwave
Model #:	7770.00
Frequency Band:	824-896 MHz
Gain:	11.5 dBd
Vertical Beamwidth:	15°
Horizontal Beamwidth:	82°
Polarization:	Dual Linear ± 45°
Size L x W x D:	55.0" x 11.0" x 5.0"



1900 MHz

Manufacturer:	Powerwave
Model #:	7770.00
Frequency Band:	1850-1990 MHz
Gain:	13.4 dBd
Vertical Beamwidth:	7°
Horizontal Beamwidth:	86°
Polarization:	Dual Linear ± 45°
Size L x W x D:	55.0" x 11.0" x 5.0"



3. RF Exposure Prediction Methods

The emission field calculation results displayed in the following figures were generated using the following formula as outlined in FCC bulletin OET 65:

$$\text{Power Density} = \left(\frac{1.6^2 \times EIRP}{4\pi \times R^2} \right) \text{x Off Beam Loss}$$

Where:

EIRP = Effective Isotropic Radiated Power

R = Radial Distance = $\sqrt{(H^2 + V^2)}$

H = Horizontal Distance from antenna in meters

V = Vertical Distance from radiation center of antenna in meters

Ground reflection factor of 1.6

Off Beam Loss is determined by the selected antenna pattern

These calculations assume that the antennas are operating at 100 percent capacity and power, and that all channels are transmitting simultaneously. Obstructions (trees, buildings, etc.) that would normally attenuate the signal are not taken into account. The calculations assume even terrain in the area of study and do not take into account actual terrain elevations which could attenuate the signal. As a result, the predicted signal levels reported below are much higher than the actual signal levels will be from the finished modifications.

PAUL J. FORD AND COMPANY
STRUCTURAL ENGINEERS
250 East Broad Street • Suite 1500 • Columbus, Ohio 43215-3708

Date: **August 14, 2012**

Eva Morales
Crown Castle USA Inc.
3530 Toringdon Way, Suite 300
Charlotte, NC 28277
704.405.6612

Paul J. Ford and Company
250 East Broad Street, Suite 1500
Columbus, Ohio 43215
614.221.6679
kmahlum@pjfweb.com

Subject: **Structural Analysis Report**

Carrier Designation:	*AT&T Mobility* Co-Locate **Carrier Site Number:** **Carrier Site Name:**	 CT1012 PINNEY STREET
Crown Castle Designation:	**Crown Castle BU Number:** **Crown Castle Site Name:**	876377 HORTON 2 / FREDSALL
PROPERTY	**Crown Castle JDE Job Number:** **Crown Castle Work Order Number:** **Crown Castle Application Number:**	199136 519445 157742 Rev. 1
Engineering Firm Designation:	**Paul J. Ford Project Number:**	37512-1619 R1
Site Data:	161 Pinney Street, COLEBROOK, Litchfield County, CT Latitude *41° 57' 58.57"*, Longitude *-73° 7' 19.65"* 148 Foot - **Monopole Tower**	

Dear Eva Morales,

Paul J. Ford 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 481671, in accordance with application 157742, revision 1.

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

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

The structural analysis was performed for this tower in accordance with the requirements of TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures and 2005 CT State Building Code using a fastest mile wind speed of 80 mph with no ice, 28.1 mph with 1 inch ice thickness and 50 mph under service loads.

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

Respectfully submitted by:

Kevin Mahlum, E.I.
Structural Engineer

tnxTower Report - version 6.0.3.0

STATE OF CONNECTICUT
JOSEPH PACHICARAH JACOBS
No. PEN 22731
LICENSED PROFESSIONAL ENGINEER
AUG 15 2012

PAUL J. FORD AND COMPANY
STRUCTURAL ENGINEERS
250 East Broad Street • Suite 1500 • Columbus, Ohio 43215-3708

Date: **August 14, 2012**

Eva Morales
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Charlotte, NC 28277
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Subject: **Structural Analysis Report**

Carrier Designation:	***AT&T Mobility* Co-Locate**	
	Carrier Site Number:	CT1012
	Carrier Site Name:	PINNEY STREET
Crown Castle Designation:	**Crown Castle BU Number:**	876377
	Crown Castle Site Name:	HORTON 2 / FREDSALL
PROPERTY		
	Crown Castle JDE Job Number:	199136
	Crown Castle Work Order Number:	519445
	Crown Castle Application Number:	157742 Rev. 1
Engineering Firm Designation:	**Paul J. Ford Project Number:**	37512-1619 R1
Site Data:	**161 Pinney Street, COLEBROOK, Litchfield County, CT** **Latitude *41° 57' 58.57"*, Longitude *-73° 7' 19.65"*** **148 Foot - Monopole Tower**	

Dear Eva Morales,

Paul J. Ford 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 481671, in accordance with application 157742, revision 1.

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

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

The structural analysis was performed for this tower in accordance with the requirements of TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures and 2005 CT State Building Code using a fastest mile wind speed of 80 mph with no ice, 28.1 mph with 1 inch ice thickness and 50 mph under service loads.

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

Respectfully submitted by:

Kevin Mahlum, E.I.
Structural Engineer

tnxTower Report - version 6.0.3.0

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 148 ft Monopole tower designed by SUMMIT in September of 2000. The tower was originally designed for a wind speed of 85 mph per TIA/EIA-222-F.

2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures and 2005 CT State Building Code using a fastest mile wind speed of 80 mph with no ice, 28.1 mph with 1 inch ice thickness and 50 mph under service loads.

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
140.0	140.0	1	kmw communications	AM-X-CD-14-65-00T-RET w/ Pipe	3	3/8	-
		2		AM-X-CD-16-65-00T-RET w/ Pipe			
		1	raycap	DC6-48-60-18-8F			
138.0	138.0	6	ericsson	RRUS-11			
		1	tower mounts	Side Arm Mount [SO 102-3]			

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
150.0	148.0	3	alcatel lucent	1900MHz RRH (65MHz)	3	1-1/4	2
		3		800 EXTERNAL NOTCH FILTER			
		3		800MHZ RRH			
		9	rfs celwave	ACU-A20-N			
		3		APXVSPP18-C-A20 w/ Pipe			
		1	tower mounts	Miscellaneous (NA507-1)			
		6	decibel	DB980H90E-M w/ Pipe	6	1-5/8	3
		1	tower mounts	Platform Mount [LP 401-1]	-	-	1
140.0	140.0	6	powerwave technologies	7770.00 w/ Pipe	12	1-5/8	1
		6		LGP 17201			
		6		LGP21901			
		1	tower mounts	T-Arm Mount [TA 602-3]			
130.0	130.0	3	antel	BXA-171085-12BF-EDIN-2 w/ Pipe	-	-	2
		1		BXA-70080-6CF-EDIN-6 w/ Pipe			
		2		BXA-70080/6CF w/ Pipe			
		2		LPA-80080-6CF-EDIN-6 w/ Pipe			
		6	rfs celwave	FD9R6004/2C-3L			
		2	antel	LPA-80080/6CF w/ Pipe	-	-	3
		6		LPA-185080/12CFx2 w/ Pipe			
		4		LPA-80080/6CF w/ Pipe	12	1-5/8	1
		1	tower mounts	Platform Mount [LP 305-1]			
100.0	102.0	1	lucent	KS24019-L112A	1	1/2	1
	100.0	1	tower mounts	Side Arm Mount [SO 701-1]			

Notes:
1) Existing Equipment
2) Reserved Equipment
3) Equipment to be Removed

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	SEA Cpmsultants, 99674.03-A, 09/05/2000	1532992	CCISITES
4-POST-MODIFICATION INSPECTION	PJF, 41708-0177_Record, 02/11/2009	2385953	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	PJF/Summit, 29200-1364/11163, 09/11/2000	1629428	CCISITES
4-TOWER MANUFACTURER DRAWINGS	PJF/Summit, 29200-1364/11163, 09/11/2000	1883532	CCISITES

3.1) Analysis Method

tnxTower (version 6.0.3.0), 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.
4) Monopole was reinforced in conformance with the referenced modification drawings

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

4) ANALYSIS RESULTS

Table 4 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	148 - 117.25	Pole	TP27.227x22x0.1875	1	-6.75	755.23	55.9	Pass
L2	117.25 - 97.25	Pole	TP30.2515x26.2571x0.25	2	-9.45	1142.41	79.1	Pass
L3	97.25 - 80.75	Pole	TP33.056x30.2515x0.443	3	-11.60	2049.74	55.7	Pass
L4	80.75 - 40	Pole	TP39.483x31.4476x0.4385	4	-20.07	2447.21	75.2	Pass
L5	40 - 13.25	Pole	TP43.4677x37.7133x0.4502	5	-28.31	2845.69	82.5	Pass
L6	13.25 - 12.75	Pole	TP43.5527x43.4677x0.4516	6	-28.44	2827.21	83.3	Pass
L7	12.75 - 5.3333	Pole	TP44.8134x43.5527x0.4254	7	-30.21	2838.90	86.6	Pass
L8	5.3333 - 4.75	Pole	TP44.9126x44.8134x0.4467	8	-30.36	2888.05	85.5	Pass
L9	4.75 - 0	Pole	TP45.72x44.9126x0.4425	9	-31.56	2947.77	85.9	Pass
							Summary	
						Pole (L7)	86.6	Pass
						Rating =	86.6	Pass

Table 5 - Tower Component Stresses vs. Capacity – LC7

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	90.4	Pass
1	Base Plate	0	78.4	Pass
1	Base Foundation Steel Interaction	0	91.4	Pass
1, 2	Base Foundation Soil Interaction	0	92.3	Pass

Structure Rating (max from all components) =	92.3%

Notes:

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

2) According to the procedures prescribed and agreed to by the Crown Castle Engineering Foundation Committee, held in January 2010, the existing caisson foundation was analyzed using the methodology in the software 'PLS-Caisson' (Version 8.10, or newer, by Power Line Systems, Inc.). Per the methods in PLS-Caisson, the soil reactions of cohesive soils are calculated using 8CD independent of the depth of the soil layer. The depth of soil to be ignored at the top of the caisson is the greater of the geotechnical report's recommendation, the frost depth of the site or half of the caisson diameter.

APPENDIX A

TNXTOWER OUTPUT

Tower Input Data

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

Tower is located in Litchfield County, Connecticut.
Basic wind speed of 80 mph.
Nominal ice thickness of 1.0000 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 28 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.333.
Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

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

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	148.0000-117.2500	30.7500	3.50	18	22.0000	27.2270	0.1875	0.7500	A572-60 (60 ksi)
L2	117.2500-97.2500	23.5000	0.00	18	26.2571	30.2514	0.2500	1.0000	A572-60 (60 ksi)
L3	97.2500-80.7500	16.5000	4.25	18	30.2514	33.0560	0.4430	1.7721	Reinf 57.15 ksi (57 ksi)
L4	80.7500-40.0000	45.0000	5.00	18	31.4476	39.4830	0.4385	1.7538	Reinf 57.63 ksi (58 ksi)
L5	40.0000-13.2500	31.7500	0.00	18	37.7133	43.4677	0.4502	1.8009	Reinf 57.88 ksi (58 ksi)
L6	13.2500-12.7500	0.5000	0.00	18	43.4677	43.5527	0.4516	1.8063	Reinf 57.22 ksi (57 ksi)
L7	12.7500-	7.4167	0.00	18	43.5527	44.8134	0.4254	1.7017	Reinf 59.22 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
	5.3333								(59 ksi)
L8	5.3333-4.7500	0.5833	0.00	18	44.8134	44.9126	0.4467	1.7867	Reinf 57.28 ksi (57 ksi)
L9	4.7500-0.0000	4.7500		18	44.9126	45.7200	0.4425	1.7699	Reinf 57.96 ksi (58 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	22.3394	12.9812	780.3007	7.7434	11.1760	69.8193	1561.6281	6.4918	3.5420	18.891
	27.6470	16.0919	1486.4203	9.5990	13.8313	107.4677	2974.7964	8.0475	4.4620	23.797
L2	27.2662	20.6366	1763.4291	9.2325	13.3386	132.2051	3529.1786	10.3203	4.1812	16.725
	30.7181	23.8062	2707.1425	10.6505	15.3677	176.1575	5417.8471	11.9053	4.8843	19.537
L3	30.7181	41.9159	4705.3765	10.5820	15.3677	306.1854	9416.9444	20.9619	4.5445	10.258
	33.5659	45.8596	6162.3812	11.5776	16.7924	366.9734	12332.871 1	22.9342	5.0381	11.372
L4	32.7033	43.1535	5242.4244	11.0082	15.9754	328.1569	10491.747 0	21.5809	4.7631	10.863
	40.0921	54.3360	10465.156 1	13.8608	20.0574	521.7613	20944.082 6	27.1731	6.1773	14.089
L5	39.2152	53.2488	9341.2384	13.2284	19.1583	487.5807	18694.768 2	26.6295	5.8451	12.983
	44.1382	61.4719	14371.544 6	15.2712	22.0816	650.8386	28761.999 6	30.7418	6.8579	15.232
L6	44.1382	61.6556	14413.590 2	15.2707	22.0816	652.7427	28846.146 2	30.8337	6.8555	15.181
	44.2245	61.7774	14499.193 0	15.3009	22.1248	655.3380	29017.464 5	30.8946	6.8705	15.214
L7	44.2245	58.2354	13684.454 2	15.3102	22.1248	618.5132	27386.914 8	29.1232	6.9165	16.258
	45.5047	59.9377	14919.993 3	15.7577	22.7652	655.3856	29859.618 8	29.9746	7.1384	16.779
L8	45.5047	62.9001	15642.411 7	15.7502	22.7652	687.1191	31305.406 2	31.4560	7.1010	15.898
	45.6054	63.0407	15747.518 4	15.7854	22.8156	690.2090	31515.757 8	31.5263	7.1185	15.937
L9	45.6054	62.4552	15604.208 7	15.7869	22.8156	683.9278	31228.949 8	31.2335	7.1258	16.104
	46.4253	63.5892	16469.708 5	16.0735	23.2258	709.1139	32961.088 2	31.8006	7.2680	16.425

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
L1 148.0000-117.2500				1	1	1		
L2 117.2500-97.2500				1	1	1		
L3 97.2500-80.7500				1	1	1		
L4 80.7500-40.0000				1	1	1		
L5 40.0000-13.2500				1	1	1		
L6 13.2500-12.7500				1	1	1		
L7 12.7500-5.3333				1	1	1		
L8 5.3333-4.7500				1	1	1		
L9 4.7500-				1	1	1		

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals
ft	ft^2	in					in	in
0.0000								

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
HB114-1-0813U4-M5J(1 1/4")	C	No	Inside Pole	148.0000 - 0.0000	3	No Ice	0.0000	1.20
						1/2" Ice	0.0000	1.20
						1" Ice	0.0000	1.20
						2" Ice	0.0000	1.20
						4" Ice	0.0000	1.20
***								
LCF158-50A(1-5/8")	C	No	Inside Pole	140.0000 - 0.0000	12	No Ice	0.0000	0.80
						1/2" Ice	0.0000	0.80
						1" Ice	0.0000	0.80
						2" Ice	0.0000	0.80
						4" Ice	0.0000	0.80
FB-L98B-002-75000(3/8")	C	No	Inside Pole	140.0000 - 0.0000	1	No Ice	0.0000	0.06
						1/2" Ice	0.0000	0.06
						1" Ice	0.0000	0.06
						2" Ice	0.0000	0.06
						4" Ice	0.0000	0.06
WR-VG122ST-BRDA(3/8)	C	No	CaAa (Out Of Face)	140.0000 - 0.0000	1	No Ice	0.0000	0.20
						1/2" Ice	0.0000	0.74
						1" Ice	0.0000	1.89
						2" Ice	0.0000	6.03
						4" Ice	0.0000	21.63
WR-VG122ST-BRDA(3/8)	C	No	CaAa (Out Of Face)	140.0000 - 0.0000	1	No Ice	0.0385	0.20
						1/2" Ice	0.1385	0.74
						1" Ice	0.2385	1.89
						2" Ice	0.4385	6.03
						4" Ice	0.8385	21.63
***								
LDF7-50A(1-5/8")	C	No	Inside Pole	130.0000 - 0.0000	12	No Ice	0.0000	0.82
						1/2" Ice	0.0000	0.82
						1" Ice	0.0000	0.82
						2" Ice	0.0000	0.82
						4" Ice	0.0000	0.82
***								
LDF4-50A(1/2")	C	No	Inside Pole	100.0000 - 0.0000	1	No Ice	0.0000	0.15
						1/2" Ice	0.0000	0.15
						1" Ice	0.0000	0.15
						2" Ice	0.0000	0.15
						4" Ice	0.0000	0.15
***								
LDF4-50A(1/2")	C	No	Inside Pole	8.2500 - 0.0000	1	No Ice	0.0000	0.15
						1/2" Ice	0.0000	0.15
						1" Ice	0.0000	0.15
						2" Ice	0.0000	0.15
						4" Ice	0.0000	0.15
***								
Aero MP3-05	C	No	CaAa (Out Of	99.5000 - 0.0000	1	No Ice	0.3478	0.00

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
			Face)			1/2" Ice	0.4001	0.00
						1" Ice	0.6566	0.00
						2" Ice	0.8788	0.00
						4" Ice	1.3232	0.00
******								

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 K
L1	148.0000-117.2500	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.876	0.46
L2	117.2500-97.2500	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	1.553	0.47
L3	97.2500-80.7500	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	6.374	0.39
L4	80.7500-40.0000	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	15.742	0.96
L5	40.0000-13.2500	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	10.333	0.63
L6	13.2500-12.7500	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.193	0.01
L7	12.7500-5.3333	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	2.865	0.18
L8	5.3333-4.7500	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.225	0.01
L9	4.7500-0.0000	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	1.835	0.11

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 K
L1	148.0000-117.2500	A	1.181	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	6.250	0.58
L2	117.2500-97.2500	A	1.152	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	7.063	0.57
L3	97.2500-80.7500	A	1.126	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	15.648	0.46
L4	80.7500-40.0000	A	1.075	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	38.646	1.14
L5	40.0000-13.2500	A	1.000	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	24.787	0.74
L6	13.2500-12.7500	A	1.000	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.448	0.01
L7	12.7500-5.3333	A	1.000	0.000	0.000	0.000	0.000	0.00

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 K
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	6.638	0.20
L8	5.3333-4.7500	A	1.000	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.522	0.02
L9	4.7500-0.0000	A	1.000	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	4.252	0.13

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	148.0000-117.2500	-0.0375	0.0217	-0.2271	0.1311
L2	117.2500-97.2500	-0.1003	0.0579	-0.3770	0.2176
L3	97.2500-80.7500	-0.4377	0.2527	-0.8611	0.4972
L4	80.7500-40.0000	-0.4443	0.2565	-0.8925	0.5153
L5	40.0000-13.2500	-0.4509	0.2603	-0.9096	0.5252
L6	13.2500-12.7500	-0.4535	0.2618	-0.8994	0.5192
L7	12.7500-5.3333	-0.4542	0.2622	-0.9025	0.5210
L8	5.3333-4.7500	-0.4548	0.2626	-0.9055	0.5228
L9	4.7500-0.0000	-0.4552	0.2628	-0.9076	0.5240

Discrete Tower Loads

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 K
Platform Mount [LP 401-1]	C	None		0.0000	148.0000	No Ice	24.3300	24.3300	1.65
						1/2" Ice	30.2200	30.2200	2.03
						1" Ice	36.1100	36.1100	2.41
						2" Ice	47.8900	47.8900	3.18
						4" Ice	71.4500	71.4500	4.72
***									
APXVSPP18-C-A20 w/ Mount Pipe	A	From Face	4.0000 0.00 -2.00	0.0000	150.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.4975 9.1490 9.7672 11.0311 13.6786	6.9458 8.1266 9.0212 10.8440 14.8507	0.08 0.15 0.22 0.41 0.91
APXVSPP18-C-A20 w/ Mount Pipe	B	From Face	4.0000 0.00 -2.00	0.0000	150.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.4975 9.1490 9.7672 11.0311 13.6786	6.9458 8.1266 9.0212 10.8440 14.8507	0.08 0.15 0.22 0.41 0.91
APXVSPP18-C-A20 w/ Mount Pipe	C	From Face	4.0000 0.00 -2.00	0.0000	150.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.4975 9.1490 9.7672 11.0311 13.6786	6.9458 8.1266 9.0212 10.8440 14.8507	0.08 0.15 0.22 0.41 0.91
1900MHz RRH (65MHz)	A	From Face	4.0000 0.00	0.0000	150.0000	No Ice 1/2"	2.6979 2.9362	2.7708 3.0111	0.06 0.08

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			-2.00			Ice	3.1832	3.2600	0.11
						1" Ice	3.7030	3.7837	0.18
						2" Ice	4.8463	4.9348	0.35
						4" Ice			
1900MHz RRH (65MHz)	B	From Face	4.0000	0.0000	150.0000	No Ice	2.6979	2.7708	0.06
			0.00			1/2"	2.9362	3.0111	0.08
			-2.00			Ice	3.1832	3.2600	0.11
						1" Ice	3.7030	3.7837	0.18
						2" Ice	4.8463	4.9348	0.35
						4" Ice			
1900MHz RRH (65MHz)	C	From Face	4.0000	0.0000	150.0000	No Ice	2.6979	2.7708	0.06
			0.00			1/2"	2.9362	3.0111	0.08
			-2.00			Ice	3.1832	3.2600	0.11
						1" Ice	3.7030	3.7837	0.18
						2" Ice	4.8463	4.9348	0.35
						4" Ice			
(3) ACU-A20-N	A	From Face	4.0000	0.0000	150.0000	No Ice	0.0778	0.1361	0.00
			0.00			1/2"	0.1210	0.1890	0.00
			-2.00			Ice	0.1728	0.2506	0.00
						1" Ice	0.3025	0.3997	0.01
						2" Ice	0.6654	0.8015	0.04
						4" Ice			
(3) ACU-A20-N	B	From Face	4.0000	0.0000	150.0000	No Ice	0.0778	0.1361	0.00
			0.00			1/2"	0.1210	0.1890	0.00
			-2.00			Ice	0.1728	0.2506	0.00
						1" Ice	0.3025	0.3997	0.01
						2" Ice	0.6654	0.8015	0.04
						4" Ice			
(3) ACU-A20-N	C	From Face	4.0000	0.0000	150.0000	No Ice	0.0778	0.1361	0.00
			0.00			1/2"	0.1210	0.1890	0.00
			-2.00			Ice	0.1728	0.2506	0.00
						1" Ice	0.3025	0.3997	0.01
						2" Ice	0.6654	0.8015	0.04
						4" Ice			
800MHZ RRH	A	From Face	4.0000	0.0000	150.0000	No Ice	2.4899	2.0685	0.05
			0.00			1/2"	2.7061	2.2705	0.07
			-2.00			Ice	2.9310	2.4812	0.10
						1" Ice	3.4068	2.9284	0.16
						2" Ice	4.4620	3.9265	0.32
						4" Ice			
800MHZ RRH	B	From Face	4.0000	0.0000	150.0000	No Ice	2.4899	2.0685	0.05
			0.00			1/2"	2.7061	2.2705	0.07
			-2.00			Ice	2.9310	2.4812	0.10
						1" Ice	3.4068	2.9284	0.16
						2" Ice	4.4620	3.9265	0.32
						4" Ice			
800MHZ RRH	C	From Face	4.0000	0.0000	150.0000	No Ice	2.4899	2.0685	0.05
			0.00			1/2"	2.7061	2.2705	0.07
			-2.00			Ice	2.9310	2.4812	0.10
						1" Ice	3.4068	2.9284	0.16
						2" Ice	4.4620	3.9265	0.32
						4" Ice			
800 EXTERNAL NOTCH FILTER	A	From Face	4.0000	0.0000	150.0000	No Ice	0.7701	0.3747	0.01
			0.00			1/2"	0.8898	0.4647	0.02
			-2.00			Ice	1.0181	0.5634	0.02
						1" Ice	1.3007	0.7868	0.04
						2" Ice	1.9696	1.3372	0.11
						4" Ice			
800 EXTERNAL NOTCH FILTER	B	From Face	4.0000	0.0000	150.0000	No Ice	0.7701	0.3747	0.01
			0.00			1/2"	0.8898	0.4647	0.02
			-2.00			Ice	1.0181	0.5634	0.02
						1" Ice	1.3007	0.7868	0.04
						2" Ice	1.9696	1.3372	0.11
						4" Ice			
800 EXTERNAL NOTCH	C	From Face	4.0000	0.0000	150.0000	No Ice	0.7701	0.3747	0.01

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment ° 	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
FILTER			0.00 -2.00			1/2" Ice 1" Ice 2" Ice 4" Ice	0.8898 1.0181 1.3007 1.9696	0.4647 0.5634 0.7868 1.3372	0.02 0.02 0.04 0.11
Miscellaneous (NA507-1)	C	From Face	4.0000 0.00 -2.00	0.0000	150.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.8000 6.7000 8.6000 12.4000 20.0000	4.8000 6.7000 8.6000 12.4000 20.0000	0.25 0.29 0.34 0.44 0.64
**									
**									
***									
(2) 7770.00 w/ Mount Pipe	A	From Face	4.0000 0.00 0.00	0.0000	140.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.1194 6.6258 7.1283 8.1643 10.3599	4.2543 5.0137 5.7109 7.1553 10.4117	0.06 0.10 0.16 0.29 0.66
(2) 7770.00 w/ Mount Pipe	B	From Face	4.0000 0.00 0.00	0.0000	140.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.1194 6.6258 7.1283 8.1643 10.3599	4.2543 5.0137 5.7109 7.1553 10.4117	0.06 0.10 0.16 0.29 0.66
(2) 7770.00 w/ Mount Pipe	C	From Face	4.0000 0.00 0.00	0.0000	140.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.1194 6.6258 7.1283 8.1643 10.3599	4.2543 5.0137 5.7109 7.1553 10.4117	0.06 0.10 0.16 0.29 0.66
(2) LGP 17201	A	From Face	4.0000 0.00 0.00	0.0000	140.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.9460 2.1337 2.3301 2.7488 3.6900	0.5180 0.6396 0.7699 1.0564 1.7331	0.03 0.04 0.06 0.09 0.19
(2) LGP 17201	B	From Face	4.0000 0.00 0.00	0.0000	140.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.9460 2.1337 2.3301 2.7488 3.6900	0.5180 0.6396 0.7699 1.0564 1.7331	0.03 0.04 0.06 0.09 0.19
(2) LGP 17201	C	From Face	4.0000 0.00 0.00	0.0000	140.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.9460 2.1337 2.3301 2.7488 3.6900	0.5180 0.6396 0.7699 1.0564 1.7331	0.03 0.04 0.06 0.09 0.19
(2) LGP21901	A	From Face	4.0000 0.00 0.00	0.0000	140.0000	No Ice 1/2" Ice Ice 1" Ice 2" Ice 4" Ice	0.2695 0.3432 0.4255 0.6160 1.1009	0.1838 0.2483 0.3216 0.4940 0.9425	0.01 0.01 0.01 0.02 0.07
(2) LGP21901	B	From Face	4.0000 0.00 0.00	0.0000	140.0000	No Ice 1/2" Ice Ice 1" Ice 2" Ice 4" Ice	0.2695 0.3432 0.4255 0.6160 1.1009	0.1838 0.2483 0.3216 0.4940 0.9425	0.01 0.01 0.01 0.02 0.07
(2) LGP21901	C	From Face	4.0000 0.00 0.00	0.0000	140.0000	No Ice 1/2" Ice Ice	0.2695 0.3432 0.4255	0.1838 0.2483 0.3216	0.01 0.01 0.01

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						1" Ice	0.6160	0.4940	0.02
						2" Ice	1.1009	0.9425	0.07
						4" Ice			
T-Arm Mount [TA 602-3]	C	None		0.0000	140.0000	No Ice	11.5900	11.5900	0.77
						1/2" Ice	15.4400	15.4400	0.99
						1" Ice	19.2900	19.2900	1.21
						2" Ice	26.9900	26.9900	1.64
						4" Ice	42.3900	42.3900	2.50
AM-X-CD-16-65-00T-RET w/ Mount Pipe	A	From Leg	4.0000 0.00 0.00	0.0000	140.0000	No Ice	8.4975	6.3042	0.07
						1/2" Ice	9.1490	7.4790	0.14
						1" Ice	9.7672	8.3676	0.21
						2" Ice	11.0311	10.1785	0.38
						4" Ice	13.6786	14.0237	0.87
AM-X-CD-14-65-00T-RET w/ Mount Pipe	B	From Leg	4.0000 0.00 0.00	0.0000	140.0000	No Ice	5.7442	4.0153	0.03
						1/2" Ice	6.1977	4.6330	0.08
						1" Ice	6.6606	5.2765	0.13
						2" Ice	7.6178	6.6779	0.25
						4" Ice	9.6678	9.7441	0.61
AM-X-CD-16-65-00T-RET w/ Mount Pipe	C	From Leg	4.0000 0.00 0.00	0.0000	140.0000	No Ice	8.4975	6.3042	0.07
						1/2" Ice	9.1490	7.4790	0.14
						1" Ice	9.7672	8.3676	0.21
						2" Ice	11.0311	10.1785	0.38
						4" Ice	13.6786	14.0237	0.87
DC6-48-60-18-8F	B	From Leg	4.0000 0.00 0.00	0.0000	140.0000	No Ice	2.5667	2.5667	0.02
						1/2" Ice	2.7978	2.7978	0.04
						1" Ice	3.0377	3.0377	0.07
						2" Ice	3.5432	3.5432	0.13
						4" Ice	4.6580	4.6580	0.30
***									
(2) RRUS-11	A	From Leg	2.0000 0.00 0.00	0.0000	138.0000	No Ice	4.4236	1.1855	0.05
						1/2" Ice	4.7079	1.3512	0.07
						1" Ice	5.0009	1.5256	0.10
						2" Ice	5.6127	1.9002	0.17
						4" Ice	6.9402	2.7532	0.36
(2) RRUS-11	B	From Leg	2.0000 0.00 0.00	0.0000	138.0000	No Ice	4.4236	1.1855	0.05
						1/2" Ice	4.7079	1.3512	0.07
						1" Ice	5.0009	1.5256	0.10
						2" Ice	5.6127	1.9002	0.17
						4" Ice	6.9402	2.7532	0.36
(2) RRUS-11	C	From Leg	2.0000 0.00 0.00	0.0000	138.0000	No Ice	4.4236	1.1855	0.05
						1/2" Ice	4.7079	1.3512	0.07
						1" Ice	5.0009	1.5256	0.10
						2" Ice	5.6127	1.9002	0.17
						4" Ice	6.9402	2.7532	0.36
Side Arm Mount [SO 102-3]	C	None		0.0000	138.0000	No Ice	3.0000	3.0000	0.08
						1/2" Ice	3.4800	3.4800	0.11
						1" Ice	3.9600	3.9600	0.14
						2" Ice	4.9200	4.9200	0.20
						4" Ice	6.8400	6.8400	0.32
***									
(2) LPA-80080/6CF w/ Mount Pipe	A	From Face	4.0000 0.00 0.00	0.0000	130.0000	No Ice	4.5639	10.7282	0.05
						1/2" Ice	5.1051	11.9896	0.11
						1" Ice	5.6116	12.9683	0.19
						2" Ice	6.6508	14.9795	0.36
						4" Ice	8.8342	19.2168	0.86

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment ° °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(2) LPA-80080/6CF w/ Mount Pipe	B	From Face	4.0000 0.00 0.00	0.0000	130.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.5639 5.1051 5.6116 6.6508 8.8342	10.7282 11.9896 12.9683 14.9795 19.2168	0.05 0.11 0.19 0.36 0.86
BXA-171085-12BF-EDIN-2 w/ Mount Pipe	A	From Face	4.0000 0.00 0.00	0.0000	130.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.9710 5.5211 6.0361 7.0911 9.3593	5.2283 6.3892 7.2610 9.0462 12.8165	0.04 0.08 0.14 0.27 0.67
BXA-171085-12BF-EDIN-2 w/ Mount Pipe	B	From Face	4.0000 0.00 0.00	0.0000	130.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.9710 5.5211 6.0361 7.0911 9.3593	5.2283 6.3892 7.2610 9.0462 12.8165	0.04 0.08 0.14 0.27 0.67
BXA-171085-12BF-EDIN-2 w/ Mount Pipe	C	From Face	4.0000 0.00 0.00	0.0000	130.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.9710 5.5211 6.0361 7.0911 9.3593	5.2283 6.3892 7.2610 9.0462 12.8165	0.04 0.08 0.14 0.27 0.67
BXA-70080/6CF w/ Mount Pipe	A	From Face	4.0000 0.00 0.00	0.0000	130.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.0736 6.6306 7.1524 8.2495 10.7781	6.0983 7.2558 8.1258 9.9156 13.7095	0.04 0.09 0.16 0.31 0.75
BXA-70080/6CF w/ Mount Pipe	B	From Face	4.0000 0.00 0.00	0.0000	130.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.0736 6.6306 7.1524 8.2495 10.7781	6.0983 7.2558 8.1258 9.9156 13.7095	0.04 0.09 0.16 0.31 0.75
BXA-70080-6CF-EDIN-6 w/ Mount Pipe	C	From Face	4.0000 0.00 0.00	0.0000	130.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.0062 6.5619 7.0826 8.1672 10.6907	6.2035 7.3594 8.2293 10.0193 13.8398	0.04 0.10 0.16 0.31 0.75
(2) LPA-80080-6CF-EDIN-6 w/ Mount Pipe	C	From Face	4.0000 0.00 0.00	0.0000	130.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.5604 5.1019 5.6085 6.6479 8.8318	10.7396 12.0018 12.9809 14.9930 19.2318	0.05 0.11 0.19 0.36 0.86
(2) FD9R6004/2C-3L	A	From Face	4.0000 0.00 0.00	0.0000	130.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.3665 0.4506 0.5433 0.7546 1.2808	0.0846 0.1362 0.1965 0.3430 0.7396	0.00 0.01 0.01 0.02 0.06
(2) FD9R6004/2C-3L	B	From Face	4.0000 0.00 0.00	0.0000	130.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.3665 0.4506 0.5433 0.7546 1.2808	0.0846 0.1362 0.1965 0.3430 0.7396	0.00 0.01 0.01 0.02 0.06
(2) FD9R6004/2C-3L	C	From Face	4.0000 0.00 0.00	0.0000	130.0000	No Ice 1/2" Ice 1" Ice 2" Ice	0.3665 0.4506 0.5433 0.7546 1.2808	0.0846 0.1362 0.1965 0.3430 0.7396	0.00 0.01 0.01 0.02 0.06

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						4" Ice			
Platform Mount [LP 305-1]	C	None		0.0000	130.0000	No Ice	18.0100	18.0100	1.12
						1/2" Ice	23.3300	23.3300	1.35
						1" Ice	28.6500	28.6500	1.58
						2" Ice	39.2900	39.2900	2.05
						4" Ice	60.5700	60.5700	2.97
***									
Side Arm Mount [SO 701-1]	A	None		0.0000	100.0000	No Ice	0.8500	1.6700	0.07
						1/2" Ice	1.1400	2.3400	0.08
						1" Ice	1.4300	3.0100	0.09
						2" Ice	2.0100	4.3500	0.12
						4" Ice	3.1700	7.0300	0.18
KS24019-L112A	A	From Face	2.0000 0.00 2.00	0.0000	100.0000	No Ice	0.1556	0.1556	0.01
						1/2" Ice	0.2247	0.2247	0.01
						1" Ice	0.3025	0.3025	0.01
						2" Ice	0.4840	0.4840	0.02
						4" Ice	0.9506	0.9506	0.06
******									

Tower Pressures - No Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg % %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1 148.0000-117.2500	132.2079	1.487	24	63.072	A	0.000	63.072	63.072	100.00	0.000	0.000
					B	0.000	63.072		100.00	0.000	0.000
					C	0.000	63.072		100.00	0.000	0.876
L2 117.2500-97.2500	107.0516	1.4	23	47.586	A	0.000	47.586	47.586	100.00	0.000	0.000
					B	0.000	47.586		100.00	0.000	0.000
					C	0.000	47.586		100.00	0.000	1.553
L3 97.2500-80.7500	88.8782	1.327	22	43.524	A	0.000	43.524	43.524	100.00	0.000	0.000
					B	0.000	43.524		100.00	0.000	0.000
					C	0.000	43.524		100.00	0.000	6.374
L4 80.7500-40.0000	60.1817	1.187	19	121.723	A	0.000	121.723	121.723	100.00	0.000	0.000
					B	0.000	121.723		100.00	0.000	0.000
					C	0.000	121.723		100.00	0.000	15.742
L5 40.0000-13.2500	26.3617	1	16	91.493	A	0.000	91.493	91.493	100.00	0.000	0.000
					B	0.000	91.493		100.00	0.000	0.000
					C	0.000	91.493		100.00	0.000	10.333
L6 13.2500-12.7500	12.9999	1	16	1.813	A	0.000	1.813	1.813	100.00	0.000	0.000
					B	0.000	1.813		100.00	0.000	0.000
					C	0.000	1.813		100.00	0.000	0.193
L7 12.7500-5.3333	9.0240	1	16	27.308	A	0.000	27.308	27.308	100.00	0.000	0.000
					B	0.000	27.308		100.00	0.000	0.000
					C	0.000	27.308		100.00	0.000	2.865
L8 5.3333-4.7500	5.0415	1	16	2.181	A	0.000	2.181	2.181	100.00	0.000	0.000
					B	0.000	2.181		100.00	0.000	0.000
					C	0.000	2.181		100.00	0.000	0.225
L9 4.7500-0.0000	2.3679	1	16	17.938	A	0.000	17.938	17.938	100.00	0.000	0.000
					B	0.000	17.938		100.00	0.000	0.000
					C	0.000	17.938		100.00	0.000	1.835

Tower Pressure - With Ice

G_H = 1.690

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 148.0000-117.2500	132.2079	1.487	3	1.1812	69.126	A	0.000	69.126	69.126	100.00	0.000	0.000
						B	0.000	69.126		100.00	0.000	0.000
						C	0.000	69.126		100.00	0.000	6.250
L2 117.2500-97.2500	107.0516	1.4	3	1.1517	51.524	A	0.000	51.524	51.524	100.00	0.000	0.000
						B	0.000	51.524		100.00	0.000	0.000
						C	0.000	51.524		100.00	0.000	7.063
L3 97.2500-80.7500	88.8782	1.327	3	1.1262	46.621	A	0.000	46.621	46.621	100.00	0.000	0.000
						B	0.000	46.621		100.00	0.000	0.000
						C	0.000	46.621		100.00	0.000	15.648
L4 80.7500-40.0000	60.1817	1.187	2	1.0748	129.372	A	0.000	129.372	129.372	100.00	0.000	0.000
						B	0.000	129.372		100.00	0.000	0.000
						C	0.000	129.372		100.00	0.000	38.646
L5 40.0000-13.2500	26.3617	1	2	1.0000	96.285	A	0.000	96.285	96.285	100.00	0.000	0.000
						B	0.000	96.285		100.00	0.000	0.000
						C	0.000	96.285		100.00	0.000	24.787
L6 13.2500-12.7500	12.9999	1	2	1.0000	1.896	A	0.000	1.896	1.896	100.00	0.000	0.000
						B	0.000	1.896		100.00	0.000	0.000
						C	0.000	1.896		100.00	0.000	0.448
L7 12.7500-5.3333	9.0240	1	2	1.0000	28.544	A	0.000	28.544	28.544	100.00	0.000	0.000
						B	0.000	28.544		100.00	0.000	0.000
						C	0.000	28.544		100.00	0.000	6.638
L8 5.3333-4.7500	5.0415	1	2	1.0000	2.278	A	0.000	2.278	2.278	100.00	0.000	0.000
						B	0.000	2.278		100.00	0.000	0.000
						C	0.000	2.278		100.00	0.000	0.522
L9 4.7500-0.0000	2.3679	1	2	1.0000	18.729	A	0.000	18.729	18.729	100.00	0.000	0.000
						B	0.000	18.729		100.00	0.000	0.000
						C	0.000	18.729		100.00	0.000	4.252

Tower Pressure - Service

G_H = 1.690

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 148.0000-117.2500	132.2079	1.487	10	63.072	A	0.000	63.072	63.072	100.00	0.000	0.000
					B	0.000	63.072		100.00	0.000	0.000
					C	0.000	63.072		100.00	0.000	0.876
L2 117.2500-97.2500	107.0516	1.4	9	47.586	A	0.000	47.586	47.586	100.00	0.000	0.000
					B	0.000	47.586		100.00	0.000	0.000
					C	0.000	47.586		100.00	0.000	1.553
L3 97.2500-80.7500	88.8782	1.327	8	43.524	A	0.000	43.524	43.524	100.00	0.000	0.000
					B	0.000	43.524		100.00	0.000	0.000
					C	0.000	43.524		100.00	0.000	6.374
L4 80.7500-40.0000	60.1817	1.187	8	121.723	A	0.000	121.723	121.723	100.00	0.000	0.000
					B	0.000	121.723		100.00	0.000	0.000
					C	0.000	121.723		100.00	0.000	15.742
L5 40.0000-13.2500	26.3617	1	6	91.493	A	0.000	91.493	91.493	100.00	0.000	0.000
					B	0.000	91.493		100.00	0.000	0.000
					C	0.000	91.493		100.00	0.000	10.333
L6 13.2500-12.7500	12.9999	1	6	1.813	A	0.000	1.813	1.813	100.00	0.000	0.000
					B	0.000	1.813		100.00	0.000	0.000
					C	0.000	1.813		100.00	0.000	0.193
L7 12.7500-5.3333	9.0240	1	6	27.308	A	0.000	27.308	27.308	100.00	0.000	0.000
					B	0.000	27.308		100.00	0.000	0.000
					C	0.000	27.308		100.00	0.000	2.865

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L8 5.3333-4.7500	5.0415	1	6	2.181	A	0.000	2.181	2.181	100.00	0.000	0.000
					B	0.000	2.181		100.00	0.000	0.000
					C	0.000	2.181		100.00	0.000	0.225
L9 4.7500-0.0000	2.3679	1	6	17.938	A	0.000	17.938	17.938	100.00	0.000	0.000
					B	0.000	17.938		100.00	0.000	0.000
					C	0.000	17.938		100.00	0.000	1.835

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice
4	Dead+Wind 60 deg - No Ice
5	Dead+Wind 90 deg - No Ice
6	Dead+Wind 120 deg - No Ice
7	Dead+Wind 150 deg - No Ice
8	Dead+Wind 180 deg - No Ice
9	Dead+Wind 210 deg - No Ice
10	Dead+Wind 240 deg - No Ice
11	Dead+Wind 270 deg - No Ice
12	Dead+Wind 300 deg - No Ice
13	Dead+Wind 330 deg - No Ice
14	Dead+Ice+Temp
15	Dead+Wind 0 deg+Ice+Temp
16	Dead+Wind 30 deg+Ice+Temp
17	Dead+Wind 60 deg+Ice+Temp
18	Dead+Wind 90 deg+Ice+Temp
19	Dead+Wind 120 deg+Ice+Temp
20	Dead+Wind 150 deg+Ice+Temp
21	Dead+Wind 180 deg+Ice+Temp
22	Dead+Wind 210 deg+Ice+Temp
23	Dead+Wind 240 deg+Ice+Temp
24	Dead+Wind 270 deg+Ice+Temp
25	Dead+Wind 300 deg+Ice+Temp
26	Dead+Wind 330 deg+Ice+Temp
27	Dead+Wind 0 deg - Service
28	Dead+Wind 30 deg - Service
29	Dead+Wind 60 deg - Service
30	Dead+Wind 90 deg - Service
31	Dead+Wind 120 deg - Service
32	Dead+Wind 150 deg - Service
33	Dead+Wind 180 deg - Service
34	Dead+Wind 210 deg - Service
35	Dead+Wind 240 deg - Service
36	Dead+Wind 270 deg - Service
37	Dead+Wind 300 deg - Service
38	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	148 - 117.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-15.88	0.16	-1.88
			Max. Mx	11	-6.75	224.35	-1.29
			Max. My	8	-6.75	0.27	-225.52
			Max. Vy	11	-13.07	224.35	-1.29
			Max. Vx	8	13.07	0.27	-225.52
			Max. Torque	11			1.17

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L2	117.25 - 97.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-19.71	0.32	-1.98
			Max. Mx	11	-9.45	549.36	-1.55
			Max. My	8	-9.45	0.50	-550.49
			Max. Vy	11	-14.64	549.36	-1.55
			Max. Vx	8	14.64	0.50	-550.49
			Max. Torque	11			1.17
L3	97.25 - 80.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-22.42	0.38	-2.01
			Max. Mx	11	-11.60	734.66	-1.68
			Max. My	8	-11.60	0.62	-735.78
			Max. Vy	11	-15.63	734.66	-1.68
			Max. Vx	8	15.63	0.62	-735.78
			Max. Torque	11			1.18
L4	80.75 - 40	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-32.90	0.62	-2.09
			Max. Mx	11	-20.07	1421.34	-2.08
			Max. My	8	-20.07	0.99	-1422.37
			Max. Vy	11	-18.62	1421.34	-2.08
			Max. Vx	8	18.61	0.99	-1422.37
			Max. Torque	11			1.25
L5	40 - 13.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-42.79	0.81	-2.15
			Max. Mx	11	-28.31	2044.64	-2.38
			Max. My	8	-28.31	1.28	-2045.59
			Max. Vy	11	-20.58	2044.64	-2.38
			Max. Vx	8	20.58	1.28	-2045.59
			Max. Torque	11			1.30
L6	13.25 - 12.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-42.93	0.82	-2.15
			Max. Mx	11	-28.44	2054.93	-2.38
			Max. My	8	-28.44	1.29	-2055.88
			Max. Vy	11	-20.60	2054.93	-2.38
			Max. Vx	8	20.60	1.29	-2055.88
			Max. Torque	11			1.30
L7	12.75 - 5.3333	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-45.04	0.86	-2.17
			Max. Mx	11	-30.21	2209.24	-2.45
			Max. My	8	-30.21	1.36	-2210.17
			Max. Vy	11	-21.03	2209.24	-2.45
			Max. Vx	8	21.03	1.36	-2210.17
			Max. Torque	11			1.31
L8	5.3333 - 4.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-45.21	0.86	-2.17
			Max. Mx	11	-30.36	2221.51	-2.45
			Max. My	8	-30.36	1.36	-2222.44
			Max. Vy	11	-21.06	2221.51	-2.45
			Max. Vx	8	21.05	1.36	-2222.44
			Max. Torque	11			1.31
L9	4.75 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-46.63	0.89	-2.17
			Max. Mx	11	-31.56	2322.14	-2.49
			Max. My	8	-31.56	1.40	-2323.06
			Max. Vy	11	-21.33	2322.14	-2.49
			Max. Vx	8	21.33	1.40	-2323.06
			Max. Torque	11			1.32

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	14	46.63	-0.00	0.00
	Max. H_x	11	31.57	21.32	-0.01
	Max. H_z	2	31.57	-0.01	21.32
	Max. M_x	2	2320.52	-0.01	21.32
	Max. M_z	5	2321.78	-21.32	0.01
	Max. Torsion	11	1.32	21.32	-0.01
	Min. Vert	8	31.57	0.01	-21.32
	Min. H_x	5	31.57	-21.32	0.01
	Min. H_z	8	31.57	0.01	-21.32
	Min. M_x	8	-2323.06	0.01	-21.32
	Min. M_z	11	-2322.14	21.32	-0.01
	Min. Torsion	5	-1.32	-21.32	0.01

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	31.57	0.00	-0.00	1.18	0.17	-0.00
Dead+Wind 0 deg - No Ice	31.57	0.01	-21.32	-2320.52	-1.05	-0.25
Dead+Wind 30 deg - No Ice	31.57	10.67	-18.47	-2010.60	-1161.93	0.44
Dead+Wind 60 deg - No Ice	31.57	18.47	-10.67	-1161.00	-2011.43	1.02
Dead+Wind 90 deg - No Ice	31.57	21.32	-0.01	0.04	-2321.78	1.32
Dead+Wind 120 deg - No Ice	31.57	18.46	10.65	1161.41	-2010.21	1.27
Dead+Wind 150 deg - No Ice	31.57	10.65	18.46	2011.92	-1159.81	0.88
Dead+Wind 180 deg - No Ice	31.57	-0.01	21.32	2323.06	1.40	0.25
Dead+Wind 210 deg - No Ice	31.57	-10.67	18.47	2013.14	1162.29	-0.44
Dead+Wind 240 deg - No Ice	31.57	-18.47	10.67	1163.53	2011.79	-1.02
Dead+Wind 270 deg - No Ice	31.57	-21.32	0.01	2.49	2322.14	-1.32
Dead+Wind 300 deg - No Ice	31.57	-18.46	-10.65	-1158.87	2010.57	-1.27
Dead+Wind 330 deg - No Ice	31.57	-10.65	-18.46	-2009.38	1160.17	-0.88
Dead+Ice+Temp	46.63	0.00	-0.00	2.17	0.89	-0.00
Dead+Wind 0 deg+Ice+Temp	46.63	-0.00	-3.48	-393.69	0.97	-0.10
Dead+Wind 30 deg+Ice+Temp	46.63	1.74	-3.01	-340.61	-197.20	0.08
Dead+Wind 60 deg+Ice+Temp	46.63	3.01	-1.74	-195.59	-342.28	0.23
Dead+Wind 90 deg+Ice+Temp	46.63	3.48	0.00	2.51	-395.38	0.33
Dead+Wind 120 deg+Ice+Temp	46.63	3.01	1.74	200.60	-342.28	0.33
Dead+Wind 150 deg+Ice+Temp	46.63	1.74	3.01	345.62	-197.21	0.25
Dead+Wind 180 deg+Ice+Temp	46.63	0.00	3.48	398.70	0.97	0.10
Dead+Wind 210 deg+Ice+Temp	46.63	-1.74	3.01	345.62	199.14	-0.08
Dead+Wind 240 deg+Ice+Temp	46.63	-3.01	1.74	200.60	344.21	-0.23
Dead+Wind 270 deg+Ice+Temp	46.63	-3.48	-0.00	2.50	397.31	-0.33
Dead+Wind 300 deg+Ice+Temp	46.63	-3.01	-1.74	-195.60	344.21	-0.33
Dead+Wind 330 deg+Ice+Temp	46.63	-1.74	-3.01	-340.61	199.14	-0.25
Dead+Wind 0 deg - Service	31.57	0.00	-8.33	-906.71	-0.30	-0.10
Dead+Wind 30 deg - Service	31.57	4.17	-7.21	-785.47	-454.27	0.17
Dead+Wind 60 deg - Service	31.57	7.21	-4.17	-453.23	-786.46	0.40
Dead+Wind 90 deg - Service	31.57	8.33	-0.00	0.79	-907.69	0.52
Dead+Wind 120 deg - Service	31.57	7.21	4.16	454.95	-785.98	0.50
Dead+Wind 150 deg - Service	31.57	4.16	7.21	787.54	-453.43	0.34
Dead+Wind 180 deg -	31.57	-0.00	8.33	909.26	0.66	0.10

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Service						
Dead+Wind 210 deg - Service	31.57	-4.17	7.21	788.02	454.62	-0.17
Dead+Wind 240 deg - Service	31.57	-7.21	4.17	455.78	786.82	-0.40
Dead+Wind 270 deg - Service	31.57	-8.33	0.00	1.75	908.05	-0.52
Dead+Wind 300 deg - Service	31.57	-7.21	-4.16	-452.40	786.34	-0.50
Dead+Wind 330 deg - Service	31.57	-4.16	-7.21	-784.99	453.79	-0.34

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.00	-31.57	0.00	-0.00	31.57	0.00	0.001%
2	0.01	-31.57	-21.32	-0.01	31.57	21.32	0.013%
3	10.67	-31.57	-18.47	-10.67	31.57	18.47	0.000%
4	18.47	-31.57	-10.67	-18.47	31.57	10.67	0.000%
5	21.32	-31.57	-0.01	-21.32	31.57	0.01	0.003%
6	18.46	-31.57	10.65	-18.46	31.57	-10.65	0.000%
7	10.65	-31.57	18.46	-10.65	31.57	-18.46	0.000%
8	-0.01	-31.57	21.32	0.01	31.57	-21.32	0.013%
9	-10.67	-31.57	18.47	10.67	31.57	-18.47	0.000%
10	-18.47	-31.57	10.67	18.47	31.57	-10.67	0.000%
11	-21.32	-31.57	0.01	21.32	31.57	-0.01	0.003%
12	-18.46	-31.57	-10.65	18.46	31.57	10.65	0.000%
13	-10.65	-31.57	-18.46	10.65	31.57	18.46	0.000%
14	0.00	-46.63	0.00	-0.00	46.63	0.00	0.004%
15	-0.00	-46.63	-3.48	0.00	46.63	3.48	0.001%
16	1.74	-46.63	-3.01	-1.74	46.63	3.01	0.001%
17	3.01	-46.63	-1.74	-3.01	46.63	1.74	0.001%
18	3.48	-46.63	0.00	-3.48	46.63	-0.00	0.001%
19	3.01	-46.63	1.74	-3.01	46.63	-1.74	0.001%
20	1.74	-46.63	3.01	-1.74	46.63	-3.01	0.001%
21	0.00	-46.63	3.48	-0.00	46.63	-3.48	0.001%
22	-1.74	-46.63	3.01	1.74	46.63	-3.01	0.001%
23	-3.01	-46.63	1.74	3.01	46.63	-1.74	0.001%
24	-3.48	-46.63	-0.00	3.48	46.63	0.00	0.001%
25	-3.01	-46.63	-1.74	3.01	46.63	1.74	0.001%
26	-1.74	-46.63	-3.01	1.74	46.63	3.01	0.001%
27	0.00	-31.57	-8.33	-0.00	31.57	8.33	0.006%
28	4.17	-31.57	-7.22	-4.17	31.57	7.21	0.002%
29	7.21	-31.57	-4.17	-7.21	31.57	4.17	0.002%
30	8.33	-31.57	-0.00	-8.33	31.57	0.00	0.006%
31	7.21	-31.57	4.16	-7.21	31.57	-4.16	0.002%
32	4.16	-31.57	7.21	-4.16	31.57	-7.21	0.002%
33	-0.00	-31.57	8.33	0.00	31.57	-8.33	0.006%
34	-4.17	-31.57	7.22	4.17	31.57	-7.21	0.002%
35	-7.21	-31.57	4.17	7.21	31.57	-4.17	0.002%
36	-8.33	-31.57	0.00	8.33	31.57	-0.00	0.006%
37	-7.21	-31.57	-4.16	7.21	31.57	4.16	0.002%
38	-4.16	-31.57	-7.21	4.16	31.57	7.21	0.002%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	6	0.00000001	0.00000001
2	Yes	15	0.00013072	0.00014622

3	Yes	21	0.00000001	0.00009754
4	Yes	21	0.00000001	0.00009438
5	Yes	17	0.00003244	0.00008861
6	Yes	21	0.00000001	0.00009888
7	Yes	21	0.00000001	0.00009522
8	Yes	15	0.00013075	0.00014840
9	Yes	21	0.00000001	0.00009583
10	Yes	21	0.00000001	0.00009907
11	Yes	17	0.00003244	0.00009255
12	Yes	21	0.00000001	0.00009397
13	Yes	21	0.00000001	0.00009755
14	Yes	6	0.00000001	0.00004794
15	Yes	17	0.00000001	0.00010104
16	Yes	17	0.00000001	0.00011333
17	Yes	17	0.00000001	0.00011309
18	Yes	17	0.00000001	0.00010231
19	Yes	17	0.00000001	0.00011617
20	Yes	17	0.00000001	0.00011560
21	Yes	17	0.00000001	0.00010360
22	Yes	17	0.00000001	0.00011620
23	Yes	17	0.00000001	0.00011667
24	Yes	17	0.00000001	0.00010288
25	Yes	17	0.00000001	0.00011366
26	Yes	17	0.00000001	0.00011401
27	Yes	15	0.00013627	0.00007319
28	Yes	17	0.00000001	0.00012325
29	Yes	17	0.00000001	0.00011284
30	Yes	15	0.00013632	0.00009341
31	Yes	17	0.00000001	0.00012855
32	Yes	17	0.00000001	0.00011609
33	Yes	15	0.00013637	0.00007370
34	Yes	17	0.00000001	0.00011752
35	Yes	17	0.00000001	0.00012862
36	Yes	15	0.00013632	0.00009420
37	Yes	17	0.00000001	0.00011213
38	Yes	17	0.00000001	0.00012390

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	148 - 117.25	35.723	34	2.1278	0.0076
L2	120.75 - 97.25	23.983	34	1.9043	0.0035
L3	97.25 - 80.75	15.536	34	1.4767	0.0019
L4	85 - 40	11.961	34	1.3086	0.0015
L5	45 - 13.25	3.423	34	0.6949	0.0006
L6	13.25 - 12.75	0.295	34	0.2154	0.0002
L7	12.75 - 5.3333	0.273	34	0.2075	0.0002
L8	5.3333 - 4.75	0.047	34	0.0842	0.0001
L9	4.75 - 0	0.037	34	0.0750	0.0001

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
150.0000	APXVSPP18-C-A20 w/ Mount Pipe	34	35.723	2.1278	0.0076	20042
148.0000	Platform Mount [LP 401-1]	34	35.723	2.1278	0.0076	20042
140.0000	(2) 7770.00 w/ Mount Pipe	34	32.168	2.0866	0.0063	12526
138.0000	(2) RRUS-11	34	31.287	2.0747	0.0059	10020
130.0000	(2) LPA-80080/6CF w/ Mount Pipe	34	27.818	2.0143	0.0047	5566

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
100.0000	Side Arm Mount [SO 701-1]	34	16.416	1.5229	0.0020	2994

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	148 - 117.25	91.002	8	5.4112	0.0193
L2	120.75 - 97.25	61.153	9	4.8544	0.0090
L3	97.25 - 80.75	39.642	9	3.7679	0.0049
L4	85 - 40	30.527	9	3.3397	0.0039
L5	45 - 13.25	8.743	9	1.7747	0.0016
L6	13.25 - 12.75	0.755	9	0.5502	0.0004
L7	12.75 - 5.3333	0.698	9	0.5301	0.0004
L8	5.3333 - 4.75	0.120	9	0.2150	0.0002
L9	4.75 - 0	0.095	9	0.1917	0.0001

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
150.0000	APXVSPP18-C-A20 w/ Mount Pipe	8	91.002	5.4112	0.0193	8071
148.0000	Platform Mount [LP 401-1]	8	91.002	5.4112	0.0193	8071
140.0000	(2) 7770.00 w/ Mount Pipe	8	81.965	5.3111	0.0159	5044
138.0000	(2) RRUS-11	8	79.724	5.2819	0.0151	4035
130.0000	(2) LPA-80080/6CF w/ Mount Pipe	8	70.904	5.1314	0.0120	2240
100.0000	Side Arm Mount [SO 701-1]	9	41.885	3.8856	0.0052	1186

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
L1	148 - 117.25 (1)	TP27.227x22x0.1875	30.7500	0.0000	0.0	36.000	15.7378	-6.75	566.56	0.012
L2	117.25 - 97.25 (2)	TP30.2515x26.2571x0.25	23.5000	0.0000	0.0	36.000	23.8062	-9.45	857.02	0.011
L3	97.25 - 80.75 (3)	TP33.056x30.2515x0.443	16.5000	0.0000	0.0	34.290	44.8438	-11.60	1537.69	0.008
L4	80.75 - 40 (4)	TP39.483x31.4476x0.4385	45.0000	0.0000	0.0	34.578	53.0935	-20.07	1835.87	0.011
L5	40 - 13.25 (5)	TP43.4677x37.7133x0.450 2	31.7500	0.0000	0.0	34.728	61.4719	-28.31	2134.80	0.013
L6	13.25 - 12.75 (6)	TP43.5527x43.4677x0.451 6	0.5000	0.0000	0.0	34.332	61.7774	-28.44	2120.94	0.013
L7	12.75 - 5.3333 (7)	TP44.8134x43.5527x0.425 4	7.4167	0.0000	0.0	35.532	59.9377	-30.21	2129.71	0.014
L8	5.3333 - 4.75 (8)	TP44.9126x44.8134x0.446 7	0.5833	0.0000	0.0	34.368	63.0407	-30.36	2166.58	0.014
L9	4.75 - 0 (9)	TP45.72x44.9126x0.4425	4.7500	0.0000	0.0	34.776	63.5892	-31.56	2211.38	0.014

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	148 - 117.25 (1)	TP27.227x22x0.1875	225.57	26.338	36.000	0.732	0.00	0.000	36.000	0.000
L2	117.25 - 97.25 (2)	TP30.2515x26.2571x0.25	550.80	37.521	36.000	1.042	0.00	0.000	36.000	0.000
L3	97.25 - 80.75 (3)	TP33.056x30.2515x0.443	736.23	25.185	34.290	0.734	0.00	0.000	34.290	0.000
L4	80.75 - 40 (4)	TP39.483x31.4476x0.4385	1423.33	34.294	34.578	0.992	0.00	0.000	34.578	0.000
L5	40 - 13.25 (5)	TP43.4677x37.7133x0.4502	2046.94	37.741	34.728	1.087	0.00	0.000	34.728	0.000
L6	13.25 - 12.75 (6)	TP43.5527x43.4677x0.4516	2057.24	37.670	34.332	1.097	0.00	0.000	34.332	0.000
L7	12.75 - 5.3333 (7)	TP44.8134x43.5527x0.4254	2211.63	40.494	35.532	1.140	0.00	0.000	35.532	0.000
L8	5.3333 - 4.75 (8)	TP44.9126x44.8134x0.4467	2223.90	38.665	34.368	1.125	0.00	0.000	34.368	0.000
L9	4.75 - 0 (9)	TP45.72x44.9126x0.4425	2324.57	39.338	34.776	1.131	0.00	0.000	34.776	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	148 - 117.25 (1)	TP27.227x22x0.1875	13.08	0.831	24.000	0.069	0.63	0.036	24.000	0.001
L2	117.25 - 97.25 (2)	TP30.2515x26.2571x0.25	14.65	0.616	24.000	0.051	0.60	0.020	24.000	0.001
L3	97.25 - 80.75 (3)	TP33.056x30.2515x0.443	15.64	0.349	22.860	0.031	0.58	0.010	22.860	0.000
L4	80.75 - 40 (4)	TP39.483x31.4476x0.4385	18.63	0.351	23.052	0.030	0.52	0.006	23.052	0.000
L5	40 - 13.25 (5)	TP43.4677x37.7133x0.4502	20.59	0.335	23.152	0.029	0.47	0.004	23.152	0.000
L6	13.25 - 12.75 (6)	TP43.5527x43.4677x0.4516	20.61	0.334	22.888	0.029	0.46	0.004	22.888	0.000
L7	12.75 - 5.3333 (7)	TP44.8134x43.5527x0.4254	21.04	0.351	23.688	0.030	0.45	0.004	23.688	0.000
L8	5.3333 - 4.75 (8)	TP44.9126x44.8134x0.4467	21.06	0.334	22.912	0.029	0.45	0.004	22.912	0.000
L9	4.75 - 0 (9)	TP45.72x44.9126x0.4425	21.34	0.336	23.184	0.029	0.44	0.004	23.184	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	148 - 117.25 (1)	0.012	0.732	0.000	0.069	0.001	0.745 ✔	1.333	H1-3+VT ✔

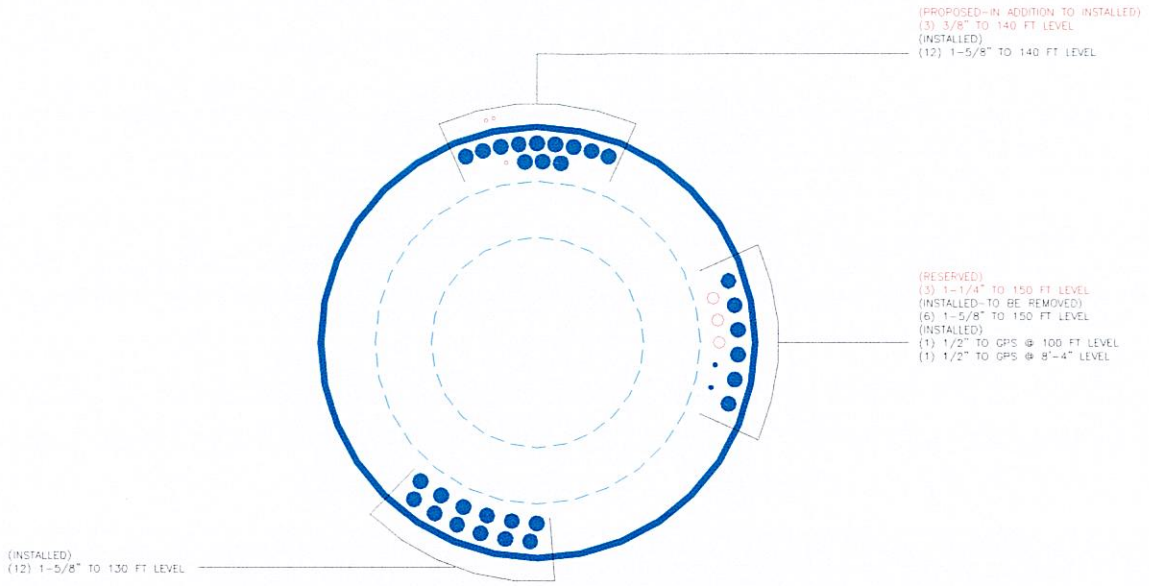
Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L2	117.25 - 97.25 (2)	0.011	1.042	0.000	0.051	0.001	1.054 ✔	1.333	H1-3+VT ✔
L3	97.25 - 80.75 (3)	0.008	0.734	0.000	0.031	0.000	0.742 ✔	1.333	H1-3+VT ✔
L4	80.75 - 40 (4)	0.011	0.992	0.000	0.030	0.000	1.003 ✔	1.333	H1-3+VT ✔
L5	40 - 13.25 (5)	0.013	1.087	0.000	0.029	0.000	1.100 ✔	1.333	H1-3+VT ✔
L6	13.25 - 12.75 (6)	0.013	1.097	0.000	0.029	0.000	1.111 ✔	1.333	H1-3+VT ✔
L7	12.75 - 5.3333 (7)	0.014	1.140	0.000	0.030	0.000	1.154 ✔	1.333	H1-3+VT ✔
L8	5.3333 - 4.75 (8)	0.014	1.125	0.000	0.029	0.000	1.139 ✔	1.333	H1-3+VT ✔
L9	4.75 - 0 (9)	0.014	1.131	0.000	0.029	0.000	1.146 ✔	1.333	H1-3+VT ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
L1	148 - 117.25	Pole	TP27.227x22x0.1875	1	-6.75	755.23	55.9	Pass
L2	117.25 - 97.25	Pole	TP30.2515x26.2571x0.25	2	-9.45	1142.41	79.1	Pass
L3	97.25 - 80.75	Pole	TP33.056x30.2515x0.443	3	-11.60	2049.74	55.7	Pass
L4	80.75 - 40	Pole	TP39.483x31.4476x0.4385	4	-20.07	2447.21	75.2	Pass
L5	40 - 13.25	Pole	TP43.4677x37.7133x0.4502	5	-28.31	2845.69	82.5	Pass
L6	13.25 - 12.75	Pole	TP43.5527x43.4677x0.4516	6	-28.44	2827.21	83.3	Pass
L7	12.75 - 5.3333	Pole	TP44.8134x43.5527x0.4254	7	-30.21	2838.90	86.6	Pass
L8	5.3333 - 4.75	Pole	TP44.9126x44.8134x0.4467	8	-30.36	2888.05	85.5	Pass
L9	4.75 - 0	Pole	TP45.72x44.9126x0.4425	9	-31.56	2947.77	85.9	Pass
							Summary	
						Pole (L7)	86.6	Pass
						RATING =	**86.6**	**Pass**

APPENDIX B

BASE LEVEL DRAWING

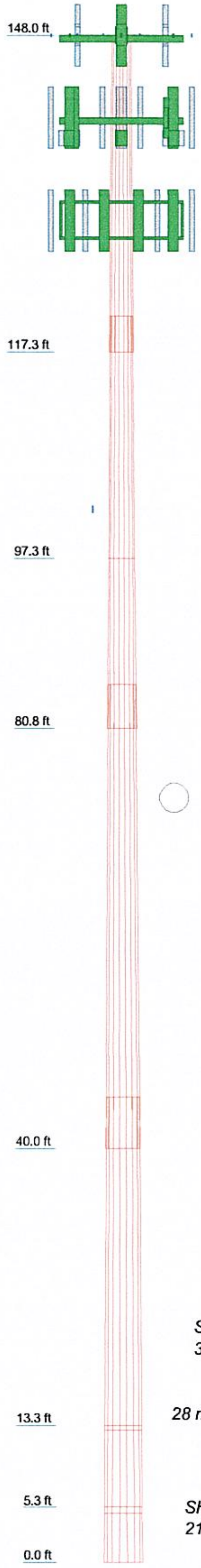


APPENDIX C

ADDITIONAL CALCULATIONS

Section	1	2	3	4	5	6	7	8	9
Length (ft)	30.7500	23.5000	16.5000	45.0000	31.7500	0.5000	7.4167	[illegible]	[illegible]
Number of Sides	18	18	18	18	18	18	18	18	18
Thickness (in)	0.1875	0.2500	0.4430	0.4385	0.4502	0.4516	0.4254	[illegible]	[illegible]
Socket Length (ft)	3.5000		4.2500	5.0000					
Top Dia (in)	22.0000	26.2571	30.2514	31.4476	37.7133	43.4677	43.5527	[illegible]	[illegible]
Bot Dia (in)	27.2270	30.2514	33.0560	39.4830	43.4677	43.5527	44.8134	[illegible]	[illegible]
Grade	A572-60		Reinf 57.15 ksi	Reinf 57.63 ksi	Reinf 57.88 ksi	Reinf 57.22 ksi	[illegible]	[illegible]	[illegible]
Weight (K)	1.5	1.8	2.5	7.5	6.2	0.1	1.5	0.1	1.0

Weight (K): 22.2



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
APXVSPP18-C-A20 w/ Mount Pipe	150	AM-X-CD-14-65-00T-RET w/ Mount Pipe	140
APXVSPP18-C-A20 w/ Mount Pipe	150	AM-X-CD-16-65-00T-RET w/ Mount Pipe	140
APXVSPP18-C-A20 w/ Mount Pipe	150	DC6-48-60-18-8F	140
1900MHz RRH (65MHz)	150	(2) RRUS-11	138
1900MHz RRH (65MHz)	150	(2) RRUS-11	138
1900MHz RRH (65MHz)	150	(2) RRUS-11	138
(3) ACU-A20-N	150	Side Arm Mount [SO 102-3]	138
(3) ACU-A20-N	150	(2) LPA-80080/6CF w/ Mount Pipe	130
(3) ACU-A20-N	150	(2) LPA-80080/6CF w/ Mount Pipe	130
800MHZ RRH	150	BXA-171085-12BF-EDIN-2 w/ Mount Pipe	130
800MHZ RRH	150	BXA-171085-12BF-EDIN-2 w/ Mount Pipe	130
800MHZ RRH	150	BXA-171085-12BF-EDIN-2 w/ Mount Pipe	130
800 EXTERNAL NOTCH FILTER	150	BXA-70080/6CF w/ Mount Pipe	130
800 EXTERNAL NOTCH FILTER	150	BXA-70080/6CF w/ Mount Pipe	130
800 EXTERNAL NOTCH FILTER	150	BXA-70080-6CF-EDIN-6 w/ Mount Pipe	130
Miscellaneous (NA507-1)	150	(2) LPA-80080-6CF-EDIN-6 w/ Mount Pipe	130
Platform Mount [LP 401-1]	148	(2) FD9R6004/2C-3L	130
(2) 7770.00 w/ Mount Pipe	140	(2) FD9R6004/2C-3L	130
(2) 7770.00 w/ Mount Pipe	140	(2) FD9R6004/2C-3L	130
(2) 7770.00 w/ Mount Pipe	140	Platform Mount [LP 305-1]	130
(2) LGP 17201	140	Side Arm Mount [SO 701-1]	100
(2) LGP 17201	140	KS24019-L112A	100
(2) LGP 17201	140		
(2) LGP21901	140		
(2) LGP21901	140		
(2) LGP21901	140		
T-Arm Mount [TA 602-3]	140		
AM-X-CD-16-65-00T-RET w/ Mount Pipe	140		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-60	60 ksi	75 ksi	Reinf 57.22 ksi	57 ksi	72 ksi
Reinf 57.15 ksi	57 ksi	72 ksi	Reinf 59.22 ksi	59 ksi	75 ksi
Reinf 57.63 ksi	58 ksi	73 ksi	Reinf 57.28 ksi	57 ksi	65 ksi
Reinf 57.88 ksi	58 ksi	73 ksi	Reinf 57.96 ksi	58 ksi	73 ksi

TOWER DESIGN NOTES

1. Tower is located in Litchfield County, Connecticut.
2. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 28 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 86.3%

AXIAL
47 K

SHEAR *3 K*

MOMENT *398 kip-ft*

TORQUE 0 kip-ft
28 mph WIND - 1.0000 in ICE

AXIAL
32 K

SHEAR *21 K*

MOMENT *2318 kip-ft*

TORQUE 1 kip-ft
REACTIONS - 80 mph WIND

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FAX: 614.448.4118

Job: ***Ex. 148-ft Monopole / Horton 2 / Fredsall Property***		
Project: ***PJF#37512-1619 B / BU#876377***		
Client: Crown Castle	Drawn by: Kevin Mahlum	App'd:
Code: TIA/EIA-222-F	Date: 08/15/12	Scale: NTS
Path:		Dwg No. E-1

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#:
Site Name:
App #:

Anchor Rod Data		
Qty:	12	
Diam:	2.25	in
Rod Material:	A615-J	
Yield, Fy:	75	ksi
Strength, Fu:	100	ksi
Bolt Circle:	52	in
Anchor Spacing:	6	in

Plate Data		
W=Side:	51	in
Thick:	2.75	in
Grade:	55	ksi
Clip Distance:	8	in

Stiffener Data (Welding at both sides)		
Configuration:	Unstiffened	
Weld Type:		**
Groove Depth:		in **
Groove Angle:		degrees
Fillet H. Weld:		<-- Disregard
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		ksi

Pole Data		
Diam:	45.72	in
Thick:	0.3125	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round

Stress Increase Factor		
ASD ASIF:	1.333	

Base Reactions		
TIA Revision:	F	
Unfactored Moment, M:	2325	ft-kips
Unfactored Axial, P:	32	kips
Unfactored Shear, V:	21	kips

Anchor Rod Results

TIA F --> Maximum Rod Tension	176.2 Kips
Allowable Tension:	195.0 Kips
Anchor Rod Stress Ratio:	90.4% **Pass**

Base Plate Results Flexural Check

Base Plate Stress:	43.1 ksi
Allowable PL Bending Stress:	55.0 ksi
Base Plate Stress Ratio:	78.4% **Pass**

PL Ref. Data
Yield Line (in): 26.40
Max PL Length: 26.40

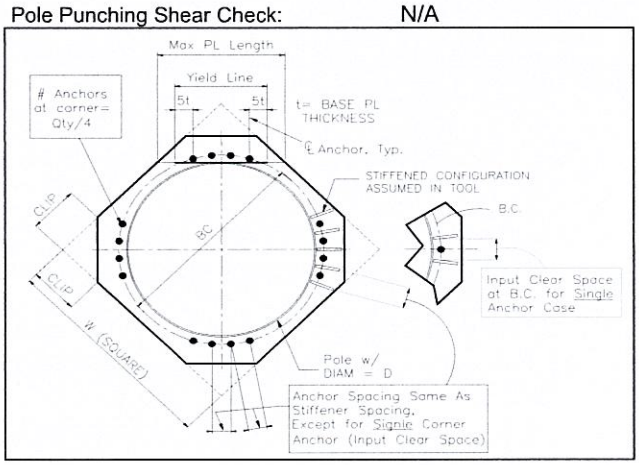
N/A - Unstiffened

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

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Job Number:	37512-1619 R1	**Page:**	1
Site Number:	876377	**By:**	LGR
Site Name:	Horton 2 / Fredsall Property	**Date:**	8/15/2012

DRILLED PIER SOIL AND STEEL ANALYSIS - TIA/EIA-222-F

Unfactored Base Reactions from RISA

	Comp. (+)	Tension (-)	
Moment, M =	2325.0		k-ft
Shear, V =	21.0		kips
Axial Load, P =	32.0		kips
OTM =	2335.5	0.0	k-ft @ Ground

Safety Factors / Load Factors / Φ Factors

Tower Type =	Monopole DP
ACI Code =	ACI 318-02
Seismic Design Category =	D
Reference Standard =	TIA/EIA-222-F
Use 1.3 Load Factor?	Yes
Load Factor =	1.30

Drilled Pier Parameters

Diameter =	6 ft
Height Above Grade =	0.5 ft
Depth Below Grade =	18.5 ft
fc' =	3 ksi
εc =	0.003 in/in
Mat Ftdn. Cap Width =	10 ft
Mat Ftdn. Cap Length =	10 ft
Depth Below Grade =	5.5 ft

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

Load Combinations Checked per TIA/EIA-222-F

1. Ult. Skin Friction/2.00 + Ult. End Bearing/2.00
+ Effective Soil Wt. - Buoyant Conc. Wt. ≥ Compression
2. Ult. Skin Friction/2.00 + Buoyant Conc. Wt./1.25 ≥ Uplift
3. Ult. Skin Friction/1.50 + Buoyant Conc. Wt./1.50 ≥ Uplift

Steel Parameters

Number of Bars =	16
Rebar Size =	#11
Rebar Fy =	60 ksi
Rebar MOE =	29000 ksi
Tie Size =	#5
Side Clear Cover to Ties =	3 in

Soil Parameters

Water Table Depth =	11.00 ft
Depth to Ignore Soil =	3.33 ft
Depth to Full Cohesion =	0 ft
Full Cohesion Starts at?	Ground

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

Direct Embed Pole Shaft Parameters

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

Maximum Capacity Ratios

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

Define Soil Layers

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

Layer	Thickness ft	Unit Weight pcf	Cohesion psf	Friction Angle degrees	Soil Type	Ultimate End Bearing psf	Comp. Ult. Skin Friction psf	Tension Ult. Skin Friction psf	Depth ft
1	3	100	0	0	Sand				3
2	8	140	0	38	Sand	8000			11
3	3	139	0	38	Sand	8000			14
4	4	160	0	40	Sand	12000			18
5	6	160	0	40	Sand	12000			24
6									
7									
8									
9									
10									
11									
12									

Soil Results: Overturning

Depth to COR =	13.29 ft, from Grade	Shear, V =	21.00 kips
Bending Moment, M =	2614.67 k-ft, from COR	Resisting Shear, Va =	22.75 kips
Resisting Moment, Ma =	2832.28 k-ft, from COR		
MOMENT RATIO =	**92.3%** **OK**	**SHEAR RATIO =**	**92.3%** **OK**

Soil Results: Uplift

Uplift, T =	0.00 kips
Allowable Uplift Cap., Ta =	105.52 kips
UPLIFT RATIO =	**0.0%** **OK**

Soil Results: Compression

Compression, C =	32.00 kips
Allowable Comp. Cap., Ca =	430.33 kips
COMPRESSION RATIO =	**7.4%** **OK**

Steel Results (ACI 318-02):

Minimum Steel Area =	13.57 sq in	Axial Load, P =	38.79 kips @ 5.50 ft Below Grade
Actual Steel Area =	24.96 sq in	Moment, M =	2389.82 k-ft @ 5.50 ft Below Grade
		Allowable Moment, Ma =	2613.61 k-ft
Allowable Min Axial, Pa =	-1036.80 kips, Where Ma = 0 k-ft	**MOMENT RATIO =**	**91.4%** **OK**
Allowable Max Axial, Pa =	4726.51 kips, Where Ma = 0 k-ft		

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

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

Site Data

BU#: *876377*
Site Name: *Horton 2 / Fredsall Property*
App #:

Enter Load Factors Below:		
For M (WL)	1.3	<---- Enter Factor
For P (DL)	1.3	<---- Enter Factor

Maximum Shaft Superimposed Forces		
TIA Revision:	F	
Max. Service Shaft M:	2389.82	ft-kips **(* Note)**
Max. Service Shaft P:	38.79	kips
Max Axial Force Type:	Comp.	

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

Load Factor	Shaft Factored Loads		
1.30	Mu:	3106.766	ft-kips
1.30	Pu:	50.427	kips

Pier Properties			
Concrete:			
Pier Diameter =	6.0	ft	
Concrete Area =	4071.5	in^2	
Reinforcement:			
Clear Cover to **Tie**=	3.00	in	
Horiz. **Tie** Bar Size=	5		
Vert. Cage Diameter =	5.28	ft	
Vert. Cage Diameter =	63.34	in	
Vertical Bar Size =	11		
Bar Diameter =	1.41	in	
Bar Area =	1.56	in^2	
Number of Bars =	16		
As Total=	24.96	in^2	
A s/ Aconc, Rho:	0.0061	0.61%	

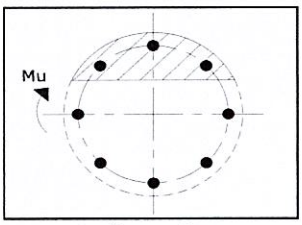
Material Properties		
Concrete Comp. strength, f'c =	3000	psi
Reinforcement yield strength, Fy =	60	ksi
Reinforcing Modulus of Elasticity, E =	29000	ksi
Reinforcement yield strain =	0.00207	
Limiting compressive strain =	0.003	
ACI 318 Code		
Select Analysis ACI Code=	2002	
Seismic Properties		
Seismic Design Category =	D	
Seismic Risk =	**High**	

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

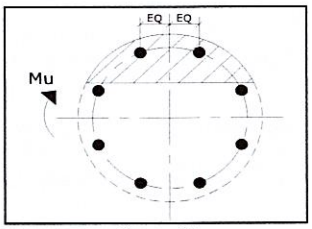
ACI 10.5 , ACI 21.10.4, and IBC 1810.
Min As for Flexural, Tension Controlled, Shafts:
(3)*(Sqrt(f'c)/Fy: 0.0027
200 / Fy: 0.0033

Results:

Governing Orientation Case: **2**



Case 1



Case 2

Dist. From Edge to Neutral Axis: **12.24** in
Extreme Steel Strain, ϵt: **0.0134**
$\epsilon t > 0.0050$, Tension Controlled
Reduction Factor,φ: **0.900**

Minimum Rho Check:

Actual Req'd Min. Rho:	0.33%	Flexural
Provided Rho:	0.61%	OK

Ref. Shaft Max Axial Capacities, ϕ Max(Pn or Tn):		
Max Pu = (φ=0.65) Pn.		
Pn per ACI 318 (10-2)	6144.47	kips
at Mu=(ϕ=0.65)Mn=	3192.16	ft-kips
Max Tu, (φ=0.9) Tn =	1347.84	kips
at Mu=ϕ=(0.90)Mn=	0.00	ft-kips

Output Note: Negative Pu=Tension

For Axial Compression, φ Pn = Pu:	50.43	kips
Drilled Shaft Moment Capacity, φMn:	**3397.68**	ft-kips
Drilled Shaft Superimposed Mu:	**3106.77**	ft-kips

(Mu/φMn, Drilled Shaft Flexure CSR:	**91.4%**