ROBINSON & COLE LLP

KENNETH C. BALDWIN

280 Trumbull Street
Hartford, CT 06103-3597
Main (860) 275-8200
Fax (860) 275-8299
kbaldwin@rc.com
Direct (860) 275-8345

September 10, 2010

Linda Roberts
Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

ORIGINAL

Re: **EM-VER-076-091112 – 258 Ridge Road, Madison, Connecticut**
Completion of Construction Activity

Dear Ms. Roberts:

The purpose of this letter is to notify you and the Connecticut Siting Council that the above-referenced Cellco Partnership d/b/a Verizon Wireless telecommunications facility has now been activated.

If you have any questions or need any additional information regarding this facility please do not hesitate to contact me.

Sincerely,

Kenneth C. Baldwin

KCB/kmd
Copy to:
Sandy M. Carter

STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL
Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950
E-Mail: siting.council@ct.gov
www.ct.gov/csc

December 14, 2009

Kenneth C. Baldwin, Esq.
Robinson & Cole LLP
280 Trumbull Street
Hartford, CT 06103-3597

RE: **EM-VER-076-091112** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 258 Ridge Road, Madison, Connecticut.

Dear Attorney Baldwin:

The Connecticut Siting Council (Council) hereby acknowledges your notice to modify this existing telecommunications facility, pursuant to Section 16-50j-73 of the Regulations of Connecticut State Agencies.

The proposed modifications are to be implemented as specified here and in your notice dated November 12, 2009, including the placement of all necessary equipment and shelters within the tower compound. The modifications are in compliance with the exception criteria in Section 16-50j-72 (b) of the Regulations of Connecticut State Agencies as changes to an existing facility site that would not increase tower height, extend the boundaries of the tower site, increase noise levels at the tower site boundary by six decibels, and increase the total radio frequencies electromagnetic radiation power density measured at the tower site boundary to or above the standard adopted by the State Department of Environmental Protection pursuant to General Statutes § 22a-162. This facility has also been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies now used on this tower.

This decision is under the exclusive jurisdiction of the Council. Please be advised that the validity of this action shall expire one year from the date of this letter. Any additional change to this facility will require explicit notice to this agency pursuant to Regulations of Connecticut State Agencies Section 16-50j-73. Such notice shall include all relevant information regarding the proposed change with cumulative worst-case modeling of radio frequency exposure at the closest point of uncontrolled access to the tower base, consistent with Federal Communications Commission, Office of Engineering and Technology, Bulletin 65. Any deviation from this format may result in the Council implementing enforcement proceedings pursuant to General Statutes § 16-50u including, without limitation, imposition of expenses resulting from such failure and of civil penalties in an amount not less than one thousand dollars per day for each day of construction or operation in material violation.

Thank you for your attention and cooperation.

Very truly yours,

S. Derek Phelps
Executive Director

SDP/MP/laf

c: The Honorable Fillmore McPherson, First Selectman, Town of Madison
Marilyn M. Ozols, Planning & Zoning Administrator, Town of Madison
Crown Castle USA, Inc.

G:\EM\BAM-VERIZON\MADISON\dc121409RidgeRd.DOC

CSC
CONNECTICUT SITING COUNCIL

STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL
Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950
E-Mail: siting.council@ct.gov
www.ct.gov/csc

November 18, 2009

The Honorable Al Goldberg
First Selectman
Town of Madison
Madison Town Campus
8 Campus Drive
Madison, CT 06443-2563

RE: **EM-VER-076-091112** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 258 Ridge Road, Madison, Connecticut.

Dear First Selectman Goldberg:

The Connecticut Siting Council (Council) received this request to modify an existing telecommunications facility, pursuant to Regulations of Connecticut State Agencies Section 16-50j-72.

If you have any questions or comments regarding this proposal, please call me or inform the Council by December 2, 2009.

Thank you for your cooperation and consideration.

Very truly yours,

S. Derek Phelps
Executive Director

SDP/jbw

Enclosure: Notice of Intent

c: Marilyn M. Ozols, Planning & Zoning Administrator, Town of Madison

CSC
CONNECTICUT SITING COUNCIL

ROBINSON & COLE

EM-VER-076-091112

KENNETH C. BALDWIN

280 Trumbull Street
Hartford, CT 06103-3597
Main (860) 275-8200
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kbaldwin@rc.com
Direct (860) 275-8345

ORIGINAL

November 12, 2009

Via Hand Delivery

S. Derek Phelps
Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Notice of Exempt Modification**
258 Ridge Road, Madison, Connecticut

Dear Mr. Phelps:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") intends to install antennas on the recently approved 150-foot self-supporting monopole tower owned by Crown Castle USA, Inc. ("Crown") at 258 Ridge Road in Madison, Connecticut. Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Madison's First Selectman, Fillmore McPherson. The Town of Madison is the owner of the property on which the tower is located.

The facility consists of a 150-foot self-supporting monopole tower capable of supporting multiple carriers within a fenced compound at 258 Ridge Road in Madison. The tower is currently, or will soon be, shared by T-Mobile with antennas at the 150-foot level and AT&T with antennas at the 140-foot level on the tower. Cellco intends to install twelve (12) panel-type antennas at the 130-foot level on the tower and place a 12' x 30' equipment shelter and a 1000 gallon propane tank on the ground within the existing fenced compound. Attached behind Tab 1 are Project Plans for the proposed Cellco facility.

The planned modifications to the Madison facility fall squarely within those activities explicitly provided for in R.C.S.A. § 16-50j-72(b)(2).

1. The proposed modification will not increase the overall height of the existing tower. Cellco's antennas will be mounted with their centerline at the 130-foot level on the 150-foot tower.

2. The proposed installation of a 12' x 30' equipment shelter and propane tank will not require an extension of the fenced compound or lease area.

3. The proposed installation will not increase the noise levels at the facility by six decibels or more.

4. The operation of the antennas will not increase radio frequency (RF) power density levels at the facility to a level at or above the Federal Communications Commission (FCC) adopted safety standard. The worst-case RF power density calculations for all existing and Cellco antennas would be 29.86% of the FCC standard. A copy of the cumulative power density calculations table is attached behind Tab 2.

Also attached, behind Tab 3, is a Structural Analysis confirming that the tower and foundation can support the existing and Cellco antennas and associated equipment.

For the foregoing reasons, Cellco respectfully submits that the proposed antenna installation at the facility constitutes an exempt modification under R.C.S.A. § 16-50j-72(b)(2).

Sincerely,

Kenneth C. Baldwin

Attachments
Copy to:
Fillmore McPherson, Madison First Selectman
Sandy M. Carter
Michelle Kababik

Cellco Partnership

d.b.a. **verizon** wireless

WIRELESS COMMUNICATIONS FACILITY

MADISON 3
258 RIDGE ROAD
MADISON, CT 06443

SITE DIRECTIONS

FROM: 99 EAST RIVER DRIVE, EAST HARTFORD, CONNECTICUT

TO: 258 RIDGE ROAD, MADISON, CT 06443

1.	Depart E River Dr	
2.	Take ramp left for I-84 East toward Boston	0.3 mi
3.	At exit 55, take ramp right for SR-2 / Veterans of Foreign Wars Memorial Hwy East toward Norwich / New London	3.4 mi
4.	At exit 50, take ramp right for SR-3 South toward Glastonbury / Wethersfield	2.7 mi
5.	Take ramp left for I-91 South toward New Haven	5.1 mi
6.	At exit 22S, take ramp left for SR-9 South toward Middletown / Old Saybrook	2.2 mi
7.	At exit 9, take ramp right for Ct-81 toward Killingworth / Clinton	0.2 mi
8.	Turn right onto SR-81 / Killingworth Rd	7.9 mi
9.	At roundabout, take 2nd exit	0.4 mi
10.	Bear right onto Green Hill Rd	4.7 mi
11.	Turn right onto Ridge Rd	0.4 mi
12.	Arrive at 258 Ridge Road, Madison, Connecticut 06443	

GENERAL NOTES

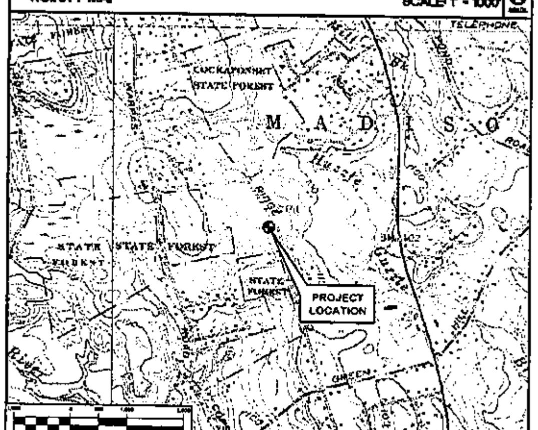
1. PROPOSED ANTENNA LOCATIONS AND HEIGHTS PROVIDED BY CELLCO PARTNERSHIP.

PROJECT SCOPE

1. THE PROPOSED SCOPE OF WORK GENERALLY INCLUDES THE INSTALLATION OF A 12'x30' PREFABRICATED WIRELESS EQUIPMENT SHELTER ON A CONCRETE FOUNDATION AND A 1,000 GALLON PROPANE TANK ON A CONCRETE PAD, LOCATED WITHIN THE EXISTING WIRELESS COMMUNICATIONS LEASE AREA.
2. A TOTAL OF TWELVE (12) DIRECTIONAL PANEL ANTENNAS ARE PROPOSED TO BE MOUNTED ON AN EXISTING ±150' TALL MONOPOLE TOWER AT A CENTERLINE ELEVATION OF ±130' ABOVE THE TOWER BASE.
3. ELECTRIC AND TELCO UTILITIES SHALL BE ROUTED UNDERGROUND TO THE PROPOSED EQUIPMENT SHELTER FROM AN EXISTING UTILITY BACKBOARD LOCATED ADJACENT TO THE FENCED COMPOUND.

VICINITY MAP

SCALE: 1" = 1000'



PROJECT SUMMARY

SITE NAME:	MADISON 3
SITE ADDRESS:	258 RIDGE ROAD MADISON, CT 06443
LESSEE/TENANT:	CELLCO PARTNERSHIP d.b.a. VERIZON WIRELESS 99 EAST RIVER DRIVE EAST HARTFORD, CT 06108
CONTACT PERSON:	SANDY CARTER CELLCO PARTNERSHIP (860) 803-8219
TOWER COORDINATES:	LATITUDE 41°-18'-33.1" LONGITUDE 72°-36'-50.8"

COORDINATES ARE BASED ON CONNECTICUT SITING COUNCIL DATABASE.

SHEET INDEX

SHT. NO.	DESCRIPTION	REV. NO.
T-1	TITLE SHEET	0
C-1	COMPOUND PLAN AND ELEVATION	0

DESIGNED BY:	CFC
DRAWN BY:	DEB
CHK'D BY:	DMD

REV	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	11/12/09	DEB	DMD	ISSUED FOR CSC
A	11/11/09	DEB	DMD	ISSUED FOR CSC-CLIENT REVIEW

Cellco Partnership d.b.a. verizon wireless

NATCOMM

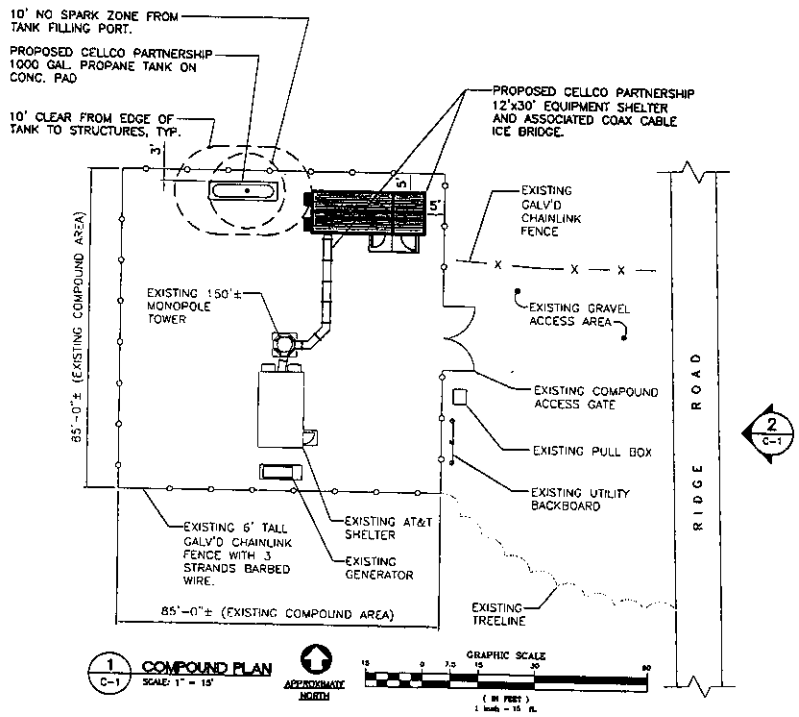
VERIZON WIRELESS
WIRELESS COMMUNICATIONS FACILITY
MADISON 3
258 RIDGE ROAD
MADISON, CT 06443

DATE: 11/11/09
SCALE: AS NOTED
JOB NO. 09094

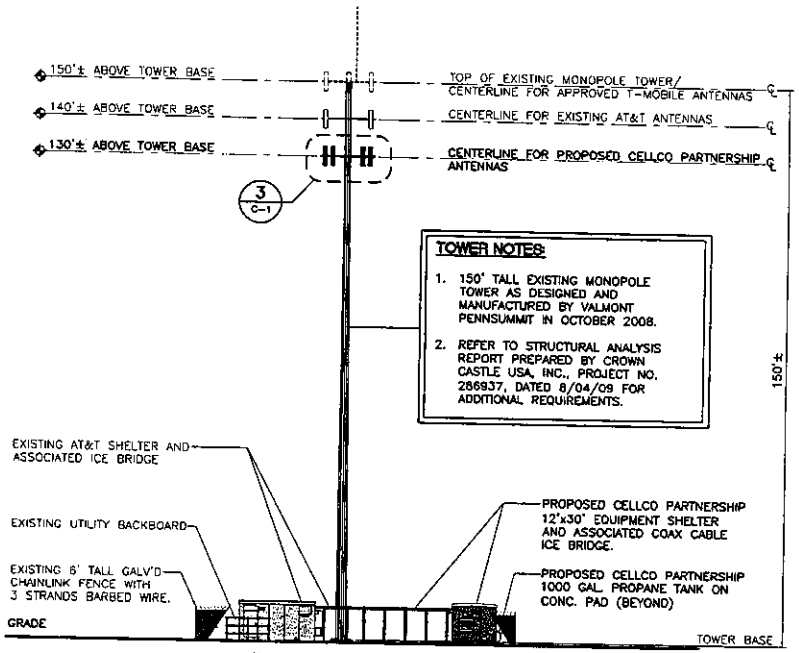
TITLE SHEET

T-1

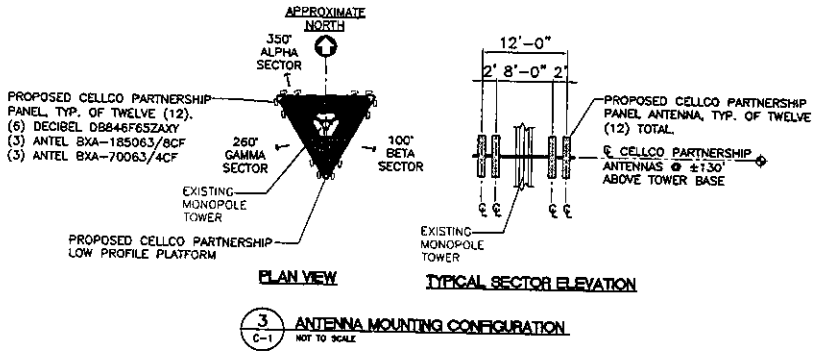
Sheet No. 1 of 2



1 C-1 **COMPOUND PLAN**
SCALE: 1" = 15'



2 C-1 **EAST ELEVATION**
SCALE: 1" = 15'
GRAPHIC SCALE



3 C-1 **ANTENNA MOUNTING CONFIGURATION**
NOT TO SCALE

DESIGNED BY:	CFC
DRAWN BY:	DEB
CHK'D BY:	DMD

REV	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	11/12/09	DEB	DMD	ISSUED FOR CSC
A	11/11/09	DEB	DMD	ISSUED FOR CSC-CLIENT REVIEW

Cellco Partnership d/b/a verizon wireless

NATELCOM

VERIZON WIRELESS
WIRELESS COMMUNICATIONS FACILITY
MADISON 3
250 RIDGE ROAD
MADISON, CT 06443

DATE: 11/11/09
SCALE: AS NOTED
JOB NO. 09094

COMPOUND PLAN AND ELEVATION

C-1
Sheet No. 2 of 2

	General	Power	Density					
Site Name: Madison 3								
Tower Height: Verizon @ 130Ft.								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*T-Mobile	8	151	150	0.0193	1945	1.0000	1.93%	
*AT&T UMTS	1	500	140	0.0092	880	0.5867	1.56%	
*AT&T GSM	4	296	140	0.0217	880	0.5867	3.70%	
*AT&T GSM	2	427	140	0.0157	1900	1.0000	1.57%	
Verizon	**7**	**405**	**130**	**0.0603**	**1970**	**1.0000**	**6.03%**	
Verizon	**9**	**383**	**130**	**0.0733**	**869**	**0.5793**	**12.65%**	
Verizon	**1**	**565**	**130**	**0.0120**	**757**	**0.4973**	**2.41%**	
								29.86%
* Source: Siting Council								

Date: **August 04, 2009**

Ben Goodhart
Crown Castle USA Inc.
3530 Toringdon Way, Suite 300
Charlotte, NC 28277

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

Subject: **Structural Analysis Report**

Carrier Designation:	***Verizon Wireless* Co-Locate** **Carrier Site Name:**	 Madison 3, CT
Crown Castle Designation:	**Crown Castle BU Number:** **Crown Castle Site Name:** **Crown Castle Work Order Number:**	5800059 Ridge Road, Madison 286937
Engineering Firm Designation:	**Crown Castle USA Project Number:**	286937
Site Data:	**258 Ridge Road, MADISON, New Haven County, CT** **Latitude *41° 18' 33.3"*, Longitude *-72° 36' 51.57"*** **150 Foot - Monopole Tower**	

Dear Ben Goodhart,

Crown Castle USA 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 286937, in accordance with application 86004, 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:

LC1: Existing + Reserved + Proposed Equipment **Sufficient Capacity**
Note: See Table I and Table II for the proposed and existing/reserved loading, respectively.

The analysis has been performed in accordance with the TIA-222-G standard and local code requirements based upon a wind speed of 115 mph 3-second gust.

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

We at *Crown Castle USA* 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.

Structural analysis prepared by: Levi Marcus, E.I.T.

Respectfully submitted by:

Douglas K. Pineo

Douglas K. Pineo, P.E.
Manager Structural Design

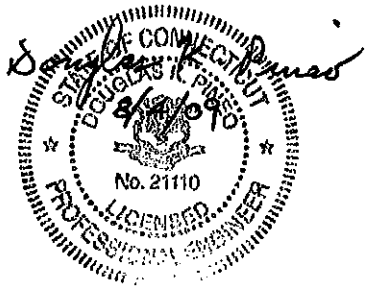


TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 150 ft Monopole tower designed by Valmont Pennsummit in October of 2008. The tower was originally designed for a wind speed of 115 mph per TIA-222-G. This tower has replaced the tower referenced by BU# 805102.

2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of TIA-222-G Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a 3-second gust wind speed of 115 mph with no ice, 50 mph with 0.75 inch ice thickness and 60 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
130	130	3	antel	BXA-185063/8CF w/ Mount Pipe	18	1-5/8	-
		3	antel	BXA-70063/4CF w/ Mount Pipe			
		6	decibel	DB846F65ZAXY w/ Mount Pipe			
		1	tower mounts	Platform Mount [LP 601-1]			

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	159	1	dbspectra	DS4C06F36D-N	2 18	7/8 1-5/8	2
	150	9	remec	GSM PCS 1900 MASTHEAD AMPLIFIER			
		9	rfs celwave	APX16PV-16PVL-E w/ Mount Pipe			
		1	tower mounts	Pipe Mount [PM 601-1]			
		1	tower mounts	Platform Mount [LP 702-1]			
140	140	12	MLA	MLA ANTENNA w/ Mount Pipe	12	1-5/8	1
		6	lgp telecom	TMA-DDD 850/1900			
		6	powerwave technologies	7770.00 w/ Mount Pipe	12	1-5/8	2
		6	powerwave technologies	LGP21401			
		6	powerwave technologies	LGP21903			
		1	tower mounts	T-Arm Mount [TA 602-3]			

Notes:
1) MLA Equipment Controlling
2) Reserved Equipment

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)
150	160	2	decibel	DB616-AB	14	1-5/8
	150	12	allgon	7273.01 w/Mount Pipe		
		6	ericsson	Generic TMA		
		1	tower mounts	Platform Mount [LP 702-1]		
140	140	12	antel	RWA-80017 w/ Mount Pipe	12	1-5/8
		6	ericsson	Generic TMA		
		1	tower mounts	T-Arm Mount [TA 602-3]		
130	130	12	allgon	7273.01 w/Mount Pipe	12	1-5/8
		6	ericsson	Generic TMA		
		1	tower mounts	T-Arm Mount [TA 602-3]		
120	120	12	allgon	7273.01 w/Mount Pipe	12	1-5/8
		6	ericsson	Generic TMA		
		1	tower mounts	T-Arm Mount [TA 602-3]		
80	80	1	andrew	P4-57W	1	1-5/8
		1	tower mounts	Side Arm Mount [SO 301-1]		

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	ANS consultants, Inc.	2354009	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	Davinci Engineering / Valmont Pennsummit	2354010	CCISITES
4-TOWER MANUFACTURER DRAWINGS	Davinci Engineering / Valmont Pennsummit	2354011	CCISITES

3.1) Analysis Method

RISATower (version 5.3.1.0), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

3.2) Assumptions

1) Tower and structures were built in accordance with the manufacturer's specifications.
2) The tower and structures have been maintained in accordance with the manufacturer's specification.
3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.

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

4) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	150 - 110	Pole	TP39.633x28.4x0.25	1	-10.519	1751.230	46.2	Pass
L2	110 - 94.25	Pole	TP43.556x37.6587x0.2813	2	-14.157	2179.630	57.3	Pass
L3	94.25 - 46.25	Pole	TP56.472x41.4489x0.375	3	-28.313	3764.260	63.2	Pass
L4	46.25 - 0	Pole	TP68.71x53.6862x0.4375	4	-51.851	5449.160	64.7	Pass
							Summary	
						Pole (L4)	64.7	Pass
						Rating =	64.7	Pass

Table 6 - Tower Component Stresses vs. Capacity - LC1

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	50.3	Pass
1	Base Plate	0	41.8	Pass
1	Base Foundation (Concrete)	0	70.6	Pass

Structure Rating (max from all components) =	70.6%

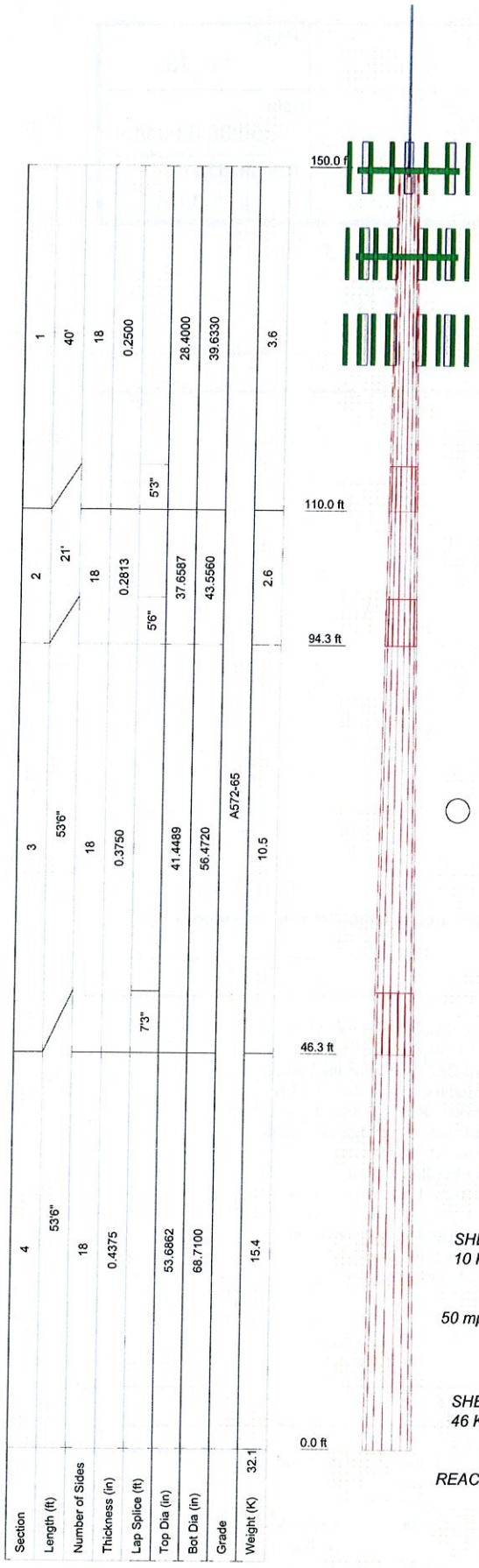
Notes:
1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.

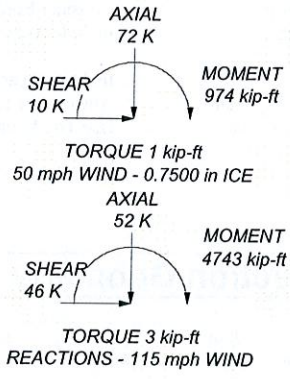
4.1) Recommendations

The tower and its base foundation are sufficient to carry the proposed and reserved loading. No modifications are needed at this time.

APPENDIX A

RISA TOWER OUTPUT





DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
DS4C06F36D-N	150	(2) TMA-DDD 850/1900	140
(3) APX16PV-16PVL-E w/ Mount Pipe	150	(2) TMA-DDD 850/1900	140
(3) APX16PV-16PVL-E w/ Mount Pipe	150	(2) TMA-DDD 850/1900	140
(3) APX16PV-16PVL-E w/ Mount Pipe	150	Platform Mount [LP 601-1]	140
(3) GSM PCS 1900 MASTHEAD AMPLIFIER	150	(2) DB846F65ZAXY w/ Mount Pipe	130
(3) GSM PCS 1900 MASTHEAD AMPLIFIER	150	BXA-185063/8CF w/ Mount Pipe	130
(3) GSM PCS 1900 MASTHEAD AMPLIFIER	150	BXA-70063/4CF w/ Mount Pipe	130
Pipe Mount [PM 601-1]	150	(2) DB846F65ZAXY w/ Mount Pipe	130
Platform Mount [LP 702-1]	150	BXA-185063/8CF w/ Mount Pipe	130
(4) MLA ANTENNA w/ Mount Pipe	140	BXA-70063/4CF w/ Mount Pipe	130
(4) MLA ANTENNA w/ Mount Pipe	140	Platform Mount [LP 601-1]	130
(4) MLA ANTENNA w/ Mount Pipe	140		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	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 115 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 RATING: 62.9%

CROWN CASTLE
Shaping the Wireless World
Crown Castle USA, Inc.
2000 Corporate Drive
Canonsburg, PA 15317
Phone: (724) 416-2000
FAX: (724) 416-2254

Job: BU# 5800059			
Project:			
Client: Crown Castle USA	Drawn by: jmessmer	App'd:	
Code: TIA-222-G	Date: 08/04/09	Scale: NTS	
Path: R:\SA Models - Letters\Work Area\LMarcus\5800059\5800059.eri		Dwg No. E-1	

RISATower	Job	Page
	BU# 805102	1 of 13
Crown Castle USA, Inc. 2000 Corporate Drive Canonsburg, PA 15317 Phone: (724) 416-2000 FAX: (724) 416-2254	Project	Date 12:50:38 08/04/09
	Client Crown Castle USA	Designed by jmessmer

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 115 mph.
Structure Class II.
Exposure Category C.
Topographic Category 1.
Crest Height 0'.
Nominal ice thickness of 0.7500 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, 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	150'-110'	40'	5'3"	18	28.4000	39.6330	0.2500	1.0000	A572-65 (65 ksi)
L2	110'-94'3"	21'	5'6"	18	37.6587	43.5560	0.2813	1.1252	A572-65 (65 ksi)
L3	94'3"-46'3"	53'6"	7'3"	18	41.4489	56.4720	0.3750	1.5000	A572-65

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
L4	46'3"-0'	53'6"		18	53.6862	68.7100	0.4375	1.7500	(65 ksi) A572-65 (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	28.8381	22.3370	2236.2460	9.9932	14.4272	155.0021	4475.4345	11.1706	4.5584	18.234
	40.2444	31.2504	6123.6557	13.9810	20.1336	304.1516	12255.3691	15.6282	6.5354	26.142
L2	39.7367	33.3722	5890.3390	13.2690	19.1306	307.9014	11788.4286	16.6893	6.1328	21.802
	44.2279	38.6377	9141.4756	15.3625	22.1264	413.1470	18294.9797	19.3225	7.1708	25.492
L3	43.6565	48.8882	10420.1082	14.5812	21.0560	494.8755	20853.9274	24.4487	6.6350	17.693
	57.3432	66.7695	26545.7225	19.9144	28.6878	925.3322	53126.3745	33.3911	9.2791	24.744
L4	56.5817	73.9424	26487.9491	18.9033	27.2726	971.2305	53010.7517	36.9782	8.6788	19.837
	69.7700	94.8049	55828.9999	24.2367	34.9047	1599.4703	111731.461 1	47.4115	11.3230	25.881

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 150'-110'				1	1	1		
L2 110'-94'3"				1	1	1		
L3 94'3"-46'3"				1	1	1		
L4 46'3"-0'				1	1	1		

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
LDF7-50A (1-5/8 FOAM)	A	No	Inside Pole	150' - 5'	18	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82
						1" Ice	0.00	0.82
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	140' - 5'	12	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82
						1" Ice	0.00	0.82
LDF5-50A (7/8 FOAM)	A	No	Inside Pole	150' - 5'	2	No Ice	0.00	0.33
						1/2" Ice	0.00	0.33
						1" Ice	0.00	0.33
AVA7-50 (1-5/8 LOW DENSI. FOAM)	B	No	Inside Pole	130' - 0'	18	No Ice	0.00	0.72
						1/2" Ice	0.00	0.72
						1" Ice	0.00	0.72

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
L1	150'-110'	A	0.000	0.000	0.000	0.000	0.617
		B	0.000	0.000	0.000	0.000	0.259
		C	0.000	0.000	0.000	0.000	0.295
L2	110'-94'3"	A	0.000	0.000	0.000	0.000	0.243
		B	0.000	0.000	0.000	0.000	0.204
		C	0.000	0.000	0.000	0.000	0.155
L3	94'3"-46'3"	A	0.000	0.000	0.000	0.000	0.740
		B	0.000	0.000	0.000	0.000	0.622
		C	0.000	0.000	0.000	0.000	0.472
L4	46'3"-0'	A	0.000	0.000	0.000	0.000	0.636
		B	0.000	0.000	0.000	0.000	0.599
		C	0.000	0.000	0.000	0.000	0.406

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
L1	150'-110'	A	1.719	0.000	0.000	0.000	0.000	0.617
		B		0.000	0.000	0.000	0.000	0.259
		C		0.000	0.000	0.000	0.000	0.295
L2	110'-94'3"	A	1.679	0.000	0.000	0.000	0.000	0.243
		B		0.000	0.000	0.000	0.000	0.204
		C		0.000	0.000	0.000	0.000	0.155
L3	94'3"-46'3"	A	1.616	0.000	0.000	0.000	0.000	0.740
		B		0.000	0.000	0.000	0.000	0.622
		C		0.000	0.000	0.000	0.000	0.472
L4	46'3"-0'	A	1.449	0.000	0.000	0.000	0.000	0.636
		B		0.000	0.000	0.000	0.000	0.599
		C		0.000	0.000	0.000	0.000	0.406

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	150'-110'	0.0000	0.0000	0.0000	0.0000
L2	110'-94'3"	0.0000	0.0000	0.0000	0.0000
L3	94'3"-46'3"	0.0000	0.0000	0.0000	0.0000
L4	46'3"-0'	0.0000	0.0000	0.0000	0.0000

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 K
150									
DS4C06F36D-N	A	From Leg	4.00 0' 9'	0.0000	150'	No Ice 1/2" Ice 1" Ice	5.50 7.37 9.25	5.50 7.37 9.25	0.070 0.110 0.161
(3) APX16PV-16PVL-E w/ Mount Pipe	A	From Leg	4.00 0' 0'	0.0000	150'	No Ice 1/2" Ice 1" Ice	6.94 7.44 7.94	3.29 4.00 4.66	0.059 0.103 0.156
(3) APX16PV-16PVL-E w/ Mount Pipe	B	From Leg	4.00 0' 0'	0.0000	150'	No Ice 1/2" Ice 1" Ice	6.94 7.44 7.94	3.29 4.00 4.66	0.059 0.103 0.156
(3) APX16PV-16PVL-E w/ Mount Pipe	C	From Leg	4.00 0' 0'	0.0000	150'	No Ice 1/2" Ice 1" Ice	6.94 7.44 7.94	3.29 4.00 4.66	0.059 0.103 0.156
(3) GSM PCS 1900 MASTHEAD AMPLIFIER	A	From Leg	4.00 0' 0'	0.0000	150'	No Ice 1/2" Ice 1" Ice	1.43 1.60 1.77	0.39 0.50 0.62	0.011 0.019 0.029
(3) GSM PCS 1900 MASTHEAD AMPLIFIER	B	From Leg	4.00 0' 0'	0.0000	150'	No Ice 1/2" Ice 1" Ice	1.43 1.60 1.77	0.39 0.50 0.62	0.011 0.019 0.029
(3) GSM PCS 1900 MASTHEAD AMPLIFIER	C	From Leg	4.00 0' 0'	0.0000	150'	No Ice 1/2" Ice 1" Ice	1.43 1.60 1.77	0.39 0.50 0.62	0.011 0.019 0.029
Pipe Mount [PM 601-1]	A	From Leg	4.00 0' 0'	0.0000	150'	No Ice 1/2" Ice 1" Ice	3.00 3.74 4.48	0.90 1.12 1.34	0.065 0.079 0.093
Platform Mount [LP 702-1]	C	None		0.0000	150'	No Ice 1/2" Ice 1" Ice	24.53 29.94 35.35	24.53 29.94 35.35	1.335 1.646 1.956
140									
(4) MLA ANTENNA w/ Mount Pipe	A	From Leg	4.00 0' 0'	0.0000	140'	No Ice 1/2" Ice 1" Ice	11.67 12.41 13.15	4.23 5.86 7.35	0.075 0.141 0.220
(4) MLA ANTENNA w/ Mount Pipe	B	From Leg	4.00 0' 0'	0.0000	140'	No Ice 1/2" Ice 1" Ice	11.67 12.41 13.15	4.23 5.86 7.35	0.075 0.141 0.220
(4) MLA ANTENNA w/ Mount Pipe	C	From Leg	4.00 0' 0'	0.0000	140'	No Ice 1/2" Ice 1" Ice	11.67 12.41 13.15	4.23 5.86 7.35	0.075 0.141 0.220
(2) TMA-DDD 850/1900	A	From Leg	4.00 0' 0'	0.0000	140'	No Ice 1/2" Ice 1" Ice	0.50 0.62 0.75	0.52 0.64 0.77	0.031 0.042 0.055
(2) TMA-DDD 850/1900	B	From Leg	4.00 0' 0'	0.0000	140'	No Ice 1/2" Ice 1" Ice	0.50 0.62 0.75	0.52 0.64 0.77	0.031 0.042 0.055
(2) TMA-DDD 850/1900	C	From Leg	4.00 0' 0'	0.0000	140'	No Ice 1/2" Ice 1" Ice	0.50 0.62 0.75	0.52 0.64 0.77	0.031 0.042 0.055
Platform Mount [LP 601-1]	C	None		0.0000	140'	No Ice 1/2" Ice 1" Ice	28.47 33.59 38.71	28.47 33.59 38.71	1.122 1.514 1.905
130									
(2) DB846F65ZAXY w/ Mount Pipe	A	From Leg	4.00 0' 0'	0.0000	130'	No Ice 1/2" Ice 1" Ice	7.27 7.88 8.48	7.82 9.01 9.91	0.047 0.111 0.188
BXA-185063/8CF w/ Mount Pipe	A	From Leg	4.00 0'	0.0000	130'	No Ice 1/2" Ice	3.18 3.56	3.00 3.61	0.028 0.057

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
			0'			1" Ice	3.96	4.24	0.094
BXA-70063/4CF w/ Mount Pipe	A	From Leg	4.00 0' 0'	0.0000	130'	No Ice 1/2" Ice 1" Ice	5.40 5.84 6.30	3.62 4.22 4.83	0.028 0.068 0.116
(2) DB846F65ZAXY w/ Mount Pipe	B	From Leg	4.00 0' 0'	0.0000	130'	No Ice 1/2" Ice 1" Ice	7.27 7.88 8.48	7.82 9.01 9.91	0.047 0.111 0.188
BXA-185063/8CF w/ Mount Pipe	B	From Leg	4.00 0' 0'	0.0000	130'	No Ice 1/2" Ice 1" Ice	3.18 3.56 3.96	3.00 3.61 4.24	0.028 0.057 0.094
BXA-70063/4CF w/ Mount Pipe	B	From Leg	4.00 0' 0'	0.0000	130'	No Ice 1/2" Ice 1" Ice	5.40 5.84 6.30	3.62 4.22 4.83	0.028 0.068 0.116
(2) DB846F65ZAXY w/ Mount Pipe	C	From Leg	4.00 0' 0'	0.0000	130'	No Ice 1/2" Ice 1" Ice	7.27 7.88 8.48	7.82 9.01 9.91	0.047 0.111 0.188
BXA-185063/8CF w/ Mount Pipe	C	From Leg	4.00 0' 0'	0.0000	130'	No Ice 1/2" Ice 1" Ice	3.18 3.56 3.96	3.00 3.61 4.24	0.028 0.057 0.094
BXA-70063/4CF w/ Mount Pipe	C	From Leg	4.00 0' 0'	0.0000	130'	No Ice 1/2" Ice 1" Ice	5.40 5.84 6.30	3.62 4.22 4.83	0.028 0.068 0.116
Platform Mount [LP 601-1]	C	None		0.0000	130'	No Ice 1/2" Ice 1" Ice	28.47 33.59 38.71	28.47 33.59 38.71	1.122 1.514 1.905

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

Comb. No.	Description
22	1.2 Dead+1.6 Wind 300 deg - No Ice
23	0.9 Dead+1.6 Wind 300 deg - No Ice
24	1.2 Dead+1.6 Wind 330 deg - No Ice
25	0.9 Dead+1.6 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	150 - 110	Pole	Max Tension	42	0.000	0.000	-0.000
			Max. Compression	26	-25.426	0.000	2.123
			Max. Mx	8	-10.644	-596.884	0.768
			Max. My	2	-10.625	0.000	603.483
			Max. Vy	8	25.752	-596.884	0.768
			Max. Vx	2	-25.919	0.000	603.483
			Max. Torque	8			2.663
L2	110 - 94.25	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	26	-29.746	0.000	2.122
			Max. Mx	8	-14.271	-1015.919	0.802
			Max. My	2	-14.255	0.000	1025.096
			Max. Vy	8	28.308	-1015.919	0.802
			Max. Vx	2	-28.475	0.000	1025.096
			Max. Torque	8			2.661
L3	94.25 - 46.25	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	26	-45.787	0.000	2.117
			Max. Mx	8	-28.380	-2512.878	0.855
			Max. My	2	-28.371	0.000	2529.732
			Max. Vy	8	36.501	-2512.878	0.855
			Max. Vx	2	-36.667	0.000	2529.732
			Max. Torque	8			2.659
L4	46.25 - 0	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	26	-71.920	0.000	2.111
			Max. Mx	8	-51.861	-4716.955	0.864

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. My	2	-51.860	0.000	4742.574
			Max. Vy	8	45.570	-4716.955	0.864
			Max. Vx	2	-45.731	0.000	4742.574
			Max. Torque	8			2.656

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	26	71.920	0.000	-0.000
	Max. H_x	21	38.913	45.543	0.000
	Max. H_z	3	38.913	0.000	45.705
	Max. M_x	2	4742.574	0.000	45.704
	Max. M_z	8	4716.955	-45.543	0.000
	Max. Torsion	8	2.655	-45.543	0.000
	Min. Vert	3	38.913	0.000	45.705
	Min. H_x	9	38.913	-45.543	0.000
	Min. H_z	15	38.913	0.000	-45.705
	Min. M_x	14	-4740.839	0.000	-45.704
	Min. M_z	20	-4716.955	45.543	0.000
	Min. Torsion	20	-2.655	45.543	0.000

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	43.237	0.000	-0.000	-0.700	0.000	0.000
1.2 Dead+1.6 Wind 0 deg - No Ice	51.884	0.000	-45.704	-4742.574	0.000	0.000
0.9 Dead+1.6 Wind 0 deg - No Ice	38.913	0.000	-45.705	-4721.054	0.000	0.000
1.2 Dead+1.6 Wind 30 deg - No Ice	51.884	22.772	-39.584	-4107.655	-2358.514	-1.326
0.9 Dead+1.6 Wind 30 deg - No Ice	38.913	22.772	-39.584	-4088.887	-2347.873	-1.320
1.2 Dead+1.6 Wind 60 deg - No Ice	51.884	39.442	-22.854	-2371.929	-4085.080	-2.298
0.9 Dead+1.6 Wind 60 deg - No Ice	38.913	39.442	-22.854	-2361.000	-4066.650	-2.287
1.2 Dead+1.6 Wind 90 deg - No Ice	51.884	45.543	-0.000	-0.863	-4716.955	-2.655
0.9 Dead+1.6 Wind 90 deg - No Ice	38.913	45.543	-0.000	-0.642	-4695.703	-2.642
1.2 Dead+1.6 Wind 120 deg - No Ice	51.884	39.442	22.854	2370.200	-4085.076	-2.300
0.9 Dead+1.6 Wind 120 deg - No Ice	38.913	39.442	22.854	2359.715	-4066.647	-2.288
1.2 Dead+1.6 Wind 150 deg - No Ice	51.884	22.772	39.584	4105.922	-2358.510	-1.328
0.9 Dead+1.6 Wind 150 deg - No Ice	38.913	22.772	39.584	4087.599	-2347.871	-1.322

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
1.2 Dead+1.6 Wind 180 deg - No Ice	51.884	0.000	45.704	4740.839	0.000	0.000
0.9 Dead+1.6 Wind 180 deg - No Ice	38.913	0.000	45.705	4719.764	0.000	0.000
1.2 Dead+1.6 Wind 210 deg - No Ice	51.884	-22.772	39.584	4105.922	2358.510	1.328
0.9 Dead+1.6 Wind 210 deg - No Ice	38.913	-22.772	39.584	4087.599	2347.871	1.322
1.2 Dead+1.6 Wind 240 deg - No Ice	51.884	-39.442	22.854	2370.200	4085.076	2.300
0.9 Dead+1.6 Wind 240 deg - No Ice	38.913	-39.442	22.854	2359.715	4066.647	2.288
1.2 Dead+1.6 Wind 270 deg - No Ice	51.884	-45.543	-0.000	-0.863	4716.955	2.655
0.9 Dead+1.6 Wind 270 deg - No Ice	38.913	-45.543	-0.000	-0.642	4695.703	2.642
1.2 Dead+1.6 Wind 300 deg - No Ice	51.884	-39.442	-22.854	-2371.929	4085.080	2.298
0.9 Dead+1.6 Wind 300 deg - No Ice	38.913	-39.442	-22.854	-2361.000	4066.650	2.287
1.2 Dead+1.6 Wind 330 deg - No Ice	51.884	-22.772	-39.584	-4107.655	2358.514	1.326
0.9 Dead+1.6 Wind 330 deg - No Ice	38.913	-22.772	-39.584	-4088.887	2347.873	1.320
1.2 Dead+1.0 Ice+1.0 Temp	71.920	0.000	0.000	-2.111	0.000	0.000
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	71.920	0.000	-9.590	-974.353	0.000	0.000
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	71.920	4.777	-8.305	-844.116	-483.240	-0.345
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	71.920	8.274	-4.795	-488.300	-836.996	-0.598
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	71.920	9.554	0.000	-2.247	-966.480	-0.691
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	71.920	8.274	4.795	483.806	-836.996	-0.598
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	71.920	4.777	8.305	839.622	-483.240	-0.345
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	71.920	0.000	9.590	969.859	0.000	0.000
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	71.920	-4.777	8.305	839.622	483.240	0.345
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	71.920	-8.274	4.795	483.806	836.996	0.598
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	71.920	-9.554	0.000	-2.247	966.480	0.691
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	71.920	-8.274	-4.795	-488.300	836.996	0.598
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	71.920	-4.777	-8.305	-844.116	483.240	0.345
Dead+Wind 0 deg - Service	43.237	0.000	-6.956	-720.605	0.000	0.000
Dead+Wind 30 deg - Service	43.237	3.466	-6.024	-624.159	-358.039	-0.202
Dead+Wind 60 deg - Service	43.237	6.003	-3.478	-360.663	-620.141	-0.350
Dead+Wind 90 deg - Service	43.237	6.931	0.000	-0.720	-716.078	-0.405
Dead+Wind 120 deg - Service	43.237	6.003	3.478	359.222	-620.141	-0.350
Dead+Wind 150 deg - Service	43.237	3.466	6.024	622.718	-358.039	-0.202
Dead+Wind 180 deg - Service	43.237	0.000	6.956	719.164	0.000	0.000
Dead+Wind 210 deg - Service	43.237	-3.466	6.024	622.718	358.039	0.202
Dead+Wind 240 deg - Service	43.237	-6.003	3.478	359.222	620.141	0.350
Dead+Wind 270 deg - Service	43.237	-6.931	0.000	-0.720	716.078	0.405
Dead+Wind 300 deg - Service	43.237	-6.003	-3.478	-360.663	620.141	0.350
Dead+Wind 330 deg - Service	43.237	-3.466	-6.024	-624.159	358.039	0.202

Solution Summary

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
1	0.000	-43.237	0.000	0.000	43.237	0.000	0.000%
2	0.000	-51.884	-45.708	0.000	51.884	45.704	0.005%
3	0.000	-38.913	-45.708	0.000	38.913	45.705	0.004%
4	22.772	-51.884	-39.584	-22.772	51.884	39.584	0.000%
5	22.772	-38.913	-39.584	-22.772	38.913	39.584	0.000%
6	39.442	-51.884	-22.854	-39.442	51.884	22.854	0.000%
7	39.442	-38.913	-22.854	-39.442	38.913	22.854	0.000%
8	45.544	-51.884	0.000	-45.543	51.884	0.000	0.001%
9	45.544	-38.913	0.000	-45.543	38.913	0.000	0.001%
10	39.442	-51.884	22.854	-39.442	51.884	-22.854	0.000%
11	39.442	-38.913	22.854	-39.442	38.913	-22.854	0.000%
12	22.772	-51.884	39.584	-22.772	51.884	-39.584	0.000%
13	22.772	-38.913	39.584	-22.772	38.913	-39.584	0.000%
14	0.000	-51.884	45.708	0.000	51.884	-45.704	0.005%
15	0.000	-38.913	45.708	0.000	38.913	-45.705	0.004%
16	-22.772	-51.884	39.584	22.772	51.884	-39.584	0.000%
17	-22.772	-38.913	39.584	22.772	38.913	-39.584	0.000%
18	-39.442	-51.884	22.854	39.442	51.884	-22.854	0.000%
19	-39.442	-38.913	22.854	39.442	38.913	-22.854	0.000%
20	-45.544	-51.884	0.000	45.543	51.884	0.000	0.001%
21	-45.544	-38.913	0.000	45.543	38.913	0.000	0.001%
22	-39.442	-51.884	-22.854	39.442	51.884	22.854	0.000%
23	-39.442	-38.913	-22.854	39.442	38.913	22.854	0.000%
24	-22.772	-51.884	-39.584	22.772	51.884	39.584	0.000%
25	-22.772	-38.913	-39.584	22.772	38.913	39.584	0.000%
26	0.000	-71.920	0.000	0.000	71.920	-0.000	0.000%
27	0.000	-71.920	-9.590	0.000	71.920	9.590	0.000%
28	4.777	-71.920	-8.305	-4.777	71.920	8.305	0.000%
29	8.274	-71.920	-4.795	-8.274	71.920	4.795	0.000%
30	9.554	-71.920	0.000	-9.554	71.920	-0.000	0.000%
31	8.274	-71.920	4.795	-8.274	71.920	-4.795	0.000%
32	4.777	-71.920	8.305	-4.777	71.920	-8.305	0.000%
33	0.000	-71.920	9.590	0.000	71.920	-9.590	0.000%
34	-4.777	-71.920	8.305	4.777	71.920	-8.305	0.000%
35	-8.274	-71.920	4.795	8.274	71.920	-4.795	0.000%
36	-9.554	-71.920	0.000	9.554	71.920	-0.000	0.000%
37	-8.274	-71.920	-4.795	8.274	71.920	4.795	0.000%
38	-4.777	-71.920	-8.305	4.777	71.920	8.305	0.000%
39	0.000	-43.237	-6.958	0.000	43.237	6.956	0.003%
40	3.466	-43.237	-6.026	-3.466	43.237	6.024	0.003%
41	6.004	-43.237	-3.479	-6.003	43.237	3.478	0.003%
42	6.933	-43.237	0.000	-6.931	43.237	-0.000	0.003%
43	6.004	-43.237	3.479	-6.003	43.237	-3.478	0.003%
44	3.466	-43.237	6.026	-3.466	43.237	-6.024	0.003%
45	0.000	-43.237	6.958	0.000	43.237	-6.956	0.003%
46	-3.466	-43.237	6.026	3.466	43.237	-6.024	0.003%
47	-6.004	-43.237	3.479	6.003	43.237	-3.478	0.003%
48	-6.933	-43.237	0.000	6.931	43.237	-0.000	0.003%
49	-6.004	-43.237	-3.479	6.003	43.237	3.478	0.003%
50	-3.466	-43.237	-6.026	3.466	43.237	6.024	0.003%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	6	0.00000001	0.00000001
2	Yes	10	0.00006339	0.00013618
3	Yes	10	0.00004500	0.00011503
4	Yes	13	0.00000001	0.00010080
5	Yes	13	0.00000001	0.00007645
6	Yes	13	0.00000001	0.00010671
7	Yes	13	0.00000001	0.00008105
8	Yes	11	0.00000001	0.00011648
9	Yes	11	0.00000001	0.00009290
10	Yes	13	0.00000001	0.00009900
11	Yes	13	0.00000001	0.00007513
12	Yes	13	0.00000001	0.00010506
13	Yes	13	0.00000001	0.00007978
14	Yes	10	0.00006339	0.00013607
15	Yes	10	0.00004500	0.00011495
16	Yes	13	0.00000001	0.00010506
17	Yes	13	0.00000001	0.00007978
18	Yes	13	0.00000001	0.00009900
19	Yes	13	0.00000001	0.00007513
20	Yes	11	0.00000001	0.00011648
21	Yes	11	0.00000001	0.00009290
22	Yes	13	0.00000001	0.00010671
23	Yes	13	0.00000001	0.00008105
24	Yes	13	0.00000001	0.00010080
25	Yes	13	0.00000001	0.00007645
26	Yes	6	0.00000001	0.00000001
27	Yes	12	0.00000001	0.00006097
28	Yes	12	0.00000001	0.00006683
29	Yes	12	0.00000001	0.00006690
30	Yes	12	0.00000001	0.00006032
31	Yes	12	0.00000001	0.00006599
32	Yes	12	0.00000001	0.00006634
33	Yes	12	0.00000001	0.00006029
34	Yes	12	0.00000001	0.00006634
35	Yes	12	0.00000001	0.00006599
36	Yes	12	0.00000001	0.00006032
37	Yes	12	0.00000001	0.00006690
38	Yes	12	0.00000001	0.00006683
39	Yes	9	0.00000001	0.00010383
40	Yes	9	0.00000001	0.00009590
41	Yes	9	0.00000001	0.00010507
42	Yes	9	0.00000001	0.00010614
43	Yes	9	0.00000001	0.00009469
44	Yes	9	0.00000001	0.00010153
45	Yes	9	0.00000001	0.00010335
46	Yes	9	0.00000001	0.00010153
47	Yes	9	0.00000001	0.00009469
48	Yes	9	0.00000001	0.00010614
49	Yes	9	0.00000001	0.00010507
50	Yes	9	0.00000001	0.00009590

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	150 - 110	9.243	39	0.5454	0.0024
L2	115.25 - 94.25	5.473	39	0.4619	0.0009
L3	99.75 - 46.25	4.063	39	0.3962	0.0006
L4	53.5 - 0	1.141	39	0.1956	0.0002

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
150'	DS4C06F36D-N	39	9.243	0.5454	0.0024	90610
140'	(4) MLA ANTENNA w/ Mount Pipe	39	8.109	0.5268	0.0018	45305
130'	(2) DB846F65ZAXY w/ Mount Pipe	39	7.002	0.5053	0.0014	22652

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	150 - 110	60.748	2	3.5763	0.0154
L2	115.25 - 94.25	35.999	2	3.0369	0.0057
L3	99.75 - 46.25	26.734	2	2.6060	0.0039
L4	53.5 - 0	7.511	2	1.2873	0.0012

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
150'	DS4C06F36D-N	2	60.748	3.5763	0.0154	14009
140'	(4) MLA ANTENNA w/ Mount Pipe	2	53.308	3.4597	0.0121	7004
130'	(2) DB846F65ZAXY w/ Mount Pipe	2	46.040	3.3222	0.0091	3500

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
L1	150 - 110 (1)	TP39.633x28.4x0.25	40'	0'	0.0	30.0805	-10.625	1751.230	0.006
L2	110 - 94.25 (2)	TP43.556x37.6587x0.2813	21'	0'	0.0	37.2586	-14.255	2179.630	0.007
L3	94.25 - 46.25 (3)	TP56.472x41.4489x0.375	53'6"	0'	0.0	64.3463	-28.371	3764.260	0.008
L4	46.25 - 0 (4)	TP68.71x53.6862x0.4375	53'6"	0'	0.0	94.8049	-51.860	5449.160	0.010

Pole Bending Design Data

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L1	150 - 110 (1)	TP39.633x28.4x0.25	603.482	1366.850	0.442	0.000	1366.850	0.000
L2	110 - 94.25 (2)	TP43.556x37.6587x0.2813	1025.092	1872.442	0.547	0.000	1872.442	0.000
L3	94.25 - 46.25 (3)	TP56.472x41.4489x0.375	2529.733	4188.467	0.604	0.000	4188.467	0.000
L4	46.25 - 0 (4)	TP68.71x53.6862x0.4375	4742.575	7661.150	0.619	0.000	7661.150	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V_u K	ϕV_n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u kip-ft	ϕT_n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	150 - 110 (1)	TP39.633x28.4x0.25	25.919	528.014	0.049	0.000	2797.592	0.000
L2	110 - 94.25 (2)	TP43.556x37.6587x0.2813	28.475	654.013	0.044	0.000	3832.958	0.000
L3	94.25 - 46.25 (3)	TP56.472x41.4489x0.375	36.667	1129.490	0.032	0.000	8575.667	0.000
L4	46.25 - 0 (4)	TP68.71x53.6862x0.4375	45.731	1647.480	0.028	0.000	15677.500	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	150 - 110 (1)	0.006	0.442	0.000	0.049	0.000	0.450 ✓	1.000	4.10-1a ✓
L2	110 - 94.25 (2)	0.007	0.547	0.000	0.044	0.000	0.556 ✓	1.000	4.10-1a ✓
L3	94.25 - 46.25 (3)	0.008	0.604	0.000	0.032	0.000	0.613 ✓	1.000	4.10-1a ✓
L4	46.25 - 0 (4)	0.010	0.619	0.000	0.028	0.000	0.629 ✓	1.000	4.10-1a ✓

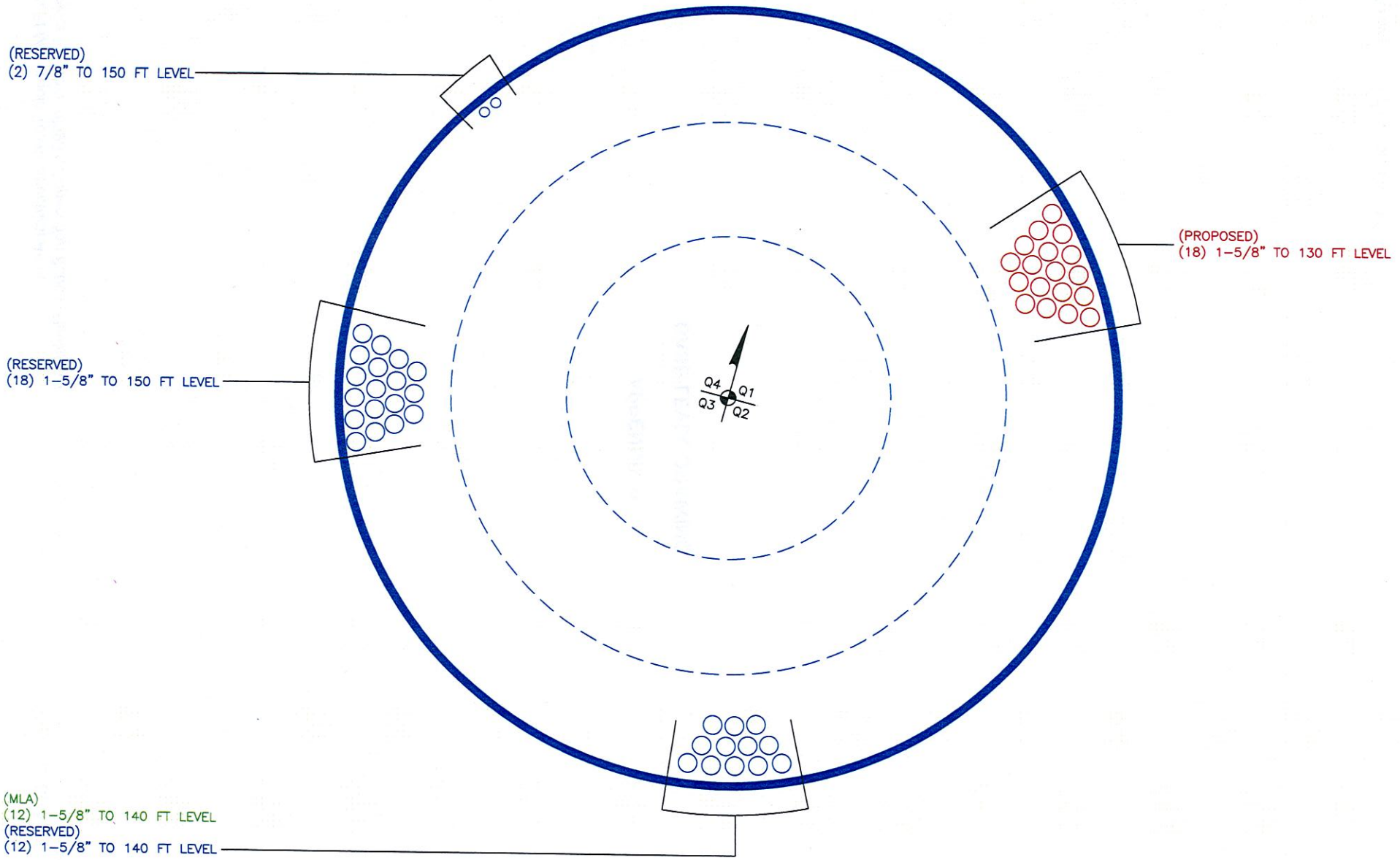
RISATower	Job	Page
	BU# 805102	13 of 13
Crown Castle USA, Inc. 2000 Corporate Drive Canonsburg, PA 15317 Phone: (724) 416-2000 FAX: (724) 416-2254	Project	Date 12:50:38 08/04/09
	Client Crown Castle USA	Designed by jmessmer

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
L1	150 - 110	Pole	TP39.633x28.4x0.25	1	-10.625	1751.230	45.0	Pass
L2	110 - 94.25	Pole	TP43.556x37.6587x0.2813	2	-14.255	2179.630	55.6	Pass
L3	94.25 - 46.25	Pole	TP56.472x41.4489x0.375	3	-28.371	3764.260	61.3	Pass
L4	46.25 - 0	Pole	TP68.71x53.6862x0.4375	4	-51.860	5449.160	62.9	Pass
							Summary	
						Pole (L4)	62.9	Pass
						RATING =	**62.9**	**Pass**

APPENDIX B

BASE LEVEL DRAWING



BUSINESS UNIT: 5800059 TOWER ID: C_BASELEVEL

APPENDIX C

ADDITIONAL CALCULATIONS

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

Assumptions: Rod groups at corners. Total # rods divisible by 4. Maximum total # of rods = 48.
Rod Spacing = Straight Center-to-Center distance between any (2) adjacent rods (same corner)

Site Data

BU#: *5800059*
Site Name: *Ridge Road*
App #: *86004 R1*

Reactions		
Mu:	4743	ft-kips
Axial, Pu:	52	kips
Shear, Vu:	46	kips

Connection Type: *Butt*

Anchor Rod Data		
Qty:	24	
Diam:	2.25	in
Rod Material:	A615-J	
Strength, Fu:	100	ksi
Yield, Fy:	75	ksi
Bolt Circle:	76	in
Anchor Spacing:	6	in

Plate Data		
W=Side:	77	in
Thick:	3	in
Grade:	50	ksi
B effective	40.18	in

Pole Data		
Diam:	68.71	in
Thick:	0.4375	in
Grade:	65	ksi

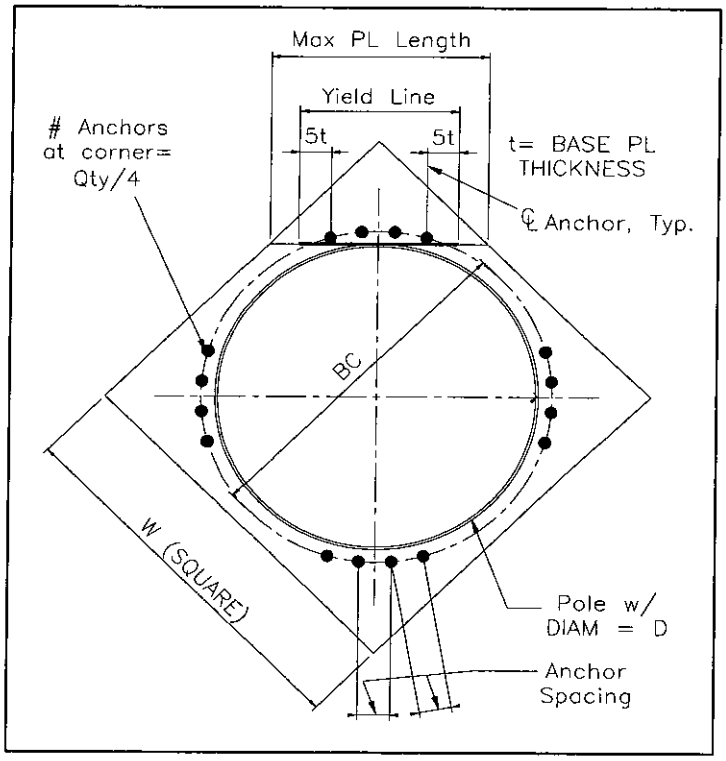
Anchor Rod Results

Max Rod (Cu+ Vu/ή):	130.8 Kips
Allowable Axial, Φ*Fu*Anet:	260.0 Kips
Anchor Rod Stress Ratio:	50.3% **Pass**

Base Plate Results

Base Plate Stress:	18.8 ksi
Allowable Plate Stress:	45.0 ksi
Base Plate Stress Ratio:	41.8% **Pass**

PL Ref. Data
Yield Line (in):
40.18
Max PL Length:
40.18



Monopole Drilled Pier

Checks capacity of a single drilled shaft foundation for a monopole

CROWN

BU#: 5800059
Site Name: *Ridge Road*
App Number: *86004 R1*

Design Reactions		
Shear, **S**:	46.00	kips
Moment, **Mt**:	4743.00	ft-kips
Tower Weight, **Wt**:	52.00	kips
Tower Height, **H**:	150	ft
Base Diameter, **BD**:	68.7	in

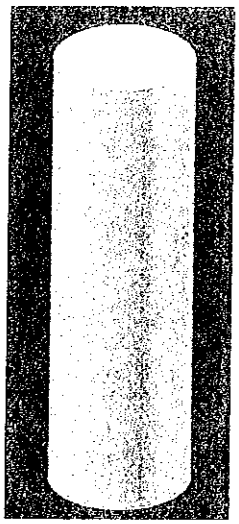
Foundation Dimensions		
Caisson Diameter, **CD**:	8.0	ft
Ext. Above Grade, **E**:	0.5	ft
Depth Below Grade, **L**:	39.0	ft
Neglected Depth, **N**:	5.0	ft
Rebar Size, **Sp**:	11	
Rebar Quantity, **mp**:	28	

Material Properties		
Rebar Tensile, **Fy**:	60000	psi
Concrete Strength, **F'c**:	4000	psi
Concrete Density, δ**x**:	150	pcf
Clear Cover, **cc**:	3	in

Soil Properties		
Soil Unit Weight, γ:	63	pcf
Ultimate Bearing, **Bc**:	14.567	ksf Gross
Seismic Zone, **z**:	1	

Caisson Analysis		
Depth to Zero Shear	13.7	ft
Max Moment	5858.36	ft-kips
Required Length	32	ft
Max Soil Moment	9565.6	ft-kips

Design Checks	*Capacity/ Availability*	*Demand/ Limits*	*Check*
Minimum Req'd Dia. 1 (ft):	8.00	2.13	OK
Minimum Req'd Dia. 2 (ft):	8.00	7.73	OK
Rebar Area (in^2):	43.68	36.19	OK
Pier moment capacity (k-ft):	8297.11	5858.36	OK
Rebar spacing (in):	8.69	4.5 < Bs <12	OK
Development Length (in)	300.85	59.20	OK
Required Length (ft):	39.50	32.00	OK
Soil moment capacity(k-ft):	9565.60	4743.00	OK



CAISSON Version 10.00 1:26:25 PM Tuesday, August 04, 2009
Crown Castle USA

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*                                                                           *
*  PIER FOUNDATIONS ANALYSIS AND DESIGN - (C) 1995,2002 POWER LINE SYSTEMS, INC.*
*                                                                           *
*****************************************************************************
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*** ANALYSIS IDENTIFICATION : BU 5800059
NOTES :

*** PIER PROPERTIES CONCRETE STRENGTH (ksi) = 4.00 STEEL STRENGTH (ksi) = 60.00

DIAMETER (ft) = 8.000 DISTANCE FROM TOP OF PIER TO GROUND LEVEL (ft) = 0.50

*** SOIL PROPERTIES

LAYER	TYPE	THICKNESS (ft)	DEPTH AT TOP OF LAYER (ft)	DENSITY (pcf)	CU (psf)	KP	PHI (degrees)
1	C	12.00	0.00	65.0	0.0		
2	S	8.00	12.00	42.6		2.660	26.97
3	S	21.00	20.00	62.6		3.120	30.97

*** DESIGN (FACTORED) LOADS AT TOP OF PIER MOMENT (ft-k) = 4743.0 VERTICAL (k) = 52.0 SHEAR (k) = 46.0
ADDITIONAL SAFETY FACTOR AGAINST SOIL FAILURE = 1.33

*** CALCULATED PIER LENGTH (ft) = 32.000

*** CHECK OF SOILS PROPERTIES AND ULTIMATE RESISTING FORCES ALONG PIER

TYPE	TOP OF LAYER BELOW TOP OF PIER (ft)	THICKNESS (ft)	DENSITY (pcf)	CU (psf)	KP	FORCE (k)	ARM (ft)
C	0.50	12.00	65.0	0.0		0.00	6.50
S	12.50	8.00	42.6		2.660	485.39	16.74
S	20.50	4.51	62.6		3.120	425.78	22.84
S	25.01	6.99	62.6		3.120	-849.32	28.66

*** SHEAR AND MOMENTS ALONG PIER

DISTANCE BELOW TOP OF PIER (ft)	WITH THE ADDITIONAL SAFETY FACTOR SHEAR (k)	MOMENT (ft-k)	WITHOUT ADDITIONAL SAFETY FACTOR SHEAR (k)	MOMENT (ft-k)
0.00	61.8	6493.4	46.4	4870.2
3.20	61.8	6691.3	46.4	5018.6
6.40	61.8	6889.2	46.4	5167.0
9.60	61.8	7087.1	46.4	5315.5
12.80	46.8	7282.8	35.1	5462.2
16.00	-129.1	7158.5	-96.8	5369.0
19.20	-332.8	6426.9	-249.6	4820.3
22.40	-591.5	4974.2	-443.6	3730.7
25.60	-786.1	2618.0	-589.6	1963.5
28.80	-417.1	680.1	-312.8	510.1
32.00	0.0	-0.0	0.0	-0.0

*** TOTAL REINFORCEMENT PCT = 0.44 REINFORCEMENT AREA (in^2) = 31.85
*** USABLE AXIAL CAP. (k) = 52.0 USABLE MOMENT CAP. (ft-k) = 5781.9

*** US Standard Re-Bars (Select one of the following):

160	BARS #4	(AREA = 0.20 in^2	DIA = 0.500 in)	AT SPACING (in) =	1.69
103	BARS #5	(AREA = 0.31 in^2	DIA = 0.625 in)	AT SPACING (in) =	2.62
73	BARS #6	(AREA = 0.44 in^2	DIA = 0.750 in)	AT SPACING (in) =	3.70
54	BARS #7	(AREA = 0.60 in^2	DIA = 0.875 in)	AT SPACING (in) =	5.00
41	BARS #8	(AREA = 0.79 in^2	DIA = 1.000 in)	AT SPACING (in) =	6.59
32	BARS #9	(AREA = 1.00 in^2	DIA = 1.128 in)	AT SPACING (in) =	8.44
26	BARS #10	(AREA = 1.27 in^2	DIA = 1.270 in)	AT SPACING (in) =	10.39
21	BARS #11	(AREA = 1.56 in^2	DIA = 1.410 in)	AT SPACING (in) =	12.87
15	BARS #14	(AREA = 2.25 in^2	DIA = 1.693 in)	AT SPACING (in) =	18.01

*** WEIGHT OF CAISSON (kips) = 241.274
*** PRESSURE UNDER CAISSON DUE TO INPUT DESIGN AXIAL LOAD (psf) = 1034.5

CAISSON Version 10.00 1:27:01 PM Tuesday, August 04, 2009
Crown Castle USA

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*                                                                           *
*  PIER FOUNDATIONS ANALYSIS AND DESIGN - (C) 1995,2002 POWER LINE SYSTEMS, INC.*
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*** ANALYSIS IDENTIFICATION : BU 5800059
NOTES :

*** PIER PROPERTIES CONCRETE STRENGTH (ksi) = 4.00 STEEL STRENGTH (ksi) = 60.00

DIAMETER (ft) = 8.000 DISTANCE FROM TOP OF PIER TO GROUND LEVEL (ft) = 0.50

*** SOIL PROPERTIES

LAYER	TYPE	THICKNESS (ft)	DEPTH AT TOP OF LAYER (ft)	DENSITY (pcf)	CU (psf)	KP	PHI (degrees)
1	C	12.00	0.00	65.0	0.0		
2	S	8.00	12.00	42.6		2.660	26.97
3	S	21.00	20.00	62.6		3.120	30.97

*** DESIGN (FACTORED) LOADS AT TOP OF PIER MOMENT (ft-k) = 10197.5 VERTICAL (k) = 52.0 SHEAR (k) = 98.9
ADDITIONAL SAFETY FACTOR AGAINST SOIL FAILURE = 1.33

*** CALCULATED PIER LENGTH (ft) = 39.500

*** CHECK OF SOILS PROPERTIES AND ULTIMATE RESISTING FORCES ALONG PIER

TYPE	TOP OF LAYER BELOW TOP OF PIER (ft)	THICKNESS (ft)	DENSITY (pcf)	CU (psf)	KP	FORCE (k)	ARM (ft)
C	0.50	12.00	65.0	0.0		0.00	6.50
S	12.50	8.00	42.6		2.660	485.39	16.74
S	20.50	9.77	62.6		3.120	1044.06	25.74
S	30.27	9.23	62.6		3.120	-1396.61	35.11

*** SHEAR AND MOMENTS ALONG PIER

DISTANCE BELOW TOP OF PIER (ft)	WITH THE ADDITIONAL SAFETY FACTOR SHEAR (k)	WITH THE ADDITIONAL SAFETY FACTOR MOMENT (ft-k)	WITHOUT ADDITIONAL SAFETY FACTOR SHEAR (k)	WITHOUT ADDITIONAL SAFETY FACTOR MOMENT (ft-k)
0.00	132.8	14035.0	99.6	10526.5
3.95	132.8	14559.8	99.6	10920.1
7.90	132.8	15084.5	99.6	11313.6
11.85	132.8	15609.2	99.6	11707.2
15.80	-46.3	15846.5	-34.7	11885.2
19.75	-299.6	15177.2	-224.7	11383.2
23.70	-645.1	13349.3	-483.8	10012.2
27.65	-1072.4	9981.2	-804.3	7486.1
31.60	-1220.3	5012.9	-915.3	3759.8
35.55	-646.7	1301.4	-485.1	976.1
39.50	0.0	0.0	0.0	0.0

*** TOTAL REINFORCEMENT PCT = 1.00 REINFORCEMENT AREA (in^2) = 72.38
*** USABLE AXIAL CAP. (k) = 52.0 USABLE MOMENT CAP. (ft-k) = 12047.4

*** US Standard Re-Bars (Select one of the following):

362	BARS #4	(AREA = 0.20 in^2	DIA = 0.500 in) AT SPACING (in) =	0.75
234	BARS #5	(AREA = 0.31 in^2	DIA = 0.625 in) AT SPACING (in) =	1.15
165	BARS #6	(AREA = 0.44 in^2	DIA = 0.750 in) AT SPACING (in) =	1.64
121	BARS #7	(AREA = 0.60 in^2	DIA = 0.875 in) AT SPACING (in) =	2.23
92	BARS #8	(AREA = 0.79 in^2	DIA = 1.000 in) AT SPACING (in) =	2.94
73	BARS #9	(AREA = 1.00 in^2	DIA = 1.128 in) AT SPACING (in) =	3.70
57	BARS #10	(AREA = 1.27 in^2	DIA = 1.270 in) AT SPACING (in) =	4.74
47	BARS #11	(AREA = 1.56 in^2	DIA = 1.410 in) AT SPACING (in) =	5.75
33	BARS #14	(AREA = 2.25 in^2	DIA = 1.693 in) AT SPACING (in) =	8.19

*** WEIGHT OF CAISSON (kips) = 297.823
*** PRESSURE UNDER CAISSON DUE TO INPUT DESIGN AXIAL LOAD (psf) = 1034.5