

# 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@po.state.ct.us](mailto:siting.council@po.state.ct.us)

[www.ct.gov/csc](http://www.ct.gov/csc)

May 23, 2006

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

RE: **EM-VER-139-051-089-060428** - Cellco Partnership d/b/a Verizon Wireless notice of intent to modify existing telecommunications facilities located at 44 Fyler Place, Suffield; 281 Woodhouse Road, Fairfield; 200 Stanley Street, New Britain; and 167 Lester Street, New Britain, Connecticut.

Dear Attorney Baldwin:

At a public meeting held on May 17, 2006, the Connecticut Siting Council (Council) acknowledged your notice to modify these existing telecommunications facilities, 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 April 28, 2006, including the placement of all necessary equipment and shelters within the tower compounds. 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 existing facility sites that would not increase tower heights, extend the boundaries of the tower sites, increase noise levels at the tower site boundaries by six decibels, and increase the total radio frequencies electromagnetic radiation power densities measured at the tower site boundaries to or above the standard adopted by the State Department of Environmental Protection pursuant to General Statutes § 22a-162. These facilities have also been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies now used on these towers.

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 any of these facilities 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,

Pamela B. Katz, P.E.  
Chairman

PBK/laf

c: See Attached List

List Attachment

- c: The Honorable Timothy T. Stewart, Mayor, City of New Britain
- Steven P. Schiller, Director of Planning, City of New Britain
- The Honorable Kenneth A. Flatto, First Selectman, Town of Fairfield
- Joseph E. Devonshuk, Town Planner, Town of Fairfield
- The Honorable Scott R. Lingenfelter, First Selectman, Town of Suffield
- Phil Chester, Planning Consultant, Town of Suffield
- Jeffrey W. Barbadora, Crown Atlantic Company
- Michele G. Briggs, New Cingular Wireless PCS, LLC
- Christopher B. Fisher, Esq., Cuddy & Feder LLP
- Christine Farrell, Omnipoint Communications, Inc.
- Thomas F. Flynn III, Nextel Communications Inc.
- Thomas J. Regan, Esq., Brown Rudnick Berlack Israels LLP

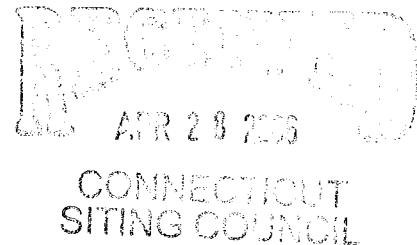
280 Trumbull Street  
Hartford, CT 06103-3597  
Main (860) 275-8200  
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kbaldwin@rc.com  
Direct (860) 275-8345

EM-VER-139-051-089-060428

April 28, 2006

*Via Hand Delivery*

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



Re: **Notice of Exempt Modification – Antenna Swap**  
**44 Fyler Place, Suffield, CT**  
**281 Woodhouse Road, Fairfield, CT**  
**200 Stanley Street, New Britain, CT**  
**167 Lester Street, New Britain, CT**

Dear Mr. Phelps:

Cellco Partnership d/b/a Verizon Wireless (“Cellco”) currently maintains a wireless telecommunications facility at each of the above referenced locations. In its continuing effort to improve the quality and reliability of its wireless service, Cellco intends to replace and upgrade the cellular antennas at each of these existing facility locations.

**Suffield- 44 Fyler Place**

The Council originally approved Cellco’s shared use of this facility on March 15, 2001. On March 3, 2005, the Council approved Cellco’s request to replace six of its cellular antennas with six PCS antennas. Cellco now intends to modify this facility further by replacing the remaining six cellular antennas with six newer model cellular antennas at the same location on the tower. Attached behind Tab 1 are specifications for the existing cellular and proposed replacement antennas as well as a structural analysis for the Fyler Place facility.

**Fairfield- 281 Woodhouse Road**

The Council originally approved Cellco’s shared use of this facility on February 17, 1988. On March 4, 2004, the Council approved Cellco’s request to replace its cellular antennas. Cellco now intends to modify this facility further by replacing six cellular antennas with six newer model antennas at the same location on



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the tower. Attached behind Tab 2 are specifications for the existing cellular and proposed replacement antennas as well as a structural analysis for the Woodhouse Road facility.

**New Britain- 200 Stanley Street**

The Council originally approved Cellco's shared use of this facility on February 14, 2002. On July 13, 2004, the Council approved Cellco's request to replace six of its cellular antennas with six PCS antennas. Cellco now intends to modify this facility further by replacing the remaining six cellular antennas with six newer model cellular antennas at the same location on the tower. Attached behind Tab 3 are specifications for the existing cellular and proposed replacement antennas as well as a structural analysis for the Stanley Street facility.

**New Britain- 167 Lester Street**

The Council originally approved Cellco's shared use of this facility on April 25, 2001. On February 18, 2004, the Council approved Cellco's request to replace six of its cellular antennas with six PCS antennas. Cellco now intends to modify this facility further by replacing the remaining six cellular antennas with six newer model cellular antennas at the same location on the tower. Attached behind Tab 4 are specifications for the existing cellular and proposed replacement antennas as well as a structural analysis for the Stanley Street facility.

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 the chief elected official of each affected municipality.

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

1. The proposed modifications will not result in any increase in the overall height of the existing structures. Cellco's replacement antennas will be located at the same heights and locations as the existing antennas.
2. The proposed modifications will not affect associated equipment areas and will not require the extension of the site boundaries.
3. The proposed modifications will not increase noise levels at the facility by six decibels or more.



# ROBINSON & COLE<sub>LLP</sub>

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4. The proposed modifications will not result in changes to radio frequency (RF) power density levels at either facility. Therefore, no new Power Density Calculation Tables are provided.

Also, structural analyses have been performed and are attached for each structure Cellco intends to modify.

For the foregoing reasons, Cellco respectfully submits that the proposed modifications to the each of the above-referenced telecommunications facilities constitutes an exempt modification under R.C.S.A. § 16-50j-72(b)(2).

Sincerely,



Kenneth C. Baldwin

Enclosures

Copy to:

Scott Lingenfelter, Suffield First Selectman  
Kenneth A. Flatto, Fairfield First Selectman  
Timothy T. Stewart, New Britain Mayor  
Sandy M. Carter  
Michelle Kababik

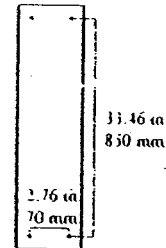
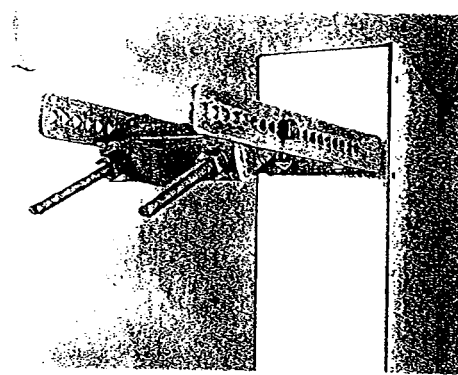
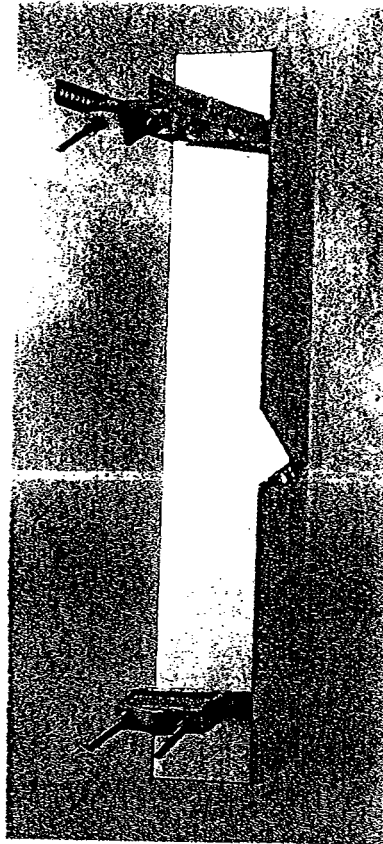


# ALP-E 9011-Din

Enhanced Log-Periodic Antenna

## Features:

- Small Size
- Aesthetically Pleasing
- Suitable For TDMA/CDMA
- High Return Loss
- Low Intermodulation
- High FTB
- Broadbanded
- Side-lobe Suppression
- Sturdy Design
- Down-Tilt Brackets Incl.



The distance between the center of the bolts (on the back of the antenna) are shown in the drawing above.

Bolt diameter is: 3/8-16  
[comes with lock nut].



Frequency Range:	800-900 MHz
Impedance:	50 ohm
Connector Type:	7/16 Din
Return Loss:	20 dB
Polarization:	Vertical
Gain:	> 11 dBd
Front To Back Ratio:	> 30 dB
Side-Lobe Suppression:	18 dB
Intermodulation (2x25W):	IM3 > 146 dB
	IM5 > 153 dB
	IM7/9 > 163 dB
Power Rating:	500 W
H-Plane (-3 dB point):	85 - 92°
V-Plane (-3 dB point):	16 - 18°
Lightning Protection:	DC Grounded

Overall Height:	43 in	[1092 mm]
Width:	6.5 in	[165 mm]
Depth:	8 in	[203 mm]
Weight Including Tilt-Brackets:	20 lbs	[9.1 Kg]
Rated Wind Velocity:	113 mph	[180 Km/h]
Wind Area (Cx A/Side):	2.3 sq. ft.	[0.22 sq.m]
Lateral Thrust At Rated Wind Worst Case:	112 lbs	[500 N]



Radiating Elements:	Aluminum
Extrusion:	Aluminum
Radome:	Grey PVC
Tilt-Bracket:	Hot Dip Galvanized Steel
Antenna Bolts:	Stainless Steel

The ALP-E 9011-Din is made in U.S.A.

# WPA-80090/4CF

When ordering, replace "\_\_\_" with connector type.

## Mechanical specifications

Length	1205 mm	47.4 in
Width	205 mm	8.1 in
Depth	145 mm	5.7 in
Weight	5.4 kg	12.0 lbs

### Wind Area

Front	0.25 m <sup>2</sup>	2.66 ft <sup>2</sup>
Side	0.17 m <sup>2</sup>	1.88 ft <sup>2</sup>

### Rated Wind Velocity (Safety factor 2.0)

	67.9 km/hr	42.2 mph
--	------------	----------

### Wind load @ 100 mph (161 km/hr)

Front	362 N	81.4 lbs
Side	264 N	59.4 lbs

### Mounting

through two pairs of clamps to pipe diameter 250-127 mm (2.0-5.0 in), or by U-clamps to a 2" pipe.

Antenna consisting of aluminum alloy with brass feedline, covered by a UV safe fiberglass radome.

Mounting Bracket #36210002

Downtilt Bracket #36114003

## Electrical specifications

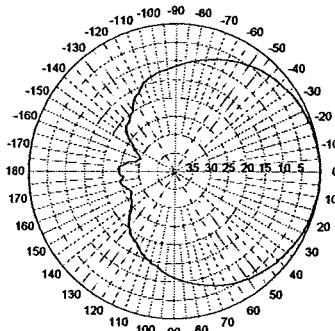
Frequency Range	806-960 MHz
Impedance	50Ω
Connector	N / NE / DIN / E DIN
VSWR	<1.4:1
Polarization	Vertical
Gain	11.5 dBd
Power Rating	500 W
Half Power Angle	
H-Plane	90°
E-Plane	15°
Lobe Tilt	0°
Null Fill	10%
Lightning Protection	Direct Ground

### Typical Value

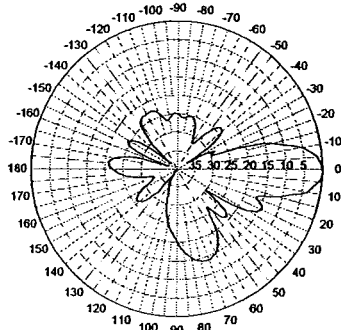
Power Rating limited by connector only  
 NE indicates an elongated N Connector  
 E-DIN indicates an elongated DIN Connector

Improvements in mechanical and/or electrical performance of the antenna may be made without notice.

## Radiation-pattern<sup>1)</sup>



Horizontal



Vertical

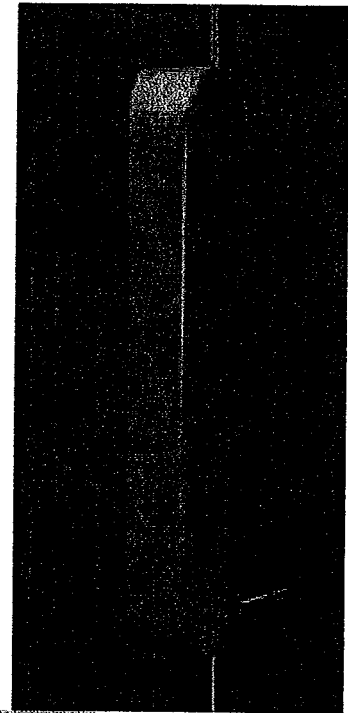
## Featuring upper side lobe suppression.

Radiation patterns for all Antel antennas are measured with the antenna mounted on a fiberglass pole.

Mounting on a metal pole will typically improve the Front-to-Back Ratio.

CF Denotes a Center-Fed Connector.

806-960 MHz



806-960 MHz



**Antel's Exclusive 3T (True Transmission Line Technology) Antenna Design:**

- Single-piece, watercut brass feedline assembly for consistent performance.
- Unique single-piece feedline design eliminates the need for solder joints in the signal path.
- A non-collinear system with access to every radiating element for broad bandwidth and superior performance.
- Air as insulation for virtually no internal signal loss.

Every Antel antenna is under a five-year limited warranty for repair or replacement.

Antenna available with center-fed connector only.



Revision Date: 05/27/03



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

March 22, 2006

Veronica Harris  
 Crown Castle International  
 1200 McArthur Blvd  
 Mahwah, NJ 07430  
 (201) 236-9094

Paul J. Ford and Company  
 250 East Broad Street, Suite 1500  
 Columbus, Ohio 43215  
 (614) 221-6679  
 jkechichian@pjfweb.com

**Subject: Structural Analysis Report**

**Carrier Designation**

Verizon Wireless Co-Locate  
 Carrier Site Number: N/A  
 Carrier Site Name: Suffield 2

**Crown Castle Designation**

Crown Castle BU Number: 801486  
 Crown Castle Site Name: CT Suffield 2 CAC 801486  
 Crown Castle JDE Job Number: 71273

**Engineering Firm Designation**

Paul J. Ford and Company Project Number: 37506-0225

**Site Data**

44 Flyer Place, Suffield, Connecticut, Hartford County  
 Latitude 41° 58' 49.7", Longitude -72° 39' 26.2"  
 110 Foot - Monopole

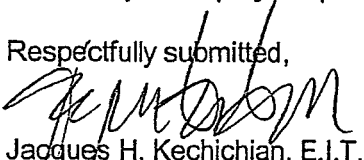
Dear Veronica Harris,

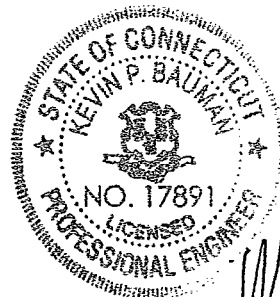
Paul J. Ford and Company is pleased to submit this "Structural Analysis Report" to determine the structural adequacy of the aforementioned pole. This analysis has been performed in accordance with the Crown Castle Structural 'Statement of Work' and the terms of Crown Castle Purchase Order Number 204497. The purpose of the analysis is to determine the suitability of the pole with the addition of (6) WPA-80090/4CF at an elevation of 92 feet, combined with the existing and reserved equipment on the structure. This analysis has been performed in accordance with the Telecommunications Industry Association Standard TIA/EIA-222-F for the following wind design wind velocities; 80 mph Basic Wind Velocity without ice, 69 mph Basic Wind Velocity with 0.5" radial ice, and 50 mph (Operational) Basic Wind Velocity without ice.

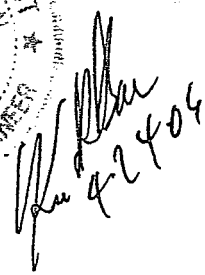
Based on our analysis, we have determined that the tower structure and foundation are sufficient for the proposed loading and modifications to the existing structure are not required at this time.

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

Respectfully submitted,

  
 Jacques H. Kechichian, E.I.T.  
 Project Engineer







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**INTRODUCTION**

The CT Suffield 2 CAC 801486 tower was originally designed and manufactured by FWT, Inc. in 2002. This monopole is FWT, Inc. job number M02-0203. Paul J. Ford and Company was supplied with the original tower drawings.

The 110-ft monopole was originally designed in accordance with Telecommunications Industry Association Standard TIA/EIA-222-F for the following design wind velocities; 80 mph Basic Wind Velocity without ice, and 69 mph Basic Wind Velocity with 0.5" radial ice.

We were provided with the following foundation information; Foundation Drawings by Martin De La Rosa dated 5/30/2000.

**ANALYSIS CRITERIA**

Crown Castle has asked Paul J. Ford and Company to provide a structural analysis of the existing 110-ft monopole located in Suffield, Connecticut known as the CT Suffield 2 CAC 801486 site. Our structural analysis of this tower was completed according to the recommendations of the "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures", TIA/EIA-222-F. This standard recommends a minimum basic design wind velocity of 80 mph (measured at 33-ft above grade) for Hartford County. If ice accumulation is considered, this standard allows a reduced design wind velocity of 69 mph with simultaneous 0.5" solid radial ice accumulation.

**Table 1 – Proposed Antenna and Cable Information**

Center Line Elevation (feet)	Number Of Antenna	Antenna Manufacturer	Antenna Model	Mount Model	Number of Feed Lines	Feed Line Size (inches)
92	6	Antel	WPA-80090/4CF	-	-	-

**Table 2 – Existing and Reserved Antenna and Cable Information**

Center Line Elevation (feet)	Number Of Antenna	Antenna Manufacturer	Antenna Model	Mount Model	Number of Feed Lines	Feed Line Size (inches)
110	12	Decibel	DB844H90-XY	LP Platform	12 *	1 5/8
					12 **	SLA 1 1/4
92	6	Decibel	DB948F85T2E-M	LP Platform	12 *	1 1/4
	6 ***	Swedcom	ALP-E-9011 DIN		12 **	SLA 1 5/8
83	12	Decibel	DB844H90-XY	LP Platform	12 *	7/8
					12 **	SLA 1 5/8
74	9	Decibel	DB978H90T2E-M	LP Platform	12 *	1 1/4
					12 **	SLA 1 5/8

(\* ) Installed Coax; (\*\* ) SLA Coax  
 (\*\*\*) Antennas to be replaced

**Table 3 – Design Antenna and Cable Information**

Center Line Elevation (feet)	Number of Antenna	Antenna Manufacturer	Antenna Model	Mount Model	Number of Feed Lines	Feed Line Size (inches)
110	12	Swedcom	ALP9212	LP Platform	Unk.	Unk.
102	12	Swedcom	ALP9212	LP Platform	Unk.	Unk.
92	12	Swedcom	ALP9212	LP Platform	Unk.	Unk.
82	12	Swedcom	ALP9212	LP Platform	Unk.	Unk.
72	12	Swedcom	ALP9212	LP Platform	Unk.	Unk.

Note: The existing antenna coax is assumed to be placed on the tower in the positions indicated in the information provided by Crown. Refer to Appendix B.

**ANALYSIS PROCEDURE**

**Table 4 – Documents Provided**

Document	Remarks	Reference	Source
Proposed antenna loading		801486	Crown Castle
Existing antenna loading		801486	Crown Castle
Original Tower Drawings		MOO-0747-A	FWT
Foundation Drawings		-	De La Rosa

**Analysis Methods**

RISA Tower (Version 4.0), a commercially available software program, was used to create a three-dimensional model of the tower and calculate member stresses for various dead, live, wind, and ice load cases. The analysis was performed in accordance with the Telecommunications Industry Association Standard TIA/EIA-222-F. Selected output from the analysis is included in Appendix A.

**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 manufacturer's specifications.
3. The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
4. When applicable, transmission cables are considered to be structural components for calculating wind loads, as allowed by TIA/EIA-222-F.

If any of these assumptions are not valid or have been made in error, this analysis may be affected, and Paul J. Ford and Company should be allowed to review any new information to determine its effect on the structural integrity of the tower.

## ANALYSIS RESULTS

Our structural analysis of the existing CT Suffield 2 CAC 801486 pole indicates that the pole is adequate as it now stands to safely support the proposed antenna loading.

**Table 5 – Tower Component Stresses vs. Capacity**

Elevation ft	Component Type	Size	P K	SF*P <sub>allow</sub> K	% Capacity	Pass Fail
109 - 95	Pole	TP26.715x23.476x0.1875	-2.94	820.73	12.1	Pass
95 - 48.08	Pole	TP37.573x26.715x0.3125	-15.53	1862.61	38.7	Pass
48.08 - 0	Pole	TP48.075x35.8094x0.375	-28.87	2951.56	48.8	Pass
	Anchor Bolts				38.8	Pass
	Base Plate				37.1	Pass
					Summary	
				Pole (L3)	48.8	Pass
				RATING =	48.8	Pass

With the information that was provided to us, we were able to compare the design loads to our calculated loads. Refer to the chart below:

Foundation	Vector	Design Load	Actual Load	Ratio
Base	OTM	1788.0 Kips-Ft	1384.0 Kips-Ft	77%
	Shear	21.7 Kips	18.0 Kips	83%

As you can see, our calculated loads are lower than the design loads. The foundation should be adequate to support the revised antenna loads.

## APPENDIX A

### Output from Computer Programs

#### 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 Hartford County, Connecticut.
- Basic wind speed of 80 mph.
- Nominal ice thickness of 0.5000 in.
- Ice density of 56 pcf.
- A wind speed of 69 mph is used in combination with ice.
- 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.

#### 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	109.00-95.00	14.00	0.00	18	23.4760	26.7150	0.1875	0.7500	A572-65 (65 ksi)
L2	95.00-48.08	46.92	4.92	18	26.7150	37.5730	0.3125	1.2500	A572-65 (65 ksi)
L3	48.08-0.00	53.00		18	35.8094	48.0750	0.3750	1.5000	A572-65 (65 ksi)

#### Tapered Pole Properties

Section	Tip Dia. in	Area in <sup>2</sup>	I in <sup>4</sup>	r in	C in	I/C in <sup>3</sup>	J in <sup>4</sup>	I/Q in <sup>2</sup>	w in	w/t
L1	23.8382	13.8596	949.6645	8.2674	11.9258	79.6310	1900.5786	6.9311	3.8018	20.276
	27.1271	15.7872	1403.5717	9.4173	13.5712	103.4227	2808.9903	7.8951	4.3718	23.316
L2	27.1271	26.1880	2306.3730	9.3729	13.5712	169.9459	4615.7808	13.0965	4.1518	13.286
	38.1526	36.9578	6482.4687	13.2275	19.0871	339.6259	12973.467	18.4824	6.0628	19.401
L3	37.5180	42.1758	6690.4028	12.5792	18.1912	367.7825	13389.608	21.0919	5.6425	15.047
	48.8166	56.7749	16320.399	16.9335	24.4221	668.2635	32662.273	28.3929	7.8012	20.803

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor $A_r$	Adjust. Factor $A_r$	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals
ft	ft <sup>2</sup>	in					in	in
L1 109.00-95.00				1	1	1		
L2 95.00-48.08				1	1	1		
L3 48.08-0.00				1	1	1		

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

Description	Face or Leg	Allow Shield	Component Type	Placement	Total Number		$C_A A_A$	Weight
				ft			ft <sup>2</sup> /ft	plf
LDF7-50A (1 5/8" foam)	C	No	Inside Pole	107.00 - 0.00	12	No Ice	0.00	0.92
LDF6-50 (1 1/4" foam)	C	No	Inside Pole	107.00 - 0.00	12	1/2" Ice	0.00	0.92
						No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
LDF7-50A (1 5/8" foam)	C	No	Inside Pole	92.00 - 0.00	12	No Ice	0.00	0.92
LDF6-50 (1 1/4" foam)	C	No	Inside Pole	92.00 - 0.00	12	1/2" Ice	0.00	0.92
						No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
LDF7-50A (1 5/8" foam)	C	No	Inside Pole	82.00 - 0.00	12	No Ice	0.00	0.92
LDF5-50A (7/8" foam)	C	No	Inside Pole	82.00 - 0.00	12	1/2" Ice	0.00	0.92
						No Ice	0.00	0.33
						1/2" Ice	0.00	0.33
LDF7-50A (1 5/8" foam)	C	No	Inside Pole	72.00 - 0.00	9	No Ice	0.00	0.92
LDF6-50 (1 1/4" foam)	C	No	Inside Pole	72.00 - 0.00	9	1/2" Ice	0.00	0.92
						No Ice	0.00	0.66
						1/2" Ice	0.00	0.66

### Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation	Face	$A_R$	$A_F$	$C_A A_A$ In Face	$C_A A_A$ Out Face	Weight
n	ft		ft <sup>2</sup>	ft <sup>2</sup>	ft <sup>2</sup>	ft <sup>2</sup>	K
L1	109.00-95.00	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	0.000	0.23
L2	95.00-48.08	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	0.000	2.57
L3	48.08-0.00	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	0.000	3.23

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

Tower Section	Tower Elevation	Face or Leg	Ice Thickness	$A_R$	$A_F$	$C_A A_A$ In Face	$C_A A_A$ Out Face	Weight
n	ft		in	ft <sup>2</sup>	ft <sup>2</sup>	ft <sup>2</sup>	ft <sup>2</sup>	K
L1	109.00-95.00	A	0.500	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	0.000	0.23
L2	95.00-48.08	A	0.500	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	0.000	2.57
L3	48.08-0.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A <sub>R</sub> ft <sup>2</sup>	A <sub>F</sub> ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> In Face ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Out Face ft <sup>2</sup>	Weight K
		C		0.000	0.000	0.000	0.000	3.23

### Feed Line Center of Pressure

Section	Elevation ft	CP <sub>x</sub> in	CP <sub>z</sub> in	CP <sub>x</sub> Ice in	CP <sub>z</sub> Ice in
L1	109.00-95.00	0.0000	0.0000	0.0000	0.0000
L2	95.00-48.08	0.0000	0.0000	0.0000	0.0000
L3	48.08-0.00	0.0000	0.0000	0.0000	0.0000

### Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustmen t °	Placement ft	C <sub>A</sub> A <sub>A</sub> Front ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Side ft <sup>2</sup>	Weight K
6' LR	C	None		0.0000	113.00	No Ice 1/2" 2.52	1.50 2.52	0.02 0.03
(4) DB844H90-XY w/Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	110.00	No Ice 1/2" 4.20	3.58 6.73	0.04 0.08
(4) DB844H90-XY w/Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	110.00	No Ice 1/2" 4.20	3.58 6.73	0.04 0.08
(4) DB844H90-XY w/Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	110.00	No Ice 1/2" 4.20	3.58 6.73	0.04 0.08
FWT 14' Low Profile Platform	C	None		0.0000	107.00	No Ice 1/2" 33.61	28.34 33.61	1.64 2.16
(2) DB948F85T2E-M w/Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	92.00	No Ice 1/2" 3.23	2.62 6.01	0.03 0.07
(2) DB948F85T2E-M w/Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	92.00	No Ice 1/2" 3.23	2.62 6.01	0.03 0.07
(2) DB948F85T2E-M w/Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	92.00	No Ice 1/2" 3.23	2.62 6.01	0.03 0.07
(2) WPA-80090/4CF w/Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	92.00	No Ice 1/2" 4.26	3.86 4.31	0.03 0.06
(2) WPA-80090/4CF w/Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	92.00	No Ice 1/2" 4.26	3.86 4.31	0.03 0.06
(2) WPA-80090/4CF w/Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	92.00	No Ice 1/2" 4.26	3.86 4.31	0.03 0.06
FWT 14' Low Profile Platform	C	None		0.0000	92.00	No Ice 1/2" 33.61	28.34 33.61	1.64 2.16
(4) DB844H90-XY w/Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	83.00	No Ice 1/2" 4.20	3.58 6.73	0.04 0.08

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment	Placement ft		C <sub>A</sub> A <sub>A</sub> Front ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Side ft <sup>2</sup>	Weight K
(4) DB844H90-XY w/Mount Pipe	B	From Leg	4.00	0.0000	83.00	No Ice	3.58	5.63	0.04
			0.00			1/2"	4.20	6.73	0.08
			0.00			Ice			
(4) DB844H90-XY w/Mount Pipe	C	From Leg	4.00	0.0000	83.00	No Ice	3.58	5.63	0.04
			0.00			1/2"	4.20	6.73	0.08
			0.00			Ice			
FWT 14' Low Profile Platform	C	None		0.0000	82.00	No Ice	28.34	28.34	1.64
						1/2"	33.61	33.61	2.16
						Ice			
(3) DB978H90T2E-M w/Mount Pipe	A	From Leg	4.00	0.0000	74.00	No Ice	3.70	3.36	0.03
			0.00			1/2"	4.32	4.38	0.07
			0.00			Ice			
(3) DB978H90T2E-M w/Mount Pipe	B	From Leg	4.00	0.0000	74.00	No Ice	3.70	3.36	0.03
			0.00			1/2"	4.32	4.38	0.07
			0.00			Ice			
(3) DB978H90T2E-M w/Mount Pipe	C	From Leg	4.00	0.0000	74.00	No Ice	3.70	3.36	0.03
			0.00			1/2"	4.32	4.38	0.07
			0.00			Ice			
FWT 14' Low Profile Platform	C	None		0.0000	72.00	No Ice	28.34	28.34	1.64
						1/2"	33.61	33.61	2.16
						Ice			

**Tower Pressures - No Ice**

$G_H = 1.690$

Section Elevation ft	z ft	K <sub>z</sub>	q <sub>z</sub> psf	A <sub>G</sub> ft <sup>2</sup>	F a c e	A <sub>F</sub> ft <sup>2</sup>	A <sub>R</sub> ft <sup>2</sup>	A <sub>leg</sub> ft <sup>2</sup>	Leg %	C <sub>A</sub> A <sub>A</sub> In Face ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Out Face ft <sup>2</sup>
L1 109.00-95.00	101.85	1.38	23	29.278	A	0.000	29.278	29.278	100.00	0.000	0.000
					B	0.000	29.278	100.00			
					C	0.000	29.278	100.00			
L2 95.00-48.08	70.77	1.244	20	125.683	A	0.000	125.683	125.683	100.00	0.000	0.000
					B	0.000	125.683	100.00			
					C	0.000	125.683	100.00			
L3 48.08-0.00	23.13	1	17	170.330	A	0.000	170.330	170.330	100.00	0.000	0.000
					B	0.000	170.330	100.00			
					C	0.000	170.330	100.00			

**Tower Pressure - With Ice**

$G_H = 1.690$

Section Elevation ft	z ft	K <sub>z</sub>	q <sub>z</sub> psf	t <sub>z</sub> in	A <sub>G</sub> ft <sup>2</sup>	F a c e	A <sub>F</sub> ft <sup>2</sup>	A <sub>R</sub> ft <sup>2</sup>	A <sub>leg</sub> ft <sup>2</sup>	Leg %	C <sub>A</sub> A <sub>A</sub> In Face ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Out Face ft <sup>2</sup>
L1 109.00-95.00	101.85	1.38	17	0.5000	30.445	A	0.000	30.445	30.445	100.00	0.000	0.000
						B	0.000	30.445	100.00			
						C	0.000	30.445	100.00			
L2 95.00-48.08	70.77	1.244	15	0.5000	129.593	A	0.000	129.593	129.593	100.00	0.000	0.000
						B	0.000	129.593	100.00			
						C	0.000	129.593	100.00			



Section Elevation	z	K <sub>z</sub>	q <sub>z</sub>	t <sub>z</sub>	A <sub>G</sub>	F a c e	A <sub>F</sub>	A <sub>R</sub>	A <sub>leg</sub>	Leg %	C <sub>A</sub> A <sub>A</sub> In Face	C <sub>A</sub> A <sub>A</sub> Out Face
ft	ft		psf	in	ft <sup>2</sup>		ft <sup>2</sup>	ft <sup>2</sup>	ft <sup>2</sup>		ft <sup>2</sup>	ft <sup>2</sup>
L3 48.08-0.00	23.13	1	12	0.5000	174.336	A	0.000	174.336	174.336	100.00	0.000	0.000
						B	0.000	174.336		100.00		
						C	0.000	174.336		100.00		

**Tower Pressure - Service**

$G_H = 1.690$

Section Elevation	z	K <sub>z</sub>	q <sub>z</sub>	A <sub>G</sub>	F a c e	A <sub>F</sub>	A <sub>R</sub>	A <sub>leg</sub>	Leg %	C <sub>A</sub> A <sub>A</sub> In Face	C <sub>A</sub> A <sub>A</sub> Out Face
ft	ft		psf	ft <sup>2</sup>		ft <sup>2</sup>	ft <sup>2</sup>	ft <sup>2</sup>		ft <sup>2</sup>	ft <sup>2</sup>
L1 109.00-95.00	101.85	1.38	9	29.278	A	0.000	29.278	29.278	100.00	0.000	0.000
					B	0.000	29.278		100.00		
					C	0.000	29.278		100.00		
L2 95.00-48.08	70.77	1.244	8	125.683	A	0.000	125.683	125.683	100.00	0.000	0.000
				3	B	0.000	125.683		100.00		
					C	0.000	125.683		100.00		
L3 48.08-0.00	23.13	1	6	170.330	A	0.000	170.330	170.330	100.00	0.000	0.000
				0	B	0.000	170.330		100.00		
					C	0.000	170.330		100.00		

**Tower Forces - No Ice - Wind Normal To Face**

Section Elevation	Add Weight	Self Weight	F a c e	e	C <sub>F</sub>	R <sub>R</sub>	D <sub>F</sub>	D <sub>R</sub>	A <sub>E</sub>	F	w	Ctrl. Face
ft	K	K							ft <sup>2</sup>	K	plf	
L1 109.00-95.00	0.23	0.71	A	1	0.65	1	1	1	29.278	0.73	51.94	C
			B	1	0.65	1	1	1	29.278			
			C	1	0.65	1	1	1	29.278			
L2 95.00-48.08	2.57	5.04	A	1	0.65	1	1	1	125.683	2.80	59.65	C
			B	1	0.65	1	1	1	125.683			
			C	1	0.65	1	1	1	125.683			
L3 48.08-0.00	3.23	8.92	A	1	0.65	1	1	1	170.330	3.10	64.46	C
			B	1	0.65	1	1	1	170.330			
			C	1	0.65	1	1	1	170.330			
Sum Weight:	6.03	14.67						OTM	343.81 kip-ft	6.62		

**Tower Forces - No Ice - Wind 60 To Face**

Section Elevation	Add Weight	Self Weight	F a c e	e	C <sub>F</sub>	R <sub>R</sub>	D <sub>F</sub>	D <sub>R</sub>	A <sub>E</sub>	F	w	Ctrl. Face
ft	K	K							ft <sup>2</sup>	K	plf	
L1 109.00-95.00	0.23	0.71	A	1	0.65	1	1	1	29.278	0.73	51.94	C
			B	1	0.65	1	1	1	29.278			
			C	1	0.65	1	1	1	29.278			
L2 95.00-48.08	2.57	5.04	A	1	0.65	1	1	1	125.683	2.80	59.65	C
			B	1	0.65	1	1	1	125.683			
			C	1	0.65	1	1	1	125.683			
L3 48.08-0.00	3.23	8.92	A	1	0.65	1	1	1	170.330	3.10	64.46	C
			B	1	0.65	1	1	1	170.330			

Section Elevation	Add Weight	Self Weight	Face	e	C <sub>F</sub>	R <sub>R</sub>	D <sub>F</sub>	D <sub>R</sub>	A <sub>E</sub>	F	w	Ctrl. Face
ft	K	K							ft <sup>2</sup>	K	plf	
Sum Weight:	6.03	14.67	C	1	0.65	1	1	1	170.330 343.81 kip-ft	6.62		

**Tower Forces - No Ice - Wind 90 To Face**

Section Elevation	Add Weight	Self Weight	Face	e	C <sub>F</sub>	R <sub>R</sub>	D <sub>F</sub>	D <sub>R</sub>	A <sub>E</sub>	F	w	Ctrl. Face
ft	K	K							ft <sup>2</sup>	K	plf	
L1 109.00-95.00	0.23	0.71	A	1	0.65	1	1	1	29.278	0.73	51.94	C
			B	1	0.65	1	1	1	29.278			
			C	1	0.65	1	1	1	29.278			
L2 95.00-48.08	2.57	5.04	A	1	0.65	1	1	1	125.683	2.80	59.65	C
			B	1	0.65	1	1	1	125.683			
			C	1	0.65	1	1	1	125.683			
L3 48.08-0.00	3.23	8.92	A	1	0.65	1	1	1	170.330	3.10	64.46	C
			B	1	0.65	1	1	1	170.330			
			C	1	0.65	1	1	1	170.330			
Sum Weight:	6.03	14.67						OTM	343.81 kip-ft	6.62		

**Tower Forces - With Ice - Wind Normal To Face**

Section Elevation	Add Weight	Self Weight	Face	e	C <sub>F</sub>	R <sub>R</sub>	D <sub>F</sub>	D <sub>R</sub>	A <sub>E</sub>	F	w	Ctrl. Face
ft	K	K							ft <sup>2</sup>	K	plf	
L1 109.00-95.00	0.23	0.93	A	1	0.65	1	1	1	30.445	0.57	40.50	C
			B	1	0.65	1	1	1	30.445			
			C	1	0.65	1	1	1	30.445			
L2 95.00-48.08	2.57	5.99	A	1	0.65	1	1	1	129.593	2.16	46.13	C
			B	1	0.65	1	1	1	129.593			
			C	1	0.65	1	1	1	129.593			
L3 48.08-0.00	3.23	10.20	A	1	0.65	1	1	1	174.336	2.38	49.48	C
			B	1	0.65	1	1	1	174.336			
			C	1	0.65	1	1	1	174.336			
Sum Weight:	6.03	17.11						OTM	265.96 kip-ft	5.11		

**Tower Forces - With Ice - Wind 60 To Face**

Section Elevation	Add Weight	Self Weight	Face	e	C <sub>F</sub>	R <sub>R</sub>	D <sub>F</sub>	D <sub>R</sub>	A <sub>E</sub>	F	w	Ctrl. Face
ft	K	K							ft <sup>2</sup>	K	plf	
L1 109.00-95.00	0.23	0.93	A	1	0.65	1	1	1	30.445	0.57	40.50	C
			B	1	0.65	1	1	1	30.445			
			C	1	0.65	1	1	1	30.445			
L2 95.00-48.08	2.57	5.99	A	1	0.65	1	1	1	129.593	2.16	46.13	C
			B	1	0.65	1	1	1	129.593			
			C	1	0.65	1	1	1	129.593			
L3 48.08-0.00	3.23	10.20	A	1	0.65	1	1	1	174.336	2.38	49.48	C
			B	1	0.65	1	1	1	174.336			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C <sub>F</sub>	R <sub>R</sub>	D <sub>F</sub>	D <sub>R</sub>	A <sub>E</sub> ft <sup>2</sup>	F K	w plf	Ctrl. Face
Sum Weight:	6.03	17.11	C	1	0.65	1	1	1 OTM	174.336 265.96 kip-ft	5.11		

**Tower Forces - With Ice - Wind 90 To Face**

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C <sub>F</sub>	R <sub>R</sub>	D <sub>F</sub>	D <sub>R</sub>	A <sub>E</sub> ft <sup>2</sup>	F K	w plf	Ctrl. Face
L1 109.00-95.00	0.23	0.93	A	1	0.65	1	1	1	30.445	0.57	40.50	C
			B	1	0.65	1	1	1	30.445			
			C	1	0.65	1	1	1	30.445			
L2 95.00-48.08	2.57	5.99	A	1	0.65	1	1	1	129.593	2.16	46.13	C
			B	1	0.65	1	1	1	129.593			
			C	1	0.65	1	1	1	129.593			
L3 48.08-0.00	3.23	10.20	A	1	0.65	1	1	1	174.336	2.38	49.48	C
			B	1	0.65	1	1	1	174.336			
			C	1	0.65	1	1	1	174.336			
Sum Weight:	6.03	17.11						OTM	265.96 kip-ft	5.11		

**Tower Forces - Service - Wind Normal To Face**

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C <sub>F</sub>	R <sub>R</sub>	D <sub>F</sub>	D <sub>R</sub>	A <sub>E</sub> ft <sup>2</sup>	F K	w plf	Ctrl. Face
L1 109.00-95.00	0.23	0.71	A	1	0.65	1	1	1	29.278	0.28	20.29	C
			B	1	0.65	1	1	1	29.278			
			C	1	0.65	1	1	1	29.278			
L2 95.00-48.08	2.57	5.04	A	1	0.65	1	1	1	125.683	1.09	23.30	C
			B	1	0.65	1	1	1	125.683			
			C	1	0.65	1	1	1	125.683			
L3 48.08-0.00	3.23	8.92	A	1	0.65	1	1	1	170.330	1.21	25.18	C
			B	1	0.65	1	1	1	170.330			
			C	1	0.65	1	1	1	170.330			
Sum Weight:	6.03	14.67						OTM	134.30 kip-ft	2.59		

**Tower Forces - Service - Wind 60 To Face**

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C <sub>F</sub>	R <sub>R</sub>	D <sub>F</sub>	D <sub>R</sub>	A <sub>E</sub> ft <sup>2</sup>	F K	w plf	Ctrl. Face
L1 109.00-95.00	0.23	0.71	A	1	0.65	1	1	1	29.278	0.28	20.29	C
			B	1	0.65	1	1	1	29.278			
			C	1	0.65	1	1	1	29.278			
L2 95.00-48.08	2.57	5.04	A	1	0.65	1	1	1	125.683	1.09	23.30	C
			B	1	0.65	1	1	1	125.683			
			C	1	0.65	1	1	1	125.683			
L3 48.08-0.00	3.23	8.92	A	1	0.65	1	1	1	170.330	1.21	25.18	C
			B	1	0.65	1	1	1	170.330			

Section Elevation	Add Weight	Self Weight	Face	e	C <sub>F</sub>	R <sub>R</sub>	D <sub>F</sub>	D <sub>R</sub>	A <sub>E</sub>	F	w	Ctrl. Face
ft	K	K	C						ft <sup>2</sup>	K	plf	
Sum Weight:	6.03	14.67		1	0.65	1	1	1	170.330 134.30 kip-ft	2.59		

**Tower Forces - Service - Wind 90 To Face**

Section Elevation	Add Weight	Self Weight	Face	e	C <sub>F</sub>	R <sub>R</sub>	D <sub>F</sub>	D <sub>R</sub>	A <sub>E</sub>	F	w	Ctrl. Face
ft	K	K	C						ft <sup>2</sup>	K	plf	
L1 109.00-95.00	0.23	0.71	A	1	0.65	1	1	1	29.278	0.28	20.29	C
			B	1	0.65	1	1	1	29.278			
			C	1	0.65	1	1	1	29.278			
L2 95.00-48.08	2.57	5.04	A	1	0.65	1	1	1	125.683	1.09	23.30	C
			B	1	0.65	1	1	1	125.683			
			C	1	0.65	1	1	1	125.683			
L3 48.08-0.00	3.23	8.92	A	1	0.65	1	1	1	170.330	1.21	25.18	C
			B	1	0.65	1	1	1	170.330			
			C	1	0.65	1	1	1	170.330			
Sum Weight:	6.03	14.67						OTM	134.30 kip-ft	2.59		

**Discrete Appurtenance Pressures - No Ice G<sub>H</sub> = 1.690**

Description	Aiming Azimuth	Weight	Offset <sub>x</sub>	Offset <sub>z</sub>	z	K <sub>z</sub>	q <sub>z</sub>	C <sub>A</sub> A <sub>c</sub> Front	C <sub>A</sub> A <sub>c</sub> Side
	°	K	ft	ft	ft		psf	ft <sup>2</sup>	ft <sup>2</sup>
6' LR	0.0000	0.02	0.00	0.00	113.00	1.421	23	1.50	1.50
DB844H90-XY w/Mount Pipe	0.0000	0.16	0.00	-4.98	110.00	1.411	23	14.32	22.52
DB844H90-XY w/Mount Pipe	120.0000	0.16	4.31	2.49	110.00	1.411	23	14.32	22.52
DB844H90-XY w/Mount Pipe	240.0000	0.16	-4.31	2.49	110.00	1.411	23	14.32	22.52
FWT 14' Low Profile Platform	0.0000	1.64	0.00	0.00	107.00	1.399	23	28.34	28.34
DB948F85T2E-M w/Mount Pipe	0.0000	0.06	0.00	-5.14	92.00	1.340	22	5.24	9.84
DB948F85T2E-M w/Mount Pipe	120.0000	0.06	4.45	2.57	92.00	1.340	22	5.24	9.84
DB948F85T2E-M w/Mount Pipe	240.0000	0.06	-4.45	2.57	92.00	1.340	22	5.24	9.84
WPA-80090/4CF w/Mount Pipe	0.0000	0.06	0.00	-5.14	92.00	1.340	22	7.72	7.47
WPA-80090/4CF w/Mount Pipe	120.0000	0.06	4.45	2.57	92.00	1.340	22	7.72	7.47
WPA-80090/4CF w/Mount Pipe	240.0000	0.06	-4.45	2.57	92.00	1.340	22	7.72	7.47
FWT 14' Low Profile Platform	0.0000	1.64	0.00	0.00	92.00	1.340	22	28.34	28.34
DB844H90-XY w/Mount Pipe	0.0000	0.16	0.00	-5.23	83.00	1.302	21	14.32	22.52
DB844H90-XY w/Mount Pipe	120.0000	0.16	4.53	2.61	83.00	1.302	21	14.32	22.52
DB844H90-XY w/Mount Pipe	240.0000	0.16	-4.53	2.61	83.00	1.302	21	14.32	22.52
FWT 14' Low Profile Platform	0.0000	1.64	0.00	0.00	82.00	1.297	21	28.34	28.34

Description	Aiming Azimuth °	Weight K	Offset <sub>x</sub> ft	Offset <sub>z</sub> ft	z ft	K <sub>z</sub>	q <sub>z</sub> psf	C <sub>A</sub> A <sub>c</sub> Front ft <sup>2</sup>	C <sub>A</sub> A <sub>c</sub> Side ft <sup>2</sup>
DB978H90T2E-M w/Mount Pipe	0.0000	0.09	0.00	-5.32	74.00	1.260	21	11.09	10.09
DB978H90T2E-M w/Mount Pipe	120.0000	0.09	4.60	2.66	74.00	1.260	21	11.09	10.09
DB978H90T2E-M w/Mount Pipe	240.0000	0.09	-4.60	2.66	74.00	1.260	21	11.09	10.09
FWT 14' Low Profile Platform	0.0000	1.64	0.00	0.00	72.00	1.250	20	28.34	28.34
	Sum Weight:	8.18							

**Discrete Appurtenance Pressures - With Ice G<sub>H</sub> = 1.690**

Description	Aiming Azimuth °	Weight K	Offset <sub>x</sub> ft	Offset <sub>z</sub> ft	z ft	K <sub>z</sub>	q <sub>z</sub> psf	C <sub>A</sub> A <sub>c</sub> Front ft <sup>2</sup>	C <sub>A</sub> A <sub>c</sub> Side ft <sup>2</sup>	t <sub>z</sub> in
6' LR	0.0000	0.03	0.00	0.00	113.00	1.421	17	2.52	2.52	0.5000
DB844H90-XY w/Mount Pipe	0.0000	0.31	0.00	-4.98	110.00	1.411	17	16.81	26.91	0.5000
DB844H90-XY w/Mount Pipe	120.0000	0.31	4.31	2.49	110.00	1.411	17	16.81	26.91	0.5000
DB844H90-XY w/Mount Pipe	240.0000	0.31	-4.31	2.49	110.00	1.411	17	16.81	26.91	0.5000
FWT 14' Low Profile Platform	0.0000	2.16	0.00	0.00	107.00	1.399	17	33.61	33.61	0.5000
DB948F85T2E-M w/Mount Pipe	0.0000	0.14	0.00	-5.14	92.00	1.340	16	6.46	12.02	0.5000
DB948F85T2E-M w/Mount Pipe	120.0000	0.14	4.45	2.57	92.00	1.340	16	6.46	12.02	0.5000
DB948F85T2E-M w/Mount Pipe	240.0000	0.14	-4.45	2.57	92.00	1.340	16	6.46	12.02	0.5000
WPA-80090/4CF w/Mount Pipe	0.0000	0.13	0.00	-5.14	92.00	1.340	16	8.51	8.62	0.5000
WPA-80090/4CF w/Mount Pipe	120.0000	0.13	4.45	2.57	92.00	1.340	16	8.51	8.62	0.5000
WPA-80090/4CF w/Mount Pipe	240.0000	0.13	-4.45	2.57	92.00	1.340	16	8.51	8.62	0.5000
FWT 14' Low Profile Platform	0.0000	2.16	0.00	0.00	92.00	1.340	16	33.61	33.61	0.5000
DB844H90-XY w/Mount Pipe	0.0000	0.31	0.00	-5.23	83.00	1.302	16	16.81	26.91	0.5000
DB844H90-XY w/Mount Pipe	120.0000	0.31	4.53	2.61	83.00	1.302	16	16.81	26.91	0.5000
DB844H90-XY w/Mount Pipe	240.0000	0.31	-4.53	2.61	83.00	1.302	16	16.81	26.91	0.5000
FWT 14' Low Profile Platform	0.0000	2.16	0.00	0.00	82.00	1.297	16	33.61	33.61	0.5000
DB978H90T2E-M w/Mount Pipe	0.0000	0.20	0.00	-5.32	74.00	1.260	15	12.96	13.15	0.5000
DB978H90T2E-M w/Mount Pipe	120.0000	0.20	4.60	2.66	74.00	1.260	15	12.96	13.15	0.5000
DB978H90T2E-M w/Mount Pipe	240.0000	0.20	-4.60	2.66	74.00	1.260	15	12.96	13.15	0.5000
FWT 14' Low Profile Platform	0.0000	2.16	0.00	0.00	72.00	1.250	15	33.61	33.61	0.5000
	Sum Weight:	11.91								

**Discrete Appurtenance Pressures - Service G<sub>H</sub> = 1.690**

Description	Aiming Azimuth °	Weight K	Offset <sub>x</sub> ft	Offset <sub>z</sub> ft	z ft	K <sub>z</sub>	q <sub>z</sub> psf	C <sub>A</sub> Ac Front ft <sup>2</sup>	C <sub>A</sub> Ac Side ft <sup>2</sup>
6' LR	0.0000	0.02	0.00	0.00	113.00	1.421	9	1.50	1.50
DB844H90-XY w/Mount Pipe	0.0000	0.16	0.00	-4.98	110.00	1.411	9	14.32	22.52
DB844H90-XY w/Mount Pipe	120.0000	0.16	4.31	2.49	110.00	1.411	9	14.32	22.52
DB844H90-XY w/Mount Pipe	240.0000	0.16	-4.31	2.49	110.00	1.411	9	14.32	22.52
FWT 14' Low Profile Platform	0.0000	1.64	0.00	0.00	107.00	1.399	9	28.34	28.34
DB948F85T2E-M w/Mount Pipe	0.0000	0.06	0.00	-5.14	92.00	1.340	9	5.24	9.84
DB948F85T2E-M w/Mount Pipe	120.0000	0.06	4.45	2.57	92.00	1.340	9	5.24	9.84
DB948F85T2E-M w/Mount Pipe	240.0000	0.06	-4.45	2.57	92.00	1.340	9	5.24	9.84
WPA-80090/4CF w/Mount Pipe	0.0000	0.06	0.00	-5.14	92.00	1.340	9	7.72	7.47
WPA-80090/4CF w/Mount Pipe	120.0000	0.06	4.45	2.57	92.00	1.340	9	7.72	7.47
WPA-80090/4CF w/Mount Pipe	240.0000	0.06	-4.45	2.57	92.00	1.340	9	7.72	7.47
FWT 14' Low Profile Platform	0.0000	1.64	0.00	0.00	92.00	1.340	9	28.34	28.34
DB844H90-XY w/Mount Pipe	0.0000	0.16	0.00	-5.23	83.00	1.302	8	14.32	22.52
DB844H90-XY w/Mount Pipe	120.0000	0.16	4.53	2.61	83.00	1.302	8	14.32	22.52
DB844H90-XY w/Mount Pipe	240.0000	0.16	-4.53	2.61	83.00	1.302	8	14.32	22.52
FWT 14' Low Profile Platform	0.0000	1.64	0.00	0.00	82.00	1.297	8	28.34	28.34
DB978H90T2E-M w/Mount Pipe	0.0000	0.09	0.00	-5.32	74.00	1.260	8	11.09	10.09
DB978H90T2E-M w/Mount Pipe	120.0000	0.09	4.60	2.66	74.00	1.260	8	11.09	10.09
DB978H90T2E-M w/Mount Pipe	240.0000	0.09	-4.60	2.66	74.00	1.260	8	11.09	10.09
FWT 14' Low Profile Platform	0.0000	1.64	0.00	0.00	72.00	1.250	8	28.34	28.34
Sum Weight:		8.18							

### Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M <sub>x</sub> kip-ft	Sum of Overturning Moments, M <sub>z</sub> kip-ft	Sum of Torques kip-ft
Leg Weight	14.67					
Bracing Weight	0.00					
Total Member Self-Weight	14.67			0.00	0.00	
Total Weight	28.87			0.00	0.00	
Wind 0 deg - No Ice		0.00	-17.77	-1358.41	0.00	0.00
Wind 30 deg - No Ice		8.89	-15.39	-1176.42	-679.21	0.00
Wind 60 deg - No Ice		15.39	-8.89	-679.21	-1176.42	0.00
Wind 90 deg - No Ice		17.77	0.00	0.00	-1358.41	0.00
Wind 120 deg - No Ice		15.39	8.89	679.21	-1176.42	0.00
Wind 150 deg - No Ice		8.89	15.39	1176.42	-679.21	0.00
Wind 180 deg - No Ice		0.00	17.77	1358.41	0.00	0.00
Wind 210 deg - No Ice		-8.89	15.39	1176.42	679.21	0.00
Wind 240 deg - No Ice		-15.39	8.89	679.21	1176.42	0.00
Wind 270 deg - No Ice		-17.77	0.00	0.00	1358.41	0.00
Wind 300 deg - No Ice		-15.39	-8.89	-679.21	1176.42	0.00
Wind 330 deg - No Ice		-8.89	-15.39	-1176.42	679.21	0.00

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M <sub>x</sub> kip-ft	Sum of Overturning Moments, M <sub>y</sub> kip-ft	Sum of Torques kip-ft
Member Ice	2.44					
Total Weight Ice	35.05			0.00	0.00	
Wind 0 deg - Ice		0.00	-15.08	-1173.00	0.00	0.00
Wind 30 deg - Ice		7.54	-13.06	-1015.84	-586.50	0.00
Wind 60 deg - Ice		13.06	-7.54	-586.50	-1015.84	0.00
Wind 90 deg - Ice		15.08	0.00	0.00	-1173.00	0.00
Wind 120 deg - Ice		13.06	7.54	586.50	-1015.84	0.00
Wind 150 deg - Ice		7.54	13.06	1015.84	-586.50	0.00
Wind 180 deg - Ice		0.00	15.08	1173.00	0.00	0.00
Wind 210 deg - Ice		-7.54	13.06	1015.84	586.50	0.00
Wind 240 deg - Ice		-13.06	7.54	586.50	1015.84	0.00
Wind 270 deg - Ice		-15.08	0.00	0.00	1173.00	0.00
Wind 300 deg - Ice		-13.06	-7.54	-586.50	1015.84	0.00
Wind 330 deg - Ice		-7.54	-13.06	-1015.84	586.50	0.00
Total Weight	28.87			0.00		
Wind 0 deg - Service		0.00	-6.94	-530.63	0.00	0.00
Wind 30 deg - Service		3.47	-6.01	-459.54	-265.31	0.00
Wind 60 deg - Service		6.01	-3.47	-265.31	-459.54	0.00
Wind 90 deg - Service		6.94	0.00	0.00	-530.63	0.00
Wind 120 deg - Service		6.01	3.47	265.31	-459.54	0.00
Wind 150 deg - Service		3.47	6.01	459.54	-265.31	0.00
Wind 180 deg - Service		0.00	6.94	530.63	0.00	0.00
Wind 210 deg - Service		-3.47	6.01	459.54	265.31	0.00
Wind 240 deg - Service		-6.01	3.47	265.31	459.54	0.00
Wind 270 deg - Service		-6.94	0.00	0.00	530.63	0.00
Wind 300 deg - Service		-6.01	-3.47	-265.31	459.54	0.00
Wind 330 deg - Service		-3.47	-6.01	-459.54	265.31	0.00

### 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
15	Dead+Wind 0 deg+Ice
16	Dead+Wind 30 deg+Ice
17	Dead+Wind 60 deg+Ice
18	Dead+Wind 90 deg+Ice
19	Dead+Wind 120 deg+Ice
20	Dead+Wind 150 deg+Ice
21	Dead+Wind 180 deg+Ice
22	Dead+Wind 210 deg+Ice
23	Dead+Wind 240 deg+Ice
24	Dead+Wind 270 deg+Ice
25	Dead+Wind 300 deg+Ice
26	Dead+Wind 330 deg+Ice
27	Dead+Wind 0 deg - Service
28	Dead+Wind 30 deg - Service
29	Dead+Wind 60 deg - Service
30	Dead+Wind 90 deg - Service

Comb. No.	Description
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	109 - 95	Pole	Max Tension	14	0.00	0.00	0.00
			Max. Compression	14	-4.27	0.00	0.00
			Max. Mx	5	-2.94	-52.70	0.00
			Max. My	2	-2.94	0.00	52.70
			Max. Vy	5	4.14	-52.70	0.00
			Max. Vx	2	-4.14	0.00	52.70
			Max. Torque	16			
L2	95 - 48.08	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-20.63	0.00	0.00
			Max. Mx	5	-15.53	-522.86	0.00
			Max. My	8	-15.53	0.00	-522.86
			Max. Vy	5	14.70	-522.86	0.00
			Max. Vx	8	14.70	0.00	-522.86
			Max. Torque	16			
L3	48.08 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-35.05	0.00	0.00
			Max. Mx	5	-28.87	-1383.54	0.00
			Max. My	2	-28.87	0.00	1383.54
			Max. Vy	5	17.79	-1383.54	0.00
			Max. Vx	8	17.79	0.00	-1383.54
			Max. Torque	16			

### Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	18	35.05	-15.08	0.00
	Max. H <sub>x</sub>	11	28.87	17.77	0.00
	Max. H <sub>z</sub>	2	28.87	0.00	17.77
	Max. M <sub>x</sub>	2	1383.54	0.00	17.77
	Max. M <sub>z</sub>	5	1383.54	-17.77	0.00
	Max. Torsion	26	0.00	7.54	13.06
	Min. Vert	1	28.87	0.00	0.00
	Min. H <sub>x</sub>	5	28.87	-17.77	0.00
	Min. H <sub>z</sub>	8	28.87	0.00	-17.77
	Min. M <sub>x</sub>	8	-1383.54	0.00	-17.77
	Min. M <sub>z</sub>	11	-1383.54	17.77	0.00
	Min. Torsion	16	-0.00	-7.54	13.06

### Tower Mast Reaction Summary



Load Combination	Vertical K	Shear <sub>x</sub> K	Shear <sub>z</sub> K	Overturing Moment, M <sub>x</sub> kip-ft	Overturing Moment, M <sub>z</sub> kip-ft	Torque kip-ft
Dead Only	28.87	0.00	0.00	0.00	0.00	0.00
Dead+Wind 0 deg - No Ice	28.87	0.00	-17.77	-1383.54	0.00	0.00
Dead+Wind 30 deg - No Ice	28.87	8.89	-15.39	-1198.18	-691.77	0.00
Dead+Wind 60 deg - No Ice	28.87	15.39	-8.89	-691.77	-1198.18	-0.00
Dead+Wind 90 deg - No Ice	28.87	17.77	0.00	0.00	-1383.54	0.00
Dead+Wind 120 deg - No Ice	28.87	15.39	8.89	691.77	-1198.18	0.00
Dead+Wind 150 deg - No Ice	28.87	8.89	15.39	1198.18	-691.77	-0.00
Dead+Wind 180 deg - No Ice	28.87	0.00	17.77	1383.54	0.00	0.00
Dead+Wind 210 deg - No Ice	28.87	-8.89	15.39	1198.18	691.77	0.00
Dead+Wind 240 deg - No Ice	28.87	-15.39	8.89	691.77	1198.18	-0.00
Dead+Wind 270 deg - No Ice	28.87	-17.77	0.00	0.00	1383.54	0.00
Dead+Wind 300 deg - No Ice	28.87	-15.39	-8.89	-691.77	1198.18	0.00
Dead+Wind 330 deg - No Ice	28.87	-8.89	-15.39	-1198.18	691.77	-0.00
Dead+Ice	35.05	0.00	0.00	0.00	0.00	0.00
Dead+Wind 0 deg+Ice	35.05	0.00	-15.08	-1201.81	0.00	0.00
Dead+Wind 30 deg+Ice	35.05	7.54	-13.06	-1040.80	-600.91	0.00
Dead+Wind 60 deg+Ice	35.05	13.06	-7.54	-600.91	-1040.80	-0.00
Dead+Wind 90 deg+Ice	35.05	15.08	0.00	0.00	-1201.81	0.00
Dead+Wind 120 deg+Ice	35.05	13.06	7.54	600.91	-1040.80	0.00
Dead+Wind 150 deg+Ice	35.05	7.54	13.06	1040.80	-600.91	-0.00
Dead+Wind 180 deg+Ice	35.05	0.00	15.08	1201.81	0.00	0.00
Dead+Wind 210 deg+Ice	35.05	-7.54	13.06	1040.80	600.91	0.00
Dead+Wind 240 deg+Ice	35.05	-13.06	7.54	600.91	1040.80	-0.00
Dead+Wind 270 deg+Ice	35.05	-15.08	0.00	0.00	1201.81	0.00
Dead+Wind 300 deg+Ice	35.05	-13.06	-7.54	-600.91	1040.80	0.00
Dead+Wind 330 deg+Ice	35.05	-7.54	-13.06	-1040.80	600.91	-0.00
Dead+Wind 0 deg - Service	28.87	0.00	-6.94	-540.54	0.00	0.00
Dead+Wind 30 deg - Service	28.87	3.47	-6.01	-468.12	-270.27	0.00
Dead+Wind 60 deg - Service	28.87	6.01	-3.47	-270.27	-468.12	-0.00
Dead+Wind 90 deg - Service	28.87	6.94	0.00	0.00	-540.54	0.00
Dead+Wind 120 deg - Service	28.87	6.01	3.47	270.27	-468.12	0.00
Dead+Wind 150 deg - Service	28.87	3.47	6.01	468.12	-270.27	-0.00
Dead+Wind 180 deg - Service	28.87	0.00	6.94	540.54	0.00	0.00
Dead+Wind 210 deg - Service	28.87	-3.47	6.01	468.12	270.27	0.00
Dead+Wind 240 deg - Service	28.87	-6.01	3.47	270.27	468.12	-0.00
Dead+Wind 270 deg - Service	28.87	-6.94	0.00	0.00	540.54	0.00
Dead+Wind 300 deg - Service	28.87	-6.01	-3.47	-270.27	468.12	0.00
Dead+Wind 330 deg - Service	28.87	-3.47	-6.01	-468.12	270.27	-0.00

### Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
1	0.00	-28.87	0.00	0.00	28.87	0.00	0.000%
2	0.00	-28.87	-17.77	0.00	28.87	17.77	0.000%
3	8.89	-28.87	-15.39	-8.89	28.87	15.39	0.000%
4	15.39	-28.87	-8.89	-15.39	28.87	8.89	0.000%
5	17.77	-28.87	0.00	-17.77	28.87	0.00	0.000%
6	15.39	-28.87	8.89	-15.39	28.87	-8.89	0.000%
7	8.89	-28.87	15.39	-8.89	28.87	-15.39	0.000%
8	0.00	-28.87	17.77	0.00	28.87	-17.77	0.000%
9	-8.89	-28.87	15.39	8.89	28.87	-15.39	0.000%
10	-15.39	-28.87	8.89	15.39	28.87	-8.89	0.000%
11	-17.77	-28.87	0.00	17.77	28.87	0.00	0.000%
12	-15.39	-28.87	-8.89	15.39	28.87	8.89	0.000%
13	-8.89	-28.87	-15.39	8.89	28.87	15.39	0.000%

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
14	0.00	-35.05	0.00	0.00	35.05	0.00	0.000%
15	0.00	-35.05	-15.08	0.00	35.05	15.08	0.000%
16	7.54	-35.05	-13.06	-7.54	35.05	13.06	0.000%
17	13.06	-35.05	-7.54	-13.06	35.05	7.54	0.000%
18	15.08	-35.05	0.00	-15.08	35.05	0.00	0.000%
19	13.06	-35.05	7.54	-13.06	35.05	-7.54	0.000%
20	7.54	-35.05	13.06	-7.54	35.05	-13.06	0.000%
21	0.00	-35.05	15.08	0.00	35.05	-15.08	0.000%
22	-7.54	-35.05	13.06	7.54	35.05	-13.06	0.000%
23	-13.06	-35.05	7.54	13.06	35.05	-7.54	0.000%
24	-15.08	-35.05	0.00	15.08	35.05	0.00	0.000%
25	-13.06	-35.05	-7.54	13.06	35.05	7.54	0.000%
26	-7.54	-35.05	-13.06	7.54	35.05	13.06	0.000%
27	0.00	-28.87	-6.94	0.00	28.87	6.94	0.000%
28	3.47	-28.87	-6.01	-3.47	28.87	6.01	0.000%
29	6.01	-28.87	-3.47	-6.01	28.87	3.47	0.000%
30	6.94	-28.87	0.00	-6.94	28.87	0.00	0.000%
31	6.01	-28.87	3.47	-6.01	28.87	-3.47	0.000%
32	3.47	-28.87	6.01	-3.47	28.87	-6.01	0.000%
33	0.00	-28.87	6.94	0.00	28.87	-6.94	0.000%
34	-3.47	-28.87	6.01	3.47	28.87	-6.01	0.000%
35	-6.01	-28.87	3.47	6.01	28.87	-3.47	0.000%
36	-6.94	-28.87	0.00	6.94	28.87	0.00	0.000%
37	-6.01	-28.87	-3.47	6.01	28.87	3.47	0.000%
38	-3.47	-28.87	-6.01	3.47	28.87	6.01	0.000%

### Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.0000001	0.0000001
2	Yes	4	0.0000001	0.00001028
3	Yes	4	0.0000001	0.00071358
4	Yes	4	0.0000001	0.00071358
5	Yes	4	0.0000001	0.00001028
6	Yes	4	0.0000001	0.00071358
7	Yes	4	0.0000001	0.00071358
8	Yes	4	0.0000001	0.00001028
9	Yes	4	0.0000001	0.00071358
10	Yes	4	0.0000001	0.00071358
11	Yes	4	0.0000001	0.00001028
12	Yes	4	0.0000001	0.00071358
13	Yes	4	0.0000001	0.00071358
14	Yes	4	0.0000001	0.0000001
15	Yes	4	0.0000001	0.00001857
16	Yes	4	0.0000001	0.00077703
17	Yes	4	0.0000001	0.00077703
18	Yes	4	0.0000001	0.00001857
19	Yes	4	0.0000001	0.00077703
20	Yes	4	0.0000001	0.00077703
21	Yes	4	0.0000001	0.00001857
22	Yes	4	0.0000001	0.00077703
23	Yes	4	0.0000001	0.00077703
24	Yes	4	0.0000001	0.00001857
25	Yes	4	0.0000001	0.00077703
26	Yes	4	0.0000001	0.00077703
27	Yes	4	0.0000001	0.0000001
28	Yes	4	0.0000001	0.00005695
29	Yes	4	0.0000001	0.00005695
30	Yes	4	0.0000001	0.0000001
31	Yes	4	0.0000001	0.00005695
32	Yes	4	0.0000001	0.00005695
33	Yes	4	0.0000001	0.0000001
34	Yes	4	0.0000001	0.00005695

35	Yes	4	0.00000001	0.00005695
36	Yes	4	0.00000001	0.00000001
37	Yes	4	0.00000001	0.00005695
38	Yes	4	0.00000001	0.00005695

### Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	109 - 95	10.719	30	0.7849	0.0000
L2	95 - 48.08	8.451	30	0.7525	0.0000
L3	53 - 0	2.792	30	0.4792	0.0000

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

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
113.00	6' LR	30	10.719	0.7849	0.0000	63235
110.00	(4) DB844H90-XY w/Mount Pipe	30	10.719	0.7849	0.0000	63235
107.00	FWT 14' Low Profile Platform	30	10.392	0.7818	0.0000	63235
92.00	(2) DB948F85T2E-M w/Mount Pipe	30	7.975	0.7395	0.0000	17897
83.00	(4) DB844H90-XY w/Mount Pipe	30	6.589	0.6868	0.0000	11047
82.00	FWT 14' Low Profile Platform	30	6.439	0.6799	0.0000	10596
74.00	(3) DB978H90T2E-M w/Mount Pipe	30	5.290	0.6214	0.0000	7987
72.00	FWT 14' Low Profile Platform	30	5.017	0.6063	0.0000	7524

### Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	109 - 95	27.429	5	2.0088	0.0000
L2	95 - 48.08	21.627	5	1.9258	0.0000
L3	53 - 0	7.145	5	1.2265	0.0000

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

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
113.00	6' LR	5	27.429	2.0088	0.0000	24777
110.00	(4) DB844H90-XY w/Mount Pipe	5	27.429	2.0088	0.0000	24777
107.00	FWT 14' Low Profile Platform	5	26.594	2.0000	0.0000	24777
92.00	(2) DB948F85T2E-M w/Mount Pipe	5	20.409	1.8959	0.0000	7010
83.00	(4) DB844H90-XY w/Mount Pipe	5	16.861	1.7764	0.0000	4324
82.00	FWT 14' Low Profile Platform	5	16.479	1.7608	0.0000	4148
74.00	(3) DB978H90T2E-M w/Mount Pipe	5	13.538	1.6239	0.0000	3125
72.00	FWT 14' Low Profile Platform	5	12.839	1.5871	0.0000	2944

### Compression Checks

### Pole Design Data

Section No.	Elevation ft	Size	L ft	L <sub>u</sub> ft	Kl/r	F <sub>a</sub> ksi	A in <sup>2</sup>	Actual P K	Allow. P <sub>a</sub> K	Ratio $\frac{P}{P_a}$
L1	109 - 95 (1)	TP26.715x23.476x0.1875	14.00	0.00	0.0	39.000	15.7872	-2.94	615.70	0.005
L2	95 - 48.08 (2)	TP37.573x26.715x0.3125	46.92	0.00	0.0	39.000	35.8284	-15.53	1397.31	0.011
L3	48.08 - 0 (3)	TP48.075x35.8094x0.375	53.00	0.00	0.0	39.000	56.7749	-28.87	2214.22	0.013

### Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M <sub>x</sub> kip-ft	Actual f <sub>bx</sub> ksi	Allow. F <sub>bx</sub> ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M <sub>y</sub> kip-ft	Actual f <sub>by</sub> ksi	Allow. F <sub>by</sub> ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	109 - 95 (1)	TP26.715x23.476x0.1875	52.70	6.115	39.000	0.157	0.00	0.000	39.000	0.000
L2	95 - 48.08 (2)	TP37.573x26.715x0.3125	522.86	19.662	39.000	0.504	0.00	0.000	39.000	0.000
L3	48.08 - 0 (3)	TP48.075x35.8094x0.375	1383.5	24.844	39.000	0.637	0.00	0.000	39.000	0.000

### Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f <sub>v</sub> ksi	Allow. F <sub>v</sub> ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f <sub>vt</sub> ksi	Allow. F <sub>vt</sub> ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	109 - 95 (1)	TP26.715x23.476x0.1875	4.14	0.262	26.000	0.020	0.00	0.000	26.000	0.000
L2	95 - 48.08 (2)	TP37.573x26.715x0.3125	14.70	0.410	26.000	0.032	0.00	0.000	26.000	0.000
L3	48.08 - 0 (3)	TP48.075x35.8094x0.375	17.79	0.313	26.000	0.024	0.00	0.000	26.000	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	109 - 95 (1)	0.005	0.157	0.000	0.020	0.000	0.162	1.333	H1-3+VT ✓
L2	95 - 48.08 (2)	0.011	0.504	0.000	0.032	0.000	0.516	1.333	H1-3+VT ✓
L3	48.08 - 0 (3)	0.013	0.637	0.000	0.024	0.000	0.650	1.333	H1-3+VT ✓

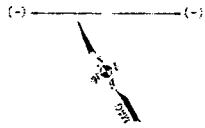
### Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	SF*P <sub>allow</sub> K	% Capacity	Pass Fail	
L1	109 - 95	Pole	TP26.715x23.476x0.1875	1	-2.94	820.73	12.1	Pass	
L2	95 - 48.08	Pole	TP37.573x26.715x0.3125	2	-15.53	1862.61	38.7	Pass	
L3	48.08 - 0	Pole	TP48.075x35.8094x0.375	3	-28.87	2951.56	48.8	Pass	
							Summary		
							Pole (L3)	48.8	Pass
							<b>RATING =</b>	<b>48.8</b>	<b>Pass</b>

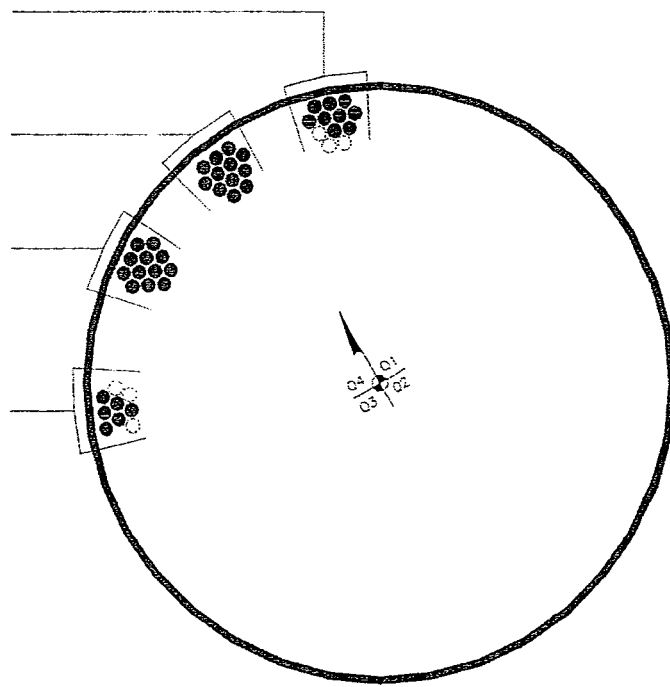
APPENDIX B

Cable Routing Drawing

MAGNETIC NORTH- DEVIATION FOR TRUE NORTH= -14.70 DEGREES



- LEVEL 107 FT LEVEL  
 (RESERVED)  
 (3) 1-5/8" TO 107 FT LEVEL  
 (INSTALLED)  
 (9) 1-5/8" TO 107 FT LEVEL  
 (CINGULAR WIRELESS)
- LEVEL 92 FT LEVEL  
 (INSTALLED)  
 (12) 1-1/4" TO 92 FT LEVEL  
 (VERIZON WIRELESS)
- LEVEL 82 FT LEVEL  
 (INSTALLED)  
 (12) 7/8" TO 82 FT LEVEL  
 (NEXTEL)
- LEVEL 72 FT LEVEL  
 (RESERVED)  
 (3) 1-1/4" TO 72 FT LEVEL  
 (INSTALLED)  
 (6) 1-1/4" TO 72 FT LEVEL  
 (SPRINT PCS)



## APPENDIX C

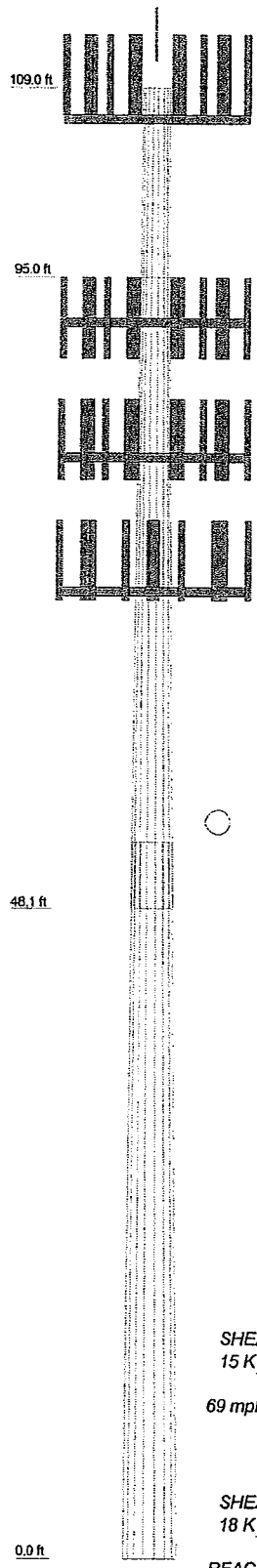
### *Listing of Referenced Documents*

Document	Document ID
ERI Tower Profile	Attached
Foundation Drawings	821489
Tower Drawings	823124
Structural Report	620078

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Program Version 4.0.0.0 - 11/18/2005 File:T:/375\_Crown\_Castle/37506-0225.eri

Section	1	2	3
Length (ft)	14.00	46.02	53.00
Number of Slides	18	18	18
Thickness (in)	0.1875	0.3125	0.3750
Lap Splice (ft)			4.82
Top Dia (in)	23.4760	26.7150	35.8094
Bot Dia (in)	25.7150	37.5730	48.0750
Grade		A572-65	
Weight (K)	0.7	5.0	8.9



### DESIGNED APPURTENANCE LOADING

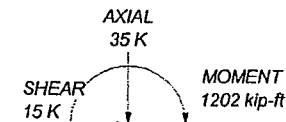
TYPE	ELEVATION	TYPE	ELEVATION
6' LR	113	(2) WPA-80090/4CF w/ Mount Pipe	92
(4) DB844H90-XY w/Mount Pipe	110	FWT 14' Low Profile Platform	92
(4) DB844H90-XY w/Mount Pipe	110	(4) DB844H90-XY w/Mount Pipe	83
(4) DB844H90-XY w/Mount Pipe	110	(4) DB844H90-XY w/Mount Pipe	83
FWT 14' Low Profile Platform	107	(4) DB844H90-XY w/Mount Pipe	83
(2) DB948F85T2E-M w/Mount Pipe	92	FWT 14' Low Profile Platform	82
(2) DB948F85T2E-M w/Mount Pipe	92	(3) DB978H90T2E-M w/Mount Pipe	74
(2) DB948F85T2E-M w/Mount Pipe	92	(3) DB978H90T2E-M w/Mount Pipe	74
(2) WPA-80090/4CF w/ Mount Pipe	92	(3) DB978H90T2E-M w/Mount Pipe	74
(2) WPA-80090/4CF w/ Mount Pipe	92	FWT 14' Low Profile Platform	72

### MATERIAL STRENGTH

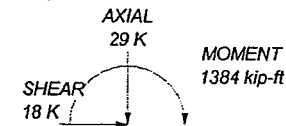
GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi			

### TOWER DESIGN NOTES

1. Tower is located in Hartford 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 69 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 48.8%



69 mph WIND - 0.5000 in ICE



REACTIONS - 80 mph WIND

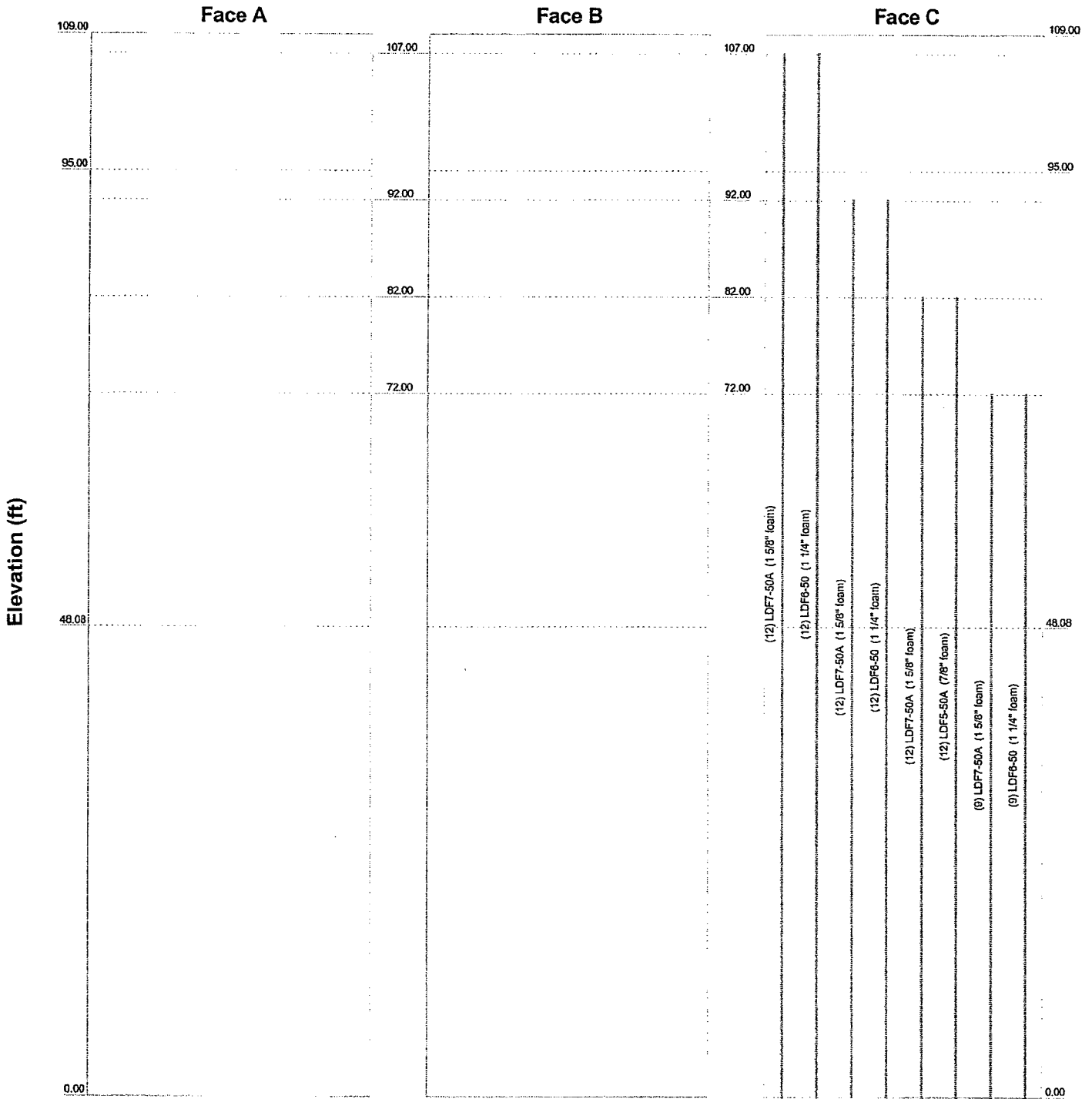
<b>Paul J. Ford &amp; Company</b> 250 East Broad Street Columbus, OH 43215 Phone: (614) 221-6679 FAX: (614) 448-4105 PJF	Job: <b>Existing 1110' Monopole Suffield CT</b>
	Project: <b>BU #801486 (37506-0225)</b>
	Client: <b>Crown Castle International</b> Drawn by: JHK App'd:
	Code: <b>TIA/EIA-222-F</b> Date: 03/22/06 Scale: NTS
	Path: <b>T:\375 Crown Castle\37506-0225.dwg</b> Dwg No: <b>E-1</b>



# Feedline Distribution Chart

## 0' - 109'

Round      Flat      App In Face      App Out Face      Truss Leg



**Paul J. Ford & Company**

250 East Broad Street  
Columbus, OH 43215

Phone: (614) 221-6679  
FAX: (614) 448-4105

PJF

**Job: Existing 1110' Monopole Suffield CT**

Project: BU #801486 (37506-0225)

Client: Crown Castle International | Drawn by: JHK | App'd:

Code: TIA/EIA-222-F | Date: 03/22/06 | Scale: NTS

Path: T:\375 Crown Castle\37506-0225.dwg | Dwg No. E-7



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**MONOPOLE BASE PLATE ANALYSIS**

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TITLE: Existing 110' Monopole  
SITE: 801486  
OWNER: CCI  
COMM. NO: 37506-0225  
DATE: 22-Mar-06

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Number of Sides	18	Stress Increase	1.33
Shaft Dia, DF	48.075 in.	Base Plate Shape	SQUARE
PT-to-PT, DP	48.817 in.		
Min Bolt Circle	52.08 in.	Actual Bolt Circle	55.00 in.

---

Base Reactions

Moment	1384.0 ft-kips
Axial Load	29.0 kips
Base Elevation	0.0 ft

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Bolt Details

Number of Bolts	16
Bolt Diameter	2 1/4 inches
Bolt Type	A615 #18J
Mom. Of Inertia	6050.00 inches <sup>4</sup>
Bolt Tension, T	75.49 kips
Allowable Tension	194.51 kips
Bolt Compression, C	77.30 kips
Actual / Allowable Ratio	38.8% <input checked="" type="checkbox"/>

---

Base Plate Details

Plate Moment, MPL	1070.65 inch-kips
Bend Plane, W	38.19 inches
Plate Thickness, t	2.75 inches
Plate Width	61.00 inches
Plate Steel Spec.	ASTM A633 GRADE 60
Plate Steel Grade	60.00 ksi
Actual Stress	22.24 ksi
Allowable Stress	60.00 ksi
Actual / Allowable Ratio	37.1% <input checked="" type="checkbox"/>

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Base Plate Analysis Summary

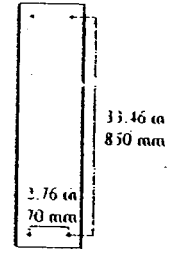
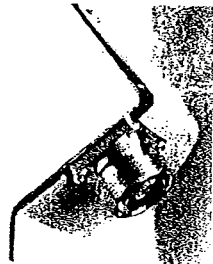
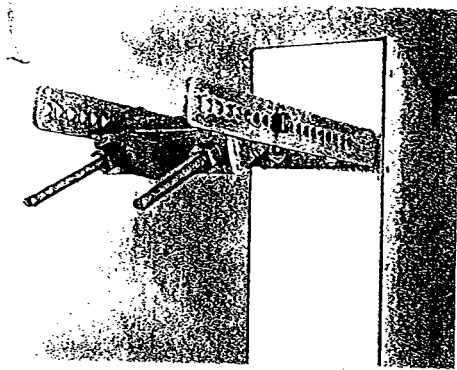
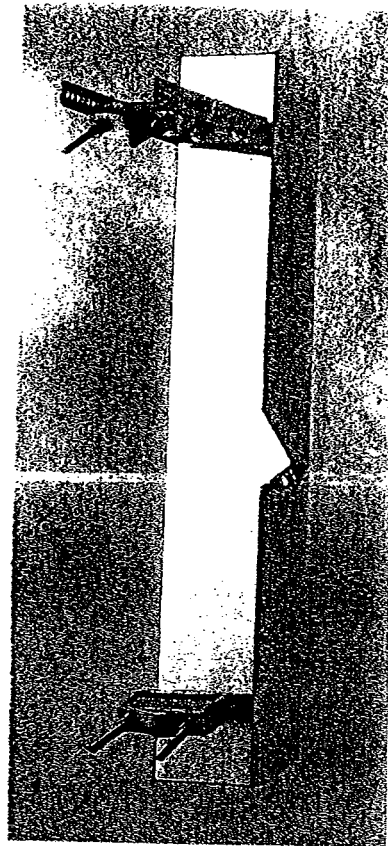
Plate Thickness	2.75 in.	Bolt Circle	55.00 in.
Plate Diameter	61.00 in.	Bolt Diameter	2.25 in.
Number of Bolts	16	Bolt Type	A615 #18J

# ALP-E 9011-Din

Enhanced Log-Periodic Antenna

## Features:

- ❑ Small Size
- ❑ Aesthetically Pleasing
- ❑ Suitable For TDMA/CDMA
- ❑ High Return Loss
- ❑ Low Intermodulation
- ❑ High FTB
- ❑ Broadbanded
- ❑ Side-lobe Suppression
- ❑ Sturdy Design
- ❑ Down-Tilt Brackets Incl.



The distance between the center of the bolts (on the back of the antenna) are shown in the drawing above.

Bolt diameter is: 3/8-16  
[comes with lock nut].



Frequency Range:	800-900 MHz
Impedance:	50 ohm
Connector Type:	7/16 Din
Return Loss:	20 dB
Polarization:	Vertical
Gain:	> 11 dBd
Front To Back Ratio:	> 30 dB
Side-Lobe Suppression:	18 dB
Intermodulation (2x25W):	IM3 > 146 dB
	IM5 > 153 dB
	IM7/9 > 163 dB
Power Rating:	500 W
H-Plane (-3 dB point):	85 - 92°
V-Plane (-3 dB point):	16 - 18°
Lightning Protection:	DC Grounded

Overall Height:	43 in	[1092 mm]
Width:	6.5 in	[165 mm]
Depth:	8 in	[203 mm]
Weight Including Tilt-Brackets:	20 lbs	[9.1 Kg]
Rated Wind Velocity:	113 mph	[180 Km/h]
Wind Area (CxA/Side):	2.3 sq. ft.	[0.22 sq.m]
Lateral Thrust At Rated Wind Worst Case:	112 lbs	[500 N]



Radiating Elements:	Aluminum
Extrusion:	Aluminum
Radome:	Grey PVC
Tilt-Bracket:	Hot Dip Galvanized Steel
Antenna Bolts:	Stainless Steel

The ALP-E 9011-Din is made in U.S.A.

# WPA-80090/4CF

When ordering, replace "\_\_\_" with connector type.

## Mechanical specifications

Length	1205 mm	47.4 in
Width	205 mm	8.1 in
Depth	145 mm	5.7 in
Weight	5.4 Kg	12.0 lbs

### Wind Area

Front	0.25 m <sup>2</sup>	2.66 ft <sup>2</sup>
Side	0.17 m <sup>2</sup>	1.88 ft <sup>2</sup>

### Rated Wind Velocity (Safety factor 2.0)

67.9 km/hr	> 422 mph
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### Windload @ 100 mph (161 km/hr)

Front	362 N	81.4 lbs
Side	264 N	59.4 lbs

## Mounting

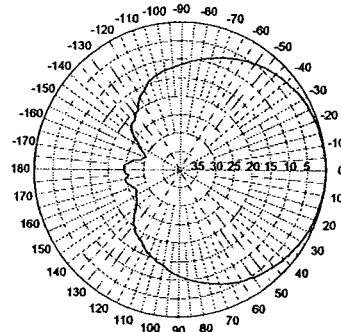
Through two pair of clamps to pipe diameter Ø50 (2 3/8 in) or by U-clamps to a 2" pipe.

Antenna consisting of aluminum alloy with brass feedlines covered by a UV safe fiberglass radome.

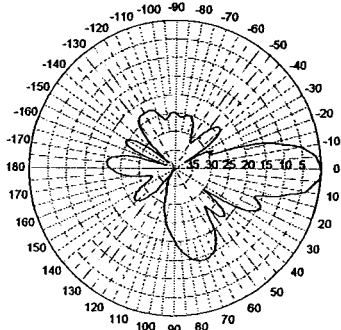
Mounting Bracket #36210002

Down tilt Bracket #36112003

## Radiation-pattern<sup>1)</sup>



Horizontal



Vertical

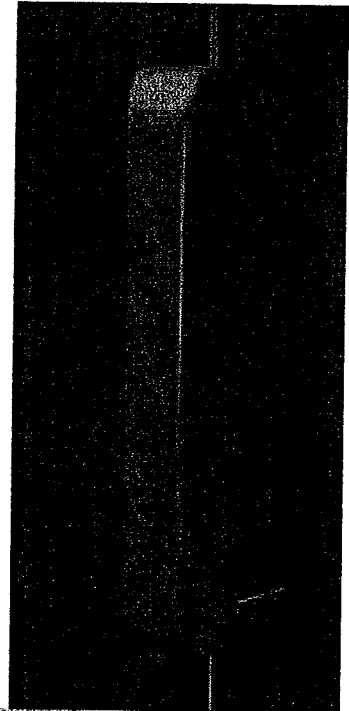
## Featuring upper side lobe suppression.

Radiation patterns for all Antel antennas are measured with the antenna mounted on a fiberglass pole.

Mounting on a metal pole will typically improve the Front-to-Back Ratio.

CF Denotes a Center-Fed Connector.

806-960 MHz



806-960 MHz



Antel's Exclusive 3T (True Transmission Line Technology) Antenna Design:

- Single-piece, watercut brass feedline assembly for consistent performance.
- Unique single-piece feedline design eliminates the need for solder joints in the signal path.
- A non-collinear system with access to every radiating element for broad bandwidth and superior performance.
- Air as insulation for virtually no internal signal loss.

Every Antel antenna is under a five-year limited warranty for repair or replacement.

Antenna available with center-fed connector only.

## Electrical specifications

Frequency Range	806-960 MHz
Impedance	50Ω
Connector	N, NE, DIN, E-DIN
VSWR	1.4:1
Polarization	Vertical
Gain	11.5 dBd
Power Rating	500 W
Half Power Angle	
H-Plane	90°
E-Plane	15°
Lobe Tilt	0°
Null Fill	10%
Lightning Protection	Direct Ground

### Typical Values

Power Rating limited by connector only.  
NE indicates an elongated N connector.  
E-DIN indicates an elongated DIN connector.

Improvements to mechanical and/or electrical performance of the antenna may be made without notice.





March 24, 2006

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Crown Castle International  
1200 McArthur Blvd.  
Mahwah, NJ 07430  
(201) 236-9094

PSG Engineering, Ltd.  
8206 Forest Gate Drive  
Sugar Land, TX 77479

Phone: (281) 343-7099  
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**Subject: Structural Analysis Report**

**Carrier Designation** Verizon Wireless Co-Locate  
Carrier Site Number: "BRG126"  
Carrier Site Name: "Fairfield"

**Crown Castle Designation** Crown Castle BU Number: 806355  
Crown Castle Site Name: BRG 126 943086  
Crown Castle JDE Job Number: 71325

**Engineering Firm Designation** PSG Engineering Project Number: 0601H117-A160171

**Site Data** 281 Woodhouse Road, Fairfield, CT, Fairfield County  
Latitude 41°-11'-45.3", Longitude -73°-16'-52.9".  
171 Foot - Monopole Tower

Dear Ms. Harris,

PSG Engineering, Ltd. is pleased to submit this "Structural Analysis Report" to determine the structural integrity of the aforementioned 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 204553. The purpose of the analysis is to determine the suitability of the tower with the addition of the proposed equipment listed in Table 1 of this report when combined with the existing and reserved equipment on the structure. This analysis has been performed in accordance with the TIA/EIA 222-F standard based upon a wind speed condition of 85 mph.

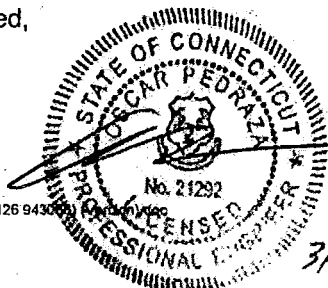
Based on our analysis we have determined the tower and foundation ARE sufficient for the proposed loading.

All proposed equipment shall be installed in accordance with Crown Castle Drawing Number(s): 806355\_A\_158.DWG.

We at PSG Engineering appreciate the opportunity of providing our continuing professional services to you and Crown Castle International. If you have any questions or need further assistance on this or any other projects please give us a call.

Respectfully submitted,

Oscar Pedraza, P.E.  
President



0601H117-A160171 (806355) (BRG 126 943086)

3/27/06

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**INTRODUCTION**

This tower was designed by Engineered Endeavors, Inc. on May 1, 1998 per TIA/EIA-222-F using a basic wind speed of 85 mph and 64 mph with 1/2" radial ice. The original tower height was 160 feet. The tower has been previously extended to an overall height 171 feet.

**ANALYSIS CRITERIA**

This tower is designed using the TIA/EIA-222-F standard.

The following design criteria apply:

- Basic wind speed of 85 mph.
- Nominal ice thickness of 0.5000 in.
- Ice density of 56 pcf.
- A wind speed of 74 mph is used in combination with ice.
- Deflections calculated using a wind speed of 50 mph.
- Feedline torque is considered.
- Pressures are calculated at each section.
- Stress ratio used in tower member design is 1.333

**Table 1 – Proposed (P) Antenna and Cable Information**

Center Line Elevation (feet)	Number Of Antenna	Antenna Manufacturer	Antenna Model	Mount	Number Of Feed Lines	Feed Line Size (inches)
158	6(P)	Antel	WPA-80090/4CF	-	-	-

**Table 2 – Installed (I) and Reserved (R) Antenna and Cable Information**

Center Line Elevation (feet)	Number Of Antenna	Antenna Manufacturer	Antenna Model	Mount	Number Of Feed Lines	Feed Line Size (inches)
165	3(I)	EMS Wireless	DR90-17-02DP	Tri-Bracket (1)	6(I)+6(R) (External)	1 5/8
*158	*6(I)	*Swedcom	*ALP-E 9011-DIN	Platform w/Handrail (1)	12(I)	1 5/8
	6(I)	Decibel	DB948F85T2E-M		12(I)	
150	6(I)	Powerwave Technologies	7770.00	Platform w/Handrail (1)	12(I) (Internal)	1 1/4
	6(I)		LGP2140X			
140	6(I)+6(R)	EMS Wireless	RR90-17-02DP	Platform w/Handrail (1)	18(I)+6(R) (External)	1 5/8
125	1(I)+1(R)	Sinclair	SRL 420NHD-1	Single Standoff (1) Standoff T-Arm (2)	1(I)+1(R) (Internal)	7/8

\*Note: Installed (6) Swedcom antennas will be removed and replaced with proposed loads. Installed (6) Decibel antennas, coax lines, and mount will remain.

**Table 3 – Original Tower Manufacturer Design Antenna and Cable Information**

Center Line Elevation (feet)	Number Of Antenna	Antenna Manufacturer	Antenna Model	Mount	Number Of Feed Lines	Feed Line Size (inches)
160	12	Swedcom	ALP 9212	EEI Standard AMPS Platform	Not Available (Internal)	
148	12	Swedcom	ALP 11011	EEI Standard AMPS Platform		
138	12	Swedcom	ALP 199015	EEI Standard AMPS Platform		
128	12	Swedcom	ALP 9212	EEI Standard AMPS Platform		
118	12	Swedcom	ALP 9212	EEI Standard AMPS Platform		

**ANALYSIS PROCEDURE**

**Table 4 – Documents Provided**

Document	Remarks	Reference	Source
Original Tower Design	Engineered Endeavors, Inc.	653293	Crown Site Data Manager
Crown Castle Application	Application ID: 30242 Revision 1	-	Crown Regional Office
CAD Level Drawing(s)	167',158',148',138',118' Level Drawing(s)	-	Crown CAD Dept.

**Analysis Methods**

RISATower (Version 4.0.0.00), a commercially available software program, was used to create a three-dimensional model of the tower and calculate member stresses for various dead, live, wind, and ice load cases. All loads were computed in accordance with the ANSI/EIA/TIA 222F or the local building code requirements. Selected output from the analysis is included in Appendix A.

**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 manufacturer's specifications.
3. The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2.
4. When applicable, transmission cables are considered to be structural components for calculating wind loads, as allowed by TIA/EIA-222F.

If any of these assumptions are not valid or have been made in error, this analysis may be affected, and PSG Engineering should be allowed to review any new information to determine its effect on the structural integrity of the tower.

**ANALYSIS RESULTS**

**Table 5 – Tower Section Capacity**

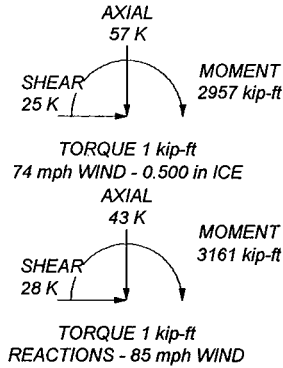
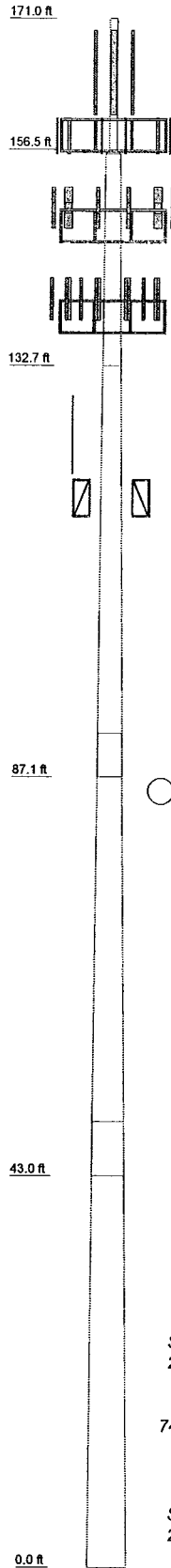
Section Number	Elevation (feet)	Percent Capacity Used	Pass / Fail
1	171 - 156.5	29.9	Pass
2	156 - 132.6	17.6	Pass
3	132.6 - 87.0	58.8	Pass
4	87.0 - 43	69.9	Pass
5	43 - 0	73.6	Pass
Anchor Bolts		70.0	Pass
Base Plate		87.8	Pass
Base Foundation (Compared with original design loads)		≤79.7	Pass



## APPENDIX A

### Output from Computer Programs

Section	1	3	4	5	6
Length (ft)	145"	23'3-31/32"	49'3"	48'11-1/32"	49'
Number of Sides	1	18	18	18	18
Thickness (in)	0.365	0.188	0.375	0.438	0.500
Lap Splice (ft)		38"		4'10"	6'
Top Dia (in)	10.750	19.500	23.584	32.796	41.531
Bot Dia (in)	10.750	24.790	34.630	43.750	52.500
Grade	A53-B-35		A572-65		
Weight (K)	0.6	1.0	5.7	8.7	12.3



### APPURTENANCES

TYPE	ELEVATION	TYPE	ELEVATION
Valmont Light Duty Tri-Bracket (1)	167	(2) 7770.00 w/Mount Pipe	150
DR90-17-02DP w/Mount Pipe	165	(2) LGP2140X (TMA)	150
DR90-17-02DP w/Mount Pipe	165	(2) 7770.00 w/Mount Pipe	150
DR90-17-02DP w/Mount Pipe	165	(2) LGP2140X (TMA)	150
(2) DB948F85T2E-M w/Mount Pipe	158	PIROD 12' Platform w / handrails	148
(2) WPA-80090/4CF w/Mount Pipe	158	(4) RR90-17-02DP w/Mount Pipe	140
(2) DB948F85T2E-M w/Mount Pipe	158	(4) RR90-17-02DP w/Mount Pipe	140
(2) WPA-80090/4CF w/Mount Pipe	158	(4) RR90-17-02DP w/Mount Pipe	140
(2) DB948F85T2E-M w/Mount Pipe	158	PIROD 12' Platform w / handrails	138
(2) WPA-80090/4CF w/Mount Pipe	158	(2) SRL-420NHD-1	125
PIROD 12' Platform w / handrails	158	Pirod 4' Side Mount Standoff (1)	118
(2) 7770.00 w/Mount Pipe	150	5' Standoff T-Arm (5' face width)	118
(2) LGP2140X (TMA)	150	5' Standoff T-Arm (14' face width)	118

### MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A53-B-35	35 ksi	63 ksi	A572-65	65 ksi	80 ksi

### TOWER DESIGN NOTES

1. Tower is located in Fairfield County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 74 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 50 mph wind.

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	Project: <b>(806355) (BRG 126 943086)</b>
	Client: <b>Crown Castle International</b> Drawn by: <b>Oscar Pedraza</b> App'd:
	Code: <b>TIA/EIA-222-F</b> Date: <b>03/24/06</b> Scale: <b>NTS</b>
	Path: <b>C:\Documents and Settings\opedraza\PSG\Desktop\Temp\0601H117\806355.dwg</b> Dwg No: <b>E-1</b>

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## 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 Fairfield County, Connecticut.

Basic wind speed of 85 mph.

Nominal ice thickness of 0.500 in.

Ice density of 56 pcf.

A wind speed of 74 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.

## 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	171'-156'6"	14'6"	0'	Round	10.750	10.750	0.365		A53-B-35 (35 ksi)
L2	156'6"-156'	6"	0'	18	10.750	19.500	0.365	1.460	A572-65 (65 ksi)
L3	156'-132'8-1/32"	23'3-31/32"	3'8"	18	19.500	24.790	0.188	0.750	A572-65 (65 ksi)
L4	132'8-1/32"-87'1-1/32"	49'3"	4'10"	18	23.584	34.630	0.375	1.500	A572-65 (65 ksi)
L5	87'1-1/32"-43'	48'11-1/32"	6'	18	32.796	43.750	0.438	1.750	A572-65 (65 ksi)
L6	43'-0'	49'		18	41.531	52.500	0.500	2.000	A572-65 (65 ksi)

## Tapered Pole Properties

Section	Tip Dia. in	Area in <sup>2</sup>	I in <sup>4</sup>	r in	C in	I/C in <sup>3</sup>	J in <sup>4</sup>	I/Q in <sup>2</sup>	w in	w/t
L1	10.750	11.902	160.659	3.676	5.375	29.890	320.880	5.951	0.000	0
	10.750	11.902	160.659	3.676	5.375	29.890	320.880	5.951	0.000	0
L2	10.916	12.031	163.929	3.687	5.461	30.018	328.074	6.017	1.250	3.424
	19.801	22.168	1025.469	6.793	9.906	103.520	2052.288	11.086	2.790	7.643
L3	19.801	11.493	541.578	6.856	9.906	54.672	1083.869	5.748	3.102	16.544
	25.172	14.642	1119.653	8.734	12.593	88.908	2240.779	7.322	4.033	21.51
L4	24.783	27.624	1879.852	8.239	11.980	156.910	3762.178	13.815	3.491	9.309
	35.164	40.772	6044.321	12.161	17.592	343.583	12096.596	20.390	5.435	14.493
L5	34.401	44.934	5944.077	11.487	16.660	356.780	11895.976	22.471	5.002	11.433
	44.425	60.145	14254.835	15.376	22.225	641.387	28528.426	30.078	6.930	15.84
L6	43.536	65.117	13850.506	14.566	21.098	656.485	27719.237	32.565	6.430	12.859



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

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C <sub>AA</sub> ft <sup>2</sup> /ft	Weight klf
***EL. 167' LEVEL***								
LDF7-50A (1-5/8 FOAM)	A	No	CaAa (Out Of Face)	167' - 10'	11	No Ice	0.000	0.001
						1/2" Ice	0.000	0.002
LDF7-50A (1-5/8 FOAM)	A	No	CaAa (Out Of Face)	167' - 10'	1	No Ice	0.198	0.001
						1/2" Ice	0.298	0.002
*								
***EL. 158' LEVEL***								
LDF7-50A (1-5/8 FOAM)	A	No	Inside Pole	158' - 10'	12	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
*								
***EL. 148' LEVEL***								
LDF6-50A (1-1/4 FOAM)	A	No	Inside Pole	148' - 10'	12	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
*								
***EL. 138' LEVEL***								
LDF7-50A (1-5/8 FOAM)	A	No	CaAa (Out Of Face)	138' - 10'	22	No Ice	0.000	0.001
						1/2" Ice	0.000	0.002
LDF7-50A (1-5/8 FOAM)	A	No	CaAa (Out Of Face)	138' - 10'	2	No Ice	0.198	0.001
						1/2" Ice	0.298	0.002
*								
***EL. 118' LEVEL***								
VXL5-50 (7/8 FOAM)	A	No	Inside Pole	118' - 10'	2	No Ice	0.000	0.000
						1/2" Ice	0.000	0.000
*								
***TOWER HARDWARE***								
Climbing Ladder (Ar)	C	No	CaAa (Out Of Face)	171' - 10'	1	No Ice	0.037	0.001
						1/2" Ice	0.137	0.002

### Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A <sub>R</sub> ft <sup>2</sup>	A <sub>F</sub> ft <sup>2</sup>	C <sub>AA</sub> In Face ft <sup>2</sup>	C <sub>AA</sub> Out Face ft <sup>2</sup>	Weight K
L1	171'-156'6"	A	0.000	0.000	0.000	2.079	0.118
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.544	0.015
L2	156'6"-156'	A	0.000	0.000	0.000	0.099	0.010
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.019	0.000
L3	156'-132'8-1/32"	A	0.000	0.000	0.000	6.730	0.685
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.875	0.023
L4	132'8-1/32"-87'1-1/32"	A	0.000	0.000	0.000	27.076	2.173
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	1.709	0.046
L5	87'1-1/32"-43'	A	0.000	0.000	0.000	26.187	2.110
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	1.653	0.044
L6	43'-0'	A	0.000	0.000	0.000	19.602	1.579

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Tower Section	Tower Elevation ft	Face	$A_R$ ft <sup>2</sup>	$A_F$ ft <sup>2</sup>	$C_A A_A$ In Face ft <sup>2</sup>	$C_A A_A$ Out Face ft <sup>2</sup>	Weight K
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	1.238	0.033

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

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	$A_R$ ft <sup>2</sup>	$A_F$ ft <sup>2</sup>	$C_A A_A$ In Face ft <sup>2</sup>	$C_A A_A$ Out Face ft <sup>2</sup>	Weight K
L1	171'-156'6"	A	0.500	0.000	0.000	0.000	3.129	0.309
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	1.994	0.022
L2	156'6"-156'	A	0.500	0.000	0.000	0.000	0.149	0.019
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.069	0.001
L3	156'-132'8"-1/32"	A	0.500	0.000	0.000	0.000	10.130	1.303
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	3.208	0.036
L4	132'8"-1/32"-87'1-1/32"	A	0.500	0.000	0.000	0.000	40.751	4.659
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	6.268	0.070
L5	87'1"-1/32"-43'	A	0.500	0.000	0.000	0.000	39.413	4.514
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	6.062	0.068
L6	43'-0'	A	0.500	0.000	0.000	0.000	29.502	3.379
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	4.537	0.051

### Feed Line Center of Pressure

Section	Elevation ft	$CP_x$ in	$CP_z$ in	$CP_x$ Ice in	$CP_z$ Ice in
L1	171'-156'6"	-0.041	-0.156	-0.120	-0.148
L2	156'6"-156'	-0.041	-0.227	-0.127	-0.244
L3	156'-132'8"-1/32"	-0.041	-0.354	-0.132	-0.418
L4	132'8"-1/32"-87'1-1/32"	-0.039	-0.687	-0.123	-0.852
L5	87'1"-1/32"-43'	-0.041	-0.722	-0.133	-0.921
L6	43'-0'	-0.033	-0.576	-0.110	-0.760

### Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	$C_A A_A$ Front ft <sup>2</sup>	$C_A A_A$ Side ft <sup>2</sup>	Weight K
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Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C <sub>AA</sub> Front ft <sup>2</sup>	C <sub>AA</sub> Side ft <sup>2</sup>	Weight K	
***EL. 167' LEVEL***									
DR90-17-02DP w/Mount Pipe	A	From Leg	2.000 0' 0'	0.000	165'	No Ice 1/2" Ice	10.355 11.110	7.153 9.254	0.092 0.163
DR90-17-02DP w/Mount Pipe	B	From Leg	2.000 0' 0'	0.000	165'	No Ice 1/2" Ice	10.355 11.110	7.153 9.254	0.092 0.163
DR90-17-02DP w/Mount Pipe	C	From Leg	2.000 0' 0'	0.000	165'	No Ice 1/2" Ice	10.355 11.110	7.153 9.254	0.092 0.163
Valmont Light Duty Tri-Bracket (1)	C	None		0.000	167'	No Ice 1/2" Ice	1.760 2.080	1.760 2.080	0.054 0.070
* *									
***EL. 158' LEVEL***									
(2) DB948F85T2E-M w/Mount Pipe	A	From Leg	4.000 0' 0'	0.000	158'	No Ice 1/2" Ice	2.622 3.230	4.918 6.008	0.034 0.069
(2) WPA-80090/4CF w/Mount Pipe	A	From Leg	4.000 0' 0'	0.000	158'	No Ice 1/2" Ice	4.220 4.754	4.134 4.939	0.034 0.072
(2) DB948F85T2E-M w/Mount Pipe	B	From Leg	4.000 0' 0'	0.000	158'	No Ice 1/2" Ice	2.622 3.230	4.918 6.008	0.034 0.069
(2) WPA-80090/4CF w/Mount Pipe	B	From Leg	4.000 0' 0'	0.000	158'	No Ice 1/2" Ice	4.220 4.754	4.134 4.939	0.034 0.072
(2) DB948F85T2E-M w/Mount Pipe	C	From Leg	4.000 0' 0'	0.000	158'	No Ice 1/2" Ice	2.622 3.230	4.918 6.008	0.034 0.069
(2) WPA-80090/4CF w/Mount Pipe	C	From Leg	4.000 0' 0'	0.000	158'	No Ice 1/2" Ice	4.220 4.754	4.134 4.939	0.034 0.072
PiROD 12' Platform w/ handrails	C	None		0.000	158'	No Ice 1/2" Ice	26.300 35.600	26.300 35.600	1.920 2.340
* *									
***EL. 148' LEVEL***									
(2) 7770.00 w/Mount Pipe	A	From Leg	4.000 0' 0'	0.000	150'	No Ice 1/2" Ice	5.981 6.439	4.116 4.769	0.053 0.097
(2) LGP2140X (TMA)	A	From Leg	4.000 0' 0'	0.000	150'	No Ice 1/2" Ice	1.225 1.378	0.367 0.480	0.018 0.024
(2) 7770.00 w/Mount Pipe	B	From Leg	4.000 0' 0'	0.000	150'	No Ice 1/2" Ice	5.981 6.439	4.116 4.769	0.053 0.097
(2) LGP2140X (TMA)	B	From Leg	4.000 0' 0'	0.000	150'	No Ice 1/2" Ice	1.225 1.378	0.367 0.480	0.018 0.024
(2) 7770.00 w/Mount Pipe	C	From Leg	4.000 0' 0'	0.000	150'	No Ice 1/2" Ice	5.981 6.439	4.116 4.769	0.053 0.097
(2) LGP2140X (TMA)	C	From Leg	4.000 0' 0'	0.000	150'	No Ice 1/2" Ice	1.225 1.378	0.367 0.480	0.018 0.024
PiROD 12' Platform w/	C	None		0.000	148'	No Ice	26.300	26.300	1.920

<b>ERITower</b>  <b>PSG Engineering, Ltd.</b> 245 Commerce Green Blvd., Suite 240 Sugar Land, TX 77478 Phone: 281.265.3444 FAX: 281.265.3454	<b>Job</b> PSG Engineering Project Number: 0601H117-A160171	<b>Page</b> 6 of 10
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Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C <sub>AA</sub> Front ft <sup>2</sup>	C <sub>AA</sub> Side ft <sup>2</sup>	Weight K
handrails * *						1/2" Ice 35.600	35.600	2.340
***EL. 138' LEVEL***								
(4) RR90-17-02DP w/Mount Pipe	A	From Leg	4.000 0' 0'	0.000	140'	No Ice 1/2" Ice 4.910 5.572	3.636 4.703	0.044 0.082
(4) RR90-17-02DP w/Mount Pipe	B	From Leg	4.000 0' 0'	0.000	140'	No Ice 1/2" Ice 4.910 5.572	3.636 4.703	0.044 0.082
(4) RR90-17-02DP w/Mount Pipe	C	From Leg	4.000 0' 0'	0.000	140'	No Ice 1/2" Ice 4.910 5.572	3.636 4.703	0.044 0.082
PIROD 12' Platform w / handrails * *	C	None		0.000	138'	No Ice 1/2" Ice 26.300 35.600	26.300 35.600	1.920 2.340
***EL. 118' LEVEL***								
5' Standoff T-Arm (5' face width)	A	From Leg	2.670 0' 0'	0.000	118'	No Ice 1/2" Ice 3.500 4.200	3.500 4.200	0.129 0.168
Pirod 4' Side Mount Standoff (1)	B	From Leg	2.670 0' 0'	0.000	118'	No Ice 1/2" Ice 2.720 4.910	2.720 4.910	0.050 0.089
(2) SRL-420NHD-1	C	From Leg	4.000 0' 0'	0.000	125'	No Ice 1/2" Ice 1.647 2.538	1.647 2.538	0.015 0.028
5' Standoff T-Arm (14' face width)	C	From Leg	2.670 0' 0'	0.000	118'	No Ice 1/2" Ice 6.900 8.700	6.900 8.700	0.197 0.258

## 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



<b>ERITower</b>  <b>PSG Engineering, Ltd.</b> 245 Commerce Green Blvd., Suite 240 Sugar Land, TX 77478 Phone: 281.265.3444 FAX: 281.265.3454	<b>Job</b> PSG Engineering Project Number: 0601H117-A160171	<b>Page</b> 7 of 10
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Comb. No.	Description
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 Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	171 - 156.5	40.672	27	2.177	0.002
L2	156.5 - 156	34.094	27	2.127	0.002
L3	156 - 132.669	33.871	27	2.126	0.002
L4	136.336 - 87.0859	25.524	27	1.877	0.002
L5	91.9193 - 43	10.978	27	1.193	0.001
L6	49 - 0	2.976	27	0.566	0.000

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

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
167'	Valmont Light Duty Tri-Bracket (1)	27	38.842	2.161	0.002	21107
165'	DR90-17-02DP w/Mount Pipe	27	37.930	2.153	0.002	17589
158'	(2) DB948F85T2E-M w/Mount Pipe	27	34.764	2.131	0.002	8382
150'	(2) 7770.00 w/Mount Pipe	27	31.232	2.084	0.002	5933
148'	PiROD 12' Platform w / handrails	27	30.368	2.061	0.002	5471
140'	(4) RR90-17-02DP w/Mount Pipe	27	27.005	1.939	0.002	4172
138'	PiROD 12' Platform w / handrails	27	26.192	1.905	0.002	3963
125'	(2) SRL-420NHD-1	27	21.211	1.695	0.002	3756
118'	5' Standoff T-Arm (5' face width)	27	18.754	1.589	0.002	3753

### Maximum Tower Deflections - Design Wind

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Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	171 - 156.5	116.161	2	6.211	0.007
L2	156.5 - 156	97.421	2	6.073	0.007
L3	156 - 132.669	96.786	2	6.070	0.007
L4	136.336 - 87.0859	72.979	2	5.365	0.007
L5	91.9193 - 43	31.422	2	3.414	0.003
L6	49 - 0	8.525	2	1.621	0.001

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

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
167'	Valmont Light Duty Tri-Bracket (1)	2	110.951	6.167	0.007	7743
165'	DR90-17-02DP w/Mount Pipe	2	108.352	6.146	0.007	6452
158'	(2) DB948F85T2E-M w/Mount Pipe	2	99.331	6.083	0.007	3065
150'	(2) 7770.00 w/Mount Pipe	2	89.263	5.953	0.007	2138
148'	PiROD 12' Platform w / handrails	2	86.798	5.887	0.007	1968
140'	(4) RR90-17-02DP w/Mount Pipe	2	77.205	5.542	0.007	1492
138'	PiROD 12' Platform w / handrails	2	74.884	5.445	0.007	1416
125'	(2) SRL-420NHD-1	2	60.667	4.840	0.006	1336
118'	5' Standoff T-Arm (5' face width)	2	53.647	4.533	0.006	1332

### Base Plate Design Data

Plate Thickness in	Number of Anchor Bolts	Anchor Bolt Size in	Actual Allowable Ratio Bolt Tension K	Actual Allowable Ratio Bolt Compression K	Actual Allowable Ratio Plate Stress ksi	Actual Allowable Ratio Stiffener Stress ksi	Controlling Condition	Ratio
2.250	20	2.250	122.220	126.532	77.285		Plate	n/a
			174.904	290.340	45.000			
			0.70	0.44	n/a			

### Compression Checks

### Pole Design Data

Section No.	Elevation ft	Size	L ft	L <sub>a</sub> ft	Kl/r	F <sub>a</sub> ksi	A in <sup>2</sup>	Actual P K	Allow. P <sub>a</sub> K	Ratio P/P <sub>a</sub>
L1	171 - 156.5 (1)	TP10.75x10.75x0.365	14'6"	0'	0.0	21.000	11.902	-2.774	249.947	0.011
L2	156.5 - 156 (2)	TP19.5x10.75x0.365	6"	0'	0.0	39.000	12.031	-2.776	469.214	0.006
L3	156 - 132.669 (3)	TP24.79x19.5x0.188	23'3- 31/32"	0'	0.0	39.000	14.147	-8.350	551.725	0.015

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Section No.	Elevation ft	Size	L ft	L <sub>u</sub> ft	Kl/r	F <sub>a</sub> ksi	A in <sup>2</sup>	Actual P K	Allow. P <sub>a</sub> K	Ratio P/P <sub>a</sub>
L4	132.669 - 87.0859 (4)	TP34.63x23.584x0.375	49'3"	0'	0.0	39.000	39.482	-16.265	1539.790	0.011
L5	87.0859 - 43 (5)	TP43.75x32.796x0.438	48'11-1/32"	0'	0.0	39.000	58.279	-27.033	2272.890	0.012
L6	43 - 0 (6)	TP52.5x41.531x0.5	49'	0'	0.0	39.000	82.524	-43.116	3218.440	0.013

### Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M <sub>x</sub> kip-ft	Actual f <sub>bx</sub> ksi	Allow. F <sub>bx</sub> ksi	Ratio f <sub>bx</sub> /F <sub>bx</sub>	Actual M <sub>y</sub> kip-ft	Actual f <sub>by</sub> ksi	Allow. F <sub>by</sub> ksi	Ratio f <sub>by</sub> /F <sub>by</sub>
L1	171 - 156.5 (1)	TP10.75x10.75x0.365	22.247	8.931	23.100	0.387	0.000	0.000	23.100	0.000
L2	156.5 - 156 (2)	TP19.5x10.75x0.365	22.247	8.893	39.000	0.228	0.000	0.000	39.000	0.000
L3	156 - 132.669 (3)	TP24.79x19.5x0.188	206.979	29.932	39.000	0.767	0.000	0.000	39.000	0.000
L4	132.669 - 87.0859 (4)	TP34.63x23.584x0.375	963.842	35.912	39.000	0.921	0.000	0.000	39.000	0.000
L5	87.0859 - 43 (5)	TP43.75x32.796x0.438	1896.125	37.795	39.000	0.969	0.000	0.000	39.000	0.000
L6	43 - 0 (6)	TP52.5x41.531x0.5	3161.233	35.887	39.000	0.920	0.000	0.000	39.000	0.000

### Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f <sub>v</sub> ksi	Allow. F <sub>v</sub> ksi	Ratio f <sub>v</sub> /F <sub>v</sub>	Actual T kip-ft	Actual f <sub>vt</sub> ksi	Allow. F <sub>vt</sub> ksi	Ratio f <sub>vt</sub> /F <sub>vt</sub>
L1	171 - 156.5 (1)	TP10.75x10.75x0.365	5.841	0.491	14.000	0.070	0.002	0.000	14.000	0.000
L2	156.5 - 156 (2)	TP19.5x10.75x0.365	5.869	0.488	26.000	0.020	0.002	0.000	26.000	0.000
L3	156 - 132.669 (3)	TP24.79x19.5x0.188	14.400	1.018	26.000	0.078	0.006	0.000	26.000	0.000
L4	132.669 - 87.0859 (4)	TP34.63x23.584x0.375	19.539	0.495	26.000	0.038	1.270	0.023	26.000	0.001
L5	87.0859 - 43 (5)	TP43.75x32.796x0.438	23.736	0.407	26.000	0.031	1.285	0.012	26.000	0.000
L6	43 - 0 (6)	TP52.5x41.531x0.5	27.738	0.336	26.000	0.026	1.297	0.007	26.000	0.000

### Pole Interaction Design Data

Section No.	Elevation ft	Ratio P P <sub>a</sub>	Ratio f <sub>bx</sub> F <sub>bx</sub>	Ratio f <sub>by</sub> F <sub>by</sub>	Ratio f <sub>v</sub> F <sub>v</sub>	Ratio f <sub>vt</sub> F <sub>vt</sub>	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	171 - 156.5 (1)	0.011	0.387	0.000	0.070	0.000	0.399	1.333	H1-3+VT
L2	156.5 - 156 (2)	0.006	0.228	0.000	0.020	0.000	0.234	1.333	H1-3+VT
L3	156 - 132.669 (3)	0.015	0.767	0.000	0.078	0.000	0.784	1.333	H1-3+VT
L4	132.669 -	0.011	0.921	0.000	0.038	0.001	0.932	1.333	H1-3+VT

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	<b>Client</b> Crown Castle International	<b>Designed by</b> Oscar Pedraza

Section No.	Elevation ft	Ratio	Ratio	Ratio	Ratio	Ratio	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
		$\frac{P}{P_a}$	$\frac{f_{bc}}{F_{bc}}$	$\frac{f_{by}}{F_{by}}$	$\frac{f_v}{F_v}$	$\frac{f_{vt}}{F_{vt}}$			
L5	87.0859 (4) 87.0859 - 43 (5)	0.012	0.969	0.000	0.031	0.000	0.981	1.333	H1-3+VT
L6	43 - 0 (6)	0.013	0.920	0.000	0.026	0.000	0.934	1.333	H1-3+VT

### Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	SF*P <sub>allow</sub> K	% Capacity	Pass Fail	
L1	171 - 156.5	Pole	TP10.75x10.75x0.365	1	-2.774	333.179	29.9	Pass	
L2	156.5 - 156	Pole	TP19.5x10.75x0.365	2	-2.776	625.462	17.6	Pass	
L3	156 - 132.669	Pole	TP24.79x19.5x0.188	3	-8.350	735.449	58.8	Pass	
L4	132.669 - 87.0859	Pole	TP34.63x23.584x0.375	4	-16.265	2052.540	69.9	Pass	
L5	87.0859 - 43	Pole	TP43.75x32.796x0.438	5	-27.033	3029.762	73.6	Pass	
L6	43 - 0	Pole	TP52.5x41.531x0.5	6	-43.116	4290.180	70.0	Pass	
							Summary		
							Pole (L5)	73.6	Pass
							Base Plate	87.8	Pass
							<b>RATING =</b>	<b>87.8</b>	<b>Pass</b>

Using 2:1 B(eff) per Crown Standards:

P = 122.22 kips

Arm = 3"

M(pl) = 122.2k (3") = 366.66 k"

B(eff) = 8.25"

f(b) = 52.67 ksi/in

F(b) = 60 ksi

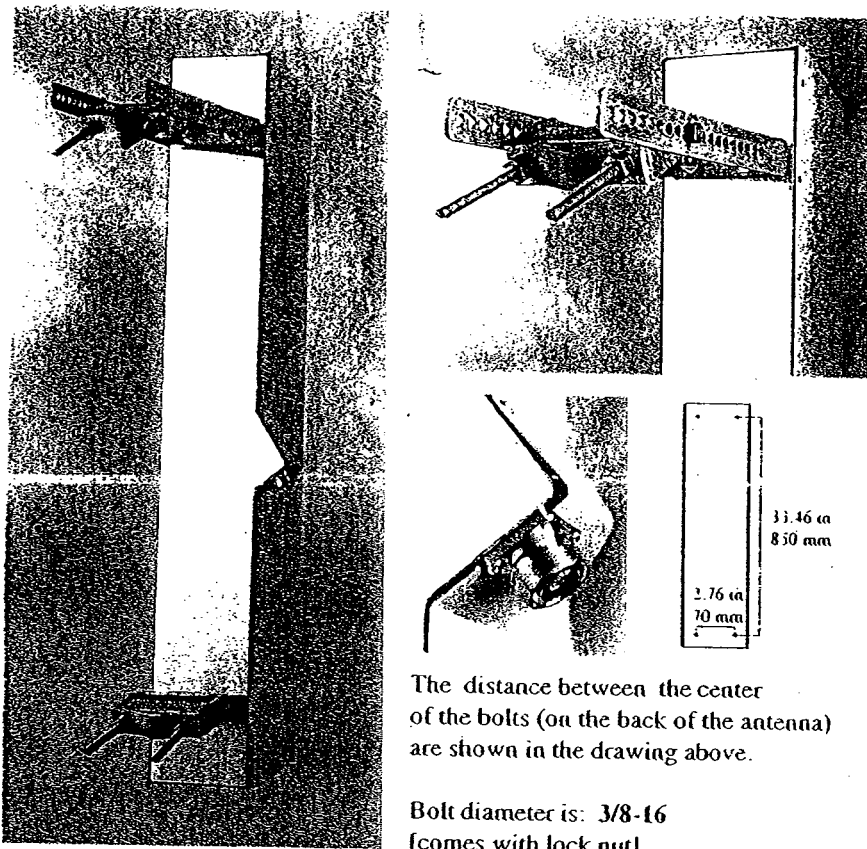
Therefore % Capacity in base plate is 87.8%

# ALP-E 9011-Din

Enhanced Log-Periodic Antenna

## Features:

- Small Size
- Aesthetically Pleasing
- Suitable For TDMA/CDMA
- High Return Loss
- Low Intermodulation
- High FTB
- Broadbanded
- Side-lobe Suppression
- Sturdy Design
- Down-Tilt Brackets Incl.



Frequency Range:	800-900 MHz
Impedance:	50 ohm
Connector Type:	7/16 Din
Return Loss:	20 dB
Polarization:	Vertical
Gain:	> 11 dBd
Front To Back Ratio:	> 30 dB
Side-Lobe Suppression:	18 dB
Intermodulation (2x25W):	IM3 > 146 dB IM5 > 153 dB IM7/9 > 163 dB
Power Rating:	500 W
H-Plane (-3 dB point):	85 - 92°
V-Plane (-3 dB point):	16 - 18°
Lightning Protection:	DC Grounded

Overall Height:	43 in	[1092 mm]
Width:	6.5 in	[165 mm]
Depth:	8 in	[203 mm]
Weight Including Tilt-Brackets:	20 lbs	[9.1 Kg]
Rated Wind Velocity:	113 mph	[180 Km/h]
Wind Area (CxA/Side):	2.3 sq. ft.	[0.22 sq.m]
Lateral Thrust At Rated Wind Worst Case:	112 lbs	[500 N]

Radiating Elements:	Aluminum
Extrusion:	Aluminum
Radome:	Grey PVC
Tilt-Bracket:	Hot Dip Galvanized Steel
Antenna Bolts:	Stainless Steel

The ALP-E 9011-Din is made in U.S.A.

# WPA-80090/4CF

When ordering, replace "\_\_\_" with connector type.

## Mechanical specifications

Length	1295 mm	47.4 in
Width	205 mm	8.1 in
Depth	145 mm	5.7 in
Weight	5.4 kg	12.0 lbs

### Wind Area

Front	0.25 m <sup>2</sup>	2.66 ft <sup>2</sup>
Side	0.17 m <sup>2</sup>	1.88 ft <sup>2</sup>

### Rated Wind Velocity (Safety factor 2.0)

67.9 km/hr > 42.2 mph

### Wind load @ 100 mph (161 km/hr)

Front	962 N	217.4 lbs
Side	264 N	59.4 lbs

## Mounting

Through two pair of clamps to pipe diameter Ø50 (2 3/8 in) or by U-clamps to a 2" pipe

Antenna consisting of aluminum alloy with brass feedlines covered by a UV safe fiberglass radome

Mounting Bracket #36210002

Downfall Bracket #36114003

## Electrical specifications

Frequency Range	806-960 MHz
Impedance	50Ω
Connector	N, NE, DIN, E, DIN
VSWR	1.4:1
Polarization	Vertical
Gain	11.5 dBd
Power Rating	500 W
Half Power Angle	
H-Plane	90°
E-Plane	15°
Lobe Tilt	0°
Null/Fill	10%
Lightning Protection	Direct Ground

### Typical values

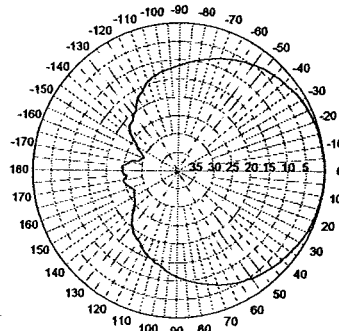
Power Rating limited by connector only

NE indicates an elongated N Connector

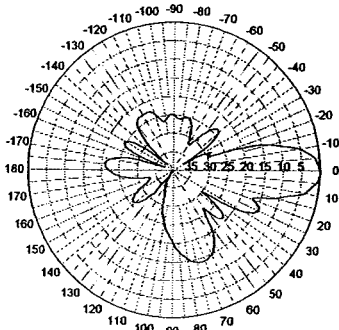
E-DIN indicates an elongated DIN Connector

Improvements to mechanical and/or electrical performance of the antenna may be made without notice.

## Radiation-pattern<sup>1)</sup>



Horizontal



Vertical

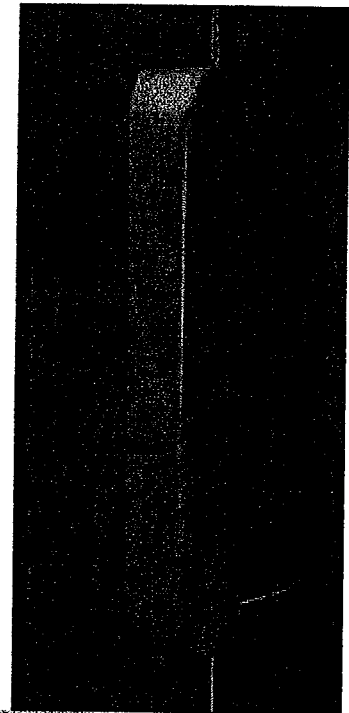
## Featuring upper side lobe suppression.

Radiation patterns for all Antel antennas are measured with the antenna mounted on a fiberglass pole.

Mounting on a metal pole will typically improve the Front-to-Back Ratio.

CF Denotes a Center-Fed Connector.

806-960 MHz



806-960 MHz



Antel's Exclusive 3T (True Transmission Line Technology) Antenna Design:

- Single-piece, watercut brass feedline assembly for consistent performance.
- Unique single-piece feedline design eliminates the need for solder joints in the signal path.
- A non-collinear system with access to every radiating element for broad bandwidth and superior performance.
- Air as insulation for virtually no internal signal loss.

Every Antel antenna is under a five-year limited warranty for repair or replacement.

Antenna available with center-fed connector only.



Revision Date: 05/27/03



March 23, 2006

Veronica Harris  
Crown Castle International  
1200 McArthur Blvd.  
Mahwah, NJ 07430  
(201) 236-9094

PSG Engineering, Ltd.  
8206 Forest Gate Drive  
Sugar Land, TX 77479

Phone: (281) 343-7099  
Fax: (281) 343-7127

**Subject: Structural Analysis Report**

**Carrier Designation**

**Verizon Wireless Co-Locate**  
**Carrier Site Number: "HRT2129"**  
**Carrier Site Name: "New Britain-4"**

**Crown Castle Designation**

**Crown Castle BU Number: 803843**  
**Crown Castle Site Name: CT NEW BRITAIN 4 CAC 803843**  
**Crown Castle JDE Job Number: 71179**

**Engineering Firm Designation**

**PSG Engineering Project Number: 0601H115-A060195**

**Site Data**

**Stanley Street, New Britain, CT, Hartford County**  
**Latitude 41°-39'-16.4", Longitude -72°-46'-09.59"**  
**195 Foot - Monopole Tower**

Dear Ms. Harris,

PSG Engineering, Ltd. is pleased to submit this, "Structural Analysis Report" to determine the structural integrity of the aforementioned 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 204344. The purpose of the analysis is to determine the suitability of the tower with the addition of the proposed equipment listed in Table 1 of this report when combined with the existing and reserved equipment on the structure. This analysis has been performed in accordance with the TIA/EIA 222-F standard based upon a wind speed condition of 80 mph.

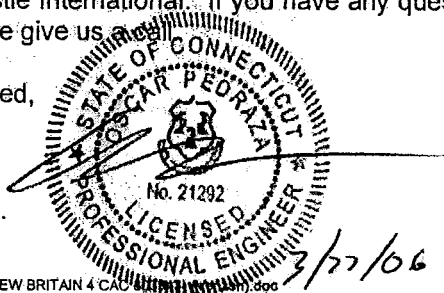
Based on our analysis we have determined the tower and foundation ARE sufficient for the proposed loading.

All proposed equipment shall be installed in accordance with Crown Castle Drawing Number(s): 803843\_A\_100.DWG.

We at PSG Engineering appreciate the opportunity of providing our continuing professional services to you and Crown Castle International. If you have any questions or need further assistance on this or any other projects please give us a call.

Respectfully submitted,

Oscar Pedraza, P.E.  
President



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**INTRODUCTION**

This tower was designed by Paul J. Ford and Company for Summit Manufacturing, LLC on April 24, 2001 per TIA/EIA-222-F using a basic wind speed of 80 mph and 69 mph with 1/2" radial ice.

**ANALYSIS CRITERIA**

This tower is designed using the TIA/EIA-222-F standard.

The following design criteria apply:

- Basic wind speed of 80 mph.
- Nominal ice thickness of 0.5000 in.
- Ice density of 56 pcf.
- A wind speed of 69 mph is used in combination with ice.
- Deflections calculated using a wind speed of 50 mph.
- Feedline torque is considered.
- Pressures are calculated at each section.
- Stress ratio used in tower member design is 1.333

**Table 1 – Proposed (P) Antenna and Cable Information**

Center Line Elevation (feet)	Number Of Antenna	Antenna Manufacturer	Antenna Model	Mount	Number Of Feed Lines	Feed Line Size (inches)
102	6(P)	Antel	WPA-80090/4CF	-	-	-

**Table 2 – Installed (I) and Reserved (R) Antenna and Cable Information**

Center Line Elevation (feet)	Number Of Antenna	Antenna Manufacturer	Antenna Model	Mount	Number Of Feed Lines	Feed Line Size (inches)
195	3(I)	Allgon	7250.02	Low Profile Platform (1)	6(I)+6(R) (Internal)	1 5/8
	9(R)	Dapa	58210			
185	-	-	-	Low Profile Platform (1)	-	-
*102	*6(I)	*Swedcom	*ALP-E 9011-DIN	T-Arm w/ work platform (3)	12(I) (Internal)	1 5/8
	6(I)	Decibel	DB948F85T2E-M			

\*Note: Installed (6) Swedcom antennas will be removed and replaced with proposed loads. Installed (6) Decibel antennas, coax lines, and mount will remain.

**Table 3 – Original Tower Manufacturer Design Antenna and Cable Information**

Center Line Elevation (feet)	Number Of Antenna	Antenna Manufacturer	Antenna Model	Mount	Number Of Feed Lines	Feed Line Size (inches)
195	12	Standard	Panel Antenna	14' Low Platform	Not Available (Internal)	
185	12	Standard	Panel Antenna	14' Low Platform		
175	12	Standard	Panel Antenna	14' Low Platform		
165	1	Standard	Microwave Dish	Dish Mount		
155	12	Standard	Panel Antenna	(3) 14' T-Arm Mounts		
145	12	Standard	Panel Antenna	(3) 14' T-Arm Mounts		
135	1	Standard	Microwave Dish	Dish Mount		

## ANALYSIS PROCEDURE

**Table 4 – Documents Provided**

Document	Remarks	Reference	Source
Original Tower Design	Summit Manufacturing	925033	Crown Site Data Manager
Crown Castle Application	Application ID: 30133 Revision 1	-	Crown Regional Office
CAD Level Drawing(s)	193',185',100' Level Drawing(s)	-	Crown CAD Dept.

### Analysis Methods

RISATower (Version 4.0.0.00), a commercially available software program, was used to create a three-dimensional model of the tower and calculate member stresses for various dead, live, wind, and ice load cases. All loads were computed in accordance with the ANSI/EIA/TIA 222F or the local building code requirements. Selected output from the analysis is included in Appendix A.

### 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 manufacturer's specifications.
3. The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2.
4. When applicable, transmission cables are considered to be structural components for calculating wind loads, as allowed by TIA/EIA-222F.

If any of these assumptions are not valid or have been made in error, this analysis may be affected, and PSG Engineering should be allowed to review any new information to determine its effect on the structural integrity of the tower.

## ANALYSIS RESULTS

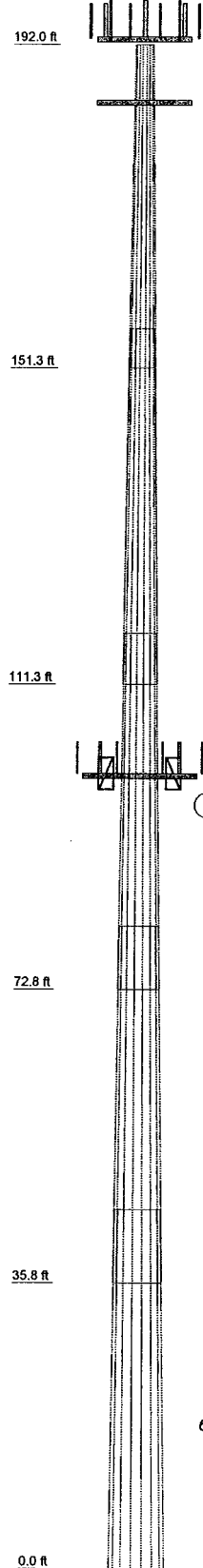
**Table 5 – Tower Section Capacity**

Section Number	Elevation (feet)	Percent Capacity Used	Pass / Fail
1	192 - 151.25	14.0	Pass
2	151.25 - 111.25	15.9	Pass
3	111.25 - 72.75	18.6	Pass
4	72.75 - 35.75	19.9	Pass
5	35.75 - 0	22.8	Pass
Anchor Bolts		35.0	Pass
Base Plate		25.5	Pass
Base Foundation (Compared with original design loads)		≤32.5	Pass

## APPENDIX A

### Output from Computer Programs

Section	1	2	3	4	5
Length (ft)	40.750	45.000	45.000	45.000	45.000
Number of Sides	18	18	18	18	18
Thickness (in)	0.313	0.438	0.500	0.563	0.563
Lap Splice (ft)		5.000	6.500	8.000	9.250
Top Dia (in)	26.000	36.995	48.633	59.659	70.154
Bot Dia (in)	39.245	51.621	63.259	74.285	84.780
Grade			A572-65		
Weight (K)	4.4	8.3	13.5	18.2	21.0



**APPURTENANCES**

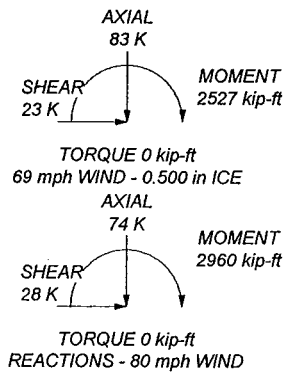
TYPE	ELEVATION	TYPE	ELEVATION
(3) 58210 w/Mount Pipe	195	(2) WPA-80090/4CF w/Mount Pipe	102
7250.02 w/Mount Pipe	195	(2) DB948F85T2E-M w/Mount Pipe	102
(3) 58210 w/Mount Pipe	195	(2) WPA-80090/4CF w/Mount Pipe	102
7250.02 w/Mount Pipe	195	(2) DB948F85T2E-M w/Mount Pipe	102
(3) 58210 w/Mount Pipe	195	(2) WPA-80090/4CF w/Mount Pipe	102
7250.02 w/Mount Pipe	195	5' Standoff T-Arm (14' face width)	100
PIROD 13' Low Profile Platform (Monopole)	193	T1520KTA Monopole T-Arm Work Support	100
(4) Mount Pipe (2"x72")	185	5' Standoff T-Arm (14' face width)	100
(4) Mount Pipe (2"x72")	185	T1520KTA Monopole T-Arm Work Support	100
(4) Mount Pipe (2"x72")	185	5' Standoff T-Arm (14' face width)	100
PIROD 13' Low Profile Platform (Monopole)	185	T1520KTA Monopole T-Arm Work Support	100
(2) DB948F85T2E-M w/Mount Pipe	102		

**MATERIAL STRENGTH**

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi			

**TOWER DESIGN NOTES**

1. Tower is located in Hartford 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 69 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 25.9%



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245 Commerce Green Blvd., Suite 240		Project: (803843) (CT NEW BRITAIN 4 CAC 803843)	
Sugar Land, TX 77478		Client: Crown Castle International	
Phone: 281.265.3444		Drawn by: Oscar Pedraza	
FAX: 281.265.3454		Code: TIA/EIA-222-F	
		Date: 03/24/06	
		Path: C:\Documents and Settings\opedraza\PSG\Desktop\Temp\0601H115\803843.dwg	
		App'd: _____	
		Scale: NTS	
		Dwg No. E-1	

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	<b>Client</b> Crown Castle International	<b>Designed by</b> Oscar Pedraza

## 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 Hartford County, Connecticut.

Basic wind speed of 80 mph.

Nominal ice thickness of 0.500 in.

Ice density of 56 pcf.

A wind speed of 69 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.

## 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	192.000- 151.250	40.750	5.000	18	26.000	39.245	0.313	1.250	A572-65 (65 ksi)
L2	151.250- 111.250	45.000	6.500	18	36.995	51.621	0.438	1.750	A572-65 (65 ksi)
L3	111.250-72.750	45.000	8.000	18	48.633	63.259	0.500	2.000	A572-65 (65 ksi)
L4	72.750-35.750	45.000	9.250	18	59.659	74.285	0.563	2.250	A572-65 (65 ksi)
L5	35.750-0.000	45.000		18	70.154	84.780	0.563	2.250	A572-65 (65 ksi)

## Tapered Pole Properties

Section	Tip Dia. in	Area in <sup>2</sup>	I in <sup>4</sup>	r in	C in	I/C in <sup>3</sup>	J in <sup>4</sup>	I/Q in <sup>2</sup>	w in	w/t
L1	26.401	25.479	2124.026	9.119	13.208	160.814	4250.848	12.742	4.026	12.883
	39.850	38.616	7394.882	13.821	19.936	370.923	14799.495	19.312	6.357	20.343
L2	39.216	50.764	8571.295	12.978	18.793	456.080	17153.868	25.387	5.741	13.122
	52.417	71.075	23524.065	18.170	26.223	897.062	47079.084	35.544	8.315	19.006
L3	51.529	76.388	22358.990	17.087	24.706	905.012	44747.401	38.201	7.679	15.359
	64.235	99.599	49561.269	22.279	32.136	1542.256	99187.753	49.809	10.254	20.507
L4	63.220	105.509	46553.204	20.979	30.307	1536.069	93167.665	52.765	9.510	16.907
	75.431	131.622	90378.902	26.171	37.737	2394.982	180876.727	65.824	12.084	21.483
L5	74.289	124.246	76019.762	24.705	35.638	2133.110	152139.553	62.135	11.357	20.19
	86.088	150.360	134732.986	29.897	43.068	3128.361	269643.257	75.194	13.931	24.767



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	<b>Client</b> Crown Castle International	<b>Designed by</b> Oscar Pedraza

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C <sub>A</sub> A <sub>A</sub> ft <sup>2</sup> /ft	Weight klf
* ***EL. 100' LEVEL***								
LDF7-50A (1-5/8 FOAM)	A	No	Inside Pole	100.000 - 10.000	12	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
* ***TOWER HARDWARE***								
Climbing Ladder (Ar)	C	No	CaAa (Out Of Face)	192.000 - 10.000	1	No Ice	0.037	0.001
						1/2" Ice	0.137	0.002

### Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A <sub>R</sub> ft <sup>2</sup>	A <sub>F</sub> ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> In Face ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Out Face ft <sup>2</sup>	Weight K
L1	192.000-151.250	A	0.000	0.000	0.000	0.000	0.401
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	1.528	0.041
L2	151.250-111.250	A	0.000	0.000	0.000	0.000	0.394
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	1.500	0.040
L3	111.250-72.750	A	0.000	0.000	0.000	0.000	0.647
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	1.444	0.039
L4	72.750-35.750	A	0.000	0.000	0.000	0.000	0.728
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	1.388	0.037
L5	35.750-0.000	A	0.000	0.000	0.000	0.000	0.507
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.966	0.026

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

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A <sub>R</sub> ft <sup>2</sup>	A <sub>F</sub> ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> In Face ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Out Face ft <sup>2</sup>	Weight K
L1	192.000-151.250	A	0.500	0.000	0.000	0.000	0.000	0.401
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	5.603	0.063
L2	151.250-111.250	A	0.500	0.000	0.000	0.000	0.000	0.394
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	5.500	0.061
L3	111.250-72.750	A	0.500	0.000	0.000	0.000	0.000	0.647
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	5.294	0.059
L4	72.750-35.750	A	0.500	0.000	0.000	0.000	0.000	0.728
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	5.087	0.057
L5	35.750-0.000	A	0.500	0.000	0.000	0.000	0.000	0.507
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	3.541	0.040

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### Feed Line Center of Pressure

Section	Elevation <i>ft</i>	CP <sub>x</sub>	CP <sub>z</sub>	CP <sub>x</sub>	CP <sub>z</sub>
		<i>in</i>	<i>in</i>	Ice <i>in</i>	Ice <i>in</i>
L1	192.000-151.250	-0.048	0.028	-0.165	0.095
L2	151.250-111.250	-0.048	0.028	-0.169	0.097
L3	111.250-72.750	-0.048	0.028	-0.171	0.099
L4	72.750-35.750	-0.048	0.028	-0.172	0.099
L5	35.750-0.000	-0.034	0.020	-0.123	0.071

### Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment  °	Placement  <i>ft</i>	CA <sub>AA</sub>	CA <sub>AA</sub>	Weight  <i>K</i>	
			Horz Lateral <i>ft</i>	Vert <i>ft</i>			Front <i>ft<sup>2</sup></i>	Side <i>ft<sup>2</sup></i>		
***EL. 193' LEVEL***										
(3) 58210 w/Mount Pipe	A	From Leg	4.000	0.000	0.000	195.000	No Ice 1/2" Ice	3.986 4.594	3.486 4.537	0.037 0.070
7250.02 w/Mount Pipe	A	From Leg	4.000	0.000	0.000	195.000	No Ice 1/2" Ice	4.448 5.032	3.536 4.719	0.041 0.076
(3) 58210 w/Mount Pipe	B	From Leg	4.000	0.000	0.000	195.000	No Ice 1/2" Ice	3.986 4.594	3.486 4.537	0.037 0.070
7250.02 w/Mount Pipe	B	From Leg	4.000	0.000	0.000	195.000	No Ice 1/2" Ice	4.448 5.032	3.536 4.719	0.041 0.076
(3) 58210 w/Mount Pipe	C	From Leg	4.000	0.000	0.000	195.000	No Ice 1/2" Ice	3.986 4.594	3.486 4.537	0.037 0.070
7250.02 w/Mount Pipe	C	From Leg	4.000	0.000	0.000	195.000	No Ice 1/2" Ice	4.448 5.032	3.536 4.719	0.041 0.076
PiROD 13' Low Profile Platform (Monopole)	C	None			0.000	193.000	No Ice 1/2" Ice	15.700 20.100	15.700 20.100	1.300 1.765
***EL. 185' LEVEL***										
(4) Mount Pipe (2"x72")	A	From Leg	4.000	0.000	0.000	185.000	No Ice 1/2" Ice	1.425 1.929	1.425 1.929	0.023 0.036
(4) Mount Pipe (2"x72")	B	From Leg	4.000	0.000	0.000	185.000	No Ice 1/2" Ice	1.425 1.929	1.425 1.929	0.023 0.036
(4) Mount Pipe (2"x72")	C	From Leg	4.000	0.000	0.000	185.000	No Ice 1/2" Ice	1.425 1.929	1.425 1.929	0.023 0.036
PiROD 13' Low Profile Platform (Monopole)	C	None			0.000	185.000	No Ice 1/2" Ice	15.700 20.100	15.700 20.100	1.300 1.765



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Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>AA</sub> Front	C <sub>AA</sub> Side	Weight	
			Horz Lateral	Vert						ft
***EL. 100' LEVEL***										
(2) DB948F85T2E-M w/Mount Pipe	A	From Leg	4.000	0.000	0.000	102.000	No Ice 1/2" Ice	2.622 3.230	4.918 6.008	0.034 0.069
(2) WPA-80090/4CF w/Mount Pipe	A	From Leg	4.000	0.000	0.000	102.000	No Ice 1/2" Ice	4.220 4.754	4.134 4.939	0.034 0.072
5' Standoff T-Arm (14' face width)	A	From Leg	2.670	0.000	0.000	100.000	No Ice 1/2" Ice	6.900 8.700	6.900 8.700	0.197 0.258
T1520KTA Monopole T-Arm Work Support	A	From Leg	2.670	0.000	0.000	100.000	No Ice 1/2" Ice	4.050 5.250	1.740 2.280	0.070 0.084
(2) DB948F85T2E-M w/Mount Pipe	B	From Leg	4.000	0.000	0.000	102.000	No Ice 1/2" Ice	2.622 3.230	4.918 6.008	0.034 0.069
(2) WPA-80090/4CF w/Mount Pipe	B	From Leg	4.000	0.000	0.000	102.000	No Ice 1/2" Ice	4.220 4.754	4.134 4.939	0.034 0.072
5' Standoff T-Arm (14' face width)	B	From Leg	2.670	0.000	0.000	100.000	No Ice 1/2" Ice	6.900 8.700	6.900 8.700	0.197 0.258
T1520KTA Monopole T-Arm Work Support	B	From Leg	2.670	0.000	0.000	100.000	No Ice 1/2" Ice	4.050 5.250	1.740 2.280	0.070 0.084
(2) DB948F85T2E-M w/Mount Pipe	C	From Leg	4.000	0.000	0.000	102.000	No Ice 1/2" Ice	2.622 3.230	4.918 6.008	0.034 0.069
(2) WPA-80090/4CF w/Mount Pipe	C	From Leg	4.000	0.000	0.000	102.000	No Ice 1/2" Ice	4.220 4.754	4.134 4.939	0.034 0.072
5' Standoff T-Arm (14' face width)	C	From Leg	2.670	0.000	0.000	100.000	No Ice 1/2" Ice	6.900 8.700	6.900 8.700	0.197 0.258
T1520KTA Monopole T-Arm Work Support	C	From Leg	2.670	0.000	0.000	100.000	No Ice 1/2" Ice	4.050 5.250	1.740 2.280	0.070 0.084

## 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

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Comb. No.	Description
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 Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	192 - 151.25	9.399	35	0.463	0.000
L2	156.25 - 111.25	6.161	35	0.383	0.000
L3	117.75 - 72.75	3.461	35	0.279	0.000
L4	80.75 - 35.75	1.631	35	0.186	0.000
L5	45 - 0	0.523	35	0.103	0.000

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

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
195.000	(3) 58210 w/Mount Pipe	35	9.399	0.463	0.000	124258
193.000	PiROD 13' Low Profile Platform (Monopole)	35	9.399	0.463	0.000	124258
185.000	(4) Mount Pipe (2"x72")	35	8.737	0.448	0.000	88756
102.000	(2) DB948F85T2E-M w/Mount Pipe	35	2.598	0.239	0.000	23721
100.000	5' Standoff T-Arm (14' face width)	35	2.498	0.234	0.000	23849

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	<b>Client</b> Crown Castle International	<b>Designed by</b> Oscar Pedraza

### Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	192 - 151.25	24.051	11	1.185	0.000
L2	156.25 - 111.25	15.765	10	0.981	0.000
L3	117.75 - 72.75	8.858	10	0.714	0.000
L4	80.75 - 35.75	4.175	10	0.475	0.000
L5	45 - 0	1.339	10	0.263	0.000

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

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
195.000	(3) 58210 w/Mount Pipe	11	24.051	1.185	0.000	48598
193.000	PiROD 13' Low Profile Platform (Monopole)	11	24.051	1.185	0.000	48598
185.000	(4) Mount Pipe (2"x72")	11	22.358	1.147	0.000	34713
102.000	(2) DB948F85T2E-M w/Mount Pipe	10	6.649	0.610	0.000	9272
100.000	5' Standoff T-Arm (14' face width)	10	6.392	0.597	0.000	9322

### Base Plate Design Data

Plate Thickness in	Number of Anchor Bolts	Anchor Bolt Size in	Actual Allowable Ratio Bolt Tension K	Actual Allowable Ratio Bolt Compression K	Actual Allowable Ratio Plate Stress ksi	Actual Allowable Ratio Stiffener Stress ksi	Controlling Condition	Ratio
3.250	24	2.250	60.420	66.572	14.005		Bolt T	0.35
			174.904	290.340	41.250			
			0.35	0.23	0.34			

### Compression Checks

### Pole Design Data

Section No.	Elevation ft	Size	L ft	L <sub>u</sub> ft	Kl/r	F <sub>a</sub> ksi	A in <sup>2</sup>	Actual P K	Allow. P <sub>a</sub> K	Ratio P/P <sub>a</sub>
L1	192 - 151.25 (1)	TP39.245x26x0.313	40.750	0.000	0.0	39.000	37.004	-7.396	1443.160	0.005
L2	151.25 - 111.25 (2)	TP51.621x36.995x0.438	45.000	0.000	0.0	39.000	68.141	-16.231	2657.500	0.006
L3	111.25 - 72.75	TP63.259x48.633x0.5	45.000	0.000	0.0	39.000	95.472	-30.398	3723.410	0.008

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Section No.	Elevation ft	Size	L ft	L <sub>u</sub> ft	Kl/r	F <sub>a</sub> ksi	A in <sup>2</sup>	Actual P K	Allow. P <sub>a</sub> K	Ratio $\frac{P}{P_a}$
	(3)									
L4	72.75 - 35.75 (4)	TP74.285x59.659x0.563	45.000	0.000	0.0	39.000	126.255	-47.914	4923.930	0.010
L5	35.75 - 0 (5)	TP84.78x70.154x0.563	45.000	0.000	0.0	39.000	150.360	-73.823	5864.030	0.013

### Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M <sub>x</sub> kip-ft	Actual f <sub>bx</sub> ksi	Allow. F <sub>bx</sub> ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M <sub>y</sub> kip-ft	Actual f <sub>by</sub> ksi	Allow. F <sub>by</sub> ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	192 - 151.25 (1)	TP39.245x26x0.313	201.113	7.088	39.000	0.182	0.000	0.000	39.000	0.000
L2	151.25 - 111.25 (2)	TP51.621x36.995x0.438	551.934	8.036	39.000	0.206	0.000	0.000	39.000	0.000
L3	111.25 - 72.75 (3)	TP63.259x48.633x0.5	1101.17 5	9.328	39.000	0.239	0.000	0.000	39.000	0.000
L4	72.75 - 35.75 (4)	TP74.285x59.659x0.563	1831.65 8	9.978	39.000	0.256	0.000	0.000	39.000	0.000
L5	35.75 - 0 (5)	TP84.78x70.154x0.563	2960.35 8	11.356	39.000	0.291	0.000	0.000	39.000	0.000

### Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f <sub>v</sub> ksi	Allow. F <sub>v</sub> ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f <sub>vt</sub> ksi	Allow. F <sub>vt</sub> ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	192 - 151.25 (1)	TP39.245x26x0.313	7.224	0.195	26.000	0.015	0.000	0.000	26.000	0.000
L2	151.25 - 111.25 (2)	TP51.621x36.995x0.438	11.106	0.163	26.000	0.013	0.000	0.000	26.000	0.000
L3	111.25 - 72.75 (3)	TP63.259x48.633x0.5	18.297	0.192	26.000	0.015	0.000	0.000	26.000	0.000
L4	72.75 - 35.75 (4)	TP74.285x59.659x0.563	22.515	0.178	26.000	0.014	0.000	0.000	26.000	0.000
L5	35.75 - 0 (5)	TP84.78x70.154x0.563	27.667	0.184	26.000	0.014	0.000	0.000	26.000	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	192 - 151.25 (1)	0.005	0.182	0.000	0.015	0.000	0.187	1.333	H1-3+VT
L2	151.25 - 111.25 (2)	0.006	0.206	0.000	0.013	0.000	0.212	1.333	H1-3+VT
L3	111.25 - 72.75 (3)	0.008	0.239	0.000	0.015	0.000	0.247	1.333	H1-3+VT
L4	72.75 - 35.75	0.010	0.256	0.000	0.014	0.000	0.266	1.333	H1-3+VT

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Section No.	Elevation ft	Ratio	Ratio	Ratio	Ratio	Ratio	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
		$\frac{P}{P_a}$	$\frac{f_{bx}}{F_{bx}}$	$\frac{f_{by}}{F_{by}}$	$\frac{f_v}{F_v}$	$\frac{f_{vt}}{F_{vt}}$			
L5	35.75 - 0 (5)	0.013	0.291	0.000	0.014	0.000	0.304	1.333	H1-3+VT

### Section Capacity Table

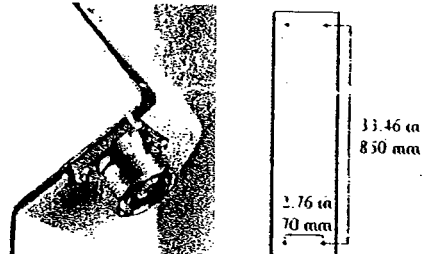
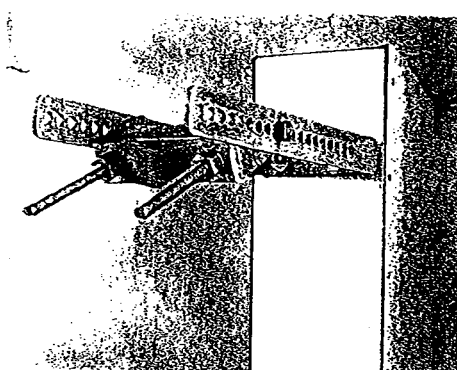
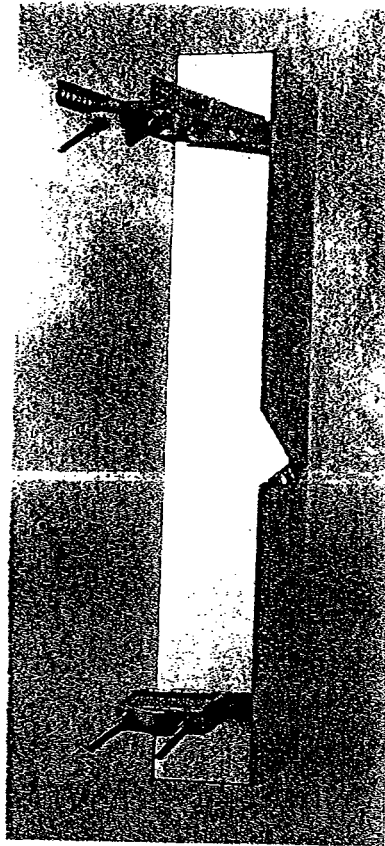
Section No.	Elevation ft	Component Type	Size	Critical Element	P K	SF*P <sub>allow</sub> K	% Capacity	Pass Fail
L1	192 - 151.25	Pole	TP39.245x26x0.313	1	-7.396	1923.732	14.0	Pass
L2	151.25 - 111.25	Pole	TP51.621x36.995x0.438	2	-16.231	3542.447	15.9	Pass
L3	111.25 - 72.75	Pole	TP63.259x48.633x0.5	3	-30.398	4963.305	18.6	Pass
L4	72.75 - 35.75	Pole	TP74.285x59.659x0.563	4	-47.914	6563.598	19.9	Pass
L5	35.75 - 0	Pole	TP84.78x70.154x0.563	5	-73.823	7816.752	22.8	Pass
Summary								
Pole (L5)							22.8	Pass
Base Plate							25.9	Pass
<b>RATING =</b>							<b>25.9</b>	<b>Pass</b>

# ALP-E 9011-Din

Enhanced Log-Periodic Antenna

## Features:

- ❑ Small Size
- ❑ Aesthetically Pleasing
- ❑ Suitable For TDMA/CDMA
- ❑ High Return Loss
- ❑ Low Intermodulation
- ❑ High FTB
- ❑ Broadbanded
- ❑ Side-lobe Suppression
- ❑ Sturdy Design
- ❑ Down-Tilt Brackets Incl.



The distance between the center of the bolts (on the back of the antenna) are shown in the drawing above.

Bolt diameter is: 3/8-16  
[comes with lock nut].



Frequency Range:	800-900 MHz
Impedance:	50 ohm
Connector Type:	7/16 Din
Return Loss:	20 dB
Polarization:	Vertical
Gain:	> 11 dBd
Front To Back Ratio:	> 30 dB
Side-Lobe Suppression:	18 dB
Intermodulation (2x25W):	IM3 > 146 dB IM5 > 153 dB IM7/9 > 163 dB
Power Rating:	500 W
H-Plane (-3 dB point):	85 - 92°
V-Plane (-3 dB point):	16 - 18°
Lightning Protection:	DC Grounded

Overall Height:	43 in	[1092 mm]
Width:	6.5 in	[165 mm]
Depth:	8 in	[203 mm]
Weight Including Tilt-Brackets:	20 lbs	[9.1 Kg]
Rated Wind Velocity:	113 mph	[180 Km/h]
Wind Area (CxA/Side):	2.3 sq. ft.	[0.22 sq.m]
Lateral Thrust At Rated Wind Worst Case:	112 lbs	[500 N]



Radiating Elements:	Aluminum
Extrusion:	Aluminum
Radome:	Grey PVC
Tilt-Bracket:	Hot Dip Galvanized Steel
Antenna Bolts:	Stainless Steel

The ALP-E 9011-Din is made in U.S.A.

# WPA-80090/4CF

When ordering, replace "\_\_\_" with connector type.

## Mechanical specifications

Length	1265 mm	47.4 in
Width	205 mm	8.1 in
Depth	145 mm	5.7 in
Weight	5.4 kg	12.0 lbs

### Wind Area

Front	0.25 m <sup>2</sup>	2.66 ft <sup>2</sup>
Side	0.47 m <sup>2</sup>	5.08 ft <sup>2</sup>

### Rated Wind Velocity (Safety factor 2.0)

67.9 km/hr	42.2 mph
------------	----------

### Wind load @ 100 mph (161 km/hr)

Front	862 N	193.4 lbs
Side	264 N	59.4 lbs

## Mounting

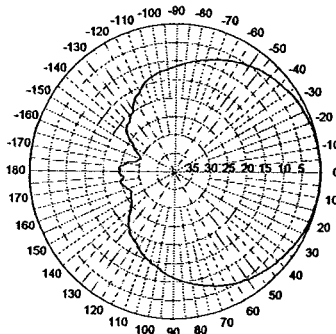
Through two pairs of clamps to pipe diameter 250 (2.77 in) or 300 (3.0 in), or by U-clamps to a 2" pipe.

Antenna consisting of aluminum alloy with brass feedlines covered by a UV safe fiberglass radome.

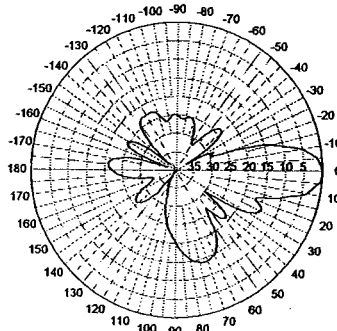
Mounting Bracket #36210002

Downtilt Bracket #36114003

## Radiation-pattern<sup>1)</sup>



Horizontal



Vertical

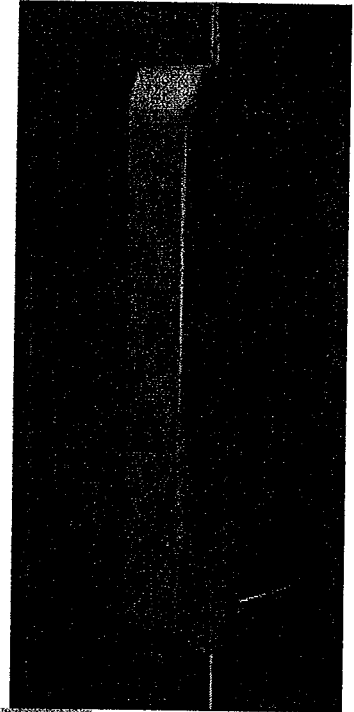
## Featuring upper side lobe suppression.

Radiation patterns for all Antel antennas are measured with the antenna mounted on a fiberglass pole.

Mounting on a metal pole will typically improve the Front-to-Back Ratio.

CF Denotes a Center-Fed Connector.

806-960 MHz



806-960 MHz



Antel's Exclusive 3T (True Transmission Line Technology) Antenna Design:

- Single-piece, watercut brass feedline assembly for consistent performance.
- Unique single-piece feedline design eliminates the need for solder joints in the signal path.
- A non-collinear system with access to every radiating element for broad bandwidth and superior performance.
- Air as insulation for virtually no internal signal loss.

Every Antel antenna is under a five-year limited warranty for repair or replacement.

Antenna available with center-fed connector only.

## Electrical specifications

Frequency Range	806-960 MHz
Impedance	50Ω
Connector	NINE DIN E DIN
VSWR	1.4:1
Polarization	Vertical
Gain	11.5 dBd
Power Rating	500 W
Half Power Angle	
H-Plane	90°
E-Plane	15°
Lobe Tilt	0°
Null Fill	10%
Lightning Protection	Direct Ground

### Typical Values

- Power Rating limited by connector only
- NE indicates an elongated N Connector
- E DIN indicates an elongated DIN Connector

Improvements to the mechanical and/or electrical performance of the antenna may be made without notice.





March 23, 2006

Veronica Harris  
Crown Castle International  
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(201) 236-9094

PSG Engineering, Ltd.  
8206 Forest Gate Drive  
Sugar Land, TX 77479

Phone: (281) 343-7099  
Fax: (281) 343-7127

**Subject: Structural Analysis Report**

**Carrier Designation**

**Verizon Wireless Co-Locate**  
**Carrier Site Number: "HRT2128"**  
**Carrier Site Name: "New Britain-3"**

**Crown Castle Designation**

**Crown Castle BU Number: 803175**  
**Crown Castle Site Name: CT NEW BRITAIN 3 CAC 803175**  
**Crown Castle JDE Job Number: 71178**

**Engineering Firm Designation**

**PSG Engineering Project Number: 0601H114-A060188**

**Site Data**

**Lester Road, New Britain, CT, Hartford County**  
**Latitude 41°-41'-11.8", Longitude -72°-45'-27.8"**  
**188 Foot - Monopole Tower**

Dear Ms. Harris,

PSG Engineering, Ltd. is pleased to submit this "Structural Analysis Report" to determine the structural integrity of the aforementioned 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 204344. The purpose of the analysis is to determine the suitability of the tower with the addition of the proposed equipment listed in Table 1 of this report when combined with the existing and reserved equipment on the structure. This analysis has been performed in accordance with the TIA/EIA 222-F standard based upon a wind speed condition of 80 mph.

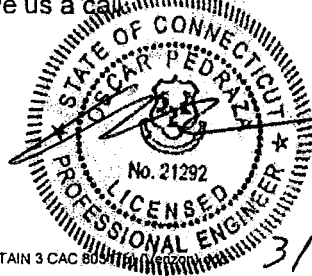
Based on our analysis we have determined the tower and foundation ARE sufficient for the proposed loading.

All proposed equipment shall be installed in accordance with Crown Castle Drawing Number(s): 803175\_A\_147.DWG.

We at PSG Engineering appreciate the opportunity of providing our continuing professional services to you and Crown Castle International. If you have any questions or need further assistance on this or any other projects please give us a call.

Respectfully submitted,

Oscar Pedraza, P.E.  
President



3/27/06



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## INTRODUCTION

This tower was designed by Paul J. Ford and Company for Summit Manufacturing, LLC on December 11, 2000 per TIA/EIA-222-F using a basic wind speed of 85 mph and 74 mph with 1/2" radial ice.

## ANALYSIS CRITERIA

This tower is designed using the TIA/EIA-222-F standard.

The following design criteria apply:

- Basic wind speed of 80 mph.
- Nominal ice thickness of 0.5000 in.
- Ice density of 56 pcf.
- A wind speed of 69 mph is used in combination with ice.
- Deflections calculated using a wind speed of 50 mph.
- Feedline torque is considered.
- Pressures are calculated at each section.
- Stress ratio used in tower member design is 1.333

**Table 1 – Proposed (P) Antenna and Cable Information**

Center Line Elevation (feet)	Number Of Antenna	Antenna Manufacturer	Antenna Model	Mount	Number Of Feed Lines	Feed Line Size (inches)
147	6(P)	Antel	WPA-80090/4CF	-	-	-

**Table 2 – Installed (I) and Reserved (R) Antenna and Cable Information**

Center Line Elevation (feet)	Number Of Antenna	Antenna Manufacturer	Antenna Model	Mount	Number Of Feed Lines	Feed Line Size (inches)
190	3(I)+9(R)	Allgon	7184	Low Profile Platform w/Handrail (1)	6(I)+18(R) (Internal)	1 5/8
177	-	-	-	Low Profile Platform (1)	-	-
163	6(I)+3(R)	EMS Wireless	RR90-17-02DP	Low Profile Platform (1)	12(I)+6(R) (Internal)	1 5/8
	6(I)	Standard	TMA			
*147	*6(I)	*Swedcom	*ALP-E 9011-DIN	Low Profile Platform (1)	12(I) (Internal)	1 5/8
	6(I)	Decibel	DB948F85T2E-M			

\*Note: Installed (6) Swedcom antennas will be removed and replaced with proposed loads. Installed (6) Decibel antennas, coax lines, and mount will remain.

**Table 3 – Original Tower Manufacturer Design Antenna and Cable Information**

Center Line Elevation (feet)	Number Of Antenna	Antenna Manufacturer	Antenna Model	Mount	Number Of Feed Lines	Feed Line Size (inches)
190	12	Standard	60"x12"x3" Panel	14' Platform	Not Available (Internal)	
177	12	Standard	60"x12"x3" Panel	14' Platform		
162	12	Standard	60"x12"x3" Panel	14' Platform		
147	12	Standard	60"x12"x3" Panel	14' Platform		

## ANALYSIS PROCEDURE

**Table 4 – Documents Provided**

Document	Remarks	Reference	Source
Original Tower Design	Summit Manufacturing	679659	Crown Site Data Manager
Crown Castle Application	Application ID: 30126 Revision 1	-	Crown Regional Office
CAD Level Drawing(s)	188', 177', 162', 147' Level Drawing(s)	-	Crown CAD Dept.

### Analysis Methods

RISATower (Version 4.0.0.00), a commercially available software program, was used to create a three-dimensional model of the tower and calculate member stresses for various dead, live, wind, and ice load cases. All loads were computed in accordance with the ANSI/EIA/TIA 222F or the local building code requirements. Selected output from the analysis is included in Appendix A.

### 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 manufacturer's specifications.
3. The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2.
4. When applicable, transmission cables are considered to be structural components for calculating wind loads, as allowed by TIA/EIA-222F.

If any of these assumptions are not valid or have been made in error, this analysis may be affected, and PSG Engineering should be allowed to review any new information to determine its effect on the structural integrity of the tower.

## ANALYSIS RESULTS

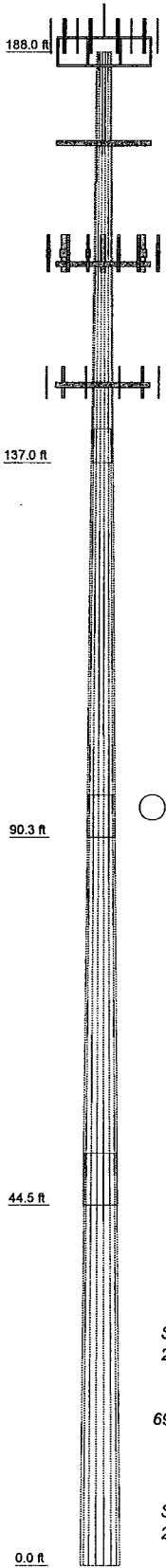
**Table 5 – Tower Section Capacity**

Section Number	Elevation (feet)	Percent Capacity Used	Pass / Fail
1	188 - 137	44.6	Pass
2	137 - 90.25	62.8	Pass
3	90.25 - 44.5	63.7	Pass
4	44.5 - 0	53.4	Pass
Anchor Bolts		62.0	Pass
Base Plate		59.8	Pass
Base Foundation (Compared with original design loads)		≤66.8	Pass

## APPENDIX A

### Output from Computer Programs

Section	1	2	3	4	
Length (ft)	51,000	51,000	51,000	51,000	51,000
Number of Sides	18	18	18	18	18
Thickness (in)	0.250	0.313	0.375	0.500	0.500
Lap Splice (ft)	4.250	5.250	6.500		
Top Dia (in)	22,000	31,318	40,302	48,899	
Bot Dia (in)	32,711	42,030	51,014	59,610	
Grade					A572-65
Weight (K)	3.7	6.3	9.4	14.8	34.1



### APPURTENANCES

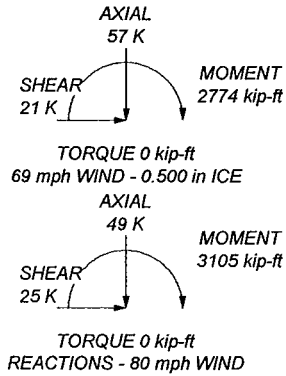
TYPE	ELEVATION	TYPE	ELEVATION
Generic C-2 Lightning Spur	192	(3) RR90-17-02DP w/Mount Pipe	163
(4) 7184 w/Mount Pipe	190	(2) TMA	163
(4) 7184 w/Mount Pipe	190	(3) RR90-17-02DP w/Mount Pipe	163
(4) 7184 w/Mount Pipe	190	PIROD 13' Low Profile Platform (Monopole)	162
PIROD 13' Platform w/handrails (Monopole)	188	(2) WPA-80090/4CF w/Mount Pipe	147
(2) Mount Pipe (2"x72")	177	(2) DB948F85T2E-M w/Mount Pipe	147
(2) Mount Pipe (2"x72")	177	(2) WPA-80090/4CF w/Mount Pipe	147
PIROD 13' Low Profile Platform (Monopole)	177	(2) DB948F85T2E-M w/Mount Pipe	147
(2) Mount Pipe (2"x72")	177	(2) WPA-80090/4CF w/Mount Pipe	147
(2) TMA	163	PIROD 13' Low Profile Platform (Monopole)	147
(3) RR90-17-02DP w/Mount Pipe	163	(2) DB948F85T2E-M w/Mount Pipe	147
(2) TMA	163		

### MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi			

### TOWER DESIGN NOTES

1. Tower is located in Hartford 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 69 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 63.7%



<b>PSG Engineering, Ltd.</b>		Job: <b>PSG Engineering Project Number: 0601H114-A06018</b>	
245 Commerce Green Blvd., Suite 240		Project: <b>(803175) (CT NEW BRITAIN 3 CAC 803175)</b>	
Sugar Land, TX 77478		Client: Crown Castle International	Drawn by: Oscar Pedraza
Phone: 281.265.3444		Code: TIA/EIA-222-F	Date: 03/24/06
FAX: 281.265.3454		Path:	Scale: NTS
		Dwg No. E-1	

<b>ERITower</b>  <b>PSG Engineering, Ltd.</b> 245 Commerce Green Blvd., Suite 240 Sugar Land, TX 77478 Phone: 281.265.3444 FAX: 281.265.3454	<b>Job</b> PSG Engineering Project Number: 0601H114-A060188	<b>Page</b> 1 of 9
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	<b>Client</b> Crown Castle International	<b>Designed by</b> Oscar Pedraza

## 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 Hartford County, Connecticut.

Basic wind speed of 80 mph.

Nominal ice thickness of 0.500 in.

Ice density of 56 pcf.

A wind speed of 69 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.

## 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	188.000- 137.000	51.000	4.250	18	22.000	32.711	0.250	1.000	A572-65 (65 ksi)
L2	137.000-90.250	51.000	5.250	18	31.318	42.030	0.313	1.250	A572-65 (65 ksi)
L3	90.250-44.500	51.000	6.500	18	40.302	51.014	0.375	1.500	A572-65 (65 ksi)
L4	44.500-0.000	51.000		18	48.899	59.610	0.500	2.000	A572-65 (65 ksi)

## Tapered Pole Properties

Section	Tip Dia. in	Area in <sup>2</sup>	I in <sup>4</sup>	r in	C in	I/C in <sup>3</sup>	J in <sup>4</sup>	I/Q in <sup>2</sup>	w in	w/t
L1	22.339	17.259	1031.483	7.721	11.176	92.294	2064.324	8.631	3.432	13.728
	33.216	25.758	3429.020	11.524	16.617	206.354	6862.553	12.881	5.317	21.269
L2	32.708	30.754	3735.323	11.007	15.910	234.782	7475.561	15.380	4.962	15.879
	42.678	41.379	9098.069	14.810	21.351	426.114	18208.109	20.693	6.847	21.911
L3	42.044	47.524	9571.647	14.174	20.474	467.512	19155.889	23.766	6.433	17.155
	51.801	60.273	19526.797	17.977	25.915	753.491	39079.287	30.142	8.318	22.183
L4	51.039	76.809	22730.963	17.182	24.841	915.074	45491.836	38.412	7.726	15.452
	60.530	93.808	41409.240	20.984	30.282	1367.459	82872.966	46.913	9.611	19.223

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A <sub>r</sub>	Adjust. Factor A <sub>r</sub>	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals
ft	ft <sup>2</sup>	in					in	in

<b>ERITower</b>  <b>PSG Engineering, Ltd.</b> 245 Commerce Green Blvd., Suite 240 Sugar Land, TX 77478 Phone: 281.265.3444 FAX: 281.265.3454	<b>Job</b> PSG Engineering Project Number: 0601H114-A060188	<b>Page</b> 2 of 9
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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 <sup>2</sup>	in					in	in
L1 188.000-137.000				1	1	1		
L2 137.000-90.250				1	1	1		
L3 90.250-44.500				1	1	1		
L4 44.500-0.000				1	1	1		

**Monopole Base Plate Data**

Base Plate Data	
Base plate is square	√
Base plate is grouted	
Anchor bolt grade	A615-75
Anchor bolt size	2.250 in
Number of bolts	20
Embedment length	84.000 in
$f_c$	3.000 ksi
Grout space	4.000 in
Base plate grade	A572-50
Base plate thickness	3.000 in
Bolt circle diameter	67.000 in
Outer diameter	66.000 in
Inner diameter	36.000 in
Corner clipped	12.000 in
Base plate type	Plain Plate

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

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

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

Description	Face or Leg	Allow Shield	Component Type	Placement	Total Number	$C_{AA}$	Weight
				ft		ft <sup>2</sup> /ft	klf
***EL. 188' LEVEL***							
LDF7-50A (1-5/8 FOAM)	A	No	Inside Pole	188.000 - 10.000	24	No Ice 1/2" Ice	0.000 0.001
*							

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Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C <sub>AA</sub> ft <sup>2</sup> /ft	Weight klf
*								
***EL. 162' LEVEL***								
LDF7-50A (1-5/8 FOAM)	A	No	Inside Pole	162.000 - 10.000	18	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
*								
***EL. 147' LEVEL***								
LDF7-50A (1-5/8 FOAM)	A	No	Inside Pole	147.000 - 10.000	12	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
*								
***TOWER HARDWARE***								
Climbing Ladder (Ar)	C	No	CaAa (Out Of Face)	188.000 - 10.000	1	No Ice	0.037	0.001
						1/2" Ice	0.137	0.002

### Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A <sub>R</sub> ft <sup>2</sup>	A <sub>F</sub> ft <sup>2</sup>	C <sub>AA</sub> In Face ft <sup>2</sup>	C <sub>AA</sub> Out Face ft <sup>2</sup>	Weight K
L1	188.000-137.000	A	0.000	0.000	0.000	0.000	1.471
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	1.913	0.051
L2	137.000-90.250	A	0.000	0.000	0.000	0.000	2.070
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	1.753	0.047
L3	90.250-44.500	A	0.000	0.000	0.000	0.000	2.026
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	1.716	0.046
L4	44.500-0.000	A	0.000	0.000	0.000	0.000	1.528
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	1.294	0.035

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

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A <sub>R</sub> ft <sup>2</sup>	A <sub>F</sub> ft <sup>2</sup>	C <sub>AA</sub> In Face ft <sup>2</sup>	C <sub>AA</sub> Out Face ft <sup>2</sup>	Weight K
L1	188.000-137.000	A	0.500	0.000	0.000	0.000	0.000	1.471
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	7.012	0.078
L2	137.000-90.250	A	0.500	0.000	0.000	0.000	0.000	2.070
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	6.428	0.072
L3	90.250-44.500	A	0.500	0.000	0.000	0.000	0.000	2.026
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	6.290	0.070
L4	44.500-0.000	A	0.500	0.000	0.000	0.000	0.000	1.528
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	4.744	0.053



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### Feed Line Center of Pressure

Section	Elevation	CP <sub>X</sub>	CP <sub>Z</sub>	CP <sub>X</sub>	CP <sub>Z</sub>
	ft	in	in	Ice in	Ice in
L1	188.000-137.000	-0.048	0.028	-0.163	0.094
L2	137.000-90.250	-0.048	0.028	-0.167	0.096
L3	90.250-44.500	-0.048	0.028	-0.169	0.098
L4	44.500-0.000	-0.037	0.021	-0.130	0.075

### Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment °	Placement ft	C <sub>A</sub> A <sub>Front</sub> ft <sup>2</sup>	C <sub>A</sub> A <sub>Side</sub> ft <sup>2</sup>	Weight K
			Horz Lateral ft	Vert ft					
***EL. 188' LEVEL***									
(4) 7184 w/Mount Pipe	A	From Leg	4.000	0.000	190.000	No Ice	3.330	3.555	0.037
			0.000			1/2" Ice	3.937	4.596	0.068
			0.000						
(4) 7184 w/Mount Pipe	B	From Leg	4.000	0.000	190.000	No Ice	3.330	3.555	0.037
			0.000			1/2" Ice	3.937	4.596	0.068
			0.000						
(4) 7184 w/Mount Pipe	C	From Leg	4.000	0.000	190.000	No Ice	3.330	3.555	0.037
			0.000			1/2" Ice	3.937	4.596	0.068
			0.000						
PiROD 13' Platform w/handrails (Monopole)	C	None		0.000	188.000	No Ice	31.300	31.300	1.822
						1/2" Ice	40.200	40.200	2.452
***EL. 177' LEVEL***									
(2) Mount Pipe (2"x72")	A	From Leg	4.000	0.000	177.000	No Ice	1.425	1.425	0.023
			0.000			1/2" Ice	1.929	1.929	0.036
			0.000						
(2) Mount Pipe (2"x72")	B	From Leg	4.000	0.000	177.000	No Ice	1.425	1.425	0.023
			0.000			1/2" Ice	1.929	1.929	0.036
			0.000						
(2) Mount Pipe (2"x72")	C	From Leg	4.000	0.000	177.000	No Ice	1.425	1.425	0.023
			0.000			1/2" Ice	1.929	1.929	0.036
			0.000						
PiROD 13' Low Profile Platform (Monopole)	C	None		0.000	177.000	No Ice	15.700	15.700	1.300
						1/2" Ice	20.100	20.100	1.765
***EL. 162' LEVEL***									
(3) RR90-17-02DP w/Mount Pipe	A	From Leg	4.000	0.000	163.000	No Ice	4.910	3.636	0.044
			0.000			1/2" Ice	5.572	4.703	0.082
			0.000						
(2) TMA	A	From Leg	4.000	0.000	163.000	No Ice	1.400	0.700	0.012
			0.000			1/2" Ice	1.560	0.821	0.022
			0.000						
(3) RR90-17-02DP w/Mount Pipe	B	From Leg	4.000	0.000	163.000	No Ice	4.910	3.636	0.044
			0.000			1/2" Ice	5.572	4.703	0.082
			0.000						
(2) TMA	B	From Leg	4.000	0.000	163.000	No Ice	1.400	0.700	0.012

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Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C <sub>AA</sub> Front ft <sup>2</sup>	C <sub>AA</sub> Side ft <sup>2</sup>	Weight K	
			0.000			1/2" Ice 1.560	0.821	0.022	
(3) RR90-17-02DP w/Mount Pipe	C	From Leg	0.000 4.000 0.000 0.000	0.000	163.000	No Ice 4.910 1/2" Ice 5.572	3.636 4.703	0.044 0.082	
(2) TMA	C	From Leg	0.000 4.000 0.000 0.000	0.000	163.000	No Ice 1.400 1/2" Ice 1.560	0.700 0.821	0.012 0.022	
PiROD 13' Low Profile Platform (Monopole) *	C	None	0.000	0.000	162.000	No Ice 15.700 1/2" Ice 20.100	15.700 20.100	1.300 1.765	
***EL. 147' LEVEL***									
(2) DB948F85T2E-M w/Mount Pipe	A	From Leg	0.000 4.000 0.000 0.000	0.000	147.000	No Ice 2.622 1/2" Ice 3.230	4.918 6.008	0.034 0.069	
(2) WPA-80090/4CF w/Mount Pipe	A	From Leg	0.000 4.000 0.000 0.000	0.000	147.000	No Ice 4.220 1/2" Ice 4.754	4.134 4.939	0.034 0.072	
(2) DB948F85T2E-M w/Mount Pipe	B	From Leg	0.000 4.000 0.000 0.000	0.000	147.000	No Ice 2.622 1/2" Ice 3.230	4.918 6.008	0.034 0.069	
(2) WPA-80090/4CF w/Mount Pipe	B	From Leg	0.000 4.000 0.000 0.000	0.000	147.000	No Ice 4.220 1/2" Ice 4.754	4.134 4.939	0.034 0.072	
(2) DB948F85T2E-M w/Mount Pipe	C	From Leg	0.000 4.000 0.000 0.000	0.000	147.000	No Ice 2.622 1/2" Ice 3.230	4.918 6.008	0.034 0.069	
(2) WPA-80090/4CF w/Mount Pipe	C	From Leg	0.000 4.000 0.000 0.000	0.000	147.000	No Ice 4.220 1/2" Ice 4.754	4.134 4.939	0.034 0.072	
PiROD 13' Low Profile Platform (Monopole) *	C	None	0.000	0.000	147.000	No Ice 15.700 1/2" Ice 20.100	15.700 20.100	1.300 1.765	
***TOWER HARDWARE***									
Generic C-2 Lightning Spur	C	None		0.000	192.000	No Ice 4.000 1/2" Ice 7.000	4.000 7.000	0.000 0.000	

## 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

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Comb. No.	Description
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 Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	188 - 137	38.143	36	1.872	0.000
L2	141.25 - 90.25	20.992	36	1.536	0.000
L3	95.5 - 44.5	8.880	35	0.948	0.000
L4	51 - 0	2.360	35	0.428	0.000

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

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
192.000	Generic C-2 Lightning Spur	36	38.143	1.872	0.000	42236
190.000	(4) 7184 w/Mount Pipe	36	38.143	1.872	0.000	42236
188.000	PiROD 13' Platform w/handrails (Monopole)	36	38.143	1.872	0.000	42236
177.000	(2) Mount Pipe (2"x72")	36	33.892	1.807	0.000	19198
163.000	(3) RR90-17-02DP w/Mount Pipe	36	28.602	1.718	0.000	8446
162.000	PiROD 13' Low Profile Platform (Monopole)	36	28.232	1.711	0.000	8121

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Elevation	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
147.000	(2) DB948F85T2E-M w/Mount Pipe	36	22.906	1.591	0.000	5149

### Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	188 - 137	97.435	11	4.782	0.001
L2	141.25 - 90.25	53.648	11	3.926	0.000
L3	95.5 - 44.5	22.701	11	2.425	0.000
L4	51 - 0	6.035	11	1.094	0.000

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

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
192.000	Generic C-2 Lightning Spur	11	97.435	4.782	0.001	16722
190.000	(4) 7184 w/Mount Pipe	11	97.435	4.782	0.001	16722
188.000	PiROD 13' Platform w/handrails (Monopole)	11	97.435	4.782	0.001	16722
177.000	(2) Mount Pipe (2"x72")	11	86.584	4.621	0.000	7600
163.000	(3) RR90-17-02DP w/Mount Pipe	11	73.077	4.393	0.000	3342
162.000	PiROD 13' Low Profile Platform (Monopole)	11	72.135	4.375	0.000	3213
147.000	(2) DB948F85T2E-M w/Mount Pipe	11	58.534	4.068	0.000	2035

### Base Plate Design Data

Plate Thickness in	Number of Anchor Bolts	Anchor Bolt Size in	Actual Allowable Ratio Bolt Tension K	Actual Allowable Ratio Bolt Compression K	Actual Allowable Ratio Plate Stress ksi	Actual Allowable Ratio Stiffener Stress ksi	Controlling Condition	Ratio
3.000	20	2.250	108.778	113.637	29.895		Plate	0.80
			174.904	290.340	37.500			
			0.62	0.39	0.80			

### Compression Checks

### Pole Design Data

<b>ERITower</b>  <b>PSG Engineering, Ltd.</b> 245 Commerce Green Blvd., Suite 240 Sugar Land, TX 77478 Phone: 281.265.3444 FAX: 281.265.3454	<b>Job</b> PSG Engineering Project Number: 0601H114-A060188	<b>Page</b> 8 of 9
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	<b>Client</b> Crown Castle International	<b>Designed by</b> Oscar Pedraza

Section No.	Elevation ft	Size	L ft	L <sub>n</sub> ft	Kl/r	F <sub>a</sub> ksi	A in <sup>2</sup>	Actual P K	Allow. P <sub>a</sub> K	Ratio P P <sub>a</sub>
L1	188 - 137 (1)	TP32.711x22x0.25	51.000	0.000	0.0	39.000	25.049	-11.015	976.932	0.011
L2	137 - 90.25 (2)	TP42.03x31.318x0.313	51.000	0.000	0.0	39.000	40.285	-19.111	1571.110	0.012
L3	90.25 - 44.5 (3)	TP51.014x40.302x0.375	51.000	0.000	0.0	39.000	58.648	-30.219	2287.280	0.013
L4	44.5 - 0 (4)	TP59.61x48.899x0.5	51.000	0.000	0.0	39.000	93.808	-48.592	3658.500	0.013

### Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M <sub>x</sub> kip-ft	Actual f <sub>bx</sub> ksi	Allow. F <sub>bx</sub> ksi	Ratio f <sub>bx</sub> F <sub>bx</sub>	Actual M <sub>y</sub> kip-ft	Actual f <sub>by</sub> ksi	Allow. F <sub>by</sub> ksi	Ratio f <sub>by</sub> F <sub>by</sub>
L1	188 - 137 (1)	TP32.711x22x0.25	369.248	22.709	39.000	0.582	0.000	0.000	39.000	0.000
L2	137 - 90.25 (2)	TP42.03x31.318x0.313	1082.14	32.158	39.000	0.825	0.000	0.000	39.000	0.000
L3	90.25 - 44.5 (3)	TP51.014x40.302x0.375	1938.49	32.613	39.000	0.836	0.000	0.000	39.000	0.000
L4	44.5 - 0 (4)	TP59.61x48.899x0.5	3104.54	27.244	39.000	0.699	0.000	0.000	39.000	0.000

### Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f <sub>v</sub> ksi	Allow. F <sub>v</sub> ksi	Ratio f <sub>v</sub> F <sub>v</sub>	Actual T kip-ft	Actual f <sub>vt</sub> ksi	Allow. F <sub>vt</sub> ksi	Ratio f <sub>vt</sub> F <sub>vt</sub>
L1	188 - 137 (1)	TP32.711x22x0.25	13.753	0.549	26.000	0.042	0.000	0.000	26.000	0.000
L2	137 - 90.25 (2)	TP42.03x31.318x0.313	17.425	0.433	26.000	0.033	0.000	0.000	26.000	0.000
L3	90.25 - 44.5 (3)	TP51.014x40.302x0.375	20.990	0.358	26.000	0.028	0.000	0.000	26.000	0.000
L4	44.5 - 0 (4)	TP59.61x48.899x0.5	24.689	0.263	26.000	0.020	0.000	0.000	26.000	0.000

### Pole Interaction Design Data

Section No.	Elevation ft	Ratio P P <sub>a</sub>	Ratio f <sub>bx</sub> F <sub>bx</sub>	Ratio f <sub>by</sub> F <sub>by</sub>	Ratio f <sub>v</sub> F <sub>v</sub>	Ratio f <sub>vt</sub> F <sub>vt</sub>	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	188 - 137 (1)	0.011	0.582	0.000	0.042	0.000	0.594	1.333	H1-3+VT
L2	137 - 90.25 (2)	0.012	0.825	0.000	0.033	0.000	0.837	1.333	H1-3+VT
L3	90.25 - 44.5 (3)	0.013	0.836	0.000	0.028	0.000	0.850	1.333	H1-3+VT
L4	44.5 - 0 (4)	0.013	0.699	0.000	0.020	0.000	0.712	1.333	H1-3+VT

### Section Capacity Table

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Section No.	Elevation ft	Component Type	Size	Critical Element	P K	SF*P <sub>allow</sub> K	% Capacity	Pass Fail	
L1	188 - 137	Pole	TP32.711x22x0.25	1	-11.015	1302.250	44.6	Pass	
L2	137 - 90.25	Pole	TP42.03x31.318x0.313	2	-19.111	2094.290	62.8	Pass	
L3	90.25 - 44.5	Pole	TP51.014x40.302x0.375	3	-30.219	3048.944	63.7	Pass	
L4	44.5 - 0	Pole	TP59.61x48.899x0.5	4	-48.592	4876.780	53.4	Pass	
							<b>Summary</b>		
							Pole (L3)	63.7	Pass
							Base Plate	59.8	Pass
							<b>RATING =</b>	<b>63.7</b>	<b>Pass</b>