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

July 18, 2011

Jennifer A. Herz, Esq.
Brown Rudnick LLP
CityPlace I, 185 Asylum Street
Hartford, CT 06103

RE: **EM-T-MOBILE-007-110630** - Omnipoint Communications, as subsidiary of T-Mobile USA, Inc., notice of intent to modify an existing telecommunications facility located at 1684 Chamberlain Highway, Berlin, Connecticut.

Dear Attorney Herz:

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

- Any deviation from the proposed modification as specified in this notice and supporting materials with Council shall render this acknowledgement invalid;
- Any material changes to this modification as proposed shall require the filing of a new notice with the Council;
- Not less than 45 days after completion of construction, the Council shall be notified in writing that construction has been completed;
- The validity of this action shall expire one year from the date of this letter; and
- The applicant may file a request for an extension of time beyond the one year deadline provided that such request is submitted to the Council not less than 60 days prior to the expiration;

The proposed modifications including the placement of all necessary equipment and shelters within the tower compound are to be implemented as specified here and in your notice dated June 30, 2011. The modifications are in compliance with the exception criteria in Section 16-50j-72 (b) of the Regulations of Connecticut State Agencies as changes to an existing facility site that would not increase tower height, extend the boundaries of the tower site, increase noise levels at the tower site boundary by six decibels, and increase the total radio frequencies electromagnetic radiation power density measured at the tower site boundary to or above the standard adopted by the State Department of Environmental Protection pursuant to General Statutes § 22a-162. This facility has also been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies now used on this tower.

This decision is under the exclusive jurisdiction of the Council. Please be advised that the validity of this action shall expire one year from the date of this letter. Any additional change to this facility will require explicit notice to this agency pursuant to Regulations of Connecticut State Agencies Section 16-50j-73. Such notice shall include all relevant information regarding the proposed change with cumulative worst-case modeling of radio frequency exposure at the closest point of uncontrolled access to the tower base, consistent with Federal Communications Commission, Office of Engineering and Technology, Bulletin 65. Thank you for your attention and cooperation.

Very truly yours,

Linda Roberts
Executive Director

LR/CDM/laf

c: The Honorable Adam P. Salina, Mayor, Town of Berlin
Denise McNair, Interim Town Manager, Town of Berlin
Hellyn Riggins, Town Planner, Town of Berlin
Crown Castle USA, Inc.

CSC
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July 1, 2011

The Honorable Adam P. Salina
Mayor
Town of Berlin
240 Kensington Road
Kensington, CT 06037

RE: **EM-T-MOBILE-007-110630** - Omnipoint Communications, as subsidiary of T-Mobile USA, Inc., notice of intent to modify an existing telecommunications facility located at 1684 Chamberlain Highway, Berlin, Connecticut.

Dear Mayor Salina:

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

If you have any questions or comments regarding this proposal, please call me or inform the Council by July 18, 2011.

Thank you for your cooperation and consideration.

Very truly yours,

Linda Roberts

Linda Roberts
Executive Director

LR/jbw

Enclosure: Notice of Intent

c: Denise McNair, Interim Town Manager, Town of Berlin
Hellyn Riggins, Town Planner, Town of Berlin

CSC
CONNECTICUT SITING COUNCIL

BROWNRUDNICK

CityPlace I
185 Asylum
Street
Hartford
Connecticut
06103
tel 860.509.6500
fax 860.509.6501

JENNIFER A. HERZ
Direct Dial: (860) 509-6527
jherz@brownrudnick.com

EM-T-MOBILE-007-110630

Via Hand Delivery

June 30, 2011

Robert Stein, Chairman
Connecticut Siting Council
Ten Franklin Square
New Britain, CT 06051

RE: **Notice of Exempt Modification / Berlin @ 1684 Chamberlain Highway**

Dear Chairman Stein:

On behalf of T-Mobile Northeast, LLC ("T-Mobile"), enclosed for filing is an original and 5 copies of T-Mobile's Notice of Exempt Modification for the Facility located at 1684 Chamberlain Highway in Berlin.

I also enclose herewith a check in the amount of $625.00 representing the filing fee.

I would appreciate it if you would date-stamp the enclosed copy of this transmittal letter and return it to the courier delivering this package.

If you have any questions, please feel free to contact me.

Very truly yours,

BROWN RUDNICK LLP

Jennifer A. Herz

JH/bh
Enclosures

cc/encl: Adam P. Salina, Mayor

40284821 v1 - HERZJA - 029431/0001

CONNECTICUT SITING COUNCIL

In re:

T-Mobile Northeast, LLC's Notice to Make an Exempt Modification to an Existing Facility at 1684 Chamberlain Highway, Berlin, Connecticut.	:	**EXEMPT MODIFICATION NO. _____**
	:	
	:	June 30, 2011

NOTICE OF EXEMPT MODIFICATION

Pursuant to Conn. Agencies Regs. §§ 16-50j-73 and 16-50j-72(b), T-Mobile Northeast, LLC ("T-Mobile") hereby gives notice to the Connecticut Siting Council ("Council") and the Town of Berlin of T-Mobile's intent to make an exempt modification to the existing monopole tower (the "Tower") located at 1684 Chamberlain Highway in Berlin, Connecticut. Specifically, T-Mobile plans to upgrade its wireless system in Connecticut by implementing its Universal Mobile Telecommunications System ("UMTS"). UMTS is a third-generation ("3G") technology that utilizes a code division multiple access ("CDMA") base to allow for fast and large data transfers. To accomplish this upgrade, T-Mobile must modify its antenna and equipment configurations at many of its existing sites.

Once the UMTS upgrade is complete, T-Mobile will operate on a more unified communication system, allowing international wireless telephones to function world-wide. Furthermore, UMTS will enhance global positioning system ("GPS") navigation capabilities and provide emergency responders with more advanced tracking capabilities. The proposed UMTS technology is compatible with the existing second-generation ("2G") Global System for Mobile Communication ("GSM") currently on the Tower and the proposed upgrade is expected to enhance the existing 2G system. In order to accomplish the upgrade at this site,

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T-Mobile plans to add UMTS technology and install associated equipment at the base of the Tower.

Under the Council's regulations (Conn. Agencies Regs. § 16-50j-72(b)), T-Mobile's plans do not constitute a modification subject to the Council's review because T-Mobile will not change the height of the Tower, will not extend the boundaries of the site, will not increase the noise levels at the site, and will not increase the total radio frequency electromagnetic radiation power density at the site to levels above applicable standards.

The Tower is a 123-foot monopole tower located at 1684 Chamberlain Highway in Berlin, Connecticut (latitude N 41° 35' 23.07", longitude W -72° 48' 19.2"). The Tower is owned by Crown Castle. Multiple carriers are currently located on the Tower. Currently, T-Mobile has 3 panel antennas with a centerline of 100 feet mounted on the Tower. A site plan with Tower specifications is attached.

T-Mobile plans to install 3 UMTS (Model No.APX16DWV) antennas and 6 Tower Mounted Amplifiers ("TMA") on the Tower. The 6 new TMA will include 3 Twin AWS and 3 Twin PCS. The centerline of the new antennas and TMAs will remain at 100 feet. T-Mobile also plans to run 6 additional 1-5/8 inch coaxial cables to the new antennas.

To confirm the Tower can support these changes, T-Mobile commissioned Paul J. Ford and Company to perform a Structural Analysis of the Tower (attached). According to the Structural Analysis Report, dated June 2, 2011, the Tower has "sufficient capacity" for T-Mobile's planned modifications (Structural Analysis Report, page 1).

Within the existing compound T-Mobile plans to relocate Metro PCS's ice bridge to outside its equipment pad area. T-Mobile plans to locate its equipment cabinet on the

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existing 6-foot by 15-foot (approximately) pad. Hence, no increase in the size of the boundaries of the site is necessary.

Excluding brief, minor, construction-related noise during the addition of the antennas, TMAs and the installation of the equipment cabinet, the proposed changes to the Tower will not increase noise levels at the site.

The proposed antennas will not adversely impact the health and safety of the surrounding community or the people working on the Tower. The total radio frequency exposure measured around the Tower will be well below the National Council on Radiation Protection and Measurements' ("NCRP") standard adopted by the Federal Communications Commission ("FCC"). The worst-case power density analysis[1] measured at the base of the Tower indicates that T-Mobile's antennas will emit 10.86% of the NCRP's standard for maximum permissible exposure. Collectively, the antennas on the Tower will emit 82.6% of the NCRP's standard for maximum permissible exposure. Therefore, the power density levels will be below the FCC mandated radio frequency exposure limits in all locations around the Tower, even with extremely conservative assumptions. The power density analysis is attached.[2]

In conclusion, T-Mobile's proposed plan install antennas, TMAs and ground equipment at this site does not constitute a modification subject to the Council's jurisdiction because T-Mobile will not increase the height of the Tower, will not extend the boundaries of the site, will not increase the noise levels at the site, and the total radio frequency

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[1] Please note, the power density analysis takes into account the most conservative information available. Therefore, the analysis may take into account carriers that are not currently located on the Tower in order to provide the most conservative analysis.

[2] Please note that Metro PCS's installation is referred to as Pocket on the Power Density analysis.

electromagnetic radiation power density will stay within all applicable standards. *See* Conn. Agencies Regs. § 16-50j-72.

T-MOBILE NORTHEAST, LLC

By: _____

Jennifer A. Herz
Brown Rudnick LLP
185 Asylum Street
Hartford, CT 06103-3402
Email - jherz@brownrudnick.com
Phone - 860.509.6527 /Fax - 860.509.6501

Certificate of Service

This is to certify that on this 30th day of June, 2011, the foregoing Notice of Exempt Modification was sent, via first class mail, to the following:

Mayor Adam P. Salina
Berlin Town Hall
240 Kensington Road
Berlin, CT 06037

By: _____
Jennifer A. Herz

40284491 v1 - 029431/0001

BROWN RUDNICK LLP
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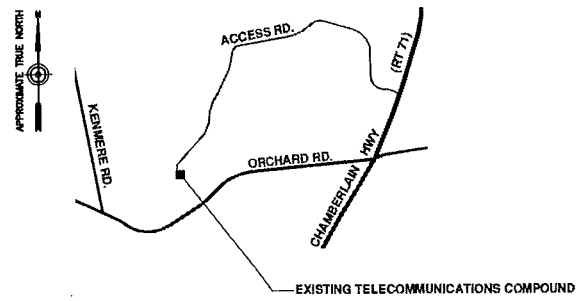
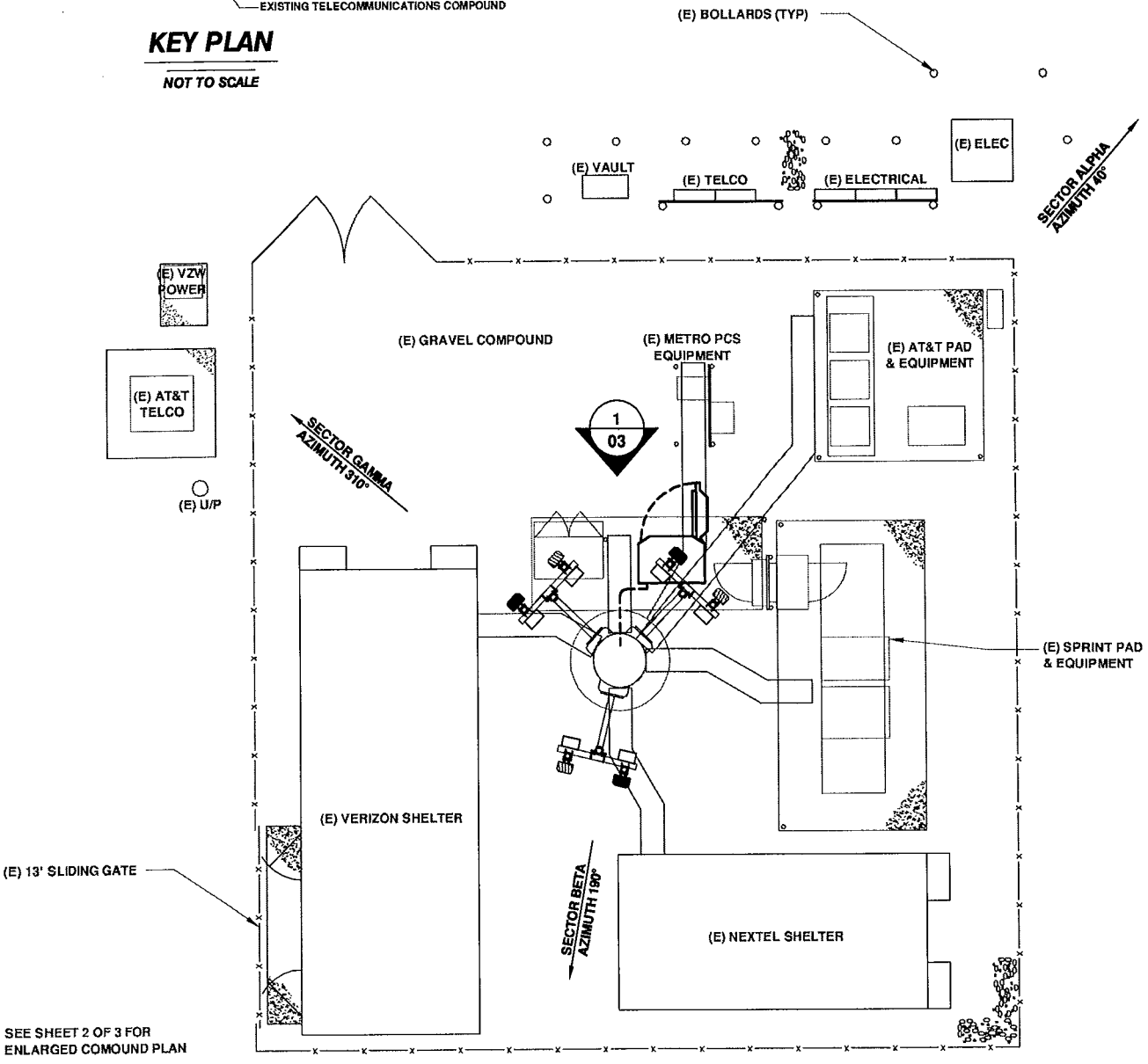
185 ASYLUM STREET
HARTFORD, CT 06103
(860) 509-6500



KEY PLAN

NOT TO SCALE



COMPOUND PLAN

NOT TO SCALE

SUBMITTALS	
LE REV A	05-10-11
LE REV 0	06-08-11

ATLANTIS GROUP
1340 Centre Street
Suite 203
Newton, MA 02459
Office: 617-965-0789
Fax: 617-213-5056

LEASE EXHIBIT

SITE NUMBER: CT11604B
SITE NAME: BERLIN MONOPOLE

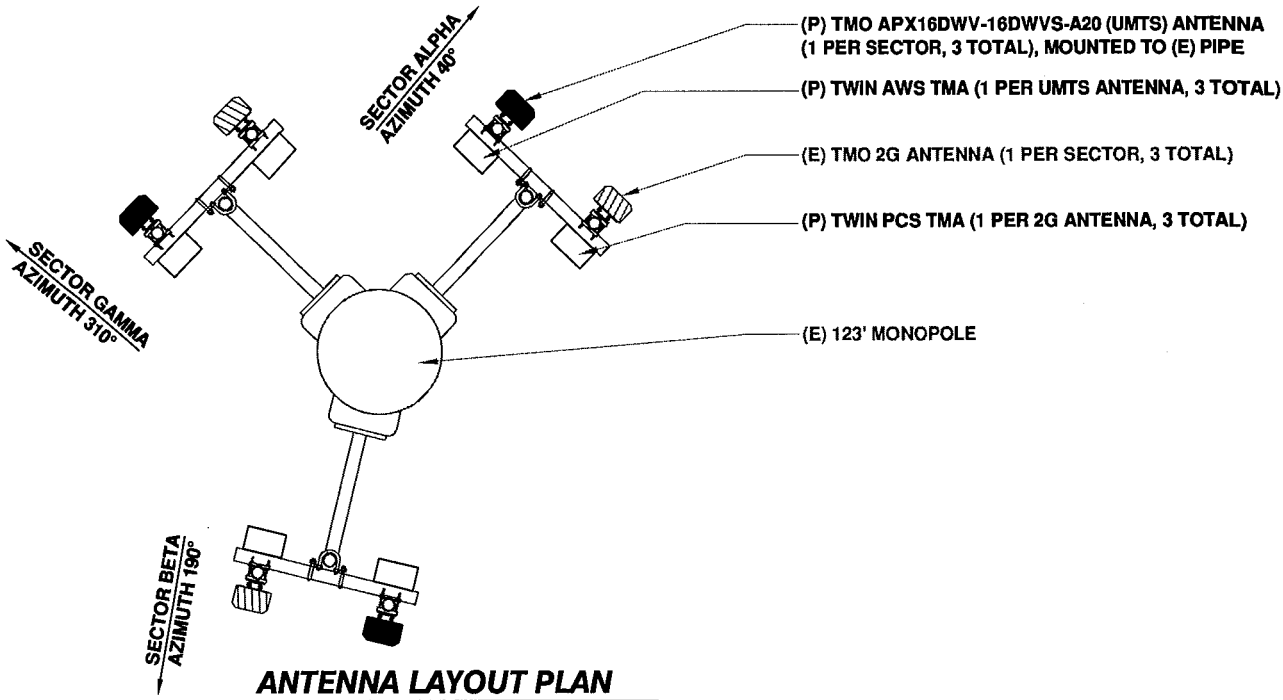
1684 CHAMBERLAIN HWY (RT 71)
BERLIN, CT 06037

NORTHEAST TOWERS
199 BRICKYARD ROAD
FARMINGTON, CT 06032
OFFICE: (860) 677-1999

FOR

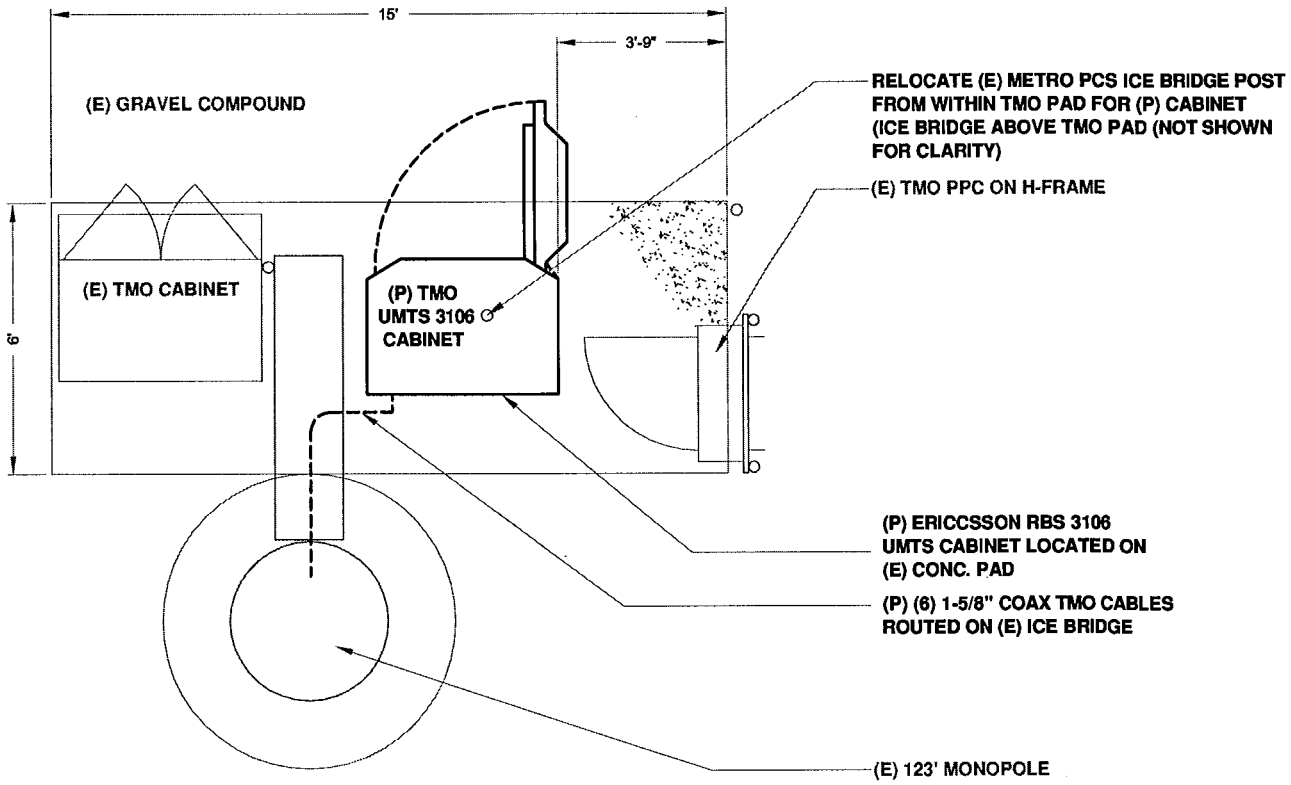
T-MOBILE NORTHEAST, LLC
35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002
OFFICE: (860) 692-7100
FAX: (860) 692-7159

DRAWN BY: CF | CHECKED BY: SM



ANTENNA LAYOUT PLAN

NOT TO SCALE



EQUIPMENT LAYOUT PLAN

NOT TO SCALE

SUBMITTALS	
LE REV A	05-10-11
LE REV 0	06-06-11

ATLANTIS GROUP
1340 Centre Street
Suite 203
Newton, MA 02459
Office: 617-965-0789
Fax: 617-213-5056

LEASE EXHIBIT

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SITE NAME: BERLIN MONOPOLE

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BLOOMFIELD, CT 06002
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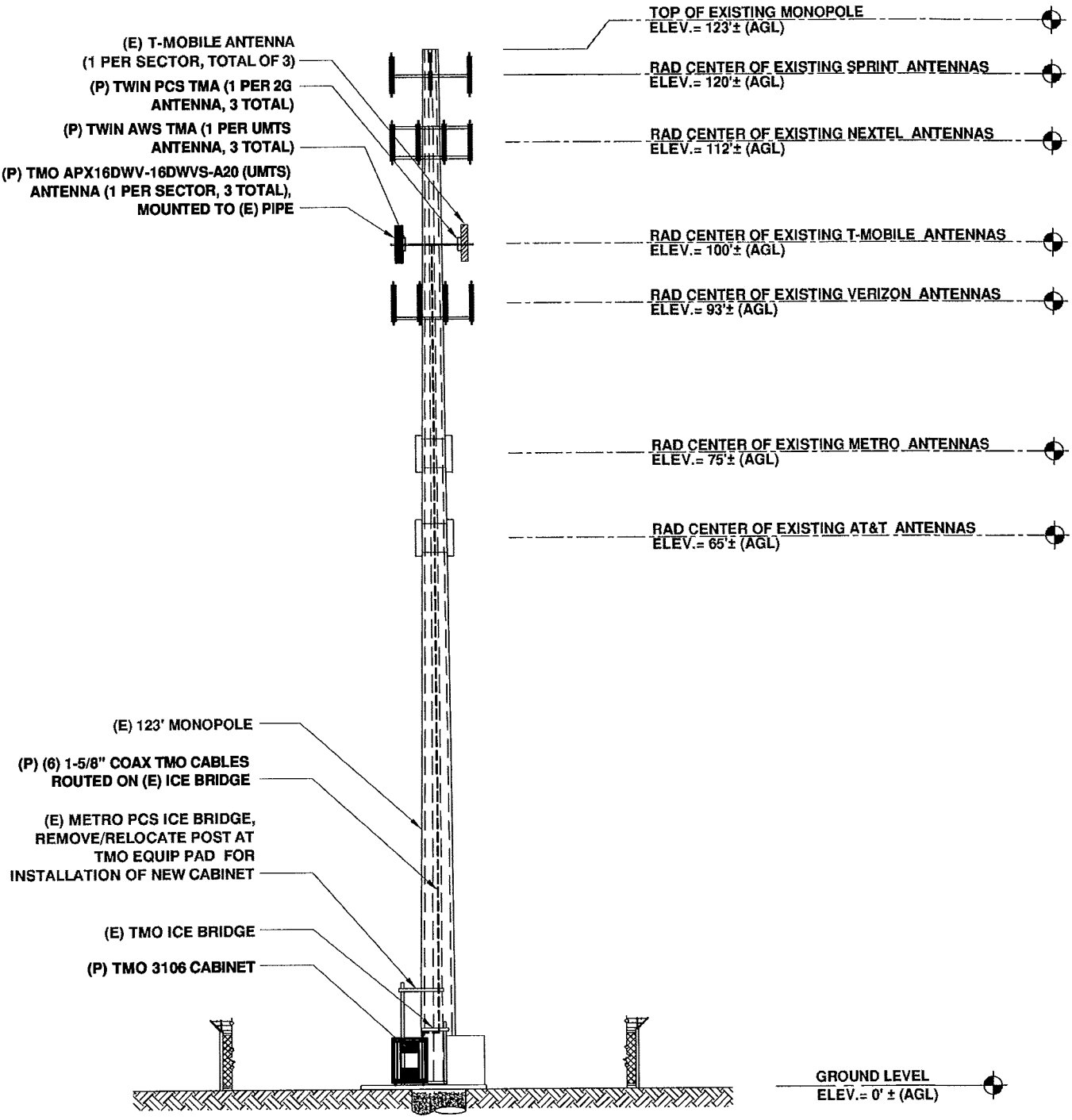

1/03 **ELEVATION**

NOT TO SCALE

SUBMITTALS	
LE REV A	05-10-11
LE REV 0	06-06-11

ATLANTIS GROUP
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Suite 203
Newton, MA 02459
Office: 617-965-0789
Fax: 617-213-5056

LEASE EXHIBIT

SITE NUMBER: CT11604B
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FAX: (860) 692-7159

DRAWN BY: CF | CHECKED BY: SM

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

Date: **June 2, 2011**

Veronica Harris
Crown Castle USA Inc.
1200 McArthur Blvd
Mahwah, NJ 07430
201.236.9094

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

Subject: **Structural Analysis Report**

Carrier Designation:	***T-Mobile* Co-Locate**	
	Carrier Site Number:	CT11604B
	Carrier Site Name:	Sprint Berlin Kensington
Crown Castle Designation:	**Crown Castle BU Number:**	876382
	Crown Castle Site Name:	Berlin / Laviana Orchard
	Crown Castle JDE Job Number:	157653
	Crown Castle Work Order Number:	409634
Engineering Firm Designation:	**Paul J Ford and Company Project Number:**	37511-0160R1
Site Data:	**1684 Chamberlain Hwy, Berlin, Hartford County, CT**	
	Latitude *41° 35' 23.07"*, Longitude *-72° 48' 19.2"*	
	123 Foot - Monopole Tower	

Dear Veronica Harris,

Paul J Ford and Company is pleased to submit this **"Structural Analysis Report"** to determine the structural integrity of the above mentioned tower. This analysis has been performed in accordance with the Crown Castle Structural 'Statement of Work' and the terms of Crown Castle Purchase Order Number 417570, in accordance with application 123370, revision 1.

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

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

The analysis has been performed in accordance with the TIA/EIA-222-F standard based upon fastest mile wind speeds of 80 mph with no ice, 69 mph with 1/2 inch ice thickness and 50 mph under service loads

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

Respectfully submitted by:

Richard W. Hoffman, P.E.
Project Manager

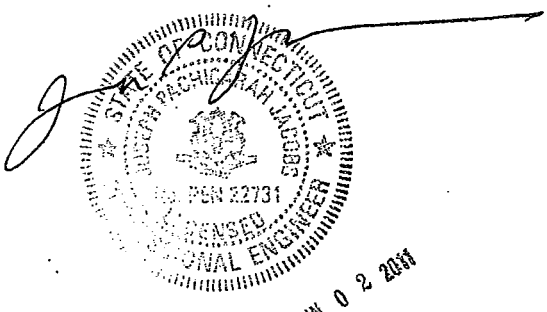


TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 123 ft Monopole tower designed by Summit Manufacturing in July of 2000. The tower was originally designed for a wind speed of 85 mph per TIA/EIA-222-F.

2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a fastest mile wind speed of 80 mph with no ice, 69 mph with 1/2 inch ice thickness and 50 mph under service loads.

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
100	101	3	rfs	APX16DWV-16DWV-S-E-A20 w/ mount pipe	6	1 5/8	-
		3	rfs	RFS ATMAA-1412D-1A20			
		3	rfs celwave	ATMPP1412D-1CWA			

Table 2 - Existing and Reserved Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
120	121	6	decibel	DB980H65T2E-M w/Mount Pipe	6	1 1/4	3
		9	ems wireless	FV65-14-00NA2 w/Mount Pipe	9	1 5/8	2
	120	1	tower mounts	Platform Mount [LP 305-1]	-	-	1
112	113	12	decibel	DB844H90E-XY w/Mount Pipe	12	7/8	1
	112	1	tower mounts	Platform Mount [LP 402-1]			
100	101	3	ems wireless	RR65-18-02DP w/Mount Pipe	6	1 5/8	1
		3	remec	Remec S20057A-1	-	-	4
	100	1	tower mounts	T-Arm Mount [TA 602-3]	-	-	1
93	94	6	decibel	DB844F90A-SX w/Mount Pipe	12	1 5/8	1
		6	decibel	DB948F85T2E-M w/ Mount Pipe			
	93	1	tower mounts	Platform Mount [LP 305-1]			
75	75	3	rfs	RFS APXV18-206517S-C w/ mount pipe	6	1 5/8	1
		1	tower mounts	Side Arm Mount [SO 101-3]			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
65	65	3	adc	ADC CG-1900DD-Full-DIN TMA	6	1 5/8	6
		3	ems wireless	MB96RR900200DPBL w/Mount Pipe			
		6	powerwave technologies	P65-15-XLH-RR w/ Mount Pipe	6	1 5/8	5
		6	powerwave technologies	TT19-08BP111-001			
		1	tower mounts	Pipe Mount [PM 601-3]	-	-	3
		1	tower mounts	Side Arm Mount [SO 102-3]			5
50	51	1	lucent	KS24019-L112A	1	1/2	1
	50	1	tower mounts	Side Arm Mount [SO 702-1]	-	-	

Notes:
1) Existing
2) MLA; Controls Over Existing
3) Existing; Does Not Control
4) Existing; To Be Removed
5) Reserved
6) Existing; Controls Over Reserved

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Reference	Source
3-GEOTECHNICAL REPORTS	Dr. Clarence Welti, 5/5/00	1629353	CCISITES
3-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	PJF, 29200-0802, 6/6/00	1629413	CCISITES
3-TOWER MANUFACTURER DRAWINGS	PJF, 29200-0802, 6/6/00	1629384	CCISITES
3-POST MOD BPSA	Vertical Solutions, 080828.04, 12/11/08	2611098	CCISITES
3-TOWER STRUCTURAL ANALYSIS REPORTS	PJF, 37511-0160 Revised, 2/16/11	2823214	CCISITES

3.1) Analysis Method

RISATower (version 5.4.2.0), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

3.2) Assumptions

1) Tower and structures were built in accordance with the manufacturer's specifications.
2) The tower and structures have been maintained in accordance with the manufacturer's specification.
3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
4) When applicable, transmission cables are considered as structural components for calculating wind loads as allowed by TIA/EIA-222-F.
5) Existing mounts were assumed based off pictures present on CCISites, using the best fit mount within the Crown Castle mount catalogue.
6) The existing, post installed #18J reinforcing anchors have a minimum allowable load capacity of 170 kips (based on proof load testing to a minimum of 212 kips).

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

4) ANALYSIS RESULTS

Table 4 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	123 - 82.25	Pole	TP28.114x22x0.1875	1	-8.32	782.55	72.3	Pass
L2	82.25 - 58	Pole	TP31.3777x27.2139x0.25	2	-12.72	1284.07	91.5	Pass
L3	58 - 40.75	Pole	TP33.966x31.3777x0.3265	3	-15.00	1779.04	82.0	Pass
L4	40.75 - 29.75	Pole	TP35.1164x32.6753x0.3424	4	-18.30	1964.67	91.3	Pass
L5	29.75 - 0	Pole	TP39.58x35.1164x0.3844	5	-24.78	2486.12	94.4	Pass
							Summary	
						Pole (L5)	94.4	Pass
						Rating =	94.4	Pass

Table 5 - Tower Component Stresses vs. Capacity - LC1

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1,4	Anchor Rods	0	96.3	Pass
1	Base Plate	0	62.5	Pass
1,2	Base Foundation Steel	0	75.8	Pass
1,2	Base Foundation Soil Interaction	0	61.7	Pass

Structure Rating (max from all components) =	96.3%

Notes:
1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.
2) According to the procedures prescribed and agreed to by the Crown Castle Engineering Foundation Committee, held in January 2010, the existing caisson foundation was analyzed using the methodology in the software 'PLS-Caisson' (Version 8.10, or newer, by Power Line Systems, Inc.). Per the methods in PLS-Caisson, the soil reactions of cohesive soils are calculated using 8CD independent of the depth of the soil layer. The depth of soil to be ignored at the top of the caisson is the greater of the geotechnical report's recommendation, the frost depth of the site or half of the caisson diameter.
3) Capacities up to 105% are considered acceptable based on analysis methods used.
4) Worst case; original and post installed.

APPENDIX A

RISA TOWER OUTPUT

Tower Input Data

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

Tower is located in Hartford County, Connecticut.
Basic wind speed of 80 mph.
Nominal ice thickness of 1.0000 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 38 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.
Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

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

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	123.00-82.25	40.75	3.50	18	22.0000	28.1140	0.1875	0.7500	A607-60 (60 ksi)
L2	82.25-58.00	27.75	0.00	18	27.2139	31.3777	0.2500	1.0000	A607-65 (65 ksi)
L3	58.00-40.75	17.25	4.25	18	31.3777	33.9660	0.3267	1.3068	65 ksi (w/ Reinf.) (65 ksi)
L4	40.75-29.75	15.25	0.00	18	32.6749	35.1164	0.3424	1.3696	65 ksi (w/ Reinf.) (65 ksi)
L5	29.75-0.00	29.75		18	35.1164	39.5800	0.3844	1.5376	65 ksi (w/ Reinf.) (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	22.3394	12.9812	780.3007	7.7434	11.1760	69.8193	1561.6281	6.4918	3.5420	18.891
	28.5477	16.6198	1637.5523	9.9139	14.2819	114.6592	3277.2593	8.3115	4.6181	24.63
L2	28.1670	21.3958	1965.3102	9.5722	13.8246	142.1599	3933.2064	10.6999	4.3496	17.399
	31.8618	24.6998	3023.6079	11.0503	15.9399	189.6884	6051.1944	12.3523	5.0825	20.33
L3	31.8618	32.1982	3922.1146	11.0231	15.9399	246.0569	7849.3900	16.1022	4.9475	15.144
	34.4900	34.8821	4986.9425	11.9420	17.2547	289.0189	9980.4469	17.4444	5.4030	16.538
L4	33.8699	35.1382	4640.8348	11.4780	16.5989	279.5877	9287.7761	17.5725	5.1482	15.036
	35.6581	37.7916	5773.5287	12.3448	17.8391	323.6442	11554.6543	18.8994	5.5779	16.29
L5	35.6581	42.3760	6458.2727	12.3299	17.8391	362.0286	12925.0433	21.1920	5.5039	14.318
	40.1906	47.8220	9281.9602	13.9144	20.1066	461.6366	18576.1339	23.9155	6.2895	16.362

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 123.00-82.25				1	1	1		
L2 82.25-58.00				1	1	1		
L3 58.00-40.75				1	1	1		
L4 40.75-29.75				1	1	1		
L5 29.75-0.00				1	1	1		

Feed Line/Linear Appurtenances - Entered As Round Or Flat

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

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
LDF7-50A (1-5/8 FOAM) (MLA)	C	No	Inside Pole	120.00 - 0.00	9	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82
						1" Ice	0.00	0.82
						2" Ice	0.00	0.82
						4" Ice	0.00	0.82
***								
**								
LDF5-50A (7/8 FOAM) (E)	C	No	Inside Pole	112.00 - 0.00	12	No Ice	0.00	0.33
						1/2" Ice	0.00	0.33
						1" Ice	0.00	0.33
						2" Ice	0.00	0.33
						4" Ice	0.00	0.33
***								
LDF7-50A (1-5/8	C	No	Inside Pole	100.00 - 0.00	6	No Ice	0.00	0.82

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
FOAM)						1/2" Ice	0.00	0.82
(P)						1" Ice	0.00	0.82
						2" Ice	0.00	0.82
						4" Ice	0.00	0.82
LDF7-50A (1-5/8	C	No	Inside Pole	100.00 - 0.00	6	No Ice	0.00	0.82
FOAM)						1/2" Ice	0.00	0.82
(E)						1" Ice	0.00	0.82
						2" Ice	0.00	0.82
						4" Ice	0.00	0.82
***								
LDF7-50A (1-5/8	C	No	Inside Pole	93.00 - 0.00	12	No Ice	0.00	0.82
FOAM)						1/2" Ice	0.00	0.82
(E)						1" Ice	0.00	0.82
						2" Ice	0.00	0.82
						4" Ice	0.00	0.82
***								
***								
AVA7-50 (1-5/8 LOW	C	No	CaAa (Out Of	75.00 - 0.00	1	No Ice	0.20	0.72
DENSI. FOAM)			Face)			1/2" Ice	0.30	2.23
(E)						1" Ice	0.40	4.36
						2" Ice	0.60	10.44
						4" Ice	1.00	29.94
AVA7-50 (1-5/8 LOW	C	No	CaAa (Out Of	75.00 - 0.00	1	No Ice	0.00	0.72
DENSI. FOAM)			Face)			1/2" Ice	0.00	2.23
(E)						1" Ice	0.00	4.36
						2" Ice	0.00	10.44
						4" Ice	0.00	29.94
AVA7-50 (1-5/8 LOW	C	No	Inside Pole	75.00 - 0.00	4	No Ice	0.00	0.72
DENSI. FOAM)						1/2" Ice	0.00	0.72
(E)						1" Ice	0.00	0.72
						2" Ice	0.00	0.72
						4" Ice	0.00	0.72
***								
LDF7-50A (1-5/8	C	No	Inside Pole	65.00 - 0.00	6	No Ice	0.00	0.82
FOAM)						1/2" Ice	0.00	0.82
(E)						1" Ice	0.00	0.82
						2" Ice	0.00	0.82
						4" Ice	0.00	0.82
LDF7-50A (1-5/8	C	No	CaAa (Out Of	65.00 - 0.00	1	No Ice	0.00	0.82
FOAM)			Face)			1/2" Ice	0.00	2.33
(R)						1" Ice	0.00	4.46
						2" Ice	0.00	10.54
						4" Ice	0.00	30.04
LDF7-50A (1-5/8	C	No	CaAa (Out Of	65.00 - 0.00	5	No Ice	0.00	0.82
FOAM)			Face)			1/2" Ice	0.00	2.33
(R)						1" Ice	0.00	4.46
						2" Ice	0.00	10.54
						4" Ice	0.00	30.04
****								
LDF4P-50A (1/2	C	No	Inside Pole	50.00 - 0.00	1	No Ice	0.00	0.15
FOAM)						1/2" Ice	0.00	0.15
(E)						1" Ice	0.00	0.15
						2" Ice	0.00	0.15
						4" Ice	0.00	0.15
**								
1.25" Plate	C	No	CaAa (Out Of	59.50 - 0.00	1	No Ice	0.35	0.00
			Face)			1/2" Ice	0.40	0.00
						1" Ice	0.66	0.00
						2" Ice	0.88	0.00
						4" Ice	1.32	0.00

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	123.00-82.25	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	0.68
L2	82.25-58.00	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	3.888	0.89
L3	58.00-40.75	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	9.415	0.78
L4	40.75-29.75	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	6.004	0.50
L5	29.75-0.00	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	16.237	1.35

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	123.00-82.25	A	1.145	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	0.68
L2	82.25-58.00	A	1.094	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	8.293	1.24
L3	58.00-40.75	A	1.049	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	18.550	1.32
L4	40.75-29.75	A	1.008	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	11.829	0.85
L5	29.75-0.00	A	1.000	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	31.373	2.22

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	123.00-82.25	0.0000	0.0000	0.0000	0.0000
L2	82.25-58.00	-0.2002	0.1156	-0.3737	0.2158
L3	58.00-40.75	-0.5906	0.3410	-0.9573	0.5527
L4	40.75-29.75	-0.5952	0.3436	-0.9713	0.5608
L5	29.75-0.00	-0.6032	0.3483	-0.9839	0.5680

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
3/4" x 8 ft lightning rod	C	None		0.0000	123.00	No Ice	0.60	0.60	0.01

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(not)							1/2" Ice	1.41	1.41	0.02
							1" Ice	2.25	2.25	0.03
							2" Ice	3.67	3.67	0.07
							4" Ice	5.74	5.74	0.21
***										
(3) FV65-14-00NA2 w/Mount Pipe (MLA)	A	From Face	4.00	0.00	0.0000	120.00	No Ice	8.64	6.95	0.06
			0.00	1.00			1/2" Ice	9.29	8.13	0.12
			1.00				1" Ice	9.91	9.02	0.20
							2" Ice	11.18	10.84	0.38
							4" Ice	13.83	14.85	0.89
(3) FV65-14-00NA2 w/Mount Pipe (MLA)	B	From Face	4.00	0.00	0.0000	120.00	No Ice	8.64	6.95	0.06
			0.00	1.00			1/2" Ice	9.29	8.13	0.12
			1.00				1" Ice	9.91	9.02	0.20
							2" Ice	11.18	10.84	0.38
							4" Ice	13.83	14.85	0.89
(3) FV65-14-00NA2 w/Mount Pipe (MLA)	C	From Face	4.00	0.00	0.0000	120.00	No Ice	8.64	6.95	0.06
			0.00	1.00			1/2" Ice	9.29	8.13	0.12
			1.00				1" Ice	9.91	9.02	0.20
							2" Ice	11.18	10.84	0.38
							4" Ice	13.83	14.85	0.89
Platform Mount [LP 305-1] (E)	C	None			0.0000	120.00	No Ice	18.01	18.01	1.12
							1/2" Ice	23.33	23.33	1.35
							1" Ice	28.65	28.65	1.58
							2" Ice	39.29	39.29	2.05
							4" Ice	60.57	60.57	2.97
**										
(4) DB844H90E-XY w/Mount Pipe (E)	A	From Face	4.00	0.00	0.0000	112.00	No Ice	3.58	5.40	0.04
			0.00	1.00			1/2" Ice	4.20	6.49	0.08
			1.00				1" Ice	4.73	7.30	0.13
							2" Ice	5.86	8.96	0.25
							4" Ice	8.27	12.49	0.62
(4) DB844H90E-XY w/Mount Pipe (E)	B	From Face	4.00	0.00	0.0000	112.00	No Ice	3.58	5.40	0.04
			0.00	1.00			1/2" Ice	4.20	6.49	0.08
			1.00				1" Ice	4.73	7.30	0.13
							2" Ice	5.86	8.96	0.25
							4" Ice	8.27	12.49	0.62
(4) DB844H90E-XY w/Mount Pipe (E)	C	From Face	4.00	0.00	0.0000	112.00	No Ice	3.58	5.40	0.04
			0.00	1.00			1/2" Ice	4.20	6.49	0.08
			1.00				1" Ice	4.73	7.30	0.13
							2" Ice	5.86	8.96	0.25
							4" Ice	8.27	12.49	0.62
Platform Mount [LP 402-1] (E)	C	None			0.0000	112.00	No Ice	33.04	33.04	2.17
							1/2" Ice	43.38	43.38	2.68
							1" Ice	53.72	53.72	3.19
							2" Ice	74.40	74.40	4.21
							4" Ice	115.76	115.76	6.26
***										
APX16DWV-16DWV-S-E-A20 w/ mount pipe (P)	A	From Face	4.00	0.00	0.0000	100.00	No Ice	7.27	3.46	0.06
			0.00	1.00			1/2" Ice	7.78	4.19	0.11
			1.00				1" Ice	8.29	4.88	0.16
							2" Ice	9.34	6.31	0.29
							4" Ice	11.57	9.36	0.67
APX16DWV-16DWV-S-E-A20 w/ mount pipe (P)	B	From Face	4.00	0.00	0.0000	100.00	No Ice	7.27	3.46	0.06
			0.00	1.00			1/2" Ice	7.78	4.19	0.11
			1.00				1" Ice	8.29	4.88	0.16

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						1" Ice	9.34	6.31	0.29
						2" Ice	11.57	9.36	0.67
						4" Ice			
APX16DWV-16DWV-S-E-A20 w/ mount pipe (P)	C	From Face	4.00 0.00 1.00	0.0000	100.00	No Ice	7.27	3.46	0.06
						1/2" Ice	7.78	4.19	0.11
						1" Ice	8.29	4.88	0.16
						2" Ice	9.34	6.31	0.29
						4" Ice	11.57	9.36	0.67
RFS ATMAA-1412D-1A20 (P)	A	From Face	4.00 0.00 1.00	0.0000	100.00	No Ice	1.17	0.47	0.01
						1/2" Ice	1.31	0.57	0.01
						1" Ice	1.47	0.69	0.02
						2" Ice	1.81	0.95	0.05
						4" Ice	2.58	1.57	0.13
RFS ATMAA-1412D-1A20 (P)	B	From Face	4.00 0.00 1.00	0.0000	100.00	No Ice	1.17	0.47	0.01
						1/2" Ice	1.31	0.57	0.01
						1" Ice	1.47	0.69	0.02
						2" Ice	1.81	0.95	0.05
						4" Ice	2.58	1.57	0.13
RFS ATMAA-1412D-1A20 (P)	C	From Face	4.00 0.00 1.00	0.0000	100.00	No Ice	1.17	0.47	0.01
						1/2" Ice	1.31	0.57	0.01
						1" Ice	1.47	0.69	0.02
						2" Ice	1.81	0.95	0.05
						4" Ice	2.58	1.57	0.13
ATMPP1412D-1CWA (P)	A	From Face	4.00 0.00 1.00	0.0000	100.00	No Ice	1.17	0.42	0.01
						1/2" Ice	1.32	0.53	0.02
						1" Ice	1.48	0.65	0.03
						2" Ice	1.82	0.92	0.05
						4" Ice	2.61	1.57	0.13
ATMPP1412D-1CWA (P)	B	From Face	4.00 0.00 1.00	0.0000	100.00	No Ice	1.17	0.42	0.01
						1/2" Ice	1.32	0.53	0.02
						1" Ice	1.48	0.65	0.03
						2" Ice	1.82	0.92	0.05
						4" Ice	2.61	1.57	0.13
ATMPP1412D-1CWA (P)	C	From Face	4.00 0.00 1.00	0.0000	100.00	No Ice	1.17	0.42	0.01
						1/2" Ice	1.32	0.53	0.02
						1" Ice	1.48	0.65	0.03
						2" Ice	1.82	0.92	0.05
						4" Ice	2.61	1.57	0.13
RR65-18-02DP w/Mount Pipe (E)	A	From Face	4.00 0.00 1.00	0.0000	100.00	No Ice	4.91	3.64	0.04
						1/2" Ice	5.57	4.70	0.08
						1" Ice	6.14	5.48	0.13
						2" Ice	7.32	7.08	0.25
						4" Ice	9.81	10.47	0.61
RR65-18-02DP w/Mount Pipe (E)	B	From Face	4.00 0.00 1.00	0.0000	100.00	No Ice	4.91	3.64	0.04
						1/2" Ice	5.57	4.70	0.08
						1" Ice	6.14	5.48	0.13
						2" Ice	7.32	7.08	0.25
						4" Ice	9.81	10.47	0.61
RR65-18-02DP w/Mount Pipe (E)	C	From Face	4.00 0.00 1.00	0.0000	100.00	No Ice	4.91	3.64	0.04
						1/2" Ice	5.57	4.70	0.08
						1" Ice	6.14	5.48	0.13
						2" Ice	7.32	7.08	0.25
						4" Ice	9.81	10.47	0.61
T-Arm Mount [TA 602-3] (E)	C	None		0.0000	100.00	No Ice	11.59	11.59	0.77
						1/2" Ice	15.44	15.44	0.99

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						Ice	19.29	19.29	1.21
						1" Ice	26.99	26.99	1.64
						2" Ice	42.39	42.39	2.50
						4" Ice			
***									
(2) DB844F90A-SX w/Mount Pipe (E)	A	From Face	4.00 0.00 1.00	0.0000	93.00	No Ice	3.77	5.40	0.04
						1/2" Ice	4.42	6.49	0.08
						1" Ice	4.97	7.30	0.13
						2" Ice	6.10	8.96	0.25
						4" Ice	8.53	12.49	0.62
(2) DB844F90A-SX w/Mount Pipe (E)	B	From Face	4.00 0.00 1.00	0.0000	93.00	No Ice	3.77	5.40	0.04
						1/2" Ice	4.42	6.49	0.08
						1" Ice	4.97	7.30	0.13
						2" Ice	6.10	8.96	0.25
						4" Ice	8.53	12.49	0.62
(2) DB844F90A-SX w/Mount Pipe (E)	C	From Face	4.00 0.00 1.00	0.0000	93.00	No Ice	3.77	5.40	0.04
						1/2" Ice	4.42	6.49	0.08
						1" Ice	4.97	7.30	0.13
						2" Ice	6.10	8.96	0.25
						4" Ice	8.53	12.49	0.62
(2) DB948F85T2E-M w/ Mount Pipe (E)	A	From Face	4.00 0.00 1.00	0.0000	93.00	No Ice	2.13	4.45	0.03
						1/2" Ice	2.49	5.12	0.06
						1" Ice	2.86	5.80	0.10
						2" Ice	3.62	7.22	0.19
						4" Ice	5.36	10.31	0.49
(2) DB948F85T2E-M w/ Mount Pipe (E)	B	From Face	4.00 0.00 1.00	0.0000	93.00	No Ice	2.13	4.45	0.03
						1/2" Ice	2.49	5.12	0.06
						1" Ice	2.86	5.80	0.10
						2" Ice	3.62	7.22	0.19
						4" Ice	5.36	10.31	0.49
(2) DB948F85T2E-M w/ Mount Pipe (E)	C	From Face	4.00 0.00 1.00	0.0000	93.00	No Ice	2.13	4.45	0.03
						1/2" Ice	2.49	5.12	0.06
						1" Ice	2.86	5.80	0.10
						2" Ice	3.62	7.22	0.19
						4" Ice	5.36	10.31	0.49
Platform Mount [LP 305-1] (E)	C	None		0.0000	93.00	No Ice	18.01	18.01	1.12
						1/2" Ice	23.33	23.33	1.35
						1" Ice	28.65	28.65	1.58
						2" Ice	39.29	39.29	2.05
						4" Ice	60.57	60.57	2.97
***									
***									
RFS APXV18-206517S-C w/ mount pipe (E)	A	From Face	1.00 0.00 0.00	0.0000	75.00	No Ice	5.45	5.05	0.07
						1/2" Ice	5.99	6.06	0.11
						1" Ice	6.51	6.93	0.17
						2" Ice	7.57	8.71	0.31
						4" Ice	9.95	12.48	0.72
RFS APXV18-206517S-C w/ mount pipe (E)	B	From Face	1.00 0.00 0.00	0.0000	75.00	No Ice	5.45	5.05	0.07
						1/2" Ice	5.99	6.06	0.11
						1" Ice	6.51	6.93	0.17
						2" Ice	7.57	8.71	0.31
						4" Ice	9.95	12.48	0.72
RFS APXV18-206517S-C w/ mount pipe (E)	C	From Face	1.00 0.00 0.00	0.0000	75.00	No Ice	5.45	5.05	0.07
						1/2" Ice	5.99	6.06	0.11
						1" Ice	6.51	6.93	0.17
						2" Ice	7.57	8.71	0.31

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						2" Ice	9.95	12.48	0.72
						4" Ice			
Side Arm Mount [SO 101-3]	C	None		0.0000	75.00	No Ice	7.50	7.50	0.25
(E)						1/2" Ice	8.90	8.90	0.33
						1" Ice	10.30	10.30	0.41
						2" Ice	13.10	13.10	0.58
						4" Ice	18.70	18.70	0.90
***									
MB96RR900200DPBL w/Mount Pipe	A	From Face	1.00 0.00	0.0000	65.00	No Ice	11.47	9.48	0.07
(E)			0.00			1/2" Ice	12.08	10.90	0.15
						1" Ice	12.71	12.17	0.25
						2" Ice	14.07	14.38	0.47
						4" Ice	17.08	19.00	1.10
MB96RR900200DPBL w/Mount Pipe	B	From Face	1.00 0.00	0.0000	65.00	No Ice	11.47	9.48	0.07
(E)			0.00			1/2" Ice	12.08	10.90	0.15
						1" Ice	12.71	12.17	0.25
						2" Ice	14.07	14.38	0.47
						4" Ice	17.08	19.00	1.10
MB96RR900200DPBL w/Mount Pipe	C	From Face	1.00 0.00	0.0000	65.00	No Ice	11.47	9.48	0.07
(E)			0.00			1/2" Ice	12.08	10.90	0.15
						1" Ice	12.71	12.17	0.25
						2" Ice	14.07	14.38	0.47
						4" Ice	17.08	19.00	1.10
ADC CG-1900DD-Full-DIN TMA	A	From Face	1.00 0.00	0.0000	65.00	No Ice	1.29	0.32	0.02
(E)			0.00			1/2" Ice	1.44	0.42	0.02
						1" Ice	1.60	0.52	0.03
						2" Ice	1.95	0.76	0.06
						4" Ice	2.75	1.35	0.14
ADC CG-1900DD-Full-DIN TMA	B	From Face	1.00 0.00	0.0000	65.00	No Ice	1.29	0.32	0.02
(E)			0.00			1/2" Ice	1.44	0.42	0.02
						1" Ice	1.60	0.52	0.03
						2" Ice	1.95	0.76	0.06
						4" Ice	2.75	1.35	0.14
ADC CG-1900DD-Full-DIN TMA	C	From Face	1.00 0.00	0.0000	65.00	No Ice	1.29	0.32	0.02
(E)			0.00			1/2" Ice	1.44	0.42	0.02
						1" Ice	1.60	0.52	0.03
						2" Ice	1.95	0.76	0.06
						4" Ice	2.75	1.35	0.14
Pipe Mount [PM 601-3]	C	None		0.0000	65.00	No Ice	4.39	4.39	0.20
(E)						1/2" Ice	5.48	5.48	0.24
						1" Ice	6.57	6.57	0.28
						2" Ice	8.75	8.75	0.36
						4" Ice	13.11	13.11	0.53
***									
KS24019-L112A	C	From Face	2.00 0.00	0.0000	50.00	No Ice	0.10	0.10	0.01
(E)			1.00			1/2" Ice	0.18	0.18	0.01
						1" Ice	0.26	0.26	0.01
						2" Ice	0.42	0.42	0.01
						4" Ice	0.74	0.74	0.02
Side Arm Mount [SO 702-1]	C	None		0.0000	50.00	No Ice	1.00	1.43	0.03
(E)						1/2" Ice	1.00	2.05	0.04
						1" Ice	1.00	2.67	0.05
						2" Ice	1.00	3.91	0.07
						4" Ice	1.00	6.39	0.12

Tower Pressures - No Ice

G_H = 1.690

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 123.00-82.25	102.09	1.381	23	85.089	A	0.000	85.089	85.089	100.00	0.000	0.000
					B	0.000	85.089		100.00	0.000	0.000
					C	0.000	85.089		100.00	0.000	0.000
L2 82.25-58.00	69.88	1.239	20	59.733	A	0.000	59.733	59.733	100.00	0.000	0.000
					B	0.000	59.733		100.00	0.000	0.000
					C	0.000	59.733		100.00	0.000	3.888
L3 58.00-40.75	49.26	1.121	18	46.966	A	0.000	46.966	46.966	100.00	0.000	0.000
					B	0.000	46.966		100.00	0.000	0.000
					C	0.000	46.966		100.00	0.000	9.415
L4 40.75-29.75	35.20	1.019	17	31.383	A	0.000	31.383	31.383	100.00	0.000	0.000
					B	0.000	31.383		100.00	0.000	0.000
					C	0.000	31.383		100.00	0.000	6.004
L5 29.75-0.00	14.58	1	16	92.592	A	0.000	92.592	92.592	100.00	0.000	0.000
					B	0.000	92.592		100.00	0.000	0.000
					C	0.000	92.592		100.00	0.000	16.237

Tower Pressure - With Ice

G_H = 1.690

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 123.00-82.25	102.09	1.381	5	1.1451	92.867	A	0.000	92.867	92.867	100.00	0.000	0.000
						B	0.000	92.867		100.00	0.000	0.000
						C	0.000	92.867		100.00	0.000	0.000
L2 82.25-58.00	69.88	1.239	4	1.0942	64.361	A	0.000	64.361	64.361	100.00	0.000	0.000
						B	0.000	64.361		100.00	0.000	0.000
						C	0.000	64.361		100.00	0.000	8.293
L3 58.00-40.75	49.26	1.121	4	1.0492	49.982	A	0.000	49.982	49.982	100.00	0.000	0.000
						B	0.000	49.982		100.00	0.000	0.000
						C	0.000	49.982		100.00	0.000	18.550
L4 40.75-29.75	35.20	1.019	4	1.0078	33.306	A	0.000	33.306	33.306	100.00	0.000	0.000
						B	0.000	33.306		100.00	0.000	0.000
						C	0.000	33.306		100.00	0.000	11.829
L5 29.75-0.00	14.58	1	4	1.0000	97.551	A	0.000	97.551	97.551	100.00	0.000	0.000
						B	0.000	97.551		100.00	0.000	0.000
						C	0.000	97.551		100.00	0.000	31.373

Tower Pressure - Service

G_H = 1.690

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 123.00-	102.09	1.381	9	85.089	A	0.000	85.089	85.089	100.00	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
82.25					B	0.000	85.089		100.00	0.000	0.000
					C	0.000	85.089		100.00	0.000	0.000
L2 82.25-58.00	69.88	1.239	8	59.733	A	0.000	59.733	59.733	100.00	0.000	0.000
					B	0.000	59.733		100.00	0.000	0.000
					C	0.000	59.733		100.00	0.000	3.888
L3 58.00-40.75	49.26	1.121	7	46.966	A	0.000	46.966	46.966	100.00	0.000	0.000
					B	0.000	46.966		100.00	0.000	0.000
					C	0.000	46.966		100.00	0.000	9.415
L4 40.75-29.75	35.20	1.019	7	31.383	A	0.000	31.383	31.383	100.00	0.000	0.000
					B	0.000	31.383		100.00	0.000	0.000
					C	0.000	31.383		100.00	0.000	6.004
L5 29.75-0.00	14.58	1	6	92.592	A	0.000	92.592	92.592	100.00	0.000	0.000
					B	0.000	92.592		100.00	0.000	0.000
					C	0.000	92.592		100.00	0.000	16.237

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
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	123 - 82.25	Pole	Max Tension	24	0.00	-0.00	0.00
			Max. Compression	14	-18.33	0.00	0.00
			Max. Mx	11	-8.32	313.89	-0.00
			Max. My	8	-8.32	0.00	-313.89
			Max. Vy	11	-13.81	313.89	-0.00
			Max. Vx	8	13.81	0.00	-313.89
			Max. Torque	26			0.00
L2	82.25 - 58	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-25.44	0.44	-0.26
			Max. Mx	11	-12.72	743.10	-0.04
			Max. My	8	-12.72	0.08	-743.07
			Max. Vy	11	-17.57	743.10	-0.04
			Max. Vx	8	17.57	0.08	-743.07
			Max. Torque	13			0.03
L3	58 - 40.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-28.53	1.02	-0.62
			Max. Mx	11	-15.00	977.24	-0.12
			Max. My	8	-15.00	0.17	-977.19
			Max. Vy	11	-18.47	977.24	-0.12
			Max. Vx	8	18.47	0.17	-977.19
			Max. Torque	13			0.09
L4	40.75 - 29.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-32.95	1.73	-1.03
			Max. Mx	11	-18.30	1266.52	-0.19
			Max. My	8	-18.30	0.29	-1266.41
			Max. Vy	11	-19.40	1266.52	-0.19
			Max. Vx	8	19.40	0.29	-1266.41
			Max. Torque	13			0.15
L5	29.75 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-41.14	3.15	-1.85
			Max. Mx	11	-24.78	1867.35	-0.33
			Max. My	8	-24.78	0.55	-1867.14
			Max. Vy	11	-20.98	1867.35	-0.33
			Max. Vx	8	20.98	0.55	-1867.14
			Max. Torque	13			0.27

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	24	41.14	6.19	-0.00
	Max. H_x	11	24.79	20.96	-0.00
	Max. H_z	2	24.79	0.00	20.96
	Max. M_x	2	1866.47	0.00	20.96
	Max. M_z	5	1866.25	-20.96	-0.00
	Max. Torsion	13	0.27	10.48	18.15
	Min. Vert	1	24.79	0.00	0.00
	Min. H_x	5	24.79	-20.96	-0.00
	Min. H_z	8	24.79	0.00	-20.96
	Min. M_x	8	-1867.14	0.00	-20.96
	Min. M_z	11	-1867.35	20.96	-0.00
	Min. Torsion	7	-0.27	-10.48	-18.15

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	24.79	0.00	0.00	0.33	0.54	0.00

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead+Wind 0 deg - No Ice	24.79	-0.00	-20.96	-1866.47	0.55	-0.23
Dead+Wind 30 deg - No Ice	24.79	10.48	-18.15	-1616.37	-932.86	-0.13
Dead+Wind 60 deg - No Ice	24.79	18.15	-10.48	-933.07	-1616.16	0.01
Dead+Wind 90 deg - No Ice	24.79	20.96	0.00	0.33	-1866.25	0.14
Dead+Wind 120 deg - No Ice	24.79	18.15	10.48	933.74	-1616.15	0.24
Dead+Wind 150 deg - No Ice	24.79	10.48	18.15	1617.04	-932.86	0.27
Dead+Wind 180 deg - No Ice	24.79	-0.00	20.96	1867.14	0.55	0.23
Dead+Wind 210 deg - No Ice	24.79	-10.48	18.15	1617.04	933.95	0.13
Dead+Wind 240 deg - No Ice	24.79	-18.15	10.48	933.74	1617.25	-0.01
Dead+Wind 270 deg - No Ice	24.79	-20.96	0.00	0.33	1867.35	-0.14
Dead+Wind 300 deg - No Ice	24.79	-18.15	-10.48	-933.07	1617.25	-0.24
Dead+Wind 330 deg - No Ice	24.79	-10.48	-18.15	-1616.37	933.95	-0.27
Dead+Ice	41.14	0.00	0.00	1.85	3.15	0.00
Dead+Wind 0 deg+Ice	41.14	-0.00	-6.19	-579.86	3.32	-0.10
Dead+Wind 30 deg+Ice	41.14	3.10	-5.36	-501.94	-287.60	-0.06
Dead+Wind 60 deg+Ice	41.14	5.36	-3.10	-288.97	-500.56	0.01
Dead+Wind 90 deg+Ice	41.14	6.19	0.00	1.95	-578.48	0.07
Dead+Wind 120 deg+Ice	41.14	5.36	3.10	292.87	-500.56	0.11
Dead+Wind 150 deg+Ice	41.14	3.10	5.36	505.83	-287.59	0.12
Dead+Wind 180 deg+Ice	41.14	-0.00	6.19	583.75	3.32	0.10
Dead+Wind 210 deg+Ice	41.14	-3.10	5.36	505.83	294.24	0.06
Dead+Wind 240 deg+Ice	41.14	-5.36	3.10	292.87	507.21	-0.01
Dead+Wind 270 deg+Ice	41.14	-6.19	0.00	1.95	585.13	-0.07
Dead+Wind 300 deg+Ice	41.14	-5.36	-3.10	-288.97	507.21	-0.11
Dead+Wind 330 deg+Ice	41.14	-3.10	-5.36	-501.94	294.24	-0.12
Dead+Wind 0 deg - Service	24.79	-0.00	-8.19	-729.92	0.55	-0.09
Dead+Wind 30 deg - Service	24.79	4.09	-7.09	-632.09	-364.58	-0.05
Dead+Wind 60 deg - Service	24.79	7.09	-4.09	-364.80	-631.88	0.00
Dead+Wind 90 deg - Service	24.79	8.19	0.00	0.34	-729.71	0.06
Dead+Wind 120 deg - Service	24.79	7.09	4.09	365.47	-631.88	0.09
Dead+Wind 150 deg - Service	24.79	4.09	7.09	632.76	-364.58	0.11
Dead+Wind 180 deg - Service	24.79	-0.00	8.19	730.59	0.55	0.09
Dead+Wind 210 deg - Service	24.79	-4.09	7.09	632.76	365.68	0.05
Dead+Wind 240 deg - Service	24.79	-7.09	4.09	365.47	632.98	-0.00
Dead+Wind 270 deg - Service	24.79	-8.19	0.00	0.34	730.81	-0.06
Dead+Wind 300 deg - Service	24.79	-7.09	-4.09	-364.80	632.98	-0.09
Dead+Wind 330 deg - Service	24.79	-4.09	-7.09	-632.09	365.68	-0.11

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.00	-24.79	0.00	0.00	24.79	0.00	0.000%
2	0.00	-24.79	-20.96	0.00	24.79	20.96	0.000%
3	10.48	-24.79	-18.15	-10.48	24.79	18.15	0.000%
4	18.15	-24.79	-10.48	-18.15	24.79	10.48	0.000%
5	20.96	-24.79	0.00	-20.96	24.79	-0.00	0.000%
6	18.15	-24.79	10.48	-18.15	24.79	-10.48	0.000%
7	10.48	-24.79	18.15	-10.48	24.79	-18.15	0.000%
8	0.00	-24.79	20.96	0.00	24.79	-20.96	0.000%
9	-10.48	-24.79	18.15	10.48	24.79	-18.15	0.000%
10	-18.15	-24.79	10.48	18.15	24.79	-10.48	0.000%
11	-20.96	-24.79	0.00	20.96	24.79	-0.00	0.000%
12	-18.15	-24.79	-10.48	18.15	24.79	10.48	0.000%
13	-10.48	-24.79	-18.15	10.48	24.79	18.15	0.000%
14	0.00	-41.14	0.00	0.00	41.14	0.00	0.000%
15	0.00	-41.14	-6.19	0.00	41.14	6.19	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
16	3.10	-41.14	-5.36	-3.10	41.14	5.36	0.000%
17	5.36	-41.14	-3.10	-5.36	41.14	3.10	0.000%
18	6.19	-41.14	0.00	-6.19	41.14	-0.00	0.000%
19	5.36	-41.14	3.10	-5.36	41.14	-3.10	0.000%
20	3.10	-41.14	5.36	-3.10	41.14	-5.36	0.000%
21	0.00	-41.14	6.19	0.00	41.14	-6.19	0.000%
22	-3.10	-41.14	5.36	3.10	41.14	-5.36	0.000%
23	-5.36	-41.14	3.10	5.36	41.14	-3.10	0.000%
24	-6.19	-41.14	0.00	6.19	41.14	-0.00	0.000%
25	-5.36	-41.14	-3.10	5.36	41.14	3.10	0.000%
26	-3.10	-41.14	-5.36	3.10	41.14	5.36	0.000%
27	0.00	-24.79	-8.19	0.00	24.79	8.19	0.000%
28	4.09	-24.79	-7.09	-4.09	24.79	7.09	0.000%
29	7.09	-24.79	-4.09	-7.09	24.79	4.09	0.000%
30	8.19	-24.79	0.00	-8.19	24.79	0.00	0.000%
31	7.09	-24.79	4.09	-7.09	24.79	-4.09	0.000%
32	4.09	-24.79	7.09	-4.09	24.79	-7.09	0.000%
33	0.00	-24.79	8.19	0.00	24.79	-8.19	0.000%
34	-4.09	-24.79	7.09	4.09	24.79	-7.09	0.000%
35	-7.09	-24.79	4.09	7.09	24.79	-4.09	0.000%
36	-8.19	-24.79	0.00	8.19	24.79	0.00	0.000%
37	-7.09	-24.79	-4.09	7.09	24.79	4.09	0.000%
38	-4.09	-24.79	-7.09	4.09	24.79	7.09	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00041418
3	Yes	6	0.00000001	0.00005588
4	Yes	6	0.00000001	0.00005595
5	Yes	4	0.00000001	0.00039581
6	Yes	6	0.00000001	0.00005614
7	Yes	6	0.00000001	0.00005580
8	Yes	4	0.00000001	0.00041427
9	Yes	6	0.00000001	0.00005610
10	Yes	6	0.00000001	0.00005603
11	Yes	4	0.00000001	0.00039595
12	Yes	6	0.00000001	0.00005584
13	Yes	6	0.00000001	0.00005618
14	Yes	4	0.00000001	0.00000001
15	Yes	4	0.00000001	0.00066328
16	Yes	5	0.00000001	0.00032989
17	Yes	5	0.00000001	0.00033134
18	Yes	4	0.00000001	0.00065789
19	Yes	5	0.00000001	0.00033801
20	Yes	5	0.00000001	0.00033100
21	Yes	4	0.00000001	0.00066689
22	Yes	5	0.00000001	0.00034175
23	Yes	5	0.00000001	0.00034028
24	Yes	4	0.00000001	0.00066397
25	Yes	5	0.00000001	0.00033358
26	Yes	5	0.00000001	0.00034061
27	Yes	4	0.00000001	0.00020800
28	Yes	5	0.00000001	0.00014710
29	Yes	5	0.00000001	0.00014745
30	Yes	4	0.00000001	0.00020611
31	Yes	5	0.00000001	0.00014849
32	Yes	5	0.00000001	0.00014682
33	Yes	4	0.00000001	0.00020813
34	Yes	5	0.00000001	0.00014841
35	Yes	5	0.00000001	0.00014805
36	Yes	4	0.00000001	0.00020632
37	Yes	5	0.00000001	0.00014703

38	Yes	5	0.00000001	0.00014870

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	123 - 82.25	33.864	36	2.2555	0.0002
L2	85.75 - 58	17.155	35	1.8788	0.0002
L3	58 - 40.75	7.816	35	1.2669	0.0002
L4	45 - 29.75	4.754	35	0.9783	0.0002
L5	29.75 - 0	2.072	35	0.6624	0.0001

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
123.00	3/4" x 8 ft lightning rod	36	33.864	2.2555	0.0002	22483
120.00	(3) FV65-14-00NA2 w/Mount Pipe	36	32.444	2.2360	0.0002	22483
112.00	(4) DB844H90E-XY w/Mount Pipe	36	28.681	2.1808	0.0002	10219
100.00	APX16DWV-16DWV-S-E-A20 w/ mount pipe	35	23.194	2.0746	0.0002	4886
93.00	(2) DB844F90A-SX w/Mount Pipe	35	20.146	1.9904	0.0002	3745
75.00	RFS APXV18-206517S-C w/ mount pipe	35	13.107	1.6636	0.0002	2616
65.00	MB96RR900200DPBL w/Mount Pipe	35	9.816	1.4321	0.0002	2329
50.00	KS24019-L112A	35	5.845	1.0861	0.0002	2883

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	123 - 82.25	86.385	11	5.7569	0.0005
L2	85.75 - 58	43.787	11	4.7964	0.0005
L3	58 - 40.75	19.960	11	3.2353	0.0004
L4	45 - 29.75	12.142	11	2.4985	0.0004
L5	29.75 - 0	5.293	11	1.6920	0.0003

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
123.00	3/4" x 8 ft lightning rod	11	86.385	5.7569	0.0005	8960
120.00	(3) FV65-14-00NA2 w/Mount Pipe	11	82.767	5.7072	0.0005	8960
112.00	(4) DB844H90E-XY w/Mount Pipe	11	73.175	5.5665	0.0005	4071
100.00	APX16DWV-16DWV-S-E-A20 w/ mount pipe	11	59.188	5.2959	0.0005	1945

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
93.00	(2) DB844F90A-SX w/Mount Pipe	11	51.415	5.0812	0.0005	1489
75.00	RFS APXV18-206517S-C w/ mount pipe	11	33.461	4.2475	0.0005	1035
65.00	MB96RR900200DPBL w/Mount Pipe	11	25.064	3.6568	0.0005	919
50.00	KS24019-L112A	11	14.928	2.7738	0.0004	1134

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
L1	123 - 82.25 (1)	TP28.114x22x0.1875	40.75	0.00	0.0	36.000	16.3072	-8.32	587.06	0.014
L2	82.25 - 58 (2)	TP31.3777x27.2139x0.25	27.75	0.00	0.0	39.000	24.6998	-12.72	963.29	0.013
L3	58 - 40.75 (3)	TP33.966x31.3777x0.3267	17.25	0.00	0.0	39.000	34.2209	-15.00	1334.61	0.011
L4	40.75 - 29.75 (4)	TP35.1164x32.6749x0.3424	15.25	0.00	0.0	39.000	37.7916	-18.30	1473.87	0.012
L5	29.75 - 0 (5)	TP39.58x35.1164x0.3844	29.75	0.00	0.0	39.000	47.8220	-24.78	1865.06	0.013

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	123 - 82.25 (1)	TP28.114x22x0.1875	313.89	34.127	36.000	0.948	0.00	0.000	36.000	0.000
L2	82.25 - 58 (2)	TP31.3777x27.2139x0.25	743.11	47.010	39.000	1.205	0.00	0.000	39.000	0.000
L3	58 - 40.75 (3)	TP33.966x31.3777x0.3267	977.28	42.168	39.000	1.081	0.00	0.000	39.000	0.000
L4	40.75 - 29.75 (4)	TP35.1164x32.6749x0.3424	1266.58	46.962	39.000	1.204	0.00	0.000	39.000	0.000
L5	29.75 - 0 (5)	TP39.58x35.1164x0.3844	1867.45	48.543	39.000	1.245	0.00	0.000	39.000	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V K	Actual f_v ksi	Allow. F_v ksi	Ratio $\frac{f_v}{F_v}$	Actual T kip-ft	Actual f_{vt} ksi	Allow. F_{vt} ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	123 - 82.25 (1)	TP28.114x22x0.1875	13.81	0.847	24.000	0.071	0.00	0.000	24.000	0.000
L2	82.25 - 58 (2)	TP31.3777x27.2139x0.25	17.57	0.711	26.000	0.055	0.00	0.000	26.000	0.000
L3	58 - 40.75 (3)	TP33.966x31.3777x0.3267	18.47	0.540	26.000	0.041	0.01	0.000	26.000	0.000
L4	40.75 - 29.75 (4)	TP35.1164x32.6749x0.3424	19.40	0.513	26.000	0.039	0.01	0.000	26.000	0.000
L5	29.75 - 0 (5)	TP39.58x35.1164x0.3844	20.98	0.439	26.000	0.034	0.01	0.000	26.000	0.000

Pole Interaction Design Data

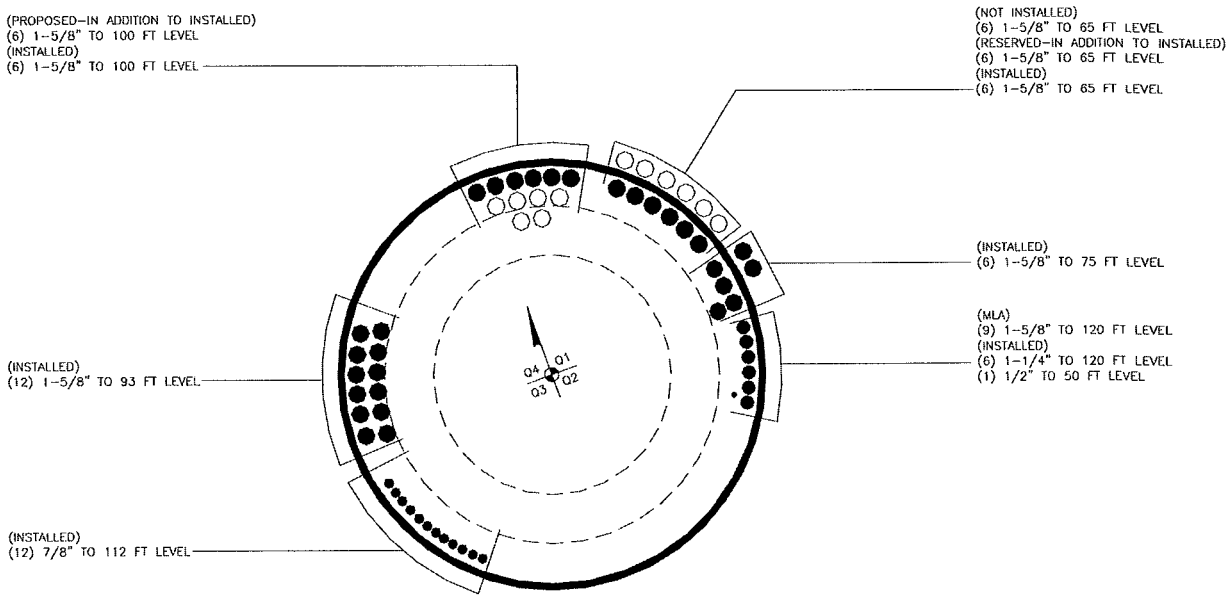
Section No.	Elevation ft	Ratio P / P_a	Ratio f_{bx} / F_{bx}	Ratio f_{by} / F_{by}	Ratio f_v / F_v	Ratio f_{vt} / F_{vt}	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	123 - 82.25 (1)	0.014	0.948	0.000	0.071	0.000	0.963 ✓	1.333	H1-3+VT ✓
L2	82.25 - 58 (2)	0.013	1.205	0.000	0.055	0.000	1.219 ✓	1.333	H1-3+VT ✓
L3	58 - 40.75 (3)	0.011	1.081	0.000	0.041	0.000	1.093 ✓	1.333	H1-3+VT ✓
L4	40.75 - 29.75 (4)	0.012	1.204	0.000	0.039	0.000	1.217 ✓	1.333	H1-3+VT ✓
L5	29.75 - 0 (5)	0.013	1.245	0.000	0.034	0.000	1.258 ✓	1.333	H1-3+VT ✓

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
L1	123 - 82.25	Pole	TP28.114x22x0.1875	1	-8.32	782.55	72.3	Pass
L2	82.25 - 58	Pole	TP31.3777x27.2139x0.25	2	-12.72	1284.07	91.5	Pass
L3	58 - 40.75	Pole	TP33.966x31.3777x0.3267	3	-15.00	1779.04	82.0	Pass
L4	40.75 - 29.75	Pole	TP35.1164x32.6749x0.3424	4	-18.30	1964.67	91.3	Pass
L5	29.75 - 0	Pole	TP39.58x35.1164x0.3844	5	-24.78	2486.12	94.4	Pass
							Summary	
						Pole (L5)	94.4	Pass
						RATING =	**94.4**	**Pass**

APPENDIX B

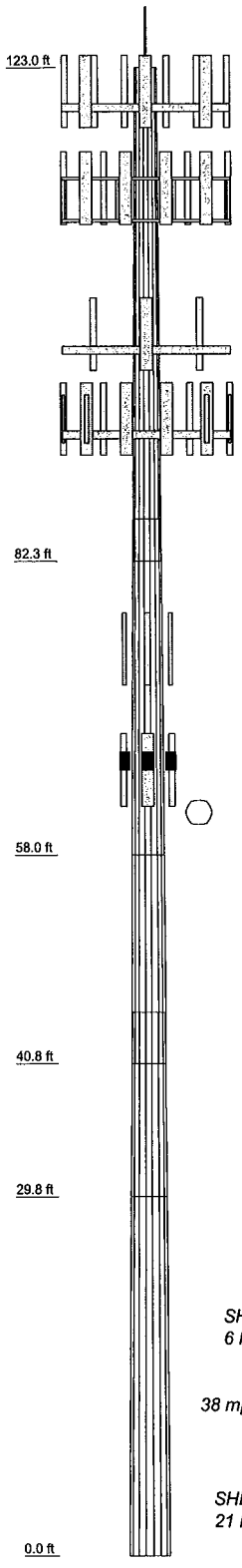
BASE LEVEL DRAWING

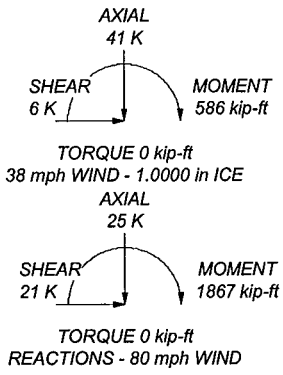


APPENDIX C

ADDITIONAL CALCULATIONS

Section	5	4	3	2	1
Length (ft)	29.75	15.25	17.25	27.75	40.75
Number of Sides	18	18	18	18	18
Thickness (in)	0.3844	0.3424	0.3267	0.2500	0.1875
Socket Length (ft)			4.25	3.50	
Top Dia (in)	35.1164	32.6749	31.3777	27.2139	22.0000
Bot Dia (in)	39.5800	35.1164	33.9660	31.3777	28.1140
Grade	65 ksi (w/ Reinf.)		A607-65	A607-60	
Weight (K) 12.7	4.6	1.9	2.0	2.2	2.1





DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
3/4" x 8 ft lightning rod (not)	123	(2) DB844F90A-SX w/Mount Pipe (E)	93
(3) FV65-14-00NA2 w/Mount Pipe (MLA)	120	(2) DB844F90A-SX w/Mount Pipe (E)	93
(3) FV65-14-00NA2 w/Mount Pipe (MLA)	120	(2) DB948F85T2E-M w/ Mount Pipe (E)	93
(3) FV65-14-00NA2 w/Mount Pipe (MLA)	120	(2) DB948F85T2E-M w/ Mount Pipe (E)	93
Platform Mount [LP 305-1] (E)	120	(2) DB948F85T2E-M w/ Mount Pipe (E)	93
(4) DB844H90E-XY w/Mount Pipe (E)	112	Platform Mount [LP 305-1] (E)	93
(4) DB844H90E-XY w/Mount Pipe (E)	112	RFS APXV18-206517S-C w/ mount pipe (E)	75
(4) DB844H90E-XY w/Mount Pipe (E)	112	RFS APXV18-206517S-C w/ mount pipe (E)	75
Platform Mount [LP 402-1] (E)	112	RFS APXV18-206517S-C w/ mount pipe (E)	75
APX16DWV-16DWV-S-E-A20 w/ mount pipe (P)	100	Side Arm Mount [SO 101-3] (E)	75
APX16DWV-16DWV-S-E-A20 w/ mount pipe (P)	100	MB96RR900200DPBL w/Mount Pipe (E)	65
APX16DWV-16DWV-S-E-A20 w/ mount pipe (P)	100	MB96RR900200DPBL w/Mount Pipe (E)	65
RFS ATMAA-1412D-1A20 (P)	100	MB96RR900200DPBL w/Mount Pipe (E)	65
RFS ATMAA-1412D-1A20 (P)	100	ADC CG-1900DD-Full-DIN TMA (E)	65
RFS ATMAA-1412D-1A20 (P)	100	ADC CG-1900DD-Full-DIN TMA (E)	65
ATMPP1412D-1CWA (P)	100	ADC CG-1900DD-Full-DIN TMA (E)	65
ATMPP1412D-1CWA (P)	100	Pipe Mount [PM 601-3] (E)	65
ATMPP1412D-1CWA (P)	100	KS24019-L112A (E)	50
RR65-18-02DP w/Mount Pipe (E)	100	Side Arm Mount [SO 702-1] (E)	50
RR65-18-02DP w/Mount Pipe (E)	100		
RR65-18-02DP w/Mount Pipe (E)	100		
T-Arm Mount [TA 602-3] (E)	100		
(2) DB844F90A-SX w/Mount Pipe (E)	93		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A607-60	60 ksi	75 ksi	65 ksi (w/ Reinf.)	65 ksi	80 ksi
A607-65	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 38 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 94.4%

Paul J Ford and Company
250 E. Broad Street Suite 1500
Columbus, Ohio 43215
Structural Engineers
Phone: 614.221.6679
FAX: 614.448.4105

Job: *37511-0160*		
Project: *876382, Laviana Orchard; Berlin, Connecticut*		
Client: Crown Castle	Drawn by: Richard Hoffman	App'd:
Code: TIA/EIA-222-F	Date: 06/02/11	Scale: NTS
Path: T:\375_Crown_Castle\2011\37511-0160 BU 876382\WO 409534 BU 876382\37511-0160R1.er		Dwg No. E-1

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

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

Site Data

BU#: *876382*
Site Name: *Laviana Orchard*
App #: *123370, Rev. 1*

Reactions		
Moment:	1222.182	ft-kips
Axial:	25	kips
Shear:	21	kips

Moment adjusted to account for additional anchor bolts.

Connection Type:	*Butt*

Anchor Rod Data		
Qty:	8	
Diam:	2.25	in
Rod Material:	A615-J	
Grade(Fy):	75	ksi
Bolt Circle:	46	in
Anchor Spacing:	6	in

Plate Data		
W=Side:	44	in
Thick:	2.75	in
Grade:	55	ksi
B effective	22.73	in

Pole Data		
Diam:	39.5	in
Thick:	0.2812	in
Grade:	65	ksi

Stress Increase Factor		
ASIF:	1.333	

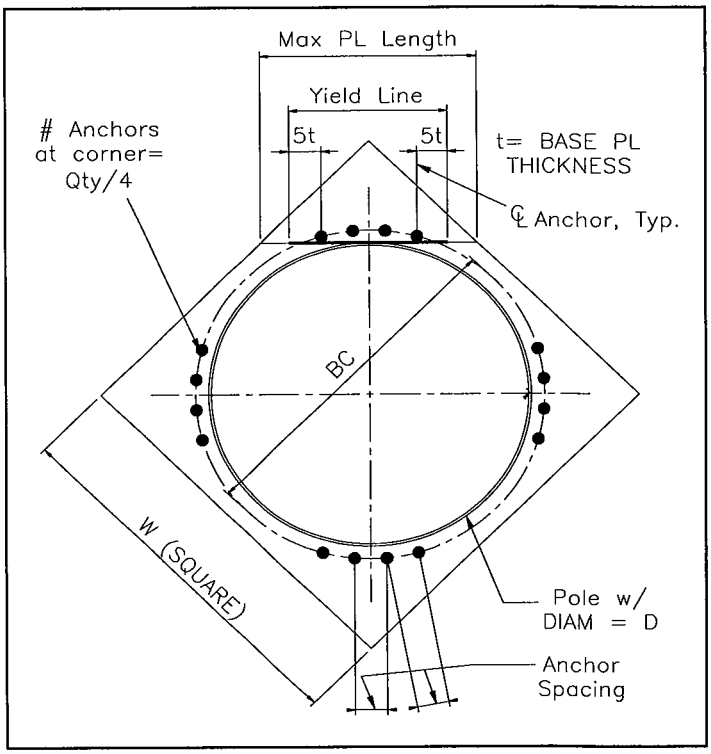
Anchor Rod Results

Maximum Rod Tension:	156.3 Kips
Allowable Tension:	195.0 Kips
Anchor Rod Stress Ratio:	80.2% Pass
Post Installed Anchors:	96.3% Pass

Base Plate Results

Base Plate Stress:	34.4 ksi
Allowable Plate Stress:	55.0 ksi
Base Plate Stress Ratio:	62.5% Pass

PL Ref. Data
Yield Line (in):
22.73
Max PL Length:
22.73



PAUL J. FORD AND COMPANY
STRUCTURAL ENGINEERS

Job Number: 37511-0160R1 | **Page:** 1
Site Number: 876382 | **By:** RH
Site Name: Laviana Orchard | **Date:** 6/2/2011

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

Unfactored Base Reactions from RISA

	Comp. (+)	Tension (-)	
Moment, M =	1867.0		k-ft
Shear, V =	21.0		kips
Axial Load, P =	25.0		kips
OTM =	1877.5	0.0	k-ft @ Ground

Safety Factors / Load Factors / F Factors

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

Drilled Pier Parameters

Diameter =	6	ft
Height Above Grade =	0.5	ft
Depth Below Grade =	20	ft
fc' =	3	ksi
ec =	0.003	in/in
Mat Ftdn. Cap Width =		ft
Mat Ftdn. Cap Length =		ft
Depth Below Grade =		ft

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

Load Combinations Checked per TIA/EIA-222-F

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

Steel Parameters

Number of Bars =	16	
Rebar Size =	#11	
Rebar Fy =	60	ksi
Rebar MOE =	29000	ksi
Tie Size =	#5	
Side Clear Cover to Ties =	4	in

Soil Parameters

Water Table Depth =	15.00	ft
Depth to Ignore Soil =	3.33	ft
Depth to Full Cohesion =	0	ft
Full Cohesion Starts at?	Ground	

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

Maximum Capacity Ratios

Maximum Soil Ratio =	110.0%
Maximum Steel Ratio =	105.0%

Define Soil Layers

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

Layer	Thickness ft	Unit Weight pcf	Cohesion psf	Friction Angle degrees	Soil Type	Ultimate End Bearing psf	Comp. Ult. Skin Friction psf	Tension Ult. Skin Friction psf	Depth ft
1	5	135		38	Sand				5
2	10	135		38	Sand				15
3	15	135		38	Sand	40000	1200		30
4									
5									
6									
7									
8									
9									
10									
11									
12									

Soil Results: Overturning

Depth to COR =	14.37	ft, from Grade
Bending Moment, M =	2179.22	k-ft, from COR
Resisting Moment, Ma =	3531.91	k-ft, from COR

MOMENT RATIO = 61.7% OK

Shear, V =	21.00	kips
Resisting Shear, Va =	34.04	kips

SHEAR RATIO = 61.7% OK

Soil Results: Uplift

Uplift, T =	0.00	kips
Allowable Uplift Cap., Ta =	62.50	kips

UPLIFT RATIO = 0.0% OK

Soil Results: Compression

Compression, C =	25.00	kips
Allowable Comp. Cap., Ca =	611.43	kips

COMPRESSION RATIO = 4.1% OK

Steel Results (ACI 318-02):

Minimum Steel Area =	20.36	sq in
Actual Steel Area =	24.96	sq in
Allowable Min Axial, Pa =	-1036.80	kips, Where Ma = 0 k-ft
Allowable Max Axial, Pa =	4726.51	kips, Where Ma = 0 k-ft
Axial Load, P =	46.21	kips @ 4.50 ft Below Grade
Moment, M =	1963.98	k-ft @ 4.50 ft Below Grade
Allowable Moment, Ma =	2592.26	k-ft

MOMENT RATIO = 75.8% OK

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

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

Site Data

BU#: *876382*
Site Name: *Laviana Orchard*
App #: *123370, Rev. 1*

Maximum Shaft Superimposed Forces		
TIA Revision:	F	
Max. Service Shaft M:	1963.98	ft-kips (* Note)
Max. Service Shaft P:	46.21	kips
Max Axial Force Type:	Comp.	

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

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

Load Factor	Shaft Factored Loads		
1.30	Mu:	2553.174	ft-kips
1.30	Pu:	60.073	kips

Pier Properties

Concrete:

Pier Diameter = 6.0 ft
Concrete Area = 4071.5 in^2

Reinforcement:

Clear Cover to **Tie**= 4.00 in
Horiz. **Tie** Bar Size= 5
Vert. Cage Diameter = 5.11 ft
Vert. Cage Diameter = 61.34 in
Vertical Bar Size = 11
Bar Diameter = 1.41 in
Bar Area = 1.56 in^2
Number of Bars = 16
As Total= 24.96 in^2
A s/ Aconc, Rho: 0.0061 0.61%

Material Properties

Concrete Comp. strength, f'c =	3000	psi
Reinforcement yield strength, Fy =	60	ksi
Reinforcing Modulus of Elasticity, E =	29000	ksi
Reinforcement yield strain =	0.00207	
Limiting compressive strain =	0.003	

ACI 318 Code

Select Analysis ACI Code= 2002

Seismic Properties

Seismic Design Category = D
Seismic Risk = **High**

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

ACI 10.5 , ACI 21.10.4, and IBC 1810.
Min As for Flexural, Tesnion Controlled, Shafts:

(3)*(Sqrt(f'c)/Fy: 0.0027
200 / Fy: 0.0033
IBC 1810.1.2: 0.0050 SDC D, E, or F
Governing: 0.0050 **0.50%**

ACI 10.8 and 10.9
Min As for Columns, Comp. Controlled, Shafts:

Min As: 0.0100 **1.00%**

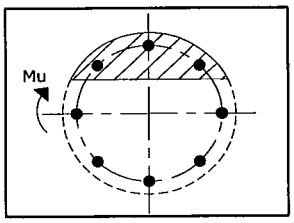
Minimum Rho Check:

Actual Req'd Min. Rho: 0.50% Flexural Member
Provided Rho: 0.61% OK

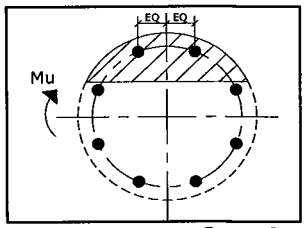
Ref. Shaft Max Axial Capacities, f Max(Pn or Tn):		
Max Pu = (f =0.65) Pn.		
Pn per ACI 318 (10-2)	6144.47	kips
at Mu=(f =0.65)Mn=	3164.92	ft-kips
Max Tu, (f =0.9) Tn =	1347.84	kips
at Mu=f =(0.90)Mn=	0.00	ft-kips

Results:

Governing Orientation Case: **2**



Case 1



Case 2

Extreme Steel Strain, ?t: **0.0127**
?t > 0.0050, Tension Controlled
Reduction Factor,f : **0.900**

Dist. From Edge to Neutral Axis: **12.61** in

Output Note: Negative Pu=Tension

For Axial Compression, f Pn = Pu =	60.07	kips
Drilled Shaft Moment Capacity, f Mn:	**3369.95**	ft-kips
Drilled Shaft Superimposed Mu:	**2553.17**	ft-kips

(Mu/f Mn, Drilled Shaft Flexure CSR:	**75.76%**

T-Mobile

T-Mobile USA Inc.
35 Griffin Rd South, Bloomfield, CT 06002-1853
Phone: (860) 692-7100
Fax: (860) 692-7159

Technical Memo

To: Northeast Tower Inc
From: Amir Uzzaman - Radio Frequency Engineer
cc: Jason Overbey
Subject: Power Density Report for CT11604B
Date: June 10, 2011

1. Introduction:

This report is the result of an Electromagnetic Field Intensities (EMF - Power Densities) study for the T-Mobile antenna installation on a Monopole at 1684 Chamberlain Highway, Berlin, CT. This study incorporates the most conservative consideration for determining the practical combined worst case power density levels that would be theoretically encountered from locations surrounding the transmitting location.

2. Discussion:

The following assumptions were used in the calculations:

1) The emissions from T-Mobile transmitters are in the (1935-1944.8), (2140-2145), (2110-2120)MHz frequency Band.
2) The antenna array consists of three sectors, with 2 antennas per sector.
3) The model number for GSM antenna is RR90-17-02DP.
3) The model number for UMTS antenna is APX16DWV-16DWV.
4) GSM antenna center line height is 100 ft.
4) UMTS antenna center line height is 100 ft.
5) The maximum transmit power from any GSM sector is 1816.02 Watts Effective Radiated Power (EiRP) assuming 8 channels per sector.
5) The maximum transmit power from any UMTS sector is 2559.12 Watts Effective Radiated Power (EiRP) assuming 2 channels per sector.
6) All the antennas are simultaneously transmitting and receiving, 24 hours a day.
7) Power levels emitting from the antennas are increased by a factor of 2.56 to account for possible in-phase reflections from the surrounding environment. This is rarely the case, and if so, is never continuous.
8) The average ground level of the studied area does not change significantly with respect to the transmitting location.

Equations given in "FCC OET Bulletin 65, Edition 97-01" were then used with the above information to perform the calculations.

3. Conclusion:

Based on the above worst case assumptions, the power density calculation from the T-Mobile antenna installation on a Monopole at 1684 Chamberlain Highway, Berlin, CT, is 0.10863 mW/cm^2. This value represents 10.863% of the Maximum Permissible Exposure (MPE) standard of 1 milliwatt per square centimeter (mW/cm^2) set forth in the FCC/ANSI/IEEE C95.1-1991. Furthermore, the proposed antenna location for T-Mobile will not interfere with existing public safety communications, AM or FM radio broadcasts, TV, Police Communications, HAM Radio communications or any other signals in the area.
The combined Power Density from other carriers is 71.73661%. The combined Power Density for the site is 82.6% of the M.P.E. standard.

Connecticut Market

T · ·Mobile·

Worst Case Power Density

Site:	**CT11604B**
Site Address:	**1684 Chamberlain Highway**
Town:	**Berlin**
Tower Height:	**125 ft.**
Tower Style:	**Monopole**

GSM Data		UMTS Data	
Base Station TX output	20 W	**Base Station TX output**	40 W
Number of channels	8	**Number of channels**	2
Antenna Model	RR90-17-02DP	**Antenna Model**	APX16DWV-16DWV
Cable Size	1 5/8 in.	**Cable Size**	1 5/8 in.
Cable Length	125 ft.	**Cable Length**	125 ft.
Antenna Height	100.0 ft.	**Antenna Height**	100.0 ft.
Ground Reflection	1.6	**Ground Reflection**	1.6
Frequency	1945.0 MHz	**Frequency**	2.1 GHz
Jumper & Connector loss	4.50 dB	**Jumper & Connector loss**	1.50 dB
Antenna Gain	16.5 dBi	**Antenna Gain**	18.0 dBi
Cable Loss per foot	0.0116 dB	**Cable Loss per foot**	0.0116 dB
Total Cable Loss	1.4500 dB	**Total Cable Loss**	1.4500 dB
Total Attenuation	5.9500 dB	**Total Attenuation**	2.9500 dB
Total EIRP per Channel	53.56 dBm	**Total EIRP per Channel**	61.07 dBm
(In Watts)	227.00 W	**(In Watts)**	1279.56 W
Total EIRP per Sector	62.59 dBm	**Total EIRP per Sector**	64.08 dBm
(In Watts)	1816.02 W	**(In Watts)**	2559.12 W
nsg	10.5500	**nsg**	15.0500
Power Density (S) =	**0.045090 mW/cm^2**	**Power Density (S) =**	**0.063541 mW/cm^2**
T-Mobile Worst Case % MPE =		**10.8632%**	

Equation Used :

$$S = \frac{EIRP}{4\pi R^2}$$

Office of Engineering and Technology (OET) Bulletin 65, Edition 97-01, August 1997

Co-Location Total

Carrier	% of Standard
Town	0.0498 %
Pocket	12.1006 %
Clearwire	0.7770 %
Clearwire	0.5015 %
Sprint	17.5845 %
Nextel	4.4671 %
VoiceStream	3.1831 %
Verizon	12.9768 %
Cingular UMTS	7.2532 %
Cingular	8.5878 %
Cingular	4.2552 %
Other Antenna Systems	
Total Excluding T-Mobile	**71.7366 %**
T-Mobile	10.8632
Total % MPE for Site	**82.5998%**