HPC Wireless Services
22 Shelter Rock Lane.
Building C
Danbury, CT, 06810
P.: 203.797.1112

EM-T-MOBILE-082-130520

ORIGINAL

May 15, 2013

VIA OVERNIGHT COURIER

Connecticut Siting Council
10 Franklin Square
New Britain, Connecticut 06051
Attn: Ms. Melanie A. Bachman, Acting Executive Director

Re: T-Mobile Northeast LLC – exempt modification
328 Meriden Road, Middlefield, Connecticut

Dear Ms. Bachman:

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

T-Mobile plans to modify the existing wireless communications facility owned by Crown Castle and located at 328 Meriden Road in the Town of Middlefield (coordinates 41°-32'-50.98" N, 72°-42'-59.41" W). Attached are a compound plan and elevation depicting the planned changes, and documentation of the structural sufficiency of the structure to accommodate the revised antenna configuration. Also included is a power density report reflecting the modification to T-Mobile's operations at the site.

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

1. T-Mobile will replace its six (6) existing panel antennas with six (6) new antennas

at a center line of approximately 104'. T-Mobile will also remove three (3) of six (6) TMAs. A hybrid cable will be run from the equipment to the antennas along the existing coaxial cable run. The proposed modifications will not extend the height of the approximately 133.5' structure.

2. T-Mobile's proposed changes will have no effect on the site boundaries.

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

4. The changes to the facility will not increase the calculated "worst case" power density for the combined operations at the site to a level at or above the applicable standard for uncontrolled environments as calculated for a mixed frequency site. As indicated on the attached report prepared by EBI Consulting, T-Mobile's operations at the site will result in a power density of approximately 1.085%; the combined site operations will result in a total power density of approximately 46.765%.

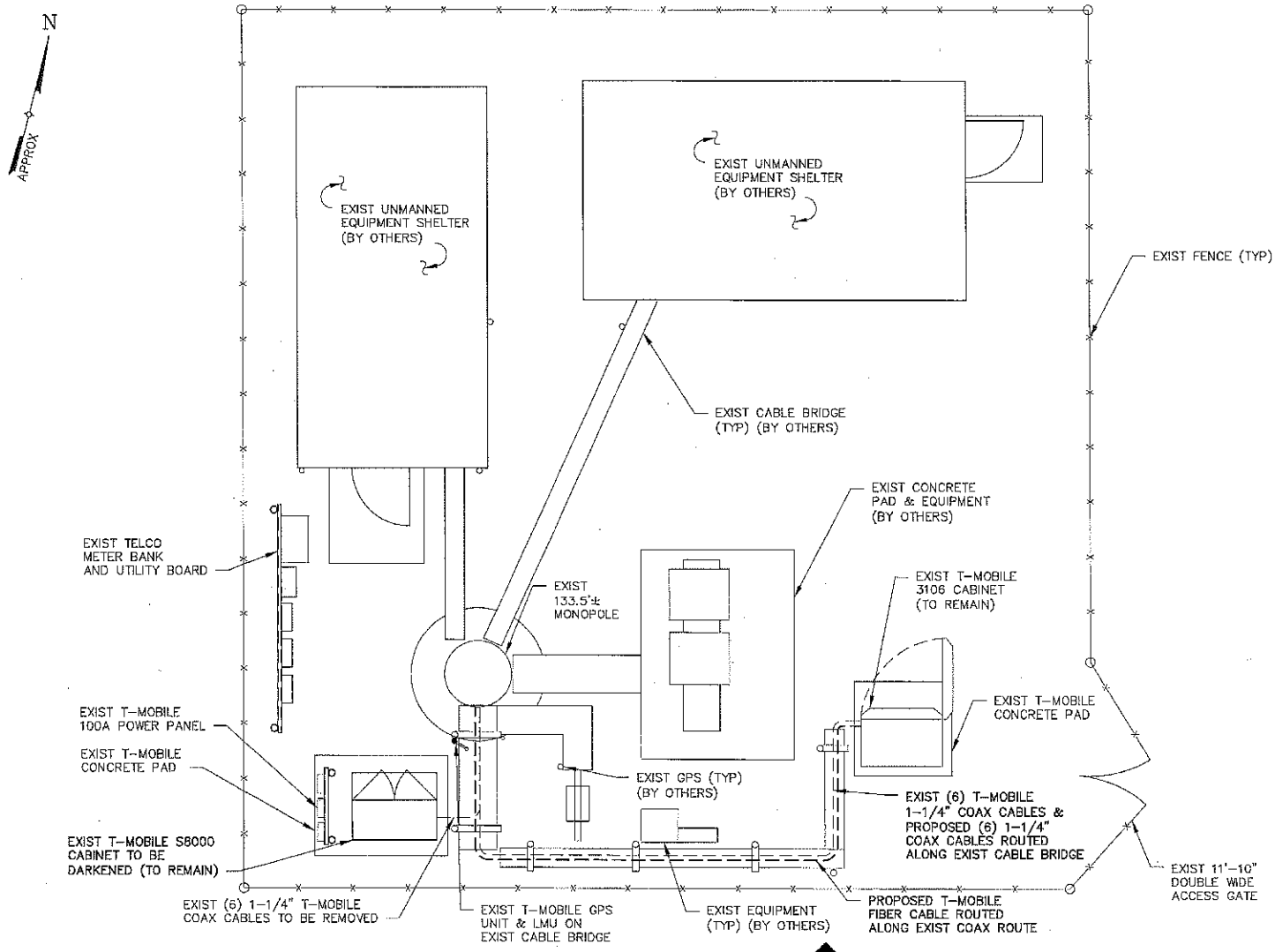
Please feel free to contact me by phone at (617) 281-0084 or by e-mail at agiannaras@hpcwireless.com with questions concerning this matter. Thank you for your consideration.

Respectfully yours,

Alex Giannaras

Alex Giannaras

cc: Honorable Jon A. Brayshaw, First Selectman, Town of Middlefield
James Kolman (underlying property owner)



STRUCTURAL NOTE:
EXIST MOUNTS, PLATFORMS AND MONOPOLE TO BE VERIFIED FOR STRUCTURAL SUITABILITY OF PROPOSED INSTALLATION BY A STATE LICENSED P.E.

1 / L-1 SITE PLAN
SCALE: 1/8" = 1'-0"

1 / L-2

CONFIGURATION
2C

0 1 2 3
ORIGINAL SIZE IN INCHES

TECTONIC
• PLANNING • SURVEYING
• ENGINEERING • CONSTRUCTION MANAGEMENT
TECTONIC Engineering & Surveying Consultants P.C.
1279 Route 300
Newburgh, NY 12550
Phone: (845) 567-0656
Fax: (845) 567-0703

T-Mobile NORTHEAST LLC.
T-MOBILE NORTHEAST, LLC. PHONE: (973) 898-6500
4 SYLVAN DRIVE
PARSIPPANY, NJ 07054

APPROVALS
T-MOBILE
LANDLORD
RF
CONSTRUCTION

PROJECT NUMBER	DESIGNED BY
5644.CT11309A	TN

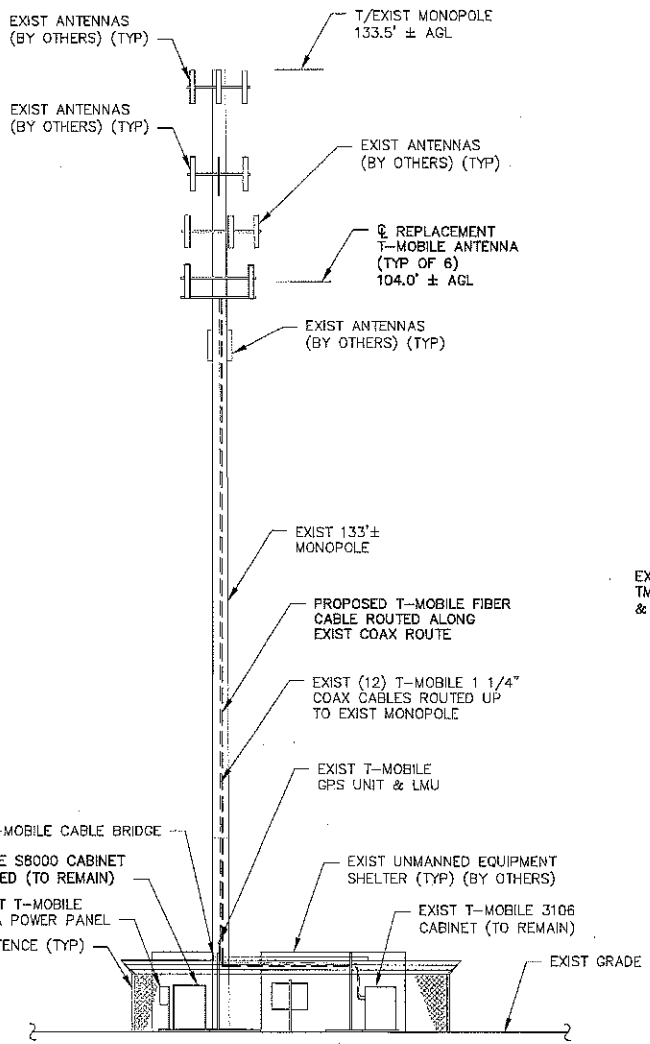
REV	DATE	REVISION	DRAWN BY
1	4/22/13	FOR COMMENT	WY
1	4/23/13	PER COMMENTS	JT
2	5/13/13	REVISED PER SA	JT

ISSUED BY | DATE

SITE INFORMATION
CT11309A
CT11309A_MIDDLEFIELD_RT66
238 MERIDAN ROAD
MIDDLEFIELD, CT 06455

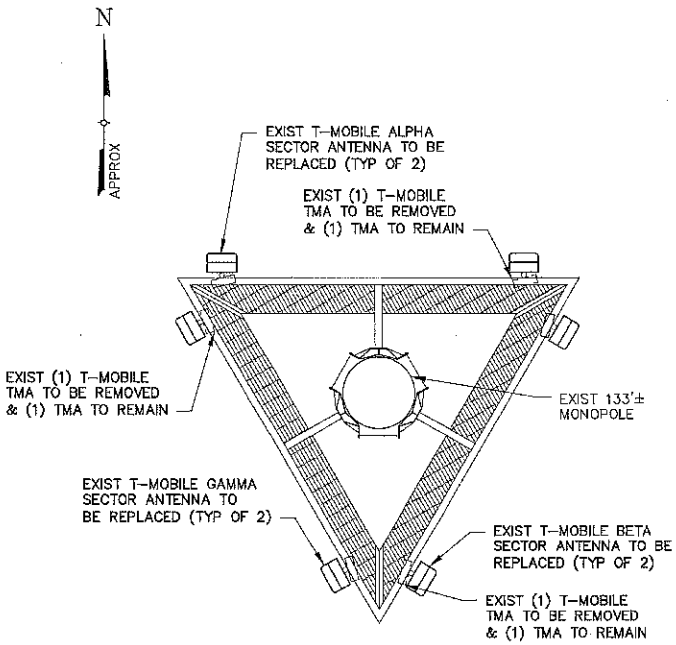
SHEET TITLE
SITE PLAN

SHEET NUMBER
L-1



1 / L-2 ELEVATION

SCALE: 1/16" = 1'-0"



2 / L-2 ANTENNA PLAN

SCALE: 1/4" = 1'-0"

STRUCTURAL NOTE:
EXIST MOUNTS, PLATFORMS AND MONOPOLE TO BE VERIFIED FOR STRUCTURAL SUITABILITY OF PROPOSED INSTALLATION BY A STATE LICENSED P.E.

CONFIGURATION
2C

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4 SYLVAN GROVE
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CT11309A_MIDDLEFIELD_RT66
238 MERIDAN ROAD
MIDDLEFIELD, CT 06455

SHEET TITLE
ELEVATION &
ANTENNA PLAN

SHEET NUMBER
L-2

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

Date: **April 19, 2013**

Darcy Tarr
Crown Castle USA Inc.
3530 Toringdon Way, Suite 300
Charlotte, NC 28277
704.405.6589

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

Subject: **Structural Analysis Report**

Carrier Designation:	*T-Mobile* **Co-Locate**	
	Carrier Site Number:	CT11309A
	Carrier Site Name:	CT11309A
Crown Castle Designation:	**Crown Castle BU Number:**	876340
	Crown Castle Site Name:	COE HILL
	Crown Castle JDE Job Number:	232459
	Crown Castle Work Order Number:	600927
	Crown Castle Application Number:	186717 Rev. 0
Engineering Firm Designation:	**Paul J Ford and Company Project Number:**	37513-1268
Site Data:	**238 Meridan Rd., MIDDLEFIELD, Middlesex County, CT**	
	Latitude *41° 32' 50.98"*, Longitude *-72° 42' 59.41"*	
	133.5 Foot - Monopole Tower	

Dear Darcy Tarr,

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 539151, in accordance with application 186717, revision 0.

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

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

The structural analysis was performed for this tower in accordance with the requirements of the TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures and the 2005 Connecticut Building Code using a fastest mile wind speed of 85 mph with no ice, 37.6 mph with 0.75 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:

Bob Koors, E.I.
Structural Designer

tnxTower Report - version 6.0.3.0

APR 2 2 2013

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

Date: **April 19, 2013**

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Subject: **Structural Analysis Report**

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	Carrier Site Number:	CT11309A
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1) INTRODUCTION

This tower is a 133.5 ft Monopole tower designed by SUMMIT in January of 1998.
The tower was originally designed for a wind speed of 90 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 85 mph with no ice, 37.6 mph with 0.75 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
101.0	104.0	3	ericsson	ERICSSON AIR 21 B2A B4P w/ Mount Pipe	1	1-5/8	-
		3	ericsson	ERICSSON AIR 21 B4A B2P w/ Mount Pipe			
		3	ericsson	KRY 112 144/1			

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

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
131.0	132.0	3	kmw communications	AM-X-CD-16-65-00T-RET w/ Mount Pipe	1 2	3/8 3/4	2
		1	raycap	DC6-48-60-18-8F			
		6	powerwave technologies	P65-15-XLH-RR w/ Mount Pipe	12	1-1/4	1
		6	powerwave technologies	TT19-08BP111-001			
	131.0	1	tower mounts	Platform Mount [LP 712-1]			
129.0	129.0	6	ericsson	RRUS-11	-	-	2
		1	tower mounts	Side Arm Mount [SO 102-3]			
119.0	121.0	3	alcatel lucent	800MHz 2X50W RRH W/FILTER	3	1-1/4	2
		3	alcatel lucent	PCS 1900MHz 4x45W-65MHz			
		1	powerwave technologies	P40-16-XLPP-RR-A w/ Mount Pipe			
		2	rfs celwave	APXVSPP18-C-A20 w/ Mount Pipe			
	119.0	1	tower mounts	Pipe Mount [PM 601-3]			
		1	tower mounts	Platform Mount [LP 712-1]	-	-	1

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
111.0	113.0	9	decibel	844H90T6E-XY w/ Mount Pipe	9	1-1/4	1
	111.0	1	tower mounts	Platform Mount [LP 712-1]			
101.0	104.0	3	andrew	E15S09P94	-	-	3
		3	andrew	ONEBASE TWIN DUAL DUPLEX TMA			
		6	rfs celwave	APX16DWV-16DWV-S-E-A20 w/ Mount Pipe			
	101.0	1	tower mounts	Platform Mount [LP 713-1]	12	1-1/4	1
95.0	95.0	3	rfs celwave	APXV18-206517S-ACU w/ Mount Pipe	6	1-5/8	1
		1	tower mounts	Pipe Mount [PM 601-3]			
60.0	61.0	1	symmetricom	58532A	1	1/2	1
	60.0	1	tower mounts	Side Arm Mount [SO 304-1]			
50.0	51.0	1	lucent	KS24019-L112A	1	1/2	1
	50.0	1	tower mounts	Side Arm Mount [SO 102-1]			

Notes:
1) Existing Equipment
2) Reserved Equipment
3) Equipment To Be Removed

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	SEA, 96684.03G, 10/07/97	1613531	CCISITES
4-POST-MODIFICATION INSPECTION	PJF, 37510-0656 RP, 09/02/10	2427628	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	PJF, 29298-051, 01/23/98	1613597	CCISITES
4-TOWER MANUFACTURER DRAWINGS	PJF, 29298-051, 01/23/98	1533009	CCISITES
4-TOWER REINFORCEMENT DESIGN/DRAWINGS/DATA	FDH, 08-01314E, 05/05/09	2331830	CCISITES

3.1) Analysis Method

tnxTower (version 6.0.3.0), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

3.2) Assumptions

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

This analysis may be affected if any assumptions are not valid or have been made in error. Paul J Ford 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	133.5 - 121.5	Pole	TP10.75x10.75x0.33	1	-2.50	302.40	70.7	Pass
L2	121.5 - 119	Pole	TP22x10.75x0.33	2	-2.51	302.40	70.7	Pass
L3	119 - 85.25	Pole	TP28.414x22x0.25	3	-11.30	1178.65	82.4	Pass
L4	85.25 - 75	Pole	TP30.362x28.414x0.5002	4	-12.56	1966.48	59.0	Pass
L5	75 - 68.25	Pole	TP31.1447x28.6489x0.3125	5	-14.68	1612.89	88.9	Pass
L6	68.25 - 37.75	Pole	TP36.941x31.1447x0.5336	6	-20.82	2858.07	72.6	Pass
L7	37.75 - 0	Pole	TP43.49x34.9711x0.5544	7	-33.91	3615.20	84.3	Pass
							Summary	
						Pole (L5)	88.9	Pass
						Rating =	88.9	Pass

Table 5 - Tower Component Stresses vs. Capacity – LC7

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	95.5	Pass
1	Base Plate	0	72.2	Pass
1	Base Foundation Steel	0	61.0	Pass
1,2	Base Foundation Soil Interaction	0	83.8	Pass
1	Flange Connection	119	95.3	Pass

Structure Rating (max from all components) =	95.5%

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

APPENDIX A

TNXTOWER OUTPUT

Tower Input Data

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

4) Tower is located in Middlesex County, Connecticut.
5) Basic wind speed of 85 mph.
6) Nominal ice thickness of 0.7500 in.
7) Ice thickness is considered to increase with height.
8) Ice density of 56.00 pcf.
9) A wind speed of 38 mph is used in combination with ice.
10) Temperature drop of 50 °F.
11) Deflections calculated using a wind speed of 50 mph.
12) A non-linear (P-delta) analysis was used.
13) Pressures are calculated at each section.
14) Stress ratio used in pole design is 1.333.
15) Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

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

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	133.50-121.50	12.00	0.00	Round	10.7500	10.7500	0.3300		A53-B-35 (35 ksi)
L2	121.50-119.00	2.50	0.00	Round	10.7500	22.0000	0.3300		A53-B-35 (35 ksi)
L3	119.00-85.25	33.75	0.00	12	22.0000	28.4140	0.2500	1.0000	A572-65 (65 ksi)
L4	85.25-75.00	10.25	3.75	12	28.4140	30.3620	0.5002	2.0008	Reinf 52.37 ksi (52 ksi)
L5	75.00-68.25	10.50	0.00	12	28.6489	31.1447	0.3125	1.2500	A572-65 (65 ksi)
L6	68.25-37.75	30.50	4.75	12	31.1447	36.9410	0.5336	2.1343	Reinf 58.58 ksi (59 ksi)
L7	37.75-0.00	42.50		12	34.9711	43.4900	0.5544	2.2177	Reinf 58.97 ksi (59 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/ft
L1	10.7500	10.8027	146.7269	3.6887	5.3750	27.2980	293.0540	5.3981	0.0000	0
	10.7500	10.8027	146.7269	3.6887	5.3750	27.2980	293.0540	5.3981	0.0000	0
L2	10.7500	10.8027	146.7269	3.6887	5.3750	27.2980	293.0540	5.3981	0.0000	0
	22.0000	22.4658	1319.7243	7.6712	11.0000	119.9749	2635.8534	11.2262	0.0000	0
L3	22.7761	17.5087	1057.2060	7.7865	11.3960	92.7699	2142.1860	8.6173	5.2260	20.904
	29.4164	22.6720	2295.4415	10.0827	14.7185	155.9566	4651.1868	11.1585	6.9450	27.78
L4	29.4164	44.9592	4471.4028	9.9932	14.7185	303.7954	9060.2744	22.1276	6.2744	12.544
	31.4331	48.0967	5474.3613	10.6905	15.7275	348.0754	11092.5402	23.6717	6.7965	13.588
L5	30.5824	28.5135	2922.3159	10.1444	14.8401	196.9196	5921.4042	14.0335	6.8404	21.889
	32.2434	31.0249	3764.4981	11.0379	16.1330	233.3418	7627.8937	15.2695	7.5093	24.03
L6	32.2434	52.5939	6290.4357	10.9588	16.1330	389.9117	12746.1281	25.8851	6.9168	12.963
	38.2441	62.5526	10583.0556	13.0339	19.1354	553.0605	21444.1398	30.7865	8.4702	15.874
L7	37.1905	61.4429	9289.5942	12.3212	18.1151	512.8108	18823.2364	30.2403	7.8864	14.224
	45.0242	76.6514	18036.0006	15.3709	22.5278	800.6101	36545.8271	37.7255	10.1694	18.342

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 133.50-121.50				1	1	1		
L2 121.50-119.00				1	1	1		
L3 119.00-85.25				1	1	1		
L4 85.25-75.00				1	1	1		
L5 75.00-68.25				1	1	1		
L6 68.25-37.75				1	1	1		
L7 37.75-0.00				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 klf
******										

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 klf
LCF114-50J(1-1/4")	C	No	Inside Pole	131.00 - 0.00	12	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
						2" Ice	0.00	0.00
						4" Ice	0.00	0.00
FB-L98B-002-50000(3/8)	C	No	Inside Pole	131.00 - 0.00	1	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight klf
						2" Ice	0.00	0.00
						4" Ice	0.00	0.00
WR-VG86ST-BRD(3/4)	C	No	Inside Pole	131.00 - 0.00	2	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
						2" Ice	0.00	0.00
						4" Ice	0.00	0.00
***								
HB114-1-08U4-M5J(1 1/4")	C	No	CaAa (Out Of Face)	119.00 - 0.00	2	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
						2" Ice	0.00	0.01
						4" Ice	0.00	0.03
HB114-1-08U4-M5J(1 1/4")	C	No	CaAa (Out Of Face)	119.00 - 0.00	1	No Ice	0.15	0.00
						1/2" Ice	0.25	0.00
						1" Ice	0.35	0.00
						2" Ice	0.55	0.01
						4" Ice	0.95	0.03
**								
LDF6-50A(1-1/4")	C	No	Inside Pole	111.00 - 0.00	9	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
						2" Ice	0.00	0.00
						4" Ice	0.00	0.00
***								
LDF6-50A(1-1/4")	C	No	Inside Pole	101.00 - 0.00	12	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
						2" Ice	0.00	0.00
						4" Ice	0.00	0.00
MLE Hybrid 9Power/18Fiber RL 2(1 5/8)	C	No	Inside Pole	101.00 - 0.00	1	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
						2" Ice	0.00	0.00
						4" Ice	0.00	0.00
***								
AVA7-50(1-5/8")	C	No	Inside Pole	95.00 - 0.00	6	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
						2" Ice	0.00	0.00
						4" Ice	0.00	0.00
***								
LDF4-50A(1/2")	C	No	Inside Pole	60.00 - 0.00	1	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
						2" Ice	0.00	0.00
						4" Ice	0.00	0.00
***								
LDF4-50A(1/2")	C	No	Inside Pole	50.00 - 0.00	1	No Ice	0.00	0.00
						1/2" Ice	0.00	0.00
						1" Ice	0.00	0.00
						2" Ice	0.00	0.00
						4" Ice	0.00	0.00
***								
Aero MP3-05	C	No	CaAa (Out Of Face)	70.50 - 0.00	2	No Ice	0.35	0.00
						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
Aero MP3-08	C	No	CaAa (Out Of Face)	87.00 - 77.00	2	No Ice	0.47	0.00
						1/2" Ice	0.58	0.00
						1" Ice	0.69	0.00
						2" Ice	0.91	0.00
						4" Ice	1.36	0.00
******								

Feed Line/Linear Appurtenances Section Areas

Tower Sectio n	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	133.50-121.50	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	0.09
L2	121.50-119.00	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	0.02
L3	119.00-85.25	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	6.831	0.77
L4	85.25-75.00	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	9.278	0.33
L5	75.00-68.25	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	2.605	0.22
L6	68.25-37.75	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	25.912	0.99
L7	37.75-0.00	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	32.072	1.22

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Sectio n	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	133.50-121.50	A	0.882	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	0.09
L2	121.50-119.00	A	0.876	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	0.02
L3	119.00-85.25	A	0.858	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	13.292	1.03
L4	85.25-75.00	A	0.834	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	14.047	0.41
L5	75.00-68.25	A	0.823	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	4.737	0.27
L6	68.25-37.75	A	0.794	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	43.132	1.20
L7	37.75-0.00	A	0.750	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	53.385	1.49

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	133.50-121.50	0.0000	0.0000	0.0000	0.0000
L2	121.50-119.00	0.0000	0.0000	0.0000	0.0000
L3	119.00-85.25	-0.2467	0.1424	-0.4160	0.2402
L4	85.25-75.00	-0.8540	0.4930	-1.0959	0.6327
L5	75.00-68.25	-0.4395	0.2537	-0.6907	0.3988

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
L6	68.25-37.75	-0.8493	0.4903	-1.1889	0.6864
L7	37.75-0.00	-0.8782	0.5070	-1.2519	0.7228

Discrete Tower Loads

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) P65-15-XLH-RR w/ Mount Pipe	A	From Face	4.00 0.00 1.00	0.00	131.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.07 6.51 6.96 7.90 9.89	4.19 4.80 5.44 6.84 9.95	0.06 0.10 0.16 0.29 0.65
(2) P65-15-XLH-RR w/ Mount Pipe	B	From Face	4.00 0.00 1.00	0.00	131.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.07 6.51 6.96 7.90 9.89	4.19 4.80 5.44 6.84 9.95	0.06 0.10 0.16 0.29 0.65
(2) P65-15-XLH-RR w/ Mount Pipe	C	From Face	4.00 0.00 1.00	0.00	131.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.07 6.51 6.96 7.90 9.89	4.19 4.80 5.44 6.84 9.95	0.06 0.10 0.16 0.29 0.65
(2) TT19-08BP111-001	A	From Face	4.00 0.00 1.00	0.00	131.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.64 0.75 0.87 1.13 1.77	0.52 0.62 0.73 0.98 1.58	0.02 0.02 0.03 0.05 0.12
(2) TT19-08BP111-001	B	From Face	4.00 0.00 1.00	0.00	131.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.64 0.75 0.87 1.13 1.77	0.52 0.62 0.73 0.98 1.58	0.02 0.02 0.03 0.05 0.12
(2) TT19-08BP111-001	C	From Face	4.00 0.00 1.00	0.00	131.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.64 0.75 0.87 1.13 1.77	0.52 0.62 0.73 0.98 1.58	0.02 0.02 0.03 0.05 0.12
AM-X-CD-16-65-00T-RET w/ Mount Pipe	A	From Face	4.00 0.00 1.00	0.00	131.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.50 9.15 9.77 11.03 13.68	6.30 7.48 8.37 10.18 14.02	0.07 0.14 0.21 0.38 0.87
AM-X-CD-16-65-00T-RET w/ Mount Pipe	B	From Face	4.00 0.00 1.00	0.00	131.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.50 9.15 9.77 11.03 13.68	6.30 7.48 8.37 10.18 14.02	0.07 0.14 0.21 0.38 0.87
AM-X-CD-16-65-00T-RET w/ Mount Pipe	C	From Face	4.00 0.00 1.00	0.00	131.00	No Ice 1/2" Ice 1" Ice 2" Ice	8.50 9.15 9.77 11.03 13.68	6.30 7.48 8.37 10.18 14.02	0.07 0.14 0.21 0.38 0.87

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
							4" Ice			
DC6-48-60-18-8F	A	From Face	4.00	0.00	0.00	131.00	No Ice	1.47	1.47	0.02
			0.00				1/2" Ice	1.67	1.67	0.04
			1.00				1" Ice	1.88	1.88	0.06
							2" Ice	2.33	2.33	0.11
							4" Ice	3.38	3.38	0.24
Platform Mount [LP 712-1]	C	None			0.00	131.00	No Ice	24.53	24.53	1.34
							1/2" Ice	29.94	29.94	1.65
							1" Ice	35.35	35.35	1.96
							2" Ice	46.17	46.17	2.58
							4" Ice	67.81	67.81	3.82
*										
(2) RRUS-11	A	From Face	4.00	0.00	0.00	129.00	No Ice	3.25	1.37	0.05
			0.00				1/2" Ice	3.49	1.55	0.07
			0.00				1" Ice	3.74	1.74	0.09
							2" Ice	4.27	2.14	0.15
							4" Ice	5.43	3.04	0.31
(2) RRUS-11	B	From Face	4.00	0.00	0.00	129.00	No Ice	3.25	1.37	0.05
			0.00				1/2" Ice	3.49	1.55	0.07
			0.00				1" Ice	3.74	1.74	0.09
							2" Ice	4.27	2.14	0.15
							4" Ice	5.43	3.04	0.31
(2) RRUS-11	C	From Face	4.00	0.00	0.00	129.00	No Ice	3.25	1.37	0.05
			0.00				1/2" Ice	3.49	1.55	0.07
			0.00				1" Ice	3.74	1.74	0.09
							2" Ice	4.27	2.14	0.15
							4" Ice	5.43	3.04	0.31
Side Arm Mount [SO 102-3]	C	None			0.00	129.00	No Ice	3.00	3.00	0.08
							1/2" Ice	3.48	3.48	0.11
							1" Ice	3.96	3.96	0.14
							2" Ice	4.92	4.92	0.20
							4" Ice	6.84	6.84	0.32
***										
APXVSPP18-C-A20 w/ Mount Pipe	A	From Face	4.00	0.00	0.00	119.00	No Ice	8.50	6.95	0.08
			0.00				1/2" Ice	9.15	8.13	0.15
			2.00				1" Ice	9.77	9.02	0.22
							2" Ice	11.03	10.84	0.41
							4" Ice	13.68	14.85	0.91
APXVSPP18-C-A20 w/ Mount Pipe	B	From Face	4.00	0.00	0.00	119.00	No Ice	8.50	6.95	0.08
			0.00				1/2" Ice	9.15	8.13	0.15
			2.00				1" Ice	9.77	9.02	0.22
							2" Ice	11.03	10.84	0.41
							4" Ice	13.68	14.85	0.91
P40-16-XLPP-RR-A w/ Mount Pipe	C	From Face	4.00	0.00	0.00	119.00	No Ice	9.37	4.83	0.07
			0.00				1/2" Ice	9.91	5.57	0.13
			2.00				1" Ice	10.45	6.27	0.20
							2" Ice	11.56	7.80	0.37
							4" Ice	13.89	11.11	0.82
PCS 1900MHz 4x45W-65MHz	A	From Face	4.00	0.00	0.00	119.00	No Ice	2.71	2.61	0.06
			0.00				1/2" Ice	2.95	2.85	0.08
			2.00				1" Ice	3.20	3.09	0.11
							2" Ice	3.72	3.61	0.17
							4" Ice	4.86	4.74	0.35
PCS 1900MHz 4x45W-65MHz	B	From Face	4.00	0.00	0.00	119.00	No Ice	2.71	2.61	0.06
			0.00				1/2" Ice	2.95	2.85	0.08

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
			2.00				Ice	3.20	3.09	0.11
							1" Ice	3.72	3.61	0.17
							2" Ice	4.86	4.74	0.35
							4" Ice			
PCS 1900MHz 4x45W-65MHz	C	From Face	4.00		0.00	119.00	No Ice	2.71	2.61	0.06
			0.00				1/2"	2.95	2.85	0.08
			2.00				Ice	3.20	3.09	0.11
							1" Ice	3.72	3.61	0.17
							2" Ice	4.86	4.74	0.35
							4" Ice			
800MHz 2X50W RRH W/FILTER	A	From Face	4.00		0.00	119.00	No Ice	2.40	2.25	0.06
			0.00				1/2"	2.61	2.46	0.09
			2.00				Ice	2.83	2.68	0.11
							1" Ice	3.30	3.13	0.17
							2" Ice	4.34	4.15	0.34
							4" Ice			
800MHz 2X50W RRH W/FILTER	B	From Face	4.00		0.00	119.00	No Ice	2.40	2.25	0.06
			0.00				1/2"	2.61	2.46	0.09
			2.00				Ice	2.83	2.68	0.11
							1" Ice	3.30	3.13	0.17
							2" Ice	4.34	4.15	0.34
							4" Ice			
800MHz 2X50W RRH W/FILTER	C	From Face	4.00		0.00	119.00	No Ice	2.40	2.25	0.06
			0.00				1/2"	2.61	2.46	0.09
			2.00				Ice	2.83	2.68	0.11
							1" Ice	3.30	3.13	0.17
							2" Ice	4.34	4.15	0.34
							4" Ice			
Platform Mount [LP 712-1]	C	None			0.00	119.00	No Ice	24.53	24.53	1.34
							1/2"	29.94	29.94	1.65
							Ice	35.35	35.35	1.96
							1" Ice	46.17	46.17	2.58
							2" Ice	67.81	67.81	3.82
							4" Ice			
Pipe Mount [PM 601-3]	C	None			0.00	119.00	No Ice	4.39	4.39	0.20
							1/2"	5.48	5.48	0.24
							Ice	6.57	6.57	0.28
							1" Ice	8.75	8.75	0.36
							2" Ice	13.11	13.11	0.53
							4" Ice			
***										
(3) 844H90T6E-XY w/ Mount Pipe	A	From Face	4.00		0.00	111.00	No Ice	3.30	4.92	0.03
			0.00				1/2"	3.69	5.60	0.07
			2.00				Ice	4.12	6.28	0.12
							1" Ice	5.01	7.71	0.23
							2" Ice	6.92	10.83	0.56
							4" Ice			
(3) 844H90T6E-XY w/ Mount Pipe	B	From Face	4.00		0.00	111.00	No Ice	3.30	4.92	0.03
			0.00				1/2"	3.69	5.60	0.07
			2.00				Ice	4.12	6.28	0.12
							1" Ice	5.01	7.71	0.23
							2" Ice	6.92	10.83	0.56
							4" Ice			
(3) 844H90T6E-XY w/ Mount Pipe	C	From Face	4.00		0.00	111.00	No Ice	3.30	4.92	0.03
			0.00				1/2"	3.69	5.60	0.07
			2.00				Ice	4.12	6.28	0.12
							1" Ice	5.01	7.71	0.23
							2" Ice	6.92	10.83	0.56
							4" Ice			
Platform Mount [LP 712-1]	C	None			0.00	111.00	No Ice	24.53	24.53	1.34
							1/2"	29.94	29.94	1.65
							Ice	35.35	35.35	1.96
							1" Ice	46.17	46.17	2.58
							2" Ice	67.81	67.81	3.82
							4" Ice			

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
***									
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	A	From Face	4.00 0.00 3.00	0.00	101.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.83 7.35 7.86 8.93 11.18	5.64 6.48 7.26 8.86 12.29	0.11 0.17 0.23 0.38 0.81
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	B	From Face	4.00 0.00 3.00	0.00	101.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.83 7.35 7.86 8.93 11.18	5.64 6.48 7.26 8.86 12.29	0.11 0.17 0.23 0.38 0.81
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	C	From Face	4.00 0.00 3.00	0.00	101.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.83 7.35 7.86 8.93 11.18	5.64 6.48 7.26 8.86 12.29	0.11 0.17 0.23 0.38 0.81
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	A	From Face	4.00 0.00 3.00	0.00	101.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.83 7.35 7.86 8.93 11.18	5.64 6.48 7.26 8.86 12.29	0.11 0.17 0.23 0.38 0.81
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	B	From Face	4.00 0.00 3.00	0.00	101.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.83 7.35 7.86 8.93 11.18	5.64 6.48 7.26 8.86 12.29	0.11 0.17 0.23 0.38 0.81
ERICSSON AIR 21 B4A B2P w/ Mount Pipe	C	From Face	4.00 0.00 3.00	0.00	101.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.83 7.35 7.86 8.93 11.18	5.64 6.48 7.26 8.86 12.29	0.11 0.17 0.23 0.38 0.81
KRY 112 144/1	A	From Face	4.00 0.00 3.00	0.00	101.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.41 0.50 0.59 0.81 1.36	0.20 0.27 0.35 0.53 1.00	0.01 0.01 0.02 0.03 0.08
KRY 112 144/1	B	From Face	4.00 0.00 3.00	0.00	101.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.41 0.50 0.59 0.81 1.36	0.20 0.27 0.35 0.53 1.00	0.01 0.01 0.02 0.03 0.08
KRY 112 144/1	C	From Face	4.00 0.00 3.00	0.00	101.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.41 0.50 0.59 0.81 1.36	0.20 0.27 0.35 0.53 1.00	0.01 0.01 0.02 0.03 0.08
Platform Mount [LP 713-1]	C	None		0.00	101.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	31.27 39.68 48.09 64.91 98.55	31.27 39.68 48.09 64.91 98.55	1.51 1.93 2.35 3.19 4.86
***									
APXV18-206517S-ACU w/ Mount Pipe	A	From Face	4.00 0.00 0.00	0.00	95.00	No Ice 1/2" Ice	5.40 5.96 6.48	4.70 5.86 6.73	0.05 0.09 0.15

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
						1" Ice	7.55	8.51	0.28
						2" Ice	9.92	12.28	0.68
						4" Ice			
APXV18-206517S-ACU w/ Mount Pipe	B	From Face	4.00 0.00 0.00	0.00	95.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.40 5.96 6.48 7.55 9.92	4.70 5.86 6.73 8.51 12.28	0.05 0.09 0.15 0.28 0.68
APXV18-206517S-ACU w/ Mount Pipe	C	From Face	4.00 0.00 0.00	0.00	95.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.40 5.96 6.48 7.55 9.92	4.70 5.86 6.73 8.51 12.28	0.05 0.09 0.15 0.28 0.68
Pipe Mount [PM 601-3]	C	None		0.00	95.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.39 5.48 6.57 8.75 13.11	4.39 5.48 6.57 8.75 13.11	0.20 0.24 0.28 0.36 0.53
***									
58532A	A	From Face	4.00 0.00 1.00	0.00	60.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.22 0.29 0.37 0.55 1.01	0.22 0.29 0.37 0.55 1.01	0.00 0.00 0.01 0.02 0.06
Side Arm Mount [SO 304-1]	A	None		0.00	60.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.63 1.00 1.37 2.11 3.59	0.94 1.45 1.96 2.98 5.02	0.02 0.03 0.04 0.06 0.09
***									
KS24019-L112A	A	From Face	4.00 0.00 1.00	0.00	50.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.16 0.22 0.30 0.48 0.95	0.16 0.22 0.30 0.48 0.95	0.01 0.01 0.01 0.02 0.06
Side Arm Mount [SO 102-1]	A	None		0.00	50.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.50 1.74 1.98 2.46 3.42	1.50 1.75 2.00 2.50 3.50	0.03 0.04 0.04 0.07 0.11
***									

Tower Pressures - No Ice

G_H = 1.690

Section Elevation ft	z ft	K_Z	q_z ksf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1 133.50-121.50	127.50	1.471	0.03	10.750	A	0.000	10.750	10.750	100.00	0.000	0.000
					B	0.000	10.750		100.00	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z ksf	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
					C	0.000	10.750		100.00	0.000	0.000
L2 121.50-119.00	120.11	1.446	0.03	3.411	A	0.000	3.411	3.411	100.00	0.000	0.000
					B	0.000	3.411		100.00	0.000	0.000
					C	0.000	3.411		100.00	0.000	0.000
L3 119.00-85.25	101.61	1.379	0.03	70.895	A	0.000	70.895	70.895	100.00	0.000	0.000
					B	0.000	70.895		100.00	0.000	0.000
					C	0.000	70.895		100.00	0.000	6.831
L4 85.25-75.00	80.07	1.288	0.02	25.102	A	0.000	25.102	25.102	100.00	0.000	0.000
					B	0.000	25.102		100.00	0.000	0.000
					C	0.000	25.102		100.00	0.000	9.278
L5 75.00-68.25	71.60	1.248	0.02	17.068	A	0.000	17.068	17.068	100.00	0.000	0.000
					B	0.000	17.068		100.00	0.000	0.000
					C	0.000	17.068		100.00	0.000	2.605
L6 68.25-37.75	52.88	1.144	0.02	86.526	A	0.000	86.526	86.526	100.00	0.000	0.000
					B	0.000	86.526		100.00	0.000	0.000
					C	0.000	86.526		100.00	0.000	25.912
L7 37.75-0.00	18.28	1	0.02	124.910	A	0.000	124.910	124.910	100.00	0.000	0.000
					B	0.000	124.910		100.00	0.000	0.000
					C	0.000	124.910		100.00	0.000	32.072

Tower Pressure - With Ice

G_H = 1.690

Section Elevation ft	z ft	K_Z	q_z ksf	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 133.50-121.50	127.50	1.471	0.01	0.8821	12.514	A	0.000	12.514	12.514	100.00	0.000	0.000
						B	0.000	12.514		100.00	0.000	0.000
						C	0.000	12.514		100.00	0.000	0.000
L2 121.50-119.00	120.11	1.446	0.01	0.8758	3.776	A	0.000	3.776	3.776	100.00	0.000	0.000
						B	0.000	3.776		100.00	0.000	0.000
						C	0.000	3.776		100.00	0.000	0.000
L3 119.00-85.25	101.61	1.379	0.00	0.8584	75.723	A	0.000	75.723	75.723	100.00	0.000	0.000
						B	0.000	75.723		100.00	0.000	0.000
						C	0.000	75.723		100.00	0.000	13.292
L4 85.25-75.00	80.07	1.288	0.00	0.8342	26.527	A	0.000	26.527	26.527	100.00	0.000	0.000
						B	0.000	26.527		100.00	0.000	0.000
						C	0.000	26.527		100.00	0.000	14.047
L5 75.00-68.25	71.60	1.248	0.00	0.8230	18.006	A	0.000	18.006	18.006	100.00	0.000	0.000
						B	0.000	18.006		100.00	0.000	0.000
						C	0.000	18.006		100.00	0.000	4.737
L6 68.25-37.75	52.88	1.144	0.00	0.7937	90.560	A	0.000	90.560	90.560	100.00	0.000	0.000
						B	0.000	90.560		100.00	0.000	0.000
						C	0.000	90.560		100.00	0.000	43.132
L7 37.75-0.00	18.28	1	0.00	0.7500	129.904	A	0.000	129.904	129.904	100.00	0.000	0.000
						B	0.000	129.904		100.00	0.000	0.000
						C	0.000	129.904		100.00	0.000	53.385

Tower Pressure - Service

G_H = 1.690

Section Elevation ft	z ft	K_Z	q_z ksf	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 133.50-121.50	127.50	1.471	0.01	10.750	A	0.000	10.750	10.750	100.00	0.000	0.000
					B	0.000	10.750		100.00	0.000	0.000

Section Elevation ft	z ft	K_z	q_z ksf	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
					C	0.000	10.750		100.00	0.000	0.000
L2 121.50-119.00	120.11	1.446	0.01	3.411	A	0.000	3.411	3.411	100.00	0.000	0.000
					B	0.000	3.411		100.00	0.000	0.000
					C	0.000	3.411		100.00	0.000	0.000
L3 119.00-85.25	101.61	1.379	0.01	70.895	A	0.000	70.895	70.895	100.00	0.000	0.000
					B	0.000	70.895		100.00	0.000	0.000
					C	0.000	70.895		100.00	0.000	6.831
L4 85.25-75.00	80.07	1.288	0.01	25.102	A	0.000	25.102	25.102	100.00	0.000	0.000
					B	0.000	25.102		100.00	0.000	0.000
					C	0.000	25.102		100.00	0.000	9.278
L5 75.00-68.25	71.60	1.248	0.01	17.068	A	0.000	17.068	17.068	100.00	0.000	0.000
					B	0.000	17.068		100.00	0.000	0.000
					C	0.000	17.068		100.00	0.000	2.605
L6 68.25-37.75	52.88	1.144	0.01	86.526	A	0.000	86.526	86.526	100.00	0.000	0.000
					B	0.000	86.526		100.00	0.000	0.000
					C	0.000	86.526		100.00	0.000	25.912
L7 37.75-0.00	18.28	1	0.01	124.910	A	0.000	124.910	124.910	100.00	0.000	0.000
					B	0.000	124.910		100.00	0.000	0.000
					C	0.000	124.910		100.00	0.000	32.072

Load Combinations

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	133.5 - 121.5	Pole	Max Tension	8	0.00	-0.00	0.00
			Max. Compression	14	-4.89	0.21	0.12
			Max. Mx	11	-2.50	48.89	0.04
			Max. My	2	-2.50	0.06	48.87
			Max. Vy	11	-5.14	48.89	0.04
			Max. Vx	2	-5.14	0.06	48.87
			Max. Torque	3			0.30
L2	121.5 - 119	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-5.10	0.21	0.12
			Max. Mx	11	-2.67	61.85	0.04
			Max. My	2	-2.67	0.06	61.84
			Max. Vy	11	-5.24	61.85	0.04
			Max. Vx	2	-5.24	0.06	61.84
			Max. Torque	3			0.30
L3	119 - 85.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-19.78	0.54	0.02
			Max. Mx	11	-11.31	544.61	0.01
			Max. My	2	-11.30	0.18	549.49
			Max. Vy	11	-18.67	544.61	0.01
			Max. Vx	8	18.81	0.18	-549.41
			Max. Torque	4			0.68
L4	85.25 - 75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-21.26	0.61	-0.03
			Max. Mx	11	-12.57	668.88	0.01
			Max. My	2	-12.56	0.21	674.63
			Max. Vy	11	-19.58	668.88	0.01
			Max. Vx	8	19.72	0.21	-674.59
			Max. Torque	4			0.68
L5	75 - 68.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-23.80	0.74	-0.10
			Max. Mx	11	-14.69	881.75	-0.01
			Max. My	2	-14.68	0.25	888.93
			Max. Vy	11	-20.87	881.75	-0.01
			Max. Vx	8	21.02	0.25	-888.93
			Max. Torque	4			0.68
L6	68.25 - 37.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-30.78	1.12	-0.25
			Max. Mx	11	-20.83	1463.57	-0.05
			Max. My	8	-20.82	0.38	-1474.28
			Max. Vy	11	-24.32	1463.57	-0.05
			Max. Vx	8	24.46	0.38	-1474.28
			Max. Torque	3			0.87
L7	37.75 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-45.21	1.73	-0.60
			Max. Mx	11	-33.91	2604.91	-0.16
			Max. My	8	-33.91	0.57	-2621.41
			Max. Vy	11	-29.37	2604.91	-0.16
			Max. Vx	8	29.51	0.57	-2621.41
			Max. Torque	8			-1.17

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	14	45.21	-0.00	-0.00
	Max. H_x	11	33.93	29.35	0.00
	Max. H_z	2	33.93	0.00	29.48
	Max. M_x	2	2621.10	0.00	29.48
	Max. M_z	5	2603.76	-29.35	0.00

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
	Max. Torsion	2	1.17	0.00	29.48
	Min. Vert	8	33.93	0.00	-29.48
	Min. H_x	5	33.93	-29.35	0.00
	Min. H_z	8	33.93	0.00	-29.48
	Min. M_x	8	-2621.41	0.00	-29.48
	Min. M_z	11	-2604.91	29.35	0.00
	Min. Torsion	8	-1.17	0.00	-29.48

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	33.93	-0.00	0.00	0.15	0.56	0.00
Dead+Wind 0 deg - No Ice	33.93	-0.00	-29.48	-2621.10	0.57	-1.17
Dead+Wind 30 deg - No Ice	33.93	14.67	-25.53	-2270.17	-1301.72	-1.11
Dead+Wind 60 deg - No Ice	33.93	25.42	-14.74	-1310.63	-2255.08	-0.74
Dead+Wind 90 deg - No Ice	33.93	29.35	-0.00	0.16	-2603.76	-0.16
Dead+Wind 120 deg - No Ice	33.93	25.42	14.74	1310.94	-2255.08	0.46
Dead+Wind 150 deg - No Ice	33.93	14.67	25.53	2270.48	-1301.71	0.95
Dead+Wind 180 deg - No Ice	33.93	-0.00	29.48	2621.41	0.57	1.17
Dead+Wind 210 deg - No Ice	33.93	-14.67	25.53	2270.49	1302.86	1.09
Dead+Wind 240 deg - No Ice	33.93	-25.42	14.74	1310.95	2256.22	0.72
Dead+Wind 270 deg - No Ice	33.93	-29.35	-0.00	0.16	2604.91	0.16
Dead+Wind 300 deg - No Ice	33.93	-25.42	-14.74	-1310.63	2256.23	-0.44
Dead+Wind 330 deg - No Ice	33.93	-14.67	-25.53	-2270.17	1302.86	-0.93
Dead+Ice+Temp	45.21	0.00	0.00	0.60	1.73	-0.00
Dead+Wind 0 deg+Ice+Temp	45.21	0.00	-7.09	-650.69	1.83	-0.36
Dead+Wind 30 deg+Ice+Temp	45.21	3.53	-6.14	-563.46	-321.92	-0.32
Dead+Wind 60 deg+Ice+Temp	45.21	6.11	-3.55	-325.05	-558.91	-0.19
Dead+Wind 90 deg+Ice+Temp	45.21	7.06	-0.00	0.62	-645.63	-0.01
Dead+Wind 120 deg+Ice+Temp	45.21	6.11	3.55	326.29	-558.91	0.18
Dead+Wind 150 deg+Ice+Temp	45.21	3.53	6.14	564.70	-321.92	0.31
Dead+Wind 180 deg+Ice+Temp	45.21	0.00	7.09	651.93	1.83	0.36
Dead+Wind 210 deg+Ice+Temp	45.21	-3.53	6.14	564.70	325.57	0.32
Dead+Wind 240 deg+Ice+Temp	45.21	-6.11	3.55	326.29	562.57	0.19
Dead+Wind 270 deg+Ice+Temp	45.21	-7.06	-0.00	0.62	649.28	0.01
Dead+Wind 300 deg+Ice+Temp	45.21	-6.11	-3.55	-325.05	562.57	-0.18
Dead+Wind 330 deg+Ice+Temp	45.21	-3.53	-6.14	-563.46	325.57	-0.31
Dead+Wind 0 deg - Service	33.93	0.00	-10.22	-910.73	0.58	-0.41
Dead+Wind 30 deg - Service	33.93	5.09	-8.85	-788.70	-451.93	-0.38
Dead+Wind 60 deg - Service	33.93	8.81	-5.11	-455.29	-783.19	-0.26
Dead+Wind 90 deg - Service	33.93	10.18	-0.00	0.16	-904.44	-0.06
Dead+Wind 120 deg - Service	33.93	8.81	5.11	455.60	-783.19	0.16
Dead+Wind 150 deg - Service	33.93	5.09	8.85	789.01	-451.93	0.33
Dead+Wind 180 deg - Service	33.93	0.00	10.22	911.05	0.58	0.41
Dead+Wind 210 deg - Service	33.93	-5.09	8.85	789.01	453.08	0.38
Dead+Wind 240 deg - Service	33.93	-8.81	5.11	455.60	784.34	0.25

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 270 deg - Service	33.93	-10.18	-0.00	0.16	905.59	0.06
Dead+Wind 300 deg - Service	33.93	-8.81	-5.11	-455.29	784.34	-0.15
Dead+Wind 330 deg - Service	33.93	-5.09	-8.85	-788.70	453.08	-0.32

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	-33.93	0.00	0.00	33.93	0.00	0.000%
2	0.00	-33.93	-29.48	0.00	33.93	29.48	0.006%
3	14.67	-33.93	-25.53	-14.67	33.93	25.53	0.000%
4	25.42	-33.93	-14.74	-25.42	33.93	14.74	0.000%
5	29.35	-33.93	0.00	-29.35	33.93	0.00	0.006%
6	25.42	-33.93	14.74	-25.42	33.93	-14.74	0.000%
7	14.67	-33.93	25.53	-14.67	33.93	-25.53	0.000%
8	0.00	-33.93	29.48	0.00	33.93	-29.48	0.006%
9	-14.67	-33.93	25.53	14.67	33.93	-25.53	0.000%
10	-25.42	-33.93	14.74	25.42	33.93	-14.74	0.000%
11	-29.35	-33.93	0.00	29.35	33.93	0.00	0.006%
12	-25.42	-33.93	-14.74	25.42	33.93	14.74	0.000%
13	-14.67	-33.93	-25.53	14.67	33.93	25.53	0.000%
14	0.00	-45.21	0.00	-0.00	45.21	-0.00	0.000%
15	0.00	-45.21	-7.09	-0.00	45.21	7.09	0.001%
16	3.53	-45.21	-6.14	-3.53	45.21	6.14	0.000%
17	6.11	-45.21	-3.55	-6.11	45.21	3.55	0.000%
18	7.06	-45.21	0.00	-7.06	45.21	0.00	0.001%
19	6.11	-45.21	3.55	-6.11	45.21	-3.55	0.000%
20	3.53	-45.21	6.14	-3.53	45.21	-6.14	0.000%
21	0.00	-45.21	7.09	-0.00	45.21	-7.09	0.001%
22	-3.53	-45.21	6.14	3.53	45.21	-6.14	0.000%
23	-6.11	-45.21	3.55	6.11	45.21	-3.55	0.000%
24	-7.06	-45.21	0.00	7.06	45.21	0.00	0.001%
25	-6.11	-45.21	-3.55	6.11	45.21	3.55	0.000%
26	-3.53	-45.21	-6.14	3.53	45.21	6.14	0.000%
27	0.00	-33.93	-10.22	-0.00	33.93	10.22	0.003%
28	5.09	-33.93	-8.85	-5.09	33.93	8.85	0.003%
29	8.81	-33.93	-5.11	-8.81	33.93	5.11	0.003%
30	10.18	-33.93	0.00	-10.18	33.93	0.00	0.003%
31	8.81	-33.93	5.11	-8.81	33.93	-5.11	0.003%
32	5.09	-33.93	8.85	-5.09	33.93	-8.85	0.003%
33	0.00	-33.93	10.22	-0.00	33.93	-10.22	0.003%
34	-5.09	-33.93	8.85	5.09	33.93	-8.85	0.003%
35	-8.81	-33.93	5.11	8.81	33.93	-5.11	0.003%
36	-10.18	-33.93	0.00	10.18	33.93	0.00	0.003%
37	-8.81	-33.93	-5.11	8.81	33.93	5.11	0.003%
38	-5.09	-33.93	-8.85	5.09	33.93	8.85	0.003%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	6	0.00000001	0.00000001
2	Yes	14	0.00006805	0.00011359
3	Yes	18	0.00000001	0.00008829
4	Yes	18	0.00000001	0.00009106
5	Yes	14	0.00006810	0.00010183
6	Yes	18	0.00000001	0.00008955
7	Yes	18	0.00000001	0.00008914

8	Yes	14	0.00006805	0.00011359
9	Yes	18	0.00000001	0.00009154
10	Yes	18	0.00000001	0.00008840
11	Yes	14	0.00006810	0.00010188
12	Yes	18	0.00000001	0.00008984
13	Yes	18	0.00000001	0.00009063
14	Yes	6	0.00000001	0.00000001
15	Yes	15	0.00000001	0.00012535
16	Yes	16	0.00000001	0.00007050
17	Yes	16	0.00000001	0.00007073
18	Yes	15	0.00000001	0.00012407
19	Yes	16	0.00000001	0.00007062
20	Yes	16	0.00000001	0.00007065
21	Yes	15	0.00000001	0.00012546
22	Yes	16	0.00000001	0.00007152
23	Yes	16	0.00000001	0.00007092
24	Yes	15	0.00000001	0.00012494
25	Yes	16	0.00000001	0.00007100
26	Yes	16	0.00000001	0.00007132
27	Yes	14	0.00000001	0.00004679
28	Yes	14	0.00000001	0.00012011
29	Yes	14	0.00000001	0.00013403
30	Yes	14	0.00000001	0.00004565
31	Yes	14	0.00000001	0.00012629
32	Yes	14	0.00000001	0.00012410
33	Yes	14	0.00000001	0.00004679
34	Yes	14	0.00000001	0.00013618
35	Yes	14	0.00000001	0.00012080
36	Yes	14	0.00000001	0.00004572
37	Yes	14	0.00000001	0.00012778
38	Yes	14	0.00000001	0.00013143

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	133.5 - 121.5	27.96	27	1.97	0.01
L2	121.5 - 119	23.13	33	1.81	0.00
L3	119 - 85.25	22.20	33	1.78	0.00
L4	85.25 - 75	11.13	33	1.25	0.00
L5	78.75 - 68.25	9.49	33	1.17	0.00
L6	68.25 - 37.75	7.08	33	0.98	0.00
L7	42.5 - 0	2.80	33	0.60	0.00

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
131.00	(2) P65-15-XLH-RR w/ Mount Pipe	27	26.93	1.93	0.00	5074
129.00	(2) RRUS-11	27	26.11	1.90	0.00	5074
119.00	APXVSPP18-C-A20 w/ Mount Pipe	33	22.20	1.78	0.00	4408
111.00	(3) 844H90T6E-XY w/ Mount Pipe	33	19.29	1.67	0.00	5358
101.00	ERICSSON AIR 21 B2A B4P w/ Mount Pipe	33	15.85	1.50	0.00	3743
95.00	APXV18-206517S-ACU w/ Mount Pipe	33	13.94	1.40	0.00	3170
60.00	58532A	33	5.45	0.84	0.00	3356
50.00	KS24019-L112A	33	3.80	0.70	0.00	3262

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	133.5 - 121.5	80.27	2	5.64	0.01
L2	121.5 - 119	66.43	8	5.18	0.01
L3	119 - 85.25	63.74	8	5.10	0.01
L4	85.25 - 75	32.00	8	3.60	0.00
L5	78.75 - 68.25	27.27	8	3.36	0.00
L6	68.25 - 37.75	20.36	8	2.82	0.00
L7	42.5 - 0	8.05	8	1.74	0.00

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
131.00	(2) P65-15-XLH-RR w/ Mount Pipe	2	77.31	5.54	0.01	1814
129.00	(2) RRUS-11	2	74.95	5.45	0.01	1814
119.00	APXVSPP18-C-A20 w/ Mount Pipe	8	63.74	5.10	0.01	1571
111.00	(3) 844H90T6E-XY w/ Mount Pipe	8	55.39	4.79	0.01	1900
101.00	ERICSSON AIR 21 B2A B4P w/ Mount Pipe	8	45.55	4.31	0.00	1322
95.00	APXV18-206517S-ACU w/ Mount Pipe	8	40.06	4.02	0.00	1118
60.00	58532A	8	15.67	2.42	0.00	1173
50.00	KS24019-L112A	8	10.92	2.02	0.00	1138

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	133.5 - 121.5 (1)	TP10.75x10.75x0.33	12.00	0.00	0.0	21.00	10.8027	-2.50	226.86	0.011
L2	121.5 - 119 (2)	TP22x10.75x0.33	2.50	0.00	0.0	21.00	10.8027	-2.51	226.86	0.011
L3	119 - 85.25 (3)	TP28.414x22x0.25	33.75	0.00	0.0	39.00	22.6720	-11.30	884.21	0.013
L4	85.25 - 75 (4)	TP30.362x28.414x0.5002	10.25	0.00	0.0	31.42	46.9489	-12.56	1475.23	0.009
L5	75 - 68.25 (5)	TP31.1447x28.6489x0.3125	10.50	0.00	0.0	39.00	31.0249	-14.68	1209.97	0.012
L6	68.25 - 37.75 (6)	TP36.941x31.1447x0.5336	30.50	0.00	0.0	35.15	61.0016	-20.82	2144.09	0.010
L7	37.75 - 0 (7)	TP43.49x34.9711x0.5544	42.50	0.00	0.0	35.38	76.6514	-33.91	2712.08	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	133.5 - 121.5 (1)	TP10.75x10.75x0.33	48.90	21.50	23.10	0.931	0.00	0.00	23.10	0.000
L2	121.5 - 119 (2)	TP22x10.75x0.33	48.90	21.50	23.10	0.931	0.00	0.00	23.10	0.000
L3	119 - 85.25 (3)	TP28.414x22x0.25	549.49	42.28	39.00	1.084	0.00	0.00	39.00	0.000
L4	85.25 - 75 (4)	TP30.362x28.414x0.5002	674.63	24.42	31.42	0.777	0.00	0.00	31.42	0.000
L5	75 - 68.25 (5)	TP31.1447x28.6489x0.3125	888.93	45.71	39.00	1.172	0.00	0.00	39.00	0.000
L6	68.25 - 37.75 (6)	TP36.941x31.1447x0.5336	1474.28	33.65	35.15	0.957	0.00	0.00	35.15	0.000
L7	37.75 - 0 (7)	TP43.49x34.9711x0.5544	2621.41	39.29	35.38	1.110	0.00	0.00	35.38	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	133.5 - 121.5 (1)	TP10.75x10.75x0.33	5.14	0.48	14.00	0.068	0.15	0.03	14.00	0.002
L2	121.5 - 119 (2)	TP22x10.75x0.33	5.19	0.48	14.00	0.045	0.15	0.03	14.00	0.002
L3	119 - 85.25 (3)	TP28.414x22x0.25	18.81	0.83	26.00	0.065	0.33	0.01	26.00	0.000
L4	85.25 - 75 (4)	TP30.362x28.414x0.5002	19.72	0.42	20.95	0.041	0.39	0.01	20.95	0.000
L5	75 - 68.25 (5)	TP31.1447x28.6489x0.3125	21.02	0.68	26.00	0.053	0.46	0.01	26.00	0.000
L6	68.25 - 37.75 (6)	TP36.941x31.1447x0.5336	24.46	0.40	23.43	0.035	0.76	0.01	23.43	0.000
L7	37.75 - 0 (7)	TP43.49x34.9711x0.5544	29.51	0.38	23.59	0.033	1.17	0.01	23.59	0.000

Pole Interaction Design Data

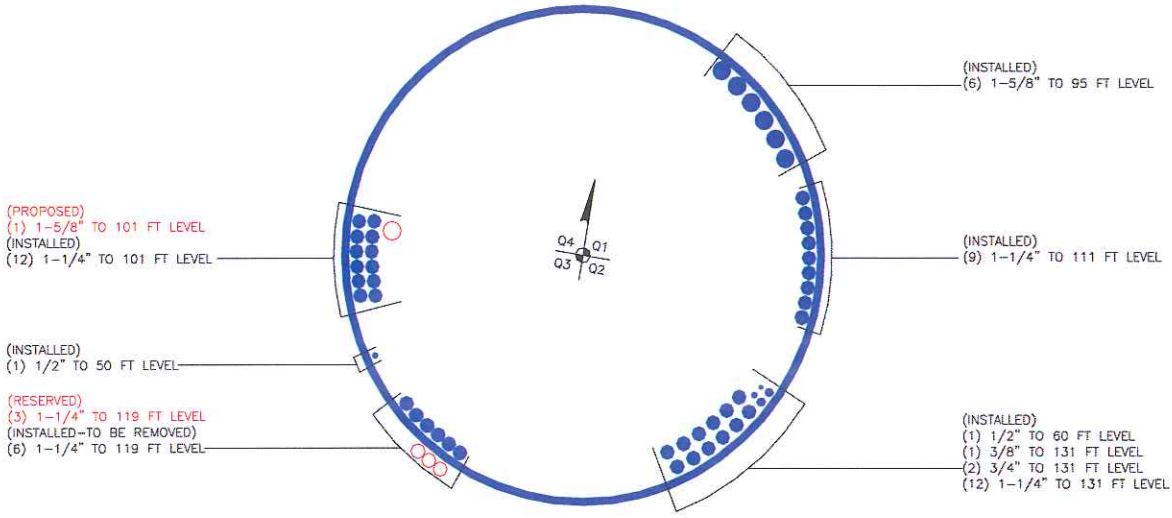
Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	133.5 - 121.5 (1)	0.011	0.931	0.000	0.068	0.002	0.943 ✔	1.333	H1-3+VT ✔
L2	121.5 - 119 (2)	0.011	0.931	0.000	0.045	0.002	0.943 ✔	1.333	H1-3+VT ✔
L3	119 - 85.25 (3)	0.013	1.084	0.000	0.065	0.000	1.098 ✔	1.333	H1-3+VT ✔
L4	85.25 - 75 (4)	0.009	0.777	0.000	0.041	0.000	0.786 ✔	1.333	H1-3+VT ✔
L5	75 - 68.25 (5)	0.012	1.172	0.000	0.053	0.000	1.185 ✔	1.333	H1-3+VT ✔
L6	68.25 - 37.75 (6)	0.010	0.957	0.000	0.035	0.000	0.967 ✔	1.333	H1-3+VT ✔
L7	37.75 - 0 (7)	0.013	1.110	0.000	0.033	0.000	1.123 ✔	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	133.5 - 121.5	Pole	TP10.75x10.75x0.33	1	-2.50	302.40	70.7	Pass
L2	121.5 - 119	Pole	TP22x10.75x0.33	2	-2.51	302.40	70.7	Pass
L3	119 - 85.25	Pole	TP28.414x22x0.25	3	-11.30	1178.65	82.4	Pass
L4	85.25 - 75	Pole	TP30.362x28.414x0.5002	4	-12.56	1966.48	59.0	Pass
L5	75 - 68.25	Pole	TP31.1447x28.6489x0.3125	5	-14.68	1612.89	88.9	Pass
L6	68.25 - 37.75	Pole	TP36.941x31.1447x0.5336	6	-20.82	2858.07	72.6	Pass
L7	37.75 - 0	Pole	TP43.49x34.9711x0.5544	7	-33.91	3615.20	84.3	Pass
							Summary	
						Pole (L5)	88.9	Pass
						RATING =	**88.9**	**Pass**

APPENDIX B

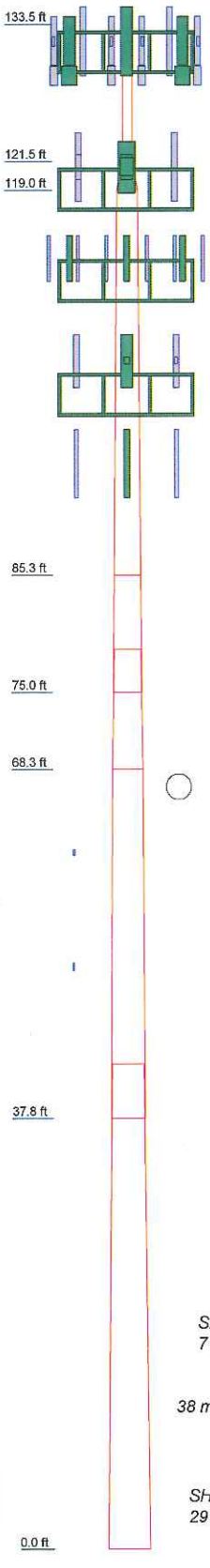
BASE LEVEL DRAWING

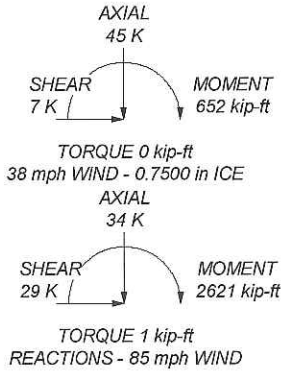

(INSTALLED)
(6) 1-5/8" TO 95 FT LEVEL
(PROPOSED)
(1) 1-5/8" TO 101 FT LEVEL
(INSTALLED)
(12) 1-1/4" TO 101 FT LEVEL
(INSTALLED)
(9) 1-1/4" TO 111 FT LEVEL
(INSTALLED)
(1) 1/2" TO 50 FT LEVEL
(RESERVED)
(3) 1-1/4" TO 119 FT LEVEL
(INSTALLED-TO BE REMOVED)
(6) 1-1/4" TO 119 FT LEVEL
(INSTALLED)
(1) 1/2" TO 60 FT LEVEL
(1) 3/8" TO 131 FT LEVEL
(2) 3/4" TO 131 FT LEVEL
(12) 1-1/4" TO 131 FT LEVEL
Q4
Q1
Q3
Q2

APPENDIX C

ADDITIONAL CALCULATIONS

Section	1	2	3	4	5	6	7
Length (ft)	12.00	2.50	33.75	10.25 / 10.50	10.50	30.50	42.50
Number of Sides	1	1	12	12	12	12	12
Thickness (in)	0.3300	0.3300	0.2500	0.5002	0.3125	0.5336	0.5544
Socket Length (ft)				3.75		4.75	
Top Dia (in)	10.7500	10.7500	22.0000	28.4140	28.6489	31.1447	34.9711
Bot Dia (in)	10.7500	22.0000	28.4140	30.3620	31.1447	36.9410	43.4900
Grade	A53-B-35		A572-65	Reinf 52.37 ksi		A572-65	Reinf 58.58 ksi / Reinf 58.97 ksi
Weight (K)	0.4	0.1	2.3	1.6	1.1	6.0	10.0





DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
(2) P65-15-XLH-RR w/ Mount Pipe	131	(3) 844H90T6E-XY w/ Mount Pipe	111
(2) P65-15-XLH-RR w/ Mount Pipe	131	(3) 844H90T6E-XY w/ Mount Pipe	111
(2) P65-15-XLH-RR w/ Mount Pipe	131	(3) 844H90T6E-XY w/ Mount Pipe	111
(2) TT19-08BP111-001	131	Platform Mount [LP 712-1]	111
(2) TT19-08BP111-001	131	ERICSSON AIR 21 B2A B4P w/ Mount Pipe	101
(2) TT19-08BP111-001	131		
AM-X-CD-16-65-00T-RET w/ Mount Pipe	131	ERICSSON AIR 21 B2A B4P w/ Mount Pipe	101
AM-X-CD-16-65-00T-RET w/ Mount Pipe	131	ERICSSON AIR 21 B2A B4P w/ Mount Pipe	101
AM-X-CD-16-65-00T-RET w/ Mount Pipe	131	ERICSSON AIR 21 B4A B2P w/ Mount Pipe	101
DC6-48-60-18-8F	131	ERICSSON AIR 21 B4A B2P w/ Mount Pipe	101
Platform Mount [LP 712-1]	131		
(2) RRUS-11	129	ERICSSON AIR 21 B4A B2P w/ Mount Pipe	101
(2) RRUS-11	129	KRY 112 144/1	101
(2) RRUS-11	129	KRY 112 144/1	101
Side Arm Mount [SO 102-3]	129	KRY 112 144/1	101
APXVSPP18-C-A20 w/ Mount Pipe	119	Platform Mount [LP 713-1]	101
APXVSPP18-C-A20 w/ Mount Pipe	119	APXV18-206517S-ACU w/ Mount Pipe	95
P40-16-XLPP-RR-A w/ Mount Pipe	119	APXV18-206517S-ACU w/ Mount Pipe	95
PCS 1900MHz 4x45W-65MHz	119	APXV18-206517S-ACU w/ Mount Pipe	95
PCS 1900MHz 4x45W-65MHz	119	Pipe Mount [PM 601-3]	95
PCS 1900MHz 4x45W-65MHz	119	58532A	60
800MHz 2X50W RRH W/FILTER	119	Side Arm Mount [SO 304-1]	60
800MHz 2X50W RRH W/FILTER	119	KS24019-L112A	50
800MHz 2X50W RRH W/FILTER	119	Side Arm Mount [SO 102-1]	50
Platform Mount [LP 712-1]	119		
Pipe Mount [PM 601-3]	119		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A53-B-35	35 ksi	58 ksi	Reinf 58.58 ksi	59 ksi	74 ksi
A572-65	65 ksi	80 ksi	Reinf 58.97 ksi	59 ksi	74 ksi
Reinf 52.37 ksi	52 ksi	66 ksi			

TOWER DESIGN NOTES

1. Tower is located in Middlesex 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 38 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 88.9%

Paul J Ford and Company
250 E. Broad Street Suite 1500
Columbus, OH 43215
Phone: 614.221.6679
FAX: 614.448.44105

Job: *133' Pole (Coe Hill / Middlefield, CT)*			
Project: *PJF #37513-1268 / BU #876340*			
Client: CCI	Drawn by: Robert Koors	App'd:	
Code: TIA/EIA-222-F	Date: 04/22/13	Scale: NTS	
Path: T:\375_Crown_Castle\2013\37513-1268 BU 876340\37513-1268_Reinforced.eri		Dwg No. E-1	

PAUL J. FORD AND COMPANY
STRUCTURAL ENGINEERS
250 East Broad Street • Suite 1500 • Columbus, Ohio 43215-3708
Phone 614-221-6679 • Fax 614-448-4105 • www.PJFweb.com

Date: 4/22/2013
PJF Project: 37513-1268
Client Ref. # 876340
Site Name: Coe Hill
Description: 133' Pole
Owner: CCI
Engineer: RMK

v4.0 - Effective 1-12-12

Asymmetric Anchor Rod Analysis

Moment =	2621	k-ft	TIA Ref.	F	Location =	Base Plate		
Axial =	34.0	kips	ASIF =	1.3333	η =	N/A	for BP, Rev. G Sect. 4.9.9	
Shear =	29.0	kips	Max Ratio =	105.0%	Threads =	N/A	for FP, Rev. G	
Anchor Qty =	16							

** For Post Installed Anchors: Check anchors for embedment, epoxy/grout bond, and capacity based on proof load. **

Item	Nominal Anchor Dia, in	Anchor Spec	Fy, ksi	Fu, ksi	Location, degrees	Anchor Circle, in	Area Override, in^2	Area, in^2	Max Net Compression, kips	Max Net Tension, kips	Load for Capacity Calc, kips	Capacity Override, kips	Capacity, kips	Capacity Ratio
1	2.250	#18J A615 Gr 75	75	100	0.0	58.99	0.00	3.98	166.57	162.32	162.32	170.00	170.00	95.5%
2	2.250	#18J A615 Gr 75	75	100	90.0	58.99	0.00	3.98	166.57	162.32	162.32	170.00	170.00	95.5%
3	2.250	#18J A615 Gr 75	75	100	180.0	58.99	0.00	3.98	166.57	162.32	162.32	170.00	170.00	95.5%
4	2.250	#18J A615 Gr 75	75	100	270.0	58.99	0.00	3.98	166.57	162.32	162.32	170.00	170.00	95.5%
5	2.250	#18J A615 Gr 75	75	100	11.5	51.00	0.00	3.98	144.29	140.04	140.04	0.00	195.00	71.8%
6	2.250	#18J A615 Gr 75	75	100	25.0	51.00	0.00	3.98	144.29	140.04	140.04	0.00	195.00	71.8%
7	2.250	#18J A615 Gr 75	75	100	38.5	51.00	0.00	3.98	144.29	140.04	140.04	0.00	195.00	71.8%
8	2.250	#18J A615 Gr 75	75	100	101.5	51.00	0.00	3.98	144.29	140.04	140.04	0.00	195.00	71.8%
9	2.250	#18J A615 Gr 75	75	100	115.0	51.00	0.00	3.98	144.29	140.04	140.04	0.00	195.00	71.8%
10	2.250	#18J A615 Gr 75	75	100	128.5	51.00	0.00	3.98	144.29	140.04	140.04	0.00	195.00	71.8%
11	2.250	#18J A615 Gr 75	75	100	191.5	51.00	0.00	3.98	144.29	140.04	140.04	0.00	195.00	71.8%
12	2.250	#18J A615 Gr 75	75	100	205.0	51.00	0.00	3.98	144.29	140.04	140.04	0.00	195.00	71.8%
13	2.250	#18J A615 Gr 75	75	100	218.5	51.00	0.00	3.98	144.29	140.04	140.04	0.00	195.00	71.8%
14	2.250	#18J A615 Gr 75	75	100	281.5	51.00	0.00	3.98	144.29	140.04	140.04	0.00	195.00	71.8%
15	2.250	#18J A615 Gr 75	75	100	295.0	51.00	0.00	3.98	144.29	140.04	140.04	0.00	195.00	71.8%
16	2.250	#18J A615 Gr 75	75	100	308.5	51.00	0.00	3.98	144.29	140.04	140.04	0.00	195.00	71.8%
								63.68						

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

Assumptions: 1) Rod groups at corners. Total # rods divisible by 4. Maximum total # of rods = 48 (12 per Corner).
2) Rod Spacing = Straight Center-to-Center distance between any (2) adjacent rods (same corner)
3) Clear space between bottom of leveling nut and top of concrete **not** exceeding (1)*(Rod Diameter)

Site Data

BU#:
Site Name:
App #:

Anchor Rod Data		
Qty:	12	
Diam:	2.25	in
Rod Material:	A615-J	
Yield, Fy:	75	ksi
Strength, Fu:	100	ksi
Bolt Circle:	51	in
Anchor Spacing:	6	in

Plate Data		
W=Side:	49	in
Thick:	3	in
Grade:	50	ksi
Clip Distance:	0	in

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

Pole Data		
Diam:	43.49	in
Thick:	0.375	in
Grade:	65	ksi
# of Sides:	12	"0" IF Round

Stress Increase Factor		
ASD ASIF:	1.333	

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

Base Reactions		
TIA Revision:	F	
Unfactored Moment, M:	1812.6	ft-kips
Unfactored Axial, P:	25.5	kips
Unfactored Shear, V:	21.8	kips

Anchor Rod Results

TIA F --> Maximum Rod Tension 140.0 Kips

See asymetric spreadsheet

Base Plate Results Flexural Check

Base Plate Stress:	36.1 ksi
Allowable PL Bending Stress:	50.0 ksi
Base Plate Stress Ratio:	72.2% **Pass**

PL Ref. Data
Yield Line (in):
25.81
Max PL Length:
25.81

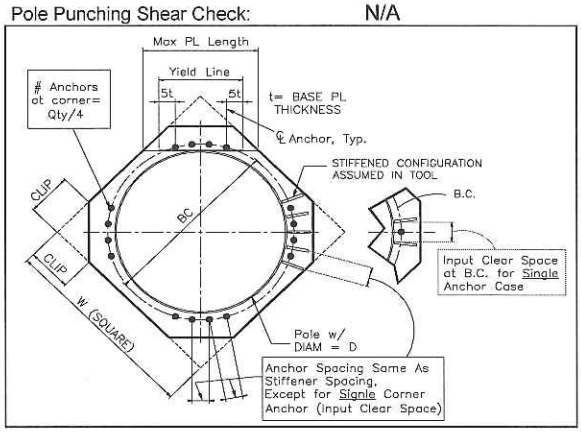
N/A - Unstiffened

Stiffener Results

Horizontal Weld :	N/A
Vertical Weld:	N/A
Plate Flex+Shear, fb/Fb+(fv/Fv)^2:	N/A
Plate Tension+Shear, ft/Ft+(fv/Fv)^2:	N/A
Plate Comp. (AISC Bracket):	N/A

Pole Results

Pole Punching Shear Check: N/A



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Page	1	of	1
By	RMK	Date	4/22/2013
Project	37513-1268		
Client	Crown Castle		
PROJ#	876340		

Rev. Date: 1/2/2012

Stilt Extension Connection

@ 119 ' elevation

Assume 3 legs w/ 38.5 " Tube Circle

Revision = F

Reactions from TNXTower:

Moment = 48.9 k-ft

Axial = 2.51 kips

Shear = 5.18 kips

Unbraced length = 66 in.

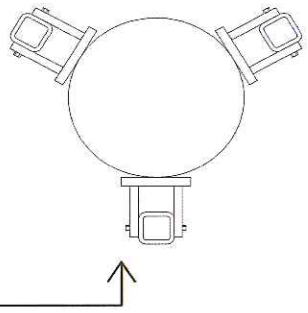
K = 2.1

Number of Bolt Rows (N) = 6 Even Number

Bolt Spacing (S) = 3

$$I = \frac{N * (B.C.)^2}{8}$$

$I = 555.8 \text{ in}^2$



My/I = 20.3 kips

Axial/leg = 0.83667 kips

Tension = 19.5 kips

Compression = 21.2 kips

Moment = 341.88 k-ft

Using HSS 6x6x1/2

Available Strength in Axial Compression

Per AISC 13th edition for ASD (Table 4-4)

KL = 11.55

Pn/Ωc = 244.95 kips

Pn/Ωc = 326.6 > 21.2

Ratio = 6.5%

KL	øcPn
11	251
12	240

Available Flexural Strength

Per AISC 13th edition for ASD (Table 3-13)

Mn/Ω = 45.4 k-in

Mn/Ω = 60.5333 > 28.49

Ratio = 47.1%

Combined Strength

Pr/Pc = 0.06478 <—— Use (H1-1b) Per AISC 13th edition

0.50304 < 1.0, PASS

Ratio = 50.3%

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250 East Broad Street • Suite 500 • Columbus, Ohio 43215
Ph: (614) 221-6679 • Fax1: (614) 221-2540 • Fax2: (614) 221-0166

PJF Project Number:	37513-1268
Job Description:	119' Connection
Site Name:	Coe Hill

Bolted-On Bridge Stiffener Calculations

Tension Force ($T_{applied}$) =	20.3221	kips
Eccentricity (e) =	14.25	inches
Number of Bolt Rows (N) =	6	
Bolt Spacing (S) =	3	inches
Allowable Stress Increase =	1.3333	

V_{allow} (Hollo Bolt) =	15.0	kips
T_{allow} (Hollo Bolt) =	15.0	kips
Sum r^2 =	157.5	inches^2
Ry (Shear Force) =	3.39	kips/bolt
Rx (Tension Force) =	13.79	kips/bolt

Combined Stress Ratio = **95.3%** **OK**

NOTE: REMEMBER TO CHECK PLATE BENDING

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Job Number:	37513-0643 R1	**Page:**	1
Site Number:	BU 817966	**By:**	RMK
Site Name:	TX Thornton	**Date:**	4/22/2013

DRILLED PIER SOIL AND STEEL ANALYSIS - TIA-222-G

Factored Base Reactions from RISA

	Comp. (+)	Tension (-)	
Moment, Mu =	4692.0		k-ft
Shear, Vu =	44.0		kips
Axial Load, Pu1 =	56.0		kips (from 1.2D + 1.6W)*
Axial Load, Pu2 =	42.0	0.0	kips (from 0.9D + 1.6W)**
OTMu =	4714.0	0.0	k-ft @ Ground

*Axial Load, Pu1 will be used for Soil Compression Analysis.
**Axial Load, Pu2 will be used for Steel Analysis.

Safety Factors / Load Factors / Φ Factors

Tower Type =	Monopole DP
ACI Code =	ACI 318-05
Seismic Design Category =	D
Reference Standard =	TIA-222-G
Use 1.3 Load Factor?	Yes
Load Factor =	1.00

Drilled Pier Parameters

Diameter =	6	ft
Height Above Grade =	0.5	ft
Depth Below Grade =	28	ft
fc' =	4	ksi
εc =	0.003	in/in
Mat Ftdn. Cap Width =		ft
Mat Ftdn. Cap Length =		ft
Depth Below Grade =		ft

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

Load Combinations Checked per TIA-222-G

1. (0.75) Ult. Skin Friction + (0.75) Ult. End Bearing
+ Effective Soil Wt. - Buoyant Conc. Wt. ≥ Compression
2. (0.75) Ult. Skin Friction + Buoyant Conc. Wt. ≥ Uplift

Steel Parameters

Number of Bars =	28	
Rebar Size =	#11	
Rebar Fy =	60	ksi
Rebar MOE =	29000	ksi
Tie Size =	#4	
Side Clear Cover to Ties =	4	in

Soil Parameters

Water Table Depth =	13.00	ft
Depth to Ignore Soil =	4.00	ft
Depth to Full Cohesion =	0	ft
Full Cohesion Starts at?	Ground	

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

Direct Embed Pole Shaft Parameters

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

Maximum Capacity Ratios

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

Define Soil Layers

Note: Cohesion = Undrained Shear Strength = 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	13	100	0	28	Sand	0			13
2	7	100	0	29	Sand	0			20
3	10	120	0	35	Sand	16000			30
4									
5									
6									
7									
8									
9									
10									
11									
12									

Soil Results: Overturning

Depth to COR =	20.61	ft, from Grade	Shear, Vu =	44.00	kips
Bending Moment, Mu =	5620.98	k-ft, from COR	Resisting Shear, ΦVn =	57.71	kips
Resisting Moment, ΦMn =	7372.68	k-ft, from COR			

MOMENT RATIO = 76.2% OK **SHEAR RATIO = 76.2% OK**

Soil Results: Uplift

Uplift, Tu =	0.00	kips
Uplift Capacity, ΦTn =	94.41	kips

UPLIFT RATIO = 0.0% OK

Soil Results: Compression

Compression, Cu =	56.00	kips
Comp. Capacity, ΦCn =	302.11	kips

COMPRESSION RATIO = 18.5% OK

Steel Results (ACI 318-05):

Minimum Steel Area =	13.57	sq in
Actual Steel Area =	43.68	sq in
Axial, ΦPn (min) =	-2358.72	kips, Where ΦMn = 0 k-ft
Axial, ΦPn (max) =	8484.01	kips, Where ΦMn = 0 k-ft

Axial Load, Pu =	71.69	kips @ 6.50 ft Below Grade
Moment, Mu =	4956.94	k-ft @ 6.50 ft Below Grade
Moment, ΦMn =	5667.98	k-ft

MOMENT RATIO = 87.5% 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#: *BU 817966*
Site Name: *TX Thornton*
App #:

Loads Already Factored		
For M (WL)	1	<----Disregard
For P (DL)	1	<----Disregard

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=	4	
Vert. Cage Diameter =	5.13	ft
Vert. Cage Diameter =	61.59	in
Vertical Bar Size =	11	
Bar Diameter =	1.41	in
Bar Area =	1.56	in^2
Number of Bars =	28	
As Total=	43.68	in^2
A s/ Aconc, Rho:	0.0107	1.07%

ACI 10.5 , ACI 21.10.4, and IBC 1810.
Min As for Flexural, Tension Controlled, Shafts:
(3)*(Sqrt(f'c)/Fy: 0.0032
200 / Fy: 0.0033

Minimum Rho Check:

Actual Req'd Min. Rho:	0.33%	Flexural
Provided Rho:	1.07%	OK

Ref. Shaft Max Axial Capacities, ϕ Max(Pn or Tn):		
Max Pu = (φ=0.65) Pn,		
Pn per ACI 318 (10-2)	8484.01	kips
at Mu=(ϕ=0.65)Mn=	4348.09	ft-kips
Max Tu, (φ=0.9) Tn =	2358.72	kips
at Mu=ϕ=(0.90)Mn=	0.00	ft-kips

Maximum Shaft Superimposed Forces		
TIA Revision:	G	
Max. Factored Shaft Mu:	4956.94	ft-kips (* Note)
Max. Factored Shaft Pu:	71.69	kips
Max Axial Force Type:	Comp.	

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

Load Factor	Shaft Factored Loads		
1.00	Mu:	4956.94	ft-kips
1.00	Pu:	71.69	kips

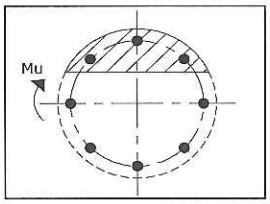
Material Properties

Concrete Comp. strength, f'c =	4000	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=	2005	
Seismic Properties		
Seismic Design Category =	D	
Seismic Risk =	**High**	

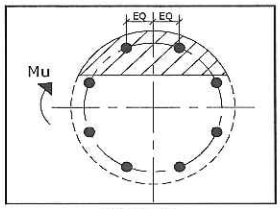
Solve (Run) <-- Press Upon Completing All Input

Results:

Governing Orientation Case: **2**



Case 1



Case 2

Dist. From Edge to Neutral Axis:	**14.12**	in
Extreme Steel Strain, εt:	**0.0111**	
	εt > 0.0050, Tension Controlled	
Reduction Factor,φ:	**0.900**	

Output Note: Negative Pu=Tension

For Axial Compression, φ Pn = Pu:	71.69	kips
Drilled Shaft Moment Capacity, φMn:	**5667.99**	ft-kips
Drilled Shaft Superimposed Mu:	**4956.94**	ft-kips

(Mu/φMn, Drilled Shaft Flexure CSR:	87.5%

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

Date: **April 19, 2013**

Darcy Tarr
Crown Castle USA Inc.
3530 Toringdon Way, Suite 300
Charlotte, NC 28277
704.405.6589

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

Subject: **Structural Analysis Report**

Carrier Designation:	***T-Mobile* Co-Locate**	
	Carrier Site Number:	CT11309A
	Carrier Site Name:	CT11309A
Crown Castle Designation:	**Crown Castle BU Number:**	876340
	Crown Castle Site Name:	COE HILL
	Crown Castle JDE Job Number:	232459
	Crown Castle Work Order Number:	600927
	Crown Castle Application Number:	186717 Rev. 0
Engineering Firm Designation:	**Paul J Ford and Company Project Number:**	37513-1268
Site Data:	**238 Meridan Rd., MIDDLEFIELD, Middlesex County, CT** **Latitude *41° 32' 50.98"*, Longitude *-72° 42' 59.41"*** **133.5 Foot - Monopole Tower**	

Dear Darcy Tarr,

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 539151, in accordance with application 186717, revision 0.

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

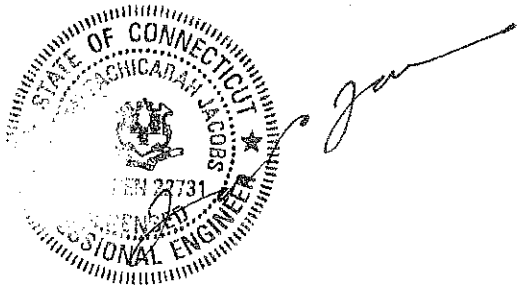
LC7: Existing + Reserved + Proposed Equipment **Sufficient Capacity**
Note: See Table I and Table II for the proposed and existing/reserved loading, respectively.

The structural analysis was performed for this tower in accordance with the requirements of the TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures and the 2005 Connecticut Building Code using a fastest mile wind speed of 85 mph with no ice, 37.6 mph with 0.75 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:

Bob Koors, E.I.
Structural Designer



tnxTower Report - version 6.0.3.0

APR 22 2013

EBI Consulting
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RADIO FREQUENCY EMISSIONS ANALYSIS REPORT
EVALUATION OF HUMAN EXPOSURE POTENTIAL TO NON-IONIZING EMISSIONS

T-Mobile Existing Facility

Site ID: CT11309A

Middlefield Route 66
238 Meriden Road
Middlefield, CT 06455

May 14, 2013

EBI Project Number: 62136255

21 B Street · Burlington, MA 01803 · Tel: (781) 273.2500 · Fax: (781) 273.3311

EBI Consulting
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May 14, 2013

T-Mobile USA
Attn: Jason Overbey, RF Manager
35 Griffin Road South
Bloomfield, CT 06002

Re: Emissions Values for Site: **CT11309A - Middlefield Route 66**

EBI Consulting was directed to analyze the proposed T-Mobile facility located at 238 Meriden Road, Middlefield, CT, for the purpose of determining whether the emissions from the Proposed T-Mobile Antenna Installation located on this property are within specified federal limits.

All information used in this report was analyzed as a percentage of current Maximum Permissible Exposure (% MPE) as listed in the FCC OET Bulletin 65 Edition 97-01and ANSI/IEEE Std C95.1. The FCC regulates Maximum Permissible Exposure in units of microwatts per square centimeter (μW/cm2). The number of μW/cm2 calculated at each sample point is called the power density. The exposure limit for power density varies depending upon the frequencies being utilized. Wireless Carriers and Paging Services use different frequency bands each with different exposure limits, therefore it is necessary to report results and limits in terms of percent MPE rather than power density.

All results were compared to the FCC (Federal Communications Commission) radio frequency exposure rules, 47 CFR 1.1307(b)(1) – (b)(3), to determine compliance with the Maximum Permissible Exposure (MPE) limits for General Population/Uncontrolled environments as defined below.

General population/uncontrolled exposure limits apply to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Therefore, members of the general public would always be considered under this category when exposure is not employment related, for example, in the case of a telecommunications tower that exposes persons in a nearby residential area.

Public exposure to radio frequencies is regulated and enforced in units of microwatts per square centimeter (μW/cm2). The general population exposure limit for the cellular band is 567 μW/cm2, and the general population exposure limit for the PCS band is 1000 μW/cm2. Because each carrier will be using different frequency bands, and each frequency band has different exposure limits, it is necessary to report percent of MPE rather than power density.

Occupational/controlled exposure limits apply to situations in which persons are exposed as a consequence of their employment and in which those persons who are exposed have been made fully aware of the potential for exposure and can exercise control over their exposure. Occupational/controlled exposure limits also apply where exposure is of a transient nature as a result of incidental passage through a location where exposure levels may be above general population/uncontrolled limits (see below), as long as the exposed person has been made fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Additional details can be found in FCC OET 65.

CALCULATIONS

Calculations were done for the proposed T-Mobile Wireless antenna facility located at 238 Meriden Road, Middlefield, CT, using the equipment information listed below. All calculations were performed per the specifications under FCC OET 65. Since T-Mobile is proposing highly focused directional panel antennas, which project most of the emitted energy out toward the horizon, the actual antenna pattern gain value in the direction of the sample area was used. For this report the sample point is a 6 foot person standing at the base of the tower

For all calculations, all equipment was calculated using the following assumptions:

1) 2 GSM channels (1935.000 MHz—to 1945.000 MHz) were considered for each sector of the proposed installation.
2) 2 UMTS channels (2110.000 MHz to 2120.000 MHz / 2140.000 MHz to 2145.000 MHz) were considered for each sector of the proposed installation
3) 2 LTE channels (2110.000 MHz to 2120.000 MHz / 2140.000 MHz to 2145.000 MHz) were considered for each sector of the proposed installation
4) All radios at the proposed installation were considered to be running at full power and were uncombined in their RF transmissions paths per carrier prescribed configuration. Per FCC OET Bulletin No. 65 - Edition 97-01 recommendations to achieve the maximum anticipated value at each sample point, all power levels emitting from the proposed antenna installation 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.
5) For the following calculations the sample point was the top of a six foot person standing at the base of the tower. The actual gain in this direction was used per the manufactures supplied specifications.
6) The antenna used in this modeling is the Ericsson AIR21 for LTE, UMTS and GSM. This is based on feedback from the carrier with regards to anticipated antenna selection. This antenna has a 15.6 dBd gain value at its main lobe. Actual antenna gain values were used for all calculations as per the manufacturers specifications

7) The antenna mounting height centerline of the proposed antennas is **104 feet** above ground level (AGL)
8) Emissions values for additional carriers were taken from the Connecticut Siting Council active database. Values in this database are provided by the individual carriers themselves.

All calculation were done with respect to uncontrolled / general public threshold limits

Site ID	CT11309A - Middlefield Route 66
Site Addresss	238 Meriden Road, Middlefield, CT 06455
Site Type	Monopole

Sector 1

Antenna Number	Antenna Make	Antenna Model	Status	Frequency Band	Technology	Power Out Per Channel (Watts)	Number of Channels	Composite Power	Antenna Gain in direction of sample point (dBd)	Antenna Height (ft)	analysis height	Cable Size	Cable Loss (dB)	Additional Loss	ERP	Power Density Value	Power Density Percentage
1a	Ericsson	AIR21 B4A/B2P	Active	AWS - 2100 MHz	LTE	60	2	120	-3.95	104	98	None	0	0	48.326044	1.808985	0.18090%
1b	Ericsson	AIR21 B4A/B2P	Not Used	-	-			0	-3.95	104	98	None	0	0	0	0	0.00000%
2a	Ericsson	AIR21 B2A / B4P	Active	PCS - 1950 MHz	GSM / UMTS	30	2	60	-3.95	104	98	1-5/8"	0	0	24.163022	0.904493	0.09045%
2B	Ericsson	AIR21 B2A / B4P	Passive	AWS - 2100 MHz	UMTS	30	2	60	-3.95	104	98	1-5/8"	0	0	24.163022	0.904493	0.09045%
														Sector total Power Density Value:		0.362%	

Sector 2

Antenna Number	Antenna Make	Antenna Model	Status	Frequency Band	Technology	Power Out Per Channel (Watts)	Number of Channels	Composite Power	Antenna Gain in direction of sample point (dBd)	Antenna Height (ft)	analysis height	Cable Size	Cable Loss (dB)	Additional Loss	ERP	Power Density Value	Power Density Percentage
1a	Ericsson	AIR21 B4A/B2P	Active	AWS - 2100 MHz	LTE	60	2	120	-3.95	104	98	None	0	0	48.326044	1.808985	0.18090%
1b	Ericsson	AIR21 B4A/B2P	Not Used	-	-			0	-3.95	104	98	None	0	0	0	0	0.00000%
2a	Ericsson	AIR21 B2A / B4P	Active	PCS - 1950 MHz	GSM / UMTS	30	2	60	-3.95	104	98	1-5/8"	0	0	24.163022	0.904493	0.09045%
28	Ericsson	AIR21 B2A / B4P	Passive	AWS - 2100 MHz	UMTS	30	2	60	-3.95	104	98	1-5/8"	0	0	24.163022	0.904493	0.09045%
														Sector total Power Density Value:		0.362%	

Sector 3

Antenna Number	Antenna Make	Antenna Model	Status	Frequency Band	Technology	Power Out Per Channel (Watts)	Number of Channels	Composite Power	Antenna Gain in direction of sample point (dBd)	Antenna Height (ft)	analysis height	Cable Size	Cable Loss (dB)	Additional Loss	ERP	Power Density Value	Power Density Percentage
1a	Ericsson	AIR21 B4A/B2P	Active	AWS - 2100 MHz	LTE	60	2	120	-3.95	104	98	None	0	0	48.326044	1.808985	0.18090%
1b	Ericsson	AIR21 B4A/B2P	Not Used	-	-			0	-3.95	104	98	None	0	0	0	0	0.00000%
2a	Ericsson	AIR21 B2A / B4P	Active	PCS - 1950 MHz	GSM / UMTS	30	2	60	-3.95	104	98	1-5/8"	0	0	24.163022	0.904493	0.09045%
28	Ericsson	AIR21 B2A / B4P	Passive	AWS - 2100 MHz	UMTS	30	2	60	-3.95	104	98	1-5/8"	0	0	24.163022	0.904493	0.09045%
														Sector total Power Density Value:		0.362%	

Site Composite MPE %	
Carrier	MPE %
T-Mobile	1.085%
AT&T	22.410%
Metro PCS	13.470%
Sprint	5.090%
Nextel	4.710%
Total Site MPE %	**46.765%**

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Summary

All calculations performed for this analysis yielded results that were well within the allowable limits for general public exposure to RF Emissions.

The anticipated Maximum Composite contributions from the T-Mobile facility are **1.085% (0.326% from each sector)** of the allowable FCC established general public limit considering all three sectors simultaneously sampled at the ground level.

The anticipated composite MPE value for this site assuming all carriers present is **46.765%** of the allowable FCC established general public limit sampled at the ground level. This is based upon values listed in the Connecticut Siting Council database for existing carrier emissions

FCC guidelines state that if a site is found to be out of compliance (over allowable thresholds), that carriers over a 5% contribution to the composite value will require measures to bring the site into compliance. For this facility, the composite values calculated were well within the allowable 100% threshold standard per the federal government

Scott Heffernan
RF Engineering Director

EBI Consulting
21 B Street
Burlington, MA 01803