Robinson+Cole

KENNETH C. BALDWIN

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

Also admitted in Massachusetts

August 27, 2015

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

Re: **Notice of Exempt Modification – Facility Modification**
374 Three Mile Road, Glastonbury, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains fifteen (15) antennas at the top of the existing 145-foot tower at 374 Three Mile Road in Glastonbury, Connecticut (the "Property"). The tower is owned by Crown Castle ("Crown"). The Council approved Cellco's use of this tower in 1996 (Docket No. 174). Cellco now intends to replace nine (9) of its existing antennas with three (3) model SBNHH-1D65B, 700 MHz antennas; three (3) model SBNHH-1D65B, 1900 MHz antennas; and three (3) model SBNHH-1D65B, 2100 MHz antennas, all at the same level on the tower. Cellco also intends to replace three (3) existing remote radio heads ("RRHs") with three (3) newer model RRHs, and install three (3) additional RRHs and two (2) HYBRIFLEX™ fiber optic antenna cables. Included in Attachment 1 are specifications for Cellco's replacement antennas, RRHs and HYBRIFLEX™ cables.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Richard J. Johnson, Town Manager of the Town of Glastonbury. A copy of this letter is also being sent to Josephine I. and John R. Flanagan, the owners of the Property and to Crown, the tower owner.

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

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's replacement antennas and RRHs will be located on its existing platform at the 148-foot level on the tower.

2. The proposed modifications will not involve any change to ground-mounted equipment and, therefore, will not require the extension of the site boundary.

3. The proposed modifications will not increase noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.

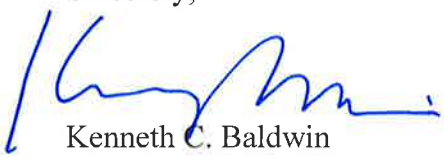
4. The operation of the replacement antennas will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety standard. A cumulative worst-case General Power Density table for Cellco's modified facility is included in Attachment 2.

5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.

6. The tower and its foundation can support Cellco's proposed modifications. (*See* Structural Analysis Report included in Attachment 3).

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

Sincerely,



Kenneth C. Baldwin

Enclosures
Copy to:
Richard J. Johnson, Glastonbury Town Manger
Josephine I. and John R. Flanagan
Crown Castle
Tim Parks

ATTACHMENT 1

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

SBNHH-1D65B

Andrew® Tri-band Antenna, 698–896 and 2x 1695–2360 MHz, 65° horizontal beamwidth, internal RET. Both high bands share the same electrical tilt.

- Interleaved dipole technology providing for attractive, low wind load mechanical package

Electrical Specifications

Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2180	2300–2360
Gain, dBi	14.9	14.7	17.7	18.2	18.6	18.6
Beamwidth, Horizontal, degrees	68	66	69	66	63	58
Beamwidth, Vertical, degrees	12.1	10.7	5.6	5.2	5.0	4.5
Beam Tilt, degrees	0–14	0–14	0–7	0–7	0–7	0–7
USLS, dB	14	13	15	15	15	13
Front-to-Back Ratio at 180°, dB	27	29	28	28	28	27
CPR at Boresight, dB	20	23	20	20	17	21
CPR at Sector, dB	14	10	12	10	9	1
Isolation, dB	25	25	25	25	25	25
Isolation, Intersystem, dB	30	30	30	30	30	30
VSWR | Return Loss, dB	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350	350	350	300
Polarization	±45°	±45°	±45°	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2180	2300–2360
Gain by all Beam Tilts, average, dBi	14.5	14.3	17.4	17.9	18.2	18.3
Gain by all Beam Tilts Tolerance, dB	±0.5	±0.8	±0.4	±0.3	±0.5	±0.3
Gain by Beam Tilt, average, dBi	0 ° | 14.6	0 ° | 14.5	0 ° | 17.4	0 ° | 17.8	0 ° | 18.1	0 ° | 18.2
	7 ° | 14.6	7 ° | 14.4	3 ° | 17.5	3 ° | 17.9	3 ° | 18.3	3 ° | 18.4
	14 ° | 14.2	14 ° | 13.6	7 ° | 17.4	7 ° | 17.9	7 ° | 18.2	7 ° | 18.4
Beamwidth, Horizontal Tolerance, degrees	±2.2	±3.4	±2	±4.6	±5.7	±4.3
Beamwidth, Vertical Tolerance, degrees	±0.8	±1	±0.3	±0.2	±0.3	±0.2
USLS, dB	16	14	16	16	16	15
Front-to-Back Total Power at 180° ± 30°, dB	25	26	27	26	26	26
CPR at Boresight, dB	22	23	21	20	20	22
CPR at Sector, dB	13	11	16	12	11	4

* CommScope® supports NGMN recommendations on Base Station Antenna Standards (BASTA). To learn more about the benefits of BASTA, download the whitepaper Time to Raise the Bar on BSAs.

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol® multiband with internal RET
Band	Multiband
Brand	DualPol® | Teletilt®
Operating Frequency Band	1695 – 2360 MHz | 698 – 896 MHz
Performance Note	Outdoor usage

Product Specifications

SBNHH-1D65B

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Aluminum | Low loss circuit board
Radome Material	Fiberglass, UV resistant
Reflector Material	Aluminum
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	6
Wind Loading, maximum	617.7 N @ 150 km/h 138.9 lbf @ 150 km/h
Wind Speed, maximum	241.4 km/h | 150.0 mph

Dimensions

Depth	181.0 mm | 7.1 in
Length	1851.0 mm | 72.9 in
Width	301.0 mm | 11.9 in
Net Weight	18.4 kg | 40.6 lb

Remote Electrical Tilt (RET) Information

Input Voltage	10–30 Vdc
Power Consumption, idle state, maximum	2.0 W
Power Consumption, normal conditions, maximum	13.0 W
Protocol	3GPP/AISG 2.0 (Multi-RET)
RET Interface	8-pin DIN Female | 8-pin DIN Male
RET Interface, quantity	1 female | 1 male
RET System	Teletilt®

Regulatory Compliance/Certifications

Agency	Classification
RoHS 2011/65/EU	Compliant by Exemption
China RoHS SJ/T 11364-2006	Above Maximum Concentration Value (MCV)
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system

Included Products

BSAMNT-1 — Wide Profile Antenna Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

* Footnotes

Performance Note	Severe environmental conditions may degrade optimum performance

PCS RF MODULES

RRH1900 2X60 - HW CHARACTERISTICS

LA6.0.1/13.3

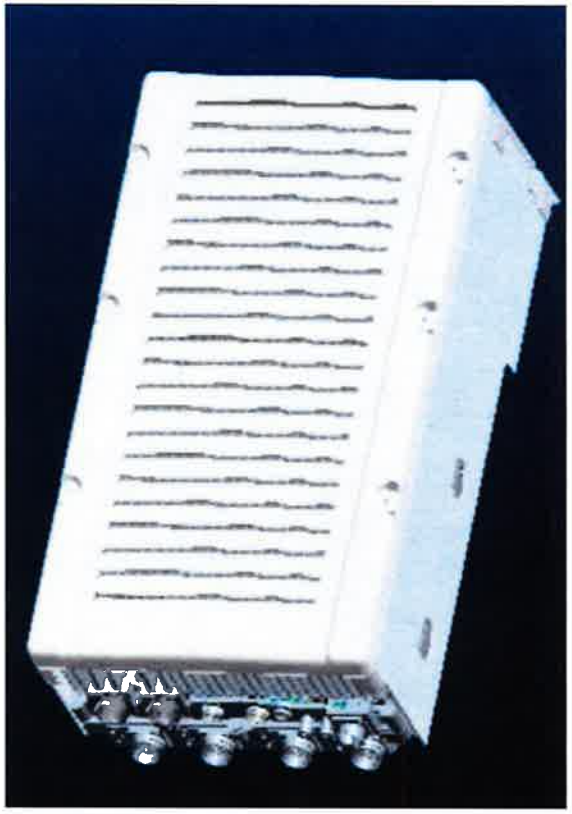
		RRH2x60
RF Output Power		2x60W
Instantaneous Bandwidth		20MHz
Transmitter		2 TX
Receiver	1900 HW version 1900A HW version	2 Branch RX – LA6.0.1 4 Branch RX – LR13.3
Features		AISG 2.0 for RET/TMA
		Internal Smart Bias-T
Power		-48VDC
CPRI Ports		2 CPRI Rate 3 Ports
External Alarms		4 External User Alarms
Monitor Ports		TX
Environmental		GR487 Compliance
RF Connectors		7/16 DIN (top mounted)

** Not a Verizon Wireless deployed product

NEW PCS RF MODULES FOR VZW
RRH2X60 - HW CHARACTERISTICS

LR14.3

	RRH2x60
RF Output Power	2x60W (4x30W HW Ready)
Instantaneous Bandwidth	60MHz
Target Reliability (Annual Return Rate)	<2%
Receiver	4 Branch Rx
Features	AISG 2.0 for RET/TMA
Power	-48VDC
	Internal Smart Bias-T
CPRI Ports	2 CPRI Rate 5 Ports
External Alarms	4 External User Alarms
Monitor Ports	TX, RX
Environmental	GR487 Compliance
RF Connectors	7/16 DIN (downward facing)
Dimensions	22"(h) x 12"(w)x 9.4" (d)**
Weight	55lb**



**- Includes solar shield but not mounting brackets (8 lbs.)

Alcatel·Lucent

ALCATEL-LUCENT WIRELESS PRODUCT DATASHEET

RRH2X60-AWS FOR BAND 4 APPLICATIONS

The Alcatel-Lucent RRH2x60-AWS is a high power, small form factor Remote Radio Head operating in the AWS frequency band (3GPP Band 4) for LTE technology. It is designed with an eco-efficient approach, providing operators with the means to achieve high quality and high capacity coverage with minimum site requirements and efficient operation.

A distributed Node B expands the deployment options by using two components, a Base Band Unit (BBU) containing the digital assets and a separate RRH containing the radio-frequency (RF) elements. This modular design optimizes available space and allows the main components of a Node B to be installed separately, within the same site or several kilometers apart.

The Alcatel-Lucent RRH2x60-AWS is linked to the BBU by an optical-fiber connection carrying downlink and uplink digital radio signals along with operations, administration and maintenance (OA&M) information.

SUPERIOR RF PERFORMANCE

The Alcatel-Lucent RRH2x60-AWS integrates all the latest technologies. This allows to offer best-in-class characteristics.

It delivers an outstanding 120 watts of total RF power thanks to its two transmit RF paths of 60 W each.

It is ideally suited to support multiple-input multiple-output (MIMO) 2x2 operation.

It includes four RF receivers to natively support 4-way uplink reception diversity. This improves the radio uplink coverage and this can be used to extend the cell radius commensurate with 2x2MIMO 2x60 W for the downlink.

It supports multiple discontinuous LTE carriers within an instantaneous bandwidth of 45 MHz corresponding to the entire AWS B4 spectrum.

The latest generation power amplifiers (PA) used in this product achieve high efficiency (>40%), resulting in improved power consumption figures.

OPTIMIZED TCO

The Alcatel-Lucent RRH2x60-AWS is designed to make available all the benefits of a distributed Node B, with excellent RF characteristics, with low capital expenditures (CAPEX) and low operating expenditures (OPEX).

The Alcatel-Lucent RRH2x60-AWS is a very cost-effective solution to deploy LTE MIMO.

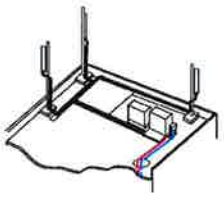
EASY INSTALLATION

The RRH2x60-AWS includes a reversible mounting bracket which allows for ease of installation behind an antenna, or on a rooftop knee wall while providing easy access to the mid body RF connectors.

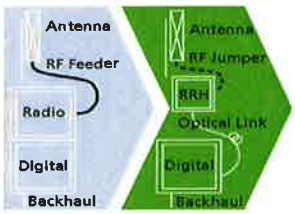
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation time and costs.

The Alcatel-Lucent RRH2x60-AWS is a zero-footprint solution and is convection cooled without fans for silent operation, simplifying negotiations with site property owners and minimizing environmental impacts.

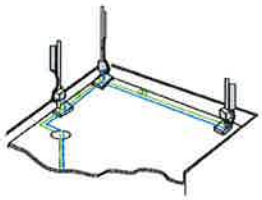
Installation can easily be done by a single person as the Alcatel–Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



Macro



RRH for space-constrained cell sites



Distributed

FEATURES

- RRH2x60-AWS integrates two power amplifiers of 60W rating (at each antenna connector)
- Support multiple carriers over the entire 3GPP band 4
- RRH2x60-AWS is optimized for LTE operation
- RRH2x60-AWS is a very compact and lightweight product
- Advanced power management techniques are embedded to provide power savings, such as PA bias control

BENEFITS

- MIMO LTE operation with only one single unit per sector
- Improved uplink coverage with built-in 4-way receive diversity capability
- RRH can be mounted close to the antenna, eliminating nearly all losses in RF cables and thus reducing power consumption by 50% compared to conventional solutions
- Distributed configurations provide easily deployable and cost-effective solutions, near zero footprint and silent solutions, with minimum impact on the neighborhood, which ease the deployment
- RETA and TMA support without additional hardware thanks to the AISG v2.0 port and the integrated Bias-Tees. Bias-Tees support AISG DC supply and signaling.

TECHNICAL SPECIFICATIONS

Specifications listed are hardware capabilities. Some capabilities depend on support in a specific software release or future release.

Dimensions and weights

- HxWxD : 510x285x186mm (27 l with solar shield)
- Weight : 20 kg (44 lbs)

Electrical Data

- Power Supply : -48V DC (-40.5 to -57V)
- Power Consumption (ETSI average traffic load reference) : 250W @2x60W

RF Characteristics

- Frequency band: 1710-1755, UL / 2110-2155 MHz, DL (3GPP band 4)
- Output power: 2x60W at antenna connectors
- Technology supported: LTE
- Instantaneous bandwidth: 45 MHz
- Rx diversity: 2-way and 4-way uplink reception
- Typical sensitivity without Rx diversity: -105 dBm for LTE

Connectivity

- Two CPRI optical ports for daisychaining and up to six RRHs per fiber
- Type of optical fiber: Single-Mode (SM) and Multi-Mode (MM) SFPs
- Optical fiber length: up to 500m using MM fiber, up to 20km using SM fiber
- TMA/RETA : AISG 2.0 (RS485 connector and internal Bias-Tee)
- Six external alarms
- Surge protection for all external ports (DC and RF)

Environmental specifications

- Operating temperature: -40°C to 55°C including solar load
- Operating relative humidity: 8% to 100%
- Environmental Conditions : ETS 300 019-1-4 class 4.1E
- Ingress Protection : IEC 60529 IP65
- Acoustic Noise : Noiseless (natural convection cooling)

Safety and Regulatory Data

- EMC : 3GPP 25113, EN 301 489-1, EN 301 489-23, GR 1089, GR 3108, OET-65
- Safety : IEC60950-1, EN 60825-1, UL, ANSI/NFPA 70, CAN/CSA-C22.2
- Regulatory : FCC Part 15 Class B, CE Mark – European Directive : 2002/95/EC (ROHS); 2002/96/EC (WEEE); 1999/5/EC (R&TTE)
- Health : EN 50385

Alcatel·Lucent

AT THE SPEED OF IDEAS™

Product Data Sheet HB158-1-08U8-S8J18

HYBRIFLEX™ RRH Hybrid Feeder Cabling Solution, 1-5/8", Single-Mode Fiber

Product Description

RFS' HYBRIFLEX Remote Radio Head (RRH) hybrid feeder cabling solution combines optical fiber and DC power for RRHs in a single lightweight aluminum corrugated cable, making it the world's most innovative solution for RRH deployments.

It was developed to reduce installation complexity and costs at Cellular sites. HYBRIFLEX allows mobile operators deploying an RRH architecture to standardize the RRH installation process and eliminate the need for and cost of cable grounding. HYBRIFLEX combines optical fiber (multi-mode or single-mode) and power in a single corrugated cable. It eliminates the need for junction boxes and can connect multiple RRHs with a single feeder. Standard RFS CELLFLEX® accessories can be used with HYBRIFLEX cable. Both pre-connectorized and on-site options are available.

Figure 1: HYBRIFLEX Series

Features/Benefits

- Aluminum corrugated armor with outstanding bending characteristics – minimizes installation time and enables mechanical protection and shielding
- Same accessories as 1 5/8" coaxial cable
- Outer conductor grounding – Eliminates typical grounding requirements and saves on installation costs
- Lightweight solution and compact design – Decreases tower loading
- Robust cabling – Eliminates need for expensive cable trays and ducts
- Installation of tight bundled fiber optic cable pairs directly to the RRH – Reduces CAPEX and wind load by eliminating need for interconnection
- Optical fiber and power cables housed in single corrugated cable – Saves CAPEX by standardizing RRH cable installation and reducing installation requirements
- Outdoor polyethylene jacket – Ensures long-lasting cable protection

Technical Specifications

Outer Conductor Armor	Corrugated Aluminum	[mm (in)]	46.5 (1.83)
Jacket	Polyethylene, PE	[mm (in)]	50.3 (1.98)
UV-Protection	Individual and External Jacket		Yes
Weight, Approximate		[kg/m (lb/ft)]	1.9 (1.30)
Minimum Bending Radius, Single Bending		[mm (in)]	200 (8)
Minimum Bending Radius, Repeated Bending		[mm (in)]	500 (20)
Recommended/Maximum Clamp Spacing		[m (ft)]	1.0 / 1.2 (3.25 / 4.0)
DC-Resistance Outer Conductor Armor		[Ω/km (Ω/1000ft)]	068 (0.205)
DC-Resistance Power Cable, 8.4mm²(8AWG)		[Ω/km (Ω/1000ft)]	2.1 (0.307)
Version			Single-mode OM3
Quantity, Fiber Count			16 (8 pairs)
Core/Clad		[µm]	50/125
Primary Coating (Acrylate)		[µm]	245
Buffer Diameter, Nominal		[µm]	900
Secondary Protection, Jacket, Nominal		[mm (in)]	2.0 (0.08)
Minimum Bending Radius		[mm (in)]	104 (4.1)
Insertion Loss @ wavelength 850nm		dB/km	3.0
Insertion Loss @ wavelength 1310nm		dB/km	1.0
Standards (Meets or exceeds)			UL94-V0, UL1666 RoHS Compliant
Size (Power)		[mm² (AWG)]	8.4 (8)
Quantity, Wire Count (Power)			16 (8 pairs)
Size (Alarm)		[mm² (AWG)]	0.8 (18)
Quantity, Wire Count (Alarm)			4 (2 pairs)
Type			UV protected
Strands			19
Primary Jacket Diameter, Nominal		[mm (in)]	6.8 (0.27)
Standards (Meets or exceeds)			NFPA 130, ICEA S-95-658 UL Type XHHW-2, UL 44 UL-LS Limited Smoke, UL VW-1 IEEE-383 (1974), IEEE1202/FT4 RoHS Compliant
Installation Temperature		[°C (°F)]	-40 to +65 (-40 to149)
Operation Temperature		[°C (°F)]	-40 to +65 (-40 to149)

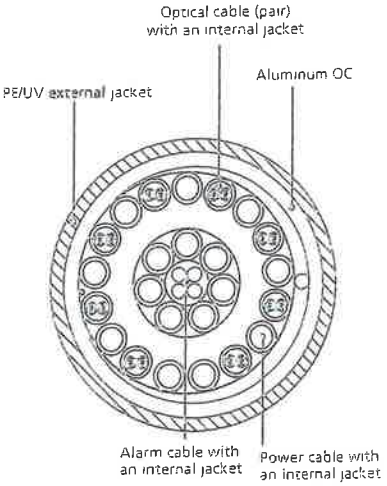


Figure 2: Construction Detail

* This data is provisional and subject to change

ATTACHMENT 2

	General	Power	Density					
Site Name: East Glastonbury								
Tower Height: 145Ft.								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*Nextel	9	100	126	0.0204	851	0.5673	3.59%	
*T-Mobile LTE	2	24	117	0.0013	2100	1.0000	0.13%	
*T-Mobile GSM/UMTS	2	12	117	0.0006	1950	1.0000	0.06%	
*T-Mobile UMTS	2	12	117	0.0006	2100	1.0000	0.06%	
*AT&T UMTS	2	565	138	0.0213	880	0.5867	3.64%	
*AT&T UMTS	2	875	138	0.0330	1900	1.0000	3.30%	
*AT&T GSM	4	813	138	0.0614	1900	1.0000	6.14%	
*AT&T GSM	1	647	138	0.0122	880	0.5867	2.08%	
*AT&T LTE	1	1615	138	0.0305	734	0.4893	6.23%	
*Sprint				0.0042	1900	1.0000	0.42%	
*XM Sat Radio	2	4552	99	0.3340	2337	1.0000	33.40%	
Verizon PCS	**11**	**384**	**148**	**0.0693**	**1970**	**1.0000**	**6.93%**	
Verizon Cellular	**9**	**386**	**148**	**0.0570**	**869**	**0.5793**	**9.84%**	
Verizon AWS	**1**	**2306**	**148**	**0.0379**	**2145**	**1.0000**	**3.79%**	
Verizon 700	**1**	**1050**	**148**	**0.0172**	**746**	**0.4973**	**3.47%**	
								83.09%
* Source: Siting Council								

ATTACHMENT 3

PJF PAUL J. FORD & COMPANY

Date: **June 24, 2015**

Marianne Dunst
Crown Castle
3530 Toringdon Way Suite 300
Charlotte, NC 28277

Paul J Ford and Company
250 E. Broad Street Suite 600
Columbus, OH 43215
614.221.6679

Subject: **Structural Analysis Report**

Carrier Designation:	***Verizon Wireless* Co-Locate**	
	Carrier Site Number:	119698
	Carrier Site Name:	East Glastonbury CT
Crown Castle Designation:	**Crown Castle BU Number:**	806368
	Crown Castle Site Name:	HRT 049B 943215
	Crown Castle JDE Job Number:	338054
	Crown Castle Work Order Number:	1079081
	Crown Castle Application Number:	300801 Rev. 1
Engineering Firm Designation:	**Paul J Ford and Company Project Number:**	37515-2141.001.7805
Site Data:	**374 Three Mile Rd., GLASTONBURY, Hartford County, CT** **Latitude *41° 41' 36.93"*, Longitude *-72° 32' 50.11"*** **145 Foot - Monopole Tower**	

Dear Marianne Dunst,

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 798943, in accordance with application 300801, 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:

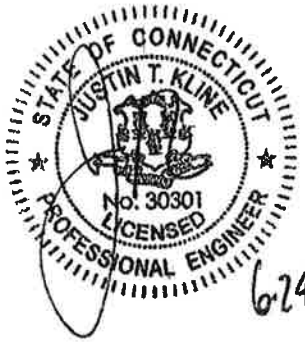
LC5: Existing + Proposed Equipment — **Sufficient Capacity**
Note: See Table I and Table II for the proposed and existing loading, respectively.

This analysis has been performed in accordance with the TIA/EIA-222-F standard and 2005 CT State Building Code with 2009 amendment based upon a wind speed of 80 mph fastest mile.

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

Respectfully submitted by:

Jared Smith, E.I.
Structural Designer



6-24-15

PAUL J. FORD & COMPANY

Date: **June 24, 2015**

Marianne Dunst
Crown Castle
3530 Toringdon Way Suite 300
Charlotte, NC 28277

Paul J Ford and Company
250 E. Broad Street Suite 600
Columbus, OH 43215
614.221.6679

Subject: **Structural Analysis Report**

Carrier Designation:	***Verizon Wireless* Co-Locate**	
	Carrier Site Number:	119698
	Carrier Site Name:	East Glastonbury CT
Crown Castle Designation:	**Crown Castle BU Number:**	806368
	Crown Castle Site Name:	HRT 049B 943215
	Crown Castle JDE Job Number:	338054
	Crown Castle Work Order Number:	1079081
	Crown Castle Application Number:	300801 Rev. 1
Engineering Firm Designation:	**Paul J Ford and Company Project Number:**	37515-2141.001.7805
Site Data:	**374 Three Mile Rd., GLASTONBURY, Hartford County, CT**	
	Latitude *41° 41' 36.93"*, Longitude *-72° 32' 50.11"*	
	145 Foot - Monopole Tower	

Dear Marianne Dunst,

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 798943, in accordance with application 300801, 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:

LC5: Existing + Proposed Equipment **Sufficient Capacity**
Note: See Table I and Table II for the proposed and existing loading, respectively.

This analysis has been performed in accordance with the TIA/EIA-222-F standard and 2005 CT State Building Code with 2009 amendment based upon a wind speed of 80 mph fastest mile.

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

Respectfully submitted by:

Jared Smith, E.I.
Structural Designer

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 145 ft Monopole tower designed by ENGINEERED ENDEAVORS, INC. in January of 1997. The tower was originally designed for a wind speed of 90 mph per TIA/EIA-222-F. This monopole has been modified to include base plate stiffeners per the referenced reinforcing drawings by GPD dated 3/8/2005 (See assumption #5).

2) ANALYSIS CRITERIA

This analysis has been performed in accordance with the TIA/EIA-222-F standard and 2005 CT State Building Code with 2009 amendment based upon a wind speed of 80 mph fastest mile.

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
147.0	148.0	3	alcatel lucent	RRH2X60-PCS	2	1-5/8	-
		6	alcatel lucent	RRH2x60-AWS			
		9	andrew	SBNHH-1D65B w/ Mount Pipe			
		1	rfs celwave	DB-T1-6Z-8AB-0Z			

Table 2 - Existing 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
147.0	148.0	3	alcatel lucent	RRH2x40-AWS	-	-	2
		3	antel	BXA-171063-12CF-EDIN-2 w/ Mount Pipe			
		2	swedcom	SLCP 2x6014 w/ Mount Pipe			
		3	antel	BXA-171063-8BF-2 w/ Mount Pipe			
		1	antel	BXA-70063-6CF-EDIN-6 w/ Mount Pipe			
		2	antel	LPA-80063/6CF w/ Mount Pipe	12 1	1-5/8 1-1/4	1
		1	rfs celwave	DB-T1-6Z-8AB-0Z			
		4	swedcom	SC-E 6014 rev2 w/ Mount Pipe			
	147.0	1	tower mounts	Platform Mount [LP 1001-1]			
	145.0	6	rfs celwave	FD9R6004/2C-3L			
137.0	138.0	3	communication components inc.	DTMABP7819VG12A	12 1 1 2	1-1/4 3/8 1/2 3/4	1
		6	ericsson	RRUS-11			
		2	kmw communications	AM-X-CD-16-65-00T-RET w/ Mount Pipe			
		3	powerwave technologies	7020.00			
		3	powerwave technologies	7770.00 w/ Mount Pipe			
		6	powerwave technologies	LGP13519			
		4	powerwave technologies	P65-17-XLH-RR w/ Mount Pipe			
		3	powerwave technologies	TT19-08BP111-001			
		1	raycap	DC6-48-60-18-8F			
	137.0	1	tower mounts	Platform Mount [LP 1001-1]			
126.0	130.0	2	gps	GPS_A	12 2	1-1/4 1/2	1
	128.0	12	decibel	DB844G65ZAXY w/ Mount Pipe			
	126.0	1	tower mounts	Platform Mount [LP 601-1]			
116.0	117.0	6	ericsson	ERICSSON AIR 21 B2A B4P w/ Mount Pipe	13	1-5/8	1
		3	ericsson	KRY 112 144/1			
	116.0	1	tower mounts	Platform Mount [LP 601-1]			
95.0	97.0	1	ems wireless	RR65-18-02DP w/ Mount Pipe	3	1-1/4	1
	96.0	1	repeater technologies	DA1900-39			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
	95.0	2	tower mounts	Side Arm Mount [SO 701-1]			
87.0	87.0	3	allgon	7250.02 w/ Mount Pipe	6	1-1/4	1
		1	tower mounts	Pipe Mount [PM 601-3]			

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

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	Dr. Clarence Welti, 12/16/1996	262197	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	EEI, 2310, 03/25/1997	974245	CCISITES
4-TOWER MANUFACTURER DRAWINGS	EEI, 2310, 01/10/1997	262188	CCISITES
4-TOWER REINFORCEMENT DESIGN/DRAWINGS/DATA	B&T, 2005078.57, 03/08/2005	1037241	CCISITES

3.1) Analysis Method

tnxTower (version 6.1.4.1), 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) At the time of this analysis, sufficient foundation information was not available at CCI sites. However, we were able to obtain a copy of the original monopole design. This drawing contained the original foundation design reactions. Based on these reactions we were able to compare to the current analysis. By doing this we have assumed the existing foundation was properly designed to handle the loading from the original monopole design.
5) The existing monopole base plate has been reinforced using a Crown-approved system in accordance with the above referenced documents. However, in this analysis we found that the existing base plate without modifications has adequate capacity and therefore, we did not consider the existing base plate stiffeners in the strength calculations

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	145 - 92.5	Pole	TP35.64x20.5x0.3438	1	-17.08	1948.09	72.3	Pass
L2	92.5 - 44.71	Pole	TP48.61x33.5106x0.4375	2	-29.93	3390.15	75.1	Pass
L3	44.71 - 0	Pole	TP60.5x45.8529x0.4688	3	-48.84	4563.49	77.3	Pass
							Summary	
						Pole (L3)	77.3	Pass
						Rating =	77.3	Pass

Table 5 - Tower Component Stresses vs. Capacity – LC5

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	73.6	Pass
1	Base Plate	0	87.7	Pass
1,2	Base Foundation (Compared w/ Design Loads)	0	85.1	Pass

Structure Rating (max from all components) =	87.7%

Notes:
1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.
2) Foundation capacity determined by comparing analysis reactions to original design reactions.

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:

3) Tower is located in Hartford County, Connecticut.
4) Basic wind speed of 80.00 mph.
5) Nominal ice thickness of 1.0000 in.
6) Ice thickness is considered to increase with height.
7) Ice density of 56.00 pcf.
8) A wind speed of 37.60 mph is used in combination with ice.
9) Deflections calculated using a wind speed of 60.00 mph.
10) A non-linear (P-delta) analysis was used.
11) Pressures are calculated at each section.
12) Stress ratio used in pole design is 1.333.

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		Use TIA-222-G Tension Splice Capacity Exemption		

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	145.0000-92.5000	52.5000	5.00	12	20.5000	35.6400	0.3438	1.3750	A572-65 (65 ksi)
L2	92.5000-44.7100	52.7900	6.58	12	33.5106	48.6100	0.4375	1.7500	A572-65 (65 ksi)
L3	44.7100-0.0000	51.2900		12	45.8529	60.5000	0.4688	1.8750	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	21.2232	22.3104	1156.9477	7.2159	10.6190	108.9507	2344.2898	10.9805	4.5728	13.303
	36.8972	39.0685	6212.5548	12.6361	18.4615	336.5137	12588.320	19.2283	8.6303	25.106
L2	36.1733	46.5917	6504.9565	11.8402	17.3585	374.7421	2 13180.805	22.9310	7.8083	17.848
	50.3248	67.8630	20100.989	17.2458	25.1800	798.2925	4 40730.054	33.4001	11.8550	27.097

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
L3	49.4158	68.5018	18009.2974	16.2475	23.7518	758.2281	36491.7203	33.7145	11.0323	23.536
	62.6342	90.6097	41678.8054	21.4912	31.3390	1329.9341	84452.5593	44.5953	14.9578	31.91

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_r	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 145.0000-92.5000				1	1	1		
L2 92.5000-44.7100				1	1	1		
L3 44.7100-0.0000				1	1	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
HB158-1-08U8-S8J18(1-5/8)	C	No	CaAa (Out Of Face)	145.0000 - 0.0000	1	No Ice	0.0000	1.30
						1/2" Ice	0.0000	2.81
						1" Ice	0.0000	4.94
						2" Ice	0.0000	11.02
						4" Ice	0.0000	30.52
HJ7-50A(1-5/8")	C	No	Inside Pole	145.0000 - 0.0000	12	No Ice	0.0000	1.04
						1/2" Ice	0.0000	1.04
						1" Ice	0.0000	1.04
						2" Ice	0.0000	1.04
						4" Ice	0.0000	1.04
HB114-21U3M12-XXXF(1-1/4")	C	No	CaAa (Out Of Face)	145.0000 - 0.0000	1	No Ice	0.0000	1.22
						1/2" Ice	0.0000	2.47
						1" Ice	0.0000	4.32
						2" Ice	0.0000	9.87
						4" Ice	0.0000	28.29
HB158-1-08U8-S8J18(1-5/8)	C	No	CaAa (Out Of Face)	145.0000 - 0.0000	1	No Ice	0.1980	1.30
						1/2" Ice	0.2980	2.81
						1" Ice	0.3980	4.94
						2" Ice	0.5980	11.02
						4" Ice	0.9980	30.52
LCF114-50J(1-1/4")	C	No	Inside Pole	137.0000 - 0.0000	12	No Ice	0.0000	0.70
						1/2" Ice	0.0000	0.70
						1" Ice	0.0000	0.70
						2" Ice	0.0000	0.70
						4" Ice	0.0000	0.70
LCF12-50J(1/2)	C	No	Inside Pole	137.0000 - 0.0000	1	No Ice	0.0000	0.15
						1/2" Ice	0.0000	0.15
						1" Ice	0.0000	0.15
						2" Ice	0.0000	0.15
						4" Ice	0.0000	0.15
FB-L98B-002-75000(3/8")	C	No	Inside Pole	137.0000 - 0.0000	1	No Ice	0.0000	0.06
						1/2" Ice	0.0000	0.06
						1" Ice	0.0000	0.06
						2" Ice	0.0000	0.06
						4" Ice	0.0000	0.06
WR-VG86ST-BRD(3/4)	C	No	Inside Pole	137.0000 - 0.0000	2	No Ice	0.0000	0.59
						1/2" Ice	0.0000	0.59
						1" Ice	0.0000	0.59
						2" Ice	0.0000	0.59
						4" Ice	0.0000	0.59
LDF4-50A(1/2")	C	No	Inside Pole	126.0000 - 0.0000	2	No Ice	0.0000	0.15
						1/2" Ice	0.0000	0.15
						1" Ice	0.0000	0.15

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
						2" Ice	0.0000	0.15
						4" Ice	0.0000	0.15
LDF6-50A(1-1/4")	C	No	Inside Pole	126.0000 - 0.0000	12	No Ice	0.0000	0.66
						1/2" Ice	0.0000	0.66
						1" Ice	0.0000	0.66
						2" Ice	0.0000	0.66
						4" Ice	0.0000	0.66
AVA7-50(1-5/8)	C	No	Inside Pole	116.0000 - 0.0000	6	No Ice	0.0000	0.70
						1/2" Ice	0.0000	0.70
						1" Ice	0.0000	0.70
						2" Ice	0.0000	0.70
						4" Ice	0.0000	0.70
LDF7-50A(1-5/8")	C	No	Inside Pole	116.0000 - 0.0000	6	No Ice	0.0000	0.82
						1/2" Ice	0.0000	0.82
						1" Ice	0.0000	0.82
						2" Ice	0.0000	0.82
						4" Ice	0.0000	0.82
MLE Hybrid 9Power/18Fiber RL 2(1 5/8)	C	No	Inside Pole	116.0000 - 0.0000	1	No Ice	0.0000	1.07
						1/2" Ice	0.0000	1.07
						1" Ice	0.0000	1.07
						2" Ice	0.0000	1.07
						4" Ice	0.0000	1.07
LDF6-50A(1-1/4")	C	No	CaAa (Out Of Face)	95.0000 - 0.0000	1	No Ice	0.1550	0.66
						1/2" Ice	0.2550	1.91
						1" Ice	0.3550	3.78
						2" Ice	0.5550	9.33
						4" Ice	0.9550	27.78
LDF6-50A(1-1/4")	C	No	CaAa (Out Of Face)	87.0000 - 0.0000	6	No Ice	0.0000	0.66
						1/2" Ice	0.0000	1.91
						1" Ice	0.0000	3.78
						2" Ice	0.0000	9.33
						4" Ice	0.0000	27.78
LDF6-50A(1-1/4")	C	No	CaAa (Out Of Face)	95.0000 - 0.0000	2	No Ice	0.0000	0.66
						1/2" Ice	0.0000	1.91
						1" Ice	0.0000	3.78
						2" Ice	0.0000	9.33
						4" Ice	0.0000	27.78
2" (Nominal) Conduit	C	No	Inside Pole	137.0000 - 0.0000	1	No Ice	0.0000	0.72
						1/2" Ice	0.0000	0.72
						1" Ice	0.0000	0.72
						2" Ice	0.0000	0.72
						4" Ice	0.0000	0.72

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	145.0000-92.5000	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	10.783	1.84
L2	92.5000-44.7100	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	16.870	2.42
L3	44.7100-0.0000	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	15.783	2.29

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

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	145.0000-92.5000	A	1.164	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	23.584	2.57
L2	92.5000-44.7100	A	1.090	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	39.117	4.66
L3	44.7100-0.0000	A	1.000	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	35.284	4.28

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	145.0000-92.5000	-0.2475	0.1429	-0.4625	0.2670
L2	92.5000-44.7100	-0.4163	0.2404	-0.8237	0.4756
L3	44.7100-0.0000	-0.4253	0.2455	-0.8436	0.4870

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
Platform Mount [LP 1001-1]	C	None		0.0000	147.0000	No Ice	47.7000	47.7000	3.02
						1/2" Ice	59.5000	59.5000	3.62
						1" Ice	71.3000	71.3000	4.22
						2" Ice	94.9000	94.9000	5.43
						4" Ice	142.1000	142.1000	7.85
***									
Platform Mount [LP 1001-1]	C	None		0.0000	137.0000	No Ice	47.7000	47.7000	3.02
						1/2" Ice	59.5000	59.5000	3.62
						1" Ice	71.3000	71.3000	4.22
						2" Ice	94.9000	94.9000	5.43
						4" Ice	142.1000	142.1000	7.85
***									
Platform Mount [LP 601-1]	C	None		0.0000	126.0000	No Ice	28.4700	28.4700	1.12
						1/2" Ice	33.5900	33.5900	1.51
						1" Ice	38.7100	38.7100	1.91
						2" Ice	48.9500	48.9500	2.69
						4" Ice	69.4300	69.4300	4.26
8-ft Ladder	C	None		0.0000	124.0000	No Ice	5.0000	7.0700	0.04
						1/2" Ice	9.7300	9.7300	0.07
						1" Ice	11.1900	11.1900	0.08
						2" Ice	13.9800	13.9800	0.11
						4" Ice	18.8900	18.8900	0.15
***									
Platform Mount [LP 601-1]	C	None		0.0000	116.0000	No Ice	28.4700	28.4700	1.12
						1/2" Ice	33.5900	33.5900	1.51
						1" Ice	38.7100	38.7100	1.91
						2" Ice	48.9500	48.9500	2.69
						4" Ice	69.4300	69.4300	4.26

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
8-ft Ladder	C	None		0.0000	114.0000	No Ice	5.0000	7.0700	0.04
						1/2" Ice	9.7300	9.7300	0.07
						1" Ice	11.1900	11.1900	0.08
						2" Ice	13.9800	13.9800	0.11
						4" Ice	18.8900	18.8900	0.15
***									
Side Arm Mount [SO 701-1]	B	From Leg	2.0000 0.00 0.00	0.0000	95.0000	No Ice	0.8500	1.6700	0.07
						1/2" Ice	1.1400	2.3400	0.08
						1" Ice	1.4300	3.0100	0.09
						2" Ice	2.0100	4.3500	0.12
						4" Ice	3.1700	7.0300	0.18
Side Arm Mount [SO 701-1]	C	From Leg	2.0000 0.00 0.00	0.0000	95.0000	No Ice	0.8500	1.6700	0.07
						1/2" Ice	1.1400	2.3400	0.08
						1" Ice	1.4300	3.0100	0.09
						2" Ice	2.0100	4.3500	0.12
						4" Ice	3.1700	7.0300	0.18
Ice Shield 1.5' x 2.0'	C	From Leg	4.0000 0.00 0.00	0.0000	99.0000	No Ice	0.3500	0.4667	0.03
						1/2" Ice	0.4840	0.6395	0.04
						1" Ice	0.6265	0.8210	0.06
						2" Ice	0.9377	1.2099	0.12
						4" Ice	1.6636	2.0914	0.27
***									
Pipe Mount [PM 601-3]	C	None		0.0000	87.0000	No Ice	4.3900	4.3900	0.20
						1/2" Ice	5.4800	5.4800	0.24
						1" Ice	6.5700	6.5700	0.28
						2" Ice	8.7500	8.7500	0.36
						4" Ice	13.1100	13.1100	0.53
***									
DB-T1-6Z-8AB-0Z	A	From Leg	4.0000 0.00 1.00	0.0000	147.0000	No Ice	5.6000	2.3333	0.04
						1/2" Ice	5.9154	2.5580	0.08
						1" Ice	6.2395	2.7914	0.12
						2" Ice	6.9136	3.2840	0.21
						4" Ice	8.3654	4.3728	0.45
(2) FD9R6004/2C-3L	A	From Leg	4.0000 0.00 -2.00	0.0000	147.0000	No Ice	0.3665	0.0846	0.00
						1/2" Ice	0.4506	0.1362	0.01
						1" Ice	0.5433	0.1965	0.01
						2" Ice	0.7546	0.3430	0.02
						4" Ice	1.2808	0.7396	0.06
(2) SC-E 6014 rev2 w/ Mount Pipe	A	From Leg	4.0000 0.00 1.00	0.0000	147.0000	No Ice	3.7829	4.3959	0.03
						1/2" Ice	4.1817	5.0091	0.07
						1" Ice	4.5912	5.6403	0.12
						2" Ice	5.4423	6.9563	0.22
						4" Ice	7.2927	9.8967	0.54
(2) RRH2x60-AWS	A	From Leg	4.0000 0.00 1.00	0.0000	147.0000	No Ice	2.1904	1.4290	0.04
						1/2" Ice	2.3976	1.6109	0.06
						1" Ice	2.6134	1.8015	0.08
						2" Ice	3.0710	2.2085	0.13
						4" Ice	4.0899	3.1263	0.26
RRH2X60-PCS	A	From Leg	4.0000 0.00 1.00	0.0000	147.0000	No Ice	2.5667	2.0106	0.06
						1/2" Ice	2.7914	2.2184	0.08
						1" Ice	3.0247	2.4349	0.10
						2" Ice	3.5173	2.8938	0.16
						4" Ice	4.6062	3.9152	0.31
(3) SBNHH-1D65B w/ Mount Pipe	A	From Leg	4.0000 0.00	0.0000	147.0000	No Ice	8.6482	7.4197	0.08
						1/2"	9.2781	8.4535	0.15

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
			1.00			Ice	9.8967	9.3468	0.23
						1" Ice	11.1637	11.1834	0.42
						2" Ice	13.8163	15.2188	0.94
						4" Ice			
DB-T1-6Z-8AB-0Z	A	From Leg	4.0000 0.00 1.00	0.0000	147.0000	No Ice	5.6000	2.3333	0.04
						1/2"	5.9154	2.5580	0.08
						Ice	6.2395	2.7914	0.12
						1" Ice	6.9136	3.2840	0.21
						2" Ice	8.3654	4.3728	0.45
						4" Ice			
(2) FD9R6004/2C-3L	B	From Leg	4.0000 0.00 -2.00	0.0000	147.0000	No Ice	0.3665	0.0846	0.00
						1/2"	0.4506	0.1362	0.01
						Ice	0.5433	0.1965	0.01
						1" Ice	0.7546	0.3430	0.02
						2" Ice	1.2808	0.7396	0.06
						4" Ice			
(2) SC-E 6014 rev2 w/ Mount Pipe	B	From Leg	4.0000 0.00 1.00	0.0000	147.0000	No Ice	3.7829	4.3959	0.03
						1/2"	4.1817	5.0091	0.07
						Ice	4.5912	5.6403	0.12
						1" Ice	5.4423	6.9563	0.22
						2" Ice	7.2927	9.8967	0.54
						4" Ice			
(2) RRH2x60-AWS	B	From Leg	4.0000 0.00 1.00	0.0000	147.0000	No Ice	2.1904	1.4290	0.04
						1/2"	2.3976	1.6109	0.06
						Ice	2.6134	1.8015	0.08
						1" Ice	3.0710	2.2085	0.13
						2" Ice	4.0899	3.1263	0.26
						4" Ice			
RRH2X60-PCS	B	From Leg	4.0000 0.00 1.00	0.0000	147.0000	No Ice	2.5667	2.0106	0.06
						1/2"	2.7914	2.2184	0.08
						Ice	3.0247	2.4349	0.10
						1" Ice	3.5173	2.8938	0.16
						2" Ice	4.6062	3.9152	0.31
						4" Ice			
(3) SBNHH-1D65B w/ Mount Pipe	B	From Leg	4.0000 0.00 1.00	0.0000	147.0000	No Ice	8.6482	7.4197	0.08
						1/2"	9.2781	8.4535	0.15
						Ice	9.8967	9.3468	0.23
						1" Ice	11.1637	11.1834	0.42
						2" Ice	13.8163	15.2188	0.94
						4" Ice			
(2) LPA-80063/6CF w/ Mount Pipe	C	From Leg	4.0000 0.00 1.00	0.0000	147.0000	No Ice	10.5771	10.6706	0.05
						1/2"	11.2413	11.9322	0.14
						Ice	11.8720	12.9107	0.25
						1" Ice	13.1633	14.9215	0.48
						2" Ice	15.8657	19.1577	1.09
						4" Ice			
(2) FD9R6004/2C-3L	C	From Leg	4.0000 0.00 -2.00	0.0000	147.0000	No Ice	0.3665	0.0846	0.00
						1/2"	0.4506	0.1362	0.01
						Ice	0.5433	0.1965	0.01
						1" Ice	0.7546	0.3430	0.02
						2" Ice	1.2808	0.7396	0.06
						4" Ice			
(2) RRH2x60-AWS	C	From Leg	4.0000 0.00 1.00	0.0000	147.0000	No Ice	2.1904	1.4290	0.04
						1/2"	2.3976	1.6109	0.06
						Ice	2.6134	1.8015	0.08
						1" Ice	3.0710	2.2085	0.13
						2" Ice	4.0899	3.1263	0.26
						4" Ice			
RRH2X60-PCS	C	From Leg	4.0000 0.00 1.00	0.0000	147.0000	No Ice	2.5667	2.0106	0.06
						1/2"	2.7914	2.2184	0.08
						Ice	3.0247	2.4349	0.10
						1" Ice	3.5173	2.8938	0.16
						2" Ice	4.6062	3.9152	0.31
						4" Ice			
(3) SBNHH-1D65B w/	C	From Leg	4.0000	0.0000	147.0000	No Ice	8.6482	7.4197	0.08

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
Mount Pipe			0.00 1.00			1/2" Ice 1" Ice 2" Ice 4" Ice	9.2781 9.8967 11.1637 13.8163	8.4535 9.3468 11.1834 15.2188	0.15 0.23 0.42 0.94
***									
DTMABP7819VG12A	A	From Leg	4.0000 0.00 1.00	0.0000	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.1389 1.2835 1.4368 1.7693 2.5380	0.3907 0.4884 0.5947 0.8334 1.4144	0.02 0.03 0.04 0.06 0.14
(2) RRUS-11	A	From Leg	4.0000 0.00 1.00	0.0000	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.2486 3.4905 3.7411 4.2682 5.4260	1.3726 1.5510 1.7380 2.1381 3.0418	0.05 0.07 0.09 0.15 0.31
AM-X-CD-16-65-00T-RET w/ Mount Pipe	A	From Leg	4.0000 0.00 1.00	0.0000	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.4975 9.1490 9.7672 11.0311 13.6786	6.3042 7.4790 8.3676 10.1785 14.0237	0.07 0.14 0.21 0.38 0.87
7020.00	A	From Leg	4.0000 0.00 1.00	0.0000	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.1191 0.1714 0.2323 0.3801 0.7793	0.2042 0.2791 0.3627 0.5559 1.0459	0.00 0.01 0.01 0.02 0.07
7770.00 w/ Mount Pipe	A	From Leg	4.0000 0.00 1.00	0.0000	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.2208 6.7144 7.2182 8.2568 10.4762	4.8204 5.5082 6.2127 7.6716 11.0613	0.09 0.14 0.21 0.36 0.76
(2) LGP13519	A	From Leg	4.0000 0.00 1.00	0.0000	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.3379 0.4220 0.5147 0.7260 1.2523	0.2074 0.2804 0.3621 0.5513 1.0335	0.01 0.01 0.01 0.02 0.07
P65-17-XLH-RR w/ Mount Pipe	A	From Leg	4.0000 0.00 1.00	0.0000	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	11.8229 12.5940 13.3752 14.9400 18.3336	9.0563 10.6186 12.2051 14.6968 19.6430	0.09 0.18 0.28 0.51 1.14
TT19-08BP111-001	A	From Leg	4.0000 0.00 1.00	0.0000	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.6449 0.7568 0.8773 1.1444 1.7822	0.5198 0.6232 0.7354 0.9856 1.5896	0.02 0.02 0.03 0.05 0.12
DC6-48-60-18-8F	A	From Leg	4.0000 0.00 1.00	0.0000	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.4667 1.6667 1.8778 2.3333 3.3778	1.4667 1.6667 1.8778 2.3333 3.3778	0.02 0.04 0.06 0.11 0.24
DTMABP7819VG12A	B	From Leg	4.0000 0.00 1.00	0.0000	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice	1.1389 1.2835 1.4368 1.7693 2.5380	0.3907 0.4884 0.5947 0.8334 1.4144	0.02 0.03 0.04 0.06 0.14

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						4" Ice			
(2) RRUS-11	B	From Leg	4.0000 0.00 1.00	0.0000	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.2486 3.4905 3.7411 4.2682 5.4260	1.3726 1.5510 1.7380 2.1381 3.0418	0.05 0.07 0.09 0.15 0.31
AM-X-CD-16-65-00T-RET w/ Mount Pipe	B	From Leg	4.0000 0.00 1.00	0.0000	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.4975 9.1490 9.7672 11.0311 13.6786	6.3042 7.4790 8.3676 10.1785 14.0237	0.07 0.14 0.21 0.38 0.87
7020.00	B	From Leg	4.0000 0.00 1.00	0.0000	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.1191 0.1714 0.2323 0.3801 0.7793	0.2042 0.2791 0.3627 0.5559 1.0459	0.00 0.01 0.01 0.02 0.07
7770.00 w/ Mount Pipe	B	From Leg	4.0000 0.00 1.00	0.0000	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.2208 6.7144 7.2182 8.2568 10.4762	4.8204 5.5082 6.2127 7.6716 11.0613	0.09 0.14 0.21 0.36 0.76
(2) LGP13519	B	From Leg	4.0000 0.00 1.00	0.0000	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.3379 0.4220 0.5147 0.7260 1.2523	0.2074 0.2804 0.3621 0.5513 1.0335	0.01 0.01 0.01 0.02 0.07
P65-17-XLH-RR w/ Mount Pipe	B	From Leg	4.0000 0.00 1.00	0.0000	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	11.8229 12.5940 13.3752 14.9400 18.3336	9.0563 10.6186 12.2051 14.6968 19.6430	0.09 0.18 0.28 0.51 1.14
TT19-08BP111-001	B	From Leg	4.0000 0.00 1.00	0.0000	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.6449 0.7568 0.8773 1.1444 1.7822	0.5198 0.6232 0.7354 0.9856 1.5896	0.02 0.02 0.03 0.05 0.12
DTMABP7819VG12A	C	From Leg	4.0000 0.00 1.00	0.0000	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.1389 1.2835 1.4368 1.7693 2.5380	0.3907 0.4884 0.5947 0.8334 1.4144	0.02 0.03 0.04 0.06 0.14
(2) RRUS-11	C	From Leg	4.0000 0.00 1.00	0.0000	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.2486 3.4905 3.7411 4.2682 5.4260	1.3726 1.5510 1.7380 2.1381 3.0418	0.05 0.07 0.09 0.15 0.31
7020.00	C	From Leg	4.0000 0.00 1.00	0.0000	137.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.1191 0.1714 0.2323 0.3801 0.7793	0.2042 0.2791 0.3627 0.5559 1.0459	0.00 0.01 0.01 0.02 0.07
7770.00 w/ Mount Pipe	C	From Leg	4.0000 0.00 1.00	0.0000	137.0000	No Ice 1/2" Ice 1" Ice	6.2208 6.7144 7.2182 8.2568	4.8204 5.5082 6.2127 7.6716	0.09 0.14 0.21 0.36

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	10.4762	11.0613	0.76
						4" Ice			
(2) LGP13519	C	From Leg	4.0000 0.00 1.00	0.0000	137.0000	No Ice	0.3379	0.2074	0.01
						1/2" Ice	0.4220	0.2804	0.01
						1" Ice	0.5147	0.3621	0.01
						2" Ice	0.7260	0.5513	0.02
						4" Ice	1.2523	1.0335	0.07
(2) P65-17-XLH-RR w/ Mount Pipe	C	From Leg	4.0000 0.00 1.00	0.0000	137.0000	No Ice	11.8229	9.0563	0.09
						1/2" Ice	12.5940	10.6186	0.18
						1" Ice	13.3752	12.2051	0.28
						2" Ice	14.9400	14.6968	0.51
						4" Ice	18.3336	19.6430	1.14
TT19-08BP111-001	C	From Leg	4.0000 0.00 1.00	0.0000	137.0000	No Ice	0.6449	0.5198	0.02
						1/2" Ice	0.7568	0.6232	0.02
						1" Ice	0.8773	0.7354	0.03
						2" Ice	1.1444	0.9856	0.05
						4" Ice	1.7822	1.5896	0.12
***									
(4) DB844G65ZAXY w/ Mount Pipe	A	From Leg	4.0000 0.00 2.00	0.0000	126.0000	No Ice	4.9042	4.9208	0.03
						1/2" Ice	5.3460	5.5962	0.08
						1" Ice	5.7972	6.2837	0.13
						2" Ice	6.7311	7.7123	0.26
						4" Ice	8.7345	10.8330	0.62
(2) GPS_A	A	From Leg	4.0000 0.00 4.00	0.0000	126.0000	No Ice	0.2975	0.2975	0.00
						1/2" Ice	0.3739	0.3739	0.00
						1" Ice	0.4589	0.4589	0.01
						2" Ice	0.6549	0.6549	0.02
						4" Ice	1.1506	1.1506	0.08
(4) DB844G65ZAXY w/ Mount Pipe	B	From Leg	4.0000 0.00 2.00	0.0000	126.0000	No Ice	4.9042	4.9208	0.03
						1/2" Ice	5.3460	5.5962	0.08
						1" Ice	5.7972	6.2837	0.13
						2" Ice	6.7311	7.7123	0.26
						4" Ice	8.7345	10.8330	0.62
(4) DB844G65ZAXY w/ Mount Pipe	C	From Leg	4.0000 0.00 2.00	0.0000	126.0000	No Ice	4.9042	4.9208	0.03
						1/2" Ice	5.3460	5.5962	0.08
						1" Ice	5.7972	6.2837	0.13
						2" Ice	6.7311	7.7123	0.26
						4" Ice	8.7345	10.8330	0.62
***									
(2) ERICSSON AIR 21 B2A B4P w/ Mount Pipe	A	From Leg	4.0000 0.00 1.00	0.0000	116.0000	No Ice	6.8253	5.6424	0.11
						1/2" Ice	7.3471	6.4800	0.17
						1" Ice	7.8631	7.2567	0.23
						2" Ice	8.9261	8.8640	0.38
						4" Ice	11.1755	12.2932	0.81
KRY 112 144/1	A	From Leg	4.0000 0.00 1.00	0.0000	116.0000	No Ice	0.4083	0.2042	0.01
						1/2" Ice	0.4969	0.2733	0.01
						1" Ice	0.5941	0.3511	0.02
						2" Ice	0.8145	0.5326	0.03
						4" Ice	1.3590	0.9992	0.08
(2) ERICSSON AIR 21 B2A B4P w/ Mount Pipe	B	From Leg	4.0000 0.00 1.00	0.0000	116.0000	No Ice	6.8253	5.6424	0.11
						1/2" Ice	7.3471	6.4800	0.17
						1" Ice	7.8631	7.2567	0.23
						2" Ice	8.9261	8.8640	0.38
						4" Ice	11.1755	12.2932	0.81
KRY 112 144/1	B	From Leg	4.0000	0.0000	116.0000	No Ice	0.4083	0.2042	0.01

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00 1.00			1/2" Ice	0.4969 0.5941	0.2733 0.3511	0.01 0.02
						1" Ice	0.8145	0.5326	0.03
						2" Ice	1.3590	0.9992	0.08
						4" Ice			
(2) ERICSSON AIR 21 B2A B4P w/ Mount Pipe	C	From Leg	4.0000 0.00 1.00	0.0000	116.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.8253 7.3471 7.8631 8.9261 11.1755	5.6424 6.4800 7.2567 8.8640 12.2932	0.11 0.17 0.23 0.38 0.81
KRY 112 144/1	C	From Leg	4.0000 0.00 1.00	0.0000	116.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.4083 0.4969 0.5941 0.8145 1.3590	0.2042 0.2733 0.3511 0.5326 0.9992	0.01 0.01 0.02 0.03 0.08
***									
RR65-18-02DP w/ Mount Pipe	B	From Leg	4.0000 0.00 2.00	0.0000	95.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.5931 5.0883 5.5778 6.5876 8.7306	3.3194 4.0888 4.7844 6.2255 9.3076	0.03 0.07 0.12 0.22 0.56
***									
7250.02 w/ Mount Pipe	A	From Leg	1.0000 0.00 0.00	0.0000	87.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.2362 4.7096 5.1662 6.1061 8.3213	3.3238 4.3022 5.0504 6.5968 9.8896	0.04 0.07 0.12 0.22 0.56
7250.02 w/ Mount Pipe	B	From Leg	1.0000 0.00 0.00	0.0000	87.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.2362 4.7096 5.1662 6.1061 8.3213	3.3238 4.3022 5.0504 6.5968 9.8896	0.04 0.07 0.12 0.22 0.56
7250.02 w/ Mount Pipe	C	From Leg	1.0000 0.00 0.00	0.0000	87.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.2362 4.7096 5.1662 6.1061 8.3213	3.3238 4.3022 5.0504 6.5968 9.8896	0.04 0.07 0.12 0.22 0.56

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
DA1900-39	C	Paraboloid w/o Radome	From Leg	4.0000 0.00 1.00	0.0000		95.0000	3.5417	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	9.8500 10.3200 10.7900 11.7300 13.6000	0.05 0.10 0.15 0.26 0.47

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 145.0000-92.5000	116.7975	1.435	23.46	122.806	A	0.000	122.806	122.806	100.00	0.000	0.000
					B	0.000	122.806		100.00	0.000	0.000
					C	0.000	122.806		100.00	0.000	10.783
L2 92.5000-44.7100	67.9006	1.229	20.02	166.370	A	0.000	166.370	166.370	100.00	0.000	0.000
					B	0.000	166.370		100.00	0.000	0.000
					C	0.000	166.370		100.00	0.000	16.870
L3 44.7100-0.0000	21.4903	1	16.40	201.627	A	0.000	201.627	201.627	100.00	0.000	0.000
					B	0.000	201.627		100.00	0.000	0.000
					C	0.000	201.627		100.00	0.000	15.783

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 145.0000-92.5000	116.7975	1.435	5.18	1.1638	132.989	A	0.000	132.989	132.989	100.00	0.000	0.000
						B	0.000	132.989		100.00	0.000	0.000
						C	0.000	132.989		100.00	0.000	23.584
L2 92.5000-44.7100	67.9006	1.229	4.42	1.0904	175.640	A	0.000	175.640	175.640	100.00	0.000	0.000
						B	0.000	175.640		100.00	0.000	0.000
						C	0.000	175.640		100.00	0.000	39.117
L3 44.7100-0.0000	21.4903	1	3.62	1.0000	209.753	A	0.000	209.753	209.753	100.00	0.000	0.000
						B	0.000	209.753		100.00	0.000	0.000
						C	0.000	209.753		100.00	0.000	35.284

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 145.0000-92.5000	116.7975	1.435	13.19	122.806	A	0.000	122.806	122.806	100.00	0.000	0.000
					B	0.000	122.806		100.00	0.000	0.000
					C	0.000	122.806		100.00	0.000	10.783
L2 92.5000-44.7100	67.9006	1.229	11.26	166.370	A	0.000	166.370	166.370	100.00	0.000	0.000
					B	0.000	166.370		100.00	0.000	0.000
					C	0.000	166.370		100.00	0.000	16.870
L3 44.7100-0.0000	21.4903	1	9.23	201.627	A	0.000	201.627	201.627	100.00	0.000	0.000
					B	0.000	201.627		100.00	0.000	0.000
					C	0.000	201.627		100.00	0.000	15.783

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	29.65					
Bracing Weight	0.00					
Total Member Self-Weight	29.65			1.18	2.22	
Total Weight	48.87			1.18	2.22	
Wind 0 deg - No Ice		0.49	-39.92	-4137.81	-46.24	-3.15
Wind 30 deg - No Ice		20.15	-34.52	-3579.16	-2080.57	-1.73
Wind 60 deg - No Ice		34.52	-20.06	-2079.27	-3567.13	-0.43
Wind 90 deg - No Ice		39.78	-0.30	-29.45	-4110.31	1.00
Wind 120 deg - No Ice		34.59	19.54	2028.70	-3572.38	2.73
Wind 150 deg - No Ice		19.70	34.35	3563.59	-2034.37	3.83
Wind 180 deg - No Ice		-0.07	39.77	4125.61	10.22	3.89
Wind 210 deg - No Ice		-19.82	34.51	3580.62	2053.49	2.78
Wind 240 deg - No Ice		-34.36	19.97	2072.82	3556.31	0.43
Wind 270 deg - No Ice		-39.61	0.02	4.95	4098.21	-2.04
Wind 300 deg - No Ice		-34.25	-19.82	-2054.12	3543.99	-3.46
Wind 330 deg - No Ice		-19.70	-34.35	-3560.82	2039.54	-3.83
Member Ice	8.12					
Total Weight Ice	75.41			6.11	11.89	
Wind 0 deg - Ice		0.11	-11.14	-1179.75	1.07	-0.95
Wind 30 deg - Ice		5.60	-9.63	-1019.34	-582.40	-0.51
Wind 60 deg - Ice		9.62	-5.59	-588.60	-1009.16	-0.07
Wind 90 deg - Ice		11.09	-0.07	-0.34	-1165.52	0.38
Wind 120 deg - Ice		9.64	5.47	589.67	-1011.49	0.88
Wind 150 deg - Ice		5.50	9.60	1028.22	-572.90	1.16
Wind 180 deg - Ice		-0.01	11.10	1188.41	12.80	1.13
Wind 210 deg - Ice		-5.52	9.63	1031.34	598.46	0.76
Wind 240 deg - Ice		-9.58	5.57	598.66	1029.19	0.07
Wind 270 deg - Ice		-11.05	-0.00	5.99	1185.24	-0.64
Wind 300 deg - Ice		-9.56	-5.54	-584.25	1027.22	-1.06
Wind 330 deg - Ice		-5.50	-9.60	-1015.90	596.85	-1.16
Total Weight	48.87			1.18	2.22	
Wind 0 deg - Service		0.28	-22.46	-2328.01	-26.77	-1.77
Wind 30 deg - Service		11.34	-19.42	-2013.77	-1171.08	-0.97
Wind 60 deg - Service		19.42	-11.28	-1170.08	-2007.27	-0.24
Wind 90 deg - Service		22.37	-0.17	-17.05	-2312.81	0.56
Wind 120 deg - Service		19.46	10.99	1140.65	-2010.23	1.53
Wind 150 deg - Service		11.08	19.32	2004.03	-1145.10	2.15
Wind 180 deg - Service		-0.04	22.37	2320.17	4.99	2.19
Wind 210 deg - Service		-11.15	19.41	2013.61	1154.32	1.56
Wind 240 deg - Service		-19.33	11.23	1165.47	1999.66	0.24
Wind 270 deg - Service		-22.28	0.01	2.30	2304.48	-1.15
Wind 300 deg - Service		-19.27	-11.15	-1155.93	1992.73	-1.95
Wind 330 deg - Service		-11.08	-19.32	-2003.45	1146.48	-2.15

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

Comb. No.	Description
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	145 - 92.5	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-34.16	3.05	0.11
			Max. Mx	11	-17.11	943.96	-1.32
			Max. My	2	-17.08	-1.18	956.39
			Max. Vy	5	26.34	-942.84	1.75
			Max. Vx	2	-26.60	-1.18	956.39
			Max. Torque	2			2.92
L2	92.5 - 44.71	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-51.94	6.96	-3.18
			Max. Mx	5	-29.94	-2346.95	14.90
			Max. My	2	-29.93	-22.82	2367.49
			Max. Vy	5	33.49	-2346.95	14.90
			Max. Vx	2	-33.64	-22.82	2367.49
			Max. Torque	8			-3.62
L3	44.71 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-76.16	12.16	-6.21
			Max. Mx	5	-48.84	-4224.86	30.15
			Max. My	2	-48.84	-47.31	4253.31
			Max. Vy	5	39.81	-4224.86	30.15
			Max. Vx	2	-39.95	-47.31	4253.31
			Max. Torque	8			-3.87

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	14	76.16	-0.00	0.00
	Max. H_x	11	48.87	39.60	-0.02
	Max. H_z	2	48.87	-0.49	39.92
	Max. M_x	2	4253.31	-0.49	39.92

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
	Max. M_z	5	4224.86	-39.78	0.30
	Max. Torsion	13	3.77	19.70	34.35
	Min. Vert	30	48.87	-22.37	0.17
	Min. H_x	5	48.87	-39.78	0.30
	Min. H_z	8	48.87	0.07	-39.77
	Min. M_x	8	-4240.86	0.07	-39.77
	Min. M_z	11	-4212.55	39.60	-0.02
	Min. Torsion	8	-3.87	0.07	-39.77

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	48.87	-0.00	0.00	1.18	2.22	0.00
Dead+Wind 0 deg - No Ice	48.87	0.49	-39.92	-4253.31	-47.31	-3.16
Dead+Wind 30 deg - No Ice	48.87	20.15	-34.52	-3679.22	-2138.46	-1.77
Dead+Wind 60 deg - No Ice	48.87	34.52	-20.06	-2137.37	-3666.59	-0.48
Dead+Wind 90 deg - No Ice	48.87	39.78	-0.30	-30.15	-4224.86	0.96
Dead+Wind 120 deg - No Ice	48.87	34.59	19.54	2085.61	-3671.95	2.72
Dead+Wind 150 deg - No Ice	48.87	19.70	34.35	3663.31	-2091.21	3.81
Dead+Wind 180 deg - No Ice	48.87	-0.07	39.77	4240.86	10.49	3.87
Dead+Wind 210 deg - No Ice	48.87	-19.82	34.51	3680.73	2110.81	2.77
Dead+Wind 240 deg - No Ice	48.87	-34.36	19.97	2130.78	3655.58	0.43
Dead+Wind 270 deg - No Ice	48.87	-39.60	0.02	5.09	4212.55	-2.00
Dead+Wind 300 deg - No Ice	48.87	-34.25	-19.82	-2111.62	3642.97	-3.39
Dead+Wind 330 deg - No Ice	48.87	-19.70	-34.35	-3660.50	2096.49	-3.77
Dead+Ice	76.16	0.00	-0.00	6.21	12.16	0.00
Dead+Wind 0 deg+Ice	76.16	0.11	-11.14	-1243.04	1.29	-0.98
Dead+Wind 30 deg+Ice	76.16	5.60	-9.63	-1074.05	-613.46	-0.55
Dead+Wind 60 deg+Ice	76.16	9.62	-5.59	-620.18	-1063.09	-0.11
Dead+Wind 90 deg+Ice	76.16	11.09	-0.07	-0.35	-1227.83	0.36
Dead+Wind 120 deg+Ice	76.16	9.64	5.47	621.32	-1065.52	0.87
Dead+Wind 150 deg+Ice	76.16	5.50	9.60	1083.31	-603.58	1.18
Dead+Wind 180 deg+Ice	76.16	-0.01	11.10	1252.06	13.49	1.16
Dead+Wind 210 deg+Ice	76.16	-5.52	9.63	1086.56	630.51	0.80
Dead+Wind 240 deg+Ice	76.16	-9.58	5.57	630.67	1084.29	0.11
Dead+Wind 270 deg+Ice	76.16	-11.05	-0.00	6.23	1248.71	-0.62
Dead+Wind 300 deg+Ice	76.16	-9.56	-5.54	-615.67	1082.25	-1.05
Dead+Wind 330 deg+Ice	76.16	-5.50	-9.59	-1070.47	628.85	-1.17
Dead+Wind 0 deg - Service	48.87	0.28	-22.45	-2393.60	-25.61	-1.78
Dead+Wind 30 deg - Service	48.87	11.34	-19.42	-2070.44	-1202.69	-1.00
Dead+Wind 60 deg - Service	48.87	19.42	-11.28	-1202.55	-2062.83	-0.27
Dead+Wind 90 deg - Service	48.87	22.37	-0.17	-16.44	-2376.84	0.54
Dead+Wind 120 deg - Service	48.87	19.46	10.99	1174.47	-2065.83	1.53
Dead+Wind 150 deg - Service	48.87	11.08	19.32	2062.47	-1176.05	2.15
Dead+Wind 180 deg - Service	48.87	-0.04	22.37	2387.63	6.91	2.19
Dead+Wind 210 deg - Service	48.87	-11.15	19.41	2072.33	1189.14	1.57
Dead+Wind 240 deg - Service	48.87	-19.33	11.23	1199.89	2058.64	0.25
Dead+Wind 270 deg - Service	48.87	-22.28	0.01	3.40	2371.92	-1.13
Dead+Wind 300 deg - Service	48.87	-19.26	-11.15	-1188.02	2051.48	-1.92
Dead+Wind 330 deg - Service	48.87	-11.08	-19.32	-2059.88	1181.07	-2.14

Solution Summary

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
1	0.00	-48.87	0.00	0.00	48.87	-0.00	0.000%
2	0.49	-48.87	-39.92	-0.49	48.87	39.92	0.002%
3	20.15	-48.87	-34.52	-20.15	48.87	34.52	0.000%
4	34.52	-48.87	-20.06	-34.52	48.87	20.06	0.000%
5	39.78	-48.87	-0.30	-39.78	48.87	0.30	0.002%
6	34.59	-48.87	19.54	-34.59	48.87	-19.54	0.000%
7	19.70	-48.87	34.35	-19.70	48.87	-34.35	0.000%
8	-0.07	-48.87	39.77	0.07	48.87	-39.77	0.002%
9	-19.82	-48.87	34.51	19.82	48.87	-34.51	0.000%
10	-34.36	-48.87	19.97	34.36	48.87	-19.97	0.000%
11	-39.61	-48.87	0.02	39.60	48.87	-0.02	0.002%
12	-34.25	-48.87	-19.82	34.25	48.87	19.82	0.000%
13	-19.70	-48.87	-34.35	19.70	48.87	34.35	0.000%
14	0.00	-76.16	0.00	-0.00	76.16	0.00	0.003%
15	0.11	-76.16	-11.14	-0.11	76.16	11.14	0.001%
16	5.60	-76.16	-9.63	-5.60	76.16	9.63	0.001%
17	9.62	-76.16	-5.59	-9.62	76.16	5.59	0.001%
18	11.09	-76.16	-0.07	-11.09	76.16	0.07	0.001%
19	9.64	-76.16	5.47	-9.64	76.16	-5.47	0.001%
20	5.50	-76.16	9.60	-5.50	76.16	-9.60	0.001%
21	-0.01	-76.16	11.10	0.01	76.16	-11.10	0.001%
22	-5.52	-76.16	9.63	5.52	76.16	-9.63	0.001%
23	-9.58	-76.16	5.57	9.58	76.16	-5.57	0.001%
24	-11.05	-76.16	-0.00	11.05	76.16	0.00	0.001%
25	-9.56	-76.16	-5.54	9.56	76.16	5.54	0.001%
26	-5.50	-76.16	-9.60	5.50	76.16	9.59	0.001%
27	0.28	-48.87	-22.46	-0.28	48.87	22.45	0.001%
28	11.34	-48.87	-19.42	-11.34	48.87	19.42	0.000%
29	19.42	-48.87	-11.28	-19.42	48.87	11.28	0.000%
30	22.37	-48.87	-0.17	-22.37	48.87	0.17	0.004%
31	19.46	-48.87	10.99	-19.46	48.87	-10.99	0.000%
32	11.08	-48.87	19.32	-11.08	48.87	-19.32	0.001%
33	-0.04	-48.87	22.37	0.04	48.87	-22.37	0.001%
34	-11.15	-48.87	19.41	11.15	48.87	-19.41	0.000%
35	-19.33	-48.87	11.23	19.33	48.87	-11.23	0.000%
36	-22.28	-48.87	0.01	22.28	48.87	-0.01	0.004%
37	-19.27	-48.87	-11.15	19.26	48.87	11.15	0.001%
38	-11.08	-48.87	-19.32	11.08	48.87	19.32	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	6	0.00000001	0.00000001
2	Yes	11	0.00000001	0.00007280
3	Yes	13	0.00000001	0.00005758
4	Yes	13	0.00000001	0.00005933
5	Yes	11	0.00000001	0.00005386
6	Yes	13	0.00000001	0.00005963
7	Yes	13	0.00000001	0.00005496
8	Yes	11	0.00000001	0.00009952
9	Yes	13	0.00000001	0.00006114
10	Yes	13	0.00000001	0.00005796
11	Yes	11	0.00000001	0.00006475
12	Yes	13	0.00000001	0.00005548
13	Yes	13	0.00000001	0.00006113
14	Yes	6	0.00000001	0.00003074
15	Yes	11	0.00000001	0.00002996
16	Yes	11	0.00000001	0.00002931
17	Yes	11	0.00000001	0.00003394
18	Yes	11	0.00000001	0.00002746
19	Yes	11	0.00000001	0.00003844

20	Yes	11	0.00000001	0.00002699
21	Yes	11	0.00000001	0.00003113
22	Yes	11	0.00000001	0.00004098
23	Yes	11	0.00000001	0.00003304
24	Yes	11	0.00000001	0.00002845
25	Yes	11	0.00000001	0.00002852
26	Yes	11	0.00000001	0.00004246
27	Yes	11	0.00000001	0.00004491
28	Yes	12	0.00000001	0.00004681
29	Yes	12	0.00000001	0.00004987
30	Yes	10	0.00009161	0.00014241
31	Yes	12	0.00000001	0.00005136
32	Yes	11	0.00000001	0.00014658
33	Yes	11	0.00000001	0.00005080
34	Yes	12	0.00000001	0.00005319
35	Yes	12	0.00000001	0.00004785
36	Yes	10	0.00009163	0.00014813
37	Yes	11	0.00000001	0.00014916
38	Yes	12	0.00000001	0.00005366

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	145 - 92.5	42.822	27	2.8076	0.0147
L2	97.5 - 44.71	18.451	27	1.8919	0.0042
L3	51.29 - 0	4.866	28	0.8868	0.0013

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
147.0000	Platform Mount [LP 1001-1]	27	42.822	2.8076	0.0147	19569
137.0000	Platform Mount [LP 1001-1]	27	38.358	2.6608	0.0126	12230
126.0000	Platform Mount [LP 601-1]	27	32.335	2.4565	0.0098	5148
124.0000	8-ft Ladder	27	31.266	2.4188	0.0094	4658
116.0000	Platform Mount [LP 601-1]	27	27.101	2.2658	0.0076	3372
114.0000	8-ft Ladder	27	26.093	2.2269	0.0071	3154
99.0000	Ice Shield 1.5' x 2.0'	27	19.088	1.9235	0.0044	2140
96.0000	DA1900-39	27	17.826	1.8600	0.0040	2085
95.0000	Side Arm Mount [SO 701-1]	27	17.418	1.8386	0.0039	2083
87.0000	Pipe Mount [PM 601-3]	27	14.353	1.6641	0.0030	2148

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	145 - 92.5	76.010	2	4.9835	0.0260
L2	97.5 - 44.71	32.770	2	3.3601	0.0075
L3	51.29 - 0	8.646	3	1.5758	0.0023

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
147.0000	Platform Mount [LP 1001-1]	2	76.010	4.9835	0.0260	11126
137.0000	Platform Mount [LP 1001-1]	2	68.090	4.7233	0.0223	6953
126.0000	Platform Mount [LP 601-1]	2	57.406	4.3613	0.0174	2926
124.0000	8-ft Ladder	2	55.509	4.2945	0.0166	2647
116.0000	Platform Mount [LP 601-1]	2	48.120	4.0233	0.0134	1915
114.0000	8-ft Ladder	2	46.331	3.9543	0.0126	1791
99.0000	Ice Shield 1.5' x 2.0'	2	33.901	3.4162	0.0078	1213
96.0000	DA1900-39	2	31.662	3.3035	0.0071	1181
95.0000	Side Arm Mount [SO 701-1]	2	30.936	3.2655	0.0069	1181
87.0000	Pipe Mount [PM 601-3]	3	25.495	2.9558	0.0053	1216

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	145 - 92.5 (1)	TP35.64x20.5x0.3438	52.5000	0.0000	0.0	39.000	37.4725	-17.08	1461.43	0.012
L2	92.5 - 44.71 (2)	TP48.61x33.5106x0.4375	52.7900	0.0000	0.0	39.000	65.2117	-29.93	2543.25	0.012
L3	44.71 - 0 (3)	TP60.5x45.8529x0.4688	51.2900	0.0000	0.0	37.783	90.6097	-48.84	3423.47	0.014

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	145 - 92.5 (1)	TP35.64x20.5x0.3438	956.39	37.087	39.000	0.951	0.00	0.000	39.000	0.000
L2	92.5 - 44.71 (2)	TP48.61x33.5106x0.4375	2367.60	38.557	39.000	0.989	0.00	0.000	39.000	0.000
L3	44.71 - 0 (3)	TP60.5x45.8529x0.4688	4255.55	38.398	37.783	1.016	0.00	0.000	37.783	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	145 - 92.5 (1)	TP35.64x20.5x0.3438	26.60	0.710	26.000	0.057	2.92	0.053	26.000	0.002
L2	92.5 - 44.71 (2)	TP48.61x33.5106x0.4375	33.64	0.516	26.000	0.040	2.91	0.022	26.000	0.001
L3	44.71 - 0 (3)	TP60.5x45.8529x0.4688	40.00	0.441	26.000	0.035	1.77	0.008	26.000	0.000

Pole Interaction Design Data

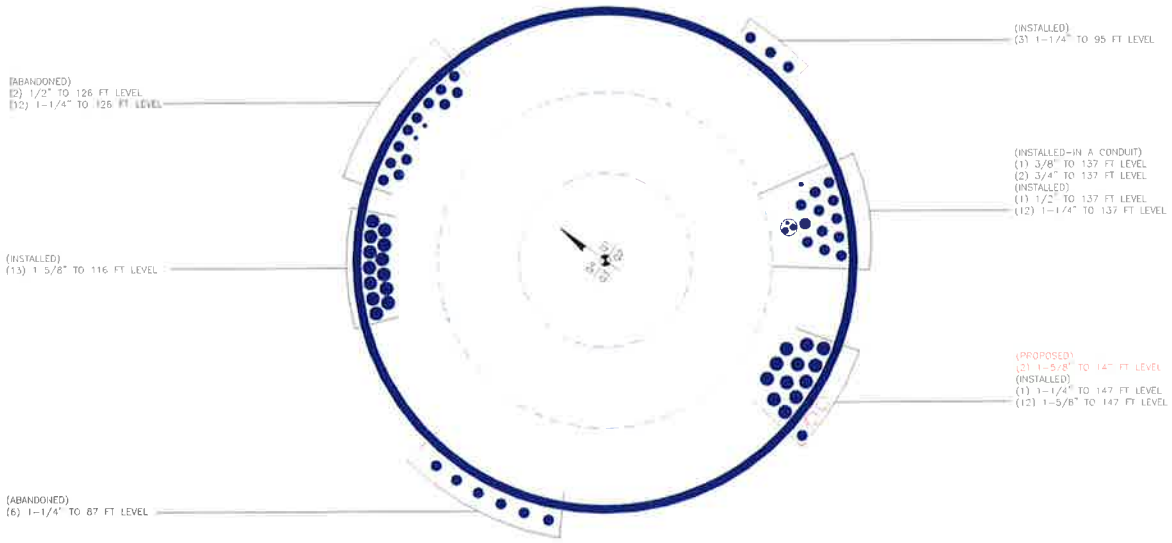
Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	145 - 92.5 (1)	0.012	0.951	0.000	0.057	0.002	0.963 ✔	1.333	H1-3+VT ✔
L2	92.5 - 44.71 (2)	0.012	0.989	0.000	0.040	0.001	1.001 ✔	1.333	H1-3+VT ✔
L3	44.71 - 0 (3)	0.014	1.016	0.000	0.035	0.000	1.031 ✔	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	145 - 92.5	Pole	TP35.64x20.5x0.3438	1	-17.08	1948.09	72.3	Pass
L2	92.5 - 44.71	Pole	TP48.61x33.5106x0.4375	2	-29.93	3390.15	75.1	Pass
L3	44.71 - 0	Pole	TP60.5x45.8529x0.4688	3	-48.84	4563.49	77.3	Pass
							Summary	
						Pole (L3)	77.3	Pass
						RATING =	**77.3**	**Pass**

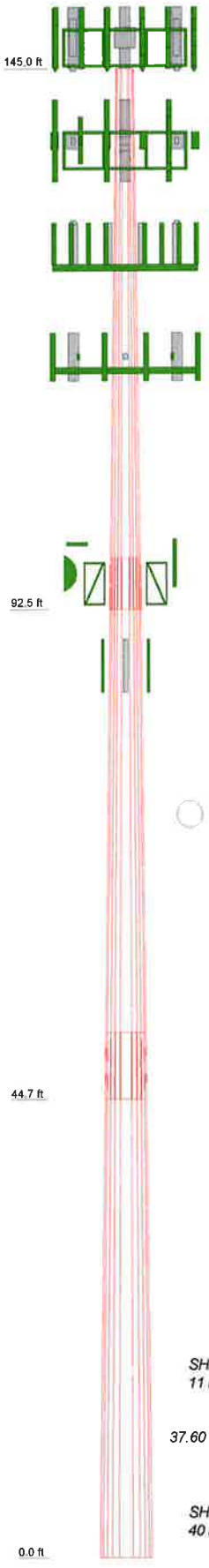
APPENDIX B

BASE LEVEL DRAWING



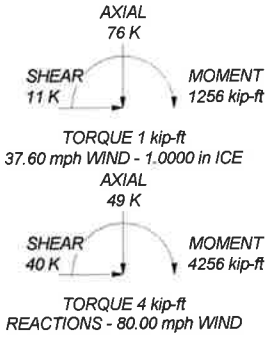
APPENDIX C

ADDITIONAL CALCULATIONS



Section	1	2	3
Length (ft)	52.5000	52.7900	51.2900
Number of Sides	12	12	12
Thickness (in)	0.3438	0.4375	0.4688
Socket Length (ft)	5.0000	6.5800	
Top Dia (in)	20.5000	33.5106	45.8529
Bot Dia (in)	35.6400	48.6100	60.5000
Grade		A572-65	
Weight (K)	5.5	10.3	13.9

29.6



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Platform Mount [LP 1001-1]	147	TT19-08BP111-001	137
DB-T1-6Z-8AB-0Z	147	DTMABP7819VG12A	137
(2) FD9R6004/2C-3L	147	(2) RRUS-11	137
(2) SC-E 6014 rev2 w/ Mount Pipe	147	7020.00	137
(2) RRH2x60-AWS	147	7770.00 w/ Mount Pipe	137
RRH2X60-PCS	147	(2) LGP13519	137
(3) SBNHH-1D65B w/ Mount Pipe	147	(2) P65-17-XLH-RR w/ Mount Pipe	137
DB-T1-6Z-8AB-0Z	147	TT19-08BP111-001	137
(2) FD9R6004/2C-3L	147	Platform Mount [LP 601-1]	126
(2) SC-E 6014 rev2 w/ Mount Pipe	147	(4) DB844G65ZAXY w/ Mount Pipe	126
(2) RRH2x60-AWS	147	(2) GPS_A	126
RRH2X60-PCS	147	(4) DB844G65ZAXY w/ Mount Pipe	126
(3) SBNHH-1D65B w/ Mount Pipe	147	(4) DB844G65ZAXY w/ Mount Pipe	126
(2) LPA-80063/6CF w/ Mount Pipe	147	8-ft Ladder	124
(2) FD9R6004/2C-3L	147	Platform Mount [LP 601-1]	116
(2) RRH2x60-AWS	147	(2) ERICSSON AIR 21 B2A B4P w/ Mount Pipe	116
RRH2X60-PCS	147	KRY 112 144/1	116
(3) SBNHH-1D65B w/ Mount Pipe	147	(2) ERICSSON AIR 21 B2A B4P w/ Mount Pipe	116
Platform Mount [LP 1001-1]	137	KRY 112 144/1	116
DTMABP7819VG12A	137	(2) ERICSSON AIR 21 B2A B4P w/ Mount Pipe	116
(2) RRUS-11	137	KRY 112 144/1	116
AM-X-CD-16-65-00T-RET w/ Mount Pipe	137	8-ft Ladder	114
7020.00	137	Ice Shield 1.5' x 2.0'	99
7770.00 w/ Mount Pipe	137	Side Arm Mount [SO 701-1]	95
(2) LGP13519	137	Side Arm Mount [SO 701-1]	95
P65-17-XLH-RR w/ Mount Pipe	137	RR65-18-02DP w/ Mount Pipe	95
TT19-08BP111-001	137	DA1900-39	95
DC6-48-60-18-8F	137	7250.02 w/ Mount Pipe	87
DTMABP7819VG12A	137	7250.02 w/ Mount Pipe	87
(2) RRUS-11	137	7250.02 w/ Mount Pipe	87
AM-X-CD-16-65-00T-RET w/ Mount Pipe	137	Pipe Mount [PM 601-3]	87
7020.00	137		
7770.00 w/ Mount Pipe	137		
(2) LGP13519	137		
P65-17-XLH-RR w/ Mount Pipe	137		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Hartford County, Connecticut.
2. Tower designed for a 80.00 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 37.60 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60.00 mph wind.
5. TOWER RATING: 77.3%

Paul J Ford and Company
250 E. Broad Street Suite 600
Columbus, OH 43215
Phone: 614.221.6679
FAX: 614.448.4105

Job:	Ex. 145-ft Monopole in Hartford Co., CT
Project:	PJF: 37515-2141 (BU: 806368)
Client: Crown Castle	Drawn by: Jared Smith
Code: TIA/EIA-222-F	Date: 06/24/15
Path:	Scale: N
	Dwg No.

PAUL J. FORD AND COMPANY
STRUCTURAL ENGINEERS
250 East Broad Street • Suite 600 • Columbus, Ohio 43215-3708

By	JWS
Date	6/24/2015
Project	37515-2141.001
Client	CCI
PROJ#	879129

Foundation Comparison

Reactions	Original Design	Current Analysis	Ratio
Moment (ft-kips)	5001.4	4256.0	85.1%
Shear (kips)	44.6	40.0	89.7%

Note: Although the shear capacity is at 89.7%, the moment reaction is the governing criteria for a monopole drilled shaft foundation, therefore, the overall capacity for this foundation 85.1%.

Stiffened or Unstiffened, Ungrouted, Circular Base Plate - Any Rod Material

TIA Rev F

Site Data

BU#: *806368*
Site Name:
App #:

Pole Manufacturer:	*Other*

Anchor Rod Data		
Qty:	20	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	70	in

Plate Data		
Diam:	76.5	in
Thick:	2.25	in
Grade:	60	ksi
Single-Rod B-eff:	9.73	in

Stiffener Data (Welding at both sides)		
Config:		*
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:	60.5	in
Thick:	0.46875	in
Grade:	65	ksi
# of Sides:	12	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

Stress Increase Factor		
ASIF:	1.333	

Reactions		
Moment:	4256	ft-kips
Axial:	49	kips
Shear:	40	kips

If No stiffeners, Criteria:	AISC ASD	<-Only Applcable to Unstiffened Cases

Anchor Rod Results

Maximum Rod Tension:	143.5 Kips	Rigid
Allowable Tension:	195.0 Kips	Service, ASD
Anchor Rod Stress Ratio:	73.6% Pass	Fty*ASIF

Base Plate Results

	Flexural Check	
Base Plate Stress:	52.6 ksi	Rigid
Allowable Plate Stress:	60.0 ksi	Service ASD
Base Plate Stress Ratio:	87.7% Pass	0.75*Fy*ASIF
		Y.L. Length: 35.21

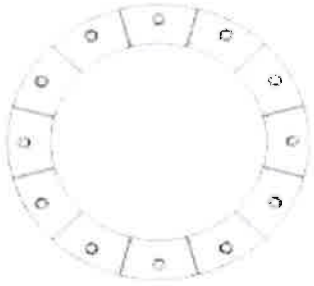
n/a

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



* 0 = none, 1 = every bolt, 2 = every 2 bolts, 3 = 2 per bolt

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