Robinson+Cole

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Also admitted in Massachusetts

June 29, 2015

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

Re: **Notice of Exempt Modification – Facility Modification**
Bright Meadow Boulevard, Enfield, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the 134-foot level of the existing 147.5-foot tower off Bright Meadow Boulevard in Enfield, Connecticut (the "Property"). The tower is owned by Crown Castle. The Council approved Cellco's use of the existing tower in 1999. Cellco now intends to modify its facility by replacing six (6) of its existing antennas with three (3) model SBNHH-1D65B, 1900 MHz antennas and three (3) model SBNHH-1D65B, 2100 MHz antennas, all at the same 134-foot level on the tower. Cellco also intends to replace three (3) existing remote radio heads ("RRHs") with three (3) newer model RRHs, and install six (6) new remote radio heads ("RRHs") and one (1) HYBRIFLEX™ antenna cable. Included in Attachment 1 are specifications for Cellco's replacement antennas, RRHs and HYBRIFLEX™ cable.

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 Matthew W. Coppler, Town Manager of the Town of Enfield. A copy of this letter is also being sent to Connecticut Light & Power, the owner of the Property.

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. The replacement antennas and RRHs will be located at the 134-foot level on the 147.5-foot 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 General Power Density table 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:
Matthew W. Coppler, Enfield Town Manager
Connecticut Light & Power
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

ALCATEL-LUCENT B13 RRH4X30-4R

Alcatel-Lucent B13 Remote Radio Head 4x30-4R is the newest addition of Remote Radio Head to the extended product line of Alcatel-Lucent's distributed Base Station solutions, aimed at facilitating smooth RF site acquisition and related civil engineering.

Supporting 2Tx/4Tx MIMO and 4-way Rx diversity, Alcatel-Lucent B13 RRH4x30-4R allows operators to have a compact radio solution to deploy LTE in the 700U band (700 MHz, 3GPP band 13), providing them with the means to achieve high capacity, high quality and high coverage with minimum site requirements.

The Alcatel-Lucent B13 RRH4x30-4R product has four transmit RF paths, offering the possibility to **select, via software only, 2Tx or 4Tx MIMO configurations** with either 2x60 W or 4x30 W RF output power. It supports also 4-way Rx diversity and up to 10MHz instantaneous bandwidth.

The Alcatel-Lucent B13 RRH4x30-4R is a near zero-footprint solution and operates noise free, simplifying negotiations with site property owners and minimizing environmental impacts.

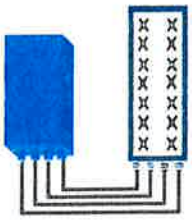
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the RF feeder needs and installation costs.

FEATURES

- Supporting LTE in 700 MHz band (700U, 3GPP band 13)
- LTE 2Tx or 4Tx MIMO (SW switchable)
- Output power: Up to 2x60W or 4x30W
- 10MHz LTE carrier with 4Rx Diversity
- Convection-cooled (fan-less)
- Supports AISG 2.0 ALD devices (RET, TMA) through RS485 or RF ports

BENEFITS

- Compact to reduce additional footprint when adding LTE in 700U band
- MIMO scheme operation selection (2Tx or 4Tx) by software only
- Improves downlink spectral efficiency through MIMO4
- Increases LTE coverage thanks to 4Rx diversity capability and best in class Rx sensitivity
- Flexible mounting options: Pole or Wall



4x30W with 4T4R
or
2x60W with 2T4R

Can be switched between modes via SW w/o site visit

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Features & performance	
Number of TX/RX paths	4 duplexed (either 4T4R or 2T4R by SW)
Frequency band	U700 (C) (3GPP bands 13): DL: 746 - 756 MHz / UL: 777 - 787 MHz
Instantaneous bandwidth - #carriers	10MHz – 1 LTE carrier (in 10MHz occupied bandwidth)
LTE carrier bandwidth	10 MHz
RF output power	2x60W or 4x30W (by SW)
Noise figure – RX Diversity scheme	2 dB typ. (<2.5 dB max) – 2 or 4 way Rx diversity
Sizes (HxWxD) in mm (in.) Volume in L Weight in kg (lb) (w/o mounting HW)	550 x 305 x 230 (21.6" x 12.0" x 9") (with solar shield) 38 (with solar shield) 26 (57.2) (with solar shield)
DC voltage range DC power consumption	-40.5 to -57V at full performance, -38 to -57V with relaxation on power consumption 550W typical @100% RF load (in 2Tx or 4TX mode)
Environmental conditions Wind load (@150km/h or 93mph)	-40°C (-40°F) /+55°C (+131°F) IP65 Frontal:<200N / Lateral :<150N
Antenna ports	4 ports 7/16 DIN female (50 ohms) VSWR < 1.5
CPRI ports	2 CPRI ports (HW ready for Rate7, 9.8 Gbps) SFP single mode dual fiber
AISG interfaces	1 AISG2.0 output (RS485) Integrated Smart Bias Tees (x2)
Misc. Interfaces	4 external alarms (1 connector) – 4 RF Tx & 4 RF Rx monitor ports - 1 DC connector (2 pins)
Installation conditions	Pole and wall mounting
Regulatory compliance	3GPP 36.141 / 3GPP 36.113 / GR-1089-CORE / GR-3108-CORE / UL 60950-1 / FCC Part 27

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.)

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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.

[illegible]

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.

[illegible]

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.

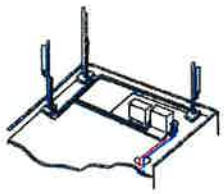
[illegible]

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.

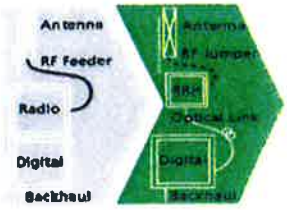
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation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

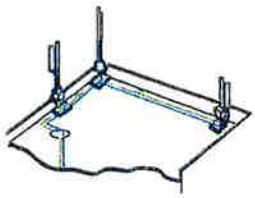
Installation can easily be done by a single person as the Alcatel-Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



Macro



RRH for space-constrained cell sites



Distributed

- 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
- 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.

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 CELLFLEX² 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)

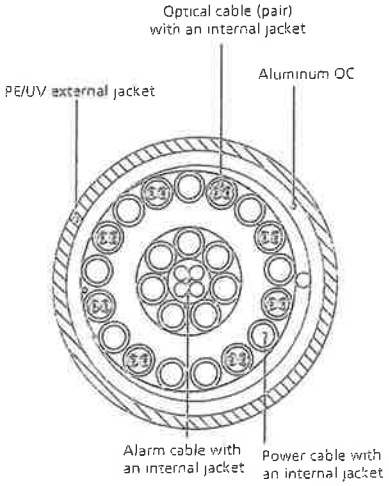


Figure 2: Construction Detail

* This data is provisional and subject to change

ATTACHMENT 2

	General	Power	Density					
Site Name: North Thompsonville (Enfield)								
Tower Height: 147.5Ft.								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*AT&T UMTS	2	565	119	0.0287	880	0.5867	4.89%	
*AT&T UMTS	2	875	119	0.0444	1900	1.0000	4.44%	
*AT&T GSM	1	283	119	0.0072	880	0.5867	1.22%	
*AT&T GSM	4	525	119	0.0533	1900	1.0000	5.33%	
*AT&T LTE	1	1375	119	0.0349	734	0.4893	7.13%	
*MetroPCS CDMA	3	727	107	0.0685	2135	1.0000	6.85%	
*MetroPCS LTE	1	1200	107	0.0377	2130	1.0000	3.77%	
*Clearwire	2	153	147	0.0051	2496	1.0000	0.51%	
*Clearwire	1	211	147	0.0035	11 GHz	1.0000	0.35%	
*Sprint CDMA/LTE	3	347.5	147	0.0173	1900	1.0000	1.73%	
*Sprint CDMA/LTE	1	195	147	0.0032	850	0.5667	0.57%	
*Sprint CDMA/LTE	2	195	147	0.0065	2500	1.0000	0.65%	
*Nextel	9	100	127	0.0201	851	0.5673	3.54%	
*XM Sat Radio	2	307	142	0.0109	2340	1.0000	1.09%	
Verizon PCS	**11**	**421**	**134**	**0.0927**	**1970**	**1.0000**	**9.27%**	
Verizon Cellular	**9**	**393**	**134**	**0.0708**	**869**	**0.5793**	**12.23%**	
Verizon AWS	**1**	**3500**	**134**	**0.0701**	**2145**	**1.0000**	**7.01%**	
Verizon 700	**1**	**2100**	**134**	**0.0421**	**746**	**0.4973**	**8.46%**	
								79.06%
* Source: Siting Council								

ATTACHMENT 3

PJF PAUL J. FORD & COMPANY

Date: **May 28, 2015**

Holly Haas
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:	119680
	Carrier Site Name:	N. Thompsonville CT
Crown Castle Designation:	**Crown Castle BU Number:**	876348
	Crown Castle Site Name:	ENFIELD
	Crown Castle JDE Job Number:	333441
	Crown Castle Work Order Number:	1066328
	Crown Castle Application Number:	294573 Rev. 5
Engineering Firm Designation:	**Paul J Ford and Company Project Number:**	37515-1738.002.7805
Site Data:	**Bright Meadow Blvd., ENFIELD, Hartford County, CT** **Latitude *42° 1' 14.91"*, Longitude *-72° 35' 6.59"*** **147.5 Foot - Monopole Tower**	

Dear Holly Haas,

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 790692, in accordance with application 294573, revision 5.

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.

The analysis has been performed in accordance with the TIA/EIA-222-F standard and the 2005 CT State Building Code based upon a fastest mile wind speed of 80 mph with no ice, 37.6 mph with 1 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. 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

5-28-15

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 147.5 ft Monopole tower designed by SUMMIT in September of 1998. The tower was originally designed for a wind speed of 85 mph per TIA/EIA-222-F. The pole was modified by Paul J. Ford and Company in February of 2013.

2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a fastest mile wind speed of 80 mph with no ice, 37.6 mph with 1 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
132.0	134.0	3	alcatel lucent	RRH2X60-AWS	1	1-5/8	-
		3	alcatel lucent	RRH2X60-PCS			
		3	alcatel lucent	RRH2x60-700			
		6	commscope	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	147.0	3	alcatel lucent	TD-RRH8x20-25	3 1 1	1-1/4 3/4 5/8	1
		3	rfs celwave	APXVSPP18-C-A20 w/ Mount Pipe			
		3	rfs celwave	APXVTM14-ALU-I20 w/ Mount Pipe			
		1	tower mounts	Platform Mount [LP 712-1]			
145.0	146.0	2	alcatel lucent	800MHz 2X50W RRH W/FILTER W/Mount pipes	-	-	1
		1	alcatel lucent	PCS 1900MHz 4x45W-65MHz			
	145.0	1	tower mounts	Side Arm Mount [SO 102-3]			
	144.0	1	alcatel lucent	800MHz 2X50W RRH W/FILTER W/Mount pipes			
		2	alcatel lucent	PCS 1900MHz 4x45W-65MHz			
132.0	134.0	3	alcatel lucent	RRH2X40-AWS	-	-	2
		3	antel	BXA-171063-12BF-EDIN-X w/ Mount Pipe			
		3	antel	BXA-171063-8BF-EDIN-2 w/ Mount Pipe			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
		3	antel	BXA-70063-4CF-EDIN-X w/ Mount Pipe	19	1-5/8	1
		3	antel	BXA-70063-6CF-EDIN-2 w/ Mount Pipe			
		1	rfs celwave	DB-T1-6Z-8AB-0Z			
	132.0	1	tower mounts	Platform Mount [LP 712-1]			
119.0	119.0	3	ericsson	RRU-11	-	-	1
		1	raycap	DC6-48-60-18-8F			
		1	tower mounts	Pipe Mount [PM 601-3]			
117.0	119.0	1	andrew	SBNH-1D6565C w/ Mount Pipe	9 2 1	1-5/8 3/4 3/8	1
		1	kmw communications	AM-X-CD-14-65-00T-RET w/ Mount Pipe			
		1	kmw communications	AM-X-CD-16-65-00T-RET w/ Mount Pipe			
		3	powerwave technologies	7770.00 w/ Mount Pipe			
		6	powerwave technologies	LGP21401			
	117.0	1	tower mounts	Platform Mount [LP 712-1]			
107.0	107.0	3	rfs celwave	APXV18-206517S-C w/ Mount Pipe	6	1-5/8	1
		1	tower mounts	Pipe Mount [PM 601-3]			
49.0	50.0	1	symmetricom	58532A	1	1/2	1
	49.0	1	tower mounts	Side Arm Mount [SO 701-1]			

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

3) ANALYSIS PROCEDURE

Table 3 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	FDH, 120604EG1, 8/20/12	1532963	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	PJF, 29298-598, 9/15/98	1613614	CCISITES
4-TOWER MANUFACTURER DRAWINGS	Summit, 3960, 9/11/98	1613591	CCISITES
4-TOWER REINFORCEMENT DESIGN/DRAWINGS/DATA	PJF, 37513-0644, 2/27/13	3667620	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) When applicable, transmission cables are considered as structural components for calculating wind loads as allowed by TIA/EIA-222-F.

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	147.5 - 108.5	Pole	TP29.41x22x0.25	1	-9.25	1083.24	56.3	Pass
L2	108.5 - 72.25	Pole	TP35.798x28.1975x0.25	2	-14.38	1431.15	99.8	Pass
L3	72.25 - 48	Pole	TP39.9048x34.4429x0.3125	3	-19.88	2041.56	97.7	Pass
L4	48 - 35.75	Pole	TP42.232x39.9048x0.3853	4	-21.40	2265.57	93.7	Pass
L5	35.75 - 0	Pole	TP48.4x40.4641x0.375	5	-31.72	2971.67	93.9	Pass
							Summary	
						Pole (L2)	99.8	Pass
						Rating =	99.8	Pass

Table 5 - Tower Component Stresses vs. Capacity – LC5

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	87.1	Pass
1	Base Plate	0	78.3	Pass
1	Base Foundation Steel	0	51.3	Pass
1	Base Foundation Soil Interaction	0	65.0	Pass

Structure Rating (max from all components) =	99.8%

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

4.1) Recommendations

The tower and its foundation have sufficient capacity to carry the existing and proposed loads. No modifications are required at this time.

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:

1) Tower is located in Hartford County, Connecticut.
2) Basic wind speed of 80 mph.
3) Nominal ice thickness of 1.0000 in.
4) Ice thickness is considered to increase with height.
5) Ice density of 56.00 pcf.
6) A wind speed of 38 mph is used in combination with ice.
7) Deflections calculated using a wind speed of 50 mph.
8) A non-linear (P-delta) analysis was used.
9) Pressures are calculated at each section.
10) Stress ratio used in pole design is 1.333.
11) Local bending stresses due to climbing loads, feed line 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		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	147.5000-108.5000	39.0000	3.75	18	22.0000	29.4100	0.2500	1.0000	A572-60 (60 ksi)
L2	108.5000-72.2500	40.0000	4.50	18	28.1975	35.7980	0.2500	1.0000	A607-65 (65 ksi)
L3	72.2500-48.0000	28.7500	0.00	18	34.4429	39.9048	0.3125	1.2500	A607-65 (65 ksi)
L4	48.0000-35.7500	12.2500	5.25	18	39.9048	42.2320	0.3852	1.5410	Reinf 56.71 ksi (57 ksi)
L5	35.7500-0.0000	41.0000		18	40.4641	48.4000	0.3750	1.5000	A607-65 (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

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	22.3394	17.2586	1031.4832	7.7212	11.1760	92.2945	2064.3237	8.6310	3.4320	13.728
	29.8637	23.1385	2485.6899	10.3518	14.9403	166.3751	4974.6504	11.5714	4.7362	18.945
L2	29.3560	22.1763	2188.3323	9.9214	14.3243	152.7703	4379.5441	11.0903	4.5228	18.091
	36.3502	28.2073	4503.2898	12.6195	18.1854	247.6324	9012.5051	14.1063	5.8604	23.442
L3	35.8424	33.8531	4982.1874	12.1163	17.4970	284.7450	9970.9304	16.9298	5.5120	17.638
	40.5204	39.2706	7777.2418	14.0553	20.2716	383.6517	15564.7171	19.6390	6.4732	20.714
L4	40.5204	48.3238	9535.0287	14.0294	20.2716	470.3634	19082.6038	24.1665	6.3452	16.47
	42.8835	51.1695	11320.6724	14.8556	21.4539	527.6754	22656.2409	25.5896	6.7548	17.534
L5	42.1202	47.7161	9688.4702	14.2316	20.5558	471.3260	19389.6888	23.8626	6.4617	17.231
	49.1466	57.1618	16656.2703	17.0489	24.5872	677.4366	33334.4574	28.5863	7.8584	20.956

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 147.5000-108.5000				1	1	1		
L2 108.5000-72.2500				1	1	1		
L3 72.2500-48.0000				1	1	1		
L4 48.0000-35.7500				1	1	1		
L5 35.7500-0.0000				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
Aero MP3-03	C	No	CaAa (Out Of Face)	49.0000 - 39.0000	1	No Ice	0.2625	0.00
						1/2" Ice	0.3736	0.00
						1" Ice	0.4847	0.00
						2" Ice	0.7069	0.00
						4" Ice	1.1514	0.00
******								
HB058-M12-XXXF(5/8")	C	No	Inside Pole	147.0000 - 0.0000	1	No Ice	0.0000	0.24
						1/2" Ice	0.0000	0.24
						1" Ice	0.0000	0.24
						2" Ice	0.0000	0.24
						4" Ice	0.0000	0.24
HB114-1-08U4-M5J(1 1/4")	C	No	Inside Pole	147.0000 - 0.0000	3	No Ice	0.0000	1.08
						1/2" Ice	0.0000	1.08
						1" Ice	0.0000	1.08
						2" Ice	0.0000	1.08
						4" Ice	0.0000	1.08
WR-VG86ST-BRD(3/4)	C	No	Inside Pole	147.0000 - 0.0000	1	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
LDF7-50A(1-5/8")	C	No	Inside Pole	132.0000 - 0.0000	18	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
HB158-1-08U8-S8J18(1-5/8)	C	No	Inside Pole	132.0000 - 0.0000	1	No Ice	0.0000	1.30
						1/2" Ice	0.0000	1.30
						1" Ice	0.0000	1.30

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
						2" Ice	0.0000	1.30
						4" Ice	0.0000	1.30
HB158-1-08U8-S8J18(1-5/8)	C	No	Inside Pole	132.0000 - 0.0000	1	No Ice	0.0000	1.30
						1/2" Ice	0.0000	1.30
						1" Ice	0.0000	1.30
						2" Ice	0.0000	1.30
						4" Ice	0.0000	1.30
LDF7-50A(1-5/8")	C	No	Inside Pole	117.0000 - 0.0000	9	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
FB-L98B-002-75000(3/8")	C	No	Inside Pole	117.0000 - 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	117.0000 - 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
LCF158-50JL(1-5/8")	C	No	CaAa (Out Of Face)	107.0000 - 0.0000	1	No Ice	0.1980	0.52
						1/2" Ice	0.2980	2.03
						1" Ice	0.3980	4.16
						2" Ice	0.5980	10.24
						4" Ice	0.9980	29.74
LDF4-50A(1/2")	C	No	Inside Pole	49.0000 - 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
2" (Nominal) Conduit	C	No	Inside Pole	117.0000 - 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
LCF158-50JL(1-5/8")	C	No	CaAa (Out Of Face)	107.0000 - 0.0000	5	No Ice	0.0000	0.52
						1/2" Ice	0.0000	2.03
						1" Ice	0.0000	4.16
						2" Ice	0.0000	10.24
						4" Ice	0.0000	29.74

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	147.5000-108.5000	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	0.000	0.64
L2	108.5000-72.2500	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	6.880	1.22
L3	72.2500-48.0000	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	5.064	0.82
L4	48.0000-35.7500	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	4.788	0.42
L5	35.7500-0.0000	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	7.079	1.22

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
L1	147.5000-108.5000	A	1.176	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	0.64
L2	108.5000-72.2500	A	1.128	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	15.053	2.21
L3	72.2500-48.0000	A	1.074	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	10.785	1.46
L4	48.0000-35.7500	A	1.029	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	9.366	0.70
L5	35.7500-0.0000	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	14.435	2.04

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	147.5000-108.5000	0.0000	0.0000	0.0000	0.0000
L2	108.5000-72.2500	-0.2314	0.1336	-0.4417	0.2550
L3	72.2500-48.0000	-0.2551	0.1473	-0.4820	0.2783
L4	48.0000-35.7500	-0.4540	0.2621	-0.7771	0.4487
L5	35.7500-0.0000	-0.2443	0.1410	-0.4547	0.2625

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight K
TD-RRH8x20-25	A	From Leg	4.0000 0.00 0.00	0.00	147.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.7198 5.0138 5.3165 5.9478 7.3141	1.7027 1.9196 2.1453 2.6224 3.6805	0.07 0.10 0.13 0.20 0.40
APXVSPP18-C-A20 w/ Mount Pipe	A	From Leg	4.0000 0.00 0.00	0.00	147.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.4975 9.1490 9.7672 11.0311 13.6786	6.9458 8.1266 9.0212 10.8440 14.8507	0.08 0.15 0.23 0.41 0.91
APXVTM14-ALU-I20 w/ Mount Pipe	A	From Leg	4.0000 0.00 0.00	0.00	147.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.1342 7.6618 8.1830 9.2563 11.5262	4.9591 5.7544 6.4723 8.0099 11.4120	0.08 0.13 0.19 0.34 0.75
TD-RRH8x20-25	B	From Leg	4.0000 0.00 0.00	0.00	147.0000	No Ice 1/2" Ice	4.7198 5.0138 5.3165	1.7027 1.9196 2.1453	0.07 0.10 0.13

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	5.9478	2.6224	0.20
						2" Ice	7.3141	3.6805	0.40
						4" Ice			
APXVSPP18-C-A20 w/ Mount Pipe	B	From Leg	4.0000 0.00 0.00	0.00	147.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.4975 9.1490 9.7672 11.0311 13.6786	6.9458 8.1266 9.0212 10.8440 14.8507	0.08 0.15 0.23 0.41 0.91
APXVTM14-ALU-I20 w/ Mount Pipe	B	From Leg	4.0000 0.00 0.00	0.00	147.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.1342 7.6618 8.1830 9.2563 11.5262	4.9591 5.7544 6.4723 8.0099 11.4120	0.08 0.13 0.19 0.34 0.75
TD-RRH8x20-25	C	From Leg	4.0000 0.00 0.00	0.00	147.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.7198 5.0138 5.3165 5.9478 7.3141	1.7027 1.9196 2.1453 2.6224 3.6805	0.07 0.10 0.13 0.20 0.40
APXVSPP18-C-A20 w/ Mount Pipe	C	From Leg	4.0000 0.00 0.00	0.00	147.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.4975 9.1490 9.7672 11.0311 13.6786	6.9458 8.1266 9.0212 10.8440 14.8507	0.08 0.15 0.23 0.41 0.91
APXVTM14-ALU-I20 w/ Mount Pipe	C	From Leg	4.0000 0.00 0.00	0.00	147.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.1342 7.6618 8.1830 9.2563 11.5262	4.9591 5.7544 6.4723 8.0099 11.4120	0.08 0.13 0.19 0.34 0.75
Platform Mount [LP 712-1]	C	None		0.00	147.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	24.5300 29.9400 35.3500 46.1700 67.8100	24.5300 29.9400 35.3500 46.1700 67.8100	1.34 1.65 1.96 2.58 3.82
(3) 5' x 2" Pipe Mount	A	From Face	4.0000 0.00 0.00	0.00	147.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.0000 1.3932 1.7031 2.3506 3.7778	1.0000 1.3932 1.7031 2.3506 3.7778	0.06 0.06 0.08 0.11 0.22
(3) 5' x 2" Pipe Mount	B	From Face	4.0000 0.00 0.00	0.00	147.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.0000 1.3932 1.7031 2.3506 3.7778	1.0000 1.3932 1.7031 2.3506 3.7778	0.06 0.06 0.08 0.11 0.22
(3) 5' x 2" Pipe Mount	C	From Face	4.0000 0.00 0.00	0.00	147.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.0000 1.3932 1.7031 2.3506 3.7778	1.0000 1.3932 1.7031 2.3506 3.7778	0.06 0.06 0.08 0.11 0.22
***									
800MHz 2X50W RRH W/FILTER W/Mount pipes	A	From Leg	2.0000 0.00 -1.00	0.00	145.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.7148 3.0250 3.3485 4.0439 5.6629	2.8803 3.2839 3.7054 4.6191 6.7993	0.08 0.11 0.14 0.23 0.47
PCS 1900MHz 4x45W-	A	From Leg	2.0000	0.00	145.0000	No Ice	2.7087	2.6111	0.06

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
65MHz			0.00 1.00			1/2" Ice 1" Ice 2" Ice 4" Ice	2.9477 3.1953 3.7164 4.8623	2.8475 3.0925 3.6084 4.7439	0.08 0.11 0.17 0.35
800MHz 2X50W RRH W/FILTER W/Mount pipes	B	From Leg	2.0000 0.00 1.00	0.00	145.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.7148 3.0250 3.3485 4.0439 5.6629	2.8803 3.2839 3.7054 4.6191 6.7993	0.08 0.11 0.14 0.23 0.47
PCS 1900MHz 4x45W-65MHz	B	From Leg	2.0000 0.00 -1.00	0.00	145.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.7087 2.9477 3.1953 3.7164 4.8623	2.6111 2.8475 3.0925 3.6084 4.7439	0.06 0.08 0.11 0.17 0.35
800MHz 2X50W RRH W/FILTER W/Mount pipes	C	From Leg	2.0000 0.00 1.00	0.00	145.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.7148 3.0250 3.3485 4.0439 5.6629	2.8803 3.2839 3.7054 4.6191 6.7993	0.08 0.11 0.14 0.23 0.47
PCS 1900MHz 4x45W-65MHz	C	From Leg	2.0000 0.00 -1.00	0.00	145.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.7087 2.9477 3.1953 3.7164 4.8623	2.6111 2.8475 3.0925 3.6084 4.7439	0.06 0.08 0.11 0.17 0.35
Side Arm Mount [SO 102-3]	C	None		0.00	145.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.0000 3.4800 3.9600 4.9200 6.8400	3.0000 3.4800 3.9600 4.9200 6.8400	0.08 0.11 0.14 0.20 0.32
***									
BXA-70063-4CF-EDIN-X w/ Mount Pipe	A	From Leg	4.0000 0.00 2.00	0.00	132.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.3988 5.8435 6.2986 7.2405 9.2612	3.6927 4.2947 4.9133 6.2583 9.2851	0.03 0.07 0.12 0.23 0.58
BXA-70063-6CF-EDIN-2 w/ Mount Pipe	A	From Leg	4.0000 0.00 2.00	0.00	132.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.9686 8.6091 9.2158 10.4591 13.0655	5.8008 6.9529 7.8191 9.6015 13.3662	0.04 0.10 0.17 0.34 0.80
DB-T1-6Z-8AB-0Z	A	From Leg	4.0000 0.00 2.00	0.00	132.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.6000 5.9154 6.2395 6.9136 8.3654	2.3333 2.5580 2.7914 3.2840 4.3728	0.04 0.08 0.12 0.21 0.45
RRH2x60-700	A	From Leg	4.0000 0.00 2.00	0.00	132.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.9569 4.2724 4.5965 5.2705 6.7224	1.8157 2.0752 2.3603 2.9566 4.2529	0.06 0.08 0.11 0.17 0.35
RRH2X60-AWS	A	From Leg	4.0000 0.00 2.00	0.00	132.0000	No Ice 1/2" Ice 1" Ice 2" Ice	2.1904 2.3976 2.6134 3.0710 4.0899	1.4290 1.6109 1.8015 2.2085 3.1263	0.04 0.06 0.08 0.13 0.26

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
						4" Ice			
RRH2X60-PCS	A	From Leg	4.0000 0.00 2.00	0.00	132.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.5667 2.7914 3.0247 3.5173 4.6062	2.0106 2.2184 2.4349 2.8938 3.9152	0.06 0.08 0.10 0.16 0.31
(2) SBNHH-1D65B w/ Mount Pipe	A	From Leg	4.0000 0.00 2.00	0.00	132.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.6393 9.2963 9.9210 11.1952 13.8631	7.0730 8.2637 9.1753 11.0130 15.0524	0.07 0.14 0.21 0.39 0.90
DB-T1-6Z-8AB-0Z	A	From Leg	4.0000 0.00 2.00	0.00	132.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.6000 5.9154 6.2395 6.9136 8.3654	2.3333 2.5580 2.7914 3.2840 4.3728	0.04 0.08 0.12 0.21 0.45
BXA-70063-4CF-EDIN-X w/ Mount Pipe	B	From Leg	4.0000 0.00 2.00	0.00	132.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.3988 5.8435 6.2986 7.2405 9.2612	3.6927 4.2947 4.9133 6.2583 9.2851	0.03 0.07 0.12 0.23 0.58
BXA-70063-6CF-EDIN-2 w/ Mount Pipe	B	From Leg	4.0000 0.00 2.00	0.00	132.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.9686 8.6091 9.2158 10.4591 13.0655	5.8008 6.9529 7.8191 9.6015 13.3662	0.04 0.10 0.17 0.34 0.80
RRH2x60-700	B	From Leg	4.0000 0.00 2.00	0.00	132.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.9569 4.2724 4.5965 5.2705 6.7224	1.8157 2.0752 2.3603 2.9566 4.2529	0.06 0.08 0.11 0.17 0.35
RRH2X60-AWS	B	From Leg	4.0000 0.00 2.00	0.00	132.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.1904 2.3976 2.6134 3.0710 4.0899	1.4290 1.6109 1.8015 2.2085 3.1263	0.04 0.06 0.08 0.13 0.26
RRH2X60-PCS	B	From Leg	4.0000 0.00 2.00	0.00	132.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.5667 2.7914 3.0247 3.5173 4.6062	2.0106 2.2184 2.4349 2.8938 3.9152	0.06 0.08 0.10 0.16 0.31
(2) SBNHH-1D65B w/ Mount Pipe	B	From Leg	4.0000 0.00 2.00	0.00	132.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.6393 9.2963 9.9210 11.1952 13.8631	7.0730 8.2637 9.1753 11.0130 15.0524	0.07 0.14 0.21 0.39 0.90
BXA-70063-4CF-EDIN-X w/ Mount Pipe	C	From Leg	4.0000 0.00 2.00	0.00	132.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.3988 5.8435 6.2986 7.2405 9.2612	3.6927 4.2947 4.9133 6.2583 9.2851	0.03 0.07 0.12 0.23 0.58
BXA-70063-6CF-EDIN-2 w/ Mount Pipe	C	From Leg	4.0000 0.00 2.00	0.00	132.0000	No Ice 1/2" Ice 1" Ice	7.9686 8.6091 9.2158 10.4591	5.8008 6.9529 7.8191 9.6015	0.04 0.10 0.17 0.34

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	13.0655	13.3662	0.80
						4" Ice			
RRH2x60-700	C	From Leg	4.0000 0.00 2.00	0.00	132.0000	No Ice	3.9569	1.8157	0.06
						1/2" Ice	4.2724	2.0752	0.08
						1" Ice	4.5965	2.3603	0.11
						2" Ice	5.2705	2.9566	0.17
						4" Ice	6.7224	4.2529	0.35
RRH2X60-AWS	C	From Leg	4.0000 0.00 2.00	0.00	132.0000	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	C	From Leg	4.0000 0.00 2.00	0.00	132.0000	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
(2) SBNHH-1D65B w/ Mount Pipe	C	From Leg	4.0000 0.00 2.00	0.00	132.0000	No Ice	8.6393	7.0730	0.07
						1/2" Ice	9.2963	8.2637	0.14
						1" Ice	9.9210	9.1753	0.21
						2" Ice	11.1952	11.0130	0.39
						4" Ice	13.8631	15.0524	0.90
Platform Mount [LP 712-1]	C	None		0.00	132.0000	No Ice	24.5300	24.5300	1.34
						1/2" Ice	29.9400	29.9400	1.65
						1" Ice	35.3500	35.3500	1.96
						2" Ice	46.1700	46.1700	2.58
						4" Ice	67.8100	67.8100	3.82
***									
RRU-11	A	From Leg	4.0000 0.00 0.00	0.00	119.0000	No Ice	1.9116	1.4717	0.04
						1/2" Ice	2.1019	1.6452	0.06
						1" Ice	2.3009	1.8274	0.08
						2" Ice	2.7248	2.2176	0.12
						4" Ice	3.6763	3.1016	0.25
DC6-48-60-18-8F	A	From Leg	4.0000 0.00 0.00	0.00	119.0000	No Ice	1.4667	1.4667	0.02
						1/2" Ice	1.6667	1.6667	0.04
						1" Ice	1.8778	1.8778	0.06
						2" Ice	2.3333	2.3333	0.11
						4" Ice	3.3778	3.3778	0.24
RRU-11	B	From Leg	4.0000 0.00 0.00	0.00	119.0000	No Ice	1.9116	1.4717	0.04
						1/2" Ice	2.1019	1.6452	0.06
						1" Ice	2.3009	1.8274	0.08
						2" Ice	2.7248	2.2176	0.12
						4" Ice	3.6763	3.1016	0.25
RRU-11	C	From Leg	4.0000 0.00 0.00	0.00	119.0000	No Ice	1.9116	1.4717	0.04
						1/2" Ice	2.1019	1.6452	0.06
						1" Ice	2.3009	1.8274	0.08
						2" Ice	2.7248	2.2176	0.12
						4" Ice	3.6763	3.1016	0.25
Pipe Mount [PM 601-3]	C	None		0.00	119.0000	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
***									
Platform Mount [LP 712-1]	C	None		0.00	117.0000	No Ice	24.5300	24.5300	1.34

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
						1/2" Ice	29.9400	29.9400	1.65
						1" Ice	35.3500	35.3500	1.96
						2" Ice	46.1700	46.1700	2.58
						4" Ice	67.8100	67.8100	3.82
(2) 6' x 2.375" Pipe Mount	A	From Face	4.0000 0.00 0.00	0.00	117.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.4250 1.9250 2.2939 3.0596 4.7022	1.4250 1.9250 2.2939 3.0596 4.7022	0.02 0.03 0.05 0.09 0.23
(2) 6' x 2.375" Pipe Mount	B	From Face	4.0000 0.00 0.00	0.00	117.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.4250 1.9250 2.2939 3.0596 4.7022	1.4250 1.9250 2.2939 3.0596 4.7022	0.02 0.03 0.05 0.09 0.23
(2) 6' x 2.375" Pipe Mount	C	From Face	4.0000 0.00 0.00	0.00	117.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.4250 1.9250 2.2939 3.0596 4.7022	1.4250 1.9250 2.2939 3.0596 4.7022	0.02 0.03 0.05 0.09 0.23
SBNH-1D6565C w/ Mount Pipe	A	From Leg	4.0000 0.00 2.00	0.00	117.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	11.5561 12.2227 12.8929 14.2911 17.4280	9.7151 11.1857 12.5942 14.8689 19.6184	0.10 0.19 0.28 0.51 1.15
7770.00 w/ Mount Pipe	A	From Leg	4.0000 0.00 2.00	0.00	117.0000	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) LGP21401	A	From Leg	4.0000 0.00 2.00	0.00	117.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.2880 1.4453 1.6112 1.9690 2.7882	0.3640 0.4785 0.6017 0.8739 1.5220	0.01 0.02 0.03 0.05 0.14
AM-X-CD-14-65-00T-RET w/ Mount Pipe	B	From Leg	4.0000 0.00 2.00	0.00	117.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.7442 6.1977 6.6606 7.6178 9.6678	4.0153 4.6330 5.2765 6.6779 9.7441	0.05 0.10 0.15 0.27 0.63
7770.00 w/ Mount Pipe	B	From Leg	4.0000 0.00 2.00	0.00	117.0000	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) LGP21401	B	From Leg	4.0000 0.00 2.00	0.00	117.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.2880 1.4453 1.6112 1.9690 2.7882	0.3640 0.4785 0.6017 0.8739 1.5220	0.01 0.02 0.03 0.05 0.14
AM-X-CD-16-65-00T-RET w/ Mount Pipe	C	From Leg	4.0000 0.00 2.00	0.00	117.0000	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

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
7770.00 w/ Mount Pipe	C	From Leg	4.0000 0.00 2.00	0.00	117.0000	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) LGP21401	C	From Leg	4.0000 0.00 2.00	0.00	117.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.2880 1.4453 1.6112 1.9690 2.7882	0.3640 0.4785 0.6017 0.8739 1.5220	0.01 0.02 0.03 0.05 0.14
***									
APXV18-206517S-C w/ Mount Pipe	A	From Leg	4.0000 0.00 0.00	0.00	107.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.4042 5.9597 6.4808 7.5467 9.9193	4.7000 5.8600 6.7338 8.5150 12.2774	0.05 0.10 0.15 0.28 0.68
APXV18-206517S-C w/ Mount Pipe	B	From Leg	4.0000 0.00 0.00	0.00	107.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.4042 5.9597 6.4808 7.5467 9.9193	4.7000 5.8600 6.7338 8.5150 12.2774	0.05 0.10 0.15 0.28 0.68
APXV18-206517S-C w/ Mount Pipe	C	From Leg	4.0000 0.00 0.00	0.00	107.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.4042 5.9597 6.4808 7.5467 9.9193	4.7000 5.8600 6.7338 8.5150 12.2774	0.05 0.10 0.15 0.28 0.68
Pipe Mount [PM 601-3]	A	None		0.00	107.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.3900 5.4800 6.5700 8.7500 13.1100	4.3900 5.4800 6.5700 8.7500 13.1100	0.20 0.24 0.28 0.36 0.53
***									
Side Arm Mount [SO 701-1]	A	From Face	2.0000 0.00 0.00	0.00	49.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.8500 1.1400 1.4300 2.0100 3.1700	1.6700 2.3400 3.0100 4.3500 7.0300	0.07 0.08 0.09 0.12 0.18
58532A	A	From Leg	4.0000 0.00 1.00	0.00	49.0000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.2209 0.2897 0.3672 0.5481 1.0137	0.2209 0.2897 0.3672 0.5481 1.0137	0.00 0.00 0.01 0.02 0.06

Tower Pressures - No Ice

G_H = 1.690

Section Elevation ft	z ft	K_Z	q_z psf	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

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 147.5000-108.5000	127.2746	1.471	24.07	83.541	A	0.000	83.541	83.541	100.00	0.000	0.000
					B	0.000	83.541		100.00	0.000	0.000
					C	0.000	83.541		100.00	0.000	0.000
L2 108.5000-72.2500	89.9920	1.332	21.78	97.736	A	0.000	97.736	97.736	100.00	0.000	0.000
					B	0.000	97.736		100.00	0.000	0.000
					C	0.000	97.736		100.00	0.000	6.880
L3 72.2500-48.0000	59.8774	1.186	19.42	75.986	A	0.000	75.986	75.986	100.00	0.000	0.000
					B	0.000	75.986		100.00	0.000	0.000
					C	0.000	75.986		100.00	0.000	5.064
L4 48.0000-35.7500	41.8172	1.07	17.53	41.924	A	0.000	41.924	41.924	100.00	0.000	0.000
					B	0.000	41.924		100.00	0.000	0.000
					C	0.000	41.924		100.00	0.000	4.788
L5 35.7500-0.0000	17.4163	1	16.38	133.884	A	0.000	133.884	133.884	100.00	0.000	0.000
					B	0.000	133.884		100.00	0.000	0.000
					C	0.000	133.884		100.00	0.000	7.079

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 147.5000-108.5000	127.2746	1.471	5.32	1.1758	91.184	A	0.000	91.184	91.184	100.00	0.000	0.000
						B	0.000	91.184		100.00	0.000	0.000
						C	0.000	91.184		100.00	0.000	0.000
L2 108.5000-72.2500	89.9920	1.332	4.81	1.1279	104.840	A	0.000	104.840	104.840	100.00	0.000	0.000
						B	0.000	104.840		100.00	0.000	0.000
						C	0.000	104.840		100.00	0.000	15.053
L3 72.2500-48.0000	59.8774	1.186	4.29	1.0741	80.545	A	0.000	80.545	80.545	100.00	0.000	0.000
						B	0.000	80.545		100.00	0.000	0.000
						C	0.000	80.545		100.00	0.000	10.785
L4 48.0000-35.7500	41.8172	1.07	3.87	1.0288	44.024	A	0.000	44.024	44.024	100.00	0.000	0.000
						B	0.000	44.024		100.00	0.000	0.000
						C	0.000	44.024		100.00	0.000	9.366
L5 35.7500-0.0000	17.4163	1	3.62	1.0000	140.014	A	0.000	140.014	140.014	100.00	0.000	0.000
						B	0.000	140.014		100.00	0.000	0.000
						C	0.000	140.014		100.00	0.000	14.435

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 147.5000-108.5000	127.2746	1.471	9.40	83.541	A	0.000	83.541	83.541	100.00	0.000	0.000
					B	0.000	83.541		100.00	0.000	0.000
					C	0.000	83.541		100.00	0.000	0.000
L2 108.5000-72.2500	89.9920	1.332	8.51	97.736	A	0.000	97.736	97.736	100.00	0.000	0.000
					B	0.000	97.736		100.00	0.000	0.000
					C	0.000	97.736		100.00	0.000	6.880
L3 72.2500-48.0000	59.8774	1.186	7.59	75.986	A	0.000	75.986	75.986	100.00	0.000	0.000
					B	0.000	75.986		100.00	0.000	0.000
					C	0.000	75.986		100.00	0.000	5.064
L4 48.0000-35.7500	41.8172	1.07	6.85	41.924	A	0.000	41.924	41.924	100.00	0.000	0.000
					B	0.000	41.924		100.00	0.000	0.000
					C	0.000	41.924		100.00	0.000	4.788

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
L5 35.7500-0.0000	17.4163	1	6.40	133.884	A	0.000	133.884	133.884	100.00	0.000	0.000
					B	0.000	133.884		100.00	0.000	0.000
					C	0.000	133.884		100.00	0.000	7.079

Load Combinations

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	147.5 - 108.5	Pole	Max Tension	15	0.00	-0.00	-0.00
			Max. Compression	14	-20.46	0.38	2.40
			Max. Mx	11	-9.30	343.77	0.53
			Max. My	2	-9.25	0.01	350.53
			Max. Vy	11	-16.36	343.77	0.53
			Max. Vx	2	-16.64	0.01	350.53
			Max. Torque	11			-2.17
L2	108.5 - 72.25	Pole	Max Tension	1	0.00	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Compression	14	-28.35	1.63	1.84
			Max. Mx	11	-14.41	991.91	0.27
			Max. My	2	-14.38	-0.15	1008.42
			Max. Vy	11	-19.58	991.91	0.27
			Max. Vx	2	-19.86	-0.15	1008.42
			Max. Torque	11			-2.17
L3	72.25 - 48	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-35.88	3.12	1.42
			Max. Mx	11	-19.90	1583.27	0.10
			Max. My	2	-19.88	-0.07	1607.52
			Max. Vy	11	-21.54	1583.27	0.10
			Max. Vx	2	-21.83	-0.07	1607.52
			Max. Torque	10			-2.27
L4	48 - 35.75	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-37.82	3.39	1.26
			Max. Mx	11	-21.42	1735.60	-0.05
			Max. My	2	-21.40	-0.18	1761.82
			Max. Vy	11	-22.00	1735.60	-0.05
			Max. Vx	2	-22.29	-0.18	1761.82
			Max. Torque	10			-2.27
L5	35.75 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-50.98	5.10	0.27
			Max. Mx	11	-31.72	2687.44	-0.96
			Max. My	2	-31.72	-0.76	2724.97
			Max. Vy	11	-24.33	2687.44	-0.96
			Max. Vx	2	-24.61	-0.76	2724.97
			Max. Torque	10			-2.26

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	15	50.98	-0.00	6.86
	Max. H_x	11	31.74	24.30	-0.02
	Max. H_z	2	31.74	-0.02	24.58
	Max. M_x	2	2724.97	-0.02	24.58
	Max. M_z	5	2685.86	-24.30	0.02
	Max. Torsion	4	2.25	-21.06	12.31
	Min. Vert	1	31.74	0.00	0.00
	Min. H_x	5	31.74	-24.30	0.02
	Min. H_z	8	31.74	0.02	-24.58
	Min. M_x	8	-2723.77	0.02	-24.58
	Min. M_z	11	-2687.44	24.30	-0.02
	Min. Torsion	10	-2.26	21.06	-12.31

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	31.74	0.00	0.00	-0.56	0.76	0.00
Dead+Wind 0 deg - No Ice	31.74	0.02	-24.58	-2724.97	-0.76	-0.74
Dead+Wind 30 deg - No Ice	31.74	12.17	-21.30	-2360.79	-1343.82	-1.72
Dead+Wind 60 deg - No Ice	31.74	21.06	-12.31	-1364.18	-2326.66	-2.25
Dead+Wind 90 deg - No Ice	31.74	24.30	-0.02	-2.13	-2685.86	-2.18
Dead+Wind 120 deg - No Ice	31.74	21.04	12.27	1360.33	-2325.10	-1.52
Dead+Wind 150 deg - No Ice	31.74	12.14	21.28	2358.05	-1341.13	-0.46
Dead+Wind 180 deg - No Ice	31.74	-0.02	24.58	2723.77	2.33	0.74
Dead+Wind 210 deg - No Ice	31.74	-12.17	21.30	2359.59	1345.37	1.73
Dead+Wind 240 deg - No Ice	31.74	-21.06	12.31	1363.00	2328.22	2.26

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Dead+Wind 270 deg - No Ice	31.74	-24.30	0.02	0.96	2687.44	2.18
Dead+Wind 300 deg - No Ice	31.74	-21.04	-12.27	-1361.51	2326.70	1.51
Dead+Wind 330 deg - No Ice	31.74	-12.14	-21.28	-2359.25	1342.72	0.44
Dead+Ice	50.98	-0.00	-0.00	-0.27	5.10	-0.00
Dead+Wind 0 deg+Ice	50.98	0.00	-6.86	-807.37	4.97	-0.27
Dead+Wind 30 deg+Ice	50.98	3.40	-5.94	-699.42	-394.43	-0.53
Dead+Wind 60 deg+Ice	50.98	5.89	-3.43	-404.07	-686.75	-0.65
Dead+Wind 90 deg+Ice	50.98	6.80	-0.00	-0.53	-793.66	-0.60
Dead+Wind 120 deg+Ice	50.98	5.89	3.43	403.07	-686.51	-0.38
Dead+Wind 150 deg+Ice	50.98	3.40	5.94	698.60	-394.01	-0.06
Dead+Wind 180 deg+Ice	50.98	-0.00	6.86	806.79	5.45	0.27
Dead+Wind 210 deg+Ice	50.98	-3.40	5.94	698.84	404.86	0.53
Dead+Wind 240 deg+Ice	50.98	-5.89	3.43	403.49	697.18	0.65
Dead+Wind 270 deg+Ice	50.98	-6.80	0.00	-0.05	804.09	0.59
Dead+Wind 300 deg+Ice	50.98	-5.89	-3.43	-403.65	696.94	0.38
Dead+Wind 330 deg+Ice	50.98	-3.40	-5.94	-699.18	404.44	0.06
Dead+Wind 0 deg - Service	31.74	0.01	-9.60	-1066.75	0.19	-0.29
Dead+Wind 30 deg - Service	31.74	4.75	-8.32	-924.23	-525.39	-0.68
Dead+Wind 60 deg - Service	31.74	8.23	-4.81	-534.21	-909.98	-0.89
Dead+Wind 90 deg - Service	31.74	9.49	-0.01	-1.22	-1050.52	-0.86
Dead+Wind 120 deg - Service	31.74	8.22	4.79	531.94	-909.37	-0.60
Dead+Wind 150 deg - Service	31.74	4.74	8.31	922.39	-524.34	-0.18
Dead+Wind 180 deg - Service	31.74	-0.01	9.60	1065.52	1.40	0.29
Dead+Wind 210 deg - Service	31.74	-4.75	8.32	923.00	526.97	0.68
Dead+Wind 240 deg - Service	31.74	-8.23	4.81	532.98	911.56	0.89
Dead+Wind 270 deg - Service	31.74	-9.49	0.01	-0.01	1052.11	0.86
Dead+Wind 300 deg - Service	31.74	-8.22	-4.79	-533.17	910.96	0.60
Dead+Wind 330 deg - Service	31.74	-4.74	-8.31	-923.63	525.93	0.18

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	-31.74	0.00	0.00	31.74	0.00	0.000%
2	0.02	-31.74	-24.58	-0.02	31.74	24.58	0.000%
3	12.17	-31.74	-21.30	-12.17	31.74	21.30	0.000%
4	21.06	-31.74	-12.31	-21.06	31.74	12.31	0.000%
5	24.30	-31.74	-0.02	-24.30	31.74	0.02	0.000%
6	21.04	-31.74	12.27	-21.04	31.74	-12.27	0.000%
7	12.14	-31.74	21.28	-12.14	31.74	-21.28	0.000%
8	-0.02	-31.74	24.58	0.02	31.74	-24.58	0.000%
9	-12.17	-31.74	21.30	12.17	31.74	-21.30	0.000%
10	-21.06	-31.74	12.31	21.06	31.74	-12.31	0.000%
11	-24.30	-31.74	0.02	24.30	31.74	-0.02	0.000%
12	-21.04	-31.74	-12.27	21.04	31.74	12.27	0.000%
13	-12.14	-31.74	-21.28	12.14	31.74	21.28	0.000%
14	0.00	-50.98	0.00	0.00	50.98	0.00	0.000%
15	0.00	-50.98	-6.86	-0.00	50.98	6.86	0.000%
16	3.40	-50.98	-5.94	-3.40	50.98	5.94	0.000%
17	5.89	-50.98	-3.43	-5.89	50.98	3.43	0.000%
18	6.80	-50.98	-0.00	-6.80	50.98	0.00	0.000%
19	5.89	-50.98	3.43	-5.89	50.98	-3.43	0.000%
20	3.40	-50.98	5.94	-3.40	50.98	-5.94	0.000%
21	-0.00	-50.98	6.86	0.00	50.98	-6.86	0.000%
22	-3.40	-50.98	5.94	3.40	50.98	-5.94	0.000%
23	-5.89	-50.98	3.43	5.89	50.98	-3.43	0.000%
24	-6.80	-50.98	0.00	6.80	50.98	-0.00	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
25	-5.89	-50.98	-3.43	5.89	50.98	3.43	0.000%
26	-3.40	-50.98	-5.94	3.40	50.98	5.94	0.000%
27	0.01	-31.74	-9.60	-0.01	31.74	9.60	0.000%
28	4.75	-31.74	-8.32	-4.75	31.74	8.32	0.000%
29	8.23	-31.74	-4.81	-8.23	31.74	4.81	0.000%
30	9.49	-31.74	-0.01	-9.49	31.74	0.01	0.000%
31	8.22	-31.74	4.79	-8.22	31.74	-4.79	0.000%
32	4.74	-31.74	8.31	-4.74	31.74	-8.31	0.000%
33	-0.01	-31.74	9.60	0.01	31.74	-9.60	0.000%
34	-4.75	-31.74	8.32	4.75	31.74	-8.32	0.000%
35	-8.23	-31.74	4.81	8.23	31.74	-4.81	0.000%
36	-9.49	-31.74	0.01	9.49	31.74	-0.01	0.000%
37	-8.22	-31.74	-4.79	8.22	31.74	4.79	0.000%
38	-4.74	-31.74	-8.31	4.74	31.74	8.31	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00099538
3	Yes	6	0.00000001	0.00009845
4	Yes	6	0.00000001	0.00010596
5	Yes	5	0.00000001	0.00015686
6	Yes	6	0.00000001	0.00009808
7	Yes	6	0.00000001	0.00010270
8	Yes	5	0.00000001	0.00004667
9	Yes	6	0.00000001	0.00010493
10	Yes	6	0.00000001	0.00009733
11	Yes	5	0.00000001	0.00015184
12	Yes	6	0.00000001	0.00010474
13	Yes	6	0.00000001	0.00010021
14	Yes	4	0.00000001	0.00000537
15	Yes	4	0.00009742	0.00091880
16	Yes	5	0.00000001	0.00040792
17	Yes	5	0.00000001	0.00046685
18	Yes	5	0.00000001	0.00009838
19	Yes	5	0.00000001	0.00040231
20	Yes	5	0.00000001	0.00043146
21	Yes	4	0.00009731	0.00090845
22	Yes	5	0.00000001	0.00046302
23	Yes	5	0.00000001	0.00040376
24	Yes	5	0.00000001	0.00009928
25	Yes	5	0.00000001	0.00046456
26	Yes	5	0.00000001	0.00043519
27	Yes	4	0.00000001	0.00033609
28	Yes	5	0.00000001	0.00023122
29	Yes	5	0.00000001	0.00026230
30	Yes	4	0.00000001	0.00075787
31	Yes	5	0.00000001	0.00022799
32	Yes	5	0.00000001	0.00024746
33	Yes	4	0.00000001	0.00033997
34	Yes	5	0.00000001	0.00025780
35	Yes	5	0.00000001	0.00022588
36	Yes	4	0.00000001	0.00075051
37	Yes	5	0.00000001	0.00025705
38	Yes	5	0.00000001	0.00023844

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	147.5 - 108.5	44.30	27	2.57	0.01
L2	112.25 - 72.25	26.01	27	2.28	0.01
L3	76.75 - 48	11.69	27	1.48	0.00
L4	48 - 35.75	4.48	27	0.87	0.00
L5	41 - 0	3.31	27	0.74	0.00

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
147.0000	TD-RRH8x20-25	27	44.03	2.57	0.01	23547
145.0000	800MHz 2X50W RRH W/FILTER W/Mount pipes	27	42.95	2.56	0.01	23547
132.0000	BXA-70063-4CF-EDIN-X w/ Mount Pipe	27	35.99	2.49	0.01	7595
119.0000	RRU-11	27	29.30	2.38	0.01	4129
117.0000	Platform Mount [LP 712-1]	27	28.31	2.35	0.01	3858
107.0000	APXV18-206517S-C w/ Mount Pipe	27	23.55	2.19	0.01	3136
49.0000	Side Arm Mount [SO 701-1]	27	4.67	0.89	0.00	2707

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	147.5 - 108.5	112.83	2	6.54	0.02
L2	112.25 - 72.25	66.30	2	5.82	0.01
L3	76.75 - 48	29.82	2	3.78	0.01
L4	48 - 35.75	11.45	2	2.22	0.00
L5	41 - 0	8.45	2	1.88	0.00

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
147.0000	TD-RRH8x20-25	2	112.14	6.54	0.02	9472
145.0000	800MHz 2X50W RRH W/FILTER W/Mount pipes	2	109.39	6.52	0.02	9472
132.0000	BXA-70063-4CF-EDIN-X w/ Mount Pipe	2	91.70	6.35	0.02	3053
119.0000	RRU-11	2	74.68	6.06	0.02	1657
117.0000	Platform Mount [LP 712-1]	2	72.16	6.00	0.02	1548
107.0000	APXV18-206517S-C w/ Mount Pipe	2	60.06	5.59	0.01	1254
49.0000	Side Arm Mount [SO 701-1]	2	11.93	2.26	0.00	1064

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	147.5 - 108.5 (1)	TP29.41x22x0.25	39.0000	0.0000	0.0	36.00	22.5731	-9.25	812.63	0.011
L2	108.5 - 72.25 (2)	TP35.798x28.1975x0.25	40.0000	0.0000	0.0	39.00	27.5289	-14.38	1073.63	0.013
L3	72.25 - 48 (3)	TP39.9048x34.4429x0.3125	28.7500	0.0000	0.0	39.00	39.2706	-19.88	1531.55	0.013
L4	48 - 35.75 (4)	TP42.232x39.9048x0.3853	12.2500	0.0000	0.0	34.03	49.9499	-21.40	1699.60	0.013
L5	35.75 - 0 (5)	TP48.4x40.4641x0.375	41.0000	0.0000	0.0	39.00	57.1618	-31.72	2229.31	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	147.5 - 108.5 (1)	TP29.41x22x0.25	350.53	26.57	36.00	0.738	0.00	0.00	36.00	0.000
L2	108.5 - 72.25 (2)	TP35.798x28.1975x0.25	1008.42	51.31	39.00	1.316	0.00	0.00	39.00	0.000
L3	72.25 - 48 (3)	TP39.9048x34.4429x0.3125	1607.52	50.28	39.00	1.289	0.00	0.00	39.00	0.000
L4	48 - 35.75 (4)	TP42.232x39.9048x0.3853	1761.82	42.06	34.03	1.236	0.00	0.00	34.03	0.000
L5	35.75 - 0 (5)	TP48.4x40.4641x0.375	2724.97	48.27	39.00	1.238	0.00	0.00	39.00	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	147.5 - 108.5 (1)	TP29.41x22x0.25	16.64	0.74	24.00	0.062	0.40	0.01	24.00	0.001
L2	108.5 - 72.25 (2)	TP35.798x28.1975x0.25	19.86	0.72	26.00	0.056	0.44	0.01	26.00	0.000
L3	72.25 - 48 (3)	TP39.9048x34.4429x0.3125	21.83	0.56	26.00	0.043	0.65	0.01	26.00	0.000
L4	48 - 35.75 (4)	TP42.232x39.9048x0.3853	22.29	0.45	22.68	0.039	0.67	0.01	22.68	0.000
L5	35.75 - 0 (5)	TP48.4x40.4641x0.375	24.61	0.43	26.00	0.033	0.74	0.01	26.00	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	147.5 - 108.5 (1)	0.011	0.738	0.000	0.062	0.001	0.750 ✔	1.333	H1-3+VT ✔
L2	108.5 - 72.25 (2)	0.013	1.316	0.000	0.056	0.000	1.330 ✔	1.333	H1-3+VT ✔
L3	72.25 - 48 (3)	0.013	1.289	0.000	0.043	0.000	1.303 ✔	1.333	H1-3+VT ✔

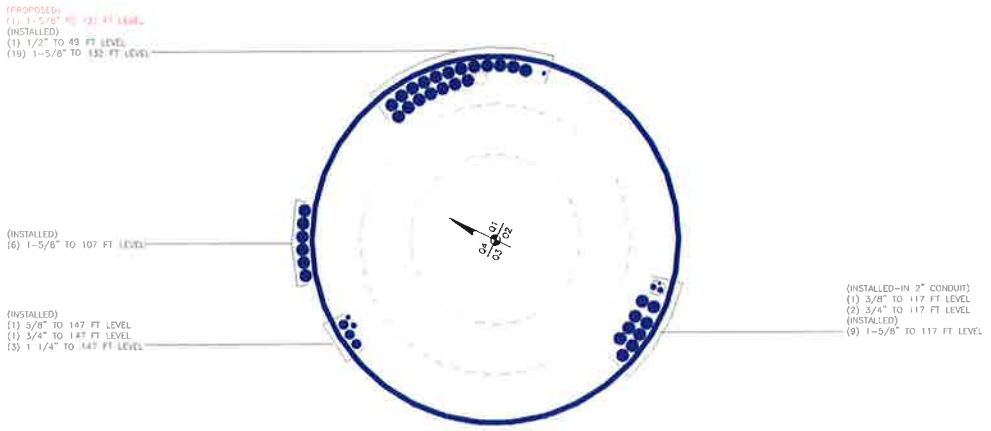
Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L4	48 - 35.75 (4)	0.013	1.236	0.000	0.039	0.000	1.249 ✔	1.333	H1-3+VT ✔
L5	35.75 - 0 (5)	0.014	1.238	0.000	0.033	0.000	1.252 ✔	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	147.5 - 108.5	Pole	TP29.41x22x0.25	1	-9.25	1083.24	56.3	Pass
L2	108.5 - 72.25	Pole	TP35.798x28.1975x0.25	2	-14.38	1431.15	99.8	Pass
L3	72.25 - 48	Pole	TP39.9048x34.4429x0.3125	3	-19.88	2041.56	97.7	Pass
L4	48 - 35.75	Pole	TP42.232x39.9048x0.3853	4	-21.40	2265.57	93.7	Pass
L5	35.75 - 0	Pole	TP48.4x40.4641x0.375	5	-31.72	2971.67	93.9	Pass
							Summary	
						Pole (L2)	99.8	Pass
						RATING =	**99.8**	**Pass**

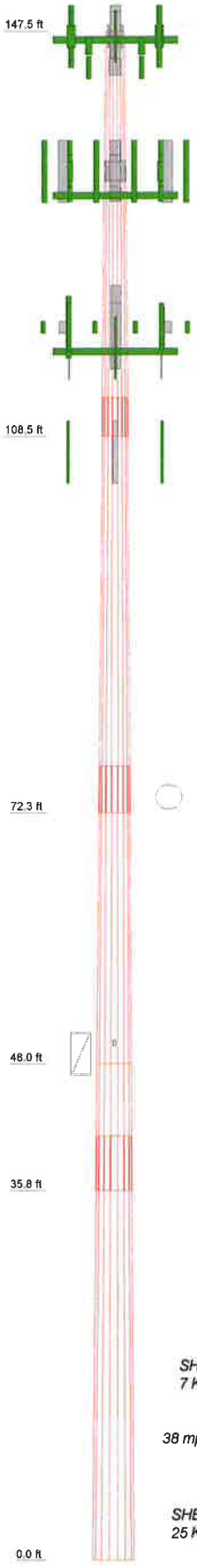
APPENDIX B

BASE LEVEL DRAWING



APPENDIX C

ADDITIONAL CALCULATIONS



Section	1	2	3	4	5
Length (ft)	39.0000	40.0000	28.7500	12.2500	41.0000
Number of Sides	18	18	18	18	18
Thickness (in)	0.2500	0.2500	0.3125	0.3852	0.3750
Socket Length (ft)	3.7500	4.5000		5.2500	
Top Dia (in)	22.0000	28.1975	34.4429	39.9048	40.4641
Bot Dia (in)	29.4100	35.7980	39.9048	42.2320	48.4000
Grade	A572-60	A572-60	A607-65	Reinf 56.71 ksi	A607-65
Weight (K)	2.7	3.4	3.6	2.1	7.3

Total Weight (K) 19.1

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
TD-RRH8x20-25	147	RRH2X60-AWS	132
APXVSPP18-C-A20 w/ Mount Pipe	147	RRH2X60-PCS	132
APXVTM14-ALU-I20 w/ Mount Pipe	147	(2) SBNHH-1D65B w/ Mount Pipe	132
TD-RRH8x20-25	147	BXA-70063-4CF-EDIN-X w/ Mount Pipe	132
APXVSPP18-C-A20 w/ Mount Pipe	147	BXA-70063-6CF-EDIN-2 w/ Mount Pipe	132
APXVTM14-ALU-I20 w/ Mount Pipe	147	RRH2x60-700	132
TD-RRH8x20-25	147	RRH2X60-AWS	132
APXVSPP18-C-A20 w/ Mount Pipe	147	RRH2X60-PCS	132
APXVTM14-ALU-I20 w/ Mount Pipe	147	(2) SBNHH-1D65B w/ Mount Pipe	132
Platform Mount [LP 712-1]	147	Platform Mount [LP 712-1]	132
(3) 5' x 2" Pipe Mount	147	RRU-11	119
(3) 5' x 2" Pipe Mount	147	DC6-48-60-18-8F	119
(3) 5' x 2" Pipe Mount	147	RRU-11	119
800MHz 2X50W RRH W/FILTER W/Mount pipes	145	RRU-11	119
PCS 1900MHz 4x45W-65MHz	145	Pipe Mount [PM 601-3]	119
800MHz 2X50W RRH W/FILTER W/Mount pipes	145	Platform Mount [LP 712-1]	117
PCS 1900MHz 4x45W-65MHz	145	(2) 6' x 2.375" Pipe Mount	117
800MHz 2X50W RRH W/FILTER W/Mount pipes	145	(2) 6' x 2.375" Pipe Mount	117
PCS 1900MHz 4x45W-65MHz	145	(2) 6' x 2.375" Pipe Mount	117
Side Arm Mount [SO 102-3]	145	SBNH-1D6565C w/ Mount Pipe	117
BXA-70063-4CF-EDIN-X w/ Mount Pipe	132	7770.00 w/ Mount Pipe	117
BXA-70063-6CF-EDIN-2 w/ Mount Pipe	132	(2) LGP21401	117
DB-T1-6Z-8AB-0Z	132	AM-X-CD-14-65-00T-RET w/ Mount Pipe	117
RRH2x60-700	132	7770.00 w/ Mount Pipe	117
RRH2X60-AWS	132	(2) LGP21401	117
RRH2X60-PCS	132	AM-X-CD-16-65-00T-RET w/ Mount Pipe	117
(2) SBNHH-1D65B w/ Mount Pipe	132	7770.00 w/ Mount Pipe	117
DB-T1-6Z-8AB-0Z	132	(2) LGP21401	117
BXA-70063-4CF-EDIN-X w/ Mount Pipe	132	APXV18-206517S-C w/ Mount Pipe	107
BXA-70063-6CF-EDIN-2 w/ Mount Pipe	132	APXV18-206517S-C w/ Mount Pipe	107
RRH2x60-700	132	APXV18-206517S-C w/ Mount Pipe	107
		Pipe Mount [PM 601-3]	107
		Side Arm Mount [SO 701-1]	49
		58532A	49

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-60	60 ksi	75 ksi	Reinf 56.71 ksi	57 ksi	71 ksi
A607-65	65 ksi	80 ksi			

TOWER DESIGN NOTES

1. Tower is located in Hartford County, Connecticut.
2. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 38 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 99.8%

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

Job:	147' MP; Enfield, CT; Enfield
Project:	PJF 37513-0644 (BU 876348)
Client: Crown Castle	Drawn by: Jared Smith — App'd:
Code: TIA/EIA-222-F	Date: 05/28/15 — Scale: N
Path:	Dwg No.

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

v4.4 - Effective 7-12-13

Date: 5/28/2015
PJF Project: 37515-1738.002
Client Ref. # BU 876348
Site Name: Enfield
Description: 147.5' MP
Owner: Crown Castle
Engineer: JWS

Asymmetric Anchor Rod Analysis

Moment =	2725	k-ft	TIA Ref.	F	Location =	Base Plate		
Axial =	32.0	kips	ASIF =	1.3333	η =	N/A	for BP, Rev. G Sect. 4.9.9	
Shear =	25.0	kips	Max Ratio =	105.0%	Threads =	N/A	for FP, Rev. G	
Anchor Qty =	15							

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

Item	Nominal Anchor Dia, in	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	32.4	55.00	0.00	3.98	169.90	165.27	165.27	0.00	195.00	84.8%
2	2.250	#18J A615 Gr 75	75	100	45.0	55.00	0.00	3.98	168.29	163.66	163.66	0.00	195.00	83.9%
3	2.250	#18J A615 Gr 75	75	100	57.6	55.00	0.00	3.98	166.76	162.12	162.12	0.00	195.00	83.1%
4	2.250	#18J A615 Gr 75	75	100	122.4	55.00	0.00	3.98	169.67	165.04	165.04	0.00	195.00	84.6%
5	2.250	#18J A615 Gr 75	75	100	135.0	55.00	0.00	3.98	172.09	167.46	167.46	0.00	195.00	85.9%
6	2.250	#18J A615 Gr 75	75	100	147.6	55.00	0.00	3.98	174.39	169.76	169.76	0.00	195.00	87.1%
7	2.250	#18J A615 Gr 75	75	100	212.4	55.00	0.00	3.98	174.39	169.76	169.76	0.00	195.00	87.1%
8	2.250	#18J A615 Gr 75	75	100	225.0	55.00	0.00	3.98	172.09	167.46	167.46	0.00	195.00	85.9%
9	2.250	#18J A615 Gr 75	75	100	237.6	55.00	0.00	3.98	169.67	165.04	165.04	0.00	195.00	84.6%
10	2.250	#18J A615 Gr 75	75	100	302.4	55.00	0.00	3.98	166.76	162.12	162.12	0.00	195.00	83.1%
11	2.250	#18J A615 Gr 75	75	100	315.0	55.00	0.00	3.98	168.29	163.66	163.66	0.00	195.00	83.9%
12	2.250	#18J A615 Gr 75	75	100	327.6	55.00	0.00	3.98	169.90	165.27	165.27	0.00	195.00	84.8%
13	1.750	A193 Gr B7	105	125	0.0	60.40	0.00	2.41	114.25	111.45	111.45	0.00	132.29	84.2%
14	1.750	A193 Gr B7	105	125	110.0	60.40	0.00	2.41	111.01	108.21	108.21	0.00	132.29	81.8%
15	1.750	A193 Gr B7	105	125	250.0	60.40	0.00	2.41	111.01	108.21	108.21	0.00	132.29	81.8%
								54.98						

Foundation Loads:

Pole weight or tower leg compression =	32	(kips)
Horizontal load at top of pier =	25	(kips)
Overturning moment at top of pier=	2725	(ft-kips)

Design criteria:

Safety factor against overturning =	1.5	

Soil Properties:

Soil density =	115	(pcf)
Allowable soil bearing =	3.25	(ksf)
Depth to water table =	4	(ft)

Dimensions:

Pier shape (round or square)	S	("R" or "S")
Pier width =	8	(ft)
Pier height above grade =	0.5	(ft)
depth to bottom of footing =	10	(ft)
Footing thickness =	3	(ft)
Footing width =	23.5	(ft)
Footing length =	23.5	(ft)

Concrete:

Concrete strength =	3	(ksi)
Rebar strength =	60	(ksi)
ultimate load factor =	1.3	

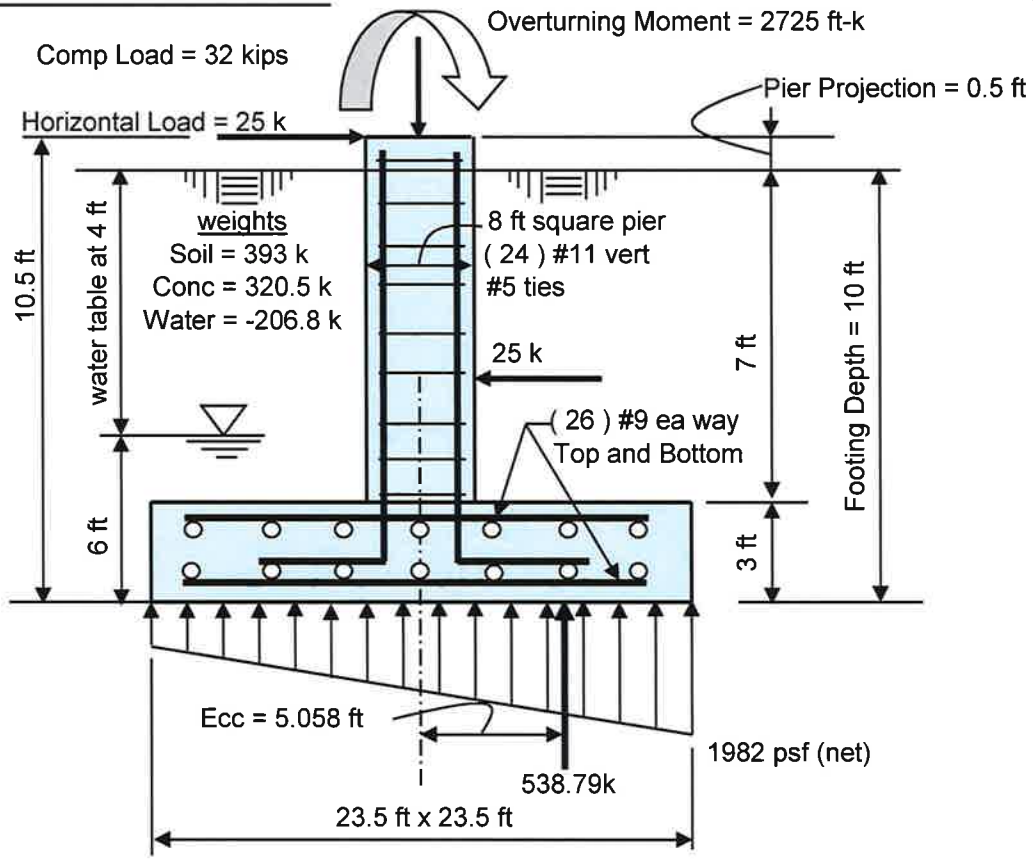
Reinforcing Steel:

	Pad	
minimum cover over rebar =	3	inches
size of pad rebar =	#9	bar
quantity of pad rebar =	26	(ea direction)

Reinforcing Steel:

	Pier	
size of vert rebar in pier=	#11	bar
vertical rebar quantity =	24	
size of pier ties =	#5	bar
minimum cover over rebar =	3	inches

Total volume of concrete = 79.1 cu yd



Summary of analysis results	
Maximum Net Soil Bearing = 1.982 ksf Allowable Net Soil Bearing = 3.25 ksf **Soil Bearing Stress Ratio = 0.61 Okay**	Ult Bending Shear Capacity = 110 psi Ult Bending Shear Stress = 27 psi **Bending Shear Stress Ratio = 0.25 Okay**
Ftg Overturning Resistance = 6331 ft-kips Overturning Moment = 2725 ft-kips Required Overturning Safety Factor = 1.5 Overturning Safety Factor = 2.323 **Ratio = 0.65 Okay**	Pad Bending Moment Capacity= 3537 ft-k Pad Bending Moment = 1018 ft-k **Bending Moment Stress Ratio = 0.29 OK**

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#: *876348*
Site Name: *Enfield*
App #:

Anchor Rod Data		
Qty:	12	
Diam:	2.25	in
Rod Material:	A615-J	
Yield, Fy:	75	ksi
Strength, Fu:	100	ksi
Bolt Circle:	55	in
Anchor Spacing:	6	in

Plate Data		
W=Side:	52	in
Thick:	3	in
Grade:	50	ksi
Clip Distance:	4	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:	48.4	in
Thick:	0.375	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round

Stress Increase Factor		
ASD ASIF:	1.333	

Base Reactions		
TIA Revision:	F	
Unfactored Moment, M:	2366	ft-kips
Unfactored Axial, P:	27.8	kips
Unfactored Shear, V:	21.7	kips

Reactions adjusted to account for additional anchor rods

Anchor Rod Results

TIA F --> Maximum Rod Tension	169.8 Kips
Allowable Tension:	195.0 Kips
Anchor Rod Stress Ratio:	87.1% **Pass**

Base Plate Results Flexural Check

Base Plate Stress:	39.2 ksi
Allowable PL Bending Stress:	50.0 ksi
Base Plate Stress Ratio:	78.3% **Pass**

PL Ref. Data	
Yield Line (in):	25.14
Max PL Length:	25.14

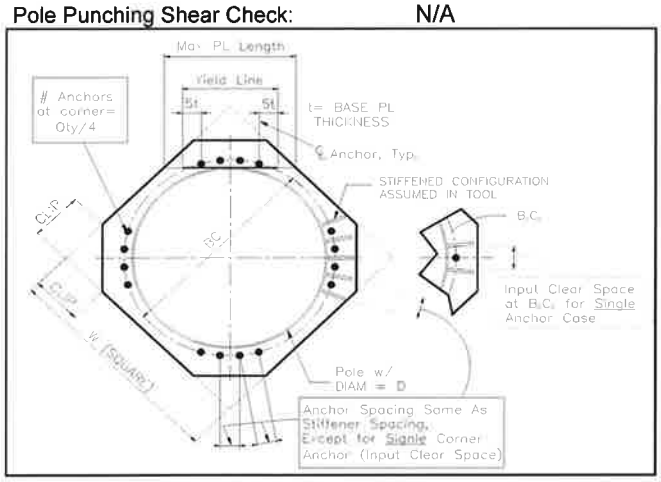
N/A - Unstiffened

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



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

General Information:
==========

File Name: G:\TOWER\375_Crown_Castle\2015\37515-1738_876348_ENFIELD\37515-1738...\37515-1738.002.col
Project: 37513-0644 BP
Column: Engineer:
Code: ACI 318-11 Units: English

Run Option: Investigation Slenderness: Not considered
Run Axis: X-axis Column Type: Architectural

Material Properties:
==========

f'c = 3 ksi fy = 60 ksi
Ec = 3122.02 ksi Es = 29000 ksi
Ultimate strain = 0.003 in/in
Betal = 0.85

Section:
==========

Rectangular: Width = 96 in Depth = 96 in

Gross section area, Ag = 9216 in^2
Ix = 7.07789e+006 in^4 Iy = 7.07789e+006 in^4
rx = 27.7128 in ry = 27.7128 in
Xo = 0 in Yo = 0 in

Reinforcement:
==========

Bar Set: ASTM A615

Size	Diam (in)	Area (in^2)	Size	Diam (in)	Area (in^2)	Size	Diam (in)	Area (in^2)
# 3	0.38	0.11	# 4	0.50	0.20	# 5	0.63	0.31
# 6	0.75	0.44	# 7	0.88	0.60	# 8	1.00	0.79
# 9	1.13	1.00	# 10	1.27	1.27	# 11	1.41	1.56
# 14	1.69	2.25	# 18	2.26	4.00			

Confinement: Tied; #5 ties with #10 bars, #5 with larger bars.
phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.65

Layout: Rectangular
Pattern: All Sides Equal (Cover to transverse reinforcement)
Total steel area: As = 37.44 in^2 at rho = 0.41% (Note: rho < 0.50%)
Minimum clear spacing = 13.15 in

24 #11 Cover = 3 in

Factored Loads and Moments with Corresponding Capacities:
==========

No.	Pu kip	Mux k-ft	PhiMnx k-ft	PhiMn/Mu	NA depth in	Dt depth in	eps_t	Phi
1	32.00	3786.30	7388.74	1.951	11.90	91.67	0.02011	0.900

*** End of output ***