Robinson+Cole

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Also admitted in Massachusetts

April 2, 2015

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

Re: **Notice of Exempt Modification – Facility Modification**
117 Washington Avenue, North Haven, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains fifteen (15) wireless telecommunications antennas at the 117-foot level on an existing 120-foot tower at 117 Washington Avenue in North Haven (the "Property"). The tower is owned Crown Castle. Cellco's use of the tower was approved by the Council in 1990 (Docket No. 117). Cellco now intends to modify its facility by replacing nine (9) of its existing antennas with three (3) model LNX-6514DS-VTM, 700 MHz antennas; three (3) model HBXX-6516DS-VTM, 1900 MHz antennas; and three (3) model HBXX-6517DS-VTM, 2100 MHz antennas, all at the level on the tower. Cellco also intends to install six (6) remote radio heads ("RRHs") behind its 1900 MHz and 2100 MHz antennas. Included in Attachment 1 are specifications for Cellco's replacement antennas and RRHs.

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 Michael J. Freda, First Selectman of the Town of North Haven. A copy of this letter is also being sent to Luciani Realty Limited Partnership, 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).

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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 installed on its existing antenna platform at the 117-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 General Power Density table with 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:
Michael J. Freda, North Haven First Selectman
Luciani Realty Limited Partnership
Tim Parks

ATTACHMENT 1

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

LNX-6514DS-VTM

Andrew® Antenna, 698–896 MHz, 65° horizontal beamwidth, RET compatible

- Great solution to maximize network coverage and capacity
- Excellent gain, VSWR, front-to-back ratio, and PIM specifications for robust network performance
- Ideal choice for site collocations and tough zoning restrictions
- Excellent solution for site sharing and maximizing capacity
- Fully compatible with Andrew remote electrical tilt system for greater OpEx savings
- The RF connectors are designed for IP67 rating and the radome for IP56 rating

Electrical Specifications

Frequency Band, MHz	**698–806**	**806–896**
Gain, dBi	15.8	15.9
Beamwidth, Horizontal, degrees	65	64
Beamwidth, Vertical, degrees	12.4	11.2
Beam Tilt, degrees	0–10	0–10
USLS, dB	17	18
Front-to-Back Ratio at 180°, dB	32	30
CPR at Boresight, dB	23	23
CPR at Sector, dB	12	10
Isolation, dB	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153
Input Power per Port, maximum, watts	400	400
Polarization	±45°	±45°
Impedance	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	**698–806**	**806–896**
Gain by all Beam Tilts, average, dBi	15.6	15.7
Gain by all Beam Tilts Tolerance, dB	±0.4	±0.5
Gain by Beam Tilt, average, dBi	0 ° | 15.7 5 ° | 15.7 10 ° | 15.3	0 ° | 15.9 5 ° | 15.8 10 ° | 15.3
Beamwidth, Horizontal Tolerance, degrees	±0.9	±1.4
Beamwidth, Vertical Tolerance, degrees	±0.8	±0.6
USLS, dB	18	20
Front-to-Back Total Power at 180° ± 30°, dB	25	23
CPR at Boresight, dB	25	24
CPR at Sector, dB	15	12

* 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®
Band	Single band
Brand	DualPol® | Teletilt®

Product Specifications

LNX-6514DS-VTM

Operating Frequency Band	698 – 896 MHz

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Aluminum
Radome Material	Fiberglass, UV resistant
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	2
Wind Loading, maximum	617.7 N @ 150 km/h 138.9 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

Dimensions

Depth	181.0 mm | 7.1 in
Length	1847.0 mm | 72.7 in
Width	301.0 mm | 11.9 in
Net Weight	14.2 kg | 31.3 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 2.0 Actuator	LNX-6514DS-A1M
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

DB380 — Pipe Mounting Kit for 2.4"-4.5" (60-115mm) OD round members on wide panel antennas. Includes 2 clamp sets and double nuts.

DB5083 — Downtilt Mounting Kit for 2.4"-4.5" (60 - 115 mm) OD round members. Includes a heavy-duty, galvanized steel downtilt mounting bracket assembly and associated hardware. This kit is compatible with the DB380 pipe mount kit for panel antennas that are equipped with two mounting brackets.

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

HBXX-6516DS-VTM

Andrew® Quad Port Teletilt® Antenna, 1710–2180 MHz, 65° horizontal beamwidth, RET compatible

- Each DualPol® array can be independently adjusted for greater flexibility
- Excellent gain, VSWR, front-to-back ratio, and PIM specifications for robust network performance
- Ideal choice for site collocations and tough zoning restrictions
- Great solution to maximize network coverage and capacity
- The values presented on this datasheet have been calculated based on N-P-BASTA White Paper version 9.6 by the NGMN Alliance

Electrical Specifications

Frequency Band, MHz	**1710–1880**	**1850–1990**	**1920–2180**
Gain by all Beam Tilts, average, dBi	17.2	17.2	17.5
Gain by all Beam Tilts Tolerance, dB	±0.3	±0.3	±0.5
Gain by Beam Tilt, average, dBi	0 ° | 17.0 5 ° | 17.3 10 ° | 17.0	0 ° | 17.1 5 ° | 17.4 10 ° | 17.0	0 ° | 17.4 5 ° | 17.7 10 ° | 17.2
Beamwidth, Horizontal, degrees	67	66	64
Beamwidth, Horizontal Tolerance, degrees	±2.7	±2.3	±3.5
Beamwidth, Vertical, degrees	7.5	7.0	6.6
Beamwidth, Vertical Tolerance, degrees	±0.5	±0.4	±0.4
Beam Tilt, degrees	0–10	0–10	0–10
USLS, dB	18	19	19
Front-to-Back Total Power at 180° ± 30°, dB	26	26	26
CPR at Boresight, dB	22	22	22
CPR at Sector, dB	9	9	9
Isolation, dB	30	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350
Polarization	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol® single band, quad
Band	Single band
Brand	DualPol® | Teletilt®
Operating Frequency Band	1710 – 2180 MHz
Number of Ports, all types	4

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Low loss circuit board
Radome Material	PVC, UV resistant
RF Connector Interface	7-16 DIN Female

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

HBXX-6517DS-VTM

Andrew® Quad Port Antenna, 1710–2180 MHz, 65° horizontal beamwidth, RET compatible

- Superior azimuth tracking and pattern symmetry with excellent passive intermodulation suppression

Electrical Specifications

Frequency Band, MHz	1710–1880	1850–1990	1920–2180
Gain, dBi	19.0	19.1	19.2
Beamwidth, Horizontal, degrees	67	66	65
Beamwidth, Vertical, degrees	5.0	4.7	4.4
Beam Tilt, degrees	0–6	0–6	0–6
USLS, dB	18	18	18
Front-to-Back Ratio at 180°, dB	30	30	30
CPR at Boresight, dB	21	22	21
CPR at Sector, dB	10	11	9
Isolation, dB	30	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350
Polarization	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	1710–1880	1850–1990	1920–2180
Gain by all Beam Tilts, average, dBi	18.5	18.6	18.8
Gain by all Beam Tilts Tolerance, dB	±0.4	±0.3	±0.4
Gain by Beam Tilt, average, dBi	0 ° | 18.4	0 ° | 18.4	0 ° | 18.7
	3 ° | 18.7	3 ° | 18.7	3 ° | 18.9
	6 ° | 18.4	6 ° | 18.5	6 ° | 18.6
Beamwidth, Horizontal Tolerance, degrees	±2.4	±1.7	±2.9
Beamwidth, Vertical Tolerance, degrees	±0.3	±0.3	±0.3
USLS, dB	18	19	19
Front-to-Back Total Power at 180° ± 30°, dB	25	26	26
CPR at Boresight, dB	22	23	22
CPR at Sector, dB	10	10	9

* 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® quad
Band	Single band
Brand	DualPol® | Teletilt®
Operating Frequency Band	1710 – 2180 MHz

Product Specifications

HBXX-6517DS-VTM

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Low loss circuit board
Radome Material	PVC, UV resistant
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	4
Wind Loading, maximum	668.0 N @ 150 km/h 150.2 lbf @ 150 km/h
Wind Speed, maximum	241.0 km/h | 149.8 mph

Dimensions

Depth	166.0 mm | 6.5 in
Length	1903.0 mm | 74.9 in
Width	305.0 mm | 12.0 in
Net Weight	19.5 kg | 43.0 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 2.0 Actuator	HBXX-6517DS-A2M
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

600899A-2 — 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.

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	2 Branch RX – LA6.0.1
	1900A HW version	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
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.

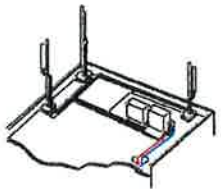
EASY INSTALLATION

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.

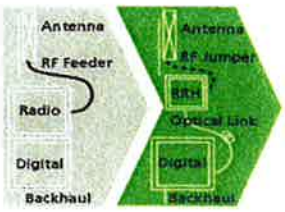
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation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

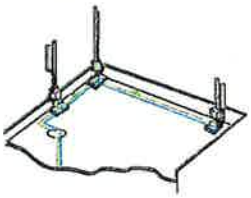
Installation can easily be done by a single person as the Alcatel-Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



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™

ATTACHMENT 2

	General	Power	Density					
Site Name: North Haven								
Tower Height: 120Ft.								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*Sprint WiMAX	3	562	107	0.0530	2657	1.0000	5.30%	
*Sprint microwave	2	4.42	107	0.0003	22500	1.0000	0.03%	
*Sprint microwave	2	4.42	107	0.0003	22500	1.0000	0.03%	
*Sprint CDMA/LTE	3	693	106	0.0665	1900	1.0000	6.65%	
*Sprint CDMA/LTE	1	390	106	0.0125	850	0.5667	2.20%	
*Sprint CDMA/LTE	2	693	106	0.0444	2500	1.0000	4.44%	
*Clearwire	2	153	105	0.0100	2496	1.0000	1.00%	
*Clearwire	1	211	105	0.0069	11 GHz	1.0000	0.69%	
Verizon PCS	**1**	**1694**	**117**	**0.0445**	**1970**	**1.0000**	**4.45%**	
Verizon Cellular	**9**	**321**	**117**	**0.0759**	**869**	**0.5793**	**13.10%**	
Verizon AWS	**1**	**1874**	**117**	**0.0492**	**2145**	**1.0000**	**4.92%**	
Verizon 700	**1**	**697**	**117**	**0.0183**	**746**	**0.4973**	**3.68%**	
								46.48%
* Source: Siting Council								

ATTACHMENT 3

Date: **March 19, 2015**

Rebecca Klein
Crown Castle
525 Alderman Lane
Fort Mill, SC 29715

AW Solutions Inc
300 Crown Oak Centre Drive
Longwood, FL 32750
407-260-0231

Subject: **Structural Analysis Report**

Carrier Designation:	***Verizon Wireless* Co-Locate Carrier Site Name:**	North Haven
Crown Castle Designation:	**Crown Castle BU Number:**	806454
	Crown Castle Site Name:	NHV 112 948129
	Crown Castle JDE Job Number:	325503
	Crown Castle Work Order Number:	1028282
	Crown Castle Application Number:	285046 Rev. 2
Engineering Firm Designation:	**AW Solutions Inc Project Number:**	806454
Site Data:	**117 WASHINGTON STREET, NORTH HAVEN, New Haven County, CT** **Latitude *41° 23' 46.93"*, Longitude *-72° 51' 27.67"*** **120 Foot - Monopole Tower**	

Dear Rebecca Klein,

AW Solutions Inc 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 768054, in accordance with application 285046, revision 2.

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

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

This analysis has been performed in accordance with the TIA-222-F standard and 2005 CT State Building Code based upon a wind speed of 85 mph fastest mile.

We at *AW Solutions Inc* 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.

Structural analysis prepared by: Heather Rivera, EI / AC

Respectfully submitted by:

03/19/15

Alan Lockrem, PE
Director of Engineering

tnxTower Report - version 6.1.4.1

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 120 ft Monopole tower designed by VALMONT in March of 1990. The tower was originally designed for a wind speed of 90 mph per EIA-222-D.

2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a fastest mile wind speed of 85 mph with no ice, 38 mph with 0.75 inch ice thickness and 50 mph under service loads.

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
115.0	117.0	3	alcatel lucent	RRH2X60-AWS	-	-	-
		3	alcatel lucent	RRH2X60-PCS			
		3	commscope	HBXX-6516DS-A2M w/ Mount Pipe			
		3	commscope	HBXX-6517DS-A2M w/ Mount Pipe			
		3	commscope	LNX-6514DS-A1M w/ Mount Pipe			

Table 2 - Existing and Reserved Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
115.0	117.0	3	alcatel lucent	RRH2X40-AWS	-	-	3
		3	antel	BXA-171063-12CF-EDIN-2 w/ Mount Pipe			
		2	antel	BXA-70063-6CF-2 w/ Mount Pipe			
		1	antel	BXA-70063-6CF-EDIN-4 w/ Mount Pipe			
		6	rfs celwave	FD9R6004/2C-3L			
		3	rymsa wireless	MG D3-800TV w/ Mount Pipe			
		6	decibel	DB844G65ZAXY w/ Mount Pipe	13	1-5/8	1
		1	rfs celwave	DB-T1-6Z-8AB-0Z			
	115.0	1	tower mounts	Platform Mount [LP 602-1]	-	-	1
106.0	107.0	3	alcatel lucent	1900MHz RRH (65MHz)	-	-	1
	106.0	1	tower mounts	Pipe Mount [PM 601-3]			
	105.0	3	alcatel lucent	800 EXTERNAL NOTCH FILTER			
		3	alcatel lucent	800MHZ RRH			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
105.0	109.0	1	dragonwave	A-ANT-23G-2-C	6	5/16	1
		1	andrew	VHLP2-18	4	1/2	
		1	andrew	VHLP800-11	3	1-1/4	
	106.0	3	alcatel lucent	TD-RRH8x20-25	1	1-1/4	2
		3	rfs celwave	APXVTM14-C-120 w/ Mount Pipe			
		9	rfs celwave	ACU-A20-N	-	-	1
		3	rfs celwave	APXVSPP18-C-A20 w/ Mount Pipe			
	105.0	3	argus technologies	LLPX310R w/ Mount Pipe	-	-	1
		3	4amsung telecommunications	FDD_R6_RRH			
		1	tower mounts	Platform Mount [LP 602-1]			
90.0	90.0	3	rfs celwave	APXV18-206517S-C w/ Mount Pipe	6	1-5/8	1
		1	tower mounts	Pipe Mount [PM 601-3]			

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

Table 3 – Design 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)
-						

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	FDH Engineering	2294635	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	SAC Engineering	253930	CCISITES
4-TOWER MANUFACTURER DRAWINGS	Valmont	253972	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.
5) The existing base plate grout was not considered in this analysis.

This analysis may be affected if any assumptions are not valid or have been made in error. AW Solutions Inc should be notified to determine the effect on the structural integrity of the tower.

4) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	120 - 77.33	Pole	TP30.45x21.91x0.22	1	-7.88	1015.71	78.3	Pass
L2	77.33 - 34.33	Pole	TP38.61x29.08x0.31	2	-14.98	1947.19	91.9	Pass
L3	34.33 - 0	Pole	TP44.85x36.85x0.38	3	-24.19	2791.89	94.5	Pass
							Summary	
						Pole (L3)	94.5	Pass
						RATING =	94.5	Pass

Table 6 - Tower Component Stresses vs. Capacity - LC7

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	93.9	Pass
1	Base Plate	0	44.4	Pass
1	Base Foundation	0	50.0	Pass

Structure Rating (max from all components) =	94.5%

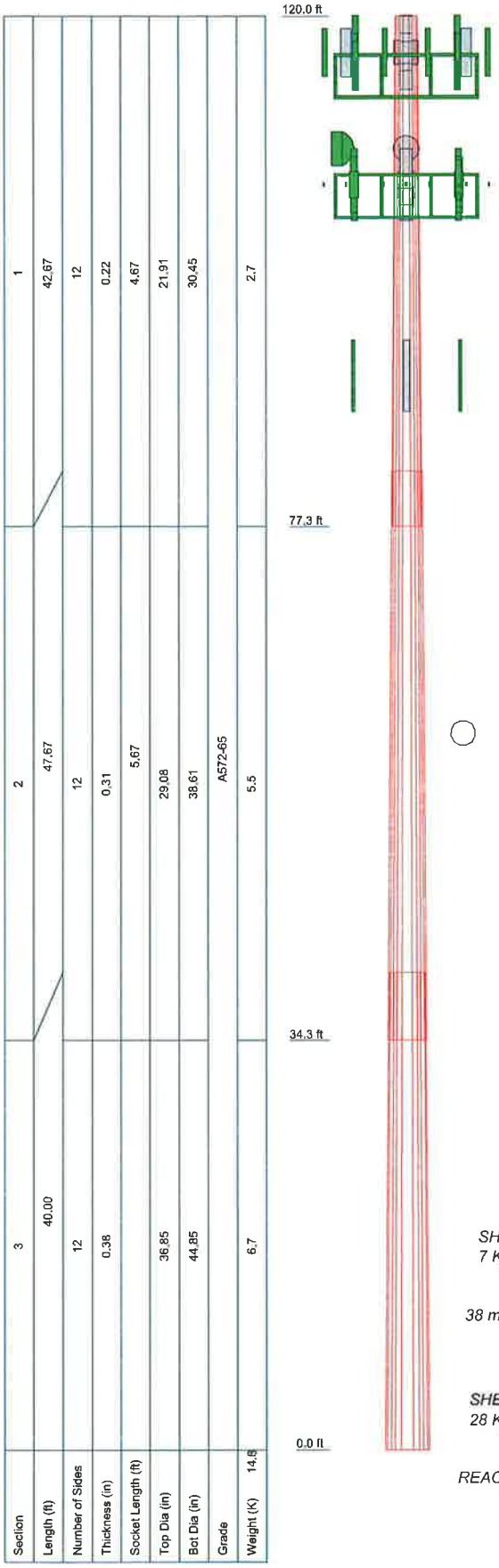
Notes:
1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.

4.1) Recommendations

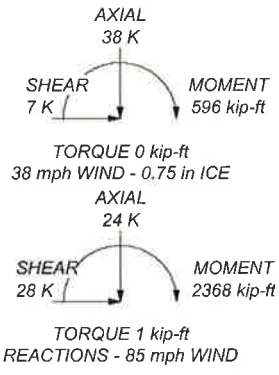
The tower and its foundation have sufficient capacity to carry the existing, reserved, and proposed loads. No modifications are required at this time.

APPENDIX A

TNXTOWER OUTPUT



Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	42.67	12	0.22	4.67	21.91	30.45		2.7
2	47.67	12	0.31	5.67	29.08	38.61	A572-65	5.5
3	40.00	12	0.38		36.85	44.85		6.7
								14.8



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
(2) DB844G65ZAXY w/ Mount Pipe	115	APXVSPP18-C-A20 w/ Mount Pipe	105
DB-T1-6Z-8AB-0Z	115	LLPX310R w/ Mount Pipe	105
HBXX-6516DS-A2M w/ Mount Pipe	115	(3) ACU-A20-N	105
LNX-6514DS-A1M w/ Mount Pipe	115	FDD_R6_RRH	105
HBXX-6517DS-A2M w/ Mount Pipe	115	APXVTM14-C-120 w/ Mount Pipe	105
RRH2X60-AWS	115	TD-RRH8x20-25	105
RRH2X60-PCS	115	APXVSPP18-C-A20 w/ Mount Pipe	105
(2) DB844G65ZAXY w/ Mount Pipe	115	LLPX310R w/ Mount Pipe	105
HBXX-6516DS-A2M w/ Mount Pipe	115	(3) ACU-A20-N	105
LNX-6514DS-A1M w/ Mount Pipe	115	FDD_R6_RRH	105
HBXX-6517DS-A2M w/ Mount Pipe	115	APXVTM14-C-120 w/ Mount Pipe	105
RRH2X60-AWS	115	TD-RRH8x20-25	105
RRH2X60-PCS	115	APXVSPP18-C-A20 w/ Mount Pipe	105
(2) DB844G65ZAXY w/ Mount Pipe	115	LLPX310R w/ Mount Pipe	105
HBXX-6516DS-A2M w/ Mount Pipe	115	(3) ACU-A20-N	105
LNX-6514DS-A1M w/ Mount Pipe	115	FDD_R6_RRH	105
HBXX-6517DS-A2M w/ Mount Pipe	115	APXVTM14-C-120 w/ Mount Pipe	105
RRH2X60-AWS	115	TD-RRH8x20-25	105
RRH2X60-PCS	115	Platform Mount [LP 602-1]	105
Platform Mount [LP 602-1]	115	6' x 2" Mount Pipe	105
1900MHz RRH (65MHz)	106	6' x 2" Mount Pipe	105
800MHZ RRH	106	6' x 2" Mount Pipe	105
800 EXTERNAL NOTCH FILTER	106	A-ANT-23G-2-C	105
1900MHz RRH (65MHz)	106	VHLP2-18	105
800MHZ RRH	106	VHLP800-11	105
800 EXTERNAL NOTCH FILTER	106	Pipe Mount [PM 601-3]	90
1900MHz RRH (65MHz)	106	APXV18-206517S-C w/ Mount Pipe	90
800MHZ RRH	106	APXV18-206517S-C w/ Mount Pipe	90
800 EXTERNAL NOTCH FILTER	106	APXV18-206517S-C w/ Mount Pipe	90
Pipe Mount [PM 601-3]	106		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in New Haven County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 38 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 94.5%

AW Solutions Inc
300 Crown Oak Centre Drive
Longwood, FL 32750
Phone: 407-260-0231
FAX:

Job: BU806454			
Project: WO1028282			
Client: Crown Castle	Drawn by: Heather Rivera EI		App'd:
Code: TIA/EIA-222-F	Date: 03/19/15		Scale: NTS
Path:			Dwg No. E-1

Tower Input Data

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

Tower is located in New Haven County, Connecticut.
Basic wind speed of 85 mph.
Nominal ice thickness of 0.75 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 38 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.333.
Local bending stresses due to climbing loads, 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	120.00-77.33	42.67	4.67	12	21.91	30.45	0.22	0.88	A572-65 (65 ksi)
L2	77.33-34.33	47.67	5.67	12	29.08	38.61	0.31	1.25	A572-65 (65 ksi)
L3	34.33-0.00	40.00		12	36.85	44.85	0.38	1.50	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	22.68	15.30	918.60	7.77	11.35	80.94	1861.33	7.53	5.28	24.132
	31.52	21.32	2486.81	10.82	15.77	157.66	5038.96	10.49	7.57	34.583
L2	31.07	28.99	3061.61	10.30	15.06	203.27	6203.65	14.27	6.95	22.217
	39.97	38.60	7225.71	13.71	20.00	361.29	14641.24	19.00	9.51	30.379
L3	39.32	44.04	7479.36	13.06	19.09	391.83	15155.22	21.68	8.87	23.656
	46.43	53.70	13558.79	15.92	23.23	583.62	27473.79	26.43	11.01	29.373

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 120.00-77.33				1	1	1		
L2 77.33-34.33				1	1	1		
L3 34.33-0.00				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
level 115 561(1-5/8")	B	No	Inside Pole	115.00 - 12.00	13	No Ice	0.00	1.35
						1/2" Ice	0.00	1.35
						1" Ice	0.00	1.35
						2" Ice	0.00	1.35
						4" Ice	0.00	1.35
level 105 HB114-1-0813U4-M5J(1 1/4")	A	No	CaAa (Out Of Face)	105.00 - 12.00	3	No Ice	0.00	1.20
						1/2" Ice	0.00	2.45
						1" Ice	0.00	4.30
						2" Ice	0.00	9.85
						4" Ice	0.00	28.27
HB114-21U3M12-XXXF(1-1/4")	A	No	CaAa (Out Of Face)	105.00 - 12.00	1	No Ice	0.15	1.22
						1/2" Ice	0.25	2.47
						1" Ice	0.35	4.32
						2" Ice	0.55	9.87
						4" Ice	0.95	28.29
7983A(1/2")	C	No	CaAa (Out Of Face)	105.00 - 12.00	3	No Ice	0.00	0.08
						1/2" Ice	0.00	0.74
						1" Ice	0.00	2.01
						2" Ice	0.00	6.39
						4" Ice	0.00	22.47
7983A(1/2")	C	No	Inside Pole	105.00 - 12.00	1	No Ice	0.00	0.08
						1/2" Ice	0.00	0.08
						1" Ice	0.00	0.08
						2" Ice	0.00	0.08
						4" Ice	0.00	0.08
9207(5/16")	C	No	Inside Pole	105.00 - 12.00	6	No Ice	0.00	0.60
						1/2" Ice	0.00	0.60
						1" Ice	0.00	0.60
						2" Ice	0.00	0.60
						4" Ice	0.00	0.60

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
2" Rigid Conduit	C	No	CaAa (Out Of Face)	105.00 - 12.00	1	No Ice	0.00	2.80
						1/2" Ice	0.00	4.33
						1" Ice	0.00	6.47
						2" Ice	0.00	12.57
						4" Ice	0.00	32.12
2" Rigid Conduit	C	No	CaAa (Out Of Face)	105.00 - 12.00	1	No Ice	0.20	2.80
						1/2" Ice	0.30	4.33
						1" Ice	0.40	6.47
						2" Ice	0.60	12.57
						4" Ice	1.00	32.12
level 90 LCF158-50J(1-5/8")	C	No	CaAa (Out Of Face)	90.00 - 12.00	5	No Ice	0.00	0.92
						1/2" Ice	0.00	2.45
						1" Ice	0.00	4.60
						2" Ice	0.00	10.72
						4" Ice	0.00	30.29
LCF158-50J(1-5/8")	C	No	CaAa (Out Of Face)	90.00 - 12.00	1	No Ice	0.20	0.92
						1/2" Ice	0.30	2.45
						1" Ice	0.40	4.60
						2" Ice	0.60	10.72
						4" Ice	1.00	30.29
Safety Line 3/8	C	No	CaAa (Out Of Face)	120.00 - 0.00	1	No Ice	0.04	0.22
						1/2" Ice	0.14	0.75
						1" Ice	0.24	1.28
						2" Ice	0.44	2.34
						4" Ice	0.84	4.46

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	120.00-77.33	A	0.000	0.000	0.000	4.261	0.13
		B	0.000	0.000	0.000	0.000	0.66
		C	0.000	0.000	0.000	9.681	0.34
L2	77.33-34.33	A	0.000	0.000	0.000	6.622	0.21
		B	0.000	0.000	0.000	0.000	0.75
		C	0.000	0.000	0.000	18.856	0.66
L3	34.33-0.00	A	0.000	0.000	0.000	3.439	0.11
		B	0.000	0.000	0.000	0.000	0.39
		C	0.000	0.000	0.000	10.242	0.34

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	120.00-77.33	A	0.854	0.000	0.000	0.000	8.990	0.42
		B		0.000	0.000	0.000	0.000	0.66
		C		0.000	0.000	0.000	23.867	0.91
L2	77.33-34.33	A	0.798	0.000	0.000	0.000	13.971	0.65
		B		0.000	0.000	0.000	0.000	0.75
		C		0.000	0.000	0.000	40.901	1.95
L3	34.33-0.00	A	0.750	0.000	0.000	0.000	7.004	0.32
		B		0.000	0.000	0.000	0.000	0.39

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
		C		0.000	0.000	0.000	22.854	0.97

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	120.00-77.33	-0.27	0.02	-0.54	0.07
L2	77.33-34.33	-0.47	0.08	-0.83	0.15
L3	34.33-0.00	-0.34	0.06	-0.66	0.15

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ° ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
level 115									
(2) DB844G65ZAXY w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.90 5.35 5.80 6.73 8.73	4.92 5.60 6.28 7.71 10.83	0.03 0.08 0.13 0.26 0.62
DB-T1-6Z-8AB-0Z	A	From Leg	4.00 0.00 2.00	0.000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.60 5.92 6.24 6.91 8.37	2.33 2.56 2.79 3.28 4.37	0.04 0.08 0.12 0.21 0.45
HBXX-6516DS-A2M w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.18 6.65 7.14 8.13 10.26	4.53 5.20 5.90 7.37 10.56	0.05 0.10 0.15 0.29 0.67
LNX-6514DS-A1M w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.65 9.31 9.93 11.20 13.87	7.08 8.27 9.18 11.02 15.06	0.06 0.13 0.21 0.39 0.90
HBXX-6517DS-A2M w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.98 9.65 10.29 11.59 14.32	6.96 8.18 9.14 11.02 15.03	0.07 0.14 0.21 0.40 0.91
RRH2X60-AWS	A	From Leg	4.00 0.00	0.000	115.00	No Ice 1/2"	3.96 4.27	1.82 2.08	0.06 0.08

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
			2.00			Ice	4.60	2.36	0.11
						1" Ice	5.27	2.96	0.17
						2" Ice	6.72	4.25	0.35
						4" Ice			
RRH2X60-PCS	A	From Leg	4.00	0.000	115.00	No Ice	2.57	2.01	0.06
			0.00			1/2"	2.79	2.22	0.08
			2.00			Ice	3.02	2.43	0.10
						1" Ice	3.52	2.89	0.16
						2" Ice	4.61	3.92	0.31
						4" Ice			
*									
(2) DB844G65ZAXY w/ Mount Pipe	B	From Leg	4.00	0.000	115.00	No Ice	4.90	4.92	0.03
			0.00			1/2"	5.35	5.60	0.08
			2.00			Ice	5.80	6.28	0.13
						1" Ice	6.73	7.71	0.26
						2" Ice	8.73	10.83	0.62
						4" Ice			
HBXX-6516DS-A2M w/ Mount Pipe	B	From Leg	4.00	0.000	115.00	No Ice	6.18	4.53	0.05
			0.00			1/2"	6.65	5.20	0.10
			2.00			Ice	7.14	5.90	0.15
						1" Ice	8.13	7.37	0.29
						2" Ice	10.26	10.56	0.67
						4" Ice			
LNX-6514DS-A1M w/ Mount Pipe	B	From Leg	4.00	0.000	115.00	No Ice	8.65	7.08	0.06
			0.00			1/2"	9.31	8.27	0.13
			2.00			Ice	9.93	9.18	0.21
						1" Ice	11.20	11.02	0.39
						2" Ice	13.87	15.06	0.90
						4" Ice			
HBXX-6517DS-A2M w/ Mount Pipe	B	From Leg	4.00	0.000	115.00	No Ice	8.98	6.96	0.07
			0.00			1/2"	9.65	8.18	0.14
			2.00			Ice	10.29	9.14	0.21
						1" Ice	11.59	11.02	0.40
						2" Ice	14.32	15.03	0.91
						4" Ice			
RRH2X60-AWS	B	From Leg	4.00	0.000	115.00	No Ice	3.96	1.82	0.06
			0.00			1/2"	4.27	2.08	0.08
			2.00			Ice	4.60	2.36	0.11
						1" Ice	5.27	2.96	0.17
						2" Ice	6.72	4.25	0.35
						4" Ice			
RRH2X60-PCS	B	From Leg	4.00	0.000	115.00	No Ice	2.57	2.01	0.06
			0.00			1/2"	2.79	2.22	0.08
			2.00			Ice	3.02	2.43	0.10
						1" Ice	3.52	2.89	0.16
						2" Ice	4.61	3.92	0.31
						4" Ice			
*									
(2) DB844G65ZAXY w/ Mount Pipe	C	From Leg	4.00	0.000	115.00	No Ice	4.90	4.92	0.03
			0.00			1/2"	5.35	5.60	0.08
			2.00			Ice	5.80	6.28	0.13
						1" Ice	6.73	7.71	0.26
						2" Ice	8.73	10.83	0.62
						4" Ice			
HBXX-6516DS-A2M w/ Mount Pipe	C	From Leg	4.00	0.000	115.00	No Ice	6.18	4.53	0.05
			0.00			1/2"	6.65	5.20	0.10

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
			2.00			Ice	7.14	5.90	0.15
						1" Ice	8.13	7.37	0.29
						2" Ice	10.26	10.56	0.67
						4" Ice			
LNX-6514DS-A1M w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	0.000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.65 9.31 9.93 11.20 13.87	7.08 8.27 9.18 11.02 15.06	0.06 0.13 0.21 0.39 0.90
HBXX-6517DS-A2M w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	0.000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.98 9.65 10.29 11.59 14.32	6.96 8.18 9.14 11.02 15.03	0.07 0.14 0.21 0.40 0.91
RRH2X60-AWS	C	From Leg	4.00 0.00 2.00	0.000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.96 4.27 4.60 5.27 6.72	1.82 2.08 2.36 2.96 4.25	0.06 0.08 0.11 0.17 0.35
RRH2X60-PCS	C	From Leg	4.00 0.00 2.00	0.000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.57 2.79 3.02 3.52 4.61	2.01 2.22 2.43 2.89 3.92	0.06 0.08 0.10 0.16 0.31
Platform Mount [LP 602-1]	C	None		0.000	115.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	32.03 38.71 45.39 58.75 85.47	32.03 38.71 45.39 58.75 85.47	1.34 1.80 2.26 3.17 5.00
level 106 1900MHz RRH (65MHz)	A	From Leg	4.00 0.00 1.00	0.000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.70 2.94 3.18 3.70 4.85	2.77 3.01 3.26 3.78 4.93	0.06 0.08 0.11 0.18 0.35
800MHZ RRH	A	From Leg	4.00 0.00 -1.00	0.000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.49 2.71 2.93 3.41 4.46	2.07 2.27 2.48 2.93 3.93	0.05 0.07 0.10 0.16 0.32
800 EXTERNAL NOTCH FILTER	A	From Leg	4.00 0.00 -1.00	0.000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.77 0.89 1.02 1.30 1.97	0.37 0.46 0.56 0.79 1.34	0.01 0.02 0.02 0.04 0.11
1900MHz RRH (65MHz)	B	From Leg	4.00 0.00 1.00	0.000	106.00	No Ice 1/2" Ice Ice	2.70 2.94 3.18	2.77 3.01 3.26	0.06 0.08 0.11

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						1" Ice	3.70	3.78	0.18
						2" Ice	4.85	4.93	0.35
						4" Ice			
800MHZ RRH	B	From Leg	4.00 0.00 -1.00	0.000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.49 2.71 2.93 3.41 4.46	2.07 2.27 2.48 2.93 3.93	0.05 0.07 0.10 0.16 0.32
800 EXTERNAL NOTCH FILTER	B	From Leg	4.00 0.00 -1.00	0.000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.77 0.89 1.02 1.30 1.97	0.37 0.46 0.56 0.79 1.34	0.01 0.02 0.02 0.04 0.11
1900MHz RRH (65MHz)	C	From Leg	4.00 0.00 1.00	0.000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.70 2.94 3.18 3.70 4.85	2.77 3.01 3.26 3.78 4.93	0.06 0.08 0.11 0.18 0.35
800MHZ RRH	C	From Leg	4.00 0.00 -1.00	0.000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.49 2.71 2.93 3.41 4.46	2.07 2.27 2.48 2.93 3.93	0.05 0.07 0.10 0.16 0.32
800 EXTERNAL NOTCH FILTER	C	From Leg	4.00 0.00 -1.00	0.000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.77 0.89 1.02 1.30 1.97	0.37 0.46 0.56 0.79 1.34	0.01 0.02 0.02 0.04 0.11
Pipe Mount [PM 601-3]	C	None		0.000	106.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.39 5.48 6.57 8.75 13.11	4.39 5.48 6.57 8.75 13.11	0.20 0.24 0.28 0.36 0.53
level 105 APXVSPP18-C-A20 w/ Mount Pipe	A	From Leg	4.00 0.00 1.00	0.000	105.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.50 9.15 9.77 11.03 13.68	6.95 8.13 9.02 10.84 14.85	0.08 0.15 0.23 0.41 0.91
LLPX310R w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.000	105.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.07 5.48 5.91 6.79 8.70	2.98 3.53 4.09 5.31 8.13	0.05 0.08 0.13 0.23 0.54
(3) ACU-A20-N	A	From Leg	4.00 0.00 1.00	0.000	105.00	No Ice 1/2" Ice 1" Ice	0.08 0.12 0.17 0.30	0.14 0.19 0.25 0.40	0.00 0.00 0.00 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
						2" Ice	0.67	0.80	0.04
						4" Ice			
FDD_R6_RRH	A	From Leg	4.00	0.000	105.00	No Ice	1.79	0.78	0.03
			0.00			1/2"	1.97	0.92	0.04
			0.00			Ice	2.16	1.07	0.06
						1" Ice	2.57	1.39	0.09
						2" Ice	3.49	2.14	0.20
						4" Ice			
APXVTM14-C-120 w/ Mount Pipe	A	From Leg	4.00	0.000	105.00	No Ice	7.13	4.96	0.08
			0.00			1/2"	7.66	5.75	0.13
			1.00			Ice	8.18	6.47	0.19
						1" Ice	9.26	8.01	0.34
						2" Ice	11.53	11.41	0.75
						4" Ice			
TD-RRH8x20-25	A	From Leg	4.00	0.000	105.00	No Ice	4.72	1.70	0.07
			0.00			1/2"	5.01	1.92	0.10
			1.00			Ice	5.32	2.15	0.13
						1" Ice	5.95	2.62	0.20
						2" Ice	7.31	3.68	0.40
						4" Ice			
*									
APXVSPP18-C-A20 w/ Mount Pipe	B	From Leg	4.00	0.000	105.00	No Ice	8.50	6.95	0.08
			0.00			1/2"	9.15	8.13	0.15
			1.00			Ice	9.77	9.02	0.23
						1" Ice	11.03	10.84	0.41
						2" Ice	13.68	14.85	0.91
						4" Ice			
LLPX310R w/ Mount Pipe	B	From Leg	4.00	0.000	105.00	No Ice	5.07	2.98	0.05
			0.00			1/2"	5.48	3.53	0.08
			0.00			Ice	5.91	4.09	0.13
						1" Ice	6.79	5.31	0.23
						2" Ice	8.70	8.13	0.54
						4" Ice			
(3) ACU-A20-N	B	From Leg	4.00	0.000	105.00	No Ice	0.08	0.14	0.00
			0.00			1/2"	0.12	0.19	0.00
			1.00			Ice	0.17	0.25	0.00
						1" Ice	0.30	0.40	0.01
						2" Ice	0.67	0.80	0.04
						4" Ice			
FDD_R6_RRH	B	From Leg	4.00	0.000	105.00	No Ice	1.79	0.78	0.03
			0.00			1/2"	1.97	0.92	0.04
			0.00			Ice	2.16	1.07	0.06
						1" Ice	2.57	1.39	0.09
						2" Ice	3.49	2.14	0.20
						4" Ice			
APXVTM14-C-120 w/ Mount Pipe	B	From Leg	4.00	0.000	105.00	No Ice	7.13	4.96	0.08
			0.00			1/2"	7.66	5.75	0.13
			1.00			Ice	8.18	6.47	0.19
						1" Ice	9.26	8.01	0.34
						2" Ice	11.53	11.41	0.75
						4" Ice			
TD-RRH8x20-25	B	From Leg	4.00	0.000	105.00	No Ice	4.72	1.70	0.07
			0.00			1/2"	5.01	1.92	0.10
			1.00			Ice	5.32	2.15	0.13
						1" Ice	5.95	2.62	0.20
						2" Ice	7.31	3.68	0.40

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			
*									
APXVSPP18-C-A20 w/ Mount Pipe	C	From Leg	4.00 0.00 1.00	0.000	105.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.50 9.15 9.77 11.03 13.68	6.95 8.13 9.02 10.84 14.85	0.08 0.15 0.23 0.41 0.91
LLPX310R w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.000	105.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.07 5.48 5.91 6.79 8.70	2.98 3.53 4.09 5.31 8.13	0.05 0.08 0.13 0.23 0.54
(3) ACU-A20-N	C	From Leg	4.00 0.00 1.00	0.000	105.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.08 0.12 0.17 0.30 0.67	0.14 0.19 0.25 0.40 0.80	0.00 0.00 0.00 0.01 0.04
FDD_R6_RRH	C	From Leg	4.00 0.00 0.00	0.000	105.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.79 1.97 2.16 2.57 3.49	0.78 0.92 1.07 1.39 2.14	0.03 0.04 0.06 0.09 0.20
APXVTM14-C-120 w/ Mount Pipe	C	From Leg	4.00 0.00 1.00	0.000	105.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.13 7.66 8.18 9.26 11.53	4.96 5.75 6.47 8.01 11.41	0.08 0.13 0.19 0.34 0.75
TD-RRH8x20-25	C	From Leg	4.00 0.00 1.00	0.000	105.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.72 5.01 5.32 5.95 7.31	1.70 1.92 2.15 2.62 3.68	0.07 0.10 0.13 0.20 0.40
Platform Mount [LP 602-1]	C	None		0.000	105.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	32.03 38.71 45.39 58.75 85.47	32.03 38.71 45.39 58.75 85.47	1.34 1.80 2.26 3.17 5.00
6' x 2" Mount Pipe	A	From Leg	4.00 0.00 4.00	0.000	105.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.43 1.92 2.29 3.06 4.70	1.43 1.92 2.29 3.06 4.70	0.02 0.03 0.05 0.09 0.23
6' x 2" Mount Pipe	C	From Leg	4.00 0.00 4.00	0.000	105.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.43 1.92 2.29 3.06 4.70	1.43 1.92 2.29 3.06 4.70	0.02 0.03 0.05 0.09 0.23

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
6' x 2" Mount Pipe	B	From Leg	4.00 0.00 1.00	0.000	105.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.43 1.92 2.29 3.06 4.70	1.43 1.92 2.29 3.06 4.70	0.02 0.03 0.05 0.09 0.23
level 90 APXV18-206517S-C w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.000	90.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.40 5.96 6.48 7.55 9.92	4.70 5.86 6.73 8.51 12.28	0.05 0.10 0.15 0.28 0.68
APXV18-206517S-C w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.000	90.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.40 5.96 6.48 7.55 9.92	4.70 5.86 6.73 8.51 12.28	0.05 0.10 0.15 0.28 0.68
APXV18-206517S-C w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.000	90.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.40 5.96 6.48 7.55 9.92	4.70 5.86 6.73 8.51 12.28	0.05 0.10 0.15 0.28 0.68
Pipe Mount [PM 601-3]	C	None		0.000	90.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.39 5.48 6.57 8.75 13.11	4.39 5.48 6.57 8.75 13.11	0.20 0.24 0.28 0.36 0.53

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
level 105 A-ANT-23G-2-C	A	Paraboloid w/Shroud (HP)	From Leg	4.00 0.00 4.00	0.000		105.00	2.17	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.72 4.01 4.30 4.88 6.04	0.03 0.05 0.07 0.11 0.19
VHLP2-18	A	Paraboloid w/Shroud (HP)	From Leg	4.00 0.00 4.00	0.000		105.00	2.17	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.72 4.01 4.30 4.88 6.04	0.03 0.05 0.07 0.11 0.20
VHLP800-11	C	Paraboloid	From	4.00	0.000		105.00	2.80	No Ice	6.16	0.05

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
		w/Shroud (HP)	Leg	0.00					1/2" Ice	6.53	0.08
				4.00					1" Ice	6.90	0.12
									2" Ice	7.65	0.18
									4" Ice	9.13	0.32

Load Combinations

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	120 - 77.33	Pole	Max Tension	2	0.00	-0.00	-0.00
			Max. Compression	14	-16.45	1.29	0.96
			Max. Mx	5	-7.91	-461.89	4.38
			Max. My	8	-7.88	3.42	-469.72
			Max. Vy	5	17.91	-461.89	4.38
			Max. Vx	8	18.16	3.42	-469.72
			Max. Torque	5			1.32
L2	77.33 - 34.33	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-26.27	3.40	0.67
			Max. Mx	5	-14.99	-1323.47	10.65
			Max. My	8	-14.98	8.68	-1342.23
			Max. Vy	5	23.12	-1323.47	10.65
			Max. Vx	8	23.37	8.68	-1342.23
			Max. Torque	4			1.32
L3	34.33 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-37.56	4.98	0.41
			Max. Mx	5	-24.19	-2338.69	16.49
			Max. My	8	-24.19	13.52	-2367.64
			Max. Vy	5	27.61	-2338.69	16.49
			Max. Vx	8	27.85	13.52	-2367.64
			Max. Torque	4			1.37

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	22	37.56	3.38	-5.90
	Max. H_x	11	24.21	27.53	-0.05
	Max. H_z	2	24.21	-0.17	27.77
	Max. M_x	2	2360.96	-0.17	27.77
	Max. M_z	5	2338.69	-27.60	0.14
	Max. Torsion	4	1.37	-23.89	14.01
	Min. Vert	1	24.21	0.00	0.00
	Min. H_x	5	24.21	-27.60	0.14
	Min. H_z	8	24.21	0.11	-27.83
	Min. M_x	8	-2367.64	0.11	-27.83
	Min. M_z	11	-2334.15	27.53	-0.05
	Min. Torsion	11	-1.23	27.53	-0.05

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	24.21	0.00	0.00	-0.29	1.46	0.00
Dead+Wind 0 deg - No Ice	24.21	0.17	-27.77	-2360.96	-17.74	-0.91
Dead+Wind 30 deg - No Ice	24.21	13.85	-24.11	-2051.27	-1174.12	-1.19
Dead+Wind 60 deg - No Ice	24.21	23.89	-14.01	-1195.21	-2023.85	-1.37
Dead+Wind 90 deg - No Ice	24.21	27.60	-0.14	-16.49	-2338.69	-1.24
Dead+Wind 120 deg - No Ice	24.21	23.84	13.88	1179.41	-2018.57	-0.26
Dead+Wind 150 deg - No Ice	24.21	13.67	24.13	2053.54	-1154.65	0.73

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 180 deg - No Ice	24.21	-0.11	27.83	2367.64	13.52	1.10
Dead+Wind 210 deg - No Ice	24.21	-13.81	24.14	2054.57	1173.47	1.22
Dead+Wind 240 deg - No Ice	24.21	-23.81	14.06	1199.47	2017.82	1.18
Dead+Wind 270 deg - No Ice	24.21	-27.53	0.05	5.59	2334.15	1.23
Dead+Wind 300 deg - No Ice	24.21	-23.82	-13.85	-1176.83	2019.06	0.27
Dead+Wind 330 deg - No Ice	24.21	-13.71	-24.02	-2041.56	1161.25	-0.74
Dead+Ice+Temp	37.56	-0.00	-0.00	-0.41	4.98	-0.00
Dead+Wind 0 deg+Ice+Temp	37.56	0.04	-6.79	-593.43	0.70	-0.30
Dead+Wind 30 deg+Ice+Temp	37.56	3.38	-5.89	-515.48	-290.42	-0.34
Dead+Wind 60 deg+Ice+Temp	37.56	5.84	-3.42	-300.26	-504.28	-0.34
Dead+Wind 90 deg+Ice+Temp	37.56	6.75	-0.03	-4.10	-583.43	-0.26
Dead+Wind 120 deg+Ice+Temp	37.56	5.83	3.39	296.04	-503.06	0.00
Dead+Wind 150 deg+Ice+Temp	37.56	3.35	5.90	515.34	-286.04	0.25
Dead+Wind 180 deg+Ice+Temp	37.56	-0.02	6.80	594.29	7.76	0.34
Dead+Wind 210 deg+Ice+Temp	37.56	-3.38	5.90	515.58	299.70	0.35
Dead+Wind 240 deg+Ice+Temp	37.56	-5.82	3.43	300.56	512.31	0.30
Dead+Wind 270 deg+Ice+Temp	37.56	-6.73	0.01	0.88	591.82	0.26
Dead+Wind 300 deg+Ice+Temp	37.56	-5.83	-3.39	-296.10	512.60	-0.00
Dead+Wind 330 deg+Ice+Temp	37.56	-3.35	-5.87	-513.28	296.92	-0.26
Dead+Wind 0 deg - Service	24.21	0.06	-9.61	-818.08	-5.17	-0.32
Dead+Wind 30 deg - Service	24.21	4.79	-8.34	-710.80	-405.75	-0.42
Dead+Wind 60 deg - Service	24.21	8.27	-4.85	-414.24	-700.11	-0.48
Dead+Wind 90 deg - Service	24.21	9.55	-0.05	-5.91	-809.16	-0.43
Dead+Wind 120 deg - Service	24.21	8.25	4.80	408.36	-698.27	-0.09
Dead+Wind 150 deg - Service	24.21	4.73	8.35	711.18	-399.01	0.25
Dead+Wind 180 deg - Service	24.21	-0.04	9.63	820.00	5.67	0.38
Dead+Wind 210 deg - Service	24.21	-4.78	8.35	711.55	407.50	0.42
Dead+Wind 240 deg - Service	24.21	-8.24	4.86	415.31	699.98	0.41
Dead+Wind 270 deg - Service	24.21	-9.53	0.02	1.74	809.55	0.43
Dead+Wind 300 deg - Service	24.21	-8.24	-4.79	-407.86	700.40	0.10
Dead+Wind 330 deg - Service	24.21	-4.74	-8.31	-707.42	403.25	-0.26

Solution Summary

Load Comb.	Sum of Applied Forces PX	PY	PZ	Sum of Reactions PX	PY	PZ	% Error
	K	K	K	K	K	K	

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	-24.21	0.00	0.00	24.21	0.00	0.000%
2	0.17	-24.21	-27.77	-0.17	24.21	27.77	0.000%
3	13.85	-24.21	-24.11	-13.85	24.21	24.11	0.000%
4	23.89	-24.21	-14.01	-23.89	24.21	14.01	0.000%
5	27.60	-24.21	-0.14	-27.60	24.21	0.14	0.000%
6	23.84	-24.21	13.88	-23.84	24.21	-13.88	0.000%
7	13.67	-24.21	24.13	-13.67	24.21	-24.13	0.000%
8	-0.11	-24.21	27.83	0.11	24.21	-27.83	0.000%
9	-13.81	-24.21	24.14	13.81	24.21	-24.14	0.000%
10	-23.81	-24.21	14.06	23.81	24.21	-14.06	0.000%
11	-27.53	-24.21	0.05	27.53	24.21	-0.05	0.000%
12	-23.82	-24.21	-13.85	23.82	24.21	13.85	0.000%
13	-13.71	-24.21	-24.02	13.71	24.21	24.02	0.000%
14	0.00	-37.56	0.00	0.00	37.56	0.00	0.000%
15	0.04	-37.56	-6.79	-0.04	37.56	6.79	0.000%
16	3.38	-37.56	-5.89	-3.38	37.56	5.89	0.000%
17	5.84	-37.56	-3.42	-5.84	37.56	3.42	0.000%
18	6.75	-37.56	-0.03	-6.75	37.56	0.03	0.000%
19	5.83	-37.56	3.39	-5.83	37.56	-3.39	0.000%
20	3.35	-37.56	5.90	-3.35	37.56	-5.90	0.000%
21	-0.02	-37.56	6.80	0.02	37.56	-6.80	0.000%
22	-3.38	-37.56	5.90	3.38	37.56	-5.90	0.000%
23	-5.82	-37.56	3.43	5.82	37.56	-3.43	0.000%
24	-6.73	-37.56	0.01	6.73	37.56	-0.01	0.000%
25	-5.83	-37.56	-3.39	5.83	37.56	3.39	0.000%
26	-3.35	-37.56	-5.87	3.35	37.56	5.87	0.000%
27	0.06	-24.21	-9.61	-0.06	24.21	9.61	0.000%
28	4.79	-24.21	-8.34	-4.79	24.21	8.34	0.000%
29	8.27	-24.21	-4.85	-8.27	24.21	4.85	0.000%
30	9.55	-24.21	-0.05	-9.55	24.21	0.05	0.000%
31	8.25	-24.21	4.80	-8.25	24.21	-4.80	0.000%
32	4.73	-24.21	8.35	-4.73	24.21	-8.35	0.000%
33	-0.04	-24.21	9.63	0.04	24.21	-9.63	0.000%
34	-4.78	-24.21	8.35	4.78	24.21	-8.35	0.000%
35	-8.24	-24.21	4.86	8.24	24.21	-4.86	0.000%
36	-9.53	-24.21	0.02	9.53	24.21	-0.02	0.000%
37	-8.24	-24.21	-4.79	8.24	24.21	4.79	0.000%
38	-4.74	-24.21	-8.31	4.74	24.21	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	0.00006810
3	Yes	5	0.00000001	0.00012560
4	Yes	5	0.00000001	0.00013445
5	Yes	4	0.00000001	0.00040172
6	Yes	5	0.00000001	0.00012625
7	Yes	5	0.00000001	0.00012585
8	Yes	4	0.00000001	0.00028240
9	Yes	5	0.00000001	0.00013364
10	Yes	5	0.00000001	0.00012572
11	Yes	4	0.00000001	0.00027594
12	Yes	5	0.00000001	0.00012943
13	Yes	5	0.00000001	0.00012982

14	Yes	4	0.00000001	0.00001185
15	Yes	5	0.00000001	0.00005849
16	Yes	5	0.00000001	0.00007040
17	Yes	5	0.00000001	0.00007107
18	Yes	5	0.00000001	0.00005735
19	Yes	5	0.00000001	0.00006946
20	Yes	5	0.00000001	0.00006963
21	Yes	5	0.00000001	0.00005841
22	Yes	5	0.00000001	0.00007221
23	Yes	5	0.00000001	0.00007114
24	Yes	5	0.00000001	0.00005828
25	Yes	5	0.00000001	0.00007131
26	Yes	5	0.00000001	0.00007165
27	Yes	4	0.00000001	0.00003388
28	Yes	4	0.00000001	0.00038087
29	Yes	4	0.00000001	0.00043774
30	Yes	4	0.00000001	0.00007480
31	Yes	4	0.00000001	0.00038327
32	Yes	4	0.00000001	0.00038211
33	Yes	4	0.00000001	0.00005394
34	Yes	4	0.00000001	0.00043444
35	Yes	4	0.00000001	0.00038162
36	Yes	4	0.00000001	0.00006574
37	Yes	4	0.00000001	0.00040734
38	Yes	4	0.00000001	0.00041111

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	120 - 77.33 (1)	TP30.45x21.91x0.22	42.67	0.00	0.0	36.88	20.66	-7.88	761.98	0.010
L2	77.33 - 34.33 (2)	TP38.61x29.08x0.31	47.67	0.00	0.0	39.00	37.46	-14.98	1460.76	0.010
L3	34.33 - 0 (3)	TP44.85x36.85x0.38	40.00	0.00	0.0	39.00	53.70	-24.19	2094.44	0.012

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	120 - 77.33 (1)	TP30.45x21.91x0.22	469.73	38.08	36.88	1.032	0.00	0.00	36.88	0.000
L2	77.33 - 34.33 (2)	TP38.61x29.08x0.31	1342.26	47.36	39.00	1.214	0.00	0.00	39.00	0.000
L3	34.33 - 0 (3)	TP44.85x36.85x0.38	2367.68	48.68	39.00	1.248	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	120 - 77.33 (1)	TP30.45x21.91x0.22	18.16	0.88	26.00	0.069	0.76	0.03	26.00	0.001
L2	77.33 - 34.33 (2)	TP38.61x29.08x0.31	23.37	0.62	26.00	0.049	0.95	0.02	26.00	0.001
L3	34.33 - 0 (3)	TP44.85x36.85x0.38	27.85	0.52	26.00	0.041	1.10	0.01	26.00	0.000

Pole Interaction Design Data

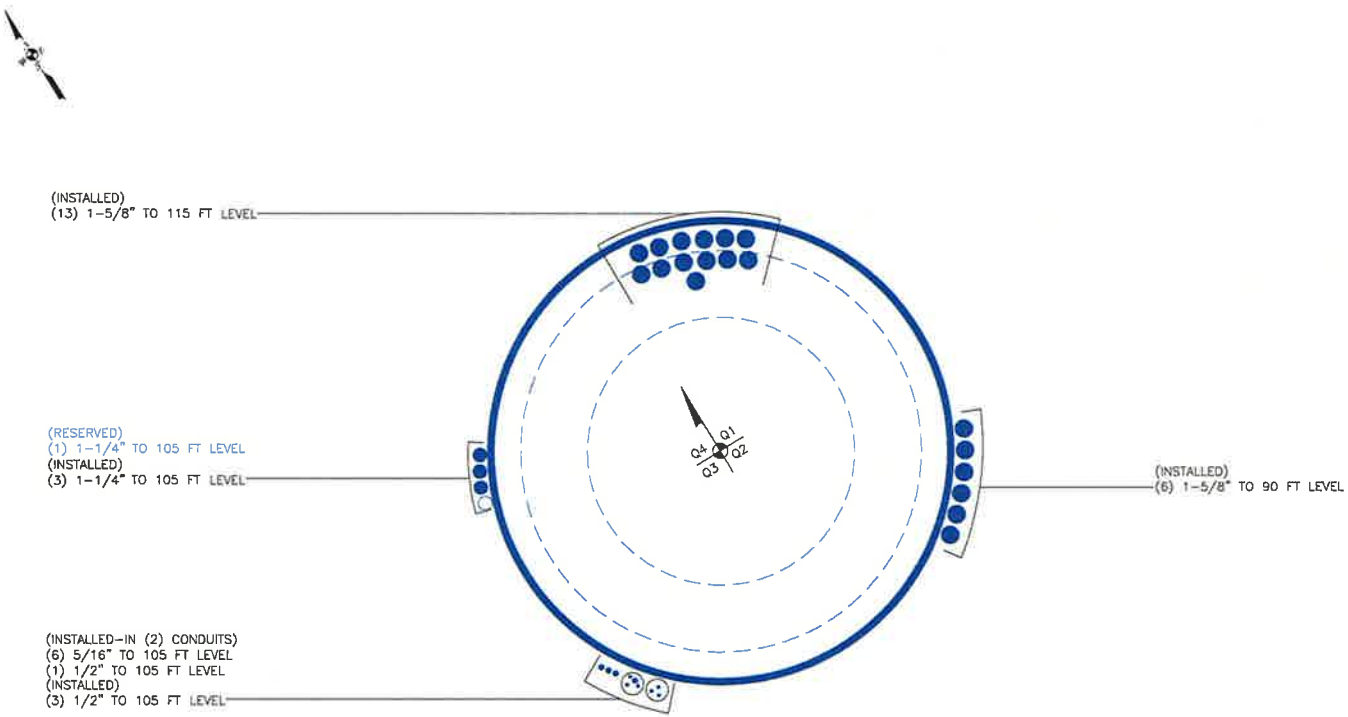
Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	120 - 77.33 (1)	0.010	1.032	0.000	0.069	0.001	1.044 ✔	1.333	H1-3+VT ✔
L2	77.33 - 34.33 (2)	0.010	1.214	0.000	0.049	0.001	1.225 ✔	1.333	H1-3+VT ✔
L3	34.33 - 0 (3)	0.012	1.248	0.000	0.041	0.000	1.260 ✔	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	120 - 77.33	Pole	TP30.45x21.91x0.22	1	-7.88	1015.71	78.3	Pass
L2	77.33 - 34.33	Pole	TP38.61x29.08x0.31	2	-14.98	1947.19	91.9	Pass
L3	34.33 - 0	Pole	TP44.85x36.85x0.38	3	-24.19	2791.89	94.5	Pass
							Summary	
						Pole (L3)	94.5	Pass
						RATING =	**94.5**	**Pass**

APPENDIX B

BASE LEVEL DRAWING



BUSINESS UNIT: 806454 TOWER ID: C_BASELEVEL

APPENDIX C

ADDITIONAL CALCULATIONS

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

TIA Rev F

Site Data

BU#: *806454*
Site Name: *NHV 112 948129*
App #: *285046 Rev. 2*

Pole Manufacturer:	*Other*

Reactions		
Moment:	2368	ft-kips
Axial:	24	kips
Shear:	28	kips

Anchor Rod Data		
Qty:	12	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	51.16	in

Plate Data		
Diam:	57.16	in
Thick:	2.75	in
Grade:	60	ksi
Single-Rod B-eff:	12.02	in

Stiffener Data (Welding at both sides)		
Config:	0	*
Weld Type:		
Groove Depth:		<-- Disregard
Groove Angle:		<-- Disregard
Fillet H. Weld:		in
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		ksi

Pole Data		
Diam:	44.85	in
Thick:	0.375	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	

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

Anchor Rod Results

		Rigid
Maximum Rod Tension:	183.1 Kips	Service, ASD
Allowable Tension:	195.0 Kips	Fty*ASIF
Anchor Rod Stress Ratio:	93.9% Pass	

Base Plate Results

	Flexural Check	Rigid
Base Plate Stress:	26.6 ksi	Service ASD
Allowable Plate Stress:	60.0 ksi	0.75*Fy*ASIF
Base Plate Stress Ratio:	44.4% Pass	Y.L. Length:
		24.61

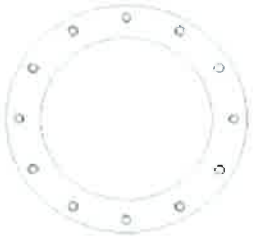
n/a

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

CCI Foundation Tool Suite - Monopole Pier

CCIFTS 1.2.108.14286 - Phase 1-2 Date: 3/19/2015

BU:	806454
Site Name:	NHV 112 948129
App Number:	285046 Rev. 2
Work Order:	1028282

CROWN CASTLE

Monopole Drilled Pier

Input

Criteria

TIA Revision:	F
ACI 318 Revision:	2002
Seismic Category:	B

Forces

Compression	24	kips
Shear	28	kips
Moment	2368	k-ft
Swelling Force	0	kips

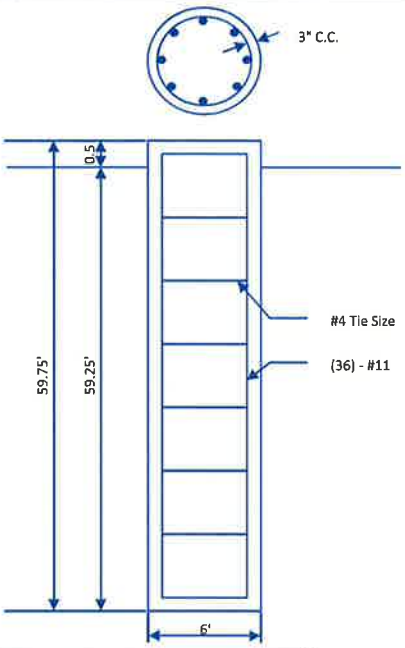
Foundation Dimensions

Pier Diameter:	6	ft
Ext. above grade:	0.5	ft
Depth below grade:	59.25	ft

Material Properties

Number of Rebar:	36	
Rebar Size:	11	
Tie Size	4	
Rebar tensile strength:	60	ksi
Concrete Strength:	3000	psi
Ultimate Concrete Strain	0.003	in/in
Clear Cover to Ties:	3	in

Soil Profile: 1



Layer	Thickness (ft)	From (ft)	To (ft)	Unit Weight (pcf)	Cohesion (psf)	Friction Angle (deg)	Ultimate Uplift Skin Friction (ksf)	Ultimate Comp. Skin Friction (ksf)	Ultimate Bearing Capacity (ksf)	SPT 'N' Counts
1	3.33	0	3.33	105	0				0	
2	8.67	3.33	12	105		25			0	
3	1	12	13	110	1250				0	
4	29	13	42	47.6	1250				0	
5	17.25	42	59.25	52.6	1500				14	

Analysis Results

Soil Lateral Capacity

Depth to Zero Shear:	13.02	ft
Max Moment, Mu:	2636.41	k-ft
Soil Safety Factor:	13.23	
Safety Factor Req'd:	2	
RATING:	15.1%	

Soil Axial Capacity

Skin Friction (k):	351.90	kips
End Bearing (k):	197.92	kips
Comp. Capacity (k), ϕCn:	549.82	kips
Comp. (k), Cu:	31.20	kips
RATING:	5.7%	

Concrete/Steel Check

Mu (from soil analysis)	3427.33	k-ft
ϕMn	6861.44	k-ft
RATING:	50.0%	

rho provided	1.38	
rho required	0.33	OK
Rebar Spacing	4.14	
Spacing required	22.56	OK
Dev. Length required	45.98	
Dev. Length provided	61.78	OK

Overall Foundation Rating: 50.0%