

December 4, 2015

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

Re: **Notice of Exempt Modification – Facility Modification  
1440 Main Street, Woodbury, Connecticut**

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless (“Cellco”) currently maintains twelve (12) antennas at the 150-foot level of the existing 163-foot tower at 1440 Main Street in Woodbury, Connecticut (the “Property”). The tower is owned by Crown Castle (“Crown”). The Council approved Cellco’s use of this tower in 2003. Cellco now intends to replace six (6) of its existing antennas with three (3) model SBNHH-1D65B, 1900 MHz antennas and three (3) model SBNHH-1D65B, 700/2100 MHz antennas, all at the same 150-foot level on the tower. Cellco also intends to install nine (9) remote radio heads (“RRHs”) and two (2) HYBRIFLEX™ antenna cables. Included in Attachment 1 are specifications for Cellco’s replacement antennas, RRHs and HYBRIFLEX™ cables.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to William J. Butterly, Jr., First Selectman of the Town of Woodbury. A copy of this letter is also being sent to Tikva Wolff, the owner of the Property and Crown, the tower owner.

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

# Robinson+Cole

Melanie A. Bachman  
December 4, 2015  
Page 2

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's replacement antennas and RRH's will be located at the 150-foot level on the 163-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 worst-case General Power Density table for Cellco's modified facility is included in Attachment 2.
5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.
6. The tower and its foundation can support Cellco's proposed modifications. (*See Structural Analysis Report included in Attachment 3*).

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

Sincerely,



Kenneth C. Baldwin

Enclosures

Copy to:

William J. Butterly, Jr., Woodbury First Selectman  
Tikva Wolff  
Crown Castle  
Tim Parks

# **ATTACHMENT 1**

## 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

COMMSCOPE®

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

RoHS 2011/65/EU  
China RoHS SJ/T 11364-2006  
ISO 9001:2008

### Classification

Compliant by Exemption  
Above Maximum Concentration Value (MCV)  
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.

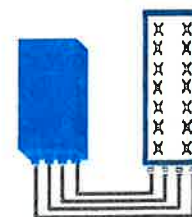
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the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

## TECHNICAL SPECIFICATIONS

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

www.alcatel-lucent.com Alcatel, Lucent, Alcatel-Lucent and the Alcatel-Lucent logo are trademarks of Alcatel-Lucent. All other trademarks are the property of their respective owners. The information presented is subject to change without notice. Alcatel-Lucent assumes no responsibility for inaccuracies contained herein. Copyright © 2014 Alcatel-Lucent. All Rights Reserved

# PCS RF MODULES

## RRH1900 2X60 - HW CHARACTERISTICS

LA6.0.1/13.3

<b>RRH2x60</b>	
RF Output Power	2X60W
Instantaneous Bandwidth	20MHz
Transmitter	2 TX
Receiver	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

ALCATEL-LUCENT – CONFIDENTIAL – SOLELY FOR AUTHORIZED PERSONS HAVING A NEED TO KNOW – PROPRIETARY – USE PURSUANT TO COMPANY INSTRUCTION

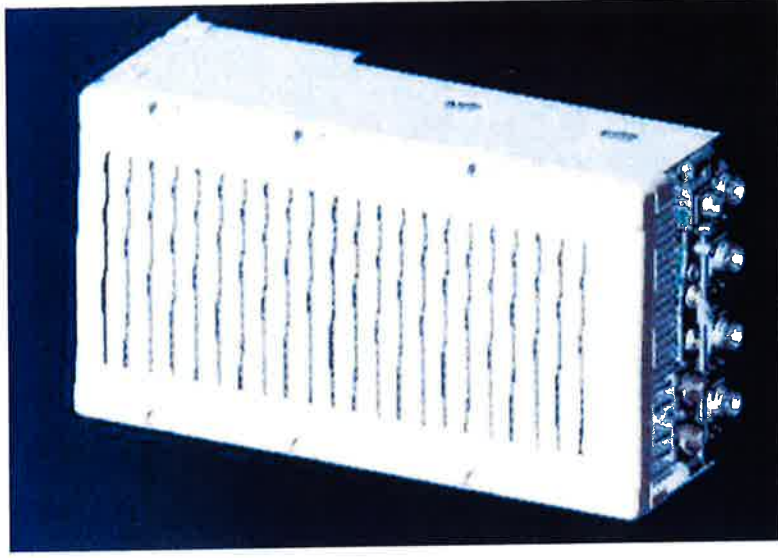


# NEW PCS RF MODULES FOR VZW

## 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
CPRI Ports	Internal Smart Bias-T
External Alarms	2 CPRI Rate 5 Ports
Monitor Ports	4 External User Alarms
Environmental	TX, RX
RF Connectors	GR487 Compliance
Dimensions	7/16 DIN (downward facing) 22"(h) x 12"(w) x 9.4" (d)**
Weight	55lb**



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

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.

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.

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).

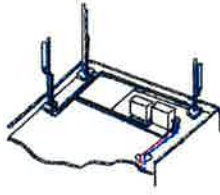
The Alcatel-Lucent RRH2x60-AWS is a very cost-effective solution to deploy LTE MIMO.

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.

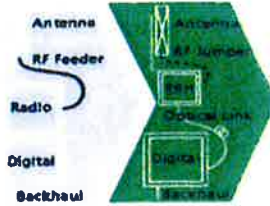
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation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

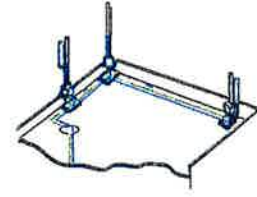
Installation can easily be done by a single person as the Alcatel-Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



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 daisy chaining 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

www.alcatel-lucent.com Alcatel, Lucent, Alcatel-Lucent and the Alcatel-Lucent logo are trademarks of Alcatel-Lucent. All other trademarks are the property of their respective owners. The information presented is subject to change without notice. Alcatel-Lucent assumes no responsibility for inaccuracies contained herein.

Copyright © 2012 Alcatel-Lucent. All rights reserved. M201200000X (March)

AT THE SPEED OF IDEAS™

Alcatel-Lucent 



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

**Product Description**

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

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

**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



Figure 1: HYBRIFLEX Series

**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
<b>Mechanical Properties</b>			
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)
<b>Electrical Properties</b>			
DC-Resistance Outer Conductor Armor		(Ω/km (Ω/1000ft))	068 (0.205)
DC-Resistance Power Cable, 8.4mm <sup>2</sup> (8AWG)		(Ω/km (Ω/1000ft))	2.1 (0.307)
<b>Optical Properties</b>			
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
<b>DC Power Cable Properties</b>			
Size (Power)		(mm (AWG))	8.4 (8)
Quantity, Wire Count (Power)			16 (8 pairs)
Size (Alarm)		(mm (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
<b>Operating Conditions</b>			
Installation Temperature		(°C (°F))	-40 to +65 (-40 to 149)
Operation Temperature		(°C (°F))	-40 to +65 (-40 to 149)

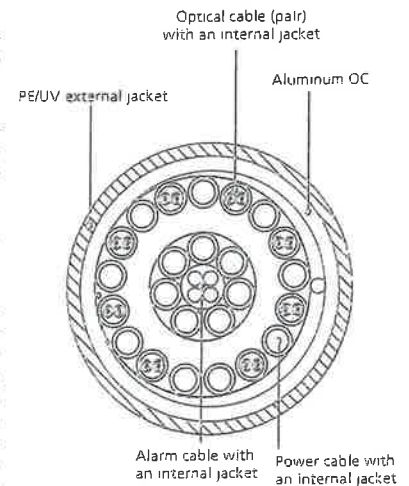


Figure 2: Construction Detail

All information contained in the present datasheet is subject to confirmation at time of ordering.

# **ATTACHMENT 2**

		General		Power		Density							
		# OF CHAN.	WATTS ERP	HEIGHT	CALC. POWER DENS	FREQ.	MAX. PERMISS. EXP.	FRACTION MPE					Total
<b>Site Name: Woodbury N</b>													
<b>Tower Height: 163Ft.</b>													
<b>CARRIER</b>													
*Sprint CDMA/LTE	2	693	158	0.0200	1900	1.0000	2.00%						
*Sprint CDMA/LTE	1	390	158	0.0056	850	0.5667	0.99%						
*Sprint CDMA/LTE	2	693	158	0.0200	2500	1.0000	2.00%						
*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	1313	119	0.0333	734	0.4893	6.81%						
<b>Verizon PCS</b>	<b>7</b>	<b>408</b>	<b>150</b>	<b>0.0456</b>	<b>1970</b>	<b>1.0000</b>	<b>4.56%</b>						
<b>Verizon Cellular</b>	<b>9</b>	<b>386</b>	<b>150</b>	<b>0.0555</b>	<b>869</b>	<b>0.5793</b>	<b>9.58%</b>						
<b>Verizon AWS</b>	<b>1</b>	<b>3500</b>	<b>150</b>	<b>0.0559</b>	<b>2145</b>	<b>1.0000</b>	<b>5.59%</b>						
<b>Verizon 700</b>	<b>1</b>	<b>2100</b>	<b>150</b>	<b>0.0336</b>	<b>746</b>	<b>0.4973</b>	<b>6.75%</b>						<b>54.18%</b>
* Source: Siting Council													

# **ATTACHMENT 3**

Date: **November 17, 2015**

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



Destek Engineering, LLC  
1281 Kennestone Circle, Suite 100  
Marietta, GA 30066  
(770) 693 0835

**Subject: Structural Analysis Report**

**Carrier Designation:** **Verizon Wireless Co-Locate**  
**Carrier Site Number:** 117765  
**Carrier Site Name:** Woodbury N CT

**Crown Castle Designation:** **Crown Castle BU Number:** 876379  
**Crown Castle Site Name:** N. WOODBURY / WOLFF PARCEL  
**Crown Castle JDE Job Number:** 355384  
**Crown Castle Work Order Number:** 1152821  
**Crown Castle Application Number:** 320737 Rev. 1

**Engineering Firm Designation:** **Destek Engineering, LLC Project Number:** 1502467

**Site Data:** **1440 Main Street North, WOODBURY, Litchfield County, CT**  
**Latitude 41° 35' 23.81", Longitude -73° 10' 11.52"**  
**163 Foot - Monopole Tower**

Dear Rebecca Klein,

Destek Engineering, LLC 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 845623, in accordance with application 320737, revision 1.

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

LC5: Existing + Proposed Equipment

**Sufficient Capacity**

Note: See Table I and Table II for the proposed and existing/reserved loading, respectively.

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

All modifications and equipment proposed in this report shall be installed in accordance with the attached drawings for the determined available structural capacity to be effective.

We at Destek Engineering, LLC 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: Grant Wang, EIT

Respectfully submitted by:

Ahmet Colakoglu, PE  
President





## TABLE OF CONTENTS

### 1) INTRODUCTION

### 2) ANALYSIS CRITERIA

Table 1 - Proposed Antenna and Cable Information

Table 2 - Existing and Reserved Antenna and Cable Information

Table 3 - Design Antenna and Cable Information

### 3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

3.1) Analysis Method

3.2) Assumptions

### 4) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary)

Table 6 - Tower Components vs. Capacity

4.1) Recommendations

### 5) APPENDIX A

tnxTower Output

### 6) APPENDIX B

Base Level Drawing

### 7) APPENDIX C

Additional Calculations

## 1) INTRODUCTION

This tower is a 163 ft Monopole tower designed by ENGINEERED ENDEAVORS, INC. in September of 1999. The tower was originally designed for a wind speed of 0 mph per TIA/EIA-222-F.

## 2) ANALYSIS CRITERIA

The structural analysis was performed for this tower in accordance with the requirements of TIA/EIA-222-F Structural Standards for Steel Antenna Towers and Antenna Supporting Structures using a fastest mile wind speed of 80 mph with no ice, 28.1 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
148.0	150.0	3	alcatel lucent	RRH2X60-AWS	2	1-5/8	-
		3	alcatel lucent	RRH2X60-PCS			
		3	alcatel lucent	RRH2x60-700			
		6	andrew	SBNHH-1D65B 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
160.0	171.0	1	sinclair	SC229-SFXLDF	1	1/2	1
	160.0	1	tower mounts	Side Arm Mount [SO 301-1]			
156.0	158.0	3	alcatel lucent	1900MHz RRH (65MHz)	3	1-1/4	1
		3	alcatel lucent	800 EXTERNAL NOTCH FILTER			
		3	alcatel lucent	800MHZ RRH			
		9	rfs celwave	ACU-A20-N			
	3	rfs celwave	APXVSP18-C-A20 w/ Mount Pipe				
156.0	1	tower mounts	Platform Mount [LP 602-1]				
148.0	151.0	3	antel	BXA-171085-12BF-2 w/ Mount Pipe	-	-	2
		3	antel	BXA-70063-6CF-2 w/ Mount Pipe			
	150.0	6	antel	LPA-80080/6CF w/ Mount Pipe	12	1-5/8	1
		6	rfs celwave	FD9R6004/2C-3L			
148.0	1	tower mounts	Platform Mount [LP 403-1]				
141.0	142.0	12	decibel	DB846G90A-XY w/ Mount Pipe	12	1-5/8	1
	141.0	1	tower mounts	Platform Mount [LP 303-1]			
120.0	121.0	6	ericsson	TME-RRUS-11	-	-	1
	120.0	1	tower mounts	Side Arm Mount [SO 104-3]			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
118.0	119.0	3	ericsson	RRUS 11 B12	1 2 12	3/8 7/8 1-5/8	1
		3	kmw communications	AM-X-CD-16-65-00T-RET w/ Mount Pipe			
		6	powerwave technologies	7770.00 w/ Mount Pipe			
		6	powerwave technologies	LGP21401			
		6	powerwave technologies	LGP21901			
		1	raycap	DC6-48-60-18-8F			
	118.0	1	tower mounts	Platform Mount [LP 403-1]			
108.0	110.0	1	telewave	ANT150D6-9	1	1/2	1
22.0	24.0	1	lucent	KS24019-L112A	1	1/2	1
	22.0	1	tower mounts	Side Arm Mount [SO 701-1]			

Notes:

- 1) Existing Equipment
- 2) 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)
160	-	12	-	DB980H90	-	-
		1	-	Low Profile Platform		
145	-	12	-	DB980H90	-	-
		1	-	Low Profile Platform		
130	-	12	-	DB980H90	-	-
		1	-	Low Profile Platform		
115	-	12	-	DB980H90	-	-
		1	-	Low Profile Platform		

### 3) ANALYSIS PROCEDURE

**Table 4 - Documents Provided**

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	CWA, Site# CT33XC518, Dated 09/07/1999	1531966	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	EEl, Job# 5621, Dated 09/14/1999	1614612	CCISITES
4-TOWER MANUFACTURER DRAWINGS	EEl, Job# 5621, Dated 09/14/1999	1613543	CCISITES
4-TOWER STRUCTURAL ANALYSIS REPORTS	SSOE Group, Job# 015-00428-00 BC 0777, Dated 07/01/2015	5732375	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.

This analysis may be affected if any assumptions are not valid or have been made in error. Destek Engineering, LLC 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	163 - 121.58	Pole	TP42.37x34.28x0.3125	1	-11.03	2109.93	21.0	Pass
L2	121.58 - 84.663	Pole	TP48.83x40.6057x0.375	2	-22.71	2918.91	42.3	Pass
L3	84.663 - 42.2	Pole	TP56.25x46.7974x0.4375	3	-36.01	3923.81	53.8	Pass
L4	42.2 - 0	Pole	TP63.5x53.916x0.5	4	-56.06	5197.71	58.8	Pass
							Summary	
						Pole (L4)	58.8	Pass
						Rating =	58.8	Pass

**Table 6 - Tower Component Stresses vs. Capacity – LC5**

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	58.3	Pass
1	Base Plate	0	59.7	Pass
1	Base Foundation	0	58.4	Pass
1	Base Foundation Soil Interaction	0	36.8	Pass

<b>Structure Rating (max from all components) =</b>	<b>59.7%</b>
---	--------------

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:

- 3) Tower is located in Litchfield County, Connecticut.
- 4) Basic wind speed of 80 mph.
- 5) Nominal ice thickness of 0.7500 in.
- 6) Ice thickness is considered to increase with height.
- 7) Ice density of 56 pcf.
- 8) A wind speed of 28 mph is used in combination with ice.
- 9) Temperature drop of 50 °F.
- 10) Deflections calculated using a wind speed of 50 mph.
- 11) A non-linear (P-delta) analysis was used.
- 12) Pressures are calculated at each section.
- 13) Stress ratio used in pole design is 1.333.
- 14) Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

## Options

Consider Moments - Legs Consider Moments - Horizontals Consider Moments - Diagonals Use Moment Magnification ✓ Use Code Stress Ratios ✓ Use Code Safety Factors - Guys ✓ Escalate Ice Always Use Max Kz Use Special Wind Profile Include Bolts In Member Capacity Leg Bolts Are At Top Of Section Secondary Horizontal Braces Leg Use Diamond Inner Bracing (4 Sided) Add IBC .6D+W Combination	Distribute Leg Loads As Uniform Assume Legs Pinned ✓ Assume Rigid Index Plate ✓ Use Clear Spans For Wind Area Use Clear Spans For KL/r Retension Guys To Initial Tension ✓ Bypass Mast Stability Checks ✓ Use Azimuth Dish Coefficients ✓ Project Wind Area of Appurt. Autocalc Torque Arm Areas SR Members Have Cut Ends Sort Capacity Reports By Component Triangulate Diamond Inner Bracing Use TIA-222-G Tension Splice Capacity Exemption	Treat Feedline Bundles As Cylinder Use ASCE 10 X-Brace Ly Rules Calculate Redundant Bracing Forces Ignore Redundant Members in FEA SR Leg Bolts Resist Compression All Leg Panels Have Same Allowable Offset Girt At Foundation ✓ Consider Feedline Torque Include Angle Block Shear Check Poles ✓ Include Shear-Torsion Interaction Always Use Sub-Critical Flow Use Top Mounted Sockets
--	--	---

## 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	163.00-121.58	41.42	5.83	18	34.2800	42.3700	0.3125	1.2500	A572-65 (65 ksi)
L2	121.58-84.66	42.75	6.67	18	40.6057	48.8300	0.3750	1.5000	A572-65 (65 ksi)
L3	84.66-42.20	49.13	7.58	18	46.7974	56.2500	0.4375	1.7500	A572-65 (65 ksi)
L4	42.20-0.00	49.78		18	53.9160	63.5000	0.5000	2.0000	A572-65 (65 ksi)

## Tapered Pole Properties

Section	Tip Dia. in	Area in <sup>2</sup>	I in <sup>4</sup>	r in	C in	I/C in <sup>3</sup>	J in <sup>4</sup>	I/Q in <sup>2</sup>	w in	w/t
L1	34.8088	33.6915	4911.1720	12.0585	17.4142	282.0205	9828.8063	16.8490	5.4833	17.546

Section	Tip Dia. in	Area in <sup>2</sup>	I in <sup>4</sup>	r in	C in	I/C in <sup>3</sup>	J in <sup>4</sup>	I/Q in <sup>2</sup>	w in	w/t
	43.0236	41.7158	9322.3361	14.9304	21.5240	433.1144	18656.9387	20.8619	6.9071	22.103
L2	42.3716	47.8846	9791.4962	14.2819	20.6277	474.6769	19595.8764	23.9469	6.4866	17.298
	49.5833	57.6736	17107.6924	17.2015	24.8056	689.6695	34237.8956	28.8423	7.9341	21.158
L3	48.8218	64.3765	17480.3378	16.4578	23.7731	735.2997	34983.6766	32.1944	7.4663	17.066
	57.1177	77.5026	30501.1953	19.8134	28.5750	1067.4084	61042.5248	38.7587	9.1300	20.869
L4	56.2301	84.7712	30558.3044	18.9627	27.3893	1115.7005	61156.8181	42.3937	8.6092	17.218
	64.4796	99.9810	50134.4235	22.3650	32.2580	1554.1702	100334.8152	50.0000	10.2960	20.592

Tower Elevation ft	Gusset Area (per face) ft <sup>2</sup>	Gusset Thickness in	Gusset Grade	Adjust. Factor A <sub>r</sub>	Adjust. Factor A <sub>r</sub>	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 163.00-121.58				1	1	1		
L2 121.58-84.66				1	1	1		
L3 84.66-42.20				1	1	1		
L4 42.20-0.00				1	1	1		

### Feed Line/Linear Appurtenances - Entered As Round Or Flat

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

### Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	C <sub>A</sub> A <sub>A</sub> ft <sup>2</sup> /ft	Weight plf
HB158-1-08U8-S8J18(1-5/8)	A	No	Inside Pole	148.00 - 8.00	14	No Ice	1.30
						1/2" Ice	1.30
						1" Ice	1.30
						2" Ice	1.30
						4" Ice	1.30
HB114-1-0813U4-M5J(1 1/4")	A	No	Inside Pole	156.00 - 8.00	3	No Ice	1.20
						1/2" Ice	1.20
						1" Ice	1.20
						2" Ice	1.20
						4" Ice	1.20
LDF7-50A(1-5/8")	A	No	Inside Pole	141.00 - 8.00	12	No Ice	0.82
						1/2" Ice	0.82
						1" Ice	0.82
						2" Ice	0.82
						4" Ice	0.82
LDF4-50A(1/2")	A	No	CaAa (Out Of Face)	22.00 - 8.00	1	No Ice	0.15
						1/2" Ice	0.84
						1" Ice	2.14
						2" Ice	6.58
						4" Ice	22.78
LDF4-50A(1/2")	B	No	Inside Pole	108.00 - 8.00	1	No Ice	0.15

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C <sub>A</sub> A <sub>A</sub> ft <sup>2</sup> /ft	Weight plf
						1/2" Ice	0.00	0.15
						1" Ice	0.00	0.15
						2" Ice	0.00	0.15
						4" Ice	0.00	0.15
LDF4-50A(1/2")	B	No	Inside Pole	160.00 - 8.00	1	No Ice	0.00	0.15
						1/2" Ice	0.00	0.15
						1" Ice	0.00	0.15
						2" Ice	0.00	0.15
						4" Ice	0.00	0.15
***								
FB-L98B-002-75000(3/8")	C	No	Inside Pole	118.00 - 8.00	1	No Ice	0.00	0.06
						1/2" Ice	0.00	0.06
						1" Ice	0.00	0.06
						2" Ice	0.00	0.06
						4" Ice	0.00	0.06
WR-VG86ST-BRDA(7/8)	C	No	Inside Pole	118.00 - 8.00	2	No Ice	0.00	0.68
						1/2" Ice	0.00	0.68
						1" Ice	0.00	0.68
						2" Ice	0.00	0.68
						4" Ice	0.00	0.68
LCF158-50A(1-5/8")	C	No	Inside Pole	118.00 - 8.00	12	No Ice	0.00	0.80
						1/2" Ice	0.00	0.80
						1" Ice	0.00	0.80
						2" Ice	0.00	0.80
						4" Ice	0.00	0.80
***								
Safety Line 3/8	C	No	CaAa (Out Of Face)	163.00 - 8.00	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
5/8" Step Bolts	C	No	CaAa (Out Of Face)	163.00 - 8.00	1	No Ice	0.04	1.00
						1/2" Ice	0.14	1.56
						1" Ice	0.24	2.73
						2" Ice	0.44	6.91
						4" Ice	0.84	22.58
***								

### Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A <sub>R</sub> ft <sup>2</sup>	A <sub>F</sub> ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> In Face ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Out Face ft <sup>2</sup>	Weight K
L1	163.00-121.58	A	0.000	0.000	0.000	0.000	0.80
		B	0.000	0.000	0.000	0.000	0.01
		C	0.000	0.000	0.000	3.279	0.05
L2	121.58-84.66	A	0.000	0.000	0.000	0.000	1.17
		B	0.000	0.000	0.000	0.000	0.01
		C	0.000	0.000	0.000	2.922	0.41
L3	84.66-42.20	A	0.000	0.000	0.000	0.000	1.34
		B	0.000	0.000	0.000	0.000	0.01
		C	0.000	0.000	0.000	3.362	0.52
L4	42.20-0.00	A	0.000	0.000	0.000	0.882	1.08
		B	0.000	0.000	0.000	0.000	0.01
		C	0.000	0.000	0.000	2.707	0.42

### Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A <sub>R</sub> ft <sup>2</sup>	A <sub>F</sub> ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> In Face ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Out Face ft <sup>2</sup>	Weight K
L1	163.00-121.58	A	0.893	0.000	0.000	0.000	0.000	0.80
		B		0.000	0.000	0.000	0.000	0.01



Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A <sub>R</sub> ft <sup>2</sup>	A <sub>F</sub> ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> In Face ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Out Face ft <sup>2</sup>	Weight K
L2	121.58-84.66	C	0.860	0.000	0.000	0.000	18.081	0.15
		A		0.000	0.000	0.000	0.000	1.17
		B		0.000	0.000	0.000	0.000	0.01
L3	84.66-42.20	C	0.811	0.000	0.000	0.000	16.115	0.50
		A		0.000	0.000	0.000	0.000	1.34
		B		0.000	0.000	0.000	0.000	0.01
L4	42.20-0.00	C	0.750	0.000	0.000	0.000	17.963	0.62
		A		0.000	0.000	0.000	3.153	1.11
		B		0.000	0.000	0.000	0.000	0.01
		C		0.000	0.000	0.000	13.804	0.49

### Feed Line Center of Pressure

Section	Elevation ft	CP <sub>x</sub> in	CP <sub>z</sub> in	CP <sub>x</sub> Ice in	CP <sub>z</sub> Ice in
L1	163.00-121.58	-0.1003	0.0579	-0.4792	0.2767
L2	121.58-84.66	-0.1007	0.0582	-0.4909	0.2834
L3	84.66-42.20	-0.1010	0.0583	-0.4862	0.2807
L4	42.20-0.00	-0.0809	0.0153	-0.3784	0.1153

### Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustmen t	Placement ft	C <sub>A</sub> A <sub>A</sub> Front ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Side ft <sup>2</sup>	Weight K	
***									
Side Arm Mount [SO 301-1]	A	From Leg	1.00 0.00 0.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.00 1.39 1.78 2.56 4.12 5.06	0.90 1.42 1.94 2.98 5.06	0.02 0.03 0.04 0.06 0.10
SC229-SFXLDF	A	From Leg	2.00 0.00 11.00	0.0000	160.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.95 7.97 10.00 14.12 21.45	5.95 7.97 10.00 14.12 21.45	0.03 0.07 0.13 0.28 0.74
***156ft***									
APXVSP18-C-A20 w/ Mount Pipe	A	From Leg	4.00 0.00 2.00	0.0000	156.00	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
APXVSP18-C-A20 w/ Mount Pipe	B	From Leg	4.00 0.00 2.00	20.0000	156.00	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
APXVSP18-C-A20 w/ Mount Pipe	C	From Leg	4.00 0.00 2.00	20.0000	156.00	No Ice 1/2" Ice 1" Ice 2" 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

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>A</sub> A <sub>A</sub> Front	C <sub>A</sub> A <sub>A</sub> Side	Weight	
			Horz Lateral	Vert						
			ft	ft		ft	ft <sup>2</sup>	ft <sup>2</sup>	K	
800MHZ RRH	A	From Leg	4.00	0.00	0.0000	156.00	4" Ice			
							No Ice	2.49	2.07	0.05
							1/2"	2.71	2.27	0.07
							Ice	2.93	2.48	0.10
							1" Ice	3.41	2.93	0.16
							2" Ice	4.46	3.93	0.32
800MHZ RRH	B	From Leg	4.00	0.00	20.0000	156.00	4" Ice			
							No Ice	2.49	2.07	0.05
							1/2"	2.71	2.27	0.07
							Ice	2.93	2.48	0.10
							1" Ice	3.41	2.93	0.16
							2" Ice	4.46	3.93	0.32
800MHZ RRH	C	From Leg	4.00	0.00	20.0000	156.00	4" Ice			
							No Ice	2.49	2.07	0.05
							1/2"	2.71	2.27	0.07
							Ice	2.93	2.48	0.10
							1" Ice	3.41	2.93	0.16
							2" Ice	4.46	3.93	0.32
(3) ACU-A20-N	A	From Leg	4.00	0.00	0.0000	156.00	4" Ice			
							No Ice	0.08	0.14	0.00
							1/2"	0.12	0.19	0.00
							Ice	0.17	0.25	0.00
							1" Ice	0.30	0.40	0.01
							2" Ice	0.67	0.80	0.04
(3) ACU-A20-N	B	From Leg	4.00	0.00	20.0000	156.00	4" Ice			
							No Ice	0.08	0.14	0.00
							1/2"	0.12	0.19	0.00
							Ice	0.17	0.25	0.00
							1" Ice	0.30	0.40	0.01
							2" Ice	0.67	0.80	0.04
(3) ACU-A20-N	C	From Leg	4.00	0.00	20.0000	156.00	4" Ice			
							No Ice	0.08	0.14	0.00
							1/2"	0.12	0.19	0.00
							Ice	0.17	0.25	0.00
							1" Ice	0.30	0.40	0.01
							2" Ice	0.67	0.80	0.04
1900MHz RRH (65MHz)	A	From Leg	4.00	0.00	0.0000	156.00	4" Ice			
							No Ice	2.71	2.61	0.06
							1/2"	2.95	2.84	0.08
							Ice	3.20	3.09	0.11
							1" Ice	3.72	3.61	0.17
							2" Ice	4.86	4.74	0.35
1900MHz RRH (65MHz)	B	From Leg	4.00	0.00	20.0000	156.00	4" Ice			
							No Ice	2.71	2.61	0.06
							1/2"	2.95	2.84	0.08
							Ice	3.20	3.09	0.11
							1" Ice	3.72	3.61	0.17
							2" Ice	4.86	4.74	0.35
1900MHz RRH (65MHz)	C	From Leg	4.00	0.00	20.0000	156.00	4" Ice			
							No Ice	2.71	2.61	0.06
							1/2"	2.95	2.84	0.08
							Ice	3.20	3.09	0.11
							1" Ice	3.72	3.61	0.17
							2" Ice	4.86	4.74	0.35
800 EXTERNAL NOTCH FILTER	A	From Leg	4.00	0.00	0.0000	156.00	4" Ice			
							No Ice	0.77	0.37	0.01
							1/2"	0.89	0.46	0.02
							Ice	1.02	0.56	0.02
							1" Ice	1.30	0.79	0.04
							2" Ice	1.97	1.34	0.11
800 EXTERNAL NOTCH FILTER	B	From Leg	4.00	0.00	20.0000	156.00	4" Ice			
							No Ice	0.77	0.37	0.01
							1/2"	0.89	0.46	0.02
							Ice	1.02	0.56	0.02
							1" Ice	1.30	0.79	0.04

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>A</sub> A <sub>Front</sub>	C <sub>A</sub> A <sub>Side</sub>	Weight	
			Horz	Lateral						ft
							ft <sup>2</sup>	ft <sup>2</sup>	K	
800 EXTERNAL NOTCH FILTER	C	From Leg	4.00	0.00	20.0000	156.00	2" Ice	1.97	1.34	0.11
							4" Ice			
							No Ice	0.77	0.37	0.01
							1/2"	0.89	0.46	0.02
							Ice	1.02	0.56	0.02
							1" Ice	1.30	0.79	0.04
Platform Mount [LP 602-1]	A	None	0.0000	156.00	0.0000	156.00	2" Ice	1.97	1.34	0.11
							4" Ice			
							No Ice	32.03	32.03	1.34
							1/2"	38.71	38.71	1.80
							Ice	45.39	45.39	2.26
							1" Ice	58.75	58.75	3.17
***148ft Verizon*** (2) LPA-80080/6CF w/ Mount Pipe	A	From Leg	4.00	0.00	0.0000	148.00	2" Ice	85.47	85.47	5.00
							4" Ice			
							No Ice	4.56	10.73	0.05
							1/2"	5.11	11.99	0.11
							Ice	5.61	12.97	0.19
							1" Ice	6.65	14.98	0.36
(3) LPA-80080/6CF w/ Mount Pipe	B	From Leg	4.00	0.00	0.0000	148.00	2" Ice	8.83	19.22	0.86
							4" Ice			
							No Ice	4.56	10.73	0.05
							1/2"	5.11	11.99	0.11
							Ice	5.61	12.97	0.19
							1" Ice	6.65	14.98	0.36
LPA-80080/6CF w/ Mount Pipe	C	From Leg	4.00	0.00	0.0000	148.00	2" Ice	8.83	19.22	0.86
							4" Ice			
							No Ice	4.56	10.73	0.05
							1/2"	5.11	11.99	0.11
							Ice	5.61	12.97	0.19
							1" Ice	6.65	14.98	0.36
(2) FD9R6004/2C-3L	A	From Leg	4.00	0.00	0.0000	148.00	2" Ice	1.28	0.74	0.06
							4" Ice			
							No Ice	0.37	0.08	0.00
							1/2"	0.45	0.14	0.01
							Ice	0.54	0.20	0.01
							1" Ice	0.75	0.34	0.02
(2) FD9R6004/2C-3L	B	From Leg	4.00	0.00	0.0000	148.00	2" Ice	1.28	0.74	0.06
							4" Ice			
							No Ice	0.37	0.08	0.00
							1/2"	0.45	0.14	0.01
							Ice	0.54	0.20	0.01
							1" Ice	0.75	0.34	0.02
(2) FD9R6004/2C-3L	C	From Leg	4.00	0.00	0.0000	148.00	2" Ice	1.28	0.74	0.06
							4" Ice			
							No Ice	0.37	0.08	0.00
							1/2"	0.45	0.14	0.01
							Ice	0.54	0.20	0.01
							1" Ice	0.75	0.34	0.02
(2) SBNHH-1D65B w/ Mount Pipe	A	From Leg	4.00	0.00	0.0000	148.00	2" Ice	13.86	15.04	0.90
							4" Ice			
							No Ice	8.64	7.07	0.07
							1/2"	9.29	8.26	0.13
							Ice	9.92	9.17	0.21
							1" Ice	11.19	11.01	0.39
SBNHH-1D65B w/ Mount Pipe	B	From Leg	4.00	0.00	0.0000	148.00	2" Ice	13.86	15.04	0.90
							4" Ice			
							No Ice	8.64	7.07	0.07
							1/2"	9.29	8.26	0.13
							Ice	9.92	9.17	0.21
							1" Ice	11.19	11.01	0.39
(3) SBNHH-1D65B w/ Mount Pipe	C	From Leg	4.00	0.00	0.0000	148.00	No Ice	8.64	7.07	0.07
								9.29	8.26	0.13

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment	Placement ft	CA <sub>AA</sub> Front ft <sup>2</sup>	CA <sub>AA</sub> Side ft <sup>2</sup>	Weight K
			2.00			1/2" Ice 11.19	9.17 11.01	0.21 0.39
						1" Ice 13.86	15.04	0.90
						2" Ice		
						4" Ice		
RRH2x60-700	A	From Leg	4.00 0.00 2.00	0.0000	148.00	No Ice 1/2" Ice 4.27 4.60	1.82 2.08 2.36	0.06 0.08 0.11
						1" Ice 5.27	2.96	0.17
						2" Ice 6.72	4.25	0.35
						4" Ice		
RRH2x60-700	B	From Leg	4.00 0.00 2.00	0.0000	148.00	No Ice 1/2" Ice 4.27 4.60	1.82 2.08 2.36	0.06 0.08 0.11
						1" Ice 5.27	2.96	0.17
						2" Ice 6.72	4.25	0.35
						4" Ice		
RRH2x60-700	C	From Leg	4.00 0.00 2.00	0.0000	148.00	No Ice 1/2" Ice 4.27 4.60	1.82 2.08 2.36	0.06 0.08 0.11
						1" Ice 5.27	2.96	0.17
						2" Ice 6.72	4.25	0.35
						4" Ice		
RRH2X60-AWS	A	From Leg	4.00 0.00 2.00	0.0000	148.00	No Ice 1/2" Ice 4.27 4.60	2.16 2.44 2.73	0.06 0.08 0.11
						1" Ice 5.27	3.34	0.18
						2" Ice 6.72	4.66	0.37
						4" Ice		
RRH2X60-AWS	B	From Leg	4.00 0.00 2.00	0.0000	148.00	No Ice 1/2" Ice 4.27 4.60	2.16 2.44 2.73	0.06 0.08 0.11
						1" Ice 5.27	3.34	0.18
						2" Ice 6.72	4.66	0.37
						4" Ice		
RRH2X60-AWS	C	From Leg	4.00 0.00 2.00	0.0000	148.00	No Ice 1/2" Ice 4.27 4.60	2.16 2.44 2.73	0.06 0.08 0.11
						1" Ice 5.27	3.34	0.18
						2" Ice 6.72	4.66	0.37
						4" Ice		
RRH2X60-PCS	A	From Leg	4.00 0.00 2.00	0.0000	148.00	No Ice 1/2" Ice 2.79 3.02	2.01 2.22 2.43	0.06 0.08 0.10
						1" Ice 3.52	2.89	0.16
						2" Ice 4.61	3.92	0.31
						4" Ice		
RRH2X60-PCS	B	From Leg	4.00 0.00 2.00	0.0000	148.00	No Ice 1/2" Ice 2.79 3.02	2.01 2.22 2.43	0.06 0.08 0.10
						1" Ice 3.52	2.89	0.16
						2" Ice 4.61	3.92	0.31
						4" Ice		
RRH2X60-PCS	C	From Leg	4.00 0.00 2.00	0.0000	148.00	No Ice 1/2" Ice 2.79 3.02	2.01 2.22 2.43	0.06 0.08 0.10
						1" Ice 3.52	2.89	0.16
						2" Ice 4.61	3.92	0.31
						4" Ice		
Platform Mount [LP 403-1]	B	None		0.0000	148.00	No Ice 1/2" Ice 24.30 29.75	18.85 24.30 29.75	1.50 1.80 2.09
						1" Ice 40.65	40.65	2.69
						2" Ice 62.45	62.45	3.87
						4" Ice		

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment	Placement  ft	CA <sub>AA</sub> Front	CA <sub>AA</sub> Side	Weight  K	
***141ft***									
(4) DB846G90A-XY w/ Mount Pipe	A	From Leg	4.00 0.00 1.00	0.0000	141.00	No Ice	5.23	7.53	0.04
						1/2"	5.78	8.72	0.10
						Ice	6.30	9.62	0.16
						1" Ice	7.37	11.45	0.32
						2" Ice	9.69	15.60	0.77
(4) DB846G90A-XY w/ Mount Pipe	B	From Leg	4.00 0.00 1.00	0.0000	141.00	No Ice	5.23	7.53	0.04
						1/2"	5.78	8.72	0.10
						Ice	6.30	9.62	0.16
						1" Ice	7.37	11.45	0.32
						2" Ice	9.69	15.60	0.77
(4) DB846G90A-XY w/ Mount Pipe	C	From Leg	4.00 0.00 1.00	0.0000	141.00	No Ice	5.23	7.53	0.04
						1/2"	5.78	8.72	0.10
						Ice	6.30	9.62	0.16
						1" Ice	7.37	11.45	0.32
						2" Ice	9.69	15.60	0.77
Platform Mount [LP 303-1]	A	None		0.0000	141.00	No Ice	14.66	14.66	1.25
						1/2"	18.87	18.87	1.48
						Ice	23.08	23.08	1.71
						1" Ice	31.50	31.50	2.18
						2" Ice	48.34	48.34	3.10
(2) TME-RRUS-11	A	From Leg	1.38 0.59 1.00	23.0000	120.00	No Ice	3.25	1.37	0.05
						1/2"	3.49	1.55	0.07
						Ice	3.74	1.74	0.09
						1" Ice	4.27	2.14	0.15
						2" Ice	5.43	3.04	0.31
(2) TME-RRUS-11	B	From Leg	1.38 0.59 1.00	23.0000	120.00	No Ice	3.25	1.37	0.05
						1/2"	3.49	1.55	0.07
						Ice	3.74	1.74	0.09
						1" Ice	4.27	2.14	0.15
						2" Ice	5.43	3.04	0.31
(2) TME-RRUS-11	C	From Leg	1.38 0.59 1.00	23.0000	120.00	No Ice	3.25	1.37	0.05
						1/2"	3.49	1.55	0.07
						Ice	3.74	1.74	0.09
						1" Ice	4.27	2.14	0.15
						2" Ice	5.43	3.04	0.31
(2) 2" x 4' Mount Pipe	A	From Leg	1.38 0.59 0.00	0.0000	120.00	No Ice	0.79	0.79	0.02
						1/2"	1.03	1.03	0.03
						Ice	1.28	1.28	0.04
						1" Ice	1.81	1.81	0.06
						2" Ice	3.11	3.11	0.16
(2) 2" x 4' Mount Pipe	B	From Leg	1.38 0.59 0.00	0.0000	120.00	No Ice	0.79	0.79	0.02
						1/2"	1.03	1.03	0.03
						Ice	1.28	1.28	0.04
						1" Ice	1.81	1.81	0.06
						2" Ice	3.11	3.11	0.16
(2) 2" x 4' Mount Pipe	C	From Leg	1.38 0.59 0.00	0.0000	120.00	No Ice	0.79	0.79	0.02
						1/2"	1.03	1.03	0.03
						Ice	1.28	1.28	0.04
						1" Ice	1.81	1.81	0.06
						2" Ice	3.11	3.11	0.16
Side Arm Mount [SO 104-3]	B	None		0.0000	120.00	No Ice	3.30	3.30	0.29
						1/2"	4.13	4.13	0.32
						Ice	4.96	4.96	0.46

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment	Placement  ft	C <sub>A</sub> A <sub>A</sub> Front  ft <sup>2</sup>	C <sub>A</sub> A <sub>A</sub> Side  ft <sup>2</sup>	Weight  K	
						1" Ice	6.62	6.62	0.63
						2" Ice	9.94	9.94	0.98
						4" Ice			
***118ft***									
(2) 7770.00 w/ Mount Pipe	A	From Leg	3.68 1.56 1.00	23.0000	118.00	No Ice	6.12	4.25	0.06
						1/2"	6.63	5.01	0.10
						Ice	7.13	5.71	0.16
						1" Ice	8.16	7.16	0.29
						2" Ice	10.36	10.41	0.66
						4" Ice			
(2) 7770.00 w/ Mount Pipe	B	From Leg	3.68 1.56 1.00	23.0000	118.00	No Ice	6.12	4.25	0.06
						1/2"	6.63	5.01	0.10
						Ice	7.13	5.71	0.16
						1" Ice	8.16	7.16	0.29
						2" Ice	10.36	10.41	0.66
						4" Ice			
(2) 7770.00 w/ Mount Pipe	C	From Leg	3.68 1.56 1.00	23.0000	118.00	No Ice	6.12	4.25	0.06
						1/2"	6.63	5.01	0.10
						Ice	7.13	5.71	0.16
						1" Ice	8.16	7.16	0.29
						2" Ice	10.36	10.41	0.66
						4" Ice			
AM-X-CD-16-65-00T-RET w/ Mount Pipe	A	From Leg	3.68 1.56 1.00	23.0000	118.00	No Ice	8.50	6.30	0.07
						1/2"	9.15	7.48	0.14
						Ice	9.77	8.37	0.21
						1" Ice	11.03	10.18	0.38
						2" Ice	13.68	14.02	0.87
						4" Ice			
AM-X-CD-16-65-00T-RET w/ Mount Pipe	B	From Leg	3.68 1.56 1.00	23.0000	118.00	No Ice	8.50	6.30	0.07
						1/2"	9.15	7.48	0.14
						Ice	9.77	8.37	0.21
						1" Ice	11.03	10.18	0.38
						2" Ice	13.68	14.02	0.87
						4" Ice			
AM-X-CD-16-65-00T-RET w/ Mount Pipe	C	From Leg	3.68 1.56 1.00	23.0000	118.00	No Ice	8.50	6.30	0.07
						1/2"	9.15	7.48	0.14
						Ice	9.77	8.37	0.21
						1" Ice	11.03	10.18	0.38
						2" Ice	13.68	14.02	0.87
						4" Ice			
(2) LGP21901	A	From Leg	3.68 1.56 1.00	23.0000	118.00	No Ice	0.27	0.18	0.01
						1/2"	0.34	0.25	0.01
						Ice	0.43	0.32	0.01
						1" Ice	0.62	0.49	0.02
						2" Ice	1.10	0.94	0.07
						4" Ice			
(2) LGP21901	B	From Leg	3.68 1.56 1.00	23.0000	118.00	No Ice	0.27	0.18	0.01
						1/2"	0.34	0.25	0.01
						Ice	0.43	0.32	0.01
						1" Ice	0.62	0.49	0.02
						2" Ice	1.10	0.94	0.07
						4" Ice			
(2) LGP21901	C	From Leg	3.68 1.56 1.00	23.0000	118.00	No Ice	0.27	0.18	0.01
						1/2"	0.34	0.25	0.01
						Ice	0.43	0.32	0.01
						1" Ice	0.62	0.49	0.02
						2" Ice	1.10	0.94	0.07
						4" Ice			
RRUS 11 B12	A	From Leg	3.68 1.56 1.00	23.0000	118.00	No Ice	3.31	1.36	0.05
						1/2"	3.55	1.54	0.07
						Ice	3.80	1.73	0.10
						1" Ice	4.33	2.13	0.15
						2" Ice	5.50	3.04	0.31
						4" Ice			
RRUS 11 B12	B	From Leg	3.68	23.0000	118.00	No Ice	3.31	1.36	0.05

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment t °	Placement ft	CA <sub>A</sub> Front ft <sup>2</sup>	CA <sub>A</sub> Side ft <sup>2</sup>	Weight K	
			1.56			1/2"	3.55	1.54	0.07
			1.00			Ice	3.80	1.73	0.10
						1" Ice	4.33	2.13	0.15
						2" Ice	5.50	3.04	0.31
						4" Ice			
RRUS 11 B12	C	From Leg	3.68	23.0000	118.00	No Ice	3.31	1.36	0.05
			1.56			1/2"	3.55	1.54	0.07
			1.00			Ice	3.80	1.73	0.10
						1" Ice	4.33	2.13	0.15
						2" Ice	5.50	3.04	0.31
						4" Ice			
(2) LGP21401	A	From Leg	3.68	23.0000	118.00	No Ice	1.29	0.23	0.01
			1.56			1/2"	1.45	0.31	0.02
			1.00			Ice	1.61	0.40	0.03
						1" Ice	1.97	0.61	0.05
						2" Ice	2.79	1.12	0.14
						4" Ice			
(2) LGP21401	B	From Leg	3.68	23.0000	118.00	No Ice	1.29	0.23	0.01
			1.56			1/2"	1.45	0.31	0.02
			1.00			Ice	1.61	0.40	0.03
						1" Ice	1.97	0.61	0.05
						2" Ice	2.79	1.12	0.14
						4" Ice			
(2) LGP21401	C	From Leg	3.68	23.0000	118.00	No Ice	1.29	0.23	0.01
			1.56			1/2"	1.45	0.31	0.02
			1.00			Ice	1.61	0.40	0.03
						1" Ice	1.97	0.61	0.05
						2" Ice	2.79	1.12	0.14
						4" Ice			
DC6-48-60-18-8F	B	From Leg	3.68	23.0000	118.00	No Ice	2.57	2.57	0.02
			1.56			1/2"	2.80	2.80	0.04
			1.00			Ice	3.04	3.04	0.07
						1" Ice	3.54	3.54	0.13
						2" Ice	4.66	4.66	0.30
						4" Ice			
2" x 6' Mount Pipe	A	From Leg	3.68	0.0000	118.00	No Ice	1.20	1.20	0.03
			1.56			1/2"	1.80	1.80	0.04
			0.00			Ice	2.17	2.17	0.05
						1" Ice	2.93	2.93	0.09
						2" Ice	4.57	4.57	0.23
						4" Ice			
2" x 6' Mount Pipe	B	From Leg	3.68	0.0000	118.00	No Ice	1.20	1.20	0.03
			1.56			1/2"	1.80	1.80	0.04
			0.00			Ice	2.17	2.17	0.05
						1" Ice	2.93	2.93	0.09
						2" Ice	4.57	4.57	0.23
						4" Ice			
2" x 6' Mount Pipe	C	From Leg	3.68	0.0000	118.00	No Ice	1.20	1.20	0.03
			1.56			1/2"	1.80	1.80	0.04
			0.00			Ice	2.17	2.17	0.05
						1" Ice	2.93	2.93	0.09
						2" Ice	4.57	4.57	0.23
						4" Ice			
Platform Mount [LP 403-1]	B	None		0.0000	118.00	No Ice	18.85	18.85	1.50
						1/2"	24.30	24.30	1.80
						Ice	29.75	29.75	2.09
						1" Ice	40.65	40.65	2.69
						2" Ice	62.45	62.45	3.87
						4" Ice			
***108ft*** ANT150D6-9	A	From Leg	2.00	0.0000	108.00	No Ice	4.00	4.00	0.03
			0.00			1/2"	6.03	6.03	0.06
			2.00			Ice	8.07	8.07	0.10
						1" Ice	12.20	12.20	0.23
						2" Ice	20.59	20.59	0.63

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C <sub>A</sub> A <sub>A</sub> Front	C <sub>A</sub> A <sub>A</sub> Side	Weight
			Horz Lateral	Vert					
			ft	ft	°	ft	ft <sup>2</sup>	ft <sup>2</sup>	K
							4" Ice		
***22ft*** KS24019-L112A	C	From Leg	2.00 0.00 2.00		0.0000	22.00	No Ice 0.16 1/2" 0.22 Ice 0.30 1" Ice 0.48 2" Ice 0.95 4" Ice	0.16 0.22 0.30 0.48 0.95	0.01 0.01 0.01 0.02 0.06
Side Arm Mount [SO 701-1]	C	From Leg	1.00 0.00 0.00		0.0000	22.00	No Ice 0.85 1/2" 1.14 Ice 1.43 1" Ice 2.01 2" Ice 3.17 4" Ice	1.67 2.34 3.01 4.35 7.03	0.07 0.08 0.09 0.12 0.18
***									

### Load Combinations

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



### Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	163 - 121.58	Pole	Max Tension	11	0.00	-0.00	-0.00
			Max. Compression	14	-19.16	0.41	0.41
			Max. Mx	11	-11.05	357.59	-5.49
			Max. My	2	-11.05	-5.29	358.33
			Max. Vy	11	-16.81	357.59	-5.49
			Max. Vx	2	-16.84	-5.29	358.33
			Max. Torque	13			-1.91
L2	121.58 - 84.663	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-35.29	0.38	0.38
			Max. Mx	11	-22.72	1161.94	-14.92
			Max. My	2	-22.72	-14.75	1163.70
			Max. Vy	11	-25.23	1161.94	-14.92
			Max. Vx	2	-25.26	-14.75	1163.70
			Max. Torque	13			-2.31
L3	84.663 - 42.2	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-50.92	0.66	0.22
			Max. Mx	11	-36.02	2294.29	-25.85
			Max. My	2	-36.01	-25.56	2297.09
			Max. Vy	11	-29.16	2294.29	-25.85
			Max. Vx	8	29.19	26.27	-2296.96
			Max. Torque	13			-2.29
L4	42.2 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-73.78	1.24	-0.05
			Max. Mx	11	-56.06	3848.30	-38.66
			Max. My	8	-56.06	39.22	-3852.47
			Max. Vy	11	-33.16	3848.30	-38.66
			Max. Vx	8	33.20	39.22	-3852.47
			Max. Torque	13			-2.25

### Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	14	73.78	0.00	0.00
	Max. H <sub>x</sub>	11	56.07	33.13	-0.24
	Max. H <sub>z</sub>	2	56.07	-0.24	33.17
	Max. M <sub>x</sub>	2	3852.24	-0.24	33.17
	Max. M <sub>z</sub>	5	3846.96	-33.13	0.24
	Max. Torsion	7	2.03	-16.36	-28.61
	Min. Vert	1	56.07	0.00	0.00
	Min. H <sub>x</sub>	5	56.07	-33.13	0.24
	Min. H <sub>z</sub>	8	56.07	0.24	-33.17
	Min. M <sub>x</sub>	8	-3852.47	0.24	-33.17
	Min. M <sub>z</sub>	11	-3848.30	33.13	-0.24
	Min. Torsion	13	-2.04	16.36	28.61

### Tower Mast Reaction Summary

Load Combination	Vertical K	Shear <sub>x</sub> K	Shear <sub>z</sub> K	Overturning Moment, M <sub>x</sub> kip-ft	Overturning Moment, M <sub>z</sub> kip-ft	Torque kip-ft
Dead Only	56.07	0.00	0.00	0.11	0.66	0.00
Dead+Wind 0 deg - No Ice	56.07	0.24	-33.17	-3852.24	-37.87	1.81
Dead+Wind 30 deg - No Ice	56.07	16.78	-28.85	-3355.38	-1956.51	1.07

Load Combination	Vertical	Shear <sub>x</sub>	Shear <sub>z</sub>	Overturning Moment, M <sub>x</sub>	Overturning Moment, M <sub>z</sub>	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Dead+Wind 60 deg - No Ice	56.07	28.82	-16.80	-1959.44	-3350.72	0.04
Dead+Wind 90 deg - No Ice	56.07	33.13	-0.24	-38.43	-3846.96	-0.99
Dead+Wind 120 deg - No Ice	56.07	28.57	16.38	1892.93	-3312.22	-1.75
Dead+Wind 150 deg - No Ice	56.07	16.36	28.61	3317.11	-1889.77	-2.03
Dead+Wind 180 deg - No Ice	56.07	-0.24	33.17	3852.47	39.23	-1.77
Dead+Wind 210 deg - No Ice	56.07	-16.78	28.85	3355.60	1957.86	-1.05
Dead+Wind 240 deg - No Ice	56.07	-28.82	16.80	1959.66	3352.07	-0.06
Dead+Wind 270 deg - No Ice	56.07	-33.13	0.24	38.66	3848.30	0.95
Dead+Wind 300 deg - No Ice	56.07	-28.57	-16.38	-1892.69	3313.57	1.73
Dead+Wind 330 deg - No Ice	56.07	-16.36	-28.61	-3316.87	1891.12	2.04
Dead+Ice+Temp	73.78	0.00	0.00	0.05	1.24	0.00
Dead+Wind 0	73.78	0.03	-5.02	-599.33	-3.96	0.15
deg+Ice+Temp						
Dead+Wind 30	73.78	2.54	-4.36	-521.65	-302.81	0.02
deg+Ice+Temp						
Dead+Wind 60	73.78	4.36	-2.54	-304.18	-520.19	-0.11
deg+Ice+Temp						
Dead+Wind 90	73.78	5.02	-0.03	-5.20	-597.83	-0.22
deg+Ice+Temp						
Dead+Wind 120	73.78	4.33	2.48	295.19	-514.95	-0.26
deg+Ice+Temp						
Dead+Wind 150	73.78	2.48	4.33	516.49	-293.74	-0.24
deg+Ice+Temp						
Dead+Wind 180	73.78	-0.03	5.02	599.41	6.52	-0.15
deg+Ice+Temp						
Dead+Wind 210	73.78	-2.54	4.36	521.73	305.38	-0.02
deg+Ice+Temp						
Dead+Wind 240	73.78	-4.36	2.54	304.26	522.75	0.11
deg+Ice+Temp						
Dead+Wind 270	73.78	-5.02	0.03	5.28	600.40	0.22
deg+Ice+Temp						
Dead+Wind 300	73.78	-4.33	-2.48	-295.10	517.51	0.26
deg+Ice+Temp						
Dead+Wind 330	73.78	-2.48	-4.33	-516.41	296.30	0.24
deg+Ice+Temp						
Dead+Wind 0 deg - Service	56.07	0.10	-12.96	-1505.17	-14.39	0.70
Dead+Wind 30 deg - Service	56.07	6.55	-11.27	-1311.03	-764.09	0.42
Dead+Wind 60 deg - Service	56.07	11.26	-6.56	-765.57	-1308.87	0.02
Dead+Wind 90 deg - Service	56.07	12.94	-0.10	-14.95	-1502.76	-0.38
Dead+Wind 120 deg - Service	56.07	11.16	6.40	739.71	-1293.81	-0.68
Dead+Wind 150 deg - Service	56.07	6.39	11.17	1296.20	-738.00	-0.80
Dead+Wind 180 deg - Service	56.07	-0.10	12.96	1505.40	15.74	-0.70
Dead+Wind 210 deg - Service	56.07	-6.55	11.27	1311.26	765.43	-0.42
Dead+Wind 240 deg - Service	56.07	-11.26	6.56	765.80	1310.22	-0.02
Dead+Wind 270 deg - Service	56.07	-12.94	0.10	15.18	1504.11	0.38
Dead+Wind 300 deg - Service	56.07	-11.16	-6.40	-739.48	1295.16	0.68
Dead+Wind 330 deg - Service	56.07	-6.39	-11.17	-1295.97	739.35	0.80

### Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
1	0.00	-56.07	0.00	0.00	56.07	0.00	0.000%
2	0.24	-56.07	-33.17	-0.24	56.07	33.17	0.000%
3	16.78	-56.07	-28.85	-16.78	56.07	28.85	0.000%
4	28.82	-56.07	-16.80	-28.82	56.07	16.80	0.000%
5	33.13	-56.07	-0.24	-33.13	56.07	0.24	0.000%

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
6	28.57	-56.07	16.38	-28.57	56.07	-16.38	0.000%
7	16.36	-56.07	28.61	-16.36	56.07	-28.61	0.000%
8	-0.24	-56.07	33.17	0.24	56.07	-33.17	0.000%
9	-16.78	-56.07	28.85	16.78	56.07	-28.85	0.000%
10	-28.82	-56.07	16.80	28.82	56.07	-16.80	0.000%
11	-33.13	-56.07	0.24	33.13	56.07	-0.24	0.000%
12	-28.57	-56.07	-16.38	28.57	56.07	16.38	0.000%
13	-16.36	-56.07	-28.61	16.36	56.07	28.61	0.000%
14	0.00	-73.78	0.00	0.00	73.78	0.00	0.000%
15	0.03	-73.78	-5.02	-0.03	73.78	5.02	0.000%
16	2.54	-73.78	-4.36	-2.54	73.78	4.36	0.000%
17	4.36	-73.78	-2.54	-4.36	73.78	2.54	0.000%
18	5.02	-73.78	-0.03	-5.02	73.78	0.03	0.000%
19	4.33	-73.78	2.48	-4.33	73.78	-2.48	0.000%
20	2.48	-73.78	4.33	-2.48	73.78	-4.33	0.000%
21	-0.03	-73.78	5.02	0.03	73.78	-5.02	0.000%
22	-2.54	-73.78	4.36	2.54	73.78	-4.36	0.000%
23	-4.36	-73.78	2.54	4.36	73.78	-2.54	0.000%
24	-5.02	-73.78	0.03	5.02	73.78	-0.03	0.000%
25	-4.33	-73.78	-2.48	4.33	73.78	2.48	0.000%
26	-2.48	-73.78	-4.33	2.48	73.78	4.33	0.000%
27	0.10	-56.07	-12.96	-0.10	56.07	12.96	0.000%
28	6.55	-56.07	-11.27	-6.55	56.07	11.27	0.000%
29	11.26	-56.07	-6.56	-11.26	56.07	6.56	0.000%
30	12.94	-56.07	-0.10	-12.94	56.07	0.10	0.000%
31	11.16	-56.07	6.40	-11.16	56.07	-6.40	0.000%
32	6.39	-56.07	11.17	-6.39	56.07	-11.17	0.000%
33	-0.10	-56.07	12.96	0.10	56.07	-12.96	0.000%
34	-6.55	-56.07	11.27	6.55	56.07	-11.27	0.000%
35	-11.26	-56.07	6.56	11.26	56.07	-6.56	0.000%
36	-12.94	-56.07	0.10	12.94	56.07	-0.10	0.000%
37	-11.16	-56.07	-6.40	11.16	56.07	6.40	0.000%
38	-6.39	-56.07	-11.17	6.39	56.07	11.17	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	0.00032992
3	Yes	5	0.00000001	0.00007564
4	Yes	5	0.00000001	0.00007333
5	Yes	4	0.00000001	0.00021468
6	Yes	5	0.00000001	0.00006617
7	Yes	5	0.00000001	0.00007351
8	Yes	4	0.00000001	0.00019063
9	Yes	5	0.00000001	0.00007162
10	Yes	5	0.00000001	0.00007367
11	Yes	4	0.00000001	0.00008805
12	Yes	5	0.00000001	0.00007283
13	Yes	5	0.00000001	0.00006575
14	Yes	4	0.00000001	0.00000001
15	Yes	4	0.00000001	0.00059017
16	Yes	4	0.00000001	0.00061268
17	Yes	4	0.00000001	0.00061208
18	Yes	4	0.00000001	0.00058821
19	Yes	4	0.00000001	0.00059993
20	Yes	4	0.00000001	0.00060074
21	Yes	4	0.00000001	0.00058919
22	Yes	4	0.00000001	0.00061323
23	Yes	4	0.00000001	0.00061361
24	Yes	4	0.00000001	0.00059071
25	Yes	4	0.00000001	0.00060332
26	Yes	4	0.00000001	0.00060271
27	Yes	4	0.00000001	0.00006180
28	Yes	4	0.00000001	0.00025027
29	Yes	4	0.00000001	0.00023461
30	Yes	4	0.00000001	0.00004326
31	Yes	4	0.00000001	0.00020333
32	Yes	4	0.00000001	0.00025032
33	Yes	4	0.00000001	0.00005261
34	Yes	4	0.00000001	0.00022452
35	Yes	4	0.00000001	0.00023682
36	Yes	4	0.00000001	0.00003631
37	Yes	4	0.00000001	0.00024548
38	Yes	4	0.00000001	0.00020181

### Compression Checks

### Pole Design Data

Section No.	Elevation ft	Size	L ft	L <sub>u</sub> ft	K/lr	F <sub>a</sub> ksi	A in <sup>2</sup>	Actual P K	Allow. P <sub>a</sub> K	Ratio $\frac{P}{P_a}$
L1	163 - 121.58 (1)	TP42.37x34.28x0.3125	41.42	0.00	0.0	39.000	40.5858	-11.03	1582.84	0.007
L2	121.58 - 84.663 (2)	TP48.83x40.6057x0.375	42.75	0.00	0.0	39.000	56.1469	-22.71	2189.73	0.010
L3	84.663 - 42.2 (3)	TP56.25x46.7974x0.4375	49.13	0.00	0.0	39.000	75.4767	-36.01	2943.59	0.012
L4	42.2 - 0 (4)	TP63.5x53.916x0.5	49.78	0.00	0.0	39.000	99.9810	-56.06	3899.26	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	163 - 121.58 (1)	TP42.37x34.28x0.3125	362.85	10.623	39.000	0.272	0.00	0.000	39.000	0.000
L2	121.58 - 84.663 (2)	TP48.83x40.6057x0.375	1176.1 5	21.597	39.000	0.554	0.00	0.000	39.000	0.000
L3	84.663 - 42.2 (3)	TP56.25x46.7974x0.4375	2318.8 2	27.493	39.000	0.705	0.00	0.000	39.000	0.000
L4	42.2 - 0 (4)	TP63.5x53.916x0.5	3885.0 1	29.997	39.000	0.769	0.00	0.000	39.000	0.000

### Pole Shear Design Data

Section No.	Elevation ft	Size	Actual $V$ K	Actual $f_v$ ksi	Allow. $F_v$ ksi	Ratio $\frac{f_v}{F_v}$	Actual $T$ kip-ft	Actual $f_{vt}$ ksi	Allow. $F_{vt}$ ksi	Ratio $\frac{f_{vt}}{F_{vt}}$
L1	163 - 121.58 (1)	TP42.37x34.28x0.3125	17.05	0.420	26.000	0.032	0.95	0.014	26.000	0.001
L2	121.58 - 84.663 (2)	TP48.83x40.6057x0.375	25.48	0.454	26.000	0.035	1.19	0.011	26.000	0.000
L3	84.663 - 42.2 (3)	TP56.25x46.7974x0.4375	29.40	0.390	26.000	0.030	1.17	0.007	26.000	0.000
L4	42.2 - 0 (4)	TP63.5x53.916x0.5	33.40	0.334	26.000	0.026	1.06	0.004	26.000	0.000

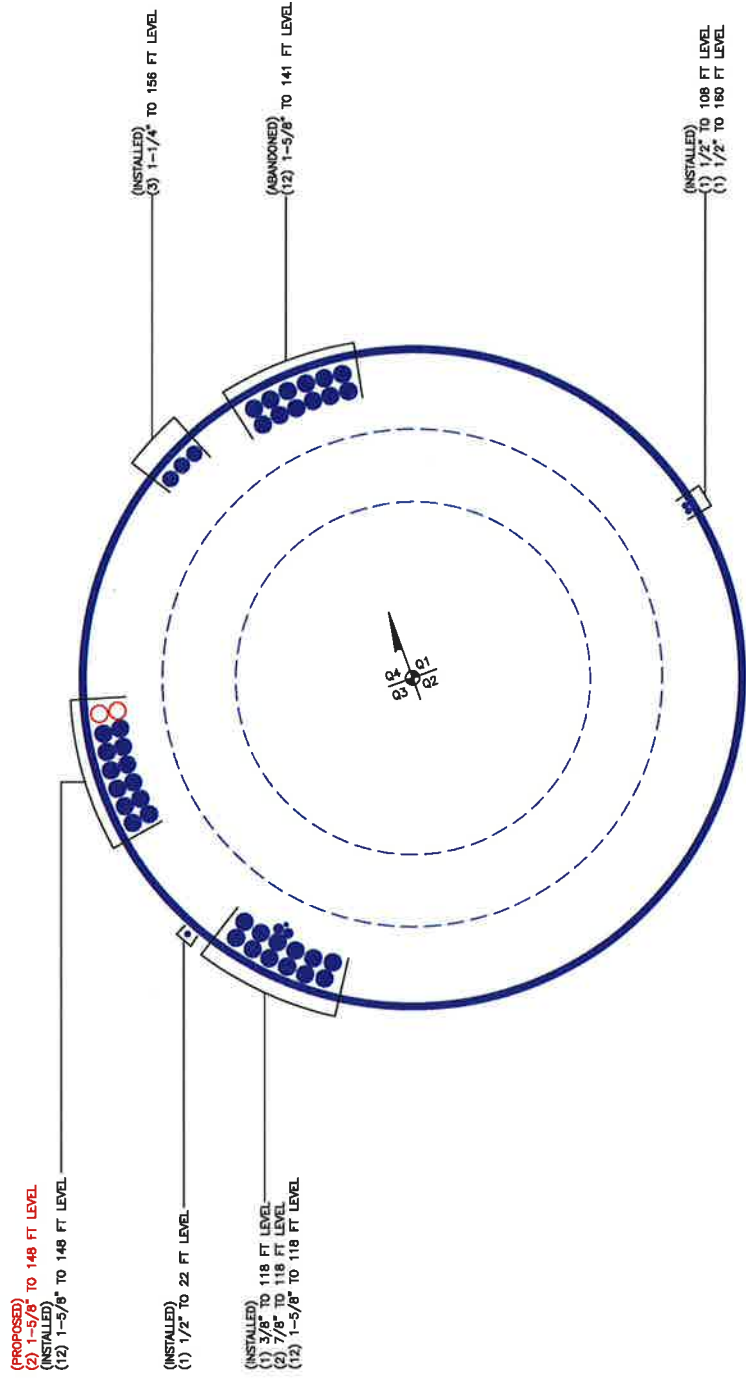
### Pole Interaction Design Data

Section No.	Elevation ft	Ratio $P$ $P_a$	Ratio $f_{bx}$ $F_{bx}$	Ratio $f_{by}$ $F_{by}$	Ratio $f_v$ $F_v$	Ratio $f_{vt}$ $F_{vt}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	163 - 121.58 (1)	0.007	0.272	0.000	0.032	0.001	0.280	1.333	H1-3+VT ✓
L2	121.58 - 84.663 (2)	0.010	0.554	0.000	0.035	0.000	0.564	1.333	H1-3+VT ✓
L3	84.663 - 42.2 (3)	0.012	0.705	0.000	0.030	0.000	0.717	1.333	H1-3+VT ✓
L4	42.2 - 0 (4)	0.014	0.769	0.000	0.026	0.000	0.784	1.333	H1-3+VT ✓

### Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	$P$ K	$SF \cdot P_{allow}$ K	% Capacity	Pass Fail	
L1	163 - 121.58	Pole	TP42.37x34.28x0.3125	1	-11.03	2109.93	21.0	Pass	
L2	121.58 - 84.663	Pole	TP48.83x40.6057x0.375	2	-22.71	2918.91	42.3	Pass	
L3	84.663 - 42.2	Pole	TP56.25x46.7974x0.4375	3	-36.01	3923.81	53.8	Pass	
L4	42.2 - 0	Pole	TP63.5x53.916x0.5	4	-56.06	5197.71	58.8	Pass	
							Summary		
							Pole (L4)	58.8	Pass
							RATING =	58.8	Pass

**APPENDIX B**  
**BASE LEVEL DRAWING**



BUSINESS UNIT: 876379 TOWER ID: C\_BASELEVEL

**APPENDIX C**  
**ADDITIONAL CALCULATIONS**



# Stiffened or Unstiffened, UngROUTED, Circular Base Plate - Any Rod Material

## TIA Rev F

### Site Data

BU#:	876379
Site Name:	N.WOODBURYWOLFF P.
App #:	320737 Rev. 1
Pole Manufacturer:	Other

Reactions		
Moment:	3885	ft-kips
Axial:	56	kips
Shear:	33	kips

### Anchor Rod Data

Qty:	22	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	73	in

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

### Anchor Rod Results

Maximum Rod Tension:	113.6 Kips
Allowable Tension:	195.0 Kips
Anchor Rod Stress Ratio:	58.3% <b>Pass</b>

<b>Rigid</b>
Service ASD
Fty*ASIF

### Plate Data

Diam:	79	in
Thick:	2.5	in
Grade:	60	ksi
Single-Rod B-eff:	9.16	in

### Base Plate Results

Base Plate Stress:	35.8 ksi	Flexural Check
Allowable Plate Stress:	60.0 ksi	
Base Plate Stress Ratio:	59.7% <b>Pass</b>	

<b>Rigid</b>
Service ASD
0.75*Fy*ASIF
Y.L. Length:
36.01

### Stiffener Data (Welding at both sides)

Config:	0	*
Weld Type:	Both	
Groove Depth:	0.25	in **
Groove Angle:	45	degrees
Fillet H. Weld:	0.3125	in
Fillet V. Weld:	0.3125	in
Width:	5	in
Height:	18	in
Thick:	0.75	in
Notch:	0.5	in
Grade:	50	ksi
Weld str.:	70	ksi

**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

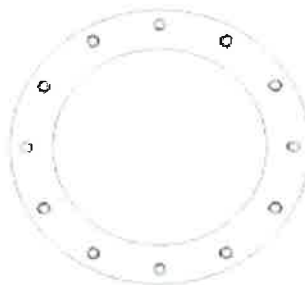
Pole Punching Shear Check:	n/a
----------------------------	-----

### Pole Data

Diam:	63.5	in
Thick:	0.5	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

### Stress Increase Factor

ASIF:	1.333
-------	-------



\* 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

BU: 876379  
 Site Name: N.WOODBURY/WOLFF PARCEL  
 App Number: 320737 Rev.1  
 Work Order: 1152821



Monopole Drilled Pier

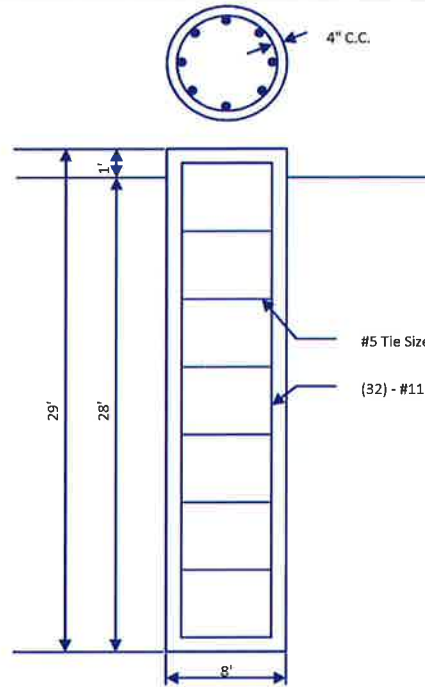
Input

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

**Forces**  
 Compression: 56 kips  
 Shear: 33 kips  
 Moment: 3885 k-ft  
 Swelling Force: 0 kips

**Foundation Dimensions**  
 Pier Diameter: 8 ft  
 Ext. above grade: 1 ft  
 Depth below grade: 28 ft

**Material Properties**  
 Number of Rebar: 32  
 Rebar Size: 11  
 Tie Size: 5  
 Rebar tensile strength: 60 ksi  
 Concrete Strength: 4000 psi  
 Ultimate Concrete Strain: 0.003 in/in  
 Clear Cover to Ties: 4 in



Soil Profile: Soil

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	4	0	4	135	0	0	0	0	0	
2	1	4	5	135	0	38	0	0	0	
3	9.5	5	14.5	135	0	38	0.8	0.8	0	
4	0.5	14.5	15	75	0	38	0.8	0.8	0	
5	13	15	28	75	0	38	1.6	1.6	32	

Analysis Results

Soil Lateral Capacity  
 Depth to Zero Shear: 6.50 ft  
 Max Moment, Mu: 4123.33 k-ft  
 Soil Safety Factor: 5.43  
 Safety Factor Req'd: 2  
**RATING: 36.8%**

Soil Axial Capacity  
 Skin Friction (k): 361.91 kips  
 End Bearing (k): 804.25 kips  
 Comp. Capacity (k), φCn: 1166.16 kips  
 Comp. (k), Cu: 72.80 kips  
**RATING: 6.2%**

Concrete/Steel Check  
 Mu (from soil analysis) 5360.33 k-ft  
 φMn 9171.65 k-ft  
**RATING: 58.4%**

rho provided 0.69  
 rho required 0.33 OK

Rebar Spacing 6.97  
 Spacing required 22.56 OK

Dev. Length required 21.16  
 Dev. Length provided 53.51 OK

**Overall Foundation Rating: 58.4%**