Robinson+Cole

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Also admitted in Massachusetts

September 1, 2015

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

Re: **Notice of Exempt Modification – Facility Modification**
570 New Park Avenue, West Hartford, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) antennas at the 147-foot of the existing 150-foot tower at 570 New Park Avenue in West Hartford, Connecticut (the "Property"). The tower is owned by Crown Castle ("Crown"). The Council approved Cellco's use of this tower in 1990 (Docket No. 131). Cellco now intends to replace six (6) of its existing antennas with three (3) model SBNHH-1D65B, 700/2100 MHz antennas and three (3) model SBNHH-1D65B, 1900 MHz antennas, all at the same level on the tower. Cellco also intends to replace three (3) existing remote radio heads ("RRHs"), and install six (6) additional RRHs and one (1) HYBRIFLEX™ fiber optic antenna cable. Included in Attachment 1 are specifications for Cellco's replacement antennas, RRHs and HYBRIFLEX™ cable.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Ronald Van Winkle, Town Manager for the Town of West Hartford. A copy of this letter is also being sent to 570 New Park LLC, the owner of the Property and to Crown, the tower owner.

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

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's replacement antennas and RRHs will be located on its existing platform at the 147-foot level on the tower.

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

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

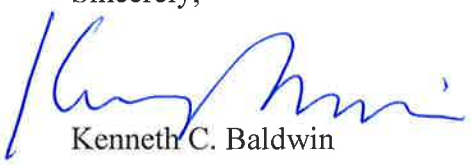
4. The operation of the replacement antennas will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety standard. A cumulative worst-case General Power Density table for Cellco's modified facility is included in Attachment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

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

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

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

Sincerely,



Kenneth C. Baldwin

Enclosures
Copy to:
Ronald Van Winkle, Town Manager
570 New Park LLC
Crown Castle
Tim Parks

ATTACHMENT 1

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

SBNHH-1D65B

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

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

Electrical Specifications

Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2200	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	1920–2200	2300–2360
Gain by all Beam Tilts, average, dBi	14.5	14.3	17.4	17.9	18.2	18.3
Gain by all Beam Tilts Tolerance, dB	±0.5	±0.8	±0.4	±0.3	±0.5	±0.3
Gain by Beam Tilt, average, dBi	0 ° | 14.6	0 ° | 14.5	0 ° | 17.4	0 ° | 17.8	0 ° | 18.1	0 ° | 18.2
	7 ° | 14.6	7 ° | 14.4	3 ° | 17.5	3 ° | 17.9	3 ° | 18.3	3 ° | 18.4
	14 ° | 14.2	14 ° | 13.6	7 ° | 17.4	7 ° | 17.9	7 ° | 18.2	7 ° | 18.4
Beamwidth, Horizontal Tolerance, degrees	±2.2	±3.4	±2	±4.6	±5.7	±4.3
Beamwidth, Vertical Tolerance, degrees	±0.8	±1	±0.3	±0.2	±0.3	±0.2
USLS, dB	16	14	16	16	16	15
Front-to-Back Total Power at 180° ± 30°, dB	25	26	27	26	26	26
CPR at Boresight, dB	22	23	21	20	20	22
CPR at Sector, dB	13	11	16	12	11	4

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

General Specifications

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

Product Specifications

SBNHH-1D65B

Mechanical Specifications

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

Dimensions

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

Remote Electrical Tilt (RET) Information

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

Packed Dimensions

Depth	299.0 mm | 11.8 in
Length	1970.0 mm | 77.6 in
Width	409.0 mm | 16.1 in
Shipping Weight	31.0 kg | 68.3 lb

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

Product Specifications

SBNHH-1D65B

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.

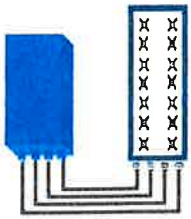
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the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

Alcatel·Lucent

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

PCS RF MODULES

RRH1900 2X60 - HW CHARACTERISTICS

LA6.0.1/13.3

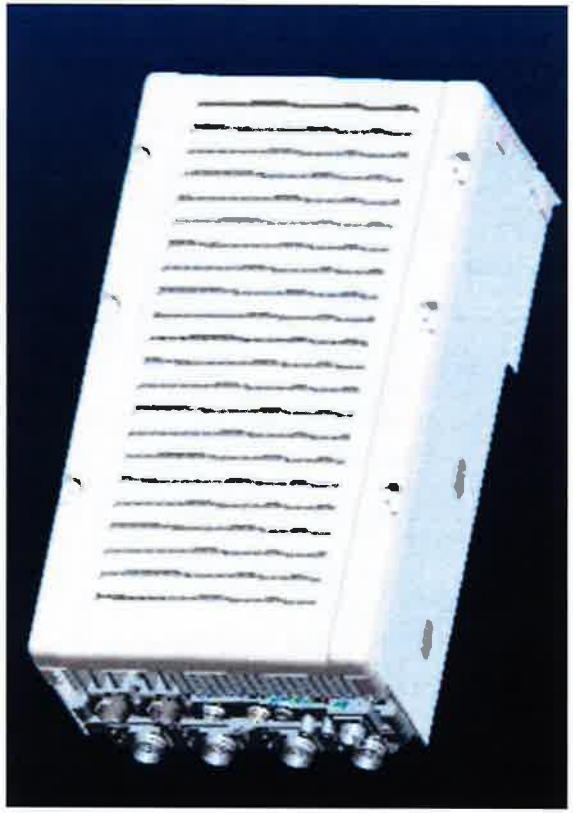
		RRH2x60
RF Output Power		2x60W
Instantaneous Bandwidth		20MHz
Transmitter		2 TX
Receiver	1900 HW version	2 Branch RX – LA6.0.1
	1900A HW version	4 Branch RX – LR13.3
Features		AISG 2.0 for RET/TMA
		Internal Smart Bias-T
Power		-48VDC
CPRI Ports		2 CPRI Rate 3 Ports
External Alarms		4 External User Alarms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

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ALCATEL-LUCENT WIRELESS PRODUCT DATASHEET

RRH2X60-AWS FOR BAND 4 APPLICATIONS

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

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

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

SUPERIOR RF PERFORMANCE

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

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

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

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

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

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

OPTIMIZED TCO

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

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

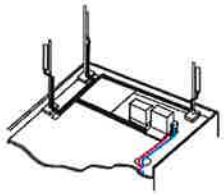
EASY INSTALLATION

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

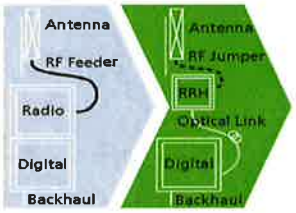
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation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

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

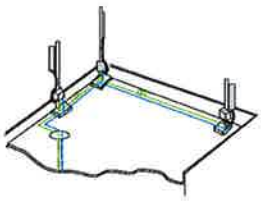
Installation can easily be done by a single person as the Alcatel–Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



Macro



RRH for space-constrained cell sites



Distributed

FEATURES

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

BENEFITS

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

TECHNICAL SPECIFICATIONS

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

Dimensions and weights

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

Electrical Data

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

RF Characteristics

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

Connectivity

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

Environmental specifications

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

Safety and Regulatory Data

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

Alcatel·Lucent

AT THE SPEED OF IDEAS™

Product Data Sheet HB158-1-08U8-S8J18

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

Product Description

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

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

Figure 1: HYBRIFLEX Series

Features/Benefits

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

Technical Specifications

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

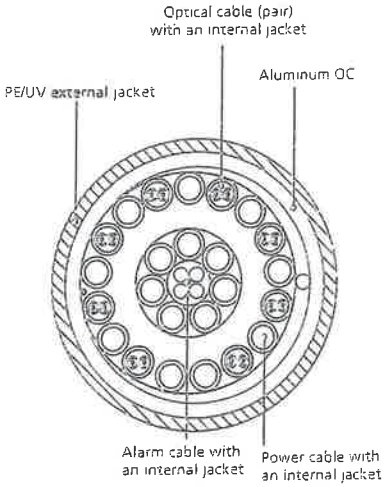


Figure 2: Construction Detail

* This data is provisional and subject to change

ATTACHMENT 2

	General	Power	Density					
Site Name: West Hartford								
Tower Height: 150Ft.								
CARRIER	**# OF CHAN.**	**WATTS ERP**	**HEIGHT**	**CALC. POWER DENS**	**FREQ.**	**MAX. PERMISS. EXP.**	**FRACTION MPE**	**Total**
*Sprint CDMA/LTE	7	348	135	0.0480	1900	1.0000	4.80%	
*Sprint CDMA/LTE	1	195	135	0.0038	850	0.5667	0.68%	
*Sprint CDMA/LTE	2	195	135	0.0077	2500	1.0000	0.77%	
*Sensus (CL&P)	1	200	117	0.0053	940.1125	0.6267	0.84%	
*XM Sat Radio	2	302	160	0.0085	2337.49	1.0000	0.85%	
Verizon PCS	**11**	**402**	**147**	**0.0736**	**1970**	**1.0000**	**7.36%**	
Verizon Cellular	**9**	**382**	**147**	**0.0572**	**869**	**0.5793**	**9.87%**	
Verizon AWS	**1**	**3500**	**147**	**0.0582**	**2145**	**1.0000**	**5.82%**	
Verizon 700	**1**	**2100**	**147**	**0.0349**	**746**	**0.4973**	**7.03%**	
								38.02%
* Source: Siting Council								

ATTACHMENT 3

July 20, 2015

Veronica Harris
Crown Castle
1200 McArthur Blvd
Mahwah, NJ 07430
(201) 236-9094

B+T Group
1717 S. Boulder, Suite 300
Tulsa, OK 74119
(918) 587-4630
btwo@btgrp.com

Subject:	**Structural Analysis Report**	
Carrier Designation:	***Verizon Wireless* Co-Locate**	
	Carrier Site Number:	N/A
	Carrier Site Name:	West Hartford, CT
Crown Castle Designation:	**Crown Castle BU Number:**	806370
	Crown Castle Site Name:	HRT 099 943226
	Crown Castle JDE Job Number:	337987
	Crown Castle Work Order Number:	1091227
	Crown Castle Application Number:	300668 Rev. 7
Engineering Firm Designation:	**B+T Group Project Number:**	99070.003.01
Site Data:	**570 New Park Avenue, West Hartford, Hartford County, CT** **Latitude *41° 44' 10.5"*, Longitude *-72° 43' 14.2"*** **150 Foot - Monopole Tower**	

Dear Veronica Harris,

B+T Group 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 807572, in accordance with application 300668, revision 7.

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 1 and Table 2 for the proposed and existing/reserved loading, respectively.

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

All 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 *B+T Group* appreciate the opportunity of providing our continuing professional services to you and Crown Castle. If you have any questions or need further assistance on this or any other projects please give us a call.

Respectfully submitted by:
B+T Engineering, Inc.

Leena Kantheti, E.I.T.
Project Engineer

Chad E. Tuttle, P.E.
President
COA: PEC.0001564 Expires: 02/10/2016

tnxTower Report - version 6.1.4.1

TABLE OF CONTENTS

1) INTRODUCTION

This tower is a 150 ft. Monopole tower designed by Valmont in May of 1990. The tower was originally designed for a wind speed of 125 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 80 mph with no ice, 37.6 mph with 1 inch ice thickness and 50 mph under service loads.

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
146.0	147.0	3	Alcatel Lucent	RRH2X60-PCS	1	1-5/8	--
		3	Alcatel Lucent	RRH2x60-700			
		3	Alcatel Lucent	RRH2x60-AWS			
		6	Commscope	SBNHH-1D65B			
		1	Rfs Celwave	DB-T1-6Z-8AB-0Z			

Table 2 - Existing Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
146.0	147.0	**5**	**Antel**	**BXA-171063-12CF-EDIN-2**	**6**	**1-1/4**	**4**
		1	**Antel**	**BXA-171063-8BF-2**			
		3	**Antel**	**RRH2x40-AWS**			
		3	Antel	BXA-70063-6CF-EDIN-4	1 12	1-5/8 1-1/4	1
		1	Rfs Celwave	DB-T1-6Z-8AB-0Z			
		3	Antel	BXA-70063-6CF-EDIN-5			
	146.0	1	--	Platform Mount [LP 713-1]			
137.0	137.0	3	Alcatel Lucent	800MHz 2X50W RRH W/FILTER	--	--	1
		6	Alcatel Lucent	PCS 1900MHz 4x45W-65MHz			
		1	--	Side Arm Mount [SO 102-3]			
134.0	135.0	3	Alcatel Lucent	TD-RRH8x20-25	1	5/8	1
		3	Rfs Celwave	APXVTM14-C-120			
		3	Rfs Celwave	APXVSPP18-C-A20	3	1-1/4	1
		3	Rfs Celwave	IBC1900BB-1			
		3	Rfs Celwave	IBC1900HG-2A			
	134.0	1	--	Platform Mount [LP 713-1]			
117.0	122.0	1	Antel	BCD-87010	--	--	3
	117.0	1	--	Side Arm Mount [SO 702-1]			

Notes:
1) Existing Equipment
2) Reserved Equipment

2) Reserved Equipment
3) Abandoned Equipment Considered In This Analysis
4) 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)
147	147	3	Celwave	PD10017	--	--
		1	Generic	Platform		
140	140	6	Celwave	PD1132	--	--
134	134	1	Generic	Platform	--	--

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
Online Application	Verizon Wireless Co-Locate, Revision # 7	300668	CCI Sites
Tower Manufacturer Drawing	Valmont, Date:05/22/1990	260794	CCI Sites
Foundation Mapping	TEP, Project No. 082233	2308022	CCI Sites
Geotech Report	TEP, Project No. 082233.01	2308053	CCI Sites
Antenna Configuration	Crown CAD Package	Date: 08/31/2015	CCI Sites

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) Mount areas and weights are assumed based on photographs provided.

This analysis may be affected if any assumptions are not valid or have been made in error. B+T Group 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	150 - 96.833	Pole	TP39.21x26.19x0.313	1	-11.278	1962.203	41.0	Pass
L2	96.833 - 48	Pole	TP50.55x37.197x0.406	2	-21.901	3293.416	49.9	Pass
L3	48 - 0	Pole	TP61.5x48.022x0.5	3	-40.996	5071.452	50.3	Pass

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
							Summary	
						Pole (L3)	50.3	Pass
						RATING =	**50.3**	**Pass**

Table 6 - Tower Component Stresses vs. Capacity – LC5

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	Base	44.7	Pass
1	Base Plate	Base	33.0	Pass
1	Base Foundation (Structure)	Base	28.4	Pass
1	Base Foundation (Soil Interaction)	Base	75.0	Pass

Structure Rating (max from all components) =	**75.0%**

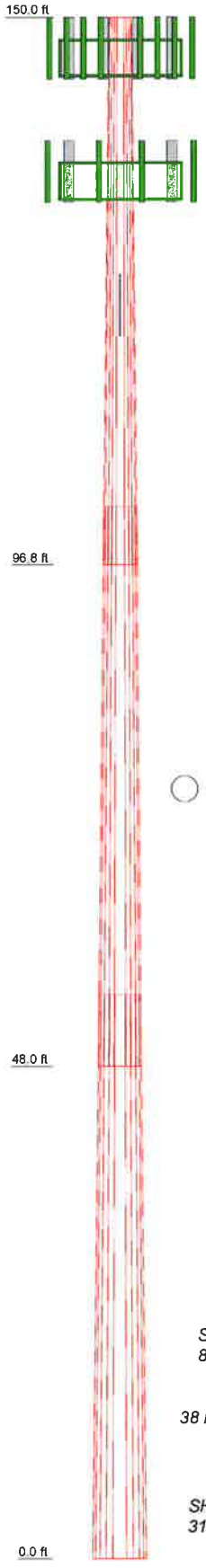
Notes:
1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.

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.

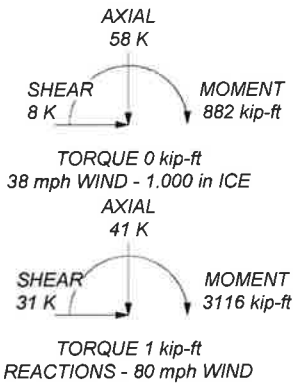
APPENDIX A

TNXTOWER OUTPUT



Section	1	2	3
Length (ft)	53.167	54.500	55.000
Number of Sides	12	12	12
Thickness (in)	0.313	0.406	0.500
Socket Length (ft)	5.667	7.000	
Top Dia (in)	26.190	37.197	48.022
Bot Dia (in)	39.210	50.550	61.500
Grade		A572-65	
Weight (K)	5.9	10.5	16.3

32.8



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
BXA-70063-6CF-EDIN-5 w/ Mount Pipe (E)	146	Platform Mount [LP 713-1] (E)	146
BXA-70063-6CF-EDIN-5 w/ Mount Pipe (E)	146	800MHz 2X50W RRH W/FILTER (E)	137
BXA-70063-6CF-EDIN-5 w/ Mount Pipe (E)	146	800MHz 2X50W RRH W/FILTER (E)	137
BXA-70063-6CF-EDIN-4 w/ Mount Pipe (E)	146	800MHz 2X50W RRH W/FILTER (E)	137
DB-T1-6Z-8AB-0Z (E)	146	(2) PCS 1900MHz 4x45W-65MHz (E)	137
BXA-70063-6CF-EDIN-4 w/ Mount Pipe (E)	146	(2) PCS 1900MHz 4x45W-65MHz (E)	137
BXA-70063-6CF-EDIN-4 w/ Mount Pipe (E)	146	(2) PCS 1900MHz 4x45W-65MHz (E)	137
(2) SBNHH-1D65B w/ Mount Pipe (P)	146	(3) 4' x 2" Pipe Mount (E)	137
(2) SBNHH-1D65B w/ Mount Pipe (P)	146	(3) 4' x 2" Pipe Mount (E)	137
(2) SBNHH-1D65B w/ Mount Pipe (P)	146	(3) 4' x 2" Pipe Mount (E)	137
RRH2x60-700 (P)	146	Side Arm Mount [SO 102-3] (E)	137
RRH2x60-700 (P)	146	APXVSPP18-C-A20 w/ Mount Pipe (E)	134
RRH2x60-700 (P)	146	APXVSPP18-C-A20 w/ Mount Pipe (E)	134
RRH2X60-PCS (P)	146	APXVSPP18-C-A20 w/ Mount Pipe (E)	134
RRH2X60-PCS (P)	146	IBC1900BB-1 (E)	134
RRH2X60-PCS (P)	146	IBC1900BB-1 (E)	134
RRH2x60-AWS (P)	146	IBC1900BB-1 (E)	134
RRH2x60-AWS (P)	146	IBC1900HG-2A (E)	134
RRH2x60-AWS (P)	146	IBC1900HG-2A (E)	134
DB-T1-6Z-8AB-0Z (P)	146	IBC1900HG-2A (E)	134
6' x 2" Mount Pipe (E-FOR TME/PER PH)	146	APXVTM14-C-120 w/ Mount Pipe (R)	134
6' x 2" Mount Pipe (E-FOR TME/PER PH)	146	APXVTM14-C-120 w/ Mount Pipe (R)	134
6' x 2" Mount Pipe (E-FOR TME/PER PH)	146	APXVTM14-C-120 w/ Mount Pipe (R)	134
		TD-RRH8x20-25 (R)	134
		TD-RRH8x20-25 (R)	134
		TD-RRH8x20-25 (R)	134
		6' x 2" Mount Pipe (E)	134
		6' x 2" Mount Pipe (E)	134
		6' x 2" Mount Pipe (E)	134
		Platform Mount [LP 713-1] (E)	134
		BCD-87010 (AB)	117
		Side Arm Mount [SO 702-1] (AB)	117

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Hartford County, Connecticut.
2. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 38 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 50.3%

B+T Group
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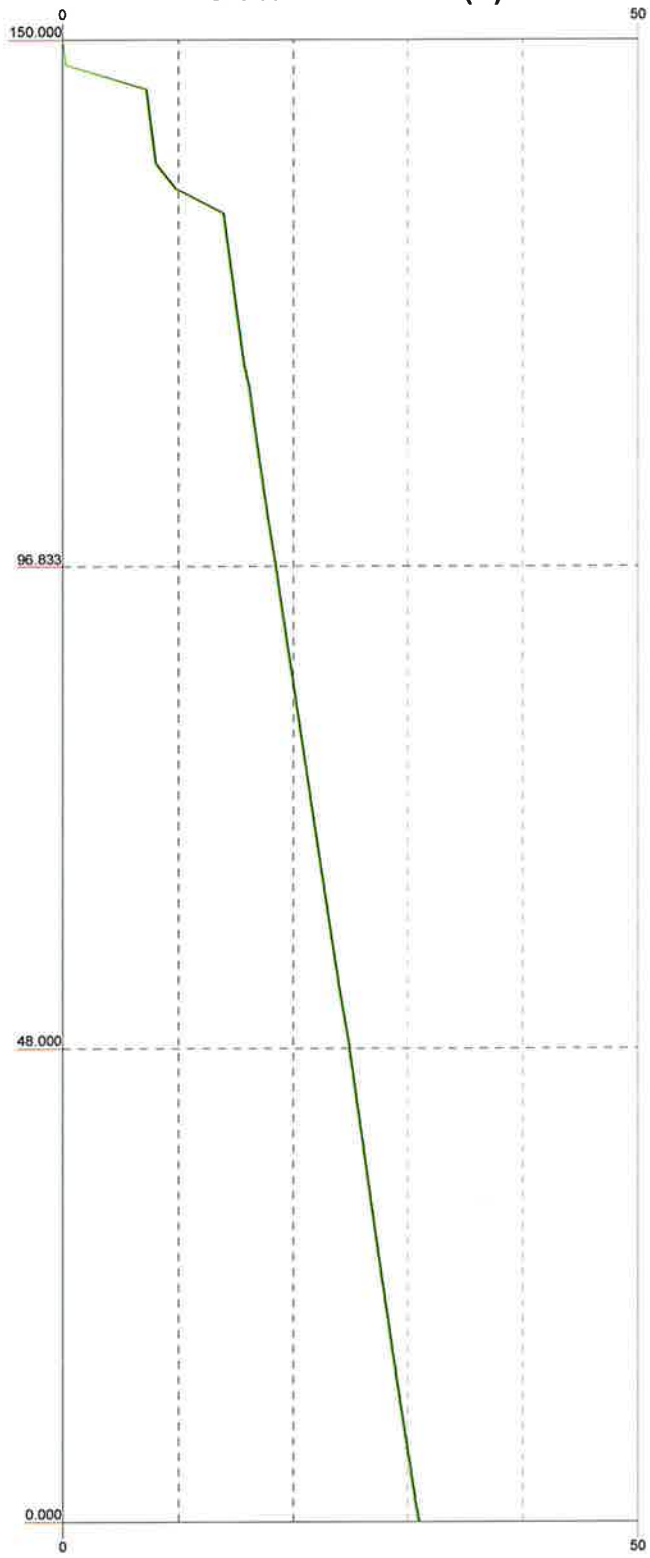
Tulsa, OK 74119
Phone: (918) 587-4630
FAX: (918) 295-0265

Job: 99070.002.01- HRT 099 943226,CT (BU#806			
Project:			
Client: Crown Castle	Drawn by: lkantheti	App'd:	
Code: TIA/EIA-222-F	Date: 08/31/15	Scale: NT	
Path:		Dwg No. E	

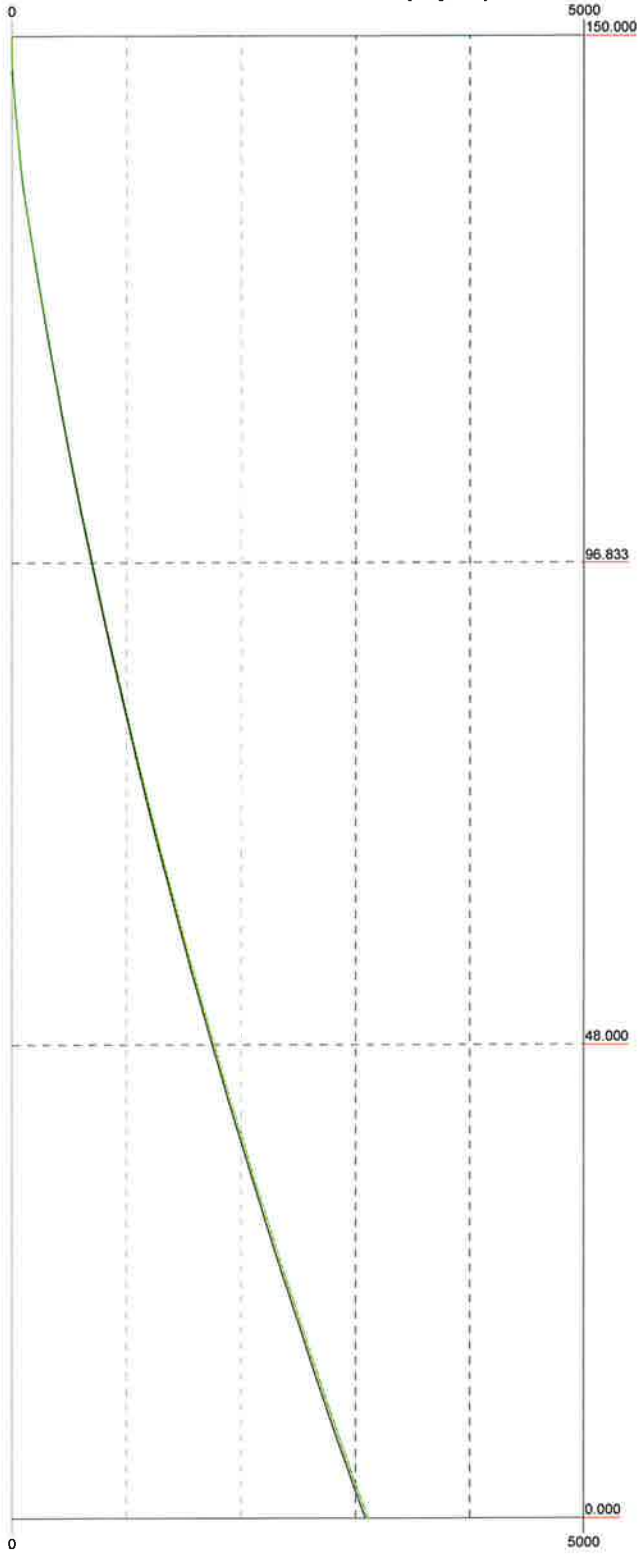
Vx Vz

Mx Mz

Global Mast Shear (K)



Global Mast Moment (kip-ft)



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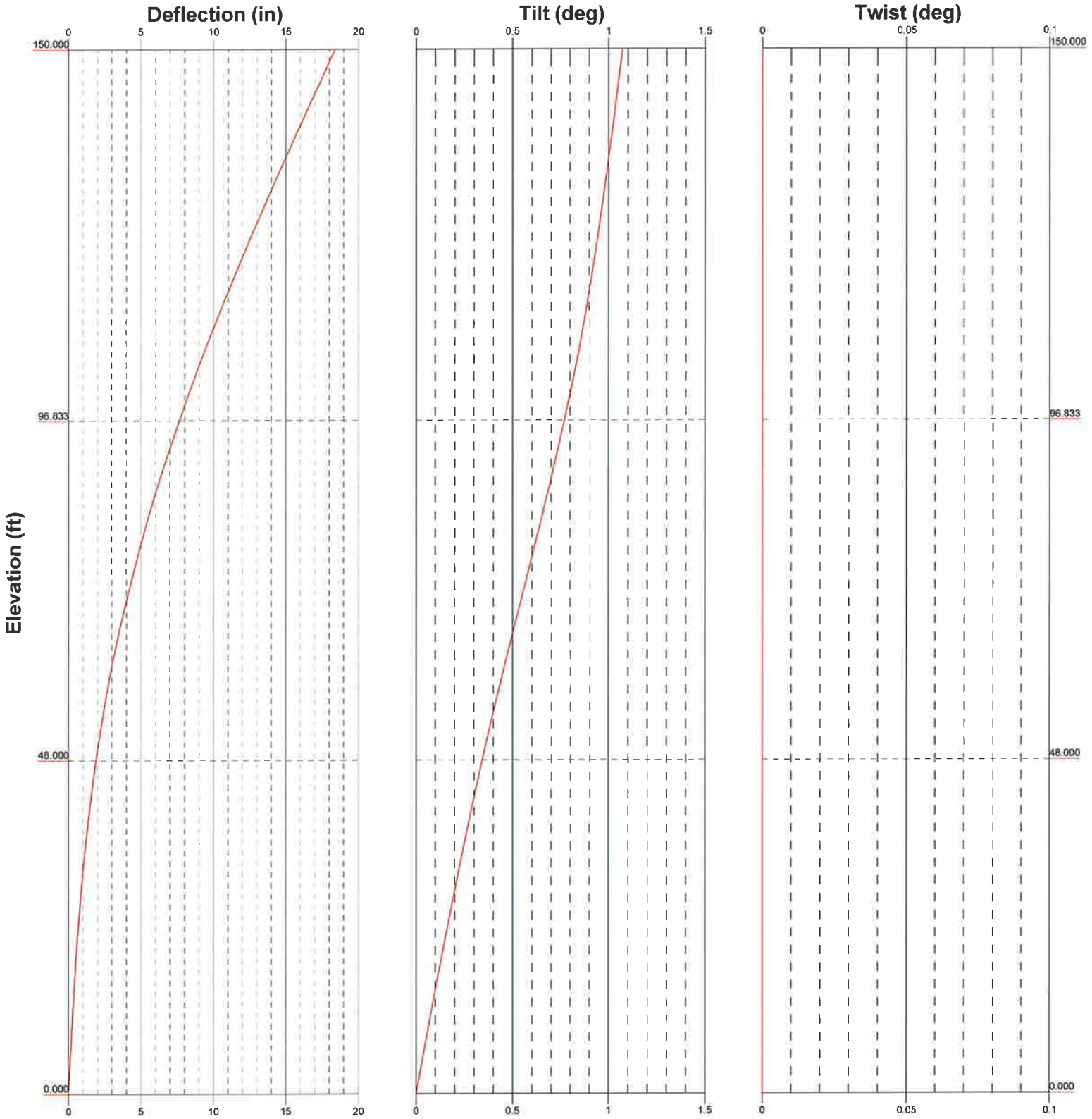
Code: TIA/EIA-222-F	Date: 08/31/15	Scale: NT	
Path:		Dwg No. E-	

TIA/EIA-222-F - Service - 50 mph

Maximum Values



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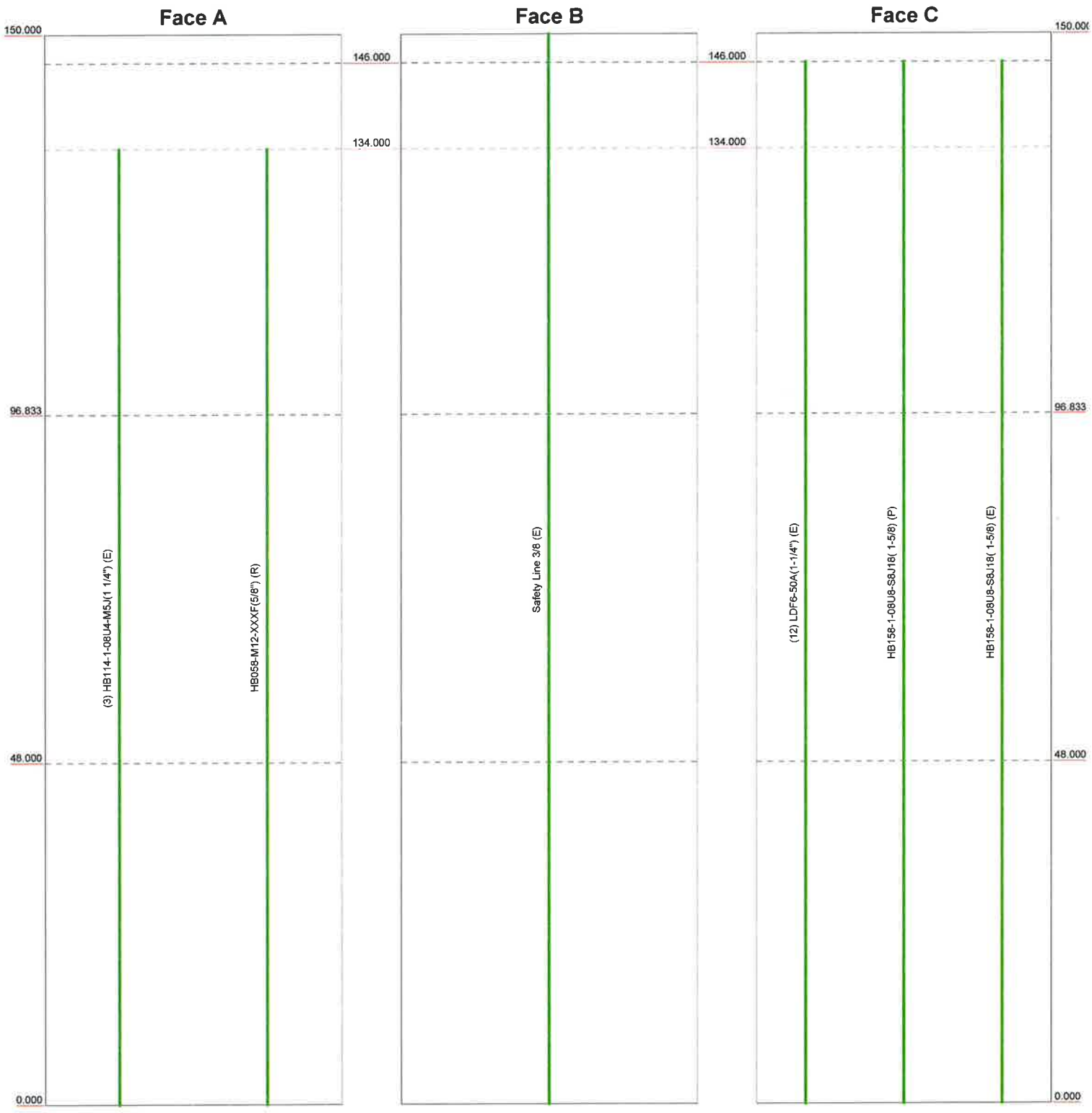
Project:			
Client: Crown Castle	Drawn by: lkantheti	App'd:	
Code: TIA/EIA-222-F	Date: 08/31/15	Scale: NT	
Path:		Dwg No. E-	

0' - 150'

Round | Flat | App In Face | App Out Face | Truss Leg



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Project:			
Client: Crown Castle	Drawn by: lkantheti	App'd:	
Code: TIA/EIA-222-F	Date: 08/31/15	Scale: NT	
Path:		Dwg No. E	

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 Hartford County, Connecticut.
Basic wind speed of 80 mph.
Nominal ice thickness of 1.000 in.
Ice thickness is considered to increase with height.
Ice density of 56.000 pcf.
A wind speed of 38 mph is used in combination with ice.
Temperature drop of 50.000 °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	150.000-96.833	53.167	5.667	12	26.190	39.210	0.313	1.250	A572-65 (65 ksi)
L2	96.833-48.000	54.500	7.000	12	37.197	50.550	0.406	1.625	A572-65 (65 ksi)
L3	48.000-0.000	55.000		12	48.022	61.500	0.500	2.000	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	27.114	26.039	2225.660	9.264	13.566	164.057	4509.790	12.816	6.181	19.781
	40.593	39.141	7558.871	13.925	20.311	372.161	15316.321	19.264	9.671	30.946
L2	39.947	48.127	8314.933	13.171	19.268	431.538	16848.308	23.687	8.880	21.859
	52.333	65.594	21051.625	17.951	26.185	803.960	42656.300	32.284	12.459	30.667
L3	51.492	76.511	22055.082	17.013	24.876	886.614	44689.576	37.656	11.530	23.06
	63.669	98.210	46644.596	21.838	31.857	1464.187	94514.596	48.336	15.142	30.284

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 150.000-96.833				1	1	1		
L2 96.833-48.000				1	1	1		
L3 48.000-0.000				1	1	1		

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	Number Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight klf
AB										

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight klf
***								
LDF6-50A(1-1/4") (E)	C	No	Inside Pole	146.000 - 0.000	12	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
						2" Ice	0.000	0.001
						4" Ice	0.000	0.001
HB158-1-08U8-S8J18(1-5/8) (P)	C	No	Inside Pole	146.000 - 0.000	1	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
						2" Ice	0.000	0.001
						4" Ice	0.000	0.001
HB158-1-08U8-S8J18(1-5/8) (E)	C	No	Inside Pole	146.000 - 0.000	1	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
						2" Ice	0.000	0.001
						4" Ice	0.000	0.001
AB								
HB114-1-08U4-M5J(1	A	No	Inside Pole	134.000 - 0.000	3	No Ice	0.000	0.001

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight klf
1/4")						1/2" Ice	0.000	0.001
(E)						1" Ice	0.000	0.001
						2" Ice	0.000	0.001
						4" Ice	0.000	0.001
HB058-M12-XXXF(5/8"	A	No	Inside Pole	134.000 - 0.000	1	No Ice	0.000	0.000
)						1/2" Ice	0.000	0.000
(R)						1" Ice	0.000	0.000
						2" Ice	0.000	0.000
						4" Ice	0.000	0.000
AB								
Safety Line 3/8	B	No	CaAa (Out Of	150.000 - 0.000	1	No Ice	0.037	0.000
(E)			Face)			1/2" Ice	0.137	0.001
						1" Ice	0.238	0.001
						2" Ice	0.437	0.002
						4" Ice	0.838	0.004
AB								

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	150.000-96.833	A	0.000	0.000	0.000	0.000	0.129
		B	0.000	0.000	0.000	1.994	0.012
		C	0.000	0.000	0.000	0.000	0.517
L2	96.833-48.000	A	0.000	0.000	0.000	0.000	0.170
		B	0.000	0.000	0.000	1.831	0.011
		C	0.000	0.000	0.000	0.000	0.514
L3	48.000-0.000	A	0.000	0.000	0.000	0.000	0.167
		B	0.000	0.000	0.000	1.800	0.011
		C	0.000	0.000	0.000	0.000	0.505

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	150.000-96.833	A	1.170	0.000	0.000	0.000	0.000	0.129
		B		0.000	0.000	0.000	14.434	0.078
		C		0.000	0.000	0.000	0.000	0.517
L2	96.833-48.000	A	1.098	0.000	0.000	0.000	0.000	0.170
		B		0.000	0.000	0.000	13.258	0.071
		C		0.000	0.000	0.000	0.000	0.514
L3	48.000-0.000	A	1.000	0.000	0.000	0.000	0.000	0.167
		B		0.000	0.000	0.000	12.341	0.066
		C		0.000	0.000	0.000	0.000	0.505

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
L1	150.000-96.833	0.048	0.028	0.301	0.174
L2	96.833-48.000	0.048	0.028	0.313	0.181
L3	48.000-0.000	0.048	0.028	0.305	0.176

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
AB											
BXA-70063-6CF-EDIN-5 w/ Mount Pipe (E)	A	From Leg	4.000 0.000 1.000			0.000	146.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.969 8.609 9.216 10.459 13.066	5.801 6.953 7.819 9.601 13.366	0.042 0.103 0.171 0.335 0.804
BXA-70063-6CF-EDIN-5 w/ Mount Pipe (E)	B	From Leg	4.000 0.000 1.000			0.000	146.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.969 8.609 9.216 10.459 13.066	5.801 6.953 7.819 9.601 13.366	0.042 0.103 0.171 0.335 0.804
BXA-70063-6CF-EDIN-5 w/ Mount Pipe (E)	C	From Leg	4.000 0.000 1.000			0.000	146.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.969 8.609 9.216 10.459 13.066	5.801 6.953 7.819 9.601 13.366	0.042 0.103 0.171 0.335 0.804
BXA-70063-6CF-EDIN-4 w/ Mount Pipe (E)	A	From Leg	4.000 0.000 1.000			0.000	146.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.969 8.609 9.216 10.459 13.066	5.398 6.546 7.409 9.184 12.933	0.042 0.101 0.168 0.327 0.787
DB-T1-6Z-8AB-0Z (E)	B	From Leg	4.000 0.000 1.000			0.000	146.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	5.600 5.915 6.240 6.914 8.365	2.333 2.558 2.791 3.284 4.373	0.044 0.080 0.120 0.213 0.455
BXA-70063-6CF-EDIN-4 w/ Mount Pipe (E)	B	From Leg	4.000 0.000 1.000			0.000	146.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.969 8.609 9.216 10.459 13.066	5.398 6.546 7.409 9.184 12.933	0.042 0.101 0.168 0.327 0.787
BXA-70063-6CF-EDIN-4 w/ Mount Pipe (E)	C	From Leg	4.000 0.000 1.000			0.000	146.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.969 8.609 9.216 10.459 13.066	5.398 6.546 7.409 9.184 12.933	0.042 0.101 0.168 0.327 0.787
(2) SBNHH-1D65B w/ Mount Pipe (P)	A	From Leg	4.000 0.000 1.000			0.000	146.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	8.637 9.293 9.917 11.190 13.855	7.071 8.260 9.170 11.006 15.043	0.066 0.135 0.212 0.394 0.903
(2) SBNHH-1D65B w/ Mount Pipe	B	From Leg	4.000 0.000			0.000	146.000	No Ice 1/2" Ice	8.637 9.293	7.071 8.260	0.066 0.135

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(P)			1.000			1" Ice	9.917	9.170	0.212
						2" Ice	11.190	11.006	0.394
						4" Ice	13.855	15.043	0.903
(2) SBNHH-1D65B w/ Mount Pipe	C	From Leg	4.000	0.000	146.000	No Ice	8.637	7.071	0.066
			0.000			1/2" Ice	9.293	8.260	0.135
(P)			1.000			1" Ice	9.917	9.170	0.212
						2" Ice	11.190	11.006	0.394
						4" Ice	13.855	15.043	0.903
RRH2x60-700	A	From Leg	4.000	0.000	146.000	No Ice	3.957	1.816	0.060
(P)			0.000			1/2" Ice	4.272	2.075	0.083
			1.000			1" Ice	4.596	2.360	0.109
						2" Ice	5.271	2.957	0.173
						4" Ice	6.722	4.253	0.354
RRH2x60-700	B	From Leg	4.000	0.000	146.000	No Ice	3.957	1.816	0.060
(P)			0.000			1/2" Ice	4.272	2.075	0.083
			1.000			1" Ice	4.596	2.360	0.109
						2" Ice	5.271	2.957	0.173
						4" Ice	6.722	4.253	0.354
RRH2x60-700	C	From Leg	4.000	0.000	146.000	No Ice	3.957	1.816	0.060
(P)			0.000			1/2" Ice	4.272	2.075	0.083
			1.000			1" Ice	4.596	2.360	0.109
						2" Ice	5.271	2.957	0.173
						4" Ice	6.722	4.253	0.354
RRH2X60-PCS	A	From Leg	4.000	0.000	146.000	No Ice	2.567	2.011	0.055
(P)			0.000			1/2" Ice	2.791	2.218	0.075
			1.000			1" Ice	3.025	2.435	0.099
						2" Ice	3.517	2.894	0.155
						4" Ice	4.606	3.915	0.313
RRH2X60-PCS	B	From Leg	4.000	0.000	146.000	No Ice	2.567	2.011	0.055
(P)			0.000			1/2" Ice	2.791	2.218	0.075
			1.000			1" Ice	3.025	2.435	0.099
						2" Ice	3.517	2.894	0.155
						4" Ice	4.606	3.915	0.313
RRH2X60-PCS	C	From Leg	4.000	0.000	146.000	No Ice	2.567	2.011	0.055
(P)			0.000			1/2" Ice	2.791	2.218	0.075
			1.000			1" Ice	3.025	2.435	0.099
						2" Ice	3.517	2.894	0.155
						4" Ice	4.606	3.915	0.313
RRH2x60-AWS	A	From Leg	4.000	0.000	146.000	No Ice	3.957	1.816	0.060
(P)			0.000			1/2" Ice	4.272	2.075	0.083
			1.000			1" Ice	4.596	2.360	0.109
						2" Ice	5.271	2.957	0.173
						4" Ice	6.722	4.253	0.354
RRH2x60-AWS	B	From Leg	4.000	0.000	146.000	No Ice	3.957	1.816	0.060
(P)			0.000			1/2" Ice	4.272	2.075	0.083
			1.000			1" Ice	4.596	2.360	0.109
						2" Ice	5.271	2.957	0.173
						4" Ice	6.722	4.253	0.354
RRH2x60-AWS	C	From Leg	4.000	0.000	146.000	No Ice	3.957	1.816	0.060
(P)			0.000			1/2" Ice	4.272	2.075	0.083
			1.000			1" Ice	4.596	2.360	0.109
						2" Ice	5.271	2.957	0.173
						4" Ice	6.722	4.253	0.354
DB-T1-6Z-8AB-0Z	B	From Leg	4.000	0.000	146.000	No Ice	5.600	2.333	0.044
(P)			0.000			1/2" Ice	5.915	2.558	0.080
			1.000			1" Ice	6.240	2.791	0.120
						2" Ice	6.914	3.284	0.213

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
						4" Ice	8.365	4.373	0.455
6' x 2" Mount Pipe (E-FOR TME/PER PH)	A	From Leg	4.000 0.000 0.000	0.000	146.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.425 1.925 2.294 3.060 4.702	1.425 1.925 2.294 3.060 4.702	0.022 0.033 0.048 0.090 0.231
6' x 2" Mount Pipe (E-FOR TME/PER PH)	B	From Leg	4.000 0.000 0.000	0.000	146.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.425 1.925 2.294 3.060 4.702	1.425 1.925 2.294 3.060 4.702	0.022 0.033 0.048 0.090 0.231
6' x 2" Mount Pipe (E-FOR TME/PER PH)	C	From Leg	4.000 0.000 0.000	0.000	146.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.425 1.925 2.294 3.060 4.702	1.425 1.925 2.294 3.060 4.702	0.022 0.033 0.048 0.090 0.231
Platform Mount [LP 713-1] (E)	C	None		0.000	146.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	31.270 39.680 48.090 64.910 98.550	31.270 39.680 48.090 64.910 98.550	1.510 1.929 2.348 3.186 4.862
AB									
800MHz 2X50W RRH W/FILTER (E)	A	From Leg	2.000 0.000 0.000	0.000	137.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.401 2.613 2.833 3.300 4.337	2.254 2.460 2.675 3.132 4.148	0.064 0.086 0.111 0.172 0.338
800MHz 2X50W RRH W/FILTER (E)	B	From Leg	2.000 0.000 0.000	0.000	137.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.401 2.613 2.833 3.300 4.337	2.254 2.460 2.675 3.132 4.148	0.064 0.086 0.111 0.172 0.338
800MHz 2X50W RRH W/FILTER (E)	C	From Leg	2.000 0.000 0.000	0.000	137.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.401 2.613 2.833 3.300 4.337	2.254 2.460 2.675 3.132 4.148	0.064 0.086 0.111 0.172 0.338
(2) PCS 1900MHz 4x45W-65MHz (E)	A	From Leg	2.000 0.000 0.000	0.000	137.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.709 2.948 3.195 3.716 4.862	2.611 2.847 3.092 3.608 4.744	0.060 0.083 0.110 0.173 0.347
(2) PCS 1900MHz 4x45W-65MHz (E)	B	From Leg	2.000 0.000 0.000	0.000	137.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.709 2.948 3.195 3.716 4.862	2.611 2.847 3.092 3.608 4.744	0.060 0.083 0.110 0.173 0.347
(2) PCS 1900MHz 4x45W-65MHz (E)	C	From Leg	2.000 0.000 0.000	0.000	137.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	2.709 2.948 3.195 3.716 4.862	2.611 2.847 3.092 3.608 4.744	0.060 0.083 0.110 0.173 0.347
(3) 4' x 2" Pipe Mount (E)	A	From Leg	2.000 0.000 0.000	0.000	137.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	0.785 1.028 1.281 1.814 3.111	0.785 1.028 1.281 1.814 3.111	0.029 0.035 0.044 0.072 0.167

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight K
(3) 4' x 2" Pipe Mount	B	From Leg	2.000	0.000	137.000	No Ice	0.785	0.785	0.029
(E)			0.000			1/2" Ice	1.028	1.028	0.035
			0.000			1" Ice	1.281	1.281	0.044
						2" Ice	1.814	1.814	0.072
						4" Ice	3.111	3.111	0.167
(3) 4' x 2" Pipe Mount	C	From Leg	2.000	0.000	137.000	No Ice	0.785	0.785	0.029
(E)			0.000			1/2" Ice	1.028	1.028	0.035
			0.000			1" Ice	1.281	1.281	0.044
						2" Ice	1.814	1.814	0.072
						4" Ice	3.111	3.111	0.167
Side Arm Mount [SO 102-3]	C	None		0.000	137.000	No Ice	3.000	3.000	0.081
(E)						1/2" Ice	3.480	3.480	0.111
						1" Ice	3.960	3.960	0.141
						2" Ice	4.920	4.920	0.201
						4" Ice	6.840	6.840	0.321
AB									
APXVSPP18-C-A20 w/ Mount Pipe	A	From Leg	4.000	0.000	134.000	No Ice	8.498	6.946	0.083
(E)			0.000			1/2" Ice	9.149	8.127	0.151
			1.000			1" Ice	9.767	9.021	0.227
						2" Ice	11.031	10.844	0.406
						4" Ice	13.679	14.851	0.909
APXVSPP18-C-A20 w/ Mount Pipe	B	From Leg	4.000	0.000	134.000	No Ice	8.498	6.946	0.083
(E)			0.000			1/2" Ice	9.149	8.127	0.151
			1.000			1" Ice	9.767	9.021	0.227
						2" Ice	11.031	10.844	0.406
						4" Ice	13.679	14.851	0.909
APXVSPP18-C-A20 w/ Mount Pipe	C	From Leg	4.000	0.000	134.000	No Ice	8.498	6.946	0.083
(E)			0.000			1/2" Ice	9.149	8.127	0.151
			1.000			1" Ice	9.767	9.021	0.227
						2" Ice	11.031	10.844	0.406
						4" Ice	13.679	14.851	0.909
IBC1900BB-1	A	From Leg	4.000	0.000	134.000	No Ice	1.127	0.533	0.022
(E)			0.000			1/2" Ice	1.273	0.647	0.030
			1.000			1" Ice	1.427	0.770	0.039
						2" Ice	1.761	1.041	0.065
						4" Ice	2.534	1.688	0.147
IBC1900BB-1	B	From Leg	4.000	0.000	134.000	No Ice	1.127	0.533	0.022
(E)			0.000			1/2" Ice	1.273	0.647	0.030
			1.000			1" Ice	1.427	0.770	0.039
						2" Ice	1.761	1.041	0.065
						4" Ice	2.534	1.688	0.147
IBC1900BB-1	C	From Leg	4.000	0.000	134.000	No Ice	1.127	0.533	0.022
(E)			0.000			1/2" Ice	1.273	0.647	0.030
			1.000			1" Ice	1.427	0.770	0.039
						2" Ice	1.761	1.041	0.065
						4" Ice	2.534	1.688	0.147
IBC1900HG-2A	A	From Leg	4.000	0.000	134.000	No Ice	1.127	0.533	0.022
(E)			0.000			1/2" Ice	1.273	0.647	0.030
			1.000			1" Ice	1.427	0.770	0.039
						2" Ice	1.761	1.041	0.065
						4" Ice	2.534	1.688	0.147
IBC1900HG-2A	B	From Leg	4.000	0.000	134.000	No Ice	1.127	0.533	0.022
(E)			0.000			1/2" Ice	1.273	0.647	0.030
			1.000			1" Ice	1.427	0.770	0.039
						2" Ice	1.761	1.041	0.065
						4" Ice	2.534	1.688	0.147
IBC1900HG-2A	C	From Leg	4.000	0.000	134.000	No Ice	1.127	0.533	0.022

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(E)			0.000 1.000			1/2" Ice 1" Ice 2" Ice 4" Ice	1.273 1.427 1.761 2.534	0.647 0.770 1.041 1.688	0.030 0.039 0.065 0.147
APXVTM14-C-120 w/ Mount Pipe (R)	A	From Leg	4.000 0.000 1.000	0.000	134.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.134 7.662 8.183 9.256 11.526	4.959 5.754 6.472 8.010 11.412	0.077 0.131 0.193 0.338 0.752
APXVTM14-C-120 w/ Mount Pipe (R)	B	From Leg	4.000 0.000 1.000	0.000	134.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.134 7.662 8.183 9.256 11.526	4.959 5.754 6.472 8.010 11.412	0.077 0.131 0.193 0.338 0.752
APXVTM14-C-120 w/ Mount Pipe (R)	C	From Leg	4.000 0.000 1.000	0.000	134.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.134 7.662 8.183 9.256 11.526	4.959 5.754 6.472 8.010 11.412	0.077 0.131 0.193 0.338 0.752
TD-RRH8x20-25 (R)	A	From Leg	4.000 0.000 1.000	0.000	134.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.720 5.014 5.316 5.948 7.314	1.703 1.920 2.145 2.622 3.680	0.070 0.097 0.128 0.201 0.397
TD-RRH8x20-25 (R)	B	From Leg	4.000 0.000 1.000	0.000	134.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.720 5.014 5.316 5.948 7.314	1.703 1.920 2.145 2.622 3.680	0.070 0.097 0.128 0.201 0.397
TD-RRH8x20-25 (R)	C	From Leg	4.000 0.000 1.000	0.000	134.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.720 5.014 5.316 5.948 7.314	1.703 1.920 2.145 2.622 3.680	0.070 0.097 0.128 0.201 0.397
6' x 2" Mount Pipe (E)	A	From Leg	4.000 0.000 0.000	0.000	134.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.425 1.925 2.294 3.060 4.702	1.425 1.925 2.294 3.060 4.702	0.022 0.033 0.048 0.090 0.231
6' x 2" Mount Pipe (E)	B	From Leg	4.000 0.000 0.000	0.000	134.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.425 1.925 2.294 3.060 4.702	1.425 1.925 2.294 3.060 4.702	0.022 0.033 0.048 0.090 0.231
6' x 2" Mount Pipe (E)	C	From Leg	4.000 0.000 0.000	0.000	134.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.425 1.925 2.294 3.060 4.702	1.425 1.925 2.294 3.060 4.702	0.022 0.033 0.048 0.090 0.231
Platform Mount [LP 713-1] (E)	C	None		0.000	134.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	31.270 39.680 48.090 64.910 98.550	31.270 39.680 48.090 64.910 98.550	1.510 1.929 2.348 3.186 4.862
AB BCD-87010 (AB)	A	From Leg	3.000 0.000	0.000	117.000	No Ice 1/2" Ice	2.903 4.050	2.903 4.050	0.027 0.048

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			5.000			1" Ice	5.213	5.213	0.077
						2" Ice	7.015	7.015	0.157
						4" Ice	9.848	9.848	0.410
Side Arm Mount [SO 702-1] (AB)	A	From Leg	3.000 0.000 0.000	0.000	117.000	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	1.000 1.250 1.500 2.000 3.000	1.430 2.050 2.670 3.910 6.390	0.027 0.038 0.049 0.071 0.115
AB									

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

Comb. No.	Description
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	150 - 96.833	Pole	Max Tension	18	0.000	0.000	0.000
			Max. Compression	14	-21.498	-1.314	-0.126
			Max. Mx	5	-11.283	-602.957	-5.451
			Max. My	2	-11.295	5.058	596.013
			Max. Vy	5	17.755	-602.957	-5.451
			Max. Vx	2	-17.596	5.058	596.013
			Max. Torque	3			-1.022
L2	96.833 - 48	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	14	-35.236	-1.422	-0.188
			Max. Mx	5	-21.904	-1593.776	-11.304
			Max. My	8	-21.910	-11.727	-1579.236
			Max. Vy	5	23.985	-1593.776	-11.304
			Max. Vx	8	23.826	-11.727	-1579.236
			Max. Torque	2			-0.917
L3	48 - 0	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	14	-58.307	-1.572	-0.274
			Max. Mx	5	-40.996	-3106.419	-18.011
			Max. My	8	-40.996	-18.449	-3083.189
			Max. Vy	5	31.039	-3106.419	-18.011
			Max. Vx	8	30.883	-18.449	-3083.189
			Max. Torque	2			-0.946

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	19	58.307	-7.226	-4.166
	Max. H_x	11	41.009	31.022	0.120
	Max. H_z	2	41.009	0.120	30.866
	Max. M_x	2	3083.154	0.120	30.866
	Max. M_z	5	3106.419	-31.022	-0.120
	Max. Torsion	8	0.945	-0.120	-30.866
	Min. Vert	1	41.009	0.000	0.000
	Min. H_x	5	41.009	-31.022	-0.120
	Min. H_z	8	41.009	-0.120	-30.866
	Min. M_x	8	-3083.189	-0.120	-30.866
	Min. M_z	11	-3105.506	31.022	0.120
	Min. Torsion	2	-0.946	0.120	30.866

Tower Mast Reaction Summary

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 Only	41.009	0.000	0.000	0.017	-0.443	0.000
Dead+Wind 0 deg - No Ice	41.009	-0.120	-30.866	-3083.154	17.538	0.946
Dead+Wind 30 deg - No Ice	41.009	15.407	-26.671	-2661.099	-1537.868	0.709
Dead+Wind 60 deg - No Ice	41.009	26.806	-15.329	-1525.986	-2681.318	0.281
Dead+Wind 90 deg - No Ice	41.009	31.022	0.120	18.011	-3106.419	-0.222
Dead+Wind 120 deg - No Ice	41.009	26.926	15.537	1557.173	-2699.288	-0.665
Dead+Wind 150 deg - No Ice	41.009	15.615	26.791	2679.105	-1569.020	-0.929
Dead+Wind 180 deg - No Ice	41.009	0.120	30.866	3083.189	-18.448	-0.945
Dead+Wind 210 deg - No Ice	41.009	-15.407	26.671	2661.133	1536.956	-0.709
Dead+Wind 240 deg - No Ice	41.009	-26.806	15.329	1526.020	2680.405	-0.282
Dead+Wind 270 deg - No Ice	41.009	-31.022	-0.120	-17.975	3105.506	0.221
Dead+Wind 300 deg - No Ice	41.009	-26.926	-15.537	-1557.137	2698.376	0.665
Dead+Wind 330 deg - No Ice	41.009	-15.615	-26.791	-2679.069	1568.109	0.930
Dead+Ice+Temp	58.307	0.000	0.000	0.274	-1.572	-0.000
Dead+Wind 0 deg+Ice+Temp	58.307	-0.028	-8.283	-871.730	2.646	0.353
Dead+Wind 30 deg+Ice+Temp	58.307	4.139	-7.159	-752.751	-437.106	0.243
Dead+Wind 60 deg+Ice+Temp	58.307	7.197	-4.117	-431.995	-760.180	0.068
Dead+Wind 90 deg+Ice+Temp	58.307	8.327	0.028	4.591	-880.007	-0.125
Dead+Wind 120 deg+Ice+Temp	58.307	7.226	4.166	440.023	-764.482	-0.285
Dead+Wind 150 deg+Ice+Temp	58.307	4.188	7.188	757.629	-444.558	-0.368
Dead+Wind 180 deg+Ice+Temp	58.307	0.028	8.283	872.307	-5.959	-0.353
Dead+Wind 210 deg+Ice+Temp	58.307	-4.139	7.159	753.327	433.793	-0.243
Dead+Wind 240 deg+Ice+Temp	58.307	-7.197	4.117	432.572	756.866	-0.068
Dead+Wind 270 deg+Ice+Temp	58.307	-8.327	-0.028	-4.014	876.694	0.125
Dead+Wind 300 deg+Ice+Temp	58.307	-7.226	-4.166	-439.446	761.169	0.285
Dead+Wind 330 deg+Ice+Temp	58.307	-4.188	-7.188	-757.052	441.245	0.368
Dead+Wind 0 deg - Service	41.009	-0.047	-12.057	-1204.678	6.574	0.370
Dead+Wind 30 deg - Service	41.009	6.018	-10.418	-1039.765	-601.173	0.277
Dead+Wind 60 deg - Service	41.009	10.471	-5.988	-596.241	-1047.958	0.110
Dead+Wind 90 deg - Service	41.009	12.118	0.047	7.049	-1214.066	-0.087
Dead+Wind 120 deg - Service	41.009	10.518	6.069	608.454	-1054.988	-0.260
Dead+Wind 150 deg - Service	41.009	6.100	10.465	1046.830	-613.351	-0.364
Dead+Wind 180 deg - Service	41.009	0.047	12.057	1204.714	-7.489	-0.370
Dead+Wind 210 deg - Service	41.009	-6.018	10.418	1039.800	600.258	-0.277
Dead+Wind 240 deg - Service	41.009	-10.471	5.988	596.276	1047.043	-0.110
Dead+Wind 270 deg - Service	41.009	-12.118	-0.047	-7.013	1213.150	0.087
Dead+Wind 300 deg - Service	41.009	-10.518	-6.069	-608.419	1054.073	0.260
Dead+Wind 330 deg - Service	41.009	-6.100	-10.465	-1046.794	612.436	0.364

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.000	-41.009	0.000	0.000	41.009	0.000	0.000%
2	-0.120	-41.009	-30.866	0.120	41.009	30.866	0.000%
3	15.407	-41.009	-26.671	-15.407	41.009	26.671	0.000%
4	26.806	-41.009	-15.329	-26.806	41.009	15.329	0.000%
5	31.022	-41.009	0.120	-31.022	41.009	-0.120	0.000%
6	26.926	-41.009	15.537	-26.926	41.009	-15.537	0.000%
7	15.615	-41.009	26.791	-15.615	41.009	-26.791	0.000%
8	0.120	-41.009	30.866	-0.120	41.009	-30.866	0.000%
9	-15.407	-41.009	26.671	15.407	41.009	-26.671	0.000%
10	-26.806	-41.009	15.329	26.806	41.009	-15.329	0.000%
11	-31.022	-41.009	-0.120	31.022	41.009	0.120	0.000%
12	-26.926	-41.009	-15.537	26.926	41.009	15.537	0.000%
13	-15.615	-41.009	-26.791	15.615	41.009	26.791	0.000%
14	0.000	-58.307	0.000	0.000	58.307	0.000	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
15	-0.028	-58.307	-8.283	0.028	58.307	8.283	0.000%
16	4.139	-58.307	-7.159	-4.139	58.307	7.159	0.000%
17	7.197	-58.307	-4.117	-7.197	58.307	4.117	0.000%
18	8.327	-58.307	0.028	-8.327	58.307	-0.028	0.000%
19	7.226	-58.307	4.166	-7.226	58.307	-4.166	0.000%
20	4.188	-58.307	7.188	-4.188	58.307	-7.188	0.000%
21	0.028	-58.307	8.283	-0.028	58.307	-8.283	0.000%
22	-4.139	-58.307	7.159	4.139	58.307	-7.159	0.000%
23	-7.197	-58.307	4.117	7.197	58.307	-4.117	0.000%
24	-8.327	-58.307	-0.028	8.327	58.307	0.028	0.000%
25	-7.226	-58.307	-4.166	7.226	58.307	4.166	0.000%
26	-4.188	-58.307	-7.188	4.188	58.307	7.188	0.000%
27	-0.047	-41.009	-12.057	0.047	41.009	12.057	0.000%
28	6.018	-41.009	-10.418	-6.018	41.009	10.418	0.000%
29	10.471	-41.009	-5.988	-10.471	41.009	5.988	0.000%
30	12.118	-41.009	0.047	-12.118	41.009	-0.047	0.000%
31	10.518	-41.009	6.069	-10.518	41.009	-6.069	0.000%
32	6.100	-41.009	10.465	-6.100	41.009	-10.465	0.000%
33	0.047	-41.009	12.057	-0.047	41.009	-12.057	0.000%
34	-6.018	-41.009	10.418	6.018	41.009	-10.418	0.000%
35	-10.471	-41.009	5.988	10.471	41.009	-5.988	0.000%
36	-12.118	-41.009	-0.047	12.118	41.009	0.047	0.000%
37	-10.518	-41.009	-6.069	10.518	41.009	6.069	0.000%
38	-6.100	-41.009	-10.465	6.100	41.009	10.465	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	0.00003233
3	Yes	4	0.00000001	0.00061932
4	Yes	4	0.00000001	0.00059781
5	Yes	4	0.00000001	0.00001425
6	Yes	4	0.00000001	0.00061623
7	Yes	4	0.00000001	0.00064528
8	Yes	4	0.00000001	0.00005044
9	Yes	4	0.00000001	0.00058768
10	Yes	4	0.00000001	0.00061193
11	Yes	4	0.00000001	0.00002058
12	Yes	4	0.00000001	0.00064026
13	Yes	4	0.00000001	0.00060834
14	Yes	4	0.00000001	0.00000001
15	Yes	4	0.00000001	0.00042103
16	Yes	4	0.00000001	0.00045250
17	Yes	4	0.00000001	0.00045410
18	Yes	4	0.00000001	0.00042632
19	Yes	4	0.00000001	0.00045992
20	Yes	4	0.00000001	0.00045903
21	Yes	4	0.00000001	0.00042170
22	Yes	4	0.00000001	0.00044994
23	Yes	4	0.00000001	0.00045145
24	Yes	4	0.00000001	0.00042299
25	Yes	4	0.00000001	0.00045704
26	Yes	4	0.00000001	0.00045486
27	Yes	4	0.00000001	0.00000980

28	Yes	4	0.00000001	0.00005666
29	Yes	4	0.00000001	0.00005231
30	Yes	4	0.00000001	0.00000658
31	Yes	4	0.00000001	0.00005376
32	Yes	4	0.00000001	0.00005956
33	Yes	4	0.00000001	0.00001101
34	Yes	4	0.00000001	0.00005064
35	Yes	4	0.00000001	0.00005496
36	Yes	4	0.00000001	0.00000685
37	Yes	4	0.00000001	0.00005829
38	Yes	4	0.00000001	0.00005250

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	150 - 96.833	18.391	31	1.069	0.002
L2	102.5 - 48	8.597	31	0.811	0.001
L3	55 - 0	2.418	31	0.403	0.000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
146.000	BXA-70063-6CF-EDIN-5 w/ Mount Pipe	31	17.507	1.051	0.002	60619
137.000	800MHz 2X50W RRH W/FILTER	31	15.532	1.010	0.002	23315
134.000	APXVSPP18-C-A20 w/ Mount Pipe	31	14.881	0.995	0.001	18943
117.000	BCD-87010	31	11.333	0.906	0.001	9184

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	150 - 96.833	47.017	6	2.733	0.005
L2	102.5 - 48	21.989	6	2.075	0.002
L3	55 - 0	6.186	6	1.031	0.001

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
146.000	BXA-70063-6CF-EDIN-5 w/ Mount	6	44.759	2.687	0.005	23833

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
	Pipe					
137.000	800MHz 2X50W RRH W/FILTER	6	39.711	2.581	0.004	9166
134.000	APXVSPP18-C-A20 w/ Mount Pipe	6	38.048	2.545	0.004	7447
117.000	BCD-87010	6	28.981	2.316	0.003	3609

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	150 - 96.833 (1)	TP39.21x26.19x0.313	53.167	0.000	0.0	39.000	37.744	-11.278	1472.020	0.008
L2	96.833 - 48 (2)	TP50.55x37.197x0.406	54.500	0.000	0.0	39.000	63.351	-21.901	2470.680	0.009
L3	48 - 0 (3)	TP61.5x48.022x0.5	55.000	0.000	0.0	38.739	98.210	-40.996	3804.540	0.011

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	150 - 96.833 (1)	TP39.21x26.19x0.313	605.978	21.018	39.000	0.539	0.000	0.000	39.000	0.000
L2	96.833 - 48 (2)	TP50.55x37.197x0.406	1599.967	25.610	39.000	0.657	0.000	0.000	39.000	0.000
L3	48 - 0 (3)	TP61.5x48.022x0.5	3116.242	25.540	38.739	0.659	0.000	0.000	38.739	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	150 - 96.833 (1)	TP39.21x26.19x0.313	17.822	0.472	26.000	0.037	0.665	0.011	26.000	0.000
L2	96.833 - 48 (2)	TP50.55x37.197x0.406	24.051	0.380	26.000	0.030	0.665	0.005	26.000	0.000
L3	48 - 0 (3)	TP61.5x48.022x0.5	31.104	0.317	26.000	0.025	0.665	0.003	26.000	0.000

Pole Interaction Design Data

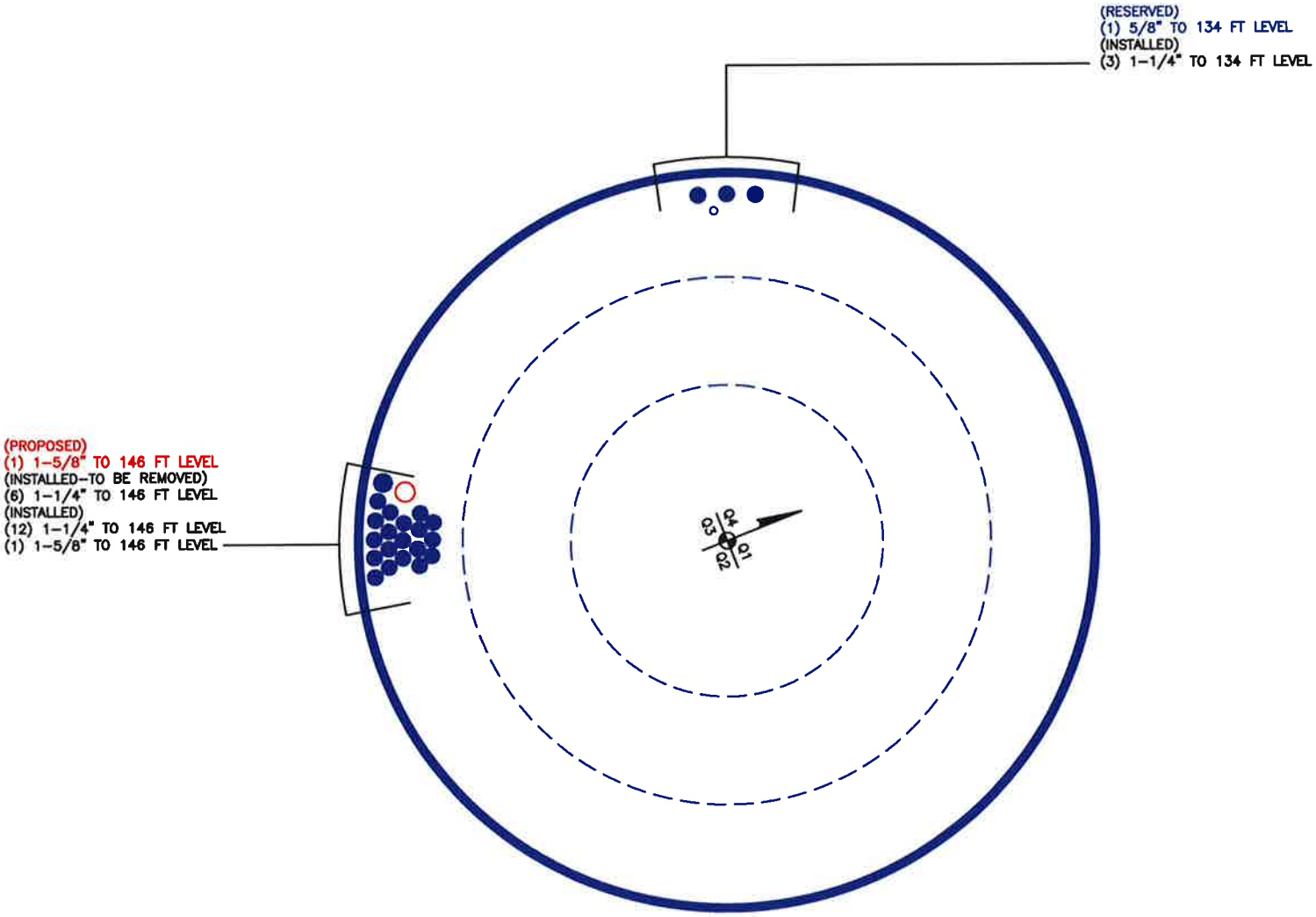
Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	150 - 96.833 (1)	0.008	0.539	0.000	0.037	0.000	0.547 ✔	1.333	H1-3+VT ✔
L2	96.833 - 48 (2)	0.009	0.657	0.000	0.030	0.000	0.666 ✔	1.333	H1-3+VT ✔
L3	48 - 0 (3)	0.011	0.659	0.000	0.025	0.000	0.670 ✔	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	150 - 96.833	Pole	TP39.21x26.19x0.313	1	-11.278	1962.203	41.0	Pass
L2	96.833 - 48	Pole	TP50.55x37.197x0.406	2	-21.901	3293.416	49.9	Pass
L3	48 - 0	Pole	TP61.5x48.022x0.5	3	-40.996	5071.452	50.3	Pass
							Summary	
						Pole (L3)	50.3	Pass
						RATING =	**50.3**	**Pass**

APPENDIX B

BASE LEVEL DRAWING



BUSINESS UNIT: 806370

APPENDIX C

ADDITIONAL CALCULATIONS

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

TIA Rev F

Site Data

BU#: *806370*
Site Name: *HRT 099 943226, CT*
App #: *300668 Revision # 2*

Pole Manufacturer:	*Other*

Reactions		
Moment:	3116	ft-kips
Axial:	41	kips
Shear:	31	kips

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

Anchor Rod Data		
Qty:	24	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	70.17	in

Plate Data		
Diam:	76.17	in
Thick:	3	in
Grade:	60	ksi
Single-Rod B-eff:	8.24	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:	61.5	in
Thick:	0.5	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	

Anchor Rod Results

Maximum Rod Tension:	87.1 Kips	Rigid
Allowable Tension:	195.0 Kips	Service, ASD
Anchor Rod Stress Ratio:	44.7% Pass	Fty*ASIF

Base Plate Results

	Flexural Check	Rigid
Base Plate Stress:	19.8 ksi	Service ASD
Allowable Plate Stress:	60.0 ksi	0.75*Fy*ASIF
Base Plate Stress Ratio:	33.0% Pass	Y.L. Length: 33.79

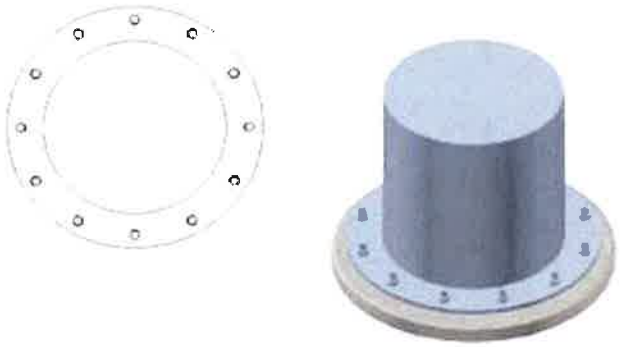
n/a

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: 7/20/2015

BU:	806370
Site Name:	HRT 099 943226, CT
App Number:	300668: Rev. 7
Work Order:	1091227

CROWN CASTLE

Monopole Drilled Pier

Input

Criteria

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

Forces

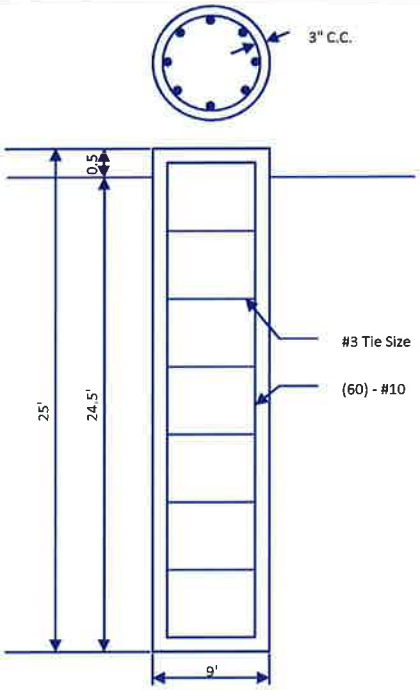
Compression	41 kips
Shear	31 kips
Moment	3116 k-ft
Swelling Force	0 kips

Foundation Dimensions

Pier Diameter:	9 ft
Ext. above grade:	0.5 ft
Depth below grade:	24.5 ft

Material Properties

Number of Rebar:	60
Rebar Size:	10
Tie Size	3
Rebar tensile strength:	60 ksi
Concrete Strength:	3000 psi
Ultimate Concrete Strain	0.003 in/in
Clear Cover to Ties:	3 in



Soil Profile: Soil Properties

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	4.5	0	4.5	100			0	0	0	
2	0.5	4.5	5	100	300	30	0	0	0	
3	9	5	14	100	300	30	0.8	0.8	0	
4	1	14	15	36	100	23	0.8	0.8	0	
5	9.5	15	24.5	36	100	23	0.6	0.6	6	

Analysis Results

Soil Lateral Capacity

Depth to Zero Shear:	5.81 ft
Max Moment, Mu:	3324.87 k-ft
Soil Safety Factor:	2.67
Safety Factor Req'd:	2
RATING:	75.0%

Soil Axial Capacity

Skin Friction (k):	193.68 kips
End Bearing (k):	190.85 kips
Comp. Capacity (k), ϕCn:	384.53 kips
Comp. (k), Cu:	53.30 kips
RATING:	13.9%

Concrete/Steel Check

Mu (from soil analysis)	4322.33 k-ft
ϕMn	15201.48 k-ft
RATING:	28.4%

rho provided	0.83	
rho required	0.33	OK
Rebar Spacing	3.96	
Spacing required	20.32	OK
Dev. Length required	18.44	
Dev. Length provided	55.65	OK

Overall Foundation Rating: 75.0%