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July 27, 2016

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

Re: **Notice of Exempt Modification – Facility Modification**
345 Bushy Hill Road, Simsbury, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) antennas at the top of the existing 100-foot tower at 345 Bushy Hill Road in Simsbury, Connecticut (the "Property"). The tower and underlying property are owned by Simsbury Fire District ("SFD"). The Council approved Cellco's use of this tower in 2013 (Petition No. 1077). Cellco now intends to replace all of its existing antennas with three (3) model SBNHH-1D65B, 700 MHz antennas; three (3) model SBNHH-1D65B, 850 MHz antennas; three (3) model SBNHH-1D65B, 1900 MHz antennas; and three (3) model SBNHH-1D65B, 2100 MHz antennas, all at the same level on the tower. Cellco also intends to install nine (9) remote radio heads ("RRHs") behind its antennas. Included in Attachment 1 are specifications for Cellco's replacement antennas and RRHs.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Lisa L. Heavner, Simsbury's First Selectwoman. A copy of this letter is also being sent to SVD, the owner of the Property and the tower.

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

15034550-v1

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 continue to be attached to its existing t-arms at the top of 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).

A copy of the Simsbury Assessor's Parcel Map and property owner information is included in Attachment 4.

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:
Lisa L. Heavner, Simsbury First Selectwoman
Simsbury Fire District
Tim Parks

ATTACHMENT 1

Product Specifications

SBNHH-1D65B

Multiband 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 (First Lobe), dB	14	13	15	15	15	13
Front-to-Back Ratio at 180°, dB	27	29	28	28	28	27
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 7 ° | 14.6 14 ° | 14.2	0 ° | 14.5 7 ° | 14.4 14 ° | 13.6	0 ° | 17.4 3 ° | 17.5 7 ° | 17.4	0 ° | 17.8 3 ° | 17.9 7 ° | 17.9	0 ° | 18.1 3 ° | 18.3 7 ° | 18.2	0 ° | 18.2 3 ° | 18.4 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, beampeak to 20° above beampeak, 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 Type	Sector with internal RET
Band	Multiband
Brand	DualPol®
Operating Frequency Band	1695 – 2360 MHz | 698 – 896 MHz
Performance Note	Outdoor usage

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, frontal	618.0 N @ 150 km/h 138.9 lbf @ 150 km/h
Wind Loading, lateral	197.0 N @ 150 km/h 44.3 lbf @ 150 km/h
Wind Loading, rear	728.0 N @ 150 km/h 163.7 lbf @ 150 km/h
Wind Speed, maximum	241 km/h | 150 mph

Dimensions

Depth	180.0 mm | 7.1 in
Length	1851.0 mm | 72.9 in
Width	301.0 mm | 11.9 in
Net Weight, without mounting kit	18.4 kg | 40.6 lb

Remote Electrical Tilt (RET) Information

Input Voltage	10–30 Vdc
Internal RET	High band (1) | Low band (1)
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

Packed Dimensions

Depth	296.0 mm | 11.7 in
Length	2025.0 mm | 79.7 in
Width	390.0 mm | 15.4 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

Product Specifications

COMMSCOPE®

SBNHH-1D65B

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.

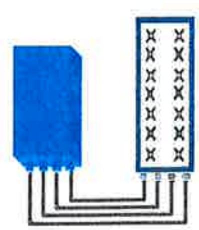
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the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

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

ALCATEL-LUCENT WIRELESS PRODUCT DATASHEET

RRH2X60-1900A-4R FOR BAND 2/25 APPLICATIONS

The Alcatel-Lucent RRH2x60-1900A-4R is a high power, small form factor Remote Radio Head operating in the PCS 1900MHz frequency band for WCDMA and LTE technologies. 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 RRH2x60-1900A-4R 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 RRH2x60-1900A-4R integrates all the latest technologies. This allows operators 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.

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 RRH2x60-1900A-4R 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).

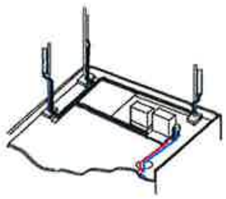
The Alcatel-Lucent RRH2x60-1900A-4R is a very cost-effective solution to deploy LTE MIMO.

EASY INSTALLATION

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 RRH2x60-1900A-4R installation, providing more flexible site selection and improved network quality along with greatly reduced installation time and costs.

The Alcatel-Lucent RRH2x60-1900A-4R 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 RRH2x60-190A-4R is compact and weighs about 21 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.



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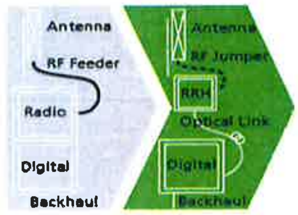
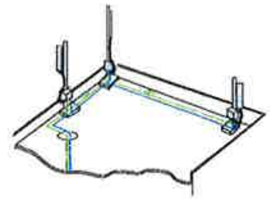


RRH for space-constrained cell sites



Distributed

FEATURES

- RRH2x60-1900A-4R integrates two power amplifiers of 60W rating (at each antenna connector)
- RRH2x60-1900A-4R can operate WCDMA only, LTE only or a mix of WCDMA and LTE
- RRH2x60-1900A-4R offers the possibility for WCDMA (non MIMO) to operate the two radio chains independently (2 blocks of 20 MHz anywhere in the band)
- RRH2x60-1900A-4R is a very compact and lightweight product
- Advanced power management techniques are embedded to provide power savings, such as PA bias control

BENEFITS

- MIMO deployment and/or WCDMA and LTE simultaneous 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 : 500x285x208 mm (30l with solar shield)
- Weight : 21 kg (46 lbs) (with solar shield)

Electrical Data

- Power Supply : -48V DC (-40.5 to -57V)
- Power Consumption: 460W typ. @2x60W (100%RF)

RF Characteristics

- Supported spectrum: DL 1930-1990 / UL 1850-1910
- Frequency band: 3GPP band 2/25
- Output power: 2x60W at antenna connectors
- Technology supported: W-CDMA and LTE
- Instantaneous bandwidth: 20 MHz (MIMO) or 2x20 MHz (non MIMO)
- Rx diversity: 2-way and 4-way uplink reception
- Typical sensitivity without Rx diversity: -124.8dBm for WCDMA and -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 15km 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

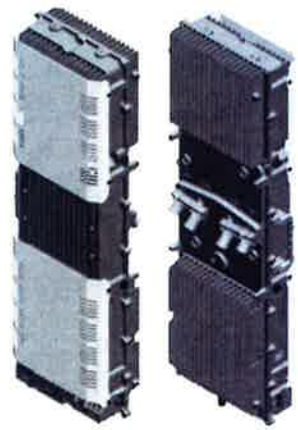
- Operating temperature: -40°C to 55°C including solar load
- Operating relative humidity: 8% to 100%
- Environmental Conditions: ETS300-019-1-4 class4.1E
- Ingress Protection: IEC 60529 IP65
- Acoustic Noise : Noiseless (natural convection cooling)

Safety and Regulatory Data

- EMC : 3GPP 25113, EN 301 489-1, EN 301 489-23, GR 1089
- Safety : IEC60950-1, EN 60825-1
- Regulatory: CE Mark-European Directive 2002/95/EC (RoHS), 2002/96/EC (WEEE), 1999/5/EC (R&TTE)
- Health : EN 50385

ALCATEL-LUCENT
WIRELESS PRODUCT DATASHEET
B4 RRH2X60-4R FOR AWS BAND APPLICATIONS

The Alcatel-Lucent B4 RRH2x60-4R 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 B4 RRH2x60-4R 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 B4 RRH2x60-4R integrates all the latest technologies. This allows operators 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 B4 RRH2x60-4R 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 B4 RRH2x60-4R is a very cost-effective solution to deploy LTE MIMO.

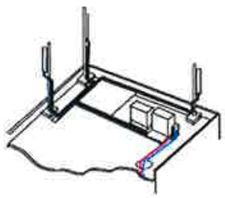
EASY INSTALLATION

The B4 RRH2x60-4R 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 B4 RRH2x60-4R installation, providing more flexible site selection and improved network quality along with greatly reduced installation time and costs.

The Alcatel-Lucent B4 RRH2x60-4R 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 B4 RRH2x60-4R is compact and weighs about 25 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.



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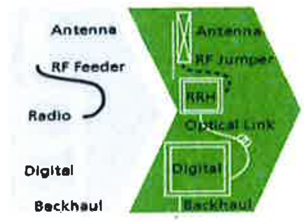
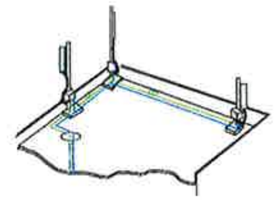


RRH for space-constrained cell sites



Distributed

FEATURES

- B4 RRH2x60-4R integrates two power amplifiers of 60W rating (at each antenna connector)
- Support multiple carriers over the entire 3GPP band 4
- B4 RRH2x60-4R is optimized for LTE operation
- B4 RRH2x60-4R 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 : 930x270x146 mm (with solar shield)
- Weight : 25 kg (55 lbs) (with solar shield)

Electrical Data

- Power Supply : -48V DC (-38 to -57V)
- Power Consumption:
  346W typ. @2x30W (100%RF),
  560W typ. @2x60W (100%RF)

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 (3-6) 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 300m using MM fiber, up to 15km using SM fiber
- TMA/RETA : AISG 2.0 (RS485 connector and internal Bias-Tee)
- Four 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
- Health : EN 50385

Alcatel·Lucent

ATTACHMENT 2

	General	Power	Density					
Site Name: Simsbury 2								
Tower Height: 80Ft. (ext. to 100')								
CARRIER	# OF CHAN.	WATTS ERP	HEIGHT	CALC. POWER DENS	FREQ.	MAX. PERMISS. EXP.	FRACTION MPE	Total
*AT&T	2	500	90	880	0.0510	0.5867	0.87%	
*AT&T	1	500	90	1900	0.0255	1.0000	0.25%	
*AT&T	1	500	90	700	0.0255	0.4667	0.55%	
*AT&T	1	500	90	1900	0.0255	1.0000	0.25%	
*AT&T	1	500	90	2300	0.0255	1.0000	0.25%	
*T-Mobile	8	157	77	1945	0.0896	1.0000	0.90%	
*Simsbury Fire			85	453.1625			3.99%	
*Simsbury Police			85	453.75			3.98%	
*Farm. Valley Health			85	453.7875			3.98%	
*Town Wide			85	453.55			3.99%	
Verizon PCS	**1**	**2224**	**100**	**0.0800**	**1970**	**1.0000**	**8.00%**	
Verizon Cellular	**9**	**311**	**100**	**0.1006**	**869**	**0.5793**	**17.37%**	
Verizon AWS	**1**	**2229**	**100**	**0.0801**	**2145**	**1.0000**	**8.01%**	
Verizon 700	**1**	**649**	**100**	**0.0233**	**746**	**0.4973**	**4.69%**	
								57.09%
* Source: Siting Council								

ATTACHMENT 3

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

80-ft Existing PennSummit Monopole
w/ 26-ft Extension

Proposed Verizon Wireless
Antenna Upgrade

Verizon Site Ref: Simsbury 2

345 Bushy Hill Road
Simsbury, CT

Centek Project No. 16001.012

Date: March 18, 2016

STATE OF CONNECTICUT
TIMOTHY J. LYNN
No. 29336
LICENSED
PROFESSIONAL ENGINEER

Prepared for:

Verizon Wireless
99 East River Road, 9th Floor
East Hartford, CT 06108

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Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna upgrade proposed by Verizon Wireless on the existing monopole (tower) located in Simsbury, CT.

The host tower is a 80-ft tall, two-section, eighteen sided, tapered monopole, originally designed by Paul J. Ford and Company and manufactured by PennSummit Tubular, LLC job no; 29204-0049 dated February 24, 2004 with a 26-ft extension designed by Centek; project no. 13135 dated September 16, 2013. The tower geometry, structure member sizes and foundation system information were obtained from the aforementioned PennSummit design documents and the aforementioned structural analysis report prepared by Centek.

Antenna and appurtenance information were obtained from the aforementioned Centek structural report, visual verification from grade by Centek personnel on March 15, 2016 and a Verizon RF data sheet.

The tower consists of two (2) tapered vertical steel sections conforming to ASTM A607-65 and one (1) HSS12.75"x0.625" pipe extension conforming to ASTM A500-Gr. B (42 ksi). The vertical tower sections are slip joint connected. The extension is flange connected to the top of the tower. The diameter of the pole (flat-flat) is 22.00-in at the top and 33.40-in at the base.

Verizon proposes the removal of twelve (12) panel antennas and six (6) remote radio heads and the installation of twelve (12) panel antennas and nine (9) Remote Radio Heads mounted to the existing T-Arms. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna and appurtenance configuration.

Antenna and Appurtenance Summary

The existing, proposed and future loads considered in this analysis consist of the following:

- TOWN (EXISTING):
  Antennas: One (1) 6-ft Omni-directional whip, one (1) ground plane antenna and two (2) dipole antennas mounted on three (3) 4-ft standoff mounts with an elevation of 105-ft above grade.
  Coax Cables: One (1) 1-1/4" ∅ and three (3) 7/8" ∅ coax cables running on the inside of the existing tower.
- T-MOBILE (EXISTING):
  Antennas: Three (3) RFS APX16DWV-16DWVS-E-A20 panel antennas and three (3) 10"x8"x3" TMA's flush mounted with a RAD center elevation of 77-ft above grade.
  Coax Cables: Six (6) 1-5/8" ∅ coax cables running on the inside of the existing tower.
- VERIZON (EXISTING TO REMAIN):
  Antennas: Two (2) Raycap RC2DC-3315-PF-48 main distribution boxes mounted on three (3) T-Arms with a RAD center elevation of 100-ft above grade.
  Coax Cables: Two (2) 1-5/8" ∅ Hybriflex fiber cables running on the inside of the existing tower.

- VERIZON (EXISTING TO REMOVE):
  Antennas: Six (6) Antel BXA-70063-6CF panel antennas, six (6) Antel BXA-171063-12CF panel antennas, three (3) Alcatel-Lucent RRH2x40-AWS Remote Radio Heads and three (3) Alcatel-Lucent RRH2x40-LTE Remote Radio Heads mounted on three (3) T-Arms with a RAD center elevation of 100-ft above grade.
- **VERIZON (PROPOSED):**
  Antennas: Twelve (12) Andrew SBNHH-1D65B panel antennas, three (3) Alcatel-Lucent RRH4x30-B13 remote radio heads, three (3) Alcatel-Lucent RRH2x60-PCS remote radio heads and three (3) Alcatel-Lucent RRH4x45/2x90-AWS remote radio heads mounted on three (3) T-Arms with a RAD center elevation of 100-ft above grade.

Primary Assumptions Used in the Analysis

- The tower structure's theoretical capacity not including any assessment of the condition of the tower.
- The tower carries the horizontal and vertical loads due to the weight of antennas, ice load and wind.
- Tower is properly installed and maintained.
- Tower is in plumb condition.
- Tower loading for antennas and mounts as listed in this report.
- All bolts are appropriately tightened providing the necessary connection continuity.
- All welds are fabricated with ER-70S-6 electrodes.
- All members are assumed to be as specified in the original tower design documents or reinforcement drawings.
- All members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
- All member protective coatings are in good condition.
- All tower members were properly designed, detailed, fabricated, installed and have been properly maintained since erection.
- Any deviation from the analyzed antenna loading will require a new analysis for verification of structural adequacy.
- All existing coax cables to be installed as indicated in this report.

Analysis

The existing tower was analyzed using a comprehensive computer program entitled tnxTower. The program analyzes the tower, considering the worst case loading condition. The tower is considered as loaded by concentric forces along the tower shaft, and the model assumes that the shaft members are subjected to bending, axial, and shear forces.

The existing tower was analyzed for the controlling basic wind speed (fastest mile) with no ice and a 75% reduction of wind force with ½ inch accumulative ice to determine stresses in members as per guidelines of TIA/EIA-222-F-96 entitled "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures", the American Institute of Steel Construction (AISC) and the Manual of Steel Construction; Allowable Stress Design (ASD).

The controlling wind speed is determined by evaluating the local available wind speed data as provided in Appendix K of the CSBC[1] and the wind speed data available in the TIA/EIA-222-F-96 Standard. The higher of the two wind speeds is utilized in preparation on the tower analysis.

Tower Loading

Tower loading was determined by the basic wind speed as applied to projected surface areas with modification factors per TIA/EIA-222-F, gravity loads of the tower structure and its components, and the application of ½" radial ice on the tower structure and its components.

Basic Wind Speed:	Hartford; v = 80 mph (fastest mile)	*[Section 16 of TIA/EIA-222-F-96]*
	Simsbury; v = 95 mph (3 second gust) equivalent to v = 77.5 mph (fastest mile)	*[Appendix K of the 2005 CT Building Code Supplement]*
	TIA/EIA-222-F wind speed controls.	
Load Cases:	Load Case 1; 80 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 2; 69 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 69 mph wind speed velocity represents 75% of the wind pressure generated by the 80 mph wind speed.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	Load Case 3; Seismic – not checked	*[Section 1614.5 of State Bldg. Code 2005] does not control in the design of this structure type*

[1] The 2005 Connecticut State Building Code as amended by the 2005 CT State Supplement. (CSBC)

Tower Capacity

Tower stresses were calculated utilizing the structural analysis software tnxTower. Allowable stresses were determined based on Table 5 of the TIA/EIA code with a 1/3 increase per Section 3.1.1.1 of the same code.

- Calculated stresses were found to be within allowable limits. In Load Case 1, per tnxTower "Section Capacity Table", this tower was found to be at **89.3%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L4)	0.00'-41.5'	89.3%	**PASS**

Foundation and Anchors

The existing foundation consists of a 5.0-ft square x 3.5-ft long reinforced concrete pier on a 17.0-ft square x 3.0-ft thick reinforced concrete pad. The sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned Centek structural analysis. The base of the tower is connected to the foundation by means of (8) 2.25"∅, ASTM A615-75 anchor bolts embedded approximately 6-ft into the concrete foundation structure.

- The tower base reactions developed from the governing Load Case 1 were used in the verification of the foundation and its anchors:

Location	Vector	Proposed Reactions
Base	Shear	10 kips
	Compression	12 kips
	Moment	828 kip-ft

- The foundation was found to be within allowable limits.

Foundation	Design Limit	IBC 2003/2005 CT State Building Code Section 3108.4.2 (FS)(1)	Proposed Loading (FS)(1)	Result
Reinforced Concrete Pad and Pier	OTM(2)	2.0	2.84	**PASS**

Note 1: FS denotes Factor of Safety.
Note 2: OTM denotes Overturning Moment

- The anchor bolts and base plate were found to be within allowable limits.

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Combined Compression and Bending	65.4%	**PASS**
Base Plate	Bending	80.4%	**PASS**

Conclusion

This analysis shows that the subject tower **is adequate** to support the proposed antenna configuration.

The analysis is based, in part, on the information provided to this office by Verizon Wireless. If the existing conditions are different than the information in this report, Centek Engineering, Inc. must be contacted for resolution of any potential issues.

Please feel free to call with any questions or comments.

Respectfully Submitted by:

Timothy J. Lynn, PE
Structural Engineer

STATE OF CONNECTICUT
TIMOTHY J. LYNN
No. 29336
LICENSED
PROFESSIONAL ENGINEER

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

All engineering services are performed on the basis that the information used is current and correct. This information may consist of, but is not necessarily limited to:

- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of Centek Engineering, Inc. or generated by field inspections or measurements of the structure.
- It is the responsibility of the client to ensure that the information provided to Centek Engineering, Inc. and used in the performance of our engineering services is correct and complete. In the absence of information to the contrary, we assume that all structures were constructed in accordance with the drawings and specifications and are in an un-corroded condition and have not deteriorated. It is therefore assumed that its capacity has not significantly changed from the "as new" condition.
- All services will be performed to the codes specified by the client, and we do not imply to meet any other codes or requirements unless explicitly agreed in writing. If wind and ice loads or other relevant parameters are to be different from the minimum values recommended by the codes, the client shall specify the exact requirement. In the absence of information to the contrary, all work will be performed in accordance with the latest revision of ANSI/ASCE10 & ANSI/EIA-222
- All services performed, results obtained, and recommendations made are in accordance with generally accepted engineering principles and practices. Centek Engineering, Inc. is not responsible for the conclusions, opinions and recommendations made by others based on the information we supply.

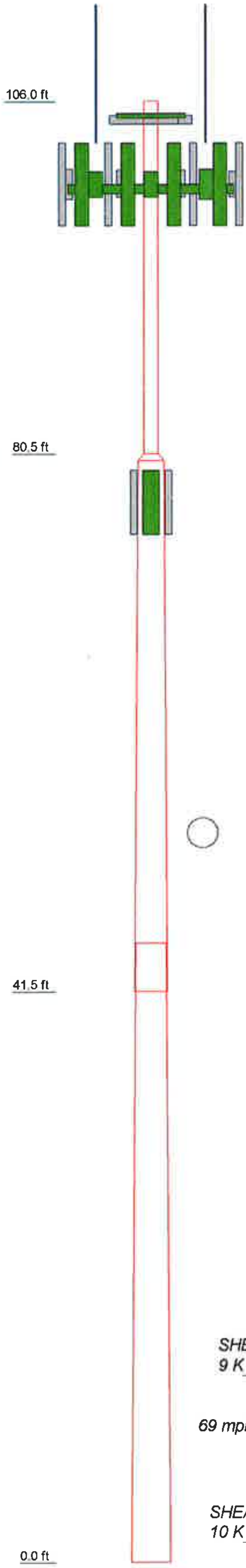
GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

tnxTower, is an integrated structural analysis and design software package for Designed specifically for the telecommunications industry, tnxTower, formerly ERITower and RISATower, automates much of the tower analysis and design required by the TIA/EIA 222 Standard.

tnxTower Features:

- tnxTower can analyze and design 3- and 4-sided guyed towers, 3- and 4-sided self-supporting towers and either round or tapered ground mounted poles with or without guys.
- The program analyzes towers using the TIA-222-G (2005) standard or any of the previous TIA/EIA standards back to RS-222 (1959). Steel design is checked using the AISC ASD 9th Edition or the AISC LRFD specifications.
- Linear and non-linear (P-delta) analyses can be used in determining displacements and forces in the structure. Wind pressures and forces are automatically calculated.
- Extensive graphics plots include material take-off, shear-moment, leg compression, displacement, twist, feed line, guy anchor and stress plots.
- tnxTower contains unique features such as True Cable behavior, hog rod take-up, foundation stiffness and much more.

Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	25.50	1	0.6250		12.7500	12.7500	A500-42	2.1
2	0.50	1	0.6250		12.7500	22.0000	A36	0.1
3	38.50	18	0.1875	3.50	22.0000	27.7000		1.9
4	45.00	18	0.2500		26.8068	33.4700	A607-65	3.6
								7.7



DESIGNED APPURTENANCE LOADING

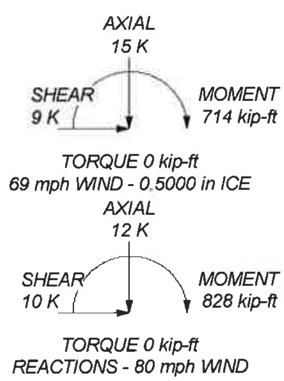
TYPE	ELEVATION	TYPE	ELEVATION
4-ft Standoff	105	RRH4x45/2x90-AWS (Verizon - Proposed)	100
4-ft Standoff	105	RRH2x60-PCS (Verizon - Proposed)	100
4-ft Standoff	105	RRH2x60-PCS (Verizon - Proposed)	100
3.5"x60" Horizontal Pipe	105	RRH2x60-PCS (Verizon - Proposed)	100
6' x 2" Omni	105	RC2DC-3315-PF-48 (Verizon - Existing)	100
DB404	105	RC2DC-3315-PF-48 (Verizon - Existing)	100
ANT220D3	105	Valmont T-Arm (3) (Verizon - Existing)	100
DB201-A	105	APX16DWV-16DWVS-E-A20 (T-Mobile - Existing)	77
(4) SBNHH-1D65B (Verizon - Proposed)	100	APX16DWV-16DWVS-E-A20 (T-Mobile - Existing)	77
(4) SBNHH-1D65B (Verizon - Proposed)	100	TMA 10"x8"x3" (T-Mobile - Existing)	77
(4) SBNHH-1D65B (Verizon - Proposed)	100	TMA 10"x8"x3" (T-Mobile - Existing)	77
RRH4x30-B13 (Verizon - Proposed)	100	TMA 10"x8"x3" (T-Mobile - Existing)	77
RRH4x30-B13 (Verizon - Proposed)	100	Valmont Uni-Tri Bracket (T-Mobile - Existing)	77
RRH4x30-B13 (Verizon - Proposed)	100	APX16DWV-16DWVS-E-A20 (T-Mobile - Existing)	77
RRH4x45/2x90-AWS (Verizon - Proposed)	100		
RRH4x45/2x90-AWS (Verizon - Proposed)	100		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A500-42	42 ksi	58 ksi	A607-65	65 ksi	80 ksi
A36	36 ksi	58 ksi			

TOWER DESIGN NOTES

1. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 69 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 50 mph wind.
4. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
5. Welds are fabricated with ER-70S-6 electrodes.
6. TOWER RATING: 89.3%



Centek Engineering Inc.
63-2 North Branford Rd.
Branford, CT 06405
Phone: (203) 488-0580
FAX: (203) 488-8587

Job: **16001.012 - Simsbury 2**		
Project: **80' PennSummit Monopole - 345 Bushy Hill Rd., Simsbury,**		
Client: Verizon Wireless	Drawn by: TJL	App'd:
Code: TIA/EIA-222-F	Date: 03/17/16	Scale: NTS
Path:		Dwg No. E-1

Tower Input Data

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

- Basic wind speed of 80 mph.
- Nominal ice thickness of 0.5000 in.
- Ice density of 56.0 pcf.
- A wind speed of 69 mph is used in combination with ice.
- Temperature drop of 50 °F.
- Deflections calculated using a wind speed of 50 mph.
- Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..
- Welds are fabricated with ER-70S-6 electrodes..
- 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
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)
SR Members Have Cut Ends
SR Members Are Concentric

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
Add IBC .6D+W Combination
√ Sort Capacity Reports By Component
Triangulate Diamond Inner Bracing
Treat Feed Line 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 Feed Line Torque
Include Angle Block Shear Check
Use TIA-222-G Bracing Resist. Exemption
Use TIA-222-G Tension Splice Exemption

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	106.00-80.50	25.50	0.00	Round	12.7500	12.7500	0.6250		A500-42 (42 ksi)
L2	80.50-80.00	0.50	0.00	Round	12.7500	22.0000	0.6250		A36 (36 ksi)
L3	80.00-41.50	38.50	3.50	18	22.0000	27.7000	0.1875	0.7500	A607-65 (65 ksi)
L4	41.50-0.00	45.00		18	26.8068	33.4700	0.2500	1.0000	A607-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	12.7500	23.8074	438.6696	4.2925	6.3750	68.8109	877.3392	11.8966	0.0000	0
	12.7500	23.8074	438.6696	4.2925	6.3750	68.8109	877.3392	11.8966	0.0000	0
L2	12.7500	23.8074	438.6696	4.2925	6.3750	68.8109	877.3392	11.8966	0.0000	0
	22.0000	41.9697	2398.9954	7.5604	11.0000	218.0905	4797.9909	20.9723	0.0000	0
L3	22.3394	12.9812	780.3007	7.7434	11.1760	69.8193	1561.6281	6.4918	3.5420	18.891
	28.1273	16.3734	1565.7983	9.7669	14.0716	111.2736	3133.6569	8.1882	4.5452	24.241
L4	27.7466	21.0728	1877.6407	9.4277	13.6179	137.8807	3757.7521	10.5384	4.2780	17.112
	33.9863	26.3601	3675.2194	11.7931	17.0028	216.1543	7355.2747	13.1825	5.4507	21.803

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	Double Angle Stitch Bolt Spacing Redundants in
L1 106.00-80.50				1	1	1			
L2 80.50-80.00				1	1	1			
L3 80.00-41.50				1	1	1			
L4 41.50-0.00				1	1	1			

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
1 5/8 (T-Mobile - Existing)	C	No	Inside Pole	77.00 - 0.00	6	No Ice	0.00	1.04
						1/2" Ice	0.00	1.04
7/8	C	No	Inside Pole	80.00 - 0.00	3	No Ice	0.00	0.54
						1/2" Ice	0.00	0.54
1 1/4	C	No	Inside Pole	80.00 - 0.00	1	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
HYBRIFLEX 1-5/8" (Verizon - Existing)	C	No	Inside Pole	80.00 - 0.00	2	No Ice	0.00	1.90
						1/2" Ice	0.00	1.90
7/8	C	No	CaAa (Out Of Face)	100.00 - 80.00	3	No Ice	0.00	0.54
						1/2" Ice	0.00	1.52
1 1/4	C	No	CaAa (Out Of Face)	100.00 - 80.00	1	No Ice	0.00	0.66
						1/2" Ice	0.00	1.91
HYBRIFLEX 1-5/8" (Verizon - Existing)	C	No	CaAa (Out Of Face)	100.00 - 80.00	2	No Ice	0.20	1.90
						1/2" Ice	0.30	3.41

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	106.00-80.50	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	7.722	0.12
L2	80.50-80.00	A	0.000	0.000	0.000	0.000	0.00

Tower Section	Tower Elevation ft	Face	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.198	0.00
L3	80.00-41.50	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.46
L4	41.50-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.51

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft²	A_F ft²	C_AA_A In Face ft²	C_AA_A Out Face ft²	Weight K
L1	106.00-80.50	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	11.622	0.26
L2	80.50-80.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.298	0.01
L3	80.00-41.50	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.46
L4	41.50-0.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.51

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	106.00-80.50	-0.3061	0.1767	-0.3928	0.2268
L2	80.50-80.00	-0.4039	0.2332	-0.5270	0.3042
L3	80.00-41.50	0.0000	0.0000	0.0000	0.0000
L4	41.50-0.00	0.0000	0.0000	0.0000	0.0000

Discrete Tower Loads

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
4-ft Standoff	A	From Face	0.00 0.00 0.00	0.0000	105.00	No Ice 1/2" Ice	1.40 1.73	0.09 0.13	0.03 0.04

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* *ft* *ft* *ft*	*Azimuth Adjustment* °	*Placement* *ft*		C_AA_A *Front* *ft*^{2}	C_AA_A *Side* *ft*^{2}	*Weight* *K*
4-ft Standoff	A	From Face	0.00 0.00 0.00	0.0000	105.00	No Ice 1/2" Ice	1.40 1.73	0.09 0.13	0.03 0.04
4-ft Standoff	B	From Face	0.00 0.00 0.00	0.0000	105.00	No Ice 1/2" Ice	1.40 1.73	0.09 0.13	0.03 0.04
3.5"x60" Horizontal Pipe	C	From Face	0.00 0.00 0.00	0.0000	105.00	No Ice 1/2" Ice	1.33 1.69	1.33 1.69	0.08 0.18
6' x 2" Omni	A	From Face	4.00 0.00 3.00	0.0000	105.00	No Ice 1/2" Ice	1.20 1.80	1.20 1.80	0.02 0.03
DB404	A	From Face	4.00 0.00 3.00	0.0000	105.00	No Ice 1/2" Ice	1.14 2.05	1.14 2.05	0.01 0.02
ANT220D3	B	From Face	4.00 0.00 3.00	0.0000	105.00	No Ice 1/2" Ice	1.10 1.50	1.10 1.50	0.04 0.05
DB201-A	C	From Face	4.00 0.00 3.00	0.0000	105.00	No Ice 1/2" Ice	1.10 1.98	1.10 1.98	0.03 0.03
APX16DWV-16DWVS-E-A 20 (T-Mobile - Existing)	A	From Face	0.50 0.00 0.00	0.0000	77.00	No Ice 1/2" Ice	7.07 7.52	2.15 2.49	0.04 0.07
APX16DWV-16DWVS-E-A 20 (T-Mobile - Existing)	B	From Face	0.50 0.00 0.00	0.0000	77.00	No Ice 1/2" Ice	7.07 7.52	2.15 2.49	0.04 0.07
APX16DWV-16DWVS-E-A 20 (T-Mobile - Existing)	C	From Face	0.50 0.00 0.00	0.0000	77.00	No Ice 1/2" Ice	7.07 7.52	2.15 2.49	0.04 0.07
TMA 10"x8"x3" (T-Mobile - Existing)	A	From Face	4.00 5.00 0.00	0.0000	77.00	No Ice 1/2" Ice	0.00 0.00	0.00 0.00	0.02 0.02
TMA 10"x8"x3" (T-Mobile - Existing)	A	From Face	4.00 5.00 0.00	0.0000	77.00	No Ice 1/2" Ice	0.00 0.00	0.00 0.00	0.02 0.02
TMA 10"x8"x3" (T-Mobile - Existing)	A	From Face	4.00 5.00 0.00	0.0000	77.00	No Ice 1/2" Ice	0.00 0.00	0.00 0.00	0.02 0.02
Valmont Uni-Tri Bracket (T-Mobile - Existing)	C	None		0.0000	77.00	No Ice 1/2" Ice	1.75 1.94	1.75 1.94	0.29 0.31
(4) SBNHH-1D65B (Verizon - Proposed)	A	From Face	4.00 0.00 0.00	0.0000	100.00	No Ice 1/2" Ice	8.33 8.88	5.34 5.79	0.04 0.09
(4) SBNHH-1D65B (Verizon - Proposed)	B	From Face	4.00 0.00 0.00	0.0000	100.00	No Ice 1/2" Ice	8.33 8.88	5.34 5.79	0.04 0.09
(4) SBNHH-1D65B (Verizon - Proposed)	C	From Face	4.00 0.00 0.00	0.0000	100.00	No Ice 1/2" Ice	8.33 8.88	5.34 5.79	0.04 0.09
RRH4x30-B13 (Verizon - Proposed)	A	From Face	4.00 0.00 0.00	0.0000	100.00	No Ice 1/2" Ice	2.52 2.74	1.89 2.09	0.06 0.08
RRH4x30-B13 (Verizon - Proposed)	B	From Face	4.00 0.00 0.00	0.0000	100.00	No Ice 1/2" Ice	2.52 2.74	1.89 2.09	0.06 0.08
RRH4x30-B13	C	From Face	4.00	0.0000	100.00	No Ice	2.52	1.89	0.06

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
(Verizon - Proposed)			0.00			1/2" Ice	2.74	2.09	0.08
			0.00						
RRH4x45/2x90-AWS	A	From Face	4.00	0.0000	100.00	No Ice	3.01	1.91	0.08
(Verizon - Proposed)			-4.00			1/2" Ice	3.26	2.13	0.10
			0.00						
RRH4x45/2x90-AWS	B	From Face	4.00	0.0000	100.00	No Ice	3.01	1.91	0.08
(Verizon - Proposed)			-4.00			1/2" Ice	3.26	2.13	0.10
			0.00						
RRH4x45/2x90-AWS	C	From Face	4.00	0.0000	100.00	No Ice	3.01	1.91	0.08
(Verizon - Proposed)			-4.00			1/2" Ice	3.26	2.13	0.10
			0.00						
RRH2x60-PCS	A	From Face	4.00	0.0000	100.00	No Ice	2.51	1.55	0.06
(Verizon - Proposed)			4.00			1/2" Ice	2.73	1.74	0.07
			0.00						
RRH2x60-PCS	B	From Face	4.00	0.0000	100.00	No Ice	2.51	1.55	0.06
(Verizon - Proposed)			4.00			1/2" Ice	2.73	1.74	0.07
			0.00						
RRH2x60-PCS	C	From Face	4.00	0.0000	100.00	No Ice	2.51	1.55	0.06
(Verizon - Proposed)			4.00			1/2" Ice	2.73	1.74	0.07
			0.00						
RC2DC-3315-PF-48	A	From Face	2.00	0.0000	100.00	No Ice	3.52	2.29	0.03
(Verizon - Existing)			0.00			1/2" Ice	3.77	2.51	0.05
			0.00						
RC2DC-3315-PF-48	B	From Face	2.00	0.0000	100.00	No Ice	3.52	2.29	0.03
(Verizon - Existing)			0.00			1/2" Ice	3.77	2.51	0.05
			0.00						
Valmont T-Arm (3)	C	None		0.0000	100.00	No Ice	21.00	21.00	1.01
(Verizon - Existing)						1/2" Ice	29.00	29.00	1.24

Tower Pressures - No Ice

$G_H = 1.690$

Section Elevation ft	*z* ft	K_Z	q_z psf	A_G ft²	*Face*	A_F ft²	A_R ft²	A_{leg} ft²	*Leg %*	C_AA_A *In Face* ft²	C_AA_A *Out Face* ft²
L1 106.00-80.50	93.25	1.346	22.05	27.094	A	0.000	27.094	27.094	100.00	0.000	0.000
					B	0.000	27.094		100.00	0.000	0.000
					C	0.000	27.094		100.00	0.000	7.722
L2 80.50-80.00	80.23	1.289	21.12	0.724	A	0.000	0.724	0.724	100.00	0.000	0.000
					B	0.000	0.724		100.00	0.000	0.000
					C	0.000	0.724		100.00	0.000	0.198
L3 80.00-41.50	60.45	1.189	19.39	79.727	A	0.000	79.727	79.727	100.00	0.000	0.000
					B	0.000	79.727		100.00	0.000	0.000
					C	0.000	79.727		100.00	0.000	0.000
L4 41.50-0.00	20.05	1	16.38	105.125	A	0.000	105.125	105.125	100.00	0.000	0.000
					B	0.000	105.125		100.00	0.000	0.000
					C	0.000	105.125		100.00	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 106.00-80.50	93.25	1.346	16.53	0.5000	29.219	A	0.000	29.219	29.219	100.00	0.000	0.000
						B	0.000	29.219		100.00	0.000	0.000
						C	0.000	29.219		100.00	0.000	11.622
L2 80.50-80.00	80.23	1.289	15.84	0.5000	0.766	A	0.000	0.766	0.766	100.00	0.000	0.000
						B	0.000	0.766		100.00	0.000	0.000
						C	0.000	0.766		100.00	0.000	0.298
L3 80.00-41.50	60.45	1.189	14.54	0.5000	82.935	A	0.000	82.935	82.935	100.00	0.000	0.000
						B	0.000	82.935		100.00	0.000	0.000
						C	0.000	82.935		100.00	0.000	0.000
L4 41.50-0.00	20.05	1	12.29	0.5000	108.583	A	0.000	108.583	108.583	100.00	0.000	0.000
						B	0.000	108.583		100.00	0.000	0.000
						C	0.000	108.583		100.00	0.000	0.000

Tower Pressure - Service

$G_H = 1.690$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
L1 106.00-80.50	93.25	1.346	8.61	27.094	A	0.000	27.094	27.094	100.00	0.000	0.000
					B	0.000	27.094		100.00	0.000	0.000
					C	0.000	27.094		100.00	0.000	7.722
L2 80.50-80.00	80.23	1.289	8.25	0.724	A	0.000	0.724	0.724	100.00	0.000	0.000
					B	0.000	0.724		100.00	0.000	0.000
					C	0.000	0.724		100.00	0.000	0.198
L3 80.00-41.50	60.45	1.189	7.57	79.727	A	0.000	79.727	79.727	100.00	0.000	0.000
					B	0.000	79.727		100.00	0.000	0.000
					C	0.000	79.727		100.00	0.000	0.000
L4 41.50-0.00	20.05	1	6.40	105.125	A	0.000	105.125	105.125	100.00	0.000	0.000
					B	0.000	105.125		100.00	0.000	0.000
					C	0.000	105.125		100.00	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
L1 106.00-80.50	0.12	2.07	A	1	0.59	1	1	1	27.094	0.88	34.64	C
			B	1	0.59	1	1	1	27.094			
			C	1	0.59	1	1	1	27.094			
L2 80.50-80.00	0.00	0.06	A	1	0.59	1	1	1	0.724	0.02	44.62	C
			B	1	0.59	1	1	1	0.724			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
			C	1	0.59	1	1	1	0.724			
L3 80.00-41.50	0.46	1.92	A	1	0.65	1	1	1	79.727	1.70	44.10	C
			B	1	0.65	1	1	1	79.727			
			C	1	0.65	1	1	1	79.727			
L4 41.50-0.00	0.51	3.63	A	1	0.65	1	1	1	105.125	1.89	45.59	C
			B	1	0.65	1	1	1	105.125			
			C	1	0.65	1	1	1	105.125			
Sum Weight:	1.09	7.68						OTM	224.73 kip-ft	4.50		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1 106.00-80.50	0.12	2.07	A	1	0.59	1	1	1	27.094	0.88	34.64	C
			B	1	0.59	1	1	1	27.094			
			C	1	0.59	1	1	1	27.094			
L2 80.50-80.00	0.00	0.06	A	1	0.59	1	1	1	0.724	0.02	44.62	C
			B	1	0.59	1	1	1	0.724			
			C	1	0.59	1	1	1	0.724			
L3 80.00-41.50	0.46	1.92	A	1	0.65	1	1	1	79.727	1.70	44.10	C
			B	1	0.65	1	1	1	79.727			
			C	1	0.65	1	1	1	79.727			
L4 41.50-0.00	0.51	3.63	A	1	0.65	1	1	1	105.125	1.89	45.59	C
			B	1	0.65	1	1	1	105.125			
			C	1	0.65	1	1	1	105.125			
Sum Weight:	1.09	7.68						OTM	224.73 kip-ft	4.50		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1 106.00-80.50	0.12	2.07	A	1	0.59	1	1	1	27.094	0.88	34.64	C
			B	1	0.59	1	1	1	27.094			
			C	1	0.59	1	1	1	27.094			
L2 80.50-80.00	0.00	0.06	A	1	0.59	1	1	1	0.724	0.02	44.62	C
			B	1	0.59	1	1	1	0.724			
			C	1	0.59	1	1	1	0.724			
L3 80.00-41.50	0.46	1.92	A	1	0.65	1	1	1	79.727	1.70	44.10	C
			B	1	0.65	1	1	1	79.727			
			C	1	0.65	1	1	1	79.727			
L4 41.50-0.00	0.51	3.63	A	1	0.65	1	1	1	105.125	1.89	45.59	C
			B	1	0.65	1	1	1	105.125			
			C	1	0.65	1	1	1	105.125			
Sum Weight:	1.09	7.68						OTM	224.73 kip-ft	4.50		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1 106.00-80.50	0.26	2.27	A	1	0.59	1	1	1	29.219	0.81	31.63	C
			B	1	0.59	1	1	1	29.219			
			C	1	0.59	1	1	1	29.219			
L2 80.50-80.00	0.01	0.06	A	1	0.59	1	1	1	0.766	0.02	40.14	C
			B	1	0.59	1	1	1	0.766			
			C	1	0.59	1	1	1	0.766			
L3 80.00-41.50	0.46	2.53	A	1	0.65	1	1	1	82.935	1.32	34.41	C
			B	1	0.65	1	1	1	82.935			
			C	1	0.65	1	1	1	82.935			
L4 41.50-0.00	0.51	4.42	A	1	0.65	1	1	1	108.583	1.47	35.32	C
			B	1	0.65	1	1	1	108.583			
			C	1	0.65	1	1	1	108.583			
Sum Weight:	1.23	9.28						OTM	186.28 kip-ft	3.62		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1 106.00-80.50	0.26	2.27	A	1	0.59	1	1	1	29.219	0.81	31.63	C
			B	1	0.59	1	1	1	29.219			
			C	1	0.59	1	1	1	29.219			
L2 80.50-80.00	0.01	0.06	A	1	0.59	1	1	1	0.766	0.02	40.14	C
			B	1	0.59	1	1	1	0.766			
			C	1	0.59	1	1	1	0.766			
L3 80.00-41.50	0.46	2.53	A	1	0.65	1	1	1	82.935	1.32	34.41	C
			B	1	0.65	1	1	1	82.935			
			C	1	0.65	1	1	1	82.935			
L4 41.50-0.00	0.51	4.42	A	1	0.65	1	1	1	108.583	1.47	35.32	C
			B	1	0.65	1	1	1	108.583			
			C	1	0.65	1	1	1	108.583			
Sum Weight:	1.23	9.28						OTM	186.28 kip-ft	3.62		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1 106.00-80.50	0.26	2.27	A	1	0.59	1	1	1	29.219	0.81	31.63	C
			B	1	0.59	1	1	1	29.219			
			C	1	0.59	1	1	1	29.219			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L2 80.50-80.00	0.01	0.06	A	1	0.59	1	1	1	0.766	0.02	40.14	C
			B	1	0.59	1	1	1	0.766			
			C	1	0.59	1	1	1	0.766			
L3 80.00-41.50	0.46	2.53	A	1	0.65	1	1	1	82.935	1.32	34.41	C
			B	1	0.65	1	1	1	82.935			
			C	1	0.65	1	1	1	82.935			
L4 41.50-0.00	0.51	4.42	A	1	0.65	1	1	1	108.583	1.47	35.32	C
			B	1	0.65	1	1	1	108.583			
			C	1	0.65	1	1	1	108.583			
Sum Weight:	1.23	9.28						OTM	186.28 kip-ft	3.62		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1 106.00-80.50	0.12	2.07	A	1	0.613	1	1	1	27.094	0.35	13.88	C
			B	1	0.613	1	1	1	27.094			
			C	1	0.613	1	1	1	27.094			
L2 80.50-80.00	0.00	0.06	A	1	0.59	1	1	1	0.724	0.01	17.43	C
			B	1	0.59	1	1	1	0.724			
			C	1	0.59	1	1	1	0.724			
L3 80.00-41.50	0.46	1.92	A	1	0.65	1	1	1	79.727	0.66	17.23	C
			B	1	0.65	1	1	1	79.727			
			C	1	0.65	1	1	1	79.727			
L4 41.50-0.00	0.51	3.63	A	1	0.65	1	1	1	105.125	0.74	17.81	C
			B	1	0.65	1	1	1	105.125			
			C	1	0.65	1	1	1	105.125			
Sum Weight:	1.09	7.68						OTM	88.62 kip-ft	1.76		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1 106.00-80.50	0.12	2.07	A	1	0.613	1	1	1	27.094	0.35	13.88	C
			B	1	0.613	1	1	1	27.094			
			C	1	0.613	1	1	1	27.094			
L2 80.50-80.00	0.00	0.06	A	1	0.59	1	1	1	0.724	0.01	17.43	C
			B	1	0.59	1	1	1	0.724			
			C	1	0.59	1	1	1	0.724			
L3 80.00-41.50	0.46	1.92	A	1	0.65	1	1	1	79.727	0.66	17.23	C
			B	1	0.65	1	1	1	79.727			
			C	1	0.65	1	1	1	79.727			
L4 41.50-0.00	0.51	3.63	A	1	0.65	1	1	1	105.125	0.74	17.81	C
			B	1	0.65	1	1	1	105.125			
			C	1	0.65	1	1	1	105.125			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
Sum Weight:	1.09	7.68						OTM	88.62 kip-ft	1.76		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
L1 106.00-80.50	0.12	2.07	A	1	0.613	1	1	1	27.094	0.35	13.88	C
			B	1	0.613	1	1	1	27.094			
			C	1	0.613	1	1	1	27.094			
L2 80.50-80.00	0.00	0.06	A	1	0.59	1	1	1	0.724	0.01	17.43	C
			B	1	0.59	1	1	1	0.724			
			C	1	0.59	1	1	1	0.724			
L3 80.00-41.50	0.46	1.92	A	1	0.65	1	1	1	79.727	0.66	17.23	C
			B	1	0.65	1	1	1	79.727			
			C	1	0.65	1	1	1	79.727			
L4 41.50-0.00	0.51	3.63	A	1	0.65	1	1	1	105.125	0.74	17.81	C
			B	1	0.65	1	1	1	105.125			
			C	1	0.65	1	1	1	105.125			
Sum Weight:	1.09	7.68						OTM	88.62 kip-ft	1.76		

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	7.68					
Bracing Weight	0.00					
Total Member Self-Weight	7.68			-0.49	0.14	
Total Weight	11.65			-0.49	0.14	
Wind 0 deg - No Ice		-0.02	-10.20	-784.65	2.44	-0.21
Wind 30 deg - No Ice		5.14	-8.82	-678.44	-396.26	-0.33
Wind 60 deg - No Ice		8.93	-5.08	-390.58	-688.74	-0.36
Wind 90 deg - No Ice		10.32	0.02	1.81	-796.64	-0.29
Wind 120 deg - No Ice		8.95	5.12	393.58	-691.04	-0.15
Wind 150 deg - No Ice		5.18	8.84	679.76	-400.24	0.04
Wind 180 deg - No Ice		0.02	10.20	783.66	-2.16	0.21
Wind 210 deg - No Ice		-5.14	8.82	677.46	396.54	0.33
Wind 240 deg - No Ice		-8.93	5.08	389.59	689.02	0.36
Wind 270 deg - No Ice		-10.32	-0.02	-2.79	796.92	0.29
Wind 300 deg - No Ice		-8.95	-5.12	-394.56	691.32	0.15
Wind 330 deg - No Ice		-5.18	-8.84	-680.74	400.52	-0.04
Member Ice	1.61					
Total Weight Ice	14.72			-0.47	0.23	
Wind 0 deg - Ice		-0.02	-8.50	-666.90	2.34	-0.30
Wind 30 deg - Ice		4.29	-7.35	-576.56	-336.60	-0.38
Wind 60 deg - Ice		7.44	-4.23	-331.86	-585.29	-0.35

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 90 deg - Ice		8.61	0.02	1.64	-677.09	-0.23
Wind 120 deg - Ice		7.46	4.27	334.57	-587.40	-0.05
Wind 150 deg - Ice		4.32	7.37	577.72	-340.25	0.14
Wind 180 deg - Ice		0.02	8.50	665.95	-1.88	0.30
Wind 210 deg - Ice		-4.29	7.35	575.61	337.07	0.38
Wind 240 deg - Ice		-7.44	4.23	330.91	585.76	0.35
Wind 270 deg - Ice		-8.61	-0.02	-2.58	677.55	0.23
Wind 300 deg - Ice		-7.46	-4.27	-335.51	587.86	0.05
Wind 330 deg - Ice		-4.32	-7.37	-578.67	340.72	-0.14
Total Weight	11.65			-0.49	0.14	
Wind 0 deg - Service		-0.01	-3.99	-307.67	0.98	-0.08
Wind 30 deg - Service		2.01	-3.45	-266.07	-155.18	-0.13
Wind 60 deg - Service		3.49	-1.99	-153.32	-269.73	-0.14
Wind 90 deg - Service		4.04	0.01	0.37	-311.99	-0.11
Wind 120 deg - Service		3.50	2.00	153.83	-270.63	-0.06
Wind 150 deg - Service		2.03	3.46	265.92	-156.73	0.02
Wind 180 deg - Service		0.01	3.99	306.62	-0.81	0.08
Wind 210 deg - Service		-2.01	3.45	265.02	155.35	0.13
Wind 240 deg - Service		-3.49	1.99	152.27	269.90	0.14
Wind 270 deg - Service		-4.04	-0.01	-1.42	312.16	0.11
Wind 300 deg - Service		-3.50	-2.00	-154.88	270.80	0.06
Wind 330 deg - Service		-2.03	-3.46	-266.97	156.90	-0.02

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

Comb. No.	Description
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	106 - 80.5	Pole	Max Tension	33	0.00	-0.00	0.00
			Max. Compression	14	-6.15	0.13	0.08
			Max. Mx	11	-4.04	123.29	0.64
			Max. My	2	-4.06	0.59	120.47
			Max. Vy	11	-6.54	123.29	0.64
			Max. Vx	2	-6.41	0.59	120.47
			Max. Torque	22			-0.37
L2	80.5 - 80	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-6.22	0.13	0.08
			Max. Mx	11	-4.10	126.57	0.65
			Max. My	2	-4.12	0.60	123.68
			Max. Vy	11	-6.57	126.57	0.65
			Max. Vx	2	-6.44	0.60	123.68
			Max. Torque	22			-0.37
L3	80 - 41.5	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-9.49	0.24	0.49
			Max. Mx	11	-6.86	401.14	1.90
			Max. My	2	-6.87	1.53	394.05
			Max. Vy	11	-8.62	401.14	1.90
			Max. Vx	2	-8.49	1.53	394.05
			Max. Torque	22			-0.37
L4	41.5 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-14.72	0.24	0.49
			Max. Mx	11	-11.64	827.81	2.92
			Max. My	2	-11.64	2.55	815.06
			Max. Vy	11	-10.33	827.81	2.92
			Max. Vx	2	-10.21	2.55	815.06
			Max. Torque	22			-0.36

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	24	14.72	8.61	0.02
	Max. H_x	11	11.65	10.32	0.02
	Max. H_z	2	11.65	0.02	10.20
	Max. M_x	2	815.06	0.02	10.20
	Max. M_z	5	827.51	-10.32	-0.02
	Max. Torsion	16	0.36	-4.29	7.35

Location	*Condition*	*Gov. Load Comb.*	*Vertical* K	*Horizontal, X* K	*Horizontal, Z* K
	Min. Vert	1	11.65	0.00	0.00
	Min. H_x	5	11.65	-10.32	-0.02
	Min. H_z	8	11.65	-0.02	-10.20
	Min. M_x	8	-814.01	-0.02	-10.20
	Min. M_z	11	-827.81	10.32	0.02
	Min. Torsion	22	-0.36	4.29	-7.35

Tower Mast Reaction Summary

Load Combination	*Vertical* K	*Shear$_x$* K	*Shear$_z$* K	*Overturning Moment, M_x* kip-ft	*Overturning Moment, M_z* kip-ft	*Torque* kip-ft
Dead Only	11.65	0.00	0.00	-0.51	0.15	-0.00
Dead+Wind 0 deg - No Ice	11.65	-0.02	-10.20	-815.06	2.55	-0.21
Dead+Wind 30 deg - No Ice	11.65	5.14	-8.82	-704.73	-411.62	-0.32
Dead+Wind 60 deg - No Ice	11.65	8.93	-5.08	-405.69	-715.44	-0.34
Dead+Wind 90 deg - No Ice	11.65	10.32	0.02	1.88	-827.51	-0.27
Dead+Wind 120 deg - No Ice	11.65	8.95	5.12	408.80	-717.83	-0.13
Dead+Wind 150 deg - No Ice	11.65	5.18	8.84	706.07	-415.77	0.04
Dead+Wind 180 deg - No Ice	11.65	0.02	10.20	814.01	-2.25	0.21
Dead+Wind 210 deg - No Ice	11.65	-5.14	8.82	703.68	411.92	0.32
Dead+Wind 240 deg - No Ice	11.65	-8.93	5.08	404.65	715.74	0.34
Dead+Wind 270 deg - No Ice	11.65	-10.32	-0.02	-2.92	827.81	0.27
Dead+Wind 300 deg - No Ice	11.65	-8.95	-5.12	-409.85	718.12	0.13
Dead+Wind 330 deg - No Ice	11.65	-5.18	-8.84	-707.11	416.07	-0.04
Dead+Ice+Temp	14.72	-0.00	-0.00	-0.49	0.24	-0.00
Dead+Wind 0 deg+Ice+Temp	14.72	-0.02	-8.50	-702.52	2.49	-0.29
Dead+Wind 30 deg+Ice+Temp	14.72	4.29	-7.35	-607.35	-354.59	-0.36
Dead+Wind 60 deg+Ice+Temp	14.72	7.44	-4.23	-349.57	-616.57	-0.33
Dead+Wind 90 deg+Ice+Temp	14.72	8.61	0.02	1.72	-713.27	-0.22
Dead+Wind 120 deg+Ice+Temp	14.72	7.46	4.27	352.41	-618.80	-0.04
Dead+Wind 150 deg+Ice+Temp	14.72	4.32	7.37	608.55	-358.46	0.14
Dead+Wind 180 deg+Ice+Temp	14.72	0.02	8.50	701.50	-1.99	0.29
Dead+Wind 210 deg+Ice+Temp	14.72	-4.29	7.35	606.33	355.09	0.36
Dead+Wind 240 deg+Ice+Temp	14.72	-7.44	4.23	348.55	617.08	0.33
Dead+Wind 270 deg+Ice+Temp	14.72	-8.61	-0.02	-2.75	713.78	0.22
Dead+Wind 300 deg+Ice+Temp	14.72	-7.46	-4.27	-353.44	619.30	0.04
Dead+Wind 330 deg+Ice+Temp	14.72	-4.32	-7.37	-609.58	358.96	-0.14
Dead+Wind 0 deg - Service	11.65	-0.01	-3.99	-320.04	1.09	-0.08
Dead+Wind 30 deg - Service	11.65	2.01	-3.45	-276.76	-161.37	-0.12
Dead+Wind 60 deg - Service	11.65	3.49	-1.99	-159.47	-280.55	-0.13
Dead+Wind 90 deg - Service	11.65	4.04	0.01	0.41	-324.51	-0.11
Dead+Wind 120 deg - Service	11.65	3.50	2.00	160.04	-281.48	-0.05
Dead+Wind 150 deg - Service	11.65	2.03	3.46	276.64	-162.99	0.02
Dead+Wind 180 deg - Service	11.65	0.01	3.99	318.98	-0.79	0.08
Dead+Wind 210 deg - Service	11.65	-2.01	3.45	275.71	161.67	0.12
Dead+Wind 240 deg - Service	11.65	-3.49	1.99	158.41	280.85	0.13
Dead+Wind 270 deg - Service	11.65	-4.04	-0.01	-1.47	324.81	0.11
Dead+Wind 300 deg - Service	11.65	-3.50	-2.00	-161.09	281.79	0.05
Dead+Wind 330 deg - Service	11.65	-2.03	-3.46	-277.70	163.30	-0.02

Solution Summary

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
1	0.00	-11.65	0.00	0.00	11.65	0.00	0.000%
2	-0.02	-11.65	-10.20	0.02	11.65	10.20	0.000%
3	5.14	-11.65	-8.82	-5.14	11.65	8.82	0.000%
4	8.93	-11.65	-5.08	-8.93	11.65	5.08	0.000%
5	10.32	-11.65	0.02	-10.32	11.65	-0.02	0.000%
6	8.95	-11.65	5.12	-8.95	11.65	-5.12	0.000%
7	5.18	-11.65	8.84	-5.18	11.65	-8.84	0.000%
8	0.02	-11.65	10.20	-0.02	11.65	-10.20	0.000%
9	-5.14	-11.65	8.82	5.14	11.65	-8.82	0.000%
10	-8.93	-11.65	5.08	8.93	11.65	-5.08	0.000%
11	-10.32	-11.65	-0.02	10.32	11.65	0.02	0.000%
12	-8.95	-11.65	-5.12	8.95	11.65	5.12	0.000%
13	-5.18	-11.65	-8.84	5.18	11.65	8.84	0.000%
14	0.00	-14.72	0.00	0.00	14.72	0.00	0.000%
15	-0.02	-14.72	-8.50	0.02	14.72	8.50	0.000%
16	4.29	-14.72	-7.35	-4.29	14.72	7.35	0.000%
17	7.44	-14.72	-4.23	-7.44	14.72	4.23	0.000%
18	8.61	-14.72	0.02	-8.61	14.72	-0.02	0.000%
19	7.46	-14.72	4.27	-7.46	14.72	-4.27	0.000%
20	4.32	-14.72	7.37	-4.32	14.72	-7.37	0.000%
21	0.02	-14.72	8.50	-0.02	14.72	-8.50	0.000%
22	-4.29	-14.72	7.35	4.29	14.72	-7.35	0.000%
23	-7.44	-14.72	4.23	7.44	14.72	-4.23	0.000%
24	-8.61	-14.72	-0.02	8.61	14.72	0.02	0.000%
25	-7.46	-14.72	-4.27	7.46	14.72	4.27	0.000%
26	-4.32	-14.72	-7.37	4.32	14.72	7.37	0.000%
27	-0.01	-11.65	-3.99	0.01	11.65	3.99	0.000%
28	2.01	-11.65	-3.45	-2.01	11.65	3.45	0.000%
29	3.49	-11.65	-1.99	-3.49	11.65	1.99	0.000%
30	4.04	-11.65	0.01	-4.04	11.65	-0.01	0.000%
31	3.50	-11.65	2.00	-3.50	11.65	-2.00	0.000%
32	2.03	-11.65	3.46	-2.03	11.65	-3.46	0.000%
33	0.01	-11.65	3.99	-0.01	11.65	-3.99	0.000%
34	-2.01	-11.65	3.45	2.01	11.65	-3.45	0.000%
35	-3.49	-11.65	1.99	3.49	11.65	-1.99	0.000%
36	-4.04	-11.65	-0.01	4.04	11.65	0.01	0.000%
37	-3.50	-11.65	-2.00	3.50	11.65	2.00	0.000%
38	-2.03	-11.65	-3.46	2.03	11.65	3.46	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	5	0.00000001	0.00024628
3	Yes	6	0.00000001	0.00033047
4	Yes	6	0.00000001	0.00034680
5	Yes	5	0.00000001	0.00018523
6	Yes	6	0.00000001	0.00033794
7	Yes	6	0.00000001	0.00033903
8	Yes	5	0.00000001	0.00011699
9	Yes	6	0.00000001	0.00034409
10	Yes	6	0.00000001	0.00032981
11	Yes	5	0.00000001	0.00031717
12	Yes	6	0.00000001	0.00034551
13	Yes	6	0.00000001	0.00034232

14	Yes	4	0.00000001	0.00005265
15	Yes	6	0.00000001	0.00012054
16	Yes	6	0.00000001	0.00086195
17	Yes	6	0.00000001	0.00090211
18	Yes	6	0.00000001	0.00011577
19	Yes	6	0.00000001	0.00089014
20	Yes	6	0.00000001	0.00088272
21	Yes	6	0.00000001	0.00011660
22	Yes	6	0.00000001	0.00089807
23	Yes	6	0.00000001	0.00086284
24	Yes	6	0.00000001	0.00011902
25	Yes	6	0.00000001	0.00090081
26	Yes	6	0.00000001	0.00090313
27	Yes	5	0.00000001	0.00005341
28	Yes	5	0.00000001	0.00082523
29	Yes	5	0.00000001	0.00090561
30	Yes	5	0.00000001	0.00005866
31	Yes	5	0.00000001	0.00085535
32	Yes	5	0.00000001	0.00085814
33	Yes	4	0.00000001	0.00084151
34	Yes	5	0.00000001	0.00088447
35	Yes	5	0.00000001	0.00081933
36	Yes	5	0.00000001	0.00007206
37	Yes	5	0.00000001	0.00090107
38	Yes	5	0.00000001	0.00088279

Maximum Tower Deflections - Service Wind

Section No.	*Elevation ft*	*Horz. Deflection in*	*Gov. Load Comb.*	*Tilt °*	*Twist °*
L1	106 - 80.5	28.885	36	2.2973	0.0048
L2	80.5 - 80	17.055	36	1.9869	0.0023
L3	80 - 41.5	16.847	36	1.9840	0.0023
L4	45 - 0	5.330	36	1.0884	0.0008

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	*Appurtenance*	*Gov. Load Comb.*	*Deflection in*	*Tilt °*	*Twist °*	*Radius of Curvature ft*
105.00	4-ft Standoff	36	28.398	2.2820	0.0049	11108
100.00	(4) SBNHH-1D65B	36	25.968	2.2062	0.0042	9256
77.00	APX16DWV-16DWVS-E-A20	36	15.620	1.9575	0.0023	2866

Maximum Tower Deflections - Design Wind

Section No.	*Elevation ft*	*Horz. Deflection in*	*Gov. Load Comb.*	*Tilt °*	*Twist °*
L1	106 - 80.5	73.456	11	5.8452	0.0133

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L2	80.5 - 80	43.396	11	5.0559	0.0064
L3	80 - 41.5	42.868	11	5.0485	0.0063
L4	45 - 0	13.575	11	2.7717	0.0022

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
105.00	4-ft Standoff	11	72.218	5.8062	0.0134	4443
100.00	(4) SBNHH-1D65B	11	66.046	5.6135	0.0115	3702
77.00	APX16DWV-16DWVS-E-A20	11	39.750	4.9811	0.0064	1144

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	106 - 104.725	TP12.75x12.75x0.625	25.50	0.00	0.0	25.200	23.8074	-0.52	599.95	0.001
	104.725 - 103.45					25.200	23.8074	-0.64	599.95	0.001
	103.45 - 102.175					25.200	23.8074	-0.77	599.95	0.001
	102.175 - 100.9					25.200	23.8074	-0.89	599.95	0.001
	100.9 - 99.625					25.200	23.8074	-3.81	599.95	0.006
	99.625 - 98.35					25.200	23.8074	-2.50	599.95	0.004
	98.35 - 97.075					25.200	23.8074	-2.60	599.95	0.004
	97.075 - 95.8					25.200	23.8074	-2.71	599.95	0.005
	95.8 - 94.525					25.200	23.8074	-2.81	599.95	0.005
	94.525 - 93.25					25.200	23.8074	-2.92	599.95	0.005
	93.25 - 91.975					25.200	23.8074	-3.03	599.95	0.005
	91.975 - 90.7					25.200	23.8074	-3.14	599.95	0.005
	90.7 - 89.425					25.200	23.8074	-3.25	599.95	0.005
	89.425 - 88.15					25.200	23.8074	-3.36	599.95	0.006
	88.15 - 86.875					25.200	23.8074	-3.47	599.95	0.006
	86.875 - 85.6					25.200	23.8074	-3.58	599.95	0.006
	85.6 - 84.325					25.200	23.8074	-3.69	599.95	0.006
	84.325 - 83.05					25.200	23.8074	-3.81	599.95	0.006
	83.05 - 81.775					25.200	23.8074	-3.92	599.95	0.007
	81.775 - 80.5					25.200	23.8074	-4.04	599.95	0.007
L2	80.5 - 80 (2)	TP22x12.75x0.625	0.50	0.00	0.0	21.600	23.8074	-4.04	514.24	0.008
L3	80 - 78.1579	TP27.7x22x0.1875	38.50	0.00	0.0	39.000	13.1435	-4.20	512.60	0.008
	78.1579 - 76.3158					39.000	13.3058	-4.73	518.92	0.009
	76.3158 - 74.4737					39.000	13.4681	-4.84	525.26	0.009
	74.4737 - 72.6316					39.000	13.6304	-4.96	531.59	0.009

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 $\frac{P}{P_a}$
	72.6316 - 70.7895					39.000	13.7927	-5.07	537.91	0.009
	70.7895 - 68.9474					39.000	13.9550	-5.19	544.25	0.010
	68.9474 - 67.1053					39.000	14.1173	-5.30	550.58	0.010
	67.1053 - 65.2632					39.000	14.2796	-5.42	556.90	0.010
	65.2632 - 63.4211					39.000	14.4419	-5.55	563.24	0.010
	63.4211 - 61.5789					39.000	14.6042	-5.67	569.57	0.010
	61.5789 - 59.7368					39.000	14.7665	-5.80	575.89	0.010
	59.7368 - 57.8947					39.000	14.9288	-5.92	582.23	0.010
	57.8947 - 56.0526					39.000	15.0912	-6.05	588.55	0.010
	56.0526 - 54.2105					39.000	15.2535	-6.18	594.88	0.010
	54.2105 - 52.3684					39.000	15.4158	-6.31	601.22	0.011
	52.3684 - 50.5263					39.000	15.5781	-6.45	607.54	0.011
	50.5263 - 48.6842					39.000	15.7404	-6.58	613.88	0.011
	48.6842 - 46.8421					39.000	15.9027	-6.72	620.21	0.011
	46.8421 - 45					39.000	16.0650	-6.86	626.53	0.011
	45 - 41.5					39.000	16.3734	-3.19	638.56	0.005
L4	45 - 41.5	TP33.47x26.8068x0.25	45.00	0.00	0.0	39.000	21.4841	-4.17	837.88	0.005
	41.5 - 39.3158					39.000	21.7407	-7.56	847.89	0.009
	39.3158 - 37.1316					39.000	21.9973	-7.77	857.90	0.009
	37.1316 - 34.9474					39.000	22.2540	-7.98	867.90	0.009
	34.9474 - 32.7632					39.000	22.5106	-8.19	877.91	0.009
	32.7632 - 30.5789					39.000	22.7672	-8.40	887.92	0.009
	30.5789 - 28.3947					39.000	23.0239	-8.62	897.93	0.010
	28.3947 - 26.2105					39.000	23.2805	-8.84	907.94	0.010
	26.2105 - 24.0263					39.000	23.5371	-9.06	917.95	0.010
	24.0263 - 21.8421					39.000	23.7938	-9.28	927.96	0.010
	21.8421 - 19.6579					39.000	24.0504	-9.51	937.97	0.010
	19.6579 - 17.4737					39.000	24.3070	-9.73	947.97	0.010
	17.4737 - 15.2895					39.000	24.5636	-9.96	957.98	0.010
	15.2895 - 13.1053					39.000	24.8203	-10.20	967.99	0.011
	13.1053 - 10.9211					39.000	25.0769	-10.43	978.00	0.011
	10.9211 - 8.73684					39.000	25.3335	-10.67	988.01	0.011

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 $\frac{P}{P_a}$
	8.73684 - 6.55263					39.000	25.5902	-10.91	998.02	0.011
	6.55263 - 4.36842					39.000	25.8468	-11.15	1008.03	0.011
	4.36842 - 2.18421					39.000	26.1034	-11.40	1018.03	0.011
	2.18421 - 0					39.000	26.3601	-11.64	1028.04	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	106 - 104.725	TP12.75x12.75x0.625	0.79	0.138	27.720	0.005	0.00	0.000	27.720	0.000
	104.725 - 103.45		1.43	0.249	27.720	0.009	0.00	0.000	27.720	0.000
	103.45 - 102.175		2.13	0.371	27.720	0.013	0.00	0.000	27.720	0.000
	102.175 - 100.9		2.90	0.505	27.720	0.018	0.00	0.000	27.720	0.000
	100.9 - 99.625		5.44	0.949	27.720	0.034	0.00	0.000	27.720	0.000
	99.625 - 98.35		12.78	2.228	27.720	0.080	0.00	0.000	27.720	0.000
	98.35 - 97.075		20.22	3.526	27.720	0.127	0.00	0.000	27.720	0.000
	97.075 - 95.8		27.73	4.837	27.720	0.174	0.00	0.000	27.720	0.000
	95.8 - 94.525		35.34	6.162	27.720	0.222	0.00	0.000	27.720	0.000
	94.525 - 93.25		43.00	7.499	27.720	0.271	0.00	0.000	27.720	0.000
	93.25 - 91.975		50.74	8.848	27.720	0.319	0.00	0.000	27.720	0.000
	91.975 - 90.7		58.54	10.209	27.720	0.368	0.00	0.000	27.720	0.000
	90.7 - 89.425		66.41	11.582	27.720	0.418	0.00	0.000	27.720	0.000
	89.425 - 88.15		74.35	12.965	27.720	0.468	0.00	0.000	27.720	0.000
	88.15 - 86.875		82.35	14.361	27.720	0.518	0.00	0.000	27.720	0.000
	86.875 - 85.6		90.41	15.767	27.720	0.569	0.00	0.000	27.720	0.000
	85.6 - 84.325		98.54	17.184	27.720	0.620	0.00	0.000	27.720	0.000
	84.325 - 83.05		106.73	18.612	27.720	0.671	0.00	0.000	27.720	0.000
	83.05 - 81.775		114.98	20.051	27.720	0.723	0.00	0.000	27.720	0.000
	81.775 - 80.5		123.29	21.501	27.720	0.776	0.00	0.000	27.720	0.000
L2	80.5 - 80 (2)	TP22x12.75x0.625	123.29	21.501	23.760	0.905	0.00	0.000	23.760	0.000
L3	80 - 78.1579	TP27.7x22x0.1875	138.74	23.257	39.000	0.596	0.00	0.000	39.000	0.000
	78.1579 - 76.3158		151.57	24.789	39.000	0.636	0.00	0.000	39.000	0.000
	76.3158 - 74.4737		165.11	26.355	39.000	0.676	0.00	0.000	39.000	0.000
	74.4737 - 72.6316		178.80	27.862	39.000	0.714	0.00	0.000	39.000	0.000
	72.6316 - 70.7895		192.64	29.313	39.000	0.752	0.00	0.000	39.000	0.000
	70.7895 - 68.9474		206.62	30.710	39.000	0.787	0.00	0.000	39.000	0.000
	68.9474 - 67.1053		220.74	32.056	39.000	0.822	0.00	0.000	39.000	0.000
	67.1053 - 65.2632		235.00	33.353	39.000	0.855	0.00	0.000	39.000	0.000
	65.2632 - 63.4211		249.41	34.603	39.000	0.887	0.00	0.000	39.000	0.000
	63.4211 - 61.5789		263.96	35.809	39.000	0.918	0.00	0.000	39.000	0.000

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 $\frac{f_{by}}{F_{by}}$
	61.5789 - 59.7368		278.65	36.973	39.000	0.948	0.00	0.000	39.000	0.000
	59.7368 - 57.8947		293.47	38.095	39.000	0.977	0.00	0.000	39.000	0.000
	57.8947 - 56.0526		308.44	39.178	39.000	1.005	0.00	0.000	39.000	0.000
	56.0526 - 54.2105		323.55	40.224	39.000	1.031	0.00	0.000	39.000	0.000
	54.2105 - 52.3684		338.80	41.234	39.000	1.057	0.00	0.000	39.000	0.000
	52.3684 - 50.5263		354.18	42.209	39.000	1.082	0.00	0.000	39.000	0.000
	50.5263 - 48.6842		369.70	43.152	39.000	1.106	0.00	0.000	39.000	0.000
	48.6842 - 46.8421		385.35	44.063	39.000	1.130	0.00	0.000	39.000	0.000
	46.8421 - 45		401.14	44.943	39.000	1.152	0.00	0.000	39.000	0.000
	45 - 41.5		190.13	20.504	39.000	0.526	0.00	0.000	39.000	0.000
L4	45 - 41.5	TP33.47x26.8068x0.25	241.44	20.212	39.000	0.518	0.00	0.000	39.000	0.000
	41.5 - 39.3158		450.83	36.852	39.000	0.945	0.00	0.000	39.000	0.000
	39.3158 - 37.1316		470.27	37.546	39.000	0.963	0.00	0.000	39.000	0.000
	37.1316 - 34.9474		489.88	38.211	39.000	0.980	0.00	0.000	39.000	0.000
	34.9474 - 32.7632		509.67	38.849	39.000	0.996	0.00	0.000	39.000	0.000
	32.7632 - 30.5789		529.64	39.462	39.000	1.012	0.00	0.000	39.000	0.000
	30.5789 - 28.3947		549.78	40.051	39.000	1.027	0.00	0.000	39.000	0.000
	28.3947 - 26.2105		570.11	40.617	39.000	1.041	0.00	0.000	39.000	0.000
	26.2105 - 24.0263		590.61	41.161	39.000	1.055	0.00	0.000	39.000	0.000
	24.0263 - 21.8421		611.28	41.685	39.000	1.069	0.00	0.000	39.000	0.000
	21.8421 - 19.6579		632.14	42.188	39.000	1.082	0.00	0.000	39.000	0.000
	19.6579 - 17.4737		653.17	42.672	39.000	1.094	0.00	0.000	39.000	0.000
	17.4737 - 15.2895		674.38	43.139	39.000	1.106	0.00	0.000	39.000	0.000
	15.2895 - 13.1053		695.76	43.587	39.000	1.118	0.00	0.000	39.000	0.000
	13.1053 - 10.9211		717.33	44.020	39.000	1.129	0.00	0.000	39.000	0.000
	10.9211 - 8.73684		739.07	44.436	39.000	1.139	0.00	0.000	39.000	0.000
	8.73684 - 6.55263		760.99	44.837	39.000	1.150	0.00	0.000	39.000	0.000
	6.55263 - 4.36842		783.09	45.224	39.000	1.160	0.00	0.000	39.000	0.000
	4.36842 - 2.18421		805.36	45.597	39.000	1.169	0.00	0.000	39.000	0.000
	2.18421 - 0		827.81	45.957	39.000	1.178	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	106 - 104.725	TP12.75x12.75x0.625	0.47	0.020	16.800	0.002	0.08	0.006	16.800	0.000
	104.725 - 103.45		0.52	0.022	16.800	0.003	0.07	0.006	16.800	0.000
	103.45 - 102.175		0.57	0.024	16.800	0.003	0.07	0.006	16.800	0.000
	102.175 - 100.9		0.62	0.026	16.800	0.003	0.07	0.006	16.800	0.000
	100.9 - 99.625		5.09	0.214	16.800	0.025	0.08	0.007	16.800	0.000
	99.625 - 98.35		5.81	0.244	16.800	0.029	0.16	0.013	16.800	0.001
	98.35 - 97.075		5.87	0.246	16.800	0.029	0.16	0.013	16.800	0.001
	97.075 - 95.8		5.93	0.249	16.800	0.030	0.30	0.025	16.800	0.001
	95.8 - 94.525		5.99	0.251	16.800	0.030	0.30	0.025	16.800	0.001
	94.525 - 93.25		6.04	0.254	16.800	0.030	0.30	0.025	16.800	0.001
	93.25 - 91.975		6.09	0.256	16.800	0.030	0.29	0.024	16.800	0.001
	91.975 - 90.7		6.15	0.258	16.800	0.031	0.29	0.024	16.800	0.001
	90.7 - 89.425		6.20	0.260	16.800	0.031	0.29	0.024	16.800	0.001
	89.425 - 88.15		6.25	0.262	16.800	0.031	0.29	0.024	16.800	0.001
	88.15 - 86.875		6.30	0.265	16.800	0.032	0.29	0.024	16.800	0.001
	86.875 - 85.6		6.35	0.267	16.800	0.032	0.29	0.024	16.800	0.001
	85.6 - 84.325		6.40	0.269	16.800	0.032	0.29	0.024	16.800	0.001
	84.325 - 83.05		6.45	0.271	16.800	0.032	0.29	0.024	16.800	0.001
	83.05 - 81.775		6.50	0.273	16.800	0.033	0.29	0.024	16.800	0.001
	81.775 - 80.5		6.54	0.275	16.800	0.033	0.29	0.024	16.800	0.001
L2	80.5 - 80 (2)	TP22x12.75x0.625	6.57	0.276	14.400	0.022	0.29	0.024	14.400	0.002
L3	80 - 78.1579	TP27.7x22x0.1875	6.65	0.506	26.000	0.039	0.29	0.024	26.000	0.001
	78.1579 - 76.3158		7.32	0.550	26.000	0.042	0.29	0.023	26.000	0.001
	76.3158 - 74.4737		7.40	0.549	26.000	0.042	0.27	0.021	26.000	0.001
	74.4737 - 72.6316		7.48	0.548	26.000	0.042	0.27	0.021	26.000	0.001
	72.6316 - 70.7895		7.55	0.548	26.000	0.042	0.27	0.020	26.000	0.001
	70.7895 - 68.9474		7.63	0.547	26.000	0.042	0.27	0.020	26.000	0.001
	68.9474 - 67.1053		7.71	0.546	26.000	0.042	0.27	0.019	26.000	0.001
	67.1053 - 65.2632		7.79	0.545	26.000	0.042	0.27	0.019	26.000	0.001
	65.2632 - 63.4211		7.87	0.545	26.000	0.042	0.27	0.018	26.000	0.001
	63.4211 - 61.5789		7.94	0.544	26.000	0.042	0.27	0.018	26.000	0.001
	61.5789 - 59.7368		8.02	0.543	26.000	0.042	0.27	0.018	26.000	0.001
	59.7368 - 57.8947		8.09	0.542	26.000	0.042	0.27	0.017	26.000	0.001
	57.8947 - 56.0526		8.17	0.541	26.000	0.042	0.27	0.017	26.000	0.001
	56.0526 - 54.2105		8.25	0.541	26.000	0.042	0.27	0.017	26.000	0.001
	54.2105 - 52.3684		8.32	0.540	26.000	0.042	0.27	0.016	26.000	0.001
	52.3684 - 50.5263		8.40	0.539	26.000	0.041	0.27	0.016	26.000	0.001
	50.5263 - 48.6842		8.47	0.538	26.000	0.041	0.27	0.016	26.000	0.001
	48.6842 - 46.8421		8.54	0.537	26.000	0.041	0.27	0.015	26.000	0.001

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 $\frac{f_{vt}}{F_{vt}}$
	46.8421 - 45		8.62	0.536	26.000	0.041	0.27	0.015	26.000	0.001
	45 - 41.5		3.92	0.239	26.000	0.018	0.12	0.006	26.000	0.000
L4	45 - 41.5	TP33.47x26.8068x0.25	4.87	0.227	26.000	0.017	0.15	0.006	26.000	0.000
	41.5 - 39.3158		8.87	0.408	26.000	0.031	0.27	0.011	26.000	0.000
	39.3158 - 37.1316		8.95	0.407	26.000	0.031	0.27	0.011	26.000	0.000
	37.1316 - 34.9474		9.03	0.406	26.000	0.031	0.27	0.010	26.000	0.000
	34.9474 - 32.7632		9.11	0.405	26.000	0.031	0.27	0.010	26.000	0.000
	32.7632 - 30.5789		9.19	0.404	26.000	0.031	0.27	0.010	26.000	0.000
	30.5789 - 28.3947		9.27	0.403	26.000	0.031	0.27	0.010	26.000	0.000
	28.3947 - 26.2105		9.36	0.402	26.000	0.031	0.27	0.009	26.000	0.000
	26.2105 - 24.0263		9.44	0.401	26.000	0.031	0.27	0.009	26.000	0.000
	24.0263 - 21.8421		9.52	0.400	26.000	0.031	0.27	0.009	26.000	0.000
	21.8421 - 19.6579		9.60	0.399	26.000	0.031	0.27	0.009	26.000	0.000
	19.6579 - 17.4737		9.68	0.398	26.000	0.031	0.27	0.009	26.000	0.000
	17.4737 - 15.2895		9.76	0.397	26.000	0.031	0.27	0.008	26.000	0.000
	15.2895 - 13.1053		9.84	0.397	26.000	0.031	0.27	0.008	26.000	0.000
	13.1053 - 10.9211		9.93	0.396	26.000	0.030	0.27	0.008	26.000	0.000
	10.9211 - 8.73684		10.01	0.395	26.000	0.030	0.27	0.008	26.000	0.000
	8.73684 - 6.55263		10.09	0.394	26.000	0.030	0.27	0.008	26.000	0.000
	6.55263 - 4.36842		10.17	0.394	26.000	0.030	0.27	0.008	26.000	0.000
	4.36842 - 2.18421		10.25	0.393	26.000	0.030	0.27	0.008	26.000	0.000
	2.18421 - 0		10.33	0.392	26.000	0.030	0.27	0.007	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	106 - 104.725	0.001	0.005	0.000	0.002	0.000	0.006 ✔	1.333	H1-3+VT ✔
	104.725 - 103.45	0.001	0.009	0.000	0.003	0.000	0.010 ✔	1.333	H1-3+VT ✔
	103.45 - 102.175	0.001	0.013	0.000	0.003	0.000	0.015 ✔	1.333	H1-3+VT ✔
	102.175 - 100.9	0.001	0.018	0.000	0.003	0.000	0.020 ✔	1.333	H1-3+VT ✔

Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	100.9 - 99.625	0.006	0.034	0.000	0.025	0.000	0.041 ✔	1.333	H1-3+VT ✔
	99.625 - 98.35	0.004	0.080	0.000	0.029	0.001	0.085 ✔	1.333	H1-3+VT ✔
	98.35 - 97.075	0.004	0.127	0.000	0.029	0.001	0.132 ✔	1.333	H1-3+VT ✔
	97.075 - 95.8	0.005	0.174	0.000	0.030	0.001	0.179 ✔	1.333	H1-3+VT ✔
	95.8 - 94.525	0.005	0.222	0.000	0.030	0.001	0.227 ✔	1.333	H1-3+VT ✔
	94.525 - 93.25	0.005	0.271	0.000	0.030	0.001	0.276 ✔	1.333	H1-3+VT ✔
	93.25 - 91.975	0.005	0.319	0.000	0.030	0.001	0.325 ✔	1.333	H1-3+VT ✔
	91.975 - 90.7	0.005	0.368	0.000	0.031	0.001	0.374 ✔	1.333	H1-3+VT ✔
	90.7 - 89.425	0.005	0.418	0.000	0.031	0.001	0.424 ✔	1.333	H1-3+VT ✔
	89.425 - 88.15	0.006	0.468	0.000	0.031	0.001	0.474 ✔	1.333	H1-3+VT ✔
	88.15 - 86.875	0.006	0.518	0.000	0.032	0.001	0.524 ✔	1.333	H1-3+VT ✔
	86.875 - 85.6	0.006	0.569	0.000	0.032	0.001	0.575 ✔	1.333	H1-3+VT ✔
	85.6 - 84.325	0.006	0.620	0.000	0.032	0.001	0.626 ✔	1.333	H1-3+VT ✔
	84.325 - 83.05	0.006	0.671	0.000	0.032	0.001	0.678 ✔	1.333	H1-3+VT ✔
	83.05 - 81.775	0.007	0.723	0.000	0.033	0.001	0.730 ✔	1.333	H1-3+VT ✔
	81.775 - 80.5	0.007	0.776	0.000	0.033	0.001	0.783 ✔	1.333	H1-3+VT ✔
L2	80.5 - 80 (2)	0.008	0.905	0.000	0.022	0.002	0.913 ✔	1.333	H1-3+VT ✔
L3	80 - 78.1579	0.008	0.596	0.000	0.039	0.001	0.605 ✔	1.333	H1-3+VT ✔
	78.1579 - 76.3158	0.009	0.636	0.000	0.042	0.001	0.645 ✔	1.333	H1-3+VT ✔
	76.3158 - 74.4737	0.009	0.676	0.000	0.042	0.001	0.685 ✔	1.333	H1-3+VT ✔
	74.4737 - 72.6316	0.009	0.714	0.000	0.042	0.001	0.724 ✔	1.333	H1-3+VT ✔
	72.6316 - 70.7895	0.009	0.752	0.000	0.042	0.001	0.762 ✔	1.333	H1-3+VT ✔
	70.7895 - 68.9474	0.010	0.787	0.000	0.042	0.001	0.797 ✔	1.333	H1-3+VT ✔
	68.9474 - 67.1053	0.010	0.822	0.000	0.042	0.001	0.832 ✔	1.333	H1-3+VT ✔
	67.1053 - 65.2632	0.010	0.855	0.000	0.042	0.001	0.865 ✔	1.333	H1-3+VT ✔
	65.2632 - 63.4211	0.010	0.887	0.000	0.042	0.001	0.898 ✔	1.333	H1-3+VT ✔

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
	63.4211 - 61.5789	0.010	0.918	0.000	0.042	0.001	0.929 ✔	1.333	H1-3+VT ✔
	61.5789 - 59.7368	0.010	0.948	0.000	0.042	0.001	0.959 ✔	1.333	H1-3+VT ✔
	59.7368 - 57.8947	0.010	0.977	0.000	0.042	0.001	0.987 ✔	1.333	H1-3+VT ✔
	57.8947 - 56.0526	0.010	1.005	0.000	0.042	0.001	1.015 ✔	1.333	H1-3+VT ✔
	56.0526 - 54.2105	0.010	1.031	0.000	0.042	0.001	1.042 ✔	1.333	H1-3+VT ✔
	54.2105 - 52.3684	0.011	1.057	0.000	0.042	0.001	1.068 ✔	1.333	H1-3+VT ✔
	52.3684 - 50.5263	0.011	1.082	0.000	0.041	0.001	1.093 ✔	1.333	H1-3+VT ✔
	50.5263 - 48.6842	0.011	1.106	0.000	0.041	0.001	1.118 ✔	1.333	H1-3+VT ✔
	48.6842 - 46.8421	0.011	1.130	0.000	0.041	0.001	1.141 ✔	1.333	H1-3+VT ✔
	46.8421 - 45	0.011	1.152	0.000	0.041	0.001	1.164 ✔	1.333	H1-3+VT ✔
	45 - 41.5	0.005	0.526	0.000	0.018	0.000	0.531 ✔	1.333	H1-3+VT ✔
L4	45 - 41.5	0.005	0.518	0.000	0.017	0.000	0.523 ✔	1.333	H1-3+VT ✔
	41.5 - 39.3158	0.009	0.945	0.000	0.031	0.000	0.954 ✔	1.333	H1-3+VT ✔
	39.3158 - 37.1316	0.009	0.963	0.000	0.031	0.000	0.972 ✔	1.333	H1-3+VT ✔
	37.1316 - 34.9474	0.009	0.980	0.000	0.031	0.000	0.989 ✔	1.333	H1-3+VT ✔
	34.9474 - 32.7632	0.009	0.996	0.000	0.031	0.000	1.006 ✔	1.333	H1-3+VT ✔
	32.7632 - 30.5789	0.009	1.012	0.000	0.031	0.000	1.022 ✔	1.333	H1-3+VT ✔
	30.5789 - 28.3947	0.010	1.027	0.000	0.031	0.000	1.037 ✔	1.333	H1-3+VT ✔
	28.3947 - 26.2105	0.010	1.041	0.000	0.031	0.000	1.051 ✔	1.333	H1-3+VT ✔
	26.2105 - 24.0263	0.010	1.055	0.000	0.031	0.000	1.066 ✔	1.333	H1-3+VT ✔
	24.0263 - 21.8421	0.010	1.069	0.000	0.031	0.000	1.079 ✔	1.333	H1-3+VT ✔
	21.8421 - 19.6579	0.010	1.082	0.000	0.031	0.000	1.092 ✔	1.333	H1-3+VT ✔
	19.6579 - 17.4737	0.010	1.094	0.000	0.031	0.000	1.105 ✔	1.333	H1-3+VT ✔
	17.4737 - 15.2895	0.010	1.106	0.000	0.031	0.000	1.117 ✔	1.333	H1-3+VT ✔
	15.2895 - 13.1053	0.011	1.118	0.000	0.031	0.000	1.128 ✔	1.333	H1-3+VT ✔
	13.1053 - 10.9211	0.011	1.129	0.000	0.030	0.000	1.140 ✔	1.333	H1-3+VT ✔

Section No.	Elevation ft	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	10.9211 - 8.73684	0.011	1.139	0.000	0.030	0.000	1.150 ✔	1.333	H1-3+VT ✔
	8.73684 - 6.55263	0.011	1.150	0.000	0.030	0.000	1.161 ✔	1.333	H1-3+VT ✔
	6.55263 - 4.36842	0.011	1.160	0.000	0.030	0.000	1.171 ✔	1.333	H1-3+VT ✔
	4.36842 - 2.18421	0.011	1.169	0.000	0.030	0.000	1.181 ✔	1.333	H1-3+VT ✔
	2.18421 - 0	0.011	1.178	0.000	0.030	0.000	1.190 ✔	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	106 - 80.5	Pole	TP12.75x12.75x0.625	1	-4.04	799.73	58.7	Pass
L2	80.5 - 80	Pole	TP22x12.75x0.625	2	-4.04	685.48	68.5	Pass
L3	80 - 41.5	Pole	TP27.7x22x0.1875	3	-6.86	835.17	87.3	Pass
L4	41.5 - 0	Pole	TP33.47x26.8068x0.25	4	-11.64	1370.38	89.3	Pass
							Summary	
						Pole (L4)	89.3	Pass
						RATING =	**89.3**	**Pass**

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	$OM := 828 \cdot ft \cdot kips$	(Input From tnxTower)
Shear Force =	$Shear := 10 \cdot kips$	(Input From tnxTower)
Axial Force =	$Axial := 12 \cdot kips$	(Input From tnxTower)

Anchor Bolt Data:

Use ASTM A615 Grade 75

Number of Anchor Bolts =	$N := 8$	(User Input)
Diameter of Bolt Circle =	$D_{bc} := 39.00 \cdot in$	(User Input)
Bolt "Column" Distance =	$l := 3.0 \cdot in$	(User Input)
Bolt Ultimate Strength =	$F_u := 100 \cdot ksi$	(User Input)
Bolt Yield Strength =	$F_y := 75 \cdot ksi$	(User Input)
Bolt Modulus =	$E := 29000 \cdot ksi$	(User Input)
Diameter of Anchor Bolts =	$D := 2.25 \cdot in$	(User Input)
Threads per Inch =	$n := 4.5$	(User Input)

Base Plate Data:

Use ASTM A572 60

Plate Yield Strength =	$Fy_{bp} := 60 \cdot ksi$	(User Input)
Base Plate Thickness =	$t_{bp} := 2.00 \cdot in$	(User Input)
Base Plate Diameter =	$D_{bp} := 38.00 \cdot in$	(User Input)
Outer Pole Diameter =	$D_{pole} := 33.47 \cdot in$	(User Input)

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

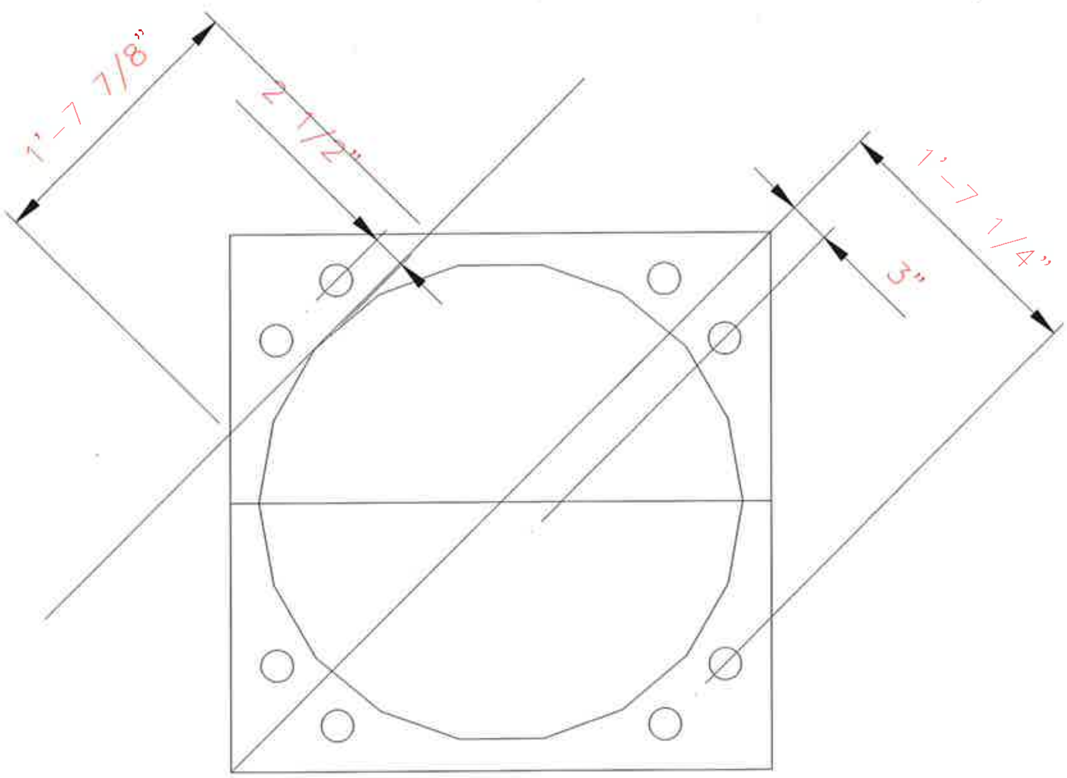
$d_1 := 19.25in$ (User Input)

$d_2 := 3in$ (User Input)

Critical Distances For Bending in Plate:

$ma_1 := 2.5in$ (User Input)

Effective Width of Baseplate for Bending = $B_{eff} := 19.875in$ (User Input)



ANCHOR BOLT AND PLATE GEOMETRY

Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Polar Moment of Inertia = $I_p := \left[(d_1)^2 \cdot 4 + (d_2)^2 \cdot 4\right] = 1.518 \times 10^3 \cdot in^2$

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 3.976 \cdot in^2$

Net Area of Bolt = $A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n}\right)^2 = 3.248 \cdot in^2$

Net Diameter = $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 2.033 \cdot in$

Radius of Gyration of Bolt = $r := \frac{D_n}{4} = 0.508 \cdot in$

Section Modulus of Bolt = $S_x := \frac{\pi \cdot D_n^{\,3}}{32} = 0.826 \cdot in^3$

Check Anchor Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{d_1}{I_p} - \frac{Axial}{N} = 124.5 \cdot kips$

Allowable Tensile Force (Gross Area) = $T_{ALL.Gross} := 1.333 \cdot (0.33 \cdot A_g \cdot F_u) = 174.9 \cdot kips$ (1.333 increase allowed per TIA/EIA)

Allowable Tensile Force (Net Area) = $T_{ALL.Net} := 1.333 \cdot (0.60 \cdot A_n \cdot F_y) = 194.812 \cdot kips$ (1.333 increase allowed per TIA/EIA)

Bolt Tension % of Capacity = $\frac{T_{Max}}{T_{ALL.Net}} \cdot 100 = 63.9$ Bolts are "upset bolts". Use net area per AISC

Condition1 = $Condition1 := if\left(\frac{T_{Max}}{T_{ALL.Net}} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$

Condition1 = "OK" Note Shear stress is negligible

Check Anchor Bolt Bending Stress:

Maximum Bending Moment = $M_x := \left(\frac{Shear}{N}\right) \cdot l = 0.312 \cdot ft \cdot kips$

Maximum Bending Stress = $f_{bx} := \frac{M_x}{S_x} = 4.5 \cdot ksi$

Allowable Bending Stress = $F_{bx} := 1.333 \cdot 0.6 \cdot F_y = 60 \cdot ksi$ (1.333 increase allowed per TIA/EIA)

Check Combined Stress Requirement:

Per ASCE Manual 72: "If the clearance between the base plate and concrete does not exceed two times the bolt diameter a bending stress analysis of the bolts is NOT normally required.

$$l := \begin{cases} l & \text{if } l > 2 \cdot D_n \\ 0 & \text{otherwise} \end{cases} = 0 \cdot in$$

$$f_{bx} := \begin{cases} f_{bx} & \text{if } l > 2 \cdot D_n \\ 0 & \text{otherwise} \end{cases} = 0 \cdot ksi$$

Check Anchor Bolt Compression/Combined Stress:

Applied Compressive Force = $C_{Max} := OM \cdot \frac{d_1}{I_p} + \frac{Axial}{N} = 127.5 \cdot kips$

Applied Compressive Stress = $f_a := \frac{C_{Max}}{A_n} = 39.3 \cdot ksi$

$K := 0.65$

$$C_c := \sqrt{\frac{2 \cdot \pi^2 \cdot E}{F_y}} = 87.364$$

$$F_a := \begin{cases} \dfrac{\left[1 - \dfrac{\left(\frac{K \cdot l}{r}\right)^2}{2 \cdot C_c^2}\right] \cdot F_y}{\dfrac{5}{3} + \dfrac{3 \cdot \left(\frac{K \cdot l}{r}\right)}{8 \cdot C_c} - \dfrac{\left(\frac{K \cdot l}{r}\right)^3}{8 \cdot C_c^3}} & \text{if } \frac{K \cdot l}{r} \le C_c \\ \dfrac{12 \cdot \pi^2 \cdot E}{23 \cdot \left(\frac{K \cdot l}{r}\right)^2} & \text{if } \frac{K \cdot l}{r} > C_c \end{cases} = 45 \cdot ksi$$

Allowable Compressive Stress = $F_a := 1.333 \cdot F_a = 60 \cdot ksi$ (1.333 increase allowed per TIA/EIA)

Combined Stress % of Capacity = $\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}}\right) \cdot 100 = 65.4$

Condition 2 = $Condition2 := if\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} \le 1.00, \text{"OK"}, \text{"Overstressed"}\right)$

Condition2 = "OK"

Base Plate Analysis:

Force from Bolts = $C_1 := \frac{OM \cdot d_1}{I_p} + \frac{Axial}{N} = 127.479 \cdot kips$

$C_2 := \frac{OM \cdot d_2}{I_p} + \frac{Axial}{N} = 21.133 \cdot kips$

Applied Bending Stress in Plate = $f_{bp} := \frac{6 \cdot (2C_1 \cdot ma_1)}{B_{eff} t_{bp}^{\ 2}} = 48.11 \cdot ksi$

Allowable Bending Stress in Plate = $F_{bp} := 1.33 \cdot 0.75 \cdot Fy_{bp} = 59.9 \cdot ksi$

Plate Bending Stress % of Capacity = $\frac{f_{bp}}{F_{bp}} \cdot 100 = 80.4$

Condition3 = $Condition3 := if\left(\frac{f_{bp}}{F_{bp}} < 1.00, "Ok", "Overstressed"\right)$

Condition3 = "Ok"

Standard Monopole Foundation:

Input Data:

Tower Data

Overturning Moment =	$OM := 828 \cdot ft \cdot kips$	(User Input from tnxTower)
Shear Force =	$Shear := 10 \cdot kip$	(User Input from tnxTower)
Axial Force =	$Axial := 12 \cdot kip$	(User Input from tnxTower)
Tower Height =	$H_t := 106 \cdot ft$	(User Input)

Footing Data:

Overall Depth of Footing =	$D_f := 6.0 \cdot ft$	(User Input)
Length of Pier =	$L_p := 3.5 \cdot ft$	(User Input)
Extension of Pier Above Grade =	$L_{pag} := 0.5 \cdot ft$	(User Input)
Diameter of Pier =	$d_p := 5.0 \cdot ft$	(User Input)
Thickness of Footing =	$T_f := 3.0 \cdot ft$	(User Input)
Width of Footing =	$W_f := 17.0 \cdot ft$	(User Input)

Anchor Bolt Data:

Length of Anchor Bolts =	$L_{st} := 84 \cdot in$	(User Input)
Projection of Anchor Bolts Above Pier =	$A_{BP} := 12.0 \cdot in$	(User Input)
Anchor Bolt Diameter =	$d_{anchor} := 2.25 \cdot in$	(User Input)
Base Plate Bolt Circle =	$MP := 39.0 \cdot in$	(User Input)

Material Properties:

Concrete Compressive Strength =	$f_c := 3000 \cdot psi$	(User Input)	
Steel Reinforcment Yield Strength =	$f_y := 60000 \cdot psi$	(User Input)	
Anchor Bolt Yield Strength =	$f_{ya} := 75000 \cdot psi$	(User Input)	
Internal Friction Angle of Soil =	$\Phi_s := 30 \cdot deg$	(User Input)	
Allowable Soil Bearing Capacity =	$q_s := 3000 \cdot psf$	(User Input)	
Unit Weight of Soil =	$\gamma_{soil} := 100 \cdot pcf$	(User Input)	
Unit Weight of Concrete =	$\gamma_{conc} := 150 \cdot pcf$	(User Input)	
Foundation Bouyancy =	$Bouyancy := 0$	(User Input)	(Yes=1 / No=0)
Depth to Neglect =	$n := 0 \cdot ft$	(User Input)	
Cohesion of Clay Type Soil =	$c := 0 \cdot ksf$	(User Input)	(Use 0 for Sandy Soil)
Seismic Zone Factor =	$Z := 2$	(User Input)	(UBC-1997 Fig 23-2)
Coefficient of Friction Between Concrete =	$\mu := 0.45$	(User Input)	

Pier Reinforcement:

Bar Size =	$BS_{pier} := 11$	(User Input)	
Bar Diameter =	$d_{bpier} := 1.41 \cdot in$	(User Input)	
Number of Bars =	$NB_{pier} := 12$	(User Input)	
Clear Cover of Reinforcement =	$Cvr_{pier} := 3 \cdot in$	(User Input)	
Reinforcement Location Factor =	$\alpha_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	$\beta_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	$\lambda_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	$\gamma_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Diameter of Tie =	$d_{Tie} := 0.5 \cdot in$	(User Input)	

Pad Reinforcement:

Bar Size =	$BS_{top} := 8$	(User Input)	(Top of Pad)
Bar Diameter =	$d_{btop} := 1.0 \cdot in$	(User Input)	(Top of Pad)
Number of Bars =	$NB_{top} := 17$	(User Input)	(Top of Pad)
Bar Size =	$BS_{bot} := 8$	(User Input)	(Bottom of Pad)
Bar Diameter =	$d_{bbot} := 1.0 \cdot in$	(User Input)	(Bottom of Pad)
Number of Bars =	$NB_{bot} := 17$	(User Input)	(Bottom of Pad)
Clear Cover of Reinforcement =	$Cvr_{pad} := 3.0 \cdot in$	(User Input)	
Reinforcement Location Factor =	$\alpha_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	$\beta_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	$\lambda_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	$\gamma_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)

Calculated Factors:

Pier Reinforcement Bar Area = $A_{bpier} := \frac{\pi \cdot d_{bpier}^2}{4} = 1.561 \cdot in^2$

Pad Top Reinforcement Bar Area = $A_{btop} := \frac{\pi \cdot d_{btop}^2}{4} = 0.785 \cdot in^2$

Pad Bottom Reinforcement Bar Area = $A_{bbot} := \frac{\pi \cdot d_{bbot}^2}{4} = 0.785 \cdot in^2$

Coefficient of Lateral Soil Pressure = $K_p := \frac{1 + \sin(\Phi_s)}{1 - \sin(\Phi_s)} = 3$

Load Factor =
$$LF := \begin{cases} 1.333 & \text{if } H_t \le 700 \cdot ft \\ 1.7 & \text{if } H_t \ge 1200 \cdot ft \\ 1.333 + \left(\frac{H_t - 700ft}{1200ft - 700ft}\right) \cdot 0.4 & \text{otherwise} \end{cases} = 1.333$$

Stability of Footing:

Adjusted Concrete Unit Weight = $\gamma_c := \text{if}(\text{Bouyancy} = 1, \gamma_{conc} - 62.4\text{pcf}, \gamma_{conc}) = 150 \cdot \text{pcf}$

Adjusted Soil Unit Weight = $\gamma_s := \text{if}(\text{Bouyancy} = 1, \gamma_{soil} - 62.4\text{pcf}, \gamma_{soil}) = 100 \cdot \text{pcf}$

Passive Pressure = $P_{pn} := K_p \cdot \gamma_s \cdot n + c \cdot 2 \cdot \sqrt{K_p} = 0 \cdot \text{ksf}$

$P_{pt} := K_p \cdot \gamma_s \cdot (D_f - T_f) + c \cdot 2 \cdot \sqrt{K_p} = 0.9 \cdot \text{ksf}$

$P_{top} := \text{if}[n < (D_f - T_f), P_{pt}, P_{pn}] = 0.9 \cdot \text{ksf}$

$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p} = 1.8 \cdot \text{ksf}$

$P_{ave} := \dfrac{P_{top} + P_{bot}}{2} = 1.35 \cdot \text{ksf}$

$T_p := \text{if}[n < (D_f - T_f), T_f, (D_f - n)] = 3$

$A_p := W_f \cdot T_p = 51$

Ultimate Shear = $S_u := P_{ave} \cdot A_p = 68.85 \cdot \text{kip}$

Weight of Concrete Pad = $WT_c := \left[\left(W_f^2 \cdot T_f\right) + d_p^2 \cdot L_p\right] \cdot \gamma_c = 143.175 \cdot \text{kip}$

Weight of Soil Above Footing = $WT_{s1} := \left[\left(W_f^2 - d_p^2\right) \cdot \begin{cases} (L_p - L_{pag} - n) & \text{if } (L_p - L_{pag} - n) \ge 0 \\ 0 & \text{if } (L_p - L_{pag} - n) \le 0 \end{cases}\right] \cdot \gamma_s = 79.2 \cdot \text{kip}$

Weight of Soil Wedge at Back Face = $WT_{s2} := \left(\dfrac{D_f^2 \cdot \tan(\Phi_s)}{2} \cdot W_f\right) \cdot \gamma_s = 17.667 \cdot \text{kip}$

Weight of Soil Wedge at back face Corners = $WT_{s3} := 2 \cdot \left[(D_f)^3 \cdot \dfrac{\tan(\Phi_s)}{3}\right] \cdot \gamma_s = 8.314 \cdot \text{kips}$

Total Weight = $WT_{tot} := WT_c + WT_{s1} + \text{Axial} = 234.375 \cdot \text{kip}$

Resisting Moment = $M_r := (WT_{tot}) \cdot \dfrac{W_f}{2} + S_u \cdot \dfrac{T_f}{3} + \left[(WT_{s2} + WT_{s3}) \cdot \left(W_f + \dfrac{D_f \tan(\Phi_s)}{3}\right)\right] = 2533 \cdot \text{kip} \cdot \text{ft}$

Overturning Moment = $M_{ot} := OM + \text{Shear} \cdot (L_p + T_f) = 893 \cdot \text{kip} \cdot \text{ft}$

Factor of Safety Actual = $FS := \dfrac{M_r}{M_{ot}} = 2.84$

Factor of Safety Required = $FS_{req} := 2$

OverTurning_Moment_Check := if(FS ≥ FS_{req}, "Okay", "No Good")

OverTurning_Moment_Check = "Okay"

Shear Capacity in Pier:

Shear Resistance of Pier = $S_p := \frac{\mu \cdot WT_{tot}}{FS_{req}} = 52.734 \cdot kips$

Shear_Check := if(S_p > Shear, "Okay", "No Good")

Shear_Check = "Okay"

Bearing Pressure Caused by Footing:

Area of the Mat = $A_{mat} := W_f^2 = 289$

Section Modulus of Mat = $S := \frac{W_f^3}{6} = 818.83 \cdot ft^3$

Maximum Pressure in Mat = $P_{max} := \frac{(WT_c + Axial)}{A_{mat}} + \frac{M_{ot}}{S} = 1.628 \cdot ksf$

Max_Pressure_Check := if(P_max < q_s, "Okay", "No Good")

Max_Pressure_Check = "Okay"

Minimum Pressure in Mat = $P_{min} := \frac{(WT_c + Axial)}{A_{mat}} - \frac{M_{ot}}{S} = -0.554 \cdot ksf$

Min_Pressure_Check := if[(P_min ≥ 0)·(P_min < q_s), "Okay", "No Good"]

Min_Pressure_Check = "No Good"

Distance to Resultant of Pressure Distribution = $X_p := \frac{P_{max}}{\frac{P_{max} - P_{min}}{W_f}} \cdot \frac{1}{3} = 4.228$

Distance to Kern = $X_k := \frac{W_f}{6} = 2.833$

Since Resultant Force is Not in Kern, Area to which Pressure is Applied Must be Reduced.

Eccentricity = $e := \frac{M_{ot}}{WT_{tot}} = 3.81$

Adjusted Soil Pressure = $P_a := \frac{2 \cdot (WT_c + Axial)}{3 \cdot W_f \cdot \left(\frac{W_f}{2} - e\right)} = 1.298 \cdot ksf$

$q_{adj} := if(P_{min} < 0, P_a, P_{max}) = 1.298 \cdot ksf$

Pressure_Check := if(q_adj < q_s, "Okay", "No Good")

Pressure_Check = "Okay"

Concrete Bearing Capacity:

Strength Reduction Factor = $\Phi_c := 0.65$ (ACI-2008 9.3.2.2)

Bearing Strength Between Pier and Pad = $P_b := \Phi_c \cdot 0.85 \cdot f_c \cdot \frac{\pi \cdot d_p^2}{4} = 4.686 \times 10^3 \cdot kips$ (ACI-2008 10.14)

$Bearing\_Check := if(P_b > LF \cdot Axial, "Okay", "No\ Good")$

$Bearing\_Check = "Okay"$

Shear Strength of Concrete:

Beam Shear: (Critical section located at a distance d from the face of Pier) (ACI 11.3.1.1)

$\phi_c := 0.85$ (ACI 9.3.2.5)

$d := T_f - Cvr_{pad} - d_{bbot} = 32 \cdot in$

$d_1 := \frac{W_f}{2} - \frac{d_p}{2}$

$d_2 := d_1 - d$

$L := \left(\frac{W_f}{2} - e\right) \cdot 3$

$Slope := if\left(L > W_f, \frac{P_{max} - P_{min}}{W_f}, \frac{q_{adj}}{L}\right)$

$V_{req} := LF \cdot \left[\left(q_{adj} - Slope \cdot d_1\right) + \left(\frac{Slope \cdot d_1}{2}\right)\right] \cdot W_f d_1$

$V_{Avail} := \phi_c \cdot 2 \cdot \sqrt{f_c \cdot psi} \cdot W_f \cdot d$ (ACI-2008 11.2.1.1)

$Beam\_Shear\_Check := if(V_{req} < V_{Avail}, "Okay", "No\ Good")$

$Beam\_Shear\_Check = "Okay"$

Punching Shear: (Critical Section Located at a distance of d/2 from the face of pier) (ACI 11.11.1.2)

Critical Perimeter of Punching Shear = $b_o := (d_p + d) \cdot \pi = 24.1$

Area Included Inside Perimeter = $A_{bo} := \frac{\pi \cdot (d_p + d)^2}{4} = 46.2$

Area Outside of Perimeter = $A_{out} := A_{mat} - A_{bo} = 242.8$

Guess Value = $v_u := 1ksf$ (From "Foundation Analysis and design", By Joseph Bowles, Eq. 8-9)

Given $d^2 + d_p \cdot d = \frac{WT_{tot}}{\pi \cdot v_u}$

$v_u := Find(v_u) = 3.6 \cdot ksf$

$V_u := v_u \cdot d \cdot W_f = 165.4 \cdot kips$

Required Shear Strength = $V_{req} := LF \cdot V_u = 220.5 \cdot kips$

Available Shear Strength = $V_{Avail} := \phi_c \cdot 4 \cdot \sqrt{f_c \cdot psi} \cdot b_o \cdot d = 1722.4 \cdot kip$ (ACI-2008 11.11.2.1)

Punching_Shear_Check := if($V_{req} < V_{Avail}$, "Okay", "No Good")

Punching_Shear_Check = "Okay"

Steel Reinforcement in Pad:

Required Reinforcement for Bending:

Strength Reduction Factor = $\phi_m := .90$ (ACI-2008 9.3.2.1)

$q_b := q_{adj} - d_1 \cdot Slope = 0.744 \cdot ksf$

Maximum Bending at Face of Pier = $M_u := LF \cdot \left[(q_{adj} - q_b) \cdot \frac{d_1^2}{3} + q_b \cdot \frac{d_1^2}{2} \right] \cdot W_f = 454 \cdot kip \cdot ft$

$$\beta := \begin{cases} 0.85 & \text{if } 2500 \cdot psi \le f_c \le 4000 \cdot psi \\ 0.65 & \text{if } f_c > 8000 \cdot psi \\ \left[0.85 - \left[\frac{\left(\frac{f_c}{psi} - 4000 \right)}{1000} \right] \cdot 0.5 \right] & \text{otherwise} \end{cases} = 0.85$$

(ACI-200810.2.7.3)

$R_n := \frac{M_u}{\phi_m \cdot W_f \cdot d^2} = 29 \cdot psi$

$\rho := \frac{0.85 \cdot f_c}{f_y} \left(1 - \sqrt{1 - \frac{2 \cdot R_n}{0.85 \cdot f_c}} \right) = 0.0005$

$\rho_{min} := \rho = 0.00049$

Required Reinforcement for Temperature and Shrinkage:

$$\rho_{sh} := \begin{cases} .0018 & \text{if } f_y \geq 60000 \cdot psi \\ .0020 & \text{otherwise} \end{cases}$$ (ACI -2008 7.12.2.1)

Check Bottom Bars:

$$As := \begin{cases} \rho_{min} \cdot W_f \cdot d & \text{if } \rho_{min} > \frac{\rho_{sh}}{2} \\ \rho_{sh} \cdot W_f \cdot \frac{d}{2} & \text{otherwise} \end{cases} = 5.875 \cdot in^2$$

$$As_{prov} := A_{bbot} \cdot NB_{bot} = 13.4 \cdot in^2$$

Pad_Reinforcement_Bot := if(As_prov > As, "Okay", "No Good")

Pad_Reinforcement_Bot = "Okay"

Check top Bars:

$$As := \rho_{sh} \cdot \left(W_f \cdot \frac{d}{2}\right) = 5.9 \cdot in^2$$

$$As_{prov} := A_{btop} \cdot NB_{top} = 13.4 \cdot in^2$$

Pad_Reinforcement_Top := if(As_prov > As, "Okay", "No Good")

Pad_Reinforcement_Top = "Okay"

Developement Length Pad Reinforcement:

Bar Spacing =

$$B_{sPad} := \frac{W_f - 2 \cdot Cvr_{pad} - NB_{bot} \cdot d_{bbot}}{NB_{bot} - 1} = 11.31 \cdot in$$

Spacing or Cover Dimension =

$$c := if\left(Cvr_{pad} < \frac{B_{sPad}}{2}, Cvr_{pad}, \frac{B_{sPad}}{2}\right) = 3 \cdot in$$

Transverse Reinforcement Index =

$$k_{tr} := 0$$ (ACI-2008 12.2.3)

$$L_{dbt} := \frac{3 \cdot f_y \cdot \alpha_{pad} \cdot \beta_{pad} \cdot \gamma_{pad} \cdot \lambda_{pad}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \frac{c + k_{tr}}{d_{bbot}}} \cdot d_{bbot} = 27.4 \cdot in$$

Minimum Development Length =

$$L_{dbmin} := 12 \cdot in$$ (ACI-2008 12.2.1)

L_dbtCheck := if(L_dbt ≥ L_dbmin, "Use L.dbt", "Use L.dbmin")

Available Length in Pad =

$$L_{Pad} := \frac{W_f}{2} - \frac{d_p}{2} - Cvr_{pad} = 69 \cdot in$$

Lpad_Check := if(L_Pad > L_dbt, "Okay", "No Good")

Lpad_Check = "Okay"

Steel Reinforcement in Pier:

Area of Pier = $A_p := \frac{\pi \cdot d_p^2}{4} = 2827.43 \cdot in^2$

$A_{smin} := 0.0033 \cdot A_p = 9.33 \cdot in^2$

$A_{sprov} := NB_{pier} \cdot A_{bpier} = 18.74 \cdot in^2$

Steel_Area_Check := if($A_{sprov} > A_{smin}$, "Okay", "No Good")

Steel_Area_Check = "Okay"

Bar Spacing In Pier = $B_{sPier} := \frac{d_p \cdot \pi}{NB_{pier}} - d_{bpier} = 14.298 \cdot in$

Diameter of Reinforcement Cage = $Diam_{cage} := d_p - 2 \cdot Cvr_{pier} = 54 \cdot in$

Maximum Moment in Pier = $M_p := \left[OM + Shear \cdot \left(L_p + \frac{A_{BP}}{2}\right)\right] \cdot LF = 13884.5 \cdot in \cdot kips$

Pier Check evaluated from outside program and results are listed below;

$$\left(D \;\; N \;\; n \;\; P_u \;\; M_{xu}\right) := \left(d_p \cdot 12 \;\; NB_{pier} \;\; BS_{pier} \;\; \frac{Axial \cdot 1.333}{kips} \;\; \frac{M_p}{in \cdot kips}\right)$$

$$\left(D \;\; N \;\; n \;\; P_u \;\; M_{xu}\right) = \left(60 \;\; 12 \;\; 11 \;\; 15.996 \;\; 1.388 \times 10^4\right)$$

$$\left(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho\right) := (0 \;\; 0 \;\; 0 \;\; 0)$$

$$\left(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho\right) := \phi P'_n\left(D, N, n, P_u, M_{xu}\right)^T$$

$$\left(\phi P_n \;\; \phi M_{xn} \;\; f_{sp} \;\; \rho\right) = \left(28.676 \;\; 2.489 \times 10^4 \;\; -60 \;\; 6.621 \times 10^{-3}\right)$$

Axial_Load_Check := if($\phi P_n \geq P_u$, "Okay", "No Good")

Axial_Load_Check = "Okay"

Bending_Check := if($\phi M_{xn} \geq M_{xu}$, "Okay", "No Good")

Bending_Check = "Okay"

Development Length Pier Reinforcement:

Available Length in Foundation:

$$L_{pier} := L_p - Cvr_{pier} = 39 \cdot in$$

$$L_{pad} := T_f - Cvr_{pad} = 33 \cdot in$$

Tension: (ACI-2008 12.2.3)

Spacing or Cover Dimension = $c := if\left(Cvr_{pier} < \frac{B_{sPier}}{2}, Cvr_{pier}, \frac{B_{sPier}}{2}\right) = 3 \cdot in$

Transverse Reinforcement = $k_{tr} := 0$ (ACI-2008 12.2.3)

$$L_{dbt} := \frac{3 \cdot f_y \cdot \alpha_{pier} \cdot \beta_{pier} \cdot \gamma_{pier} \cdot \lambda_{pier}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \left(\frac{c + k_{tr}}{d_{bpier}}\right)} \cdot d_{bpier} = 54.45 \cdot in$$

Minimum Development Length = $L_{dh} := \frac{1200 \cdot d_{bpier}}{\sqrt{\frac{f_c}{psi}}} \cdot .7 = 21.624 \cdot in$ (ACI 12.2.1)

Pier reinforcement bars are standard 90 degree hooks and therefore developement in the pad is computed as follows:

$$L_{db} := max(L_{dbt}, L_{dbmin})$$

$$L_{tension\_Check} := if(L_{pier} + L_{pad} > L_{dbt}, \text{"Okay"}, \text{"No Good"})$$

$$L_{tension\_Check} = \text{"Okay"}$$

Compression: (ACI-2008 12.3.2)

$$L_{dbc1} := \frac{.02 \cdot d_{bpier} \cdot f_y}{\sqrt{f_c \cdot psi}} = 30.892 \cdot in$$

$$L_{dbmin} := 0.0003 \cdot \frac{in^2}{lb} \cdot (d_{bpier} \cdot f_y) = 25.38 \cdot in$$

$$L_{dbc} := if(L_{dbc1} \ge L_{dbmin}, L_{dbc1}, L_{dbmin}) = 30.892 \cdot in$$

$$L_{compression\_Check} := if(L_{pier} + L_{pad} > L_{dbc}, \text{"Okay"}, \text{"No Good"})$$

$$L_{compression\_Check} = \text{"Okay"}$$

Tie Size and Spacing in Column:

Minimum Tie Size = $Tie_{min} := if(BS_{pier} \le 10, 3, 4) = 4$

Used #4 Ties

Seismic Factor = $z := if(Z \le 2, 1, 0.5) = 1$ (ACI-2008 21.10.5)

$s_{lim1} := 16 \cdot d_{bpier} \cdot z = 22.56 \cdot in$

$s_{lim2} := 48 \cdot d_{Tie} \cdot z = 24 \cdot in$

$s_{lim3} := D_f \cdot z = 72 \cdot in$

$s_{lim4} := 18in$

Maximum Spacing = $s_{tie} := min\left(\begin{pmatrix} s_{lim1} \\ s_{lim2} \\ s_{lim3} \\ s_{lim4} \end{pmatrix}\right) = 18 \cdot in$

Number of Ties Required = $n_{tie} := \frac{L_{pier} - 3 \cdot in}{s_{tie}} + 1 = 3$

Check Anchor Steel Embedment:

Depth Available = $D_{ab} := L_{st} - A_{BP} = 6 \cdot ft$

Length of Anchor Bolt = $L_{anchor} := \frac{(0.11 \cdot f_{ya}) \cdot in}{\sqrt{f_c \cdot psi}} = 12.552 \cdot ft$

$Depth\_Check := if(D_{ab} \ge L_{anchor}, \text{"Okay"}, \text{"No Good"})$

Depth_Check = "No Good"

Note: Anchor plate is provided

SITE NAME	SIMSBURY_2_CT	ECP - CELL #	8 / 315
LATITUDE	41.841383	LONGITUDE	-72.850426
700 RRH upgrade. 60W RRH will use both low band ports on the 700 / 850 antenna. Tilts must be set the same on both low band ports		SAVE BUTTON	
		STRUCTURE TYPE	Monopole
700 Mhz - LTE Current Config	**ALPHA**	**BETA**	**GAMMA**
EQUIPMENT TYPE	ALU RH-2X40-700	ALU RH-2X40-700	ALU RH-2X40-700
ANTENNA TYPE	BXA-70063-6CF-2-750MHZ	BXA-70063-6CF-2-750MHZ	BXA-70063-6CF-2-750MHZ
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	70	190	310
DOWN TILT (MECH/DEG)	0	5	0
RAD CTR (FT AGL)	101.4	101.4	101.4
TMA - INSTALLED	No	No	No
RRH - INSTALLED	Yes	Yes	Yes
700 Mhz - LTE Future Config	**ALPHA**	**BETA**	**GAMMA**
EQUIPMENT TYPE	ALU RH-2X60-700 U	ALU RH-2X60-700 U	ALU RH-2X60-700 U
ANTENNA TYPE	SBNHH-1D65B	SBNHH-1D65B	SBNHH-1D65B
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	70	190	310
DOWN TILT (MECH/DEG)	0 electrical	8 electrical	4 electrical
RAD CTR (FT AGL)	101.4	101.4	101.4
TMA - QTY / MODEL			
RRH - QTY/MODEL			
850 Celluar - Current Config	**ALPHA**	**BETA**	**GAMMA**
EQUIPMENT TYPE	N/A	N/A	N/A
ANTENNA TYPE	BXA-70063-6CF-2-850MHZ	BXA-70063-6CF-2-850MHZ	BXA-70063-6CF-2-850MHZ
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	70	190	310
DOWN TILT (MECH/DEG)	0	4	0
RAD CTR (FT AGL)	101.4	101.4	101.4
TMA - INSTALLED	No	No	No
RRH - INSTALLED	No	No	No
850 Celluar - Future Config	**ALPHA**	**BETA**	**GAMMA**
EQUIPMENT TYPE	N/A	N/A	N/A
ANTENNA TYPE	SBNHH-1D65B	SBNHH-1D65B	SBNHH-1D65B
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	70	190	310
DOWN TILT (MECH/DEG)	0 electrical	8 electrical	4 electrical
RAD CTR (FT AGL)	101.4	101.4	101.4
TMA - QTY / MODEL			
RRH - QTY/MODEL			
1900 PCS - Current Config	**ALPHA**	**BETA**	**GAMMA**
EQUIPMENT TYPE	N/A	N/A	N/A
ANTENNA TYPE	BXA-171063-12CF-EDIN-2	BXA-171063-12CF-EDIN-2	BXA-171063-12CF-EDIN-2
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	70	190	310
DOWN TILT (MECH/DEG)	0	2	0
RAD CTR (FT AGL)	101.4	101.4	101.4
TMA - INSTALLED	No	No	No
RRH - INSTALLED	No	No	No
1900 PCS - Future Config	**ALPHA**	**BETA**	**GAMMA**
EQUIPMENT TYPE	ALU RRH_2X90-PCS	ALU RRH_2X90-PCS	ALU RRH_2X90-PCS
ANTENNA TYPE	SBNHH-1D65B	SBNHH-1D65B	SBNHH-1D65B
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	70	190	310
DOWN TILT (MECH/DEG)	0 electrical	5 electrical	3 electrical
RAD CTR (FT AGL)	101.4	101.4	101.4
TMA - QTY / MODEL			
RRH - QTY/MODEL			

AWS - LTE Current Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	ALU RRH_2X40-AWS	ALU RRH_2X40-AWS	ALU RRH_2X40-AWS
ANTENNA TYPE	BXA-171063-12CF-EDIN-2	BXA-171063-12CF-EDIN-2	BXA-171063-12CF-EDIN-2
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	70	190	310
DOWN TILT (MECH/DEG)	0	2	0
RAD CTR (FT AGL)	101.4	101.4	101.4
TMA - INSTALLED	No	No	No
RRH - INSTALLED	Yes	Yes	Yes
AWS - LTE Future Config	**ALPHA**	**BETA**	**GAMMA**
EQUIPMENT TYPE	ALU RRH_2X60-AWS	ALU RRH_2X60-AWS	ALU RRH_2X60-AWS
ANTENNA TYPE	SBNHH-1D65B	SBNHH-1D65B	SBNHH-1D65B
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	70	190	310
DOWN TILT (MECH/DEG)	0 electrical	5 electrical	3 electrical
RAD CTR (FT AGL)	101.4	101.4	101.4
TMA - QTY / MODEL			
RRH - QTY/MODEL			

TX / RX FREQUENCIES			TX POWER OUTPUT	
Cellular A-Band	**PCS F / AWS-Band**	**700 Mhz C - Block**	Cellular (Watts)	20
TX - 869-880,890-891.5 MHz	TX - 1970-1975 / 2145-2155	TX - 746-757	PCS (Watts)	16
RX - 824-835,845-846.5 MHz	RX - 1890-1895 / 1745-1755	RX - 776-787	LTE/ AWS (Watts)	40

ALPHA				BETA				GAMMA			
Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code	Ant.	Freq.	Func.	Color Code
A1	800	Tx1/Rx0	RED	A7	800	Tx2/Rx0	BLUE	A13	800	Tx3/Rx0	GREEN
A2	1900	Tx1/Rx0	RED/	A8	1900	Tx2/Rx0	BLUE/ WHITE	A14	1900	Tx3/Rx0	GREEN/WHITE
A3	700	Tx1/Rx0	RED/ ORANGE	A9	700	Tx2/Rx0	BLUE/ ORANGE	A15	700	Tx3/Rx0	GREEN/ORANGE
A4	700	Tx4/Rx1	RED/RED/ ORANGE	A10	700	Tx5/Rx1	BLUE/BLUE/ ORANGE	A16	700	Tx6/Rx1	GREEN/GREEN/ ORANGE
A5	1900	Tx4/Rx1	RED/RED/ WHITE	A11	1900	Tx5/Rx1	BLUE/BLUE/ WHITE	A17	1900	Tx6/Rx1	GREEN/GREEN/ WHITE
A6	800	Tx4/Rx1	RED/RED	A12	800	Tx5/Rx1	BLUE/BLUE	A18	800	Tx6/Rx1	GREEN/GREEN
F1-A	1700	Tx/Rx	RED/ BROWN	F1-B	1700	Tx/Rx	BLUE/BROWN	F1-C	1700	Tx/Rx	GREEN/BROWN
F1-D	1700	Tx/Rx	RED/RED/ BROWN	F1-E	1700	Tx/Rx	BLUE/BLUE/BROWN	F1-F	1700	Tx/Rx	GREEN/GREEN/BROWN

System Performance Engineer	Performance Manager	INITIALS	DATE
Prepared By: Mark Brauer	Alex Restrepo	MB	9/16/2015

Product Specifications

COMMSCOPE®

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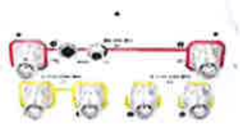


SBNHH-1D65B

Andrew® Tri-band Antenna, 698–896 and 2 x 1710–2360 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**	**1710–1880**	**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**	**1710–1880**	**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 7 ° | 14.6 14 ° | 14.2	0 ° | 14.5 7 ° | 14.4 14 ° | 13.6	0 ° | 17.4 3 ° | 17.5 7 ° | 17.4	0 ° | 17.8 3 ° | 17.9 7 ° | 17.9	0 ° | 18.1 3 ° | 18.3 7 ° | 18.2	0 ° | 18.2 3 ° | 18.4 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	1710 – 2360 MHz | 698 – 896 MHz

Mechanical Specifications

Product Specifications

COMMSCOPE®

POWERED BY ANDREW

SBNHH-1D65B

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	1828.0 mm | 72.0 in
Width	301.0 mm | 11.9 in
Net Weight	18.4 kg | 40.6 lb

Remote Electrical Tilt (RET) Information

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

Regulatory Compliance/Certifications

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

Included Products

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

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.

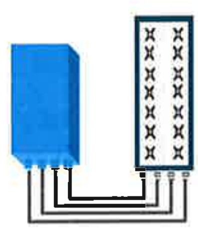
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the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

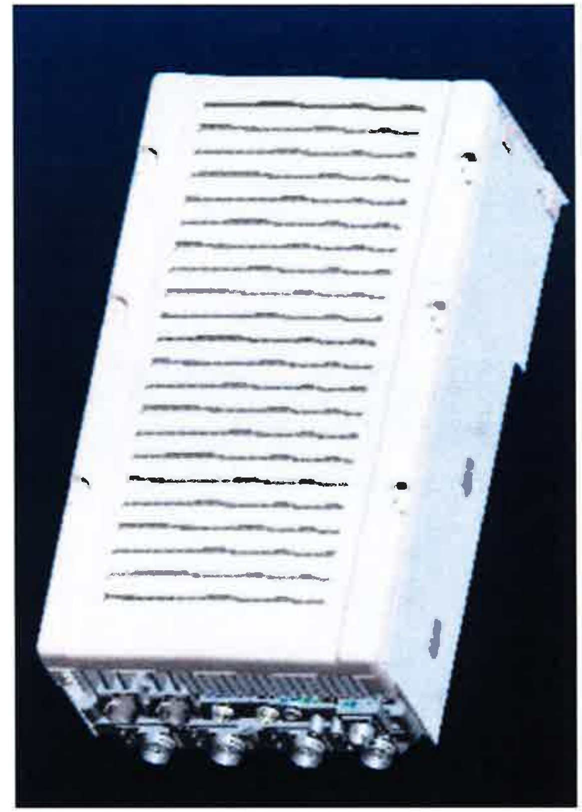
Features & performance	
Number of TX/RX paths	4 duplexed (either 4T4R or 2T4R by SW)
Frequency band	U700 (C) (3GPP bands 13): DL: 746 - 756 MHz / UL: 777 - 787 MHz
Instantaneous bandwidth - #carriers	10MHz – 1 LTE carrier (in 10MHz occupied bandwidth)
LTE carrier bandwidth	10 MHz
RF output power	2x60W 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

Alcatel·Lucent

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.)

VZW Network Equipment Reporting Form (NERF)

Vendor	Alcatel-Lucent	Model	B66a RRH 4Tx/4Rx 4x45W or 2x 90W (SW selectable)	Function	RRH for distributed architecture with a CPRI interface between digital and RF processing components. The RRH has 4 Tx ports and 4 Rx ports. Can be SW configured for 2 Tx with 90W rf per port or 4 Tx with 45W rf per port. The RRH has passive cooling only.

*1)Equipment Configuration	*2)Heat Release @50°F Intake Temp [W]		*3)Airflow Rate @ 100% Activity Rate [cfm]		*4)Dimensions [in]		Non-Thermal Data		
	100% Activity	50% Activity	Nominal (70°F)	Max (95°F)	External (WxDxH)	Clear (F/R/S)	Installed Weight [lb]	*5)Sound @ Nominal [LwAd]	*6)Name Plate [W]
Minimum			N/A Convection cooled	N/A Convection cooled	w/o Solar Shield W = 11.4in D = 6.7in H = 25.2in (W=290mm) (D=170mm) (H=640mm)	Front: 12" Rear: 7.5" Right: 12" Left: 12" Top: 12" Bottom: 24"			
Typical			N/A Convection cooled	N/A Convection cooled	with Solar Shield W = 12in D = 7.6in H = 25.8in (W=304mm) (D=193mm) (H=655mm)		62lb 72 lb(w mounting brackets)	N/A Convection cooled	
Full	825W (add 60W for AISG)	TBD	N/A Convection cooled	N/A Convection cooled	N/A			N/A Convection cooled	

*7)Equipment EC-Class	N/A Convection cooled	*10)Fan Speed	N/A Convection cooled	*13)Fan Hot-Swap	N/A Convection cooled	*16)Environ. Tests	N/A Convection cooled	*18)Temp. Rise [°F]	N/A Convection cooled
*8)Non-Optimal EC-Class	N/A Convection cooled	*11)Fan Logic	N/A Convection cooled	*14)Shut-Down	N/A Convection cooled	*17)Allow. Max [°F]	N/A Convection cooled	*19)Rec. Max [°F]	N/A Convection cooled
*9)Exhaust Openings	N/A Convection cooled	*12)Fan Alarm	N/A Convection cooled	*15)Temp. Access	N/A Convection cooled	*17)Allow. Min [°F]	N/A Convection cooled	*19)Rec. Min [°F]	N/A Convection cooled

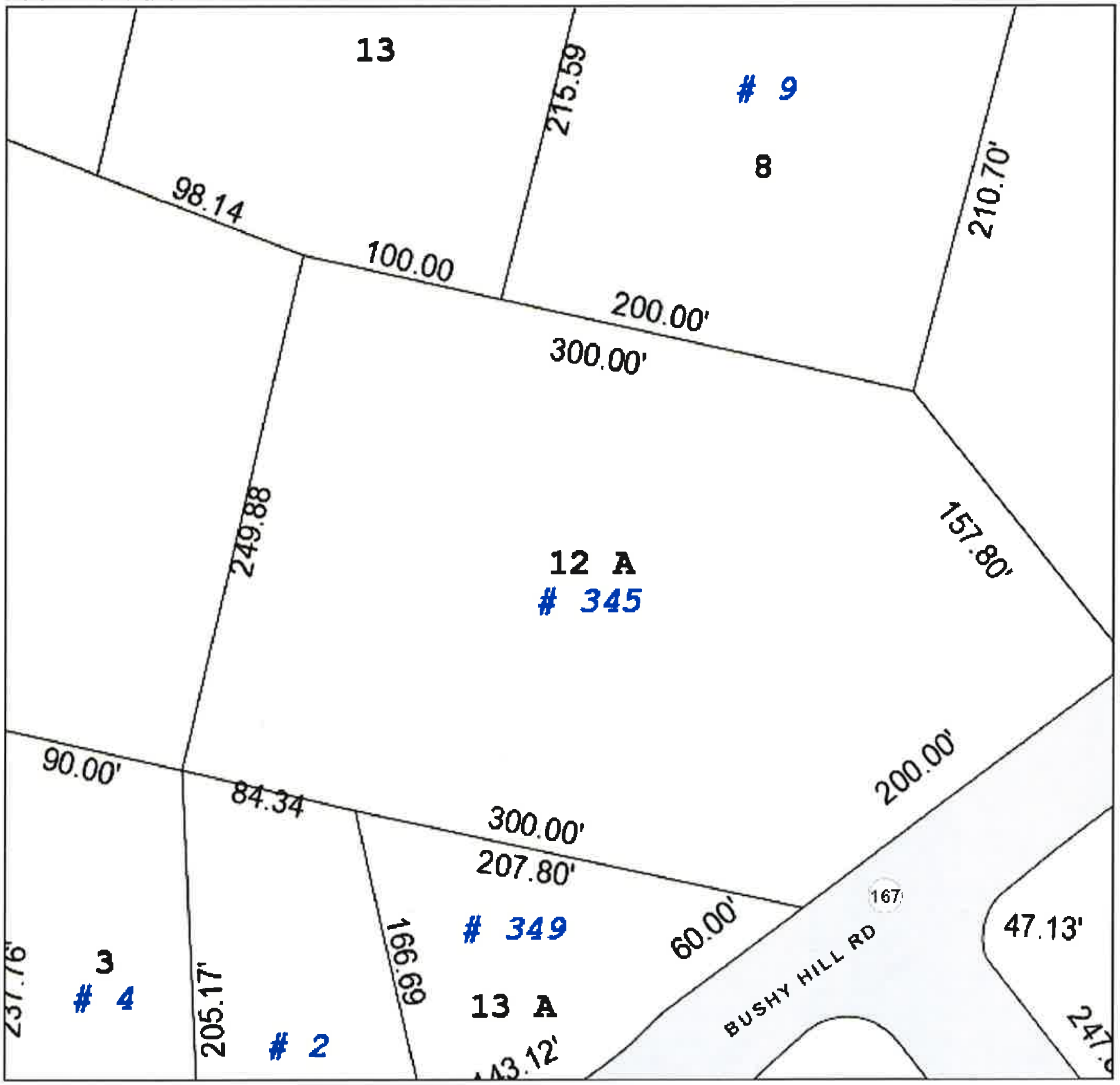
Power Reporting					
Power Input	-48V	No. Power Supplies	N/A (Customer provided power plant)	Number of Inputs per Power Supply	1
*24)Maximum Demand (total system in Watts)	825W (add 60W for AISG)	Maximum Input (each power supply in Watts)	N/A (Customer provided power plant)	Maximum Output (each power supply in Watts)	58W (to AISG port, 29V/2A)
Power Supply Connection Type	DC entry via Conduit Box	Power Supply Make & Model	N/A (Customer provided power plant)		
Input Protection	no input fuse	Input Protection Make & Model	N/A (Customer provided power plant)		
Redundancy Scheme	N/A				
Nominal Voltage	-48VDC	Maximum Voltage	-57V	Minimum Voltage	-38V
*25)Max Current at Nominal Voltage	17.2A (add 1.2A if AISG port loaded 2A*29V)	*25)Max Current at Maximum Voltage	14.5A (add 1A if AISG port loaded 2A*29V)	*25)Max Current at Minimum Voltage	21.7A (add 1.5A if AISG port loaded 2A*29V)

Return completed forms to Engineering and Operations Support (EOS)
Richard.damiano@verizonwireless.com

ATTACHMENT 4

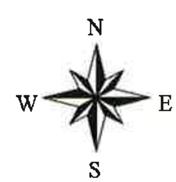
Town of Simsbury
Geographic Information System (GIS)

Date Printed: 7/20/2016



MAP DISCLAIMER - NOTICE OF LIABILITY
This map is for assessment purposes only. It is not for legal description or conveyances. All information is subject to verification by any user. The Town of Simsbury and its mapping contractors assume no legal responsibility for the information contained herein.

Approximate Scale: 1 inch = 75 feet



The Assessor's office is responsible for the maintenance of records on the ownership of properties. Assessments are computed at 70% of the estimated market value of real property at the time of the last revaluation which was 2012.

SIMSBURY
CONNECTICUT

Information on the Property Records for the Municipality of Simsbury was last updated on 7/20/2016.

Parcel Information

Location:	345 BUSHY HILL ROAD	Property Use:	Public Use	Primary Use:	Fire Station - Volunteer
Unique ID:	04007606	Map Block Lot:	C16 301 012A	Acres:	1.74
490 Acres:	0.00	Zone:	R-40	Volume / Page:	0257/0645
Developers Map / Lot:		Census:	4661010		

Value Information

	Appraised Value	70% Assessed Value
Land	304,500	213,150
Buildings	815,963	571,170
Detached Outbuildings	15,912	11,140
Total	1,136,375	795,460

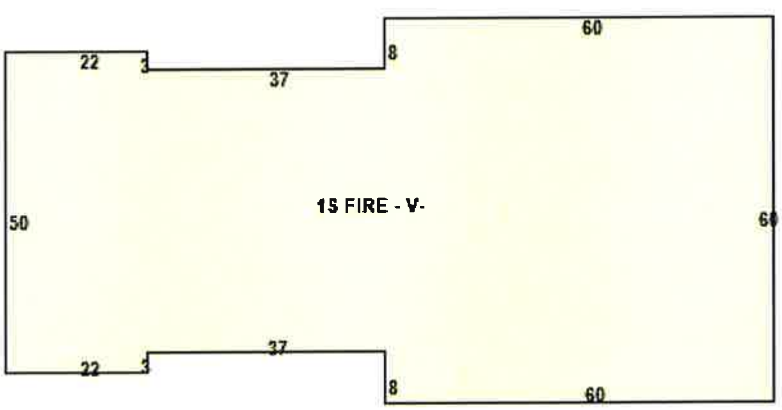
Owner's Information

Owner's Data

SIMSBURY FIRE DISTSRICT
869 HOPMEADOW STREET
SIMSBURY CT 06070

Building 1

C16-301-012A 03/17/2012



Category:	Public Use	Use:	Fire Station - Volunteer	Stories:	1.00

Above Grade:	6,328	Below Grade:	0	Below Grade Finish:	0
Construction:	Good	Year Built:	1998	Heating:	Hot Water
Fuel:	Gas	Cooling Percent:	43%	Siding:	Brick
Roof Material:	Compo_Built-Up	Beds/Units:	0		

Special Features

Attached Components

Detached Outbuildings

Type:	Year Built:	Length:	Width:	Area:
Paving Paving	1998			19,700
Light Poles Poles	1998			1

Owner History - Sales

Owner Name	Volume	Page	Sale Date	Deed Type	Valid Sale	Sale Price
SIMSBURY FIRE DISTSRICT	0257	0645	12/21/1981		No	$0

Information Published With Permission From The Assessor