Robinson+Cole

KENNETH C. BALDWIN

280 Trumbull Street
Hartford, CT 06103-3597
Main (860) 275-8200
Fax (860) 275-8299
kbaldwin@rc.com
Direct (860) 275-8345

Also admitted in Massachusetts

July 6, 2015

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

Re: **Notice of Exempt Modification – Facility Modification**
324 Montevideo Road, Avon, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains ten (10) wireless telecommunications antennas at the 55-foot level on the existing 60-foot tower at 324 Montevideo Road in Avon, Connecticut (the "Property"). The tower and underlying property are owned by Talcott Mountain Science Center. The Council approved Cellco's shared use of this tower in 1989. Cellco now intends to modify its facility by replacing four (4) of its existing antennas with two (2) model SBNHH-1D65B, 1900 MHz antennas and two (2) model SBNHH-1D65B, 2100 MHz antennas, all at the same 55-foot level on the tower. Cellco also intends to replace two (2) existing remote radio heads ("RRHs") with two (2) newer model RRHs, and install four (4) new RRHs and one (1) HYBRIFLEX™ antenna cable. Included in Attachment 1 are specifications for Cellco's replacement antennas, RRHs and HYBRIFLEX™ cable.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Brandon Robertson, Avon's Town Manager and the Talcott Mountain Science Center, the owner of the Property.

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

1. The proposed modifications will not result in an increase in the height of the existing tower. The replacement antennas and RRHs will be located at the 55-foot level on the 60-foot tower.

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

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

4. The operation of the replacement antennas will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety standard. Far Field Approximation tables for each of Cellco's operating frequencies for the modified Talcott Mountain facility are included in Attachment 2. As indicated on these tables, Cellco's modified facility will operate well within the FCC standards for RF emissions.

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

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

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

Sincerely,

Kenneth C. Baldwin

Enclosures
Copy to:
Brandon Roberts, Avon Town Manger
Talcott Mountain Science Center
Tim Parks

ATTACHMENT 1

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.

SBNHH-1D65B

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

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

Electrical Specifications

Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2180	2300–2360
Gain, dBi	14.9	14.7	17.7	18.2	18.6	18.6
Beamwidth, Horizontal, degrees	68	66	69	66	63	58
Beamwidth, Vertical, degrees	12.1	10.7	5.6	5.2	5.0	4.5
Beam Tilt, degrees	0–14	0–14	0–7	0–7	0–7	0–7
USLS, dB	14	13	15	15	15	13
Front-to-Back Ratio at 180°, dB	27	29	28	28	28	27
CPR at Boresight, dB	20	23	20	20	17	21
CPR at Sector, dB	14	10	12	10	9	1
Isolation, dB	25	25	25	25	25	25
Isolation, Intersystem, dB	30	30	30	30	30	30
VSWR | Return Loss, dB	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350	350	350	300
Polarization	±45°	±45°	±45°	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2180	2300–2360
Gain by all Beam Tilts, average, dBi	14.5	14.3	17.4	17.9	18.2	18.3
Gain by all Beam Tilts Tolerance, dB	±0.5	±0.8	±0.4	±0.3	±0.5	±0.3
Gain by Beam Tilt, average, dBi	0 ° | 14.6	0 ° | 14.5	0 ° | 17.4	0 ° | 17.8	0 ° | 18.1	0 ° | 18.2
	7 ° | 14.6	7 ° | 14.4	3 ° | 17.5	3 ° | 17.9	3 ° | 18.3	3 ° | 18.4
	14 ° | 14.2	14 ° | 13.6	7 ° | 17.4	7 ° | 17.9	7 ° | 18.2	7 ° | 18.4
Beamwidth, Horizontal Tolerance, degrees	±2.2	±3.4	±2	±4.6	±5.7	±4.3
Beamwidth, Vertical Tolerance, degrees	±0.8	±1	±0.3	±0.2	±0.3	±0.2
USLS, dB	16	14	16	16	16	15
Front-to-Back Total Power at 180° ± 30°, dB	25	26	27	26	26	26
CPR at Boresight, dB	22	23	21	20	20	22
CPR at Sector, dB	13	11	16	12	11	4

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

General Specifications

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

Product Specifications

SBNHH-1D65B

Mechanical Specifications

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

Dimensions

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

Remote Electrical Tilt (RET) Information

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

Regulatory Compliance/Certifications

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

Included Products

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

* Footnotes

Performance Note	Severe environmental conditions may degrade optimum performance

ALCATEL-LUCENT B13 RRH4X30-4R

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

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

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

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

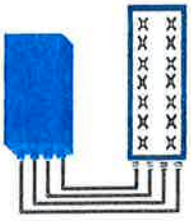
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the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

FEATURES

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

BENEFITS

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



4x30W with 4T4R
or
2x60W with 2T4R

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

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

PCS RF MODULES

RRH1900 2X60 - HW CHARACTERISTICS

LA6.0.1/13.3

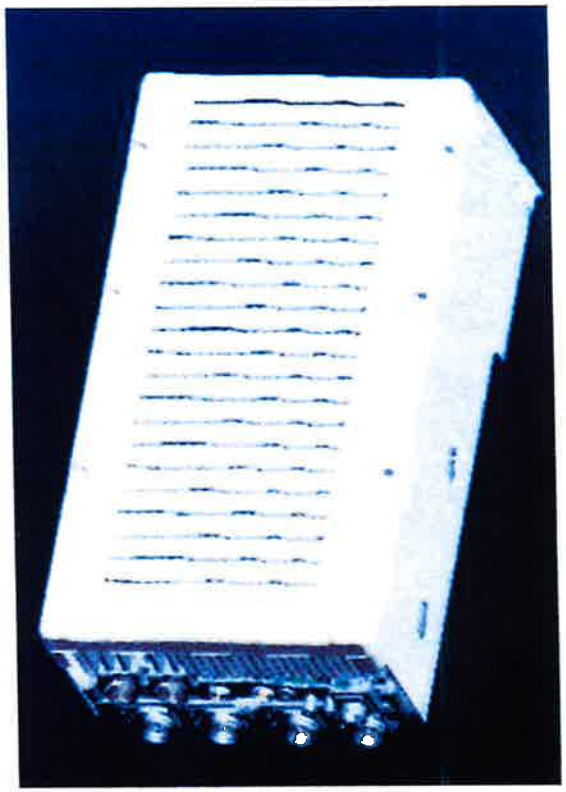
	RRH2x60
RF Output Power	2x60W
Instantaneous Bandwidth	20MHz
Transmitter	2 TX
Receiver 1900 HW version 1900A HW version	2 Branch RX – LA6.0.1 4 Branch RX – LR13.3
Features	AISG 2.0 for RET/TMA
	Internal Smart Bias-T
Power	-48VDC
CPRI Ports	2 CPRI Rate 3 Ports
External Alarms	4 External User Alarms
Monitor Ports	TX
Environmental	GR487 Compliance
RF Connectors	7/16 DIN (top mounted)

** Not a Verizon Wireless deployed product

NEW PCS RF MODULES FOR VZW
RRH2X60 - HW CHARACTERISTICS

LR14.3

	RRH2x60
RF Output Power	2x60W (4x30W HW Ready)
Instantaneous Bandwidth	60MHz
Target Reliability (Annual Return Rate)	<2%
Receiver	4 Branch Rx
Features	AISG 2.0 for RET/TMA
Power	-48VDC
	Internal Smart Bias-T
CPRI Ports	2 CPRI Rate 5 Ports
External Alarms	4 External User Alarms
Monitor Ports	TX, RX
Environmental	GR487 Compliance
RF Connectors	7/16 DIN (downward facing)
Dimensions	22"(h) x 12"(w)x 9.4" (d)**
Weight	55lb**



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

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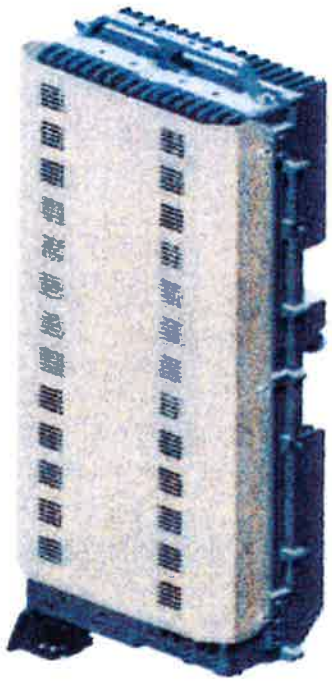
ALCATEL-LUCENT
WIRELESS PRODUCT DATASHEET
RRH2X60-AWS FOR BAND 4 APPLICATIONS

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



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

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

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

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

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

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

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

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

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

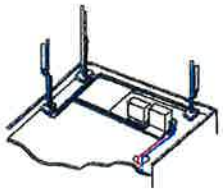
The Alcatel-Lucent RRH2x60-AWS is a very cost-effective solution to deploy LTE MIMO.

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

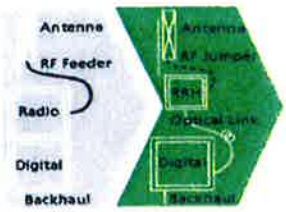
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation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

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

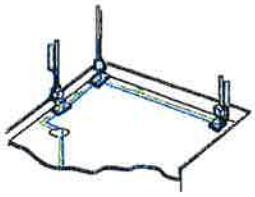
Installation can easily be done by a single person as the Alcatel-Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



Macro



RRH for space-constrained cell sites



Distributed

- RRH2x60-AWS integrates two power amplifiers of 60W rating (at each antenna connector)
- Support multiple carriers over the entire 3GPP band 4
- RRH2x60-AWS is optimized for LTE operation
- RRH2x60-AWS is a very compact and lightweight product
- Advanced power management techniques are embedded to provide power savings, such as PA bias control
- MIMO LTE operation with only one single unit per sector
- Improved uplink coverage with built-in 4-way receive diversity capability
- RRH can be mounted close to the antenna, eliminating nearly all losses in RF cables and thus reducing power consumption by 50% compared to conventional solutions
- Distributed configurations provide easily deployable and cost-effective solutions, near zero footprint and silent solutions, with minimum impact on the neighborhood, which ease the deployment
- RETA and TMA support without additional hardware thanks to the AISG v2.0 port and the integrated Bias-Tees. Bias-Tees support AISG DC supply and signaling.

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

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

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

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

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

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

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

Alcatel·Lucent

AT THE SPEED OF IDEAS™

Product Data Sheet HB158-1-08U8-S8J18

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

Product Description

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

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

Figure 1: HYBRIFLEX Series

Features/Benefits

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

Technical Specifications

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

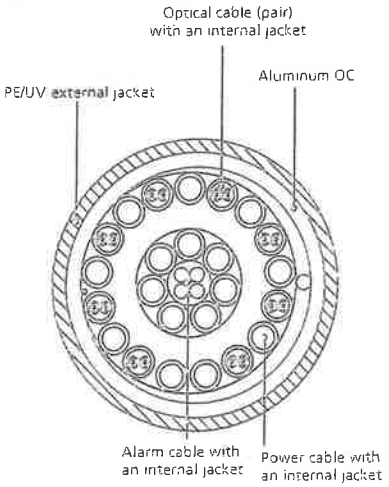


Figure 2: Construction Detail

* This data is provisional and subject to change

ATTACHMENT 2

Far Field Approximation
with downtilt variation

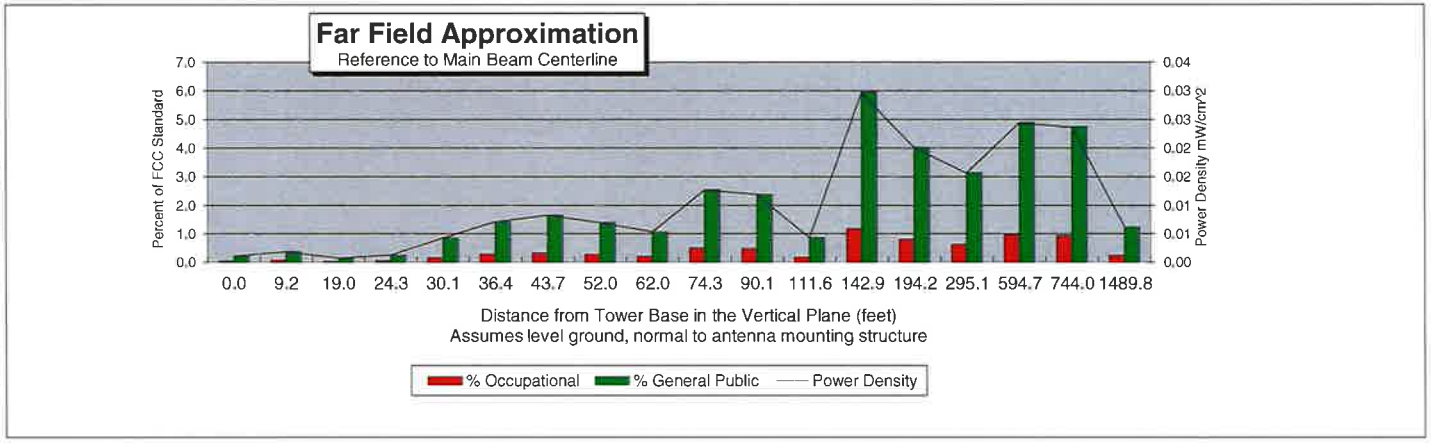
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	Talcott Mtn, CT
Site #:	
Date:	06/30/15
Name:	Mark Brauer
File Name:	Talcott Mtn, CT - FF Power

Operating Freq. (MHz)	**746.0**
Antenna Height (ft):	**55.0**
Antenna Gain (dBi):	**14.8**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
ERP (w):	**2100.0**
Number of Channels	**1**



Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	2.0	
Solve for r, dx to antenna	52.0	52.8	55.3	57.4	60.1	63.5	67.9	73.6	80.9	90.7	104.0	123.1	152.1	201.0	299.6	596.9	745.8	1490.7	
Distance from Antenna Structure Base in Horizontal plane	0.0	9.2	19.0	24.3	30.1	36.4	43.7	52.0	62.0	74.3	90.1	111.6	142.9	194.2	295.1	594.7	744.0	1489.8	
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2	
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0	
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.03	0.02	0.02	0.02	0.02	0.01	
Percent of Occupational Standard	0.0	0.1	0.0	0.0	0.2	0.3	0.3	0.3	0.2	0.5	0.5	0.2	1.2	0.8	0.6	1.0	0.9	0.2	
Percent of General Population Standard	0.2	0.4	0.1	0.2	0.9	1.4	1.7	1.4	1.1	2.5	2.4	0.9	5.9	4.0	3.1	4.9	4.7	1.2	

Antenna Type SBNHH-1D65B
Max% 5.95%

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 Po
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

Far Field Approximation
with downtilt variation

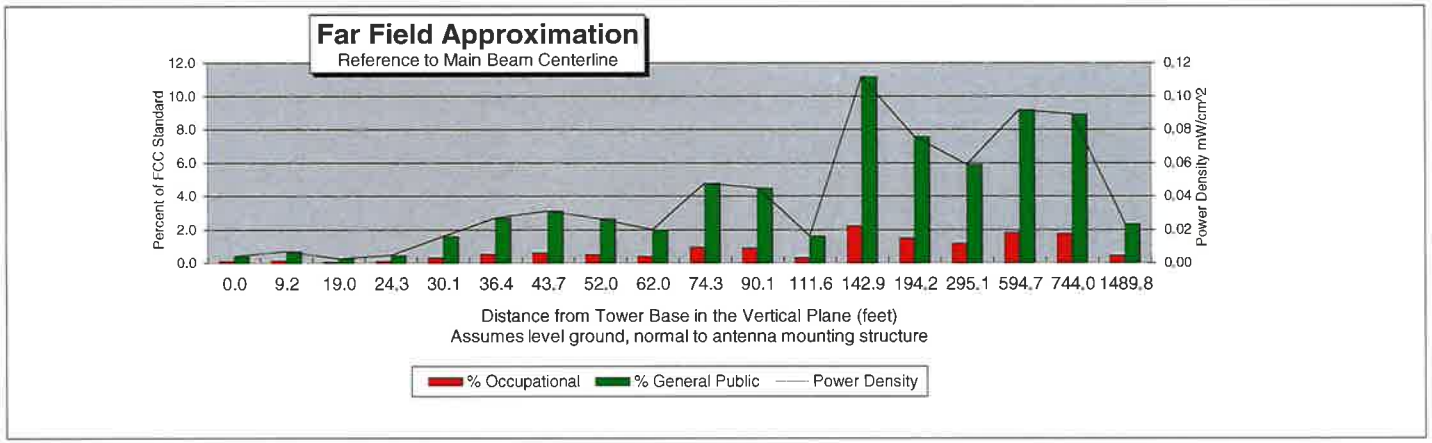
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	Talcott Mtn, CT
Site #:	
Date:	06/30/15
Name:	Mark Brauer
File Name:	Talcott Mtn, CT - FF Power

Operating Freq. (MHz)	**2145.0**
Antenna Height (ft):	**55.0**
Antenna Gain (dBi):	**18.3**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
ERP (w):	**3500.0**
Number of Channels	**1**



Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	2.0	
Solve for r, dx to antenna	52.0	52.8	55.3	57.4	60.1	63.5	67.9	73.6	80.9	90.7	104.0	123.1	152.1	201.0	299.6	596.9	745.8	1490.7	
Distance from Antenna Structure Base in Horizontal plane	0.0	9.2	19.0	24.3	30.1	36.4	43.7	52.0	62.0	74.3	90.1	111.6	142.9	194.2	295.1	594.7	744.0	1489.8	
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2	
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0	
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	
Power Density (mW/cm^2)	0.00	0.01	0.00	0.00	0.02	0.03	0.03	0.03	0.02	0.05	0.04	0.02	0.11	0.08	0.06	0.09	0.09	0.02	
Percent of Occupational Standard	0.1	0.1	0.0	0.1	0.3	0.5	0.6	0.5	0.4	1.0	0.9	0.3	2.2	1.5	1.2	1.8	1.8	0.5	
Percent of General Population Standard	0.4	0.7	0.2	0.5	1.6	2.7	3.1	2.6	2.0	4.8	4.5	1.6	11.2	7.6	5.9	9.2	8.9	2.3	

Antenna Type SBNHH-1D65B
Max% 11.17%

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 Po
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

Far Field Approximation
with downtilt variation

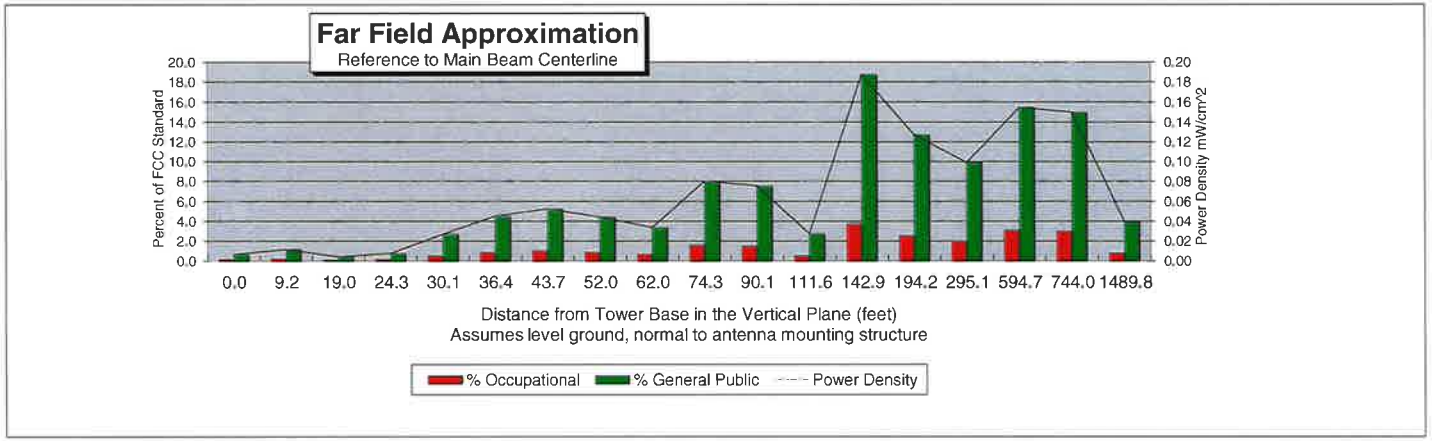
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	Talcott Mtn, CT
Site #:	
Date:	06/30/15
Name:	Mark Brauer
File Name:	Talcott Mtn, CT - FF Power

Operating Freq. (MHz)	**1970.0**
Antenna Height (ft):	**55.0**
Antenna Gain (dBi):	**18.5**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
ERP (w):	**5616.0**
Number of Channels	**11**



Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	2.0
Solve for r, dx to antenna	52.0	52.8	55.3	57.4	60.1	63.5	67.9	73.6	80.9	90.7	104.0	123.1	152.1	201.0	299.6	596.9	745.8	1490.7
Distance from Antenna Structure Base in Horizontal plane	0.0	9.2	19.0	24.3	30.1	36.4	43.7	52.0	62.0	74.3	90.1	111.6	142.9	194.2	295.1	594.7	744.0	1489.8
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2
dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.01	0.01	0.00	0.01	0.03	0.05	0.05	0.04	0.03	0.08	0.08	0.03	0.19	0.13	0.10	0.15	0.15	0.04
Percent of Occupational Standard	0.1	0.2	0.1	0.2	0.5	0.9	1.0	0.9	0.7	1.6	1.5	0.5	3.8	2.5	2.0	3.1	3.0	0.8
Percent of General Population Standard	0.7	1.1	0.4	0.8	2.7	4.5	5.2	4.4	3.4	8.0	7.5	2.7	18.8	12.7	9.9	15.4	15.0	3.9

Antenna Type SBNHH-1D65B
Max% 18.76%

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 Po
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

Far Field Approximation
with downtilt variation

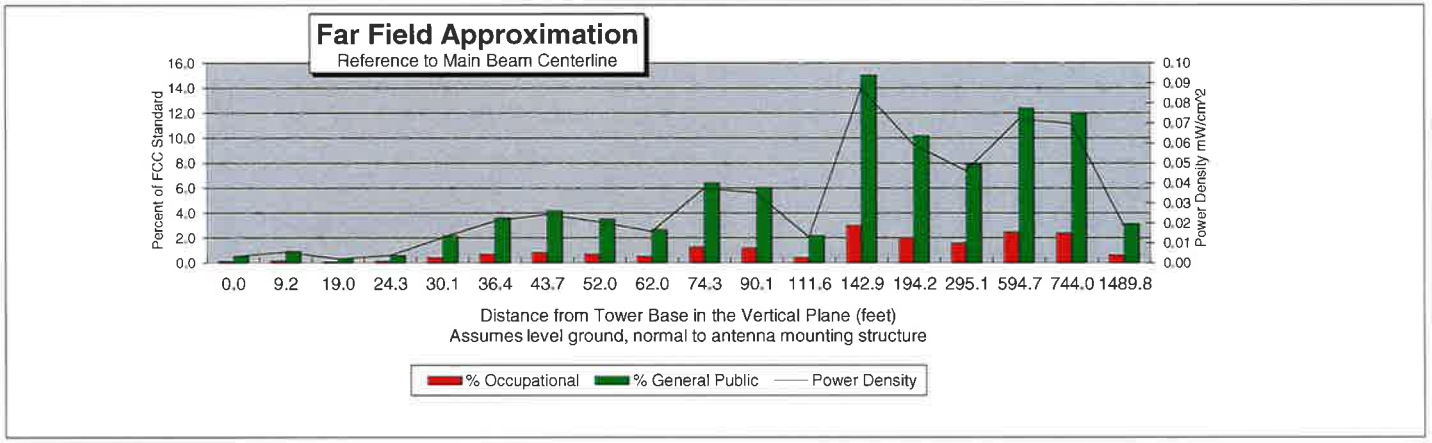
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	Talcott Mtn, CT
Site #:	
Date:	06/30/15
Name:	Mark Brauer
File Name:	Talcott Mtn, CT - FF Power

Operating Freq. (MHz)	**869.0**
Antenna Height (ft):	**55.0**
Antenna Gain (dBi):	**16.7**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**0.0**
ERP (w):	**3997.0**
Number of Channels	**9**



Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	45.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	5.0	4.0	2.0
Solve for r, dx to antenna	52.0	52.8	55.3	57.4	60.1	63.5	67.9	73.6	80.9	90.7	104.0	123.1	152.1	201.0	299.6	596.9	745.8	1490.7
Distance from Antenna Structure Base in Horizontal plane	0.0	9.2	19.0	24.3	30.1	36.4	43.7	52.0	62.0	74.3	90.1	111.6	142.9	194.2	295.1	594.7	744.0	1489.8
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dB down from centerline (referenced to centerline)	36.76	34.35	38.52	35.34	29.54	26.8	25.59	25.63	25.99	21.21	20.29	23.24	13.03	12.3	9.92	2	0.2	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.01	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.04	0.04	0.01	0.09	0.06	0.05	0.07	0.07	0.02
Percent of Occupational Standard	0.1	0.2	0.1	0.1	0.4	0.7	0.8	0.7	0.5	1.3	1.2	0.4	3.0	2.0	1.6	2.5	2.4	0.6
Percent of General Population Standard	0.5	0.9	0.3	0.6	2.2	3.6	4.2	3.5	2.7	6.4	6.0	2.2	15.1	10.2	7.9	12.4	12.0	3.1

Antenna Type LPA-80063-6CF
Max% 15.06%

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 Po
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

ATTACHMENT 3

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

60-ft Existing Lattice Tower

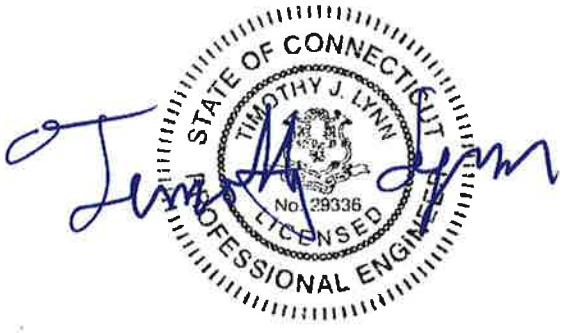
Proposed Verizon Wireless
Antenna Upgrade

Verizon Site Ref: Talcott Mountain

324 Montevideo Road
Avon, CT

Centek Project No. 15001.047

Date: June 2, 2015



Prepared for:

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

63-2 North Branford Road, Branford, CT 06405 203.488.0580 Fax 203.488.8587 www.CentekEng.com

Table of Contents

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 lattice (tower) located in Avon, CT.

The host tower is a 60-ft, three legged, steel lattice tower. The tower geometry, structure member sizes and foundation information were obtained from a previous structural report prepared by Centek Engineering, Inc. job no.; 13140.000 dated December 19, 2013.

Antenna and appurtenance information were obtained from the aforementioned Centek structural report and a Verizon RF data sheet.

The tower consists of one (1) tapered and two (2) straight vertical steel sections consisting of ASTM A53-B-35 (35ksi) pipe legs. Diagonal and horizontal lateral support bracing consists of steel angle conforming to ASTM A36 (36ksi) and steel pipe conforming to ASTM A53-B-35 (35ksi). The vertical tower sections are connected by bolted flange plates while the pipe legs and bracing are connected by bolted and welded gusset connections. The tower face width is 7.58-ft at the top and 9.70-ft at the bottom.

Verizon proposes the removal of four (4) panel antennas and the installation of four (4) panel antennas, six (6) RRH's and one (1) main distribution box mounted on two (2) 13-ft frames 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:

- UNKNOWN (Existing):
  Antennas: One (1) 18-ft dome mounted to the top of the tower.
  Coax Cables: One (1) 7/8" ∅ cable running on a leg/face of the existing tower as specified in Section 3 of this report.
- AT&T (EXISTING):
  Antennas: Twelve (12) CCI HPA-65R-BUU-H8 panel antennas, twenty-one (21) Ericsson remote radio units, six (6) Ericsson A2's and four (4) Raycap DC6-48-60-18-8F surge arrestors mounted within the existing doppler radar dome with a RAD center elevation of ±67-ft above grade.
  Coax Cables: Four (4) 2-1/4" innerducts containing two (2) fiber trunks, eight (8) DC trunks and three (3) RET cables and one (1) #2 THHN ground running on a face of the existing tower.
- VERIZON WIRELESS (Existing to Remain):
  Antennas: One (1) RFS APX75-866514-CT8, one (1) Antel BXA-70080-6CF, two (2) Antel LPA-80063-6CF, two (2) LPA-80080-6CF panel antennas and one (1) Raycap RC2DC-3315-PF main distribution box mounted on two (2) 13-ft face mount fames with a RAD center elevation of ±55-ft above finished grade.
  Coax Cables: Twelve (12) 1-5/8" ∅ coax cables and one (1) 1-5/8" fiber cable running on a face of the existing tower as specified in Section 3 of this report.

- VERIZON WIRELESS (Existing to Remove):
  Antennas: Two (2) Antel BXA-171063-8CF panel antennas, two (2) Antel BXA-171063-12CF panel antennas and two (2) Alcatel-Lucent RRH-2x40-AWS remote radio heads mounted on two (2) 13-ft face mount fames with a RAD center elevation of ±55-ft above finished grade.
- **VERIZON (Proposed):**
  Antennas: Four (4) Andrew SBNHH-1D65B panel antennas, two (2) Alcatel-Lucent RRH4x30-B13 Remote Radio Heads, two (2) Alcatel-Lucent RRH2x60-PCS remote radio heads, two (2) Alcatel-Lucent RRH2x60-AWS and one (1) Raycap RC2DC-3315-PF main distribution box mounted on two (2) 13-ft face mount fames with a RAD center elevation of ±55-ft above finished grade.
  Coax Cables: One (1) 1-5/8" ∅ fiber cable running on a leg/face of the existing tower as specified in Section 3 of this report.

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]*
	Avon; 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 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 2009 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 2, per tnxTower "Section Capacity Table", this tower was found to be at **99.0%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Leg (T5)	0'-0"- 6'-3"	99.0%	**PASS**
Diagonal (T2)	19'-6"- 39'-6"	70.4%	**PASS**

Foundation and Anchors

The foundation consists of a 3.5-ft thick triangular mat. The tower legs are encased within the concrete mat.

- The tower reactions developed from the governing Load Case 1 of the proposed reinforced tower condition were used in the verification of the foundation and anchor bolts:

Leg Reactions	Vector	Proposed Tower Reactions
Leg	Shear	**7 kips**
	Compression	**74 kips**
	Uplift	**64 kips**
Base	Shear	**12 kips**
	Compression	**13 kips**
	Moment	**584 kip-ft**

- The foundation system was found to be within allowable limits.

Foundation Type	Design Limit	Allowable Limit/FS	Proposed Loading	Result
Triangular Mat Foundation	Bearing Pressure	12.0 ksf (1)	1.35 ksf	**PASS**
	OM (2)	2.0 (3)	2.84	**PASS**

Note 1: Minimum allowable soil bearing pressure taken as 12.0ksf (conservative) for basalt rock.
Note 2: (OM) Denotes overturning moment.
Note 3: Min required Factor of Safety (FS) of 2.0 required per IBC 2003/2005 CSBC Section 3108.4.2.

Conclusion and Recommendations

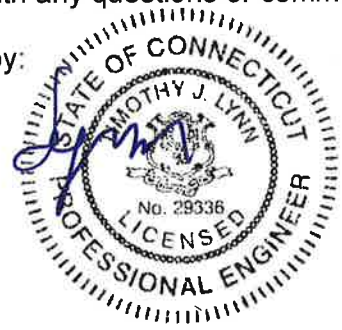
This analysis shows that the subject tower **is adequate** to support the proposed antenna configuration with the below recommendations.

- **All coax cables routed as specified in Section 3 of this report**

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

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:

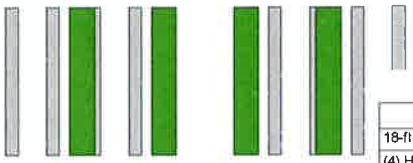
- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of Centek Engineering, Inc. or 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.

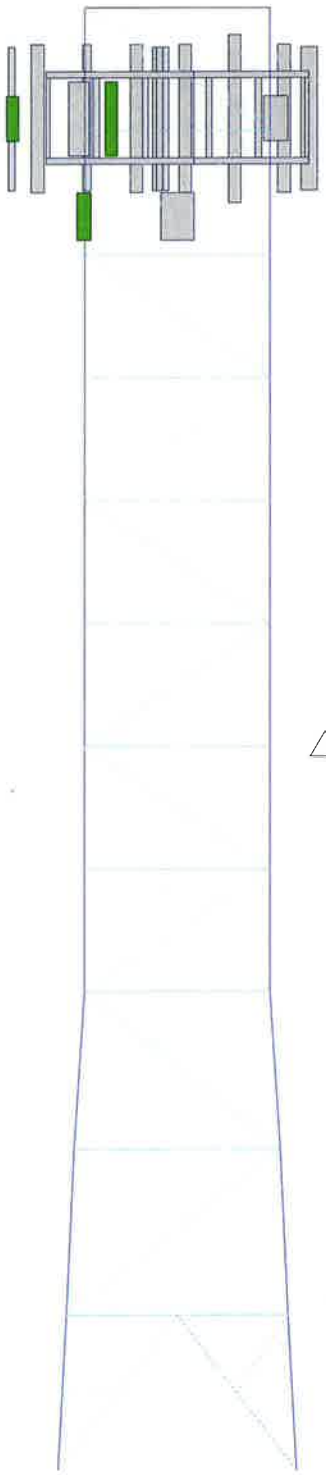
GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

tnxTower, is an integrated structural analysis and design software package for Designed specifically for the telecommunications industry, tnxTower, formerly RISA Tower, 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.





Legs	P3.5x.226													
Leg Grade	A53-B-35													
Diagonals	L3x3x3/16	P2x.154		P2.5x.203										
Diagonal Grade	A36			A53-B-35										
Top Girts			N.A.			L3x5x1/4								
Horizontals	2L2x2x3/16	L3x3x1/4			L2 1/2x2 1/2x1/4									
Red. Horizontals	L2x2x3/16				N.A.									
Red. Diagonals	L2x2x3/16				N.A.									
Face Width (ft)	9.70833	8.96875		8.28125									7.58333	
# Panels @ (ft)	4.5	1 @ 6.3		1 @ 6.8			1 @ 6.4					8 @ 5		
Weight (K)		0.6		0.4			0.4					1.5		1.6

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
18-ft Doppler	68.5	LPA-80080-6CF (Verizon - Existing)	55
(4) HPA-65R-BUU-H8 (ATI - Proposed)	67	SBNHH-1D65B (Verizon - Proposed)	55
		BXA-70080-6CF (Verizon - Existing)	55
(4) HPA-65R-BUU-H8 (ATI - Proposed)	67	13-ft Face Mount Frame (Verizon - Existing)	55
(4) HPA-65R-BUU-H8 (ATI - Proposed)	67	13-ft Face Mount Frame (Verizon - Existing)	55
(7) RRUS-11 (ATI - Proposed)	67	LPA-80063-6CF (Verizon - Existing)	55
(7) RRUS-11 (ATI - Proposed)	67	SBNHH-1D65B (Verizon - Proposed)	55
(7) RRUS-11 (ATI - Proposed)	67	APX75-866514-CT8 (Verizon - Existing)	55
(2) A2 (ATI - Proposed)	67		
(2) A2 (ATI - Proposed)	67	SBNHH-1D65B (Verizon - Proposed)	55
(2) A2 (ATI - Proposed)	67	RRH2x60-AWS (Verizon - Proposed)	55
(4) DC6-48-60-18-8F Surge Arrestor (ATI - Proposed)	67	RRH2x60-AWS (Verizon - Proposed)	55
		RRH2x60-07-U (Verizon - Proposed)	55
Doppler Platform	60	RRH2x60-07-U (Verizon - Proposed)	55
Doppler Platform Support	57	RRH2x60-PCS (Verizon - Proposed)	55
Doppler Platform Support	57	RRH2x60-PCS (Verizon - Proposed)	55
Doppler Platform Support	57	RC2DC-3315-PF-48 (Verizon - Existing)	51
SBNHH-1D65B (Verizon - Proposed)	55		
LPA-80080-6CF (Verizon - Existing)	55	RC2DC-3315-PF-48 (Verizon - Proposed)	51
LPA-80063-6CF (Verizon - Existing)	55		

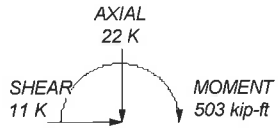
MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A53-B-35	35 ksi	63 ksi	A36	36 ksi	58 ksi

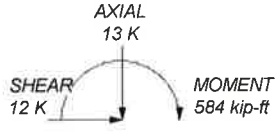
TOWER DESIGN NOTES

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 RATING: 99%

MAX. CORNER REACTIONS AT BASE:
DOWN: 74 K
UPLIFT: -64 K
SHEAR: 7 K



TORQUE 2 kip-ft
69 mph WIND - 0.5000 in ICE

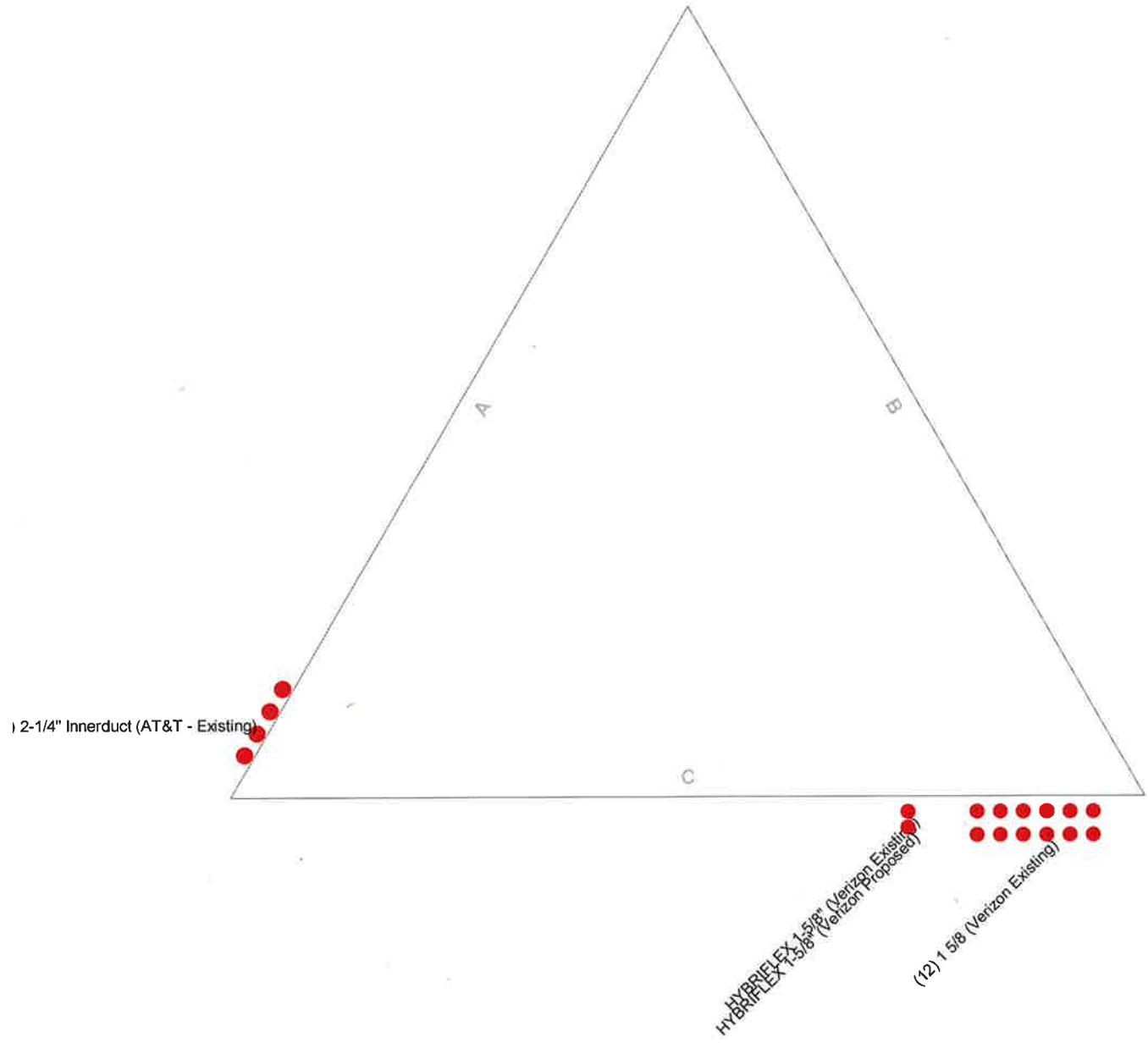


TORQUE 2 kip-ft
REACTIONS - 80 mph WIND

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

Job:	15001.047 - Talcott Mountain		
Project:	60' Lattice Tower - 324 Montevideo Road, Avon,		
Client: Verizon Wireless	Drawn by: TJL	App'd:	
Code: TIA/EIA-222-F	Date: 06/02/15	Scale: NTS	
Path:		Dwg No. E-1	

Round Flat App In Face App Out Face



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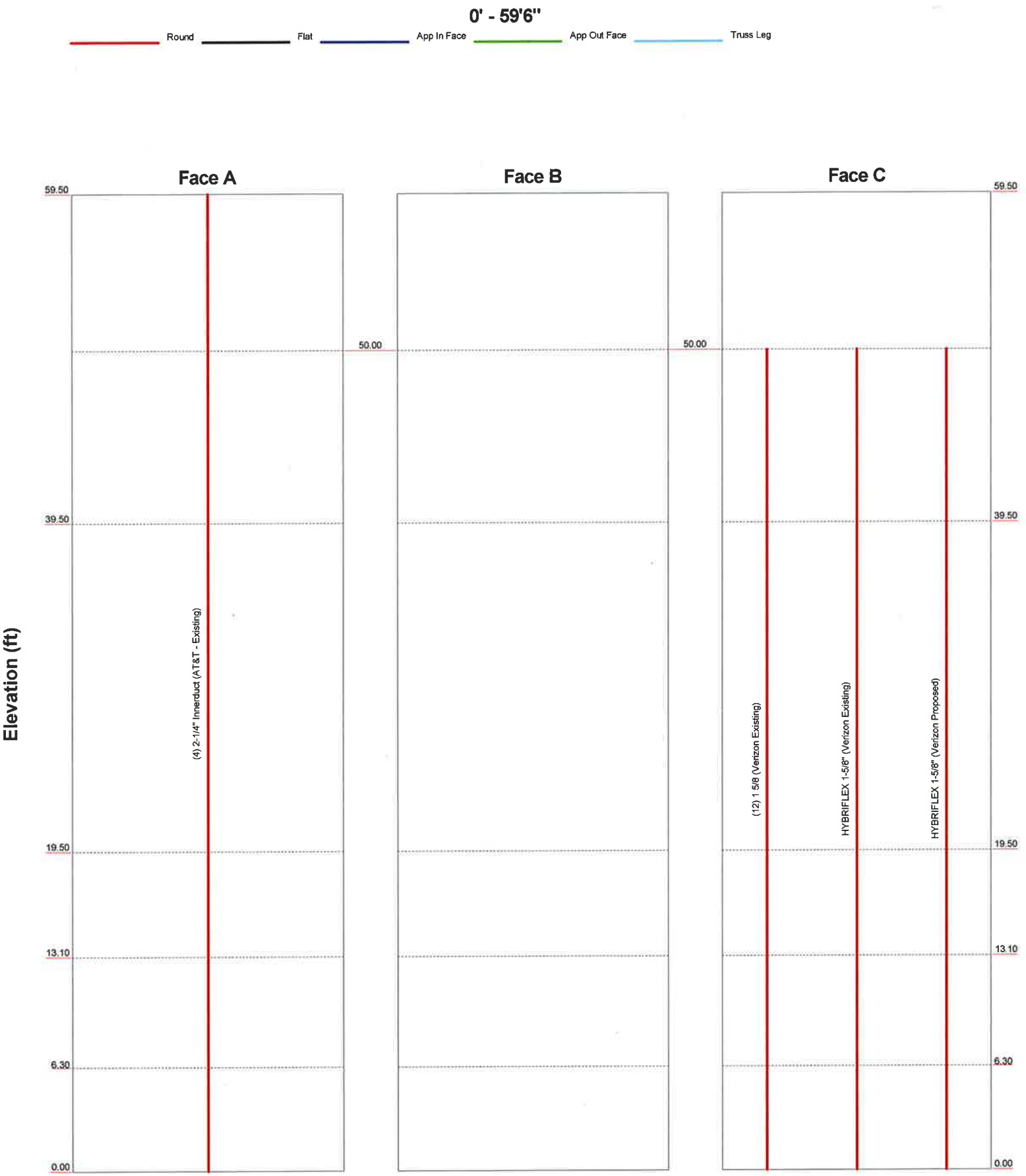
Client: Verizon Wireless	Drawn by: TJL	App'd:	
Code: TIA/EIA-222-F	Date: 06/02/15	Scale: NTS	
Path:		Dwg No. E-7	



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Client: Verizon Wireless		Drawn by: TJL	App'd:
Code: TIA/EIA-222-F		Date: 06/02/15	Scale: NTS
Path:			Dwg No. E-7

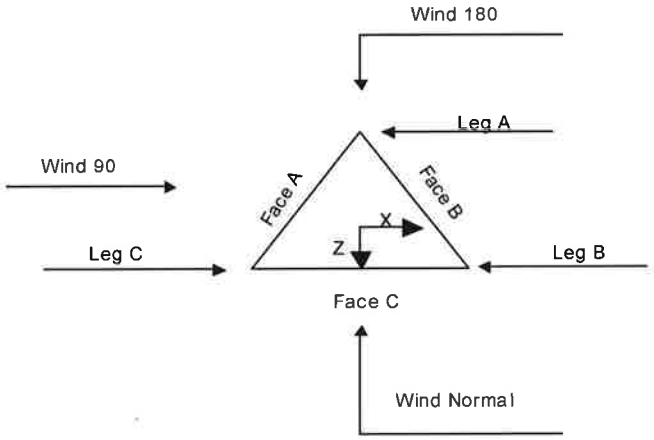
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 59.50 ft above the ground line.
The base of the tower is set at an elevation of 0.00 ft above the ground line.
The face width of the tower is 7.58 ft at the top and 9.71 ft at the base.
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 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.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in tower member design is 1.333.
Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

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



Triangular Tower

Tower Section Geometry

Tower Section	Tower Elevation	Assembly Database	Description	Section Width	Number of Sections	Section Length
	ft			ft		ft
T1	59.50-39.50			7.58	1	20.00
T2	39.50-19.50			7.58	1	20.00
T3	19.50-13.10			7.58	1	6.40
T4	13.10-6.30			8.28	1	6.80
T5	6.30-0.00			8.97	1	6.30

Tower Section Geometry *(cont'd)*

Tower Section	Tower Elevation	Diagonal Spacing	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset	Bottom Girt Offset
	ft	ft				in	in
T1	59.50-39.50	5.00	K Brace Left	No	Yes	0.0000	0.0000
T2	39.50-19.50	5.00	K Brace Left	No	Yes	0.0000	0.0000
T3	19.50-13.10	6.40	K Brace Right	No	Yes	0.0000	0.0000
T4	13.10-6.30	6.80	K Brace Left	No	Yes	0.0000	0.0000
T5	6.30-0.00	6.30	K1 Down	No	Yes	0.0000	0.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 59.50-39.50	Pipe	P3.5x.226	A53-B-35 (35 ksi)	Pipe	P2.5x.203	A53-B-35 (35 ksi)
T2 39.50-19.50	Pipe	P3.5x.226	A53-B-35 (35 ksi)	Pipe	P2.5x.203	A53-B-35 (35 ksi)
T3 19.50-13.10	Pipe	P3.5x.226	A53-B-35 (35 ksi)	Pipe	P2x.154	A53-B-35 (35 ksi)
T4 13.10-6.30	Pipe	P3.5x.226	A53-B-35 (35 ksi)	Pipe	P2x.154	A53-B-35 (35 ksi)
T5 6.30-0.00	Pipe	P3.5x.226	A53-B-35 (35 ksi)	Single Angle	L3x3x3/16	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 59.50-39.50	Single Angle	L3x5x1/4	A36 (36 ksi)	Solid Round		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	No. of Mid Girts	Mid Girt Type	Mid Girt Size	Mid Girt Grade	Horizontal Type	Horizontal Size	Horizontal Grade
T1 59.50-39.50	None	Flat Bar		A36 (36 ksi)	Single Angle	L2 1/2x2 1/2x1/4	A36 (36 ksi)
T2 39.50-19.50	None	Single Angle		A36 (36 ksi)	Single Angle	L2 1/2x2 1/2x1/4	A36 (36 ksi)
T3 19.50-13.10	None	Single Angle		A36 (36 ksi)	Single Angle	L3x3x1/4	A36 (36 ksi)
T4 13.10-6.30	None	Single Angle		A36 (36 ksi)	Single Angle	L3x3x1/4	A36 (36 ksi)
T5 6.30-0.00	None	Single Angle		A36 (36 ksi)	Double Equal Angle	2L2x2x3/16	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Redundant Bracing Grade		Redundant Type	Redundant Size	K Factor
T5 6.30-0.00	A36 (36 ksi)	Horizontal (1)	Single Angle	L2x2x3/16	1
		Diagonal (1)	Single Angle	L2x2x3/16	1

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Gusset Area (per face) ft²	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
T1 59.50-39.50	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T2 39.50-19.50	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T3 19.50-13.10	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T4 13.10-6.30	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T5 6.30-0.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	K Factors[1] Legs	X Brace Diags X Y	K Brace Diags X Y	Single Diags X Y	Girts X Y	Horiz. X Y	Sec. Horiz. X Y	Inner Brace X Y
T1	Yes	No	1	1	1	1	1	1	1	1
59.50-39.50				1	1	1	1	1	1	1
T2	Yes	No	1	1	1	1	1	1	1	1
39.50-19.50				1	1	1	1	1	1	1
T3	Yes	No	0.5	1	1	1	1	1	1	1
19.50-13.10				1	1	1	1	1	1	1
T4 13.10-6.30	Yes	No	0.5	1	1	1	1	1	1	1
				1	1	1	1	1	1	1
T5 6.30-0.00	Yes	No	0.9	1	1	1	1	1	1	1
				1	1	1	1	1	1	1

[1] *Note: K factors are applied to member segment lengths. K-braces without inner supporting members will have the K factor in the out-of-plane direction applied to the overall length.*

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T1 59.50-39.50	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T2 39.50-19.50	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T3 19.50-13.10	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T4 13.10-6.30	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T5 6.30-0.00	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

Tower Section Geometry *(cont'd)*

Tower Elevation	Connection Offsets							
	Diagonal				K-Bracing			
	Vert. Top	Horiz. Top	Vert. Bot.	Horiz. Bot.	Vert. Top	Horiz. Top	Vert. Bot.	Horiz. Bot.
ft	in	in	in	in	in	in	in	in
T1 59.50-39.50	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
T2 39.50-19.50	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
T3 19.50-13.10	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
T4 13.10-6.30	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000
T5 6.30-0.00	0.0000	3.0000	0.0000	3.0000	0.0000	0.0000	0.0000	0.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T1 59.50-39.50	Flange	0.8750 A325N	4	0.5000 A325N	2	0.6250 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.5000 A325N	1	0.6250 A325N	0
T2 39.50-19.50	Flange	0.8750 A325N	4	0.5000 A325N	2	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.5000 A325N	1	0.6250 A325N	0
T3 19.50-13.10	Flange	0.0000 A325N	0	0.7500 A325N	1	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.7500 A325N	1	0.6250 A325N	0
T4 13.10-6.30	Flange	0.0000 A325N	0	0.7500 A325N	1	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.5000 A325N	1	0.6250 A325N	0
T5 6.30-0.00	Flange	0.0000 A325N	0	0.7500 A325N	1	0.6250 A325N	0	0.0000 A325N	0	0.6250 A325N	0	0.5000 A325N	1	0.6250 A325N	0

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
1 5/8 (Verizon Existing)	C	Yes	Ar (CfAe)	50.00 - 0.00	1.0000	-0.38	12	6	1.0000	1.9800		1.04
2-1/4" Innerduct (AT&T - Existing)	A	Yes	Ar (CfAe)	59.50 - 0.00	0.0000	-0.41	4	4	1.0000	2.2500		4.00
HYBRIFLEX 1-5/8" (Verizon Existing)	C	Yes	Ar (CfAe)	50.00 - 0.00	1.0000	-0.24	1	1	1.9800	1.9800		1.90
HYBRIFLEX	C	Yes	Ar (CfAe)	50.00 - 0.00	3.0000	-0.24	1	1	1.9800	1.9800		1.90

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
1-5/8" (Verizon Proposed)												

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
T1	59.50-39.50	A	15.000	0.000	0.000	0.000	0.32
		B	0.000	0.000	0.000	0.000	0.00
		C	13.860	0.000	0.000	0.000	0.17
T2	39.50-19.50	A	15.000	0.000	0.000	0.000	0.32
		B	0.000	0.000	0.000	0.000	0.00
		C	26.400	0.000	0.000	0.000	0.33
T3	19.50-13.10	A	4.800	0.000	0.000	0.000	0.10
		B	0.000	0.000	0.000	0.000	0.00
		C	8.448	0.000	0.000	0.000	0.10
T4	13.10-6.30	A	5.100	0.000	0.000	0.000	0.11
		B	0.000	0.000	0.000	0.000	0.00
		C	8.976	0.000	0.000	0.000	0.11
T5	6.30-0.00	A	4.725	0.000	0.000	0.000	0.10
		B	0.000	0.000	0.000	0.000	0.00
		C	8.316	0.000	0.000	0.000	0.10

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	59.50-39.50	A	0.500	5.417	16.250	0.000	0.000	0.51
		B		0.000	0.000	0.000	0.000	0.00
		C		7.823	13.038	0.000	0.000	0.47
T2	39.50-19.50	A	0.500	5.417	16.250	0.000	0.000	0.51
		B		0.000	0.000	0.000	0.000	0.00
		C		14.900	24.833	0.000	0.000	0.90
T3	19.50-13.10	A	0.500	1.733	5.200	0.000	0.000	0.16
		B		0.000	0.000	0.000	0.000	0.00
		C		4.768	7.947	0.000	0.000	0.29
T4	13.10-6.30	A	0.500	1.842	5.525	0.000	0.000	0.17
		B		0.000	0.000	0.000	0.000	0.00
		C		5.066	8.443	0.000	0.000	0.31
T5	6.30-0.00	A	0.500	1.706	5.119	0.000	0.000	0.16
		B		0.000	0.000	0.000	0.000	0.00
		C		4.694	7.822	0.000	0.000	0.28

Feed Line Shielding

Section	Elevation	Face	A_R	A_R Ice	A_F	A_F Ice
	ft		ft^2	ft^2	ft^2	ft^2
T1	59.50-39.50	A	0.861	2.037	0.656	0.948
		B	0.000	0.000	0.000	0.000
		C	0.795	1.961	0.606	0.913
T2	39.50-19.50	A	0.861	2.037	0.625	0.903
		B	0.000	0.000	0.000	0.000
		C	1.515	3.736	1.100	1.656
T3	19.50-13.10	A	0.191	0.482	0.188	0.271
		B	0.000	0.000	0.000	0.000
		C	0.336	0.883	0.330	0.497
T4	13.10-6.30	A	0.189	0.478	0.188	0.271
		B	0.000	0.000	0.000	0.000
		C	0.333	0.877	0.330	0.497
T5	6.30-0.00	A	0.000	0.493	0.785	1.134
		B	0.000	0.000	0.000	0.000
		C	0.000	0.905	1.382	2.080

Feed Line Center of Pressure

Section	Elevation	CP_X	CP_Z	CP_X Ice	CP_Z Ice
	ft	in	in	in	in
T1	59.50-39.50	-1.6403	5.6422	-0.5981	4.7918
T2	39.50-19.50	1.4458	7.9453	2.1127	6.8961
T3	19.50-13.10	1.6465	8.9878	2.4001	7.8864
T4	13.10-6.30	1.7939	9.6797	2.6078	8.5148
T5	6.30-0.00	1.4117	7.5402	1.9858	6.0130

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
18-ft Doppler	C	None			0.0000	68.50	No Ice	180.00	180.00	2.00
							1/2" Ice	185.00	185.00	4.40
Doppler Platform	C	None			0.0000	60.00	No Ice	0.00	0.00	1.00
							1/2" Ice	0.00	0.00	1.30
Doppler Platform Support	A	None			0.0000	57.00	No Ice	3.17	3.17	0.10
							1/2" Ice	3.87	3.87	0.14
Doppler Platform Support	B	None			0.0000	57.00	No Ice	3.17	3.17	0.10
							1/2" Ice	3.87	3.87	0.14
Doppler Platform Support	C	None			0.0000	57.00	No Ice	3.17	3.17	0.10
							1/2" Ice	3.87	3.87	0.14
13-ft Face Mount Frame (Verizon - Existing)	B	From Face	0.50	0.00	0.0000	55.00	No Ice	6.50	6.50	0.30
				0.00			1/2" Ice	7.80	7.80	0.35
13-ft Face Mount Frame (Verizon - Existing)	A	From Face	0.50	0.00	0.0000	55.00	No Ice	6.50	6.50	0.30
				0.00			1/2" Ice	7.80	7.80	0.35

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
LPA-80063-6CF	B	From Face	0.50	0.0000	55.00	No Ice	10.31	9.01	0.03
(Verizon - Existing)			6.00			1/2" Ice	10.87	9.55	0.10
			0.00						
SBNHH-1D65B	B	From Face	0.50	0.0000	55.00	No Ice	8.33	5.34	0.04
(Verizon - Proposed)			4.00			1/2" Ice	8.88	5.79	0.09
			0.00						
APX75-866514-CT8	B	From Face	0.50	0.0000	55.00	No Ice	9.77	4.71	0.03
(Verizon - Existing)			0.00			1/2" Ice	10.38	5.21	0.08
			0.00						
SBNHH-1D65B	B	From Face	0.50	0.0000	55.00	No Ice	8.33	5.34	0.04
(Verizon - Proposed)			-4.00			1/2" Ice	8.88	5.79	0.09
			0.00						
LPA-80063-6CF	B	From Face	0.50	0.0000	55.00	No Ice	10.31	9.01	0.03
(Verizon - Existing)			-6.00			1/2" Ice	10.87	9.55	0.10
			0.00						
LPA-80080-6CF	A	From Face	0.50	0.0000	55.00	No Ice	4.33	9.09	0.02
(Verizon - Existing)			-8.75			1/2" Ice	4.76	9.64	0.07
			0.00						
SBNHH-1D65B	A	From Face	0.50	0.0000	55.00	No Ice	8.33	5.34	0.04
(Verizon - Proposed)			-6.75			1/2" Ice	8.88	5.79	0.09
			0.00						
BXA-70080-6CF	A	From Face	0.50	0.0000	55.00	No Ice	5.77	4.56	0.02
(Verizon - Existing)			-2.75			1/2" Ice	6.22	5.00	0.05
			0.00						
SBNHH-1D65B	A	From Face	0.50	0.0000	55.00	No Ice	8.33	5.34	0.04
(Verizon - Proposed)			1.25			1/2" Ice	8.88	5.79	0.09
			0.00						
LPA-80080-6CF	A	From Face	0.50	0.0000	55.00	No Ice	4.33	9.09	0.02
(Verizon - Existing)			3.25			1/2" Ice	4.76	9.64	0.07
			0.00						
(4) HPA-65R-BUU-H8	A	From Face	4.00	0.0000	67.00	No Ice	0.00	0.00	0.07
(AT&T - Proposed)			0.00			1/2" Ice	0.00	0.00	0.14
			0.00						
(4) HPA-65R-BUU-H8	B	From Face	4.00	0.0000	67.00	No Ice	0.00	0.00	0.07
(AT&T - Proposed)			0.00			1/2" Ice	0.00	0.00	0.14
			0.00						
(4) HPA-65R-BUU-H8	C	From Face	4.00	0.0000	67.00	No Ice	0.00	0.00	0.07
(AT&T - Proposed)			0.00			1/2" Ice	0.00	0.00	0.14
			0.00						
(7) RRUS-11	A	From Face	4.00	0.0000	67.00	No Ice	0.00	0.00	0.05
(AT&T - Proposed)			0.00			1/2" Ice	0.00	0.00	0.07
			0.00						
(7) RRUS-11	B	From Face	4.00	0.0000	67.00	No Ice	0.00	0.00	0.05
(AT&T - Proposed)			0.00			1/2" Ice	0.00	0.00	0.07
			0.00						
(7) RRUS-11	C	From Face	4.00	0.0000	67.00	No Ice	0.00	0.00	0.05
(AT&T - Proposed)			0.00			1/2" Ice	0.00	0.00	0.07
			0.00						
(2) A2	A	From Face	4.00	0.0000	67.00	No Ice	0.00	0.00	0.02
(AT&T - Proposed)			0.00			1/2" Ice	0.00	0.00	0.03
			0.00						
(2) A2	B	From Face	4.00	0.0000	67.00	No Ice	0.00	0.00	0.02
(AT&T - Proposed)			0.00			1/2" Ice	0.00	0.00	0.03
			0.00						
(2) A2	C	From Face	4.00	0.0000	67.00	No Ice	0.00	0.00	0.02
(AT&T - Proposed)			0.00			1/2" Ice	0.00	0.00	0.03
			0.00						

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(4) DC6-48-60-18-8F Surge Arrestor	A	From Face	4.00 0.00	0.0000	67.00	No Ice 1/2" Ice	0.00 0.00	0.00 0.00	0.02 0.04
(AT&T - Proposed)			0.00						
RRH2x60-AWS	A	From Leg	1.00	0.0000	55.00	No Ice	3.78	2.07	0.06
(Verizon - Proposed)			-4.00 0.00			1/2" Ice	4.09	2.35	0.08
RRH2x60-AWS	C	From Leg	1.00	0.0000	55.00	No Ice	3.78	2.07	0.06
(Verizon - Proposed)			-4.00 0.00			1/2" Ice	4.09	2.35	0.08
RRH2x60-07-U	A	From Leg	1.00	0.0000	55.00	No Ice	0.00	1.63	0.05
(Verizon - Proposed)			0.00 0.00			1/2" Ice	0.00	1.83	0.07
RRH2x60-07-U	C	From Leg	1.00	0.0000	55.00	No Ice	0.00	1.63	0.05
(Verizon - Proposed)			0.00 0.00			1/2" Ice	0.00	1.83	0.07
RRH2x60-PCS	A	From Leg	1.00	0.0000	55.00	No Ice	2.51	1.55	0.06
(Verizon - Proposed)			4.00 0.00			1/2" Ice	2.73	1.74	0.07
RRH2x60-PCS	C	From Leg	1.00	0.0000	55.00	No Ice	2.51	1.55	0.06
(Verizon - Proposed)			4.00 0.00			1/2" Ice	2.73	1.74	0.07
RC2DC-3315-PF-48	A	From Leg	0.00	0.0000	51.00	No Ice	3.52	2.29	0.03
(Verizon - Existing)			0.00 0.00			1/2" Ice	3.77	2.51	0.05
RC2DC-3315-PF-48	C	From Leg	0.00	0.0000	51.00	No Ice	3.52	2.29	0.03
(Verizon - Proposed)			0.00 0.00			1/2" Ice	3.77	2.51	0.05

Tower Pressures - No Ice

$G_H = 1.202$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
T1 59.50-39.50	49.50	1.123	18	158.333	A	5.687	35.781	13.333	32.15	0.000	0.000
					B	6.344	21.642		47.64	0.000	0.000
					C	5.737	34.707		32.97	0.000	0.000
T2 39.50-19.50	29.50	1	16	158.333	A	5.417	35.781	13.333	32.36	0.000	0.000
					B	6.042	21.642		48.16	0.000	0.000
					C	4.942	46.527		25.91	0.000	0.000
T3 19.50-13.10	16.30	1	16	52.903	A	1.625	10.826	4.275	34.34	0.000	0.000
					B	1.812	6.217		53.24	0.000	0.000
					C	1.482	14.329		27.04	0.000	0.000
T4 13.10-6.30	9.70	1	16	60.920	A	1.799	11.549	4.541	34.02	0.000	0.000
					B	1.987	6.638		52.65	0.000	0.000
					C	1.657	15.282		26.81	0.000	0.000
T5 6.30-0.00	3.15	1	16	60.936	A	6.340	8.935	4.210	27.56	0.000	0.000
					B	7.126	4.210		37.14	0.000	0.000

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
					C	5.743	12.526		23.04	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.202$

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
T1 59.50-39.50	49.50	1.123	14	0.5000	160.000	A	21.646	33.662	16.667	30.13	0.000	0.000
						B	6.344	30.282		45.50	0.000	0.000
						C	18.469	36.144		30.52	0.000	0.000
T2 39.50-19.50	29.50	1	12	0.5000	160.000	A	21.389	33.662	16.667	30.28	0.000	0.000
						B	6.042	30.282		45.88	0.000	0.000
						C	29.219	41.447		23.59	0.000	0.000
T3 19.50-13.10	16.30	1	12	0.5000	53.437	A	6.742	9.959	5.344	32.00	0.000	0.000
						B	1.812	8.707		50.80	0.000	0.000
						C	9.262	12.592		24.45	0.000	0.000
T4 13.10-6.30	9.70	1	12	0.5000	61.487	A	7.241	10.682	5.676	31.67	0.000	0.000
						B	1.987	9.319		50.21	0.000	0.000
						C	9.934	13.508		24.21	0.000	0.000
T5 6.30-0.00	3.15	1	12	0.5000	61.462	A	11.110	9.398	5.262	25.66	0.000	0.000
						B	7.126	8.185		34.37	0.000	0.000
						C	12.868	11.973		21.18	0.000	0.000

Tower Pressure - Service

$G_H = 1.202$

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
T1 59.50-39.50	49.50	1.123	7	158.333	A	5.687	35.781	13.333	32.15	0.000	0.000
					B	6.344	21.642		47.64	0.000	0.000
					C	5.737	34.707		32.97	0.000	0.000
T2 39.50-19.50	29.50	1	6	158.333	A	5.417	35.781	13.333	32.36	0.000	0.000
					B	6.042	21.642		48.16	0.000	0.000
					C	4.942	46.527		25.91	0.000	0.000
T3 19.50-13.10	16.30	1	6	52.903	A	1.625	10.826	4.275	34.34	0.000	0.000
					B	1.812	6.217		53.24	0.000	0.000
					C	1.482	14.329		27.04	0.000	0.000
T4 13.10-6.30	9.70	1	6	60.920	A	1.799	11.549	4.541	34.02	0.000	0.000
					B	1.987	6.638		52.65	0.000	0.000
					C	1.657	15.282		26.81	0.000	0.000
T5 6.30-0.00	3.15	1	6	60.936	A	6.340	8.935	4.210	27.56	0.000	0.000
					B	7.126	4.210		37.14	0.000	0.000
					C	5.743	12.526		23.04	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
T1	0.49	1.58	A	0.262	2.402	0.605	1	1	27.335	1.45	72.57	A
59.50-39.50			B	0.177	2.675	0.586	1	1	19.025			
			C	0.255	2.421	0.603	1	1	26.675			
T2	0.65	1.52	A	0.26	2.407	0.605	1	1	27.048	1.49	74.61	C
39.50-19.50			B	0.175	2.682	0.586	1	1	18.715			
			C	0.325	2.231	0.624	1	1	33.970			
T3	0.21	0.39	A	0.235	2.482	0.598	1	1	8.102	0.47	72.86	C
19.50-13.10			B	0.152	2.765	0.582	1	1	5.429			
			C	0.299	2.299	0.616	1	1	10.303			
T4 13.10-6.30	0.22	0.42	A	0.219	2.533	0.594	1	1	8.665	0.51	74.82	C
			B	0.142	2.803	0.58	1	1	5.839			
			C	0.278	2.356	0.609	1	1	10.970			
T5 6.30-0.00	0.20	0.57	A	0.251	2.435	0.602	1	1	11.719	0.61	96.57	C
			B	0.186	2.643	0.588	1	1	9.600			
			C	0.3	2.297	0.616	1	1	13.457			
Sum Weight:	1.77	4.48						OTM	130.32 kip-ft	4.53		

Tower Forces - No Ice - Wind 45 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
T1	0.49	1.58	A	0.262	2.402	0.605	0.825	1	26.339	1.40	69.93	A
59.50-39.50			B	0.177	2.675	0.586	0.825	1	17.915			
			C	0.255	2.421	0.603	0.825	1	25.671			
T2	0.65	1.52	A	0.26	2.407	0.605	0.825	1	26.100	1.45	72.71	C
39.50-19.50			B	0.175	2.682	0.586	0.825	1	17.658			
			C	0.325	2.231	0.624	0.825	1	33.105			
T3	0.21	0.39	A	0.235	2.482	0.598	0.825	1	7.817	0.45	71.02	C
19.50-13.10			B	0.152	2.765	0.582	0.825	1	5.112			
			C	0.299	2.299	0.616	0.825	1	10.043			
T4 13.10-6.30	0.22	0.42	A	0.219	2.533	0.594	0.825	1	8.351	0.50	72.85	C
			B	0.142	2.803	0.58	0.825	1	5.491			
			C	0.278	2.356	0.609	0.825	1	10.680			
T5 6.30-0.00	0.20	0.57	A	0.251	2.435	0.602	0.825	1	10.610	0.56	89.36	C
			B	0.186	2.643	0.588	0.825	1	8.353			
			C	0.3	2.297	0.616	0.825	1	12.452			
Sum Weight:	1.77	4.48						OTM	126.12 kip-ft	4.37		

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 ft²	F K	w plf	Ctrl. 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
T1	0.49	1.58	A	0.262	2.402	0.605	0.8	1	26.197	1.39	69.55	A
59.50-39.50			B	0.177	2.675	0.586	0.8	1	17.756			
			C	0.255	2.421	0.603	0.8	1	25.528			
T2	0.65	1.52	A	0.26	2.407	0.605	0.8	1	25.964	1.45	72.44	C
39.50-19.50			B	0.175	2.682	0.586	0.8	1	17.507			
			C	0.325	2.231	0.624	0.8	1	32.981			
T3	0.21	0.39	A	0.235	2.482	0.598	0.8	1	7.777	0.45	70.76	C
19.50-13.10			B	0.152	2.765	0.582	0.8	1	5.067			
			C	0.299	2.299	0.616	0.8	1	10.006			
T4 13.10-6.30	0.22	0.42	A	0.219	2.533	0.594	0.8	1	8.306	0.49	72.56	C
			B	0.142	2.803	0.58	0.8	1	5.441			
			C	0.278	2.356	0.609	0.8	1	10.639			
T5 6.30-0.00	0.20	0.57	A	0.251	2.435	0.602	0.8	1	10.451	0.56	88.33	C
			B	0.186	2.643	0.588	0.8	1	8.174			
			C	0.3	2.297	0.616	0.8	1	12.309			
Sum Weight:	1.77	4.48						OTM	125.52 kip-ft	4.34		

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 ft²	F K	w plf	Ctrl. Face
T1	0.49	1.58	A	0.262	2.402	0.605	0.85	1	26.482	1.41	70.31	A
59.50-39.50			B	0.177	2.675	0.586	0.85	1	18.073			
			C	0.255	2.421	0.603	0.85	1	25.815			
T2	0.65	1.52	A	0.26	2.407	0.605	0.85	1	26.235	1.46	72.98	C
39.50-19.50			B	0.175	2.682	0.586	0.85	1	17.809			
			C	0.325	2.231	0.624	0.85	1	33.228			
T3	0.21	0.39	A	0.235	2.482	0.598	0.85	1	7.858	0.46	71.28	C
19.50-13.10			B	0.152	2.765	0.582	0.85	1	5.157			
			C	0.299	2.299	0.616	0.85	1	10.080			
T4 13.10-6.30	0.22	0.42	A	0.219	2.533	0.594	0.85	1	8.396	0.50	73.13	C
			B	0.142	2.803	0.58	0.85	1	5.541			
			C	0.278	2.356	0.609	0.85	1	10.722			
T5 6.30-0.00	0.20	0.57	A	0.251	2.435	0.602	0.85	1	10.768	0.57	90.39	C
			B	0.186	2.643	0.588	0.85	1	8.531			
			C	0.3	2.297	0.616	0.85	1	12.596			
Sum Weight:	1.77	4.48						OTM	126.72 kip-ft	4.39		

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 ft²	F K	w plf	Ctrl. Face
T1	0.98	2.19	A	0.346	2.182	0.631	1	1	42.884	1.55	77.55	A
59.50-39.50			B	0.229	2.502	0.597	1	1	24.414			
			C	0.341	2.192	0.629	1	1	41.218			

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
T2	1.41	2.11	A	0.344	2.185	0.63	1	1	42.609	1.67	83.58	C
39.50-19.50			B	0.227	2.508	0.596	1	1	24.099			
			C	0.442	1.987	0.669	1	1	56.967			
T3	0.45	0.56	A	0.313	2.263	0.62	1	1	12.914	0.53	82.69	C
19.50-13.10			B	0.197	2.607	0.59	1	1	6.948			
			C	0.409	2.047	0.655	1	1	17.514			
T4 13.10-6.30	0.48	0.60	A	0.292	2.319	0.613	1	1	13.793	0.58	85.06	C
			B	0.184	2.651	0.587	1	1	7.460			
			C	0.381	2.102	0.644	1	1	18.635			
T5 6.30-0.00	0.44	0.89	A	0.334	2.21	0.627	1	1	17.000	0.63	99.68	C
			B	0.249	2.44	0.602	1	1	12.050			
			C	0.404	2.056	0.653	1	1	20.690			
Sum Weight:	3.75	6.36						OTM	142.30 kip-ft	4.96		

Tower Forces - With Ice - Wind 45 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
T1	0.98	2.19	A	0.346	2.182	0.631	0.825	1	39.096	1.41	70.70	A
59.50-39.50			B	0.229	2.502	0.597	0.825	1	23.304			
			C	0.341	2.192	0.629	0.825	1	37.986			
T2	1.41	2.11	A	0.344	2.185	0.63	0.825	1	38.865	1.52	76.08	C
39.50-19.50			B	0.227	2.508	0.596	0.825	1	23.041			
			C	0.442	1.987	0.669	0.825	1	51.854			
T3	0.45	0.56	A	0.313	2.263	0.62	0.825	1	11.734	0.48	75.03	C
19.50-13.10			B	0.197	2.607	0.59	0.825	1	6.630			
			C	0.409	2.047	0.655	0.825	1	15.893			
T4 13.10-6.30	0.48	0.60	A	0.292	2.319	0.613	0.825	1	12.526	0.52	77.13	C
			B	0.184	2.651	0.587	0.825	1	7.112			
			C	0.381	2.102	0.644	0.825	1	16.896			
T5 6.30-0.00	0.44	0.89	A	0.334	2.21	0.627	0.825	1	15.056	0.56	88.83	C
			B	0.249	2.44	0.602	0.825	1	10.803			
			C	0.404	2.056	0.653	0.825	1	18.438			
Sum Weight:	3.75	6.36						OTM	129.56 kip-ft	4.50		

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 ft²	F K	w plf	Ctrl. Face
T1	0.98	2.19	A	0.346	2.182	0.631	0.8	1	38.555	1.39	69.72	A
59.50-39.50			B	0.229	2.502	0.597	0.8	1	23.145			
			C	0.341	2.192	0.629	0.8	1	37.524			
T2	1.41	2.11	A	0.344	2.185	0.63	0.8	1	38.331	1.50	75.01	C
39.50-19.50			B	0.227	2.508	0.596	0.8	1	22.890			
			C	0.442	1.987	0.669	0.8	1	51.123			

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
T3	0.45	0.56	A	0.313	2.263	0.62	0.8	1	11.566	0.47	73.94	C
19.50-13.10			B	0.197	2.607	0.59	0.8	1	6.585			
			C	0.409	2.047	0.655	0.8	1	15.661			
T4 13.10-6.30	0.48	0.60	A	0.292	2.319	0.613	0.8	1	12.345	0.52	75.99	C
			B	0.184	2.651	0.587	0.8	1	7.062			
			C	0.381	2.102	0.644	0.8	1	16.648			
T5 6.30-0.00	0.44	0.89	A	0.334	2.21	0.627	0.8	1	14.778	0.55	87.28	C
			B	0.249	2.44	0.602	0.8	1	10.625			
			C	0.404	2.056	0.653	0.8	1	18.117			
Sum Weight:	3.75	6.36						OTM	127.74 kip-ft	4.43		

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 ft²	F K	w plf	Ctrl. Face
T1	0.98	2.19	A	0.346	2.182	0.631	0.85	1	39.638	1.43	71.68	A
59.50-39.50			B	0.229	2.502	0.597	0.85	1	23.462			
			C	0.341	2.192	0.629	0.85	1	38.448			
T2	1.41	2.11	A	0.344	2.185	0.63	0.85	1	39.400	1.54	77.15	C
39.50-19.50			B	0.227	2.508	0.596	0.85	1	23.192			
			C	0.442	1.987	0.669	0.85	1	52.584			
T3	0.45	0.56	A	0.313	2.263	0.62	0.85	1	11.903	0.49	76.13	C
19.50-13.10			B	0.197	2.607	0.59	0.85	1	6.676			
			C	0.409	2.047	0.655	0.85	1	16.125			
T4 13.10-6.30	0.48	0.60	A	0.292	2.319	0.613	0.85	1	12.707	0.53	78.26	C
			B	0.184	2.651	0.587	0.85	1	7.161			
			C	0.381	2.102	0.644	0.85	1	17.144			
T5 6.30-0.00	0.44	0.89	A	0.334	2.21	0.627	0.85	1	15.334	0.57	90.38	C
			B	0.249	2.44	0.602	0.85	1	10.981			
			C	0.404	2.056	0.653	0.85	1	18.760			
Sum Weight:	3.75	6.36						OTM	131.38 kip-ft	4.57		

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 ft²	F K	w plf	Ctrl. Face
T1	0.49	1.58	A	0.262	2.402	0.605	1	1	27.335	0.57	28.35	A
59.50-39.50			B	0.177	2.675	0.586	1	1	19.025			
			C	0.255	2.421	0.603	1	1	26.675			
T2	0.65	1.52	A	0.26	2.407	0.605	1	1	27.048	0.58	29.15	C
39.50-19.50			B	0.175	2.682	0.586	1	1	18.715			
			C	0.325	2.231	0.624	1	1	33.970			
T3	0.21	0.39	A	0.235	2.482	0.598	1	1	8.102	0.18	28.46	C
19.50-13.10			B	0.152	2.765	0.582	1	1	5.429			
			C	0.299	2.299	0.616	1	1	10.303			

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
T4 13.10-6.30	0.22	0.42	A	0.219	2.533	0.594	1	1	8.665	0.20	29.23	C
			B	0.142	2.803	0.58	1	1	5.839			
			C	0.278	2.356	0.609	1	1	10.970			
T5 6.30-0.00	0.20	0.57	A	0.251	2.435	0.602	1	1	11.719	0.24	37.72	C
			B	0.186	2.643	0.588	1	1	9.600			
			C	0.3	2.297	0.616	1	1	13.457			
Sum Weight:	1.77	4.48						OTM	50.91 kip-ft	1.77		

Tower Forces - Service - Wind 45 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
T1	0.49	1.58	A	0.262	2.402	0.605	0.825	1	26.339	0.55	27.32	A
59.50-39.50			B	0.177	2.675	0.586	0.825	1	17.915			
			C	0.255	2.421	0.603	0.825	1	25.671			
T2	0.65	1.52	A	0.26	2.407	0.605	0.825	1	26.100	0.57	28.40	C
39.50-19.50			B	0.175	2.682	0.586	0.825	1	17.658			
			C	0.325	2.231	0.624	0.825	1	33.105			
T3	0.21	0.39	A	0.235	2.482	0.598	0.825	1	7.817	0.18	27.74	C
19.50-13.10			B	0.152	2.765	0.582	0.825	1	5.112			
			C	0.299	2.299	0.616	0.825	1	10.043			
T4 13.10-6.30	0.22	0.42	A	0.219	2.533	0.594	0.825	1	8.351	0.19	28.46	C
			B	0.142	2.803	0.58	0.825	1	5.491			
			C	0.278	2.356	0.609	0.825	1	10.680			
T5 6.30-0.00	0.20	0.57	A	0.251	2.435	0.602	0.825	1	10.610	0.22	34.91	C
			B	0.186	2.643	0.588	0.825	1	8.353			
			C	0.3	2.297	0.616	0.825	1	12.452			
Sum Weight:	1.77	4.48						OTM	49.27 kip-ft	1.71		

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
T1	0.49	1.58	A	0.262	2.402	0.605	0.8	1	26.197	0.54	27.17	A
59.50-39.50			B	0.177	2.675	0.586	0.8	1	17.756			
			C	0.255	2.421	0.603	0.8	1	25.528			
T2	0.65	1.52	A	0.26	2.407	0.605	0.8	1	25.964	0.57	28.30	C
39.50-19.50			B	0.175	2.682	0.586	0.8	1	17.507			
			C	0.325	2.231	0.624	0.8	1	32.981			
T3	0.21	0.39	A	0.235	2.482	0.598	0.8	1	7.777	0.18	27.64	C
19.50-13.10			B	0.152	2.765	0.582	0.8	1	5.067			
			C	0.299	2.299	0.616	0.8	1	10.006			
T4 13.10-6.30	0.22	0.42	A	0.219	2.533	0.594	0.8	1	8.306	0.19	28.35	C
			B	0.142	2.803	0.58	0.8	1	5.441			
			C	0.278	2.356	0.609	0.8	1	10.639			

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
T5 6.30-0.00	0.20	0.57	A	0.251	2.435	0.602	0.8	1	10.451	0.22	34.50	C
			B	0.186	2.643	0.588	0.8	1	8.174			
			C	0.3	2.297	0.616	0.8	1	12.309			
Sum Weight:	1.77	4.48						OTM	49.03 kip-ft	1.70		

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
T1	0.49	1.58	A	0.262	2.402	0.605	0.85	1	26.482	0.55	27.46	A
59.50-39.50			B	0.177	2.675	0.586	0.85	1	18.073			
			C	0.255	2.421	0.603	0.85	1	25.815			
T2	0.65	1.52	A	0.26	2.407	0.605	0.85	1	26.235	0.57	28.51	C
39.50-19.50			B	0.175	2.682	0.586	0.85	1	17.809			
			C	0.325	2.231	0.624	0.85	1	33.228			
T3	0.21	0.39	A	0.235	2.482	0.598	0.85	1	7.858	0.18	27.85	C
19.50-13.10			B	0.152	2.765	0.582	0.85	1	5.157			
			C	0.299	2.299	0.616	0.85	1	10.080			
T4 13.10-6.30	0.22	0.42	A	0.219	2.533	0.594	0.85	1	8.396	0.19	28.57	C
			B	0.142	2.803	0.58	0.85	1	5.541			
			C	0.278	2.356	0.609	0.85	1	10.722			
T5 6.30-0.00	0.20	0.57	A	0.251	2.435	0.602	0.85	1	10.768	0.22	35.31	C
			B	0.186	2.643	0.588	0.85	1	8.531			
			C	0.3	2.297	0.616	0.85	1	12.596			
Sum Weight:	1.77	4.48						OTM	49.50 kip-ft	1.71		

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	1.63					
Bracing Weight	2.85					
Total Member Self-Weight	4.48			1.99	2.71	
Total Weight	12.95			1.99	2.71	
Wind 0 deg - No Ice		0.18	-11.40	-565.14	-7.13	-1.59
Wind 30 deg - No Ice		5.84	-9.84	-490.96	-290.44	-0.56
Wind 45 deg - No Ice		8.15	-8.07	-403.02	-406.35	0.02
Wind 60 deg - No Ice		9.89	-5.76	-287.69	-494.16	0.59
Wind 90 deg - No Ice		11.36	-0.18	-7.84	-566.55	1.64
Wind 120 deg - No Ice		9.87	5.54	277.04	-488.49	2.29
Wind 135 deg - No Ice		7.89	7.82	393.09	-392.44	2.28
Wind 150 deg - No Ice		5.53	9.66	485.11	-273.41	2.20
Wind 180 deg - No Ice		-0.18	11.22	564.32	12.54	1.60
Wind 210 deg - No Ice		-5.84	9.84	494.94	295.85	0.56
Wind 225 deg - No Ice		-8.15	8.07	407.00	411.77	-0.02

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 240 deg - No Ice		-10.05	5.86	294.07	503.74	-0.70
Wind 270 deg - No Ice		-11.36	0.18	11.82	571.97	-1.64
Wind 300 deg - No Ice		-9.71	-5.45	-270.66	489.75	-2.19
Wind 315 deg - No Ice		-7.89	-7.82	-389.11	397.86	-2.28
Wind 330 deg - No Ice		-5.53	-9.66	-481.13	278.82	-2.20
Member Ice	1.88					
Total Weight Ice	21.85			5.92	1.51	
Wind 0 deg - Ice		0.14	-10.40	-480.96	-5.97	-0.91
Wind 30 deg - Ice		5.16	-8.73	-410.01	-245.19	-0.07
Wind 45 deg - Ice		7.18	-7.12	-334.63	-342.22	0.37
Wind 60 deg - Ice		8.69	-5.06	-236.71	-415.15	0.77
Wind 90 deg - Ice		10.09	-0.14	-1.56	-478.93	1.52
Wind 120 deg - Ice		9.01	5.08	242.88	-420.29	1.95
Wind 135 deg - Ice		6.99	6.93	335.89	-331.64	1.73
Wind 150 deg - Ice		4.92	8.60	414.37	-232.24	1.58
Wind 180 deg - Ice		-0.14	9.87	478.23	8.99	0.97
Wind 210 deg - Ice		-5.16	8.73	421.84	248.20	0.07
Wind 225 deg - Ice		-7.18	7.12	346.47	345.23	-0.37
Wind 240 deg - Ice		-9.14	5.32	255.83	430.78	-1.04
Wind 270 deg - Ice		-10.09	0.14	13.40	481.95	-1.52
Wind 300 deg - Ice		-8.55	-4.82	-223.76	410.69	-1.74
Wind 315 deg - Ice		-6.99	-6.93	-324.06	334.65	-1.73
Wind 330 deg - Ice		-4.92	-8.60	-402.53	235.25	-1.58
Total Weight	12.95			1.99	2.71	
Wind 0 deg - Service		0.07	-4.45	-223.20	-2.38	-0.62
Wind 30 deg - Service		2.28	-3.84	-194.22	-113.05	-0.22
Wind 45 deg - Service		3.18	-3.15	-159.87	-158.33	0.01
Wind 60 deg - Service		3.86	-2.25	-114.82	-192.63	0.23
Wind 90 deg - Service		4.44	-0.07	-5.50	-220.91	0.64
Wind 120 deg - Service		3.86	2.17	105.78	-190.42	0.89
Wind 135 deg - Service		3.08	3.05	151.11	-152.90	0.89
Wind 150 deg - Service		2.16	3.77	187.06	-106.40	0.86
Wind 180 deg - Service		-0.07	4.38	218.00	5.30	0.62
Wind 210 deg - Service		-2.28	3.84	190.90	115.97	0.22
Wind 225 deg - Service		-3.18	3.15	156.55	161.24	-0.01
Wind 240 deg - Service		-3.93	2.29	112.43	197.17	-0.27
Wind 270 deg - Service		-4.44	0.07	2.18	223.82	-0.64
Wind 300 deg - Service		-3.79	-2.13	-108.16	191.71	-0.86
Wind 315 deg - Service		-3.08	-3.05	-154.43	155.81	-0.89
Wind 330 deg - Service		-2.16	-3.77	-190.38	109.31	-0.86

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 45 deg - No Ice
5	Dead+Wind 60 deg - No Ice
6	Dead+Wind 90 deg - No Ice
7	Dead+Wind 120 deg - No Ice
8	Dead+Wind 135 deg - No Ice
9	Dead+Wind 150 deg - No Ice
10	Dead+Wind 180 deg - No Ice
11	Dead+Wind 210 deg - No Ice

Comb. No.	Description
12	Dead+Wind 225 deg - No Ice
13	Dead+Wind 240 deg - No Ice
14	Dead+Wind 270 deg - No Ice
15	Dead+Wind 300 deg - No Ice
16	Dead+Wind 315 deg - No Ice
17	Dead+Wind 330 deg - No Ice
18	Dead+Ice+Temp
19	Dead+Wind 0 deg+Ice+Temp
20	Dead+Wind 30 deg+Ice+Temp
21	Dead+Wind 45 deg+Ice+Temp
22	Dead+Wind 60 deg+Ice+Temp
23	Dead+Wind 90 deg+Ice+Temp
24	Dead+Wind 120 deg+Ice+Temp
25	Dead+Wind 135 deg+Ice+Temp
26	Dead+Wind 150 deg+Ice+Temp
27	Dead+Wind 180 deg+Ice+Temp
28	Dead+Wind 210 deg+Ice+Temp
29	Dead+Wind 225 deg+Ice+Temp
30	Dead+Wind 240 deg+Ice+Temp
31	Dead+Wind 270 deg+Ice+Temp
32	Dead+Wind 300 deg+Ice+Temp
33	Dead+Wind 315 deg+Ice+Temp
34	Dead+Wind 330 deg+Ice+Temp
35	Dead+Wind 0 deg - Service
36	Dead+Wind 30 deg - Service
37	Dead+Wind 45 deg - Service
38	Dead+Wind 60 deg - Service
39	Dead+Wind 90 deg - Service
40	Dead+Wind 120 deg - Service
41	Dead+Wind 135 deg - Service
42	Dead+Wind 150 deg - Service
43	Dead+Wind 180 deg - Service
44	Dead+Wind 210 deg - Service
45	Dead+Wind 225 deg - Service
46	Dead+Wind 240 deg - Service
47	Dead+Wind 270 deg - Service
48	Dead+Wind 300 deg - Service
49	Dead+Wind 315 deg - Service
50	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
T1	59.5 - 39.5	Leg	Max Tension	5	21.91	0.32	-0.69
			Max. Compression	13	-28.02	0.79	-0.18
			Max. Mx	6	17.51	-1.05	0.07
			Max. My	3	-23.01	-0.39	1.01
			Max. Vy	14	1.50	-0.13	0.23
			Max. Vx	10	-1.49	0.23	0.39
		Diagonal	Max Tension	11	6.66	0.00	0.00
			Max. Compression	3	-6.75	0.00	0.00
			Max. Mx	31	2.83	0.06	0.00
			Max. My	27	-0.05	0.00	-0.00
			Max. Vy	31	-0.03	0.00	0.00
			Max. Vx	27	0.00	0.00	0.00
		Horizontal	Max Tension	5	1.14	0.00	0.00
			Max. Compression	13	-1.10	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Mx	32	0.27	-0.05	0.00
			Max. My	26	0.67	0.00	0.00
			Max. Vy	32	0.02	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
		Top Girt	Max Tension	10	1.74	0.00	0.00
			Max. Compression	2	-1.69	0.00	0.00
			Max. Mx	18	0.02	-0.07	0.00
			Max. My	9	-1.41	0.00	0.00
			Max. Vy	18	0.04	0.00	0.00
			Max. Vx	9	-0.00	0.00	0.00
T2	39.5 - 19.5	Leg	Max Tension	5	48.58	0.24	-0.91
			Max. Compression	13	-56.63	0.86	-0.47
			Max. Mx	14	34.04	1.22	0.19
			Max. My	3	-47.06	-0.27	1.19
			Max. Vy	7	0.37	-0.78	-0.45
			Max. Vx	2	-0.34	-0.05	1.02
		Diagonal	Max Tension	11	7.64	0.00	0.00
			Max. Compression	3	-7.74	0.00	0.00
			Max. Mx	31	5.33	0.06	0.00
			Max. My	27	-0.40	0.00	-0.00
			Max. Vy	31	-0.03	0.00	0.00
			Max. Vx	27	0.00	0.00	0.00
		Horizontal	Max Tension	13	0.98	0.00	0.00
			Max. Compression	13	-0.98	0.00	0.00
			Max. Mx	18	0.12	-0.05	0.00
			Max. My	26	0.71	0.00	0.00
			Max. Vy	18	0.02	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
T3	19.5 - 13.1	Leg	Max Tension	5	54.28	0.29	0.56
			Max. Compression	13	-62.88	0.80	0.15
			Max. Mx	11	-54.18	0.92	-0.00
			Max. My	2	-61.32	-0.36	-0.74
			Max. Vy	4	0.20	-0.87	0.06
			Max. Vx	31	-0.17	0.39	0.32
		Diagonal	Max Tension	3	4.08	0.00	0.00
			Max. Compression	11	-4.09	0.00	0.00
			Max. Mx	31	3.51	0.05	0.00
			Max. My	27	-0.44	0.00	-0.00
			Max. Vy	31	0.02	0.00	0.00
			Max. Vx	27	0.00	0.00	0.00
		Horizontal	Max Tension	5	1.49	0.00	0.00
			Max. Compression	13	-1.85	0.00	0.00
			Max. Mx	24	0.70	-0.05	0.00
			Max. My	34	0.80	0.00	0.00
			Max. Vy	24	0.03	0.00	0.00
			Max. Vx	34	-0.00	0.00	0.00
T4	13.1 - 6.3	Leg	Max Tension	5	58.65	0.22	-0.59
			Max. Compression	13	-67.78	0.20	-0.27
			Max. Mx	6	49.31	-0.31	-0.18
			Max. My	30	-60.83	-0.23	0.74
			Max. Vy	24	-0.10	0.27	-0.33
			Max. Vx	6	0.21	0.10	-0.59
		Diagonal	Max Tension	6	4.44	0.00	0.00
			Max. Compression	3	-4.47	0.00	0.00
			Max. Mx	29	3.65	0.06	0.00
			Max. My	24	0.24	0.00	-0.00
			Max. Vy	29	-0.02	0.00	0.00
			Max. Vx	24	0.00	0.00	0.00
		Horizontal	Max Tension	13	1.18	0.00	0.00
			Max. Compression	13	-1.18	0.00	0.00
			Max. Mx	32	0.56	-0.07	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. My	26	0.88	0.00	0.00
			Max. Vy	32	0.03	0.00	0.00
			Max. Vx	26	-0.00	0.00	0.00
T5	6.3 - 0	Leg	Max Tension	5	60.04	0.24	0.48
			Max. Compression	13	-69.72	0.00	0.00
			Max. Mx	13	-69.66	1.30	0.10
			Max. My	6	-58.83	-0.19	-0.75
			Max. Vy	2	-0.54	1.27	0.09
			Max. Vx	6	-0.30	-0.19	-0.75
		Diagonal	Max Tension	6	3.04	0.11	0.00
			Max. Compression	14	-3.08	0.00	0.00
			Max. Mx	13	-2.14	-0.17	-0.00
			Max. My	30	-2.16	-0.14	0.00
			Max. Vy	13	-0.05	0.00	0.00
			Max. Vx	30	0.00	0.00	0.00
		Horizontal	Max Tension	3	2.85	-0.02	-0.01
			Max. Compression	6	-3.17	-0.02	-0.01
			Max. Mx	5	0.63	-0.06	-0.00
			Max. My	23	-2.93	-0.01	-0.01
			Max. Vy	27	-0.03	-0.04	-0.01
			Max. Vx	23	0.00	0.00	0.00
		Redund Horz 1 Bracing	Max Tension	13	1.21	0.00	0.00
			Max. Compression	13	-1.21	0.00	0.00
			Max. Mx	20	0.92	-0.00	0.00
			Max. My	28	0.95	0.00	0.00
			Max. Vy	20	0.00	0.00	0.00
			Max. Vx	28	-0.00	0.00	0.00
		Redund Diag 1 Bracing	Max Tension	13	1.02	0.00	0.00
			Max. Compression	13	-1.02	0.00	0.00
			Max. Mx	30	0.92	-0.00	0.00
			Max. My	24	0.34	0.00	0.00
			Max. Vy	30	0.00	0.00	0.00
			Max. Vx	24	0.00	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg C	Max. Vert	13	73.80	6.38	-3.55
	Max. H_x	13	73.80	6.38	-3.55
	Max. H_z	4	-61.62	-5.40	3.27
	Min. Vert	5	-63.81	-5.72	3.18
	Min. H_x	5	-63.81	-5.72	3.18
	Min. H_z	12	71.05	5.97	-3.59
Leg B	Max. Vert	7	71.20	-6.18	-3.48
	Max. H_x	15	-62.33	5.54	3.12
	Max. H_z	16	-59.91	5.25	3.18
	Min. Vert	15	-62.33	5.54	3.12
	Min. H_x	7	71.20	-6.18	-3.48
	Min. H_z	8	68.22	-5.81	-3.49
Leg A	Max. Vert	2	71.63	-0.18	7.15
	Max. H_x	13	-30.71	0.67	-3.24
	Max. H_z	2	71.63	-0.18	7.15
	Min. Vert	10	-62.91	0.17	-6.42

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
	Min. H_x	6	5.25	-0.67	0.51
	Min. H_z	10	-62.91	0.17	-6.42

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	12.95	0.00	-0.00	2.00	2.72	0.00
Dead+Wind 0 deg - No Ice	12.95	0.18	-11.40	-565.96	-7.16	-1.61
Dead+Wind 30 deg - No Ice	12.95	5.84	-9.84	-491.75	-290.92	-0.58
Dead+Wind 45 deg - No Ice	12.95	8.15	-8.07	-403.68	-407.02	0.01
Dead+Wind 60 deg - No Ice	12.95	9.89	-5.76	-288.18	-494.99	0.59
Dead+Wind 90 deg - No Ice	12.95	11.36	-0.18	-7.88	-567.46	1.64
Dead+Wind 120 deg - No Ice	12.95	9.87	5.54	277.41	-489.19	2.30
Dead+Wind 135 deg - No Ice	12.95	7.89	7.82	393.70	-393.07	2.29
Dead+Wind 150 deg - No Ice	12.95	5.53	9.66	485.86	-273.83	2.21
Dead+Wind 180 deg - No Ice	12.95	-0.18	11.21	565.25	12.58	1.61
Dead+Wind 210 deg - No Ice	12.95	-5.84	9.84	495.75	296.35	0.57
Dead+Wind 225 deg - No Ice	12.95	-8.15	8.07	407.68	412.46	-0.01
Dead+Wind 240 deg - No Ice	12.95	-10.05	5.85	294.53	504.49	-0.69
Dead+Wind 270 deg - No Ice	12.95	-11.36	0.18	11.87	572.90	-1.64
Dead+Wind 300 deg - No Ice	12.95	-9.71	-5.45	-271.08	490.56	-2.20
Dead+Wind 315 deg - No Ice	12.95	-7.89	-7.82	-389.73	398.50	-2.29
Dead+Wind 330 deg - No Ice	12.95	-5.53	-9.66	-481.88	279.26	-2.21
Dead+Ice+Temp	21.85	0.00	-0.00	5.94	1.53	-0.00
Dead+Wind 0 deg+Ice+Temp	21.85	0.14	-10.40	-482.58	-6.00	-0.92
Dead+Wind 30 deg+Ice+Temp	21.85	5.16	-8.73	-411.51	-246.09	-0.07
Dead+Wind 45 deg+Ice+Temp	21.85	7.18	-7.12	-335.87	-343.48	0.37
Dead+Wind 60 deg+Ice+Temp	21.85	8.69	-5.06	-237.61	-416.71	0.77
Dead+Wind 90 deg+Ice+Temp	21.85	10.09	-0.14	-1.59	-480.67	1.53
Dead+Wind 120 deg+Ice+Temp	21.85	9.01	5.08	243.68	-421.69	1.97
Dead+Wind 135 deg+Ice+Temp	21.85	6.99	6.93	337.11	-332.85	1.74
Dead+Wind 150 deg+Ice+Temp	21.85	4.92	8.60	415.86	-233.06	1.60
Dead+Wind 180 deg+Ice+Temp	21.85	-0.14	9.87	480.01	9.05	0.98
Dead+Wind 210 deg+Ice+Temp	21.85	-5.16	8.73	423.40	249.15	0.07
Dead+Wind 225 deg+Ice+Temp	21.85	-7.18	7.12	347.77	346.54	-0.37
Dead+Wind 240 deg+Ice+Temp	21.85	-9.14	5.32	256.73	432.27	-1.04
Dead+Wind 270 deg+Ice+Temp	21.85	-10.09	0.14	13.48	483.73	-1.52
Dead+Wind 300 deg+Ice+Temp	21.85	-8.55	-4.82	-224.57	412.23	-1.75
Dead+Wind 315 deg+Ice+Temp	21.85	-6.99	-6.93	-325.23	335.89	-1.74
Dead+Wind 330 deg+Ice+Temp	21.85	-4.92	-8.60	-403.98	236.11	-1.60
Dead+Wind 0 deg - Service	12.95	0.07	-4.45	-219.86	-1.14	-0.63
Dead+Wind 30 deg - Service	12.95	2.28	-3.84	-190.88	-111.98	-0.22
Dead+Wind 45 deg - Service	12.95	3.18	-3.15	-156.48	-157.34	0.00
Dead+Wind 60 deg - Service	12.95	3.86	-2.25	-111.36	-191.70	0.23
Dead+Wind 90 deg - Service	12.95	4.44	-0.07	-1.86	-220.01	0.64
Dead+Wind 120 deg - Service	12.95	3.86	2.17	109.58	-189.43	0.90
Dead+Wind 135 deg - Service	12.95	3.08	3.05	155.01	-151.88	0.89
Dead+Wind 150 deg - Service	12.95	2.16	3.77	191.01	-105.30	0.86
Dead+Wind 180 deg - Service	12.95	-0.07	4.38	222.02	6.58	0.63
Dead+Wind 210 deg - Service	12.95	-2.28	3.84	194.87	117.43	0.22
Dead+Wind 225 deg - Service	12.95	-3.18	3.15	160.47	162.78	-0.00
Dead+Wind 240 deg - Service	12.95	-3.93	2.29	116.26	198.73	-0.27
Dead+Wind 270 deg - Service	12.95	-4.44	0.07	5.85	225.45	-0.64
Dead+Wind 300 deg - Service	12.95	-3.79	-2.13	-104.68	193.29	-0.86
Dead+Wind 315 deg - Service	12.95	-3.08	-3.05	-151.02	157.33	-0.89

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Dead+Wind 330 deg - Service	12.95	-2.16	-3.77	-187.02	110.75	-0.86

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.00	-12.95	0.00	-0.00	12.95	0.00	0.000%
2	0.18	-12.95	-11.40	-0.18	12.95	11.40	0.005%
3	5.84	-12.95	-9.84	-5.84	12.95	9.84	0.005%
4	8.15	-12.95	-8.07	-8.15	12.95	8.07	0.005%
5	9.89	-12.95	-5.76	-9.89	12.95	5.76	0.005%
6	11.36	-12.95	-0.18	-11.36	12.95	0.18	0.005%
7	9.87	-12.95	5.54	-9.87	12.95	-5.54	0.005%
8	7.89	-12.95	7.82	-7.89	12.95	-7.82	0.005%
9	5.53	-12.95	9.66	-5.53	12.95	-9.66	0.005%
10	-0.18	-12.95	11.22	0.18	12.95	-11.21	0.005%
11	-5.84	-12.95	9.84	5.84	12.95	-9.84	0.005%
12	-8.15	-12.95	8.07	8.15	12.95	-8.07	0.005%
13	-10.05	-12.95	5.86	10.05	12.95	-5.85	0.005%
14	-11.36	-12.95	0.18	11.36	12.95	-0.18	0.005%
15	-9.71	-12.95	-5.45	9.71	12.95	5.45	0.005%
16	-7.89	-12.95	-7.82	7.89	12.95	7.82	0.005%
17	-5.53	-12.95	-9.66	5.53	12.95	9.66	0.005%
18	0.00	-21.85	0.00	-0.00	21.85	0.00	0.000%
19	0.14	-21.85	-10.40	-0.14	21.85	10.40	0.000%
20	5.16	-21.85	-8.73	-5.16	21.85	8.73	0.000%
21	7.18	-21.85	-7.12	-7.18	21.85	7.12	0.000%
22	8.69	-21.85	-5.06	-8.69	21.85	5.06	0.000%
23	10.09	-21.85	-0.14	-10.09	21.85	0.14	0.000%
24	9.01	-21.85	5.08	-9.01	21.85	-5.08	0.000%
25	6.99	-21.85	6.93	-6.99	21.85	-6.93	0.000%
26	4.92	-21.85	8.60	-4.92	21.85	-8.60	0.000%
27	-0.14	-21.85	9.87	0.14	21.85	-9.87	0.000%
28	-5.16	-21.85	8.73	5.16	21.85	-8.73	0.000%
29	-7.18	-21.85	7.12	7.18	21.85	-7.12	0.000%
30	-9.14	-21.85	5.32	9.14	21.85	-5.32	0.000%
31	-10.09	-21.85	0.14	10.09	21.85	-0.14	0.000%
32	-8.55	-21.85	-4.82	8.55	21.85	4.82	0.000%
33	-6.99	-21.85	-6.93	6.99	21.85	6.93	0.000%
34	-4.92	-21.85	-8.60	4.92	21.85	8.60	0.000%
35	0.07	-12.95	-4.45	-0.07	12.95	4.45	0.002%
36	2.28	-12.95	-3.84	-2.28	12.95	3.84	0.002%
37	3.18	-12.95	-3.15	-3.18	12.95	3.15	0.002%
38	3.86	-12.95	-2.25	-3.86	12.95	2.25	0.002%
39	4.44	-12.95	-0.07	-4.44	12.95	0.07	0.002%
40	3.86	-12.95	2.17	-3.86	12.95	-2.17	0.002%
41	3.08	-12.95	3.05	-3.08	12.95	-3.05	0.002%
42	2.16	-12.95	3.77	-2.16	12.95	-3.77	0.002%
43	-0.07	-12.95	4.38	0.07	12.95	-4.38	0.002%
44	-2.28	-12.95	3.84	2.28	12.95	-3.84	0.002%
45	-3.18	-12.95	3.15	3.18	12.95	-3.15	0.002%
46	-3.93	-12.95	2.29	3.93	12.95	-2.29	0.002%
47	-4.44	-12.95	0.07	4.44	12.95	-0.07	0.002%
48	-3.79	-12.95	-2.13	3.79	12.95	2.13	0.002%
49	-3.08	-12.95	-3.05	3.08	12.95	3.05	0.002%
50	-2.16	-12.95	-3.77	2.16	12.95	3.77	0.002%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00008507
2	Yes	4	0.00000001	0.00099188
3	Yes	4	0.00000001	0.00098160
4	Yes	4	0.00000001	0.00097857
5	Yes	4	0.00000001	0.00097949
6	Yes	4	0.00000001	0.00098867
7	Yes	4	0.00000001	0.00099088
8	Yes	4	0.00000001	0.00098741
9	Yes	4	0.00000001	0.00098264
10	Yes	4	0.00000001	0.00098236
11	Yes	4	0.00000001	0.00099260
12	Yes	4	0.00000001	0.00099561
13	Yes	4	0.00000001	0.00099422
14	Yes	4	0.00000001	0.00098552
15	Yes	4	0.00000001	0.00098362
16	Yes	4	0.00000001	0.00098765
17	Yes	4	0.00000001	0.00099222
18	Yes	4	0.00000001	0.00007448
19	Yes	5	0.00000001	0.00013565
20	Yes	5	0.00000001	0.00013436
21	Yes	5	0.00000001	0.00013397
22	Yes	5	0.00000001	0.00013414
23	Yes	5	0.00000001	0.00013550
24	Yes	5	0.00000001	0.00013584
25	Yes	5	0.00000001	0.00013553
26	Yes	5	0.00000001	0.00013487
27	Yes	5	0.00000001	0.00013493
28	Yes	5	0.00000001	0.00013644
29	Yes	5	0.00000001	0.00013694
30	Yes	5	0.00000001	0.00013663
31	Yes	5	0.00000001	0.00013532
32	Yes	5	0.00000001	0.00013471
33	Yes	5	0.00000001	0.00013513
34	Yes	5	0.00000001	0.00013571
35	Yes	4	0.00000001	0.00096007
36	Yes	4	0.00000001	0.00095426
37	Yes	4	0.00000001	0.00095224
38	Yes	4	0.00000001	0.00095179
39	Yes	4	0.00000001	0.00095412
40	Yes	4	0.00000001	0.00095498
41	Yes	4	0.00000001	0.00095437
42	Yes	4	0.00000001	0.00095388
43	Yes	4	0.00000001	0.00095741
44	Yes	4	0.00000001	0.00096455
45	Yes	4	0.00000001	0.00096681
46	Yes	4	0.00000001	0.00096695
47	Yes	4	0.00000001	0.00096375
48	Yes	4	0.00000001	0.00096145
49	Yes	4	0.00000001	0.00096180
50	Yes	4	0.00000001	0.00096233

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	59.5 - 39.5	1.299	46	0.1485	0.0106
T2	39.5 - 19.5	0.647	46	0.1271	0.0076
T3	19.5 - 13.1	0.160	46	0.0710	0.0041
T4	13.1 - 6.3	0.069	46	0.0477	0.0088
T5	6.3 - 0	0.006	37	0.0229	0.0010

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
68.50	18-ft Doppler	46	1.299	0.1485	0.0106	127159
67.00	(4) HPA-65R-BUU-H8	46	1.299	0.1485	0.0106	127159
60.00	Doppler Platform	46	1.299	0.1485	0.0106	127159
57.00	Doppler Platform Support	46	1.215	0.1468	0.0106	127159
55.00	13-ft Face Mount Frame	46	1.147	0.1454	0.0106	127159
51.00	RC2DC-3315-PF-48	46	1.013	0.1421	0.0105	74799

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	59.5 - 39.5	3.295	13	0.3762	0.0251
T2	39.5 - 19.5	1.642	13	0.3221	0.0185
T3	19.5 - 13.1	0.406	13	0.1801	0.0104
T4	13.1 - 6.3	0.176	13	0.1209	0.0196
T5	6.3 - 0	0.015	4	0.0582	0.0025

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
68.50	18-ft Doppler	13	3.295	0.3762	0.0251	50620
67.00	(4) HPA-65R-BUU-H8	13	3.295	0.3762	0.0251	50620
60.00	Doppler Platform	13	3.295	0.3762	0.0251	50620
57.00	Doppler Platform Support	13	3.081	0.3718	0.0247	50620
55.00	13-ft Face Mount Frame	13	2.910	0.3682	0.0244	50620
51.00	RC2DC-3315-PF-48	13	2.571	0.3600	0.0235	29777

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load K	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	59.5	Leg	A325N	0.8750	4	5.48	26.46	0.207 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	2	3.37	4.12	0.818 ✔	1.333	Bolt Shear
		Horizontal	A325N	0.5000	1	1.14	4.12	0.276 ✔	1.333	Bolt Shear
		Top Girt	A325N	0.6250	2	0.87	6.44	0.135 ✔	1.333	Bolt Shear
T2	39.5	Leg	A325N	0.8750	4	12.14	26.46	0.459 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.5000	2	3.87	4.12	0.938 ✔	1.333	Bolt Shear
		Horizontal	A325N	0.5000	1	0.98	4.12	0.238 ✔	1.333	Bolt Shear
T3	19.5	Diagonal	A325N	0.7500	1	4.09	9.28	0.441 ✔	1.333	Bolt Shear
		Horizontal	A325N	0.7500	1	1.85	9.28	0.199 ✔	1.333	Bolt Shear
T4	13.1	Diagonal	A325N	0.7500	1	4.47	9.28	0.482 ✔	1.333	Bolt Shear
		Horizontal	A325N	0.5000	1	1.18	4.12	0.285 ✔	1.333	Bolt Shear
T5	6.3	Diagonal	A325N	0.7500	1	3.04	6.80	0.447 ✔	1.333	Member Bearing
		Horizontal	A325N	0.5000	1	3.17	8.25	0.384 ✔	1.333	Bolt Shear

Compression Checks

Leg Design Data (Compression)

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 P / P_a
T1	59.5 - 39.5	P3.5x.226	20.00	5.00	44.9 K=1.00	18.319	2.6795	-28.02	49.09	0.571 ✔
T2	39.5 - 19.5	P3.5x.226	20.00	5.00	44.9 K=1.00	18.319	2.6795	-56.63	49.09	1.154 ✔
T3	19.5 - 13.1	P3.5x.226	6.41	6.41	28.8 K=0.50	19.497	2.6795	-62.88	52.24	1.204 ✔
T4	13.1 - 6.3	P3.5x.226	6.81	6.81	30.6 K=0.50	19.377	2.6795	-67.78	51.92	1.305 ✔
T5	6.3 - 0	P3.5x.226	6.31	3.16	25.5 K=0.90	19.709	2.6795	-69.72	52.81	1.320 ✔

Diagonal Design Data (Compression)

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 P / P_a

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 $\frac{P}{P_a}$
T1	59.5 - 39.5	P2.5x.203	8.67	8.67	109.8 K=1.00	11.571	1.7040	-6.75	19.72	0.342 ✔
T2	39.5 - 19.5	P2.5x.203	8.67	8.67	109.8 K=1.00	11.571	1.7040	-7.74	19.72	0.392 ✔
T3	19.5 - 13.1	P2x.154	9.81	9.81	149.6 K=1.00	6.676	1.0745	-4.09	7.17	0.571 ✔
T4	13.1 - 6.3	P2x.154	10.60	10.60	161.6 K=1.00	5.722	1.0745	-4.47	6.15	0.728 ✔
T5	6.3 - 0	L3x3x3/16	7.96	7.39	107.2 K=1.14	11.867	1.0900	-3.08	12.94	0.238 ✔

Horizontal Design Data (Compression)

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 $\frac{P}{P_a}$
T1	59.5 - 39.5	L2 1/2x2 1/2x1/4	7.58	7.02	171.6 K=1.00	5.072	1.1900	-1.10	6.04	0.183 ✔
T2	39.5 - 19.5	L2 1/2x2 1/2x1/4	7.58	7.02	171.6 K=1.00	5.072	1.1900	-0.98	6.04	0.163 ✔
T3	19.5 - 13.1	L3x3x1/4	7.58	6.96	141.0 K=1.00	7.506	1.4400	-1.85	10.81	0.171 ✔
T4	13.1 - 6.3	L3x3x1/4	8.28	7.72	156.5 K=1.00	6.100	1.4400	-1.18	8.78	0.134 ✔
T5	6.3 - 0	2L2x2x3/16	8.97	8.41	120.1 K=1.00	10.270	1.4300	-3.17	14.69	0.216 ✔

Top Girt Design Data (Compression)

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 $\frac{P}{P_a}$
T1	59.5 - 39.5	L3x5x1/4	7.58	6.82	122.1 K=0.99	9.242	1.9400	-1.69	17.93	0.094 ✔

Redundant Horizontal (1) Design Data (Compression)

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 $\frac{P}{P_a}$
T5	6.3 - 0	L2x2x3/16	2.24	2.08	91.6 K=1.45	14.013	0.7150	-1.21	10.02	0.121 ✔

Redundant Diagonal (1) Design Data (Compression)

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 $\frac{P}{P_a}$
T5	6.3 - 0	L2x2x3/16	3.76	3.46	112.7 K=1.07	11.308	0.7150	-1.02	8.09	0.126 ✔

Tension Checks

Leg Design Data (Tension)

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 $\frac{P}{P_a}$
T1	59.5 - 39.5	P3.5x.226	20.00	5.00	44.9	21.000	2.6795	21.91	56.27	0.389 ✔
T2	39.5 - 19.5	P3.5x.226	20.00	5.00	44.9	21.000	2.6795	48.58	56.27	0.863 ✔
T3	19.5 - 13.1	P3.5x.226	6.41	6.41	57.6	21.000	2.6795	54.28	56.27	0.965 ✔
T4	13.1 - 6.3	P3.5x.226	6.81	6.81	61.1	21.000	2.6795	58.65	56.27	1.042 ✔
T5	6.3 - 0	P3.5x.226	6.31	3.16	28.3	21.000	2.6795	60.04	56.27	1.067 ✔

Diagonal Design Data (Tension)

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 $\frac{P}{P_a}$
T1	59.5 - 39.5	P2.5x.203	8.67	8.67	109.8	21.000	1.7040	6.66	35.79	0.186 ✔
T2	39.5 - 19.5	P2.5x.203	8.67	8.67	109.8	21.000	1.7040	7.64	35.79	0.214 ✔
T3	19.5 - 13.1	P2x.154	9.81	9.81	149.6	21.000	1.0745	4.08	22.57	0.181 ✔
T4	13.1 - 6.3	P2x.154	10.60	10.60	161.6	21.000	1.0745	4.44	22.57	0.197 ✔
T5	6.3 - 0	L3x3x3/16	7.96	7.39	98.2	29.000	0.6945	3.04	20.14	0.151 ✔

Horizontal Design Data (Tension)

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 P / P_a
T1	59.5 - 39.5	L2 1/2x2 1/2x1/4	7.58	7.02	113.1	29.000	0.7753	1.14	22.48	0.051 ✔
T2	39.5 - 19.5	L2 1/2x2 1/2x1/4	7.58	7.02	113.1	29.000	0.7753	0.98	22.48	0.044 ✔
T3	19.5 - 13.1	L3x3x1/4	7.58	6.96	93.5	29.000	0.9159	1.49	26.56	0.056 ✔
T4	13.1 - 6.3	L3x3x1/4	8.28	7.72	102.6	29.000	0.9628	1.18	27.92	0.042 ✔
T5	6.3 - 0	2L2x2x3/16	8.97	8.41	123.4	29.000	0.8967	2.85	26.00	0.110 ✔

Top Girt Design Data (Tension)

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 P / P_a
T1	59.5 - 39.5	L3x5x1/4	7.58	6.82	101.0	29.000	1.3144	1.74	38.12	0.046 ✔

Redundant Horizontal (1) Design Data (Tension)

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 P / P_a
T5	6.3 - 0	L2x2x3/16	2.24	2.08	40.4	21.600	0.7150	1.21	15.44	0.078 ✔

Redundant Diagonal (1) Design Data (Tension)

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 P / P_a
T5	6.3 - 0	L2x2x3/16	3.76	3.46	67.3	21.600	0.7150	1.02	15.44	0.066 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
T1	59.5 - 39.5	Leg	P3.5x.226	1	-28.02	65.43	42.8	Pass
T2	39.5 - 19.5	Leg	P3.5x.226	28	-56.63	65.43	86.5	Pass
T3	19.5 - 13.1	Leg	P3.5x.226	55	-62.88	69.64	90.3	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
T4	13.1 - 6.3	Leg	P3.5x.226	64	-67.78	69.21	97.9	Pass
T5	6.3 - 0	Leg	P3.5x.226	73	-69.72	70.40	99.0	Pass
T1	59.5 - 39.5	Diagonal	P2.5x.203	9	-6.75	26.28	25.7	Pass
							61.4 (b)	
T2	39.5 - 19.5	Diagonal	P2.5x.203	36	-7.74	26.28	29.4	Pass
							70.4 (b)	
T3	19.5 - 13.1	Diagonal	P2x.154	63	-4.09	9.56	42.8	Pass
T4	13.1 - 6.3	Diagonal	P2x.154	72	-4.47	8.20	54.6	Pass
T5	6.3 - 0	Diagonal	L3x3x3/16	77	-3.08	17.24	17.8	Pass
							33.5 (b)	
T1	59.5 - 39.5	Horizontal	L2 1/2x2 1/2x1/4	24	-1.10	8.05	13.7	Pass
							20.7 (b)	
T2	39.5 - 19.5	Horizontal	L2 1/2x2 1/2x1/4	31	-0.98	8.05	12.2	Pass
							17.8 (b)	
T3	19.5 - 13.1	Horizontal	L3x3x1/4	60	-1.85	14.41	12.8	Pass
							14.9 (b)	
T4	13.1 - 6.3	Horizontal	L3x3x1/4	67	-1.18	11.71	10.0	Pass
							21.4 (b)	
T5	6.3 - 0	Horizontal	2L2x2x3/16	76	-3.17	19.58	16.2	Pass
							28.8 (b)	
T1	59.5 - 39.5	Top Girt	L3x5x1/4	6	-1.69	23.90	7.1	Pass
							10.2 (b)	
T5	6.3 - 0	Redund Horz 1 Bracing	L2x2x3/16	78	-1.21	13.36	9.1	Pass
T5	6.3 - 0	Redund Diag 1 Bracing	L2x2x3/16	79	-1.02	10.78	9.4	Pass
							Summary	
						Leg (T5)	99.0	Pass
						Diagonal (T2)	70.4	Pass
						Horizontal (T5)	28.8	Pass
						Top Girt (T1)	10.2	Pass
						Redund Horz 1 Bracing (T5)	9.1	Pass
						Redund Diag 1 Bracing (T5)	9.4	Pass
						Bolt Checks	70.4	Pass
						RATING =	**99.0**	**Pass**

CENTEK engineering
Centered on Solutions
63-2 North Branford Road
Branford, CT 06405
www.centekeng.com
P: (203) 488-0580
F: (203) 488-8587

Subject: FOUNDATION REINFORCEMENT DESIGN

Location: Avon, CT

Rev. 0: 6/2/15

Prepared by: T.J.L. Checked by: C.F.C.
Job No. 15001.047

Mat Foundation Analysis:

Input Data:

Tower Data

Overturning Moment =	$OM := 584 \cdot kips$	(User Input from tnxTower)
Shear Force =	$S_t := 12 \cdot kip$	(User Input from tnxTower)
Axial Force =	$WT_t := 13 \cdot kip$	(User Input from tnxTower)
Max Compression Force =	$C_t := 74 \cdot kip$	(User Input from tnxTower)
Uplift Force =	$U_t := 64 \cdot kip$	(User Input from tnxTower)
Tower Height =	$H_t := 59.5 \cdot ft$	(User Input)
Tower Width =	$W_t := 8.97 \cdot ft$	(User Input)
Tower Position on Foundation (1=offset, 2=centered) =	$Pos_t := 2$	(User Input)

Mat Data:

Overall Depth of Mat =	$D_f := 3.5 \cdot ft$	(User Input)
Thickness of Mat =	$T_f := 3.5 \cdot ft$	(User Input)
Length of Pier =	$L_p := 0ft$	(User Input)
Extension of Pier Above Grade =	$L_{pag} := 0.0 \cdot ft$	(User Input)
Diameter of Pier =	$d_p := 0.0 \cdot ft$	(User Input)
Foundation Reinforcement Area =	$A_{matreinf} := 310.10ft^2$	(User Input)
Distance From Center of Compression Leg to Extreme Edge of Proposed Mat =	$C_x := 5.75ft$	(User Input)
Distance From Tower/Mat Centroid to Front Edge of Proposed Mat =	$WT_x := 11.25ft$	(User Input)
Distance From Tower/Mat Centroid to Rear Edge of Proposed Mat =	$WTx_2 := 8.38ft$	(User Input)
Distance From Center of Uplift Legs to Extreme Edge of Proposed Mat =	$U_x := 14.00ft$	(User Input)
Section Moment of Area/Inertia of Mat =	$I_{mat} := 8120.4ft^4$	(User Input)
Section Modulus of Mat =	$S_{mat} := \left(\frac{I_{mat}}{WT_x}\right) = 743.03 \cdot ft^3$	(User Input)
Overall Width of Mat From Toe to Rear Edge=	$W_f := 19.63 \cdot ft$	(User Input)
Overall Width of Mat at Toe =	$W_{ftoe} := 6.25ft$	(User Input)
Overturing Moment Factor of Safety Required =	$FS_{reqd} := 2.0$	(User Input)

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Material Properties:

Concrete Compressive Strength =	$f_c := 4000 \cdot psi$	(User Input)	
Steel Reinforcment Yield Strength =	$f_y := 60000 \cdot psi$	(User Input)	
Internal Friction Angle of Soil =	$\theta_s := 30 \cdot deg$	(User Input)	
Allowable Soil Bearing Capacity =	$q_s := 12000 \cdot psf$	(User Input)	(Note: Allowable soil bearing pressure may be increased by 1/3rd for transient load efffects.
Unit Weight of Soil =	$\gamma_{soil} := 0 \cdot pcf$	(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 =	$n := 3.5 \cdot ft$	(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)	

Proposed Mat Reinforcement:

Bar Size =	$BS_{top} := 7$	(User Input)	(Top of Mat)
Bar Diameter =	$d_{btop} := 0.875 \cdot in$	(User Input)	(Top of Mat)
Bar Size =	$BS_{bot} := 7$	(User Input)	(Bottom of Mat)
Bar Diameter =	$d_{bbot} := 0.875 \cdot in$	(User Input)	(Bottom of Mat)
Clear Cover of Reinforcement =	$Cvr_{Mat} := 3.0 \cdot in$	(User Input)	
Reinforcement Location Factor =	$\alpha_{Mat} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	$\beta_{Mat} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	$\lambda_{Mat} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	$\gamma_{Mat} := 1.0$	(User Input)	(ACI-2008 12.2.4)

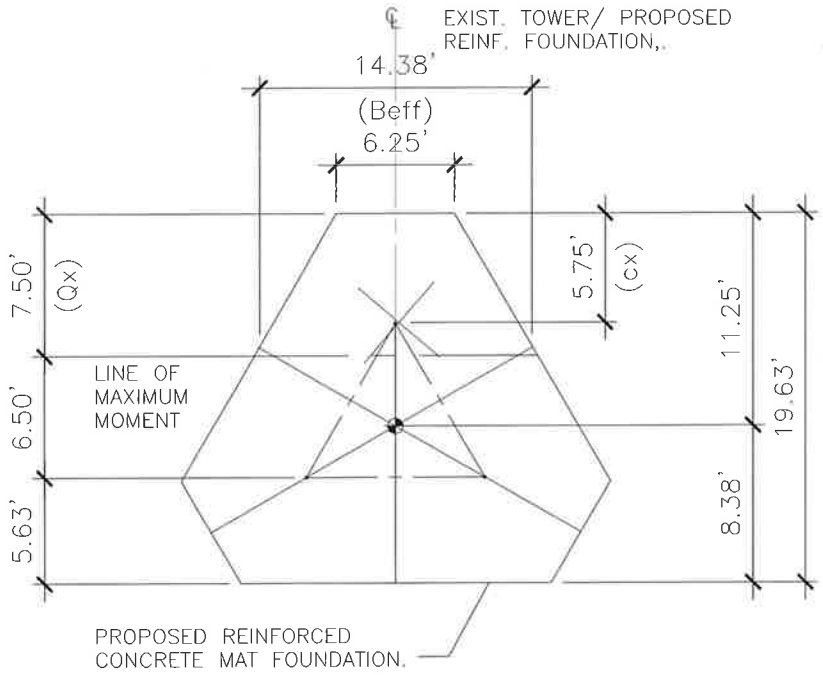
Calculated Factors:

Mat Top Reinforcement Bar Area = $A_{btop} := \frac{\pi \cdot d_{btop}^2}{4} = 0.6 \cdot in^2$

Mat Bottom Reinforcement Bar Area = $A_{bbot} := \frac{\pi \cdot d_{bbot}^2}{4} = 0.6 \cdot in^2$

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

Load Factor = $LF := \begin{cases} 1.333 & \text{if } H_t \le 700\cdot ft \\ 1.7 & \text{if } H_t \ge 1200\cdot ft \\ 1.333 + \left(\frac{H_t - 700ft}{1200ft - 700ft}\right)\cdot 0.4 & \text{otherwise} \end{cases}$ = 1.33



PLAN

Area: 310.100242
Perimeter: 67.852540
Bounding box: X: -11.308757 -- 11.308757
Y: -8.333333 -- 11.254008
Centroid: X: 0.000000
Y: 0.000000
Moments of inertia: X: 8120.374659
Y: 8120.374659
Product of inertia: XY: 0.000000
Radii of gyration: X: 5.117254
Y: 5.117254
Principal moments and X-Y directions about centroid:
I: 8120.374659 along [0.006003 0.999982]
J: 8120.374659 along [-0.999982 0.006003]

Proposed Reinforced Foundation Geometry:

Stability of Mat:

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

Adjusted Soil Unit Weight = $\gamma_s := if(Bouyancy = 1, \gamma_{soil} - 62.4pcf, \gamma_{soil}) = 0 \cdot pcf$

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

$P_{pt} := K_p \cdot \gamma_s \cdot (D_f - T_f) + c \cdot 2 \cdot \sqrt{K_p} = 0 \cdot ksf$

$P_{top} := if[n < (D_f - T_f), P_{pt}, P_{pn}] = 0 \cdot ksf$

$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p} = 0 \cdot ksf$

$P_{ave} := \frac{P_{top} + P_{bot}}{2} = 0 \cdot ksf$

$T_p := if[n < (D_f - T_f), T_f, (D_f - n)] = 0$ $A_p := W_{ftoe} \cdot T_p = 0$

Ultimate Shear = $S_u := P_{ave} \cdot A_p = 0 \cdot kip$

Volume of Existing Concrete Piers Within Mat = $V_{pier} := 3 \cdot \left(T_f \cdot \frac{d_p^2 \cdot \pi}{4} \right) = 0 \cdot ft^3$

Volume of Proposed Mat = $V_{matreinf} := A_{matreinf} T_f = 1085.35 \cdot ft^3$

Weight of Concrete Mat = $WT_c := V_{matreinf} \gamma_{conc} = 162.8 \cdot kips$

Total Weight of Concrete Mat and Tower = $WT_{tot} := WT_c = 162.8 \cdot kips$

Overturning Moment = $M_{ot} := OM + S_t \cdot (T_f) = 626 \cdot kip \cdot ft$

Required Moment = $M_{design} := M_{ot} \cdot FS_{reqd} = 1252 \cdot kip \cdot ft$

Resisting Moment without Anchors = $M_r := (WT_{tot}) \cdot WT_x = 1779 \cdot kip \cdot ft$

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

$OverTurning\_Moment\_Check := if(FS \geq FS_{reqd}, "Okay", "Provide Anchorage")$

OverTurning_Moment_Check = "Okay"

Reinforced Concrete Mat Shear and Moment Calculations:

Mat Dead Load = $WT_{tot} = 162.8 \cdot kips$

Equivalent Soil Reaction Occuring at Base of Foundation = $Q := C_t + WT_{tot} - U_t = 172.8 \cdot kips$

Summing Moments About Toe of Mat Foundation to Find Distance of Soil Reaction (Qx) =

$$M := \left[\left(C_t \cdot C_x\right) + \left(WT_{tot} \cdot WT_x\right) - \left(U_t \cdot U_x\right)\right] - S_t \cdot \left(T_f + L_{pag}\right) = 1297.57 \cdot kip \cdot ft$$

$$Q_x := \frac{M}{Q} = 7.51 \cdot ft$$

Qx > Cx Therefore Shear and Moment Calculations Are As Follows:

$C_x = 5.75 \cdot ft$

$V1_A := -C_t = -74 \cdot kips$

$V2_A := V1_A + Q = 98.8 \cdot kips$

$V3_A := V2_A - WT_{tot} = -64 \cdot kips$

$V4_A := V3_A + U_t = 0 \cdot kips$

$$M1_A := -\left[\frac{S_t}{2} \cdot \left(T_f + L_{pag}\right)\right] = -21 \cdot kip \cdot ft$$

$M2_A := M1_A + V1_A \cdot \left(Q_x - C_x\right) = -151.17 \cdot kip \cdot ft$

$M3_A := M2_A + V2_A \cdot \left(WT_x - Q_x\right) = 186.72 \cdot kip \cdot ft$

$M4_A := M3_A + V3_A \cdot \left(U_x - WT_x\right) = 21 \cdot kip \cdot ft$

$$M5_A := M4_A - \left[\frac{S_t}{2} \cdot \left(T_f + L_{pag}\right)\right] = 0 \cdot kip \cdot ft$$

$M_1 := \left|M1_A\right| = 21 \cdot kip \cdot ft$

$M_2 := \left|M2_A\right| = 151.17 \cdot kip \cdot ft$

$M_3 := \left|M3_A\right| = 186.72 \cdot kip \cdot ft$

$M_4 := \left|M4_A\right| = 21 \cdot kip \cdot ft$

$M_5 := \left|M5_A\right| = 0 \cdot kip \cdot ft$

$$M_{max} := \max\begin{pmatrix} M_1 \\ M_2 \\ M_3 \\ M_4 \\ M_5 \\ 0 \\ 0 \\ 0 \end{pmatrix} = 186.72 \cdot kip \cdot ft$$

Mat Steel Reinforcement Design:

Required Reinforcement for Bending:

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

Design Moment = $M_n := \left(\frac{LF}{\phi_m}\right) \cdot M_{max} = 276.56 \cdot kip \cdot ft$

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

(ACI-200810.2.7.3)

$b_{eff} := 171in$ (User Input) Effective width taken at point of maximum moment through triangular mat foundation.

$d := T_f - Cvr_{Mat} - d_{bbot} = 38.13 \cdot in$

$A_{st} := \frac{M_n}{(0.9 f_y \cdot d)} = 1.61 \cdot in^2$

$a := \frac{A_{st} \cdot f_y}{\beta \cdot f_c \cdot b_{eff}} = 0.17 \cdot in$

$A_{st} := \frac{M_n}{f_y \cdot \left(d - \frac{a}{2}\right)} = 1.45 \cdot in^2$

$\rho := \frac{A_{st}}{b_{eff} d} = 0.00022$

Required Reinforcement for Temperature and Shrinkage:

$$\rho_{sh} := \begin{cases} .0018 & \text{if } f_y \ge 60000 \cdot psi \\ .0020 & \text{otherwise} \end{cases} = 0.0018$$

(ACI -2008 7.12.2.1)

Determine Bottom Bars:

$$As := \begin{cases} A_{st} & \text{if } \rho > \frac{\rho_{sh}}{2} \\ \rho_{sh} \cdot b_{eff} \frac{d}{2} & \text{otherwise} \end{cases} = 5.87 \cdot in^2$$

Quantity of Rebar Required = $Nbar_{reqd} := \frac{As}{A_{bbot}} = 9.8$ $Nbar_{prov} := 14$

Rebar Spacing = $B_s := \left(\frac{b_{eff} - 2 \cdot Cvr_{Mat} - d_{bbot}}{Nbar_{prov}}\right) - d_{bbot} = 10.8 \cdot in$

(USE #7 @12" o.c. min.
Area of steel =
0.60in^2*14 = 8.40in^2

Soil Bearing Pressure:

Distance to Kern = $X_k := \frac{W_f}{3} = 6.54$

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

Distance of Equivalent Soil Reaction From Toe = $a := Q_x = 7.51 \cdot ft$

$Eccentricity\_Check := if\left(a > X_k, "InsideMiddleThird", "OutsideMiddleThird"\right)$

$Eccentricity\_Check = "InsideMiddleThird"$

Total Load = $P_{total} := Q = 173 \cdot kip$

For Equilibrium Total Soil Reacton Shall Equal Total Downward Dead Load

Maximum Pressure in Mat = $P_{max} := \frac{P_{total}}{A_{matreinf}} + \frac{P_{total} \cdot \left(WT_x - Q_x\right) \cdot WT_x}{I_{mat}} = 1.35 \cdot ksf$

$Max\_Pressure\_Check := if\left(P_{max} < q_s, "Okay", "No Good"\right)$

$Max\_Pressure\_Check = "Okay"$

Minimum Pressure in Mat = $P_{min} := \frac{P_{total}}{A_{matreinf}} - \frac{P_{total} \cdot \left(WT_x - Q_x\right) \cdot WT_x}{I_{mat}} = -0.24 \cdot ksf$

$Min\_Pressure\_Check := if\left[\left(P_{min} \geq 0\right) \cdot \left(P_{min} < q_s\right), "Okay", "No Good"\right]$

$Min\_Pressure\_Check = "No Good"$

If Resultant Force is Not in Kern, Area to which Pressure is Applied Must be Reduced as Follows:-

Distance to Resultant of Pressure Distribution = $X_p := \frac{P_{max}}{\frac{P_{max} - P_{min}}{W_f}} \cdot \frac{1}{3} = 5.56$

Area Under Mat Subjected to Triangular Pressure Distribution = $A_{pressure} := a \cdot \left(\frac{a}{\tan(60 \cdot deg)}\right) + W_{ftoe} \cdot (a) = 79.49 \cdot ft^2$

Total Pressure Within Triangular Pressure Diagram = $P_a := \frac{2 \cdot P_{total}}{3 \cdot A_{pressure}} = 1.45 \cdot ksf$

Adjusted Soil Pressure = $q_{adj} := if\left(a \leq X_k, P_a, P_{max}\right) = 1.35 \cdot ksf$

$Pressure\_Check := if\left(q_{adj} < q_s, "Okay", "No Good"\right)$

$Pressure\_Check = "Okay"$

SITE NAME	067133_TALCOTT_MTN_CT	ECP - CELL #	0	8	133
LATITUDE	41.811767	LONGITUDE	-72.798708		
RET antenna upgrade with 60W AWS and 700 RRH upgrade. Please not the combination of mechanical and electrical tilt. The 60W 4 port 700 RRH will be connected to the low band ports on the AWS and PCS antenna. Please note the electrical tilt for 700 is on the SBNHH antennas		SAVE BUTTON			
		STRUCTURE TYPE	Monopole		

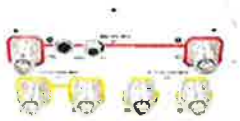
700 Mhz - LTE Current Config	ALPHA	BETA	GAMMA
EQUIPMENT TYPE	ALU TRDU-2X40-700	#N/A	ALU TRDU-2X40-700
ANTENNA TYPE	APX75-866514T8 749MHZ	#N/A	BXA-70080-6CF-EDIN-6
QTY OF ANTENNAS PER FACE	1	#N/A	1
ORIENTATION (DEG)	30	#N/A	270
DOWN TILT (MECH/DEG)	3	#N/A	7
RAD CTR (FT AGL)	55	#N/A	55
TMA - INSTALLED	No	#N/A	No
RRH - INSTALLED	No	#N/A	No
700 Mhz - LTE Future Config	**ALPHA**	**BETA**	**GAMMA**
EQUIPMENT TYPE	ALU TRDU-2X40-700	#N/A	ALU TRDU-2X40-700
ANTENNA TYPE	APX75-866514T8 749MHZ	#N/A	BXA-70080-6CF-EDIN-6
QTY OF ANTENNAS PER FACE	keep as placeholder	#N/A	keep as placeholder
ORIENTATION (DEG)	30	#N/A	270
DOWN TILT (MECH/DEG)	8 elect / 3 mech	#N/A	10 elect / 3 mech
RAD CTR (FT AGL)	55	#N/A	55
TMA - QTY / MODEL			
RRH - QTY/MODEL	1 ALU RH_2X60-700U		1 ALU RH_2X60-700U
850 Celluar - Current Config	**ALPHA**	**BETA**	**GAMMA**
EQUIPMENT TYPE	CELLULAR MOD 4.0B	#N/A	CELLULAR MOD 4.0B
ANTENNA TYPE	LPA-80063-6CF-EDIN-10	#N/A	LPA-80080-6CF-EDIN-6
QTY OF ANTENNAS PER FACE	2	#N/A	2
ORIENTATION (DEG)	30	#N/A	270
DOWN TILT (MECH/DEG)	3	#N/A	5
RAD CTR (FT AGL)	55	#N/A	55
TMA - INSTALLED	No	#N/A	No
RRH - INSTALLED	No	#N/A	No
850 Celluar - Future Config	**ALPHA**	**BETA**	**GAMMA**
EQUIPMENT TYPE	CELLULAR MOD 4.0B	#N/A	CELLULAR MOD 4.0B
ANTENNA TYPE	LPA-80063-6CF-EDIN-10	#N/A	LPA-80080-6CF-EDIN-6
QTY OF ANTENNAS PER FACE	2	#N/A	2
ORIENTATION (DEG)	30	#N/A	270
DOWN TILT (MECH/DEG)	3	#N/A	5
RAD CTR (FT AGL)	55	#N/A	55
TMA - QTY / MODEL			
RRH - QTY/MODEL			
1900 PCS - Current Config	**ALPHA**	**BETA**	**GAMMA**
EQUIPMENT TYPE	PCS MOD 4.0B	#N/A	PCS MOD 4.0B
ANTENNA TYPE	BXA-171063-8CF-EDIN-2	#N/A	BXA-171063-8CF-EDIN-2
QTY OF ANTENNAS PER FACE	1	#N/A	1
ORIENTATION (DEG)	30	#N/A	270
DOWN TILT (MECH/DEG)	4	#N/A	4
RAD CTR (FT AGL)	55	#N/A	55
TMA - INSTALLED	No	#N/A	No
RRH - INSTALLED	No	#N/A	No
1900 PCS - Future Config	**ALPHA**	**BETA**	**GAMMA**
EQUIPMENT TYPE	PCS MOD 4.0B	#N/A	PCS MOD 4.0B
ANTENNA TYPE	SBNHH-1D65B	#N/A	SBNHH-1D65B
QTY OF ANTENNAS PER FACE	1	#N/A	1
ORIENTATION (DEG)	30	#N/A	270
DOWN TILT (MECH/DEG)	2 electical / 3 mechanical	#N/A	2 electical / 3 mechanical
RAD CTR (FT AGL)	55	#N/A	55
TMA - QTY / MODEL			
RRH - QTY/MODEL	1 ALU RH_2X60-PCS		1 ALU RH_2X60-PCS
AWS - LTE Current Config	**ALPHA**	**BETA**	**GAMMA**
EQUIPMENT TYPE	ALU RRH_2X40-AWS	#N/A	ALU RRH_2X40-AWS
ANTENNA TYPE	BXA-171063-12BF-EDIN-2	#N/A	BXA-171063-12BF-EDIN-2
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	30	#N/A	270
DOWN TILT (MECH/DEG)	3	#N/A	3
RAD CTR (FT AGL)	55	#N/A	55
TMA - INSTALLED	No	#N/A	No
RRH - INSTALLED	Yes	#N/A	Yes
AWS - LTE Future Config	**ALPHA**	**BETA**	**GAMMA**
EQUIPMENT TYPE	2100 BBU	#N/A	2100 BBU
ANTENNA TYPE	SBNHH-1D65B	#N/A	SBNHH-1D65B
QTY OF ANTENNAS PER FACE	1	1	1
ORIENTATION (DEG)	30	#N/A	270
DOWN TILT (MECH/DEG)	2 electical / 3 mechanical	#N/A	3 electical / 3 mechanical
RAD CTR (FT AGL)	55	#N/A	55
TMA - QTY / MODEL			
RRH - QTY/MODEL	1 ALU RH_2X60-AWS		1 ALU RH_2X60-AWS

NUMBER OF CABLE'S NEEDED								Fiber Lines Model number			
TOTAL # FIBER LINES	2	TOTAL # OF MAINLINES				12		FIBER LINE MODEL #			HB158-1-08U8-S8J18
TOTAL # TOP JUMPERS	6	TOTAL # OF TOP JUMPERS				28		FIBER TOP JUMPER MODEL #			HB114-1-08U4-S4J18
Equipment Cable Ordering		**MAIN CABLE #**	12	+	0			**TOP JUMPER #**	16	+	8
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/ WHITE	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				Rob Hesselbach				MB			3/24/2015

Product Specifications

COMMSCOPE®

POWERED BY ANDREW.



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	0 ° | 14.5	0 ° | 17.4	0 ° | 17.8	0 ° | 18.1	0 ° | 18.2
	7 ° | 14.6	7 ° | 14.4	3 ° | 17.5	3 ° | 17.9	3 ° | 18.3	3 ° | 18.4
	14 ° | 14.2	14 ° | 13.6	7 ° | 17.4	7 ° | 17.9	7 ° | 18.2	7 ° | 18.4
Beamwidth, Horizontal Tolerance, degrees	±2.2	±3.4	±2	±4.6	±5.7	±4.3
Beamwidth, Vertical Tolerance, degrees	±0.8	±1	±0.3	±0.2	±0.3	±0.2
USLS, dB	16	14	16	16	16	15
Front-to-Back Total Power at 180° ± 30°, dB	25	26	27	26	26	26
CPR at Boresight, dB	22	23	21	20	20	22
CPR at Sector, dB	13	11	16	12	11	4

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

General Specifications

Antenna Brand	Andrew®
Antenna Type	DualPol® multiband with internal RET
Band	Multiband
Brand	DualPol® | Teletilt®
Operating Frequency Band	1710 – 2360 MHz | 698 – 896 MHz

Mechanical Specifications

Product Specifications

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.

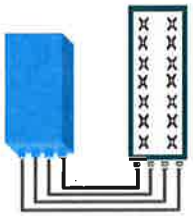
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the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

Alcatel·Lucent

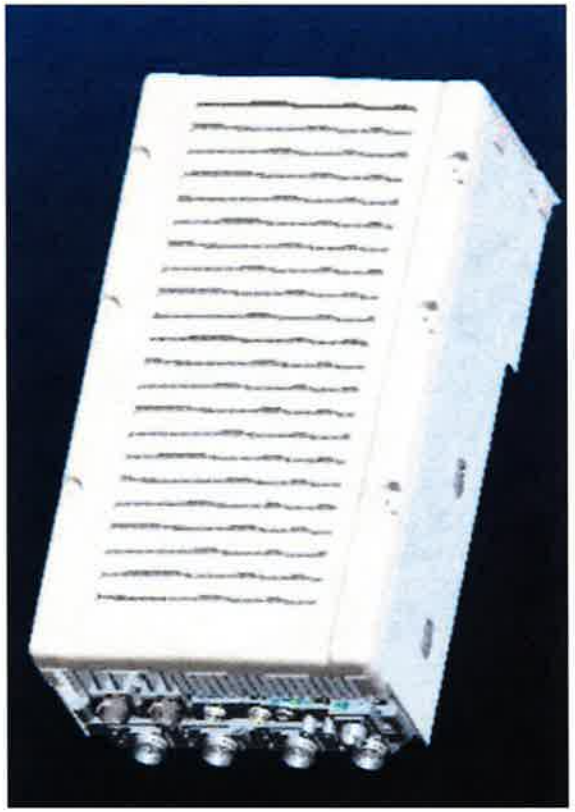
TECHNICAL SPECIFICATIONS

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

NEW PCS RF MODULES FOR VZW
RRH2X60 - HW CHARACTERISTICS

LR14.3

	RRH2x60
RF Output Power	2x60W (4x30W HW Ready)
Instantaneous Bandwidth	60MHz
Target Reliability (Annual Return Rate)	<2%
Receiver	4 Branch Rx
Features	AISG 2.0 for RET/TMA
Power	-48VDC
	Internal Smart Bias-T
CPRI Ports	2 CPRI Rate 5 Ports
External Alarms	4 External User Alarms
Monitor Ports	TX, RX
Environmental	GR487 Compliance
RF Connectors	7/16 DIN (downward facing)
Dimensions	22"(h) x 12"(w)x 9.4" (d)**
Weight	55lb**



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

Alcatel·Lucent

ALCATEL-LUCENT WIRELESS PRODUCT DATASHEET

RRH2X60-AWS FOR BAND 4 APPLICATIONS

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

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

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

SUPERIOR RF PERFORMANCE

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

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

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

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

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

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

OPTIMIZED TCO

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

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

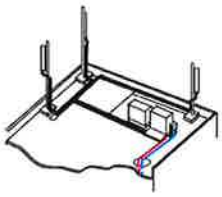
EASY INSTALLATION

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

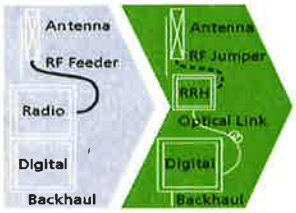
The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment. However, many of these sites can host an Alcatel-Lucent RRH2x60-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation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

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

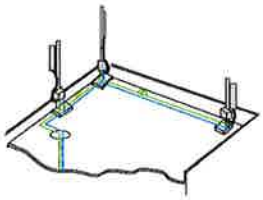
Installation can easily be done by a single person as the Alcatel–Lucent RRH2x60-AWS is compact and weighs about 20 kg, eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day.



Macro



RRH for space-constrained cell sites



Distributed

FEATURES

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

BENEFITS

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

TECHNICAL SPECIFICATIONS

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

36.7"x10.6"x5.8"

Dimensions and weights

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

Electrical Data

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

RF Characteristics

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

Connectivity

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

Environmental specifications

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

Safety and Regulatory Data

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

Alcatel·Lucent

AT THE SPEED OF IDEAS™

Product Data Sheet DB-B1 and DB-T1 Series

DC and Fiber Management Distribution Boxes for HYBRIFLEX™ Cable

Product Description

The RFS Distribution Box design comes with the option for pluggable over voltage protection (OVP) for up to 6 remote radios and the connection for 6 pairs of optical fiber with LC optical fiber cable management. There is a hybrid cable input with a jumper configuration for power and optical fiber to the remote radio heads (RRHs). A custom wall, a 2-inch pole, and an H-Frame mounting bracket are included. Both the compact and standard design are available with lightening protection.

Features/Benefits

- Designed to accommodate varying diameters of HYBRIFLEX™ (combined power and fiber optic) cables – up to 2 inches
- Supports Single- and Multi-Mode Optical fiber
- NEMA 4x rated enclosure – allows **flexibility for indoor or outdoor installation** on a roof or tower top
- Weatherproof enclosure and ports – **improves system reliability**
- Modular design – makes replacement or addition of OVP easy without removal of other components within the box
- Strikesorb OVP technology – protects equipment from damaging surges up to 60 kA on an 8/20 waveform and up to 5 kA on a 10/350 waveform (certain models only)
- Low residual voltage and high impedance – **ideally suited for RRH technology** – won't shut down the RRH the way spark gap technology does (certain models only)

Technical Specifications

Mechanical Specifications

Model Number	DB-B1-6C-8AB-0Z	DB-T1-6Z-8AB-0Z
Enclosure Design	Standard, 6 OVP's	Standard without OVP
Dimensions - H x W x D, mm (in)	610 x 610 x 254 (24 x 24 x 10)	610 x 610 x 254 (24 x 24 x 10)
Weight, kg (lb)	20 (44)	20 (44)
Suppression Connection Method	Compression lug, #2-#14 AWG Copper, #2-#12 Aluminum	
Fiber Connection Method	LC-LC Single- or Multi-mode duplex	
Environmental Rating	NEMA 4x	
Operating Temperature, °C (°F)	-40 to +80 (-40 to +176)	
UV Protection	ISO 4892-2 Method A Xenon-Arc 2160 hrs	

Electrical Specifications

Nominal Operating Voltage	48 VDC	
Nominal Discharge Current (I_n) per UL 1449 3rd Ed	20 kA 8/20 µs	N/A
Maximum Discharge Current (I_{max}) per NEMA LS-1	60 kA 8/20 µs	N/A
Maximum Impulse (Lightning) Current (I_{imp}) per IEC 61643-1	5 kA 10/350 µs	N/A
Maximum Continuous Operating Voltage (U_c)	75 VDC	N/A
Voltage Protection Rating per UL1449 3rd Ed	400 V	N/A
Protection Class as per IEC 61643-1	Class 1	N/A
Strikesorb OVP Compliance	ANSI/UL 1449-3rd Ed	N/A
	IEEE C62.41	N/A
	NEMA LS-1	N/A
	IEC 61643-1	N/A
	IEC 61643-12	N/A
	EN 61643-11	N/A

* This data is provisional and subject to change.